

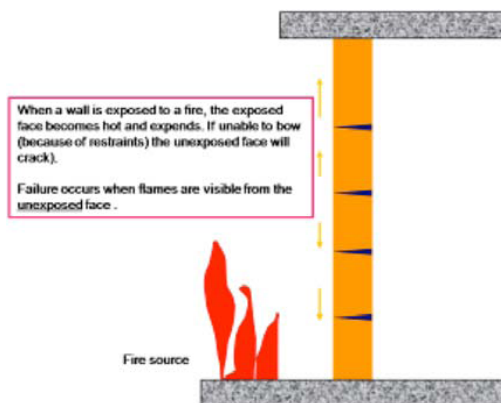
## Fire Resistance Levels

### Building Code of Australia and Australian Standards

BCA Volume 1 Part C defines the fire resistance requirements for Class 2 to 9 buildings. BCA Volume 2 Part 3.7.1 defines the fire resistance requirements for Class 1 and 10a buildings. Australian Standard AS 3700 sets out the means of determining the fire resistance of masonry, for the three limit states described in the BCA.

The Fire Resistance Level (FRL) for Structural Adequacy is the ability of a wall to remain stable when exposed to fire. Structural Adequacy is a function of:

- Thermal expansion of the material
- Slenderness (affected by thickness, vertical span and horizontal span between supports)
- Reinforcement.

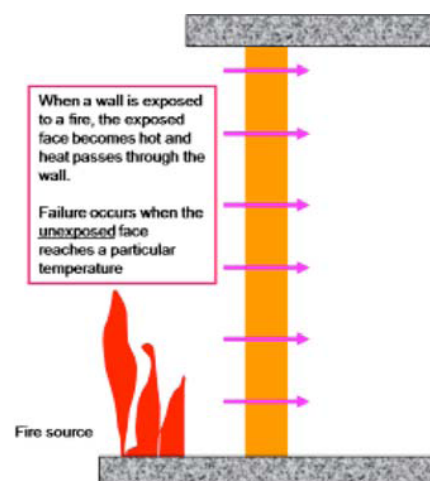
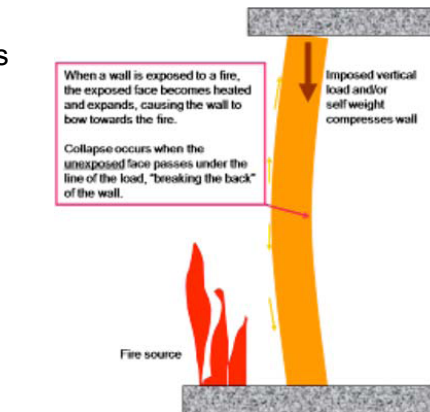


The Fire Resistance Level (FRL) for Integrity is the ability of a wall to resist the passage of flames and hot gasses from one side to the other. Integrity is a function of:

- Material type
- Material thickness

The Fire Resistance Level (FRL) for Insulation is the ability of a wall to resist the passage of heat from one side to the other. Insulation is a function of:

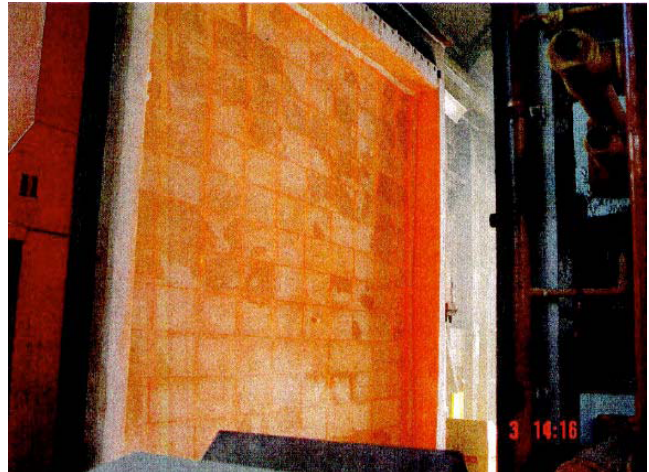
- Material type
- Equivalent thickness
- Render on two sides (if present)



## Fire Test to AS 1530.4

- The material properties may be determined from fire tests to AS 1540.4.
- This information may be then interpreted using the formulae given in AS 3700 or similar standards to predict wall behaviour.

Wall panels may be supported at the top and bottom and subjected to an applied load. This is known as a "load bearing test".



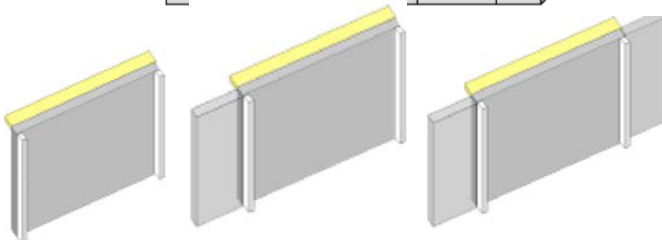
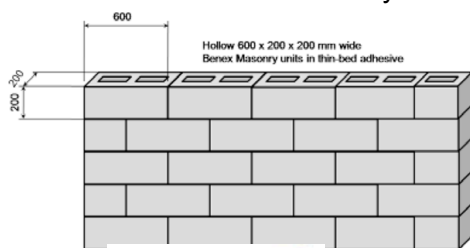
Alternatively the panels may be supported on one side and not subjected to any externally applied load. This is known as a "non-load bearing test". The terminology is a little misleading, since experience has shown that collapse of a wall (structural adequacy failure) is more influenced by the number of sides supported and the corresponding wall slenderness than by the magnitude of this applied vertical load. A more informative description would be "test with supports at top and bottom" and "test with supports on four sides".

The standard fire test in AS 1530.4 uses the same three failure criteria, mentioned in the BCA and AS 3700, of structural adequacy, integrity and insulation.

## Benex Wall System Performance

The following Benex wall systems were evaluated for FRL performance for structural adequacy as follows:

System 1: Benex Hollow Wall System - 200mm unreinforced wall.



| Fire Resistance Level (Structural Adequacy) in minutes |     |     |     |     |
|--|-----|-----|-----|-----|
| Unreinforced Benex Masonry (200mm wide)                |     |     |     |     |
| Length Between vertical supports (m)                   |     |     |     |     |
|  | 2.4 | 4.2 | 6.0 | 9.0 |
| 10.0   | 240 | -   | -   | -   |
| 8.0  | 240 | 60  | -   | -   |
| 6.0  | 240 | 180 | 30  | -   |
| 4.0  | 240 | 240 | 240 | 180 |
| 2.4  | 240 | 240 | 240 | 240 |

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**BENEX**



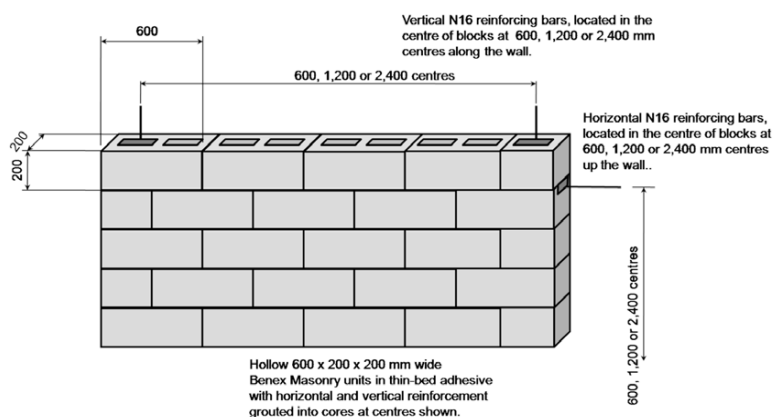
## System 2: Core-filled Benex Wall System 200mm wide with various reinforcing configurations.

The following table is for 200 mm Reinforced Benex Masonry, supported on all four sides to the structure, i.e. fixed to both columns, a braced strong/stiff top beam, and at the base with connectors designed to transmit the loads to the supports. The designer must determine the design load (kPa) and compare this to the tabulated capacity (kPa).

The masonry must be reinforced in accordance with one of the three options, as follows:

1. N16 horizontal and vertical reinforcement at 2,400 mm centres
2. N16 horizontal and vertical reinforcement at 1,200 mm centres
3. N16 horizontal and vertical reinforcement at 600 mm centres

The following tables are based Benex properties reported in CSIRO Report No DTS767 (dated 30/10/07), and the method used in AS 3700 Section 6, with the following qualifications. Provided the reinforcement and connections to the structural frame are adequate to withstand 0.5 kPa horizontal out-of-plane load, non-loadbearing Benex walls will be suitable for 240 minutes Fire Resistance Level (Structural Adequacy).



| Fire Resistance Level (Structural Adequacy) in minutes                                     |     |     |     |     |
|--|-----|-----|-----|-----|
| <b>200 mm Benex Masonry, Reinforced Horizontally and Vertically w<br/>1 N16 @ 2,400 mm</b> |     |     |     |     |
| Length Between vertical supports (m)   |     |     |     |     |
|  | 2.4 | 4.2 | 6.0 | 9.0 |
| 10.0   | 240 | -   | -   | -   |
| 8.0  | 240 | 240 | -   | -   |
| 6.0  | 240 | 240 | 240 | -   |
| 4.0  | 240 | 240 | 240 | 240 |
| 2.4  | 240 | 240 | 240 | 240 |
| <b>200 mm Benex Masonry, Reinforced Horizontally and Vertically w<br/>1 N16 @ 1,200 mm</b> |     |     |     |     |
| Length Between vertical supports (m)   |     |     |     |     |
|  | 2.4 | 4.2 | 6.0 | 9.0 |
| 10.0   | 240 | 240 | 240 | -   |
| 8.0  | 240 | 240 | 240 | -   |
| 6.0  | 240 | 240 | 240 | 240 |
| 4.0  | 240 | 240 | 240 | 240 |
| 2.4  | 240 | 240 | 240 | 240 |
| <b>200 mm Benex Masonry, Reinforced Horizontally and Vertically w<br/>1 N16 @ 600 mm</b>   |     |     |     |     |
| Length Between vertical supports (m)   |     |     |     |     |
|  | 2.4 | 4.2 | 6.0 | 9.0 |
| 10.0   | 240 | 240 | 240 | -   |
| 8.0  | 240 | 240 | 240 | -   |
| 6.0  | 240 | 240 | 240 | 240 |
| 4.0  | 240 | 240 | 240 | 240 |
| 2.4  | 240 | 240 | 240 | 240 |