ACCESSIBILITY ON A SHOE STRING

BY SAM CLARK

Accessibility is becoming an important part of more and more building projects. Disability ultimately affects every family and most individuals; we are all eventually subject to illness, accident, and aging. In an important sense, accessibility is for everybody.

As a designer and builder, I have included accessibility in everything I've designed in the last few years. When it isn't practical to make a place accessible at the time of construction, I try to make it easy to adapt later.

People often expect accessibility to be expensive, difficult to build, and institutional looking. And indeed this is often the case when buildings are poorly adapted after the fact. But when it's emphasized from the start, accessibility can be simple and affordable without calling attention to itself. As a bonus, the features that make buildings usable for people with disabilities make life and work easier for all.

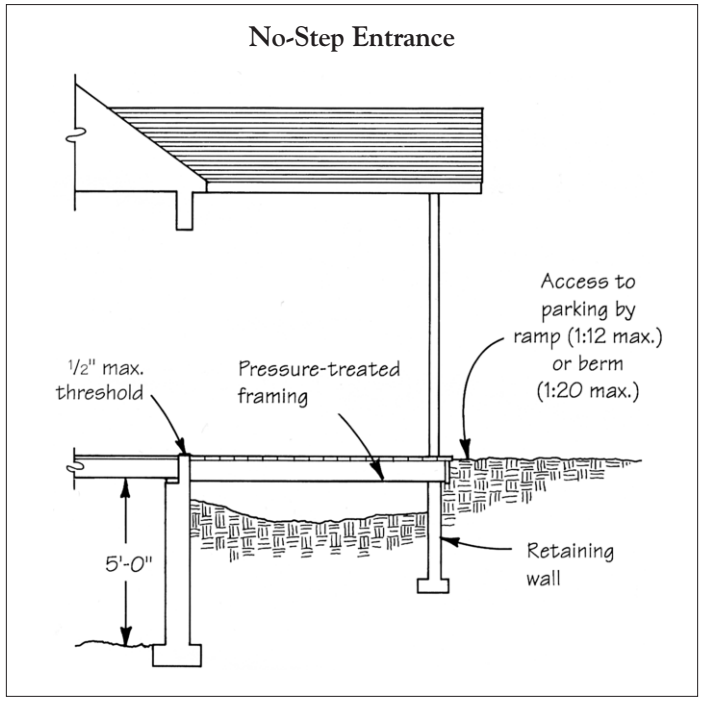

Figure 1. *An accessible house must have at least one "no-step" entrance, such as this porch, which serves as a level bridge between the ground-floor entrance and an earth berm leading from the parking area.*

Defining Accessibility

Though we identify accessibility with wheelchairs, it's really broader and simpler: Accessibility means detailing buildings so that all potential inhabitants, their visitors, and their families can get about without impediment and do ordinary tasks and activities conveniently, whatever their age or physical condition. People experience a wide range of impairments or challenges that influence mobility, strength, hearing, vision, and cognition. When we keep these varieties of experience in mind as we design, many of the features of accessible design become obvious.

Accessible design comes down to careful site planning and layout, and thoughtful selection and use of ordinary building products. There will be some extra costs, but most accessibility comes from using ordinary things in an educated way.

This article summarizes some key features needed for accessibility and what they typically cost, using examples from a recent Habitat for Humanity house built in Barre, Vt. The house was designed by David Scheckman of Iron Bridge Woodworkers and Builders, in Plainfield, Vt. I worked on the accessible features of the plan.

Site and Entrance Design

The goal of site planning is to minimize the effects of slopes, and to make as much of the site as possible usable by people with impaired mobility. That requires avoiding stairs and keeping paths gradual. An accessible path must be no steeper than a rise of one foot in twenty feet (1:20). This is called a berm. A path rising at 1:20 to 1:12, whatever its surface, is considered a ramp, and requires railings. Anything steeper than this will not really be accessible.

The Habitat site sloped about 3 feet down to the east. The two devices we used to minimize problems are fairly standard. First, the house was set low in the ground. Second, the parking was located on the higher side, as near floor level as possible — in this case, about 18 inches below it. Had we located the parking on the low side we would have needed a 20- to 30-foot ramp. But long ramps can be expensive, and they label a building "accessible."

Instead, we created a no-step entrance with a paved berm leading from the parking area to a covered porch (see Figure 1). The porch is a protected outside landing; because it's level, it had to be covered. Without a roof, a level landing would invite rain and snow under the door. This porch is also a bridge to the berm over a swale that drains water away from the house perimeter.

Floor Plan and Foundation

A story-and-a-half or two-story design can be partially accessible, as long as one full bath, one bedroom, and the laundry are downstairs, along with public areas. But a single-story design is the simplest way to make the entire house accessible. At the Habitat house, complete accessibility was the top priority, and we chose to build on one story, though this was a more costly option, owing to a larger foundation and bigger roof for the same square footage.

To minimize the extra costs, we decided on a frost wall foundation with a crawlspace. Excavation and concrete costs were about what a smaller full foundation would have cost. The construction manager, John Mallery of Natural Systems in Montpelier, Vt., suggested using a 5-foot frost wall. This provided enough headroom in the crawl space to fit the furnace and water heater, and to provide lots of convenient storage. This space is served by a hatch with a simple stairs, and provides many of the virtues of a basement without the expense. All in all, we felt the design achieved our goals for a fully-accessible plan on one-story at the same cost as a two-story house with a full basement.

Circulation: Doors and Halls

The pathways in an accessible house must be spacious. To begin

WITH CREATIVE DESIGN, ORDINARY BUILDING PRODUCTS CAN MAKE ANY HOME MORE ACCESSIBLE

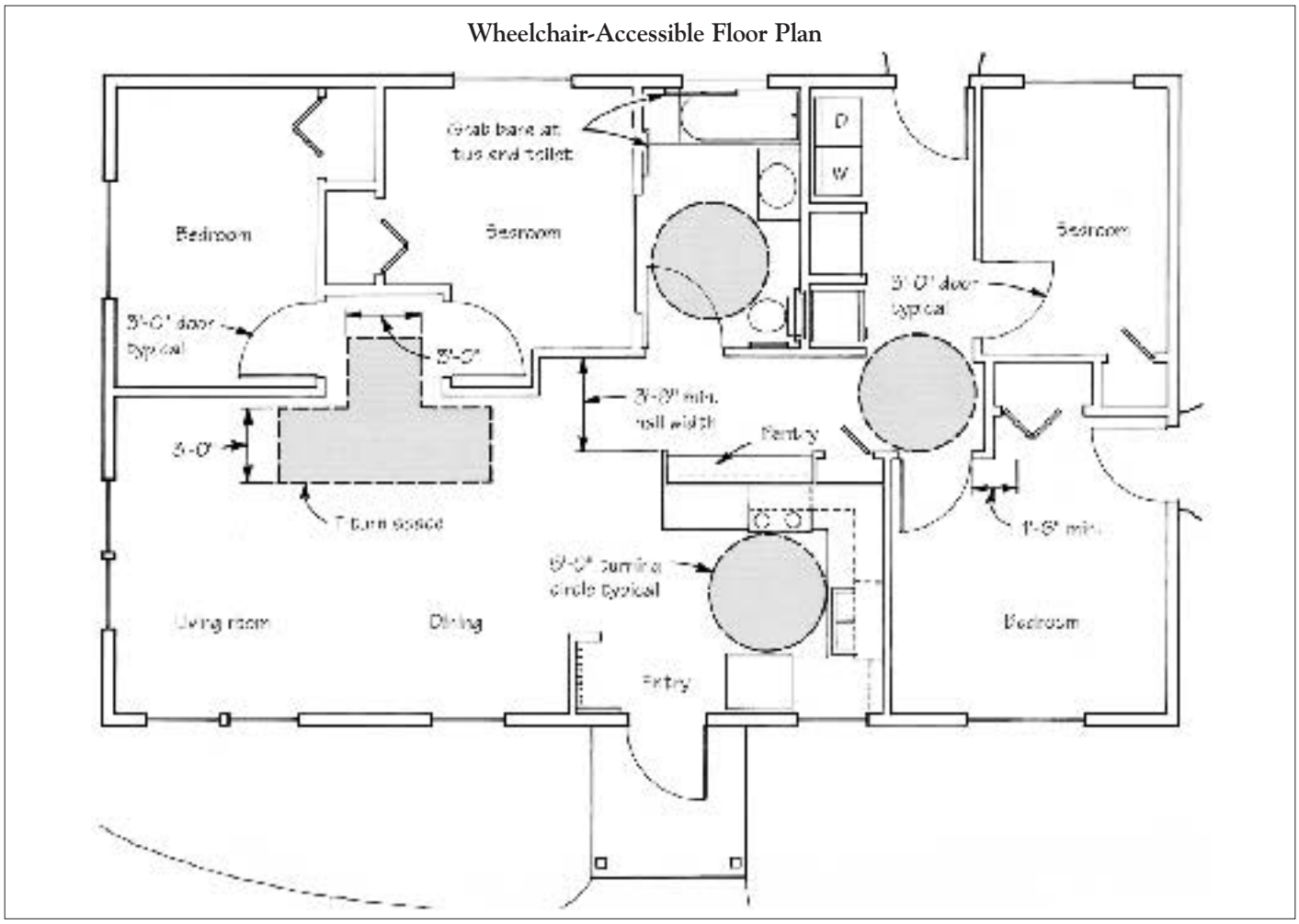

Figure 2. *The pathways in an accessible house must be spacious. The halls in this accessible floor plan are all at least 3 1/2 feet wide and the doorways 3 feet wide for convenient wheelchair travel. In addition, a wheelchair user needs a 5-foot-diameter "turning circle" to reverse direction and at least 18 inches on the swing side of doors. In the kitchen, a wheelchair needs a minimum floor space of 30x48 inches to approach an appliance, closet, or phone.*

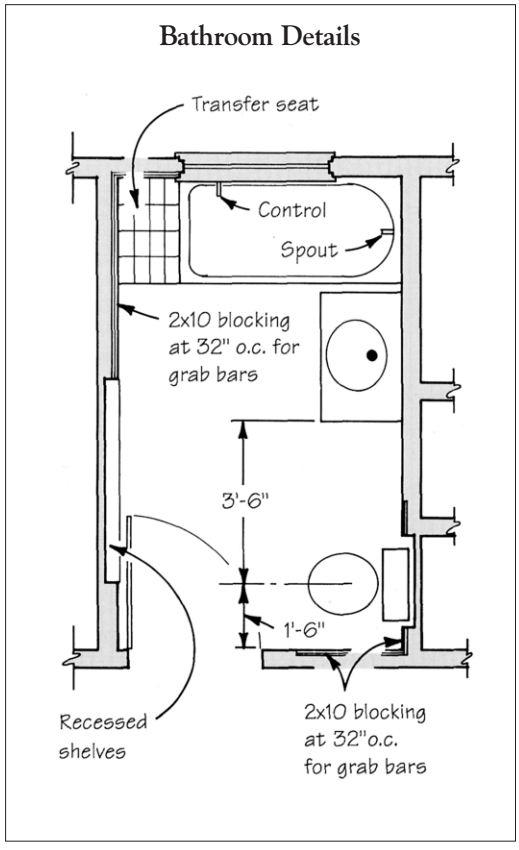

Figure 3. *In this bathroom plan, a standard toilet is recessed 2 inches to make additional room for a wheelchair user to open the door from inside. The toilet is placed in the corner with ample open space on one side for "transfers" from and to a wheelchair, and the tub has a transfer seat at the foot. Two-by-ten blocking was provided wherever grab bars might be useful.*

with, a hall or other pathway should be at least 3 feet wide for convenient wheelchair travel along a straight line. A doorway requires a minimum *clear* opening of 32 inches. This refers not to the nominal door size but the available space between the door stops or any other projections into the opening. The best solution is to use 3-foot doors everywhere, although a 2-foot-10-inch door can also work.

Circulation becomes more complex when turns and transitions are considered. Though whole book chapters are devoted to this subject, there are a few key points.

First, a right-angle turn is difficult to make from a 3-foot hallway into a 32-inch-wide door opening. To provide more maneuvering room, make halls with doorways along them at least 3 foot 6 inches wide.

To reverse direction, a wheelchair user needs either a 5-foot-diameter "turning circle," or a 3-foot-wide space to pull into to make a "T turn." Turning areas will occur naturally on the plan, but it's important to make sure they are provided where people will need them most.

To open a door inward (from the swing side), a person using a wheelchair or walker usually takes a position next to the door, pulls the door open, pivots, and then goes through. This is impossible unless there is a space of at least 18 inches (preferably 24 inches) beside the door on the handle side. This is the feature most often omitted when spaces are adapted.

A wheelchair needs a minimum floor space of 30x48 inches to approach an appliance, closet, or phone.

These necessary clear spaces are shown on the floor plan in Figure 2. Usually they can be provided by repositioning partitions, adjusting door locations, reversing door swings, or other small adjustments. In the Habitat design, the hallways were widened somewhat at the expense of the bedrooms. The designer also eliminated as much of the hallway as possible by creating a relatively open plan. Putting the laundry and other services along hallways also conserved space.

Door details are important. Lever handles are much easier to turn and pull than knobs. I can't think of any reason to use regular knobs.

Door sills or thresholds should stick up no more than 1/2 inch if beveled, and 1/4 inch if square-edged. For interior doors, it's easiest

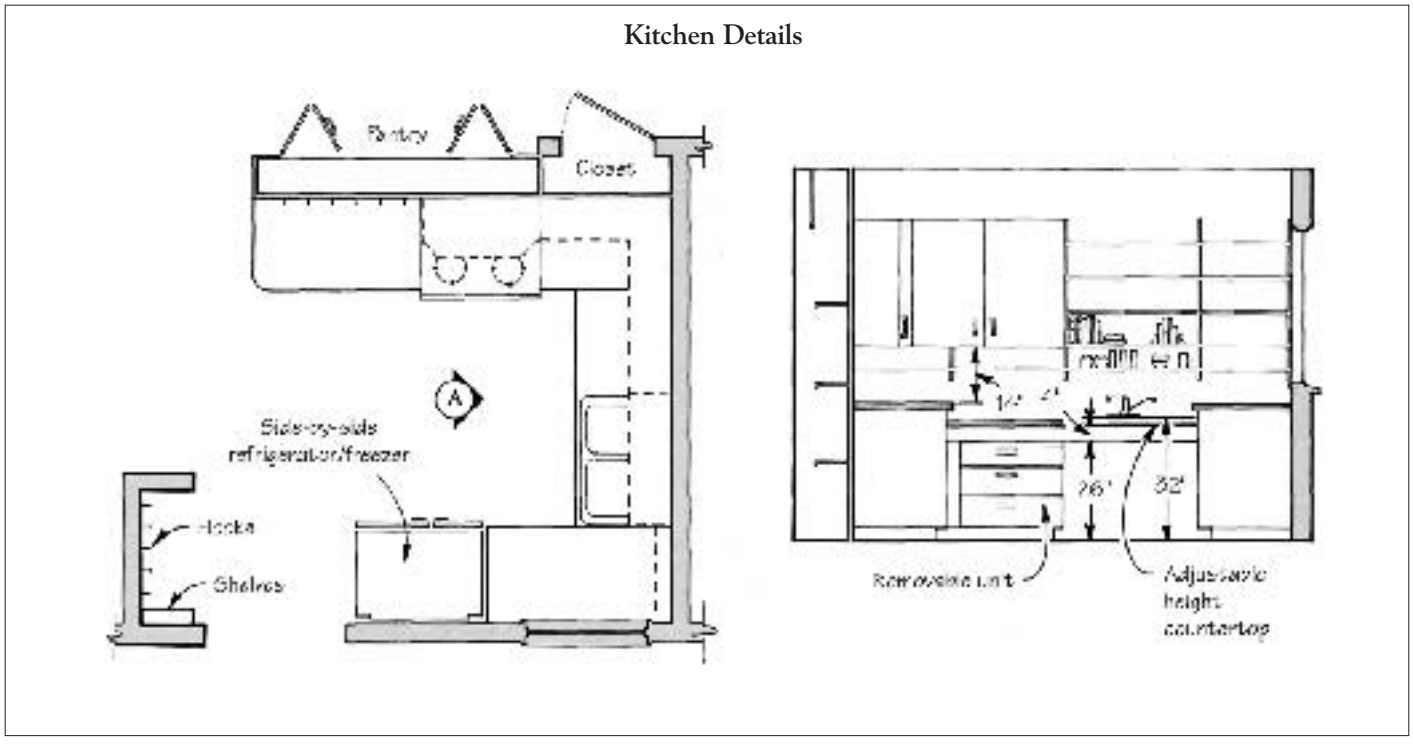

Figure 4. *In kitchens, a variety of work heights is essential. A site-built adjustable-height sink counter, installed with wooden cleats over a short cabinet, can be repositioned to raise and lower the countertop. The cabinets have lots of drawers, which hold more than shelves and allow the contents to be easily found and retrieved. Overhead cabinets are positioned only 12 to 14 inches above counter height.*

to do without thresholds. Few standard exterior door sill profiles meet the standard when installed in the usual way, on the subfloor. Some — such as traditional oak thresholds — can be made to work by setting them down onto the framing. Some companies, such as Weather Shield, sell a low-profile aluminum threshold that can be installed with either wood or steel doors. Most sliding doors and center-hinged exterior French doors will not work at all unless the screen door is eliminated, although Andersen has developed a mini-ramp accessory that offers a partial solution.

Extra costs for doors are less than expected. Three-foot-wide doors are only $2 to $8 more than 32-inch models. The lever handles that make it easy for anyone to open a door now cost about $4 more than knobsets.

Windows

A casement, or crank window, is the easiest to operate, particularly over a counter. For high-end brands, casement prices are within a few dollars of double-hung prices. Other companies charge about 15% more for their casements. For tall casements, companies such as Andersen and Marvin sell an accessory that connects the two window locks so they can be operated from a single, low position. These cost about $45 each. In general, window costs will be determined as much by design and choice of manufacturer as by accessibility requirements. Better quality, more costly windows of any type will operate more easily than cheaper versions.

To reduce costs, the Habitat house used double-hung windows and sliders, perhaps less than ideal, but more economical. In the kitchen, we provided one casement above the counters where a double-hung is extremely awkward to operate. In the master bedroom, we provided an extra door. A door is a better egress for mobility-impaired people than a window, because it eliminates the need to climb out in an emergency.

Bathroom

The bathroom is perhaps the trickiest part of an accessible design. Also, the needs of specific users drastically influence the design, particularly for bathing. For example, a person with a strong left arm needs a different layout than a right-handed person. It's best to design a bathroom for a particular user whenever possible.

The Habitat design, though nonstandard, illustrates some typical features (see Figure 3). The bathroom door itself is always a problem because of its extra width. If it opens in, it can obstruct wheelchair movement in the bathroom. An outward opener can crowd the hall. A pocket door or sliding door can be hard to keep working smoothly, and can also be somewhat awkward to operate. We chose the inward opener, since the bathroom was rather long, and recessed the toilet 2 inches to provide additional clearance between the door and the toilet.

The toilet is in the corner centered 18 inches from the wall. This allows for grab bars behind and beside it if needed. The space beside it makes room for a wheelchair. This basic configuration allows for a variety of "transfers" from and to a wheelchair. We used a standard toilet, not the "accessible" models, which are too tall for some people. Raised seats can be purchased to increase the effective seat height if needed.

The tub has a transfer seat at the foot. The shower control, which has a temperature limit and a lever handle, is mounted where it can be reached from the transfer seat. Ideally, there would be maneuvering space at the other end of the tub, also. Two-by-ten blocking was provided wherever we thought grab bars might be useful. I saved a sketch showing blocking locations for future reference.

The vanity must provide knee room below and be adjustable in height without major replumbing. To create the knee space, the sink is shallower than usual — no more than 3 inches deep at the front and sloping to no more than 7 inches at the rear. Some standard models fit the bill nicely, and some companies are coming out with affordable models. We chose to use a drop-in, but some wall-hung units will also work. To maximize knee room, the drain swings back to the wall, and the trap is mounted on the wall.

The sink counter is mounted on plywood brackets, which can be moved up or down from 29 to 34 inches. The pipes are covered to prevent burns from hot water. The water supplies use flexible tubing to make changing the height easier.

The mirror goes right down to the counter splash to make it visible to seated users. The faucet is a lever model. Recessed shelves replace the medicine cabinet.

These adjustments add perhaps 10 or 12 square feet of space not found in a typical small bathroom. In a small home, this space could cost about $600. Of course, in a big house, that space might be there anyway.

The grab bars, blocking, and the transfer seat might add $400 to the cost of the bath. None of the other detailing adds cost directly, but there is extra design work needed, including working closely with the family who owns the house. More labor is also needed during installation; good support from all trades really helps.

Kitchen

Even when disability is not an issue, people differ in the counter heights they like. A variety of work heights is essential. One of these choices should allow for working seated — if only at a nearby kitchen table. We addressed this by providing an adjustable-height sink counter.

There are a number of simple ways to make the sink height adjustable. I chose to leave a knee space under the sink, and ordered a short cabinet to put under the sink counter to the left of the sink (see Figure 4). This short cabinet is also removable in case a wider counter for working seated is desired.

The counter sits on wooden cleats

screwed to the cabinets at either end. The 5/4 x 4-inch wood apron under the counter makes it strong enough to span this distance. The counter can be raised or lowered by repositioning the cleats.

The sink should be shallow (6½ inches maximum), and the drain should be at the back to maximize knee space. The former feature is essential, the latter highly desirable. I mention this because shallow sinks are easy to find. The cheapest, off-brand models sold at home centers are often shallow. But the rear drain sink is a special model at much higher cost. So, we chose the standard model.

The cabinets have lots of drawers, which hold more than shelves and allow the contents to be easily found and retrieved. Drawers are essential for anyone who has trouble bending, reaching, or seeing. Overhead cabinets should be positioned only 12 to 14 inches up from the standard counter height. This is more easily reached by shorter people, and essential for wheelchair users.

We chose D-shaped handles for the cabinets; they're easier to grab than round pulls.

The greater number of drawers increases kitchen costs $200 or $300, though I would argue that the drawers would improve a kitchen designed for any users. Beyond that, the accessible kitchen need be no more costly than a conventional design.

Electrical

The most important electrical changes cost nothing. Switches should be lowered to 42 or 44 inches on-center, where they are convenient for everyone, and outlets raised. As standard practice, I locate outlets 24 inches from the floor. It is also helpful to add outlets and switches where the standard locations might be awkward for some users. The service panel should be on the ground floor where anyone can get to it, and should be positioned somewhat lower on the wall. In the kitchen, outlets should be located as conveniently as possible.

Selecting Appliances

When selecting appliances, pay attention to controls — the knobs, pulls, and switches that regulate appliances or equipment, and the dials, screens, notches, or markings that indicate what setting the equipment is on.

First of all, good controls are easy for anyone to reach. For a stove, hood, or refrigerator they should be near the front. They should be easy to grab and turn, even for people with little hand strength. A good test is to operate the handles with a closed fist. If this is possible, they are probably okay.

Good controls are also easy for anyone to understand. Many modern appliances use electronics to do lots of things, but are difficult to make sense of. They may have to be programmed, and the appearance of the controls themselves offer few clues to their uses. Switches may be tiny and hard to distinguish from each other and from their background. Such devices will be useless to many people. The feedback system, which lets the user know what's going on with a device, should also be clear. Numbers should be large, stops or clicks on a knob easy to feel, signal lights or displays large and bright. It's excellent if a device has more than one way to signal the user, to accommodate people who take in such information in different ways. A timer that gives an audible tone plus a visual cue is better than one that gives one cue only.

These requirements don't always mean higher costs. Cheaper equipment, being simpler, may in some cases have excellent controls. This is largely an issue of product selection and careful shopping. In the case of the Habitat project, in addition to lever faucets, we had to purchase a stove and a hood. We shopped with the family to find the best affordable units.

The big problems with refrigerators is that the freezer is usually hard to reach from a wheelchair. Side-by-side or bottom-freezer models are best, though they do tend to be $200 to $300 more expensive and are very wide. A less expensive alternative is to find a conventional fridge with a freezer that begins lower than 4 feet. You could also provide a 36-inch-wide opening so a side-by-side unit could be added later.

In Brief

This brief article by no means covers the field. Builders and designers will have to read up on this subject, as we have on energy, moisture migration, healthy house, and other emerging topics.

I also recommend plan reviews, particularly on your first projects. It's easy to get the basic concepts of accessibility right, yet make small errors that leave the house less successful and less in conformance with codes or good practice. Local advocacy agencies, state officials, or designers in this specialty can review your plans.

Finally, if you are building for a specific disabled client, that person and his or her family should be heavily involved in the details. They know best what will work. ■

Sam Clark works with UserNeeds Design, accessibility specialists in Plainfield, Vt., and is working with Margaret Wylde and Adrian Baron-Robbins on Building for a Lifetime: A Guide to Barrier Free Design and Construction *from Taunton Press.*