

HANDHOLES AND JUNCTION BOXES



Handholes perform several important functions:

- Provide drainage for the conduit system so that freezing water does not damage the conduit or wires.

- Provide a location for bending the conduit run without damaging the wires.





- Provide a junction for conduits coming from different directions.



- Facilitate pulling wires for fairly long distances.
- Provide access to the system for maintenance.

Handholes must be Mn/DOT approved handholes and must be listed on the Approved Products List (APL) for Signals.



Before installation begins, the inspector must examine each handhole to ensure:

- Handholes meet requirements outlined in the Contract documents.
- No physical damage such as cracks or chips

Before any work on handhole installation begins, the inspector and the contractor must know some basic information, such as the overall height of the handhole with the cover. This information is needed for digging the hole to the correct depth. For example, the hole for a PVC handhole with 12 inches (305 millimeters) of compact



rock and metal casting must be 50.5 inches (1.27 meters) deep to have the top of the casting flush with the ground. This will place the top of the handhole without the casting 2 inches (51 millimeters) below the finished grade.

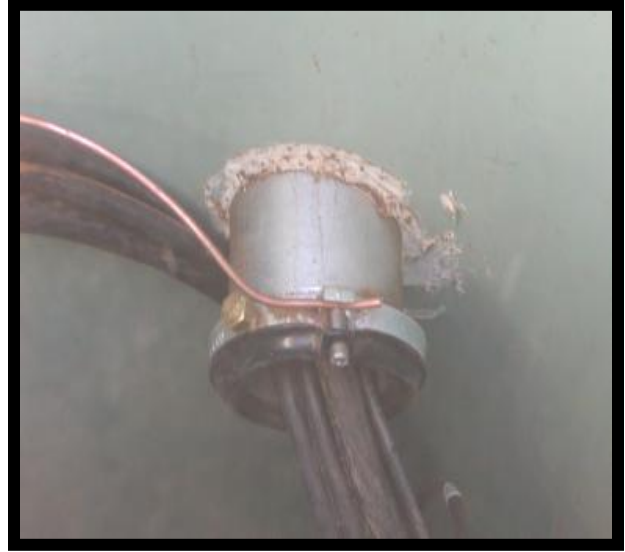
Key points to remember:

- Handholes must be installed at the location specified in the contract documents and as staked by the engineer or his representative.



- The tops of the handholes or the grade must be set as directed by the engineer.
 - Handholes must be backfilled after the frame casting and cover have been installed onto the handhole.
 - It may be necessary to install handholes in low areas to facilitate drainage of the conduit system.
 - It is the contractor's option, at his own expense, to install additional handholes to facilitate the work.
- On lighting projects, additional handholes must be approved by the Engineer.
 - Handholes must be installed an adequate distance from existing structures to allow for proper compaction.

- If existing handholes are to be used in a new system, the contractor must clean all the debris from the existing handholes before pulling any wires.
- Conduits terminating in handholes must extend 2 inches to 3 inches (50 millimeters to 75 millimeters) beyond the inside wall of the handhole.
- After the handholes and conduit are installed the sides of each handhole must be made watertight.
- Bushings and bonding wire must be installed and then the conduit ends must be capped until the wires are pulled.

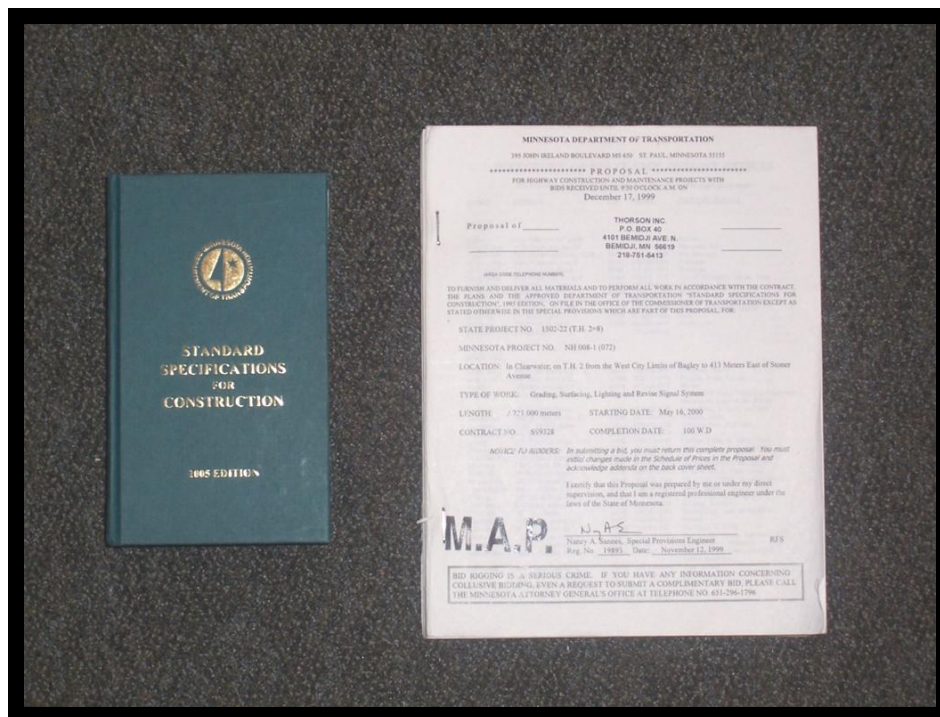


Special attention must be paid to handhole installation. Repairing or replacing damaged handholes is a difficult and costly task. Handholes that are not installed properly are a continuous maintenance problem.... they get hit by plows or settlement occurs around the handhole due to improper compaction.

Mn/DOT no longer requires "ball locators" in handholes for signal and lighting systems. When specified in the Contract documents, ends of conduits (without handholes) will require "ball locators" at both signal and lighting systems.



The installation requirements for PVC handholes are addressed in the contract documents.



LINEAR LOW DENSITY POLYETHYLENE (LLDPE) HANDHOLES

Mn/DOT has approved the use of a new Plastic Linear Low Density Polyethylene (LLDPE) handholes, frames, and covers for use on signal and lighting projects. LLDPE handholes, frames and covers, must be Mn/DOT approved handholes and must be listed on the Mn/DOT Approved Products List (APL) for Signals.

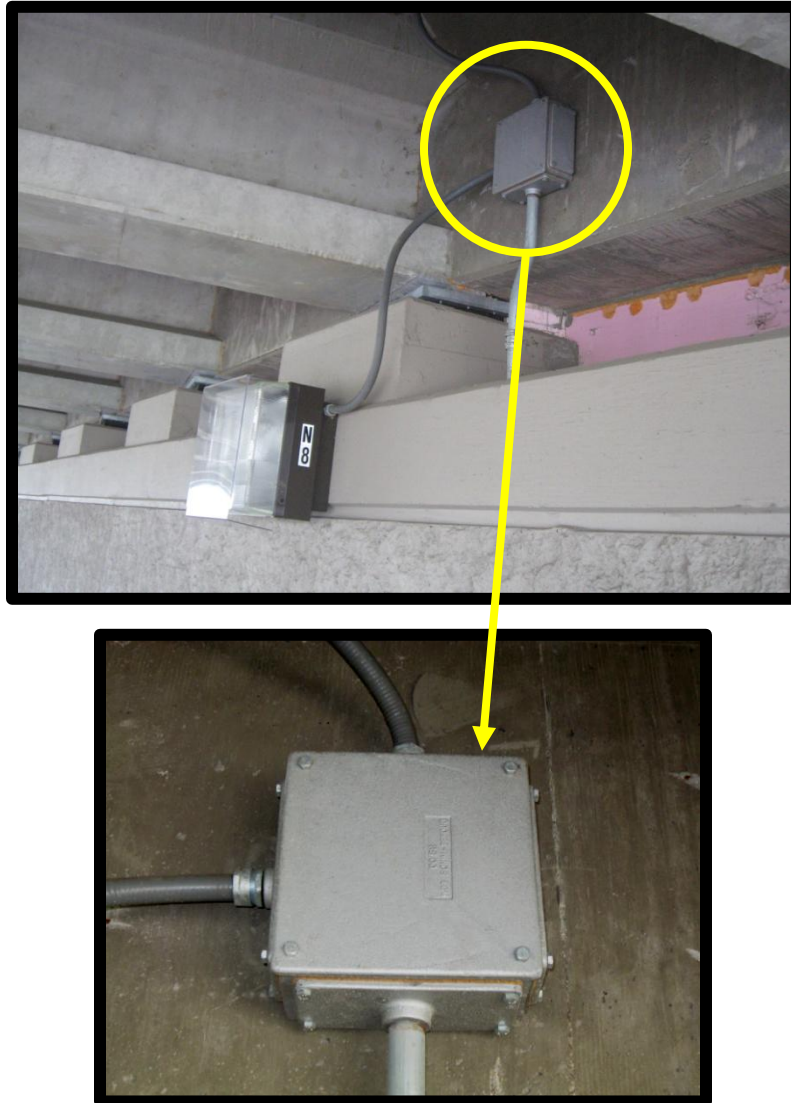
Unlike an earlier version of the plastic frame and cover, the new plastic frame and cover is allowed for use in sidewalk areas.

The Contractor must refer to the Contract documents for handhole installation requirements.



JUNCTION BOXES FOR SIGNALS AND ROADWAY LIGHTING - 3838

Junction boxes for traffic signal and roadway lighting systems must be as specified in the Contract documents.



Junction boxes must be attached to concrete using masonry anchorages or power activated studs with the required hardware to permit removal of the junction box.

Suggested Standard Electrical Junction Box Sizes on Bridges

Traffic Signal Junction Boxes

- 12" x 12" x 8" ID: conduit size is 2".
- 24" x 24" x 8" ID: conduit size is 3" or 4".

Lighting System Junction Boxes

- Wallpack j-boxes (largest conduit is 1")
- 8 ½" x 8 ½" x 4" ID: Minimum Size allowed as per Mn/DOT Spec Book (3838.2B)

Boxes where conductors are #6 or smaller and conduit is larger than 1".

- 12" x 12" x 8" ID: conduit size is 2".
- 24" x 24" x 8" ID: conduit size is 3" or 4".
-

Straight Pulls - Use 8 times the largest conduit size if conductors are #4 or larger)

- 16" X 16" X 8": conduit size is 2"
- 24" X 24" X 8": conduit size is 3"
- 32" X 32" X 8": conduit size is 4"
- 12" X 12" X 8": conduit size is 2"
- 18" X 18" X 8": conduit size is 3"
- **Angle Pulls or where there are splices** - Use 6 times the largest conduit size where conductors are #4 or larger.
- 24" X 24" X 8": conduit size is 4"

- The above standard sizes are based on cubic inches to allow for the number of wires, on conduit size to allow cable pulling and routing space, and to meet the requirements of the National Electrical Code (NEC)

Notes:

- These are based on the most common situations and selected from the standard sizes available from manufacturers
- Standard sizes available from manufacturers range from 4" x 4" x 3" to 36" x 36" x 12"
- Loop splice kits and lighting cable splices were also considered in the cubic inch measurement
- In addition all junction boxes must meet current Mn/DOT specs and the current NEC requirements

National Electrical Code Requirements that Apply to Box Sizing:**Article 314.16:**

- For conductors size #6 and smaller and cables containing # 6 and smaller conductors
- This section requires that boxes meet a volume in cubic inches based on the sizes of individual conductors
- (#14 wire = 2 cu in each) *This section applies mostly to signals because all the conductors are #6 or smaller except for service laterals*

Article 314.28:

- For conductors size #4 and larger and cables containing # 4 and larger conductors
- This section requires box sizing to be based on the sizes and number of conduits connected to a box
- *This section applies mostly to lighting because we use #4 or larger conductors except where feeding wall packs*
- There are two conditions listed in this section; straight pulls and angle pulls
- For straight pulls the box length required to be 8 times the size of the largest conduit
- For angle pulls the box length required to be 6 times the size of the largest conduit

Junction Box Installation

Junction Boxes for both traffic signal systems and roadway lighting systems must be installed as required by the Contract documents.