

# Cellular Phone Communication Sites--An Overview

by Deputy Assistant Chief Ronald R. Spadafora

Cellular phone companies are establishing cellular phone sites in buildings throughout New York City. It is not uncommon to have buildings with two or three different cellular phone site installations. These systems, strategically placed after an in-depth analysis by telecommunication engineers, can cause operational difficulties for FDNY firefighting forces.

The Buildings Department requires the building owner to file an alteration application, illustrating the site layout and electrical equipment components. Plans must show structural support and mounting details of all proposed cellular equipment and antennae. After examination and approval, the Buildings Department will issue a work permit for the construction of the cellular phone site. This article will familiarize FDNY members with these sites and suggest safe operating procedures.

Cellular phone systems consist of four major components: base station or interface room; electrical power; coaxial cable; and antennae. The base station is a computer that acts as a radio transmitter and receiver. Older models have air handler/condenser cooling equipment adjacent to them. New base stations are self-contained units with built-in cooling systems. Depending on their size, base stations can weigh from 1000 pounds to more than five tons.

There are two types of base station installations: interior and roof-mounted. Interior base stations are located within an enclosed room. Cellular equipment must not occupy more than five percent of the floor area on a zoning lot or 400 square feet. The temperature inside this room is regulated by air-conditioning equipment. Some interior systems employ intake and exhaust fans. The cellular phone company monitors this equipment via door alarm and/or smoke/heat detectors. A sign identifying this room is not required by the New York City Building Code.

A roof-mounted base station generally is designed to sit suspended over the roof upon one or more steel I-beams. These I-beams are installed at least six inches into the exterior walls of the building. The ends of the beams are bolted into a steel plate implanted into the walls. This type of connection is known as a pitch-pocket assembly.

Large roof-mounted base stations can span the entire width of the roof. They are supported by the building's bearing walls. A steel grating encompassing it allows telecommunication repair personnel easy access to all sides of the equipment. This metal

Electrical supply lines--protected by metal conduit--rise vertically from the cellar up to the roof-mounted base station along the front exterior wall of the building. Frequently, the conduit is placed on the surface of the roof, causing a tripping hazard.

walkway enlarges the area of the roof covered by the base station, thereby reducing the roof area

Firefighters may need to ventilate at a fire. Small roof-mounted base stations may be located in a corner of the roof, supported by an I-beam pitch-pocketed into two adjacent exterior walls.

Primary electrical power for a cellular phone installation generally is between 50 and 200 amps AC. It is found separate from the building's main electrical service. Interior base stations normally have their primary power located inside the enclosure. Roof-mounted systems have primary power installed at a point inside the building where the electrical power for the building enters from the street. Secondary (back-up) power for both interior and roof-mounted base stations generally consists of batteries, usually located inside the base station itself.

Some installations use diesel-powered generators. In rare instances, natural gas-powered generators are found. Generators, when located on the roof, increase the dead load. They provide the additional hazard of fuel/gas piping extending vertically via the interior or exterior of the building. Base stations should be de-energized by shutting down the primary power. Subsequently, secondary power sources either should be disconnected (batteries, when accessible) or turned off (generators). Be aware that batteries located inside base stations may be inaccessible to firefighting units. This back-up power supply, if not disconnected, can continue to operate the cellular phone site for hours.



Antennae situated above the perimeter walls at the roof level are a visual indication of a cellular phone communication site.

## Hazards to Consider

- Electrocution**--From primary and secondary power supplies, energized equipment, electrical wiring.
- Hazardous Materials**--Sulfuric acid, diesel fuel, natural gas, radio frequency radiation.
- Products of Combustion**--Hydrogen sulfide (PVC wiring insulation).
- Fuel-Enriched Fire**--Generator fuel lines damaged by fire.
- Explosion**--Hydrogen gas emitting from batteries coming in contact with a spark produced during disconnection operations.
- Inhibited Roof Access/Egress**--Placement of roof-mounted base stations and antennae.
- Tripping**--Wiring on the roof.



Roof-mounted base station (approximate weight is 20,000 lbs.) supported by two steel I-beams, which extend the entire width of the roof. The steel I-beams are pitch-pocketed into the two bearing walls of the building. Sometimes, the I-beams, measuring 10 inches, are secured to the building parapet. Metal grill surface surrounding the base station allows telecommunication workers to access all sides of the base station. It will, however, decrease the area of the roof Firefighters will be able to ventilate.

Standard wiring (208V) runs from the primary electrical power supply source to the base station. In roof-mounted systems, this wiring will travel up along the exterior of the building inside metal conduit or via interior shaftways/staircases to the base station. Coaxial foam radio frequency cable, however, is used to supply power from the base station to the radio antennae. Interior systems, therefore, have coaxial cable running via an interior or exterior path from the base station room to antennae on the roof.

Coaxial cable carries only a small amount (three to four watts) of electrical current. On the roof, coaxial cable is found unprotected around the perimeter of the building along the base of the exterior walls. Cable wires strung across the roof surface are protected from damage by a light metal covering known as a cable tray. Cable trays reduce the available area Firefighters may need to ventilate the building properly.

Radio wave transmitter and receiver antennae are found installed above the roof along the exterior walls of the building. They generally are constructed of lightweight metal and/or fiberglass. Antennae may not extend higher than six feet above the height of the roof or parapet or six feet above any penthouse or bulkhead if so attached. By law, antennae must be attached to a building or other structure that has a use independent of supporting the antennae.

Grouped into sets of three (one transmitter and two receivers), they come in many shapes and sizes. Each antenna is restricted to an area no more than 8.45 square feet or one meter in diameter. Two of the most common types are the whip (two to 10 feet high and only two to six inches wide); and the sector (a rectangle that is four to five feet high and six to 12 inches wide). Connection hardware weakened by fire can cause antennae to fall to the ground, injuring Firefighters. Antennae produce radio frequency (RF) radiation. It is recommended that all members avoid operating directly in front of them and as a practical guide for keeping (RF) radiation exposures low, maintain a three- to four-foot distance from any telecommunications antenna.

### Command strategy

- Ensure a tower ladder response on the initial-alarm assignment for a reported fire in a cellular phone site building.
- Special-call an additional Ladder Company above the initial alarm for a fire requiring roof vent operations. Consider assigning this Ladder Company to shut off all electrical power to the base station.
- Consider special-calling an additional Battalion Chief above the 10-75 signal to supervise roof operations.
- Request the response of utility and fuel companies that provide electric, diesel fuel and natural gas to the building, if necessary.
- If the identity of the cellular phone company is known, request the response of a representative to provide valuable technical information.
- Ensure Safety Operating Battalion response to all serious fires involving cellular phone site equipment.
- Consider the possibility of exterior parapet wall failure caused by steel I-beams expanding when exposed to fire at roof-mounted cell sites.
- For fires involving the roof, establish a collapse zone around the entire perimeter of the building.

- Ensure strict SCBA compliance as protection against the combustion by-products (hydrogen chloride) of burning PVC wiring insulation.
- Limit the number of access and egress points into and out of the building.
- Verify that primary and secondary power sources have been shut down.
- Delay roof-cutting operations until it is verified that all electrical power to the base station has been turned off.
- Verify that primary and secondary power sources to the base station have been shut down. Consider the time delay involved when back-up batteries are inaccessible.
- Employ horizontal ventilation techniques on upper floors of the building when vertical roof ventilation is negated and/or limited.
- Increase the use of hooks at top-floor fires during the operational and overhaul stages of the fire when roof-cutting is negated by base station(s) and electrical wiring.
- During nighttime operations, ensure sufficient artificial lighting at the roof level to facilitate access/egress from ladders, for roof ventilation and to alleviate the tripping hazard. Consider special-calling the Tactical Support Unit for use of their 31-foot telescoping light tower, electrical generator and specialized lighting equipment.
- Consider switching to an exterior operation should the roof become untenable. At roof-mounted base station installations, failure of the steel I-beam support system can cause the base station to fall onto the roof. This action could precipitate a total or partial collapse of the roof into the top floor.
- Inform the incoming next level of command of all actions that have been implemented and the tasks still to be completed.

### Firefighting tactics

- Inform the Incident Commander (IC) of the exact location of the interior base station room.
- Communicate to the IC the layout of cellular phone company

equipment on the roof.

- Utilize portable dry chemical fire extinguishers for quick knockdown of incipient fires.
- Firefighters must shut down both primary and secondary power supply sources to the base station(s).
- Shut down air conditioning and/or fans servicing interior base station rooms prior to commencement of fire extinguishment operations.
- Firefighters must check termination points of air conditioning and fan ducts leading from interior base station rooms to detect possible fire and smoke spread.
- Ladder Companies must restrict the use of metal tools in areas where “live” equipment and wiring exist.
- At top-floor fires in buildings with roof-mounted base station installations, avoid cutting a roof opening too close to supporting I-beams. Flame impingement could cause these supports to fail.
- Avoid cutting roof wiring and coaxial cable.
- Ensure apparatus ladder/boom placement does not dislodge roof-mounted antennae.
- Engine Companies must ensure interior base station room has been de-energized prior to hand-line operations.
- Engine Companies must consider using combination fog/straight stream nozzles on hand-lines.
- Engine Companies must restrict the use of water in the vicinity of energized cellular phone equipment and wiring.

#### **Battalion administrative procedures**

- Schedule periodic drills/MUDs at cellular phone site buildings.
- Pre-plan ladder apparatus placement by ascertaining roof antennae locations.
- Alternate means of roof access/egress (adjacent buildings, fire escapes) must be explored.
- Determine whether cellular phone site equipment is monitored by a central station company. If so, record name and phone number for future reference. Ascertain cellular communication company representative phone number for vital technical information.
- Battalion Chiefs should consider the building as a candidate target hazard and ensure the building is inspected regularly.

#### **Company administrative procedures**

- Notify Battalion, Division and all first-alarm units of the cellular phone site building via telephone, followed by a written memo.
- Perform an on-site inspection of the building. Members should acquaint themselves with the outstanding features of the installation (base station location, primary and secondary electrical power sources, antennae placement, alarm/detection system, etc.).
- Examine Building Department work permits and communication company site plans for proper approval. When appropriate, issue Violation Orders to the building owner or building management to produce these documents for Fire Department review.
- Complete and submit a Critical Information Dispatch (CIDS) card to the Battalion Fire Prevention Coordinator for endorsement and eventual forwarding to the CIDS Control Desk.



Unprotected coaxial foam radio frequency cable, originating from an interior base station, is fastened to the roof-side surface of the parapet wall where it connects to an antenna. Cable trays or raceways, also pictured, protect the coaxial cable, which travels across the roof surface.

- Unreported and/or unlabeled hazardous substances (sulfuric acid, diesel fuel, natural gas) discovered upon unit inspection warrant the preparation and faxing of Form A-8H (Hazardous Material Referral Report) to the Bureau of Operations, Toxic Substance Unit.

#### **Conclusion**

Cellular phone company site buildings pose yet another challenge to FDNY firefighting forces. Information gathered by units during alarm response, building inspections and company drills will greatly facilitate operations. This knowledge also will enhance fireground safety. Seek out these buildings in your unit's administrative district and anticipate one or more of these sites being constructed in your district in the very near future. A follow-up article on “Cell Phone Stations” by Lieutenants Albert Gonzalez and John M. Miles will be featured in an upcoming issue of *WNYF*.

#### **Acknowledgments**

Richard C. Visconti, RA: “Cellular Antenna,” Technical Policy and Procedure Notice #5/98, NYC Department of Buildings, July 1, 1998, Todd DeMatteo, project manager, Omnipoint Communications, Inc., for supplying technical information about cellular phone communication site systems, and RA Tell: Telecommunications Antenna Installation Guidelines, Richard Tell Associates, Las Vegas, 1996.



#### **About the Author...**

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