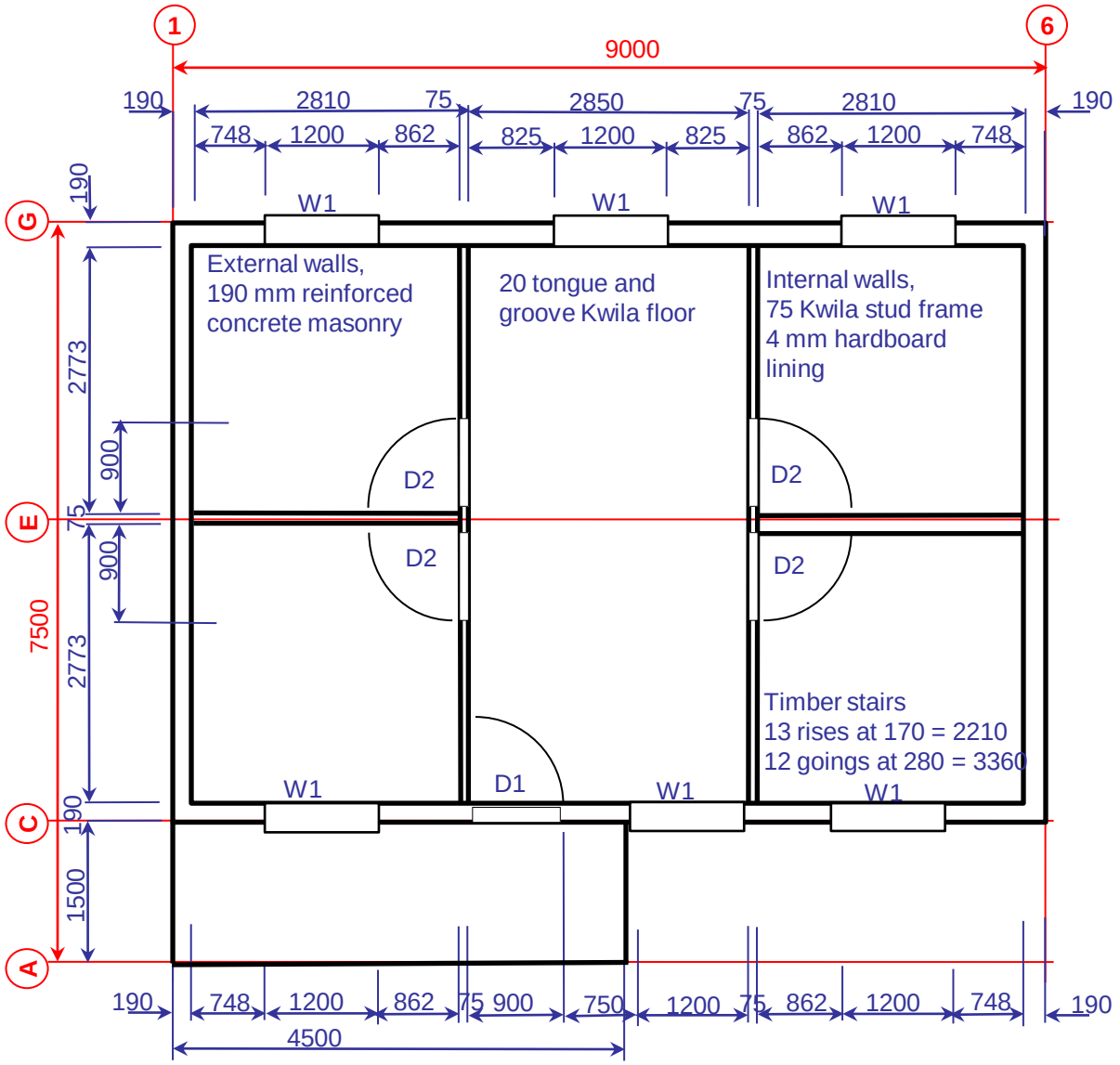
Concrete Slab-on-Ground

This training package provides information on concrete slab-on-ground construction, including reinforcement, formwork, mix, placement and curing, for village infrastructure and houses common in South-East Asia and the South Pacific region.

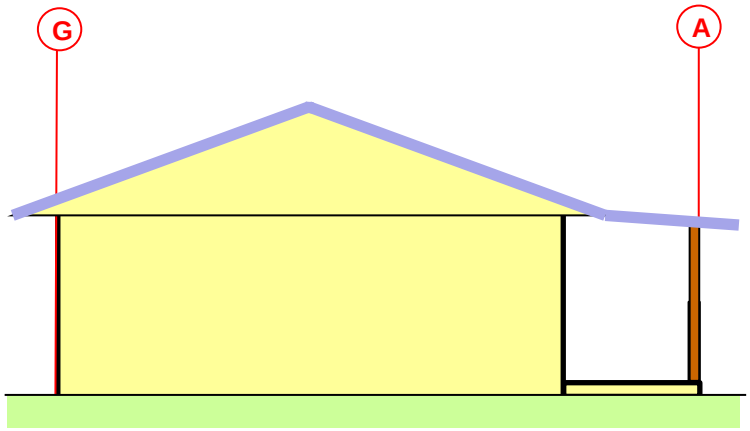
House superstructures may be either:

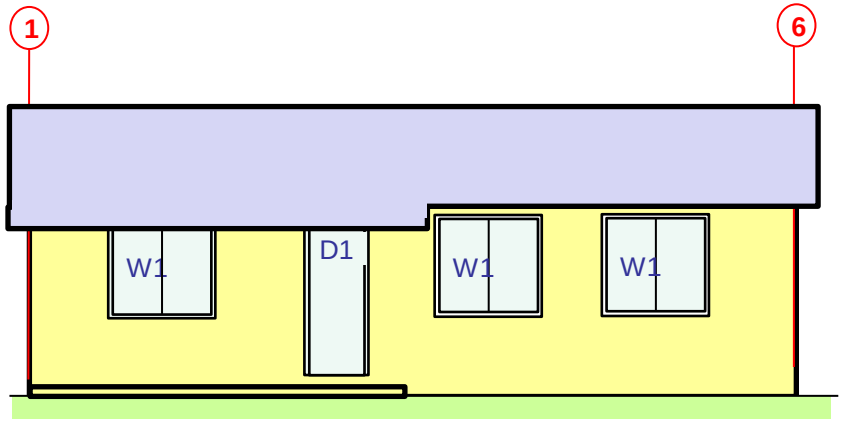
- single-leaf reinforced concrete masonry or
- clad timber or steel frames.

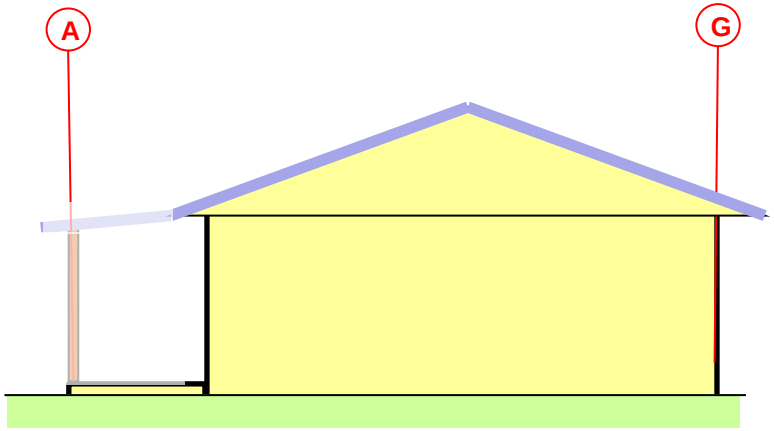
Typical Single Storey Reinforced Concrete Masonry House - Floor Plan

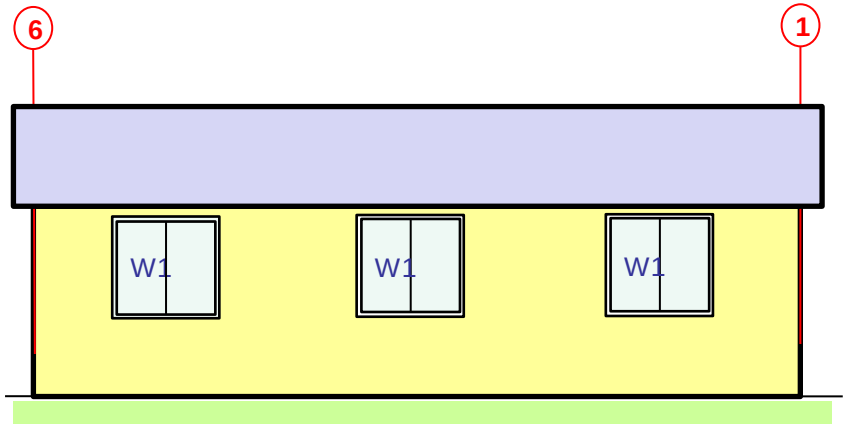


Typical Single Storey Reinforced Concrete Masonry House - Elevations









Typical Single Storey Reinforced Concrete Masonry House

Concrete Slab-on-ground and Ground Beams

All concrete, N20 (20 MPa), vibrated and cured by coverinng with wet sand (or equivalent) for seven days

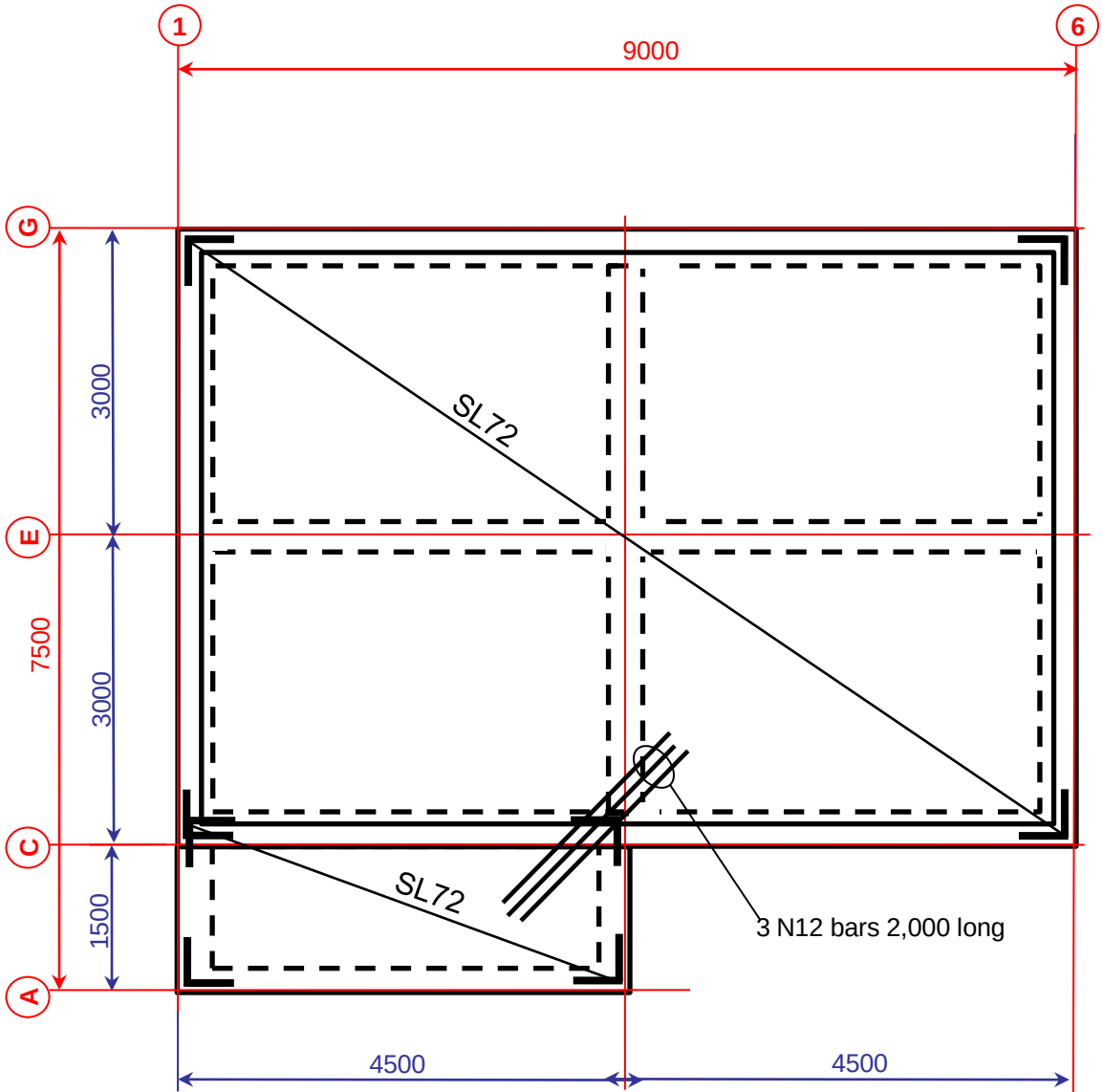
SL72 mesh in top half of slab, Minimum cover 20 mm

50 mm sand bed under slab, but not under beams

0.2 mm PVC membrane under slab and beams

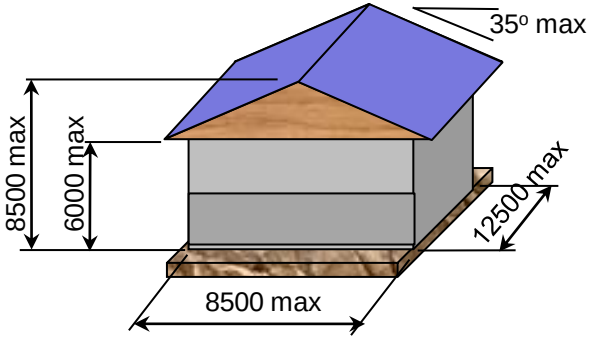
Use 400 mm diameter bored piers if there is soft soil

Beams as shown anround perimeter and across centre of slab. 3-L11TM trench mesh in bottom of each beam.



Concrete Slab-on-ground and Ground Beams

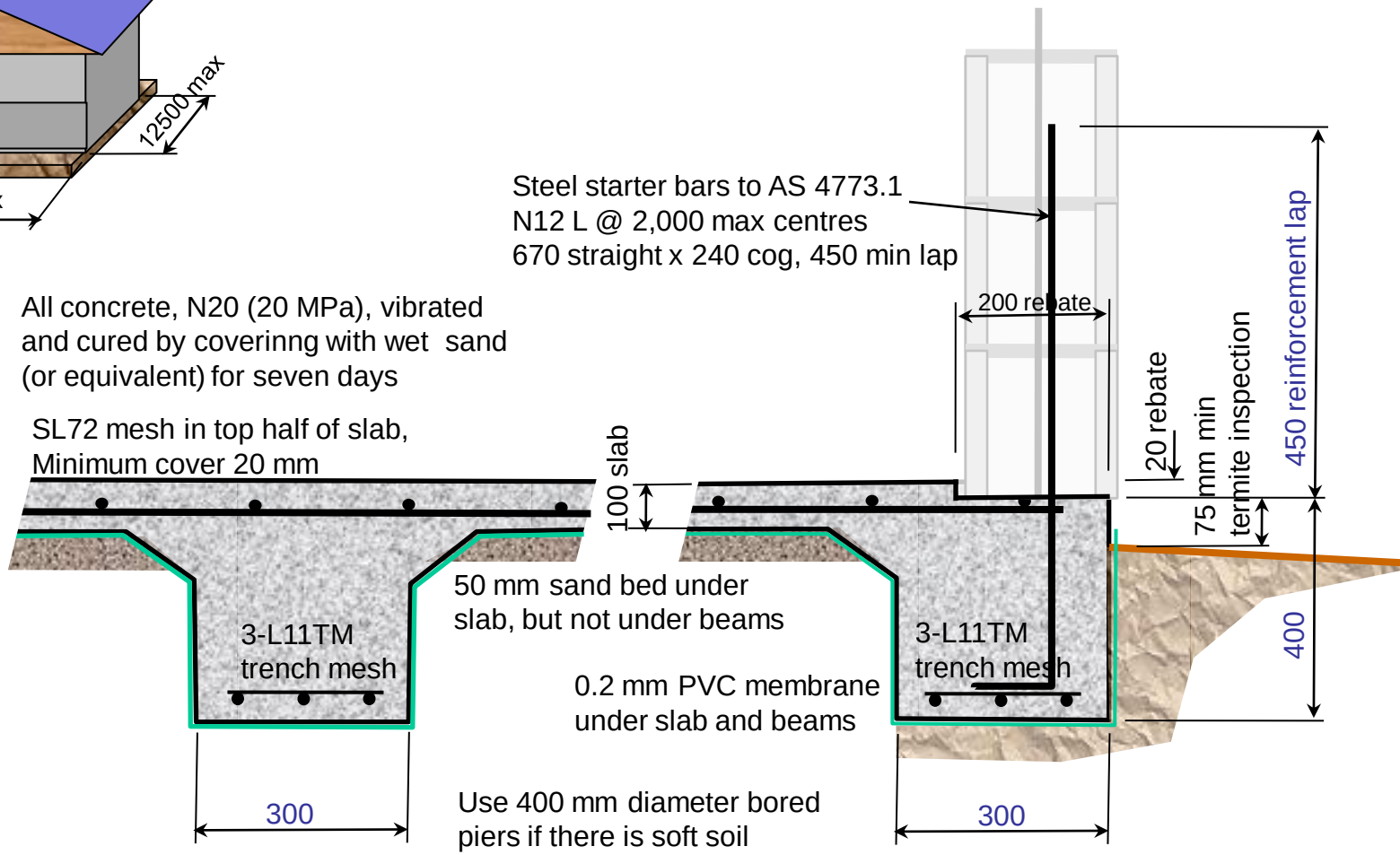
Limitation of this design
Site classification A,S, M, H, H1
Maximum dimensions as shown
For other dimensions, refer to 2870



Steel starter bars to AS 4773.1
N12 L @ 2,000 max centres
670 straight x 240 cog, 450 min lap

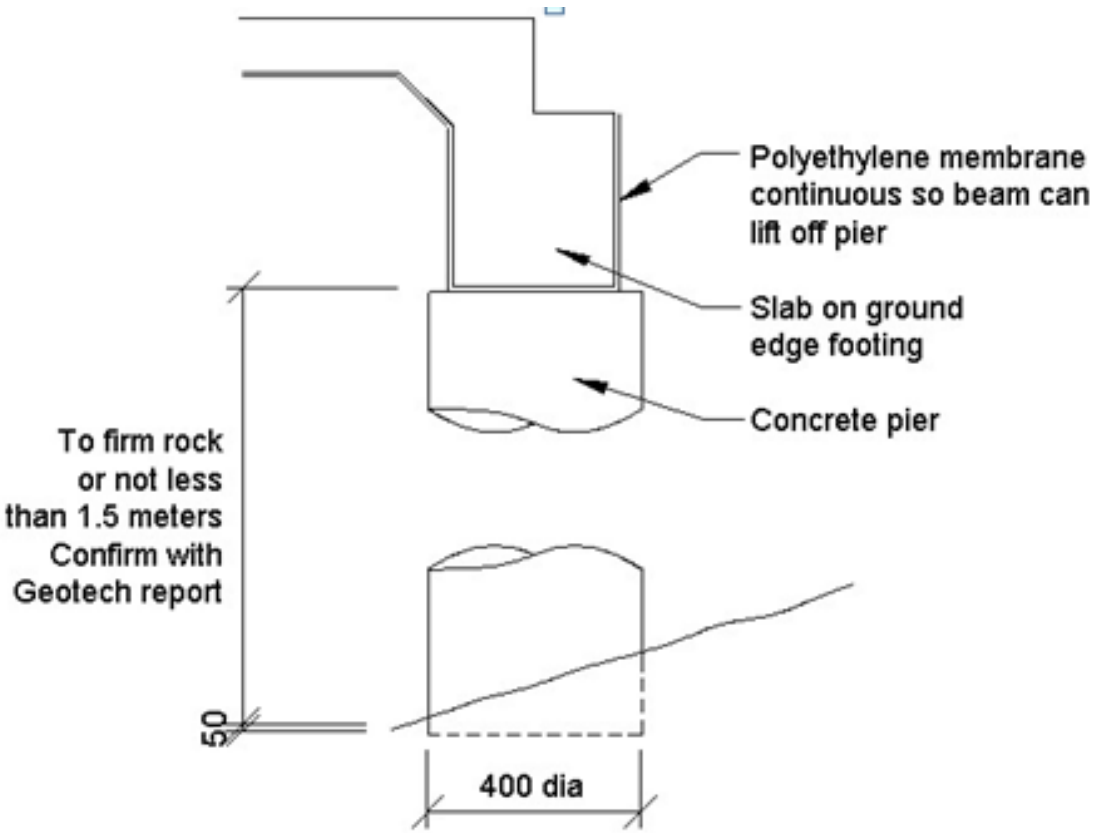
All concrete, N20 (20 MPa), vibrated and cured by coverinng with wet sand (or equivalent) for seven days

SL72 mesh in top half of slab, Minimum cover 20 mm



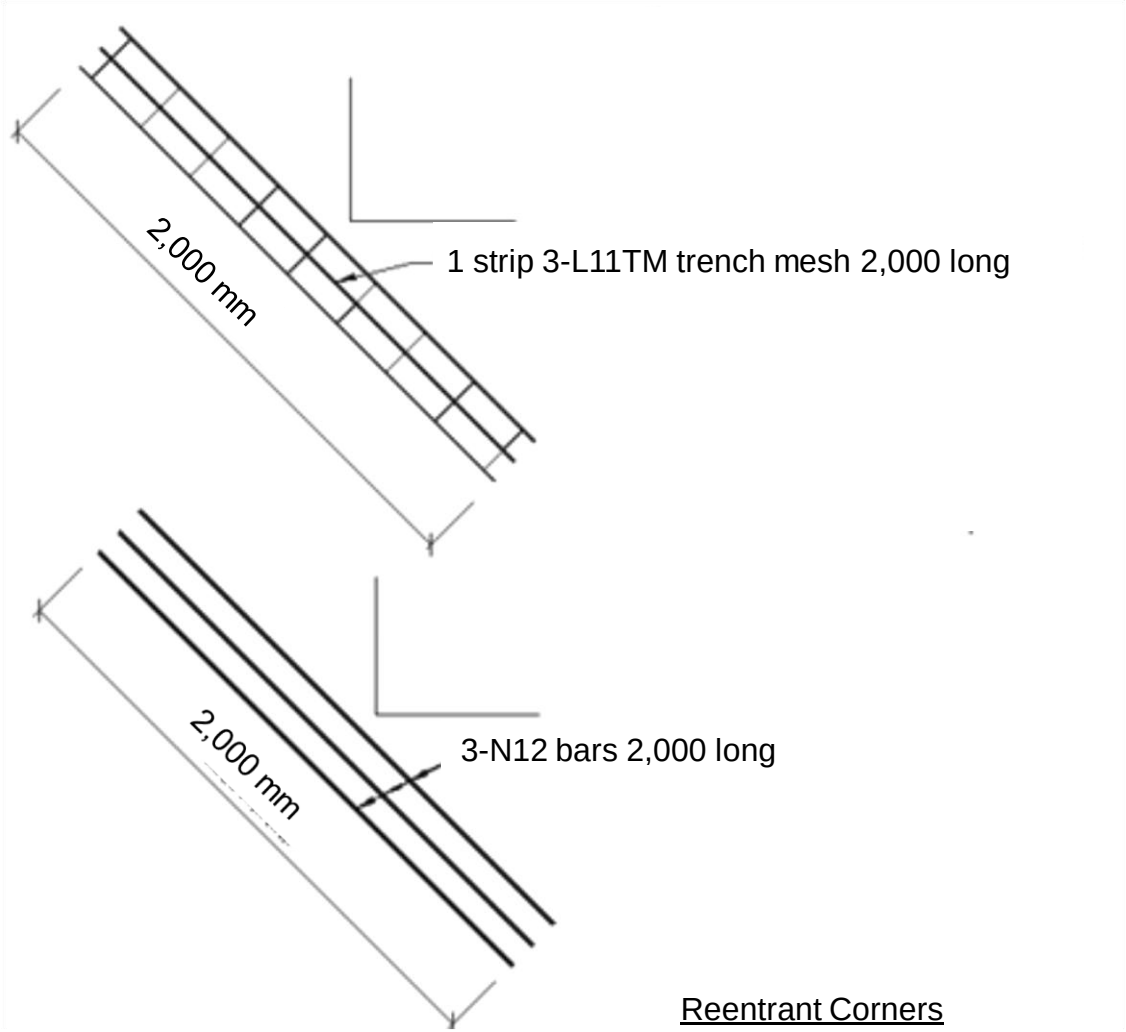
Use 400 mm diameter bored piers if there is soft soil

Concrete Slab-on-ground and Ground Beams – Bored Piers



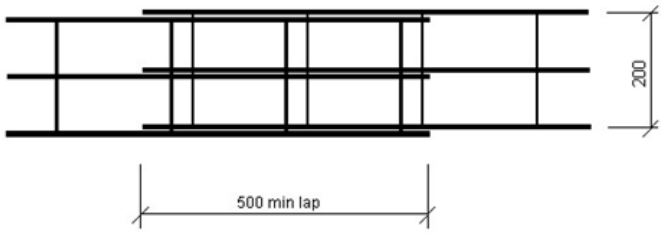
Slab on Ground with Concrete Piers

Concrete Slab-on-ground and Ground Beams - Corner Reinforcement

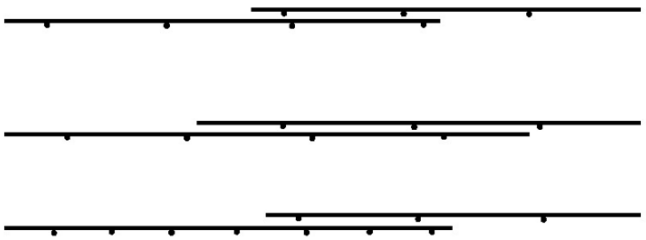


Reentrant Corners

Concrete Slab-on-ground and Ground Beams – Reinforcement Laps

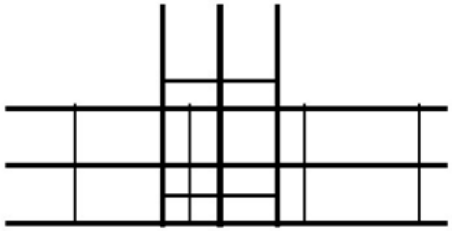


Trench Mesh Splices

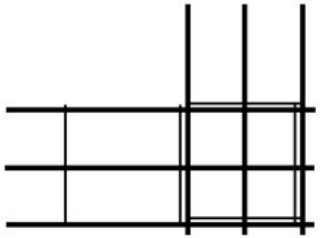


Overlap at least two cross bars

Laps in Reinforcement Fabric

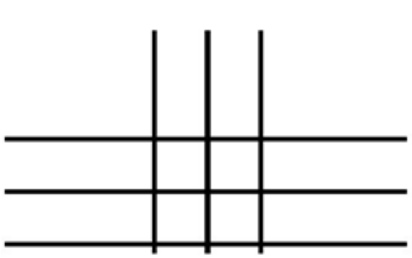


T Intersection For Trench Mesh

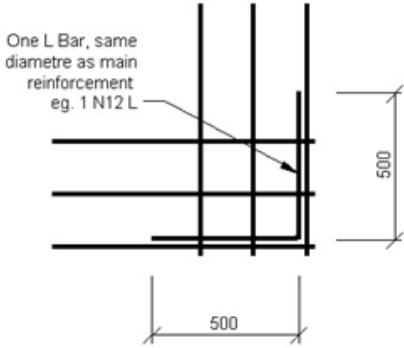


L Intersection For Trench Mesh

Laps in reinforcing bars



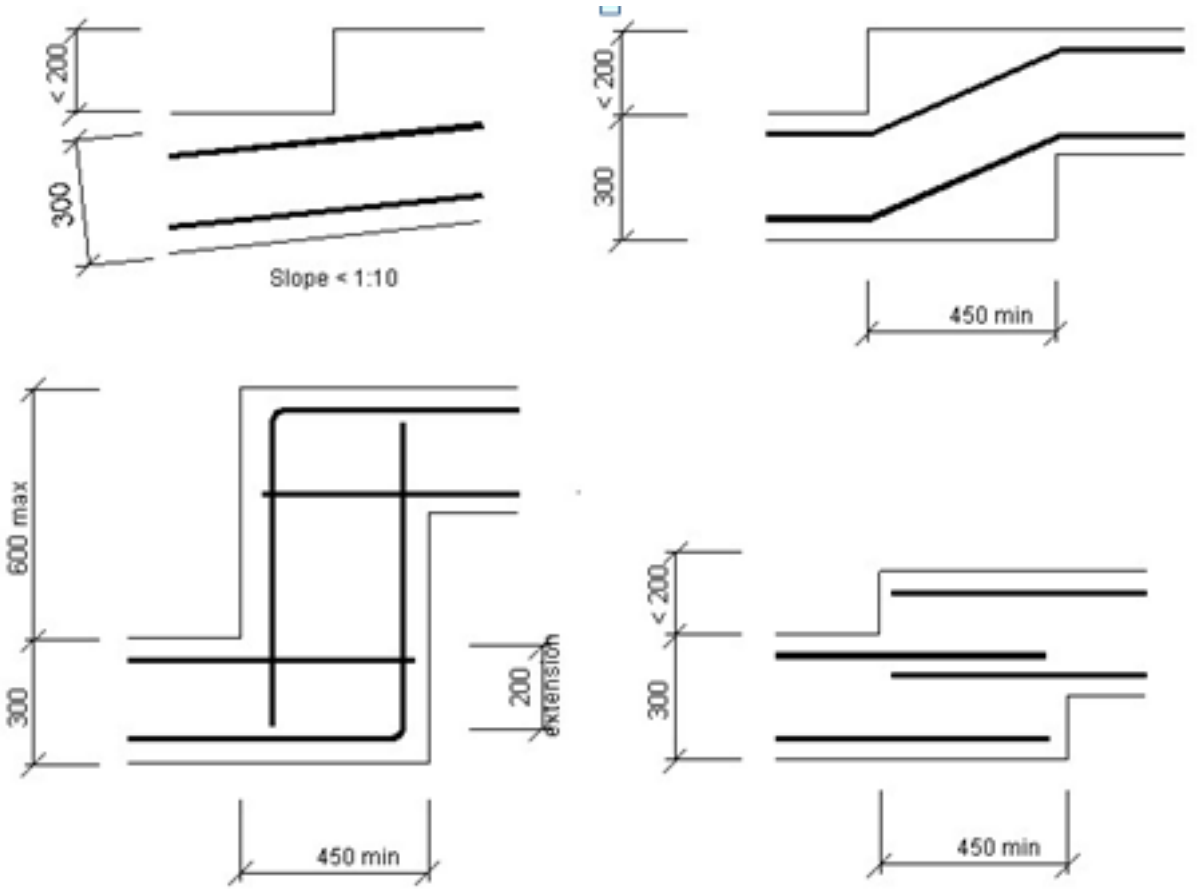
T intersections for reinforcing bars



L intersections for reinforcing bars

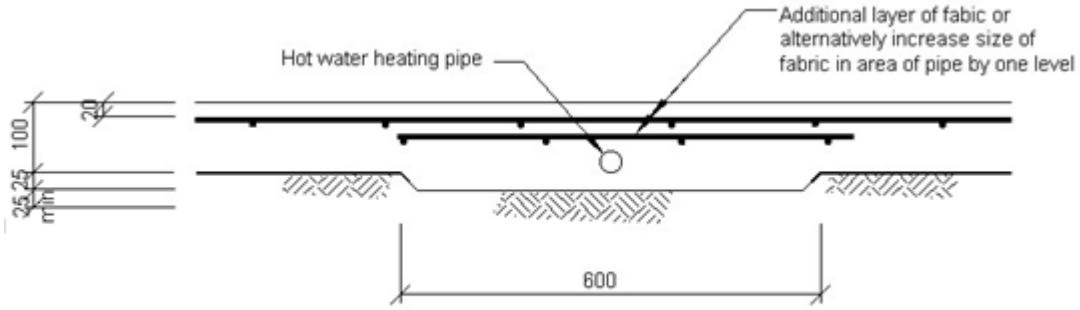
Intersections in Reinforcing Bars

Concrete Slab-on-ground and Ground Beams – Stepped Beams

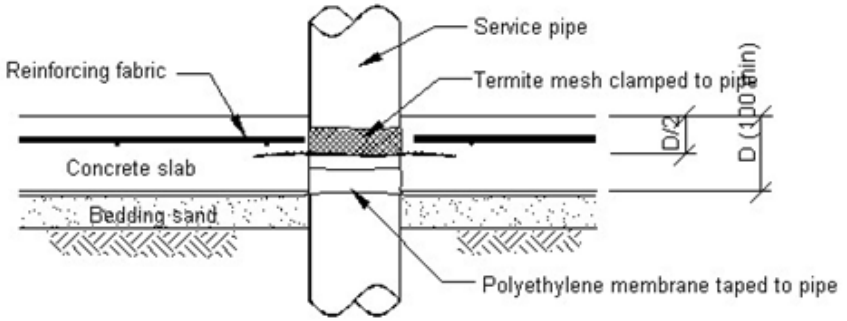


Stepped Strip Footing (300 deep)

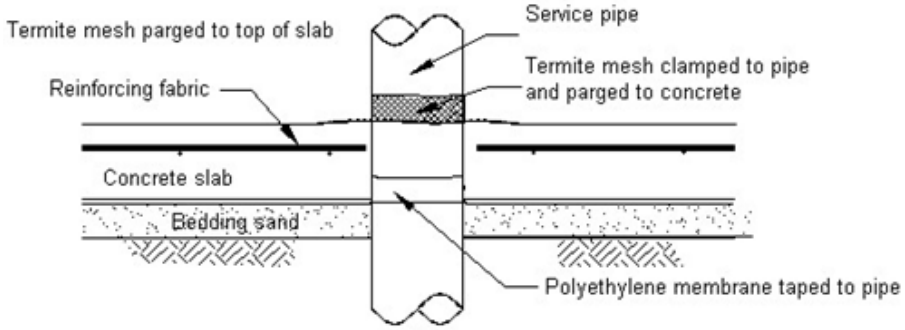
Concrete Slab-on-ground and Ground Beams – Pipes & Penetrations



Hot Water Heating Pipes Embedded in Slab

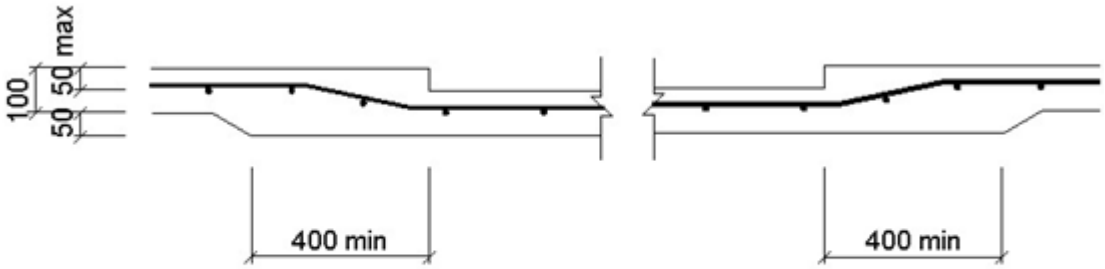


CHECK WITH AS3661.1

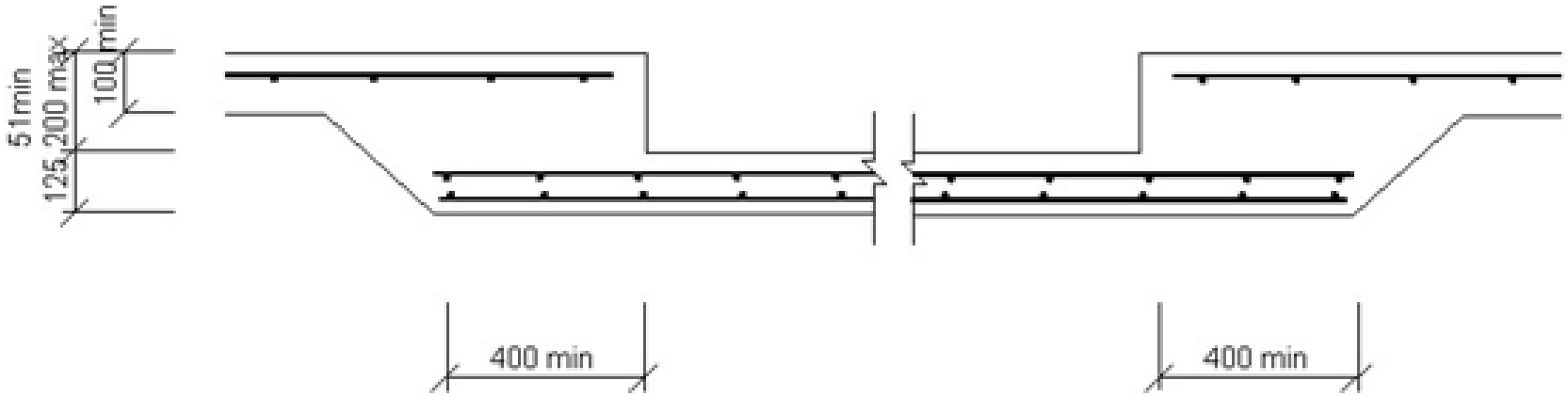


Termite Mesh Detail at Service Penetration

Concrete Slab-on-ground and Ground Beams – Recess Details



Shallow Recesses in Slabs



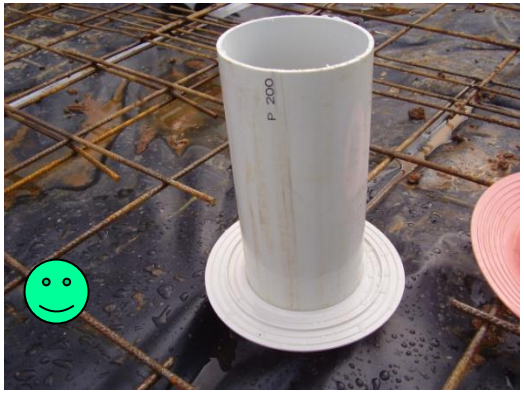
Deep Recesses in Slabs

Termite Management

Termites must be prevented from entering the building. Barriers force the termites to the surface, where they can be detected and destroyed.

An exposed concrete edge
ensures the termites are visible

Termite collars prevent termites from entering beside drainage pipes.



Termite barriers and membranes prevent termites from entering at the junction between walls and slabs.

Waffle Pod Slab-on-Ground

As an alternative to conventional excavated ground beams, expanded polystyrene waffle pods may be used to form the ground beams on top of compacted foundations. For details, refer to AS 2870.

20 MPa Concrete Specification

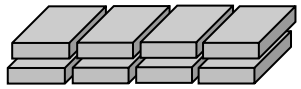
For 1 cubic metre of 20 MPa concrete, the mix should be:

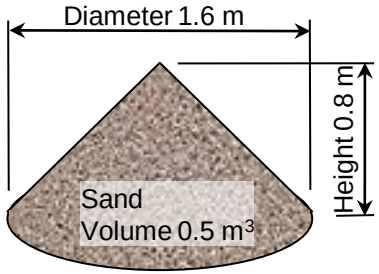
- 8 bags (40 kg each) of GP or GB portland cement - Cement is also available in 20 kg bags, in which case 16 would be required.

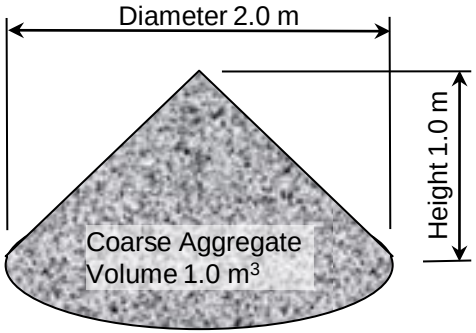
- 0.5 m^3 of sand - Sand should be clean sharp sand, NOT brickies sand or plasters sand.

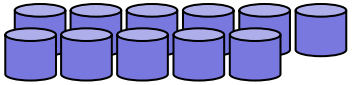
- 1.0 m^3 of 20 mm coarse aggregate - Aggregate should be clean 20 mm river gravel, crushed aggregate or similar.

- 220 – 230 litres of water – Approximately 11 20 litre buckets (300 mm diameter x 290 mm deep). Less water should be used if sand or aggregate are damp.


Cement 8 – 40 kg bags



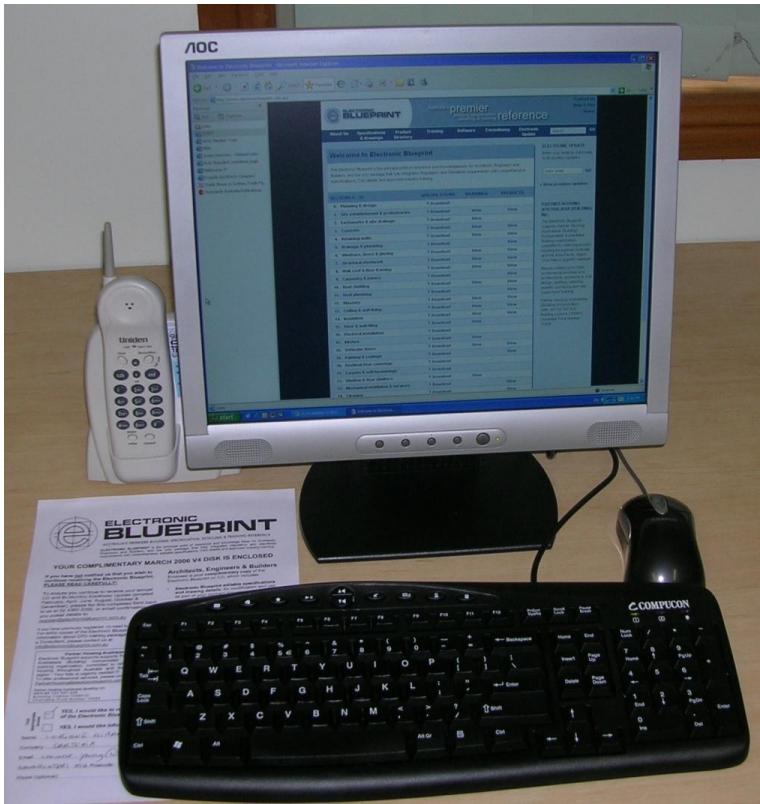



Water 11 – 20 litre buckets

Source: Cement Concrete & Aggregates Australia

Specification

This module provides typical specifications, summarised from the Electronic Blueprint. More comprehensive editable building specifications may be downloaded from: www.electronicblueprint.com



Specification

Scope

This specification covers the construction of the following concrete members for residential applications:

- Concrete footings
- Concrete ground beams
- Concrete slab-on-ground
- Concrete piers.

Relevant Standards

- AS 3600 Concrete Structures
- AS 3610 Formwork for concrete
- AS 3660.1 Termite management – New Building work
- 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
- AS 2159 Rules for the design and installation of piling (SAA Piling Code)

Specification

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.

Specification

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.

Sand bedding shall comply with the relevant Standard (AS 2758.1).

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

Specification

Vapour Barrier

Vapour barriers shall be placed over the bedding sand layer.

Adhesive tape shall be fixed around pipe penetrations.

Vapour barriers shall comply with AS 4200. Vapour barriers shall be not less than medium impact resistance polyethylene vapour barrier 0.2 mm thick. In areas of known salt damp, a damp-proofing membrane with high impact resistance is required. Adhesive tape shall be PVC for normal applications, or polyethylene tape for fixing to higher strength or thicker membranes.

Reinforcement for Concrete Slab on Ground and Footings

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

Reinforcement shall comply with 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

Specification

Bar Chairs

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

Concrete for slab on ground and footings

Concrete shall comply with AS 2870. Unless stated otherwise, properties shall be not less than:

- Characteristic compressive strength of 20 MPa (Strength grade N20)
- Maximum aggregate size of 20 mm
- Of sufficient slump to facilitate the nominates means of placement
- Subject to plant control testing.

Specification

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.

Reinforcement Cover - The lapping of welded fabric reinforcement in the top face of a slab will significantly increase the thickness of reinforcement and reduce the cover. The slab thickness shall be such as to provide both sufficient cover and sufficient effective depth.

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.

Specification

Recesses in Concrete Slabs

In order to achieve falls in tiled floors in bathrooms and the like, recess the concrete slabs to avoid a lip at the tiled edge. This recess may be formed after the concrete has been screeded level. The corner position of recesses may be marked by fixing temporary vertical reinforcing bars to the fabric. Such bars should not puncture the membrane.

For large tiled areas, the slab should provide for uniform falls to wastes and associated pipework. If there is likely to be difficulty in achieving such uniform falls, it allow for a 40 to 50 mm screed laid subsequently by the tiler. The thickness of the screed (if required), tile bedding and tiles should be shown on the structural concrete details, to ensure that the finished levels are appropriate.

Curing Concrete

All concrete shall be cured using a sprayed curing compound or by covering with sand that is kept we for at least seven days.

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

Specification

Formwork

Formwork shall comply with the relevant Standard (AS 3610).

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.

Maintenance

The building owner is responsible for the building and site maintenance as detailed in the CSIRO Pamphlet 10-19 Guide to Home Owners on Foundation Maintenance and Footing Performance.

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Disclaimer

This training package covers broad engineering principles and building practices, with particular emphasis on affordable housing and associated village infrastructure in the Asia-Pacific region. These broad principles and practices must be translated into specific requirements for particular projects by professional architects, engineers or builders with the requisite qualifications and experience. Associated sample specifications and drawings are available in electronic format, with the express intention that architects, engineers and builders will edit them to suit the particular requirements of specific projects. The design, construction and costing of structures must be carried out by qualified and experienced architects, engineers and builders, who must make themselves aware of any changes to the applicable standards, building regulations and other relevant regulations. The authors, publishers and distributors of these documents, specifications and associated drawings do not accept any responsibility for incorrect, inappropriate or incomplete use of this information.

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