Innovations: automatic warehouses

‘Waardering van sprinklers’ - 17 mei 2022

RESILIENCE IS A CHOICE.

Warehouse 1990s

The 1990 vision of the future

Dotcom Bubble – the internet – everything changed

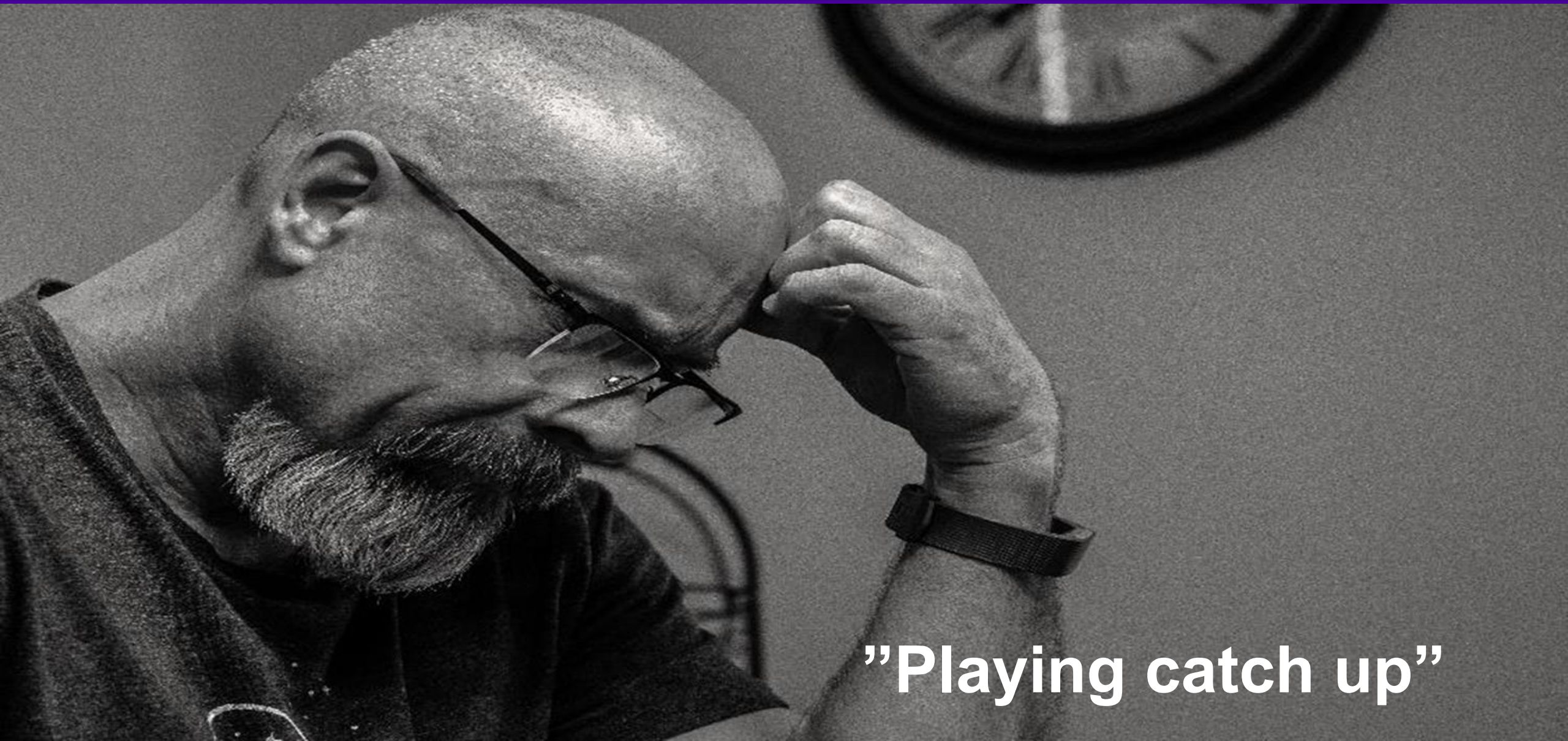
- Online
- B2C & B2B
- 20%
- 8% to 28%
- 2 days

Warehousing and logistic change

The changes

- Scale – warehouse size increasing
- Taller
- People and automation
- Levels - platforms
- Containers
- Ignition source in the array

What does that all mean for fire protection?



Firefighter – suppression - extinguishment

A journey

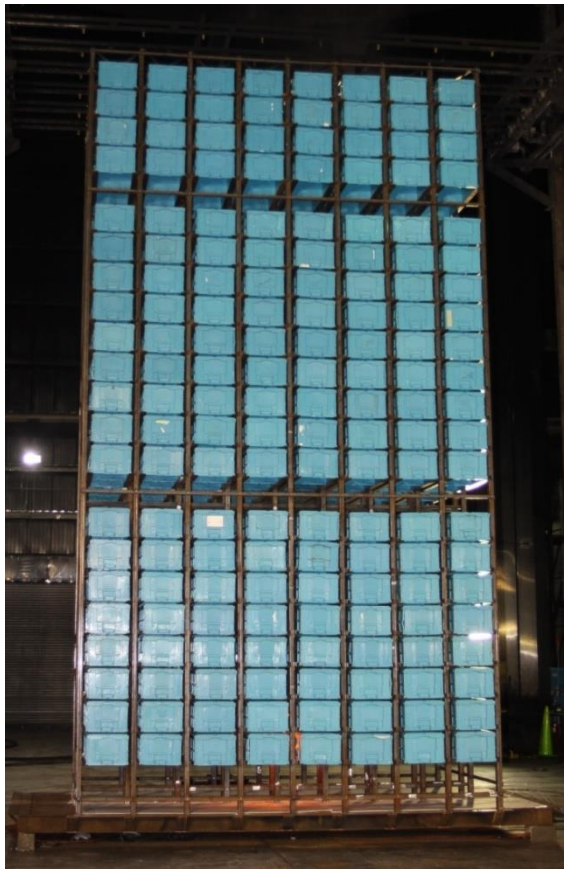
Things getting automated

ASRS – challenges

- Dense storage
- Narrow aisles and flues
- Structure
- Storage containers – a lot of them!
- Protection – where do you put it?

Research - Standard rack ≠ Mini Load

Standard Rack

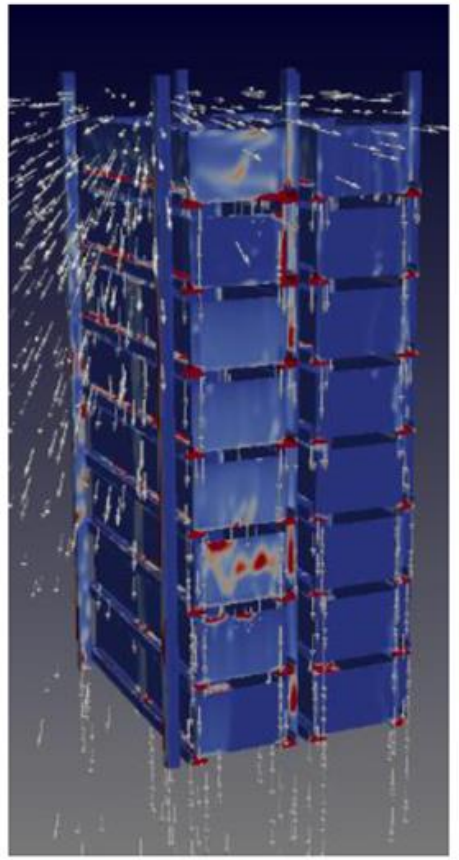


Mini Load

Water penetration

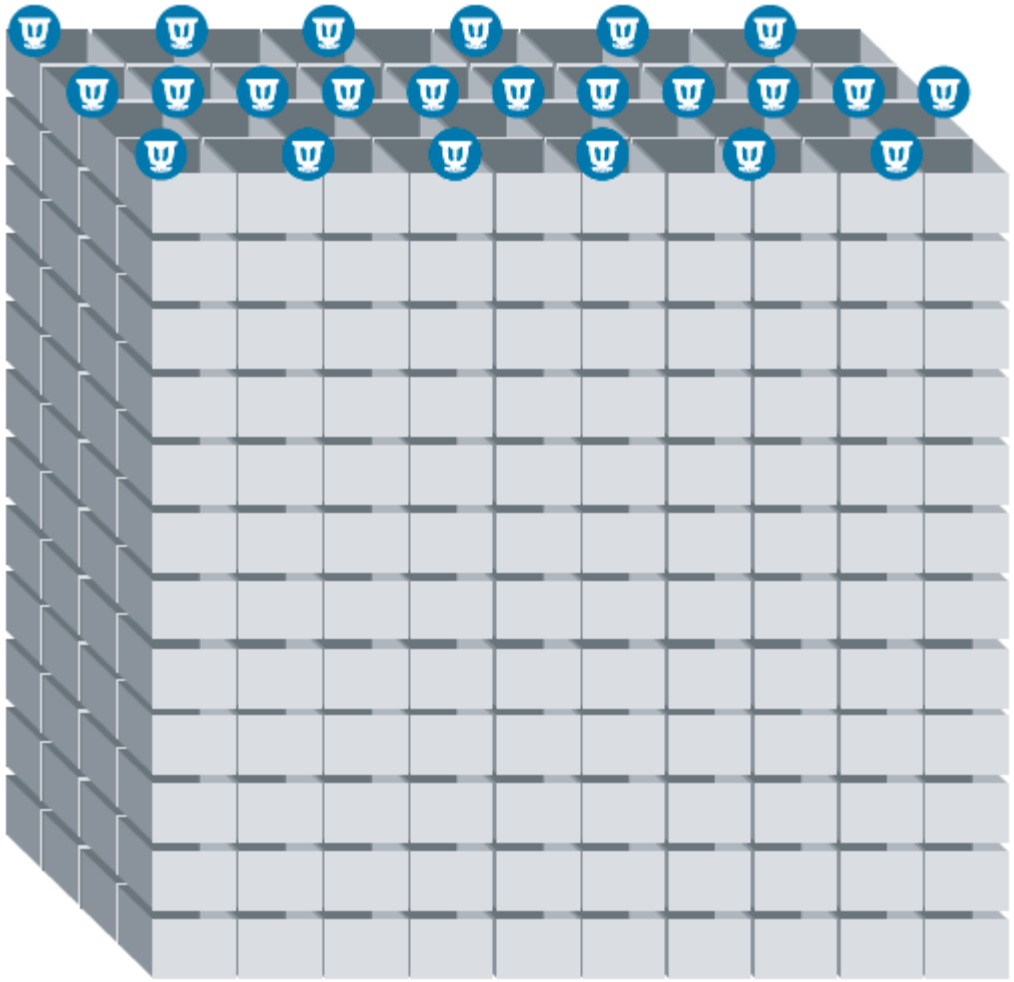
Fire Test Evaluation

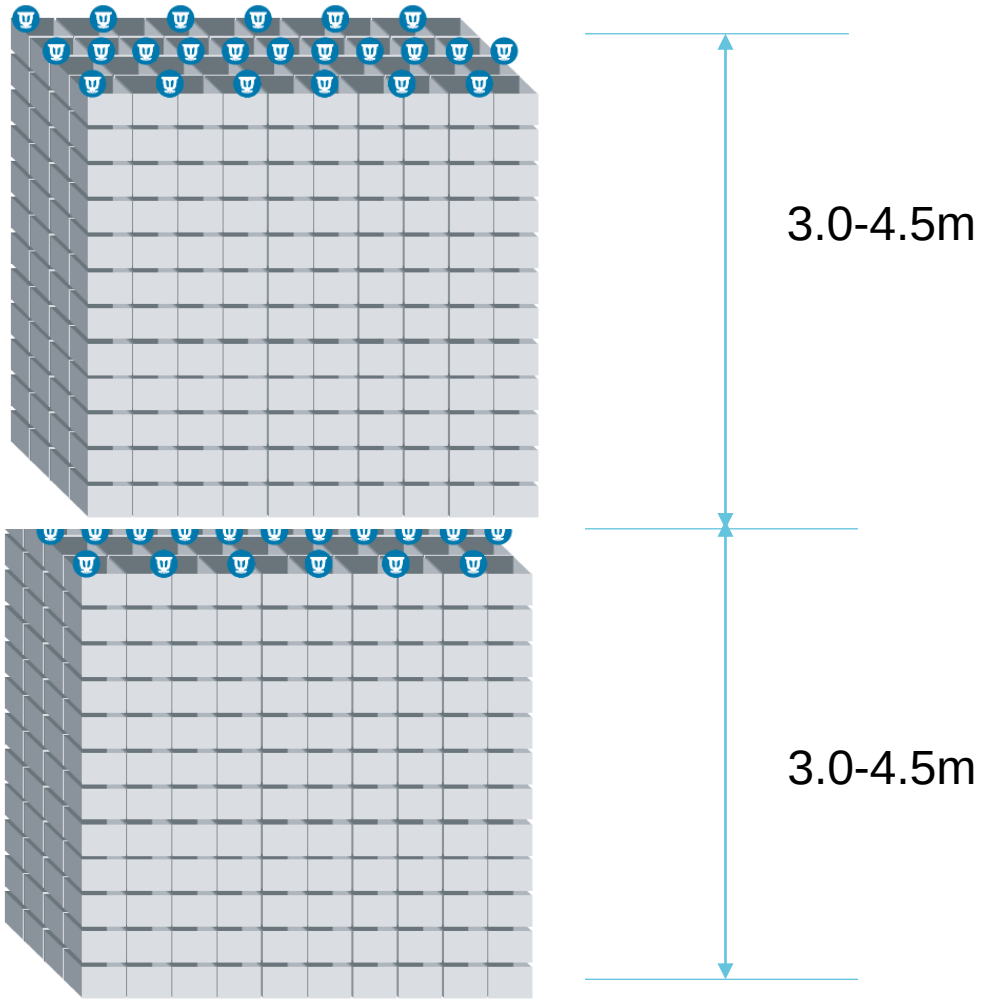
Water Transport Evaluation



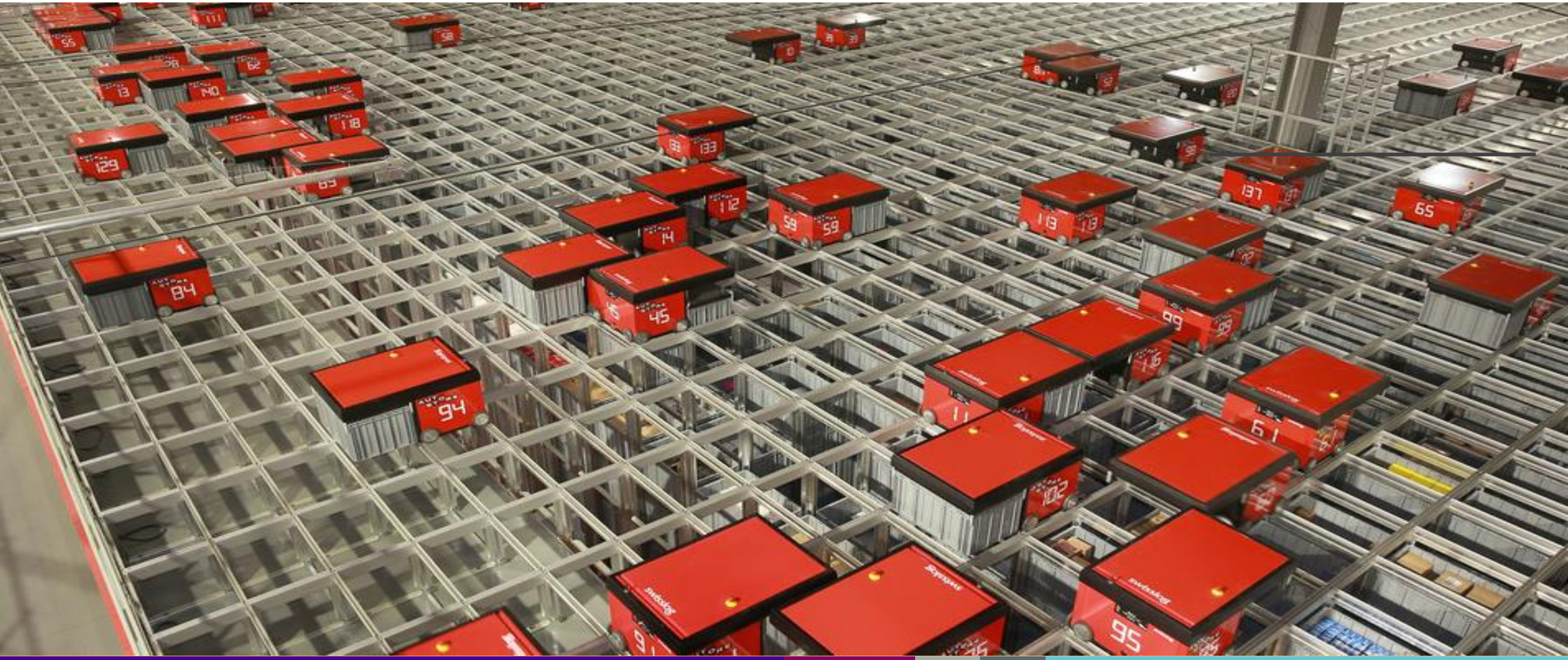
Water Transport Modeling

Modular – protection layers





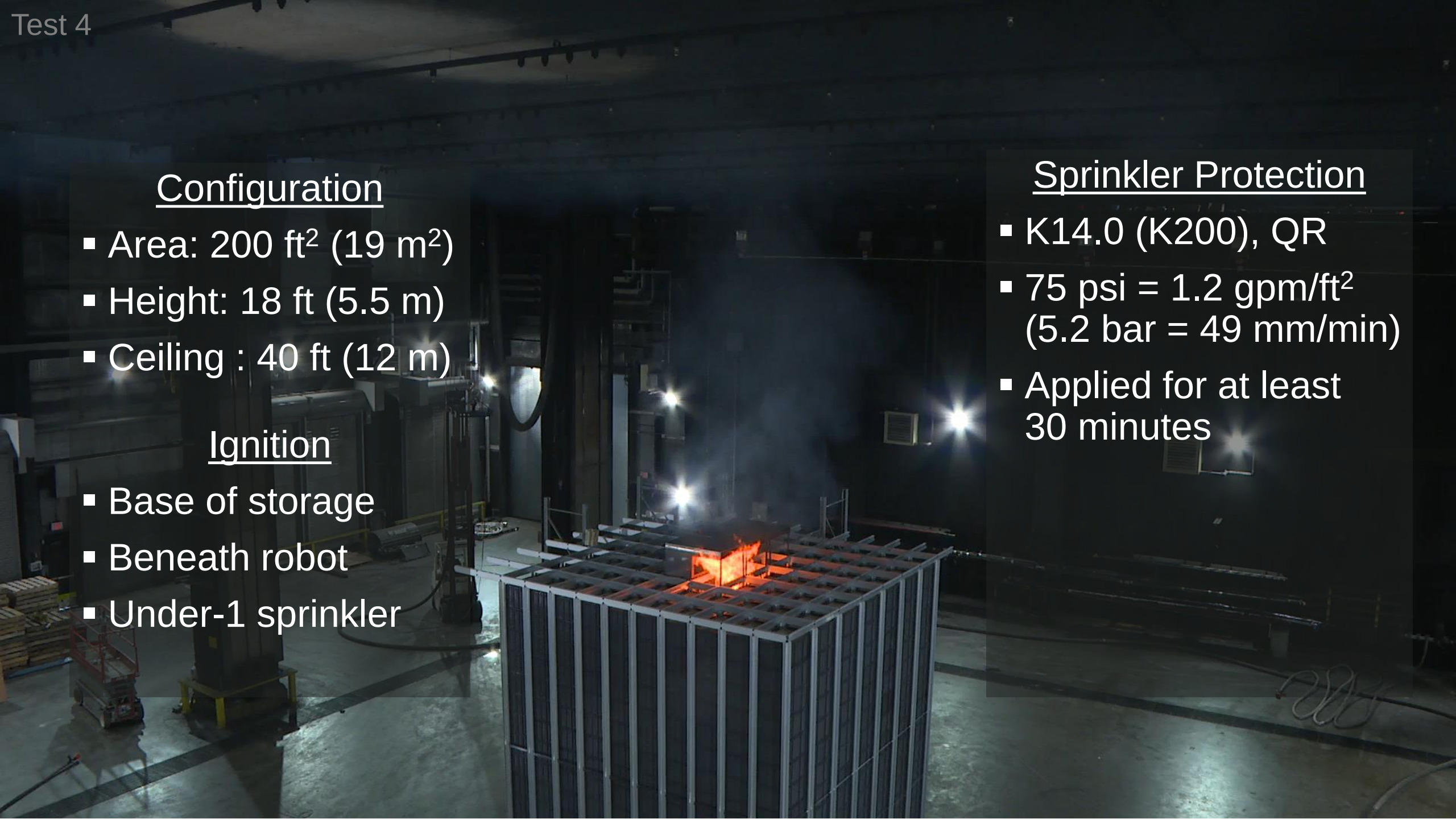
Top-Loading ASRS Design Features



Top-Loading ASRS Design Features

- Highly automated
  - Product transport using robots
  - Can be fully automated with 24/7 availability
  - Limited personnel
- Extremely dense storage arrays
  - Unique storage structures
  - Can store millions of containers
- Easily expandable construction

Test 4



Configuration

- Area: 200 ft^2 (19 m^2)
- Height: 18 ft (5.5 m)
- Ceiling : 40 ft (12 m)

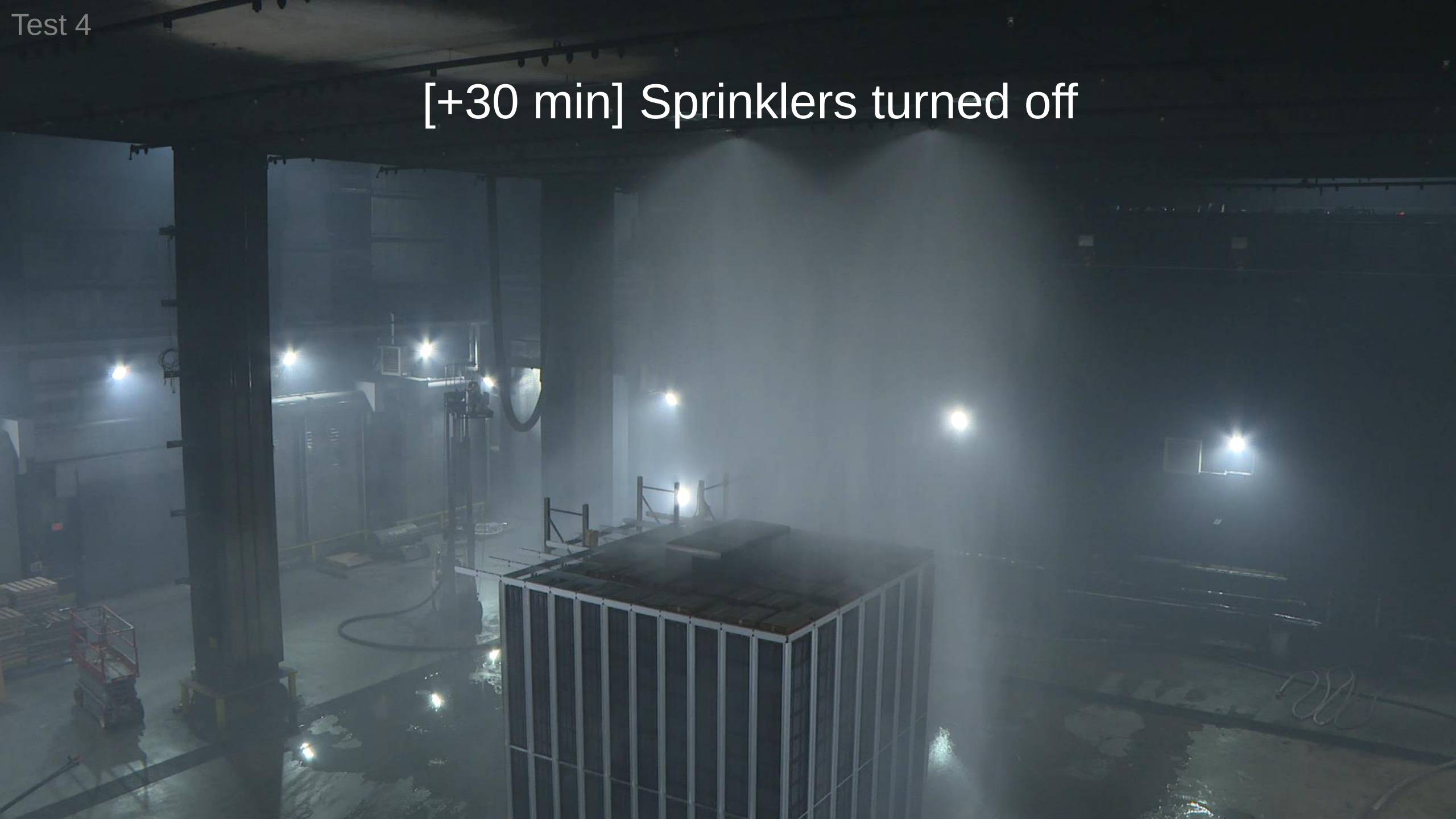
Ignition

- Base of storage
- Beneath robot
- Under-1 sprinkler

Sprinkler Protection

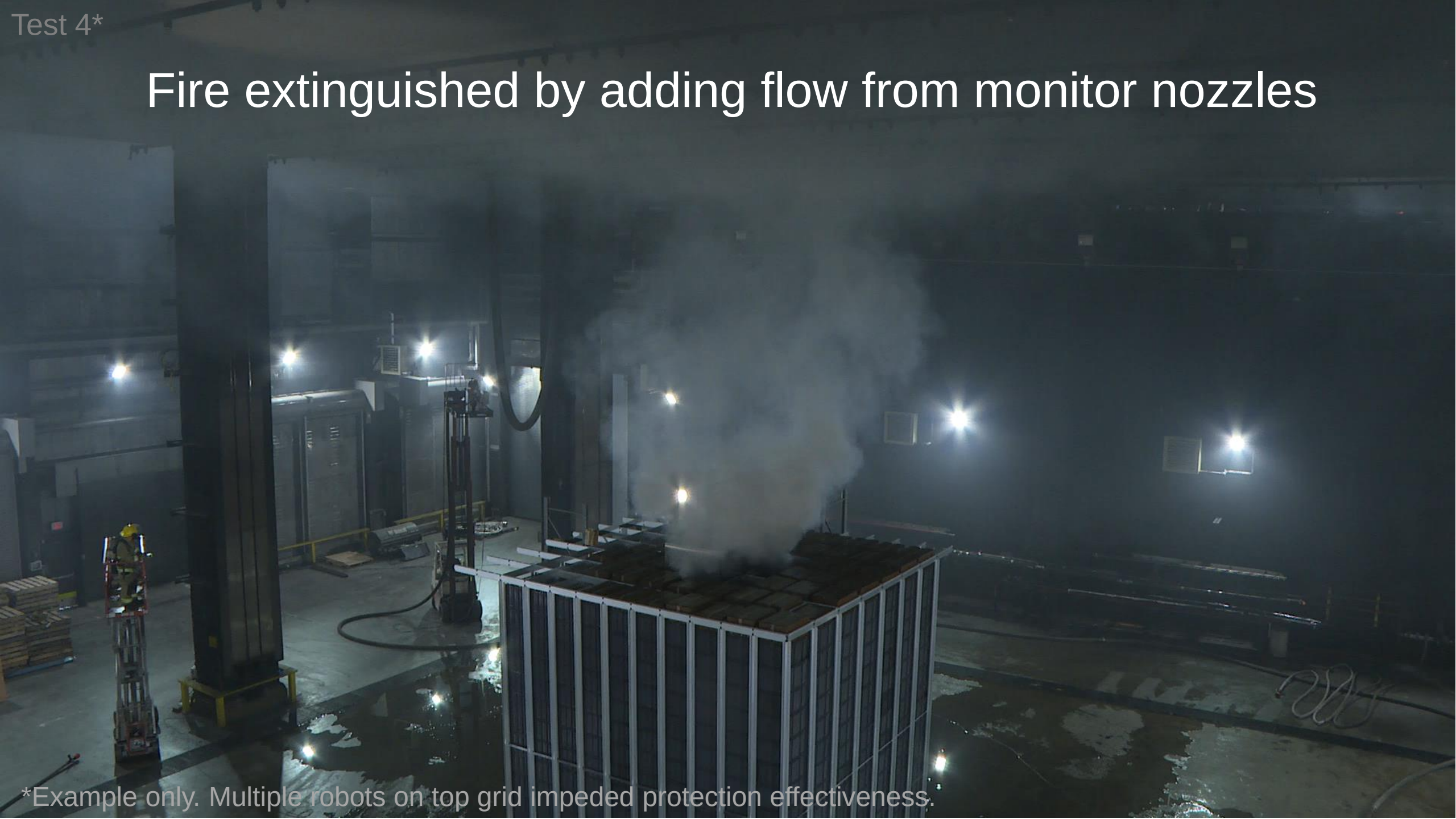
- K14.0 (K200), QR
- 75 psi = 1.2 gpm/ft^2 (5.2 bar = 49 mm/min)
- Applied for at least 30 minutes

[+30 min] Sprinklers turned off

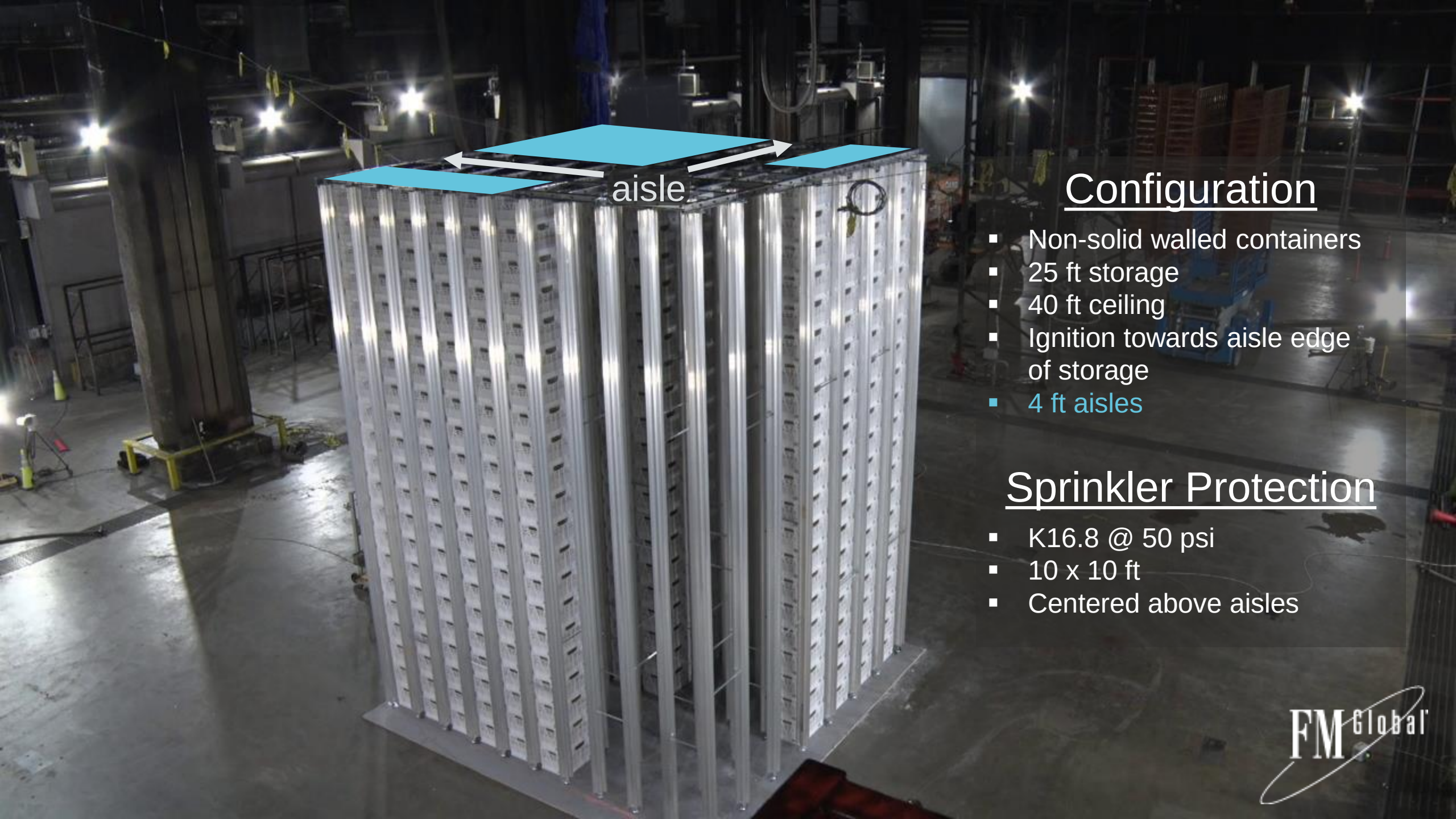


Test 4*

Fire extinguished by adding flow from monitor nozzles



*Example only. Multiple robots on top grid impeded protection effectiveness.

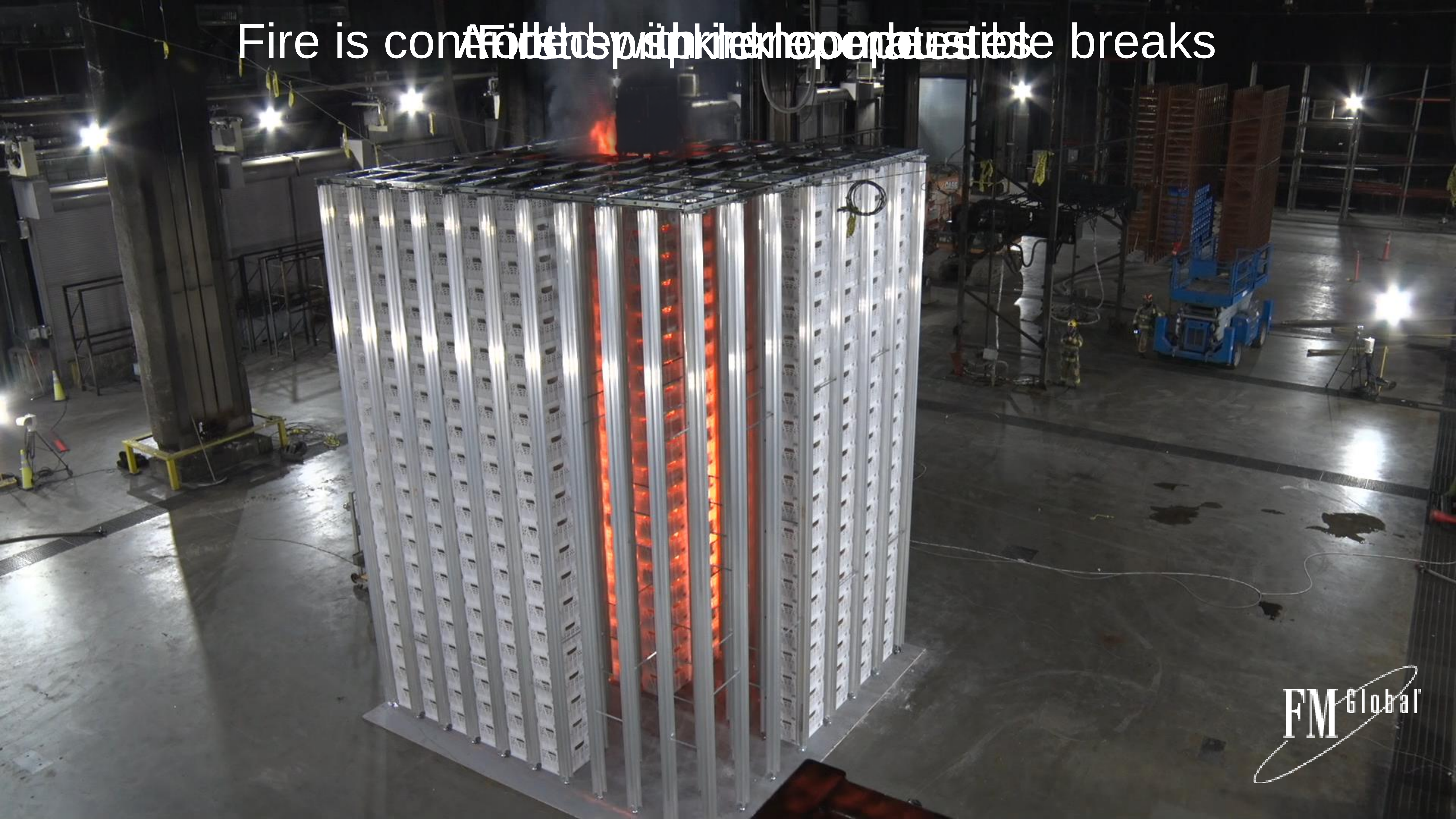


Configuration

- Non-solid walled containers
- 25 ft storage
- 40 ft ceiling
- Ignition towards aisle edge of storage
- 4 ft aisles

Sprinkler Protection

- K16.8 @ 50 psi
- 10 x 10 ft
- Centered above aisles


FM Global

Fire Test Summary

- Lessons Learned
  - Sprinklers suppress fire
  - Monitor nozzles can extinguish fire
  - Robots obstruct fire protection
  - Lower ceilings reduce hazard
  - Vertical barriers can stop fire spread
  - Aisles needed with non-solid walled containers
  - Overhaul is time consuming
- Final Extinguishment is achievable
  - Coupled automatic + manual protection

Future thoughts

- Reshoring – pressure for warehousing
- Labour markets
- The last mile
- The disruptors
- Protectable storage arrays?
- A need for change – carrier, container, design

Future thoughts

1. Early fire protection thinking

2. Early fire service engagement

3. Open to change - adapt

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