

SECTION 4. COVER TO REINFORCEMENT

A fundamental and most critical 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 such members.

4.1 Nominal cover

IS 456:2000 Clause 26.4.1 states that the nominal cover to any bar shall not be less than the diameter of the bar.

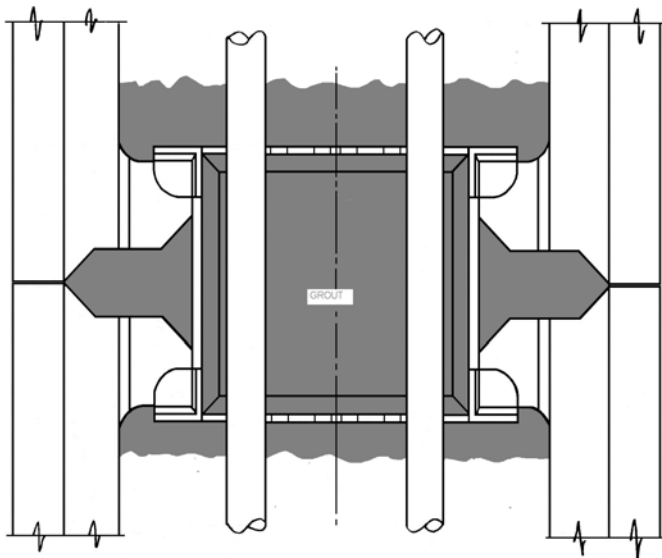
4.2 Cover requirements for durability

The minimum nominal cover to any bar to meet durability requirements is given in IS 456:2000 Table 16 and is as follows:

Exposure	Cover	
Mild	20	(15 for main bars up to 12mm diameter)
Moderate	30	
Severe	45	(50 for M35 concrete and above)
Very Severe	50	(45 for M35 concrete and above)
Extreme	75	

When designing the blocks for **mortarless** masonry a great deal of attention was paid to achieving satisfactory cover to the embedded reinforcement. This is a most important structural aspect that is overlooked in all similar dry stack systems.

Most dry stack systems provide totally inadequate cover in the vicinity of the perpend and many also provide totally inadequate cover in the vicinity of the bed joints, but this issue has been addressed in the **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 perpend

4.3 Cover requirements for fire resistance

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 assessing fire resistance.

The nominal covers to meet specified period of fire resistance are tabulated in IS 456:2000 Table 16A for beams, slabs, ribs and columns. They are not tabulated for walls.

The Australian concrete code AS 3600-2009 provides a lot of guidance on the FRL for walls, FRL being the Fire Resistance Level. In Australia there are three aspects to FRL viz. structural adequacy, integrity and insulation and it is expressed with three numbers in that order. For example an FRL of 60:60:60 means that the member has an FRP of 60 minutes or more for structural adequacy, integrity and insulation in that order. If a member satisfies the structural adequacy requirement it is generally deemed to satisfy the structural integrity requirement.

FRP stands for Fire Resistance Period and this is the time in minutes to reach the appropriate failure criteria if tested for fire in accordance with the Appropriate Standard.

In solid concrete walls the FRP for insulation can be taken as follows

Wall Thickness (mm)	FRP for insulation (mins)
60	30
80	60
100	90
120	120
150	180
175	240

When assessing the FRP structural adequacy it is a matter of whether the wall is exposed to fire on one or both sides and the FRP can be determined by calculation taking into consideration first of all the ratio of the design axial load in the fire situation to the ultimate strength of the particular wall, and secondly the wall thickness and the axis distance. The axis distance is the distance to the centroid of the tensile reinforcement on fire side of the wall measure from the exposed surface of the wall on the fire side.