TAMPERE UNIVERSITY OF TECHNOLOGY
Faculty of business and built environment, Department of Civil Engineering
Research Centre of Metal Structures, Seinäjoki, Tampere, Finland

Eurocode: EN 1991-1-2

Car fires in car parks

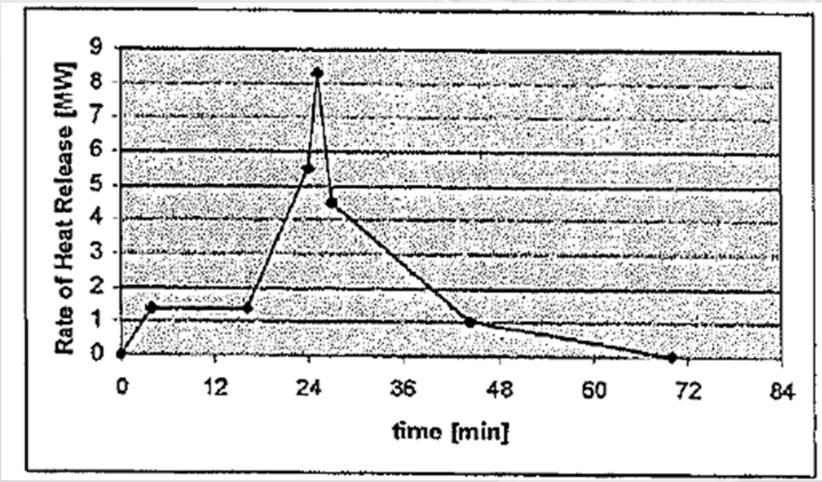
New clause E.2.5(5)

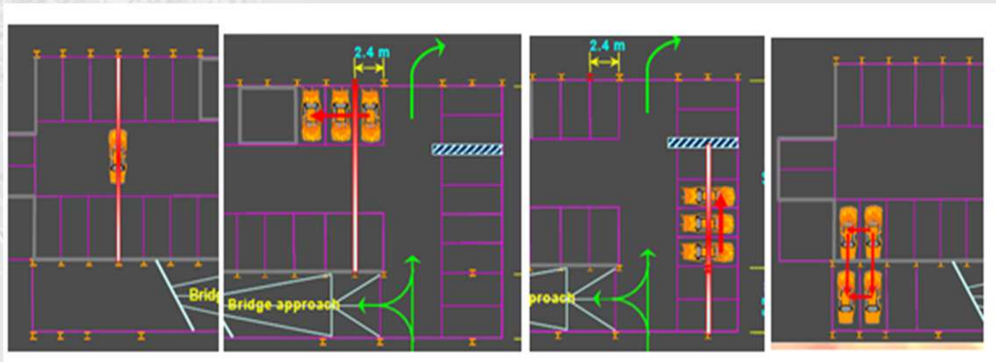
Reason: No information is given for car fires. Car fire is an important scenario in fire. No common rules are given so many different applications are used in real projects for this deeply studied subject. This means high financial risks for contractors.

The following rate of heat release should be used for one car in car park fires.

The following fire scenarios should be considered in design.

References: A lot of European researches.





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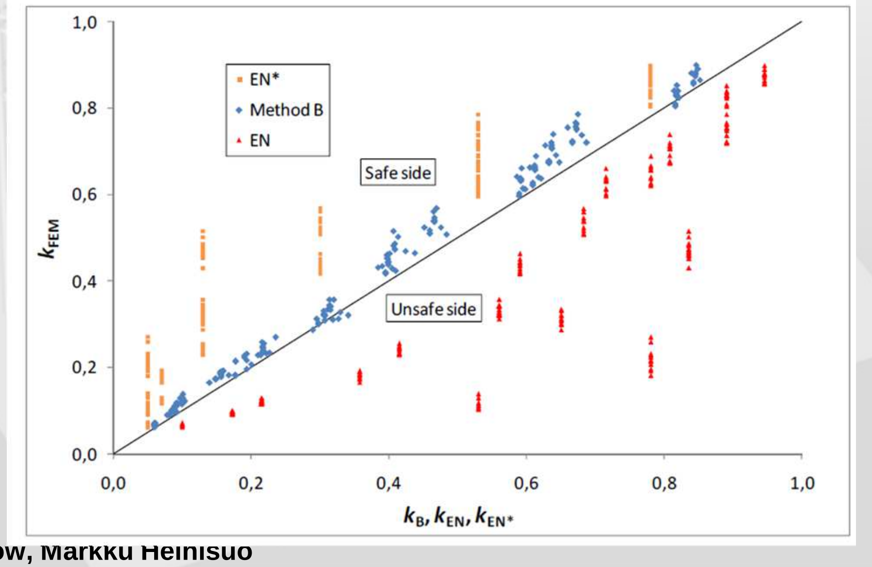
Shear resistance of plate in non-uniform elevated temperature

New NOTE after clause 4.2.1(3)

Reason: Using maximum temperature and EN rules (EN* in the figure) the design is very safe. Using mean temperature θ_{web} and EN rules (EN in the figure) the design is unsafe. Instead of reduction factor $k_{y,\theta,web}$ (class 1,2 and 3 cross-sections) or $k_{p0.2,\theta,web}$ (class 4 cross-sections) which are based on mean temperature, a reduction factor $k_{y,\theta,ref}$ (class 1,2 and 3 cross-sections) or $k_{p0.2,\theta,ref}$ (class 4 cross-sections) based on the new reference temperature θ_{ref} has shown to be relevant (Method B in the figure). Verification was done using a comprehensive non-linear FEM.



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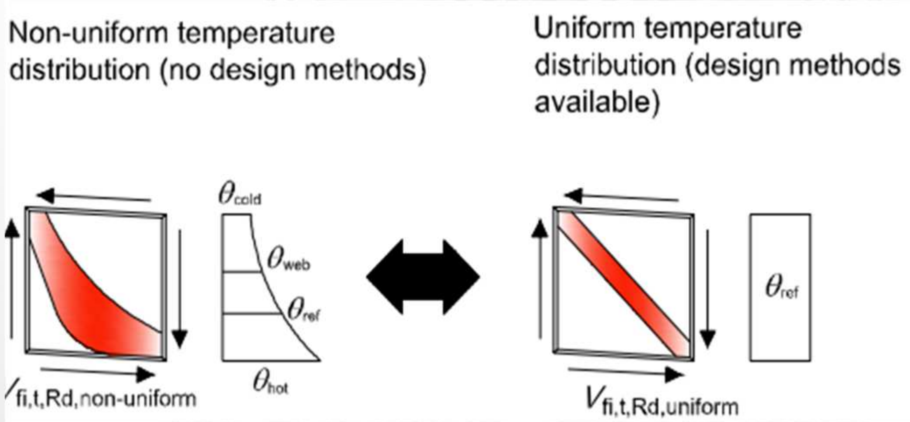
Note. Shear resistance of the plate in non-uniform temperature as shown in the Figure.



The reference temperature is calculated as: $\theta_{ref}=\theta_{hot}-d(\theta_{hot}-\theta_{web})$ where d:

$$d = k_y k_a k_d \left[0.33 + 0.025 \left(\frac{\theta_{hot} - \theta_{web}}{\theta_{web} - \theta_{cold}} - 1 \right) \right]$$

$$k_y = 1 + 0.00035 (f_y - 235), \quad 1 \le k_y \le 1.06$$

$$k_a = 0.9 + 0.1 \left(\frac{a}{h} \right), \quad 0.95 \le k_a \le 1.15$$

$$k_d = 1 + \left(\frac{\theta_{hot} - \theta_{web}}{\theta_{web} - \theta_{cold}} - 1 \right) \left(\frac{\theta_{cold} - 200}{2000} \right), \quad 1 \le k_d \le 1.40$$

References: National research. Doctoral thesis. Paper accepted to JCSR.