

## How to construct a soundproof generator shed

By *H. Skip Thomsen*

**G**enerators are notoriously noisy: If quiet-as-possible operation is important to you, then the most important consideration in designing your generator shed will be soundproofing.

Probably the best method is to construct a small concrete-block building, insulated on the inside with a sound

absorbing rigid foam. In addition, you will need to make provisions for exhaust and, in some cases, coolant plumbing to get through a wall. The building needs to be large enough for the equipment and for access all the way around it. (It will probably end up about eight-by-eight feet.) Standing head-room would be nice, but it isn't essential.

Ideally, your generator shed would be located where you cannot hear the engine from anywhere you don't want

where snow can blow into the doors when open and against them when closed.

Your options in constructing a building will depend somewhat on whether you have to deal with a local building inspector. In most cases, a permit is not required if your building is under a certain size—often 100 square feet, in which case an eight-by-eight shed is exempt.

If this exemption does not apply to your area, a wooden shelter can be built on "skids" and qualify as a temporary or movable building, thereby side-stepping the hassles of permits.

Railroad ties work well for the foundation of a small building, and they can qualify as "skids" in the process.

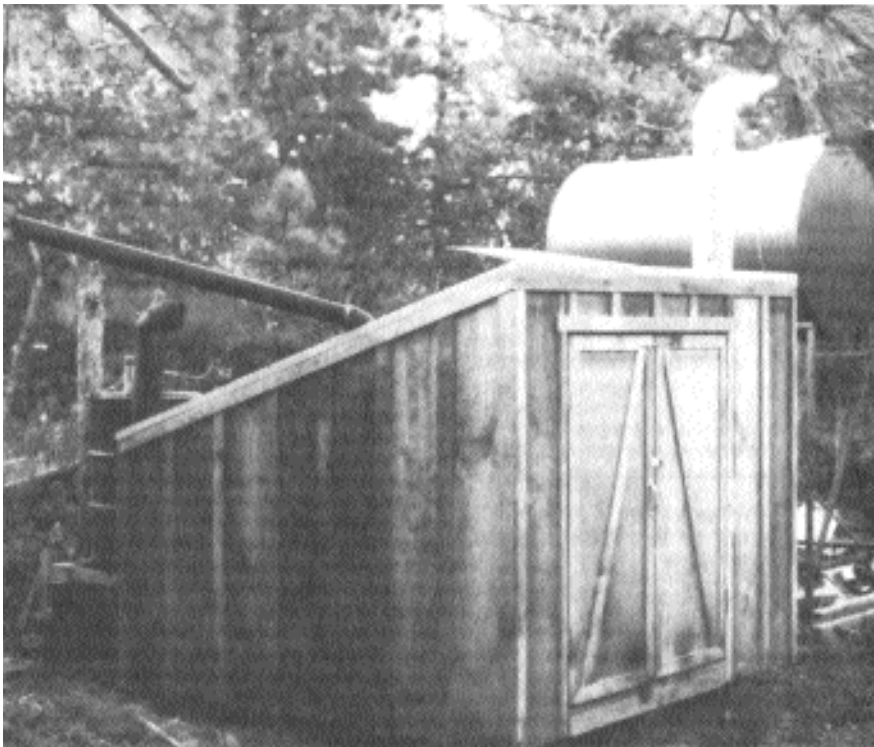
If you prefer the permanence and durability of concrete and have had no experience in this area, there are several good books available for the novice builder.

In designing your building, you need to consider how the machinery will be moved into the building initially, and out again, if necessary, for repairs. Doors must be designed to accommodate not only the size of the equipment but the equipment and/or persons necessary to move it in and out of the building. Better to have the door opening too big than too small.

An easy way to make certain that the opening is big enough is to install two doors that when open, so as to expose most of the wall in which they are installed. One of the doors can then be latched to the floor and/or the top of the door-frame and left closed except for those times when the full opening size is required.

### Railroad ties

We built the wooden shed for our CDI diesel generator on a foundation of three railroad ties. The floor consisted of four-inch thick planks, spiked together and onto the ties. (See diagram 1.) From there on up, it was just a standard stud-wall building with



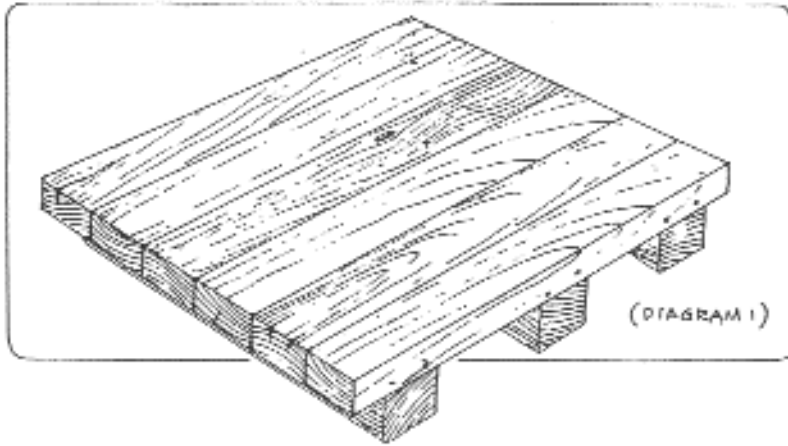
*The soundproof generator shed*

absorbing rigid foam. If this sounds like more work and expense than you had anticipated, or if the aesthetics of a concrete-block building offend your sensibilities, a wooden structure can be made to do nearly as well.

In either case, you will have to provide some sort of positive-flow ventilation system to keep the inside temperature of the building at a reason-

able level. But there are other considerations as well: the cost of running in-the-necessary wire from the generator to the points of use of the electricity, and access for installing and servicing the equipment.

If the location of your shed allows it, the doors should be on the side away from the prevailing weather. This is particularly important in snow country,



*A floor built of railroad ties and planks*

a shed roof and double doors on the tall side.

We learned much from this building. We insulated every square inch of the interior with two-inch thick foam, and still, the whole building seemed to emit a low-pitched rumble when the generator was running. The low-frequency vibrations of the machinery telegraphed through the floor into the entire building, and the building itself acted as a large loudspeaker. No amount of insulation would completely silence it. But even with the building set up this way, the noise level was acceptable in our particular installation because of the distance between the shed and the house.

### **An isolation pad**

But what if you cannot isolate the shed? Isolate the engine/generator chassis from the walls of the building. How? Mount the equipment on a platform

of short ties or concrete, and the building on a perimeter foundation of ties (See diagrams 2 and 3). To make the noise isolation as effective as possible, the equipment and/or pad must not touch the building itself anywhere.

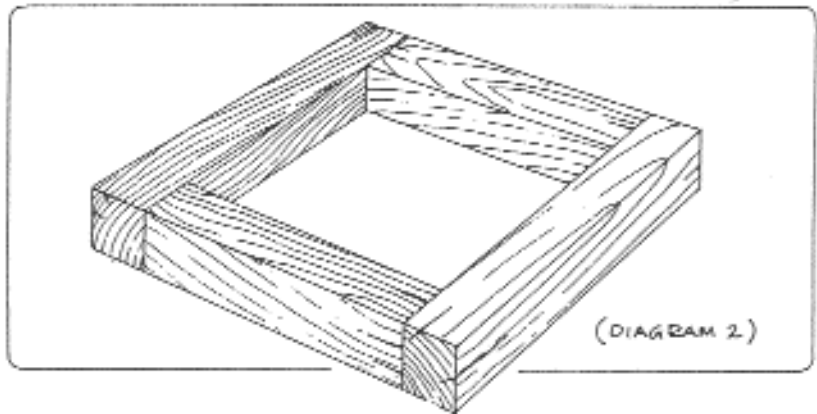
The gap between the foundation or building floor and the pad - can be stuffed with appropriate-sized pieces of foam rubber, or covered with a flexible material like inner-tube rubber or heavy-gauge upholstery vinyl. It could also be covered with stapled down bug screen and used as the floor vent for incoming building-ventilation air. More on that later.

Once the floor is built, whether it is a deck of planks or a perimeter of ties, the building itself is most easily constructed with basic frame construction (see diagram 4).

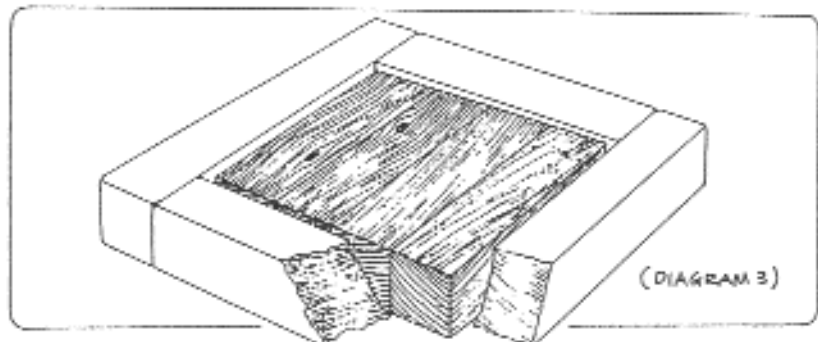
### **Use rigid foam panels**

Studs can be laid out on standard 24" centers, or to accommodate whatever available rigid foam panels you will use. (Fiberglass insulation is not effective as sound insulation.)

Full stud-space thickness foam panels or several thinner panels will do the job. If you use thinner panels, separate them from each other and from the outer wall with thin spacers.



*The railroad tie "perimeter foundation"*



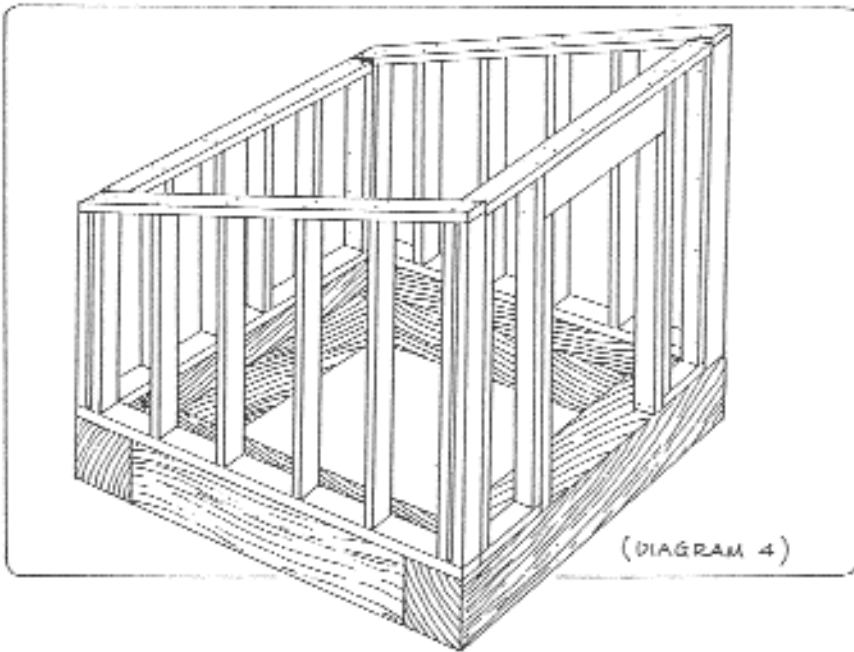
*Cutaway view of equipment pad within "perimeter foundation"*

## Ventilation is vital

Building ventilation is paramount to insure the health of your generator's engine. The size and type of engine will determine the amount of ventilation required, but just about any engine will eventually overheat in an inadequately-ventilated space. A little experimenting with our CDI diesel generator dictated that a minimum positive airflow of 1000 cubic feet per minute (CFM) was required to maintain a reasonable temperature on a hot day.

Squirrel-cage blowers are hard to beat for efficiency, especially where the size of the unit is a consideration. A fan-type exhaust system would require such a large opening in the building that any soundproofing would be rendered ineffective,

A squirrel-cage blower is easy to duct and can discharge through an eight-inch stack. The top of the stack should be fitted with an elbow facing away from the prevailing wind to keep out rain and snow. (See diagram 5.) The blower we used in our installation had a 9½" diameter wheel and was belt-driven by a ¼ HP motor.



*The walls on a "perimeter foundation" of railroad ties*

Any added dead air space helps when insulating for sound. The innermost foam panels can be installed right across the studs, thereby eliminating their ability to transmit any noise directly to the outer-wall sheathing. Use the same principles on the ceiling, too.

### Exhaust pipes

Exhaust pipes get very hot, so it is essential to route the pipe through the wall of your building in such a way that it will maintain a safe distance between the pipe and anything combustible.

Make absolutely certain that exhaust pipes are routed well away from any fuel-lines, fuel pumps or fuel storage! Simply cutting a large enough hole in the building is one solution, but that would effectively sabotage much of your sound-proofing.

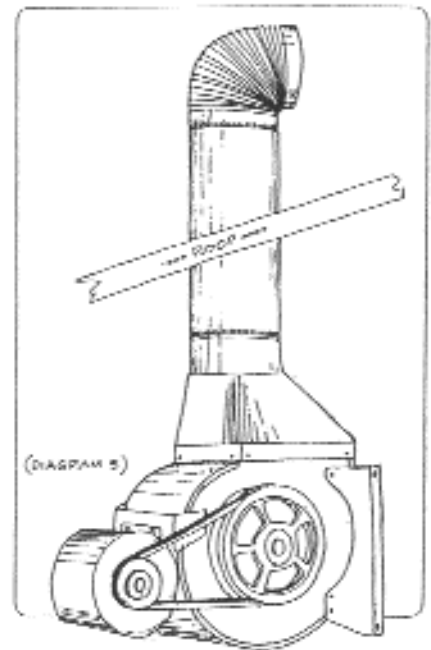
The answer is to cut a hole that will allow at least six inches of space between the exhaust pipe and any wood. (For- example, a 14" diameter hole for a 2" diameter pipe.)

Cut a piece of galvanized sheet metal (or aluminum, if you happen to

have any lying around) big enough to cover the hole, then cut a hole in the middle of the sheet-metal about an inch bigger than the exhaust pipe. With the pipe supported to the wall with an insulated exhaust hanger (auto-supply item), mount the sheet metal to the wall so that the pipe is centered in the hole. Then stuff the gap between the pipe and the hole with fiberglass insulation.

If you feel tempted to route the exhaust pipe out through a hole in the floor, consider that the operations which take place in a generator shed often involve spilling or leaking of fuel and/or oil. It is next to impossible to clean flammables off a wooden floor well enough to insure that no serious fire hazard exists.

Coolant plumbing which must be routed out of the shed needs to be isolated from the building only to prevent engine vibration/noise from being transmitted to the building. Simply cut the hole for the plumbing slightly too big and pack the space with a resilient material, such as a short length of foam pipe-insulation.



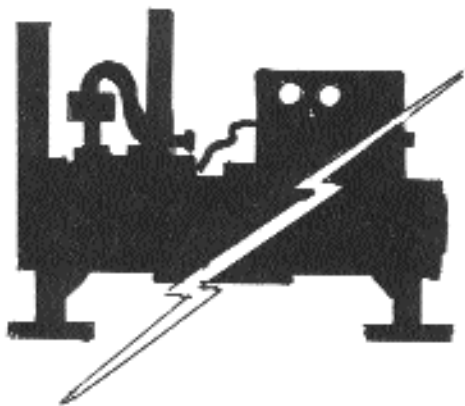
*The cooling blower*

The cooling blower isn't going to be very effective without an air inlet that will allow as much air into the building as the blower is pumping out. A simple air inlet is a hole cut in the floor and covered with a taped-down furnace-filter element to keep out dust, bugs and other critters.

An alternative is to use the space between the equipment-mounting pad (if used) and the floor. In either case, the opening must be a minimum of one square foot and there must be an opening of the same size or larger in the perimeter foundation. A hole in the floor works better than a hole in a wall because the ground under the building absorbs much of the noise that would otherwise radiate directly out of the air vent.

A little extra time and effort spent in preparing a home for your permanent generator installation will pay you back generously for years to come. Any mechanical equipment is likely to perform better and longer in a clean, controlled environment, and generators are no exception. And if your generator is your primary power source, as ours was for 10 years, why not have the luxury that it be silent from your living quarters?

(Parts of this article were excerpted from Mr. Thomsen's book, *More Power to You!*, which provides step-by-step instructions for building a high-output electrical system powered by a diesel engine. It is available from Backwoods Home Magazine.) Δ



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