

BELL SYSTEM PRACTICES
Outside Plant Construction
and Maintenance

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AT&T Co Standard

PRESSURE TESTING
WAX FILLED HORIZONTAL PLUGS

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1. GENERAL

1.01 This section describes the method of constructing wax filled pressure testing plugs in paper-insulated cable for the purpose of subdividing the cable into gas sections. This section replaces Section G50.670.3, Issue 1, which is cancelled.

1.02 The wax filled plug is usually used in manholes in circumstances where space limitations make it necessary to construct the plug at an existing splice. The wax-filled plugs are suitable only for use in underground cables not exposed to high temperatures such as steam mains, etc. The asphalt filled plugs should be used in aerial cables.

1.03 No. 2 Pressure Plug Wax is used to fill the sleeve rather than asphalt, in order to permit identification of the conductor insulation colors in the splice.

2. PREPARATION OF CABLE

2.01 The lead sleeve should be removed and, if the splice is paraffin treated, the conductors should be boiled out with hot paraffin in the usual manner.

2.02 The separation of the sheath ends should be reduced approximately one inch by ballooning the core.

2.03 Hardwood core pins of the length and diameter shown in Table I, should be prepared and inserted in the usual way, before the paraffin solidifies.

Table I

<u>Diameter of Cable</u>	<u>Diameter of Pin</u>	<u>Length of Pin</u>	<u>Depth of Ring</u>
1/2 in. to 3/4 in.	1/8 in.	4 in.	1/32 in.
Over 3/4 in. to 1 in.	3/16 in.	4 in.	1/16 in.
Over 1 in. to 1-1/4 in.	1/4 in.	4 in.	3/32 in.
Over 1-1/4 in. to 1-1/2 in.	5/16 in.	6 in.	1/8 in.
Over 1-1/2 in. to 1-3/4 in.	3/8 in.	6 in.	5/32 in.
Over 1-3/4 in. to 2 in.	3/8 in.	6 in.	3/16 in.
Over 2 in. to 2-1/2 in.	1/2 in.	6 in.	7/32 in.
Over 2-1/2 in. to 3 in.	5/8 in.	6 in.	1/4 in.
Over 3 in.	3/4 in.	6 in.	5/16 in.

2.04 One ring should be formed at each end of the sheath 1-1/2 inches from the edge of each butt while the paraffin remaining in the core is still soft. The depth of the ring should be as indicated in Table I, above.

2.05 Six or eight loose turns of houseline should be applied to the splice.

2.06 **Placing Valves:** If the plug is being made between two gas sections, an F Pressure Testing Valve should be installed in the cable sheath two feet from each end of the lead sleeve. At end plugs a valve should be installed on the pressure side of the plug two feet from the end of the sleeve and a hole should be drilled at the other side two feet from the sleeve. If the cable is under pressure the valve cores should be removed so that the cable at the plug will remain at atmospheric pressure during the filling operation. After removing the cores, the open valves should be protected to avoid water entering the cable through the open valves.

2.07 If the plug is being made in a working cable and it is advisable to keep the alarm system in operation, a cylinder of gas should be connected to the cable near the adjacent contactor with the regulator adjusted to 1 pound above contactor operating pressure.

3. PREPARATION OF LEAD SLEEVE

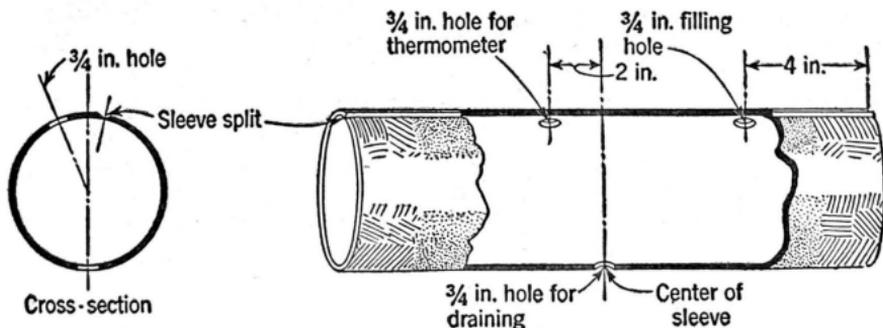
3.01 A lead sleeve approximately 6 inches longer than the splice opening and of the diameter shown in Table II should be prepared.

Table II

<u>Diameter of Cable</u>	<u>Size of Sleeve Inside Diameter</u>
1/2 in. to 3/4 in.	2 in.
Over 3/4 in. to 1 in.	2-1/2 in.
Over 1 in. to 1-1/4 in.	3 in.
Over 1-1/4 in. to 1-1/2 in.	4 in.
Over 1-1/2 in. to 1-3/4 in.	4-1/2 in.
Over 1-3/4 in. to 2 in.	*5 in.
Over 2 in. to 2-1/2 in.	*5-1/2 in.
Over 2-1/2 in. to 3 in.	*6 in.
Over 3 in.	*7 in.

*Use Extra Strength Lead Sleeve

3.02 Openings having a diameter of 3/4 inch are required in the sleeve to permit filling and draining, as illustrated below. The lower opening which is used as a drain should be equipped with an L Pressure Testing Flange. In placing the flange, it is advisable to flatten the sleeve slightly around the hole after which the flange can be fitted in the hole and soldered in position using a cable soldering form. Flanges should not be installed in the upper two holes at this time.



3.03 If it is necessary to split the sleeve, it should be split along a line a little to one side of the two top holes, as indicated above. After opening, the inside of the sleeve

should be examined carefully, removing any lead or solder projections that may be seen near the holes. The sleeve should then be centered over the opening, marking its correct position on the ends of the sheath, after which the seam can be soldered and the sleeve wiped in position.

4. WAX IMPREGNATION AND FILLING

4.01 **Preparation for Impregnating Core:** A six-inch filling funnel should be placed in the hole in the sleeve nearest the wiped joint. The lower end of the stem should project to a point about 1/2 inch above the conductors. It is important that a seamless metal funnel be used and that the diameter of the lower end of the stem be not less than 1/2 inch, preferably larger. The end of the stem may be cut off in order to obtain an opening of sufficient diameter to permit free flow of the wax and asphalt.

4.02 An armored thermometer reading to 500° F. should be inserted in the other hole. The bulb end of the thermometer should be worked through the core to a point about 1/2 inch from the bottom of the lead sleeve.

4.03 Later cleaning of the sleeve will be facilitated if at this stage two or three layers of heavy paper are wrapped tightly around the sleeve. Openings should, of course, be provided to fit over the filling and draining holes in the sleeve.

4.04 The flange at the bottom of the sleeve should be equipped with a drainage valve to control the flow of wax through the sleeve.

4.05 **Impregnation with No. 1 Wax:** One 18-quart pot of hot No. 1 Pressure Plug Wax (approximately 22 pounds) should be sufficient for impregnating a plug in a 2-5/8 inch diameter cable. Approximately 2 pounds of the wax will be absorbed in the impregnating process. Two pots are necessary for the filling operation, one containing the wax used in filling the sleeve, and an empty pot for receiving the wax as it flows from the sleeve.

4.06 With the drain valve open, three or four dippers of wax heated to a temperature of 350° F. (25° higher at 32° F. air temperature; 40° higher at 0° F. air temperature) should be poured through the plug, allowing the wax to drain from the valve into a pot. Then the valve should be partially closed and adjusted so that a thin stream of wax flows into the pot. Hot wax (350° F.) should now be poured in rapidly enough to fill

the sleeve, after which the pouring should be continued keeping the sleeve full and the rate of drainage adjusted to a point where a reading of 265° F. (or above) is obtained on the thermometer. The drain valve should then be closed.

4.07 The temperature of the wax should then be kept within the range of 250° to 265°F. for a period of 15 minutes, by opening the drainage valve as necessary and adding sufficient hot wax to the sleeve to keep it filled. Then, with the drain closed, the temperature should be permitted to drop as rapidly as it will, the sleeve being kept full by the addition of hot wax.

4.08 When the thermometer reaches 200° F. or slightly below, the valve should be opened until all the wax has drained out of the sleeve. Then the thermometer and drainage valve should be removed. The flange at the bottom should be sealed with a flange plug having the threads coated with pipe joint compound or its equivalent.

4.09 **Filling Sleeve with No. 2 Wax:** Approximately 15 minutes after the No. 1 wax has drained from the sleeve, the sleeve should be filled with No. 2 Pressure Plug Wax heated to a temperature of 170° F. This temperature is only about 20° above the melting point of the wax and is the lowest at which the material can be introduced without danger of solidification before all spaces within the sleeve are completely filled. The filling temperature should not be allowed to exceed this value as the No. 1 wax used for the initial impregnation may otherwise melt and cause the plug to be ineffective.

4.10 The No. 2 wax should be poured into the funnel until the sleeve is full. During this operation the wiped joints should be tapped with a cable dresser to force out any air that may be trapped at the ends of the sleeve.

4.11 After the original filling, the plug should be permitted to cool to nearly atmospheric temperature, leaving the flange plugs out at the top flanges.

4.12 Additional No. 2 wax heated to just above the melting point (150° F.) should then be added until the sleeve is completely filled. The cable should not be disturbed after the first filling operation.

4.13 After the sleeve has been filled, L Pressure Testing Flanges should be soldered over the two upper holes and flange plugs placed in the flanges. The threads should be coated with standard pipe joint compound or its equivalent.