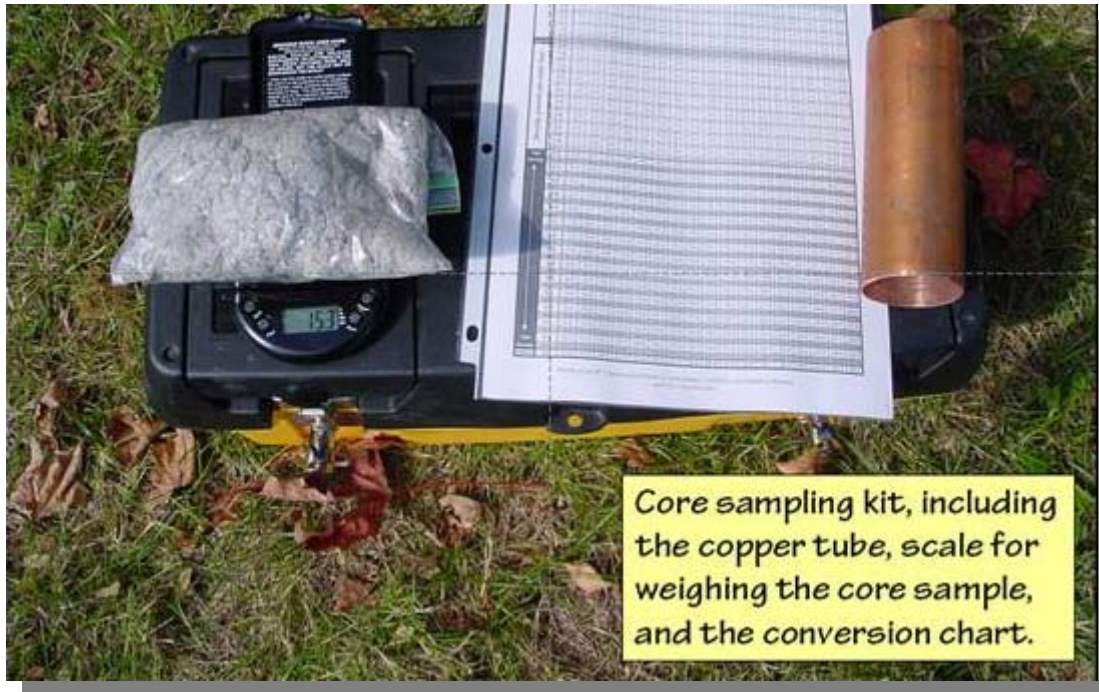


Core Sampling Kit for Cellulose Insulation

It is often useful to be able to determine the installed density of dense pack cellulose in a wall. Because the installer must work without the benefit of viewing the coverage or density, core sampling was devised at least fifteen years ago to measure density. I don't know of a commercial supplier of core sampling kits, but all the necessary parts are available. This short document includes a materials list for my core sampling kit and brief instruction for its use.



Materials List for the Cellulose Core Sampling Kit

- Drain, waste, and vent (DWV) copper pipe, 2 inches inside diameter, 12 inches long (the one in the photo is only 6 inches long; I prefer 12 inches). Remove the burrs from the inside edges and sharpen one end with an inside bevel.
- Pocket digital scale that reads to 1/10th of a gram and up to 50 grams max (100 gram maximum is OK). I like the Jennings JS-50X or 100X. Take a look at http://www.saveonscales.com/product_jennings_js50x_digital_pocket_scale.html for a source. This is very similar to the one in the photo above. The scale must have a “tare” feature. This allows you to zero the scale with an empty plastic bag on it so that when you weigh your sample, you are weighing ONLY the cellulose, not the bag.
- Density conversion chart. This chart is good ONLY for the 2-inch DWV copper pipe. It's a good idea to laminate this or put the chart in a plastic sleeve (this is shown in the photo). This density chart is at the end of this document.
- 2 1/8 inch hole saw, I recommend a carbide-tipped one. Mine is made by Relton and cost about \$85.00 from J&R Products (800-343-4446).
- Cordless drill, 1/2 inch is best.
- Box of plastic reclosable sandwich bags. You pull the cellulose out of the core sampling pipe with a hooked probe into the plastic bag. A filled bag is shown in the photo.

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- Permanent marker to write on the plastic bags. This is important if you are taking more than one core sample at a house.
- Tape measure. You must know the inside depth of the wall cavity that you are testing. The depth of the wall also leads you to the correct column on the density conversion chart.
- Hooked probe to pull cellulose out of the core sampling pipe and into the plastic bag. This probe should be at least 14 inches long with a handle on one end. The hooked end should be bent at a right angle and the bent end should be about $\frac{3}{4}$ inch long. A coat hanger will do, but a “lightening rod” (used for holding up fiberglass between floor joists) type wire is better because it is heavier gauge than a coat hanger. A man I know who does core sampling with the same type of core sample pipe claims he is able to pull the pipe out of the wall and the cellulose stays inside as a plug. He then empties the plug into a container to weigh. I have not been able to get all the cellulose to stay in the pipe when I do this, so I prefer to pull it out with the hooked tool.
- Empty cassette tape case or a light, empty, and rigid CD case. Because the surface of the scale is small (the full plastic bag overlaps), I place this empty case between the scale surface the plastic bag. I can also easily stick an empty plastic bag in this case when I am zeroing the scale (using the tare function), so the empty bag doesn’t blow away in the wind. Other lightweight items will work here, but remember the weight limit of your scale; in some cases, your cellulose sample might have a net weight of 30 grams.
- Tool box to hold everything. My tool box holds everything but my $\frac{1}{2}$ inch cordless drill.
- You will also need the tools to remove and replace any finished siding.

Using the Cellulose Core Sampling Kit

Why take core samples?

Core samples are taken to measure the density of installed cellulose insulation. Dense pack cellulose, if installed correctly, should have an average density ranging from 3.2 to 4.5 pounds per cubic foot. There are many reasons to determine the actual installed density.

An insulation installer might want to ensure that the installed density is correct. Density can be affected by the machine settings, weather, insulation manufacturer and batch, quality of electrical power operating the machine and, of course, the method used for installation. Because dense packing cellulose into a wall is done without being able to see the final product, a core sample can readily show the final result.

A program inspector or monitor responsible for quality assurance might take core samples in walls for the purpose of demonstrating a high quality installation. In such a case multiple core samples might be taken at the same building site, so all samples should be clearly marked and cataloged. Photographs of core sample locations keyed to the sample markings can be helpful.

For the most part, my experience with core sampling has been for the purpose of training installers to dense pack properly. I have found it to be a very good training tool with scores of installers.

Where should the samples be taken?

Drill holes for core sampling at least two feet away from the insulation fill hole. Core sampling only measures the density of insulation at the core hole; your sample might have found the only bad spot in the entire building (or the only good spot). A quality control specialist mentioned to me that a true idea of the installed density in an average house would require about thirty core samples. This is, of course, out of the question for most quality assurance activities.

It is always best to use core sampling and an infrared camera together. Use the camera to inspect for coverage and settling; use the core sampling to determine installed density. If you have both of these techniques available to you, I think four core samples on the average house are adequate for typical quality assurance practice.

How should the samples be taken?

Start by carefully removing the finished siding. If you don't already know how to remove the various siding types you will encounter, you will want to spend some time with a good insulation contractor who can teach proper siding removal and replacement techniques to you.

With the siding removed, drill the core sample hole in the sheathing with the 2 1/8 inch hole saw. Use caution at the end of hole-drilling process so that you don't damage the cellulose sample.

Insert the copper core sampling pipe into the drilled hole by twisting the pipe until you hit the backside of the interior wall finish material. Sharpening the leading edge of the pipe with an inside bevel makes the pipe move through the cellulose more easily and with less disturbance to the cellulose sample.

Hold an empty and open plastic bag at the end of the sample pipe while you drag and scrape the cellulose from the inside of the pipe into the bag. Do your best to get all the insulation. In low-light conditions, a small flashlight might be needed to check the inside of the pipe.

Zero your scale with another empty plastic sample bag and any additional base extender you might be using (I recommend an empty cassette tape or CD case as base extenders in the materials list). Remove the sample pipe from the drilled hole and measure the inside depth of the wall cavity.

Put the insulation sample on the scale and record its weight. Because the scale is very sensitive, wind can be frustrating; you might want to move to a protected area. On the density conversion chart made for the core sampling pipe, find the column that corresponds to the inside depth of the wall cavity. Read down until you find the weight of your sample. Now follow that row all the way over to the left on the chart to find the corresponding density in pounds per cubic foot.

Record all the necessary information for each core sample.

Fill the core sample hole in the wall back up with insulation, plug the hole with a wood or plastic plug, and then replace the siding.

Move on to the next core sample location and do it all again.

Cover your tracks:

Never drill through finished siding unless absolutely necessary. If it is necessary, figure out an acceptable way to make your finished core sample hole invisible before you start to drill. Of course, it is best to remove the finished siding before drilling through the sheathing. After you weigh the sample, fill the hole with insulation, plug the hole with a wood or plastic plug, and then replace the siding.