RECOMMENDED GUIDELINES
for
NEW UTILITY INSTALLATIONS

an invited presentation
at the
Session on Highway Rights-of-Way:
Safety in the Clear Zone
and Utility Installations

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PART I. RECOMMENDED GUIDELINES

Purpose

The purpose of these guidelines is to enhance traffic safety in practical economical ways that do not significantly detract from the primary responsibility of utility companies, the safe transmission of power.

Applicability

These general guidelines are intended for use with above ground utility facilities, including:

1. New utility installations,

2. Existing utility facilities which are to be relocated or adjusted within the right-of-way of highway facilities under development or construction.

3. Existing utility facilities which are to be adjusted or relocated for safety improvements.

General Guidelines

The recommended general guidelines for consideration in the design and placement of above ground utilities within the highway right-of-way are as follows:

1. **Clear Recovery Area.** New above ground utility installations should be located outside of the clear recovery area or as far from the traveled way (or the face of the curb, if a curb is present) as practical, preferably along the right-of-way line. If a "clear recovery area" has not been recommended by the entity responsible for the roadway, Table 1 may be used as a guide. In situations where it is necessary to locate above ground utility facilities within the established clear recovery area of the highway, appropriate measures to improve traffic safety should be considered, such as placing utility facilities at locations which minimize exposure to out-of-control vehicles, using breakaway or impact attenuation devices, or shielding vehicles from the structures with longitudinal barriers.
Table 1. Recommended lateral dimension of Clear Recovery Area
Unless constrained by right of way or other structures.
(Feet from edge of traveled way to face of pole)

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<tr>
<th>Roadway Speed Limit (mph)</th>
<th>Lateral Distance* to Face of Poles (feet)</th>
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<td>25</td>
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<td>30</td>
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*These values taken directly or interpolated from the M&IHTO Guide for Selecting Locating and Designing Traffic Barriers, 1977.
2. **Joint Pole Use.** Consideration should be given to the joint use of poles within the right-of-way of roadways to the extent possible to minimize exposure of out-of-control vehicles.

3. **Span Between Poles.** The largest feasible span between poles should be used to reduce the number of poles so as to minimize the exposure of out-of-control vehicles.

4. **Susceptible Locations.** Locations where above ground utility installations are susceptible to being hit by out-of-control vehicles, such as medians, traffic islands, lane drops or lane narrowing zones should be avoided to the extent practical.

5. **Accident Experience.** Consideration should be given to accident history when adjusting or relocating utility facilities. Appropriate safety measures to improve traffic safety should be considered for locations with a significant accident history. Examples of safety measures include placing utility facilities at locations which minimize exposure of out-of-control vehicles, using breakaway or impact attenuation devices, or shielding errant motorists from the structures with longitudinal barriers.
PART II. COMMENTARY

Clear Recovery Area

The guidelines, as described here are based principally on the concept of a clear recovery area, which is defined as "the roadside border area, starting at the edge of the traveled way, available for safe use by errant vehicles."(1) New above ground utility installations should be located outside of the clear recovery area or as far from the traveled way (or the face of the curb, if a curb is present) as practical, preferably along the right-of-way line. This means, in most situations, locating above ground utility facilities as close to the right-of-way line as practical. The term "as close as practical" is used because there are situations where it may not be practical to place the utility facilities at the right-of-way line. For example, for poles with cross-arm structures, it is usually necessary to place the pole inside the right-of-way line to prevent the power lines from encroaching on private property. The presence of existing underground facilities, such as gas and water lines, may also preclude the placement of utility facilities at the right-of-way line.

In situations where above ground utility facilities are needed within the established clear recovery area of the highway, consideration should first be given to the feasibility of eliminating those facilities by undergrounding or selection of alternate locations. If it is determined that the placement of utilities underground is not technically feasible or is unreasonably costly, and there are no feasible alternate locations, other appropriate measures to improve traffic safety relative to utility facilities should be considered.

Safety measures can be divided into two approaches. The first approach is to reduce the probability of a vehicle collision. The second approach is to reduce the severity of the impact when the utility facility is struck by an errant vehicle. These two approaches may be considered singly or in combination as dictated by the specific site conditions.

Safety treatments to reduce the probability of utility facilities being struck by errant vehicles include, but not be limited to, the following:

- Place utility facilities at locations that are less likely to be struck by out-of-control vehicles, e.g., on the inside of a curve instead of the outside; on minor streets instead of major roadways, etc.

- Increase the lateral offset of utility facilities to the extent practical, e.g., use of vertical construction instead of cross-arm construction to allow poles to be placed at the right-of-way line.
Reduce the number of poles through joint use and/or use of largest feasible span between poles.

It should be pointed out that some of these safety treatments such as vertical construction and increasing the span between poles may necessitate the use of larger and/or taller poles. This could result in more severe impacts if such poles are struck. It is necessary to evaluate the tradeoff between accident frequency and severity in these situations to assure safety is enhanced by such treatments.

Use of Safety Structures

The safety of specific utility pole installations could be improved with the use of safety structures, including breakaway devices, guardrails, and crash cushions. Similar devices have been used to improve roadside safety of highways for over twenty years, but major improvements have been made since 1980 that render some safety structures applicable to utility installations for the first time.

The most comprehensive guide for the application of safety structures is the American Association of State Highway and Transportation Officials (AASHTO) Guide for Selecting, Locating, and Designing Traffic Barriers (1), commonly referred to as the Barrier Guide. In most cases, the criteria for use of the three types of safety structures are consistent with the Barrier Guide. It should be noted, however, that the Barrier Guide was primarily intended for use with rural highways and may not always be directly applicable to urban roadways and streets. Also, it is important to point out that many new designs for specific structures have been developed since the Barrier Guide was published in 1977. These new designs will be referenced in this report.

Breakaway Devices

A breakaway device, as applied to a utility pole or a luminaire support, functions by allowing the pole to be broken away by an impacting vehicle, thus allowing the vehicle to proceed on its errant path without a precipitous stop. The severed pole will then normally descend to the ground after the impacting vehicle passes through.

The criteria for application of a breakaway device to a utility pole or a luminaire support are as follows:

- The pole is within the clear recovery area as previously defined.
- The alternative of relocating the pole is not a practical solution due to constraints of right-of-way, roadside environment, or economics.
The pole is class 4-40 or smaller in size and does not have heavy devices or equipment, such as transformers or capacitor banks, attached to it. (Breakaway devices may be used on poles of material other than wood, but the pole should not be significantly heavier or taller than a class 4-40 timber pole.)

The pole is not within a zone of significant pedestrian activity (as defined by benefit/cost considerations.)

After impact by a vehicle the final rest position of the severed pole and dislocated conductors should not pose a significant hazard to pedestrians, other vehicles, or properties in the immediate vicinity of the pole.

There is a relatively safe clear recovery area beyond the breakaway pole available for the vehicle to decelerate and come to a comparatively safe stop.

Location of down guy wires should be made with full consideration of their influence on impacting vehicles and the influence of loss of support for the main structure. Where down guy wires are anchored within the clear recovery area, a breakaway attachment to the guy wire should be considered to preclude the occurrence of vehicle overturn and/or more severe damage to the main structure. Details on breakaway attachments for down guy wires are given in Reference 2. In some cases pole guys or tree guys can be beneficial in that they are more effective in preventing a fallen pole from leaning into or falling onto the traveled way.

Under most circumstances, luminaire supports within the clear recovery area should be of breakaway design. The exception to this is where a support would fall in the roadway (on or in the path of other vehicles) or where there is such exposure to pedestrians that the breakaway design would not be cost beneficial. Details on breakaway designs for luminaire supports are given in Reference 3.

Guardrails

In some places guardrail is a good choice to protect traffic from a rigid utility pole or luminaire support. Guardrail functions by redirecting the errant vehicle away from the pole so that the driver has a better chance of regaining control of the vehicle or coming to a comparatively safe stop. The Barrier Guide states that guardrails may be used for this purpose on the basis of engineering judgment or a cost-effectiveness study (See Table III-A-2 and the discussion on page 21 of the Barrier Guide).
The criteria for application of guardrails to shield rigid utility poles or luminaire supports are as follows:

- The pole(s) is(are) within the clear recovery area.
- The alternative of relocating the poles is not a practical solution due to constraints of right-of-way, roadside environment, or economics.
- The installation of a guardrail over the length necessary to shield the pole(s) does not constitute a greater potential hazard to the driving public.
- The guardrail will not direct errant vehicles into a roadside zone of greater hazard.
- The face of the guardrail should not be closer than two feet from the edge of the traveled lane or the face of the curb. A distance of ten feet or more is preferred, if practical.
- The guardrail is in a position where it will function as designed. i.e. automobiles will impact the rail at speeds predominately less than 60 mph and at angles predominately less than 25 degrees. The guardrail should not be placed in a position relative to a barrier curb such that vehicle ramping prevents redirection.

There are several factors to be considered in designing a guardrail installation. These factors are discussed in Section III of the Barrier Guide and will not be covered in this document. In addition to the operational guardrail systems given on pages 56 through 39 of the Barrier Guide, there are now several new systems with somewhat improved performance characteristics.

It should be noted that the end of a guardrail can be a hazard if not designed properly. A crashworthy end treatment should be used if the guardrail terminates within the clear recovery area. In addition to the end treatments shown on pages 50 and 51 in the Barrier Guide, there are now several new designs available that have vastly improved performance. Details of some of the improved designs are provided in References 4 through 6.
Crash Cushions

Crash cushions protect errant vehicles from impact with a rigid utility pole or luminaire support primarily by decelerating the errant vehicle in a controlled manner and bringing it to a relatively safe stop before the rigid pole is reached. As stated in the Barrier Guide, crash cushions "are used to shield rigid objects or hazardous conditions that cannot be removed, relocated or made breakaway."

The use of a crash cushion may be determined on the basis of engineering judgment or a cost-effectiveness analysis. Crash cushions are more likely to be cost-effective for isolated hazards, e.g., a single pole with a high frequency of accident involvement, than for a pole line several hundred feet or more in length.

The criteria for application of crash cushions to shield errant vehicles from a rigid utility pole or luminaire support are as follows:

- The pole is within the clear recovery area.
- The alternative of relocating the pole is not a practical solution due to constraints of right-of-way, roadside environment, or economics.
- The pole does not meet the requirements for breakaway treatment.
- There is sufficient space in front of the rigid pole to accommodate the crash cushion without encroaching on the traveled way.
- The final rest position assumed by an impacting vehicle and an impacted crash cushion as well as debris detached during the impact should not pose a hazard to other traffic.
- The trajectory of an errant vehicle redirected by a crash cushion should be into a zone where a reasonably safe stop can be accomplished. Because of the relatively low frequency of vehicle impacts with utility poles, luminaire supports, or other utility structures, the more sophisticated crash cushions used at sites such as ramp exit gores are unlikely to be cost-effective. Where crash cushions are determined to be a good countermeasure to a specific safety problem, the inertial crash cushions, shown on pages 131 and 132 of the Barrier Guide will probably be the better economic choice.
Site Specific Safety Considerations

There are some specific situations that deserve special safety considerations. Brief discussions of some situations are presented here.

Curves

On urban arterials, especially those with crowned cross sections, consideration should be given to placing a pole line on the inside rather than the outside of curves. As shown in Figure 1(a), poles on the outside of a curve usually have a higher exposure to vehicle impacts. This is particularly important for situations where there is a single curve after a long straight section of roadway or where one curve is substantially more severe than other curves which are in close proximity. However, for winding roadways with sequentially occurring curves in opposite directions, it would not normally be cost-effective for the pole line to cross the road repeatedly in order to achieve the inside curve placement.

When a pole line is placed on the inside of a severe curve, e.g., a curve with a radius of less than 1700 feet, it may be necessary to place strain poles on the outside of the curve, as shown in Figure 1(b). These strain poles should be of a size which is adaptable to a breakaway design. Pole guys and strain poles should only be used if they can be designed in such a way that the fallen pole guy wire will not pose a hazard to traffic. A preferred alternative to the use of breakaway strain poles and down guy wires is the use of a compression strut (push brace or stub pole), as shown in Figure 1(c).

Lane Drops and Roadway Narrowing

Placement of poles downstream of a lane drop or the area where the roadway narrows should be discouraged. This is especially important when it can be reasonably foreseen that an inattentive or physically impaired driver might not be able to accurately perceive the lane drop or lane narrowing. These situations are illustrated by Figures 2 and 3. Another cause of this problem is a traffic conflict, where a driver is prevented by another vehicles from changing lanes or moving laterally. If it is impractical to span the critical zone without a pole, consideration should be given to the use of a guardrail or crash cushion.

Traffic Island

Placement of poles on a traffic island should be strongly discouraged. Islands are an element of traffic control at an intersection and are usually located within the boundaries of the traveled way. As such, they are likely to be occasionally traversed by errant vehicles. This traversal should not be prevented by a utility pole placed as shown in Figure 4. If the placement of a utility pole in an island is a practical necessity, consideration should be given to protecting errant vehicles with a crash cushion.
Placement of poles in medians, as illustrated in Figure 4, should be strongly discouraged. Medians are safeguards against head-on collisions and, as such, provide space for errant vehicles to regain control or space for installation of median barriers. A pole or pole line in a median should only be considered if vehicles can be completely shielded from the poles by median barriers. Luminaries are often placed in protected positions on top of median barriers.

Use of Existing Safety Structures

Where guardrails, bridge rails and crash cushions exist, consideration should be given in pole placement to take advantage of the shielding influence of these structures. An example is shown in Figure 5. During new highway or street construction, coordination of safety structure design and utility facility design should be pursued to reduce the influence of unshielded poles.

Traffic Conflicts

Where critical traffic conflicts can be foreseen, especially at intersections of high-speed roadways, pole placement may be designed to avoid the most critical secondary collisions. For example, if the major roadway is north-south in direction and the minor roadway is east-west, the most critical quadrants for a secondary collision (collision of a vehicle with a pole after an initial two vehicle collision) are the northeast and southwest quadrants. Thus, the preferred placement for poles at this intersection would be in the northwest and/or southeast quadrants, as shown in Figure 6.
Figure 1. Location of Utility Poles on Curves
Figure 2. Exposure of Vehicle to Utility Pole Downstream of Lane Drop.

Figure 3. Placement of Pole Downstream of Roadway Narrowing.
Figure 4. Inappropriate Location of Poles Within a Traffic Island or Median

Figure 5. Pole Shielded from Traffic by an Existing Guardrail
Figure 6. Intersection Zones Having Highest Exposure to Secondary Collisions
REFERENCES


4. "New Guardrail End Treatment," Study No. 2-8-86-404, Texas State Department of Highways and Public Transportation, Texas Transportation Institute, Texas A&M University System, College Station, Texas, ongoing project.


