Brandschutz der nächsten Generation

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CASE STUDIES OF A NEW SIMPLIFIED NATURAL FIRE MODEL AND SAFETY CONCEPT FOR STRUCTURAL FIRE SAFETY DESIGN

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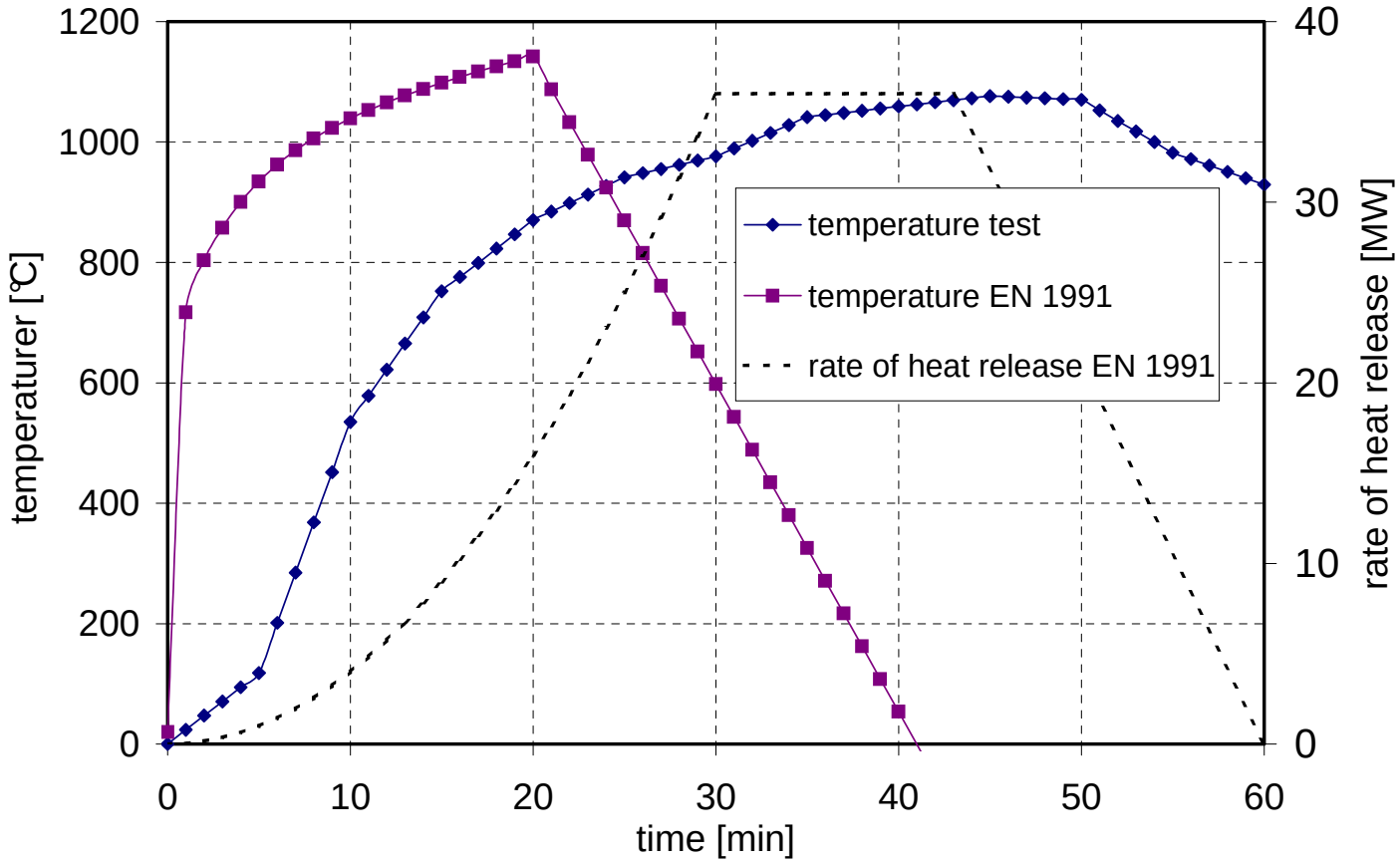
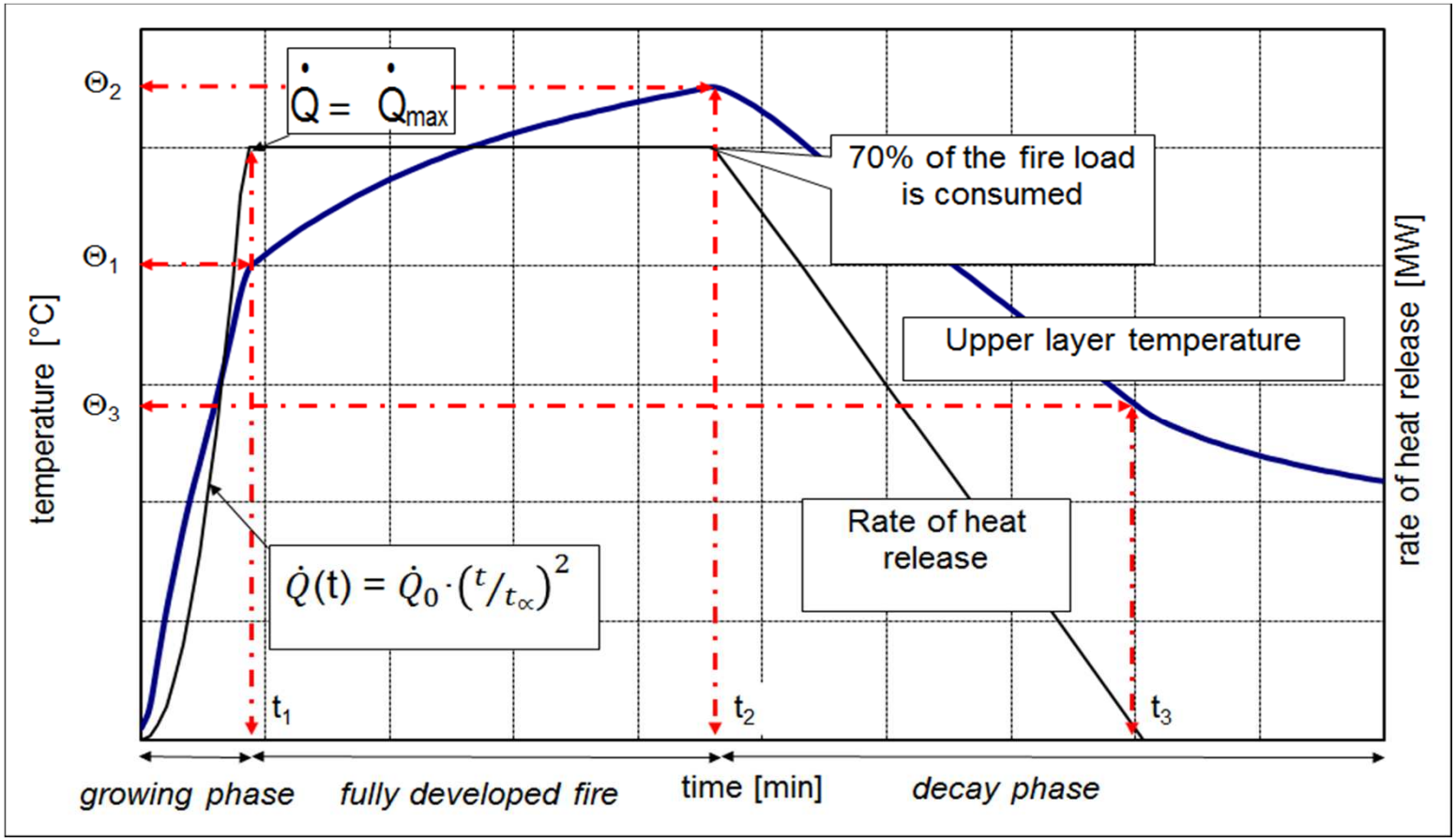
Parametric curves EN 1991-1-2



no temporal correlation between RHR and parametric curves

Approach of parametric fire curves

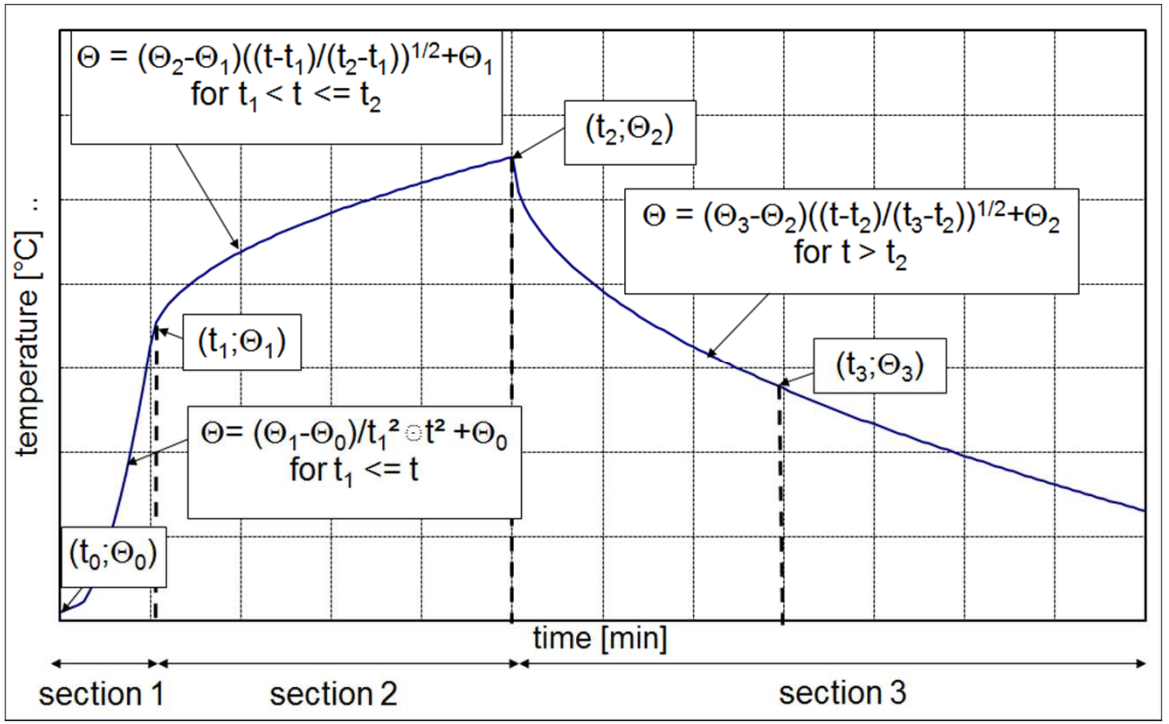


Parametric fire curves vent.-contr.

$\Theta_1 = -8.75 \cdot 1/O - 0.1\ b + 1175$ [℃]

$\Theta_2 = (0.004\ b - 17) \cdot 1/O - 0.4\ b + 2175$ [℃]

$\Theta_3 = -5.0 \cdot 1/O - 0.16\ b + 1060$ [℃]



with

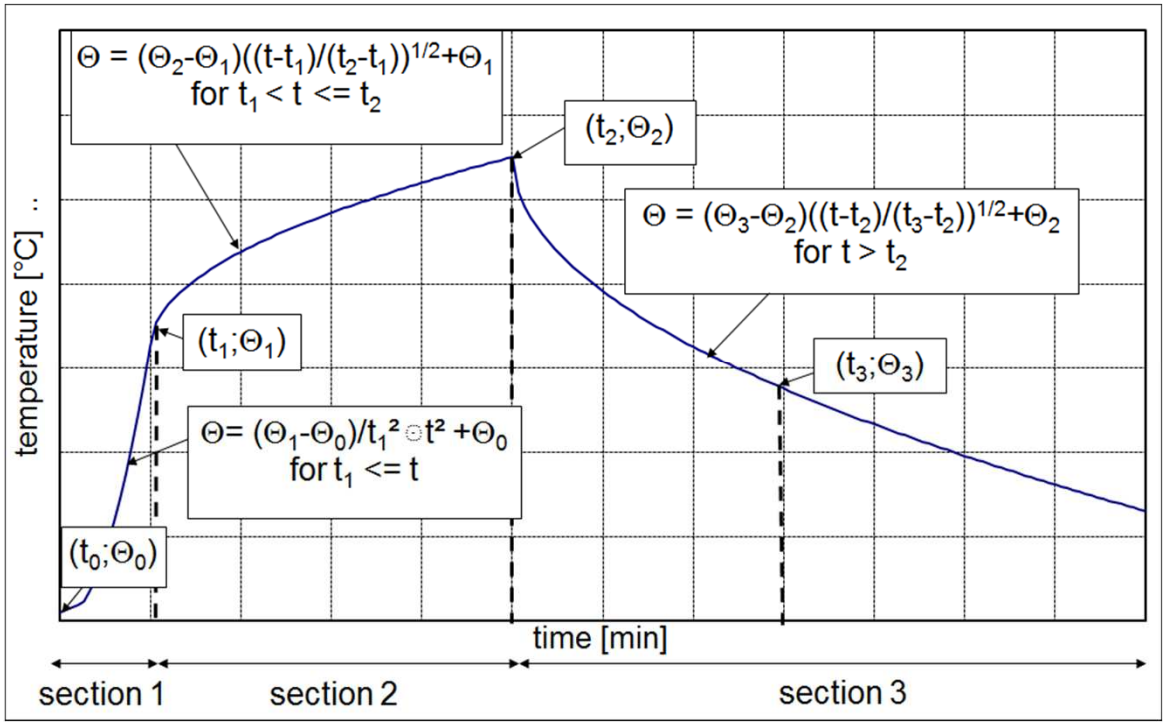
opening factor	$O = A_w\sqrt{h_w} / A_t$ [$m^{1/2}$],
area of ventilation openings	A_w [m^2],
averaged height of ventilation openings	h_w [m],
total area of enclosing components	A_t [m^2],
averaged thermal property of enclosure	b [$J/m^2s^{0.5}K$].

Parametric fire curves fuel-contr.

$\Theta_1 = 24000\ k + 20\ [℃]$

$\Theta_2 = 33000\ k + 20\ [℃]$

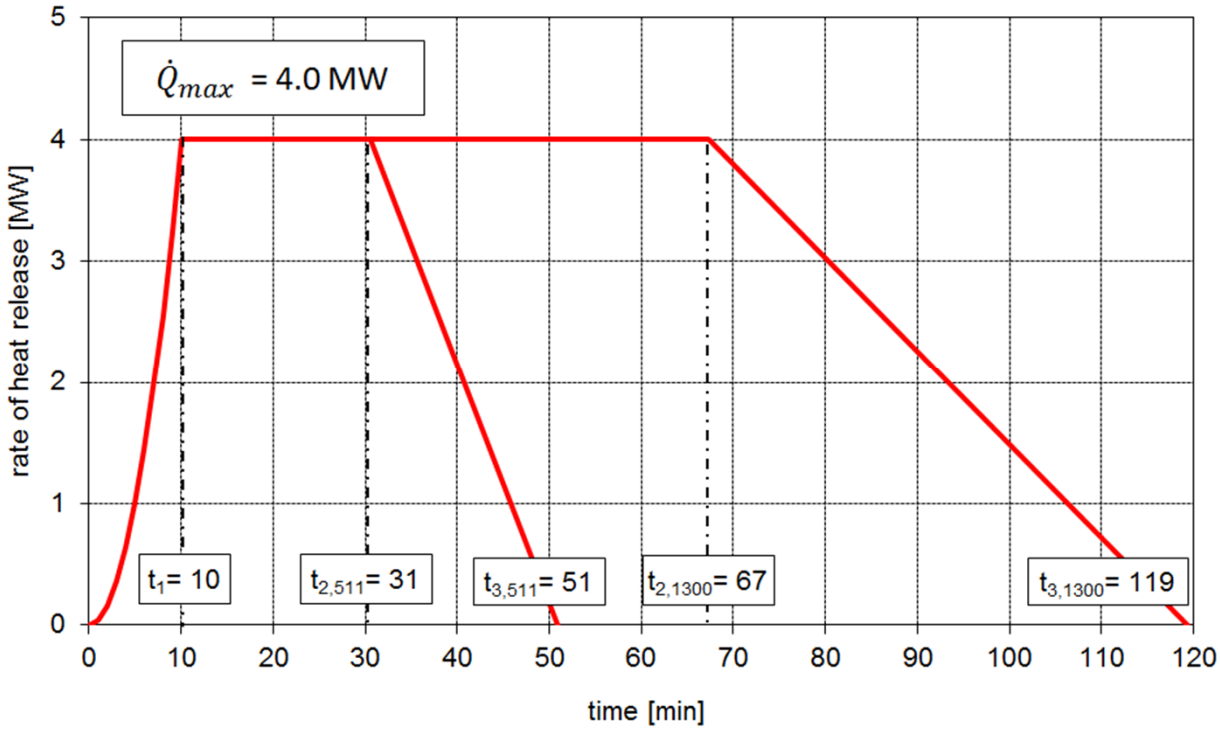
$\Theta_3 = 16000\ k + 20\ [℃]$



$$k = \left(\frac{\dot{Q}^{2}_{max,f}}{A_w \sqrt{h_w} \cdot A_T \cdot b} \right)^{1/3}$$

Example of application

Floor area of fire compartment	A_f = 16 m², Height of fire compartment	H = 3.00 m
Area of openings	A_w = 8.0 m², Averaged opening height	h_w = 2.50 m²
Ventilation factor	$A_w\sqrt{h_w}$= 12.65 $m^{3/2}$ Opening factor	O = 0.158 $m^{1/2}$
Total area of the enclosing components	A_t = 80.0 m²	
Fire load density q_x = 511 MJ/m²	Q_{511} = 8176 MJ	
averaged thermal property of enclosure	b = 1500 J/(m²$s^{0,5}$K)	



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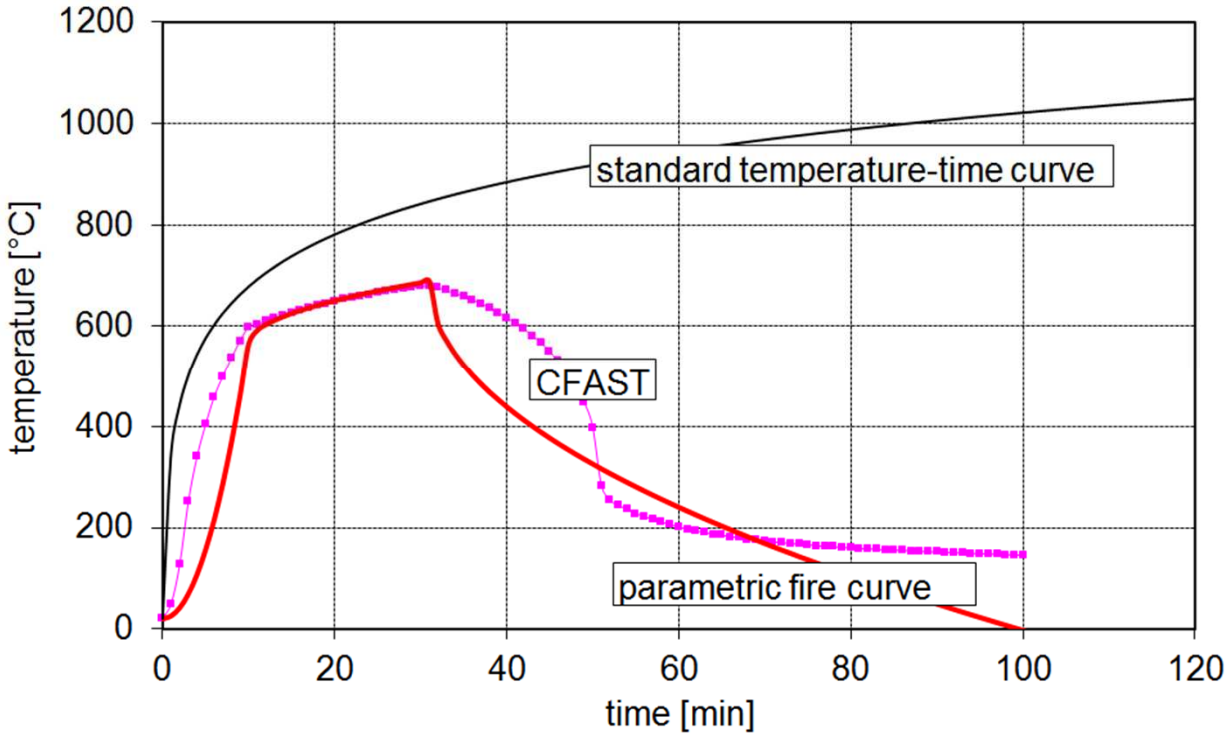

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