

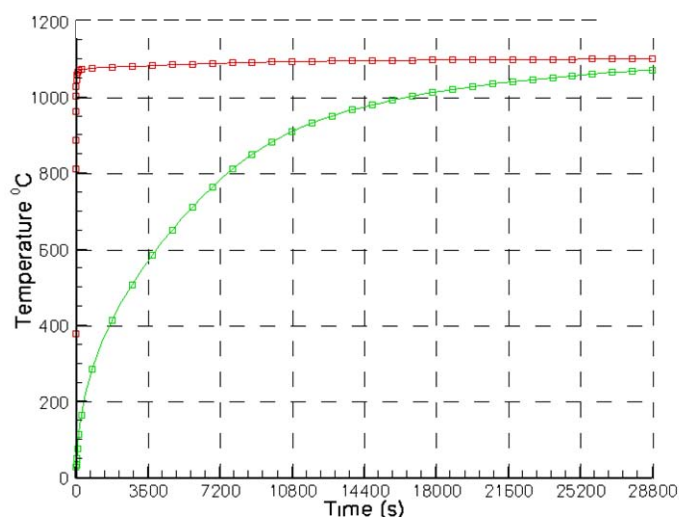


Figure 4–9. Calculated temperature rise in an insulated floor slab heated from below.

Green: top of slab; red: bottom of slab at top of corrugation.

4.7.3 Findings – Structural Thermal Insulation

- For the heaviest columns in WTC 7, when insulated for a 3 h fire rating, simulations show that it would take an exposure of about 7 h at post-flashover upper layer gas temperatures to raise the steel temperature to 600 °C, the point at which the steel strength has been reduced by half. As will be seen in Chapter 9, this is far longer than the time over which post-flashover gas temperatures were sustained in the computed WTC 7 fires. For comparison, this steel temperature would be reached in under ½ h if the insulation were not applied.
- Simulations for the insulated lighter columns in WTC 7 show that this steel temperature is reached in about 4 h. This is also longer than the time over which post-flashover gas temperatures were sustained in the computed WTC 7 fires. With no applied insulation, the steel temperature reaches 600 °C in under 1/2 h.
- Simulations of different size beams in a floor assembly showed that the two lighter steel beams (insulated for a 2 h rating) and the bottom of an insulated floor slab (insulated for a 2 h rating), exposed to 1100 °C air temperatures, reached 600 °C in approximately 1 h. The heaviest floor beam reached 600 °C in almost 2 h. These times are modestly longer than the time over which post-flashover temperatures were sustained in the computed WTC 7 fires.

4.8 REFERENCES

- Cantor 1985. Irwin G. Cantor P.C., Structural Engineers, Structural Drawings, 7 World Trade Center.
- FDNY (New York City Fire Department). 1990. Fire Fighting Procedures and Fire Operations for High-Rise Office Buildings, New York, NY.
- Flack and Kurtz 1988. Flack and Kurtz Mechanical Engineers, Mechanical and Electrical Drawings for Salomon Brothers 7 World Trade Center Headquarters.
- HRS Systems, Inc. 2004. Hass (Hydraulic Analyzer of Sprinkler Systems) Version 7.5. Software. 2004.