

SCHEDULED INSPECTION  
OF EXCHANGE AERIAL CABLE

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1. GENERAL

1.01 The purpose of this Section is to provide a method of inspecting and repairing the exchange aerial cable plant and to discover and remedy defects and conditions that eventually would cause trouble if not corrected. The term "reconditioning," as used hereafter, includes this work and any other corrective or preventive measures taken to insure the serviceability of the outside plant.

1.02 To keep the aerial cable plant in good working condition and to prevent service interruptions, it is necessary to do preventive maintenance work. This work shall be done on a well-programmed and organized day-to-day basis rather than on a campaign or drive basis in order that the most beneficial and best results may be obtained for each maintenance dollar spent. The volume of reconditioning work to be completed in a given year in the area shall be determined by an annual review of service objectives, results, and maintenance costs.

1.03 The work done shall be only that necessary to place the cable plant in a good serviceable condition and no effort shall be expended in attempting to put the plant in perfect condition. It is not intended that the forces engaged in cable reconditioning work shall remedy defects in all types of outside plant. Their efforts should be confined primarily to the aerial cable plant. In general, the cable reconditioning forces will not handle the defective pair problems.

1.04 Defects or poor conditions in the drop wire plant, hazardous to cable plant and found at a pole, shall be corrected, but any other defects in drop wires shall be referred to other forces for attention.

## 2. RECONDITIONING FORCE

2.01 Preventive maintenance work on aerial cables, except removal of bowing, can best be done by groups in the Construction Department under the supervision of a foreman. These groups shall be thoroughly experienced in their work and capable of doing splicing as well as line work.

2.02 Removal of bows from aerial cable should be done with a gang of five men, including the foreman, to obtain the best efficiency. The men should be thoroughly experienced in line work and trained in the procedure of removing bows. It is suggested that at least one or more gangs specialize in this work.

## 3. TRAINING OF RECONDITIONING FORCE

3.01 The men chosen for this work shall be adequately trained under close supervision to establish a "viewpoint" and insure their efficiency in the preventive maintenance job. It is desirable that all necessary work be done, but that overdoing of the job be avoided.

3.02 They shall be thoroughly familiar with specifications covering joint pole construction and proper clearances between electric light and power plant and telephone plant, and other clearances pertaining to the telephone plant. They shall also understand the reasons for clearances specified. Equipped with this knowledge, they will be able to decide which conditions should be reported for immediate correction and those which may be programmed for correction on an orderly basis. In addition, they shall be fully acquainted with the causes of various types of sheath breaks as outlined in Part 8.

3.03 The men on bowing work shall be adequately trained in the procedure of doing the work and the reasons for the various phases of the job. They should know what effect their work has in removing bows and where bowing removal work should be done.

#### 4. MOTOR VEHICLE EQUIPMENT

4.01 The 1-1/2 ton LC or CLM motor vehicle unit equipped with a ladder platform and with gas pressure testing equipment and the other tools and material usually carried on cable maintenance units is considered as best adapted for cable reconditioning work.

4.02 For the bowing removal work, a line trunk equipped with a winch and equipment as covered in Bell System Practices, Section G52.415, "Removing Bows from Aerial Cables," is required.

#### 5. SELECTION OF CABLES TO BE RECONDITIONED

5.01 Since a relatively small percentage of the aerial cable plant is responsible for a large percentage of the cable troubles, care should be exercised to select for reconditioning first those cables responsible for the most trouble. The cable test centers will maintain records of all aerial cables to which will be posted currently each trouble as it occurs. Whenever the trouble frequency for any cable, or portion thereof, exceeds the average normal frequency for all aerial cables, that cable will be referred to the construction superintendent by forwarding two copies of form PF-699 as outlined in Bell System Practices, Section F38.916.

Note: In general, cables which reach the par trouble performance through accidental causes or through such trouble classifications as bullet holes, spur holes, cracked terminal tails, or other items which do not reflect a general poor condition of the particular cable leg, shall not be referred to the construction superintendent unless there is evidence that other conditions exist which should be corrected.

5.02 In the event the number of cables reaching par trouble performance drops to a level below that considered normal for the total in service (generally occasioned by periods of light seasonal rainfall) the construction superintendent may request additional cables for possible inspection on other than a trouble performance basis. Such cables will generally be confined to those bearing the oldest "last inspection" date.

5.03 The construction superintendent, on receipt of this information, shall have his records posted and a field check made of the cable. After satisfying himself as to the scope of the work required, it shall be scheduled for reconditioning. In scheduling the cable for reconditioning, he shall consider all cables that have been referred to him so that preference may be given to those cables, or portions thereof, that are causing the most trouble. The size of the cable and its importance from a service standpoint shall also be considered.

5.04 The selection of cables for bowing removal is based on the number and size of bows experienced in the cable. An inspection of the cables on 10-M and 16-M strand should be made and any bows recorded on charts as covered in Bell System Practices, Section G52.415. Where there are eight No. 1 bows, four or more No. 2 bows, three or more No. 3 or larger bows, or an equivalent amount of bowing in bows of various degrees, in eight sections of the cable, the cable is bowed sufficiently to require remedial measures.

5.05 The charts of cables requiring attention shall be forwarded to the plant engineers for review. In general, if a cable is to remain in the plant over five years, it shall be scheduled for bowing removal work.

## 6. METHOD OF MAKING INSPECTION FOR SHEATH DEFECTS

6.01 The construction superintendent, before proceeding with the inspection of a cable, shall provide the inspection crew with a copy of the list of defects furnished by the cable test center showing the types of trouble that have occurred in the cable and any additional items of a structural nature, etc., noted at the time of the field check, which should be corrected. The descriptive location of the cable, as furnished by the test center, shall also be supplemented where necessary to assist the inspection crew. In making the inspection, particular attention shall be given to conditions causing such types of troubles.

6.02 In general, the types of inspection to be made will include the following, depending upon the particular conditions encountered:

(a) Visually inspecting cable by climbing all poles.

(b) Inspection in the spans by use of ladders and ladder platforms in addition to climbing poles.

(c) Riding the cable or inspecting from ladders where not accessible to motor vehicle equipment.

(d) Where there are indications of the cable sheath being in generally poor condition due to ring cuts, cracks, bug holes, etc., it will be advisable to use nitrogen gas in connection with one of the above inspection methods.

6.03 The inspection, size of crew required, and the kind of re-conditioning work for each cable shall be determined by the construction superintendent after the field check covered in Paragraph 5.03 has been made.

6.04 When it is necessary to use nitrogen gas in connection with the inspection work, the procedure shall be as follows:

(a) Admit nitrogen gas to the cable at a convenient point and maintain the pressure at approximately 20 pounds at the tank.

Note: In general, some leakage will occur at the face plates of terminals but little loss of pressure will be experienced from this source. If it appears that the gas is leaving the tank at a rapid rate, a large sheath break, probably near the point of application, may be expected. If this condition is found, the fault should be located and remedied before the inspection continues.

(b) Allow a sufficient length of time for the gas to build up a pressure in the cable - approximately 5 minutes.

(c) The men shall start at the pole at which gas is applied and work away from this pole for a distance of approximately 10 pole sections each way. After approximately 10 sections both ways from the starting point have been covered, gas shall be applied at a new point approximately 10 sections beyond the last pole inspected and the procedure as outlined above repeated.

(d) Defects shall be repaired in accordance with standard practices as they are found unless they require a considerable amount of time or loss of gas pressure. In such cases, the defects shall be marked and repaired after the section under pressure has been inspected.

(e) Apply testing solution to the cable within reaching distance of the poles and to any locations at which the condition of the sheath is questionable, as well as to joints, seams, terminal stubs, terminal nipples, and plugs.

## 7. SCOPE OF INSPECTION AND WORK TO BE DONE

7.01 All defects and conditions in the aerial cable plant that will cause trouble shall be cleared or reported to others for attention if it is not practicable for the inspector to clear them. Irregularities in drop wires located at the pole shall be corrected if these irregularities are hazards to cable plant.

7.02 Defects in cable sheaths shall be repaired in accordance with standard practices, either by wiping or soldering over the defect if there is no opening in the sheath that would allow moisture to enter the cable. This applies particularly to ring cuts not through the sheath. Where there is an opening through the sheath, moisture may have entered although service may not have been affected. Where necessary, the sheathing shall be opened and dried out or removed, the cable boiled out, or desiccant used.

7.03 Permanent repairs shall be made where temporary taped openings are found. The testboard shall be notified in each case in accordance with existing instructions.

## 8. SHEATH BREAKS

8.01 Cable sheath breaks, in general, are the result of:

(a) Bowing - All cases of pronounced cable bowing shall be referred to the construction superintendent so that the bowing removal work can be scheduled as provided under Selection of Cables to be Reconditioned. It is desirable in these cases to defer the reconditioning of the cable until the bowing removal work has been completed.

(b) Ring Cuts - Sheath cuts are sometimes caused by cable rings and usually occur at the first two rings each side of a pole. Repairs should be made to the sheathing and aerial cable supports placed to prevent further damage. Cable supports shall be placed near but not over the two ring positions each side of the pole worked on. Cable shields and clips which are in good condition shall, in general, not be replaced.

(c) Defective Rings - Defective cable rings shall be replaced not to exceed one span. If more than one span should be replaced, the case should be referred to others for attention. Particular attention shall be paid to rings at railroad crossings and other locations where they are exposed to smoke or other gases, or where there is an abnormal amount of moisture present in the air usually in areas adjacent to large bodies of water. Strand tests shall be made in accordance with standard practices where required.

(d) Missing Cable Rings - Where cable rings are missing, new rings shall be placed. Improper spacing of rings shall be corrected if the cable is not adequately supported. Slight variations in the spacing of rings not affecting adequate support of the cable need not be corrected.

(e) Sleeves Not Properly Supported - Rings or splice supports shall be placed where marline ties have been used, where ties or sleeve supports are missing, or where the supporting devices are defective.

(f) Chafing - Cables shall be inspected at locations where trouble may be caused by chafing against tree limbs, building roofs, fire escapes, poles, etc. Tree rubs can be eliminated by pruning where permission can be obtained. When tree rubs cannot be eliminated in this manner, standard practices shall be followed in the placing of molding or tree guards.

(g) Cable Bugs - Where cable bugs are found to be a source of trouble on a particular cable, the case shall be referred to the construction superintendent for:

- (1) Consideration of the use of gas to determine the extent of the damage.
- (2) Need for preventive treatment to be applied in connection with cable reconditioning work.

(h) Cable Clamps - Cable clamps shall be placed where necessary. Loose cable clamps and straps shall be refastened or replaced if necessary. Grade clamps shall be tightened or replaced where necessary. If the cable has moved due to a loose clamp, the cable shall be pulled back to its original position before tightening or replacing the clamp. When replacing a grade clamp, the new one shall be placed adjacent to the present

one before removing the old clamp. When it is necessary to move a grade clamp, a new one shall be placed in the required position before removing the existing one. Additional grade clamps shall only be placed at those locations where there is evidence of the cable moving with respect to the strand, or where other conditions indicate they are warranted.

## 9. ELECTRICAL BURNS

9.01 Electrical burns result from contacts with or inadequate separation from power circuits and also from lightning discharges. The contributing causes are:

(a) Insufficient Clearance Between Telephone Construction and Power Circuits on Poles or Elsewhere - The inspector shall, where practicable, correct all cases where clearances are inadequate as covered in the specifications on joint use construction. He shall report to his supervisor all cases requiring correction which he is unable to care for. **IN NO CASE SHALL TELEPHONE COMPANY EMPLOYEE DO ANY WORK WHICH INVOLVES THE HANDLING OF POWER OR OTHER FOREIGN CIRCUITS.** Safe clearances shall be provided between series incandescent or arc lighting fixtures and wires and telephone communication circuits, crossarm bolts, cable hanger bolts, and other fixtures. Clearances shall be viewed from the standpoint that metallic fixtures of the power company may become energized. Guard arms shall be placed where necessary.

(b) Inadequate Protection Over Trolley Wires - Where telephone cables cross over trolley wires with a clearance such that the trolley poles, when off the contact wires, may come in contact with a cable, a guard shall be placed over the cable and messenger in accordance with standard specifications. Locations at which guards are required or where repairs are needed, which cannot be cared for by the inspector, shall be reported.

(c) Inadequate Separation From Foreign Signal Circuits - While low voltage signal circuits, such as fire alarm circuits, telegraph circuits, private telephone circuits, etc., may not of themselves present a serious hazard to telephone plant, experience has shown that such circuits are not always provided with adequate clearances from power circuits and often serve to bring the power circuits into contact with telephone plant with disastrous results. The manner in which such circuits are maintained is not within the control of the telephone company

and it is therefore necessary to keep the telephone plant separated from them with safe clearances. The inspector shall carefully inspect such clearances and correct all telephone plant conditions that may cause trouble to the telephone plant, or report as covered in Paragraph 11.01. Cases that involve work on the part of other companies shall be handled in accordance with Paragraph 9.01(a).

(d) Inadequate Protection Against Lightning Discharges - All aerial cable protective devices shall be inspected to determine the condition of the protector blocks, to discover any missing blocks or broken finger springs and to insure that ground connections are properly made and in good condition. All necessary cleaning, repairing, and replacing shall be done.

(e) Cable Bonds - Bonds from cable to messenger strand shall be inspected to insure that they are in good condition. Additional bonding shall be provided where required (see B.S.P. G10.345) and loose clamps shall be tightened. Aerial and underground cables shall be bonded together where required.

## 0. MISCELLANEOUS CAUSES OF CABLE TROUBLE

10.01 The following are also contributing causes of cable trouble.

(a) Incorrect Drop Wire Construction - Defects or poor conditions in the drop wire plant which are hazards to cable plant, that are found at poles shall be corrected. Defects in drop wire construction which are not hazards to cable plant shall be referred to other forces for correction.

(b) Dirty Terminals and Terminals in Poor Condition - Loose supporting screws shall be tightened and missing screws shall be replaced. If both mounting lugs at either the top or bottom of 14 type terminals are broken, the terminal shall be secured by means of a terminal clamp. The terminal stub cables shall be inspected, repaired, and clamped where necessary. Broken covers shall be replaced. Dirty terminals shall be cleaned and all cross connecting terminals repaired and painted where necessary.

(c) Lateral Pipes Improperly Sealed or Defective - All subsidiary pipes shall be inspected and sealed against the entrance of water. Pipes found to be rusted away at the ground line shall be referred to other forces for attention.

(d) Leaky Insulating Joints - Insulating joints shall be inspected to see that they are apparently in good mechanical condition, i. e., watertight. The inspector shall refasten, repaint, or make repairs, if necessary.

## 11. REFERRED JOBS

11.01 The forces reconditioning the aerial cable plant will find bad maintenance conditions that cannot be cared for by them. Generally, items of this nature would be deteriorated poles, improper guying, improper clearances, defective strand conditions at R. R. crossings, and in corrosive areas, etc. Such conditions shall be reported on form P-3028, which shall be forwarded via lines of organization to the plant engineer. All plant irregularities which cannot be corrected on a cable shall be collected and reported as one referred job by using one P-3028 form with attachments if necessary.

## 12. RECORDS AND REPORTS

12.01 All bad conditions or defects found and cleared shall be recorded on form PF-699 as the work of reconditioning progresses. A record shall be kept on this form, in the space provided therefor, of all the sheath breaks and defects repaired, and the length of cable inspected.

12.02 The location (pole or span), the nature of the defect, and the cause of all sheath breaks, leaky joints or seams, and defective terminals shall be given in the space provided. The location (pole or span) of all taped openings repaired in both exchange and toll cables shall also be noted.

12.03 A record shall be kept on the form of all the productive time expended and the truck hours used on each cable or portion of cable.

12.04 Whenever it is advisable to include in any inspection a section of cable not covered by the form PF-699 originating at the test center, the construction superintendent shall furnish to the test center the information justifying the issuing of a special PF-699 on other than a trouble performance basis. Upon receipt of the form PF-699 this section of cable shall be handled in the same manner as the original form PF-699 in order that the test center history record may be posted.

12.05 On completion of the inspection of any cable or portion thereof, the log shall be posted to reflect the completion date, such administrative data as may be required shall be recorded, and an adjustment shall be made of the number of miles pending. One copy of form PF-699 shall be forwarded to the cable test center so that the records may be posted. On completion of the posting at the cable test center, the form shall be forwarded to the general plant supervisor's office.