



UL / FIREPROOFING SEMINAR

BY

**KEVIN TWYFORD
FIREPROOFING PRODUCT
MANAGER**

High-Performance Coatings & Fireproofing



- Carboline Company A/D Fire Protection Systems and Nu-Chem Fireproofing have joined to offer the most complete fireproofing package available from any single source.
- Cementitious & intumescent fireproofing systems.
- Zinc-rich primers for steel
- Polyurethane coatings for color & gloss retention
- Epoxy coatings for CMU, drywall -Sanitile.

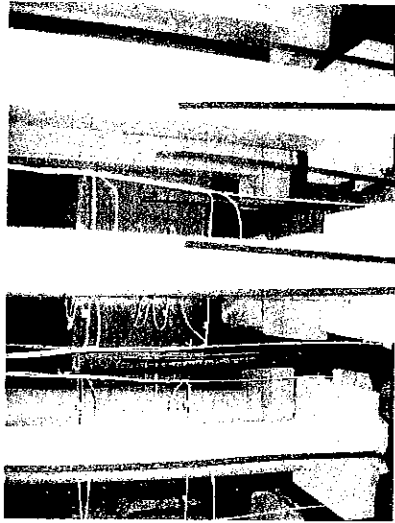
Objective Today

- 1 To provide a clear understanding of fire protection
- 2 Testing Agencies
- 3 Test Criteria
- 4 Physical Properties
- 5 Different Generic Types
- 6 Specification errors to avoid

Product Lines

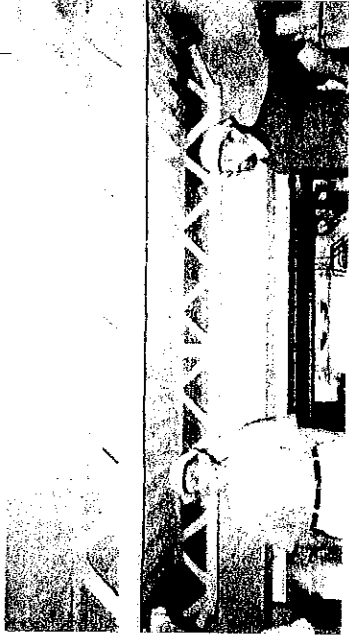
- Southwest Vermiculite Type 5, Type 7
- Pyrolite 15, 22, 40
- Nullifire
- S605 - Exterior Solvent based AD Firefilm II -- Interior Water based
- Nu-Chem
- Thermosorb - Interior Solvent based
- Thermo-Lag 3000 Exterior epoxy (pre-erection)

Columns in ASTM E-119 Furnace



UL 1709
ASTM E 119
ASTM E 119
ASTM E 119
ASTM E 119
ASTM E 119
ASTM E 119
ASTM E 119
ASTM E 119
ASTM E 119

Inside Test Frame at UL Joist and Deck UL Design P741



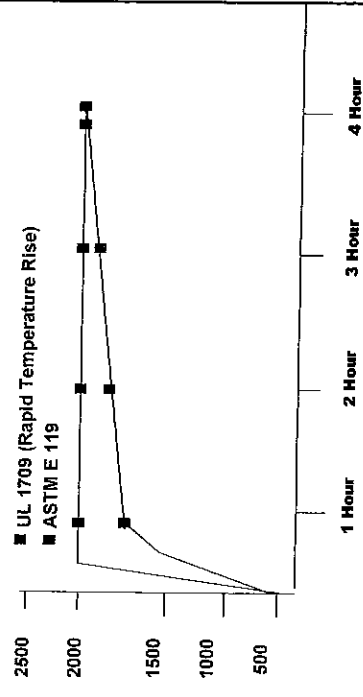
UL 1709
ASTM E 119
ASTM E 119
ASTM E 119
ASTM E 119
ASTM E 119
ASTM E 119
ASTM E 119
ASTM E 119
ASTM E 119

UL 1709 Fire Resistance Test Criteria

- Hydrocarbon Fire Time-Temperature Curve-simulates explosion from intense fire.
- Protection required by Industrial Risk Insurers (IRI), generally not Building Codes
- Requires additional environmental exposure testing..

UL 1709
ASTM E 119
ASTM E 119
ASTM E 119
ASTM E 119
ASTM E 119
ASTM E 119
ASTM E 119
ASTM E 119
ASTM E 119

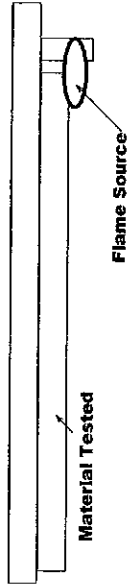
TIME VS TEMPERATURE



UL 1709
ASTM E 119
ASTM E 119
ASTM E 119
ASTM E 119
ASTM E 119
ASTM E 119
ASTM E 119
ASTM E 119
ASTM E 119

ASTM E 84

STEINER TUNNEL TEST



**NOTE: Measure Distance Flame Travels Over Specified Period of Time.
DOES NOT AN HOURLY RATING.**

Top of the Test Furnace @ UL



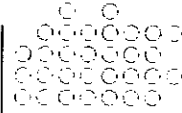
Observing the Furnace at UL



Fire Tests Results

- Fire test designs published and products listed and certified by:
 - UL: Underwriters Laboratories Inc
 - ULC: Underwriters Laboratories of Canada
 - ITS: Inertek Testing Services (Warrick Hersey)
 - FM: Factory Mutual
- Results published listing directories
- Describes in detail how an assembly is constructed to achieve an hourly rating.
- Determines material type & thickness for desired hourly rating.
- Intumescent coatings are subjected to E119 fire testing, plus interior or exterior environmental testing. The IC is then re-tested in the furnace to confirm intumescent performance.

UL Fire Resistance Directory



- *Number System* -

UL Directory Numbering System

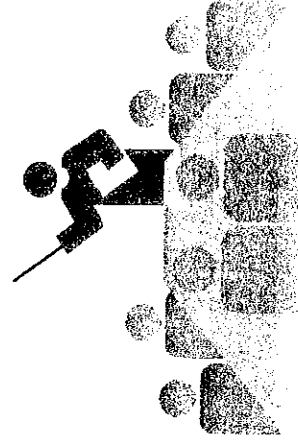
1st Digit : Prefix letter Identifies the Group of Construction

- A-L series test - floor assemblies.
- D & G tests - most common floors
- J tests - concrete systems
- P- test are roofs ONLY
- X & Y tests - columns
- U series test - wall ratings.
- XR tests - UL 1709 designs

Last 3 digits: Numbers Identifies type of protection required

- 200 series test - ceiling grid systems
- 500 series test - gypsum wallboard
- 600 series test - intumescent coatings
- 700-800 **Sprayed Fire-Resistive Materials - SFRM**
 - 700 series - cementitious fireproofing
 - 800 series- mineral fiber fireproofing
- 900 series test - "unprotected" category

How to Choose UL Assemblies



Floor Designs:

- What type of Deck? - profile, etc.
- Painted or Galvanized Decking?
- What type of concrete? - density
- How thick is concrete from top of corrugations to top of slab?
- What is structural assembly support?
- Hourly rating to be achieved?

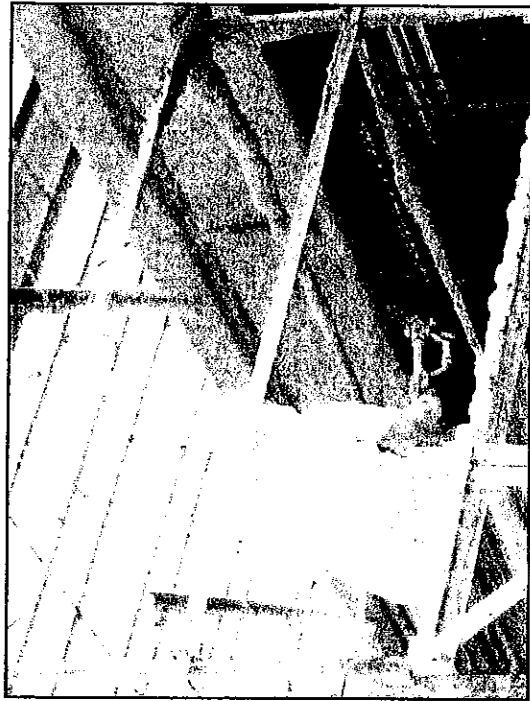


Roof Assembly

- Type of Deck - gauge, profile
- Painted or galvanized decking?
- Is gypsum sheathing placed in assembly?
- Type of insulation and thickness of insulation
- Spacing of joists or beams
- Hourly rating required?

Columns:

- Type of column - tube, pipe or w-shape?
- Tube / pipe size, wall thickness.
- What are the sizes of steel to be used ? I.e. - W/D or "mass" of steel
- Exposed or concealed finishes?



Fireproofing Problem Areas to Avoid

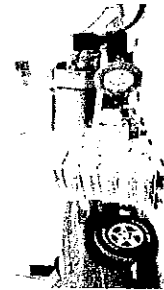
- Primed Steel / Fireproofing Compatibility
- Studwall Tracks with rated Steel Members
- Installation of clips & hangers prior to fireproofing assemblies.
- Roof traffic during / after fireproofing the roof deck.
- Choosing desired material types, densities, etc.
- Choosing the proper UL assemblies & listing them on drawings.

Fireproofing Material Types

- Cementitious (plaster)**
- Regular (>15 pcf)
 - Medium (>22 pcf)
 - High (>40 pcf)
 - Ultra-high (>52 pcf)

Mineral Fiber (insulation)

- Regular (14-15) pcf
- Medium (>21 pcf)

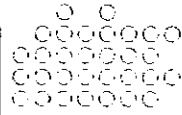


Specify F.P. Material for Intended Use

- Regular Density - (15pcf) interior, concealed above ceilings, behind walls.
- Medium Density - (22pcf) interior exposed. mechanical/electrical rooms, storage areas.
- High Density - (40pcf) - exposed to abuse. parking decks, jails, loading docks, warehouses, etc.
- Ultra-High Density- (55 pcf) - high impact/abuse. industrial & petrochemical facilities, smooth finishes in commercial construction.

Intumescent Fireproof Coatings

Function, Types, UL Testing and Performance Criteria

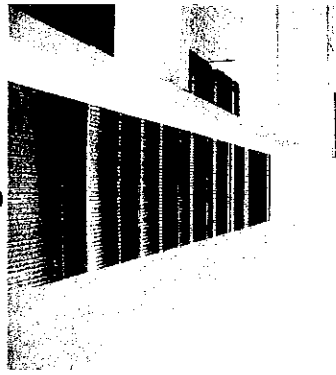


**Intumescent coating.....
what is it?**



0000
00000
000000
0000000
00000000
000000000

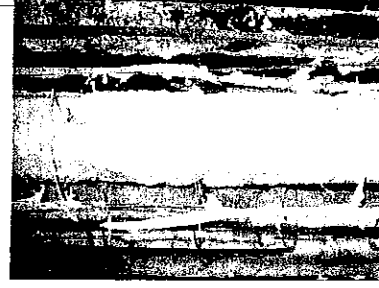
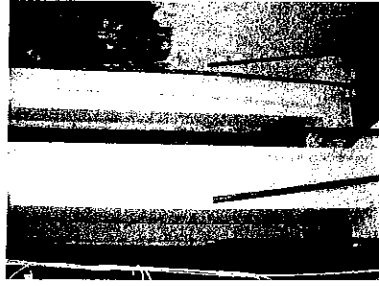
Intumescent fireproof coatings are:



- Applied like a "paint" in mills. (it is a coating)
- it has an aesthetic finish that can be topcoated or finish coated.
- The coating intumesces, or "swells", up to 50 times original size, producing an "ash".
- The ash insulates the steel from temperature rise.

0000
00000
000000
0000000
00000000

Column before and after intumescent process



0000
00000
000000
0000000
00000000

ESPN Headquarters, Bristol, CT

Why design with an intumescent?

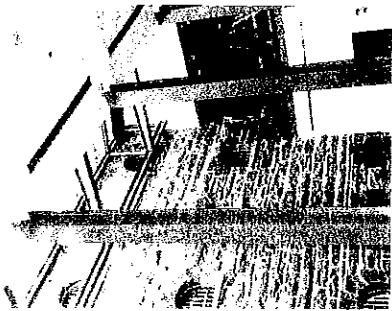
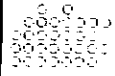


Photo: Bill Fraundorfer, Braintree, ON

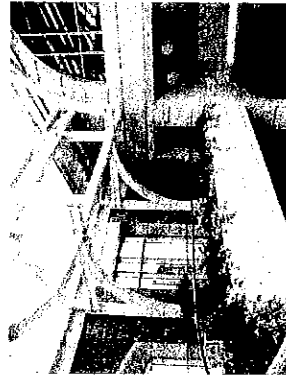
- For exposed, fire-rated steel members- to get the look of steel.
- For "tight" tolerances adjacent CMU, ductwork, studs, piping, etc.
- For critically clean areas like labs, pharmaceuticals, & micro-electronics mfg. No dusting allowed



Different types of Intumescent Coatings

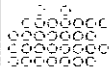
- Water-based IC, low-VOC and 60-70% SBV, for interior application. Up to 3 hour fire ratings.
- Solvent-based IC for limited exterior, light duty exposure. 60-70% SBV. Some require fibers or mesh. Up to 4 hour ratings.
- There is 2-part epoxy-based IC for commercial and petrochemical environments. Solvent free, 100% SBV. Most require fibers and/or mesh.

Application areas using an Intumescent?

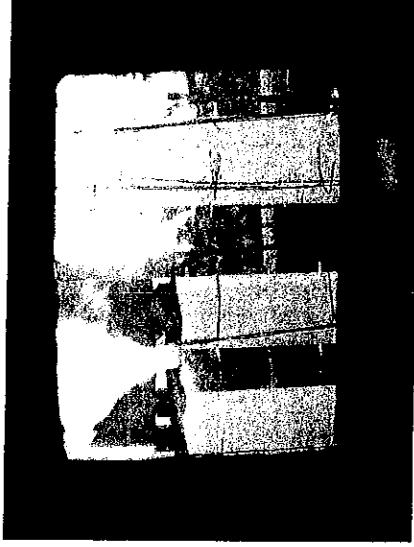


World Trade Center East - Boston, MA

- Atriums
- Stairwells
- Clean rooms
- Stadiums/Arenas
- Hospital OR Rooms
- Gymnasiums
- Natatoriums
- Exterior Canopies



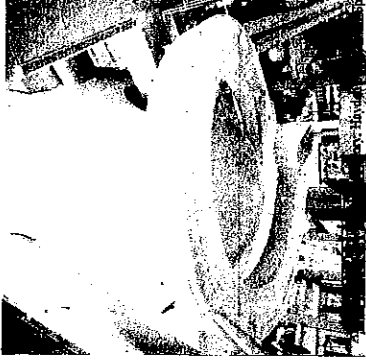
Columns During Fire Test



Recent developments at UL:
Intumescent Classifications:

- **Conditioned Interior Space Purpose** - subjected to a 250 hr (10 day) high humidity exposure. Limited to climate controlled spaces, not to exceed 75% relative humidity.
- **Interior General Purpose** - subjected to 180 day high humidity exposure. Limited to interior service.
- **Exposed Purpose** - UL investigated for permanent exterior use

Facilities using intumescent fireproofing



- Commercial/Atriums
- Hospitals/OR Rooms
- Telecommunications
- Pharmaceuticals
- Clean Rooms
- Micro-electronics
- Chemical process
- Food Processing

When Specifying an Intumescent, verify:

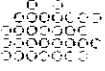
- Primers - must be compatible with the IC. Surface prep - wipe primed steel clean from dirt/grease.
- Topcoats - are required & must be listed in the specific UL test. Most require topcoating with quality enamel or polyurethane.
- Is the intumescent application interior or exterior ?
- Verify if the steel sizes have been UL TESTED for the hourly rating required.
- Cannot be applied to roof or floor decks, small joists.
- Only w-shapes, tubes, pipes, big trusses.
- Remember that Fire retardant coatings has no hourly rating.

SPECIFICATION ERRORS

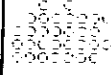
- Wrong UL number for the application for project
- Always get some advice on increasing steel sizes for intumescent coatings
- Update your specifications to eliminate extras

Cheat Sheets

- AD Southwest Cementitious Fireproofing
- Intumescent Fireproofing



Kevin Twyford
Gulf Coast Fireproofing Division
ktwyford@carboline.com



**SOUTHWEST CEMENTITIOUS PRODUCTS
SIMPLIFIED GUIDE TO UNDERWRITERS' LABORATORIES FIRE RESISTANCE RATINGS**

1. Floor-Ceiling Assemblies - One Hour (Joist & Beams)
 Composite floor - minimum 2 1/2" lightweight concrete over 2 1/2" - 5" deckD916
 Composite 2 1/2" L/W/NW concrete over 22 ga. 1 1/2" - 3" deckD739
 Composite floor min. 3 1/2" NW concrete over 22 ga.D916
 Non-composite 2 1/2" L/W/NW concrete over various corrugated form decksG701
 Pre-cast tees/hollow core slabs, poured in place slabs (see test).....J701/J957/J709

2. Floor-Ceiling Assemblies - Two Hour (Joist & Beams)
 Composite floor - minimum 2 1/2" lightweight concrete over 2 1/2" - 5" deckD916
 Composite 2 1/2" L/W/NW concrete over 22 ga. 1 1/2" - 3" deckD739
 Composite floor min. 3 1/2" NW concrete over 22 ga.D916
 Non-composite 2 1/2" L/W/NW concrete over various corrugated form decksG701
 Pre-cast tees/hollow core slabs, poured in place slabs (see test).....J701/J957/J709

3. Floor-Ceiling Assemblies - Three Hour (Joist & Beams)
 Composite floor - minimum 2 1/2" lightweight concrete over 2 1/2" - 5" deckD916
 Composite 2 1/2" L/W/NW concrete over 22 ga. 1 1/2" - 3" deckD739
 Composite floor min. 3 1/2" NW concrete over 22 ga.D916
 Non-composite 2 1/2" L/W/NW concrete over various corrugated form decksG701
 Pre-cast tees/hollow core slabs, poured in place slabs (see test).....J704/J957/J709

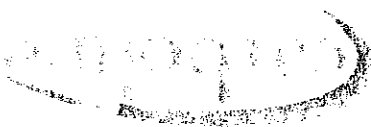
4. Beams/Joist/Girders Only Designs for Isolated Member Ratings/Substitutions
 Beams (min. 8X28) supporting metal floor deck with 2 1/2" L/W/NW concrete.....N791
 Joist (min. 10K1) supporting floor deck with 2 1/2" L/W/NW concrete.....S739
 Beams (min. 6X16) supporting 22 ga. 1 1/2" metal roof deck.....P741
 Joist (min. 10K1) supporting 22 ga. 1 1/2" metal roof deck.....P741

5. Roof-Ceiling Assemblies 1, 1 1/2 and 2 Hours
 Polystyrene board on gypsum wallboard 1 1/2" 22 ga. (W6X16, 10K1).....P717
 Isocyanurate insulation w/wo gypsum wallboard 1 1/2" 22 ga. (W6X16, 10K1).....P741
 Fiberboard/fiberglass insulation 1 1/2" 22 ga. (W6X16, 10K1).....P701/S739
 Lightweight Insulating Concrete Roof Deck.....P921

6. Columns (1 - 4 hours)
 W ShapesX772/Y725
 Pipes and Tube SteelX771

Kevin Twyford - Gulf Coast Fireproofing Product Manager
 281-996-5328

Caroline Company
 Executive Offices
 350 Hanley Industrial Court
 St. Louis, MO 63144
 314/644-1000
 FAX: 314/644-4617



SELECTING INTUEMISENT FIREPROOFING DESIGNS FOR UL

UL # - Exterior Grade Applications - Nullifire S605

W-Shapes Columns	1, 1 1/2 and 2 hour ratings	X629
Tube Steel Columns	1, 1 1/2 and 2 hour ratings	X630
Pipe Columns	1, 1 1/2 and 2 hour ratings	X631
Unrestrained Beams	1, 1 1/2 and 2 hour ratings	N609
Unrestrained Beams	1, 1 1/2 and 2 hour ratings	D784

UL # - Interior Grade Applications - Solvent Based - Thermosorb

W-Shapes Columns	1 through 4 hours	X660
Tube Steel Columns	1 through 4 hours	X661
Pipe Columns	1 through 3 hours	X662
Unrestrained Beams	1 through 2 hours	N619
Unrestrained Beams	1 through 3 hours	D946

UL # - Interior Grade Applications - Firefilm III - Water Based

W-Shapes Columns	1, 1 1/2 and 2 hour ratings	X641
Tube Steel Columns	1, 1 1/2 and 2 hour ratings	X642
Pipe Columns	1, 1 1/2 and 2 hour ratings	X642
Unrestrained Beams	1 1/2 and 2 hour ratings	D941
Unrestrained Beams	1 hour ratings	D948

Kevin Twyford - Gulf Coast Fireproofing Product Manager
281-996-5328

Carboline Company
Executive Offices
350 Hanley Industrial Court
St. Louis, MO 63144
314/644-1000
FAX: 314/644-4617

