

Mind the Gap Between FM Global and Building Codes

International Association of
Cold Storage Construction

M.R. Mannex, PE
Chief Engineering Technical Specialist
FM Global

4 Nov 2011
Las Vegas NV

FM Global

Overview

- **Who is FM Global**
- **Why different from codes?**
- **Fire hazards**
- **Construction - wind, collapse**
- **Testing**
- **Project coordination**
- **FM Approvals**

Who is FM Global

- Mutual insurance company – owned by our clients
- In business 176 years
- Purpose – Client value conservation by minimizing the risk of property damage and business interruption.

Organization

- Research – the basis of our standards
- Approvals – end use components and systems as they are installed
- Testing – feeds Research and Approvals
- Information delivery:
 - Field engineering
 - FM Global Data Sheets
 - Approval publications

Our Role

- **We are:**
 - a consultant
 - providing advice
 - in a partnership with our (and your) client
 - using flexible guidelines
- **We are not:**
 - an Authority Having Jurisdiction (AHJ)
 - telling the client what they must do
 - bound to prescriptive standards or codes.

Why are there differences in FM Global standards and Model Codes?

- **FM Global goal is to get the client back in business with minimal delay**
 - The resulting damage threshold is often small.
- **The Code's goal is mainly personnel safety:**
 - Get all personnel out of the building safely.
 - Business continuity not a focus.
 - The resulting damage threshold can be large.

NFPA and Model Building Codes

- **Purpose** – Main objective is life safety. Some property protection, and minor societal impact.
- **Basis** – Mostly, second or third hand testing (95% from FM Global), sometimes opinions.
- **Method** – **Rhetorical consensus**: corporations, contractors, fire equipment manufacturers, fire departments, and anyone else with a vested interest
- **Implementation** – prescriptively enforced by AHJs who are sometimes not specifically trained for this.

FM Global Engineering model

- **Purpose** – Client value conservation. Focus on minimizing property damage.
- **Basis** – First hand **research and testing**
- **Method** – Research and standards work together quickly
- **Implementation** –
 - Advice at each site is **customized on a scenario basis to the local conditions**
 - Sometimes we allow less than our standards, or ask for more – **local engineers use sound engineering judgment based on FM Global's knowledge.**

Performance Based Implementation

- Advice at each site is **customized** on a **scenario basis** to the **local conditions**
- Sometimes we allow less than our standards, or ask for more – **it's the local engineer's call.**
- This can look like inconsistency – it's not, it's tailoring to the situation.

Can we compare the NFPA and FM Global standards?

- Too many options to compare them comprehensively with real equivalence.
- The standards differ in general approach and terminology.
- Example: storage sprinklers
 - Encapsulation – NFPA = yes, FM Global = no.
 - ‘Storage Sprinkler’ – NFPA = no, FM Global = yes.
 - Adjustments and Interpolation – NFPA = yes, FM Global = no.
 - e.g. - storage height, aisle width, steel column protection

Codes and NFPA standards associated with refrigerated storage

The following is not intended to be a complete research of the codes. That's not FM Global's job, that's the job of a consulting engineer or architect. This is only an example and I'm sure I missed something. The point is, one or the other is not more important or better, they are different for good reasons.

Standards for storage sprinkler systems

FM Global Data Sheet

NFPA standard

- 8-9, *Storage of Class 1, 2, 3, 4 and Plastic Commodities* → • NFPA 13, *Standard for the Installation of Sprinkler Systems*
- 8-29, *Refrigerated Storage* → • NFPA 13
- 2-0, *Installation Guidelines for Automatic Sprinklers* → • NFPA 13
- 2-81, *Fire Protection System Inspection, Testing and Maintenance* → • NFPA 25, *Inspection, Testing and Maintenance of Water-Based Fire Protection Systems*

Standards for refrigerated construction

FM Global Data Sheet

NFPA standard

- 1-57, *Plastics in Construction* → • NFPA 5000, *Building Construction and Safety Code*
- 12-61, *Mechanical Refrigeration* → • NFPA 1, *Fire Code (refers to ASHRAE 15)*

Standards for exterior construction

FM Global Data Sheet

NFPA standard

- 1-57, *Plastics in Construction* → • NFPA 5000, *Building Construction and Safety Code*
- 1-29, *Roof Deck Securement and Above-Deck Roof Components* → • NFPA 5000
- FM Approval Guide → • (No analogue)

IMP acceptance test differences

- Model Codes
 - ASTM E-84 – “Steiner Tunnel test” – not applicable to thermoplastics or vertical orientations
 - NFPA 286 – “small room test” – 8 x 12 x 8 high ft. (similar to UBC 26-3, ISO 9705, UL 1715, FM Global Small Room Test)
- FM Global – full scale test and small room test
 - FM Global Approval Standard 4880, *Class 1 Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish Materials or Coatings, and Exterior Wall Systems.*
 - FM Global Approval Standard 4881 *Class 1 Exterior Wall Systems* (includes the fire performance from 4880)
 - Performed at the FM Global Research Campus

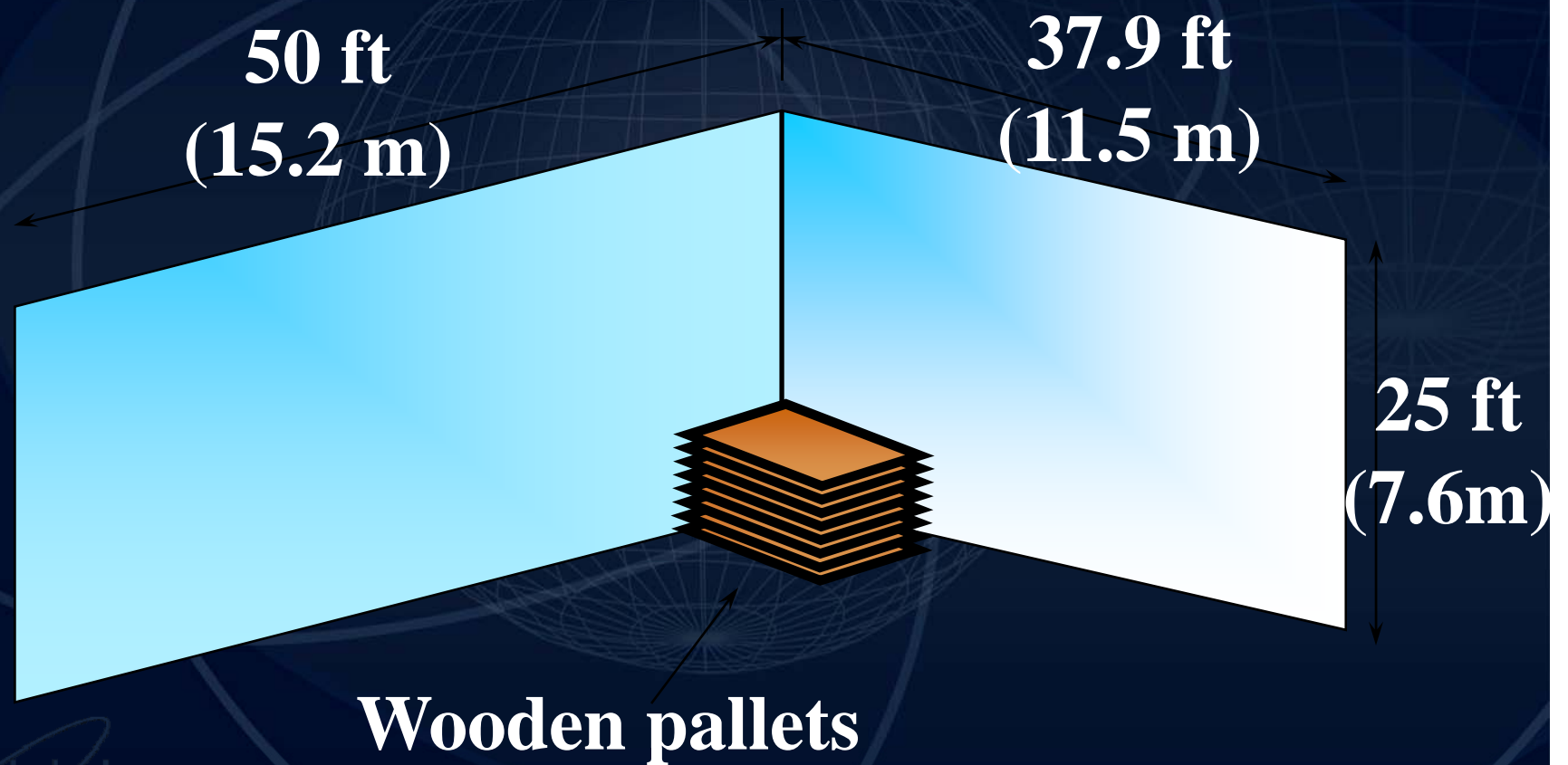
Testing done at our Research Campus



FM Approval scope

- Approval includes all hazards to which the final installation may be exposed
- For interior panels, meet fire hazards requirements
- If exterior walls or roof included, must also meet wind, hail, wind driven debris, exterior fire exposure, and collapse loads.

FMRC Corner Fire Test



12:22:47

00:00:00



1-07-99

000000

-20

-15

-10

25

20

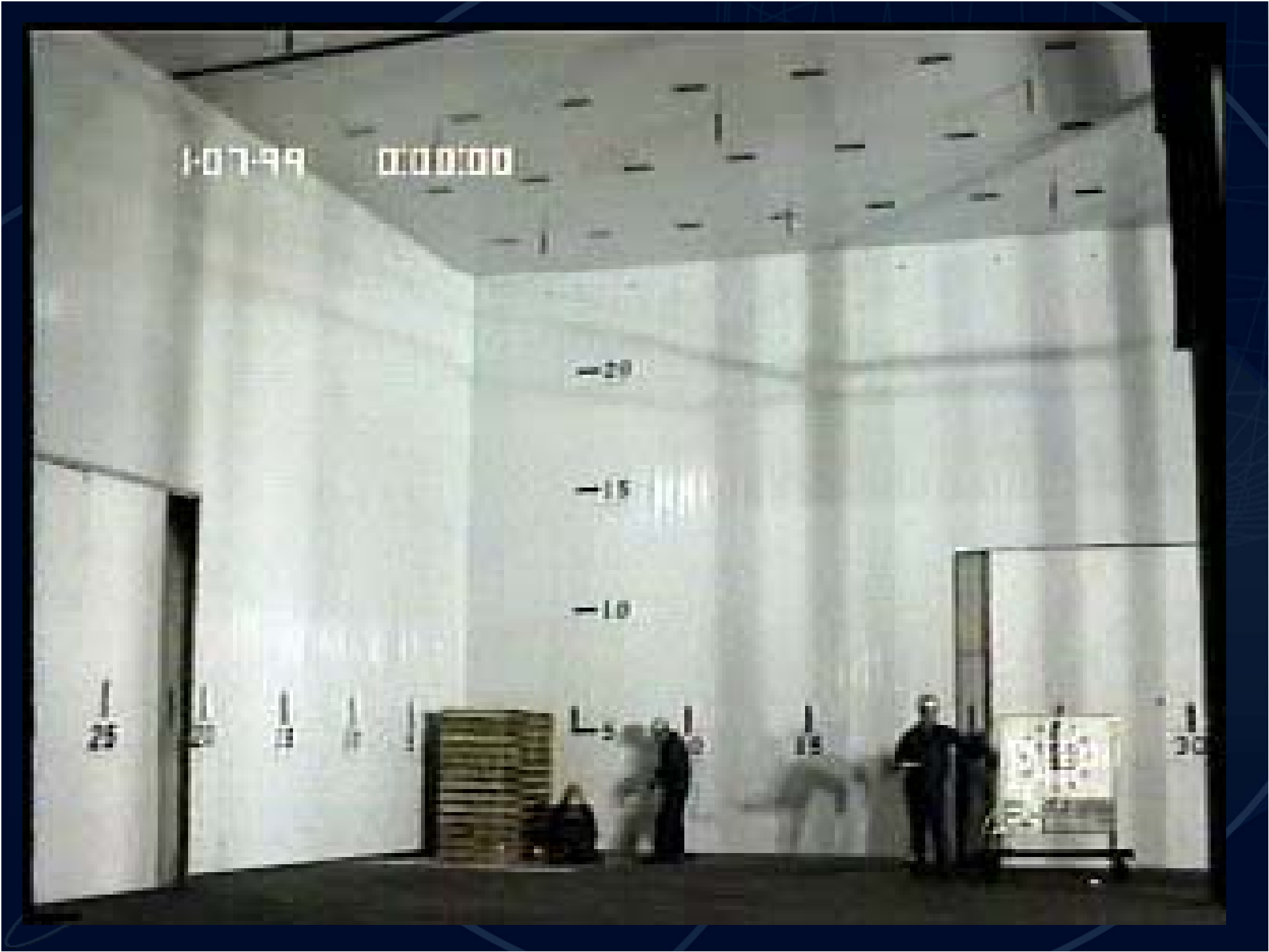
15

10

5

0

20



FM Approval Guide

Searchable free web-based database of 50,000 components, systems, and services, highest property protection standards.

- Procedure – proposal, testing, QC, contract, on-going QC

The screenshot displays the FM Approval Guide website interface. At the top, the logo "ApprovalGuide" is visible. Below the logo, there are search filters: "Country:" with a dropdown menu, a "Search" button, and "Certification:" with a dropdown menu. The main content area is titled "Division: Building Materials" and lists various product categories, each with a magnifying glass icon and a brief description of FM Approval Class Numbers. The categories listed are:

- Roofing Products and Assemblies (FM Approval Class Numbers 4435, 4450, 4451, 4454, 4470, 4471)
- Exterior Roofing and Siding (FM Approval Class Number 4880)
- Heat and Smoke Vents for Roofs (FM Approval Class Number 4430)
- Building Insulations - Walls and Ceilings (FM Approval Class Numbers 4411, 4651, 4880, 4881, 4882)
- Fire Protective Coatings
- Explosion Venting Construction (FM Approval Class Number 4440)
- Wall & Floor Penetration Fire Stops (FM Approval Class Number 4990)
- Fire Doors, Frames and Accessories (FM Approval Class Number 4100)
- Windstorm Resistant Fenestration (FM Approval Class Number 4350)
- Cooling Towers, System Components (FM Approval Class Number 4930)
- Air Handling, System Components
- Pipe Insulation (FM Approval Class Number 4924)
- Pipe Insulation**
- Pre-Insulated Pipe
- Pipe Insulation for Use in Cleanroom Occupancies in the Semiconductor Industry
- Expanded Plastic Packaging Material & Plastic Pallets
- Firestop Contractors (FM Approval Class Number 4991)
- Flood Abatement Equipment (FM Approval Class Number 2510)
- Wafer Carriers for Use in Cleanroom Occupancies in the Semiconductor Industry
- Skylights for Roofs (FM Approval Class Number 4431)
- Open Shelving for Racks (FM Approval Class 6914)

Roof Nav

Searchable free web-based database of roofing components and systems.

The screenshot displays the RoofNav website interface. At the top, there is a navigation bar with links for 'Help', 'Support', and 'Training'. Below this is a secondary navigation bar with links for 'PROJECTS', 'PRODUCT SEARCH', 'ASSEMBLY SEARCH', 'RATINGS CALCULATOR', 'REFERENCE MATERIALS', and a help icon. The main content area features three tabs: 'Classifications', 'Specifications', and 'Search Results'. The 'Specifications' tab is active, showing a form for 'Assembly Characteristics'. This form includes several dropdown menus and input fields: 'Roof System' (Single-Ply System), 'Application' (New Roof), 'Cover Securement' (Attached), 'Deck Type' (Steel), 'Slope' (0.125 in 12 (0.6°)), and a dropdown for 'Equal or Less'. Below this is the 'Assembly Ratings' section with dropdowns for 'Wind Uplift' (60), 'Internal Fire' (1), 'Exterior Fire' (A), and 'Hail' (MH). At the bottom of the form are 'Search' and 'Reset' buttons. The footer contains links for 'Conditions of Use', 'Privacy Policy', and 'Compatibility', along with the copyright notice '© 2005-2010 FM Approvals LLC. All rights reserved.'

Help · Support · Training

RoofNav

PROJECTS | PRODUCT SEARCH | ASSEMBLY SEARCH | RATINGS CALCULATOR | REFERENCE MATERIALS | ?

Classifications Specifications Search Results

Assembly Characteristics

Roof System: Single-Ply System

Application: New Roof

Cover Securement: Attached

Deck Type: Steel

Slope: 0.125 in 12 (0.6°) Equal or Less

Assembly Ratings

Wind Uplift: 60 Equal or Greater

Internal Fire: 1

Exterior Fire: A

Hail: MH

Search Reset

Conditions of Use · Privacy Policy · Compatibility

© 2005-2010 FM Approvals LLC. All rights reserved.

Sprinkler design

- Fire protection design – more demanding of either the construction or occupancy
- Construction - Non-FM Approved metal sandwich panel [DS 1-57]
- Occupancy – storage [DS 8-9]

Combustible sandwich panel fire hazards

- Material - Two basic kinds: Thermoplastic (e.g., polystyrene), and thermoset (e.g., polyurethane, polyisocyanurate).
 - Thermoplastic – higher fire hazard. When heated, melts and forms an ignitable liquid pool, fire. Melts 400F. Sprinklers alone cannot control a fire involving exposed expanded or extruded polystyrene.
 - Thermoset – When heated, chars and does not melt. Ignition 600-700F.
- Amount of fuel – thickness and density
- Facing – material and securement

Combustible contents (storage) fire hazards

- FM Global Data Sheet 8-9, *Storage of Class 1, 2, 3, 4 and Plastic Commodities*
 - Commodity – what is stored
 - Arrangement – how is it stored (e.g., racks, solid pile)
 - Ceiling height
 - Sprinkler type (temp, sensitivity, orientation, orifice size)
- Why not storage height?
 - FM Global – accounts for a storage heights that can fit
 - NFPA – protection may restrict storage heights

Sprinkler system types

- FM Global - Type of sprinkler system driven by temperature [DS 8-29]. Above 20°F – dry sprinkler system. Below 20°F – FM Approved Refrigerated Area Pre-action System
- NFPA 13 – Dry systems below 40°F. Special dry air supplies and pre-action detection required below 32°F.

Sprinkler system hot topics

- FM Global guidelines for some protection systems or sprinklers may not match the Underwriter Laboratories guidelines.
- Ceiling only (ESFR) wet systems w/ anti-freeze – allowable above 25°F. [FM Global DS 2-0, 2.4.7.1]
- New FM Approved dry systems which eliminate in-rack sprinklers for ceilings up to 45 ft.
- Ice plugs - air supply and inspection

Roof and exterior wall systems

- FM Global guidelines for wind forces are higher than many codes.
- Snow loading on roofs
- Exterior fire resistance [ASTM E 108, *Standard Test Methods for Fire Tests of Roof Coverings*]
- Wind driven debris in high risk windstorm areas (hurricanes).

Having trouble keeping track of all this?

- What should a design professional, contractor or supplier do?
- Is the project insured by FM Global? Ask building owner or call the local FM Global office (www.fmglobal.com)
- Not a FM Global client – use FM Approved components and standards at your own option, but FM Global cannot comment on any aspect of the project.

Project coordination services

- **Goal – avoid surprises** to our common client
- FM Global local office will provide consulting regarding FM Approved component selection and refrigerated area construction and design, fire protection design.
- Review plans and make site construction period visits.
- **Key - Get us involved as early as possible**, no later than schematics. No design professional can make recommendations which will not affect scope, schedule, or cost if they are brought in too late - neither can FM Global.

Resources

- ❑ www.fmglobal.com – Includes link to:
 - ✓ FM Approval standards – open source
 - ✓ FM Approvals – for obtaining product Approval
 - ✓ Data Sheets – free standards
- ❑ www.roofnav.com – free
 - ✓ Exterior roofing
- ❑ www.approvalguide.com – free
 - ✓ Sandwich panels
 - ✓ Sprinkler systems

Questions?

FM Global