



Built on the Past, Designed for the

A new home
embraces
zero-energy
living while
respecting
its historic
neighbors

BY MATTHEW SWETT

A few miles from where I live lies Ebey's Landing National Historical Reserve. It's a soul-stirring place where a hummock of land overlooks farmers' fields as they descend to meet the Salish Sea. I'm struck by the beautiful way in which humans and nature coexist; plowed furrows bending around windswept trees give the sense that human and natural forces have found balance.

This is not by accident. Past residents were so moved by this place that they took steps to protect it. With the National Park Service, they formed the historical reserve—the first public-private partnership of its kind—to look after the character and culture of the community as well as the land itself. Today the reserve extends over 17,000 acres and encompasses the entire community of Coupeville, Washington's second-oldest town. Situated on the protected waters of Penn Cove, the town owes much of its character to the New England sea captains who settled there and left behind elegantly simple buildings. It was here that I was asked to design a new home that would strike a balance between the heritage of the past and the needs of the future.

Neighborhood friendly—and net zero

My client was a military pilot serving as acting energy manager for the local Navy base. His goals for the house were succinct but comprehensive: It should be well designed and energy neutral, and it should complement the established neighborhood. We agreed that it needed a strong connection to nature through landscaping and an abundance of natural light. I also suggested that the design be easily adaptable to future needs.

Located near the town center, the site occupies a corner lot looking out on Penn Cove and Mount Baker to the north and has unfettered solar exposure to the south. Although



As if they were always there. The new house, cottage, and garage match the architecture of Coupeville's historic district more closely than the awkward 1940s structures they replaced.



Future

Architecture that blends in *by Peter Keyes*

Ebey's Landing National Historical Reserve contains more than 400 historic structures, with the largest concentration in the town of Coupeville. In the design of this home, it was clear to both Matthew and me that reinforcing the local character was especially important on this site near the town's historic core. Coupeville's 19th- and 20th-century houses express a variety of styles, and the intention was not to mimic any particular one. Rather, it was to enable the new house to fit in with its neighbors through fundamental architectural similarities in scale, form, and detail (photos right).

Scale. There are no old mansions in Coupeville; its historic buildings are modest in scale, reflecting their origins on the frontier of the Washington Territory and the ethos of the New England sailors who built them. The design kept the building footprints small by breaking the home into three separate structures.

Building clusters. Perhaps even more important to the character of the town than the details of the buildings themselves, these clusters of buildings tightly interwoven with outdoor areas define spaces in a way that a single building in the middle of

a quarter-acre does not. Yards are not hidden behind fences, so passersby get glimpses into the life that goes on there.

Building form. The historic buildings comprise compact, simple shapes topped by steeply pitched roofs (which are hidden by false fronts on the commercial buildings). The new home's design employs three steep gables and a low-pitched roof on the one-story section. This is fronted by flat-roofed bays that recall the commercial blocks nearby.

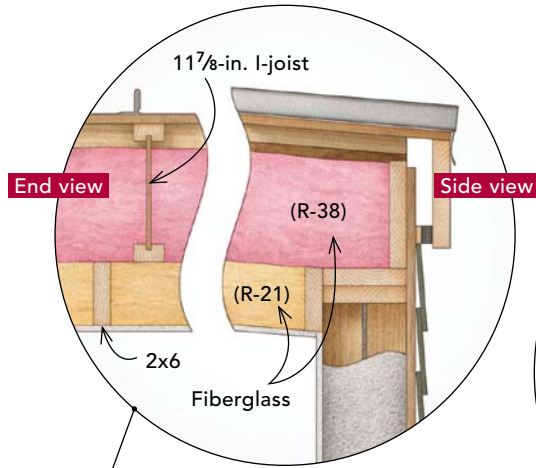
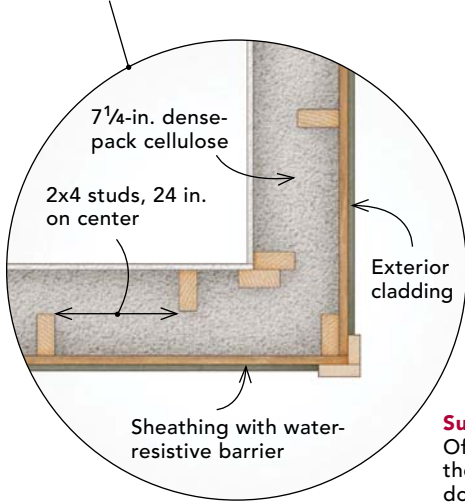
Simplicity. While the Queen Anne and Second Empire houses in town sport period

details, the earlier and vernacular houses have a simplicity in detail and trim that matches their overall form. This simplicity was mirrored with visually traditional materials, understated trim, and clear punched openings for individual windows or small clusters of windows.

Identity. Located on a corner lot, the buildings have facades and doors that address both streets. The rear door of the house may be used more often, but the front door and porch give the house an appropriate formality on the main street and afford a fine view of the cove.

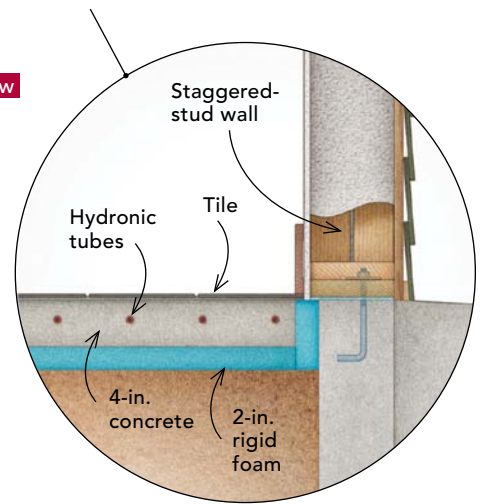


Building envelope Staggered-stud walls on 2x8 plates are insulated with dense-pack cellulose (R-28).



Superinsulated shed roof Offset framing reduces thermal bridging in this double-roof assembly.

Thermal-mass floors Tile over 2-in. concrete provides thermal mass combined with radiant heating. In the sunroom, a 4-in. slab over rigid foam maximizes solar gain.



Override skylight Two 9-ft. Kalwall panels are supported by 4x4 fir purlins, flashed, and covered with a continuous polycarbonate sheet.

Geothermal system A ground-source heat pump supplies all of the house's heat, air-conditioning, and hot water.

Living roof Roof plantings restore the environment displaced by the building and provide a unique experience for homeowners.

Gable roof Raised-heel scissor trusses with R-60 blown-in fiberglass insulation form a well-insulated roof with enough height for gable-end windows in the upstairs bedroom.

Photovoltaic system A 5kw PV array is installed on the roofs of the cottage and the garage.

less energy, MORE LIVABILITY

The house met its low-energy goal with a solid envelope and a high-mass radiant-floor system coupled with a ground-source heat pump and a 5kw photovoltaic array. Comfort didn't get shorted, however: An inventive skylight illuminates the interior without sacrificing the envelope, and a bright sunroom puts whatever sunlight there is to good use.

sandwiched between two historically significant buildings, the structures on this lot were hardly historic. Dating from the 1940s, the flat-topped, vinyl-clad house and cottage had the look of temporary commercial space. The buildings had been neglected for many years and were deteriorating slowly. In fact, the only salvageable parts proved to be their foundations.

No problem with preservationists

New buildings inside the historical reserve require an additional layer of design review, and we faced the process with some trepidation. The regulations had just been updated, and our project was slated to be one of the first reviewed under the new guidelines.

As it turned out, the guidelines were clear without attempting to micromanage design options. While they require new construction to reflect the scale, materials, and massing of their neighbors, they also mandate that it be “stylistically distinct.” This allowed considerable latitude to incorporate elements of traditional Coupeville architecture into a low-energy, contemporary home. Collaborating with me on the preliminary design was Peter Keyes, an architecture professor at the University of Oregon who is also a part-time Coupeville resident and an expert on the town’s historic architecture (see “Architecture that blends in,” p. 45). Our concerns about whether modern sustainable technologies would be accepted by the historic-review committee were quickly laid to rest. Their acceptance of the very visible photovoltaic (PV) panels exemplifies their focus on stewardship and the long-term health of the community rather than adhering slavishly to a fixed vision of the past.

Budgetary constraints also expressed themselves in the home’s design. With much of the budget allocated to sustainable technologies, materials and detailing were necessarily simple. Rather than introducing layers of ornament or high-cost materials, the project uses the arrangement of the buildings to provide interest. Painted fiber-cement siding proved both inexpensive and complementary to the town’s historic character. Standard vinyl windows were ordered with a painted finish to add a little exterior spice at a reasonable cost. My client’s expertise in energy management allowed us to take full advantage of the latest programs and subsidies available, and the extensive green-building experience of our builder, Cascade Custom Homes, meant



Sunlight and shelter. A central patio is sheltered from the wind by the structures around it. Sunlight passing through the south-facing dining-area doors is stored by the thermal mass of the tile-and-concrete floor.

that high-performance techniques were already built in to the workflow.

Working with the site

Retaining portions of the original foundations meant designing the new buildings on more or less the same footprints as the originals. Concrete contains a considerable amount of embodied energy, so reusing this resource fit with our commitment to a minimal ecological impact. Even with the extent of repairs and structural upgrades required, the reduced site disturbance and material use made the choice worth it.

My client suggested eliminating the cottage, but I convinced him otherwise. When our needs change, we’re often faced with either remodeling our home or moving. I argued that a small cottage can provide the space for a boomerang child, a home business, an aging parent, a tenant, or any number of other functions, thereby taking pressure off the home and its occupants. As it turned out, calculated rental income from the cottage helped meet the bank’s loan-to-value ratio for the property, making it a critical piece of the project.

Though based on the existing foundations, the orientations of the new house and cottage were designed to respond to the climate. With the views to the north and the sun to the south, the buildings loosely encircle a south-facing courtyard, sheltering it from the wind. A south-facing sunroom stores heat in its thick concrete floor, while north-facing windows are placed to maximize views and minimize energy loss. The roofs are pitched to optimize solar gain, while the buildings’ increase in height from south to north minimizes shading of the site.

The corner lot presented its own challenge. Coupeville is extremely walkable, and we wanted to present a friendly face on both street fronts. The solution was to provide two front doors, both of which lead to the center of the house. Whether you are coming or going, the layout with the kitchen in the middle makes this feel quite natural.

A multifaceted approach to energy

Even when my clients opt out of formal participation in a green-rating system, I still recommend scoring projects informally to increase their awareness and serve as a

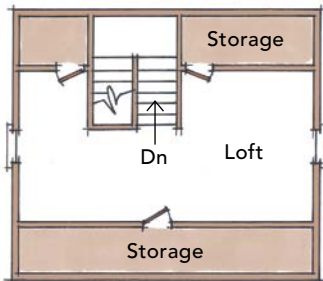
ADAPTABLE and ACCESSIBLE

Creating a home that will stand the test of time includes making it adaptable to its owners' changing needs. With the consent of his clients, the author tries to make every project he designs meet certain minimum standards of accessibility. This house (1698 sq. ft.) and cottage (586 sq. ft.) offer five good examples.

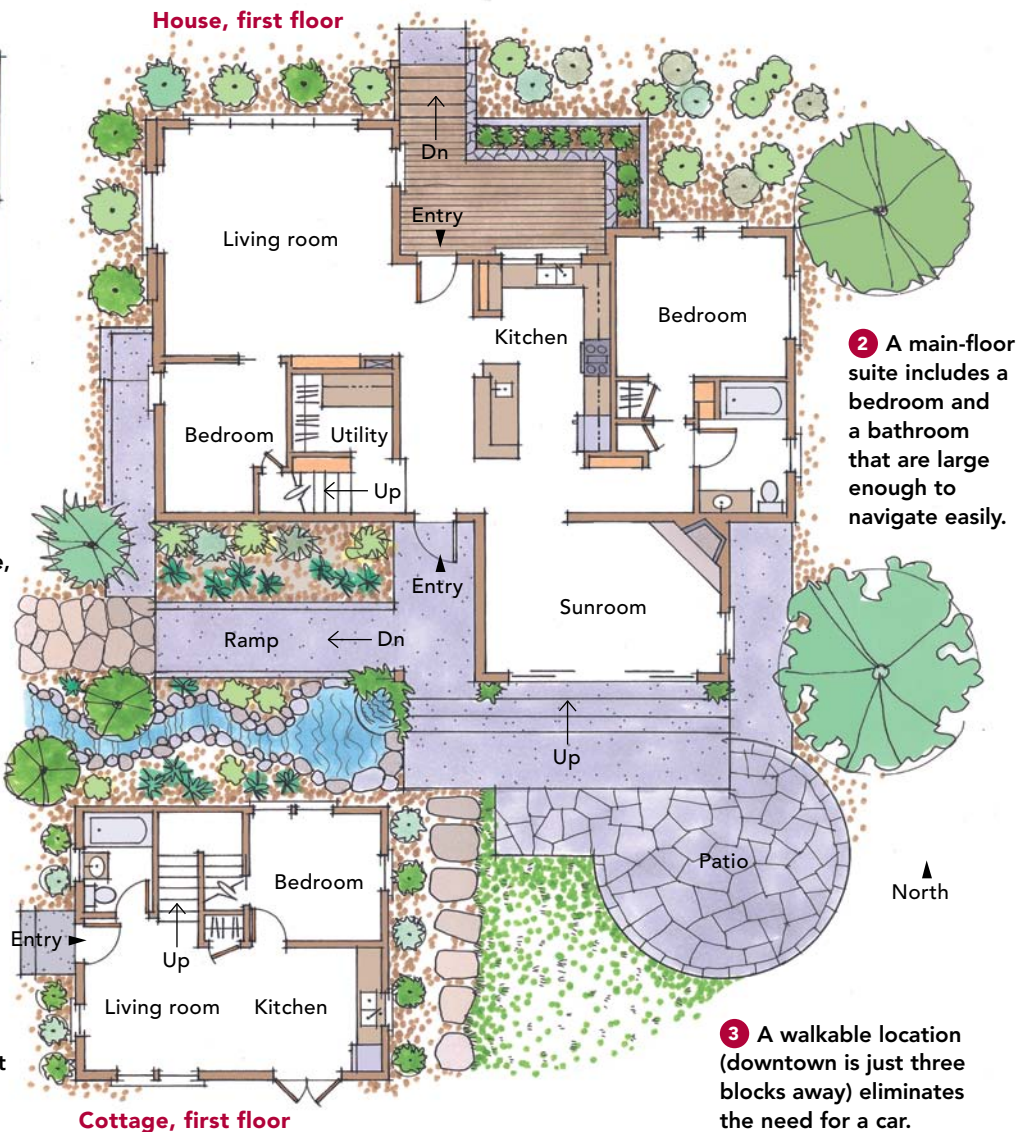
1 An open plan makes it easy to navigate the space.



5 Integrated into the landscape, a concrete entry ramp offers an easy way in without calling attention to itself.



4 A self-contained apartment provides rental income or space for other uses.



2 A main-floor suite includes a bedroom and a bathroom that are large enough to navigate easily.

3 A walkable location (downtown is just three blocks away) eliminates the need for a car.

guide in reducing the project's impact on the planet. For this project, we used both Built Green and LEED for Homes as verification tools. The project was officially certified as a 5-Star Built Green home; while we didn't pursue LEED certification, it informally scored at the Platinum level.

Our environmental design strategy was pragmatic and was dictated by Coupeville's relatively mild climate as well as a modest budget. Rather than investing virtually all of our resources in the envelope, as we would for a Passive House, we opted for a systems approach, combining a good envelope (an R-60 roof, 8-in. R-28 walls made with stag-

gered studs, and solid air-sealing) with a high-mass radiant-floor system. In addition to providing comfortable heat delivery, the mass acts as a thermal dampener and evens out the temperature through diurnal swings, cold snaps, and other extreme weather conditions. Instead of spending \$50,000 on high-performance windows, we used good, low-cost vinyl windows and applied the \$32,000 savings toward the PV array and a ground-source heat pump.

We rounded out the mechanical systems with a heat-recovery ventilator, a drainwater heat-recovery system, and smart thermostats, the latter to provide real-time feedback and

data tracking so that my client can monitor the house's performance.

Enabling all of this was my client's tireless pursuit of whatever subsidies he could find for energy-saving features, including the heat pump and the PV panels. By using all Washington-made components, he was able to qualify for the maximum rate by which the electric utility buys back power.

Maximum light, minimum heat loss

Here in the Pacific Northwest, we need as much vitamin D as we can get. That makes me a firm believer in introducing natural light to a home wherever possible. Because



Central skylight. A supersize skylight built with Kalwall composite panels lights the home's interior without compromising the thermal performance of the roof.

the perimeter windows on this house were generally reduced to match the modest glazing of nearby historic homes, I needed a novel approach. This involved adding a massive skylight at the center of the house, where the interior is typically the darkest.

To accomplish this, I used Kalwall translucent composite panels to create a superinsulated light diffuser. We assembled two 9-ft. panels on-site and then capped them with a continuous polycarbonate waterproofing sheet. Supported by 4x4 Douglas-fir purlins, the result is a beautiful, soft, shoji-like skylight that illuminates the interior and provides R-25 thermal performance.

Despite Washington's wet and rainy image, Coupeville lies in the rain shadow of the Olympic Mountains and receives a scant 21 in. of precipitation a year. With an eye toward someday collecting this rainwater for irrigation, we selected nonreactive metal roofs to prevent contaminants from leaching into the runoff as well as a living roof to absorb and filter the rain. The roofs are piped to rain gardens for on-site infiltration with future tank storage planned.

An innovative mounting system for the PV panels clips them to the ribs on the roof, eliminating penetrations and providing plenty of airflow to cool the panels for maximum

efficiency. The 5kw PV system required to meet net-zero demands is so large that it covers roofs on both the garage and the cottage. Surprisingly, reserve officials accepted this in a way that typifies their stewardship of this beautiful area's past and its future. As the parks department's staff architect shared with me, preservation requires merging the wisdom of the past with the knowledge of the present. It's this respect for the long view that creates a truly sustaining future. □

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