

**BELL SYSTEM PRACTICES**  
**Outside Plant Construction**  
**and Maintenance**

**SECTION G73.418.4**  
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**AT&T Co Standard**

# **PRESSURE TESTING**

## **LEAK LOCATION METHODS**

### **TWO-CYLINDER METHOD**

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#### **1. GENERAL**

1.01 This is a new section which describes the Two-Cylinder Method of leak location in cables maintained under pressure. This method is applicable in the final location of large, medium and small leaks in underground and buried cable.

1.02 The Two-Cylinder Method provides a way of stabilizing a pressure gradient so that the pressures at various points in the section of cable under test will become constant and the shape of the gradient on each side of the leak will not change.

1.03 Cylinders of gas are connected to the cable at approximately equal distances on each side of the suspected location of the leak, with regulators adjusted to admit gas at constant pressures slightly higher than the existing cable pressure. The test is continued until the pressure gradient between cylinders has become stabilized. A set of pressure readings is then obtained for the preparation of a leak location graph.

## 2. APPLICATION

2.01 The Two-Cylinder Method of leak location has advantage under the special conditions outlined below.

- (a) **Where the existing cable pressure is low and it is necessary to charge the cable to protect service:** By connecting cylinders of gas on each side of the suspected leak location, the work of finding the leak can continue and at the same time protection will be given to the cable.
- (b) **In the location of a small leak having a relatively flat gradient slope:** By admitting gas to the cable at approximately ten pounds pressure, the pressure is maintained at a high level at points close to the leak. This increases the escape of the gas through the leak and steepens the gradient slope which permits a more accurate leak location to be obtained.
- (c) **When there is more than one leak in the cable under test:** By locating the cylinders so that the section of cable between cylinders contains only one known leak, the effect of the other leaks on the gradient is eliminated. If necessary, one cylinder can be placed close to one of the leaks so that not less than two valve points can be made available between this cylinder and the leak to be located.
- (d) **In cables not normally under pressure,** sheath cracks or other openings which have caused conductor trouble, that has dried out before being found by electrical measurements, can be located by this method. Temporary valves can be installed in the vicinity of the trouble to provide points for adding gas and making pressure readings.

## 3. PROCEDURE IN MAKING TEST

3.01 The Two-Cylinder Method should not be employed without first taking a preliminary set of pressure readings to obtain an approximate location of the leak. Temporary close-spaced valves should then be installed so as to obtain two and preferably three evenly spaced reading points on each side of the leak. The distance between cylinders should not be any greater than necessary to obtain suitable reading points.

3.02 Two valves are required at the location of the cylinders. One valve is used for gas admission. The second valve should be located on the cable one to two feet on the leak side of the gas admission valve. This valve is used to check the charging pressure and also as one of the reading points for the leak location measurements.

3.03 The apparatus used at a charging point consists of a 220 cu. ft. cylinder equipped with a standard regulator and a B Gas Regulator. The regulators should be connected as shown in the section in the G80 Division describing the B Gas Regulator.

3.04 The regulated pressure of the two cylinders should be adjusted to approximately the same value under a no flow condition before being connected to the cable. These pressure values should be at least one-half pound higher than the highest pressure existing in the gas section. This is necessary in order that the regulated pressure at the cylinders and the rate of gas flow to the leak can be maintained at constant values during the test. The regulator pressure should not be less than about 8.0 pounds as low pressures result in flatter gradients and less accurate leak locations.

3.05 Connect the regulator hoses to the cable and start admitting gas from the two cylinders. Minor adjustment of the regulators may be necessary after 5 or 10 minutes of gas flow to obtain the desired charging pressure. Do not change the regulator setting after this time as this would disturb the gas flow and delay the stabilization of the leak gradient.

3.06 Continue admitting gas until the gradient between the two cylinders has stabilized. The time required to reach a stable condition will vary from one-half hour to one hour for each 1000 feet of cable under test. A stable condition will be indicated when the pressure measured at one of the valves near the midpoint between cylinders maintains a constant value for a period of one-half hour or more.

3.07 After the gradient has stabilized, take a set of pressure readings at the valve points between cylinders by the Two-Direction Method and prepare a leak location graph. If the pressure at any valve differs by more than .02 pound between the first and second reading it is an indication that one of the readings is in error or that the section had not become stabilized. In this event a new series of readings should be made.

#### **4. EXAMPLE**

4.01 The application of the Two-Cylinder Method of leak location is illustrated by the following example.

4.02 The two cylinders were connected at Valves No. 1 and No. 6 with charging pressures of approximately 8.00 pounds. The pressure was read at intervals at Valve No. 3 near the midpoint of the section until a stable condition was indicated by the 2:00 PM readings. Pressure measurements were then obtained at all valve points by the Two-Direction Method.

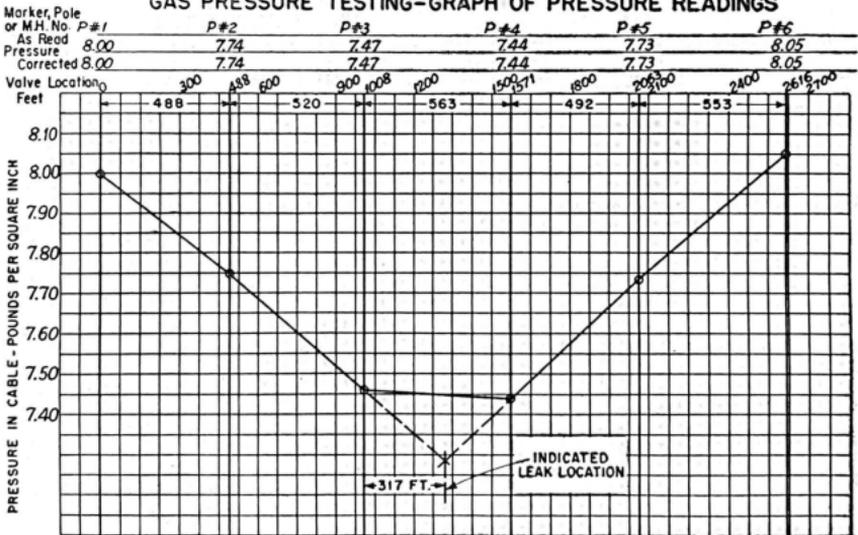
## TWO-CYLINDER METHOD DATA SHEET

### Valve Location

Time of Reading	Valve No. 1	Valve No. 2	Valve No. 3	Valve No. 4	Valve No. 5	Valve No. 6
11:10 A.M.	8.00					
11:20 "						8.05
11:45 "			7.26			
12:10 P.M.			7.45			
1:15 "			7.47			
2:00 "			7.47			
2:10 "	8.00					
2:20 "		7.74				
2:25 "			7.47			
2:30 "				7.44		
2:40 "					7.73	
2:50 "						8.05
3:00 "					7.73	
3:10 "				7.44		
3:15 "			7.47			
3:20 "		7.74				
3:30 "	8.00					

4.03 The graph plotted from these readings is shown below.

**GAS PRESSURE TESTING—GRAPH OF PRESSURE READINGS**



**LEAK LOCATION GRADIENT  
TWO-CYLINDER METHOD**