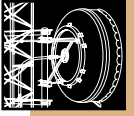




*Microwave and Wireless  
System Planning*



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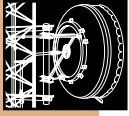
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## Microwave Antenna Systems *Overview*



Andrew microwave and wireless systems include a wide range of product offerings including antennas, transmission line, and accessories. In addition, we offer a variety of services to help you including sales support, program management, and on-site installation. This catalog provides you with the information you need to plan and build a microwave system. It details the options available in both electrical and mechanical performance parameters.

- *Quality products*
- *Product selection assistance*
- *Certified installation*
- *System performance guarantee*
- *Single point responsibility... Andrew*

### ***Microwave Antenna Systems***

Typical microwave systems use a coaxial or waveguide transmission line between the antenna and radio. Another option, direct integrated systems, attach the radio directly to the antenna. The direct integrated antennas are options available to Andrew ValuLine Series<sup>®</sup> antennas.

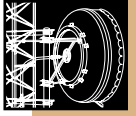
#### **Terrestrial Microwave Antennas**

Terrestrial microwave (TMW) antennas produce highly directional beams that are typically used in point-to-point microwave systems. Options are available in grid or solid reflectors, single polarized, dual polarized, and multiband operation. These variations provide radiation pattern control and other performance levels to meet your requirements.

Grids are used at the low end of the spectrum (below 3.6 GHz) and where low wind loading is required. They are only available in single polarized versions and contain coaxial inputs.

Solid reflectors are used throughout the frequency spectrum. Depending upon the antenna type, antenna inputs are either coaxial or rectangular waveguide.

Dual polarized antennas can double your system's capacity or provide a solution for site coordination issues. Multiband antennas allow two different frequency bands, many with dual polarity, to be placed within one operating antenna. This reduces the occupied tower space and wind loading to the tower.



## Microwave Transmission Lines

Microwave transmission line's main function is to effectively deliver as much energy from the antenna to the receiver, or from the transmitter to the antenna. The two types of transmission line are coaxial and waveguide.

Coaxial transmission line is either air or foam dielectric. Generally, air cable provides lower return loss and insertion loss than foam cable. However, foam cable does not require air pressurization.

Waveguide transmission line is available in these types: elliptical, circular, rigid rectangular, and flexible rectangular. A typical system uses elliptical waveguide (EWG) as the main feeder to the system. Elliptical waveguide varies in size based upon the frequency it carries. After the elliptical waveguide, with connectors, is routed into the building, rigid rectangular waveguide (RWG) is used. Rigid rectangular waveguide provides the required mechanical and twisting characteristics. The flex section is the final link from the transmission line to the radio. Flex sections can remove mechanical stresses placed on the (soldered) flanges and simplify final testing and assembly.

Circular Waveguide (WC) provides the best electrical performance specifications when low attenuation is critical. However, the installer is tasked with additional installation, testing and tuning challenges. The circular waveguide is typically used for the vertical portion of the feeder run, with a circular-to-rectangular transition located at the top and bottom of the vertical run. At each transition end, elliptical waveguide jumpers connect with the antenna's feed and radio.

### Dehydration Pressurization Equipment

Dehydration pressurization equipment maintains the integrity of waveguide and air dielectric type microwave systems. It does so by placing dry air, on demand, through the transmission line and into the feed preventing ingress of moisture that can degrade its electrical performance. Although gaskets are provided when required within connectors and interface flanges, condensation can be drawn into a system if it is not pressurized.

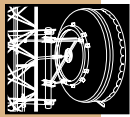
It is important to provide this internal air pathway



throughout the system to the feed. This is typically interfaced through the waveguide or air dielectric transmission line. Dry air enters the transmission line through an adapter located on the RF connector.

Dehydration systems create dry air which keep the dew point within the transmission line/feed system at  $-40^{\circ}\text{C}$  ( $-40^{\circ}\text{F}$ )\*, which is a lower temperature than that of most microwave site locations. In addition, the air pressure provided is greater than the air outside, and will not allow the ambient moisture to be drawn into the system that can degrade both insertion and return loss (VSWR) measurements.

\* operational dew point dependent on dehydrator selection



## Powertools System Planning Software

The Andrew Powertools system planning CD-ROM contains an easy-to-use suite of system planning tools. Powertools software programs cut the time needed to accurately plan an RF telecommunication system.

The Powertools CD-ROM includes several system planning programs to speed the RF system design process. These programs are especially useful for the design of terrestrial microwave antenna systems, PCS and cellular systems, DTV and NTSC broadcast systems, wireless RF, broadcast and microwave transmission line systems.

The Powertools CD-ROM includes these TMW system planning tools:

- Andrew Microwave System Planner (AMSP)
- ezGuide™
- PSI Select Pressurization Planner

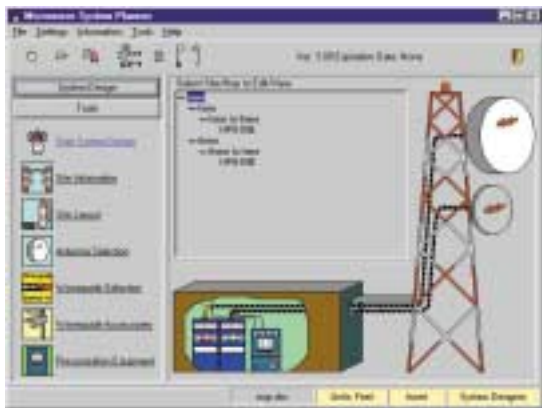
It also includes these additional system planning tools:

- Andrew Antenna System Planner (AASP)
- Andrew Broadcast System Planner (ABSP)
- Andrew ESA System Planner

You can request the Powertools CD-ROM (Bulletin M400) or download software tools from the Andrew web site, [www.andrew.com](http://www.andrew.com).

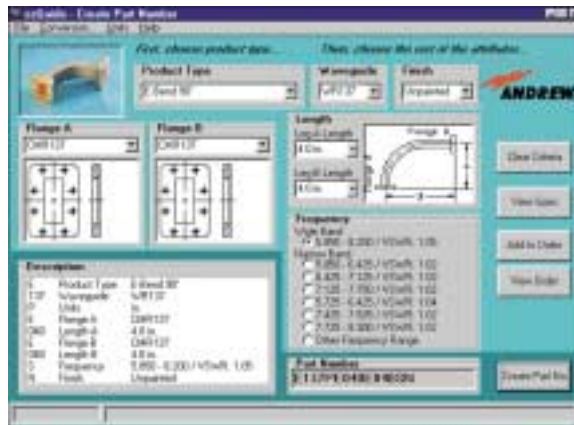
### Andrew Microwave System Planner (AMSP)

The AMSP is a complete terrestrial microwave system design tool. AMSP helps you with equipment selection and system planning, including choices of terrestrial microwave antennas, waveguide, flex twists, accessories, and pressurization. The program generates custom solutions with standard Andrew products, automatically checking component compatibility and preventing the design of an incompatible system. After you complete the system design, AMSP provides you with a customized bill of materials.



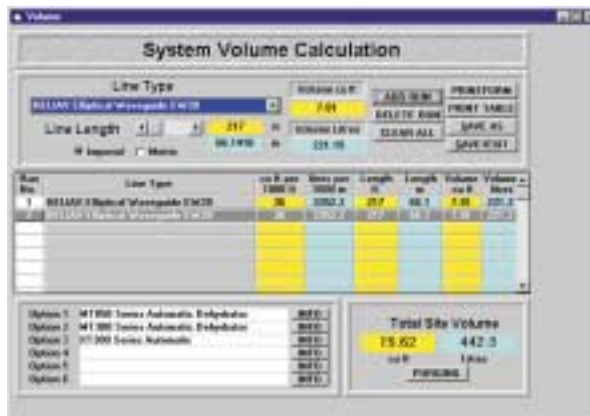
### ezGuide

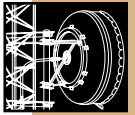
ezGuide software guides the design and ordering process for rectangular waveguide microwave transmission lines. The exact component type, waveguide size, flange types, component dimensions, operating frequency band, and finish can be specified with point-and-click options. Each product is pictured on the screen and diagrammed for your reference.



### PSI Select Pressurization Planner

The PSI Select Pressurization Planner offers complete information on Andrew pressurization products and accessories. The program performs system calculations and dehydrator selection for either a new site or for modifying an existing site. PSI Select Pressurization Planner also provides catalog information and several pressurization presentations in Microsoft® PowerPoint®.





### Andrew Antenna System Planner (AASP)

The AASP graphically guides you through the entire design process and allows you to create and save up to five of your own operating bands in any frequency range from 0 to 8 GHz. All components are checked for frequency compatibility, and electrical performance is given for each transmission line including insertion loss and VSWR for selected cables. The base station antennas selection program includes Radiation Pattern Envelopes (RPEs) and specifications for easy viewing, printing, and exporting to popular propagation software programs. The enhanced repeater program for null sites answers common scenarios and provides a list of materials for the repeater site. After you complete the system design, AASP provides you with a customized bill of materials and the Andrew parts necessary for your system.



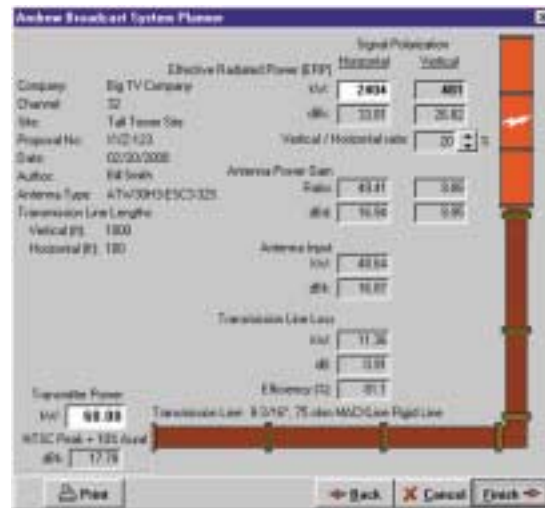
### Andrew ESA System Planner

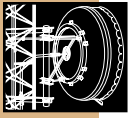
Andrew ESA System Planner is a complete earth station antenna system design tool. The ESA System Planner helps you with equipment selection and system planning, including choices of earth station antennas and accessories. The program generates custom solutions with standard Andrew products, automatically checking compatibility and preventing the design of an incompatible system. After you complete the system design, the ESA System Planner provides you with a customized bill of materials.



### Andrew Broadcast System Planner (ABSP)

The ABSP helps broadcast consultants and engineers configure digital and analog television broadcast systems. The ABSP supports H-Pol, E-Pol, and C-Pol designs; printed information and full layout of the system, including antenna patterns and tabulated data, along with data for power analyses. It also produces electronic files of antenna patterns for propagation studies. The ABSP comes preloaded with more than a dozen standard directional patterns and 35 popular broadcast transmission line selections.





## Systems Using Air-Dielectric HELIAX® Coaxial Cable

Andrew offers terrestrial microwave antenna systems from 335 MHz to 3.9 GHz\* in a wide range of frequency band offerings to meet your system design requirements. The details below describe each component of the terrestrial microwave antenna system shown on the following page.

**1 Antenna.** Many different antennas are available to meet your electrical and mechanical specifications. The types of antennas include grid, standard, focal plane, and shielded, all providing the flexible range of performance parameters required for each system design. Whether it's radiation side lobe suppression, low VSWR, dual or multiband operation, high wind, or extreme environment, Andrew provides the highest quality products in the industry. See pages 51-60.

Grid, standard, and focal plane antennas consist of three major components, the mount, reflector, and feed. Focal plane antennas further reduce side lobe and front to back levels. Most antennas feature a modular design to allow interchangeability or field upgrading. Shielded antennas add the shield around the reflector's aperture to reduce radiation side lobes. In addition, a planar radome is included to reduce the wind load effects of the shield.

*Antenna Options.* Most antennas have standard options for harsh environment, high wind, flange inputs, paint color, radome, and packaging. See pages 114-122.

*Optional Struts.* Optional struts can provide added rigidity to antennas. Bottom struts help with snow and ice loading. See page 123.

*Termination Loads.* Termination loads are used in a dual or multi-band antenna when all of the feed ports are not being used. They keep interport isolation levels low rather than use a shorting plate. See pages 126, 212.

**2 Radome.** You can reduce wind loading for standard and focal plane antennas by installing an optional molded radome. Molded radomes are either fiberglass or a thermoformed plastic material. All UHX, UHP and HSX type antennas include a TEGLAR® radome. All other shielded antennas include a Hypalon radome. Upgrades to TEGLAR® radomes are available for all shielded antennas 6 ft (2.0 m) and larger. Note: All 4 ft (1.2 m) shielded antennas include a TEGLAR® radome. See pages 115-119.

**3 Mounts.** All standard mounts are included with the standard antenna selections. For optional mounts such as vertical look or high tilt angle, contact Andrew. (High wind mounts request Bulletin 3511). See pages 95-110.

**4 Jumpers.** In most cases, transmission lines should connect directly to the back of the antenna feed flange. In cases where the mechanical limits of large diameter coaxial lines prevent this connection, the use of jumpers can provide the needed link. Smaller diameter HJ series cables, typically 1/2" or 7/8" diameter sizes, are used to provide the dry air path to the feed system. The 7/8" EIA flange provides the gas pass connection between cable diameters. See page 472.

\*Spread spectrum, other unlicensed radio systems, and selected antennas are available with coaxial inputs above 3.9 GHz, where noted.

**5 HELIAX® Transmission Lines.** HELIAX coaxial cable is one of the most common transmission lines used to effectively connect the antenna to the radio equipment at lower microwave frequencies. Its superior electrical and mechanical characteristics make it the best overall choice for the main feeder selection. Standard and low VSWR performance versions are available. Its corrugated construction allows you to bend and twist it for routing during installation. After installation, its rigidity provides long term installation, even in harsh environments. HELIAX coaxial cable is manufactured in continuous lengths to enable one piece use from the antenna to shelter. Available with or without connector attachment. See pages 534-565.

**6 HELIAX Connectors.** Coaxial cable does not end with a common (or default) mating flange. Many choices are available based upon your system's demands. Andrew recommends the 7/8" EIA flanges due to their superior electrical and mechanical characteristics. All air dielectric connectors contain a 1/8" NPT fitting for pressurization interface equipment. See pages 534-565.

**7 Grounding Kits.** Grounding kits help reduce the effect of lightning strikes by providing an alternative path to ground for the outer conductor. A minimum of three grounding kits are recommended for each transmission line run; one at the top of the (vertical) run, one at the bottom of the vertical run before it leaves the tower, and one prior to shelter entry. Other options are available. See pages 609-613.

**8 Hanger Support and Attachment Accessories.** Many HELIAX product accessories are available to securely fasten each transmission line type for various applications. See pages 593-608.

**9 Wall/Roof Feed-Thru Plates.** With or without the Arrestor Port Feed-Thru option the Wall/Roof Feed-Thru Plate allows building access for your transmission line, providing protection from the outdoor environment. Several types are available. See pages 619-620.

**10 Connector.** You have many options available for the connector to be used at the bottom of the run. Typically a gas barrier type is used to maintain air pressure within the air dielectric transmission line. See pages 534-565.

**11 Arrestor AGS Series.** Lightning surge arrestors are used between the end of the transmission line run and an inside jumper to protect the inner conductor of coaxial type transmission lines. The Arrestor allows the RF energy to pass, but restricts high voltage within the system. See pages 614-616.

**12 Jumpers.** Jumpers work well indoors. They provide better flexibility to make installation and transmission line testing easier. They can be either foam or air dielectric depending on individual system requirements. See pages 472.

**13 Pressurization System.** One pressurization system is typically required for each site. Many systems and components are available. The selection you make is based on system volume, system pressure, power requirements, and available options. The total internal transmission line and antenna volume at the site is calculated to properly size the dehydrator. The weak link in the pressure system is usually the antenna's feed window. This is particularly true of lower frequency/dual or multiband antennas with large diameter feed windows. Pressure limits rated below the standard 10 lb/in<sup>2</sup> are noted within the antenna specifications. The ValuLine® limit is 5 lb/in<sup>2</sup>. Power for ac or vdc versions is available. No power is also an option. Other options, such as sound deadening, high/low pressure, and high humidity are available. See pages 642-671.

# System Planning Worksheet

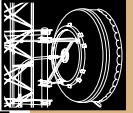
Duplicate this sheet.

## Antenna System Components

Item No.	Description	Color* (G,O,W)	Type No.	Quantity	Unit Price	Extended Price
<b>Antenna Equipment</b>						
1	Antenna					
	Optional Strut					
	Termination Load					
2	Radome					
3	Mount					

<b>Transmission Lines and Accessories</b>						
4	Jumper Cable Assembly (optional)					
5	HELIAX Coaxial Cable					
6	Connector, Top					
	Bottom					
7	Grounding Kit					
8	Cable Hanger Kit Hoisting Grip Hardware Kit Angle Adapter Kit Round Member Adapter Kit Ceiling Adapter Nylon Cable Tie Kit Threaded Rod Support Kit					
9	Wall-Roof Feed Thru or Plate/Boot					
10	Connector					
11	AGS Surge Arrestor					
12	Jumper					

Antennas: Shielded, Standard Parabolic, Focal Plane, and Grid.  
Transmission Lines: HELIAX® Air-Dielectric Coaxial Cable



Item No.	Description	Type No.	Quantity	Unit Price	Extended Price
<b>Pressurization Equipment (for Air-Dielectric Systems)</b>					
13	Dehydrator				

**Total Antenna Systems Estimate FOB Factory**

Customer Name \_\_\_\_\_

Contact \_\_\_\_\_

Project \_\_\_\_\_

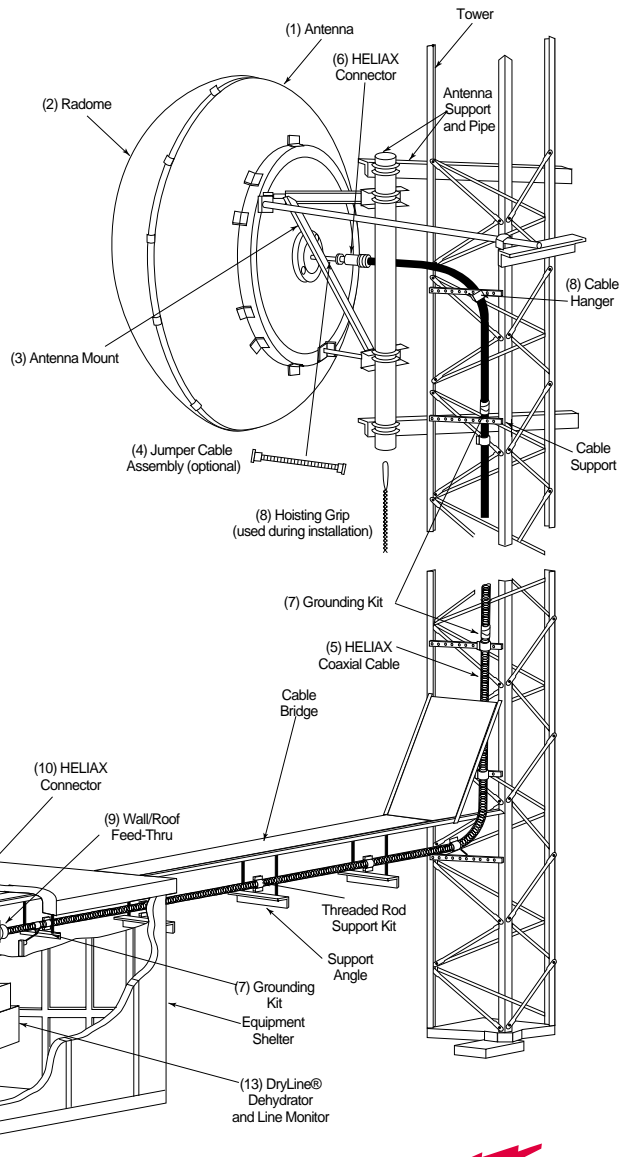
Quotation No. \_\_\_\_\_

Telephone No. \_\_\_\_\_

Customer Ref. No. \_\_\_\_\_

Site Name \_\_\_\_\_

Points to Site(s) \_\_\_\_\_

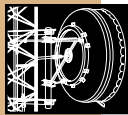


\*G=Gray, O=Orange, W=White  
(shielded and standard parabolic antennas)  
(Continued)

Prepared By: \_\_\_\_\_

Date: \_\_\_\_\_

Telephone No.: \_\_\_\_\_



## Systems Using Foam-Dielectric HELIAX® Coaxial Cable

Andrew offers terrestrial microwave antenna systems from 335 MHz to 3.9 GHz\* in a wide range of frequency band offerings to meet your system design requirements. The details below describe each component of the terrestrial microwave antenna system shown on the following page.

**1 Antenna.** Many different antennas are available to meet your electrical and mechanical specifications. The types of antennas include grid, standard, focal plane, and shielded, all providing the flexible range of performance parameters required for each system design. Whether it's radiation side lobe suppression, low VSWR, dual or multiband operation, high wind, or extreme environment, Andrew provides the highest quality products in the industry. See pages 51-60.

Grid, standard, and focal plane antennas consist of three major components, the mount, reflector, and feed. Focal plane antennas further reduce side lobe and front to back levels. Most antennas feature a modular design to allow interchangeability or field upgrading. Shielded (or shrouded) antennas add the shield around the reflector's aperture to reduce radiation side lobes. In addition, a planar radome is included to reduce the wind load effects of the shield.

*Antenna Options.* Most antennas have standard options for harsh environment, high wind, flange inputs, paint color, radome, and packaging. See pages 114-122.

*Optional Struts.* Optional struts can provide added rigidity to antennas. Bottom struts help with snow and ice loading. See page 123.

*Termination Loads.* Termination loads are used in a dual or multiband antenna when all of the feed ports are not being used. They keep interport isolation levels low rather than use a shorting plate. See pages 126-212.

**2 Radome.** You can reduce wind loading for standard and focal plane antennas by installing an optional molded radome. Molded radomes are either fiberglass or a thermoformed plastic material. All UHX, UHP, and HSX type antennas include a TEGLAR® radome. All other shielded antennas include a Hypalon radome. Upgrades to TEGLAR radomes are available for all shielded antennas 6 ft (2.0 m) and larger. Note: All 4 ft (1.2 m) shielded antennas include a TEGLAR radome. See pages 115-119.

**3 Mounts.** All standard mounts are included with the standard antenna selections. For optional mounts such as vertical look or high tilt angle, contact Andrew. (High wind mounts request Bulletin 3511). See pages 95-110.

**4 Jumpers.** In most cases transmission lines should connect directly to the back of the antenna feed flange. In cases where the mechanical limits of large diameter coaxial lines prevent this connection, the use of jumpers can provide the needed link. Smaller diameter HJ series cables, typically 1/2" or 7/8" diameter sizes, are used to provide the dry air path to the feed system. The 7/8" EIA flange provides the gas pass connection between cable diameters. See page 472.

\*Spread spectrum, other unlicensed radio systems, and selected antennas are available with coaxial inputs above 3.9 GHz, where noted.

**5 HELIAX® Transmission Lines.** HELIAX coaxial cable is one of the most common transmission lines used to effectively connect the antenna to the radio equipment at lower microwave frequencies. Its superior electrical and mechanical characteristics make it the best overall choice for the main feeder selection. Standard and low VSWR performance versions are available. Its corrugated construction allows you to bend and twist it for routing during installation. After installation, its rigidity provides long term installation, even in harsh environments. HELIAX coaxial cable is manufactured in continuous lengths to enable one piece use from the antenna to shelter. Available with or without connector attachment. See pages 474-526.

**6 HELIAX Connectors.** Coaxial cable does not end with a common (or default) mating flange. Many choices are available based upon your system's demands. Choose a connector that correctly mates with the antenna's flange or jumper. See pages 462-470, 474-526.

**7 Grounding Kits.** Grounding kits help reduce the effect of lightning strikes by providing an alternative path to ground for the outer conductor. A minimum of three grounding kits are recommended for each transmission line run; one at the top of the (vertical) run, one at the bottom of the vertical run before it leaves the tower, and one prior to shelter entry. Other options are available. See pages 609-613.

**8 Hanger Support and Attachment Accessories.** Many HELIAX product accessories are available to securely fasten each transmission line type for various applications. See pages 593-608.

**9 Wall/Roof Feed-Thru Plates.** With or without the Arrestor Port Feed-Thru option, the Wall/Roof Feed-Thru Plate allows building access for your transmission line, providing protection from the outdoor environment. Several types are available. See pages 619-620.

**10 Connector.** You have many options available for the connector to be used at the bottom of the run. Larger diameter cables may require a jumper for flexibility inside equipment rooms. Choose a mating connector to fit to a jumper or directly to the equipment. See pages 462-470, 474-526.

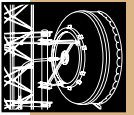
**11 Arrestor AGS Series.** Lightning surge arrestors are used between the end of the transmission line run and an inside jumper to protect the inner conductor of coaxial type transmission lines. The Arrestor allows the RF energy to pass, but restricts high voltage within the system. See pages 614-616.

**12 Jumpers.** Jumpers work well indoors. They provide better flexibility to make installation and transmission line testing easier. They can be either foam or air dielectric depending on individual system requirements. See page 472.

# System Planning Worksheet

Duplicate this sheet.

## Antenna System Components

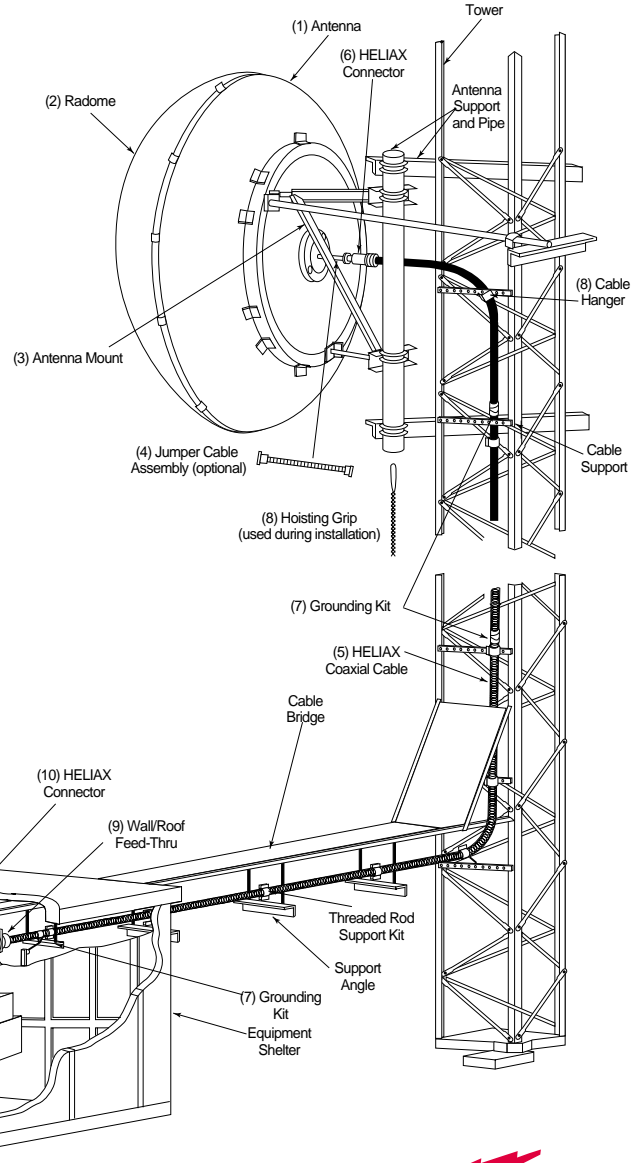


Item No.	Description	Color* (G,O,W)	Type No.	Quantity	Unit Price	Extended Price
<b>Antenna Equipment</b>						
1	Antenna					
	Optional Strut					
	Termination Load					
2	Radome					
3	Mount					

<b>Transmission Lines and Accessories</b>						
4	Jumper Cable Assembly (optional)					
5	HELIAX Coaxial Cable					
6	Connector, Top					
	Bottom					
7	Grounding Kit					
8	Cable Hanger Kit Hoisting Grip Hardware Kit Angle Adapter Kit Round Member Adapter Kit Ceiling Adaptor Nylon Cable Tie Kit Threaded Rod Support Kit					
9	Wall-Roof Feed Thru or Plate/Boot					
10	Connector					
11	AGS Surge Arrestor					
12	Jumper					

**Antennas:** Shielded, Standard Parabolic, Focal Plane, and Grid.  
**Transmission Lines:** HELIAX® Air-Dielectric Coaxial Cable

Customer Name \_\_\_\_\_  
 Contact \_\_\_\_\_  
 Project \_\_\_\_\_  
 Quotation No. \_\_\_\_\_  
 Telephone No. \_\_\_\_\_  
 Customer Ref. No. \_\_\_\_\_  
 Site Name \_\_\_\_\_  
 Points to Site(s) \_\_\_\_\_

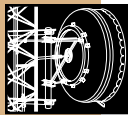


\*G=Gray, O=Orange, W=White  
 (shielded and standard parabolic antennas)

Prepared By: \_\_\_\_\_

Date: \_\_\_\_\_

Telephone No.: \_\_\_\_\_



## Systems Using HELIAX® Elliptical Waveguide

Andrew offers terrestrial microwave antenna systems from 3.4 GHz to 19.7 GHz (up to 58 GHz including ValuLine® series) in a wide range of frequency band offerings to meet your system design requirements. The details below describe each component of the terrestrial microwave antenna system shown on the following page.

**1 Antenna.** Many different antennas are available to meet your electrical and mechanical specifications. The types of antennas include, standard, focal plane, and shielded, all providing the flexible range of performance parameters required for each system design. Whether it's radiation side lobe suppression, low VSWR, dual or multiband operation, high wind, or extreme environment, Andrew provides the highest quality products in the industry. See pages 60-94.

Standard, and focal plane antennas consist of three major components, the mount, reflector, and feed. Focal plane antennas further reduce side lobe and front to back levels. Most antennas feature a modular design to allow interchangeability or field upgrading. Shielded (or shrouded) antennas add the shield around the reflector's aperture to reduce radiation side lobes. In addition, a planar radome is included to reduce the wind load effects of the shield.

*Antenna Options.* Most antennas have standard options for harsh environment, high wind, flange inputs, paint color, radome, and packaging. See pages 114-122.

*Optional Struts.* Optional struts can provide added rigidity to antennas. Bottom struts help with snow and ice loading. See page 123.

*Termination Loads.* Termination loads are used in a dual or multiband antenna when all of the feed ports are not being used. They keep interport isolation levels low rather than use a shorting plate. See pages 126, 212.

**2 Radome.** You can reduce wind loading for standard and focal plane antennas by installing an optional molded radome. Molded radomes are either fiberglass or a thermoformed plastic material. All UHX, UHP, and HSX type antennas include a TEGLAR® radome. All other shielded antennas include a Hypalon radome. Upgrades to TEGLAR radomes are available for all shielded antennas 6 ft (2.0 m) and larger. Note: All 4 ft (1.2 m) shielded antennas include a TEGLAR radome. See pages 115-119.

**3 Mounts.** All standard mounts are included with the standard antenna selections. For optional mounts such as vertical look or high tilt angle, contact Andrew. (High wind mounts request Bulletin 3511). See pages 95-110.

**4 Flex Sections.** In most cases transmission line connects directly to the back of the antenna feed flange. When the mechanical limit of elliptical waveguide prevents this connection, use a flex section to provide the necessary link. Extra care is required to support flexible component in the outdoors. See pages 61-88, 202-208.

**5. HELIAX® Elliptical Waveguide.** Elliptical waveguide is the most common transmission line used to effectively connect the antenna to the radio equipment. Its superior electrical and mechanical characteristics make it the best overall choice for

the main feeder selection. Standard and low VSWR performance versions are available. Elliptical waveguide's corrugated construction allows you to bend and twist it for routing during installation. Its rigidity provides long term durability, even in harsh environments. HELIAX Elliptical Waveguide is manufactured in continuous lengths to enable one piece use from the antenna to shelter. Available with or without connector attachment. See pages 160-193.

**6 HELIAX Elliptical Waveguide Connectors.** Elliptical waveguide does not end with a common (or default) mating flange. Many choices are available based upon your system's demands. See pages 160-193.

**7 Grounding Kits.** Grounding kits help reduce the effect of lightning strikes by providing an alternative path to ground. A minimum of three grounding kits are recommended for each transmission line run; one at the top of the (vertical) run, one at the bottom of the vertical run before it leaves the tower, and one prior to shelter entry. Other options are available. See pages 197-198.

**8 Hanger Support and Attachment Accessories.** Many product accessories are available to securely fasten each transmission line type for various applications. See pages 194-196.

**9 Wall/Roof Feed-Thru Plates.** With or without the Arrestor Port Feed-Thru option, this plate allows building access for your transmission line, providing protection from the outdoor environment. Several types are available. See page 200.

**10 Pressure Windows.** A pressure window is used as a gas barrier at the bottom of the transmission line run. Pressurization is required for waveguide that is not subjected to a controlled environment. After you have run and terminated the waveguide in the equipment room, the pressure window is usually placed in series between the bottom connector and the rectangular waveguide components. The pressure window allows the RF energy to pass but maintains pressure within the system. See pages 210-212.

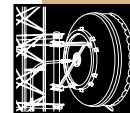
**11 Rigid Rectangular Waveguide Components.** Rigid waveguide components are used within the equipment room or shelter where space is limited. They provide a much smaller bend and twist radius than that of comparable elliptical waveguide. In addition, waveguide and flange adapters can provide quick fix solutions. Rigid waveguide components are custom manufactured based upon your system requirements. Request ezGuide, the free planning software from Andrew. See pages 202-218.

**12 Flex Sections.** Flex sections work well at the radio interface area. They provide stress relief to the rigid rectangular waveguide flanges and also make installation and transmission line testing easier. See pages 61-88, 202-206.

**13 Pressurization System.** One pressurization system is typically required for each site. Many systems and components are available. The selection you make is based on system volume, system pressure, power requirements, and available options. The total internal transmission line and antenna volume at the site is calculated to properly size the dehydrator. The weak link in the pressure system is usually the antenna's feed window. This is particularly true of lower frequency/dual or multiband antennas with large diameter feed windows. Pressure limits rated below the standard 10 lb/in<sup>2</sup> are noted within the antenna specifications. The ValuLine® limit is 5 lb/in<sup>2</sup>. Power for ac or vdc versions is available. No power is also an option. Other options, such as sound deadening, high/low pressure, and high humidity are available. See pages 642-671.

# System Planning Worksheet

Duplicate this sheet.



**Antennas:** Shielded and Standard Parabolic  
**Transmission Lines:** HELIAX® Elliptical Waveguide

## Antenna System Components

Item No.	Description	Color* (G,O,W)	Type No.	Quantity	Unit Price	Extended Price
<b>Antenna Equipment</b>						
1	Antenna					
	Optional Strut					
	Termination Load					
2	Radome					
3	Mount					

Item No.	Description	Color* (G,O,W)	Type No.	Quantity	Unit Price	Extended Price
<b>Transmission Lines and Accessories</b>						
4	Flex Section (optional)					
5	HELIAX Elliptical Waveguide					
6	Connector, Top					
	Bottom					
7	Grounding Kit					
8	Waveguide Hanger Kit Hoisting Grip Hardware Kit Angle Adapter Kit Adapter Threaded Rod Support Kit					
9	Wall-Roof Feed Thru or Plate/Boot					
10	Pressure Window					
11	Rigid Waveguide					
12	Flex Sections					

\*G=Gray, O=Orange, W=White  
 \*\*Request ezGuide™ software. See page 24.

(Continued)

Prepared By: \_\_\_\_\_

Date: \_\_\_\_\_

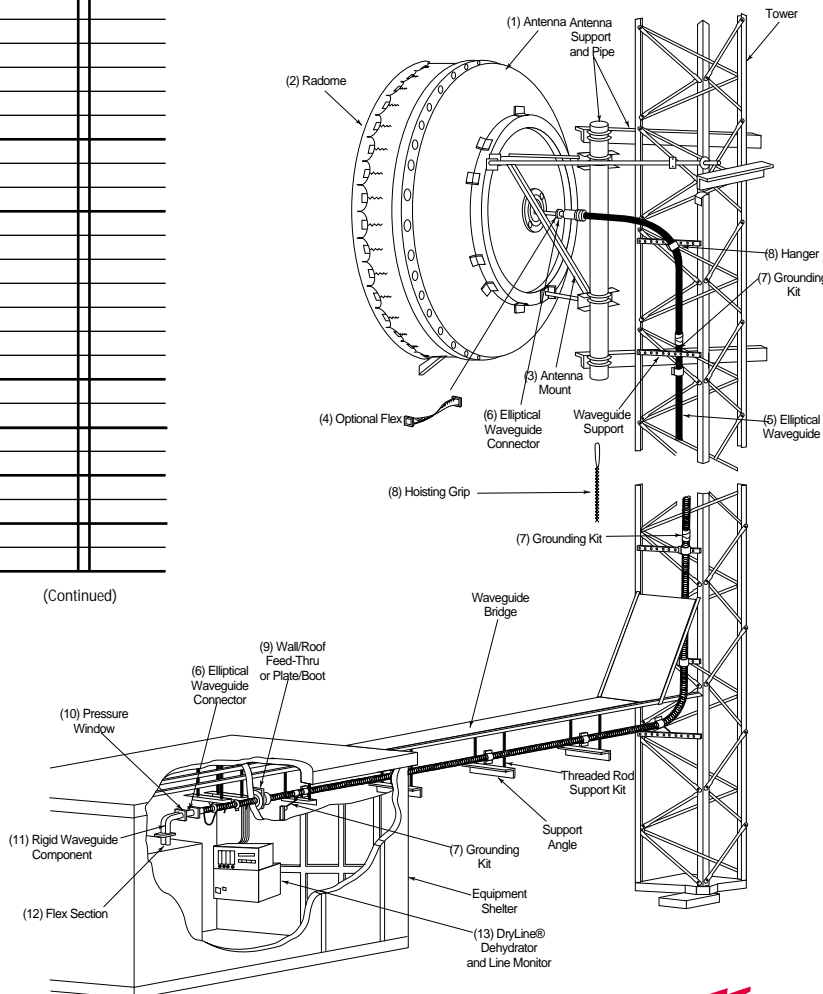
Telephone No.: \_\_\_\_\_

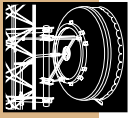
Item No.	Description	Type No.	Quantity	Unit Price	Extended Price
	Bending Tool Kit				
	Flex Hanger				
	Connector Flare Tool				

<b>Pressurization Equipment</b>					
13	Dehydrator				

## Total Antenna Systems Estimate FOB Factory

Customer Name \_\_\_\_\_  
 Contact \_\_\_\_\_  
 Project \_\_\_\_\_  
 Quotation No. \_\_\_\_\_  
 Telephone No. \_\_\_\_\_  
 Customer Ref. No. \_\_\_\_\_  
 Site Name \_\_\_\_\_  
 Points to Site(s) \_\_\_\_\_





## Systems Using Circular Waveguide

Andrew offers terrestrial microwave antenna systems from 3.54 GHz to 19.7 GHz in a wide range of frequency band offerings to meet your system design requirements. The details below describe each component of the terrestrial microwave antenna system shown on the following page.

**1 Antenna.** Many different antennas are available to meet your electrical and mechanical specifications. The types of antennas include, standard, focal plane, and shielded, all providing the flexible range of performance parameters required for each system design. Whether it's radiation side lobe suppression, low VSWR, dual or multiband operation, high wind, or extreme environment, Andrew provides the highest quality products in the industry. See pages 60-94.

Standard, and focal plane antennas consist of three major components, the mount, reflector, and feed. Focal plane antennas further reduce side lobe and front to back levels. Most antennas feature a modular design to allow interchangeability or field upgrading. Shielded (or shrouded) antennas add the shield around the reflector's aperture to reduce radiation side lobe activity. In addition, a planar radome is included to reduce the wind load effects of the shield.

*Antenna Options.* Most antennas have standard options for harsh environment, high wind, flange inputs, paint color, radome, and packaging. See pages 114-122.

*Optional Struts.* Optional struts can provide added rigidity to antennas. Bottom struts help with snow and ice loading. See page 123.

*Termination Loads.* Termination loads are used in a dual or multiband antenna when all of the feed ports are not being used. They keep interport isolation levels low rather than use a shorting plate. See pages 126, 212.

**2 Radome.** You can reduce wind loading for standard and focal plane antennas by installing an optional molded radome. Molded radomes are either fiberglass or a thermoformed plastic material. All UHX and UHP type antennas include a TEGLAR® radome. All other shielded antennas include a Hypalon radome. Upgrades to TEGLAR radomes are available for all shielded antennas 6 ft (2.0 m) and larger. Note: All 4 ft (1.2 m) shielded antennas include a TEGLAR radome. See pages 115-119.

**3 Mounts.** All standard mounts are included with the standard antenna selections. For optional mounts such as vertical look or high tilt angle, contact Andrew. (High wind mounts request Bulletin 3511). See pages 95-110.

**4 Flex Sections.** In most cases transmission line connects directly to the back of the antenna feed flange. When the mechanical limit of elliptical waveguide prevents this connection, use a flex section to provide the necessary link. Extra care is required to support flexible component in the outdoors. In many cases the plane of the waveguide flange is physically different than that of the transition body at the end of the circular waveguide run. The use of a flex section, in addition to elliptical waveguide, can provide an alternative flange mating solution. See pages 61-88, 202-208.

**5 Elliptical Waveguide (Top Jumper).** Top jumpers allow mechanical flexibility between the circular waveguide transition and the antenna. An elliptical waveguide jumper is a short section of transmission line with connectors attached at each end. Standard elliptical waveguide supports are used to secure the line. Additional rigid rectangular twist components allow waveguide plane rotation in a short length. See pages 160-193.

**6 Grounding Kits.** Grounding kits help reduce the effect of lightning strikes by providing an alternative path to ground. A grounding kit is recommended for each transmission line jumper located at the top of the system. Other options are available. See pages 197-198.

**7 Circular-to-Rectangular Transition (Top Transition).** The top transition is available, in most cases, in single or dual polarization. The top transition provides an interface between the circular waveguide and a common rectangular flange. Transitions include swivel flanges to ease alignment and installation. Dual polarized versions place both flanges in the same vertical plane to ease routing and installation of elliptical waveguide. See pages 221-222.

**8 Circular Waveguide.** Circular waveguide provides superior electrical characteristics including low insertion loss. See pages 219-220.

**9 Rigid Support Hanger.** The rigid support hanger securely attaches the top of the vertical run to restrict upper movement of the circular waveguide. See page 225.

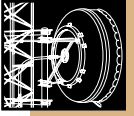
**10 Slide Hanger.** The slide hanger provides the added side-to-side support between vertical spring hangers. See page 225.

**11 Spring Hanger.** The spring hanger supports the weight of the vertical (circular) waveguide run. It allows for any expansion and contraction due to temperature fluctuations. See page 225.

**12 Compensation Clamp.** The compensation clamp allows the electrical energy (polarity) to be aligned with the bottom transition. See page 223.

**13 Circular-to-Rectangular Transition (Bottom Transition).** In closed type systems, those with transitions at both the top and bottom, the added filter section is included to reduce or eliminate overmoding. See Grounding Kits, above. See pages 221-222.

**14 Elliptical Waveguide Bottom Jumper.** The bottom jumpers allow mechanical flexibility between the circular waveguide transition and the radio equipment. An elliptical waveguide jumper is typically a short section of transmission line with connectors attached at each end. Standard elliptical waveguide supports are used to secure the line. Additional rigid rectangular twist components allow waveguide plane rotation in a short length. See pages 160-193.



**15 Sliding Hanger.** As the vertical circular waveguide run expands and contracts, the sliding hanger allows slight vertical movement of the horizontal elliptical waveguide run preventing stress on soldered flanges of the transition. See page 226.

**16 Grounding Kits.** Grounding kits help reduce the effect of lightning strikes by providing an alternative path to ground. A grounding kit is recommended for each transmission line run before it enters the shelter. Other options are available. See pages 197-198.

**17 Wall/Roof Feed-Thru Plates.** The Arrestor Port Feed-Thru Plate allows building access for your transmission line, providing protection from the outdoor environment. Several types are available. See page 200.

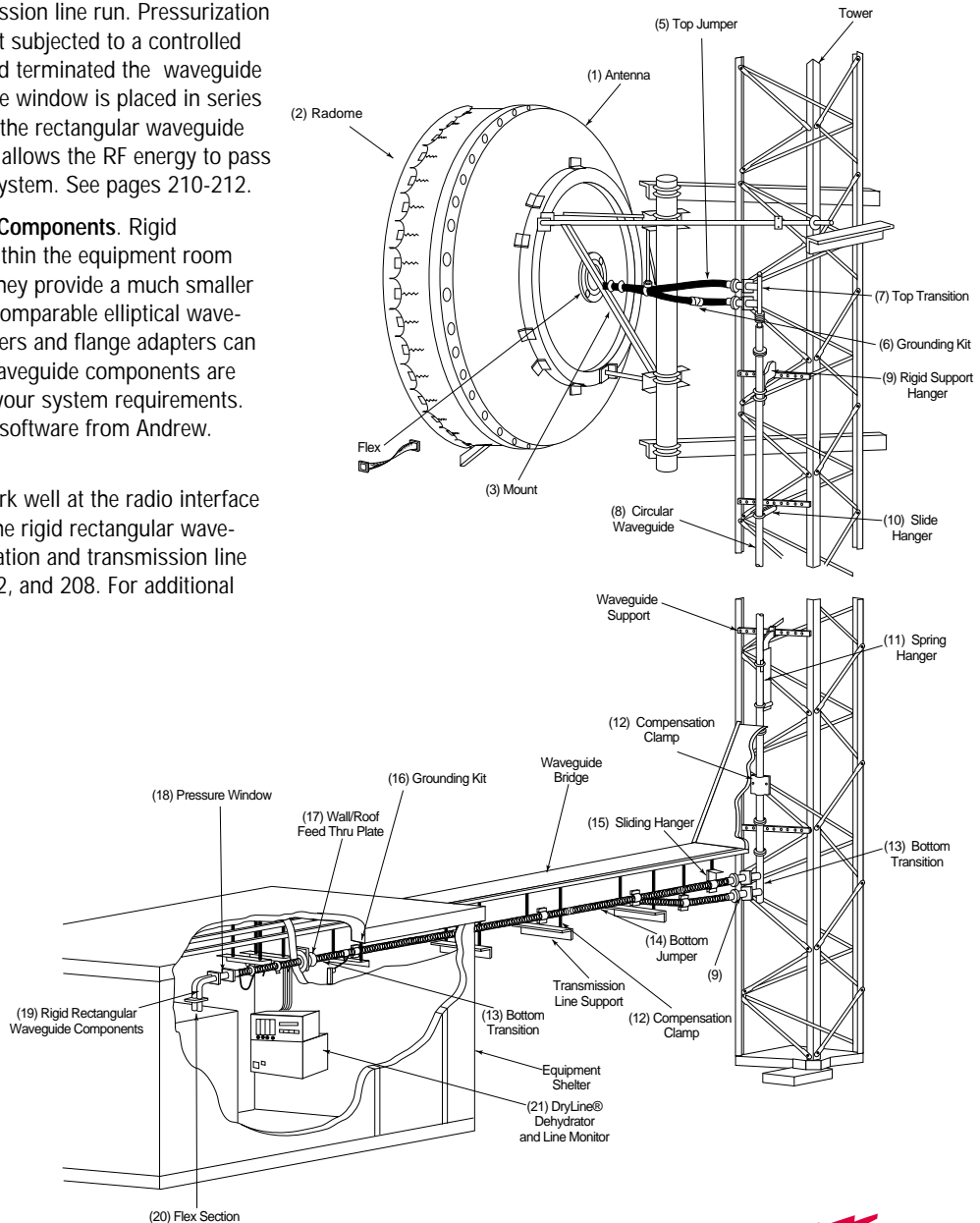
**18 Pressure Windows.** A pressure window is used as a gas barrier at the bottom of the transmission line run. Pressurization is required for waveguide that is not subjected to a controlled environment. After you have run and terminated the waveguide in the equipment room, the pressure window is placed in series between the bottom connector and the rectangular waveguide components. The pressure window allows the RF energy to pass but maintains pressure within the system. See pages 210-212.

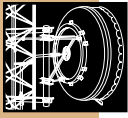
**19 Rigid Rectangular Waveguide Components.** Rigid waveguide components are used within the equipment room or shelter where space is limited. They provide a much smaller bend and twist radius than that of comparable elliptical waveguide. In addition, waveguide adapters and flange adapters can provide quick fix solutions. Rigid waveguide components are custom manufactured based upon your system requirements. Request ezGuide, the free planning software from Andrew. See pages 202-218.

**20 Flex Sections.** Flex sections work well at the radio interface area. They provide stress relief to the rigid rectangular waveguide flanges and also make installation and transmission line testing easier. See pages 61-88, 202, and 208. For additional information see page 34.

**21 Pressurization System.** One pressurization system is typically required for each site. Many systems and components are available. The selection you make is based on system volume, system pressure, power requirements, and available options. The total internal transmission line and antenna volume at the site is calculated to properly size the dehydrator. The weak link in the pressure system is usually the antenna's feed window. This is particularly true of lower frequency/dual or multiband antennas with large diameter feed windows. Pressure limits rated below the standard 10 lb/in<sup>2</sup> are noted within the antenna specifications. The ValuLine® limit is 5 lb/in<sup>2</sup>. Power for ac or vdc versions is available.

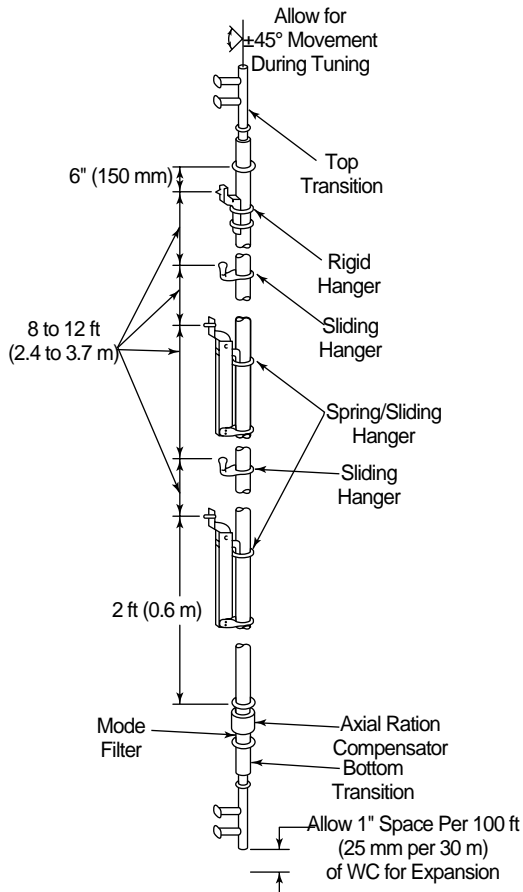
No power is also an option. Other options, such as sound deadening, high/low pressure, and high humidity are available. See pages 642-671.





# Systems Using Circular Waveguide

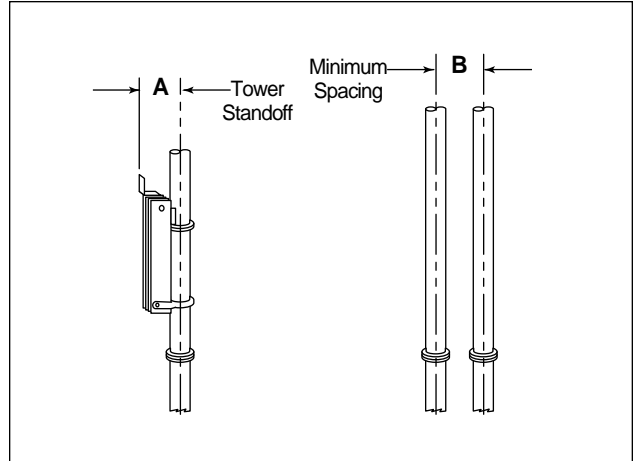
## WC109 and WC166

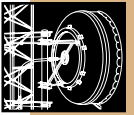


- Position hangers as illustrated above
- Attach top rigid hanger to member capable of supporting entire run
- Maximum deviation from true straight should be 1.5 in per 20 ft (38 mm per 6 m)
- Position elliptical waveguide sliding support 18-24 in (455-610 mm) from bottom transition
- Top transition must be positioned at 90° multiple of bottom transition and allow  $\pm 45^\circ$  rotation during tuning
- Position first elliptical waveguide hanger 18-24 in (455-610 mm) from elliptical waveguide sliding support

## Tower Standoff and Minimum Spacing

Waveguide Type	A	B
	Tower Standoff in (mm)	Minimum Spacing in (mm)
WC109	2.9 (73)	4.9 (124)
WC166	3.1 (78)	5.8 (147)





## System Equipment

Description	See Pages
1 HELIAX® Coaxial Cable	440-635
2 Connectors	462-470
3 HELIAX Jumpers	584-587
4 Base Station Antennas	232-241
5 Transmission Line Supports and Accessories	599-625
6 Equipment Shelters	692-701
Concrete Structural Options Door Options Basic Electrical System Optional Electrical Equipment Environmental Control Equipment	
7 Pressurization Equipment	242-271
Dehydrator, automatic Pressurization equipment and accessories	
8 Microwave Antenna System	20-34
Antennas Waveguides Coaxial Cables System Planning	

The typical wireless system shown in the illustration may be used as a guide in planning your system.

