

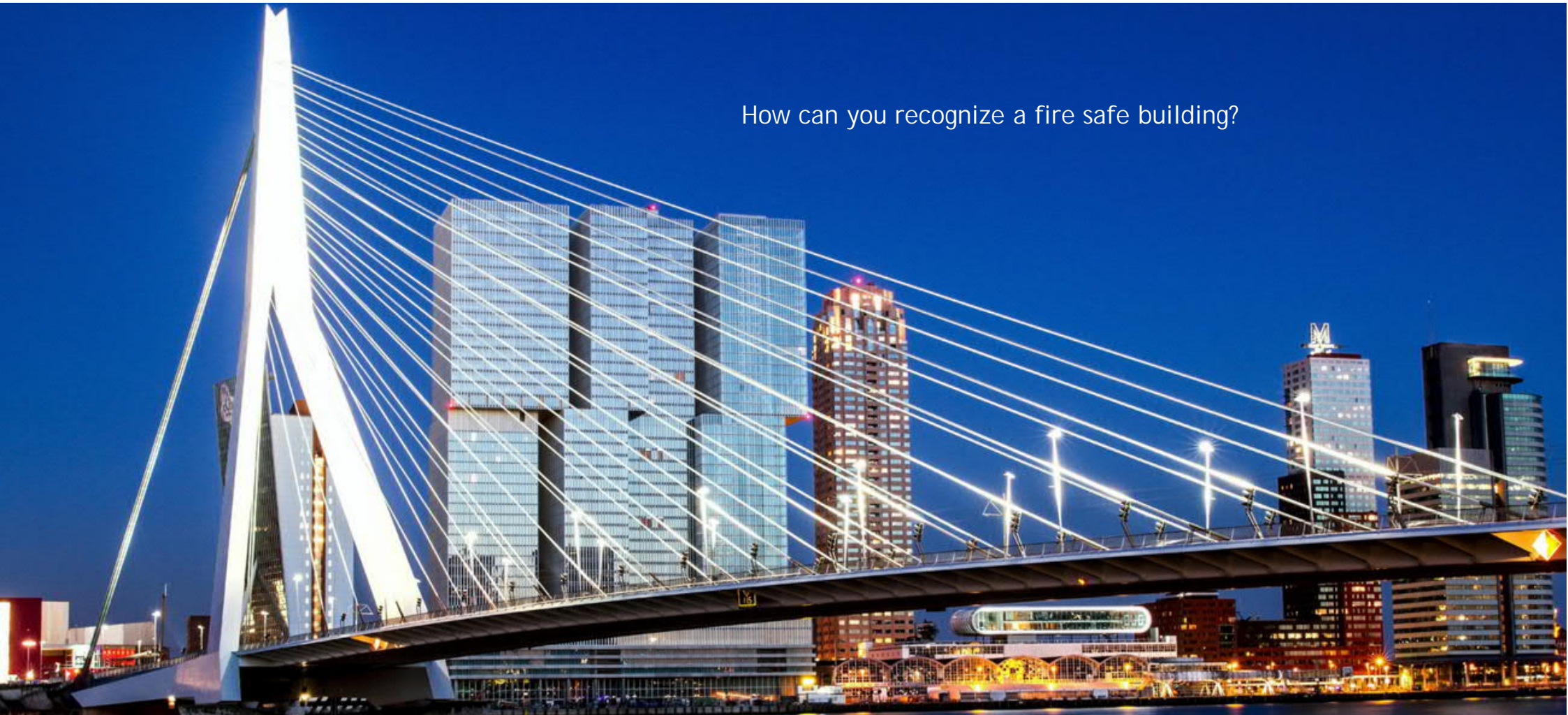
The Rotterdam Building Fire Safety Mini seminar



CHAPTER BENELUX



How can you recognize a fire safe building?

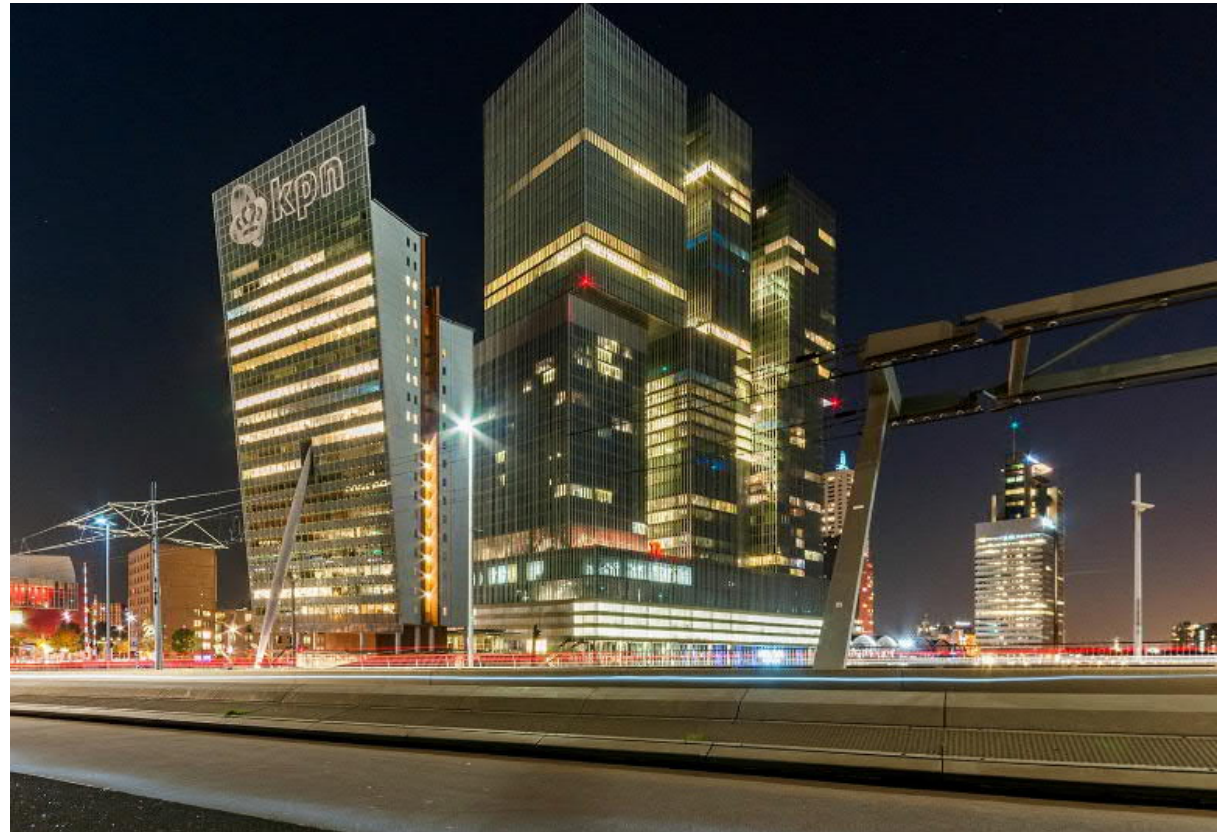


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Outline of presentation

1. The Rotterdam - 'The facts'
2. Fire Safety Strategy (FSS)
 1. Codes and guidelines
 2. General concept for high rise
 3. The Rotterdam concept
 4. Floor plans
 5. Sprinkler concept
 6. In case of sprinkler failure?
3. Questions and discussions



The Rotterdam - 'The facts' (1)

Status : start for DGMR 2006, groundbreaking December 2009, completion November 2013

Clients : De Rotterdam CV, The Hague (Joint venture MAB/ OVG)

Location : Rotterdam, Netherlands

Site : Former harbour waterfront between KPN tower and Cruise Terminal at Kop van Zuid

Program : Total 162,000m2:

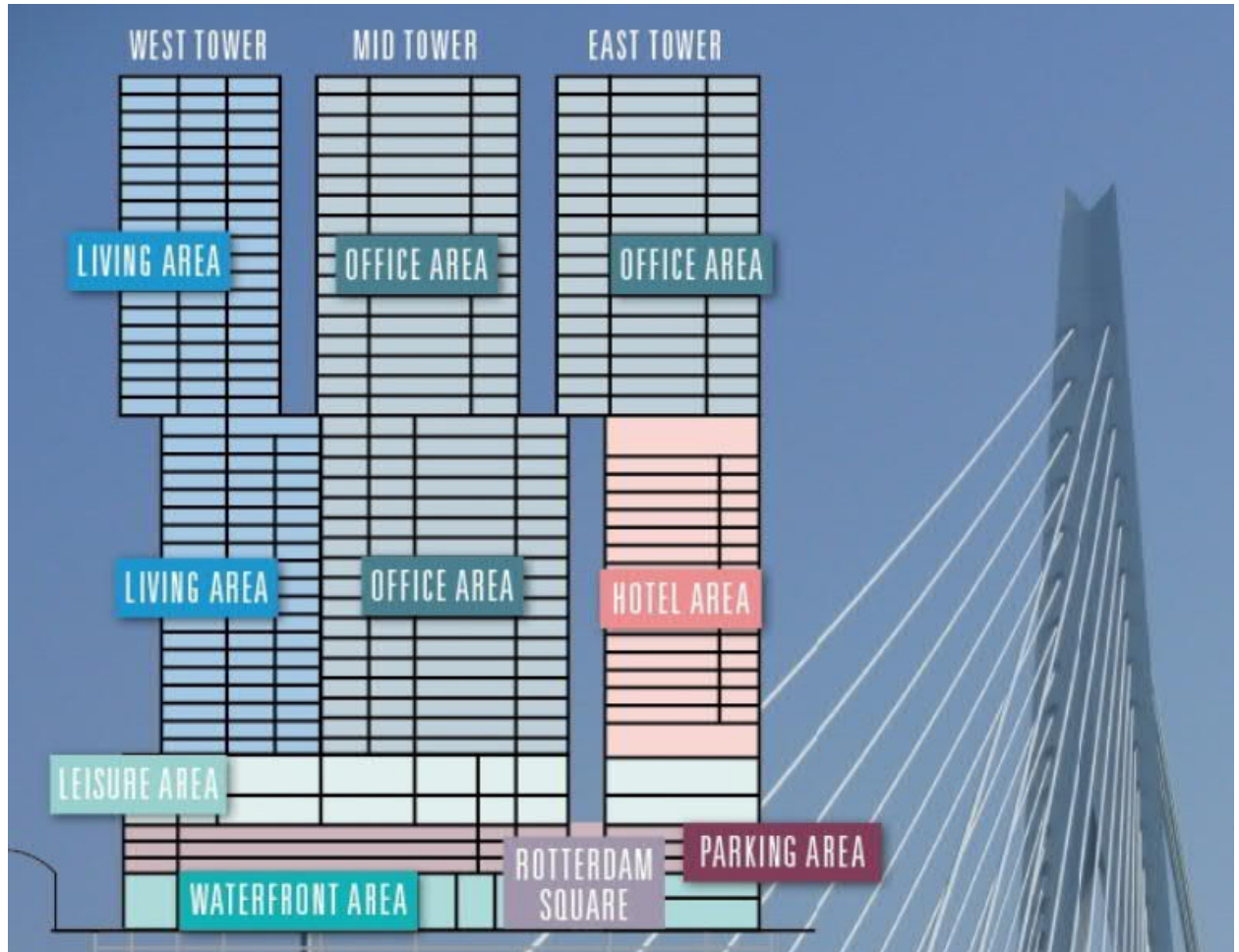
- offices 72,000 m2;
- 240 apartments 34,5000 m2;
- hotel (278 rooms) / congress restaurant 19,000 m2;
- retail / F&B 1,000 m2;
- leisure 4,500 m2;
- parking (approx. 650 vehicles) 3 1,000 m2



The Rotterdam - 'The facts' (2)

Cross section

- 3 towers on a base
- 44 floors
- 149 m
- 2 underground levels



FSS - Codes and guidelines

Codes and guidelines:

- Dutch Buildingcode 'Bouwbesluit 2003'
- Above 70 meter 'just as safe as a lower building'
- Dutch Guide line 'Hoogbouwrichtlijn' is used'
- Rules for building near transport routes for combustible liquids
- Fire safety in High rise building is always a custom made fire safety concept

For buildings up to 70 meters limited high rise requirements:

- Dry risers
- 1 x fire brigade elevator
- No sprinklers
- Smoke lobby for staircases
- No evacuation alarm for residential buildings


FSS - General for high rise

Building concept comply to Buildingcode, e.g:

- Escapes routes (walking distances) / structural requirements
- Fire compartments (1.000 m2 /60 minutes rated)
- Usage of materials
-

Add compensation for high rise:

- Fire control
- Longer escape times
- Fire service deployment
- Reliability of services
- Evacuation alarm and fire detection is case of an emergency

Project:	De Rotterdam	datum	12-11-2010	
Onderwerp:	berekening ontruimingstijd - bovengrondse bouwdelen			

West toren trap TW-01				
A: tijd van 1e persoon van 1e verdieping tot onderzijde trap op de beganegrond (vanuit ruimte W.01.004)				
onderdeel traject		loopsnelheid [m/s]	benodigde tijd	Totale tijd A
Afstand horizontaal	14,2 m1	1,6	0:00:23	0:00:29
Afstand over trap	8,273 m1	0,8	0:00:07	
B: Tijd die alle personen nodig hebben om de onderste trede van de trap te paseren				
Totaal aantal personen (personen)	breedte trap [m1]	reductie [m1]	doorstroom capaciteit [personen/m/s]	Totale tijd B
1142	1,2	0,3	1,28	0:16:31
C: Toeslag hoogte verschil				
hoogste verblijfsgebiedsvloer [m1]	aantal segmenten van	50 m1	toeslag per segment [mm:ss]	Totale tijd C
141	2		0:01:30	0:03:00
D: Traject laatste persoon van onderzijde trap tot uitgang				
onderdeel traject		loopsnelheid [m/s]	benodigde tijd [mm:ss]	Totale tijd D
Afstand horizontaal	17,7 m1	0,37	0:00:07	0:00:07
Theoretische ontruimingstijd To-Trap TW-01				0:20:07

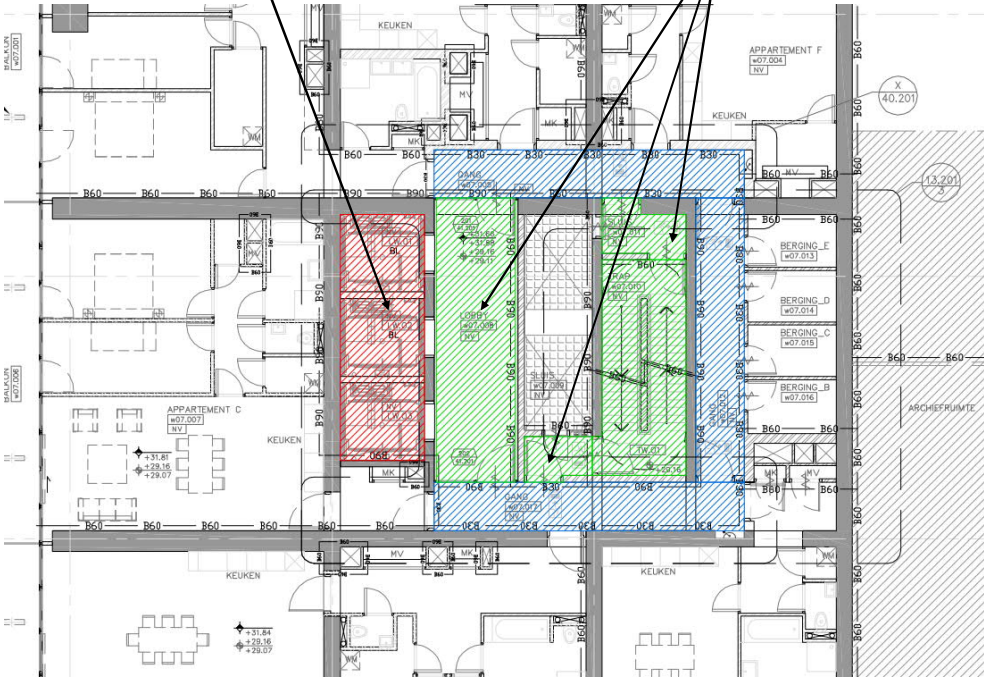
00x
A

FSS - The Rotterdam (general)

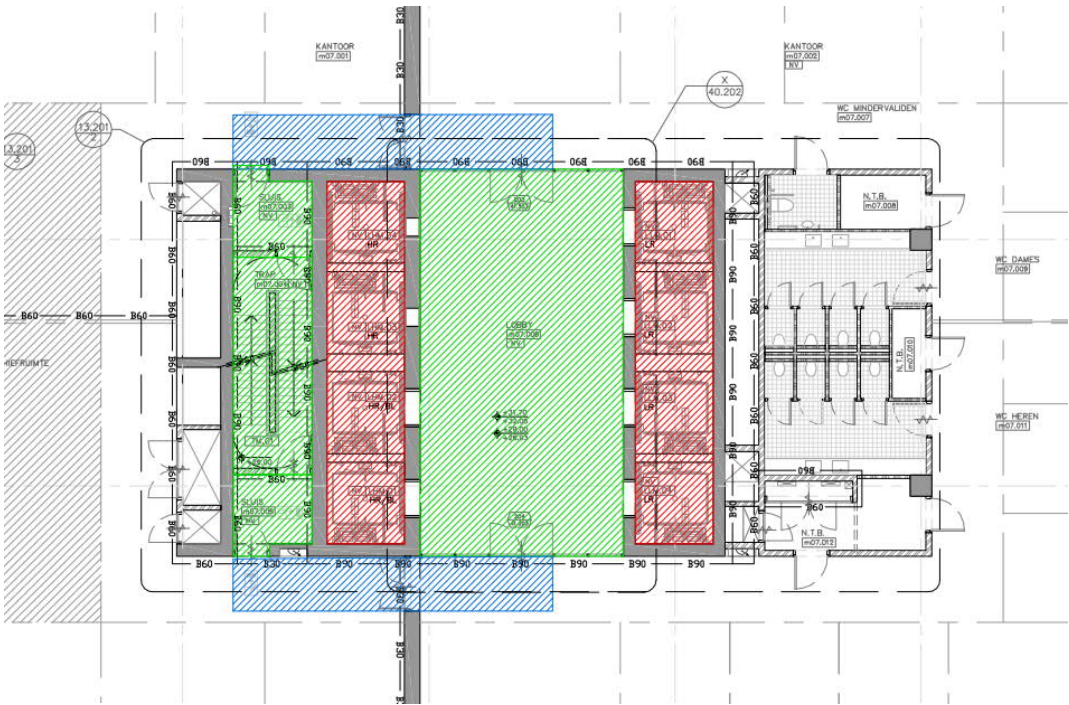
Aspect	< 70 meter	De Rotterdam (added)
Fire control	<ul style="list-style-type: none"> No sprinkler Fire compartments <1.000 m2 60 minutes fire rated 	<ul style="list-style-type: none"> Full sprinkler coverage, also in residential area's Every floor/tower a fire compartement
Escape routes	<ul style="list-style-type: none"> Evacuation time between 20 minutes 60 minutes rated staircases 30 minutes smoke rated lobby for entrance staircase 	Evacuation time between 20-60 minutes <ul style="list-style-type: none"> 90 minutes rated staircases 30/60 minutes rated lobby positive pressure differential system for staircases in office and hotel
Fire service deployment	<ul style="list-style-type: none"> Dry riser 1 x fire brigade elevator 	<ul style="list-style-type: none"> Wet riser with own water supply, pumps 2 x fire brigade elevator + 90 minutes + S200 fire lobby
Evacuation alarm and fire detection is case of an emergency	<ul style="list-style-type: none"> PA type system in general. Excl. residential. Automatic fire detection. Excl. residential. 	<ul style="list-style-type: none"> PA type system, also in residential area's Automatic fire detection in staircase and corridors of the residential area
Reliability of services	-	Emergency power generator for: <ul style="list-style-type: none"> Fire brigade elevators Positive pressure systems Pumps for wet riser system Second diesel driven sprinkler pump

Floor plan - typical 'core design'

2x fire brigade elevator Smoke lobby



Residential



office

-  = Rookrijke vluchtroute
-  = Liftschacht ingericht als brand- en rookrijke vluchtroute
-  = Ruimte ingericht als brand- en rookrijke vluchtroute

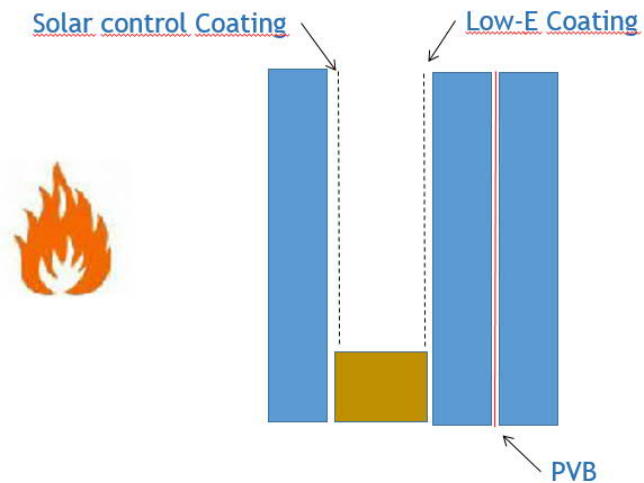
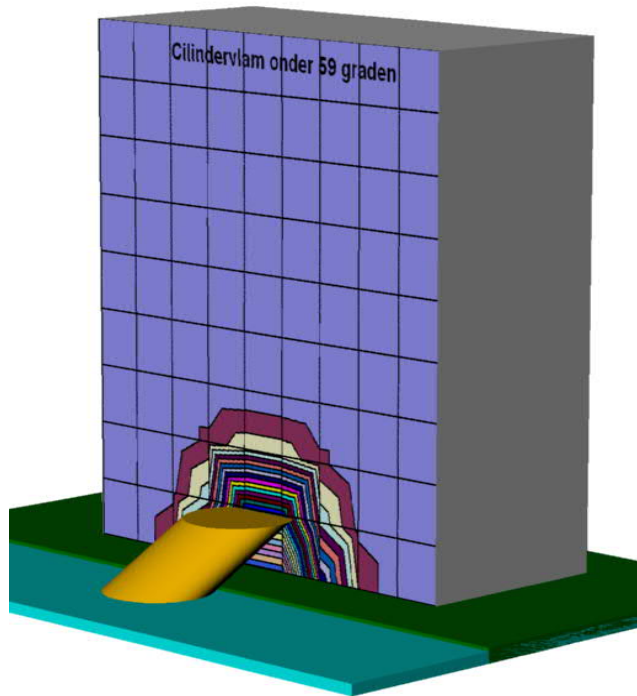
Pool fire (1)

- Scenario: spil of 75 tons Benzeen: Poolfire \varnothing 25 m
- In case of a pool fire evacuation of the building should be possible.



Pool fire (2)

- Calculated flux: 40 - 45 kW/m² and parts direct flame contact
- Max. inside flux < 15 KW/m2 optimal 2/3 KW/m2
- 30 minutes

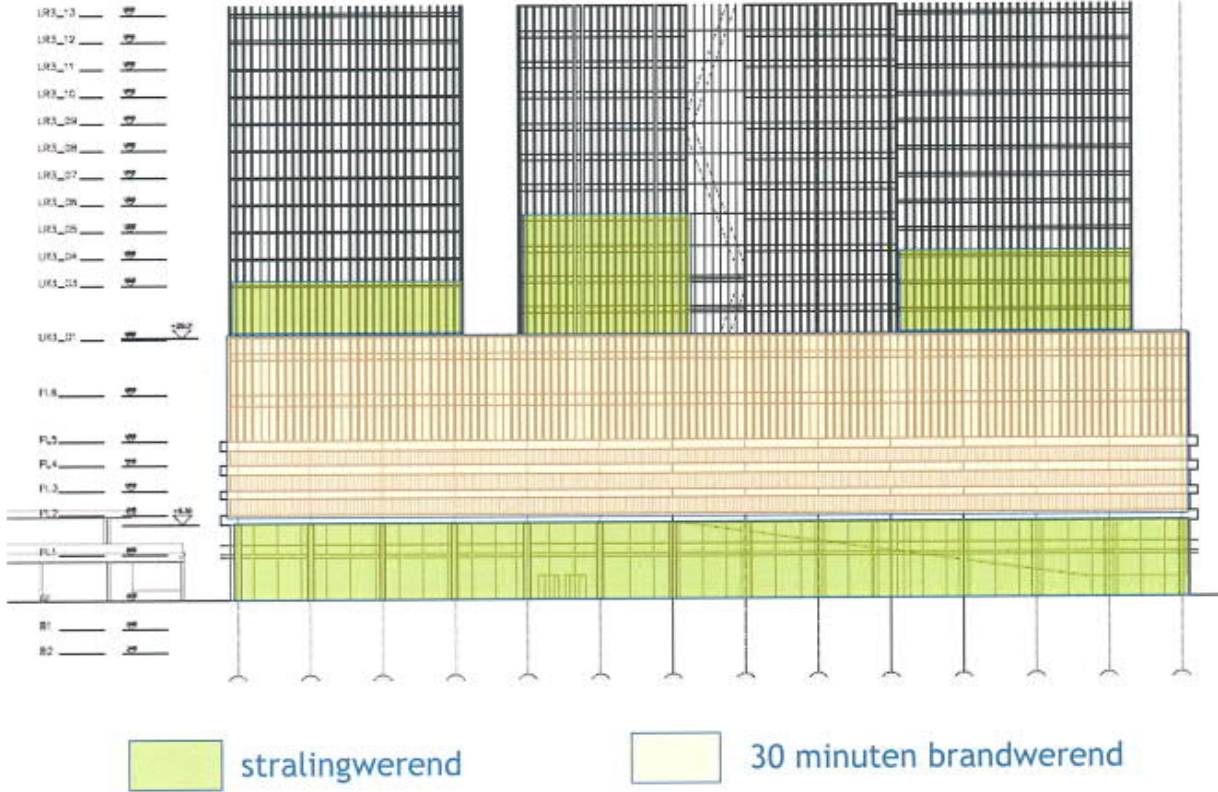


Anealled floatglass

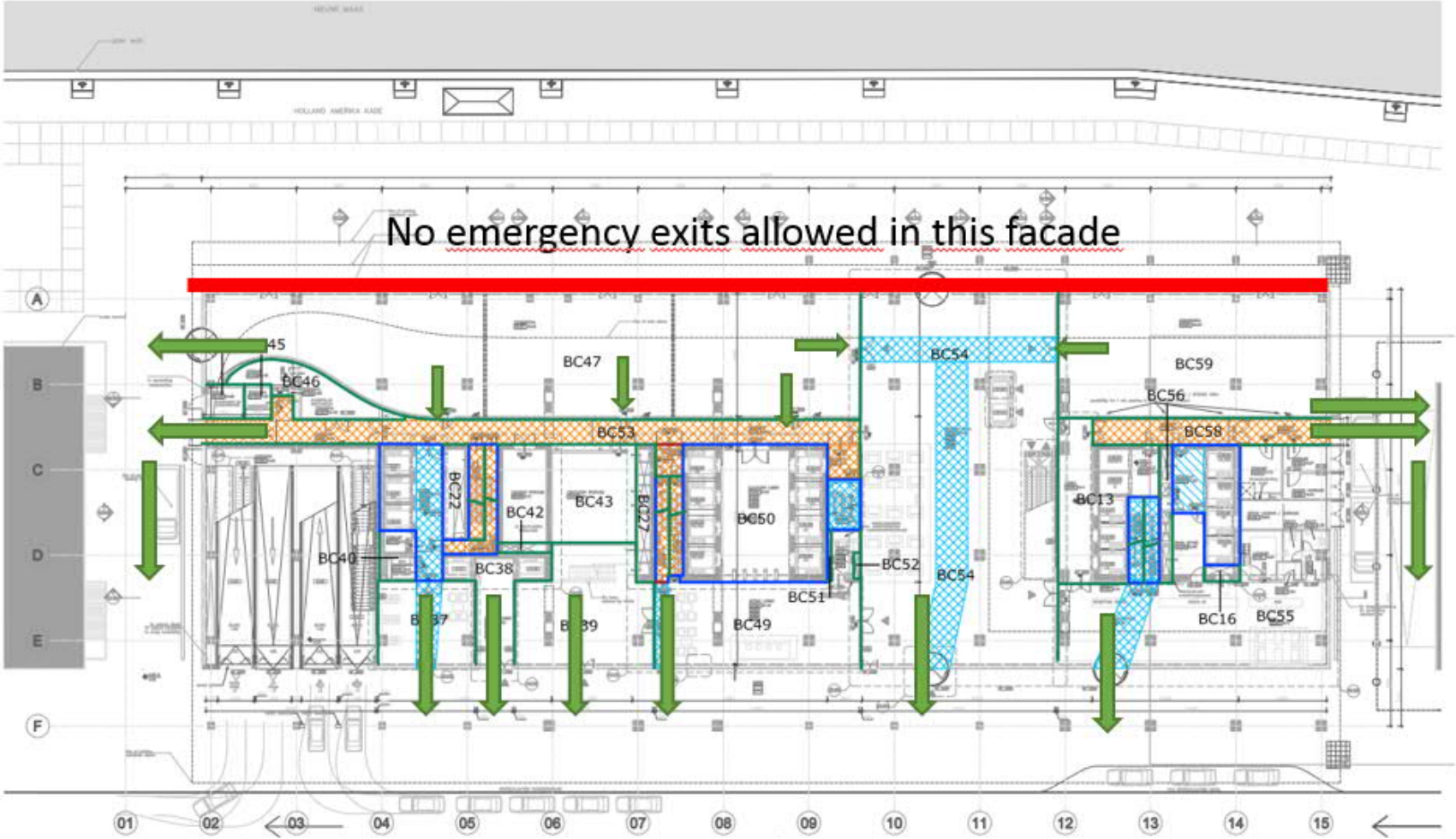
40-45 kW/m² : EW 27 Minutes

Pool fire (3)

Gevel maaszijde



Effects of pool fire on the floor plan



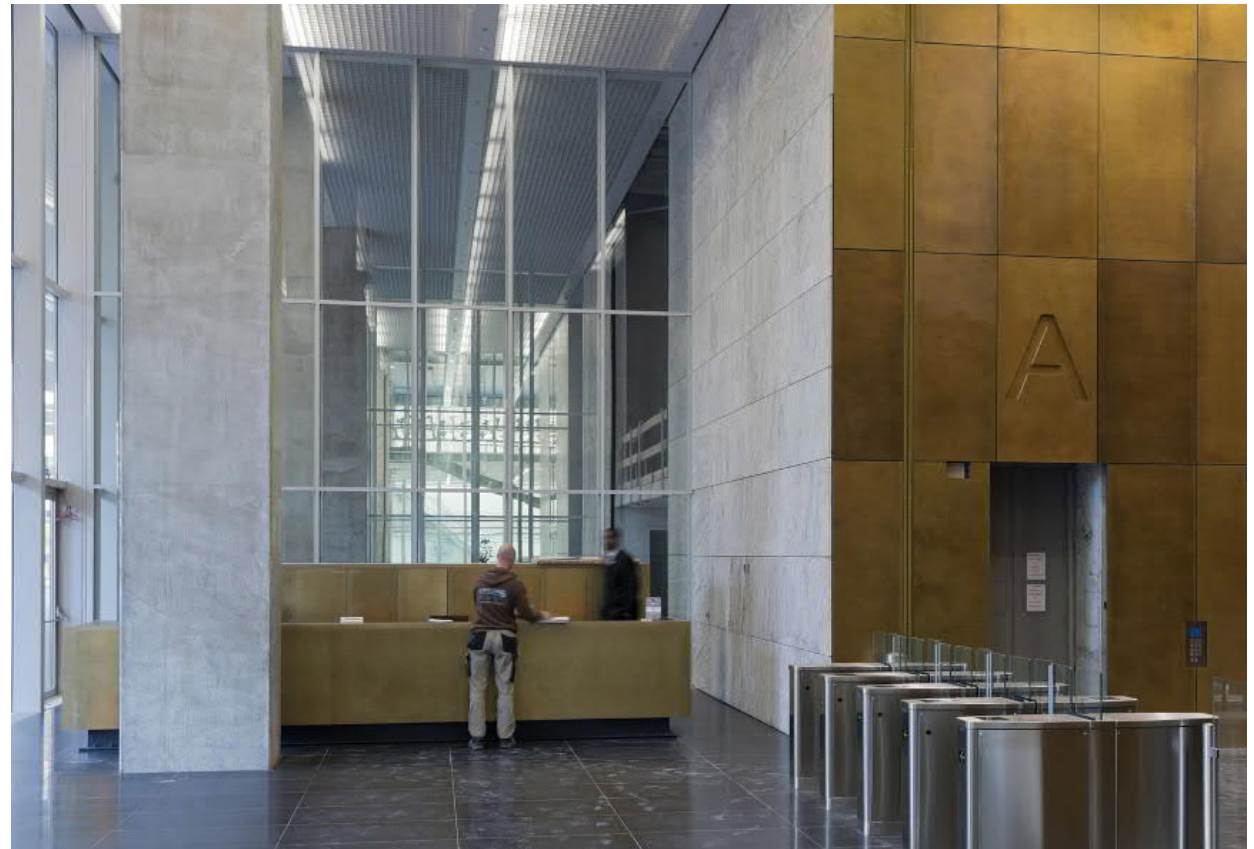
Glazen puien

60 minutes fire rated:

- EI at floor level (direct fire load behind the wall)
- EW at ceiling level (no fire load direct behind)

Due to high extra support behind (steel)

Concept conformed by notified body



Sprinkler concept

Water supply:

- VAS (EN 12845)
- Water reservoir (no use of the river water)
- E+D pump set
- Multiple outlet pump set
 - Around 45 meter for every pressure zone
 - Riser for each zone (3x)

Protection:

- NFPA 13
- Residential/light hazard/OH2 depending on the area



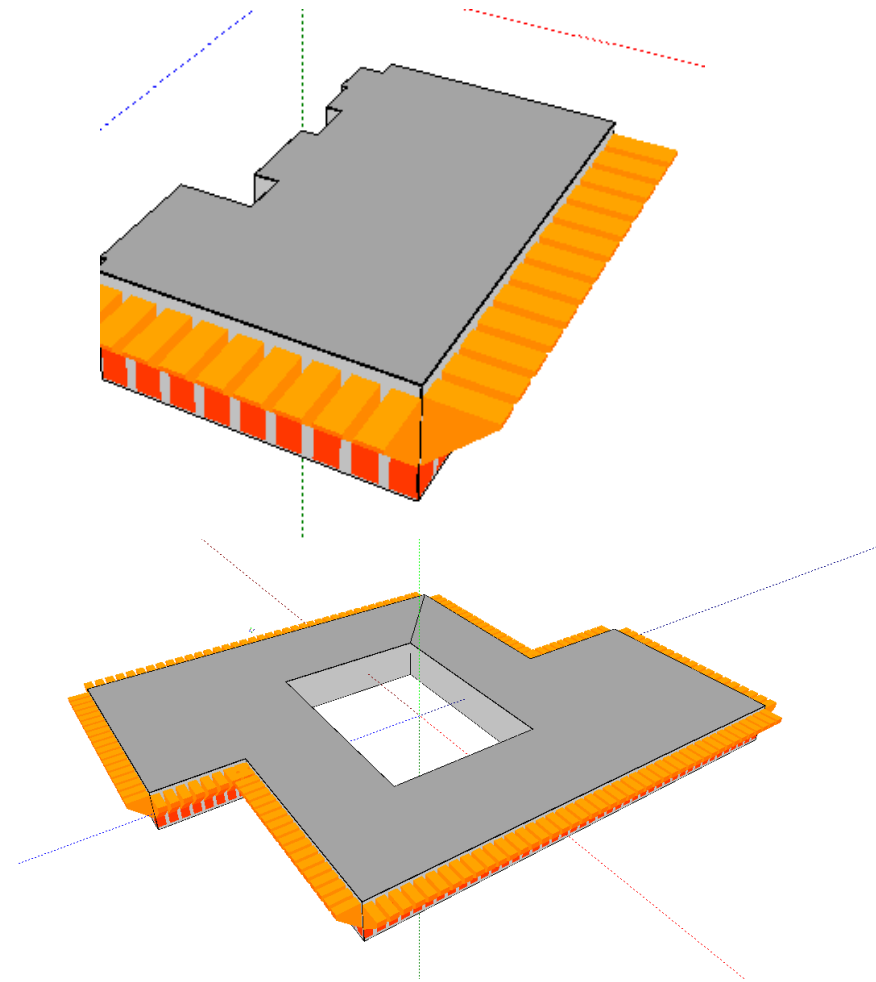
External flame spread In case of sprinkler failure

Prevent risk of external flame spread in case of sprinkler failure:

- External flame spread calculations
- No reduction on structural demands or fire rating around staircases (R120)

Situations:

- Between floors
- Between towers
- Calculations where made to asses this risk, model based on Dutch calculation method NEN 6068
- On few places fire rated glazing required to prevent fire spread



Question / discussions?



How can you recognize a fire safe building?



dGm^R

Wij staan voor u klaar!