

## SECTION 3. COVER TO REINFORCEMENT

A fundamental and most important aspect of the durability of any reinforced concrete member or any masonry member containing reinforcement is the provision of adequate cover to the reinforcement. It is also an important aspect of achieving a fire rating for a reinforced masonry member in terms of structural adequacy.

### 3.1 Cover requirements for durability

AS 3700 Section 5 requires the grout cover to reinforcement to be at least as shown in Table 5.1.

The requirements of Table 5.1 as they apply to **mortarless** can be summarized as follows:

Exposure Environment	Location	Grade of blocks	Grout cover to reinf't (mm)
<b>INTERIOR</b>			
Normal	Any	Protected	5
Subject to non-saline wetting and drying	Any	GP	15
Subject to saline wetting & drying	Any	Exposure	25
<b>EXTERIOR</b>			
Below DPC or in contact with non-aggressive soils	Any	GP	15
Below DPC or in contact with aggressive soils	Any	Exposure	25
Above DPC	Mild - Arid	Protected	5
Above DPC	Mild - Temperate	Protected	5
Above DPC	Mild - Tropical	Protected	15
Above DPC	Moderate	Protected	5
Above DPC	Industrial	Exposure	25
Above DPC	Marine	GP	15
Above DPC	Severe Marine	Exposure	25
<b>EXTERIOR (Coated)</b>			
Above DPC	Any	Protected	5
Below DPC	Any	Protected	15

Notes:

'Grade of blocks' refers to salt attack resistance grade as per AS/NZS 4455.1 – see below.

GP means General Purpose.

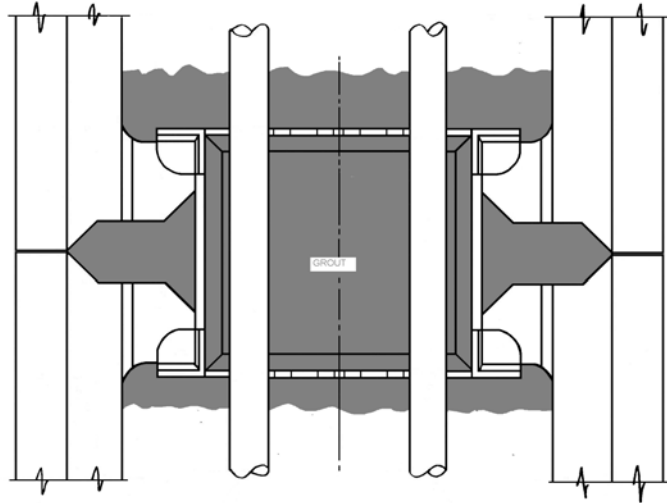
'Exterior (Coated)' means blockwork in an exterior environment that is protected by a coating that is in accordance with AS 3700 Clause 5.4.2 noting that the requirements differ for above DPC and below DPC situations.

Minimum cement content in grout to be 300 kg/m<sup>3</sup>

It is most important to note that the minimum cover shown in the above table is the cover provided by the grout. It is not the cover measured from the outer face of the block shell.

While it is very clear that some allowance has been made for the contribution of the block shell to the total cover, the actual contribution is not quantified. It is also very clear that the covers specified in Table 5.1 would generally be inadequate if there was no contribution from the face shell of the masonry units.

Most dry-stack masonry systems provide totally inadequate cover in the vicinity of the perpends and many also provide totally inadequate cover in the vicinity of the bed joints but this issue has been addressed in the Mortarless Pty Ltd **mortarless** masonry units.



**Plan view on connector joining two 200 mortarless blocks and supporting two horizontal bars, showing the shaping of the ends of the blocks to maximize grout penetration into the perpends**

The allowance of some contribution from the block shell to the total effective cover is also evident in that the minimum grade of the masonry units (salt attack resistance grade) increases as the exposure environment worsens. The minimum salt attack resistance grade of the masonry units is defined in AS/NZS 4456.10:1997 as follows:

- Protected - Masonry units categorized 'general purpose' would suit this category and there is no test method that differentiates the two categories. It is expected that the supplier would nominate the products that fit this category, and these would essentially be any products made by a competent manufacturer.
- General Purpose - The Code again places reliance on the supplier's experience, according to which it is possible to demonstrate that the product has a history of surviving under environmental conditions similar to those existing at the site under consideration. Products that do not satisfy the test requirements for 'exposure' category (i.e. mass loss limit) could fit this category.
- Exposure - The Code once more places reliance on the supplier's experience, but this time according to which it is possible to demonstrate that the product has a history of surviving in saline environments. Products tested in accordance with the Code must suffer a mass loss of <0.4g in 40 cycles.

It should be noted that the above information on categories has been omitted from the current 2003 edition of AS/NZS 4456.10.

Designers should note that the cover might have to be increased to suit the size of the coarse aggregate in the grout as the cover must be no less than the size of the coarse aggregate. (Clause 11.7.2.5)

It should also be noted that galvanizing reinforcement or increasing the compressive strength of the grout does not validate decreasing the cover.

The **mortarless** masonry of Mortarless Pty Ltd is arguably the only concrete block system available that can provide an adequate level of certainty in the accurate placing of reinforcement, and this means that it is arguably the only concrete block system with which there can be a satisfactory degree of confidence in the cover that is being provided to the reinforcement, particularly the cover to vertical reinforcing bars.

As can be seen in the above table, 5mm is the minimum cover required in any circumstance. The minimum grout cover in the **mortarless** blockwork system is always sufficient to satisfy this requirement.

Engineers should note that any reinforced masonry that contains horizontal reinforcement should preferably be constructed with H blocks or Double-U blocks because this goes a long way to ensuring the horizontal bars passing through perpend receive the specified minimum cover. Use of flush ended blocks with recessed webs is not barred, however it is required that bars passing through the perpend are supported clear of the end webs to ensure they receive the specified minimum cover in the perpend and at all other positions along their entire length. (Clause 5.9.2)

It is not practical to expect this or achieve this with standard flush ended blocks, and therefore flush ended hollow blocks should generally never be used in masonry construction that contains horizontal reinforcement.

### 3.2 Cover requirements for fire resistance (structural adequacy)

**Mortarless** masonry must always be fully grouted, however it can be designed as reinforced or unreinforced as required. It is anticipated that most **mortarless** masonry elements will be designed as reinforced masonry for bending and in-plane shear. As such it is also anticipated that most mortarless masonry elements will be considered reinforced masonry elements for the purposes of FRL assessment.

In terms of structural adequacy, the minimum cover to reinforcement must be in accordance with AS 3700 Table 6.2, and this varies from 30 mm to 60mm depending on the fire resistance level required. (AS 3700 Clause 6.3.6) This is readily achievable with **mortarless** masonry.

In contrast to the measurement of cover for the purposes of durability, the cover for fire resistance is measured from the outside face of the block shell.