

**FIRE SCIENCE IN
EMERGENCY PLANNING
HAZARDS ASSESSMENTS**

Charles “Chuck” Rives
Pantex Plant Emergency
Management Department

TWO TOPICS

- Scenario development
- Event recognition

FIRE BARRIER RATINGS

Fire Resistance – Volume 1

With Hourly Ratings for Beams, Floors, Roofs,
Columns, Walls and Partitions

Contains
Classifications

See Volume 2 for Hourly Ratings for Joint Systems, Through-
Penetration Firestop Systems and Electrical Circuit
Protective Systems and Duct Assemblies

See Volume 3 for Hourly Ratings for Dampers, Fire Doors,
Glazing Materials and Related Equipment

Please read information contained in paragraph 2 on page v and the
number system table for fire rated assemblies on page 1 in Volume 1

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Directory

- Frequently used in
Emergency
Planning Hazards
Assessments
 - Limits source term
 - Indicator of Barrier
Failure – for event
recognition and
EAL development

WHERE DO FIRE BARRIER RATINGS COME FROM

Fire Resistance – Volume 1

With Hourly Ratings for Beams, Floors, Roofs, Columns, Walls and Partitions

Contains Classifications

See Volume 2 for Hourly Ratings for Joint Systems, Through-Penetration Firestop Systems and Electrical Circuit Protective Systems and Dust Assemblies

See Volume 2 for Hourly Ratings for Dampers, Fire Doors, Glazing Materials and Related Equipment

Please read information contained in paragraph 2 on page v and the number system table for fire rated assemblies on page 1 in Volume 1

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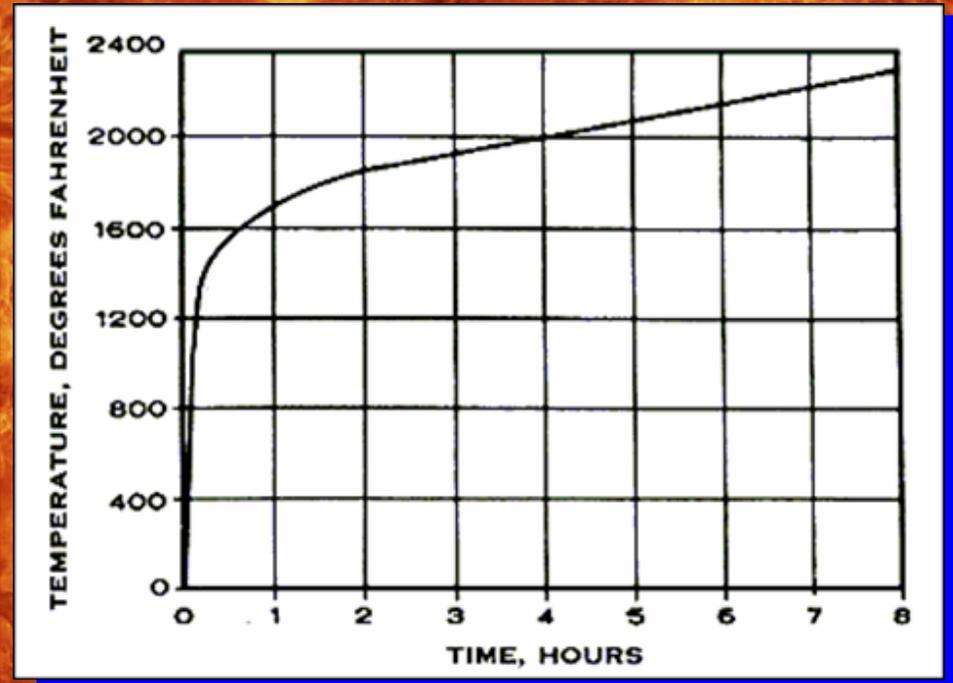
- Controlled laboratory experiments
- Standard Test Fires with Standard Conditions
- Nationally Recognized Testing Laboratories

RATINGS

- Doors & Windows
 - 15, 30, 45 minutes
 - 1, 1.5, 2, 3, and 4 hours

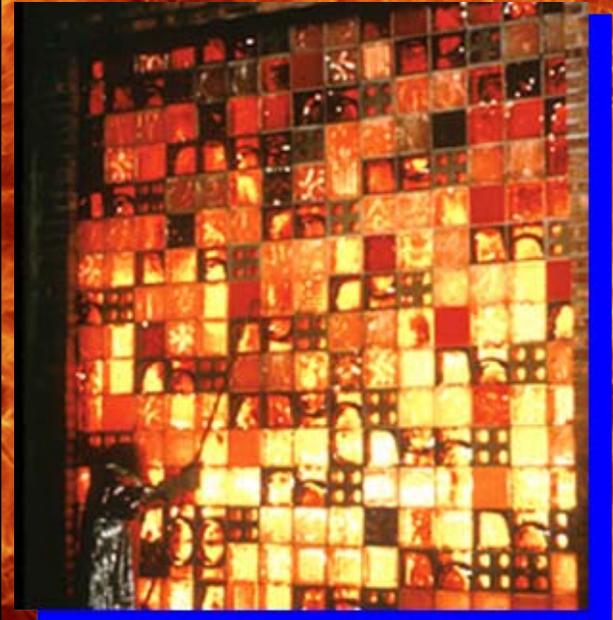
STANDARD TIME/TEMP CURVE

- Based on a historic test – Burned a small number of structures full of thermocouples and normal combustible loading.
- Modern fire tests use gas burners to produce similar insults to tested components.



NFPA 251 FIRE TESTS APPLY TO

- assemblies of masonry units
- and composite assemblies of structural materials for buildings,
- including
 - bearing and other walls and partitions,
 - columns, girders, beams, slabs, and
 - composite slab and beam assemblies for floors and roofs.



COMMON TEST PROTOCOLS

- Wall assemblies
- Floor/Ceiling Assemblies
- Door assemblies

COMMON “FAILING” CRITERIA

- Failure to support load
- Temp. Increase on unexposed side to 250-deg. F above ambient
- Excess temp (as specified) on steel members
- Failure under hose streams (walls and partitions)

TEST ASSUMPTIONS

- One Sample Passes One Test One Time
- Standard Uniform Test Fires
- “Hours” terminology

**WALL
ASSEMBLY
FAILING
UL FIRE TEST**



EQUIVALENT BARRIERS

- Some fire and building codes
 - (like the older Uniform Building Code)
- Established equivalent ratings.
 - Use 3/8-inch rated gyp-rock on both sides of a metal stud wall and get 1-hour rating.
 - Add sprinklers to both sides and it becomes a 2-hour wall

EQUIVALENT BARRIERS (CONT'D)

- A solid-core wooden door can receive a 20-minute rating with no testing.
- Put a 20-minute door into a 4-hour wall, and it all becomes a one-hour assembly

SOURCE TERM DETERMINATION

- Fire Area
 - Often: an area encased by rugged passive barriers
 - At Pantex: within any one structure not segregated by 4-hr assemblies
- Sprinkler Design Area
 - How big of a fire is the sprinkler system expected to successfully fight
 - NFPA 13 sets rules for sprinkler design areas.

SOURCE TERM DETERMINATION (CONT'D)

- Sprinkler Design Area
- Varies with:
 - overall system size
 - Hazard class (based on combustible loading expectations)

EVENT RECOGNITION

- Since the real fire may not behave like the standard time/temp curve fire, it may not be conservative to base very many decisions during an emergency on the rated times for barriers.
- When you can state with some engineering judgment that the “expected” fire will be (somehow) less severe than the “standard” fire, then it can become more defensible.

SUMMARY –

- Fire rated barriers can be useful for both scenario development & postulation and event recognition
- How they apply can be very dependent upon how the “expected” fire compares to the “standard” fire.
- Sprinkler systems can provide insight on what the system designer “expects” for a fire within a building.

UL TESTING VIDEO CLIP





THE END