Why are so many small builders and contractors not taking advantage of new methods designed to help them build better buildings at reduced costs? Is it because they aren't convinced of the merits of the changes? Here's a look at some of the more promising ones.

Ignoring New Technologies Can Cost You

by Henri de Marne

In recent years, as my work has focused on disseminating information about newer and better building and energy-conservation techniques, I've become increasingly disappointed to see how often my colleagues in the building and remodeling fields turn up their noses at new techniques.

The time has long since arrived for us to adapt our building techniques to new conditions; the givens have changed dramatically in the last dozen years or so. Unfortunately, those who are building the bulk of the houses and doing most of the remodeling in this country—the small builders—are the most difficult to win over.

Why are small builders and contractors not taking advantage of all the research and educational materials at their disposal to help them build better buildings at reduced costs? Participants at workshops I attend or teach are always asking questions and attentive, but they don't seem to be making changes in the field. Is it because they aren't convinced of the merits of the changes?

Whatever the reason, they are selling themselves (and their clients) short by ignoring these improved techniques. What exactly are some of the more promising ones? Let's start at the foundation.

Anchors

The purpose of anchor bolts is to hold the part of the building above ground to the foundation so the wind won't knock it over. How often have you been faced with a problem caused by a concrete contractor who pushed the anchor bolts down into the concrete using the threads as a depth gauge?

There are two ways to deal with the problem as you install the mud sills: Either omit the washer and nut entirely, or chisel a hole to permit their use. In either case, the bolts do not offer much security; the reason most buildings don't blow off their foundations is due more to the weight of the structure and the lack of hurricane-force winds.

Marking, drilling and chiseling mud sills are time-comsuming steps that can be avoided by the use of various anchor plates. Teco's "Sill Ties" or Simpson's "Mud Sill Anchors" are two high-quality products that are embedded in the concrete or mudded in the cores of block foundations.

They have their own depth gauge to make it a little more difficult for the concrete contractor to mess you up, as well as arms that fold over a two-by-four or two-by-six sill plate to hold it securely. Some can be nailed onto the sill plate first and the entire assembly dropped into the wet concrete after the pour.

For porch or deck posts, a variety of an-

chors is available to hold the posts off the foundation while securing them to it, allowing proper drainage where posts are not pressure treated.

Two-Stud Corners

There are a number of relatively new framing techniques that both save lumber and allow increased insulation. One example is the two-stud corner.

To my dismay, most new houses I see still are built with the old-fashioned three- or four-stud corner posts. Some builders believe this is needed for strength, when in fact the end stud of a wall carries only half the weight of the line studs.

Perhaps this is a leftover from the old post-and-beam construction (which is still much in use today). In a regular stud wall, however, we're dealing with entirely different spans.

And while the two-stud corner allows insulation to fill most of the corners of a house, the standard three-stud corner does not. (Thanks to the three-stud corner, many home owners have tightened their homes only to discover dark discoloration and mildew on the interior side of exterior corners; the comers are cold and moist, so warm air condenses and dust collects on them.)

24-Inch O.C. Framing

Another very common practice is the use of 16 inches o.c. framing. Those who believe that anything over 16 inches o.c. spells imminent collapse of the building should recognize two things: that there are many buildings framed 24 inches o.c. without any problems whatsoever, and that building codes permit it. The common use of two-by-sixes rather than two-by-fours for increased insulation makes this argument even more absurd.

The only possible exception is when hardboard siding is used. Manufacturers recommend 16-inch o.c. framing to prevent buckling, but some of that buckling also is caused by butting the boards too tightly.

At this point we must ask whether it makes sense to build 16 inches o.c. just so we can use hardboard siding when we can save a third of the number of framing members otherwise necessary by going to 24-inch o.c. Consider also that we would use much less labor and fewer fasteners. The hardboard industry should increase the thickness of its product to make it sturdier and to meet the new framing criteria.

The absurdity of hanging on to old ideas is best illustrated by the following story.

I've worked with some young builders who insist on using 16-inch o.c. framing and nailing wood clapboards every eight inches to keep them from buckling. They don't realize that the intermediate nailing between studs has nothing to do with preventing buckling. No wood with a tendency to twist would be prevented from doing so simply by installing nails into the plywood or flakeboard sheathing. (But as I've said before, some folks believe in both a belt and suspenders.)

Interior Partition Posts

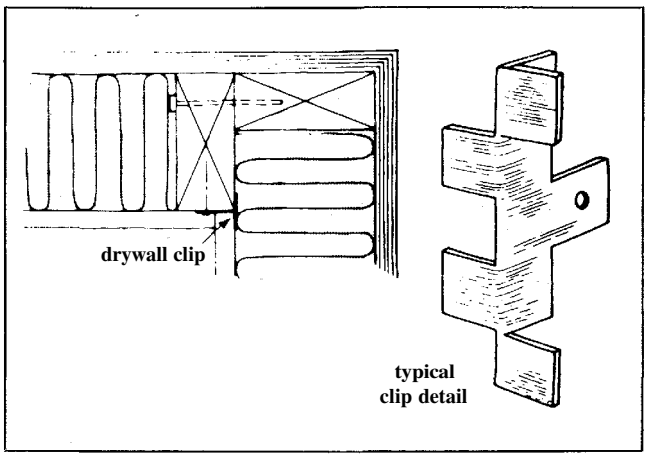
Interior partition posts traditionally have been made of one stud in the exterior walls on each side of the end stud of the partition, with the sole purpose of providing a means to fasten drywall or plaster lath. The cavity left between those three studs and the sheathing almost never gets insulated—with the same results as found with corner posts.

A simple solution is to nail a horizontal two-by-three on edge between the line studs so that the interior partition end stud can be fastened to it. This permits insulation in the entire cavity.

Back-Up Clips

There still is much use of two-inch or one-inch material to act as drywall grounds—a tremendous waste of material and time spent cutting and fastening. This stems from the resistance of many builders to metal back-up clips, under the mistaken impression that drywall must be fastened to remain in place.

If a sheet of drywall is held in place by the back-up clips and locked by the perpendicular sheet nailed to the stud or plate, where can it go? Back-up clips can be installed in an entire house by an unskilled worker in half a day, there's no way this could be done for so little cost using precious wood grounds.



Headers

Headers are another much abused and misunderstood element. A header is built to support weight across an opening. Why then is it routinely installed when there is no weight to support?

I constantly see headers over doors and windows on gable walls parallel to the run-of-floor joists. What are they asked to support? Save money and put insulation in those areas.

The practice of placing headers immediately above the door or window and then cutting and installing cripples to distribute the top-plate load onto the header is illogical. It also can permit deflection of the header, thus affecting the function of the door or window.

Put it under the plate instead, and eliminate the cripple. Any deflection taking place would be reflected in the shearing of the drywall at the fasteners in the horizontal headpiece above the door or window frame.

Plywood headers have advantages over lumber headers, because they allow insulation to be placed between the interior and exterior covers in addition to saving money. But they must be properly sized and built.

Bracing

Corner bracing is another area where savings and more rigid construction can be achieved. When structural sheathing is used, there is no need for further bracing, of course, but the growing popularity of insulated sheathing has necessitated the use of corner bracing.

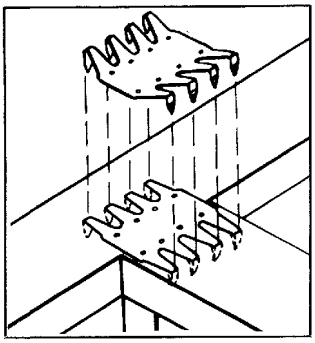
Let-in bracing—whereby a one-by-four or one-by-six is let in cuts made by saw, chisel and hammer—is not only expensive, but it is truly strong only if the cuts are perfect, if there is a tight fit on all three sides of the cut and if they are properly nailed.

Faster systems include steel bracing, which comes in flat straps that are nailed in the form of an "X" over the studs, and which are thin enough not to affect the application of sheathing or siding. A T-strap or L-strap steel bracing requires only one saw cut following a chalk line and works under both tension and compression.

These are not the only solutions, however. The American Plywood Association has tested the application of plywood siding over one-inch insulated sheathing and found that it provides stronger racking resistance than corner bracing (provided the recommended nails are used and the nailing schedule is followed).

Having built several houses, including my own, in this fashion, I personally can attest to this. I've encountered no problems whatsoever—not even a creak under very strong wind pressures.

The practice of using a two-inch bottom plate and a double two-inch top plate also is wasteful and unnecessary. A one-inch bottom plate is sufficient to hold the studs in place when the partition is erected, and it's no weaker than a two-inch plate when end-grain nailing of the studs is considered.



A strapnail coming in for a landing.

Steel anchors placed every four feet or so—or plywood sheathing or siding overlapping the plate and nailed over the band joists or mud sills—provide ample anchorage in areas where strong winds or earthquakes are anticipated.

Double top plates serve only one purpose: They hold the structure together by overlapping. Again, a variety of steel fasteners can be used at much less cost in material and labor to accomplish the same thing, and more insulation can be used—eliminating or reducing the problem of dark streaking at the top of the wall, depending on how well the ceiling is insulated or whether band-joist insulation is installed between the first and second floors.

Ceiling Loads

Increased levels of insulation now recommended in ceilings (particularly in cold regions) can be accommodated with very minor changes in normal construction practices.

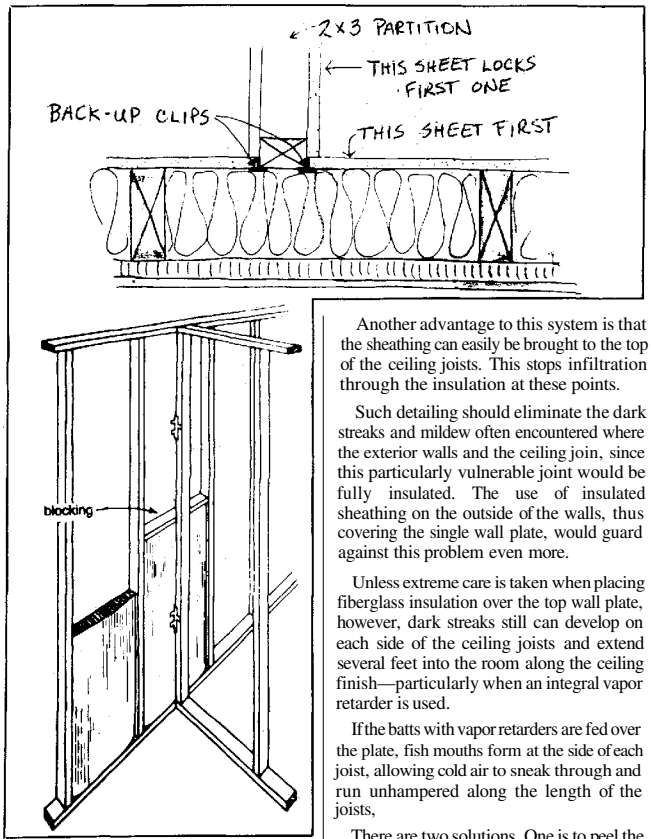
For example, elevated trusses are common, but most builders continue to rely on conventional rafters without allowing for the additional R-factor at the exterior wall plate.

In common framing practices, a bird's mouth is cut on each rafter, then it's nailed next to a ceiling joist where it rests on the exterior wall plate. Assuming it is carried as it should be, this compresses the insulation over the wall plate, or it seals the air space that should be left between the insulation and sheathing (unless a baffle is installed).

A simple solution gets rid of all the problems. Install the ceiling joists in the standard way over the wall plate, then nail a two-by-four on top of the joists flush with their ends. Fasten the rafters to that two-by-four directly over the ceiling joists, and use a steel fastener to replace the standard nailing of the rafter to the joists.

Teco and Simpson make a variety of anchors that can be used for this purpose; my preference is for either Teco's Ty-Down Srs. or Simpson's Seismic and Hurricane Ties, because they tie the rafters to the joists below by going around the rafter seat (or, in the case of elevated trusses, they tie the trusses to the studs).

A house built in this manner is not likely to lose its roof in an unusually strong wind. In addition, this gives the depth of the joists, at a minimum, for insulation; more can be added over the two-by-four elevated rafter seat as long as a baffle is used to allow a slight air space.



Use back-up clips in lieu of two extra studs where an interior partition meets an outside wall.

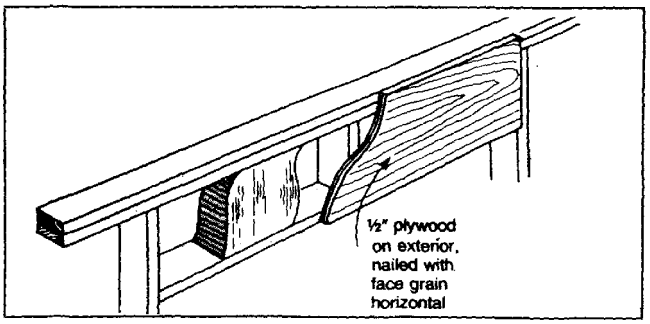
Another advantage to this system is that the sheathing can easily be brought to the top of the ceiling joists. This stops infiltration through the insulation at these points.

Such detailing should eliminate the dark streaks and mildew often encountered where the exterior walls and the ceiling join, since this particularly vulnerable joint would be fully insulated. The use of insulated sheathing on the outside of the walls, thus covering the single wall plate, would guard against this problem even more.

Unless extreme care is taken when placing fiberglass insulation over the top wall plate, however, dark streaks still can develop on each side of the ceiling joists and extend several feet into the room along the ceiling finish—particularly when an integral vapor retarder is used.

If the batts with vapor retarders are fed over the plate, fish mouths form at the side of each joist, allowing cold air to sneak through and run unhampered along the length of the joists,

There are two solutions. One is to peel the vapor retarder back and staple it down the face of the wall, thus blocking air passage—but this does not ensure that the insulation



The making of a boxed header.

sits squarely and tightly over the plate.

The other option is to use unfaced insulation, which makes quality control easy to monitor. A six-mil plastic sheet stapled to the ceiling provides a more effective vapor retarder than the integral aluminum or kraft paper—and keeping vapor out is very desirable, despite the mistaken belief of some builders that ceiling vapor retarders should not be used so that moisture can escape into the attic.

Beams

Removing a bearing wall and installing a beam to carry the weight that the wall previously supported can have some undesirable effects. Experienced contractors are aware of several ways to handle the problem, but I'd like to touch upon them for people with less background.

Where a beam is needed and a flush ceiling is desired below, either a flush or an upset beam can be substituted. Obviously, the ceiling frame on each side of the wall to be removed must be temporily supported while the bearing partition is dismantled, and the ceiling joists must be cut back to allow for the insertion of a flush beam (which, as the name implies, is flush with the bottom of the joists attached to it).

Here again, a variety of steel fasteners is available, including U-Grips joist hangers, and stirrups for the beam to achieve structural strength.

When the beam must be deeper than the joists it is to support or when other conditions make a flush beam undesirable, there are two ways to install an upset beam (a beam above the joist system).

If the area above is an attic or other storage space, for example, the beam simply can be installed above the joists, and steel twist straps can be used to fasten them together. In a finished storage space, the floor can be raised to the level of the top of the beam.

When a partition is involved, however, it often is possible to start from the top, supporting the higher load while removing the bottom of the partition and replacing it with the upset beam. The partition sits on the beam, the floor joists below are tied to the beam with twist straps, and the lower bearing wall is removed.

Roof Problems

Over the past couple of years, I've been involved in several legal cases brought after the contractor erred in installing roof sheathing.

The contractor omitted H-clips, and the plywood sheathing buckled from expansion. To add insult to injury, the wave of adjoining sheets always seemed to work counter to each other; in other words, the lower sheet would buckle down, the adjacent one would buckle up, and so on. This resulted in a horizontal ridge pattern four feet apart, where the asphalt shingles showed a very sharp line.

When building an addition, first cut openings through existing construction to establish lines of planes.

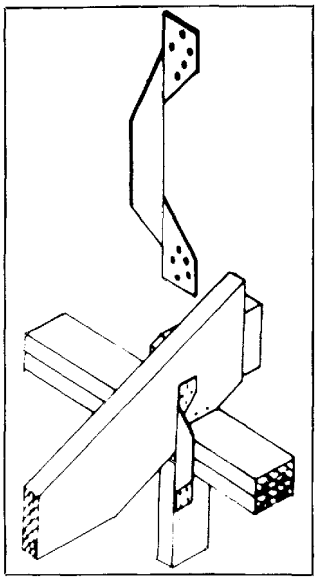
Heavy snow loads, sun and the like eventually can cause a break at these points, and a new roof may be needed ahead of schedule.

If you encounter this problem, installing H-clips is hardly practical, but two-by-three blocking nailed between the trusses at the plywood joints may help to raise the concave edge and thereby reduce the stress on the shingles and the visual impact that results.

Additions

To avoid a difference in planes of floors, walls and ceilings, a good rule of thumb is to cut openings through the existing construction to establish lines of planes before structural members are installed. Remove a baseboard and open the base of a wall so you can establish the finished level of the existing floor before setting the joist system down.

Even this is no guarantee of long-term success, however. Joists will shrink, and what was a perfect match can turn into a slight



Detail of Teco's "Ty-Down Sr." rafter anchor.

drop between old and new—which can generate bitter comments on your expertise.

Do the same for the walls and the ceiling, remembering that is easier to build slightly wider and taller and to shim than it is to shave down. Whenever possible, remove part of the old finish where old and new meet, so that the new finish can bridge over the joints. There are instances when a floating joint is best, however; experience helps you make those decisions.

Some Final Thoughts

Remodelers should remind themselves that the new technology—some of which is described here—is applicable to their trade. Just because the house they are working on is "built the old-fashioned way" does not mean they have to stick with Smith-Barney (to borrow a phrase from the company's s current ad campaign).

The following example helps to illustrate this point. About 10 years ago I was involved in the construction of a large, two-story addition to a 100-year-old inn. The addition was built on the north side, which was exposed to strong winter winds. The old rooms were uncomfortable and difficult to heat.

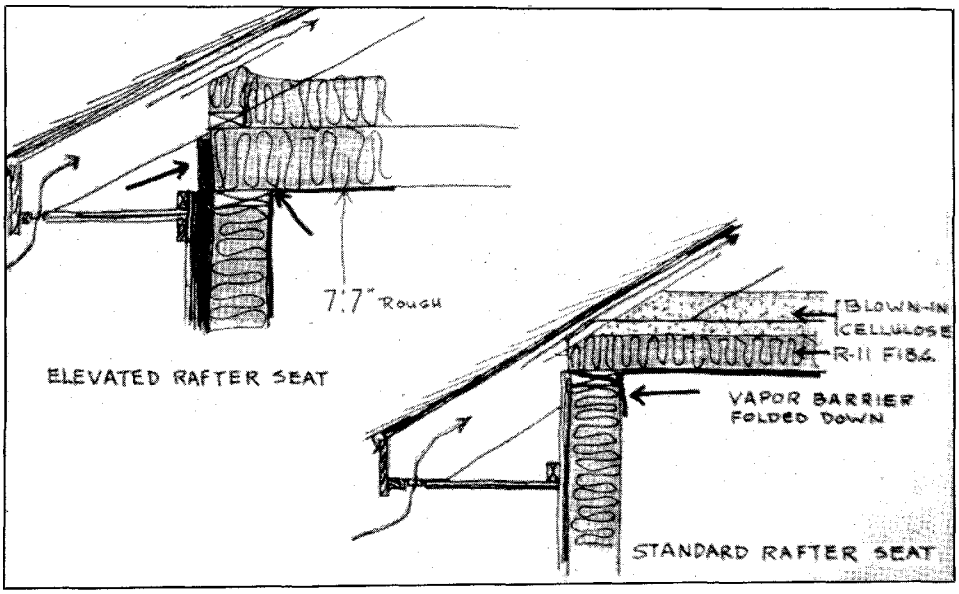
The walls of the addition were built with two-by-four studs 24 inches o.c. They were filled with R-19 fiberglass, had one-inch styrofoam on the outside and six-mil plastic on the inside, and were covered with clapboards. New Marvin windows were installed, the ceiling was insulated to R-38, etc.

When construction was complete, the owners wondered what should be done with the old warm-air furnace, which they feared would now be inadequate to heat the greatly increased space.

I assured them that the present system was sufficient. And it was; the new rooms were the most comfortable and sought-after rooms at the inn.

There's a moral to all of this. When so many great strides have been made in the way we build houses while keeping costs down, it's a shame that more of us don't take advantage of the new methods and materials. Old habits are hard to break, but it behooves us to keep trying. ■

Henri de Marne recently signed on with Construction-Marketing Associates to teach at least two seminars in Boston and New Hampshire this month. For more information, contact the organization at 32 Cedar St., Dedham, Mass. 02026; phone 617/326-8409.



An elevated rafter seat allows extra insulation while still providing plenty of ventilation.