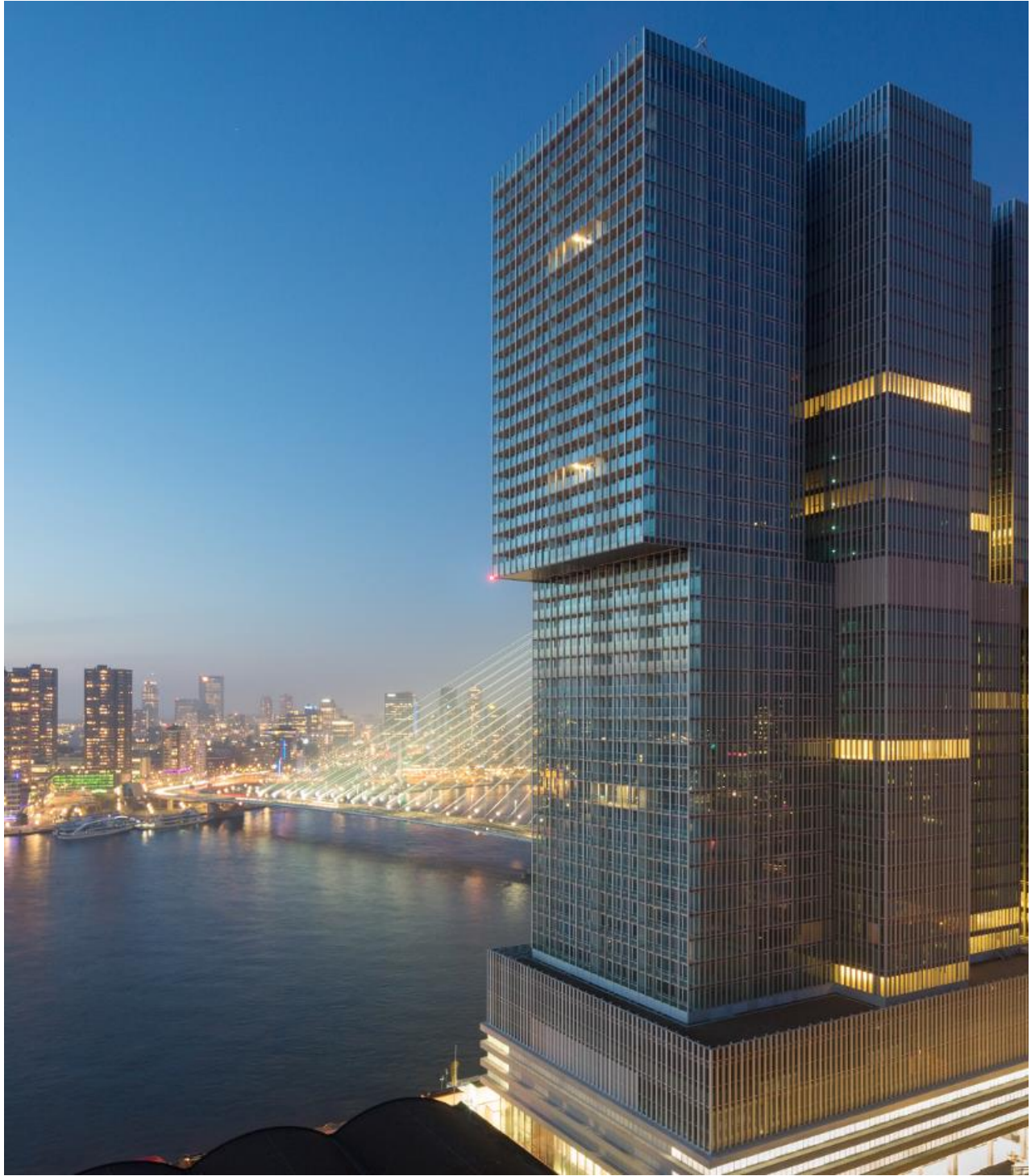


# Practical issues with protection of a high-rise residential building



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# Agenda

## Introduction:

- Introduction of Aqua+ & DGMR
- The need for high-rise residential buildings?
- Building development, trends?
- What are high-rise residential buildings?

## Deeper look into:

- Practical aspects for sprinklers in high-rise residential buildings

## Note:

- Information in this presentation is based on experience from the presenters
- EN 12845 based, other sprinkler standards have other possibilities and limitations
- Information presented is for general information only, every situation is different



# Introduction Aqua+

## Aqua+

- + 5 offices
- + 270+ employees
- + Complete fire protection systems

## Projects

- + 3D engineering / BIM
- + In-house prefabrication by our own welding robots

## Service and maintenance

- + National coverage
- + Fleet management
- + 24 hour service



Booking.com Amsterdam



Haut Amsterdam



Madame Tussauds Amsterdam

# Introduction DGMR

3 offices

260+ employees

2,000 projects per year

25,000,000 turnover

Consultancy services

Acoustics and sound

Building Physics

**Fire safety** and security

Sustainability and Health

Facade Technology

Spatial Planning and Environment

Vibration

Software



The Valley - Amsterdam



Rijks Museum - Amsterdam



Van Gogh Museum - Amsterdam

# The need for high-rise residential buildings?

## Why the need for high-rise residential buildings?

- Huge need for new housing; Government target is 100.000 new houses every year
- Living in city over outside of the city

From a recent news article:

*‘We need to add a lot of housing, but not fill up our green areas. Therefore, in the cities, every square meter is used as efficiently as possible.’*

When having limited space to build, going up is the only option.

## Wonen op grote hoogte steeds populairder in Nederland



#	naam	stad	hoogte	gebruik	gereed
1	De Zalmhaven	Rotterdam	215	wonen	2022
2	Maastoren	Rotterdam	165	kantoor	2010
3	New Orleans	Rotterdam	158	wonen	2010
4	Cooltoren	Rotterdam	154	wonen	2022
5	Montevideo	Rotterdam	152	wonen	2005
6	Gebouw Delftse Poort 1	Rotterdam	151	kantoor	1991
7	De Rotterdam	Rotterdam	151	wonen / hotel / kantoor	2013
8	Rembrandt Tower	Amsterdam	150	kantoor	1995
9	Millennium Tower	Rotterdam	149	hotel / kantoor	2000
10	Ministerie van Binnenlandse Zaken	Den Haag	147	kantoor	2012
10	Ministerie van Justitie en Veiligheid	Den Haag	147	kantoor	2012
12	Hoftoren	Den Haag	142	kantoor	2003
13	Westpoint	Tilburg	142	wonen	2004

# Building trends

## Buildings trends:

- Not only high-rise offices but also residential and mixed functions
- Sustainability:
  - Wood constructions
    - Floors and walls
    - No concrete flooring



# What are high-rise residential buildings?

## What are high-rise (HR) residential buildings?

- Difference between Building code and sprinkler standards

## Dutch Building code

- > 20 meter first HR demands (dry risers and fire brigade elevator)
- > 70 meter outside Building code -> often sprinklers

## Sprinkler standard

- EN 12845, Annex E

### Annex E (normative)

### Special requirements for high rise systems

#### E.1 General

The requirements of this annex shall be applied to the sprinkler protection of multi-storey buildings with a height difference between the highest and lowest sprinkler exceeding 45 m.

# Sprinkler standard approach of HR(1)

## Special demands and requirements in the sprinkler standard EN 12845:

- Management of maximum pressure in the system:

### 8.2 Maximum water pressure

**8.2.1** Except during testing, water pressure shall not exceed 12 bar at equipment connections or locations identified in 8.2.1.1 and 8.2.1.2. The pressure in pumped systems shall take into account any increase in driver speed and pressure due to closed valve condition.

**8.2.2** In high rise sprinkler systems, where the height difference between the highest and lowest sprinkler exceeds 45 m, water pressures might exceed 12 bar at the following locations (providing all equipment subject to pressures greater than 12 bar is fit for the purpose):

- a) pump outlets;
- b) riser and distribution pipes.

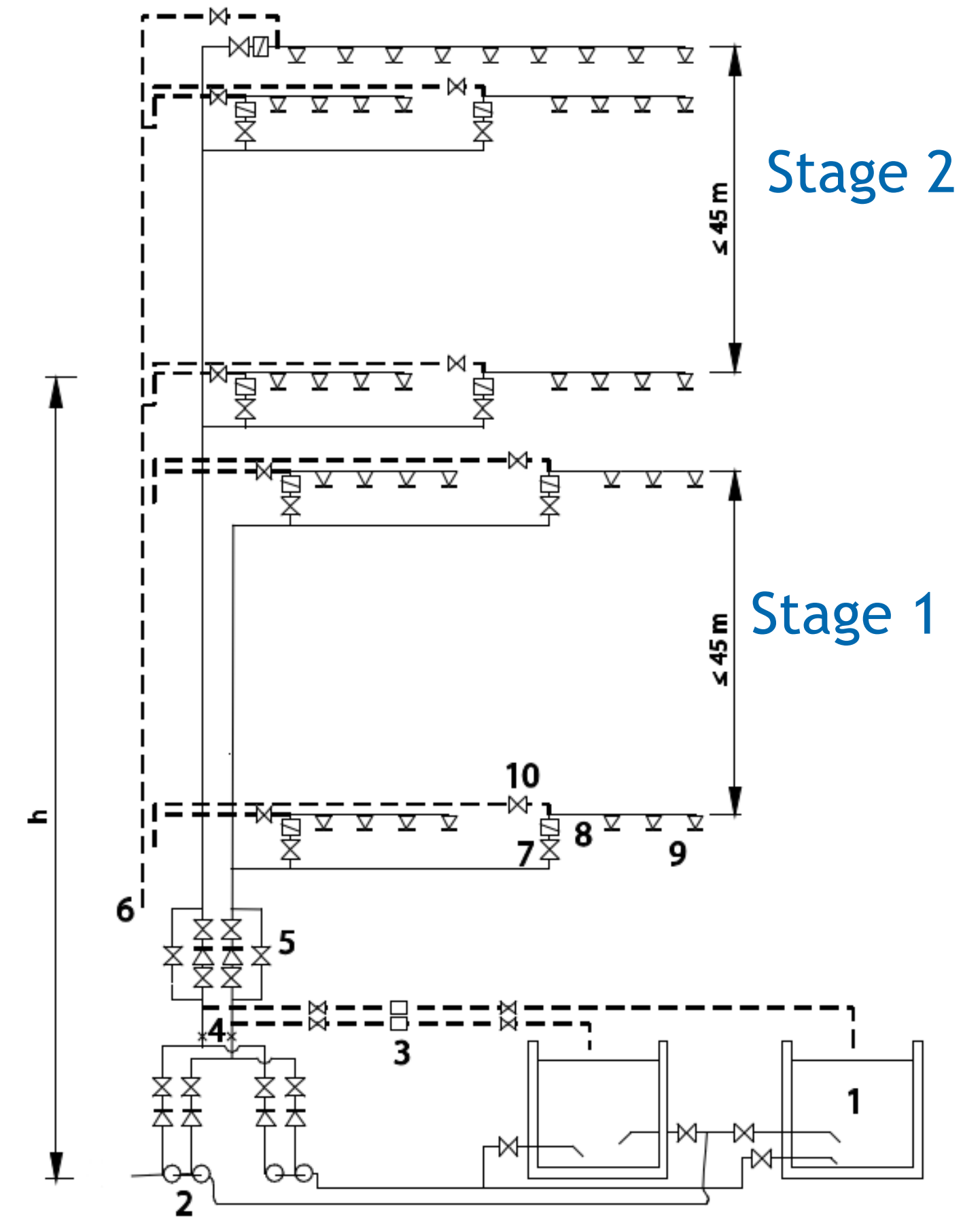
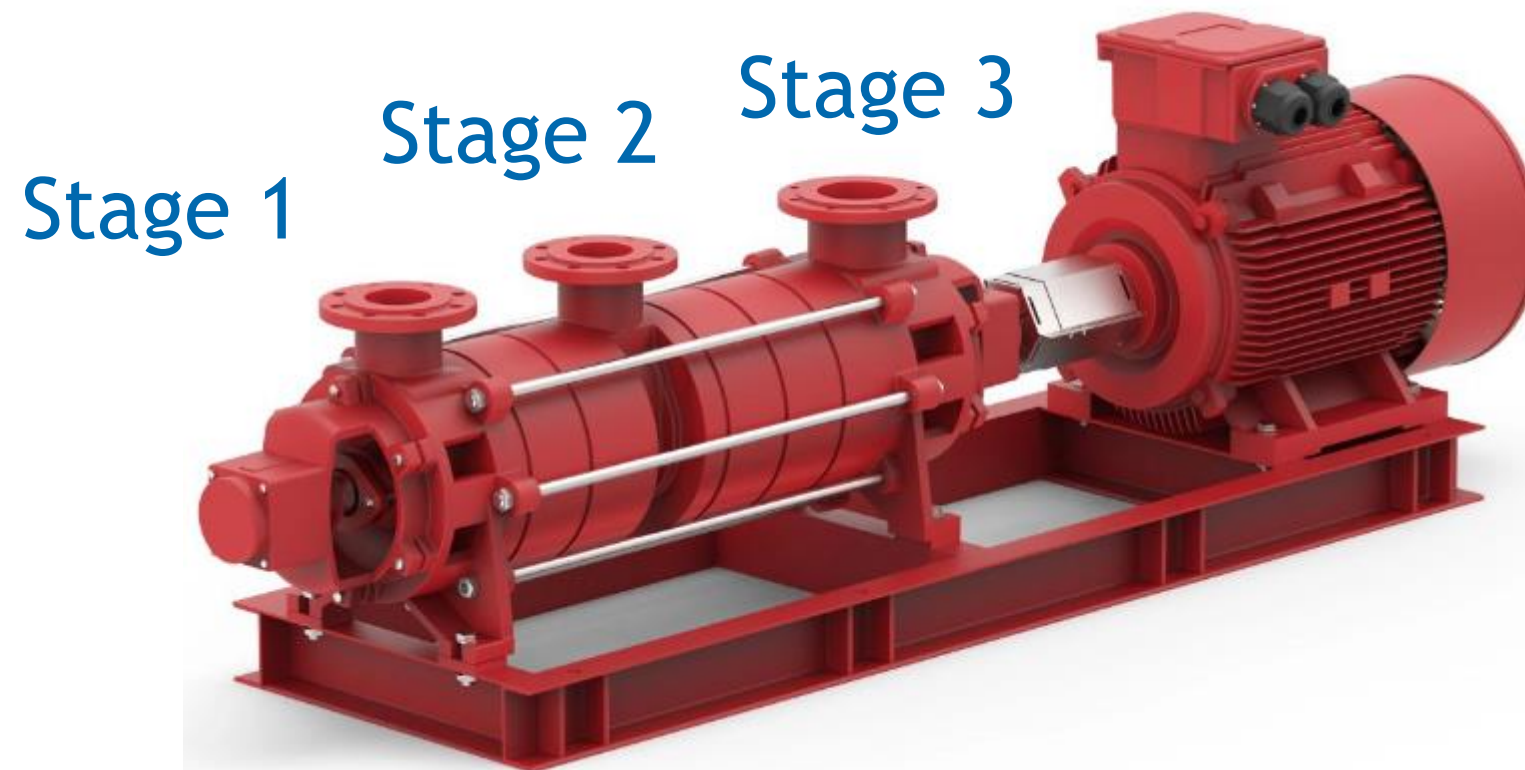
- Extra reliability:
  - High rise sprinkler systems shall conform to the requirements for Ordinary Hazard Group III protection (also for OH1 hazards)
  - Water supply (The system shall have at least one superior single water supply)



# Practical aspects - water supply

## Sprinkler pump > 45 meters:

- Multi pressure stages
- Each a separate riser -> space in technical shafts
- Multi outlet pumps (or a pump for every pressure stage)
- Large pumphouse
- Power supply
- Or use Pressure Reducing Valves to regulate pressure



# Practical aspects - Visual aspects

## Visual aspects:

- Sprinkler is okay, but we don't want to see the system:
  - Concealed sprinkler heads
  - Sprinkler piping in floor and walls

## Complicating factors:

- No suspended ceilings (sometimes in corridors)
- Concrete floors
- Wooden floors
- Layout changes
- No paint on coverplates



# Practical aspects - piping in flooring

## Complicating factors:

- Steel pipes can't be used in concrete
- Plastic pipe is possible:
  - Within approval
    - Size limitations
    - Pressure limitations ->

Sizes: 32 x 3 and 50 x 4.5 (DN25 & DN40)

Pipe Length: 50m Coils or 5m Straight lengths

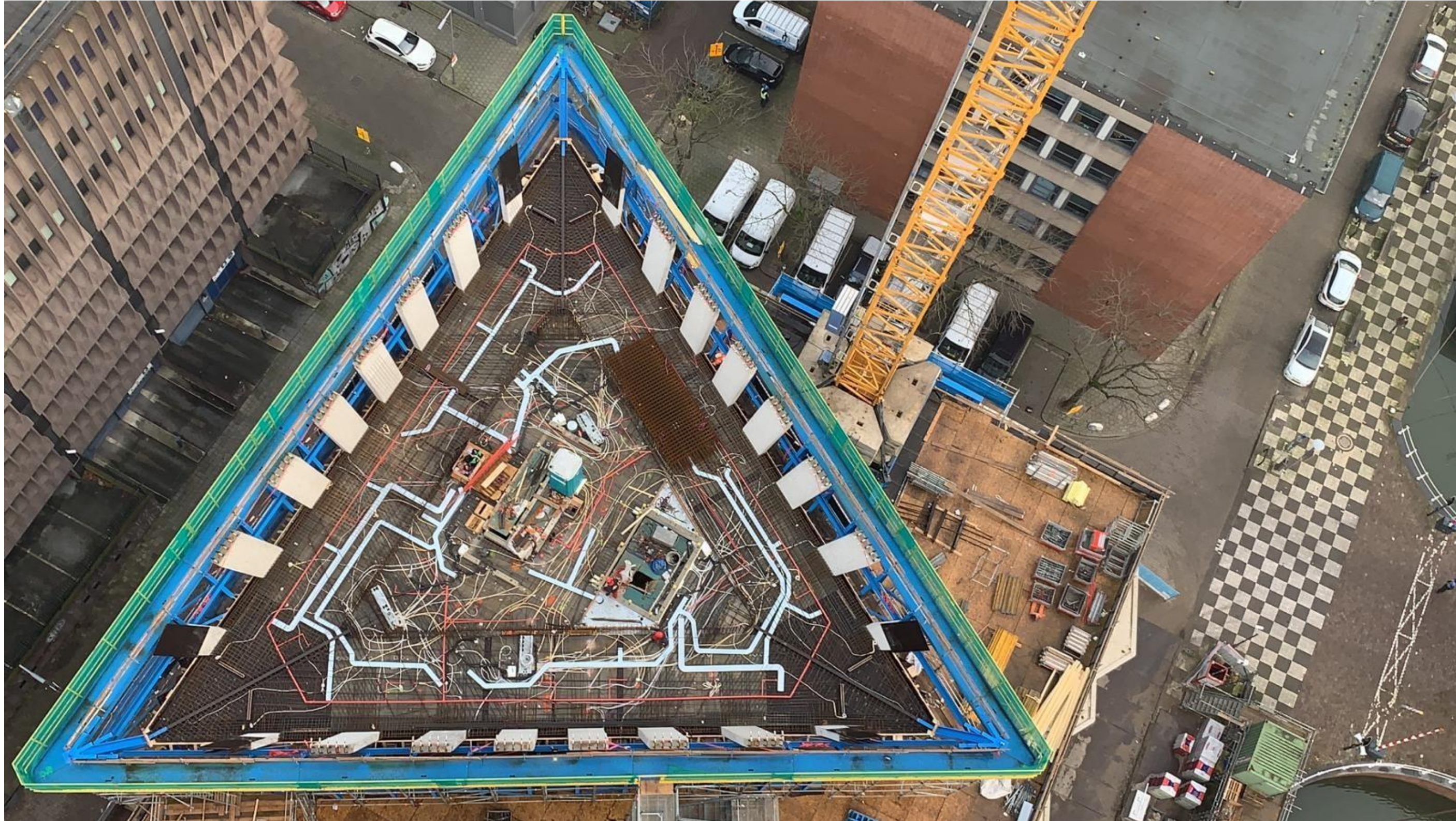
Maximum Operating Pressure: 10 bar (145 psi)

Maximum Temperature Rating: -10° - 40°C (14° - 104°F)

Colour: Bright red in colour as conforming to RAL 3000

# Practical aspects - piping in flooring

Casanova Rotterdam:



# Practical aspects - piping in flooring

Casanova Rotterdam:



# Practical aspects - piping in flooring

Casanova Rotterdam:



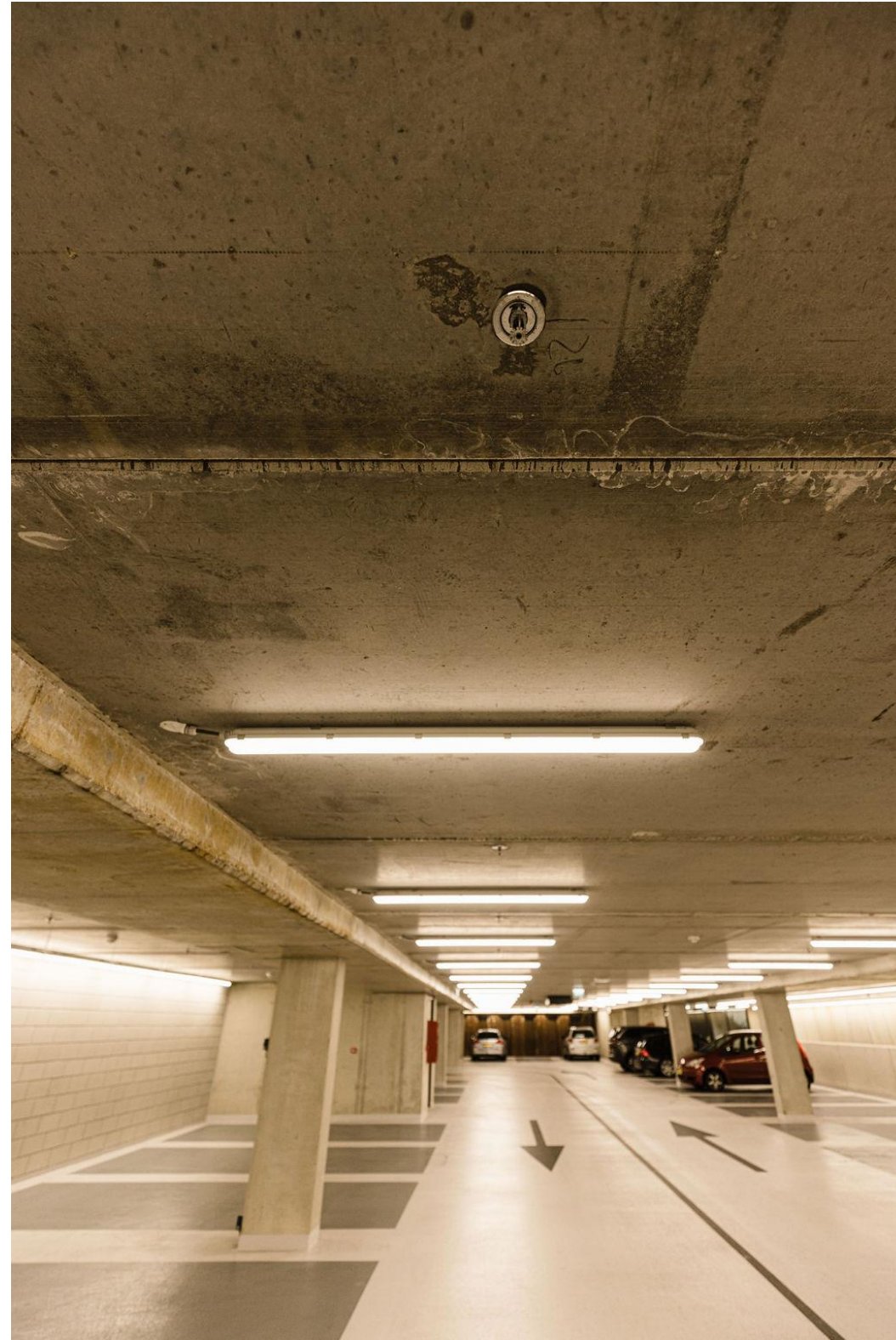
# Practical aspects - piping in flooring

Meelfabriek Leiden:



# Practical aspects - piping in flooring

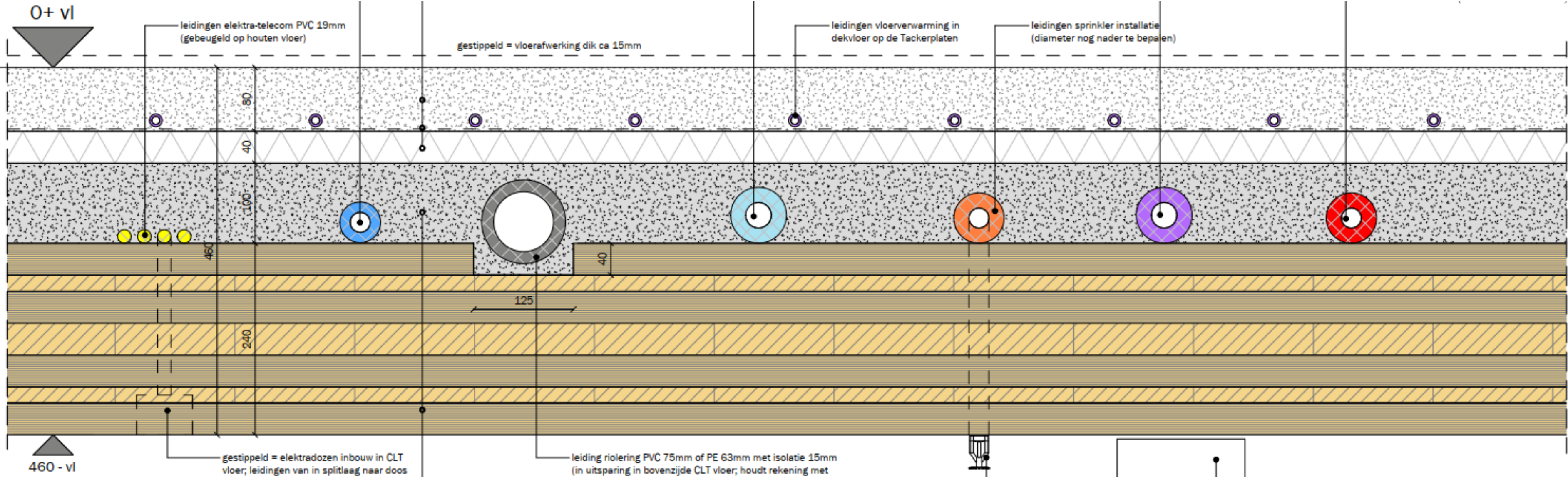
Meelfabriek Leiden:





# Practical aspects - piping in flooring

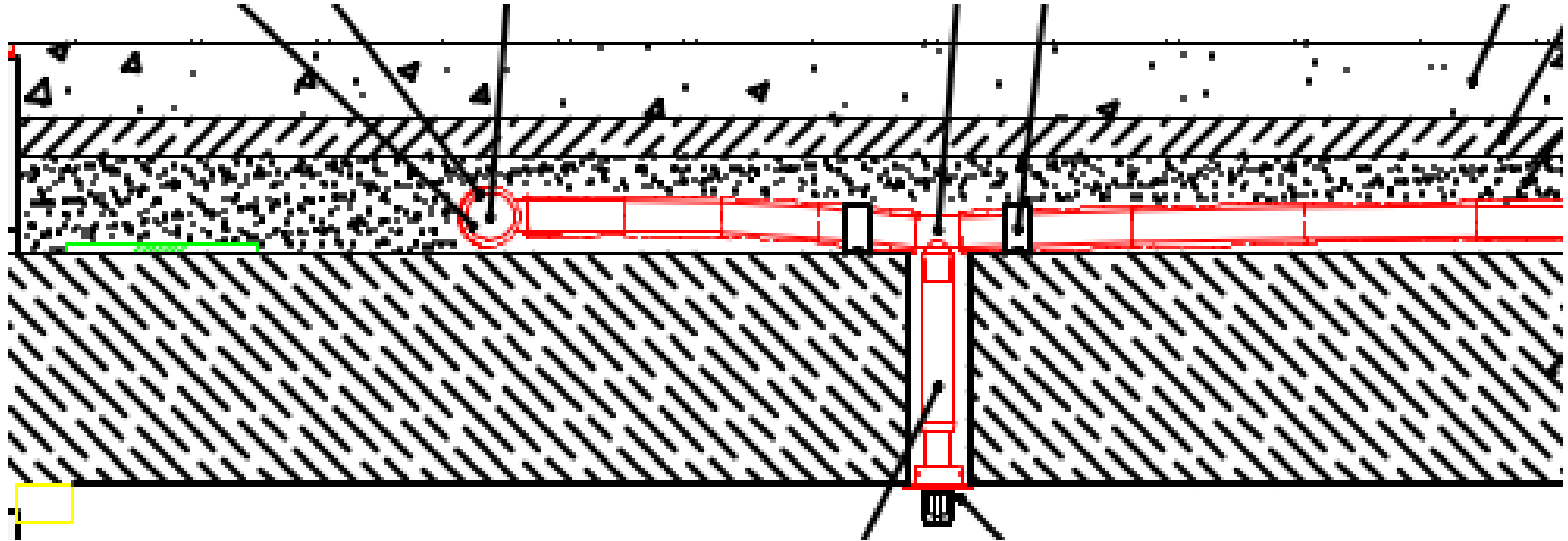
## SAWA Rotterdam:



# Practical aspects - piping in flooring

## SAWA Rotterdam:

- Engineering detail / BIM 3D



# Practical aspects - concealed heads

## Use should fit sprinkler approval:

- Standard concealed sprinkler we know from offices, not approved in a massive ceilings.



## Solutions:

- Use heads approved for in massive floors
- Use flush sprinkler heads with cover



# Thank you

# Questions?

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