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Harrowsmith CountryLife

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Home Built
in Organic
Style**



Water Gardens

What You Should Know



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RAMMED EARTH COMES TO CANADA

Even if you've never heard the official name before, you're probably already familiar with rammed earth houses. Anyone who has admired a postcard view of a quaint Mediterranean port has seen them—a jumble of whitewashed houses with red tile roofs climbing the seaside hills. Indeed, they have been the standard in house construction in southern Europe and the Middle East since biblical times. None other than the Great Wall of China, or at least most of it, was built of rammed earth. Today, it is still the basic building material through much of the world and although rooted in tradition, it has easily adapted to modern architecture. More than just for houses, many a mall, school and hospital in Western Australia—indeed, 20 percent of all local construction—is made of rammed earth. Meanwhile, the Perth yellow pages are chock full of rammed-earth contractors.

But it's a long way from sunny Australia to the Great White North. Meror Krayenhoff's foray into rammed earth construction was the first—and still one of the few—attempts to introduce the technology to Canada. With all its attributes, you'd think it would have caught on like the hula-hoop, but so far, rammed earth houses are as rare as a smiling face on Bay Street.

Meror says it's all a matter of what we're used to. "Rammed earth evolved in hot dry climates, where wood is too rare and precious to be used as a building material," he says. "Meanwhile, the Canadian building tradition is the exact opposite—stick-frame construction is so ingrained that anything else is greeted with raised eyebrows." Indeed, rammed earth has yet to be recognized in local building codes and there was some scepticism, even among environmentalists, that it is practical anywhere but Salt Spring and environs, whose winters are hardly as severe as the Canadian norm. Meror scoffs at doubters. "There is a long tradition of rammed earth in the French Alps," he says, and he knows of experiments with the technique in the Yukon. "I think rammed earth has great possibilities in less temperate parts of the country," he continues. Currently, Meror is proving his point as work proceeds on his current project, a rammed earth nature interpretive centre for the Osoyoos First Nation in the B.C. interior. From there, he's anxious to apply his technique to an even colder locale.

earned its stripes," Brenda says, recalling an anomalous snowstorm that plunged Salt Spring into a prolonged blackout. "After three days without heat and electricity, our neighbours were bailing out, while our rammed earth walls kept us tolerably warm."

Mark concurs: "That storm confirmed that we had done the right thing," he says. "Not only did we build the house of our dreams, we also built something that satisfies our environmental conscience." No longer is rammed earth a foreign concept for Mark and Brenda—no doubt, they'll be singing its praises for years to come. ☺



Taking a break from "ramming chores," Mark poses with Brenda as work proceeds on their house.

Further Reading

The Rammed Earth House by Cynthia Wright et al., Chelsea Green Publishing Co.
Buildings of Earth and Straw: Structural Design for Rammed Earth and Straw Bale Architecture by Ann Edminster and Bruce King, Chelsea Green Publishing Co.

Edify Yourself

For anyone considering the merits of rammed earth building, Meror Krayenhoff offers enlightening weekend seminars. Participants learn the basics of the technique, tour several local rammed earth houses and even get to do a little on-site ramming. Courses are held on Salt Spring Island on the weekend of July 16 and September 17; a third two-Saturday course is scheduled at Camosun College in Victoria. Check www.sirewall.com for fees and more information.

Specs

Concept New single-storey home on oceanfront 4-acre lot. Employs unusual rammed-earth construction technique. Design and construction: Meror Krayenhoff and Ron Cooke, Terra Firma Builders, Salt Spring Island, British Columbia

Genesis Construction under way September 2003; occupied December 2004.

Location Salt Spring Island, British Columbia

Bedrooms 2

Bathrooms 3

Total usable floor area about 2,300 square feet on one level

Construction Rammed earth employs soil as a building material, which is poured into forms and compressed into solid walls. Special seismic adaptation and added insulation by builder:

Foundation For seismic stability, the structure requires extra-wide (five to six feet) concrete footings.

Roof Metal standing-seam panels. Chosen for its environmental capabilities, the roof will last longer than other roofing materials and can be recycled. Rainwater is collected from roof and stored for household use.

Insulation Rigid foam insulation integrated into earth walls (see illustration, page 60); icynene spray-foam in ceilings

Electrical service Standard 200-amp service

Heat Water-source heat pump extracts warmth from seawater and stores it for household use in a heat exchanger. Considered an exceptionally eco-friendly type of home heat in that, except for a small amount of electricity to run the unit, it does not rely on fossil fuels (see "Home Is Where the Heat Is," October 1998). Heat dispensed through rooms via heat exchanger and radiant-floor cables.

Windows Low-E, double-glazed, argon-filled units—aluminum cladding over wood frames

Floors Poured concrete, tinted with pigment



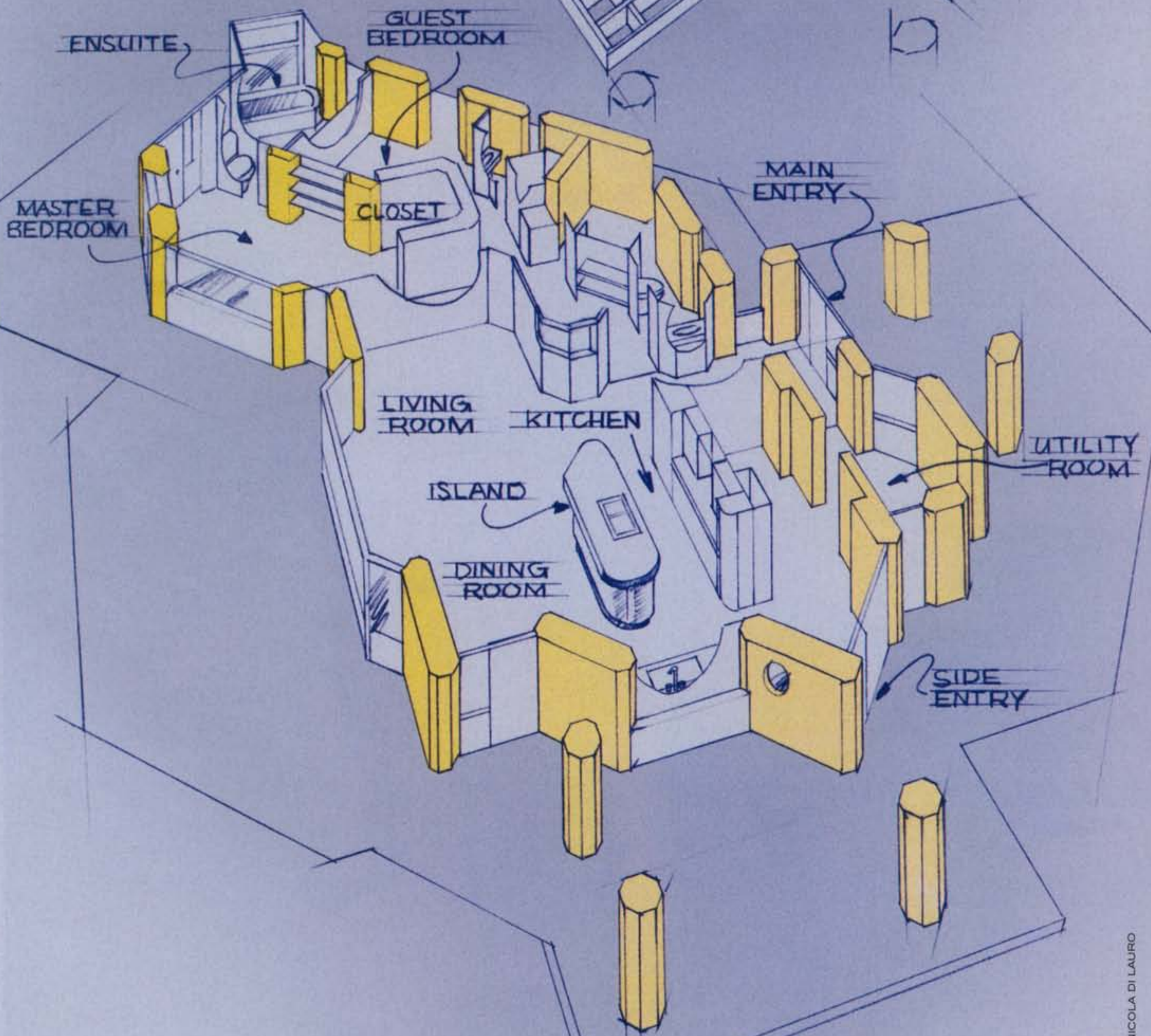
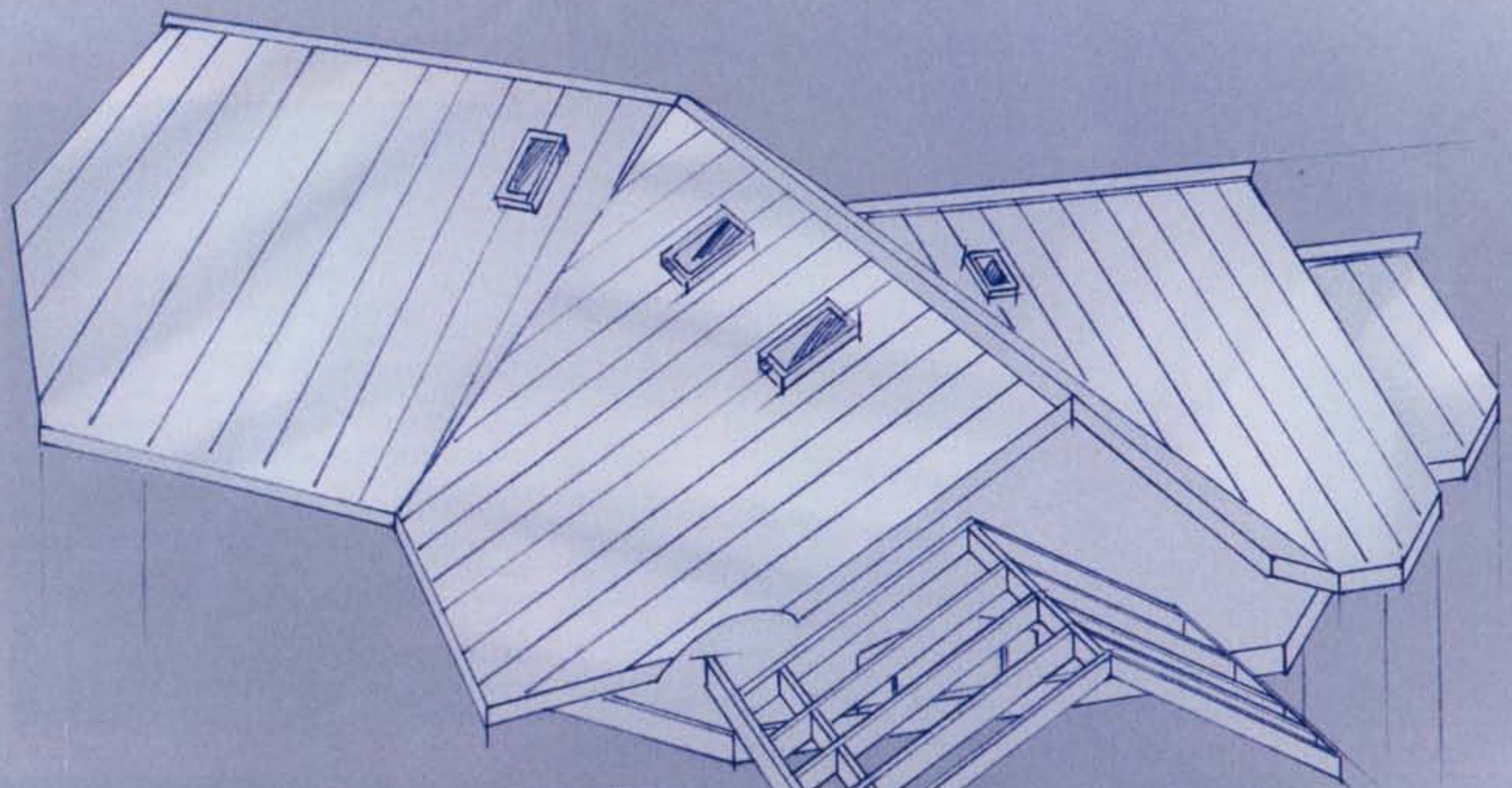
High on the list of priorities was Brenda and Mark's desire to take advantage of every view to the water. State-of-the-art creature comforts—notably in the kitchen—add to the appeal of the house.

Continued from page 61...

plumbing and wiring, have to be settled precisely beforehand since they will be buried within the earth walls—but when construction finally commenced in the summer of 2003, Mark and Brenda were always on hand to watch the progress. "A pad was cleared in the middle of the yard to function as a palette on which the basic building ingredients—the soil, water, cement and pigment—were mixed together," Mark says. To get an artistic variation in colour now and then, the amount of pigment in the recipe would vary somewhat. "When the mixture had the right consistency—it should crumble like cookie dough—a skid-steer would pour the earth into the forms." But Mark

was more than a mere observer. Putting his regular nine-to-five routine aside for the duration, he donned a hard hat and became one of the crew, more than willing to climb into the wall-forms with a pneumatic compressor and help with the ramming. "All that pounding—hours of it—is very labour intensive," Mark recalls. "It took two whole months, but it was well worth it." Not only did his own labour save significantly on the bottom line, he was also proud to have had a hand in building his own house. "How many other people can say that?" he beams.

Now that the house is completed, Mark and Brenda can bask in the pride of a job well done. "Only this past December, during our very first winter here, the house





7

7 ...and rams it some more until the earth is pounded hard and firm. As the wall is filled up with earth, new sections are added to the form until the wall reaches its full height. Forms are left in place until the work has a chance to dry.

8 With the forms removed, the wall stands in all its glory. Subtle striations and variations in colour—signatures of rammed earth construction—mark the numerous rammed layers. The free-form architecture is beginning to materialize as most of the walls stand in place. The foreground will be filled in with yet more walls.

9 Electrical, mechanical, central vac and other household systems have to be put in place while the walls are being built. Inset panel for electrical outlet is one of Meror's stylistic signature marks.

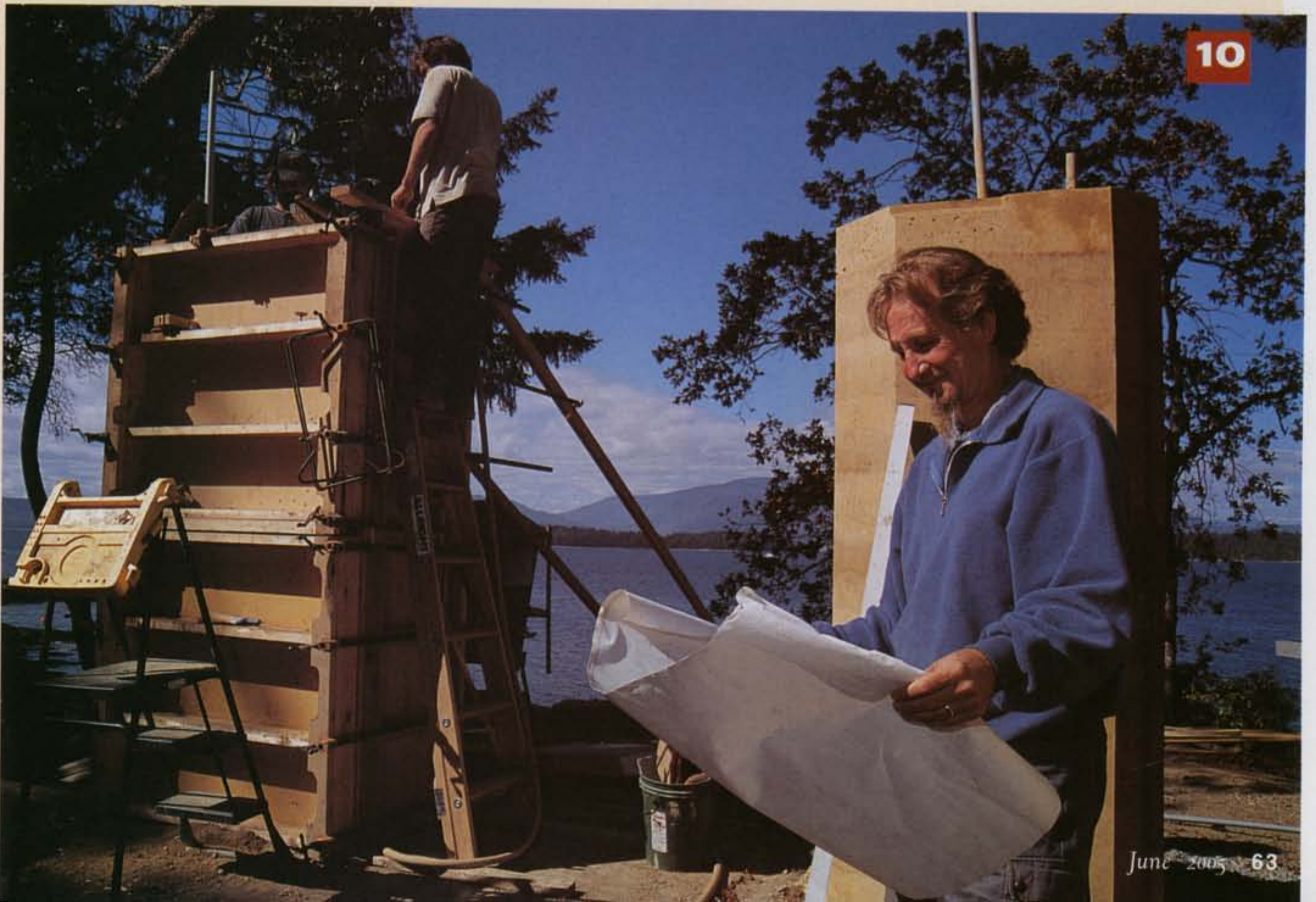
10 While the crew, including Mark, tops off another wall, builder Meror takes a look at the blueprints.



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1 As if the ground were a mixing bowl and the skid-steer bucket a Mixmaster, the essential ingredients—earth, cement and pigment—are stirred and blended together.

2 Water is added to the dry components until the recipe acquires the texture of cookie dough. If a clump shatters when tossed to the ground, it's just the right consistency.

3 Its bucket full of the raw, mixed ingredients, the skid-steer heads over to the house site, where the wall forms stand at the ready. The earth is then dumped into the form.

4 Then the ramming begins. Homeowner Mark climbs into the form with his pneumatic compressing tool and rams the earth...

5 ...and rams it...

6 ...and rams it...



3



6



installations with steel reinforcing bars, placed at regular intervals. Together, the two innovations—thermal and seismic—mark Meror’s work as uniquely suited to local conditions: A cut above, he calls it the “S.I.R.E.” for Stabilized Insulated Rammed Earth wall (see illustration, opposite page).

The more Brenda and Mark learned, the more they were convinced that rammed earth would work for them. “In 2000, we started bouncing ideas around,” Brenda recalls. “We left the technical stuff to Meror and relied on his creative staff—notably designer Ron Cooke—to shape concepts into a firm plan.” From the start,



Rammed earth houses are known for their organic appeal and Brenda and Mark’s house is no exception. It was designed to blend effortlessly with its environment.



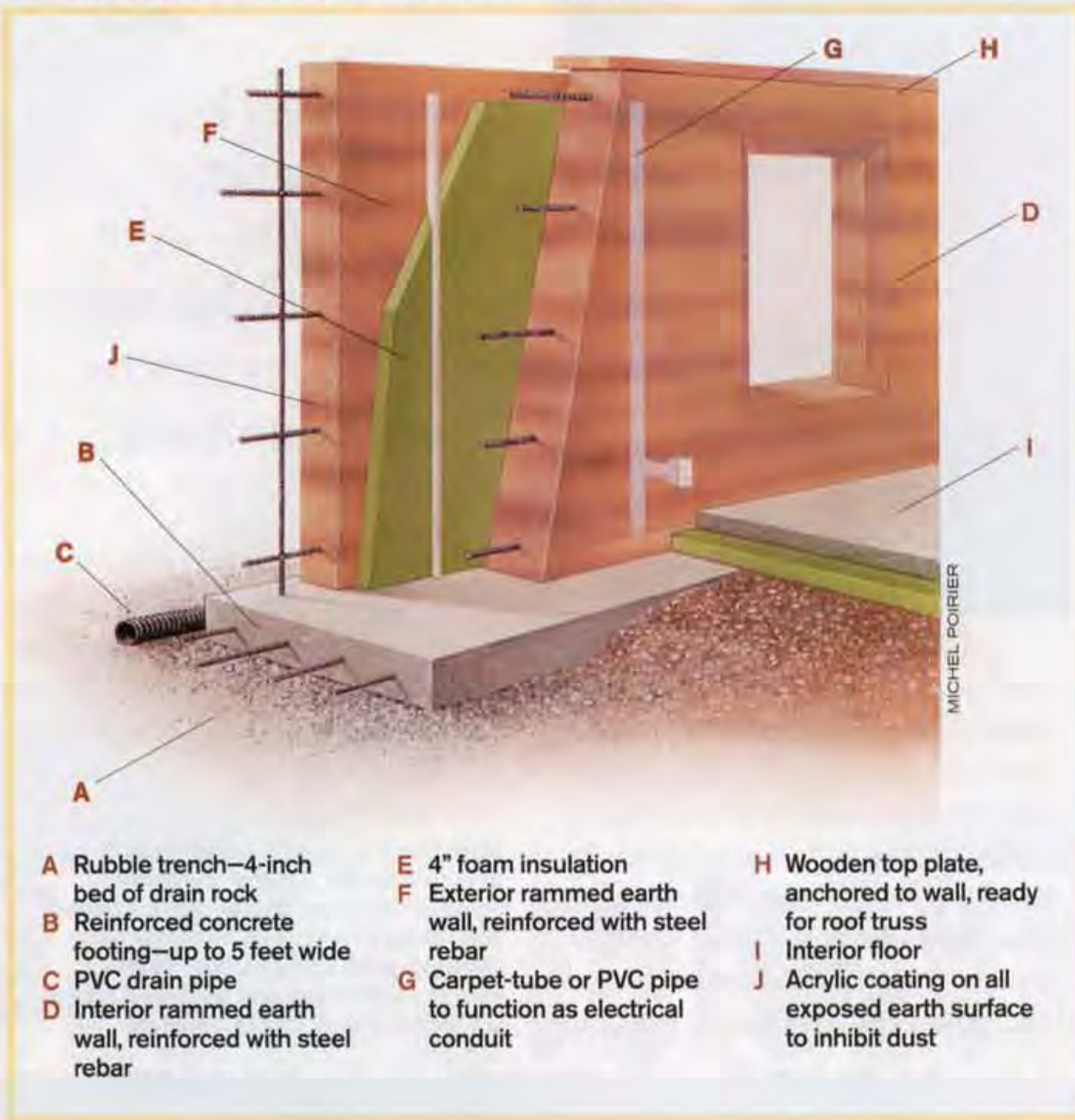
Even so, Meror saw room for improvement. He says that rammed earth works like a charm in a warm climate, but in Canada—even in a place as balmy as Salt Spring—its thermal capabilities need a helping hand. So Meror went the concept one better by embedding a layer of rigid insulation within his walls. “This boosts their thermal performance to at

least R33, which is more than adequate to weather a Canadian winter,” he says. But the innovations didn’t stop there. Meror also saw room for improvement when it came to seismic issues—an often overlooked, but very real concern on the west coast. “Here, it’s important that a building stands a fighting chance in the event of an earthquake,” so he bolsters all his

the couple had some basic criteria in mind: that the architecture blend with its surroundings; that all amenities be on one floor; and most of all, that the principal rooms—especially the master suite and living area—take advantage of the available view. And what a view: a typical Salt Spring vista over the Strait of Georgia. “The best vantage point was from a spot close to the shore where previous owners had built a small cabin,” Brenda continues. Without a second thought, the cabin was sold and towed to a new location, leaving the site clear for their new home.

It took a long time to work out a floor plan—that’s the nature of rammed earth, because all the mechanical systems, like
Text continues on page 65...

ANATOMY OF A "S.I.R.E." RAMMED EARTH WALL



- | | | |
|--|--|---|
| A Rubble trench—4-inch bed of drain rock | E 4" foam insulation | H Wooden top plate, anchored to wall, ready for roof truss |
| B Reinforced concrete footing—up to 5 feet wide | F Exterior rammed earth wall, reinforced with steel rebar | I Interior floor |
| C PVC drain pipe | G Carpet-tube or PVC pipe to function as electrical conduit | J Acrylic coating on all exposed earth surface to inhibit dust |
| D Interior rammed earth wall, reinforced with steel rebar | | |

Although new to this country, rammed earth is one of the oldest construction methods in the world (see "Rammed Earth Comes to Canada," page 66). Its basic component is ordinary dirt, mixed with a measure of water, a dash of cement and soupçon of pigment. It doesn't sound like much to base a building on, but when dumped into forms, layer upon layer of the earth mixture is "rammed"—that is, pummelled and pounded and tamped and battered—until it morphs into something as hard and as durable as concrete. Removing the forms reveals an earthen wall that is as beautiful as it is strong. "I love the look of a rammed earth wall," Mark says. There are subtle striations in colour and variations in texture—here and there, you can discern the layers—which lends a unique and natural appearance lacking in, say, factory brick or ordinary poured concrete. "Even on the interior, rammed-earth is designed to be seen," he says. And, uninhibited by convention, the

technique lends itself to innovative, free-flowing architectural statements—indeed, rammed earth houses are guaranteed to turn heads.

Brenda and Mark were introduced to the concept through Meror Krayenhoff, a local contractor with a keen interest in eco-building and sustainable living. It was he who brought rammed earth to Salt Spring—indeed, his company, Terra Firma Builders Ltd., was the first to bring it to Canada, after he studied buildings in the Middle East and Australia. Brenda and Mark's house is his twelfth rammed earth project. "Aesthetics are important," he says, "but only the beginning of the long list of the virtues of earth buildings." For example, rammed earth houses are so solid that they boast superb acoustics and rank with the best in terms of fire resistance. They also score points for exceptionally low maintenance. "There is no siding to repair and no painting to be done. And because it doesn't rely on wood, the structure will never rot, nor

will it be host to carpenter ants or termites, which are the scourge of stick-frame buildings, especially out here on the coast." In the long run, Meror believes this more than compensates for the premium—about 15 percent over ordinary dwellings—in up-front costs.

The dearth of wood is another factor in rammed earth's favour. "It doesn't require much lumber," Meror continues, noting that conventional homes consume about 47 trees each. "We use dirt instead of wood—that's a big environmental bonus." But its biggest trump card, according to Meror, lies in energy efficiency, specifically thermal mass, which has long been acknowledged as a major factor in passive solar applications (see "Glass & Mass," April 2005). "To take advantage of the natural warmth of the sun, you need a large, solid-as-a-rock surface that can absorb a lot of heat and store it. Concrete and stone masonry are often cited as prime materials for thermal mass, but my technique, with solid earth walls up to two feet thick, is certainly in the same ball park," he says.

The Recipe

Soil—about 5 litres

Water—about half a litre

Cement—10 percent (about 500 mL)

Pigment—1 percent (about 1 Tablespoon)

The formula for rammed earth varies, especially by colour—it can vary from chocolate brown through all shades of earth tones to muted beige—but the basic recipe starts and ends with plain old dirt. It has been compared to both concrete and adobe brick, but it definitely isn't.

Not adobe—Similar to rammed earth in that its basic ingredient is earth, adobe differs in that it is formed into blocks, which are not assembled in place until they are dried in the sun.

Not concrete—Like concrete, rammed earth is poured into forms. However, concrete employs gravel and sand, not earth, and buckets more water; it is also more demanding of resources.

It's probably a foreign concept to you and, only a few years ago, rammed earth construction was, likewise, an unknown quantity to Mark Haughey and Brenda Plaxton. At the time, the couple—newly arrived urban refugees from Calgary—was considering any number of alternative building techniques for their new house on Salt Spring Island, British Columbia, and although it was uncharted territory, something about using dirt—basic, unadulterated earth—as a building material struck a chord. “Perhaps it’s because of my background as a geologist,” Mark muses. Eager to build a house that reflected his environmental ethic, Mark was drawn to rammed earth. It appealed to him even more than straw bale, cob, stackwall or other out-of-the-mainstream building materials.

Brenda approached it from a different angle. After learning about environmental allergies, she vowed that her next



home would be free of mould, dust and household contaminants that can render a dwelling uncomfortable, if not uninhabitable. “Rammed earth houses have a reputation for good indoor air quality,” she remarks. There is very little wood in them—only a fraction of what would be used in a conventional frame house—and hence, fewer opportunities for mould to

There is very little wood in rammed earth construction—only a fraction of what would be used in a conventional frame house.

grow, which is often the culprit behind the foul indoor air. Nor do they contain any of a whole list of chemicals—fungicides, solvents, and formaldehyde—that are routinely found in conventional construction materials.

Mark Haughey and Brenda Plaxton take five on the patio of their new ocean-side home on Salt Spring Island. The house is a shining example of rammed earth construction, whose energy capabilities and aesthetic charm are winning over lots of new fans.





RAM-IFICATIONS

Soil as a building material?

Take a look at an innovative home that employs rammed earth construction, an environmentally friendly building technique whose main ingredient is little more than good, solid dirt.

STORY BY **TOM CRUICKSHANK**
PHOTOGRAPHY BY **JEFFREY BOSDET**