



Standard Operating Procedure

Title / Subject

Communication Towers

References/Updates:
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Table of Change

1.		Page 1
2.		
3.		

1. Introduction/Purpose

This policy is pertinent to any agency purchasing a communications tower system for use with the SIRN system.

2. Definitions

All definitions are located in the "Definitions" document located on the SIRN Website at www.sirn.wv.gov.

3. Requirements: Self Supporting & guyed towers

- 3.1** Contract Items must meet or exceed the mandatory requirements specific to each item described below; as well as the Mandatory Requirements for all items described in Section 3.2 and 3.3 herein. **All self-supporting towers** 140 foot or higher must support up to four 8-foot HP 6 GHZ Dishes – 80 feet to 10 foot below the top of the tower four, 6 foot HP GHZ Dishes – 80 foot to 10 foot below the top of the tower and 12 foot sector boom at top one on each tower face. **All guyed towers** 140 foot or higher must have guyed tower torque stabilizers and must support up to four 8 foot HP 6 GHZ Dishes – 80 foot to 10 foot below the top of the tower four, 6 foot HP GHZ Dishes – 80 foot to 10 foot below the top of the tower and 12 foot sector boom at top one on each tower face. **All towers must be solid leg construction.**

TOWER APPURTENANCES: Must be compatible to self-supporting and guyed towers.

- 3.1.1 Six Foot Standard Arm.
- 3.1.2 Six Foot Tapered Side Arm.
- 3.1.3 Safety Climb Device (acceptable increments of 100 foot).
- 3.1.4 Medium white light, and red LED beacon combinations.
- 3.1.5 Red side lights must be LED fixtures.
- 3.1.6 Four-inch microwave dish mounts with all hardware.
- 3.1.7 Ice shields for six (6) foot dishes.
- 3.1.8 Ice shields for eight (8) foot dishes.
- 3.1.9 Twenty (20) foot vertical waveguide ladder
- 3.1.10 Ten (10) foot horizontal waveguide
- 3.1.11 Three (3) foot standard side arms.
- 3.1.12 Three (3) foot tapered side arms.
- 3.1.13 Twelve-foot sector booms
- 3.1.14 Tower light controller kit for tower lights.

3.2 General Mandatory Requirements

- 3.2.1 Vendor must warranty contract items for a minimum of one (1) year.
- 3.2.2 All towers must meet industry standards (i.e. Underwriters Laboratories (UL) Federal Communications Commission (FCC) and Institute of Electrical and Electronic Engineers (IEEE)).
- 3.2.3 Towers must be constructed on an equilateral triangle pattern with steel lifts and cross bracing members of either bolted or welded construction. The triangular size must be sufficient to meet the Electronics Industries Association (EIA) standards as per the International Building Code acceptance. All tower sections and accessories will be hot dipped galvanized after fabrication according to American Association for Testing and Materials (ASTM) specifications A-123m which gives a minimum of two (2) ounces of zinc per square foot of surface.
- 3.2.4 Towers must be designed for a minimum wind loading and radial ice per ANSI/TIA-222 REV-H Standards, or most current, and the International Building Code Acceptance. Wind and ice must be considered on the tower, antenna, guys and all appurtenances. The vendor must accordingly consider that the structures are for essential facilities. Importance factors must be adjusted accordingly.
- 3.2.5 Guyed towers must be able to accommodate torque arms at appropriate location to support 6 GHZ, 10 GHZ, and 18 GHZ microwave dishes and directional antenna. All guyed towers must have a minimum face width of forty- two (42) inches or greater.
- 3.2.6 Towers must have a standard lightning rod assembly designed to be mounted higher than the uppermost antenna.
- 3.2.7 Towers must have a climbing leg or step pegs designed to meet current EIA standards per the International Building Code Acceptance. Steps will run continuously from top to bottom on one leg of the tower. Self-Supporting towers, which are greater than 140 foot to 400 foot, will have three (3) climbing legs with step bolts, or pegs from the ground to an elevation of 2/3 of the height of the tower. One leg will have continuous step bolts for the entire height of the tower. A safety climbing device must be installed on the permanent climbing leg over the entire height of the tower. Climbing device must meet Occupational Safety & Health Administration (OSHA) standards.
- 3.2.8 Towers must be provided with two (2) vertical waveguide ladders. Towers must be designed with waveguide ladders on two faces. Waveguide ladders must accommodate snap-in, and bolt-on style hangers with a minimum width of 28 inches or greater. Guyed towers must have waveguide brace brackets on two faces, as a substitute for the dual waveguide ladder, providing the tower is structurally designed to use the wave guide brackets.
- 3.2.9 Towers must be designed and fabricated according to the Energy Information Administration (EIA) standards per the International Code Acceptance (REV-H or most current), which can be found at www.iccsafe.org.
- 3.2.10 All tower members must be designed to allow easy inspection of all surfaces for possible corrosion.
- 3.2.11 The shaft of guyed towers must be supported on a point mount at the center of the foundation in a manner to prevent transmission of binding forces between the tower and concrete base.

- 3.2.12** Structural steel must comply with the latest specifications for structural steel for bridges and buildings, which can be found at www.aisc.org.
- 3.2.13** All welding must be x-ray quality and conform to the latest American Institute of Steel Construction (AISC) and Advance Wireless Service (AWS) standards, which can be found at www.aws.org.
- 3.2.14** Any members that are received buckled or bent must be replaced.
- 3.2.15** Nuts and bolts must conform to the latest ASTM standards, which can be found at www.astm.org. Split ring lock must be supplied to secure all nuts, or equivalent lock nut attachment to prevent the nuts from vibrating loose.
- 3.2.16** All guy strands must be extra high strength and conform to the latest ASTM specifications, with a class A zinc coding.
- 3.2.17** Tower guys must be provided with a turnbuckle safety at each anchor point.
- 3.2.18** Tower guys must each be provided as one continuous strand from anchor points to the tower.
- 3.2.19** All towers must have grounding plates attached to each leg at tapered base section to accommodate thermo weld connection of ground wires.
- 3.2.20** Tower must be supplied with tower lighting package as appropriate to its height.
- 3.2.21** Tower lighting package must be a dual lighting system as approved by FAA. Components must consist of white (LED) light(s) to be operational during the daytime and red (LED) light(s) to be operational at night.
- 3.2.22** Tower lighting package must include necessary control equipment to monitor tower lights.
- 3.2.23** Ice shields must be provided for center beacons where applicable.
- 3.2.24** Tower packages must include a twelve (12) foot sector boom to be mounted at the top of the structure with twelve (12) antenna locations on the boom. In addition, the tower must be designed to accommodate up to ten (10) UHF/VHF antenna on a six (6) foot side arm distributed equally over the tower height down to a height of fifty (50) foot. Antennas will be up to eighteen (18) foot in length.
- 3.2.25** The tower loading requirements listed under each tower in Section 3.1., must also include ice shields over dishes. Tower must be designed for multiple carriers with three, 12-foot sector booms located at four locations starting from the top of the tower spaced every 4- foot down the tower. (Microwave dishes are back-to-back with ray domes at four locations equally distributed over the mounting height location as indicated above.) There will be 12 UHF/VHF antennas on 3-foot sidearm equally distributed over the entire height of the tower. Transmission lines will vary from (but not limited to) 1 ¼ inch, EW 63, EW 52, EW 99, 5/8 inch and ½ inch lines. Towers, antennas, and lines are to assume a minimum loading under REV H or most current standards.
- 3.2.26** All tower drawings must have a West Virginia Professional Engineer's (PE) stamp or seal.
- 3.2.27** Each structural member must be identified by a part number and any parts with the same part number must be interchangeable. This will result in tower sections capable of being installed in and

120° rotation without changing the tower structurally. Match marking requirements of tower sections by the manufacturer, for proper assembly, shall not be acceptable.

3.2.29 Tower leg members must be solid, **hollow leg designs will not be considered**.

3.2.30 Flanged leg connections must utilize a minimum of four bolts per leg. Tower leg members must utilize a 50 KSI minimum yield strength.

3.2.31 The tower manufacturer must maintain the highest quality steel manufacturing standards for production. Only AWS certified welders must be employed for tower fabrication. A fully qualified quality control department must be employed with a quality control manual maintained to establish minimum acceptable fabrication standards, procedures, and requirements for documentation.