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Connection Temperatures during the Fire Test in Mokrsko

The main goal of the fire test was the overall behaviour of the structure, which may not be observed on separate elements. The test was focused on the improvement of description of elements and its connection behaviour. For the fire experiment, a new building was erected in front of the CTU educational centre Joseph gallery in Central Bohemia, 50 km south from Prague. The structure represented one floor of an administrative building of size 18 x 12 m. The composite slab on the castellated beams was designed with a span 9 to 12 m and on beams with corrugated webs with a span 9 to 6 m.

Mechanical load was designed to comply with regular administrative building. The dead load of the tested structure reached 2.6 kN/m², the variable load 3.0 kN/m². The 15 m³ of unwrought wooden bars 50 x 50 mm of length 1 m of softwood dried to moisture till 12% represented the fire

load. The openings of height 2.54 m and total length 8.00 m with parapet 1 m ventilated the compartment. To allow a smooth development of fire no glazing was installed.

The beam to beam and beam to column connections were designed as header plate, plate thickness 10 mm with four bolts M16 class 8.8. The improved fire resistance of the connections was reached by encasing two bolts in the concrete of the slab. The maximum temperature of the lower bolt in the beam to column connection reached 56% of the temperature in the lower flange in the beam midspan, the upper encased bolt 17% of the midspan maximum in the flange. In case of beam to beam connection, the temperature in the lower unprotected bolt was 46% of the maximal temperature in the beam's flange in the midspan, whilst the upper protected bolt 22% of the same maximal temperature.

Experimental Building



Overall view of the experimental building with scaffolding for measuring deflections



Fire load consisted of 15m³ of wooden bars, which were evenly distributed into 50 piles

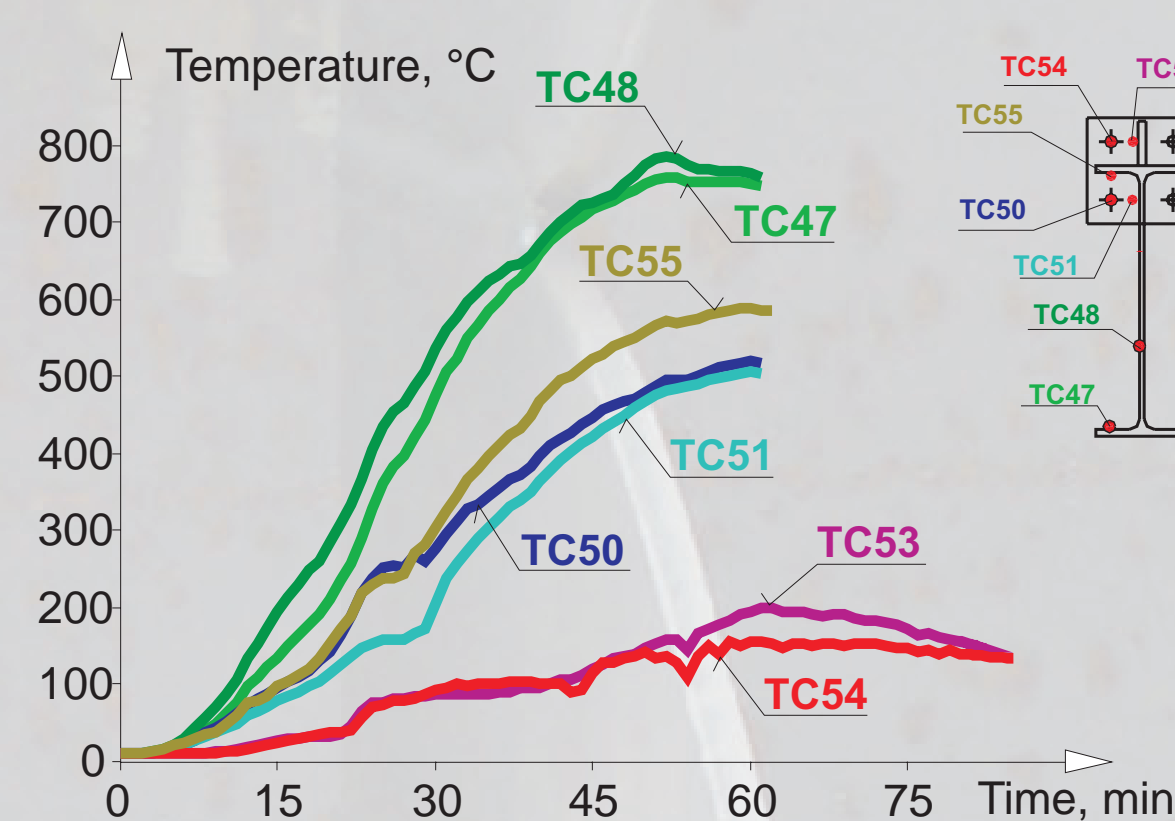


Mechanical load was represented by 78 sand bags, whose weight varied from 793 to 1087 kg

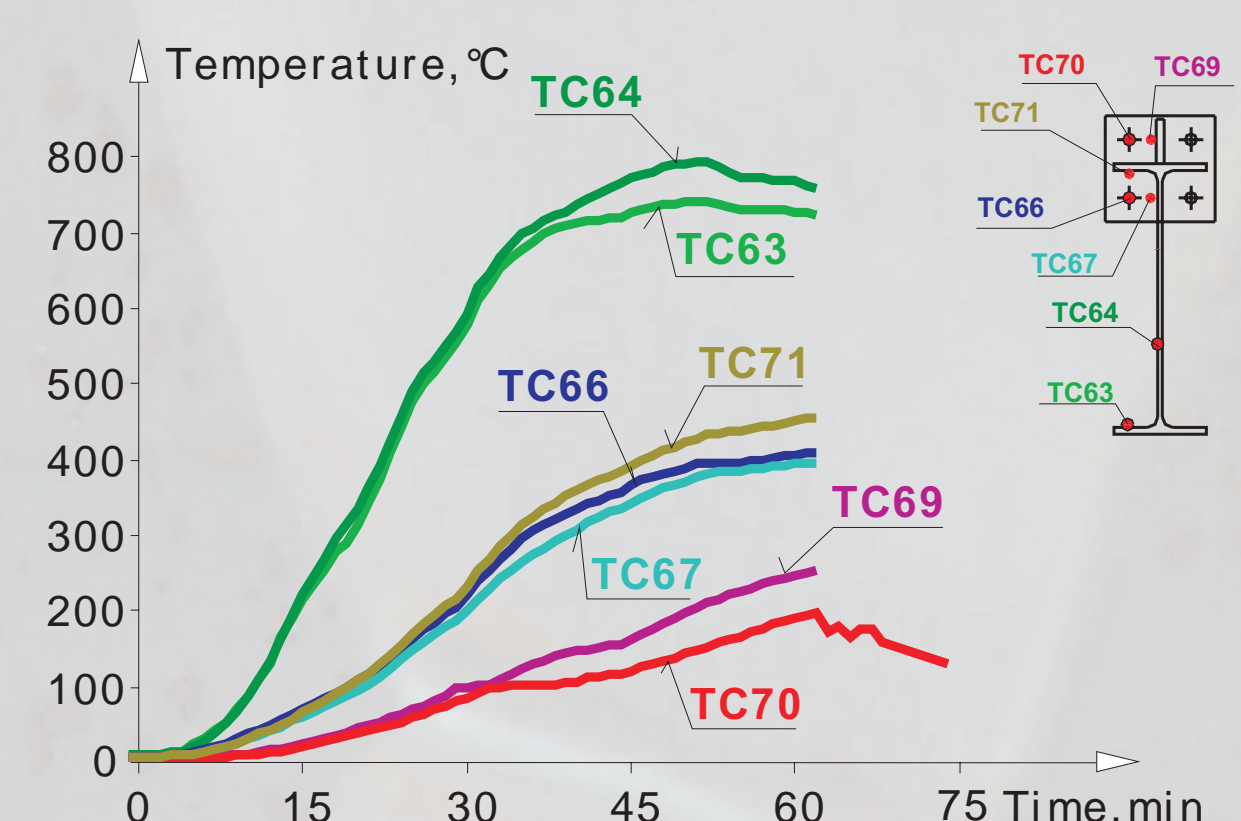
Measured Connection Temperature



Beam to column (A) and beam to beam (B) connections with thermocouples

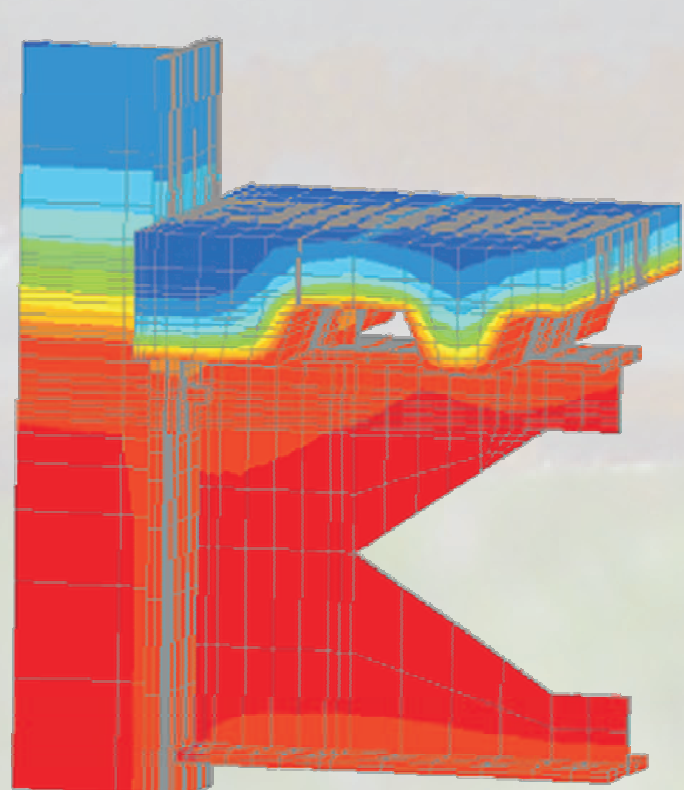


Measured temperatures in connection of beam AS4 to the central column (A)

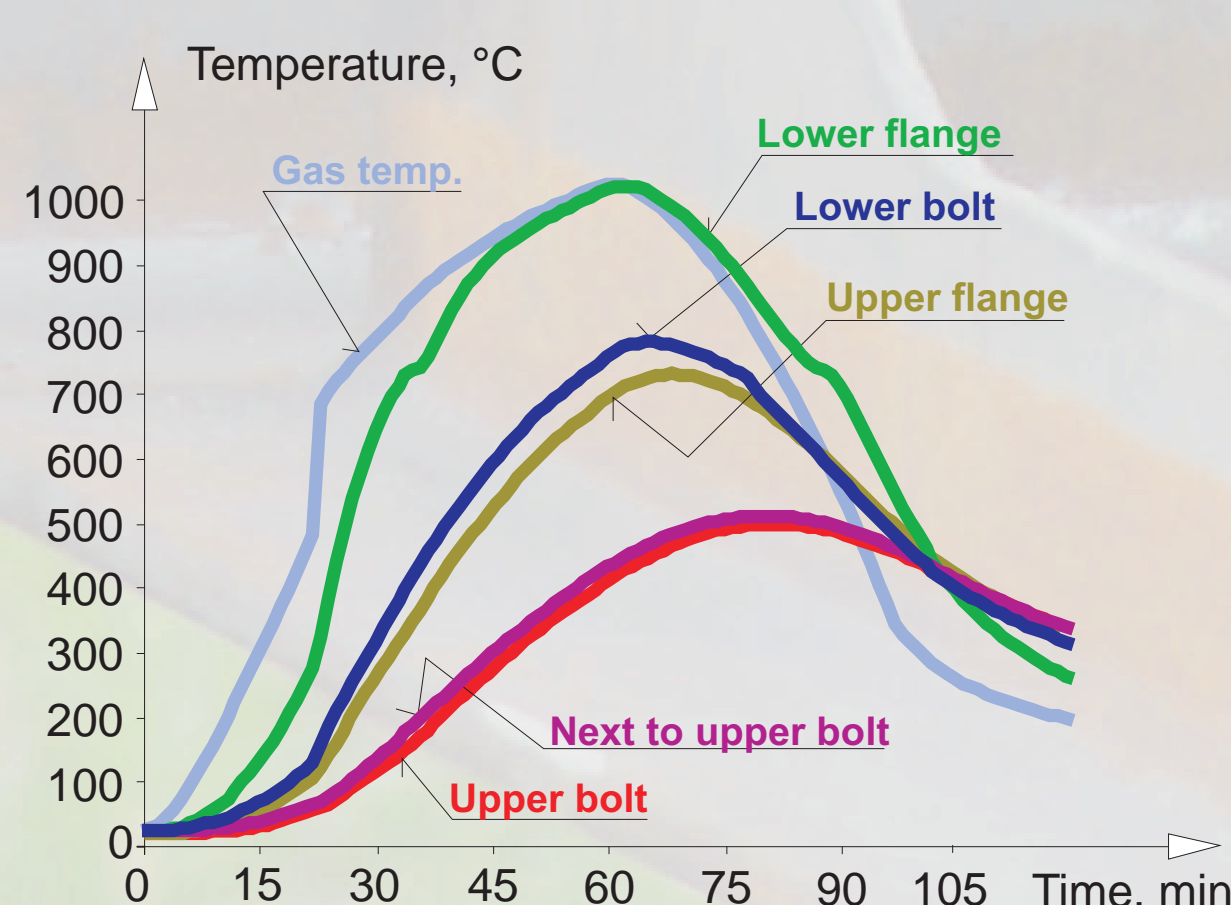


Measured temperatures in connection of beam AS5 to a primary beam (B)

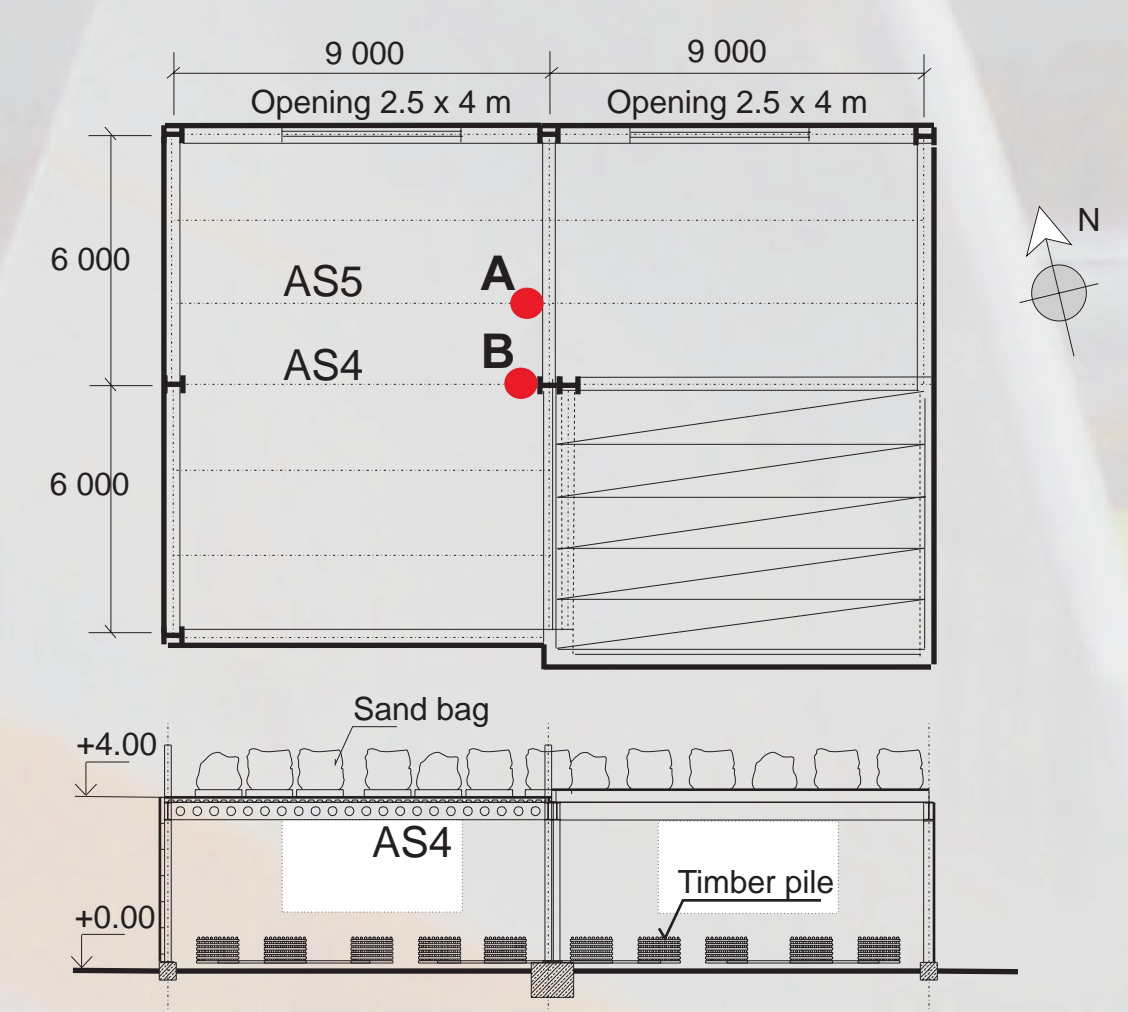
Predicted Connection Temperature



Predicted temperature distribution in the beam to column connection



Predicted temperature developments in beam to column connection



Plan and section of the experimental building with marked connections