Maximum Allowable Operating Pressure (MAOP) & Integrity Verification Process (IVP)

2013 NGA Fall Operations Conference
Pipeline Integrity/Corrosion
October 3, 2013

Lauren Toczyloski
Pipeline Integrity Engineer
Con Edison
Agenda

- Con Edison Gas Background
- Con Edison Gas Transmission System Overview
- MAOP Validation Background
- Con Edison’s Records Search & MAOP Validation
- PHMSA’s Draft Integrity Verification Process Chart
- AGA’s Proposed Regulatory Language
Disclaimer

The pipeline operations of local distribution operators are very diverse. The actions taken for MAOP and integrity verification depend on the specific characteristics of each pipeline system. The actions taken or planned at Con Edison may vary from other operators.
Con Edison Gas Service Territory
Con Edison Company Background (Gas)

- Distributes gas to ~1.1 million customers in Manhattan, the Bronx, Queens, and Westchester County
- Maintains approx. 4,300 miles of gas mains and 377,000 service pipes
Con Edison Gas Transmission System

- 89 miles of mains > 125 psig
- MAOP: 245 & 350 psig
- Installed from 1948 to 2013
- Operating at 12% - 32% SMYS
- Customers: Power Generation & Gas Distribution System
- Unpiggable System
- 100% in Class 4, HCA
- 50 miles operating > 20% SMYS
  - 99% installed prior to 1970
    (i.e.- grandfathered pipe)
MAOP Validation Background

• MAOP requirements were defined by code 192.619 in 1970
  – Post-Code Pipe: Design Pressure, Pressure Test, Highest Actual Operating Pressure & Historical Knowledge
  – Pre-Code Pipe: Grandfather Clause

• Pipeline Safety, Regulatory Certainty, and Jobs Creation Act of 2011 (issued 1/3/12):
  – Pipeline operators must report on records that establish MAOP for transmission pipelines
  – The DOT must issue regulations for untested pipe operating in high consequence areas above 30% SYMS

• New reporting requirements in the Annual Report:
  – Part Q: MAOP Determination Method Inquiry
  – Part R: Pressure Test Inquiry

• PHMSA’s Draft Integrity Verification Process
MAOP Validation Effort

• Focused on Pressure Testing documentation:
  – Pipeline Safety Act, Sec. 23(d): confirm the material strength of previously untested lines in HCAs and operating at > 30% SMYS
  – NTSB P-11-15: “defects can only be considered stable if a gas pipeline has been subjected to a post-construction hydrostatic pressure test of at least 1.25 times the MAOP”
  – Annual Report Part R: collected pressure testing information
  – “Pressure testing has long been an industry-accepted method for validating the integrity of pipelines” ASME B31.8S-2004

• Con Edison’s MAOP Validation:
  – Con Edison’s records verified that 99% of all our transmission lines were subject to a post-construction pressure test
  – Reported as MAOP valid in Part Q of Annual Report
Con Edison Records Review Process

• Major Scanning Effort:
  – 600 boxes of paper records were pulled from storage
  – Scanning vendor brought onsite with equipment to perform work
  – 46,000 documents were reviewed

• Scanned Records Review:
  – Records vendor hired to review all scans for basic information
  – Performed a double blind review of every document
  – Initial Metadata collected: Borough, Date, Facility Type (Transmission, Distribution, Regulator, Other)
  – If Transmission, additional info collected: Location, Pipe Size, Segment #, Pressure, MAOP Relevant (Yes/No), Document Type

• MAOP Relevant Review:
  – Engineering vendor hired to review all MAOP Relevant documents
  – Additional MAOP related Metadata collected: Design Information and Pressure Testing information
PHMSA’s Draft IVP Chart

PHMSA DRAFT IVP CHART 9/10/2013
Gas Transmission 49 CFR Part 192

1. Determine jurisdiction (State/federal)
2. Identify pertinent state-specific rules that exceed Part 192.8 impact on IVP
3. Highlight/adjust screening criteria

If segment is in:
- HCA or MACA Class 4, or MACA Class 3, or
- MACA Class 2 w/ MAOP ≥20% SMYS, or
- MACA Class 1 w/ MAOP ≤20% SMYS

Perform Material Documentation Process (See Sidebar Process) And Document Basis for MACOP - Note 6

Option 1: Validate Traceable Material Documentation
(See Note 2)

Option 2: Perform Subpart J Pressure Test [If segment has history of M&C failures, include ‘Spike’ Pressure (NTSB P-11-14)]

Option 3: Derate Pipeline Communicate with Class Location

Option 4: Derate Pipeline Communicate with Class Location

End of Material Documentation Process; Return to IVP Process

Note:
- Grandfathered means pipe segments installed before July 1, 1970 with MAOP established in accordance with 192.616(c).
- High Consequence Area (HCA) as defined in 192.903.
- Legacy Pipe means pipe manufactured using LTERW, SSAW, Flash Weld (AO Smith), or pipe w/ joint factor < 1.0 (e.g., lap welded pipe) regardless of date of manufacture, OR pipe constructed or repaired using problematic construction techniques such as wrinkle bends, miter > 3 degrees, Dresser Couplings, non-standard fittings, arc welds, eccentricity welds, bell spigots, paddle weld repairs, etc.
- Modern Pipe means pipe other than Legacy Pipe.
- Moderate Consequence Area (MCA) means non-HCA pipe in Class 4, 3, or 2 locations, & Class 1 locations with 1 hour/occupied site in PR.

Note 1: Validation of MAOP per 192.616(e), MAOP, while applicable, is not anticipated to be a problem and not addressed in IVP flow chart.

Note 2: Validated material properties req’d for line pipe of ≥42 grade and greater, and pipe ≥ 27"OD if on the mainland, and fittings, valves, flanges & components.

Note 3: If operator does not have design & material documentation in accordance with 193.519(a)(1) per AHD 11-01 & 12-06, segment deemed not to have adequate documentation for purposes of this determination. Required records include mill test reports (or equivalent) showing test results for chemical & mechanical properties.

Note 4: Sampling to cover each unique combination of pipe type and vintage.

Note 5: If operator does not have pressure test records in accordance with 192.616(c)(2) per AHD 11-01 & 12-06, segment deemed not to have a valid pressure test.

Note 6: If operator chooses ECA option, material documentation process must be conducted as part of the ECA process step 7.

Note 7: ECA consists of material documentation, assessment, and analysis to establish material condition of pipeline and MAOP, communicate with segment-specific issue and documentation shortcomings. Assessment could include, as appropriate: SIF Program, OS, Coating Survey, Interference Survey Remaining Life Fatigue Analysis, etc.

Note 8: Rmc 192.616(a) to require min. 1.25 MAOP pressure test for new pipe.

**Some state requirements exceed Part 192: For example: (i) pressure test at 150% MAOP to establish MAOP, or (ii) all gas transmission (GT) to be classified and constructed to Class 4 requirements, or (iii) define as GT if MAOP > 125 psig, etc.
Con Ed’s Path on the existing Draft IVP
IVP Chart: Initial Screening

Start
Integrity Verification Process (IVP)
See Note 1

1. Determine Jurisdiction (State/Federal)
2. Identify pertinent state-specific rules that exceed Part 192 & impact IVP**
3. Highlight/adjust screening criteria

1. Is segment in either:
   HCA or
   MCA Class 4, or
   MCA Class 3, or
   MCA Class 2 w/ MAOP ≥20% SMYS, or
   MCA Class 1 w/ MAOP ≥20% SMYS?

   No → Continue to Operate and Maintain in Accordance with Part 192

   Yes → Perform Material Documentation Process (See Sidebar Process)
   And Document Basis for MAOP - Note 6

2. [Grandfathered]
   OR
   [History of M&C failure(s)]
   OR
   [Test Pressure < specified in 619(a)(2)]
   Notes 5 & 8

3. Modern

4. Legacy or Modern Pipe?
   Legacy

5. [Grandfathered]
   OR
   [History of M&C failure(s)]
   OR
   [Test Pressure < specified in 619(a)(2) or 1.25 x MAOP, whichever is greater]
   Notes 5 & 8

6. All No
Note 3: Required records include mill test reports showing test results for chemical and mechanical properties.

Implement program to test pipe samples to establish material properties. Program based on long term statistical sampling program and utilize in situ NDE, cutouts and destructive tests, destructive tests of pipe cutout for other reasons (such as repairs and relocations), use of conservative assumptions for evaluation of defects and repair criteria, etc. See Note 4.
IVP Chart: Remediation for Legacy Pipe

1. Replace Pipe Comply w Part 192
   - Optional

2. Develop Specific Guidelines
   - Engineering Critical Assessment (ECA)
     See Note 7
   - Yes
     - 4 options to establish MAOP
       Go to step 5, 6, 9, or 10

3. Based on Results Take Appropriate Action to Est. MAOP

4. Perform Subpart J Pressure Test with “Spike” Pressure
   (NTSB P-11-14)

5. Derate Pipeline Commensurate with Class Location

Perform Material Documentation Process (See Sidebar Process) And Document Basis for MAOP - Note 6
In Line Inspection: Explorer Robot

• Current Explorer Technology
  – Commercially available for 6-8” and 20-26” pipe
  – Un-tethered, self propelled, remote controlled robot
  – Capable of sharp bends and can pass through plug valves
  – Hot Tap for launch and retrieve

• Next Generation
  – Technology in development for other sizes (16”, 30 – 36”)
  – Additional Features being developed
    • Crack sensor, Mechanical Damage sensor, Rescue tool, Pipeline Cleaning tool and In-line charger
AGA Study: Evaluation of MAOP Testing for In-Service Transmission Pipelines
MAOP Remediation Timelines

<table>
<thead>
<tr>
<th>Location</th>
<th>≥ 50% SMYS</th>
<th>20 – 50% SMYS</th>
<th>&lt; 20% SMYS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Legacy</td>
<td>Modern</td>
<td>Legacy</td>
</tr>
<tr>
<td>HCA</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>MCA Class 4</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>MCA Class 3</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>MCA Class 2</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>MCA Class 1</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>

- Operators have diverse systems, which will result in a variety of MAOP validation methods
- Deadlines should be established at the State Regulator level
- Operating within New York City is challenging
  - A replacement project for 10-miles of transmission main is currently scheduled to take 10-years to complete
AGA’s Proposed Regulatory Language: 192.619(e)

- For pipelines operating greater than 30% SMYS in HCAs, that have not been previously tested:
  - Perform a pressure test, consistent with 192.619 a(2)
  - Perform an In-line Inspection
  - Reduce the pipeline MAOP by 20%
  - “A procedure that has been approved by the Administrator”

- Maintain the existing grandfather clause for all pipelines operating below 30% SMYS
Thank You!

Questions?

Lauren Toczyłowski
Pipeline Integrity Engineer
toczyłowskil@coned.com