you simply substitute steel studs for wood studs, the thermal resistance factor (R value) of the wall system is reduced 25-50 percent.

Not long ago, designs for two story homes and buildings called for 2x4 wood studs. Now, to satisfy current codes, thicker insulation is required which in turn requires 2x6 wood studs. Clearly, the 2x6 wood studs are over-designed for typical load bearing requirements of light frame construction. Yet building code conventions still use stud spacing of 16 to 24 inches on center. Wood also allows thermal bridging with an R-1 per inch of thickness. Even with single top and bottom plates, about 19% of a typical wood wall rates only an R-6.

These considerations give rise to the question, "Is there a better way to capitalize on steel's inherent structural advantages while minimizing its disadvantages in framing buildings?"

Randolph D. Hedgebeth, an architect in Tacoma, Washington, has been asking these questions. Over the years, Mr. Hedgebeth has been thinking of new methods of framing with cold-formed steel using common components. As a result, he has proposed a new integrated approach to cold-formed steel framing. Using this innovative system, a wall system was recently built and tested, and it obtained a surprising thermal rating of R38.

According to the IRC (International Residential Code), if you increase the steel stud spacing from 16 inches to 24 inches on center, the U value goes down by 10%. Why not improve it further? Randy Hedgebeth proposes moving the studs out to 32 or 48 inches. Even 6- or 8-foot spacings can be used by locating the studs on each side of the windows and doors. As a result, the windows and doors do not require load-bearing headers. The exterior cladding then spans vertically, and uses 2-inch horizontal zee girts at 24 inches on center spanning across the studs. Hat channels, ⅞-inch, are installed on the inside for attaching the interior gypsum board. With this cross framing, there is no direct thermal short through the wall. The only steel-to-steel contact occurs at the intersections where zee and hat ding or gypsum board. The exterior cladding can be wood board, cement board, stucco, brick or just about any siding product.

Standard windows fit within the two-inch zee girt and siding envelope, allowing the wall system to be panelized; this method also increases the thermal efficiency of the windows significantly.

Balloon framing methods, running the studs all the way from the footing to the roof, can be used in this approach with floor joists set inside a channel ledger horizontally spanning across the inside face of the exterior studs. Unlike typical platform framing, the joists do not have to align with the studs in this framing method. The floor system can use metal decking with concrete fill.

Roof rafters connect to the studs with a simple back-to-back connection. The roof system uses deeper zee purlins with the roof strap bracing. The vapor barrier can be simply the primer of the interior gypsum wall board, so any moisture within the wall cavity can move to the exterior.

The zee girts are turned down, so if any water gets into the wall system it is channeled to the outside. Time-tested, old-fashioned building felt is recommended as it "breathes" and is water-vapor permeable. The 6-inch studs can be placed so the outside face is on the concrete or building line. The 2-inch zee girts and cladding are outboard of the building, so the inside room is only reduced by the depth of the hat channel. Thus, wall cavity moisture has an escape path. Plywood or other sheathing is deliberately left out of this framing system for better moisture control and less weight.

LEED® = Leadership in Energy and Environmental Design

This innovative but simple framing system has many advantages, and goes a long way towards using the full design potential of cold-formed steel for green and sustainable buildings, embodying the US Green Building Council's LEED® philosophy. Engineers should consider such new types of framing systems for rational, energy-efficient cold-formed steel buildings that utilize steel's full LEED® engineering potential.▪