

Best Practices for  
Installing Lightcloud

# Planning Guidelines

Lightcloud Network  
Wireless Networking Considerations  
Wireless Mesh Network  
Placement of Devices  
Powering Devices  
Placing the Gateway  
Installation Checklists  
Installing Lightcloud Sensors

# Getting Started

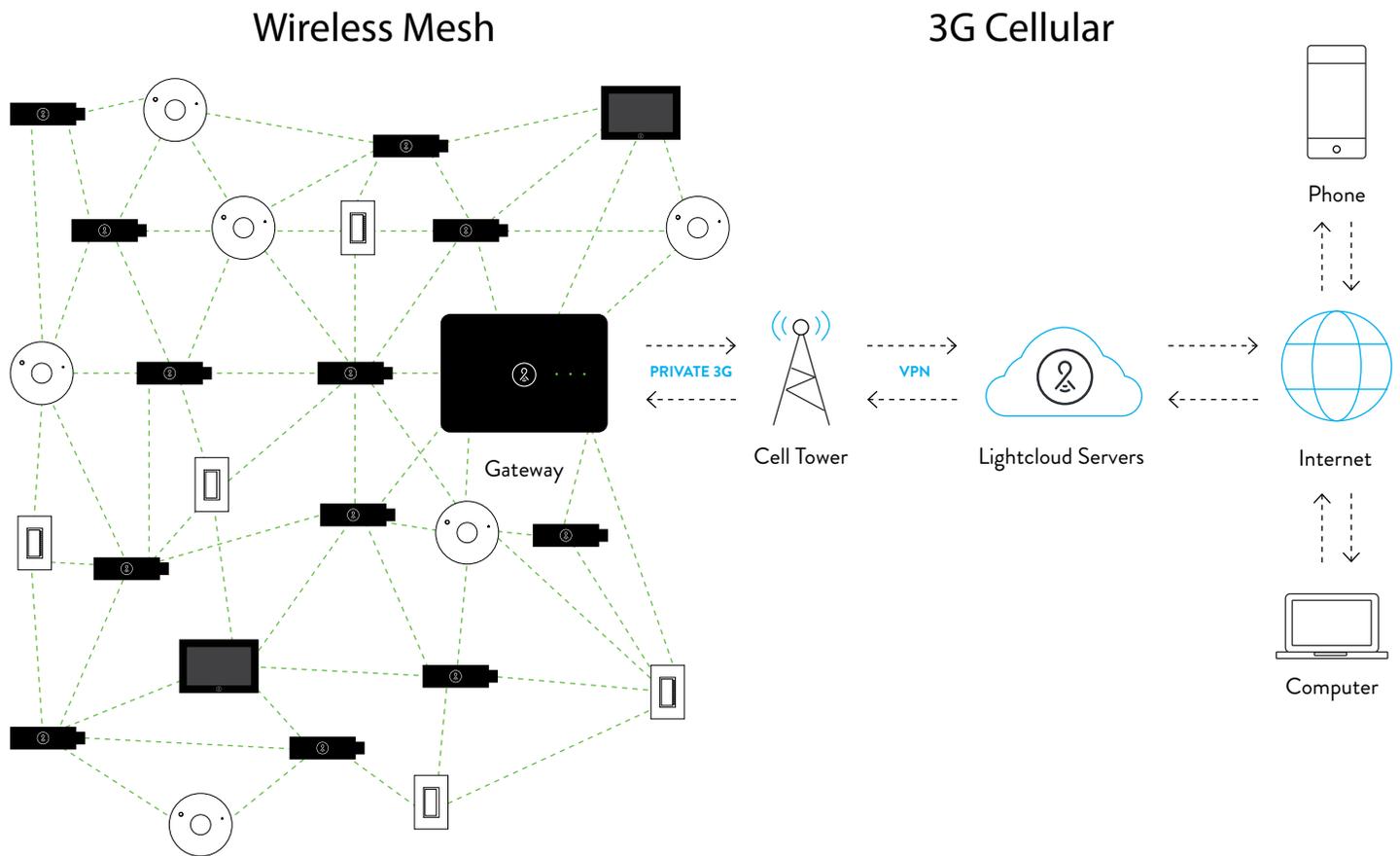
Setting up a Lightcloud system is simple. Following these guidelines will make setup even easier. Proper placement and planning is the most important part of a successful Lightcloud installation. Please read this entire guide prior to installation.

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# Lightcloud Network

## Two Independent, Wireless Networks



Note: All Lightcloud Devices extend the Lightcloud network's range except for Daylight which does not repeat a mesh network signal.

### Lightcloud operates on two different networks: 3G Cellular and a wireless mesh.

The 3G Cellular network connects the Lightcloud system via the Gateway to RAB allowing remote management of the system including lighting controls from your phone. If the Gateway doesn't have a 3G signal, there's no way to set up the Lightcloud system or control it remotely.

Lightcloud Devices communicate with each other using a wireless mesh network. For any Device to join the network, the Device has to be within range of another Device on the network. This has a great advantage over traditional WiFi networks. With traditional WiFi, each Device must be within range of the router. With a mesh network, each Device extends the range of the network by repeating the signal from other Devices.

### Advantages to using a mesh network for lighting controls

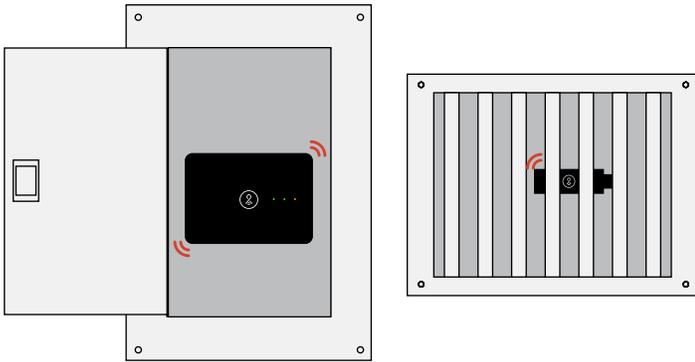
- **Scalability** - Lightcloud Devices don't need to be within direct range of the Gateway. **All Lightcloud Devices except for Daylight extend the range of the network.** This allows for a much larger network using only one Gateway.
- **Reliability** - Mesh networks are self-healing, meaning that if a Device goes offline, traffic is routed around it to other Devices in the network, without interruption of service. When an offline Device comes back online, it rejoins the network seamlessly.

As is the case with setting up any new wireless network, it pays to think ahead and consider a few key factors to make sure your Lightcloud network functions optimally.

# Wireless Network Considerations

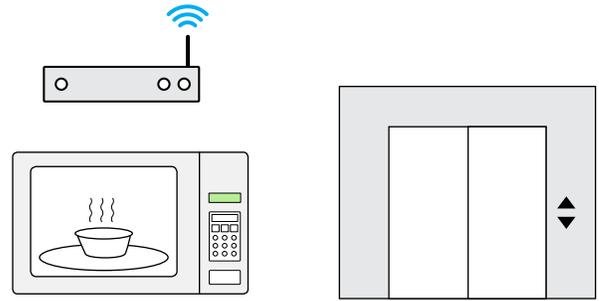
## Things to Avoid

Wireless signals are greatly affected by building materials and wireless interference. For a Lightcloud system to function properly, Devices need to be placed in unenclosed areas, preferably without significant interference from things like cordless phones, microwaves, WiFi routers, or large motors such as those found in elevator rooms.



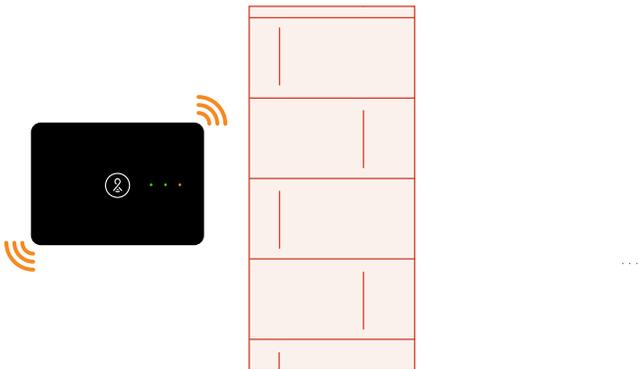
### ✗ Avoid Enclosures

Do not place the Gateway or other Lightcloud Devices inside metal enclosures — inside panels. Metal enclosures will greatly reduce wireless transmission.



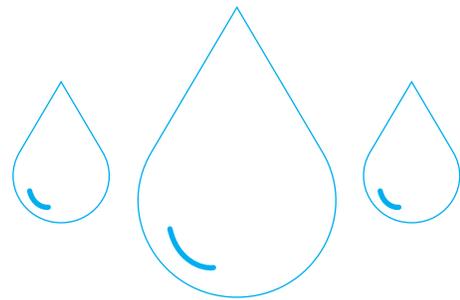
### ✗ Avoid Interference

When possible, avoid placing Lightcloud Devices near common sources of wireless interference, such as microwave ovens, cordless phones, WiFi routers, or large motors such as those found in elevator machine rooms.



### ✗ Avoid Obstructions

All wireless networking works by sending messages through the electromagnetic field — the same as light, but not visible. Just as with visible light, it can be bent, reflected or outright stopped. If you can see a straight or reflected line from one Device to another, the signal should be strong. Dense materials such as concrete may obstruct wireless signals and require routing around.



### ✗ Avoid Moisture

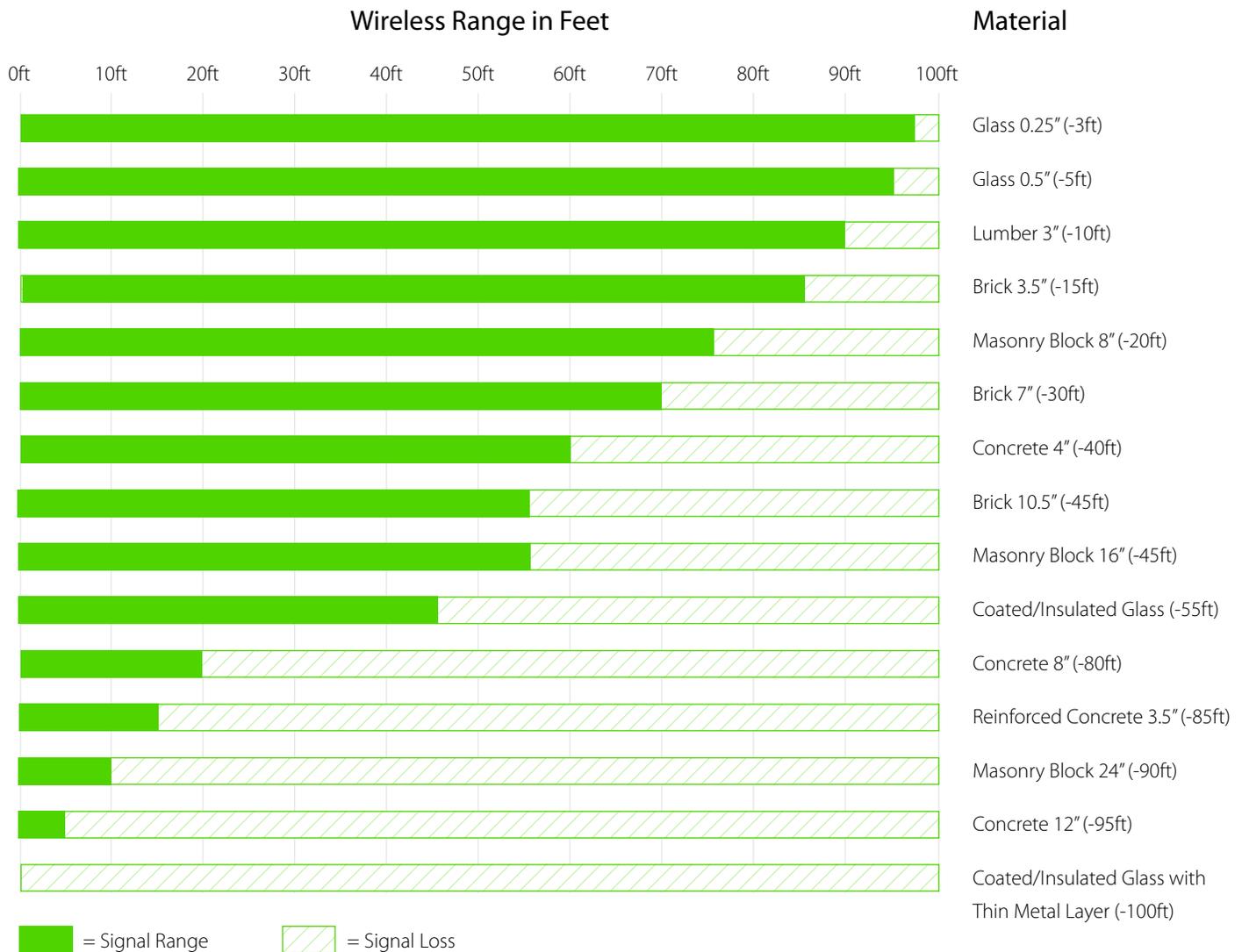
Water (in the form of humidity and occupancy by people) will absorb RF signals, reducing effective range. Very humid environments or areas that will be populated by large numbers of people will require reduced distance between Lightcloud Devices.

# Wireless Mesh Network

## Range Through Building Materials

The range and reliability of the Lightcloud wireless mesh network is greatly impacted by building materials and environmental factors. For the purposes of maintaining a high quality, reliable installation, the maximum indoor wireless range of a Lightcloud Device is 100 feet.

*Note: Devices with a clear line-of-sight to each other (no obstructions whatsoever) can exceed this limit but other factors such as interference can still limit that distance. Effective range is reduced by transmitting through building materials.*



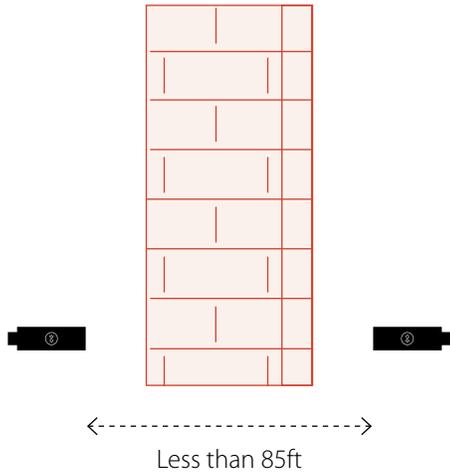
### Calculating the effective range of communication between two Devices

- Subtract the building material's loss amount from the chart above from 100'.
- If there are multiple materials between Devices, add them up.
- The result is the maximum suggested distance between those Devices. If this distance is below 10', it may be necessary to route around that obstruction with other Devices (see page 6).

# Wireless Mesh Network

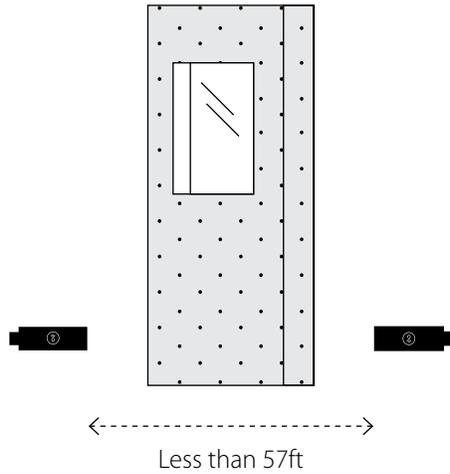
## Obstruction Examples

### Brick Wall



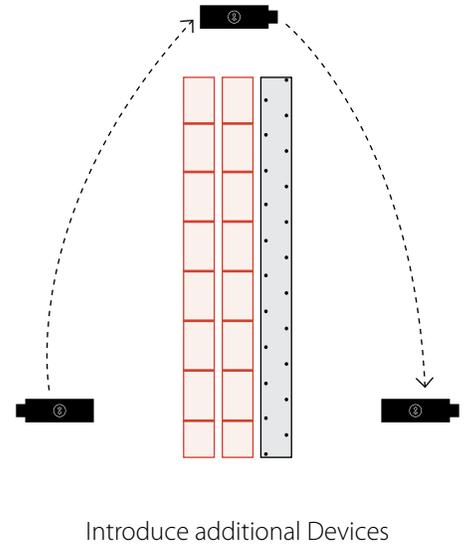
Two Devices are separated by a 3.5"-thick brick wall:  $100' - 15' = 85'$ . Don't place these Devices farther than 85' apart.

### Concrete Wall with Glass Window



Two Devices are separated by a 4"-thick concrete wall and glass window:  $100ft - 40ft - 3ft = 57ft$ . Don't place these Devices farther than 57ft apart.

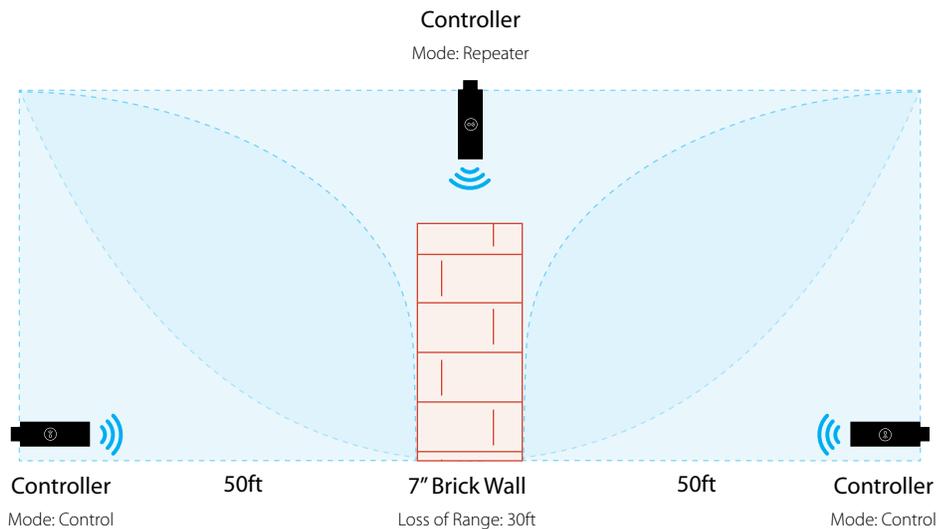
### Brick and Concrete Walls



Introduce additional Devices  
Two Devices are separated by two 7" brick walls and a 4"-thick concrete wall:  $100' - 30' - 30' - 40' = 0'$ . You will need to introduce additional Devices to route around or through these obstructions.

## Connect Devices Separated by an Obstruction

When two Devices are separated by an obstruction like brick or concrete, add a Controller in Repeater mode near one side of the obstruction. Controllers in Repeater mode extend the mesh network without controlling a load.



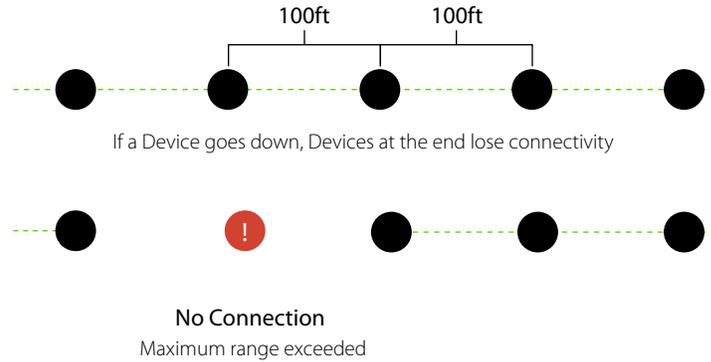
# Wireless Mesh Network

## Layout & Alignment

### Avoid long lines or chains

When possible, avoid installing Lightcloud Devices in a long line or “chain,” as this can make the network more fragile.

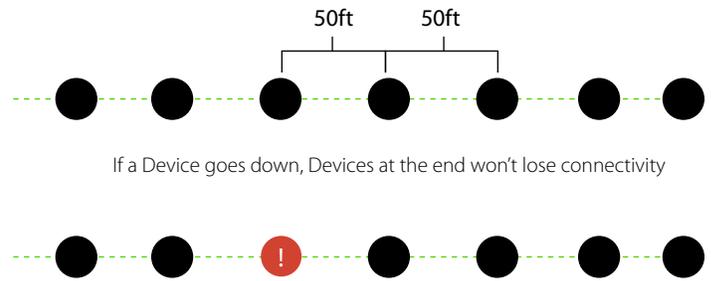
✗  
DON'T



### Tight-linked chains

If it is unavoidable to create a chain of Devices, try to place them closer together so that if one Device can't communicate, the surrounding Devices will still be able to reach each other.

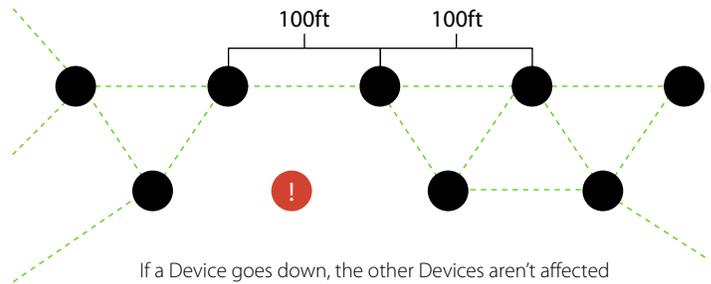
✓  
DO



### Create a mesh pattern

Ideally, Devices should be able to mesh together with other Devices in order to create redundancy.

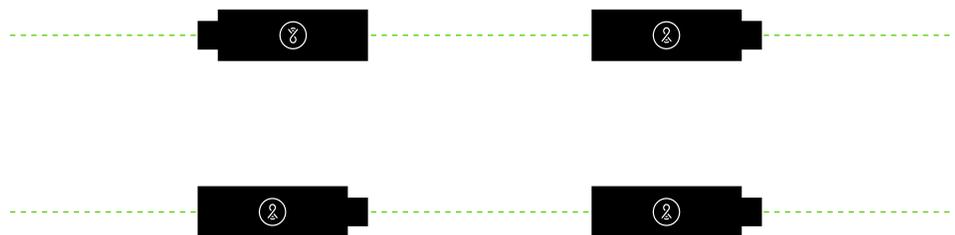
✓  
DO



### Optimal Controller Alignment

For most applications, Controller alignment isn't a concern, however when pushing Controller separation to its limits or going through lots of building materials, aligning Controllers can increase connection strength.

✓  
IDEAL



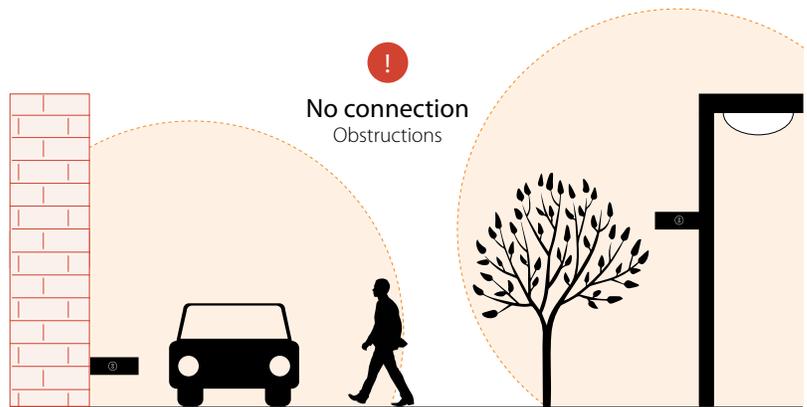
# Placement of Devices

## Outdoor Space

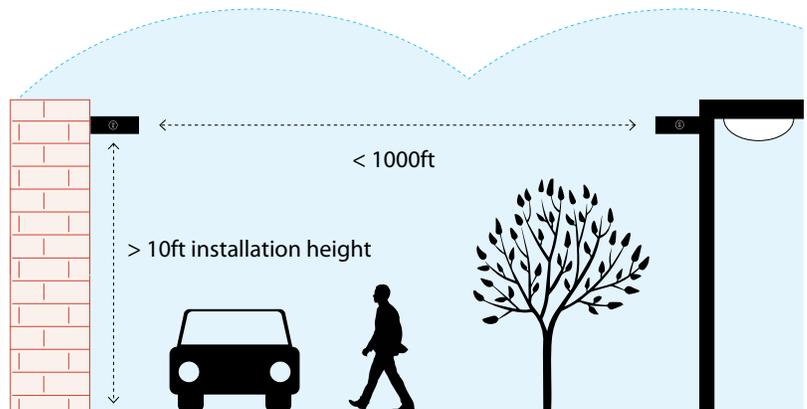
Outdoor Devices with no interference or obstructions have a maximum range of 1000ft and suggested mounting height of greater than 10ft.

Raising Controllers above obstructions such as trees improves network reliability and prevents signal loss. Keep in mind, some obstructions are temporary such as cars and people — these obstructions could cause intermittent connection loss.

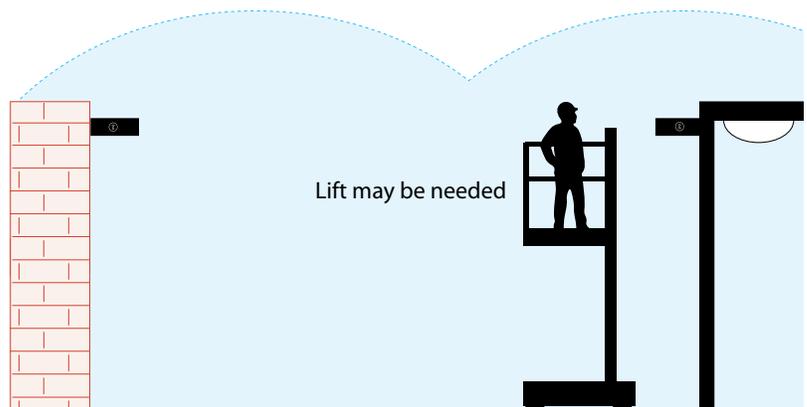
**✗**  
**DON'T**  
Place Controller too low



**✓**  
**DO**  
Place Controllers above obstructions



**✓**  
**DO**  
Finalize pole installation  
before leaving site

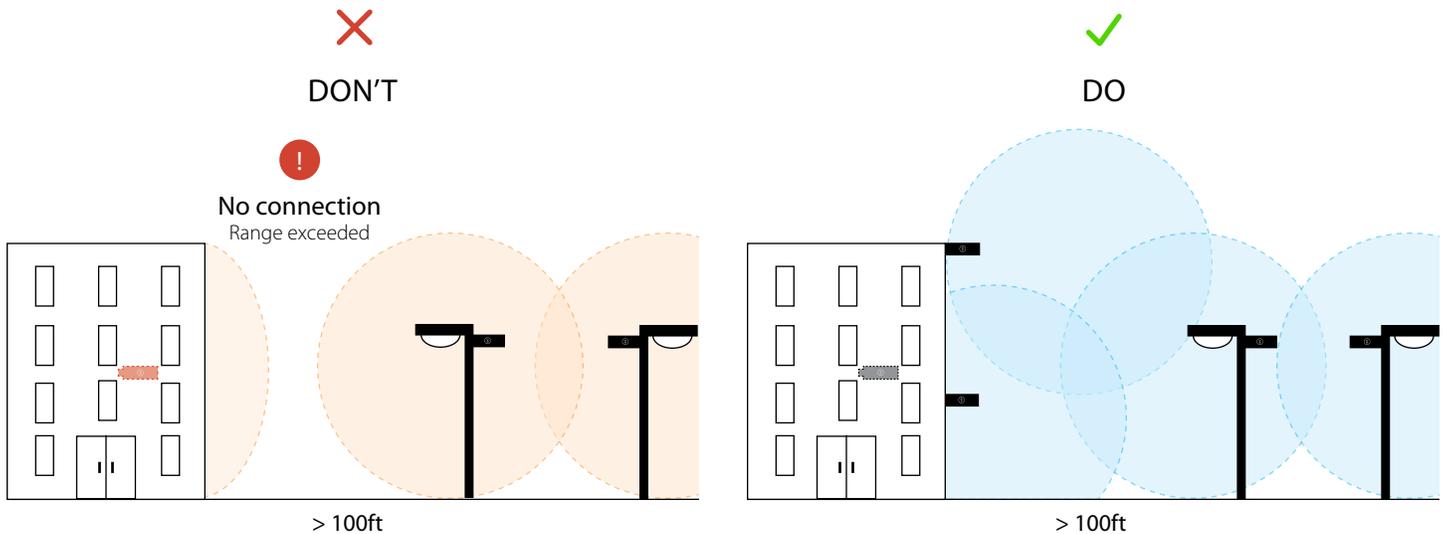


# Placement of Devices

## Outdoor Space & Corners

### Connecting Lightcloud inside a building to an adjacent outdoor space

Place a Controller on the exterior of the building within range of the interior and exterior mesh network. Multiple Controllers on the exterior of the building will improve mesh network reliability.



### Interior of building to outdoor space

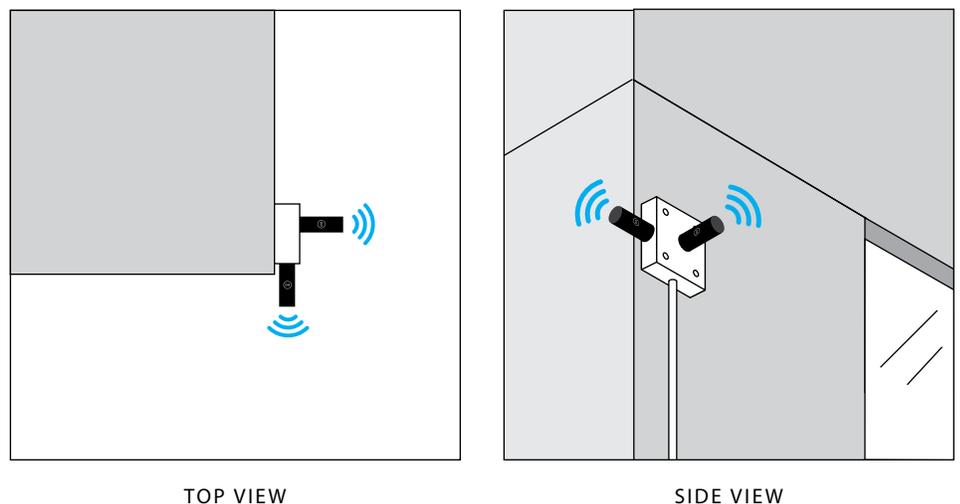
Signal needs to travel through exterior wall, then all the way to the pole.

### Exterior of building to outdoor space

Optional Controller on roof if there are obstructions between building and poles Controller.

### Devices around corners

If you need to direct a wireless mesh signal around the corner of a building, you can install two Controllers in a 90° fashion from each other as pictured.

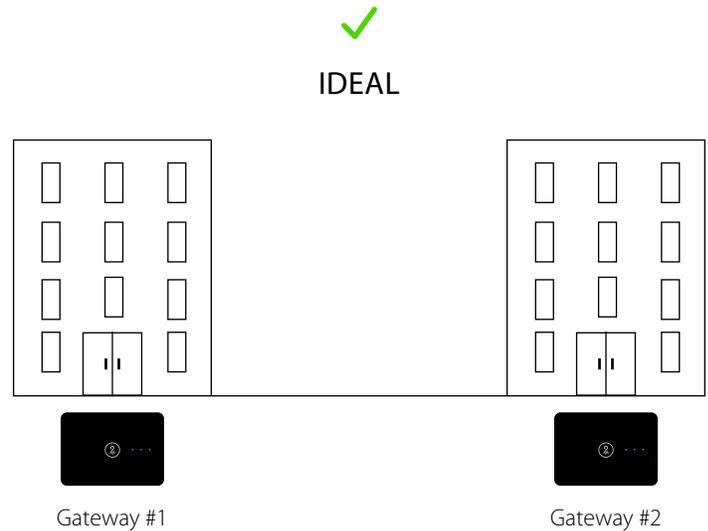


# Placement of Devices

## Multiple Buildings

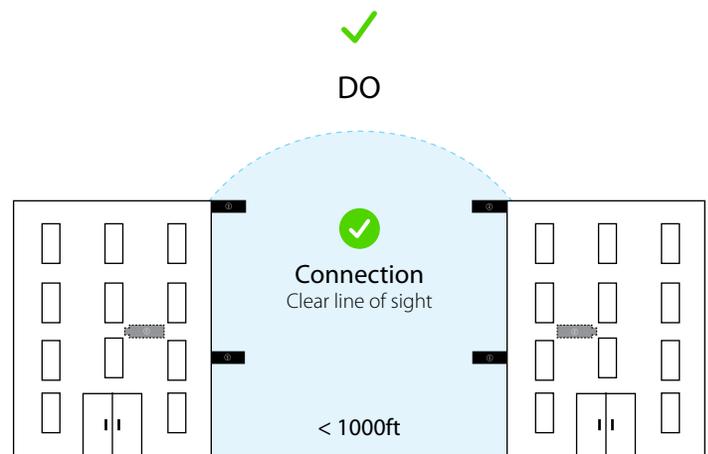
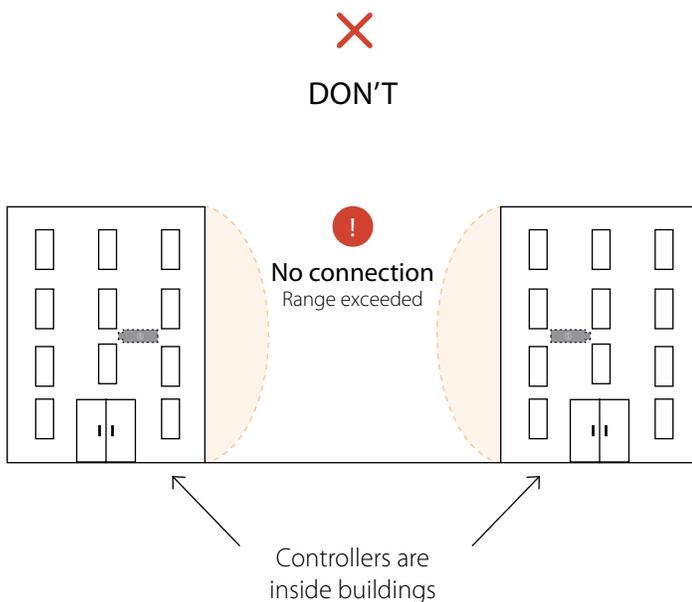
It is highly recommended that one Gateway is used for each building.

Lightcloud mesh networks can be extended into multiple buildings using a single Gateway, but it is not a recommended practice as it increases the chances of the building without a Gateway disconnecting from the mesh network.



## Controller configuration to connect two buildings

If a single Gateway must be used for two buildings, place a Controller outside each building at both bases and roofs. The two buildings must be in range of each other.



1. Place a Controller on top of each building.
2. Place an additional Controller outside each building but near an indoor Controller using the Controller configuration below. This creates two line-of-sight pathways between the buildings, increasing reliability.

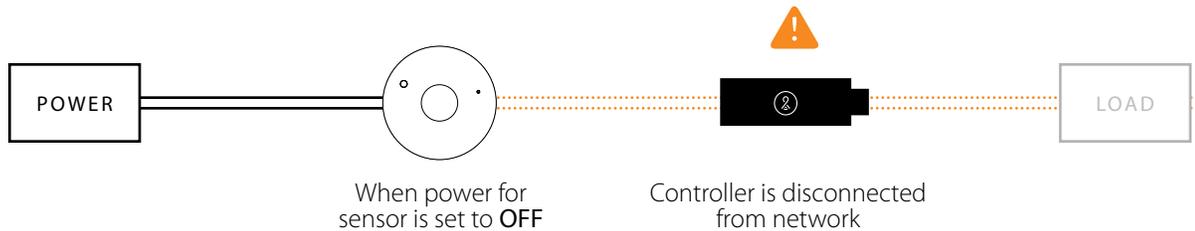
# Powering Devices

## Lightcloud Devices require a constant hot feed

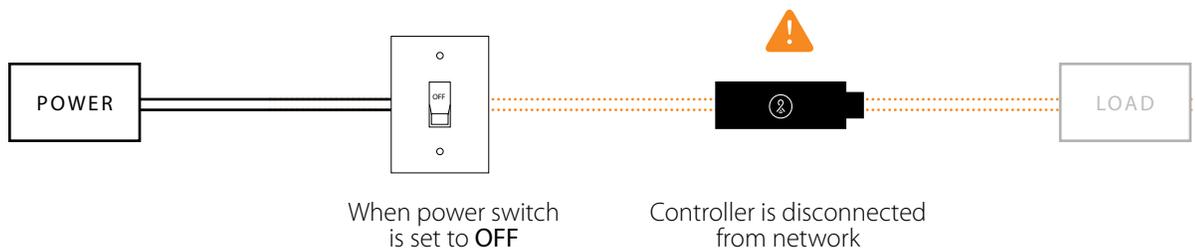
Avoid putting Gateways, Controllers, Sensors and other AC-powered Devices downstream of any electrical component that interrupts power, for example, a photocell, occupancy sensor, or another switching Device.

*Note: Daylight does not require a hot feed.*

✗  
DON'T



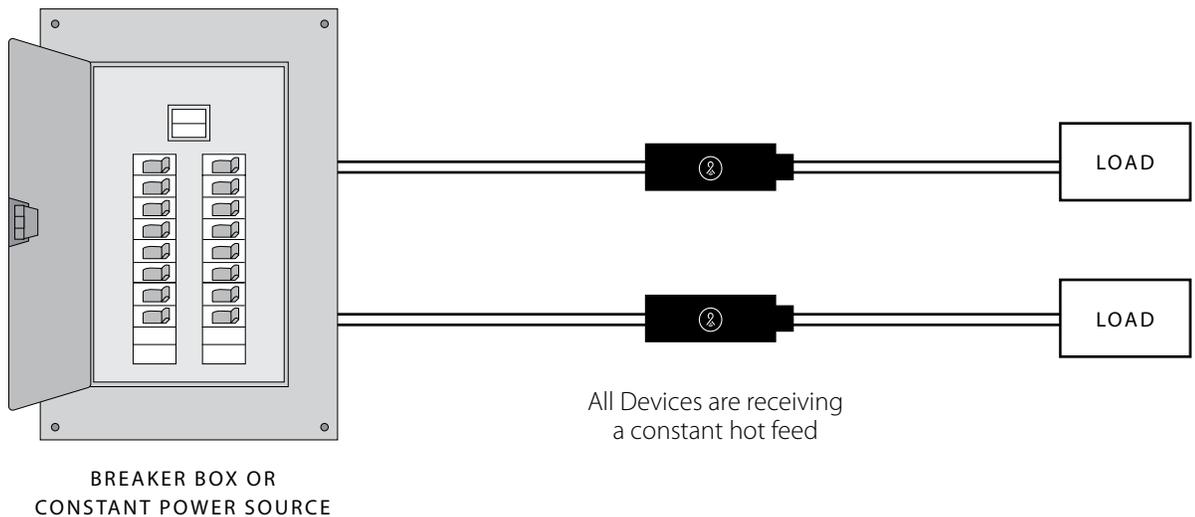
✗  
DON'T



✗  
DON'T



✓  
DO



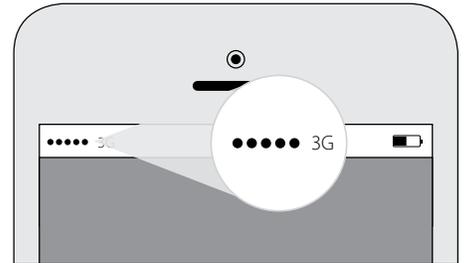
# Placing the Gateway

## Signal & Power

For the Gateway to connect to both the 3G and mesh network, the Gateway must be placed in an area with reliable cellular service and within range of at least one but preferably several Lightcloud Devices. If you've identified multiple locations inside the building with a reliable cellular signal, pick a location near the center of the Lightcloud installation. The Gateway should be at the edge of a building, or closer to a window if possible.

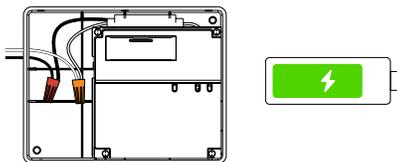
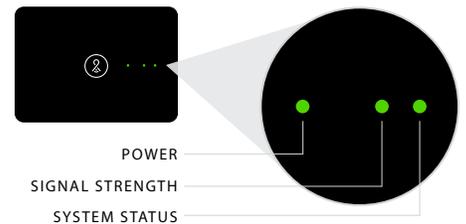
### 1. Use Your Cellphone

Start by using your cellphone. If your cellphone doesn't have service, then the Gateway most likely won't either. Look for a location in your installation that is both as central to the other Devices as possible, and has good cellular reception. Cellular reception is more vital than being in a central location. You can always add additional Lightcloud Devices to improve the mesh network, but you can't improve the cellular reception.



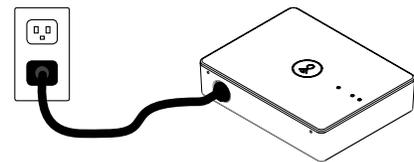
### 2. Test the Gateway Signal

Once you've chosen a few possible locations for your Gateway, make sure you test the cellular reception on the Gateway itself. The cellphone is a good starting point for gauging reception, but every Device has a slightly different antenna and may be on a different network. The Gateway has a cellular indicator light that will show signal strength once powered. It may be necessary to wait several minutes to receive an accurate measurement. To test the cellular signal strength on the Gateway, there are two options: charge the battery or wire a temporary plug.



#### 2a. Charge the Battery

Connect the Gateway to line voltage and let it charge the included battery backup for half an hour. Disconnect the Gateway from the line voltage, and carry the Gateway to the potential installation location. If the signal light is green, you're ready to install the Gateway.

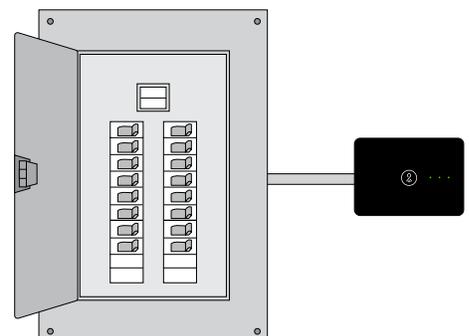


#### 2b. Wire a Temporary Plug

The Gateway can be temporarily wired to a cord and plug. Plug the Gateway into an outlet near the potential installation location and test for signal strength. If you see a green light, you're ready to install the Gateway.

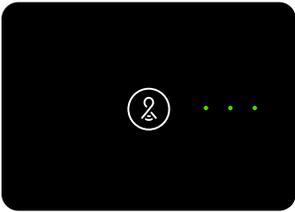
### 3. Permanent Power to the Gateway

The Gateway is designed for a permanent, mains-powered installation. Once you've found a location with a strong cellular signal, hard-wire the Gateway to a constant power source.



# Installation Checklist

## Gateway



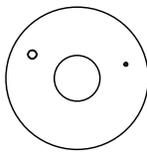
- ✓ Gateway has cellular reception
- ✓ Gateway is located centrally to other Lightcloud Devices
- ✓ Gateway is installed to permanent, constant power
- ✓ Gateway is free from locations with heavy interference
- ✓ Gateway is in an unobstructed location

# Installation Checklist

## Other Devices



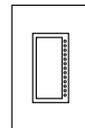
Touch



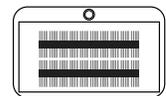
Sensor



Controller



Dimmer



Daylight

- ✓ Device is within range of one or more Lightcloud Device
- ✓ Device is wired to permanent, constant power (*except for Daylight*)
- ✓ Device is free from locations with heavy interference
- ✓ Device is in an unobstructed location

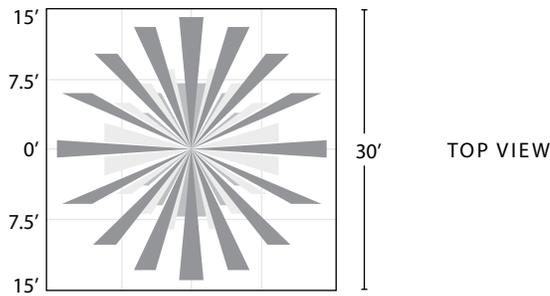
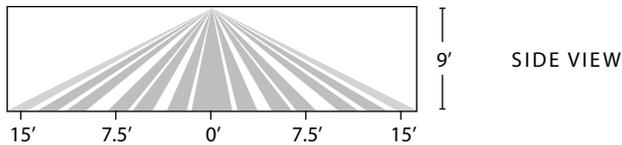
# Installing Lightcloud Sensors

## Coverage

Sensor coverage is determined by mounting height and the distance between sensors. Motion cannot be detected through windows.

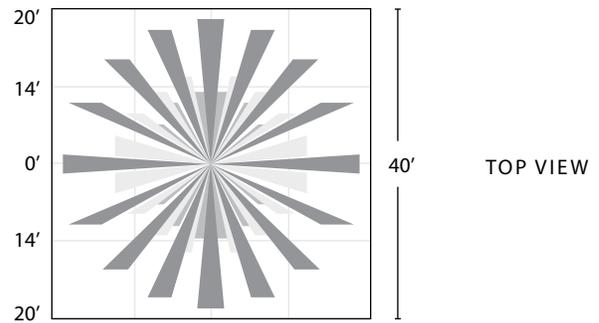
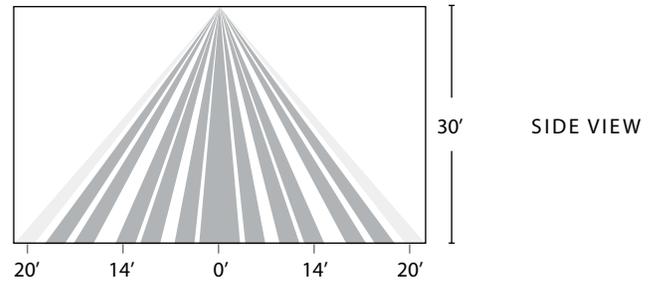
### Standard Mounting Height (8 to 12 feet)

Coverage radius 15 feet at 9 foot mounting height



### High Bay (25 to 45 feet)

Coverage radius 20 feet at 30 foot mounting height

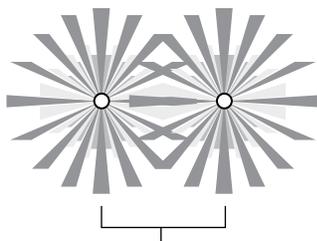


## Adding Multiple Sensors

For rooms requiring more coverage than offered by a single Ceiling Sensor, position multiple sensors with overlapping coverage.



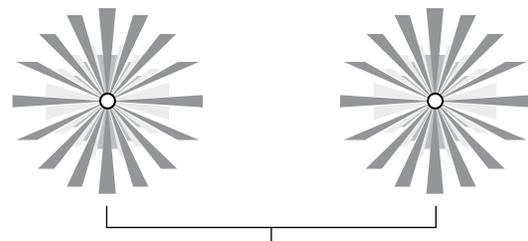
DO



< 30 ft Standard Mount  
< 40 ft High Bay



DON'T



> 30 ft Standard Mount  
> 40 ft High Bay

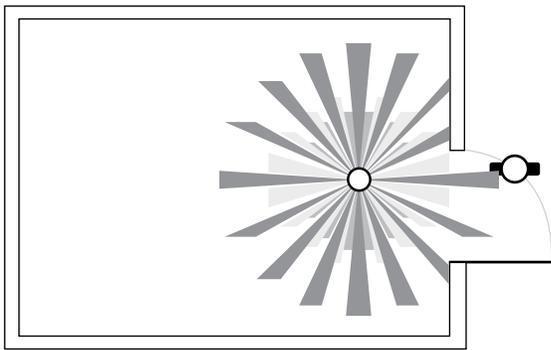
# Installing Lightcloud Sensors

## Proximity

### Proximity to Doors

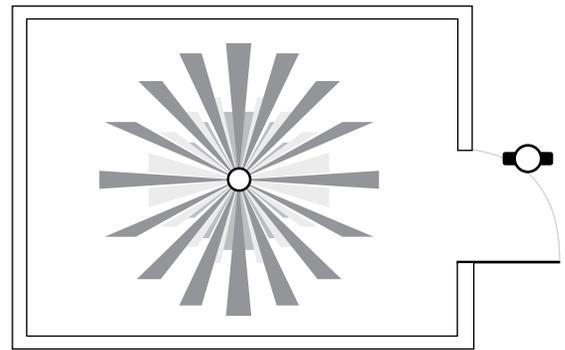
When Installing a Sensor in a single room with a door or window, be mindful of the coverage radius to make sure that movement is only detected inside the room and not outside the door.

✗  
DON'T



←-----→  
< 15 ft Standard Mount  
< 20 ft High Bay

✓  
DO

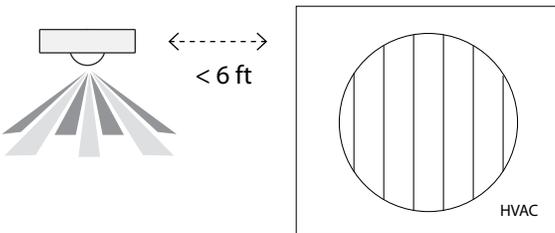


←-----→  
< 15 ft Standard Mount  
< 20 ft High Bay

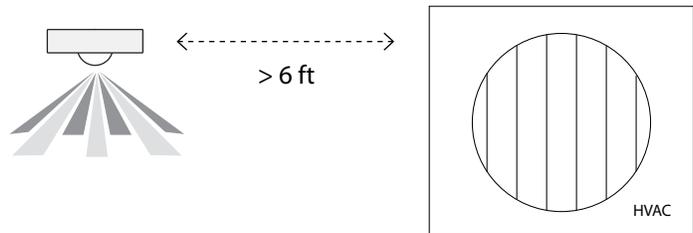
### Proximity to HVAC

Do not place Sensors within 6 feet of HVAC vents as this may interfere with occupancy/vacancy detection.

✗  
DON'T



✓  
DO



# Ready to Install?

[lightcloud.com](http://lightcloud.com)

1 (844) LIGHTCLOUD