

CABLE TROUBLE ANALYSIS PLAN

CABLE TROUBLE CODE CARD FORM E-3628A

1. GENERAL

1.01 This is one of a group of Plant Series Bell System Practices on the Cable Trouble Analysis Plan. It describes the codes which provide a uniform means to record, handle, summarize, and analyze cable trouble. These are shown on Form E-3628A (Fig. 1).

1.02 This section is reissued to provide a revised Form E-3628A to include additional coding, and to make corresponding changes in the descriptive material.

1.03 Use the general codes to group cable troubles. Subgroup Codes and Detail Codes are provided for analysis purposes—*when results show the need for further study.*

2. TROUBLE CODING

2.01 Troubles should be coded in accordance with the following definitions. When a trouble may be charged to more than one code, the code selected should most nearly reflect the basic cause, so that an analysis of such troubles will lead to the proper corrective measures. Troubles will be summarized monthly by General Codes 1 through 9 on Form E-5408, which is described in Section 660-003-013, and entered quarterly and annually on the Cable Trouble Summary Form E-3626A, which is described in Section 660-003-012.

SHEATH BREAK

CODE 1—STRUCTURAL

2.02 This code covers troubles associated with the structural protection provided by the cable sheath, and is divided into the following subgroups:

11—Lead Sheath—Crack: Troubles resulting from cable bowing, inadequate support, cable vibration and torsion, cable creeping on grade, etc. Includes troubles from all cracks in stub cables associated with terminals, load coils, etc.

12—Lead Sheath—Support Cut: Troubles resulting from cut or chafe by ring, lashing wire, grade clamp, cable support, cable clamp, wire tie, marlin tie, etc. Troubles resulting from cuts or chafes from supports adjacent to tree pull-offs and tree guards; also, troubles resulting from sheath breaks started by cuts or chafes from supports, ie, a ring cut which develops into a crystallized crack at the bottom of the cut, due to the action of bowing. Exclude troubles resulting from cuts or chafes by supports in direct contact with trees, guys, poles of other lines, etc. These troubles are classified as Subgroup Code 13. Include troubles in stub cables associated with terminals, load coils, etc, resulting from cuts or chafes by supports.

13—Lead Sheath—Other Chafe: Troubles resulting from chafes against through bolts, poles, guys, or other fixtures of the cable line, against guys or poles of other lines, against trees, strand-mounted terminals, etc. Chafes or cuts caused by rings, lashing wire, and other cable supports in direct contact with these items or objects and crystallized sheath troubles resulting from cables striking against poles and other objects in or along the cable line. Include troubles from these sources—stub cables associated with terminals, load coils, etc.

14—Poly Sheath—Cracks, Cuts, Chafes: Troubles resulting from cracks, support cuts, and other chafes to sheath other than lead, as defined in Subgroup Codes 11 through 13.

CODE 2—EXTERNAL PHYSICAL CONTACT

2.03 This code is divided into the following subgroups:

21—Bullet: Troubles resulting from bullets or gunshot striking cable, cable stubs, and loading coil or similar type of cases.

22—Bruise: Troubles resulting from bruise, cut, dent, mark, scar, etc, in the cable sheath where the sheath is broken through, either immediately or at a later date, but the source of the object causing the damage cannot be definitely determined. Exclude troubles resulting from bruise, cut, dent, etc, which can be definitely traced to Subgroup Codes 23, 24, 32, and 33.

23—Bell Workmen: Troubles resulting from Bell employees, and from employees of contractors doing work for the Telephone Company, spurring or stepping on cable, puncturing it with pick or digging bar, striking cable with tools or material, blowing open sheath or sleeve with excessive "temporary" gas pressure, replacing or moving poles in the cable lead, failing to clean ducts sufficiently, etc. Cable failures caused by water entering an open splice, trouble opening, or insulating joint. Exclude troubles caused by failures of taped openings resulting from poor workmanship which are classified as Subgroup Code 54.

→ **24 — Other Workmen:** Troubles resulting from damage caused by workmen other than Bell employees or by employees of contractors doing work for the Telephone Company, or from damage caused by firemen while extinguishing fires.

CODE 3—OTHER PHYSICAL ACTIVITY

2.04 This code is divided into the following subgroups:

31—Fire: Troubles resulting directly from damage caused by fire. Exclude damage to the cable plant caused by fire fighting equipment, efforts to extinguish the fire, or other related incidents, as these troubles should be classified as Subgroup Code 24 or 32.

32—Accidents, Falling and Flying Objects: Sheath break troubles resulting from trees and other falling objects or material, or from aircraft or motor vehicle striking pole or cable.

33—Rodents and Insects: Troubles resulting from damage by squirrels, gophers, rats, beetles, borers, etc.

CODE 4—SHEATH—ELECTRICAL

2.05 This code is divided into the following subgroups:

41—Corrosion: Troubles resulting from stray current, or from electrolytic action, chemical or soil corrosion, etc. Troubles resulting from electrolysis through failure of an electrolysis relay to function properly; from corrosion caused by chemicals used to open railway switches; and also from corrosion where there is no trolley system.

42—Lightning: Troubles resulting from direct or indirect lightning stroke to cable. Lightning charges entering cable via telephone wire plant, via foreign wire plant, fence, etc. Exclude troubles resulting from power arc follow-up of a lightning stroke to cable, as these are classified as Subgroup Code 43.

43—Foreign Wire: Troubles resulting from electrical burns through the sheath, caused by power arc follow-up. Contact between cable and other foreign wire, telephone wire crossed with foreign wire and telephone cable sheath, by telephone wire (which enters cable) crossed with foreign wire, etc.

CODE 5—SHEATH CLOSURES

2.06 This code includes all devices and techniques used to make cable sheath continuous. This code is divided into the following subgroups:

51—Lead Sleeves: Troubles associated with lead sleeves, caused by failure of soldered joints, seams, patches, and end plate.

→ **52—Splice and Terminal Cases:** Troubles in mechanical splice closure caused by end seal, gasket, faceplate seal, gland, seam, cracked case, broken bolts, sheath pull-outs, etc., and also from mechanical troubles in the cases of load coils.

53—Pressure Fitting: Trouble in the following: flange, valve (including tube and core), contactor (including tube), transducers (including tube), bypass, feeder tubing, screw plug, gas feeder pipe, manifolds, etc.

54—Taped Opening: Troubles resulting from failure of the covering of sheath openings which have been temporarily or permanently closed and those caused by covering failures resulting from poor workmanship. Exclude circuit troubles which develop at these points independently of any failure of the temporary covering and circuit troubles caused by employees while working in the cable at these points, such troubles being cleared before the sheath opening is taped or wrapped. These troubles are classified as Subgroup Code 71.

55—Vents: Troubles at vents mounted on sheaths or closures.

CODE 6—SHEATH—OTHER

2.07 This code is divided into the following subgroups:

61—Sheath—All Other Causes: Sheath break troubles resulting from wind, flood, sleet, landslide, water undermining conduit, soil erosion or frost exposing cable to damage, manufacturing defect, malicious damage and theft, customer, children, etc.

NO SHEATH BREAK

CODE 7A — SPLICING

2.08 This code is divided into the following subgroups:

71—Splicing—Paper and Pulp: Trouble in splice, trouble opening, or insulating joints in paper pulp cables, ie, inadequate protection at edge of sheath, charred insulation, splicing error, wire improperly twisted, soldering defective or omitted, wire piercing cotton sleeve, cotton sleeve displaced, broken or ravelled insulation, moisture left in, scrap metal or barb left in, core wrapped too tight, broken conductor, damage from removing lead sleeve or sheath, splicing in faulty pair, picking or opening up wrong pair, connector not pressed or inadequately pressed, improperly spliced coaxial tube, etc. All conductor troubles in temporarily taped or wrapped openings, not associated with failure of the covering of these openings. Exclude cable

failures caused by water entering an open splice, trouble opening, or insulating joint, as these are classified as Subgroup Code 23.

72—Splicing—Plastic and Other: Troubles in cable other than paper- or pulp-insulated conductors in splices, trouble openings, and insulating joints, ie, splicing error, soldering defective or omitted, cotton sleeve displaced, broken insulation, broken conductor, damage from removing sheath or closure, wire piercing cotton sleeve, splicing in faulty pair, picking or opening up wrong pair, connector not pressed or inadequately pressed, wire improperly twisted, improperly spliced coaxial tube, etc. All conductor troubles in temporarily taped or wrapped openings, not associated with failure of the covering of these openings. Exclude troubles involving ready access terminations, as these troubles are classified as Subgroup Code 74.

73—Pressure Plug: Troubles located in pressure plugs, resulting in the following: low dielectric, insulation broken, air leak (through plug, not sheath), or other causes.

CODE 7B — TERMINATING

2.09 This code is divided into the following subgroups:

74—Ready Access Terminations: Cable, splicing, and block troubles attributable to the installation of the closure, termination of blocks and subsequent rearrangements and changes of block terminations, conductors damaged removing sheath, connecting to faulty pair, twisted sleeve defective, uninsulated bare wire, insulation crushed by housing, conductor broken, cover left off, plastic-filled sleeve missing, etc.

Note: For the purpose of this Plan, Dedicated Plant Control Point and Access Point closures and cabinets should be considered as Ready Access Terminations. Also, report troubles of these types occurring in cable cross-connection terminals. Troubles involving cross-connection wires should be included.

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75 — Fixed terminals: Troubles resulting from failure of sealed chamber or gasket, or damage to face plate, binding posts, protector or connecting block, or loose locknuts. Troubles in terminal stubs are classified according to their cause and location and are not to be included in Subcode 75.

CODE 8 — CORE — ELECTRICAL

2.10 This code is divided into the following subgroups:

81—Lightning: Troubles resulting from required protectors not being provided, wires not cut through protector as required, protector blocks missing, protector ground not properly connected, induction, sheath crushed, coaxial tube crushed, etc.

82—Foreign Wire: Troubles resulting from telephone wire (which enters cable) crossed with foreign wire, cable crossed with foreign wire at point of trouble or elsewhere, power arc follow-up at point of trouble or elsewhere, operation of small-gauge cable used in lieu of fuses, induction, etc.

CODE 9 — CORE — OTHER

2.11 This code is divided into the following subgroups:

91—Defective Insulation—Paper and Pulp: Conductor insulation or core wrapping missing due to manufacturer, defective insulation in load coils, etc.

92—Defective Insulation—Plastic and Other: Conductor insulation or core wrapping missing due to manufacturer, defective insulation in load coils, etc.

93—Water in Cable: Moisture trouble caused by water in PIC cable. Such water troubles would be caused by: shipped in cable, inadequate capping, PIC not plugged off, water translocated by air pressure with water source unknown. Exclude troubles caused by moisture entering cable through sheath break.

94—Core—All Other Causes: Troubles resulting from broken or missing insulation caused by the following: damaged setting up, stepping or climbing on cable, drilling sheath for pressure valve, grade clamp or other structural constrictions, storm, accident, ice and frost, sheath dented by bullet, stone, or other missile, tool, or material.

ATTACHED:

**FIG. 1 — FORM E-3628A — FRONT
— BACK**

CABLE TROUBLE CODE CARD
INCLUDES SUBGROUP CODES AND DETAIL CODES
FOR TROUBLE ANALYSIS

SHEATH BREAK(General Code) 1. **STRUCTURAL**

(Subgroup Code)

11. **LEAD SHEATH - CRACK**

1. Within 6" of closure end
2. Beyond 6" of closure end
3. In slit sheath repair
4. Within 6" of repair
5. At or near patch
6. At or near constriction
7. At or near pressure plug
8. Elsewhere

(Detail Code)

12. **LEAD SHEATH - SUPPORT CUT**

1. Ring
2. Lashing wire
3. Grade clamp
4. Cable support
5. Cable clamp
6. Wire tie
7. All other

13. **LEAD SHEATH - OTHER CHAFE**

1. Tree, directly or via support
2. Through bolt
3. Strand mounted terminal
4. Other telephone plant
5. Foreign wire plant
6. All other

14. **POLY SHEATH - CRACKS, CUTS, CHAFES**

1. Crack - within 6" of splice or terminal closure
2. Crack - other stress areas
3. Crack - elsewhere
4. Cut - lashing wire
5. Cut - other supports
6. Chafe - tree, directly or via support
7. Chafe - through bolt
8. Chafe - strand mounted terminal
9. Chafe - other telephone plant
10. Chafe - foreign
11. All other

2. **EXTERNAL PHYSICAL CONTACT**21. **BULLET**

(In cable, cable stubs, load coil cases, terminals, closures, pressure fittings, etc.)

22. **BRUISE**

(Including cut, dent, mark, scar, etc. - actual sheath break occurring immediately or delayed and initial cause not definitely known)

23. **BELL WORKMEN**

1. Spur cut
2. Spurring or stepping on cable
3. Pick or digging bar puncture
4. Other tools or material striking cable
5. Sheath or sleeve opened by "temporary" gas pressure
6. Sheath or sleeve opened by "permanent" gas pressure
7. Pole replacement or move
8. Duct not sufficiently cleaned
9. Water entering open splice, trouble or insulating joint opening
10. Dragging cable over rough or sharp objects
11. All other

24. **OTHER WORKMEN**

(Sheath cut or broken at time of contact and/or definitely known as the initial cause)

1. Other wire using companies
2. Highway construction
3. Building construction
4. Railroad construction
5. Quarry or mine operation
6. Gas company

7. Water company
8. Other pipeline companies
9. All other

3. **OTHER PHYSICAL ACTIVITY**31. **FIRE**

1. Gas filling station
2. Building or other structure
3. Vehicle including aircraft
4. Forest, brush or grass fire
5. Gas explosion or manhole fire
6. Oil slush-pit fire
7. Material under cable
8. All other

32. **ACCIDENTS, FALLING AND FLYING OBJECTS**

1. Motor vehicle
2. Aircraft
3. Trees
4. Structures
5. Missiles
6. All other

33. **RODENTS AND INSECTS**

1. Squirrels
2. Gophers
3. Rats
4. Beetles
5. Borers
6. All other

4. **SHEATH ELECTRICAL**41. **CORROSION**

1. Stray current (electrolysis)
2. Chemical - snow removal
3. Chemical - other
4. Metal shield deterioration
5. All other

42. **LIGHTNING**

1. Direct stroke to cable
2. Entered cable via telephone wire plant
3. Entered cable via foreign wire plant
4. Entered cable via fence or similar structures
5. All other

43. **FOREIGN WIRE**

1. Power arc follow-up
2. Contact with electric transportation facilities
3. Other foreign wire contact
4. Telephone wire contact
5. Telephone wire crossed with foreign wire and telephone cable sheath
6. Telephone wire (which enters cable) crossed with foreign wire
7. All other

5. **SHEATH CLOSURES**51. **LEAD SLEEVE**

1. Soldered joint
2. Soldered seam
3. Wrapped joint
4. Poured resin seal
5. End plate
6. All other

52. **SPLICE AND TERMINAL CASES**

1. End seal
2. Gasket
3. Face plate seal
4. Gland (UG-16 term.)
5. Stub nipple
6. Broken bolts
7. Sheath pull-outs
8. All other

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53. PRESSURE FITTING

1. Flange
2. Valve (including tube)
3. Contactor (including tube)
4. Transducer (including tube)
5. Manifold (including tube)
6. By-pass
7. Feeder tubing
8. Gas feeder pipe
9. Screw plug
10. All other

54. TAPED OPENING

(Temporarily taped or wrapped opening and permanently taped closure, including gasket plate installations, insulating joints and associated by-passes)

1. Steam
2. Chemical
3. Water
4. Mechanical damage including flexing
5. All other

55. VENTS

1. Sheath mounted
2. Closure mounted
3. Other

6. SHEATH OTHER

61. SHEATH - ALL OTHER CAUSES

1. Flood
2. Snow, ice, sleet
3. Frost cracking
4. Land slide
5. Soil erosion
6. Malicious damage
7. Customer, children
8. Manufacturing defect
9. All other

NO SHEATH BREAK

7A. SPICING

71. SPICING - PAPER AND PULP

(In splice, trouble opening or insulating joint)

1. Inadequate protection at edge of sheath
2. Charred insulation
3. Splicing error
4. Wire improperly twisted or broken
5. Soldering defective or omitted
6. Crimped sleeve joint defective
7. Coaxial tube improperly spliced
8. Sleeve punctured, missing or displaced
9. Broken or ravelled insulation "shiner"
10. Moisture left in
11. Scrap metal or barb left in
12. Core wrapped too tightly
13. Damage in removing sheath or closure
14. All other

72. SPICING - PLASTIC AND OTHER

(In splice, trouble opening or insulating joint - but excluding ready access (RA) terminations)

1. Splicing error
2. Soldering defective or omitted
3. Crimped sleeve joint defective
4. Coaxial tube improperly spliced
5. Sleeve missing or slipped
6. Uninsulated bare wire "shiner"
7. Conductor broken
8. Damage in removing sheath or closure
9. All other

73. PRESSURE PLUG

1. Low dielectric
2. Insulation broken
3. Air leak
4. All other

7B. TERMINATING

74. READY ACCESS TERMINATIONS

1. Conductors damaged removing sheath
2. Uninsulated bare wire "shiner"
3. Conductor broken
4. Connecting to faulty pair
5. Insulation crushed by housing
6. Cover left off
7. Connector not pressed or inadequately pressed
8. All other

75. FIXED TERMINALS

1. Sealed chamber or gasket
2. Face plate - all causes
3. Binding posts
4. Protector or connecting block
5. All other

8. CORE ELECTRICAL

81. LIGHTNING

1. Required protectors not provided
2. Wires not cut through protector
3. Protector blocks missing
4. Protector not grounded
5. Sheath crushed only
6. Coaxial tube crushed only
7. Sheath and coaxial tube crushed
8. Protector operated
9. All other

82. FOREIGN WIRE

1. Contact with telephone wire
2. Power arc follow-up
3. Fuse cable operation
4. Induction
5. All other

9. CORE OTHER

91. DEFECTIVE INSULATION - PAPER AND PULP

1. At pressure plug
2. Conductor insulation missing - manufacturer
3. Core wrapping missing - manufacturer
4. Load coil
5. All other

92. DEFECTIVE INSULATION - PLASTIC AND OTHER

1. At pressure plug
2. Conductor insulation missing, punctured or split - manufacturer
3. Core wrapping missing - manufacturer
4. Load coil
5. All other

93. WATER IN CABLE

(Excluding cases of moisture entering cable through sheath break)

1. Shipped in cable
2. Inadequate capping
3. PIC not plugged off - water source unknown
4. Translocated by air pressure - water source unknown
5. All other

94. CORE - ALL OTHER CAUSES

(Insulation or conductor broken)

1. In setting up cable
2. Stepping or climbing on cable
3. Grade clamp and other structural constrictions
4. Storm
5. Accident
6. Ice and frost
7. Sheath dented by bullet, stone or other missile, tool or material
8. Drilling sheath for pressure valve or vent
9. All other