

European Patent Office

Fire Safety main building (EPO II)

Introduction EPO II

- Main building of EPO and part of the EPO-terrain on industrial zone 'Plaspoelpolder' in Rijswijk (near highway A4)



Aerial view European Patent Office establishment Rijswijk (source: Google Earth)

Introduction EPO II



- Main building of the EPO-terrain
- Building permit in 1969
- Building time 1969 - 1972
- High-rise (80 m, with 26 floors) is typical for this building
- Expectation: EPO II will be in use for about 5 - 6 years



Impression main building (source: European Patent Office)

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Definition of a problem



- The building was build in the period 1969 - 1972
- From this time, the awareness of fire safety has considerably increased
- The same applies to the level of fire safety in the Dutch building regulations
- Therefore some concerns raised inside the European Patent Office about the level of fire safety
- Various permits with different drawings and contradictory information about the fire safety allegedly also lead to some discussion with the local fire department
- EPO asked DGMR as an independent fire safety consultant to assess the current state of fire safety of EPO II

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Definition of a problem



The investigation was based on the following questions:

1. What is the level of fire safety documented in the building permits (level obtained by rights)?
2. Does this level of fire safety still comply to the Dutch Building Code with regard to existing buildings?
3. Is there a need for a higher level of fire safety, to avoid physical danger for occupants or the fire brigade?
4. What is the required legal state of fire safety of building EPO II (in relation to the answers on the questions 1, 2 and 3)?
5. What improvements or corrections must be made to the building EPO II to meet the required minimal legal fire safety level?

Legislation



Level obtained by rights

- Every building of construction has to comply to it's building permit
- When untraceable, the municipal can grant an exemption from this level
- The provided level of fire safety should than be compliant with the building regulations for existing buildings (in principal)

Legislation



Housing Act (Woningwet)

- Article 1a: 'Duty of care' (zorgplicht)
 - ✓ *"The owner of a building shall ensure that following the state of that building no risk to health or safety arises or continues to exist"*

- Article 1b: absolute minimum level
 - ✓ *"It is prohibited to bring, keep and maintain an existing building in such a state that it does no longer comply with the regulations with relation to existing building in the Building Code (Bouwbesluit)"*

Legislation



Building Code (Bouwbesluit)

- Two different levels of regulations:
 - ✓ Technical requirements for existing buildings
 - ❖ Absolute minimal requirement of every existing building and construction
 - ❖ Reflects the common building regulations of around 1930
 - ✓ Technical requirements for new developments
 - ❖ Requirements for every new construction or building or part of it
 - ❖ Highest level of regulations which can be required by the municipality

Theoretical investigation



Level obtained by rights

- In the city archives of Rijswijk and Delft didn't give much information about the fire safety concept.
- Officially the level of fire safety should comply to the regulations for existing buildings in the Dutch Building Code
- EPO II, with a height of about 80 m, doesn't fit in these regulations
- A higher level of fire safety is required
- DGMR executed a Risk Analysis for EPO II, to determine which level of fire safety is sufficient for this building

Risk Analysis EPO II



Normative fire progress

- Evacuation
 - ✓ Detection time (10 min)
 - ✓ Alarm time (2 min)
 - ✓ Evacuation time high-rise (17 min)
- Fire fighting
 - ✓ Detection time (10 min)
 - ✓ Alarm time (2 min)
 - ✓ Attendance time (8 min)
 - ✓ Prepare time (7 min)
 - ✓ Rescue time / extinction time (31 min)

Risk Analysis EPO II dGm^R

Evacuation time high-rise

- Flow capacity each stair (high-rise): 74 persons per minute
- Refuge area in staircase (high-rise): 82 persons per floor
- Only 25 occupants per floor flow into a staircase
- The capacity of the staircase is over 3 times as much as the inflow
- Not the capacity of the staircase is leading in this situation, but the walking speed of the occupants

- ✓ Various determination methods are available, all with different walking speeds
- ✓ The walking speed on the stairs has been conservatively determined on 0.32 m/s (obstructed walking on stairs)
- ✓ Mainly due to the next influences:
 - ✓ Influence of other occupants
 - ✓ Continual change of directions in the staircase

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Risk Analysis EPO II dGm^R

Evacuation	Time (minutes)	Fire fighting
	0	
Detection time (10 min.)		Detection time (10 min.)
	10	
Alarm time (2 min.)		Alarm time (2 min.)
	12	
Evacuation time (17 min.)		Attendance time (8 min.)
	20	
		Prepare time (7 min.)
	27	
		Rescue time / extinction time (33 min.)
Building empty	29	
	60	
		Time to complete the extinction
		Fire under control

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Risk Analysis EPO II



Evacuation EPO II

- Building empty 29 minutes after begin fire
- Building Code: required fire-resistance from fire compartments to other fire compartments and escape routes in existing buildings is minimal 20 minutes

Conclusion of Risk Analysis EPO II

The regulations for existing building in the Dutch Building Code are insufficient to ensure a safe evacuation of the high-rise of EPO II

Risk Analysis EPO II



Fire safety concept

The conclusion of the Risk Analysis of EPO II makes a new safety level necessary. This safety level should be determined based on:

- the normative fire progress of EPO II
- the current condition of the building
- the remaining lifetime of the building

To determine the current condition of the building, DGMR globally inspected the building on the following aspects, related to fire safety:

1. Architectural components
2. Structural components
3. Installation components
4. Usage of the building

Risk Analysis EPO II



Inspections EPO II

Central questions during the inspections:

Is the current level of fire safety of EPO II sufficient so that there is an adequate safety level?

If not, what adjustments should be made so the required safety level fits in it.

Inspections EPO II



General

- Global impression of the state of fire safety of the building (no 100% overview of the current fire safety)
- Therefore reference parts of the building has been inspected:
 - Complete ground floor
 - Complete first floor
 - Conference rooms and library on the second floor
 - Void of the conference rooms on the third floor
 - Transition between low-rise and high-rise on the fourth floor
 - A floor in the high-rise (5th - 24th)
 - Technical floor (25th)
 - Elevator machine floor (26th)

Inspections EPO II

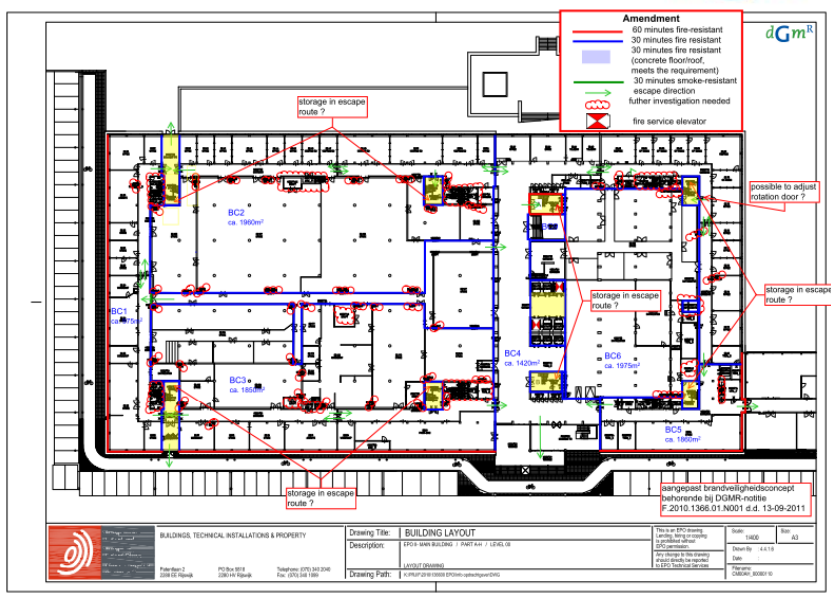


Findings:


- Fire resistance to collapse: no additional provisions
- Controllability of fire: additional provisions
- Use of materials: no additional provisions
- Fire detection system: perform 0-measurement
partly replace system
- Evacuation alarm system: direct activation evacuation alarm
perform 0-measurement
- Emergency lighting: some additional provisions
- Evacuation signs: no additional provisions
- Facilities for fire fighting: provisions needed regarding
fire service elevators


To limit provisions devise new fire safety concept

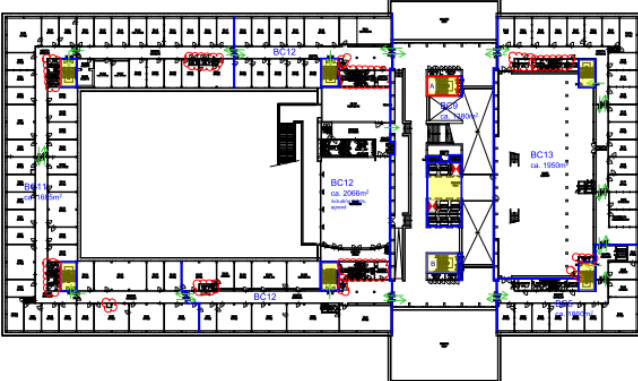
Fire safety concept




Fire safety concept









aangepast brandveiligheidsconcept
 behorende bij DGMR-notitie
 F.2010.1366.01.N001 d.d. 13-09-2011

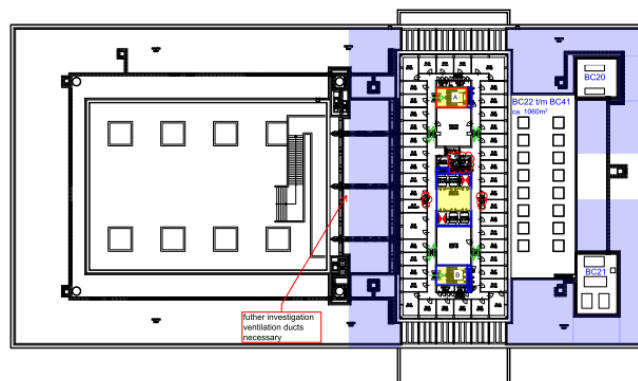
	BUILDING TECHNICAL INSTALLATIONS & PROPERTY	Drawing Title: BUILDING LAYOUT	Title: 1366	Scale: A3
	Project: 2 PO Box 9010 2200 HV Noordwijk Telephone: 07743 200 200 Fax: 07743 200 180	Description: EP04 SAN-BUILDING / PART A4 / LEVEL 02 LAYOUT DRAWING Drawing Path: J:\PROJECTEN\1366\01\EP04\san-voedingplan.dwg	This is an EPD drawing covering the following EPD components: - Sanitary fittings - Sanitary systems - EPD Sanitary Services	Date: 13-09-2011 Drawn by: 44114 Checked: 3000070

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Fire safety concept













aangepast brandveiligheidsconcept
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<h2>Provisions</h2>	
 <p>25th floor</p>	<p><u>Observation 31:</u> This door is mounted in a smoke partition. The window and door frame are of good quality. Large seams are visible between the door and the door frame. The wired glass is not ideal but sufficient for this specific application.</p>
	<p><u>Solution</u> The area of the seams need to be reduced as much as possible (preferably to nil). It is sufficient to mount tight fitting draught excluder strips. These are available in any hardware store.</p>
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<h2>Provisions</h2>	
 <p>25th floor</p>	<p><u>Observation 7:</u> A large gap in the fire partition wall is not properly closed. Cables and pipes mounted through this gap do not have the proper 30 minutes fire resistance.</p>
	<p><u>Solution</u> The gap in the wall should be closed with a fire resistance material, for example cement (or any other inorganic binder). An alternative is using fire resistant paste, such as Gerco F60. The cables need to be covered with a 30 minutes fire resistant coating, applied on both sides of the partition. The product Gerco One will suffice.</p>
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Provisions

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25th floor



Observation 14:

Both the conduit and air duct (with dimensions 500 x 500 mm) are mounted through a fire partition wall without the proper fire resistant measures.

Solution:

The steel conduit and the cables within it need to be covered with a 30 minutes fire resistant coating, applied on both sides of the partition. The product Gerco One will suffice.

The air duct needs to be fitted with a fire damper. Fire dampers are supplied by the company Rf-t (amongst others). Their product CU-LT would be sufficient.

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Subsequent steps

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Current scope of works:

- Finish inspection reports (app. 2 weeks)
- Complete)-measurement R2B (app. 3 weeks)
- Set priorities in provisions (app. 3 weeks)

Further actions:

- Alter programme of requirements fire detection system (and evacuation alarm system)
- Discuss provisions with local fire department
- Find contractor(s)
- Survey works carried out

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