Water mist installation in the Dutch Textile Museum

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Contents

- Dutch textile museum in monumental building
- Building did not comply with national building regulations
- Water mist installation for an equivalent fire safety level

- The process from start to finish

Fire safety advise: parties involved

efectis
nederland

FSA

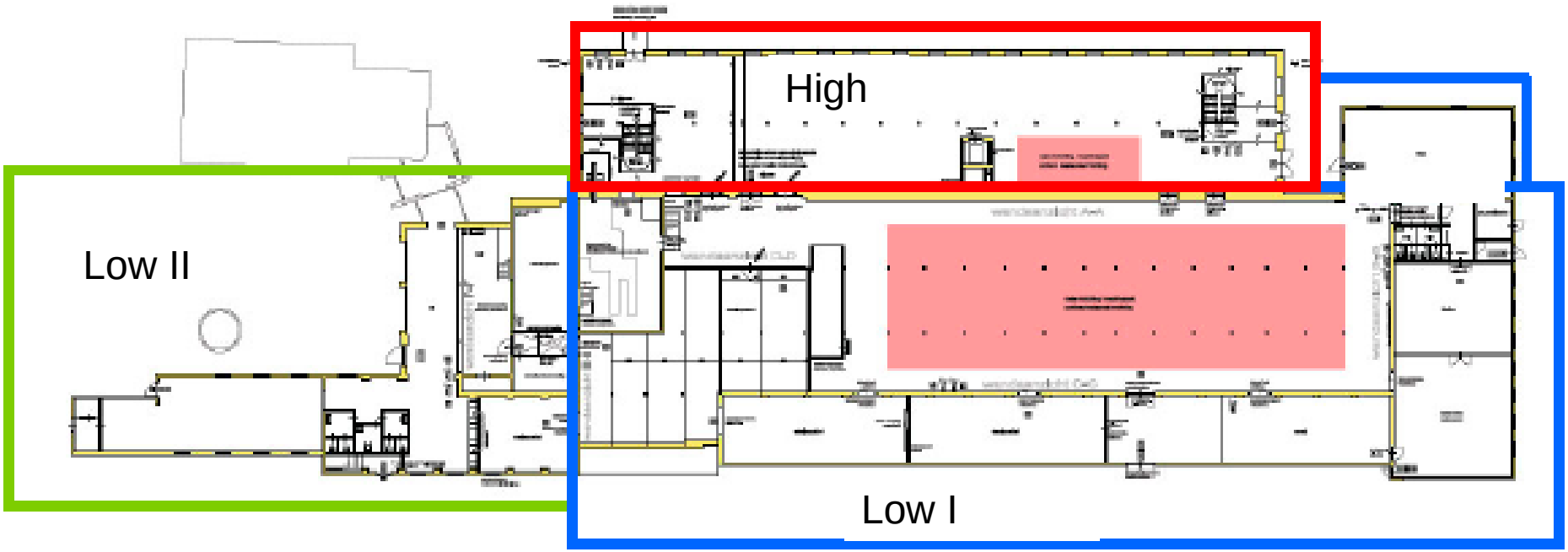
CAUBERG-HUYGEN
RAADGEVENDE INGENIEURS BV

Victor Meeussen: Efectis NL

Jan Hordijk: Fire Safety Assistance

Ingrid Naus: Cauberg-Huygen

Layout

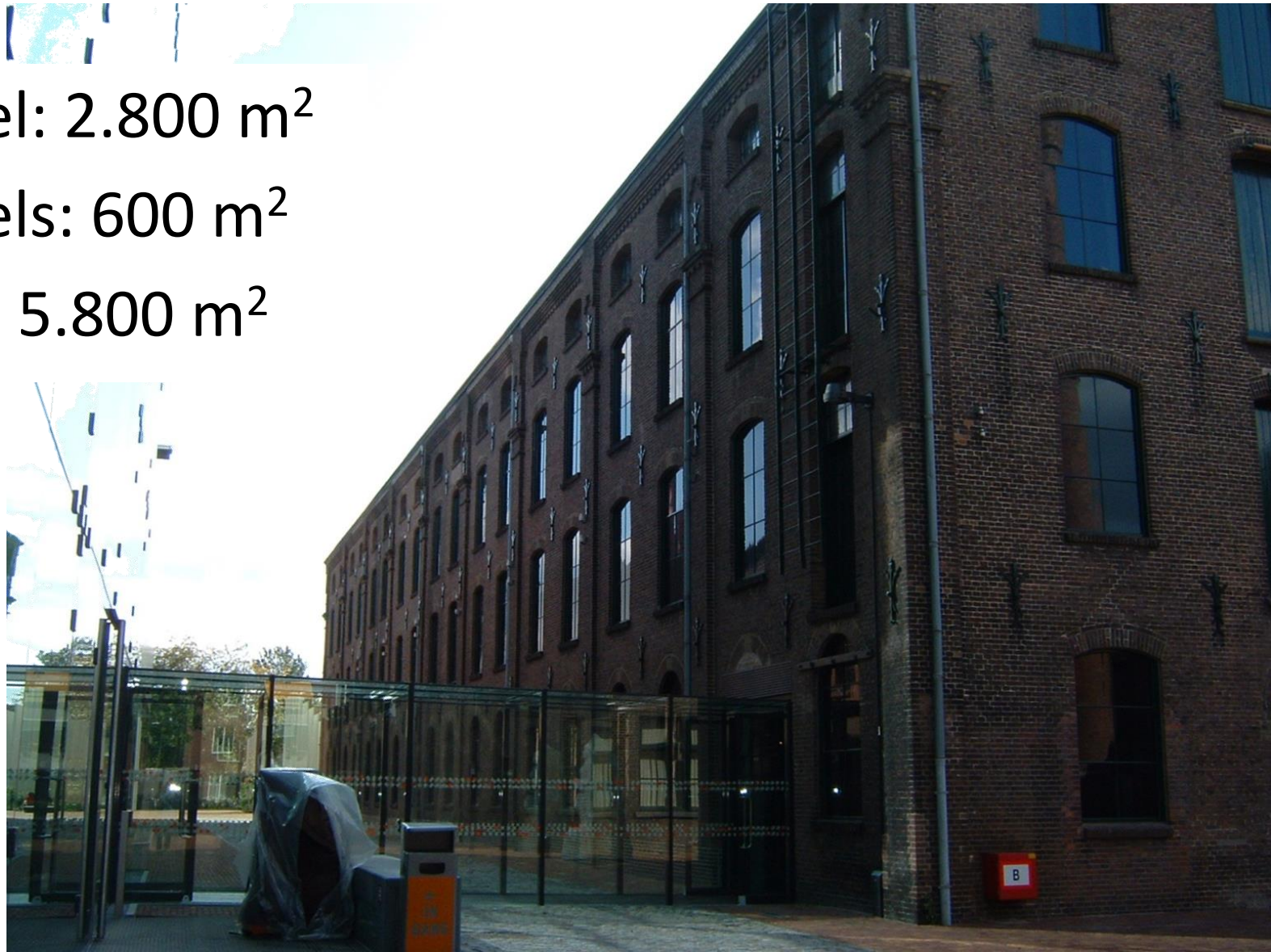


Dutch Textile Museum

- Built in 1880
- Restored in 1982 en declared a monumental building
- Dutch Textile Museum since 1982
- Renovation in 2008

Dutch Textile Museum

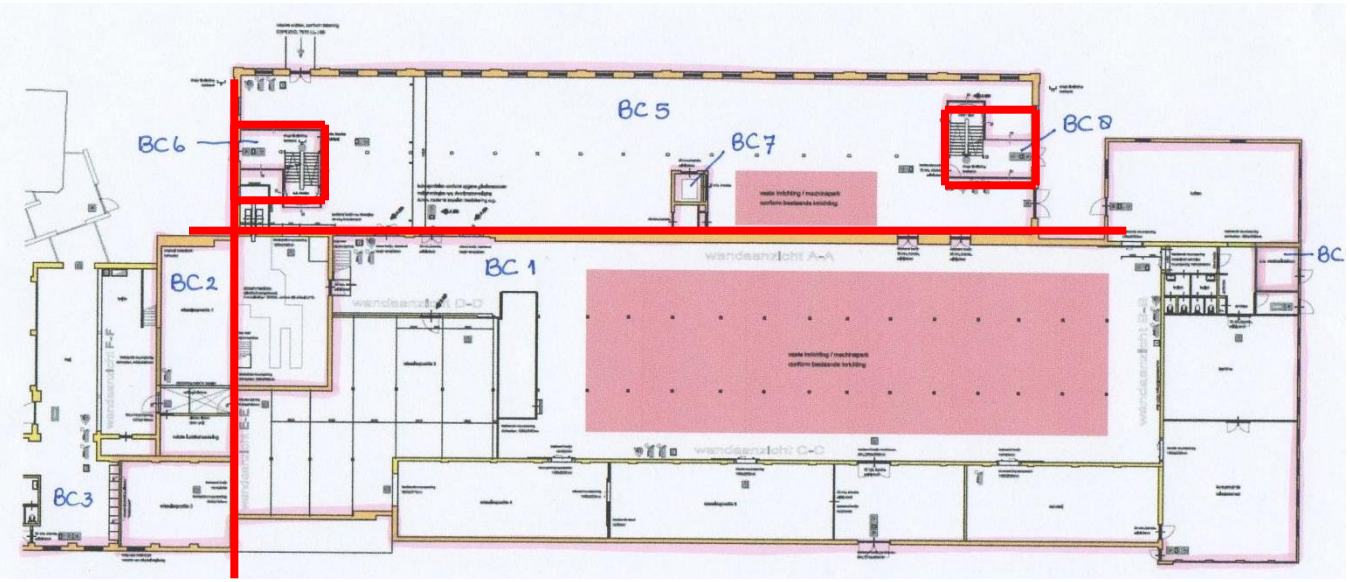
- 1 level: 2.800 m^2
- 5 levels: 600 m^2
- Total: 5.800 m^2

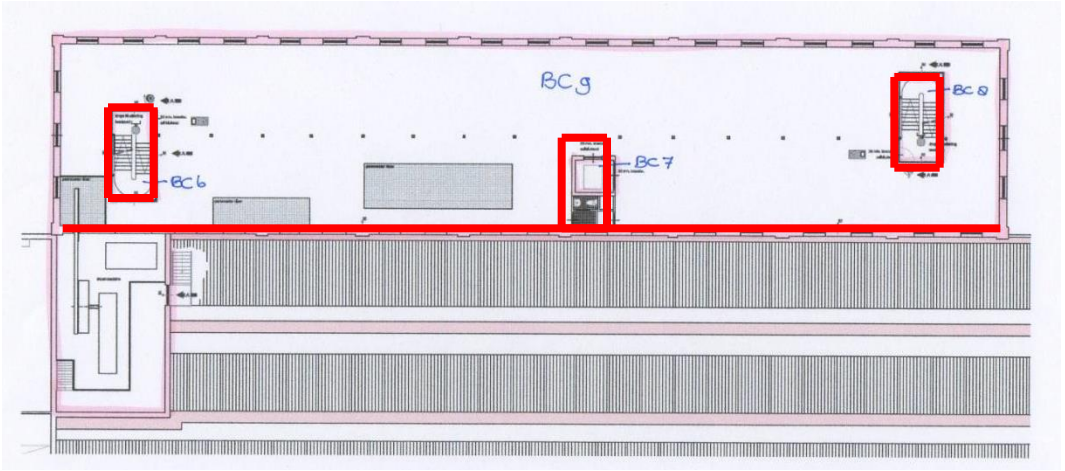


Fire load lower part

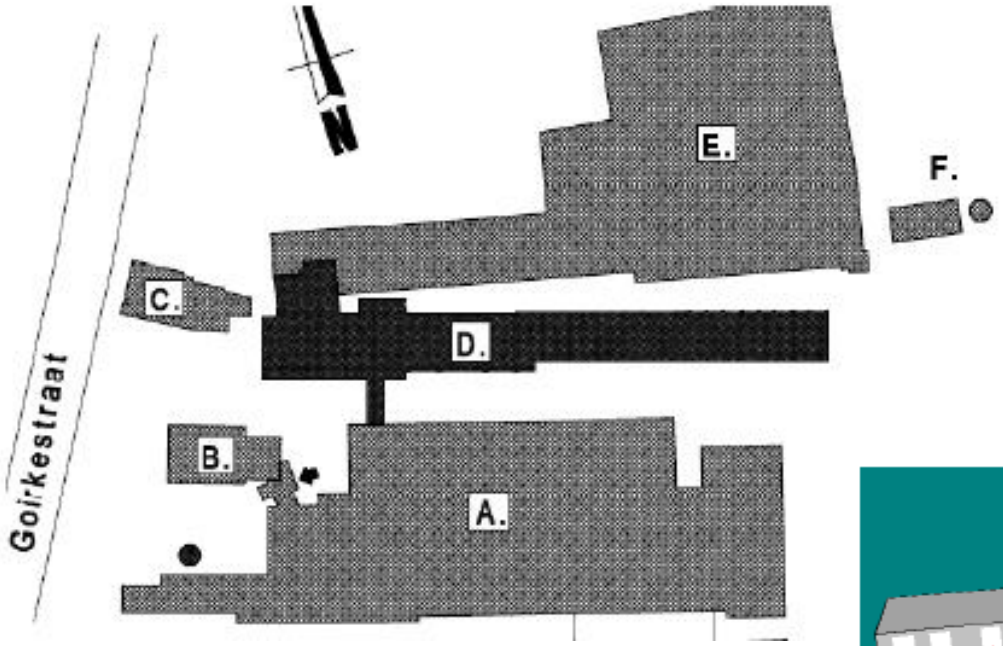
Fire load high part

Original fire compartment

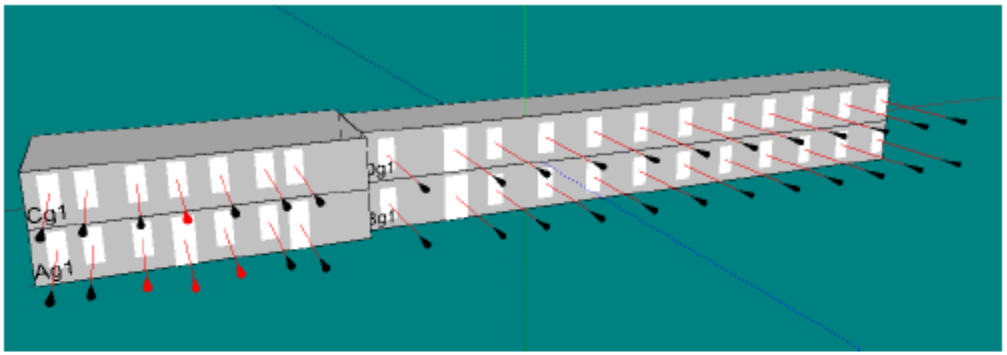


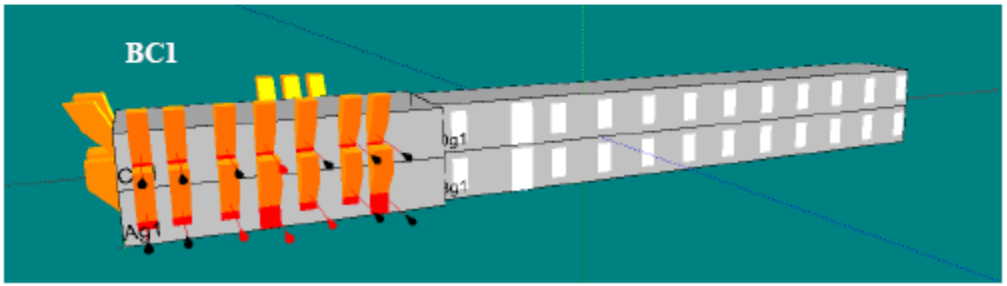


Surrounding buildings



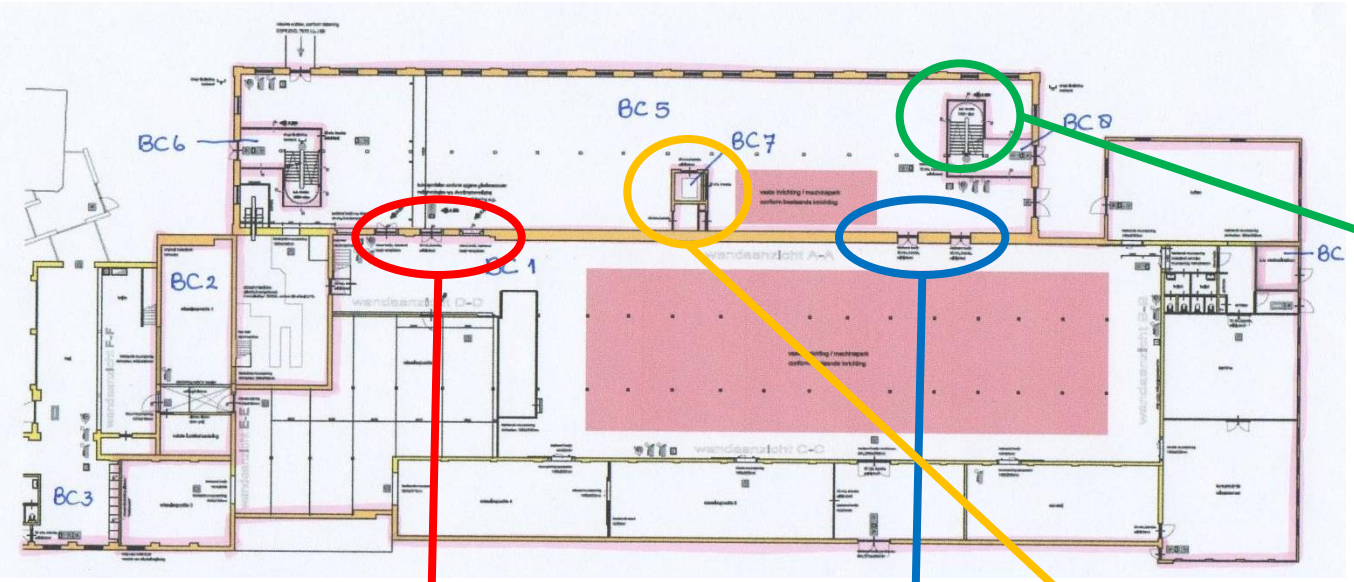
< 10 m distance
to unprotected buildings



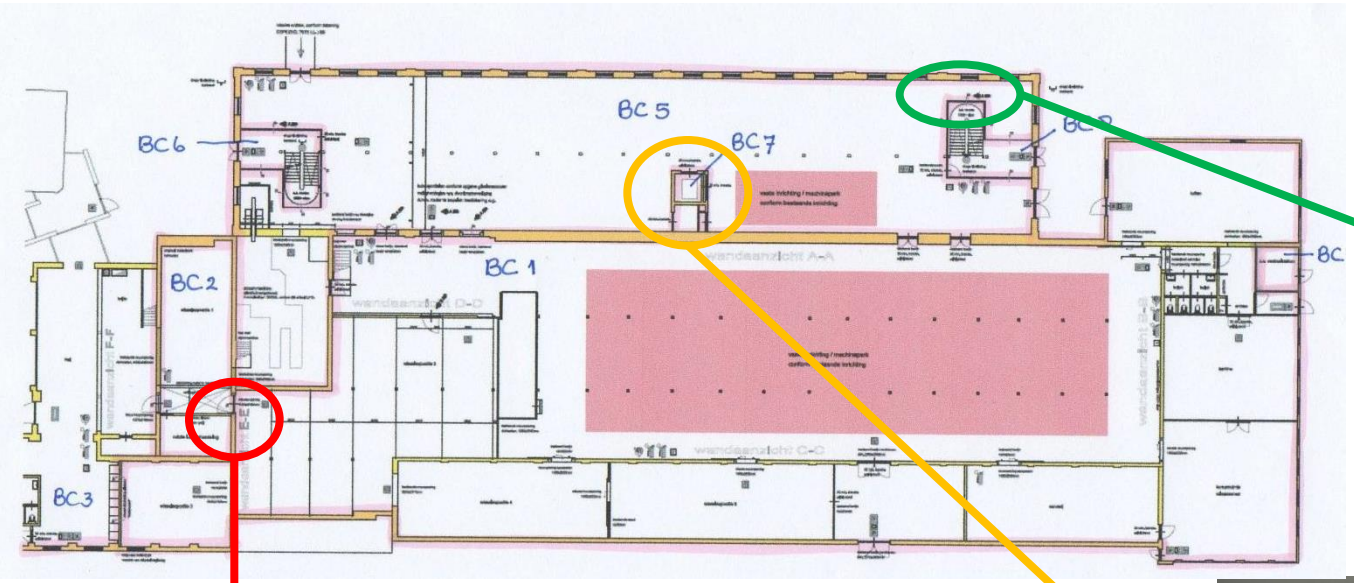


- No fire spread based on building regulations
- Possible fire spread based on realistic assumptions

State of the building



State of the building



Dutch building regulations

- Two levels
  - Functional requirements
  - Performance requirements
- The building has to comply with the functional requirements
- That can be done by :
  - complying with the performance requirements
  - or by doing something that results in an equivalent fire safety level

Compliance with regulations

Functional requirements	**For new buildings** Desired safety level	**For existing buildings** Minimum safety level
Strength of the construction	No	Yes
Emergency lighting	Yes	Yes
Preventing ignition	Yes	Yes
Reaction to fire	No	No
Resistance to fire	No	No
Smoke spread through building	No	No
Escape routes	No	No
Prevention of casualties	Yes	Yes
Fire fighting possibilities	No	No

Possible solutions

Solution	Owner	User	Mon. commission	Fire department
~~Change fire compartments by replacing walls and doors~~	Yes	No	**No**	No
~~Accept that the building can burn down completely~~	Yes	No	No	**No**
~~Apply an automatic fire suppression system: sprinkler~~	No	No	**No**	Yes
Apply an automatic fire suppression system: water mist	No	No	No	No

Initial arguments against

- User:
  - water damage to the inventory
- Monuments:
  - water damage to inventory and construction
  - installation elements are visible
  - damage to monumental elements in order to apply the system

Monuments

Fire is preferred …

Over the small possibility of water…

Initial arguments against

- Fire department:
  - unknown system
  - equivalent fire safety level has to be proved

Arguments in favour

- Fire department:
  - Without an automatic fire suppression system:
    - No entering the building to control the fire
    - Only protecting the surrounding buildings
    - Protecting the nearby own buildings (newly built and existing) is not possible
  - Scenario is not acceptable to owner-user-fire department
  - Only solution: water mist system

Steps / parties involved

- Define the goals of the system and demonstrate equivalent fire safety → *Fire safety advisor*
- Convince monuments of minimal damage → *Fire safety advisor, installation advisor*
- Get a building permit → *Advisor, fire department and city*
- Define the basic principles of the system, to comply to the goals → *Installation advisor*

Steps / parties involved

- Design the system → *Installation advisor / Installation company*
- Apply the system to the building → *Installation company*
- Combine the system to the existing fire detection system → *Fire department, Installation companies mechanical and electrotechnical*
- Certify the system → *Inspection body*

Goals

- Goals of the water mist installation:
  - Equivalent fire safety for large fire compartment
  - Equivalent fire safety for resistance to fire of staircases
  - Equivalent fire safety for too large distances to exits
  - Equivalent fire safety to prevent fire spread to adjacent buildings
  - Limiting damage to both inventory and construction during a fire

Fire compartment

- Basic approach for applying sprinkler system: relation between fire load and size fire compartment

- Sprinkler is generally accepted, water mist is not (yet)

- Equivalent fire safety after explaining extinction principles of water mist vs. sprinkler

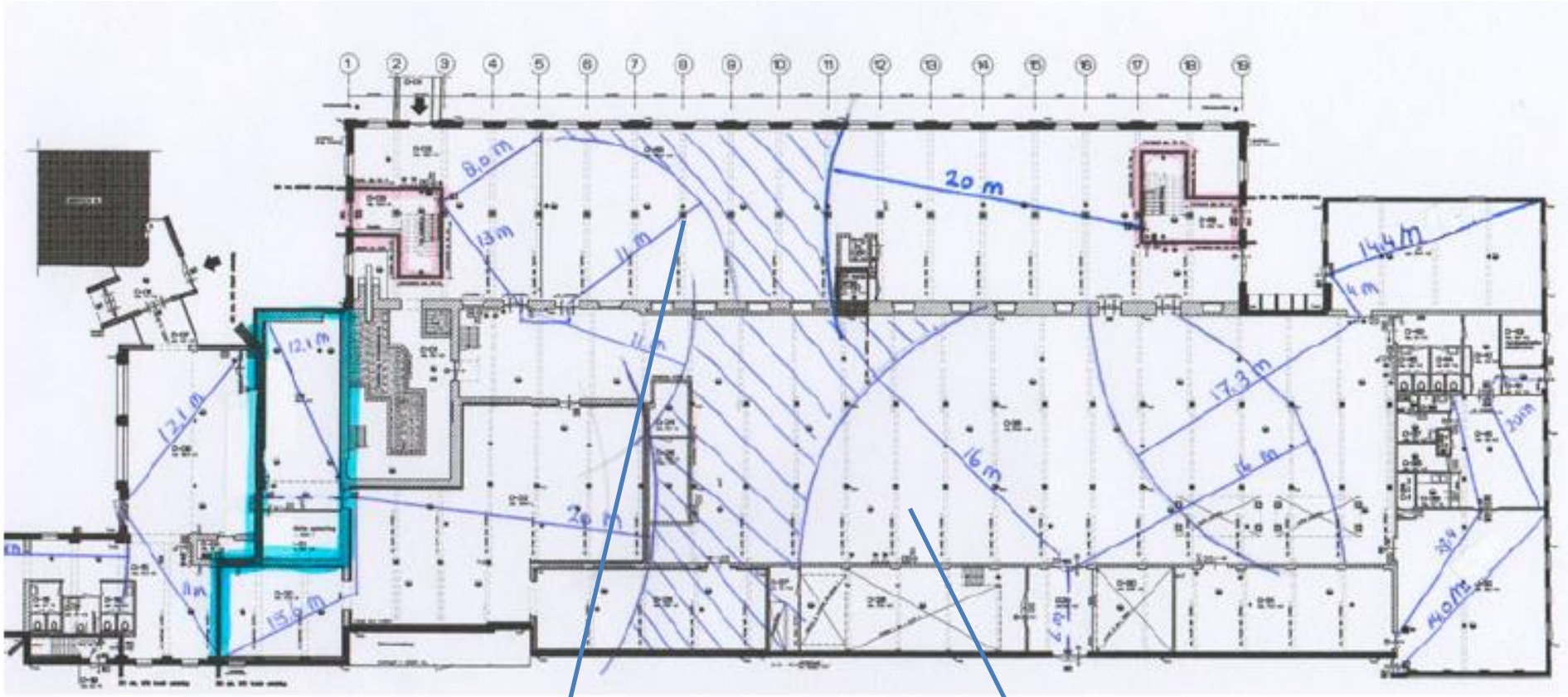
Staircases

- Staircases with wired glass

- Water mist controls the fire in initial stage of fire; chance of both staircases threatened by a fire is very small
- Water mist reduces radiation; staircases can be used

- Solution: water mist in combination with 30 min resistance to fire

Distances to exits



Water mist reduces fire, more escape time available

Zone modelling: more escape time available than necessary, even without water mist

Fire spread between buildings

Equivalent fire safety

- One installation is applied to compensate for 4 deficiencies

- The reliability of the installation is an important factor:
  - Availability of a sufficient amount of water
  - Reliability of pump(s)

Specifications system

- Water mist: NFPA 750
- Risk category: LH / OH
- Capacity: 1.5 mm/min
- Water capacity: 60 min

Pump system

- 3th degree water supply system
- Capacity VdS / CEA 4001 OH II

  Min. 140 m^2 or 9 nozzles
- 4 pumps (N+1), electric

  4 x 27 kW, high pressure max. 140 bar

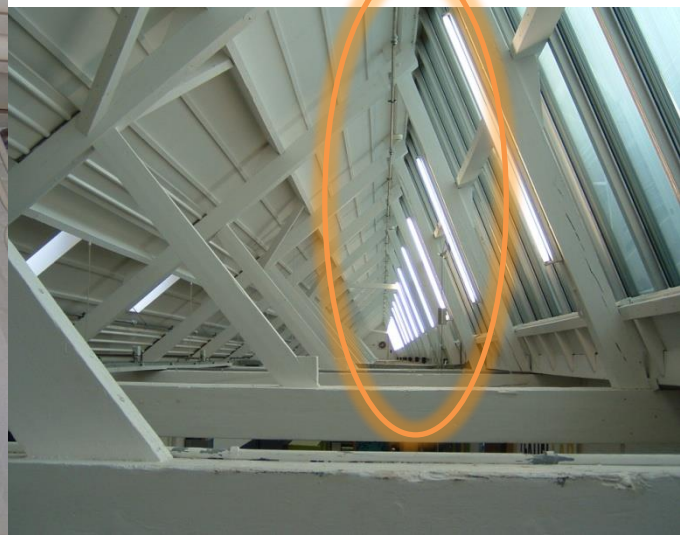
Water supply

- Water tanks 5 m^3
- Automatic suppletion from water supply system
- Full capacity suppletion 400 l/min, from main water supply system;

  4” DHPE base pipe

Nozzles

- To prevent fire spread in compartment
- To prevent fire spread between buildings
- “Invisible” piping and nozzles



Main problems “on the road”

- Communication: from beginning to end …
  - Between architect and owner
  - Between owner and fire department
  - Between fire department and fire safety advisor
  - Between detection company and inspection company
  - Between mechanical and electrical installations

….

Final result

- Certified installation, a building that complies with all building requirements
- Monumental building with a fire safety level comparable to a new building
- Owner, user, fire department and monuments pleased with the final solution

Recommendations

Integral approach:

- make one person responsible
- for the entire fire safety concept
- from start to finish

Thank you for your attention

Your response is welcome!

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