TELEPHONE CONDUITS

GENERAL

Telephone companies may request permission to attach telephone conduits to bridge structures proposed for construction on the Colorado Highway System. All such requests should be coordinated through the District Utility Engineer, who should submit the request, in writing, to Staff Bridge Design. Such requests must state the proposed schedule for installation, the location of the conduits, the type of conduit sleeve required, and the size, spacing, capacity, and number of inserts. For Off-system projects, requests for conduits will be processed as outlined at the predesign meeting. For aesthetic and safety reasons, conduits will not be permitted under deck overhangs or on bridge railing.

The Contractor will install sleeves for conduits through abutments, pier caps, and diaphragms and will install concrete inserts. The sleeves and inserts will be supplied by the telephone company. The cost of installation will be included in the work to avoid the time and costs involved in separate contract negotiations for reimbursement from the telephone company. Installation of hangers, conduit, and expansion devices will be handled by the telephone company.

The plans shall indicate the size, spacing, and capacity of the inserts, the basis of payment for installation, and what materials are to be furnished by the telephone company.

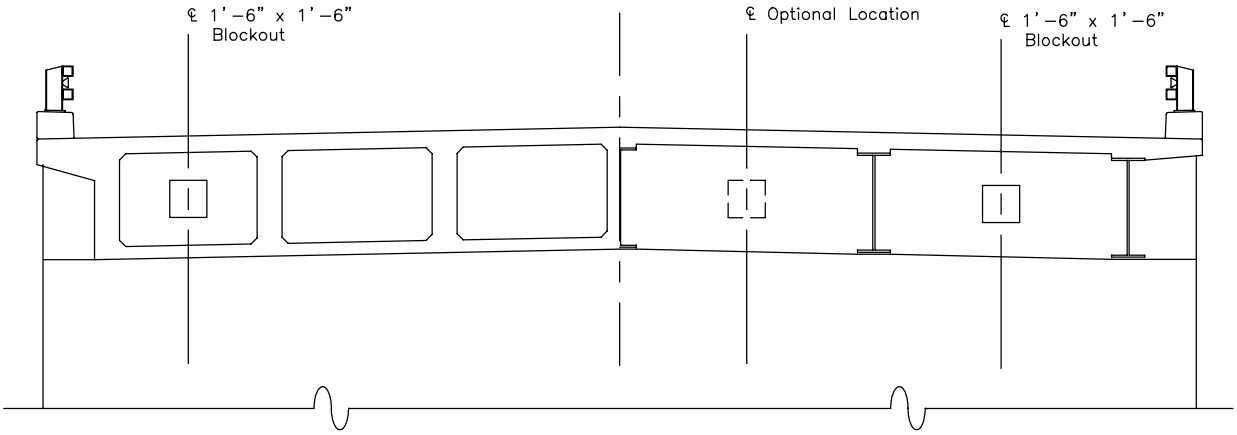
UTILITY BLOCKOUTS

Blockouts shall be sized to accommodate only those utilities to be installed during bridge construction. When attending the FIR meeting, designers should inquire as to what utilities the bridge will carry to assure that they are accommodated.

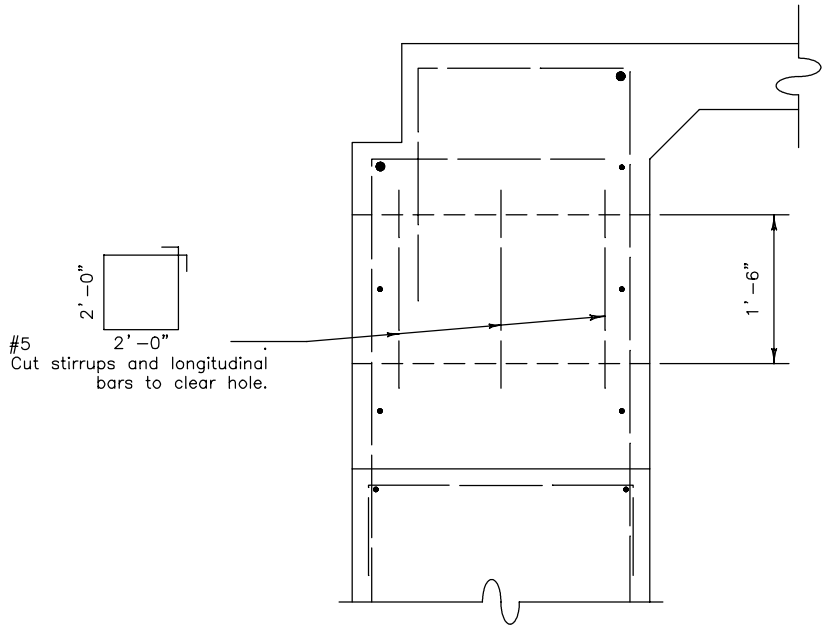
Blockouts shall not extend below the bottom of the superstructure. Some utilities may be accommodated by placing them in PVC pipes cast in precast, prestressed concrete box girders.

The effect of the abutment backfill settling on the utility needs to be considered by the designer. The means used to prevent the utility from being pinched where it projects from the abutment shall be detailed on the plans. Collapsible cardboard void material of sufficient height, width, and length, above the utility may be one of the means used to address that problem.

Blockouts that allow for the installation of "future" utilities shall not be provided. In the past, blockouts have been provided in the exterior bays of abutments and piers of some bridges, but they were rarely, if ever, used once the "future" utility was installed. The installation of a utility through a vacant abutment blockout of an in-service bridge would require removal of portions of the approach slab (if existing), temporary excavation shoring, excavation of the abutment backfill, and traffic control, making it unlikely a utility would elect to locate there. Virtually all utilities installed on bridges in service are attached to the soffit of the deck overhang, regardless of the impact to bridge aesthetics.



ELEVATION



SECTION

TYPICAL ABUTMENT BLOCKOUT DETAIL

The typical abutment blockout detail should be modified as required.

TOP MOUNTED

Bridge-mounted highway lighting shall be avoided wherever possible. The designer shall investigate the possibility of mounting the lighting on an extended pier cap. If bridge-mounted lighting cannot be avoided, it shall be located as close to a pier as is practical.

UNDERNEATH

Bridges crossing all public ways will have underneath lighting. The lighting location is to be determined by the District Design Unit.

17.4.1 PROJECT PROCEDURES

The need for sign and signal structures should be established as early as possible in the design process. If standard or special overhead signs or mast arm signals are to be used on a project, a structural engineer must be assigned to them. Special designs are made to accommodate large panels, mast arms longer than 50 feet, and variable message sign (VMS) boxes. The structural engineer can be a CDOT or a consultant employee. In either case, it is important that adequate time be scheduled for the assigned structural engineer to do the required work.

The sign and signal work shall include the following:

1. Determine whether CDOT sign and signal standard drawings can be used without a special design. If not, provide a special design.

2. For overhead sign structures, obtain a structure number from the Bridge Management Unit by calling (303) 757-9187.

3. Seal the plan sheets for all special designs.

4. Check the shop drawings for all signs and for special signal work.

The current CDOT sign and signal standards are pre-sealed documents and do not need to be sealed for individual projects. All special signs and signals must be designed and sealed on an individual basis. A structural engineer shall be assigned to each project to determine if a special design is required and to check the shop drawings.

17.4.2 MINIMUM DESIGN REQUIREMENTS

The design of sign and signal supports shall be in conformance with the current issue of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and National Cooperative Highway Research Program (NCHRP) Report 412.

NCHRP Report 412 shall be used to address fatigue issues on sign bridges (with or without VMS boxes) even though the report focuses on cantilevered signals, signs and light supports. Regardless of the structure type, the allowable stress range for main members at the tips of stiffeners as called for in Details 21 and 22 of Figure 1.9.6.1 in the Fatigue Guide shall be 11 ksi based on CDOT field observations. Use importance factors of 1.0 for the design of all CDOT overhead sign and mast arm signal structures.

Sign and signal structures shall be placed at right angles (within 10 degrees) to approaching motorists. All sign and some signal supports located within the clear zone must be shielded with a crashworthy barrier. If a barrier is used, or is required, the sign or signal structure shall be located just beyond the design deflection distance of the barrier to minimize the required span length.

17.4.3 BRIDGE-MOUNTED SIGN STRUCTURES

17.4.3.A DESIGN CONSIDERATIONS

Design loads for sign structure supports shall be calculated by assuming an 8 ft deep sign over the entire roadway width under the sign structure. This will account for any signs that may be added in the future. Loads from the sign structure shall be included in the design of the bridge. See subsection 17.4.2 for other design information.

17.4.3.B GEOMETRICS

Bridge-mounted sign structures shall be avoided wherever possible. If this cannot be done, the sign shall be located as close to a pier support as is practical. Signs shall be aligned parallel to the bridge if the skew angle is 80 degrees or more. Otherwise, the signs shall be set perpendicular to the traveling lanes underneath. For a horizontally curved roadway, signs shall be placed perpendicular to a chord intersecting the curve at a point 350 feet ahead of the sign location. The bottom of a luminaries or sign shall be placed 6 inches above the bottom of the fascia girder. The minimum vertical clearance for bridge mounted sign structures shall be 16'-6".

17.4.3.C AESTHETICS

Signs shall be mounted on bridges with the following in mind:

1. Preferably, the top of the sign and its support should not project above the bridge rail.

2. Whenever possible, the support structure should be hidden from view as seen by traffic on the lower roadway when viewed from a distance.

3. The sign support shall be detailed in such a manner that it will permit the sign and lighting bracket to be installed level.

4. When the sign support will be exposed to view, care shall be taken in determining member sizes and connections to provide the best possible appearance.

17.4.3.D SIGN PLACEMENT

Whenever possible, the designer should avoid locating signs under bridge overhangs which could cause partial shading or partial exposure to the elements. Avoid placing signs directly under structure drip-lines because such installations may result in uneven fading, discoloring and reading difficulty.

17.4.3.E INSTALLATION

Expansion type concrete anchors are undesirable for attaching sign support brackets to the supporting structure because of vibration and pullout concerns. Instead, A307 or A325 bolts shall be used as through bolts or A307 all-thread rod may be used to make drilled-in-place anchor bolts bonded to the supporting concrete with an approved two-part epoxy system. Through and drilled-in-place anchor bolts can be used to resist direct tension and shear loads. The depth and diameter of drilled holes for bonded anchor bolts shall be 9 bolt diameters plus 2″ and one bolt diameter plus 1/8″ respectively. Bonded anchor bolts are 100% effective if the spacing and edge distance is equal to or greater than 9

bolt diameters and are considered to be 50% effective when the edge distance or spacing is reduced to 4.5 bolt diameters. Edge distances and spacings less than 4.5 bolt diameters are not allowed.

Use cast-in-place A307 J-bolts for new concrete work.

When an approved proprietary bolting system is specified, the following note shall be added to the plans:

> The bolting system is to be installed using the manufacturer's recommendations.

When an approved two-part epoxy system is specified, the following note shall be added to the plans:

> The two-part epoxy system shall be installed using the manufacturer's recommendations.

Torque all through bolts to the following values in ft-lbs and, for bonded anchor bolts, do not exceed the specified tension working limit in pounds for permanent dead loads:

ASTM Spec	Bolt Dia.	-- Torque -- dry	lub	Tens. Limit
A307	0.500"	25	20	1400
"	0.750"	85	60	3300
"	1.000"	200	150	6000
A325	0.500"	70	50	N.A.
"	0.750"	240	180	"
"	1.000"	350	265	"

Use interpolation to get torque and tension limit values for other size bolts.

With respect to allowed bolting materials, A36 may be substituted for A307 and A449 may be substituted for A325.