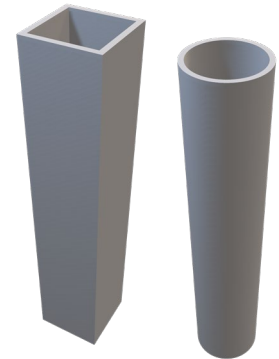
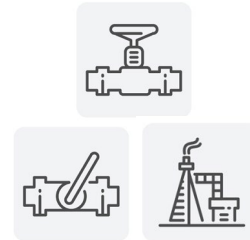


# UL 1709 updates

## PFPNet Conference 2024

Simon Baker, staff engineer  
Kevin Hyland, principal engineer

Oct. 21, 2024



# Agenda

1. UL 1709, the Standard for Rapid Rise Fire Tests of Protection Materials for Structural Steel – July 8, 2024, revisions
2. Proposed seventh edition
3. Critical process control equipment (CPCE) test method overview

# UL 1709

- Proposal dated Feb. 23, 2024
- Ballot closed April 8, 2024
  
- Revisions to comparative beam test
- Hollow section column test protocol for reactive materials
- Fire test procedures for passive fire protection (PFP) systems for CPCE



# UL 1709 beam testing: Revisions to comparative method

- Did not reach consensus
- Nine yes
- Nine no
- Needed more than 50% yes to continue
  
- “The [currently published] test arrangement as described [in UL 1709] is configured to allow a test to be carried out within the constraints of what can be achieved with a [existing] furnace, rather than to represent a typical structural arrangement from a hydrocarbon facility.”
- Comparative beam test method still in UL 1709
- Another proposal is being prepared.



# UL 1709: Hollow section columns

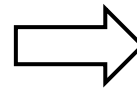
- For reactive products, test both rectangular shape and circular shape of same shape factor (A/P)
- The worse-case shape can be considered representative of the other and be used for the remainder of the hollow section test program.
- No change for nonreactive products (spray-applied fire resistive materials, gypsum board, mineral batts, etc.)
- Alternatively, if big spread in performance, can test full program of both shapes

Ø5  
min.

Test rectangular  
shape

55  
min.

Worse-performing shape  
used for remainder of hollow  
section program



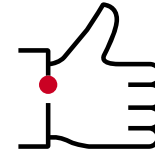
65  
min.

Test circular shape

55  
min.

# UL 1709: Hollow section columns

- Consensus reached
  - Twenty yes
  - Zero no
- 
- Proceeded to publication on July 8, 2024
  - New Annex A5, Hollow Section Ratings
  - UL Solutions communicated timeline, effective date



# UL 1709: CPCE

- Critical process control equipment
- CPCE test procedure – Ian Bradley, PFP specialists
- Part 3
  
- Consensus reached
- Nineteen yes
- Two no
- Proceeded to publication on July 8, 2024



# UL 1709

Proposed seventh edition





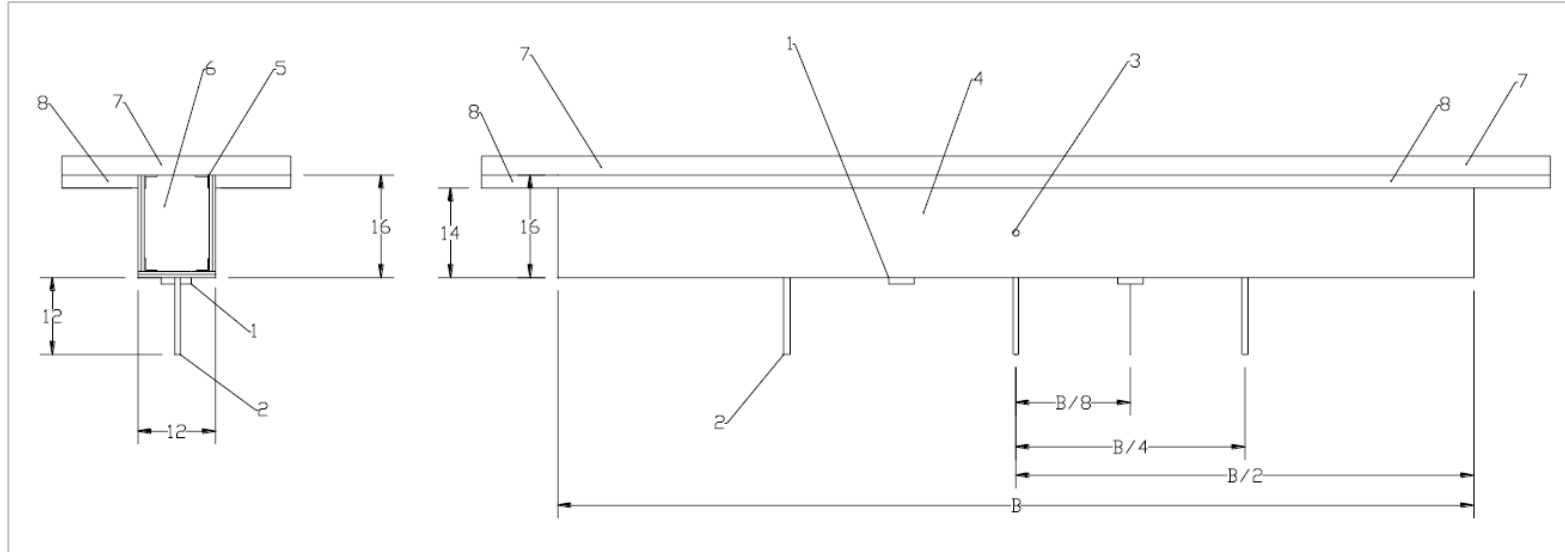
# UL 1709, proposed seventh edition

- Proposal draft viewable in UL Standards & Engagement's Collaborative Standards Development System (CSDS)
- [csds.UL.com](https://csds.ul.com)
- Dated July 30, 2024
- Proposed by Robert Berhinig, UL 1709 Technical Committee member
  
- Part 1 – Introduction
- Part 2 – General Requirements
- Part 3 – Tests of Structural Elements
- Part 4 – Tests for PFP for CPCE
- Annexes

# UL 1709, proposed seventh edition

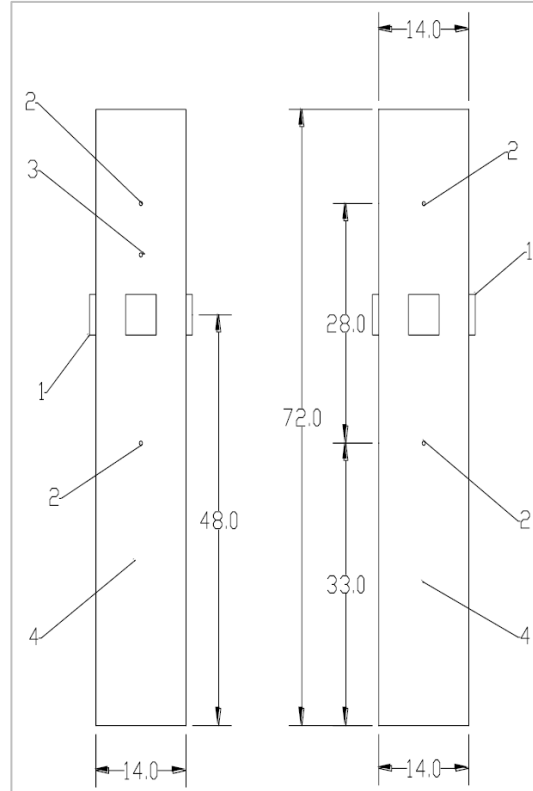
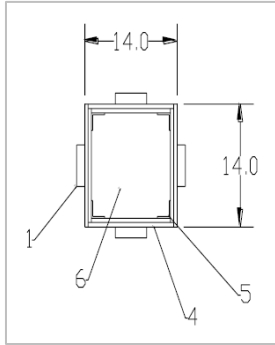
- Key proposed changes
  - Calibration of horizontal furnaces – New
  - Calibration of engulfment (column) furnaces – Revision
  - UL 2431, the Standard for Durability of Fire Resistive Coatings and Materials; durability/environmental requirement applies to all parts of UL 1709 (including CPCE) – Revision
  - Horizontal beam test (reference to UL 263, the Standard for Fire Tests of Building Construction and Materials) – New

# Calibration specimen for floor furnace



Three-sided box component

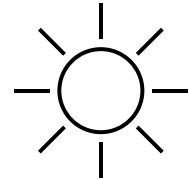
# Calibration specimen for engulfment (column) furnace



Source: UL 1709 proposal dated July 30, 2024

# UL 2431 applies to all parts of UL 1709

- Simulated environmental exposures
- All structural and nonstructural items shall demonstrate an ability to retain a level of their fire-resistive properties when exposed to environmental conditions anticipated where a hydrocarbon pool fire may occur.
- These environmental conditions are represented by the conditions defined in UL 2431, Section 5, Conditioning Environments, in compliance with Classification Category I-A, Outdoor, Heavy Industrial.
- Acceptable performance for items with a protective coating system shall be as defined in UL 2431, Section 11, Performance Criteria.

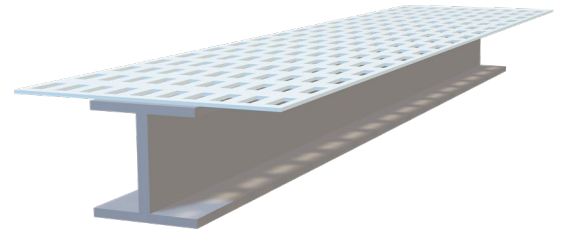


# Horizontal beam test

## 14 Horizontal Members – Beams

14.1 The fire test is to follow the requirements of UL 263, loaded unrestrained beam test with the following modifications:

- Furnace thermocouple locations
- Additional deflection requirement when deflection exceeds  $(1.5 L^2)/(400 d)$



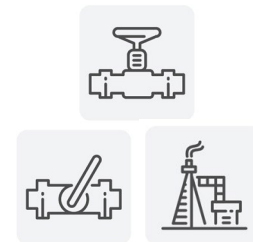
# UL 1709

CPCE test method overview



# CPCE

- “In the oil, gas and petrochemical industry, precision control of the flow of product through valves in the system is vital, and modulation of that flow depends on the valve actuator. These critical pieces of equipment must perform reliably and safely under the most extreme conditions.”
- “Additional requirements in the oil and gas industry may be called for, such as fireproof versions of actuators that reliably maintain all functionality, even during the direct impact of fire. In the event of a fire, the enclosure absorbs the heat and ensures reliable actuator operation, ensuring that the valve still functions.”



<https://www.valvemagazine.com/articles/electric-actuators-in-the-oil-and-gas-industry>



# Three categories of test specimens

Category of test specimen	Description	Test type applicability
Functional specimen	An item of CPCE, operated during the fire test at a regular interval	Functional (see note)
Nonfunctional specimen	An item of CPCE, inoperative during the fire test	Nonfunctional
Characteristic specimen	A dummy specimen of equivalent size and section factor to an item of CPCE	Nonfunctional

Note: Functional tests can also be used to generate temperature data as per nonfunctional tests.

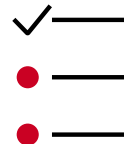
Category	Purpose	When to use	Test specimen	Other	Thermocouples
Functional specimen	Tests operation of item during fire	When failure criteria of CPCE is unknown	Representative of actual item of CPCE in field installation	Needs limit switch to confirm correct operation of item	Optional

Category	Purpose	When to use	Test specimen	Other	Thermocouples
Functional specimen	Tests operation of item during fire	When failure criteria of CPCE is unknown	Representative of actual item of CPCE in field installation	Needs limit switch to confirm correct operation of item	Optional
Nonfunctional specimen	Characterizes temperature response of item	When failure criteria of CPCE is known	Representative of actual item of CPCE in field installation		Required

Category	Purpose	When to use	Test specimen	Other	Thermocouples
Functional specimen	Tests operation of item during fire	When failure criteria of CPCE is unknown	Representative of actual item of CPCE in field installation	Needs limit switch to confirm correct operation of item	Optional
Nonfunctional specimen	Characterizes temperature response of item	When failure criteria of CPCE is known	Representative of actual item of CPCE in field installation		Required
Characteristic	Characterizes temperature response of item	Test without actual CPCE; characterizes PFP material vs. section factor	Steel; section factor greater than or equal to CPCE item; boxes and pipe sections or combo	For CPCE predominantly made of steel	Required

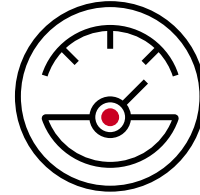
# Test setup

- Verify test specimens against construction drawings
- Fire protection system applied in a manner representative of practice; protect entirety of test specimen
- Fire protection system thickness measured at various locations, with different thicknesses of installed material noted
- Test specimen shall be mounted on supports a minimum of 20 in. (0.5 m) above furnace floor
- Electrical, hydraulic or pneumatic connections for operational specimens



# Performance criteria

- Operability – Successful completion of an operation cycle or continuity of signal
- Specimen temperature – Time–temperature profile at each measurement position on body of test specimen
- Integrity of systems and assemblies
  - Consider penetration of flames or hot gases through cracks, holes or breaches in joints
  - Effectiveness of fixing system



# Test report

- Report basics (test laboratory, dates, test sponsor, product identification, product manufacturer, etc.)
- Test specimen category
- Test specimen construction details, photographs, conditioning
- Material properties related to fire performance
- Test results
  - Thermocouple locations and temperature data
  - Operability of specimen
  - Classification attained, duration for each performance criteria





# Thank you

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