



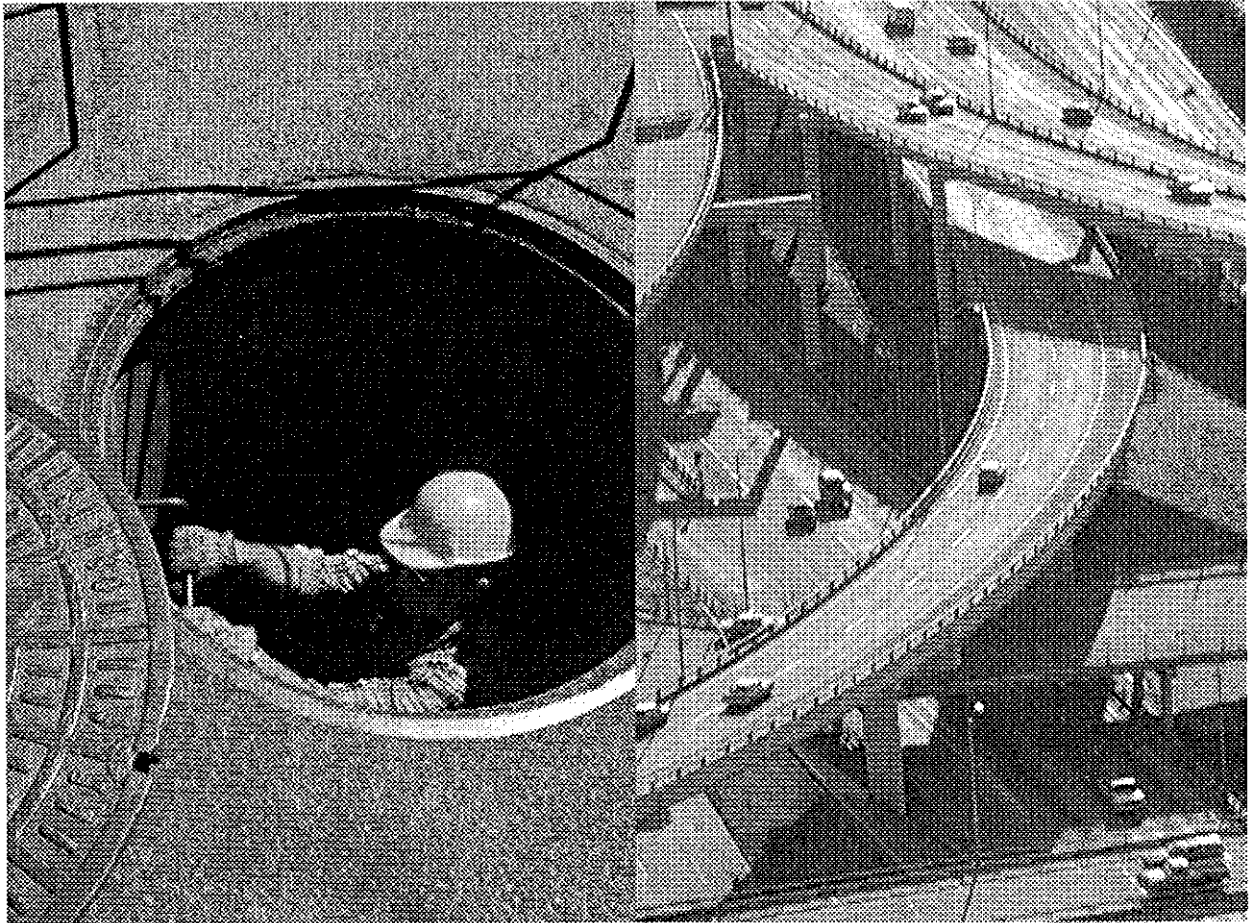
From:

A Guide for
Accommodating Utilities Within
Highway Right-of-Way

October 2005

American Association of State Highway and
Transportation Officials

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A Guide for

**Accommodating
Utilities Within
Highway
Right-of-Way**

October 2005



American Association
of State Highway and
Transportation Officials

Prepared by the
AASHTO Technical Committee
on Geometric Design

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INTRODUCTION

Transportation, communications, and utility networks are growing in complexity. Such networks include highways, railways, and waterways at the surface; subways, pipelines, and cables below the surface; communication lines and transmission lines above the surface; and wireless communication systems. The possibility of two or more networks occupying a common right-of-way or intersecting increases as the networks grow. As a result, problems arise due to the construction, maintenance, and operations of one network affecting the others.

Each transportation agency has the responsibility to maintain highway right-of-way under its jurisdiction and to preserve the operational safety, integrity, and function of the highway facility. Since the manner in which utilities cross or otherwise occupy highway right-of-way can materially affect the safe operation, maintenance, and appearance of the highway, it is necessary that such use and occupancy be authorized and reasonably regulated. Transportation agencies have various degrees of authority to regulate the use of utilities within highway rights-of-way generally through their authority to designate and to control the use made of right-of-way acquired for public highway purposes. Their authority depends upon Federal laws and regulations; and state laws or regulations that differ between states. Also, a state may have local, city, or county government laws and regulations differing from those applicable statewide. Aside from the necessary differences imposed by state and local laws, regulations, franchises, governmentallindustry codes, climate, and geography, reasonable uniformity in the engineering requirements should be employed by transportation agencies to regulate the use of highway right-of-way by utilities.

Utilities have various degrees of authority to install their lines and facilities on the right-of-way of public roads and streets. Like transportation agencies, their authorities depend upon state laws and regulations, which differ between states. Utilities also depend upon franchises, local laws, and ordinances, which may differ in the several political subdivisions within a state.

It is in the public interest for utility facilities to be accommodated on highway right-of-way when such use and occupancy do not adversely affect highway safety, construction, maintenance, or operations. In this respect, guidelines outlining safe and rational practices for accommodating utilities within highway right-of-way are of valuable assistance to the transportation agencies. The guidelines herein are provided in the interest of developing and preserving safe highway operations and roadsides.

These guidelines make no reference to the legal right of utilities to use or occupy highway right-of-way or to the financial responsibility involved in the adjustment or installation of utilities on such right-of-way. State law governs these matters. These guidelines should be interpreted and applied to the extent consistent with state laws, which give utilities the right to use or occupy highway right-of-way.

It is the intent of these guidelines to assist the various transportation agencies in establishing and administering reasonably uniform utility accommodation policies. Minimizing possible interference and impairment to the highway and its structures, minimizing adverse visual impacts, and minimizing maintenance are covered in these guidelines. Wherever appropriate, existing utility accommodation policies should be updated in light of these guidelines.

APPLICABILITY

These guidelines apply to all public and private utilities, including, but not limited to, electric power, communications, cable television, water, gas, oil, slurry, petroleum products, steam, sanitary sewers, drainage, irrigation, and similar facilities that are to be located, adjusted, or relocated within the right-of-way of highways under the jurisdiction of transportation agencies. Such utilities may involve underground, surface, or overhead facilities, either singularly or in combination.

These guidelines do not apply to the public–private partnerships for the installation and shared use of fiber optic cable on freeways (Shared Resource Projects). Information on the implementation, planning, design, and construction of Shared Resource Projects is contained in AASHTO *Guidance on Sharing Freeway and Highway Rights-of-Way for Telecommunications* (1).

SCOPE

These guidelines are provided for consideration and use by transportation agencies in regulating the use and occupancy of highway right-of-way by utilities. They are limited to matters, which are the responsibility of transportation agencies for preserving the safe operation, maintenance, construction, and integrity of the highway.

Where the laws or orders of public authority, industry, or governmental codes, or transportation agencies prescribe a higher degree of protection than provided by these guidelines, the higher degree of protection shall prevail. These guidelines supplement, but do not alter the provisions of the AASHTO *A Policy on the Accommodation of Utilities within Freeway Right-of-Way* (2).

It is recognized that a distinction exists between buried fiber optic cables and other utilities. These guidelines supplement, but do not alter the provisions of AASHTO *Guidance on Sharing Freeway and Highway Rights-of-Way for Telecommunications* (1).

DEFINITIONS OF TERMS

The terminology used in utility guidelines and policies should depart as little as practical from conventional usage. However, there is a need for some terms having restricted or special meaning. The definitions used in this guide are in the Glossary. It is suggested that these definitions be used universally.

GENERAL CONSIDERATIONS

SAFETY

- Highway safety is important when accommodating utility facilities within highway right-of-way. Utility accommodation should not adversely affect highway constructibility, operations, maintenance, and safety.
 - The design, location, and manner in which utilities use and occupy highway right-of-way shall conform to the policies of the transportation agency to provide and maintain a clear zone.
 - All permits for utility work should include provisions for the maintenance and protection of the traveling public, as well as provide a safe workspace for the utility workers.
 - The transportation agency and the utility procedures should provide for emergency maintenance operations.
-

DESIGN

- Highway and utility facilities, by tradition, practice, and, in some instances, laws, frequently co-exist within the same corridors. Therefore, it is essential that these public service facilities be compatibly designed and operated. Joint highway and utility planning and development efforts are encouraged.
- The potential impact on the highway and its use shall be considered in the design and location of utility facilities *within* the highway corridor. Likewise, the impact of a new or reconstructed highway or street on existing utility facilities should be considered in an attempt to avoid utility relocations.
- The utility shall be responsible to ensure that their facility is properly designed, installed, operated, and maintained including depth, clearances, and separation between lines, and the work is in accordance with the transportation agency's utility accommodation policy.
- The transportation agency should be responsible for review and approval of the utility's proposal in accordance with the agency's utility accommodation policy.
- Underground utilities should be accurately located using the American Society of Civil Engineer's *Standard Guidelines for the Collection and Depiction of Existing Subsurface Utility Data (3)* where the exact location of underground utility infrastructure is required. The survey information should be developed early in the design process so that the designer can show on the plans the accurate location of underground utilities that could cause injuries and property damage.

LOCATION

- New utility lines should be located to minimize the need for later adjustment to accommodate future highway improvements and to permit servicing such lines with minimum interference to highway traffic.
- New longitudinal utility installations should be located on a uniform alignment as near as practicable to the right-of-way line and outside the clear zone.
- Longitudinal utility installations on urban streets with closely abutting improvements may require variances to the recommended location on the highway right-of-way and consideration of alternate techniques conducive to safe traffic movement that are permitted by government and industry codes. Such installations shall be resolved in a manner consistent with the prevailing limitations and conditions.
- The location of utility facilities and appurtenances shall be in accordance with the Americans With Disabilities Act (5).

PRESERVATION AND RESTORATION

- *Erosion and Sediment Control.* Appropriate erosion control devices should be placed before work starts. The surface area disturbed by utility installations or relocations should be kept to a minimum.
 - *Restoration.* Restoration methods should be in accordance with the transportation agency's specifications and/or special provisions in utility use and occupancy agreements.
 - *Drainage.* Care should be taken in utility installations to avoid disturbing existing highway or private drainage facilities.
-

- **Trees.** The transportation agency's utility accommodation policy and/or permission to spray, cut, trim, or remove trees should be incorporated into the use and occupancy permit. When the removal of a tree is authorized, the stump should either be cut to the ground or be removed and the hole properly backfilled. All debris, refuse, and waste should be removed from the site. With the transportation agency's approval, removed trees may be chipped and/or shredded and used as mulch for site restoration.
- **Traffic Control.** Traffic controls for utility construction and maintenance operations shall conform to the *Manual on Uniform Traffic Control Devices (4)* or the transportation agency's requirements. Any utility construction or maintenance operation should be planned with full regard to safety, and interference with roadway traffic should be kept to an absolute minimum. On heavily traveled highways, utility construction operations interfering with traffic should not be allowed during periods of peak traffic flow.
- **Maintenance.** Maintenance activities within the right-of-way should be considered when installing utility facilities and appropriate markers or other warning devices. The use and occupancy permit, or where applicable the transportation agency utility accommodation policy, should identify the maintenance operations that will be permitted and indicate situations where prior notification to the transportation agency is required.
- **Records.** Records shall be maintained by the utility company that describe the facility, usage, size, configuration, material, location, and vertical clearance (or depth of cover) at time of installation and any special features such as encasement. Upon completion of construction, the utility should provide accurate as-built plans to the transportation agency, as requested. This information should be in a reproducible form available to other utilities and transportation agencies.
- **Relocations.** Where highway construction or alterations are considered, utility companies should be involved early in the design process. This will permit joint and parallel activities to be coordinated throughout the life of the highway project. Early involvement may facilitate completion of utility relocations prior to the start of project construction. Where utilities exist within the right-of-way of a highway to be widened or improved and a utility relocation is likely, consideration should be given to again accommodate those existing utilities within the highway right-of-way.

VISUAL QUALITY

- Visual and environmental impacts need to be addressed when reviewing locations for new aerial installations. The type and size of utility facilities and the manner and extent to which they are permitted within the highway right-of-way can materially alter the scenic quality, appearance, and view of highway roadsides and adjacent areas. For these reasons additional controls are applicable, particularly in certain areas that have been acquired or set aside for their scenic quality. Such areas may include scenic strips, overlooks, rest areas, recreation areas, the right-of-way of highways adjacent thereto, and the right-of-way of sections of highways which pass through public parks, historic sites, and wildlife refuges.
 - New aerial installations should be avoided in scenic areas where a feasible and prudent alternative exists. They should be considered only where:
 - Other locations pose unusual difficulty, are unreasonably costly, or are more undesirable from the standpoint of visual quality;
-

Locating the utility underground is not technically feasible or is unreasonably costly; and

The proposed installation can be made at a location and will employ suitable designs and materials that give adequate attention to the visual qualities of the area being traversed.

UNDERGROUND FACILITIES

GENERAL

Location

- a Utility crossings should be avoided in deep cuts, near footings of bridges and retaining walls, at highway cross drains where flow of water, drift, or streambed load may be obstructed, in wet or rocky terrain where it is difficult to attain minimum cover, and through paved or unpaved slopes under structures.
- On longitudinal installations, the utility should be located on uniform alignment as near as practicable to the right-of-way line. This will provide a safe environment for traffic operations, preserve the integrity of the highway, and preserve space for future highway improvements or other utility installations.

Highway Structure Attachments

- Attachments to bridge structures should be avoided where it is feasible and reasonable to locate utility lines elsewhere. Where other locations for a utility line to span an obstruction are not practical consideration should be given to attaching the utility line to a bridge structure by a method acceptable to the transportation agency.
- Generally, acceptable utility installations are those that will occupy a position beneath the structure's deck, between the outer girders or beams or within a cell. The utility should always be located above the low superstructure steel or masonry. When the utility is attached to a structure in such a manner, the future inspection and maintenance of the structure should not be hindered to the point where this necessary work cannot be reasonably accomplished.
- Appropriate controls should be developed by each transportation agency for the size and pressure for pipelines conveying hazardous materials, and for the location of shutoff valves on each side of the structure. For security purposes, gas, oil, sewer, or other hazardous utility facilities should not be allowed on structures identified as most critical.
- a In areas subject to seismic concern, special attention is needed in the design, installation, and maintenance of utilities *attached* to highway *structures*. This is necessary in order to *minimize* the effects of seismic activity and is especially important when the utility line carries hazardous or high-pressure substances.

Cover

- a On transverse (crossing) installations, the critical controls for depth of cover are the low points in the highway cross section (see Figure 1). Usually these are the bottoms of the longitudinal ditches. On longitudinal installations the critical controls for cover are the depths of lateral drainage facilities, bridge structures, and likely highway maintenance operations. In cold climates the depth of cover should be sufficient to withstand the greatly increased impact loads transmitted through the frozen soil. Minimum coverage requirements should be in accordance with the transportation agency's utility accommodation policy.

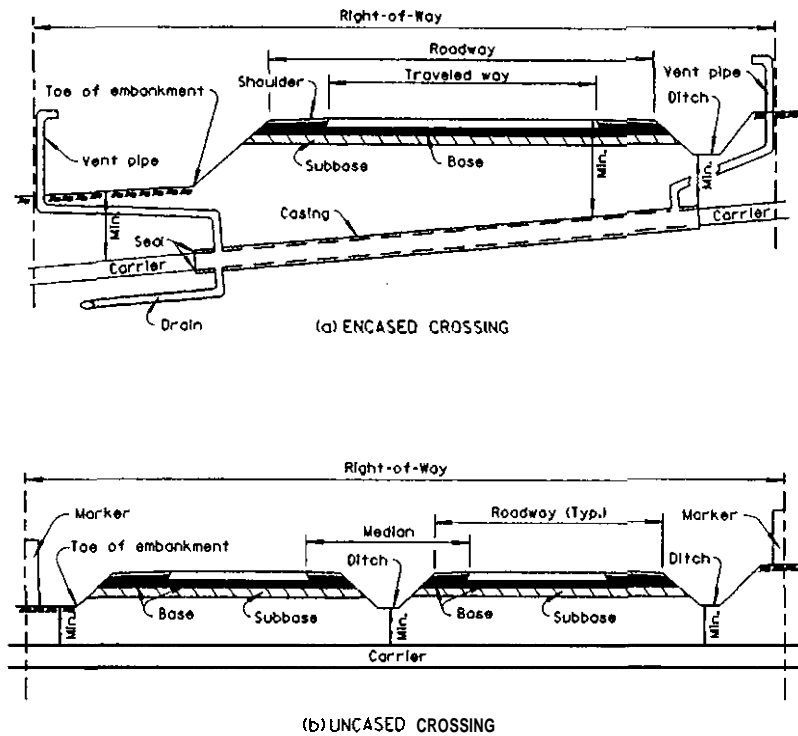


Figure 1. Examples of Features for Utility Crossings

- Where less than minimum cover will result, the utility line shall be provided with additional mechanical protection by the utility company. In such instances, the designer should consider increasing wall thickness or encasing the utility facility when the depth of cover is less than desirable, taking into account the relative risk with respect to the product carried and engineering and safety factors.

Separation

Utility facilities should be separated from highway facilities to avoid damage during installation and to provide for reasonable success in locating utilities with electronic devices. Separation of the utilities from highway facilities or other utilities may require the acquisition of additional property by the utility company.

Electric power and communication cables, gas lines, water lines, and sewer lines should be separated from one another as required by appropriate codes and ordinances.

Protection

- All non-metallic underground lines shall be accompanied by a trace wire, metallic tape, or other method to effectively locate and mark the underground lines. Whenever feasible, such methods should include devices incorporated into the utility line. The method used to locate and mark the exact location of the line shall be in accordance with the transportation agency's utility accommodation policy.
- No underground facility should be permitted within the highway right-of-way unless the facility operator subscribes to the services of a "call-before-you dig" system serving two or more utilities in the area. Where such service is not available, the facility operator should be required to:

(a) provide copies of as-built records including horizontal and vertical controls to the transportation agency; (b) update these records annually or whenever a change occurs; (c) provide a single, reliable, 24-hour telephone number to be used for locating and temporarily marking requests for emergency and routine activities by the transportation agency or by any entity planning to work within the highway right-of-way.

- The utility owner should place, as appropriate, permanent markers identifying the location of underground utilities, whether the utilities are crossing the highway or installed longitudinally. Markers should be installed in such a manner as to not interfere with highway safety and maintenance operations. Preferably, the markers should be located at the right-of-way line if that location will provide adequate warning. The telephone numbers to request marking the line location prior to excavation and for emergency response should appear on the marker.
- When it is likely that highway construction or maintenance activities could involve existing underground utilities, it is desirable to locate and identify these facilities well in advance of the commencement of the work as an aid to work crews. The location of each underground utility should be identified by the utility owner with stakes, paint, or other temporary on-the-surface markings coded with an identifying color consistent with the American Public Works Association's *Recommended Marking Guidelines for Underground Utilities (6)* by utility type.

Appurtenances

- Vents, drains, markers, manholes, shafts, shut-offs, cross-connect boxes, pedestals, pad-mounted devices, and similar appurtenances should not be located where they would interfere with the accessible facilities for the disabled.
- Appurtenances protruding more than 100 mm (4 in.) above the ground line should be located outside the clear zone and as close to the right-of-way line as practical. If no feasible alternative exists, appurtenances within the clear zone should meet breakaway criteria or be shielded by a traffic barrier.
- Utility accesses and valve covers should not be located in the roadway of rural highways. In urban and suburban areas there may be no feasible alternative to locating utility accesses and valve covers in the roadway, in which case they should not be located in a wheel path, if possible. Coordination among utilities is essential where utility accesses and valve covers are to occupy highway right-of-way.

Encasement

The following controls are suggested for providing encasement of pipeline crossings of the highway:

- Casings should be considered for the following conditions:
 - Crossings of freeways, expressways, and other controlled access highways and at other locations where it is necessary to avoid trenched construction.
 - As protection for carrier pipe from external loads or shock either during or after construction of the highway.

As a means of conveying leaking fluids or gases away from the area directly beneath the roadway to a point of venting at or near the right-of-way line or to a point of drainage in the highway ditch or a natural drainage way.

- The transportation agency should determine the need for casing of pressurized carrier pipes and carriers of materials that are flammable, corrosive, expansive, energized, or unstable.
- Jacked or bored installations of coated carrier pipes should be encased. Exceptions may be made where assurance can be provided against damage to the protective coating.
- Consideration should be given to encasement or other suitable protection for any pipeline (a) with less than minimum cover, (b) near footings of bridges or other highway structures or across unstable or subsiding ground, (c) near other locations where hazardous conditions may exist, or (d) on a structure that crosses an environmentally sensitive waterway or other natural area.
- Rigid encasement or suitable bridging should be used where support of pavement would be impaired by depression of flexible carrier pipe (see Figure 2). Casings should be designed to support the load of the highway and superimposed loads thereon and, as a minimum, should equal the structural requirements for highway drainage facilities. Casings should be composed of materials of satisfactory durability under conditions to which they may be exposed.
- Where pipelines are encased, the encasement should extend a suitable distance beyond the slope or ditch lines. For all access-controlled highways, the encasement should extend from right-of-way line to right-of-way line. On curbed sections, it should extend outside the outer curbs. Where appropriate, the encasement should provide for future widening of the highway without need for any utility adjustment.
- Casing pipe should be sealed at the ends with a flexible material to prevent flowing water and debris from entering the annular space between the casing and the carrier. The installations should include necessary appurtenances, such as vents and markers (see Figure 1(a)).
- For steel carrier pipes that employ cathodic protection anticorrosion systems: (a) the carrier and casing pipes should be effectively insulated from one another; (b) carrier and casing should be cathodically protected as a unit; or (c) consideration should be given to alternate mechanical protection in lieu of encasement.

Mechanical Protection

For some conditions, pipeline crossings of the highway may be installed without encasement. The following controls are suggested for providing mechanical protection to uncased pipeline crossings of the highway (see Figure 3).

- On uncased construction the carrier shall conform to the material and design requirements of utility industry and governmental codes and standards. In addition, the carrier pipe should be designed to support the load of the highway plus superimposed loads thereon when the pipe is operated under all ranges of pressure from maximum internal to zero pressure. Such installations should employ a higher factor of safety in the design, construction, and testing than would normally be required for cased construction.
- Suitable bridging, concrete slabs, or other appropriate measures should be used to protect existing uncased pipelines which by reason of shallow cover or location make them vulnerable to damage from highway construction or maintenance operations (see Figure 3). Such existing lines may remain in place without further protection measures if they are of adequate depth and do not conflict with the highway construction or maintenance operations, provided both highway and utility officials are satisfied that the lines are, and will remain, structurally sound and operationally safe.

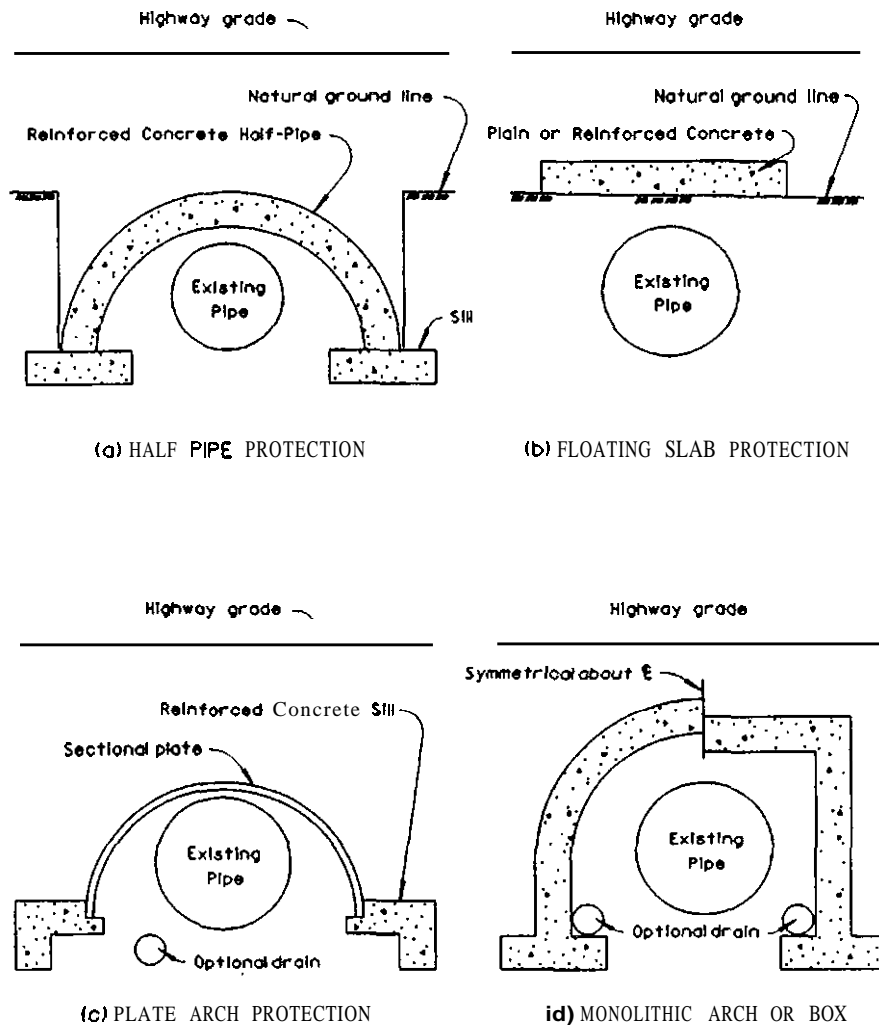


Figure 2. Examples of Protection of Existing Utility Lines Under a Highway

- Uncased crossing of welded steel pipelines which carry flammable, corrosive, expansive, energized, or unstable materials, particularly if carried at high pressure or potential, may be permitted, provided additional protective measures are taken in lieu of encasement. Such measures would employ a higher factor of safety in the location, design, construction, and testing of the uncased-carrier pipe, including such features as increased depth of cover, thicker wall pipe, radiograph testing of welds, hydrostatic testing, coating and wrapping, and cathodic protection.

INSTALLATION

Untrenched construction is the preferred method to install utility facilities crossing highways and streets in order to minimize disturbance of pavement surface. When the trench method is employed to install a utility crossing a highway, pavement restoration can be complicated by the details involved with the restoration and need for a detailed Traffic Control Plan.

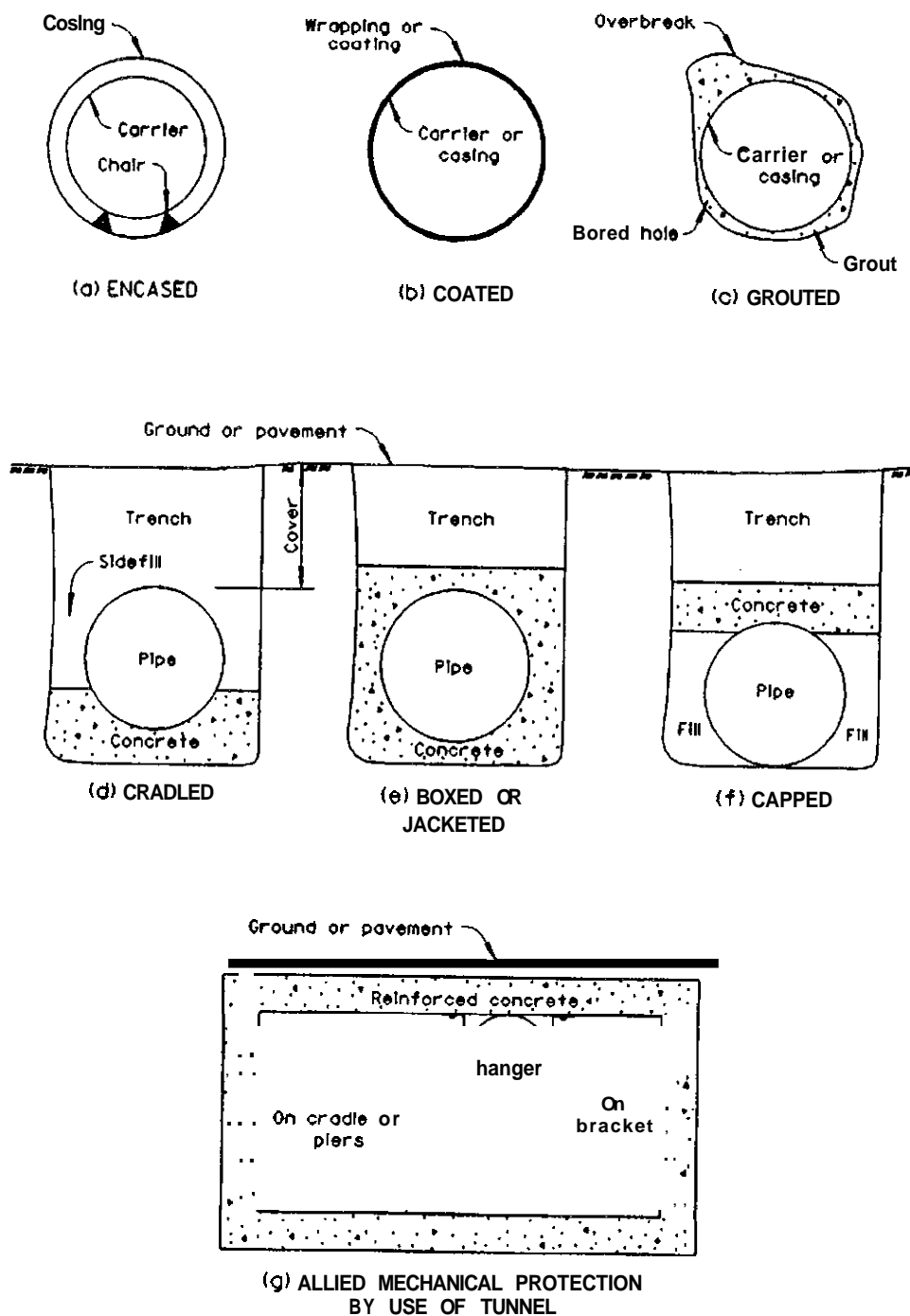


Figure 3. Example of Mechanical Protection for Underground Utility Crossings

Untrenched Construction

- Methods may include directional drilling, micro tunneling, driving, coring, or boring
- The size of the untrenched construction should be restricted and the conditions specified under which the void outside the carrier or casing must be backfilled with grout. Where soils are favorable and the carrier is 1.2 m (4 ft) or more deep, the diameter of the untrenched construction

hole may be five percent larger than the diameter of the carrier. Grout backfill should be considered for carriers or casings more than 300 mm (12 in.) in diameter and for overbreaks, unused holes, or abandoned carriers or casings. Untrenched excavations 100 mm (4 in.) or less in diameter may be exempt from void filling requirements in accordance with the transportation agency's utility accommodation policy.

- Portal limits of pipeline crossings should be established beyond the surfaced areas of the highway so as to avoid impairing the roadway during installation of the pipeline. Where a bulkhead seals the pipeline portal, the portal should be suitably offset from the surfaced area of the highway. Where a bulkhead is not installed in the pipeline, the portal should be offset not less than the vertical difference in elevation between the surfaced area of the highway and the pipeline.

Trenched Construction

- At highway crossings, care must be taken to prevent the trench from becoming a drainage channel.
- On longitudinal lines, care must be taken to prevent the trench from interfering with surface or subsurface drainage.

Proper pavement restoration details depend on a number of factors including construction methods, pavement type, pavement conditions, and proximity of pavement joints. The transportation agency's standard specifications for trenching and backfilling shall be applied. Where no specification exists, the following applies:

- When the existing highway pavement is cut to accommodate a utility installation, the opening should be saw cut to match the pavement thickness.

The width of pavement removal should be determined by the width of the required trench plus 300 mm (12 in.) minimum on each side of the trench (See Figure 4). The additional pavement removal is intended to minimize later development of a sag in the surface of pavement over the trench. In the event the distance of any adjacent longitudinal or transverse joint or crack is less than 1.2 m (4 ft) from the recommended width of cut, the pavement should be removed and replaced to that joint or crack.

Trenches should be cut to have vertical faces, where soil and depth conditions permit, with a maximum width of outside diameter of casing or carrier, plus 0.5 m (2 ft). They shall be shored where required by law. Lateral and vertical support shall be provided for all existing facilities and structures. Short tunnel sections should be used near adjacent utilities or facilities.

- Bedding should be provided to a depth of 150 mm (6 in.) or half the diameter of the casing or carrier, whichever is less. Bedding should consist of granular material, free of lumps, clods, stones, and frozen materials and should be graded to a firm but yielding surface without abrupt change in bearing value. Unstable soils and rock ledges should be sub-excavated from the bedding zone and replaced by suitable material. The bottom of the trench should be prepared to provide uniform bedding throughout the length of the installation.
 - Backfill under the roadway and foreslopes should be placed in two stages: first, fill to the level of the top of carrier or casing and second, fill to the former surface. Fill should consist of suitable material placed in layers of appropriate thickness to permit consolidation by compaction according to current applicable specifications. For backfill of trenched pavement, materials and methods of compaction should be adapted to achieve prompt restoration of traffic service.
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- The transportation agency may require that backfill and/or repaving be performed by either its forces, under its direction at the expense of the utility owner, or by a licensed contractor certified by the transportation agency. Where a utility owner can demonstrate that it is capable of acceptable and adequate repair, it may be authorized to perform its own restoration using specifications acceptable to the transportation agency.

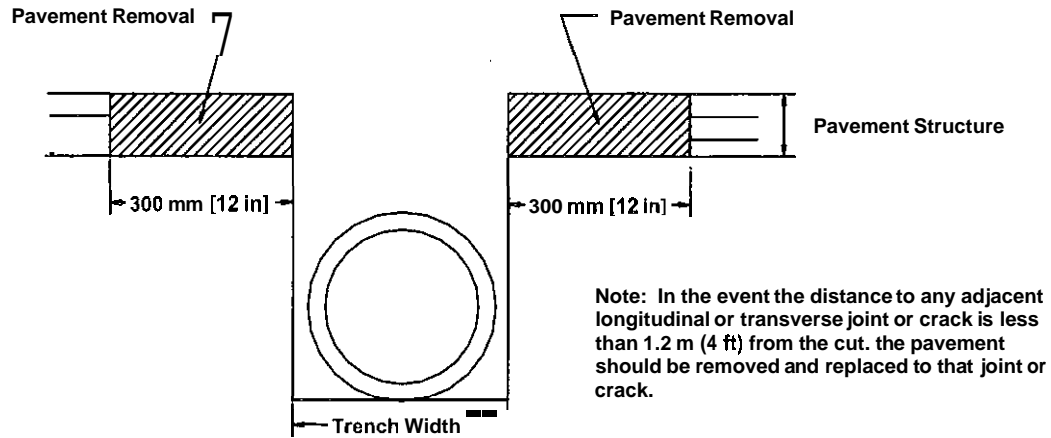


Figure 4. Illustration of a Pavement Cut

- During construction, open trenches or other excavations within the clear zone should not be permitted to remain beyond the workday unless backfilled, covered, delineated, or shielded in accordance with the transportation agency's utility accommodation policy.

Utility Tunnels and Bridges

- A utility tunnel or a bridge occasionally is provided for a carrier or casing crossing a major highway at a strategic location. Where it can be foreseen that several utility crossings will be needed, the cost of a tunnel (either a large casing or a box culvert) or a bridge may be less than that for the alternate of several untrenched or separate carriers or casings. Where these conditions exist, the transportation agency should take steps as necessary to ensure that adequate coordination is performed with and among the utilities to anticipate their needs for future crossings and to converge their facilities to a single joint use crossing.
- In a tunnel or on a bridge, provision shall be made to isolate mutually hazardous materials being carried, such as fuel and electric energy, by auxiliary encasement of incompatible carriers or by establishing separate compartments.
- The utility tunnel or utility bridge structure should conform in appearance, location, cover, earthwork, and markers to the culvert and bridge practices of the transportation agency.

PIPELINES

- Pressure pipelines shall conform to the currently applicable sections of Federal (7, 8, 9, 10), state, local, and industry codes.
 - Liquid petroleum pipelines shall conform to the currently applicable recommended practice of the American Petroleum Institute (11) for pipeline crossings under highways.
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- Any pipeline carrying hazardous materials shall conform to the rules and regulations of the U.S. Department of Transportation (8) governing the transportation of such materials.
- Water lines shall conform to the currently applicable standards by the American Water Works Association (12).
- A pipeline crossing should be avoided within basins of an underpass drained by a pump if the pipeline carries a liquid, liquidified gas, or other potentially hazardous materials.
- Additional protection shall be provided for any pipeline with less than minimum cover.
- Vents should be located at the high end of short casings and generally at both ends of casings longer than 45 m (150 ft). Vent standpipes should be located and constructed so as not to interfere with maintenance or use of the highway nor to be concealed by vegetation; preferably they should stand on a fence or right-of-way line (see Figure 1(a)). In urban areas, such vents should be permitted only where they do not affect pedestrian traffic.
- Drains should be provided for casings and tunnels enclosing carriers of liquid, liquified gas, or heavy gas. Drains may outfall into roadside ditches or at locations approved by the transportation agency. Such outfall should not be used as a wasteway for purging the carrier unless specifically authorized.
- Shut-off valves, preferably automatic, shall be installed in lines at or near ends of structures.
- Pipeline installation permits should specify the class of materials being carried, the maximum working, test, or design pressures, and the design standards for the carrier.
- When it is anticipated that there will be a change in the class of materials being carried or an increase in the maximum design pressure specified in the permit, the utility shall be required to give the transportation agency advance notice and obtain approval for such changes. The notice shall specify the applicable codes to be used.

POWER AND COMMUNICATION LINES

- Electric power and communication facilities shall conform to the currently applicable *National Electrical Safety Code* (13). Where the Code apparently does not apply, the minimum standards in that Code for the lowest voltage line shall apply. Utility owners or industry standards may prescribe more protection.
- Factors such as water conditions, type of soil, and facility congestion may cause variation in the technique and practices for installation of underground power and communication lines. Installation methods include trenching or plowing of conduit, duct, or buried cable; plowing for burial of cable; jacking or pushing of pipe or conduit; and small boring or mechanical compaction for pulling pipe, duct, or cable.

IRRIGATION AND DRAINAGE PIPES

Irrigation and drainage pipes installed across highway right-of-way should be designed and constructed in accordance with the transportation agency's specifications for highway culverts and bridges. If these facilities are privately owned, the transportation agency should require proof of insurance (with the agency named as an additional insured) as a condition of permit approval.

OVERHEAD FACILITIES

LOCATION AND SAFETY

- In keeping with the nature and extent of roadside development alongside highways, above-ground facilities should be located outside of the clear zone and as near as practical to the right-of-way line. Where there are curbed sections, the utilities should be located as far as practical behind the face of outer curbs and, where feasible, behind the sidewalks at such locations that will not interfere with adjacent property use and in compliance with the Americans with Disabilities Act (5).
- The location of overhead utility facilities on highways with narrow right-of-way or on urban streets with closely abutting improvements requires special considerations. Before locating the utility at other than the right-of-way line, consideration should be given to designs employing self-supporting, armless single-pole construction, with vertical alignment of wires or cables, or other techniques permitted by governmental or industry codes that are conducive to a safe traffic environment. Exception to these clearances may be made where poles and guys can be placed at locations behind existing guardrail, and/or beyond drainage ditches, the toe or top of slopes, retaining walls, or in other similar protected locations.
- Appurtenances with the clear zone protruding more than 100 mm [4 in] above the ground line should be located outside the clear zone and as near to the right-of-way line, as practical. If no feasible alternative exists, appurtenances within the clear zone should meet breakaway criteria or be shielded by a traffic barrier.
- Where irregular-shaped portions of the right-of-way extend beyond or do not reach the normal right-of-way limits, variances in the location of utilities should be allowed to maintain a reasonably uniform alignment for longitudinal installations. Such installations will reduce the need for guys and anchors between poles and roadway.
- Longitudinal installations of poles, guys, or other facilities should not be located in a highway median. If longitudinal installations are constructed, the facility shall be installed in such a manner that it does not create a hazard to the traveling public.
- For crossings of a highway, poles should not be located in the highway median unless there is no feasible option. In which case, if located within the clear zone, they shall be a breakaway design or shielded by a traffic barrier.

DESIGN

- All overhead lines regardless of voltage or metallic content shall meet the requirements of the *National Electrical Safety Code (13)*.
 - Designs employing self-supporting, armless, single-pole construction, with vertical alignment of wires, or cables, or other techniques permitted by governmental or industry codes should be considered whenever feasible. However, they must be conducive to safe traffic operations.
 - Joint-use, single-pole construction should be encouraged at locations where more than one utility or type of facility is involved. Where such designs are used, the *National Electrical Safety Code (13)* shall be followed.
 - The distance between utility poles should be the longest feasible span lengths consistent with geometric and design line loading considerations.
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- Where practical and economically feasible, existing pole lines should be replaced with buried cables when relocation is necessary within the highway right-of-way. Buried cable may not be practical where there will be multiple connections to overhead lines, to utility customers, or where line voltage is high.

VERTICAL CLEARANCES

The minimum vertical clearance for overhead power and communication lines above the highway and approaches to the highway should conform to the current *National Electrical Safety Code* (13). Greater clearances should be used when required by state law, regulation, or policy.

DITCHES AND CANALS

Ditches and canals not required for highway drainage, which closely parallel the highway, should not be constructed within the highway right-of-way. Where ditch maintenance roads are adjacent to ditches or canals that cross the highway, consideration should be given to safety, traffic operations, and the cost of a grade separation when providing for the continuity of such roads.

GLOSSARY

Arterial Highway — A general term denoting a highway primarily for through traffic, usually on a continuous route.

Average Daily Traffic — The average 24-hour volume, being the total volume during a stated period divided by the number of days in that period. Unless otherwise stated, the period is a year. The term is commonly abbreviated as ADT.

Backfill — Material used to replace or the act of replacing material removed during construction; also may denote material placed or the act of placing material adjacent to structures.

Bedding — Composition and shaping of soil or other suitable material to support a pipe, conduit, casing, or utility tunnel.

Boring — The operation by which large carriers or casings are jacked through oversize bores. The bores are carved progressively ahead of the leading edge of the advancing pipe as soil is mucked back through the pipe.

Cap — A rigid structural element surmounting a pipe, conduit, casing, or utility tunnel

Carrier — A pipe directly enclosing a transmitted fluid (liquid, gas, or slurry). Also an electric or communication cable, wire, or line.

Casing — A larger pipe, conduit, or duct enclosing a carrier

Clear Zone — The total roadside border area, starting at the edge of the traveled way, available for safe use by errant vehicles. This area may consist of a shoulder, a recoverable slope, a non-recoverable slope, and/or a clear run-out area. The desired width is dependent upon the traffic volumes and speeds, and on the roadside geometry.

Coating — Material applied to or wrapped around a pipe.

Conduit — An enclosed tubular casing, singularly or multiple, for the protection of wires, cables, or lines, usually jacketed and often extended from utility access hole to utility access hole.

Control of Access — The condition where the right of owners or occupants of abutting land or other persons to access, light, air, or view in connection with a highway is fully or partially controlled by public authority.

Full Control of Access — The authority to control access is exercised to give preference to through traffic by providing access connections with selected public roads only by prohibiting crossings at grade or direct private driveway connections.

Partial Control of Access — The authority to control access is exercised to give preference to through traffic to a degree that, in addition to access connections with selected public roads, there may be some crossings at grade and some private driveway connections.

Coring— The operation by which a small casing is drilled into firm soil. As the pipe advances, the core material is removed by sluicing during or after the drilling.

Cover— Depth to top of pipe, conduit, casing, cable, or similar line or utility tunnel below the earth or roadway surface.

Cradle— A rigid structural element below and supporting a carrier or casing.

Direct Burial— Installing a utility underground without encasement.

Drain— An appurtenance to discharge liquid contaminants from casings.

Driving— The operation by which a small pipe is driven through compressible soils by a steady thrust, hammering, or vibrating. A casing or corrosion-resistant covering shall be used.

Duct— An enclosed tubular casing for protecting wires, lines, or cables, often flexible or semi-rigid.

Encasement— Structural element surrounding a carrier or casing.

Encroachment— Unauthorized use of highway right-of-way or easements by such items as signs, fences, buildings, utilities, parking, storage, etc.

Expressway— A divided arterial highway for through traffic with partial control of access and generally with grade separations at major intersections.

Freeway— A controlled-access, divided arterial with grade separations at intersections.

Frontage Road— A local street or road auxiliary to and located on the side of an arterial highway for service to abutting property and adjacent areas and for control of access.

Grounded— Electrically connected to earth or to some extended conducting body which serves instead of the earth whether the connection is intentional or accidental.

Grout— A fluid mixture of cement and water or of cement, sand, and water used to fill joints and voids. Also called slurry.

Highway, Street, or Road— A general term denoting a public way for the transportation of people, materials, goods, and services, but primarily for vehicular travel, including the entire area within the right-of-way.

Interchange— A system of interconnecting roadways in conjunction with one or more grade separations providing for the movement of traffic between two or more roadways on different levels.

Jacket— A concrete encasement placed around a carrier or casing.

Manhole (Utility Access Hole)— An opening in an underground system which workers may enter for the purpose of making installations, removals, inspections, repairs, connections, and tests.

Median— The portion of a divided highway separating the traveled ways for traffic in opposite directions.

Pavement Structure — The combination of subbase, base course, and surface course placed on a subgrade to support the traffic load and distribute it to the roadbed.

Permit — The written agreement by which a transportation agency approves the use and occupancy of highway rights-of-way by utility facilities or private lines. Also called Occupancy Agreement.

Pipe — A formed hollow cylinder for the conveyance of liquids or gases. Cylinders formed from plate material in the course of the fabrication of auxiliary equipment are not pipe as defined here.

Flexible Pipe — A plastic, fiberglass, or metallic pipe having large ratio of diameter-to-wall thickness which can be deformed without undue stress.

Rigid Pipe — Pipe assigned for diametric deflections of less than one percent.

Semi-Rigid Pipe — Pipe designed to tolerate from one percent to three percent diametric deflection.

Plowing — Direct burial of a line by means of a "plow" type mechanism, which breaks the ground, places the line and closes the break in the ground in a single operation.

Pressure — The relative internal pressure in a pipe

Private Lines — Privately owned facilities, which convey or transmit the commodities outlined in the definition of utility facilities, but are devoted exclusively for private use.

Ramp — A turning roadway at an interchange for travel between intersection legs.

Rest Area — A roadside area with parking facilities separated from the roadway provided for motorists to stop and rest for short periods. It may include drinking water, toilets, tables and benches, telephones, information, and other facilities for travelers.

Right-of-Way — A general term denoting land, property, or interest therein, usually in a strip, acquired for or devoted to transportation purposes.

Roadside — A general term denoting the area adjoining the outer edge of the roadway. Extensive areas between the roadways of a divided highway may also be considered roadside.

Roadway — The portion of a highway, including shoulders, for vehicular use. A divided highway has two or more roadways.

Scenic Overlook — A roadside area provided for motorists to stop their vehicles beyond the shoulder, primarily for viewing the scenery in safety.

Scenic Strips — Strips of land or water adjacent to highways, or interests therein, which are acquired by the transportation agency for restoration, preservation, or enhancement of scenic beauty adjoining a highway.

Slab, Floating — A slab between a utility line and a structure or pavement, that does not contact either,

Sleeve—A short casing through pier or abutment of highway structure.

Slurry — A thin mixture of liquid, especially water, and any of several finely divided substances, such as cement or clay particles. Also called grout.

Temporary Barrier — A temporary device used to prevent vehicular access into construction or maintenance work zones and to redirect an impacting vehicle so as to minimize damage to the vehicle and injury to the occupants, while providing worker protection.

Traffic Barrier — A device used to prevent a vehicle from striking a more severe obstacle or feature located on the roadside or in the median, or to prevent crossover median accidents

Traffic Control Plan — A plan for handling traffic through a specific highway or street work zone or project.

Transportation Agency — The department, agency, commission, board, or official of any state or political subdivision thereof charged by its law with the responsibility for highway administration

Traveled Way — The portion of the roadway for the movement of through traffic

Trenched — Installed in a narrow open excavation

Untrenched — Installed without breaking the ground or pavement surface for such operations as jacking, tunneling, or boring.

Utility Access Hole (Manhole) — An opening in an underground system which workers may enter for the purpose of making installations, removals, inspections, repairs, connections, and tests.

Utility Accommodation Policy — A statement of the policies and procedures used by a transportation agency to regulate and accommodate utilities within the highway right-of-way.

Utility Facility — A privately, publicly, or cooperatively owned line, facility, or system for producing, transmitting, or distributing communications, cable, heat, gas, oil, crude products, water, steam, waste, storm water not connected with highway drainage, or any other similar commodity, including any fire or police signal system or street lighting system, which directly or indirectly serves the public.

Utility Tunnel — An underpass for one or more utility lines.

Vent — An appurtenance to discharge lighter than air contaminants from a casing

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