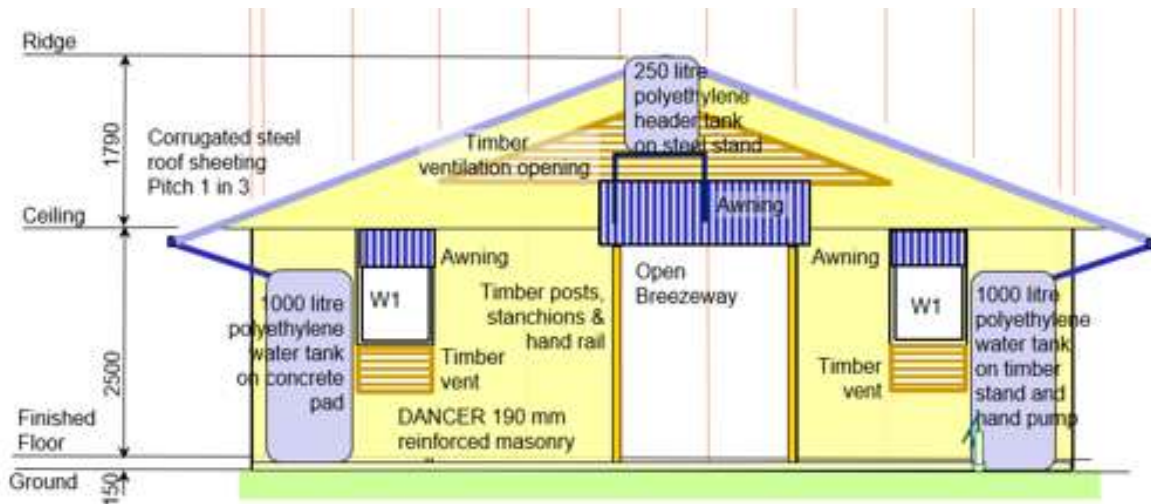


DANCER 8.4 x 5.7 Modular House

Timber roof + reinforced masonry superstructure + concrete slab-on-ground



Quasar Management Services Pty Limited
ABN 21 003 954 210
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Quasar Management Services¹ Pty Limited is consulting civil engineer and management consultancy (a wholly owned subsidiary of Partner Housing Australasia), providing pro bono and fee-for-service professional design and governance services, for village-based construction projects in the South Pacific.

¹ Quasar Management Services Pty Limited trading as Quasar Management Services

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Revisions

This document, and its component parts, constitute a working file, which is updated progressively and periodically formalised as work is undertaken. The revision dates represent when the consolidated information herein was activated.

260327(RM)-1 27/3/26 Format update and routine update

QMS - DANCER 8.4 x 5.7 Modular House (Reinforced Masonry)

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27 March 2026

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Limited Structural Certification



Quasar Management Services Pty Limited
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1. The purpose and intention of this document are to describe, in **generic** terms, the design and detailing of the DANCER Building System for a **Generic DANCER 8.4 x 5.7 Modular House consisting of Timber roof + reinforced concrete masonry superstructure and concrete slab on ground**).
2. These designs are suitable for adaption for specific sites in the Papua New Guinea (PNG) Highlands and other non-cyclonic regions of PNG.
3. Adaptation of these generic designs for specific sites must be performed by a suitably qualified and experienced structural engineer, with the authority and responsibility to monitor and certify the design and construction.
4. Quasar Management Services, its employees, contractors and sub-consultants do not accept any responsibility for the execution, monitoring or certification of the adaptation process specified herein.
5. This certification is applicable only to the designs described herein, including the stated external dimensions, member sizes, materials, connection details, fixings and internal layout. Any deviation in any way from the designs and specifications herein renders this certification invalid for the particular project.
6. This certification is applicable only to the construction by builders (e.g. Vision for Homes [PNG]) that have been approved and trained by Quasar Management Services. This certification is rendered invalid for construction by all other builders or contractors.
7. The designs herein may not be used for applications that do not comply with the building, locations and designs listed below.

Location: Papua New Guinea Generic

Building: Small detached village building; Presenting a low degree of hazard to life and other property in case of failure;

Single storey; Cladding on elevated braced timber frame complying with the DANCER design principles;

Maximum dimensions: 16.5 x 8.4 m, 2.7 m storey, Maximum eaves height 6.0 m, Maximum ridge height 8.5 m, Maximum pitch 35°

Design: Design life 50 years; Annual probability of exceedance 1 in 500; Probability of exceedance during design life: 0.10

Soil: Based on a rectangular footing 450 mm wide founded 600 mm deep in compacted soil.

| Soil Type | AS 2870 Site Classification | Characteristic internal friction angle, degrees | Characteristic cohesion, kPa | Characteristic ultimate bearing capacity, kPa |
|--------------------------|-----------------------------|---|------------------------------|---|
| Sand or rock | A | 36° | 0 kPa | 1060 kPa |
| Slightly reactive clay | S | 30° | 3 kPa | 670 kPa |
| Moderately reactive clay | M | 27° | 6 kPa | 640 kPa |

QMS - DANCER 8.4 x 5.7 Modular House (Reinforced Masonry)

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Permanent Loads: Elevated timber building, $w = 2.5 \text{ kN/m}^2$ (floor area), Reinforced masonry building $w = 3.5 \text{ kN/m}^2$ (floor area)

Imposed Loads: Floor load 1.5 kPa; Roof load 0.25 kPa

Wind: Most of the country except south-east. (refer also to map for reduced velocities)

Noncyclonic Level I $V_{u\ 500\ (3,10)} = 40 \text{ m/s}$ $k_{p\ 500} = 1.0, k_{p\ 250} = 0.90$

Resulting in wind Classification of N2 or N1 (to AS 4055)

Earthquake: Probability $k_{p\ 500} = 1.0, k_{p\ 250} = 0.75$; Hazard $Z_{500} = \text{As per table below}$; Subsoil = C; Ordinate $C_{h(T1)} = 3.68$; Ductility, $\mu = 2.00$; Performance, $S_p = 0.77$

| Location | Hazard Z_{500} |
|--|---------------------|
| Zone 3 (Moderate Hazard) – Central region of the mainland, Northern Province, D'Entrecasteaux and Trobriand Islands, Northern New Ireland and Admiralty Islands (Includes Mendi, Kerema, Klunga, Wabag, Mt Hagen, Kundiawa, Goroko, Bulolo, Wau, Popondetta, Lombrum, Lorengau, Kayieng) | 0.24 |
| Zone 4 (Very Low Hazard) – Papuan Peninsula - Louisiade Archipelago and St. Mathias Group (Includes Daru, Port Moresby, Alotau) | 0.16 |

Tsunami: Not applicable. For each site, determine that the combination of distance from high water mark, height of finished floor above mean sea level, distance from high earthquake area ($Z > 0.4$), are such that the Tsunami Risk Factor is zero.

Flood: Not applicable. For each site, determine that the distance to closest water course OR height of finished floor above normal level of water course OR funnelling of catchment runoff past structure are such that the Flooding Risk Factor is 0.

Subject to the conditions above, I certify that the generic building described in this document complies with: principles of structural mechanics for strength, stability and serviceability; and the specific requirements of the relevant Australian Standards.

Buildings outside the scope described above must be designed for the relevant applicable local wind classifications and other relevant factors, using the principles described herein, by a suitably qualified and experienced structural engineer.

This is not a Construction Certificate.



Rod Johnston

B Tech, M Eng Sc, MICD, MIE Aust, Life-Member Consult Australia
Managing Director – Quasar Management Services Pty Ltd

Part 1 – Planning and Architectural Design

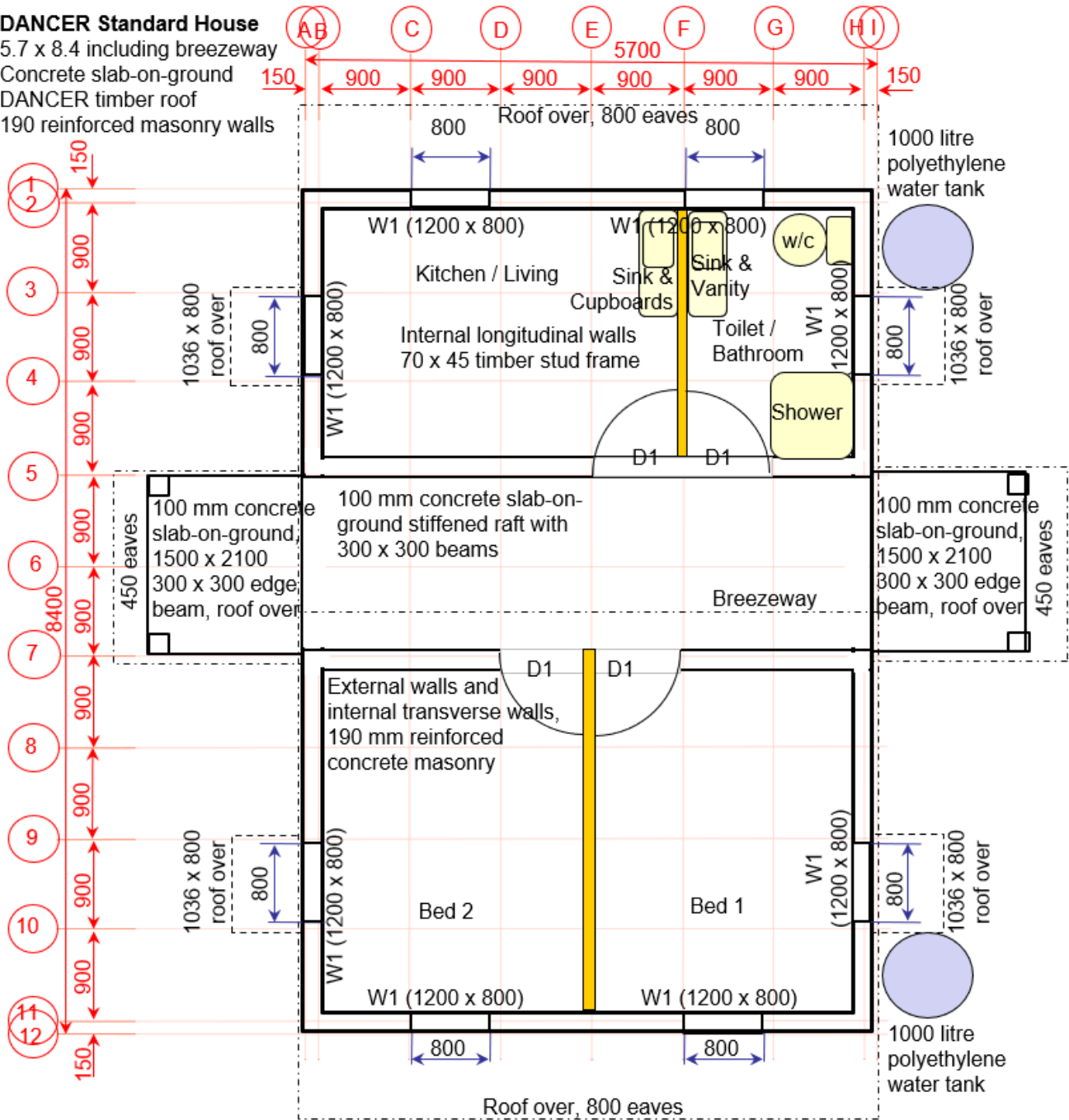
Locality Plan

Site Plan

Floor Plan

DANCER Standard House

5.7 x 8.4 including breezeway
 Concrete slab-on-ground
 DANCER timber roof
 190 reinforced masonry walls

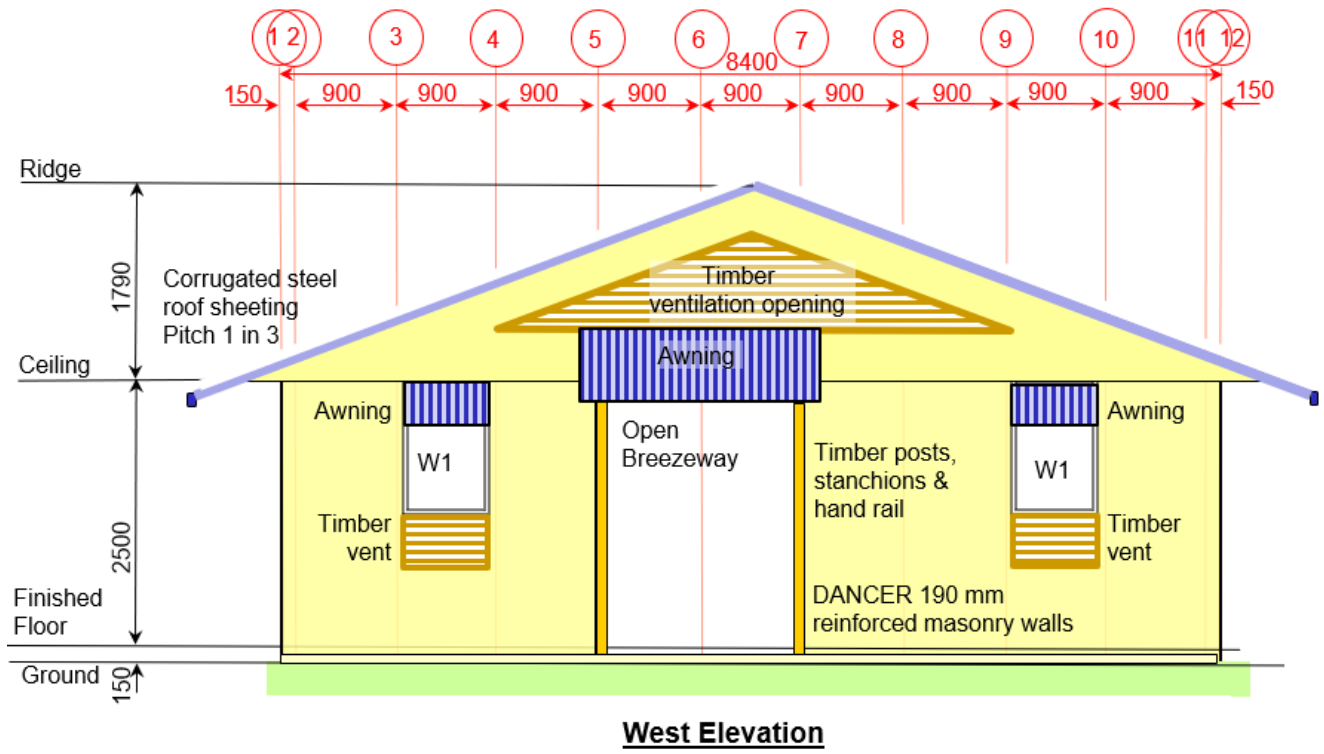


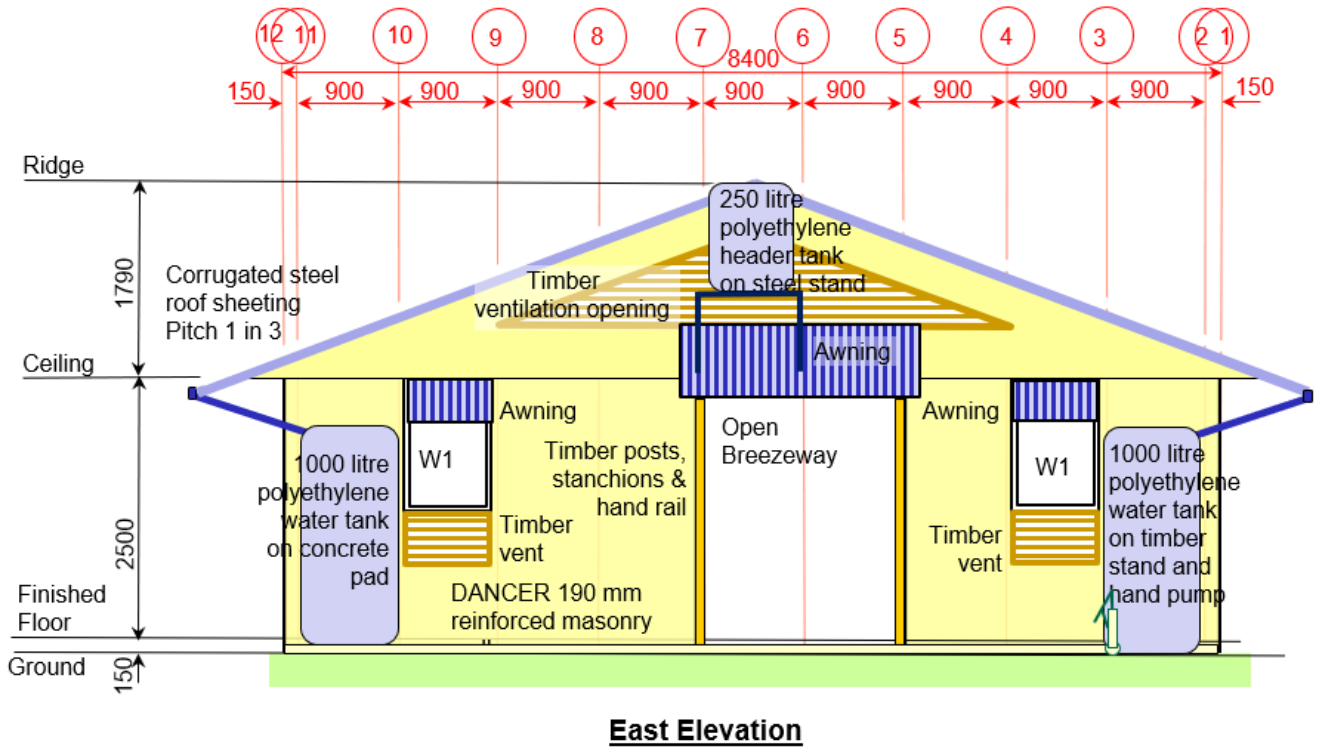
Floor Plan

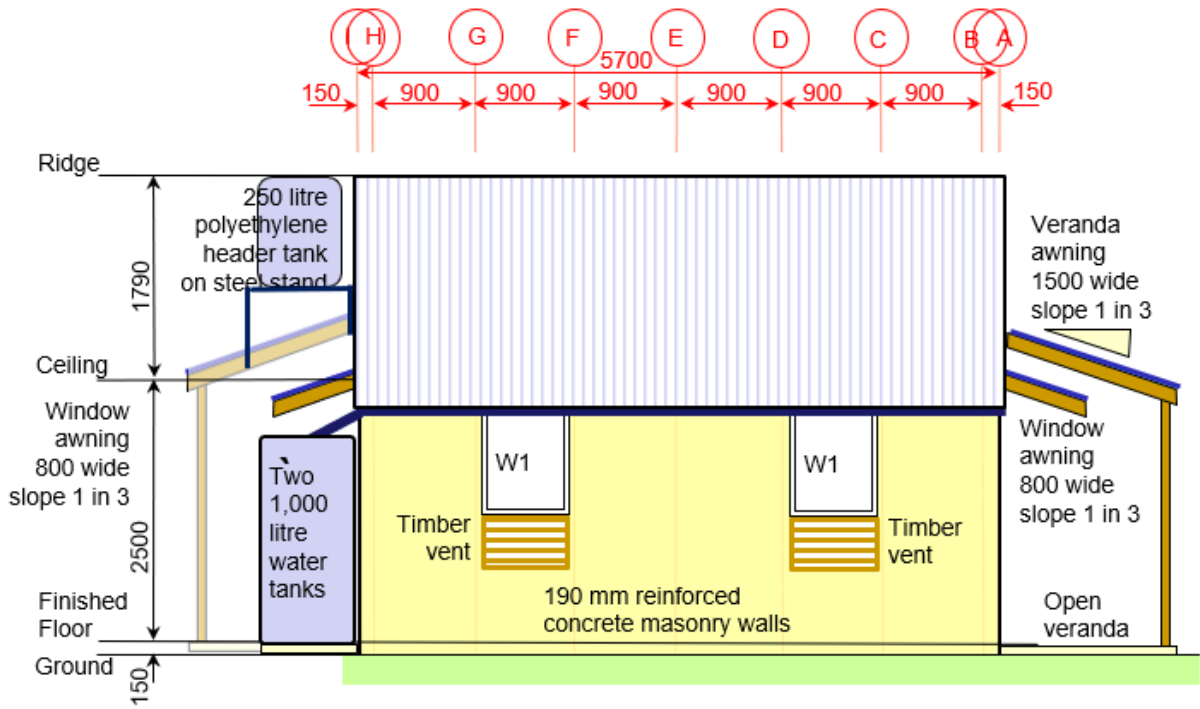
This house has been designed to meet the dual criteria of cultural sensitivity and structural resistance to cyclonic wind and earthquake. The architectural features include a breezeway, increased roof slope, roof space ventilation, window and breezeway awnings and enlarged window ventilation. The house is capable of accommodating further cultural enhancement by the retrofitted palm leaf roof and palm leaf wall veneers if required.

QMS - DANCER 8.4 x 5.7 Modular House (Reinforced Masonry)

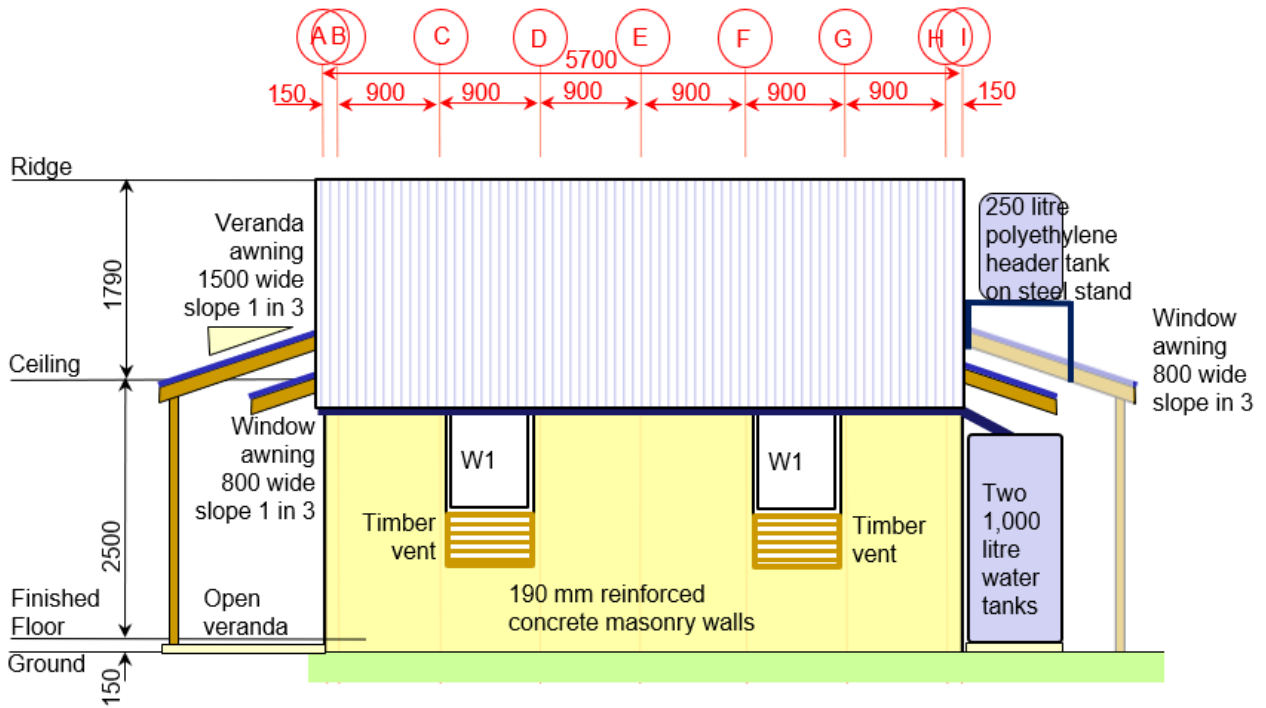
Elevations





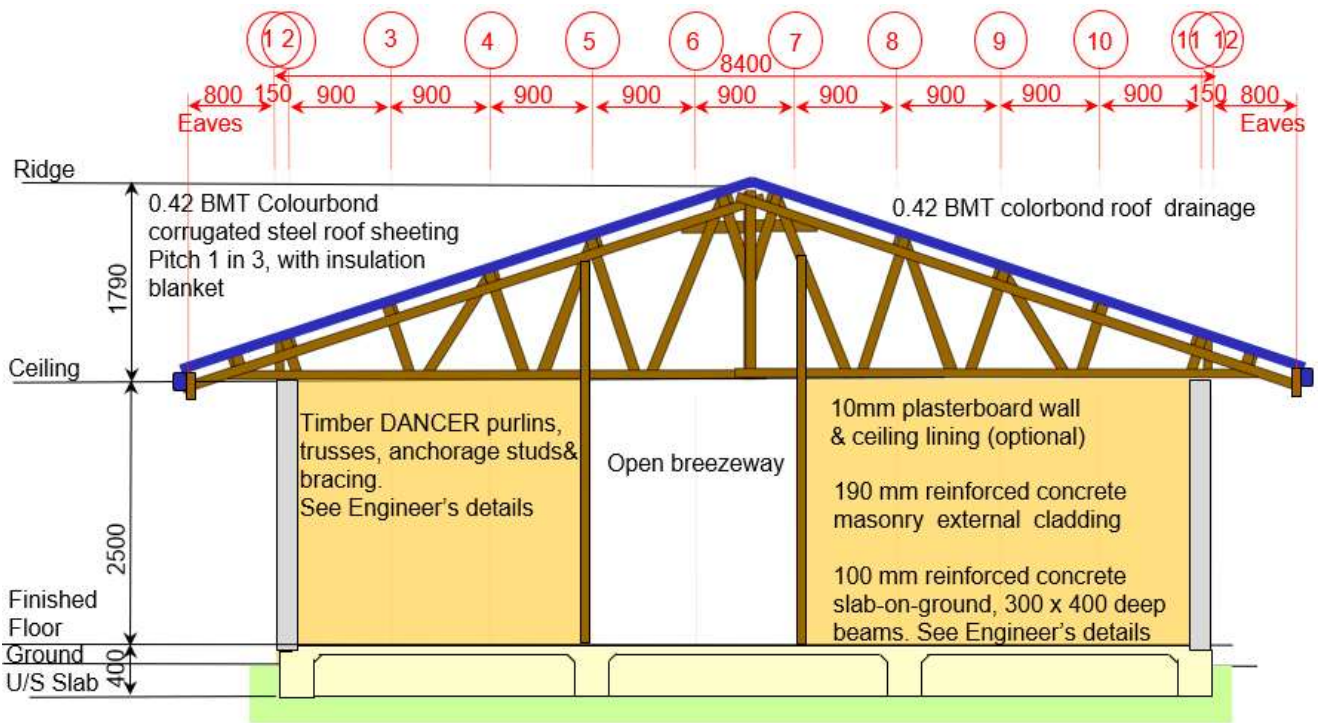


North Elevation



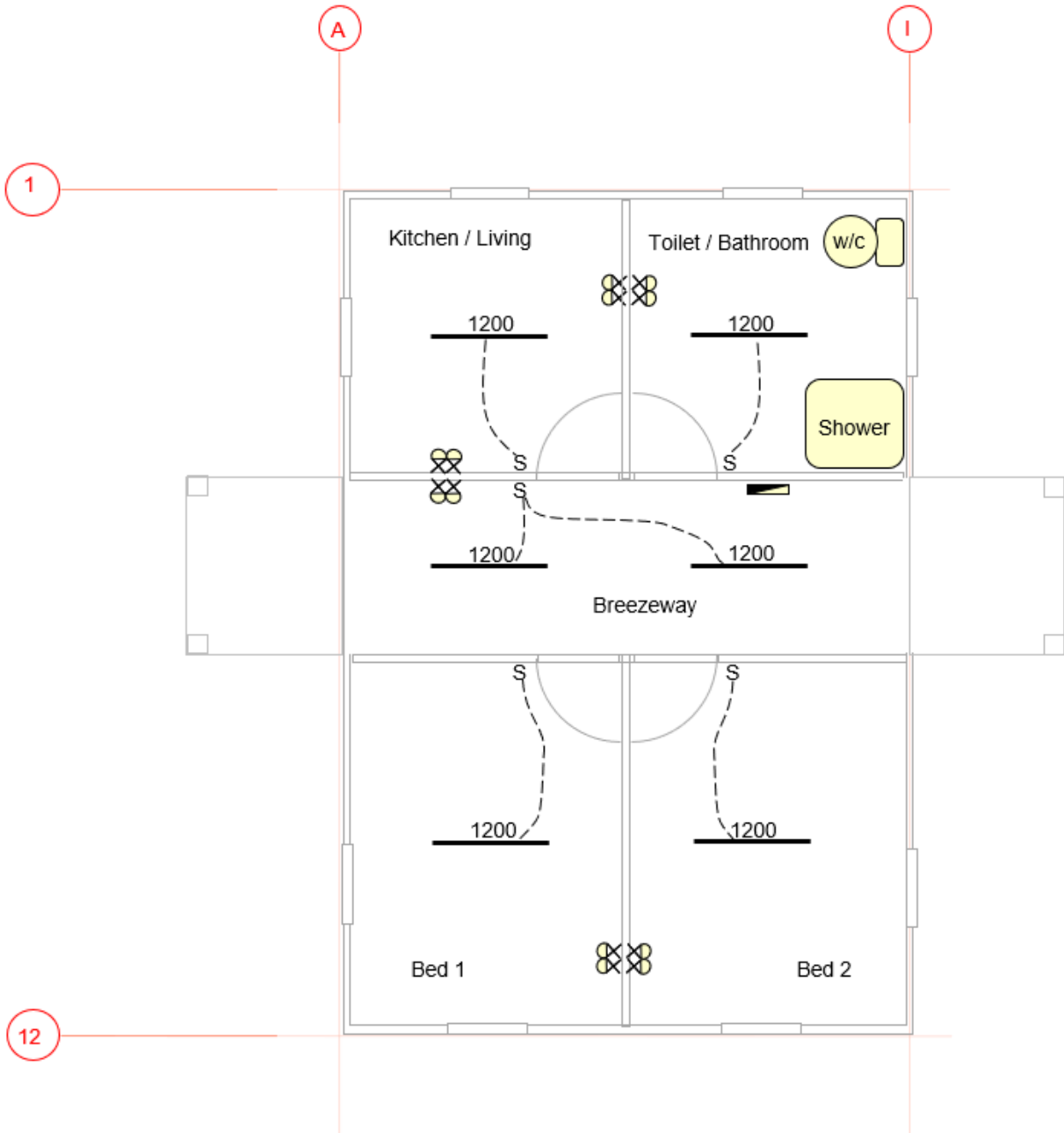
South Elevation

Section



Section

Electrical Services



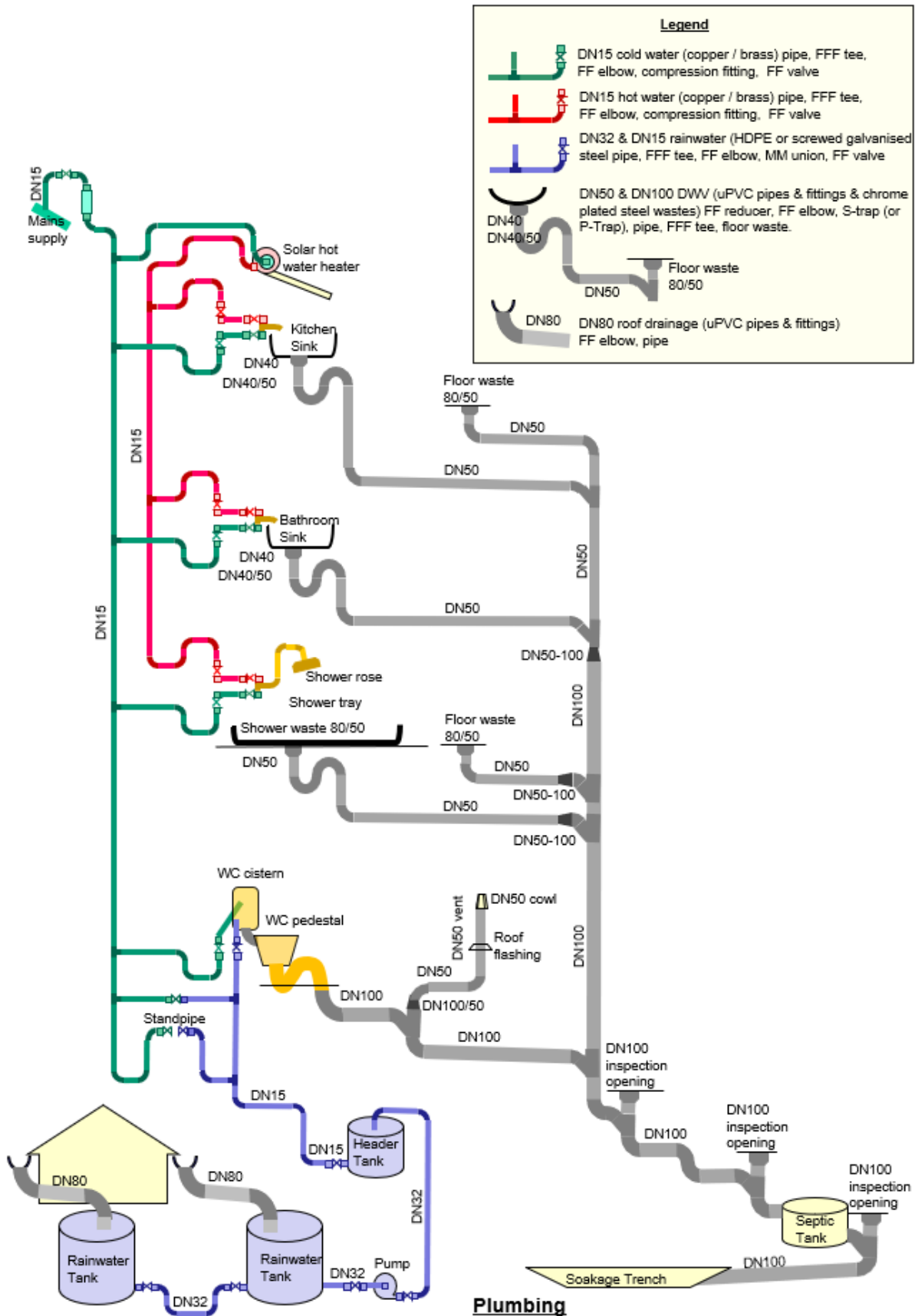
Notes:

1. All electrical installation shall comply with AS 3000 and the Specification, relevant to a 240 volt single-phase supply
2. Mains supply and/or solar power supply to be designed separately.

Electrical Services

- S Switch, 1200 above floor
- ⊗ Double GPO, 300 above floor
- ▬ Switch board
- 1200 Light, 1 x 36W, 1222 x 26mm bare batten fluorescent tube

Plumbing



Plumbing

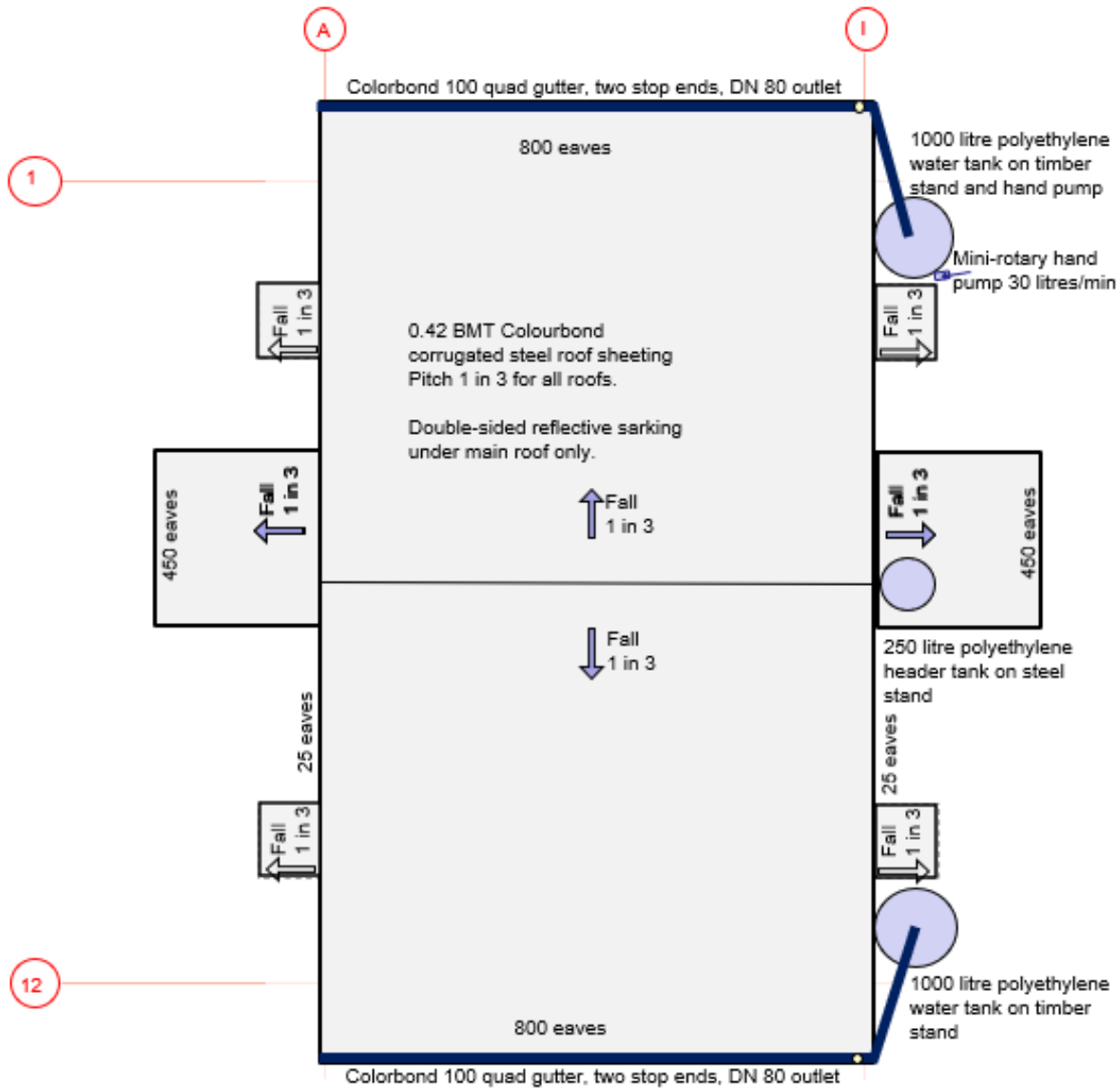
QMS - DANCER 8.4 x 5.7 Modular House (Reinforced Masonry)

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Roof Plumbing

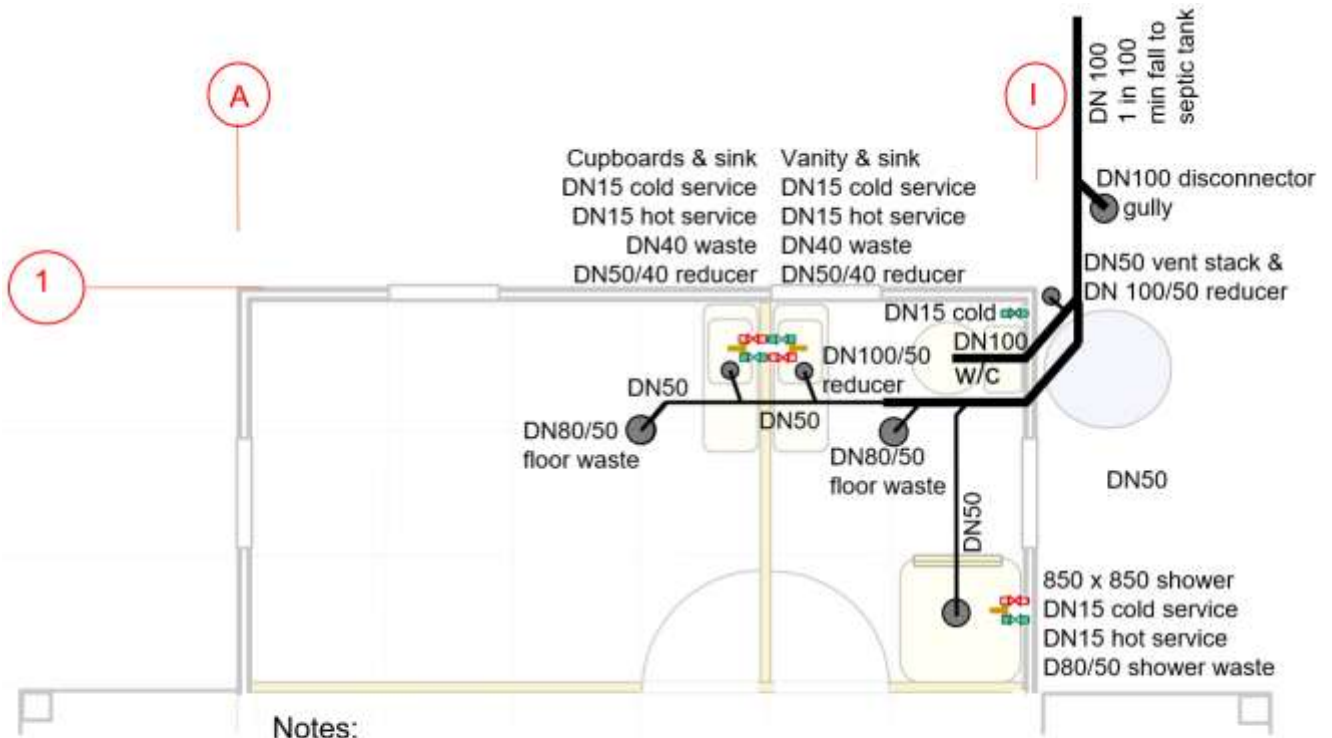


Notes:

1. All roofing – 0.42 BMT Colourbond corrugated steel roof sheeting (pitch 1 in 3), fixed with cyclone washers, 12-14x35 T17 HD/TG HH Class, top-lock hex galv roofing screws & plastic washers, screw spacing (main part of roof including 1.2 m from ends) – 80 mm (at every rib)
2. Sarking (for main roof only) – Double sided reflective insulation placed between roof sheet and timber purlins
Roof Insulation (optional alternative to sarking for main roof only) - R1.8 reflective foil & glass fibre blanket
3. Eaves gutter and rainwater collection - DN80 roof drainage (uPVC pipes, inlet & FF 88 elbows). Refer to plumbing schematic for further details.
4. Colorbond 100 quad eaves gutter, Colorbond 100 quad stop ends, 12-14x35 T17 HD/TG HH Class 3 screws, Colorbond DN80 clip saddles
5. Colorbond steel 200 x 0.6 mm thick ridge flashing, Colorbond steel 0.6 mm thick barge moulds, fixings galv roofing nails 65 x 3.75mm and jolt head nails 125 x 5.6mm fixings for flashing & barge moulds

Roof Plumbing

Hot & Cold Water and Sanitary Plumbing

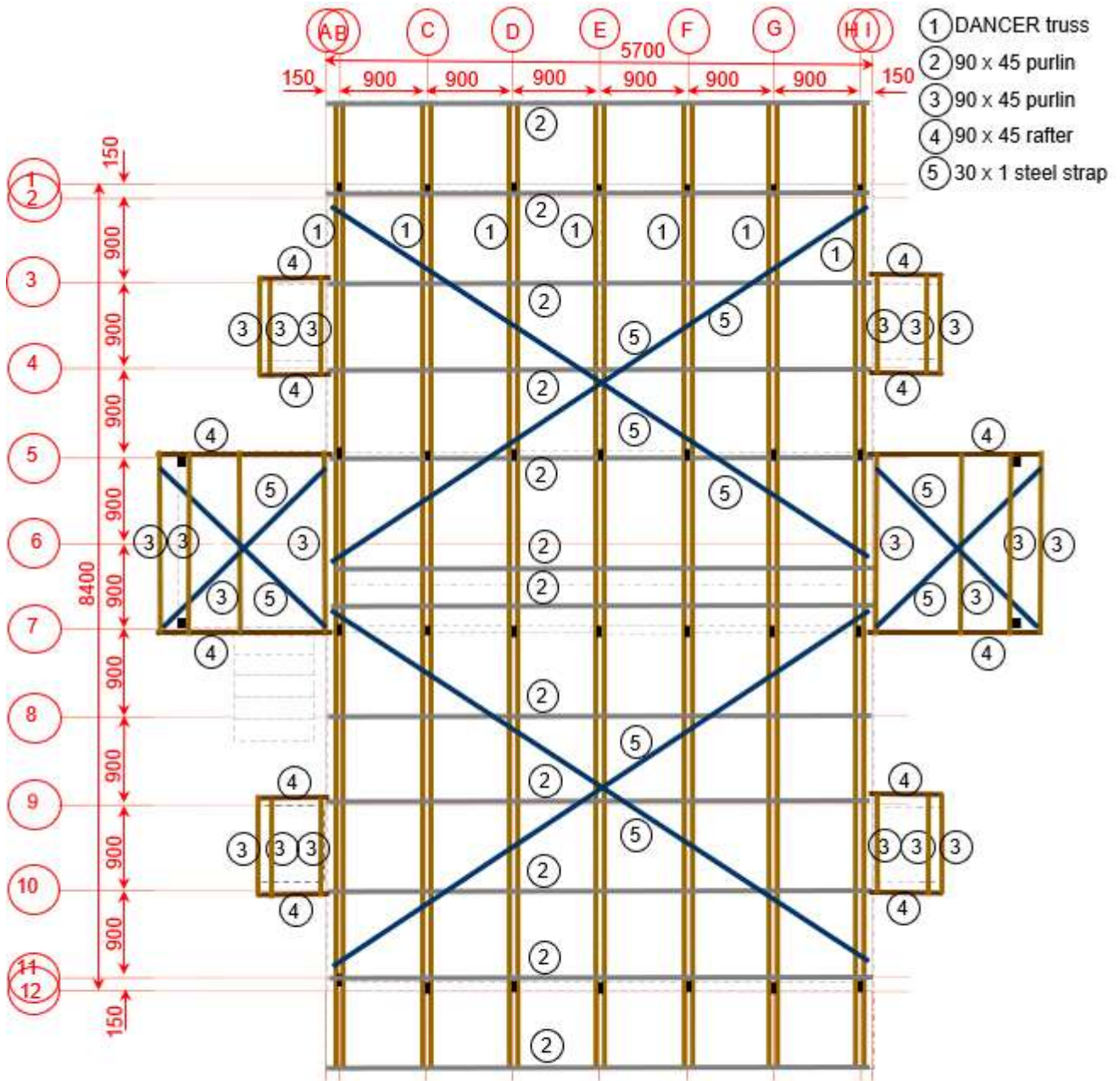


1. All plumbing shall comply with AS/NZS 3500.5.

Hot & Cold Water and Sanitary Plumbing

Part 2 – Engineering Design

Timber Roof Framing



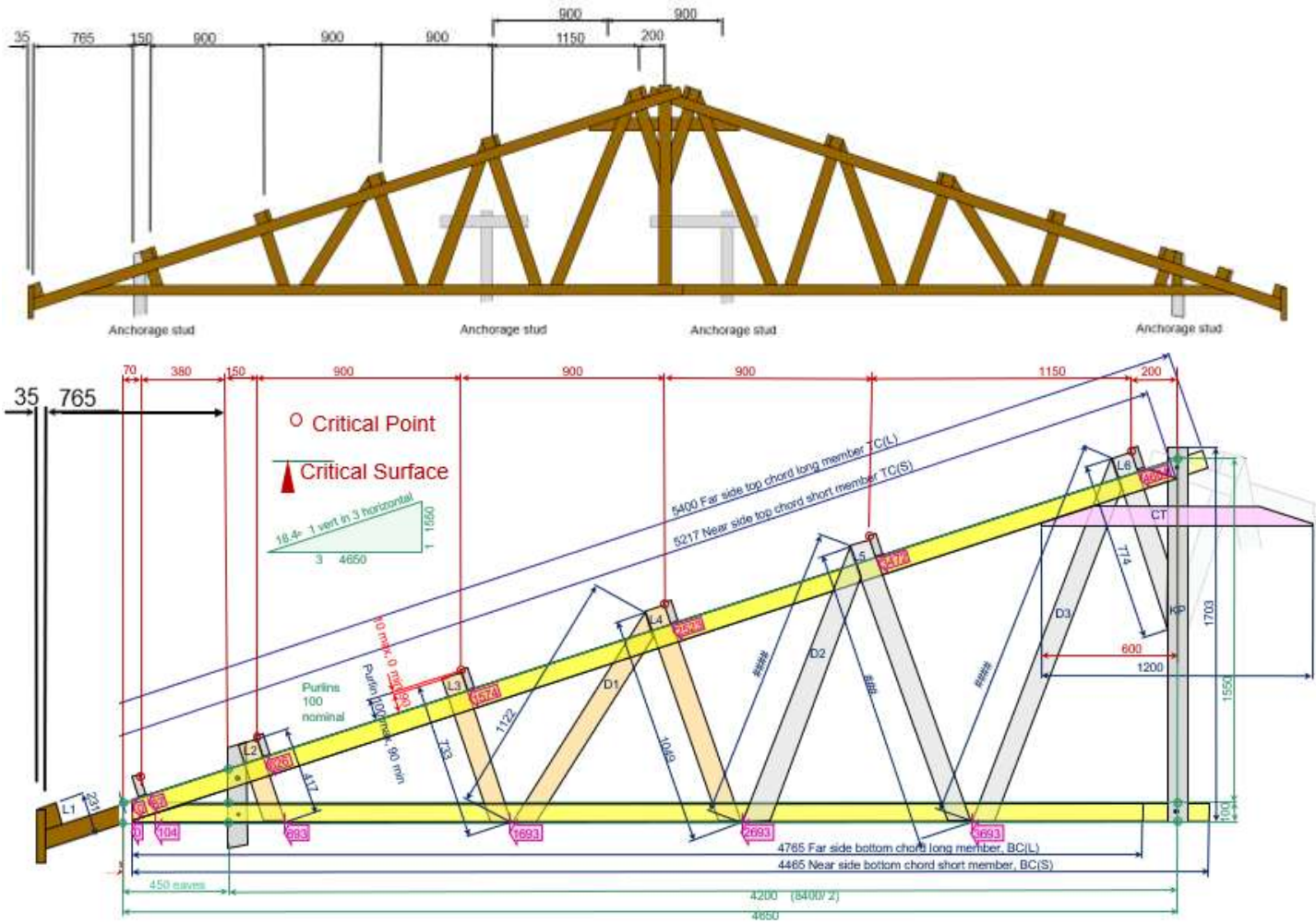
Notes:

1. All timber shall be graded F7, SD6, JD4 or stronger. Australian and New Zealand Seasoned Radiata Pine are deemed to meet this specification.
2. For all other items, substitution of other sizes must be approved by the Engineer.
3. Refer to Engineer's Details for fixings, connections and associated members.

Timber Roof Framing

Details of **DANCER** Trusses

The following dimensions are for the Standard **DANCER** 8.4 Truss, with eaves overhang of 800 mm. All members shall be 90 x 45 MGP10 Strength group SD5, Joint group JD4 (or better)



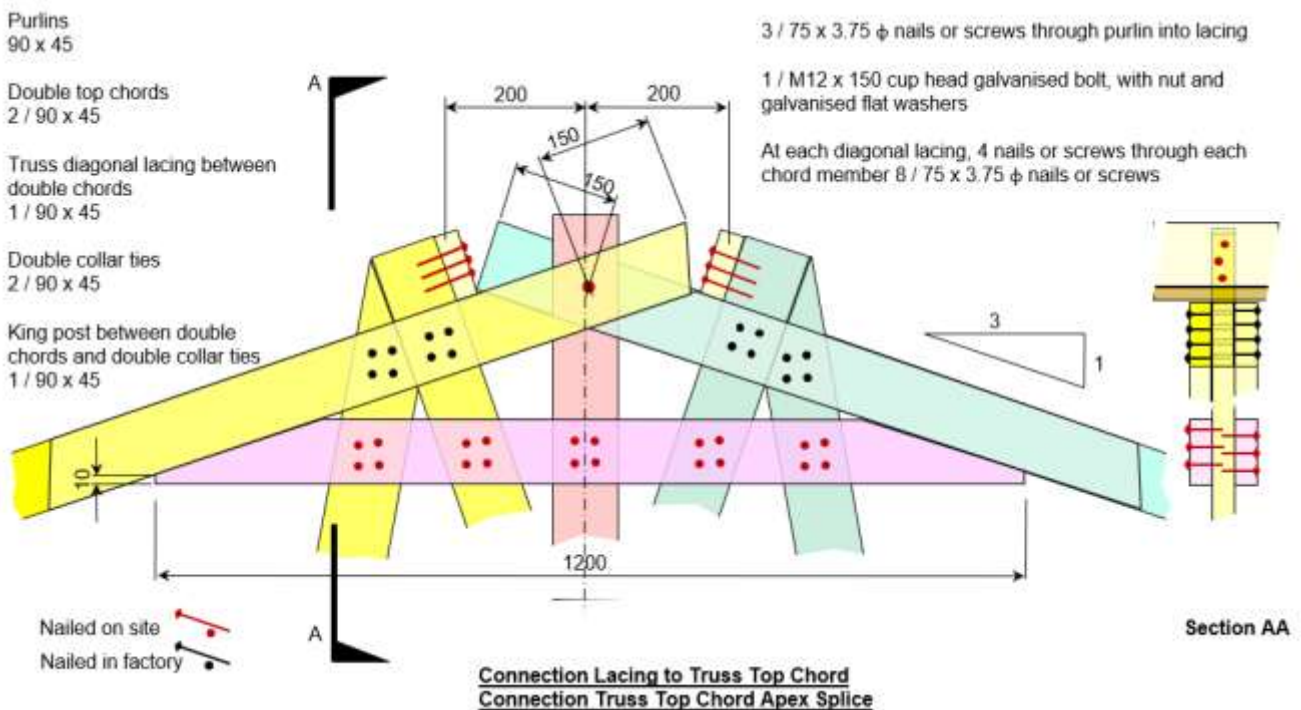
| Roof Trusses | | 8400 span + 800 eaves | | | |
|--------------|------------------------|-----------------------|-------------|-------|--------------|
| Item | Component | Section | | | Length mm |
| | | mm | x | mm | |
| TC(L) | Truss Top Chord (or R | 90 | x | 45 F7 | 5,417 |
| TC(S) | Truss Top Chord (or R | 90 | x | 45 F7 | 5,234 |
| BC(L) | Truss Bottom Chord (a | 90 | x | 45 F7 | 4,765 |
| BC(S) | Truss Bottom Chord (a | 90 | x | 45 F7 | 4,455 |
| CT | Collar Tie | 90 | x | 45 F7 | 1,200 |
| KP | King Post | 90 | x | 45 F7 | 1,735 |
| L1 | Lacing at eaves | 90 | x | 45 F7 | 232 |
| L2 | Lacing at anchorage st | 90 | x | 45 F7 | 417 |
| L3 | Lacing | 90 | x | 45 F7 | 734 |
| L4 | Lacing | 90 | x | 45 F7 | 1,050 |
| L5 | Lacing | 90 | x <td 45 F7 | 1,367 | |
| L6 | Lacing | 90 | x | 45 F7 | 760 |
| D1 | Diagonal | 90 | x | 45 F7 | 1,129 |
| D2 | Diagonal | 90 | x | 45 F7 | 1,357 |
| D3 | Diagonal | 90 | x | 45 F7 | 1,777 |

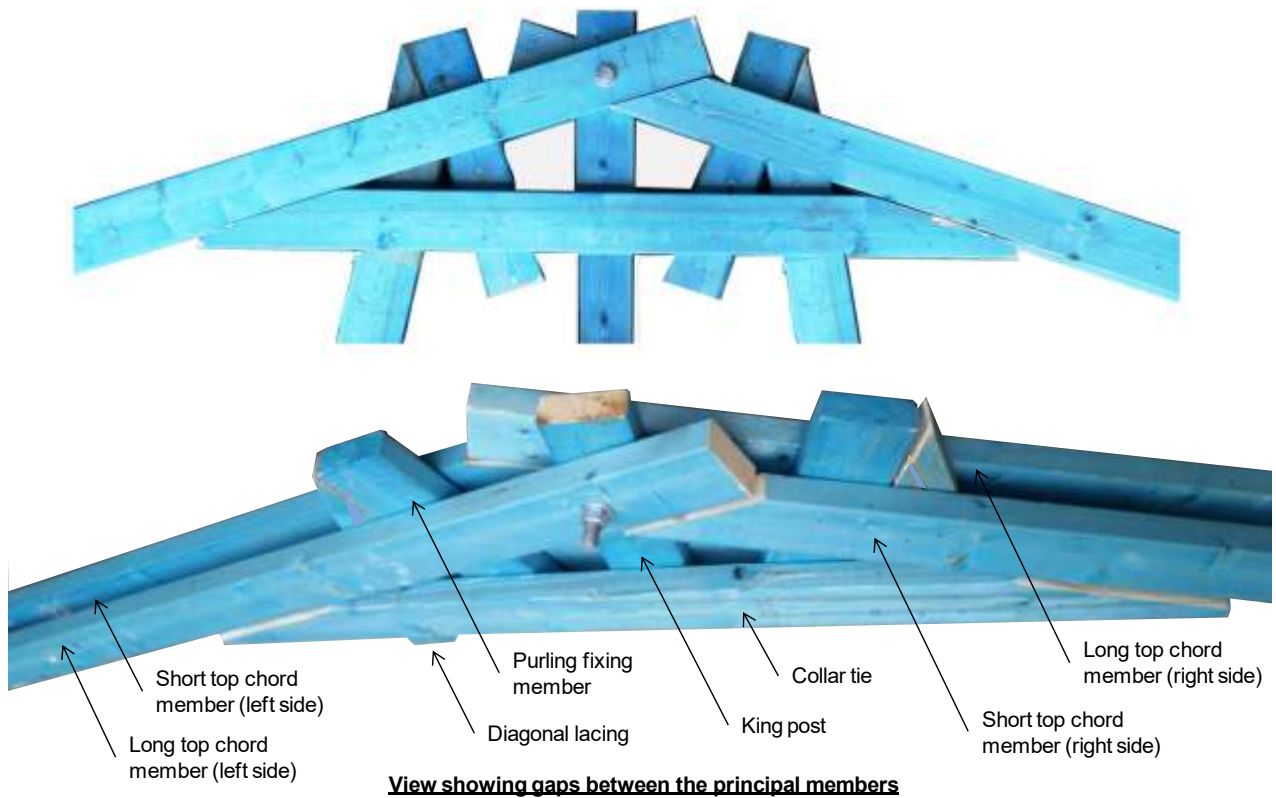
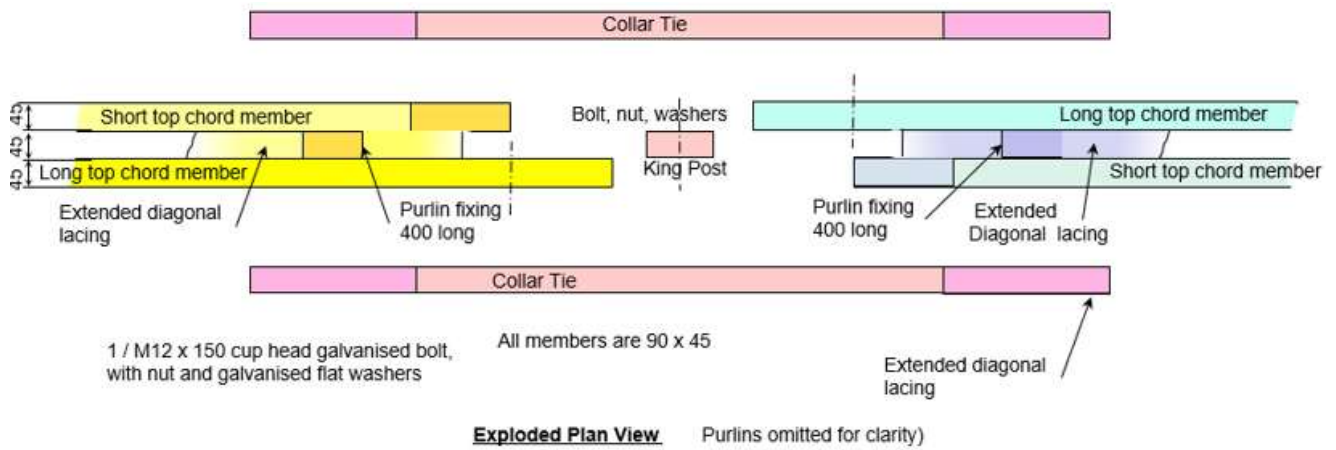
DANCER Truss Bolted Apex Splice

Trusses longer than 3.5 metres cannot be easily transported over significant distances.

They must be fabricated in two sections and joined on site. In this case the top chords must be joined with a bolted connection, and the bottom chords must be joined by a bolted connection.

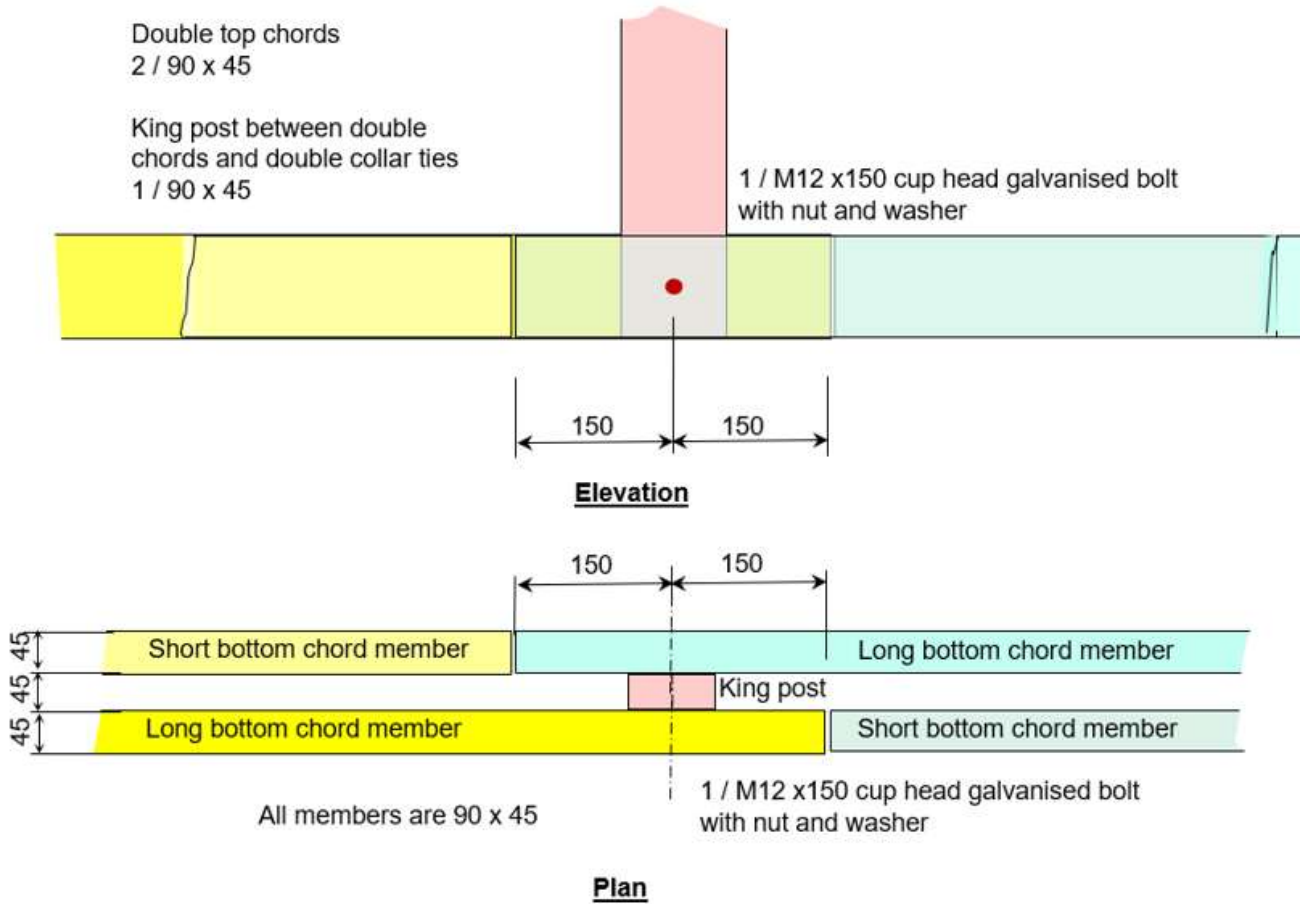
Bolted connections must not incorporate nails, since the premature failure of the nails could disrupt the timber and destroy the bolted connection before it has time to be effective.



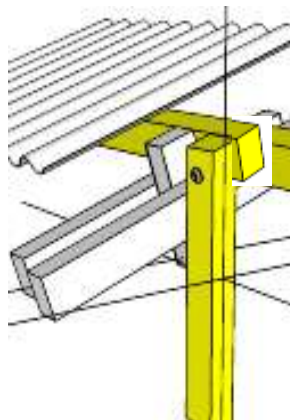
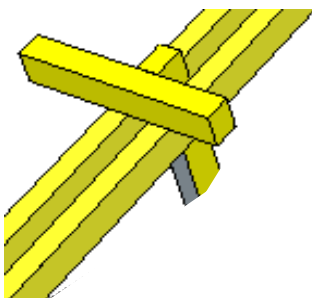


DANCER Truss Bolted Bottom Chord Splice

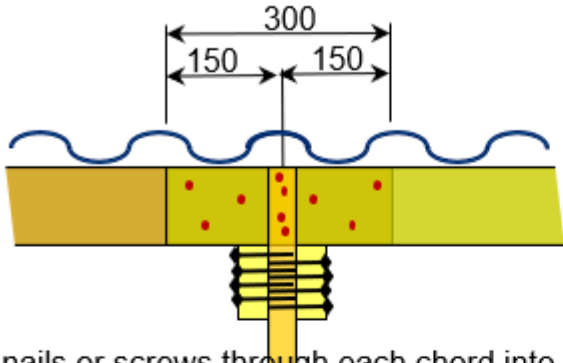
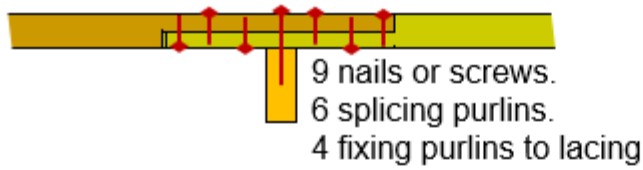
The Bottom Chords shall be spliced in a lapped double chord arrangement (similar to the top chord).



Connection Truss Bottom Chord Splice

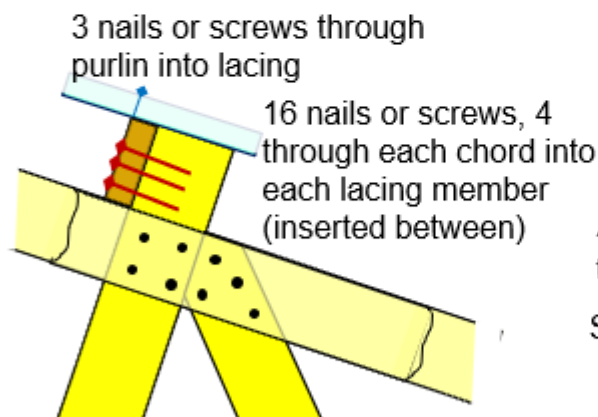


Purlin, Diagonal Lacing and Double Top Chord Connections

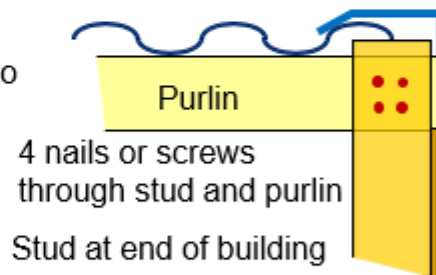


4 nails or screws through each chord into each lacing member (inserted between)


Purlin Splice (Preferred Detail)




Connection Purlin to Double Top Chord Connection Lacing to Double Top Chord



Connection Purlin to End Wall Stud

Nailed on site 

Nailed in factory 

75 x 3.75 ϕ nails or screws

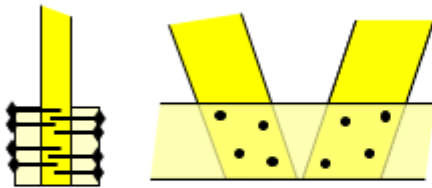
Purlins, double chords and truss diagonal lacing between double chords 90 x 45 F7 timber

Top Chord, Lacing, Purlin Fixing and Purlin Splice

Double Bottom Chord, Anchorage Stud and Eaves Connections

75 x 3.75 ϕ nails or screws

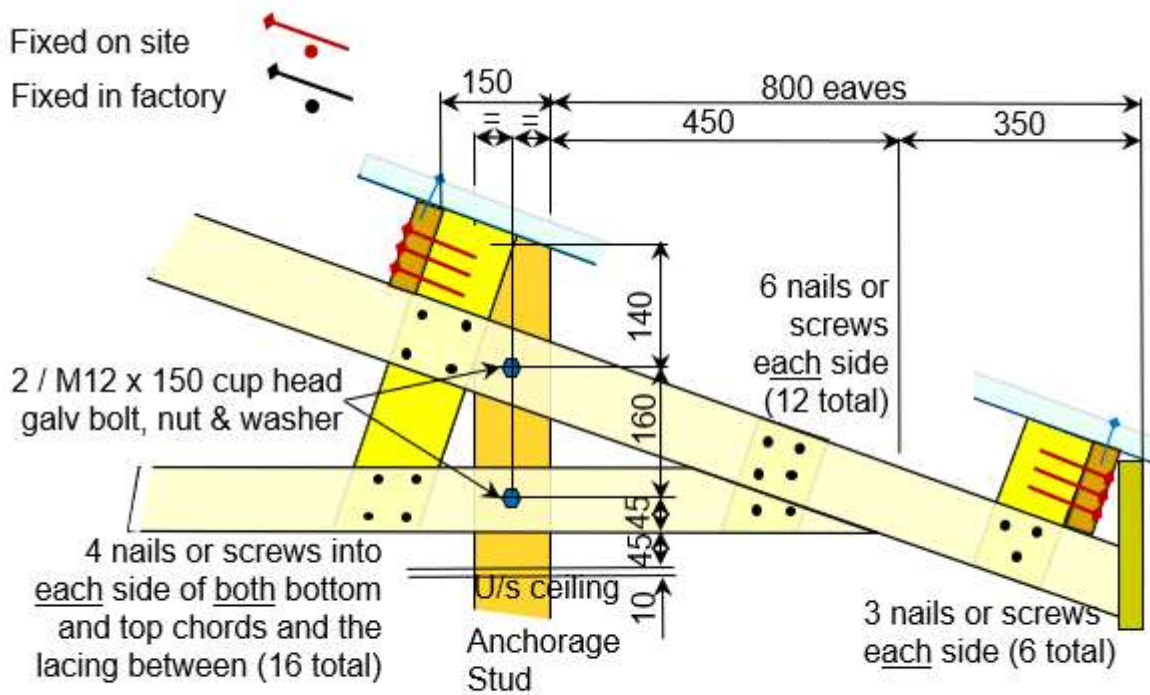
Fixed in factory



Purlins, double chords and truss diagonal lacing between double chords are all 90 x 45 F7

4 nails or screws through each side of both bottom chords into lacing at both lacing (16 total)

Connection of Lacing to Bottom Chords



Top Chord to Bottom Chord
Top Chord to Anchorage Stud

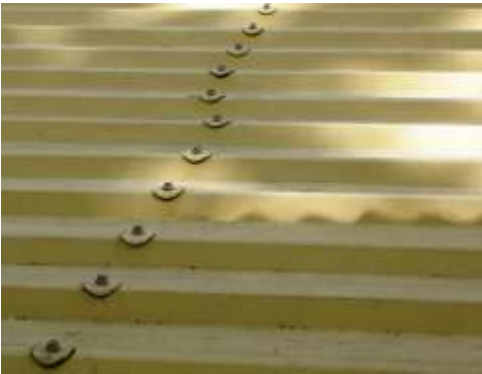
800 Eaves

Roof Fixings and Cyclone Washers

Cyclonic wind can suck roof sheeting (and wall sheeting) off the framing if there is an insufficient number of appropriate roofing screws, or if the screws have been installed without cyclone washers.

Roof sheets should be fixed through the high point of the ribs using long screws, not valley fixed. Roof sheets shall be laid in continuous lengths where practical, with the upper end turned up using the correct tool.

In very high wind areas, turn the sheets down into the eaves gutter at the lower end.



Refer to the Lysaght Design Manual

CUSTOM ORB®/CUSTOM BLUE ORB®





Table 4.2

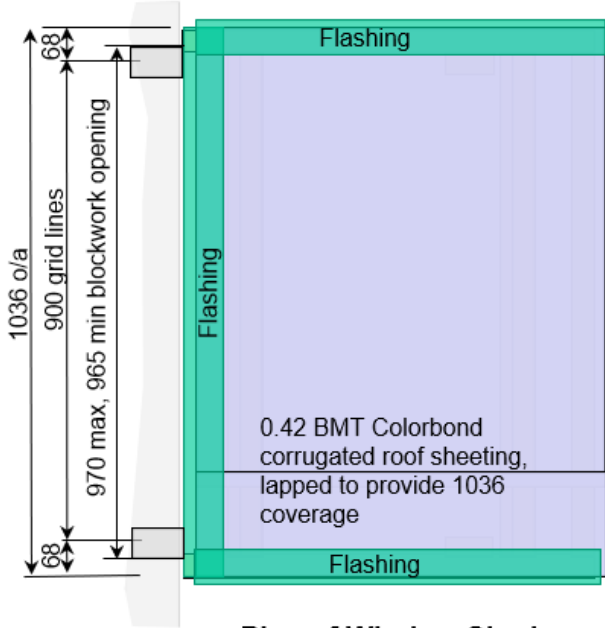
CUSTOM ORB® 0.42mm BMT.

| Span (mm) | Roof | | | |
|-----------|-------------|-----------------------|---------|---------|
| | Crest fixed | With cyclonic washers | | |
| | | 3.75kPa | 5.58kPa | 8.21kPa |
| 450 | OK | OK | OK | X |
| 600 | OK | OK | OK | X |
| 750 | OK | OK | OK | X |
| 900 | OK | OK | X | X |

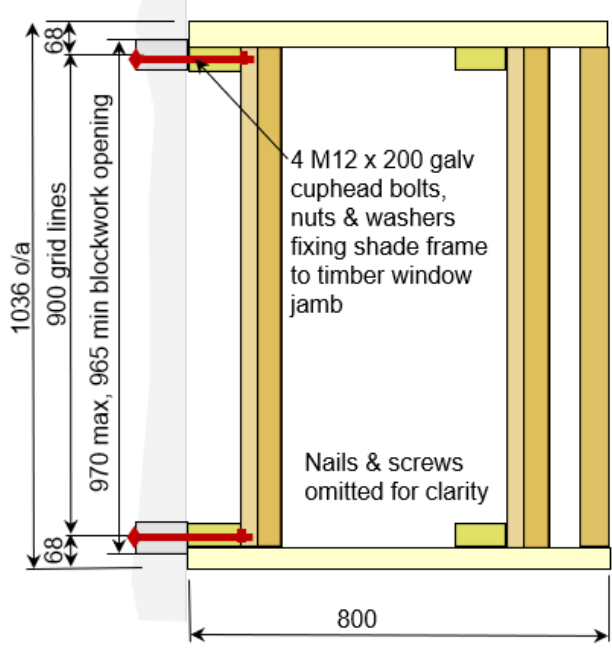
Window Shades

All timber members 90 x 45 F7,
 fixed at each end by –
 4 / 90 x 3.45 φ screws, or
 4 / 90 x 3.75 φ nails

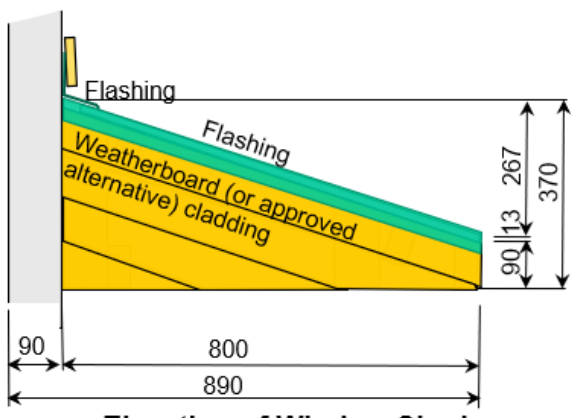
Nailed or screwed on site 
 Nailed or screwed in factory 



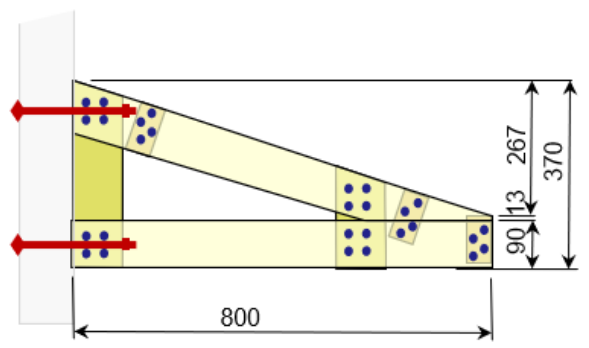
Plan of Window Shade



Plan of Window Shade Frame

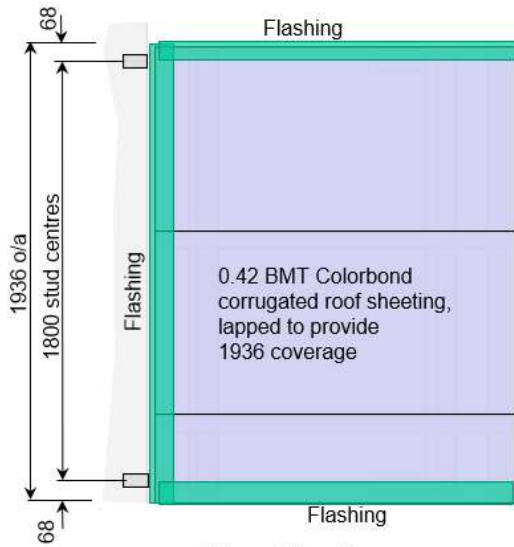


Elevation of Window Shade

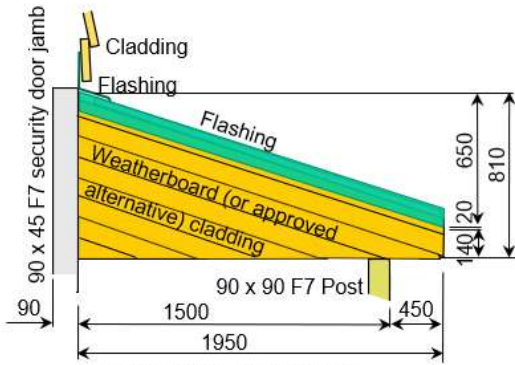


Elevation of Window Shade Frame

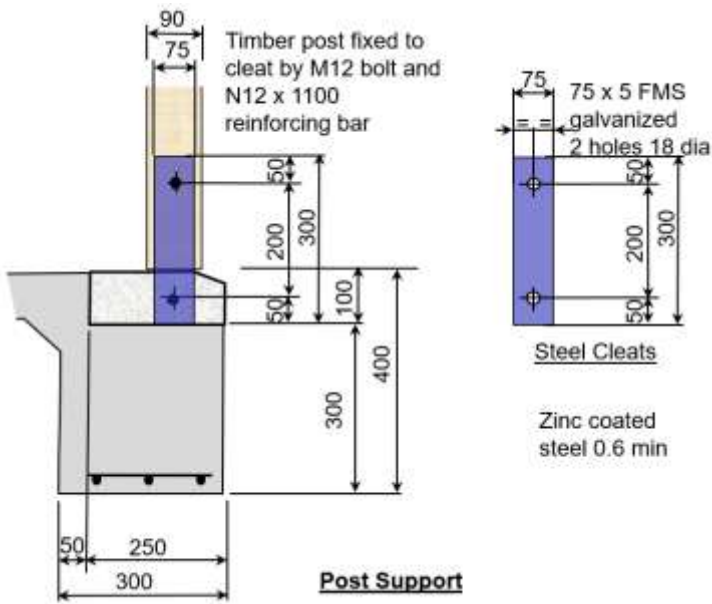
Awning



Plan of Awning

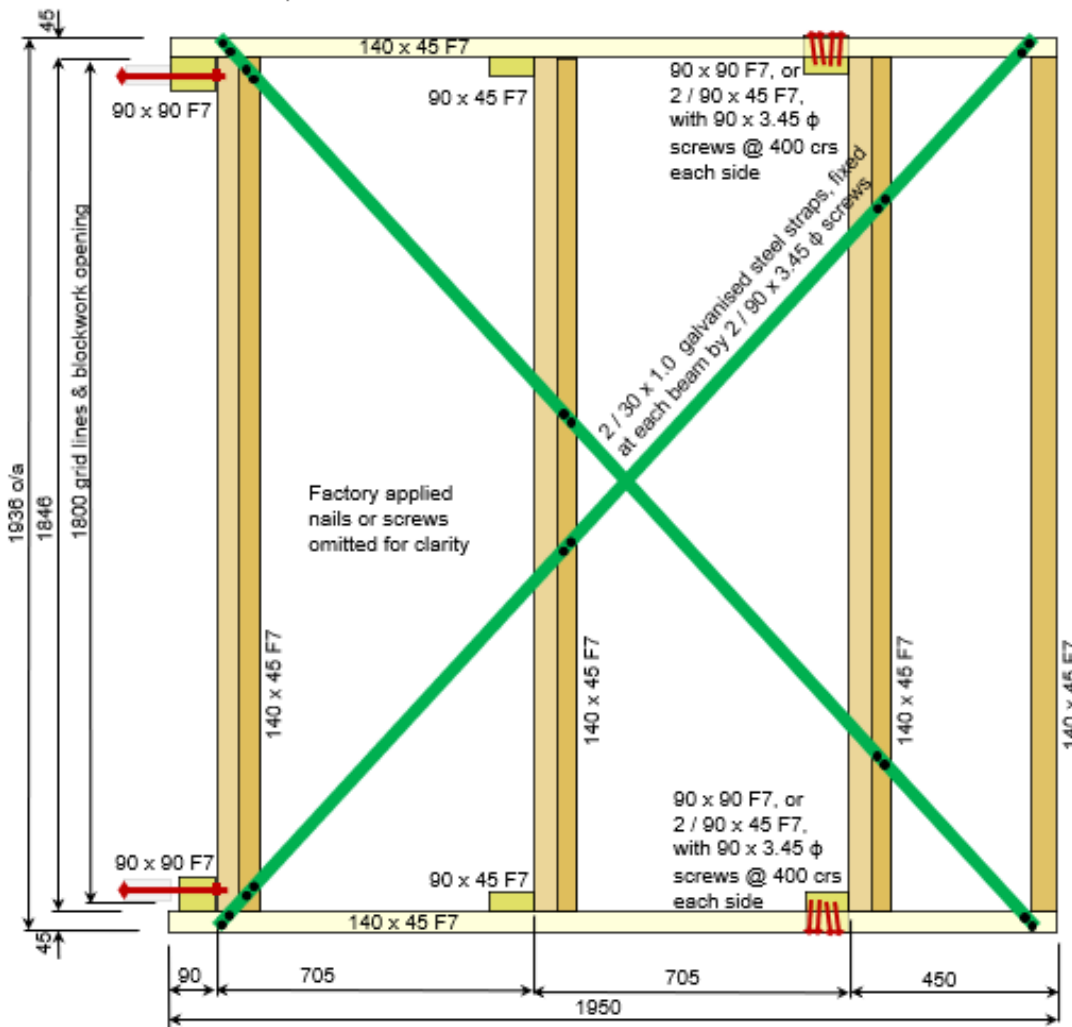


Elevation of Awning

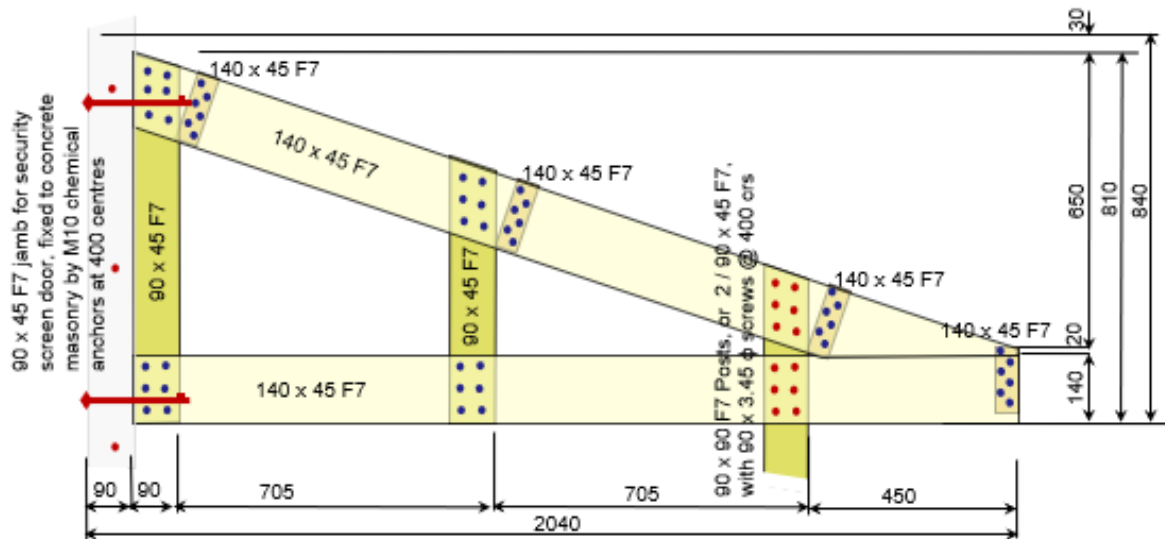


All timber members shall be fixed at each end by –
 6 / 90 x 3.45 φ screws. If screws cannot be used,
 substitute 6 / 90 x 3.75 φ nails

Nailed or screwed on site
 Nailed or screwed in factory

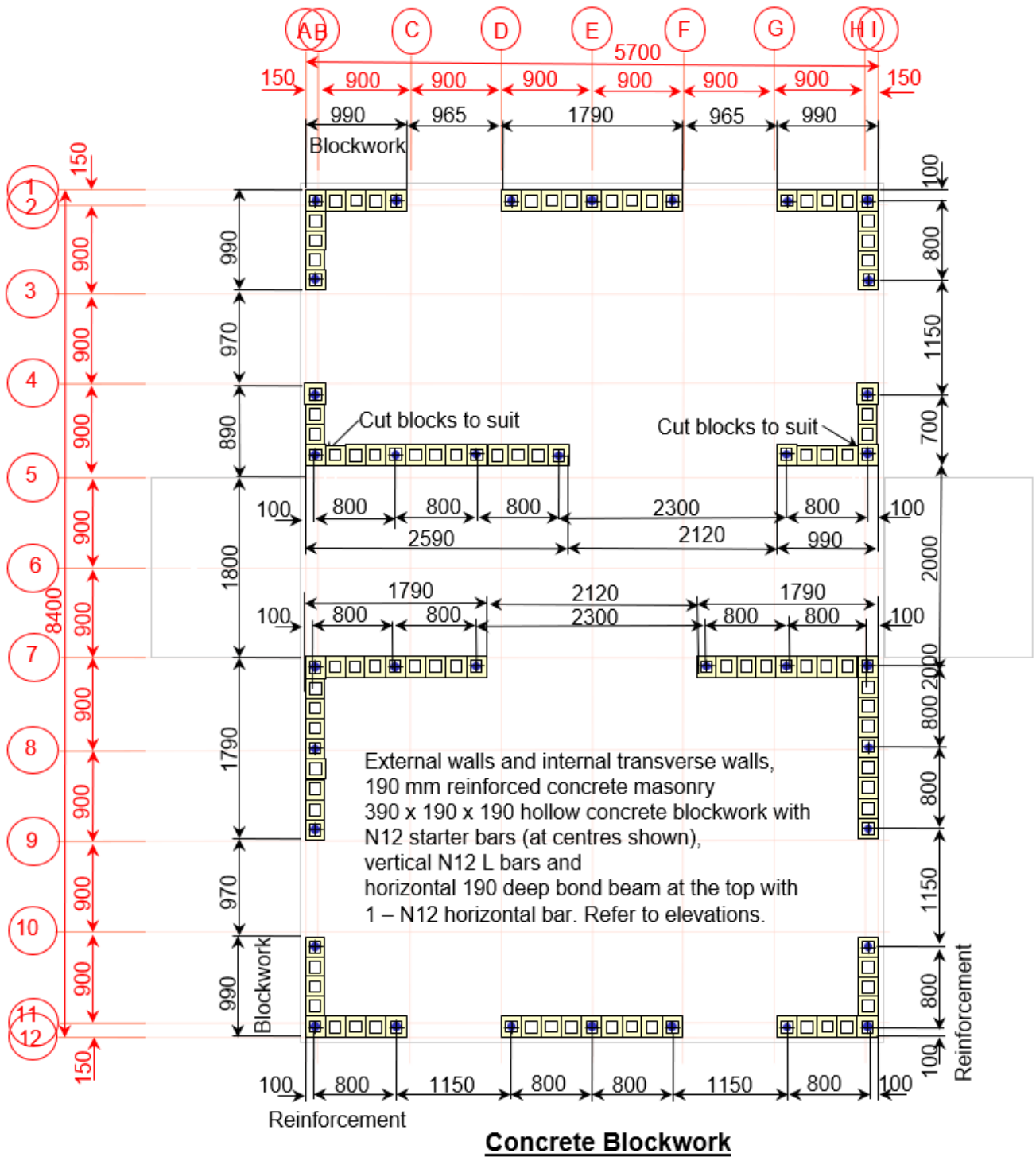


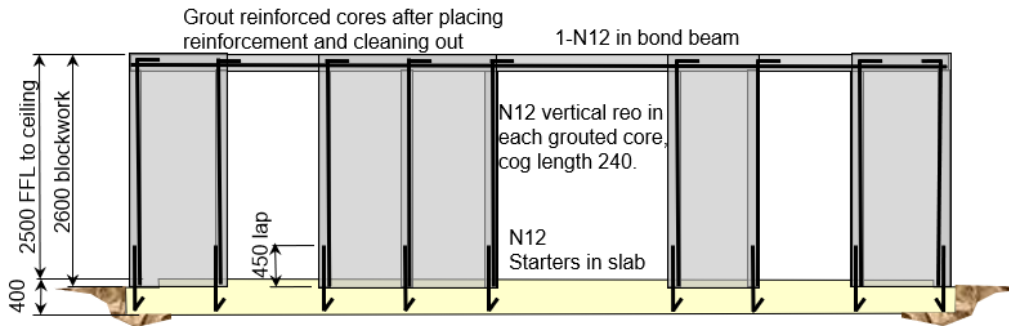
Plan of Awning Frame



Elevation of Awning Frame

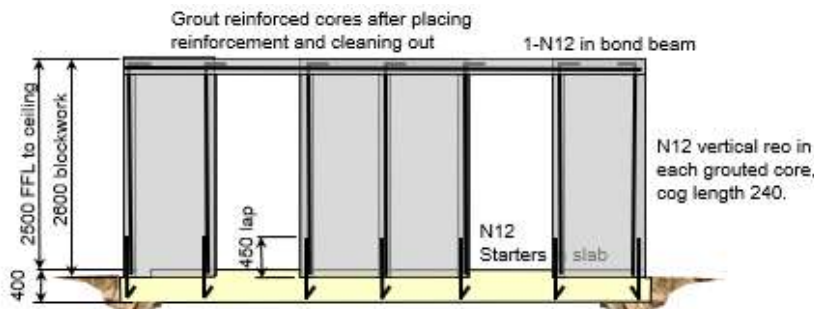
Reinforced Concrete Masonry Walls





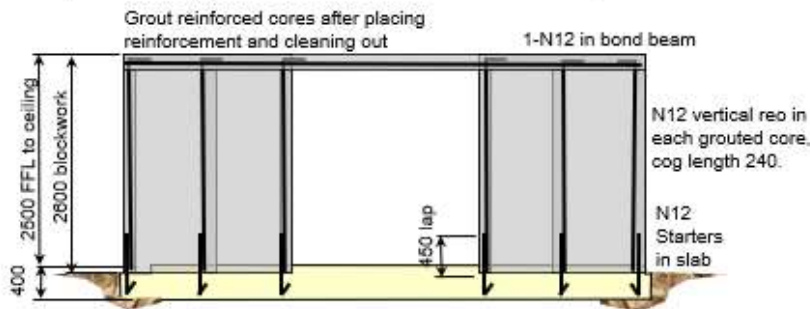
Concrete slab/beam system, including sand bed, reinforcement, membrane etc, designed to AS 2870. Edge beams and cross beams, 400 x 300 mm, 3-11TM trench mesh. 100 mm concrete slb, SL72 mesh.

Section through Longitudinal External Wall Reinforcement



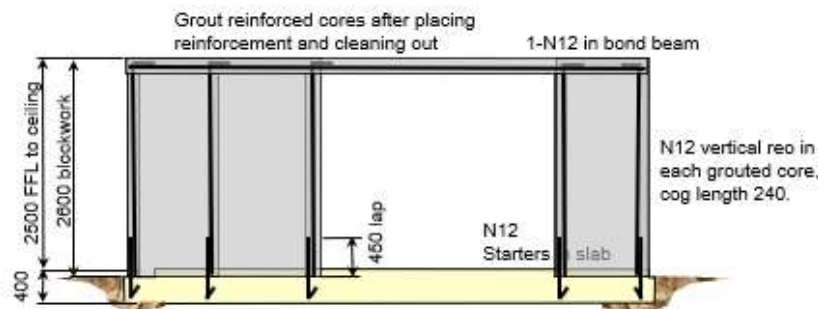
Concrete slab/beam system, including sand bed, reinforcement, membrane etc, designed to AS 2870. Edge beams and cross beams, 400 x 300 mm, 3-11TM trench mesh. 100 mm concrete slb, SL72 mesh.

Section through Transverse External Wall Reinforcement



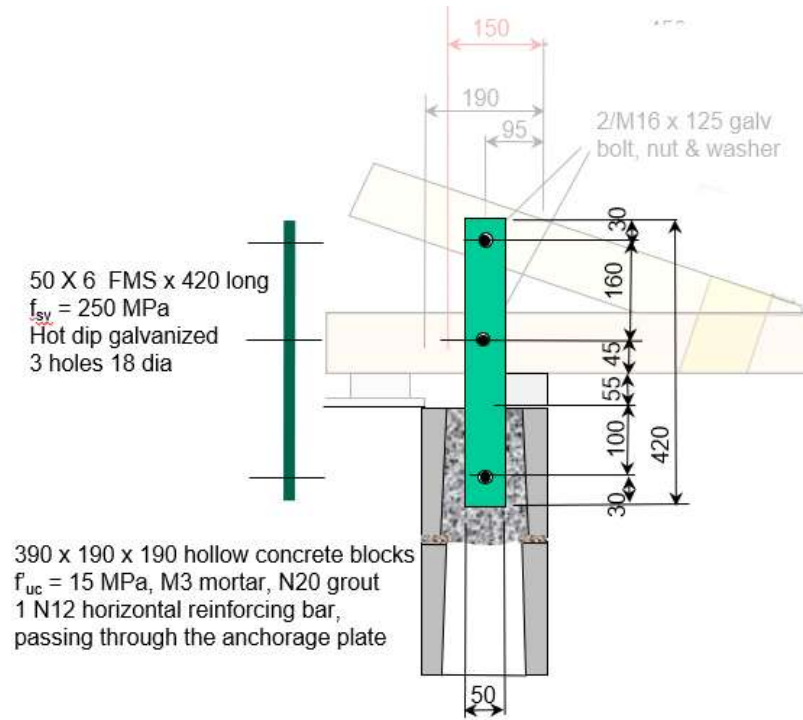
Concrete slab/beam system, including sand bed, reinforcement, membrane etc, designed to AS 2870. Edge beams and cross beams, 400 x 300 mm, 3-11TM trench mesh. 100 mm concrete slb, SL72 mesh.

Section through Transverse Internal Bedroom Wall Reinforcement

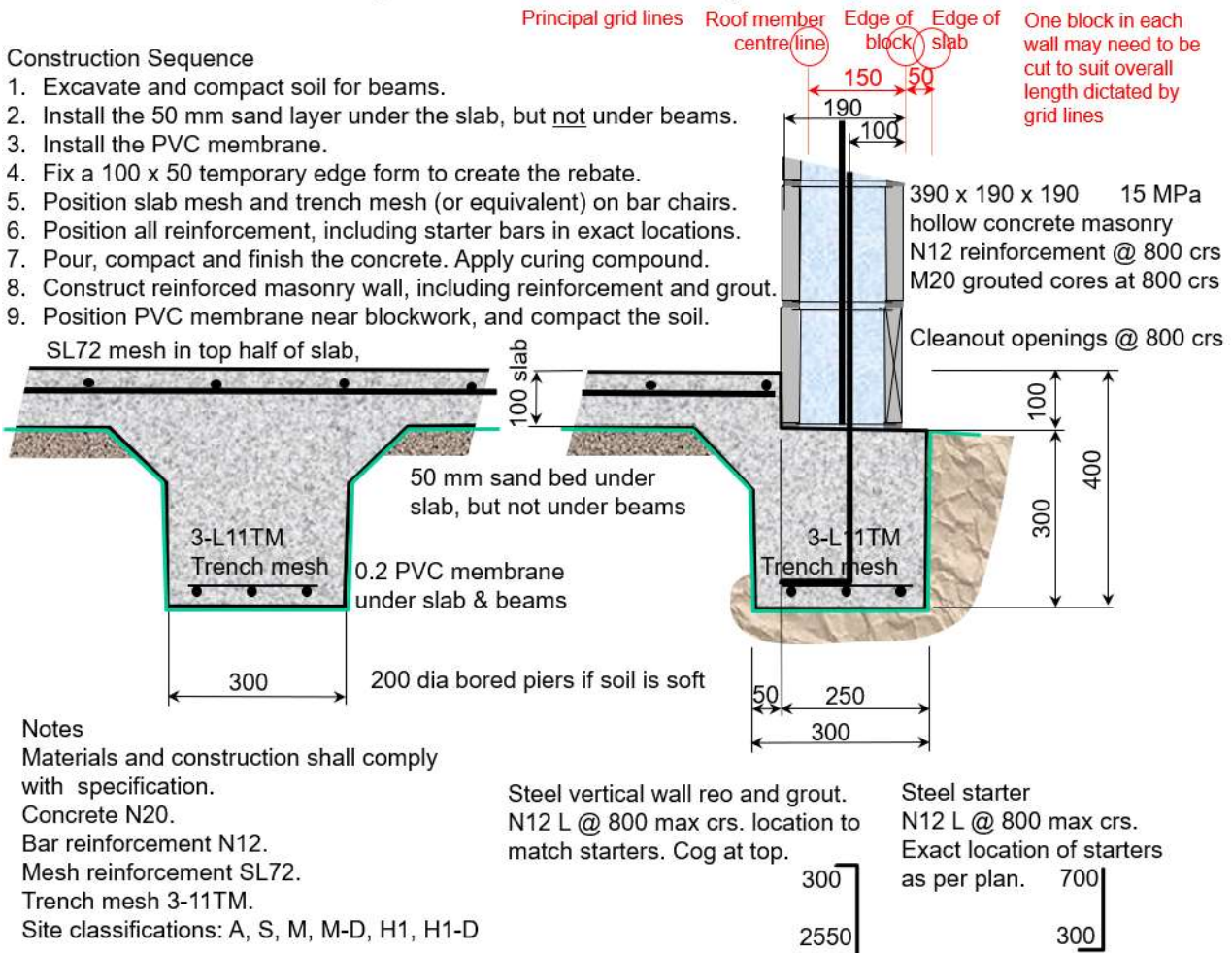


Concrete slab/beam system, including sand bed, reinforcement, membrane etc, designed to AS 2870. Edge beams and cross beams, 400 x 300 mm, 3-11TM trench mesh, 100 mm concrete slb, SL72 mesh.

Section through Transverse Internal Kitchen/Bathroom Wall Reinforcement
(looking towards kitchen/bathroom from breezeway)



Section through Roof Anchorage to Reinforced Concrete Masonry Wall




Section through Concrete Slab-on-Ground and Reinforced Concrete Masonry Wall


Concrete Slabs and Footings

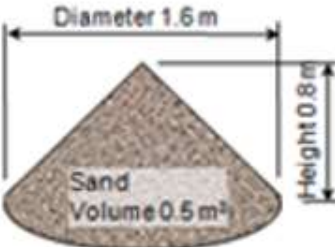
| | | |
|----------------------------------|----------------|-----|
| 20 MPa mix (by volume) 1 : 2 : 4 | | |
| Volume of concrete | m ³ | 1.0 |
| Wastage included | % | |
| GP or GB cement | 40 kg bags | 8 |
| Clean sharp sand | m ³ | 0.5 |
| 20 mm rock aggregate | m ³ | 1.0 |

**For 1 cubic metre (1 m³)
of 20 MPa concrete**




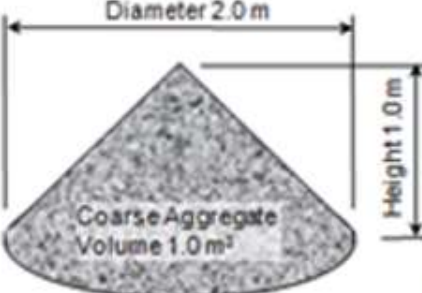
Cement 8 – 40 kg bags







Sand
Volume 0.5 m³






Coarse Aggregate
Volume 1.0 m³





Water 11 – 20 litre buckets



Part 3 – Specifications

All construction shall comply with the comprehensive project specifications are published in a separate document. The following is a summary of some key parts of that specification.

Concrete Slabs-on-Ground and Footings

Scope

This section covers the construction of the following concrete members for small to medium sized buildings:

- Concrete footings
- Concrete ground beams
- Concrete slab-on-ground

Building Regulations and Standards

All materials and construction shall comply with the most recent version of:

- the relevant parts of the Building Regulations;
- the Standards referred to therein;
- other Standards nominated in this specification; and
- other relevant Regulations.

Relevant Standards

AS 3600 Concrete Structures

AS 3610 Formwork for concrete

AS 3660.1 Termite management – New Building work

AS 3660.2 Termite management – In and around existing buildings and structures – Guidelines

AS 3660.3 Termite management – Assessment criteria for termite management systems

AS 1379 Specification and supply of concrete

AS 1478.2 Chemical admixtures for concrete, mortar and grout

AS 2870 Residential slabs and footings - Construction

AS 3799 Liquid membrane-forming curing compounds for concrete

AS 4200.1 Pliable building membranes and underlays - Materials

AS/NZS 4671 Steel reinforcing materials

Commencement

Work shall commence as soon as practical after, but not before,

(a) The Builder has issued:

- a written order
- the relevant contract drawings, specifications and schedule of work
- written approval of any details provided by the Contractor

(b) Completion of the survey and establishment of pegs and profiles, and

(c) Completion of bulk earthworks under and adjacent to the building.

Definitions

Site Classifications (based on AS 2870)

Class A – Most sand and rock sites with little or no ground movement from moisture changes

Class S – Slightly reactive clay sites with only slight ground movement from moisture changes

Class M – Moderately reactive clay or silt sites, which can experience moderate ground movement from moisture changes

Class H – Highly reactive clay sites, which can experience high ground movement from moisture changes

Class E – Extremely reactive sites, which can experience extreme ground movement from moisture changes

Class P – Filled sites including soft or unstable foundation, soils, such as soft clay or silt or loose sands, landslip, mine subsidence, collapsing soils, soils subject to erosion, reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise.

Note:

For deep-seated movements, typical of dry climates and corresponding to a design depth of suction change equal to or greater than 3 metres, the classification Classes M, H and E shall be modified to M-D, H-D or E-D.

Sand Bedding

A bedding sand layer 50 to 100 mm in thickness shall be placed over the compacted soil base to the level of the underside of the slab.

Vapour Barrier

The vapour barrier shall be installed immediately beneath the concrete slab-on-ground and footings. The vapour barrier shall not be punctured. Laps shall be 200 mm at joints. Plumbing penetrations shall be taped or sealed with a close fitting sleeve. Where shallow bulk piers are used, the vapour barrier shall line the pier hole to enable the piers and footings to be poured integrally.

Reinforcement

Reinforcement shall be placed in accordance with the drawings such that the following laps and cover are achieved. Three N12 corner bars 2.0 metre long shall be placed at all re-entrant corners.

| Reinforcement | Minimum Required Laps |
|---------------|---------------------------|
| Bars | 500 mm |
| Fabric | 2 cross wires overlapping |
| Trench mesh | 500 mm |

Bar chairs shall be placed at one metre centres both ways. Bar chairs shall incorporate wide bases and be placed on metal bases that do not puncture the vapour barrier. Where fabric with 7 mm bars at 200 mm centres (SL72), or lighter, is used, the bar chair spacing shall be reduced to 800 mm. Bar chairs shall be placed to give the following clear cover.

- 40 mm in concrete in contact with unprotected ground
- 40 mm in concrete exposed externally
- 30 mm to a sealed vapour barrier
- 20 mm to the internal surface

Placing Concrete

Trenches and footing excavations shall be dewatered and cleaned prior to concrete placement so that no softened or loosened material remains.

All concrete shall be compacted by mechanical immersion vibrator.

Finishing Concrete

Concrete surfaces shall be finished as noted below unless specified otherwise.

- Floor slabs - Steel float.
- External paths, driveways and parking areas at less than 10% slope - Fine broomed steel float.
- External paths, driveways and parking areas at greater than 10% slope - Coarse broomed steel float.
- Vertical surfaces exposed in the completed building - Rubbed back to fill all voids and provide smooth surface.
- Vertical surfaces not exposed in the completed building - Off form finish.

Curing Concrete

All concrete shall be cured using a sprayed curing compound.

Wax-based compounds shall not be used in areas requiring the subsequent application of curing adhesives.

Stripping Formwork

Unless adverse weather or the use of retarders delays the hardening of concrete, the minimum stripping time for formwork shall be 3 days.

Sand Bedding

Sand bedding shall comply with the Drawings, Building Regulations and relevant Standard (AS 2758.1). Unless stated otherwise, sand shall be clean, free from salts, vegetable matter and impurities, and with the following grading:

| Sieve | Percent Passing |
|----------|-----------------|
| 4.75 mm | 90 to 100 |
| 2.36 mm | 60 to 100 |
| 1.18 mm | 30 to 85 |
| 0.600 mm | 15 to 60 |
| 0.300 mm | 5 to 30 |
| 0.150 mm | 0 to 15 |
| 0.075 mm | 0 to 10 |

Vapour Barrier

Vapour barriers shall comply with the Drawings, Building Regulations and relevant Standard (AS 4200). Unless stated otherwise, vapour barriers shall be not less than medium impact resistance polyethylene vapour barrier 0.2 mm thick.

Adhesive tape shall be PVC for normal applications, or polyethylene tape for fixing to higher strength or thicker membranes.

Bar Chairs

Bar chairs shall comply with the Drawings, Building Regulations and relevant Standard. Unless stated otherwise, properties shall such that:

- Reinforcement is positioned in the top half of the concrete slab
- Reinforcement in footings has 40 mm in concrete in contact with unprotected ground and 30 mm to a sealed vapour barrier

Reinforcement

Reinforcement shall comply with the Drawings, Building Regulations and relevant Standard (AS 4671, AS 2870). Unless stated otherwise, properties shall be not less than:

- Deformed bars - 500 MPa, normal ductility (N)
- Square fabric, rectangular fabric and trench mesh - 500 MPa, low (L) or normal (N) ductility ribbed wires
- Fitments -500 MPa, low (L) or normal (N) ductility ribbed wires
- Round bar (e.g. R250 N10 for dowels) - 250 MPa round

Concrete

Concrete shall comply with the Drawings, Building Regulations and relevant Standard (AS 3600 or AS 2870). Unless stated otherwise, properties shall be not less than:

Characteristic compressive strength of 20 MPa (Strength grade N20) for residential ground slabs and footings to AS 2870

Characteristic compressive strength of 25 MPa (Strength grade N25) for other structures to AS 3600

Maximum aggregate size of 20 mm

Of sufficient slump to facilitate the nominated means of placement

Subject to plant control testing.

Admixtures may be used only if approved by the Engineer.

Formwork

Formwork shall comply with the Drawings, Building Regulations and relevant Standard (AS 3610).

Curing Compounds

Curing compounds shall comply with the Drawings, Building Regulations and relevant Standard (AS 3799). Unless stated otherwise, curing compounds shall be hydrocarbon, solvent-based acrylic, water-based acrylic or wax-based acrylic. Wax-based compounds shall not be used in areas requiring the subsequent application of curing adhesives.

Joint Material

Joint material shall comply with the Drawings, Building Regulations and relevant Standard (AS 2870). Unless stated otherwise:

- Backing rod for control joints, expansion joints and articulation joints shall be expanded polystyrene tube or bead or, rigid steel backing profile with closed cell foam adhered to the metal profile face.
- Joint sealant shall be gun grade multi-purpose polyurethane sealant.

Termite Protection

Scope

This section covers installation of termite barriers.

Building Regulations and Standards

All materials and construction shall comply with the most recent version of:

- the relevant parts of the Building Regulations;
- the Standards referred to therein;
- other Standards nominated in this specification; and
- other relevant Regulations.

Relevant Standards

AS 3660.1 Termite management – New Building work

AS 3600 Concrete structures

AS 3700 Masonry structures

AS 4773.1 Residential masonry – Design

AS 4773.2 Residential masonry - Construction

Commencement

Work shall commence as soon as practical after, but not before,

(a) The Builder has issued:

- a written order
- the relevant contract drawings, specifications and schedule of work
- written approval of any details provided by the Contractor

(b) The structure is complete to a stage to receive termite protection:

- For protection placed in wet concrete - formwork is in position
- For protection placed on slab or masonry – concrete has hardened and lower masonry courses constructed.

Termite Barriers

Termite protection measures shall comply with the Building Regulations and the relevant Standard (AS 3660.1)

Note

The aim of most termite barriers is to force the termites to the surface of the structure, where they are visible and can be easily eradicated. Some termite barriers also include chemicals that deter the termites from passing. Other systems, involving chemical dosing and graded stone barriers may be applicable, but must be properly maintained. Refer to the relevant materials specifications.

Termite Barrier Components in Concrete Footings or Concrete Slabs

Components in concrete footings or concrete slabs acting as a termite barrier shall comply with the Drawings, Building Regulations and relevant Standard (AS 3660.1).

Unless stated otherwise, properties shall be not less than the following:

- Structural elements below a termite barrier shall be manufactured from a termite resistant material.
- Components, used to assist a concrete footing or concrete slab to act as a termite barrier, shall be such that no cracks or openings exceed a width of 1 mm. The following components are deemed suitable for this application:
 - Pipe collars, manufactured from unplasticized polyvinyl chloride (PVC) with a minimum thickness of 1 mm with hardness not less than Shore D 80 (instantaneous), provided they are either clamped or parged to the penetrating service, or are tight fitting to the penetrating service such as to prevent any gap giving access to termites.
 - Pipe collars, manufactured from woven stainless-steel mesh with a 50 mm annulus, attached to the penetrating service by a stainless-steel clamp. Such collars shall be:
 - Embedded in the concrete; or
 - Clamped and parged to the top surface of the slab, and protected from damage by covering with a tile mortar bed or a false floors of cupboards or vanities. The clamp shall be sealed with the parging mix.

Termite Barriers Consisting of Woven Stainless-Steel Mesh

Woven stainless steel mesh acting as a termite barrier shall comply with the Drawings, Building Regulations and relevant Standard (AS 3660.1). Unless stated otherwise, properties shall be not less than the following:

- Mesh shall be woven wire from a fine wire loom.
- Wire shall be stainless steel grade 304 or 316 (AS 1449).
- Wire diameter shall be not less than 0.18 mm.
- Aperture size shall be not greater than 0.66 mm × 0.45 mm, except in those locations where a very small species of heterotermes vagus is present (e.g. parts of northern Australia), the aperture shall be reduced to a maximum of 0.40 × 0.40 mm

Pipe collars, manufactured from woven stainless-steel mesh with a 50 mm annulus, shall be attached to any penetrating service by a stainless-steel clamp. Such collars shall be:

- Embedded in concrete; or
- Clamped and parged to the top surface of the slab, and protected from damage by covering with a tile mortar bed or a false floors of cupboards or vanities. The clamp shall be sealed with the parging mix.

Termite Barrier Parging Material for Woven Stainless-Steel Mesh

Parging material, for woven stainless-steel mesh acting as a termite barrier, shall comply with the Drawings, Building Regulations and relevant Standard (AS 3660.1). Unless stated otherwise, parging material shall be a highly modified cementitious grout of a water-dispersed copolymer with a dry mixture of Type GP portland cement and sieved aggregate of a size that passes readily through the woven stainless-steel mesh.

Hardened parging material shall provide:

- Termite resistance, when in contact with soil and termite workings;
- Bond strength (mesh to substrate) of not less than 1 kN/m at 28 days for a temperature range of 10°C to 30°C at a relative humidity range of 10%RH to 70%RH; and for at least 60 freeze-thaw cycles in saline solution between -15°C and 18°C.

Termite Barriers Consisting of Composite Fibre Blanket and Plastic Membrane with Termiticide Impregnation

Termite barriers, consisting of composite fibre blanket and plastic membrane with termiticide impregnation, shall comply with the Drawings, Building Regulations and relevant Standard (AS 3660.1). Unless stated otherwise, properties shall be not less than:

- Internal non-woven fibre blanket, not less than 200 grams per square metre,
- Impregnated with termiticide of pyrethroid deltamethrin crystals to a loading of not less than 1 gram per square metre (low toxicity to warm blooded animals which both strongly repels and kills termites),
- Bonded to a top moisture vapour barrier of low density polyethylene (LDPE), not less than 200 microns thick,
- Bonded to a bottom membrane of low density polyethylene (LDPE) not less than 50 microns thick, to prevent the termiticide leaching into soil.

Installation

Termite protection shall provide a continuous barrier that prevents termites from entering the building undetected. The critical areas for termite entry, including the external perimeter, construction joints and plumbing penetrations, shall be protected and treated by a termite management system. The system installation shall conform to the manufacturer's guidelines.

A manufacturer's warranty for a minimum of fifty (50) years shall be provided. The warranty shall be renewable on an annual basis, base on annual inspection by the system installation organisation. Such a warranty shall provide for timber replacement should a system breach occur.

A certificate permanently fixed to the building in a prominent location, such as a meter box, kitchen cupboard, or similar, shall indicate the following:

- Method of protection.
- Date of installation.
- Life expectancy of any termiticide and the required re-injection date.
- Installer's or manufacturer's recommendations for the scope and frequency of future inspections for termite activity, not greater than 12 months.

Concrete footing or concrete slab acting as a termite barrier

A concrete footing or concrete slab, which is used as a termite barrier, shall be such that no cracks through it exceed a width of 1 mm. Except for joints tied by steel reinforcement between a footing and slab, all joints shall include a termite barrier, integral with the concrete slab. All interfaces, between penetrations and the surrounding concrete of a footing or slab, shall be protected by an integral barrier.

Sheet material acting as a termite barrier

Sheet material barriers and their joints shall be constructed of termite-resistant materials, such that termites are unable to pass through them. The maximum aperture size of a perforated sheet material barrier shall be sufficiently small as to deny access to foraging termite species of the region.

QMS - DANCER 8.4 x 5.7 Modular House (Reinforced Masonry)

Combinations of materials likely to cause electrolytic reaction shall not be used, e.g. stainless-steel mesh shall not be used in contact with mild steel reinforcement.

Barriers need only be physical, but could also include chemical impregnation if this is available.

Options are:

- Sheet metal barrier, similar to a metal flashing.
- Stainless steel mesh barrier, joined and fixed by resistant adhesive.
- Non-toxic waterproof compound impregnated into a geotextile.
- Internal non-woven fibre blanket impregnated with deltamethrin crystals (low toxicity to warm blooded animals) which both strongly repels and (where necessary) kills termites, bonded within casing layers, top plastic layer (200 microns), which doubles as a moisture vapour layer, and bottom plastic layer (50 microns) prevents termiticide leaching into soil.

Timber Structural Framing

Scope

This section covers timber framing, such as columns, posts, beams, battens, rafters, trusses and the like, consisting of sawn timber, plywood and glued-laminated timber.

Building Regulations and Standards

All materials and construction shall comply with the most recent version of:

- the relevant parts of the Building Regulations;
- the Standards referred to therein;
- other Standards nominated in this specification; and
- other relevant Regulations.

Relevant Standards

AS 1684.1 Residential Timber Framed Construction – Design Criteria

AS 1684.3 Residential Timber Framed Construction – Cyclonic areas

AS 1720.1 Timber structures - Part 1 Design methods

AS 1720.2 Timber structures - Part 2 Timber properties

AS 1604 Timber – Preservative treated – Sawn and round

AS 2082 Visually stress-graded hardwood for structural purposes

AS 2858 Visually stress-graded softwood for structural purposes

AS 2878 Timbers – Classification into strength groups

AS 3519 Timber – Machine proof grading

AS/NZS 1748 Timber – Stress graded – Product requirements for mechanically stress-graded timber

AS/NZS 2098 Methods of test for veneer and plywood

AS/NZS 2269 Plywood – Structural

AS/NZS 4063 Timber – Stress graded In-grade strength and stiffness evaluation

AS/NZS 4357 Structural laminated veneer lumber

AS/NZS 4490 Timber – Procedures for monitoring structural properties

AS/NZS 4491 Timber – Glossary of terms in timber related Standards

AS 1111 ISO metric hexagon commercial bolts and screws

AS 1397 Steel sheet and strip

AS 2334 Steel nails – Metric series

AS 3566 Screws – Self drilling – For the building and construction industries

AS 3660 Protection of buildings from subterranean termites

QMS - DANCER 8.4 x 5.7 Modular House (Reinforced Masonry)

Commencement

Work shall commence as soon as practical after, but not before,

(a) the Builder has issued:

- a written order
- the relevant contract drawings, specifications and schedule of work
- written approval of any details provided by the Contractor

(b) concrete slabs, footings or other structures that support the frame are in place.

Levels, Dimensions, Squareness and Setting Out

The structure upon which the framing is to be constructed shall be within the specified tolerances, with particular attention given to levels, dimensions, squareness and setting out.

Notes

- (a) Levels: It is critical that all floor framing is level. Before commencing the set out, check that slab or timber floor framing is level. It may be necessary to pack the frames in the low areas or to rectify the high areas.
- (b) Dimensions and Squareness: Check the position and squareness of the concrete slab or footings before commencing construction. Measure diagonals to check squareness.
- (c) Setting Out: When setting out the wall framing, a small error in position can lead to misalignment of the other components, such as the roof. Base the set out on the longest side of a building, since this will reduce the likelihood of errors in squareness.
- (d) Prefabricated Trusses or Roof Framing: If there are setting-out errors in the walls, there is a possibility that prefabricated roof trusses or framing may fail to engage the required supports. In complicated buildings, check the position of walls, before constructing the roof. It is critical that all wall framing be fixed and braced plumb.

Bracing and Tie-Down

All buildings shall be adequately supported against lateral wind loads, as specified in the relevant Standard (AS 1170.2 or AS 4055). In some cases, lateral earthquake loads may be a design criterion. The bracing requirements shall be determined for the appropriate Region, Terrain Category, Topography and Shielding and recorded on the drawings by the design engineer.

Tie Down

All buildings shall be adequately tied down to resist overturning due to wind loads, as specified in the relevant Standard (AS 1170.2 or AS 4055). The tie-down requirements should be determined for the appropriate Region, Terrain Category, Topography and Shielding and recorded on the drawings by the design engineer. Ensure that all tie-down systems are continuous to the footings or to the specified location on the structure.

Nailing

Where architraves are required to be subsequently removed during construction, the nails shall be temporarily left proud. On completion they shall be driven in and punched where appropriate.

Timber Shrinkage

Provision shall be made for timber shrinkage. Gaps that result from timber splitting shall be repaired, filled with wood filler and sanded smooth before completion.

Notes

- (a) Timber shrinks in cross section, although, due to the grain structure, it remains relatively stable in length. Cover strips should be provided at the edges of timber paneling to allow for shrinkage. The use of kiln-dried timbers will reduce shrinkage.
- (b) As timber dries, it shrinks, and in some circumstances, cracks can open. The moisture content varies with type and the degree of seasoning. Seasoned timber has moisture content in the range approximately 10% to 15%, and a variation of up to 2% within any lot of timber. Dense close-grained hardwoods dry more slowly than softwoods.

Preservatives

Timber in exposed applications shall be treated with pyrethroid- and metal-based light organic solvent preservatives (LOSPs) to minimize fungal decay and attack by insects.

Health Warnings and Precautions

Precautions shall be in accordance with the requirements of the relevant Regulations and, where applicable, the recommendations of the following reference *RIC Good Wood Project & the Good Wood Advisory Centre, Victoria, Preservatives*.

Light Organic Solvent Preservative (LOSP)

- LOSP is a solvent-based treatment, which inhibits fungal invasion of timber. It contains copper naphthenate, zinc naphthenate, tri-butyl tin oxide (TBTO) or pentachlorophenol (PCP), with resin or wax to improve its retention and to increase its ability to repel water.
- LOSP will release, to the atmosphere, 30-40 litres of hydrocarbon solvent per cubic metre of treated timber.
- LOSP is suitable for above-ground applications where dimensional-stability is important, is used principally in external applications (e.g. fences, decks and outdoor furniture).
- LOSP is not suitable for in-ground applications because it does not chemically fix in the wood, and will leach into the soil.
- LOSP must not be used for food storage, except where LOSP formulation is of very low toxicity.
- Where LOSP treated timber is exposed, cut or drilled, the exposed surface should be coated with a post-protection treatment.

Although previously in use, the following timber preservatives shall not be used.

- (a) *Creosote*: Creosote gives off a vapour that irritates the eyes and skin; and is therefore not recommended.
- (b) *Pigment Emulsified Creosote (PEC)*: PEC is a combination of coal tar, with a heavy metal pigment used to stabilize it. PEC is not suitable for normal building applications.
- (c) *Pentachlorophenol (PCP)*: PCP (derived from sodium pentachlorophenate) is an organochlorine family, of the same chemical group as DDT and Agent Orange. PCP can cause fatigue, fever, weight loss and nausea. PCP dioxins can also cause birth defects, allergies or cancer. PCPs can be passed on to successive generations through sperm and breast milk. PCP must be disposed of without special technology and facilities. It is recommended that PCPs should not be used.
- (d) *Copper Chrome Arsenate (CCA)*: CCA consists of heavy metals, copper, chromium and arsenic, which may leach from the timber and pose a health risk. CCA shall not be used; and when timber treatment is required, one of the alternatives listed above may be used.

If CCA-treated timber is already in use, the following precautions should be taken:

- Wear protective equipment when handling CCA treated timber.
- Wash hands thoroughly after handling CCA treated timber.
- Do not allow food to come into contact with CCA treated timber.
- Do not burn CCA treated timber in open fires, stoves, fireplaces or the like.

(e) Ammoniacal copper quaternary (ACQ)

(f) Copper azole

(g) Boron

Design and Construction

Timber structures shall comply with the Drawings, Building Regulations and relevant Standard, AS 1684.1 and AS 1720.1 [general applications]).

Minimum Strength Grade

Timber used for structural framing purposes shall have a strength grade not less than MGP10 as applicable.

Timber Type, Properties, Preservation and Application

Timber and timber products shall comply with the Drawings, Building Regulations and relevant Standard (AS 1684.1, AS 1684.3 or AS 1720.1 and shall be of the nominated stress grade (or strength group), durability class, and (where appropriate) lyctid susceptibility, shrinkage and ignitability.

1. The following tables are based on AS 1684.2 & 3 Table H1. For additional properties and definitions refer to source document.

QMS - DANCER 8.4 x 5.7 Modular House (Reinforced Masonry)

2. Preservative requirement: P = Should be preservative treated, S = Should be seasoned, O = Commonly used untreated
3. Availability: R = Readily available, L = Limited Availability
4. Durability Class: 1 = Highest natural durability to 4 = Lowest natural durability.
5. Where required to achieve particular resistance to termite and/or borer attack, the species listed herein shall be treated to achieve the hazard levels listed in AS 1684.2 & 3 Table C1.
6. Lyctid Susceptible: S = Susceptible, N = Not susceptible, R = Rarely susceptible

Timber and Timber Products for Use Below Ground Level

Timber and timber products shall not be used in direct contact with the ground. If timber is required to be embedded below ground level, it shall be encased in Grade N20 concrete (20 MPa) of sufficient thickness to provide not less than 50 mm cover to all parts of the timber.

Masonry

Scope

This section covers the construction of partially reinforced hollow concrete blockwork used as the walls of buildings constructed on concrete slab-on-ground.

Building Regulations and Standards

All materials and construction shall comply with the most recent version of:

- the relevant parts of the Building Regulations;
- the Standards referred to therein;
- other Standards nominated in this specification; and
- other relevant Regulations.

Relevant Standards

AS 3700 Masonry structures

AS 3700 Supplement 1 Masonry Structures – Commentary

AS 4773.1 Masonry in small buildings – Design

AS 4773.2 Masonry in small buildings – Construction

AS/NZS 4455 Masonry units and segmental pavers

AS/NZS 4456 Masonry units and segmental pavers - Methods of test

AS/NZS 2904 Damp-proof courses and flashings

AS/NZS 2699.1 Built-in components for masonry construction - Wall ties

AS/NZS 2699.2 Built-in components for masonry construction - Connectors and accessories

AS/NZS 2699.3 Built-in components for masonry construction - Lintels and shelf angles (durability requirements)

AS 3972 Portland and blended cements

AS 2758.1 Aggregates and rock for engineering purposes - Concrete aggregates

AS 3660.1 Termite management – New Building work

AS 3660.2 Termite management – In and around existing buildings and structures - Guidelines

AS/NZS 4671 Steel reinforcing materials

AS 3600 Concrete structures

AS 2870 Residential slabs and footings – Construction

Mortar

For general applications, Type M3 mortar shall be used, and shall consist by volume of:

- 1 part GP or GB cement, 1 part lime, 6 parts sand (water thickener optional)
- 1 part GP or GB cement, 5 parts sand plus water thickener

Damp-Proof Course

Damp-proof-courses shall be built into the masonry in accordance with the Drawings, Building Regulations and relevant Standard (AS 3700). Unless stated otherwise, damp-proof-courses shall be:

- Placed under walls to provide a continuous damp-proof barrier around the building
- Lapped not less than 150 mm at joints
- Projecting through the entire width of the masonry and project beyond the external face of the masonry
- Stepped at changes of floor level
- Positioned (if applicable) under the coping of any parapet more than 300 mm above adjoining roof cladding
- Positioned (if applicable) in chimney stacks, 150 mm to 300 mm above the highest junction of roof and chimney
- At least 75 mm above finished surface level of adjacent paved, concreted or landscaped areas that slope away from the wall
- At least 50 mm above finished paved or concreted areas sloping at least 50 mm over the first 1 m from the building and protected from the direct effects of the weather by a carport, verandah or similar
- At least 150 mm above the adjacent finished ground in all other cases.

Flashings

- Flashings shall be built into the masonry in accordance with the Drawings, Building Regulations and relevant Standard (AS 3700). Unless stated otherwise, flashings shall be:
- Fixed with clouts to timber studs or built into an inner leaf of masonry as applicable
- Built into the external leaf of walls exposed to weather, extending across the cavity,
- Turned up 150 mm and nailed to the frame or built 30 mm into an inner leaf of masonry,
- Positioned at openings (unless they are protected by an overhang), where they shall extend 100 mm past the end of opening and be turned up to prevent leakage.

Termite Protection

Masonry walls in buildings shall incorporate termite protection.

QMS - DANCER 8.4 x 5.7 Modular House (Reinforced Masonry)

Mortar Joints

Mortar joints shall comply with the Drawings, Building Regulations and relevant Standard (AS 3700). Unless stated otherwise, mortar joints shall comply with the following:

- Mortar joint shall be 10 mm thick.
- Mortar joints in hollow blockwork, shall be face shell bedded and shall be ironed, unless a flush joint is specified for aesthetic reasons.

Provision for Timber Shrinkage

In masonry veneer construction, a gap in accordance with schedule below shall be left between the timber frame and the top of the masonry, and at window sills, to accommodate timber shrinkage.

| Location in timber framed buildings | Minimum Clearances (mm) | |
|---|---------------------------|--------------------|
| | Unseasoned hardwood frame | Other timber frame |
| Sills of lower or single storey windows | 10 mm | 5 mm |
| Roof overhangs of single storey buildings | 16 mm | 8 mm |
| Sills of second storey windows | 20 mm | 10 mm |
| Roof overhangs of two storey buildings | 24 mm | 12 mm |

Reinforced Masonry Construction (Excluding Retaining Walls)

All construction of reinforced concrete masonry shall comply with the Drawings, Building Regulations and relevant Standard (AS 3700). Unless stated otherwise, the following shall apply:

Vertical steel reinforcement shall be tied using tie wire to steel starter bars through clean-out holes in each reinforced core and fixed in position at the top of the wall by plastic clips or template. Starter bars shall be tied into position to provide the specified lap above the top surface of the footing. The starter bars shall be held in position on the centre line of a reinforced blockwork wall by a timber member or template and controlled within a tolerance of ± 5 mm through the wall and ± 50 mm along the wall.

Horizontal steel may be laid in contact with rebated webs of Double U or H blocks. It shall be held in position by steel ties or plastic clips. Cover to horizontal steel in lintel blocks shall be maintained by the use of wheel type plastic clips.

The minimum cover (from the edge of the steel reinforcement to the inside face of the block core) shall be 20 mm, except where specified otherwise. In severe marine environments, saline or contaminated water including tidal and splash zones, and within 1 km of an industry in which chemical pollutants are produced, the minimum cover to the inside face of the block core shall be 30 mm.

QMS - DANCER 8.4 x 5.7 Modular House (Reinforced Masonry)

For houses (and similar buildings) consisting of partially reinforced concrete masonry on concrete slab-on-ground, control joints shall not be built in.

For other reinforced concrete masonry applications, control joints shall be built into reinforced concrete masonry at all points of potential cracking and at the locations shown on the drawings. The spacing of control joints should not exceed 8.0 metres, except that the spacing of control joints may be increased in reinforced masonry walls meeting the following criteria:

- Consisting of at least 190 mm hollow concrete units,
- Built less than 3.0 metres high,
- Incorporating a top reinforced bond beam,
- Incorporating N16 horizontal reinforcement at not greater than 400 mm centres,
- On a site with rock or slightly reactive foundations,
- With a reinforced concrete footing of adequate stiffness.

Hollow Concrete Masonry Units

Hollow concrete masonry units shall comply with the Drawings, Building Regulations and relevant Standard (AS/NZS 4455.1) and the following properties:

- Dimensional Category DW4;
- General Purpose Salt Attack Resistance Grade (except for applications requiring Exposure Grade including saline wetting or drying, aggressive soils, severe marine environments, saline or contaminated water including tidal or splash zones, or within 1 km of a industry producing chemical pollutants);
- Characteristic Compressive Strength not less than a value specified by the Engineer or 15 MPa (measured using face shell bedding), whichever is the lesser;
- Characteristic Lateral Modulus of Rupture not less than 0.8 MPa;
- Mean Coefficient of Residual Drying Contraction not more than 0.6 mm/m.
- When intended for face applications and exposed to the weather:
 - Permeability not more than 2 mm/minute
 - Efflorescence Potential of Nil or Slight
 - Colour and texture within an agreed range.
- If units are intended to incorporate both horizontal and vertical reinforcement and are not protected both sides by a waterproof membrane, they shall be “H” or “Double U” configuration such that:
- Units may be fully grouted and may be reinforced both vertically and horizontally;
- Cores such that concrete grout may flow easily around and enclose the reinforcement in all cores; and provide cover is consistent with the requirements for durability, strength and fire resistance as appropriate.

Cement

Cement shall be Type GP portland cement or GB blended cement complying with the relevant Standard.(AS 3972).

Water Thickener

Water thickener shall be methyl-cellulose based.

Sand

Sand shall be well graded and free from salts, vegetable matter and impurities. Sand shall not contain more than 10% of the material passing the 75 micron sieve. Sand within the following grading limits complies with this requirement and is deemed suitable for concrete masonry.

| Sieve | Percent Passing |
|--------------|------------------------|
| 4.76 mm | 100 |
| 2.36 mm | 95–100 |
| 1.18 mm | 60–100 |
| 600 µm | 30–100 |
| 300 µm | 10–50 |
| 150 µm | 0–10 |
| 75 µm | 0–4 |

Concrete Grout

Concrete grout shall comply with the Drawings, Building Regulations and relevant Standard (AS 3700). Unless stated otherwise, properties shall be:

- a minimum portland cement content of 300 kg/cubic metre;
- a maximum aggregate size of 10 mm;
- sufficient slump to completely fill the cores; and
- a minimum compressive cylinder strength of 20 MPa.

Part 4 – Cutting Lists

| Floor | | Material List | | | | | | Cutting Schedule | | |
|-------|---------------------|---------------|---|----|----------|----------|-------|------------------|---|--------|
| Item | Component | Section | | | Material | Quantity | | No | @ | Length |
| | | mm | x | mm | | x | m | | | mm |
| FB | Floor Bearer | 140 | x | 45 | F7 | x | 99.0 | 30 | @ | 3,000 |
| FBS | Floor Bearer Spacer | 140 | x | 45 | F7 | x | 6.6 | 20 | @ | 300 |
| FJ | Floor Joist | 140 | x | 45 | F7 | x | 264.0 | 80 | @ | 3,000 |

| Roof Trusses | | Material List | | | | | | Cutting Schedule | | |
|--------------|------------------------|---------------|---|----|----------|----------|------|------------------|---|--------------|
| Roof Trusses | | | | | | | | No | @ | Length |
| | | | | | | | | | | 6.600 |
| Item | Component | Section | | | Material | Quantity | | No | @ | Length |
| | | mm | x | mm | | x | m | | | mm |
| TC(L) | Truss Top Chord (or R | 90 | x | 45 | F7 | x | 81.2 | 18 | @ | 4,100 |
| TC(S) | Truss Top Chord (or R | 90 | x | 45 | F7 | x | 77.5 | 18 | @ | 3,916 |
| BC(L) | Truss Bottom Chord (a | 90 | x | 45 | F7 | x | 76.5 | 18 | @ | 3,865 |
| BC(S) | Truss Bottom Chord (a | 90 | x | 45 | F7 | x | 70.4 | 18 | @ | 3,555 |
| CT | Collar Tie | 90 | x | 45 | F7 | x | 23.8 | 18 | @ | 1,200 |
| KP | King Post | 90 | x | 45 | F7 | x | 28.4 | 18 | @ | 1,435 |
| L1 | Lacing at eaves | 90 | x | 45 | F7 | x | 4.6 | 18 | @ | 232 |
| L2 | Lacing at anchorage st | 90 | x | 45 | F7 | x | 8.3 | 18 | @ | 417 |
| L3 | Lacing | 90 | x | 45 | F7 | x | 14.5 | 18 | @ | 734 |
| L4 | Lacing | 90 | x | 45 | F7 | x | 20.8 | 18 | @ | 1,050 |
| L5 | Lacing | 90 | x | 45 | F7 | x | 0.0 | 0 | @ | 0 |
| L6 | Lacing | 90 | x | 45 | F7 | x | 15.1 | 18 | @ | 760 |
| D1 | Diagonal | 90 | x | 45 | F7 | x | 22.1 | 18 | @ | 1,118 |
| D2 | Diagonal | 90 | x | 45 | F7 | x | 27.4 | 18 | @ | 1,385 |
| D3 | Diagonal | 90 | x | 45 | F7 | x | 0.0 | 0 | @ | 0 |

| Purlins, Veranda, Fascias, Barge Boards | | Material List | | | | | | Cutting Schedule | | |
|---|---------------------------|---------------|---|----|----------|----------|-------|------------------|---|--------|
| Item | Component | Section | | | Material | Quantity | | No | @ | Length |
| | | mm | x | mm | | x | m | | | mm |
| CJ | Ceiling Joist (additional | 45 | x | 90 | F7 | x | 41.3 | 9 | @ | 3,300 |
| CBa | Ceiling Batten | 45 | x | 90 | F7 | x | 172.8 | 64 | @ | 2,700 |
| VRa | Veranda Rafter | 90 | x | 45 | F7 | x | 18.4 | 9 | @ | 1,862 |
| VBe | Veranda Beam | 0 | x | 0 | | x | 17.2 | 4 | @ | 3,900 |
| RDB | Roof Bracing | 90 | x | 45 | F7 | x | 24.3 | 4 | @ | 5,532 |
| FaB | Fascia Board | 230 | x | 45 | F7 | x | 24.4 | 6 | @ | 3,700 |
| BaB | Barge Board | 230 | x | 45 | F7 | x | 21.8 | 4 | @ | 4,954 |
| RPu | Roof Purlin (or Roofing | 90 | x | 45 | F7 | x | 165.1 | 45 | @ | 3,300 |