



# Building *with* steel

## Part 3: The final straight

*In the third and final part of our series, we discuss the finishing operations on your steel framed home. As with earlier articles, this is meant as a general guide only, and some practices may vary from place to place. You should always comply with local regulations (especially for services), follow your designer's specifications and frame supplier's instructions and seek expert advice when you need it.*



Your steel frame is now structurally complete and ready to support the roofing, cladding, lining, fit out components and services that will turn it into a dwelling. All of these items have particular fixing requirements to ensure a sound, serviceable and aesthetically pleasing finish. If you have built the structure carefully and accurately, you can expect few problems in the finishing stages.

The exact sequence of finishing operations may vary from house to house. The sequence described here is the one most commonly used. We've also added some of the general principles of thermal efficiency and condensation; although these are not specific to steel framed construction, they are things you need to consider before or during the finishing stages.

### **Fascia and guttering**

Modern pre-painted steel fascia and gutter systems are quite straightforward to install and come with many accessories to make the job easy, whether you decide to do it yourself or have them installed by an expert. You can also use timber fascia if you are confident it will have sufficient stability and durability for your project. Fascia brackets are screwed to each truss or rafter and the fascia clipped to the brackets. The exact design and accessories vary with the fascia system, and the manufacturer's instructions should be followed. Gutters are usually clipped to the fascia with a combination of clips and overstraps. Note that in

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*Frame prior to final fit out.*

some states only licensed plumbers can install rainwater drainage systems, so always check the local situation before deciding what to do yourself.

## Roof tiling

The basic processes of sarking, battening and tiling a steel roof structure are basically the same as for timber framing, but there are differences between systems such as the spacing of trusses and the size and shape of the battens. Working at heights is not for everyone, and should be left to the experts in most cases.

Tile clips are used to secure roof tiles to steel or timber battens, at a frequency specified in the Building Code of Australia (BCA). Clips are usually supplied by tile manufacturers to suit specific tile and batten combinations. L-shaped clips are most commonly used to secure the side-lap of the tile where the lower or 'nose' end sits on the top or 'back' end of the lower tile. U-shaped clips are sometimes used at the back end of the tile, performing a similar function to nails used with timber battens, but are less effective as they do not stop the nose of the tile lifting in wind gusts. Tile clips are typically made from galvanized wire. Tiles may also be screwed to steel battens.

## Roof sheeting

There are no unusual requirements for installing steel roof systems to steel framing. A typical installation is comprised of steel 'top hat' battens, insulation foil/blanket and steel roof sheeting. With sheet roofing the insulation material always goes between the sheeting and battens, which differs from tiled roofing where it is placed below the battens.

The type and frequency of screw fastening varies depending on the sheet profile and the wind region of the site. Always follow the manufacturer's recommendations. Note that in some states only licensed plumbers can install steel roofing.

## Windows and doors

Windows, doors and their associated accessories and trims are exactly the same for steel and timber framing of the same wall frame depth. As these depths vary regionally for both timber and steel, make sure you specify the correct jamb, frame or reveal width when ordering windows.

The window and door openings in framed construction are designed on the assumption that the wind forces on the window or door are transferred to the jambs and sill and not to the head (top) frame member. Similarly, window and door units are not intended to bear loads anywhere on their top frame member. Therefore it is important when installing all window and door units to leave a clear gap of typically 20mm between the structural frame and the top frame of the door or window unit. This gap will be covered by the architrave internally, and by a storm mould or trim externally. Compressible thermal insulation may be placed in the gap if required.

## Brickwork

Masonry veneer with steel or timber framing is the most common form of residential construction in Australia. The masonry skin is stabilised by the frame, to which it is connected by steel or nylon ties embedded in the mortar joints. The ties may be fastened to the sides or face of the steel studs, with face fixing being more common when bracing sheets or insulation boards are installed.

The strength, durability and fixing frequency of brick ties for various building conditions are specified in the BCA.

## Exterior cladding

Various types of lightweight cladding, such as fibre cement sheet, hardboard and steel, are commonly used on walls, gables and feature panels, especially in upper floor construction where low mass has a structural advantage. Typically these materials are fixed with screws or clips recommended by the manufacturer. Steel framing provides a stable, durable substrate for these materials.

## Plumbing services

The BCA does not regulate electrical wiring or plumbing in housing, except to ensure that the installation of these services does not cause damage to the structure. The BCA requirements in this regard are that:

- Services must pass through pre-punched service holes or through extra holes located near the centreline of studs – the structurally safest place.



Air-Cell Permishield used as building wrap.

- Copper and brass pipes and fittings must be isolated from steel framing to prevent corrosion.
- Plastic grommets must be used where copper and brass pipes pass through service holes in steel framing.

Where plastic plumbing pipes and fittings are used, there is no requirement for isolation from the steel frame, but pipes should always be protected from damage due to sharp corners or edges. This applies equally to timber and masonry construction, where services pass near or through bracing straps, brackets, ties and other metal components. Flared or grommets holes are designed to protect plastic pipes from damage where they pass through steel framing members.

All plumbing pipes and fittings should be securely fastened to prevent water hammer. Services are sometimes placed in the cavities of brick veneer walls, but some local authorities may not allow this due to the risk of the cavity being breached by mortar and other debris. Plumbing services should be carried out by licensed contractors who will be familiar with the requirements of their trade.

## Electrical services

In all buildings including houses, electrical services should be installed in accordance with the relevant Australian Standards by an appropriately licensed contractor. Where cables need to pass through plain holes in steel framing members, plastic grommets are used to protect the cables. Flared holes placed by some manufacturers are designed to



provide protection without the need for grommets. Manufacturers usually provide multiple holes in studs and plates to make wiring and plumbing easier for contractors.

### **Interior lining**

Plasterboard linings in a steel framed building are fixed with a combination of adhesive and bugle head screws – the same adhesive is used for both timber and steel construction. Fibre cement interior lining is fixed with adhesive and self-embedding head screws. In areas that will be ceramic or porcelain tiled, lining manufacturers usually recommend using screws only.

### **Skirtings and architraves**

Installation of skirtings, architraves and trim is normally done with specific screws for each job, such as countersunk head extended drill point screws. These should be readily available from normal hardware stores or fastener distributors.

If you are confident with power nailing tools, hardened pneumatic driven nails specially developed for steel framing are available for use in air powered nailing guns. These nails can be used to fix timber window and door jambs, architraves and skirting to the steel frame.

*Above L-R: Wall cladding being fixed to steel frame; attaching fascia and gutter to steel frame.*

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### **Thermal insulation**

The BCA sets performance levels for the thermal performance of buildings. These requirements may be met by either using deemed-to-satisfy thermal ratings in the walls, roofs and floors or using an approved computer software program to demonstrate compliance. In either case, the thermal performance of the building envelope will need to be considered and in most cases, some form of insulation will be required.

In the walls, board systems can be fixed to the external face of the stud or bulk insulation e.g. glass fibre, wool, cellulose fibre or polyester can be placed between the studs to achieve the required rating. In both cases reflective foil can be used to assist with the performance of the wall. It is highly desirable that the building wrap be vapour permeable so that any vapour in the cavity can escape. Similar insulation systems are available for roofs, and building wrap placed below external roofing should always be vapour impermeable.

The insulation requirements are independent of the type of structural frame. With lightweight claddings such as fibre cement, hardboards and steel, it is required that a thermal break be

provided to the wall stud. An acceptable solution is the attachment of a 12mm expanded polystyrene (EPS) strip to the external face of the stud. Other proprietary systems can also give the required performance (R=0.5). Thermal breaks may also be required where the roof cladding and lining are both fixed to a common batten. The thermal break is not required with brick veneer and other similar forms of construction.

In all climates, the area and orientation of glazing and extent of shading is one of the biggest influences on the thermal performance of the building. An external wall with a total R-value of 2 will insulate 12 times better than basic clear single glazing. Well designed glazing provides the opportunity to achieve greater energy efficiencies through reducing the need for heating in cooler climates, minimizing heat gains in hotter weather, allowing air movements for cooling in hotter weather and providing natural light.

### **Condensation**

When moist air comes in contact with cold surfaces such as windows and walls, condensation can form. This can lead to problems of mould growth and in extreme cases affect the durability of susceptible materials. As modern buildings become better sealed and more energy efficient, there is less ability

to vent moisture through cracks or gaps in the building structure. Therefore consideration of moisture in buildings is now more important than ever.

In areas of high moisture generation such as kitchens, bathrooms and laundries, exhaust fans should be provided to externally vent the moisture when the room is in use. It is recommended that the lining, e.g. plasterboard, in all areas be sealed and painted with two coats of washable paint. This will improve the vapour resistance of the internal lining. In tropical areas, the outdoor air is more humid and therefore it is better to use paint that is vapour permeable.

A building wrap is commonly placed around the exterior of the wall studs. The building wrap functions as an air and water barrier, and some wraps also assist in providing the insulation to the building.

### Bushfire resistance

Many homes in Australia may be subject to bushfire attack. These attacks can be resisted by both active and passive means, and the way you design and finish your home externally can have a big impact on its ability to survive a bushfire attack. The detailed construction requirements for various levels of expected bushfire attack by radiant heat, ember and flame contact are contained in the Australian Standard AS 3959 *Building in bushfire-prone areas*. Authorities in most states also publish information covering new construction, building alteration and bushfire preparedness in affected areas.

### Lightning

Emergency authorities usually recommend taking refuge inside buildings during electrical storms. Small buildings such as houses usually do not have dedicated lightning protection systems and so direct lightning strikes can cause significant damage to the building and its contents, and present risks to the lives of its occupants from electric shock and fire. A well-constructed steel-roofed steel-framed home offers considerable intrinsic protection from a lightning strike, and is less likely to ignite or suffer significant damage causing additional emergency consequences.

### Housekeeping - a reminder

Although you have now moved on from most of the 'heavy duty' construction processes, site safety and waste control remain just as important. On completion of each finishing stage, the affected area should be cleared and waste material disposed of safely and responsibly. Excess materials should be stacked and stored to allow for use at a later date - or sold locally to help someone else's project!

Don't forget that self-drilling screws create steel 'swarf' as they drill. Whilst not a problem in small quantities, when swarf gets into the wrong places it can mar the appearance of coated steel surfaces. It's a good idea to sweep away swarf progressively as you work, along with any discarded screws and small offcuts, to minimise any adverse effects. ■

### Typical tools for finishing operations

As we mentioned in the first article, the tools required for steel frame construction are familiar and readily available. This is what you're likely to need during the final stages of your project:

- A good quality battery screwdriver
- A pair of articulated snips
- Several toggle clamps
- A good quality level at least 1M long
- General hand tools

OB 149 - Part 1: *Why choose steel for your building project?*

TOB 150 - Part 2: *Construction aspects.* See also 'Steel' under subject listing for back issues, p.54 this issue.

Thanks to National Association of Steel-Framed Housing Inc (NASH) for providing the information for this article.



#### • NASH

A good source of information on suppliers and technical information. Visit their website for up to date information on residential and low-rise steel framed construction. Training is offered at some TAFEs for tradespeople wishing to gain expertise with steel framing. These courses may be suitable for owner builders with some experience in building. 1800 656 986, [www.nash.asn.au](http://www.nash.asn.au)

#### • Technosteel Australia

Manufacturer of steel house frames, roof trusses and floor systems, mainly for the owner builder. 1300 553 457 [www.technosteelaustralia.com](http://www.technosteelaustralia.com)



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