

STATION PROTECTION SELECTION AND APPLICATION

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1. GENERAL

1.01 This practice is reissued to update information on when fuseless (carbon or gas) and fused protectors can be used to satisfy the requirements of the National Electrical Code. All copies of CTSP 475-500-402, Issue 1, should be removed from the file and destroyed.

1.02 Fuseless station protectors are preferred over fused station protectors and should be used, provided the requirements listed in paragraph 3 are met. These requirements are for protecting customer stations, including coin telephones at indoor or outdoor locations, and general requirements for protecting PBX circuits.

NOTE: Gas tube protectors or protector units should be installed only at locations specified on detailed plans or other written instructions. They should not be used to replace conventional carbon block protectors in all cases.

1.03 Station protectors ensure safety to customers and telephone company personnel and prevent damage to station equipment from abnormally high voltage and current.

1.04 Isolated sections of aerial cable are considered open wire, unless the cable is effectively grounded to a multigrounded power neutral (MGN) or to an extensive water (metallic pipe) system.

2. MATERIAL

2.01 This paragraph lists the material covered in this practice. For convenience, CTS catalog numbers are listed if available.

- a. 20 Gauge Bridle Wire, CTS #90-07-001-0.
- b. UR Cable Conductor Connectors, CTS #66-14-032-3.
- c. 201 Grounding Lug.
- d. Sneak Current Fuse 60D, CTS #70-75-033-5.

3. FUSELESS STATION PROTECTION AND REQUIREMENTS (AERIAL CABLE)

3.01 Fuseless protectors should be used at all stations provided one of the three fusible link requirements listed in paragraph a. is met, and one of the grounding requirements in paragraph b. is met.

a. Fusible Link Requirement:

- (1) The station is served by 24 gauge (or smaller) cable.

(2) The station is served by cable that has a fusible link, such as a 24 gauge terminal stub, a minimum of 8 inches in length.

(3) Single pair drop wire is served by open or multiple wire and has a fusible link of 24 or 26 gauge copper black wire, or 20 gauge copper steel red bridle wire with 30% conductivity.

NOTE: The bridling between drop wire and open wire (rural wire) must consist of at least 30 inches of 20 gauge copper steel red bridle wire with 30% conductivity.

b. Proper ground medium requirements in order of preference. If a preferred ground is available, it should be used. See CTSP 475-500-410.

(1) A metallic cold water pipe bonded to an MGN system.

(2) A metallic cold water pipe bonded to the power ground.

(3) A metallic cold water pipe (at least 10 feet of this pipe must be buried in moist soil).

(4) Metallic service entrance conduit (except aluminum) bonded to the service entrance box of an MGN system.

(5) Service ground of an MGN power system.

(6) Another effective ground is a recent development known as a **concrete encased electrode**. It consists of not less than 50 feet of 3/8 inch reinforcing steel bar or 20 feet of No. 4 bare copper wire, embedded below grade in a concrete foundation or footing. The bar or conductor is stubbed up into an accessible location for grounding connections. In the absence of an acceptable water pipe or an MGN system, it should be considered as a first choice ground.

NOTE: If one of these grounds is not available, a fused type protector must be used.

3.02 A fuseless protector must not be used with multiple drop wire when the stations are served by open or multiple wire.

NOTE: A fuseless protector can be used with multiple drop wire when the stations are served by a grounded metal sheath or shielded cable.

3.03 Drop wire from an unexposed cable terminal into an exposed area exposes both the customer station and the distribution cable. Fuseless protectors are required at both ends of the drop. When the drop is to be joined to a cable pair, a fusible link is required.

4. FUSED STATION PROTECTION AND REQUIREMENTS

4.01 When the ground requirements or bridling requirements described in paragraph 3 cannot be met, a fused type protector must be used.

5. STATION PROTECTION AND REQUIREMENTS (BURIED AND UNDERGROUND)

5.01 Fuseless station protectors may be used with buried distribution cable connected to exposed cable when 24 or 26 gauge cable is located so that it will serve as a fusible link.

5.02 Fuseless station protectors may not be used when the buried distribution cable is 19 or 22 gauge and no fuse cable has been placed. Fuseless protectors may be used **only** if 24 or 26 gauge copper cable conductors, a minimum of 8 inches in length, are placed at the junction point to serve as a fusible link between the service wire and the buried cable.

NOTE: Use UR cable conductor connectors to join the fine gauge (24 or 26 gauge) conductors, used as a fusible link, to the service wire and buried distribution cable. Use 24 gauge wire as a fusible link for 19 gauge cable conductors. Use 24 or 26 gauge wire as a fusible link for 22 gauge conductors.

5.03 When the requirement specified in paragraphs 5.01 and 5.02 cannot be met, fused type protectors must be used.

5.04 For any length of buried wire, bond the aluminum shield or armored wire to the ground terminal of the protector and cable terminal by means of a 201 grounding lug. See CTSP 475-500-405, paragraph 6.

5.05 Service drops joined to exposed underground cable pairs require the same type of protectors as drop wire joined to exposed aerial cable pairs.

6. PBX STATION PROTECTION (CENTRAL OFFICE TRUNKS, TIE TRUNKS, OFF PREMISES EXTENSIONS, RINGING FEEDERS, AND BATTERY FEEDER CIRCUITS)

6.01 When PBX systems are served by exposed cables, the following protection is required:

a. The sheath or shield of the cable must be grounded.

b. A fuse cable must be spliced between the entrance cable and the terminating facilities if the conductors are larger than 24 gauge.

c. The terminating facilities shall be equipped with heat coils and carbon blocks or sneak current fuses and a station protector.

6.02 When drop or multiple drop wire is extended from exposed cables, fuseless protectors should be used. When drop wire is to be joined to a cable pair, a fusible link is required as instructed in paragraphs 3 and 5.02.

6.03 Fuseless protectors may be used with open or multiple wire when the requirements specified in paragraphs 3.01, a., (3) and 3.01, (b) are observed. Otherwise, fused protectors must be used.

6.04 Battery feeder circuits extended from exposed cables require the following protection:

- a. As specified in paragraph 6.01.
- b. Where a single battery feeder is extended from a grounded metal shielded cable with a fusible link, as specified in paragraph 3.01, a., a protected terminal or a fuseless type protector meeting the requirements specified in paragraph 3.01, b., is all the protection required.
- c. Where two or more cable pairs are used in a multiple and these pairs are extended by a single drop wire, the arrangement may be considered as a single pair and protection provided as described in paragraph 6.05, b.
- d. When two or more cable pairs are used in multiple and these pairs are extended by two or more drop wires, fused type protectors must be used.
- e. When multiple drop wire is extended from a cable terminal (with a fusible link) on a protected distribution terminal, no other protection is required for a single pair battery feeder circuit.
- f. When two or more battery feeder pairs are extended from protected terminals (with a fusible link), no other protection is required.

6.05 Battery feeder circuits extended from open or multiple wire, require the following protection:

- a. When the wire has a fusible link as specified in paragraph 3.01, a., (3) and the protector can be grounded as specified in paragraph 3.01, b., a fuseless protector may be used with a single battery feeder pair. Otherwise, a fused protector must be used.
- b. A fused protector must be used with two or more pairs.

6.06 Exposed PBX lines (central office trunks, tie trunks, off premises extensions, and ringing feeder circuits) extended from metal sheath cables must be protected with sneak current fuses. Sneak current fuses are not required when pairs are extended from a protector frame equipped with heat coils and carbon blocks.

6.07 Exposed PBX lines (central office trunks, tie trunks, off premises extensions, and ringing feeder circuits) extended from open or multiple wire must be protected with sneak current fuses. Protection can be provided as follows:

- a. Fuseless protectors equipped with sneak current fuses may be used with a single drop when the grounding requirements specified in paragraph 3.01, b., can be met. Otherwise, a fused protector equipped with sneak current fuses must be used.
- b. When two or more drops are terminated at the same location, fused protectors equipped with sneak current fuses must be provided for each drop.

7. STATIONS REQUIRING SPECIAL PROTECTIVE MEASURES

7.01 Special protective measures are usually required for stations located in the following areas:

- a. At power substations or generating stations.
- b. In atmospheres containing explosive gas, vapor, or dust.
- c. Where privately owned circuits are in conflict or joint use with power circuits not suitable for general joint use.
- d. Where facilities are leased for the operation of FOREIGN signaling circuits which might impress excessive voltage or current on the system's facilities.

7.02 Outdoor stations served by exposed conductors usually require only fuseless or fused protectors.

7.03 There are some stations where protectors and special grounding arrangements are necessary, such as:

- a. **Coin Telephones:** If the drop or line wire is exposed between the cable terminal and telephone, protectors are required as specified in paragraph 3.03.
- b. **Stations on Wooden Poles:** If possible, install the stations on a pole that has a vertical ground wire connected to a multigrounded neutral. When a multigrounded neutral is not available and the station is served from a metal shielded cable, the protector is grounded to a ground rod. If the station is served from open or multiple wire, ground the protector to a ground rod in accordance with local procedures.

CAUTION: Do not install a station on a pole that has a power vertical ground wire for lightning protection unless the ground wire is connected to a multigrounded neutral.

c. Stations on Metal Poles:

CAUTION: Do not install stations on metal poles that support power circuits (open wire or in conduit) of 300 volts or more unless the pole is grounded to a multigrounded neutral or a metallic cold water pipe.

- (1) Fuseless protectors are required on metal poles supporting power circuits of 300 volts or more.
- (2) When the conductors are exposed and the power circuits on the metal pole are 300 volts or less and the pole is bonded to a

multigrounded neutral or low impedance ground, such as a metallic cold water pipe, a fuseless protector is required.

- (3) When the conductors are exposed and the power circuits on an ungrounded metal pole are 300 volts or less, a fused protector is required.
- (4) When the conductors are unexposed and the power circuits on the metal pole are 300 volts or less, no protection is required.