Design Considerations for Existing Utility Poles in Urban Areas

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ABSTRACT

Highway and street projects in urban areas often involve conflicts with existing utility poles. In determining what effect utility poles may have on a project and how they should be handled, full consideration should be given to measures to ensure the safety of the traveling public and features to protect the operation, integrity, and visual quality of the highway or street. These measures and features should reflect sound engineering principles and economic data, and should be based upon minimum offset and clear zone distances, crash experience, and available countermeasures.

INTRODUCTION

Highway and street projects in urban areas often involve conflicts with existing utility poles. This is true for improvements within existing rights-of-way and construction on new rights-of-way. In determining what effect utility poles may have on a highway or street project and how they should be handled, full consideration should be given to measures to ensure the safety of the traveling public and features to preserve and protect the operation, integrity, and visual quality of the highway or street. These measures and features should reflect sound engineering principles and economic analysis and, at a minimum, should be based upon considerations set forth in this paper.

IMPORTANT CONSIDERATIONS

Public Interest

It is in the public interest for utility facilities to be accommodated on highway and street rights-of-way, which is the most important consideration of all. And the most difficult, because utility poles are generally privately owned and installed devices and are not under the direct control of a highway agency. Hence, there is a dual responsibility—public and private interests—to considering how best to accommodate the poles on public rights-of-way. This dual responsibility sometimes complicates the implementation of effective countermeasures, unless good working relationships have been established.

Minimum Offset and Clear Zone

Minimum offset and clear zone distances are important considerations. They are normally set by highway agency policy and will usually dictate where new utility poles should be

located, and whether existing utility poles should be removed, relocated, or mitigated. Guidance for establishing offset and clear zone distances is set forth in two publications of the American Association of State Highway and Transportation Officials (AASHTO). This guidance is summarized below:

- Where there are curb and gutter sections along the highway or street, utility poles should be located at least 0.5 meters behind the face of the curb, and where feasible, behind the sidewalk. This 0.5 meter offset is not a "clear zone" in the usual sense of the term, but rather a setback for practical and operational purposes. Recommended criteria for establishing offset distances is set forth in AASHTO's *A Policy on Geometric Design of Streets and Highways* (*1*).
- Where there are ditch sections along the highway or street, rather than curb and gutter sections, utility poles should be located beyond the clear zone established by the highway agency, taking into consideration the type of road, volume of traffic, speed of vehicles, steepness of roadside slopes, horizontal curvature, and other features known to influence off-road accidents. The minimum clear zone distance will usually be at least 3.0 meters from the edge of the traveled way on low-speed, low-volume roads, and will increase as speeds and volumes increase. Recommended criteria for establishing clear zone distances are set forth in AASHTO's *Roadside Design Guide* (*2*).

The final placement of both new and relocated utility poles should be as far as practical from the roadway, consistent with other fixed objects along the road. If poles must be placed or must remain within the minimum offset or clear zone area, the reasons why this was considered acceptable should be fully documented. The lack of sufficient right-of-way width to accommodate existing utility poles, in and of itself, is not a valid reason to preclude utilities from occupying the highway right-of-way. In cases where sufficient right-of-way is not available to accommodate the utilities, highway agencies should consider acquiring additional right-of-way. In all cases, utility facilities should be treated the same as other roadside hazards. Little will be gained by moving utilities, unless their presence presents a significantly greater hazard to motorists than any other existing hazards.

Motor Vehicle Collisions

Motor vehicle collisions with utility poles are another important consideration. These crashes result in approximately 1,200 deaths each year and more than 65,000 injuries. More than half of these fatalities and injuries occur in urban areas. This degree of involvement is related to the number of poles in use, their close proximity to the traveled way, and their unyielding nature. A concentration of accidents at a site, or a certain type of accident that seems to occur over and over in a given jurisdiction, may indicate the highway/utility system is contributing to the accident potential. Utility pole accidents are subject to the same types of accident pattern as other types of roadway accidents. They are thus subject to traditional highway accident study procedures. A detailed study of accident records may identify high-accident locations and point to improvements that will reduce the number and severity of future accidents. The following countermeasures may help in this regard:

- Assist the driver to stay on the roadway. This is one obvious way to prevent utility pole accidents. It may be done by positive guidance—for example, by using pavement markings, advance warning signs, delineators, and other visual cues to tell the driver what to expect and to provide a visual path through a site. Physical enhancements such as improving the skid resistance of the pavement, widening the pavement travel lanes, widening or paving shoulders, straightening sharp curves, decreasing the speed of vehicles, or adding lighting in areas where accidents frequently occur at night may also diminish accident potential by decreasing the number of vehicles that accidentally leave the travel way.
- Place utility lines underground. By burying utility lines, poles can be removed, greatly reducing accident potential. This alternative also saves the utility company the cost for removing and replacing a pole damaged in a collision and for repairing the utility line after an accident. The primary disadvantage of this treatment is the additional initial expense. Even with underground utility lines, there still may be a need for safety treatment of surface transformer pads, switching cabinets, and other associated hardware. Rock formations and similar site conditions may make underground treatment too expensive. It may also be difficult to handle unanticipated local growth, or it may be impossible to tap some underground facilities to add customers. In spite of these and other difficulties, an underground installation is often the best design solution.
- Place new utility poles where they are less likely to be struck. Pole lines should be placed on the inside of horizontal curves where possible. Studies have shown there are many fewer off-road accidents on the inside of horizontal curves than on the outside. On winding roads, this placement may not be feasible, because the wires would have to cross the road each time sequential curves changed directions. For sharp curves, utility poles would need lateral bracing from compression struts or guy wires. With limited right-of-way, this might not be possible. Where ditches, retaining walls, guardrail, or similar features exist, pole lines should be placed behind them. Errant vehicles cannot travel past them to strike the poles.
- Relocate existing utility poles farther away from the roadway. Both accident rate and accident severity will decrease when utility poles are moved farther from the travel way. Ideally, utility poles should be placed near the right-of-way line (i.e., beyond the 0.5 meter minimum offset or, desirably, behind the sidewalk in curb and gutter sections, and outside the clear zone in ditch sections). Vertical construction of the utility poles can sometimes be used instead of cross-arm construction to provide more lateral clearance. The full effectiveness of moving poles away from the roadway cannot be achieved if other fixed objects are allowed to remain in the clear zone. A utility pole accident reduction program should be part of a comprehensive plan that removes all types of objects from the clear zone.
- Reduce the number of utility poles. An obvious way to decrease utility pole accidents is to decrease the number of poles beside the roadway. There are several methods available: (1) encourage joint use of existing poles, with one pole carrying street lights, electric power, telephone, cable TV and other utility lines; (2) place poles on only one side of the street; and (3) increase pole spacing by using bigger, taller poles. Before adopting any of these procedures, an engineering study should be conducted to determine whether the changes would be cost-effective and appropriate for the specific site. For example, decreasing the spacing of poles may require that the remaining poles be larger

and taller than the previous ones. These larger poles will be struck less frequently because there are fewer of them. However, they may cause more severe accidents because of their larger size and thus cancel any savings that might have accrued because of the decreased number of accidents.

- Incorporate a yielding design. When a pole must remain in place, it can be modified to break upon impact and swing out of the path of the vehicle, reducing the severity of an accident. Breakaway sign and luminaire supports have been used along highways and streets for many years. Unlike the previous countermeasures, use of a yielding breakaway design is intended to reduce the severity of an accident rather than the accident frequency. Several breakaway designs have been successfully crash-tested, have demonstrated satisfactory in-service performance, and may be feasible for poles in vulnerable locations that cannot economically be removed or relocated.
- Shield utility poles. If it is not feasible or practical to place utility lines underground, relocate them, make them breakaway, or to provide any other of the previous countermeasures, then other treatments may be necessary. One acceptable treatment is to shield the fixed object. Roadside barriers perform this function by redirecting the vehicle away from the utility structure, allowing the driver an opportunity to recover control of the vehicle. Criteria on roadside barriers in the AASHTO *Roadside Design Guide* (*2*) may be used to determine whether a barrier is an appropriate treatment and, if so, what design is suitable for site conditions. There are instances in which a guardrail is not appropriate. One example is when there is not enough room between the guardrail and the fixed object for the guardrail to fully deflect during impact. Another way to shield a vehicle from striking a utility pole is to use a crash cushion. A crash cushion is normally used where there is an isolated fixed-object hazard. If there are several objects, a guardrail is probably a better safety device. Guardrail and crash cushions should not be used indiscriminately because they are expensive to install and to maintain, and they are closer to the road than the objects they are shielding. They are involved in more accidents than unshielded objects. They should be used only when they are warranted by the reduction in accident severity.
- Warn motorists. The number or severity of accidents may be decreased by warning motorists of the presence of poles adjacent to the roadway. This may be done by placing reflective paint, sheeting, or object markers on utility poles. Poles close to the traveled way, on the outside of a horizontal curve, where a lane becomes narrow, at the end of a lane drop, or in other locations where vehicles are likely to travel close to them are candidates for such warning where more comprehensive treatments are not justified.

CONCLUSIONS

In locating utility poles on highway and street rights-of-way in urban areas, it is essential for highway agency and utility company representatives to seriously consider measures to ensure the safety of the traveling public and features to preserve and protect the operation, integrity, and visual quality of the highway or street. Cooperation, coordination, and communication are essential elements if the public is to be served. Everything else will follow.

BIBLIOGRAPHY

American Association of State Highway and Transportation Officials. *A Policy on Geometric Design of Streets and Highways.* Washington, D.C., 1994.

American Association of State Highway and Transportation Officials. *Roadside Design Guide.* Washington, D.C., 1996.

Federal Highway Administration. *Highway/Utility Guide.* Publication No. FHWA-SA-93-049. Washington, D.C., 1993.