

**CABLE PRESSURE SYSTEMS**  
**CONSTRUCTION TESTS**  
**PROCEDURES DURING PLACING AND SPLICING**  
**AND ACCEPTANCE PROCEDURES**

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**NOTICE**

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**2.01** A record of all pressure readings and associated data should be maintained by the construction forces for each length of cable in order to facilitate comparison of readings with those taken previously during the course of the placing and splicing work. This form will provide a quality control tracking record to ensure that new air core cable does not receive moisture damage while being placed or spliced. In addition, it will provide a pressure data record for use during future air pressure maintenance work on the cable. Figure 1 is an illustration of Form E-3975 for use in maintaining an air pressure record. Data should be entered as shown in the illustration.

**2.02** The Construction Test Cable Pressure Record (E-3975) must be retained by the construction forces until all splicing work has been completed and the cable pressures have stabilized above the minimum pressure objective. When this is complete, the E-3975 must be forwarded to the manager responsible for cable maintenance.

### **3. CONSTRUCTION TESTS (PROCEDURE DURING PLACING)**

#### **A. General**

**3.01** Buried, underground, and submarine air core cables (due to their subsurface location) are particularly subject to moisture trouble in the event of a leak. In addition, they are not readily accessible for sheath repair after placing. It is therefore advisable to test these cables for airtightness before and after placing. In some cases, monitoring during placing with an automatic field pressure alarm is advisable for immediate notification of pressure drop during placing operations.

**3.02** Aerial cable is not subject to submersion and is less likely to develop moisture trouble. Since aerial cable is accessible for repair operations, a limited testing procedure is specified.

**3.03** When testing lengths of cable during placing or splicing activity, any leak that is large enough to cause a significant loss of static pressure (1-1/2 psi or greater) should be located and repaired or replaced. Temperature, barometric pressure, and elevation changes will cause small fluctuations in static pressure conditions. A major temperature change of thirty degrees would change the pressure level by one pound while an altitude change of one thousand feet would change the pressure level

by one-half pound. Therefore, small changes should be expected due to normal temperature and altitude changes while significant changes should be investigated and repairs made.

**3.04** Cables are placed under pressure at the factory to the equivalent of approximately 10 psi. Each reel is equipped with at least one end valve for reading pressure. Pressure readings made at the factory are recorded on a tag which is attached to the cable or reel.

**3.05** Pressure readings should be made and recorded on Form E-3975 for each cable length immediately after delivery to permit repair of any defect before cable conductors are affected. The initiation of Form E-3975 and the responsibility for taking this first reading should be with the local supply force or the personnel responsible for receipt of cable. If this initial reading indicates pressure lost, the cable should not be accepted by the supply force. For extended storage, weekly readings should be taken by the supply group and recorded on Form E-3975. All subsequent pressure readings should be recorded on the same Form E-3975 to establish a continuous record. The Form E-3975 should remain on file with the supply group or personnel responsible for receipt of cable until the reel has been removed from the storage yard. The Form E-3975 should then be forwarded to the appropriate construction supervisor for subsequent entries.

**3.06** The construction group is responsible for checking the pressure and recording on Form E-3975 before removing the reel from the storage yard for placement. If there is no significant loss in pressure from the previous readings, the reel can be removed from the yard and the placing operation proceeds.

#### **B. Buried Cable**

**3.07** A pressure reading should be made immediately after placing. When placed by plow, this reading should be taken at the time the plow is stopped to change reels. This reading will indicate only large leaks developed in placing. If a leak is indicated at this time, the cable ends should be exposed and the cable buffered at each end until the leak can be located and repaired. A field automatic pressure alarm procedure can be used during the plowing operation to provide immediate indication of sheath damage.

**CONSTRUCTION TEST  
CABLE PRESSURE RECORD**

E-3975

①	②	③	④	⑤	⑥	⑦
ENG. JOB NUMBER	ITEM & SERIAL NUMBER	LENGTH (FT)	DATE	LOCATION	PRESS READ	REMARKS

- ① **ENG. JOB NUMBER:** ESTIMATE, ROUTINE, OR KEEP COST ORDER NUMBER.
- ② **ITEM & SERIAL NUMBER:** LIST THE ITEM SUCH AS REEL. ETC., AND ITS SERIAL NUMBER
- ③ **LENGTH (FT):** SHOW LENGTH OF CABLE ON REEL.
- ④ **DATE:** SHOW DATE READING WAS MADE.
- ⑤ **LOCATION:** SHOW LOCATION READING WAS MADE. IF READING IS RECORDED FROM TAG ON REEL INDICATE AS SHOWN.
- ⑥ **PRESSURE READING:** SHOW PRESSURE READING ON TAG OR AT LOCATION INDICATED IN COLUMN 4.
- ⑦ **REMARKS:** LIST MISCELLANEOUS DATA OF ITEM RECORDED, SUCH AS LOCATION, MANHOLE, POLE, AND STATION OR MARKER NUMBER, LOSS IN PRESSURE RECORDED. TROUBLE FOUND, CORRECTIVE ACTION TAKEN.

Fig. 1—Construction Test Cable Pressure Record

**3.08** An additional pressure reading should be taken approximately 24 hours after placing to determine if any small leaks were developed during the placing operation. If a small leak is indicated, buffer at each end of the cable until the leak can be found and repaired.

**3.09** When the interval between placing and splicing is an extended period, pressure measurements should be made for all unspliced lengths at two-week intervals thereafter to reduce the danger of having lengths of cable unprotected by air pressure.

**C. Underground Cable**

**3.10** The pressure tests to be made on underground cable are similar to those outlined for buried cable.

**3.11** Pressure measurements should be made prior to and immediately after a reel length is pulled in to be certain no leaks were developed during the placing operation. In order to preclude the necessity for entering the manhole for subsequent pressure measurements, the cable ends can be raised and secured so the end valves are accessible from the manhole opening. Any usable cable footage remaining on the reel should be repressurized with the ends capped and a new Form E-3975 prepared for the remaining cable. After returned to the storage yard, the supply organization is again responsible for weekly readings and entries on the E-3975.

**3.12** If a leak is detected in a length of underground cable after it is pulled into the duct and tests show that the leak is not due to a defective valve or end seal, the leak should be cleared by pulling the length of cable out of the duct and repaired or replaced with a new section of cable.

**3.13** Procedures outlined in paragraphs 3.08 and 3.09 for buried cable also pertain to underground cable.

**D. Aerial PIC Cable**

**3.14** Aerial PIC cable is not ordinarily ordered shipped under pressure. Pressure tests before and after placing operations are not required.

**3.15** Aerial cable to be maintained under continuous pressure should be pressure tested at the splice location as outlined in Part 4(B).

**E. Submarine Cable**

**3.16** Submarine cable should be tested as outlined for buried cable.

**F. Loading Coil Cases, Terminals, Etc**

**3.17** Load coil and apparatus cases are charged with air at the factory to the equivalent of 9 psi. A pressure reading should be made for each apparatus item immediately after delivery by the local supply force to permit repair or return of the defective item.

**3.18** The construction placing group should check the pressure on all static pressurized load coil cases, apparatus cases, and other associated pressurized apparatus to ensure that they are still holding the static charge prior to removing these items from the storage yard for placement. If the pressure is flat, repairs should be made if the leak source can be determined. If the leak source cannot be determined, the material should be returned and a replacement ordered.

**3.19** As a further check on airtightness of the stub cable and case, the unit should remain under pressure until the stub cable is opened for splicing. Measure the pressure just before opening the stub cable for splicing.

**3.20** If a leak is indicated, recharge the case or terminal and flash test the end seal and stub. Generally, the leak will be found in this operation. If the leak is not found, flash test the case to locate the leak. When the leak is located, the item must be repaired or replaced.

**4. CONSTRUCTION TESTS (PROCEDURE DURING SPLICING)**

**4.01** Construction tests during splicing should be applied to all cable work, associated air pressure hardware, and other equipment maintained under pressure.

**4.02** The installation of all pressure associated hardware, plugs, and other apparatus should coincide with the progress of the splicing work so that the complete pressure system will be available for testing purposes.

**A. Flash Tests**

**4.03** All work on cables to be maintained under pressure shall be flash tested upon completion. Flash tests are also made on cables not maintained under pressure when covered by instructions pertaining to the particular job.

**4.04** Procedures for flash testing cables are as follows:

- (1) Where a pressure valve is not available, install a C pressure flange and/or an F pressure valve in the sleeve or closure.
- (2) Adjust a pressure testing regulator, under a no-flow condition, to feed nitrogen at a pressure not to exceed 20 pounds. Admit nitrogen into the cable until the pressure is between 7 and 10 psi. Check this pressure with a C pressure gauge or by reading the back pressure on the low pressure gauge of the regulator. Allow the pressure to stabilize for 3 to 4 minutes with the C gauge attached to see if the pressure will drop off.
- (3) With the air source connected and gas entering the sleeve or closure, flash test all work and the cable sheath adjacent to the work for leaks. Pressure testing solution or ultrasonic leak locating test equipment can be used to conduct this test. Continue flash testing along the sheath as far as can be reached conveniently. In manholes, the sheath should be tested to the duct entrance in each direction. Use a splicer mirror, if necessary, to examine the back of the sleeve or closure and sheath.
- (4) If any leaks are found, disconnect the air source, release the pressure buildup in the cable, and repair the leaks. Repeat the flash test. After tests have been completed, replace the F valve with the C pressure flange plug unless the location is to be a permanent valve point.

**B. Tests of Spliced Sections**

**4.05** If the cable is supplied under pressure or placed under pressure during installation, pressure measurements should be made on all cable lengths just prior to opening the ends for splicing and recorded on Form E-3975. If any leak is indicated, add nitrogen if necessary and flash test

the valves and end seals in an attempt to locate the leak. If the leak is not found, the condition should be recorded on the E-3975 pressure data form so that steps can be taken to locate and clear the leak. A nitrogen cylinder should be connected to the section containing the leak, if necessary, to maintain pressure until the leak can be located and repaired.

**4.06** As splicing progresses, the completed section between the work location and the pressure plug or section end should be kept charged by leaving a cylinder connected near the plug or end point with the regulator set at 6 pounds for underground or buried cable and 3 pounds for aerial cable. As the distance of the splicing work from this cylinder increases, nitrogen should also be introduced at such intermediate points as required to maintain minimum acceptable pressure in the completed section. Before opening the end to splice on additional lengths, a pressure reading should be made in the completed section to ensure that there is adequate pressure.

**4.07** Isolated sections, such as load sections, that are to be left disconnected from the remainder of the cable for some time, should also be maintained under pressure per paragraph 4.06. The last splice in the isolated section is made in order that moisture troubles will not occur.

**C. Tests of Pressure Plugs and Bypass Connections**

**4.08** To guard against the possibility of blockage or restriction, pressure tests should be made to ensure the proper operation of bypass valves and the free flow of air through bypass connections. Also, a check should be made of the tightness of pressure plugs.

**4.09** To make these tests, a pressure testing valve is necessary on each side of the bypass located within a few feet of the point where the bypass pipe or tubing connects to the cable. In most cases, these valves are already available as standard construction. Where pressure testing valves are not available, F flanges and F valves should be installed for the tests. Upon completion of the tests, the extra valves should be removed and screw plugs placed in the flanges.

**4.10** Selecting a time when the cable is pressurized and there is no open splice in the section, tests should be made as follows.

(1) With the bypass valve open, check the pressure on each side of the bypass by means of a C pressure gauge. The two readings should be the same.

(2) Place a gauge on one valve, remove the core of the other, and observe the drop in pressure. This drop should be rapid, reducing the pressure to two pounds or less within 15 minutes.

(3) Restore the valve core and place a second gauge on this valve. Observe the restoration of pressure on both gauges. They should read the same during pressure buildup.

(4) Repeat procedures outlined in (2) and (3) in reverse order.

(5) If the above tests are unsatisfactory, it is an indication of a restriction or connection which should be removed.

**4.11** All pressure plugs, whether factory of field constructed, should be tested as part of the splicing operation. Closed bypass valves should also be tested for airtightness.

**4.12** To check the tightness of pressure plugs and closed bypass valves, connect a pressure gauge to the valve on one side of the plug and record readings for a 5-minute period to ensure that the pressure is stabilized. If the readings remain the same, remove the core of the valve on the other side of the plug. Record gauge readings for a second 5-minute period. If there is any variation from the previously observed reading, the airtightness of the plug and bypass valve should be suspected and corrective measures taken by repairing or replacing the valve or rebuilding the plug. The test should be repeated after the repair work has been done.

**D. Cable Section Completion Tests**

**4.13** When all splicing work has been completed in the overall cable section, the section should be connected to the permanent air source and pressurized to the required operating pressure.

**4.14** When the cable has been pressurized, the alarm sensors should be placed into operation and the cable should be monitored as part of the pressure network. In cases where it is not practical to place the sensor in operation immediately, pressure readings should be made semiweekly at three points along the cable section, midpoint and near each end, during the period that the alarm circuit is not in service.

**4.15** If the initial monitoring indicates that the cable will not maintain minimum pressure objectives, the necessary leak-locating work will have to be done to bring the cable up to standard.

**4.16** A cable section is considered satisfactory if it maintains minimum pressure objectives for seven consecutive days after all splicing work has been completed and monitoring procedures have been implemented. The 2nd level construction manager should notify the 2nd level maintenance manager that all work has been successfully completed and is ready for the maintenance organization to accept responsibility for the cable.

**4.17** The cable maintenance force will have five working days to accept or reject a job. If any pressurization deviations are found by cable maintenance and the job is rejected, the construction work force will have fourteen days to correct the unsatisfactory work. After corrections are made, the job should be resubmitted for acceptance.