BELL SYSTEM PRACTICES
Outside Plant Construction and Maintenance

SECTION G73.156.1
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AT&T Co Standard

PRESSURE TESTING
PRESSURE GUN TYPE ASPHALT PLUG

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1. GENERAL

1.01 This section describes the pressure gun method of constructing asphalt type gas plugs in distribution terminal stubs, service cables, and other small diameter cables. This section replaces Section G50.672.2, Issue 2, which is cancelled.

1.02 The method is applicable to strip paper or pulp insulated cables of approximately one-inch diameter and smaller as well as service cables. The plugs can be made in either a vertical or horizontal section of cable.

1.03 The plugging operation consists in forcing enough hot asphalt into the core of the cable with a pressure gun to completely fill all voids in the core between two constrictions in the sheath.

2. MATERIALS AND TOOLS

2.01 **Asphalt:** The No. 1 Pressure Plug Asphalt used to impregnate the core deteriorates on repeated heating. Therefore, it is important to avoid overheating the material in preparing it for use. In addition, the asphalt remaining in the kettle should be discarded after it has been reheated 6 or 8 times.

2.02 **List of Materials:** The following is a list of the more important items of material used in making plugs by this method:

Asphalt:	**No. 1 Pressure Plug Asphalt:** (For filling the voids in the core to provide a gas plug.)
Compound:	**Pipe Joint Compound:** (For coating threads of screw plug to ensure gas tightness.)
Flange:	**Witmor WN-4 Pressure Plug Flange:** A special tinned brass flange with threaded bore. Supplied in packages of 50 flanges equipped with brass screw plugs. (Soldered to the cable at asphalt injection point.)
Solder:	**Stearine Core Solder:** (For filling the sheath depressions and soldering flanges.)

2.03 **Tools:** The following is a list of tools used in making plugs by this method, other than those normally carried by splicers:

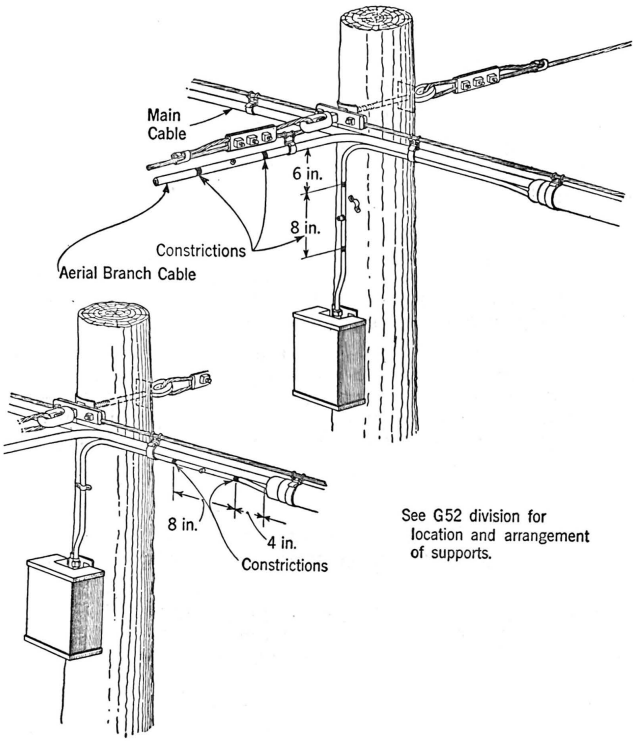
Calipers:	**3-inch Outside Calipers:** To be obtained locally. (For gauging the depth of the compression rings in the sheath.)
Clamp:	**Witmor WN-2 Pressure Plug Clamp:** A light C clamp wtih fixed jaw filed concave to fit curvature of the sheath. (For holding flange in place while soldering.)
Depressor:	**B Cable Core Depressor:** (For making a separation between core and sheath at the asphalt injection point.)
Gloves:	**Canvas Gloves:** To be obtained locally. To protect the hands in handling the pressure gun while heating it and after it is filled with asphalt.

Gun:	**Witmor WN-1 Pressure Plug Gun:** Piston type pressure gun and fittings. (For injecting asphalt into cable.) Piston rod on gun now supplied has 5/8-inch by 11 Acme screw (square) thread. Older type gun has piston rod with 1/2-inch by 24 standard screw (v) thread.
Kettle:	**Safety Compound Kettle:** (For heating asphalt.)
Needle:	**No. 1 Bone Knitting Needle:** To be obtained locally. (For puncturing the core wrapping paper.)
Pliers:	**Witmor WN-3 Pressure Plug Pliers:** Specially ground combination pliers. (For making constrictions in cable sheath.)
Thermometer:	**Armored Thermometer:** Moeller No. 3532 thermometer, 14 inches long; range 30° to 500° F. (For determining asphalt temperature.)
Tweezers:	**Spring Tweezers:** To be obtained locally. (For removing core wrapping paper through hole in sheath.)

3. LOCATION OF PLUGS

3.01 **For Pole Mounted Distribution Terminals,** the plug should preferably be located in the vertical section of the stub with the upper sheath constriction approximately 6 inches below the horizontal portion of the cable, as illustrated in the upper figure on page 4.

3.02 If there is insufficient room for the plug in the vertical section, the plug should be made in the horizontal portion. In this case, the first constriction should be no less than 4 inches from the wiped joint, as illustrated in the lower figure on page 4.



3.03 **For Strand-Mounted Terminals,** the plug is made in the stub as close to the terminal as practicable. The first constriction is placed about 4 inches from the wiped joint.

3.04 **In Aerial Branch Cables,** the plug should preferably be located in the first span from the main cable, as illustrated in the upper figure of the above sketch.

3.05 **In Underground Branch Cables,** the plug should be located in a horizontal section of the cable, preferably on the manhole wall opposite the branch splice when this is practicable.

4. CONSTRUCTION PROCEDURE

4.01 **Preparation of Cable:** If the main cable is under pressure a hole should be drilled in the sleeve at the terminal or branch splice. This is done to relieve the pressure in the cable where the plug is being made.

4.02 When the plug is to be made in the vertical section of a terminal stub, remove the cable clamps and draw the stub away from the pole about 3 inches, to form the sheath constrictions and fill them with solder.

4.03 When the plug is to be made in the horizontal section of the terminal stub, remove the cable supports between the splice and the pole and separate the stub from the main cable just enough to form the sheath and solder the constrictions. The cable adjacent to the wiped joint should be handled very carefully to prevent cracking the sheath.

4.04 When the plug is to be made in a lashed portion of the cable, sufficient lashing wire should be removed to permit separating the cable and strand just enough to form and solder the sheath constrictions and place the flange and gun fitting.

4.05 When the plug is to be made in service cables it is not necessary to make constrictions in the sheath.

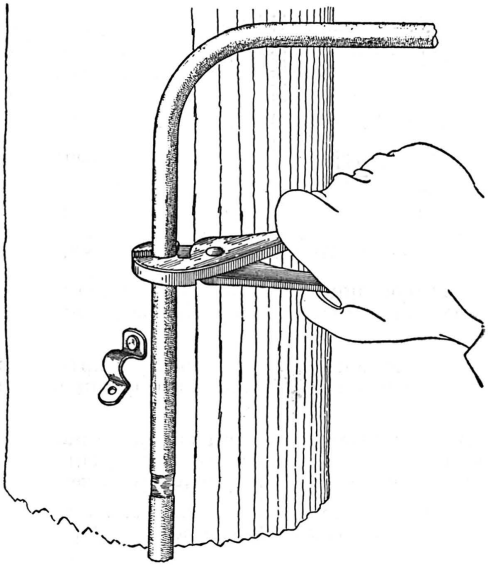
4.06 **Forming Sheath Constrictions:** The sheath should be marked at the location of the first constriction as discussed in Part 3, and at the location of the second constriction 8 inches away.

4.07 Then clean the sheath throughly at the marked points using a carding brush, and coat the surfaces with stearine.

4.08 With the special constriction pliers form two constrictions of the depth indicated in the table below:

Diameter of Cable	Depth of Constriction
Up to 3/8 inch	1/32 inch
over 3/8 to 3/4 inch	1/16 inch
over 3/4 to 1 inch	3/32 inch

4.09 The constrictions should be worked in gradually by alternately applying pressure and releasing the pliers as they are moved around the cable. The pliers should not be rotated while pressure is being applied as it may damage the sheath. The following sketch shows the pliers in use.



4.10 A pair of outside calipers should be used to gauge the depth of the constrictions. The caliper points should first be set to the diameter of the cable. Then by using a rule, the separation of the points of the caliper should be reduced by twice the depth of the constriction.

4.11 As the constriction is formed its diameter should be checked frequently until the points pass freely over any part of the circumference.

4.12 **Soldering Sheath Constrictions:** Strips of cable paster should be placed 1/16 inch from each edge of the constriction, to limit the width of the solder fillet.

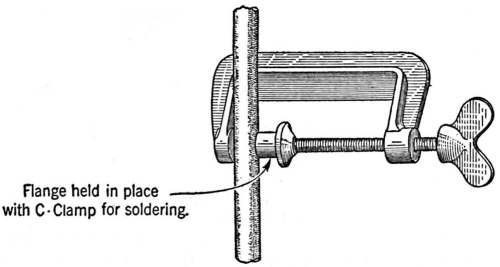
4.13 The constriction should then be carefully tinned and filled with solder flush with the sheath on either side. On aerial cables, the acetylene torch may be used in applying the solder; a small wiping cloth will aid in forming the solder flush with the sheath. In manholes, where the torch is not permitted because of its hazard, the constriction should be filled by heating with molten solder and wiping a flush joint on the sheath.

4.14 Any noticeable weak spots in the sheath between constrictions should be repaired by soldering, as the pressure applied in introducing the compound may otherwise open weak points in the sheath.

4.15 **Placing Flange:** Clean the cable sheath midway between the constrictions and coat with stearine. In vertical sections of cable the flange should be placed on the side of the sheath away from the pole. In aerial cable the flange should be toward the top of the cable, but offset from the vertical, to avoid interference with the strand. In underground cable, the flange is placed on top of the cable to permit soldering with a copper.

4.16 A hole should then be made in the sheath at this point with the Cable Drill. The sheath should be raised slightly at the opening by means of the Cable Core Depressor. Then remove the core wrapping paper at the opening with a pair of tweezers and spread the wires slightly immediately under the opening, with the bone knitting needle, exercising care to avoid damaging the insulation. This is done to ensure thorough impregnation of the core.

4.17 A pressure plug flange should be centered over the opening and held in place with a C clamp as illustrated below. Do not tighten the clamp so hard as to deform the sheath.



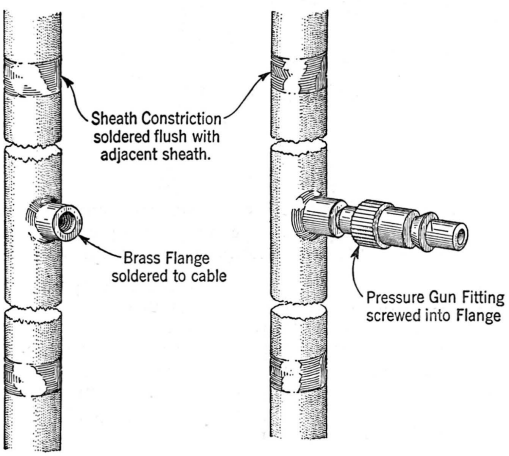
4.18 The flange can then be soldered in place using the acetylene torch in aerial cable and a soldering copper in underground cable.

4.19 In soldering flanges with the torch, the flame should be directed mainly at the flange, to avoid melting the sheath. When the stearine core solder melts readily on the

brass flange, a fillet of solder should be applied at the junction of the flange and cable. The solder will flow smoothly onto the sheath when the correct sheath temperature has been reached.

4.20 In manholes, the flange should be installed using a cable soldering form and a soldering copper. The acetylene torch must not be used in manholes because of the hazard of gas explosion.

4.21 After the solder has solidified, the C clamp can be removed and the pressure gun fitting screwed into the flange, as illustrated below. This fitting should be placed before the pressure gun is filled with asphalt.



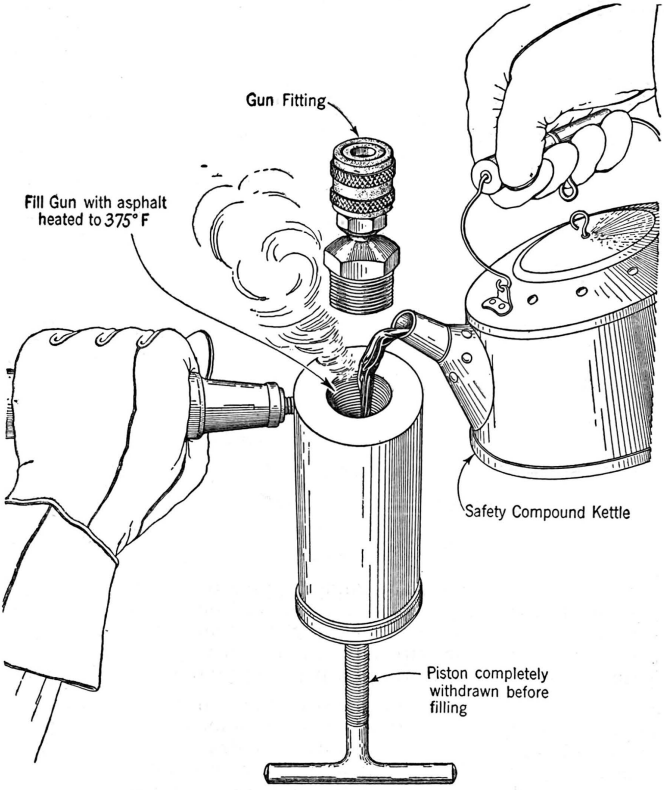
4.22 The cable between the sheath constrictions should be preheated to ensure complete impregnation of the core. The acetylene torch may be used for this purpose in aerial cable, exercising care to avoid melting the sheath. The pressure gun should likewise be preheated before filling, to ensure that the asphalt will be at the correct temperature when it reaches the splicer.

4.23 As a precaution against failure of the fittings or soldered connections under the pressure used to inject the asphalt, a cloth having a slit large enough to pass over the fittings should be wrapped loosely around the cable.

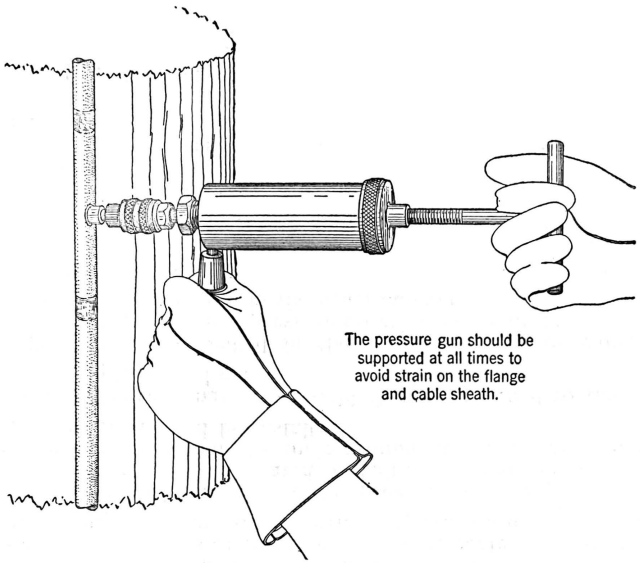
4.24 **Impregnating the Core:** Fill the pressure gun with No. 1 Pressure Plug Asphalt heated to a temperature of 375° F. in a Safety Compound Kettle. It will be observed in heating the asphalt that the temperature of the material varies considerably at different points within the pot. It is important, therefore, to stir the asphalt thoroughly and to move the thermometer around the kettle before reading the temperature.

4.25 Before filling the gun with hot asphalt, see that the piston is withdrawn to the cap end of the cylinder. Heavy gloves should be worn to protect the hands in this and other operations which entail handling the hot pressure gun. Then heat the gun and gun fitting thoroughly over the furnace to avoid chilling the asphalt, regardless of the air temperature. The piston screw should now be lubricated with auto engine oil or equivalent to prevent thread damage.

4.26 The gun should be filled with hot asphalt, as illustrated in the following figure, and the gun fitting screwed tightly into the opening using the wrench provided for the purpose. After filling, the pressure gun should be passed promptly to the splicer so as to avoid chilling the asphalt.



4.27 To couple the fittings on the flange and the pressure gun, the gun should be held perpendicular to the cable, as illustrated in the following figure. Then the gun fitting is pushed over the fitting on the flange. The two fittings engage by means of a snap locking device. When locked the fittings are gas-tight.



The pressure gun should be supported at all times to avoid strain on the flange and cable sheath.

4.28 The hot asphalt can now be forced into the cable by operating the piston screw in a **clockwise** direction. The piston should be turned until the resistance to turning increases appreciably. Then allow several seconds for the asphalt to settle and again turn the handle until it is tight, repeating these operations several times.

4.29 The workman is cautioned not to exert excessive pressure as the high pressure developed may burst the cable sheath.

4.30 The number of turns of the handle required to completely fill the core of the cable between constrictions with asphalt depends on the size and type of cable involved, but the following table should serve as a general guide in this respect.

Size of Cable	Approx. Number of Full Turns of Handle on Gun	
	Gun having 1/2-inch by 24 standard (V) thread	Gun having 5/8-inch by 11 Acme square thread
Up to 3/8 inch	12	1-1/2
Over 3/8 inch to 1/2 inch	15	3-1/2
Over 1/2 inch to 5/8 inch	23	6
Over 5/8 inch to 3/4 inch	28	9
Over 3/4 inch to 1 inch	33	18

4.31 After filling the cable allow two or three minutes for the asphalt to cool; then turn the handle two or three turns **counter-clockwise** to relieve the pressure, and disengage the pressure gun. The lock between the two halves of the fitting is released by pulling outward on the knurled portion of the gun fitting. Then remove the fitting from the flange and close the opening with the brass screw plug supplied with the flange. The threads of the latter should be coated with standard pipe joint compound or equivalent thread sealing compound.

4.32 At aerial terminals the presence of the plug in the stub can be indicated by painting the solder fillets red at each constriction. In underground cable, a gas pressure warning tag should be installed.

4.33 The terminal stub should then be clamped to the pole in the usual manner.

4.34 The hole drilled in the terminal sleeve or cable to relieve the gas pressure on cable under pressure should be closed and soldered in the usual manner.