

**BOSTON TRANSPORTATION DEPARTMENT
Rigid Plastic Conduit for Traffic Signals**

2", 3", & 4" conduits as shown on the plans shall be new grey heavy wall rigid plastic conduit of homogeneous polyvinyl chloride construction with standard wall thickness. The conduit must be free from defects and foreign matter. All bends, fittings, and couplings shall be new and free from defects. **Bends of all conduit must be made using a standard type commercial thermal bending device.**

The rigid plastic conduit must conform to and meet all current requirements and testing procedures of the American Society of Testing and Materials whenever such standards and tests shall apply. The following ASTM standards shall apply as applicable-

ASTM Specification DI 784 - Schedule 80 - Extra Heavy Wall Rigid Plastic Conduit

ASTM Specification D2564 - Specification for Solvent Cements for PVC Plastic Pipe and Fittings

Conduit must be of the type suitable for direct burial without concrete encasement.

EPC-80-PVC - Electrical plastic conduit and fittings for Type 4 applications-

All conduit shall bear distinctive markings in addition to the standard designation of the type, size, manufacture, etc. to verify that the conduit meets the special conditions of the specifications. The contractor must supply to the Engineer a letter of compliance from the manufacturer stating that the conduit meets all specifications and conditions.

The 2 inch rigid plastic conduit shall have an outside diameter of 2.375 inches and an inside diameter of 1.939 inches wall thickness .218". The 3 inch conduit shall have an outside diameter of 3.50 inches and the inside diameter of 2.900 inches wall thickness .300". All conduit shall be inspected for internal seams and sharp projections which will damage the electrical cable. The Engineer will reject any conduit that fails the specifications.

All conduit must be carefully examined before using and any broken, cracked, bent, kinked, or deformed conduit shall be rejected. The conduit used shall be unthreaded and will be connected using standard PVC Socket Type Couplings and Heavy Bodies Solvent Cement. Before installing conduit, the ends of all lengths shall be carefully reamed to eliminate burrs and sharp edges, and to insure an opening at the end of the conduit equal to the maximum Internal diameter of the conduit.

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Conduit couplings shall be constructed of Polyvinyl Chloride Rigid Plastic formed to fit the outside diameter of the conduit, to be used in conjunction with a heavy bodied solvent cement.

ASTM D2564 - Specification for Solvent Cements for Polyvinyl Chloride Plastic Pipe and Fittings.

Conduit Duct Bells Ends shall be polyvinyl Chloride Rigid Plastic approved by Underwriters' Laboratories, Inc. for use on threadless rigid plastic conduit, to be used in conjunction with a heavy bodied solvent cement.

Conduit Installation

The Contractor shall excavate the trench to a depth of thirty-six inches and a minimum of eighteen inches wide, except that if two conduits are laid in the same trench, the minimum width shall be twenty-four inches. If the condition of the bottom of the excavated trench is wet, clayey or spongy, or otherwise unsatisfactory, the Engineer may require that the bottom of the trench be excavated deeper and the space filled with clean gravel to form a firm bearing for the conduit. The grade of the finished trench shall be parallel to the proposed pitch of the conduit. A three inch layer of sand shall be used to fill the bottom of the trench. The conduit shall be installed in place on this layer of sand. After installation, the conduit shall be encased with nine (9) inches of concrete. (This is required of all PVC installed in the roadway, running in or crossing the thoroughfare. Conduit installed in the sidewalk area will be exempt from this requirement.) Conventional marking tape bearing the words "**WARNING - ELECTRICAL LINE**" shall be placed on the top of the concrete encasement the length of the trench.

The Contractor shall excavate the trench, remove and discard any objectionable material and any rocks or objects over six inches in diameter. Any material previously removed from the trench, that the Engineer deems suitable for backfilling shall be stored alongside the trench for use. After the conduit has been properly installed, the Contractor shall backfill with this material. When the material removed from an excavation is not suitable for backfilling or where storage may cause inconvenience to the traveling public or other conditions may prevail that make storage impractical, the Contractor, at the direction of the Engineer, may be directed to remove all excavated material off the contract site. New gravel will be used to fill the excavation. Gravel, if required, to make up a deficiency when excavated material is reused or when the trench is filled with new gravel.

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Trenching operations in curb areas shall take due care to support and protect the existing curb and sidewalk.

The Contractor shall prosecute his work as to avoid damage to adjacent structures or property. Where the plans show construction in close proximity to existing roads, structures, buildings and utilities, it shall be the responsibility of the Contractor, at his expense, to construct suitable drainage ditches, shoring, and bracing, or other satisfactory means and methods to protect and maintain the stability of such roads, structures, buildings and utilities located immediately adjacent to an outside the limits of construction.

Prior to placing the backfill, the Contractor shall grade and prepare the subgrade so that it is dry, well compacted, uniform and unyielding by whatever methods approved by the Engineer. Backfill shall be placed to the depth as shown on the plan or as directed by the Engineer, but in no case shall the backfill be placed in layers greater than six (6) inches. The backfill shall be thoroughly compacted by tamping with a pneumatic hammer with a round dirt tamping pad with a minimum diameter of 6 inches driven by an air compressor with a minimum of 100 psi pressure. The use of an impactor attachment on a standard back hoe with a dirt tamping pad may be substituted for the pneumatic hammer with the permission of the Engineer. Use of a vibrator type compactor on the conduit trench is prohibited.

Radius of quarter bends shall be as Boston Transportation Department Plan A37.3 dated May 11, 1998. Conduit shall be installed in such a manner as to have water drain into the manholes or handholes. Low points and pockets in the center of the run where water might accumulate must be avoided. Conduit bends shall be made using and approved thermal bending device.

All plastic conduit shall be cut square with the axis using a fine tooth hand saw with a miter box or other guide. A pipe cutter of the type used specifically for plastic conduit may be used with the permission of the Engineer, but when this type of device is used it is imperative that the conduit be sufficiently reamed to completely remove the burr or hump inside the conduit. The inside diameter of the conduit cut with a cutter must be restored to its original inside diameter by use of a tapered reamer. All burrs must be removed from the inside of the conduit and must be squarely butted. The use of a power abrasive wheel cutter is prohibited for cutting conduit and must not be used.

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When assembling two sections of plastic conduit together;

Test fit the joint wipe both the outside of the conduit and the socket of the fitting with a clean, dry cloth to remove foreign matter. Mate the two parts without forcing. Measure and mark the socket depth of the fitting on the outside of the conduit to indicate when the conduit end will be bottomed. The conduit should enter the fitting for at least 1/3 of the socket depth. If the conduit will not enter the socket by this amount, the diameter may be reduced by sanding the filing. Extreme care should be taken not to gouge or flatten the conduit end when reducing the diameter.

Application of Cement - PVC solvent cement is fast drying and, therefore, should be applied as quickly as possible, consistent with good workmanship. It may be necessary for two workers to perform this operation. Using a 1 1/2 inch natural or nylon brush, apply a thick uniform coating of cement to the inside surface of the fitting socket lightly enough to prevent the formation of a bead of cement at the interior shoulder of the fitting. Next apply a full, uniform coating of cement to the outside surface of the conduit to the depth of the fitting socket.

Assembly of Joint - Immediately after applying the coat of cement to the conduit, insert the conduit into the fitting socket until it bottoms at the fitting shoulder. Turn the conduit 1/4 turn during insertion to distribute the cement evenly. Hold the conduit in place for about a minute to prevent backing out in the case of tight interference fit joints. Wipe any excess cement away from the outside of the joint.

Appearance of Joint - A well made joint will show a full bead of cement around its entire perimeter.

Plastic conduits entering concrete handholes shall be terminated 1 1/2 inches inside the wall of the handholes and shall have attached a Duct Bell End of the required size, using the solvent cement as called for in the specifications.

All conduit installed in pull boxes and manholes, shall be installed in knockouts provided in the box and **No Excess Knockouts shall be Made**. The knockouts are designed to be made prior to backfilling around the pull boxes. After the conduit has been installed in the pullbox/manhole, the open space between the box and conduit will be sealed with Class B Cement Masonry. Any conduit installed in such a manner as to block complete access to any other conduit shall be removed and reset. The contractor shall be required after installing all conduit to blow out all conduit lines using compressed air with a pressure of 100 psi to remove all foreign matter and water.

In conduit that cable is not being installed, the Contractor shall install a 3/8 inch diameter polypropylene pull line and allow 5 feet of extra pull line at each end.