PHMSA Regulatory Perspective

Composite Repair Considerations
Composite Repair Users Group Workshop
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Presentation Overview

- Code Review and some history
- Guidance and Expectations
- Field Perspective
- Ideas to enhance regulatory interactions

Code Examples

- Available publicly through Electronic Code of Federal Regulations (E-CFR): http://www.ecfr.gov
- For PHMSA
  - Go to Title 49 – Transportation
  - Click on Parts 178-199 Pipeline and Hazardous Materials Safety Administration, Department of Transportation
  - PHMSA Pipeline is in 190-199: Part 192 Gas; Part 195 Hazardous Liquids
- States have to adopt the Federal code at a minimum, but can be more stringent. If jurisdictional to State, beware of State specific requirements.

Code Examples - gas

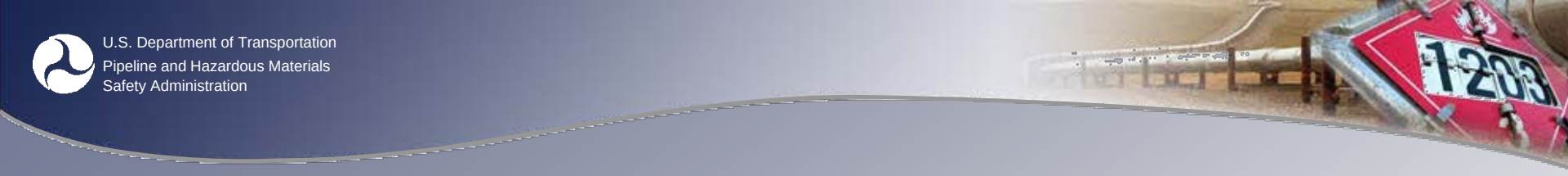
- **§ 192.309 Repair of steel pipe.**
  - b) Each of the following dents must be removed from steel pipe to be operated at a pressure that produces a hoop stress of 20 percent, or more, of SMYS, **unless the dent is repaired by a method that reliable engineering tests and analyses show can permanently restore the serviceability of the pipe:**
    - (1) A dent that contains a stress concentrator such as a scratch, gouge, groove, or arc burn.
    - (2) A dent that affects the longitudinal weld or a circumferential weld.
    - (3) In pipe to be operated at a pressure that produces a hoop stress of 40 percent or more of SMYS, a dent that has a depth of:
      - (i) More than1/4inch (6.4 millimeters) in pipe 123/4inches (324 millimeters) or less in outer diameter; or
      - (ii) More than 2 percent of the nominal pipe diameter in pipe over 123/4inches (324 millimeters) in outer diameter.

Code Examples: Gas Transmission

- **§ 192.485 Remedial measures: Transmission lines.**
  - a) *General corrosion.* Each segment of transmission line with general corrosion and with a remaining wall thickness less than that required for the MAOP of the pipeline must be replaced or the operating pressure reduced commensurate with the strength of the pipe based on actual remaining wall thickness. **However, corroded pipe may be repaired by a method that reliable engineering tests and analyses show can permanently restore the serviceability of the pipe.** Corrosion pitting so closely grouped as to affect the overall strength of the pipe is considered general corrosion for the purpose of this paragraph. asures: Transmission lines.

Code Examples - Distribution

- **§ 192.487 Remedial measures: Distribution lines other than cast iron or ductile iron lines.**
  - a) *General corrosion.* Except for cast iron or ductile iron pipe, each segment of generally corroded distribution line pipe with a remaining wall thickness less than that required for the MAOP of the pipeline, or a remaining wall thickness less than 30 percent of the nominal wall thickness, must be replaced. **However, corroded pipe may be repaired by a method that reliable engineering tests and analyses show can permanently restore the serviceability of the pipe.** Corrosion pitting so closely grouped as to affect the overall strength of the pipe is considered general corrosion for the purpose of this paragraph.



Code examples – Gas Transmission

- **§ 192.713 Transmission lines: Permanent field repair of imperfections and damages.**
  - (a) Each imperfection or damage that impairs the serviceability of pipe in a steel transmission line operating at or above 40 percent of SMYS must be—
    - (1) Removed by cutting out and replacing a cylindrical piece of pipe; or
    - (2) Repaired by a method that **reliable engineering tests and analyses show can permanently restore the serviceability of the pipe**.
  - (b) Operating pressure must be at a safe level during repair operations.

Code examples - liquid

- **§ 195.585 What must I do to correct corroded pipe?**
  - (a) *General corrosion.* If you find pipe so generally corroded that the remaining wall thickness is less than that required for the maximum operating pressure of the pipeline, you must replace the pipe. However, you need not replace the pipe if you—
    - (1) Reduce the maximum operating pressure commensurate with the strength of the pipe needed for serviceability based on actual remaining wall thickness; or
    - (2) **Repair the pipe by a method that reliable engineering tests and analyses show can permanently restore the serviceability of the pipe.**

Guidance and Expectations

- Detailed criteria, expectations and guidance is limited:
  - Some information on general expectations in the preambles of NPRM and Final Rule for 1999 amendments
  - Interpretation Nov 18, 2010
- PHMSA does not endorse/recommend any particular product
- If used, we would expect the operators to do an adequate job selecting the right materials/methods for their operations, which would include getting appropriate testing data, etc.

Preamble language

- **More language of guidance/intent in preamble: Search via www.regulations.gov or just google the following**
- **16884 Federal Register / Vol. 64, No. 66 / Wednesday, April 7, 1999 / Proposed Rules**
  - **Proposed Rule [Docket No. RSPA–98–4733; Notice 1]**
- **69660 Federal Register / Vol. 64, No. 239 / Tuesday, December 14, 1999 / Rules and Regulations**
  - Final Rule (**[Docket No. RSPA–98–4733; Amdt. 192–88; 195–68]**)

Review and Approvals

- Does PHMSA Pipeline endorse/recommend/approve specific products? No. There has been some confusion in a couple areas
  - Certain products were previously allowed through special permits prior to 1999 code amendment. Code now takes precedence, and those SPs expired. Everyone plays by same rules
  - Operators expected to have listing in their Operating and Maintenance (O&M) manual of the "approved" methodologies for repairs that they allow for all types of defects that they repair (corrosion, cracks, dents, etc.)
    - Must include documentation showing operator (engineering) reviewed the repair methodology's test results and approved for inclusion in O&M, and reliable engineering tests and analyses show as method that can permanently restore serviceability of the pipe.
    - Inspector will review for adequacy, but does not result in explicit approval from PHMSA.

Field Perspective

- We have heard of issues and failures anecdotally; typically not reportable. Few reportable incidents to glean info from, or there are multiple contributing factors
- When we see issues, typically procedural in nature. I.E. not following appropriate procedures during installation, or operator using a method/product that's not in O&M
- Without reports or data, difficult to gain lessons learned
  - Starting to consider collecting more data and asking for additional information on composite repairs through inspections

General perspective

- Generally “simple” repairs on short straight sections with minor corrosion or smooth dents with no pre-existing issues in the immediate areas have little issue.
  - However, rarely have such simple repair considerations come across our desks for review
- Repairs on more aggressive dents, gouges, cracks, wrinkle bends over longer spans need more consideration
- Repairs along a line with changing SMYS levels where say incident occurred in an 80% section and looking to apply repair to 72% section where additional defects are found post incident (or vice versa) need additional consideration
- Hear talks of operators interested in applying to longer spans of pipe for uprate in lieu of replacement
  - 2010 Interpretation said no (next slide)

Interpretation PI-10-0013 Nov 18,2010

- PHMSA Pipeline Interpretations: http://www.phmsa.dot.gov/pipeline/regs/interps
- Re pipe repairs at 49 CFR §§ 192.309(b), 192.485(a), 192.487(a), 192.713(a)(2) and 192.717(b)(5) and 49 CFR § 195.585(a)(2).
- 1. Do these regulations limit the number of discrete applications or the length of application of alternative repair systems?
- 2. Can alternative repair systems be used to increase the pressure capacity of a span of pipeline above the original maximum operating pressure in response to revised operating demands?
- 3. Can alternative repair systems be used to address the need to lower stress levels in the base pipe in response to a change in class location or other revised operating conditions?

Interpretation PI-10-0013 Nov 18,2010

- 1. Do these regulations limit the number of discrete applications or the length of application of alternative repair systems?
- **Response 1**: The regulations do not prescribe a particular limit to the number of discrete applications of an alternative repair method. The engineering test data for the material to be used must clearly demonstrate that the alternative repair method will restore the original design strength of the pipe, but will also perform in the pipeline environment in which it is installed, including withstanding secondary stresses of loading, pipe movement, soil movement, and external loads, for the length of service for which it is intended. While the 1999 rule (64 FR 69660, December 14, 1999) allows alternative repair methods for individual repairs on corroded or damaged steel pipe in natural gas pipelines or corroded steel pipe in hazardous liquid pipelines where appropriate, an operator of a pipe joint having sufficient defects should carefully consider all reliable methods of repair before installing an excessive number of alternative repairs.

Interp PI-10-0013 cont'd

- 2. Can alternative repair systems be used to increase the pressure capacity of a span of pipeline above the original maximum operating pressure in response to revised operating demands?
- **Response 2**: No. The regulations require pipeline operators to repair their pipelines as necessary to maintain safety and serviceability. No repair method can be used to increase the original design strength or the pressure of a segment of pipeline above the established maximum operating pressure.

Interp PI-10-0013

- 3. Can alternative repair systems be used to address the need to lower stress levels in the base pipe in response to a change in class location or other revised operating conditions?
- **Response 3**: No. A change in Class Location is not a repair issue. The stress level and maximum operating pressure of a given section of pipe is based on the original material and design specifications, not the material used to repair the pipe. Therefore, operators must continue to follow the requirements of §§ 192.609 and 192.611 to confirm or revise the MAOP as necessary upon a change in Class Location, regardless of whether an alternative repair method was used to perform a repair.

Max's (and some others') current list of no-nos

- Applications of any composite repair on leaking pipes is generally a big no-no
  - more for liquid pipelines, but likely also a concern with gas pipelines where there's any liquid content
  - Aware some studies being done on composite repairs that can be applied and cured underwater, but still early in development
- Application of composite repair on girth welds where there is corrosion. May be ok if appropriate testing, but in general we'd like to see that avoided if possible

Issues for continued communication

- Clear understanding and communication of potential failure modes, cyclic fatigue effects
- Consideration of interactive threats in the design and selection of repair products
- Operator Qualification
- How to inspect post installation and assess integrity
- Where is the common ground for standardization of these products, while still being sensitive to proprietary information (ASME PCC-2 helps this)

Steps to enhance regulatory interactions

- Continued involvement and discussion in standards development (ongoing):
  - ASME PCC-2 Subgroup non-metallic materials
  - Continued considerations or pros/cons through ASME B31s (gas, liquid, OQ, etc.)
  - Continued initiatives bringing everyone to the table (regulators, operators, manufacturers)
  - Continued sharing of lessons learned

Questions

Thank you!

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