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30-08-2013

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## **Assessment report for hollow concrete deck insulated with Conlit 150 mounted with expanding concrete nails**

### **Executive summary**

DBI – Danish Institute of Fire and Security Technology has been requested by Rockwool A/S to assess a hollow concrete deck insulated with Conlit 150 mineral wool boards underneath as passive fire protection.

It is the opinion of DBI that a prestressed hollow concrete deck mounted underneath with Conlit 150 mineral wool boards with thickness 30 mm, fixed to the concrete deck with 5 x 50/30 expanding concrete nails, has fire performance equal to a loadbearing deck with the classification R120 given the following conditions:

- 1) A verification of the load bearing capacity in the ultimate limit state have been established in accordance with applicable European standards for load action and construction resistance.
- 2) The following load limitations are met:
  - a.  $M_{fi,Ed} \leq 1.0 M_{Rd}$
  - b.  $V_{fi,Ed} \leq 0.85 V_{Rd}$

DBI refers to the subsequent text which gives insight into the underlying reasons for this assessment.

### **Full text assessment**

DBI – Danish Institute of Fire and Security Technology has been requested by Rockwool A/S to assess a hollow concrete deck insulated with Conlit 150 mineral wool boards underneath as passive fire protection.

#### **Product:**

The hollow concrete deck is type DE 215, reinforced with 7 pcs. of ½" cables with a characteristic ultimate tensile stress of 1770 MPa and an initial prestressing of 1150/1050 MPa. The cables had a 34 mm concrete cover.

#### **Danish Institute of Fire and Security Technology**

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Conlit 150 is a mineral wool board with nominal density of 165 kg/m<sup>3</sup> and a minimum of 150 kg/m<sup>3</sup>. The thickness is 30 mm.

Conlit 150 has the classification A1 according to EN13501-1 and non-combustible according to DS 1057.1.

#### **Basis for the assessment:**

- 1) Test report PG11490, dated 2005-09-13: fire test according to EN 1365-2:1999 of a prestressed hollow concrete deck insulated with Conlit 150 mineral wool boards.
- 2) Assessment report PHA10409, dated 22-08-2013: an assessment of the 5 x 50/30 expanding concrete nails which concludes that the 5 x 50/30 expanding concrete nails can be used for mounting of 30 mm Conlit 150 board insulation underneath a concrete deck for a duration of 150 minutes.

#### **Assessment:**

It is the opinion of DBI that a prestressed hollow concrete deck mounted underneath with Conlit 150 mineral wool boards with thickness 30 mm, fixed to the concrete deck with 5 x 50/30 expanding concrete nails with a max. c/c distance of 320 mm and a max. distance of 50 mm from the edge of the board, has fire performance equal to a loadbearing deck with the classification R120 given the following conditions:

- 1) A minimum of 4 expanding concrete nails are used per board.
- 2) A verification of the load bearing capacity in the ultimate limit state has been established in accordance with applicable European standards for load action and construction resistance.
- 3) The following load limitations are met:
  - a.  $M_{fi,Ed} \leq 1.0 M_{Rd}$
  - b.  $V_{fi,Ed} \leq 0.85 V_{Rd}$

where

$M_{fi,Ed}$ : Design bending moment derived from the load in accident limit state (fire).

$M_{Rd}$ : Design bending moment resistance in calculated ultimate limit state.

$V_{fi,Ed}$ : Design shear derived from the loads in accident limit state (fire).

$V_{Rd}$ : Design shear resistance calculated in ultimate limit state.

This assessment deals with load-bearing structures where the expected failure modes are a bending moment failure and/or shear failure. Other failure modes or local phenomena's are not included in the assessment. The fire resistance that is addressed in this assessment cannot be uncritically transferred to other concrete structures or concrete profiles. The starting point for a transfer to another concrete structure is that the structure or profile should be comparable to the design that has been tested (thermally, in composition and

materials). DBI would pay particular attention to parameters such as covering of reinforcement, concrete characteristics, type reinforcement and prestressing.

DBI further specifies the following conditions which are preconditions for the expressed opinion.

- The mounting and fixing guide enclosed this assessment is following the description given in test report PG11490.

**Remarks:**

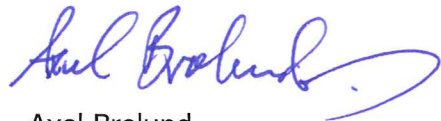
This is an expressed opinion based on the above mentioned reports.

Any changes in the product or the mounting will invalidate this assessment.

DBI - Danish Institute of Fire and Security Technology



Dan Lauridsen  
M.Sc. (Civ. Eng.)



Axel Brolund  
M.Sc. (Civ. Eng.)

Enclosure:

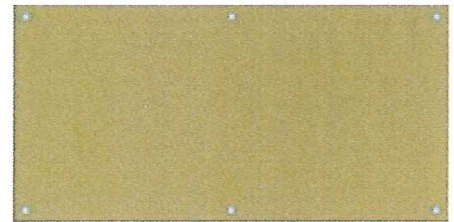
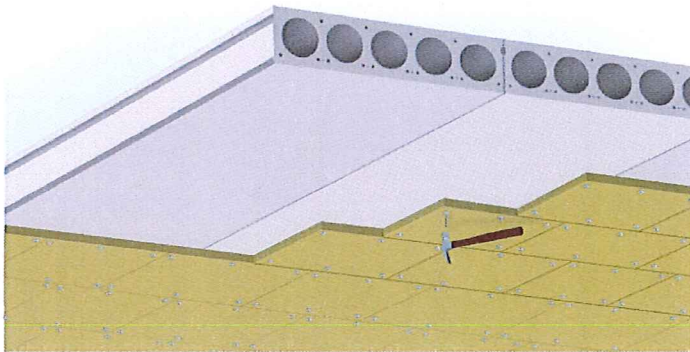
- Mounting and fixing guide (stamped and signed by DBI)

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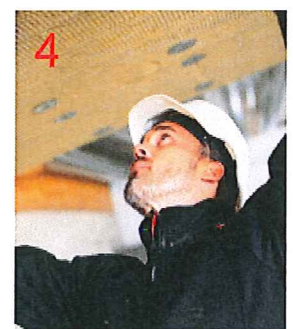
## Mounting and fixing guide

Fire protection of hollow concrete deck with 30mm of Conlit 150 mechanically fixed

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1. The thickness of the Conlit 150 board have to be 30mm.
2. Drill with a 5mm drill directly through the Conlit board and 35mm into the concrete (1).
3. Drill through the washer so it sets a clear mark on the Conlit board (2).
4. Use a 5 X 50/30 expanding concrete nail . 6 expanding concrete nail are used for each Conlit board (3).
5. The boards are mounted with an offset to each other.
6. The boards have to be fixed tightly together to ensure a close-fitting protection. (4)
7. If the Conlit fire protection is penetrated by other installations, these also have to be protected to maintain the fire protection



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*Åsel Balund*

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FIRESAFE INSULATION

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