

## PUBLIC SERVICES STATION BONDING AND GROUNDING

### 1. GENERAL

**1.01** This section is intended to provide general background knowledge on protection, grounding and bonding applicable to Public Services Station installations. More detailed coverage of related equipment and procedure can be found in Sections 876-300-100—Electrical Protection-Stations and Customer Premises Equipment, 460-100-400—Station Protection and Grounds, and 508-100-100—Grounding and Wiring Requirements Public Telephone Enclosures.

**1.02** Whenever this section is reissued, the reasons for reissue will be listed in this paragraph.

**1.03** The National Electrical Code (NEC) requirements for protecting communication circuits is defined in Article 800 of the NEC. The NEC requirements are primarily based on power exposure and only incidently on lightning exposure. Bell System requirements, however, must consider all sources of electrical disturbances or exposure, including lightning, power contact, power induction and ground potential rise, and must assure that adequate protection is provided. Therefore, all Public Services Station installations shall be grounded and protected in accordance with this practice unless otherwise specified by local instructions.

**1.04 Definitions:** The terms listed below are defined here with respect to their specific usage in this section.

- (a) **Ground**—The arbitrary zero reference point for an electrical potential. A large conducting body, such as the earth, used as a common return for an electrical circuit.
- (b) **Building Ground**—An acceptable ground connection provided by building construction steel in contact with earth ground or a bare copper wire encased in concrete building footing.

(c) **Ring Ground**—A ground ring encircling a building or structure in direct contact with the earth at a depth below earth surface not less than 2-1/2 feet, consisting of at least 20 feet of bare copper conductor not smaller than No. 2 AWG.

(d) **Water Pipe Ground**—An acceptable ground connection provided by a continuous buried **metal** pipe with at least 10 feet of length in moist earth and carrying water into the building where the station is installed.

(e) **Multigrounded Neutral (MGN) System**  
—A grounded commercial power distribution system in which the neutral wire is grounded at frequent intervals along the distribution system.

(f) **Entrance Conduit**—The conduit which carries the power service cable from the point of building attachment to the service entrance equipment.

(g) **Branch Conduit**—A conduit which carries branch power circuit wiring from the service entrance box to outlet points or secondary service boxes within the building (**DO NOT USE FOR PROTECTOR OR SIGNAL GROUND**).

(h) **Potential Equalization**—A means for maintaining two or more circuit points at approximately the same potential: usually achieved by bonding points or by providing a single connection point for all circuits involved.

### 2. GROUND SELECTION FOR STATION PROTECTORS

**2.01** Selection of an acceptable point for connecting the protector ground wire is of the utmost importance in providing an acceptable station installation. The protector ground serves as the primary Public Services Station signal ground reference point, which should be 50 ohms or less. The flow chart in Fig. 1 is designed to help the installer identify the

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HOW TO SELECT AN APPROVED GROUND FOR PUBLIC SERVICE STATION PROTECTORS

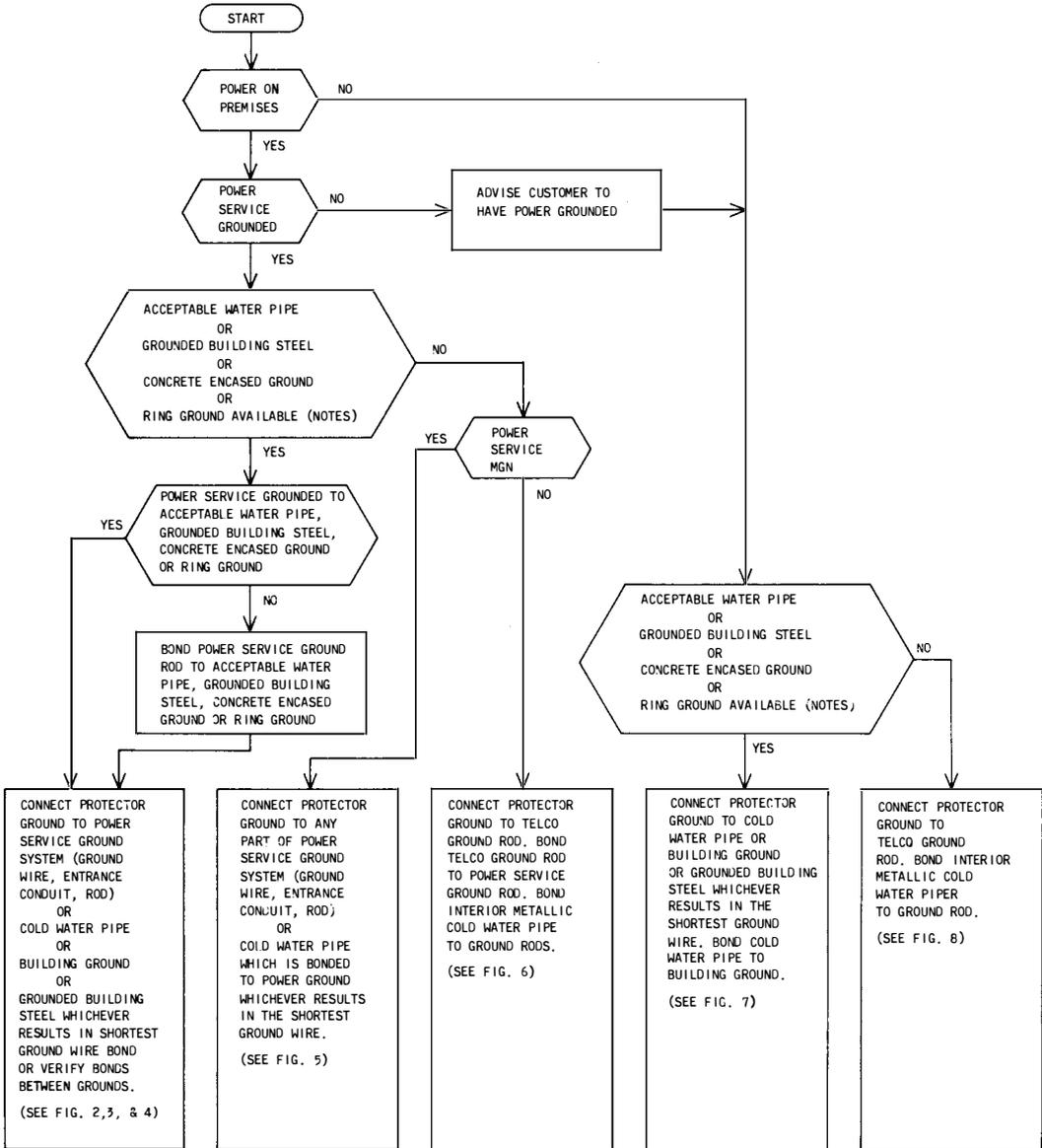


Fig. 1—Selecting An Approved Ground (Sheet 1 of 2)

## NOTES:

1. ACCEPTABLE WATER PIPE - A METAL UNDERGROUND WATER PIPE IN DIRECT CONTACT WITH THE EARTH FOR 10 FEET OR MORE AND ELECTRICALLY CONTINUOUS (OR MADE ELECTRICALLY CONTINUOUS BY BONDING AROUND INSULATING JOINTS, PLASTIC PIPE OR PLASTIC WATER METERS) TO THE POINT WHERE THE PROTECTOR GROUND WIRE IS CONNECTED.
2. CONCRETE ENCASED GROUND - AN ELECTRODE ENCASED BY AT LEAST 2 INCHES OF CONCRETE, LOCATED WITHIN AND NEAR THE BOTTOM OF A CONCRETE FOUNDATION OR FOOTING THAT IS IN DIRECT CONTACT WITH THE EARTH, CONSISTING OF AT LEAST 20 FEET OF ONE OR MORE STEEL REINFORCING BARS OR RODS OF NOT LESS THAN 1/2-INCH DIAMETER, OR CONSISTING OF AT LEAST 20 FEET OF BARE SOLID COPPER CONDUCTOR NOT SMALLER THAN NO. 4 AWG.
3. RING GROUND - A GROUND RING ENCIRCLING A BUILDING OR STRUCTURE IN DIRECT CONTACT WITH THE EARTH AT A DEPTH BELOW EARTH SURFACE NOT LESS THAN 2 1/2 FEET, CONSISTING OF AT LEAST 20 FEET OF BARE COPPER CONDUCTOR NOT SMALLER THAN NO. 2 AWG.

**Fig. 1—Selecting An Approved Ground (Sheet 2 of 2)**

best choice of a ground available in most situations. The decision blocks contain questions regarding the installation conditions, the responses to which will lead to selection of an acceptable ground. The flow chart should be followed until the last block in the path is reached. The reference notes and figures provide additional information and illustrations of actual installation procedures. All protector ground clamps should be tagged with Form E3013B, also the ground location shall be noted and placed in the station. For clarification, form E3013B has been left out of Fig. 2 through 8.

**2.02** The protector shall be located in, on, or immediately adjacent to the structure or building served and as close as practicable to the point at which the exposed conductors enter or attach: all Public Services Station Protectors shall be securely covered if within 6 feet from Public Services Station, extension, or extension bell.

**2.03** Public Services Enclosures: when the station protector is located inside of or in the immediate vicinity of the enclosure, the station protector ground terminal must be bonded to the telephone enclosure metal structure through the bonding lug provided. The ground lead must be no smaller than No. 12 AWG wire.

**Note:** The grounding conductor (third-wire of an electrical circuit) must never be used as the protector or signal ground. Refer to Section 508-100-100 covering Enclosure Bonding and Grounding in detail.

**2.04** Ground wire capacity for protectors is as shown in Table A.

**2.05** Summary of requirements for adequate Public Services Station protection and signal grounding is as follows:

- Use gas tube protection on all Public Service lines
- Select best available system ground for protector ground connection (use flow chart Fig. 1)
- Bond power ground and protector ground
- Route ground wire over shortest possible path

TABLE A

GROUND WIRE CAPACITY (SEE NOTES)

WIRE SIZE NUMBER	NUMBER OF PROTECTED CIRCUITS FUSELESS
12	2
10	6
6	7 or More

**Note 1:** Wire between protectors shall be same size as wire between protector and grounding electrode.

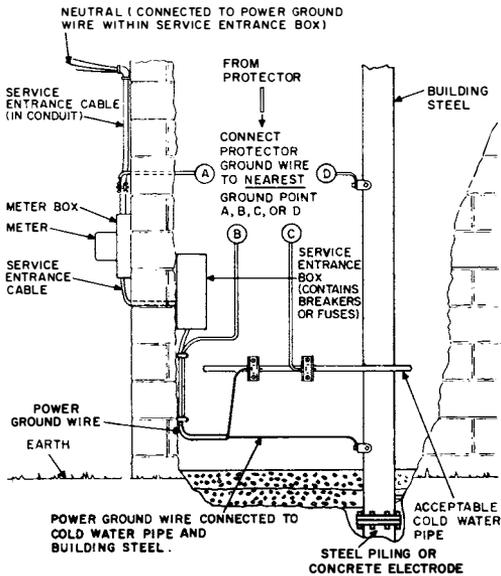
**Note 2:** All fuseless protectors used for Public Service shall be equipped with UL Listed gas tube protectors, equipped with fusible disc (11A1A, 11B1A or approved equivalent).

**Note 3:** All separate protector and power grounds must be bonded.

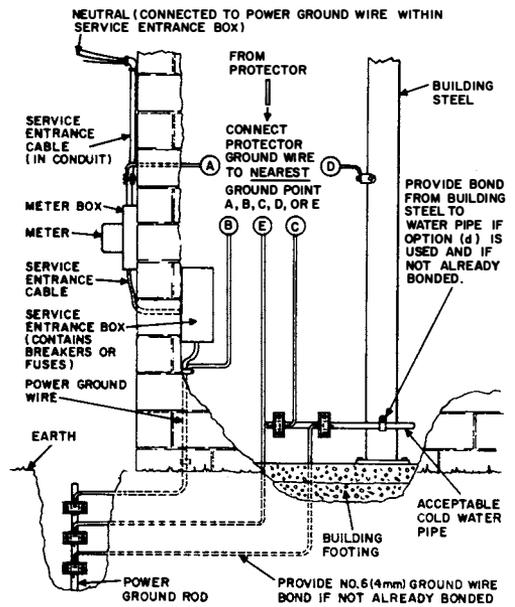
- Do not splice ground wire
- Do not use third-wire of an electrical circuit for protector ground
- All protectors located within 6 feet of station must be enclosed
- Do not use sprinkler system, gas, or hot water pipes for ground
- Use UL listed gas tube protectors equipped with a fusible disc (no applique units)
- Tag all protector grounds with Form E3013B

**Note:** For clarification Form E3013B has been left out of Fig. 2 through 8.

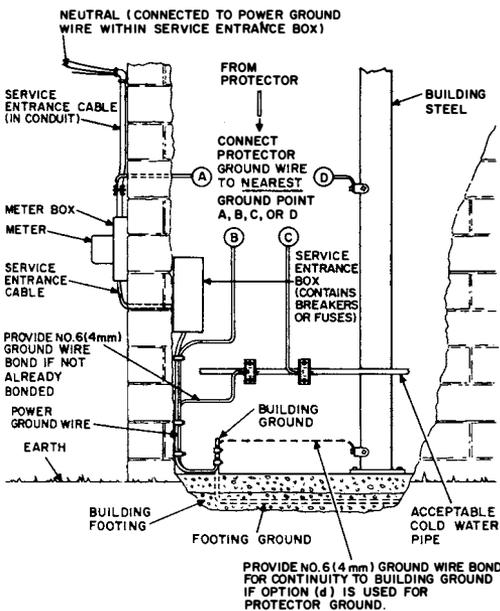
- Place a tag in station set showing location of protector and ground
- All metal enclosures equipped with commercial power must be connected to power ground
- All metal enclosures without commercial power must be grounded with a No. 12 AWG or larger ground wire.



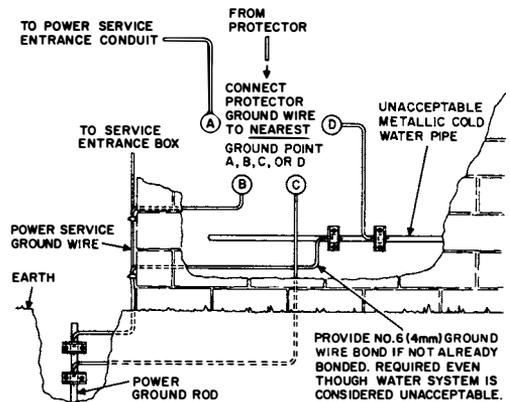
**Fig. 2—Acceptable Water System or Building Ground—Power Service Grounded to Cold Water Pipe and Grounded Building Steel**



**Fig. 4—Acceptable Water System—MGN Power Service Grounded to Ground Rod**

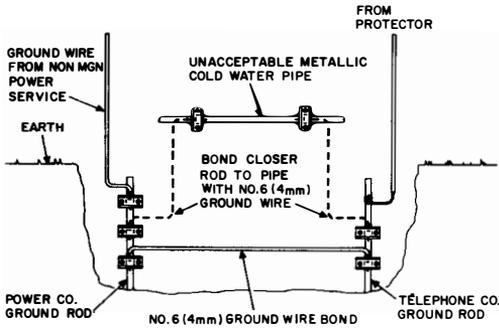


**Fig. 3—Acceptable Water System or Building Ground—Power Service Grounded to Building Footing Ground**

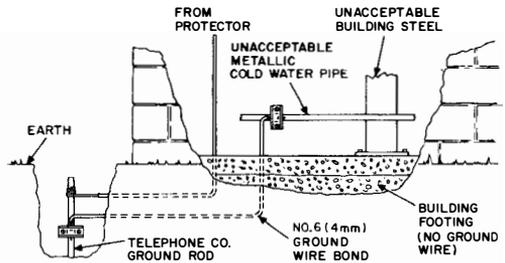


**Fig. 5—Acceptable Water System or Building Ground Not Available—MGN Power Service Grounded to Ground Rod**

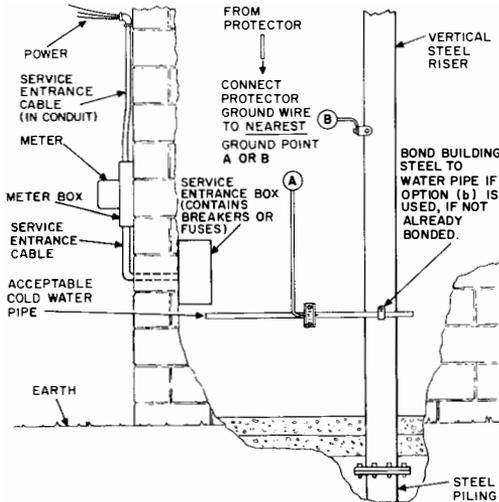
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**Fig. 6—Acceptable Water System or Building Ground Not Available—Non-MGN Power Service Grounded to Ground Rod**



**Fig. 8—Acceptable Water System or Building Ground Not Available—Power Service Not Grounded or No Power on Premises**



**Fig. 7—Acceptable Water System or Building Ground—Power Service Not Grounded or No Power on Premises**