

**UTILITY ATTACHMENTS ON STRUCTURES**  
**DESIGN CRITERIA**

07/24/2001

**DESCRIPTION**

.00 Scope - This work consists of attaching or installing utilities on new and existing structures, including buried installation within the right-of-way adjacent to and within 5-m of a structure member.

**MATERIALS**

.10 General - Construct utility attachment systems using materials from the Department's QPL and meeting the following requirements:

Paint and painting.....	00594
Structural Steel.....	02530
Forgings, Shafting, Castings and Nonferrous Materials.....	02540
Fasteners .....	02560
Pipe Markings (Reflective Sheeting).....	02910.30
Resin Bonded Anchor System .....	00535.10

.13 Brackets - Construct brackets of stainless steel or hot-dip galvanized structural steel.

**CONSTRUCTION**

.40 General - Provide sufficient space around utilities for maintenance activities.

Avoid drilling through reinforcing steel. If reinforcing steel is hit, move the anchor location and patch the hole with an approved patching material from the QPL. Anchors shall not contact reinforcing steel.

Attach conduits or brackets to concrete structures with resin bonded concrete anchors, unless otherwise shown and approved.

(a) Design Requirements - Design attachment systems so that:

- A failure does not damage the structure or endanger the public.
- The system is corrosion-resistant, withstands anticipated loads including impact from traffic induced deflection, and accommodates normal temperature movements in the structure.
- The system uses existing utility provisions to the extent feasible.
  - Brackets and hangers use slotted holes or other means of adjustment to allow for construction tolerances.

All designs shall include field verification and inspection.

(b) Submittals - Before beginning work, submit plans and calculations for the Engineer's approval, including:

- Vertical, lateral, longitudinal, vibration, inertia loading, and seismic loading of attachments as appropriate
- Maximum design and operating pressures for pressurized systems
- A check of the effect of the imposed loads on individual members of the structure and/or the entire structure as appropriate
  - Proposals for special details of pipe, casing, vents and attachments to the structure.

Pursuant to Oregon Revised Statutes, all designs and plans shall be prepared, signed, and stamped with the seal of a professional engineer registered to practice in Oregon.

(c) Large Utility - Dependant on Age, Design and construction of a structure, requests to attach a large pipeline may require having a load rating performed meeting the criteria set forth by, and at the discretion of, the Load Rating Engineer.

(d) Location Requirements:

(1) General - Locate utility installation so as to minimize changes to the structure's appearance, and to facilitate installation, inspection, and maintenance. If no other means of access is provided or provisions for utilities in box girders are occupied by others, locate utilities as close as possible to the structure exterior to allow access by snooper crane. Paint all lines/conduits exposed to public vies to match the structure color.

Provide sufficient space around utilities for maintenance activities.

Avoid allowing utilities and supports to extend below the bottom of the superstructure.

If a utility is placed on outside of an exterior girder on stream crossings, locate it on the downstream side of the structure.

Avoid drilling through reinforcing steel. If reinforcing steel is hit, move anchor location and patch hole with an approved patching material from the QPL.

Protect exposed pipe and hardware against corrosion. Piping systems visible to the motoring public shall be painted to match the existing structure color.

(2) Traffic Barrier - Do not place conduits within bridge rails or traffic barriers without prior approval of Bridge Section, Bridge Operations Unit. Where no alternative exists, limit the number and size of conduits to assure ease of placement and proper consolidation of concrete in the rail. Give special attention to details at expansion joint couplings.

(e) Attachments and Anchors - Attach conduits or brackets to concrete structures with resin bonded concrete anchors, unless otherwise approved. Mechanical anchors may be considered if the following considerations are satisfied:

- Anchors shall maintain capacity under dynamic or vibratory type loads.
- At least two anchors (4:1 safety factor per anchor) are provided for each attachment, or a single anchor with a factor of safety of 6:1.

Label all attachments to bridges according to .48.

.41 Natural Gas Lines - Conform to CFR 49 Part 192 in all aspects applicable to the work. Provide isolation valving 61 m from each end of the bridge.

.44 Other Lines - Lines carrying gas and other volatile substances shall be cased the full length of the structure. Provide transverse supports for all gas lines. Vent casings to the outside of the structure at each end and at high points of enclosed or box-type structures. Protect exposed lines from accidental and intentional damage. Provide a corrosion protection system. Water lines - Use hot-dip galvanized steel, ductile iron pipe, or approved equal. Provide isolation valving 61 m from each end of the bridge.

.46 Water Lines and Sewer Lines - Case water lines placed adjacent to bridge footings if failure of the line could undermine the footing. Provide transverse supports near each coupling for all water lines.

In box girders, make provisions for a water line failure. Provide additional drain holes or gratings at low points in cells.

.48 Labeling - Oregon Labeling System - Scheme for identification of piping systems attached to bridges. Clearly label all piping or conduit systems according to the following APWA color code:

Table -1

Material	Marker back-ground color	Lettering color
Electrical Power Lines, Cables, Conduits, Lighting Cables	Red	White
Gas, Oil, Steam, Petroleum, Gaseous Materials	Yellow	Black
Communications, Alarm, Signal Lines, Cables, or Conduits	Orange	Black
Potable Water	Blue	White
Reclaimed Water, Irrigation, Slurry Lines	Purple	White
Sewers, and Drain Lines	Green	White

Pipe markings shall conform to 02910.30. The purple color background for the label identifying reclaimed water, irrigation and slurry shall be generated by placing transparent film over the white reflective material meeting specification 02910.30. The purple tint of the transparent film shall match Federal Standard Color 595B No. 37100. Minimum length of color field shall be as shown in Table -2 or the size of the letter beyond each end of the “Legend, Owner, emergency number” text, whichever is longest.

Table -2

Pipe O.D. Min (mm)	Pipe O.D. Max. (mm)	Length of color for pipe marker field	Size of letter for legend
19	32	200	13
38	51	200	19
64	150	300	32
200	250	600	64
250	-	800	89

Where piping system is above or below normal line-of-site, place pipe label so that lettering may be seen from normal eye height.