732 ELECTRICAL UNDERGROUND MATERIAL

The Project Plans and specifications will specify the type of materials to be used and the location of conduit runs, junction boxes, and stations and offsets of pull boxes. The locations may be changed by the Resident Engineer to avoid conflicts with utilities and other underground obstructions. These changes must be documented and shown on the as-built plans.

The Inspector on the project must verify that the Contractor complies with any applicable national codes and contract requirements when installing conduit, conductors, pull boxes, and other related work. The specifications provide specific requirements that must be met for all work and materials provided.

The following procedure is a guide which should be followed by the Inspector to assure proper compliance with contract documents. The initial requirement of the contract is to blue stake any areas to be excavated prior to excavating. The Contractor must update the blue staking as required because the markings are valid for only fifteen working days.

Construction and Inspection Requirements

Conduit Installation:

- Has the Inspector sent samples of all sizes of conduit to ADOT Materials Group for testing prior to installation?
- Check to see if PVC conduit has the UL approval stamp, the manufacturer's name, trade size, schedule 40, and 90 degree temperature rating imprinted on each 10-foot length of conduit.
- Is conduit embedded in concrete structures securely tied to reinforcing steel every 12 inches?
- Check expansion fittings. Are they installed properly where conduit crossed expansion joints in the structure?
- Open trench installation of conduit should be checked for straight line, grade level, and depths.
- Is back-fill material clean and granular type, and compacted in accordance with the specifications?
- If trenches remain open overnight, a minimum of 6 inches of back-fill material should be used as a protective cover to eliminate the contraction of conduit. Backfill material shall be removed if final inspection has not been made.
- Is warning tape installed in open trenches at a depth of 6 to 8 inches above the highest conduit?
- Make sure trenches left open overnight are properly barricaded.
- See that no open trenching across an existing roadway is performed without written authorization from the Resident Engineer.
- For conduit that is designated as "future use," check to see that a #8 bare bond wire is installed and that the conduit is properly capped, plugged or sealed with conduit putty.
- Make certain that the Contractor has cut a 3-inch (75-millimeter) "Y" into the face of the curb directly over the conduit located under the curb line.
- Has the Contractor blown out, with compressed air and mandreled all existing conduits incorporated into the new system?
- When conduits enter pull boxes, are they located near the sides and 2 to 4 inches above the bottom of the pull box while sloping towards the direction of the conduit run?
- Check conduit ends in pull boxes and foundation. Do not allow the Contractor to pull the conductor until all end bells are installed on conduit ends.
- Are jacking (boring) and drilling pits no closer than 2 feet from the edge of the travel pavement and barricaded?
- Has the Contractor documented and properly noted all conduit changes on the as-built plans?

- Has the Inspector recorded all quantities on the proper forms and submitted them in a timely manner?

Electrical Conductors, Splicing, and Tagging:

Wire and cable for traffic signals, highway lighting, and other electrical systems shall be UL listed copper and rated for 600 volt operation.

- Were conduit bell ends installed on all conduit ends before wire was pulled?
- Did the Contractor clean out all of the conduit runs with compressed air and mandreled, if necessary?
- Was the UL label affixed to each reel, coil, or container of wire or cable delivered to the job site?
- Check to see if wire has distinctive and permanent markings showing the manufacturer's name or trade mark, insulation type, size, UL and voltage rating.
- Double check plans conductor schedule for the number of conductors, size, and color-coding for each conduit run.
- Was an approved pulling lubricant used?
- Make sure wire is not dragged along the pavement or earth to avoid damage to the insulation.
- Is there a minimum of 36 inches of slack wire from the conduit end bell in the pull boxes?
- Were the detector lead-in cables pulled continuously and not spliced from the detector pull box to the control cabinet?
- Were separate signal circuit wires installed to each mast arm mounted signal head from the pull box?
- Were all conductors tagged to identify their circuit number and function?
- Was tag identification correlated with the conductor schedule shown on the Project Plans?
- Was each signal wire tagged in pull boxes, in the terminal compartment of mounting assemblies, and in the control cabinet?
- Were signal conductors phase grouped together and tied in the pull box?
- Check roadway lighting conductors for circuit number tagging in pull boxes and service cabinets.
- Were in-line nonlocking type fuse connectors installed in the pull box for luminaries?
- Check fuse fault current rating and amperage rating.
- Was wire splicing done only in pull boxes, terminal compartments, and cabinets?
- Did the insulation of the splices consist of two layers of electrical rubber tape, four layers of plastic electrical tape, and two layers of friction tape?
- Were the tape splices covered with three coats of approved liquid waterproof splicing compound?
- Check loop wire soldering splices.
- Check to see if heat shrink encapsulating fit caps were used to weatherproof the soldered loop splice.
- When the conductor schedule calls out for a green insulated copper bond wire, check to see if the insulation was removed from the bond wire in the pull box at the point where the wire leaves the end bell of the conduit?

Precast Reinforced Concrete Pull Box Installation

- Check size of pull boxes specified on the Project Plans.
- Ensure that pull-box lid has proper ADOT legend.
- Reject chipped or cracked pull boxes, extensions, and covers.
- Check rock sump for depth and size of aggregate and backfill material.
- Was 30-pound (13.6-kilogram) felt paper used between aggregate and backfill material?
- Are pull boxes set at grade elevation and level with curb or sidewalk? In cut and fill areas, are the pull boxes at same level as the slope?
- Check pull boxes installed in concrete areas for expansion joint material around pull box.
- Are there four concrete blocks set under the pull box?