

3.10 Fire safety engineering in Portugal- some case studies (short version)

Lopes N., Portugal

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Fire safety engineering in Portugal - Some case studies



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1

COST Contents

- Evaluation of the temperature of the external structural elements of the Torre Sky Business Luanda, Angola
- Numerical modelling of the temperature field of precast concrete slabs to determine its fire resistance
- Evaluation of the fire resistance of the steel structure of the Shopping Centre Barreiro Retail Park, Portugal


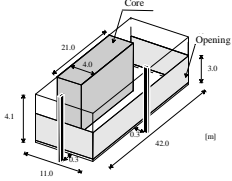
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2

COST External fire in a steel structure

Evaluation of the temperature of the external structural elements of the Torre Sky Business Luanda, Angola

Annex B of EN 1991-1-2 - Thermal actions for external members – Simplified calculation method
Annex B of EN 1993-1-2 - Heat transfer to external steelwork

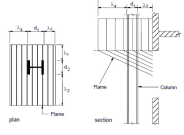
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3

COST External fire in a steel structure

Characteristics of flames and compartment

Column in the smaller facade



A_v	192	[m ²]
A_{v1}	33	[m ²]
W_v	64	[m]
h_{st}	3	[m]
A_f	462	[m ²]
A_c	1358.6	[m ²]
q_{rd}	409	[MJ/m ²]
t_f	1200	[s]
D/W	0.515625	
O	0.244776796	[m ^{1/2}]
Q	157.465	[MW]
Q	369.9720058	
T ₀	293	[K]
T _f	942.996864	[K]
L _L	0.46276466	[m]
Largura _{Chama}	11	[m]
L _H	1	[m]
L _f	1.96276466	[m]
T _{ce}	1127.583306	[K]
T _{ce} (valor médio)	1014.296432	[K]
T _f (valor médio)	868.9544358	[K]
T _f (EC3)	887.169889	[K]
d _{st}	0.3	[m]

α_c	6.711167279	[W/m ² K]
$a_{p,c}$	0.563423806	
s_c	0.451188364	
if	3650.801877	
lz	21987.64906	

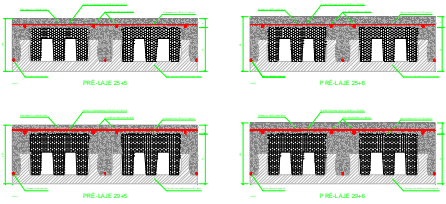
Note >> Column involved in flames
Temperature_{steel} 823.42 [K]
Temperature_{steel} 550.42 [°C]

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4

COST Fire resistance of precast concrete slabs

Numerical modelling of the temperature field of precast concrete slabs to determine its fire resistance



EN 13369 – Common rules for precast concrete products
EN 13747 – Precast concrete products – Floor plates for floor systems

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5

COST Fire resistance of precast concrete slabs

Materials:

- Steel (EN1992-1-2)
- Concrete (EN1992-1-2)
 - The minimum limit for the thermal conductivity was used (Annex O of EN 13369)
 - Convection coefficient on hot surfaces 25 W/m²K
 - Convection coefficient on cold surfaces 9 W/m²K
 - $\epsilon_f = 0.8$
 - $\epsilon_m = 0.7$
- Expandable Polystyrene blocs (Annex H of EN 13747)

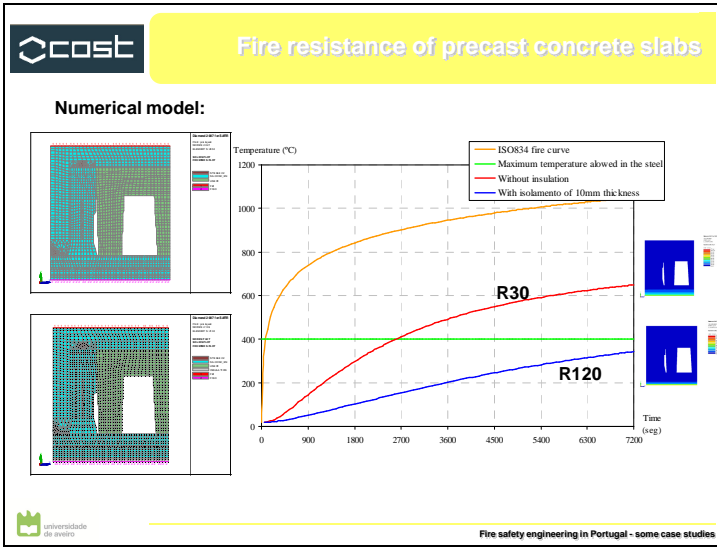
Temperature (°C)	Density (kg/m ³)	Specific heat (J/kgK)	Thermal conductivity (W/mK)
0	15	1210	0.04
100	15	1210	0.1
500	1	1000	33
1500	1	1000	33

➤ Mineral fibre sprays (10 mm)

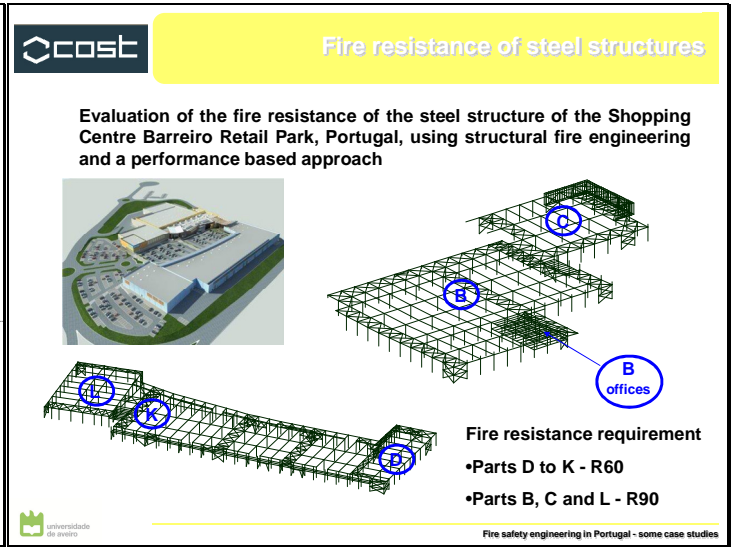
To simulate a void (EN 13747, Annex H)

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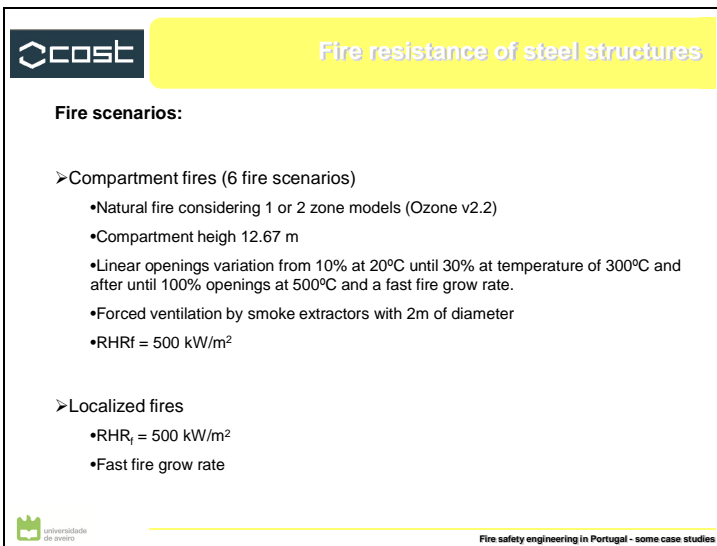
6



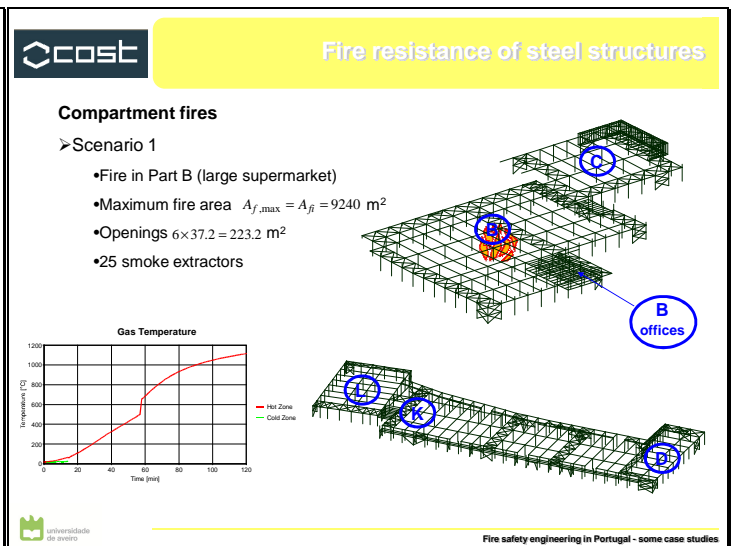
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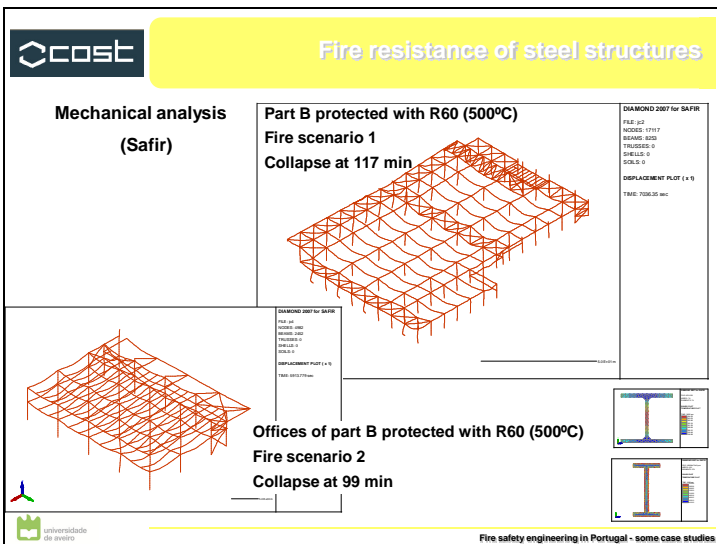
8



9



10



11

Fire resistance of steel structures

Insulation required

	Fire resistance requirement	Insulation necessary to resist standard fire of (min)	θ_{cr} (°C)
Part B	R90	R60	500
Part B (offices)	R90	R60	500
Part C	R90	R60	650 or lower
Part D	R60	R60	650 or lower
Part K	R60	R60	650 or lower
Part L	R90	R60	650 or lower

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12