



UL / FIREPROOFING SEMINAR

BY

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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)

Building Codes Drive Fire Ratings....

- 4 Model Building Codes - SBCCI, BOCA, ICBO, UBC
- International Code Began - YR2000- condensing all 4 codes
- Unique codes in specific areas - South Florida, NFPA 5000
- Authority having jurisdiction has say in building's fire ratings.
- Building code governs commercial construction



Underwriters Laboratories Testing

Fire Testing and other Criteria for UL Classification

UL
LABORATORIES
INC.
300 N. LAUREL
AVENUE
TOLSON, ILL.
61880

Why protect steel?

- By 1100°F (600°C) steel retains only 50% of original strength
- By 10 minutes into a standard fire test, the furnace temperature is 1300 °F (704°C)



ASTM E-119 Fire Test (ANSI/UL 263)

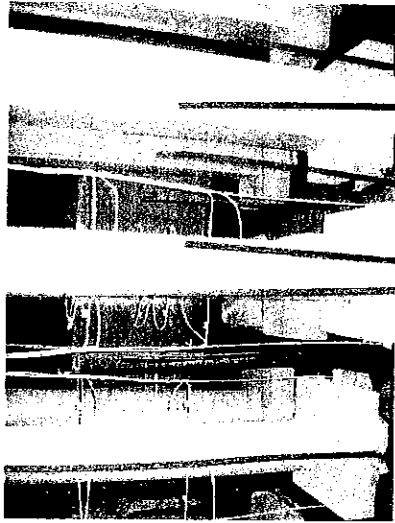
Temperature Limits for Structural Steel

- Beams & joists (in floor and roof assemblies)
 - 1300°F (704°C) maximum individual
 - 1100°F (593°C) sectional average
- Columns
 - 1200°F (649°C) maximum individual
 - 1000°F (538°C) sectional average

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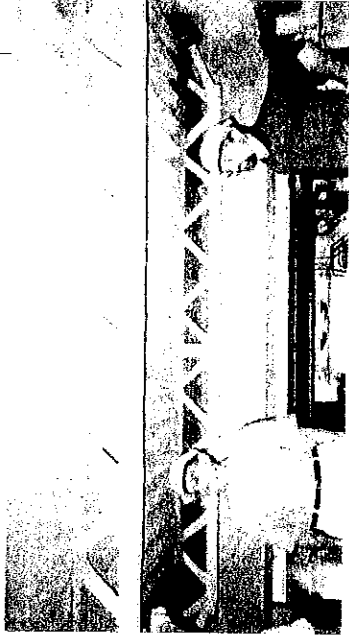
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Columns in ASTM E-119 Furnace



UL 1709
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UL 1709

Inside Test Frame at UL Joist and Deck UL Design P741



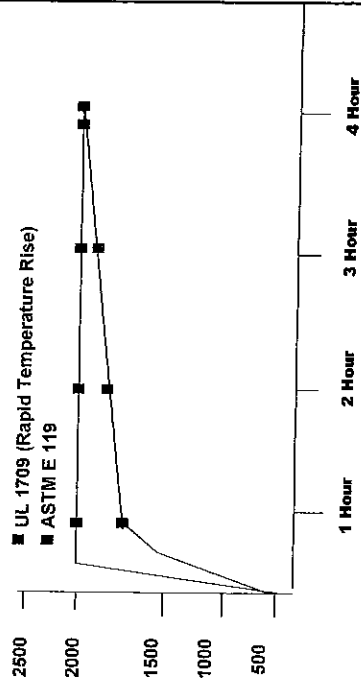
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UL 1709 Fire Resistance Test Criteria

- 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
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UL 1709

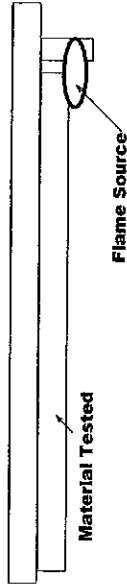
TIME VS TEMPERATURE



UL 1709
UL 1709
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UL 1709
UL 1709

ASTM E 84

STEINER TUNNEL TEST



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

UL
1000
10000
100000
1000000
10000000
100000000
1000000000

Top of the Test Furnace @ UL



UL
1000
10000
100000
1000000
10000000
100000000
1000000000

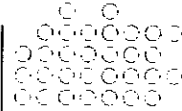
Observing the Furnace at UL



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

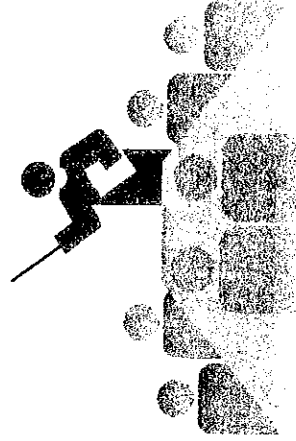
1st Digit : Prefix letter Identifies the Group of Construction

- 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?

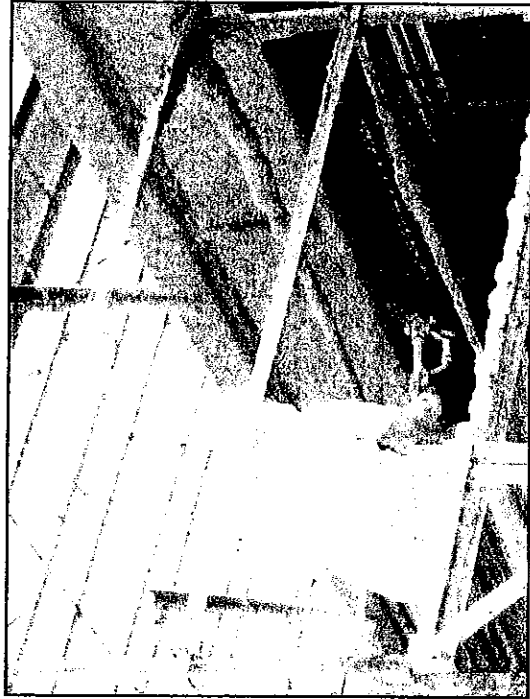


Roof Assembly

- 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

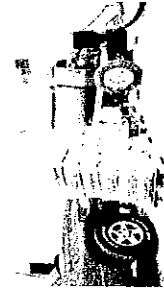
- Primed Steel / Fireproofing Compatibility
- Studwall Tracks with rated Steel Members
- Installation of clips & hangers prior to fireproofing assemblies.
- Roof traffic during / after fireproofing the roof deck.
- Choosing desired material types, densities, etc.
- Choosing the proper UL assemblies &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

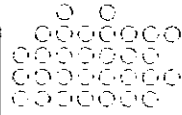


Specify F.P. Material for Intended Use

- 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

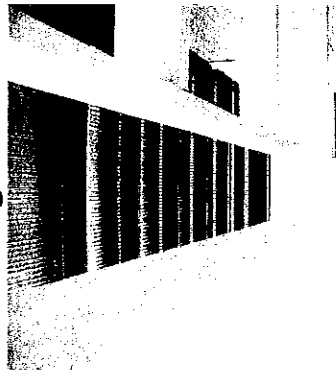
Function, Types, UL Testing and Performance Criteria



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



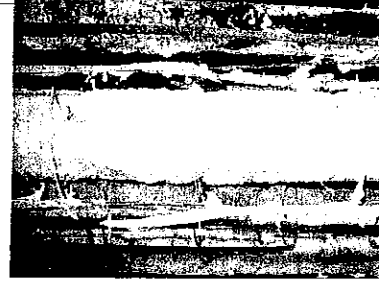
Intumescent fireproof coatings are:



- 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.

ESPN Headquarters, Bristol, CT

Column before and after intumescent process



Why design with an intumescent?

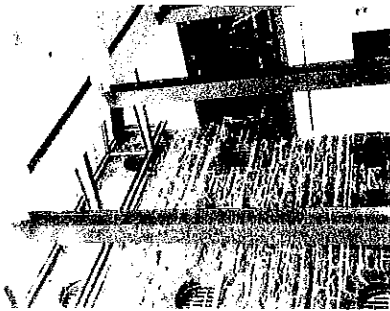
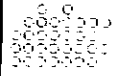


Photo: Bill Fraundorfer, Braintree, ON

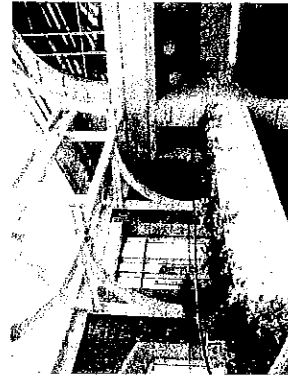
- For exposed, fire-rated steel members- to get the look of steel.
- For "tight" tolerances adjacent CMU, ductwork, studs, piping, etc.
- For critically clean areas like labs, pharmaceuticals, & micro-electronics mfg. No dusting allowed



Different types of Intumescent Coatings

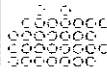
- Water-based IC, low-VOC and 60-70% SBV, for interior application. Up to 3 hour fire ratings.
- Solvent-based IC for limited exterior, light duty exposure. 60-70% SBV. Some require fibers or mesh. Up to 4 hour ratings.
- There is 2-part epoxy-based IC for commercial and petrochemical environments. Solvent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

Application areas using an Intumescent?

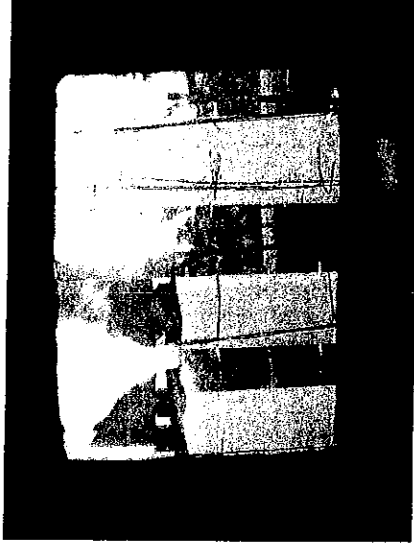


World Trade Center East - Boston, MA

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



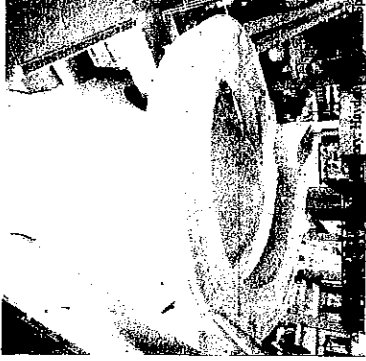
Columns During Fire Test



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



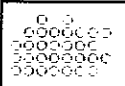
- Commercial/Atriums
- Hospitals/OR Rooms
- Telecommunications
- Pharmaceuticals
- Clean Rooms
- Micro-electronics
- Chemical process
- Food Processing

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.

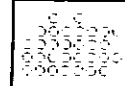
SPECIFICATION ERRORS

- 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



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**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

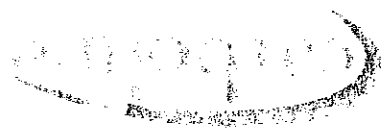
Beams (min. 8X28) supporting metal floor deck with 2 1/2" L/W/NW concrete.....N791
 Joist (min. 10K1) supporting floor deck with 2 1/2" L/W/NW concrete.....S739
 Beams (min. 6X16) supporting 22 ga. 1 1/2" metal roof deck.....P741
 Joist (min. 10K1) supporting 22 ga. 1 1/2" metal roof deck.....P741

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

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SELECTING INTUEMISENT FIREPROOFING DESIGNS FOR UL

UL # - Exterior Grade Applications - Nullfire 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

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