Case Study: Poles in the Urban Clear Zone

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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.

Many standards and guidelines apply to poles beside the roadway. For example, three primary resources were reviewed for traffic signs, four were reviewed for traffic signal posts, and several others were found to cover utility poles and support equipment.

Field investigations were conducted at the sites of 385 pole collisions. Lateral clearance from the roadway and other data were collected for statistical analysis. These data revealed several interesting characteristics associated with urban pole collisions. For example, about 90 percent of the accidents occurred within 10 ft 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.

Curves were overrepresented in pole accidents by a 6 to 1 ratio. 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.

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.

The clear zone philosophy calls for wide, flat roadsides that are free of obstacles. The clear zone concept is often difficult to retrofit to existing roads within urban areas. These older roads frequently have insufficient right-of-way, and there may be many structures, utilities, or other obstacles already in place. This paper describes one aspect (poles) of a clear zone treatment program devised by a typical southern city.

DEVELOPMENT OF THE PROGRAM

The Department of Transportation of Huntsville, Alabama (HDOT) wished to design a safety program to address the clear zone. The University of Alabama was engaged by HDOT to help prepare and conduct the program. The initial phase consisted of a review of technical literature to determine the state of the art and to establish an overall program. This stage was completed in 1986 and resulted in a publication outlining clear zone criteria for a number of types of common clear zone obstacles (*1*).

Following receipt of the report, HDOT and the university's research staff devised the second phase of the clear zone implementation plan. This involved designing policies for specific types of objects in the clear zone. A field investigation program was designed to visit the sites of 1,245 run-off-road hit-fixed-object collisions to gather data regarding accident and site characteristics. The objects were classified into four groups to facilitate the implementation program. They included 94 mailbox collisions, 177 tree collisions, 458 pole collisions, and 516 barrier, bridge-abutment, and other-object collisions.

This paper concerns the development of the clear zone implementation policy for poles. This policy was complex because it had to address several types of poles. The initial research had found that different agencies had formulated policies for various types of poles, and the Huntsville clear zone program would have to address each of these.

The remainder of this paper describes applicable standards, the field inspection program and the development of recommendations for a pole clear zone policy for Huntsville, Alabama.

LITERATURE REVIEW

Example Lateral Clearances

The development of clear zone philosophies on several fronts led to different approaches, different philosophies, and even conflicting information regarding the clear zone. Example guidelines are reviewed in the next few paragraphs for both the general situation and specific types of poles.

General Horizontal Clearances

The primary references that offer guidelines for horizontal clearances are the AASHTO Green Book (*2*) and the AASHTO Barrier Guide (*3*).

The Barrier Guide provides comprehensive procedures for selection of clearances at individual sites based on speed, side slopes, horizontal curvature, and other factors. Several clear zone statements are found throughout the text indicating that the width of the clear zone is related to vehicle speed, type of facility, and other parameters. The information can be grossly summed up in three categories:

1. Urban, curbed streets: minimum 1.5 ft behind the curb (3.0 ft desired);
2. Urban, with paved shoulder, or rural low-speed (<40 mph): minimum 10 ft from edge of through-traffic lane; and

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3. Freeways, high-speed rural collectors, and other objects in the clear zone: full treatment of the *AASHTO Barrier Guide* (*3*).

These three statements represent only one reference, and there are many other possible references that might be appropriate for any specific pole located in the clear zone.

Traffic Signs

Traffic control devices are covered in great detail in national and state versions of the *Manual on Uniform Traffic Control Devices* and other supporting documents. These references were screened for lateral clearances for signs used as traffic control devices (*4–6*). The results of that survey are shown in Table 1. The clearances shown in the table are not always identical, but there is good agreement in most instances. These clearances may be summarized in five specifications:

1. 2 ft from the face of a curb to the edge of a sign,
2. 12 ft from the edge of the traveled way,
3. 2 ft from the edge of a paved shoulder or 6 ft from the edge of other shoulders,
4. 2 ft behind guardrails, and
5. Higher standards for freeways.

Traffic Signal Poles and Controller Cabinets

The lateral clearances found in four authoritative documents (*5–8*) have been summarized in the four statements shown below. Because traffic signals are normally used only in urban areas, the lateral clearance information is more precise than that used for signs.

1. 2 ft behind a vertical curb,
2. 2 ft from the edge of the shoulder,
3. 10 ft from the edge of traffic lanes, and
4. Not in medians if possible, and where used in medians protected by guardrail.

Luminaires

The guidance for luminaires is less detailed than that found for traffic control devices. Only one national reference identified specific statements (*6*). It indicated that light poles should be placed behind guardrails, retaining walls, or other structures where possible, or as far from the roadway as possible. Otherwise, luminaire supports should be breakaway or have yielding characteristics to minimize damage to vehicles that strike them. Specific dimensions associated with clearances for luminaire supports are 2 ft behind the face of a curb or 2 ft behind usable shoulders.

Utilities

Utility organizations take advantage of roadway right-of-way for their underground and overhead carriers. This arrangement minimizes their expense in purchasing right-of-way and thus reduces rates for their customers. This practice has been followed for many years, and in some locations the maze of utility poles now presents a formidable hazard to vehicles that accidently exit the pavement. AASHTO has developed a guide for utilities along highways (*9*) and a policy for the accommodation of utilities along freeways (*10*). In addition, the Alabama Highway Department has developed a set of utility guidelines (*11*). The AASHTO utility documents contain only general statements about acceptable locations, and the Alabama Highway Department manual echoes these statements and does not provide specific clear zone dimensions.

Some of the most difficult clear zone situations involve utilities. Utility organizations have massive investments in

TABLE 1 CLEAR ZONE INFORMATION FOR TRAFFIC SIGNS

Environment	Specifications	Reference
General	Signs should have the maximum lateral clearance from the edge of the traveled way for the safety of vehicles that may leave the roadway and strike the sign supports. Advantage should be taken of existing guardrail, overcrossing structures, and other conditions to minimize the exposure of sign supports to traffic. Otherwise, breakaway or yielding supports should be used.	(*4*), p. A-21, and (*5*), p. 2A-15
	Where possible, [place] behind existing or planned guardrail, retaining walls or bridges,. . .as far as possible from the roadway out of the likely path of an out-of-control vehicle. Otherwise, breakaway or yielding supports should be used.	(*6*), pp. 1–5
Normal	2 ft from paved shoulder	(*4*), p. A-21
	2 ft behind usable shoulder	(*6*), p. 5
	6 ft from edge of shoulder	(*4*), p. A-21
	2 ft from face of curb	(*4*), p. A-21
	2 ft behind face of unmountable curb	(*6*), p. 5
	12 ft from edge of traveled way	(*4*), p. A-21
	12 ft from edge of traveled way	(*5*), p. 2A-15
	2 ft behind guardrail	(*4*), p. A-21
Urban	2 ft from curb face, recommended	(*5*), p. 2A-15
	1 ft from curb face, minimum	(*5*), p. 2A-15
	2 ft from face of curb to sign edge	(*4*), p. A-21
Expressways	6 ft from unmountable curb	(*5*), p. 2A-15
	6 ft from usable shoulder	(*5*), p. 2A-15
	6 ft from shoulder break for major signs	(*4*), p. A-21
	10 ft from nearest traffic lane, minimum	(*5*), p. 2A-15
	30 ft from nearest traffic lane, preferred for large signs	(*5*), p. 2A-15
	30 ft from edge of through lane pavement is desirable	(*4*), p. A-21
	6 ft for connecting roadways or ramps at interchanges	(*5*), p. 2A-15

lines, pipes, and other carriers. Many of these were installed a long time ago and met the standards of the day. The standards have changed over time, and utility corporations now find themselves with hardware that does not meet the current clear zone policy. Should they be forced to retrofit all of their poles to meet current criteria? If so, which criteria should they follow, because different but widely accepted standards and guidelines obviously conflict with each other in the roadside clear zone.

TREATMENTS RECOMMENDED BY NATIONAL UTILITY POLE RESEARCH

A research study performed in the early 1980s screened over 2,500 mi of highway in four states and located 9,583 utility pole accidents (*12*). The distribution of accident severity was 1.0 percent fatal accidents, 46.3 percent injury accidents, and 52.7 percent accidents where only property damage occurred. The researchers determined that the lateral clearance to the pole, the volume of traffic, and the pole density (number of poles per mile) were the key factors associated with utility pole accidents. They also developed a utility-pole-accident predictor model. This same research utilized cost data from telephone and utility corporations to prepare a cost-effectiveness analysis. General guidelines were developed for treatment of utility poles within the clear zone.

This methodology was enhanced to provide a computer program for analysis of utility poles in the clear zone. This program is called UPACE and comes complete with a user's manual for those who wish to employ the model (*13*). This user's manual contained a simplified listing of possible treatments for utility poles. These are reviewed below.

Placing Utility Lines Underground

This is an excellent treatment, but there is still a need for some poles (street lights, etc.), surface transformer pads, switching cabinets, and other associated hardware. Where these are used, they should be in compliance with the applicable clear zone guidelines. Due to the higher expense associated with underground power and communications lines, they cannot be used at every location.

Moving Poles Farther from the Roadway

Increasing the lateral clearance between the roadway and a utility pole will decrease the number of accidents. Previous research has found that those located 10 ft from the curb may be three times less likely to be struck than those located adjacent to the curb. Other research has shown an overrepresentation of pole accidents in the first 10 ft from the roadway.

Roadside Barrier

Both guardrail and impact attenuators are used to reduce the severity of traffic accidents with fixed objects. There is not a large amount of data available on the effectiveness of these devices to protect motorists from utility pole collisions.

Removing Poles

An obvious way to decrease utility pole accidents is to decrease the number of poles beside the roadway. Three methods are available:

1. Make multiple use of existing poles, with one pole carrying street lights, electric power cables, telephone cables, cable TV lines, and other utilities.
2. Place poles on only one side of the street instead of on both sides.
3. Increase the distance between poles.

Prior to the adoption of any of these procedures, an engineering study should be conducted to determine whether they are cost effective and whether they are appropriate for the specific site.

Breakaway Poles

Research is under way to develop a prototype utility pole that will shear upon a vehicle's impact and fly out of the way, rather than causing a sudden deceleration of the automobile. Several types of breakaway poles have been substantiated through vehicle crash testing and a program is now under way to field test some of these poles.

Keeping the Vehicle on the Roadway

One way to prevent utility pole accidents is to assist the driver in staying on the roadway. This can be done through improved roadway delineation (pavement marking, delineators, and other devices), providing advanced warning signs, improving the skid resistance of pavement, widening travel lanes, widening or paving shoulders, increasing lighting in areas where accidents frequently occur at night, and straightening sharp curves.

HUNTSVILLE FIELD INSPECTION PROGRAM

Representatives of HDOT and the university's research staff prepared a field inspection program to gain additional information about Huntsville clear zone collisions. Factors that might affect fixed object collisions were identified through a review of literature and an examination of sample accident reports. A data from was devised for field visits, then inspectors were trained through a combination office and field program. In the spring of 1987, sample test sites were visited and the data collection form was refined.

From the 458 pole accidents that occurred between January 1, 1985, and June 30, 1987, 385 were selected for field investigation. Of these, project personnel could locate only 310 with certainty. In some instances, the police accident report did not contain sufficient information to locate the site. In other instances, the site could be located but the specific pole could not be identified. Occasionally, the pole involved in a collision had been removed by the time inspectors got to the site (as much as 36 months after the accident). In spite of these factors, investigators identified 310 with certainty and gathered the data required by the investigation form.

Data for all 385 accidents were codified because many pieces of data—such as month, day, and time—could be taken directly from the police officer's report. Some analyses were conducted on this complete data set, but others were restricted to those 310 locations where specific field data were collected.

ANALYSIS OF RESULTS

A statistical review indicated that, in most instances, the Huntsville situation parallels the national situation for pole accident statistics. Details of the Huntsville situation may be found on Figures 1 through 13 and in the following.

Severity

The severity of vehicle impacts with poles in Huntsville is outlined by Figure 1. Injuries occurred in 39.7 percent of these collisions, fatalities occurred 1.6 percent of the time, and property damage occurred 58.7 percent of the time. The FHWA study (*12*) referenced earlier found 49.7 percent injuries, 0.9 percent fatalities, and 49.4 percent property damage. The severity of pole accidents in Huntsville can be considered as similar to the national picture.

Day and Time

The pattern for day of the week and time of day is shown by Figures 2 and 3. They indicate that the largest number of these accidents occur on Saturday and that the remainder of these accidents are reasonably balanced during the week. There is not a highly pronounced weekend effect on Friday and Saturday night, which might have indicated a strong link to alcohol impairment.

Almost half of these accidents occurred in the late night hours, after 8:00 p.m. This implies that visibility of the roadway may be a problem, or that driver fatigue or impairment might be a key.

Although there were trends toward weekend and late night overrepresentation of pole accidents, these trends were not as strong as those exhibited for other fixed-object collisions. Pole accidents were more likely to occur during normal weekdays and daylight hours than were other off-road collisions in Huntsville.

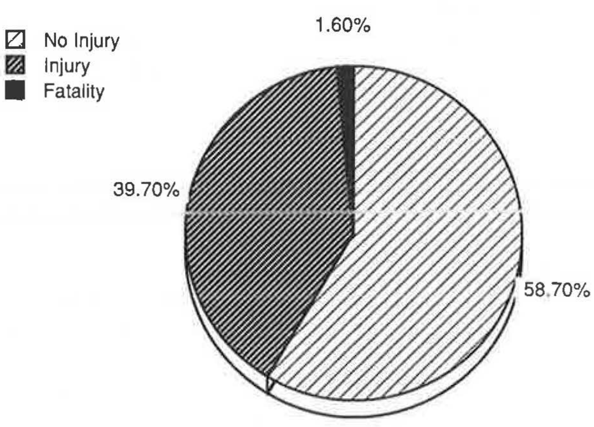

FIGURE 1 Pole accident severity.

Roadway Geometry

The effect of curvature and roadway gradient may be seen in Figure 4. It shows that more than half of the pole accidents in Huntsville occurred on straight, level roadways. The remainder of the accidents are almost equally split between straight roadways on hills, curved roadways on hills, and curved, level roadways. About 30 percent of all pole accidents took

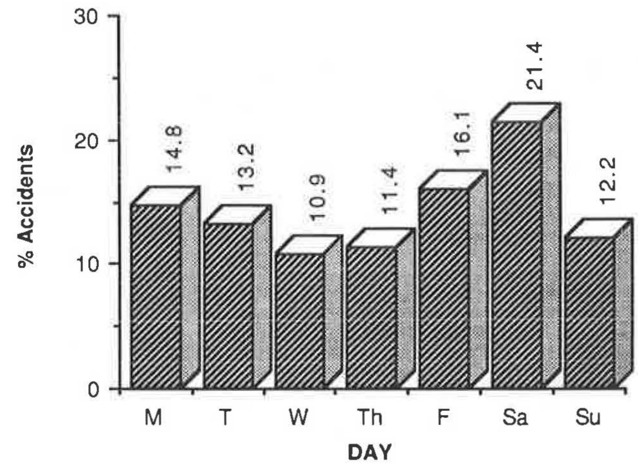

FIGURE 2 Pole accidents by day of the week.

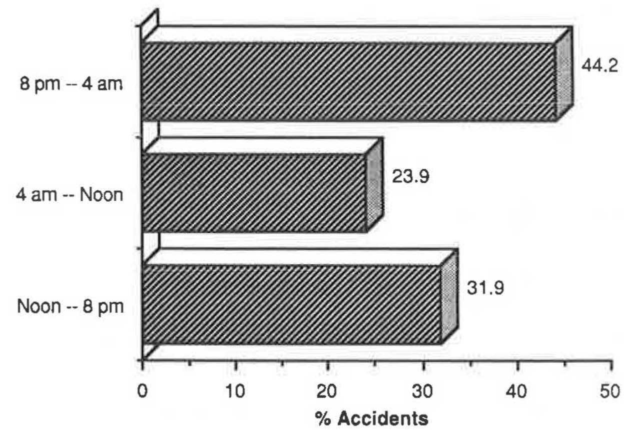

FIGURE 3 Pole accidents by time of day.

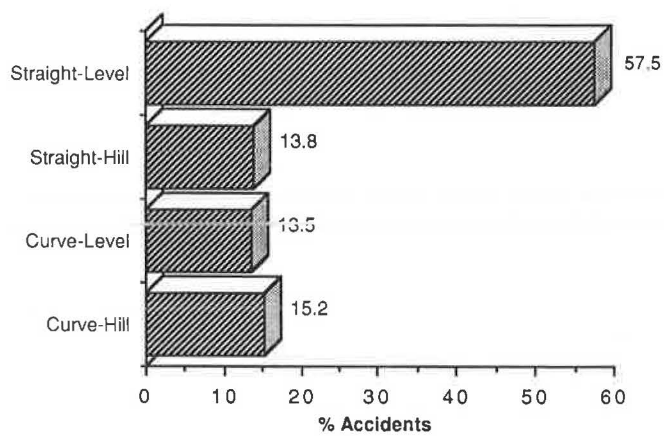

FIGURE 4 Road character for pole accidents.

place on curved sections. Since no more than 5 percent of all roadway mileage in Huntsville consists of curves, this type of roadway character is overrepresented. In other words, 30 percent of the accidents may be happening on 5 percent of the roadways, a 6 to 1 ratio.

Compared with other fixed-object collisions (such as trees), pole accidents tended to happen on straighter, more level roadways. Since poles were closer to the road, it may be that drivers who strayed off the road hit poles before they had time to recover (even on straight stretches of road).

Curves and Pole Accidents

The relationship between horizontal curves and pole accidents is indicated in Figure 5 by the percentage of collisions that occurred outside, inside, or after curves. Almost two out of three of these pole collisions occurred on straight roadways, where there was no relationship with a curve. For those accidents where a curve was involved, the collision usually occurred on the outside (18.7 percent of total collisions). Drivers were three times more likely to hit a pole on the outside of a curve than on the inside. Since over 90 percent of city street mileage is straight, poles on curves are more likely to be hazardous than poles on straightaways.

Speed

An examination was conducted to determine the effects of the posted speed limit on the number of pole accidents and their severity. The number of accidents was found to be largely related to exposure, i.e., the number of miles of streets posted at various speeds and the amount of traffic on these streets.

Given that a pole accident has occurred, the probability of having an injury is shown by Figure 6. The general trend is toward a higher probability of injury at higher speed. This is the expected case; however, there is one glaring exception. At 25 mph there is a 50 percent probability of injury in pole accidents. The research staff could not establish a precise reason for this anomaly. This low speed limit is normally restricted to residential streets, which are characterized by multiple curves. It is quite possible that horizontal curves helped account for the injury rate, or that there was a higher rate of noncompliance with speed limits in residential areas.

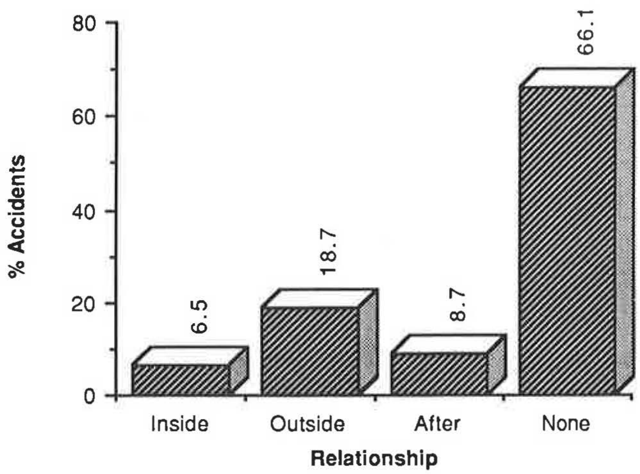

FIGURE 5 Pole accident—curve relationship.

Road Class

The percentage of accidents occurring on the various classes of streets in Huntsville is shown by Figure 7. The majority of accidents occur on arterial streets and high-speed collectors. This is reasonable because the majority of the traffic in Huntsville uses these types of roadways.

Further insight into the effect of road class is shown by Figure 8, which combines road character and road class. It shows that curves are overrepresented for local and low-speed collector roads and that curves are far less involved for higher classes of roadway. More than 40 percent of the accidents on local and low-speed collector roads occur on curves. This rate is twice as high as for the other three types of roadways in this study. This information provides good insight into organizing a treatment program for poles in the clear zone.

Surface Condition

The surface condition of the roadway is not a dominant contributing factor in accidents involving poles in the clear zone. Almost two-thirds of them occur under dry conditions (Figure 9). On the average, 72 to 76 percent of Huntsville accidents

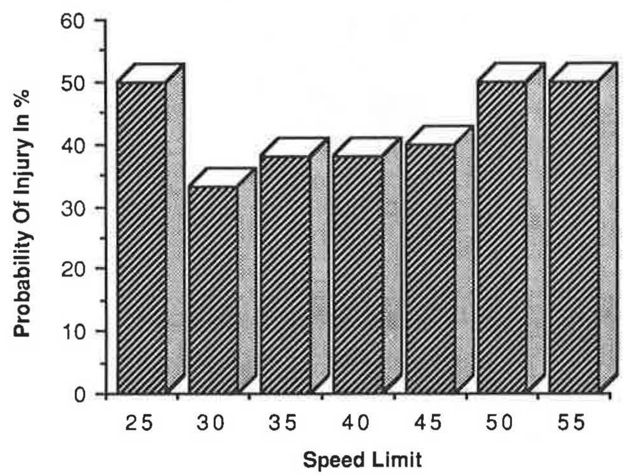

FIGURE 6 Speed relationship to severity.

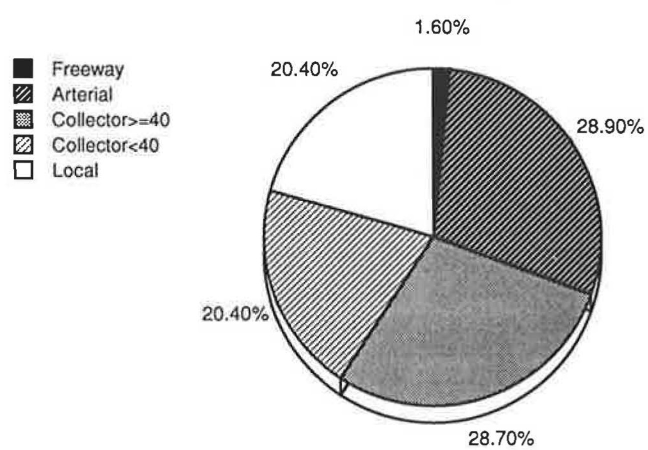

FIGURE 7 Road class for pole accidents.

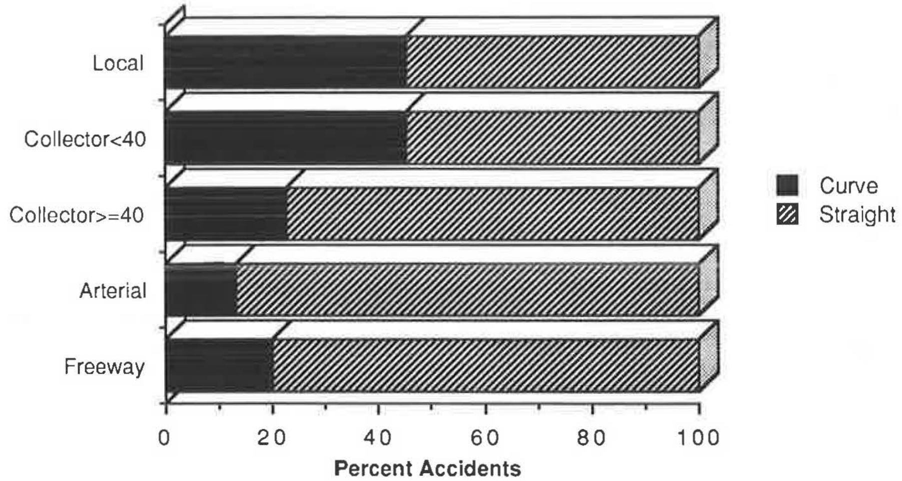

FIGURE 8 Road class and character for pole accidents.

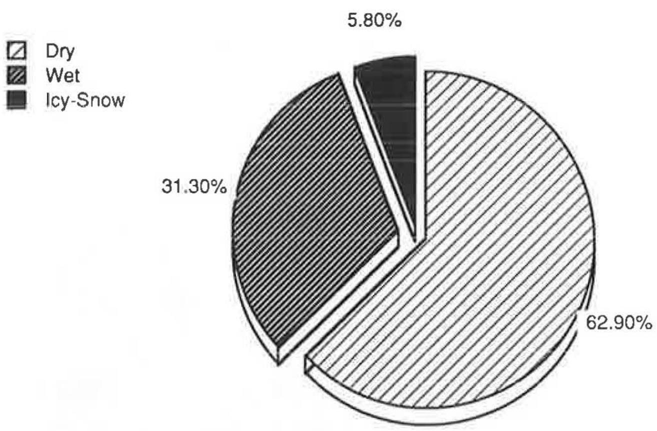

FIGURE 9 Road condition for pole accidents.

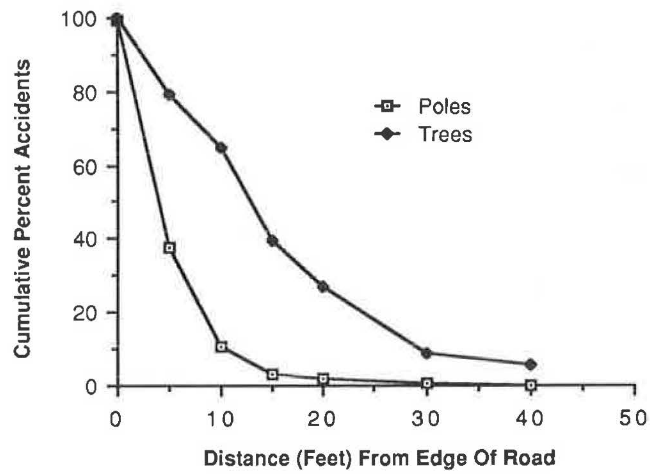

FIGURE 10 Distance to pole and tree accidents.

occur on dry pavement. Pole accidents are not greatly different from this, and wet pavement slickness does not seem to be a major factor.

Horizontal Clearance

The lateral clearance between the roadway and the object in the clear zone is the principal factor stressed in most standards and guidelines. This factor was investigated by measuring the clear zone for 310 pole collisions in Huntsville. The data are reflected by Figure 10. Within 10 ft of the pavement, the trend is highly linear and contains 90 percent of the observed collisions. For comparative purposes, the same type of information has been shown for tree accidents occurring in Huntsville. Tree accidents occur much farther from the roadway. The research staff did not attempt to determine the reason for this fact, although it could be as simple as that the average tree is located farther from the road than the average pole.

The data in Figure 10 are felt to be a strong indicator of the relationship between lateral clearance and accidents. The data also support the premises stated by other researchers: pole accidents are overrepresented within 10 ft of the road, and a pole 10 ft from the road is only one-third as likely to be hit as a pole adjacent to the road.

A further investigation was performed by examining the effect of curved and straight road segments, with and without curb. This information is shown by Figure 11. Curbs have a noticeable effect on the lateral distance that vehicles travel, while the presence or absence of a horizontal curve has almost no effect. Statistically, there is no significant difference in straight and curved roadway segments regarding how far off of the roadway the vehicle travels before having the collision.

In general, where there is no curb, the accidents are happening approximately twice as far from the edge of the roadway as where there is a curb. This supports the criteria found in most clear zone guidelines that allow fixed objects to be placed closer to the roadway where a curb is present.

Another major finding is illustrated by Figure 11. For locations with no curb, the relationship between distance and percent accidents is linear. Where curbs are present, the relationship is parabolic. Regression analyses were conducted on both curb and noncurb data. The resulting predictor equations are shown by the figure. For both equations, the statistical measures of effectiveness were extremely strong.

Pole Types and Materials

Another type of information gathered from the field survey involves the pole type (see Figure 12). More than half the accidents that occurred with posts involved posts supporting power lines. The second highest category was for nonbreakaway lights, with breakaway lights being the third highest. This may be misleading since vehicles that hit small breakaway light poles sometimes drive away from the accident and the police department never receives this information. Thus, it may be misleading to draw conclusions regarding the number of accidents with breakaway lights and breakaway sign posts.

To summarize Figure 12, 55 percent of all accidents occurred with power poles, 25 percent occurred with light posts, 14 percent occurred with signs, 1 percent with signal poles, and 4 percent with guy wires. This provides guidance for the design of a treatment program.

Size of Post

As shown by Figure 13, the majority of collisions occurred with poles having a diameter of between 10 and 12 in. This size would cover any of the smaller utility poles as well as most of the street light poles within the city of Huntsville. A large number of accidents occurred with extremely small poles (1 to 3 in.). Poles with this dimension included guy wires and

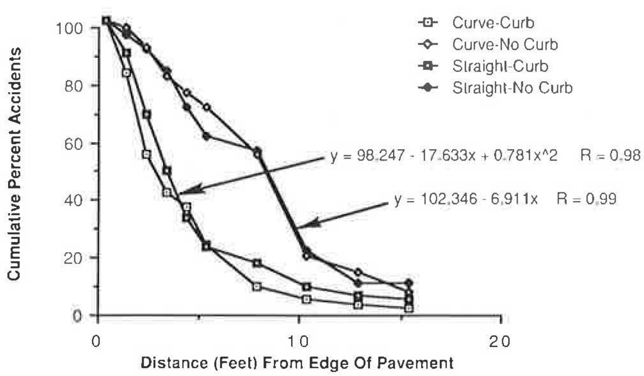

FIGURE 11 Curb effect on distance to accident.

traffic signs. While most of the traffic signs were the type that bent upon impact to minimize the collision damage, this was not the case with guy wires. They can exert a substantial force upon vehicles that strike them.

RECOMMENDATIONS

Placement of Future Poles

It was not possible to develop one single strategy for minimum lateral clearances for all poles. Previous research and national standards were segregated according to the type of pole and its intended use. That same strategy was recommended for HDOT, which was encouraged to adopt ordinances and policies for specific types of poles. Pertinent recommendations are repeated below:

- In general, utility lines are to be placed to the maximum extent practical at the outer limits of the right of way (or additional utility easement).
- The guidelines shown in Table 2 are recommended for adoption by Huntsville. Where insufficient right of way is available, an engineering analysis should determine whether purchase of additional easement is the best course of action.
- Distribution lines would be best placed in underground conduit in new developments. Ancillary equipment should be constructed in compliance with lateral clearances for utilities.
- 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.
- Where overhead lines must be located along the front of the lot, it is desirable to place them at least 10 ft behind the curb.
- 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 ft outside the toe of the slope along tangent fill sections.
- Where utility poles are to be installed along curved sections (including 200 ft of tangent section adjacent to each end on the outside of horizontal curves) or roadways having open drainage systems, consideration should be given to locating

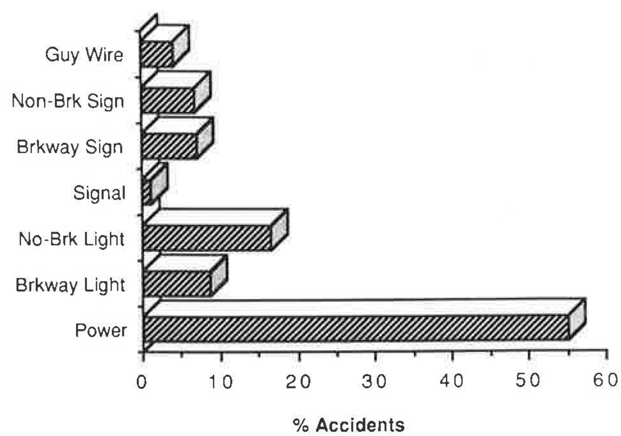

FIGURE 12 Type of post.

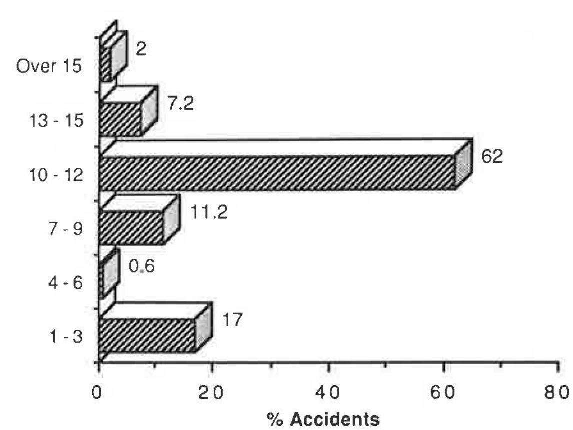

FIGURE 13 Sizes of poles in accidents.

TABLE 2 SUMMARY OF RECOMMENDED MINIMUM LATERAL CLEARANCES FOR POLES IN HUNTSVILLE

Pole Type	Minimum Lateral Clearance	Desirable Lateral Clearance
Traffic signs, traffic signals, or luminaires	1. 2 ft behind curb 2. Without curb, largest of 2 ft from paved shoulder or 6 ft from unpaved shoulder or 12 ft from edge of traveled way	1. 6 ft behind curb 2. Without curb, largest of: 10 ft from paved shoulder or 20 ft from edge of traveled way 3. Breakaway bases or other safety treatment, behind barrier or behind ditch line 4. Not in medians
Utilities (public or private)	1. 6 ft behind curb (or 2 ft behind curb for parking lane) 2. 20 ft from edge of traveled way for roads less than 50 mph (or 30 ft for roads over 50 mph)	1. At the limit of the right of way
Private poles	Private (nonutility) poles are not allowed within the public right of way in the city of Huntsville. Franchised entities may utilize such right of way, by permit or other specific approval mechanism.	

NOTE: This table does not apply to expressways or unusual roadway situations.

poles along the inside of the curve, unless they can be placed outside a nontraversable ditch section on the outside of the curve.

In general, sign, signal, and luminaire posts should be placed as far from the edge of the roadway as practical without critically reducing the visibility of the control device or the effectiveness of the lighting device. The lateral clearances in Table 2 are recommended. 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.

Placement of Existing Poles

In a utopian situation, all existing poles could be moved away from the edge of the roadway to reduce the number of accidents. This scenario is not reasonable, because such a treatment would be cost prohibitive. Even if this treatment could be undertaken, it would utilize all foreseeable public funds to clear the roadside of poles. Much of this money would be wasted since most of the objects so removed would never have been hit by a vehicle over their lifetimes.

As an alternate to moving or removing all poles in the clear zone, the most productive technique would be to target those poles most likely to be involved in collisions, especially high-severity collisions. To accomplish this purpose, the following steps were recommended:

- The key to identification of existing locations of highest risk is examination of accident data.
- Accident data should be screened to locate clusters of pole accidents. There are currently less than 20 intersections or segments where multiple accidents might indicate corrective action is needed.
- The number of pole accidents occurring in clusters should be converted to accident rates through the use of traffic volume data.
- At those sites of highest rates, additional field inspection should be conducted to determine if the poles meet current clear zone requirements as outlined previously in this paper. There may be instances when the horizontal clearances of Table 2 are not sufficient.
- Where poles do not meet current clear zone requirements, or where other data (such as an overrepresentation of curves) indicate the need for improvement, an appropriate safety treatment should be identified.
- The appropriate safety treatment at each site should be largely based on a consideration of the predicted number of accidents, the cost of the accidents, and the cost of any safety treatment. Cost-benefit ratios or other economic analyses may determine the most appropriate treatment.
- A priority list should be prepared for treatment of existing sites based on the greatest return to the public. Since all sites cannot be treated in one year, those of greatest risk should be treated first.
- After treatment of the initial sites, HDOT may have observed other locations that had characteristics similar to the initial sites but did not accumulate enough accidents to make the first priority list. These sites should be treated next.
- As aged utility lines are routinely replaced, the clearances in Table 2 should be used where practical.

SUMMARY

The development of an effective and comprehensive program to treat all objects in the clear zone is an enormous undertaking. This paper outlined a project to determine pole-accident characteristics in Huntsville, Alabama, as a means to devise a policy for future placement of poles to minimize vehicle collisions and damage while simultaneously addressing the complex issue of how to treat existing poles that were initially placed beside the roadway under approved standards but now are close to the roadway edge.

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