

Tips for Picking Up the Right Speakers for Your Industrial PA System

Planning an efficient paging system is not difficult, you do not have to be an expert sound engineer to spot potential trouble spots and come up with solutions.

Here are some tips to help you choose the right speaker that meets your needs.

1. Types of Speakers

There are three main types of speakers to consider – ceiling speakers, wall baffles, and horns.

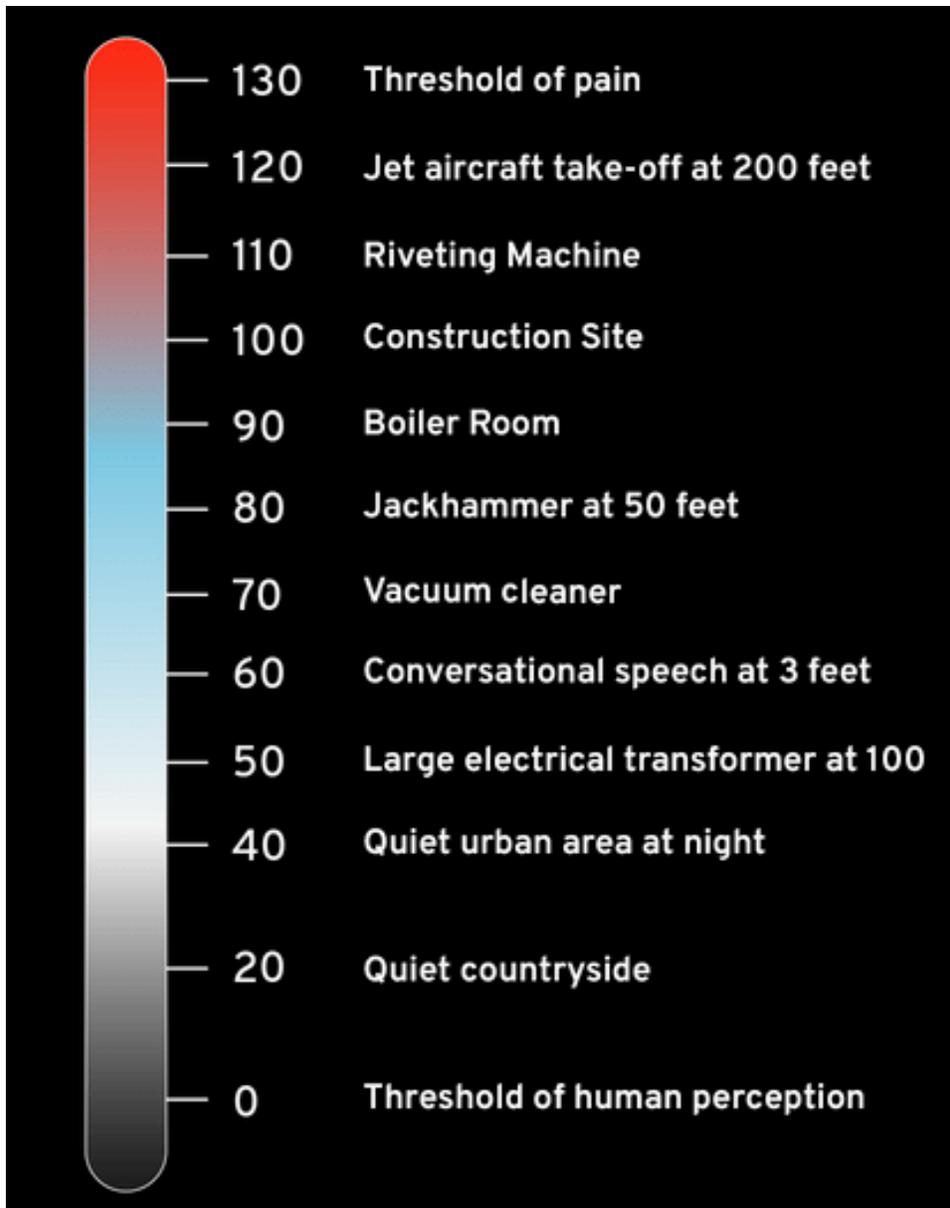
Ceiling speakers: Ceiling speakers are used with drop-tile ceiling panels and are appropriate for heights between 8 and 20 feet. A rule of thumb for placement is twice the ceiling height. So if your ceiling height is 8 feet, for example, speakers should be placed 16 feet apart. A good option for office, school or small warehouses and storage areas.

Wall baffles: Instead of radiating sound downwards as with a ceiling speaker, wall baffles send soundwaves horizontally. Wall baffles are often used when ceiling height is prohibitive or there is no access to ceiling panels. They do a good job in environments where forward coverage and spacing are important. Normally spaced 20 feet apart, wall baffles should never directly oppose each other. Wall baffle speakers are a good option for office, school and medium warehouses which have a ceiling height over 20 feet, but aren't large enough to warrant horns.

Horns: Horns are typically used in manufacturing, warehouse, and outdoor environments, or open environments such as transportation centers. These are also the types most commonly used by airports and at large shopping centers. Horns can be mounted 15 to 20-plus feet off the ground, and spaced 50 to more than 100 feet apart, aiming 30 degrees down from horizontal (60 degrees up from straight down). Like wall baffles, horns should never directly oppose each other.

2. Consider the square footage, shape, ceiling height, and noise level of your facility

How loud is loud? Only SPL can tell you. SPL stands for Sound Pressure Level which is the pressure caused by a sound wave passing through the air. Pretty obviously, the higher the SPL, the higher the volume. Speakers are rated at a specific sound level (measured in dB), at a specific power level (1 Watt), and at a specific distance away from the speaker (1M). DB or decibel is the measure of sound level output. Below is an example how SPL measurements translate into real life.



Determining the number of speakers in a typical office environment is fairly straightforward. With the spacing between speakers equal to twice the ceiling height, they can be plotted in an odd row/even row pattern repeatedly to fill a room.

Sound coverage per speaker is directly related to ceiling height. The taller the ceiling, the more the sound spreads.

For large factory or warehouse, we will need to consider the square footage, shape, ceiling height and noise level of your facility. Naturally, the larger your space, the more speakers or horns you will need to make sure all staff can hear broadcasts easily.



Typical Noise Levels

Very High (85-95dB): Conversation Difficult or Impossible

- Factory • Machine Shop • Printing Plant

High (75-85dB): Conversation Difficult

- Assembly Line • Factory

Medium (65-75dB): Voice Must Be Raised to Be Understood

- Transportation Terminal • Shipping Department • Loading Dock

Low (55-65dB): Conversation Easily Understood

The further away you are from the speaker the less sound you hear. The sound level goes down 6dB every time we double the distance from the speaker. For example, a speaker that provides 122 dB of sound at 1M will have a sound level of 116 dB at 2 M from the speaker. At 4 m (13 ft.), the sound is 110 dB; at 8 m (26 ft.), it's 104dB; at 16 m (52.5 ft, it's 98dB, etc.

To make sure everyone hears the page in a noisy room, the sound level needs to be at least **10 dB** above the ambient noise level.

The following chart provides an example of how the sound level is reduced.

Distance	Sound level (dB)	
	30W speaker	20W speaker
1 M (3.28 ft.)	122	102
2 M (6.56 ft.)	116	96
4 M (13.1 ft.)	108	90
8 M (26.25 ft.)	102	84
16 M (52.49 ft.)	96	78
32 M (105 ft.)	90	72
64 M (210 ft.)	84	66
128 M (420 ft.)	78	60

To determine the number of horn loudspeakers your installation requires, simply divide the area's total square footage by the speaker coverage for the noise level in the area as indicated in the chart below.

Ambient noise range	Horn power taps	Coverage (sq. ft.)
Very High (85-95dB)	30W	5,500
	20W	5,000
High (75-85dB)	30W	7,000
	20W	6,500
Medium (65-75dB)	30W	8,000
	20W	7,500
Low (55-65dB)	30W	10,000
	20W	9,500

Total sq.ft./speaker coverage=# of horns

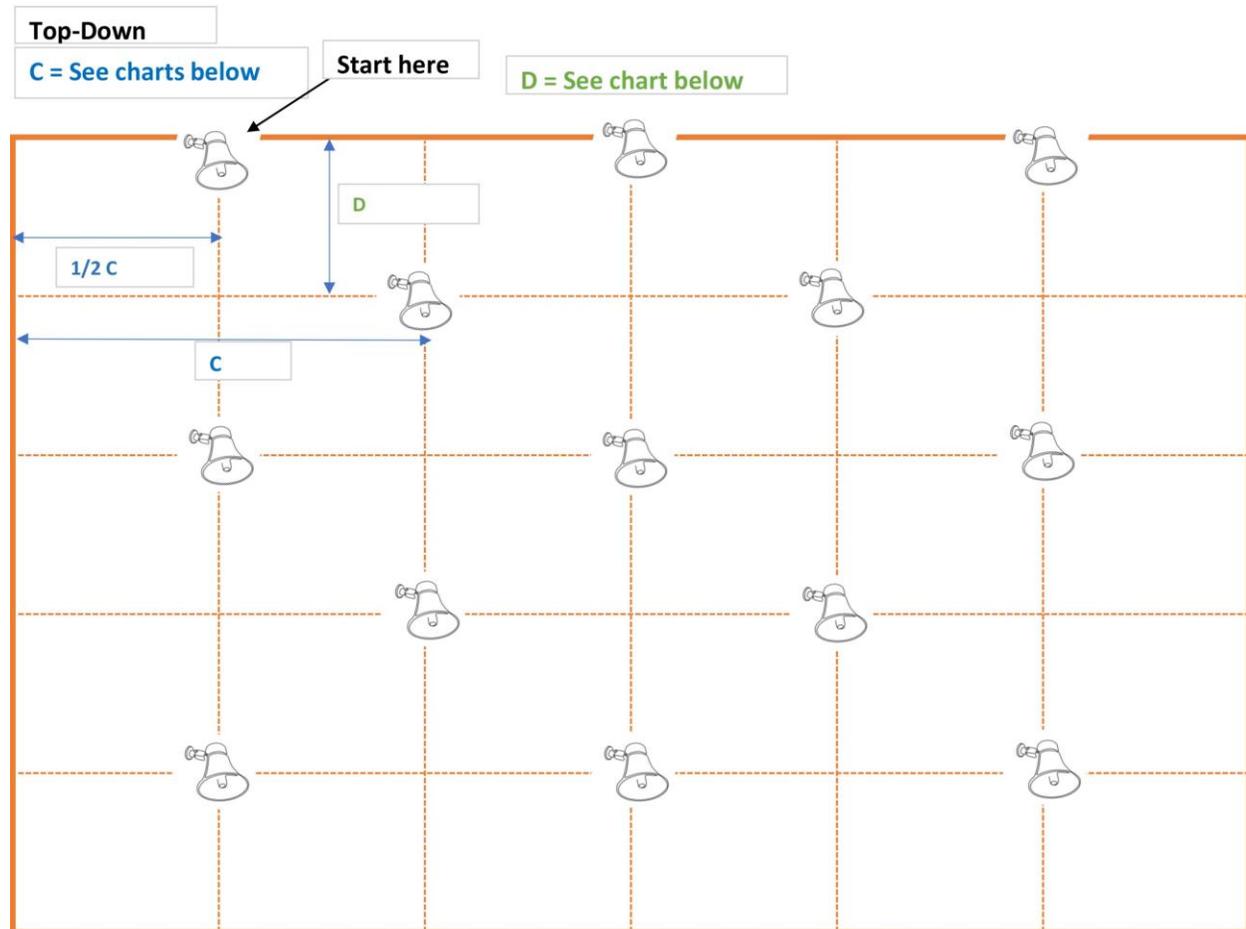
3. Horn Speaker Layout

Desired mounting height, barring obstructions, is 15 to 20 feet, with the speakers angled downward toward the listening area and facing in the same direction. Follow the diagram for the layout of the horn speakers while using the charts below to define the lettered dimensions for each specific speaker.

Begin in one corner of the area. The first speaker in Row 1 is positioned a distance equivalent to (1/2C). The next speaker in Row 1 should be a distance equivalent to (C) from the first speaker. Each additional speaker in the row should use this same spacing. Row 2 starts at the indicated distance (D) from Row 1. Using the diagram as a guide, fill in the remaining rows in this same alternating pattern until the entire area is appropriately covered.

For areas that include high shelving or corridors, speakers should be installed so that they project down the aisles between the shelves or down through the corridors. The spacing of the speakers can be adjusted so that the speakers are evenly spaced in a row.

See the layout sample and chart on next page.



Note: Each environment is unique. This layout plan is general in nature and may not be applicable for every installation.

Ambient Noise Range	Speaker Power Taps (Watts)	C	D
Medium Noise (65dB-75dB)	20	110	70
High Noise (75dB-85dB)	20	100	65
Very High Noise (85dB-95dB)	20	65	40
High Noise (75dB-85dB)	30	100	65
Very High Noise (85dB-95dB)	30	95	58