



OMES

Public Safety & Defense

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Communications Tower Standards



State of Oklahoma
Office of Management and Enterprise Services
Information Services Division

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TABLE OF REVISIONS

DATE	VERSION	REVISION DESCRIPTION
4/2/2013	Draft	Initial, under steering committee review
4/9/2013	Draft	

SECTION I - PURPOSE

INTRODUCTION: The state of Oklahoma has operational radio tower assets that are being used by different agencies that were built for different purposes, the most common purpose being voice communication. Other related services like data transmission and asset monitoring capabilities are also some of the services provided by utilizing these assets.

While understanding the specific needs by state agencies, it is very important that these assets are managed centrally and some standard is applied across the board to make sure they are all compliant to the same standard where safety and operational metrics are met. Furthermore, compliance to standards at the state level and Federal level can be asserted via adequate documentation. This statewide standard can also be shared with affiliated partners for mutual benefits.

1.01 General Purpose

The purpose of this standard is to establish guidelines for the building and managing of all radio telecommunications towers and antennas. The major goals of this standard are:

- To minimize the total number of towers within the community necessary to provide adequate radio wireless communication service to public safety users and first responders in the state of Oklahoma;
- To encourage the joint use of new and existing tower sites among all levels of government, utilities and service providers;
- To locate telecommunications towers and antennas in areas where adverse impacts on the community are minimized while maintaining Rf coverage requirements;
- To encourage the design and construction of towers and antennas to minimize duplication of infrastructure and increase value of the radio assets to the state.
- To enhance the ability of the providers of telecommunications services to deliver such services to the public safety and first responder community effectively and efficiently.

SECTION II - SCOPE

The scope of this standard is limited to establish a *Basic* and *Public Safety/First Responder Grade* radio communication tower standard to be used to regulate all registered state radio assets. The standard will be used as guide for non-state agencies including local, county, federal and tribal government and as a default standard that must be adhered to for state owned radio assets. Carriers, Utility and other telecommunications providers that provide services to Public Safety/First Responders that have been authorized by OMES to co-locate on a State Communications Tower shall comply with this standard.

- Safety & Security of state owned radio assets.
- Structural Standards for new build out.
- Multi-tenancy standards and site assessment.

- Centralized State and FCC registration of spectrum licenses.
- Communication service and resiliency standards.
- Administrative and asset management standard compliance.
- Audits.

SECTION III - DEFINITIONS

3.01 Words and Terms Defined

Words not defined herein shall be construed to have the meaning given by common and ordinary use, and shall be interpreted within the context of the sentence, Section and Article in which they occur.

For the purpose of this standard, certain words or terms used herein shall be defined as follows:

- **AGL (Above Ground Level)** When referring to a tower or other structure shall mean the distance measured from the ground level to the highest point on the tower structure or appurtenance.
- **Alternative tower structure** Clock towers, bell towers, church steeples, light/power poles, electric transmission towers, man-made trees (without accessory buildings/structures), and similar natural or man-made alternative design mounting structures that camouflage or conceal the presence of antennas or towers.
- **Antenna** Any exterior apparatus designed for wireless telecommunication, radio or television communications through the sending and/or receiving of electromagnetic waves.
- **Co-location** The mounting or installation of an antenna on an existing tower, building or structure by multiple licensees for the purpose of transmitting and/or receiving radio frequency signals for communications purposes.
- **FAA** The Federal Aviation Administration.
- **FCC** The Federal Communications Commission.
- **Governing Authority** The State of Oklahoma, Office of Management and Enterprise Services (OMES).
- **NMS (Network Management System)** Manages the network elements includes faults, configuration, accounting, performance, alarm and security management. Management tasks include discovering network inventory, monitoring device health and status, providing alerts to conditions that impact system performance, and identification of problems, their source(s) and possible solutions.
- **Non Public Safety/First Responder Grade** Any design that does not meet Public Safety Grade.

- **Public Safety/First Responder Grade** Designed to be reliable and available continually under the most severe conditions.
- **Tower** Any structure built for the sole or primary purpose of supporting FCC licensed antennas and their associated facilities. This includes but is not limited to guyed, self-support and mono-pole structures.

SECTION IV - APPLICATION OF STANDARDS

This Standard shall apply to all State Agencies. All other levels of government including Local, County, Federal and Tribal that desire to co-locate on a State Communications Tower shall comply with this standard. Carriers and other telecommunications providers that provide services to Public Safety/First Responders that have been authorized by OMES to co-locate on a State Communications Tower shall comply with this standard.

4.01 Tower Height Limitations.

The requirements of this standard shall govern the location of Type 1 Non Public Safety/First Responder grade telecommunications towers, poles, mono poles, antennas and sites that are or exceed a height in excess of fifty (50) feet. Type 2 Public Safety/First Responder grade telecommunication towers, poles, mono poles, antennas and sites of any height must comply with this standard.

4.02 Pre-existing Towers and Antennas

Any tower or antenna constructed or installed prior to the effective date of this standard shall be referred to in this regulation as “pre-existing towers” or “pre-existing antennas”. If an additional antennas and or transmission line is co-located upon a pre-existing tower after adoption of this standard the pre-existing tower shall be required to meet the standards of this document.

4.03 Exemptions

The provisions of this standard shall not apply to governmental facilities and structures that are already built for specific nonstandard purposes.

SECTION V - RADIO TOWER TYPES GENERAL PROVISIONS

Radio Asset Type -1: Non Public Safety/First Responder, All Purpose radio tower installation.

Radio Asset Type -2: Public Safety/First Responder grade radio tower installed and maintained for public safety communication only.

The guidelines set forth in this Section shall govern the design and construction of all towers, and the installation of all antennas, governed by this regulation.

The following requirements pertain to Type 1 and Type 2 class towers.

5.01 In addition to all applicable building and safety codes, all towers shall be designed to accommodate the co-location of cellular telecommunication antennas according to the following:

- A.** Must meet all applicable building and safety codes and comply with TIA-222-G for the structural design and fabrication of new and the modification of existing structural antennas, antenna-supporting structures, mounts, structural components, guy assemblies, insulators and foundations.
- B.** For towers up to 150 feet in height, the structure and fenced compound shall be designed to accommodate State needs and at least two cellular telecommunication providers.
- C.** For towers greater than 150 feet in height, the structure and fenced compound shall be designed to accommodate State needs and at least three cellular telecommunication providers.
- D.** Towers shall either maintain galvanized steel or any applicable paint requirements of the FAA.
- E.** At all tower sites, the design of all buildings and related structures shall use materials, colors, textures, screening, and landscaping that will blend the tower facilities to the natural setting and building environment.
- F.** Tower lighting shall meet FAA requirements for the individual structure.
- G.** No signage or other identifying markings of a commercial nature shall be permitted upon any tower or alternative tower structure.

5.02 Inventory of Existing Sites

To facilitate the co-location of antennas, each applicant seeking to locate a new tower, alternative tower structure or antenna, or modify any such existing structure, shall provide to the OMES Wireless Technology Division an inventory of its existing towers or alternative tower structures on form OMES-WTD-A-INV-13.

5.03 Co-location; Availability of Suitable Existing Structures

No new tower shall be permitted unless the applicant demonstrates that no existing tower or existing alternative tower structure can accommodate the applicant's proposed equipment or use. All evidence submitted shall be signed and sealed by appropriate licensed professionals or qualified industry experts. Evidence submitted to demonstrate that no existing tower or structure can accommodate the proposed antenna, transmission line, waveguide and equipment shall consist of one or more of the following:

- A.** That no existing towers or suitable alternative tower structures are located within the geographic area required to meet the applicant's engineering requirements.

- B.** That existing towers or structures are not of sufficient height to meet the applicant's engineering requirements.
- C.** That existing towers or structures do not have sufficient structural strength to support the applicant's antenna and related equipment.
- D.** That existing towers or structures do not have sufficient space to support the applicant's antenna, transmission line, waveguide and related equipment.
- E.** That the applicant's proposed antenna(s) would cause electromagnetic interference with the antenna(s) and equipment on the existing towers or structures, or the antenna(s) and equipment on the existing towers or structures would cause interference with the applicant's proposed antenna.
- F.** That the cost or contractual provisions required by the tower owner to share an existing tower or structure or to adapt an existing tower or structure for sharing are unreasonable. Costs exceeding new tower development are presumed to be unreasonable.
- G.** That the applicant adequately demonstrates that there are other limiting factors that render existing towers and structures unsuitable.

5.04 All applications for co-location on existing towers shall include;

- A.** OMES Wireless Technology Division Application for Co-Location form OMES-WTD-A-CL-13.
- B.** Antenna Data Sheet
- C.** Transmission Line Data Sheet
- D.** Equipment Data Sheets
- E.** Propagation study and/or path profile
- F.** Proposed location of antennas and equipment
- G.** Loading impact of proposed equipment
- H.** FCC License(s) or FCC Form 601
- I.** State Agencies must use OMES Wireless Technology Division approved installers.
- J.** Local, County, Federal, and Tribal Governments, Carriers, Utilities and all other applicants may use OMES Wireless Technology Division approved installers or they may use their personnel or third party installers. Request to use non approved installers must include;
 - 5.J.1** Proof of qualified installer
 - 5.J.2** Proof of liability insurance
 - 5.J.3** Proof of workers compensation insurance
 - 5.J.4** Proof of safety program

5.05 All applications for permit of new tower construction shall include;

- A.** OMES Wireless Technology Division Application for New Tower form OMES-WTD-A-NTC-13.
- B.** Proposed tower data sheet including;
 - 5.B.1** Tower design
 - 5.B.2** Foundation design
 - 5.B.3** Designed appurtenance loading including type and elevation
 - 5.B.4** Designed transmission line loading
 - 5.B.5** Safety climb equipment
 - 5.B.6** Lighting design and data sheets

- C.** Proposed Antenna data sheets
- D.** Proposed Transmission line data sheets
- E.** Propagation study and/or path profile
- F.** Proof that design meets minimum loading for co-location
- G.** Proof that tower and site design meets requirements for required grade of service
- H.** State Agencies must use OMES Wireless Technology Division tower contracts for purchase or follow proper procurement procedures.
- I.** State Agencies must use OMES Wireless Technology Division approved installers.
- J.** Local, County, Federal, and Tribal Governments, Carriers, Utilities and all other applicants may use OMES Wireless Technology Division approved installers or they may use their personnel or third party installers. Request to use non approved installers must include;
 - 5.J.1** Proof of qualified installer
 - 5.J.2** Proof of liability insurance
 - 5.J.3** Proof of workers compensation insurance
 - 5.J.4** Proof of safety program

5.06 Aesthetics

- A.** Towers shall either maintain galvanized steel or any applicable paint requirements of the FAA.
- B.** At all tower sites, the design of all buildings and related structures shall use materials, colors, textures, screening, and landscaping that will blend the tower facilities to the natural setting and building environment.
- C.** Tower lighting shall meet FAA requirements for the individual structure.
- D.** No signage or other identifying markings of a commercial nature shall be permitted upon any tower or alternative tower structure.

5.07 Setbacks and Separation

The following setbacks and separation requirements shall apply to all towers:

- A.** Tower setbacks shall be a distance equal to one-third the height of the tower from its base to any public right-of-way or property line of the lot or parcel containing the tower.
- B.** All structures shall meet the setback, screening and buffer requirements contained herein, and shall be located a minimum distance of two (2) times the height of the tower from any residential structures.

5.08 Security Fencing/Anti-Climbing Devices

All towers and supporting equipment shall be enclosed by fencing not less than six (6-10) feet in height and shall also be equipped with appropriate anti-climbing devices. All towers shall be reasonably protected against unauthorized climbing. Fencing shall be designed include a gate with three strands of barbed wire on top of a locked gate. Fence shall be of chain link, wood or other approved alternative and shall be properly maintained.

5.09 Site signage

Tower site signage must include;

- A.** Clearly marked at the entrance drive/road
 1. State Property
 2. ASR
- B.** Clearly marked at the site security fence
 1. State Property
 2. No Trespassing
 3. Authorized Personnel Only (Appendix – xxx)
 4. Site Information
 5. Site Asset Number
 6. Building Asset Number
 7. Tower Asset Number
 8. ASR Number
 9. Rf Safety
 10. Contact Information

5.10 Federal Requirements

All towers must meet or exceed current standards and regulations of the FAA, the FCC, and any other agency of the Federal government with the authority to regulate towers and antennas. If such standards and regulations are changed, the owners of the towers and antennas governed by this regulation shall bring such towers and antennas into compliance with such revised standards and regulations within six (6) months of the effective date of such standards and regulations unless a more or less stringent compliance schedule is mandated by the controlling federal agency.

5.11 Change of Ownership Notification

Upon the transfer of ownership of any tower, alternative tower structure, or lot upon which such a structure has been erected, the tower permittee shall notify the State of Oklahoma, Office of Management and Enterprise Services of the transaction in writing within 30 days.

5.01 Written Notification of Denial

The State of Oklahoma, Office of Management and Enterprise Services Wireless Technology Division shall act on any request for authorization to place, construct, or modify personal wireless service facilities within a reasonable period of time after the request is duly filed with the Office of Management and Enterprise Services, taking into account the nature and scope of such request. Decisions by the Office of Management and Enterprise Services to deny a request to place, construct, or modify personal wireless service facilities shall be in writing and supported by substantial evidence contained in a written record. (Telecommunications Act of 1996, Sec. 704, B ii, iii)

SECTION VI – TYPE 1-NON PUBLIC SAFETY/FIRST RESPONER GRADE

All sites determined to be necessary for Non Public Safety/First Responder use shall meet this additional standard on top of what was stated for Section V Radio Tower Types General Provisions. All new site buildout shall be designed and constructed to meet this standard.

- 6.01** Tower building or outdoor cabinet may be either a permanent or portable structure and must be designed to house communications equipment. If tower is located near existing work place or office equipment may be located in the facilities equipment room.
- 6.02** Electrical wiring shall meet state and local code.
- 6.03** Best practices shall be used for equipment grounding.

SECTION VII – TYPE 2- PUBLIC SAFETY/FIRST RESPONER GRADE

All sites determined to be necessary for Public Safety/First Responder use shall meet this additional standard on top of what was stated for Section V Radio Tower Types General Provisions. New site buildout shall be designed and constructed to meet this standard. Existing sites that do not meet this standard shall be brought into compliance of this standard.

- 7.01** Tower Construction and Maintenance shall comply with EIA/TIA 222-G Structural Standards for Communications Towers or most current version. The tower design shall take into consideration antenna, transmission line, and equipment loading based on the current minimum standard from the Office of Management and Enterprise Services. The tower design shall include 100% additional loading and shall be designed for a wind speed 15% greater than the Maximum Basic Wind Speed listed in Annex B for the structure's location.
- 7.02** Tower building must meet the OMES Wireless Communications Division Communications Tower Building Standard.
- 7.03** Grounding Standards shall comply with Motorola R56 Standard for the installation, maintenance, and use of emergency services communications systems.
- 7.04** Electrical Standards shall comply with NEC Power Requirements and Standards.
- 7.05** Fencing/Anti-Climbing Devices

All towers and supporting equipment shall be enclosed by fencing not less than six (10) feet in height composed of chain link, wood, concrete, metal or other approved alternative and shall be properly maintained. All towers shall be reasonably protected against unauthorized climbing and all fencing will be topped with razor wire and gates must be secured with approved lock.

7.06 Site Security

The tower building shall have alarms to monitor all doors and shall report to the NMS. Door locks shall include FIPS-201 Rfid reader and secure combination lock that report to the NMS. Security cameras shall be placed to monitor the site compound and the interior of the tower building.

SECTION VIII - TYPE - 2 ASSETS RESILIENCY REQUIREMENTS

Public Safety/First Responder tower sites shall be designed to mitigate a single point of failure. The design shall incorporate redundant fault tolerant components.

8.01 DC power N+1 redundancy

8.02 8 hours battery backup power

8.03 Permanent Generators with 5 to 7 day fuel supply

8.04 Dual HVAC units.

8.05 Site Alarm and Status Monitoring shall be achieved using standards based monitoring such as SNMP. All new site elements must include in its specifications SNMP for monitoring and alarm management. Site Monitoring shall include at a minimum the capability to monitor ;

- A. Repeater, base station, and RAN alarm and monitoring functions
- B. Tower lights
- C. Door alarm
- D. Power failure
- E. UPS
- F. Rectifier and Power Supply
- G. Battery
- H. Generator
- I. Dehydrator
- J. Network elements including radio network switch, ethernet switch, mpls switch
- K. Building Temperature
- L. Building Humidity
- M. HVAC
- N. Rfid of equipment for inventory control

8.06 Critical radio tower shall be configured with Level -1 and Level – 2 disaster recovery contingencies for voice and data communication support.

8.07 To mitigate the loss of network connection the site must have primary and secondary network connections. The equipment at the site must be configured for fast rerouting. This shall apply to all network connections including but not limited to MPLS, Ethernet and T1.

SECTION IX TYPE 2 ACCESS REQUIREMENTS

Site access shall be limited to authorized personnel only. Contractors and their Subcontractors may be granted limited and or restricted access.

9.01 Contractor, Subcontractor Access to State of Oklahoma Tower Sites

- A. Only those authorized by the OMES Wireless Services Division may have access.
- B. Each Contractor must designate a person who will identify the personnel that will require access.
- C. All personnel that must have access shall carry identification that is acceptable to OMES Wireless Services Division.
- D. OMES Wireless Services Division will issue temporary access cards and or access codes to authorized personnel.
- E. On entry and exit of site Contractor/Sub must check in with OMES.
- F. The Contractor/Sub must ensure that its personnel do not lend visitor access card or access codes to any other person.
- G. The loss or theft of any access card must be reported immediately to OMES.
- H. Contractor or Subcontractor must provide dates and time of proposed access.
- I. Changes to the individuals who need to be allowed access must be reported to OMES immediately.
- J. OMES reserves the right to refuse to grant access or revoke access to any person, contractor or subcontractor.

SECTION X - SPECIAL EXCEPTION USE

List any exceptions from the standard on both type of assets.

10.01 General

If it is adequately demonstrated that antenna co-location of this standard is not possible for a given geographic antenna placement area, applicants may submit an application for a Special Exception. A Special Exception is required before applying for a permit for towers, alternative tower structures or antennas. All structures shall meet the setback, screening and buffer requirements contained herein, and shall be located a minimum distance of two (2) times the height of the tower from any residential structures.

SECTION XI - ADMINISTRATIVE APPROVALS

Insert the administrative requirements and reference the check lists forms that must be completed and by whom within the scope of this standard.

All radio assets shall be registered with the state by completing the Antenna Site Registration form OMES-WTD-A-ASR-13, Appendix –XX.

SECTION XII - REMOVAL OF ABANDONED TOWER ASSETS

12.01 Removal of Abandoned Antennas and Towers

Any tower, antenna, transmission line or equipment that is not operated for a continuous period exceeding twelve (12) months shall be considered abandoned. The owner of such tower, antenna, transmission line or equipment shall remove the tower, antenna, transmission line or equipment within ninety (90) days of receipt of notice from OMES notifying the owner of such abandonment. If said tower, antenna, transmission line or equipment is not removed within ninety (90) days, punitive action will be pursued by the Oklahoma State Attorney's office.

SECTION XIII – CONFLICTS WITH OTHER LAWS

13.01 Conflict with Other Laws

Whenever the regulations herein require a greater width, depth or size of yard or impose other more restrictive standards than are required in or under any other statute or covenants, the requirements of this regulation shall govern. Whenever the provisions of any other statute or covenants require more restrictive standards than those of this regulation, the provisions of such statutes or covenants shall govern.

13.02 Severability

In the event any article, section, sentence, clause or phrase of this regulation shall be declared or adjudged invalid or unconstitutional, such adjudication shall in no manner affect the other articles, sections, sentences, clauses or phrases of this regulation, which shall remain in full force and effect, as if the article, section, sentence, clause, or phrase so declared or adjudged invalid or unconstitutional were not originally a part thereof.

APPENDIX – A TOWER DIAGRAM SAMPLE

