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Subject:
Robust Building System

Certificate holder:
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The master copy of this document appears on the website:
<http://www.agrement.co.za>

Validity

Users of any Agrément certificate should check its status: all currently valid certificates are listed on the website. In addition, check whether the certificate is [Active or Inactive](#).

The certificate holder is in possession of a confirmation certificate attesting to his status.

SANS 10400 –The application of the National Building



Quick guide

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Use

The certificate covers the use of the Robust Building System in all areas of South Africa for the erection of single and as an infill panel in multi storey buildings for the uses (**SANS 10400** : Table 1 of Regulation A(20)(1)) set out below:

- places of instruction (A3)
- moderate and low-risk commercial service buildings (B2 and B3)
- moderate and low-risk industrial buildings (D2 and D3)
- places for correctional or mental use (E1)
- Institutions for mental or physical incompetence (E3)
- large shop (F1)
- small shops (F2 and F3)
- offices (G1)
- dormitories (H2)
- semi-detached and row houses (H3)
- dwelling houses and related outbuildings (H4).

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This certificate and Agrément South Africa's assessment apply only to Robust buildings that are designed, manufactured and erected as described and illustrated in this certificate, and where the terms and conditions of certification are complied with.

General description

In Single storey buildings Robust building system consists of:

- Conventional strip foundation, conventional cast in situ concrete surface beds with thickened edge beams and thickening under internal walls
- walls constructed of factory produced expanded metal panels supported with additional reinforcing, to which mortar is applied on both faces. Mortar is applied to panels either by hand or mechanical packing. Mechanically applied mortar may be applied wet (pumped) or dry (gunited). Both faces of core are plastered.
- conventional roof construction and roof coverings
- Where the Robust System is to be used in the Southern Coastal Condensation Problem Area, insulated ceilings are installed in all cases and outer walls are given an additional external finish of Perlite plaster. The walls must be 130 mm, excluding 13 mm thick additional plaster on the outside.
- In multi storey structures the Robust panels are used as infill panels and are designed and constructed under the supervision of a professional competent engineer.

NB: All aspects of timber roof trusses apply to light gauge steel roof trusses except for a truss hanger, custom designed for the Robust building system. (Supplied by MiTek.)

Conventional trusses are cut into core and secured with truss hangers to the core with M10 nuts and bolts or can be tied to core with conventional hoop iron embedded 600mm into core, bent over rafter

Timber roof truss

Y10 horizontal reinforcing bars placed above all window openings and under all roof truss beams

Y10 horizontal reinforcing bars placed under all window openings overlapping 300 mm on both sides of opening

Y5.6 mm bar, 450 mm long, epoxy or silicon grouted 150 mm deep into foundation slab at 300 mm centres

Min 51 mm to max 63.5 mm steel bottom track tied to Robust core with 1.6 mm galvanised binding wire

Detail B

Robust expanded metal core panel

Window frame

Note:
All dimensions in mm.

115

Ref 100 or Ref 193 Reinforcing mesh tied to both sides of core through panels with 2.5 mm wire

250 micron damp-proof membrane or bitumin paint damp-proof course

25 mm thick screed

Ground level

150 min

300 min

250 micron damp-proof membrane

Thickened edge beam

Typical vertical section through foundation, external wall and roof structure

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PREAMBLE

This certificate was issued by Agrément South Africa in terms of the powers granted to it by the Minister of Public Works. It replaces Certificate 99/272 granted on 2 August 2000.

The present amendment allows for the system to be used in the Southern Coastal Condensation Problem Area and the use of the system in multi-storey applications with approval and responsibility of a registered competent person.

This certificate with subsequent amendments:

- has been granted after a technical appraisal of the performance of Robust Building System buildings for the uses covered by the certificate,
- is independent of any patent rights that may or may not subsist in the subject of the certificate, and
- does not relieve the certificate holder from the obligation to obtain the prior approval of the building authority concerned for the use of the subject

Agrément South Africa considers that the quality and performance of the Robust Building System will be satisfactory provided that the requirements stipulated in this certificate are adhered to. However, Agrément South Africa does not on behalf of itself, or the State, or any of its employees or Agents, guarantee such quality or performance.

Responsibility for compliance with the requirements of this certificate and the quality of the finished buildings resides with the certificate holder.

No action for damages, or any other claim whatsoever, lies against Agrément South Africa, its members, the State or any of its employees should the said components and materials fail to comply with the standard set out in this certificate.

Building authorities or users who are in any doubt about any detail or variation, should contact [Agrément South Africa](#).

The validity of this certificate is reviewed every three years. The certificate shall remain valid as long as Agrément South Africa is satisfied that:

- the certificate holder complies with the general and specific conditions of certification and the technical requirements stipulated in the certificate,
- the performance-in-use of the subject is acceptable, and
- any changes in building legislation, regulations, relevant standards or Agrément performance criteria have not invalidated the technical assessment which formed the basis of certification.

Republic of South Africa. *National Building Regulations*, Government Notice R. 2378, Government Gazette No 12780, Pretoria, South Africa, 12 October 1990

Agrément South Africa reserves the right to withdraw the certificate at any time, should reasonable cause exist.

Notices affecting the validity of this certificate will be published in the *Government Gazette*.

PART 1: CONDITIONS OF CERTIFICATION

Licensee - any person or company appointed by the certificate holder and registered with Agrément South Africa to construct Robust Building System buildings in accordance with this certificate and authorised by him to claim compliance with the certificate. It is the certificate holder's responsibility to ensure that the licensee carries out the work in compliance with this certificate and in accordance with the approved quality system.

The Robust buildings described in this certificate must be:

- designed, manufactured and erected by the certificate holder or a licensee, registered with Agrément South Africa
- constructed in accordance with the technical description (see [Part 3](#)) and the certificate holder's detailed specifications and quality assurance manual
- comply with the Conditions of Certification.

The Robust Building System is a single-storey structure constructed under the control of a professional engineer or approved competent person who:

- prepares a rational design that:
 - ensures the structural integrity of the entire building
 - adheres to the conditions of certification of this certificate and the certificate holder's specification and quality management documentation and
- monitors those aspects of the works that are covered by the rational design, to verify that the design is being correctly interpreted and that the construction techniques being used are appropriate.

Any person required to check on details of construction must refer to the documentation listed above, which is available from the certificate holder.

The Robust Building System is a combination of innovative and conventional construction. A change to any one aspect could result in one or more of the other aspects no longer complying with Agrément South Africa's performance criteria. For these reasons, no change may be made to the Robust Building System as described and illustrated in this certificate unless such change is approved in writing by Agrément South Africa before it is implemented.

SANS 17050-1: Conformity assessment-Supplier's declaration of conformity Part 1: General requirements.

SANS 17050-2: Conformity assessment-Supplier's declaration of conformity Part 2: Supporting documentation.

Robust Structures (Pty) Ltd shall be responsible for the accuracy of the information contained within the Material Data Sheets, Technical Data Sheets and Material Performance Specifications, and all other information pertaining to the supply and application of Robust Building System. Robust Structures (Pty) Ltd shall submit a COA (Certificate of Analysis) and COC (Certificate of Compliance) in terms of the requirements stipulated in **SANS 17050-1** Suppliers declaration of conformity when requested by Agrément South Africa in accordance with the documentation requirements of **SANS 17050-2**. Should Robust Structures (Pty) Ltd change or substitute any ingredient in the formulation of the product in question, then a notification shall be addressed to Agrément South Africa immediately.

Robust Building System

Tested and approved fit for purpose when constructed as specified in

CERTIFICATE 1999/272

(Amended August 2007)



General conditions

Marking

A plaque at least 100 mm x 75 mm, with Agrément South Africa's identification logo together with the number of this certificate, as depicted opposite, must be fixed at an appropriate position externally of all Robust Building Systems.

Reappraisal

- must be requested by the certificate holder prior to implementing changes to the building system
- will be required by Agrément South Africa if there are changes to the National Building Regulations or to Agrément criteria

This certificate may be withdrawn if the certificate holder or a registered licensee fails to comply with these requirements.

Validity

The continued validity of this certificate is subject to a satisfactory review by Agrément South Africa every three years.

Quality monitoring

The certificate holder is required to participate in Agrément South Africa's post-certification quality management system, which requires:

- that the certificate holder shall continue to implement and manage the quality system approved by Agrément South Africa in the assessment of the Robust Building System
- the co-operation of the certificate holder in facilitating post-certification quality monitoring by Agrément South Africa or its authorised agents.

The conventional aspects of the construction are subject to the rules of good building practice (typically as described and illustrated in Agrément South Africa's [Supplement to certificates](#) and in the *Home building manual Parts 1, 2 & 3* issued by the National Home Builders Registration Council), and must comply with the National Building Regulations.

Requirements of Supplement to certificates that must be met

The [Supplement to certificates: good building practice](#) (revised 2001) applies to those conventional aspects of the Robust Building System that have not been specifically assessed (see Part 2: *Scope of assessment* on next page). Cognisance should be taken of the recommendations contained in the *Supplement to certificates* to ensure that an acceptable standard of construction is consistently maintained.

On behalf of the Board of Agrément South Africa

Chairman
August 2007

PART 2: ASSESSMENT

Scope of assessment

This assessment applies to those innovative aspects of the Robust Building System described in [Part 3](#) of the certificate. It also applies to those conventional aspects of the building system which, in the opinion of Agrément South Africa, are influenced by the innovative aspects. The innovative aspects referred to are:

- the method of erecting walls consisting of prefabricated zig-zag expanded metal panels onto which mortar is applied either by hand-packing or by mechanical means;
- in the Southern Coastal Condensation Problem Area. (SCCP Area), the application of an additional finish of 13 mm of Pratliperl plaster to the external face of outer walls;
- the method of joining adjacent panels;
- the method of strengthening walls by including additional reinforcement;
- the method of anchoring walls to foundations;
- the method of anchoring roof trusses to walls
- use of Robust building system as infill panels in multi-story structures.

Assessment

In the opinion of Agrément South Africa, the Robust building system as described in the certificate is suitable for the construction of buildings of the [types specified](#) (page 1).

The performance in use of buildings erected with this system will be such that they will satisfy:

- the relevant requirements for safety and health prescribed by Agrément South Africa
- where stated in Table 1, the requirements of the National Building Regulations
- Agrément South Africa's performance criteria and requirements for durability and habitability.

Agrément South Africa's detailed comments on the assessment are set out in Tables 1 and 2 below. Each aspect of performance was assessed by experts in that field.

Compliance with National Building Regulations

The innovative aspects of the Robust Building System relate to the National Building Regulations as set out in Table 1. Any regulation not specifically referred to is considered to be outside the scope of this certificate and must be applied by the local authority in the normal manner.

For details see Agrément South Africa's [Assessment criteria: building and walling systems](#).

Table 1: Safety and health

Aspects of performance	Opinion of Agrément South Africa	National Building Regulations satisfied
<i>Fitness-for-purpose of materials used</i>	The materials described in Part 3 meet the requirements of the regulations.	A13(1)(a) Materials
<i>Behaviour in fire</i>	<p>Walls are classified type FR (non-combustible) with a fire-resistance rating of 60 minutes.</p> <div data-bbox="384 647 691 797" style="border: 1px solid green; padding: 5px; margin: 10px 0;"> <p>SANS 10400 – The application of the National Building Regulations</p> </div>	<p>K4 Walls, J1(1)(B), T1(1)(b) and (c) and in so far as the walls are concerned, T1(1)(b) is satisfied. They are also deemed to satisfy the regulation T1(d) in so far as the walls are concerned.</p> <p>Comments made in the section on Supplement to certificates must be taken into account when building plans are scrutinized by local authorities to check compliance with Regulations T1(1)(a), T1(1)(d) with regard to spread of smoke, and T1(1)(e).</p> <p>The following deemed-to-satisfy rules of Section 3 of SANS 10400 have been met: TT5.1(c) ,TT5.2(c) and with regard to occupancy and tenancy separating elements and party walls between adjoining dwellings units, 90 mm thick Robust walls built up to the underside of roof coverings,TT6, TT8 and TT9</p>
<i>Structural performance</i>	Satisfactory, provided the requirements of this certificate are complied with.	<p>K1, K3 & K4 Walls</p> <p>Regulations B1(1) and (2) are deemed to be satisfied:</p> <p>When Robust buildings are built in accordance with the dimensional limitations given in <i>PART 3: Technical Description</i> of this certificate.</p> <p>When these limitations are not complied with, the structural design and erection of each building is the responsibility of a professional engineer or approved competent person and deemed-to-satisfy rule BB4 of SANS 10400 is applicable.</p> <p>Regulations H1(1) and (2), <i>Foundations</i>, are deemed to be satisfied as follows:</p> <p>H1(1) on non-problematic soils;</p> <p>H1(2) in all buildings where foundations are designed by a professional engineer or approved competent person and deemed-to-satisfy rule HH1(a) applies.</p>
<i>Water penetration and rising damp</i>	Satisfactory. Robust buildings meet Agrément South Africa’s criteria for resistance to water penetration and rising damp throughout South Africa.	<p>K2 Walls</p> <p>J1(4) Floors</p> <p>L1(b) and (c) Roofs</p>

Table 2: Habitability

Aspects of performance	Opinion of Agrément South Africa	Explanatory notes
Thermal performance and energy usage	<p>Satisfactory. External walls were assessed as having R-value of 0.422 m²K/W.</p> <div data-bbox="352 539 740 786" style="border: 1px solid green; padding: 5px;"> <p>SANS 10400 XA-2011: <i>The application of the National Building Regulations Part X: Environmental sustainability Part XA: Energy usage in buildings</i></p> </div>	<p>When neither artificial heating nor cooling is applied to 53 m² Robust Building System dwellings with insulated roofs, minimum and maximum temperatures will be similar to those occurring in standard buildings.</p> <p>The annual energy requirement and energy demand of a 53 m² Robust Building System dwellings with roofs of sheet metal or concrete tiles was determined using BSIMAC (version 9) software and provided they are insulated in accordance with the requirements of Clauses 4.4.5.3 and 4.4.5.4 of SANS 10400 XA, their performance was assessed as being more than that of standard brick house, meeting the requirements of Clause 4.2.1 b) of SANS 10400 XA.</p> <ul style="list-style-type: none"> • Robust Building System roofs must be always insulated.
Energy Usage	<p>The energy required in winter to heat Robust Building System dwellings when insulated ceilings are installed will be better than that required for a standard brick house.</p> <p>NB. Insulated ceilings must be installed in all instances.</p> <div data-bbox="339 1285 727 1397" style="border: 1px solid green; padding: 5px;"> <p>SANS 204-2011: <i>Energy efficiency in buildings</i></p> </div>	
Condensation	<p>In order for the Robust system to meet Agrément criteria in the SCCP Area:</p> <ul style="list-style-type: none"> • dwellings must be fitted with 40 mm glass wool (or equivalent) insulated ceilings • outer walls must be at least 30 mm thick (as specified for coastal applications) and in addition be given an additional 13 mm Perlite finish externally. 	<p>Condensation is generally a problem in the Southern Coastal Condensation Problem Area (SCCP Area). The assessment of this aspect of performance applies only to dwellings in this area. Agrément South Africa requires that the minimum standard of performance be equivalent to that of the standard brick dwelling which is itself not immune to condensation problems.</p>

<p>Acoustic performance</p>	<p>Satisfactory. Agrément South Africa's performance criteria for sound attenuation between adjacent rooms and between adjacent dwellings have been met.</p> <div data-bbox="379 338 726 512" style="border: 1px solid green; padding: 5px; margin: 10px auto; width: fit-content;"> <p>SANS 10218: Part 1 – Acoustical properties of buildings</p> </div>	<p>Agrément South Africa's opinion is based on data from in situ airborne sound attenuation tests. The minimum weighted standardised level difference for internal walls where the different methods of construction are used has been assessed as follows:</p> <p>Plastered pumped mortar, wet mix 50 dB(DnT,w);</p> <p>Hand-placed mortar or mechanically applied wet mortar (pumped) core, plastered: 49 dB(D_{nT,w});</p> <p>Mechanically applied dry mortar (guniting), unplastered: 46 dB (DnT,w).</p> <p>These values meet Agrément South Africa's criteria and most of the recommended sound insulation values set out in SANS 10218: Part 1.</p> <p>A description of the degree of acoustic privacy that can be expected between specific rooms for various degrees of sound insulation is given in Supplement to certificates.</p>
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Table 2: Habitability (continued)

<p>Durability</p>	<p>The durability of Robust buildings will be satisfactory provided that the precautions listed in <i>PART 3: Technical Description</i> of this certificate is followed and provided buildings are regularly and adequately maintained.</p>	<p>Some minor surface cracks (hair-line cracks) may be expected to appear on external wall surfaces, particularly under windows and door frames; however such cracks have no structural significance and will not result in rainwater penetration provided the walls are properly maintained.</p> <p>In order to prevent corrosion of reinforcement in walls of buildings erected in severely corrosive environments (which include coastal areas up to 15 km inland from the sea and in industrial areas subject to corrosive fumes), mortars must be designed to meet the durability index limits set for oxygen permeability, sorptivity and chloride conductivity and referer to in <i>PART 3: Technical Description</i> of this certificate.</p>
<p>Quality Management System</p>	<p>The certificate holder's quality management system complies with Agrément South Africa's requirements. Properly applied, it will ensure that quality in design and erection of buildings and manufacture of buildings will be consistently maintained.</p>	<p>Agrément South Africa's requirements are based on SANS 9001</p> <div data-bbox="1050 882 1394 1008" style="border: 1px solid green; padding: 5px; margin: 10px auto; width: fit-content;"> <p>SANS 9001 'Quality management systems – Requirements'</p> </div>

PART 3: TECHNICAL DESCRIPTION

GENERAL DESCRIPTION

The walls of the robust building system are constructed of factory produced expanded metal panels which are erected on site, with additional reinforcement where specified; mortar is applied to both faces of the panel to form cores. Depending on the method of mortar application, the walls may be plastered.

In non-corrosive environments, external walls are 115 mm thick and may be constructed using either hand-applied or wet mix (pumped) mortar and plastered or using a dry mix (gunited) mortar.

In severely corrosive environments, which include coastal areas up to 15 km inland from the sea and industrial areas subject to corrosive fumes, external walls are 130 mm thick and are constructed using wet mix (pumped) mortar and plastered core method only.

In the Southern Coastal Condensation Problem Area (SCCP Area), external walls are 130 mm thick and constructed in a manner similar to that specified for use in severely corrosive environments above, but are in addition given an external finish of 13 mm of Pratliperl plaster. Buildings specified for the SCCP Area is also fitted with 40 mm glass wool (or similar) insulated ceilings.

In all areas internal walls are 90 mm thick.

Surface beds with thickened edge beams and thickened under internal walls, and roof construction and roof covering are conventional.

MANUFACTURE OF ROBUST PANELS

Robust panels are manufactured from 0,4 mm thick commercial quality mild steel sheeting suitable for the manufacture of expanded metal. Sheets are punched, expanded and formed into a zig-zag profile with a pitch of 100 mm and amplitude of 50 mm. At apexes and valleys of the profile, a 13 mm deep V of expanded sheet metal occurs.

Panels are manufactured as sheets of 430 mm wide and between 1200 mm and 6000 mm high.

DESIGN REQUIREMENTS

Dimensional limitations applicable to this system, beyond which a competent person will be called in to design and oversee erection, are as follows.

- | | |
|---|-------|
| (a) maximum height of eaves walls | 3,0 m |
| (b) maximum height to apex of gable walls | 5,0 m |
| (c) maximum length of gable or eaves walls between lateral support | 6,0 m |
| (d) walls offering lateral support shall extend at least to eaves height and comprise intersecting walls which: | |
| • intersect the supported wall at an angle of 90° | |
| • have a thickness of not less than 90 mm | |
| • have a length projecting beyond the face of the supported wall of not less than the greater of 500 mm or one half of the sum of | |

adjacent panel lengths in the case of intermediate supports or one half of the panel length for a corner support, as appropriate, divided by 2.5

Where such lateral support incorporates an opening, the length derived in accordance with the above shall be extended by the length of such opening;

(e) trusses are secured to eaves walls by truss hangers, to Robust Core material before mortar application. (see Figure 4)

(f) maximum length of window openings in eaves and gable walls: 3,0 m
Robust acts as a concrete lintel over all openings

(g) minimum length of external wall between:

- door and window openings,
- adjacent window openings or,
- openings and the ends of walls: 0.5 m

(h) minimum depth of ring beams to external walls, above door and window opening: 0.3 m

(i) maximum distance between movement joints: 10,0 m

ERECTION

Foundation slab, wall anchorage and damp proof-courses

A competent person classifies the site in accordance with the site class designation set out in Table 3 of the South African Institute of Engineering Geologists (SAIEG) publication *Guidelines For Urban Engineering Geological Investigations*.

In normal ground conditions (site class designation H or R) buildings are erected on conventional cast in situ concrete surface beds with thickened edge beams and under internal walls. Slabs are cast on a 0, 25 mm thick polyethylene damp-proof membrane complying with requirements of **(SANS 952 / Agrément South Africa certificated products)**, on a levelled and compacted surface. The concrete has a characteristic compressive strength of 25 MPa at 28 days.

In abnormal or problematical ground conditions, a raft foundation is designed by a professional engineer or other competent person.

Before Robust panels are erected, an 0,25 mm thick damp proof membrane or a layer of bitumen paint between 0.3 mm and 0.5 mm thick is applied to the area of slab directly under all walls. The width of the damp proof membrane will be determined by the final thickness of the wall. 130 mm, 115 mm or 90 mm.

450 mm long, Y5,6 mm starter bars are epoxy grouted or siliconed, 150 mm into slabs at 300 mm centres along the centre line of wall after erection of Robust core walls.(see Figure 3).

A 25 mm thick floor screed is provided in all cases.

Placing and staying of Robust Building System

Robust panels are erected and placed directly onto damp proof membrane on the demarcated foundation slabs. During erection, the Robust support arm jig system is used to ensure that panels are erected straight and plumb. Adjoining panels and panels that meet at corners and T-junctions are wired together with 1.6mm diameter wire or secured to each other with 16 mm drywall screws at 300 mm centres over the full height of the wall.

SANS 952 –The application of the National Building Regulations

Vertical butt joints between adjoining panels are reinforced with a 400 mm wide strip of mesh Ref 156 tied over the joint on each face of the panels.

Panels may be lengthened in height by overlapping the ends of the panels by at least 300 mm.

Roof trusses must be installed before applying mortar to the walls to further stiffen the wall panels.

In the case of a roof slab walls must be mortared before casting of slab.

Roof construction and connection of roof members to tops of eaves walls

Timber roof members are designed in accordance with the requirements of **SANS 10163**. Where gable walls are specified, trusses are installed not closer than 150 mm from the face of gable panels to allow adequate core filling behind roof members.

Roof members are secured to eaves walls with galvanised coated truss hangers or conventional hoop iron fixed to Robust Core before mortar application (see Figure 4(a)).

All alternative roofing systems such as light gauge steel roof trusses need to be designed in accordance with the requirements of **SANS 10163**. Trusses at gable walls are installed not closer than 150 mm from the face of gable panels to allow adequate core filling behind roof members.

Roof members are secured to eaves walls with galvanised truss hangers as specified and supplied by truss manufacturer and fixed to Robust Core before mortar application or alternatively with conventional hoop iron (see Figure 4(b))

All trusses must have an engineer's certificate.

Windows and Doors

Window and door openings are cut out after core erection but before mortar application. These openings are in turn supported by either the window and door frames fixed to the core or a window and door jig shuttering system prior to mortar application.

Door and window frames are conventional and may be of timber, aluminium or steel. Frames are set in position, securely braced and strutted before being built into the wall as core filling and plastering proceeds (see Figure 8).

Installation of services

Conventional services such as conduits, pipes and wires may be built into surface beds and walls during construction. With the Robust Building System all services are tied to the Robust core with 1,6 mm wire prior to mortar application. Where panels are cut to accommodate these services, additional mesh Ref 156 is tied over the back of affected areas. Pressure tests of water and drainage pipes are essential before mortar is applied to Robust core panels.

Additional reinforcement to tops of eaves walls, gable walls and around window and door openings (see Figure 6)

Before applying mortar to the metal panels, additional reinforcement is tied to each face of panels as follows:

Option1:

- Y5,6 bars horizontally:
 - Transversely over full face of wall panels placed at maximum 550 mm centres
- one Y10 bar horizontally:
 - on eaves walls between window and door head height, and the underside of roof members
 - on gable walls at mid-height of gable triangles
 - below window openings such that bars extend 300 mm beyond each side of openings
- one 1 m long Y10 bar vertically on gable walls
 - adjacent to window and door openings
 - at each side of gable walls. These bars are cranked centrally to suit the sloping top edge of gables
- 400 mm wide strips of mesh Ref 100:
 - over the full height of butt joints between panels
 - diagonally across the bottom corners of all window openings
- Y5,6mm L-bars, as single bars or in pairs, at 600 mm centres over the full height of walls at L and T wall junctions

Mortar and plaster

All mortar and plaster mixes, other than the Pratliperl plaster used as an additional finish in the Southern Coastal Condensation Problem Area, are designed by a competent person or agency to suit locally available materials and conditions of exposure. In non-corrosive environments, mortar and plaster must have a 28-day characteristic compressive strength of 10 MPa. In severely corrosive environments, mortar and plaster mixes are designed to meet the following durability index limits:

- | | |
|-----------------------------|-------------|
| • Oxygen permeability (OPI) | ± 10 |
| • Sorptivity | < 8 mm/vh |
| • Chloride conductivity | < 1,5 mS/cm |

and may have a specified 28-day characteristic strength of 15 MPa or higher (as determined by mix designer). In practice these values are usually determined from samples cored from laboratory prepared cubes; however, the density of plaster once applied to walls may be a far lower. To verify the laboratory prepared samples approach, the wet density of cores taken from the walls or from site-applied test panels must exceed 95% of the wet density of laboratory prepared samples. (To simulate wet density in cored wall samples, it is necessary to soak cores for at least 48 hours before determining the density). Alternatively, core samples from site-applied test panels can be used to confirm compliance of these samples with the durability index criteria above.

Once an acceptable mix for corrosive environments has been established, the relationship between compressive strength and the desired level of durability index is established and the compressive strength of mortars and plasters monitored.

In severely corrosive environments where mix requirements are more onerous and the need for site control essential, mix constituents are weigh-batched and mechanically mixed at a central point.

Forming wall cores of Robust Building system

Cores of Robust walls can be formed by applying mortar to Robust panels by one of the following three methods:

- mechanical application of wet mix (pumped) mortar
- hand-applied mortar, or
- mechanical application of dry mix (guniting) mortar.

In the first method of forming wall cores, that is, the mechanical application of wet mix (pumped) mortar,

a thin blinding coat is applied to both sides of the Robust panels; next, the core is formed by filling both sides of the panels to slightly above the level of the horizontal reinforcement and any additional mesh reinforcement with long-handled rubber squeegee or similar tool.

In the second method of forming wall cores, that is, the hand applied method, pure cement slurry is first flicked onto both faces of panels using a long-haired block brush. Mortar is then applied by hand to both sides of the panels to slightly above the level of reinforcement and stuck off, as above.

In the third method of forming wall cores, that is, the mechanical application of dry mix (guniting) mortar, mortar is applied to panels in a continuous operation until the specified total wall thickness is achieved. Guides are attached to panels to ensure that the specified cover to reinforcement is obtained.

The finished surface of the outer face of external walls overhangs the edge of the foundation slab by 15 mm. Mortar can be scratched to a rough finish or plastered should a smooth finish be required.

Plastering of walls (excluding walls in the SCCP Area)

Where panel cores have been filled with either a mechanically applied wet mortar mix or by hand-packing, a plaster finish is applied to both faces. In non-corrosive environments plaster will have a 28-day characteristic compressive strength of 10 MPa; however, in severely corrosive environments higher characteristic strengths may be specified.

Depending on the thickness of plaster required, it may be applied in more than one layer, with the surface of the underlying layers scratched to provide a key.

Screed gauges are used to ensure correct plaster thickness. Surfaces must have at least achieved initial set before a subsequent layer of plaster is applied. The finished surface of the outer face of external walls is to overhang the edge of the foundation slab by 15 mm.

Final plaster layers are given a float finish to required preference.

Plastering of walls in the SCCP Area

Over and above the requirements given above, Robust dwellings erected in the Southern Coastal Condensation Area are given an additional 13 mm-thick Pratliperl plaster finish to the external face of 130 mm thick outer walls.

Perlite is mixed in the ratio 4,5:1, that is, 1,5 bags of pre-treated Perlite (150l) to 1 pocket of cement (33l). Perlite and cement are thoroughly mixed with preference given to mechanical mixing, where possible. Cements with a low rate of strength less than 32,5 MPa are not used.

Basecoat mixes must be allowed sufficient time to reach dimensional stability before the Perlite plaster is applied and the surface of basecoats is properly roughened to provide a key for the subsequent plaster coat.

The Perlite plaster is trowelled and finished using standard plastering techniques to required preference.



Cover to reinforcement

Cover to reinforcement given below excludes cover provided by perlite plaster in the SCCP Area.

In non-corrosive environments 38 mm of cover of zig-zag is applied to the outer face of external wall panels (resulting in a minimum cover to reinforcement of 28 mm). In severely corrosive environments 53 mm of plaster is applied (resulting in a minimum cover to reinforcement of 40 mm). In both cases 27 mm of plaster is applied to the inside face of Robust panels in external walls and 20 mm of plaster is applied to each face of Robust panels in internal walls (resulting in a minimum cover to reinforcement of 17 mm).

Curing of walls

Newly constructed walls are kept continuously damp by spraying them with water for seven days.

Waterproofing of walls

One coat of waterproofing sealer (paint or brush coat) is applied to the outer face of all external walls and internally to bathroom walls.

The waterproofing sealant must be applied strictly in accordance with the manufacturer's specifications.

Attachment of fittings

Heavy-, medium- and light-weight fittings are secured to walls using conventional fixings.

Ceilings

Ceilings with 40 mm glass wool insulation, or equivalent, are to be installed in all buildings erected in the SCCP Area. Elsewhere, ceilings and ceiling insulation are optional.

Ceilings, where specified, are conventional and normally consist of either fibre-cement or gypsum board fixed to brandering.

Finishes

The outer surfaces of external walls are always finished with two coats of exterior grade acrylic paint.

Internal walls and ceiling, where provided, are given two coats of interior grade acrylic paint,

Other finishes are to the client's requirements.

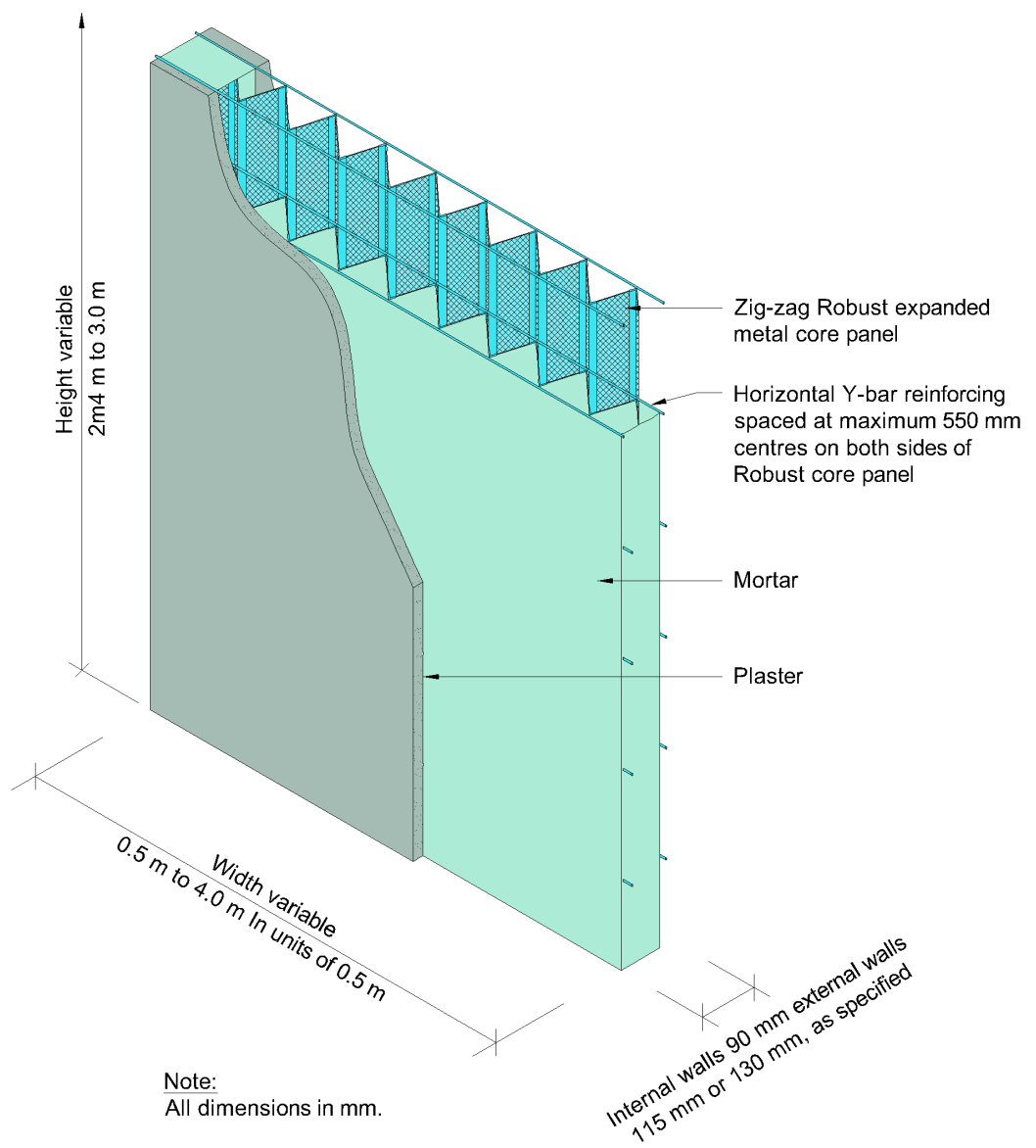


Figure 1: Isometric view of Robust wall panel

NB: All aspects of timber roof trusses apply to light gauge steel roof trusses except for a truss hanger, custom designed for the Robust building system. (Supplied by MiTek.)

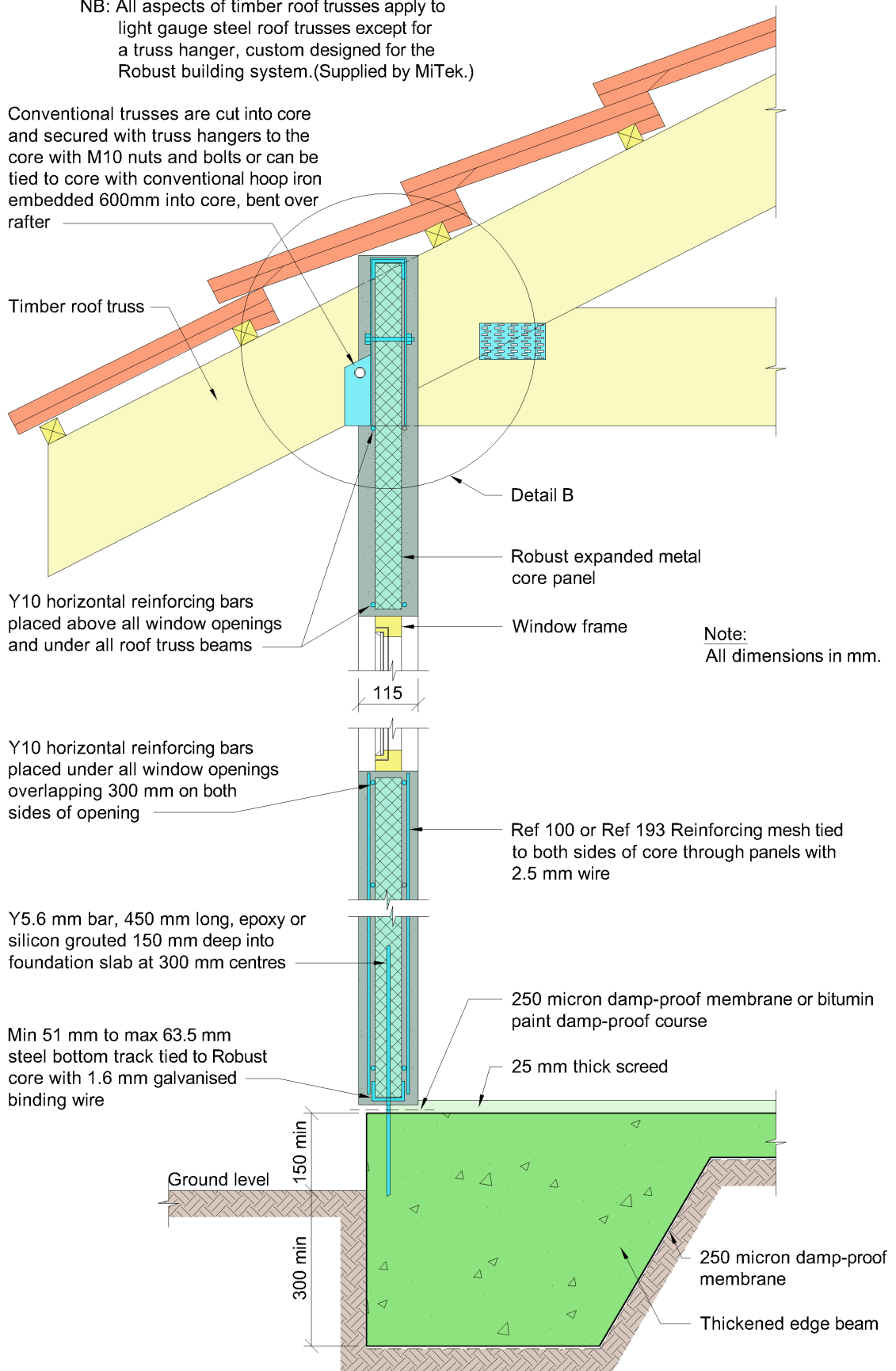
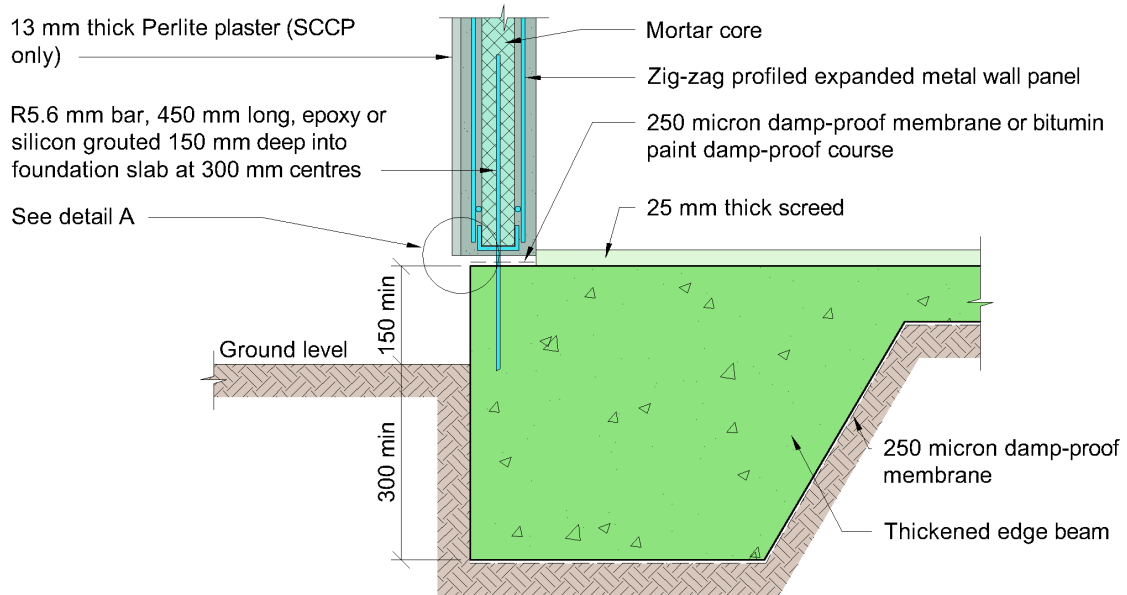
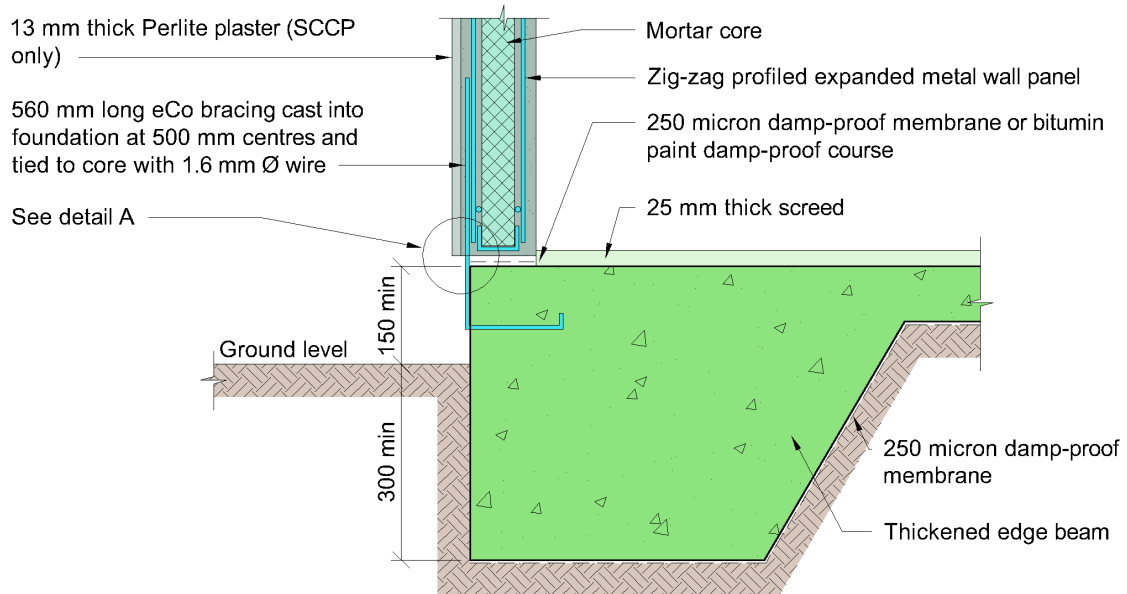


Figure 2: Typical vertical section through foundation, external wall and roof structure



(a) Foundation incorporating R5.6 mm anchor bars



(b) Foundation incorporating eCo bracing

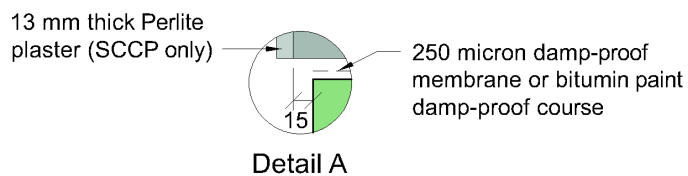
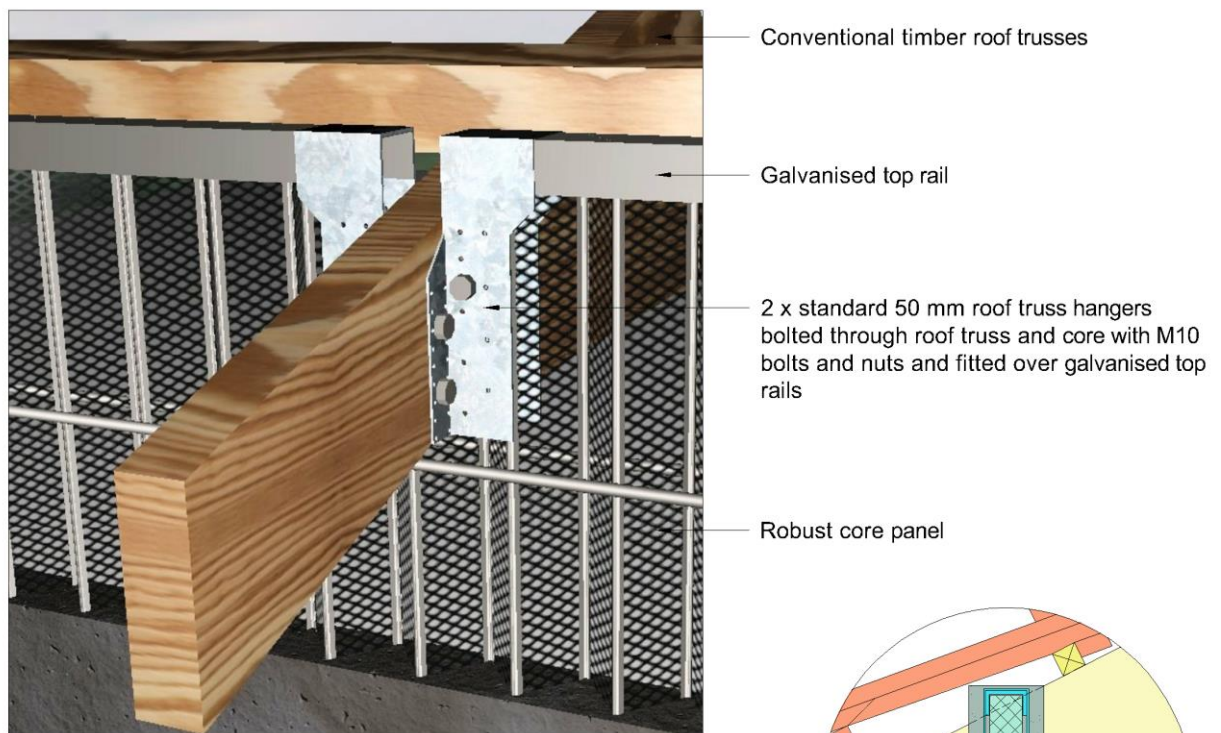
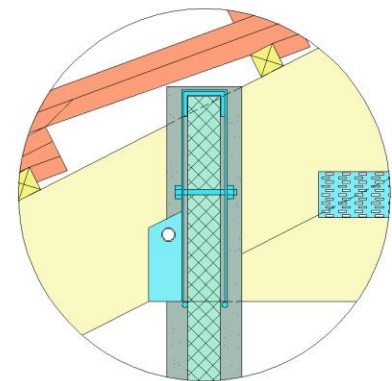


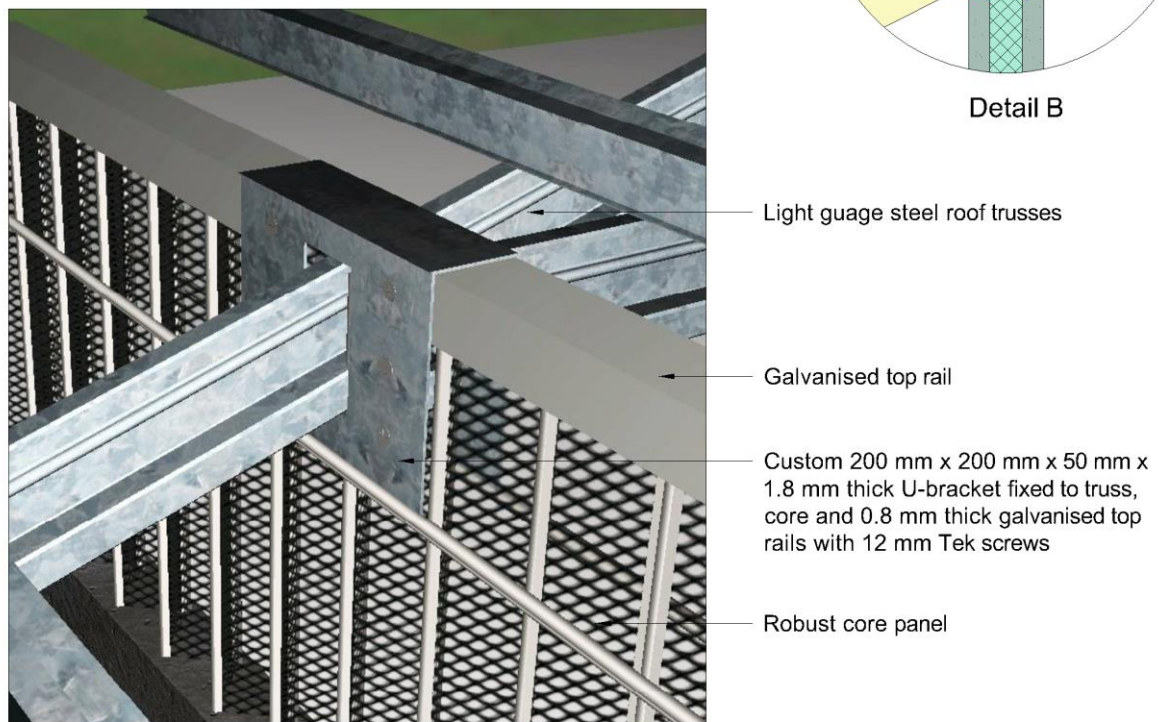
Figure 3: Typical vertical sections through foundations showing alternative anchoring details



(a) Perspective view of timber truss fixture

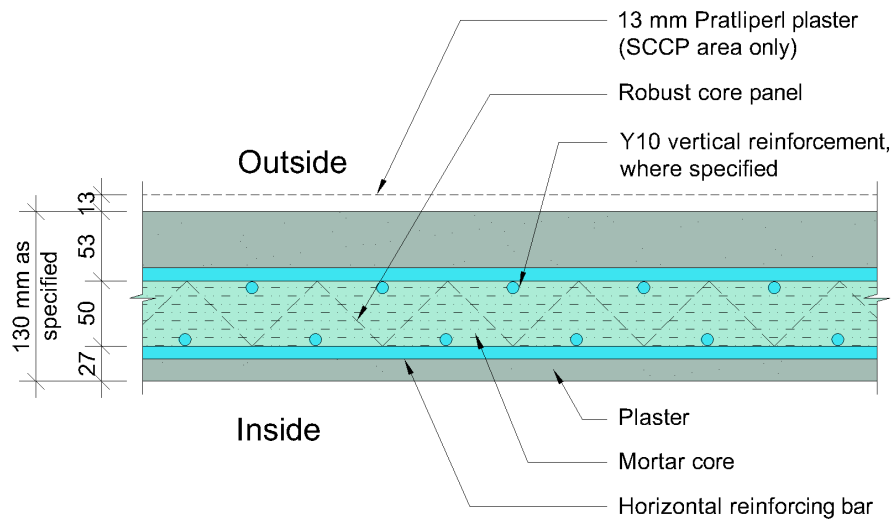


Detail B



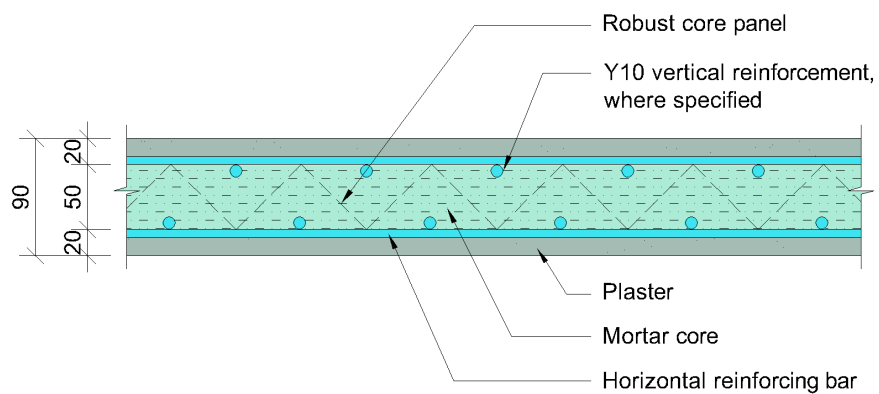
(b) Perspective view of light gauge steel truss fixture

Figure 4: Typical connection of roof members to top of eaves walls



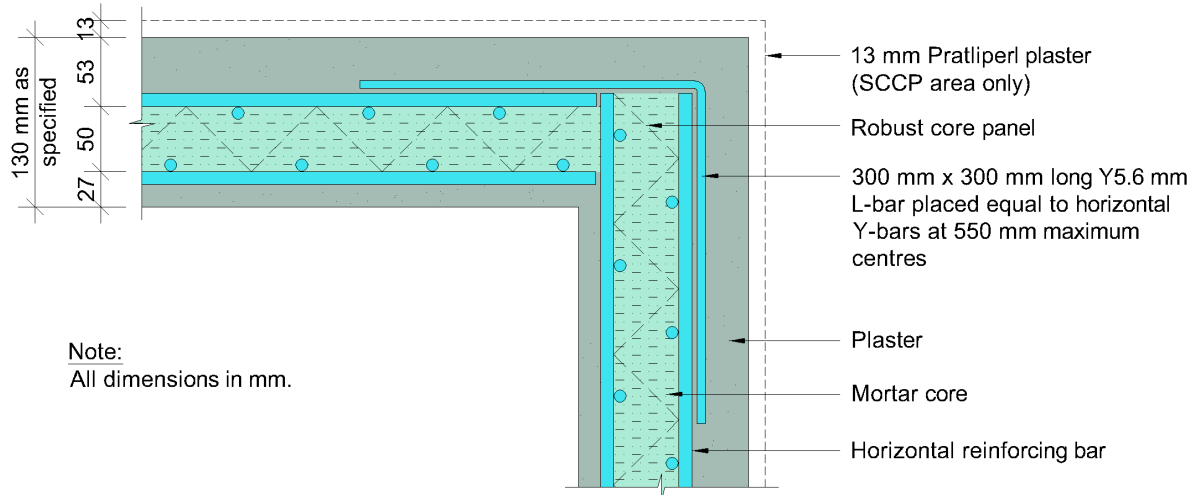
(a) Horizontal section through external wall

Note:
All dimensions in mm.

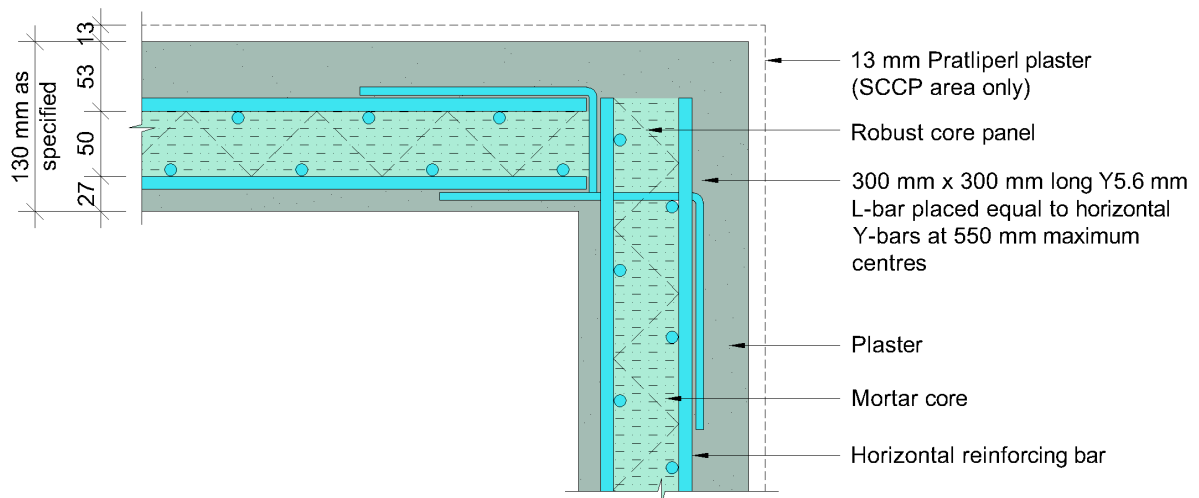


(b) Horizontal section through internal wall

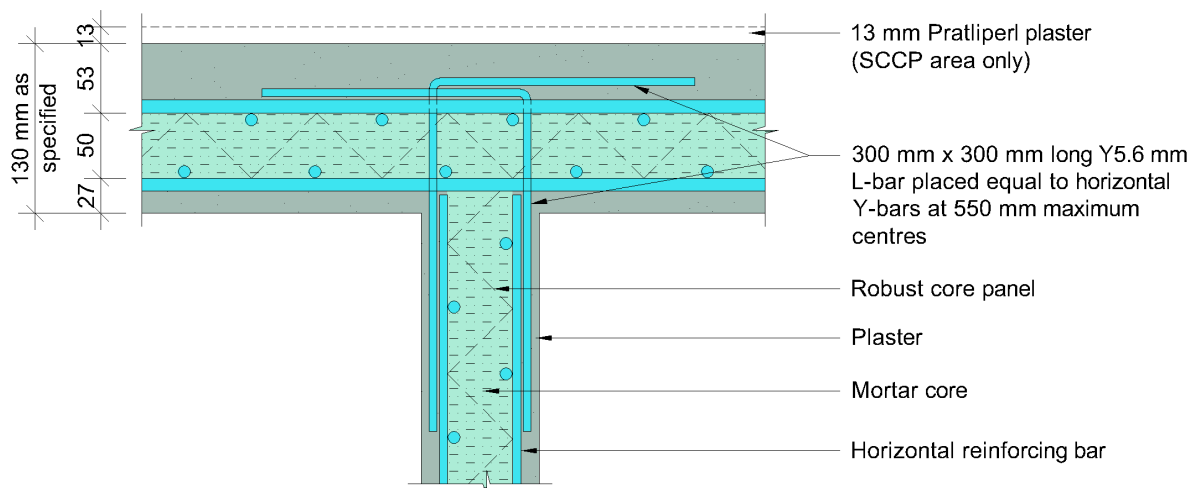
Figure 5: Horizontal wall sections



(a) Horizontal section through corner wall connection - Option 1

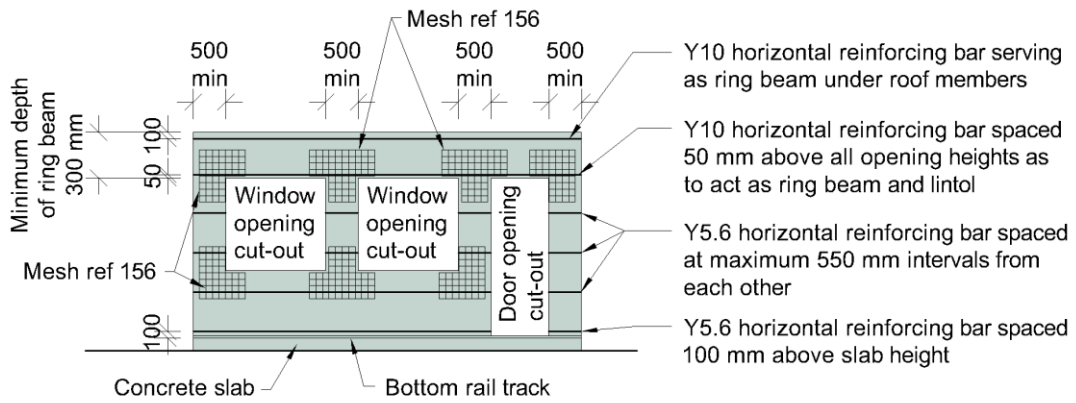


(b) Horizontal section through corner wall connection - Option 2



(a) Horizontal section through corner wall connection - Option 1

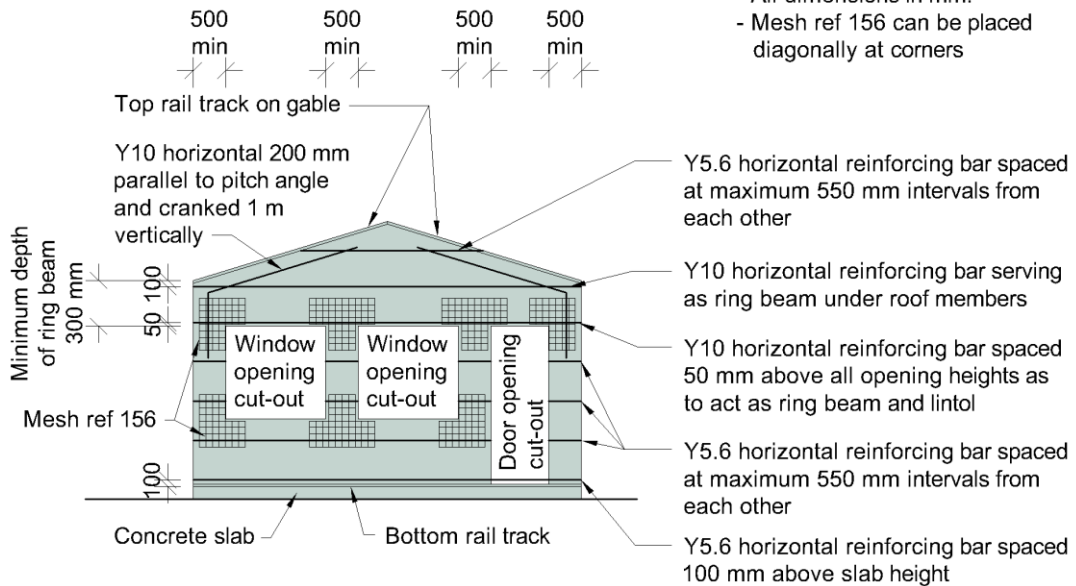
Figure 6: Horizontal sections through external wall corners and T-joint between external and internal walls



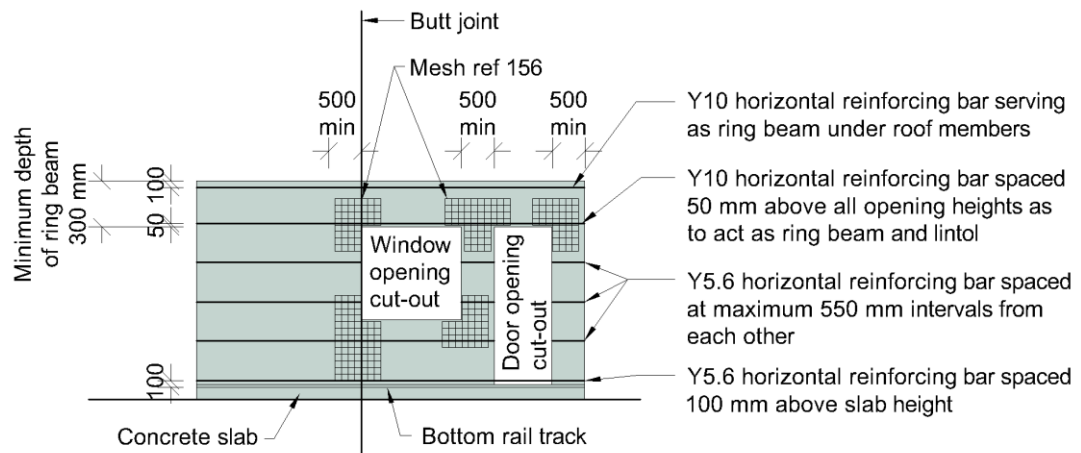
(a) Elevation 1

Notes:

- All dimensions in mm.
- Mesh ref 156 can be placed diagonally at corners

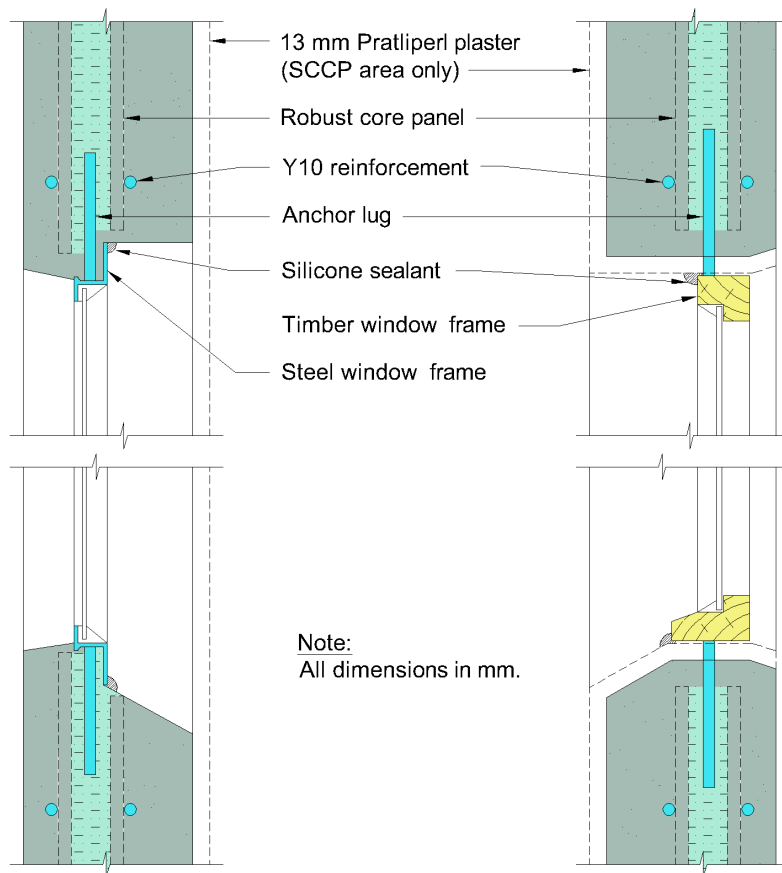


(b) Elevation 2



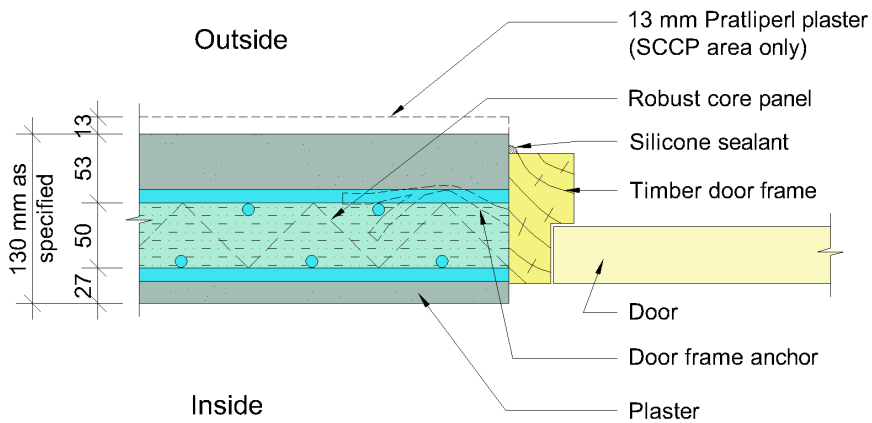
(c) Elevation 3

Figure 7: Typical elevations showing additional Y5.6, Y10 and mesh ref 156 reinforcement



(a) Vertical section through steel window frame

(b) Vertical section through timber window frame



(c) Horizontal section through timber door frame

Figure 8: Window and door details