

Steel house frames

INTRODUCTION

This bulletin has been written to assist designers, builders and homeowners to realise the benefits of frames made from TRUECORE® steel. The coating of TRUECORE® steel complies with the durability requirements of the National Construction Code (NCC) Volume 2 Part 3.4.2.2.

Whilst the information provided in this bulletin is targeted for TRUECORE® steel framing it is also applicable to other metal components contained within roof and wall cavities, such as fascia brackets, nail plates, strap bracing and wall ties.

The general information provided in this bulletin is not a substitute for professional advice. BlueScope Steel recommends that you seek specific advice regarding the needs of your project.

ENVIRONMENT

Residential framing made from TRUECORE® steel must be erected greater than 300 metres from the high water mark of “surf” and/or “exposed” salt marine influences or greater than 100 metres from the high water mark of “calm” salt marine or brackish influence. Refer to **Technical Bulletin TB-35 Australian Salt Marine Classifications** for definitions and some examples.

For steel house frames built within 2km of surf or within 1km of exposed marine, there are further minimum requirements to be eligible for a warranty, as outlined in the “WARRANTY” section of this Technical Bulletin.

HANDLING AND SITE STORAGE

As with all building materials, care should be exercised when handling and storing frames and trusses made from TRUECORE® steel.

Suitable gloves should always be worn when handling framing material. Framing material should be handled in a manner suitable to protect the coating and to avoid any adverse effects on product performance.

Minor scratches are unlikely to affect product performance, however if the coating is accidentally damaged and needs repair, the affected area can be treated by the application of a zinc rich paint designed for this purpose. Refer to **Technical Bulletin TB-10 Cut Edge Protection of next generation ZINCALUME® aluminium/zinc/magnesium alloy-coated steel and COLORBOND® prepainted steel with Activate™ technology**, and **Technical Bulletin TB-2 Overpainting and Restoration of Exterior BlueScope Steel Products**.

Frames and trusses should be stored on a flat, even surface and other loads not placed on top. This will reduce the risk of the frame being structurally damaged prior to erection.

It is good practice to minimise exposure of the frame to the weather during the building process. Prolonged exposure of the frame to the weather increases the risk of depositing salts or other corrosive materials onto the frame which can affect both the warranty and service life of the frame. This is most easily addressed by ensuring the cladding is installed as soon as possible after the frame is erected.

TERMITE CONSIDERATIONS

The NCC is the principal source document that governs how buildings can be built in Australia and Volume 2 Part 3.1.3 (subject to specific State or local council regulations), clearly recognises that if primary building elements are made from steel, no termite barrier is required. Termites and borers cannot eat steel.

The National Association of Steel-framed Housing (NASH) commissioned a study on the risk of termite damage in steel framed and timber framed houses – Prof. A P Jeary of the University of Western Sydney in 2003. There was no incidence of steel frame houses suffering termite damage in this study thus providing peace of mind when choosing a steel frame.



WALL FRAMES

Use a Membrane

An impermeable membrane should be installed under all perimeter bottom plates fixed to concrete slabs on ground. The membrane should also extend up the weather side flange of the bottom plate (see *Figures 1 and 2*).

The protection of internal bottom plates is not considered necessary. For “wet areas” refer to Australian Standard AS 3740-2010 *Waterproofing of Domestic Wet Areas*. The type of membrane used should be “impermeable to moisture”.

Suitable impermeable membranes include:

- Bitustik/Bituthene® 2000 by Grace Construction Products,

Figure 1: Deep Edge Rebates

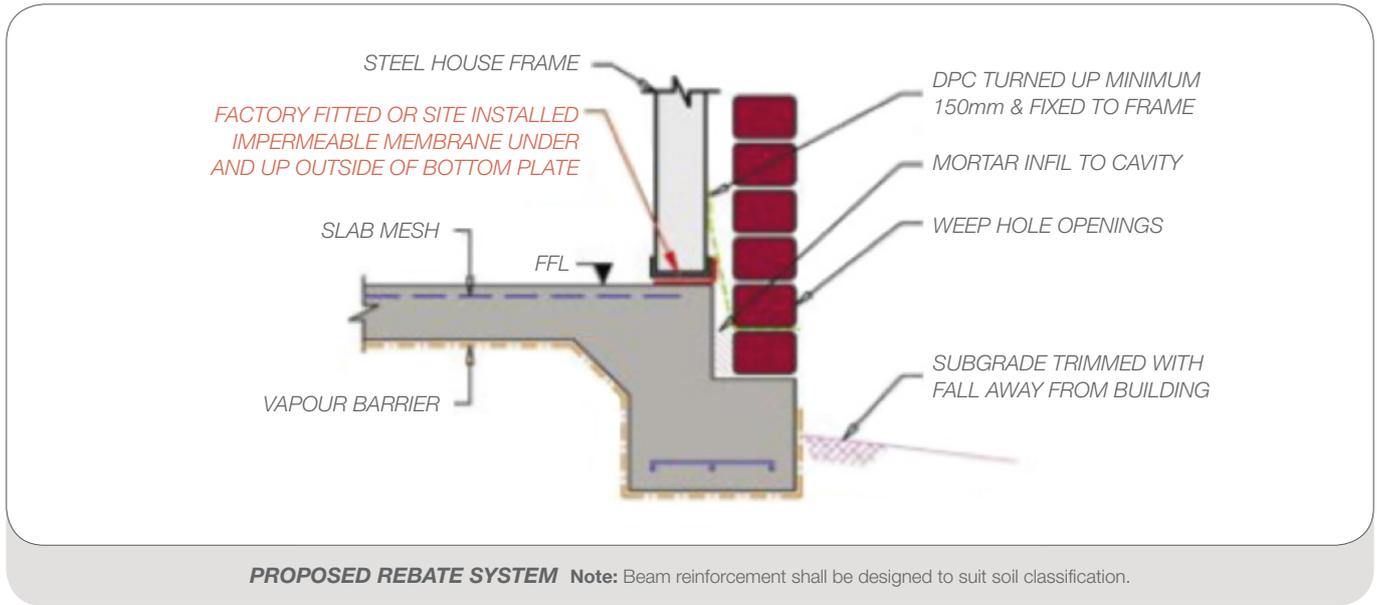
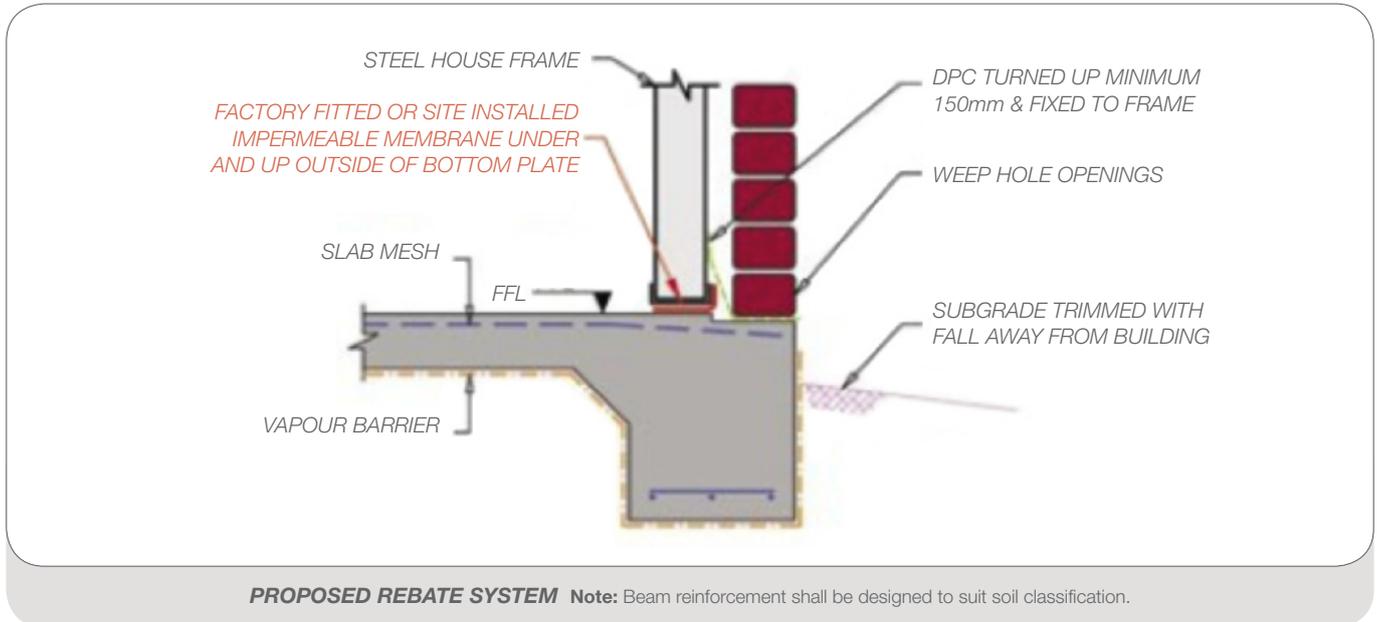


Figure 2: Shallow Edge Rebates



- Polyethylene and other compatible products mentioned in Australian/New Zealand Standard AS/NZS 2904:1995 *Damp-proof courses and flashings*
- Brushable Hydroseal from Tremco
- Kordon Termite Barrier (see manufacturer’s specification for detail).

The protection of the weather side flange (see Figure 1) is necessary because this part of the frame is subject to moist air movement from the lower parts of the cavity as it tries to evaporate and move past the masonry damp-proof course.

Wall Sarking

Wall sarking may be installed at the outer face of the framing. It has the potential to provide several benefits, including providing secondary weather protection from moisture and salt-laden air and allowing the house frame to be quickly wrapped

and protected from the external environment. Wall sarking also improves the performance of insulation minimising the downgrading impact of wind and has inherent insulation when it includes a reflective surface facing an air-gap. Wall sarking can also minimise the potential impact of mortar splash on brick ties and frame causing corrosion; see “INCOMPATIBLE MATERIALS” section of this Technical Bulletin.

Wall Insulation

House framing made from TRUECORE® steel offers many advantages, including tight dimensional tolerances, which can assist in achieving good insulation. One example of how tight tolerances can help is by reducing air leakage between the frame and insulating materials when heating a home in a cool climate.

When insulating steel wall frames in cold climates or when building with cladding materials with low thermal resistance,

such as metal, plastic or fibre-cement sheeting, then rigid board or sheathing-type insulation products are recommended. These products are not bridged by the frame so do not lose any of their insulating properties. If using bulk insulation with steel framing and lightweight cladding, the NCC requires the cladding to be battened out from the framing or for a thermal break to be used between the stud and the cladding, such as thin expanded polystyrene strips. This will ensure good thermal performance and condensation control around the framing.

Wall Ties

Sometimes a forgotten structural component, the choice of wall ties can be important to the structural performance of a building frame. Galvanized wall ties are suitable for use with steel framing in most situations, although more durable ties may be needed within 1km from breaking surf and heavy industrial areas; refer to Australian Standard AS 3700-2011: *Masonry Structures*.

Polymer wall ties are now available and should provide good performance with a steel building frame in all environments.

Stainless steel wall ties, if used, must be electrically isolated from the steel framing material to avoid the possibility of corrosion resulting from the use of incompatible dissimilar metals.

Figure 3. Sarking extending to the gutter for metal roofing

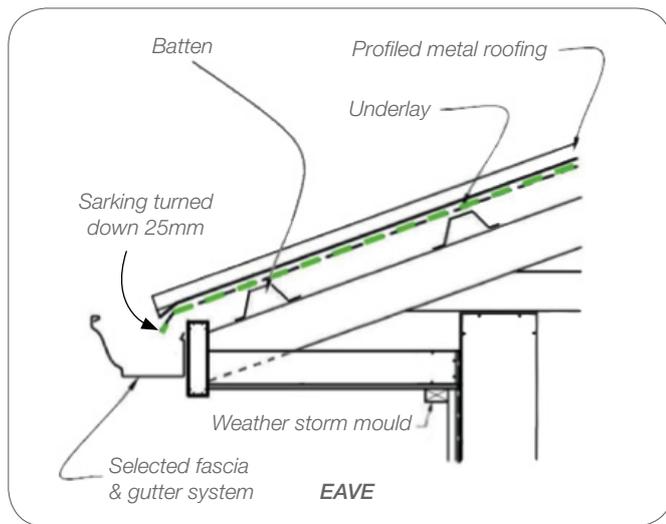
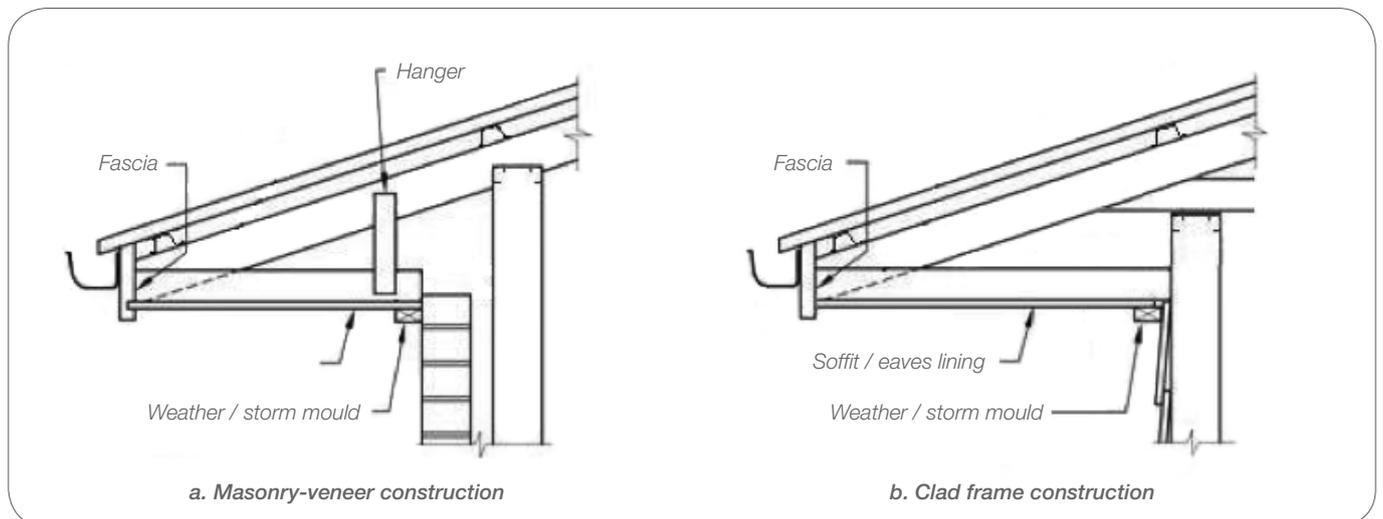


Figure 4. Storm mould as standard detail for soffit lining



ROOF TRUSSES

Roof trusses should be enclosed within the building envelope to minimise the ingress of any salt-laden or moist air into the roof space, particularly for homes in close proximity to surf or exposed marine influences. In these environments, roof design should aim to tightly seal the roof so as to minimise uncontrolled ingress of air. Installation of roof sarking, reflective foil or insulation blanket and foil is beneficial to prevent excessive ingress of air into the roof space at ridge, valleys and gutter as well as providing other benefits. For better protection the roof sarking or reflective foil should extend over the fascia, ridges and hips and extend into valley gutters; noting that for blanket and foil the blanket must terminate prior to the gutters/valley gutters to avoid wicking of moisture – refer to *Figure 3*. An alternative approach to blocking ingress into the roof space in these regions may also be achieved through the use of profile closure strips made of a durable material such as EPDM or similar compatible material. Any gaps between the wall and fascia or eaves should be sealed, such as by using appropriate storm mouldings or durable profile closure strips – refer to *Figure 4* (NCC Vol. 2 Fig 3.5.3.3).

Where roof space ventilators or vents are used they should be placed at locations where corrosive aerosol influence is minimized, e.g. leeward side of prevailing marine influences. High roof space ventilation in marine or industrial environments should also be avoided, which is in line with explanatory information of the NCC Vol.2 Clause 3.12.1.2(b)*.

Avoid areas of exposed but unwashed framing material (see **Corrosion Technical Bulletin CTB-8 Building Applications**).

* The explanatory information of NCC provides caution around the ingress of air to the building cavity from high ventilation, 'Compliance with the ventilation provisions in 3.12.1.2(b)(ii) may result in the ingress of wind driven rain, fine dust, corrosive aerosols, or stimulate the growth of mould or fungus in the roof enclosure. Consideration should therefore be given to the surrounding environmental features, including exposure to marine or industrial environments, prior to adopting this as an alternative to the roof insulation provisions in 3.12.1.2(b)(i).'

Table 1: This table recommends methods of separating the frame from the external environment over the life of the building, with level of isolation depending on the corrosive nature of the site. In marine zones, a greater level of isolation from the external environment is required to prevent salt laden air from contacting the TRUECORE® steel frame. In non-marine zones, where the external environment is benign (and there are no other significant corrosive external influences), the additional isolation measures outlined in *Table 1* are not required to satisfy the conditions of the warranty.

MARINE ZONE	
<2KM FROM SURF OR <1KM FROM EXPOSED MARINE**	<1KM FROM SURF**
ALL ROOF TYPES	
<p>– The gap at the top of the wall between the fascia, bargeboard and soffit linings, is adequately sealed such as by using appropriate storm mouldings.</p> <p>AND</p> <p>– The building has lined eaves</p>	<p>As per marine zone <2km, plus:</p> <p>– Wall sarking is installed at the outer face of the frame, in accordance with Australian Standard AS 4200.2-1994 – <i>Pliable building membranes and underlays</i> – <i>Installation requirements</i>, as soon as practicable after the frame is erected, or for brick veneer walls, inclusion of mesh on windward side of surf marine influence at vents, weep holes and gaps.</p> <p>AND</p> <p>Where roof space ventilators or vents are used:</p> <p>– They are not placed on the windward side of surf marine influence, and</p> <p>– They reduce aerosol ingress by including filter mesh <2mm hole size, eg. sand fly mesh; or creating a convoluted inlet path.</p>
METAL ROOFS	
<p>– A pliable membrane is installed beneath the roof, such as reflective foil laminate or similar, in accordance with AS4200.2-1994. In addition, the membrane extends over the fascia by at least 25mm and is turned down over the fascia or into the gutters, extends and is turned down into the valley gutters, extends over ridges and extends to barge ends (see <i>Figure 3</i>);</p> <p>OR</p> <p>– A blanket and foil is installed immediately beneath the roof. The foil extends over the fascia by at least 25mm and is turned down over fascia or into the gutters, extends and is turned down into the valley gutters, extends over ridges and extends to barge ends.</p> <p>To avoid wicking of moisture: the blanket must be cut back to terminate prior to the gutters/valley gutters or alternatively a single course of membrane (eg reflective foil laminate or similar) may be separately installed along the gutter/valley gutter perimeter prior to installing the blanket and foil.</p> <p>OR</p> <p>– Closure of entry points is achieved via durable profile closure strips (or other equivalent performing solution) at fascia, ridge, hip or valley as appropriate.</p>	<p>As per marine zone <2km</p>
TILED ROOFS	
<p>Sarking is installed beneath the roof in accordance with AS4200.2-1994.</p>	<p>As per marine zone <2km</p>

** Refer **Technical Bulletin TB-35** *Australian Salt Marine Classifications* for definitions and some examples.

EARTH THE FRAME

For safety reasons, your house frame made from TRUECORE® steel must be earthed in accordance with the NCC Clause 3.4.2.2, Australian Standard AS 3000:2007 *Wiring Rules*, and any other state, local or electricity requirements or regulations.

INCOMPATIBLE MATERIALS

Materials considered incompatible in direct contact with framing components made from TRUECORE® steel include:

- Copper
- Lead
- Brass
- Stainless steel
- Treated timber, green timber and other timber capable of retaining moisture.

NOTE:

Frames made from TRUECORE® steel should be isolated from contact with treated, green or moist timber unless specific written advice has been obtained from BlueScope Steel.

- Washers containing significant amounts of carbon black eg. Neoprene.

In general, mortar splashes don't pose corrosion problems if kept dry. However, if the mortar forms a continuous bridge between the brick veneer wall or slab and the TRUECORE® steel frame, it may lead to corrosion of the steel frame via moisture "wicking".

Incompatible components should be isolated from frames or trusses.

PHONE / RADIO RECEPTION

A steel frame should not affect your telephone, wireless computer network, radio, mobile phone or television reception.

NOISE

A study published by CSIRO (G A King, Dr. M Ridge and G S Walker – in *Building Materials and Equipment*, Vol. 17 No.1) has concluded that steel framed houses are no "noisier" than houses with other types of frames. Whether a steel frame is mechanically jointed or welded, movement caused by changes in temperature should not cause significant noise in a properly constructed and insulated home.

FASTENERS

The correct choice of fastener is critical to long-term performance when fixing premium steel products. Fasteners used to fix your steel framing should conform to Australian Standard AS 3566.2-2002 – *Self-drilling screws for the building and construction industries – PART 2: Corrosion resistance requirements* Class 3, with the exception that Class 4 fasteners should be used when used at less than 400m from the high water mark of “surf” or “exposed” salt marine influences. Do not use stainless steel fasteners with steel framing made from TRUECORE® steel.

Screws used solely for installing internal plasterboard should be minimum Class 2 as per *Table 1* in AS3566.2-2002.

Fasteners used to secure framing made from TRUECORE® steel should conform to relevant standards, be compatible with and have equivalent durability to TRUECORE® steel.

NOTE:

Welded areas must be treated by the application of a zinc rich paint to ensure weld affected area has equivalent performance to the remainder of the TRUECORE® steel frame.

LIGHTNING

As mentioned previously, steel frames are earthed and therefore this provides a direct path for the energy in the unlikely event of a lightning strike.

WARRANTY

A 50 year warranty is available upon application, subject to eligibility, for residential framing made from TRUECORE® steel. Warranty eligibility criteria include (but are not limited to) the following:

1. The frame made from TRUECORE® steel must be erected greater than 300 metres from the high water mark of “surf” and/or “exposed” salt marine influences or greater than 100 metres from the high water mark of “calm” salt marine or brackish influences. Refer to **Technical Bulletin TB-35** *Australian Salt Marine Classifications* for definitions and some examples.
2. Framing must be separated from ground moisture. As a minimum an impermeable membrane must be installed under all perimeter bottom plates fixed to concrete slabs on the ground. The membrane must extend up the weather side flange of the bottom plate (see *Figures 1 and 2*). Suitable impermeable membranes are listed within this Technical Bulletin.

If you have any questions regarding this Bulletin, please contact BlueScope Steel Direct on 1800 800 789.

To ensure you have the most current Technical Bulletin, please go to bluescopesteel.com.au.

3. Fasteners used must be compatible with TRUECORE® steel, offer similar corrosion performance to the frame and comply with the guidelines in this Technical Bulletin.
4. Framing must be effectively separated from the external environment over the life of the building and appropriately installed and maintained. Methods for separating a TRUECORE® steel frame from the external environment are outlined in *Table 1*. Alternative methods may also be suitable provided they result in the effective separation of the frame from the external environment.

RELATED BLUESCOPE STEEL TECHNICAL BULLETINS

Technical Bulletin TB-10

Cut Edge Protection of next generation ZINCALUME® aluminium/zinc/magnesium alloy-coated steel and COLORBOND® prepainted steel with Activate™ technology

Technical Bulletin TB-2

Overpainting and Restoration of Exterior BlueScope Steel Products

Technical Bulletin TB-16

Fasteners For Roofing and Walling Product – Selection Guide

Technical Bulletin TB-35

Australian Salt Marine Classifications

Corrosion Technical Bulletin CTB-8

Building Applications

Corrosion Technical Bulletin CTB-12

Dissimilar Metals

Corrosion Technical Bulletin CTB-13

Contact with Timber

REFERENCED AUSTRALIAN STANDARDS

- AS/NZS 2904:1995 *Damp-proof courses and flashings*
- AS 3000:2007 *Wiring Rules*
- AS 3566.2-2002 *Self-drilling screws for the building and construction industries – PART 2: Corrosion resistance requirements*
- AS 3740-2010 *Waterproofing of domestic wet areas*
- AS 3700-2011 *Masonry structures*
- AS 4200.2-1994 *Pliable building membranes and underlays – Installation requirements*

NOTE:

All Australian and Australian/New Zealand Standards should be read to incorporate any and all amendments to the most recently published version.



The information and advice contained in this Technical Bulletin ('Bulletin') is of a general nature only and has not been prepared with your specific needs in mind. You should always obtain specialist advice to ensure that the materials, approach and techniques referred to in this Bulletin meet your specific requirements.

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