

Fire Sprinkler International 2022

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Understanding the Fire Risk of Emerging Technologies

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RESILIENCE IS A CHOICE.

From robotic warehouses to electric cars and wood skyscrapers, innovation is driving a new era of technological integration. Much of the focus is placed on commercial industries seeking to increase efficiency, reduce labour costs, enhance sustainability and expand the use of alternative energy sources. These innovations often pose new loss prevention challenges requiring new solutions. This session explores how we can enable the successful use of these emerging technologies through focused research, engineering and risk management.


We used to be restricted by
technology, now we're only
restricted by imagination

- Tom Roche



risk noun

 Save Word

\ 'risk \ 

Definition of *risk* (Entry 1 of 2)

- 1 : possibility of loss or injury : [PERIL](#)
- 2 : someone or something that creates or suggests a hazard
- 3
 - a : the chance of loss or the perils to the subject matter of an insurance contract
also : the degree of probability of such loss
 - b : a person or thing that is a specified hazard to an insurer
 - c : an insurance hazard from a specified cause or source
// war risk

Loss Prevention Definition

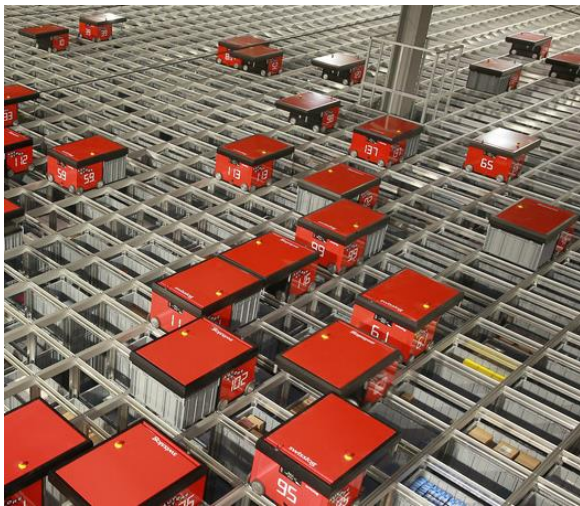
$$Risk = probability \times consequence$$

↓
frequency of a
loss event

↓
Property
Damage
+
Time
Element

Three Emerging Technologies

Case 1: Storage



Top-loading Automatic Storage and Retrieval Systems

Case 2: Renewable Energy



Lithium-ion Batteries + Energy Storage Systems

Case 3: Construction



Mass Timber Construction



Top Loading Automatic Storage and Retrieval Systems (TL-ASRS)

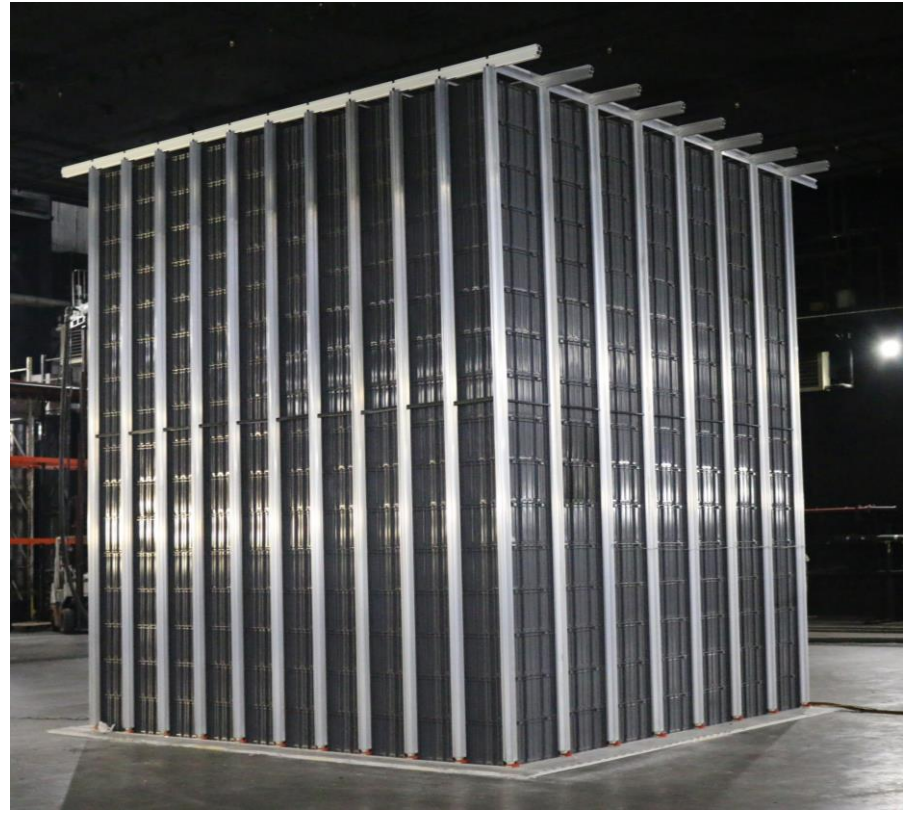
- What makes them different
 - Containers stored in tall stacks
 - Robots move along the top track
 - No aisle spaces
- Efficient and scalable
 - Fully automated
 - Extremely dense storage
 - Minimal personnel required





Traditional Warehouse

VS



Automated Warehouse

Significant increase in storage density
Potential for very long fire events
No access for *manual* fire fighting efforts

1. Sprinkler system to suppress the fire



2. Fire Service to extinguish the fire



Traditional Protection Strategy

1. Sprinkler system to suppress the fire



2. Fire Service to extinguish the fire



NEW Challenge:
Extremely dense storage
with minimal access areas

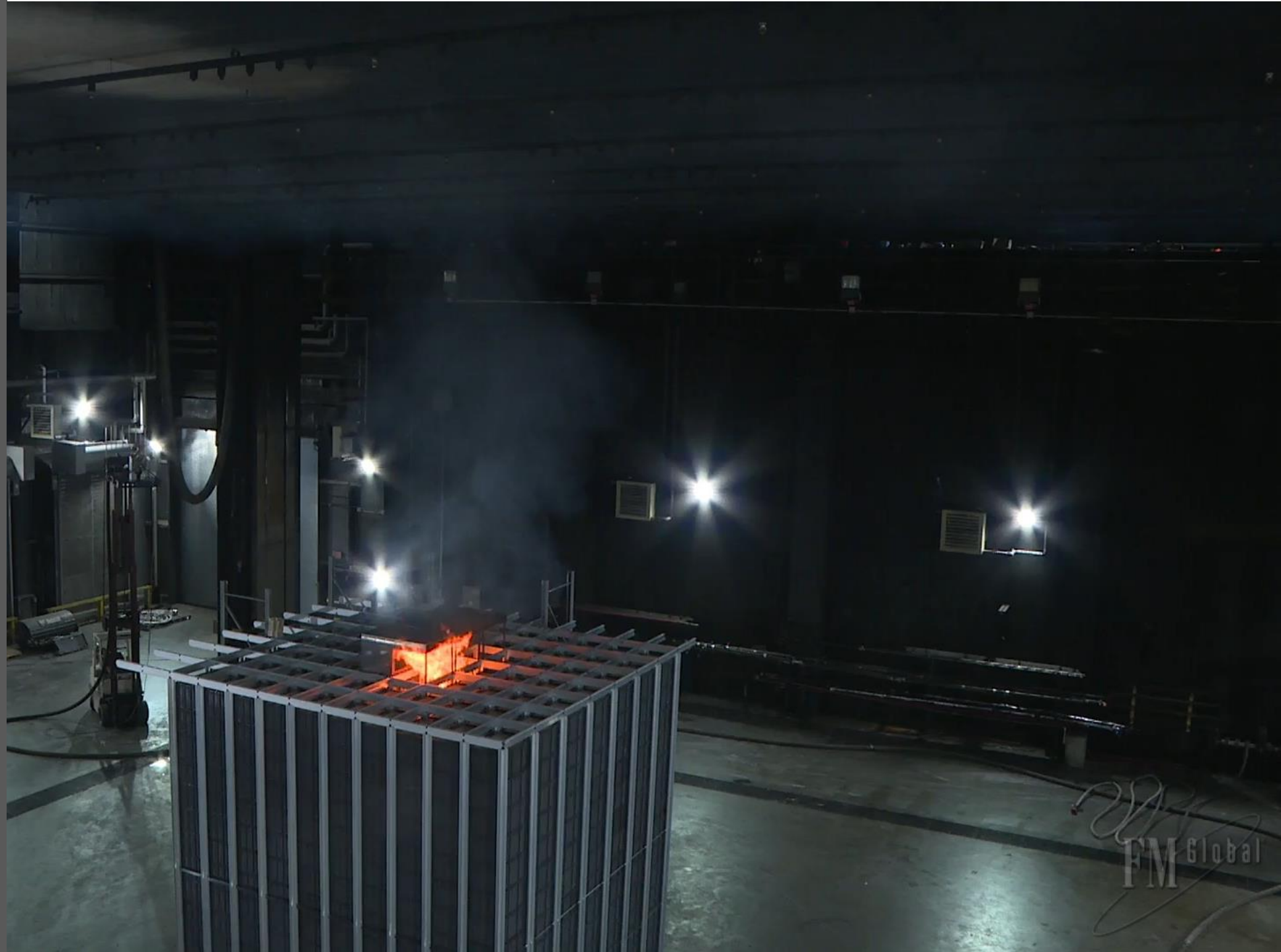
Final Extinguishment

Configuration

- Height: 18 ft (5.5 m)
- Ceiling: 40 ft (12 m)

Sprinkler Protection

- K14.0 (K200), QR
- 75 psi = 1.2 gpm/ft²
(5.2 bar = 49 mm/min)



Configuration

- Height: 18 ft (5.5 m)
- Ceiling: 40 ft (12 m)

Sprinkler Protection

- K14.0 (K200), QR
- 75 psi = 1.2 gpm/ft²
(5.2 bar = 49 mm/min)

+ 30 min

- Fire appears extinguished
- Sprinklers turned off
- Evidence of deep-seated fire observed



Traditional Strategies

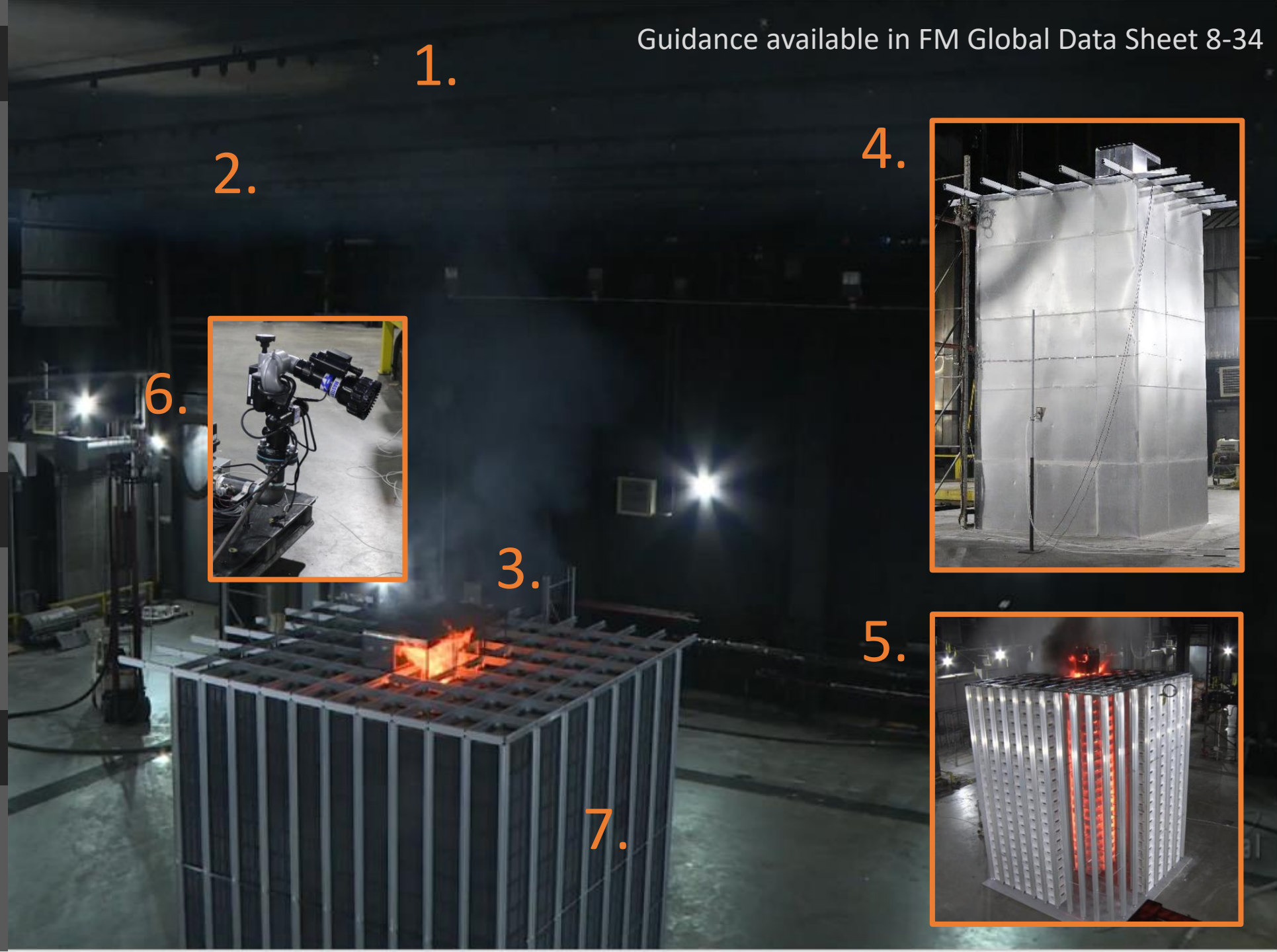
1. Increase sprinkler protection
2. Lower ceiling
3. Remove obstructions
4. Barriers
5. Aisles

Final Extinguishment

6. Monitor nozzles
7. Remove combustibles

Pre-incident Planning

8. Fire service access
9. Response strategy



Lithium-ion Batteries and Energy Storage Systems



BATTERY STORAGE

- Aligns with sustainable energy sources
 - High energy density, long life, powerful
 - Financial incentives often available
- Wide range of applications
 - Consumer electronics
 - Electric vehicles
 - Backup power in data centers
 - Industrial/grid scale applications



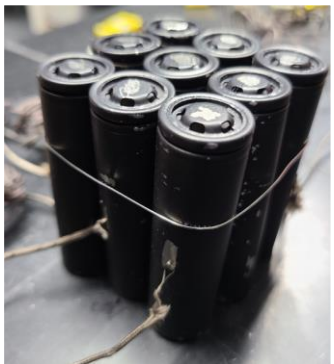
BATTERY STORAGE

- What makes them different
 - Self ignition (thermal runaway)
 - Fire and explosion hazard
 - Constantly evolving technology
- Challenges to existing protection strategies
 - Limited proven options
 - Poorly defined goals
 - Long duration fire events



January 2013
Boston Logan Airport

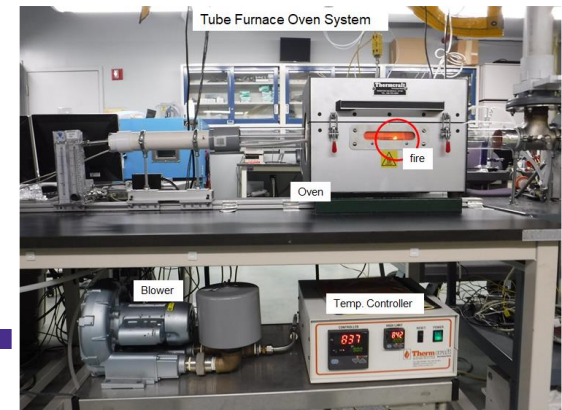
FM Global Research Approach



Explosion
Hazard



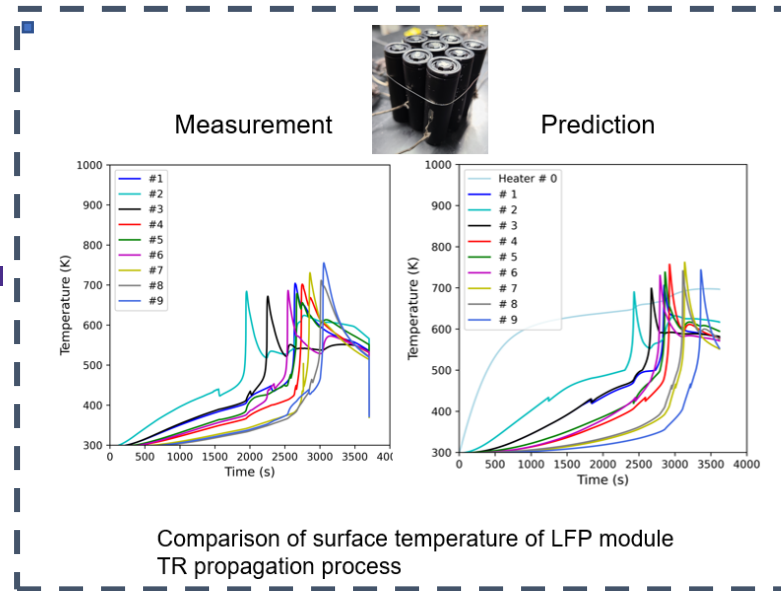
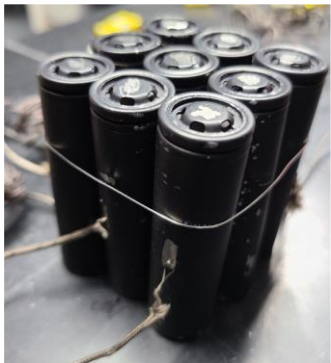
Fire
Hazard



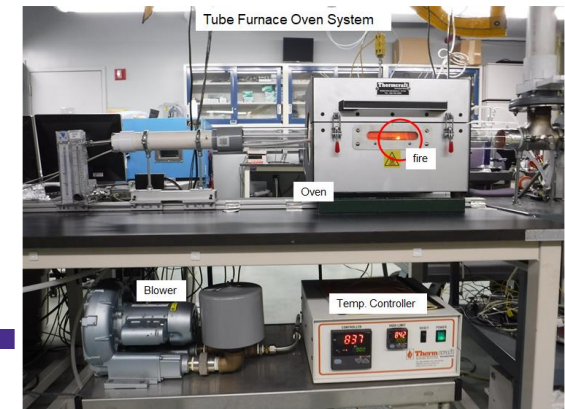
Loss Prevention



Modeling



Predictions



Understand the Protection Goals

Save the Building



Save the Equipment



In-module Protection

System Design

Prevent the Incident

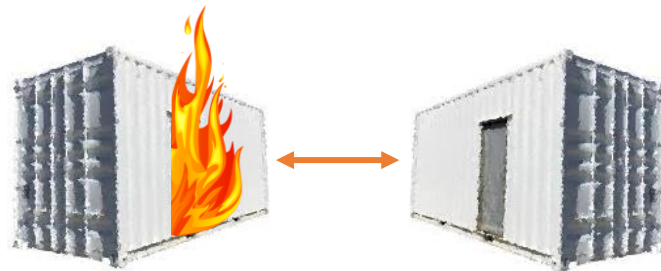
BMS

Early Detection

Product Design

Address Other Hazards

Fire Incident Response



Reduced Loss Expectancy





- Renewable sources
 - Prefabrication
 - Expedited construction
 - Looks nice!
-
- Combustible
 - Limited building codes
 - Minimal loss history

Still an Emerging Market

1. Cross laminated timber (CLT)
2. Nail laminated timber (NLT)
3. Glue laminated timber (Glulam)
4. Laminated veneer lumber (LVL)



3. Glulam

2. NLT



4. LVL





Great Fire of London
1666



Great Boston Fire
1872

Protect your combustibles!

Identified Knowledge Gaps



1. Material-of-Construction



2. Damage Scenarios (fire / water)



3. Construction Details (joints / connections)



4. Repairability

The Role of Research

- **Emerging technologies:** Are being driven by increased automation, data processing, and sustainability initiatives
- **New Opportunities:** Exist for new protection solutions
 - Layers of protection to reduce the risk of loss
 - Prevention, detection, abuse mitigation
 - Active and passive protection
- **Enable:** Challenges can be mitigated with targeted research

- A few big fires can halt an entire industry -

Thank you. Any questions?

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