SECTION 637-050-100
Issue 4, December 1976
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CABLE PRESSURE SYSTEMS

PIPE SYSTEMS

GENERAL

CONTENTS PAGE

1. GENERAL

1.01 This section describes the ***pipe system*** method of cable pressurization and the associated materials and equipment.

1.02 This section is reissued to:

- Change references from E pressure transducer to F pressure transducer.
- Change illustrations and text to reflect new C automatic shutoff valve and C manifold assembly which supersede the B automatic shutoff valve and B manifold assembly, respectively.
- Modify the recommended piping arrangement between the air dryer and meter-panel as shown in Fig. 1.
- Delete illustration and text covering F bypass valve. This valve is covered in detail in Section 637-235-100.
- Change text and illustrations for the B automatic shutoff valve and B manifold assembly to indicate that these items are superseded.

Since this is a general revision, arrows ordinarily used to indicate changes have been omitted.

1.03 The design of the pipe system is the responsibility of the outside plant engineer and is covered in detail in the 901-473 Division and Layer of Practices.

1.04 For installation and upkeep of the pipe system, refer to Sections 637-050-200 and 637-050-300, respectively.

**Reprinted to comply with modified final judgment.

2. GENERAL DESCRIPTION OF SYSTEM

2.01 The pipe system method of cable pressurization is essentially an arrangement whereby pressure is applied to cables in the cable entrance facility (vault) and at selected manholes along an underground cable route by manifolding individual cables to a paralleling CA-3131 air feeder pipe, which carries pressurized dry air from the air dryer in the central office (CO). The flow resistance of the pipe is so low that the typical pressure drop is only 2 to 3 psig at a distance of several miles from the CO. The relatively high pipe pressure and the high available airflow through the pipe produces, in effect, a dry air source (just as at the CO) at each manifold location.

2.02 Manual monitoring of the cable pressure is accomplished by reading pressures at a high valve installed approximately midway between manifolds.

2.03 Remote monitoring, either manual or automatic, is accomplished by installing F transducers in lieu of the high valves. The use, description, and installation of the F transducer is described in Section 637-222-101.

2.04 The Cable Pressure Monitoring System (CPMS), described in the 637-600 Division and Layer of Practices, is used to automatically monitor, from a central location, pressure transducers, flow transducers, contactors, and other apparatus associated with pressure systems.

3. DETAILS OF PIPE SYSTEM AT CENTRAL OFFICE

Without CPMS

3.01 Dry air is delivered from the air outlet of the air dryer to a separate meter-panel (Fig. 1) for pipe(s) leaving the office. At the meter-panel the air pressure is regulated to 10 psig and the air then passes through the panel to the pipe outlet connection(s). The panel provides necessary data on dry air usage and should be ***logged daily*** to serve as a guide for maintenance operations. The meter-panel is designed to activate a CO alarm when the flow rate exceeds a predetermined value (value depends on the type meter-panel installed). Meter-panels equipped to indicate an alarm will provide:

(a) An ***immediate alarm*** for a major pipe failure or a break in the tubing connection between the pipe and the manifold.

(b) An ***alarm within a few minutes*** for a break in the tubing between the manifold and one of the cables.

(c) An ***alarm, generally within 1 to 5 hours,*** where a zero-type leak occurs in an underground (UG) cable. The speed of alarm operation is a function of the pneumatic resistance of the cable and the location of the leak relative to the nearest manifold.

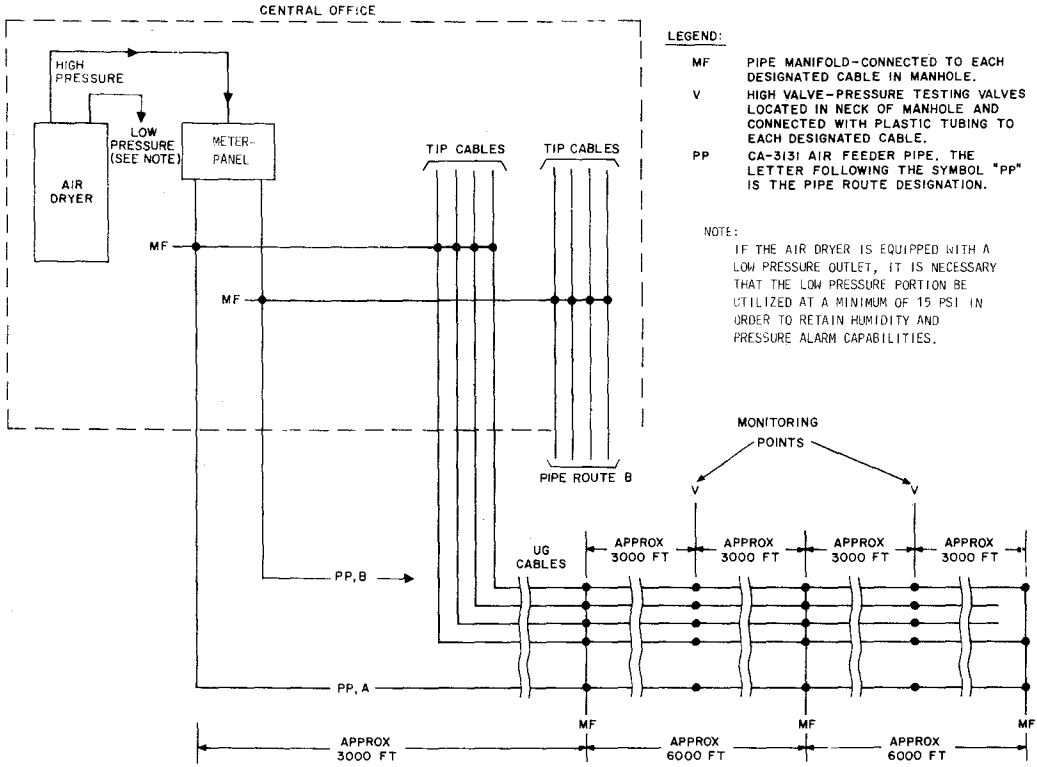


Fig. 1—Schematic of One Pipe Route in a Basic Pipe System

With CPMS

3.02 The B airflow transducer is used in conjunction with the meter-panel to generate instantaneous flow rate in lieu of the pipe alarm. In addition to its alarm feature, it also is used to totalize the airflow into the pipe systems.

3.03 Section 637-225-215 describes the use of the B airflow transducer to fulfill the alarm requirements for superseded meter-panels. Section 637-225-201 covers the D meter-panel, which is equipped with B airflow transducers used with automatic monitoring systems.

4. DETAILS IN OUTSIDE PLANT PORTION OF PIPE SYSTEM—UNDERGROUND CABLE

4.01 The pipe system is constructed according to a design as determined by ***AIRPAP.*** Monitoring manholes generally will be located about midway between manifold manholes (Fig. 1). Following is a brief description of the pipe system connections.

(a) ***In each manhole,*** the pipe ends are joined with a standard fitting equipped with a threaded port that will accommodate a pressure testing valve. This valve provides a point for reading the pipe pressure, buffering under special conditions, and providing emergency pressure protection.

(b) ***At each manifold manhole,*** a 3/8-inch plastic tubing is connected from the pipe to an automatic shutoff valve and manifold located on the vertical surface of the manhole collar. A separate 3/8-inch tubing is connected from the manifold to each UG cable assigned to the pipe route.

(c) ***At the monitoring manhole,*** F transducers are installed per Section 637-222-101. If the transducers are not installed, a high valve is located on the vertical surface of the manhole collar.

5. DETAILS IN OUTSIDE PLANT PORTION OF PIPE SYSTEM—AERIAL CABLE

5.01 Aerial cables fed from pipe systems can be classified in two broad categories:

(a) Where a plug and bypass arrangement is provided on the riser pole at the UG-aerial cable junction. This arrangement often is found on existing construction, where it was considered advisable to provide a means for isolating the UG and aerial cable.

(b) Where the aerial cable is directly pressurized from the UG without a plug and bypass. This is the recommended arrangement.

5.02 Generally, monitoring is provided by the use of the following devices:

REFERENCE	DEVICE
637-220-100	1. C Pressure Transducer
637-214-100	2. L or M Pressure Contactors
637-211-100	3. P Pressure Contactor

5.03 The recommended locations of the monitoring devices are determined by AIRPAP.

6. DESCRIPTION OF MATERIALS AND EQUIPMENT

6.01 ***CA-3131 air feeder pipe*** is used as the basic dry air artery in pipe systems. It is an aluminum-lined, black polyethylene tube approximately 0.60 inch id and 0.75 inch od, and weighs approximately 8 pounds per 100 feet. It is shipped under pressure from the factory in reel lengths of 2000 to 3500 feet. It can be hand-formed to a 5-inch radius for setting up in manholes, at meter panels, etc. ***The maximum allowable pulling stress for the pipe is 150 pounds; overstressing can shear the bond between the aluminum and the polyethylene.***

6.02 ***CA-3131 UM air feeder pipe*** has mechanical protection for additional strength and has the same internal dimensions as CA-3131. It is used for underground or buried applications and where rodents are a problem.

6.03 ***The C pipe shaper*** shown in Fig. 2 is a wooden-handled mandrel designed for insertion in the end of CA-3131 air feeder pipe prior to equipping the pipe with a pipe seal for pulling-in operations, or prior to terminating the pipe on a plastic pipe fitting. The C pipe shaper shapes the bore of the pipe to accept the various fittings. It also is used as a mandrel when cutting the CA-3131 pipe.

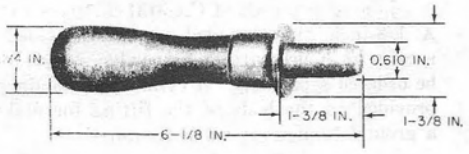


Fig. 2—C Pipe Shaper

6.04 The ***B pipe seal*** (Fig. 3) provides an air and moisture-tight seal in the ends of CA-3131 air feeder pipe prior to placing the pipe. The B pipe seal consists of a body which includes an automotive-type tire valve, rubber bushing, knurled shell, washer, nut, and valve cap (Fig. 4). The seal operates by the expansion of the rubber bushing against the inner wall of the air feeder pipe. Six replacement bushings are supplied with the seal. Additional bushings, nuts, and washers are available as replacement parts. Installation of the B pipe seal is covered in Section 637-050-200.

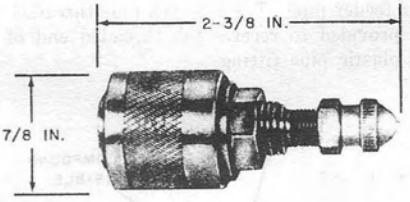


Fig. 3—B Pipe Seal

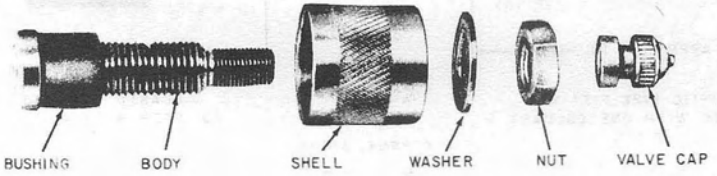


Fig. 4—B Pipe Seal Components

6.05 ***Pipe Fittings:*** Four types of plastic pipe fittings are available for making connections to the CA-3131 air feeder pipe. These fittings are made of tinned corrosion-resistant metal and are equipped with O-rings, sealing compound, and a stainless steel collar for each pipe termination. One 1-1/16 inch sealing clamp, also required for each pipe termination, must be ordered separately. These fittings, shown in Fig. 5, are as follows:

(a) The ***C plastic pipe fitting*** is used with a G fitting for joining three ends of CA-3131 air feeder pipe. The 1/4-inch pipe-threaded port is provided to receive the threaded end of the G plastic pipe fitting.

(b) The ***E plastic pipe fitting*** is used to connect CA-3131 air feeder pipe to any 1/4-inch male NPT fitting. A 1/8-inch pipe-threaded port is provided to receive an F pressure testing valve, which must be ordered separately. A cylindrical shoulder is provided on the body of the fitting for making a ground connection, where required.

(c) The ***F plastic pipe fitting*** is used for joining two ends of CA-3131 air feeder pipe. A 1/8-inch pipe-threaded port is provided to receive an F pressure testing valve, which must be ordered separately. A cylindrical shoulder is provided on the body of the fitting for making a ground connection where required.

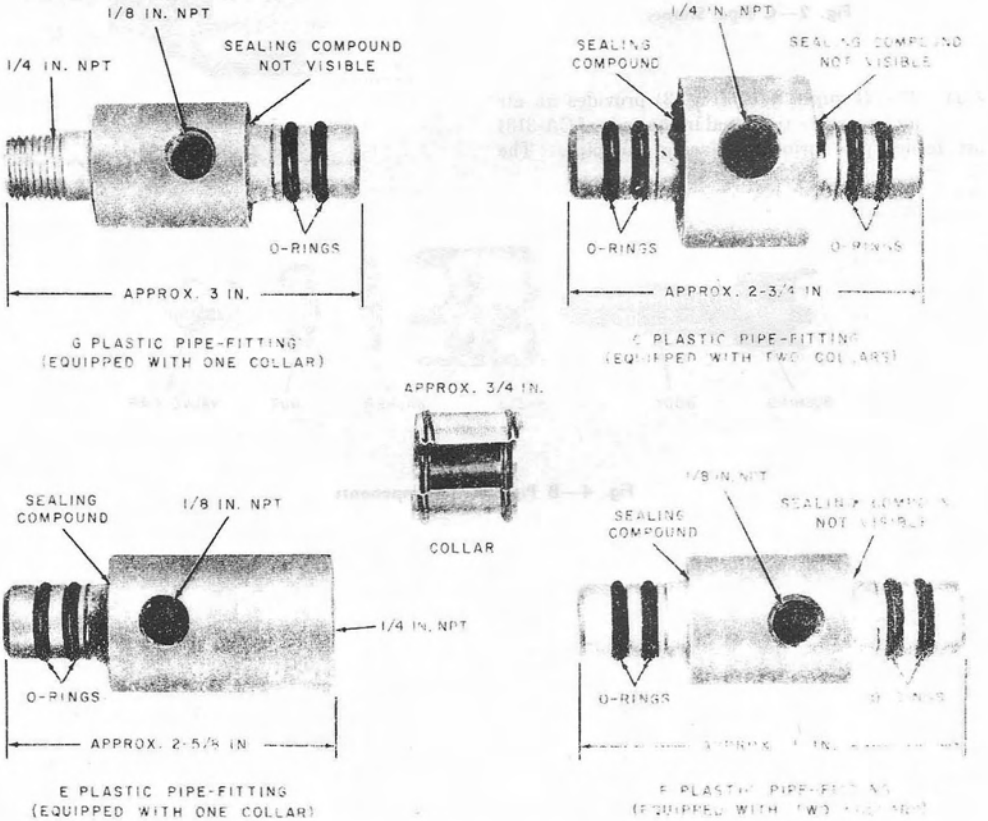
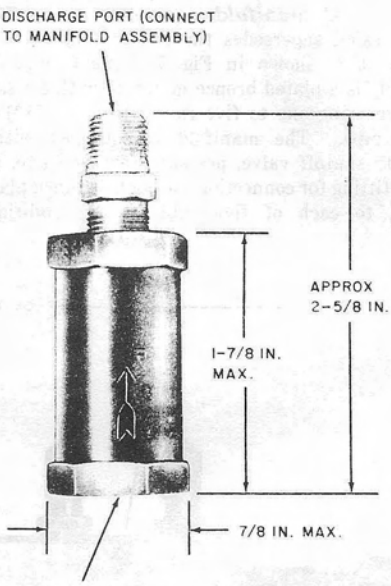


Fig. 5—Plastic Pipe Fittings

(d) The ***G plastic pipe fitting*** is used with a C plastic pipe fitting for joining three ends of CA-3131 air feeder pipe. It also is used to connect CA-3131 air feeder pipe to any 1/4-inch female NPT fitting. A 1/8-inch pipe-threaded port is provided to receive an F pressure testing valve, which must be ordered separately. A cylindrical shoulder is provided on the body of the fitting for making a ground connection, where required.

6.06 The plastic tubing and plastic tubing fittings used for connecting the CA-3131 pipe to the manifolds and the cables to the manifold are described in Section 637-235-100.

6.07 The ***C automatic shutoff valve (AT-8779),*** which supersedes the B automatic shutoff valve (AT-8665), is shown in Fig. 6. The C automatic shutoff valve is essentially a check valve which is connected in the dry air line between the CA-3131 air feeder pipe and the C manifold assembly at each manifold manhole. It protects underground cables from abnormal air loss in the event of a pipe failure by closing the air connection to the manifold. The valve will close if there is a condition whereby air would flow opposite the normal direction, ie, from the cables and manifold assembly back into the pipe, and will reopen when the pipe pressure builds up to 0.3 psig above the manifold or cable pressure. The pressure drop through the valve is a maximum of 0.5 psi for a corresponding airflow rate of 60 scfh.



NOTE:

CONNECT STREET TEE TO ENTRANCE PORT TO ALLOW CONNECTIONS FOR PLASTIC TUBING FROM PIPE LINE AND F PRESSURE TESTING VALVE

Fig. 6—C Automatic Shutoff Valve

6.08 The ***C manifold assembly (AT-8778),*** which supersedes the B manifold assembly (AT-8663), is shown in Fig. 7. The C manifold assembly is a plated bronze manifold with facilities for connecting one to five cables to a CA-3131 air feeder pipe. The manifold is equipped with a separate shutoff valve, pressure testing valve, and tubing fitting for connection, through 3/8-inch plastic tubing, to each of five cables. An additional pressure testing valve is provided for reading the manifold pressure (as compared to the pipe pressure at the entrance to the automatic shutoff valve or as compared to the pressure being delivered to each cable through the manifold). Four 3/16-inch holes are provided in the manifold block for attaching it with 3-inch No. 8 galvanized wood screws to anchors in the manhole.

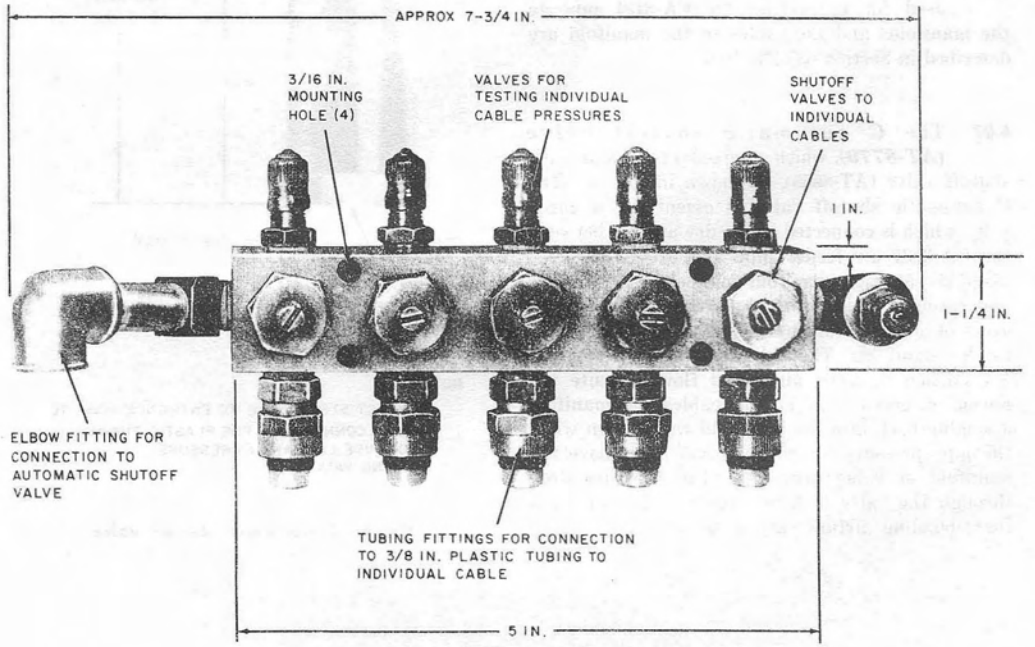


Fig. 7—C Manifold Assembly

6.09 A ***completed assembly*** of C automatic shutoff valve, C manifold, plastic tubing, etc, is shown in Fig. 8. Where possible, this assembly should be installed on the vertical surface of the manhole collar and located off the line of pull for any subsequent cable placing or removing operations.

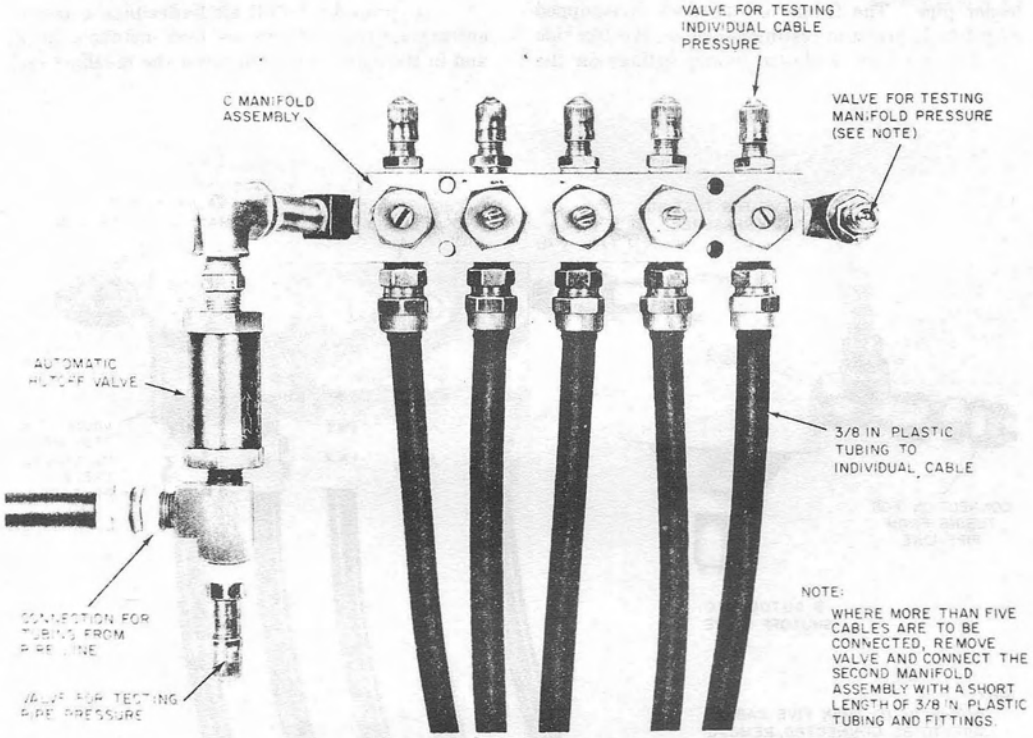


Fig. 8—Arrangement at Manifold Manhole (C Manifold Assembly and C Automatic Shutoff Valve)

6.10 A ***completed assembly*** of the ***superseded*** B manifold, B automatic shutoff valve, etc, is shown in Fig. 9.

6.11 The ***B high-valve block (AT-8622),*** shown in Fig. 10, is a plated copper alloy device that provides a convenient means for terminating the 3/8-inch plastic tubing connected to each underground cable and the CA-3131 air feeder pipe. The frame of the block is equipped with five F pressure testing valves on the top side and five 3/8-inch B plastic tubing fittings on the underside. Two 5/16-inch holes are provided in the block for mounting. The completed assembly of block and plastic tubing is shown in Fig. 11. Where possible, this assembly should be installed on the vertical surface of the opening in the manhole roof and located off the line of pull for any subsequent cable placing or removing operations.

6.12 The ***C wire guard*** is used in manholes to protect CA-3131 air feeder pipe at conduit entrances, where it crosses over manhole hooks, and in the splicing area between the manhole rack.

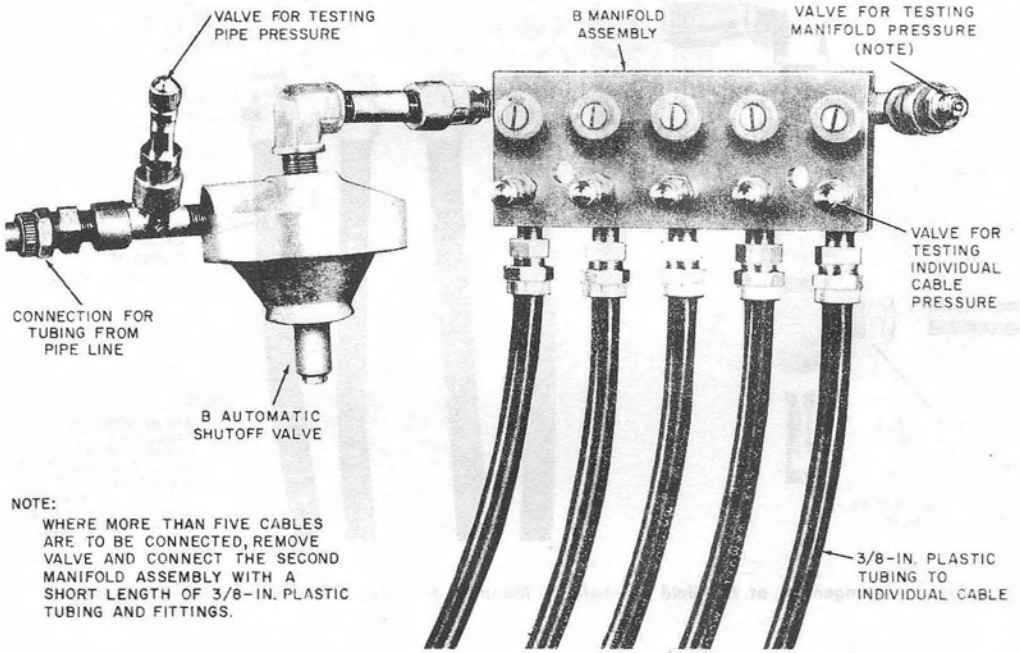


Fig. 9—Arrangement at Manifold Manhole (Superseded B Manifold Assembly and B Automatic Shutoff Valve)

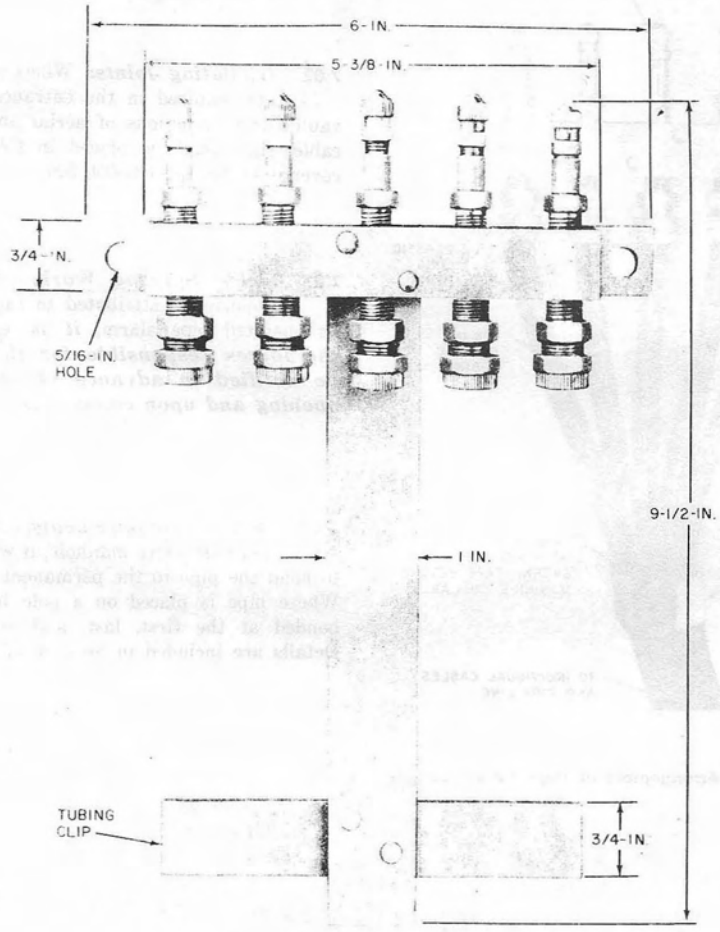


Fig. 10—B High-Valve Block

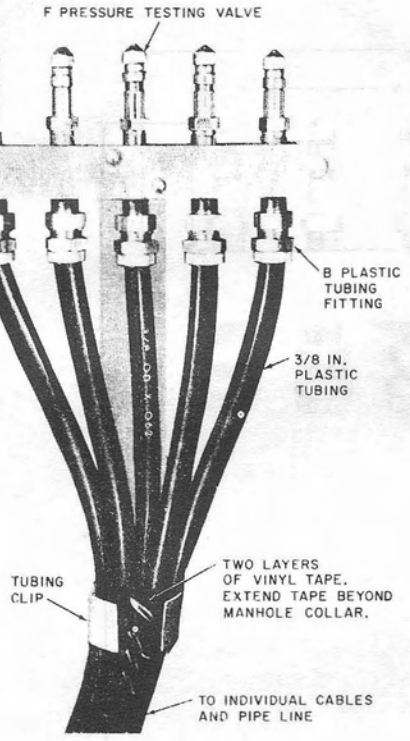


Fig. 11—Typical Arrangement at High-Valve Manhole

7. GENERAL CONSIDERATIONS

7.02 ***Insulating Joints:*** Where insulating joints are required in the entrance cables in CO vaults or in junctions of aerial and underground cable, they shall be placed in CA-3131 pipe, as covered in Section 637-050-200.

7.03 ***Cable Splicing Work:*** Because of the importance attributed to rapid response to an operated pipe alarm, ***it is essential that the forces responsible for the pipe alarm be notified in advance of any UG splice opening and upon completion of the closing.***

7.01 ***Bonding Requirements:*** At each manifold and high-valve manhole, it will be necessary to bond the pipe to the permanent manhole bond. Where pipe is placed on a pole line, it shall be bonded at the first, last, and every fifth pole. Details are included in Section 637-050-200.