Distribution Integrity Management Program (DIMP)

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Outline

- **History of DIMP**
  - Leaks, Failures, Loss of Life, Property Damage, etc.?
- **Latest Timeline**
  - Subject to change
- **Guidance Available – ASME -** Gas Piping Technology Committee (GPTC) Guidance
- **Threats**
- **Data Collection**
- **Risks**
- **Performance/Reports**

Phase 1 Findings

Issued December 2005

- **Distribution pipelines are generally safe but there are opportunities for improvement**
- **Impractical to apply transmission IMP to distribution systems**
- **Integrity management should apply to all distribution pipelines**

DIMP

Phase 1 Findings

- **Excavation damage is leading cause of distribution incidents**
- **Federal legislation is needed to support the development and implementation of comprehensive damage prevention programs at the state level***
- **Requires a partnership of all stakeholders**

***** **Addressed in PIPES Act of 2006**

FROM ‘PIPES’ Act - SECTION 2

Add new Sec. 60134. State damage prevention programs

- `(a) In General- The Secretary may make a grant to a State authority (including a municipality with respect to intrastate gas pipeline transportation) to assist in improving the overall quality and effectiveness of a damage prevention program of the State authority under subsection (e) if the State authority--
- `(1) has in effect an annual certification under section 60105 or an agreement under section 60106; and
- `(2)(A) has in effect an **effective damage prevention program** that meets the requirements of subsection (b); or
- `(B) demonstrates that it has made substantial progress toward establishing such a program, and that such program will meet the requirements of subsection (b).

FROM ‘PIPES’ Act - SECTION 2

- **(b) Damage Prevention Program Elements- An effective damage prevention program includes the following elements:**
- **(1) Participation by operators, excavators, and other stakeholders in the development and implementation of methods for establishing and maintaining effective communications between stakeholders from receipt of an excavation notification until successful completion of the excavation, as appropriate.**
- **(2) A process for fostering and ensuring the support and partnership of stakeholders, including excavators, operators, locators, designers, and local government in all phases of the program.**
- **(3) A process for reviewing the adequacy of a pipeline operator's internal performance measures regarding persons performing locating services and quality assurance programs.**
- **(4) Participation by operators, excavators, and other stakeholders in the development and implementation of effective employee training programs to ensure that operators, the one-call center, the enforcing agency, and the excavators have partnered to design and implement training for the employees of operators, excavators, and locators.**

FROM ‘PIPES’ Act - SECTION 2

- **(5) A process for fostering and ensuring active participation by all stakeholders in public education for damage prevention activities.**
- **(6) A process for resolving disputes that defines the State authority's role as a partner and facilitator to resolve issues.**
- **(7) Enforcement of State damage prevention laws and regulations for all aspects of the damage prevention process, including public education, and the use of civil penalties for violations assessable by the appropriate State authority.**
- **(8) A process for fostering and promoting the use, by all appropriate stakeholders, of improving technologies that may enhance communications, underground pipeline locating capability, and gathering and analyzing information about the accuracy and effectiveness of locating programs.**
- **(9) A process for review and analysis of the effectiveness of each program element, including a means for implementing improvements identified by such program reviews.**

Phase 1 Findings

- **Excess Flow Valves (EFVs) can be a valuable incident mitigation option; however it is addressed in PIPES Act of 2006**
- **Management of leaks is fundamental to management of risk and an effective leak management program is vital to risk control**

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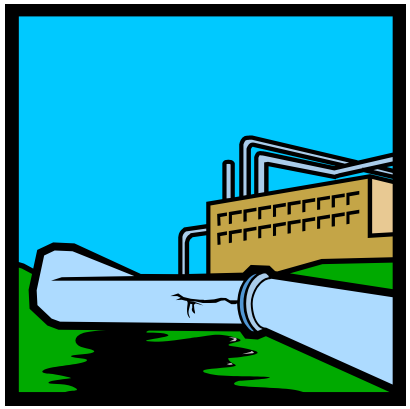


FROM ‘PIPES’ Act - SECTION 9

Amends Sec. 60109 to add new paragraph (e), subparagraph (3) of which is about EFVs as follows:

(3) EXCESS FLOW VALVES (EFVs) -

- **(A) IN GENERAL- The minimum standards shall include a requirement for an operator of a natural gas distribution system to install an excess flow valve on each single family residence service line connected to such system if--**
- **(i) the service line is installed or entirely replaced after June 1, 2008;**
- **(ii) the service line operates continuously throughout the year at a pressure not less than 10 pounds per square inch gauge;**
- **(iii) the service line is not connected to a gas stream with respect to which the operator has had prior experience with contaminants the presence of which could interfere with the operation of an excess flow valve;**
- **(iv) the installation of an excess flow valve on the service line is not likely to cause loss of service to the residence or interfere with necessary operation or maintenance activities, such as purging liquids from the service line; and**

FROM ‘PIPES’ Act - SECTION 9

- **(v) an excess flow valve meeting performance standards developed under section 60110(e) of title 49, United States Code, is commercially available to the operator, as determined by the Secretary.**
- **(B) REPORTS- Operators of natural gas distribution systems shall report annually to the Secretary on the number of excess flow valves installed on their systems under subparagraph (A).**

(4) APPLICABILITY- The Secretary shall determine which distribution pipelines will be subject to the minimum standards.

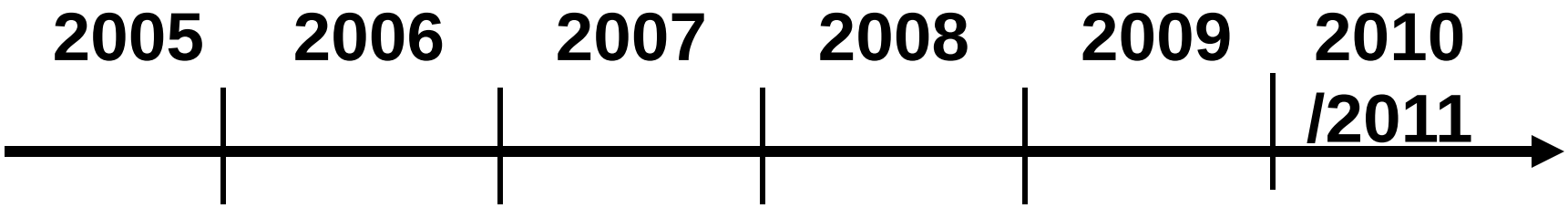
(5) DEVELOPMENT AND IMPLEMENTATION- Each operator of a distribution pipeline that the Secretary determines is subject to the minimum standards prescribed by the Secretary under this subsection shall develop and implement an integrity management program in accordance with those standards.

(6) SAVINGS CLAUSE- Subject to section 60104(c), a State authority having a current certification under section 60105 may adopt or continue in force additional integrity management requirements, including additional requirements for installation of excess flow valves, for gas distribution pipelines within the boundaries of that State.'.

Phase 1 – Recommendation

- **Most useful option to implement DIMP: A high level, flexible federal regulation done in conjunction with:**
  - **Implementation ASME (GPTC) guidance**
  - **Federal legislation to help develop and implement comprehensive state damage prevention programs**
  - **National 3-digit calling 811**
  - **Continued R & D**

Distribution Integrity Management Rulemaking Timeline



• Issue Stakeholder Report (Phase 1)

Development of Guide Material (March 06 – March 07)

•Proposed Rule March 31, 2008

•Final Rule Dec 4, 2009

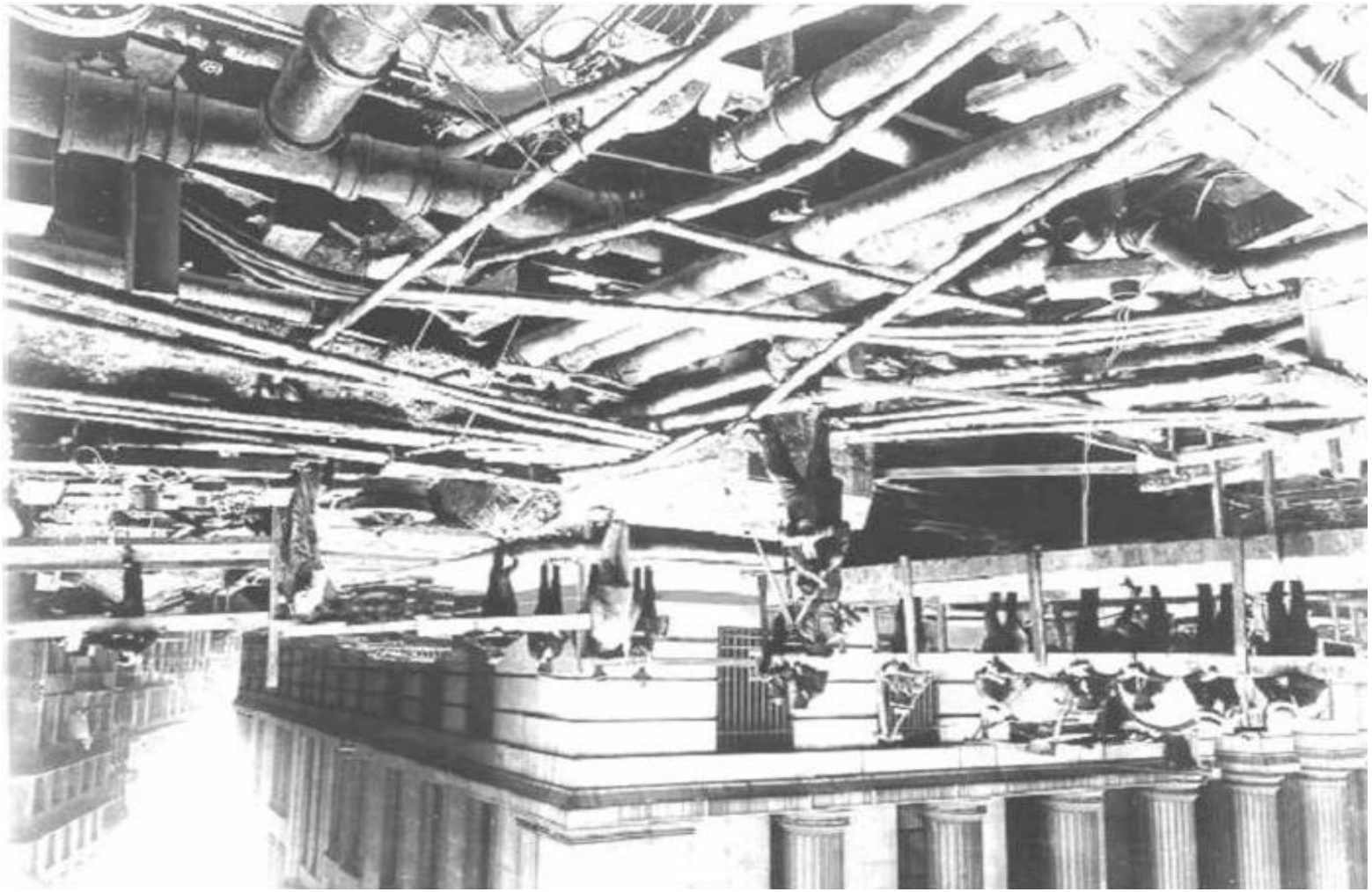
Date of Rule Feb 10, 2010

Operators Develop Plans

• Operator's Plans Implemented

Aug 2, 2011

Will this be your system on DIMP?



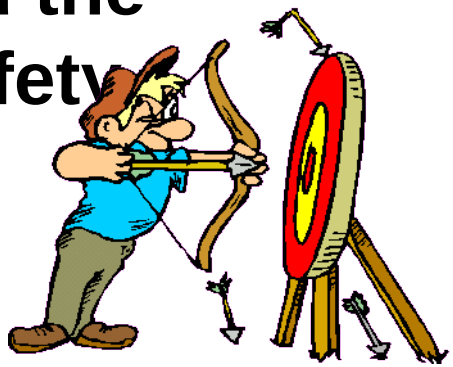
Guidance

- **GPTC has completed DIMP Guidance**
- **Draft guidance completed Nov. 2006 and revised by March 2007 on account of mandated EFVs per PIPES Act**
- **Will be available for public review/comment through ANSI public review process after NPRM is issued**

Guidance

Biggest Challenge

- **Guidance is normally prepared AFTER the final rule**
- **For DIMP, write guide material for a regulation simultaneously**
- **Challenge was met by GPTC and the guidance was met criteria for safety**



Challenges in Creating the Guidance

- **One size may not fit all in gas distribution**
- **Flexibility in how states implement elements of rule**
- **Options available – operator's choice**
- **Minimize justifying non-use of some options**
- **In some cases, "doing more" may not be needed**
- **Keeping an open mind**

Distribution Integrity Best Practices

- **While the term "Distribution Integrity" is new, risk management programs are not:**
  - **Leak and Corrosion Management Programs (1970s)**
  - **Call Before You Dig Programs (1980s)**
  - **Main Risk Assessment and Repair/Replace Programs (1990s)**
- **SHRIMP (Master Meter) -** Simple, Handy, Risk-based Integrity Management Plan

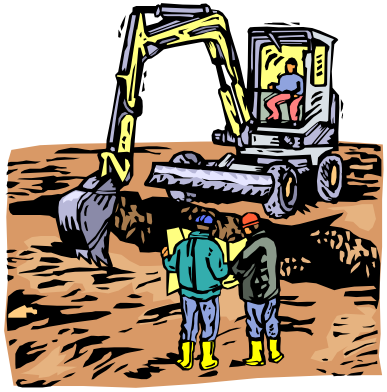
Distribution Integrity Best Practices

- **A number of "Best Practices" have evolved in the gas distribution industry**
- **Much in the anticipated new rules and guidance may be covered by existing operating procedures**
- **You probably already do most of what this rule will require**
- **Formalization and documentation will be required**

Guidance is Based on the 7 Key Elements of DIMP

1. **Know the infrastructure**
2. **Identify threats**
3. **Assess and prioritize risks**
4. **Identify and implement appropriate measures to mitigate risks**
5. **Measure performance and monitor results**
6. **Evaluate the effectiveness and make changes as needed**
7. **Periodically report performance measures**

Know the Distribution Systems



- **Materials**
- **Type of construction**
- **Operating conditions**
- **Other relevant factors within surroundings**
- **Use best information available to make decisions about what is in the system**
- **Do not have to dig up system to collect data**
- **Update information when better data becomes available**

NOTE: More than physical components

Process Focus Approach

A Basic Source:

DOT Annual Report Information

- **Includes basic information on what is in the system**
  - **Material, diameter, # of services, installation decade, leaks eliminated/repaired during the year**
- **Past reports are available through the PHMSA-OPS website**

http://phmsa.dot.gov

Know the System

Other Sources:

Maps/GIS/Records

- **Pipe location and connectivity**
- **Mains and services**
- **Pipe attributes – material, year installed, size, pressure, CP protected?, etc.**

Know the System

QUESTION

- **What was the first material used in US gas distribution systems that was non-metallic?**
- **Which country drilled the first 800 foot oil well and when?**

Know Your System

ANSWERS

- Wood
- Chinese drilled first oil well in 347 AD – Over 800’ in depth using bamboo for pipe

Seven Elements 192.1007

- Knowledge
- Identify Threats
- Evaluate and Rank Risk
- Identify & Implement Measures to Address Risks
- Measure Performance, Monitor Results & Evaluate Effectiveness
- Periodic Evaluation & Improvement
- Report Results

Knowledge of Infrastructure

Knowledge of What is Happening in and to the System

- **Review data gathered through O&M activities, as well as special field surveys or patrols**
- **Field personnel may be the best source of local system knowledge and what is happening in and to the system**

Knowledge of Infrastructure

- **Data gathered through O&M activities, etc. may include**

  - *** Leak history**
  - *** Maintenance**
  - *** Damages**
  - *** Work records**
  - *** Materials**
  - *** Repairs**
  - *** Failures**
  - *** Pipe condition**
  - *** Corrosion inspections**
  - *** Other relevant factors**
  - *** Personnel performance evaluations, etc.**

Eight Primary Threats

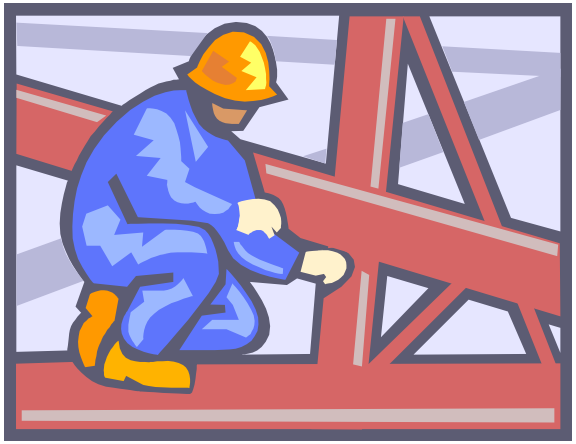
- **Corrosion**
- **Natural forces**
- **Excavation**
- **Other outside force damage**
- **Material or welds**
- **Equipment**
- **Operations**
- **Other**

(From Distribution Annual Report – Leak Cause Categories)

Examples of Corrosion Sub-Category Threats

- **External corrosion – bare steel**
- **External corrosion – cast iron (CI)**
- **External corrosion – coated & wrapped pipe**
- **External corrosion – other metallic materials**
- **Internal corrosion**

Guidance offers sub-categories
For most other threats

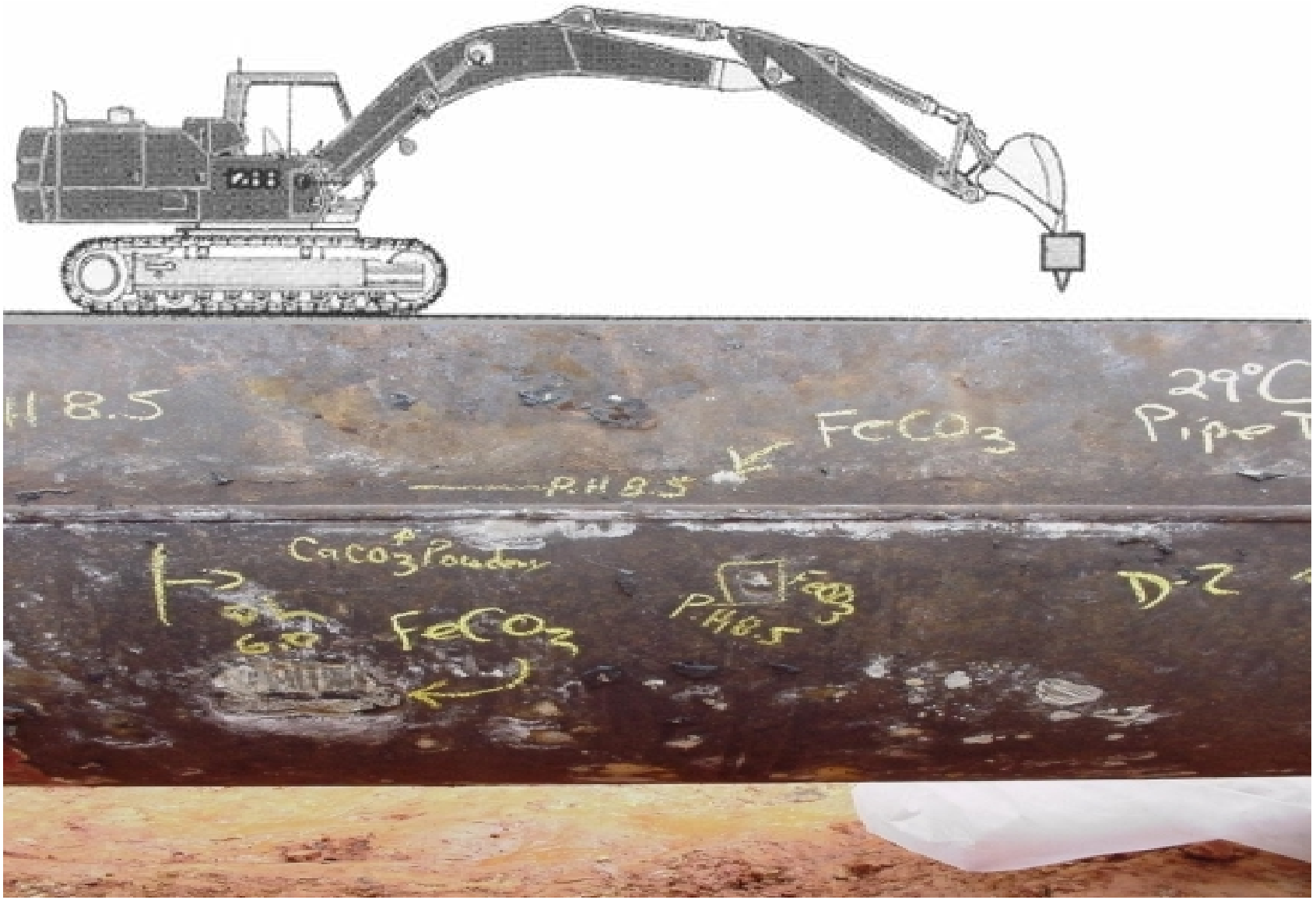


Threats

QUESTION

- **What is the greatest threat to distribution systems?**
- **What is next greatest threat?**

ANSWER



Improve Damage Prevention

- Enhanced communication
- Partnerships
- Performance measures
- Training
- Public Education & Awareness
- Dispute enforcement and consistent enforcement
- Technology and Data Analysis

Threat Identification

- **Attention can be focused on certain facilities or groups of facilities that should be subject to risk evaluation**
- **Facilities may be individual components or units (e.g., a particular district regulating station, an entire low-pressure distribution system).**
- **Groups of facilities generally have common traits (e.g., physical similarities such as the same pipe material or a particular type of valve) or common problems (e.g., small diameter cast iron pipe experiencing cracking, regulators that will not hold set point).**

Threat Identification

- **Determine if one or more of the primary, or sub, threats are causing a problem**
- **A problem is what happens when a threat is realized. Examples may include the following.**

  (a) Leak clusters, especially with a common cause or on a common material or component type.

  (b) Previously identified hazardous (e.g., Grade 1) leak history or trend.

  (c) Damage clusters due to a common cause.

  (d) Areas where poor records result in frequent mis-marking.

  (e) Known “frequent offender” excavators.

  (f) Conditions related to current or past remedial activities.

Threat Identification

- **One method for identifying applicable threats to a system is answering appropriate questions and making the determination of whether the threat**
  - **Exists throughout the system (General), or**
  - **Is limited to a certain geographic region or material (Local).**
- **Some threats may be insignificant, non-existent, or not applicable (NA). The questions may or may not be applicable to all facilities or groups of facilities in an operator's system.**
- **The guidance provides a number of sample questions which are not intended to be all-inclusive.**
- **Alternatively, some risk models perform threat identification**

Sample Questions

Corrosion Threat = External corrosion: bare steel pipe

- **Does bare steel exist in the 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?**

Sample Questions

Other Outside Force Damage Threat

Sub-category = Vehicular

- **Are aboveground facilities being hit by vehicles?**
- **Are aboveground facilities located near a roadway, driveway, or other location where they may be susceptible to vehicular damage?**
- **Are susceptible aboveground facilities protected from vehicular damage?**

Information Evaluation

Evaluate the data you gather to determine if a threat applies to your system. For example:

- **Leak surveys**
- **Corrosion control measures**
- **Leak repair data**
- **Other routine operations and maintenance activities**

Improve Data Collection as Required

- **An exposed pipe is an opportunity to capture important, useful information**
- **Improve external pipe corrosion reporting and quality**
  - **Use more specific values than Local/General/None**
  - **Define specific values with descriptive rules such as:**
    - **“observed < 3 pits” = “close”**
    - **“observed > 6 pits” = “scattered”**
  - **Review and test with field technicians**

Improve Data Collection

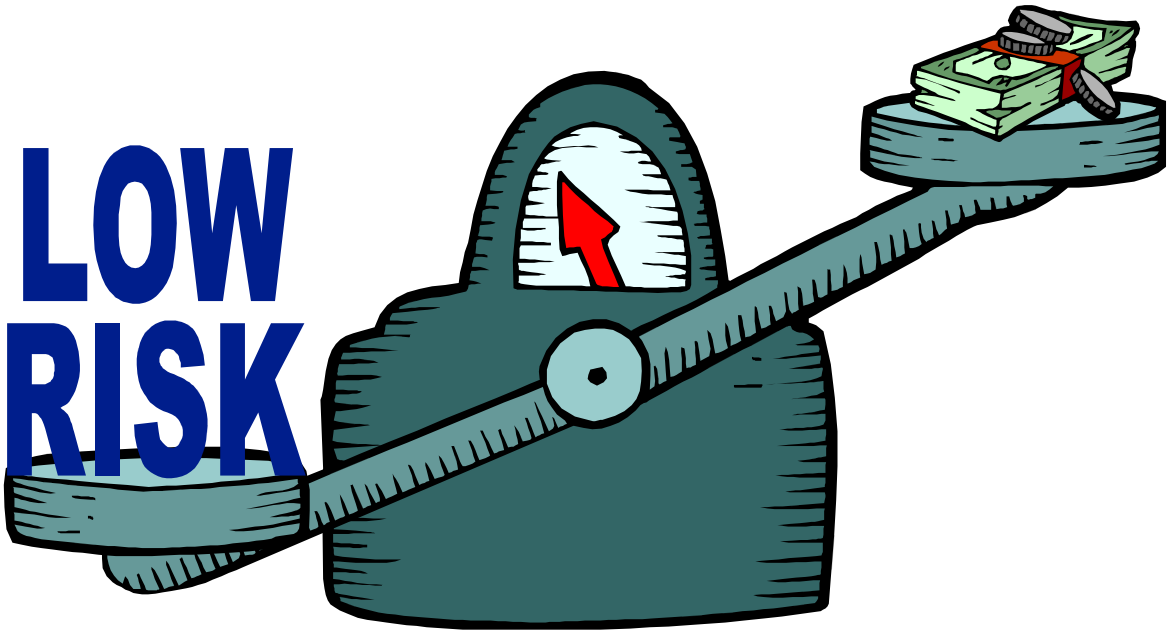
- **Best Practices to Consider for Leaks:**
  - **Geocode leaks in a GIS with the gas facilities**
  - **Implement a process to associate leaks with the leaking facility**
  - **Open leaks may be associated with any surrounding main or service pipe until pinpointed**
  - **Flag CI Breaks with a distinct identifier on leak repair forms**
  - **Capture the number of clamps and/or separate excavations to help measure the actual number and severity of leaks**
  - **Provide electronic access to leak repair field comments to aid in engineering judgment and risk assessment on individual pipes**

Information Evaluation Approaches

- Simple stand-alone approaches:
  - **Have one or more subject matter experts review available data**
  - **Conduct periodic inter-departmental meetings**
  - **Conduct periodic meetings with subject matter experts**
- More sophisticated approaches:
  - **Use an electronic database or work management system**
  - **Use risk evaluation software that compiles relevant information**

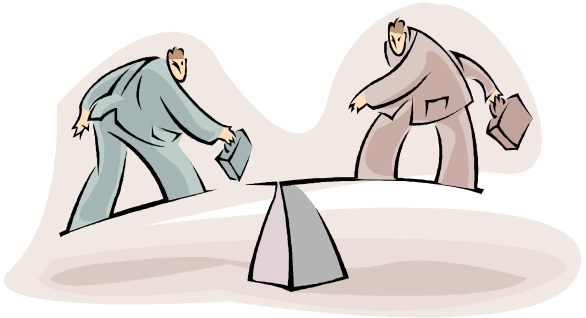
Evaluate and Rank Individual, or Groups of, Facilities

Based on Associated Risks



What is Risk?

Risk is the product of the likelihood of a problem occurring and the consequences that could be caused by the problem if it occurs.



Risk = Likelihood x Consequences

{Risk = Likelihood x Consequence x Mitigating Control Measures (i.e. a de-rating factor)}

Consequence and Failure Factor Examples

Common Consequence Factors

- Gas Volume Migration (combined size, pressure, mode of failure)
- Cover Type
- Service Length (infiltration)
- Building Use (hospital, etc.)
- Population Density
- Other Conduit (sewer, joint trench)
- Pipe Depth
- 3rd Party Construction

Common Failure Factors

- Pipe Material, Size, Pressure
- Leak History
- Year Installed
- Corrosion Extent
- Leak Cause (e.g., corrosion, 3rd Party, etc)
- Coating Condition
- Coating Type
- Joint Type
- Soil Type
- CP Faults
- Locate Requests

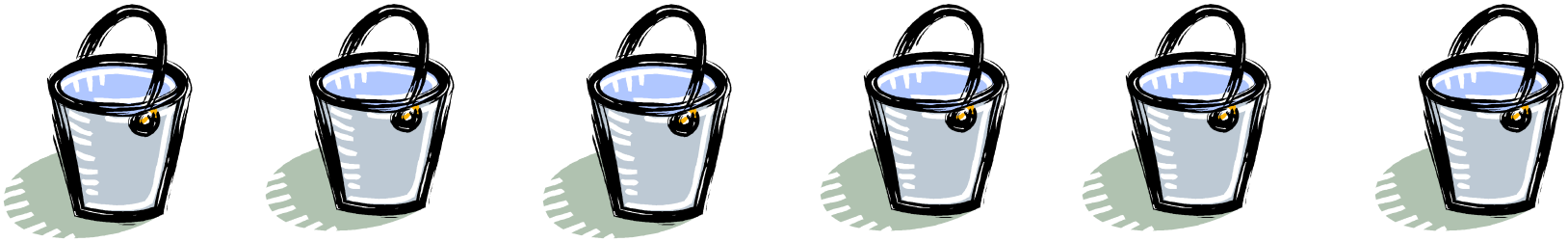
Purpose of Risk Evaluation?

- **Determine if additional risk management practices are needed for the identified threats**
- **Results should show relative risk ranking of facilities (pipe or components) relative to other facilities or groups of facilities (i.e. bare steel versus coated steel or plastic)**
- **Two general approaches:**
  - **Use of subject matter experts (SMEs)**
  - **Use of mathematical (algorithm) methods**

SME Risk Evaluation

Common traits of groups may include pipe material, CP history, vintage, O&M history, geographical area, amount of construction activity, etc.

Based on operator's judgment, any facility group may be identified for risk ranking due to significant factor(s).



Cast Iron | **Bare Steel (without CP)** | **Bare Steel (with CP)** | **Coated Steel (with CP)** | **Good PE** | **Problem Plastic**

Good Facilities May be Excluded

Facilities or groups of facilities that do not experience problems may be removed from the risk evaluation and no further action taken (except excavation threats)!

Stable or improving problem trends may require no further action.

SME Risk Evaluation

Risk Ranking

- **One approach – Create a risk matrix (chart, table, spreadsheet) of frequency and consequence and assign factors to each facility or group based on the known O&M history and input from SMEs.**
- **Assign a value to each factor.**

Sample Frequency Factors for Excavation Damage

Low	Few problems, excavators generally responsive, good map and locating records.
Medium	Moderate number of problems, excavators not very responsive, moderate map and locating records.
High	High number of problems, excavators non-responsive, poor or no map and locating records.

Sample Consequence Factors for Excavation Damage

Low	Rural location, small diameter pipe, low operating pressure.
Medium	Residential location, medium diameter pipe, medium operating pressure.
High	Predominantly multi story buildings, large diameter pipe, high operating pressure.

Sample Relative Risk Calculation

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

Relative Risk Calculations

- **A high score is not an absolute measure of risk. Scores can help determine a relative risk between two or more groups to help prioritize risk management actions.**
- **Can enhance the matrix by adding more detail or assigning a value to each consideration and adding.**

  Example – A small diameter pipeline, operating at medium pressure and located in an urban area.

Small diameter	Low risk = 1
Medium pressure	Med risk = 2
Urban area	High risk = 3
Total consequence factor	= 6

Validation

- **Validate the risk ranking results by asking:**
  - **Do the results and O&M records focus on the same facilities or groups of facilities?**
  - **Do the results agree with the SME experiences?**
- **If the answers are no, may want to review / revise evaluation process, gather more data or reevaluate the SME perspective.**
- **The differences need to be understood.**

Consideration of EFVs

- **Installation of additional EFVs beyond code requirements is one method of risk management to address the threat of excavation damage such as:**
  - **Retroactive installation in existing service lines**
  - **Install on other than single family residences**

Identify and Implement Appropriate Techniques to Manage Risk

Risk Management

- **Risk can be managed**

  > By eliminating or reducing the likelihood of a problem occurring, or

  > By lessening the consequences of a potential problem.

- **DIMP expects you to be pro-active in one or both**

Additional or Accelerated Actions (A/A)

- **The guidance gives some examples of activities that are performed in addition to the requirements of the Code to manage risk.**
- **Need to identify and rank the risks to the system and determine which risk management techniques and practices are most appropriate.**
- **May implement one or more A/A, or other action determined by the operator, when addressing one or more of the risks.**

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

Leak Management Program

DIMP will require a program of five elements:

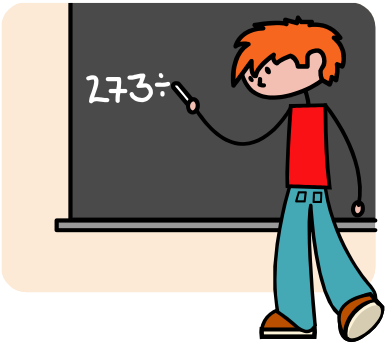
- **Locate the leaks in the distribution system.**
- **Evaluate the action or potential hazards associated with the leaks**
- **Act appropriately to mitigate these hazards**
- **Keep records, and**
- **Self-assess to determine if additional actions are necessary to keep people and property safe**

Leak Repair

Measure Performance and Monitor Results

Performance Measures

- **Address specific risk management practices you are using**
- **Should be something that can be counted, tracked, monitored and supported**
- **Select “a critical few” measurements**
- **Develop or select performance measures that can use data currently being collected or have accumulated in the past**
- **Where practical, use numeric performance measures, but**
- **Do not ignore non-numeric methods**



Example Performance Measures

Corrosion

- **Leaks due to external or internal corrosion**
- **Exposed pipe condition reports that found corrosion or coating damage**
- **Repairs required due to non-leaking pitting or coating damage (above/below ground)**
- **CP zones found with low protection levels**

Example Performance Measures

Excavation

- **Excavation caused damages (1st/2nd/3rd party)**
- **Damages per 1,000 tickets (normalized damages)**
- **Ratio of ticket no-show to total tickets received**
- **Failure by notification center to accurately transmit tickets to the operator**
- **Damages by cause, facility type (mains, services) and responsible party**

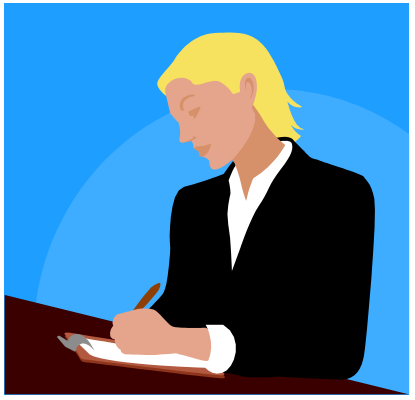
Periodically Evaluate and Improve the Program

Should include at least 2 activities:

1. **A review of the written DIMP content to ensure it remains accurate and appropriate.**
2. **Analysis of the success or effectiveness of risk management techniques, practices or A/A actions adopted to respond to specific threats.**

Periodically Report Performance Measures

- **These will be specified by PHMSA**
- **Individual states will probably add their own requirements**



Questions

- **History of DIMP**
- **Latest Timeline**
- **GPTC Guidance Available**
- **SHRIMP – Master Meter**
- **Records – No records, it did not exist**

HDR | SCHIFF