

OSHA PSM RAGAGEP Enforcement

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**Recognized
And
Generally
Accepted
Good
Engineering
Practices**

Recognized & Generally Accepted Good Engineering Practices

- *Background*
- *Early recognition of RAGAGEP*
- *RAGAGEP in OSHA's PSM standard*
- *New RAGAGEP Enforcement Guidance*

Background

- Many early OSHA standards incorporated consensus standards by reference
 - Example: 29 CFR 1910.106 *Flammable and Combustible Liquids* incorporates ASME B&PV Code Section VIII – 1968 for pressure vessels
- Incorporated standards are frozen in time – updating them requires notice-and-comment rule-making

Background

- The PSM standard takes a very different and much more performance-based, approach
- PSM expects employers to:
 - determine and document the codes, standards, and practices they will follow, and then
 - Implement and follow those codes, standards, and practices
 - “Say what you’ll do, and do what you say!”

Background

- This approach gives industry considerable flexibility
- Doesn't lock in fixed versions of published good engineering practices and standards
- Does **NOT** require employers to comply with all RAGAGEP – only those applicable to the hazards of their operations!

Background

- PSM also requires employers to **determine** and **document** that existing PSM covered equipment built to codes, standards, or practices that are no longer in general use is:
 - **Designed**
 - **Maintained**
 - **Inspected & tested**, and
 - **Operating**
in a safe manner!

Background

- There is plenty of precedent for recognizing an important role for industry standards!
- The key features of OSHA's RAGAGEP requirements are clearly visible in early industry management-system based safety documents, including
 - **CCPS** and
 - **API** publications

CCPS' *Guidelines for Technical Management of Chemical Process Safety* (1989)

- *Codes & standard use should be a part of a management system*
- Many external codes & standards may apply
- Employers need to decide which they will use
- Selected codes & standards must be clearly documented
- Alternate approaches must be
 - documented
 - at least equally protective
- Internal standards may complement external standards
- Management commitment to following external and internal RAGAGEP

API RP 750 *Management of Process Hazards (1990)*

- Design information includes design codes
- Mechanical design consistent with applicable standards at time of design or, if not available, with recognized and generally accepted engineering practices
- Document design basis for deviations from accepted standards
- Implement procedures to ensure equipment built to obsolete standards is fit for service
- Inspect and test critical equipment IAW standards

RAGAGEP in OSHA's PSM

OSHA's PSM references RAGAGEPs in two elements

- 1910.119(d) Process Safety Information
- 1910.119(j) Mechanical Integrity

RAGAGEP in OSHA's PSM

(d)(3)(i)(F) -The employer shall develop and maintain a compilation of written safety information...information pertaining to the equipment in the process shall include...**design codes and standards** employed.

RAGAGEP in OSHA's PSM

(d)(3)(ii) - The employer shall document that equipment complies with recognized and generally accepted good engineering practices.

- OSHA considered, but rejected, publishing a list of RAGAGEP providers
- The **employer** (not OSHA!) **selects** the applicable and protective RAGAGEP it will use / comply with!

RAGAGEP in OSHA's PSM

(d)(3)(iii) - For existing equipment designed and constructed in accordance with codes, standards, or practices that are no longer in general use, the employer shall determine and document that the equipment is designed, maintained, inspected, tested, and operating in a safe manner

RAGAGEP in OSHA's PSM

(j)(4)(ii) - Inspection and testing practices shall follow recognized and generally accepted good engineering practices.

RAGAGEP in OSHA's PSM

(j)(4)(iii) - The frequency of inspections and tests of process equipment shall be consistent with applicable **manufacturer's recommendations and good engineering practices**, and more frequently if determined to be necessary by prior operating experience.

RAGAGEP in OSHA's PSM

Non-mandatory Appendix C

- Gives examples of organizations producing codes and standards relied on to establish good engineering practice
- Recognizes technical reports from engineering societies for equipment design
- Recognizes the need for specific criteria for inspections,

RAGAGEP in OSHA's PSM

Non-mandatory Appendix C (cont)

- Describes the need for inspections and for taking into account the various mechanisms that can damage piping and equipment
- Highlights the need for procedures and training in conducting inspections and tests to ensure their consistency and effectiveness

RAGAGEP Enforcement Guidance

- Both the Refinery and PSM Covered Chemical Facility National Emphasis Programs (NEPs) incorporated compliance guidance to aid Compliance Officers in assessing conformance to the requirements of the PSM standard
 - Static list questions from the Refinery NEP are available in directive CPL 03-00-010 at:
https://www.osha.gov/OshDoc/Directive_pdf/CPL_03-00-010.pdf

RAGAGEP Enforcement Guidance

- The *Ferson* letter of interpretation (March 23, 2000¹) describes OSHA's position on compliance with 1910.119(d)(3)(i)(F), and states that this part:
 - “requires an employer to document which design codes and standards are used...” for process equipment, and furthermore that
 - 1910.119(d)(3)(ii) requires employers to document that covered equipment complies with RAGAGEP

¹https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATION&p_id=23722

RAGAGEP Enforcement Guidance

- OSHA has recently published (June 5, 2015) new RAGAGEP enforcement policy in the form of a “Regional Administrators” (RA) Memorandum
 - Provides guidance to OSHA field personnel (CSHOs) on enforcement of the RAGAGEP provisions of PSM
 - Addresses issues raised during Refinery and Chem NEP enforcement activities
 - Links available at <http://www.osha.gov/chemicalexecutiveorder/>

RAGAGEP RA Memo Highlights

- Summarizes the key RAGAGEP provisions:
 - (d)(3)(ii) – equipment in PSM processes must be documented as complying with RAGAGEP
 - (j)(4)(ii) - inspections and tests must be performed on process equipment IAW RAGAGEP, and
 - (j)(4)(iii) - inspection and test frequency must follow manufacturer's recommendations and GEP, and more frequently, if indicated by operating experience
 - (d)(3)(iii) – addresses ensuring safety of existing equipment when the codes and standards used in its design and construction are no longer in general use

RAGAGEP RA Memo Highlights

- Describes primary sources of RAGAGEP:
 - Published and widely adopted codes (e.g., NFPA 70, ASME B&PVC)
 - Published consensus documents (e.g., IIAR/ANSI-2, API-570)
 - Published non-consensus documents (e.g., DIERS relief system technology, peer-reviewed technical articles addressing specific hazards not elsewhere addressed)
 - Manufacturers' recommendations (e.g., for inspection intervals)

RAGAGEP RA Memo Highlights

- Describes “appropriate” uses for internal standards in regards to RAGAGEP, as referenced in the preamble to the PSM standard:
 - Providing detailed implementation procedures for published codes and standards
 - Setting requirements for unique processes, equipment, and hazards for which no protective published RAGAGEP exists
 - Supplementing/augmenting published RAGAGEP that only partially or inadequately addresses processes, occupancies, conditions, and hazards
 - Providing more effective hazard control
 - Addressing hazards where codes and standards are outdated or no longer good engineering practice

RAGAGEP RA Memo Highlights

- Addresses “shall” and “should” requirements in RAGAGEP
- Applicable “shall” & “shall not” provisions are mandatory – not complying with requirements is presumed violative
- The hazards addressed by applicable “should” provisions must be controlled!
 - “Should” provisions are preferred, acceptable approaches to hazard control
 - Alternative approaches to “should” provisions must be documented to be at least equally protective
 - Less protective approaches are not “good engineering practices” and are violative

RAGAGEP RA Memo Highlights

- Addresses various enforcement considerations, including:
 - Dealing with multiple applicable RAGAGEP
 - Clarifying that employers need not comply with RAGAGEP not relevant to the hazards of their covered processes
 - Identifying inappropriately applied RAGAGEP
 - Clarifying citing approaches when an employer fails to follow internal RAGAGEP that is more stringent than published codes and standards, but meets published requirements, e.g., citing under (j)(2), (j)(5), or PHA, MOC, or II provisions
 - Potential concerns with “mixing and matching” approaches from multiple RAGAGEP

RAGAGEP RA Memo Highlights

- Enforcement considerations (continued):
 - Guidance on properly forming citations for (d)(3)(ii), (d)(3)(iii), (j)(4)(ii), and (j)(4)(iii) violations
 - Proper documentation of (d)(3)(ii) and (d)(3)(iii) citations
 - Grouping of (d)(3)(ii) and (j)(5) citations
 - Application of retroactive provisions of newer RAGAGEP
 - Addressing updates in hazard identification and control embodied in newer, but non-retroactive RAGAGEP in accordance with (d)(3)(iii) requirements, e.g., through corporate monitoring of updates to published RAGAGEP and/or consideration through facility PHA or MOC processes

OSHA RAGAGEP NEP Citations

1910.119(d)(3)(ii) the most commonly cited PSM sub-element in both the Refinery and Chemical NEPs.

- Control of valves between pressure vessel & relief
- Relief valve back pressure
- Relief valve inlet pressure
- No relief provided
- Reliefs sizing inappropriate
- Valves inaccessible
- Valves not operable
- Facility siting not compliant w/ selected RAGAGEP, or
- Facility structures unprotected against release effects

OSHA RAGAGEP NEP Citations

Other RAGAGEP related Chem NEP citations:

- Safety interlocks not compliant with selected RAGAGEP
- RAGAGEP not documented for a wide range of equipment (e.g., glass lined vessels, piping, rupture discs, chemical hoses, pumps)
- RAGAGEP not documented for ventilation system design
- Ammonia system labeling not compliant w/ RAGAGEP
- Chlorine alarm system design not compliant w/ RAGAGEP
- Corrosion rates not calculated IAW RAGAGEP
- Chlorine shut-off valves IAW RAGAGEP not installed

RAGAGEP & Process Incidents

- Process incidents often involve the failure of multiple barriers / safeguards.
- Engineering and administrative controls frequently are key barriers and safeguards
- The design, operation, and maintenance of barriers and safeguards are frequently based on RAGAGEP
 - E.g., SIS systems designed, built, tested, and maintained IAW ISA 84.00.01, Part 1

Bellwood, IL – June 14, 2006

- Flammable liquids boiled in open-top kettle
- Heavier-than-air vapor traveled to an adjoining room & ignited
- Flash fire and deflagration killed one and injured two
- Processing area not isolated from general use area IAW RAGAGEP, e.g. NFPA 30
- Ventilation system not designed IAW with RAGAGEP, only an overhead pick-up without general ventilation & floor sweeps. No alarms on ventilation failure.



Middleton, MA – March 13, 2011

- Acetone vapors released into a congested workspace caused a deflagration that severely damaged the building
- The ventilation system was not designed IAW with RAGAGEP and allowed flammable vapors to accumulate to hazardous levels

Houston, TX – April 12, 2004

- An employer's modification of a large pressure vessel involved cutting out and later replacing a large coupon in the vessel wall
- The welding did not follow pressure vessel repair RAGAGEP
- The repaired section failed in service, rocketing the vessel into a neighboring building and causing a large product release and fire



Illiopolis, IL – April 23, 2004

- Large release of VCM exploded killing five , injuring three & destroying facility
- One cause was failure to design & maintain safety interlocks in accordance with RAGAGEP
- Critical interlocks were easily bypassed or disabled
- Bypass of interlock led to the release



Conclusions

- RAGAGEP concept allows flexibility and innovation
 - Hundreds of industry codes and standards
 - Appropriate internally produced standards complementing published documents
- PSM requires companies to choose and implement their appropriate and protective RAGAGEP – this is not dictated by OSHA!
- OSHA enforcement often identifies deviation from, or inadequate documentation of, RAGAGEP

Conclusions

- Compliance with RAGAGEP is a core requirement for the design and operation of facilities handling highly hazardous chemicals
 - Establishing RAGAGEP compliance is Process Safety Information needed to perform effective PHAs!
- Industry knowledge of process hazards and of the most effective means to control them continues to advance, and is reflected in new and updated published codes and standards

Conclusions

- Employers should keep abreast of changes to applicable RAGAGEP and consider these in their hazard identification & control efforts, such as PHAs

Any Questions??

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