SRIA Disclaimer

The information presented by the Steel Reinforcement Institute of Australia in this presentation has been prepared for general information only and does not in any way constitute recommendations or professional advice. While every effort has been made and all reasonable care taken to ensure the accuracy of the information contained in this presentation, this information should not be used or relied upon for any specific application without investigation and verification as to its accuracy, suitability and applicability by a competent professional person in this regard. The Steel Reinforcement Institute of Australia, its officers and employees and the authors and reviewers of this presentation do not give any warranties or make any representations in relation to the information provided herein and to the extent permitted by law (a) will not be held liable or responsible in any way: and (b) expressly disclaim any liability or responsibility for any loss or damage costs or expenses incurred in connection with this presentation by any person, whether that person is the reader or downloader of this presentation or not. Without limitation, this includes loss, damage, costs and expenses incurred as a result of the negligence of the authors or reviewers.

The information in this presentation should not be relied upon as a substitute for independent due diligence, professional or legal advice and in this regards the services of a competent professional person or persons should be sought.
The most controversial aspect of AS 2870 is almost certainly that some damage may occur even though all parties have fulfilled their obligations competently.

- Some factors unknown even after detailed investigation
- Compromise between cost and reasonably foreseeable actions
- Standard designs not expected to fully resist all actions
- Homeowners may request more conservative design

Comply with AS 2870 and BCA wherever possible

Simplest and most effective defense
Performance – Average house slab

Class M site
Levels taken 14 months after construction
Little change over next 5 years
(5 mm max in one corner)

<table>
<thead>
<tr>
<th>Test Hole</th>
<th>Top Cover</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100 - 120</td>
<td>135</td>
</tr>
<tr>
<td>2</td>
<td>75</td>
<td>118</td>
</tr>
<tr>
<td>3</td>
<td>116</td>
<td>120</td>
</tr>
</tbody>
</table>
Standards are interrelated


Performance Requirements (Clause 2.3.1)
A concrete slab or footing used as a termite barrier shall....
‘be designed and constructed so that any cracks passing through the slab or footing do not exceed 1 mm in width through the depth of the slab’

Deemed-to-satisfy requirements for concrete slabs (Clause 4.3.1)
‘A slab-on-ground shall be designed and constructed either in accordance with AS 2870 or AS 3600’.

- Cracking became major issue
- Resulted in large number of enquiries
### Classification of Damage with reference to concrete floors (extract)

<table>
<thead>
<tr>
<th>Description of typical damage</th>
<th>Approx. crack width limit in floor</th>
<th>Change in offset from a 3 m straightedge centred over defect</th>
<th>Damage category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hairline cracks, insignificant movement of slab from level</td>
<td>&lt; 0.3 mm</td>
<td>&lt; 8 mm</td>
<td>0 Negligible</td>
</tr>
<tr>
<td>Fine but noticeable cracks. Slab reasonably level</td>
<td>&lt; 1.0 mm</td>
<td>&lt; 10 mm</td>
<td>1 Very slight</td>
</tr>
<tr>
<td>Cracks noticeable but easily filled. Doors and windows stick slightly</td>
<td>&lt; 2.0 mm</td>
<td>&lt; 15 mm</td>
<td>2 Slight</td>
</tr>
</tbody>
</table>

#### How to ensure limits are achieved?

**Construct in accordance with Standard**
Construction in accordance with AS 2870?

Not just about placing concrete

All factors must be considered as contributing to performance

- Classify site correctly
- Select appropriate standard design
- Modify if necessary for site conditions eg rock outcrops, pipes
- Comply with detailing requirements
- Comply with construction requirements
Construction in accordance with AS 2870?

Not just about footing/raft design

Walling must also be considered

Articulated Masonry

Section 3 Standard Designs include details for:

- Articulated masonry veneer
- Articulated full masonry

Clause 1.8.1 Articulated full masonry

Full masonry construction incorporating articulation of external and internal walls

Clause 1.8.2 Articulated masonry veneer

Masonry veneer construction incorporating articulation of the masonry veneer.
Articulated Masonry

Typical articulation joints
Articulated Masonry

AS 4773.1 (2010)

Masonry for small buildings

- contains requirements for articulation joints
- called up in BCA
- contraction joints included
- expansion joints included

Also refer to:

CCAA TN61
Articulated Walling

www.ccaa.com.au

Referenced in AS 2870

<table>
<thead>
<tr>
<th>Site class (see Note)</th>
<th>Masonry wall construction and surface finish</th>
<th>Joint spacing, m for 10 mm joints</th>
<th>Joint spacing, m for 4 mm joints</th>
<th>Joint spacing, m for 5 mm joints</th>
</tr>
</thead>
<tbody>
<tr>
<td>M, M-D</td>
<td>External face finish masonry</td>
<td>6.0</td>
<td>4.2</td>
<td>6.0</td>
</tr>
<tr>
<td></td>
<td>External rendered and/or painted masonry</td>
<td>5.5</td>
<td>3.9</td>
<td>5.5</td>
</tr>
<tr>
<td></td>
<td>Internal face finish or sheeted masonry</td>
<td>6.0</td>
<td>4.2</td>
<td>6.0</td>
</tr>
<tr>
<td></td>
<td>Internal rendered and/or painted masonry</td>
<td>5.5</td>
<td>3.9</td>
<td>5.5</td>
</tr>
<tr>
<td>H1, H1-D</td>
<td>External face finished masonry</td>
<td>5.5</td>
<td>3.9</td>
<td>5.5</td>
</tr>
<tr>
<td></td>
<td>External rendered and/or painted masonry</td>
<td>5.0</td>
<td>3.5</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>Internal face finish or sheeted masonry</td>
<td>5.5</td>
<td>3.9</td>
<td>5.5</td>
</tr>
<tr>
<td></td>
<td>Internal rendered and/or painted masonry</td>
<td>5.0</td>
<td>3.5</td>
<td>5.0</td>
</tr>
<tr>
<td>H2, H2-D</td>
<td>External face finished masonry</td>
<td>5.0</td>
<td>3.5</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>External rendered and/or painted masonry</td>
<td>4.5</td>
<td>3.2</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>Internal face finish or sheeted masonry</td>
<td>5.0</td>
<td>3.5</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>Internal rendered and/or painted masonry</td>
<td>4.5</td>
<td>3.2</td>
<td>4.5</td>
</tr>
</tbody>
</table>

NOTE: Site class as defined in AS 2870. For further information and guidance on site classification, see AS 2870.
Section 5 Detailing Requirements

Drainage Requirements for rafts and slabs

- Concrete
- Reinforcement
- Vapour barriers and damp-proof membranes
- Edge rebates
- Recesses in slab panels
- Heating cables and pipes
- Shrinkage cracking control
- Beam continuity in rafts
- Beam layout restrictions
Section 5 Detailing Requirements

Requirements for Pad and Strip Footings

- Concrete
- Reinforcement
- Stepping of strip footings

Requirements in Aggressive Soils

Additional requirements for Classes M, H1, H2 and E Sites
Drainage

Avoid water ponding against or near the footing

- Slope ground away from building (50 mm over 1 m width)
- Consider effects of a number of variables such as flooding and landscaping

Avoid water entering the building

For Class 1 buildings, minimum floor height above finished ground or paving level

- 150 mm typically
- 100 mm for sandy, well-drained areas
- 50 mm where adjacent paving slopes away from building
- May be reduced locally (at doorways) if shielded from weather
Consider Abnormal Moisture Conditions

- Drains
- Channels
- Ponds
- Dams
- Tanks
- Trees
- Fill
- Urbanisation
- Previous structures

Previous structure has changed moisture conditions
Abnormal Moisture Conditions

Cut and fill

Heave due to wetting

Settlement due to drying

Note:
Distortion limit generally 1:200
Requirements for rafts and slabs

Concrete
- N20, 100 mm slump, 20 mm maximum nominal aggregate size
- In accordance with AS 1379 – ensures quality, not final performance

Reinforcement – previously covered

Vapour barriers and damp-proof membranes
- Materials, properties and installation - only in AS 2870
- NSW and SA required to have damp-proof membrane
Requirements for rafts and slabs

**Shrinkage cracking control**
- Re-entrant corners – 2 x 3-L8TM, 1 x 3-L11TM or 3-N12
- Brittle floor coverings
  - Minimum SL92 mesh or extra layer of slab mesh
  - Use appropriate bedding system
  - Delay placement of brittle finishes

[Images of large tiled areas and polished concrete floors]
Requirements for rafts and slabs

Shrinkage cracking control – floor heating

- **Electric systems** – no increase in slab thickness or mesh size
- **Hydronic systems**
  - increase slab thickness by 25 mm
  - increase mesh by one size

Hydronic floor heating system
Requirements for rafts and slabs

Beam continuity in rafts

Continuity of internal and external beams must be maintained

- from edge to edge of the slab
- across steps in the slab (Clause 6.4.4 (c) (iii))
- at re-entrant corners
  - provide internal beam
  - if < 1.5 m, refer details in Figure 5.4

Continuity of footing beams
(Figure 5.4 from AS 2870 - 2011)
(dimensions in metres)
Requirements for rafts and slabs

Beam continuity in rafts - Commentary

Arrangement of stiffening beams
(Figure C5.4 from AS 2870 - 2011)
Requirements for rafts and slabs

Beam layout restrictions

Limits placed on spacing of internal beams at external corners

Beam spacing at external corners

(Figure 5.5 from AS 2870 - 2011)
Requirements for rafts and slabs

Beam spacing at corners

3 spaces @ 6m

12m of edge beam

Extent of nominal mound
Requirements for rafts and slabs

Beam spacing at corners

Nominal beam spacing of 5 m
Bay window extension less than 1.5 m

Fall point A to B  22 mm
Fall point C to D  18 mm
Fall point E to B  31 mm

Nominal beam spacing of 5 m
Beam continuous along perimeter

Fall point A to B  14 mm
Fall point C to D  14 mm
Fall point E to B  26 mm
Requirements for rafts and slabs

Beam spacing at corners

Nominal beam spacing of 5 m
Additional internal beam

Fall point A to B 11 mm
Fall point C to D 7 mm
Fall point E to B 17 mm
Requirements for rafts and slabs

Beam continuity in rafts – maintain stiffness

Arrangement of stiffening beams
(Figure C5.5 from AS 2870 - 2011)
Requirements for Pad and Strip Footings

Concrete – as for rafts and slabs

Reinforcement – covered

Stepping of strip footings

Acceptable methods of stepping strip footings

(Figure 5.6 from AS 2870 - 2011)
Requirements in Aggressive Soils

Saline and sulphate soils

Western Sydney

Efflorescence is more common sign of soil salinity

Wagga Wagga
NSW
Requirements in Aggressive Soils

Requirements in Aggressive Soils – Clause 5.5

Two choices:
1. Isolate the concrete or masonry member from the aggressive soil
2. Use appropriate concrete strength and cover

Isolation of Concrete

Provide damp-proof membrane up to ground or finished paving level

- Extend membrane from under slab up to this point
- Lap membrane from under slab with suitable damp-proofing material (0.5 mm thick) or liquid-applied waterproofing compound applied to face of concrete and extend up to finished ground or paving level.
Requirements in Aggressive Soils

Extend membrane from under slab up to finished ground or paving level

Figure 5.7 Use of damp-proofing membrane for slab protection
(from AS 2870 - 2011)
Requirements in Aggressive Soils

Some situations may be difficult to rectify
Requirements in Aggressive Soils

Appropriate concrete strength and detailing – Consistent with AS 3600 - 2009

**Step 1** Determine appropriate exposure classification for saline soils

Exposure classification for concrete in saline soils (from Table 5.1 of AS 2870-2011)

<table>
<thead>
<tr>
<th>Saturated extract electrical conductivity ($EC_e$), dS/m</th>
<th>Exposure classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;4</td>
<td>A1</td>
</tr>
<tr>
<td>4-8</td>
<td>A2</td>
</tr>
<tr>
<td>8-16</td>
<td>B1</td>
</tr>
<tr>
<td>&gt;16</td>
<td>B2</td>
</tr>
</tbody>
</table>

Measuring salinity

Courtesy Sydney Environmental & Soil Laboratories P/L
Requirements in Aggressive Soils

Appropriate concrete strength and detailing

**Step 1** Determine appropriate exposure classification for sulfate soils

Exposure classification for concrete in sulfate soils (after Table 5.2 of AS 2870 - 2011)

<table>
<thead>
<tr>
<th>Exposure conditions</th>
<th>Exposure classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfate (expressed as SO$_4^-$)</td>
<td>pH</td>
</tr>
<tr>
<td>In soil ppm</td>
<td>In groundwater ppm</td>
</tr>
<tr>
<td>&lt;5000</td>
<td>&lt;1000</td>
</tr>
<tr>
<td>5000-10 000</td>
<td>1000-3000</td>
</tr>
<tr>
<td>10 000-20 000</td>
<td>3000-10 000</td>
</tr>
<tr>
<td>&gt;20 000</td>
<td>&gt;10 000</td>
</tr>
</tbody>
</table>
### Requirements in Aggressive Soils

#### Appropriate concrete strength and detailing

**Step 2** Determine required concrete strength and curing

Minimum design characteristic strength (              ) and curing requirements for concrete (after Table 5.3 of AS 2870 - 2011)

<table>
<thead>
<tr>
<th>Exposure classification</th>
<th>Minimum MPa</th>
<th>Minimum initial curing requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>20</td>
<td>Cure continuously for at least 3 days</td>
</tr>
<tr>
<td>A2</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>B1</td>
<td>32</td>
<td>Cure continuously for at least 7 days</td>
</tr>
<tr>
<td>B2</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>C1</td>
<td>≥50</td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>≥50</td>
<td></td>
</tr>
</tbody>
</table>

Standard designs only apply to 20 and 25 MPa concrete

Clause 3.1.1 of AS 2870
Requirements in Aggressive Soils

Appropriate concrete strength and detailing

Step 3 Determine minimum reinforcement cover

Minimum reinforcement cover for concrete (after Table 5.4 of AS 2870 - 2011)

<table>
<thead>
<tr>
<th>Exposure classification</th>
<th>Minimum cover in saline soils (mm)</th>
<th>Minimum cover in sulfate soils (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>No change</td>
<td>40</td>
</tr>
<tr>
<td>A2</td>
<td>45</td>
<td>50</td>
</tr>
<tr>
<td>B1</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>B2</td>
<td>55</td>
<td>65</td>
</tr>
<tr>
<td>C1</td>
<td>Not applicable to salinity</td>
<td>70</td>
</tr>
<tr>
<td>C2</td>
<td>Not applicable to salinity</td>
<td>85</td>
</tr>
</tbody>
</table>
Requirements in Aggressive Soils

Further Information

1. CCAA Guide to Residential Slabs and Footings in Saline Environments
   www.ccaa.com.au
2. Local Government Salinity Initiative
Section 6 Construction requirements

Excavations
- If permanent, retain material or batter sides
- If temporary, ensure adequate support of footings is maintained

Construction of slabs
- Filling – controlled and rolled
- Foundations – Natural soil of 50 kPa bearing capacity for slabs
  - Natural soil of 100 kPa bearing capacity for edge footings not tied to a footing slab
  - stepping and sloping of edge beams
  - blinding layer of sand only required for aggressive soils
- Sloping Sites – details of cut and fill
  - stepping of slabs and beams
  - where design of pier-and-slab required
Construction of slabs (continued)

- Walls retaining fill under slab
- Fixing of reinforcement and void formers
- Placing, compaction and curing of concrete

The concrete shall be transported, placed, compacted and cured in accordance with good building practice.

Construction of strip/pad footings – Foundations – 100kPa minimum

Additional requirements for *moderately*, highly and extremely reactive sites

- Penetrations through footings - sleeved
- Drainage - water not allowed to pond
- Flexible joints in drains - highly and extremely reactive sites
  (same as Clause 5.6.4)
Additional requirements for Class M, H1, H2 and E Sites

Masonry detailing – control joints

Variations in foundation material – part of footing on rock

Drainage requirements – near or under footings

Plumbing requirements – Clause 5.6.4 (b) and 6.6 (e) (i)

Flexible joints to drains

- commence within 1 m of the building perimeter
- accommodate movement up to $y_s$ in any direction
- be set at mid-position of their range at time of installation
  ie movement range of 0.5 $y_s$ from the initial setting
Additional requirements for Class M, H1, H2 and E Sites

Flexible joints to drains
Placing, Compaction and Curing of Concrete

Concrete to comply with AS 1379 Specification and supply of concrete
Ensures good quality concrete, but not final product

Main quality issues

- Addition of excess water
- Compaction
- Curing
- Tolerances
Placing, Compaction and Curing of Concrete

Addition of excess water on-site

Should be avoided - reduces strength

![Graph showing the relationship between water-to-cement ratio (w/c) and compressive strength. The graph indicates a decreasing trend in strength as the w/c ratio increases.]
Placing, Compaction and Curing of Concrete

Addition of excess water on-site

- Produces Laitance/efflorescence
- May result in Flaking
- Increases risk of Cracking
  - both plastic and long-term drying shrinkage
Compaction

Expels entrapped air – improves strength and reduces risk of cracking

Loss of Strength through incomplete compaction
Compaction

Lack of compaction reduces durability and strength
Placing, Compaction and Curing of Concrete

Curing

- Application of water to or retention of water in concrete
- Improves strength
- Reduces permeability
- Reduces risk of cracking and crack widths

Add water to concrete (must be continuous)  Retain water in concrete
Placing, Compaction and Curing of Concrete

Curing

- Important for aggressive soils
- Table 5.3 Curing requirements specified
- Clause 5.5.3(d) Curing methods detailed
- Curing compounds to comply with AS 3799

<table>
<thead>
<tr>
<th>Compound</th>
<th>0</th>
<th>20</th>
<th>40</th>
<th>60</th>
<th>80</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plastic sheeting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wax based</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chlorinated rubber</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrocarbon resin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water based</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acrylic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PVA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

72 Hour Moisture Loss (as % of untreated sample)

AS 3799 limit (90% retention)
Surface Tolerances

- Not specified in AS 2870-2011
- Guidance given in CCAA Data Sheet
  - Measurement
  - Standards and specifications
  - Specifying tolerances
  - Achieving tolerances
  - Rectification
Surface Tolerances

- Flatness – the deviation of the surface from a straight line joining two points on the surface
- Typically measured using 3-m straightedge for residential work
What are reasonable tolerances?

- **CCAA Data Sheet**
  - Flatness – 12 mm maximum deviation from 3-m straightedge
  - Surface level – to be within ± 10 mm of specified level

- **Victorian Building Authority (referenced by Fair Trading NSW)**
  Guide to Standards and Tolerances, 2007
  - Flatness – in any 2 m length ≤ 4 mm (Section 2.08)
    - in any room ≤ 10 mm (Section 2.08)
  - Level – within 40 mm of documented RL or FFL (Section 2.07)
    - entire floor within 20 mm (Section 2.08)

- Tolerances for unformed surfaces should be specified
Cover

Must be set prior to placement of concrete – AS/NZS 2425: 2015
Combined Footing Systems

Is mixed construction allowed? e.g. deepened footings and stiffened raft

For Class M and H sites, only one standard design shall be used (Clause 3.1.1)
### Equivalent construction - Table 3.1 of AS 2870

<table>
<thead>
<tr>
<th>Actual construction</th>
<th>Equivalent construction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>External walls</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Internal walls</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Single-leaf masonry</strong></td>
<td></td>
</tr>
<tr>
<td>Reinforced single-leaf masonry</td>
<td>Articulated masonry on Class A and Class S sites, or framed Articulated masonry veneer</td>
</tr>
<tr>
<td>Reinforced single-leaf masonry</td>
<td>Articulated masonry or reinforced single-leaf masonry Masonry veneer</td>
</tr>
<tr>
<td>Reinforced single-leaf masonry</td>
<td>Masonry Articulated full masonry</td>
</tr>
<tr>
<td>Articulated single-leaf masonry</td>
<td>Articulated masonry Articulated full masonry</td>
</tr>
<tr>
<td>Articulated single-leaf masonry</td>
<td>Masonry Articulated full masonry</td>
</tr>
<tr>
<td>Other single-leaf masonry</td>
<td>Framed Articulated full masonry</td>
</tr>
<tr>
<td>Other single-leaf masonry</td>
<td>Masonry Full masonry</td>
</tr>
<tr>
<td><strong>Mixed construction</strong></td>
<td></td>
</tr>
<tr>
<td>Full masonry</td>
<td>Framed Articulated full masonry</td>
</tr>
<tr>
<td>Articulated full masonry</td>
<td>Framed Masonry veneer</td>
</tr>
<tr>
<td>Articulated rendered or sheet clad frame</td>
<td>Framed Articulated masonry veneer</td>
</tr>
<tr>
<td><strong>Precast concrete panels</strong></td>
<td></td>
</tr>
<tr>
<td>Reinforced concrete panel</td>
<td>Articulated masonry veneer</td>
</tr>
<tr>
<td><strong>Earth wall construction</strong></td>
<td></td>
</tr>
<tr>
<td>Infill panels of earth wall construction</td>
<td>Articulated masonry veneer</td>
</tr>
<tr>
<td>Loadbearing earth wall construction</td>
<td>Articulated full masonry</td>
</tr>
</tbody>
</table>
Design Parameters

Differential footing movement, $\Delta$

Footing design must satisfy both limits in Table 4.1

Table 4.1 of AS 2870 - 2011

<table>
<thead>
<tr>
<th>Type of construction</th>
<th>Maximum differential deflection, as a function of span, mm</th>
<th>Maximum differential deflection, mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clad frame</td>
<td>L/300</td>
<td>40</td>
</tr>
<tr>
<td>Articulated masonry veneer</td>
<td>L/400</td>
<td>30</td>
</tr>
<tr>
<td>Masonry veneer</td>
<td>L/600</td>
<td>20</td>
</tr>
<tr>
<td>Articulated full masonry</td>
<td>L/800</td>
<td>15</td>
</tr>
<tr>
<td>Full masonry</td>
<td>L/2000</td>
<td>10</td>
</tr>
<tr>
<td>Site class</td>
<td>Type of construction</td>
<td>Depth (D) mm</td>
</tr>
<tr>
<td>------------</td>
<td>----------------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class A</td>
<td>Clad frame</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>Articulated masonry veneer</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>Masonry veneer</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>Articulated full masonry</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>Full masonry</td>
<td>500</td>
</tr>
<tr>
<td>Class S</td>
<td>Clad frame</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>Articulated masonry veneer</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>Masonry veneer</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>Articulated full masonry</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>Full masonry</td>
<td>700</td>
</tr>
<tr>
<td>Class M</td>
<td>Clad frame</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>Articulated masonry veneer</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>Masonry veneer</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>Articulated full masonry</td>
<td>625</td>
</tr>
<tr>
<td></td>
<td>Full masonry</td>
<td>950</td>
</tr>
<tr>
<td>Class M-D</td>
<td>Clad frame</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>Articulated masonry veneer</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>Masonry veneer</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>Articulated full masonry</td>
<td>650</td>
</tr>
<tr>
<td></td>
<td>Full masonry</td>
<td>1050</td>
</tr>
<tr>
<td>Class H1</td>
<td>Clad frame</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>Articulated masonry veneer</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>Masonry veneer</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>Articulated full masonry</td>
<td>750</td>
</tr>
<tr>
<td></td>
<td>Full masonry</td>
<td>1050</td>
</tr>
<tr>
<td>Class H1-D</td>
<td>Clad frame</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>Articulated masonry veneer</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>Masonry veneer</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>Articulated full masonry</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>Full masonry</td>
<td>1100</td>
</tr>
<tr>
<td>Class H2</td>
<td>Clad frame</td>
<td>550</td>
</tr>
<tr>
<td></td>
<td>Articulated masonry veneer</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td>Masonry veneer</td>
<td>750</td>
</tr>
<tr>
<td></td>
<td>Articulated full masonry</td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td>Full masonry</td>
<td></td>
</tr>
<tr>
<td>Class H2-D</td>
<td>Clad frame</td>
<td>550</td>
</tr>
<tr>
<td></td>
<td>Articulated masonry veneer</td>
<td>700</td>
</tr>
<tr>
<td></td>
<td>Masonry veneer</td>
<td>750</td>
</tr>
<tr>
<td></td>
<td>Articulated full masonry</td>
<td>1000</td>
</tr>
</tbody>
</table>
### Design Parameters

<table>
<thead>
<tr>
<th>Design Parameter</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y_s$</td>
<td>10 mm to 70 mm if $H_s &gt; 3$ m or 10 mm to 100 mm if $H_s &lt; 3$ m</td>
</tr>
<tr>
<td>$\Delta$</td>
<td>5 mm to 50 mm</td>
</tr>
<tr>
<td>Span</td>
<td>5 m to 30 m</td>
</tr>
<tr>
<td>Beam spacing</td>
<td>$\leq 1.25$ values in Figure 3.1 Clause 5.3.9 shall apply at external corners of the building. For Class E sites the beam spacing shall not exceed 5 m.</td>
</tr>
<tr>
<td>Beam depth</td>
<td>250 mm to 1200 mm</td>
</tr>
<tr>
<td>Minimum depth of any beam</td>
<td>$\geq 0.8$ max. beam depth</td>
</tr>
<tr>
<td>Beam width</td>
<td>110 mm to 400 mm</td>
</tr>
<tr>
<td>Design distributed load</td>
<td>$\leq 10$ kPa</td>
</tr>
<tr>
<td>Design edge line load</td>
<td>$\leq 25$ kN/m</td>
</tr>
</tbody>
</table>
Detailing Issues

Site considerations
- Verandahs
- Trussed roofs
- Maintenance of drainage
- Gardens and watering
- Plumbing leaks

Diagram:
- Internal wall
- Roof trusses
- Separate footing
- Verandah
Thank You