SFPE Europe Conference
Fire Safety Engineering

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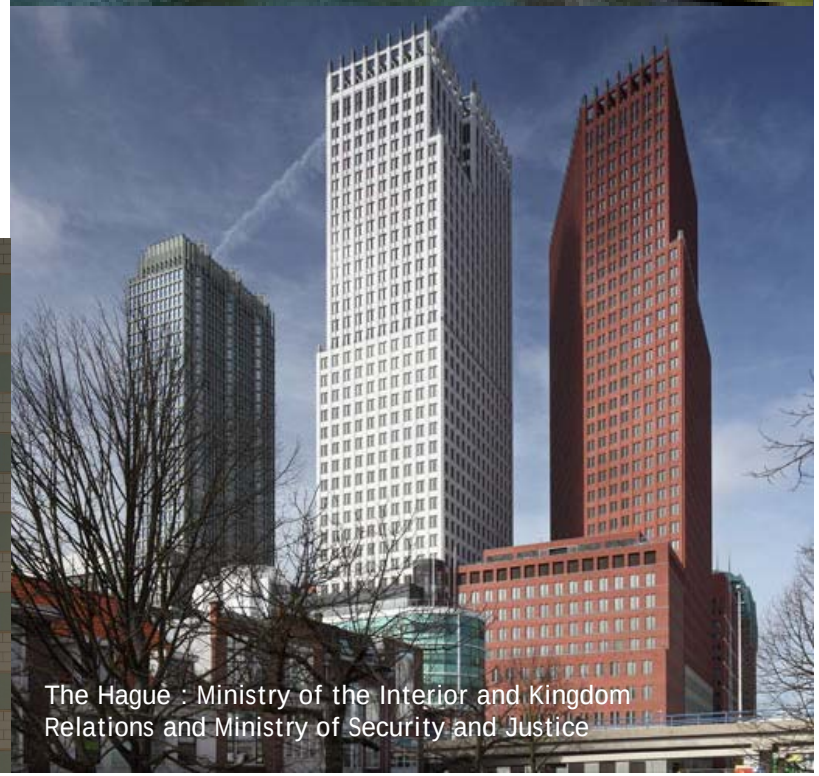
Fire safety design of a high-rise building near transport route of dangerous goods

Ing. Johan Koudijs & ing. Johan Hoogeweg

Outline

- Fire safety ‘The Rotterdam’
- Immediate cause
- Specific fire load
- Specific testing
- Result

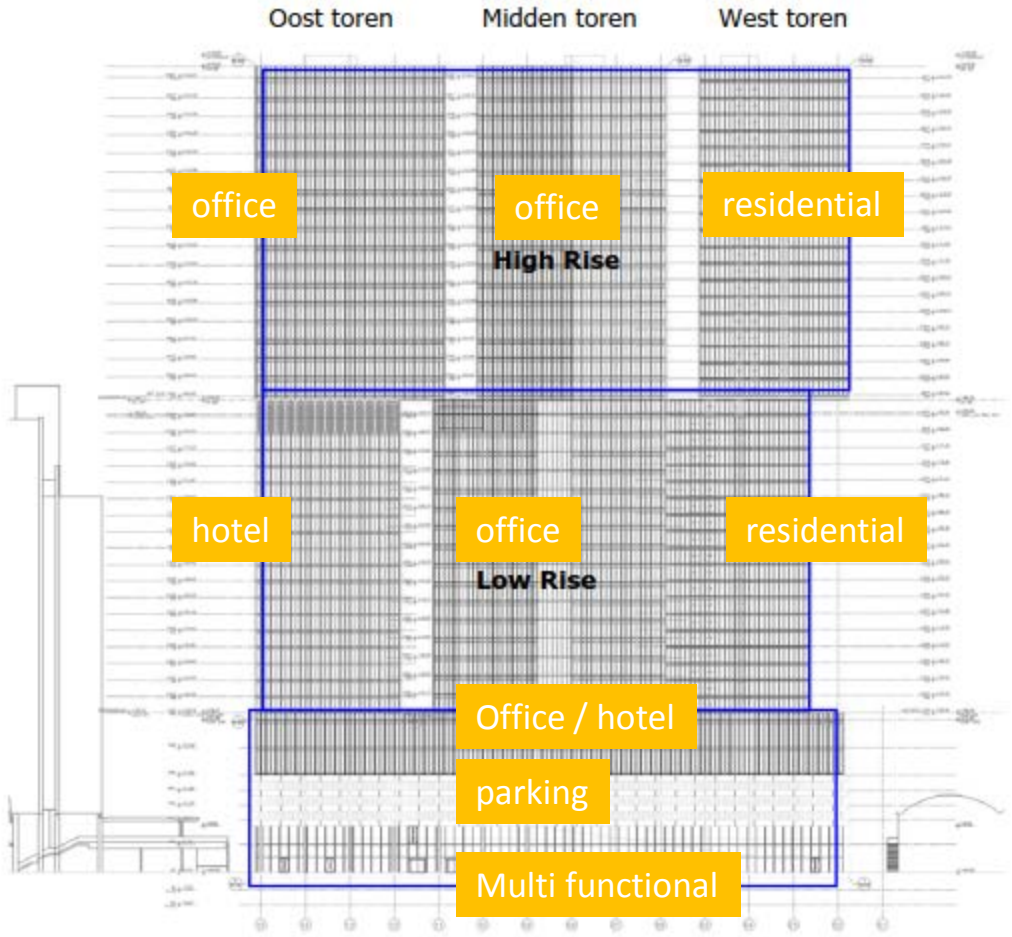


The Hague : Ministry of the Interior and Kingdom Relations and Ministry of Security and Justice

Rijksmuseum – Amsterdam

The Rotterdam – 'The facts'

- Some Facts:
  - 44 floors – 149 m
  - 2 underground levels
  - 160.000 m2 meters
  - Design started: 2006
  - Finished : end 2013
  - Designed by: OMA – Rem Koolhaas as the ' vertical city'



Fire safety ‘The Rotterdam’ (1)

- Codes and guidelines:
  - Dutch Builing Degree ‘Bouwbesluit’
  - Above 70 meter ‘just as safe as a lower building’
  - Dutch Guide line ‘Hoogbouwrichtlijn is used’

Fire safety in High rise building is always a custom made fire safety concept.

Fire safety ‘The Rotterdam’ (2)

- Some fire safety concepts we used in this building:
  - Full sprinkler protection
  - Fire compartments <1.000 m2 (except low rise parking)
  - 90 minutes fire rated staircases (for egress and fire brigade)
    - With smoke lobby
    - With positive pressure differential system
  - Fire brigade elevators (2 in each tower)
    - With 90 minutes fire rating smoke lobby
    - Additional S200 smoke

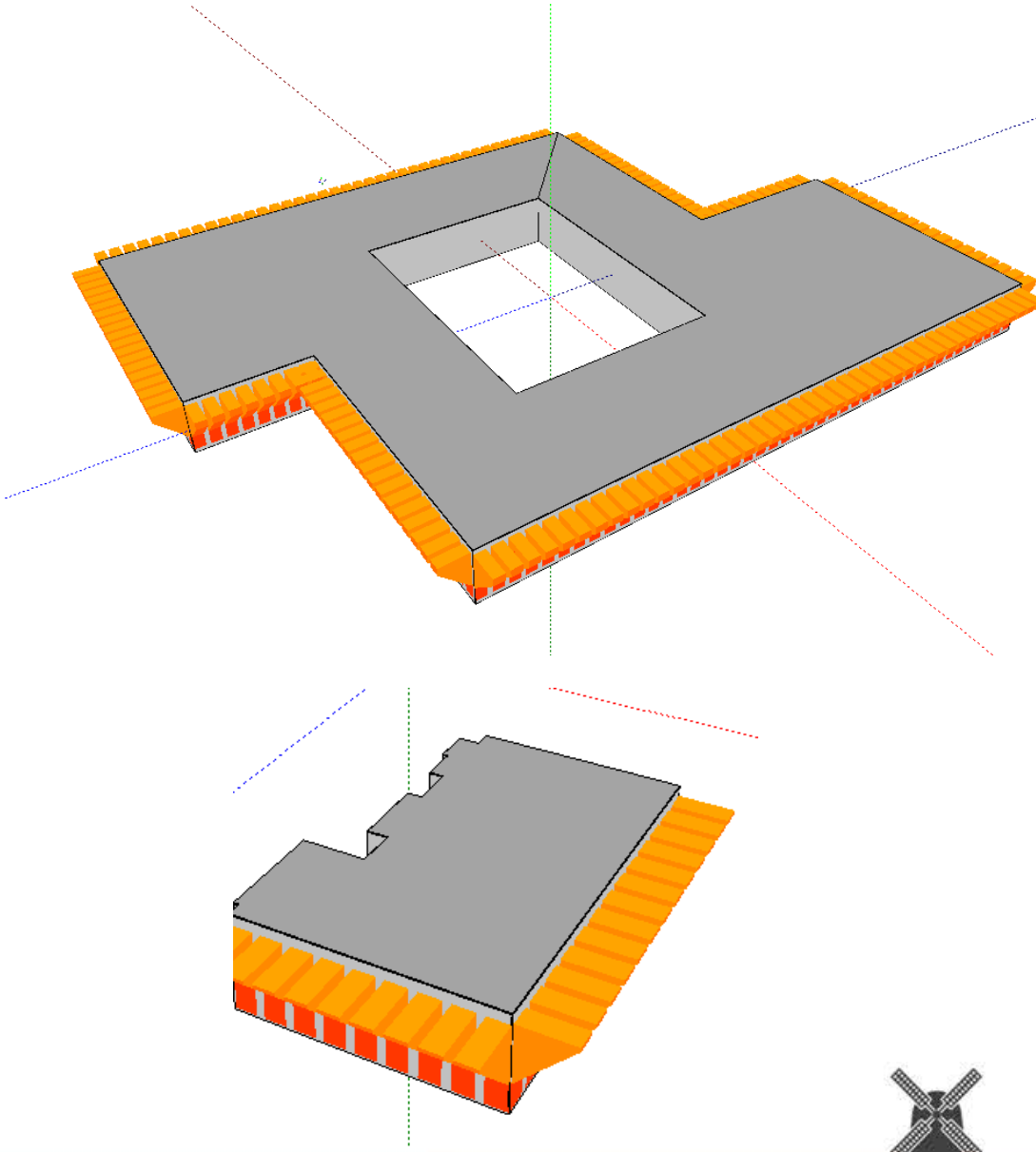
Fire safety ‘The Rotterdam’ (3)

- Some fire safety concepts we used in this building:
  - Fire detection systems
  - PA type evacuation alarm (also in residential)
  - Wet risers for the fire brigade
  - 120 minutes fire rating of the load bearing structure
  - Emergency power supply
  - … and more

Effects of pool fire on the floor plan

External flame spread

- Prevent external flame spread in case of sprinkler failure.
  - Between floors
  - Between towers
  - Models based on Dutch calculation methode NEN 6068
  - On few places fire rated glazing required to prevent fire spread

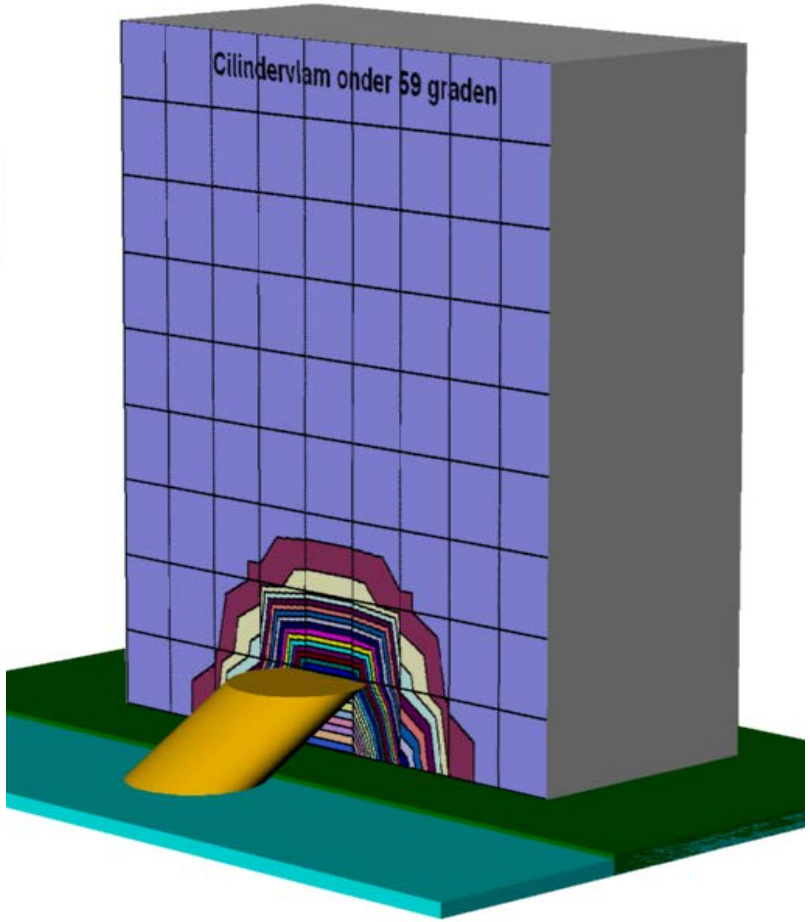


Peninsula ‘Kop van zuid’

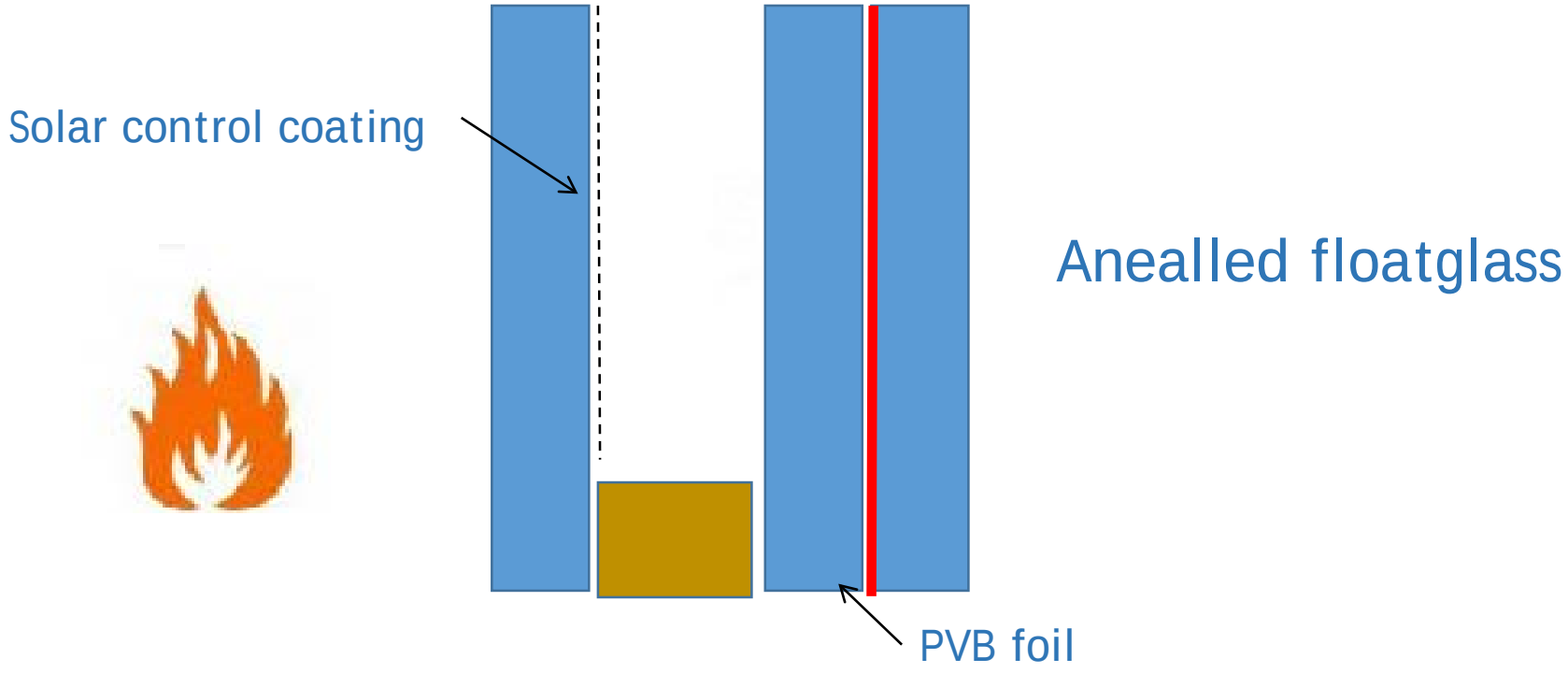
Scenario: spil of 75 tons Benzeen: Poolfire ø25 m

Representative heatflux

40 – 45 kW/m²

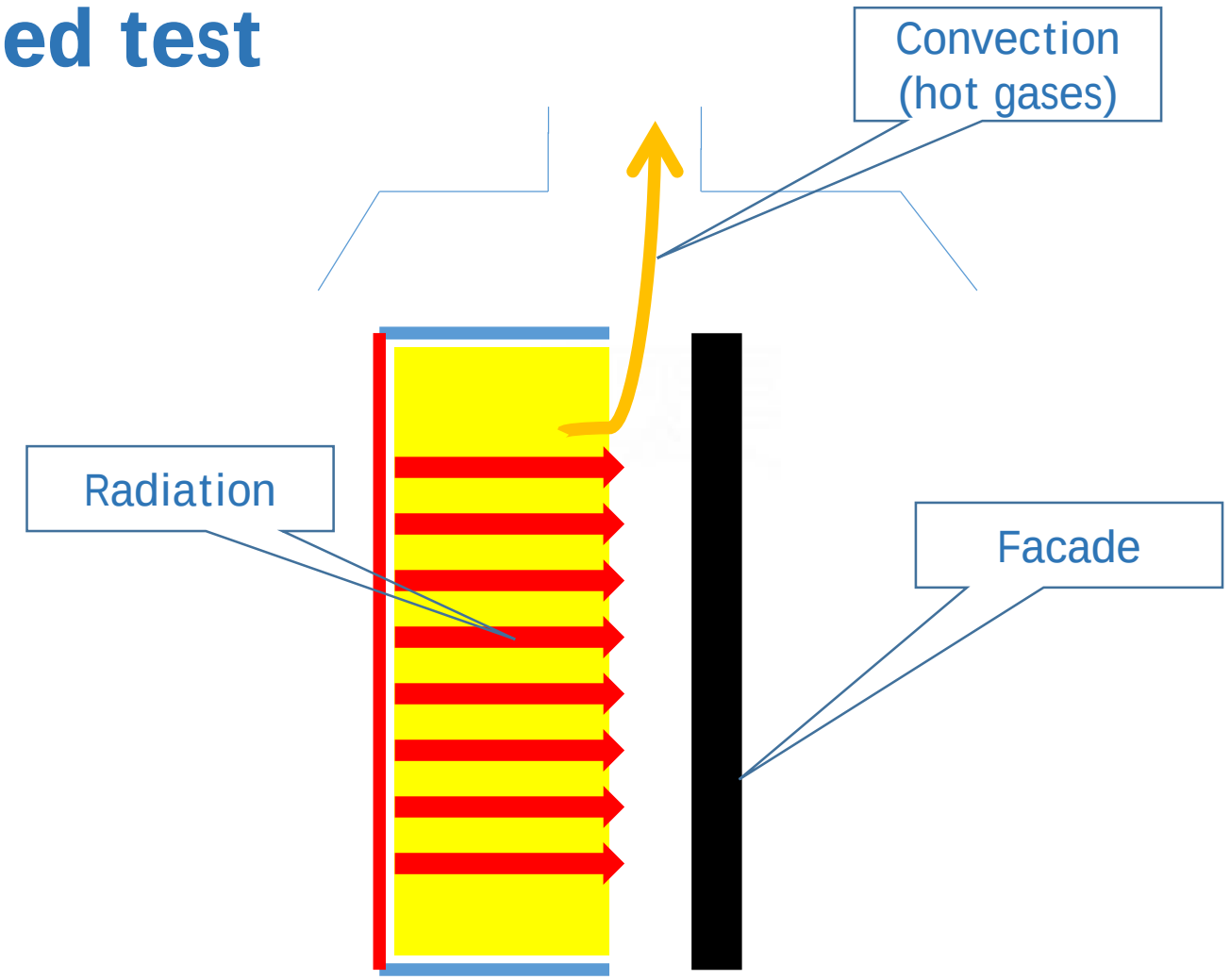


Standard EN 1634-1 test



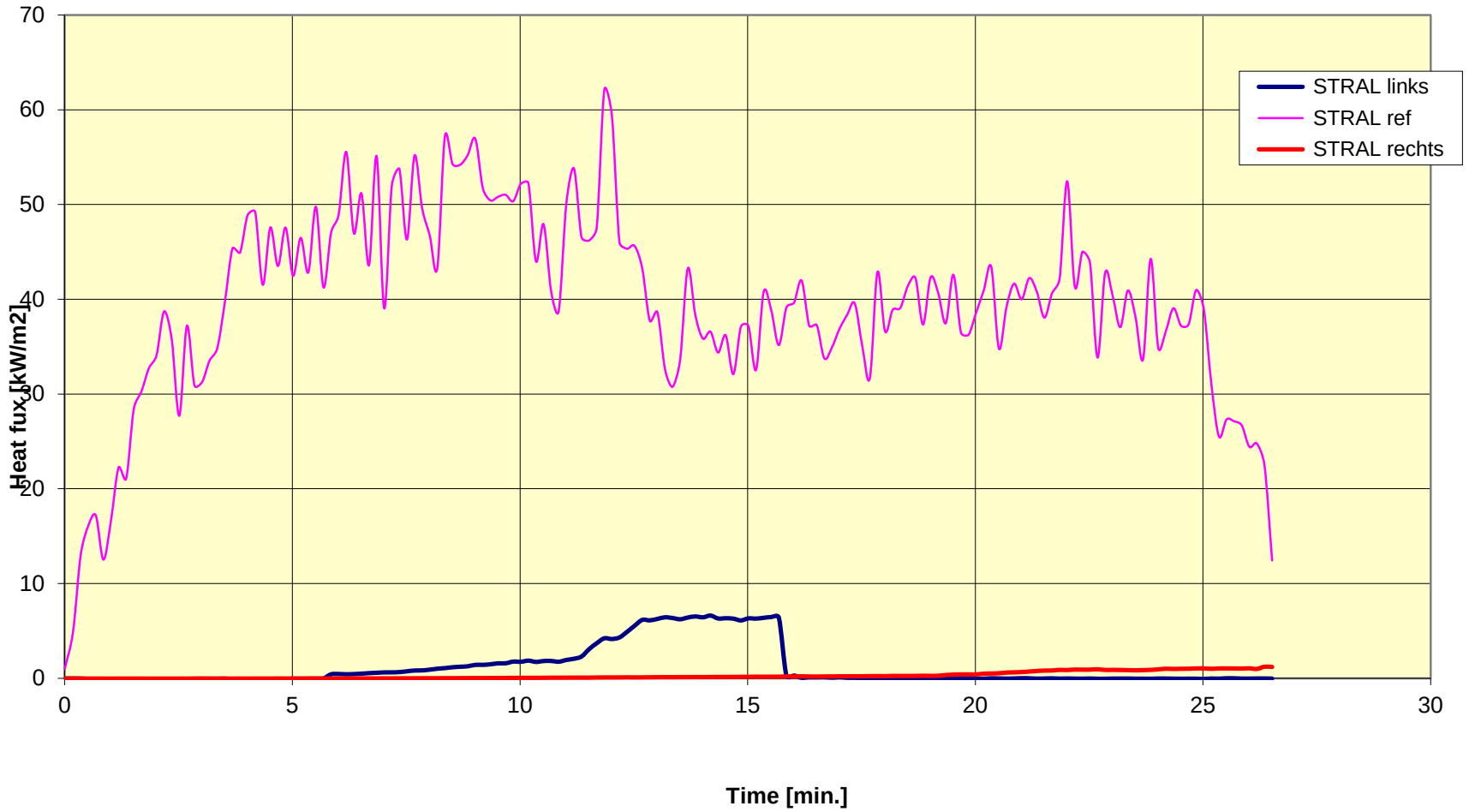
ISO 834 external fire curve: 9 Minutes

Modified test

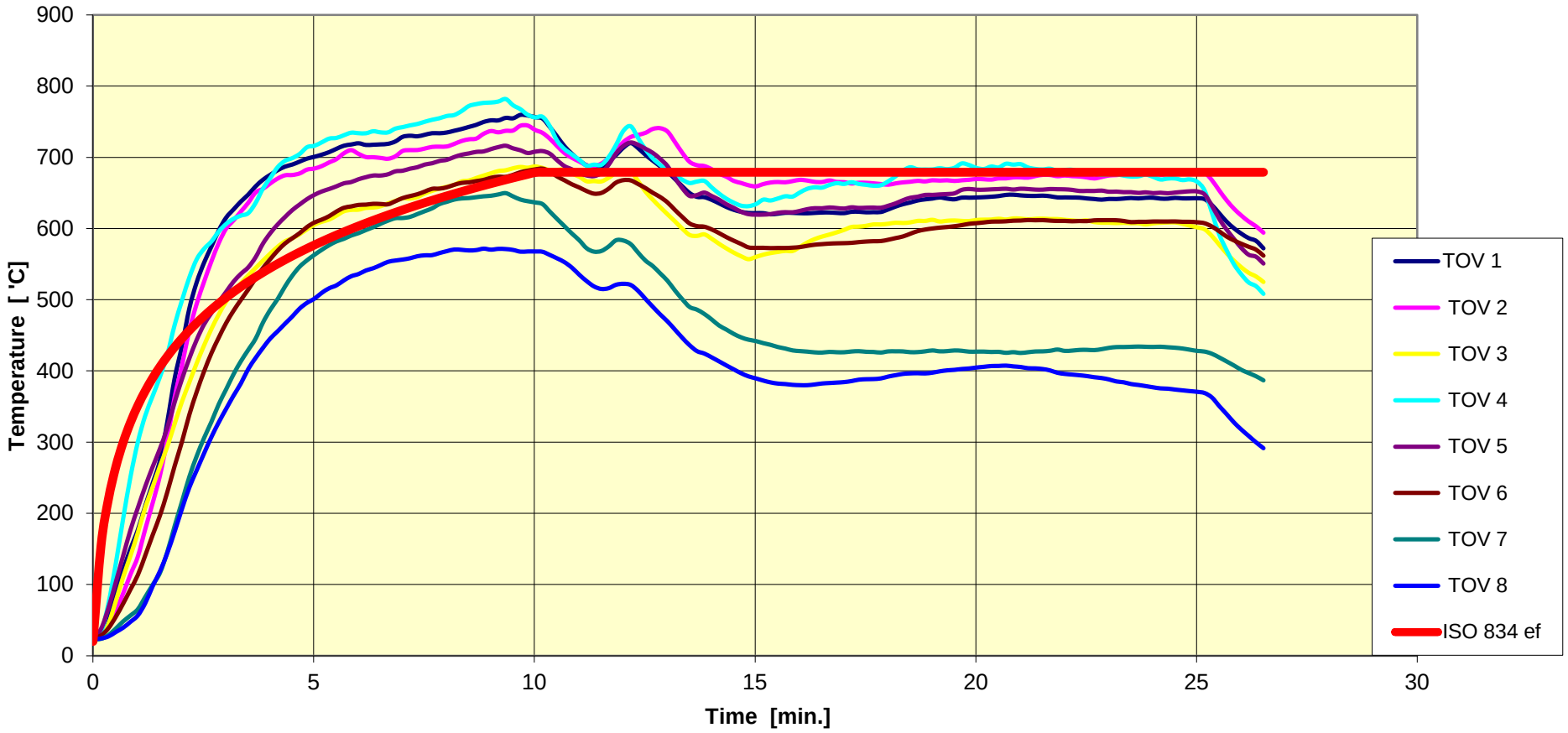


Test 2

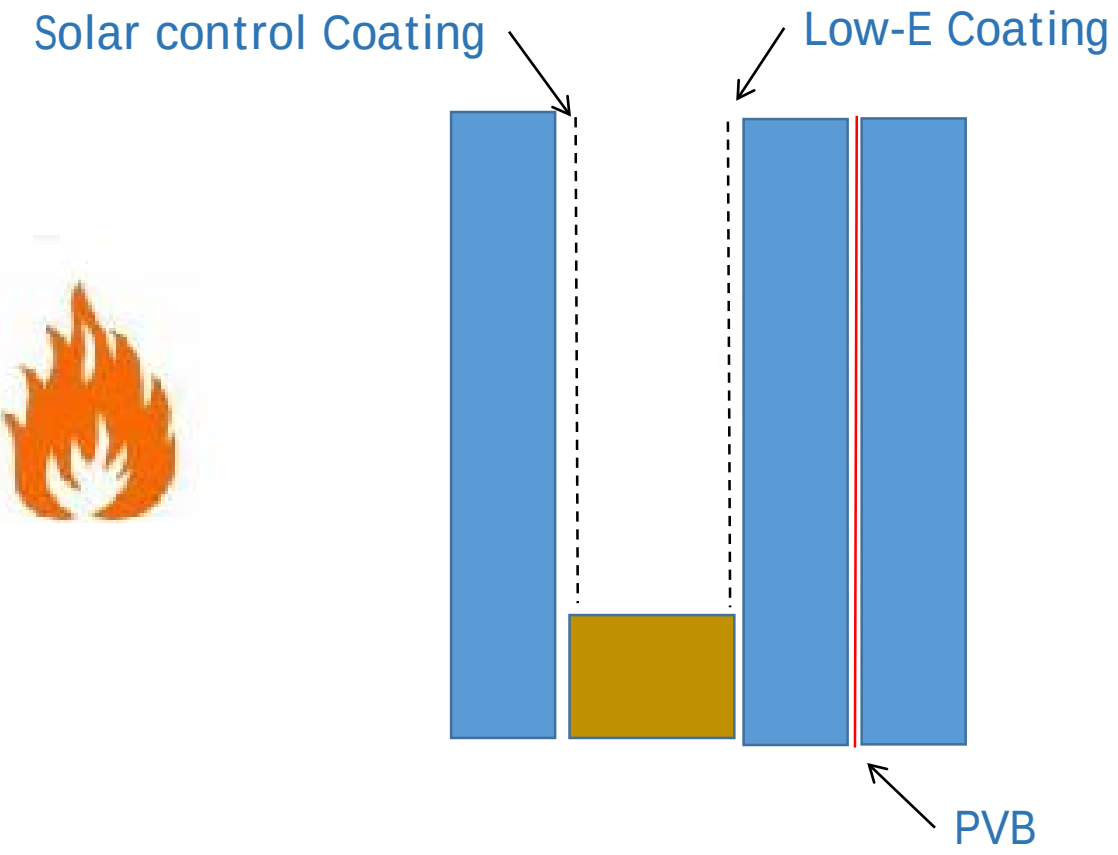
Heatflux furnace



Furnace tempratures test 1



Failure of the glazing system

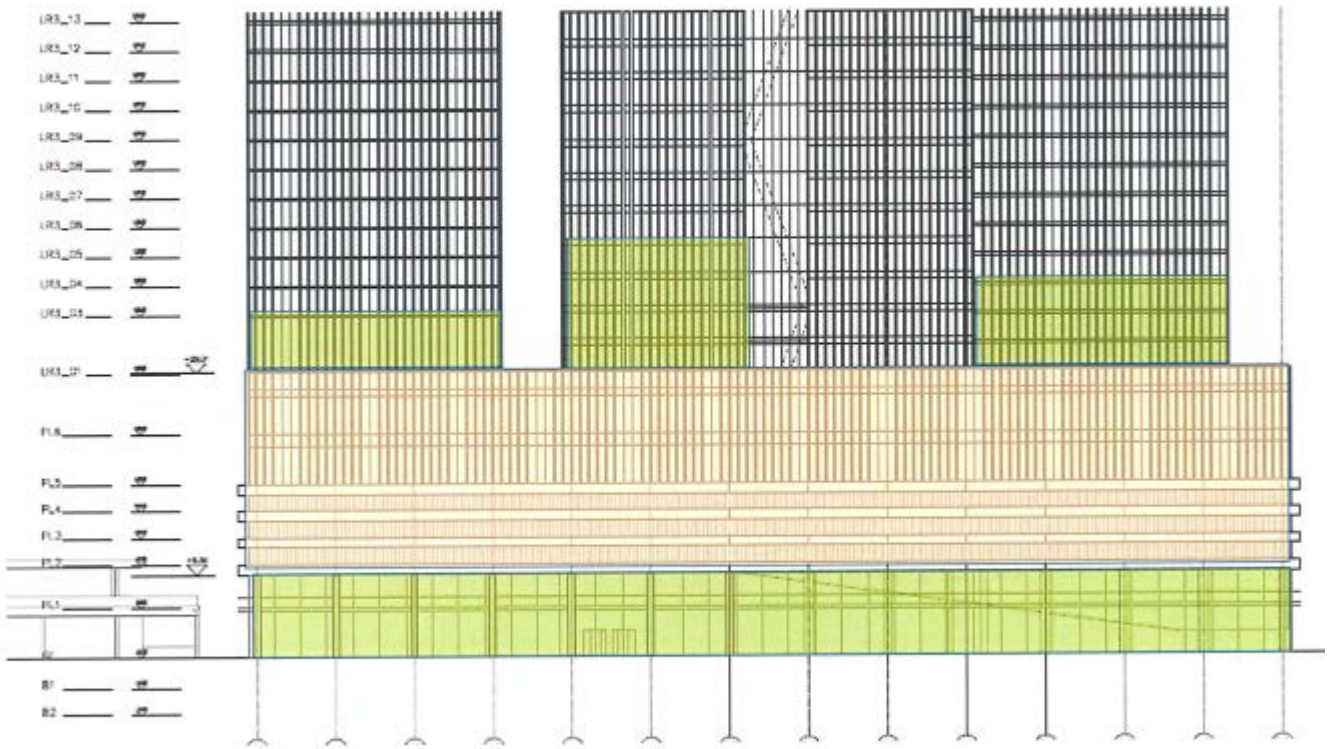


Anealled floatglass

40-45 kW/m² : EW 27 Minutes

Gevel maaszijde

dGmR



stralingwerend

30 minuten brandwerend

Further development: close to EW45ef

Unitized aluminium curtainwall EI30

Questions / discussions?

Dont forget fire safety during construction phase