

Identifying the Fire Resistance of Clay Masonry Walls

The National Construction Code requires walls to meet certain fire resistance levels (FRL), to protect properties from the risk of fire.

The FRLs for clay masonry walls are expressed as a measure of structural adequacy, integrity, and insulation, where (in the face of a fire):

- **structural adequacy** is the minimum time that the wall is expected to remain standing;
- **integrity** is the ability of the wall to prevent flames or hot gases passing through it; and
- **insulation** is the ability to keep the heat on the non-fire side of the wall below a predefined temperature.

When determining the FRL of clay masonry walls, its height and size, proximity to adjacent wall structure and whether it would be load/non-loadbearing must all be specified.

DETERMINING THE FIRE RESISTANCE LEVEL

This method for determining the FRL of the clay masonry component of a wall is based on the Think Brick Manual 5 '*Design of Clay Masonry Walls for Fire Resistance*', which is derived from AS 3700 Section 6 '*Design for Fire Resistance*'.

STRUCTURAL ADEQUACY

Structural adequacy is affected by the slenderness ratio of the wall, which dictates its stability and is calculated by:

1. identifying the length, height, and thickness of the wall, and the type of support being used;
2. consulting the charts on pages 13-21 of Manual 5. Each chart is calibrated for 18 different combinations of wall thickness and support types;
3. based on the diagram on each chart (top right of chart), selecting the one which meets your structure's specifications; and
4. finding the structural adequacy by tracking the point at which the values for wall height (y-axis) and length (x-axis) intersect.

INTEGRITY

For the purposes of design, the fire resistance for integrity can be assumed to be the lesser of the values determined for structural adequacy and insulation.

INSULATION

The FRL for insulation is a function of the material type and thickness of the wall.

For a clay masonry wall, the material thickness (MT) is the overall thickness of the wall (if the units used are solid, fully grouted, or have coring of less than 30%)

If coring is more than 30% of the units surface area then:

$$\text{Material Thickness (MT)} = \frac{\text{Net Volume of the Unit}}{\text{Area of exposed vertical face}}$$

Where: $\text{Net Volume of the Unit} = \text{Total Volume} - \text{Volume of Voids}$

Once MT has been identified, use the table below to calculate the FRL

Material Thickness (mm)	60	90	110	130	160	180
FRL for insulation (minutes)	30	60	90	120	180	240

WORKED EXAMPLE

To calculate the FRL for a solid, 110mm thick clay masonry wall, simply supported on all sides:

1. find the relevant chart in Manual 5 (e.g. Chart 2, shown in Figure 1, below);

Structural adequacy FRP (minutes) for 110 mm clay masonry walls with simple supports on four sides.

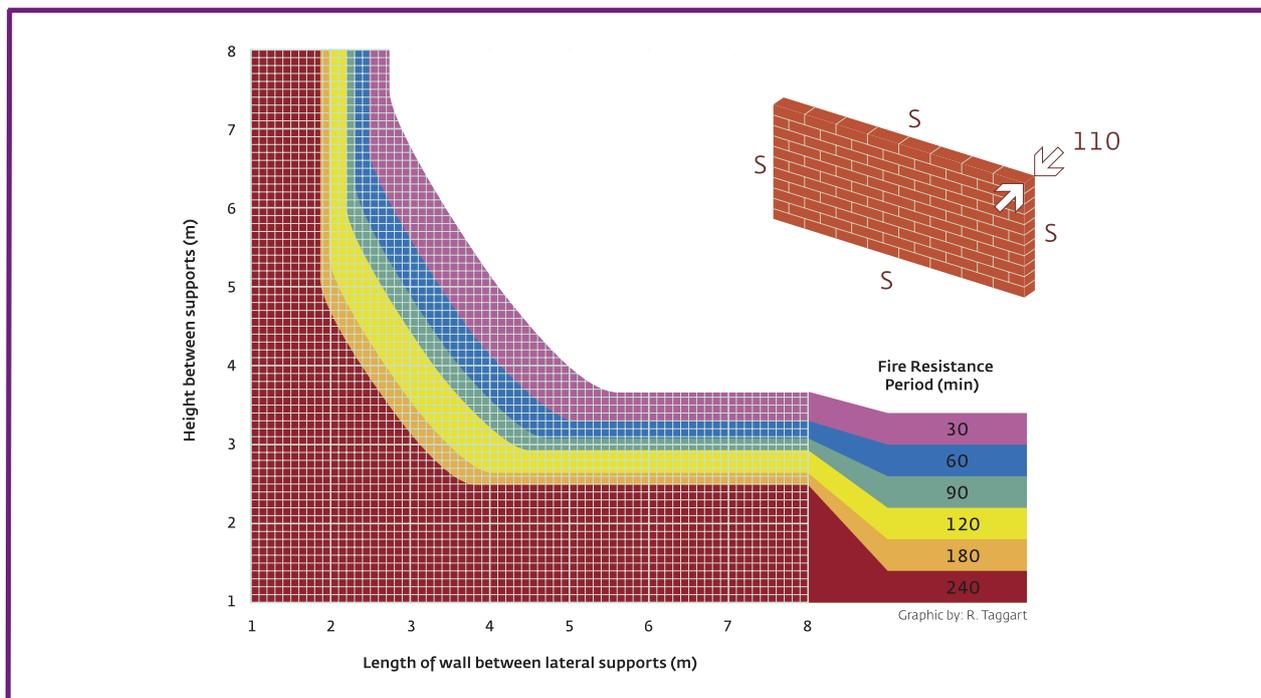


Figure 1: Chart 2 from TBA Manual 5 'Design for Fire Resistance'

2. intersect the wall height (3.5m) with the length (4.2m) to find a structural adequacy measurement of 60 minutes (as can be seen on the chart);
3. because the unit is solid, MT = 110mm, and thus the FRL for insulation is 90 minutes; and
4. the integrity measure is the lesser of structural adequacy and insulation, namely 60 minutes.

So the FRL for this wall would be 60/60/90.

Note: if a FRL is on the boundary or in between two values, the conservative, lower value is always taken.