



Fire Endurance Testing of Floor Truss Assemblies

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ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials

ASTM E119 prescribes a standard fire exposure of controlled extent and severity.

Performance is defined as the period of resistance to standard exposure before the first critical point in behavior (conditions of acceptance) is observed.

Conditions of acceptance for floor systems include:

- Sustained applied load during classification period
- No passage of flame or hot gasses
- Maximum and average temperatures of the unexposed side of the specimen
- Maximum and average temperatures of the steel joists





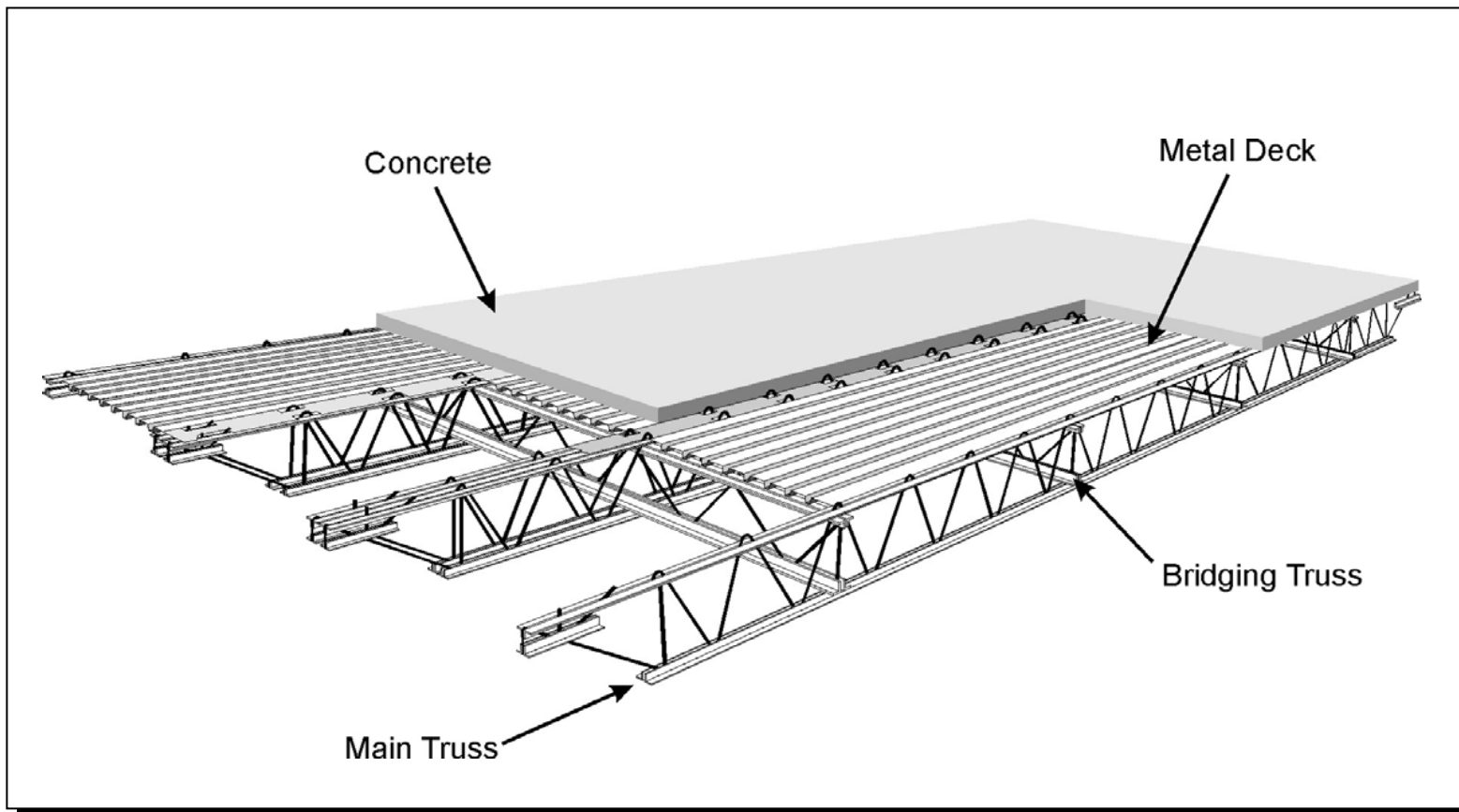
Testing Summary

- Two tests conducted in Toronto at ULC
 - August 7, 2004 - 35 ft. Restrained Assembly
 - August 11, 2004 - 35 ft. Unrestrained Assembly
- Two tests conducted in Northbrook at ULI
 - August 19, 2004 - 18 ft. Restrained Assembly
 - August 25, 2004 - 18 ft. Restrained Assembly (1/2 in. fireproofing)





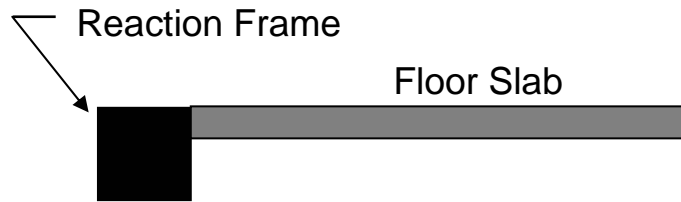
WTC Floor Assembly



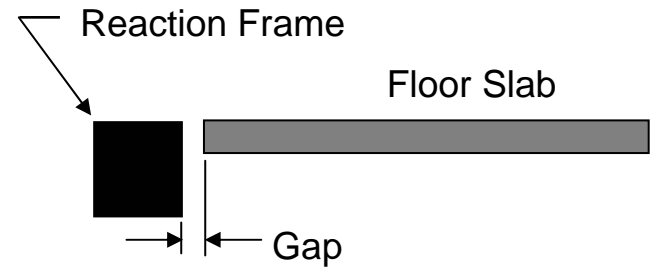


Test Restraint Conditions

Restrained Test Condition



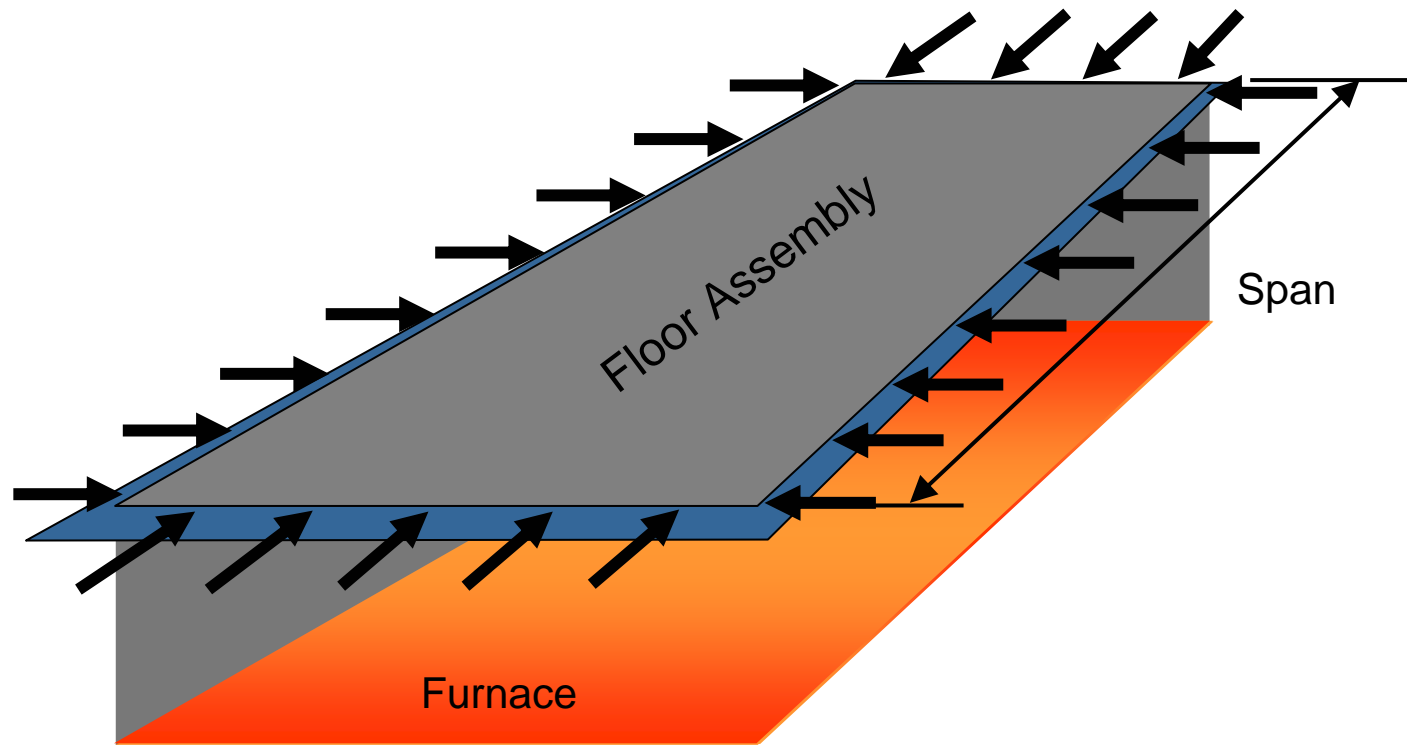
Unrestrained Test Condition





Effect of Restraint Against Thermal Expansion

Floor slab expansion is restrained, and conditions will develop





Design and Fabrication of Test Assemblies





Preparation of Test Assemblies



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Instrumentation

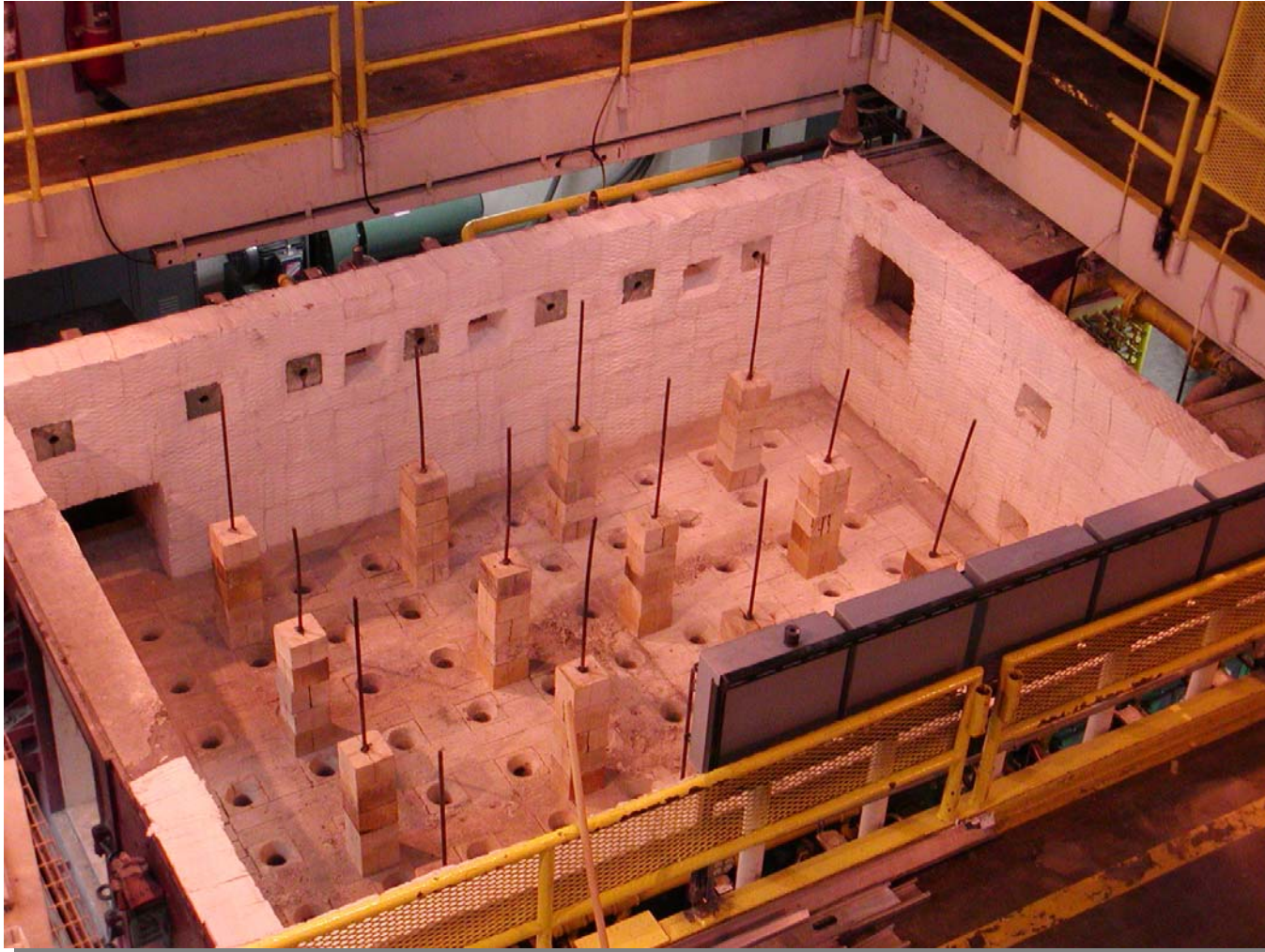
Each Assembly Contained:

- 159 Thermocouples
 - 44 on Each Main Truss
 - ~ 6 miles of thermocouple wire
- 2 Plate TC's, 2 Radiometers, 2 Asp. TC's
- 15 Deflection Measurements
 - 9 on Unexposed Surface
 - 6 on Bottom Chords





UL - Northbrook Furnace



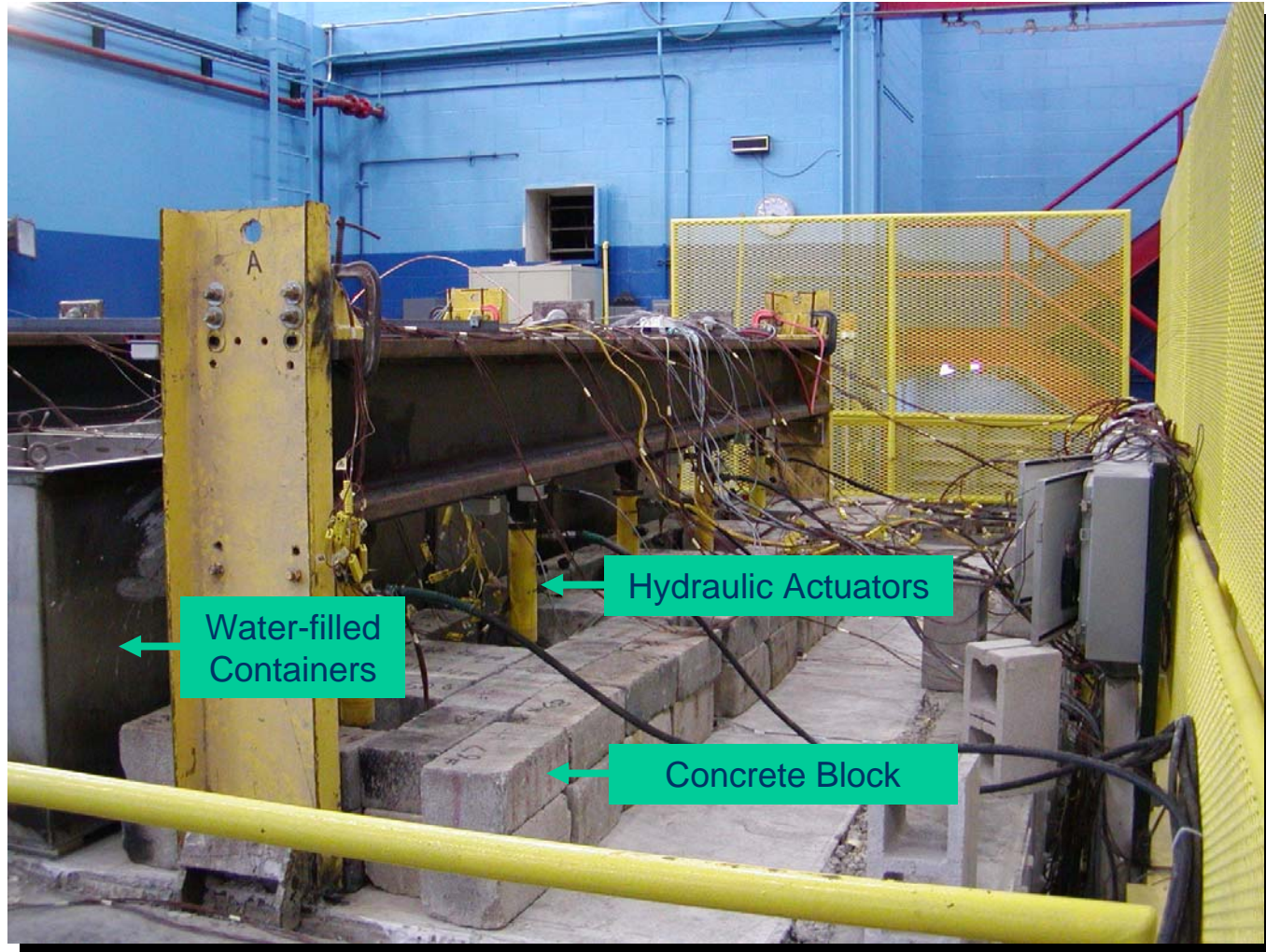


UL - Northbrook Furnace with Test Specimen





Loading of Test Assembly - Northbrook

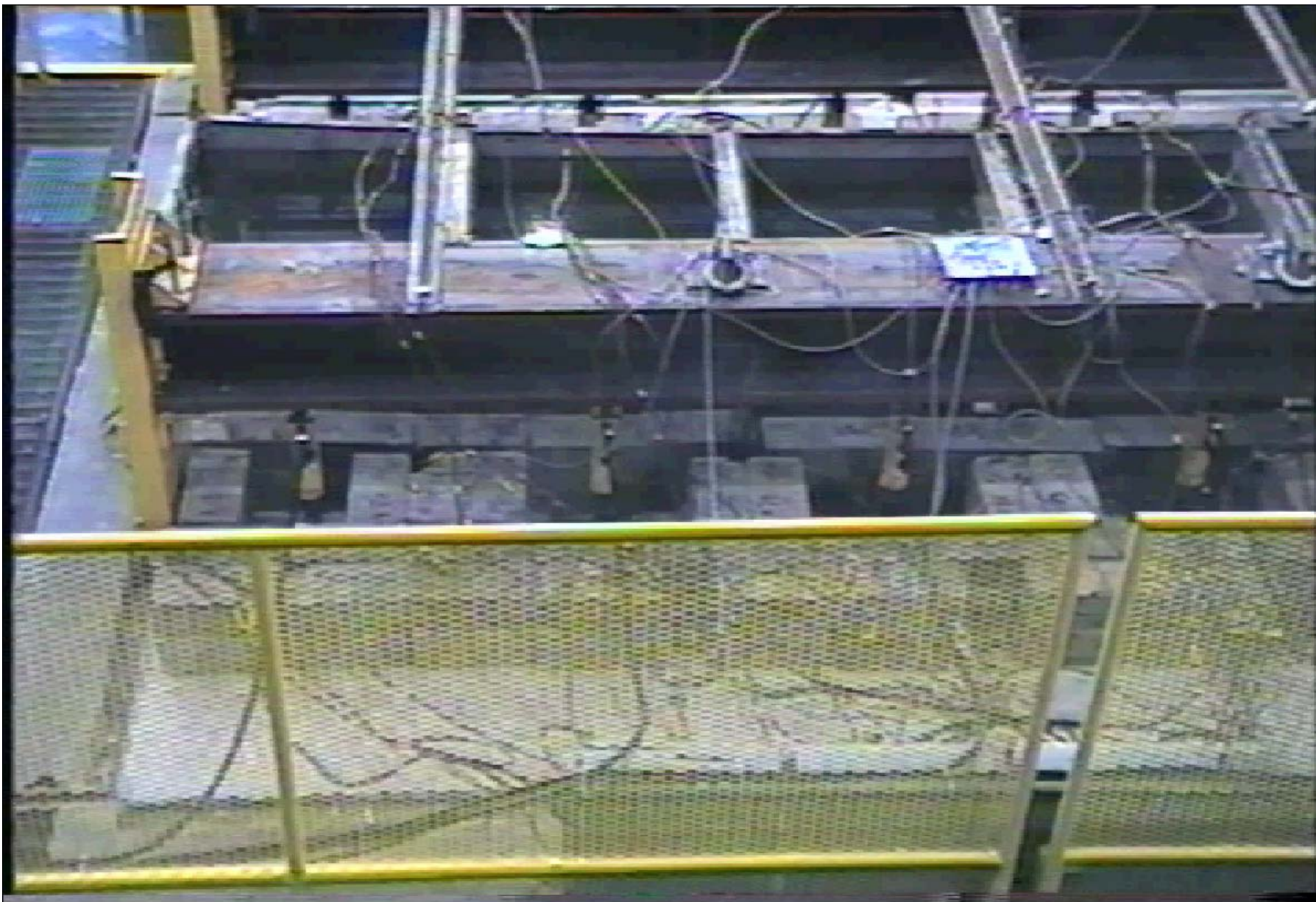




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Post Test Observations Test No. 3





Post-Test Observations – Steel Truss Behavior





Post Test Observations - Slab Deflections





Fire Resistance Ratings

Test	Description	Times to Reach End-Point Criteria (min)					Test Terminated (min)	Standard Fire Test Rating		
		Temperature on Unexposed Surface		Steel Temperatures		Failure to Support Load		ASTM E 119-61	ASTM E 119-00	
		Average (Ambient +250°F)	Maximum (Ambient +325°F)	Average (1100°F)	Maximum (1300°F)			Rating (hr)	Restrained Rating (hr)	Unrestrained Rating (hr)
1	35 ft, restrained, ¾ in fireproofing	---	111	66	62	(3)	116 ⁽¹⁾	1½	1½	1
2	35 ft, unrestrained, ¾ in fireproofing	---	---	76	62	(3)	146 ⁽²⁾	2	---	2
3	17 ft, restrained, ¾ in fireproofing	180	157	86	76	(3)	210 ⁽²⁾	2	2	1
4	17 ft, restrained, ½ in fireproofing	---	58	66	58	(3)	120 ⁽¹⁾	¾	¾	¾

(1) Imminent collapse

(2) Vertical displacement exceeded capability to measure accurately

(3) Did not occur

