

Improved Lightning Protection for Radio Transmitter Stations



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Chief Engineer (*Emeritus*)

LIGHTNING

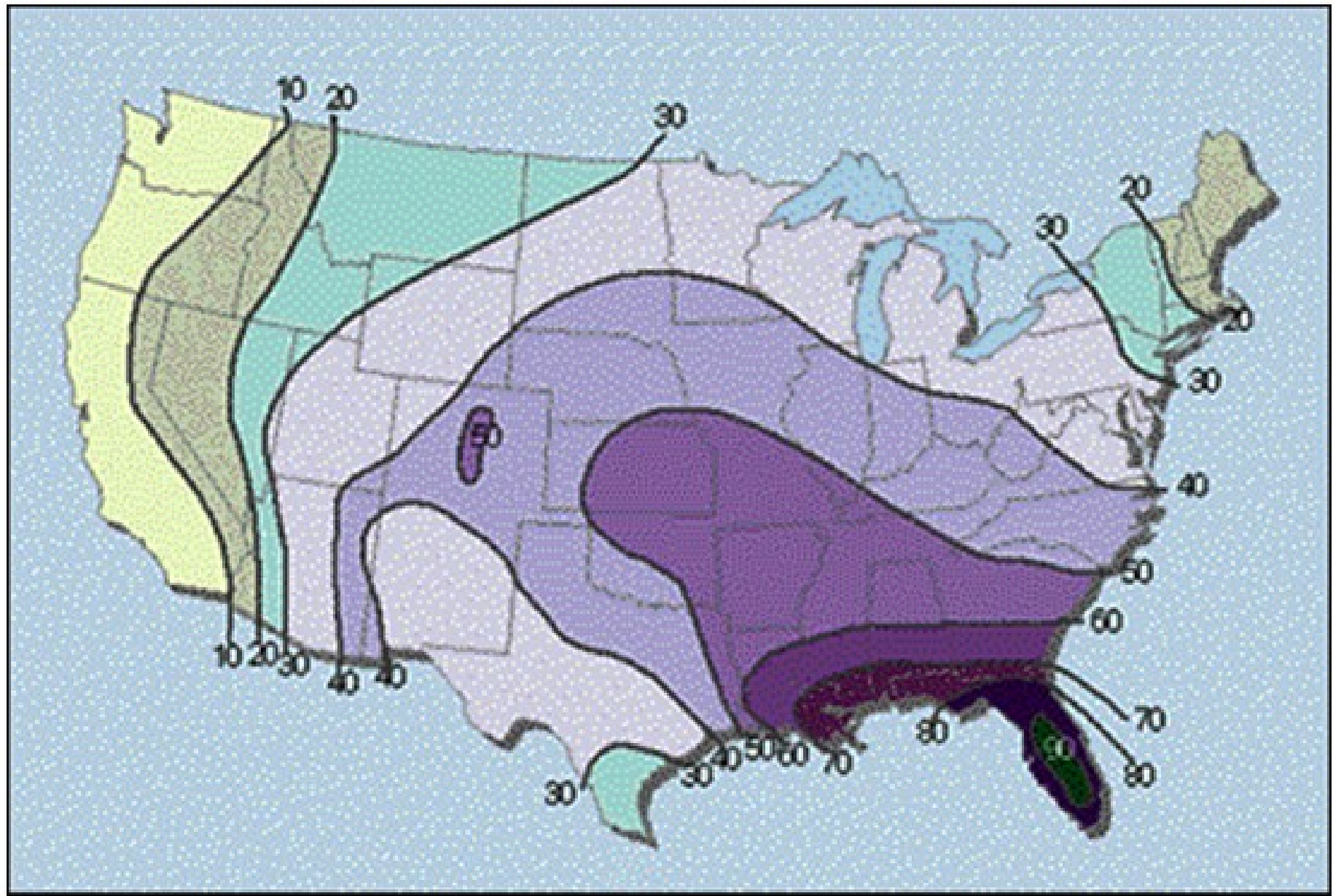




Lightning Protection Costs

The amount you spend should depend on:

- Value of asset you are protecting
 - Loss of service when off-air and time to return to air
 - Probability of getting hit by lightning
-
- **Central Paraguay - >200 hits per square km/year.**
- VS**
- **Some other areas less than 1 hit per square km/year.**



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Figure 1 Mean Annual Number of Days with Thunderstorms in The United States



Figure 2 Mean Annual Number of Days with Thunderstorms in Canada



Typical Strike Pulse

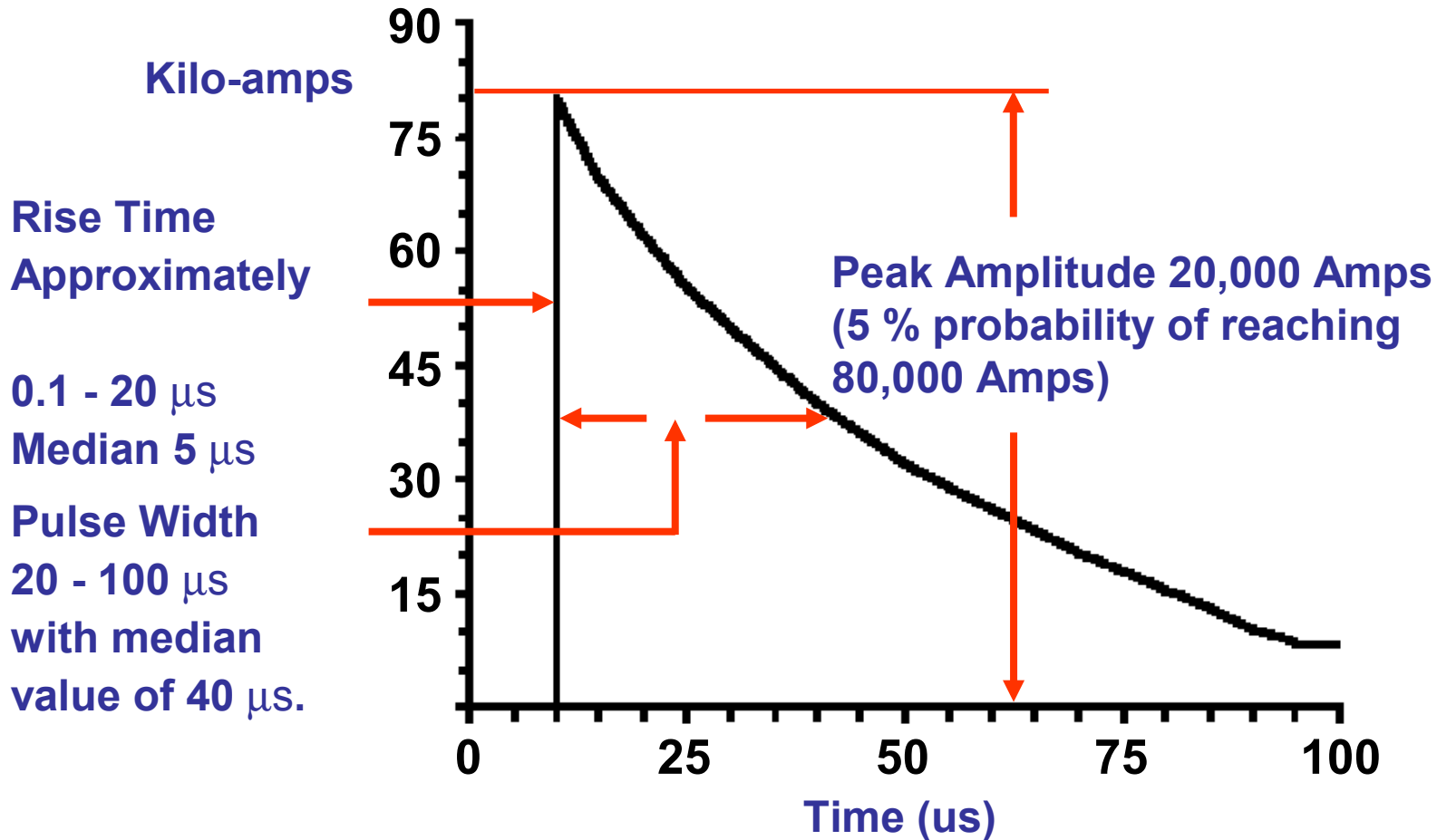


Figure 3



Key to Protection

- Conduct strike pulse current to ground through a low impedance path.
- Prevent this destructive current from flowing through your electronic equipment.



Ground Rods

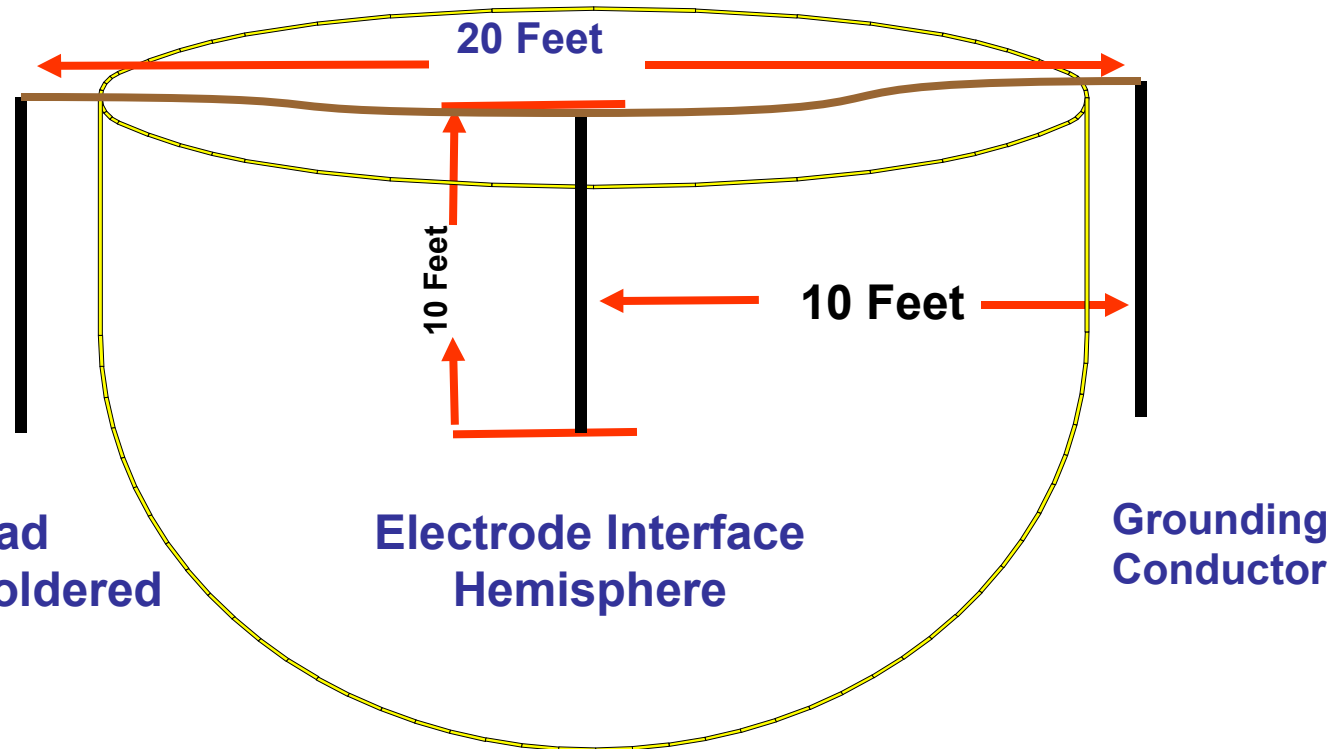
Penetrate below the frost line.

Moist soil or the water table.

Diameter 3/8" or larger.

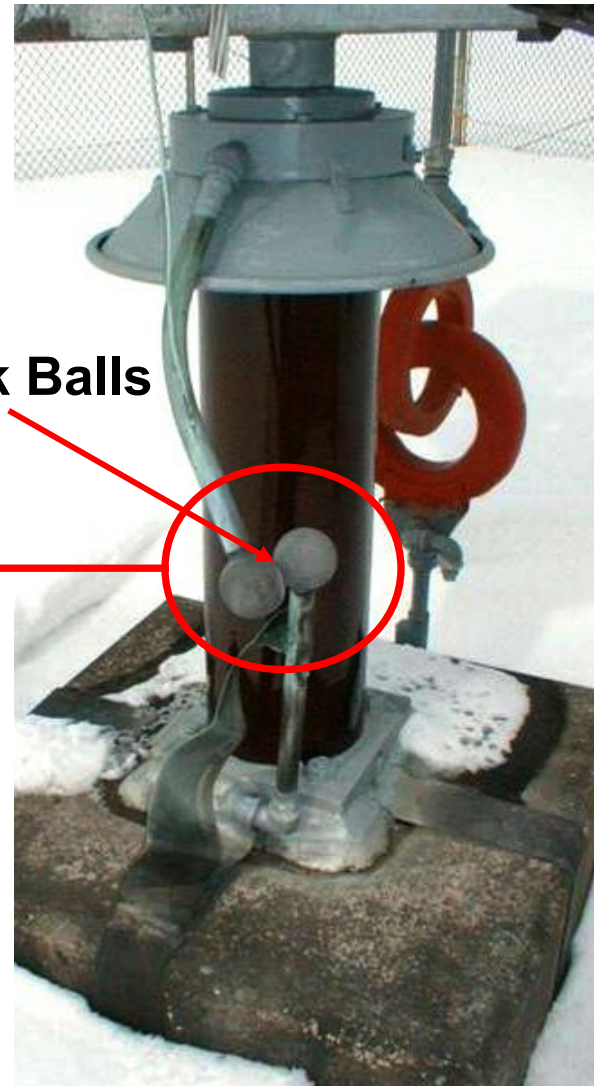
Connected with Cad welded or silver soldered copper straps.

Copper or copper clad steel.





Antenna Spark Gap



Spark Balls



Typical Path of Lightning Current Flowing to Remote Grounds

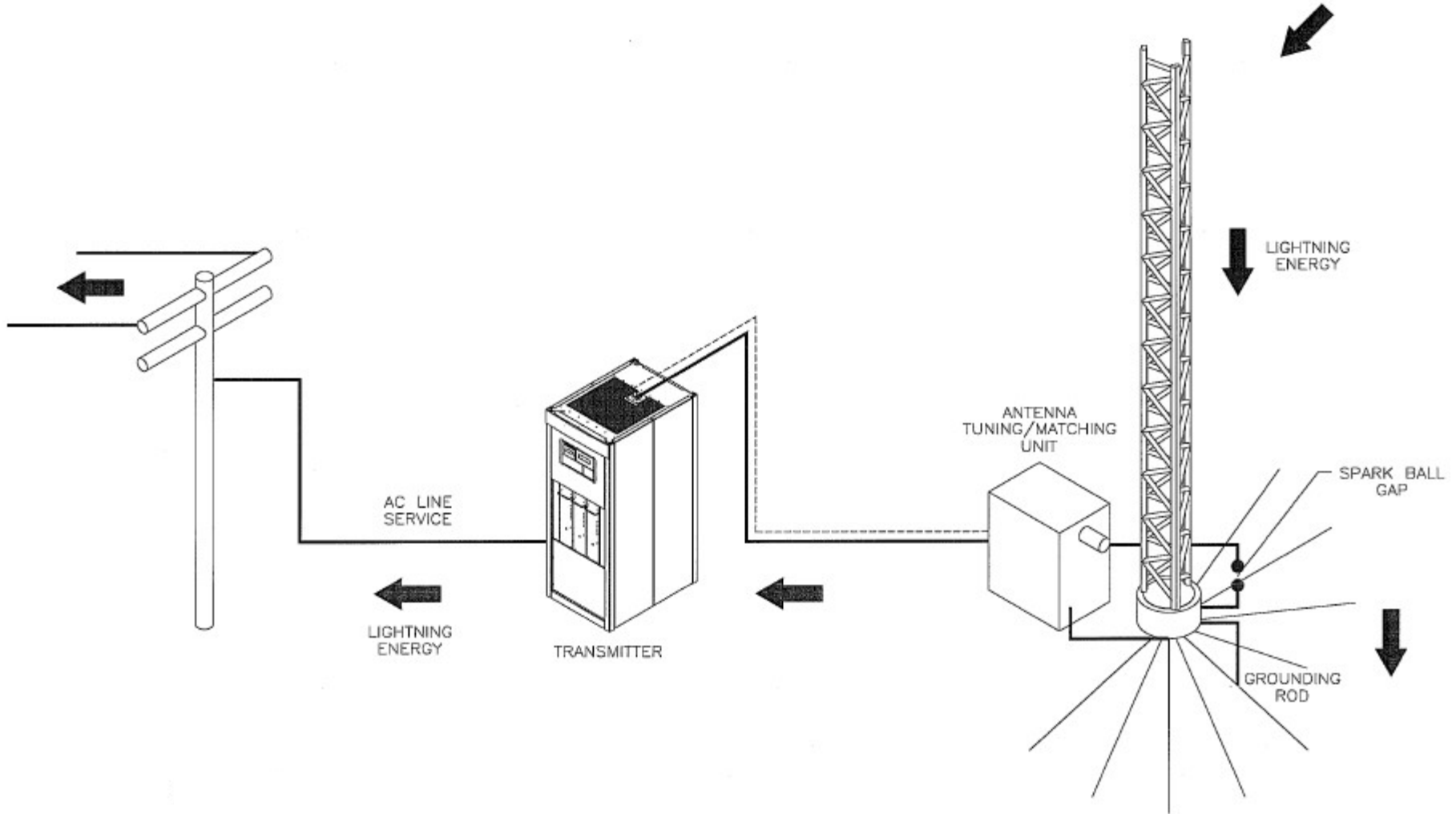


Figure 4



Use of a Surge Arrester to Prevent Transmitter Damage

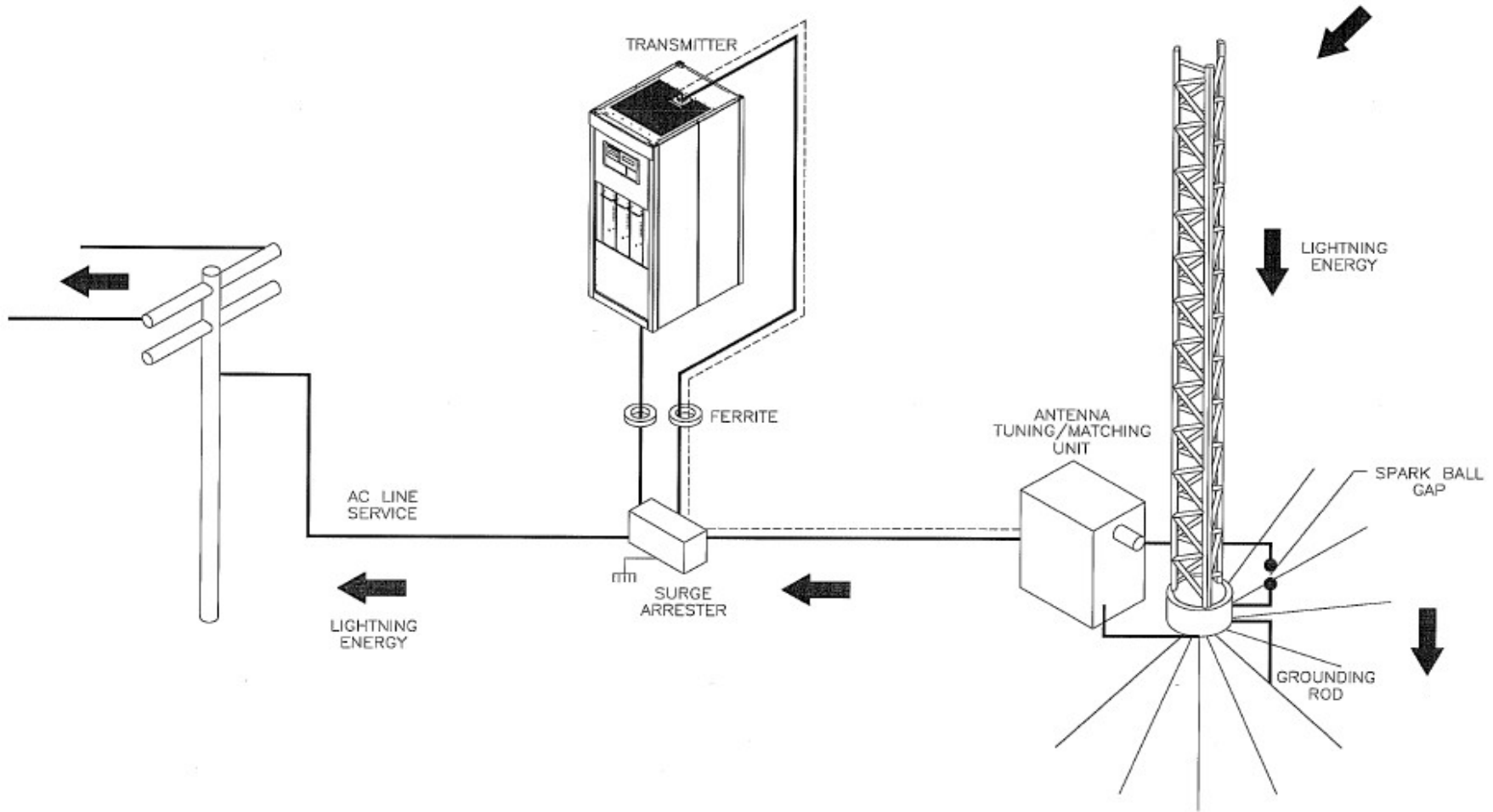
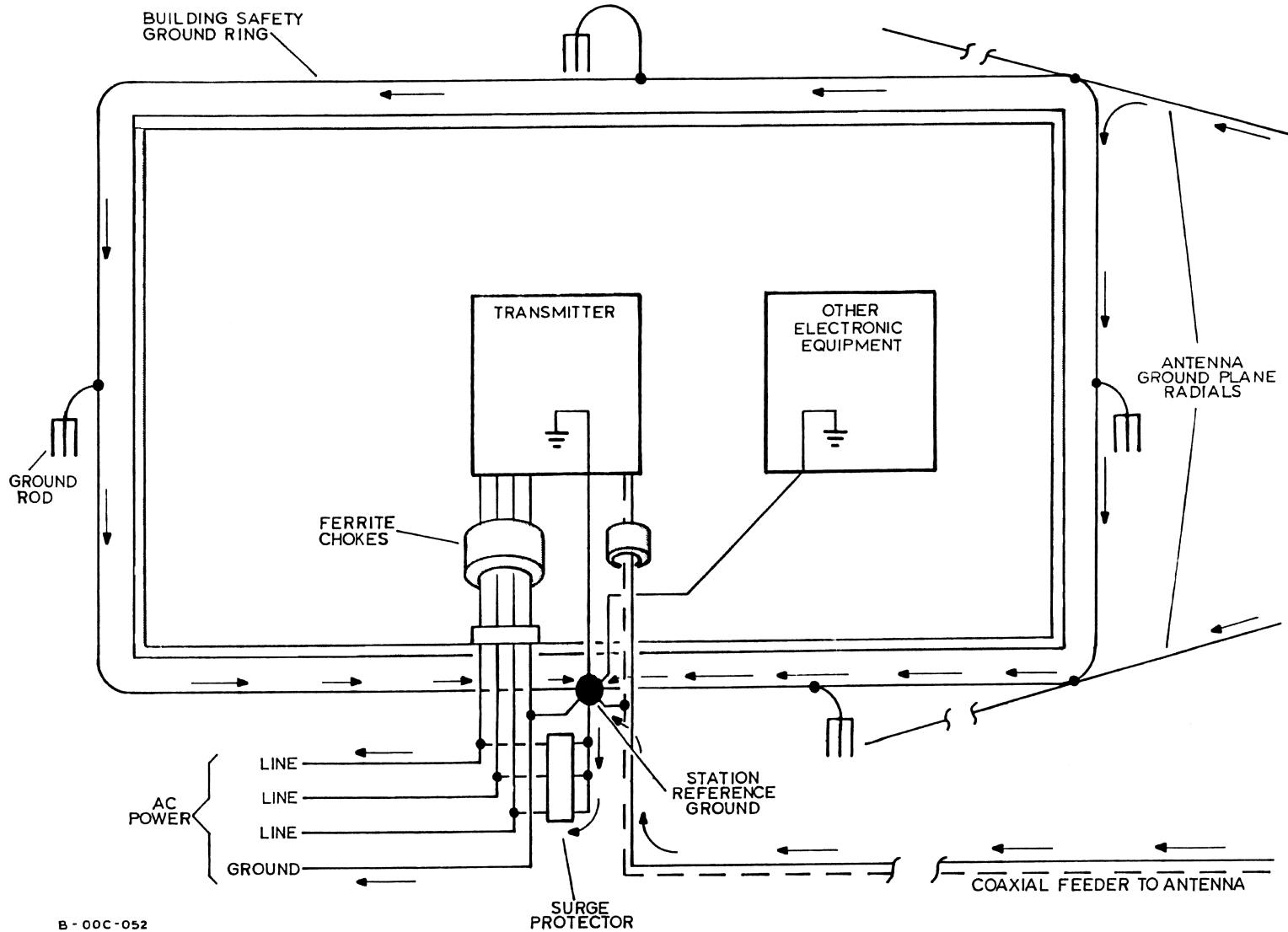


Figure 5



Ideal Transmitter Building Layout



B - 00C - 052



Basic Elements of A Well Configured Site

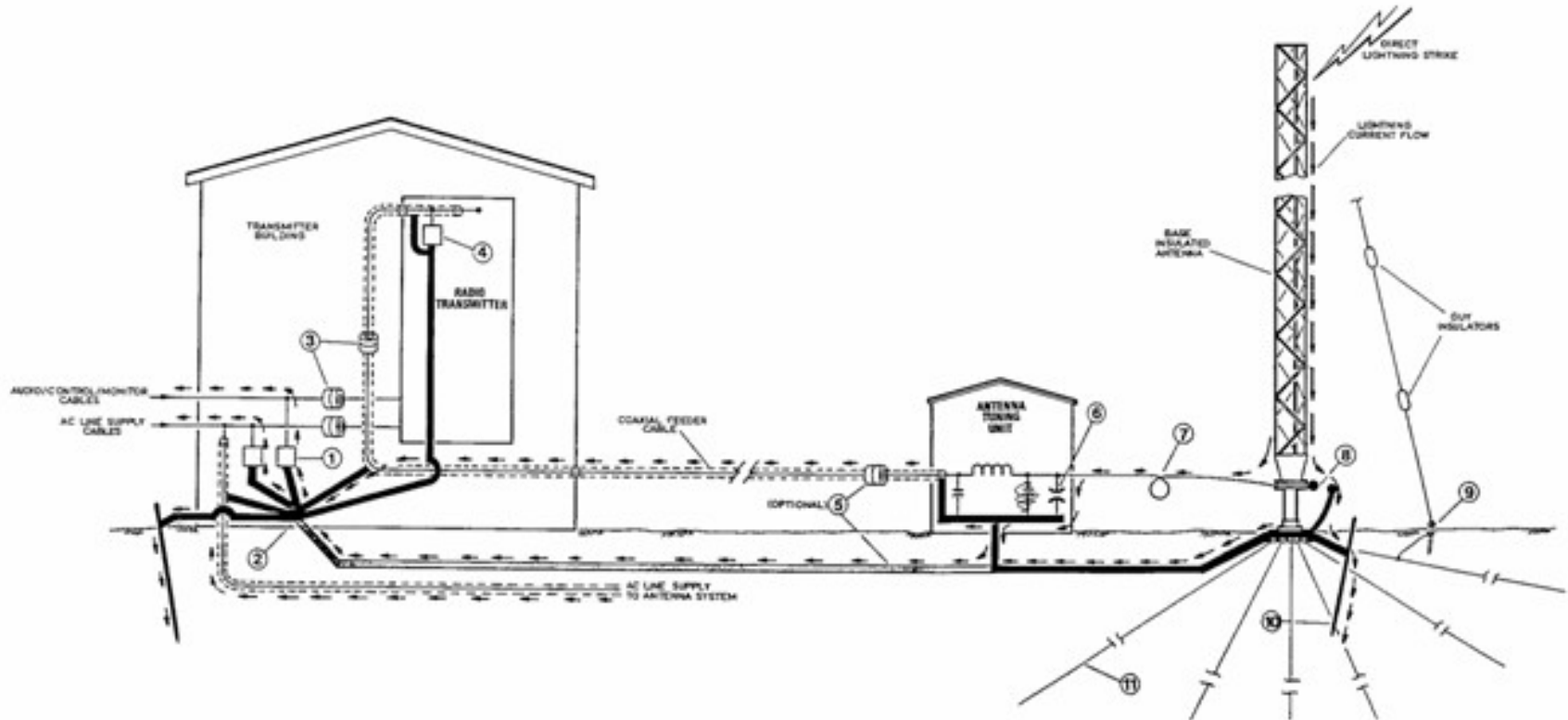


Figure 6 Basic Elements of a Well Configured Site

Figure 6

Making Digital Radio **Work.**



Surge Protection

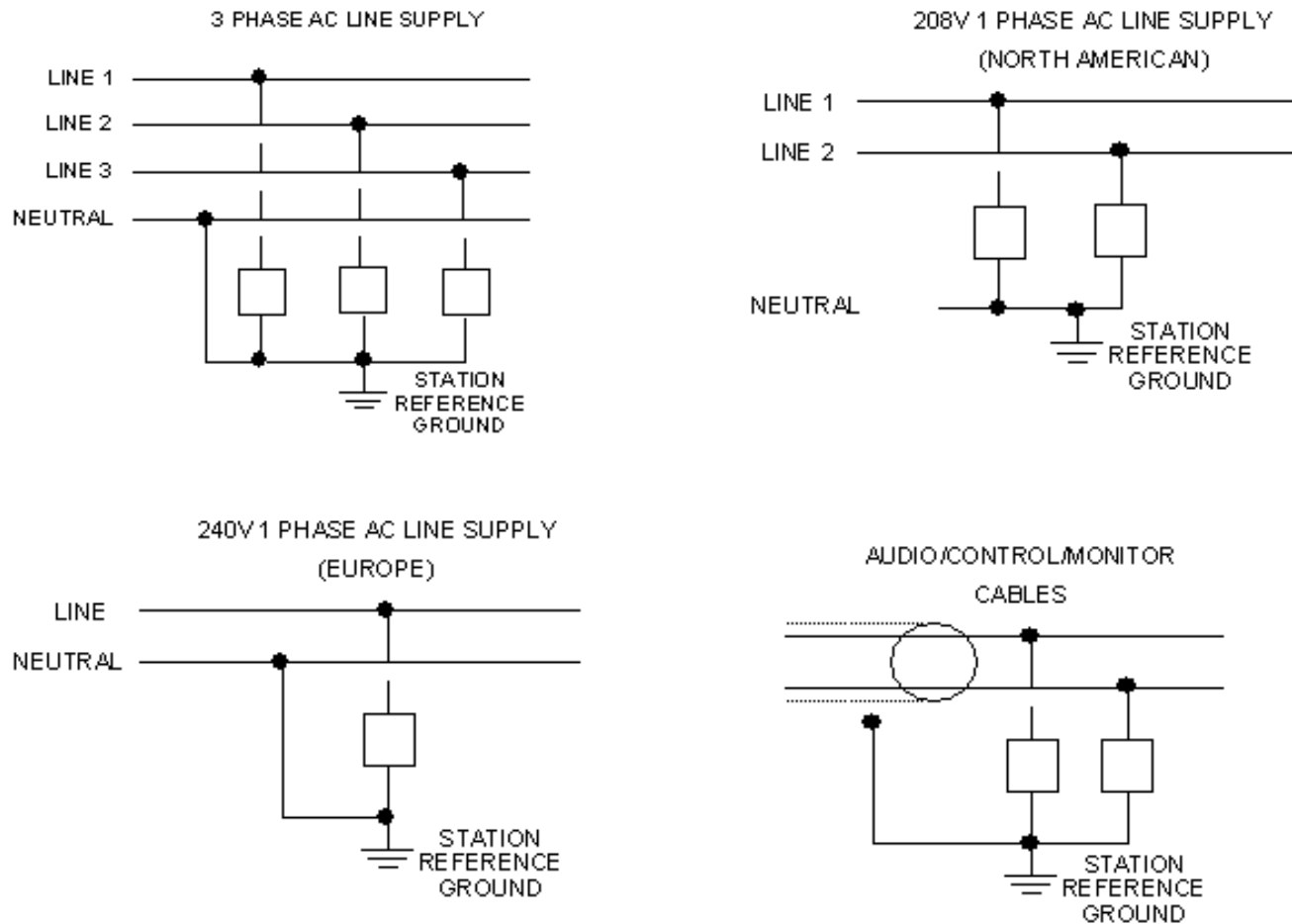
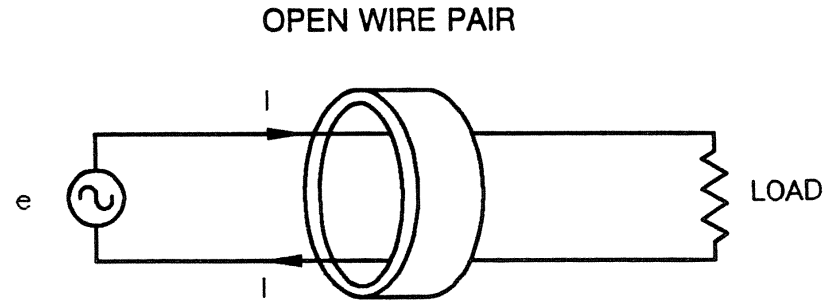


Figure 7 Surge Protector Connection on Power, Audio, Control and Monitor Wires



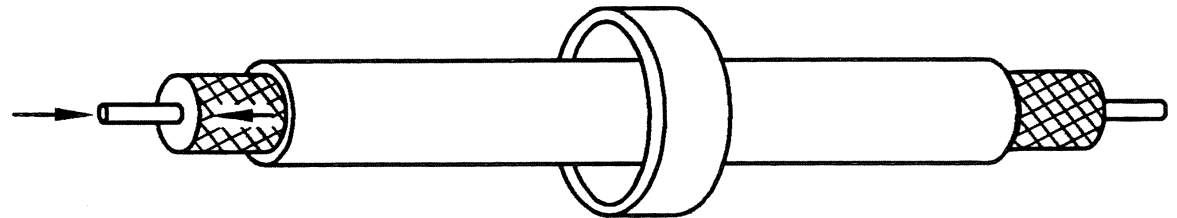
AC Power Protection

Ferrite Chokes



Use of Toroids to Impede Common Mode Signals

IN BOTH CASES THE TOROID IS INVISIBLE TO THE NORMAL CIRCUIT PATH BUT PRODUCES AN IMPEDANCE TO COMMON MODE SIGNALS



RF COAXIAL CABLE



Typical Building Layout

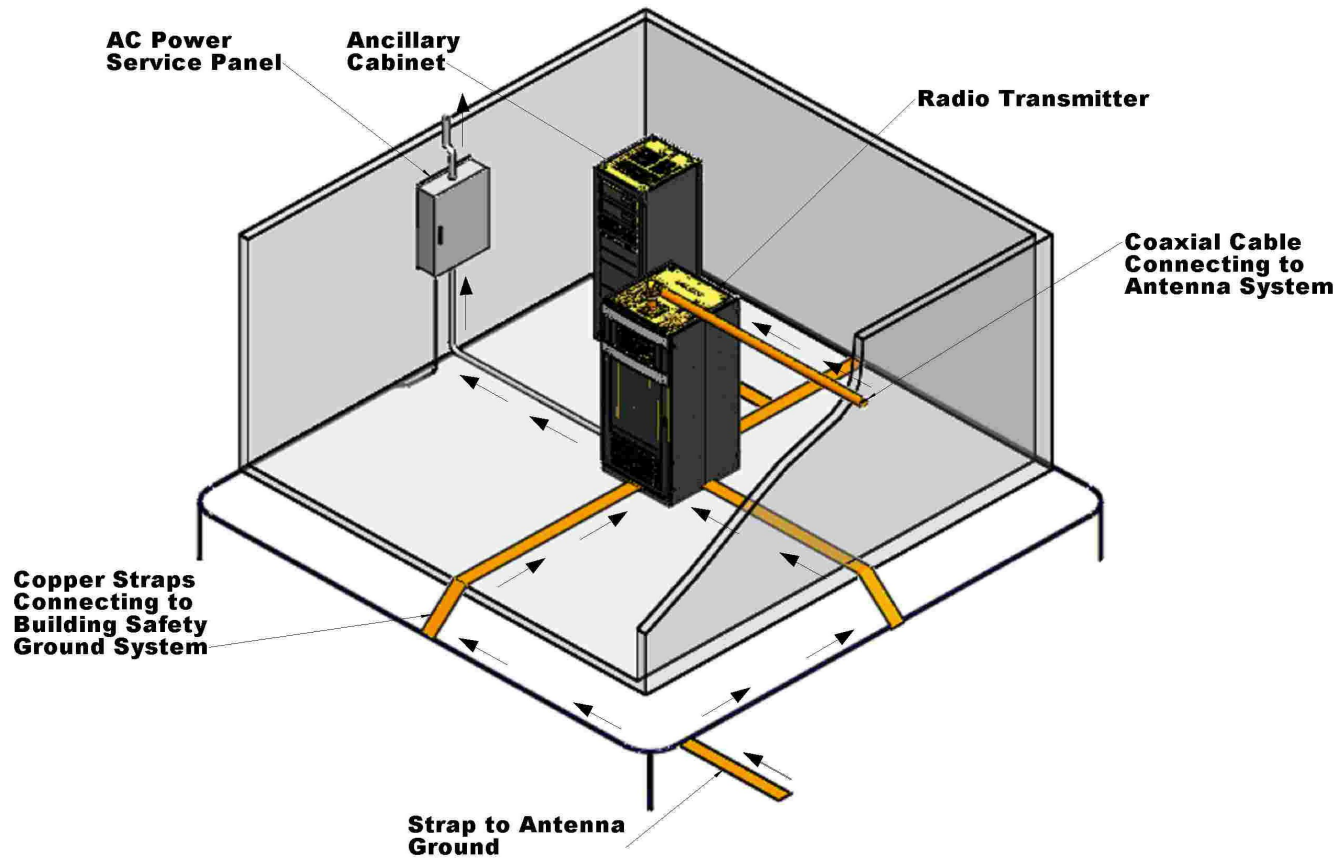


Figure 8



Improved Building Layout

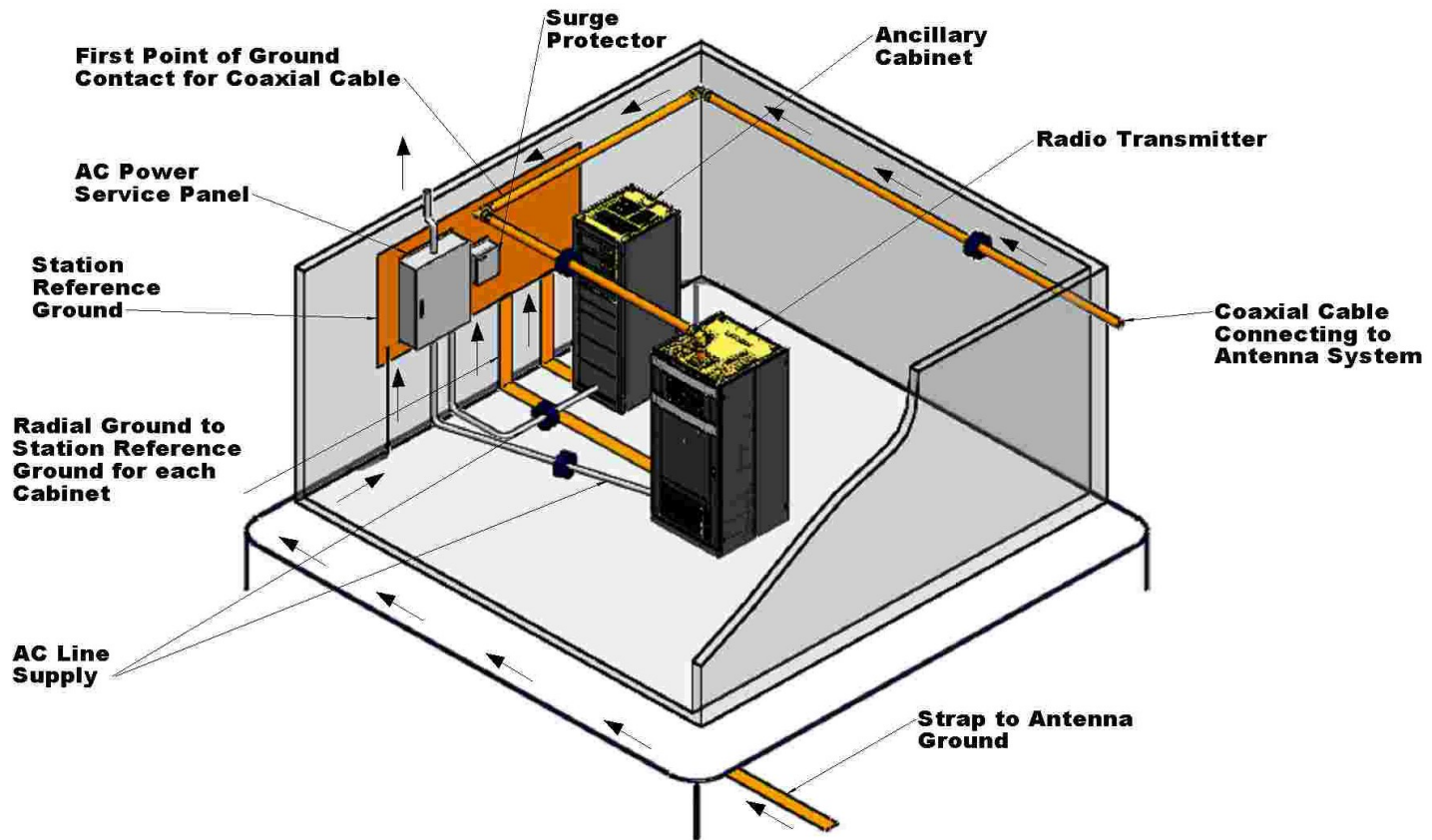


Figure 9



Good Layout at A Directional Site

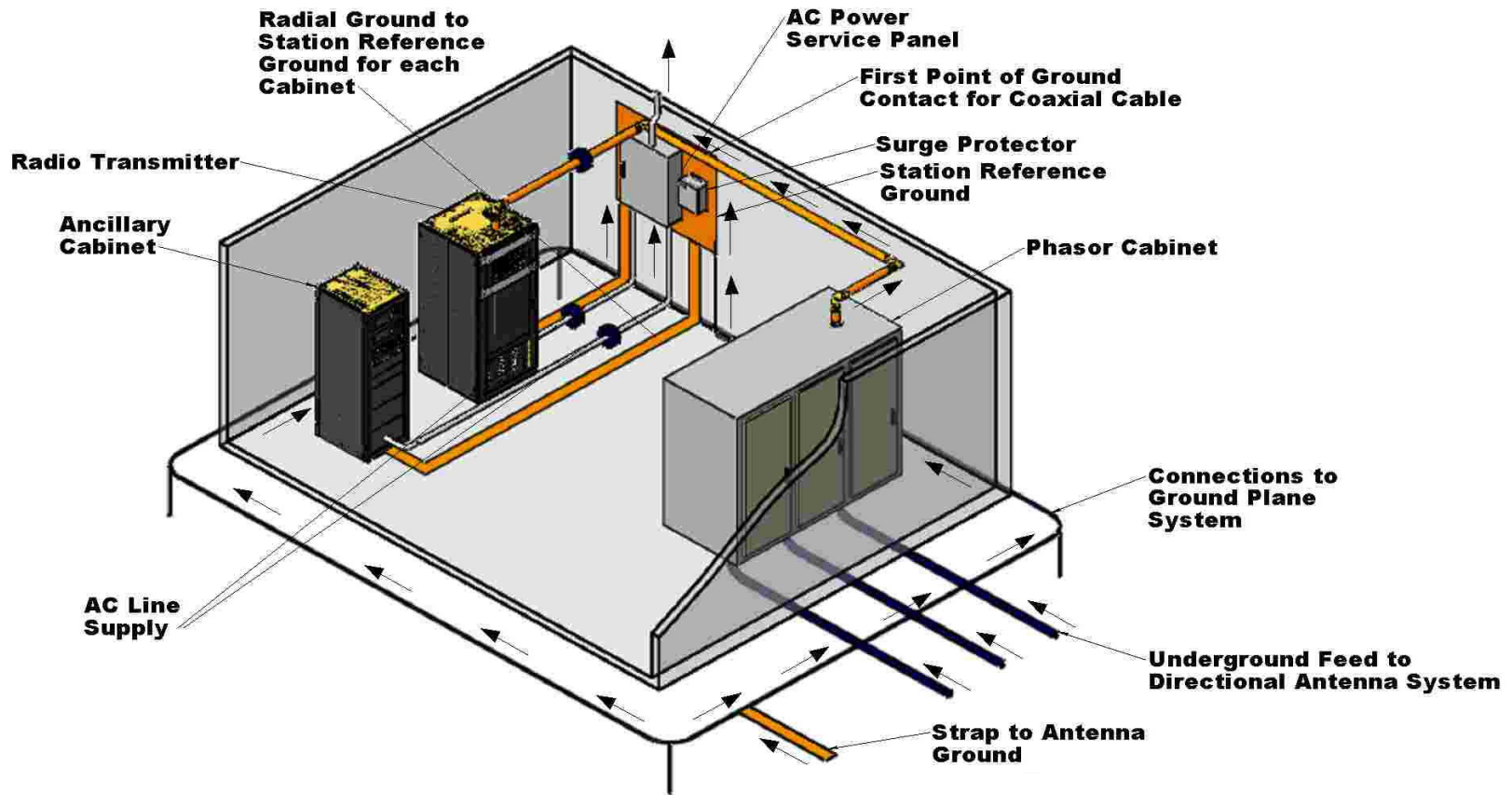


Figure 10



Reducing Unwanted Antenna Return Currents

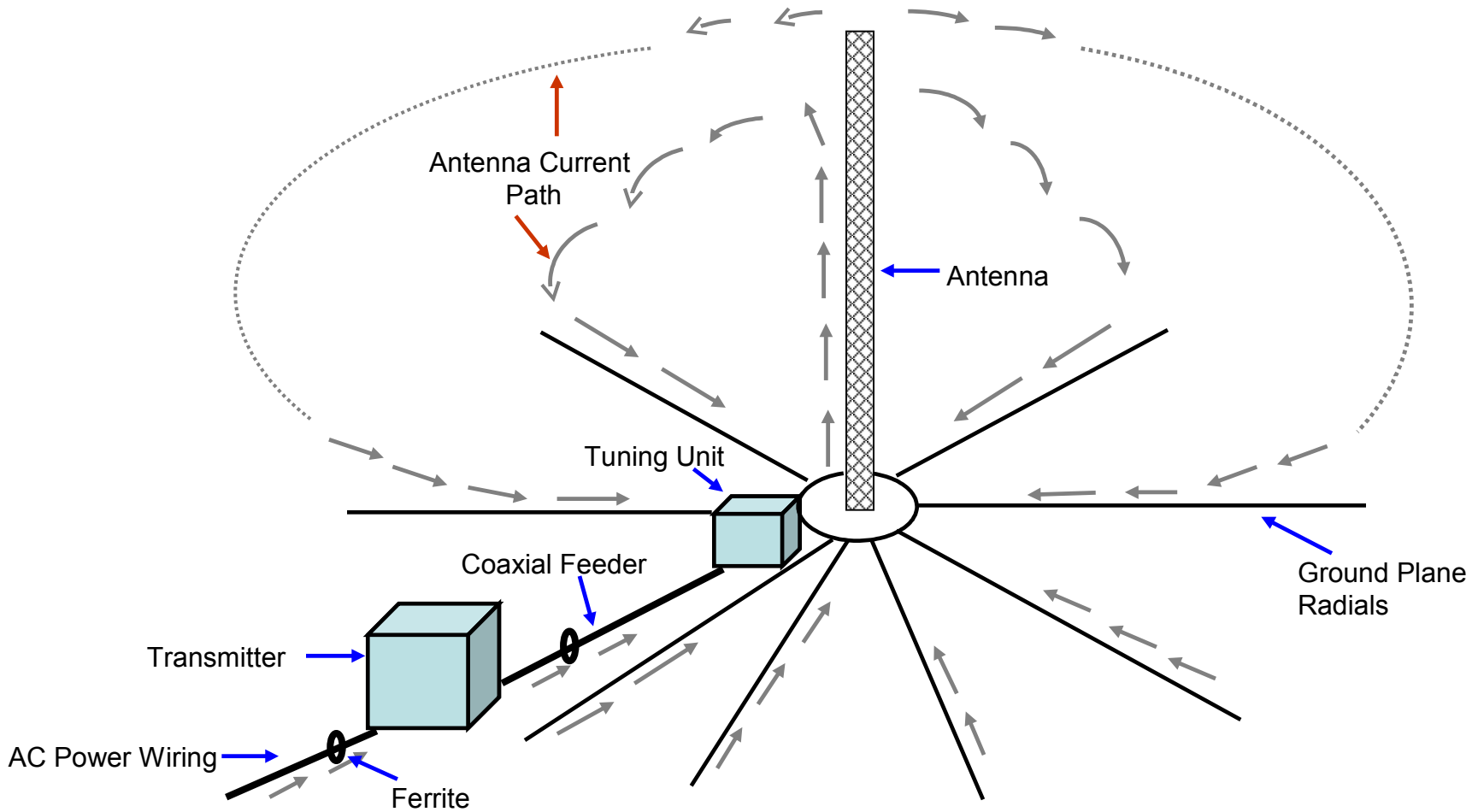


Figure 11



Summary – Key Points

**Acceptable rearrangements vary from site to site.
Often confusing.**

**Good remedial measures give significant
improvements from:**

- 1. Lightning energy originating at antenna**
- 2. Lightning energy originating at ac line supply**
- 3. Disruptive antenna current return paths**



Thank You



Making Digital Radio **Work.**