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Hit the Wall
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There is endless controversy over in-wall speakers. Are they good? Are they bad? Are they a compromise? The answers to these questions aren't altogether straightforward, like many other things in life. Done properly, an in-wall speaker system can be astoundingly good. Done poorly, its only virtue can be a reduced "spousal divorce factor."

In-walls: Good or Bad?

Today there are many choices for in-wall speakers - from run-of-the-mill, vibration-prone plastic panels with cheapo drivers to very high-quality line arrays with planar radiators. Therefore, you really can't make generalizations about the performance of all in-walls, but there are specific pros and cons associated with them. Some of these are real, and some are only perceived.

There seems to be this idea in the consumer world that in-wall + speaker = poor sound quality. Sorry; wrong answer. The only way you can be certain of a low-quality in-wall system is to specify low quality components and install or calibrate them improperly. There's nothing inherently wrong with in-walls.

Back Boxing

Now, sound leakage from the speaker to the rest of the house is a real problem. Fortunately, in-wall speakers with back boxes can significantly reduce the amount of sound leakage, so it's always a good idea to use them. Sealing the stud bay around the speaker with insulation, loaded vinyl barrier, and expanding foam or acoustic caulk also reduces sound leakage.

In-walls with back boxes solve another issue: cabinet volume and construction. The cabinet of a speaker is just as important to its overall sound quality as the transducers or crossover. Unless an in-wall speaker has a back box, you're relying on the stud bay to be the cabinet. I don't know about you, but "speaker engineer" doesn't exactly come to my mind when I see framing carpenters at work. So, stick to in-wall speakers with back boxes.

A Sharper Image

I'm continually amused when people proclaim that in-wall speakers cannot image. The simple fact is that virtually all professional sound mixing rooms have wall structures called baffles around their main monitor speakers – and no one would dare to criticize their razor-sharp imaging! In-wall speakers are essentially identical to baffle-mounted monitors, so with proper placement they can produce the same glorious and razor-sharp image.

Coverage Check

In-wall speakers sitting flat on a wall may suffer from poor coverage in the upper mids and upper highs due to transducer beaming and no toe-in. If you must put in-wall speakers flat in a wall, use models with pivoting tweeters and broad mid frequency horizontal dispersion. I'll give you a hint: Vertically-oriented midrange-tweeter-midrange speakers often work quite well. But don't let me catch you turning them sideways...

Be the Center

An in-wall center speaker very often needs to go in exactly the same spot as the screen. Fortunately, you can put the speaker behind an acoustically transparent screen. In fact, by combining in-wall speakers with an acoustically transparent screen, you can achieve a front wall profile that would make even the thinnest flat-panel jealous! New woven fabric screens can go mere inches in front of a speaker with no negative impact on sound quality whatsoever.

Crossing Over

It is true that putting a speaker in a wall will fully excite the room's bass standing waves. In-wall front speakers, for example, will drive length resonances very efficiently. Obviously, you can't use speaker placement to reduce the interaction. However, you can employ a trick with the bass management subwoofer crossover that will help tame them. Most serious resonances in medium-sized rooms are below 100 Hz. So, you can use a 100 Hz crossover frequency, and place the subwoofers for smoothest response below 100 Hz.

Looking Good

In-walls aren't all obstacles to be overcome, though. Consider the obvious aesthetic advantage. How can someone object to having speakers in the room when there aren't actually speakers in the room?! There is no loss of floor space and no large boxes to distract people away from a movie. What little visual impact in-walls do have can be creatively treated and disguised with color- and texture-matched grilles.

I've already mentioned the attractively slim profile of in-wall speakers and acoustically transparent screens, but the performance of such a system can be astoundingly cinematic. If you think about it, a cinema is basically speakers in walls (baffles) with a screen in front of them. Well, you can do that, too! The speakers are hidden, and you have superb sound-to-picture correlation.

They're Good for Acoustics

Perhaps the most distinct advantage of in-wall speakers is that they eliminate back wave interference. When a box speaker sits in a room, bass radiated from the back of the cabinet slams into the front wall, reflects back to where the listeners are sitting, and causes some very detrimental bass cancellations. If you put that box speaker in the front wall, making it comparable to an in-wall...bingo...there's no front wall to reflect the back wave. Without back wave interference, you have smoother bass response in the critical mid and upper bass regions.

Subs in Walls

Finally, consider what you can do with in-wall subwoofers! Acoustic research continues to show that subwoofers really need to go along every wall of a room. With shallow, in-wall subwoofers, you can put them exactly where you want them and make them look like nothing more than an HVAC vent!

In Wall Not Ceiling

Fairly recently, a new variety of in-wall speaker has emerged: the in-ceiling speaker. Aesthetically, the ceiling is a very desirable place to hide flush-mount speakers. However, when you put speakers in the ceiling the sound appears to *come* from the ceiling. Unless the screen is *also* up there, sound from the ceiling is most unnatural. The correlation with the picture completely falls apart. You might say to simply aim the speakers' transducers towards the listeners, but it doesn't help. It actually makes things worse, because the speakers become more localizable. It's kind of like a flashlight that was pointed at the floor suddenly being raised to point right at you. You are now totally aware of the source of the light.

For surround speakers, the localization errors are less objectionable, but far from ideal. You could aim the speakers away from the listeners to get some bounce off the walls, but it doesn't help much because there is still plenty of off-axis direct sound going from the speakers to the listeners. Their brains localize the direct sound right to the speakers. An exception to this rule is dipole surround speakers since they have a null pointing in the direction of the listeners. What listeners hear are the near reflections from the walls, and their brains are fooled into believing that the sound is actually coming from the walls.

Finally, in-ceiling speakers present a major sound leakage path to rooms above. Back boxes are a must, and even then you will probably have to implement significant sound isolation construction.

Flush mount in-wall and in-ceiling speakers can work well if you understand their pros and cons. They are definitely getting better with time, and new solutions pop up every day. Don't look at in-walls as just a cheap background music product. Some are truly high quality and can satisfy even the most demanding audiophile.

This article is based on a column published by A. Grimani in Residential Systems magazine May 2006. Chase Walton contributed to this article.