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Warsaw 02.03.2009

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NP-633/A/2009/MŁ

## Fire resistance classification of the composite installed roofs

### 1. The formal basis

1.1. Agreement No. NP-633/A/2009/MŁ

### 2. The essential basis

2.1. PN-EN 13501-2:2008 Klasyfikacja ogniowa wyrobów budowlanych i elementów budynków. Część 2: Klasyfikacja na podstawie badań odporności ogniowej, z wyłączeniem instalacji wentylacyjnej. *(eqv. EN 13501-2:2007 Fire classification of construction products and building elements – Part 2: Classification using data from fire resistance tests, excluding ventilation services).*

2.2. FIRES-FR-101-08-AUNE Report of fire resistance test of the composite installed roof.

2.3. Technical documentation submitted by the Sponsor.

## 3. Technical description

Classification concerns resistance to fire of composite installed roofs IKO INSULATIONS, with load-bearing part made of trapezoidal steel sheets.
Composite installed roofs compose of:

- water proof insulation – bitumen roofing membranes or roof foils;
- glass fabric, minimum surface weight of 120 g/m$^2$;
- thermal insulation – poliizocyjanurate PIR boards IKO Enertherm ALU, IKO Enertherm ALU50, IKO Enertherm MG or IKO Enertherm BGF with minimum core density of 30 kg/m$^3$ and the minimum thickness given in Table 1;
- vapour barrier – PE foil or bitumen membrane;
- trapezoidal steel sheet.

The trapezoidal steel sheet is fixed to:

a) concrete load-bearing beams, masonry walls made from solid blocks or concrete walls – by means of steel anchors minimum M4,5x55 mm or directly fastened steel nails minimum ϕ4,2 mm driving in by means of powder driving tools with the number of:

   - one in each bottom wave, in case of trapezoidal steel sheet span of up to 6 m;
   - two in each bottom wave at the utters supports and at the supports on which the connection of steel sheets is made, in case of trapezoidal steel sheet span between 6 m and 7,5 m;

b) steel load-bearing beams – by means of self-drilling steel screws minimum ϕ4,5x25 mm or directly fastened steel nails ϕ4,2 mm driving in by using powder driving tools with the number of:

   - one in each bottom wave, in case of trapezoidal steel sheet span of up to 6 m;
   - two in each bottom wave at the utters supports and at the supports on which the connection of steel sheets is made, in case of trapezoidal steel sheet span between 6 m and 7,5 m;

c) timber load-bearing beams - by means of screws minimum ϕ5,5x55 mm in each bottom wave with the number of:

   - one in each bottom wave, in case of trapezoidal steel sheet span of up to 6 m;
   - two in each bottom wave at the utters supports and at the supports on which the connection of steel sheets is made, in case of trapezoidal steel sheet span between 6 m and 7,5 m;

Steel sheets are longitudinally joined to each other by self-drilling screws minimum 4,5 mm x 16 mm, spaced maximum 250 mm.

Circumferential walls are insulated by minimum 5 cm thick PIR IKO Enertherm ALU (lub ALU50, lub MG or BGF) which come to the poliizocyjanurate boards PIR, and additional 0,5 mm thick steel angles 25x25 mm fixed to the trapezoidal steel sheet.

The maximal value of suspended load is 0,35 kN/m$^2$.

The suspended load is fixed to the trapezoidal steel sheets by means of hangers made of threaded 8 mm diameter steel rods and holders screwed to the bottom waves of the trapezoidal steel sheets.

The maximal load for the one hanger is:
- 0,30 kN - in case of trapezoidal steel sheet span of up to 6 m;
- 0,25 kN - in case of trapezoidal steel sheet span between 6 m and 7,5 m.

**4. Resistance to fire tests**

Resistance to fire test of composite installed roofs with load-bearing part made of trapezoidal steel sheet was carried out by FIRES Laboratory in Slovakia.
Description of test specimen and the test results are presented in Tests Report No FIRES-FR-101-08-AUNE [2.2]
During the test one of the thermoelement used to measure average and maximum temperature rise recorded in 19th minute rapidly increased above the temperature of 180 °C. After the test it was established that this termoelement was located on roof foil directly above the joint of PIR insulation boards. This information is stated in the tests report FIRES-FR-101-08-AUNE [2.2].

The other termoelements did not record the temperature rise above 180 °C till the end of the test. i.e. 31st minutes. According to the standard EN 1365-2:2002 the records of that thermoelement were not taken into account in element classification.

**5. Fire resistance classification**

Fire resistance classes of the composite installed roof with the load-bearing part made of trapezoidal steel sheet, constructed in accordance with the description given in section 3, depending on the utilization level of the trapezoidal steel sheets allowed load $\alpha_{q1}$ *), based on the PN-EN 13501-2:2008 [2.1] standard criteria are summarized in
Table 1. The allowed pitch of the roof is 0° up to 25°.

Table 1

| | Utilization level of the allowed load $\alpha_{q1}$ *) | | |
|---|---|---|---|
| | 70% | 65% | 60% |
| | Thickness of the PIR boards insulation | | |
| | ≥ 65 mm | ≥ 80 mm | ≥ 100 mm |
| Fire resistance class | **REI 15** | **REI 20** | **REI 30** |

*) $\alpha_{q1}=q(g,S)/q_1$ – maximal utilization level of the allowed load "$q_1$" applied to the trapezoidal steel sheet, established by using design value of the death weight of the roof "g" (together with the suspended load) and design value of the snow load "S".

## 6. Classification validity period

This fire resistance classification given in clause 5 remains valid until March 31, 2012 subject to no changes being introduced to the composite installed roofs solutions as described in clause 3 above.

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