Consult with a structural engineer to ensure that the wall will be robust and structurally sound.

Wall thickness can be adapted to block out high summer sun but still allow winter sun to penetrate.

Take steps to ensure the skill level and qualification of the brick layer is appropriate for the project.

Try varying gap sizes to create dynamic effects and patterns.

Integrate fixed glazing or translucent material behind the screen to create a watertight facade.

Consider different formats to achieve alternative pattern proportions.

Remember, all sides of the masonry unit will be visible. Use solid masonry units, or if hollowed blocks are to be used, give some thought as to which masonry unit is most suitable.

The allowable overlap in mm will depend on several parameters that dictate the wall's ability to provide sufficient robustness and bending resistance.

These parameters include:
- wall thickness
- way the wall is supported
- masonry bond strength
- spanning distances between supports
- bonding pattern

SOME RULES OF THUMB

TRADE SKILL LEVEL: Shade Privacy

SHADE PRIVACY

TRADE SKILL LEVEL: Non-Combustible Ventilation

NON-COMBUSTIBLE VENTILATION

SCREEN MOTIF REDUCE GLARE

SOME OTHER CONCRETE MASONRY SCREENS WE LOVE

TRADE SKILL LEVEL: Inglis Architecture

Inglis Architecture
Collins st, VIC

TRADE SKILL LEVEL: Tridente Architects

Tridente Architects
6 on 6th Apartments, SA

TRADE SKILL LEVEL: Klopper & Davis

Klopper & Davis
Carr Place Residence, WA

TRADE SKILL LEVEL: Elenberg Fraser

Elenberg Fraser
Move-in, VIC

HIT & MISS CONCRETE MASONRY BLOCK SCREEN

SOME OTHER CONCRETE MASONRY SCREENS WE LOVE

TRADE SKILL LEVEL: SJB Architects

SJB Architects
Wylde Street, Sydney, New South Wales
This flyer raises some of the issues that an engineer may need to consider when advising on the design of a ‘hit and miss’ concrete masonry wall.

Although hit and miss masonry work is becoming increasingly popular, its capacity is not well known; therefore engineers should exercise caution when designing and building such walls.

Notably, a hit and miss wall is less structurally sound than a stretcher bonded wall, due to:

• the absence of perpend joints, and
• the discontinuous nature of horizontal mortar joints which in turn causes:
  - a reduced bedded area between each masonry unit; and consequently
  - reduced unit overlap with the layers above and below it.

Due to the absence of perpend joints, hit and miss construction falls outside the scope of AS 3700 Masonry Structures sections 7.4.3 ‘Design for horizontal bending’ and 7.4.4 ‘Design for two-way bending’ and thus those provisions may not necessarily account for its actions accurately.

With almost an infinite number of potential designs, any guidance on hit and miss masonry work can only look at general principles and not provide definitive advice.

**DESIGN CONSIDERATIONS**

**LOAD-BEARING**

Due to the absence of testing, designers are advised to treat hit and miss walls as non-load-bearing systems. To ensure these walls have sufficient strength and stability, they should be supported on all four sides (or 3 sides, leaving the top edge free) and designed using AS 3700 section 7 ‘Structural Design of Unreinforced Masonry’ with reference to bending and shear.

**AS 3700 ‘MASONRY STRUCTURES’**

Engineers are advised to pay attention to the following clauses within AS 3700 when completing their designs:

• **Clause 4.6 ‘Design for Robustness’**
  
  Walls must satisfy the robustness requirements and be proportioned to resist a uniformly distributed out of plane load of 0.5 kPa;

• **Clause 7.4 ‘Design for Members in Bending’**

  Due to the absence of perpend joints, the provisions on horizontal (section 7.4.3) and two-way bending (section 7.4.4) won’t be applicable and will require some modification. Engineering judgement is therefore advised when interpreting these sections.

  Notably, preliminary flexural testing has been conducted at the University of Newcastle on hit and miss walls with dimensions of 1190 mm x 1194 mm x 90 mm, and an overlap of 70 mm (thus consisting of 90 mm gaps between each unit). The researchers observed that although stepped failure is likely to dictate failure for smaller overlaps, both line and stepped failures will have to be considered for larger overlaps.

  Equation 7.4.3.2(4) was applied so as to assess the horizontal bending capacity of the wall against line failure.

  Since hit and miss walls do not have perpend joints, the lateral section modulus \( (Z_u) \) was taken as zero.

  The calculations made for determining the perpend spacing factor \( (k_p) \) (section 7.4.3.4) when assessing the horizontal bending capacity against stepped failure criteria (equation 7.4.3.2(2) and 7.4.3.2(3)) will have to be carefully rationalised.

  Note how the section modulus of the resulting bedded area \( (Z_u) \) will account for the effect that the overlap will have on the resulting bending capacity.

  The provisions relating to vertical bending (section 7.2.2) should also be applied to the design; ensuring that the flexural tensile bond strength \( (f_{m,t}) \) is at least 0.2 MPa in accordance with section 3.3.3.

  The amount of compressive stress placed on the bed joints \( (f_{j}) \) should be carefully considered with reference to section 7.5.5 when planning the amount of unit overlap or design cross sectional area \( (A_u) \) of the bed joint. This component \( (f_{j}) \) will influence both the bending and shear capacity of the wall.

  • **Clause 7.5 ‘Design for Members in Shear’**

    Shear requirements should be calculated with guidance from this section. Consideration and care should be made to ensure the amount of overlap allows for a bedded area that has adequate bond strength to achieve the required shear capacity.

  • **Clause 7.6 ‘Design of Masonry Veneer Walls’**

    Due to the non-load-bearing capacity of the member, it may be prudent to consider and incorporate any design/construction requirements applicable to veneer walls.

    Notably, veneer wall construction requires the use of wall ties to transfer all lateral loads and forces applied to the face of the wall to the structural frame supporting the wall. Wall ties shall comply with the provisions of section 4.10 ‘Wall Ties’ with the structural design of veneer walls having to comply with section 7.6. Notably AS 4773 also has sections specific for veneer wall design and construction.

    The amount of overlap should allow for a mortar bedding area that can accommodate the insertion of wall ties whilst not compromising the requirements for durability and overall structural design. If these requirements are not adhered to, it may jeopardise the wall’s stability and/or serviceability.

**PROVIDING ADDITIONAL STRENGTH**

Designers creating walls that exceed calculated allowable areas have options they can use to provide additional strength.

For example, they may divide the desired wall area into a number of allowable sections and support each section at horizontal and vertical interfaces using bond beams and/or engaged piers. Furthermore, additives can be used in the mortar composition to increase its bond strength as well as the implementation of wall ties which transfers loads to the structural frame.

Solutions such as these can help to minimise structural weaknesses and deliver a more reliable hit and miss wall.