CABLE PRESSURE SYSTEMS
BUFFERING

CONTENTS PAGE

1. GENERAL

1.01 This section describes the procedures for maintaining air pressure (buffering) when sheath or splice openings are made in pressurized cable systems.

1.02 Whenever this section is reissued, the reason(s) for reissue will be provided in this paragraph.

1.03 This section updates and includes information formerly contained in BSP Sections 637-050-901NB, 637-305-303, Issue 1, and 637-305-303NB, Issue A.

1.04 The buffering procedures described in this section will protect cables during most work operations. However, it is beyond the scope of this section to cover every situation. If work operations appear to be out of the ordinary, i.e., prolonged shift work in a very wet conduit run, cable dig-ups, multiple sheath openings in the same manifold section, etc., additional or different buffering techniques may be required. When unusual situations arise, contact Construction staff and/or Repair Staff if assistance is needed.

1.05 A sheath or splice opening in a cable under air pressure will cause a loss of air in the cable and, if allowed to continue for several hours, it may result in moisture entering the cable where leaks exist or occur.

1.06 Plant Engineering will provide buffering information on work prints. If actual field conditions differ from the work prints and could possibly affect the buffering procedures, Plant Engineering should be contacted for additional buffering information before the cable is opened.

1.07 When cable openings are made without work prints (trouble, check-ups, etc.), a careful evaluation of the proposed cable opening should be made to determine the necessity for buffering, where to apply it, and to isure the adequate allotment of auxiliary air source(s) to provide protective pressures.

1.08 Before starting work operations, a sheath opening number must be obtained from the forces responsible for maintaining the cable sheath opening record described in BSP Section 632-020-901NB.

1.09 A pipe and cable reading will be taken prior to opening a cable and if this reading does not meet Indiana Bell's minimum acceptable pressures, contact your supervisor or the supervisor in charge of pressure. Minimum acceptable pressures are as follows: pipe-8 psig, underground cable-5 psig, buried cable-3 psig, and aerial cable-2 psig.

Reference Material (Safety)

1.10 In order to safely perform the procedures outlined in this section, the employee must be familiar with the information contained in the following sections and sub-divisions:

Section	Title
620-102-010	Outside Plant — Precautions — Underground & Buried Work
620-135-010	Guarding Work Areas

Section	Title
629-135-100	Outside Plant — Guarding Work Areas — Standard Warning Devices — Description and Use
620-140-501	Testing & Ventilating Manholes
620-150-010	Manhole Covers — Removing & Replacing
Sub-Division	
081-700-	Gas Detecting Devices
649-510-	Blowers & Heaters
649-530-	Portable Pumps & Saws

2. PROCEDURES FOR BUFFERING CABLES PRESSURIZED BY A NON-PIPE SYSTEM

Underground and Buried Cables

2.01 It is recommended that dry air be added to pressurized underground or buried cable prior to making sheath or sleeve openings if the cable is **not** pneumatically supported by an air pipe. The dry air should be supplied from auxiliary air sources at convenient manholes or valve locations within 1500 to 4500 feet on each side of the opening.

2.02 When an opening is made within 1000 feet of a central office (CO), an air source should be placed at least 1500 feet on the field side of the opening. Protection of the affected cable or cables on the CO side of the opening will require special consideration on an individual basis between the Engineering, Construction, and Plant forces involved.

NOTE: Auxiliary air sources may be a truck equipped with a dry air source, a portable air dryer, or nitrogen cylinders. Only air sources equipped with moisture alarm features shall be used (excluding nitrogen cylinders). An audible or visual moisture alarm, which can be used during work operation, is satisfactory.

2.03 Prior to opening the cable, buffer the cable as follows: measure the pressure of the cable to be buffered at the buffering points.

2.04 Connect a hose from the dry air source to an F pressure testing valve at the buffering locations. If the cable at the buffering location is not equipped with an F pressure testing valve, one should be installed as described in BSP Section 637-235-200.

2.05 Adjust the pressure regulator to deliver one pound above the pressure read at the buffering location.

2.06 If the opened cable terminates or leaves the pressurized section as a branch or lateral, an air source must be placed at the far end of the pressurized branch or lateral to maintain its pressure. When such cable is less than 500 feet in length, effective buffering cannot be provided. Special provisions may be made to provide token buffering when an abnormal number of special services appear in the cable to be opened.

2.07 When work is completed or terminated for the day, perform the following operations:

(a) Obtain a closing number from the test center in the same manner discussed in 1.07.

(b) Flash test the sheath closure, **depending on the type,** as outlined in the 633 Division of the Bell System Practices.

(c) Continue buffering until the cable pressure at the sheath closure (permanent type) reaches approximately 1/2 pound of the pre-opening pressure at the buffering points.

(d) Remove auxiliary air sources and buffering connectors.

(e) Restore all valve caps.

Aerial Cables

2.08 Engineering will not provide buffering information on work prints unless the opening location is one of the types described in Paragraph 2.10 or 2.11.

2.09 When a sheath or splice opening is made in an aerial pressurized cable, no buffering is required unless it is raining but the shut-off valve should be closed at the riser pole. If it is raining, an air source should be connected to the cable at locations approximately 1500 to 4500 feet on each side of the opening in the same manner as for underground or buried cable.

2.10 Where an opening is to be made in the aerial portion of a combination aerial/below ground cable section located beyond the underground lateral, buffer the cable so that all below ground cable is protected. The air from the buffering source should be applied at a pressure of 5 psig.

2.11 All aerial toll and trunk cables shall be buffered regardless of climatic conditions. An air source shall be connected to the cable at locations approximately 1500 to 4500 feet on each side of the opening.

NOTE: Toll centers must be contacted to obtain opening and closing clearances.

3. PROCEDURE FOR BUFFERING CABLES PRESSURIZED BY A PIPE SYSTEM

Underground Pipe System

3.01 When opening an underground cable pressurized by a pipe system, it is recommended that pipe buffering be utilized to provide the buffering.

3.02 Prior to opening the cable sheath and/or splice, measure the cable and the pipe pressure of the pipe which is to be buffered. This pressure measurement should be made with a C pressure gauge or equivalent. If the minimum pressures listed in Paragraph 1.08 are not present, proceed as described in that paragraph.

3.03 Attach a dry nitrogen or dry air hose directly to the air pipe which will be affected by the opened cable. This hose should be provided with a tee fitting and F valve which will facilitate the connection of the C pressure gague. The C pressure gauge should remain connected to the source pressure hose so the air pipe pressure may be observed throughout the work operation.

CAUTION: When a portable air dryer is used for a buffering source, only those dryers which have moisture alarming features are satisfactory. A dryer which shuts off under a moisture condition is the most desirable. Otherwise, an audible or visual moisture alarm must be provided which may be recognized from the manhole.

3.04 Advance the pressure source regulator until an increase in pipe pressure of approximately 1/2 pound above existing pressure is observed on the C pressure gauge.

3.05 Open the cable or splice.

3.06 During the course of the work operation, periodically observe the pipe pressure. If a pipe pressure reduction occurs, reestablish a level of 1/2 pound above the original pipe pressure level by increasing the source regulator pressure.

3.07 Immediately after closing the splice, remove the air pipe buffering source and flash test the splice closure and cable in the normal manner by applying air directly to the splice closure and observing a 5 PSI **back pressure.**

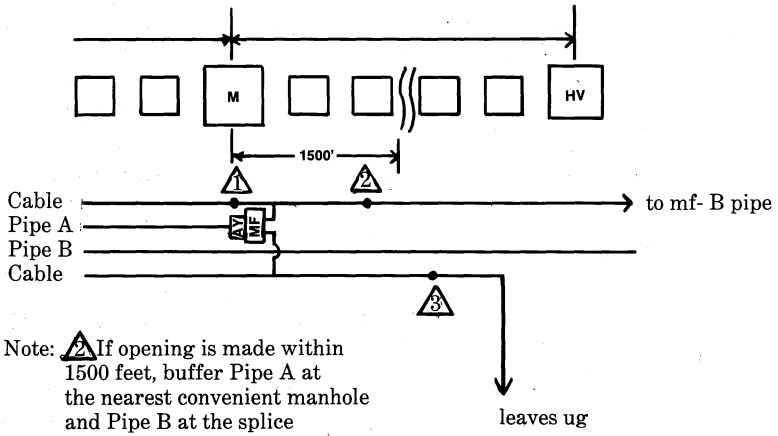

Figure A

3.08 If a splice opening is to be made in a manhole which contains a pressure manifold, the air supply should be turned off to the cable which is to be opened. In the event the cable is stubbed through a non plug stub to other cables which contain manifold tubes, these air tubes should also be turned off at the manifold block. Upon completion of the work operation, assure that all manifolds are returned to the normal positon (open).

(a) If the splice opening is to be made in a manifold manhole containing multi-pipes, e.g., Figure A, Splice #1, two pipes will have to be buffered.

3.09 After work is completed or terminated for the day, obtain a closing number, flash test, remove buffering sources and restore all valve caps.

4. SUPPLEMENTARY BUFFERING

4.01 Supplementary buffering shall be applied to an air pipe if the following condition exists:

(a) A splice opening is to be made in a manhole that does not contain the air pipe which will be affected by the opened cable. Some typical examples are shown in Figure A, Splices 2 and 3.

NOTE: Apply dry nitrogen to the affected air pipe at the location outlined in the buffering information supplied by Plant Engineering. Dry nitrogen is to be applied to the pipe at 10 psig.

4.02 Supplementary buffering shall be applied to the cable if any of the following conditions exist:

(a) The cable ends or leaves the conduit run between manifolds (cable is isolated from an air source when splice is opened). Figure A, Splice #3.

(b) The cable opening is made at or beyond the last manifold.

NOTE: When cable exceeds 500 feet in length, supplementary buffering is to be applied. This buffering shall be applied at approximately 1500 feet locations if possible or at cable end if less than 1500 feet. When such cable is less than 500 feet in length, effective buffering cannot be provided. Special provisions may be made to provide token buffering when an abnormal number of special services appear in the cable to be opened.

4.03 No supplementary buffering will be required when a cable enters a building from a manhole without passing through intermediate manholes and/or does not exit from ground before reaching the building.

5. AERIAL PIPE SYSTEM

5.01 When sheath or sleeve openings are made in an aerial cable which parallels an aerial air pipe and is directly fed by such pipe, the same buffering procedures shall be used as outlined in Paragraph 3. If a valve does not exist at the splice location, buffer the pipe at the dip pole or a convenient valve location.

6. BEYOND A PIPE SYSTEM

6.01 When sheath or sleeve openings are made in aerial cable and no pipe is present, turn off the shut off valve at the plug on the riser pole and proceed as explained in Paragraphs 2.09, 2.10 and 2.11. Plant Engineering will supply shut off valve location and provide for installation of plug and shut off valve if none exist.

7. ARRANGEMENTS FOR SUBMARINE CABLE

7.01 Since the pressure required to prevent moisture entry in the event of a sheath fault in deep water would result in excessive sheath and sleeve stresses in the land portion, submarine cables normally are maintained at the same pressure as the connection sections of cables located on land. Protection against the entrance of moisture thus is provided only for the land ends and that portion of the submarine cable in shallow waters.

7.02 When a sheath opening is to be made in a submarine cable, close the bypass valves at the junction plugs between the submarine cable and the land portions and connect an auxiliary air source to the submarine cable at each end of the crossing.

NOTE: Although the auxiliary air source should be adjusted to maintain a 10 pound pressure in the cable, pressures **up to 15 pounds** may be used if necessary.

7.03 After the sheath opening has been closed, flash tested, and restored to its normal location, continue admitting air until the pre-opening pressure is obtained, then open the by-pass valves at the junction plugs.

NOTE: If pressures above 10 pounds were employed, the excess pressure should be released from the submarine cable before the bypass valves are opened.

8. WORK PRINT INFORMATION

8.01 Plant Engineering shall provide the following information on the work print:

(a) Buffering locations in a non-pipe system, if required.

(b) The pipe or pipes to be buffered in a pipe system.

(c) Supplementary buffering information, if required.

(d) Figure B is a sample of Form PE 1002C used by the Engineer on the work print. More detail on this form is included in BSP 901-473-902NB.

PE 1002C

AIR PRESSURE INFORMATION

1. Pipe Buffering Location _____
2. Pipe to be buffered _____
3. Any cable completely isolated from all air sources when splice is opened and therefore requires cable buffering? _____
4. Pipe severely affected which does not appear at work location and requires pipe buffering? _____
5. Special Buffering Location(s) _____
   _____
6. Other Instructions _____
   _____

FIGURE B