

# Promat

# PROMATECT<sup>®</sup>-H

For fire protection of concrete & brick structures



Structural Protection

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| Type of concrete upgrading   | System code | Increase of fire resistance | Concrete/brick thickness | Board thickness      | Tests and assessments standards/labs                                    | Page no. |
|--|-------------|-----------------------------|--------------------------|----------------------|---|----------|
| <br>Concrete upgraded floor slab (Direct fixing)    | PH 111.12.1 | From 60 to 120 minutes      | 80mm concrete*           | 1 x 12mm (underside) | <a href="#">AS1530: Part 4: 2014 Report No.</a><br>• BRANZ FC17319-01-1 | 5        |
|  | PH 111.24.1 | From 120 to 240 minutes     | 120mm concrete*          | 1 x 12mm (underside) |   |          |
| <br>Concrete upgraded floor slab (Steel hat fixing) | PH 111.12.1 | From 60 to 120 minutes      | 80mm concrete*           | 1 x 12mm (underside) | <a href="#">AS1530: Part 4: 2014 Report No.</a><br>• BRANZ FC17319-01-1 | 6        |

\*For concrete floors or walls in accordance with AS3600

| Type of concrete upgrading   | System code | Increase of fire resistance | Concrete/brick thickness | Board thickness        | Tests and assessments standards/labs                     | Page no. |
|--|-------------|-----------------------------|--------------------------|------------------------|--|----------|
|  <p>Concrete/brick upgraded wall<br/>(2-sided direct fixing)</p>  | PH 112.24.1 | From 60 to 120 minutes      | 80mm concrete            | 1 x 12mm (each side)   | <b>AS1530.4: 2014 Report No.</b><br>• BRANZ FC17319-01-1 | 7        |
|  |             | From 120 to 240 minutes     | 120mm concrete           | 1 x 12mm (each side)   |  |          |
|  |             | From 60 to 120 minutes      | 90mm brick*              | 1 x 12mm (each side)   |  |          |
|  |             | From 120 to 240 minutes     | 130mm brick*             | 1 x 12mm (each side)   |  |          |
|  <p>Concrete/brick upgraded wall<br/>(1-sided direct fixing)</p> | PH 112.24.1 | From 60 to 120 minutes      | 80mm concrete            | 1 x 12mm (fire side)   | <b>AS1530.4: 2014 Report No.</b><br>• BRANZ FC17319-01-1 | 7        |
|  |             | From 60 to 120 minutes      | 80mm concrete            | 1 x 15mm (either side) |  |          |
|  |             | From 120 to 240 minutes     | 120mm concrete           | 1 x 12mm (fire side)   |  |          |
|  |             | From 120 to 240 minutes     | 120mm concrete           | 1 x 20mm (either side) |  |          |
|  |             | From 60 to 120 minutes      | 90mm brick*              | 1 x 12mm (fire side)   |  |          |
|  |             | From 60 to 120 minutes      | 90mm brick*              | 1 x 15mm (either side) |  |          |
|  |             | From 120 to 240 minutes     | 130mm brick*             | 1 x 12mm (fire side)   |  |          |
|  |             | From 120 to 240 minutes     | 130mm brick*             | 1 x 20mm (either side) |  |          |
|  <p>Concrete/brick upgraded wall<br/>(Steel hat fixing)</p>     | PH 112.12.1 | From 60 to 120 minutes      | 80mm concrete            | 1 x 12mm (each side)   | <b>AS1530.4: 2014 Report No.</b><br>• BRANZ FC17319-01-1 | 8        |
|  |             | From 60 to 120 minutes      | 90mm brick*              | 1 x 12mm (each side)   |  |          |

\*Brickwalls are for upgrade of integrity and insulation values only

## Introduction

Strengthening and upgrading the structural system to improve fire performance of an existing building is a common building renovation activity. For upgrade projects, design engineers must deal with structures in which every element carries a share of the existing load. Contractors must also deal with critical issues related to access of the work area, constructability of the repair, noise and dust control, as well as the type of construction materials. The latter may not be quite as critical as for new construction projects. Upgrading concrete systems with matrix engineered mineral board not only improves fire performance but also ensures that high, increased loading is not added to the construction. Equally important, Promat concrete upgrading systems have been tested in a series of fire resistance tests of concrete floors and walls lined with PROMATECT®-H board. Results are presented in terms of the thickness of PROMATECT®-H linings required to give a specified improvement in performance over the performance of unprotected concrete. Base concrete thicknesses are readily available from the Promat Technical Department.

The fire resistance of a reinforced concrete structure depends, to a large extent, on:

- The overall thickness of the section (in order to keep heat transfer through the member within acceptable limits),
- The average concrete cover to the reinforcement (in order to keep the temperature of the reinforcement below critical values).

The tendency of concrete to spall, or break up, in a fire can lead to loss of the insulating cover to the steel and reduction in overall thickness of the member. In some constructions, supplementary reinforcement is necessary to reduce these effects. The overall thickness and cover is determined by the properties of the aggregate used. For example, lightweight aggregate formed from expanded pulverised fly ash has low thermal conductivity and expansion, and is, to some degree, more resistant to spalling, enabling thickness and cover reduction to be made without lowering the fire resistance.

## Fire Testing Methods

Concrete floors and walls should be designed in accordance with AS3600 and are required to satisfy the three failure criteria of structural adequacy, integrity and insulation when exposed to fire from below.

Systems tested in accordance with AS1530.4: 2014 are also suitable provided they meet the minimum thickness requirement. However, some concrete structures can be exposed to more onerous heating conditions, e.g. in tunnels. Please refer to Promat for details.

## Design Considerations

The following points are some of the factors that should be considered when determining the correct specification to ensure a concrete floor will provide the required fire performance:

### 1. Concrete Density

Density not only affects the strength of concrete but also its insulation properties and susceptibility to spalling when exposed to fire.

### 2. Concrete Moisture Content

Depending on the concrete type, concrete will spall severely when exposed to fire if its moisture content is greater than 2~3%.

### 3. Concrete Thickness & Cover To Reinforcing Bars

The overall slab thickness will contribute to the strength and insulation of the structure but the concrete cover to the lowest reinforcing bars is also critical. The concrete slab may need upgrading if inadequate cover has been provided.

### 4. Supporting Steelwork

Care should be taken that any structural steel supporting the concrete slab is adequately protected against fire.

### 5. Other Factors

The reference made to suspended ceilings, light fittings, service penetrations, cavity barriers and loading in the timber floor section of this handbook apply equally to concrete floors.

### 6. Type of Fire Exposure

The rate of increase in temperature is critical to the susceptibility of concrete to spall or collapse when exposed to fire. The more rapid the rise in temperature, the greater the likelihood of damage to concrete occurring. For more details concerning the effects of fire on concrete, please refer to *Promat Tunnel Fire Protection Manual*.

## Guidance Notes

### Cover

Cover may be taken in all situations as the distance between the nearest heated face of the concrete and the surface of the main reinforcement or an average value. Determination of the cover should be done in accordance with the requirements of AS3600.

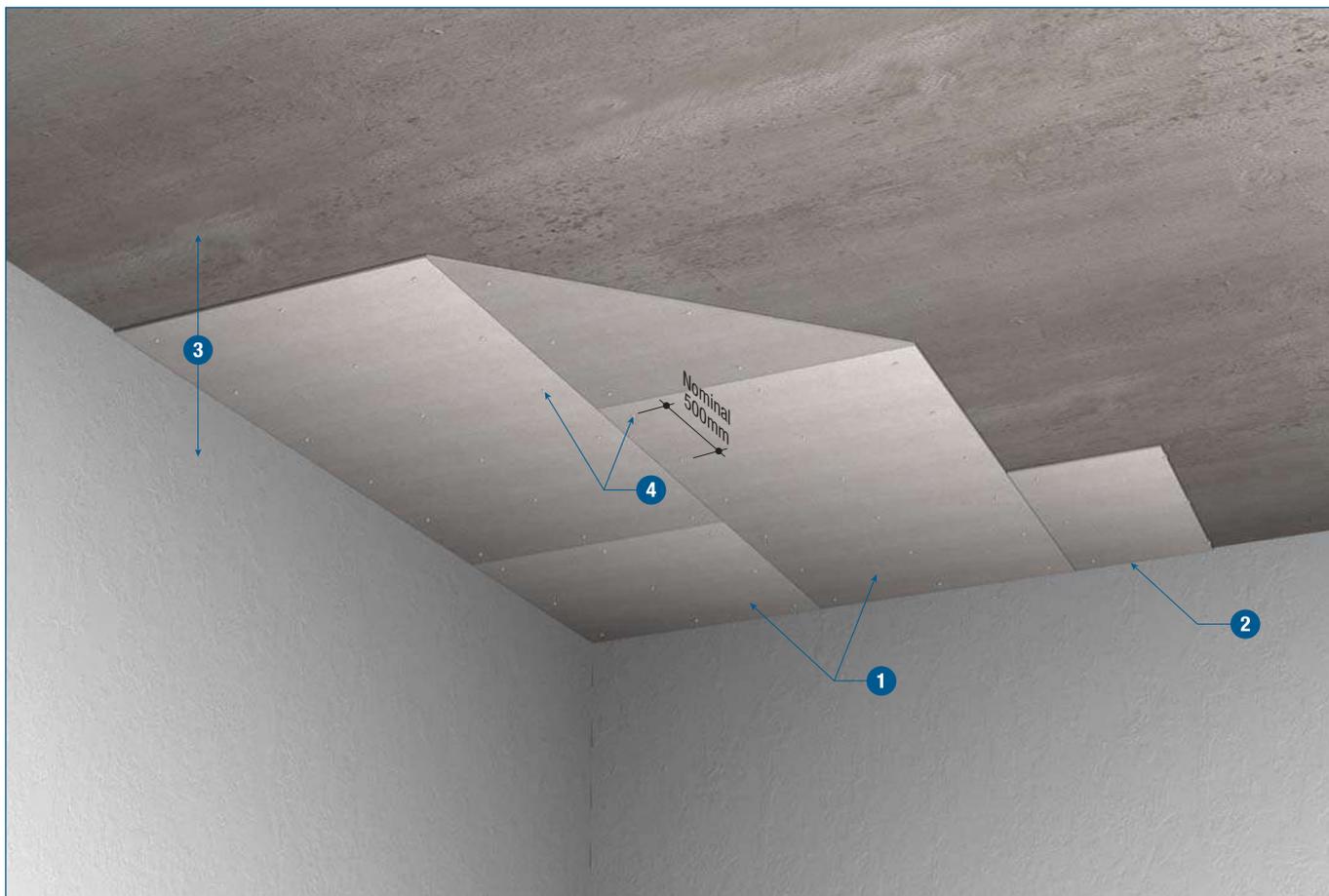
### Floor Thickness

In the case of solid slabs, the thickness to consider is the actual thickness of the slab.

For ribbed slabs, the thickness of the solid slab between the webs of adjacent ribs

For hollow slabs the effective thickness should be obtained by considering the net cross sectional area divided by the width of the cross section.

Direct fixing – Fire attack from underside / Non loadbearing and loadbearing



### TECHNICAL DATA

- 1** 1 layer of PROMATECT®-H board fixed directly to the underside of concrete floor

For increasing the fire resistance 12mm thick from 60 to 120 minutes

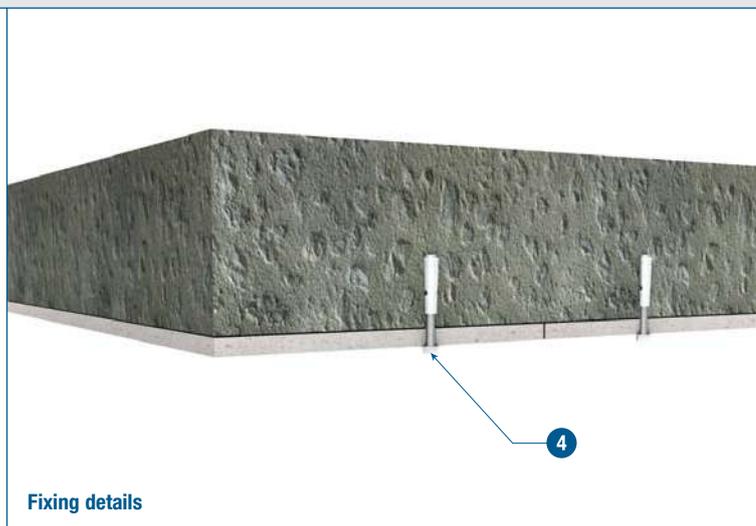
For increasing the fire resistance 12mm thick from 120 to 240 minutes

- 2** Caulk all perimeter gaps with PROMASEAL® A Acrylic Sealant

- 3** Concrete slab

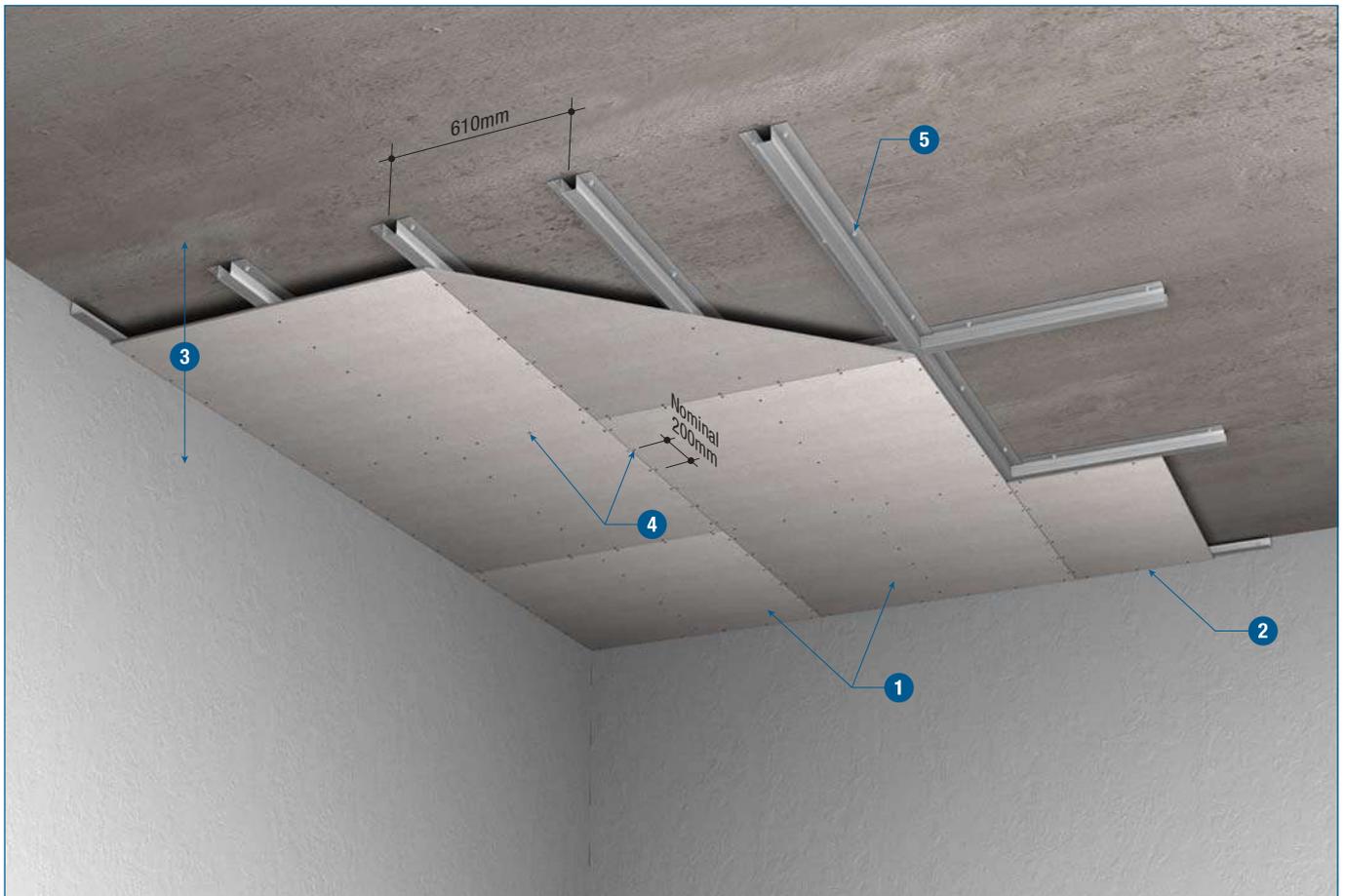
- 4** M6 masonry anchors with 16mm steel washes, minimum anchor length should allow for 25mm penetration into the concrete, fixed at maximum 500mm centres, minimum 15mm from edge of boards and 100mm from corners.

The board thickness quoted in this manual are relevant to concrete that is in designed in accordance with AS3600 and for fire resistance to the AS1530.4 fire curve. For high strength concrete or alternate fire curves eg for Tunnels, please contact Promat Australia.



Fixing details

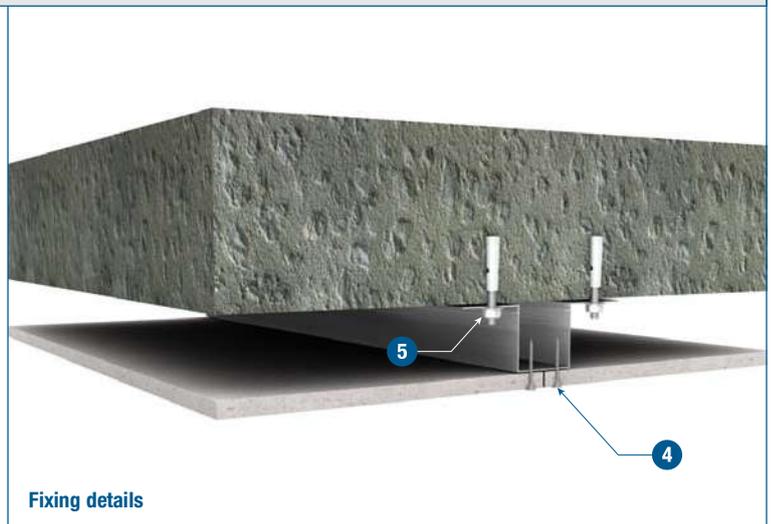
### Steel hat fixing – Fire attack from underside / Non loadbearing and loadbearing



#### TECHNICAL DATA

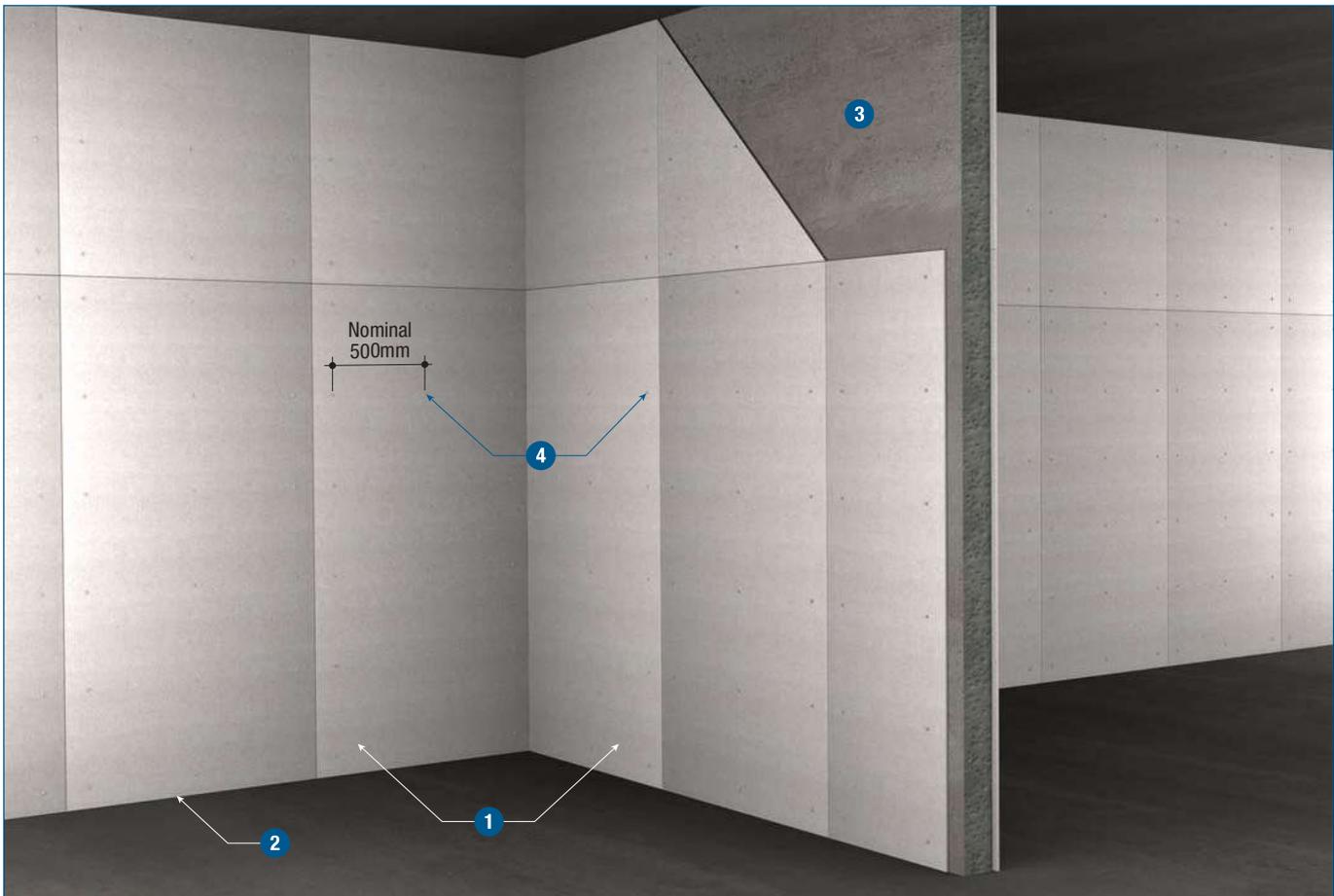
- 1 For increasing the fire resistance from 60 to 120 minutes  
1 layer of PROMATECT®-H board 12mm thick, fixed with steel hats to the underside of concrete floor.
- 2 Caulk all perimeter gaps with PROMASEAL® A Acrylic Sealant
- 3 Concrete slab
- 4 25mm x No.8 self-tapping screws at nominal 200mm centres
- 5 Steel top hats 50mm x 50mm x 50mm x 1.2mm thick at 1220mm by 610mm centres, fixed with M6 masonry anchors at nominal 500mm centres with a minimum 25mm penetration into the concrete.

The board thickness quoted in this manual are relevant to concrete that is designed in accordance with AS3600 and for fire resistance to the AS1530.4 fire curve. For high strength concrete or alternate fire curves eg for Tunnels, please contact Promat Australia.



Fixing details

Direct fixing – Fire attack from one or both sides / Non loadbearing and loadbearing



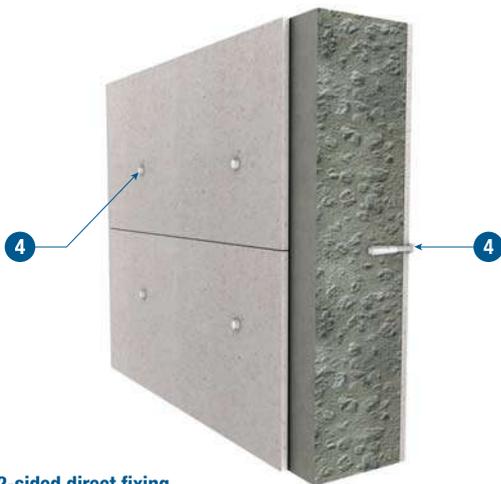
### TECHNICAL DATA

- 1 For increasing the fire resistance from 60 to 240 minutes 1 layer of PROMATECT®-H board fixed directly to each or one side of concrete or brick wall. See page 3 for the ranges of fire resistance, and the required thicknesses of wall, board and gypsum plaster where applicable.
- 2 Caulk all perimeter gaps with PROMASEAL® A Acrylic Sealant to achieve stated fire and/or acoustic performance
- 3 Concrete or brick wall

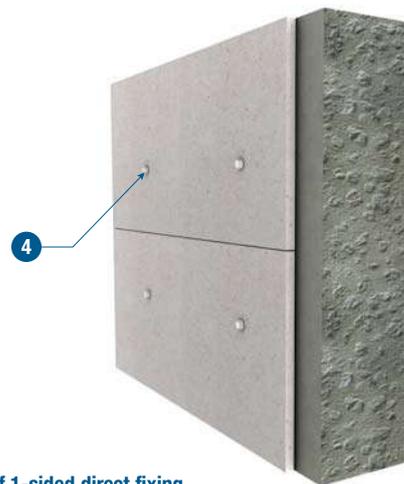
- 4 M6 masonry anchors at 500mm centres with steel washer 16mm diameter, should allow for a minimum 30mm penetration into the concrete.

For loadbearing upgrading, the concrete cover to the reinforcing at the non-board side must be of minimum 25mm thick for 120 minutes wall or minimum 55mm thick for 240 minutes wall.

The board thickness quoted in this manual are relevant to concrete that is in designed in accordance with AS3600 and for fire resistance to the AS1530.4 fire curve. For high strength concrete or alternate fire curves eg for Tunnels, please contact Promat Australia.

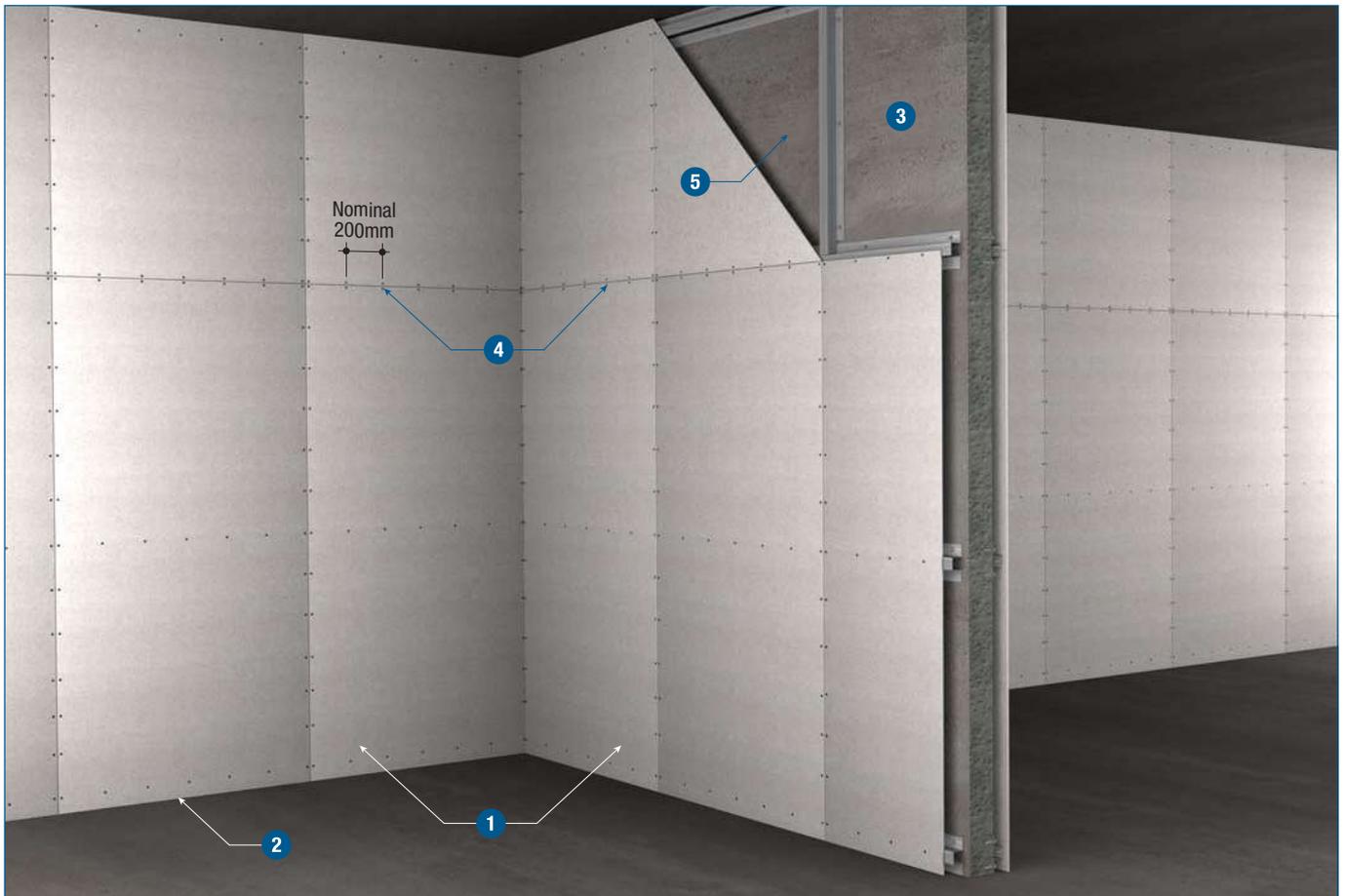


Details of 2-sided direct fixing



Details of 1-sided direct fixing

### Steel hat fixing – Fire attack from both sides / Non loadbearing and loadbearing



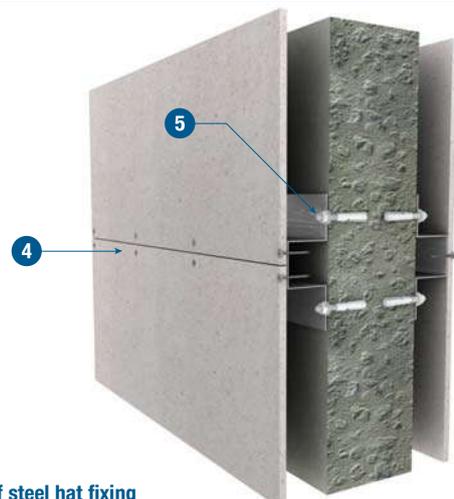
#### TECHNICAL DATA

- 1 For increasing the fire resistance from 60 to 120 minutes 1 layer of PROMATECT®-H board 12mm thick, fixed with steel hats to each side of concrete or brick wall. See page 2 for the required thicknesses of wall and gypsum plaster where applicable.
- 2 Caulk all perimeter gaps with PROMASEAL® A Acrylic Sealant to achieve stated fire and/or acoustic performance
- 3 Concrete or brick wall
- 4 25mm x No.8 self-tapping screws at nominal 200mm centres

- 5 Steel top hats 50mm x 50mm x 50mm x 1.2mm thick at 1220mm x 610mm grid spacing, fixed with M6 masonry anchors with a minimum 25mm penetration into the concrete

For loadbearing upgrading, the concrete cover to the reinforcing at the non-board side must be of minimum 25mm thick for 120 minutes wall or minimum 55mm thick for 240 minutes wall.

The board thickness quoted in this manual are relevant to concrete that is in designed in accordance with AS3600 and for fire resistance to the AS1530.4 fire curve. For high strength concrete or alternate fire curves eg for Tunnels, please contact Promat Australia.



Details of steel hat fixing

Following is the standard Architectural Specification for concrete slab or wall upgrading using PROMATECT®-H. The designer must determine the suitability of the design to the application and requirements before undertaking or constructing any works relating to the specifications and where in doubt should obtain the advice of a qualified engineer.

### Fire Attack From Underside / Fire Attack From One and/or Both Sides / Non Loadbearing & Loadbearing

Integrity and insulation for up to 240 minutes in accordance with the relevant criteria of **AS1530: Part 4: 2014**. For loadbearing and non loadbearing concrete floors/walls and non loadbearing brick walls.

### Supporting Structure

Care should be taken to ensure that the concrete upgrading system, when applied to any structural element, is adequately supported. Minimum penetration of fixings into substrate is 25mm.

### Lining Boards

Single layer each side \_\_\_\_\_mm<sup>(1)</sup> PROMATECT®-H matrix engineered mineral boards as manufactured by Promat Australia Pty Ltd. Standard board dimensions 1220mm x 2440mm x \_\_\_\_\_mm<sup>(1)</sup> to provide \_\_\_\_\_ minutes<sup>(2)</sup> of FRL.

### Fixing

Option of fixing the PROMATECT®-H concrete upgrading construction:

- 1) Lining fixed directly to concrete wall/floor with M6 anchor bolts at 500mm centres allowing sufficient length to ensure minimum 25mm penetration into concrete.
- 2) Lining fixed to top hat section steel battens with M4 self-tapping screws at nominal 200mm centres. Steel battens fixed to concrete wall or floor with M6 anchor bolts at nominal 500mm centres, allowing a minimum 25mm penetration into the substrate.

Similar details apply for brick wall constructions.

### Tests & Standards

The complete system along with all materials and the framing should be tested and assessed in accordance with the criteria of AS1530: Part 4 for loadbearing/ non loadbearing walls and slabs.

### Jointing

Plain butt joints between machined edges of boards. <sup>(3)</sup>

Joints filled in preparation for painting. <sup>(4)</sup>

Joints filled and taped in preparation for decoration. <sup>(5)</sup>

### Follow-on Trades

Surface of boards to be prepared for painting/plastering/tiling<sup>(6)</sup> in accordance with manufacturer's recommendations.

#### NOTES:

- <sup>(1)</sup> see Systems Index on **page 2 & 3** to ascertain the required thickness.
- <sup>(2)</sup> insert the required FRL not exceeding 240 minutes.
- <sup>(3), (4), (5), (6)</sup> delete as appropriate.
- Perimeter gaps will be filled with fire resistant PROMASEAL® A Acrylic Sealant.

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