



OSHA INSTRUCTION

U.S. DEPARTMENT OF LABOR

Occupational Safety and Health Administration

DIRECTIVE NUMBER: CPL 03-00-004

EFFECTIVE DATE: June 7, 2007

SUBJECT: Petroleum Refinery Process Safety Management National Emphasis Program

ABSTRACT

- Purpose:** This Instruction describes policies and procedures for implementing a National Emphasis Program (NEP) to reduce or eliminate the workplace hazards associated with the catastrophic release of highly hazardous chemicals at petroleum refineries.
- Scope:** This instruction applies OSHA-wide.
- References:** See paragraph III.
- State Plan Impact:** State adoption is not required. See paragraph VII.
- Action Offices:** National, Regional, and Area Offices (AOs).
- Originating Office:** Directorate of Enforcement Programs (DEP).
- Contact:** Directorate of Enforcement Programs
200 Constitution Avenue, NW, Room N3107
Washington, DC 20210
Phone: (202) 693-1850

By and Under the Authority of

Edwin G. Foulke, Jr.
Assistant Secretary

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www.riskriskandsafetyinstitute.com
281.684.4569



Executive Summary

This instruction provides guidance to Occupational Safety and Health Administration (OSHA) national, regional, and AOs, and state programs which choose to implement a similar program concerning OSHA's policy and procedures for implementing an NEP to reduce or eliminate workplace hazards associated with the catastrophic release of highly hazardous chemicals at petroleum refineries.



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- I. Purpose** This instruction describes an OSHA National Emphasis Program (NEP) for inspecting petroleum refineries (refineries) included in Standard Industrial Classification 2911 [North American Industrial Classification System (NAICS) 324110] and contains policies and procedures to verify employers' compliance with OSHA's Process Safety Management (PSM) of Highly Hazardous Chemicals standard, 29 CFR 1910.119.
- II. Scope.** This instruction applies OSHA-wide.
- III. References.** The following section refers to documents and websites which are included in this instruction.

For additional references to documents used for process safety in the refining and chemical industries, see OSHA's [PSM Safety and Health Topics website](#). This website provides references for equipment design and in-service practices (e.g., inspection, testing, preventative and predictive maintenance, repair, alteration, rerating and fitness-for-service evaluations) and other important aspects of process safety including process hazard analysis, human factors, facility siting, fire protection, mechanical integrity, procedures, management-of-change, etc.

1. [Federal Register, Volume 57, Number 36](#), pages 6355 to 6417, (including [Preamble](#)) February 24, 1992, Final Rule, *Process Safety Management (PSM) of Highly Hazardous Chemical; Explosives and Blasting Agents* standard; 29 CFR 1910.119.
2. [CPL 02-02-045 – \(formerly CPL 2-2.45A CH-1\) - Process Safety Management of Highly Hazardous Chemicals -- Compliance Guidelines and Enforcement Procedures, September 13, 1994](#)
3. [29 CFR 1910.106, Flammable and Combustible Liquids](#)
4. [29 CFR 1910.146, Permit-Required Confined Spaces](#)
5. [29 CFR 1910.147, The Control of Hazardous Energy \(Lockout/Tagout\)](#)
6. 29 CFR 1910, Subpart I, [Personnel Protective Equipment](#)
7. [29 CFR 1910.307, Hazardous \(Classified\) Locations](#)
8. [OSHA Instruction CPL 02-00-103 \(CPL 2.103\), Field Inspection Reference Manual \(FIRM\)](#), September 26, 1994
9. [CPL 02-00-140 - Complaint Policies and Procedures](#), June 23, 2006
10. [OSHA Instruction ADM 03-01-005 OSHA Compliance Records](#), August 3, 1998
11. [CPL 02-00-025 - CPL 2.25l - Scheduling System for Programmed Inspections](#), January 4, 1995



12. [Petroleum Refining Processes, OSHA Technical Manual, Section IV: Chapter 2](#)
13. [OSHA Instruction CPL 02-01-037 \(CPL 2-1.037\), Compliance Policy for Emergency Action Plans and Fire Prevention Plans](#), July 9, 2002
14. [OSHA Notice 07-03 \(CPL 02\) - Site-Specific Targeting 2007 \(SST-07\)](#), June 12, 2006
15. [OSHA Instruction CPL 02-00-137 - Fatality/Catastrophe Investigation Procedures](#), April 14, 2005
16. [OSHA Instruction CPL 02-00-094 \(CPL 2.94\), OSHA Response to Significant Events of Potentially Catastrophic Consequences](#), July 22, 1991
17. OSHA [PSM Safety and Health Topics website](#)
18. OSHA [Refinery Location List DEP Intranet website](#)
19. *Accidental Release Prevention Requirements - Risk Management Programs Under the Clean Air Act*, U.S. Environmental Protection Agency's (EPA) standard, [40 CFR 68](#)
20. *API 510 – Pressure Vessel Inspection Code: Maintenance Inspection, Rating, Repair and Alteration*; 8th ed., Addendum 1 - 12/98, Addendum 2 - 12/2000, Addendum 3 - 12/2001; and Addendum 4 – 8/2003; American Petroleum Institute (API)
21. *API 570 - Piping Inspection Code*, American Petroleum Institute, 2nd ed., 10/98, Addendum 1 - 2/2000, Addendum 2 - 12/01, Addendum 3 - 8/2003; API
22. *API Recommended Practice (RP) 572 – Inspection of Pressure Vessels*, 2nd Ed., 2001, API
23. *API RP 574 – Inspection Practices for Piping System Components*, 2nd Ed., 1998, API
24. *API/(ANSI) Standard (STD) 521 – Pressure-Relieving and Depressuring Systems*, 5th Ed., 2007, API
25. *API RP 576 - Inspection of Pressure Relieving Devices*, 2nd Ed., 2000, API
26. *API RP 578, Material Verification Program for New and Existing Alloy Piping Systems*, 1st Ed., 1998, API
27. *API RP 752, Management of Hazards Associated with Location of Process Plant Buildings*, 2nd Ed., 2003, API
28. *API RP 579, Fitness-for-Service*, 2000, API
29. *API Publication 770, A Manager's Guide to Reducing Human Errors, Improving Human*



Performance in the Process Industries, 2001, API

30. *ASME Boiler and Pressure Vessel Code*, ASME
31. *ASME B31.3 – Process Piping*; ASME
32. *Guidelines for Writing Effective Operating and Maintenance Procedures*, CCPS
33. *Guidelines for Mechanical Integrity Systems*, CCPS
34. *Guidelines for Engineering Design for Process Safety*, CCPS
35. *Guidelines for Process Safety Documentation*, CCPS
36. *Guidelines for Auditing Process Safety Management Systems*, CCPS
37. *Guidelines for Facility Siting and Layout*, CCPS
38. *Guidelines for Evaluating Process Plant Buildings for External Fires and Explosions*, CCPS
39. *Safe Design and Operation of Process Vents and Emission Control*, CCPS
40. *Plant Guidelines for Technical Management of Chemical Process Safety*, CCPS
41. *Guidelines for Investigating Chemical Process Incidents, 2nd Ed.*, CCPS
42. *NFPA 25 - Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, NFPA
43. *Dow's Fire & Explosion Index Hazard Classification Guide, 7th Ed.*, AIChE
44. *Chemical Engineer's Condensed Encyclopedia of Process Equipment, 2nd Ed., 2004*, N.P. Chermisionoff
45. *Atmospheric Relief*, PowerPoint presentation, Bill Banick, ExxonMobil, October 24-25, 2006, 9th Annual Symposium, Mary Kay O'Connor Process Safety Center, Texas A&M University, College Station, Texas
46. [*Safety Bulletin – Positive Material Verification: Prevent Errors During Alloy Steel Systems Maintenance, BP Texas City, TX Refinery Fire*](#), October, 2006, U.S. Chemical Safety and Hazard Information Board (CSB)
47. *Accident Investigations – A New Approach*, 1983, National Safety Council

IV. Expiration. This Instruction is in effect until further notice.



- V. **Action.** OSHA Regional Administrators and Area Directors (AD) must ensure that the policies and procedures set forth in this directive are followed.
- VI. **Application.** OSHA compliance personnel shall ensure that the procedures contained in this directive are followed when inspecting the refineries selected under this NEP.
- VII. **Federal Program Change.** This instruction describes a Federal program change which establishes a National Emphasis Program (NEP) for inspecting petroleum refineries (SIC 2911/NAICS 324110) to assure compliance with the Process Safety Management of Highly Hazardous Chemicals (PSM) standard, 29 CFR 1910.119. **Participation in this national emphasis effort by those States that have refineries within their jurisdiction is strongly encouraged, but is not required.** State response/notice of intent regarding this directive is required.

The State's response/notice of intent must indicate whether the State will initiate an emphasis program and if so, whether the State's program will be identical to or different from the Federal. If the State's program differs from the Federal, its implementing policies and procedures are expected to be at least as effective as those in this instruction and must be available for review. The State may either post its different Emphasis Program on its State plan website and provide the link to OSHA or provide information on how a copy may be obtained. (OSHA will provide summary information on the State responses to this instruction on its website.)

The assignment of appropriate IMIS identifier codes for State Emphasis Programs should be coordinated with the Directorate of Information Technology and the Regional Administrator.

- VIII. **Background.** OSHA is initiating this NEP to address catastrophic releases of *highly hazardous chemicals* (HHC) at refineries. The large number of fatal or catastrophic incidents in the petroleum refining industry indicates the need for a national emphasis program.

Since the PSM standard was promulgated by OSHA in 1992, no other industry sector has had as many fatal or catastrophic incidents related to the release of HHC as the petroleum refining industry (SIC 2911 (NAICS 32411)). According to OSHA's IMIS database, since May 1992, 36 fatality/catastrophe (FAT/CAT) incidents related to HHC releases in the refining industry have occurred. These incidents included 52 employee deaths and 250 employee injuries, 98 of these injuries required hospitalization. The number of refinery FAT/CAT incidents surpasses the combined total of the next three highest industries over the same period (SIC 2899 Chemical Manufacturing, Not Elsewhere Classified (NEC) – 12 FAT/CATs; SIC 2869 Industrial Organic Chemical Manufacturing, NEC – 12 FAT/CATs; and SIC 2892 Explosive Manufacturing – 11 FAT/CATs).

Recent FAT/CAT incidents involving HHC releases at refineries include the massive explosion and fire at the BP America Refinery in Texas City, TX on March 23, 2005. During an isomerization unit startup at the refinery, a splitter tower was grossly overfilled



with liquid hydrocarbons until the overpressure protection system released the hydrocarbons to a Blowdown drum and stack (Blowdown system). The relieving hydrocarbons then quickly over-filled the Blowdown system and caused the Blowdown stack to expel heavier-than-air hydrocarbon liquids and vapors into the atmosphere, resulting in the formation of an unconfined vapor cloud in and around the isomerization unit. The vapor cloud then ignited. **The ensuing explosions and fires killed 15 employees and injured another 170.** Placing non-essential employees in trailers too close to the isomerization unit substantially increased the incident's severity.

On January 19, 2005, another refinery incident killed one employee and caused multiple injuries to other employees at the Kern Oil Refinery in Bakersfield, California. At the time of the incident employees were starting-up the refinery's crude unit and were isolating and cleaning a series of three prefractionator reboiler pumps. While using a pressurized steam line to clean the body of one of the pumps, workers overpressurized the pump casing which then catastrophically ruptured, releasing and igniting hot oil that immediately exploded.

At the Giant Industries Ciniza Refinery near Gallup, New Mexico, on April 8, 2004, six employees were injured, with 4 of these employees being hospitalized with serious burn injuries when gasoline components were released and ignited. Maintenance workers were removing a malfunctioning pump from the refinery's hydrofluoric acid (HF) alkylation unit when the release occurred. A shut-off valve connecting the pump to a distillation column was to be closed during the maintenance activity. This valve, however, was apparently left in an open position, leading to the release of flammable liquids and vapors which caused subsequent explosions.

IX. Definitions and Acronyms. The following section contains definitions and acronyms used in this Instruction.

A. Definitions.

1. **Acceptable limits** mean the technical basis as defined and used to determine whether equipment is deficient. [Adapted from Ref. 33]
2. **Blowdown (s)** – refers to a piece of disposal equipment in a pressure-relieving system whose construction consists of a drum to collect liquids that are separated (“knockout”) from vapors and a vent stack, which is an elevated vertical termination discharging vapors into the atmosphere without combustion or conversion of the relieved fluid. Blowdown(s) are separate vessels intended to receive episodic (*e.g.*, when deinventorying a vessel for a planned shutdown) or emergency discharges. Blowdown(s) are designed to collect liquids and to dispose of vapors safely. In the refinery industry, hydrocarbons typically enter Blowdown(s) as liquids, vapors, or vapors entrained with liquids. Blowdown(s) typically include quench fluid systems which reduce the temperature of hot, condensable hydrocarbons entering the Blowdown as well as the amount of vapor released via the vent stack. These systems can include internal baffles to

help disengage liquids from hydrocarbon vapors. Sometimes, Blowdown(s) include inert gas or steam systems to control flashback hazards and to snuff vent stack fires if ignited by sources such as lightning. (See, e.g., API RP 521, CCPS [Ref. 40], Chermisionoff [Ref. 44], Bannick, ExxonMobil [Ref. 45])

3. **Deficient** (as per 1910.119(j)(5)) means a condition(s) in equipment/system outside of acceptable PSI limits.

Compliance Guidance: *Examples of equipment/system deficiencies include condition(s) such as:*

- 1) *equipment or systems that are not designed, fabricated, constructed or installed per Recognized and Generally Accepted Good Engineering Practices (RAGAGEP). E.g., deficiencies that do not meet RAGAGEP include the design pressure drop at the inlet of a relief device that exceeds limits specified in RAGAGEP such as the BPVC and API 521);*
- 2) *mechanical defects which interfere with the equipment/system capability to operate/function as intended, (e.g., a video camera monitoring the status of the flame at the flare fails due to some component malfunction, or a level transmitter does not function as intended);*
- 3) *a degradation in the equipment/system exceeding the equipment's acceptable limits (e.g., operating a pressure vessel, tank or piping with a wall thickness less than its retirement thickness;*
- 4) *equipment operated outside its normal operating limits (e.g., operating a pressure vessel above its pressure and temperature limits, exceeding the vibration limits of a pump, operating equipment with an associated alarm being suppressed/disabled on the control board, or the continued use of non-calibrated instrumentation which does not meet functional performance criteria);*
- 5) *equipment/system leaks;*
- 6) *Equipment by-passed to allow for continued operations, including both process equipment such as vessels, piping and valves, and process controls, such as "jumpered" instrumentation and computer controls.*

If an employer's PS does not list acceptable limits, or if an employer's PSI for equipment/systems does not state when its equipment/systems are deficient, then employers are required to comply with 29 CFR 1910.119(j)(5) by correcting deficiencies in equipment/systems which are

outside RAGAGEP limits. Additionally, equipment/systems conditions are outside acceptable limits when their functional capabilities are hampered (e.g., when the equipment/system is not functioning properly due to some mechanical component failure).

Compliance Guidance: CCPS [Ref. 33], Table 8-1, Acceptance Criteria Resources, Table 8-2, Examples of Acceptance Criteria for Common Types of Equipment, and Chapter 9 contain lists of RAGAGEP applicable to common types of process equipment. These tables and lists provide information on acceptable limits as per 1910.119(j)(5) and acceptance criteria (as defined by Ref. 32).

4. **Facility Siting** - With respect to existing plants, "siting" does not refer to the site of the plant in relation to the surrounding community. It refers, rather, to the location of various components within the establishment. (From [CPL 02-02-045](#), Appendix B).

Compliance Guidance: Examples of "the location of various components within the establishment" with respect to facility siting include, but are not limited to:

- 1) *Permanent and temporary employee-occupied buildings, including trailers, that expose employees by virtue of their location, to potential hazards such as fires, explosions, overpressures, exposure to toxic or corrosive materials, or that risk being damaged by other process equipment (e.g., toppling of equipment on to occupied structures), etc.;*
- 2) *Cooling towers;*
- 3) *Flares and other vents to the atmosphere such as Blowdown (s) and relief devices;*
- 4) *Emergency access (e.g., whether trucks or railcars block emergency access to a unit during an emergency);*
- 5) *Piperacks, (e.g., high volume/pressure flammable/combustible material pumps located under piperacks such that a seal failure might cause a large fire and domino-effect release(s) from the overhead piperack;*
- 6) *Emergency response facilities;*
- 7) *Fire Pumps;*
- 8) *Emergency isolation valves; and/or*
- 9) *Others. See CCPS [Ref. 38], Chapters 5 & 6 for other examples of*

items related to facility siting ("location of various components within the establishment").

5. **Human error** means any human action (or lack thereof) that exceeds some limit of acceptability (*i.e.*, an out-of-tolerance action) where the limits of human performance are defined by the system. (See, *e.g.*, API Publication 770).
6. **Human Factors** mean disciplines concerned with designing machines, operations and work environments so that they match human capabilities, limitations and needs. Among human factors specialists, this general term includes any technical work (engineering, procedure writing, worker training, worker selection, etc.) related to the human factor in the operator-machine systems (See, *e.g.*, API Publication 770).
7. **Process Hazard Analysis (PHA)** for this Instruction includes the original PHA, all PHA updates/"redos," and PHA revalidations as required by 1910.119(e).

Compliance Guidance: In this Instruction if an issue is specific only to the original PHA, PHA update(s), or PHA revalidation(s), it is identified as such.

8. **"Recognized And Generally Accepted Good Engineering Practice"** (RAGAGEP) – are engineering, operation, or maintenance activities based on established codes, standards, published technical reports or recommended practices (RP) or a similar document. RAGAGEPs detail generally approved ways to perform specific engineering, inspection or mechanical integrity activities, such as fabricating a vessel, inspecting a storage tank, or servicing a relief valve (See CCPS [Ref. 33]).
9. **Refinery or Refineries** means petroleum refineries in SIC 2911 (NAICS 32411).
10. **Selected Unit(s)** - PSM-covered process(es) that an inspection team leader selects to verify compliance with OSHA requirements--primarily the PSM standard. Section X.E.7 of this Instruction describes the process of selecting the covered process/unit.
11. **Throughput** means the rate of production/volume of a defined process (*e.g.*, the entire refinery or a unit/process) over a stated period of time. For example, the refinery's throughput is 200,000 barrels per day or the Fluid Catalytic Cracking Unit's throughput is 80,000 barrels per day.

B. Acronyms

1. AIChE – American Institute of Chemical Engineers



2. ANSI – American National Standards Institute
3. AAD – Assistant Area Director (OSHA)
4. AD – Area Director (OSHA)
5. AO – Area Office (OSHA)
6. API – American Petroleum Institute
7. ASME – American Society of Mechanical Engineers
8. BPVC – ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 (unless a different Section or Division is specified)
9. CSB - U.S. Chemical Safety and Hazard Information Board
10. CSHO – Compliance Safety and Health Officer
11. DEP – Directorate of Enforcement Programs (OSHA National Office)
12. EOP – Emergency Operating Procedure
13. EPA - U.S. Environmental Protection Agency
14. ESP – Emergency Shutdown Procedure
15. FIRM – Field Inspection Reference Manual
16. HAZWOPER – Hazardous Waste Operation and Emergency Response
17. IPI – Inspection Priority Items
18. ISA - The Instrumentation, Systems, and Automation Society
19. LFL – Lower Flammable Limit
20. MI – Mechanical Integrity
21. MOC - Management of Change
22. NAICS – North American Industrial Classification System
23. NEP – National Emphasis Program
24. NO – National Office (OSHA)



25. NOP – Normal Operating Procedure
26. PHA - Process Hazard Analysis
27. PSI – Process Safety Information
28. PSSR – Pre-Startup Safety Review
29. RA – Regional Administrator (OSHA)
30. RAGAGEP – Recognized and Generally Accepted Good Engineering Practices
31. RIK – Replacement-In-Kind
32. RMP – Risk Management Program (U.S. EPA)
33. RO – Regional Office (OSHA)
34. SIC – Standard Industrial Classification
35. TML – thickness measurement locations

X. Program Procedures.

A. Site Selection.

1. Targeting Sources. Inspections conducted under this NEP will be conducted at all refineries within the scope of this Instruction. These inspections will focus on PSM-covered processes at refineries. Each Area Office (AO), in conjunction with the Regional Office (RO), shall develop a master list of establishments to be inspected within that AO jurisdiction in accordance with OSHA Instruction CPL 02-00-025.
 - a. Refinery Identification. Each AO or RO shall prepare a master list of refineries from those listed in the found on OSHA's DEP Intranet website. This list represents the locations of refineries which have self-reported to Environmental Protection Agency (EPA) under their Risk Management Program (RMP) reporting requirements. Refineries (SIC 2911) that are not included in this list, but are known by the AO or RO, based on local knowledge, to exist in their jurisdictions shall be added to the master list.
 - b. Master List Generation: Once the refineries have been identified, the master list of establishments will be generated.



- c. Deletions. Based on their familiarity with local refineries, ROs and AOs shall delete from the master list:
 - i. Any refineries that are known to be out of business, documenting the basis for such determinations;
 - ii. Any refinery establishment which is an approved participant in OSHA's Voluntary Protection Programs (VPP), or in OSHA Consultation's Safety and Health Achievement Recognition Program (SHARP); or
 - iii. Any refinery establishment that has already received an inspection under this NEP.

2. Inspection Scheduling.

- a. Inspections conducted under this NEP shall be scheduled in accordance with the following priorities. Each RO and AO shall prepare a master list of refineries within their respective jurisdictions. The AO will randomly select inspection sites from the master list and any new sites added to the list using the criteria noted in Section A(1)(a) above.
- b. The RO/AO must maintain the Master list of refineries for three years after completion of all the inspections conducted under this NEP. (See OSHA Instruction [ADM 03-01-005](#) OSHA Compliance Records.)
- c. **Inspections conducted under this NEP will be scheduled over a two-year period. Regions are to schedule 40 percent of the inspections conducted under this NEP in the first year and 60 percent in the second year.** Regions have the option and are encouraged to complete the scheduled NEP inspections before the second year ends.

Note: Fewer inspections are scheduled in the first year than the second year so that Regions can have more time to train additional Level 1 and Level 2, "PSM inspectors" to be available when most inspections must be conducted.

Regions finishing their inspections under this NEP may share inspection resources to help complete all the inspections this NEP requires.

B. SST and Unprogrammed Inspections.

- 1. **SST Inspections.** Some establishments selected for inspection under this NEP may also be selected under the current Site-Specific Targeting (SST) Plan. This NEP, based on hazards related to catastrophic HHC releases at refineries, shall be carried out



concurrently with the SST Plan. Therefore, if an establishment is to be inspected both under the SST Plan and this instruction, these inspections shall be conducted at the same time. Refer to [07-03 \(CPL 02\) - Site-Specific Targeting 2007](#) (SST-07) or the SST CPL which is in effect at the time of the inspection. The comprehensive safety inspection will not follow the Program-Quality-Verification (PQV) inspections guidelines as defined by OSHA Instruction [CPL 02-02-045](#).

2. **Unprogrammed Inspections.** In all unprogrammed inspection activities relating to refineries and the PSM standards, determinations whether to conduct such an inspection shall be made according to the following:
 - a. Complaint or referral. If a formal complaint or referral is received relating to a refinery:
 - i. and involves the PSM standard, the AD shall evaluate the complaint or referral item(s) in the usual manner ([\[CPL 02-00-140\] - Complaint Policies and Procedures](#)) and conduct an NEP inspection if the AD also determines: that the facility is in SIC 2911; has not already been inspected pursuant to this Instruction; and necessary resources are available. Otherwise, the NEP inspection at this refinery would be conducted pursuant to the schedule as described in Section A(2) above; or
 - ii. if the PSM standard is not involved, the inspection or inquiry (as appropriate) will normally be limited to the complaint and referral item(s)/subject(s) only. However, if the AD determines that the facility is in SIC 2911 and has not already been inspected pursuant this Instruction, a concurrent inspection under this NEP instruction may be conducted at the AD's discretion. Otherwise, the NEP inspection at this refinery would be conducted pursuant to the schedule as described in Section A(2) above.
 - b. Refinery Accidents and Catastrophes. Responses to refinery accidents and catastrophes shall follow the guidelines contained in CPL 02-00-137 - *Fatality/Catastrophe Investigation Procedures* and, where appropriate, in OSHA Instruction [CPL 02-00-094](#), *OSHA Response to Significant Events of Potentially Catastrophic Consequence* in addition to this Instruction's guidelines.

With respect to refinery accidents or catastrophes, if an incident:

- i. involves the PSM standard, the accident shall be investigated and an NEP inspection conducted if the AD determines that the facility is in SIC 2911, has not already been inspected pursuant this Instruction, and necessary resources are available. Otherwise, the NEP inspection at this refinery would be conducted pursuant to the schedule as described in Section A(2) above; or
- ii. if the PSM standard is not involved, the inspection will normally be limited to the accident investigation item(s)/subject(s) alone. However, if the AD determines that the facility is in SIC 2911 and has not already been inspected pursuant this Instruction, a concurrent inspection under this NEP instruction may be conducted at the AD's discretion. Otherwise, the NEP inspection at this refinery would be conducted pursuant to the schedule as described in Section A.2., above.

C. Inspection Resources.

Inspections under this NEP will normally be conducted by a team. **Each NEP inspection team will include at least one Team Leader and one Level 1 Team Member as described below.** *Note: The Team Leader and Level 1 Team Member can be the same individual.* Appropriate levels of staff experience, training and preparation are essential for compliance activities relating to the PSM standard.

1. Refinery NEP Inspection Team Leaders. Inspection Team Leaders under this Instruction shall be any OSHA individual (*i.e.*, AD, AAD, Regional Managers, CSHOs, etc.) the AO AD selects. If the AD selects an individual from an OSHA RO, the AD will do so in consultation with the RA.
 - a. Team leaders must have prior experience with chemical industry safety. This experience should include experience obtained from:
 - i. accident investigations in chemical, petrochemical or refinery plants involving fires, explosions and/or toxic chemical releases; or
 - ii. previous chemical inspections involving process safety management evaluations; or
 - iii. previous chemical industry employment; or

- iv. experience leading OSHA teams on large inspections.
 - b. All OSHA personnel who will serve as team leaders must have attended OTI Course 3410, *Advanced Process Safety Management* to receive training specific to leading team inspections under this instruction.
2. Refinery NEP Inspection Team Members ("Level 1. Only trained OSHA personnel (*i.e.*, AD, AAD, Regional Managers, CSHOs, etc.) with experience in the chemical processing or refining industries shall be assigned to NEP inspections as Level 1 Team Members under this Instruction.
- a. As a minimum, Level 1 training must include the OSHA Training Institute's (OTI) Course 3300, *Safety and Health in the Chemical Processing Industries*, and Course 3400, *Hazard Analysis in the Chemical Processing Industries*. Additionally, Level 1 Team Members should have additional advanced training such as OTI Course 3410, *Advanced Process Safety Management* or other equivalent specialized seminars in process safety management.
- NOTE: Due to a significant change in course content, completion of Course 330 prior to Fiscal Year 1991 does not meet this requirement for inspection team leaders for this Instruction.*
- b. Level 1 Team Members must also have prior experience with chemical industry safety. This experience should include experience obtained from:
 - i. accident investigations in chemical, petrochemical or refinery plants involving fires, explosions and/or toxic chemical releases; or
 - ii. previous chemical inspections involving process safety management evaluations; or
 - iii. previous chemical industry employment.
3. Refinery NEP Inspection Team Members ("Level 2"). CSHOs may be assigned as inspection team members under this instruction if:
- a. they have two years of OSHA inspection experience or the equivalent; and
 - b. they have completed OTI Course 3300, "*Safety and Health in the Chemical Processing Industries*" (including offerings of this course prior to Fiscal Year 1991) and OTI Course 3400, "*Hazard*



Analysis in the Chemical Processing Industries."

4. CSHOs with Less Training ("Level 3. CSHOs who do not have the training and experience described at C.1., C.2., or C.3. above, may be assigned to an inspection team under this Instruction, in the following circumstances:
 - a. Level 3 CSHOs must be under the direction of a Level 1 or Level 2 CSHO while participating on an inspection team under this Instruction.
 - b. Level 3 CSHOs experienced in evaluating other programmatic standards such as hazard communication, lockout/tagout, confined space entry, and respiratory protection programs may evaluate programmatic sections of the PSM standard.
 - i. The following elements of 29 CFR 1910.119 may be appropriately evaluated by Level 3 CSHOs:
 - a. (c) Employee participation
 - b. (g) Training.
 - c. (h) Contractors.
 - d. (k) Hot work permits.
 - e. (m) Incident investigation.
 - f. (n) Emergency planning and response.
5. Utilization of Other OSHA Technical and Enforcement Resources. Inspection team members will fully utilize RO and NO (DEP and DSTM) technical and enforcement support resources when making decisions regarding compliance or noncompliance.
6. AD Assignment of Resources. To the extent resources allow, ADs shall use CSHOs with experience and training in the chemical industry to perform inspections under this Instruction.
7. Industry Reference Material Availability. To support inspections under this NEP, each RO must have industry reference documents available for CSHOs to use as resources to support enforcement activities during the inspection. Normally, the RO librarian provides these documents. However, AO jurisdictions conducting a larger number of inspections under this Instruction and other PSM inspections, should have these industry reference documents in their own libraries.

At a minimum, each RO must have the following documents listed in Section III, *References* of this Instruction available for CSHOs:

API 510 – Pressure Vessel Inspection Code: Maintenance Inspection,



Rating, Repair and Alteration;

API 570/(ANSI) - Piping Inspection Code

Guidelines for Mechanical Integrity Systems, CCPS

Guidelines for Engineering Design for Process Safety, CCPS

Additionally, ROs should consult with their Regional PSM Coordinators to identify other industry documents that would assist in inspections under this Instruction. See Section III, *References* in this instruction and OSHA's [PSM Safety and Health Topics website](#) for a list of other documents which could be used as resources for conducting inspections under this NEP.

8. OSHA Technical Manual Chapter on Refinery Operations. The OSHA Technical Manual includes a chapter, [Petroleum Refining Processes](#). This chapter includes information on the characteristics of crude oil, hydrocarbon types and chemistry, and major refinery products and by-products. It presents information on technology normally practiced in present operations, and describes the more common refinery processes and relevant safety and health information.

A presentation related to the above chapter on petroleum refining processes is found on the [OSHA DEP intranet website](#).

D. Inspection Process.

1. NEP Inspection Process Different Than PSM CPL PQV Process. This refinery NEP differs from the program-quality-verification (PQV) approach in PSM [CPL 02-02-045](#). The PQV approach employs a broad, open-ended inspection strategy and uses a more global approach to identify compliance deficiencies. In contrast, this NEP provides CSHOs with a tool to evaluate for compliance with the standard. This tool identifies a particular set of requirements from the PSM standard from which CSHOs are to review documents, interview employees, and verify implementation for specific processes, equipment, and procedures.

Due to their broad, open-ended approach, PQV inspections have proven to be highly resource-intensive. **This NEP is designed to facilitate inspections at all refineries within the scope of this Instruction. In contrast to the PQV approach, this NEP addresses a number of priority items which CSHOs are to evaluate for compliance. Based on the employer's compliance with inspection priority items contained in this Instruction, the inspection may be expanded to other processes/units at the refinery as per Section X.D.4.**

2. Emphasis on Implementation Over Documentation. Based on past OSHA inspection history at refineries and large chemical plants, OSHA has

typically found that these employers have extensive written documentation related to process safety management, but **the implementation of the written documentation has been inadequate. Therefore, CSHOs should focus on the implementation of the various PSM elements and ensure that employers do what they have committed to do in their PSM documentation.**

3. Two Step NEP Inspection Process. **The inspection process under this NEP includes a two-step approach:**

- a. Step 1 (Static List Based Evaluation): CSHOs shall conduct a PSM compliance review based on a static list of inspection priority items (IPI) in the PSM-covered process that was chosen as the Selected Unit(s) to be evaluated (See X.E.7). CSHOs must use Mandatory Appendix A to evaluate compliance with various PSM elements. Appendix A contains a series of questions related to various aspects of process safety at refineries, such as equipment, engineering and administrative controls, safe work practices and RAGAGEP in covered process. The answers to these questions will be the basis for determining whether the employer is in compliance with various PSM requirements.
- b. Step 2 (Dynamic List Based Evaluation): CSHOs shall conduct a PSM compliance review based on a dynamic list of inspection priority items (IPI) in the PSM-covered process that was chosen as the Selected Unit(s) to be evaluated (See X.E.7). **This step of the NEP is mandatory.**
 - i. OSHA's DEP will develop a Dynamic Master IPI List. This master list will be used to select the IPI that CSHOs will use for their PSM evaluations.
 - ii. On a periodic basis (*e.g.*, every 2 to 4 weeks), DEP will select a number of IPI from the dynamic master list which will be used to develop a dynamic list of primary and secondary IPI.
 - iii. The Primary and Secondary PSM IPI Lists are posted on OSHA's DEP/PSM intranet website. The inspection strategy conducted under this NEP is different from the open-ended comprehensive PQV approach under PSM CPL 02-02-045. Using the inspection strategy in this Instruction as compared to the PQV approach will result in more inspections with potentially fewer violations. Therefore, for inspection integrity purposes **OSHA will not publicly disclose the Dynamic Master IPI List or the Primary (Primary List) and Secondary (Secondary List) PSM IPI**

Lists that CSHOs will utilize during their inspections. The dynamic IPI will only be posted to the intranet website listed above.

- iv. CSHOs must download and use the Primary List and Secondary Lists which are listed as “*Effective*” at the time of the opening conference. For inspection preparation purposes, DEP will post the Primary List and Secondary List about 7 days before they become effective.

Example: The most recent Primary List and Secondary List posted on the DEP intranet site display “*Effective Date(s)*” of August 1st and August 17th. The inspection opening date is August 15th. In this case, CSHOs need to use the August 1st, Primary and Secondary Lists for their inspection because the opening date of the inspection is before the “*Effective Date*” of the August 17th list.

Note: CSHOs that cannot download the dynamic Primary List and Secondary List, should contact OSHA’s Office of General Industry Enforcement.

- v. CSHOs must evaluate compliance with each item on the Primary List.
- vi. If one or more of the items on the Primary List is found not to be applicable to the Selected Unit(s), IPI from the Secondary List will be used to replace those IPI from the Primary List which were inapplicable. Replacement IPI from the Secondary List will be chosen from the Secondary List in numerical order, *i.e.*, first item, second item, etc.

Example: The Primary List has 15 inspection items. After review, a CSHO finds Items #3, #5 and #12 on the Primary List are not applicable to the process being evaluated. Using the Secondary List, the CSHO would replace the non-applicable items on the Primary List with Items #1, #2, and #3 from the Secondary List.

- 4. Expanding the Inspection. **If during the compliance evaluation it is determined that a number of deficiencies exist in the employer’s PSM compliance, the inspection may be expanded to other Selected Unit(s).** See Section E.8.c, below.
- 5. Inspect Both Host and Contract Employers. CSHOs must inspect both the host employer and contract employers.



E. Inspection Procedures.

1. Supplemented FIRM Procedures. The procedures given in OSHA Instruction [CPL 02-00-103](#), *Field Inspection Reference Manual*, Chapter 2, shall be followed except as modified in the following sections.
2. Opening Conference. Where appropriate, the facility safety and health director, Process Safety Manager, or other person capable of explaining the company's Process Safety Management Program shall be included in the opening conference. The opening conference must also include the following:
 - a. Verify SIC/NAICS Code. At the opening conference, verify that the establishment's SIC/ (NAICS) code is 2911/ (32411) to confirm that the workplace is a refinery within the scope of this Instruction.
 - b. During the opening conference, CSHOs shall familiarize themselves with the establishment's emergency response procedures and emergency alarms.
 - c. CSHOs shall also request that the management representative(s) provide them with an overview of the processes/units at the refinery, including block flow and/or process flow diagrams indicating chemicals and processes involved.
 - d. To understand the basics of the employer's processes and the possible catastrophic scenarios which could occur, the team should question the management representative(s) about what catastrophic release scenarios might occur at various stages of the involved processes, what those results could be (worst case scenarios), and what controls are in place to prevent them from happening. This will assist the team when they later identify the Selected Unit(s) (See Section X.E.7) for inspection and when they ascertain whether the company's PSM program includes adequate controls.
3. Documentation to be Requested -- General and Process Related. During the opening conference, the CSHO shall request access to the documents listed below. Initially, to expedite the inspection process, only access to documents should be requested. During the inspection, to evaluate compliance with standards, the written documentation described below shall be requested to be provided by the employer, as appropriate, to substantiate citations.

Compliance Guidance: The lists of requests below specify many types of documents and employees to interview (e.g., randomly select five operators' training records to review). These lists are not intended to limit the type and number of documents to request or the number of employees



to interview. The number and type of documents to request and the number of employees to interview is at the discretion of the OSHA inspection team.

Many of the requests require the employer to provide a list of information. The intent of first requesting a list versus requesting a complete set of information on some aspect of the establishment is to limit the amount of documents that the employer would be required to produce. For example, one request is to produce a list of the pressure vessels in the Selected Unit(s). Instead of requesting the entire history file for each of the pressure vessels in a unit, CSHOs will use the list provided by the employer to randomly select a specific number of pressure vessels to review for compliance evaluation purposes.

Documents to request:

Compliance Guidance: The following document request represents documents that are typically compiled by refinery employers. While many of the documents listed below are required by the PSM standard to be maintained by the employer, some are not. Therefore, the documents requested below, may or may not be in the employer's possession. Those documents specifically required by an OSHA regulation to be kept by the employer are identified ().*

- a. All contract employee injury and illness logs compiled since May 26, 1992 as required by 1910.119(h)(2)(vi).*
- b. A list of all PSM-covered processes/units in the refinery complex.
- c. A list of all units and the maximum intended inventories* of all chemicals (in pounds) in each of the listed units.

Compliance Guidance: 1910.119(d)(2)(i)(C) requires the employer to have process safety information (PSI) for the maximum intended inventories of the chemicals which are part of their PSM-covered processes.

- d. A summary description of the refinery PSM program.
- e. Employer's written plan-of-action* regarding the implementation of employee participation.
- f. Flow diagrams*, piping and instrumentation diagrams (P&IDs)*, including P&ID legends*, plot plans*, electrical classification* diagrams, process narrative descriptions*, and original design basis of the process*/equipment* for the Selected Unit(s) (see X.E.7.).

- g. Document(s) or a listing showing the original throughput of the refinery complex and for the Selected Unit(s). Also, inspection teams should request a listing of any throughput changes* and when the change was implemented in the Selected Unit(s).
- h. The initial process hazard analysis* (PHA) and the most recent update/ “redo,”* or revalidation* for the Selected Unit(s); this includes PHA reports*, PHA worksheets*, actions to address findings and recommendations promptly*, written schedules for actions to be completed*, and documentation of resolutions of findings and recommendations*.

Compliance Guidance: Any PHA performed after May 25, 1987 which meets the requirements of 1910.119(e) may be claimed by the employer as the initial PHA for compliance purposes, see 1910.119(e)(1)(v).

- i. All PHA findings and recommendations* and the excerpted information related to previous incidents which were identified in other PHAs not included in request E.3.h. above*. Include documentation of resolution of PHA findings and recommendations*.

Compliance Guidance: The intent of this request is to limit the amount of requested documentation. Therefore, instead of requesting the entire PHA file as detailed in 3.h. above, this request is related to the other PHAs conducted between the initial and the most recent PHA. This limits the amount of information requested in this item to the PHA findings, recommendations, resolutions, and excerpted information pertaining to previous incidents.

- j. A list of the written operating procedures for safely conducting activities in the Selected Unit(s).
- k. All operating procedures* involving Blowdown (s) at the refinery.
- l. A list of procedures describing safe work practices for potentially hazardous operations, including, but not limited to, lockout/tagout, confined space entry, lifting equipment over process lines, capping/blinding open-ended valves/piping, opening process equipment or piping, excavation, and control over entrance, presence, and exit to/from a facility by maintenance, laboratory, or other support personnel.
- m. A list of all employees (*i.e.*, hourly and supervisory) presently involved in operating the Selected Unit(s) including names, job

titles, work shifts, and the name of the person(s) to whom they report (their supervisor(s)).

- n. From the list provided in E.3.m., randomly choose five employees (four hourly employees and one supervisory employee) and obtain copies of their training records for initial* and refresher training*. If any of these five randomly selected employees were involved in operating the Selected Unit(s) on May 26, 1992, and have not received initial training as per 1910.119(g)(1), obtain their certification* (“grandfather certificate”) of required knowledge, skills, and abilities to safely perform their job.
- o. Description of how the employer manages operator refresher training.
- p. For the Selected Unit(s), obtain a listing of the Pre-startup safety reviews (PSSRs) for new facilities and for modified facilities since May 26, 1992, when the modification requires a change in the PSI.
- q. From the list of PSSRs provide in response to request E.3.p.: 1) randomly select one of the PSSRs; 2) obtain all required information* related to the randomly selected PSSR on the Selected Unit(s), if available; and 3) obtain a list of employees that received training relative to the selected PSSR.

Compliance Guidance: Required information related to PSSR includes, but is not limited to: operator training records, Management-of-Change (MOCs), PSI updates, startup checklists when required by a start-up procedure.

- r. The corporate* and refinery mechanical integrity (MI) program procedures*.

Compliance Guidance: The employer is only required to have MI program procedures for the establishment's covered processes (i.e., refinery MI program procedures). However, many employers also have corporate MI program procedures which they may or may not represent as their MI program procedures for their PSM-covered process(es). If an employer uses the corporate MI procedures as part of its establishment PSM-covered process MI procedures, then PSM requires the employer to have these corporate procedures developed and implemented as part of its establishment's MI program procedures as per 1910.119(j)(2).

- s. The corporate and refinery equipment deficiency management program*.

Compliance Guidance: The employer is only required to have MI program procedures for the establishment's covered processes (i.e., refinery MI program procedures). If an employer utilizes either corporate or establishment refinery equipment deficiency programs/procedures as part of its establishment's MI program procedures (as required by 1910.119(j)(2)), then PSM requires the employer to have these corporate and refinery procedures developed and implemented as part of its establishment MI program procedures.

- t. All MI procedures (program and task specific instructions)* related to the inspection, testing, servicing, repair, alteration of pressure vessels, piping and relief system equipment.
- u. The Owner-User quality assurance inspection manual for pressure vessels* (RAGAGEP for pressure vessel inspections include for example, API 510. Section 4.3 of API 510 requires an Owner-User quality assurance manual for pressure vessel inspections).
- v. The Owner-User quality assurance inspection manual for piping* (RAGAGEP for piping inspections include for example, API 570. Section 4.3.1 of API 570, requires an Owner-User quality assurance manual for piping inspections).
- w. The documented quality control system(s) of each of the relief valve repair organizations that the employer has utilized in the past five years.

Compliance Guidance: API 510, Section 3.16 defines the qualifications required for a repair organization.

Some legal jurisdictions, e.g., states, specify the required qualifications for a pressure vessel and pressure relief valve repair organization.

- x. A list of the Selected Unit(s) relief devices* including, 1) the inspection interval for each relief device* as required by the MI procedure for inspecting relief devices (based on the service requirements, as relief devices can have differing inspection intervals. Therefore, each relief device must have its own inspection interval documented as part of the MI procedure); 2) the dates of the last two inspections for each relief device*; and 3) the date of the next scheduled inspection of each relief device*.

Compliance Guidance: The PSM standard does not require a listing of each relief device, however, 1910.119 requires that each relief device in a PSM-covered process be included in the PSI.

- y. From the list of Selected Units(s) relief devices from above (E.3.x.), select five relief devices and obtain copies of each of their original design and design basis*.
- z. A list of all pressure vessels* in each of the alkylation unit(s) and the Selected Unit(s). Include in this listing(s):
- 1) The age of each pressure vessel* based on when it was first put in-service at the refinery or some other location;
 - 2) The normal operating pressure of each pressure vessel*;
 - 3) The normal operating temperature of each pressure vessel*;
 - 4) An indication whether each of the specific pressure vessels are insulated*;
 - 5) An indication whether each of the specific pressure vessels have integrally bonded liners such as strip lining or plate lining*;
 - 6) The inspection interval for each pressure vessel* as required by the MI procedure for pressure vessel inspections (based on the service requirements, pressure vessels can have differing inspection intervals; therefore, each pressure vessel must have its own inspection interval documented as part of the MI procedure);
 - 7) The dates of the last two inspections for each pressure vessel*; and
 - 8) The date of the next scheduled inspection of each pressure vessel*.

Compliance Guidance: The PSM standard does not require a listing of each pressure vessel, however, 1910.119 requires that each pressure vessel in a PSM-covered process be included in the PSI.

- aa. From the list of pressure vessels in the Selected Unit(s) and the alkylation unit(s), randomly select one pressure vessel from each of the following categories:
- 1) The 3 oldest (in terms of when they were first put into service at the refinery) pressure vessels in the Selected Unit(s);

- 2) The three pressure vessels which operate at the highest pressures in the Selected Unit(s);
- 3) The three pressure vessels which operate at the highest temperature in the Selected Unit(s);
- 4) The three oldest (in terms of when they were first put into service at the refinery) pressure vessels in the Selected Unit(s) which have integrally bonded liners (*e.g.*, strip lined);
- 5) The three oldest (in terms of when they were first put into service at the refinery) pressure vessels in the alkylation unit(s); and
- 6) The three pressure vessels which operate at the highest pressures in the alkylation unit(s).

For each of the randomly selected pressure vessels selected from the categories above, obtain the complete history file* for each vessel which contains all the PSI applicable to those vessels, including construction and design information, operating and inspection history repair, alteration and rerating information, and any fitness-for-service assessments.

- bb. A list of all Blowdown (s) in the refinery.

Compliance Guidance: The PSM standard does not require a listing of each Blowdown, however, 1910.119 requires that each Blowdown in a PSM-covered process be include in the PSI.

- cc. The original design and design basis* for each of the Blowdown (s) in the refinery.

Compliance Guidance: The PSM standard, 1910.119(d)(3)(i)(D), requires an original design and design basis for all components of a relief system including each Blowdown(s) which are part of a PSM-covered process.

- dd. Hot work permit programs and any active permit(s)* issued for the Selected Unit(s).

- ee. A list of work orders or the equivalent for the past three years in the Selected Unit(s). Divide the list into “open” and “completed” work orders.

- ff. A list of written MOC procedures to manage changes for process chemicals, technology, equipment, procedures, and changes to

facilities that affect any covered process in the Selected Unit(s) since May 26, 1992.

- gg. Incident investigation reports* as required by 1910.119(m) for the Selected Unit(s), including resolutions* and corrective actions*.

Compliance Guidance: 1910.119(m)(7) requires incident investigation reports to be retained for five years. However, 1910.119(e)(3)(ii) requires the employer to identify in every one of its PHAs, all incidents which had the likely potential for catastrophic consequences.

- hh. Written emergency action plan per 1910.38(a)* and written emergency response plan per 1910.120(q)*.
- ii. The two most recent compliance audit reports*, appropriate responses to each of the findings*, and verifications* that deficiencies have been corrected.
- jj. A list of the employer's HAZWOPER responders per its ERP. Designate which employees are qualified at the following levels: first responder awareness, first responder operations, hazardous materials technician, hazardous materials specialist, and on-scene incident commander.
- kk. Selected product piping information, based on a random selection of five piping circuits. See Question E.1., in Appendix A, for the required information.
- ll. EPA's release reports, see Compliance Guidance, below.

Compliance Guidance: Review [EPA's Toxic Release Inventory \(TRI\) database](#) for the employer's reported releases in the three most recent years available. Releases are reported by individual chemicals aggregated over a one-year period. If the review indicates there was a large aggregate quantity of a material released (e.g., 100,000 pounds of cyclohexane) in one of the years reviewed, request the individual release reports from the employer that would identify the specifics of each release that would account for the aggregate quantity reported.

- mm. Other documents deemed necessary by the inspection team to determine compliance.

Compliance Guidance: The inspection team may request other documents for its compliance evaluation including those documents deemed necessary to evaluate compliance of those IPI

included in the Primary and Secondary PSM IPI Lists (“Dynamic List Based Evaluation”).

4. PSM Overview. Prior to beginning the initial walkaround inspection, the team shall request an explanation of the company's PSM Program including, at a minimum:
 - a. A briefing on the elements of the PSM standards and how the refinery implements them;
 - b. Identification of which personnel are responsible for implementing the standards' various elements;
 - c. A description of company records used to verify compliance with the standards;
 - d. A review of the written summary description of the PSM program.

5. Personal Protective Equipment (PPE) and Camera/Video Use. In addition to normal inspection protective equipment, CSHOs conducting these inspections shall be provided with flame-retardant coveralls for protection from flash fires. PPE shall be appropriate to the workplace environment.
 - a. CSHOs shall wear flame-retardant coveralls in all areas of the plant where there is potential for flash fires and as may be required by company policy.

Note: Clothing made of hazardous synthetic fabrics should not be worn underneath flame-retardant coveralls.
 - b. Prior to the initial walkaround inspection, CSHOs must review the employer's operating procedures for PPE selection in the Selected Unit(s) and/or areas of the facility the CSHO will be inspecting. CSHOs should ensure that these procedures and the associated PPE selection have been prepared in accordance with the PSM standard as well as 1910, Subpart I, [Personnel Protective Equipment](#). The employer's PPE requirements and the use of flame-retardant coveralls for the Selected Unit(s) and other areas to be inspected shall constitute the baseline PPE requirements for CSHOs conducting walkaround inspections.

If the employer's operating procedures require a respirator for entry into an area covered by the procedure, or in the CSHO's judgment, a respirator should be worn in the area, then the CSHO must obtain the required type of respirator and have received proper training in the use of the respirator prior to entry into the

area.

- c. Unless as provided below, CSHOs shall ensure that any still cameras and/or video cameras are intrinsically safe for use in the process areas being inspected.

Note: CSHOs may use video cameras equipped with a telephoto lens from outside classified areas and/or still cameras without batteries.

If the employer allows the use of non-intrinsically safe cameras in hazardous (classified) locations, then CSHOs may use this type of equipment when: 1) the employer issues a hot work permit for the use of the camera, and 2) continuous combustible gas metering is provided in the areas where the camera will be used.

Any time the concentration of flammable gas or vapor exceeds 10 percent of the LFL, CSHOs must not use non-intrinsically safe cameras or other similar equipment.

6. Initial Walkaround. After the opening conference, the inspection may begin with a brief initial walkaround inspection of those portions of the facility within the scope of the PSM standard. The initial walkaround should:
 - a. Provide CSHOs with a correlation between the PSM overview discussion and the actual conditions existing in the various covered processes/process units;
 - b. Provide information for the selection of the process units to be inspected;
 - c. Give CSHOs a basic overview of the facility operations;
 - d. Allow CSHOs to observe potential hazards such as pipework at risk of impact, corroded or leaking equipment, unit or control room siting and trailer location, relief devices and atmospheric vents such as Blowdown stacks and relief valves that discharge to atmosphere, and on-going construction and maintenance activities;
 - e. Solicit input from the employee representatives and contract employees concerning potential PSM program deficiencies.

Compliance Guidance: Additional walkaround activity will be necessary after the Selected Unit(s) is identified.

7. Selection of Unit(s). Based on input from the Level 1 Team Member, the

Team Leader shall select one or more PSM-covered processes to evaluate for compliance with the standard. The covered process(es) selected to be evaluated are termed the Selected Unit(s). Typically the Selected Unit(s) will be operating units, not storage units/areas (*i.e.*, tank farms), unless there is significant evidence that suggests that a storage unit/area is much more at risk of a catastrophic release than other refinery operating units. **This selection shall be based on the factors listed below, and shall be documented in the case file:**

- a. Nature (*e.g.*, tendency to form unconfined vapor cloud, high toxicity, operating pressures and temperatures) and quantity of chemicals involved;
- b. Incident reports and other history;
- c. Lead operators' input;
- d. Age of the process unit;
- e. Factors observed during the walkaround;
- f. Employee representative input;
- g. Number of employees present;
- h. Existence of Blowdown (s); and
- i. Current hot work, equipment replacement, or other maintenance activities.

Based on the employer's response to X.E.3.b and c and other information such as discussions with process engineers and unit lead operators, the Level 1 Team Member will independently verify that the Selected Unit(s) are PSM-covered processes. This determination must be documented in the case file.

Compliance Guidance: Based on incident histories at refineries, it is not intended that the key analysis for choosing the Selected Unit(s) be a resource-intensive activity. One of the last major disasters at a refinery in the U.S. occurred at what was thought to be one of the safer units in the refinery complex. Therefore, while the team leader should attempt to identify the most hazardous processes in the refinery using the criteria listed above, the criteria only guide the selection process.

*If Blowdown (s) exist at the refinery, but they are not located in the Selected Unit(s), the team leader must assure that: 1) the number of Blowdown(s) and their respective locations (*i.e.*, the unit they are located*

in) are documented in the case file; and 2) at least one Blowdown which is part of a PSM-covered process is evaluated for compliance using the IPI contained in Appendix A, Section C and the Primary and Secondary PSM IPI Lists. To accomplish this compliance evaluation of a Blowdown which is not part of the Selected Unit(s), the Team Leader will randomly select at least one of the Blowdown(s) in one or more of the other PSM-covered processes.

8. Inspection of Contractors. All contractors (including subcontractors) working on or adjacent to the Selected Unit(s) shall be inspected. CSHOs need to use the applicable IPI contained in Appendix A and those applicable IPI specified by the Primary and Secondary PSM IPI List described in Section X.D.3.b., when evaluating contract employer compliance.

If there are no contractors working on or adjacent to the Selected Unit(s) throughout the course of the inspection, the team leader will chose another PSM-covered process where contractors are known to be working and inspect those contractors as per the requirements of the above paragraph.

Compliance Guidance: Construction contractors working on or adjacent to the Selected Unit(s), must also be inspected per the above paragraphs.

9. Compliance Guidelines. Guidelines for assessing and verifying compliance with PSM standard provisions are provided in Appendix A of this Instruction, an inspection priority item evaluation described in 9.b. below, and in CPL 02-02-045. When conducting PSM compliance evaluations of the Selected Unit(s):
- a. CSHOs must use the guidance contained in mandatory Appendix A of this Instruction. This static list-based evaluation is a gap analysis formatted in a series of questions to facilitate the evaluation of various inspection priority items (IPI) related to PSM.
 - b. CSHOs must use the guidance related to the dynamic list-based evaluation described in Section X.D.3.b. This dynamic list-based evaluation of this NEP is mandatory and is a gap analysis formatted in a series of questions to facilitate the evaluation of various (IPI) related to PSM.
 - i. Like Appendix A, each gap analysis question for this dynamic list-based evaluation has three possible answers: Yes, No, and Non-Applicable (N/A). See Appendix A, *CSHO Instructions* for a discussion related to how CSHOs are to respond to the questions presented in the Primary and

Secondary PSM IPI Lists.

- ii. CSHOs will address each of the questions on the Primary IPI List by documenting a Yes, No, or N/A response.
- iii. If questions on the Primary IPI List are not applicable to the Selected Unit(s), the Team Leader will replace the non-applicable items with items from the Secondary IPI List as described in Section X.D.3.b.
- iv. **If other *prima facie* elements of a violation are established, the employer shall be cited for each “No” response to each question in the IPI list.**

Compliance Guidance: The specific violation to cite (e.g., 1910.119(j)(2)) will normally be one of the corresponding “Possible Standards Violated” that are listed with the particular question on the IPI list. However, depending on the fact finding, a CSHO may determine that an alternate standard not listed in the “Possible Standards Violated” is more appropriate. In this case, the CSHO may cite the alternate standard. The CSHO shall document the reason for using the alternate standard.

- c. Expanded Inspection. During the course of the compliance evaluation described above, if the Team Leader determines that a large number of deficiencies exist in the employer’s PSM compliance, the inspection may be expanded to other Selected Unit(s) after the Team Leader consults with the AD.
 - d. Hazardous Conditions or Violations Not Addressed by IPI or the FIRM If hazardous conditions or violations of OSHA standards are discovered that are not specifically addressed in this Instruction (*i.e.*, IPI contained in Appendix A or those specified by the Primary or Secondary PSM IPI List described in Section X.D.3.b., or the required inspection items identified in CPL 02-00-103, FIRM) then these conditions or violations may also be cited.
10. Citations. Citations for violations of the PSM standard shall be issued in accordance with [CPL 02-00-103](#) - *FIRM*, with the following additional directions:
- a. Classification. The requirements of the PSM standard are intended to eliminate or mitigate catastrophic releases of HHC. The provisions of the standard present closely interrelated requirements, emphasizing the application of management controls when addressing the risks



associated with handling or working near HHC.

- b. Any violation of the PSM standard is a condition which could kill or seriously harm employees.
- c. Accordingly, violations of the PSM standard shall **not** normally be classified as "other-than-serious."

F. Program Evaluation.

This NEP will be evaluated using data collected from case files and follow-up site visit reports submitted by each AO, through the Region, to the Office of General Industry Enforcement (GIE) in the DEP.

The AO will submit inspection data for each inspection conducted under this NEP every three months (or sooner if the AO prefers, *e.g.*, after the citations are issued). This reporting will continue until each refinery in the AO jurisdiction has been inspected and initial citations have been issued.

Information to be provided in the AO reports includes:

- a. Name of company and location;
- b. Inspection number;
- c. Opening date of inspection;
- d. Identification of each citation issued in response to the Inspection Priority Items listed in Appendix A ("Static List") and the Primary and Secondary PSM IPI List ("Dynamic List") posted on the DEP intranet website (See Section X.D.3);
- e. Listing of the Selected Unit(s) that were evaluated for compliance during the NEP inspection;
- f. The number of Blowdown (s) at the refinery and how many of them were evaluated as part of the NEP inspection; and
- g. List of how many actual and near-miss PSM incident investigations have been conducted as a result of an incident at the Selected Unit(s).

G. Outreach.

The OSHA Training Institute, in conjunction with the DEP and the Office of Public Affairs, will develop refinery PSM information and training materials. This information will be made available to the ROs for



distribution to the AOs and Consultation Program offices. Each AO and RO is encouraged to develop outreach programs that will support their enforcement efforts. Suggested outreach products and activities include the following:

1. Letters and news releases announcing implementation of this Instruction.
2. Seminars on refinery process safety topics, tailored for specific audiences such as employers, employee groups, local trade unions, apprentice programs, and equipment manufacturers.
3. Working with OSHA's cooperative program participants, including VPP, Strategic Partnership, and Alliance Program participants, to share successes and technical information concerning effective means of controlling and reducing or eliminating potential catastrophic releases at refineries. For instance, OSHA has formed the [Safe Tank Alliance](#), a national alliance with API and NFPA.

H. IMIS Coding Instructions.

The instructions that follow are for inspections under this NEP:

1. All enforcement activities: inspections, complaints, accidents, referrals, and compliance assistance (OSHA 55) conducted under this NEP Program must be coded with the NEP code "REFINERY" entered in the appropriate NEP field/item # on the respective forms.
2. All consultation activities (Form 20, 30 and Form 66) conducted in response to this NEP must include "REFINERY" in the National Emphasis Code Field on the forms as well.

XI. Appendices. The following appendix is provided as guidance for the inspection of refineries.

Appendix A: Static List of Inspection Priority Items (IPI)

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Appendix A

Static List of Inspection Priority Items (IPI)

Background and Description of Appendix. The utilization of this Appendix is mandatory for CSHOs. This appendix contains questions that CSHOs are to address in their compliance evaluation of an employer's refinery Process Safety Management (PSM) program. The list of questions in this appendix is a static list and will not to be changed while this NEP instruction is active. Another list the [Primary and Secondary PSM IPI Lists](#) found on the Directorate of Enforcement Programs (DEP) intranet website contains a series of dynamic questions which will be periodically changed while this NEP Instruction is active. CSHOs shall conduct a PSM compliance evaluation based on a static and dynamic list of inspection priority items (IPI) in the PSM-covered process that has been chosen as the Selected Unit(s) to be evaluated (See X.E.7).

This static list-based evaluation is a gap analysis formatted in a series of questions which have been developed to assess and verify the employer's PSM compliance with specific issues such as design, fabrication, installation, startup, operation, maintenance, change, controls (engineering and administrative), safe work practices, contractor safety, etc., at the refinery by examining compliance primarily within the Selected Unit(s) and other areas of the refinery as designated in this Instruction.

CSHO Instructions. The questions are designed to elicit a determination from the employer of "Yes", "No," or "N/A" by the CSHO as to whether compliance with PSM provisions have been met. **The CSHO shall mark the "Yes" answer after each question when it has been determined that the employer has met the requirements of the question. If the employer does not meet the requirements of the question, the CSHO shall indicate "No".** If the question is not applicable, the CSHO shall mark "N/A."

A determination of "No" for any question indicates non-compliance. Therefore, any "No" shall normally result in a citation for a violation of the indicated provisions if other *prima facie* elements of a violation (a hazard exists, an OSHA standard applies, employer knowledge of the hazard, and employee exposure to the hazard) are established. Each question has one or more possible citations which may be cited. However, the CSHO is not limited to the suggested list of possible violations. Based on the fact finding, other violations may be more appropriate. CSHOs shall thoroughly document each "No" determination in the case file.

Because of the interrelationship of the PSM elements, CSHOs may find that under some circumstances more than one provision of the standard may be applicable. The following excerpt from CPL [02-02-045](#), demonstrates the interrelationship of the PSM elements:

"Interrelationship of Elements.

An essential part of verifying program implementation is to audit the flow of information and activities among the elements. When information in one element is changed or when action takes place in one element that affects other elements, the CSHO shall review a sample of the related elements to see if the appropriate changes and follow-up actions have taken place.

The following example demonstrates the interrelationship among the elements:

During a routine inspection of equipment (Mechanical Integrity), the maintenance worker discovers a valve

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that no longer meets the applicable code and must be changed. Because the type of valve is no longer made, a different type of valve must be selected and installed (Management of Change). The type of valve selected may mandate different steps for the operators (Operating Procedures) who will require training and verification in the new procedures (Training). The rationale for selecting the type of valve must be made available for review by employees and their representatives (Employee Participation).

When the new valve is installed by the supplier (Contractors), it will involve shutting down part of the process (Pre-startup Safety Review) as well as brazing some of the lines (Hot Work Permit). The employer must review the response plan (Emergency Planning) to ensure that procedures are adequate for the installation hazards.

Although Management of Change provisions cover interim changes, after the new valve is in place the Process Safety Information will have to be updated before the Process Hazard Analysis is updated or revalidated, to account for potential hazards associated with the new equipment. Also, inspection and maintenance procedures and training will need to be updated (Mechanical Integrity).

In summary, 11 PSM elements can be affected by changing one valve. A CSHO would check a representative number of these 11 elements to confirm that the required follow-up activities have been implemented for the new valve”.

Given the catastrophic nature of the hazards associated with PSM, the interrelationship of the PSM elements work together as a safety net to help ensure that if the employer is deficient in one PSM element, the other elements if complied with would assist in preventing or mitigating a catastrophic incident. Consequently, the PSM standard requires the use of a one hazard-several abatement approach to ensure that PSM-related hazards are adequately controlled. Abatement requirements include both management system/program requirements (*e.g.*, the requirement to develop mechanical integrity program procedures which include piping inspection procedures, 1910.119(j)(2)), as well as specific employer action/task abatement requirements (*e.g.*, the mandate to conduct piping system inspections, 1910.119(j)(4)). In these examples, both the management program procedures and the action/task provisions act together to ensure that there are requirements for the employer to not only conduct piping system inspections (action/task), but also that there are provisions requiring that an MI management program procedure is developed and implemented. The example MI management program procedure ensures that all piping inspections are not only conducted, but that they are managed in a manner specified by the employer.

Therefore, to assure that all the employer’s process safety management systems/elements are being fully implemented, CSHOs should consider citing all applicable violations. Grouping these violations may be appropriate, see [CPL 02-00-103, FIRM, Chapter III.C.5.](#)

Example questions in this Appendix may not be the only means of achieving the performance goals of the various PSM requirements applicable to a specific question. For questions with a “No” response, CSHOs must determine if the employer uses other means to comply with the specific standards that apply to each specific “No” response/question. If the employer claims that it utilizes some other means to comply with a specific standard, the employer must be prepared to demonstrate that its performance meets the requirements of the standard. Further, based on the facts related to a specific IPI question, the listed “*possible violations*” associated with the IPI may or may not be appropriate to cite, or another standard which is not listed may also apply. In this case, when appropriate, CSHOs may cite both a standard which is and is not listed as a “*possible violation*” for the particular IPI question.

Many PSM elements and paragraphs may apply to each of the questions posed in Appendix A. For example, the Training (1910.119(g)) and Compliance Audit (1910.119(o)) elements and their respective paragraphs could apply and be listed as “*possible violations*” for each question in the appendix below. Since Appendix A is formatted to be an audit tool for CSHOs, all conceivable questions and “*possible violations*” are not included. However, as noted in the above paragraph, if CSHOs find hazardous conditions/deficiencies which are not addressed by the questions or their associated “*possible violations*”, CSHOs may also cite these “not addressed” hazardous conditions/deficiencies.

In the static list presented below, one or more “*Compliance Guidance*” statements may be provided to assist CSHOs in their compliance determinations.



IPI Questions and Related Possible Violations

A. Management of Change

1. Has the throughput changed from its original design rate for the Selected Unit(s)? If the throughput has changed, has the employer conducted a management of change (MOC) procedure for each throughput change(s) since May 26, 1992?

Yes No N/A

If no, possible violations include: 119(l)(1) – the employer did not conduct an MOC when the throughput in the Selected Unit(s) changed.

Compliance Guidance: See employer's response to document request X.E.3.g. Compare the results of the document request along with interviews of the Selected Unit(s)' process engineer(s) and lead operators to verify that throughput changes include any associated MOCs.

Regardless of the means (e.g., a debottlenecking project) used to accomplish the throughput change(s), the employer must still conduct an MOC procedure as per the requirements of 1910.119(l).

2. For each throughput MOC procedure conducted for the Selected Unit(s), has the procedure listed the technical basis for the change and ALL potential safety and health impacts of the change prior to its implementation?

Yes No N/A

If no, possible violations include:

- a. 119(l)(2)(i) – the employer did not list the technical basis for the change in its MOC procedure; or
- b. 119(l)(2)(ii) – the employer did not list ALL potential safety and health impacts of the change in its MOC procedure.

B. Relief Systems

1. For each throughput MOC procedure conducted, has the procedure included a review/analysis of the relief system (includes inlet lines, relief devices, relief discharge lines, relief disposal equipment and flare system) to determine if the throughput change might result in deficiencies in the existing relief system (e.g., under capacity, relief valve back pressure problems, etc.) and corresponding safety and health?

Yes No N/A

If no, possible violations include:

- a. 119(l)(2)(i) – the employer did not list the technical basis for the change in the MOC procedure; or
- b. 119(l)(2)(ii) – the employer did not list ALL potential safety and health impacts of the change in the MOC procedure.

Compliance Guidance: An MOC procedure is required anytime a change per the requirements of 1910.119(l) is considered. An MOC procedure is a proactive management system tool used in part to determine if a change might result in safety and health impacts. OSHA’s MOC requirement is prospective. The standard requires that an MOC procedure be completed, regardless of whether any safety and health impacts will actually be realized by the change. The intent is, in part, to have the employer analyze any potential safety and health impacts of a change prior to its implementation. Even if the employer rightly concludes there would be no safety and health impacts related to a change, 1910.119(l)(1) still requires the employer to conduct the MOC procedure. The MOC requirements are important because many large incidents have occurred in the past when changes have been made and the employer either did not consider the safety and health impacts of the change, or did not appreciate (wrongly concluded) the potential consequences of the change before it was too late. Therefore, it is not only required, but important that the employer conducts an MOC procedure on each change, even those changes the employer believes will have no safety or health impacts.

PSM is a performance standard. As such, the employer must be able to demonstrate how it performed their MOC procedure to determine the adequacy of the relief system with respect to the throughput change.

- 2. After a change in the throughput in the Selected Unit(s), did the process hazard analysis (PHA) team consider the adequacy of the existing relief system design with respect to the increased throughput during the next process hazard analysis (PHA)?
Yes No N/A

If no, possible violations include:

- a. 119(e)(1) – 1) the employer did not identify or determine in its PHA (“*The PHA shall...identify, evaluate and control the hazards...*”) whether the relief system design for the Selected Unit(s) was adequate for the unit’s actual throughput; or 2) the employer’s PHA team did find that the Selected Unit’s relief system might need an updated analysis, or, that the relief system was inadequate due to increased flow through the unit, and took no action to evaluate this situation;

Compliance Guidance: Typically, the PHA team does not do a relief system engineering analysis. However, the PHA team should determine, through proper evaluation and consultation with the refinery’s engineering/technical staff, whether the existing/current engineering analysis of the relief system is adequate for the current/actual unit throughput.



If the throughput change was implemented between the time the PSM standard became effective (May 26, 1992) and the time the original PHA was required based on the PHA phase-in schedule listed in 119(e)(1), the original PHA would need to address the throughput change. However, if there was a throughput change after the original PHA, the next PHA update/"redo" or PHA revalidation would need to address the throughput change. In either event, an MOC procedure on the throughput change would need to have been conducted and incorporated into the next scheduled PHA.

- b. 119(e)(3)(iv) – the employer’s PHA team determined that the relief system needed upgrading or that the process needs to be changed in response to issues such as under capacity, but the PHA did not address the consequences of failure of the relief system (engineering controls); or
 - c. 119(e)(6) – the employer failed to consider in its PHA update/revalidation, the throughput increase and any potential effects the increase might have on the adequacy of the current process, including the existing relief system.
3. Does the employer's process safety information (PSI) include the codes and standards they used in the design of relief systems?
Yes No N/A

If no, possible violations include: 119(d)(3)(i)(F) – the employer did not include in its PSI, the codes and standards they used in the design of relief systems.

Compliance Guidance: This is a fundamental management system requirement for ALL equipment in a PSM-covered process. The employer must specify the design they employ for their covered equipment.

4. Does the employer’s relief system design in the Selected Unit(s) comply with recognized and generally accepted good engineering practices (RAGAGEP) and the codes and standards they designated they would use for relief systems design?
Yes No N/A

If no, possible violations include:

- a. 119(d)(3)(i)(D) – the employer either did not design, or did not have the design, or the design basis PSI for a component(s) of the relief system;

Compliance Guidance: In the case where there is no design of the relief system, there cannot be PSI which documents the design or design basis.

- b. 119(d)(3)(i)(F) - the employer did not document which design codes and standards it used for the relief systems; or
- c. 119(d)(3)(ii) – the employer did not comply with RAGAGEP when it used some component of the relief system which did not meet RAGAGEP design requirements.



(An example of a RAGAGEP for designing relief systems is API STD 521).

Compliance Guidance: In this case, when an employer uses equipment which does not meet RAGAGEP requirements, the employer cannot document in their PSI that the equipment does in fact comply with RAGAGEP.

5. Does the employer's PSI include the relief system design and design basis?

Yes No N/A

If no, possible violations include: 119(d)(3)(i)(D) – the employer did not include the relief system design or design basis in its PSI.

Compliance Guidance: This includes the original design and design changes. Examples of PSI related to relief devices, their design and design basis include, but are not limited to such items as:

- a. *Identification/descriptor of each relief device;*
- b. *A listing of all equipment which will be relieved through the device;*
- c. *Design pressure;*
- d. *Set pressure;*
- e. *Listing of all sources of overpressure considered (API STD 521, Sections 4 and 5 contain examples of information on various sources of overpressure including utility/power failure – steam, electric and others (See Section 4, Table 1 – Possible Utility Failures and Equipment Affected); external fire; cooling water loss; failure of automatic controls; check-valve malfunction; etc.);*
- f. *Identification of the worst case overpressure scenario or relief design basis (API STD 521, Section 5.1, Table 2 – Guidance for Required Relieving Rates Under Selected Conditions lists some common occurrences that may be a design basis for the maximum relieving capacities required or worst case relieving scenario for equipment which are protected by a relief system);*
- g. *State of material being relieved (i.e., liquid, vapor, liquid-vapor, liquid-vapor-solid, along with an identification of the material which was the basis for the relief device selection);*
- h. *Physical properties of the relieved materials, vapor rate, molecular weight, maximum relieving pressure, heat of vaporization, specific gravity and viscosity; and*
- i. *Design calculations.*

Similar design and design bases PSI are required for the rest of the relief system equipment downstream from the relief devices, i.e., relief vent lines, manifolds, headers, other relief disposal equipment, and flare stack. For example, commonly asked questions could be as follows: What is the design retention time of a knockout drum in the relief disposal equipment? What is the design and actual loading to the flare system, etc.? Section C, below includes questions related to Blowdowns which are part of a relief system.

6. Are there intervening valves on the upstream or downstream lines to/from relief device (s)? If so, does the PHA consider the possibility that these valves could be closed during

operation, rendering the relief device(s) non-functional?

Yes No N/A

If no, possible violations include:

- a. 119(e)(1) – the employer did not identify, evaluate or control this hazard when it conducted the PHA;
- b. 119(e)(3)(iv) – the employer did not address the consequences of closing an intervening valve on a line upstream of the relief device or a relief discharge line downstream from the device when it conducted the PHA; or
- c. 119(d)(3)(ii) – the employer used intervening stop valves on relief discharge lines which do not comply with RAGAGEP. (An example RAGAGEP for intervening stop valves on relief lines is the ASME Boiler and Pressure Vessel Code (BPVC), Section UG-135(d) and Appendix M)

Compliance Guidance: In this case, when an employer uses equipment which does not meet RAGAGEP requirements, the employer cannot document in their PSI that the equipment does in fact comply with RAGAGEP.

7. If there are intervening valves on the upstream or downstream lines to/from from relief device (s), does the employer have effective controls in place to ensure these intervening valves remain open during operations?

Yes No N/A

If no, possible violations include:

- a. 119(d)(3)(ii) – the employer did not comply with RAGAGEP when it failed to provide adequate controls to ensure that intervening valves on the upstream or downstream lines to/from relief device(s) remained in the open position during operation when a pressure vessel was the possible source of a relieving event (ASME Boiler and Pressure Vessel Code, Division 1 (BPVC), Section VIII, UG-135(d) and Appendix M are examples of RAGAGEP for controlling intervening stop valves on relief lines;

Compliance Guidance: In this case, when an employer uses equipment which does not meet RAGAGEP requirements, the employer cannot document in their PSI that the equipment does in fact comply with RAGAGEP.

- b. 119(e)(1) – the employer did not identify, evaluate, or control this hazard when it conducted the PHA;
- c. 119(e)(3)(iii) –the employer did not address the appropriate safeguards--including engineering and/or administrative controls-- to ensure operating equipment does not have its relief capabilities rendered non-functional when it conducted the PHA; or

- d. 119(f)(1) - the employer did not develop or implement operating procedures for the administrative control of this hazard.

Compliance Guidance: If the employer uses chains or car-seals to ensure the intervening stop valves are open during operation, there must be an operating procedure to control this hazard administratively.

8. If there is an administrative procedure (e.g., car-seal procedure) to assure that intervening valves on lines leading to/from relief devices are in the open position during operations, has this procedure been subsequently audited?
Yes No N/A

If no, possible violations include: 119(o)(1) – the employer did not audit the procedures and practices (e.g., car-seal procedures) at least every three years to ensure they are adequate and are being followed.

9. Are there open vents which discharge to atmosphere from relief devices? If so, has the PHA considered whether these relief devices discharge to a safe location?
Yes No N/A

If no, possible violations include:

- a. 119(d)(3)(ii) – the employer did not comply with RAGAGEP when discharge lines relieved or had potential to relieve to an unsafe location when a pressure vessel was the source or potential source of the relieving event (An example of a RAGAGEP for discharging pressure vessels to safe locations is the BPVC, Section UG-135(f));

Compliance Guidance: In this case, when an employer uses equipment which does not meet RAGAGEP requirements, the employer cannot document in their PSI that the equipment does in fact comply with RAGAGEP.

- b. 119(e)(1) – the employer did not identify, evaluate, or control this hazard when it conducted the PHA;

Compliance Guidance: PHA teams must address basic questions regarding what happens to the hazardous materials after they are relieved to the atmosphere, including:

- *Are there negative effects on employees or other equipment that could cause another release (“domino effects”) of hazardous materials/HHC?*
- *What presumptions or/assessments exist to support that there will be no negative effects of an atmospheric release of hazardous materials/HHC?*
- *Are employees near where relief devices discharge, including downwind locations (e.g., on the ground, on platforms on pressure vessels in the vicinity of*

elevated relief devices, etc.)?

- *Could a release from a relief device cause a release from other equipment, or could other nearby equipment affect the released material (e.g., a furnace stack could be an ignition source if it is located proximate to an elevated relief device that is designed to relieve flammable materials)?*

Part of the employer's PHA team's evaluation, after it identifies the locations of open vents, is to determine if employees might be exposed when hazardous materials are relieved. If the PHA team concludes that a current and appropriate evaluation (such as the use of dispersion modeling) has been conducted, the evaluation could find that the vessels/vents relieve to a safe location. If the PHA team determines that this hazard has not been appropriately evaluated, the PHA team must request that such an evaluation be conducted, or make some other appropriate recommendation to ensure that the identified hazard/deviation is adequately addressed.

- c. 119(e)(3)(i) – the employer did not consider the deviation/hazard of hazardous materials/HHCs being vented to atmosphere from relief devices when it conducted the PHA; or
- d. 119(e)(3)(iii) – the employer did not address the appropriate safeguards/engineering controls for this hazard (*i.e.*, discharge to a safe location) when it conducted the PHA.

Compliance Guidance: CSHOs may also cite 1910.106 (i)(3)(ii) when an employer's unfired pressure vessels have potential to relieve/discharge flammable and combustible liquids and vapors to unsafe locations in violation of Section VIII of the 1968 BPVC, UG-134(g) requirements. To comply with 1910.106(i)(3), employers' pressure vessels must be constructed in accordance with Section VIII of the 1968 BPVC, unless a later version of Section VIII of the BPVC provides equal or more protection than the 1968 edition.

10. Does the PHA address the control of flammable material in relief discharge equipment (*e.g.*, longer discharge piping, atmospheric stacks, Blowdowns, etc.) that may contain flammable concentrations which vent directly to atmosphere?

Yes No N/A

If no, possible violations include:

- a. 1910.119(e)(1) - the employer did not identify, evaluate or control the hazard of a potential concentration of flammable vapors inside relief discharge equipment which vents directly to atmosphere when it conducted the PHA;

Compliance Guidance: Conditions such as leaking relief devices or remnants of a prior relieving event can create a hazardous condition where flammable material concentrations can exist inside relief system disposal equipment which is downstream from a relief device. The fact that these relief systems vent directly to the atmosphere

can result in the ignition of the flammable materials by ignition sources such as, but not limited to, lightning and nearby hot work.

- b. 119(e)(3)(i) – the employer’s PHA did not consider the deviation/hazard of flammable vapor concentrations in the relief system equipment located downstream from relief devices which vent to the atmosphere;
- c. 119(e)(3)(iv) – the employer did not identify the potential consequences of flammable vapors existing in the relief system equipment located downstream from relief devices which vent to the atmosphere when it conducted the PHA.

Compliance Guidance: An inert gas purge system is a possible control for flammable materials in relief system equipment which vents to atmosphere.

11. Does the employer have a mechanical integrity (MI) procedure for inspecting, testing, maintaining, and repairing relief devices that maintains the ongoing integrity of process equipment?

Yes No N/A

If no, possible violations include:

- a. 1910.119(j)(2) – if: 1) the employer did not have a MI program procedure for inspecting, testing, maintaining, and repairing relief devices or the procedure was not completely developed; 2) the employer did not implement a developed MI program procedure; or 3) the employer or the employer’s repair organization did not inspect, test, or repair relief devices per the employer’s MI program procedure and the repair organizations’ quality control systems procedure(s); or
- b. 1910.119(j)(4)(ii) – if the employer did not follow RAGAGEP when it failed to inspect, test, maintain, and/or repair relief devices per RAGAGEP requirements (Examples of RAGAGEP for relief device inspections include, but are not limited to, API 510, Section 6.6, API 576, Section 6, and CCPS [Ref. 33], Table 9-15, *Mechanical Integrity Activities for Pressure Relief Valves*).

Compliance Guidance: Refer to the employer’s response to document request X.E.3.t and w. Compare the employers MI program procedures for inspecting, testing, and repairing relief devices to the quality control systems employed by the relief device repair organization (s) the employer uses.

Relief valves are typically tested (“pop test”), inspected and repaired. Rupture disks, alternatively, are only inspected and replaced.

12. If the employer has an MI procedure for inspecting relief devices, is it inspecting relief devices on a frequency at least as often as that required in their MI procedure(s)?

Yes No N/A

If no, possible violations include:



- a. 1910.119(j)(2) – the employer did not: 1) include information in its MI program procedure related to conducting relief device inspection and testing on a specified frequency; or 2) implement the MI program procedure for conducting relief device inspection and testing on a specified frequency as required;
- b. 119(j)(4)(i) – the employer has not inspected or tested a particular relief device; or
- c. 119(j)(4)(iii) – the employer did not inspect relief devices on a frequency consistent with manufacturers’ recommendations or RAGAGEP. (Example RAGAGEP for relief device inspection frequency includes API 510, Section 6.6, API 576, Section 6.4, stating, “A *definite time interval between inspections or tests should be established for every pressure-relieving device on operating equipment*”, and see CCPS [Ref. 33], Table 9-15, *Mechanical Integrity Activities for Pressure Relief Valves*.)

Compliance Guidance: To determine if any of the relief devices are overdue for inspection: 1) use the list of requested relief devices (see document request in Section X.E.3.x) to determine if any of these relief devices have not been inspected according to the employer’s schedule or from the work order list requested (see document request in Section X.E.3.ee.), determine if any relief devices have overdue work orders for inspection. In some instances, this information may be found in the open or incomplete work orders.

If the employer’s relief device service experience (e.g., a history of fouling or plugging) indicates their inspection interval needs to be shortened, then 119(j)(4)(iii) requires the interval to be shortened. For example one RAGAGEP, API 510, Section 6.6 states, “...a pressure relieving device was heavily fouled or stuck in the last inspection or test, the service interval shall be reduced...”.

If an employer has predetermined they will replace an existing relief valve with a new valve instead of testing it, they must still inspect the existing relief valve to determine if its service condition dictates that the inspection interval for the new relief valve should be shortened. If the new valve (replacement) satisfies the design requirements of the existing valve, then it is considered a replacement-in-kind. If the new valve does not satisfy the design specifications of the existing valve, an MOC procedure per 1910.119(l) is required.

13. Does the employer’s MI procedure address who or what group is authorized by the employer to conduct relief device inspection, testing and repair, including the qualifications and credentials required for those conducting the inspection, testing and repair? **Check your inspection company to ensure they have procedures for inspecting, testing and repairing pressure relief devices**
 Yes No N/A

If no, possible violations include:



- a. 1910.119(j)(2) – if: 1) the employer did not specify in its MI program procedure the required qualifications and credentials of the individuals and organizations authorized by the employer to inspect, test, and repair relief devices; or 2) the employer did not implement its MI program procedure when individual(s) or organization(s) were used to inspect, test and repair relief devices and these individual(s) or organization(s) were not qualified or did not possess the credentials as required by the employer’s MI program procedure; or
- b. 119(j)(4)(ii) – the employer did not follow RAGAGEP when it used individual(s) or organization(s) to inspect or test relief device (s) who were not qualified and did not possess the credentials as required by RAGAGEP (Example RAGAGEP for testing relief devices include API 510, Section 6.6 which includes requirements for qualifications and training of repair personnel contained in the repair organization quality control system documentation and CCPS [Ref. 33], *Table 9-15, Mechanical Integrity Activities for Pressure Relief Valves*. An example RAGAGEP for repair organizations involved in the repair of relief devices include API 510, Sections 6.6 and 3.16. An example RAGAGEP for qualifications and certifications is CCPS [Ref.33], *Table 5-3, Widely Accepted MI Certifications*).

14. Is the equipment in the relief system in the Selected Unit(s) absent deficiencies? **What are deficiencies?**

Yes No N/A

If no, possible violations include: 1910.119(j)(5) – the employer operated deficient equipment/systems without taking necessary means to assure safe operation.

Compliance Guidance: See the definition of deficiency in Section IX.A for some examples of deficient equipment/systems.

15. When the Selected Unit(s) have been operating, has the unit flare been in-service/operational? If the flare has not been in-service, has the employer used any other effective measures, which would include developing and implementing an MOC procedure, to relieve unit equipment in the event of an upset?

Yes No N/A

If no, possible violations include:

- a. 1910.119(j)(5) – the employer operated equipment in a deficient mode in that the equipment was intended to be protected by the flare system, but, the flare was not in-service and the employer took no other necessary means to operate in a safe manner;

Compliance Guidance: If the employer claims that it is operating in this situation within the limits of their PSI, or that they are “operating in a safe and timely manner when necessary means are taken to assure safe operation”, these claims must be highly scrutinized. If this or a similar operating situation exists, a detailed MOC and a temporary operating procedure at a minimum are required.



- b. 119(l)(1) – the employer did not develop or implement an MOC procedure for operating without a flare when other associated equipment was in-service.
- c. 119(l)(2)(i) through (v) – the employer did not assure that prior to a change related to operating equipment without the protection of a flare, an MOC procedure was not developed that included the following considerations:
 - (i) – The technical basis for the proposed change;
 - (ii) - Impact of the change on safety and health;
 - (iii) - Modifications to operating procedures;
 - (iv) - Necessary time period for the change; or
 - (v) - Authorization requirements for the proposed change;
- d. 119(l)(3) – the employer did not inform or train operating, maintenance or contract employees whose job tasks were or could have been affected by operating equipment without the protection of the flare system;
- e. 119(l)(5) – the employer did not update operating procedures to reflect the operation of equipment without the protection of the flare system.
- f. 119(f)(1)(i)(C) – the employer operated equipment without the protection of a flare system and did not ensure that written temporary operating procedure (s) had been developed or implemented for this operating condition.

Compliance Guidance: To determine if the unit flare has been out-of-service, CSHOs can refer to the work order list (See document request at X.E.3.ee.), interview the unit process engineer and lead operators, obtain operating data from computer logs, etc.

C. Blowdown Drums and Vents Stacks (Blowdowns)

Compliance Guidance: If the Selected Unit(s) which are being evaluated for compliance do not have a Blowdown, see Section X.E.7. - Compliance Guidance, for information related to evaluating other Blowdown(s) at the refinery.

1. Does the PSI include the original design and design basis for each Blowdown at the refinery?
 Yes No N/A

If no, possible violations include: 119(d)(3)(i)(D) – the employer has operated Blowdowns when there was no original (or updated when required) design or design basis for each of these pieces of equipment/systems.

Compliance Guidance: Blowdowns are considered disposal equipment, that when used,



are part of a pressure relieving system (See definition at IX.A.2. and API STD 521).

CSHOs should pay particular attention in cases where multiple relief devices relieve hazardous materials (flammable, toxic, corrosive, etc.) to a single Blowdown.

Examples of PSI related to Blowdowns, their design and design basis include, but are not limited to, such items as:

- a. Physical and chemical properties of the materials relieved to Blowdowns (See API STD 521, Section 6.2.1);

Compliance Guidance: Of particular concern are heavier-than-air hydrocarbons with relatively lower boiling points. Additionally, hot hydrocarbons pose a greater risk because they are more volatile. Releasing these materials under the right conditions can result in the formation of unconfined vapor clouds which can and have resulted in major catastrophes at refineries and chemical plants.

- b. A definition of the loadings to be handled (See API STD 521, Section 7.1);
- c. The exit velocity of gasses/vapors released from the vent stack (See API STD 521, Section 7.3.4);
- d. Design basis/“worst-case” scenario for maximum liquid – vapor release to Blowdown (See API STD 521, Section 4.5.j and 7.1.3);
- e. When more than one relief device or depressuring valve discharges to a Blowdown, the geographic locations of those devices and valves must be defined (See API STD 521, Section 4.4.q. and 7.2.3);
- f. The design residence time of vapor and liquid in the drum (See API STD 521, Section 7.3.2.1.2);
- g. The design basis for the vapor – liquid separation for the drum;
- h. The design basis for the exit velocities for the vent stack; and
- i. The nature of other, lesser hazards related to smaller releases not related to the design “worst-case” scenario such as the release of toxic (e.g., H₂S) and corrosive chemicals.

2. Does the employer's PSI include the codes and standards used in the design of Blowdowns?

Yes No N/A

If no, possible violations include: 119(d)(3)(i)(F) – the employer did not include the codes and standards used in the design of Blowdown (s).

3. Since the original installation of the Blowdowns, have the original design and design basis conditions remained the same? Examples of conditions that may have changed since the original design and installation of the Blowdowns include: increased throughput in the unit(s) that relieve to the Blowdowns; additional relief streams routed to the Blowdown, Blowdowns originally designed only to handle lighter-than-air vapor emissions from their stacks have had liquids or other heavier-than-air releases emitted from their vent stacks; additional equipment, a new unit, or occupied structures have been sited near the Blowdowns in a manner that was not addressed in the original design or design basis, etc.
- Yes No N/A

If no, possible violations include:

- a. 119(l)(1) – if: 1) the employer did not conduct an MOC procedure when there were changes to Blowdown systems, or 2) the employer did not implement a developed MOC procedure prior to a change in the Blowdown system;
- b. 119(l)(4) – the employer did not update the PSI related to the relief system design and design basis prior to a Blowdown system change;
- c. 119(m)(1) – the employer failed to conduct an incident investigation of a liquid hydrocarbon, or hydrocarbon vapor release from a vent stack of a Blowdown.

Compliance Guidance: It is RAGAGEP to investigate incidents involving system upsets or abnormal operations which result in operating parameters which exceed operating limits or when layers of protection have been activated such as relief valves, and in this case Blowdown(s) (An example RAGAGEP for investigating incidents, including near-miss incidents is CCPS [Ref. 41], this document presents some common examples of near-miss incidents).

4. Did the PHA identify all scenarios where hot, heavier-than-air, or liquid hydrocarbons might be discharged from Blowdown stacks to the atmosphere?
- Yes No N/A

If no, possible violations include:

- a. 119(e)(1) – the employer did not identify or evaluate all scenarios that might result in the discharge of hot, heavier-than-air, or liquid hydrocarbons from the vent stack of a Blowdown (s) when it conducted the PHA;
- b. 119(e)(3)(i) – the employer did not identify the hazards/deviation of a hydrocarbon liquid release to atmosphere from Blowdown (s) when it conducted the PHA;
- c. 119(e)(3)(iii) – the employer’s PHA did not identify all safeguards applicable to a hot, heavier-than-air, or liquid hydrocarbon release to atmosphere through Blowdown (s); or

d. 119(e)(3)(iv) – the employer did not identify when it conducted the PHA, the consequences (e.g., fires or explosions with employee fatalities and injuries) of the failure of a safeguard (s) that could result in a liquid or vapor hydrocarbon release from a Blowdown.

5. Can the employer demonstrate that atmospheric discharges from Blowdowns are to safe locations?

Yes No N/A

If no, possible violations include:

a. 119(e)(3)(i) – the employer did not identify or evaluate the deviation/hazard related to an atmospheric release of hydrocarbon materials from Blowdown (s) when it conducted the PHA;

b. 119(e)(3)(v) – the employer did not consider facility siting with respect to the location of equipment which could either be impacted by a hydrocarbon release from a Blowdown or that might act as an ignition source for a flammable material release from a Blowdown when it conducted the PHA;

Compliance Guidance: Other structures such as control rooms, trailers, offices, motor control centers, etc., must be considered in a PHA to determine if they have been sited in a safe location that might be affected by a hydrocarbon or toxic material release from a Blowdown.

c. 119(d)(3)(ii) – the employer did not comply with RAGAGEP when it failed to evaluate (e.g., calculations and/or dispersion modeling) whether releases from relief system equipment discharged to safe locations (See e.g., API STD 521, Sections 6.3.2.2, 6.3.3.3, 6.3.4.1.2, 6.3.4.2, 7.3.3.2.5, and 7.3.4.2 for an example RAGAGEP for calculating vapor emission dispersion through atmospheric discharge) or other dispersion modeling that employees and other equipment/structures were safely located;

Compliance Guidance: Unsafe locations can include, but are not limited to, the location of equipment which could act as an ignition source, such as a furnace stack; an employee platform on a column where employees would be exposed in the event of a release; a control room; a satellite building; a trailer; a maintenance area/shop; an emergency response building; an administration building; a lunch or break room; etc.

d. 119(e)(v) – the employer (PHA team) did not consider the siting of its employees or facilities in relation to hazardous releases from relief system equipment which discharge to the atmosphere.

6. Does the PHA identify hazards related to a high level of hydrocarbon liquid in Blowdown drums?

Yes No N/A

If no, possible violations include:

- a. 119(e)(3)(i) – the employer did not *identify* or *control* the deviation/hazard of a potential high liquid level in a Blowdown drums when it conducted the PHA; or
 - b. 119(e)(3)(iii) – the employer did not identify appropriate safeguards for high liquid levels in a Blowdown drum such as a safety critical high level alarm indicating a large liquid discharge to the drum when it conducted the PHA.
7. If there is a high level alarm in the Blowdown drum, is there an MI procedure for calibrating, inspecting, testing and maintaining the instrument/control?
Yes No N/A

If no, possible violations include:

- a. 119(j)(2) – if: 1) the employer did not develop an MI program procedure for calibrating, inspecting, testing and maintaining the high level alarm instrument/control, or 2) the employer did not implement its developed MI program procedure for calibrating, inspecting, testing and maintaining the high level alarm instrument/control;
- b. 119(e)(1) – if: 1) the employer did not adequately control the hazard/deviation of a high hydrocarbon liquid level in the Blowdown when it claimed an ineffective alarm as a safeguard against high hydrocarbon liquid levels in the Blowdown drum; or 2) the employer did not evaluate the safeguard/high level alarm adequately ("*...shall identify, evaluate and control...*") when the employer conducted the PHA;
- c. 119(d)(3)(ii) – if: 1) the employer did not comply with RAGAGEP when it failed to adequately design the high level alarm; or 2) the employer did not document the design of the alarm system (PSI);

Compliance Guidance: In this case, when an employer uses equipment that does not meet RAGAGEP requirements, the employer cannot document in its PSI that the equipment does in fact comply with RAGAGEP.

- d. 119(j)(4)(i) – the employer did not inspect or test the identified PHA safeguard (high level alarm);
- e. 119(j)(4)(ii) – the employer did not follow RAGAGEP inspection or testing task specific procedures for the identified PHA safeguard (high level alarm);
- f. 119(j)(4)(iii) – the employer did not inspect or test the identified PHA safeguard (high level alarm) on a frequency consistent with applicable manufacturers' recommendations or RAGAGEP or more frequently if determined to be necessary by prior operating experience;

- g. 119(j)(4)(iv) – the employer did not document the required inspection and testing data for the identified PHA safeguard (high level alarm);

Compliance Guidance: The required documentation data must include the date of the inspection or test, the name of the person who performed the inspection or test, the serial number or other identifier of the equipment on which the inspection or test was performed, a description of the inspection or test performed, and the results of the inspection or test.

- h. 119(l)(1) - the employer changed the high level alarm safeguard prior to conducting an MOC procedure; or
- i. 119(f)(1)(iv) – if: 1) the employer did not list the safety critical high level alarm as a safety system; or 2) the employer did not describe the alarm’s function in the operating procedures.

8. If the Blowdown drum design specifies quench water for hot flammable materials, does the design include information on how the quench water is initiated and how much water is needed to quench the hot materials flowing to the drum?

Yes No N/A

If no, possible violations include:

- a. 119(d)(3)(ii) – the employer did not comply with RAGAGEP when it designed the Blowdown quench water system and it failed to include information on the initiation or quantity of quench water that was needed when system activation was required;
- b. 119(j)(5) – the employer operated the Blowdown outside acceptable limits as a result of a deficient quench water system and did not use other necessary means to assure safe operation.
- c. 119(j)(6)(ii) – the employer did not perform checks and inspections to ensure that the Blowdown quench water system was installed properly and that it could deliver the design quantity of quench water when required; or
- d. 119(f)(1)(iv) – if: 1) the employer did not list the quench water system as a safety system; or 2) the employer did not describe the quench water system’s function in the operating procedures.

9. Are there established operating procedures, including normal operating procedures (NOP), emergency operating procedures (EOP), and emergency shutdown procedures (ESP) for Blowdown (s) (See response to Request X.E.3.k.)?

Yes No N/A

If no, possible violations include: 119(f)(1)(i) – if: 1) the employer failed to develop Blowdown operating procedures, 2) the employer did not fully develop Blowdown operating procedures; or 3) the employer did not implement Blowdown operating

procedures.

10. From interviews with at least one control board operator and two outside operators who operate the Blowdown (s), have these operators received training, either initial or refresher?

Yes No N/A

If no, possible violations include: 119(g)(1) or (2) – the employer failed to provide either initial or refresher training to operators on Blowdown operating procedures.

11. From interviews with at least 3 operators that operate Blowdowns, are Blowdown operating procedures implemented as written?

Yes No N/A

If no, possible violations include:

- a. 119(f)(1) – if 1) the employer failed to develop a Blowdown operating procedure; 2) the employer did not develop Blowdown operating procedures that provide clear instructions for safely conducting activities, or 3) the employer did not implement Blowdown operating procedures as written;
- b. 119(f)(1)(ii)(A) – the employer did not include/describe the consequences of deviating from the operating limits contained in the Blowdown operating procedure;
- c. 119(f)(1)(ii)(B) – the employer did not include/describe the steps required to correct or avoid deviating from the operating limits contained in the Blowdown operating procedure; or
- d. 119(f)(1)(i)(D) or (E) – the employer did not specify the actions in the EOP or the ESP that the operator(s) must take when they are alerted to a high liquid level in the Blowdown drum.

D. Vessels

1. Do the history files for the 6 pressure vessels randomly selected as per Section X.E.3.aa. contain at least the following PSI?
 - a. Design documents including, but not limited to, pressure vessel identification number and description; contents and specific gravity; design operating temperature and pressure; overall dimensions; materials of construction, design codes and standards used; nozzle schedule; corrosion allowance; post weld heat treatments; type of support; testing procedures to be used; painting and insulation requirements; and fabrication documents such as welding procedures, welder qualifications, code calculations, manufacturer’s data reports, and heat treatment reports;
 - b. Installation documents such as pressure testing records;



- c. In-service/operations documents such as MI procedures for inspecting, testing, and repair reports and detailed reports on periods of abnormal operation (*e.g.*, process/system upsets due to high pressures or high temperatures outside the operating limits that might affect mechanical integrity of the vessel) including an analysis of the vessels integrity due to the abnormal operation;
- d. Repair, alteration and rerating documents such as repair and alteration forms, equipment still in-service with identified deficiencies or recommendations for repair for devices suitable for continued service until repairs can be completed, rerating documentation (*e.g.*, rerating calculations, new design conditions, evidence of stamping, etc.); and
- e. Fitness-for-service assessment documents (See, *e.g.*, API RP 579).

Yes No N/A

If no, possible violations include:

- a. 119(d)(2)(i)(D) – the employer did not include the safe upper and lower limits (when applicable) for pressure, temperature, capacity, flow, composition, pH, etc. in its PSI for specific pressure vessel;
- b. 119(d)(3)(i)(A) - the employer did not include the materials of construction in its PSI for a specific pressure vessel;
- c. 119(d)(3)(i)(F) - the employer’s did not include the design codes and standards used in its PSI for pressure vessels;
- d. 119(d) – the employer did not include all PSI which is required, but not otherwise mandated by another subsection of 119(d) in its written compilation of PSI for pressure vessels; or
- e. 119(m)(1) – the employer did not conduct an incident investigation when a pressure vessel experienced a period of abnormal operation (as described in D.1.c. and C.3.c., above) which affected or might have affected the integrity of the vessel;

Compliance Guidance: In this case, *the abnormal operation is considered an incident. The incident either did or reasonably could have (i.e. , “near-miss”) resulted in a catastrophic release; therefore, the integrity analysis would be part of an incident investigation and report as required by 1910.119(m).*

- 2. Does the employer’s compliance audit include auditing the vessel inspection records, and if so, has the employer audited a representative sample of pressure vessel records?
Yes No N/A

If no, possible violations include: 1910.119(o)(1) – if: 1) the employer failed to conduct compliance audits as required; or 2) the employer did not audit a representative number



of pressure vessel inspection records to verify that the vessel inspection procedures are adequate and are being followed.

Compliance Guidance: An employer should be able to explain its sampling strategies in terms of statistical validity and common sense results. For example, refinery employers typically have hundreds of pressure vessels. If an employer's vessel inspection program "audit" includes the review of only one pressure vessel record, the audit results would not represent a common sense conclusion in terms of confidence in the audit results, and the result would not be statistically valid.

3. For the Selected Unit(s) PHA, has the employer identified deviations involving pressure vessels (e.g., high flow into a pressure vessel), and if so, have all the listed credits/safeguards corresponding to the deviations been properly designed, operated, inspected, maintained, and changed to ensure they will perform as expected by the PHA team?

Yes No N/A

Compliance Guidance: An example of the application of the above question would be a case where the PHA team takes credit for a fire monitor/protection system to protect a reactor vessel from fire (deviation). That safeguard -- the fire monitor/protection system -- must perform as expected because the PHA team has taken credit for it as an effective safeguard. Therefore, the fire protection system must comply with RAGAGEP. An example RAGAGEP for in-service fire protection systems would include NFPA 25 - Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems. The fire protection system must also comply with RAGAGEP for its design and MOC where applicable.

If no, possible violations include:

- a. 119(e)(1) – if: 1) the employer identified/credited a safeguard that was ineffective or inappropriate for the hazard/deviation when it conducted the PHA; or 2) the employer did not adequately evaluate the identified/credited safeguard ("...shall identify, evaluate and control...") when it conducted the PHA;
- b. 119(e)(3)(iii) - the employer used an inadequate engineering or administrative control/ safeguard to protect against a hazard/deviation it identified in its PHA;
- c. 119(d)(3)(ii) - the employer did not design or document that the PHA identified/credited safeguard complies with RAGAGEP;

Compliance Guidance: In this case, when an employer uses equipment which does not meet RAGAGEP requirements, the employer cannot document in their PSI that the equipment does in fact comply with RAGAGEP.

- d. 119(f)(1) – the employer did not develop or did not implement an operating procedure it identified/credited in its PHA as a safeguard for an identified

hazard/deviation;

- e. 119(f)(3) – the employer did not at least annually review and certify an operating procedure was current or accurate when it identified/credited the operating procedure in its PHA as a safeguard for an identified hazard/deviation;
- f. 119(j)(2) – the employer did not ensure that an MI program procedure: 1) had been developed, 2) was current and accurate, or 3) had been implemented when it identified/credited the MI program procedure in its PHA as a safeguard for an identified hazard/deviation;
- g. 119(j)(4)(i) – (iv) – the employer did not inspect and test a safeguard to ensure it functions as intended when it identified/credited the safeguard in its PHA as protection against an identified hazard/deviation; or

Compliance Guidance: See Question C.7.d through g., above for a discussion related to citing 119(j)(4)(i) – (iv) individually for PHA safeguard violations.

- h. 119(l)(1) - the employer changed the safeguard prior to conducting an MOC procedure.
4. From the list of operating procedures (See document request X.E.3.j), randomly select 3 procedures. If pressure vessels are included in these selected procedures, do the procedures list the safety systems that are applicable to the included vessels?
Yes No N/A

If no, possible violations include:

- a. 119(f)(1)(iv) – the employer did not list in its operating procedures, the specific safety systems and their functions which are applicable to the particular pressure vessels; or
- b. 119(d)(3)(i)(H) - the employer did not compile all PSI related to specific safety system associated with a particular pressure vessel.

Compliance Guidance: Examples of safety systems include but are not limited to: emergency relief systems including relief devices, disposal systems and flares; automatic depressurization valves; remote isolation capabilities (aka emergency isolation valves; safety-instrumented-systems (SIS) including emergency shutdown systems, and safety interlock system; fire detection and protection systems; deluge systems; fixed combustible gas and fire detection system; safety critical alarms and instrumentation; uninterruptible power supply; dikes; etc.

5. Does the employer have a mechanical integrity (MI) procedure for inspecting non-metallic linings of pressure vessels?
Yes No N/A

If no, possible violations include:

- a. 119(j)(2) – if: 1) the employer did not develop MI program procedures for pressure vessels which include non-metallic linings; 2) the employer did not implement MI program procedures for pressure vessels which have non-metallic linings ; or
 - b. 119(j)(4)(ii) – the employer or “owner/user” did not follow RAGAGEP when it failed to: 1) develop inspection and testing procedures for pressure vessels with non-metallic linings; or 2) inspect (or the inspections were incomplete) pressure vessels with non-metallic linings per RAGAGEP (Some examples of RAGAGEP for developing and implementing pressure vessel inspection procedures includes API 510, Section 4.3 – *Owner-User Organization Responsibilities*; API 572, Section 8.4.5, *Inspection of Nonmetallic Linings*; CCPS [Ref.33], Chapter 6 – *MI Program Procedures* including *Table 6-1, Example MI Procedures* and *Table 9-13, Mechanical Integrity Activities for Pressure Vessels*).
6. Randomly select three pressure vessels which have integrally bonded liners such as strip lining or plate lining from the list requested in X.E.3.z. Is there an MI procedure which requires that the next scheduled inspection after an on-stream inspection be an internal inspection?
- Yes No N/A

If no, possible violations include:

- a. 119(j)(2) – if the employer did not: 1) develop an MI program procedure for pressure vessels which have integrally bonded liners, or 2) the employer did not implement the MI program procedure for pressure vessels with integrally bonded liners;
- b. 119(j)(4)(ii) – the employer or “owner/user” did not follow RAGAGEP when it did not: 1) develop MI inspection procedures for pressure vessels with integrally bonded liners; or 2) inspect (or the inspections were incomplete) pressure vessels with integrally bonded liners as required by RAGAGEP (Example RAGAGEPs for developing and implementing pressure vessel inspection procedures include API 510, Section 4.3 – *Owner-User Organization Responsibilities* and API 510, Section 6.4);

Compliance Guidance: Incorporating RAGAGEP into Procedures. Whether an employer can simply incorporate a RAGAGEP into 119(j)(2) MI program procedure (or any PSM standard) depends on whether the RAGAGEP provides specific instructions/actions or whether the RAGAGEP is generic/vague to the extent that employees required to follow a procedure would be left to interpret the RAGAGEP’s requirements absent other instructions from their employer. If the MI program procedure incorporates the RAGAGEP (or a section of a RAGAGEP) as one of its MI program procedures, and that RAGAGEP/MI program procedure provides sufficient specific instructions/ actions, then the RAGAGEP/MI program procedure would be adequate for the employer to safely manage the on-going integrity of the process.

For example, the employer could specify in its 1910.119(j)(2), written MI program procedure that it is incorporating/ following API 510, Section 6.4 for scheduling on-

stream versus internal inspections for pressure vessels with integrally bonded liners. This is acceptable because the instruction or action required by this particular section is specific – “...If the requirements of item b (See item b.5. related to non-integrally bonded liners) above are not met..., the next scheduled inspection shall be an internal inspection.”

If the employer’s MI procedure for pressure vessel inspection simply incorporates API 510 in its entirety, it would not comply with 1910.119(j)(2) because many of the provisions in API 510 are generic and do not adequately provide the specific instructions necessary to manage the MI of the covered process. To illustrate this, in Question #7 below, one of the RAGAGEP for establishing thickness-monitoring-locations (TML), API 510, Section 6.4., provides a specific requirement to establish TML, but it only provides generic/vague guidance on the locations and the number of TML required to be established for pressure vessel inspections. This section of API 510 requires pressure vessel inspectors to interpret what it meant by, “A representative number of thickness measurements must be conducted on each vessel...For example the thickness for all major components (shells, heads, cone sections) and a representative sample of vessel nozzles should be measured...” . Using only the generic guidance provided by this RAGAGEP for establishing TMLs would not comply with the requirements of 1910.119(j)(2) because the employer has the responsibility to develop an MI program procedure that clearly establishes the specific number and locations of TML for each of their pressure vessels. By establishing MI program procedures which provide clear requirements, employers assure that inspectors are conducting thorough inspections of their pressure vessels.

- c. 119(d)(3)(ii) – the employer did not comply with RAGAGEP when it failed to conduct inspections of pressure vessels with integrally bonded liners, or because the inspections were incomplete (An example RAGAGEP for inspecting pressure vessels with integrally bonded liners includes API 510, Section 6.4 and API 572, Section 10.4.5).

Compliance Guidance: The employer cannot document that PSI related to equipment/pressure vessels meets RAGAGEP if it has not conducted a thorough inspection of the equipment.

- 7. Does the employer have a MI procedure for establishing thickness measurement locations (TML) in pressure vessels, and does the employer implement that procedure when establishing the TML?

Yes No N/A

If no, possible violations include:

- a. 1910.119(j)(2) – the employer did not : 1) develop an MI program procedure for establishing TML for pressure vessels, or 2) implement the MI program procedure for establishing TML for pressure vessels; or

- b. 119(j)(4)(ii) – the employer did not follow RAGAGEP when it failed to: 1) inspect a pressure vessel at the designated TML; or 2) conduct a thorough pressure vessel inspection by inspecting only at the designated TML, when the number of designated TML was less than adequate (Example RAGAGEP for inspecting pressure vessels at designated TML include, but are not limited to, API 510, Section 6.4., API 572, Section 10.5, and CCPS [Ref. 33], *Section 4.1.2, Developing Sampling Criteria*).

Compliance Guidance: See the discussion in Question #6 above, on incorporating RAGAGEP into procedures.

8. Randomly select three insulated pressure vessels that operate between 25 °F and 250 °F from the pressure vessel list (see document request in Section X.E.3.z.). Does the employer have a MI procedure for inspecting pressure vessels for corrosion-under-insulation (CUI), and does the employer inspect pressure vessels for CUI?
Yes No N/A

If no, possible violations include:

- a. 119(j)(2) – the employer did not: 1) develop MI program procedures for CUI inspections; or 2) implement the developed MI procedures for CUI inspections;
- b. 119(j)(4)(ii) – the employer or “owner/user” did not follow RAGAGEP when it did not develop inspection procedures for CUI, or the employer did not conduct or complete external CUI inspections (Example RAGAGEP for developing and implementing pressure vessel inspection procedures include, but are not limited to, API 510, Section 4.3 – *Owner-User Organization Responsibilities*; Example RAGAGEP for external CUI inspections for pressure vessels include API 510, Section 6.3, API 572, Section 10.3.11 and CCPS [Ref. 34], Section 8.3 *Corrosion Under Wet Thermal Insulation*).
9. If the employer has an MI procedure for inspecting pressure vessels, are they inspecting their vessels at least as often as that called for in their MI procedure? Use the pressure vessel list produced in response to document request X.E.3.z.
Yes No N/A

If no, possible violations include:

- a. 1910.119(j)(2) – if: 1) the employer did not list inspection frequency requirements in its MI program procedures for inspecting pressure vessels; or 2) the employer did not implement pressure vessel inspections per the required inspection frequencies listed in the MI program procedures;
- b. 119(j)(4)(i) – the employer has failed to inspect a particular pressure vessel when required;
- c. 119(j)(4)(iii) - the employer did not inspect a particular pressure vessel as frequently as required by RAGAGEP. Example RAGAGEP for pressure vessel inspection



frequency includes, but is not limited to, API 510, Sections 6.3 and 6.4., API 572, Section 9, CCPS [Ref. 33], *Table 4-4, ITPM Plan in Tabular Form*, and *Table 9-13, Mechanical Integrity Activities for Pressure Vessels*.

Compliance Guidance: To determine if any of the pressure vessels are overdue for inspection, 1) use the list of pressure vessels that was requested (See Section X.E.3.z) to determine if any of these pressure vessels are not being inspected per the employer's MI procedure/schedule, and 2) use the requested work order list (See Section X.E.3.ee), to determine if any pressure vessels have inspection work orders that are overdue. This information may be found in open/not completed work orders.

If prior operating conditions/experience have shown to deteriorate a pressure vessel, 1910.119(j)(4)(iii) and RAGAGEP generally require the inspection interval to be more frequent (shortened). API 510, Section 6.4 is an example RAGAGEP which addresses the inspection interval adjustment due to deteriorated conditions.

10. Does the employer's MI procedure address testing (e.g., leak testing) and repair of pressure vessels? For example, does the MI procedure indicate how the testing and repair will be conducted and which personnel are authorized to do the testing and repair, including what credentials are required of employees conducting testing and repair?
Yes No N/A

If no, possible violations include:

- a. 1910.119(j)(2) – if: 1) the employer did not develop MI program procedures for testing or repair of pressure vessels, or 2) the employer did not implement MI program procedures for pressure vessel testing or repair;
- b. 119(j)(4)(i) – the employer has failed to test a particular pressure vessel when required;
- c. 119(j)(4)(ii) – the employer did not follow RAGAGEP when it failed to perform adequate test on a pressure vessel (Example RAGAGEP for testing pressure vessels include, but are not limited to API 510, Section 6.5, 7.1.2, and 7.2.10);

Compliance Guidance: API 510 requires in-service pressure vessel tests when the API authorized pressure vessel inspector believes they are necessary.

- d. 119(j)(4)(ii) – the employer did not follow RAGAGEP when it used individual(s) or organization(s) to test or repair pressure vessels who were not qualified and did not possess the credentials as required by RAGAGEP.

Compliance Guidance: RAGAGEP that require credentials include, but are not limited to:

- 1) *Credentials for pressure vessel inspectors, see API 510, Section 4.2.*

- 2) *RAGAGEP for pressure vessel examiners credentials/experience and training requirements, see API 510, Section 3.18.*
 - 3) *RAGAGEP for contractors performing NDE are the training and certification requirements ASNT-TC-1A, see CCPS [Ref. 34], Section 10.3.2.1, (In-service Inspection and Testing) Nondestructive Examination.*
 - 4) *RAGAGEP for qualifications for personnel who conduct pressure vessel repairs, alteration and rerating including qualifications for welders, see API 510, Section 7.2.1 and the BPVC, Section IX.*
 - 5) *RAGAGEP for certifications at CCPS [Ref. 33], Section 5.4 Certifications, Table 5-3, Widely Accepted MI Certifications, and Table 9-13, Mechanical Integrity Activities for Pressure Vessels.*
 - 6) *RAGAGEP requiring the employer to detail the qualifications of inspection and repair personnel (including contract employees) at API 510, Section 4.3. This section requires the owner-user to develop a quality assurance inspection manual which must include requirements for using only qualified inspection and repair personnel per subsections (g), (i), (j), and (k); or*
- e. 119(j)(3) – the employer did not train employees in the MI procedures applicable to the employees’ job tasks - in this case, the MI procedures for inspecting and welding pressure vessels.

Compliance Guidance: This training requirement applies to both host employer’s and contractor employer’s employees performing MI procedures. CPL 02-02-045, Appendix B, pg. B-27, states, “If contract employees are involved in...maintaining the on-going integrity of process equipment, then they must receive training in accordance with specific training requirements set forth in paragraphs (g) and (h), respectively”).

11. Are the pressure vessels in the Selected Unit(s) absent deficiencies?

Yes No N/A

If no, possible violations include: 1910.119(j)(5) - the employer operated deficient pressure vessels without taking necessary means to assure safe operation.

Compliance Guidance: Pressure vessel deficiencies can be discovered by interviewing pressure vessel inspectors who may include personnel from employers, contractors, insurance companies, or State inspectors. These inspectors should be experienced in reviewing pressure vessel inspection records for information related to wall thicknesses below retirement thickness, non-conforming gouging, pitting, vessel wall blistering, non-conforming/deteriorated welds, welds requiring post-weld heat treatment, work orders, and observing any leaks or significant distortion or corrosion of the vessel support structure, vessel insulation breakdown, and reviewing incident reports, etc. Other personnel to interview include welders who have worked on pressure vessels, unit



process engineers, and operators.

12. Based on record reviews and operator interviews, have there been any changes to pressure vessels or other equipment changes that could affect pressure vessel integrity, such as a change to more corrosive feed to the Selected Unit(s) or a change in the type of flange seal material used for the vessel heads or nozzles, etc., that MOC procedures should have addressed?

Yes No N/A

If no, possible violations include: 119(l)(1) – the employer did not conduct an MOC procedure before it changed a pressure vessel or its associated equipment.

13. From the MOC list (See Section X.E.3.ff) identify the oldest MOC procedure which might affect the integrity of one or more pressure vessels in the Selected Unit(s). Does this MOC procedure meet all 1910.119(l) requirements?

Yes No N/A

If no, possible violations include:

- a. 119(l)(1) - the employer did not conduct an MOC procedure prior to changing any aspect of a pressure vessel (any aspect includes the vessel itself; any internal or external associated equipment; or operating parameters such as chemical compositions, flow rates, pressure, temperature, etc.;
- b. 119(l)(2) – the employer did not consider the items listed in (l)(2)(i) through (v) in its MOC procedure prior to making a change to a pressure vessel;
- c. 119(l)(3) - the employer did not inform or train operating, maintenance or contract employees whose job tasks were or could have been affected by a change to a pressure vessel;
- d. 119(l)(4) – the employer did not update the PSI when it made a change to a pressure vessel which required the PSI to be updated; or
- e. 119(l)(5) – the employer did not update operating procedures when required to reflect the change in operation of a pressure vessel.

E. Piping

1. From the Selected Unit(s) P&IDs, randomly select five product piping circuits. For each of the five selected piping circuits, is there information in the MI piping inspection procedures or other PSI that indicates:

Compliance Guidance: From API 570 Section 3.3.1, the term “piping circuit” means a section of piping that has all points exposed to an environment of similar corrosivity and that is of similar design conditions and construction materials. Complex process units or piping systems are divided into piping circuits to manage the necessary inspections,

calculations, and record keeping. When establishing the boundary of a particular piping circuit, the piping inspector may also size it to provide a practical package for record keeping and performing field inspections.

- a. the original installation date;
- b. the specifications--including the materials of construction and strength levels;
- c. the original thickness measurements;
- d. the locations, dates and results of all subsequent thickness measurements;
- e. the “Retirement thickness”;
- f. The “piping service class” (See API 570, Section 6.2);
- g. the previous repairs and replacements; and
- h. the pertinent operational changes (*e.g.*, changes in service, operations outside normal limits).

Yes No N/A

If no, possible violations include:

- a. 119(d)(3) - the employer did not compile all PSI for use in process safety activities related to piping containing hazardous materials;

Compliance Guidance: Process safety activities include, but are not limited to, design, PHA, inspection, testing, repair, MOC, etc.;

- b. 119(j)(4)(ii) – the employer did not follow RAGAGEP for piping inspections when it failed to compile necessary and complete piping inspection records (Example RAGAGEP for piping inspection records, include but are not limited to, API 570, Section 7.6, API 574, Section 12.1, CCPS [Ref. 33], Table 9-3, *RAGAGEPs for Process Piping*, Table 9-14, *Mechanical Integrity Activities for Piping Systems*).

Compliance Guidance: See employer response to document request X.E.3.t. and v. for its MI procedures for piping inspections.

2. From the selected five product piping circuits, can it be determined from the PSI which codes and standards were used by the employer for its piping design, *e.g.*, ASME B31.3?

Yes No N/A

If no, possible violations include: 119(d)(3)(i)(F) - the employer did not include in its PSI codes and standards used in the design of piping systems.



3. Review the inspection history for the five selected product piping circuits, is there anomalous data that has not been resolved (*e.g.*, the current thickness reading for a TML indicates the pipe wall thickness is greater/thicker than the previous reading(s) with no other explanation as to how this might occur)?

Yes No N/A

If no, possible violations include:

- a. 119(j)(2) – if 1) the employer did not develop an MI program procedure for resolving anomalous inspection data, or 2) the employer did not implement an MI program procedure for resolving (*i.e.*, steps to be taken) piping inspection data which indicated anomalous data; or
- b. 119(j)(4)(ii) – the employer did not follow RAGAGEP when it did not resolve anomalous piping inspection data (Example RAGAGEP related to the quality of piping inspection data include, but are not limited to, API 570, Section 4.3.1.c, *Owner-User Organization Responsibilities*, “4.3.1...These systems and procedures will be contained in a quality assurance inspection manual or written procedure and shall include:...c. Documenting and reporting inspection and testing results” and API 570, Section 4.4, “...all examination results must be evaluated and accepted by the API authorized pressure vessel inspector”).
4. Have piping inspections been conducted on the 5 selected product piping circuits on a schedule consistent with the employer’s MI procedure for inspecting piping and RAGAGEP (See, *e.g.*, API 570)?

Yes No N/A

If no, possible violations include:

- a. 119(j)(2) – if: 1) the employer did not develop an MI program procedure which included the required inspection and testing frequencies for piping systems; or 2) the employer did not implement a MI program procedure requiring piping inspections and tests to be performed at a frequency/schedule at least as often as specified; or
- b. 119(j)(4)(iii) – the employer did not follow RAGAGEP when it did not inspect or test piping sections at intervals prescribed by RAGAGEP (Example RAGAGEP for piping inspection frequency include, but are not limited to, API 570, Section 6, *Frequency and Extent of Inspection*; API 574, Section 7.1; and CCPS [Ref. 33], *Table 8-2, Examples of Acceptance Criteria for Common Types of Equipment*, *Table 9-3, RAGAGEPs for Process Piping*, and *Table 9-14 Mechanical Integrity Activities for Piping Systems*).

Compliance Guidance: – If prior operating conditions/experience have shown to deteriorate piping systems, 1910.119(j)(4)(iii) and RAGAGEP generally require the inspection interval to be more frequent (shortened).

Based on the degradation of the piping, each piping circuit could have different

inspection intervals.

5. Have each of the 5 selected product piping circuits been classified according to their consequences failure?
Yes No N/A

If no, possible violations include:

- a. 119(j)(2) – if: 1) the employer did not develop an MI program procedure that required piping inspections to be based on a classification system which prioritizes piping inspections based on consequences of failure; or 2) the employer did not implement the MI program procedure that required piping inspections based on a classification system that prioritizes piping inspections based on consequences of failure;
- b. 119(j)(4)(ii) – the employer did not follow RAGAGEP when it did not inspect piping based on a classification system related to its consequences of failure (Example RAGAGEP for classifying piping include, but are not limited to, API 570, Section 6.2, *Piping Service Classes* and API 574, Section 7.1).

Compliance Guidance: If the employer inspects and tests all piping the same, regardless of the consequence of failure of the piping (i.e., piping inspections are implemented using the same MI program (1910.119(j)(2) and action/task (1910.119(j)(4) procedure for all piping without consideration of their consequence of failure or other operational criteria), then this question is not applicable.

6. Does the piping inspection MI procedure require corrosion-under-insulation (CUI) inspections?
Yes No N/A

If no, possible violations include:

- a. 119(j)(2) – if: 1) the employer did not develop an MI program procedure for CUI inspections; or 2) the employer developed, but failed to implement the MI program procedure for CUI inspections; or
- b. 119(j)(4)(ii) – the employer did not follow RAGAGEP when it failed to inspect piping for CUI (Example RAGAGEP for CUI piping inspections include, but are not limited to, API 570, Section 6.4, *Extent of Visual External and CUI Inspections*; API 574, Section 6.3.3, *Corrosion Under Insulation (CUI)*; CCPS [Ref. 34], Section 8.3 *Corrosion Under Wet Thermal Insulation*).

7. From the Selected Unit(s) P&IDs, identify three injection points on product piping. Does the employer's MI procedure for piping inspections list criteria/steps to be followed when establishing TML for injection points in piping circuits?
Yes No N/A

If no, possible violations include:

- a. 119(j)(2) – if: 1) the employer did not develop an MI program procedure for establishing TML for injection points and nearby piping; 2) the employer did not implement the MI program procedure for establishing TML for injection points and nearby piping or 3) the employer did not implement the MI program procedure for conducting the required injection point inspections;
- b. 119(j)(4)(ii) – the employer did not follow RAGAGEP for piping inspection and testing when it failed to: 1) establish TML for injection points and nearby piping; or 2) inspect injection points and nearby piping at the designated TML (Example RAGAGEP for piping inspections related to injection points include, but are not limited to, API 570, Section 5.3.1, *Injection Points* and API 574, Section 6.3.1, *Injection Points*).

8. Based on a review of piping inspection records, are piping deficiencies absent?
Yes No N/A

If no, possible violations include: 119(j)(5) - the employer operated deficient piping systems without taking necessary means to assure safe operation.

Compliance Guidance: An example of a piping deficiency would be a situation where piping inspection data indicates that its actual wall thickness is less than its retirement thickness, and the employer has conducted no other evaluation to determine if the piping is safe for continued operation. For a discussion on equipment deficiencies see IX.A.3-- the definition of deficient/deficiency.

9. Considering the five production piping circuits randomly selected, can the employer demonstrate that the piping was installed according to design specifications?
Yes No N/A

If no, possible violations include:

- a. 119(j)(6)(ii) – the employer did not conduct appropriate checks and inspections to ensure piping was installed according to design specifications;

Compliance Guidance: CCPS, [Ref. 35] in Section 8.3.2, subtitles Design Basis for Equipment Selection; Equipment Fabrication, Inspection and Testing; and Equipment Installation on RAGAGEP and [Ref. 33], Section 7.6, Construction and Installation include discussions on the need for quality assurance procedures to assure as-built equipment/piping will perform as designed.

- b. 119(i)(2)(i) – the employer did not ensure that piping construction and equipment was in accordance with its design specifications before the process startup;

Compliance Guidance: One way to discover whether an employer has complied with this requirement is to use field observations to determine whether the five process piping circuits' actual construction matches both their isometric drawings and "as-built" drawings.

- c. 119(d)(3)(ii) – the employer did not comply with RAGAGEP when it failed to construct or install piping systems in accordance with the system design.

Compliance Guidance: The employer cannot document that the piping system construction or installation complies with RAGAGEP if it was not constructed or installed in accordance with its design.

10. Does the employer ensure that replacement piping is suitable for its process application?

Yes No N/A

If no, possible violations include:

- a. 119(j)(4)(ii) – the employer did not follow RAGAGEP when it failed to conduct positive material identification (PMI) testing to ensure that construction materials of replacement/repaired piping were adequate for process conditions (An example RAGAGEP for PMI testing for existing piping systems includes but is not limited to, API RP 578 *Material Verification Program for New and Existing Alloy Piping Systems*, Section 4.3, and CSB, [Safety Bulletin – Positive Material Verification: Prevent Errors During Alloy Steel Systems Maintenance, BP Texas City, TX Refinery Fire](#));

- b. 119(j)(6)(ii) – the employer did not conduct checks and inspections to assure replacement piping was properly installed according to design specifications;

Compliance Guidance: The employer must be able to demonstrate its performance in complying with PSM requirements. One way an employer can demonstrate performance is by showing a CSHO how it follows or complies with a quality assurance procedure for piping replacements.

- c. 119(j)(6)(iii) – the employer did not assure prior to replacing piping, that the replacement piping was suitable for its application;
- d. 119(j)(5) - the employer operated replacement piping systems outside acceptable limits (*i.e.*, the replacement piping did not conform to its piping design specifications).
- e. 119(d)(3)(ii) – the employer did not comply with RAGAGEP when it failed to install replacement piping in accordance with its piping design specifications.

Compliance Guidance: In this case, when an employer uses equipment which does not meet RAGAGEP requirements, the employer cannot document in their PSI that



the equipment complies with RAGAGEP.

Typically, piping replacements are replacements-in-kind (RIK) when the process service does not change. However, if the piping replacement is not a RIK, then an MOC procedure is required per 1910.119(l).

11. Does the employer's MI procedure list required piping inspectors' qualifications, welders' qualifications for welding on process piping, and when qualified welding procedures are required?
Yes No N/A

If no, possible violations include:

- a. 119(j)(2) – if: 1) the employer did not develop an MI program procedure that includes requirements for: piping inspectors' qualifications; welders' qualifications for welding on process piping; or when qualified welding procedures are required; and 2) the employer did not implement the MI procedure that specifies and requires piping inspectors' qualifications, welders' qualifications for welding on process piping, and when qualified welding procedures are to be used;
- b. 119(j)(4)(ii) – the employer did not follow RAGAGEP when it failed to use qualified inspectors to inspect piping as required by RAGAGEP. Example RAGAGEP for piping inspector qualifications include, but are not limited to:
- API 570, Sections 4.2, *API Authorized Piping Inspector Qualification and Certification* and Section 3.5;
 - API 570, Section 3.12 for NDE examiners;
 - CCPS – [Ref. 34], Section 10.3.2.1, (In-service Inspection and Testing) *Nondestructive Examination* (NDE), requires ASNT-TC-1A training and certification credentials for personnel conducting non-destructive examinations;
 - CCPS [Ref. 33], *Table 5-3, Widely Accepted MI Certifications*; and *Table 9-14, Mechanical Integrity Activities for Piping Systems*; and
 - API 570, Section 4.3.1, *Owner-User Responsibilities* that specify the need for a quality assurance inspection manual that specifies the training requirements and controls necessary to assure that only qualified inspectors and examiners, including contractors are inspect piping.

F. Operating Procedures – Normal Operating Procedures (NOP), Emergency Shutdown Procedures (ESP) and Emergency Operations (EOP)

1. From the list of operating procedures (See X.E.3.j), randomly select four ESP for the Selected Unit(s). Are there ESP for the Selected Unit(s), and if so, do these ESP



specify the conditions that require an emergency shutdown?

Yes No N/A

If no, possible violations include 119(f)(1)(i)(D) – if: 1) the employer has not developed ESP when required; 2) the employer developed, but failed to implement ESP;

Compliance Guidance: ESP are usually warranted during events that may include, but are not limited to, the failure of process equipment (e.g., vessels, piping pumps, etc.) to contain or control HHC releases, loss of electrical power, loss of instrumentation or cooling, fire, explosion, etc. When EOP do not succeed during upset or emergency conditions in returning the process to a safe state, implementation of an ESP may be necessary.

When normal operating limits for parameters such as pressure, temperature, level, etc., are exceeded during an excursion, system upset, abnormal operation, etc., a catastrophic release can occur if appropriate actions are not taken. These actions must be listed in the EOP and must specify the initiating conditions or the operating limits for the EOP (e.g., temperature exceeds 225°F or pressure drops below 15 psig). 1910.119(f)(1)(ii)(A) requires that EOP list operating limits and their “consequences of deviations”. Inherent in this requirement is the information related to the initiating conditions (entry point) that would require an EOP. Next, the EOP must list the steps required to correct the deviation (119(f)(1)(ii)(B)) or to specify actions required to mitigate or stabilize the situation.

Information typically listed in EOP and/or ESP includes, but is not limited to the responsibilities for performing actions during an emergency, required PPE, additional hazards not present during normal operations, consequences of operating outside operating limits, steps to shutdown the involved process in the safest, most direct manner, conditions when operators must invoke the emergency response plan, or scenarios when they themselves must stop and evacuate. For more information on EOP and ESP, see, e.g., CCPS [Ref.32], Chapter 6, Writing Emergency Operating Procedures.

2. From interviews with at least three control board operators in the Selected Unit(s), have these operators received sufficient training, initial and refresher, to be qualified to shutdown the Selected Unit(s) per the requirements of 119(f)(1)(i)(D)?

Yes No N/A

If no, possible violations include: 119(g)(1) or (2) - the employer did not provide initial or refresher training in ESP to operators who are required to shutdown a process in a safe and timely manner during an emergency.

3. Do the ESP specify that qualified operators are assigned authority to shutdown the Selected Unit(s)?

Yes No N/A



If no, possible violations include:

- a. 119(f)(1)(i)(D) – if the employer did not specify in its ESP: 1) which operators are assigned authority to shutdown a process during an emergency; or 2) the qualifications required of operators who are expected to shutdown the process during an emergency; or
 - b. 119(f)(1)(i)(D) – if: 1) the employer failed to provide actual shutdown authority to operators; or 2) the qualified operators specified as having authority to shutdown the process during an emergency, must first seek and gain approval before shutting down the process in a safe and timely manner.
4. Based on interviews with a minimum of three control board operators in the Selected Unit(s), even if the response to #2 above is *Yes*, are qualified operators authorized or permitted to initiate an emergency shutdown of the unit without prior approval?
Yes No N/A

If no, possible violations include: 119(f)(1)(i)(D) – the employer did not implement the ESP in a manner which ensured a safe and timely shutdown.

5. From the list of operating procedures (See X.E.3.j) for the Selected Unit(s), randomly select two EOP. Do these procedures identify the “entry point,” *i.e.*, the initiating/triggering conditions or operating limits (see 1910.119(f)(1)(ii)) when the EOP is required, the consequences of a deviation from the EOP, and the steps required to correct a deviation/upset once the operating limits of the NOP have been exceeded?
Yes No N/A

If no, possible violations include:

- a. 119(f)(1)(i)(E) – the employer: 1) did not develop a required EOP; or 2) developed, but failed to implement a required EOP;
 - b. 119(f)(1)(ii) – the employer did not list in an EOP the operating limits (entry/trigger point) for when the EOP is applicable/required;
 - c. 119(f)(1)(ii)(A) – the employer did not list in an EOP the consequences of deviation from the specified operating limits; and
 - d. 119(f)(1)(ii)(B) - the employer did not list in an EOP the steps required to correct or avoid deviation.
6. From the list of operating procedures (See X.E.3.j) for the Selected Unit(s), randomly select 2 NOP. Do these NOP list the normal operating limits or “exit points” from NOP to EOP; the steps operators should take to avoid deviations/upsets; and the precautions necessary to prevent exposures, including engineering and administrative controls and PPE?



Yes No N/A

If no, possible violations include:

- a. 119(f)(1)(i)(B) – the employer: 1) did not develop a required NOP; or 2) failed to implement a required NOP;
- b. 119(f)(1)(ii) – the employer did not list the operating limits in a NOP (exit point from NOP to EOP to identify when the NOP is applicable/required);
- c. 119(f)(1)(ii)(A) - the employer did not list the consequences of deviation from the specified operating limits in a NOP; and
- d. 119(f)(1)(ii)(B) - the employer did not list the steps required to correct or avoid deviation in an NOP.

Compliance Guidance: 1910.119(f)(1)(ii) requires that all written operating procedures include "operating limits". For NOP, the "operating limits" required are those operating parameters that if they exceed the normal range or operating limits, a system upset or abnormal operating condition would occur which could lead to operation outside the design limits of the equipment/process and subsequent potential release. These operating parameters must be determined by the employer and can include, but are not limited to, pressure, temperature, flow, level, composition, pH, vibration, rate of reaction, contaminants, utility failure, etc.

It is at the point of operation outside these NOP "operating limits" that EOP procedures must be initiated. There may be a troubleshooting area defined by the employer's EOP where operator action can be used to bring the system upset back into normal operating limits. During this troubleshooting phase, if an operating parameter reaches a specified level and the process control strategy includes automatic controls, other safety devices (e.g., safety valves or rupture disks) or automatic protection systems (e.g., safety instrumented systems/emergency shutdown systems), would activate per the process design to bring the process back to a safe state. Typically, once the predefined limits for troubleshooting have been reached for a particular operating parameter, the process has reached a "never exceed limit". A buffer zone is typically provided above (and below if applicable) the trouble shooting zone ("never exceed limit") to ensure the operating parameters do not reach the design safe upper or lower limit of the equipment/process ((1910.119(d)(2)(i)(D), require these design limits to be documented in the PSI). This design safe upper and lower limits of the equipment or process are also known as the boundaries of the design operating envelope or the limit above (or below) which it is considered unknown or unsafe to operate. Once the operating parameter(s) reach the buffer zone entry point, there is no designed or intentional operator intervention (i.e., troubleshooting) to bring the process system upset back to a safe state. Any intervention in the buffer zone is as a result of the continued activation of the safety devices and automatic protection systems which initially activated at the predefined level during the troubleshooting phase. All of these predefined limits are important

information for operators to know and understand and must be included in the PSI and operating procedures.

As shown above, there is a distinction between the 1910.119(f)(1)(ii) requirement for listing the "operating limits" for the normal range of operating parameters and the design safe upper and lower limit of the equipment or process. Since it is necessary to define the design envelope which establishes how various conditions/operating parameters may vary within the safe upper and lower limits, but may not exceed those limits, 1910.119(d)(2)(i)(D) requires that the employer include the design operating envelope or the safe upper and lower limits for the operating parameters of the equipment or process in its PSI (See e.g., CCPS [32], Chapter 6, Writing Emergency Operating Procedures and CCPS [40], Appendix 12B, Example of Critical Operating Parameters: Interpretation Guidelines). If the employer has not included the safe upper and lower limits for the design operating parameters of its equipment/process, CSHOs may cite 1910.119(d)(2)(i)(D).

7. From interviews with at least three operators, are operating procedures implemented as written?
Yes No N/A

If no, possible violations include: 119(f)(1) – if: 1) the employer did not develop operating procedures when operators performed operation tasks requiring written operating procedures; 2) the employer did not provide clear instructions in its operating procedures for safely conducting activities; or 3) the employer did not ensure that operating procedures were being implemented as written.

Compliance Guidance: CSHOs might use the background information and examples below of why operators do not sometimes follow procedures to form interview questions. Examples include, but are not limited to: 1) operators do not follow procedures because they are confusing; 2) operators believe there is a more effective way to accomplish the task/procedure than the way prescribed in the required procedure; 3) the time required to carry out the procedure makes it difficult to complete as required; 4) the physical layout of the site makes it impossible to conduct the specified procedure (e.g., a ladder must be climbed to access an instrument while simultaneously having to complete another task at ground level).

8. From the list of operating procedures (see X.E.3.j) for the Selected Unit(s), randomly select 10 operating procedures. Has the employer certified at least annually that these 10 procedures are current and accurate?
Yes No N/A

If no, possible violations include: 119(f)(3) – the employer did not certify at least on an annual basis that the operating procedure was current and accurate.

G. PHA, Incident Investigation, and Compliance Audits Findings/Recommendations

1. Have all findings/recommendations from PHAs, incident investigations and compliance audits been resolved?

Yes No N/A

If no, possible violations include:

- a. 119(e)(5) – if the employer did not: 1) promptly address the team's findings and recommendations; and 2) ensure the recommendations were resolved in a timely manner;
 - b. 119(m)(5) – the employer did not resolve findings or recommendations from incident investigations;
 - c. 119(o)(4) – the employer did not determine or document an appropriate response to each audit finding.
2. Have all corrective actions from PHAs, incident investigations and compliance audits been corrected and documented?

Yes No N/A

If no, possible violations include:

- a. 119(e)(5) – the employer did not: 1) resolve PHA recommendations; 2) document both PHA resolutions and actions to be taken; or 3) complete PHA actions to resolutions or did not complete them as soon as possible;
- b. 119(m)(5) – the employer did not: 1) resolve incident investigation findings or recommendations; or 2) document resolutions or corrective actions;
- c. 119(o)(4) – the employer did not: 1) appropriately respond to audit findings/deficiencies; or 2) document that audit findings/deficiencies had been corrected; and
- d. 119(j)(5) – the employer did not correct deficiencies in equipment/equipment systems before further use when the deficiencies were identified in a PHA, incident investigation, or compliance audit.

Compliance Guidance: There may be instances when a PHA team identifies deficiencies in equipment/systems which would violate the requirements of 119(j)(5) if left uncorrected. If the employer continues to operate the deficient equipment/system, it must take interim measures per 119(j)(5) to assure safe operation, and it must also meet the 119(e)(5) requirements to resolve the findings and recommendations related to the identified deficiency.

The phrase from 119(j)(5), “safe and timely manner when necessary means are taken to assure safe operation”, when taken in conjunction with 119(e)(5) means

that when a PHA team identifies a deficiency in equipment/systems and the employer does not correct the deficiency before further use, the employer's system for promptly addressing the PHA team's findings and recommendations must assure: 1) that the recommendations are resolved in a timely manner and that the resolutions are documented; 2) the employer has documented what actions are to be taken, not only to resolve the recommendation, but to assure safe operation until the deficiency can be corrected; 3) that the employer complete actions as soon as possible; and 4) that the employer has developed a written schedule describing when corrective actions related to the resolution and any interim measures to assure safe operations will be completed.

The system that promptly addresses and resolves findings and recommendations referred to in both 1910.119(e)(5) and 1910.119(m)(5) are not requirements to develop a management program for globally addressing the resolution of findings and recommendations. Rather, these "system" requirements address how each specific finding and recommendation will be individually resolved. Each finding or recommendation will have its own unique resolution based on its nature and complexity.

3. Has the PHA of the Selected Unit(s) incorporated all the previous incidents since May 26, 1992 that had a likely potential for catastrophic consequences?
Yes No N/A

If no, possible violations include:

- a. 119(e)(3)(ii) – the employer did not incorporate information from a prior incident investigation into the next PHA conducted after the incident;
- b. 119(m)(1) – the employer did not conduct a required incident investigation; or
- c. 119(m)(4) – the employer did not prepare a report as required after it investigated an incident.

Compliance Guidance: The incident investigation report must include all information required by 1910.119(m)(4)(i) through (v).

Refer to response to document request X.E.3.gg for a list of incident investigations. Cross check this list against the incidents incorporated into the employer's PHA. Also, interview employees to determine if there were other actual or "near-miss" incidents which were not included in the employer's PHA or response to X.E.3.gg.

H. Facility Siting

1. Does the PHA for the Selected Unit(s) consider the siting of all occupied structures?
Yes No N/A

If no, possible violations include:

- a. 119(e)(3)(v) – the employer did not consider all of the occupied structures when it evaluated facility siting in the PHA;

Compliance Guidance: Facility siting considerations for occupied structures include both permanent and temporary (e.g., trailers) structures.

Global/generic facility siting questionnaires/checklists. Some employers (PHA teams) attempt to comply with this 1910.119(e)(3)(v) requirement by answering global/generic facility siting questions on a short questionnaire/checklist. PSM is a performance standard and the means the employer uses to comply with the standard are generally up to them as long as their performance ensures compliance with the requirement of the standard. If the employer uses a questionnaire/checklist as part of its PHA to identify, evaluate and control all hazards associated with facility siting, this is permissible as long as the method they used complies with the PHA methodology requirement, 1910.119(e)(2) and more importantly, all facility siting hazards have been addressed (i.e., identified, evaluated and controlled). This type of methodology would not be compliant if the employer (PHA team) did not have specific justifications for each individual situation/condition that the global/generic questions addressed.

For example, a PHA team responds "Yes" to a questionnaire/checklist asking, "Is process equipment located near unit battery limit roads sited properly?" In this case, OSHA would first expect that the employer (PHA team) would have identified each location where process equipment is sited near a unit battery limit road. Next, OSHA would expect the employer would have evaluated each piece of process equipment located in the vicinity of a roadway. This evaluation is conducted to determine if each of the specific process equipment's siting is adequate/controlled (e.g., guarded by crash barriers, elevated on a concrete pedestal, etc.) to protect it from releasing its hazardous contents should it be struck by vehicular traffic. Without specific justification or other specific evidence that corroborates the employer's "Yes" response to this global/generic questionnaire/checklist question, CSHOs could cite the employer for failing to address process equipment siting near roadways when it conducted its PHA.

- b. 119(d)(3)(ii) – the employer did not comply with RAGAGEP when it failed to protect employees inside inadequately protected (i.e., not protected by adequate separation or building construction) structures that were exposed to explosion, fire, toxic material, corrosive materials, or high pressure hazards as a result of an HHC release from process equipment (Example RAGAGEP for facility siting include, but are not limited to, CCPS [Ref. 38 and 39], API 752, and AIChE/Dow Fire and Explosion Index);

Compliance Guidance: Occupancy Criteria Evaluations for Employee Occupied Structure. OSHA does not accept occupancy criteria evaluations (see API 752, Section 2.5.2) as the basis for an employer's determination that adequate

protection has been provided for employees in occupied structures which employer's have identified as being potentially subject to explosions, fires, ingress of toxic materials or high energy releases. In these occupancy criteria evaluations, the employer identifies vulnerable employee occupied structures and the hazards they may be subjected to, but rather than providing protection to either the structures or employees through measures like employee relocation, spacing, or protective construction, the employer simply accepts the employee exposures as adequate based on their own acceptable occupancy criteria. This occupancy criteria evaluation is solely based on the occupancy threshold criteria an employer is willing to accept. For instance, API 752 list occupancy threshold criteria used by some companies as 400 personnel hours per week as acceptable exposure for employees in an occupied structure, regardless of the magnitude of the hazard these employees are potentially exposed to. The 400 personnel hours per week equates to 2 employees continually exposed in an occupied structure even if that structure has virtually no protective construction and it is sited immediately adjacent to a high pressure-high temperature reactor which contains flammable or extremely toxic materials.

Non-Essential Employees. An employer's PHA facility siting evaluation must consider the presence of non-essential personnel in occupied structures in or near covered processes. The "housing" of these non-essential employees in occupied structures near operating units may expose them to explosion, fires, toxic material, or high energy release hazards. Therefore, unlike direct support/essential personnel (e.g., operators, maintenance employees working on equipment inside a unit, field supervisors, etc.) who are needed to be located in or near operating units for logistical and response purposes, employers (PHA teams) must consider and justify why non-essential employees are required to be located in occupied structures which are vulnerable to the hazards listed above. The term "non-essential" identifies those employees who are not needed to provide direct support for operating processes. Non-essential employees include, but are not limited to, administrative personnel, laboratory employees when they are working inside a lab, maintenance staff when they are working inside maintenance shops/areas, and employees attending training classes.

- c. 119(l)(1) – the employer did not: 1) establish an MOC procedure when a temporary structure (e.g., trailer) which could affect a release or a mitigation of a release was located/placed in the area of or near a covered process; or 2) implement the MOC procedure when a temporary structure which could affect a release or a mitigation of a release was located/placed in the area of or near a covered process.

Compliance Guidance: An example of how a temporary structure could affect a release of HHC would include a situation where a trailer's unclassified electrical system could potentially ignite flammable materials/unconfined vapor cloud if released from the process.

Citations relating to facility siting for temporary structures depend on when the

structure was sited/placed. If the current PHA addresses the siting of a given temporary structure and a violation exists, the PHA requirement, 119(e)(v), would be cited. If the temporary structure was sited after the date of the current PHA and before the next PHA is due, facility siting violations would be cited using appropriate MOC requirements, 119(l)(1) – (l)(5).

- d. 119(l)(2)(i) – the employer did not address the technical basis of the proposed placement (change) of a temporary structure/trailer in its MOC procedure prior to the change; or
- e. 119(l)(2)(ii) - the employer did not address the safety and health impacts of the proposed placement (change) of a temporary structure/trailer in its MOC procedure prior to the change.

I. Human Factors

1. Did the Selected Unit(s) PHA team(s) identify and evaluate whether equipment which is described in procedures, have the same identifier in both the written procedure and the marking/labeling in the field?
Yes No N/A

If no, possible violations include:

- a. 119(e)(vi) – the employer did not identify or evaluate the possibility of human error in its PHA due to confusion when equipment described in a written procedure includes a unique identifier, but the equipment is not labeled/marked with that same identifier in the field, or vice-versa; or
- b. 119(f)(1) – the employer did not provide clear instructions in its operating procedures when it failed to include unique identifiers for the equipment described in the procedure.

Compliance Guidance: If operating employees cannot equate the equipment described in a procedure with equipment located in the field, employee confusion or operating errors may occur resulting in a release from the covered process. By providing unique identifiers for equipment both in written procedures and marking/labeling in the field, operators have less opportunity to be confused or error.

2. Did the Selected Unit(s) PHA team identify and evaluate emergency exit route sign visibility and clarity?
Yes No N/A

If no, possible violations include: 119(e)(3)(vi) - the employer failed to address human factors when it did not consider the lack of clearly visible, understandable exit route signs and instructions.



Compliance Guidance: It is important for the employer (PHA team) to consider all aspects of emergency response and employee evacuation because there are many issues that are related to human factors during emergency situations. Some factors which occur during emergency situations include: employees may not adequately see, hear, or understand the actions they are to take; the task instruction may be confusing; employees may not be able to physically complete a required task; the task may allow for an omission; the task may not provide enough time to be completed before a hazardous condition is realized; etc. Some of the human factors aspects employers must consider during a PHA include, but are not limited to:

- 1) signage – is it easy to read, clear and unambiguous;*
 - 2) routing evacuees through areas of increased danger;*
 - 3) lighting;*
 - 4) accessing emergency isolation valves (EIV) – are EIV located in areas of increased exposure for employees during an emergency or in locations where these EIV are not readily accessed by employees that need to use them during an emergency such as at higher elevations where an employee must either gain access by using stairs or a ladder;*
 - 5) employee alarm system – is it loud enough, clear and are its various signals distinguishable;*
 - 6) safety feature(s) availability during an emergency - does the process control system allow for the by-passing of safety features during periods of testing and calibration, where the safety features are not available during the testing period, or employees may forget to put the safety feature back in-service after the test making it unavailable during emergency operations; or*
 - 7) shutdown of air-handling systems - if employees are required to shutdown the HVAC system for a control building during a release of hazardous materials, can the HVAC system be isolated quickly enough to prevent the intrusion of these materials from the outside?*
3. Did the Selected Unit(s) PHA team identify and evaluate all situations where operators are expected to carry out a procedure to control an upset condition, but would not have enough time to do so based on operating conditions?
Yes No N/A

If no, possible violations include:

- a. 119(e)(3)(vi) - the employer failed to address in its PHA the human factor aspect of providing an adequate amount of time needed by employees to successfully complete all steps of a required procedure during an upset condition; or

- b. 119(f)(1) – the employer did not develop a written operating procedure which provided an adequate amount of time to successfully complete all steps of a required procedure during an upset condition.

Compliance Guidance: Interview two board operators and one outside operator to determine if they know of any operational situations where they would be expected to complete some tasks to control an process upset where past experience or knowledge identify they could not complete the task in the time expected.

4. Did the Selected Unit(s) PHA team identify and evaluate all situations where control room operators need to perform calculations during upset or emergency operating situations?

Yes No N/A

If no, possible violations include: 119(e)(vi) - the employer did not address in the PHA all human factor considerations which affect control room operators performing calculations during situations such as upset conditions or emergency operations.

Compliance Guidance: Interview two control room operators for the Selected Units) to determine whether they must perform calculations during upset or emergency operating situations. If they are required, determine whether the PHA addresses those situations.

5. Did the Selected Unit(s) PHA team identify and evaluate all situations where field employees must close isolation valves during emergencies, but where doing so would expose the employees to hazardous situations? For example, to isolate a large inventory of flammable liquids, a downstream manual isolation valve would need to be closed, but, the isolation valve is located in an area that could be consumed by fire.

Yes No N/A

If no, possible violations include: 119(e)(vi) - the employer did not address all human factors related to closing specific isolation valves during emergency situations when it conducted its PHA.

Compliance Guidance: Some employers (PHA teams) attempt to comply with this requirement by simply addressing some global/generic human factors questions on a short questionnaire/checklist. This type of methodology would not by itself be compliant if the PHA team did not have specific justifications for each of its global/generic responses. For more information on how OSHA views the use of these questionnaires/checklists, see H.1.a. - Compliance Guidance information on global/generic facility siting questionnaires/checklists - their relationship to a performance oriented standard and the need to ensure that all hazards have been addressed (i.e., identified, evaluated and controlled) by the PHA team.

For example, if a PHA team responds "Yes" to a questionnaire/checklist asking whether emergency isolation valves (EIV) are accessible during emergencies, OSHA



would then expect that the PHA team had identified, evaluated, and considered each EIV's accessibility (i.e., would the EIV be located in an area that might be consumed in fire, or is the EIV located above grade).

Without a justification or other evidence showing that the PHA team actually did identify, evaluate, and consider each EIV's accessibility, CSHOs could cite the employer for failure to address the human factor hazard(s) related to each covered EIV.

J. Employee Participation

1. Does the employer's written employee participation plan-of-action (see document request X.E.3.e.) include information on how employees will be consulted on the development of ALL PSM standard elements?

Yes No N/A

If no, possible violations include: 119(c)(1) – the employer did not develop a written employee participation plan-of-action which included information on how employees will be consulted on the development of all PSM standard elements.

2. Does the written employee participation plan-of-action include information on how employees will be consulted on how often operator refresher training is needed? Has the employer implemented its plan-of-action to consult the employees about the operator refresher training frequency?

Yes No N/A

If no, possible violations include:

- a. 119(c)(1) - the employer did not develop an employee participation plan-of-action which: 1) explains how the employer will consult employees regarding the frequency of operator refresher training; or 2) includes the requirement to consult with employees about the appropriate frequency of refresher training; or
 - b. 119(g)(2) – the employer did not: 1) determine an appropriate frequency of refresher training through its consultation with employees; or 2) provide operator refresher training as often as the employer determined based on the employee consultation process.
3. Can the employer demonstrate how they consulted employees to develop the MI element?

Yes No N/A

If no, possible violations include: 119(c)(2) – the employer did not consult employees when it developed the MI element requirements.

Compliance Guidance: From OHA CPL 02-02-045, Appendix B - "Consultation refers to a two-way dialogue between the employer and the employees and their



representatives (where they exist), in which the employer elicits, and responds to, employees' concerns and suggestions bearing upon the elements of process safety management required under this standard. Consultation is therefore more than a way to inform employees about aspects of process safety; it is a process of seeking advice, criticisms, and suggestions from employees and their representatives.

1. The employer should establish a method for informing all employees and their representatives that their process safety concerns and suggestions are welcome. The employer must also establish a mechanism by which it will respond, orally or in writing, to such concerns and suggestions.

2. In addition, the employer should affirmatively solicit the suggestions and concerns of employees and their representatives, who, by virtue of their job responsibilities, actual knowledge, or representative positions, can reasonably be expected to make substantive contributions to the development and evaluation of specific elements of process safety management”.

K. Operator Training

1. Have operating employees been trained on the procedures they are expected to perform? Use the training records of the five randomly selected operating employees (See document request in Section X.E.3.n), to determine the response to this question.

Yes No N/A

Compliance Guidance: An "A" operator might be required to perform a different set of operating procedures than a "C" operator. Therefore, to determine if the employee has in fact been trained on the specific operating procedures they are expected to perform, cross-reference the specific procedures that an individual operator is expected to perform with the training records of the specific procedures for which the individual operator has received training .

If no, possible violations include:

- a. 119(g)(1)(i) – the employer did not provide initial operator training on each specific procedure operators are expected to perform; or
 - b. 119(g)(3) – if: 1) the employer did not document the training, 2) the employer did not document the means used to verify the training, or 3) the employer did not verify that the operator understand the training.
2. Based on the employer’s explanation of their management of operator refresher training (See document request in Section X.E.3.o.), have the five randomly selected operating employees received, completed, and understood the refresher training (See document request in Section X.E.3.n.)? For each employee who operates a process, has the employer ensured that the employee understands and adheres to the current operating procedures and that the refresher training is provided at least every three years-- more often if necessary?

Yes No N/A

If no, possible violations include:

- a. 119(g)(2) – the employer did not provide operator refresher training at least every three years or more often, if necessary (*e.g.*, on a frequency consistent with that determined through consultation with employees); or
- b. 119(g)(3) – if: 1) the employer did not document the training; 2) the employer did not determine that the operator understood the training it received; or 3) the employer did not document how it verified the training .

Compliance Guidance: Interview operating employees to determine if they are receiving refresher training as required.

3. For an employer that utilizes testing and a minimum passing test score to determine whether employees understand their initial and refresher training, is the testing designed to ensure that the trainee understands the proper procedures associated with those questions the trainee answered incorrectly?

Yes No N/A

If no, possible violations include: 119(g)(3) - the employer failed to verify that operating employees understood the training subject matter of the incorrectly answered test questions.

L. P&IDError! Bookmark not defined. Verification

1. From the P&IDs for the Selected Unit(s), select 1 P&ID which contains information on several pieces of processing equipment (*e.g.*, different vessels, a large amount of instrumentation, pumps, exchangers, relief system, etc.). Using the selected P&ID, verify that the equipment in the Selected Unit is as depicted on the P&ID. Is the P&ID up-to-date and accurate based on field observations?

Yes No N/A

If no, possible violations include: 119(d)(3)(i)(B) – the employer did not ensure that PSI depicted on P&IDs was up-to-date and accurate.

Compliance Guidance: This P&ID verification will require CSHOs to determine if the equipment in the Selected Unit(s) is installed as depicted on its corresponding P&ID.

M. Contractor Safety

1. Do interviews with contract employees indicate they are aware of and understand the hazards related to their work and process?

Yes No N/A

If no, possible violations include:

- a. 119(h)(2)(ii) – the host employer did not inform contract employers of the known potential fire, explosion or toxic release hazards related to the contractor’s work and process; or
- b. 119(h)(3)(ii) – the contract employer did not instruct its employees in the known potential fire, explosion or toxic release hazards of the process and the contractor’s work when the contract employer was informed of such by the host employer.

Compliance Guidance: To assist in determining the applicable known potential fire, explosion or toxic release hazards that the host employer must inform the contract employers about, CSHOs should examine the host employer’s PHA. The PHA must identify the hazards of the process – 1910.119(e)(1) and (e)(3)(i). At a minimum, the hazards identified in the employer’s PHA which are applicable to the contractor’s work must be passed (“informed”) from the host employer to the contract employer – 1910.119(h)(2)(ii). In turn, the contract employer must then instruct its employees on the known potential fire, explosion or toxic release hazards of the process (1910.119(h)(3)(ii)), including, at a minimum, those hazards identified in the host employer’s PHA which are applicable to the contractor’s work.

- 2. Identify two contractors currently working on the Selected Unit(s) or that have worked on the Selected Unit(s) in the past. Did the host employer obtain and evaluate the contract employer’s safety information and programs before allowing them to work on the Selected Unit(s)?

Yes No N/A

If no, possible violations include: 119(h)(2)(i) – the employer did not obtain and evaluate the contract employer’s safety information and programs before allowing them to work on or near a covered process.

Compliance Guidance: As PSM is a performance standard, the employer must be able to show how they satisfied/performed their obligation to obtain and evaluate the contract employer’s safety information and programs. The implementation of a host employer’s own program or method for evaluating contract employers’ safety information and programs could be one indicator of compliance with this paragraph. Determine whether the host employer at least follows its own contract employer evaluation procedures, if these procedures exist (A host employer program for evaluating contract employer’s safety information and programs is not a requirement of the PSM standard) .

- 3. During walkaround inspections in the Selected Unit(s), observe contractors’ entry and exits from the Selected Unit(s). Is the employer effectively monitoring and controlling the entrance/exit and work (“presence”) activities of contractors in the Selected Unit(s)?



Yes No N/A

If no, possible violations include:

- a. 119(f)(4) – if the host employer: 1) did not develop safe work practices for the entrance/exit of contract employees to/from the covered process areas; or 2) developed, but failed to implement its safe work practices for contract employees entrance/exit to/from the covered process areas;
 - b. 1910.119(h)(2)(iv) – the host employer: 1) did not develop a safe work practice consistent with (f)(4) for the contract employees to enter, leave, and work in the covered process areas; or 2) developed, but failed to implement their safe work practices for contract employees to enter the covered process areas; or
 - c. 119(h)(3)(iv) – the contract employer did not ensure that contract employees follow the host employer’s safe work practices when entering, exiting, or working in the covered process areas.
4. Does the host employer periodically evaluate the performance of contractors to assure that the contractor’s employees are following ALL the obligations required of contractors per 1910.119(h)(3)?
- Yes No N/A

If no, possible violations include 119(h)(2)(v): if: 1) the employer did not evaluate the performance of contractor(s) at the facility in fulfilling their obligations under (h)(3); or 2) the employer did not periodically evaluate the performance of its contractors in fulfilling their obligations under (h)(3).

Compliance Guidance: The employer must be able to show how it satisfied/performed its obligation to assure that they are periodically evaluating the performance of their contractors in fulfilling their obligations under 1910.119(h)(3). How the host employer conducts these contractor evaluations and how often are matters for the host employer to determine and would be typically based on factors including, but not limited to, the type of contractors at the facility (nested or short term), the number of contractors and their employees, the type and risk associated with the work the contractor’s perform (e.g., opening process equipment, confined space entry, hot work, asbestos abatement, vessel/piping inspections, etc.). As part of this “host employer’s determination”, 1910.119(c)(1) and (c)(2), requires the host employer to consult with its employees on the development of all elements of PSM, including “Contractors” provisions of 1910.119(h).

If the host employer has a contractor safety evaluation procedure which includes requirements ensuring that contractors are being evaluated as often as necessary and it specifies at least those obligations detailed in 1910.119(h)(3) and this procedure is being implemented, then this would be an indication that the host employer is complying with 1910.119(h)(2)(v).



N. Safe Work Practices

1. Does the employer have a safe work practice for opening process equipment (e.g., piping and vessels)?

Yes No N/A

If no, possible violations include:

- a. 119(f)(4) - the employer did not: 1) develop safe work practices for opening process equipment; or 2) implement the safe work practices;

Compliance Guidance: The safe work practices required by this paragraph not only include host employer employees, they also include contractor employees.

- b. 119(h)(3)(iv) – the contract employer did not assure that its employees were following the host employer’s safe work practices for opening process equipment.

2. During walkaround inspections, evaluate 2 ongoing opening process equipment procedures in the Selected Unit(s) and determine whether required safe work practices are being followed.

Yes No N/A

If no, possible violations include:

- a. 119(f)(4) – the host employer did not assure the safe work practice for opening process equipment was being implemented as required; or

- b. 119(h)(3)(iv) – the contract employer did not assure the implementation of safe work practices for opening process equipment which was developed by the host employer per 1910.119(f)(4).

Compliance Guidance: CSHOs may also cite other applicable standards such as [1910.146, Permit-Required Confined Spaces](#), and [1910.147, The Control of Hazardous Energy \(Lockout/Tagout\)](#) in situations where the host or contract employer did not comply with applicable requirements of OSHA’s standards which are considered safe work practices.

3. Does the employer have a safe work practice which it implements for motorized equipment to enter operating units and adjacent roadways?

Yes No N/A

If no, possible violations include: 119(f)(4) – if the employer: 1) did not develop a safe work practice to control fire or explosion hazards when motorized equipment enter or travel (includes parking with the equipment running) on adjacent roadways to operating units that contain flammable or combustible materials; or 2) developed, but failed to implement the safe work practice for motorized equipment entering or traveling on roadways adjacent to operating units that contain flammable or



combustible materials.

Compliance Guidance: "Motorized equipment" includes, but is not limited to automobiles, pickup trucks, fork lifts, cargo tank motor vehicles (CTMV), aerial lifts, welder's trucks, etc.

Motorized equipment, if not properly controlled, can be potential ignition sources if they are near a release of flammable or combustible material, as well as possible impediments to emergency response actions when they are near operating units that are undergoing an emergency.

4. During walkaround inspections in the Selected Unit(s), observe motorized equipment. Is motorized equipment following the requirements of the employer's safe work requirements for entering operating units and adjacent roadways?
Yes No N/A

If no, possible violations include: 119(f)(4) – the employer did not implement its safe work practice for motorized equipment entering or traveling on roadways adjacent to operating units that contain flammable or combustible materials.

5. Does the employer audit its safe work practices/procedures for opening process equipment, vessel entry, and the control of entrance to a facility or covered process area?
Yes No N/A

If no, possible violations include: 119(o)(1) – the employer did not evaluate its safe work practices/procedures for opening process equipment, vessel entry, or the control of entrance to a facility or covered process area, when it conducted its compliance audit.

Compliance Guidance: An employer must audit the procedures and practices required by PSM and ensure they are adequate and are being followed, especially important basic procedures like those listed above. OSHA expects that employers would audit both the developed safe work practice and its implementation.

O. Pre-Startup Safety Reviews (PSSR)

1. From the listing of PSSR for the Selected Unit(s), (See request X.E.3.p.) identify the most recent PSSR involving a modification. Determine if the PSI and procedures the PSSR requires to be updated and in-place have been completed. From this review, was the PSI updated and procedures in-place prior to introducing an HHC into the process?
Yes No N/A

If no, possible violations include:

- a. 119(i)(2)(ii) – the employer did not ensure that safety, operating, maintenance and



emergency procedures were in-place prior to introducing an HHC into the modified process;

- b. 119(l)(5) – the employer did not update operating procedures required by paragraph (f) of the standard when the process was modified/changed;
- c. 119(i)(2)(iii) - the employer did not ensure that the PSI was updated prior to introducing an HHC into the modified process as required by paragraph (l) of the PSM standard; or
- d. 119(l)(4) – the employer did not update PSI as required by paragraph (d) of the PSM standard when the process was modified/changed.

Compliance Guidance: Examples of PSI include, but are not limited to, flow diagrams, P&IDs, piping drawings, electrical classification, etc. Examples of procedures include, but are not limited to, safety, operating, maintenance, and emergency procedures.

2. Using the same PSSR that was evaluated in #1 above, select a piece of equipment that was modified. Did the employer determine that the modified equipment met its construction and design specification?

Yes No N/A

If no, possible violations include:

- a. 119(i)(2)(i) – the employer did not confirm prior to introducing an HHC into a modified process that the construction and equipment was in accordance with its design specifications;
- b. 119(j)(2) – the employer did not: 1) develop an MI program quality assurance procedure to evaluate whether equipment is constructed and installed in accordance with the equipment design specifications; or 2) implement an MI program quality assurance procedure for evaluating whether equipment is constructed and installed in accordance with the equipment design specifications;
- c. 119(j)(6)(ii) – the employer did not perform checks or inspections to assure equipment was installed properly and consistent with design specifications;

Compliance Guidance: As PSM is a performance standard, the employer must be able to show how it satisfied/performed its obligation to determine that the selected piece of equipment was constructed and installed in accordance with its design specifications. The implementation of an employer's MI program quality assurance procedure for evaluating whether equipment is constructed and installed in accordance with the equipment design specifications could be one indicator of compliance with 1910.119(i)(2)(i) and 1910.119(j)(6)(ii). Determine whether the employer at least follows its own MI program quality assurance procedures for evaluating whether equipment meets its design specifications. An



example RAGAGEP which illustrates the relationships between MI program procedures and MI program quality assurance procedures is CCPS [Ref. 33], Chapter 6 including Table 6-1, “Example MI Procedures”;

- d. 119(d)(3)(ii) – the employer did not comply with RAGAGEP when it failed to confirm through evaluation or inspection that equipment was installed per its design specifications (An example of a RAGAGEP for the confirmation of the construction and installation of equipment per its design specifications is CCPS [Ref. 33], Chapter 6 including Table 6-1, *Example MI Procedures* and Chapter 7, *Quality Assurance-Section 7.6, Construction and Installation*); or

Compliance Guidance: When an employer constructs or installs equipment without confirming it met its design specifications, the employer could not document in their PSI that the equipment does in fact comply with RAGAGEP.

- e. 119(j)(5) - the employer did not correct deficiencies in equipment/equipment systems that were not constructed or installed in accordance with its design specifications (“*outside acceptable limits*”) without taking necessary means to assure safe operation.

P. Hot Work Permits

Compliance Guidance: If there are no on-going hot work operations to evaluate for compliance in the Selected Unit(s) when the team is prepared to evaluate these operations, then the Team Leader may select other hot work operations to evaluate which are not being conducted in the Selected Unit(s). When selecting these other hot work operations, Team Leaders must select hot work operations that are being conducted on or near another covered process in the refinery. If by the completion of the on-site portion of the inspection the team has not evaluated an on-going hot work operation, then Question P.1. would not be applicable, but Question P.2. and P.3., must still be evaluated for the Selected Unit(s).

- 1. During walkaround inspections, evaluate at least two hot work operations. Are these hot work operations conducted according to the employer’s hot work procedures?
Yes No N/A

If no, possible violations include:

- a. 119(f)(4) – the employer did not: 1) develop safe work practice(s) for all types of hot work; or 2) implement hot work procedures/safe work practices;
- b. 119(f)(4) – the host employer did not provide its hot work procedures/safe work practices to the contract employer; or
- c. 119(h)(3)(iv) – the contract employer did not assure their employees were following the hot work procedures/safe work practices required by (f)(4) of the PSM standard.



2. Does the employer audit hot work permits to assure the procedure/practice is being followed per the employer's requirements?

Yes No N/A

If no, possible violations include: 119(o)(1) - the employer did not evaluate its safe work practices/procedures for hot work permits, when it conducted its compliance audit.

Compliance Guidance: An employer must audit the procedures and practices required by PSM and ensure they are adequate and are being followed, especially important basic procedures like hot work permit practices. OSHA expects that employers would audit both the developed hot work permit procedure/practice and its implementation.

The PSM standard does not require employers to maintain a file of old or closed hot work permits. 1910.119(k), "Hot work permit", does not require hot work permit record retention after hot work operations end. However, to comply with provisions under paragraph (o)(1), an employer must audit the required PSM procedures and practices to ensure they are both adequate and are being followed, especially important basic procedures such as hot work. Since hot work permits are part of the hot work procedure, OSHA expects that employers would audit a statistically valid number of hot work permits to ensure they were completed and implemented per their procedure. This practice is consistent with industry auditing safe work practices such as CCPS, [Ref. 36] (pgs. 78 and 79), which states, for example, that, "the auditor should sample maintenance records to verify that work authorizations and safe work (e.g., hot work) permits have been completed as required". Due to the performance nature of PSM, how the employer audits its hot work permits/procedure, or any procedure, is a matter of ensuring performance (i.e., procedures are developed, adequate and are being implemented), rather than a matter of OSHA specifying how to conduct compliance audits. One way to audit hot work permits to evaluate compliance with 29 CFR 1910.119(k) is to complete the audit before the permits are discarded.

3. Based on interviews with host and contract employer operations and maintenance personnel, are hot work permit procedures, including the issuance of hot work permits, followed?

Yes No N/A

If no, possible violations include:

- a. 119(f)(4) – the employer: 1) did not develop hot work procedures/safe work practices **Error! Bookmark not defined.**; or 2) developed, but failed to implement hot work procedures/safe work practices;
- b. 119(h)(3)(i) – the contract employer did not ensure that contract employees involved in hot work operations were trained in those procedures/safe work practices;

or

- c. 119(h)(3)(iii) – the contract employer did not: 1) train contract employees in hot work procedures/safe work practices; or 2) verify that contract employees understood the training related to hot work procedures/safe work practices.

Compliance Guidance: It is important to interview welders to determine compliance with this question.

Q. Incident Investigation Reports

Compliance Guidance: CSHOs must document in the case file the number of actual and near-miss incidents which have occurred in the Selected Unit(s). The discussion below includes the meaning of “actual” and “near-miss” incidents as used in this Instruction.

OSHA and industry have found that when major incidents have occurred, most of these incidents have included precursor incidents. Additionally, OSHA and industry (See CCPS [Ref. 41], Section 5, “Reporting and Investigating Near Misses” have concluded based on past investigations, that if employers had properly responded to precursor incidents, later major incidents might not have occurred. Consequently, anytime an employer has an “opportunity” to investigate a near-miss/precursor incident (i.e., an incident that could reasonably have resulted in a catastrophic release) it is important that the required investigation is conducted and that the findings and recommendations are resolved, communicated, and integrated into other PSM elements/systems so a later major incident at the facility is prevented.

To ensure near-miss/precursor incidents are being investigated as required by 1910.119(m)(1), CSHOs should evaluate the number of near-miss incident investigations the employer has conducted to the number of actual incident investigations that have been conducted. See investigation reports provided in response to document request X.E.3.gg. An “actual incident” is defined as an incident with negative consequences such as a large HHC release, employee injuries or fatality, or a large amount of property or equipment damage. Typically, based on loss-control history, there is a much higher ratio of near-miss incidents in the chemical processing and refining industries than there are actual incidents. Therefore, it can be concluded that if the number of near-miss incident investigations are not greater than the number of actual incident investigations, then the employer is probably not investigating all required near-miss incidents.

Therefore, when the employer has more actual incident reports than near-miss reports, CSHOs should increase their scrutiny to determine if near-miss incidents are being investigated as required. To increase compliance evaluation efforts, CSHOs should interview more employees and contractors to determine if near-miss incidents are not being investigated. These compliance evaluations include determining that investigation “factors that contributed to the incident”, findings/recommendations, and corrective actions have been reported, resolved, and implemented.

One of the specific items required by the 1910.119(m)(4) investigation report is the, “factors that contributed to the incident”. Factors that contributed to the incident include all the causal factors (See 57 FR 6394 – “identifying the chain of events leading to the incident and for determining causal factors”). CCPS [Ref. 41], Section 5.1 defines a “casual factor” as, “[causal factor] also known as a critical factor, is a major contributor to the incident (a negative event or undesirable condition), that if eliminated would have either prevented the occurrence or reduced its severity or frequency”. CCPS goes on to discuss that typically process safety incidents have multiple causal factors and sometimes the term “direct cause” gets confused with the last causal factor in an incident sequence. Therefore, the employer should not just focus on the last/direct causal factor of an incident, they must report (and correct if needed) all causal factors/factors that contributed to the incident. “

Examples of “Factors that contributed to the incident”/“causal factors” can include, but are not limited to:

- *management system defects – the employer failed to develop and implement a MI program procedure for the inspection, testing and preventative maintenance of critical instrumentation;*
- *the employer did not develop or implement appropriate operating procedures;*
- *the employer did not conduct a credible PHA resulting in unidentified hazards, unsafe conditions, inadequate controls, or inadequate practices;*
- *the employer did not investigate a previous similar actual or near-miss incident;*
- *the employer did not design, operate, maintain, inspect, or change (MOC) equipment or equipment systems per RAGAGEP;*
- *the employer did not train its employees in its procedure for transferring product from the Chemical X intermediate tank to Reactor 23;*
- *the 3-inch reactor transfer line was replaced without conducting a PMI, as a result, the replaced piping that was constructed of an off-specification material failed in a short period of time;*
- *the employer’s hot work procedure/safe work practice did not include information on the need for operators to check current calibration of the portable combustible gas meter used to ensure areas around hot work operations are absent hazardous concentrations of flammable vapors/gasses;*
- *the frequency the host employer evaluated Contractor Y to make sure its employees were following the Refinery Z’s HHC Equipment Opening Procedure was less than that specified in the Refinery Z’s Contractor’s Safety Program, Section CC.DD;*

- *the PSI and operating procedures for Process B did not specify the operating limits or the pressure when the safety-instrumented-system activates;*
- *the employer's operating procedures were written in an unclear format and the format varied by unit such that operators that worked in multiple units were or could be easily confused;*
- *employees without turnout gear responded to a large fire at Unit X and received 2nd degree burns when a subsequent explosion occurred; and*
- *the acid and caustic lines were not labeled at the loading station which resulted in the off-loading of product into the wrong tank and a runaway reaction. Additionally, the PHA for the off-loading area did not consider the human factor issues of contract drivers potentially routing hazardous materials to the wrong process equipment.*

Note: Another reference that is listed in Appendix D (non-mandatory) of the PSM standard, "Accident Investigations – A New Approach", National Safety Council, asks a question about whether "management system defects" were a "contributing factor" (i.e., "Factors that contributed to the incident"). Under the heading of "Management - Management System Defects", example "Causal Factors" are listed including: 1) "...failure by supervision to detect, anticipate, or report a hazardous condition"; 2) "...supervisor responsibility and accountability [were not] adequately defined and understood; 3) "...supervisor [were not] adequately trained to fulfill assigned responsibility in accident prevention"; and 4) "...failure to initiate corrective action for a known hazardous condition that contributed to this accident"

1. Did the employer investigate and report as required ALL incidents (actual and near-miss) that occurred at the Selected Unit(s)?
Yes No N/A

If no, possible violations include: 119(m)(1) – the employer did not investigate all incidents as required.

2. Review the incident reports (See investigation reports provided in response to X.E.3.gg.) for the Selected Unit(s) to determine if any of these incidents show that a contractor's work was involved. If so, was at least one contract employee effectively involved on the incident team?
Yes No N/A

If no, possible violations include: 119(m)(3) – the employer did not involve a contract employee on the incident investigation team when the incident involved the work of the contractor.

Compliance Guidance: A contractor's work includes, but is not limited to, activities: 1) such as work which directly or indirectly results in an actual or near-miss incident, or 2) where contract employees are exposed to an HHC release during



their work, including exposures during emergency evacuations.

Sometimes contractor employees are named to incident investigation teams but either do not participate in the investigation or their effective participation is lessened by the host employer in comparison to the other members of the team. When the host employer limits the participation of the named contract employee(s) on the incident investigation team, CSHOs should consider citing 1910.119(m)(3).

3. From a review of the incident reports for the Selected Unit(s), have all the factors which contributed to each of the incidents been reported? (See discussion in *Compliance Guidance at the beginning of this section*)

Yes No N/A

If no, possible violations include:

- a. 119(m)(4)(iv) – the employer did not report all factors which contributed to an incident; or
- b. Any other corresponding violation related to a factor which was not reported as required.

Compliance Guidance: For example, a deviation was identified in the PHA, but the employer did not use appropriate engineering controls/safeguards to control the identified hazard/deviation. As a result of the lack of appropriate control an incident occurred. The absence of this control/safeguard was required to be included as a “factor which contributed to the incident”/”causal factor”. In this case, the factor which was required to be listed, but was not reported in the incident investigation report would be a “corresponding violation related to a factor which was not reported”. In this example, “possible violations include” - 1910.119(e)(1) and/or 1910.119(e)(3)(iii) for the lack/absence of the control/safeguard and 1910.119(m)(4)(iv) for not reporting a “factor which contributed to the incident”/”causal factor”.

R. Emergency Planning and Response

1. Does the employer’s emergency action plan (EAP) include procedure(s) employees can follow to distinguish between small releases/spills and large releases/spills? If so, do the procedures include the employer’s expectations of employees’ actions when either of these situations occur?

Yes No N/A

If no, possible violations include: 119(n) - the employer did not include a procedure in its ERP that instructs employees how to distinguish between small releases and spills and large releases or spills and what employees actions are required in both instances.

2. Does the EAP (1910.38(a) or ERP (1910.120(q)(1) & (2)) include information about the various purposes/meanings of the employee alarm notification system? For example, at a particular refinery complex, three long blast on the alarm system indicates immediate total unit evacuation or two long blast followed by a short blast indicates a toxic release and to shelter in designated safe havens.
- Yes No N/A

If no, possible violations include:

- a. 1910.38(a)(3)(i) – the employer did not establish an employee alarm system which complies with 1910.165;
- b. 1910.38(a)(3)(ii) – the employer did not establish distinctive signals for the different warnings or hazards that their employee alarm system indicates;
- c. 1910.38(a)(2)(i) – the employer did not provide emergency escape procedures and instructions that include the meaning of the different warnings or hazards that the employee alarm system signals indicate in its EAP;
- d. 1910.120(q)(1) – the employer did not: 1) provide for emergency alerts, including descriptions of the various distinctive hazard or danger signals for alerting employees in its ERP; or 2) implement its ERP procedures to alert employees of hazards and emergencies; or
- e. 1910.120(q)(2)(ix) – the employer did not include an element in its ERP that provides for a system to alert employees to emergencies, including descriptions of the various distinctive signals for alerting employees to imminent dangers, hazards, or emergencies.

Compliance Guidance: The potential for hazardous waste releases or spills in typical refinery operating units dictate the application of 1910.120(q) standards per OSHA [CPL 2-1.037](#) that state, " In case of a HAZWOPER release, an employer must adhere to the provisions of 1910.120(q). If elements of 1910.38(a) are not included in an emergency response plan (ERP) referenced by 1910.120(q), the CSHO may only cite 1910.120(q)."

3. Randomly select three contract employees located anywhere in the facility to interview. Determine if they have been trained per the employer's EAP or ERP. In particular, determine whether they understand the meaning of the various different alarm notifications and evacuation routes?
- Yes No N/A

If no, possible violations include:

- a. 119(g)(1) – the employer did not train operations personnel including contract operators in the emergency operations procedures;

- b. 119(h)(2)(iii) – the host employer did not explain the applicable portions of the EAP to contract employers;
 - c. 119(h)(3)(ii) – the contract employer did not instruct contract employees in the applicable provisions of the EAP; or
 - d. 119(h)(3)(iii) – the contract employer did not: 1) document the training of contract employees as required; or 2) the contractor did not verify that contract employees understand the training that was provided;
4. Randomly select three employees who possess qualifications that would allow them to respond only at the first responder awareness level (See list provided in response to document request X.E.3.jj). From interviews and call-out logs, have these employees only responded in a manner that was within their qualifications/training?
 Yes No N/A

If no, possible violations include:

- a. 1910.120(q)(6)(i) – the employer did not train employees to the first responder awareness level when these employees were performing functions expected of an individual with those qualifications;
- b. 1910.120(q)(2)(ii) – the employer did not include an element in its ERP on personnel roles, lines of authority and training; or
- c. 1910.120(q)(1) – the employer did not implement the portion of the ERP which addresses emergency procedures per 1910.120(q)(2)(ii) that addresses which employees may respond and the manner in which they may respond given their response training/qualifications;

Compliance Guidance: Responders with only first responder awareness level training take no further action beyond notifying the authorities of a release. Examples of “further actions” would include taking defensive or offensive actions to protect persons, property or the environment.

5. Randomly select three employees who possess qualifications that would allow them to respond only at the first responder operations levels (See list provided in response to X.E.3.jj). From interviews and call-out logs, have these employees responded only in a manner that was within their qualifications/training and have they been provided all PPE necessary including flame retardant clothing where appropriate?
 Yes No N/A

If no, possible violations include:

- a. 1910.120(q)(6)(ii) – the employer did not train employees to the first responder operations level when these employees were performing functions expected of an



individual with those qualifications;

- b. 1910.120(q)(2)(ii) – the employer did not include emergency procedures in its ERP which designated which employees may respond and the manner they may respond given their response qualifications (personnel roles); or
- c. 1910.120(q)(1) – the employer did not implement the portion of the ERP that addresses emergency procedures per 1910.120(q)(2)(ii) that would designate which employees may respond and the manner in which they may respond given their response training/qualifications (personnel roles).

Compliance Guidance: Responders with only first responder operations levels qualifications are trained to respond in a defensive fashion without actually trying to stop the release.



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