Metal Marches On

By Elena Marcheso Moreno

Photo courtesy of the American Iron and Steel Institute
Competitive Prices and Ease of Construction Are Helping Metal Framing Make Inroads to the Home-Building Market as the Industry Positions Itself for the 21st Century

While in the past metal stud systems were looked at warily by builders unfamiliar with their use, rising lumber prices and bottom-line considerations have pushed steel framing into full view as a cost-effective solution.

Stepped-up construction activity, environmental concerns, tightened federal regulations and an undercapacity in the lumber industry all have contributed to restricted supplies of lumber. Many builders are finding it difficult to obtain higher-quality wood from old-growth forests, forced instead to contend with second-generation lumber. Prices for the lumber that is available have been rising steadily since the early 1970s.

Only a decade ago, steel framing was not a typical choice of most home builders who were well-versed in the process of wood construction, but had little knowledge of metal systems. Availability and supply of lumber, a natural resource, continued to fluctuate. As prices for lumber rose, and steel became competitive, builders gave metal framing more careful consideration.

Yet building in metal is a different process from building in wood. While the nominal sizes of studs are the same for both materials systems, the shapes and details differ. General contractors, carpenters and local building officials can turn to codes for wood construction, but until recently there has been little guidance for constructing one- and two-family homes in metal. More often than not, a home builder had to hire an engineer or architect to review and stamp drawings before a building inspector would approve a metal-framed house. Now, that additional trouble and expense can be avoided.

Setting Standards

The National Association of Home Builders, the American Iron and Steel Institute, and the U.S. Department of Housing and Urban Development recently issued the first edition of *Prescriptive Method for Residential Cold-Formed Steel Framing*, a complete industry standard ready for adoption into local building codes. Intended for single-family houses (one- and two-family dwelling units), the standard exactly prescribes the “how-tos” for metal framing. Basic shapes of cold-formed members are standardized, labeling systems identified and minimum levels of corrosion protection specified. Tables and details are provided for floor joist spans, ceiling joist spans, rafter spans, as well as tables for wall stud placement, bracings and connections.

The document’s intent is to eliminate the need for a design professional each time a home is framed in metal. NAHB, AISI and HUD all believe the first edition achieves this goal, but other
industry trade groups do not all agree, and the jury is still out for the users.

**Steel Advantages**

Steel has great strength, much greater than wood. It can replace lumber studs on a one-for-one basis in residential buildings, a solution many builders opt to follow, although it is possible to use less framing material to do the same job as wood.

Steel has lightweight, and wall assemblies can be lifted into place by one or two workers. Steel framing has a number of environmental pluses. Because it can be cut to length by the manufacturer, there is less waste on site and more efficient material utilization overall, says Haws. Unlike wood framing members, metal is uniform throughout. Steel can be recycled, and some experts say that 66 percent of all steel products are recycled, something not really feasible with wood. However, much debate is centered on the embodied energy of recycled steel—the amount of energy required for its original manufacture from ore extraction to fabrication, through re-fabrication, and every instance of transportation to transfer the material from the plant to its ultimate use site.

NAHB first looked at steel as an environmental alternative to deforestation, and its careful studies led it to select the framing system for one of its four 21st...
Century Townhouses in the NAHB Research Home Park, where innovative home building technologies and energy efficiency are tested and demonstrated.

Because wood is hewn and rough cut, it is hard to control quality, according to Michael Gardner, director of technical services for The Association of the Wall and Ceiling Industries—International. Poor quality wood products are creating job site problems for builders, he says, from splitting wood to warped or inferior members. It is not uncommon for 10 percent to 20 percent of a bundle of lumber studs to be discarded due to these problems. And wood is subject to moisture swelling then shrinking, as well as insect infestation. For these reasons, steel will be the material of choice in a number of applications.

**Technical Barriers**

Metal framing for home construction makes economic sense, says Haws, but there are still a few technical barriers that the industry needs to recognize and solutions it needs to employ. For example, the time to construct a metal framed house should be significantly less than for a wood-framed house, but if carpenters have no experience with metal building, they are slowed by the need for training.

AISI, in combination with NAHB, sponsors training programs for builders across the country. In addition, the group works closely with Habitat for Humanity in Homestead, Fla., where more than 185 affordable homes are being built with donated materials by volunteers.

According to Tim Waite, PE, research engineer with the NAHB Research Corporation, more than 2,000 builders have been trained in metal construction over the last two years. A full week of NAHB-sponsored training costs $500, and participation in the Habitat program $79. In addition, some steel roll formers are working directly with builders and carpenters to help them become familiar with the product and its uses.

Another issue that needs careful attention in cold climates is the thermal conductivity of steel. For steel-framed houses, the normal energy conservation guidelines are not complete, according
to NAHB, because the steel framing creates a thermal bridge from outside to the home interior when interior insulation is the only strategy. Instead, NAHB and AISI recommend a complete exterior insulation system. By wrapping the steel studs in rigid insulation, thermal energy is not lost from the interiors to the outside environment.

The likelihood of rust being a problem is negligible because the framing is completed encased in the building skin material. As long as steel framing is galvanized with a G-60 coating, according to ASTM Standard A653 for Galvanized Sheet Steel, it will not rust. Galvanizing provides a protective layer on the steel surface that keeps moisture from coming in contact with the steel. The protective layer is generally permanent.

Fastenings for steel framing are not the same as for lumber. Screws are most commonly used. They resist lateral forces more effectively and, some say, are more durable than nails. However, special pins intended for “nailing” metal can be used successfully, and some studs can be delivered pre-punched for fastening. The main tools used in steel framing are tin snips, screw guns and saws. Cut metal can be rough and quite sharp, says Gardner, so workers need to wear protective gloves. Other
than that, most of the safety considerations are the same as with lumber construction.

Metal framing has been in widespread use on the U.S. West Coast for a number of years. In the dry climates typical to the area, wood dries out unevenly and too fast. Steel offers the added benefit of superior performance under seismic conditions. It is rapidly gaining popularity in other regions as well.

More builders are relying on steel framing to keep their construction costs in line with bids, says Waite. Labor costs to frame in steel are essentially equal, once the workers have been trained. Smaller building companies have adopted the system more quickly than some of the large builders. But that is changing. Waite points to Brentwood, a project in California. One builder will construct 2,000 metal framed homes in this new community. Other builders are using hybrid systems of metal and wood.

Learning about the benefits of metal framing is enticing builders to try hybrids, says Waite. Many will start with interior walls, then when they learn how to install the studs and see how straight the walls are, they try steel studs in the exterior walls of the next house. It is not hard to go on from there to floor joists and roof trusses, says Waite.

As the United States and other nations step up protection of native habitats, wood supplies will continue to decline. Waite predicts that in the long term lumber prices won’t go down, and that steel construction is here to stay.

About the Author
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