APPLICATION		
DASH	**NEXT ASSY**	**USED ON**
		VSAT Installations

Date	Rev	Revision Record	Approved
6/23/92	A		
7/12/95	B	Chg. Anti-ice to 20’	
4/15/98	C	Spec. revised, broadened & anti-ice revised	

How to Make a Building

“Satellite Ready”

Job 000	Approvals	Date
Originator:	Steven P. d’Adolf	5/13/92
Approved:		
Checked:		

HUGHES NETWORK SYSTEMS, INC.

Title: How to Make a Building “Satellite Ready”

	Sheet 1 of 22	**FSCM No. 52571**	**No. 97W0068**

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INTRODUCTION

This specification is intended to help you in making your building ready for installation of a Hughes Network System (HNS) Personal Earth Station (PES) satellite communications system. The PES system includes an outdoor antenna and an indoor electronics unit. As shown in figure 1, an interfacility link (IFL) cable connects the outdoor antenna to the indoor unit. In general, a Hughes Network Systems installation subcontractor will assist in planning locations for the outdoor antenna and the indoor unit. Certain considerations apply in choosing these locations.

Antenna Size & Location

The HNS antenna for a remote PES site is available in four different popular sizes ranging from a rectangular reflector (2 ft. by 4.4 ft.) to an oval reflector (8 ft. by 8.6 ft.). The satellite signal strength in your region of the country and the communications services desired (data rate, voice, and video) determine the size antenna required at a given site. The location of the antenna at your site should be selected so that the antenna has a clear view to the satellite (generally between Southeast and Southwest) that is not likely to be obstructed by new buildings or the growth of trees. Under normal circumstances, the location of the antenna should be selected so that it within the maximum standard cable run length distance of the PES indoor unit (421 ft. plenum, 511 ft. non-plenum – PES X000 series; 534 ft. plenum, 679 ft. non-plenum – PES 5000).

Selection of Antenna Mount Type

HNS can provide a variety of mount types. The most popular are the penetrating roof mount and the non-penetrating mast mount (NPMM).

The penetrating roof mount is the preferred type for new buildings being constructed for buildings that have 8-inch diameter columns supporting the roof. One of the columns is extended through the roof to become a base for the antenna mast. Details of penetrating mast specifications are presented on page 5. If a penetrating roof mount is selected for your building, give a copy of these specifications to your architect and to your building contractor.

If your building does not have 8-inch diameter support columns, usually a non-penetrating mast mount (NPMM) is a good choice. The NPMM has the advantage of rapid setup and the ability to be easily relocated by HNS installation or service representatives. HNS provides NPMMs in various sizes appropriate for the antenna size and the wind zone at your site. NPMMs are appropriate for flat roofs or for certain peaked roofs. As shown in figure 1, NPMMs are held in place with concrete block ballast. For those few sites where the largest antenna is required, HNS may arrange for a licensed civil engineer to inspect the building and submit plans verifying that the building is appropriate for the NPMM.

In instances where neither a penetrating roof mount nor a non-penetrating mast mount (NPMM) is appropriate, arrangements can be made for HNS to provide an attached roof mount, a wall mount, or a pole mount. A pole mount is a steel mast anchored in the ground by a concrete pier.

Providing a IFL Cable Point of Entry

If a new building is being built for your site, the provision of an interfacility link (IFL) cable point of entry as shown in figure 1 and described on page 10 will speed installation of the PES system. If your business is leasing a new building or renewing a lease, often the building owner will make concessions to keep your business. Requesting an IFL cable point of entry will help with PES installation and help the building owner in keeping the building in top shape.

Providing an Electrical Outlet for Anti-Icing

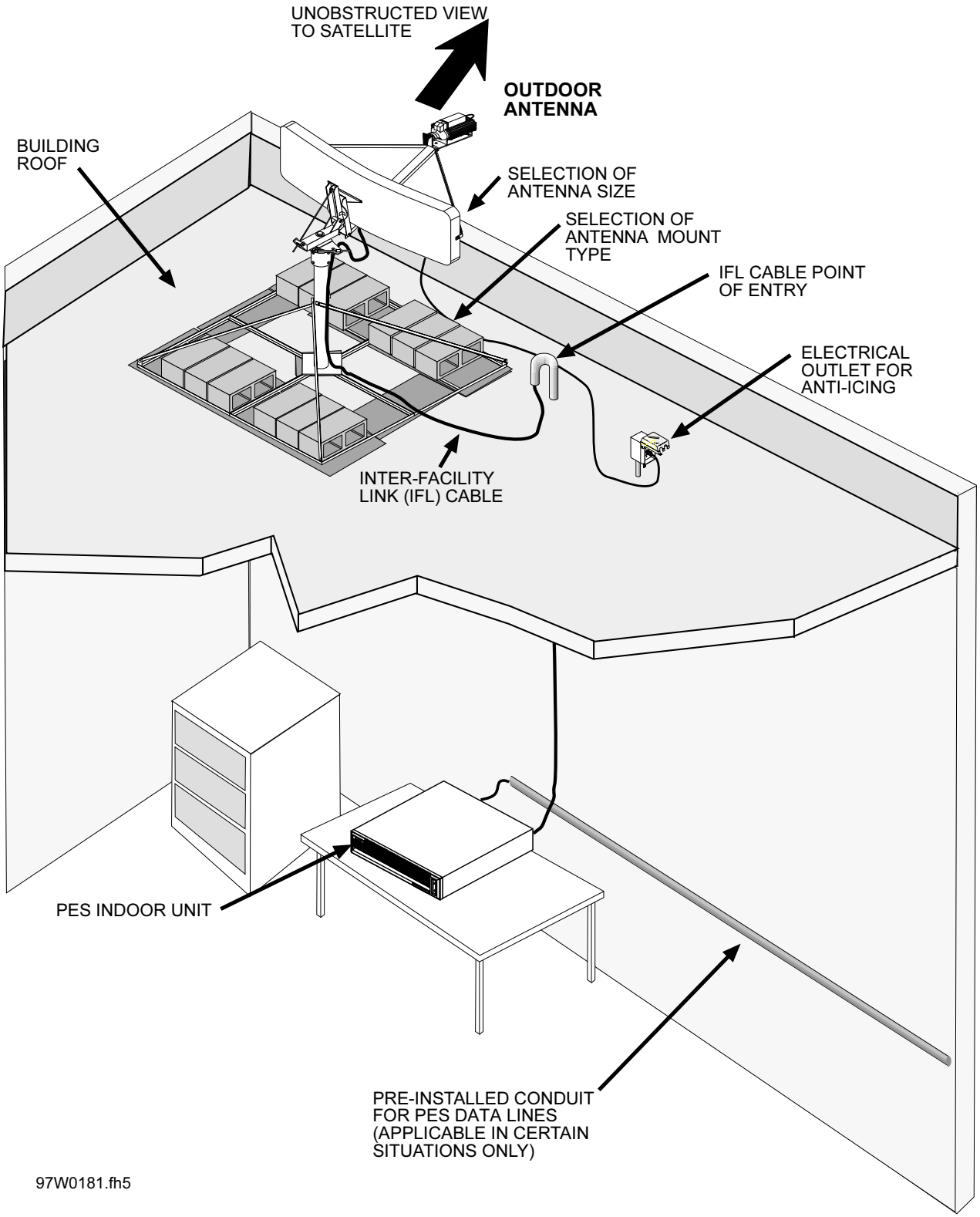
If your site is located where there is a significant amount of freezing rain, anti-icing equipment may be specified for the antenna. If so, an electrical outlet as described on page 14 is required within 20 feet of the antenna. Having this electrical outlet installed prior to the PES will speed the process.

Indoor Unit Location

In general, the PES indoor unit is usually located in the rear of the business usually near the business's data processing equipment. Under normal circumstances, the location of the PES indoor unit should be selected so that it is within standard cable run length distance of the antenna (421 ft. plenum, 511 ft. non-plenum - PES X000 series; 534 ft. plenum, 679 ft. non-plenum - PES 5000). In those rare instances where it is not possible or practical to have the indoor unit within a standard cable run length (a business on the lower floor of a high-rise building, for example), HNS can install extended run cable (up to 2764 ft. - PES X000 series; 3737 ft. - PES 5000) at additional expense to the customer per the terms of the customer's contract.

In cases where the PES indoor unit will be shared among several stores (a shopping mall application, for example), it might be placed in a central telephone closet. If the PES indoor unit is to be placed in a small room where space is at a premium (gasoline station kiosk, for example), HNS can provide wall mounting brackets possibly at additional expense depending upon the terms of a particular contract.

Figure 1. Planning for Personal Earth Station (PES) and Building Preparation



PENETRATING MAST MOUNT

This section is intended for VSAT customers who choose to install a penetrating mast mount as part of the construction of a new building. A penetrating mount has a column which passes through the roof (figure 2). Two styles of penetrating mount are:

Quick Clamp Mast - page 8
Standard Mast Connection with square plate page 11

Items to be considered include: antenna/mast location on the building, standard mast connection, cable entry, and electrical requirements.

Figure 2A. Prodelin 1.0M Quick Repoint Antenna on Penetrating Roof Mount (Standard Mast Connection with square plate)

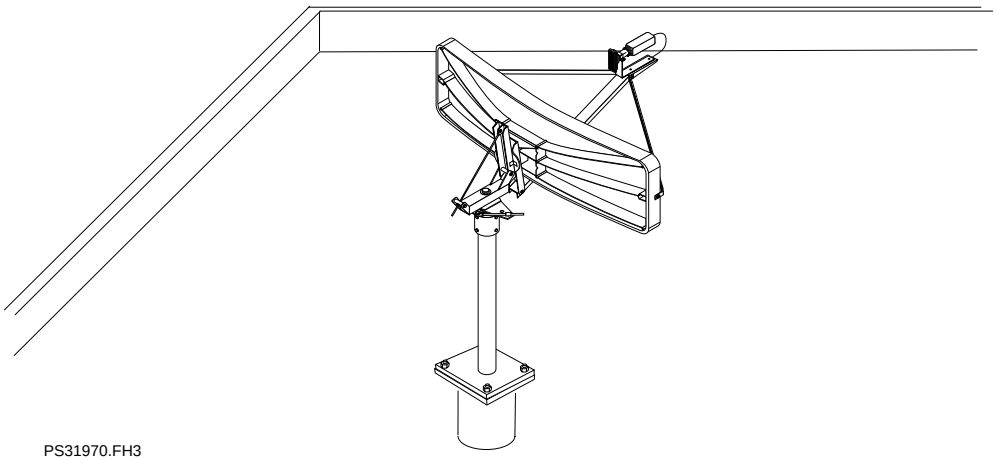


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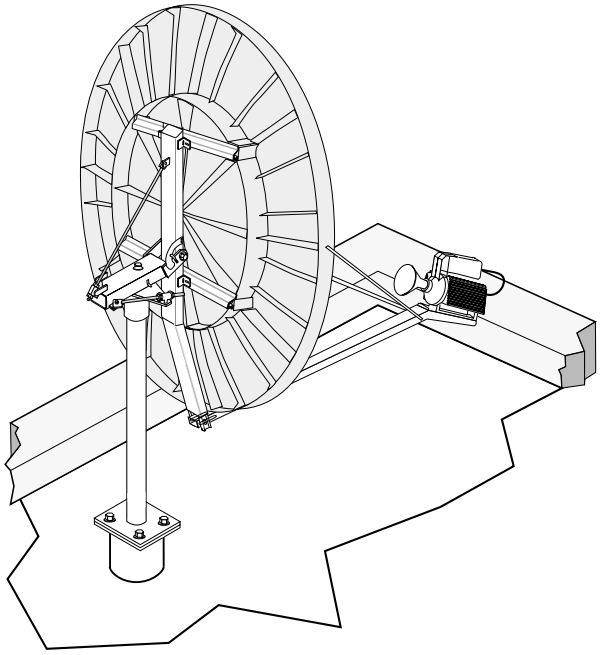
Figure 2B. Prodelin 1.8M Quick Repoint Antenna on Penetrating Roof Mount (Standard Mast Connection with square plate)



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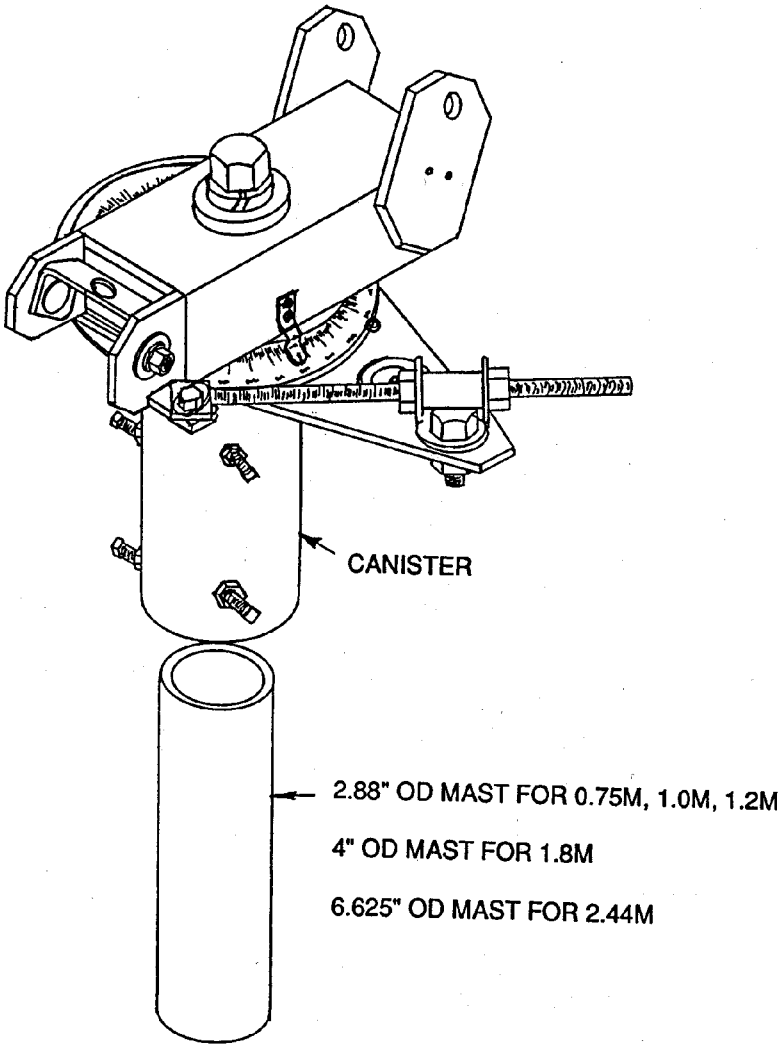
All HNS VSAT antennas are designed to fit on a mast (also called a pole or pipe). The antenna canister fits loosely over the mast and is securely clamped in place with square head screws as shown in figure 3. HNS supplies a mast according to the size of the antenna required. This section defines the requirements for providing a point for attaching this mast to a suitable building column. The canister-over-mast arrangement allows the antenna canister to be adjusted to be level if the mast is within 5 degrees of vertical.

Figure 3. Az/El Positioner Assembly for VSAT Antennas

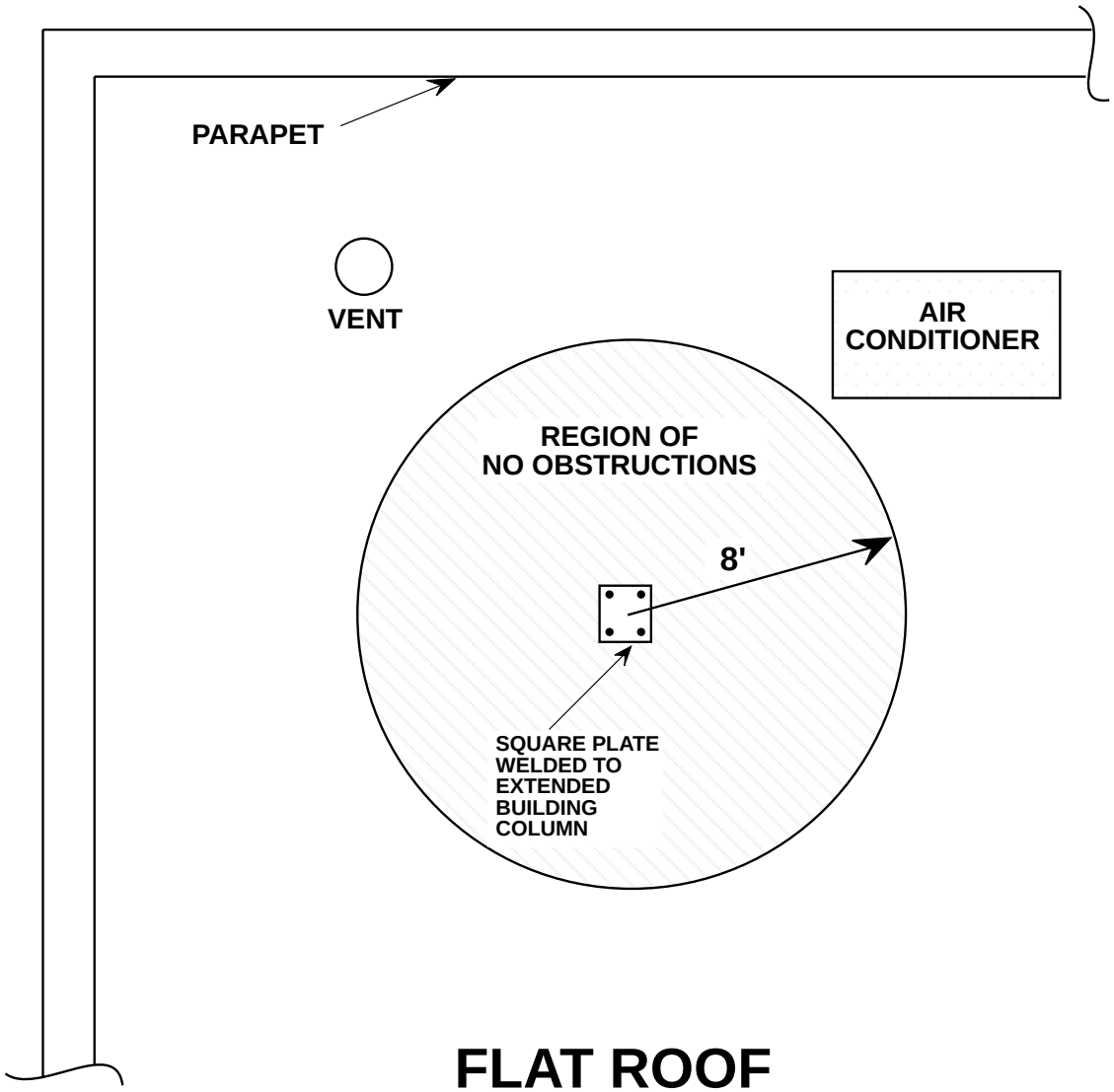


01W0231 scan

A. Antenna/Penetrating Mast Location on the Building

1. The optimum penetrating mast mount is an extension of one of the roof support columns of the building through the top plane of the roof.
2. The mast is to be located in an area of the roof that has no obstructions within a radius of 8 feet from the mast. Typical obstructions to be considered are air conditioners, tall vents, and parapets.
3. The building column needs to be securely anchored so that there is no twisting or flexing permitted at the point of attachment. HNS provided mast bolts to a square plate welded to the top of the building column.

Figure 4. Select Building Column in Region of No Obstructions



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B. Quick-Clamp Mast Penetrating Mount

The quick-clamp mast (figure 5) offers the advantage that no welding is required for installation. The quick-clamp mast is designed to attach to an existing steel I-beam shaped building column. Presently the quick-clamp mast is available with a 2.88” outside diameter mast. Therefore, the quick-clamp mast is appropriate for the 1.0 meter and 1.2 meter antennas only.

At the point where the mast passes through the roof weather protection is provided by a special roofing device know as a “pate curb”, where pate is a brand name

Figure 5. Quick-Clamp Mast

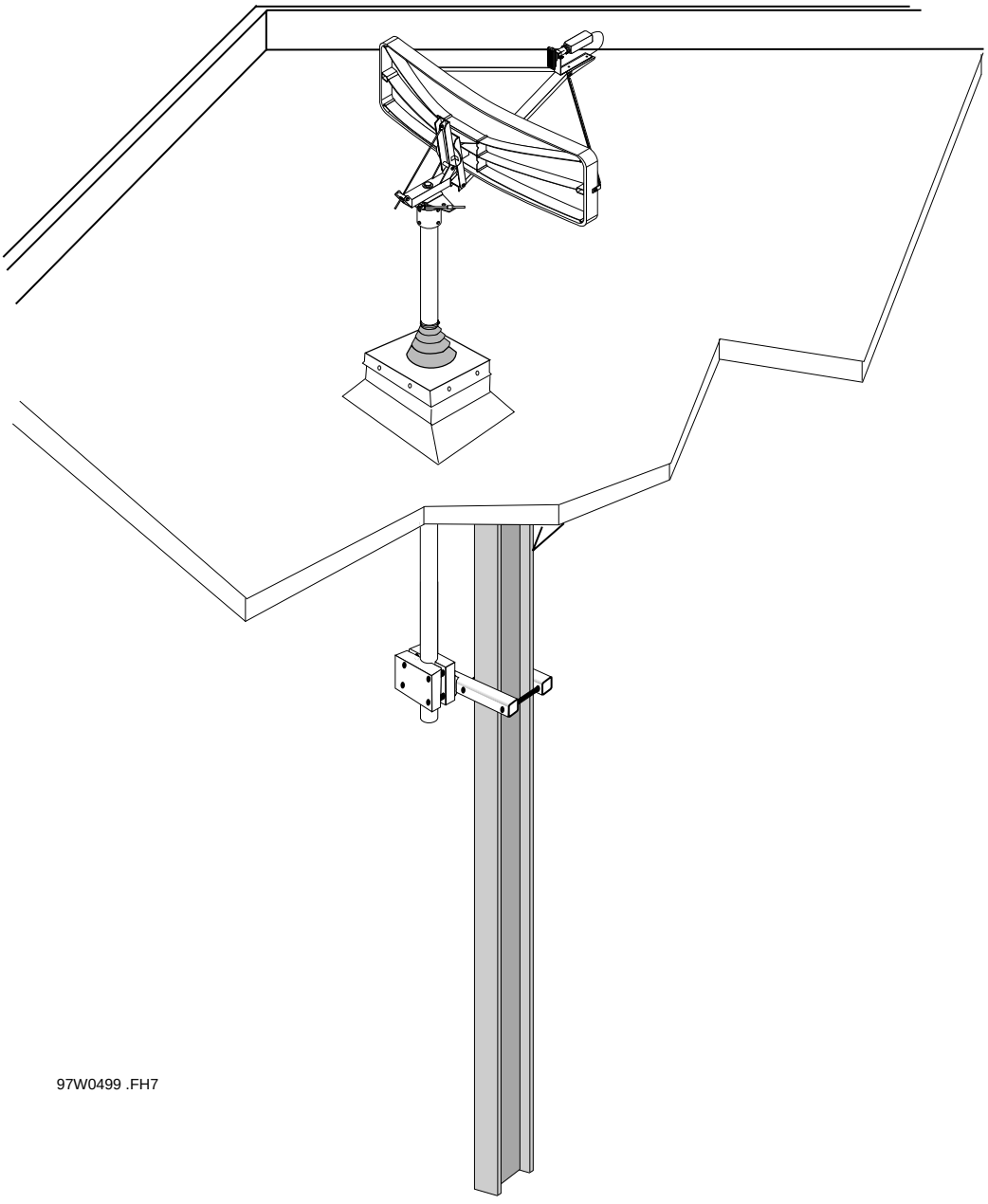

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Figure 6. Quick-Clamp Mast Structural Detail

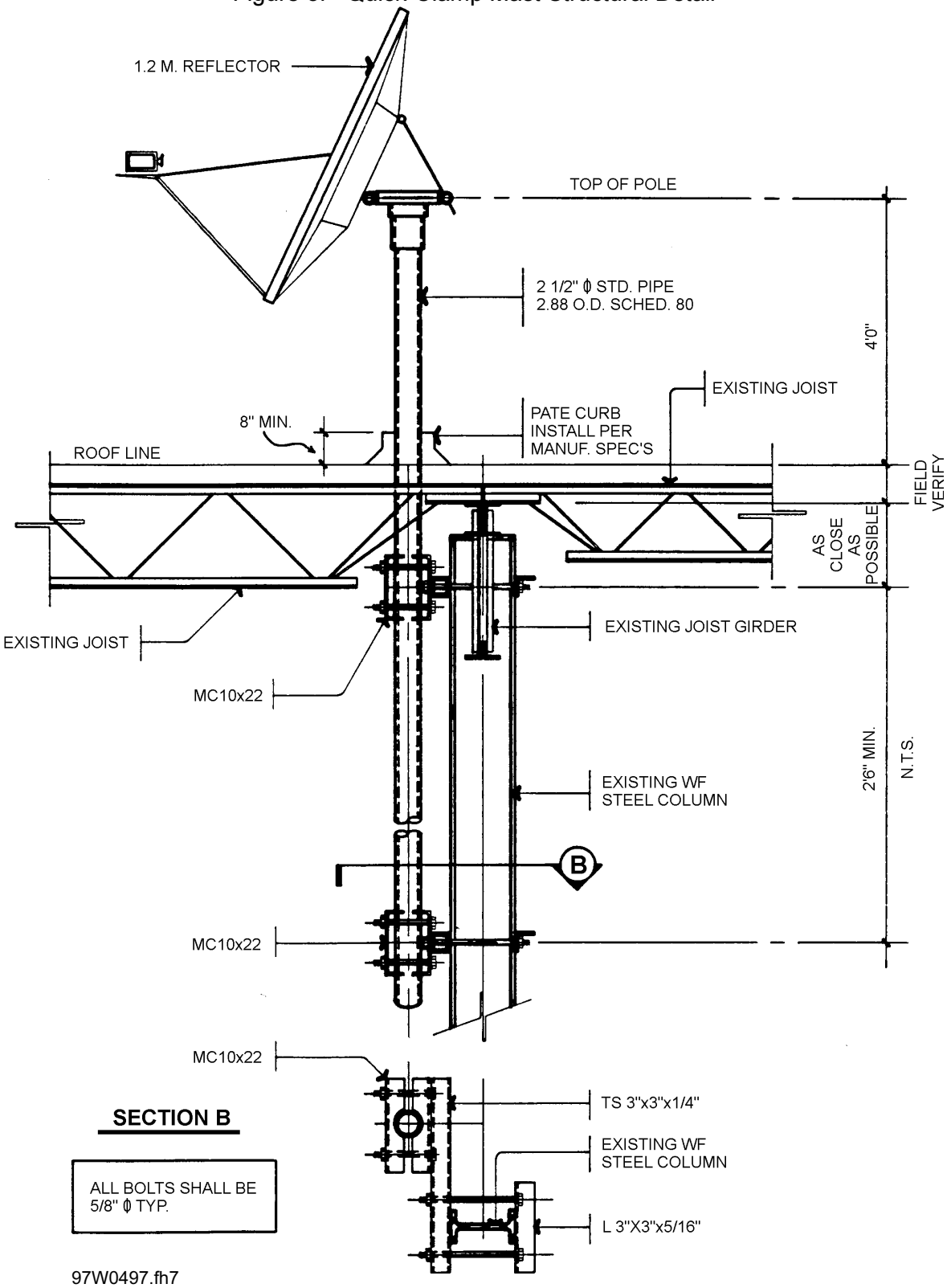

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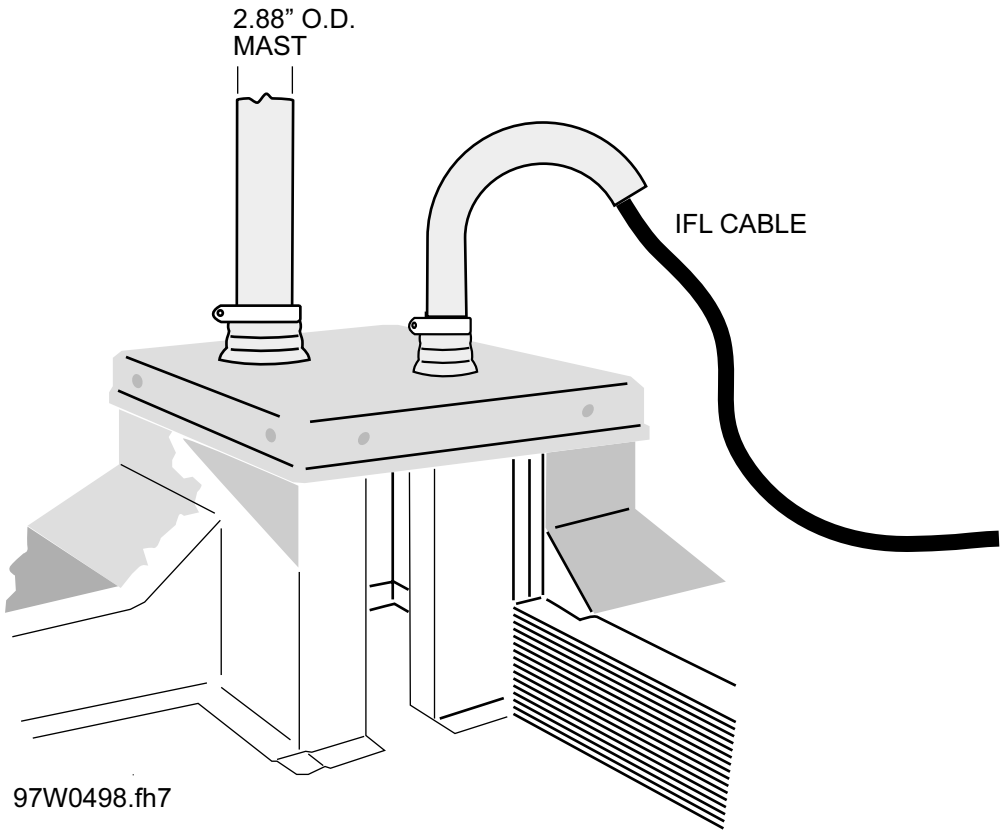
Figure 7. Pate Curb for Quick-Clamp Mast Weather Seal



C. Standard Mast Connection with square plate

The standard mast connection with square plate offers the advantage the size of the antenna (1.0, 1.2, or 1.8 meter)can be determined at the time of PES installation.

1. The building contractor needs to extend a building column to a height of 1 foot above the plane of the roof and needs to weld a 12" × 12" × 3/4" plate to the top of the column as shown in figure 8. The 12" × 12" plate is to have (4) 13/16" holes as shown in figure 9.
2. At the time of installation of the VAST antenna, the HNS installer will bring the appropriate mast for the size of antenna to be installed. **The building contractor should NOT fabricate or install a mast above the welded plate.**

Figure 8. Building Contractor Provides Extended Building Column with Welded Plate

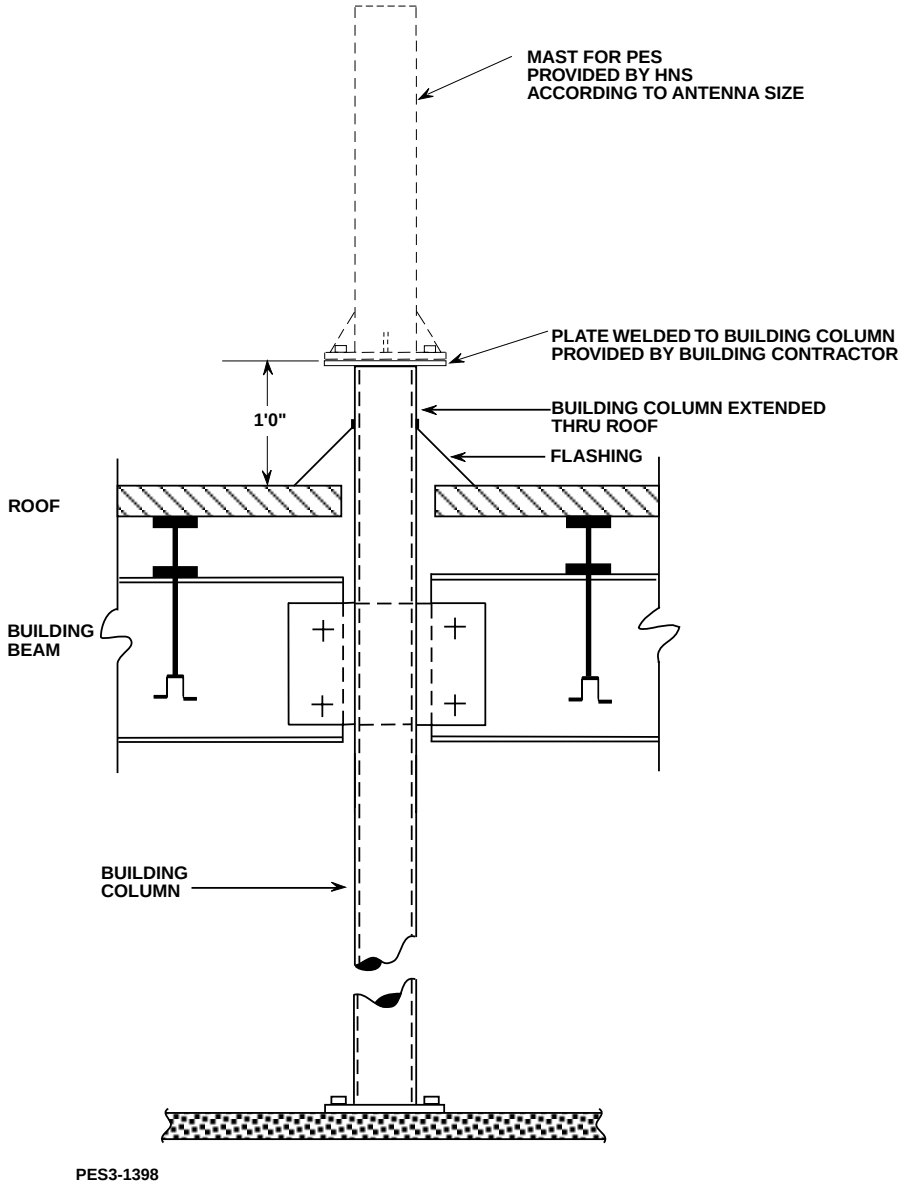
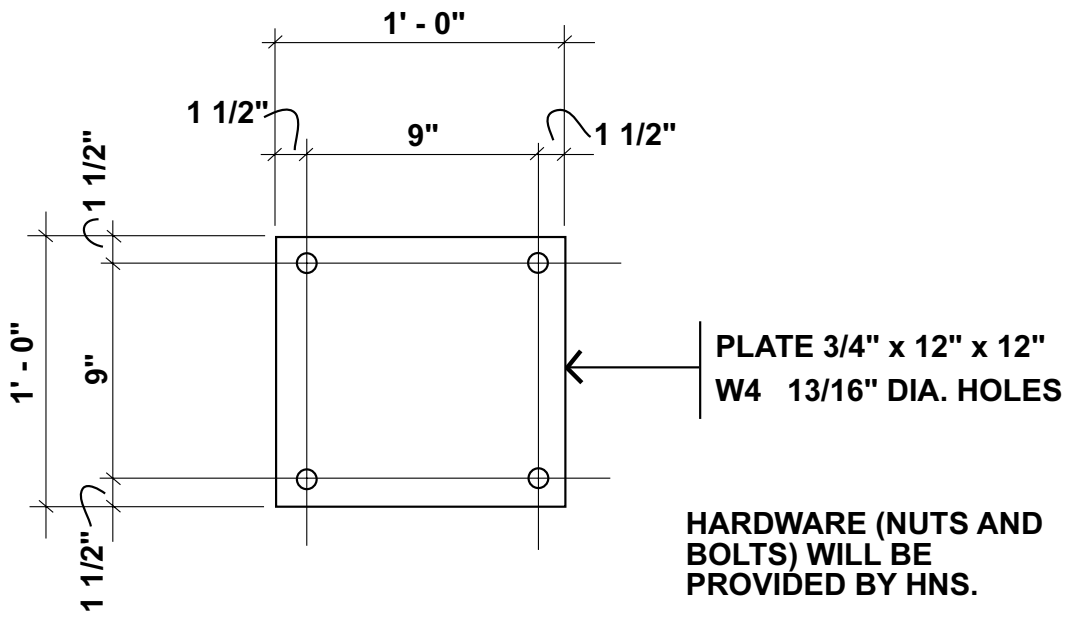
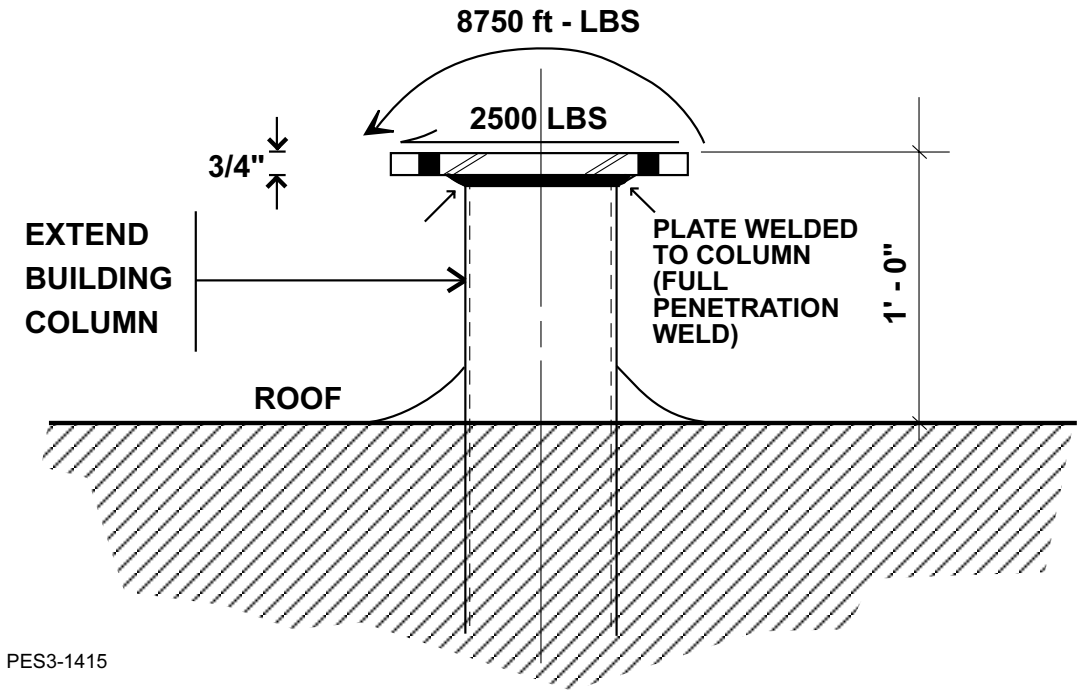


Figure 9. Building Column & Welded Plate – Specifications



NOTE: BUILDING STRUCTURAL ENGINEER OF RECORD TO PROVIDE FOR SHEAR AND MOMENT SHOWN FOR WIND ON SATELLITE ANTENNA. LOADS SHOWN ARE FOR WORST CASE OF 120 M.P.H. WIND ON A 2.4M DISH 3'6" ABOVE REFERENCE POINT (plate).



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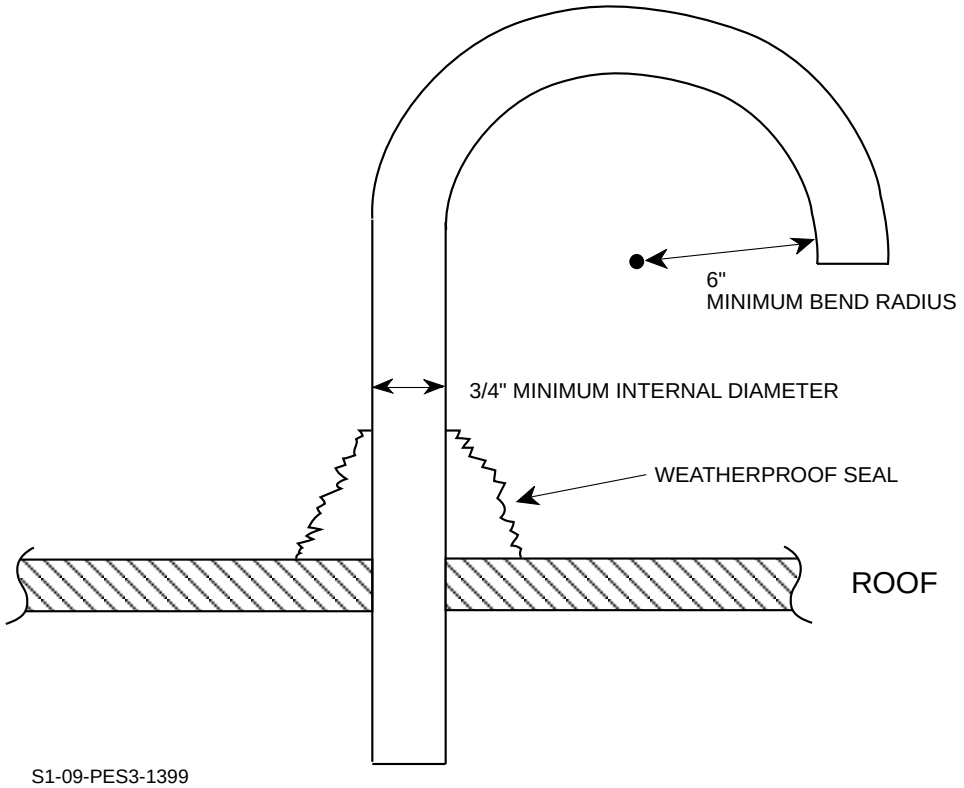
PROVIDING AN IFL CABLE POINT OF ENTRY

1. No electrical power is required on the roof to operate the PES™, unless the antenna is designated to include anti-ice equipment (see Anti-Ice Electrical, page).
2. An Interfacility Link Cable (IFL) will be installed by HNS to connect the indoor unit in the computer area to the outdoor unit on the roof. A point of entry (POE) for this coax cable is required, preferably in an area between 2 to 6 feet of the mast.
3. If conduit is used for the POE, it needs to be a minimum of 3/4" inside diameter. The path inside the building must allow for a minimum of 6" sweeps, otherwise the coax cable can be damaged.
4. A 180-degree weatherhead maintaining minimum 6" sweeps is recommended for the POE. See figure 10 for a typical weatherhead made from PVC conduit and a pipe seal boot.
5. While it is not a Hughes Network Systems requirement to have the IFL cable enclosed in conduit for its entire run from the roof to the computer area, if the building is designed with such a conduit, the building electrical engineer needs to show this on the building drawings.

   In addition, such lengthy conduit runs need to be installed with a pull string to facilitate the installation of the IFL cable by Hughes Network Systems installation personnel.

Figure 10. Weatherhead Cable Entry



NOTE: Roofer should be aware that local municipal regulations or building fire rating may require the use of EMT or rigid conduit in lieu of PVC.

ELECTRICAL REQUIREMENTS FOR ANTI-ICING

1. For those areas of the country where there is a significant amount of freezing rain, the installation of deice equipment on the antenna may be specified.

   If there is any chance that deice equipment will be installed either during the initial installation or even at a later date, a separate electrical circuit with a weatherproof receptacle or junction box should be installed above the roof as part of the base building, following the specification provided below.

2. The revised power requirements are listed in Table 1.

Table 1. Anti-Icing Power Requirements
(revised for new Prodelin equipment as of 2/10/97)

Anti-Icing System	Maximum Power (nominal)	Connection (GFI) Requirement	Connection (Standard) Requirement
1.0M rectangular full backshell	260 watts[1]	GFI circuit breaker* (15A or 20A circuit)	Std circuit breaker (15A or 20A circuit)
1.2M half backshell, anti-ice, full backshell cover	237 watts[2]	GFI circuit breaker* (15A or 20A circuit)	Std circuit breaker (15A or 20A circuit)
1.8M half backshell	490 watts[3]	GFI circuit breaker* (20A circuit)	Std circuit breaker (20A circuit)
2.44M half backshell	797 watts	GFI circuit breaker* (20A circuit)	Std circuit breaker (20A circuit)

1 Prodelin document #4096-337 Rev. A dated August 11, 1994 attached to FSB1142B incorrectly states that the 1.0M anti-ice system "operates at 440 watts." The correct value is 260 watts.

2 Prodelin document #4096-338 Rev. A dated February 28, 1995 attached to FSB1146A incorrectly states that the 1.2M anti-ice system "operates at 315 watts." The correct value is 237 watts.

3 Prodelin document #4096-378 Rev. A dated December 16, 1994 attached to FSB1153 incorrectly states that the 1.8M anti-ice system "operates at 460 watts." The correct value is 490 watts.

* In general, HNS recommends but does not require a GFI protection. If your company requires a GFI protection, it should be documented in the PES installation specification for your company. For GFI protection, your company has the option of installing a GFI circuit breaker as shown in figure 11 or a GFI switch as shown in figure 12. In general, a GFI switch provides equivalent protection at a lower initial cost. If local or municipal codes require a GFI circuit and the circuit breaker option is selected, the existing electrical sub-panel will dictate what type GFI circuit breaker must be utilized. The circuit breaker must be installed in an accessible electrical panel, and clearly labeled "satellite antenna de-icer" so a manual reset can be done if required.

3. For 1.0M, 1.2M, 1.8M and 2.4M antennas, the deice equipment includes a flexible 25 to 50 foot electrical cord with a factory-installed molded three-pronged electrical connector. As shown in figure 11, a 120-Vac receptacle (duplex outlet) within **20** feet of the mast attached is required. To avoid possible physical interference with the antenna, the top of the receptacle should be no higher than 7 inches above the roof if it is within 8 feet of the mast.
4. Additional Anti-Icing Notes:
   a. Power: 120 Vac, 60 cycle – 1 phase – does not have to be conditioned power.
   b. Circuit Breaker: 120 Vac, GFI (Ground Fault Interrupter or regular, see Table 2). Circuit breaker must also be installed in accessible electrical panel, and clearly labeled "satellite antenna anti-icer" so a manual reset can be done by customer if required.
   c. Wiring: 3-wire and conduit, if applicable, following National Electrical Code and local applicable code.
   d. Roof Receptacle**: Bell outdoor Single Gang Box (Raco # 5320-0 and Hubbell Receptacle, cat. # 5251 [15A.] or 5361 [20A.]) or their equivalent (see figures 15 and 16). Use the appropriately current rated receptacle, 15A. or 20A., for the circuit breaker installed. Locate the receptacle as closely to antenna base as is reasonably possible.
   e. Weatherproof Box Cover: Rayntite II Single Gang weatherproof cover (Raco # 5054-0) or its equivalent (see figure 17).

****Note**: Do not install/use a resettable type outlet on the roof because it will not be noticed if it trips. An indoor circuit breaker and GFI switch are preferred because they are more likely to be noticed if they trip.

Your company may choose a regular circuit breaker (where local electrical codes permit) or a Ground Fault Interrupter (GFI) circuit breaker for the anti-icing electrical circuit as shown in figure 11. In general, HNS recommends but does not require GFI protection. A GFI circuit breaker can be expensive.

Figure 12 illustrates the option of providing GFI protection using a regular circuit breaker and a lower cost GFI switch (known as a “faceless receptacle”). Your company may choose to have new buildings constructed with anti-ice receptacles according to figure 12. If your company chooses to have HNS install receptacles for anti-icing, HNS contracted electricians will install GFI anti-ice receptacles according to figure 12 unless specifically directed otherwise.

Figure 11. Receptacle on Regular or GFI **Circuit Breaker** for Anti-Icing for 1.0M, 1.2M, 1.8M or 2.4M Antennas

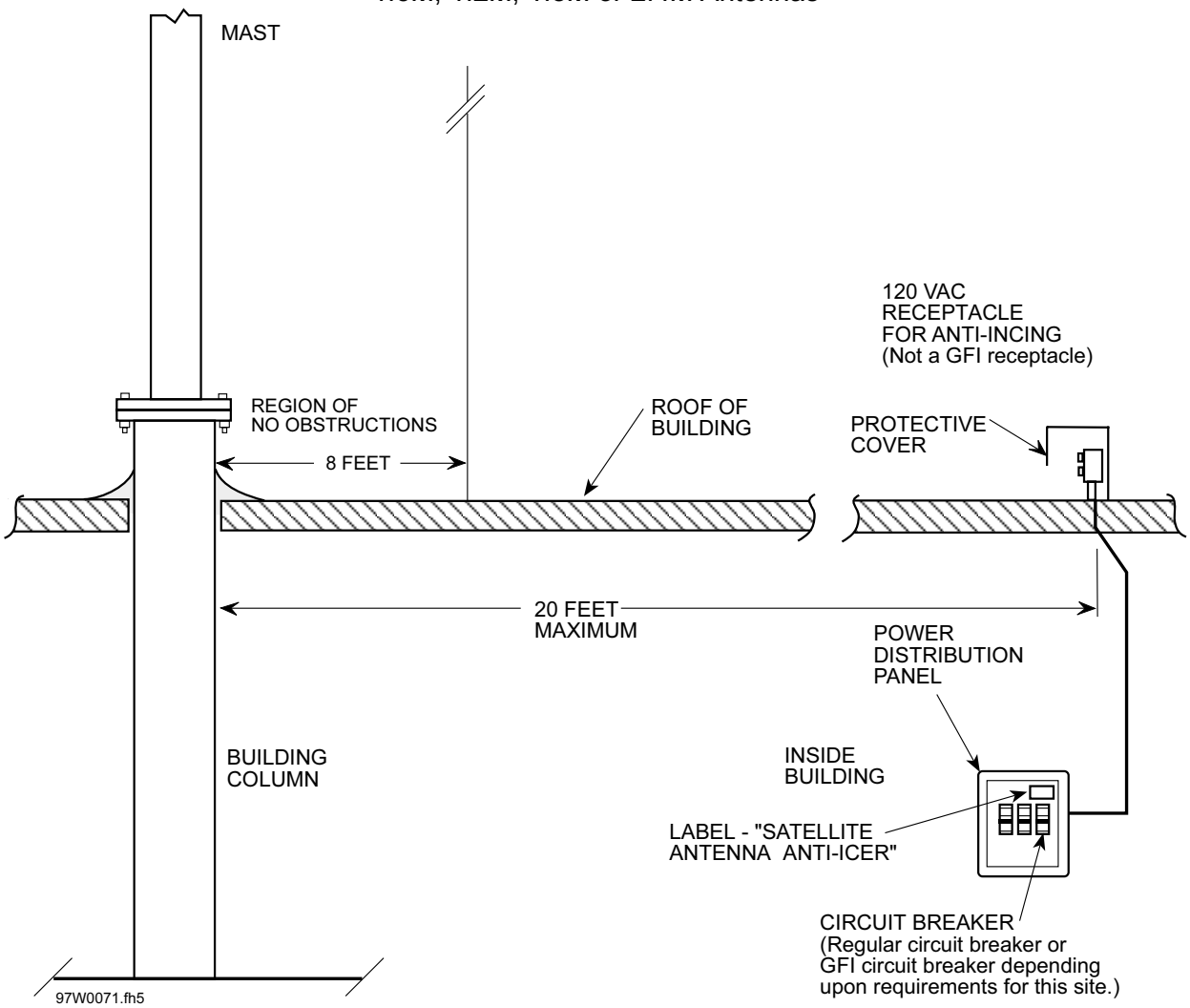


Figure 12. Lower Cost Option: Receptacle on GFI **Switch** for Anti-Icing for 1.0M, 1.2M, 1.8M or 2.4M Antennas

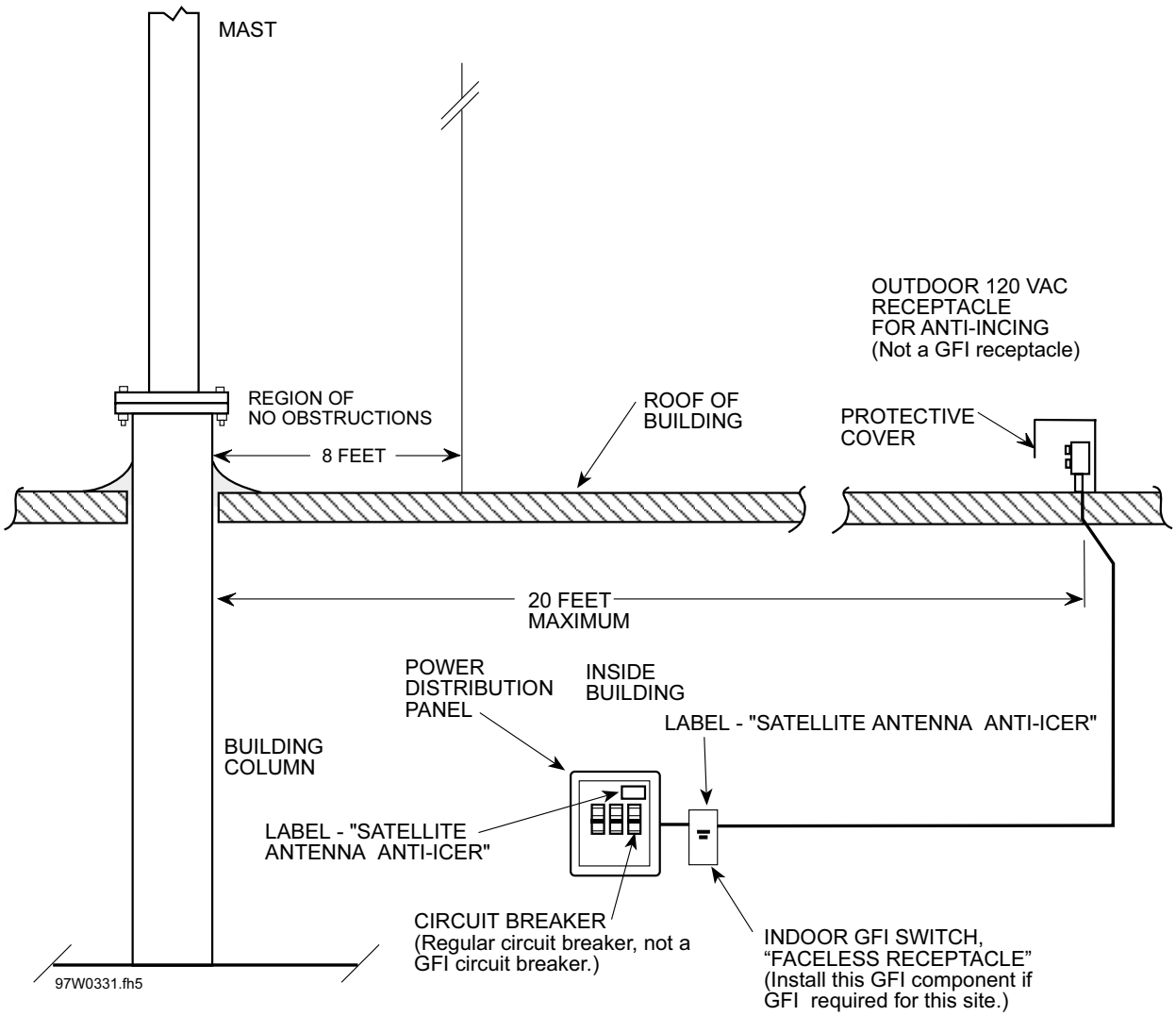
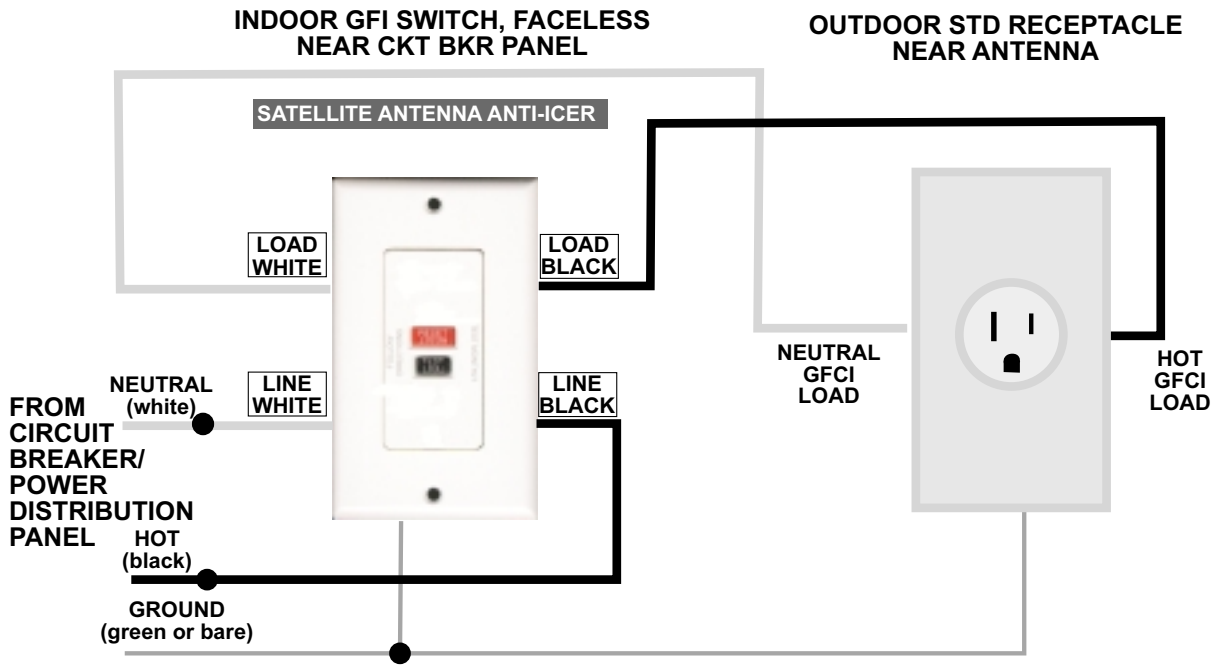


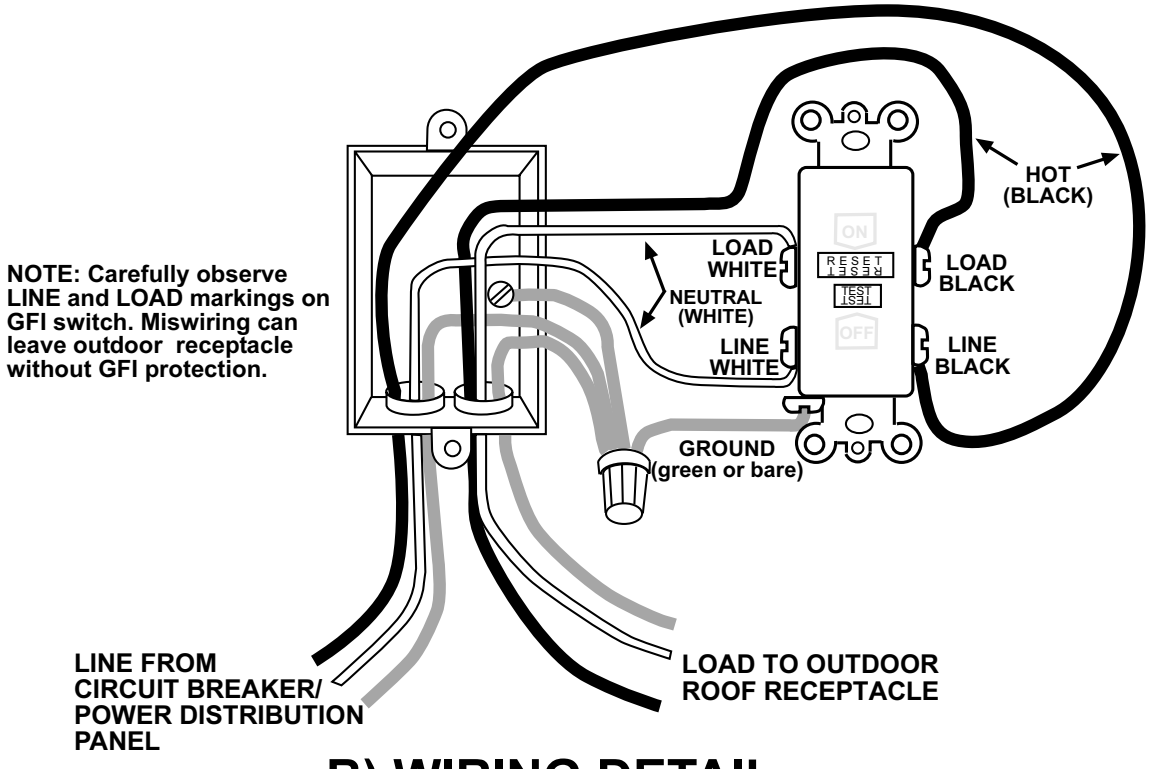
Table 2. Electrical Components for Installing Roof Receptacle for Anti-icing.

Item #	Mfg.	Mfg. Part Number	Description	Application Comment (Figure Reference)
1	Leviton or equivalent	6490 or equivalent	Ground Fault Interrupter Faceless 20A-125vac Switch (also called "faceless receptacle" even though it has no receptacle sockets)	Install indoors where GFI protection required. Available from electrical supply houses, generally not available from hardware stores. This is the preferred component for GFI protection. (figure 13)
2	Leviton or equivalent	6599 or equivalent	Ground Fault Circuit Interrupter Duplex Receptacle (GFCI) 125 vac-60 Hz 20A Feed-Through Rating, 15A-Outlet Rating	Install indoors where GFI protection required if item # 1 is not available. The electrical outlets of this component are not intended for use in this anti-ice application. Cover the electrical outlets with child protective devices. The component is being used for its feed through GFI protection only. Near the GFI receptacle, place a label reading: "Satellite Antenna Anti-Icer Only. Do not use outlets." (Figures 14)
3	Raco or equivalent	5320-0 or equivalent	Single-Gang Box, Die Cast Aluminum	Install outdoors near antenna (figure 15)
4	Hubbell or equivalent	5251 (15A 125vac) or 5361 (20A 125vac)	Heavy Duty Single Receptacle	Install appropriately rated receptacle outdoors near antenna (figure 16)
5	Raco or equivalent	5054-0 or equivalent	Rayntite single-Gang Weatherproof-while-in-use Box Cover	Install outdoors near antenna (figure 17)

Figure 13. Installing Indoor GFI Switch - “Faceless Receptacle”



A) WIRING OVERVIEW



NOTE: Carefully observe LINE and LOAD markings on GFI switch. Miswiring can leave outdoor receptacle without GFI protection.

B) WIRING DETAIL

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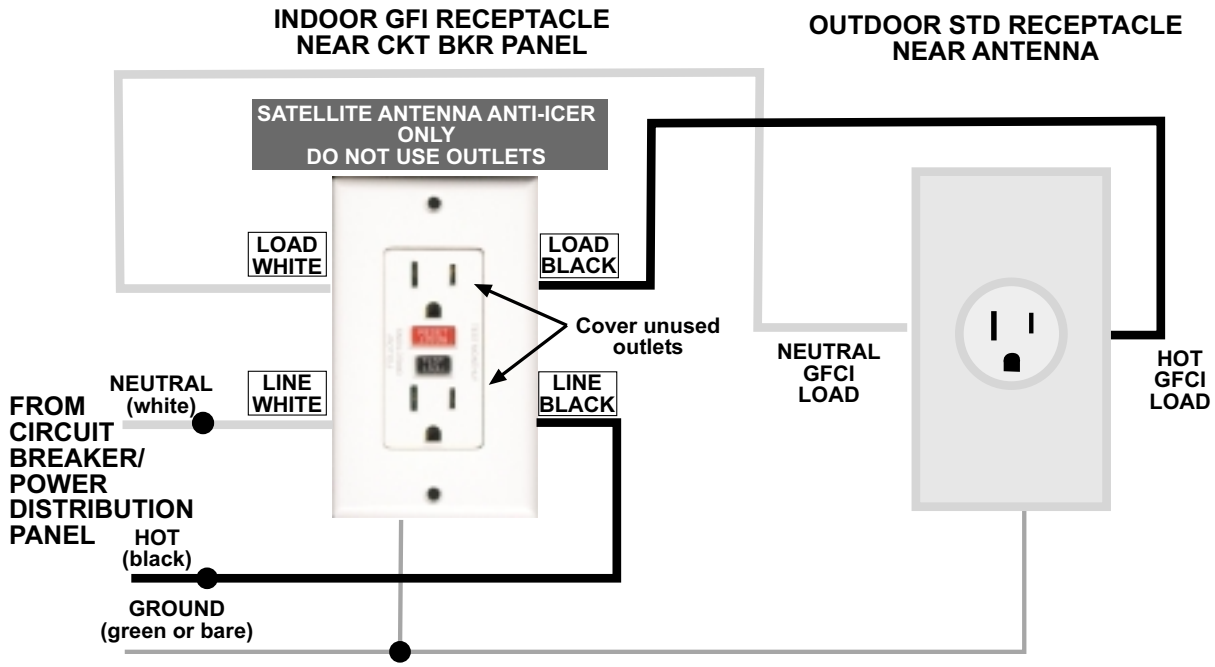
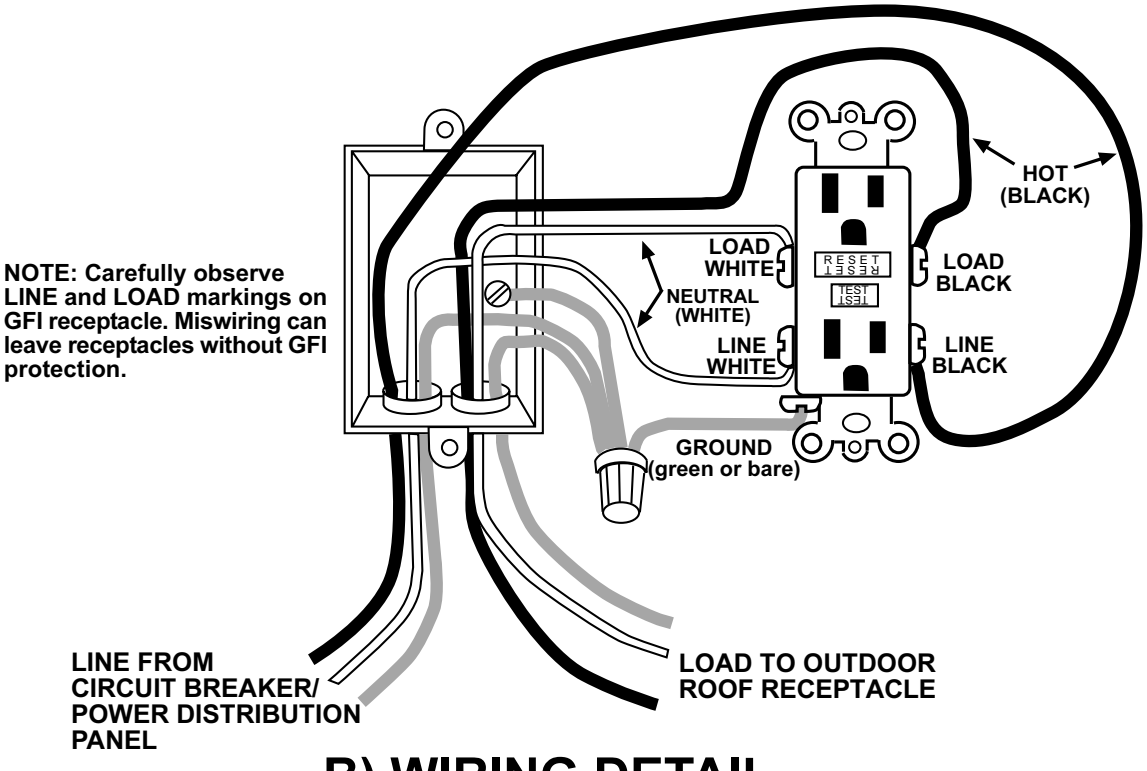
Figure 14. Installing Indoor GFI Switch - GFI Receptacle



A) WIRING OVERVIEW



NOTE: Carefully observe LINE and LOAD markings on GFI receptacle. Miswiring can leave receptacles without GFI protection.

B) WIRING DETAIL

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Figure 15. Raco 5320-0 Single-Gang Box, Die Cast Aluminum

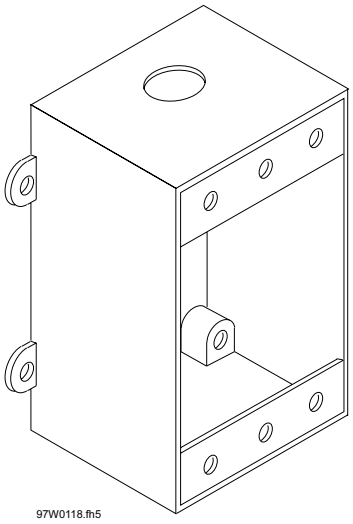

Figure 16. Hubbell Heavy Duty Single Receptacle

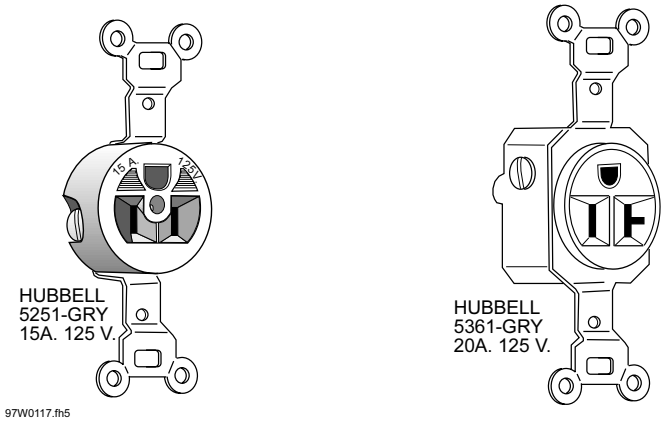
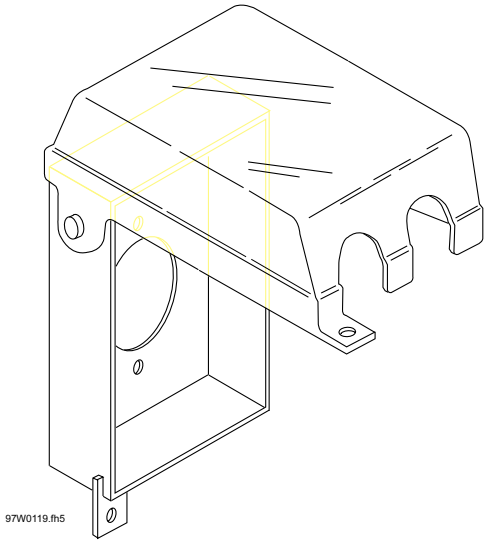
Figure 17. Rayntite II 5054-0 Single-Gang Weatherproof-while-in-use Box Cover