

BELL SYSTEM PRACTICES
Outside Plant Construction
and Maintenance

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PRESSURE TESTING

LEAK LOCATION METHODS

ONE-CYLINDER METHOD

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1. GENERAL

1.01 This section replaces the information previously contained in Section G73.245, Issue 1 describing the One-Cylinder Method (formerly known as the Two-Section 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 when the leak is very close to the end of a gas section, or is in a short isolated section of cable.

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

1.03 A cylinder of gas is connected to the cable with regulator adjusted to admit gas at a constant pressure slightly higher than the existing pressure. The cylinder is located on the side of the leak away from the end of the section and at a sufficient distance to permit three reading points between the cylinder and the leak. The test is continued until the pressure between the cylinder and the end of the section has become stabilized. A set of pressure readings is then obtained for the preparation of a leak location graph.

2. APPLICATION

2.01 The One-Cylinder Method is suitable for the location of gas leaks in underground and buried cable when the leak is very close to the end of a cable or a gas section and it

is not practicable to obtain two reading valves between the leak and the end point.

2.02 The use of the One-Cylinder Method is of particular advantage under the following conditions:

- (a) **Where the existing cable pressure is low and it is necessary to charge the cable to protect service:** By connecting the cylinder of gas to the cable, the work of finding the leak can continue and at the same time protection will be given to service.
- (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 gas through the leak and steepens the gradient slope which permits a more accurate leak location to be obtained.
- (c) **Where there is more than one leak in the section of cable under test:** By locating the cylinder so that the section of cable between the cylinder and the end point contains only one known leak, the effect of the other leaks on the gradient is eliminated.
- (d) **In cable 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 One-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 the side of the leak away from the end of the section. The distance between the leak and the point of connection of the cylinder should not be any greater than necessary to obtain the proper reading points. One reading point is required between the leak and the end of the section.

3.02 Two valves are required at the location of the cylinder. 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 equipment used at the 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 used during the test should be at least one-half pound higher than the highest pressure existing in the gas section. This is necessary in order to assure that the regulated pressure at the cylinder and the rate of gas flow to the leak can be maintained at a constant value 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 hose to the cable and start admitting gas from the cylinder. Minor adjustment of the regulator may be necessary after 5 or 10 minutes of gas flow to obtain the desired charging pressure. Do not change the regulator setting thereafter 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 cylinder and the end of the section 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 the valve at the end of the section 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 the cylinder and the end of the section 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 case a new series of readings should be made.

4. EXAMPLE

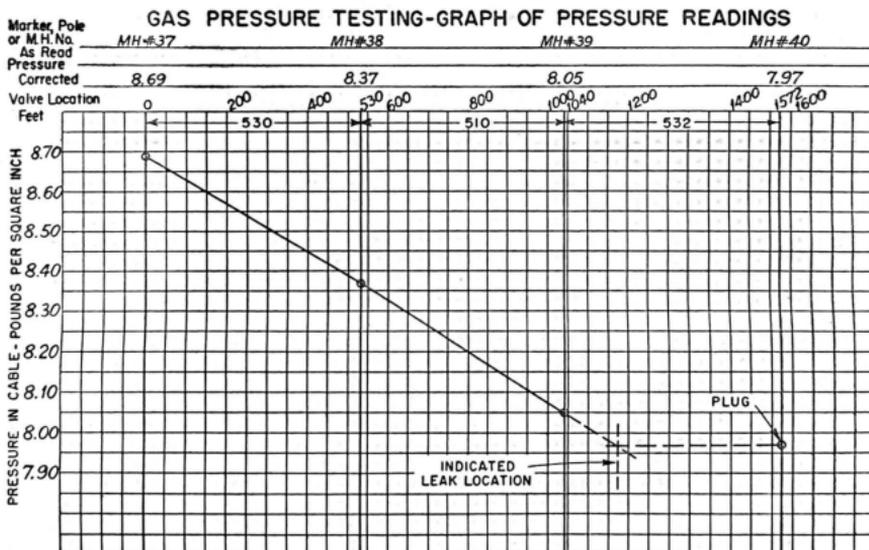
4.01 Application of the One-Cylinder Method in the location of a medium leak in a conduit section adjacent to a plug in underground cable is illustrated by the following example.

4.02 The cylinder was connected at Manhole No. 37 at a charging pressure of 8.70 pounds. The pressure was read at intervals at Manhole No. 40 at the end of the section until a stable condition was indicated by the 1:10 P.M. reading. Pressure measurements were then obtained at all valve points by the Two-Direction Method.

ONE-CYLINDER METHOD DATA SHEET

Time of Reading	Valve Locations			
	M.H. #37	M.H. #38	M.H. #39	M.H. #40
9:20 A.M.	8.70			
9:40 "				6.23
9:50 "	8.70			
11:30 "				7.97
12:00 N.				7.97
1:10 P.M.				7.97
1:20 "	8.70			
1:30 "		8.37		
1:40 "			8.05	
1:50 "				7.97
2:00 "			8.05	
2:10 "		8.37		
2:20 "	8.70			

4.03 Following is the leak location gradient plotted from the above readings. The indicated leak location is at the intersection of the extension of a straight line connecting the measured pressures at Manholes No. 38 and No. 39 with a horizontal straight line drawn through the measured pressure at Manhole No. 40.



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LEAK LOCATION GRADIENT