

Steel building frames

Introduction

This Technical Bulletin has been written to assist designers, builders and homeowners to realise the benefits of frames made from TRUECORE® aluminium/zinc/magnesium alloy-coated steel.

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

Environment

This Technical Bulletin provides guidance on practices to separate the frame from the exterior environment in relation to the distance from different marine conditions – see Table 1 (refer p.5).

Handling and site storage

As with all building materials, care must be exercised when handling and storing frames and trusses made from TRUECORE® steel. Suitable gloves must always be worn when handling framing material. Framing material must 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 and bend protection of next generation ZINCALUME® steel and COLORBOND® steel](#), and [Technical Bulletin TB-2 Overpainting and Restoration of Exterior BlueScope Products](#).

Frames and trusses must 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.

NASH publications

The National Association of Steel-framed Housing (NASH) has produced several fact sheets that outline some of the benefits of steel frames. These can be found on the NASH website under Publications. They cover the following areas:

- Fire
- Durability
- Movement
- Electrical Safety
- The Environment
- Termites

Wall frames made from TRUECORE® steel

Use a membrane

To protect the wall framing from ground moisture an impermeable membrane should be installed under all perimeter bottom plates fixed to concrete slabs on ground. The membrane should extend up the weather side flange of the bottom plate (see Figures 1 and 2). Membranes may be perforated at tie down points and service penetrations.

Protection beneath internal wall frames and upper storey wall frames is not required.

The membrane used may be factory-applied or field installed and should be:

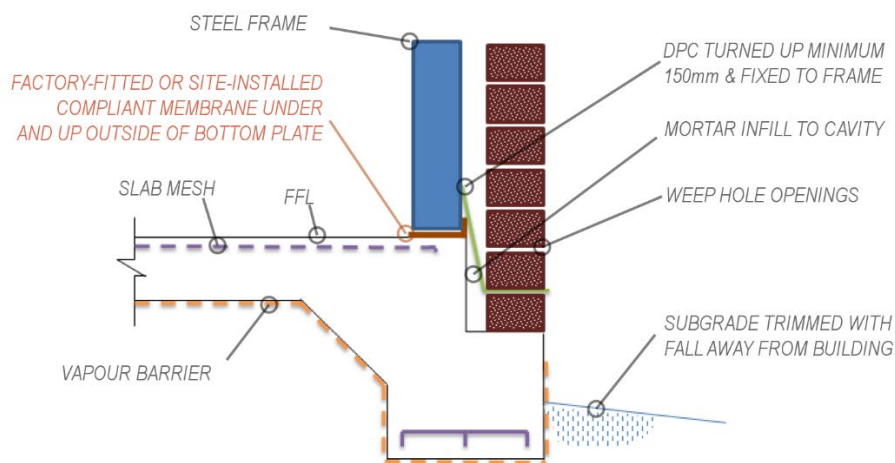
- a membrane conforming to AS 2870-2011 or AS/NZS 2904:1995; or
- a product carrying CodeMark certification for use as an impermeable membrane for framing applications.

The use of membranes under perimeter bottom plates as above is mandatory to meet the eligibility requirements of the BlueScope warranty* for frames made from TRUECORE® steel.

Termite considerations

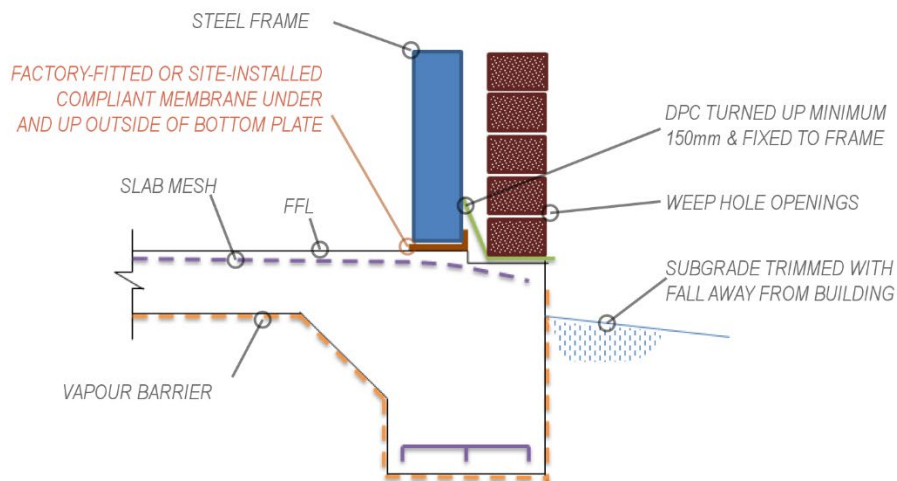
House frames manufactured from TRUECORE® steel are 100% termite and borer proof without the requirement for treatments with insecticides. The National Construction Code (NCC:2019) Volume 2 Part 3.1.4 (subject to specific state or local council regulations) recognises that if primary building elements are made from steel, no termite barrier is required.

Figure 1. Deep edge rebates



PROPOSED REBATE SYSTEM Note: Beam reinforcement shall be designed to suit soil classification.

Figure 2. Shallow edge rebates



PROPOSED REBATE SYSTEM Note: Beam reinforcement shall be designed to suit soil classification.

The protection of the weather side flange (see Figures 1 and 2) is necessary because this part of the frame is subject to moist air within the lower parts of the cavity.

Membranes may also be employed where TRUECORE® steel framing elements are used in conjunction with non-steel construction elements, such as in scenarios where timber trusses are installed on steel wall frames or steel trusses are installed atop masonry walls.

Wet areas

For waterproofing requirements in wet areas, refer to NCC:2019 Vol. 2 and AS 3740-2010. No additional moisture protection requirements apply to TRUECORE® steel framing used in wet areas.

Wall sarking

Wall sarking installed at the outer face of the framing has the potential to provide several benefits, including providing secondary weather protection from moisture and airborne salts. It also allows the frame to be quickly wrapped and protected from the external environment. Wall sarking improves the performance of insulation minimising the downgrading impact of wind and has inherent insulation when it includes a reflective surface facing an airgap. Wall sarking can also minimise the potential impact of mortar splash on the frame that may cause corrosion; see “Incompatible Materials” section of this Technical Bulletin.

Wall insulation

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 building 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. The NCC:2019 should be consulted for installation guidance where insulation batts are used with steel frames and lightweight cladding.

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 3700:2018 Masonry Structures.

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.

Roof trusses

Roof trusses should be enclosed within the building envelope (including lining of eaves and other roof overhangs) to minimise the ingress of any salt-laden or moist air into the roof space.

In close proximity to surf or exposed marine influences, roof design should aim to tightly seal the roof so as to minimise uncontrolled ingress of air into the roof cavity. Installation of roof sarking, reflective foil or insulation blanket and foil is beneficial to limit ingress of air into the roof space at ridge, valleys and gutters as well as providing other benefits. 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 should terminate prior to the gutters/valley gutters to avoid wicking of moisture – refer to Figure 3.

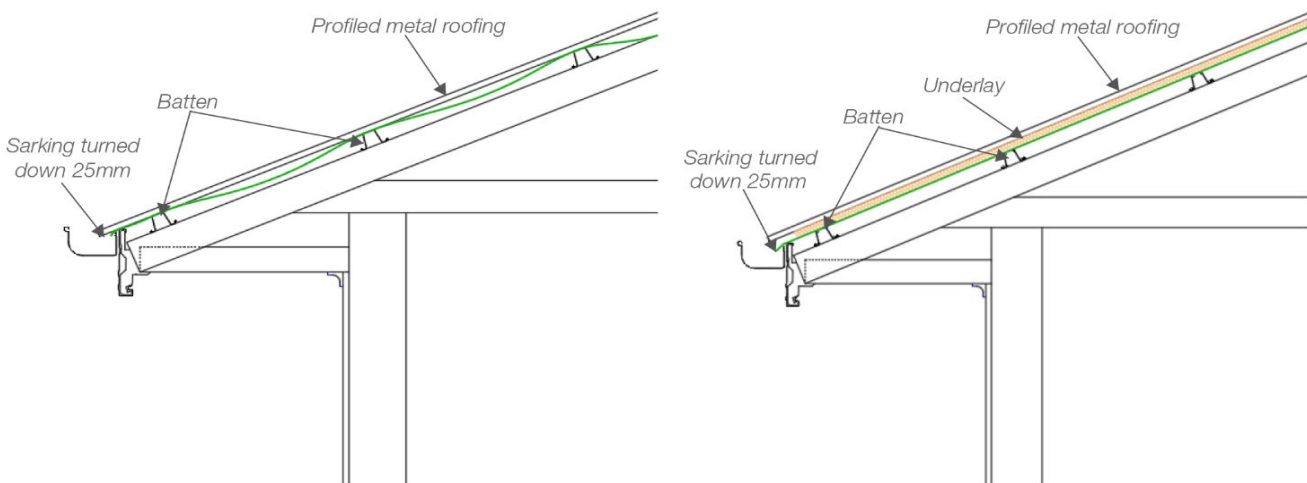
An alternative approach to blocking ingress into the roof space in these regions may also be achieved through the use of profile closure strips made of a durable material such as EPDM or similar compatible material. Any gaps between the wall and fascia or eaves should be sealed, such as by using appropriate storm mouldings or durable profile closure strips.

Where roof space ventilators or vents are used, they should be placed at locations where corrosive aerosol influence is minimised, e.g. leeward side of prevailing marine influences.

High levels of roof space ventilation in marine or industrial environments should also be considered in the context of explanatory information within NCC:2019 Vol.2, which advises caution regarding the ingress of air to the building cavity from high ventilation:

“Compliance with the ventilation provisions in 3.12.1.2 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 must 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.”

Figure 3. Sarking extending to the gutter for metal roofing



Earth the frame

For safety reasons, your frame made from TRUECORE® steel must be earthed in accordance with NCC:2019 Volume 2, Clause 3.4.2.2 and 3.4.2.6, NASH Standard, Australian Standard AS 3000:2018 Wiring Rules, and any other state, local or electrical authority requirements or regulations.

Phone / radio reception

A steel frame should not affect your telephone, Wi-Fi network, radio, mobile phone or television reception

Incompatible materials

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

- Copper
- Lead
- Brass
- Stainless steel
- Treated timber (CCA) or green timber.
- Polymers containing significant amounts of carbon black e.g. Neoprene.
- Any material likely to retain moisture for extended periods.

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 frame, it may lead to corrosion of the steel frame via moisture 'wicking'.

Incompatible components must be isolated from frames or trusses. This is best achieved via an air-gap or by use of a membrane. See section "Use a membrane".

Fasteners

The correct choice of fastener is critical to long-term performance when fixing premium steel products. Fasteners used to fix your steel framing must be suitable for corrosivity environment category 3 or higher as per ISO 9223:2012 Corrosion of metals and alloys - Corrosivity of atmospheres - Classification, determination and estimation.

Fasteners used to secure framing made from TRUECORE® steel must 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 the weld-affected area has equivalent performance to the remainder of the frame.

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, 1975) 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 building.

Lightning

When earthed correctly, steel frames provide a direct path to ground for electrical energy in the unlikely event of a lightning strike. Risk of damage resulting from lightning strikes is reduced in steel-framed buildings relative to non-conductive framing materials due to the higher energy dissipation capability of steel.

Marine locations

In marine zones, a greater level of isolation from the external environment is required to prevent salt laden air from contacting the steel frame. Table 1 (refer p. 5) describes methods of separating the frame from the external environment over the life of the building with the level of isolation required varying depending on the corrosive nature of the site and the type of roof installed (metal or tiles).

- Level 1: Applies to all locations
- Level 2: Applies to locations 1km – 2km from surf or
300m – 1km from exposed marine
- Level 3: Applies to locations 300m to 1km from surf or
5m – 100m from calm marine

These distances are measured from the high water/tide mark. BlueScope recommends frames and trusses made from TRUECORE® steel be installed greater than 300m from surf or exposed marine influences.

BlueScope does not provide a warranty* for frames and trusses made from TRUECORE® steel when installed within 300m of surf or exposed marine influences.

Building installations that are proposed within 300m of surf or exposed marine will require further consideration beyond the information contained in this Technical Bulletin. For further information, please call Steel Direct.

Marine zone definitions

Surf: Areas exposed to breaking surf and ocean spray.

Exposed: Open expanses of salt or brackish water exposed to onshore winds, but not typically prone to breaking surf.

Calm: Protected areas of salt or brackish water, including ports, harbours, bays and river estuaries.

Refer to:

[Technical Bulletin TB-35 Australian Salt Marine Classifications](#) for marine zone examples and further guidance.



Table 1. Detailing requirements for frames made from TRUECORE® steel

Frame isolation requirements	
Level 1	
All structures	<ul style="list-style-type: none"> All overhanging roof areas (eaves, patios, verandas etc.) are to be lined/enclosed. Damp-proof course installed under all ground-floor perimeter bottom plates for slab on ground construction. All fasteners used for frames made from TRUECORE® steel, (manufacture, install or second fix) are to be of compatible materials with equivalent durability to the frame.
Level 2	
Metal roofs	<p>As per Level 1, and:</p> <ul style="list-style-type: none"> 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>AND</p> <ul style="list-style-type: none"> A pliable membrane is installed beneath the roof, such as reflective foil laminate or similar, in accordance with AS 4200.2:2017. 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 Figure 3); <p>OR</p> <ul style="list-style-type: none"> 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. 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 (e.g. reflective foil laminate or similar) may be separately installed along the gutter/ valley gutter perimeter prior to installing the blanket and foil. <p>OR</p> <ul style="list-style-type: none"> Closure of entry points is achieved via durable profile closure strips (or other equivalent performing solution) at fascia, ridge, hip or valley as appropriate.
Tile roofs	<p>As per Level 1, and:</p> <ul style="list-style-type: none"> 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. Sarking is installed beneath the roof in accordance with AS 4200.2:2017.
Level 3	
All structures	<p>As per Level 2, and:</p> <ul style="list-style-type: none"> Wall sarking is installed at the outer face of the frame, in accordance with Australian Standard AS 4200.2:2017, as soon as practicable after the frame is erected and for brick veneer walls, inclusion of mesh on windward side of surf marine influence at vents, weep holes and gaps. Where roof space ventilators or vents are used, they are not placed on the windward side of surf marine influence, and they must reduce aerosol ingress by including filter mesh with <2mm hole size, e.g. sand fly mesh; or by creating a convoluted inlet path.

Warranty*

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

1. 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).
2. Fasteners used must be compatible with TRUECORE® steel, offer similar durability to the frame and comply with the guidelines in this Technical Bulletin.
3. Framing must be effectively separated from the external environment over the life of the building and the separations appropriately installed and maintained. Methods for separating a frame made from TRUECORE® steel 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.
4. BlueScope does not provide a warranty* for frames and trusses made from TRUECORE® steel when installed within 300m from surf or exposed marine influences. Distance is as measured from the high water/tide mark.

Related BlueScope Technical Bulletins

[Technical Bulletin TB-10](#) Cut edge and bend protection of next generation ZINCALUME® steel and COLORBOND® steel.

[Technical Bulletin TB-2](#) Overpainting and restoration of exterior BlueScope products

[Technical Bulletin TB-16](#) Fasteners for roofing, walling and accessory product – Selection guide

[Technical Bulletin TB-35](#) Australian salt marine classifications

[Corrosion Technical Bulletin CTB-12](#) Dissimilar metals

[Corrosion Technical Bulletin CTB-13](#) Contact with timber

Referenced Australian Standards

AS 2870-2011 Residential slabs and footings

AS/NZS 2904:1995 Damp-proof courses and flashings

AS 3000:2018 Wiring Rules

AS 3740-2010 Waterproofing of domestic wet areas

AS 3700:2018 Masonry structures

AS 4200.2:2017 Pliable building membranes and underlays - Installation requirements

Referenced International Standards

ISO 9223:2012 Corrosion of metals and alloys - Corrosivity of atmospheres - Classification, determination and estimation

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

steel.com.au

To ensure you have the
most current information

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For more information contact Steel Direct



*Warranty currently offered for residential applications only and is subject to application and eligibility criteria. Commercial warranties may be available on application. For full terms and conditions and to determine the eligibility of your building for a warranty visit warranties.bluescopesteel.com.au or call BlueScope on 1800 800 789. Warranties provided by BlueScope do not affect consumer rights under the Australian Consumer Law. 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. BlueScope Steel Limited makes no warranty as to the accuracy, completeness or reliability of any estimates, opinions or other information contained in this Bulletin and to the maximum extent permitted by law, BlueScope Steel Limited disclaims all liability and responsibility for any loss or damage, direct or indirect, which may be suffered by any person acting in reliance on anything contained in or omitted from this Bulletin. COLORBOND®, ZINCALUME®, TRUECORE®, BlueScope and the BlueScope brand mark are registered trade marks of BlueScope Steel Limited. © 2020 BlueScope Steel Limited ABN 16 000 011 058. All rights reserved.