Tame the Flame:
A Close Look at Exterior Wall Flammability

with a Focus on NFPA 285

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Safety Design in Buildings

Cairo Conference

Monday, October 17, 2016, JW Marriott Hotel Cairo

Course Description

Introduction to combustible exterior wall assemblies and systems. The presentation will focus on understanding exterior wall components, NFPA 285 testing and requirements, building codes, best practices and the importance of third party certification.

Presenter

Jonathan J. Gonzalez
Project Engineer*, UL -- *Underwriters Laboratories Middle East

My Experience started as a Product Safety Engineer in Fire Protection for Building Materials and Systems at Underwriters Laboratories' Global Headquarters in Northbrook Chicago, USA and have been in the life safety industry since. I have has been involved in numerous certifications projects, while working with international, building and certification standards. I hold a Bachelors in Construction Engineering from North Dakota State University and have recently moved to the Middle East region to UL's regional headquarters in Dubai.

Learning Objectives

1. Exterior Walls and Components
2. NFPA 285 Testing and Requirements
3. Understanding Test Methods and Codes
4. Third Party Certification

The purpose of this presentation is to convey technical knowledge to the conference participants.

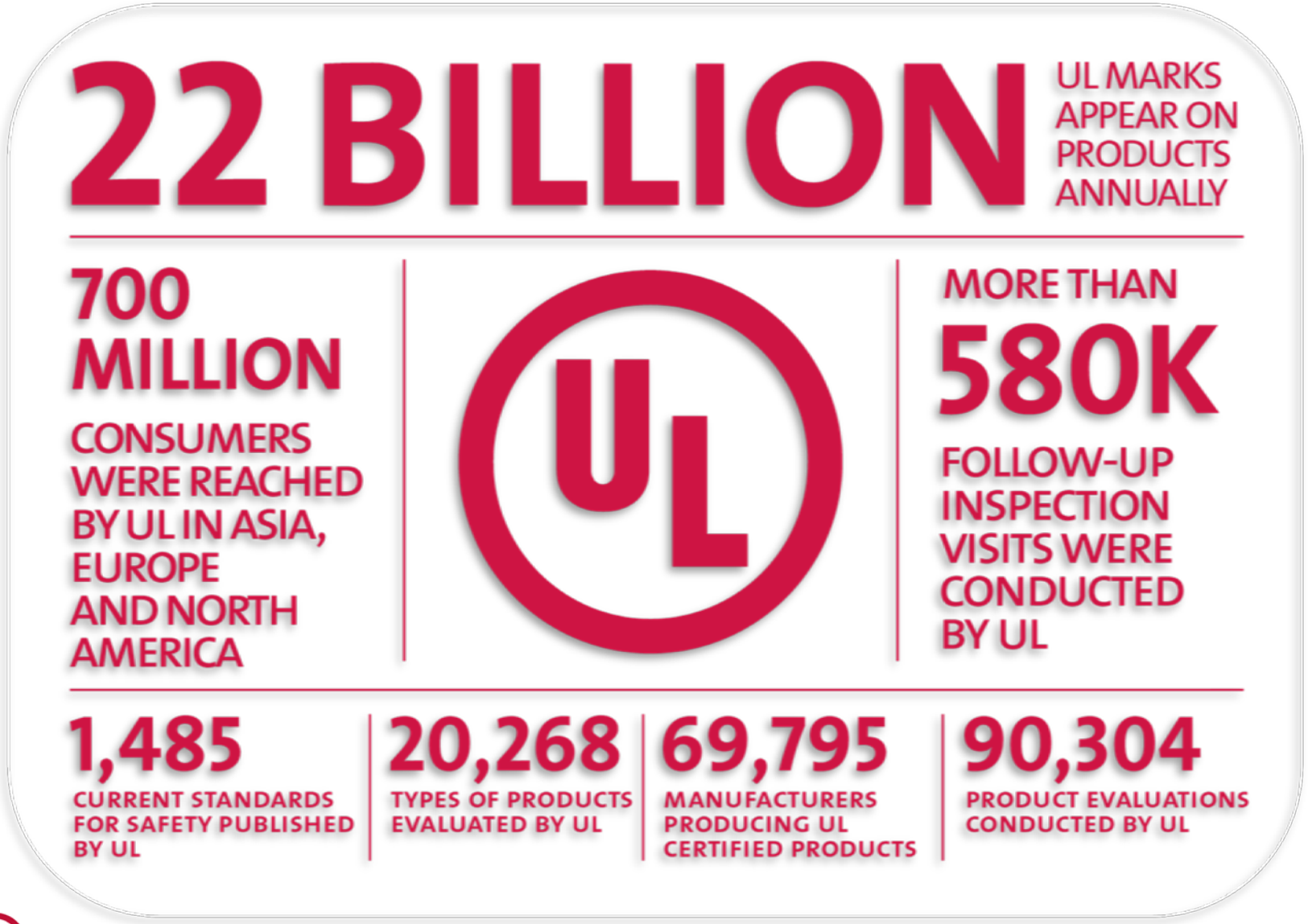
The presentation also contains slides with text that summarises the content of the presentation and the main learning objectives.

These may be used to update CPD records for relevant organisations including the Chartered Institute of Building (CIOB).

Who is UL?

To promote safe living and working environments through the application of safety science and hazard-based safety engineering.

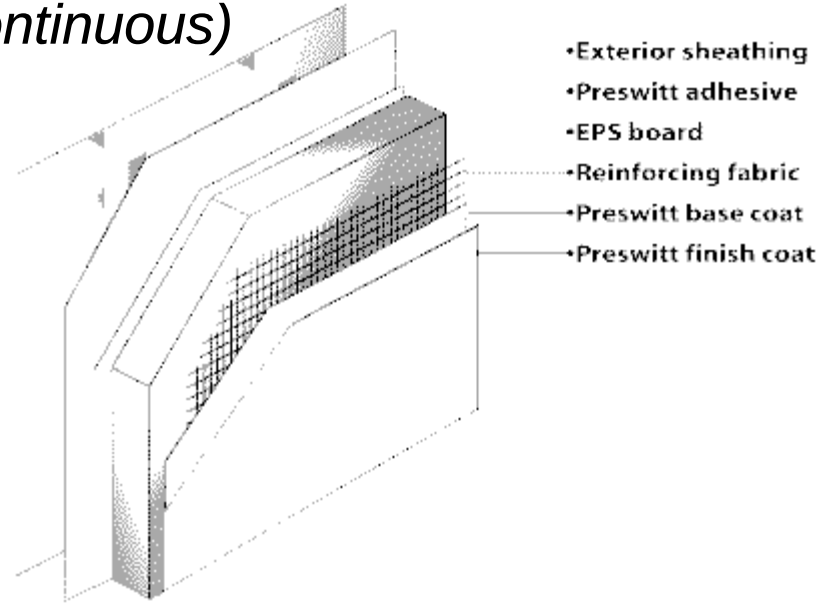
General UL Numbers



Combustible Exterior Wall Systems

A broad range of combustible components are extremely common and have been effective in exterior wall construction

- *Exterior insulated finish systems (EIFS)*
- *Metal composite cladding (MCM)*
- *Aluminum composite panels (ACM)*
- *High pressure laminates (HPL)*
- *Insulation (foam plastic, blanket, continuous)*
- *Water resistive barriers (WRB)*
- *Air barriers*



Exterior Wall Systems – Why we test

However, some combinations of components in exterior walls may not resist flame propagation if involved in a fire initiated from an interior room of origin or exterior. The results could lead to costly property damage, personal injury, or even fatalities.

Exterior Wall Systems – Why we test

Monte Carlo Casino Fire – Las Vegas

January 2008

Damage – est. $100 million

Exterior Wall Systems – Why we test

Water Club Tower Fire –
Atlantic City - 2007

Mermoz Tower – France (2012)

Exterior Wall Systems – Why we test

Grozny-City Towers,

Grozny, Chechnya - April 2013

Exterior Wall Systems – Why we test

Torch Tower – Dubai

February 2015

Possible rapid burning of aluminum cladding containing combustible core + high winds

Exterior Wall Systems – Why we test

Address Hotel Fire – Dubai December 2015

ACM tested to ASTM E119?

Exterior Wall Systems – Why we test

Ajman One Complex

March - 2016

Exterior Wall Systems – Exterior Cladding

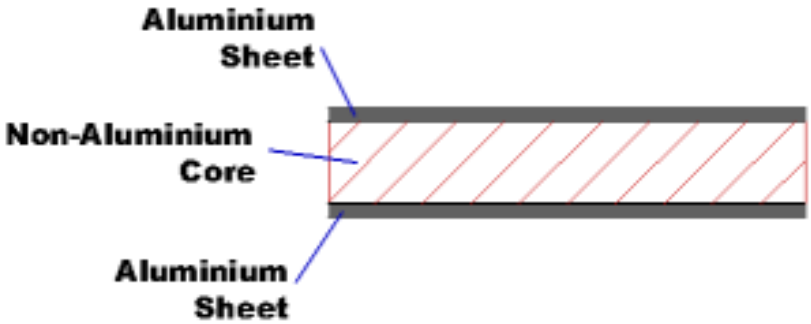
Metal Composite Materials Benefits

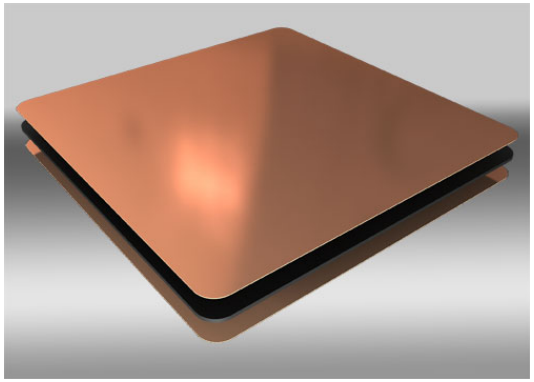
- Aesthetically attractive
- Economical
- Low maintenance
- Sustainable
- Climate Control
- Versatile
- Retrofit
- Diverse Choices

Photo and information according to Metal Construction Association (MCA)

Exterior Wall Systems – Exterior Cladding

Aluminum Composite Material



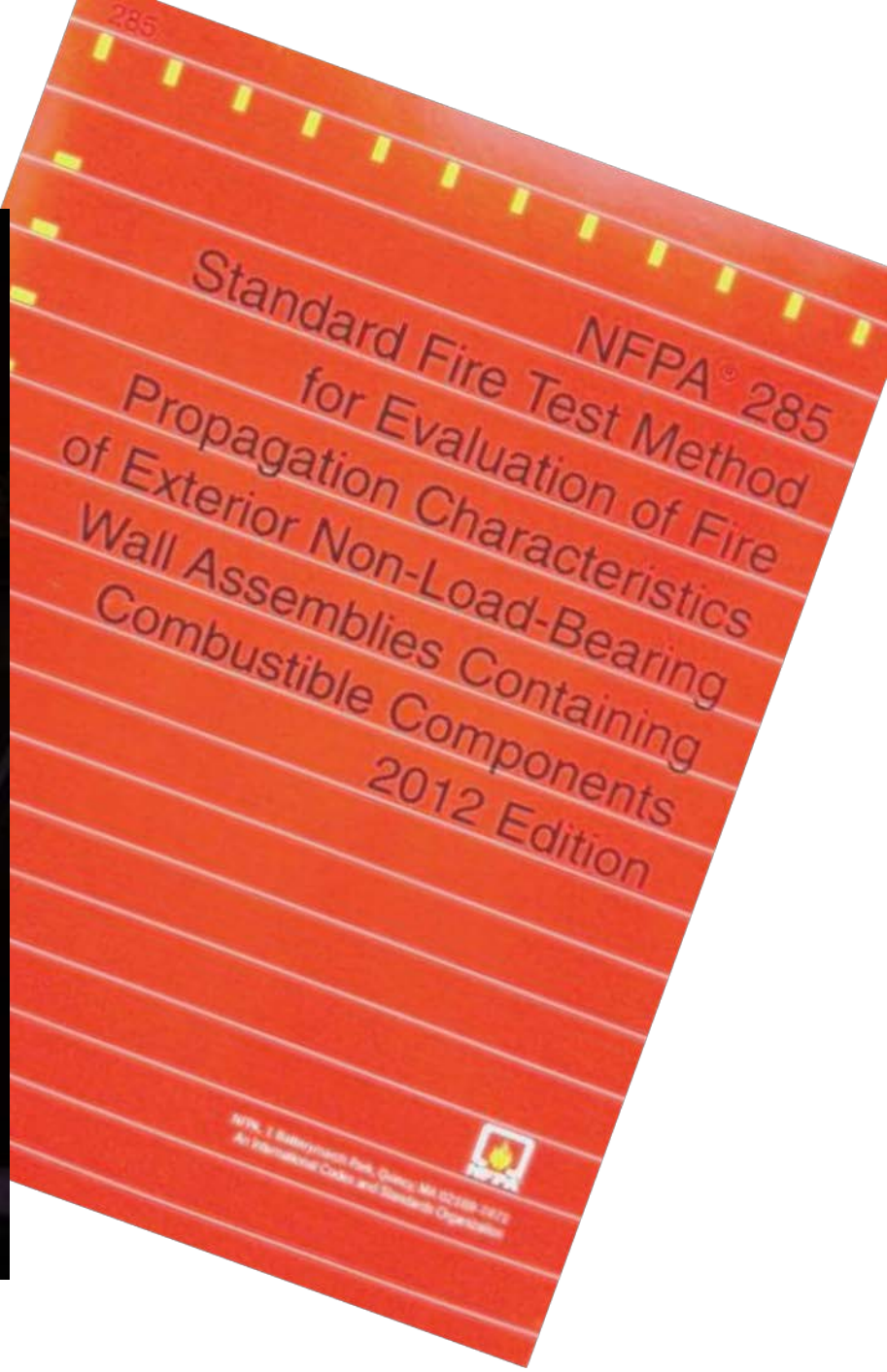


Typical Example - ACM:

0.5 mm (0.02 in.) aluminum facings chemically bonded to a foam plastic core appx. 3 to 6 mm (0.1 - 0.2 in.) total thickness

Skins: aluminum, zinc, copper, stainless steel, and titanium

NFPA 285


285
NFPA® 285
Standard Fire Test Method
for Evaluation of Fire
Propagation Characteristics
of Exterior Non-Load-Bearing
Wall Assemblies Containing
Combustible Components
2012 Edition

UL - ISMA

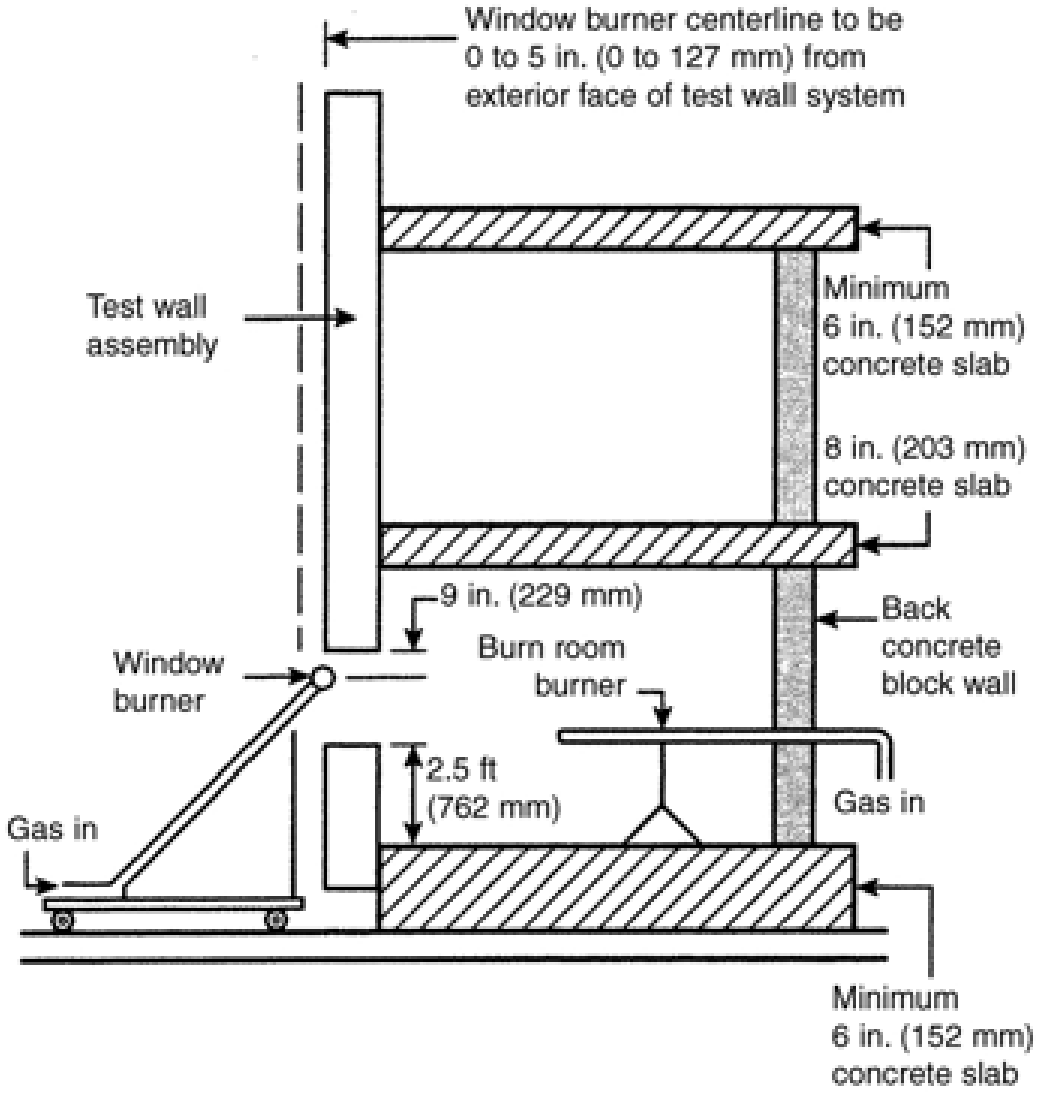
Intermediate Scale Multi-story Apparatus

NFPA 285 – FIRE PROPAGATION

- Test room @ each story – open to the front. Constructed of concrete slabs and walls
- Each test room is app. 3 m x 3 m x 2 m high (10 ft. x 10 ft. x 7 ft.)
- Complete assembly (representative of end use application, including external cladding, insulation, framing and internal wall
- Window opening 0.76 m high × 1.98 m wide (30 in. x 78 in.) sill located 0.76 m (30 in.) above the top of the first-story test room slab
- Two gas-fired burners
  - ➢One inside the first story room
  - ➢One outside the first story window opening of the wall assembly

NFPA 285 – FIRE PROPAGATION

APPARATUS



NFPA 285 – FIRE PROPAGATION

PROCEDURE

- Burners are ignited to deliver specified temperatures and heat fluxes over a 30 minute test duration. The window burner is ignited 5 minutes into the test.

NFPA 285 – FIRE PROPAGATION

CALIBRATION

The special calibration test specimen is constructed for the calibration test.

Two layers of nominal 16 mm Type X gypsum wallboard on both sides of 18- gauge steel studs spaced 610 mm on center.

NFPA 285 – FIRE PROPAGATION

NFPA 285 Fire Test Parameters

No flame propagation in second-floor room

Inside wall assembly, thermocouples shall not exceed 1000ºF

Externally, flames shall not reach 10 feet above the window's top.

Externally, flames shall not reach 5 feet laterally from the window's centerline.

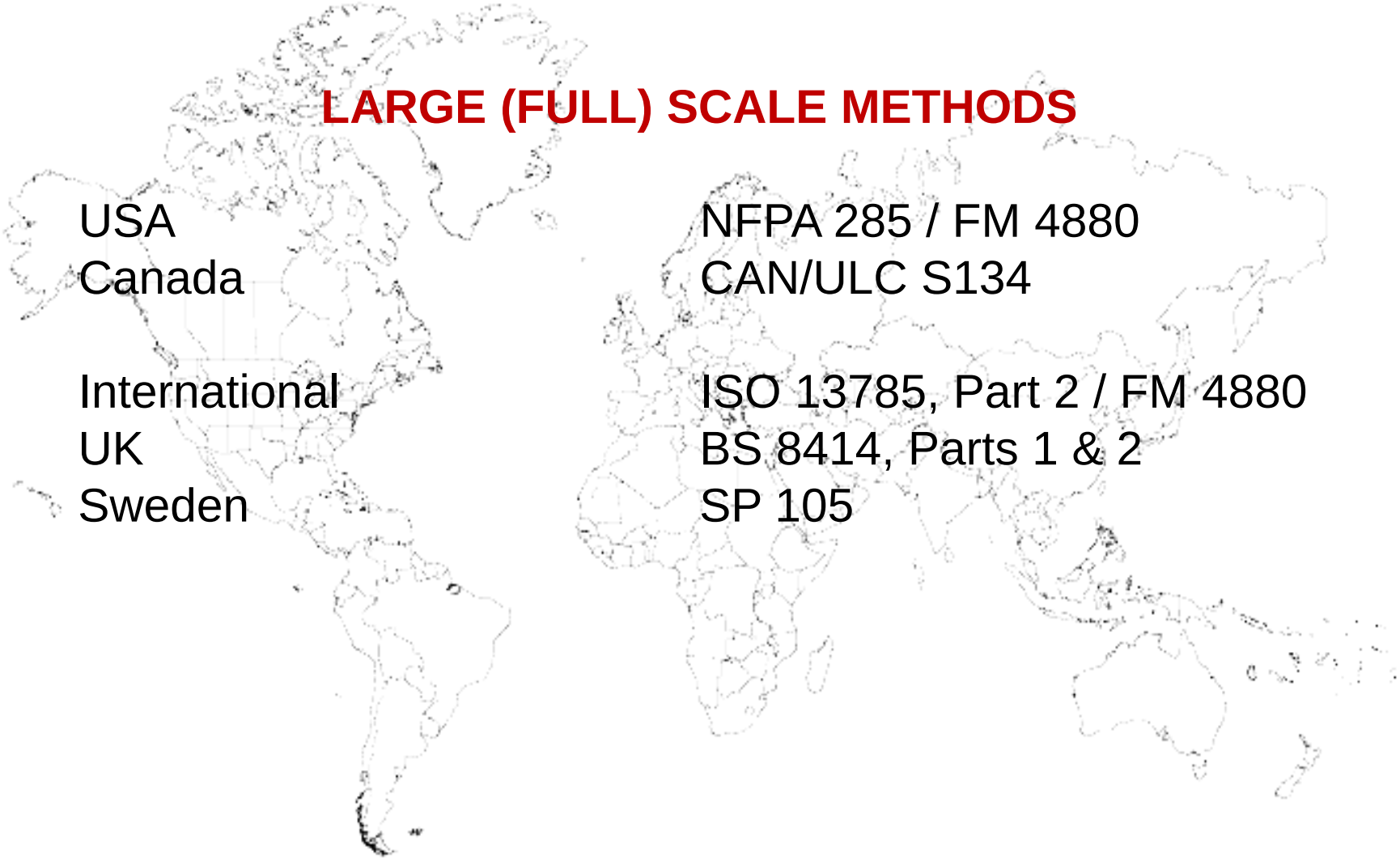
Images courtesy of DuPont Building Innovations

- Temperatures at exterior of wall must not exceed 538ºC (1000ºF) at a height of 3 m (10 ft.) above the window opening

- Exterior flames must not extend vertically more than 3 m (10 ft.) above the window opening

- Exterior flames must not extend horizontally more than 1.5 m (5 ft.) from the centerline of the window opening

Exterior Wall Flammability - A Global Concern



LARGE (FULL) SCALE METHODS

USA	NFPA 285 / FM 4880
Canada	CAN/ULC S134
International	ISO 13785, Part 2 / FM 4880
UK	BS 8414, Parts 1 & 2
Sweden	SP 105

Right Test?

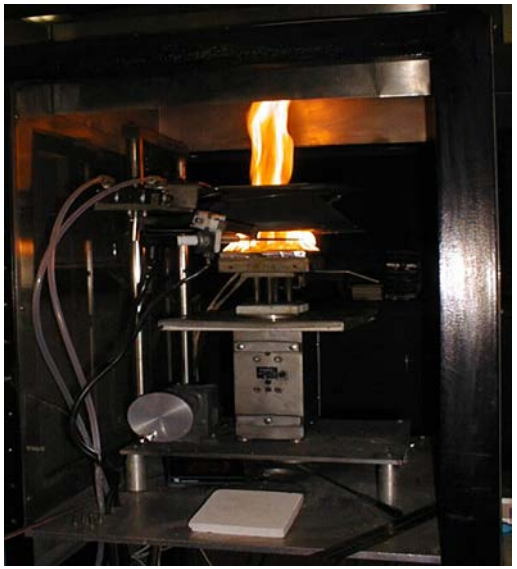
The materials used in these exterior wall fires…..

Did they have a fire rating?

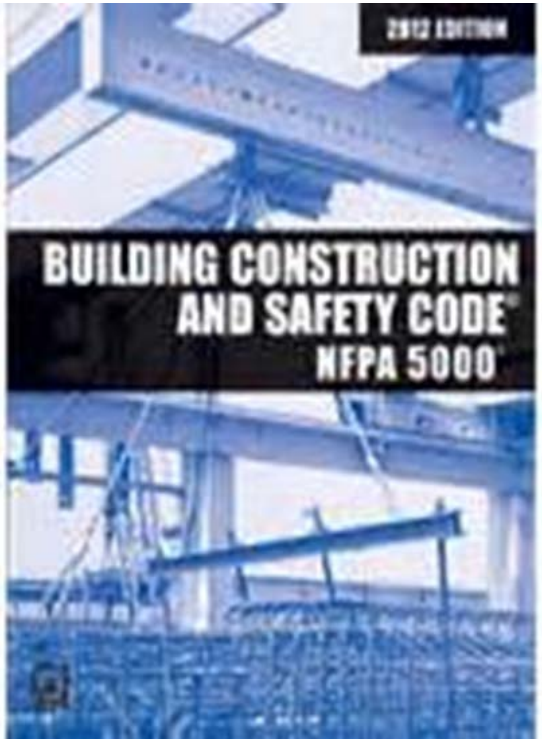
Were they certified?

If so, what test?

OTHER FIRE TEST METHODS MAY NOT FULLY ADDRESS EXTERIOR WALL HAZARD



NFPA 285 – NFPA 5000



Sections:

7.2.3 – Type I and II

7.2.4 – Type III

7.2.5 – Type IV

Exterior nonbearing walls tested in accordance with, and meeting the conditions of acceptance of, NFPA 285 shall be permitted.

NFPA 285 – NFPA 5000

Section 37.4.4

MCM installed on the exterior of buildings classified as Type I, Type II, Type III, or Type IV construction…

MCM that are part of the exterior wall assembly shall be tested in accordance with NFPA 285

NFPA 285 – NFPA 5000

Wall Assembly Flammability With Foam Plastic Insulation

48.4.1.5.1 The wall assembly shall be tested in accordance with, and the results shall comply with, the acceptance criteria of NFPA 285

NFPA 285 – IBC Code Requirements

Combustible Item		Current IBC Code Section	App. Year Added	Qualifier
Foam Plastic		2603.5.5	1988	
Metal Composite Materials / Aluminum Composite Materials	MCMs / ACMs	1407.10.4	2000	
High Pressure Laminates	HPLs	1409.10.4	2009	
Exterior Insulation Finish Systems	EIFS	1408.2	2009	By way of ASTM E2568
Fiber Reinforced Polymers	FRPs	2613.5	2009	Invokes Section 2603.5 for exterior use
Water Resistive Barriers	WRBs	1403.5	2012	Over 40 ft. High Type I, II, III, IV Construction

NFPA 285 – IBC Code Requirements (2015 Change)

1403.5 Vertical and lateral flame propagation.

Exception 1:

Walls in which the water-resistive barrier is the only combustible component and the exterior wall has a wall covering of brick, concrete, stone, terra cotta, stucco or steel with minimum thicknesses in accordance with Table 1405.2.

NFPA 285 – IBC Code Requirements (2015 Change)

1403.5 Vertical and lateral flame propagation.

Exception 2: Has three criteria

1) Walls in which the water-resistive barrier is the only combustible component and

2) The wrb has:

- Peak Heat Release Rate of less than 150 kW/m^2
- Total Heat Release of less than 20 MJ/m^2
- Effective Heat of Combustion of less than 18 MJ/kg

as determined in accordance with ASTM E1354 @50 kW/m^2 flux and

3) has a flame spread index of 25 or less and a smoke-developed index of 450 (ASTM E84 or UL 723).

Significance of Third Party Certification

- Many municipalities' laws, codes and regulations require building products be tested, listed and/or labeled before the products can be installed

- Some manufacturers make it a company policy to obtain third party certification - minimizes the possibility of non-acceptance by AHJs.

Significance of Third Party Certification

- Being Certified means a product has been evaluated, complies test standard requirements and is manufactured under follow-up inspections

not just tested

Exterior Wall Systems & Components

Exterior Wall Systems
Exterior Wall System Components

Address the Following Needs:

- Components need to be tested as part of a system (similar to fire resistance approach)
- There is a need for a public database to show system designs and how combustible products are used within them
- Needs to be available and accessible to manufacturers, architects, specifiers, and Code Authorities / Officials

Certification Directory

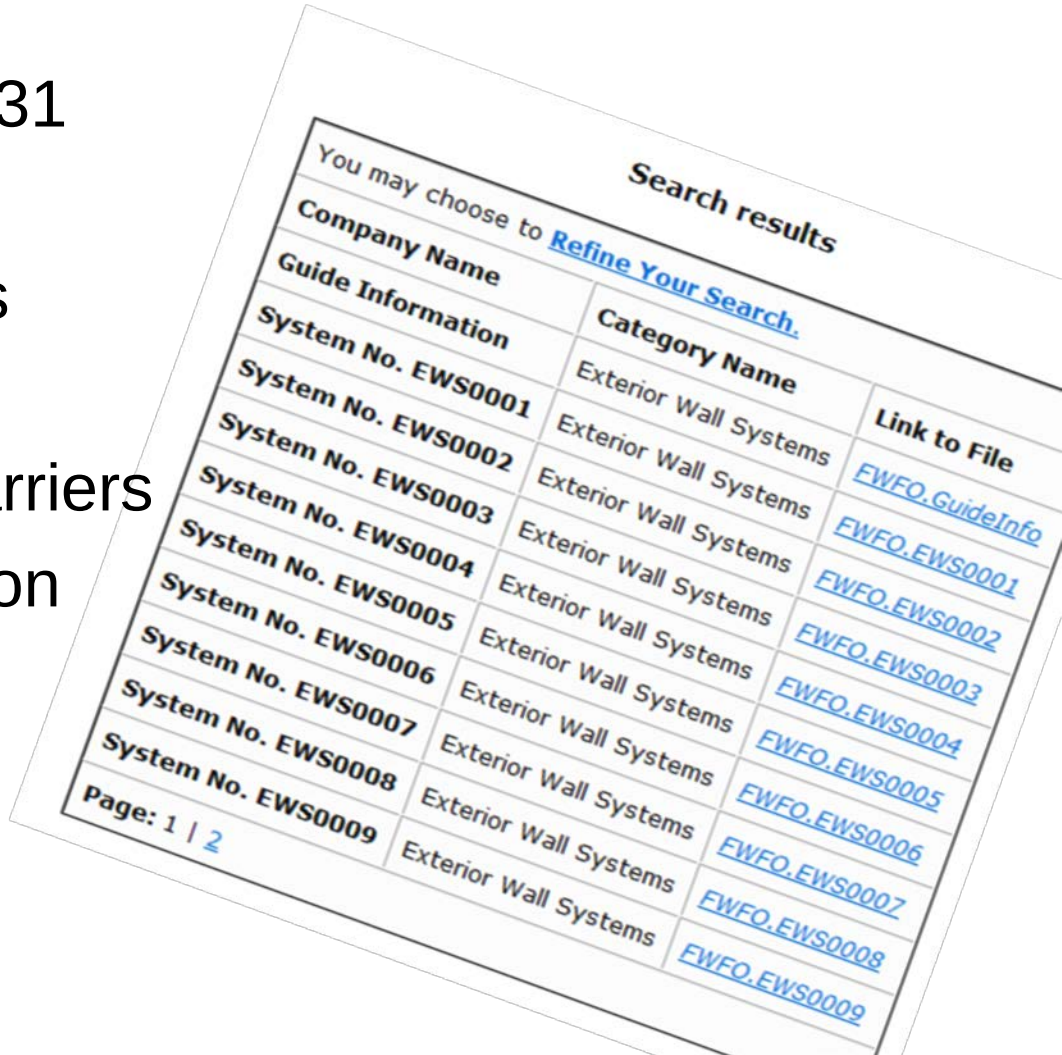
UL

NFPA 285 – UPDATE on FWFO ASSEMBLIES

Currently, there are 31 NFPA 285 UL Assemblies

EWS0001 through EWS0031

- Noncombustible veneers
- ACM panels
- Fluid applied weather barriers
- Various foams & insulation
- EIFS



Search results

You may choose to Refine Your Search.

Company Name	Category Name	Link to File
Guide Information	Exterior Wall Systems	FWFO.GuideInfo
System No. EWS0001	Exterior Wall Systems	FWFO.EWS0001
System No. EWS0002	Exterior Wall Systems	FWFO.EWS0002
System No. EWS0003	Exterior Wall Systems	FWFO.EWS0003
System No. EWS0004	Exterior Wall Systems	FWFO.EWS0004
System No. EWS0005	Exterior Wall Systems	FWFO.EWS0005
System No. EWS0006	Exterior Wall Systems	FWFO.EWS0006
System No. EWS0007	Exterior Wall Systems	FWFO.EWS0007
System No. EWS0008	Exterior Wall Systems	FWFO.EWS0008
System No. EWS0009	Exterior Wall Systems	FWFO.EWS0009

Page: 1 | 2

UL Online Certifications Directory

No charge to access

No passwords

Updated daily

Searchable

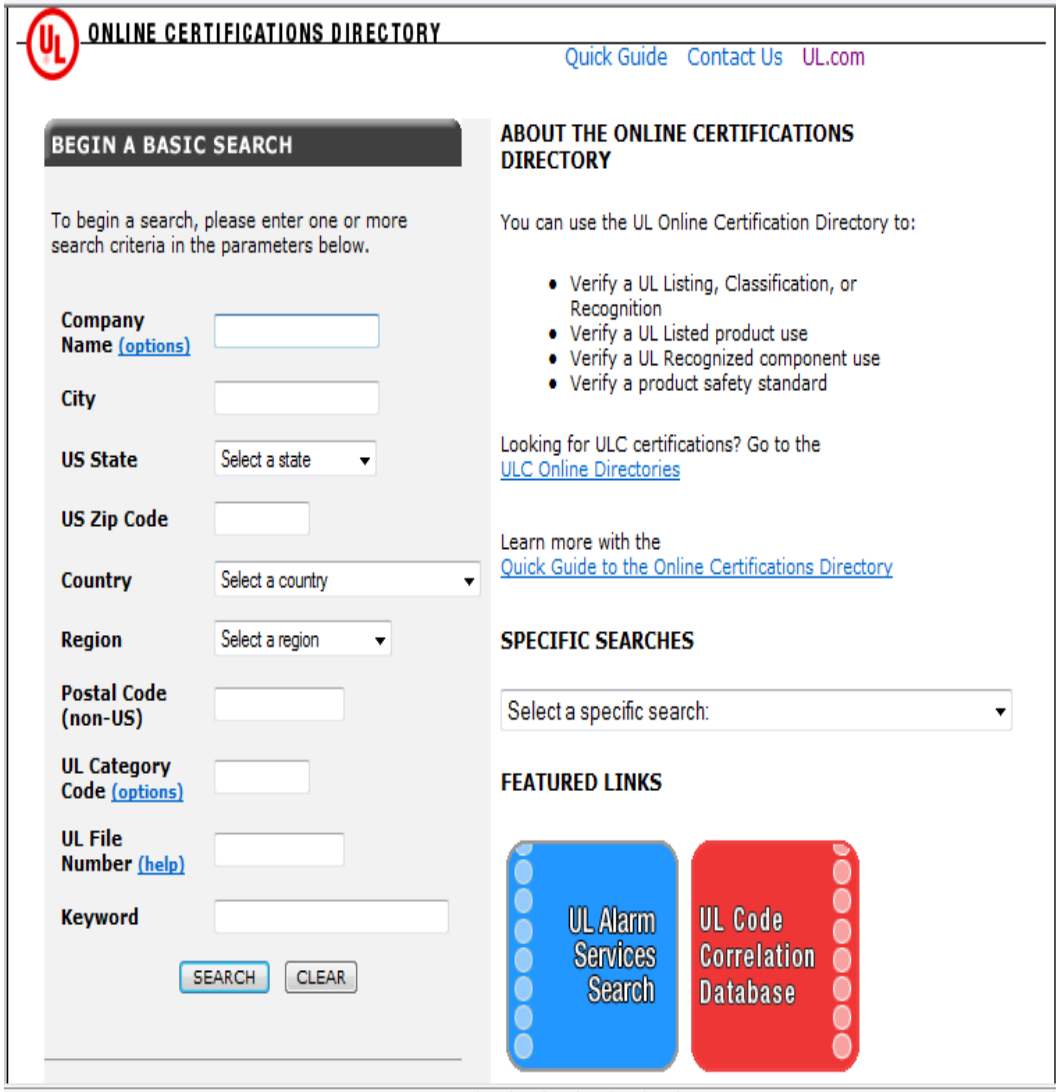
Keyword

Manufacturer

UL File Number

Standard used for evaluation

www.ul.com/database



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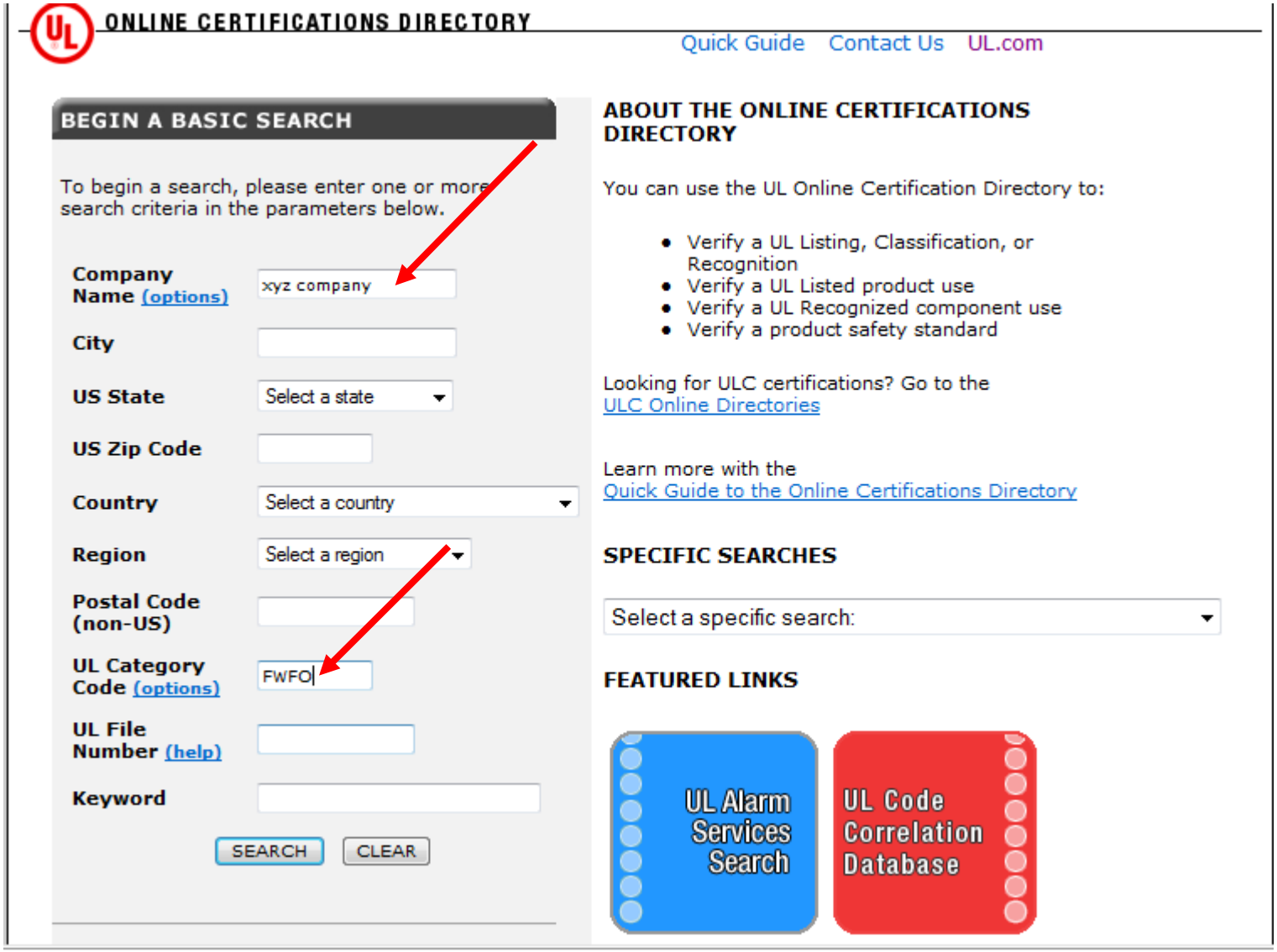


UL Online Certifications Directory

Search results

You may choose to **Refine Your Search.**

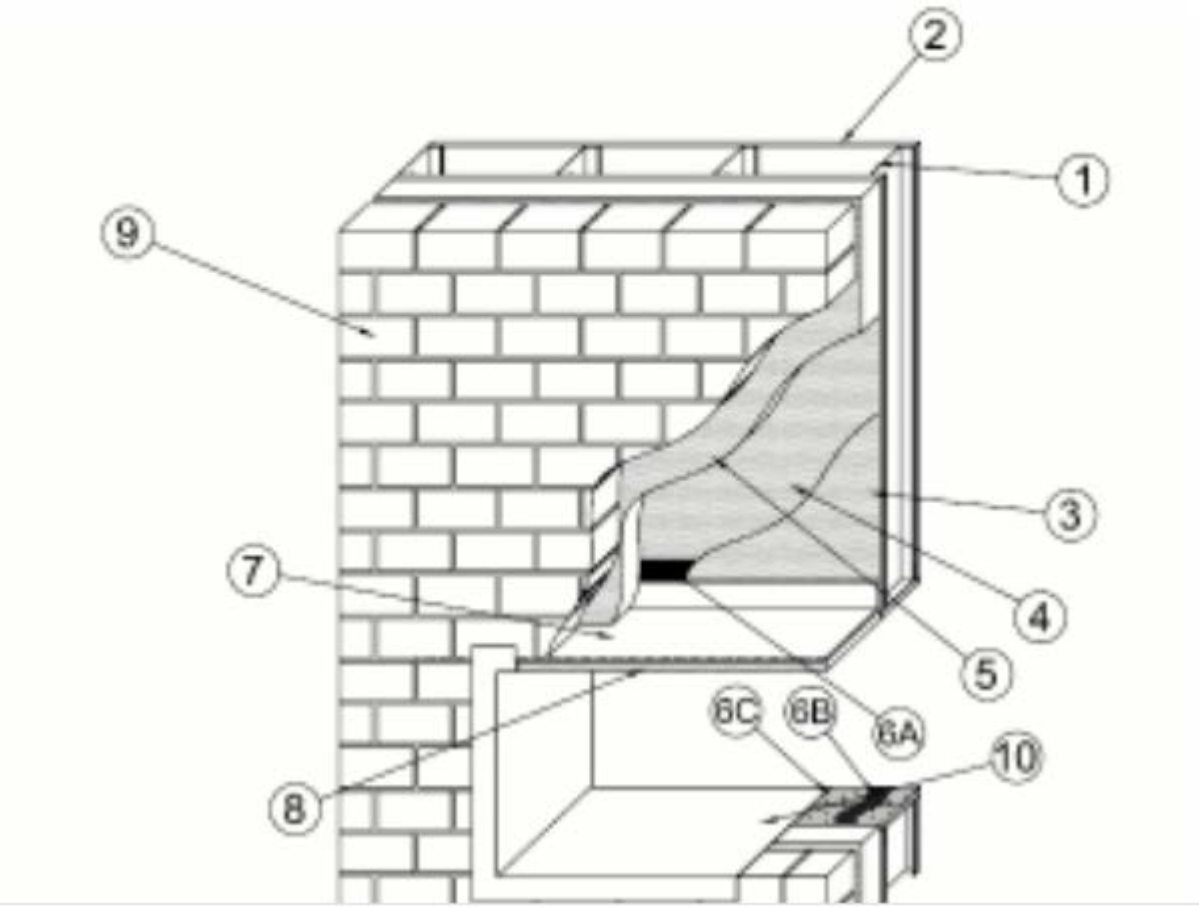
Company Name	Category Name	Link to File
Guide Information	Exterior Wall Systems	*FWFO.GuideInfo*
System No. EWS0001	Exterior Wall Systems	*FWFO.EWS0001*
System No. EWS0002	Exterior Wall Systems	*FWFO.EWS0002*
System No. EWS0003	Exterior Wall Systems	*FWFO.EWS0003*
System No. EWS0004	Exterior Wall Systems	*FWFO.EWS0004*
System No. EWS0005	Exterior Wall Systems	*FWFO.EWS0005*
System No. EWS0006	Exterior Wall Systems	*FWFO.EWS0006*
System No. EWS0007	Exterior Wall Systems	*FWFO.EWS0007*
System No. EWS0008	Exterior Wall Systems	*FWFO.EWS0008*
System No. EWS0009	Exterior Wall Systems	*FWFO.EWS0009*

Page: 1 | 2

System No. EWS0001

February 21, 2014

Exterior Wall System



1. **Steel Studs** — Min 3-5/8 in. (92 mm) deep, formed of min 16 ga. galv steel spaced max 16 in. (406 mm) OC. Additional studs to be used to completely frame window openings.

2. **Interior Gypsum Board (BWFR)*** — Min 5/8 in. (16 mm) thick, 4 ft (1.2 m) wide, attached to steel studs with 1 in. (25 mm) long, Type S steel screws spaced max 8 in. (203 mm) OC. Joints oriented vertically and covered with paper tape and joint compound. Screw heads covered with joint compound.

UNITED STATES GYPSUM CO — Type SCX

3. **Exterior Gypsum Sheathing (BWFR)*** — Exterior-grade glass mat sheathing gypsum board, minimum 5/8 in.(16 mm) thick, attached to steel studs with 1 in. (25 mm) long, Type S steel screws spaced max 8 in. (203 mm) OC. Joints oriented vertically or horizontally. Additional sheathing to be used to line framed window openings.

UNITED STATES GYPSUM CO — Type USGX

3A. **Exterior Wall System Component — Sealant*** — (Not Shown) - Sealant applied to all exterior sheathing joints prior to application of air barrier sealant (Item 4).

TREMCO INC — Tremflex 834

4. **Exterior Wall System Component — Combustible Air Barrier Sealant*** — Applied to completely cover the gypsum sheathing at a min thickness of 35 mil (0.9 mm) dry, 70 mil (1.8 mm) wet thickness.

TREMCO INC — ExoAir 230

5. **Foam Insulation (BRYX)*** — Nom 4 by 8 ft (1.2 by 2.4 m) by 2-1/2 in. (64 mm) thick, min 1.55 pcf (24.8 kg/m^3) extruded polystyrene insulation secured to gypsum sheathing with min No. 8 by 3-1/2 in. (89 mm) self-tapping steel screws in conjunction with 2 in. (51 mm) diameter steel washers.

THE DOW CHEMICAL CO — Styrofoam Scoreboard

AFM CORP — Foam-Control EPS Type IX, Film Faced Foam-Control EPS Type IX, Foam-Control EPS Type XIV or Foam-Control EPS Type XV

ATLAS EPS, DIV OF ATLAS ROOFING CORP — ThermalStar

OWENS CORNING FOAM INSULATION L L C — Foamular 250 or Foamular CC

6. **Window Flashing Materials** — (Optional) - The following items may be used as window flashing materials:

A. **Exterior Wall System Component — Window Flashing Material*** — Nom 6 in. (152 mm) wide extruded silicone rubber flashing attached to gypsum sheathing with sealant (Item 6D) to completely frame window opening.

TREMCO INC — Proglaze ETA

B. **Fiberglass Mesh** — Nom 0.012 in. (0.3 mm) thick open-weave glass-reinforcing fabric embedded within the air barrier sealant (Item 6C).

TREMCO INC — 2011 Mesh

C. **Exterior Wall System Component — Combustible Air Barrier Sealant*** — Applied to completely cover sheathing lining the window opening in conjunction with a nom 0.012 in. (0.3 mm) thick open-weave glass-reinforcing fabric embedded within the sealant.

TREMCO INC — ExoAir 230

D. **Exterior Wall System Component — Sealant*** — (Not Shown) - Sealant applied to all edges of window flashing material to adhere flashing to gypsum sheathing.

TREMCO INC — Spectrem 1

7. **Steel Lintel** — Nom 7 in. (178 mm) wide by min 3/8 in. (10 mm) thick steel used at top of window opening of brick veneer (Item 9) and extending min 8 in. (203 mm) beyond each side of the opening.

8. **Mineral Wool** — Nom 4 pcf (64 kg/m^3), 1 in. (25 mm) thick mineral batt insulation secured to the underside of steel lintel (Item 8) with two rows of steel batt pins located approx. 1 in. (25 mm) from the edges and spaced a max 8 in. (203 mm) OC.

9. **Exterior Veneer — Brick** — Nominal 4-in.-thick clay brick offset to provide a nom 1 in. air gap between foam insulation (Item 5) and brick veneer with standard type veneer anchors spaced a max 24 in. (610 mm) on center.

10. **Steel Flashing** — Formed of min 22 ga. steel. Formed to completely line window opening and overlap onto both surfaces of the wall assembly a min 1/2 in. (13 mm).

*Bearing the UL Classification Mark

Last Updated on 2014-02-21

FWFX.R27656
Exterior Wall System Components

Page Bottom

Exterior Wall System Components

See General Information for Exterior Wall System Components

TREMCO INC R27656
4475 E 175TH ST
CLEVELAND, OH 44128-3411 USA

Sealant designated ExoAir 230 for use in System Nos. EWS0001, EWS0002, EWS0003, EWS0004, EWS0005.

Sealant designated Tremflex 834 for use in System Nos. EWS0001, EWS0002, EWS0003, EWS0004, EWS0005.

Window flashing material designated Proglaze ETA for use in System Nos. EWS0001, EWS0002, EWS0003, EWS0004, EWS0005.

Sealant designated Spectrem 1 for use in System Nos. EWS0001, EWS0002, EWS0003, EWS0004, EWS0005.

Last Updated on 2014-02-17

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THANK YOU.