PRESSURE TESTING

GENERAL

CONTINUOUS FLOW SYSTEMS

CONTENTS PAGE

1. GENERAL

1.01 This section has been issued to provide general information on the major factors and equipment involved in the layout of continuous flow gas or air systems for exchange and trunk cables.

1.02 Continuous flow gas systems differ from static systems in that the cable system is supplied from a constant source of dry air or nitrogen at a pressure which affords continual protection to both aerial and underground cable plant. Minor gas leaks in the cable system are expected and have very little effect on the protection afforded by the gas system as long as they remain minor. Each cable in the system will use a normal amount of gas per day according to it's length, age and type of sheath.

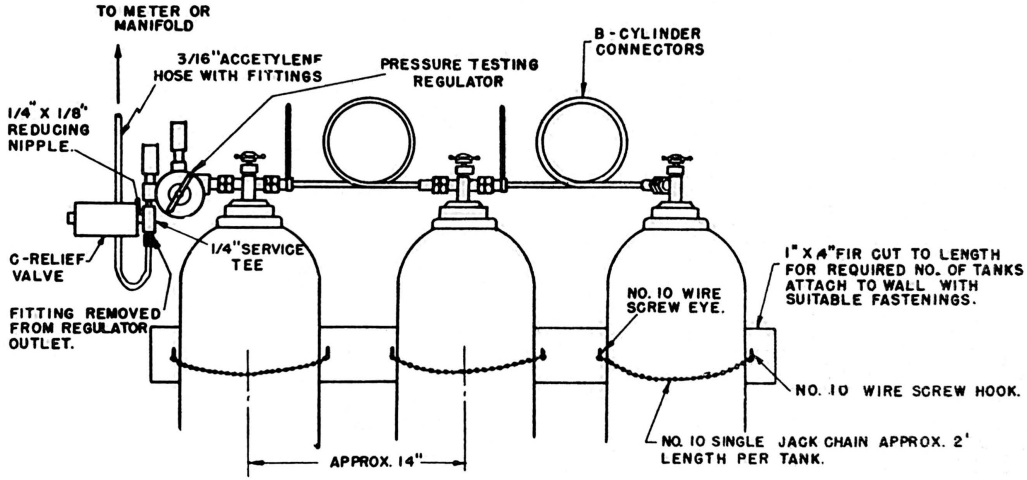
2. PRESSURE SOURCE

2.01 In selecting the type of pressure source to be used at any particular Central Office location, the total consumption of gas for all cables to be pressurized must be considered. About 1 cubic foot of gas per day for each sheath-mile of cable pressurized is considered normal. However, this figure may very considerably in each system installed. The normal consumption of gas for each system can only be determined when enough leak location work has been accomplished to attain the desired protective pressures covering the entire system. When this point has been reached, no further leak location work need be done except for maintenance purposes. The cables will then use what should be considered their normal consumption per day of dry air or nitrogen gas.

2.02 It is generally economical to supply a cable pressure system with dry air from a compressor-dehydrator when the normal consumption of gas in the system is 25 cubic feet or more per day. On systems of less consumption, dry nitrogen gas supplied from a multiple tank system is generally more economical than the use of a compressor dehydrator.

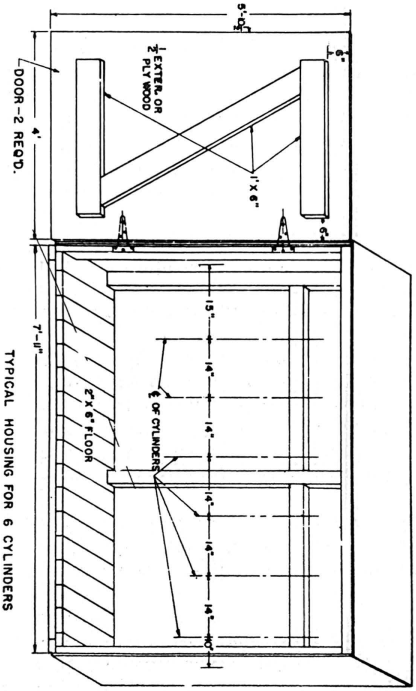
2.03 Where a compressor-dehydrator is used, it is advisable to design the pressure system so that the total normal gas consumption of all cables in the system will not exceed 75% of the rated capacity of the compressor-dehydrator.

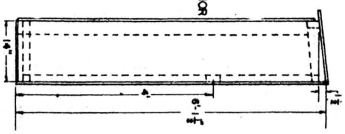
2.04 Where a multiple tank system is used, a number of cylinders, generally not over six, are joined together by use of B Cylinder Connectors. Nitrogen gas is fed to the cable system through a pressure regulator and relief valve as shown in the following illustration. The installation of an E Pressure Contactor-Terminal and associated alarm should be considered where the location of the gas reservoir is such that monitoring the tank pressure at frequent intervals is not convenient or economical.


TO METER OR MANIFOLD
3/16" ACCETYLENE HOSE WITH FITTINGS
PRESSURE TESTING REGULATOR
B-CYLINDER CONNECTORS
1/4" X 1/8" REDUCING NIPPLE
C-RELIEF VALVE
1/4" SERVICE TEE
FITTING REMOVED FROM REGULATOR OUTLET.
1" X 4" FIR CUT TO LENGTH FOR REQUIRED NO. OF TANKS ATTACH TO WALL WITH SUITABLE FASTENINGS.
NO. 10 WIRE SCREW EYE.
NO. 10 WIRE SCREW HOOK.
NO. 10 SINGLE JACK CHAIN APPROX. 2' LENGTH PER TANK.
APPROX. 14"

2.05 To prevent overloading a compressor-dehydrator, it may be found advantageous to use a temporary multiple tank system as a cource of pressure during leak location work required to bring the cable system up to a point where the desired protective pressures have been attained. Multiple tank systems may also be used on occasion as an auxiliary source of pressure at intermediate central offices or terminating points on long trunk cable systems.

2.06 For some installations of multiple tank systems as permanent sources of pressure, it may be necessary to locate the tanks outside the Central Office building. Where this is necessary due to space limitations or for convenience, a suitable housing for 6 cylinders may be provided as shown in the illustration on Page 5. For housings of less than 6 cylinders, the length of the housing may be reduced 14 inches for each cylinder omitted.


5'-0"
6"
1/2" EXTERIOR PLYWOOD
1" X 6"
6"
DOOR - 2 REQ'D.
4'
7'-11"
15"
14"
14"
14"
14"
14"
2" X 6" FLOOR
1/2 OF CYLINDERS
TYPICAL HOUSING FOR 6 CYLINDERS


FRAME - 2" X 4"
SHEATHING - 1/2" EXTERIOR PLYWOOD.
EQUIP WITH GALV. "T" HINGES AND SAFETY HASP.
14"
4"
6'-1 1/2"
1 1/2"

3. DESIGN CONSIDERATIONS

3.01 In general, each exchange cable should be designed as a separate pressure system or "pipeline" to facilitate maintenance operations. In some instances where two short exchange cables provide service to the same general area, or where an exchange cable provides service to widely separated sections of the area, it may be found advantageous to combine all or part of these cables with another cable to form one pressure system.

3.02 Each trunk cable may be designed as a separate pressure system or may be combined with one or more other trunk cables in the same general trunk route to form a circular gas system. When the pressure source is at one end of the trunk system only, the circular design provides better protection to each cable due to the larger reservoir of gas or dry air and the elimination of the low point of protection near the pressure plugs on the far ends of the cables.

3.03 Where trunk and exchange complements are contained in the same cable sheath, the cable should generally be treated as an exchange cable for pressure system design purposes.

3.04 In continuous flow systems, the cables are fed dry air or nitrogen from the Central Office pressure source at a pressure of 10 psi for both trunk and exchange cables. Each cable system should be designed and constructed so that this source pressure will be adequate to ensure the desired protective pressures over the entire length of each cable in the system.

3.05 Where existing static pressure systems on either exchange or trunk cables are to be converted to continuous flow systems, equipment originally installed for the static system, such as contactor-terminals, pressure plugs, valves, and by-passes, need not be removed. On some trunk cables it may be necessary to by-pass existing pressure plugs in order to have a free flow of gas for the entire length of the cable. In some cases it may also be necessary to readjust existing contactor settings when they are to remain under the continuous flow system. Equipment deemed unnecessary to continuous flow operation may be removed when repairs are required or at a time when other work is to be done at the particular location of such equipment.

4. USE OF PRESSURE PLUGS, VALVES, AND BY-PASSES

4.01 Pressure plugs should be placed on each cable to be pressurized in the Central Office vault to isolate the riser cables. They are also required at other locations in the outside cable plant in order to obtain the desired protective pressures as well as to create an individual pressure system of each exchange cable. In general, plugs should be held to the minimum required to ensure the required protective pressures on each cable system. For specific use of pressure plugs, refer to the Sections covering Pressure Testing, Continuous Flow Systems for Exchange Cables and for Trunk Cables.

4.02 When preparing a cable for continuous flow gas pressure, permanent valve locations are established at the ends of all distribution cables and at certain other key points on exchange and trunk cables. Temporary valves may be installed as needed by construction or maintenance forces for leak location work, but should be removed and the sheath opening sealed when such work is completed. Refer to other Sections covering Continuous Flow Systems for specific locations of permanent valves on exchange and trunk cables.

4.03 Any partial or complete restriction to the free flow of gas throughout the pressurized cable system must be by-passed. For this reason, unnecessary pressure plugs should not be installed in the cables during initial leak location and construction phases of the continuous flow system. Field forces can best determine the need for by-passes while making initial leak location tests and routine pressure tests. In general, shut-off valves should not be installed in by-passes used on exchange cable. At the discretion of the Plant Engineer, they may be installed in the by-passes used to combine two or more trunk cables into one pressure system.

5. MONITORING

5.01 To ensure adequate protective pressures over the entire continuous flow system, each individual system must be monitored by one of the following methods:

(a) Periodic pressure readings at permanent key valve locations.

(b) Periodic readings of flow meters installed between the pressure source at the Central Office and the inlet for gas to each system.

(c) Periodic readings of Pressure Switches installed at key locations on exchange cables.

(d) A combination of (a), (b) and (c) above.

5.02 The required frequency of monitoring may vary with each individual pressure system in accordance with such factors as weather conditions, age and size of cable, overall length of cable, and type of sheath. Maintenance forces can best determine the required monitoring interval for each cable system after the pressure characteristics of the particular system have been established. However, in no case should the time interval between pressure monitoring be extended to more than 30 days.

5.03 Refer to other Sections of the Practices covering Pressure Testing, Continuous Flow Systems for specific information on recommended protective pressures, placement and use of monitoring equipment, and other monitoring procedures.

6. RECORDS

6.01 It will be found advantageous to have a record consisting of a set of schematic layouts showing each cable layout for a gas system on a separate map.

6.02 Initially, the pressure record should be prepared by the plant engineers and serve as the detail of work to accompany the routine order or other work order establishing the gas pressure system. In addition, the plant engineers should maintain a continuing record of changes, addition, or deletions for each cable pressure system.

6.03 Approximate locations of valves, pressure plugs, and bypasses should be indicated on the print by the engineer. The specific location of these items by address, pole number, manhole number, or other suitable identification should be marked on the print by construction or maintenance forces when the item is placed in plant.

6.04 All house and other terminals that may not be obvious to field forces should be clearly indicated on the print by the engineer so that these terminals may be easily located for plugging.

6.05 Monitoring records should be maintained on a current and continuing basis by the maintenance forces responsible for the monitoring operation on each cable pressure system.

6.06 The following sketch, prepared by the plant engineer, illustrates a partial layout of a cable system to be placed under continuous flow pressure: