5 Lightning Protection and Grounding System

About This Chapter

This part describes the lightning protection and grounding system and the requirements for the grounding of cables and other facilities.

5.1 Requirements for the Lightning Protection and Grounding System
This part describes the basic requirements for grounding and the requirements for the grounding resistance, grounding of the DC power distribution system, equipotential grounding, and lightning rod.

5.2 Underground Grounding System of the Equipment Room
The underground grounding grid is the most important part of the underground grounding system.

5.3 Lightning Protection and Grounding of the Equipment Room
The lightning protection and grounding system of the equipment room consists of the indoor grounding bar, cable rack, grounding downlead, earth electrode, and grounding resistance.

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This part describes the outdoor part of the grounding system and the lightning protection and grounding of the RF antenna system and the satellite antenna system.

5.5 Lightning Protection and Grounding of the Base Station
The working grounds and protection grounds of the base station must be connected on the top of the cabinet. A grounding cable is led from the PE grounding bar to the indoor grounding bar of the equipment room. When several cabinets are combined, the grounding cables of adjacent cabinets are interconnected through PE grounding bars on the top of each cabinet.

5.6 Lightning Protection and Grounding of the Power Supply System
In the power supply system, lightning protection must be performed for the power supply system of the base station and the power cables.

5.7 Requirements for the Lightning Protection and Grounding of Signal Cables
For signal cables, lightning protection can be conducted by using shielded cables, installing lightning arresters, or grounding the cables.

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This part describes environment requirements for the installation of antennas and feeders.

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5.1 Requirements for the Lightning Protection and Grounding System

This part describes the basic requirements for grounding and the requirements for the grounding resistance, grounding of the DC power distribution system, equipotential grounding, and lightning rod.

Basic Requirements for Grounding

The basic requirements for grounding are as follows:

- The neutral line of the AC power cable cannot be connected to the protection ground of any communications devices.
- All grounding cables must be as short and straight as possible. The grounding cables cannot be twisted.
- Fuses or switches cannot be installed on grounding cables.
- The grounding busbar should not be oxidized. Oxidation may cause bad contact between the grounding cables and the grounding bar, and thus increasing the resistance. Ensure that the grounding cables are securely connected to the protection grounding bar of the equipment room.

Requirements for the Grounding Resistance

CAUTION

- The joint grounding system must interconnect the working ground, the protection ground, the grounding system of the building, and the grounding system of the industrial frequency AC power supply.
- The grounding resistance must meet the local requirements.

The requirements for the grounding resistance are as follows:

- The grounding resistance of the joint grounding system must be less than or equal to 10 ohms.
- For other devices in the equipment room, apply the minimum resistance requirements.

Requirements for the Grounding of the DC Power Distribution System

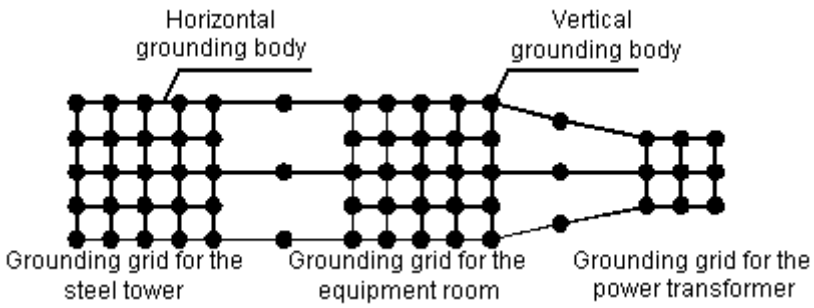
The DC working ground (reflow ground of the –48 V DC or +24 V DC power supply) must be connected with the indoor grounding bar nearby. The grounding cable must be capable of supporting the maximum load of the system.

Requirements for Equipotential Grounding

The requirements for equipotential grounding are as follows:

- All the equipment and auxiliary facilities in the equipment room must have protection grounds.
- The protection grounds in a base station must be connected to a grounding busbar. The protection grounds in an equipment room must be connected to the protection grounding bar of the equipment room.
- The working grounds and protection grounds must share the same group of grounding grids.
- The grounding grids for the equipment room, tower, and power transformer are interconnected in a multi-point manner underground. If the tower is on the roof of the equipment room and the power transformer is in the equipment room, they can share the grounding grid for the equipment room. **Figure 5-1** shows the grounding grids.

Figure 5-1 Grounding grids



- The cable rack, steel shelf, rack or chassis, metallic air conduit, and metallic window and door must be grounded.

Requirements for the Lightning Rod

The antenna of the base station must be protected by the lightning rod. The antenna must be located in the effective protection range of the lightning rod.

The lightning rod must have the special surge current downlead, which is made from the 40 mm [1.57 in.] x 4 mm [0.16 in.] galvanized flat steel.

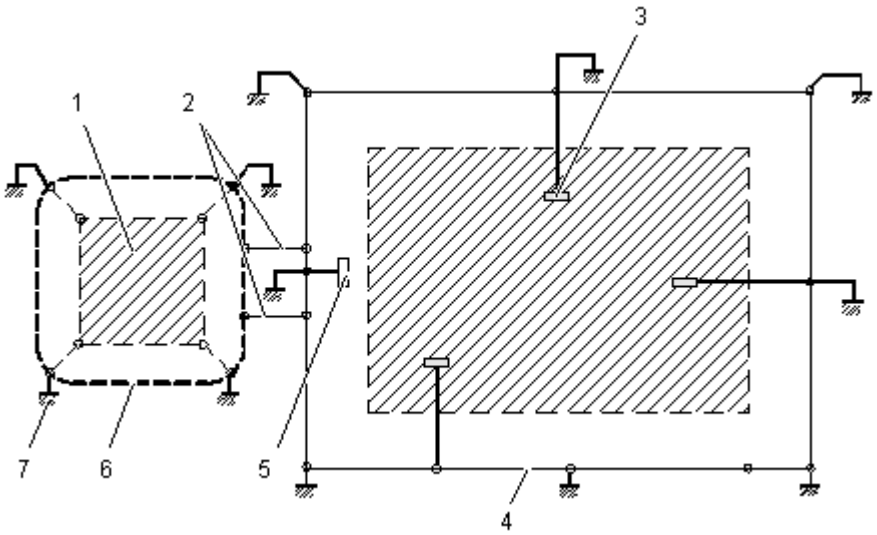
5.2 Underground Grounding System of the Equipment Room

The underground grounding grid is the most important part of the underground grounding system.

The grounding grid is buried around the base of the building and under the ground. The parts exposed on the ground surface are grounding points for devices. Various grounding copper bars are connected to the grounding pole through copper cables. The sectional area of cables must meet the local or national requirements.

Figure 5-2 shows the grounding grid under the ground.

Figure 5-2 Underground grounding system



1. Steel tower
2. Connection cable of the grounding grids for the steel tower and equipment room
3. Indoor grounding bar
4. Grounding grid for the equipment room
5. Outdoor grounding bar
6. Grounding grid
7. Grounding pole

NOTE

You can set a grounding busbar in the equipment room. The indoor rack grounding bar, AC grounding bar, and DC grounding bar are connected to the grounding busbar.

The requirements for the grounding facilities shown in **Figure 5-2** are as follows:

- The grounding grids for the power transformer, steel tower, and equipment room form a uniform grounding grid. The grounding grid must be connected to at lease two steel bars of the building and tower.
- The outdoor grounding ring can be L-shaped or C-shaped. In areas where the soil has low conductivity or soil is rare, use grounding stretch body. The grounding stretch body is a concrete bridge with built-in cables. It stretches outward from the corners of the grounding ring. The concrete bridge has strong moisture absorption capability. The recommended length of the grounding stretch body is 10 m [32.81 ft] to 30 m [98.42 ft].
- The grounding pole should use the hot galvanized steel with the following specifications:
  - Steel tube: φ50 mm [1.97 in.]. Its thickness is more than 3.5 mm [0.14 in.].
  - Angle steel: no less than 50 mm x 50 mm x 5 mm [1.97 in. x 1.97 in. x 0.197 in.]
  - Flat steel: no less than 40 mm x 4 mm [1.57 in. x 0.16 in.]
  - Length: 1.5 m [4.92 ft] to 2.5 m [8.20 ft]

  The spacing between grounding poles is 1.5 to 2 times the length of a grounding pole. The upper end of the grounding pole should be more than 0.7 m [2.30 ft] from the ground surface. In cold areas, the entire grounding pole should be buried under the frozen soil layer.
- The grounding ring should be buried 0.7 m [2.30 ft] into the cement base.
- The use of resistivity reduction mixture depends on the location of the equipment room and the status of the soil.

5.3 Lightning Protection and Grounding of the Equipment Room

The lightning protection and grounding system of the equipment room consists of the indoor grounding bar, cable rack, grounding downlead, earth electrode, and grounding resistance.

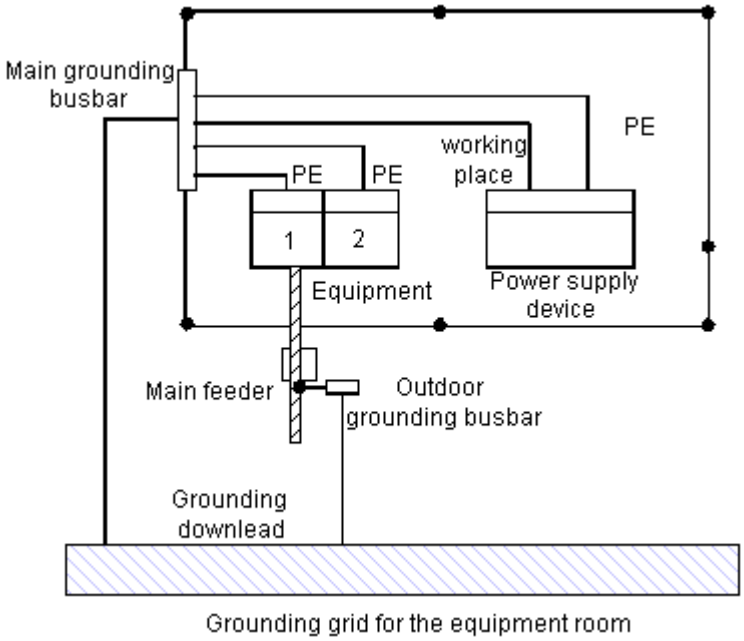
Overview

The grounding copper bars are available in the equipment room.

In the areas where lightning strokes occur frequently, indoor grounding also involves the grounding of the overhead bare wire ring on the internal wall of the equipment room. Several parts of the wire ring are connected to the outdoor port of the grounding system. The wire ring is used to ground the conductors of the door and window.

Figure 5-3 shows the grounding system of the equipment room.

Figure 5-3 Grounding system of the equipment room



NOTE

- Set a grounding busbar to interconnect the protection grounds and the working ground of the devices in the equipment room.
- Use 40 mm x 4 mm [1.57 in. x 0.16 in.] or 50 mm x 5 mm [1.97 in. x 0.20 in.] galvanized flat steel as the grounding downlead. Take protective measures for projecting parts of the downlead.

Indoor Grounding Bar

The indoor grounding bar is usually installed on a wall. The wall is near the base station and power supply cabinet and is as high as the cable rack. A single black grounding cable connects the grounding bar to the earth electrode.

For the structure and installation of the indoor grounding bar, refer to **6.2 Installing the Grounding Bar**.

Cable Rack

The cable rack must be installed before you start installing the base station.

- The indoor cable rack is connected to the indoor grounding bar by using a cable.
- The indoor cable rack must be connected separately from the outdoor cable rack.
- Both ends of the cable rack must be properly grounded.
- When the connectors between the cable racks are not properly connected, add cables to improve the electrical connection between the cable racks.

For details about the installation of the cable rack, refer to **6.1 Installing the Cabling Rack and Cabling Trough**.

Grounding Downlead

CAUTION

- The same metal material should be used for the entire lightning protection system that consists of the lightning rods, downleads, and grounding body. This prevents corrosion and poor grounding owing to long-term electrochemical reaction.
- The copper should not contact the galvanized iron parts because the copper-zinc battery may be formed on the contact surface and thus cause corrosion.

The flat braided wires or bunched wires cannot be used as the grounding downleads. They are susceptible to corrosion and oxidation. They have strong electric inductance and mutual inductance, thus affecting surge current discharge.

The grounding downlead should use galvanized flat steel or φ16 to φ18 screw-thread steel.

The grounding downlead must be welded with the lightning rods and the grounding body. The contact seam must be longer than 20 cm [7.87 in.]. Otherwise, when high current passes through the seam, the small contact area would be very hot, probably causing serious sealing-off.

- When the grounding cable is led from the roof,

  The cable should not be arranged near or in parallel with other conductors. Even if the other conductors are grounded, the space between the grounding cable and the conductors must be larger than 2 m [6.56 ft].
- When the grounding downlead must pass through the metallic tube,

  The two ends of the downlead must be connected to the two ends of the metallic tube. This metallic tube is also called the connection cable of the grounding cable.

Earth Electrode

There are four types of earth electrode: the bar-shaped earth electrode set (made of steel pipe or angle steel), the steel plate earth electrode set, the band-shaped earth electrode set, and the composite grounding grid composed of the earlier three types of earth electrodes. The band-shaped earth electrode has a outstretching structure.

You should strike the earth electrode into the earth and then use conductor to interconnect the earth electrodes.

NOTE

The earth electrode under the steel tower must be as close to the bottom of the steel tower as possible.

Grounding Resistance

NOTE

- The grounding resistance is the sum of the drifting resistance of grounding bodies and the resistance of grounding cables.
- The drifting resistance may be regarded as the resistance of the grounding body and the resistance in the soil within the reach of 20 m [65.62 ft] around the grounding body.
- If the grounding cable is not too long, ignore its resistance.
- The grounding resistance must be less than or equal to 10 ohms.

The calculation formula of the DC or industrial frequency drifting resistance varies according to the types of earth electrodes, the number of grounding poles, and the forms of combination. The following are some approximate formulas used to calculate the grounding resistance of commonly used earth electrode sets:

- Single piece of steel pipe vertical bar

  For the earth electrode of steel pipe, whose length is 2.5 m [8.20 ft.], the diameter is 5 cm [1.97 in.], and whose buried depth in the soil is over 0.5 m [1.64 ft.] (from the top of the tube to the ground), its grounding resistance R can be calculated with the following equation:

  - $R \approx 0.3\rho$ (ohm)
  - ρ: resistivity of soils

- A horizontal flat steel band

  When the length of the flat steel band is about 60 cm [23.62 in.], its grounding resistance is:

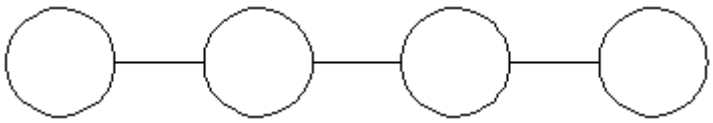
  - $R \approx 0.03\rho$ (ohm)

- Parallel earth electrode set constituted by four steel pipes

  The grounding resistance is:

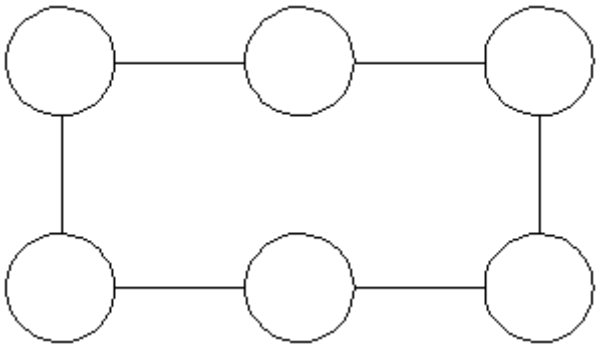
  - $R \approx 0.051\rho$ (ohm)
  - The vertical grounding poles of the earth electrode set use four steel pipes with the length of 2.5 m [8.20 ft] and the diameter of 5 cm [1.97 in.]. Its depth in soil is 0.5 m [1.64 ft]. The interval between these pipes is 5 m [16.40 ft.], and the horizontal connecting wires between these tubes are 40 mm x 4 mm [1.57 in. x 0.16 in.] galvanized flat steel bars, as shown in **Figure 5-4**.

Figure 5-4 Parallel earth electrode set constituted by four steel pipes



- Rectangular earth electrode set constituted by six steel pipes, as shown in **Figure 5-5**

Figure 5-5 Connection of vertical grounding poles of the earth electrode set



As shown in **Figure 5-5**, the steel pipes are the same as those in the parallel earth electrode set. The grounding resistance may be calculated as follows:

$R \approx 0.045\rho$ (ohm)

In the above calculations, soil resistance is the key factor. The actual soil resistivity can be measured by using a grounding resistance tester on site. If the actual value cannot be obtained, refer to the values in **Table 5-1**.

Table 5-1 Resistivity of soils

Soil Type	Resistivity (ρ/ohm-m)
Sea water	1 to 5
Kaolin	10
Peat, marshland	20
Lake water and pond water	30
Black soil, garden loam, malm, pottery clay	50
Clay	60
Sandy-clay	100
Concrete in wet soil	100 to 200
Loess	200
Sandy clay, sandy soil	300
Rocky soil	400
Topsoil mixed with the stone, under-layer gravel (humidity:	500
Sand and clay soil (The depth of sand and clay soil is no greater than 1.5 m [4.92 ft.]. The bottom layer is rocky.)	1,000
Gravel, detritus and rocky mountain	5,000

Soil Type	Resistivity (ρ/ohm-m)
Granite	20,000

The impact grounding resistance (Rch) is the product of the DC grounding resistance and the impact factor, that is:

- Rch = αR (ohm)
- R indicates the DC (or industrial frequency) grounding resistance.
- α is the impact coefficient.

The impact coefficient is related to the shape and size of the earth electrode, the impact current, and the resistivity of soils. The value of α ranges from 0.25 to 1.25. For the tabular vertical grounding body, the value of α ranges from 0.25 to 0.9.

NOTE

The type and temperature of the soils around the grounding pole affects the grounding resistance. The solutions are as follows:

- In the areas where the soils are in poor conditions, the chemical resistance-reducing agent (for example, acrylamide resistance-reducing agent) can be added around the grounding pole.
- In the high-latitude areas where the soil temperature is less than 0ºC, the grounding pole can be deeply buried and the chemical resistance-reducing agent can be added.

5.4 Outdoor Part of the Lightning Protection and Grounding System

This part describes the outdoor part of the grounding system and the lightning protection and grounding of the RF antenna system and the satellite antenna system.

Overview

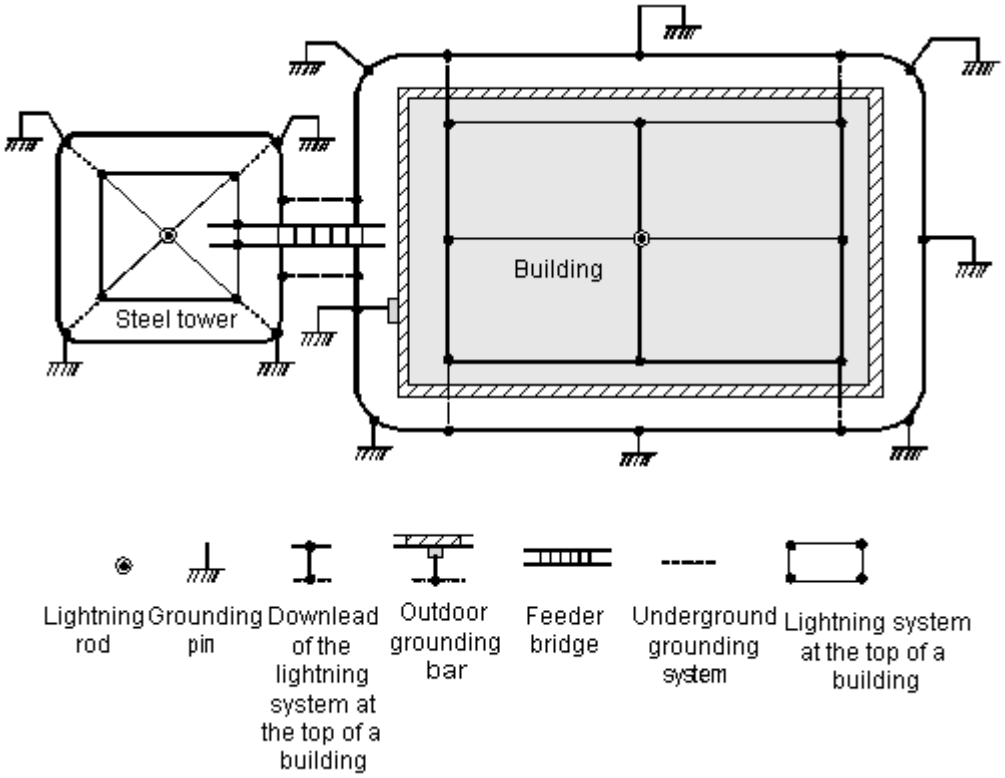
The outdoor lightning protection and grounding system consists of the grounding of the building, the grounding of the steel tower, and the grounding of the antenna system. The outdoor grounding system provides channels for the discharge of strong surge current caused by lightning. If the sectional area of the grounding conductor is less than 150 mm^2 [0.23 $in.^2$], keep the routing of the conductor as straight as possible.

CAUTION

The grounding resistance must meet the local requirements. If there is no reference standard for the resistance in the local area, the grounding resistance must be less than or equal to 10 ohms.

Figure 5-6 shows the outdoor grounding system.

Figure 5-6 Outdoor grounding of the building and steel tower



The outdoor grounding bar is usually installed in a place within 1 m [3.28 ft] away from the feeder window. The grounding bar is connected to the earth electrode through a black cable with a sectional area of more than 95 mm^2 [0.147 $in.^2$]. For details about the installation of the outdoor grounding bar, refer to the instructions on the installation of the indoor grounding bar.

Fastening the Feeder Grounding Clip

CAUTION

- When connecting the grounding cables to the grounding points such as the steel tower, cable rack, and grounding bar, remove the antirust paint on the contact part. After the connection, coat the lug, nut, and grounding points using antirust paint and wrap the bare wire and the lug handle using insulating tape.
- When the grounding cables are grounded through the feeder grounding clip base, the installation of the feeder grounding clip base must meet the requirements.

The requirements for the installation of the feeder grounding clip are as follows:

- When installing the feeder grounding clip on the steel tower,
  - If there is space for installing the grounding clip,

    Directly connect the grounding cables to the steel plate of the tower. In this way, the tower can function as the conductor to discharge the surge current. For details about the installation of the feeder grounding clip, refer to the related instructions.

- If there is no space for installing the grounding clip,

  Fasten the base of the grounding clip on the tower or the outdoor cable rack and then connect the grounding cables to the base.

- When installing the feeder grounding clip on the roof of the building without the steel tower,

  Connect it to the grounding grid on the roof of the building nearby and ensure that the grounding grid is properly grounded.

- When installing the feeder grounding clip on the outdoor cable rack,

  Connect the grounding cables to the properly grounded cable rack.

- When leading feeders into the equipment room,
  - If the outdoor grounding bar is installed,

    Connect the grounding cables to the outdoor grounding bar and ensure that the grounding cables are neatly arranged. The outdoor grounding bar is connected to the grounding grid by using the special conductor.

  - If the outdoor grounding bar is not installed,

    Connect the grounding cables to the properly grounded outdoor cable rack or to the grounding grid of the building.

    The connection point between the grounding cable and the grounding point must be painted with anticorrosive paint.

Lightning Protection and Grounding of the RF Antenna System

For details about the grounding of the RF antenna system, refer to **Grounding Locations of the Feeder Grounding Kits of the Macro Base Station**.

Lightning Protection and Grounding of the GPS/GLONASS Antenna

For details about the grounding of the GPS/GLONASS antenna, refer to **Grounding Locations of the Feeder Grounding Kits of the Macro Base Station**.

5.5 Lightning Protection and Grounding of the Base Station

The working grounds and protection grounds of the base station must be connected on the top of the cabinet. A grounding cable is led from the PE grounding bar to the indoor grounding bar of the equipment room. When several cabinets are combined, the grounding cables of adjacent cabinets are interconnected through PE grounding bars on the top of each cabinet.

5.6 Lightning Protection and Grounding of the Power Supply System

In the power supply system, lightning protection must be performed for the power supply system of the base station and the power cables.

Requirements for the Lightning Protection of the Power Supply System

The requirements for the lightning protection of the power supply system are as follows:

- The DC working ground (reflow ground of the –48 V DC or +24 V DC power supply) must be connected with the indoor grounding bar nearby. The grounding cable must be capable of supporting the maximum load of the system.
- The AC power supply is based on the TN-S.
- A dedicated power transformer must be used for the base station. Before the power cables are connected to the base station, the cables must be covered by metal jackets or steel tubes, buried under the ground (the buried section must be at least 15 m [49.21 ft.] long), and properly grounded.
- When the power transformer is installed outside the equipment room, the following requirements must be satisfied:
  - For areas with more than 20 thunderstorm days every year and a grounding resistance greater than 100 ohm•m, lightning protection cables must be installed for the aerial cables. The lightning protection cable must be no less than 500 m [1640.40 ft.] long.
  - The angles formed between the power cables and the lightning protection cables must be less than 25º.
  - All poles of the lightning protection cables (except for the last pole) must be grounded independently.

  NOTE

  - A set of zinc oxide lightning arresters must be installed at the next to the last pole.
  - If it is difficult to install lightning protection cables for existing aerial power cables, install zinc oxide lightning arresters for the last pole, the last but one pole, the last but two or three pole, the last but four pole. In addition, install a set of high-voltage fuses for the last but three or four pole.
  - The lightning protection cable and the grounding body of the lightning arrester should be of an outstretching or circle structure.
- When the power transformer is installed inside the equipment room, the following requirements must be satisfied:
  - The high-voltage power cables must run into the equipment room through underground channels, and the power cables must be no less than 200 m [656.16 ft.] long.
  - Zinc oxide lightning arresters must be installed for the three phase lines that connect the power cables and the aerial power cables. The metallic sheath of the power cables should be properly grounded.
- For the low-voltage power cables entering the base station, the following requirements must be satisfied:
  - The cables must be buried under ground before they enter the base station, and the cables should be no less than 15 m [49.2 ft] long. When the high-voltage side of the transformer uses power cables, the length of the low-voltage power cables depends on actual situations.
  - A lightning arrester should be installed where the power cables meet the AC power distribution panel, and the neutral lines led out of the power distribution panel need not be grounded.
- Zinc oxide lightning arresters must be properly installed for the three phase lines at the high-voltage side of the power transformer.
  -
  - Seamless zinc oxide lightning arresters must be properly installed for the three phase lines at the low-voltage side of the power transformer.

  - The chassis of the power transformer, the neutral lines at the low-voltage side, and the metallic sheath of the power cables connected with the transformer should be properly grounded.
  - Lightning arresters must be installed where cables run in or out of the base station.
- The uncharged parts of the power supply devices and the lightning arrester must be properly grounded. Do not conduct neutral protection.
- The DC working ground must be connected with the indoor grounding bar nearby.
  - The cross-sectional area of the grounding cables must range from 35 mm^2 [0.054 $in.^2$] to 95 mm^2 [0.147 $in.^2$] so that the cables are capable of supporting the maximum load.
  - Strand copper wires are used as grounding cables.
- The AC panel and rectifier (or high frequency switch power supply) must be equipped with multi-level protection devices.
- The voltage withstanding capability of the lightning arresters must conform to the relevant standards.

Requirements for the Lightning Protection of Led-In Power Cables

The requirements for the power cables led into the equipment room are as follows:

- Lightning arresters are installed.
- Aerial cables are not allowed for the AC or DC power cables led into or out of communications sites.
- After the low-voltage power cables are led into the AC rectifier and AC power distribution box, the power cables must be equipped with a lightning arrester that is properly grounded.
  - In rural areas, the current discharge capacity of the lightning arrester must be greater than 40 kA.
  - In suburbs with average thunderstorm days, the current discharge capacity of the lightning arrester must be greater than 40 kA.
  - In mountain areas prone to thunderstorms or standalone high buildings, the current discharge capacity of the lightning arrester must be greater than 100 kA.
- The grounding cable of the lightning arrester must be less than 1 m [3.28 ft] in length and greater than 25 mm^2 [0.039 $in.^2$]in cross-sectional area.

5.7 Requirements for the Lightning Protection and Grounding of Signal Cables

For signal cables, lightning protection can be conducted by using shielded cables, installing lightning arresters, or grounding the cables.

The requirements for the lightning protection of signal cables are as follows:

- Aerial cables are forbidden.
- A lightning arrester must be installed where the signal cables enter the base station.
- The idle lines in the signal cables must be properly grounded.
- The ends of the metallic tubes that cover the outdoor signal cables must be properly grounded.

- Signal cables must be buried under ground before they are led into and after they are led out of the base station.
- Before the signal cables are led into the base station, the shielding layers must be securely grounded.
- The lightning arresters must be securely grounded.
- For areas with more than 20 thunderstorm days every year and a grounding resistance greater than 100 ohm•m, the following measures can be taken during cable routing:
  - Arranging drainage wires over the signal cables
  - Using cables covered by metallic sheath
  - Using optical fibers

NOTE

- Huawei recommends that all signal cables use shielded cables.
- Huawei recommends that lightning arresters should be used for interconnection devices, so that the protection against a differential mode of 3 kA or a common mode of 5 kA is achieved.

5.8 Requirements for the Lightning Protection and Grounding of Feeders

This part describes environment requirements for the installation of antennas and feeders.

Environment requirements for the installation of antennas

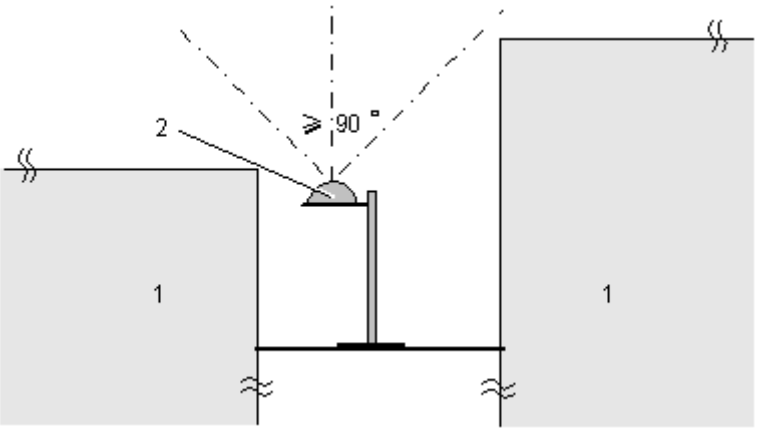
The requirements for installing antennas are as follows:

- The spacing between two antennas must be equal to or less than 1 m (3.28 ft.).
- The antennas must be located beyond the coverage of a directional antenna of which the transmit power is greater than 1 W and the frequency is higher than 400 MHz.
- The antennas must be located at least 20 m (62.62 ft.) far away from omni antennas.
- If possible, the antennas should be installed in the middle of a roof. Do not install them on the surrounding parapets or the corners of a roof.
- If an antennas has to be installed on a parapet, the following requirements must be satisfied:
  - The antenna is preferred to be installed where it does not affect the appearance affection of the building and the feeder can be fixed easily.
  - The parapet must be strong so that it can be drilled for mounting expansion bolts. A parapet of more than 600 mm [23.62 in.] in height is better for mounting expansion bolts.
- If an antennas has to be installed on a tower, the following requirements must be satisfied:
  - The location of the antenna must be higher than the top of the building where the equipment room is located.
  - The antenna should be kept far away from the high power antenna on the top of the tower.
- A dedicated lightning rod should be installed near the antenna.

  If a dedicated lightning rod is unavailable, lightning rods on the top of buildings or towers work. Interference, however, must be considered.

- The angle between the receiving end of the antenna and the lightning rod or that between the connection line at the top of the tower and the vertical line must be less than 45°. In areas prone to thunderstorms (more than 20 thunderstorm days every year), the angle must be less than 30°. The horizontal distance between the antenna and the lightning rod must be greater than 2 m (6.56 ft.)
- The upward vertical angle of the antenna must be greater than 90°, as shown in **Figure 5-7**.

Figure 5-7 Installation position of the antenna



(1) Surrounding buildings or other obstacles GPS antenna

Environment requirements for the installation of feeders

The requirements for installing antennas are as follows:

- When the antenna is installed on a roof, be sure to:
  - Run the feeder along the root of the podium of the building roof and fix the feeder using a plastic clip with steel nail.
  - The spacing of plastic pieces is 1 m [3.28 ft.]. Arrange the directions of the tips of the plastic pieces by following a certain rule. All plastic pieces are aligned with the surface of the wall so that the cable reaches the cabling ladder on the roof.
  - If the feeders are routed along the tower, fix them using fixing clips.
- When you route the feeder, be sure to:
  - Expand the feeder first and avoid bending it when laying out a feeder.
  - If bending is inevitable, ensure that the bending radius of the feeders must be 20 times greater than the diameter of the feeder.
- Use reliable material such as the packing bag to protect the connectors on both ends of the feeder.
- - If there are two feeders, use temporary labels to identify them.

    You can write the temporary labels in the same manner as that for formal labels, or any other manner.
  - Do not cross the feeders.
- If the feeders are routed along a cable ladder, fix them using fixing clips with a spacing of 2 m (6.56 ft.).

- The path from the roof to the equipment room must be clear of obstacles. In addition, waterproof and anticorrosion measures must be taken for the feeders.
- Make waterproof curves for the feeders before they are led into the equipment room.

  The vertical distance between the lowest part of the waterproof curve and the entrance must be at least 200 mm (7.87 in.) to keep the rain water out of the room.

Requirements for the Routing and Grounding of Feeders

When you route and ground the feeders, ensure that the following requirements are satisfied:

- The feeders are led into the equipment room through a cabling rack or under ground.
- Grounding clips should be correctly mounted. For details about the installation of grounding clips, refer to **Grounding of the RF Antenna Feeder** and **Grounding of the Satellite Antenna Feeder**.
- Both ends of the cabling rack properly grounded.

NOTE

After the feeder is led into the equipment room, a coaxial lightning arrester with a current discharge capacity greater than 8 kA must be installed.

5.9 Lightning Protection and Grounding of Other Equipment

This part describes the requirements for the lightning protection and grounding of other equipment such as the equipment room, metallic devices on the roof, bulbs on the roof, and the cabling rack.

The requirements for the lightning protection and grounding of the other equipment are as follows:

- The equipment room should be equipped with devices such as lightning protection band, lightning protection network, and lightning arrester. They can protect the equipment from direct lightning strikes and inductive lightning strikes.
- All metallic devices on the roof of the equipment room should be connected with a nearby lightning protection band.
- The bulbs on the roof of the equipment room should be installed under the lightning protection band.
- If the power cables of the bulbs are routed through the tower or top of the building, the cables must be routed inside a metal tube.
- The cabling rack, steel shelf, rack or chassis, metallic air conduit, and metallic window and door should be grounded.

  The grounding cables are a bundle of copper wires with cross-sectional area of bigger than 25 mm^2 [0.039 in^2].