State Interoperability Executive Council

Technical Committee

Short Term Physical Plant Guidelines V1.0
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Short Term Physical Plant Guidelines
For
OWIN Core Sites and Alternative Sites

Introduction

The intent of this document is to provide guidance for parties seeking to make improvements or replacements to tower and / or shelters at potential OWIN Core Sites. This document is not meant to serve as a blueprint for physical plant requirements nor as a comprehensive scope of work, however it may serve as a tool for agencies that have compressed time frames in regard to construction of sites. This document was prepared by members of the SIEC Technical Committee and represents input from both vendors and various State and Municipal employees.

Disclaimer

When embarking on any tower or shelter construction project, members of the SIEC Technical Committee strongly advise that individuals contact OWIN Project Engineers. This will allow for the necessary review of the project before the design phase and provide valuable information regarding space, HVAC, power, antenna placement and other physical plant requirements, and improve the likelihood of OWIN funding support and OWIN collocation of facilities.

General Plant Guidelines:

- Commercial power delivered to the site, preferably underground (as it approaches the shelter) and not from a power pole drop.
- Commercial power drop w/240 volt to 200 amp service preferably service lateral underground feed.
  - The following list is provided to help organize, and coordinate electrical service installation. Some items may not apply to all projects. Note: Ensure that the electrical installation process is tracked, managed and documented by responsible parties.
    - Where practical, keep overhead lines and poles at least 200 feet from the site compound area during construction. This helps protect against accidental contact by construction or maintenance equipment and hazards associated with ice falling from the tower while under construction.
    - To facilitate single-point grounding, request that electrical service enter the site building on the same wall as and near to the entry point for the antenna transmission lines. Also, request to have the telephone circuits, data circuits, and tower lighting connections in the same area.
    - Proper separation between overhead electrical service conductors and antenna transmission lines shall be a minimum of 2 feet (NFPA 70-2005, Article 810.13). This may require coordination between the site development engineer and the shelter manufacturer to ensure consistency in layouts.
    - Utility installations are jurisdictional. Ensure that it is clearly understood who the utility supplier will be.

  - Coordinate other utility installations such as closed-circuit television (CCTV) and Telephone Company.
  - Supply the utility with an electrical utility information form.

- If local code allows, a 6 foot fence for site security that is made of a material that will not rust should be utilized. The fence must be a minimum of 4 feet from the shelter. If allowed, consider use of a 6 foot vinyl clad galvanized chain link fence with a minimum of 5 feet from shelter topped with stainless concertina wire.
  - The fence shall be bonded - metallic objects need to be bonded to equalize the potential between conductive parts. This is done for personnel safety and to prevent arcing between metallic components that might otherwise be at different potentials. Bonding conductors shall be as short and straight as possible. (ANSI T1.313-2003, section 6.3)
  - All site fencing, including gates, within 6 feet of the grounding (earthing) electrode system (such as building or tower ground ring and radial grounding conductors), or any metallic item grounded to the grounding electrode system, shall be effectively bonded to the external grounding electrode system to help prevent shock hazard to personnel from lightning or other electrical anomalies (ANSI T1.334- 2002, section 5.3.3). In high lightning prone geographical areas, or areas of high soil resistivity, it is recommended to effectively bond fencing that is located within 10 feet of the external grounding electrode system, or within 10 feet of a grounded metallic item (ANSI T1.313-2003, section 10.3.2).
  - When fences are located at an electrical power substation, the fence grounding shall be made as required by local code and by the electric power utility company. The fence grounding should comply with IEEE-STD 80-2000 and is beyond the scope of this document.
  - Fuel storage tanks located outside of a structure should be protected from damage and tampering, and shall be enclosed within a fenced area. The minimum recommended distance between the storage tank and fence 4 feet. The minimum recommended distance between the tank and site building is 10 feet. See NFPA 58 for additional information. The fuel tank must be bonded to the external grounding electrode system.
- Sites must have road access.
- Telephone and / or fiber connectivity should be in place if it is feasible / possible to do so.
- Area around the shelter should have a graveled approach.
- Any fenced area around the shelter shall have gates that will allow a service vehicle to approach the shelter. Gate opening shall be at minimum 12 feet. Additionally, at snow sites access should be provided via a split man gate.
- For sites that are heavily forested, remove brush and dead trees at least 150 feet from the tower and shelter. Remove all vegetation within 10-20 feet of outside perimeter. This work is likely subject to the lease agreement between the owner and lessee.

- Both generator and fuel sources shall be secured within the site perimeter. It is preferred that the generator be enclosed in a shelter.
- For new tower construction projects, consider a minimum 50% future growth capability.
- Ensure that sufficient grounding for the entire communications compound, including towers, shelters, tower guying, generators, fuel storage etc. is applied - refer to current R-56 standards as they are amended from time to time. Grounding requirements will often be site specific.

Tower:

- Tower should be a heavy three or four legged tower at least 120 feet in height and at least 40 feet of the tower above the tree line. A self supporting tower is preferable. A heavy four legged 160 foot minimum tower is preferred with at least 40 feet of the tower above tree line.
- In regards to antenna and microwave installation for OWIN and core sites, please consult OWIN Engineers for site specific data.
- Tower must meet EIA / TIA 222 Revision F requirements.
- Civil works include, but are not limited to the access road, site grading, foundations, ground grid security fencing and water management. Civil works should meet or exceed the requirements of local building codes, IEA.TIA-222 Tower design standards, and industry standards such as current R56. The geotechnical analysis of site soils prior to foundation design is a requirement of proper detailed engineering.
- At least one OSHA approved climbing ladder with safety climb cable assembly should be in place
- Waveguide ladders should be specified / utilized on a case by case basis
- Twist and sway specifications to be determined by antenna loading
- Plan for a 50% design load increase to be added over entire tower to facilitate future growth
- If possible, top 40 feet of tower should be vertical
- Tower should be hot dipped galvanized

Shelter:

- Shelter should be enclosed within a fenced area, with adequate distance around the shelter for maintenance and servicing.
- Site shelter should have an adequate 48 volt DC charging system and battery bank. The battery bank capacity will be site specific determined by uptime requirements. Based on the amount of equipment present, location and accessibility of the site, this bank of batteries can vary dramatically.
- Shelter should have two (2) redundant environmental controlled lead lag HVAC (heating & cooling) systems capable of handling shelters maximum thermal load.

Thermostatically controlled ventilation fans and low ambient control are recommended. The HVACs should utilize a compressor head pressure time delay safety kit and ensure that coolant and refrigerant standards are met.

- Shelter should allow for at least 200 square feet of floor space for OWIN equipment. The recommend floor to ceiling height is 9 feet.
- For IWN sites, allow for at least 30 square feet of additional space in a secured area. Interior security fencing would be appropriate if there is a single, open equipment area within the building.
- Shelter grounding, both external and internal, must meet current National Electrical Code if not superseded by local codes and the current version of the R-56 grounding standard as these standards may be amended from time to time.
- It is critical that the installation of any antenna feed line cabling be identified for ease of repair. Where possible a dedicated cable bridge between the shelter & tower shall be utilized for OWIN purposes.
- Shelter should have an alarm capability to include:
  - High and low temperature
  - Smoke – photoelectric and ionization detectors
  - Commercial Power failure
  - Generator Failure
  - Charger Failure
  - Waveguide High Humidity
  - HVAC A-failure
  - HVAC B-failure
- ABC rated fire extinguishers, emergency eye wash kit, and first aid kit should be contained within the shelter at all timers. Consider placement of a small fold down desk and literature rack within the shelter as well.
- Shelters should also have the following:
  - Seismic level 4 rating
  - Two hour fire rating
  - Design load of 500 psf for the floor and 200 psf for the roof
  - Cable entry plate
  - Door stop / holder
  - Surge suppression of all wiring systems which enter the shelter. This includes but is not limited to AC power, DC power, all telephone-fiber-microwave connections, video circuits, tower lighting, other monitor and control circuits.
  - R-19 insulation rating
  - Integrated load center with a minimum 200 amp service, single phase with a primary surge arrestor that is a combination of metal oxide varisitor (MOV) and silicon avalance diode (SAD) device. Additional secondary electrical surge suppression for both AC and DC may be required.
  - Adequate interior lighting Interior lighting should be a minimum of 1.5 watts per square foot of interior space with full spectrum fluorescent tubes.
  - Interior wallboard should be white in color

  - External GFI receptacle – 20 A
  - Battery powered emergency lights on the interior of the shelter.

Generators:

- Site should be equipped with a Transfer Panel to provide an automatic switch between commercial and generator power.
  - Remote monitoring and control capabilities
  - Exercise timer-provides weekly 1/2 hour test
- 45 kW generator, single phase, 3 wire 120/240 volt 60 Hz. Generator must also satisfy the following:
  - Minimum 1000 gallon propane tank. The system should be designed to allow for one week's continuous run time.
  - Water jacket heater
  - Standard exhaust connector
  - Spark arresting muffler

Security:

- Locked Gate/Door Switches
  - Key card/smart key lock system (computer recording)
  - Limit public access via gates on roads leading to the site
    - Consider use of pre-welded gates that are connected with an underground frame assembly (e.g. Central Lincoln PUD)
    - Consider use of deterrents on either side of gates (e.g. rocks, trenches)
- Fences/anti-climb wires
  - Fence should be at least 6 feet high with stainless razor wire at the top.
  - Buildings and shelters should utilize a locked galvanized chain-link fence where appropriate.
  - Bottom of the fence should be secured
  - Appropriate grounding and bonding should be assured
  - Man-gate access should be appropriately controlled
  - Minimum width of the gate coming into the compound for a vehicle should be carefully considered (site dependent)
- Shelter
  - Shelter should be 30.06 bullet resistant
  - Steel door with non removable hinges and substantial locking mechanisms
  - Lock guard (pick plate) and Deadbolts
  - Sturdy and secure walls (Cement walls with rebar, steel, etc.)
  - Sturdy and secure roof construction – (i.e. no wooden roofs – instead utilize steel plates or concrete)
- Lighting
  - Exterior lighting (specially designed lights that are vandal and bullet resistant) – either motion detection or trigger (e.g. photo sensor, infrared)

  - Interior lighting - Change switch – not an on/off but instead a motion detect switch or mount a light that is activated by motion.
  - Carefully consider light positioning (site specific)

- Alarm System
  - Exterior audible alarm (perimeter breach)
  - Internal audible alarm
  - No delay alarms
  - Open door alarms
  - Notification back to dispatch location
  - Fibersense alarm on the fence (with notification)

- Signage
  - Consider use of a site identification number (Latitude/Longitude) - some identifier on the outside of the building (e.g. a State of Oregon designated number for every site)
  - Signage on fences
    - RF Hazard warning signs
    - Video surveillance
    - Number to report suspicious activity to the property owner or a local authority such as a 911 office (Note: Recommend using a Generic # or call 911– something that won't identify the critical purpose of site)

- Video
  - Consider use of motion activated video surveillance
  - Monitoring and recording (Recommend - 30 day minimum)
  - Off-site recording capabilities (web-based storage – page/email notification – access provided only to designated personnel)
  - Outside camera – day/night camera with good resolution on low-light (Carefully consider pros and cons of black and white vs. color)

- Still Photography
  - Consider use of motion activated still photography

- Audio
  - Two way audio (listen and talk-back)
  - Monitoring and recording (Recommend - 30 day minimum)

- Local telephone
  - Land line (way to restrict use only to authorized personnel)
  - Telephone on-site over microwave
  - Order-wire

- Ladders – (Building or Tower)
  - Ladder plates and locking mechanisms should be in place

- Placement and accessibility of exterior wiring and cabling
  - Carefully consider height of exterior wiring and cabling at each site