

Customer Requirements at Cell Sites

Recommendations and Requirements

INTRODUCTION

The AT&T Requirements for Cell Sites was developed first, to provide a high level guideline for proper equipment installation and maintenance at cell sites necessary for AT&T to terminate its network facilities and provide services, and second, to ensure consistency of procedures across all regions. Proper installation and maintenance of AT&T facilities and equipment (“AT&T facilities”) can reduce failure frequencies. Installations of AT&T facilities at newly constructed sites must meet the AT&T specifications prior to installation and service activation. Installations at existing cell sites will be inspected by AT&T to ensure adherence to these requirements. Improperly installed wireless carrier equipment necessary for installation of AT&T facilities should be corrected and/or upgraded, by the wireless carrier. The AT&T engineer will work with the customer to ensure all requirements are met. The AT&T engineer will provide specific requirements based on current and future needs that are uncovered during initial meetings.

Throughout the following document the term “cell site contact” will be used. In this document it can mean either the Operator (“Operator” as used herein, depending on the circumstances, means the cell site operator or lessor/licensor), or an individual tenant at the cell site. The requirements are the same regardless of who the site contact is. Decisions for approval and responsibility of modifications at the site may need to be coordinated by the tenant with the Operator, if AT&T is not dealing directly with the Operator. Additionally, this document does not cover location and installation of AT&T’s facilities outside the cell site premises.

The term “carrier” when used applies specifically to wireless carriers other than the cell site operator.

The term “AT&T engineer will be used to mean the design engineer, the dedicated BIC (Building Industry Consultant) engineer where they exist, or the Inductive Coordination and

Electrical Protection (ICEP) engineer where they exist. The AT&T engineer will be available to further elaborate on all of the requirements below during the initial on-site meeting.

1.0 Cell site contact Requirements

The cell site contact is required to provide a safe and maintained entrance, parking, and exit for AT&T vehicles.

1.1 Access

If the cell site/building is located inside a secured area, the cell site contact must agree to an access plan for AT&T maintenance and installation activities. This access plan is required to ensure that service quality can be maintained all hours of the day, and especially in after-hours conditions. One method used is daisy-chained locks (meaning that each provider at the site has one lock and chain in the lock loop to allow access to their authorized employees).

1.2 Conduit Requirements

For underground entrance facilities, the cell site contact will provide conduit from the property line to AT&T's cable termination/protector location. The AT&T engineer will specify conduit runs as necessary to accommodate cable/fiber runs from the AT&T feeder termination (i.e., outside pedestal or in-building terminal) to each carrier's Network Interface (NI) location. Note that the NI location will be at an AT&T provided enclosure, as discussed in Section 1.5, installed by AT&T. These cell site contact provided conduits should be Schedule 40 PVC sized according to need. Note, however, that recommending a minimum 2 inch conduit makes sense even for short runs since this will easily accommodate future additions and changes of Network Terminating Wire (NTW).

The following are recommended specifications:

- One conduit to house the initial facility (Note: the cell site contact is encouraged to place a second conduit for future fiber optic cable reinforcement).
- Conduit(s) will be at least 2 inch ID schedule 40 PVC (Conduit requirements greater than 2 inches will be specified by the AT&T engineer during the initial site visit).
- Conduits placed below ground must be buried between 24 and 36 inches deep.
- Conduit bends should optimally be minimized to one or two 90 degree bends (minimum 40" radius). This means that each conduit run should have no more than 180 degrees in bends between end points. Additionally, all bends in conduits will be electrical sweep bends with radii of at least 10X the conduit diameter (per BICSI TDMM, 11th edition, section 4.19 table 4.4 Building Industry Consulting Services

International Telecommunications Distribution Methods Manual). All bends and off sets with a radius less than 80' are required to be encased in 3" of 2500 psi concrete with a 7" slump.

- All pull boxes placed after the second 90 degree bend are required to be 12 times the diameter of the conduit per TDMM 11th edition, Chapter 4, section 1 subsection Pull Boxes for Conduit.
- Conduit should be sealed, capped, marked for AT&T's exclusive use, and turned up 3' above finished grade where appropriate to aid in subsequent locating.
- If the final environment is already established to a building or structure, the conduit should not protrude more than 1" beyond the inside wall or structure, with all rough or sharp edges having been de-burred.
- Conduit should be left clean, dry, and free of debris.
- Conduit should be equipped with either a 200-lb test pull wire/twin installed end to end for verification and pulling purposes.
- Conduits are to be placed in accordance with National Electric Code and other local and national standards. AT&T engineer may specify additional conduit requirements not specified.

1.3 Power Requirements

As needed, the cell site contact must provide DC power with backup where available (-48V, -24V or +24V) to AT&T equipment as first choice. If DC is not available, the owner/tenant must provide 120VAC, 20A, convenience outlet and/or a dedicated outlet for local powering needs if any (i.e. loopback devices, etc.).

Note:

1. Some circuit terminating equipment requires local powering for operation, so power service without backup can result in interruption of service.

1.4 Grounding Requirements

A grounding system that covers the tower, structure, and site must be provided to insure the dispersal of lightning and foreign voltages. The grounding system should include grounding electrodes (rods), a ground ring(s), radial (counterpoise) conductors, either individually or in combination. To provide the best possible protection, a combination of all items should be used. Actual design should be determined based on lightning exposure, soil resistivity, as well as location and design of site.

It is recommended that the ground system meets the following minimum requirements

- Metallic ground rods that are 8' x 5/8".
- A ground ring that is composed of a minimum of #2 AWG bare copper conductor.
- The ground ring is to be buried a minimum of 30" below final grade.
- Each part is bonded using either an exothermic weld or irreversible connector.

The attachment to the grounding system or tower/structure ring ground must be via #6 AWG or larger insulated copper ground wire provided by either the cell site contact or the AT&T engineer. In either case, the ground wire should be protected from damage and, in some cases, this may require owner/tenant-provided conduit. (Ground bar specifications will be based on the forecasted number of circuits, etc.) If a pedestal-type terminal is used for entrance cable protection, the AT&T engineer will request that the owner/tenant provide a #6 ground wire and coil sufficient slack wire in the vicinity of the proposed pedestal location. If the protectors will be located inside a building at the site, normal design procedures for in-building terminations protectors should be followed.

All local building codes are to be followed as well as the specifications listed in the NFPA 70: National Electric Code, Article 250 – Grounding and Bonding and ANSI T1.334-2002, "Electrical Protection of Communications Towers and Associated Structures", and any other applicable standards.

1.5 H-Frame Structures

AT&T provides the outside enclosures to house DS1 network interface devices. The AT&T engineer will advise the cell site contact during the initial site visit to provide H-Frame structures upon which one or more enclosures will be mounted. Multiple carriers will not be housed in the same AT&T provided enclosure. The following is a list of requirements for H-Frame structures used to mount AT&T provided enclosures:

- The H-Frame structure must provide at least 96 inches of horizontal mounting space. However, more space may be required, depending on the number of carriers being served.
- The H-Frame structure must be at least 3 feet from any fence or other structure.
- A ground connection to the site grounding system is to be provided at the H-Frame to allow for grounding of the AT&T enclosure(s). The H-Frame should be connected to the grounding system.
- The H-Frame should be placed in a location where the AT&T enclosure is protected from damage.

Notes:

1. The H-Frame is recommended for all outside enclosures. See **Section 1.6** for Inside Building Locations.
2. AT&T provided weatherproof enclosures may be pedestal, pole, or wall-mounted, if mutually agreed upon by the cell site contact and AT&T.
3. See **Section 1.4** above for Site Bonding & Grounding Requirements.

1.6 Inside Building Locations

If an inside building location will be used for AT&T facility termination and protection, the following guidelines apply and are consistent with normal in-building terminals:

- Backboard: A plywood backboard of sufficient size to mount all required AT&T equipment (AT&T contact will provide size specifications, a minimum of 4 feet x 4 feet x $\frac{3}{4}$ inches backboard).
- Busbar: The building owner must provide a busbar, mounted at the bottom of the backboard, to provide a single point ground for all telecom equipment at the backboard (Busbar Specification/Size will be based on the forecasted number of circuits, etc.). The busbar should be bonded to the building's power grounding system.

1.7 Roof-Top Sites

Normally, AT&T establishes the demarcation point and places the network interface at the carrier's location. However, at some roof-top installations, AT&T and the carrier may agree to place the NI at the last AT&T serving terminal. Any wire beyond the point of demarcation is non-regulated and therefore may be provided by the carrier's vendor of choice, including AT&T. The carrier may be required to provide conduit. This would be specified by the AT&T engineer. Generally, the carrier will need the building owner's approval to have the conduit placed.

Note:

1. Per **Section 2.3** below, it is recommended that cable/wire placed on the customer's side of demarcation point be shielded and bonded.

1.8 High Voltage Locations

Cell sites within a High Voltage area (such as power substation, power generating plant and high tension tower) require special high voltage isolation equipment to protect telecommunications facilities and personnel. The AT&T Inductive Coordination and Electrical Protection (ICEP) Engineer for the area must be engaged for assistance in designing the proper high voltage protection system necessary to protect AT&T facilities. Special Construction Charges or a Special Assembly may be applicable for high voltage protection equipment.

1.9 Outside Plant Cabinets

AT&T may deploy an Outside Plant cabinet at the cell site to provide telecommunication facilities. The cabinet may be mounted to H-frame, exterior wall, pole or pad mounted. The carrier should provide DC power with backup where available. This ensures that as long as the carrier has power, the AT&T facilities serving the carrier will have power. This will also eliminate the delays associated with establishing commercial power to the cabinet. Generally, the DC power to the cabinet must be dual feed, fused at the source and 15 amps at the cabinet. AT&T will need access to the fuse/breaker at the power source, in case AT&T technicians need to work on the cabinet DC plant. AT&T is not liable for any power outages. Battery backup will not be provided with the Outside Plant cabinet with DC power from AT&T. In some instances, AT&T may need access to provide temporary generator to power cabinet.

2.0 Carrier Recommendations¹

In addition to the requirements listed in Section 1, carriers should adhere to the recommendations in this section in order to ensure continuous and effective service to their end users.

2.1 Loop Length Requirement

¹ *These additional network recommendations are mentioned for informational purposes only, and are not intended to be an exhaustive list of necessary measures to implement for continuity of service, or to impose additional obligations upon AT&T beyond what is contained in applicable contracts, tariffs and/or guidebooks relating to the services AT&T provides at cell site locations. It is the customer's sole obligation beyond AT&T's point of demarcation to take reasonable and necessary precaution, based on customer's engineering guidelines, to provide continuity of service to its end-user customers.*

The following requirements apply to DS1, DS3 or Ethernet services:

- DS1 services: The carrier's equipment should be placed as close as possible to the demarcation point. Standards allow for up to 5.5 dB of loss beyond the network interface unit. This is approximately 1,000 feet of CAT 5e wire. The closer to the network interface unit the stronger the signal will be for the carrier's equipment.
- DS3 services: The carrier's equipment must be placed within 450 feet of AT&T's point of demarcation.
- Ethernet services: The carrier's equipment must be placed within 50 feet of AT&T's point of demarcation when the handoff is electrical. It is strongly recommended that the customer use Cat 5 or better Shielded Cable with a protector designed for Ethernet. The shielding limits the amount of electrical interference and noise to the cable itself as well as limiting the amount of radiated interference from the cable.

2.2 Shielded Wire & Surge Protection Device Recommendation

To ensure the highest possible level of service, AT&T recommends that carriers use shielded wire, with the shield grounded on both ends, to connect carrier equipment to the AT&T network interface. A listed primary protector used on both the AT&T end and the customer end of a shielded customer cable, grounded on each end, will help to achieve added protection - to both AT&T and customer equipment - from damage and service outage due to lightning strikes at cell sites. Primary protection should be placed as close as possible to the CPE and NIU.

AT&T does not recommend using alternatives, such as unshielded wire in metallic conduit which is grounded on both ends, or the placement of a stranded #12 AWG coupled bonding conductor which is grounded on both ends and tie-wrapped to the unshielded wire at 12" intervals. Further, if it is determined that a circuit failure occurred as the result of improper installation of carrier's equipment beyond AT&T's point of demarcation, AT&T will bill the carrier for maintenance charges. AT&T may contact the carrier and request placement of shielded wire. AT&T will bill the carrier for maintenance resulting from problems with the wiring or equipment, such as this deviation.

2.3 Bonding and Grounding

The purpose of grounding a metallic cable shield or strength member is to limit voltages that may be present from external sources such as lightning or accidental power contact. A low impedance path to ground is especially critical in locations with tall tower or antenna structures since they are particularly susceptible to damage from lightning. Each cell site location will have site-specific electrical protection or grounding requirements. The service

reliability of circuits terminating at a cell site largely depends on the grounding system of the cell site and associated structure. It is the carrier's responsibility to ensure that the site grounding system meets or exceeds requirements as listed in NFPA 70: National Electric Code, Article 250 – Grounding and Bonding. It is also recommended that the requirements listed in ATIS-0600334.2008, "Electrical Protection of Communications Towers and Associated Structures" be followed.

The AT&T Engineer should serve as a technical resource for the requirements outlined in this document. The AT&T Engineer will work closely with carriers to resolve site ground system inadequacies.

The following are a few bonding and grounding wire recommendations, based on site design, service offerings ordered, and facilities provided; additional requirements may be necessary based on a site's unique circumstances as determined by the carrier, with assistance from the AT&T Engineer:

- All grounding and bonding wires should be as short and straight as possible. Wires should be accessible for future visual inspections.
- Sharp bends in grounding and bonding conductors should be avoided.
- One splice is permitted in bond wires used for protector grounding, per the National Electrical Code Article 250, if an approved irreversible connector or exothermic welding process is used.
- The splice must be tagged with an AT&T ground wire tag. Only ground wires that are equal in size may be spliced.
- Splices are NOT permitted in the #6 AWG wires used for bonding cable shields, strength members, or splice cases.
- It is preferable to use a continuous length of wire for all grounds.
- It is recommended that all connections to ground system be #6 AWG.
- In order to insure proper grounding of AT&T services and equipment, all construction of the cell site/tower should be complete. This includes, but is not limited to the ground ring/system, conduit, permanent power, and supporting structures (H-Frame, Backboards).

Notes:

1. The AT&T Engineer will clarify these requirements at the initial site meeting and provide follow-up clarification as needed.
2. At an outside enclosure, pedestal, or the building location, the protector, NCTE, cable shields, strength members, splice cases, etc. must all be bonded to the same location

(ground bar/busbar) to minimize differences in potential between these network components.

3. OSHA 1910.268(s) (13) defines effectively grounded as: Intentionally connected to earth through a ground connection or connections of sufficiently low impedance and having sufficient current-carrying capacity to prevent the build-up of voltages which may result in undue hazard to connected equipment or to persons.