

## A materially different home

### Before a Bend couple can start building their ultra-green home, they need the right materials - and finding them is a challenge

By Kate Ramsayer / *The Bulletin*

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**Editors note:** Tom Elliott and Barbara Scott invited The Bulletin to follow their building project — to build the greenest home possible — from start to finish to share their goals, decisions, costs, concerns, problems and achievements, and to be an open book on what it takes to build such a home. The Bulletin will follow the couple's project through periodic stories. This installment examines the difficulty of finding building materials that meet the strict requirements of the green guidelines Elliott and Scott are following as part of the Living Building Challenge certification program.

Polyvinyl chloride is a key component of many building materials — and that's proving challenging for one Bend couple trying to build a house free of the plastic.

Commonly called PVC, the plastic is on the “red list” of about a dozen building materials that participants in the Living Building Challenge, a green certification program with strict standards, must avoid due to health, environmental or energy concerns.

But Barbara Scott and Tom Elliott, who are trying to meet the Living Building Challenge requirements for building an extremely efficient and environmentally friendly home in northwest Bend, are discovering just how common the material really is.

“Do you know how many things have PVC in them?” Elliott said.

The plastic is in plumbing pipes, flooring material, parts of carpet and the special roofing material that Elliott and Scott have considered to capture rainwater for drinking and other household uses.

“Finding replacements for these things, it's a challenge,” Elliott said.



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Kristian Willman, with Timberline Construction, stands in a garage filled with recycled lumber, salvaged during the deconstruction of a house on the property where a new, environmentally friendly home is planned by Barbara Scott and Tom Elliott. Builders will incorporate some of the recycled materials in the structure. The boards Willman is holding show what the salvaged pine looks like after re-milling.



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As Elliott, Scott and their design team approach the summer start date for construction on their home, they're taking a close look at everything that will be used to build the house — from the wood beams to floor tile to the glue that holds particleboard together. To meet the Living Building Challenge guidelines, they have to find products with only nontoxic and sustainable ingredients — and often find them within a specified distance of Central Oregon.

“You have to re-examine (everything), right down to the nails,” Elliott said.

Kristian Willman, owner of Bend's Timberline Construction, has been investigating many of the different building material options for the house that will be built on Northwest Shasta Place.

“It's pretty crazy; you have to analyze everything,” he said.

*Timber considerations*

Timber for the house, as well as all of the wood that goes into things like cabinets and window trimming, has to be certified by the Forest Stewardship Council. That certification guarantees the wood is cut from forests that are managed in a sustainable way, Willman said.

On top of that, the Living Building Challenge and the Leadership in Energy and Environmental Design (LEED) certification — which Elliott and Scott also are shooting for — mandate how far away the material can come from, Willman said.

The allowable distance depends on the density and type of material. Heavy materials have to be from within 250 miles, while medium-weight products can come from 500 miles away and lightweight materials must come from within 1,000 miles.

“You have to think it all the way through,” Willman said. “Where is all that material coming from?”

The Confederated Tribes of Warm Springs produces certified timber, he said. It can cost about 15 to 20 percent more than regular lumber, and with the volatility of the timber market, the builders aren't sure when different kinds of wood products will be available.

“If we have to buy a month early, we will,” Willman said. “We're going to have to take what we can get, when we can get it.”

Kristian Willman, with Timberline Construction, stands in a garage filled with recycled lumber, salvaged during the deconstruction of a house on the property where a new, environmentally friendly home is planned by Barbara Scott and Tom Elliott. Builders will incorporate some of the recycled materials in the structure. The boards Willman is holding show what the salvaged pine looks like after re-milling.

## Red-listed materials

The Living Building Challenge restricts what can be in building materials for various health or environmental reasons.

Material	Commonly found in	Reason for restriction
Formaldehyde	Carpets, wall covering, furniture, paints, adhesives, sealants, varnishes	Along with some other volatile organic compounds, can cause dizziness, headaches and irritation, as well as damage to the liver, kidney and nervous systems, and increased risk of cancer.
Halogenated flame retardants	Curtains, drapery and other textiles, padding	Linked to thyroid disruption, developmental problems and immune suppression.
Polyvinyl chloride (PVC)	Flooring, pipes, roofing membranes, furniture, carpet backings and curtains, adhesives	Chlorinated plastics can release dioxins, carcinogens that are also associated with endometriosis, and can alter reproductive, immune and endocrine systems. Other chlorinated plastics include chlorinated polyethylene, chlorosulfonated polyethylene and .

More complexity enters the picture when the builders start to look at wood products that are glued together like particleboard — because then Willman has to determine the glue's ingredients.

Some glues give off gases that can be unhealthy, and so products containing those glues are out, he said.

Formaldehyde is in a lot of engineered wood products, said M.L. Vidas, owner of Sustainable Design Services of Bend and a member of the design team.

“It will off-gas for a very long time,” she said, noting that it can accumulate when designers consider that it could be coming from building materials, cabinets, furniture and more. And as people construct well-insulated homes to prevent air leaks, she added, they want to make sure they're not trapping harmful chemicals.

“If we're going to make better buildings, more energy efficient and airtight, we've got to be more careful about what we're bringing in,” Vidas said.

*Getting the info*

The design team is still working to gather information about different environmentally friendly alternatives to problem building materials, she said.

She is helping to design a list of criteria that the team can give to suppliers, to see if they can help track down products that are from the region, are efficient and made of materials that aren't on the red list.

But getting suppliers and manufacturers to comply is not always simple.

Willman has been sending out questionnaires from the Living Building Challenge to companies asking about their products.

Questions include where all the different components and raw materials in the product come from, whether any of 30 different chemicals or compounds are in the product, what the company's recycling or waste-reduction plans are, and how much greenhouse gas the company releases per unit of the product.

“I probably have 20 of them out there, and don't have one back,” Willman said.

For the types of questions asked, see the questionnaire online at <http://ilbi.org/resources/reports/materialsqnaire/buildingmaterialsquestionnaire0812.pdf/view>.

		Neoprene.
Mercury and lead	Fluorescent lamps, thermostats, some roofing products, wire insulation	Neurotoxin, particularly concerning for fetuses and growing children.
Cadmium	Dyes in paints and textiles	Carcinogen. Can also damage kidneys and lungs.
Chlorinated fluorocarbons and hydrochlorofluorocarbons	Air conditioning systems, foam insulation	CFCs and, to a lesser degree, HCFCs can enter the atmosphere and deplete ozone.
Phthalates	Plastics	Effects unknown, but possible carcinogen.
Wood treatments with creosote, arsenic or pentachlorophenol	Treated wood, including building materials and playgrounds	Arsenic is no longer used to treat wood for residences, but is a known deadly poison. Creosote, a carcinogen, causes skin irritation and respiratory effects. Pentachlorophenol can cause birth defects and is a suspected carcinogen.
Polyurethane	Foam, insulation, hard and flexible plastics	No reason listed.

Source: The Living Building Challenge User's Guide

Because he hasn't received any response, Willman's trying to find all the information he can about things like roofing material that will fit with the homeowners' plans to collect all possible rainwater to use in the house. The material designed for that purpose is made with PVC, so that doesn't fit the requirements, while something like a metal roof probably is painted — so he has to examine paint ingredients.

He's researching things like plumbing fixtures, some of which might only come from the East Coast and would have to be shipped farther than the Living Building Challenge allows. Other fixtures aren't efficient enough for the household, which will rely on rainwater for virtually all of its freshwater use.

“So you just have to keep on searching for the next best thing,” he said.

*‘Above and beyond’*

Because of all the different components, this is probably the most challenging home on which Willman has worked.

“They're going so far above and beyond,” he said of Elliott and Scott.

Elliott is planning a database to list out all the different materials that fit the Living Building Challenge requirements — and hopefully to recoup some of the investment in the time it takes to investigate the options.

Elliott estimates that the builders have spent about \$4,000 worth of time already to do the research.

Following the strict requirements of the Living Building Challenge means Elliott and Scott can't use their first choice in some cases.

“Many times we've said, ‘Oh, that'd be really cool, but it's from 5,000 miles away,’” Elliott said.

He'd like to use American Clay to cover the interior walls, he noted, but the clay is from the Southwest — so he's looking into whether it can be mixed with Oregon seashells or ground glass to meet the local requirements.

And sometimes, the local products won't fit either — locally manufactured windows don't use Forest Stewardship Council-certified lumber, for example, or are crafted from ingredients transported from far away.

“You want to buy local, support local (businesses) as much as possible,” Scott said, but “we've committed to this grueling process.”

*A matter of values*

Once the Bend couple and their design team have chosen materials, they have to ensure everyone involved in the project — subcontractors, carpenters, construction workers and more — understand the requirements and don't use their normal adhesives or a slightly different paint with a red list ingredient.

Though finding those materials and double-checking their components is proving difficult, Elliott and Scott are enthusiastic about the result.

“I'm so excited about it; I think it's awesome,” Scott said.

While it might be years before others start only using nontoxic, sustainable materials, Scott said she believes it will happen at some point — and the more people who start doing it now, the cheaper and more readily available the products will become.

Elliott said that after decades on a farm, riding a pesticide sprayer as a 14-year-old among other things, it took him awhile to understand the ingredients he was working with, and make the switch to organic agriculture.

But now, focusing on materials that don't harm the environment or make people sick fits with his values, Elliott said.

“It's an expression of who I aspire to be,” he said.

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