THERMOPLASTIC-COPPER

PROTECTED CABLES

PRESSURE TESTING

CONTENTS PAGE

1. GENERAL

1.01 This section is issued to cover gas leak location work, method of installing F pressure testing flanges and instructions for exposing sheath and restoring protective covering (at other than sleeve locations) on thermoplastic-copper jacketed cables.

2. LEAK LOCATION WORK ON COAXIAL CABLES WITH THERMOPLASTIC-COPPER JACKET PROTECTIVE COVERING

2.01 Secure leak location measurements at regular valve points and plot gradients. Inspection of surrounding terrain may indicate an obvious cause for a leak. Analysis of gradients and pressure drop between valves will indicate whether it would be practicable to secure a more accurate location by installing additional intermediate valves. Where such valves are warranted at other than existing sleeves, install them in accordance with Part 4; wait until stable gas flow conditions have been established and take new readings for gradients. Where a Pad Monometer is available it should be used (by an employee familiar with its operations) in securing data for Time-Pressure Curves after a rough location has been secured with standard manometer and regular spaced valve readings.

2.02 After gradient locations have been determined and inspection indicated gradients are of proper shape, make a physical check of the suspected route and surrounding area. Look for dryness of soil caused by escaping gas, evidence of lightning damage, serious erosion, foreign construction etc. If exposed equipment such as terminals are close to the location, inspect and soap, to insure tightness. If existing splices, contactors, loading coils etc. are nearby it would be advisable to first soap test the outside protective covering at such locations for potential leaks.

2.03 When the procedures outlined above do not locate the leak, expose the lead sheath of the cable at the location secured from gradients, following the instructions in Part 3 of this practice.

2.04 At this opening, soap the cable and protective covering observing for gas flow between the sheath and protective covering. If gas flow is observed on one side, it establishes the direction of the leak. Make a second opening in the direction of the leak about 200 ft. away, or at a splice, if located in this interval.

2.05 Assuming that this brackets the leak, halve this distance and repeat until leak is found and cleared. (Where the Pad Manometer is used, the separation between the first and second opening may be reduced to 20 ft. If localized, uncover the intervening cable and soap over the outer covering. If not localized, follow the procedure of halving the interval, expose sheath and soap for direction of gas flow between sheath protective covering.)

2.06 Where the initial opening of the protective covering does not indicate the direction of the leak by soap test, make a second similar opening about 6 ft. from the first, install flanges and valves at both points in accordance with instructions in Part 4 and determine the direction of the leak with a flow indicator test. Then repeat the procedures outlined above, installing flow indicator flanges and valves only as required.

2.07 Keep an accurate record of all flanges placed for possible future use in leak location work.

2.08 Exposed sections of cable should be protected from the sun as much as possible, both from the standpoint of heat damage to the cable protective covering and from erroneous gas pressure readings which

may result from gas expansion under influence of the heat of the sun and surrounding air.

2.09 Removal of valves from flanges and final restoration of protective coverings in the suspected leak location area should not, in general, be done until leak has been located and cleared. However, where the halving procedure definitely localizes the leak between openings, any other openings beyond this area may be permanently restored while forces are waiting for gas equalization, etc.

2.10 From a lightning protection standpoint it is desirable that leak location work be completed and copper jacket restored as rapidly as possible.

3. REPLACEMENT OF PROTECTIVE COVERING ON CABLES WITH THERMOPLASTIC-COPPER COVERING

3.01 The following paragraph covers a detail description of the procedure for removing and replacing the protective covering to eliminate defects in the thermoplastic or copper jacket at other than sleeve locations. Occasions where this procedure is necessary are: manufacturing defects, stone bruises, severe flattening, lightning troubles, and where openings are made to determine gas flow in leak location work or to install temporary valves.

3.02 Remove protective covering in accordance with the following:

(a) Remove 15½ inches of leno cloth, half of it from either side of the center of the proposed opening. This is based on a thermoplastic opening of 2½ inches.

(b) Place temporary cable bond (No. 10 ga. wire) across the proposed opening of the copper jacket.

(c) At the center of the proposed opening, remove circumferentially by tearing with pliers a strip of copper about 2½ inches wide. Then cut the exposed edges of the copper jacket at 3/4 inch intervals and tear back in strips for a distance of about 3 inches on each side.

(d) Remove the gray sheeting in the exposed gap. Be certain that no strands of gray sheeting or cotton strings remain on the thermoplastic.

(e) Remove the thermoplastic to the sheath at the center of the opening. It is desirable to keep the section of sheath exposed to a minimum of 2½ inches and only increase this opening as required to remove any damaged section of thermoplastic which may be evident.

Note: The maximum desirable sheath exposure should be 28 inches, the limiting feature being the difficulty of forming longer sheets of material and the danger of subsequent kinking in handling the complete unit. Large openings will necessitate removing additional leno cloth, extending the tears in the copper strips and removing the gray sheeting and cotton strings from all exposed thermoplastic.

(f) Three inches from the edge of the thermoplastic, place a turn of 19 gauge copper wire around the cable and extend the tears of the strips of the copper jacket to this lashing.

(g) Bend back the strips and cut them off one inch from the bend. Dress the tabs lightly around the cable.

(h) Remove any gray sheeting or cotton strings remaining on the thermoplastic.

(i) Remove cement from copper jacket for a distance of 2½ inches on each side, beyond the turned back strips.

3.03 Replace protective covering in accordance with the following:

(a) Prepare two strips of thermoplastic tape: the first just wide enough to cover the exposed sheath and long enough to secure two complete layers and a 2 inch overlap; the second wide enough to span the distance between the copper opening and long enough to secure two complete layers and a 2 inch overlap.

(b) Coat the exposed cable sheath and adjacent edges of thermoplastic with thermoplastic cement heated to 300°F.

(c) Where a pressure testing flange is in the cable sheath, cover the flange with three four-inch square layers of No. 5547 rubber tape and hold in place over flange with one turn of one-inch No. 5547 rubber tape at each end.

(d) Place the smaller strip of thermoplastic tape around the sheath and coat the exposed surface between the layers with cement as the tape is applied.

(e) Coat the entire exposed area between the copper jacket edges with cement.

(f) Place the larger strip of thermoplastic tape around the cable in the same direction as the previously placed smaller strip and coat the exposed surface between layers with cement as the tape is applied.

(g) Place a loose spiral of 19 gauge copper wire over this tape to hold it in place. The outer surface of the tape should then be coated with cement.

(h) Prepare a sheet of 10 mil copper of such length as to extend beyond the exposed thermoplastic tape by 3 inches on each side and wide enough to encircle the cable and provide a 2 inch overlap. At 3/4 inch intervals along the end of the sheet make 1-1/4 inch deep cuts.

(i) Center the copper sheet over the repaired area and wrap it around the cable, overlapping it in the same direction as the thermoplastic tape. Hold in place by serving two turns of friction tape at the center of the copper sheet.

(j) Form the cut tabs uniformly around the cable. Starting at one end, lash the tabs down tightly with closely spaced turns of copper lashing wire for a distance of about 3/4 inch, then continue the lashing, with about 1/2 inch between turns, toward the center of the copper sheet; temporarily hold the end of the lashing wire by placing it under the friction tape previously placed. Lash the other end in the same manner, remove the friction tape and twist the lashing wire ends together at the center of the copper sheet.

(k) Spot solder the copper sheet to the copper jacket at two points on each side, and remove temporary bond previously placed.

(l) Cover the entire area of the exposed copper with a coat of hot thermoplastic cement.

4. METHOD OF INSTALLING F PRESSURE TESTING FLANGE ON CABLES WITH THERMOPLASTIC-COPPER COVERING

4.01 The following covers the method of installing a permanent F Pressure Testing Flange in the sheath of coaxial cables where auxiliary valves are necessary to make pressure readings or determining the direction of gas flow.

(a) Brighten the area of sheath in the center of the 2-1/2 inch exposure, with a carding brush and coat with stearine.

(b) Place a turn of stearine core solder around the flange tapping it to insure that the solder is in contact with the flange at all points; place the flange on the cable and tap it lightly to insure a good seat.

(c) Hold the soldering iron so it hits the top of the flange and heats it but does not contact the solder. As the tinned flange heats, the solder will adhere to it and flow down along the flange, under it and tin the sheath, finally resulting in a uniform soldered connection with a small fillet between sheath and flange. If the solder is not in contact with the flange, it tends to sludge down over the sheath; by observation such solder can be pushed against the flange as it starts to soften. Flanges cannot be placed with a solder form or mold because of the necessity of keeping the fillet as small as possible to permit raising the sheath as outlined below.

(d) A tool for raising the sheath under a flange (in order to increase the clearance over the paper wrap) should be prepared locally as follows:

(1) Secure a block of hardwood of 4" x 4" stock 2-1/2 inches long. Drill a hole through the block, starting at the center of a 4" x 4" face, large enough to fit loosely over the outside diameter formed by the thermoplastic covering on the cable or of the bare sheath in the case of non-thermoplastic covered cables. Cut this block in half through the center of the hole and with the saw cut started at the middle of one of the 4-inch edges.

(2) Secure a 7-1/2 inch length of steel bar 3/4 inch square and drill a 13/32 inch hole through this rod at its center.

(3) Secure a three-inch length of 1/2 inch steel rod threaded with 1/8 inch running pipe thread. File a rectangular section on a 1/2 inch length at one end of this rod. Place a hexagonal nut, with same size thread, about one inch from the square end of the rod.

(e) Place the wood blocks on the exposed thermoplastic, one on each side of the flange. (On non-thermoplastic protected cables space the blocks about 2-1/2 inches apart with the flange midway between the edges of the blocks). Put the rectangular steel bar on the wood blocks, centering the hole over the flange. Insert the threaded end of the round steel rod through the hole, start it into the thread in the flange and tighten into place with a wrench placed on the squared end of the round rod. Turn the nut down on to the square steel rod until hand tight. With a wrench, tighten this nut four turns which raises the sheath under the flange about 1/8 inch.

(f) Remove sheath raising tool and drill hole through sheath inside the flange. Do not puncture core wrapping paper or place muslin in the cavity. The paper will not materially restrict the gas flow and will provide better insulation.

(g) Install a standard F pressure testing valve (using thread compound) in the flange and soap test to insure gas tightness.

(h) During the period when leak location work is in progress, gas pressure equalization etc., it is necessary to protect the exposed thermoplastic to insure a satisfactory high dielectric path between sheath and copper jacket. This is accomplished by wrapping the sheath, exposed thermoplastic and turned back strips on each side of the flange with one inch rubber tape No. 5547 and the rubber tape wrapped with a half-lapped layer of two-inch friction tape.

(i) After leak location work has been completed, remove the valve and install the screw plug, sealing it with "Pipetite-Stik" thread compound.

(j) Test for gas tightness by soaping.

(k) Remove the friction and rubber tape previously placed and replace protective covering in accordance with paragraph 3.03.