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## ELEGANCE EN-MASSE

Great ideas simply need great timing to spark popular imagination.

While Sydney architect Sue Harper and her environmental engineer husband Andy Irvine have been mulling over their steel house-framing concept since the late 1990s – “We started talking about it literally 10 minutes after meeting,” Andy says – it has only been in the last six to 12 months that the concept has started sparking wider domestic and international interest.

Although the architectural world has been espousing and experimenting with mass-produced, modular housing and building designs for some time, few proponents have driven as deeply into the molecular level as Harper and Irvine.

and internal panelling. As they see it, the only way you can alter the size, shape and function of most modular buildings is to add or subtract a finished module.

The couple's efforts are now generating enquiries from developers seeking housing alternatives to traditional brick and tile-roofed structures. One interested US developer admits his experience in the rapidly expanding Central American markets to date has centred on cinder-block construction. He has pursued Sue and Andy's concept with a view to flat-packing houses in shipping containers to meet the needs of his increasingly discerning buyers.

While a long line of esteemed Australian architects leading back to Glenn Murcutt has been refining the use of steel to reflect the local vernacular, Harper and Irvine have burrowed beneath the skin to produce an elegantly universal design

them ensures that ceilings, floors and walls use a whole 2400mm x 1200mm standard building material sheet to reduce fabrication and waste.

This framing can be supported on a traditional slab, or on concrete and other pier arrangements.

These elements can be combined, like a Meccano set, to create single- and double-storey buildings of almost infinite size and shape, without needing restrictive internal load-bearing walls. The absence of load-bearing walls means the concept opens up an infinite array of internal design possibilities, and room sizes and shapes can be quickly altered by using moveable panels.

The frames' dimensions allow other components – such as double doors, windows, louvres and prefabricated steel-clad wall panels – to be fitted and fixed in a fraction of the time required by conventional building techniques. These components,

***“These steel products are lightweight and low maintenance, making them ideal for Australian and international building applications.”***

Modularity is one answer to the cost-effective mass production of shelter, but it doesn't lend itself as readily to true architectural innovation as the Sydney couple's component-level approach to steel framing, skins

element consisting of a simple, self-supporting steel frame of 2400mm by 2700mm – something Harper deftly calls a 'picture frame'. The frame sizes and the spacing between

along with the various types of linings and cladding, are to be available “after market” so that customers can easily extend, upgrade and improve their building.



Flexibility of steel addresses difficult Dangar Island site.



Sue Harper and Andy Irvine.



WEST ELEVATION



Harper and Irvine have also developed what they call “pop-outs”, prefabricated bays that attach to the same frames, allowing for smaller rooms such as kitchens, laundries, ensuites and wardrobes to be included in new house designs, or easily retro-fitted to existing homes. It also allows for the quick and easy installation of plumbing and other utilities.

To further improve environmental impact and fire resistance, Harper and Irvine are investigating a range of modular steel walling concepts – one based on polystyrene sandwiched by flat COLORBOND® steel sheeting – that can be easily and quickly installed into the frames. They say profiled steel sheeting, such as LYSAGHT CUSTOM ORB® and LYSAGHT MINI ORB® made from either COLORBOND® or ZINCALUME® steel in standard sizes, is also ideal.

“These steel products are lightweight and low maintenance, making them ideal for Australian and international building applications,” Harper says. “Perforated LYSAGHT MINI ORB® sheeting has great aesthetic appeal and is also a really flexible building product.” The couple sees little reason for not specifying COLORBOND® steel roofing on their projects, and is also investigating self-supporting steel roofing panel products.

The Harper-Irvine concept seeks to create a level of mass-produced architectural refinement we all take for granted in other luxury, mass-produced items, such as cars, boats and aircraft. Its flexibility is an added bonus.

Having built a prototype house on the Hawkesbury River several years ago – one that is undergoing constant refinement – Harper has more recently been planning substantial extensions to two more Sydney homes.

The couple has also teamed up with owner/builder Liam Flood

to complete another house on a difficult block on Dangar Island, north of Sydney. All materials had to be barged to the site, and their efforts have been recognised by a number of housing and architectural awards for design and environmental performance.

Sustainability, flexibility, ease of use and cost effectiveness form the cornerstones of the Harper-Irvine concept. It’s designed to appeal to clients wanting architectural input into discrete buildings designed for specific sites and environments, while also wanting to save on design and construction costs, and build time. Another ‘plus’ is that most of the building work can be done, especially in more remote areas, by semi-skilled workers. Transport costs will also be substantially lower than those of traditional bricks and tiles, Harper says.

The component nature of the Harper-Irvine system also means rooms can be added or extended – or removed – efficiently. For that matter, the entire house can be disassembled in a matter of days and re-erected on another site should the need arise.

Harper and Irvine also believe adherence to standards such as BASIX, the New South Wales building sustainability index, will not be difficult given the degree of insulation allowed for in wall, roofing and floor panelling and shading over windows. Their designs and room sizes can also eliminate much of the ‘dead’ space found in traditional project housing. While of no practical use, these spaces still need to be warmed in winter and cooled in summer.

Living, kitchen and dining spaces are generally 10m x 5m, while bedrooms and bathrooms are based on variations of 3.6m x 3.6m and 3.6m x 2.4m, with storage as pop-outs. The result? Housing with

smaller footprints, delivering larger than average room sizes, and more flexible living spaces.

The couple is now negotiating with a manufacturer in rural NSW whose steel business is ideally set up to fabricate their components. The next step is to secure a substantial single order for buildings such as an eco resort, classrooms, miner’s accommodation or similar so the couple can negotiate on the fabrication of thin steel sandwich wall panelling. Their aim is to start driving down overall building prices while reinforcing the concept of component-based fabrication: all the while underpinning their architectural credentials.

“All the elements are in place for a shift towards mass-produced housing stock,” Irvine says. “Steel is the ideal environmental and sustainable building material. There’s growing demand for architecturally designed housing incorporating our type of building components – increasingly from developers looking for lighter, more sustainable alternatives to brick and tiles. And clients are looking for flexible building alternatives which our concepts address.”

**Pete Heininger**



Cost-effective combination of standard components, such as double doors, with Harper’s kitchen pop-out reinforces design flexibility.



**Architect:**  
Sue Harper Architects – Sue Harper, Jaya Param

**Engineer:**  
Structural Mechanics and Dynamics – Max Irvine

**Environmental engineer:**  
OTG Environmental Solutions – Andy Irvine

**Builder:**  
To The Mill – Liam Flood

**Roof cladding:**  
LYSAGHT CUSTOM ORB® made from ZINCALUME® steel

**Project Manager:**  
Maria Flood

**Photography:**  
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