

DECT Phone System Deployment Guide

Flexible wireless solution for SMB and SOHO

About This Guide

This guide provides instructions and best practices for deployment of the Yealink W52P/W53P/W56P/W60P/CP930W-Base IP phones and repeaters RT10/RT20/RT20U/RT30, which is intended for qualified technicians (or administrator) who will deploy the DECT phone system. To complete the deployment, prior knowledge of DECT telephony concepts are necessary. For a better understanding of W52P/W53P/W56P/W60P/CP930W-Base IP phones and repeater RT10/RT20/RT20U/RT30, refer to the related documentations listed below.

At the completion of this guide you should be comfortable with the following:

- Using the handset to measure the radio signal strength and signal quality.
- Selecting a proper mounting location for base stations and repeaters.
- Operating and configuring of the base station, repeater and handset.

Documentations

The following related documents for W52P/W53P/W56P/W60P/CP930W-Base IP phones are available:

- Quick Start Guides, which describe how to assemble DECT IP phones and configure the most basic features available on DECT IP phones.
- User Guides, which describe the basic and advanced features available on DECT IP phones.
- DECT Repeater User Guide, which describes how to use repeater RT10/RT20/RT20U/RT30 with DECT IP phones.
- Auto Provisioning Guide, which describes how to auto provision DECT IP phones using the configuration files.

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Site Planning

Deployment of base stations and repeaters is a central aspect of any DECT phone solution. To successfully deploy the DECT phone system, the deployment concepts explained in this guide must be followed.

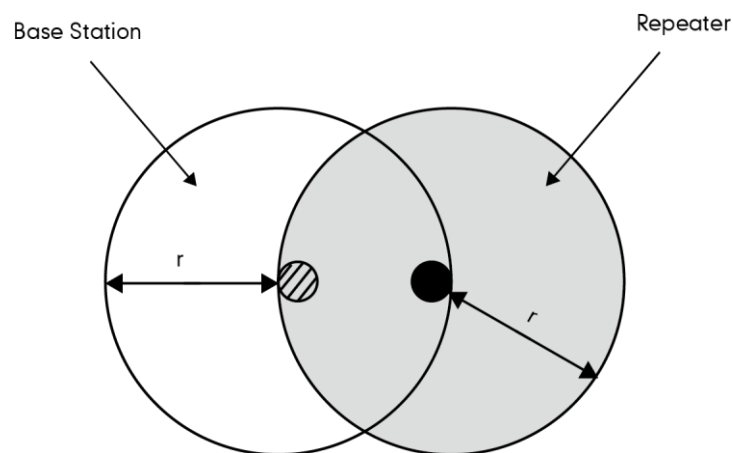
Radio Coverage Planning

A radio coverage plan must be performed to determine the optimal location and the total number of base stations and repeaters required for a given installation. The base station provides a typical coverage radius and propagates in all directions.

Inside a building: radius < 50m, depending on the building architecture and wall material.

Outside in free air: radius < 300m, depending on reflections and surroundings.

Yealink DECT repeater is designed in accordance with DECT standard. The repeater has the same radio coverage as the base station. When additional coverage area is needed, a repeater should be added, which is similar to adding a base station on the multi-cell system (the number of call paths is not increased).



A base station coverage plan is required to indicate:

- Areas where radio coverage is required
- Areas excluded from radio coverage due to the proximity of sensitive electronic equipment
- Areas where radio coverage is not required
- Areas where radio coverage is not feasible or requires repeaters
- Objects inside buildings

Site Survey

Site survey process is an information gathering process. The information received in the site survey determines user requirements and the number of cells required to support traffic. Begin the site survey by interviewing the user representative familiar with the full expectation of coverage and performance of DECT IP phone solution.

Building details

An initial look at the architecture plans will provide a global overview of the site. System deployment and installation depend upon the following building details.

- Building identification
- Construction materials, such as walls, floors, ceilings
- Type of use, such as for office, hotel, factory, or store
- Dimensions
- Number of floors
- Height of floors
- Partitioning of floors

The following table gives some general guidelines on the degree to which certain materials will obstruct the radio signal.

Materials	Degree of Attenuation	Examples
Air	None	Open space
Wood	Low	Door, floor, partition
Plastic	Low	Partition
Glass	Low	Un-tinted windows, partition
Tinted glass	Medium	Tinted windows, partition
Living creatures	Medium	Crowds, plants
Bricks	Medium	Walls
Plaster	Medium	Partitions
Ceramic	High	Tiles
Concrete	High	Load-bearing walls, floors, pillars
Metal	Very High	Reinforced concrete, metal cabinet

Signal penetration capability between the base station and handset is strong, while the signal penetration capability between the repeater and handset is weak relatively.

Counting the number of users

Counting the number of users involves knowing how many users there are, their distribution per location, and their mobility. As a rule, the deployer should know the information regarding user mobility. The following information should be also provided for the deployer:

- The number of handset users
- The potential growth of handset users
- The above average and below average traffic density

Traffic requirements are determined for each area. The deployer calculates system requirements to support user traffic.

Area Dimensions and Site Density

In more user dense sites, for example in office or enterprise environments, different sub-entities or groups may exist, where each group of users has mobility within their own system cell/single base station coverage area. As users have no mobility over the whole local site, the phenomenon of increasing number of mobile users by adding new base stations is common. However, increased number of base stations may cause quality deterioration.

To ensure a higher-quality audio experience and avoid interferences, the number of base stations for a local area and density between areas should be taken into account when deploying multiple DECT systems in a more user dense site. Yealink provides five DECT systems for different radio frequencies usage in various countries (or regions). The maximum number of base stations may vary among countries (or regions).

The following table lists the suggested maximum number of base stations that can be deployed in a 50 meter radius area for these DECT systems.

DECT System Name	Maximum Number
European	6
North America	4
Taiwan	4
Brazil	3
Korea	2

Deployment Guidance

This chapter describes how to choose appropriate locations for base stations and repeaters on different sites. The purpose of this chapter is to familiarize you with the procedures that are needed to carry out a site plan.

The following equipments are required for the deployment:

- Base Station
- Handset
- Repeater

Deploying DECT IP Phone System

The following explains the procedures required to identify the quantity and position of the base stations at prospective customer sites.

Note The following figures do not consider building elements that may influence the signal strength.

Deployment in a Single Floor Building

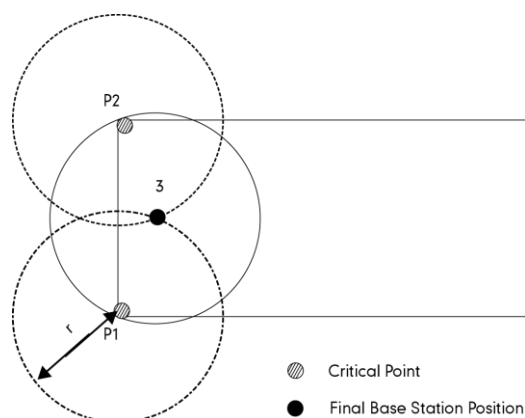
When deploying in a single floor building (the width of the building is less than 100 meters), the deployment process consists of the following steps:

- Identifying initial critical points on the floor plan

A critical point is a place that can be difficult for the radio signal to reach, such as a corner of a room, lifts and stairwells. Determine the critical points for placing the deployment base stations.

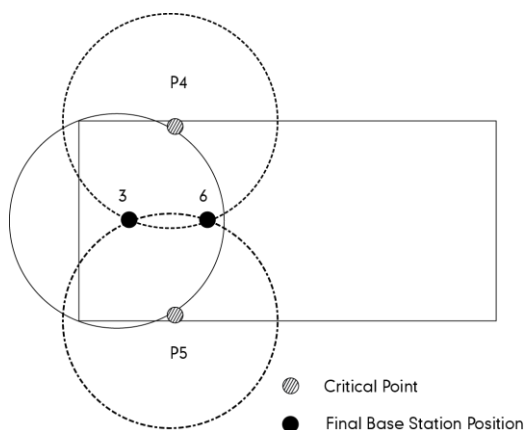
 1. Select the first critical point located in the corner furthest from the center areas of the premises. Name this point P1.
 2. Select a nearby critical point adjacent to the first one and name it P2.
- Locating the area center of the first base station
 1. Place the deployment base stations on the critical points.
 2. Set up communications between base stations and cordless handsets.
 3. Measure the radio coverage and determine the limit of the radio coverage of two critical points.
 4. Determine the intersection point of the boundary lines of different radio coverage cells. An intersection point will indicate the possible best location for mounting the permanent base station. The final position for the first base station is the intersection

point (position 3) of the two radio coverage cells.



- Locating the area center for the second base station
 1. Place the deployment base station at position 3.
 2. Repeat the measurement process to determine the limit of the radio coverage.
 3. Place the deployment base stations at position P4 and P5.
 4. Measure the radio coverage and determine the limit of the radio coverage of these two points.

The final position is again the intersection point of the radio coverage cells indicated by the broken lines, shown by position 6 in the following figure.



5. Follow the above steps to locate area centers for other base stations. Once identified, place the deployment base station at intersection points where each of the coverage cells crossed during deployment. Verify the coverage cells that reach all areas expected.

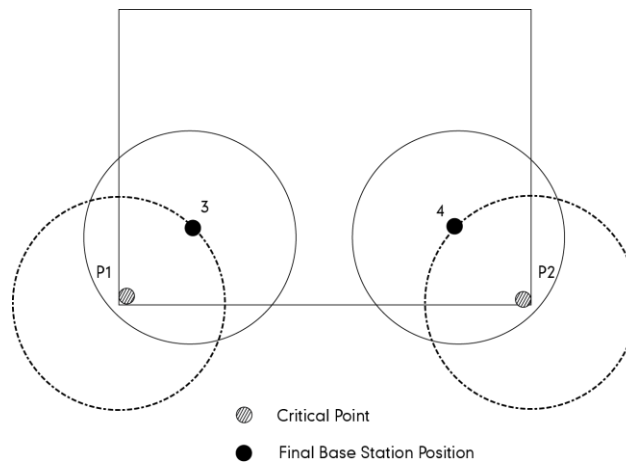
Note Make sure the new critical points are placed well within the deployed radio coverage areas.

For regular mobility users, they can search for the best base station (signal strength is the strongest) from the four registered base stations before placing a call. For more information, refer to [Yealink phone-specific user guide](#).

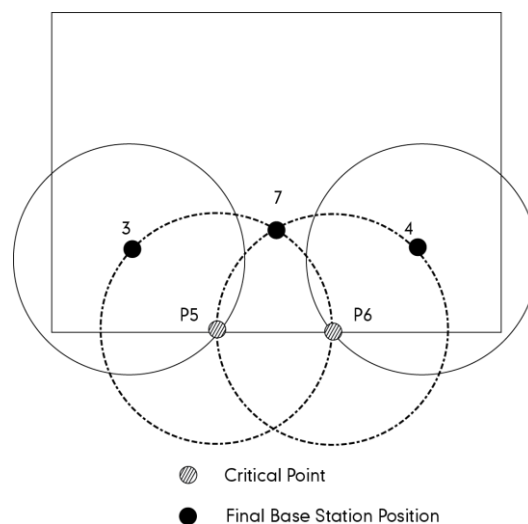
Deployment in a Wider Single Floor Building

In some deployment, there is no overlap between the deployment base stations of critical points. To deploy in these environments:

- Mark the areas of the site to be deployed.
- Place the deployment base stations on the critical point P1.
- Set up a communication between the base station and cordless handset.
- Measure the radio coverage and determine the limit of the radio coverage of the critical point.
- Measure the signal in a 45 degree angle towards the center of the area.
- Proceed to the critical point P2 and perform the same procedures.
- The area centers are the final positions for base stations, shown by position 3 and 4 in the following figure.



- Determine the limits of the coverage areas from cell centers (position 3 and 4).
- Place the deployment base stations at cell centers to determine the final position (position 7) for the third base station.



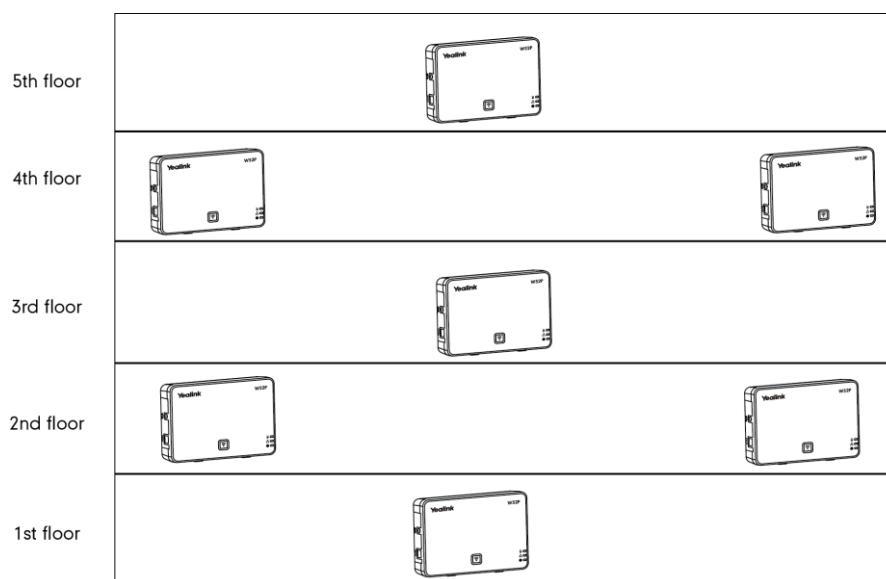
Deployment in a Multi-Floor Building

The deployment procedure varies according to:

- Radio transmission and reception through the floors
- Similarities and differences between floors

The study of transmission and reception through the floors determines whether several floors will be included in a same coverage area. There are two approaches in deploying a multiple storey building:

- If the degree of attenuation of the building construction materials (e.g., wood) of the building is low, deploy the base stations as follows:
 1. Place the base station on an intermediate floor on the site.
 2. Without moving the base station, go to the floor above, then measure the horizontal coverage at this location.
 3. Without moving the base station, go to the floor directly below and measure the horizontal coverage at this location.
 4. Arrange the base stations with one base station in the center and the others surrounding it, as shown in the following diagram.



- If the degree of attenuation of the building construction materials (e.g., metal) of the building is high, follow the above introduced steps (single floor) to deploy each floor as individual parts. For more information, refer to [Deployment in a Single Floor Building](#).

Note

The similarities between the floors do not exclude variations in the radio transmission and reception. You are advised to check the sound quality on each floor.

We recommend that you do not deploy base stations on the same vertical line.

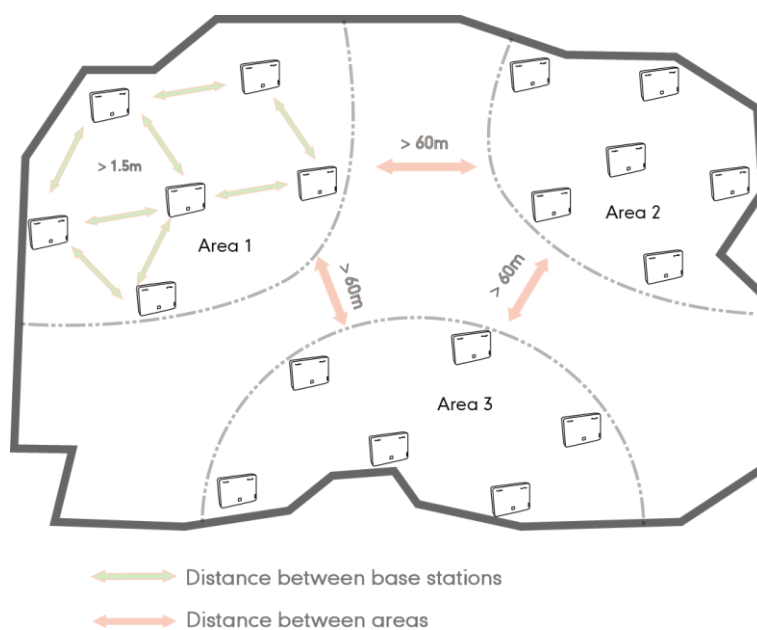
Deployment in a User Dense Building

To ensure a higher-quality audio experience and avoid interferences, comply with rules introduced in the section “[Area Dimensions and Site Density](#)” when deploying multiple DECT systems in a more user dense site.

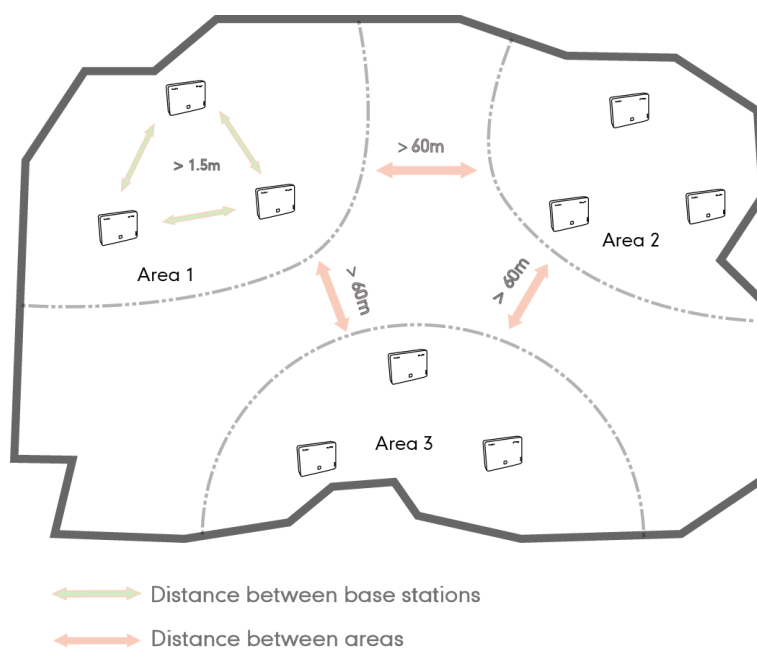
The deployment process consists of the following steps:

- Count the total number of users and associated traffic in the local site.
- Define the homogeneous traffic areas.
- Calculate the average traffic per homogeneous area.
- Determine the number of base stations necessary to support the level of traffic per homogeneous traffic area.
- Distribute base stations per homogeneous area.

Example Deployment of European DECT System



Example Deployment of North America DECT System



Note

To ensure correct operation of the DECT system, we recommend that the distance between base stations should be greater than 1.5m, and the distance between areas should be greater than 60m.

Ensure that no signal from other areas is detected in one area. For example, the handset in this area cannot search for a base station from other areas.

When adding a repeater in an area, the number of base stations should be reduced accordingly.

Deploying DECT IP Phone System with Repeater

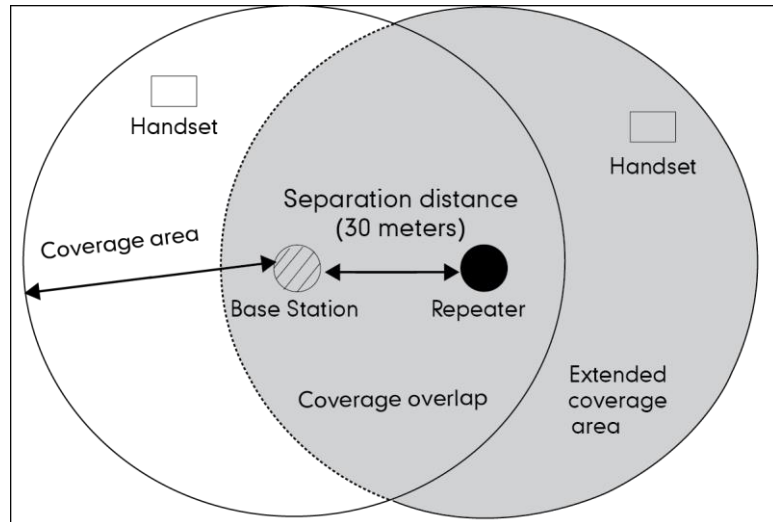
Repeater can be deployed to extend the radio coverage of the base station to cover areas where reception was previously not available. Handsets registered to the base station can work normally in the extended coverage area. Before the deployment, you need to learn the following:

- Up to 6 repeaters (RT10/RT30) or 5 repeaters (RT20/RT20U) can be registered to one base station to extend available reception range for all registered handsets.
- All repeaters must be installed within the base station coverage area.
- It is not possible to install the repeaters in series or "daisy-chain" (for RT30 is "daisy chain").
- Repeater has the same radio coverage (up to 300m in unobstructed outdoor areas and up to 50m inside buildings) as the base station.
- Repeater does not increase the quantity of call paths. It shares the call paths with the base station.
- Adding a repeater is similar to adding a base station on the multi-cell system.

The following gives two illustrative cases to assist in explaining how to identify the quantity and position of the repeaters at prospective customer sites.

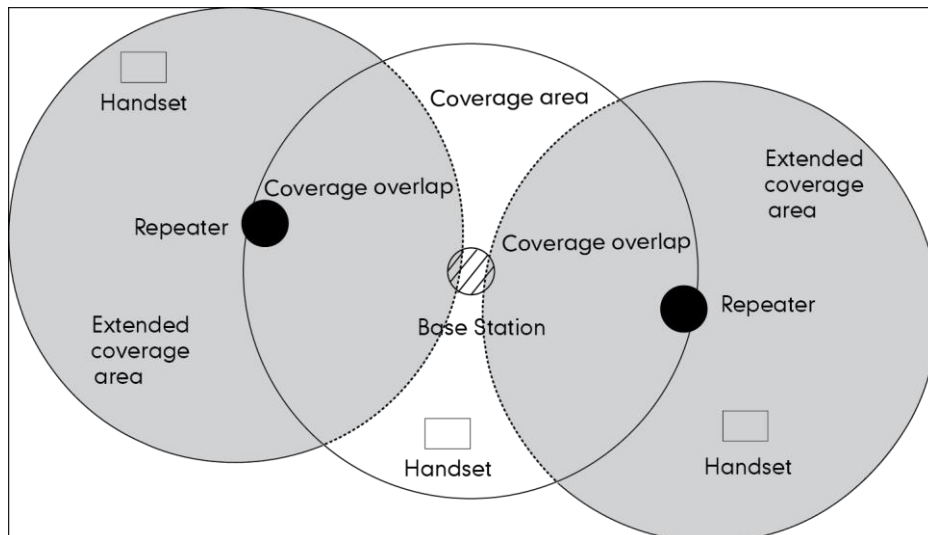
Single Repeater Only

In this case, an extended coverage range (30m) is required. You can install a repeater within the base station coverage area. The separation distance between the base station and repeater is 30m. The base will hand over calls to the repeaters as the user moves from the base station coverage area into the extended coverage area. If you want to extend the coverage range, you can extend the separation distance between the base station and repeater.



Multiple Repeaters Required

In this case, mobile handset users in the radio coverage cell require extended coverage areas in different directions.



Traffic Measurements

Calculating the traffic per homogeneous area covers two aspects:

- The average level of the total duration of communications per user.
- The average mobility per user and per area on the site.

Up to 4 DECT handsets can simultaneously make or receive calls. This means 2 DECT users can place calls to 2 other DECT users or 4 DECT users can place calls to 4 other non-DECT users. When all 4 call paths are in use, no more calls can be made or received by other handsets within the radio coverage of the base station. If the customer has an area where more than 4 DECT users would need to make or receive calls simultaneously, then you must install extra base stations in the area.

A ringing handset will also reserve a call path. If no call path is available, the handset will not receive an incoming call and ring.

Recommended Placement of Base Stations and Repeaters

For optimum range and performance from your handset, follow these recommendations:

- Keep the base station/repeater away from steel constructions - at least 4 feet/1.20 meters
- Do not place base station/repeater directly on metallic surfaces - at least 4 feet/1.20 meters
- Do not hide base station/repeater behind furniture etc.
- Do not paint the base station/repeater as paint is containing metallic/carbon particles
- The base station/repeater must be placed where the signal is needed

The following are some recommended base station and repeater placement strategies:

Around Corridors:

Base stations and repeaters should be deployed vertically preferably at corridor intersections where propagation patterns follow the corridor patterns. In case there are high objects in the area, the base station/repeater should be installed above those objects.

Multi-Storey Buildings:

Base stations and repeaters can be installed on opposite sides of the floors to take advantage of the floor-to-floor coverage. The coverage design cannot rely entirely on floor-to-floor propagation; each case must be verified due to variations in local attenuation patterns.

Large Halls:

Base stations and repeaters can be deployed in large halls that contain a central open space area with windows to the other areas. This provides a good coverage for the rooms in the inner

circle on all floors (e.g. hotels). In large halls, base stations/repeater should be installed vertically in the middle of the space below the drop ceiling.

Mounting Positions:

When base stations and repeaters are mounted vertically on a wall, the radio coverage in front of these devices is twice as large as the coverage at the rear. The base stations should always be mounted higher than the obstructive objects in the area (e.g. minimum higher than 2m above floor). Repeaters should be installed in the middle of corridors or small rooms.

Metallic Structures/Objects:

Base stations and repeaters should not be deployed near large metallic objects.

Reinforced Concrete Structures:

These structures have a high attenuation factor inside the building. They reduce the radio coverage range of the base stations and repeaters and therefore require a higher number of base stations or repeaters in the building. Lighter types of construction materials require fewer base stations since attenuation figures are considerably lower.