



Pipeline and Hazardous  
Materials Safety Administration

# **2009 PHMSA Pipeline Construction Workshop**

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# Overview

- PHMSA and co-sponsor key issues
  - Coating
  - Welding
  - Material
  - Installation
  - Lessons learned
  - Expectations
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## **PHMSA New Construction- Increase in Observed Issues**

- Pipeline construction a major focus for past 2 years
  - Special permit pipelines were the initial focus
  - Inspectors observed very serious issues covering all aspects of construction
  - Issues indicative of:
    - Failure to follow procedures
    - Lack of quality control
    - Inattention to detail
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# Summary of Construction Issues

Topic	Frequency
Coating*	117
Welding*	87
Excavation	20
Nondestructive testing	20
Pipe material*	12
Bending	9
Lowering in*	7
Hydrotesting	4
Design	3
Other	8



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## **FERC Summary**

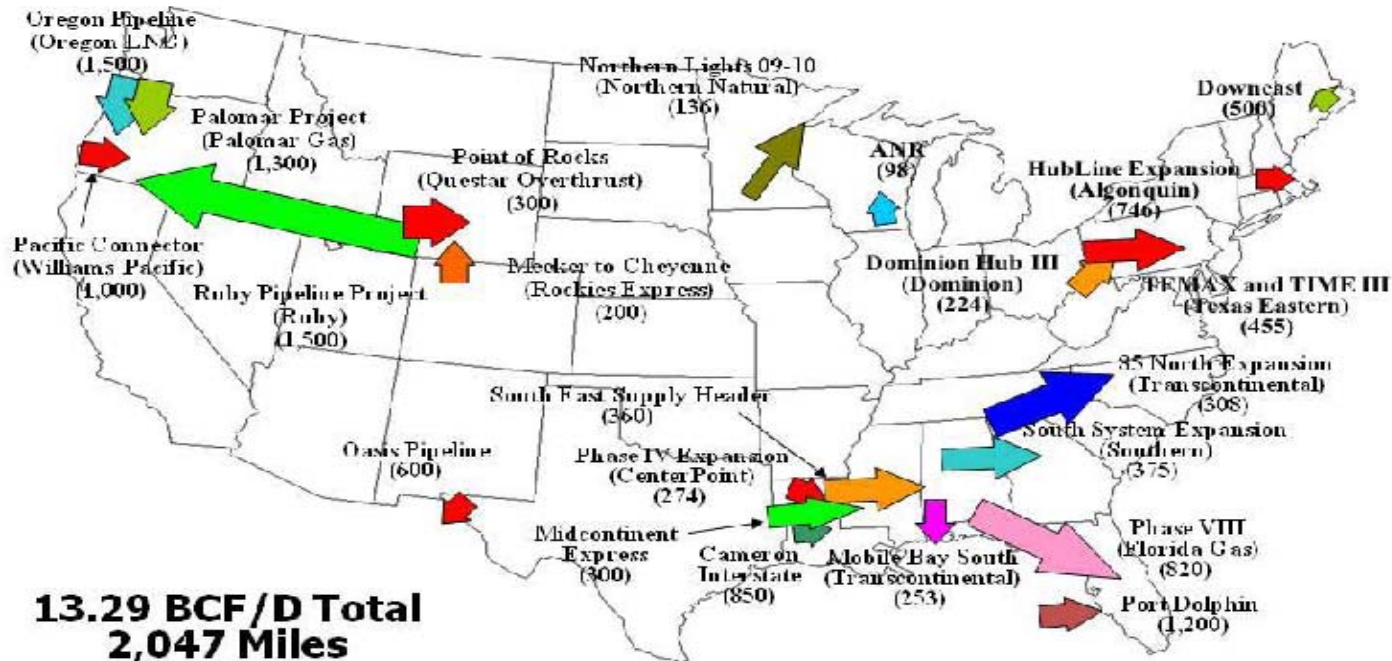
- Issued approval for 8080 miles of pipeline since 2003
  - Compliance oversight inspection concerns
    - Shortage of qualified environmental inspectors
    - Increase in winter construction
    - Workforce availability
    - Pipeline/powerline co-location benefits vs. impacts
    - 3<sup>rd</sup> party compliance program to complete project design
    - ROW restoration
  - Other issues include lack of preparation for HDD requirements and increase in pipeline repairs following construction.
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## Major Pipeline Projects Pending (MMcf/d)

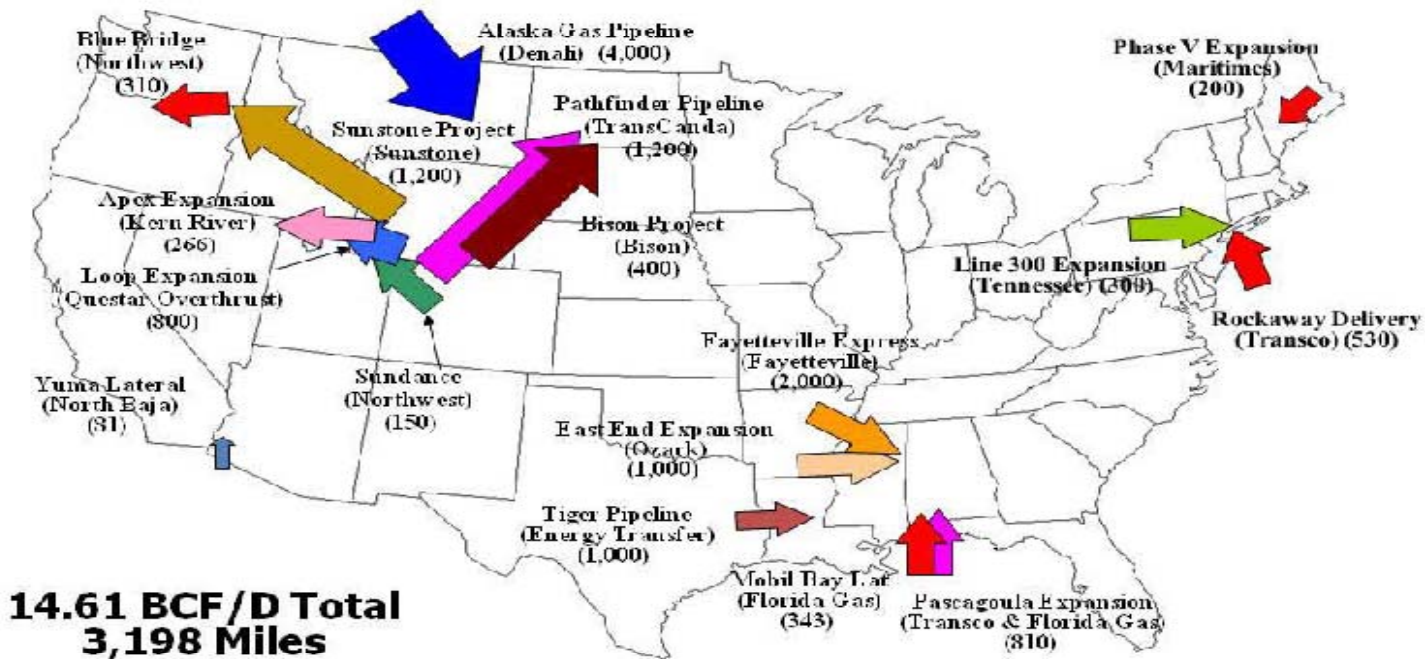
April 2009





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# Major Pipeline Projects Pre-Filing (MMcf/d) April 2009





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## **NEB Summary**

- **General observations:**
    - Inadequate quality assurance in pipe mills
    - Cold cracking due to winter construction
    - More workers hurt during pipeline construction than pipeline operation
    - Pipeline workers are changing employers all the time
    - Cultural change needed across industry
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## State Partner Summary

- State partners participated in and performed inspections on behalf of PHMSA
  - Surveyed State pipeline safety programs
  - Similar issues found by State inspectors
  - Distribution construction workshop planned for later in 2009.
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## Observation: Coating

- Coating and other cathodic protection systems are interdependent
  - Most persistent area of issues
  - Failure to follow manufacturer instructions
  - Need to ensure personnel are properly trained
  - Long term impact to pipeline integrity
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# Coating Procedures

- Surface Preparation Requirements
    - Specify by Industry Standards (SSPC & NACE)
  - Application Method Spray, Brush or Roller?
  - Application Conditions
    - Air & Surface Temperature
      - Caution use Infrared Temperature Guns that are calibrated to surface
    - Relative Humidity & Dew Point (Epoxies & Urethanes)
  - Thickness Requirements
    - Dry Fill Thickness (mils) per Coat for Liquid/Powder Coatings
  - Overlap Requirements
    - Tape Coating & Shrink Sleeves
    - Minimum Overlap of Consecutive Wraps
    - Minimum Overlap of Existing Coatings
  - Cure Time prior to Recoating or Burying
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# Coating Inspection

- Visual
    - Runs, Drips, Blisters, Foreign Inclusions
    - Wrinkles and Insufficient Overlap in Tape & Shrink Sleeves
  - Thickness Measurement
    - Critical for Liquid Applied Coatings
  - Holiday Testing (jeeping)
    - Electrical Test for Small Defects
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## **Observation: Welding**

- This issue covers a wide range of areas
  - Improperly qualified or wrong procedures
  - No procedures on site or not following procedures
  - Preheat issues
  - Cracked welds and possible long term integrity issues
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# Solutions

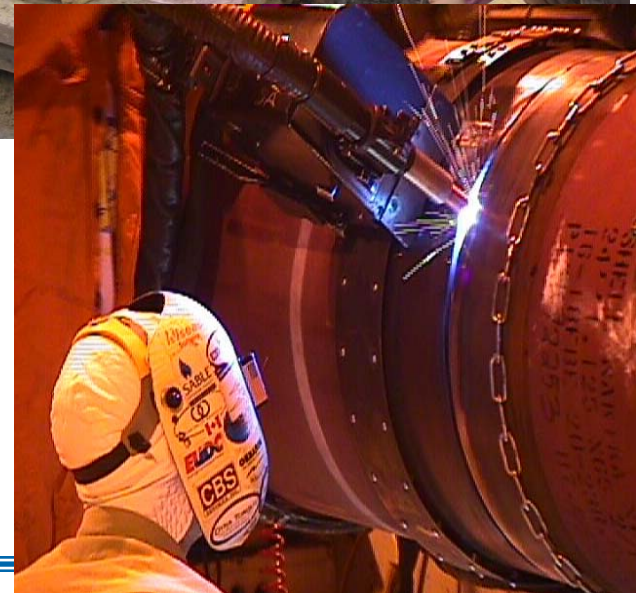
- In a high strength pipeline, use low hydrogen welding process (GMAW – FCAW - E XX18 – E XX45)
  - If using cellulosic electrodes - Allow time at temperature to allow hydrogen to diffuse from the weld (higher preheat temperatures, preheat maintenance, minimum interpass temperature, avoid weld interruption)
  - Minimize installation stresses
  - Optimize weld metal electrode selection
  - Welders must follow welding procedures
  - Verify welder performance with welding inspection
  - Preheat verification
  - Avoid accelerated weld cooling
  - Delay NDT to allow for the possibility of delayed hydrogen assisted cracking to be detected
  - Optimize radiographic procedures for crack detection
  - Verify NDT technician knowledge, skills, abilities and audit work
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# Solutions

- Development of welding procedures that manage the risk of hydrogen assisted cracking
- NDT practices that address risk
- Careful construction management





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# Repair Welding Recommendations

- Develop dedicated repair welding procedures
  - Develop specific through wall repair procedures
  - Develop specific partial wall repair procedures
  - Weather considerations
  - Avoid accelerated weld cooling
  - Preheat application and measurement
  - Preheat maintenance (minimum interpass temperature)
  - Consider the quenching effects of adjacent pipe material – deep short defects
  - Avoid weld interruption during repairs
  - Avoid delays between passes
  - Welder must follow welding procedure
  - Verify performance with welding inspection
  - Optimize NDT
  - 12 to 72 hour delay (API 1104 App. B states not less than 24 hr. delay before specimen bending)
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## **Observation: Materials**

- Low yield strength pipe found through hydrostatic tests
  - Non-integrated mills: rolling mill in one country, steel supplier in multiple countries
  - PHMSA is currently addressing this issue with various parties
    1. Is there an issue with the rolling mill?
    2. Is there an issue with the steel mill?
    3. Is there an issue with API 5L?
    4. Do operators know what they are buying?
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## Observation: Pipe Support While Lowering

- Volumetric welding NDT relies on certain assumptions on pipe stresses
- Is it four or five side booms?
- Does the contractor know and understand the expectations?
- Clear communications are needed





- Welding is a complex process
    - Costly and big consequence if mistakes occur
    - Many technical variables and strict tolerances
    - Quality management system is much more than QA/QC
  - Few outlets for collection of industry knowledge
    - Industry standards are only part of the story
    - Chains of expertise not strongly linked (researcher, engineer, welder, inspector)
    - Innovations take very long to deploy
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# Lessons Learned/Best Practices

- Ensure role/responsibility clarity and signoff
  - Run employee workshops to gather wide range of views and consolidate consensus
  - Develop programs for in-field, real time training
  - Build procedures specific to site conditions
  - Contractors explain and show their QMS
  - Database the lessons learned
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## What does PHMSA expect?

- **Quality Management System**
  - Purchase quality materials and understand what is being purchased
  - Ensure contractors understand and follow procedures; monitor performance.
  - Hire qualified personnel
  - Communicate when issues come up
  - Plan for the unexpected
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# Moving forward

- PHMSA will continue to focus on new construction
- Anticipates further enhancement of inspection protocols to achieve inspection consistency
- Distribution Pipeline Construction Workshop later in 2009





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# Quiz





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