



THE INGAA FOUNDATION, INC.

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**INGAA Foundation Workshop
Quality Assurance/Quality Control
June 18, 2008**

Executive Summary

On June 18, 2008 INGAA Foundation member representatives came together in Houston, Texas to discuss Quality Assurance/Quality Control (QA/QC) issues within the natural gas pipeline industry. A list of attendees is included in Appendix A.

Rod Seeley, Southwest Regional Director for the Pipeline and Hazardous Materials Administration (PHMSA) led off the workshop with some QA/QC observations on construction jobs that have been seen in the last year. The presentation is included as Appendix E.

The member representatives discussed the industry's top issues related to QA/QC and collaborated to define the main aspects of these issues. They then ranked the issues in order of their significance to focus on the most pertinent QA/QC problems facing the industry. The issues they chose to focus on are listed in the QA/QC Results chart in Appendix B. The definitions of each issue are listed in Appendix C.

The representatives then broke into smaller groups to brainstorm potential solutions to the QA/QC issues. Both industry-wide as well as company-specific solutions were considered. After each group had come up with their best solutions to each of the issues, the representatives came together and combined their work into a master list of potential solutions. They also discussed and defined the key points of each solution.

The specific solutions were then combined into broader categories by the INGAA Foundation. These potential solutions are listed in the first column on the QA/QC Results chart in Appendix B. Definitions of these solutions, as defined by the workshop attendees are given in Appendix D. The definitions include a brief description of each potential solution.

Finally, marks were filled in on the QA/QC Results chart in Appendix B to show which issues can be solved by each potential solution. Some of the solutions are meant to be implemented on an industry-wide level, with the help of the INGAA Foundation, however many of the solutions can be adopted by a single company to improve internal quality assurance and quality control.

The workshop attendees agreed that they did not see an advantage or need to establish new laws or regulations in this area.

The following items were identified as possible projects for the INGAA Foundation to consider:

- **Establish a Quality Culture**
 - Implement an industry-wide, quality awareness program and make sure, at the very least, that minimum requirements are being met.
 - Incorporate QA/QC into Safety Culture education efforts.
- **Improve Project Planning**
 - Increase education of customers, management, and marketing in order to create more realistic expectations about the goals of the projects.
 - Conduct an annual workshop to share lessons learned about QA/QC with pipeline companies, services and regulators.

Specific actions within these solutions were not identified in this meeting.

Appendix A- Workshop Attendees

Name	Company	Email
Blair Miller	Gulf Interstate Engineering	bmiller@gie.com
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Appendix B- QA/QC Results		Project Planning		Project Execution		QA/QC Program Implementation		Human Resources				
Potential Solutions	Issues	Planning	Rushing	Communication	Tracking and Documentation	Competing Priorities	Motivation for Correct Behavior	Resources Stretched too Thin	Changing Workforce	Understanding the Why behind a Procedure	Right Procedure versus Doing it Right	Technology Complexity
	Reinforce a Quality Culture		X	X	X	X	X	X	X	X	X	X
Incorporate Quality into Safety Culture*		X		X		X	X	X	X	X	X	
Increase Stakeholder Involvement		X	X	X		X	X	X		X	X	
Increase Incentives and Disincentives for Behavior				X			X		X			
Increase Company Inspection, Oversight, and Auditing		X		X	X	X	X		X	X	X	
Improve Project Planning		X	X	X	X	X	X	X	X	X		X
Increase Education for Customers, Management, and Marketing*		X	X	X				X	X			X
Conduct an Annual Lessons-Learned Workshop*		X		X		X				X		X
Modify Historical Estimating Practices with Current Data		X		X	X			X	X			X
Time and Materials versus Fixed Cost		X					X					
Increase Risk Taking Ability		X	X			X			X			
Formalize Job Skills and Improve Training		X	X	X	X	X	X		X	X	X	X
Increase Use of Technology While Understanding Legacy Technology		X	X	X	X		X		X	X		X
Increase Workforce and Pair New Workers with Experienced Workers		X		X		X	X		X	X	X	X
Improve Written and Electronic Documentation		X	X	X	X		X		X	X	X	X
Develop Clear Instructions, Responsibilities and Rationales		X	X	X	X		X		X	X	X	X
New Laws and/or Regulations												

*NOTE: Denotes Possible INGAA Foundation Activity

Appendix C- Definitions of Issues

Project Planning

- Project costs, schedules, and associated risk factors are not being fully identified, assessed and provided for when preparing initial execution plans, schedules, and budgets.
- When resulting cost over-runs and schedule delays occur, construction QA/QC processes suffer—lapses occur—resulting in abnormalities.
 - **Planning:** It is difficult to plan a complete project from start to finish, given all the conditions that now exist and the present natural gas pipeline capacity market design. This problem is compounded by the fact that many project managers are inexperienced for the scope and quantity of projects. Issues at the beginning of a project can compound and cascade.
 - **Rushing:** There is increased pressure at every step of the project to complete the pipeline on schedule and there are competing priorities. This inhibits paying attention to the details and biasing priorities.

Project Execution

- Highly regulated and increasingly complex projects involving a host of stakeholders/special interests have become increasingly challenging to manage effectively.
- When overall project execution is inefficient/ineffective, construction QA/QC processes suffer—lapses occur—resulting in abnormalities.
 - **Communication:** Current communication between inspectors, landowners, pipeline companies, and contractors is insufficient. This often results in non-uniform expectations between involved parties.
 - **Tracking and Documentation:** Tracking and documentation should be designed to catch when a process is out of control so that mitigative action can take place. There is a movement by PHMSA to document the entire construction process versus just the exception cases. This causes a mismatch between what is affordable (time and resources) to track.

Quality Assurance/Quality Control Program Implementation

- Construction QA/QC programs are competing with other high-visibility project priorities (Safety, Environmental, Landowner Rights, etc.) for project resources.
- When QA/QC is not a top priority, QA/QC processes suffer—lapses occur—resulting in abnormalities.
 - **Competing Priorities:** Due to other issues, such as aggressive schedules, companies are faced with competing priorities. They are often forced to make

important decisions that involve staying on schedule, remaining safe, and ensuring a quality pipeline can still be built.

- **Motivation for Correct Behavior:** The pride in quality of work has decreased, and many workers are only motivated to complete the minimum requirements so that they can collect their paycheck. The lack of experience of supervision and inspection personnel compounds the lack of motivation.

Human Resources

- Shortage of skilled/experienced workers (including professional staff)
- Lack of training
- **Resources Stretched too Thin:** There is a lack of both personnel and raw materials to complete projects within companies' budgets and schedules. This causes a huge strain on available resources and planning.
- **Changing Workforce:** There is a limited pool of qualified pipeline workers. This causes issues with older employees not understanding newer technology, and new employees not having the skills needed to complete a project properly.
- **Understanding the Why behind a Procedure:** Over time the purpose for doing some procedures is lost in the documentation. Employees know how to do the work, but don't understand the motivation and need, which helps them with priorities and focus. In situations not covered by procedures, it is important to know why something is being done so appropriate changes can be made.
- **Right Procedure versus Doing it Right:** There are often many ways to construct something and some employees don't know the difference between getting the job done and getting it done using the approved methods. Old practices sometimes are relied upon rather than new techniques that achieve additional goals.
- **Technology Complexity:** As new technology is added, workers must learn to use it. Additionally, there are many legacy technologies in the field that require repair and updates.

Appendix D- Definitions of Potential Solutions

- **Establish a Quality Culture:** Implement an industry-wide, quality awareness program and make sure, at the very least, that minimum requirements are being met.
 - **Incorporate Quality into Safety Culture (*Possible Foundation Activity*):** The explicit incorporation of public safety into the present personnel safety programs is already occurring. Quality control and assurance is a tool to accomplish both goals.
 - **Increase Stakeholder Involvement:** Include all stake holders as early as possible and make sure that they all buy into the company's project goals (safety, quality, and schedule).
 - **Increase Incentives and Disincentives for Behavior:** Reward employees for good behavior and positive outcomes, and provide clear repercussions for bad behavior.
 - **Increase Company Inspection, Oversight, and Auditing:** Increase company enforcement for quality control including aggressive oversight for quality assurance.


- **Improve Project Planning:** Improve planning to involve increased foresight before a project begins in order to avoid implementing processes midstream.
 - **Increase Education for Customers, Management, and Marketing (*Possible Foundation Activity*):** Improve the education of all involved stakeholders to create more realistic expectations about the goals of the project.
 - **Conduct an Annual Lessons-Learned Workshop (*Possible Foundation Activity*):** Conduct an annual workshop to share lessons learned about QA/QC with pipeline companies, services and regulators.
 - **Modify Historical Estimating Practices with Current Data:** Historical data on time and costs is not accurate for modern projects. Utilize current, shared and forecasted data to augment planning practices.
 - **Time and Materials versus Fixed Cost:** Good planning, including contingencies, is key to limiting unanticipated conditions. Time and material design contingencies should be incorporated throughout the project and customer commitments, if significant variables exist. This will reduce pressure to make up cost overruns by use of shortcuts.
 - **Increase Risk Taking Ability:** Take additional risk when procuring resources to help lock-up resources ahead of time.

- **Formalize Job Skills and Improve Training:** Specify job skills and offer more training to new workers before employment. Offer advanced training for current employees including project management.
 - **Increase Use of Technology While Understanding Legacy Technology:** Offer proper training on new technology. Additionally, key personnel must understand legacy technologies that are still seen in the field on older pipelines.
 - **Increase Workforce and Pair New Workers with Experienced Workers:** Pair new workers with the current experienced workforce, which will allow them to mentor each other. Include an on-the-job training checklist to ensure standard tasks are covered. Utilize additional use of retirees as inspectors, but be sure they are sensitive and trained to implement new requirements.


- **Improve Written and Electronic Documentation:** Improve documentation and work processes to aid project tracking and communication. Express documentation needs before a project starts so that everyone knows when and how to update documentation.
 - **Develop Clear Instructions, Responsibilities and Rationales:** Clarify that all instructions and contact lists should be maintained for all projects so workers know who to contact about issues. Clear goals and intentions will help to ensure that procedures and specifications are properly written and will help during implementation if conditions exist that were not anticipated in the original documents. Responsibilities and rationales should be stated at the beginning of the project.

- **New Laws and/or Regulations:** Implement new laws or new regulations to solve these issues.

Appendix E



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PHMSA Construction Observations and Issues.

More attention to details?


- **Special Permits** provide more specific criteria related to quality.
- **PHMSA** has dedicated more resources to overseeing construction activities.

I would like to relay some observations from recent construction projects for you to consider.

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PHMSA Construction Observations and Issues.

- **Welding**
- **Coating**
- **Post Construction – Corrosion**


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PHMSA Construction Observations and Issues.

WELDING ISSUES:


- **Need better Quality Control?**
 - PHMSA inspectors have observed improper control of welding material.
 - *Rod's not stored properly.*
 - *Use of incorrect Rods*

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PHMSA Construction Observations and Issues.


- **Improper welding procedure**
 - PHMSA inspector found welds were not made per an approved procedure.
 - PHMSA inspector noted that the procedures were made using three type Rods. In the field they used only one of them. Did not follow approved procedure.
- **Improper repair welding procedure**
 - PHMSA inspector found welding repairs were not made per an approved procedure. The on site inspector missed it. His QA/QC superior missed it.

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PHMSA Construction Observations and Issues.


Welding procedure qualifications not a true test of field conditions.

- **Quality issues with poor alignment from outside diameter out-of-round issues (hi low 5/32); end conditions from mill caused dimensional defects**
- **High rejection rates – need to ensure pre-heating is conducted based upon weather conditions that properly heats pipe girth weld during all welding passes.**

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PHMSA Construction Observations and Issues.


Communications:

Poor communications between AUT technician and weld repair crews to precisely indicate needed repairs?

- **improper location of repair**
- **inadequate depth of repair**


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PHMSA Construction Observations and Issues.


- **Non destructive examination (NDE), poor results from manual ultrasonic testing equipment, or not recording re-inspection**
- **Improper interpretation of MUT led to incomplete weld repair**

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PHMSA Construction Observations and Issues.


COATING ISSUES:

At the Mill


- **Surface preparation**
- **low application temperature, poor temperature control**
 - PHMSA observations at the mill were that the pipe was not properly heated per the application requirement for the coating.

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PHMSA Construction Observations and Issues.

Quality control (Following Procedures) Improper tools used to check temperature


- PHMSA inspector noticed the use of an instrument to measure temperature that was not in the operators procedures.





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PHMSA Construction Observations and Issues.

In the Field:

- **Improper application, not following application procedures**
- **poor handling**
- **holiday detector improperly or not used**
 - **Set to incorrect voltage**

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PHMSA Construction Observations and Issues.


CORROSION:

- **Significant corrosion prior to activation of cathodic protection from:**
 - interference,
 - poor construction and inspection practices

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PHMSA Construction Observations and Issues.

ENFORCEMENT

- **PHMSA does have the authority to issue enforcement for construction non compliance issues.**
- **Typically, we informally communicate with operator to correct issue prior to operation (example: Hydrotest not to proper pressure). Better to fix now rather than wait.**


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Pipeline Safety

Hazardous Materials Safety

Questions?

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