Antenna Mounting Considerations

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Subscriber Antenna Mounting Considerations

- Locate the antennas so that they have clear line of sight to the antennas at the opposite endpoint of the link.
- There should be no obstructions within ±10 degrees azimuth of the antenna bore sight.
- The elevation of the antennas should be sufficiently high, as to avoid any obstructions within –10 degrees elevation of the lower antenna.
- Mounting the antennas close to the edge of the rooftop (on a flat top roof) helps to avoid problems with the latter requirement.

Typical Installation

- Equipment
  - Two or more radios
  - Antennas (depend on install requirements)
  - Antenna Mount (non peneytating, pole, wall mount, etc)
  - COAX Cable 50 Ohm LMR400 or LMR 600
  - RP-TNC and N style connectors
  - Crimp and Soldering tools

Typical Installation

Before you install, DO A SITE SURVEY

- Plot on a good map your LOS (Radio Mobil)
- Use a hand held GPS to get coordinates
- Use a good spotting scope and find the other end
- Look for other antennas on nearby buildings
- If Avail, use a spectrum analyzer, otherwise use a laptop with RSL software

Typical Installation

- Make sure you follow local code and ord's
  - MTBR for down links can vary, have spare parts
- Do a free space loss calculation:

L = 100,4 + 20 log(km)

Typical Installation

- Do a “Test Install” first:
  - take a 2 m pole and attach a 24 dBi dish
  - connect to radio and search for other end
  - verify connectivity quality and strength
  - note general heading of antenna
  - note elevation (did you have to lift it up, etc)
  - now try antenna you plan to use

Typical Installation

- Most important part of install (Antenna)
  - Make sure the mount is STRONG
  - Will NOT move in wind (antenna loads are high)
  - Well grounded, ground rod or similar
  - COAX is tied down with gentle sweeps
  - Lightning arresting equipment is grounded
  - Use a rubber mat for skids, to protect roof

Typical Installation

- Keep COAX length S H O R T
  - No more than 33 meters
- Extend reach on the Ethernet Side
- Use FIBER to extend reach
  - Not affected by “plant / electrical noise”
  - Wonderful lightning protection

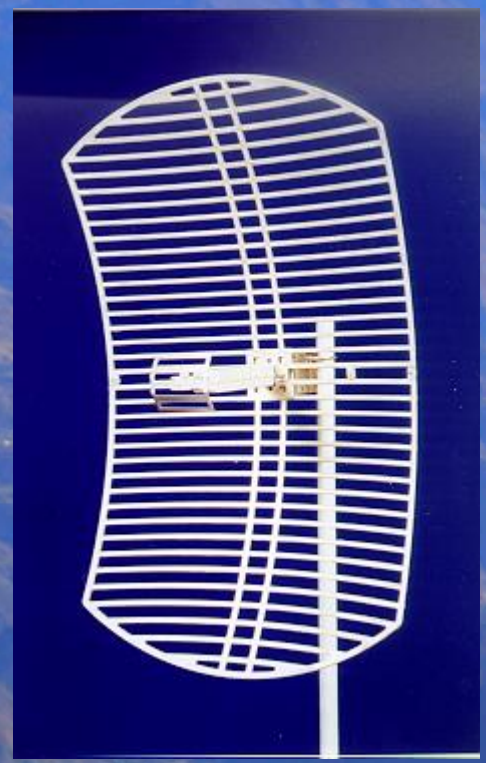
Typical Installation

- Tape and secure ALL connections
- Use 3M All Weather Tape
  - NOT Electrical tape or duct tape
- Use BLACK Nylon Ties
  - White ones will break down in UV
- If able, place COAX in conduit for protection

Antenna on roof top #1

Antenna on roof #2

Types of Antenna's (Grid Dishes)



Types of Antennas (Panel Mount)

Interference from other buildings

- Major building areas are big potential for problems

Troubleshooting / Problems

- When troubleshooting:
  - try slower speeds
  - try different frequency ranges
  - verify connections
  - verify lightning arrest equipment
  - know your environment
    - Buildings along the path (new installs by others)

Troubleshooting / Problems

- Interference can cause:
  - Packet loss because of poor queue depth
  - Packet resends
  - higher latency because of resends

Subscriber Mounting Considerations

- Other considerations include proximity to the cable run to the rooftop.
- When locating the antenna mast it is desirable to have it in close proximity to the building rooftop ground system if present. It then becomes a simple matter to provide a short, low resistance, connection to the building ground system.

Subscriber Mounting Considerations

- Conditions for microwave path design must be considered such as Earth curvature and Fresnel zone clearance.
- Observe local building and electrical codes when running all cables.
- It is necessary to determine how the IF cables will be brought up to the rooftop from inside the building.

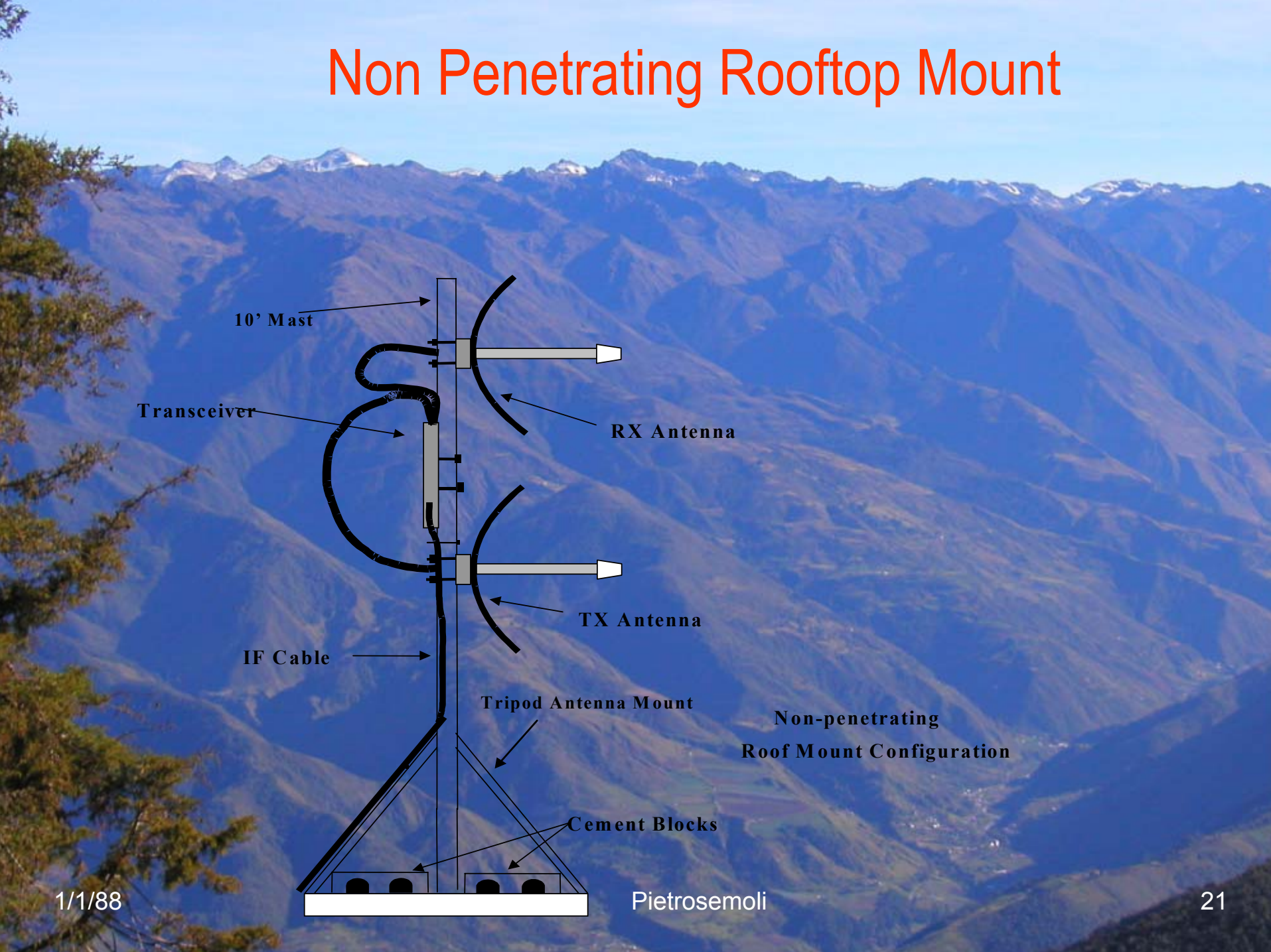
Mount Options

There are three common types of system installations employed. They are non-penetrating roof mount antenna assemblies for use on flat top roofs and the wall mount assembly for use on existing structures such as chimneys or the sides of a buildings. If the antennas have to be mounted more than about 4 m above the rooftop, a climbable tower may be a better solution to allow easier access to the equipment and to prevent antenna movement during high winds.

Non-Penetrating Roof Mount

- For a non-penetrating roof mount assembly a mount made by Rohn, model number FRM125 or equivalent is recommended.
- At least 4 cement blocks (to be used as ballast) or equivalent, are also required.
- 1 piece of 90 cm x 90 cm rubber padding can be placed under the assembly to provide roof protection.

Non Penetrating Rooftop Mount

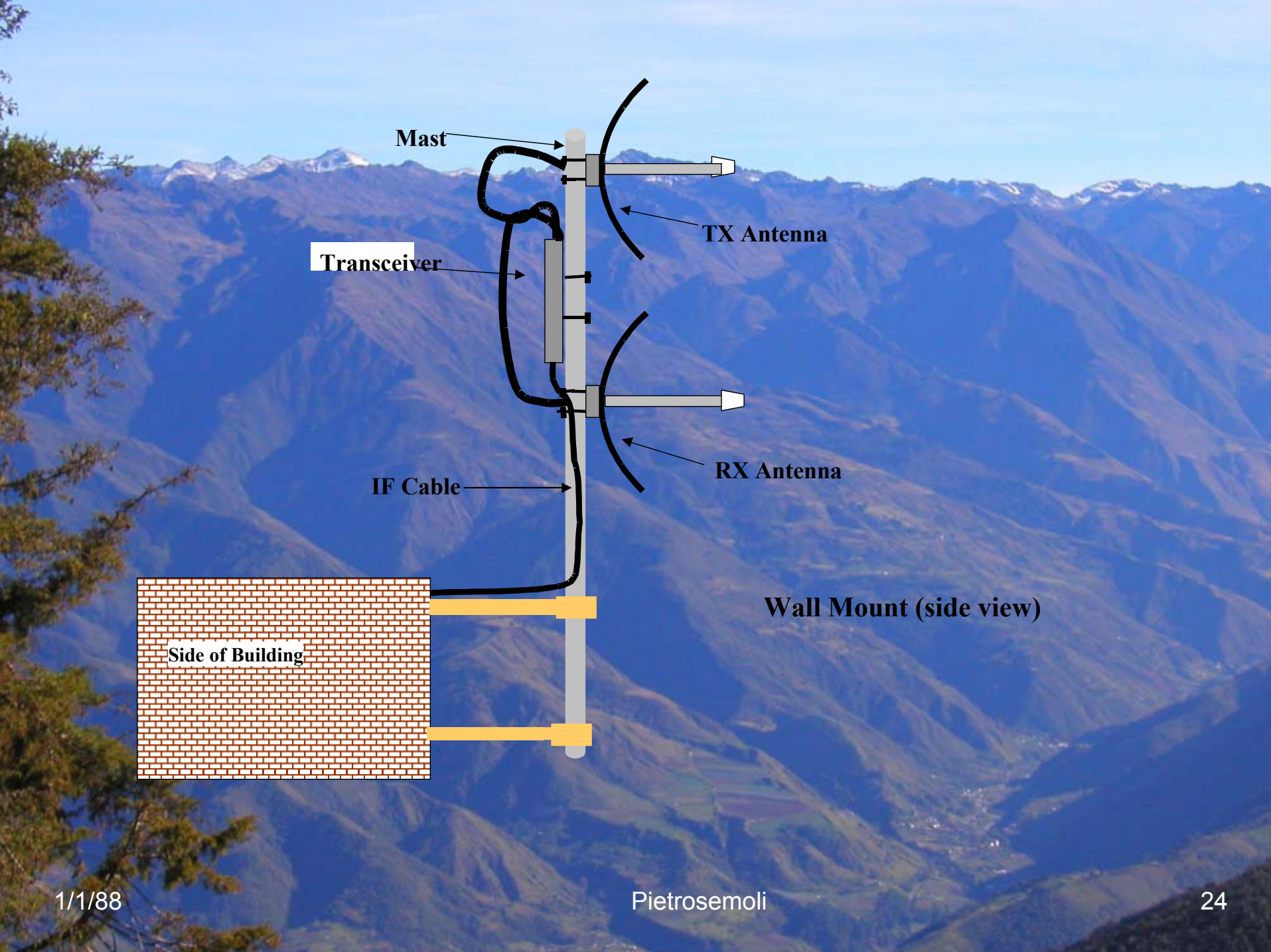


Wall mount

- For applications where the roof is not flat or strong enough to hold the weight of the non-penetrating roof mount the wall mount is the most effective solution
- This mount is affixed to the side of a building, wall or chimney

Wall mount

- The structure must be capable of handling the weight of the mast, antennas, and transceiver plus wind loading stress.
- This type of mount requires drilling four holes into the structure.
- When mounting to masonry expansion type bolts or lead anchors should be inserted into the hole drilled as a means of attaching the mounting bracket to the structure.


Mast
TX Antenna
Transceiver
RX Antenna
IF Cable
Side of Building
Wall Mount (side view)

Tower Mount

- A climbable tower is normally made of aluminum with a triangular cross section, about 30 cm per side.
- Each section is about 3 m long and several sections can be bolted together to attain the required height
- The tower must be properly guyed to withstand the expected wind in the area, as well as to support the weight of the equipment and one person

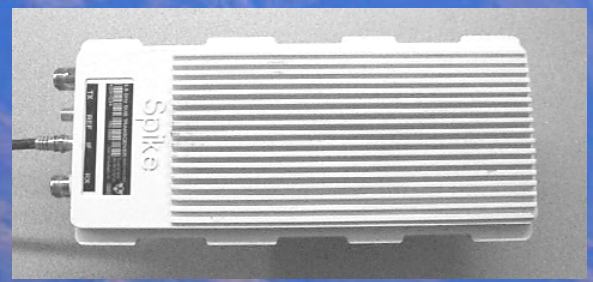
Tower Mount

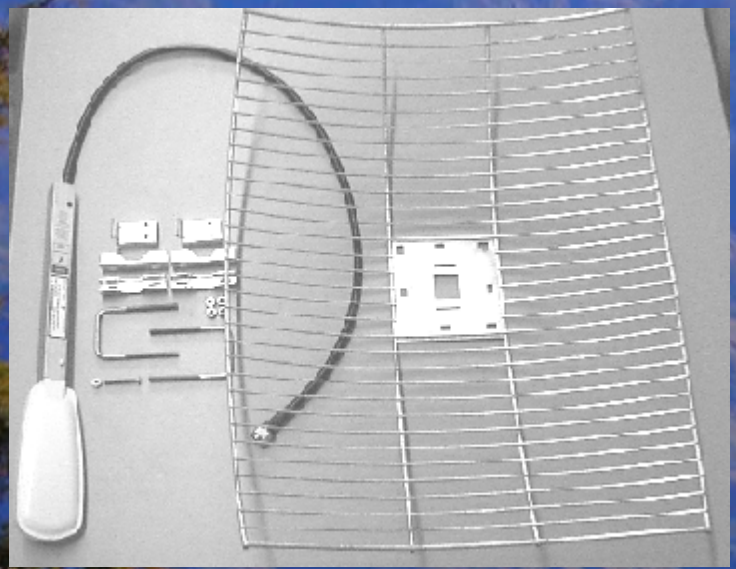
- Many countries require special training for people to be allowed to work on towers above a certain height
- A harness and adequate helmet must be worn when working on or below towers
- Avoid working on towers during strong winds or storms

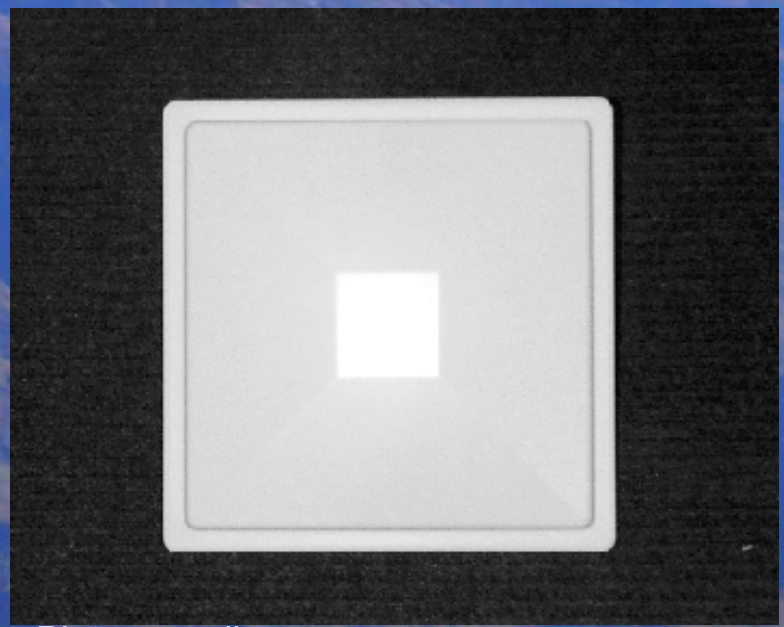
Self Supporting Towers

- Self supporting towers are expensive but sometimes needed for the Base Station
- An existing tower can sometimes be used for subscribers, although AM Transmitting station antennas should be avoided because the whole structure is active.
- FM station antennas are O.K.

Examples of Customer Premise Equipment







Ground Antenna Mast

It is recommended that the antenna mast be grounded to either the building rooftop lightning ground system or to a separate earth ground system. The mast should be connected to the ground by a low resistance heavy gauge cable AWG #10 stranded copper or larger is recommended. Use suitable ground clamps to attach the cable to the mast and the ground system. Make sure the cable is making a good electrical connection, remove all paint and corrosion from the area the clamp attaches to. Use dielectric grease on the clamp connection to prevent any electrolysis activity due to dissimilar metals.

Protect connectors from exposure

- Connectors should be protected with special tape or compound, since humidity cropping in is the main observed cause of CPE failures
- Cables should have dripping loops to prevent water getting inside the transceiver

Base Station Antennas Mounting Considerations

Omni antennas have 3 basic specifications: VSWR, vertical pattern, and horizontal pattern.

A nearby metal object can affect all of these.

VSWR is induced when a substantial part of the signal, hits a nearby metal object, and bounces back to the antenna. You can actually tune the VSWR by moving the antenna in and out. This effect becomes negligible after about 2 wavelengths (24 cm) spacing from the NEAREST metal object.

A Rhon 25 tower leg isn't very substantial and will only reflect a small part of the signal. A wall of coax cables running up the tower is substantial and will reflect a substantial amount of power. Therefore, it's not just the spacing, but also the size of the reflector.

The horizontal (azimuth) antenna pattern of an omni is allegedly a prefect circle. Putting a small pipe near the antenna tends to skew the pattern. Depending upon the spacing and construction, the tower can act as either a director or reflector, causing gain to increase or decrease slightly (3dB max).

However, if the tower reflector is a wall of coax cables, a step ladder side rail, chicken wire, or the back of someone's dish, the substantial amount of metal will block the pattern and put a big hole (gain loss) in that direction.

The vertical pattern is where a tower side mount really mess things up. Most high gain omnis have very narrow vertical radiation patterns. Placing any kind metal near it will cause the pattern to tilt in some potentially strange direction. For example, if you side mount an omni where only half of the vertical is near the tower, the pattern will uptilt a substantial amount. If you have a triangular (truncated pyramid) oil well tower, the spacing at the bottom of the omni, will be smaller than the spacing near the top. Instant uptilt is the result. When the vertical beamwidth is about 7 degrees, and the uptilt can be as much as 5 degrees, the potential for mangled coverage is too big.

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