Petroleum Piping Phenomenon

Status Report on UL 971 Nonmetallic Underground Piping for Flammable Liquids

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Who is UL?

- Underwriters Laboratories (UL) is an independent, not-for-profit organization and is recognized as a leader in standard development, product safety certification, and conformity assessment services.
- To ensure UL develops standards that are comprehensive and unbiased Standard Technical Panels (STP) are utilized.

What is a STP?

- UL forms STPs to serve as a consensus body to review and vote on proposals prior to standard publication. A STP is a group of individuals, representing a variety of interests (e.g., manufacturers, authorities having jurisdiction, etc). STP involvement includes:
  - Draft standard (proposal) development
  - Meeting attendance
  - Proposal review
  - Voting
  - Review responses and comments
  - Final publication

Performance Standard

- 40 CFR, 280.20 (b):
  - Piping that routinely contains regulated substances.....must be properly designed, constructed….in accordance with a code of practice developed by a nationally recognized association or independent testing laboratory.

Nonmetallic Underground Piping for Flammable Liquids (UL 971)

- Includes requirements for primary carrier, secondary containment, integral primary/secondary containment, normal vent and vapor recovery pipe, nonmetallic pipe, fittings, and systems intended for use underground in the distribution of petroleum-based flammable and combustible liquids, alcohols, and alcohol-blended fuels.

So, What's the Fuss All About?

New

Used

Why Revise UL 971?

- Revised UL 971 published January 2, 2004
- UL concluded piping failures were in response to:
  - Improper installation;
  - Inadequate maintenance practices; and
  - Failure to properly respond to leak detection alarms.
- States believe low retention of mechanical properties, after liquid or vapor exposure, is an important factor that has been overlooked during past evaluations.

Change in UL 971 Scope

- Clarifies that the standard only covers underground piping products that do not require special evaluation for fire, physical abuse, elevated temperature, and other additional considerations required for use in sumps or aboveground.
- Includes requirements for the evaluation of the general construction of metallic and nonmetallic piping materials and components, gaskets, adhesives, and tapes.

Effective Date - Markings & Qualified Persons

- July 1, 2004:
  - New and revised requirements related to instructions, markings, and qualified persons.

“Qualified Persons”

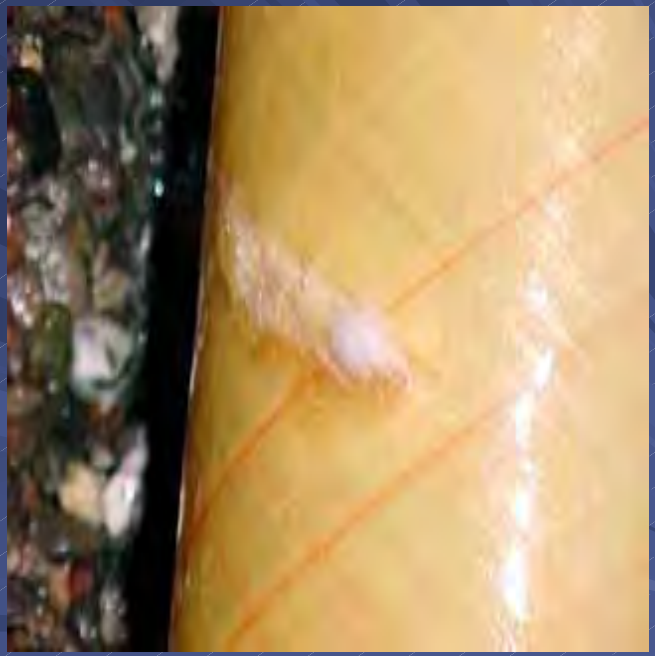
- Manufacturers are required to have a system in place to qualify persons that assemble and install their products as well as provide training and assistance.
- Manufacturers are required to provide their recommended instructions for assembly and installation with their products.

Effective Date – Construction & Performance

- **July 1, 2005:**
  - Testing parameters that require a review and retest of currently Listed underground piping products.
    - Only products that have been found to comply with the new requirements of UL 971 will be authorized to bear the UL Mark.
    - UL anticipates that there will be pipe listed to the new requirements by July 2005. UL's website (www.ul.com) will provide information on all currently certified products.

Abnormal Use

- Long-term exposure of primary exterior and secondary interior to fuel.
- Better simulation of abnormal abuses expected during assembly and installation, such as over torque and over bend conditions, drops, impacts, pull, crush, and puncture (and requiring higher retention values).



Pre-Conditioning

- Prior to compatibility and permeation tests.
- Consists of bending to the manufacturers minimum radius and conducting drop and impact tests

Compatibility

- Long Term Test
  - Maximum 2% length and diameter dimensional change
  - Maximum 5% weight change
- Short Term Test
  - Evaluate interstitial communication, UV compatibility, and both metallic and nonmetallic fitting stress tests.

Permeation

- Decreased rates of permeation
  - 4 g/sqm/day to 1 g/sqm/day for primary
  - 24 g/sqm/day to 4 g/sqm/day for secondary

Etc.

- Breakdown Test
  - New test intended to determine breakdown mode and pressure of a piping system for use as a benchmark for material property retention after immersion and other conditioning procedures.
- Sustained Pressure Test
  - New test intended to determine the material properties of flexible pipe and establish a pressure rating.
- Cyclic Pressure Test
  - Revised test intended to determine the material properties of rigid pipe and establish a pressure rating.

ONGOING REVISIONS TO UL 971

Current Major Workgroups

- **Temperature Research/Standard Scope**
- Pressure/Vacuum Testing
- Preconditioning
- General Pass/Fail, Dimensional Change, Weight Loss
- Aging Test/Service Life Calculation
- Accidental Crush Test/Long Term Burial Test
- Installation/Marking Instructions
- Permeation

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Timeline

- UL has asked the STP to:
  - Have all workgroups final reports by September 1, 2005
  - Be ready to ballot the Second Edition of UL 971 by end of 2005
  - Determine effective dates for second edition of UL 971

In Conclusion

- No official autopsy of the causes(s) of reported pipe degradation/failure by UL or the States.
- Therefore, can we accurately conclude that the petroleum piping phenomenon is a result of improper installation, inadequate maintenance, and failure to properly respond to leak detection alarms?
- Paradigm Shift?
  - Out with the old: minimum standards
  - In with the new: technology driving approach to meet real world applications

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