

2.5.2.5 UTILITIES

UTILITIES INSTALLED WITH NEW CONSTRUCTION

General

Utility facilities should be allowed on structures in accordance with the ITD Utility Accommodations Policy. If utilities are allowed on the structure, the bridge designer shall determine the method of attachment and the location.

Bridge plans shall include all hardware specifications and details for the utilities installed during original construction. All materials and workmanship shall be in accordance with the current edition of the Idaho Transportation Department Standard Specifications for Highway Construction. Water, sewer, and gas lines shall only be installed during original construction.

Provisions for future telephone, power, and cable utility attachments shall include installation of sleeves from the roadway shoulder through the abutment backwall, intermediate diaphragms, and pier diaphragms. Threaded inserts shall also be provided in the bottom of the deck slab for future utility hangars.

Design Criteria

All utilities and utility supports shall be designed according to the AASHTO LRFD Bridge Design Specification to resist Strength and Extreme Event Limits States. This includes and not limited to dead load, expansion, surge, and earthquake forces.

Location

Utilities should be located, if possible, such that a rupture or support failure will not result in damage to the bridge, the surrounding area, or be a hazard to traffic. The utility installation shall be located so as to minimize the effect on the appearance of the structure and shall not affect bridge maintenance or bridge inspection activities. For new construction, the utility should be installed between girders. For attachment to an existing bridge, the utilities may be installed on the cantilevered portion of the deck. Utilities shall not be attached above the bridge deck nor attached to the railings or posts. Utilities and supports must not extend below the bottom of the superstructure. When appurtenances such as air release valves are required, care should be taken to provide adequate space.

Termination at Bridge Ends

Utility conduit and encasements shall extend beyond the end of the bridge/approach slab and shall extend to the roadway shoulder using acceptable bends or radius sweeps. Conduits and encasements installed for future use shall have the ends capped. The details shall be shown on the bridge plans and coordinated through the Utilities Engineer.

Expansion Joints

The utilities shall be designed with a suitable expansion system as required to prevent longitudinal forces from being transferred to bridge members.

Water mains generally remain a constant temperature and are anchored in the ground at the abutments. However, the bridge will move with temperature changes and seismic forces. Pipe support systems must be designed to allow for the bridge movements. For short bridges, this generally means the bridge will move and the utility will not since it is anchored at the abutments. For long bridges that require pipe expansion joints, design must carefully locate pipe expansion joints and the corresponding longitudinal load-carrying support.

Electrical conduits that use PVC should have an expansion device for every 100' of pipe due to the higher coefficient of expansion. If more than two joints are specified, a cable or expansion limiting device is required to keep the ends from separating.

Pipelines for Fluids and Gases

The pipeline material shall be appropriate to handle the capacity and loads required, with due care taken to protect the structure and traffic. All pipelines carrying fluids and gases shall be encased the length of the structure in an acceptable encasement pipe and braced for lateral loading. The space between the carrying pipe and the encasement sleeve shall be effectively vented and drained beyond the structure at each end and at high points. Generally, a sleeve approximately 3" larger than the outside diameter of the encasement pipe shall be used to pass the utility through concrete diaphragms or abutments.

Pipelines transporting fluids and gases shall provide shut-off valves, either manual or automatic, at or near each end of the structure to provide a means of control in case of an emergency.

All pipe systems under pressure shall state the maximum operating and test pressure on the plans.

When exposed steel utility lines and supports are attached to a painted structure, they shall be painted in accordance with ITD Standard Specifications and the final coat shall match the bridge color. Any painted surfaces damaged during construction shall be cleaned and painted as directed by the Engineer. Any paint splatters shall be removed from the bridge.

Volatile Fluids

The utility company shall make provisions to electrically insulate pipelines carrying volatiles from its support.

Water and Sewer Lines

Water and Sewer lines should be steel pipe. Transverse support or bracing shall be provided for all water lines to carry Strength and Extreme Event Lateral Loading.

In box girders (closed cell), a rupture of a water line will generally flood a cell before emergency response can shut down the water main. This will be designed for an Extreme Event II load case, where the weight of water is a dead load (DC). Additional weep holes or open grating should be considered to offset this Extreme Event.

Water or sewer lines to be placed lower than adjacent bridge footings shall be encased if failure can cause undermining of the footing.

Telephone, Power, and Cable Conduit

All conduits shall be rigid. Conduits shall be galvanized steel pipe, Schedule 40 (minimum) PVC pipe of a UL approved type, or an approved equal. All metal fittings shall be galvanized in accordance with AASHTO M-111 or M-232 (ASTM A-123 or A-153 respectively). PVC pipe may be used with suitable consideration for deflection, placement of expansion fittings, and of freezing water within the conduits.

Utility Supports

Where such conduit is buried in concrete curbs or barriers or has continuous support, such support is considered to be adequate. Where hangers or brackets support conduit at intervals, the distance between supports shall be small enough to avoid excessive sag between supports. Utility supports shall be designed so that any loads imposed by the utility installation do not overstress the conduit, supports, bridge structure, or bridge members.

Designs shall provide longitudinal and transverse support for loads from gravity, earthquakes, temperature, inertia, etc. It is especially important to provide transverse and longitudinal support for single rod and other similar inserts that cannot resist moment.

Attachment of conduits or brackets to non-prestressed concrete members shall be with epoxy bond anchors. There should be a minimum of 3" edge distance to the centerline of bolt holes in concrete. Drilling into prestressed concrete members for utility attachments shall not be allowed. All welding must be approved and welding across main members will not be permitted. All steel in utility supports, including fastenings and anchorages, shall be galvanized in accordance with AASHTO M-111 or M-232 (ASTM A-123 or A-153 respectively).

The following types of supports are generally used for various utilities. Selection of a particular support type should be based on the needs of the installation and the best economy.

Concrete Embedment

This is the best structural support condition and offers maximum protection to the utility. Its cost may be high for larger conduit and the conduit cannot be replaced.

Pipe Hangers

Utility lines should be suspended by means of cast-in-place anchors, whenever possible. This is the most common type of support for utilities to be hung under the bridge deck. This allows the use of standard cast-in-place inserts and is very

flexible in terms of expansion requirements. Refer to Bridge LRFD Manual pages B2.4A and B2.4B for suggested details. To avoid complete failure of the utility hanger system by failure of one hanger for heavy pipes over traffic (10" water main or larger), the Extreme Limit State should be used assuming one hanger has failed. Vertical Anvil Insert, Figure 282 or similar inserts, will not provide resistance to longitudinal forces. Transverse supports must be provided by a second hanger extending from a girder or by a brace against the girder. Where PVC conduit is to be supported by hangers or pedestals at intervals, the distance between supports shall be small enough to avoid excessive sag of the conduit. Refer to Article A2.5 for recommended support spacing for PVC pipe.

UTILITIES INSTALLED ON EXISTING BRIDGES

General

Requests to install utilities on existing structures should follow the procedures outlined in the ITD Guide for Utility Management. Utilities shall not be allowed to attach to a highway structures until approved by ITD. Attachment details should be shown on the existing bridge plan sheets that can be obtained from the ITD Bridge Section. Design for utilities attached to existing structures should follow the same requirement as utilities installed with new construction. Any existing utilities on the same side of the structure as the proposed utility should be shown on the plans. The utility company shall be responsible for calculating design stresses in the utility and design of the support system. All calculations shall be on 8½"x11" paper and stamped by an engineer licensed in Idaho. Plans shall be either 11"x17" or 22"x34" sheets and stamped by an engineer licensed in Idaho.

Pipelines for Fluids and Gases

Bridges are not designed to carry the extra weight of future pipelines for fluids and gases. Adding these pipelines to an existing bridge will normally produce an overstress in the members. Design calculations are required to verify that no overstress occurs in the members and the live load carrying capacity of the bridge is not reduced.

Revisions:

June 2006

Added new article.