

Software applications for estimation of fire resistance of the building construction

K a m i l V a r g o v s k ý

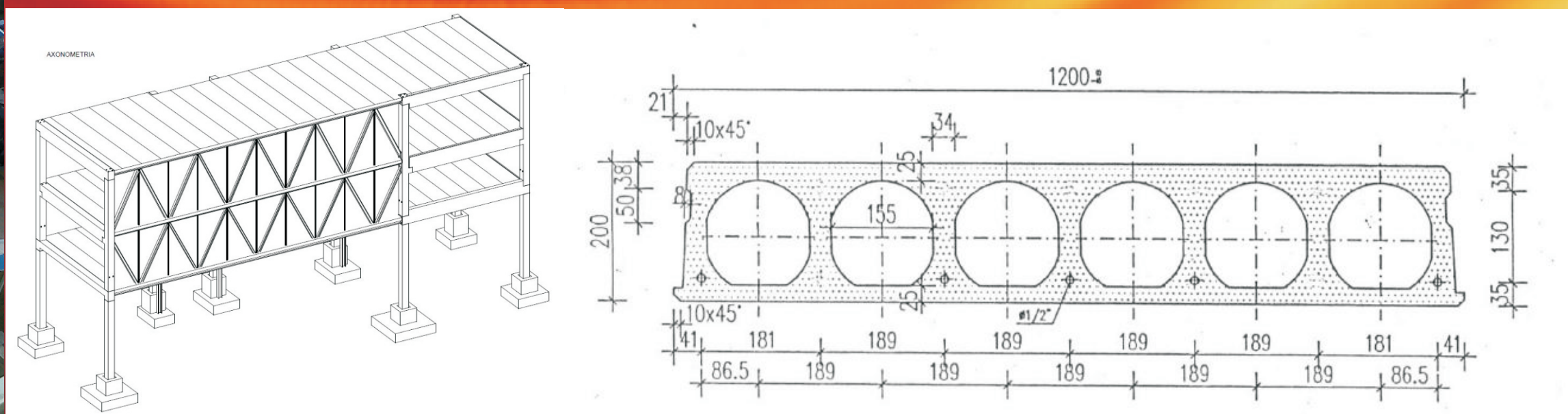
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Constructions overview

The estimation of fire resistance "Load-bearing reinforced concrete hollow panel forming rectangular section with longitudinal holes" was processing theoretical-experiment with help of calculations and simulations and by STN EN series 1363, STN EN 1365 and eurocodes series STN 1990, particularly STN EN 199x-1-2.



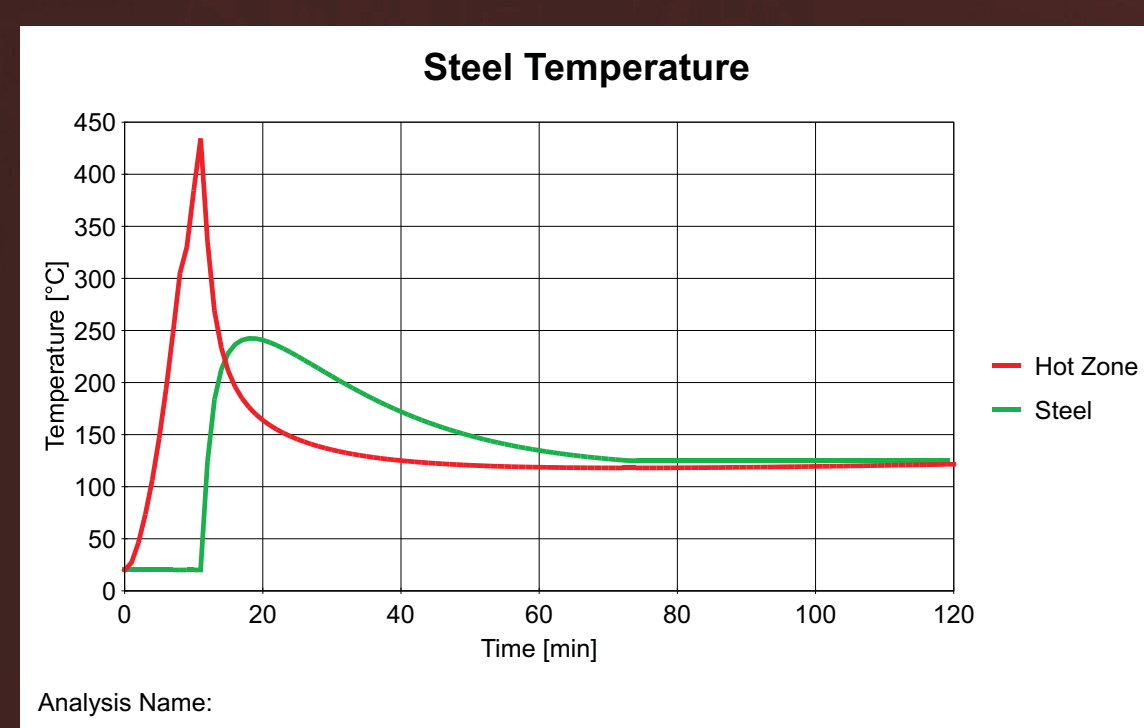
Loadbearing reinforced concrete hollow panel and his using.

Results for Interior Fire (Zone model)

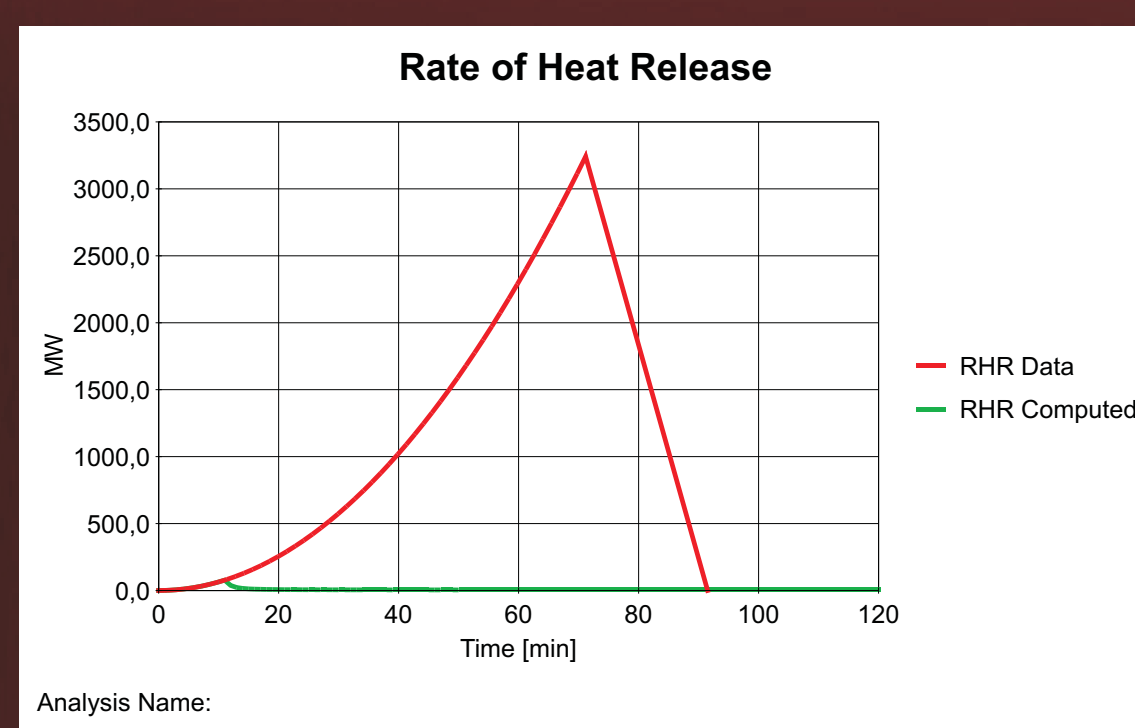
Fire Area: The maximum fire area (1720.00m) is greater than 25% of the floor area (1720.00m).

The fire load is uniformly distributed.

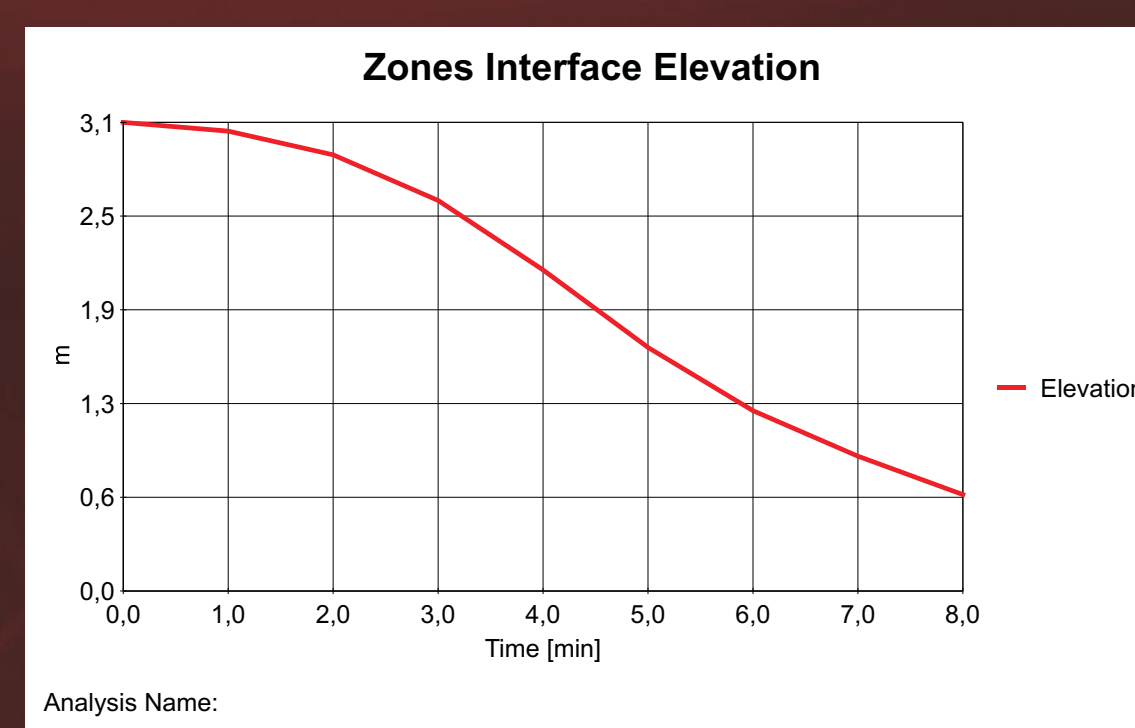
Switch to one zone: Lower layer Height < 20.0% compartment height at time [s] 343.51



Peak: 434 °C At: 11 min Hot Zone and Steel Temperature



Peak: 3241,41 MW At: 71,2 min RHR Data



h = 1,00 m At: 5,00 min Zones Interface Elevation

Critical Temperature: 476 °C - by results of the test about fire protection - REI 90 by EN 1363-1 (standard interior fire)

Failure Mode: Flexural Buckling

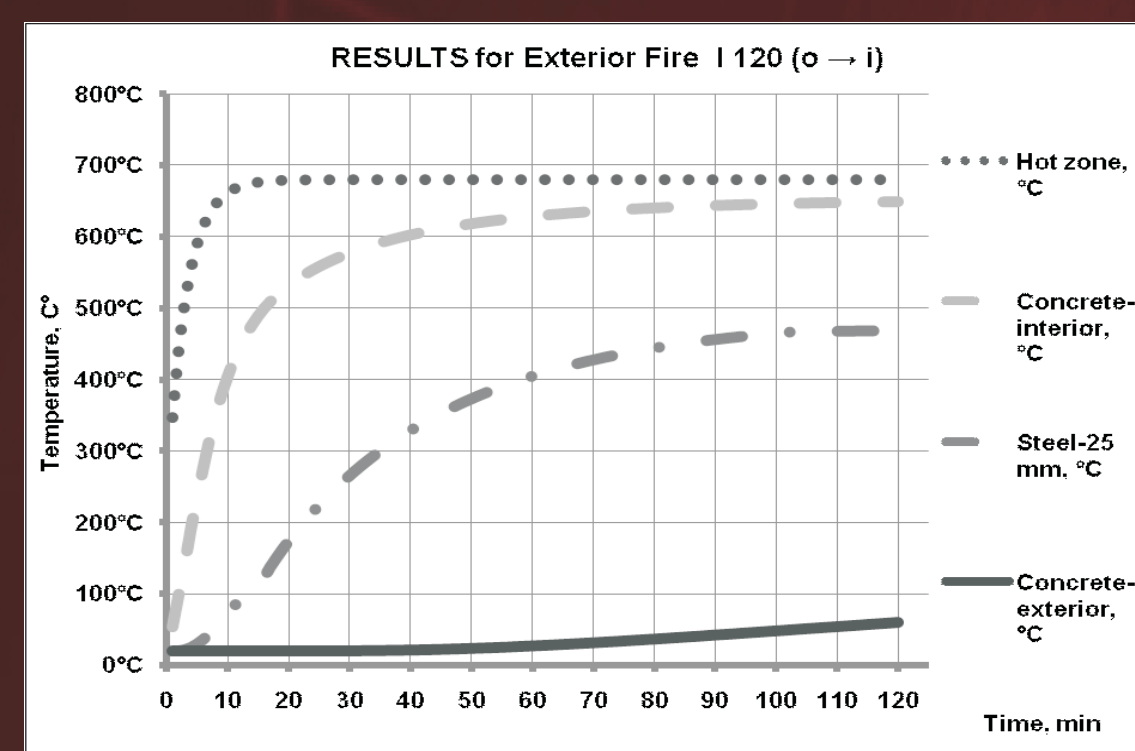
Class of the Cross Section in Fire: 1

Steel Temperature: 242 °C At 18 min.

Fire Resistance: (242,0 °C < 476 °C) 120,00 min

REW 120 (i o)

Results for standard Exterior Fire (Differential method)



Graph of the calculation of the unstationary heat conduction

Time, min	Hot zone, °C	Concrete-interior, °C	Steel-25 mm, °C	Concrete-exterior, °C
1	346,1	53,3	20	20
15	676,3	488,6	114,5	20
30	680	577,2	265,3	20,3
45	680	611,4	352,8	22,4
60	680	628,7	405	27,2
90	680	643,9	456,4	42,5
120	680	649,3	469	60,3

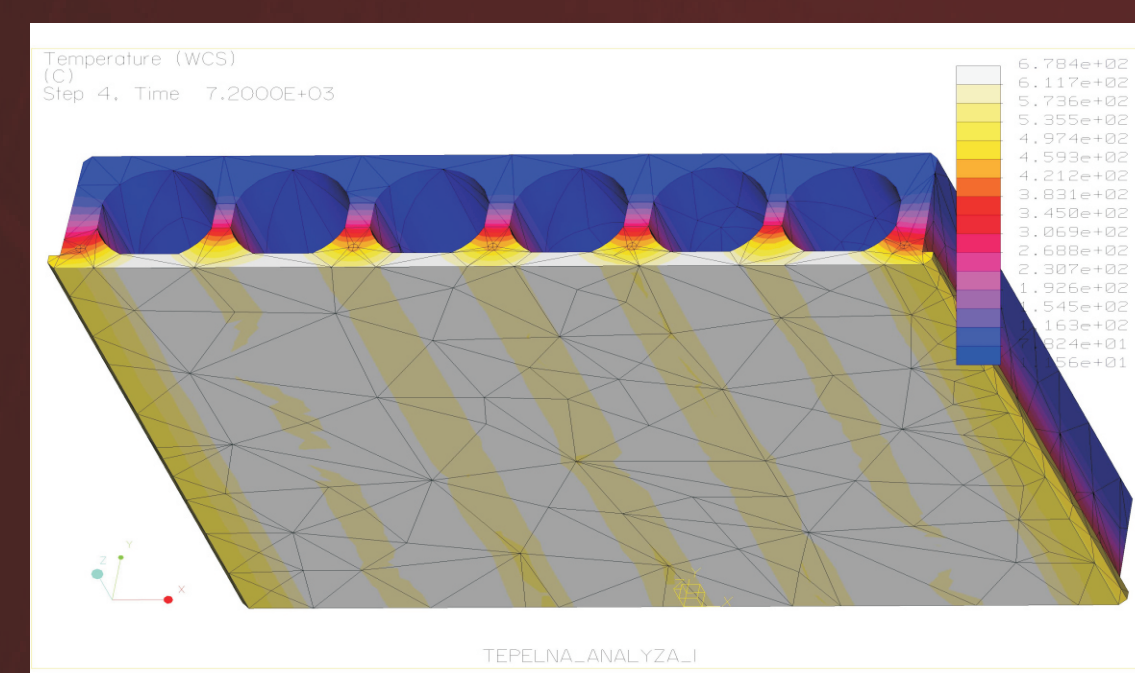
Results of calculation of the unstationary heat conduction

Temperature on interior: 649,3 °C in:120. minute
 Temperature on exterior: 60,3 °C in:120. minute (E,W 120)
 Temperature of steel cable: 469,0 °C in:120. minute (R 120)
 Critical Temperature: 476,0 °C

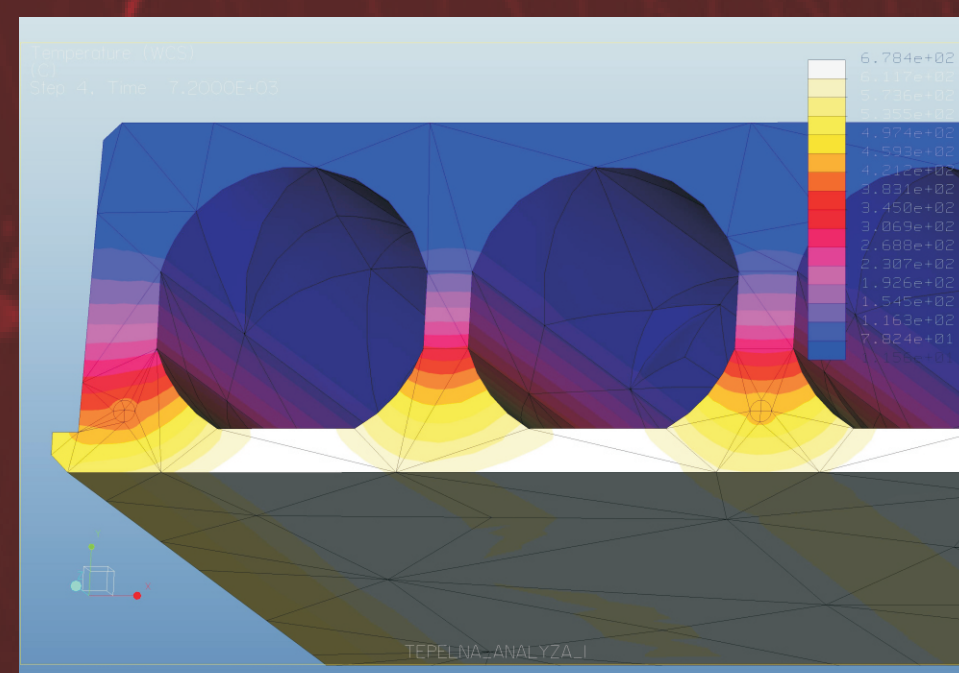
Fire Resistance: (469,0 °C < 476 °C) 120,00 minute

REW 120 (o i)

Results for standard Exterior Fire (Finite element method - FEM)



Results with network analysis by finite element method (FEM) - bottom view.



Results with network analysis by finite element method (FEM) - detail view.

Temperature on interior: 678,0 °C in:120. minute
 Temperature on exterior: 78,2 °C in:120. minute (E,W 120)
 Temperature of steel cable: 459,3 °C in:120. minute (R 120)
 Critical Temperature: 476,0 °C
 Fire Resistance: (459,3 °C < 476 °C) 120,00 minute

REW 120 (o i)