The Safer Building Envelope by using FM Approved Products

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Content:

- FM Global: History and Presence
- FM Approvals: Testing and Qualifying
- The Building Envelope
- Impacts – Risks - Testing
- FM Approval
FM Global’s Philosophy

“It’s better to prevent a loss than recover from it afterwards.”

180+ Years of Experience
1835: A Man, A Mill and an Insurance Revolution
Factory Mutual Insurance Company

- “FM Global”
- Mutual Insurance Company
- Mono-Line Insurance
  - Commercial and Industrial Property
- Largest Insurer of Commercial and Industrial Property in the World
- Clients Include Approximately 1/3 of the Fortune 1000 Companies
- Over 1800 Field Engineers Around the World
- 0 Actuaries
The full Impact of a Loss

- Property Damage
- Business Interruption
- Supply Chain Disruption

- Reputation
- Community
- Environment
- Market Share
- Client Perception
- Tragic loss of Human Life
FM Global Group helps to reduce risks

HPR Concept

Ensure that all risks are known and maintained under a certain acceptable level
FM Global Loss Prevention Data Sheets

These are building engineering guidelines which are written to help reduce the potential for property loss. They are publicly available and can be downloaded here: [www.fmglobaldatasheets.com](http://www.fmglobaldatasheets.com).

The most applicable datasheets for facades and fires are:

- Data Sheet 1-1 Firesafe Building Construction and Materials.
- Data Sheet 1-4 Fire Tests.
- Data Sheet 1-20 Protection against exterior fire exposure.
- Data Sheet 1-57 Plastics in Construction.
A Basic, Yet Unique, Business Model

1. FM Global Field Engineer Inspects Client Facility

2. FM Global Field Engineer Identifies Potential Risks

3. Client and FM Global Client Service Team Work Together to Define Solutions
   - Solutions Involve Using FM Global Property Loss Prevention Data Sheets
   - FM Global Property Loss Prevention Data Sheets Recommend the Use of FM Approved Products

4. Client Implements the Best Solution for Them
324 Engineers
10,687 Serviced Locations
10,561 Visits
A Simple Solution for Property Risk

- The Right Products ….
  - (FM Approved Products)
    - (www.approvalguide.com and www.roofnav.com)

- …. Installed and Maintained Correctly
  - (FM Global Property Loss Prevention Data Sheets)
    - (www.fmglobal.com)
Research and Testing Campus

- Natural Hazards Lab
  • EQ Lab
- Fire Protection Lab
- Electrical Hazards Lab
- Materials Fire Labs
1886
1914
1924
1932
2017

FM Approvals

130 Years of Testing

[INSERT SECURITY CLASSIFICATION IN SLIDE MASTER VIEW]
• Globally recognized testing and certification organization.

• A Notified Body in the EU under the CPR (Construction Products Regulation) and ATEX Directive (Equipment used in Potentially Explosive Atmospheres).

• A Testing and Certification Organization recognized in Canada.

• Member of EOTA under the CPR.

• Member of IECEEx (test lab and notified body).
FM Approvals certifies products and services with a unique focus on:

- Objectively testing property loss prevention products and services and certifying those that meet rigorous loss prevention standards
- Encouraging the development and use of FM Approved products and services that improve and advance property loss prevention practices
FM Approvals’ Strategy

- Expand the availability of FM Approved products locally available and serviced, and accepted by local jurisdictions.
- Protect the integrity of FM Approved products, and our customer’s investment.
- Enhance the awareness and acceptance of FM Approved products in targeted markets.
- Encourage the sharing of technical knowledge to develop global product testing standards.
- Continue to enhance the delivery of efficient and comprehensive services to our customers.
Worldwide FM Approvals’ Network Today

>60,000 Approved Products
132 Years of Service
61 Countries Manufacturing Products
215 Product Testing Standards
• Over 215 Product Testing Standards
• Based on Science and Research
• Publicly Available for Free at www.fmapprovals.com
Focus on Property Loss Prevention

Four Technical Areas

- **Building Materials**
  - Roofs
  - Walls
  - Engineered Plastics

- **Electrical Systems**
  - Equipment for Use in Explosive Atmospheres (Hazardous Locations)
  - Fire Alarm and Signaling Equipment

- **Fire Protection**
  - Sprinkler Systems
  - Foam Systems
  - Water Mist Systems
  - Extinguishing Systems
  - Flood Mitigation Products

- **Flood**
  - Perimeter barriers
  - Opening barriers
  - Pumps
  - Valves
The Safer Building Envelope

- Roofing Systems
- Roof-Mounted Systems
- Fenestrations
- Flashing Systems
- Walls
What does building envelope in this context mean and what is FM Approvals testing?

- **Roof assembly including decking, insulation, fastening system, membrane, flashing**
  
  are in the first line to defense against the elements. Only FM Approved assemblies are tested for wind uplift, internal and external fire, weathering, hail resistance, foot traffic

- **Roof mounted systems:**
  
  Cooling towers are exposed to natural hazards and fire, FM Approvals tests seismic and wind load stress and fire resistance
  Photo voltaic systems are tested for combustibility from above the roof deck, wind uplift and hail resistance, windborne debris resistance, electrical safety and performance, long-term impact of high heat absorption on roof covers

- **Walls:**
  
  FM Approved exterior walls are tested for fire performance and ability to withstand natural hazards like wind and hail without damaging the building structure

- **Fenestrations**
  
  like windows, doors shutters are tested to withstand natural hazards and fire

- **Flood abatement products**
  
  help keep flood waters away from critical facilities and structures and the interior of buildings dry

- **Seismic tested products**
  
  protect from potential damage caused by seismic movements
Impact of FIRE
Impact of Earth Quakes
6'000 Erdbeben vom 01.12.2011 - 12.02.2012 / Quelle www.e
Impact of Storms - Rain Hail - Floods
FM Approvals Target:

Protect the Building Envelope against Impacts

FM Approvals Standards

- Walls: 4880  4881  4882
- Roof- systems: 4450  4470
- Panel- Roofs: 4471
- Cavaty Walls 441
FM Approval Tests of Sandwich Panel

Reaction to Fire:

- FM Approvals Standard 4880
- Qualifies the panels for *interior* use
Fire Impact and FM Approvals Standards
Flammability characterization determined with Fire Propagation Apparatus (FPA)
- ASTM E2058 or ISO 12136
Approval Standard 4880, Class 1 Fire Rating of Building Panels or Internal Finish Materials

**Small-Scale Fire Test Method:**
Test simulates large-scale fire behavior by assessing the flammability of a small thermoset plastic sample in a glass tube under a controlled heat flux and controlled atmospheres.

**Requirements:**
- Flammability Characterization
  - Chemical heat of combustion
  - Critical heat flux for ignition
  - Thermal response parameter

Leads to a Convective Flame Spread Parameter (FSPc) for insulation core, which is a general indicator of the relative flammability of the building material.
Room Corner Test 1 - UBC 26-3
FM Approvals room fire test

8 ft (2.44 m)

8 ft (2.44 m)

8 ft (2.44 m)

15 x 15 in (0.38 m x 0.38 m) wood crib
Fire grows. Crib allowed to burn for 15 minutes.
Crib fully burning, temperatures can reach 1000F.

Char of core at extremity considered failure
Room Corner Test 2
FSPc correlated to flame propagation length along eaves in FM Approvals Corner Wall façade test
16 ft (4.9 m) Parallel Panel Test

FM 16 ft (4.9 m) parallel panel test uses a similar heat flux and is well correlated to large scale 25 ft (7.6 m) and 50 ft (15.2 m) corner tests.
Parallel Panel Test
Resistance to Combustibility

FM Approvals parallel panel fire test

360 kW propane sand burner

panel seam
Parallel Paneltest
Resistance to Combustibility

flaming cannot exceed 16 ft (4.9 m)

unlimited height installation: HRR ≤ 830 kW
- **Noncombustible**—no fuel contribution
  - concrete
- **Class 1**—limited fuel contribution
  - established by test
- **Class 2**—self propagating
  - cannot be Approved.
Exterior Application

- Based on Property Loss Prevention Data Sheets: Windmaps to select the windloads in specific areas
- Wind from inside and outside of the building
- Hail Resistance and Watertightness
FM 4881 Class 1 Exterior Wall Systems

- **Class 1 Fire Rating**
  - Small Scale Flammability
  - Room Test
  - Parallel Panel Test

- **Simulated Wind Load**

- **Windborne Debris**

- **Hail Resistance**

Minimum of 1056 Pressure Cycles
Maximum of 9000 Pressure Cycles
Ca. 5m x 5m wide specimen or larger
Resistance to Natural Hazards - Hail Launcher
Resistance to Natural Hazards - Windborne debris

35 mph (56 km/h)
2x4x8 plank

Zone HM-LM (large missile)
Aluminum Composite Material (ACM) is one kind of cavity wall assembly.
Risks of cavity wall assemblies

- Fire risk of cavity wall construction can be found in the combination of potentially combustible insulation, air / moisture retarders, cladding and the air gap inside the wall.

- Hot work, welding slag, sparks from grinding, cutting torches, and electrical short circuits are common ignition sources.
Risks of cavity wall assemblies

- Many current test standards only assess fire performance of exterior cavity wall assemblies subjected to fires on the exterior of the cavity wall assembly.

- These test methods do not address the potential fire hazard resulting from ignition of combustibles within a cavity wall.

- FM Approvals created a new fire performance test for cavity wall assemblies (FM 4411) to evaluate interior and exterior fires.
Test Method for Fire Spread Within Cavity Wall Constructions
Summary

- Current test standards do not address the potential fire hazard resulting from ignition of combustibles within a cavity wall assembly.

- FM Approvals created a new fire performance test for cavity walls (FM 4411) to address combustion from inside and outside the cavity wall assembly.
System Approach - Roofing

FM/NFPA 276
Limits Fuel Contribution Rate

ANSI / FM 4474
Minimum Rating of 60 psf (293 kg/m²)
Tested to Failure

[ INSERT SECURITY CLASSIFICATION IN SLIDE MASTER VIEW ]
Who trusts FM Approvals certified products

- Insureds of FM Global
- Other property-insurance companies
- Contractors
- Industries, Building Owners
- Authority Having Jurisdictions, Architects, Experts…..
Users of FM Approved Products
Non-FM Global Clients

- 3M
- AAM
- Agthia Group
- Air Product
- Almarai
- AMD
- Apple
- Aramco
- Autoliv
- Bangalore International Airport Expansion Project
- BMW
- Bombardier
- BPCL
- Chhatrapati Shivaji International Airport T2
- CNOOC
- Coca Cola
- Covance
- Crown Holding
- CSOT
- Cummins
- Saint-Gobain
- Dana India
- Delhi Metro
- Delphi
- Dubai Airport (New Concourse)
- Ecolab
- Essar Industries
- Ferrero Rocher
- Fiat
- Ford Motors
- GM
- Goodman Limited
- Hanes Brand
- HP
- Hyundai
- Huawei
- Ikea
- Indian Oil Corp.
- Integrated National Logistics
- Kimberly-Clark
- Kuwait National Petroleum
- LG
- Microsoft
- Mohebi Logistics
- Motorola
- Nan Ya Plastics
- New Doha International Airport
- Nike
- Oerlikon
- P&G
- Petrobras
- Pfizer
- Puratos
- Reliance Industries
- Renault Nissan Automotive India
- S.C. Johnson
- Sahyadri Farmers Producer
- Samsung
- SIMC
- SK Hynix
- State Bank of India
- Steel Authority of India
- ThyssenKrupp
- Toyota Kirloskar
- TSMC
- Vishay
- Walmart
- Zoeris
The FM Approved mark on products is not a replacement for local market regulatory requirements such as CE Mark, but indicates that a globally accepted voluntary certification mark, that adds an additional level of value and performance assurance, has been achieved.

Therefore they can help architects, designers, contractors, building owners to specify performance-tested assemblies to protect a business from natural hazards expected in their local environment.
Why FM Approvals?

- Riskmitigation
- FM Approval has an Audit Scheme implemented:
  - 1. Audit for Quality System of Manufacturer
  - annual Audits/semi-annual or quarterly at the manufacturers of System- Components: Foamsystem – Panel; Fastener; Firestop Materials/Sealants
- Maximum Reliability of Product- System and single Components
Further Infos:

- www.approvalguide.com
- www.roofnav.com
- www.fmapprovals.com
- www.fmglobal.de
Thank You!

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