GAS PIPING technology committee

GPTC Guidance for Distribution Integrity

Marti Marek
GPTC Chair

GAS PIPING technology committee

- History
  - The Gas Piping Technology Committee
    - Formed late 1960s
    - OPS developing performance-based regulations
    - OPS looking for “best practices”
    - Gas Piping Standards Committee
    - First “Guide” published same year as regulations, 1970

“Guide for Gas Transmission and Distribution Piping Systems”

GAS PIPING technology committee

- Who is GPTC?

  – Gas Industry
    - Distribution
    - Transmission
    - Manufacturing

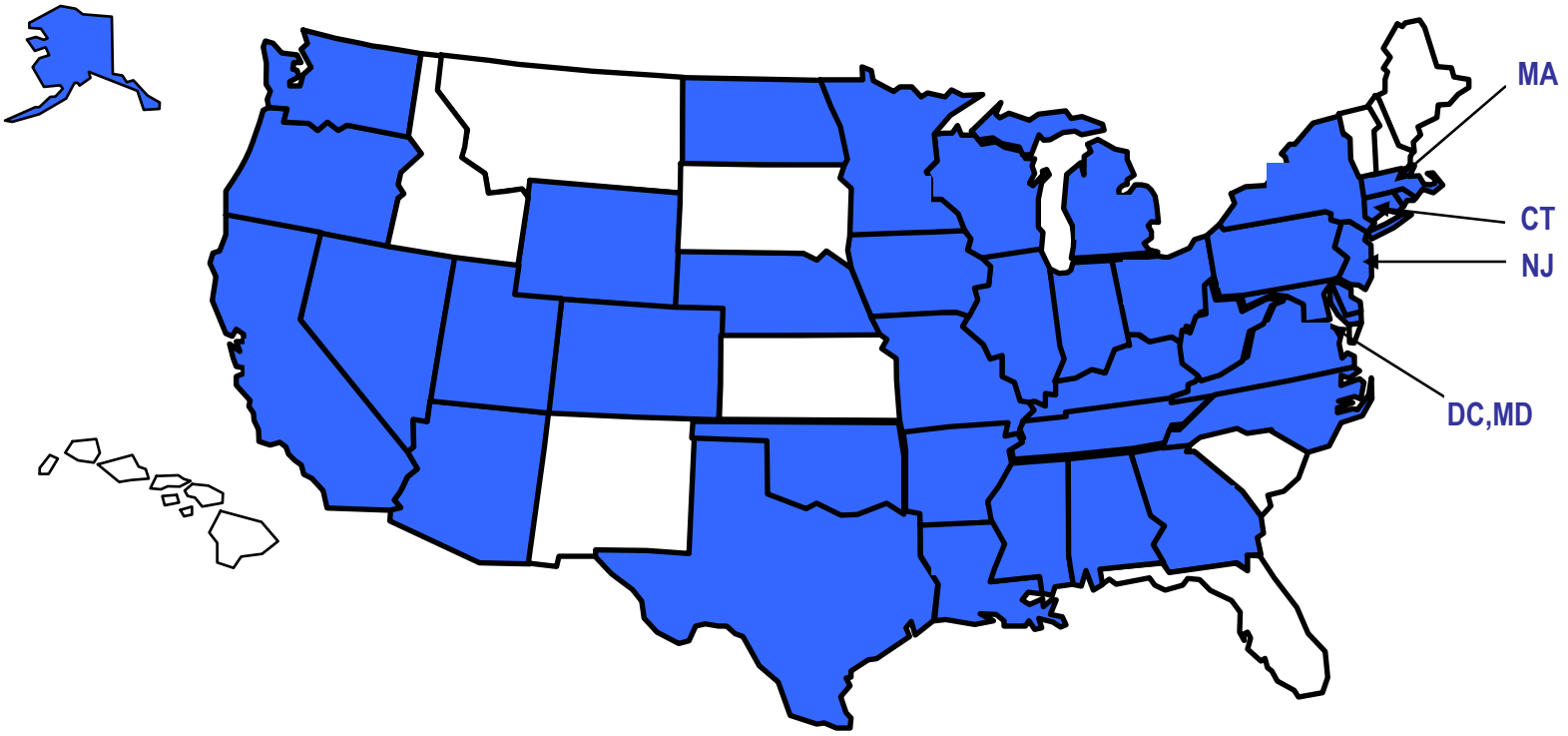
  - Gas Industry Regulators
    - State
    - Federal

  - NTSB

  - General Interest

GAS PIPING technology committee

Who is GPTC?



GAS PIPING technology committee

- Who is GPTC?
  - American National Standards Institute accredited – GPTC Z380 committee
    - Consensus process
    - Technically based
    - Independent
    - Members represent their profession

GAS PIPING technology committee

- What does GPTC do?
  - Writes guidance for complying with Parts 191 & 192 (the “Guide”)
  - Petitions PHMSA for Code changes
  - Comments on Notices of Proposed Rulemaking

GAS PIPING technology committee

- About the Guide
  - "How to" guidance
  - Advisory – does not restrict other methods of compliance
  - Already covers most aspects of system integrity:
    - Leak detection, grading, and control
    - Cast iron pipe considerations
    - Continuing surveillance
  - Recognizes system and operator diversity

GAS PIPING technology committee

- Writing DIMP Guidance
  - Requested by PHMSA & NAPSR to develop companion DI guidance
    - Provide different options for operators
    - Develop in parallel with regulation, i.e., before an NPRM is published
    - Based on the DIMP Phase I Report

GAS PIPING technology committee

- Writing DIMP Guidance
  - Major findings of Phase I
    - Differences between Distribution and Transmission preclude the wholesale use of transmission inspection techniques in distribution systems
    - DIMP Rule should be high level and permit flexibility for the wide diversity between LDCs

GAS PIPING technology committee

- Writing DIMP Guidance
  - GPTC asked to form a task group
    - Include members from outside of GPTC (particularly regulators and small operators)
    - Address the needs of small operators – preserve the KISS principal
    - Follow the 7 elements of Phase I
    - Provide examples to indicate the level of effort expected
    - Make available as a stand-alone appendix to the Guide

GAS PIPING technology committee

- Writing DIMP Guidance
  - Multiple stakeholder task group:
    - AGA
    - APGA
    - NAPSR
    - NARUC
    - PHMSA
    - PUBLIC

GAS PIPING technology committee

- What's in the Guidance?
  - Disclaimers
    - AGA - Not an AGA document
    - ANSI - Not an ANSI standard

    - "Participation by state and federal representative(s) or person(s) affiliated with the industry is not to be interpreted as government or industry endorsement…"

GAS PIPING technology committee

- What's in the Guidance?

1. Introduction
2. Elements of a DIMP
3. Knowledge
4. Identify Threats
5. Evaluate and Prioritize Risk

GAS PIPING technology committee

- What's in the Guidance?

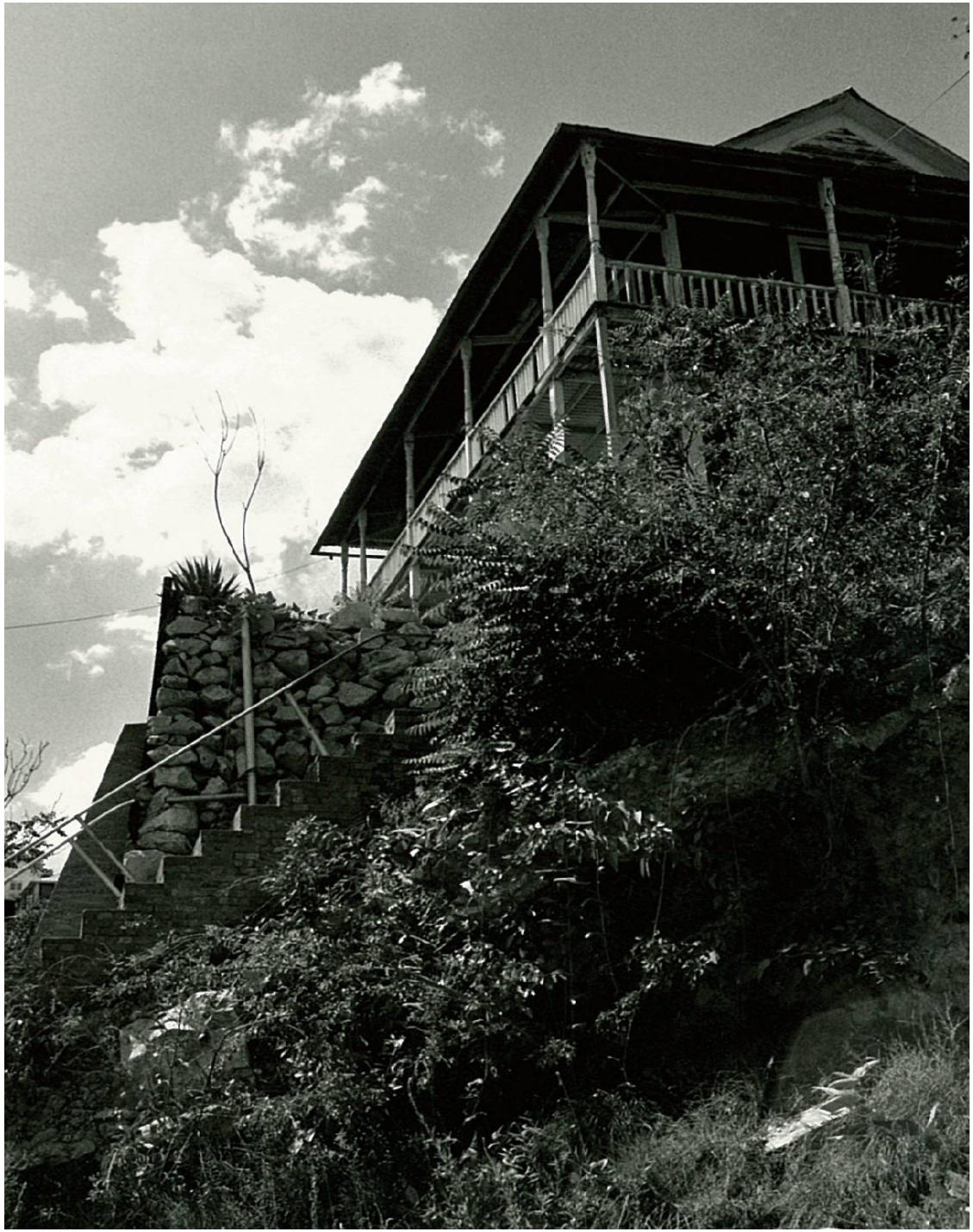
6. Identify/Implement Measures to Address Risks
7. Measure Performance, Monitor Results, Evaluate Effectiveness
8. Periodic Evaluation and Improvement
9. Report Results
10. Sample DIMP Approaches

GAS PIPING technology committee

- Section 1 - Introduction
  - Pipeline systems and operating practices vary widely
    - Materials
    - Age
    - Construction
    - Operations & maintenance practices
    - Operating environments (natural and man-made)

City Center

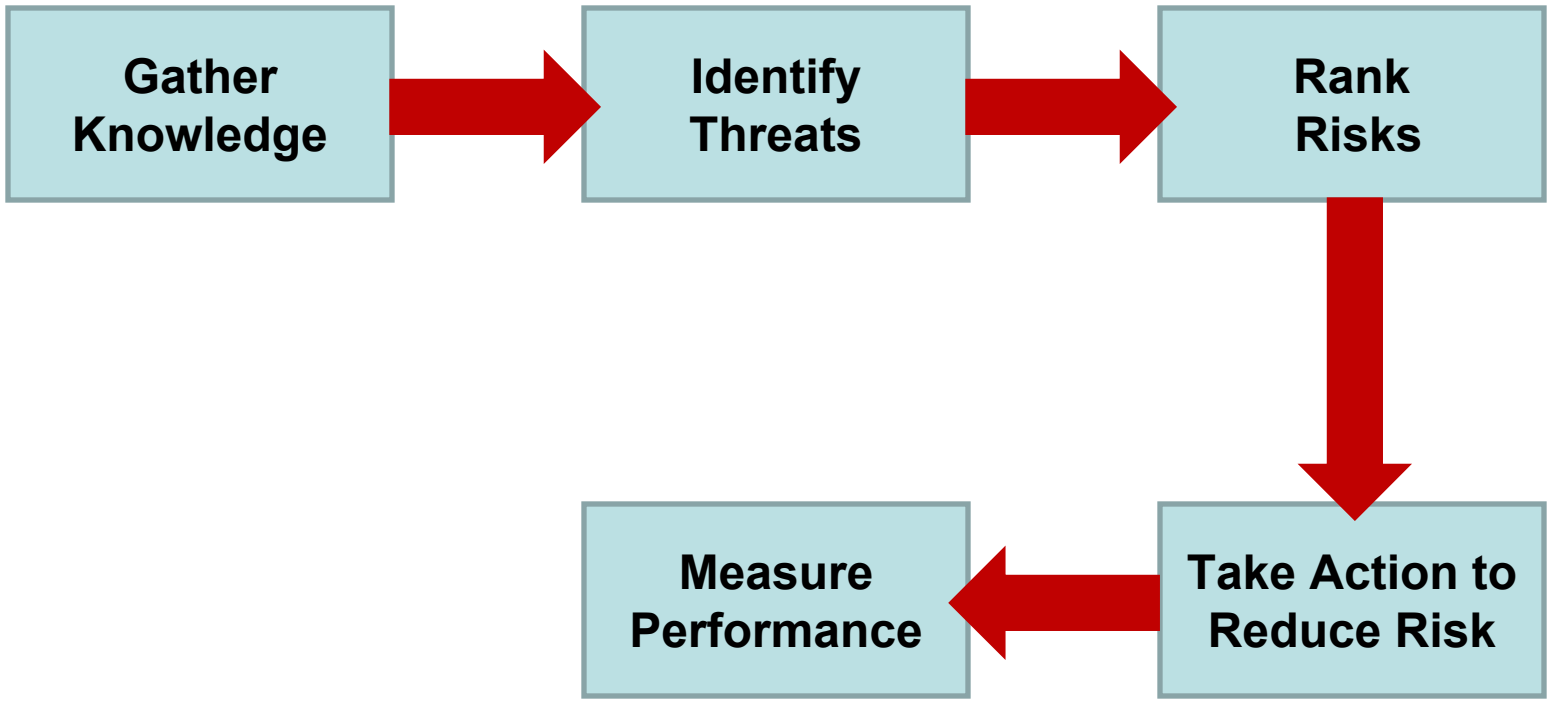

Rags IN A BOX
Hertz
Hertz



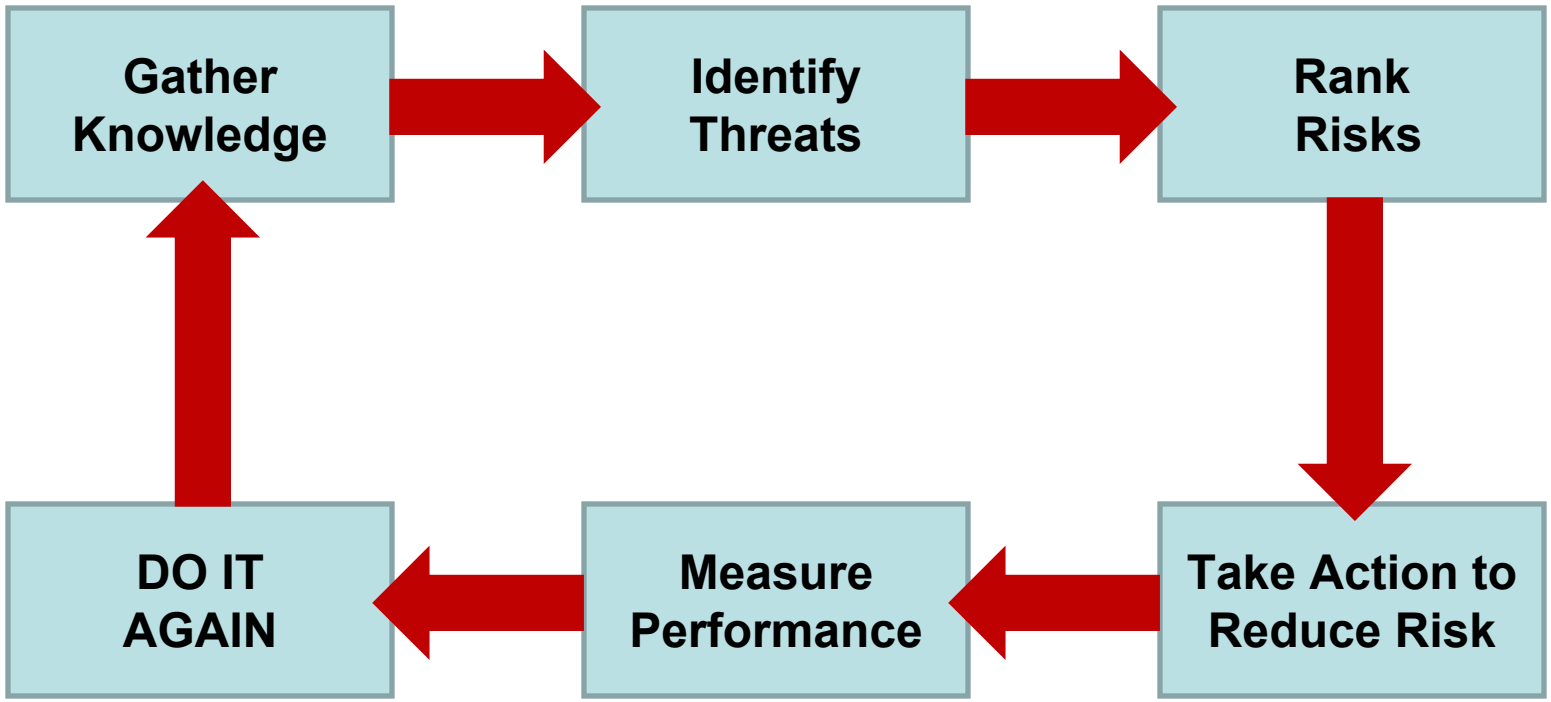
GAS PIPING technology committee

- Section 1 - Introduction
  - Caution: Guide doesn't anticipate ALL conditions.
  - Operator is not restricted from using other methods to comply
  - DIMP is a repetitive process

GAS PIPING technology committee



GAS PIPING technology committee



GAS PIPING technology committee

- Section 2 - Elements of a DIMP Program
  - Seven elements
  - Written Plan
    - Documents how the seven elements will be addressed

GAS PIPING technology committee

- Section 3 - Knowledge
  - Records (paper or electronic)
  - “Proxy” values (usually date of install)
  - 3.1(e) “Information about an existing system should be updated when new or better information becomes available”
  - 3.1(f) “Operator would not have to dig up its system just to collect information”
    - When exposed, collect information

GAS PIPING technology committee

- Section 3 - Knowledge
  - DOT Annual Reports
    - Past data available on PHMSA on-line library
    - http://ops.dot.gov/library/libindex.htm

    - Miles of main and number of services by
      - Material
      - Diameter
      - Decade of installation

GAS PIPING technology committee

- Section 3 - Knowledge
  - DOT Annual Reports
    - Leaks eliminated
    - Leaks repaired
    - Cause of leak
  - Leak repair or work order records
  - Incident reports

GAS PIPING technology committee

- Section 3 – Knowledge

– Local operations personnel

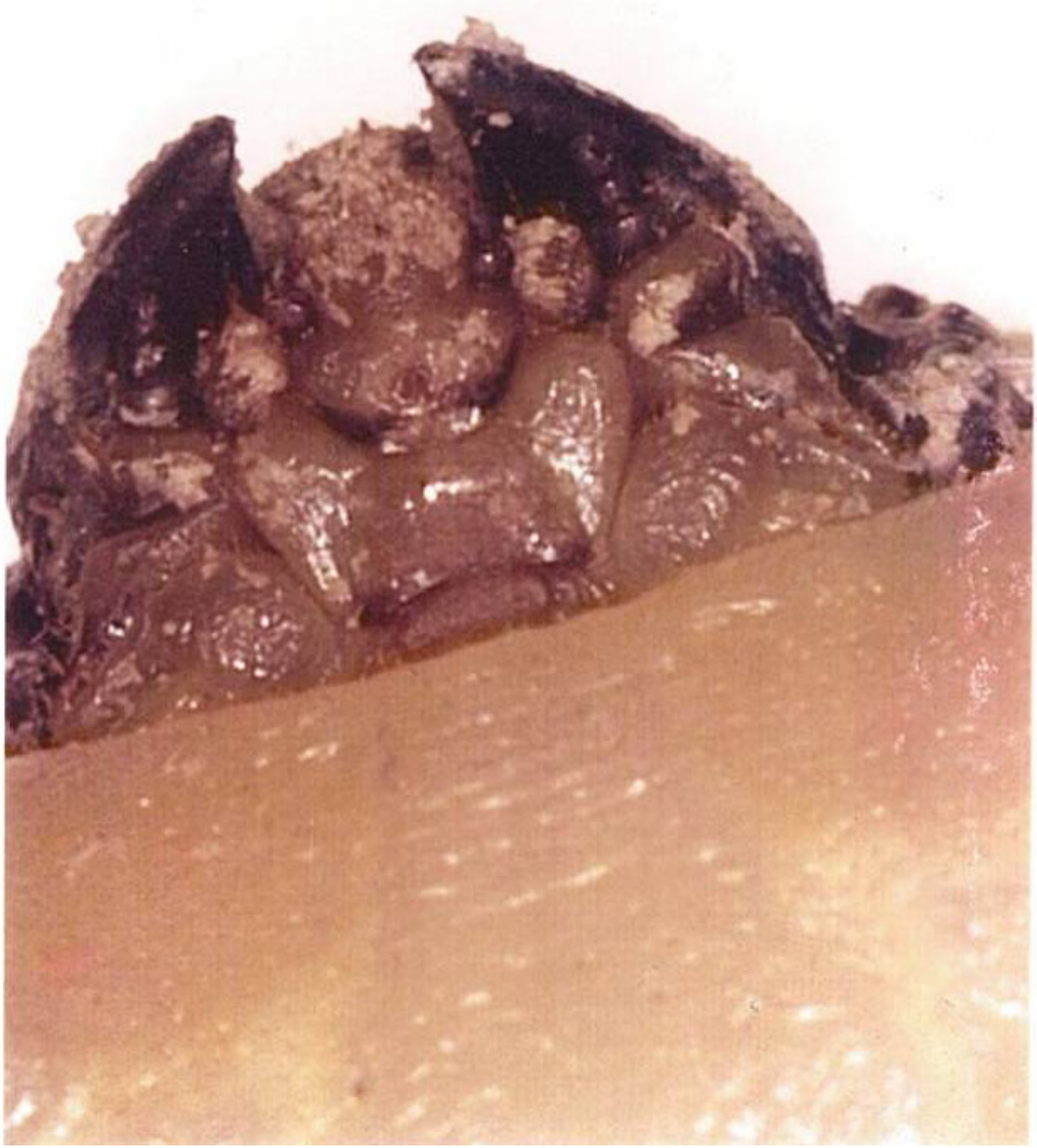
  - Unrecorded construction techniques
  - Areas prone to flooding/washouts
  - Interference currents
  - Areas where liquids accumulate

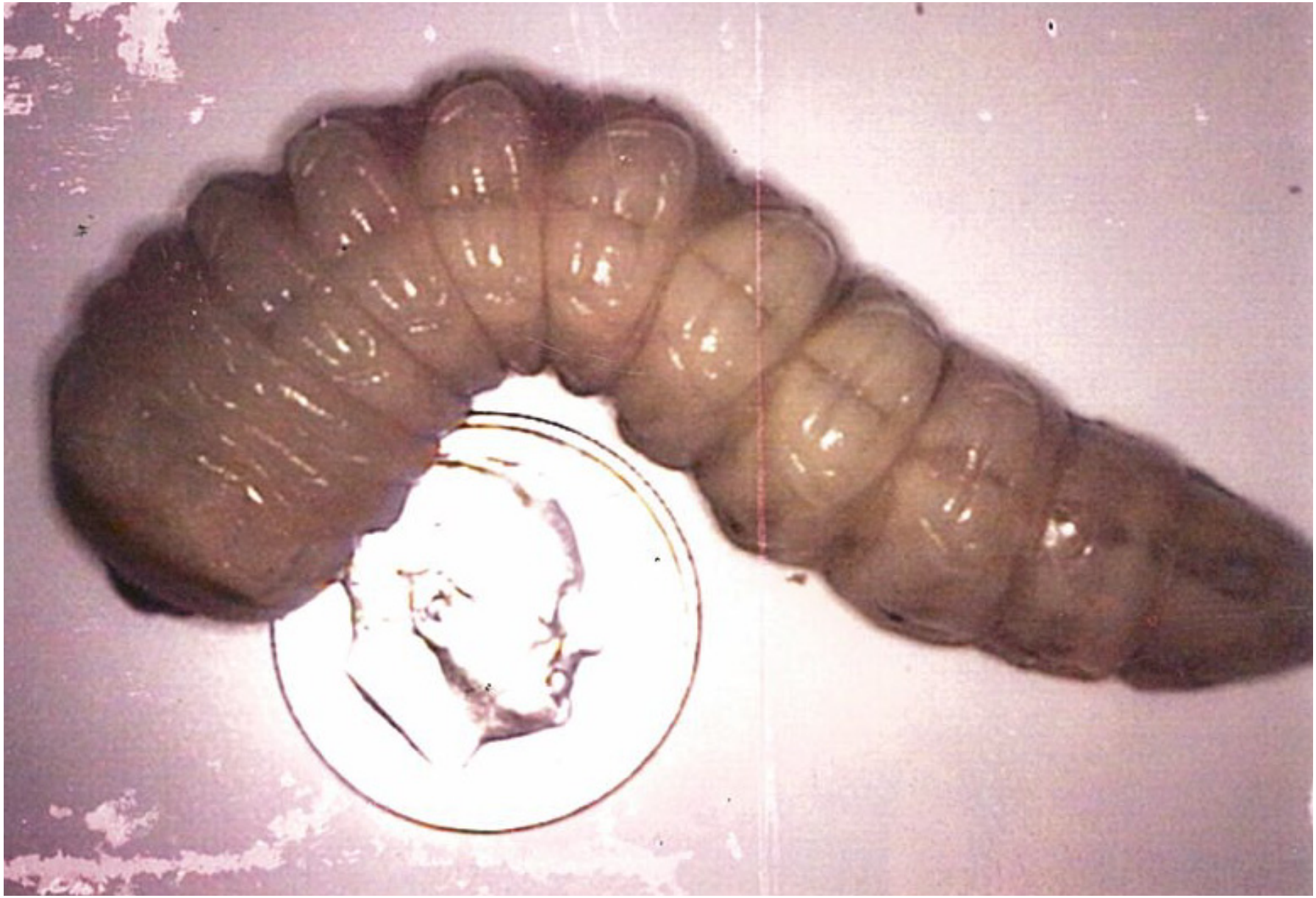
GAS PIPING technology committee

- Section 3 – Knowledge
  - 3.5 Documentation
    - Gather and retain information
    - Procedures should be updated so information is gathered for future use

GAS PIPING technology committee

- Section 4 – Identify Threats
  - DOT Annual report
    - Corrosion
    - Natural forces
    - Excavation damage
    - Other outside force damage
    - Material or weld failure
    - Equipment malfunction
    - Inappropriate operation
    - Other





Primary Threat	Threat Subcategories	Questions to Check Subcategory Applicability to System	Extent of Threat		
			General	Local	NA
Corrosion	External corrosion: Bare steel pipe	▪ Does bare steel exist in system? ▪ Is the pipe cathodically protected? ▪ Have corrosion leaks occurred? ▪ Do exposed pipe inspections indicate external corrosion? ▪ Are cathodic protection readings consistently adequate during annual monitoring? ▪ Are there known sources of stray electrical currents in the area?			
	External corrosion: Cast iron pipe (graphitization)	▪ Does cast iron or ductile iron exist in the system? ▪ Have fractures occurred in the pipe, other than those related to excavation activities? ▪ Are the fractures limited to certain diameters of pipe? ▪ Are there known sources of stray electrical currents in the area? ▪ Do exposed pipe inspections indicate external corrosion?			

Primary Threat	Threat Subcategories	Questions to Check Subcategory Applicability to System	Extent of Threat		
			General	Local	NA
Excavation Damage	Operator (or its contractor)	▪ Are damages being caused by crews not following one-call laws? ▪ Are damages increasing? ▪ Have damages from mis-located lines or poorly performing locators been experienced? ▪ Are facilities marked out and marked out accurately? ▪ Are damages being caused by failure to protect pipe during backfill operations?			
	Third-party	▪ Has an increase in construction activity been experienced? ▪ Is there a one-call system covering the distribution system? ▪ Are damages being caused by mis-located lines or poorly performing locators? ▪ Have leaks been experienced on the system where previous damage has occurred? ▪ Are there known areas of blasting or demolition activity?			

GAS PIPING technology committee

- Section 5 – Evaluate and Prioritize Risk
  - 5.1 General

GAS PIPING technology committee

- Section 5 – Evaluate and Prioritize Risk
  - 5.1 General (a)
    - A risk evaluation can help determine if additional risk management practices are needed or not
    - The final outcome should be a relative risk ranking
    - Facilities or groups of facilities can be removed from the risk evaluation and no further action necessary

GAS PIPING technology committee

- Section 5 – Evaluate and Prioritize Risk
  - 5.1 General (a)
    - A risk evaluation can help determine if additional risk management practices are needed ***or not***
    - The final outcome should be a ***relative*** risk ranking
    - Facilities or groups of facilities ***can be removed*** from the risk evaluation and ***no further action necessary***

GAS PIPING technology committee

- Section 5 – Evaluate and Prioritize Risk
  - 5.1 General (b)
    - Operators can choose a method of risk evaluation
    - As long as it results in a “relative risk” ranking
    - “Relative risk” does not indicate an absolute measure of risk

GAS PIPING technology committee

- Section 5 – Evaluate and Prioritize Risk
  - 5.1 General (c)
    - One approach: group facilities by common traits and problems
    - Risk ranking ***may*** result in a recommendation for action

GAS PIPING technology committee

- Section 5 – Evaluate and Prioritize Risk
  - 5.1 General (d)
    - Use operational requirements and engineering judgment in addition to risk evaluation
    - Systems vary widely, each operator will have different information available
    - Operators will assign different values
    - No two operators are likely to have the same results

GAS PIPING technology committee

- Section 5 – Evaluate and Prioritize Risk
  - 5.1 General (d)
    - Use operational requirements and engineering judgment in addition to risk evaluation
    - Systems ***vary widely***, each operator will have different information available
    - Operators will assign different values
    - No two operators are likely to have the same results

GAS PIPING technology committee

- Section 5 – Evaluate and Prioritize Risk
  - 5.1 General (e)
    - Operator should determine if enough information is available
    - Operator may need to determine how to get more data, or if it is readily available
    - ***Not intended that an exhaustive search be conducted***
    - Consider developing a process to capture information during routine O&M activities in the future

GAS PIPING technology committee

- Section 5 – Evaluate and Prioritize Risk
  - 5.2 Information evaluation
    - Helps determine if a threat applies
    - Tracking and trending may help prioritize risks and measure effectiveness of risk management activities

GAS PIPING technology committee

- Section 5 – Evaluate and Prioritize Risk
  - 5.2 Information evaluation
    - Have a SME review available information
    - Conduct inter-departmental meetings
    - Conduct periodic SME meetings
    - Assign a centralized department to review
    - Use an electronic data base or work management system
    - Use risk evaluation software to compile information
    - Any combination

GAS PIPING technology committee

- Subject Matter Expert (SME)

- SMEs are persons knowledgeable about design, construction, operations, or maintenance activities, or the system characteristics of a particular distribution system. Designation as a SME does not necessarily require specialized education or advanced qualifications. Some SMEs may possess these characteristics, but detailed knowledge of the pipeline system gained by working with it over time can also make someone a SME. SMEs may be employees, consultants or contractors, or any appropriate combination.

GAS PIPING technology committee

- Section 5 – Evaluate and Prioritize Risk
  - 5.3 Methods [of Risk Evaluation]
    - SME method
      - SME or SME group reviews information to determine where problems have occurred, and if likely to reoccur
    - Mathematical (algorithm) method
      - Internally developed software
      - Commercially available software (e.g., SHRIMP, or SGA/NGA Framework, or…, or…, or…)

GAS PIPING technology committee

- Section 5 – Evaluate and Prioritize Risk
  - 5.4 Example of risk evaluation [SME-type]
    - Group facilities with common traits that experience similar problems
      - Pipe material
      - Pipe specifications
      - Main or service
      - CO history
      - Fitting brand or model
      - O&M history
      - Geographical and/or geological area

GAS PIPING technology committee

- Section 5 – Evaluate and Prioritize Risk
  - 5.4 Example of risk evaluation [SME-type]
    - Create a matrix with two factors:
    - Frequency (how often or how many problems)
    - Consequence (potential damage if problem not mitigated)
    - Assign values to each factor
  - Frequency X Consequences = Risk

Example Frequency Factors	Example Considerations
LOW	Few problems (or frequency of excavation damage) experienced, excavators generally responsive, good mapping/locating records, mitigation implemented and effective.
MEDIUM	Moderate number of problems (or frequency of excavation damage) experienced, excavators not generally responsive, moderate mapping/locating records, mitigation implemented but effectiveness not yet demonstrated.
HIGH	High number of problems (or frequency of excavation damage) experienced, excavators non-responsive, poor or no mapping/locating records.

Example Consequence Factors	Example Considerations
LOW	Rural location, small-diameter pipe, low operating pressure
MEDIUM	Residential location, medium-diameter pipe, medium operating pressure
HIGH	Predominantly location, large-diameter pipe, high operating pressure

Consequence Factor (Multiplier*)	Frequency Factor (Multiplier*)		
	Low (1)	Medium (2)	High (3)
Low (1)	1 X 1	1 X 2	1 X 3
Medium (2)	2 X 1	2 X 2	2 X 3
High (3)	3 X 1	3 X 2	3 X 3
*Determined by Operator			

Sample Relative Risk Calculation

GAS PIPING technology committee

- Section 5 – Evaluate and Prioritize Risk
  - 5.4 Example of risk evaluation [SME-type]
    - More detail can be added to the matrix
    - Any methodology that gives you a relative risk ranking will work

GAS PIPING technology committee

- Section 5 – Evaluate and Prioritize Risk
  - 5.5 Validation
    - Do the risk ranking results match what your O&M records tell you?
    - Do the results agree with what your SMEs tell you?

GAS PIPING technology committee

- Section 6 – Identify and Evaluate Measures to Address Risk
  - Manage risk by:
    - Eliminating or reducing likelihood of a problem
    - Lessoning the consequences of a problem
  - Risk management measures include:
    - Prevention
    - Remediation
    - Mitigation
    - Additional or accelerated actions (A/A)

GAS PIPING technology committee

- Section 6 – Identify and Evaluate Measures to Address Risk
  - 6.1 General
    - Risk management techniques may vary
    - Operator may have different risk management practices for different facilities or groups of facilities within the same operating environment
    - Consider these examples or develop other practices to address identified risks

GAS PIPING technology committee

- Section 6 – Identify and Evaluate Measures to Address Risk
  - 6.2 Leak Management Program
    - **L**ocate leaks in the distribution system
    - **E**valuate the actual or potential hazards
    - **A**ct appropriately to mitigate these hazards
    - **K**eep records
    - **S**elf-assess to determine if additional actions are necessary to keep people and property safe

GAS PIPING technology committee

- Leak Management Program
  - Locate leaks in the distribution system
    - Proper use of leak detection equipment
    - Proper techniques when surveying or investigating
    - Qualified personnel
    - Procedures for frequency and type of surveys

GAS PIPING technology committee

- Leak Management Program
  - **E**valuate the actual or potential hazards
    - Evaluate the hazard according to established criteria
    - Operator could use the GPTC Guide criteria
      - Immediate action
      - Schedule for repair
      - Monitor
    - Some states have their own requirements

GAS PIPING technology committee

- Leak Management Program
  - **A**ct appropriately to mitigate these hazards
    - Take actions consistent with the leak classification
    - Temporary or permanent repair
    - Replacement
    - Period monitoring

GAS PIPING technology committee

- Leak Management Program
  - **K**eep records
    - Collect and record data to evaluate efficiency
    - Enough data to file regulatory reports and to self-assess

GAS PIPING technology committee

- Leak Management Program
  - **S**elf-assess
    - Use appropriate performance metrics
    - Identify changes to assure program is effective

GAS PIPING technology committee

- Section 6 – Identify and Evaluate Measures to Address Risk
  - 6.3 A/A Actions
    - Examples only
    - Not intended to rule out other reasonable actions
    - Operators encouraged to develop A/A actions they believe to be more appropriate

Examples of A/A Actions

Threats		**A/A Examples**
Corrosion	External Corrosion	• More frequent leak surveys • Replace/insert/rehab • Hot spot protection • Correct CP deficiencies
Excavation	3rd Party or Operator Damage	• Enhanced awareness education • Request regulatory intervention • Inspect targeted excavation/ backfill areas • Inspect for facility support • Participate in pre-construction meetings with project engineers and contractors in high risk areas • Expand use of EFVs

GAS PIPING technology committee

- Section 7 – Measure Performance, Monitor Results, and Evaluate Effectiveness
  - Operator should develop performance measures that match the risk management practices employed
  - Measures may be unique to the operator

GAS PIPING technology committee

- Section 7 – Measure/Monitor/Evaluate
  - Number of hazardous leaks
    - eliminated or repaired, categorized by cause
  - Total number of leaks
    - eliminated or repaired, categorized by cause
  - Number of excavation damages
  - Number of excavation tickets

GAS PIPING technology committee

- "Excavation damage is the leading cause of significant distribution pipeline incidents…. PHMSA and State partners would expect effective integrity management programs to produce a positive trend in the level of excavation damage per the number of damages per ticket (or per 1000 tickets) over time." ***PHMSA DIMP FAQ #***

GAS PIPING technology committee

PHMSA FAQs

http://primis.phmsa.dot.gov/dimp/faqs.htm

GAS PIPING technology committee

- Section 7 – Measure/Monitor/Evaluate
  - 7.1 Guidelines for developing performance measures
    - Should be something that can be counted, tracked, monitored and supported
    - Best to select a few critical measurements
    - Numeric measurements recommended

GAS PIPING technology committee

- Section 7 – Measure/Monitor/Evaluate
  - 7.1 Guidelines for developing performance measures
    - Whenever possible, utilize data operator already collects
    - Not intended that the operator launch a major new program of data collection
    - New information should necessary only if no meaningful performance measure can be derived from existing data sources.

GAS PIPING technology committee

- Section 7 – Measure/Monitor/Evaluate
  - 7.2 Examples of performance measures
    - Almost 50 listed in the Guidance
    - Separated by Threat Category

GAS PIPING technology committee

- Section 7 – Measure/Monitor/Evaluate
  - Key performance measures
    - Total number of leaks eliminated or repaired, by cause
    - Total number of hazardous leaks eliminated or repaired, by cause
    - Number of excavation damages
    - Number of excavation tickets

GAS PIPING technology committee

- Section 7 – Measure/Monitor/Evaluate
  - Year One:
    - 1,000 excavation damages per year
  - Year Two:
    - 800 excavation damages per year

GAS PIPING technology committee

- Section 7 – Measure/Monitor/Evaluate
  - Year One:
    - 1,000 excavation damages per year
    - 40,000 tickets
    - Damage Rate = 25 damages per 1,000 tickets
  - Year Two:
    - 800 excavation damages per year
    - 25,000 tickets
    - Damage Rate = 32 damages per 1,000 tickets

GAS PIPING technology committee

- Section 7 – Measure/Monitor/Evaluate
  - PHMSA FAQ:

    "PHMSA and State partners would expect effective integrity management programs to produce a ***positive trend*** in the level of excavation damage per the number of damages per ticket (or per 1000 tickets) over time."

GAS PIPING technology committee

- Section 8 – Periodic Evaluation and Improvement
  - Review and update the written plan
    - Interval determined by the operator
    - Consider annually, or
    - After major milestones (e.g., after a replacement program is complete)
    - Plan review should be documented

GAS PIPING technology committee

- Section 8 – Periodic Evaluation and Improvement
  - Review of Effectiveness
    - Review performance measures
    - Are risks managed effectively?
      - Before vs. after – improvement?
      - Downward trends?
    - Continue current practices or A/A?
    - Are different or additional performance measures needed?

GAS PIPING technology committee

- Section 8 – Periodic Evaluation and Improvement
  - Review of performance measures – frequency may vary
    - Excavation damage
    - Corrosion leakage

GAS PIPING technology committee

- Section 9 – Report Results

GAS PIPING technology committee

- Section 10 Sample DIMP Approaches
  - SME approach
  - Mathematical approach

GAS PIPING technology committee

- Section 10 Sample DIMP Approaches
  - SME approach
  - Mathematical approach

  - Rank the risks
  - Decide if A/A needed
  - Establish and monitor performance measures
  - Evaluate performance measures – change procedures as needed
  - Report

GAS PIPING technology committee

- Footnotes
  - Facilities
  - Risk
  - SME
  - A/A actions
  - Damages
  - Ticket

GAS PIPING technology committee

- Where are we now?
  - DIMP Guidance published and available
  - www.AGA.org (Publications)
    - DIMP Appendix $49
    - Entire Guide $430

GAS PIPING technology committee

- GPTC
  - Meets three times a year
  - Always looking for knowledgeable members
  - Welcomes visitors

- Next meeting
  - July 12 – 13, Washington DC

GAS PIPING technology committee

Questions?