CABLE PRESSURIZATION SYSTEM

3,000 FOOT MANIFOLD SPACING DESIGN

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1. GENERAL

1.01 This practice describes the benefits of 3,000 foot air pipe manifold spacing, and addresses the specific requirements for designing the system. The emphasis of the documentation is to simplify the process of converting an existing 6,000 foot manifold system to a 3,000 foot design. As described below, the principles that apply to this conversion process can also be adapted to the design of a new 3,000 foot system.

2. SYSTEM DESCRIPTION

2.01 As the name implies, the most obvious difference between a 6,000 foot system and a

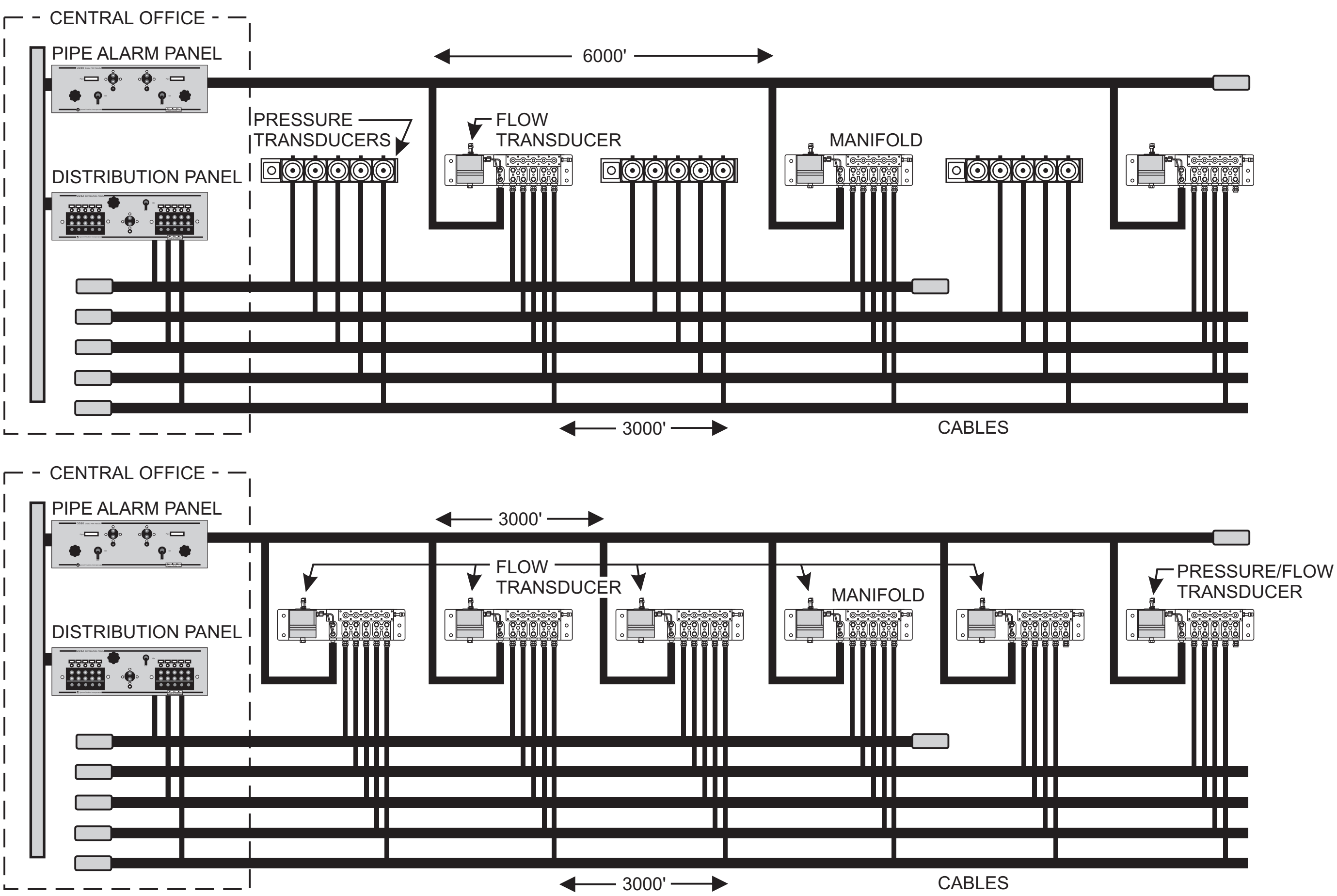

Fig. 1—6000' and 3000' Manifold Spacing Designs

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3,000 foot system is the position of air pipe manifolds (Figures 1). Another distinction to be made is the location and types of monitoring devices used. The following are some of the characteristics of an office converted from 6,000 feet to 3,000 feet:

- At midpoint pressure transducer locations, existing pressure transducers monitoring the individual cables will be replaced with a manifold(s) and a single flow transducer.
- Rather than measure pressure drops in individual cables, monitoring in a 3,000 foot system emphasizes manifold flow rates.
- The pressure of the cables in the system will be monitored by a single pressure transducer installed at the end of the air pipe. This device provides an indication of the general condition of the cables in the system. If the minimum end pipe pressure standard of 7.5 pounds per square inch (psi) is not achieved, then the system is not adequately protected.

3. REASONS FOR CONVERTING TO 3,000 FOOT MANIFOLD SPACING

3.01 There are a number of benefits associated with the 3,000 foot design. Among the most important ones are the following:

(1) ***Better Cable Protection***. The shorter manifold spacing makes it possible to supply more air flow to the cables, which results in better overall cable protection.

(2) ***Improved Monitoring***. With a flow-based air pressure system, dispatching accuracy is greatly improved. Rather than respond to a drop in cable pressure at a pressure transducer location (which may not be anywhere near the actual leak location), a technician will be dispatched to an air pipe manifold to begin systematic leak locating on the highest flowing cable. Leaks that cause high flow rates are generally near the air source.

(3) ***Improved Leak Locating***. With closer manfold spacing, it is possible to not only prioritize leaks more efficiently (identify the highest flowing ones), but the area of search when leak locating is also reduced by 50%. The results in much more efficient leak locating.

(4) ***Built-in Buffering.*** With the shorter distance between manifolds, cables will be automatically protected during splicing activity. This built-in buffering capability not only helps to protect the system, but it also helps to reduce the labor hours required for splicing (eliminating the need to place supplemental air sources on both sides of a splice location).

(5) ***Eliminates Excessive Open Circuits.*** In some 6,000 foot manifold systems, a large percentage of the midpoint pressure transducers regularly read open circuit. Rather than take the time to correct these opens, it may be more cost-effective to convert to a 3,000 foot system.

4. DESIGN IMPLEMENTATION PREREQUISITES

4.01 Before an existing 6,000 manifold spacing design can be converted to 3,000 foot spacing, there are several requirements that must be fulfilled:

(1) ***Purify Air Pipes***. It is important to know where all of the air pipes in the wire center go and where the manifolds are located. A primary function of the air pipe purification process is to account for total air flow consumption on a pipe route. In doing so the location of all air pipe manifolds on the route will be determined, as will any pipe leaks, ghost manifolds (unrecorded manifolds), cheater hoses, etc. Once total air flow has been confirmed and pressure violations corrected (if necessary), the pipe can be accurately reengineered for the new designed.

(2) ***Identify Pipes at Midpoint Pressure Transducer Locations.*** At pressure transducer locations where there are multiple air pipes, it is necessary to confirm which air pipe to use for feeding the new manifolds. This can be done by having a technician in the central office make delivery pressure adjustments at the pipe alarm panel feeding the designated pipe, while a technician in the field reads pipe pressures with a C pressure gauge. Once the correct pipe has been identified, the manifold assembly can be installed.

(3) ***Achieve Minimum Pipe Delivery Pressure***. Due to the initial increased pipe consumption requirements of closer manifold spacing, the new manifolds should not be installed until the pipe endpoint pressure is brought up to 7.5 psi.

(4) ***Determine Manhole Accessibility.*** Since the 3,000 foot design is a flow-based design that emphasizes leak locating in and around manifold locations, it is imperative that each manifold manhole is easily accessible. For this reason, it may be necessary to select a manhole other than the pressure transducer midpoint location to place the manifold assembly. Try to not to shift the installation location more than one manhole on either side of the pressure transducer location. Once the manifold and flow transducer have been installed, the midpoint pressure transducers in the adjacent manhole can be removed.

5. HARDWARE INSTALLATION REQUIREMENTS

5.01 The following 3,000 foot design installation requirements have been categorized by central office and field. The advantage of converting from an existing 6,000 foot design to a 3,000 foot design is that much of the equipment and pneumatic tubing currently being used is available for the new design. For example, at midpoint pressure transducer locations, device pairs at the 5- or 10-bank transducer housing are available for the new flow transducer, and pneumatic tubing to each cable (from the individual cable pressure transducers) is already in place and can be used for the manifold feed.

Central Office:

- The flow transducers installed at the office pipe panels need to be 0-95 Standard Cubic Feet per Hour (SCFH) devices. If a pipe panel is equipped with a 0-47.5 SCFH transducer, it needs to be replaced with the higher range device.

- A pressure transducer needs to be installed at the central office pipe panel to monitor delivery pressure. This transducer must be able to read up to 15 psi.

- Distribution panels need to be monitored with either a 0-47.5 SCFH or 0-95 SCFH flow transducer (flow range selection depends upon the number of cables being fed).

- A 0-15 psi pressure transducer is also required on each distribution panel.

Field:

- The manifold assemblies that need to ordered for the new design are available with either one manifold (for 5 cables) or two manifolds (for up to 10 cables). It is possible to determine the number of cables that need to be fed at each location by pulling a PressureMAP printout of the devices at the designated location and counting the number of pressure transducers.

- The manifold monitoring assemblies required for the conversion are also equipped with one flow transducer. The sizing requirements for these transducers are as follows: for manifolds with five cables or less, install a 0-19 SCFH transducer; for 10-bank manifolds, install a 0-47.5 SCFH transducer.

- As part of the conversion process, it is also necessary to make sure that the other existing manifolds on the pipe are monitored by a flow transducer.

- The last manifold on the route requires a pressure transducer to monitor end of pipe pressure. If the existing manifold does not include one, a pressure transducer can be installed with the manifold assembly that replaces the cable pressure transducers at the next closest manhole location back toward the central office.

- Check valves are required at manifold locations. Manifold assemblies can be ordered with built-in check valves on the feed to the tubing, or a check valve can be placed in the tubing between the air pipe and the manifold.

- In some situations an additional air pipe and pipe panel may need to be installed on a route. If an air pipe feeds more than 20 tubes, and the pressure at the end of the pipe is below the standard of 7.5 psi, another pipe is probably required. If this is the case, the existing pipe should be used to feed the first manifolds on the route, and the new pipe should be installed as an express pipe feeding the remaining manifolds on the route (Figure 2).

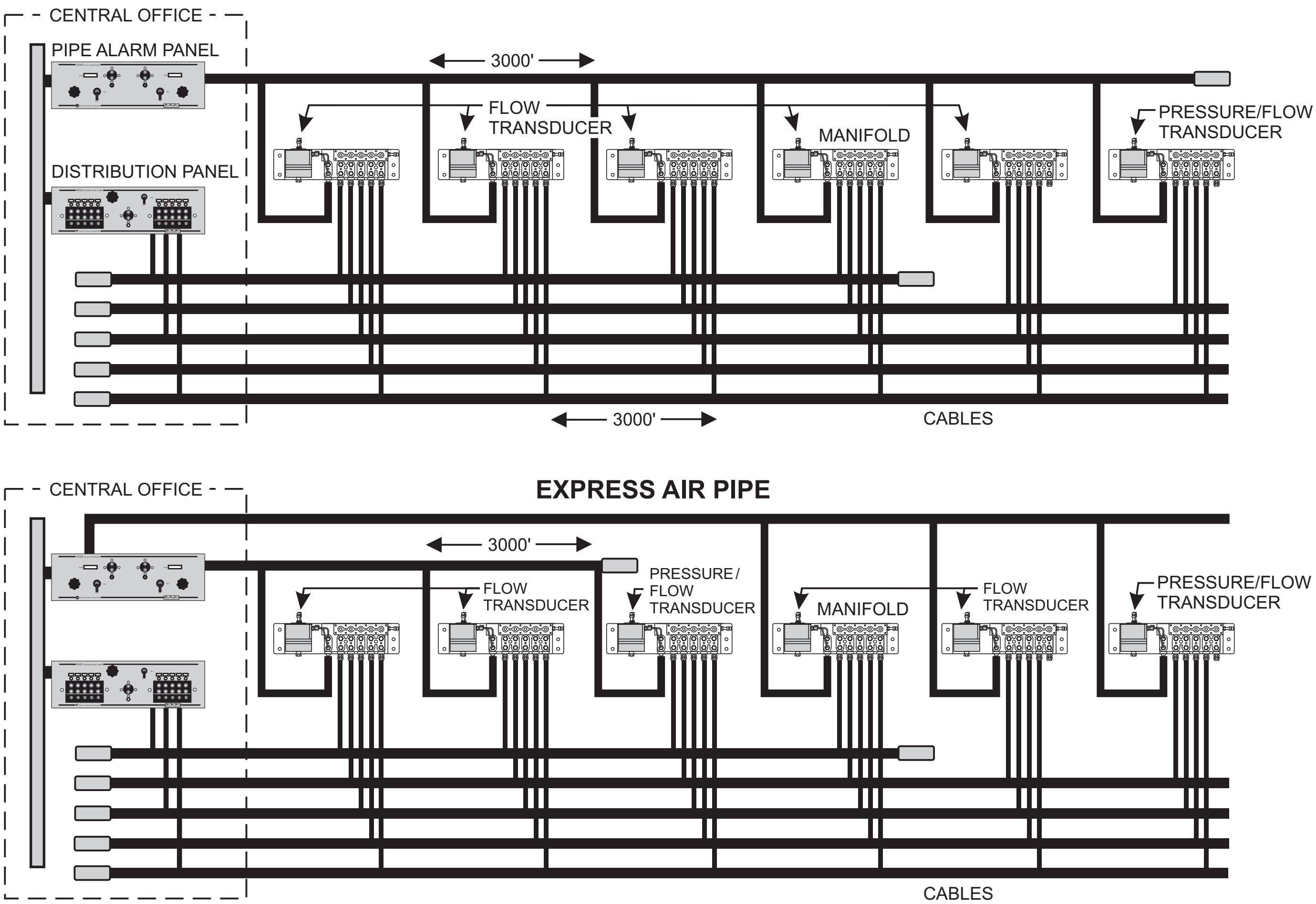

Fig. 2—Air Pipe Placement

Note: In some situations it may be more practical to install a One Inch Air Pipe in place of multiple ½" CA3131 pipes. Please contact AT&T Staff for information on this air pipe alternative.

6. OPTIMUM AIR USAGE

6.01 Each manifold in the new design must have an Optimum Air Usage (OAU) value assigned to it. Optimum Air Usage is the allowable air consumption for a manifold, or other flow source, based on the number of tubes it is feeding. A common and acceptible flow standard is 2 SCFH per sheath mile of cable. With the 3,000 manifold spacing design, each manifold tube feeds approximately ½ mile of cable. Therefore, in this type of design, the OAU value is 1 SCFH per tube.

7. 6,000 FOOT TO 3,000 FOOT CONVERSION

PROCEDURES

7.01 Following is a recommended procedure for turning up a 3,000 foot air pipe manifold spacing design from an existing 6,000 foot spacing system:

(1) Verify that there is a pressure transducer (PressureMAP EP device) installed to monitor the end of the air pipe.

(2) Verify that all flow transducers on existing manifolds and at the pipe alarm panel are operating properly.

(3) Install the new manifolds approximately midway between the existing manifolds and verify that the flow transducers are operating. Leave these manifolds in the OFF position.

(4) Adjust the delivery pressure at the pipe alarm panel to a setting between 10 and 10.5 psi.

(5) If the pressure transducer (EP device) at the end of the pipe is 7.5 psi or greater, turn on the new manifold that is closest the Central Office. Monitor the pressure of the pipe and fix any leaks in the new manifold manhole. If there are high flows (over 10 SCFH) on any cables after 20 minutes and the pressure at the end of the pipe drops below 7.5 psi, leak locating will be necessary on that cable.

(6) If the EP device monitoring the end of the pipe stabilizes at 7.5 psi or more, the next manifold can be turned on.

***Note**:* Never turn on manifolds on a route without closely monitoring the end point pipe pressure. A large pressure drop in the pipe could occur, resulting in multiple cable failures.

(7) If the pressure at the end of the pipe drops below 7.5 psi, begin leak locating on the route. Compare the flow rates of the manifolds (both old and new manifolds) with their OAU calculations. Once the pipe pressure rises to 7.5 psi or greater, turn on the next new manifold. Again, monitor end point pipe pressure.

(8) This procedure should be repeated until all of the manifolds are turned on and the pressure at the end point of the pipe has stabilized at 7.5 psi or greater.

Note: During the turning up process, make sure that the Central Office dryers are not overloaded. Do not turn on manifolds on different routes at the same time if the dryers in the office are flowing close to their maximum output.