



# **2009 Pipeline Safety Seminar**

## **CRM Control Room Management**



# *Information Websites*

*PHMSA Training and Qualification*

<http://www.phmsa.dot.gov/pipeline/TQ>

*PHMSA Pipeline Safety Regulations*

<http://www.phmsa.dot.gov/pipeline/TQ/Regulations>



# Project Drivers

- ❖ **Pipeline Safety Improvement Act of 2002**
  - Study control room operations to enhance pipeline safety
  - Provide report to Congress
- ❖ **NTSB**
  - SCADA Safety Study, based on Liquid Pipeline Systems





# Project Drivers

- ❖ PIPES Act of 2006 (Sections 12, 19, 20)
  - ❖ Establish human factors management plan
  - ❖ Reduce risks associated with human factors
  - ❖ Program to assure safe operation of pipelines
  - ❖ NTSB Recommendations – RP 1165
    - ❖ Displays, Alarms and Training
  - ❖ Accident/incident form changes on Fatigue by Dec. 31, 2007
  - ❖ **NPRM published Sept 12, 2008**



# Project Drivers

- PHMSA Objective
  - Identify CRM enhancement areas to help assure and promote the Controller's ability to *succeed in maintaining pipeline safety and integrity*
- The following addresses the NPRM



# Definitions

- **Alarm**: Part § 192/195
- Means an audible or visible means of indicating to the controller an equipment or process is outside operator defined safety-related parameters





# Definitions

- ❑ **Controller**, Part § 192/195
- ❑ Means a qualified individual whose function is to remotely monitor and control the safety-related operations of entire or multiple sections of pipeline systems via a SCADA system from a pipeline control room and who has operational authority and accountability for the daily remote operational functions of pipeline systems as defined by the pipeline operator.



# Definitions

- ❑ **Control Room:** Part § 192/195
- ❑ **Means an operations center staffed by personnel charged with the responsibility for remotely monitoring and controlling entire or multiple sections of pipeline systems.**





# Definitions

- **SCADA: Means**
- a computer-based system or systems that collects and displays information about pipeline facilities and has the ability to send commands back to the pipeline facilities
- **OR** – a system that is a combination of computer hardware and software used to send commands and acquire data for the purpose of monitoring and controlling pipelines



# Incorporated by Reference

- ❑ API Recommended Practice 1165
- ❑ Recommended practice for Pipeline SCADA Displays (in part)
- ❑ API Recommended Practice 1168
- ❑ Recommended practice “Pipeline Control Room Management” (in part)



# Procedures

- ❑ **CRM Procedures:**
- ❑ The applicable procedures must be included in § 192.605 and/or 195.402





# Rule

- ▣ Roles and Responsibilities
- ▣ Provide Adequate Information
  - SCADA Displays
- ▣ Fatigue Mitigation
- ▣ Alarm Management
- ▣ Change Management
- ▣ Operating Experience
- ▣ Training
- ▣ Qualification
- ▣ Validation



# SCOPE

- Scope:
- Control room management rule applies to any controller working in a control room who monitors and controls all or part of a pipeline system through a SCADA system.



# Roles and Responsibilities

- ▣ General Requirements:
- ▣ At least One controller, One Control Room
- ▣ Written procedures to implement these requirements
- ▣ EXCEPT:
  - Gas Distribution with less than 250,000 services
  - Gas Transmission without a compressor station





# Roles and Responsibilities

- General Requirements:
- Procedures integrated as appropriate with operating and emergency plans required by §192.605, 192.615, and 195.402
- Plan must be developed in 18 months and implemented no later than 36 months after issuance of the final rule.



# Roles and Responsibilities

- ▣ Define roles and responsibilities
  - Controller authority and responsibility to make decisions and take actions during normal operations
  - Controllers role when an AOC is detected; what actions to take and what communications are required
  - Controllers role during an emergency; what actions to take and what communications are required



# Roles and Responsibilities

(continued)

- ▣ **Develop a method of recording when a controller is responsible for monitoring or controlling any portion of a pipeline facility.**





# Provide Adequate Information

- ▣ **Each operator must:**
  - Provide the controller with the information, tools, processes and procedures necessary to carry out the roles and responsibilities defined by the operator
  - Whenever a SCADA system is expanded or replaced, the operator must implement API-RP 1165 incorporated by reference (see § 192.7 or 195.3) unless they can demonstrate it is not applicable or impracticable



# Provide Adequate Information

- Conduct and document a point-to-point verification between SCADA displays and related field equipment when field equipment is added or moved and when other changes that affect pipeline safety are made to field equipment or SCADA displays
- Verify that SCADA displays accurately depict field configuration when any modification is made to field equipment or applicable software and conduct point-to-point verification for associated changes





# Provide Adequate Information

- Test and verify an internal communication plan to provide adequate means for manual operation, start-up and shut-down of the pipeline safely at least once each calendar year but at intervals not to exceed 15 months
- Test any backup SCADA system(s) at least once each calendar year but at intervals not to exceed 15 months
- Implement API RP-1168, Section 5, (incorporated by reference, see § 192.7 or 195.3) to establish procedures for when a different controller assumes responsibility





# Fatigue Mitigation

- ▣ Establish shift lengths and schedule rotations that provide controllers off-duty time sufficient to achieve eight hours of continuous sleep
- ▣ Educate controllers and supervisors in fatigue mitigation strategies and how off-duty activities contribute to fatigue
- ▣ Train the controller and supervisor to recognize the effects of fatigue; and



# Fatigue Mitigation

- ▣ Establish a maximum limit on controller hours-of-service
  - Exceptions may be given during an emergency with management approval but only when the deviation has been defined in the operators procedures



# Alarm Management

- ◆ Each operator using a SCADA system must have a written alarm management plan based on accepted industry practices.
- ◆ An operators plan must include provisions to:
  - ◆ Review SCADA alarm as indicated in an operators Alarm Management Plan
  - ◆ Plan should detail





# Alarm Management

- The process the operator uses to ensure alarms presented to controllers by the SCADA system are accurate and support safe pipeline operations
  - **Identify points impacting safety that have been taken off scan in the SCADA host or that have had forced or manual values for extended periods on a monthly basis, and**
  - **Verify the correct alarm set-point values and descriptions each calendar year, but at intervals not to exceed 15 months**
- The plan should detail the records maintained by the operator that demonstrate the plan is being followed



# Alarm Management

- ▣ Verify the correct set-point values and descriptions on alarm set-points when associated field instruments are calibrated or changed, and each calendar year, but at intervals not to exceed 15 months.
- ▣ Review, and if necessary update, the operator's alarm management plan each calendar year, not to exceed 15 months to determine the effectiveness of the plan.



# Alarm Management

- ▣ Monitor the content and volume of activity being directed to each controllers to assure controllers have sufficient time to analyze and react to incoming alarms.
- ▣ Address all deficiencies identified in the annual alarm management plan reviews.





# Change Management

- ▣ Each operator shall implement API RP-1168, Section 7 (incorporated by reference, see § 192.7/195.3)
- ▣ Each operator must establish communications between control room representatives, management, and field personnel when planning and implementing physical changes to pipeline equipment or configuration.



# Change Management

- ▣ Field personnel must be required to notify the controller when emergency conditions exist and when making field changes that affect control room operations.
- ▣ An operator shall seek control room or control room management participation prior to implementation of significant pipeline hydraulic or configuration changes.
- ▣ An operator must document each of these occurrences and keep records for a minimum of five years.



# Operating Experience

- ▣ The operator must review control room operations following any event that must be reported as an accident or incident and correct, where necessary, deficiencies related to:
  - Controller Fatigue
  - Field Equipment
  - The operation of any relief device





# Operating Experience

- Procedures
- SCADA configuration
- SCADA performance
- Each operator must include lessons learned from the operator's experience into their training program, whether the training programs are simulator or non-simulator based.



# Training

- ▣ Each operator must establish a training program and review the training program content to identify potential improvements at least once each calendar year but at intervals not to exceed 15 months.
- ▣ An operator must train each controller to carry out the roles and responsibilities defined by the operator.
- ▣ The training program must include the following elements:



# Training

- ▣ Responding to abnormal operating conditions likely to occur simultaneously or in sequence
- ▣ Use of a simulator or non-computerized (table-top) method to train controllers to recognize abnormal operating conditions, particularly leak events.
- ▣ Training controllers on their responsibilities for communication under the operator's emergency response procedures.





# Training

- ▣ Training that is sufficient to obtain a working knowledge of the pipeline system, especially during the development of abnormal operating conditions.
- ▣ For pipeline operating setups that are periodically, but infrequently used, provide an opportunity to review procedures in advance of application.



# Validation

- ▣ Upon request, operators must submit their completed programs to PHMSA or, in the case of an intrastate pipeline facility regulated by a State, to the appropriate State agency.



# Validation

- ☐ Permitted only qualified controllers to operate the pipeline
- ☐ Implemented the requirements of this section
- ☐ Continued to address ergonomic and fatigue factors and
- ☐ Involved controllers in finding ways to sustain and improve safety and pipeline integrity through control room management





# Compliance and Deviations

- ❑ An operator must maintain for review during inspection:
  - Records that demonstrate compliance with this section
  - Documentation of decisions and analyses to support any deviation from the procedures required by this section



# Other Plans

- ▣ Amend Sec. 192.605 by adding paragraph (b)(12) to read as follows:
- ▣ Sec. 192.605 Procedural manual for operations, maintenance, and emergencies.
- ▣ \* \* \* \* \*(b) \* \* \*
- ▣ (12) Implementing the applicable control room management procedures required by Sec. 192.631.



# Other Plans

- ▣ 192.615 by adding paragraph (a)(11) to read as follows:
- ▣ Sec. 192.615 Emergency plans.
- ▣ (a) \* \* \*
- ▣ (11) Actions required to be taken by a controller during an emergency in accordance with Sec. 192.631.





# Other Plans

- ▣ 195.402 by adding paragraphs (c)(15) and (e)(10) to read as follows:
- ▣ Sec. 195.402 Procedural manual for operations, maintenance, and emergencies. \* \*  
\* \* \* (c) \* \* \*
- ▣ (15) Implementing the applicable control room management procedures required by Sec.



# Other Plans

- ▣ 195.454.\* \* \* \* \*
- ▣ (e) \* \* \*
- ▣ (10) Implementing actions required to be taken by a controller during an emergency, in accordance with Sec. 195.454.



Pipeline and Hazardous Materials  
Safety Administration

## *Contact Information*

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