U.S. Department of Transportation
Pipeline and Hazardous Materials
Safety Administration

PHMSA
Office of Pipeline Safety

Hazardous Liquid Transmission – Understanding the Application of Automatic and Remote Control Shutoff Valves

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Know what's below.
Call before you dig.

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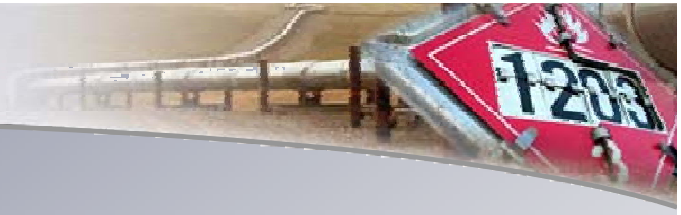
Outline

- Automatic Shutoff Valves, Remote Control Shutoff Valves, Emergency Flow Restricting Devices
  - Code Requirements and specific considerations
- Emergency response
- Montana Governor's Task Force
- Pipeline Safety, Regulatory Certainty, and Job Creation Act
- Concerns
- Considerations



Automatic Shutoff Valve (ASV)

- Electric, pneumatic, or gas powered actuators
- Signals are derived from pipeline sensors, typically:
  - Pressure
  - Flow
- Signals cause automatic closure on set pipeline parameters
- Does NOT require human action for operation

Remote Control Valve (RCV)

- Electric, pneumatic, or gas powered actuators
- Operated from a remote location
- Communication network required
- Operator reviews and evaluates data prior to positioning valve
- RCV introduces human intervention, decision making, and evaluation

Emergency Flow Restricting Device (EFRD)

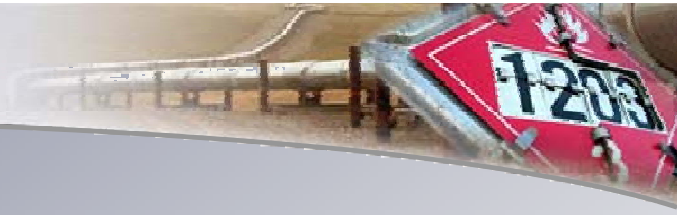
- EFRD means either:
  - Check valve
    - Permits fluid to flow freely in one direction
    - Contains a mechanism that prevents back flow
  - Remote Control Valve
    - Any valve that is operated remotely
    - Usually operated through SCADA

Current Regulatory Requirements

- Part 194 - Response Plans for Onshore Oil Pipelines
  - Worst Case Discharge Calculations
- Part 195 – Transportation of Liquids by Pipelines
  - Design
  - Construction
  - Integrity Management

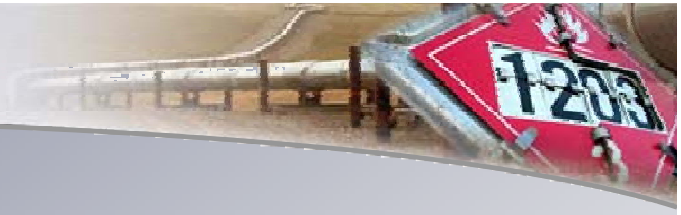
Worst Case Discharge

- **§194.105**
  - Determine worst case discharge for each response zone
  - Worst Case Discharge is one of the following:
    - (Maximum release time + Maximum shutdown response time) X Maximum flow rate + drainage volume
      - Drainage volume directly affected by valve placement and actuation time
    - Capacity of single largest breakout tank or battery of breakout tanks within single containment



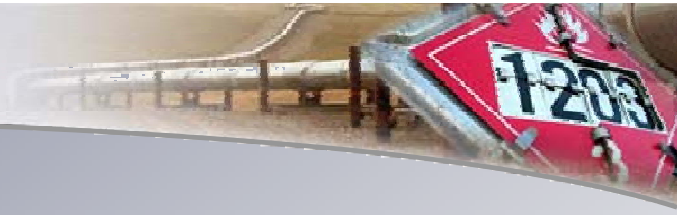
Valve Design Requirements

- **§195.116**
  - Sound engineering design
  - Compatible to pipeline material and fluid medium
  - Clearly indicates position of valve
  - Marked with manufacturer's data



Construction

- **§195.258**
  - Valve must be installed in a location that is accessible to authorized employees
  - Protected from damage or tampering

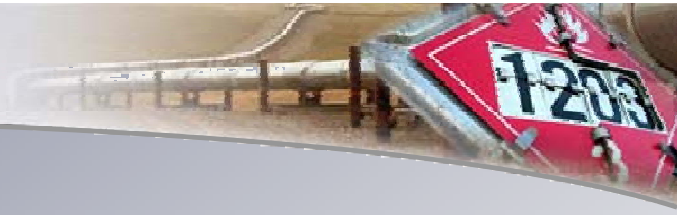


Construction

- **§195.260**
  - Valve must be installed at each of the following locations:
    - Suction end of discharge pump
    - Each line entering or leaving breakout storage tank area
    - At locations that will minimize damage or pollution from accidental discharge
    - Lateral takeoff from trunk line
    - Each side of a water crossing that is more than 100 feet wide
    - Each side of reservoir holding water for human consumption

Integrity Management in HCAs

- **§195.452**
  - General requirement
    - Prevent pipeline failures
    - Mitigate consequences of a pipeline failure in HCAs
    - Risk analysis must identify additional measures to protect the HCA and enhance public safety or environmental protection
    - Additional measures based on identified threats
    - **Installing EFRDs are additional measures**

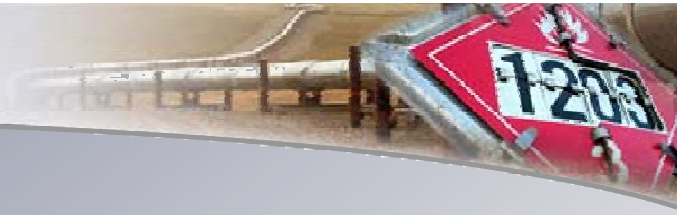


Integrity Management in HCAs

- **§195.452**
  - Factors to consider when installing EFRDs based on risk analysis:
    - Swiftness of leak detection and shutdown capabilities
    - Type of commodity being transported and leak rate
    - Volume that can be released
    - Rate of potential leakage and potential for ignition
    - Pipeline topography, profile, and terrain
    - Location of nearest response personnel
    - Benefits of reducing spill size

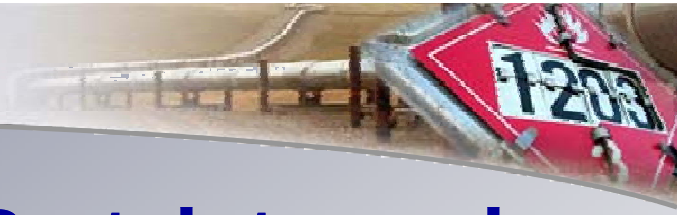
Emergency Response

- **Pipeline Emergency Response Forum Washington DC, December 9, 2011**
  - **Key points:**
    - Mitigation
    - Preparedness
    - Response
    - Recovery
    - Enhancing pipeline emergency management involves considering non-IM requirements for ASVs and RCVs



Montana Governor's Task Force

- Joint Study between MT Governor and PHMSA following July 1, 2011 Exxon Mobil crude oil spill into Yellowstone River.
- Study conducted to ensure integrity of petroleum pipelines crossing major rivers in Montana, with a focus on depth of cover and valve placement.
- Evaluate adequacy of pipeline installation, leak detection, and valve placement/actuation at major water crossings



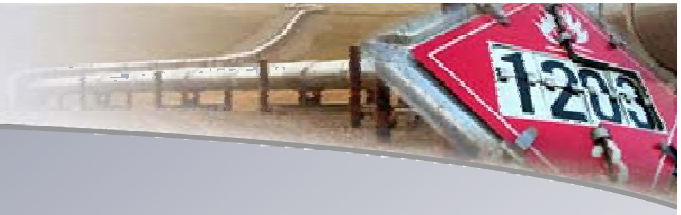
Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011

- By January 2013 – requires a study conducted by the Comptroller General (GAO) of the United States that addresses product release located within an HCA

- By January 2014 – requires by regulation the use of Automatic or Remote Controlled Shut-off valves, or equivalent technology, in newly constructed or entirely replaced facilities

Studies

- March 1991 – Emergency Flow Restricting Devices Study
  - Required by the Pipeline Safety Reauthorization Act of 1988 PL-100-561
- 1995 – Remote Control Spill Reduction Technology: A Survey and Analysis of Application for Liquid Pipeline Systems
  - Model was created to show optimal utilization of EFRDS
    - RCVs cost more
    - Lead to better response time
    - RCV and manual valve optimum spacing are comparable

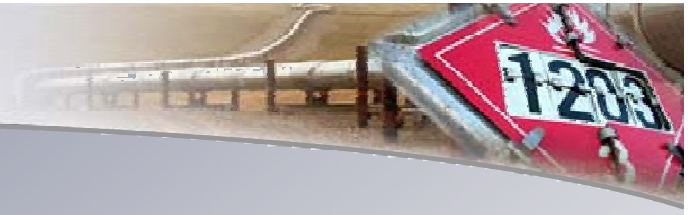


Rule Making

- September 1978 – ANPRM to require installation of ASVs and RCVs in inhabited areas for liquid and gas pipelines. This ANPRM was withdrawn. (43 FR 39402)
- February 1987 – ANPRM proposed to convert shutoff valves to ASVs or RCVs; the Department studied the selective use of ASVs and RCVs, but there was no rulemaking. (52 FR 4361)
- May 1989 – Notice of Request for Information regarding SCADA, installation of ASV/RCV, costs to convert, valve spacing criteria. (54 FR 20945)
- January 1994 – ANPRM soliciting public input regarding a study of safety, cost, feasibility, and effectiveness of using EFRDs in existing and future pipeline systems. (59 FR 2802)
- October 2010 – ANPRM issued regarding whether changes are needed to regulations governing on-shore hazardous liquid pipelines. Sought comment on whether to require the installation of EFRDs on existing pipeline systems within HCAs based on risk. (75 FR 63774)
- Note: EFRDs were addressed in IMP regulation 195.452 (i) on December 1, 2000 under Preventative and Mitigative Measures

Best Practices

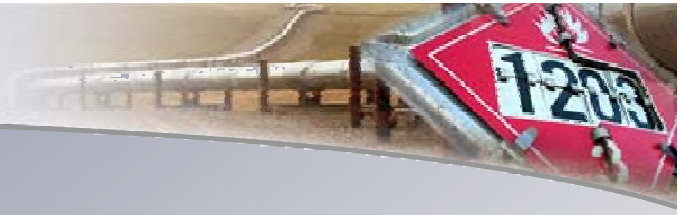
- Spill containment around valves – vaults, sumps, and leak detection
- Relief bypasses around valves to allow rapid closure and avoid overpressure events
- Inhibit switches or calculated valve transit times in valve actuation to prevent overpressure events
- Installed cameras at critical valve sites
- Solar panels/Nitrogen bottles actuation at sites with no commercial power



Vault Around Mainline Valve

Overpressure Bypass Around Valve

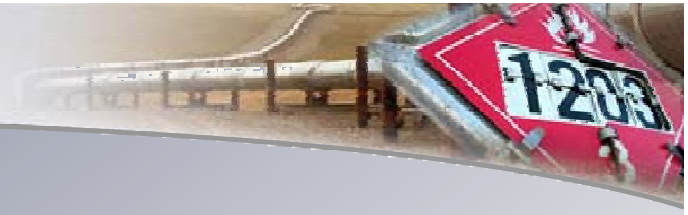
Valve Power in Remote Areas



Operational Concerns

- Control Room Management/Operator Issues
  - Operator's ability to recognize a situation that requires response and required permission to do so
  - Pumping against closed valves
  - An inadvertent closure due to operator error or computer system design
- Improper maintenance
  - Cleaning seats/valve bodies, packing, gaskets, winterization, etc

Improper Maintenance



Improper Maintenance

Other Concerns

- Instrumentation and activation require power in remote areas; may be subject to power outages
- Physical and Cyber security threats
- Fluid Hammer / flow transients
- Detectable Leak size may be too low to trigger activation
- Parallel pipelines and Cross over valves must also be addressed

Considerations for Requiring Additional EFRDs

- Prescriptive requirements for EFRDs used in PHMSA Enforcement cases:
  - Specify other HCAs beyond 100’ wide water crossings
  - Limit drain down volume by:
    - Percent volume of daily throughput
    - Absolute Number of barrels that can drain down after pump shutdown
    - Risk-based calculated volume based on commodity and HCA characteristics
- Public Comments to this workshop and proposed study
  - Provide Comments to Registry website

Questions?