PRESSURE TESTING
RESIN PLUGS—GENERAL

Contents **Page**

1. GENERAL

1.01 This section has been rewritten to list the tools and materials and to cover precautions in handling the resin and activator, preparation of materials and other common operations in making cold resin plugs in distribution terminal stubs and the complete range of sizes of other cables except those containing coaxials, video pairs or disc insulated spiral-four quads. Issue 1 is replaced.

1.02 This issue of the section contains general information applicable to several new sections covering the construction of resin plugs in the full range of sizes and types of cable.

1.03 Cold resin plugs are made in two ways, by **sheath injection** and **sleeve injection.** The method used depends on the diameter of the cable, tightness of the core and distance to the nearest splice. The details of these methods are covered in separate sections.

1.04 **The Sheath Injection** method is used primarily for plugging distribution terminal stubs and other lead sheath cable as large as 1-1/4-inch outside diameter. Cables of larger diameter and loose core cables should preferably be plugged by the sleeve injection method.

1.05 **The Sleeve Injection** method is used on lead sheath cables over 1-1/4-inch diameter, as well as on loose core cables and any cable that has a paper wrapper around an inside layer of pairs or quads, also on all sizes of alpeth, stalpeth, and lepeth sheath cables. In this method, a portion of the sheath is removed to permit preparation of the core. A close fitting lead sleeve is then installed and the resin is introduced through a hole in the sleeve.

2. TOOLS AND MATERIALS

2.01 **Tools:** The following special tools are used in plugging cables of 1-inch diameter and smaller.

Drill, Cable	For drilling 1/4-inch injection holes in the sheath of small cables.
Clamp, Flange, C	This is a spring clip, one jaw of which is equipped with a threaded pilot for holding and centering a B Pressure Plug Flange over the hole in the cable sheath.
Gun, Pressure, B	This is a piston type pressure gun with removable ratchet handle.
Holder, Gun, Pressure, B	This is a metal frame equipped with a spring tensioned chain for fastening the holder which is used to support the B gun while mixing the resin and activator.

2.02 The following special tools are used in plugging cables larger than 1-inch diameter.

Elbow, Street, Galvanized, 1/8" — 90°	A commercial pipe fitting used to facilitate injecting compound through a flange in the side of a cable.
Gun, Pressure, C	A screw actuated plunger type pressure gun with removable ratchet handle.
Drill, Cable, D	For drilling 3/8-inch injection holes.
Lifter, Sheath, B	For raising the sheath at the injection point on cables of 1-inch and larger diameter.

2.03 The following tools are used in common.

Depresser, Core, Cable, B	Used to make a separation between the core and sheath at the injection point.
Rod, Cleaning, B	This is a flat steel blade having a 1/8-inch rod welded to one end. It is used to stir the mixture in the gun and also to clean the gun.
Stick, Orange-wood, KS-6320	This is a thin wooden stick tapered at both ends. It is used to penetrate the core in order to facilitate filling.
Thermometer	Taylor No. 21,420 Thermometer, 0°-220° F. For measuring temperature of resin.
Tweezers, Spring	For removing the core wrapping paper through the hole in the sheath. Obtained locally.

2.04 **Materials:** The following materials are used in making cold resin plugs.

Flange, Plug, Pressure, B	Tinned brass flange with screw plug for use on terminal stubs and other small cables.
Flange, Pressure, D	Tinned brass flange for use on 1-inch diameter and larger cables. C Pressure flange plug is ordered separately.
Plug, Flange, Pressure, C	For closing the D Pressure Flange.
Resin, Plug, C	Available in 50 gram tube and 168 gram friction top can.
Activator, Resin, C	Available in 19 gram and 64 gram collapsible metal tubes.
Kerodex 71	Protective hand cream. Available in 4-oz. tubes. Water repellent hand cream used with Kerodex 51.
Kerodex 51	Available in 4-oz. tubes. Washable cream for use with Kerodex 71.

3. PRECAUTIONS

3.01 The C Plug Resin and C Resin Activator contain chemicals to which some individuals are allergic, thereby causing a skin reaction similar to that caused by creosote. These materials must be handled carefully to minimize contact with the skin.

3.02 **Protective Hand Creams:** Two creams are used for skin protection; water repellent Kerodex 71 is applied first, followed by Kerodex 51 which can be washed off readily. These creams are used as follows:

(a) Before handling resin or activator or any of the tools that come in contact with these materials, clean the hands and wrists and dry thoroughly.

(b) Press about 1/2 teaspoonful of Kerodex 71 into the palm and then spread thoroughly over the hands and wrists, between the fingers, etc., by rubbing for about 1/2 to 1 minute.

(c) Allow the cream to set for a minute or two, and wipe off the excess with a clean cloth.

(d) Press about 1/2 teaspoonful of Kerodex 51 into the palm, spread thoroughly as before, allow to set, then wipe off the excess.

3.03 After handling the resin, activator or tools, the workman should be careful to avoid touching the face or other parts of the body with his hands until the outer film of Kerodex 51 (which may now be contaminated) has been washed off the hands.

3.04 If the job requires handling the material throughout the day, or if the workman has any indication that he is susceptible to skin irritation in using the resins, the cream application should be repeated two or three times a day. The Kerodex 51 should be washed off with soap and water before repeating the treatment.

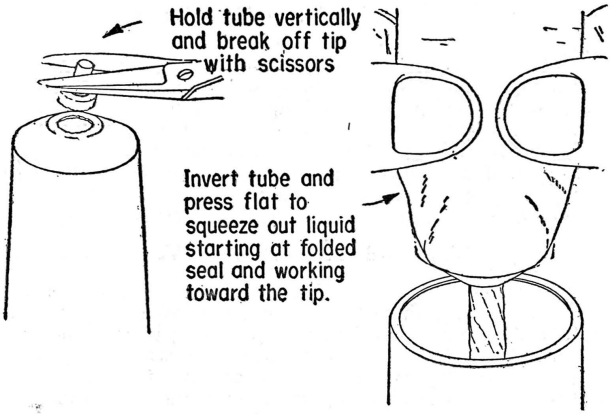
3.05 Keep all tools clean and free from spilled liquid resin. Avoid direct inhalation of the vapors and provide ventilation while the resin is being used in confined spaces.

3.06 To insure eye protection, it is advisable to wear protective goggles while preparing the resin mixture or filling and cleaning the pressure gun.

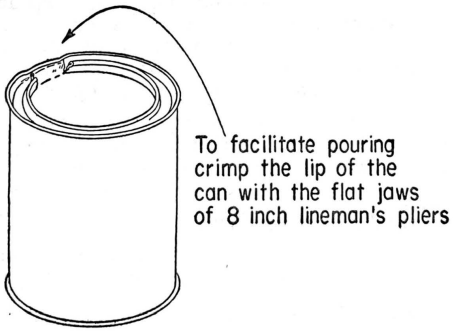
3.07 Thorough washing of the hands with soap and water is recommended after cleaning the pressure gun, or at least twice a day, to remove the cream.

3.08 Empty tubes and unused material expelled from the gun should be placed in a container for subsequent disposal.

3.09 **Handling Tubes:** The collapsible metal tubes are so designed that the tips can readily be broken off, without cutting, using the splicer's scissors or pliers as illustrated below. By holding the tube vertically before breaking the tip, then inverting the tube and squeezing out the contents as illustrated, skin contact can be minimized.



3.10 **Opening Can:** Place the can on a flat surface and remove the friction cap carefully to avoid spilling, using a 4-inch regular screwdriver or equivalent. Then form a pouring lip on the can using 8-inch lineman's pliers as illustrated below. This should be done before the activator is poured into the can.



4. MIXING REQUIREMENTS AND SETTING TIME

4.01 **Mixing:** The resin and activator will not react properly unless they are thoroughly mixed before injection into the cable. Therefore, after the resin and activator have been combined in the B gun for small cables or in the resin can for larger cables, it is imperative to mix the contents thoroughly by stirring with the flat end of the B Cleaning Rod for at least one minute before injection. If this is not done, the material will remain liquid in the cable and will not form a gas plug.

4.02 At about 70° F. air temperature the mixture of resin and activator begins to set up in about an hour. The set-up occurs progressively faster at higher temperatures; on a hot summer day the set-up may occur in 20 to 30 minutes. In cold weather the set-up time increases.

4.03 The resin and activator should, therefore, be mixed immediately before use in order to allow enough time for injection and other incidental operations as well as cleaning of the gun before the material begins to set; otherwise, cleaning becomes very difficult.

4.04 **Precaution on Applying Pressure:** In addition to the effect of air and cable temperature, the set-up time varies depending on the size of the cable, volume of resin used and its spread in the core. It is important, therefore, **to wait at least 24 hours** after the plug is made before applying pressure. Otherwise, a channel may form through the imperfectly set resin.

5. PLUGGING CABLES UNDER PRESSURE

5.01 It is always preferable to construct resin plugs in the main or branch cables before the cable is under pressure. However, when it is necessary to make a plug in a cable already under pressure, the cable should be vented on each side of the plug. This can be done by opening near-by valves, making temporary openings in the closest lead sleeves, or if necessary, by drilling temporary holes in the sheath. Check at the plug location to see that the pressure has dropped to zero before injecting the resin.

5.02 When it is undesirable to allow a large drop in cable pressure (such as at submarine crossings, etc.), a temporary by-pass around the plug can be used to avoid a pressure differential at the plug, or an auxiliary cylinder can be used beyond the temporary openings, to maintain pressure in the cable requiring protection.

5.03 Distribution terminals are generally plugged before the cable is under pressure. If it is necessary to plug a terminal in a cable that is under pressure, make a temporary opening in the lead sleeve adjacent to the terminal to relieve the pressure.

6. INSULATION RESISTANCE OF RESIN PLUGS

6.01 A large drop in insulation resistance of the cable occurs immediately after injecting resin into a cable. The lowest value occurs an hour or two after injection, when the cable becomes hot due to chemical action in the resin mixture. No permanent impairment in insulation resistance results; it gradually rises to a high value over a period of several months.

6.02 If several plugs are installed on the same pair count (as occurs in multipled terminals) the insulation resistance of the cable may drop enough to affect LIT tests. This should be taken into account in interpreting LIT measurements on cables following plugging operations.

6.03 **Megger Tests on New Cables:** The usual insulation resistance tests on new cables to determine the condition of the insulation at splices should be made **before** resin plugs are installed. If the plugs are made before testing, the Megger test will indicate low insulation resistance and make it impracticable to check the condition of the cable and splices.

7. TOOL CLEANING AND MAINTENANCE

7.01 The method of cleaning pressure guns and their maintenance is covered in the G85 series covering pressure testing tools.