TB - 34
Technical Bulletin

July 2024 - Revision 10. This issue supersedes all previous issues

Steel building frames

Introduction

This Technical Bulletin has been written to assist designers and builders to achieve best practice outcomes when working with steel frames made from TRUECORE® steel aluminium/zinc/magnesium alloy-coated steel.

This Technical Bulletin provides general guidance on steel framing installation and detailing techniques for common construction types, and has been updated in response to substantial changes to the National Construction Code in 2022 (NCC 2022).

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.

Regulatory Publications

NCC 2022 Vol 2 requires that steel frames for Class 1 & 10a buildings are designed and constructed in accordance with any of the following:

- NASH Standard Residential and Low-Rise Steel Framing Part 1 – Design Criteria
- NASH Standard Residential and Low-Rise Steel Framing Part 2 – Design Solutions
- AS 4100: Steel structures
- AS/NZS 4600: Cold-formed steel structures

Industry Publications

The National Association of Steel-framed Housing (NASH) has produced a number of publications that outline some of the benefits of steel frames. These can be found on the NASH website under “Publications” and address topics including: design, fire, durability, movement, electrical safety and termites,

NASH also publish Advisory Note *NAN 13 – Durability of Screws,* that addresses fastener solutions for fabrication and assembly of steel building frames.

A joint publication from Australian Steel Institute (ASI) and NASH, *Ventilation in Steel Roofing*, addresses a number of potential detailing solutions to address energy efficiency and condensation management requirements within NCC 2022 for common roof/ceiling and steel-clad wall designs.

Wall frames made from TRUECORE® steel

Bottom Plate Separation

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

Factory-applied adhesive impermeable membranes extending at least 10mm up both flanges are the preferred method of protection, but alternate films are also acceptable providing they are;

- 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.

Non-adhesive impermeable membranes should cover the full width of the sole of the bottom plate in a single, unbroken run and be turned up the full height of the weatherside flange of the bottom plate. The membrane may optionally also extend up the internally facing flange, but this is not essential.

The protection of the weatherside flange (see Figures 1 & 2) is necessary, because this part of the frame may be subject to moist air within the lower parts of the wall cavity.

The use of impermeable membranes under perimeter bottom plates as described above is not mandatory for compliance with the requirements of NCC 2022 but is necessary to meet the eligibility requirements of the BlueScope warranty for wall frames made from TRUECORE® steel. See "*Warranty*" section for more information about warranty eligibility requirements.

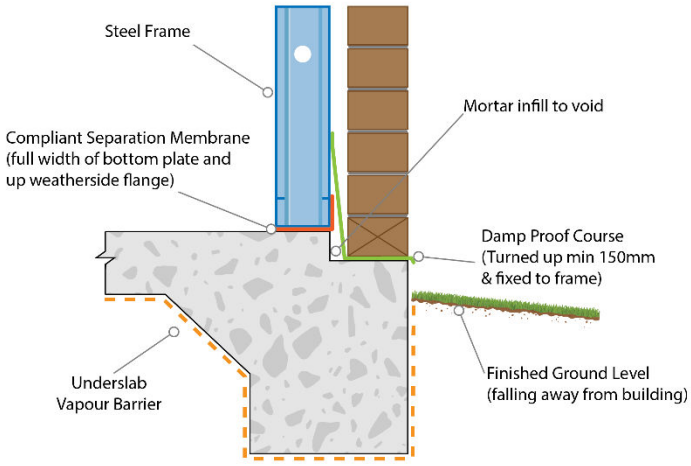

Figure 1. Shallow edge rebates

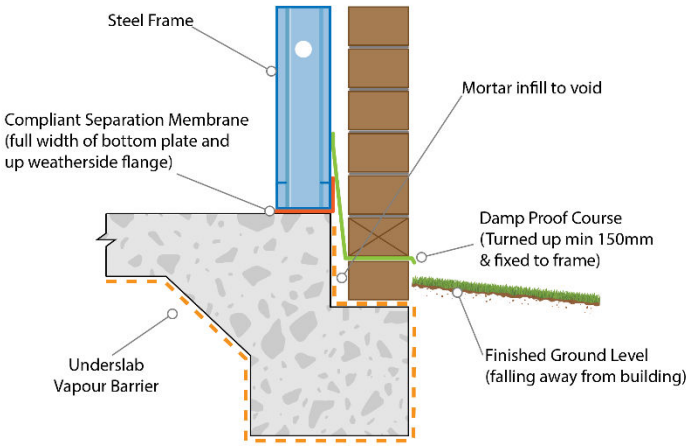

Figure 2. Deep edge rebates

Impermeable membranes should also be employed where TRUECORE® steel framing elements are used in direct contact with moisture-retaining construction elements, such as timber and masonry, in areas where moisture is high, e.g. building external faces. Scenarios may include where timber trusses are installed on steel perimeter wall frames or steel trusses are installed atop double-leaf masonry walls.

Protection under bottom plates for internal wall frames and for all upper storey wall frames is not required.

Termite considerations

Building frames manufactured from TRUECORE® steel are 100% termite and borer proof without the requirement for treatments with insecticides. NCC 2022 Volume 2 (ABCB Housing Provisions) Part 3.4.1 (subject to specific state or local council regulations) recognises that if primary building elements are made from steel, no termite barrier is required.

Wet areas

For waterproofing requirements in internal wet areas, refer to NCC 2022 for the appropriate building type and AS 3740-2021. No additional moisture protection requirements apply to TRUECORE® steel framing used adjacent to internal wet areas.

For waterproofing requirements applicable to external wet areas, such as balconies, the requirements of AS 4654.1-2012 and AS4654.2-2012 must be met.

Membranes

Pliable wall membranes installed at the outer face of the framing have the potential to provide several benefits, including secondary weather protection from moisture and airborne salts. It also allows the frame to be quickly wrapped and protected from the external environment during construction. Wall membranes improve the performance of insulation by minimising the downgrading impact of wind, and can also minimise the potential impact of mortar splash on the frame that may initiate corrosion; see "Incompatible materials" section of this Technical Bulletin.

When a wall membrane incorporates a reflective surface facing an airspace of at least 20mm, it may be recognised as contributing to the overall thermal insulation (R-value) of the built-up wall system. Accordingly, this may reduce requirements to increase bulk insulation for steel-framed wall systems relative to other construction materials. (See section *Insulation*).

Insulation

Building frames made from TRUECORE® steel offer many advantages, including tight dimensional tolerances, which can assist in improving energy efficiency. One example of how tight tolerances can help is by reducing air leakage between the frame and insulating materials when heating or cooling a building.

In many instances, the level of bulk insulation required by NCC 2022 for steel wall frames is the same or similar to those of other construction types. However, depending on the relevant climate zone and building design, there may be slight variation in the methods or materials employed to achieve insulation outcomes for steel frames. (Refer NCC 2022 Vol 2, Part 13.2.5 or NASH Technical Note 6 – *NCC 2022 Elemental Energy Efficiency Solutions Class 1 Buildings (Houses, town houses)*).

When using steel wall frames with cladding materials with low thermal resistance, such as metal, plastic or fibre-cement sheeting fixed directly to the steel frame, then “thermal breaks” are required at all points of contact between cladding & frame. These products may include 12mm EPS or 20mm timber spacers or other material solutions with an R-Value of R0.2 or greater. Thermal breaks are not required where a secondary member (e.g. metal batten) is installed between the frame and the cladding.

Wall ties

The choice of wall ties for masonry veneer construction can be important to the structural performance of a building frame. Galvanized wall ties are suitable for use with steel framing in many situations, although ties manufactured from stainless steel may be required within 1km of 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. This may be achieved through use of an appropriately coated wall tie assembly, or combined with use of an insulating membrane (additional to any pliable wall membrane), between the steel frame and the wall tie.

Roof trusses made from TRUECORE® steel

Ventilation

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

NCC 2022 requires that ventilation of roof spaces be accommodated in some climate zones at both low levels (eaves) and high levels (ridge). These requirements are contained in ABCB Housing Provisions (Part 10.8.3) and should be carefully considered to avoid introduction of excessive airborne salts into the building envelope, especially in marine locations.

In close proximity to marine influences:

- roof design should aim to tightly seal the roof and roof/wall junctions 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 in restricting ingress of air into the roof space at ridge, valleys and gutters as well as providing other benefits;
- use of profile closure strips made of a durable material such as EPDM or similar compatible material under metal roof sheeting will further control air ingress. Any gaps between the wall and fascia or eaves should be sealed, by using appropriate storm mouldings, durable profile closure strips or other methods that serve to prevent uncontrolled transient airflow into the roof cavity;
- 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;
- it is recommended that any ventilation solutions incorporate fluted or convoluted path ventilation devices to reduce the velocity of incoming air. They should also incorporate filter mesh (≤2mm aperture) where larger openings are present to minimise salt ingress into the roof cavity.

Where low level ventilation is incorporated into eave linings exclusively, 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. (See ASI publication *Ventilation in Steel Roofing*.)

Insulation

Insulation of roof spaces with trusses constructed from TRUECORE® steel may be achieved via a number of methods. ABCB Housing Provisions provide options to address the application of bulk ceiling insulation in roof spaces specifically for steel frames in Part 13.2.3.

Deemed to Satisfy provisions for pitched truss roofs with flat ceilings may include:

- increasing specified bulk insulation by a value of R0.5; or
- achieving specified insulation values cumulatively as two courses with the top course offset to cover bottom chords of trusses.

Alternatively, NASH Technical Note No. 6 (*NCC 2022 Elemental Energy Efficiency Solutions Class 1 Buildings*) states that a steel pitched-roof structure with truss spacings in excess of 600mm may not require additional bulk insulation relative to other construction materials. This document also addresses alternate roof designs, such as skillion and cathedral styles.

General Considerations

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 (elevated if possible to avoid pooling water) 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 that any building wrap and/or cladding is installed as soon as possible after the frame is erected. See "*Warranty"* section for more information about warranty eligibility requirements.

Earth the frame

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

Incompatible materials

Frames made from TRUECORE® steel may need to interact directly with a wide range of other construction materials. It is recommended that a separating membrane be used where TRUECORE® steel is in direct contact with materials that retain moisture.

Some materials are considered incompatible for use in direct contact with TRUECORE® steel in all circumstances and must always be used with an isolation method employed. Common examples of materials considered incompatible for direct contact with framing components made from TRUECORE® steel include:

- Copper
- Lead
- Brass
- Stainless steel
- Uncoated/bare steel
- Magnesium Oxide (MgO) based building boards & panels
- 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 an isolation membrane. See section "*Bottom Plate Separation*".

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.

Further advice regarding fastener selection may be obtained from NASH Advisory Note 13 – *Durability of Screws*

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.

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. 6) describes some 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 contact Steel Direct on 1800 800 789 or via email steeldirect@bluescopesteel.com.

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, canals and river estuaries.

Refer to:

Technical Bulletin TB-35 Australian Salt Marine Classifications for marine zone examples and further guidance.

If unsure of the classification or on the border between zones, it is recommended to default to the higher level of protection.

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

Frame isolation requirements	
Level 1	
All structures	• All overhanging roof areas (eaves, patios, verandas etc.) are to be lined/enclosed. • Appropriate wall and ceiling linings to be applied to frames in all internal spaces. • Impermeable membrane installed under all ground-floor perimeter bottom plates for slab on ground construction. • All fasteners used with 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	As per **Level 1**, and: • 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. AND • A pliable membrane (sarking, reflective foil laminate or blanket & foil) is installed beneath the roof, in accordance with **AS 4200.2:2017**. Sarking should be terminated at the gutter appropriate to the low-level ventilation solution installed. (See ASI publication *Ventilation In Steel Roofing*) • **To avoid wicking of moisture:** the blanket layer of blanket & foil membranes must be cut back in all instances to terminate prior to the gutters/valley gutters. 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. OR • Closure of entry points is achieved via mesh*, flashings or durable profile closure strips at fascia, ridge, hip or valley as appropriate.
Tile roofs	As per **Level 1**, and: • 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	As per **Levels 1 & 2**, and: • Wall membrane is installed at the outer face of the wall frame, in accordance with Australian Standard **AS 4200.2:2017**, as soon as practicable after the frame is erected. • Inclusion of mesh* on windward side of marine influence at any vents, weep holes or gaps. • Where roof space ventilators or vents are used, they are not placed on the windward side of marine influence, and they must reduce aerosol ingress by including filter mesh* or by creating a convoluted inlet path.

** Mesh with ≤2mm aperture size, e.g. sand fly mesh is suitable for this purpose.*

Warranty

A warranty may be available upon application, subject to eligibility, for framing made from TRUECORE® steel. The warranty is offered to eligible applicants for residential applications and is subject to terms and conditions. For full terms and conditions and to determine eligibility please 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. Warranty eligibility criteria include (but are not limited to) the following:

1. Construction of the building must meet all requirements of NCC 2022 for the relevant building type.
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 weatherside flange of the bottom plate (see Figures 1 and 2).
3. Fasteners used must be compatible with TRUECORE® steel, offer similar durability 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 the separations appropriately installed and maintained. Some 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.
5. BlueScope does not provide a warranty for frames and trusses made from TRUECORE® steel when installed within 300m of surf or exposed marine influences. Distance is as measured from the high water/tide mark.

Related BlueScope Technical Bulletins

Technical Bulletin TB-2 Overpainting and restoration of exterior BlueScope products

Technical Bulletin TB-10 Cut edge and bend protection of next generation ZINCALUME® steel and COLORBOND® steel.

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 Steel in 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 3700:2018	Masonry structures
AS 3740-2021	Waterproofing of domestic wet areas
AS 4100:2020	Steel structures
AS 4200.2:2017	Pliable building membranes and underlays - Installation
AS/NZS 4600:2018	Cold-formed steel structures
AS 4654.1:2012	Waterproofing membranes for external above-ground use – Materials
AS 4654.2:2012	Waterproofing membranes for external above-ground use – Design and installation

Referenced Industry Documents

NASH Standard Residential and Low-Rise Steel Framing Part 1 – Design Criteria

NASH Standard Residential and Low-Rise Steel Framing Part 2 – Design Solutions

NASH Technical Note 6 – NCC 2022 Elemental Energy Efficiency Solutions Class 1 Buildings (Houses, town houses) – August 2023

NASH Advisory Note 13 – Durability of Screws

Ventilation In Steel Roofing – Approaches to satisfy NCC 2022 Condensation Management requirements for residential roofs in Climate Zones 6, 7 and 8 (Australian Steel Institute & National Assoc Steel-framed Housing, 2023)

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.

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. © 2024 BlueScope Steel Limited ABN 16 000 011 058. All rights reserved.