TSA-RE Dry Pendant Sprinklers Replacement at the AMWTP …a Success Story

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HUGHES ASSOCIATES, INC.
FIRE SCIENCE & ENGINEERING

Safety Share

- How **NOT** to dispose of a can of WD40 or other aerosol.

Transuranic Storage Area – Retrieval Enclosure (TSA-RE)

Background

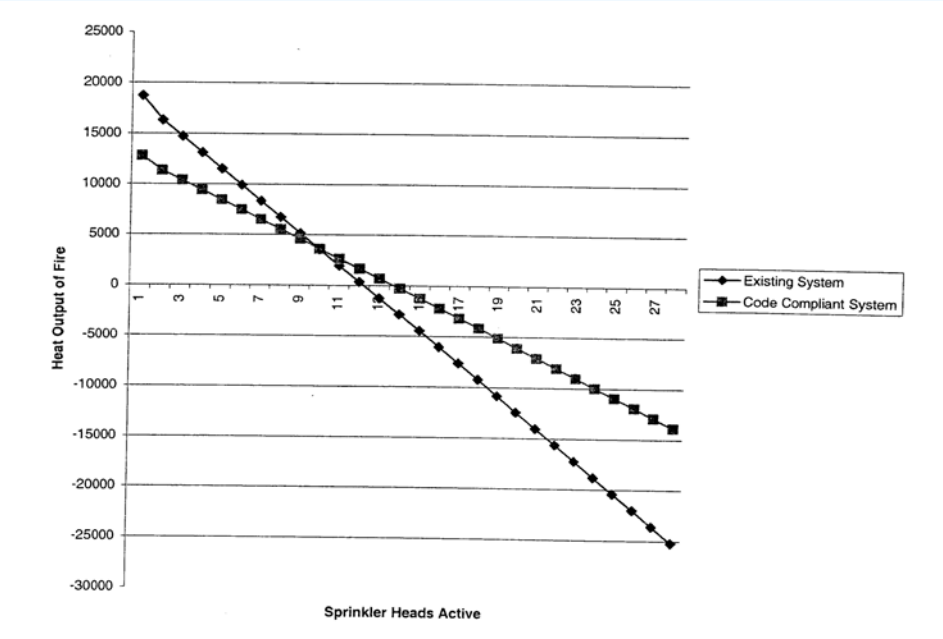
- Original dry pendant installation
  - Originally installed as pre-action (1996) and consisted of 8 independent systems using Grinnell Model F-960 dry-pendent sprinkler heads
  - Issues with linear beam detectors (alignment)
  - Converted to dry pipe in late 1990's

Background, Cont.

Equivalency Evaluation

- Dry system did not meet NFPA 13 criteria (system volume too large, time for water delivery too long)
  - Equivalency written and approved by DOE-ID

Equivalency Evaluation, Cont.



- In early 2002, an equivalency was prepared for the system size and water delivery time delay issues
  - Equivalency based on over design of the system for the commodity classification
  - Class IV commodity sprinkler design for a Class III commodity
  - DOE-ID approval received in August of 2002

Discovery of the Problem

- 10-year testing per NFPA 25, Section 5.3.1.1.1.5, was due in 2006
- Scheduled with initial sample of 35 (representing all 8 sprinkler systems) removed by support subcontractor and sent to UL for testing
  - 21 were actually tested as the remainder were damaged during removal
  - The sample tested represented the entirety of the sprinklers in the TSA-RE
- Of the 21 tested, 1 failed
  - NFPA 25, Section 5.3.1.3 states, "*Where one sprinkler within a representative sample fails to meet the test requirement, all sprinklers represented by that sample shall be replaced*."

Discovery of the Problem, Cont.

- The issue with replacement is that each of the 8 sprinkler systems have roughly 430 sprinklers, for a total of approximately 3440 sprinklers

Discovery of the Problem, Cont.

Problem now?

Discovery of the Problem, Cont.

Tarp and plywood sheet material

Fiberglass reinforced plywood boxes

How about now?

New Equivalency Investigation

- FPEs and management agreed it was prudent to test additional sprinklers
  - Was an equivalency possible based on
    - 25-psi operating pressure?
    - Robust water supply?
    - Equivalency on top of an equivalency?
  - 10 sprinklers from 8 systems removed and tested
- 80 sprinklers sent to UL for testing (plunge test)
  - 75 actually tested (remainder damaged during removal)
  - 5 failures (of total population 6 of 96 failed: 6%)
  - Failures ranged from activation at 36 psi up to did not operate at 100 psi
- Based on a 6% failure rate and the condition of some of the removed sprinklers, absolutely no technical basis to pursue equivalency


10/25/2007

Code Compliant Options

- Antifreeze system
- Wet system
- Dry system
- Sprinkler replacement

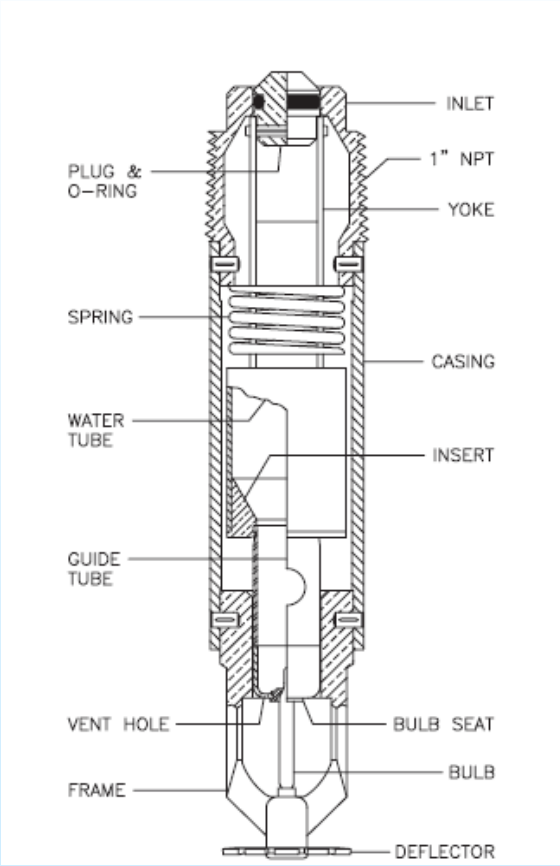
Selection Process

- Glycol
  - Not selected
    - Estimated cost $1.8M
    - Expansion tank size
    - Additional cost due to ongoing maintenance
- Wet
  - Not selected
    - Estimated cost $2.2M
    - Volume of heated space ~ 13 M ft^3 (hard to heat)
    - Addition of insulation
    - Rework of each of the fire risers

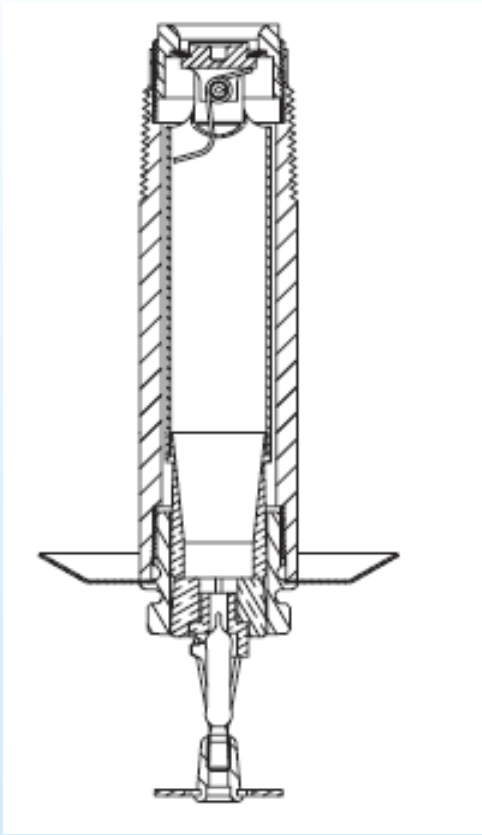
Selection Process, Cont.

- Upright dry
  - Not selected
    - Estimated cost $1.5M
    - Extensive pipe rework
- Direct Replacement
  - Selected
    - Estimated cost $700K
    - Cost was a significant consideration
    - A non O-ring design might be more reliable

Selection Process, Cont.



Grinnell Model F-960,
Standard Response



Victaulic Model V3605,
Standard Response

Selection Process, Cont.

Sprinkler Replacement and Installation

- RFP sent to solicit bids for work
  - Two attended pre-bid walkthrough
  - One submitted a bid
- Method of replacement
  - From above with temporary “scaffolding” and tie-offs
  - 100% fall protection
- Replacement work began August 27, 2007

Sprinkler Replacement and Installation, Cont.

Fall Protection and Rescue Devices

Horizontal Lifeline System

First-man Up Pole System

Rescue Positioning Device

Sprinkler Replacement and Installation, Cont.

- Challenges
  - Coordination with operations
    - FHA required no operations take place while sprinkler system was out of service
  - Physically reaching all 3440 sprinklers
  - Thermally hot/cold environment

Installation

- Project management and support
  - Coordination of contract documents
  - Recommendations/suggestions regarding fall protection equipment
  - On site during project to ensure work running smoothly
- 10CFR851 issues
  - 851 interpretations
    - Occupational medical program
    - Health and safety plan
  - Blown-insulation would required respiratory protection
    - Testing was done on rock wool to determine fiber content
    - ACGIH identifies limits based on TWA of 1 fiber/cc
    - Fiber content well below limits therefore only dust masks required
  - 100% Fall protection – Very important
- Installation complete November 8, 2007

Conclusion

- NFPA 25 IT&M program worked!
  - IT&M activities were performed on schedule
  - the problem was identified
- 10 CFR 851 was well managed
  - First major project at AMWTP that fell under 10 CFR 851
- Cooperation between ISIH and contractor was strong
  - Issues were worked through calmly and professionally (mostly)
- Air tests only performed for now (cold weather), hydro tests will be performed this summer
- The new sprinklers seem to be better than the old “O” ring style...time will tell

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Questions?

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