

## Sound Idea

A little soundproofing can make your hobby a lot easier to live with  
Canadian Home Workshop, October 2007

A friend of mine once made the mistake of complimenting his neighbour's nightly drum practices. The sound of sticks hitting snares and cymbals rattled the apartment with all the force of a Black Sabbath concert—all the louder after the ill-conceived compliment. I get the feeling this is how some people feel about home workshoppers. Buzzing bandsaws and tablesaws make a racket, especially when the audience—your spouse, kids, neighbours—is bombarded with noise every time you step into the workshop.

“I didn't bother soundproofing my old basement shop,” says Gord Graff, a woodworker in Newmarket, Ont. “Frankly, my wife and kids never complained because they got a house full of furniture. And that's the bottom line: if you're going to complain about my tablesaw making noise, then I won't start it. And if I don't start it, you won't get that cherry hutch you want.”

Graff now builds in his garage shop, and whether he knows it or not, I bet his family is happy to be rid of the basement noise. But for those woodworkers who still work down under, there are ways to cut back on the racket. But before you start padding out walls with sound-dampening insulation, it's useful to understand a bit about the science of sound.

## Feel the Vibrations

We can't see sound, but you can think of it as a stream of air travelling along a path and seeking out leaks; if air can travel through something, so can sound. You can close doors and put up walls, but unless you interrupt its path, sound will move from room to room like shouts vibrating through paper-thin motel-room walls. Sound waves (vibrations) travel along the floor to the walls and ceiling. The vibrations continue through fasteners, joists and studs into adjoining rooms. This is why tin-can telephones work: so long as there's a path—or string, in the case of a kiddie phone— sound can't be stopped.

There are two types of sound: structure-borne noise (footsteps, slamming doors, the knocking of valves and pipes), which travels through walls and ceilings to create vibrations that travel through studs and other rigid joints; and airborne sound, which travels through the air before generating vibrations in walls, ceilings and windows (the buzz of power tools, voices, bass-driven music).

To deal with both types of sound, you need to do two things: absorb and block its path (structure-borne noise), and add mass and eliminate leaks (airborne sound).

“There are three elements to controlling sound: you have to block, break and absorb the

sound,” says Andy Goyda, market development manager for Owens-Corning Canada, which manufactures noise-dampening batting and studs. “The most common mistake homeowners make is not thinking of walls and ceilings as a system. They think padding the ceiling will cut back on the noise; but they forget about the walls, and so the noise continues.”

Sound is measured in decibels (db), but for workshop purposes, sound transmission class (STC) is the most appropriate measurement. STC rates the minimum sound resistance of a floor, ceiling or wall; the greater the material’s STC, the better it will be at blocking or absorbing sound. A 24" wall covered in 1/2"-thick drywall, for example, has an STC of about 30—not even enough to muffle your voice, let alone a thickness planer. And a standard basement ceiling, with exposed joists and subfloor, is even more transparent. “You might as well be woodworking underneath a bongo drum,” says Steve Maxwell, an expert woodworker and Canadian Home Workshop’s technical editor.

### Mass Appeal

Reducing noise begins with eliminating all of the cracks leading out of your workshop, and increasing the STC of your walls and ceilings—and for that matter, doors and windows (we’ll return to these portals later on). If your shop is sheltered by 1/2" drywall, consider replacing it with 5/8" drywall. The increased mass helps to block sound and has the added benefits of increased fire protection and durability (you won’t rip a hole when you accidentally ram a piece of lumber against it). “I also have an internal wall with a special treatment,” says Maxwell, referring to his basement shop. “Before applying the drywall, I fastened 1/2" fibreboard to both sides of the wall frame. This material, combined with the drywall, does a pretty good job of stopping sound.”

Before installing drywall, you need to stuff the cavities with sound-dampening insulation. Many people think regular insulation works fine and, for most practical purposes, it works fairly well.

“My [stand-alone] shop is right between a bunch of old houses, so when I had it built, noise was a consideration because I didn’t want to irritate my neighbours,” says Konrad Sauer, a woodworker in Kitchener, Ont. “We insulated beyond code and installed highly efficient windows and doors, and so far there have been no complaints. I have a friend who’s a professional drummer, and he couldn’t believe how quiet it is outside my shop, even when I was blaring loud music.”

While regular insulation does hamper sound, you can’t just stuff your cavities with as much insulation as possible and hope for quiet times. “Interior walls are typically 2x4, so cramming R20 batts, which are 6" thick, into a 2x4 space isn’t going to work,” says Goyda. “If you compress the batt, you lose the acoustical value because it’s the air pockets in fibreglass or rock-wool insulation that trap sound.”

It works like this: when the vibrations try to work through the batts, the vibrations travel along fibres, and the fibres are criss-crossed and mismatched, so the energy keeps changing direction. As it does this, it turns into another form of energy—heat—and is trapped in the air pockets. “That’s how insulation absorbs sound, by absorbing heat,” says Goyda.

Acoustical batting, such as QuietZone, a fibreglass insulation made by Owens-Corning, and Safe ‘n’ Sound, a rock-wool insulation made by Roxul, are available in most hardware stores and retail for about the same cost as standard insulation. Neither carry R-ratings, but since you’ll be using the batting for interior walls, it doesn’t really matter. Plus, with noise, it’s thickness, not R-ratings, that count.

Safe ‘n’ Sound, which is made from basalt rock and recycled steel slag, has a higher fire rating than fibreglass insulation. Because of its density, you can make intricate cuts to fit it around electrical outlets and wiring. “Instead of using a utility knife, use a serrated bread knife,” says Kirby Williams, product application and development manager at Roxul in Milton, Ont. “Instead of pulling it behind wiring, like you would with fibreglass, you score the back, open it up and fold it back over the wire.”

Williams believes the key acoustical quality is density: “Density improves the reduction of lower-frequency sounds such as the noise from power tools.”

And in a way it makes sense: the more mass, the more noise blockage; therefore, rock wool is better at capturing sound because it’s dense.

Goyda disagrees: “For the longest time, people thought if you have a very dense batt—a 2 1/2-lb. density batt versus a 1-lb. density batt—that you’d have better noise control. That’s a myth. The National Research Council and Canada Mortgage and Housing Corporation did a study that showed there’s no difference between glass batts and rock-wool batts. I’d love to tell you fibreglass is better, but they’re equal—it’s the system that matters.”

### Channel Changer

Whether you use regular fibreglass insulation or special acoustical insulation there’s another key item for taking the edge off of sound: sheet-metal strips called resilient channel that keep drywall off of wall studs and ceiling joists. When sound hits a solid surface, such as drywall, it sets the wall vibrating, which in turn vibrates the drywall fastener and the stud, all the way through to the rest of the house, almost like an electrical current. By anchoring the drywall to resilient channel (instead of to studs and joists directly), you’ll greatly reduce sound transmission.

“This is especially important in basements,” says Maxwell. “I applied resilient channel to

the bottom edge of the second-floor joists. It was quick to install and relatively inexpensive—less than a few hundred dollars for a 650-sq.-ft. ceiling.” Maxwell installed the channels every 16", anchored by screws driven into the joists, beginning near the outside walls.

“With resilient channel, the sound vibration works its way into the drywall, but instead of continuing through to the opposite sheet of drywall, the sound sticks to the channel and doesn’t leave it until it hits the fastener, and by this point it’s been reduced by more than 50 per cent,” says Goyda. “The problem is resilient channel is easy to defeat. Let’s say you install the channels, thick drywall and acoustical batting—if you put even one drywall screw into a stud, you’ve defeated your entire noise-control system because now the sound has a direct path out of the workshop.” So keep in mind, if you’re going to put up a shelf or hook, attach it to a channel, not a stud.

Besides installing resilient channel, you can also build your non-load-bearing workshop walls using 2x3 studs, offset from one side of the wall to the other, rather than using 2x4 studs that span the wall cavity.

“I tried this when I built my home office, which is opposite the family room,” says Rick Campbell of London, Ont. “Because the studs are offset, there’s no continuous connection between the two sides of the wall, so when the TV vibrates the walls beside the family room, I can’t hear it in the office, even though I’m right beside it.”

Campbell’s method requires double the number of studs, and it isn’t really suitable for load-bearing walls. So then, if one of your workshop walls is load-bearing, what can you do? You can’t isolate it because all the framing members are tied into it, so the best thing to do is to leave it alone. “Don’t use the electrical outlets on load-bearing walls, and don’t put up shelving or build anything else onto those walls,” says Goyda.

While you’re at it, use metal studs instead of wood studs; metal isn’t as rigid as wood, which means it’s better for sound absorption. Owens-Corning even makes a metal stud specifically designed for acoustical performance. QuietZone wall-framing studs are similar to resilient channel, the difference being that you don’t need to build out door jams. “Resilient channel adds another 1/2" to the wall, which means you have to customize door jams,” says Goyda. “QuietZone studs fit inside 2x4 or 2x6 walls.” Of course, using these studs also carries a higher price tag: \$10 per 8' stud, compared with \$3 or so for a wood or metal stud.

#### Final Notes

You’ve padded your shop with thick drywall, acoustical batting and kept everything off the studs and joists—but sound is still leaving the shop and leading to another lonesome

night sleeping on the couch. Don't fret—marital bliss is only a few more steps away. Make sure there aren't any gaps around electrical outlets or lights. "Pot lights are a big leaking point because they require air space and ventilation," says Williams. "Buy the insulated box that goes over the pot light and then insulate around it. This will eliminate the sound leak."

Doors and windows are also common leaky portals. Pay particular attention to glass thickness (thicker is better) and make sure the window is properly sealed and surrounded by insulation. Doors should fit tightly, and solid-wood or industrial-strength steel doors are best. And, finally, make sure all nooks and crannies are caulked and sealed. Caulk the bottoms of walls and wherever air—and sound—can seep through.

Now, get back to building that cherry hutch.

#### Sidebar: Sound Solutions

Turning down the volume in your workshop isn't just about keeping the sound inside; it's also about turning down the volume of your tools. Here are a few simple ways to lessen the noise your tools emit.

**Straighten up** Metal tool stands make a ton of racket if they aren't bolted down and fastened tightly. Check the bolts regularly to see if they've come loose through vibration.

**Pad up** Instead of mounting a tool directly onto its metal stand, add anti-vibration pads or rubber feet to keep the bad vibrations at bay and reduce the noise.

**Beef up** If your metal stand sounds like, well, a heavy-metal band, replace it with a shop-built version made from denser material, such as MDF or wood.

**Sharpen up** Dull blades and bits not only produce shoddy work, they also make more noise than sharp, clean blades.

**Tune up** Tools not adjusted properly run louder than ones that are well-tuned, so keep your rigs and jigs lubed and aligned.