BELL SYSTEM PRACTICES
Outside Plant Construction and Maintenance

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PRESSURE TESTING
CONTINUOUS FEED PRESSURE SUBSCRIBER CABLE PROCEDURE

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1. GENERAL

1.01 This section outlines procedures for pressurizing subscriber cables from a continuous feed pressure source.

1.02 The large amount of dry air generally available from the Air Dryer makes it practical to apply pressure to subscriber cable with a minimum of preparation to outside plant.

1.03 The procedures recommended in this section are intended as a general guide to the sequence of operations for pressurizing subscriber cables. Variations from this sequence may be advisable in specific cases. For example, the plugging of building laterals and cross-connecting terminal stubs within about a mile of the central office may be more advantageously accomplished before, rather than after gas pressure has been applied. Also where time permits it may be desirable to install permanent valves in specified manholes and at aerial riser poles in advance of applying pressure.

1.04 The cable pressure that should be obtained to insure adequate protection from moisture may vary with specific conditions or with locally established practices. However, the following may serve as a general guide for desirable pressures:

(1) **UG or Buried Cable:** The objective is to obtain sufficient gas pressure to protect against the maximum anticipated waterhead. A cable pressure of 1 psi will protect

against a waterhead of 2 feet. The minimum cable pressure to provide a protective margin against the entrance of moisture may therefore be expressed as follows:

$$\text{Desirable Cable Pressure (psi)} = \frac{\text{Waterhead (Ft.)}}{2} + 1$$

(2) **Aerial Cable:** The objective is to obtain, wherever practicable, a positive pressure at the end of all distribution cable. However, because of the high pneumatic resistance of the many small cables in the distribution plant, it may not always be economical to obtain a positive pressure at every cable end. It is suggested that where a positive pressure cannot be obtained at the end of a branch cable, but there is at least 1 psi pressure at the branch splice, the matter be referred to your supervisor before doing leak location work or terminal plugging on the branch cable. A typical example of such a condition is described in the following:

Example: At the junction point of a feeder cable (100 pr.-24 ga.) and a branch cable (25 pr.-24 ga.) the cable pressure is 1.0 psi. At 1000 feet from the junction the pressure in the branch cable measures 0.54 psi. At 2000 feet from the junction the branch cable pressure may drop to 0.2 psi. No measurable pressure is found on the branch cable at 2800 feet (end point of the branch cable).

The high pneumatic resistance of this 25 pr.-24 ga. cable (40 per 1000 ft.) coupled with its length may make it impractical to obtain a positive pressure at the very end. Complete terminal plugging, and the repair of all minor leaks, could produce only a small pressure increase. The work involved in obtaining this small pressure increase would seldom be warranted.

2. SEQUENCE OF OPERATIONS

2.01 A recommended sequence of operations for pressurizing subscriber cables radiating from a central office is as follows:

(1) In the central office cable vault, make a gas plug and install a valve on each entrance cable. The valve provides an entrance for the gas, and the plug prevents gas loss through the tip cable. Where insulating joints are required they can be combined with the gas plug.

(2) After the air dryer and meter panel have been installed, connect each cable to the gas supply with tubing. In general, the connection of 3 to 5 cables per day to this gas

supply will prevent overloading the air-drying equipment and will also prevent any significant drop in the input pressure to cables that have already been connected.

(3) Install permanent valves at the specified manhole and aerial riser pole locations.

(4) Approximately two or three weeks after gas has been connected to the cables, take Gas Meter and Air Rate Indicator readings at the meter panel. Also, take pressure readings at the permanent valves progressively outward from the central office.

(5) Obtain cable records of the cables in the layout and analyze the various cable routes and the progress of pressure along them. From these analyses determine the most effective sequence of subsequent operations such as:

(a) Locating and bypassing any paraffin blocks. These blocks are generally indicated by a low gas flow at the Air Rate Indicator on the meter panel coupled with a low to zero cable pressure at adjacent valves in manholes or at aerial riser poles.

(b) Locating and repairing leaks in the underground cable. These leaks are generally indicated by high gas flow at the meter panel and low or zero cable pressure at the permanent valves. However, underground cable leaks are often located before the start of gradient work by an audible sound of escaping gas or observation of gas bubbles in a water-filled manhole.

(c) Continued high gas flow at the meter panel coupled with low cable pressure (less than 2 psi in the underground) may be indicative of serious leakage through a building terminal or cross-connection terminal on a branch cable close to the central office. Determine through pressure readings which feeder or main branch cable is taking the highest gas flow. Plug the leaking terminals and repair cable sheath leaks as required. A nongastight distribution terminal in a branch cable located close to the central office may permit more gas loss than an unplugged cross-connection terminal located further out along the cable route.

(6) Take additional Gas Meter, Air Rate Indicator, and cable pressure readings to determine the output of dry air at the pressure source, and the progress of the pressure along the cable route.

(a) In the process of obtaining pressure readings in manholes, an inspection of the lead cable sleeves should be made to determine if swelling is occurring due to gas pressure. This inspection is important partic-

ularly near the central office where the cable pressure is generally high. Reinforce any sleeves showing signs of swelling. Also reinforce any thin-walled sleeves where the pressure exceeds or is expected to exceed 6 psi. The procedure for reinforcing lead sleeves is described in other G sections.

(7) Where specified, install B End Point Contactors at aerial cable riser poles, provided the pressure is at least 1.5 psi. These contactors will monitor the condition of the UG cable and will also monitor for some distance out along the aerial cable, as described in other G sections.

(8) Install permanent valves at the specified locations on the aerial cable and take pressure readings.

(9) Where inadequate pressure is found, plug the remaining cross-connection or building terminals and any nongas-tight distribution terminals on the **feeder sections** of the aerial cable.

(10) On a routine basis, do such leak repairing and bypassing of cable constrictions in the aerial cable as may be necessary to provide adequate moisture protection. Where necessary, install temporary valves to locate cable constrictions and leaks by the pressure gradient method.

(11) Install other B End Point Contactors, where specified, provided the cable pressure is at least 1.5 psi at the contactor locations.

(12) A record of pressure readings at permanent valve locations will be found helpful for any future leak location work.

2.02 The following general sequence is recommended in selecting subscriber cables for progressive conditioning and associated build-up of pressure.

(1) Cables carrying important circuits should be given first attention.

(2) Select other cables on a preferential basis, starting with those having the highest trouble rate.

2.03 Condition the cables progressively outward from the central office, obtaining adequate protection first for the underground and buried portions of the cable plant.

2.04 Where practicable, obtain adequate positive pressures at the end of aerial branch cables.