

FIRE SAFETY WITH CONCRETE PRODUCTS

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Masonry Association

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FCIA TJC ASHE UL
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Referenced NCMA TEK

- TEK 5-8B: Detailing Concrete Masonry Fire Walls
- TEK 7-1C: Fire Resistance Rating of Concrete Masonry Assemblies
- TEK 7-2: Balanced Design Fire Protection
- TEK 7-3A: Firestopping for Concrete Masonry Walls
- TEK 7-4A: Foam Plastic Insulation in Concrete Masonry Walls

All available free on line – see www.ncma.org – Solutions Center – ETEK

Components of Balanced Design



1

Automatic Detection Systems (Alarms)

2

Automatic Suppression Systems
(Sprinkler Systems)

3

Compartmentation -
using non-combustible
materials
(Concrete Masonry)



Firewall Performance



Firewall Performance



Firewall Performance



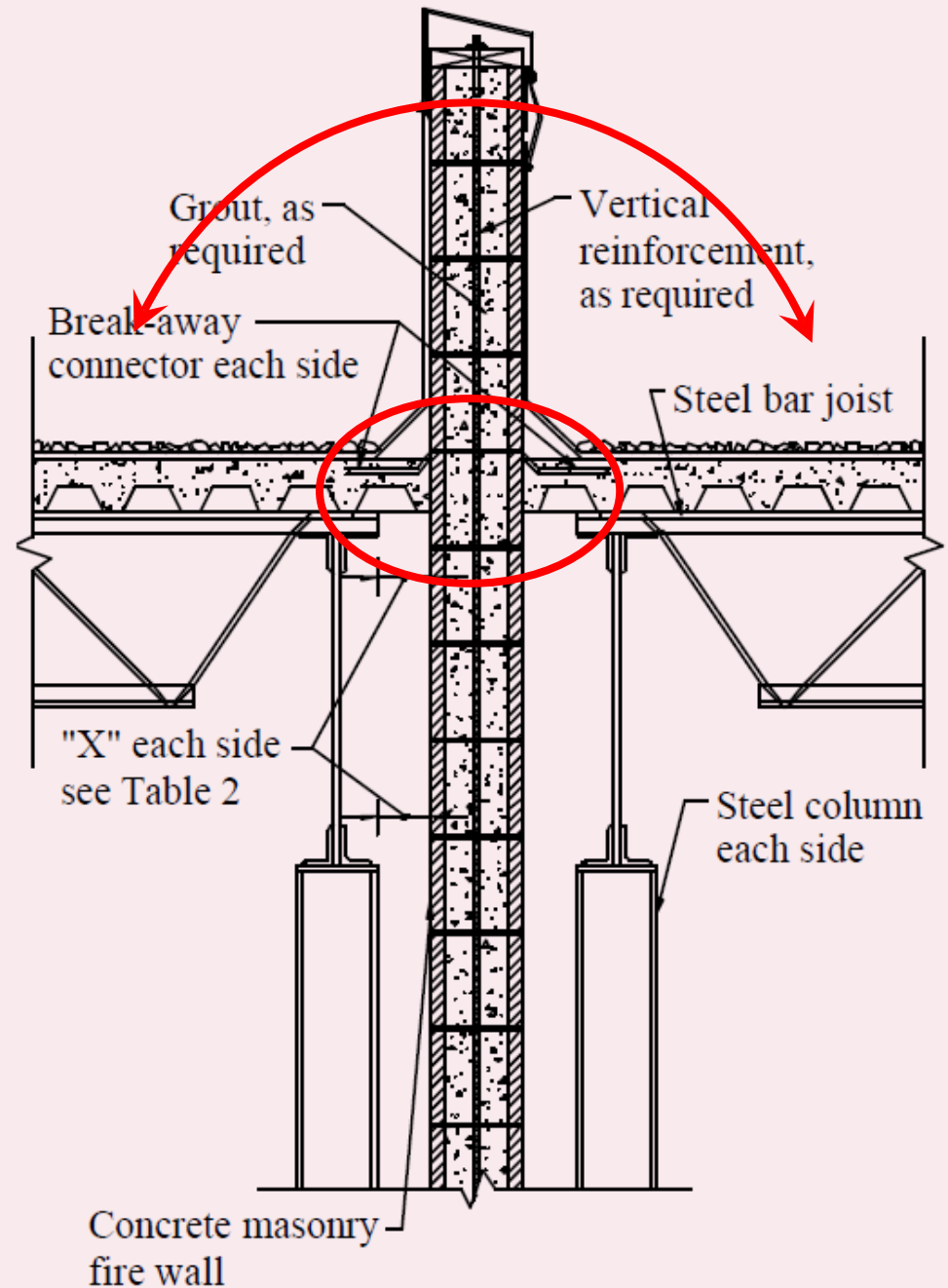
Consequence of No Fire Walls



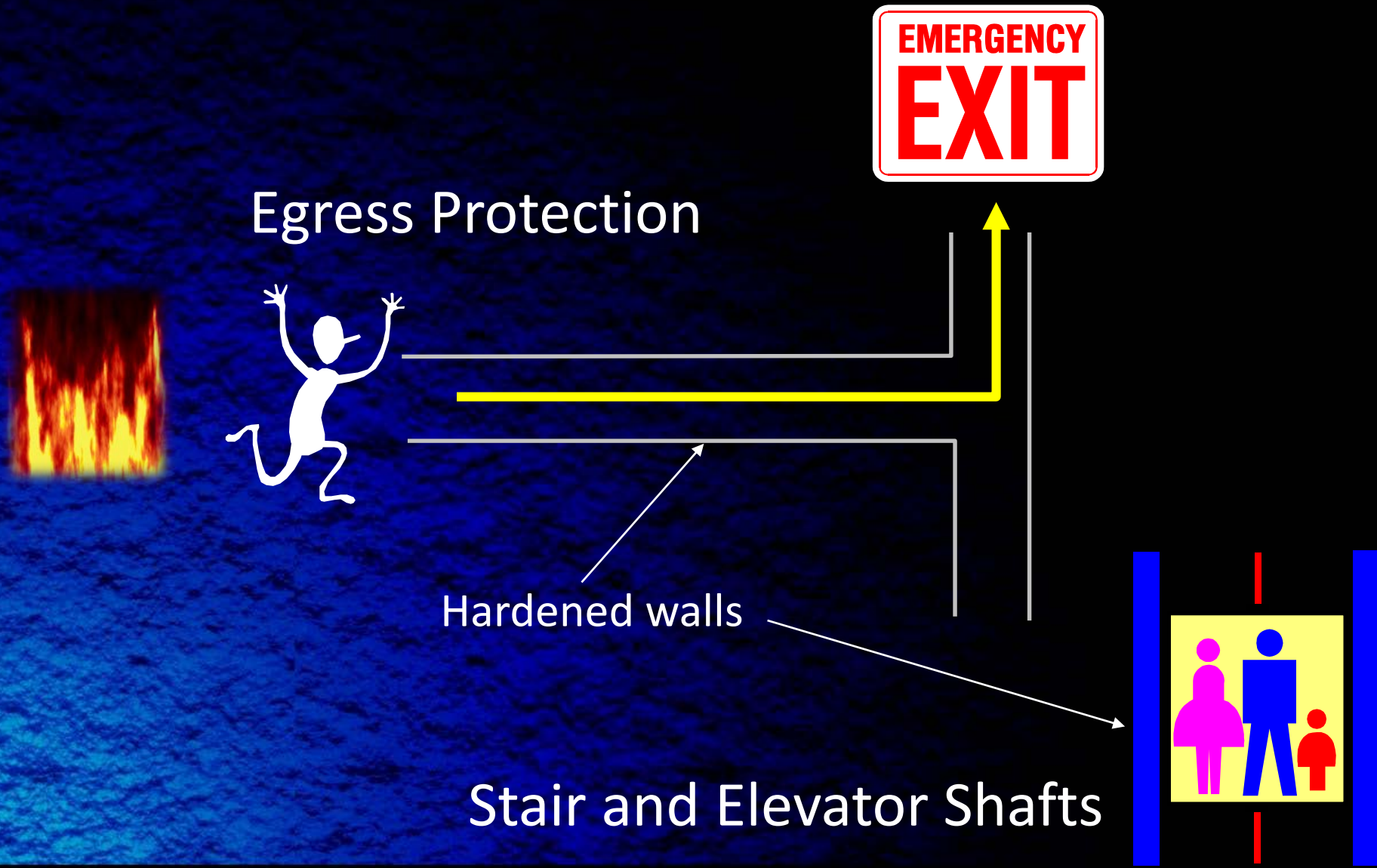
New Orleans Fire



Independent Support and Breakaway Connectors to Prevent Firewall Collapse



Robustness



Concrete Fire Ratings



ASTM E 119

Three methods for
determining ratings:

1. **Fire Testing**
2. Listing Service
3. Calculation Method



Concrete Fire Ratings Per the Building Code

Three methods for
determining ratings:

1. Fire Testing
2. Listing Service
3. Calculation Method



Underwriter's Laboratories

UL 618
UL Standard
for Safety for
Concrete Masonry Units

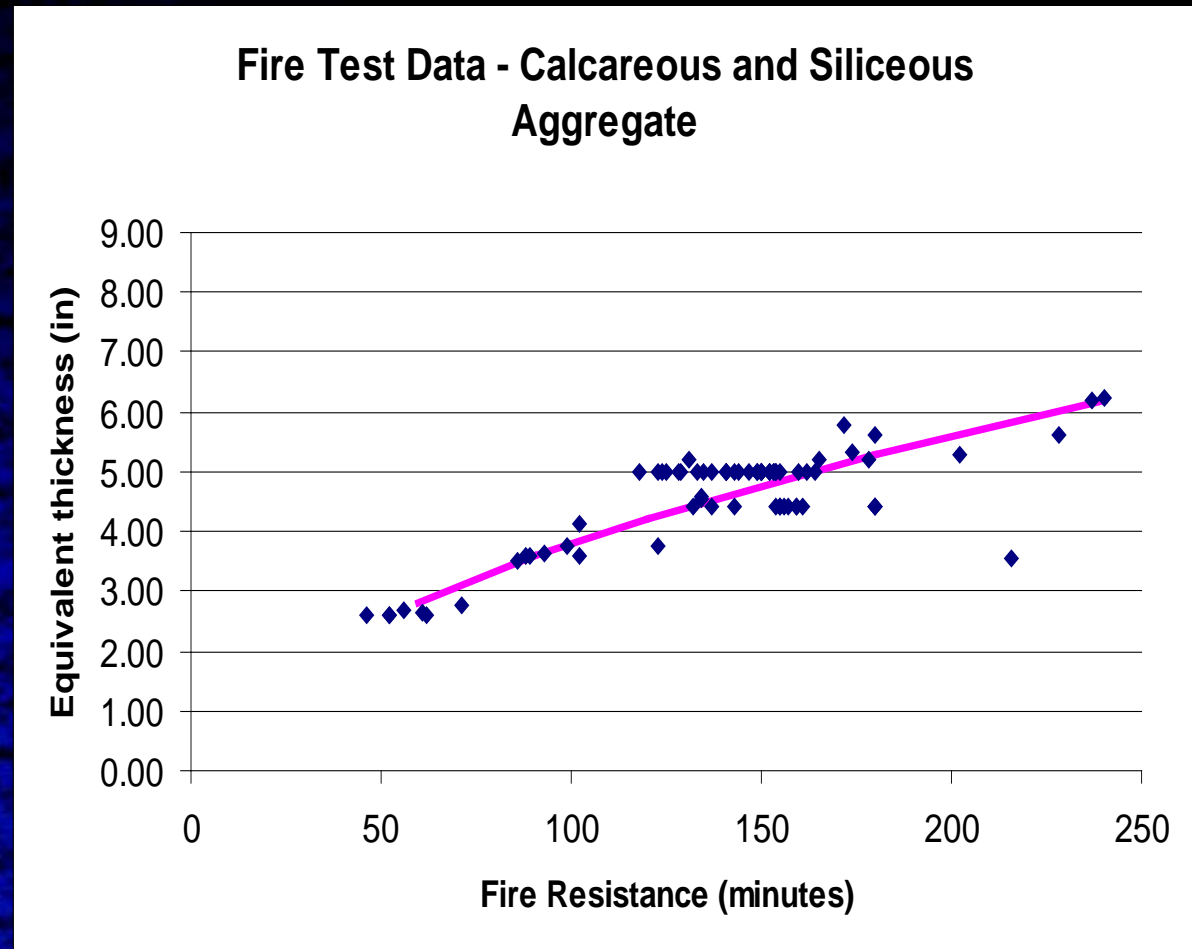
ASTM E119 – Fire Rating Criteria

- Structural – failure to support load
- Passage of heat or flame sufficient to ignite cotton waste
- Temperature rise on the unexposed surface 250°F over ambient
- Failure under hose stream - walls and partitions

Concrete Masonry Fire Ratings

Three methods for determining ratings:

1. Fire Testing
2. Listing Service
3. Calculation Method

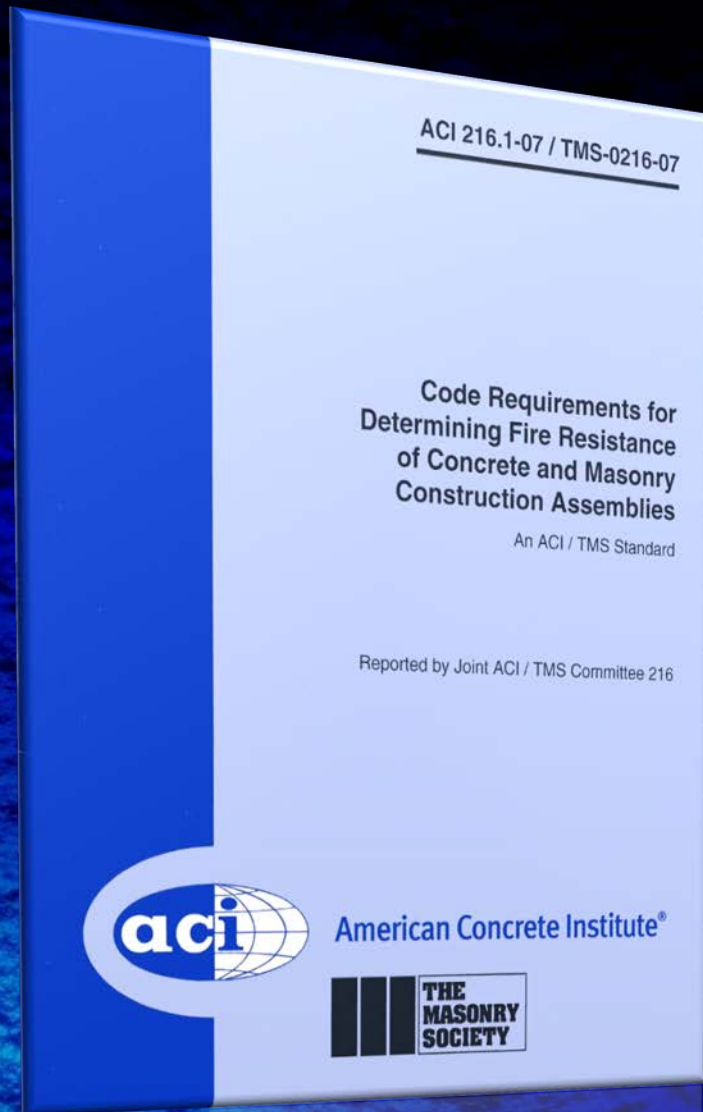


Calculated Fire Resistance Method

Fire ratings for concrete products are a function of:

- Aggregate type
- Equivalent thickness

ACI 216.1 / TMS 216

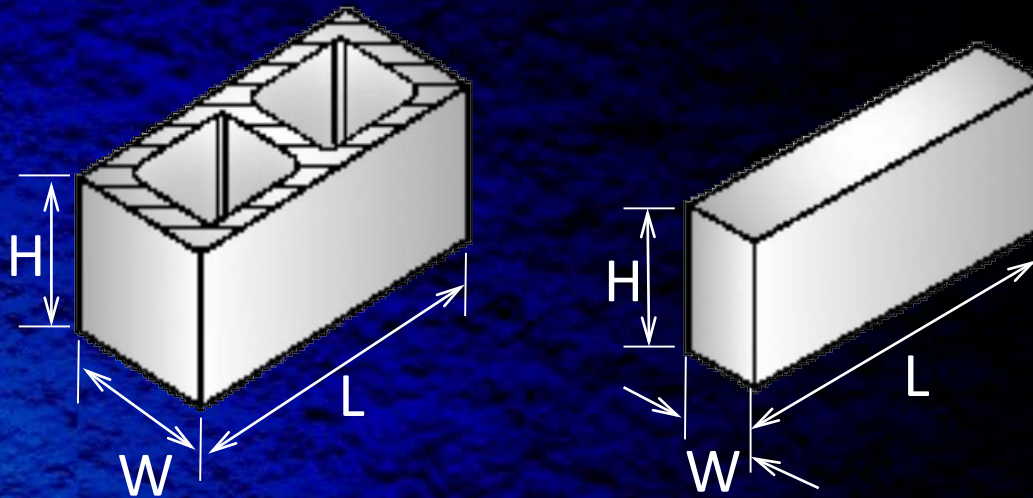


Applicable to:

- Concrete
- Concrete masonry
- Clay brick and tile masonry
- Effects of finish materials on fire resistance
- Incorporated into the I-Codes

Equivalent Thickness

Equivalent Thickness, T_e , is the solid thickness that would be obtained from the same volume of concrete without cores.



$$T_e = \% \text{ solid} \times \text{actual thickness}$$

Applicable NCMA TEK on Fire Resistance*

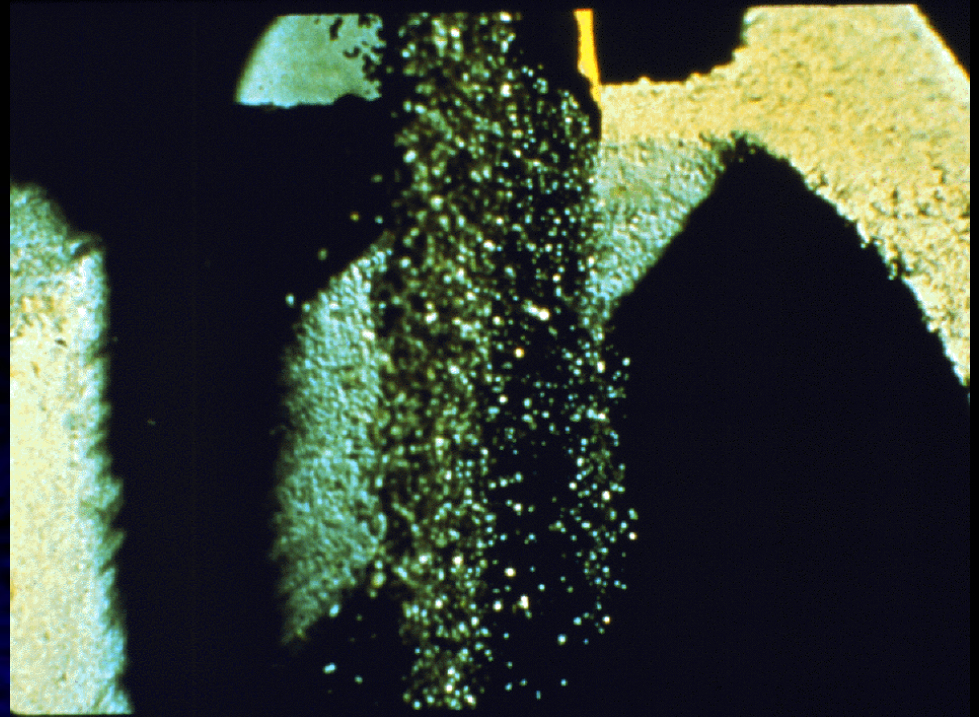
- **TEK 7-1C:** Fire Resistance Rating of Concrete Masonry Assemblies
- **TEK 7-3A** Firestopping for Concrete Masonry Walls
- **TEK 7-5B:** Evaluating Fire Exposed Concrete Masonry Walls
- **TEK 7-6:** Steel Column Fire Protection

*All are available free on-line through www.ncma.org

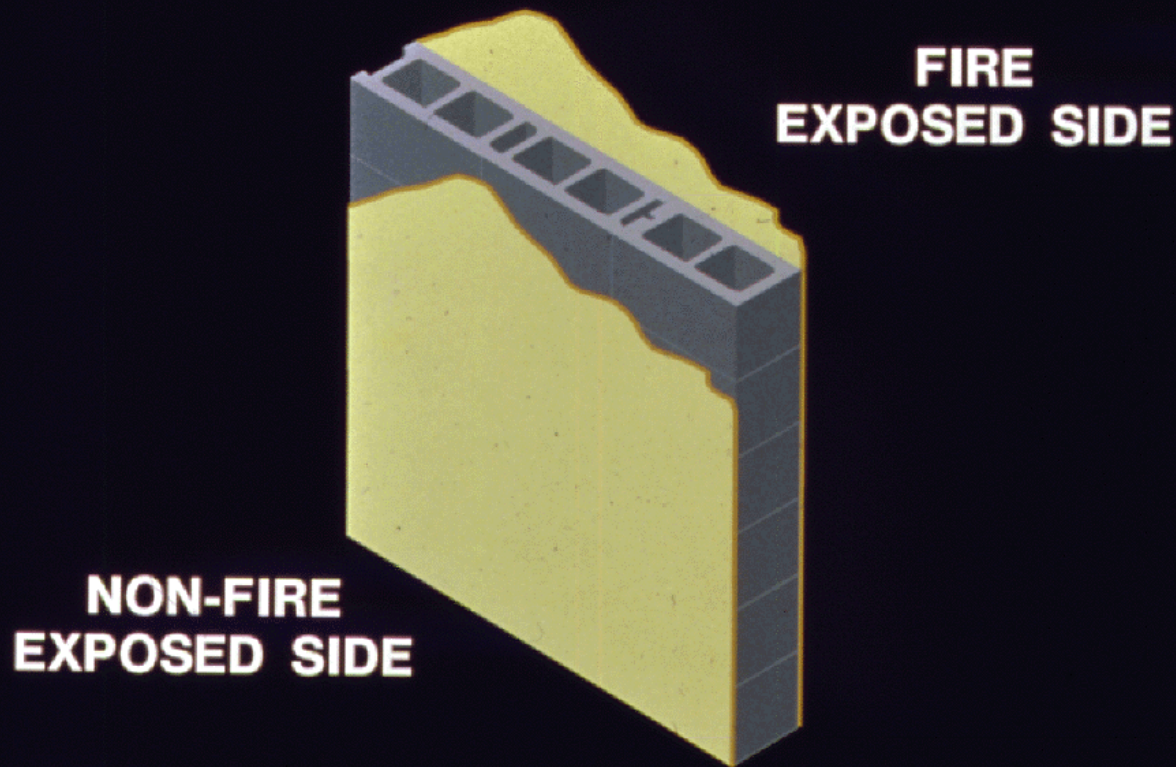
Filling Cores

When the hollow cores of concrete masonry are filled, the equivalent thickness is considered to be the actual thickness of the concrete masonry unit.

Thus all filled 8-inch and many 6-inch CMU have 4 hour ratings.



Finishes

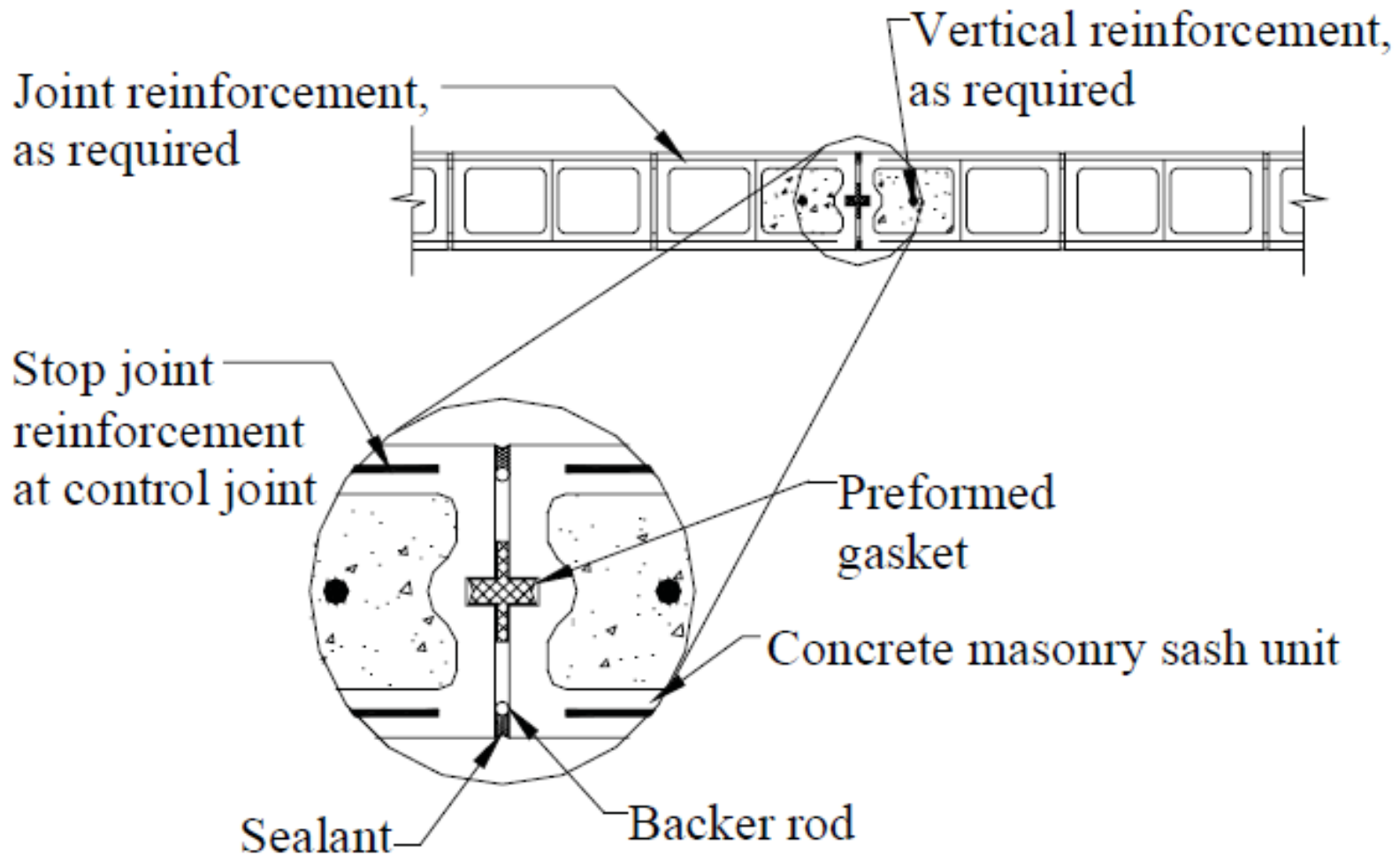


Finishes are an excellent way of increasing the fire resistance rating of existing assemblies

Repairs to Concrete Masonry

Concrete, mortar, and grout are generic listed fire resistant materials that can be used for repairs and firestopping within the limitations of the code.

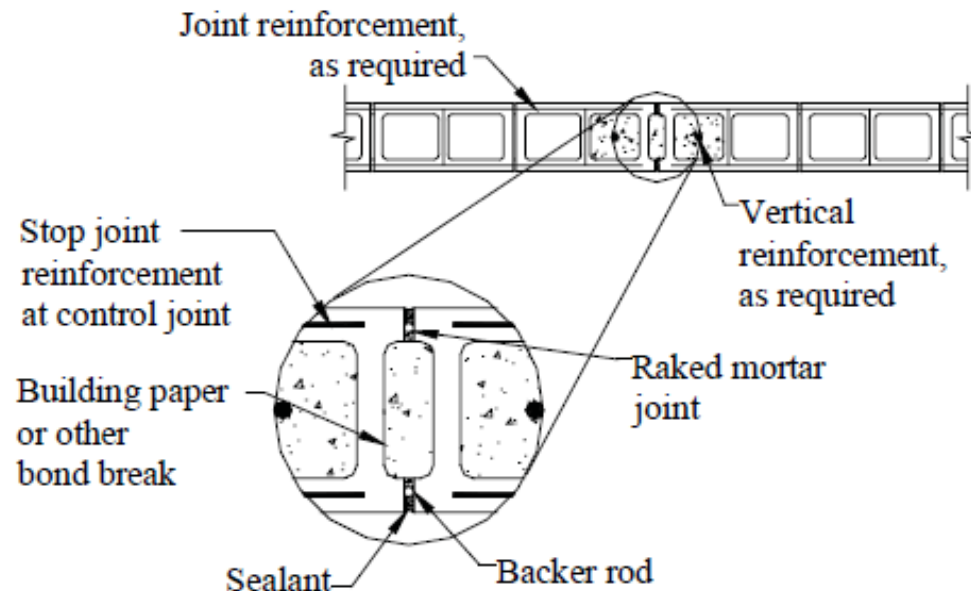
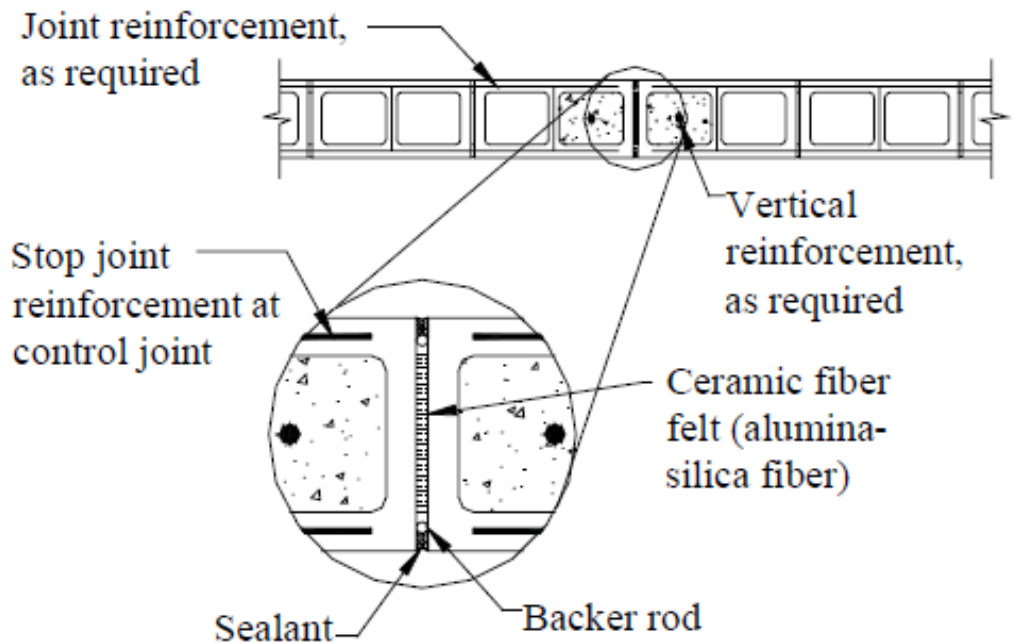
Control Joints



2-Hour Fire Resistance Rating

Control Joints

- 4 hour rated joints for masonry
- Concrete similar to top figure
- Chart indicates amount of insulation



Glazed Units

The calculated fire resistance rating procedure for a glazed unit is the same as for conventional units- Same charts based on equivalent thickness and aggregate type.



Beams, Lintels, Columns, and Floors

The IBC and ACI/TMS 216 Standard have tables for determining the calculated fire resistance rating for masonry and concrete lintels, beams and columns as well as for concrete floors.



Clay Brick & Tile

The IBC and ACI/TMS 216 Standard also address calculated fire resistance rating for clay brick and tile masonry wall assemblies (very similar to the concrete masonry wall tables and procedures).



IBC NFPA 285 Requirement

2012 IBC

2603.5.5 Vertical and lateral fire propagation. The exterior wall assembly shall be tested in accordance with and comply with the acceptance criteria of NFPA 285.

For more detailed information, see NCMA TEK 7-4A

IBC NFPA 285 Requirement

Exceptions:

1. One-story buildings complying with Section 2603.4.1.4.
2. Wall assemblies where the foam plastic insulation is covered on each face by a minimum of 1-inch (25 mm) thickness of masonry or concrete and meeting one of the following:
 - a. there is no air space between the insulation and the concrete or masonry; or
 - b. the insulation has a flame spread index of not more than 25 as determined in accordance with ASTM E 84 or UL 723 and the maximum air space between the insulation and the concrete or masonry is not more than 1-inch (25 mm).

For more detailed information, see NCMA TEK 7-4A

Exterior Generated Fires



Monte Carlo Hotel-Las Vegas

January 28, 2008



Cost Comparison Study



Fire Safe Construction Cost Comparison Study



Cost Comparison Study

The original study was conducted in MA, PA, MD, NY. However, supplements were issued later for 31 additional cities across the US.



Cost Comparison Study

Conclusion:

Cost of compartmentalized construction using a concrete based material is generally less than 5 percent of the overall construction cost and in some cases there is no increased cost.

See: <http://www.pafscac.org/>

Summary

- Concrete products provide robustness and added protection
- Fire ratings are easily determined by the various methods available.
- Compartmentation is effective and it doesn't cost as much as people think.

Questions?

Thank you for your time!



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