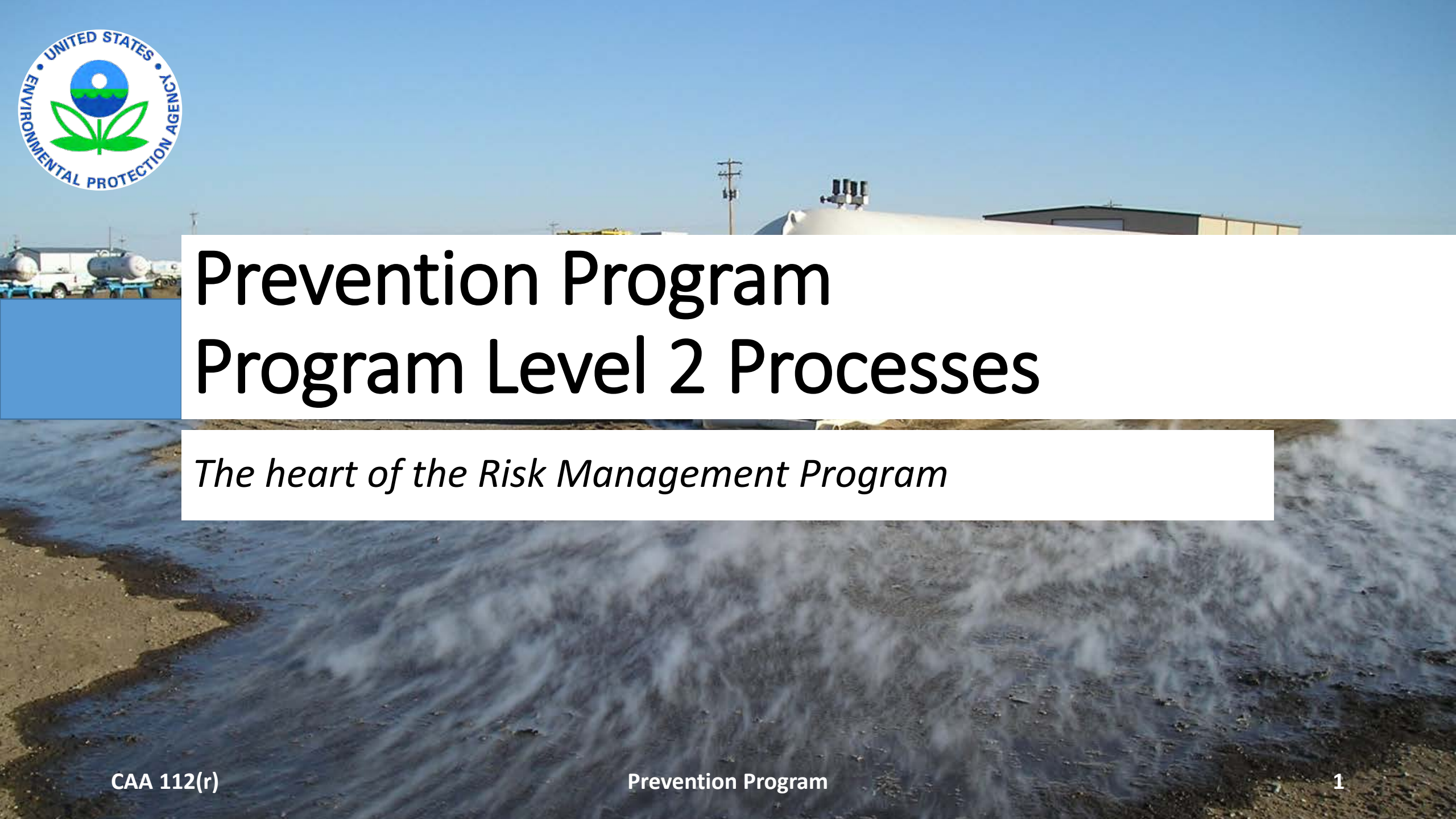


Prevention Program
Program Level 2 Processes

The heart of the Risk Management Program

Prevention Program

Program 2

- Safety information
- Hazard review
- Operating procedures
- Training
- Maintenance
- Compliance Audits
- Incident investigation

Program 3

- Process safety information
- Process hazard analysis
- Operating procedures
- Training
- Mechanical integrity
- Compliance audits
- Incident investigation
- Pre-startup review
- Management of change
- Employee participation
- Hot work permit
- Contractor accountability

Safety Information

Safety information is the foundation of a good prevention program

Guidelines and Best Management Practices

- One of the most important parts of the regulation relates to “recognized and generally accepted good engineering practices” *40 CFR 68.48(b)*

- When it comes to the Risk Management Program and chemical safety in general (General Duty Clause), the strict interpretation of “grandfather clauses” ended on June 21, 1999

Purpose of Requirement Safety Information

- Ensure understanding of safety-related aspects of equipment, processes, and chemicals
- Know limits those aspects place on operations
- Adopt accepted standards and codes
- Most program elements depend on the accuracy and thoroughness of information required by this element
  - Especially important for the hazard review

Up-to-date Safety Information Requirements for Program 2 Processes

- Hazardous/regulated substances
  - SDS – current, from actual chemical supplier
- Processes
  - Maximum intended inventories
  - Safe upper and lower limits for temperatures, pressures, flows, compositions

Up-to-date Safety Information Requirements for Program 2 Processes (cont.)

- Equipment Specifications
  - Account for upper and lower temperatures and pressures
  - Use of schedule 40 pipes
  - Pressure vessel rating vs. codes/standards
- Codes/standards used to design, build, and operate
- Compliance with good engineering practices
- Update when major change makes information inaccurate

Common Codes and Standards for Program 2 Processes

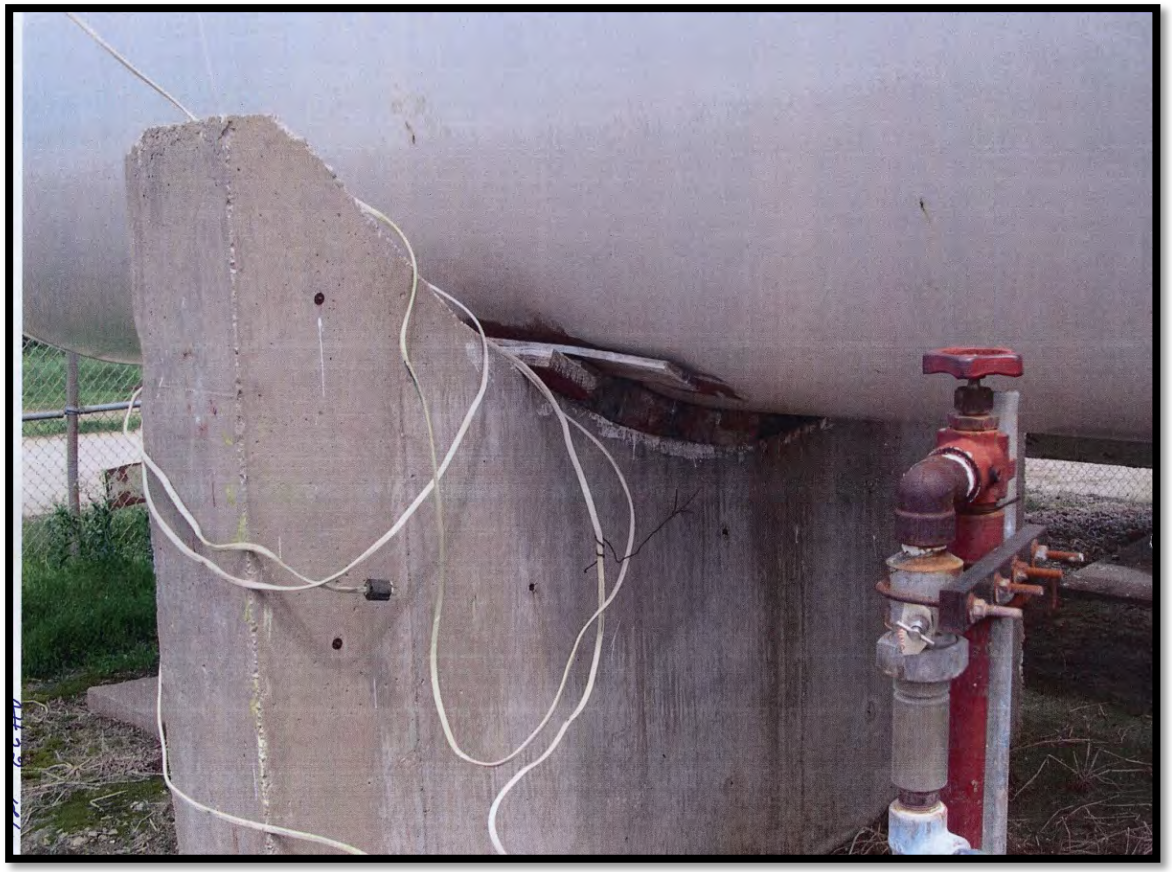
Organization	Codes Include
ANSI American National Standards Institute	Piping, electrical, power wiring, instrumentation, lighting, product storage and handling, insulation and fireproofing, painting and coating, ventilation, noise and vibration, fire protection equipment, safety equipment, pumps, compressors, motors, refrigeration equipment, pneumatic conveying
ASME	Power boilers, pressure vessels, piping, compressors, shell and tube heat exchangers, vessel components, general design and fabrication codes
API	Welded tanks, rotating equipment, bulk liquid storage systems
NFPA National Fire Protection Association The authority on fire, electrical, a	Fire pumps, flammable liquid code, liquid natural gas storage and handling, plant equipment and layout, electrical system design, shutdown systems, pressure relief equipment, venting requirements, gas turbines and engines, cooling towers, storage tanks
ASTM INTERNATIONAL	Inspection and testing, noise and vibration, materials of construction, piping materials and systems, instrumentation
The Chlorine Institute, Inc.	Chlorine handling, inspections, testing, equipment integrity

Common Deficiencies

- Safety information incomplete, not current, or inaccurate
  - Maximum inventories
  - Safe operating control limits not specified in written documents
- No or outdated SDS/MSDS
- Obsolete equipment or design with no plans to change and no documentation to show still safe
- Good engineering practices/industry standards not followed
  - Examples: anhydrous ammonia vessels with rust, no traffic barriers around piping

Rust – the cancer of steel

Saddles Fit Poorly



Saddles Not Designed to Prevent Movement

Vehicular Barriers Absent or Inadequate

Tanks On/Near Ground

Inadequate Bulkheads

Common Deficiencies

- Other examples of good engineering practices/industry standards not followed include
  - Anhydrous ammonia pipes not marked throughout the entire facility
  - Markings not readily readable from any vantage point
  - No emergency water near the ammonia loading area

New Standard Released

- Make sure to consider new standards once they are released
- There is no “grandfathering” of old standards
- ANSI/CGA K61.1 (1999) superseded by CGA G-2.1 (2014) “Requirements for the Storage and Handling of Anhydrous Ammonia” 6th Ed.

Hazard Review

Determining what could lead to problems

Overview

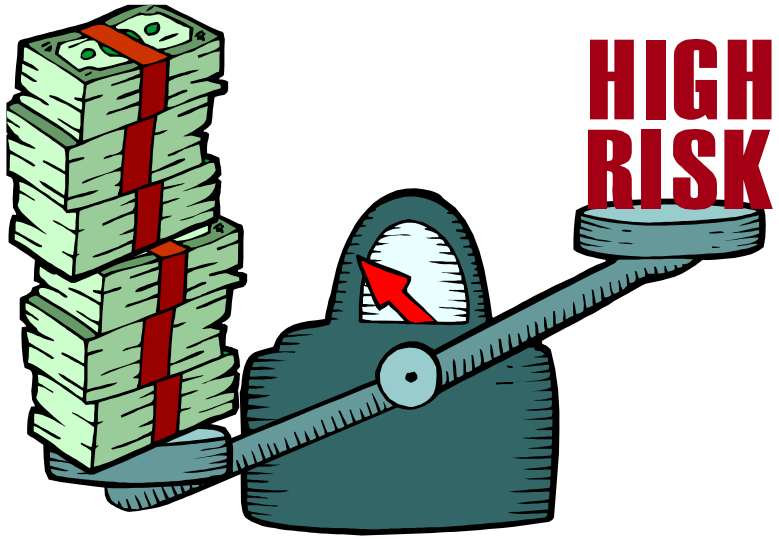
- Identify potential for chemical releases
- Incorporate safety information
- Findings used to develop operating procedures, training programs, emergency response programs
- Many options – checklists, HAZOP, fault-tree, etc.
  - If checklist used, should be facility-specific

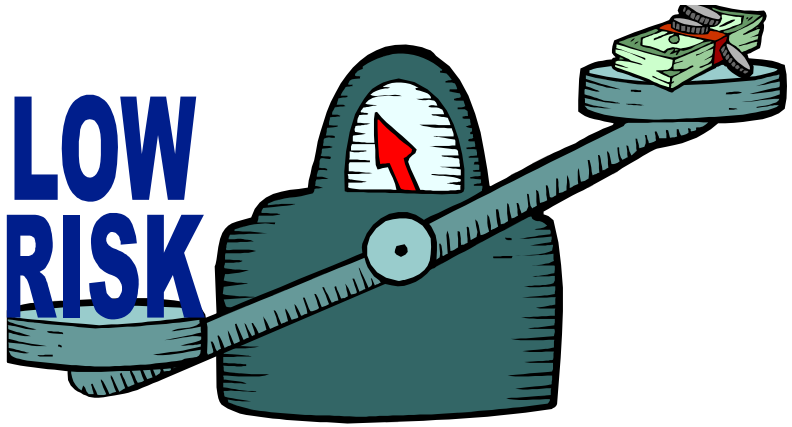
Definitions

- **Hazards:**
  - Unsafe acts or conditions that create potential for accident(s) with undesirable consequences
  - Loss of containment of flammable, combustible, highly reactive, or toxic materials
  - Uncontrolled electrical hazards or mechanical overpressure
- **Accident:** unplanned sequence of events that has undesirable consequences
- **Consequence:** impact of accident (i.e., effects on people, property, or environment)

Definitions (cont.)

- **Risk:** measure of potential human injury, economic loss, or environmental impact in terms of severity or likelihood





Factors Affecting Risk

- Process materials
- Process conditions
- Physical design
- Equipment
- Control system
- Operating procedures
- Operator training
- Test, inspection, maintenance practices
- Emergency plans
- Plant layout
- Source siting
- Protective measures
- Staff attitudes
- Management attention

Requirements

- Conduct review to identify
  - Process and regulated substance hazards
  - Equipment malfunctions or human errors that could cause release
  - Safeguards used or needed
  - Release detection/monitoring used or needed
- May use guides (e.g., checklists)

Requirements (cont.)

- Must document results and resolve identified problems in timely manner
- Update review
  - At least every 5 years
  - After major change in process (resolve problems identified before startup)

Common Deficiencies

- Industry standard(s) have not been reviewed since the facility was designed/built (i.e., “grandfathered”)
- Review has not been revised/updated at least every five years
  - Safety information not up to date, so hazard review not started on time
- Hazard review findings
  - Not resolved
  - Not documented
  - Not tracked – show up in subsequent reviews

Common Deficiencies (cont.)

- Facilities do not look past industry checklist
- Commonly missed hazards includes
  - Facility located in floodplain
  - Vessel proximity to
    - Railroad or highway
    - Other vessels with incompatible materials
      - i.e. chlorine and anhydrous ammonia
  - Underground piping

Operating Procedures

More than just a piece of paper

Operating Procedures Must Be

- Appropriate for equipment and operations
- Complete
- Easily understood by facility's operators
- Readily accessible to workers who operate or maintain process
- Reviewed/modified as often as necessary to reflect current practices and process changes

Requirements
Consequences of Deviation

- Deviations to address include
  - High pressure
  - High or low temperatures
  - Exceeding capacities
  - Operating without adequate level
  - Feeding too fast
  - And others
- Consequences could be leak, rupture, overflow, explosion, equipment damage, etc.

Requirements
Steps to Avoid or Correct Deviations

- Operating instructions to maintain appropriate conditions

- Specific steps to take to correct problems if they occur

Required Operating Procedures

- Initial startup
- Normal operations
- Temporary operations
- Emergency shutdown
- Emergency operations
- Normal shutdown
- Start-up following a normal or emergency shutdown, or a major change

Overlooked Procedures Temporary Operations

- Examples: process shutdown, extra capacity needed for limited time
- Need steps to ensure operations function safely
- Documentation must be prepared and training conducted prior to starting temporary operations

Overlooked Procedures

- Start-up Following Emergency Shutdown
  - After emergency shutdown, there may be additional steps to ensure process starts safely (e.g., evaluating equipment status due to potential damage)

- Equipment Inspection
  - Periodic inspection and surveillance of equipment

Common Deficiencies

- Failure to have all of the required procedures
- Failure to include operating limits and consequences of deviation in operating procedures
- Actual operations are not consistent with operating procedures
  - Inspectors spot issues by checking the revision date and visiting with/observing operators to see if implemented procedures match written procedures

Training

A trained workforce is a less-at-risk workforce

40 CFR Part 68 Training Requirements

Training Requirement	Section
Operating Procedures, Safe Work Practices, Refresher	68.54
Maintenance	68.56(b)
Contractors	68.56(c)
Emergency Response	68.95(a)(3)

Training Requirements Operating Procedures

- Employees trained in operating procedures pertinent to their duties *(68.54(a))*
- Refresher training required at least every 3 years *(68.54(b))*
- Training required for updated/new procedures prior to startup of process after major change *(68.54(d))*

Training Requirements Maintenance

- Training required for employees responsible for process maintenance activities *(68.56(b))*
- Training must cover
  - Hazards of process
  - How to avoid or correct unsafe conditions
  - Procedures applicable to job tasks
- Maintenance contractor responsible for training employees in facility's maintenance procedures *(68.56(c))*

Training Requirements Prior to Start-Up After Major Change

- Ensure personnel know how to do their job before process equipment is restarted
  - Changes can include new process equipment and/or introduction of regulated substance(s)
- Training in updated procedures required for
  - Operators, employees, and contractors *(68.54(d))*
  - Those involved in maintaining process equipment

Training Requirements Emergency Response

- Train employees in relevant emergency response program procedures *(68.95(a))*
  - Only required for facilities that will respond to a release of the regulated substance(s)

Common Deficiencies

- Training does not address facility-specific operating procedures
- Not all employees get refresher training
  - Process maintenance and contractor personnel
  - Multiple shifts
- Lacking documentation of each individual's training

Maintenance

Properly maintained equipment is less likely to fail

Maintenance Requirements

- Critical to safe operations
  - Preventive maintenance
  - Inspections and tests required
  - Running equipment to failure not acceptable
- Maintenance program
  - Prevent incidents/accidents/releases
  - Save facility money

Maintenance Requirements Overview

- Prepare and implement maintenance procedures
- Train maintenance employees in process hazards, how to avoid or correct unsafe conditions, and maintenance procedures
- Inspect and test equipment

Maintenance Program Includes

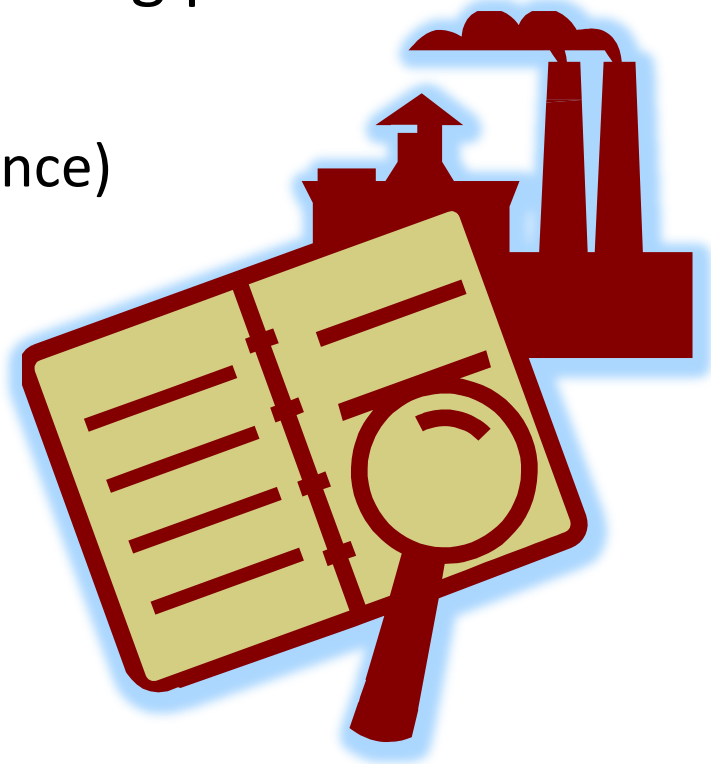
- Written program
- Criteria or rationale used to establish frequency of tests and inspections
- Test and inspection schedule established for all equipment
- Adherence to calibration testing and inspection schedules
- Established process for use, removal, or replacement of equipment out of specifications
- Written test procedures for all tests performed

Written Maintenance Procedures

- Maintain ongoing integrity of process equipment
- Resources for written procedures include
  - Vendors
  - Equipment manufacturers
  - Trade association
  - Industry standards/guidance
  - Developed in-house
  - Maintenance history

Inspection and Testing

- Use recognized and generally accepted good engineering practices
- Develop maintenance schedule
  - Manufacturer's recommendations (preventive maintenance)
  - Prior operating experience (predictive maintenance)
- Document maintenance activities
  - Written procedures
  - Reviews and revisions of procedures



Common Deficiencies

- No written maintenance procedures
- Equipment not inspected or tested
  - Especially underground piping
- Testing/inspection interval not consistent with industry standards
- Failure to follow good engineering practices
  - Examples: proactive relief valve replacement, hose replacement, painting

Compliance Audit

Inspect your own CAA 112(r) program and fix problems

Compliance Audits

- Think of this as an opportunity
- Play inspector for the day
  - Use EPA's inspector's checklist found at the bottom of the following website*
    https://www.epa.gov/rmp/guidance-facilities-risk-management-programs-rmp
- Safety audits ≠ compliance audits

*Website active as of November 2016

Requirements

- Certify that the facility has evaluated compliance at least every three years
  - Review all prevention program requirements
- Identify problem areas, recommend corrective actions, and complete corrective actions

Requirements (cont.)

- Must be performed by at least one person knowledgeable in the process *(68.58(b))*
  - If performed by outside consultant, someone from facility must also participate
  - In documents, specify the name and title of person from the facility participating in the audit
- Owner or operator shall develop a report of audit findings *(68.58(c))*

Documentation

- Responses to each of the audit's findings should be developed promptly, and any corrective actions should be explicitly listed
- Addressing deficiencies
  - Assign responsibility for each recommendation to individual
  - Assign start date and completion date
  - **Document** action taken, label "closed" with completion date

Requirements (cont.)

- Retain the two (2) most recent compliance audit reports *(68.58(e))*
  - Once a compliance audit report is more than 5 years old, it does not need to be retained

Common Deficiencies

- Failure to conduct compliance audit every 3 years
- No certification by company official
- Failure to detect major prevention program errors
- Issues identified were not addressed/documented
- Same finding appears on subsequent audits
- Only partially audited, or assumes that sections audited previously do not need to be evaluated

Incident Investigation

An incident or near miss occurred. Now what?

Definitions

- **Incident:** event that resulted in, **or could reasonably have resulted in**, a catastrophic release
- **Catastrophic release:** one that presents imminent and substantial endangerment to public health and the environment

Purpose


Find Root Cause
Avoid Repeating Mistakes
Learn from Experience
Prevent Recurrence & Future Injuries

Potential Incidents to Investigate

- CERCLA/EPCRA reportable releases
- Risk Management Program reportable accidents
- Accidents reported on the OSHA 300 log
- Actual/potential events that require equipment changes

Potential “Near Miss” Investigations

- Many facilities do not value the knowledge that can be gained from “near miss” investigation
- Consider investigation if
  - “…and the safety systems were tripped”
  - “…it was fortunate that nobody was in the area”
  - “…this same maintenance issue / safety valve relieving keeps happening”

Near Miss Investigations as an Opportunity

Learn from the past to prevent harm in the future

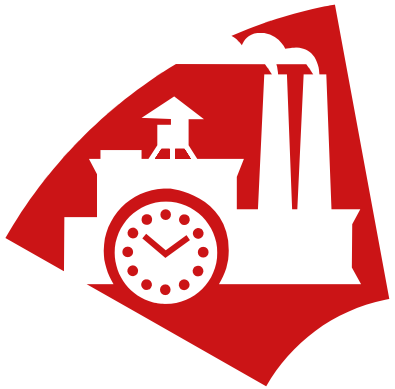
Don’t wait

for someone to get injured or a release to occur

before deciding to make changes

Requirements

- Initiate investigation within 48 hours of incident
  - Includes weekends and holidays
  - Investigation for Friday incident must begin no later than Sunday
- Establish knowledgeable investigation team



Written Report Requirements

- Summarize
  - Date of incident
  - Date investigation began
  - Description of incident
  - Factors contributing to incident
  - Address investigation team's findings/recommendations

Incident Investigation Resolution

- Owner/operator required to “promptly address and resolve” findings
- Regulation does NOT require adoption of all recommendations
- All resolutions and corrective actions must be documented
- Review findings with all affected personnel
- Retain investigation summaries for 5 years

Common Deficiencies

- “Near misses” are not investigated
- Do not investigate various release events
- Unresolved or undocumented findings/recommendations
- Reports never finalized due to liability
- Findings not discussed with affected employees/contractors or documented that communication occurred
- Investigations only find that equipment failure and/or human error was at fault
  - Did the investigation get to the true root causes?

Tip for Inspections

- When no incidents have been investigated, inspectors review
  - Information sources (OSHA 300 logs, Risk Management Program reportable, Emergency Planning and Community Right-to-Know Act (EPCRA) or Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) reportable releases, etc.) to see if incidents should have been investigated
  - Procedures to see how near misses are discussed
  - Procedures to see if all required elements are addressed