

Steel comes in from the cold

Following a story in the last issue of *SiteLines* regarding Bagley Homes' *Better Building* concept from the US, Stephen Ferdinando of Advanced Framing Consultants discusses the benefits of cold-formed steel in housing construction



The cold-formed steel industry in the US has grown steadily over the past decade, and with growing levels of restrictions on the use of wood in areas subject to hurricane wind forces, the market share of steel in residential construction is set to grow.

The high strength to weight ratio of steel and its ability to be engineered to meet the most stringent wind and seismic load requirements as specified in the Building Regulations also open the possibility for the widespread application of light gauge cold-form steel here in the UK.

A high strength to weight ratio is critical in seismic design. A low-rise structure constructed of cold-formed steel framing has a relatively small mass compared to other building materials, and as such, the building can withstand a seismic event more easily than masonry, concrete and even wood.

Roof construction is typically framed with trusses or 'stick' framing. In cold formed steel

construction, roof trusses offer many cost savings. The spacing of trusses, the reduced weight of the overall roof framing, and preassembly, all provide areas for reduced costs.

Roof trusses are commonly spaced at 24" on centre with plywood or oriented strand board spanning the top chords of the trusses to form the roof plane. An alternative to the standard 24" spacing is to have trusses designed to be spaced at 48" on centre with hat channels running perpendicular to the trusses spaced at 24" on centre. The hat channels would then support the roof decking material. This truss spacing reduces the quantity of standard trusses by half. Although the new trusses would be designed for the additional tributary area, the increased load would generate only minor alterations to the roof trusses.

The comparatively lighter weight of the steel roof trusses compared to wood trusses provides a reduction to the accumulative dead load

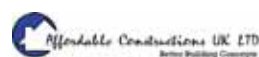
"BY CONSTRUCTING THE ROOF AT GROUND LEVEL, THE QUALITY OF WORK IS HIGHER, THE RATE OF CONSTRUCTION FASTER, AND LABOUR SAFETY IS INCREASED"

experienced throughout the structure. The comparable reduction is approximately 30% based on a material weight and span capacity.

The roof trusses can be preassembled and shipped to the site for installation or fabricated on site. An additional saving can be realised by assembling the roof structure at ground level and lifting the assembly into place. By constructing the roof at ground level, the quality of work is higher, the rate of construction faster, and labour safety is increased.

Wall framing offers numerous possibilities for savings in the project budget. The overall weight of the construction material can be reduced by using cold-formed steel. As mentioned earlier, the lighter weight of the framing offers lower applied dead loads and thus smaller structural members. The stub framing members can vary in strength without varying the wall cavity width. The material strength and thickness can be varied as well as utilising alternate member profiles. A common practice in framing is to select a typical framing member size and spacing, called 'project smoothing'. Although 'project smoothing' is a common practice for construction, it adds costs to the project whereas a panelised framing system offers the possibility to design each framing member to meet its load requirements.

These requirements can be satisfied by selecting the most efficient member through material strength and or thickness. The requirements could also be met by utilising alternative configurations of



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Second seal of approval for *Better Building* concept

Following its LABC National Type Approval, as reported in the last issue of *SiteLines* (see www.sitelines.co.uk/pdfs/27972.pdf), Bagley Homes' *Better Building* concept, delivered in the UK by Affordable Constructions UK Ltd, has



Stephen Ferdinando (left), Advanced Framing Consultants, and Harold Bagley of Bagley Homes, sign contracts in the US. Bagley Homes' *Better Building* concept, delivered in the UK through Affordable Constructions UK Ltd, has now been accepted by LABC New Homes Warranty. Advanced Framing Consultants will be providing all project management services in the UK

now been officially accepted by LABC New Homes Warranty.

Peter Bennett, Technical Services and Claims Director, LABC New Home Warranty, said: "Innovative technology is always welcome and LABC New Homes Warranty is delighted to confirm its acceptance of Affordable Constructions' three-bedroom, light gauge steel-framed house type as approved by LABC. We look forward to working with the company and developing its house type range. The objective to offer 'affordable' properties to Registered Social Landlords is to be particularly applauded."

LABC and LABC New Homes Warranty are both backing the concept in steel frame housing construction from the US that promises to deliver a three-bedroom detached house for £60k. Buildings will be constructed by nominated contractors and the £60k



price tag includes plumbing, electrics, decorating and joinery – as well as fixtures and fittings.

The designs of the *Better Building* programme can easily be adapted for both affordable and private sector housing as well as hospitals, schools and prisons – buildings can rise to five storeys under current Building Regulations.

Affordable Constructions Ltd is currently in discussion with a number of local authorities who have expressed an interest in developing the concept. Work on site is expected to commence early next year.

For more information, visit www.affcons.com

cold-formed steel members such as boxed, back-to-back, and flange-to-flange or revised shape profiles that maximise section properties.

Floor framing options can provide additional cost savings through shorter construction schedules and building heights. By providing floor framing members, truss designs or concrete floor planks, a reduced floor profile can be obtained. This smaller profile results in a shorter building with the same interior ceiling heights. The overall building height reduction provides cost savings potential in the brick cladding vertical plumbing as well as electrical, hence, the taller the building, the greater the savings with smaller floor profiles.

Furthermore, the speed at which the floor systems can be assembled offer a shorter construction schedule. The savings of a shorter schedule is realised in the reduced financing charges during construction and a faster return on the investment by having the structure available for sale or assumption by the client at an earlier date than planned.

The foundation can provide cost savings to the project by having the load requirements reduced. Since the overall structure will have a lower self weight, the load requirements

for the foundation are reduced. The framing options in steel also allow for special designed framing to distribute loads, thus reducing foundation requirements.

After construction, cost savings can be seen in the reduced number of repairs. Wood construction will settle over time which will stress attachments to the framing. Sheetrock cracks within tape and bed joints are an example of issues requiring repairs. The greater dimensional stability in steel reduces or eliminates the number of relative repairs

Insurance is another place of savings for the contractor and future owner. The non-combustible steel framing offers lower insurance rates. When steel framing is used for the structural elements of a commercial project, premiums can be reduced by up to 75%. A builder of a 400 unit multi-occupancy structure in the US received builder's risk quotes from Zurich of \$1.6 million for a wood framed structure and a \$320,000 quote for a steel framed structure. This is a savings of more than \$1 million for insurance premiums alone.

The growing market for residential steel construction are primarily being fuelled by the cost benefits but the advantages of steel in construction are wide spread.

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In residential construction, timber and cold-formed steel dominate the methods of framing.

The major advantages of steel over timber include dimensional stability, consistent quality and less waste, as well as being 100% recyclable. However, the dimensional stability and quality of wood will deteriorate as the timber industry develops a fast growing substitute to prevent the harvesting of older trees. Waste material created during construction is significantly less in steel construction compared to that of timber construction. Cold-formed steel typically has a 2% waste margin production whereas timber experiences about 20% waste.

Increasingly though, the demand for cold-formed steel is being driven by its environmental credentials – any waste created during the construction of a building using cold-form steel can be recycled. Cold formed steel contains an average of 70% recycled material – the most recycled building material in the world.