BELL SYSTEM PRACTICES
Outside Plant Construction and Maintenance

SECTION G73.417.1
Issue 1, December, 1952
AT&T Co Standard

PRESSURE TESTING
LEAK LOCATION PROCEDURES
GENERAL

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1. GENERAL

1.01 This is a new section which outlines the procedures to be followed in the location of gas leaks in cables maintained under pressure and provides a guide to assist the workman in the selection of the most advantageous leak location method to fit specific conditions.

1.02 Detail descriptions of the various leak location methods available for the location of gas leaks by pressure gradient methods are given in another group of sections in the G73 Division.

1.03 The method to be followed in a particular case will depend upon the type of cable plant, accessibility, size of leak, and other factors or irregularities that may affect the pressure gradient. In all cases, good judgment must be exercised to determine the most economical and practical procedure to be employed.

1.04 The procedures in the location of gas leaks in cables maintained under pressure may be divided into three steps as follows:

Step No. 1—Leak Detection: The purpose of this step is to detect the existence of a leak in a gas section. Generally, the detection of the leak also provides a location within three valve sections, about 9000 feet.

Step No. 2—Preliminary Leak Location: The purpose of this step is to determine an approximate location of the leak within a regular valve section of 3000 feet. In underground cable, this step generally places the leak within one or two manhole sections.

Step No. 3—Final Leak Location: The purpose of this step is to determine the actual location of the leak by the most accurate and practical methods available.

2. LEAK DETECTION

2.01 On continuous pressure systems equipped with alarm, gas leaks are detected by the operation of a contactor. The leak is located within the section protected by the operated contactor.

2.02 On continuous pressure systems without alarm, gas leaks are detected by an excessive rate of gas loss as determined by routine readings. In this case, sufficient additional readings should be made at regular valve points to locate the leak within three valve sections or about 9000 feet.

3. PRELIMINARY LEAK LOCATION

3.01 A preliminary leak location is obtained by taking pressure readings at not less than three regular valve points on each side of the suspected leak location and plotting a pressure gradient from these readings. Generally, the Two-Direction Method should be followed for all types of plant, aerial, underground or buried. The use of this method verifies the individual pressure readings and provides an approximate correction for loss in gas and drop in pressure during the time required to take the measurements.

3.02 On aerial cable routes having two or more cables, the use of the Two-Cable Method should be considered. This method minimizes the effects of temperature changes in the cable and differences in elevation between valve points.

4. FINAL LEAK LOCATION—AERIAL CABLE

4.01 Where a large leak in aerial cable is involved, the preliminary measurements usually are sufficiently accurate to permit finding the leak by a visual inspection of the cable in the vicinity of the indicated location, followed by solution testing of critical points, such as solder work, load pots, terminals, ring cuts and damaged sheath adjacent to poles.

4.02 Where the preliminary location indicates the leak in the aerial cable is of medium or small size, first inspect and solution test all solder work adjacent to the preliminary location. If the leak is not found, install temporary valves spaced 500 to 1000 feet apart on each side of the indicated location and take another set of pressure measurements by the Two-Direction Method, or by the Two-Cable Method where applicable. This should be followed by visual inspection and solution testing of the sheath adjacent to the indicated leak location until the leak is found.

5. FINAL LEAK LOCATION—UNDERGROUND CABLE

5.01 In underground cable the cable, solder work, and load pots should be inspected and solution tested in each manhole adjacent to the preliminary indicated leak location.

5.02 If the leak is not found by inspection and solution test, apply the flow indicator in the manholes on each side of the preliminary location to determine the conduit section containing the leak. This will indicate the section of cable to be replaced in case repairs are not practicable.

5.03 If the defective section is to be repaired, install temporary valves in three manholes on each side of the defective section and obtain an accurate location using Time-Pressure Curves or the Two-Cylinder Method. On multi-cable routes the Short-Circle Method can be employed instead of the Two-Cylinder Method. For small leaks, consideration should be given to the use of a precision measuring instrument and precision leak locating procedures described in other sections.

5.04 After an accurate location has been obtained, excavate the conduit structure, break open the duct containing the cable under test and expose a 6 to 10-foot section of cable. Visually inspect and solution test the exposed cable. If the leak is not found, install two temporary valves on the sheath and use the flow indicator to determine in which direction the excavation work should progress to find the leak.

6. FINAL LEAK LOCATION—BURIED CABLE

6.01 In buried cable, first expose and solution test the solder work, cable and load pots at splices adjacent to the indicated leak location as determined from the preliminary measurements.

6.02 If the leak is not found by the solution test, use the flow indicator at these open splice points to determine the section of cable containing the leak. Then install temporary valves at these splices, and at sufficient additional points along the cable to provide three valve points spaced 500 to 1000 feet apart on each side of the preliminary location. The temporary valves should then be used to obtain an accurate location using Time-Pressure Curves or the Two-Cylinder Method. On multi-cable routes the Short-Circle Method can be employed instead of the Two-Cylinder Method. For small leaks, consideration should be given to the use of a precision measuring instrument and precision leaks locating procedures described in other sections.

6.03 The location shown by the gradient plotted from the final pressure measurements will be the point where the gas is escaping through the sheath. In some cases, the gas may travel for a number of feet under the protective covering of the sheath before it works through this covering and escapes into the atmosphere.

6.04 About ten feet of the cable should be exposed at the indicated leak location and inspected for gas leakage by solution testing or submerging in water. If there is no evidence of leakage, a small opening completely around the cable should be made in the protective covering near each end of the excavation. A solution test of these openings will indicate whether gas is flowing under the protection. If escaping gas is found it will indicate the direction in which to continue the examination of the sheath. If there is no evidence of gas flow under the covering, temporary valves should be installed in the sheath and the flow indicator applied to determine in which direction the excavation work should progress to find the leak.