



Guidelines for

**Auditing
Process Safety
Management
Systems**

Second Edition

 **WILEY**


An AIChE Technology Alliance
Center for Chemical Process Safety

**Guidelines for
Auditing Process Safety
Management Systems**

This book is one in a series of process safety guideline and concept books published by the Center for Chemical Process Safety (CCPS). Please go to www.wiley.com/go/ccps for a full list of titles in this series.

Guidelines for Auditing Process Safety Management Systems

Second Edition

Center for Chemical Process Safety
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The templates, samples, and protocols for Appendices A–G are provided electronically for the user’s convenience. See those appendices for more information on the substance and format of the material.

To access this material go to:

www.aiche.org/ccps/publications/auditing.aspx

And enter the password: Auditing2010

ACRONYMS

3133	OSHA Publication 3133, <i>Process Safety Management Guidelines for Compliance</i>
ACA	Apparent Cause Analysis
ACC	American Chemistry Council
AGA	American Gas Association
AI	Asset Integrity
AIChE	American Institute of Chemical Engineers
ALARA	As low as reasonably achievable
ALARP	As low as reasonably practicable
ANSI	American National Standards Institute
API	American Petroleum Institute
APPC	Appendix C of OSHA's PSM Standard (Compliance Guidelines and Recommendations for Process Safety Management) (Nonmandatory)
ARS	Alternative release scenario
ASME	American Society of Mechanical Engineers
ASNT	American Society of Non-Destructive Testing
BEAC	Board of Environmental, Health, and Safety Auditor Certifications
B&PV	Boiler & Pressure Vessel Code
CAD	Computer-aided design
CalARP	California Accidental Release Prevention (Program)
CalOSHA	California Occupational Health and Safety Administration
CAPP	Chemical Accident Prevention Program (Nevada)
CBT	Computer-based training
CCC	Contra Costa County
CCPA	Canadian Chemical Producers Association
CCPS	Center for Chemical Process Safety
CDC	Centers for Disease Control
CEI	(Dow) Chemical Exposure Index
CEU	Council of the European Union
CIT	Citation (issued by regulator)
CML	Condition measurement location
CMMS	Computerized maintenance management system
COMAH	Control of Major Accident Hazards
CPL	Compliance directive (OSHA instruction)

CSCC	Chloride stress corrosion cracking
CSChE	Canadian Society of Chemical Engineers
CUI	Corrosion under insulation
CV	Curriculum vitae
DCS	Distributed control system
DIERS	Design Institute for Emergency Relief Systems
DOI	Department of Interior
DOT	Department of Transportation
DIERS	American Institute of Chemical Engineers—Design Institute for Emergency Relief Systems
EHSRMA	Extremely Hazardous Substances Risk Management Act (Delaware)
E&P	Exploration and production
EAP	Emergency action plan
EHS	Environmental, health, and safety
EMS	Emergency medical services/environmental management system
EOP	Emergency operating procedure
EPA	Environmental Protection Agency
ERP	Emergency response plan
ERT	Emergency response team
ESD	Emergency shutdown system
FEI	(Dow) Fire and Explosion Index
FFS	Fitness for service
FM	Factory Mutual
FMEA	Failure modes and effects analysis
GDC	General duty clause
GIP	Good industry practice (in PSM)
HAZCOM	Hazard Communication (Standard—a U.S. regulation)
HAZOP	Hazard and Operability (Study)
HAZWOPER	Hazardous Waste Operations and Emergency Response (Standard—a U.S. regulation)
HF	Hydrogen fluoride or hydrofluoric (acid)
HIRA	Hazard Identification and Risk Analysis
HSE	Health and Safety Executive (United Kingdom)
HVAC	Heating, ventilating, and air conditioning
HWP	Hot work permit
ICP	Integrated contingency plan
IDLH	Immediately dangerous to life and health
I/E	Instrument/electrical
IFSTA	International Fire Service Training Association
ILO	International Labor Organization
IPL	Independent protection layer
ITPM	Inspection, testing, and preventive maintenance
ISA	International Society of Automation (formerly Instrument Society of America)

ISO	International Standards Organization, Industrial Safety Ordinance (CCC)
IST	Inherently safer technologies
LEPC	Local Emergency Planning Committee
LNG	Liquefied Natural Gas
LOPA	Layer of protection analysis
LOTO	Lockout/tagout
MI	Mechanical Integrity
MIACC	Major Industrial Accident Council of Canada
MKOPSC	Mary Kay O'Connor Process Safety Center (Texas A&M University)
MMS	Minerals Management Service
MOC	Management of Change
MOU	Memorandum of Understanding (or Memorandum or Agreement)
MSDS	Material Safety Data Sheet
N/A	Not applicable
NB	National Board
NDE	Nondestructive examination
NEP	National Emphasis Program
NDT	Nondestructive testing
NETA	InterNational Electrical Testing Association
NFPA	National Fire Protection Association
NIMS	National Incident Management System
NIST	National Institute of Standards & Technology
OCA	Off-site consequence analysis
OEM	Original equipment manufacturer
OJT	On-the-job training
OMS	Oil movement and storage
OSHA	Occupational Safety and Health Administration
OSHAS	Occupational Health and Safety Assessment Series
OSHRC	Occupational Safety and Health Review Commission
PA	Public address (system)
PANEL	Baker, J.A. et al., <i>The Report of BP U.S. Refineries Independent Safety Review Panel</i> , January 2007 (Baker Commission Report).
PDA	Personal digital assistant
PDCA	Plan-Do-Check-Act
PFD	Process flow diagram
PHA	Process hazard analysis
P&ID	Piping and instrument diagram
PMI	Positive material identification
PPE	Personal protective equipment
PRE	Preamble to OSHA's Process Safety Management Standard
PSI	Process safety information
PSK	Process safety knowledge
PSM	Process safety management

PSSR	Pre-start-up safety review
QRA	Quantitative risk analysis
RAGAGEP	Recognized and generally accepted good engineering practice
RBI	Risk-based inspection
RBPS	Risk-based process safety
RC	Responsible Care®
RCA	Root cause analysis
RCM	Reliability centered maintenance
RCMS	Responsible Care Management System
RCRA	Resource Conservation and Recovery Act
RIK	Replacement-in-kind
RMP	Risk management program/risk management plan
RMPP	Risk Management and Prevention Program (California)
RP	Recommended practice
RSPA	Research and Special Projects Administration
SARA	Superfund Amendments and Reauthorization Act
SCBA	Self-contained breathing apparatus
SEMP	Safety and environmental management program
SIF	Safety instrumented function
SIL	Safety integrity level
SIS	Safety instrumented system
SOCMA	Society of Chemical Manufacturers and Affiliates
SOP	Standard operating procedure
SPCC	Spill prevention, countermeasures, and control
SWP	Safe work practice
TCPA	Toxic Catastrophe Prevention Act (New Jersey)
TEMA	Tubular Exchanger Manufacturer's Association
TML	Thickness measurement location
TSD	Treatment, storage, and disposal
TXC	BP Corporation, <i>Fatal Accident Investigation Report – Isomerization Unit Explosion</i> , May 2005 (Texas City Refinery)
UKHSE	United Kingdom Health and Safety Executive
UL	Underwriter's Laboratory
UPS	Uninterruptible power supply
USCG	United States Coast Guard
VPP	Voluntary protection program
VCLAR	Verbal clarification of PSM Standard by OSHA
WCLAR	Written clarification of PSM Standard by OSHA
WCS	Worst-case scenario

See the Introduction to Chapters 3–24 for additional acronyms that are used in the element chapters (Chapter 3–24) to define the sources of compliance and related audit criteria.

GLOSSARY

Accident: An incident that results in significant human loss (either injury of death), significant property damage, and/or a significant environmental impact.

Accident prevention pillar: A group of mutually supporting RBPS elements. The RBPS management system is composed of four accident prevention pillars: (1) commit to process safety, (2) understand hazards and risk, (3) manage risk, and (4) learn from experience.

Accountability: The obligation to explain and answer for one's actions that are related to expectations, objectives, and goals. In this context, those that are accountable for PSM activities are answerable to the one person who has the ultimate responsibility for the program. There may be multiple persons accountable for an activity but only one person with the ultimate responsibility. Accordingly, it is a powerful element of an effective process safety management system.

Administrative control: Procedures that will hold human and/or equipment performance within established limits.

Anecdotal: Verbal evidence that is not supported by other, corroborating evidence. For example, the results of an interview with one person are not the basis for issuing a finding.

Apparent cause analysis (ACA): A less formal investigation method that focuses on the immediate causes of a specific incident.

As low as reasonably practicable (ALARP): The concept that efforts to reduce risk should be continued until the incremental sacrifice (in terms of cost, time, effort, or other expenditure of resources) is grossly disproportionate to the incremental risk reduction achieved. The term *as low as reasonably achievable (ALARA)* is often used synonymously.

Asset integrity: A PSM program element involving work activities that help ensure that equipment is properly designed, installed in accordance with specifications, and remains fit for purpose over its life cycle. Also asset integrity and reliability.

Audit: A systematic, independent review to verify conformance with prescribed requirements using a well-defined review process to ensure consistency and to allow the auditor to reach defensible conclusions.

By exception: The term “by exception” means that only information that fits a certain definition is documented and not all of the information that was generated by the activity. For example, in a HIRA, this most commonly happens when only those hazard scenarios that resulted in a recommendation(s) are documented and

no others. In Asset Integrity, only those ITPM tasks that result in an out-of-specification result are documented.

Catastrophic release: An uncontrolled loss of containment of toxic, reactive, or flammable materials from a process that has the potential for causing onsite or offsite acute health effects, significant environmental effects (e.g., compromise of a public drinking water supply), or significant on-site or off-site property damage.

CCPA: Canadian Chemical Producer's Association, *Major Industrial Accidents Council of Canada (MIACC) Self Assessment Tool*, September 2001. PSM Guide/HISAT Revision Project: Version 070820 prepared by the PSM committee of CCPA (rights maintained by CSCHE).

Checklist: A list of items requiring verification of completion; typically, a procedure format in which each critical step is marked off (or otherwise acknowledged/verified) as it is performed. Checklists are often appended to procedures that provide a more detailed description of each step, including information regarding hazards, and a more complete description of the controls associated with the hazards. Checklists are also used in conjunction with formal hazard evaluation techniques to ensure thoroughness.

Code: Written requirements that affect a facility and/or the process safety requirements that apply to a facility. Codes contain requirements that apply to the design and implementation of management systems, design and operation of process equipment, or similar activities. The difference between a code and a standard is that codes have become part of a law or regulation, and therefore their requirements become mandatory within the jurisdictions that have adopted the code requirements in their laws or regulations. This usually occurs at the state level, but may also occur in local or federal laws or regulations.

Competency: A PSM program element associated with efforts to maintain, improve, and broaden knowledge and expertise.

Conduct of operations: The execution of operational and management tasks in a deliberate and structured manner that attempts to institutionalize the pursuit of excellence in the performance of every task and minimize variations in performance.

Confirmation: A special audit term referring to the substantiation of the existence or condition of something. A confirmation often takes the form of a written request and acknowledgement from independent third parties, but it may also be obtained orally or through observation.

Consequence: The direct, undesirable result of an incident sequence usually involving a fire, explosion, or release of toxic material. Consequence descriptions may be qualitative or quantitative estimates of the effects of an accident in terms of factors such as health impacts, economic loss, and environmental damage.

Consistency: Continued uniformity, during a period or from one period to another.

Continuous improvement: Doing better as a result of regular, consistent efforts rather than episodic or step-wise changes, producing tangible positive improvements either in performance, efficiency, or both. Continuous improvement efforts usually involve a formal evaluation of the status of an activity or management system, along

with a comparison to an achievement goal. These evaluation and comparison activities occur much more frequently than formal audits.

Contractor management: A system of controls to ensure that contracted services support (1) safe facility operations and (2) the company's process safety and personal safety performance goals. It includes the selection, acquisition, use, and monitoring of contracted services.

Controls: Engineered mechanisms and administrative policies/procedures implemented to prevent or mitigate incidents.

Core value: A value that has been promoted to an ethical imperative, accompanied with a strong individual and group intolerance for poor performance or violations of standards for activities that impact the core value.

Decommissioning: Completely de-inventorying all materials from a process unit and permanently removing the unit from service. Decommissioning normally involves permanently disconnecting the unit from other processes and utilities, and is often followed by removal of the process piping, equipment, and support structures.

Determine: To conclude; to reach an opinion consequent to the observation of the fit of sample data within the limit, range, or area associated with substantial conformance, accuracy, or other predetermined standard; to obtain firsthand knowledge of.

Effectiveness: The combination of process safety management performance and process safety management efficiency. An effective process safety management program produces the required work products of sufficient quality while consuming the minimum amount of resources.

Efficacy: See Effectiveness.

Element: Basic division in a process safety management system that correlates to the type of work that must be done (e.g., MOC).

Emergency management: A PSM program element involving work activities to plan for and respond to emergencies.

Evaluate: To reach a conclusion as to significance, worth, effectiveness, or usefulness.

Exception: A finding that is a deviation from a standard.

Facility: The physical location where the management system activity is performed. In early life-cycle stages, a facility may be the company's central research laboratory or the engineering offices of a technology vendor. In later stages, the facility may be a typical chemical plant, storage terminal, distribution center, or corporate office. Site is used synonymously with facility when describing to RMP audit criteria.

Failure modes and effects analysis (FMEA): A systematic, tabular method for evaluating and documenting the causes and effects of known types of component failures.

Fault tree: A logic model that graphically portrays the combinations of failures that can lead to a specific main failure or accident of interest.

Finding: A conclusion reached by the audit team based on data collected and analyzed in response to a specific audit question which indicates a need for improvement in the PSM program design or implementation. Findings are sometimes also referred to exceptions. Although strictly speaking a finding can be a positive or negative conclusion, common custom and terminology in auditing is to refer to the deficiencies identified as the “findings.” Findings include both the basis for the conclusion, i.e., an audit question or criteria, as well as the explanatory conclusion and the evidence that substantiates the conclusion.

Frequency: The number of occurrences per unit time at which observed events happen or are predicted to happen.

GIP: Good industry practice in PSM (i.e., a best or common practice that a facility or company has found to be a useful addition to its PSM program, or a useful but nonmandatory solution to a PSM issue.

Hazard: Chemical or physical conditions that have the potential for causing harm to people, property, or the environment. In these *Guidelines*, hazard refers to the first risk attribute: What can go wrong?

Hazard analysis: See Hazard identification and risk analysis.

Hazard and operability (HAZOP) study: A systematic method in which process hazards and potential operating problems are identified using a series of guidewords to investigate process deviations.

Hazard identification: The recognition of material, system, process, and plant characteristics that can produce undesirable consequences through the occurrence of an accident.

Hazard identification and risk analysis (HIRA): A collective term that encompasses all activities involved in identifying hazards and evaluating risk at facilities, throughout their life cycle, to make certain that risks to employees, the public, or the environment are consistently controlled within the organization’s risk tolerance.

Hazardous chemical: A material that is toxic, reactive, or flammable and is capable of causing a process safety incident if released. Also Hazardous material.

Highly hazardous chemical: A material that is toxic, reactive, or flammable and is capable of causing a process safety incident if released. These materials are included in OSHA’s PSM Standard, 29 CFR §1910.119.

Human factors: A discipline concerned with designing machines, operations, and work environments to match human capabilities, limitations, and needs. Among human factors specialists, this general term includes any technical work (e.g., engineering, procedure writing, worker training, worker selection) related to the person in man-machine systems.

Implementation: Completion of an action plan associated with the outcome of the process of resolving audit findings, incident investigation team recommendations, risk analysis team recommendations, and so forth. Also, the establishment or execution of PSM program element work activities.

Incident: An unplanned sequence of events with the potential for undesirable consequences.

Incident investigation: A systematic approach for determining the causes of an incident and developing recommendations that address the causes to help prevent or mitigate future incidents. See also Root cause analysis and Apparent cause analysis.

Independent protection layer (IPL): A device, system, or action that is capable of preventing a postulated accident sequence from proceeding to a defined, undesirable endpoint. An IPL is independent of the event that initiated the accident sequence and independent of any other IPLs. IPLs are normally identified during layer of protection analyses.

Inherently safer: A condition in which the hazards associated with the materials and operations used in the process have been reduced or eliminated, and this reduction or elimination is permanent and inseparable from the process. Inherently safer technology (IST) is also used interchangeably with inherently safety in the book.

Inspection: A work activity designed to determine if ongoing work activities associated with operating and maintaining a facility comply with an established standard. Inspections normally provide immediate feedback to the persons in charge of the ongoing activities, but normally do not examine the management systems that help ensure that policies and procedures are followed.

Inspection, testing, and preventive maintenance (ITPM): Scheduled proactive maintenance activities intended to (1) assess the current condition and/or rate of degradation of equipment, (2) test the operation/functionality of equipment, and/or (3) prevent equipment failure by restoring equipment condition.

Internal controls: The various engineering and managerial means, both formal and informal, established within an organization to help the organization direct and regulate its activities in order to achieve desired results; also refers to the general methodology by which specific management processes are carried on within an organization. The requirement for management systems and their formal evaluation during an audit are not currently compliance requirements. The evaluation of the adequacy of the internal controls is accomplished using some of the related audit criteria.

Interview: Questioning, both formally and informally, facility personnel or other individuals in order to obtain an understanding of the plant's operations and performance.

ITPM program: A program that develops, maintains, monitors, and manages inspection, testing, and preventive maintenance activities.

Internal controls: The various engineering and managerial methods, both formal and informal, established within an organization to help it direct and regulate its activities in order to achieve desired results. This term also refers to the general methodology by which specific management processes are carried on within an organization.

Knowledge, skills, and abilities (KSAs): Knowledge is related to information, which is often associated with policies, procedures, and other rule-based facts. Skills are related to the ability to perform a well-defined task with little or no

guidance or thought. Abilities concern the quality of decision making and execution when faced with an ill-defined task (e.g., applying knowledge to troubleshooting).

Lagging indicator: Outcome-oriented metrics, such as incident rates or other measures of past performance.

Layer of protection analysis (LOPA): A process of evaluating the effectiveness of independent protection layer(s) in reducing the likelihood of an undesired event.

Leading indicator: Process-oriented metrics, such as the degree of implementation or conformance to policies and procedures, that support the PSM program management system and has the capability of predicting performance.

Level of acceptable practice: Good, successful, common, or best practices in PSM that have evolved, either through common and successful usage, interpretation by regulators, or in clear and measurable reductions in process safety risk, into informal criteria that are used by industry and by regulators to define acceptable practices in PSM.

Life cycle: The stages that a physical process or a management system goes through as it proceeds from birth to death. These stages include conception, design, deployment, acquisition, operation, maintenance, decommissioning, and disposal.

Likelihood: The expected frequency of an event's occurrence, and the probability of that frequency.

Limiting conditions for operation: Specifications for critical systems that must be operational and critical resources that must be available to start a process or continue normal operation. Critical systems often include fire protection, flares, scrubbers, emergency cooling, and thermal oxidizers; critical resources normally involve staffing levels for operations and other critical functions.

Management review: A PSM program element that provides for the routine evaluation of other PSM program management systems/elements with the objective of determining if the element under review is performing as intended and producing the desired results as efficiently as possible. It is an ongoing "due diligence" review by management that fills the gap between day-to-day work activities and periodic formal audits.

Management system: A formally established set of activities designed to produce specific results in a consistent manner on a sustainable basis.

Metrics: Leading and lagging measures of process safety management efficiency or performance. Metrics include predictive indicators, such as the number of improperly performed line-breaking activities during the reporting period, and outcome-oriented indicators, such as the number of incidents during the reporting period.

National Emphasis Program: The NEP is for the refinery sector (OSHA Directive CPL 03-00-004) and extended to the chemical sector (OSHA Directive 09-06 (CPL 02)). The NEP is an inspection/enforcement program designed by OSHA to more thoroughly examine the implementation of PSM programs in the refining and chemical industries.

Near-miss incident: An unplanned sequence of events that could have caused harm or loss if conditions were different or if the events were allowed to progress, but actually did not. Also near miss.

Normalization of deviance: A gradual erosion of standards of performance as a result of increased tolerance of nonconformance. Also normalization of deviation.

Objectivity: Freedom from bias.

Observation: The noting and recording of information to support findings. Also field observation.

Operating mode: A phase of operation during the operation and maintenance stages of the life cycle of a facility. Operating modes include start-up, normal operation, shutdown, product transitions, equipment cleaning and decontamination, maintenance, and similar activities.

Operating limits: The values or ranges of values within which the process parameters normally should be maintained when operating. These values are usually associated with preserving product quality or operating the process efficiently; however, they may also incorporate the safe upper and lower limits of the process, or other important limits.

Operational readiness: A PSM program element associated with efforts to ensure that a process is ready for start-up/restart. This element applies to a variety of restart situations, ranging from restart after a brief maintenance outage to restart of a process that has been mothballed for several years.

Operator: An individual responsible for monitoring, controlling, and performing tasks as necessary to accomplish the productive activities of a system. Operator is also used in a generic sense to include people who perform a wide range of tasks (e.g., reading, calibration, incidental maintenance, manage loading/unloading, and storage of hazardous materials).

OSHA Process Safety Management, 29 CFR §1910.119 (OSHA PSM): A U.S. regulatory standard that requires use of a 14-element management system to help prevent or mitigate the effects of catastrophic releases of chemicals or energy from processes covered by the regulation.

Panel: Baker, J.A. et al., *The Report of BP U.S. Refineries Independent Safety Review Panel*, January 2007 (Baker Commission Report).

Performance: A measure of the quality or utility of PSM program work products and work activities.

Performance assurance: A formal management system that requires workers to demonstrate that they understand a training module and can apply the training in practical situations. Performance assurance is normally an ongoing process to (1) ensure that workers meet performance standards and maintain proficiency throughout their tenure in a position and (2) help identify tasks for which additional training is required.

Performance-based requirement: A requirement that defines necessary results without defining the specific means to accomplish them—the “what to do,” but not “how to do it.” The means for producing the desired results is left up to the

discretion of the facility based on an evaluation of its needs and conditions, and on industry practices. For example, the requirement to implement a MOC system that considers the impact of safety and health as part of the review/approval process, and to prevent changes that pose an unacceptable risk to workers, is a performance-based requirement. The implementer must define the process to identify and review risk associated with changes, determine what level of risk is tolerable, and evaluate the risk in sufficient detail to demonstrate that they have met a level of acceptable practice, which in this case may be to provide a safe work environment. (See also Prescriptive requirement, which differs from a performance-based requirement in that a prescriptive requirement states how the activity should be performed.)

Performance indicators: See Metrics.

Pillar: See Accident prevention pillar.

Prescriptive requirement: A requirement that explicitly states both "what to do" and "how to do it." For example, the specifications for a full body harness and the requirement that it be used when working at a certain height or within a specified distance from the edge of a roof are prescriptive requirements. (See also Performance-based requirement, which differs from a prescriptive requirement in that a performance-based requirement does not state how the activity should be performed.)

Procedures: Written, step-by-step instructions and associated information (cautions, notes, warnings) that describe how to safely perform a task.

Process safety: The protection of people and property from episodic and catastrophic incidents that may result from unplanned or unexpected deviations in process conditions.

Process safety competency: See Competency.

Process safety culture: The combination of group values and behaviors that determines the manner in which process safety is managed. A sound process safety culture refers to attitudes and behaviors that support the goal of safer process operations.

Process safety incident/event: An event that is potentially catastrophic, i.e., an event involving the release/loss of containment of hazardous materials that can result in large-scale health and environmental consequences.

Process knowledge management: A PSM program element that includes work activities to gather, organize, maintain, and provide information to other PSM program elements. Process safety knowledge primarily consists of written documents such as hazard information, process technology information, and equipment-specific information. Process safety knowledge is the product of this PSM element.

Process safety management (PSM): A management system that is focused on prevention of, preparedness for, mitigation of, response to, and restoration from catastrophic releases of chemicals or energy from a process associated with a facility. In this book, PSM does not refer exclusively to a process safety management program developed pursuant to or in accordance with OSHA's PSM Standard, 29 CFR §1910.119, but is used as a more general term to describe any

process safety management program that has defined requirements or guidance for its format, content, and implementation, whether it is required by law of regulation or is a voluntary program.

Process safety management systems: Comprehensive sets of policies, procedures, and practices designed to ensure that barriers to episodic incidents are in place, in use, and effective.

Protocol: A document that organizes audit procedures into a general sequence of audit steps and describes the actions to be taken by the auditor.

PSM audit: An activity to determine and status and quality of a PSM program. This term is not used to describe an audit performed exclusively in response to OSHA's PSM Standard, but to an audit of any PSM program.

Quantitative risk analysis (QRA): The systematic development of numerical estimates of the expected frequency and/or consequence of potential accidents associated with a facility or operation based on engineering evaluation and mathematical techniques.

Readiness review: A work activity that occurs prior to initial start-up or restarting a process unit to verify that the condition of process equipment and safety systems, the status of limiting conditions for operations, and in some cases, the training and qualification status of personnel conform to predefined conditions. Also Operational readiness review and pre-start-up readiness review.

Recognized and generally accepted good engineering practice (RAGAGEP): Legal, consensus, or recommended practices with respect to design, construction, operations, and maintenance of equipment. RAGAGEPs can take the form of law or regulation; consensus codes and standards, recommended practices, and other guidance published and maintained by industry trade and professional organizations; manufacturer's recommendations for design, installation, operations, and maintenance; or guidance derived from the operating history of the equipment within a given facility or the industry as a whole. Most of the RAGAGEPs used in the chemical/processing industry are consensus industry codes, standards, and recommended practices. These codes and standards define the level of acceptable practice within the industry for various technical and administrative issues. In addition, they are periodically updated to reflect new information from all stakeholders (equipment designers, manufacturers, users, etc.). In some cases, regulators have also directly adopted these RAGAGEPs, and in some cases they have been embedded in state or municipal law.

Related criteria: Audit criteria derived from good, successful, common, or best practices in PSM that are not considered compliance issues, but supplement and improve a PSM program that meets the minimum compliance requirements. The evaluation of PSM management systems and the internal controls they impose are performed using related criteria.

Replacement-in-kind (RIK): An item (equipment, chemical, procedure, etc.) that meets the design specification of the item it is replacing. This can be an identical replacement or any other alternative specifically provided for in the design

specification, as long as the alternative does not in any way adversely affect the use of the item or associated items.

Representative unit: A unit part of a unit that is covered by the PSM program that is being audited. When the potential scope of the audit would include a large number of units or equipment, focus units are sometimes used to help the auditors select records and documents for review, and people to interview, so that these inputs are sampled from a small number of selected units which are then considered typical of all covered units.

Resolution: Management's determination of what needs to be done in response to an audit finding (and/or associated recommendation), incident investigation team recommendation, risk analysis team recommendation, and so forth. During the resolution step, management accepts, rejects for cause, or modifies each recommendation. If the recommendation is accepted, an action plan for its implementation will typically be identified as part of the resolution. (See Implementation.)

Responsibility: The single person who has been assigned and has accepted the ultimate accountability for the development and or implementation a program, its separate activities, as well as its success or failure. There can be only one person with the ultimate responsibility for something. Although "accountability" enters into this definition, that term is used separately in this book.

Resources: The labor effort, capital and operating costs, and other inputs that must be provided to execute work activities and produce work products.

Review: To study critically an operation, procedure, condition, event, or series of transactions.

Risk: The combination of three attributes: what can go wrong, how bad could it be, and how often might it happen.

Risk analysis: A study or review of risk associated with a set of activities or list of potential accident scenarios. A risk analysis normally considers all three risk attributes. A risk analysis can provide qualitative or quantitative results.

Risk-based: The adjective "risk-based" is used to portray one or more risk attributes of a process, activity, or facility. In this context, considering any one of the three risk questions can be viewed as a risk-based activity. For example, when considering the hazards of a substance or a process in deciding how much rigor to build into an operating procedure, the term "risk-based design" is used rather than hazard-based design, even though understanding the hazard attributes was the primary determinant in the design of the procedure. So, for simplicity, rather than use the independent terms "hazard-based," "consequence-based," or "frequency-based," the single term "risk-based" is used to mean any one or a combination of these terms.

Risk-based process safety (RBPS): The CCPS's process safety management system approach that uses risk-based strategies and implementation tactics commensurate with the risk-based need for process safety activities, availability of resources, and existing process safety culture to design, correct, and improve process safety management activities. RBPS recognizes that all hazards and risks are not equal;

consequently, it advocates that more resources should be focused on managing the more significant hazards and higher risks. The approach is built on four pillars: commit to process safety, understand hazards and risk, manage risk, and learn from experience. These pillars are further divided into 20 elements (see Element).

Risk control measures: See Controls.

Risk management: The systematic application of management policies, procedures, and practices to the tasks of analyzing, assessing, and controlling risk in order to protect employees, the general public, the environment, and company assets.

Root causes: Management system failures, such as faulty design or inadequate training that led to an unsafe act or condition resulting in an incident; underlying cause. If the root causes were removed, the particular incident would not have occurred.

Root cause analysis (RCA): A formal investigation method that attempts to identify and address the management system failures that led to an incident. These root causes often are the causes, or potential causes, of other seemingly unrelated incidents. Also apparent cause analysis.

Safe upper and lower limits: The safe upper and lower limits refer to equipment design limits, not quality-related operating limits. Sometimes these values are referred to as design limits (e.g., design pressure, design temperature).

Safe work practices: An integrated set of policies, procedures, permits, and other systems that are designed to manage risks associated with nonroutine activities such as performing hot work, opening process vessels or lines, or entering a confined space.

Safeguards: See Controls.

Sampling: Selecting a portion of a large population of data or information to determine the accuracy, representativeness, or characteristics of the entire population.

Should: In this book the word “should” has been used to refer to action or guidance that is not mandatory. This has been applied to both the compliance and related audit criteria. The reason the compliance criteria are prefaced by “should” rather than “shall,” “must,” or other imperative terms is because the regulations described in this book that govern PSM programs from which the compliance criteria derived are performance-based in nature. Consequently, there may be multiple pathways to successful compliance and it is not the intent of this book to specify one method of compliance as being preferred or better than another, even inadvertently.

Stakeholder: Individuals or organizations that can (or believe they can) be affected by the facility’s operations, or who are involved with assisting or monitoring facility operation.

Stakeholder outreach: A PSM program element associated with efforts to (1) seek out and engage stakeholders in a dialogue about process safety; (2) establish a relationship with community organizations, other companies and professional groups, and local, state, and federal authorities; and (3) provide accurate information about company/facility operations, products, plans, hazards, and risks.

Standards: The PSM program element, Compliance with Standards, that helps identify, develop, acquire, evaluate, disseminate, and provide access to applicable standards, codes, regulations, and laws that affect a facility and/or the process safety requirements applicable to a facility. More generally, standards also refers to requirements promulgated by regulators, professional or industry-sponsored organizations, companies, or other groups that apply to the design and implementation of management systems, design and operation of process equipment, or similar activities.

Subcontractor: A company or individual performing work at a PSM-covered facility whose business relationship is with a third party (i.e., a general or specialty contractor) and not with the host facility directly. Subcontractors are subject to the Contractor Management element of PSM programs.

Technology steward: A person who is formally appointed to be responsible for maintaining the collective knowledge regarding a process, including process safety-related knowledge.

Testing: Verifying that the sampled information is valid. Testing can be performed by retracing data or information (i.e., physically checking against the status of the sampled information against equipment, operations, etc.), independent computation of results, and confirmation using another source of data or information.

Timely: Unless a different definition or explanation of this term is provided in a chapter within a specific context, “timely” shall mean the following: the resolution or implementation of recommendations, action items, and other follow-up activities are promptly determined, performed, or conducted. This means that they are completed in a reasonable time period given the complexity of the actions or activities decided upon and their difficulty of implementation, and that the timing should be evaluated on a case-by-case basis.

Toller: A contracted company that manufactures, stores, uses, handles, or transports chemical components of a facility’s final products.

Training: Practical instruction in job and task requirements and methods. Training may be provided in a classroom or at the workplace, and its objective is to enable workers to meet some minimum initial performance standards, to maintain their proficiency, or to qualify them for promotion to a more demanding position.

Turnaround: A scheduled shutdown period when planned inspection, testing, and preventive maintenance, as well as corrective maintenance such as modifications, replacements, or repairs is performed.

Verification: A wide variety of activities that can be employed to increase confidence in the audit data, including evaluating the application of, and adherence to laws, regulations, policies and procedures, standards, and management directives; certifying the validity of data and reports; and evaluating the effectiveness of management systems.

Verify: To confirm the truth, accuracy, or correctness of, by competent examination; to substantiate.

Voluntary consensus PSM program: A PSM program developed in response to a consensus program that is not required by law or regulation, but is specified by an

industry trade or professional organization, such as ACC, ISO, or another organization that has developed EHS consensus standards containing PSM provisions and either has recommended them to their membership or requires them to be implemented as a condition of membership.

VPP: *Voluntary Protection Program Supplement "B" 2008 Annual Self Evaluation*, VPP Application Supplement for Sites Subject to the Process Safety Management (PSM) Standard.

What-if analysis: A HIRA technique in which a brainstorming approach with a group of experienced people familiar with the subject process ask questions or voice concerns about possible undesired events.

Work force: A general term used to refer to employees and contractors at a facility. This term is often, but not exclusively, used to refer to operators, maintenance employees, and other employees or contractors who are not in a supervisory or technical role.

Workforce involvement: A PSM program element that consists of a series of work activates that (1) solicit input from the entire work force (including contractors), (2) foster a consultative relationship between management and workers at all levels of the organization, and (3) help sustain a strong process safety culture.

Working papers: Field notes used in preparation of the final report documenting work performed, techniques used, and conclusions reached while conducting the audit.

Written program: A description of a management system that defines important aspects such as purpose and scope, roles and responsibilities, tasks and procedures, necessary input information, anticipated results and work products, personnel qualifications and training, activity triggers, desired schedule and deadlines, necessary resources and tools, continuous improvement, management review, and auditing.

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Before publication, all CCPS books undergo a thorough peer review. This book was no exception; many people offered thoughtful suggestions and comments.

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PREFACE

The American Institute of Chemical Engineers (AIChE) has been closely involved with process safety and loss control issues in the chemical and allied industries for more than four decades. Through its strong ties with process designers, constructors, operators, safety professionals, and members of academia, AIChE has enhanced communication and fostered continuous improvement of the industry's high safety standards. AIChE publications and symposia have become information resources for those devoted to understanding the causes of incidents and discovering better means of preventing their occurrence and mitigating their consequences.

The Center for Chemical Process Safety (CCPS) was established in 1985 by AIChE to develop and disseminate technical information for use in the prevention of major chemical incidents. CCPS is supported by over 120 sponsoring organizations in the chemical process industry (CPI) and allied industries; these member organizations provide the necessary funding and professional experience for its technical subcommittees. Over the last few years CCPS has become a truly international organization with members from all parts of the globe. CCPS published its first *Guidelines* book in 1985, and since that time CCPS has developed over 100 guideline and concept books and sponsored 24 international meetings to foster the development of process safety professionals in all industries.

One of the earlier publications was *Guidelines for Auditing Process Safety Management Systems*, published in 1993. That book was modeled after the 12 process safety management system elements first published in 1989 in the CCPS book *Guidelines for Technical Management of Process Safety*. In 1992 OSHA published its Process Safety Management (PSM) Standard (29 CFR §1910.119). The elements of that regulation are comparable to but not identical with the original CCPS elements. Both the 1989 CCPS *Guidelines* book as well as the PSM Standard include audits as an element of a PSM program.

In 2007 CCPS published *Guidelines for Risk Based Process Safety*, which presented a new management system structure for process safety, with a risk-based strategic implementation process. That new publication contained 20 PSM program elements. Coincident with the completion of that project was a desire by the CCPS to develop *Guidelines for Auditing Process Safety Management Systems, 2nd Edition*, which would be based on the risk-based process safety elements. The project was initiated in 2007 and this book is the result.

What was missing from the first edition in 1993, given the timing of its publication, was detailed help or guidance in implementing the OSHA PSM requirement for auditing process safety management systems. This edition, although based on the 20 elements of risk-based process safety, integrates the OSHA PSM elements within the relevant element chapters and adds chapters for auditing PSM program applicability and risk management programs. Also included are various state regulations that apply to process safety management systems. In addition, extensive related PSM program audit guidance is provided, based on a number of sources, including written and verbal clarifications of the PSM Standard, related publications on PSM, successful and common practices in PSM that have emerged over the years, as well as other sources. The related guidance is a composite of collective judgments about the requirements of those standards and is not specifically approved by regulatory organizations or endorsed by the CCPS or any of its member organizations. In addition there is auditing guidance on the American Chemistry Council's (ACC) Responsible Care® management system and the EPA Risk Management Program (RMP) Rule. Performing PSM audits internationally is also presented; however, the details of non-U.S. PSM regulations are not presented.

Industry also expressed a need for an example audit protocol for both regulatory and nonregulatory requirements that might be tailored by individual companies. To meet that need a sample audit protocol is provided as an online companion to this book. See page xiv for information on how to access this resource. It is sincerely hoped that this book will provide a useful resource for the auditing of process safety management systems in the years to come.

USER'S GUIDE TO THE SECOND EDITION

This book is designed as described below, and the following should provide readers with guidance on how to use it:

- The basics of auditing process safety programs and their management systems are described in Chapters 1 and 2. These fundamental concepts are described in the context of process safety management systems; however, many of the concepts are applicable to any management system that follows the “Plan-Do-Check-Act” model. This book shows how to accomplish the “Check” step when the management system of interest is a process safety management system. Chapter 1 provides guidance on establishing a PSM audit program, while Chapter 2 provides guidance on how to conduct a particular audit.
- The auditing of each element of a process safety management or risk management program is described in Chapters 3–24. The PSM program elements addressed are those described in the CCPS book *Guidelines for Risk Based Process Safety*, plus additional chapters covering PSM program applicability and risk management programs. Both compliance (i.e., mandatory) as well as related (i.e., nonmandatory) issues are described in these element chapters.
- Several appendices are included, which provide PSM audit guidance on some specialty topics (e.g., international PSM audits, PSM audits during merger and acquisition situations), and information and examples/samples for commonly used PSM audit tools, for example audit report templates.

The PSM audit protocol derived from the audit criteria in the element chapters is described in Appendix A. This protocol is provided as an online resource in electronic spreadsheet format for ease of actual use by readers. See page xiv for information on how to access this resource.

EXECUTIVE SUMMARY

The purpose of this book is to provide current guidance on auditing process safety management systems. This guidance is based on approximately 15 years of collective experience in auditing such programs, mostly since OSHA's PSM Standard was published in May 1992 and audits of these programs began in 1995. Other guidance has become available during the intervening time from the implementation of a variety of U.S. and international regulatory and nonregulatory programs addressing process safety. This non-OSHA PSM experience also forms the basis for the contents of this book. However, given the myriad international PSM regulations that have been adopted in recent years in many countries, it was not practical to provide the same level of guidance for all these regulatory programs. Therefore, international users of this book will have to add or substitute the specific PSM requirements of the regulations that exist in their jurisdictions, as well as requirements that are imposed by their companies or sites.

Successful PSM program auditing begins with a commitment by senior company and site management to perform periodic audits of these programs, to allocate the appropriate resources to perform the audits, to ensure that the findings and recommendations are actively and carefully addressed in a timely manner, and to ensure that the activities on-site during the audit are arranged to support the audit to the maximum extent possible. Senior management has the ultimate responsibility for accomplishing these tasks. In addition, management should set the proper philosophical tone for this activity. This tone should emphasize the importance of the activity, what management hopes to learn from the audit about the PSM program in question, and the opportunity to look beyond just regulatory compliance if possible. The underlying tone should also ensure that all involved know that no personal blame will be attached to the results, but that the responsible parties will be accountable for the findings, particularly their correction. Management should participate in the audit by attending debriefs and the opening and closing meetings, if time and schedules permit. This will allow the audit team and facility personnel observe and understand management's commitment to and interest in the activity.

The only way to determine that a PSM program is working properly is to thoroughly examine both its design and implementation on a periodic basis. Therefore, a PSM audit represents a way of measuring the efficacy of the PSM program and also allows a thorough comparison against pre-determined PSM metrics. If the PSM program is not measured carefully, it cannot be controlled or

improved. At a minimum, the compliance with mandatory regulations and company standards should be evaluated and measured. However, this activity is an opportunity to explore whether the PSM program is properly focused on the appropriate processes based on their risk and on the programmatic elements that support abating those risks. It is also an opportunity to determine if the design and implementation of the PSM program has incorporated other related industry common or successful practices in PSM, and whether the PSM program reflects a philosophy of continuous improvement. The contents of this book provide the necessary guidance for executing this thorough examination.

This book is not intended to be considered as a recognized and generally accepted good engineering practice (RAGAGEP) for PSM audits. It contains comprehensive guidance for conducting such work; however, it is not a formal standard, as that term is generally used and understood in the chemical/process sector or in the engineering business. Although this book has been developed and published using the same process that has been used for many other CCPS Guidelines books, it has not been subjected to the same rigorous technical review process, including a peer review in the open literature or a voting process that is typically employed by organizations that produce and maintain codes and standards. Therefore, it should not be considered as mandatory guidance in the same context as the ASME Boiler & Pressure Vessel Code, or the standards published by the American Petroleum Institute, the National Fire Protection Association, the American National Standards Institute, or other similar documents.

INTRODUCTION

An audit is a fundamental part of an effective PSM program because its purpose is to verify that systems to manage process safety are in place and functioning effectively, and to take corrective action when findings indicate that is warranted.

This book describes PSM program elements that are both regulatory and nonregulatory. The CCPS book *Guidelines for Risk-Based Process Safety* (CCPS, 2007c) (RBPS) was used as a basis for choosing the program structure, that is, the elements that make up a PSM program. These elements are similar to but not identical to the elements in OSHA's Process Safety Management (PSM) Standard (29 CFR §1910.119), and the prevention program contained in EPA's Risk Management Program (RMP) Rule (40 CFR §68). In addition to the technical elements of a PSM program, this book addresses other sources of PSM program content and guidance, including the following:

- Process safety culture, as described in the RBPS book, the Baker Commission Report on the accident at BP–Texas City, the Chemical Safety Board (CSB) report on BP–Texas City, and the Responsible Care® former Process Safety Code published by the American Chemistry Council.
- OSHA's audit guidance published in the National Emphasis Program (NEP) for refineries.
- The Safety and Environmental Management Program (SEMP) published by the Minerals Management Service of the Department of the Interior for offshore oil platforms. SEMP is a voluntary program between the offshore oil exploration and production (E&P) industry and the U.S. Department of the Interior, Minerals Management Service (MMS). Oil platforms located on the outer continental shelf (OCS) are regulated by MMS, not OSHA. A voluntary PSM program developed by API and published in API RP-75 allows OCS facilities to implement a PSM program that is not regulatory but is recognized by MMS as a good industry practice for that sub-sector. The SEMP audit criteria are part of API RP-75 and may also be obtained at www.mms.gov/sempp.
- International process safety standards such as Seveso II in Europe, the International Labor Organization (ILO) standard C174, and the

International Standards Organization (ISO) guidance on auditing quality and environmental managements systems (ISO 19011).

Therefore, this book does not provide guidance for auditing only OSHA PSM programs, although it certainly includes such programs. In addition, this book is intended for an international audience and not just a U.S. domestic audience. International users would have to add and/or substitute regulatory requirements for PSM programs that are specific to their jurisdictions, as well as company and site-specific requirements. Appendix H provides additional auditing guidance for facilities in other countries or for U.S. companies with international operations. The book is intended to be used mainly during the operating phase of the life of a process; however, its guidance is relevant for PSM audits conducted at other times during the life cycle of a process.

Although this book addresses a broad range of possible PSM programs and management systems, it does not provide specific guidance for auditing the following types of programs:

- ACC's Responsible Care®, with the exception of the process safety portions of RCMS®.
- Quality management systems, e.g., ISO 9000.
- Security management systems.
- Occupational health and safety programs.
- Environmental programs, except for those that are part of a Risk Management Program (as required by 40 CFR §68, which is a process safety regulation and not a classical environmental regulation).

While the guidance provided herein is specific to PSM programs, many of the basic principles, as described in Chapters 1 and 2, are applicable to audits of any management system, including those listed above.

A comprehensive audit of process safety management systems can be accomplished using different approaches. This book provides alternatives for developing audit programs to meet the needs of a variety of companies from small businesses to international corporations. The book also addresses some basic skills, techniques, and tools that are fundamental to auditing, and some characteristics of good process safety management systems that an auditor should be looking for in facility PSM programs. Regardless of the approach and techniques used to conduct process safety management systems audits, the most important aspects are that the audits be objective, systematic, and done periodically.

NOMENCLATURE

Because the terms “process safety management” and the acronym “PSM” are often used interchangeably they are assigned explicit definitions for the purpose of this book in order to avoid confusion. These terms will have the following meanings:

- *Process safety management*: This term will be used to refer to a process safety management program or audit of such a program generically. In

this book this term does not refer exclusively to OSHA's Process Safety Management Standard.

- *PSM*: The acronym "PSM" will be used in conjunction with process safety management. Hence, the term "PSM audit" as used in this book will refer to an audit of any process safety program, and not just an audit performed pursuant to or in accordance with OSHA's PSM Standard or the prevention portion of EPA's RMP Rule.
- *OSHA PSM and EPA RMP*: This term will be used to refer to a PSM program or audit that is intended to comply specifically with OSHA's Process Safety Management Standard or the prevention portion of EPA's Risk Management Program Rule in the United States. The terms "PSM Standard" and "RMP Rule" will also be used to refer to the OSHA PSM regulations (29 CFR §1910.119) and the prevention portion of the EPA RMP Rule (40 CFR §68) themselves, respectively.

Finding: In this book the term "finding" is a conclusion reached by the audit team based on data collected and analyzed in response to a specific audit criteria/question that indicates a need for improvement exists in the PSM program design or implementation. Although strictly speaking a finding can be a positive or negative conclusion, common custom and terminology in auditing is to refer to the deficiencies identified as the "findings." In this book, the term "finding" will refer to the audit criteria or question, its answer (if audit questions were used), and the explanatory conclusion that describes the deficiency. Positive aspects of PSM programs will be referred to "positive results."

Should: In this book the word "should" has been used to refer to action or guidance that is not mandatory. This has been applied to both the compliance and related audit criteria. The reason that the compliance criteria are prefaced by "should" rather than "shall," "must," or other imperative terms is because the regulations described in this book that govern PSM programs from which the compliance criteria derived are performance-based in nature. Consequently, there may be multiple pathways to successful compliance and it is not the intent of this book to specify one method of compliance as being preferred or better than another, even inadvertently.

Related: In this book, the term "related" generally refers to audit criteria that are not mandatory or are not compliance issues. As such, it is usually either paired with the word "criteria" or is used in a sentence where the context is to distinguish between compliance criteria or issues and those that are not compliance or mandatory. Other uses of "related" that connote its typical meaning and syntax should be clear from the context of the sentence or paragraph where it is used.

Element Names: In the element chapters (Chapters 3–24), the name of each PSM program element in the title of the chapters is the same as that used in the CCPS RBPS book. The RBPS name has also been used in the section of each chapter containing the related criteria applicable to the element. However, in the compliance table of each chapter, the element names contained in the OSHA PSM Standard and EPA RMP Rule have been used. The OSHA PSM/EPA RMP

element has also been used in several sections of the book where the context is clear with respect to these regulations and the use of the RBPS element name would be confusing. A cross-reference between OSHA PSM elements and RBPS elements is shown in Table 1.

These and other terms are defined in the Glossary.

Table 1 Cross-Reference of RBPS Program Elements and OSHA PSM Elements

RBPS Element	OSHA PSM Element	Meaning
Process Safety Culture	N/A	The beliefs, behaviors, and customs in which the PSM program operates and which affect its efficacy
Compliance with Standards	Applicability (applies only to determining which processes and equipment should be included in the OSHA PSM program)	A system to identify, develop, acquire, evaluate, disseminate, and maintain an archive of applicable internal and external standards, codes, regulations, and laws that affect process safety and to comply with them as appropriate. This element interacts in some fashion with every RBPS management system element.
Process Safety Competency	N/A	Developing and maintaining process safety competency encompasses three interrelated actions: (1) continuous improvement in knowledge and competency, (2) ensuring that appropriate information is available to people who need to know it, and (3) consistently applying what has already been learned.
Workforce Involvement	Employee Participation	A system to enable the active participation of company and contractor workers in the design, development, implementation, and continuous improvement of the PSM program. Also includes the proper management of trade secrets, if any.
Stakeholder Outreach	N/A	A process for seeking out and engaging individuals or organizations that can be affected by the facility in a dialogue about process safety; establishing a relationship with other neighbors, other companies, and professional groups, local, state, and federal organizations; and providing necessary information about the company and facility's products, processes, plans, hazards, and risks.

RBPS Element	OSHA PSM Element	Meaning
Process Knowledge Management	Process Safety Information	<p>Technical information that describes the hazards of the materials at the facility and how the facility was designed, built, and operated and is recorded in written documents. This element also involves work activities associated with compiling, cataloging, and making the information available. However, knowledge implies understanding, not simply compiling data. Therefore, the <i>Competency</i> element complements the <i>Knowledge</i> element.</p>
Hazard Identification and Risk Analysis	Process Hazard Analysis	<p>A review process for identifying hazards and evaluating the risk of processes—throughout their life cycle—to make certain that risks to employees, the public, or the environment are consistently controlled within the organization's risk tolerance. These studies typically address the three main risk questions to the appropriate level of detail commensurate with analysis objectives, life-cycle stage, available data/information, and resources. The three main risk questions are: Hazard (What can go wrong?), Consequences (How bad could it be?), and Likelihood (How often might it happen?). This element also includes requirement to manage and control the risks identified.</p>
Operating Procedures	Operating Procedures/Safe Work Practices	<p>Written instructions listing the steps for a given task that are to be done and the manner in which they are to be performed. These tasks include startup, operate, and shut down processes, including emergency shutdown, as well as special situations such as temporary operations. Good procedures also describe the process, hazards, tools, protective equipment, and controls. Operating procedures also control activities such as transitions between products, periodic cleaning of process equipment, preparing equipment for certain maintenance activities, and other activities routinely performed by operators. Operating procedures complement safe work and maintenance procedures. This element includes that requirement that certain safe work practices be in place but does not specify the content of those practices.</p>

RBPS Element	OSHA PSM Element	Meaning
Safe Work Practices	Operating Procedures/Hot Work Permits	Work processes, which are often supplemented with permits, that control hazards and manage risk associated with nonroutine work. This element includes the OSHA PSM element Hot Work Permits.
Asset Integrity and Reliability	Mechanical Integrity	The systematic implementation of activities including inspections and tests necessary to ensure that important equipment will be suitable for its intended application throughout its life, written maintenance procedures, maintenance personnel training, deficiency management, and the quality assurance of equipment. It also helps ensure the dependability of critical safety or utility systems.
Contractor Management	Contractors	A system of controls to ensure that contracted services support both safe facility operations and the company's process safety and conventional worker safety performance goals. It addresses the selection, acquisition, use, and monitoring of such contracted services.
Training and Performance Assurance	Training (applies only to the process operators)	Informative (classroom and computer based), as well as practical education in job and task requirements and methods. Its objective is to enable workers to meet some minimum initial performance standards, to maintain their proficiency, or to qualify them for promotion to a more demanding position. Performance assurance is the means by which workers demonstrate that they have understood the training and can apply it in practical situations and is an ongoing process. Although not formally part of this element, the training of contractors and maintenance personnel is covered in the Contractor Management and Asset Integrity and Reliability elements.
MOC	MOC	A review and authorization process for evaluating proposed modifications to facility design, operations, organization, or activities—prior to implementation—to make certain that no unforeseen new hazards are introduced and that the risk of existing hazards to employees, the public, or the environment is not unknowingly increased.

RBPS Element	OSHA PSM Element	Meaning
Operational Readiness	Pre-start-up Safety Review	Processes are verified to be in a safe condition for re-start of a modified process and the initial commissioning and start-up of a new process. It addresses start-ups from all types of shutdown conditions and considers the length of time the process was in the shutdown condition. In addition, this element considers the type of work that may have been conducted on the process during the shutdown period in order to help guide the safe start-up review process.
Conduct of Operations	N/A	The execution of operational and management tasks in a deliberate and structured manner. It is also sometimes called "operational discipline" or "formality of operations," and it is closely tied to an organization's culture. Conduct of operations institutionalizes the pursuit of excellence in the performance of every task and minimizes variations in performance. Workers at every level are expected to perform their duties with alertness, due thought, full knowledge, sound judgment, and a proper sense of pride and accountability.
Emergency Management	Emergency Planning and Response	Planning for possible emergencies; providing resources to execute the plan; practicing and continuously improving the plan; training or informing employees, contractors, neighbors, and local authorities on what to do, how they will be notified and how to report an emergency; and effectively communicating with stakeholders in the event an incident does occur.
Incident Investigation	Incident Investigation	A process for reporting, tracking, and investigating incidents and near misses. It includes the formal process for investigating incidents, including staffing, performing, documenting, and tracking investigations of process safety incidents and the trending of incident and incident investigation data to identify recurring incidents. This process also manages the resolution and documentation of recommendations generated by the investigations.

RBPS Element	OSHA PSM Element	Meaning
Measurement and Metrics	N/A	Performance and efficiency indicators to monitor the near-real-time effectiveness of the PSM program and its constituent elements and work activities. It also addresses indicators to be considered, how often to collect data, and what to do with the information.
Auditing	Compliance Audits	Evaluation of whether management systems are performing as intended. It complements other elements such as Management Review and Metrics. The element provides a system for scheduling, staffing, effectively performing, and documenting periodic evaluations of all PSM program elements, as well as providing systems for managing the resolution of findings and corrective actions generated by the audits.
Management Review and Continuous Improvement	N/A	The routine evaluation of whether management systems are performing as intended and are producing the desired results as efficiently as possible. It is the ongoing "due diligence" review by management that fills the gap between day-to-day work activities and formal periodic audits. Management reviews have many of the characteristics of a first-party audit.

REFERENCES

Center for Chemical Process Safety, *Guidelines for Risk Based Process Safety*, American Institute of Chemical Engineers, New York, 2007 (CCPS, 2007c)

GUIDANCE FOR CHAPTERS 3–24

Chapters 3–24 provide detailed information and guidance for auditing specific elements of a PSM or RMP program. The following structure is used in these chapters:

- Each element chapter is formatted in a similar manner. The audit criteria and guidance section of each chapter presents two basic types of audit criteria: compliance criteria and related criteria. The compliance criteria are derived from the federal and state PSM-related regulations themselves. The related criteria are derived from several sources of clarification of these regulations, industry good/common practices in PSM, other government and industry publications on PSM, as well as several voluntary consensus programs in PSM as follows:
 - Appendix B (Interpretations and Clarifications) of PSM Compliance Directive—OSHA Instruction CPL 02-02-45
 - National Emphasis Program (NEP) for Refineries—OSHA Instruction CPL 03-00-004
 - Written and verbal clarification of the PSM and RMP regulations by their respective regulators
 - Citations issued against the OSHA PSM Standard
 - Nonmandatory publications on the OSHA PSM Standard and EPA RMP Rule:
 - OSHA 3133
 - Appendix C of the PSM Standard
 - Preamble of the PSM Standard
- Good, successful, or common industry practices in PSM and RMP
- CCPS book *Guidelines for Risk Based Process Safety*
- The Safety and Environmental Management Program (SEMP) guidance for the offshore oil industry
- The Responsible Care Management System® of the American Chemistry Council
- PSM guidance originally published by the Major Industrial Accidents Council of Canada (MIACC) before its dissolution in 1999 and now sponsored by the Canadian Chemical Producer’s Association (CCPA)

- Supplemental guidance for facilities that are part of the Voluntary Protection Program (VPP) and are covered by OSHA's PSM Standard
- The Baker Panel report on the accident at the Texas City refinery
- BP's incident investigation report of the accident at the Texas City refinery
- In Chapter 3, PSM Applicability, a description of rulings by the Occupational Safety and Health Review Commission (OSHRC) is included where appropriate as compliance auditor guidance. The OSHRC is an independent body of administrative law judges who rule on the appeal of citations issued by OSHA against companies for violations of their standards. The rulings of the OSHRC are binding on OSHA, and represent compliance guidance for the regulators as well as those companies/facilities covered by those regulations.
- The name of each PSM program element in the title of the chapters is the same as that used in CCPS's *Guidelines for Risk Based Process Safety* (CCPS, 2007c). This RBPS name has also been used in the related-criteria section of each chapter to refer to the element. However, in the compliance section of each chapter, the element name contained in the OSHA PSM Standard and EPA RMP Rule has been used.
- The inclusion of all of the criteria in Chapters 3–24 does not imply that the use of all these criteria is mandatory in any given audit for it to be successful. The extensive nature of the criteria provided in the element chapters is to allow those planning PSM audits the largest number of available criteria to choose from when evaluating PSM programs. Section 2.1.2.2 provides additional guidance on selecting audit criteria for a specific audit.
- The criteria and guidance described in these sections do not represent exclusive solutions to PSM program coverage, design, implementation, or interpretation. They represent the collective experience of many people in the chemical/processing sector who have performed many PSM audits, and the consensus opinion resulting from that experience. The compliance criteria are derived from the regulations that govern PSM programs in the United States; however, these regulations are all performance based. Performance-based regulations are goal oriented and there may be multiple pathways towards fully complying with them. Therefore, there may be alternate interpretations and solutions to the issues described in the compliance tables that are equivalent to those included, particularly the auditor guidance presented.
- The purpose of providing the related criteria is to give auditors additional guidance for evaluating PSM programs with respect to issues that go beyond the strict compliance requirements presented in the appropriate federal, state, or local regulations. These criteria, in large part, represent industry good, successful, or common practices. Some of them may represent levels of acceptable practice and should be carefully considered for examination in a PSM audit. The inclusion of the related criteria in

this book in no way infers that these criteria are required for a PSM program to be successful, nor does it infer that a PSM program will be deficient without them. There may be other, more appropriate solutions to the issues described by these criteria and the accompanying auditor guidance for an individual facility or company. In addition, their evaluation in a PSM audit is intended to be completely voluntary and not a mandatory requirement in any way. The related criteria should be used cautiously and with careful planning so that they do not inadvertently establish unintended PSM performance standards. Consensus should be sought within and between facilities and their parent companies before these criteria are used. Finally, the related criteria and guidance offered for consideration are not endorsements of nor agreements with the written or verbal clarifications made by the regulators, PSM citations issued against the regulations, other PSM guidance published by the regulators, or the successful or common PSM practices in any given company's PSM program from which they are derived.

- The audit criteria for trade secrets are included in Chapter 7, Workforce Involvement.
- Persons identified for possible interviews are named using common industry titles for persons with the responsibilities described, but these titles are used in a generic manner. Actual titles vary from company to company and sometimes among facilities of the same company. Auditors will need to determine exactly who has specific responsibilities or input at each facility where that perform an audit.
- Chapter 24 provides audit criteria for a RMP program exclusive of the prevention program portion of that program. Audits of this portion of RMP are not mandatory for regulated sites. Such audits are the responsibility of the implementing agency for RMP, which may be EPA or a state that has been granted that status by EPA—New Jersey, California, and Delaware have been granted such status. However, the prevention part of RMP must be audited triennially by the regulated site (same requirement as OSHA PSM). The element chapters provide these criteria. Chapter 24 addresses the following sections of RMP: registration, the RMP management system, the RMP submitted to the implementing agency, hazard assessment, and the RMP emergency response requirements (beyond the emergency response provisions required by OSHA PSM and prevention portion of RMP).
- Each element chapter contains state PSM program audit criteria for the following states: New Jersey, California (CalOSHA and CalARP), and Delaware. Only the unique state requirements have been described and audit criteria provided for them. Where the state requirements are identical to the corresponding OSHA PSM and EMP RMP requirement, they have not been repeated in the state section of the element chapter. Additional state PSM regulatory information and guidance can be found at the following websites:

- *New Jersey*: www.state.nj.us/dep/rpp/brp/tcpa/index.htm
- *Delaware*:
www.awm.delaware.gov/EPR/Pages/AccidentalReleasePrevention.aspx
- *California*:
 - CalARP:
www.oes.ca.gov/Operational/OESHome.nsf/978596171691962788256b350061870e/452A4B2AF244158788256CFE00778375?OpenDocument
 - CalOSHA: <http://www.dir.ca.gov/title8/5189.html>
- *Washington*:
<http://search.leg.wa.gov/wslwac/WAC%20296%20%20TITLE/WAC%20296%20-%2067%20%20CHAPTER/WAC%20296%20-%2067%20-001.htm>
- *Louisiana*: <http://www.dir.ca.gov/title8/5189.html>
- *Nevada*: ndep.nv.gov/baqp/cap.html
- Each compliance and related audit criteria is assigned a reference number. The following format has been used for these numbers:
XX–Y–ZZ

Where:

XX = Chapter number

Y = “C” for compliance or “R” for related

ZZ = Sequential number starting at 1. The number resets for related criteria.

- In each compliance and related criteria table of the element chapters, the followings abbreviations are used to indicate the source of the criteria:

3133	OSHA Publication 3133, <i>Process Safety Management Guidelines for Compliance</i>
API 75	American Petroleum Institute Recommended Practice 75, <i>Safety and Environmental Management Program</i>
APPC	Process Safety Management Standard Appendix C Compliance Guidelines and Recommendations for Process Safety Management (Nonmandatory)
CCPA	Major Industrial Accidents Council of Canada (MIACC) Self Assessment Tool, September 2001. PSM Guide/HISAT Revision Project: Version 070820 prepared by the PSM committee of CCPA (rights maintained by CSCHE)
CIT	Citation issued by OSHA against the PSM Standard
CPL	OSHA Instruction CPL 02-02-45 (PSM Compliance Directive)
GIP	Good industry practice in PSM, i.e., a good, successful, or common practice that a facility or company has found to be

	a useful addition to their PSM program, or a useful but nonmandatory solution to a PSM issue
NEP	National Emphasis Program (OSHA Directive CPL 03-00-004)
PANEL	Baker, J.A. et al., <i>The Report of BP U.S. Refineries Independent Safety Review Panel</i> , January 2007 (Baker Panel Report)
PRE	Preamble to Process Safety Management Standard
PSM	Process Safety Management Standard (29 CFR §1910.119)
RBPS	CCPS book, <i>Guidelines for Risk Based Process Safety</i>
RMP	Risk Management Program Rule (40 CFR §68)
TXC	BP Corporation, <i>Fatal Accident Investigation Report—Isomerization Unit Explosion</i> , May 2005
VCLAR	Verbal clarification of the PSM Standard by OSHA
VPP	VPP Supplement “B” 2008 Annual Self Evaluation, VPP Application Supplement for Sites Subject to the Process Safety Management (PSM) Standard
WCLAR	Written clarification of the PSM Standard by OSHA

1

PROCESS SAFETY MANAGEMENT AUDIT PROGRAMS

1.1 PROCESS SAFETY MANAGEMENT (PSM) AUDITS AND PROGRAMS

Auditing is an element of a PSM program. It is a critical element in that it provides information about the effectiveness of the program and contributes to management control of other processes, systems, facilities, and safety and health programs. A sound PSM audit program will help improve the effectiveness of a PSM program.

In discussing PSM auditing, some confusion over terminology may arise. “Auditing” is used in various contexts to describe many different types of review or assessment activities. In this book, an audit is a systematic, independent review to verify conformance with established guidelines or standards. It employs a well-defined review process to ensure consistency and to allow the auditor to reach defensible conclusions. Other related activities sometimes referred to as audits include the following:

- *Inspection.* The process of physically examining a facility.
- *Assessment, evaluation, and review.* Less formal reviews, which may combine aspects of inspections and audits, are guided by the judgment, experience, and inclination of the reviewer, often without a well-defined review procedure or process. Such a review often has a broader scope than an inspection, but it does not have the consistency and rigor of an audit. At times, companies or facilities will use these three terms and other less formal terms in lieu of “audit,” but the activity has the same rigor as an audit, often the same protocol, the same way of using the protocol (i.e., interviews, record review, etc.), and the same reporting requirements. The reasons for using these terms interchangeably vary widely. Some companies have very strict rules governing any activity entitled “audit,” including legal governance. Some companies reserve the word “audit” to only those activities that are regulatory or compliance related.

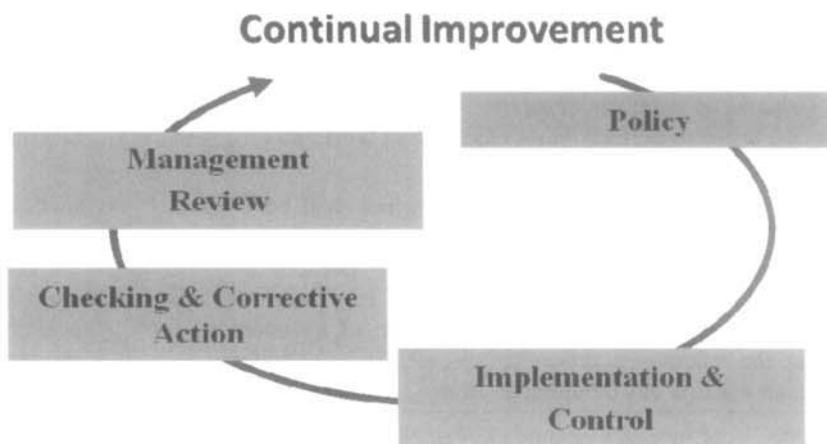
In its early publications (CCPS, 1989a and 1989b), the American Institute of Chemical Engineers' Center for Chemical Process Safety (CCPS) defined 12 elements of a process safety management program. Subsequently, OSHA adopted the Process Safety Management Standard (OSHA, 1992), which contains 14 elements, and the applicability section of the standard. In 2007 CCPS revised the definition of a process safety management program in the publication of the *Guidelines for Risk Based Process Safety* (CCPS, 2007c) to include 20 elements. In addition, several states adopted process safety regulations before and after CCPS and OSHA established their programs, for example, New Jersey (NJ, 1987), California (CA, 1988), Delaware (DE, 1989), Washington (WA, 1992), Louisiana (LA, 1993), and Nevada (NV, 1994). Some states have simply adopted the OSHA PSM standard verbatim, or nearly so, while other states have added state-specific requirements. Several states have modified their state PSM programs to include the federal RMP Rule and obtain implementing agency status from the EPA to enforce the RMP Rule within their jurisdictions (e.g., Delaware, Florida, Georgia, Kentucky, Mississippi, New Jersey, North Carolina, Ohio, and South Carolina). California has its own state RMP regulation (the CalARP program), but it is not an implementing agency for the federal RMP Rule. Also, since the publication of the first edition of this book, a number of domestic and international governmental and nongovernmental organizations have developed and published PSM program requirements. Some of these have been mandatory requirements embedded in various regulations, and some have been voluntary standards representing the consensus of the publishing organization. Table 2.1 summarizes several of these various mandatory and voluntary process safety requirements. The table has been arranged so that comparable program elements are in the same row, recognizing that the detailed requirements between comparable elements may not be the same. Some of these programs have elements that have no corresponding element in another program and these have been placed at the bottom of the table.

For the purposes of the book, the elements published by CCPS in *Guidelines for Risk Based Process Safety* (CCPS, 2007c) have been used as a guide to describing a PSM program and its elements. Management systems that address each of these 20 elements should be established to form a comprehensive PSM program.

The ISO 14001 Standard defines a management system as “that part of the overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes, and resources for developing, implementing, achieving, reviewing, and maintaining the environmental policy.” Process safety management systems are comprehensive sets of policies, procedures, and practices designed to ensure that barriers to episodic and potential process safety incidents are in place, in use, and effective. EHS management systems, including those designed for PSM programs, typically follow closely the Plan-Do-Check-Act (PDCA) model used in many total quality management systems. A PDCA management system is founded upon the notion that continuous improvement is a cardinal principle. The “plan” portion of this model is essentially the development of written policies and procedures to define a desired program (in

this case a PSM program). The “do” portion is where these policies and procedures are implemented (usually the most difficult step). The “check” portion is the evaluation or auditing of what occurs during the “do” step, while the “act” step involves taking what is learned and feeding the lessons learned back to revise the policies and procedures if necessary. This circular design with appropriate feedback is the key aspect of a PDCA management system and provides the continuous improvement. Figure 1.1 depicts a PDCA management system.

Figure 1.1 Plan-Do-Check-Act Management System



Process safety management auditing is the systematic review of these management systems to verify the suitability of these systems and their effective, consistent implementation. PSM audits are intended to determine whether management systems are in place and functioning properly to ensure operating facilities and process units have been designed, constructed, operated, and maintained to ensure that the safety and health of employees, communities, customers (to the extent that portions of the PSM program extend beyond the facility boundary, such as emergency response planning), and the environment are being properly protected. These audits are an important control mechanism within the overall management of process safety. In addition, these audits can provide other benefits such as improved operability and increased safety awareness. There are several items that are *not* included in the purpose or methods of a typical PSM audit:

- Focus on the programmatic aspects of PSM programs, not on identifying the equipment/process hazards. Process hazard analyses, hazard identification, risk assessments, and other similar activities are intended to determine the possible hazards and risk associated with the processes/equipment under consideration.

- Verify or replicate the engineering activities that took place to design the equipment and processes. For example, a PSM audit should not include within its scope work or activities that replicate the calculations performed to establish the set point and capacity of the relief devices in the processes. Engineering design reviews, design approvals, or the technical reviews associated with a MOC procedure are the appropriate places to perform this basic engineering work. A PSM audit would verify that the calculations have been performed and are in the facility's files; the correct recognized and generally accepted good engineering practices (RAGAGEP) were used to design, install, and periodically test the relief devices; and the engineering design reviews or project approvals specified in the project manual/procedures were carried out and documented. This thin, but distinct line between auditing and engineering should be carefully observed. Audit teams have neither the time nor the expertise to perform basic engineering work, and it is always outside the purpose and scope of a PSM audit.

The criteria used during PSM audits, which will be used to evaluate PSM program, may be limited to the requirements of specific laws and regulations, or they may be broadened to include company policies and standards, or the guidelines of organizations described in Table 1.1. Each company should decide on appropriate audit criteria during the design of its audit program. The audit criteria are the reference points against which the PSM program will be compared to determine whether any deficiencies exist.

A PSM audit involves examination of management system design, followed by evaluation of management system implementation. The design of the management system must be understood and then evaluated to determine if the system, when functioning as intended, will meet the applicable criteria. Then the auditor must evaluate the quality and degree of implementation since a well-designed system may not be backed up by consistent, thorough implementation.

Table 1.1 Elements of Chemical/Processing Process Safety Programs

CCPS RBPS (Note 1)	OSHA PSM & EPA RMP Program 3 (Note 3)	EPA RMP Program 2 (Note 3)	CCPS Technical Mgmt of Process Safety (Note 2)	ACC Responsible Care® RCMS® (Note 4)	ISO 14001 EMS & OSHAS 18001 (Note 5)	SOCMA ChemStewards® (Note 6)	SEMP (Note 7)	Seveso II (Note 8)	ILO C-174 (Note 9)
Process Safety Culture			- Accountability; - Objectives and Goals	- Commitment - Accountability	Resources, Roles, Responsibility (Accountability), and Authority		Leadership and Commitment	- Safety Management System (Annex III) - Organization and Personnel (Annex III-3.1)	
Compliance with Standards	PSM Applicability		Standards, Codes, and Laws		Legal and Other Requirements			Process Hazard Analysis (Annex III-3.2)	
Process Safety Competency								Training (Annex III-3.1)	
Workforce Involvement	Employee Participation			Employee Participation				Organization and Personnel	Article 9(f) Consultation with Workers & Their Representatives
Stakeholder Outreach				- CAER Integration - Siting				Community Awareness	

CCPS RBPS (Note 1)	OSHA PSM & EPA RMP Program 3 (Note 3)	EPA RMP Program 2 (Note 3)	CCPS Technical Mgmt of Process Safety (Note 2)	ACC Responsible Care® RCMS® (Note 4)	ISO 14001 EMS & OSHAS 18001 (Note 5)	SOCMA ChemStewards® (Note 6)	SEMP (Note 7)	Seveso II (Note 8)	ILO C174 (Note 9)
Process Knowledge Management	Process Safety Information	Safety information	- Process Knowledge and Documentation - Enhancement of Process Safety Knowledge	- Design Documentation - Process Hazards Information	Documentation		Safety and Environmental Information	Safety Report (Art. 9 – Annex II)	
Hazard Identification and Risk Analysis	Process Hazard Analysis	Hazard Review	- Process Risk Management - Human Factors	- Process Hazard Analysis - Multiple Safeguards - Siting	- Environmental Aspects - OSHAS 18001: Hazard Identification, Risk Assessment, and Determining Controls)		Hazards Analysis	Identification and Evaluation of Major Hazards (Safety Report - Art.9 – Annex II) - Process Hazard Analysis (Annex III-3.2) - Process Operation	Article 9(a) Identification and Analysis of Hazards and Assessment of Risks
Operating Procedures	Operating Procedures	Operating Procedures		Safe Work Practices	Operational Control		Operating Procedures	Operational Control	Article 9(b) Technical Measures
Safe Work Practices	Operating Procedures						Safe Work Practices	Operational Control (Annex III-3.3)	

1. PROCESS SAFETY MANAGEMENT AUDIT PROGRAMS

CCPS RBPS (Note 1)	OSHA PSM & EPA RMP Program 3 (Note 3)	EPA RMP Program 2 (Note 3)	CCPS Technical Mgmt of Process Safety (Note 2)	ACC Responsible Care® RCMS® (Note 4)	ISO 14001 EMS & OSHAS 18001 (Note 5)	SOCMA ChemStewards® (Note 6)	SEMP (Note 7)	Seveso II (Note 8)	ILO C174 (Note 9)
Asset Integrity and Reliability	Mechanical Integrity	Maintenance	- Process and Equipment Integrity - Capital Project Review and Design Procedures	- Maintenance and Inspection - Codes and Standards	- Monitoring and Measurement - OSHAS 18001: Performance Measurement and Monitoring)		Assurance of Quality and Mechanical Integrity	Equipment Integrity (Annex III-3.3)	Article 9(b) Technical Measures
Contractor Management	Contractor Safety			Contractors				Contractor Programs (Annex III-3.1)	Article 9(c) Organizational Measures
Training and Performance Assurance	Training	Training	Training and Performance	- Job Skill Requirements - Training - Employee Proficiency	Training and Awareness			- Organization and Personnel - Training (Annex III-3.1)	Article 9(c) Organizational Measures
Management of Change	Management of Change		Management of Change	Management of Change			Management of Change	Management of Change (Annex III-3.4)	
Operational Readiness	Pre-Start-Up Safety Review			Safety Reviews			Pre-Start-Up Review	Management of Change (Annex III-3.4)	
Conduct of Operations				Fitness for Duty	Operational Control				

CCPS RBPS (Note 1)	OSHA PSM & EPA RMP Program 3 (Note 3)	EPA RMP Program 2 (Note 3)	CCPS Technical Mgmt of Process Safety (Note 2)	ACC Responsible Care® RCMS® (Note 4)	ISO 14001 EMS & OSHAS 18001 (Note 5)	SOCMA ChemStewards® (Note 6)	SEMP (Note 7)	Seveso II (Note 8)	ILO C174 (Note 9)
Emergency Management	Emergency Planning and Response			Emergency Management	Emergency Preparedness and Response		Emergency Response	Emergency Plans (Art. 7&11, Annex III-3.5)	Article 9(d) Emergency Plans and Procedures
Incident Investigation	Incident Investigation	Incident Investigation	Incident Investigation	Incident Investigation Information Sharing	OSHAS 18001 Incident Investigation		Investigation of Incidents	Monitoring Performance	Article 9(g) Improvement of the System
Measurement and Metrics					Monitoring and Measurement				
Auditing	Compliance Audits	Compliance Audits	Audits and Corrective Actions	Performance Measurement	Internal Audit		Audit of Safety and Environmental Management Program Elements	- Audit and Review - Monitoring Performance (Annex III-3.6)	
Management Review and Continuous Improvement					Management Review				
Unique Elements									
	Trade Secrets			Trade Secrets					

CCPS RBPS (Note 1)	OSHA PSM & EPA RMP Program 3 (Note 3)	EPA RMP Program 2 (Note 3)	CCPS Technical Mgmt of Process Safety (Note 2)	ACC Responsible Care® RCMS® (Note 4)	ISO 14001 EMS & OSHAS 18001 (Note 5)	SOCMA ChemStewards® (Note 6)	SEMP (Note 7)	Seveso II (Note 8)	ILO C174 (Note 9)
									Article 9(e) Measures to Limit the Consequences of a Major Accident
				Siting					

Note 1: CCPS, Guidelines for Risk Based Process Safety, 2007.

Note 2: CCPS, *Guidelines for Technical Management of Chemical Process Safety*, 1989. This original concept of the process safety program was used in Canada by the Major Industrial Accident Council of Canada (MIACC) before its dissolution. MIACC was a voluntary PSM initiative.

The Process Safety Management committee, a joint committee with the Canadian Chemical Producers Association (CCPA), remains active, despite the dissolution of CCPA. This committee was responsible for developing tools to assist companies in assessing their own level of accomplishment toward good PSM practices.

Note 3: OSHA, Process Safety Management of Hazardous Chemicals, 29 C.F.R. §§1910.119, 1992, and EPA, Chemical Accident Prevention Provisions—Risk Management Program Rule, 40 C.F.R. §§68, 1996.

Note 4: American Chemistry Council, RCMS® Technical Specification, RC101.02, January 2004.

Note 5: National Center for Environmental Decision-Making Research (Oak Ridge National Laboratory), Technical Report NCEDR 98-06, ISO 14001 Guidance Manual, March 10, 1998. OSHAS 18001 element names are shown parenthetically if different from ISO 14001, and are derived from OHSAS 18001:2007, Occupational Health and Safety Management Systems—Requirements.

Note 6: Synthetic Organic Chemical Manufacturers Association, ChemStewardsSM Program.

Note 7: Department of the Interior, Minerals Management Service (MMS), Safety and Environmental Management Program (SEMP) Audit Protocols, 2001. American Petroleum Institute, Recommended Practice 75, Development of a Safety and Environmental Management Program for Outer Continental Shelf Operations and Facilities, 1998

Note 8: EU Council Directive 96/82/EC—9 December 1996 (Seveso II). The Seveso II citation (i.e., Annex number) is shown.

Note 9: International Labor Organization, Convention concerning the Prevention of Major Industrial Accidents, March 1, 1997, Convention:CI74.

The remainder of this chapter discusses the issues associated with the design and management of a PSM auditing program. Specifically, the issues of audit scope, frequency, staffing, reporting, follow-up, and quality assurance are discussed. Although the concepts and guidance presented in this chapter are applicable in a general manner to all domestic and international facilities with PSM programs, there are some special issues that should be considered when U.S.-based auditors perform PSM audits in international locations. Appendix H provides additional guidance for international PSM audits.

1.1.1 Management Responsibilities and Accountability

Senior management at either the company or facility level is responsible for establishing the PSM audit program. Even if line management has been formally assigned the accountability for the design and implementation of PSM program, the auditing of the program is often considered a governance activity, and company-level policies and procedures are generally used to perform PSM audits. If the company has not established the necessary management systems to plan, execute, and document PSM audits, then the site management should assume these responsibilities. Management is responsible for the following aspects of the PSM audit program:

- *Policy.* Management should establish the overall policies that will control the audit activity. Responsibilities for actually planning, executing, documenting, reporting, and following up on the results can and should be delegated to appropriate personnel. Senior management, while retaining overall responsibility for the PSM audit program, should appoint a PSM audit “champion” with the appropriate background, experience, interest, and enthusiasm who will be responsible for planning and executing the details of the program.
- *Commitment.* Management should establish the proper philosophical tone for the audit program. This tone should emphasize the importance of the activity, what management hopes to learn from the audit about the PSM program in question, and the opportunity to look beyond regulatory compliance, if possible. The underlying tone should also ensure that all involved know that no personal blame will be attached to the results, but that the responsible parties will be accountable for the findings, particularly their correction (except for extreme situations where malfeasance is involved). Management should participate in the audit by attending debriefs and the opening and closing meetings, if time and schedules allow. This will allow the audit team and facility personnel to observe and understand management’s commitment to as well as their interest in the activity. PSM audits are intended to improve the program and reduce the likelihood of a process safety incident, and only senior management can convincingly convey this commitment message.

- *Procedures.* Management should establish and implement the appropriate management-system procedures for the PSM audit program. A typical PSM audit procedure should address the following topics:
 - Selecting facilities for PSM audits
 - Establishing frequency of PSM audits
 - Planning and conducting audits, including scheduling
 - Determining training and qualifications of auditors, including lead auditors
 - Selecting and determining audit teams and assignment of the lead auditor
 - Developing and maintaining the audit protocol
 - Selecting focus units/processes and sampling guidance
 - Documenting audits
 - Following up on audit findings
 - Determining format and content of audit reports
 - Distributing and retaining audit reports
 - Communicating audit results to the employees
 - Providing access to employees of audit results
 - Certifying audits (certification required by some process safety regulations)

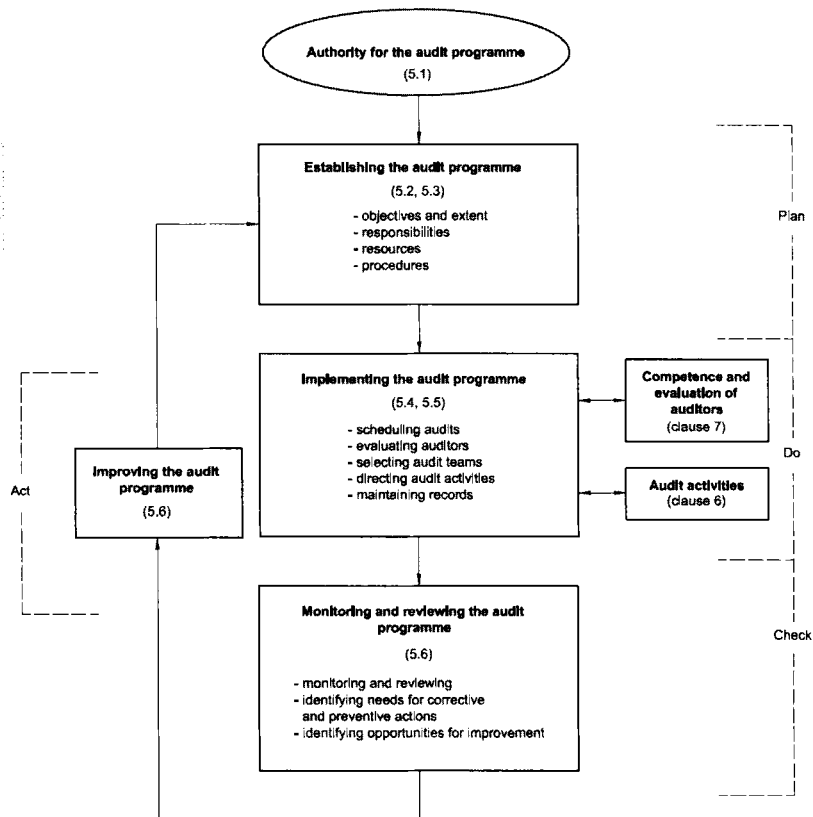
This procedure, as with other PSM-related management procedures covering other PSM program elements, should be documented, formally issued, and approved for use.

- *Resources.* Management should commit the proper resources to execute the audit program. These resources should be formally budgeted on an annual or other budget-cycle basis. The resources needed include the following:
 - Staffing and expenses associated with keeping the audit program up-to-date. Like any management system, it should be devised as a Plan-Do-Check-Act procedure, in which the “act” portion of the model requires that the management system be continually improved. Between actual audits (the use of the management system procedure), new lead auditors and audit team members will require training and the protocol will require updating.
 - Staffing and expenses associated with actual audits if these are scheduled during the budget cycle under consideration. If second- or third-party auditors will be involved, the necessary arrangements will be required in advance. Different groups and disciplines may be involved in executing PSM audits, and the individual budgets of these different groups should be coordinated.
 - Staffing and expenses associated with the follow-up of audit recommendations. The exact amount of needed resources for follow-

up activities will be difficult to project until audits have been completed, but some allowance should be made for this in planning and budgeting. These items should be resolved, requiring time and effort beyond the audit team. Engineering, operations, maintenance, and other groups and disciplines will all likely have work to do to address audit results in a timely manner. If subject matter experts from inside or outside the company are required, arrangements should be made for their services. Finally, the resolution may dictate that hardware, procedures, software, training, or other aspects of the process safety policies, practices, or procedures be modified in some manner. These may involve engineering projects, procedure revisions, or other technical work that should be planned and budgeted. Some of this work will be long term and will extend over several budget cycles, whereas some of this work will be completed relatively quickly. PSM audit programs are not one-time expenses and should be budgeted and planned as ongoing activities. Although hardware-related changes may be necessary as a result of a PSM audit, most recommendations from these audits will be programmatic in nature and will be related to changes in PSM program policies, procedures, training programs, and other management system documents and practices.

- Management is responsible for providing the right people with the proper expertise to perform PSM audits. For example, process safety experts for each element should be present for the audits if they are available.
- *Continuous improvement.* Management's role in continuous improvement is to first provide a management system for the PSM audit program that follows the Plan-Do-Check-Act model of modern management systems. This includes the policies and procedures described above. This management system, once formulated, should be successfully implemented. Figure 1.2, which is from ISO-19011 (ISO, 2002), shows diagrammatically how an audit program is managed as a Plan-Do-Check-Act model. The continuous improvement step fulfills the "act" portion of the model. The numbers in each of the boxes of Figure 1.2 are the appropriate sections of ISO-19011 that define and describe each aspect of an audit in more detail.

Figure 1.2 Audit Program Flowchart



1.1.2 Legal Issues

There are two legal issues that might affect the conduct of a PSM audit: privilege and liability. A brief discussion of each issue follows. Any company anticipating employing the concepts described herein should consult with counsel.

1.1.2.1 Privilege

The results of a PSM audit may be used as evidence by a government agency during enforcement litigation, and in civil or even criminal litigation. If, however, an audit is conducted under privilege, certain portions of it may be protected from disclosure to the government or third parties. Any company that seeks to keep a PSM audit confidential should consult legal counsel about whether and how the audit can be protected from disclosure. The following are three privileges applicable to PSM audits:

- 1) OSHA has adopted a policy regarding voluntary self-audits, which states that the agency will not “routinely request” voluntary self-audit reports and “will not use such reports as a means of identifying hazards upon which to focus inspection activities.” 65 Fed. Reg. 46,498 (July 18, 2000). While the policy leaves some “loopholes,” the policy generally states that OSHA will only request an audit report if the agency has an “independent basis” to conclude that a hazard exists, and may then request the portion of a voluntary self-audit addressing that hazard. In addition, OSHA will not issue a citation predicated upon a hazard identified in a voluntary self-audit if the hazard is corrected before the inspection or any accident, illness or injury occurs. Similarly, “if an employer is responding in good faith to a violative condition identified in a voluntary self-audit,” OSHA will not use the voluntary self-audit to prove that the violation is “willful.” For PSM audit purposes, the most important limitation in OSHA’s policy is that the audit must be “voluntary.” An audit conducted pursuant to paragraph (o) of the PSM standard is mandatory, not voluntary, and OSHA’s self-audit policy would therefore be inapplicable. An employer may, however, perform additional audits related to PSM elements that are not intended to comply with paragraph (o) or may perform an audit for processes not covered by the OSHA PSM standard, and these audits may fall under OSHA’s policy. Also, the privilege applies only in OSHA enforcement matters; the OSHA policy has no relevance to actions involving other government agencies or in civil or criminal litigation.

In addition to the OSHA policy on self-audits, a few courts have recognized a common-law audit privilege, but most courts have declined to recognize the privilege and have required disclosure of audit reports in litigation. The courts that have recognized the common-law privilege have generally looked at four factors to determine whether the privilege applies:

- whether information at issue was generated during a self-audit;
 - whether the company intentionally preserved the confidentiality of the information;
 - whether there is a strong public interest in encouraging audits of this type; and
 - whether there is a strong likelihood that not applying the privilege in this context will discourage companies from conducting the particular type of audit.
- 2) Portions of a PSM audit report may be protected by the attorney-client privilege, which is intended to facilitate candid communications between attorneys and their clients. The privilege applies to all communications between the client and attorney, and the document at issue must have been created for the purpose of assisting the attorney in providing legal advice to the company. Counsel must be actively involved in the audit process for the report to be protected by the attorney-client privilege, and

the privilege will be waived if the information is disclosed to a third party. With regard to PSM audits, a report prepared pursuant to paragraph (o) will not be protected by attorney-client privilege because the PSM Standard mandates that the company prepare a report and make it available to OSHA in the context of an inspection or enforcement litigation. At the same time, a company may choose to involve counsel in certain parts of the audit and prepare a separate report that may be protected by the attorney-client privilege. For example, the company may ask for a legal opinion regarding whether a particular practice complies with the standard. The advice provided and associated communications would typically be covered by the attorney-client privilege.

- 3) The attorney work product doctrine may protect a report from disclosure under certain circumstances. For the doctrine to apply, the information must have been created in anticipation of litigation. For example, an accident or incident report may be prepared under the direction of an attorney because civil or other litigation is likely. The work product doctrine generally applies only to legal analysis and conclusions, and does not apply to factual information. Also, a third party may overcome the doctrine by showing a substantial need for the information. The work product doctrine will typically not be applicable to a PSM audit unless it is conducted following an accident that may lead to litigation and is designed to elicit legal analysis of whether certain conditions violated the standard of care.

1.1.2.2 Liability

The two following basic sources of legal liability may flow from an audit:

- A company or facility that fails to perform an audit or performs it inadequately may be in violation of the PSM standard or the RMP regulation, and these failures may serve as evidence during civil or criminal litigation.
- To the extent a company or facility fails to respond to findings or action items resulting from the audit, violations of the PSM standard or RMP regulation may occur and may constitute evidence in a civil or criminal action. Documenting the purpose, scope, and guidance of the audit and carefully preparing the report can minimize liability.

1.1.3 PSM Audit Program Purpose and Objectives

In establishing a PSM audit program, the purpose and objectives of PSM audits should be clearly known and defined. They should define why PSM audits are performed and what the facility and/or company hopes to get out of the activity. Possible purposes for conducting PSM audits include one or more of the following:

- *Reducing the process safety risk.* The primary purpose for performing PSM audits is to identify and correct practices that have reduced the effectiveness of the PSM program management systems. The identified

practices are those that have increased the likelihood (and perhaps the severity) of a significant release of chemicals/materials included in the PSM program and could represent a potential catastrophic incident. Therefore, reducing the process safety risk is the most important reason why PSM audits should be performed. Management's commitment to measuring the effectiveness of the PSM program so that the process safety risk is as low as reasonably achievable is critical to the success of the program.

- *Domestic or international regulatory requirement.* Companies with facilities subject to process safety regulations are generally required to perform periodic PSM audits. As shown in Table 2.1, nearly all process safety regulations include such a requirement. The most common examples of these regulatory requirements in the United States is the requirement for a triennial audit for those facilities covered by OSHA's Process Safety Management Standard (i.e., an OSHA PSM audit), and/or EPA's Risk Management Program Rule. The citations for triennial audits are found at 29 CFR §1910.119(o) and 40 CFR §68.79 respectively.
- *Company/voluntary requirement.* Companies with voluntary PSM programs and companies that ascribe to trade/professional organization process safety or EHS management system programs will often have requirements for conducting periodic PSM audits. Examples include ISO 14000, ACC's Responsible Care® initiative, and SOCMA's ChemStewards® Program. Often these requirements are similar in interval and content to those conducted pursuant to the PSM or RMP regulations.
- *ACC RCMS® program certification.* ACC's Responsible Care certification process requires that the system be certified by a third party, which will require audits of the program by the certifying agent.
- *Due diligence as part of merger or acquisition.* Some companies have begun including audits (or less formal assessments or evaluations) as part of the due diligence process when considering whether to acquire another company's facility or a merger with another company. There may be considerable potential cost and regulatory liability associated with not thoroughly examining the structure and implementation of a PSM program in a prospective merger or acquisition situation. See Appendix A for additional guidance regarding PSM audits during mergers and acquisitions.
- *Gap analysis.* Many times, the initial activity in implementing a PSM program is an audit to determine the gap between existing EHS-related policies, practices, and procedures, and the desired implementation of a PSM program. This gap analysis can be used as a starting point for the PSM management systems needed for a functional PSM program, i.e., a PSM program that is working as it is designed and meets the relevant governing requirements.
- *Insurance carrier request.* Because the insurance carrier's role is property protection, its goals are different than those of a PSM program. However, since PSM programs are intended to prevent large-scale events such as

fire and explosions, there is some overlap between process safety and loss prevention. Therefore, insurance companies are interested in some of the elements of a PSM program, and will sometimes request to see the results of PSM audits.

- *Investigation of an incident.* If the investigation of a process safety incident reveals that one or more of the root causes is the failure of process safety element(s), the company may decide to perform a PSM audit to determine the depth of the failure or to determine what other PSM program elements might have systemic failures. The requirement for a post-incident PSM audit is sometimes included in a settlement agreement with a government agency.
- *Monitoring PSM program continuous improvement.* Although most PSM audits are performed due to an external trigger (even voluntary-consensus EHS programs containing PSM provisions, e.g., RC14001®, contain requirements to perform audits), a secondary reason to perform them is to measure the maturation of the PSM program. A consistently applied set of audit criteria over a period of time (usually three to six years) should show whether the program has made steady process progress both in its development and in its implementation. PSM audits also afford the opportunity to measure the level of knowledge of those persons with responsibilities for the program and its implementation, and how this knowledge level has matured.

The main objectives, or outcomes, of PSM audits are derived directly from the purposes and include the following:

- Reducing the process safety risk;
- Compliance with regulatory audit requirements; and
- Compliance with internal audit requirements.

However, there may be secondary reasons for performing PSM audits. These might include the following:

- *Sharing of successful or best practices.* Another reason to perform PSM audits is to catalogue successful policies, practices, and procedures. These can then be shared with other facilities within the same company, and perhaps even with the remainder of industry. Although, like measuring the maturation of the PSM program, this is not a primary reason for performing the audits, it is a highly useful by-product of the activity and shifts the focus to the positive things that were identified, rather than just the deficiencies that require correction. Auditors should take time to inform the facility/company staff of these successful PSM practices. Some companies will include a summary of the good PSM practices in the audit report.
- *Training of auditors.* PSM audits are excellent training opportunities for prospective auditors, others with PSM responsibilities, or those who are

expected to take on such responsibilities to learn how the PSM requirements are interpreted and applied for the facility in question, and also how to properly review documents/records, interview personnel, and observe activities within the context of auditing a PSM program.

- *Communication of information.* As with training of personnel, PSM audits are another medium for disseminating information to PSM program personnel on how the PSM Standard or internal PSM requirements are to be interpreted and applied at a particular facility or within a specific company.
- *Feedback.* PSM audits represent an opportunity (sometimes the only opportunity) to provide formal feedback on the efficacy of the PSM program.
- *Performance measurement.* PSM audits are an opportunity for the facility to be measured with respect to the effectiveness of its PSM program. Care should be taken to express this measurement for the facility as a whole, and not to leave any impression that the results represent a “report card” for any individual.

Purposes and objectives that will be common attributes in a facility or company PSM audit program should be described clearly and formally in the PSM audit management system procedure, even when they seem straightforward and obvious. This will highlight these principles and help ensure that they are incorporated into the planning of each individual audit (see Section 2.1.2.1).

1.2 PSM AUDIT PROGRAM SCOPE

The scope of a PSM audit program refers to what will be audited, that is, what plants, sites, processes, and/or PSM programs are to be subject to a PSM audit. It is important that the scope of the audit program be clearly defined. Failure to do so can lead to misunderstandings among the facilities being audited, the auditors, and the recipients of the audit reports. Failure to define the scope of an audit program can also lead to inconsistent and inaccurate audit results, to findings being missed, or to the inclusion of inappropriate observations in audit reports.

Among the parameters that can be used to define the scope of the audit program are the following:

- Type of facility (manufacturing, storage/transfer, terminals, etc.);
- Ownership (wholly owned, joint ventures, tollers, etc.);
- Geographical location;
- Facility coverage (all units versus selected units); and
- Program content (all process safety management elements versus selected elements).

A PSM audit program should, at a minimum, include all facilities covered by the company's PSM program, as directed by the program definition guidance. Examples of these types of facilities include the following:

- Processes and operations covered by applicable PSM regulations;
- Facilities in the company that manufacture, store, use, handle, or transport defined hazardous chemicals or materials at or above certain threshold amounts;
- Facilities of wholly owned subsidiaries that manufacture, store, use, handle, or transport defined hazardous chemicals or materials;
- Joint ventures and partnerships that manufacture, store, use, handle, or transport defined hazardous chemicals or materials;
- Contract chemical processors that manufacture, store, use, handle, or transport defined hazardous chemicals or materials (often known as "tollers");
- Distribution operations for defined hazardous chemicals or materials; and
- Vendors of defined hazardous chemicals or materials.

The use of other management control systems (e.g., self-inspection or internal reporting) may also influence decisions on the scope of the PSM auditing program. Where there are many effective PSM program internal control systems in place in a given facility, it is comparatively less important for the PSM audit program to be frequent and broad in scope. However, where there are few PSM internal control systems in place and the PSM audit is a principal mechanism for providing process safety management feedback to management, it is important that the coverage be broad and the frequency higher. In making this judgment, truly effective management control systems should be differentiated from those that lack substance or effectiveness.

It may be possible to take credit for parts of PSM audits through the conduct of other activities that assess the quality of the design and implementation of individual PSM element(s) or parts of them. To do so, the activities should be conducted using the remainder of the guidance presented in this book. For example, if a quality review of the PHA program is undertaken separately from the PSM audits but uses the same protocol as described in Chapter 11, and the persons conducting the review are qualified in accordance with the guidance shown in this chapter, it may be possible for the PHA portion of the next PSM to take credit for the quality review. Some facilities have chosen to audit roughly one-third of the elements each year during a three-year period, which is also an acceptable method of determining the scope of PSM audit activities.

PSM metrics can also provide useful input for determining the scope of PSM audits. Deficiencies found in PSM program areas/topics when periodically measured can be used to help determine the scope of an audit. Also, the facility/company should not fall into the common trap of believing that traditional safety statistics are an

adequate measure for the efficacy of PSM programs. Traditional statistical measures of a safety and health program (e.g., injury rate, experience modification rate, reportable injury and illness statistics) evaluate occupational safety program performance, but bear little relation to the effectiveness of the PSM program. Facilities with excellent safety and health programs, as determined by these traditional statistical measures, have still suffered major PSM incidents. CCPS has developed a set of metrics for measuring PSM programs (CCPS, 2007d). A key objective is the development of industry metrics that would become the benchmark across the chemical and petroleum industry for measuring process safety performance. CCPS has identified the following types of metrics:

- *“Lagging” metrics*—the description of the incidents that meet the threshold of severity that should be reported as part of the industry-wide process safety metrics.
- *“Leading” metrics*—a set of metrics that indicate the performance of the key work processes, operating discipline, or layers of protection that prevent incidents.
- *Near miss and other internal lagging metrics*—the description of less severe incidents (i.e., below the threshold for inclusion in the industry lagging metric) or unsafe conditions that activated one or more layers of protection. Although these events are actual events (i.e., a “lagging” metric), they are generally considered to be a good indicator of conditions that could ultimately lead to a severe incident.

The CCPS *Guidelines for Risk Based Process Safety* contains additional guidance for auditing PSM metrics. See Section 2.1.2 for additional guidance about establishing the scope of a specific PSM audit.

1.3 PSM AUDIT PROGRAM GUIDANCE

The guidance for PSM audits are the “ground rules” for how the audit program works, as well as for how the individual audits are conducted. The audit program guidance that should be defined in the management system procedure for the PSM audit program should include the following:

- The scope of the PSM audit program—what plants, sites, processes, and/or PSM programs are to be subject to PSM audits (see Section 1.3.).
- The PSM audit criteria to be included in the audits (Given the large amount of work to be performed to include all of the criteria described in Chapters 3–24, it will likely be necessary to select which criteria will not be included in a given audit, given the typical time and resource constraints. See Section 2.1.2.2 for additional guidance on selecting which audit criteria to include in a given PSM audit.).
- The frequency of PSM audits to be conducted (see Section 1.4).
- The number, importance, complexity, similarity, and locations of the process safety activities to be audited.

- How the PSM audit protocols will be generated—the statutory, regulatory, consensus industry standards, and company requirements that will define the criteria to be audited against.
- The need, if any, for auditor accreditation or registration/certification and how this is to be documented.
- The need for certification of individual audits and how this is to be documented.
- Any language, cultural, and social issues that are sensitive for the company and that should be addressed in the audit plan for a particular facility PSM audit.
- The guidance for formulating audit teams and assigning auditors to those teams.
- If PSM audits are to be scored, the assignment of the point value of each question/criteria, and if applicable, how each PSM program element or individual question/criteria will be weighted.
- Guidance on managing PSM audit documentation:
 - Format, content, and review/approval of audit reports
 - Disposition of field notes and other working papers
 - If the audit is being conducted under attorney-client privilege, how this legal requirement will be satisfied
 - How to handle compliance findings and results as opposed to the findings and results from the related criteria (see Section 1.7.1).
- Whether recommendations will be included in the audit reports or whether the formulation of recommendations to correct the deficiencies identified is to be a separate activity. Most PSM audit teams are charged with the responsibility for providing preliminary recommendations as part of their work scope, although this is not a mandatory requirement.

See Section 2.1.2.2 for additional guidance about establishing the ground rules of a specific PSM audit.

This book assumes that a PSM audit will be a stand-alone activity planned and executed on its own. However, some organizations choose to perform their PSM audits as part of corporate EHS audits or similar activities that have other/additional purposes, objectives, or scopes. As long as the PSM portion of these other types of audits follows the guidance presented in this book, it can be performed as part of other audits.

1.4 PSM AUDIT FREQUENCY AND SCHEDULING

1.4.1 Establishing the Base Interval

The frequency with which PSM audits are conducted is dependent on the objectives of the audit program and the nature of the operations involved. Thus, the audit frequency (i.e., the maximum interval between the audits) should be defined as part of the design of the audit program. There may be the need to define different frequencies for different facilities in a company's PSM program because the factors describe below may have varying influences at different facilities. PSM audits should not be unannounced or surprise activities. They should be programmed activities scheduled in advance, with adequate time for both the audited facility and audit team to prepare.

Among the factors to consider in determining audit frequencies are government regulations, voluntary consensus PSM program requirements, company policy, degree of risk, process safety management program maturity, results of prior audits, and incident history. Each of these factors should be considered in establishing audit frequencies.

- *Government regulations.* Government regulations often specify a required audit schedule. For example, OSHA's PSM Standard specifies that OSHA PSM audits be conducted at least once every three years. EPA's RMP Rule for sites with Program 2 and 3 processes also has a triennial audit requirement for the prevention portion of the RMP. Since the PSM and RMP Program 3 prevention programs are nearly identical in requirements for all elements, and to date, EPA has not clarified or interpreted the RMP Rule to establish any different prevention program audit requirements from what OSHA requires for PSM, these two audits are often combined in a single activity and adds a measure of efficiency to process safety auditing. Sometimes companies will perform PSM audits at more frequent intervals as part of a settlement agreement with regulators following an incident. Even if there are governing regulations, there may be other factors that dictate the need for more frequent audits—perhaps more frequently than what is specified in the regulatory requirements.
- *Voluntary consensus PSM programs.* Most voluntary consensus PSM programs do not specify PSM program audit frequencies and only require that they be performed "periodically" or at "appropriate intervals." Table 1.2 summarizes the required or suggested audit frequencies for regulatory and voluntary consensus PSM programs. As Table 1.2 shows, there are very few mandatory requirements for PSM audit frequencies. Most U.S. companies audit the PSM programs of their domestic facilities once every three years because of the OSHA PSM requirement, and, in the absence of more definitive requirements, for consistency this frequency has also been adopted in many cases for non-PSM domestic facilities, and international facilities of the same companies.

- *Company policies.* Company policies may specify a frequency that is different from those in the pertinent regulations and in voluntary consensus PSM programs, but in most cases, company procedures simply repeat the requirements of the relevant governing regulatory or voluntary programs.
- *Degree of risk.* If there are no governing regulations or no guidance associated with voluntary consensus PSM programs, other factors will be used to establish the frequency of PSM audits. Degree of risk of process safety incidents (i.e., either higher consequences, greater frequency of occurrence, or both) is an important factor in determining the appropriate frequency of the audits. Generally the audit frequency will be higher for operations that pose higher levels of risk. Higher risks may result from the particularly hazardous nature of the materials present, the type of process involved (e.g., one that operates at elevated pressure), or the proximity of potentially exposed populations or resources. For example, a chemical/processing facility with a large inventory of liquid chlorine on-site (e.g., multiple 90-ton rail cars) located in a densely populated area would have a higher risk than a water treatment plant that has one 1-ton chlorine cylinder and is located in a more remote area.
- *Process safety management program maturity.* Operations that have new or evolving PSM programs may need more frequent auditing than operations that have established, well-developed programs. With the former type of operation, there is a greater chance for PSM systems to break down, either due to confusion or mistakes made when implementing the new program, or through poor design of the program. In a location with a more mature PSM program, it is more likely that the management systems have been integrated into the normal, everyday operations. As a result, less frequent reviews and verifications may be adequate. Changes in either the PSM program or the audit criteria may prompt reconsideration of established audit frequencies. If a new program or a new performance criterion is introduced, it may be desirable to perform an audit sooner than originally intended to verify program implementation. This is especially true if the new criteria have been established by government regulators and are considered new compliance requirements. Changes in personnel or management or in business priorities can also cause PSM program quality to degrade.
- *Reorganization.* If the PSM program or the company is reorganized, an audit may be warranted. Reorganization may result in significant changes in PSM program responsibilities, or significant changes in the number, type, or content of PSM program activities.
- *Results of prior audits.* When the results of an audit indicate significant gaps in process safety management system design or implementation, this may indicate the need to perform the next audit sooner than the program schedule would normally indicate.

- *Incident history.* When a location has experienced frequent incidents or near misses, it may be appropriate to increase the frequency of the audits. In addition to identifying possible management system deficiencies, more frequent audits may increase awareness of process safety at the location.
- *Other EHS audits.* When PSM audits are a subpart of broader EHS audits, the frequency may be determined by the other EHS programs being audited.

In summary, while there is some variation, most U.S. facilities observe a three-year frequency for PSM audits. While this frequency is mostly due to OSHA PSM and EPA RMP regulatory requirements, every three years appears to be a frequency that is consistent with the risk, provides enough time to adequately measure the effectiveness of PSM program implementation activities, but is not so infrequent that PSM program activities that are not designed or implemented properly will languish for many years without being detected. A three-year audit frequency also does not usually represent usually an undue records-retention burden to support the audits. Therefore, when no other guidance is applicable, an initial PSM audit triennial frequency should be used, unless more frequent audits are warranted by PSM program conditions and the findings of other audits.

1.4.2 Measuring the Time between Audits

When regulatory requirements, a voluntary consensus PSM program requirement, or a company policy specify a frequency for PSM audits, there should also be some guidance on how the frequency is to be measured. Since PSM audits are not instantaneous events, but are processes where the activities unfold over a period of time, there are different ways to measure the interval specified.

- *From the date of the previous audit report.* Since the issuance of audit reports is sometimes delayed and these delays will vary from audit to audit, audit report dates are generally not used as a measure of audit interval, although some companies have done so because it is a prominently documented date.
- *From the start date of the previous audit on-site activities.* Since most PSM audits are designed to fit into a period of one workweek or less, the first date of the previous audit on-site work is often the date used to measure the required frequency. This date is almost always prominently documented in the audit report or other records and is easily referenced.
- *From the date of the previous audit closing meeting.* The closing meeting generally marks the end of the on-site audit activities and is usually the end of the specified and budgeted audit period on-site. Often companies document the closing meeting as a training or process safety activity with a dated roster, minutes, etc. As a result some companies measure their audit frequency by the previous audit closing meeting date.
- *From the certification date of the previous audit.* Process safety program audits performed pursuant to OSHA's PSM Standard or EPA's RMP Rule are required to be certified. See Section 1.8.6 for audit certification guidance. This certification is dated and serves as a prominent date that

can be used to measure audit interval. However, since these audits are usually certified when the report is finalized, the certification dates can be significantly later than the completion of the audit itself. OSHA has issued a clarification in the Compliance Directive for the PSM Standard (OSHA, 1994) saying that the three-year frequency required for PSM audits is measured from the certification date of the previous audit.

- *From the ending date of the previous audit on-site activities.* Although the on-site portion of most audits ends with a closing meeting, some interviews, records checks, or other activities may extend beyond the specified period because of unforeseen events on-site, the unavailability of necessary personnel, or other reasons. In these cases, the closure of the on-site activities may take several more weeks, and this delay will not be a regular occurrence. Therefore, the ending date of previous audit on-site activities is usually not used as an interval measure.

In summary, despite OSHA's clarification regarding measuring PSM audits based on the certification date of the previous audit, many companies have chosen to measure their PSM audit intervals from the start date of the previous audit on-site activities. In reality, the functionality of PSM programs is not sensitive to a few days or even a few weeks delay in measuring its efficacy. Therefore, several of the guidance items described above provide an adequate and regular basis to measure whether the PSM program is working or not. However, where regulations specify a frequency, delays of even a few days can result in regulatory action, so care should be taken in these situations to schedule the audits to meet the frequencies specified. Also, the frequency measurement should not be reset to extend the frequency if ownership of the company or site changes. The time between audits applies to the PSM program and its activities, not to what entity is executing them. Once a method of measuring the interval between PSM audits is established, it should be consistently applied unless a compelling reason emerges to adjust it.

Table 1.2 Audit Frequencies for Regulatory and Consensus Process Safety Programs

CCPS RBPS	CCPS Technical Mgmt of Process Safety	OSHA PSM & EPA RMP	ACC Responsible Care RCMS SM	ISO 14000 EMS	SOCMA ChemStewards [®]	SEMP	Seveso II	ILO C174
No specified or recommended frequency	No specified or recommended frequency	3 years	No specified or recommended frequency	Appropriate interval	No specified or recommended frequency	Periodically, but with a maximum interval of 4 years; initial audit should be within 2 years of establishing the program	Periodic	No specified or recommended frequency

1.5 PSM AUDIT STAFFING

1.5.1 Composition of Audit Teams

Conducting a comprehensive PSM audit normally requires a team effort, although this is not a regulatory requirement. Involving a multi-person team in the audit process brings more than one perspective to bear, provides an opportunity for intra-team discussion of observations, and allows involvement of personnel with a variety of disciplines, skills, and experiences. A limited-scope audit (e.g., assessing only one or two elements of a PSM program) can be conducted by an individual, but most PSM audits are performed by teams. When it is not possible to assign a team to perform a PSM program, the single auditor should have the skills and experience of an audit team leader. This situation, while sometimes unavoidable, should only be allowed when the PSM program being evaluated is very simple in scope and complexity, and the process has low potential consequences.

PSM audit teams usually consist of two to six members. Team size for any particular audit may vary and depends on the following:

- The size of the facility;
- The scope and complexity of the PSM program; and
- The scope and guidance of the audit, i.e.
 - The number of audit questions/criteria in the overall protocol;
 - The number of audit questions/criteria per PSM program element;
 - Which of these questions/criteria will be used during the audit, given its scope and guidance; and
 - Whether compliance and related criteria will be evaluated.

These factors will determine the amount of individual work expected of any given auditor and will help determine how many auditors will be required.

The objectivity of the audit team is a very important consideration, although the current PSM regulations do not address this issue explicitly. The CCPS book *Risk Based Process Safety* (CCPS, 2007c) defines auditors by their level of objectivity as follows (with some possible disadvantages):

- *First party.* Auditors from the facility being audited. First-party auditors have the least objectivity (but have the most firsthand knowledge of the PSM program being audited).
- *Second party.* Auditors from the same company as the facility being audited but from another location, such as a centralized corporate audit or safety/process safety group, or from another production facility within the company. Second-party auditors have better objectivity than first-party auditors, but may still suffer from some conflicts of interest or bias. Sometimes second-party auditors have a conflict of interest because they realize that today's auditees are tomorrow's auditors and that they might be on the receiving end of an audit performed by the same people they are auditing.

- *Third party.* Auditors from an independent organization, such as a consulting firm. Third-party auditors generally have the highest degree of objectivity (but could be offering recommendations to create additional work for themselves).

Important considerations that should be weighed when composing audit teams and their objectivity include the following:

- *Avoiding conflicts of interest.* Staffing an audit team with only first-party auditors has positives and negatives. While the team will have familiarity with the site operations and personnel, it may be difficult to avoid conflicts of interest or instances where an auditor is reviewing and evaluating the design or implementation of PSM program policies, practices, and procedures for which he/she has at least some responsibility or involvement. Conflicts of interest also arise where one or more of the auditors report to the manager whose activities are being audited or where the audit team leader reports to the facility manager. These conflicts, whether they are real or perceived, can compromise the objectivity of the audit and should be carefully avoided if possible.
- *Avoiding bias.* Staffing an audit team with only first-party auditors may result in an audit that is more susceptible to auditor bias. Pride of authorship may cause such auditors to overlook flaws in the policies, practices, and procedures they are evaluating or to work hard to offer reasons why these flaws should not be considered as findings. Possible bias is another reason to consider audit teams with second- or third-party auditors as well as first-party auditors.
- *Information transfer/sharing of PSM practices.* A variation on using only in-plant personnel to conduct the PSM audit that offers some of the benefits, while avoiding some of the problems, is to use second-party auditors. This can provide a team with a high degree of process familiarity, but with no direct involvement in the operations or programs of the plant being audited. This approach can also help facilitate information transfer and sharing across facilities in the same company.
- *Avoiding acceptance of the status quo.* A disadvantage of both first- and second-party auditors is the potential acceptance of the status quo, i.e., the tacit or overt acceptance of the validity of current and historical PSM program policies, practices, procedures, and assumptions, with little or no challenge. The philosophy that “this is the way we do it here” may summarize some aspect of an adequate program, but could disguise flaws that have embedded themselves in the thinking process of the personnel involved in previous audits. However, status quo acceptance can affect not only those closest to the problem, i.e., first-party auditors, but also second-party auditors from other parts of the company where the status quo has become entrenched.
- *Dedicated auditors.* The difficulty of freeing facility staff from their regular duties to conduct audits at their own or other facilities often means that an individual will only be able to participate infrequently in

PSM audits. As a result, the audit team may lack members with strong auditing skills. Therefore, some companies employ a staff of dedicated second-party auditors, usually assigned to corporate staff or to a part of the company outside the operating facilities that will be subject to PSM audits. Sometimes these staff members comprise the audit team, and other times they are used as team leaders with groups of facility staff made available through inter-facility exchange. Dedicated second-party auditors are best able to develop strong auditing skills and develop a broad perspective on the topics being audited, because they see a wide variety of operations and PSM programs. The use of a dedicated corporate audit staff can help provide continuity when follow-up audits are performed, and can help avoid possible conflicts of interest or bias. In some companies, audit teams are staffed with a mix of dedicated second-party auditors and temporarily assigned first-, second-, or third-party auditors. Assuming that the audit scope, guidance, and schedule permit, mixed teams also facilitate PSM auditor training (the gaining of audit experience), the sharing of best practices through a company, and the increasing depth of subject knowledge. Strong consideration should be given to using dedicated audit teams when the audits are scored so that the scores are assigned consistently and the results will allow the types of comparisons that scoring provides.

- *External vs. internal auditors.* Sometimes third-party auditors are used in staffing PSM audits. They may conduct audits as independent audit teams, lead teams comprised of company staff, or add to the available internal staff working under the direction of an internal team leader. The use of third-party auditors usually provides the greatest degree of objectivity to the PSM audit process, and such auditors may help supplement scarce internal resources. However, during an audit there is an opportunity to gain valuable knowledge about and appreciation for PSM program design and implementation, and if third-party auditors are used exclusively, the company or facility may fail to capitalize fully on, and to enhance further, the process safety knowledge of the internal staff. The use of third-party auditors also provides the benefits of having “fresh eyes” looking at a PSM program and lessens the possibility of status quo acceptance. The Baker Commission (Baker, 2007) noted in its final report:

The Panel recognizes that benefits can be gleaned from using employees to audit other sites, such as promoting best practices and sharing lessons across facilities. This approach has limitations, however. BP’s process safety audit teams generally did not benefit from external experiences or perspectives of audit team members because they relied primarily on a pre-existing, internalized view. . . . The Panel believes that this internalized view likely reduced the effectiveness of the audits because the auditors did not have perspectives beyond their own organization as to process safety performance.

- *OSHA PSM audit team requirements.* OSHA’s PSM Standard has a specific requirement regarding audit team composition. Paragraph (o)(2) of the PSM Standard requires that “The compliance audit shall be conducted by at least one person knowledgeable in the process.” This infers that this “knowledgeable” person should be a member of the audit team. The term “knowledgeable in the process” is not defined. Some companies have used auditors with general process knowledge of the facility being audited. Others have assigned someone from the facility being audited who has specific knowledge of the process to the audit team. This person generally acts as an advisor to the audit team. In this advisor role the knowledgeable person provides an interface between the audit team and the facility and helps identify the right people to interview, sets up those interviews, locates documents and records, and otherwise functions as a logistical resource. This advisor may be a management or nonmanagement employee. If the “knowledgeable person” is going to actually perform audit interviews and record reviews, and be responsible for drawing conclusions and formulating audit findings, then this person, whether management or nonmanagement, should not have had any responsibility for the design or implementation of the PSM program being audited. This preserves the impartiality of the audit team. However, if this person will be formally considered part of the audit team but only provides support information about the processes/equipment and their technology and operations, and serves as an ombudsman between the audit team and the facility, then this person need not be independent of the PSM program being audited. The planning process for a PSM audit should evaluate this role, decide whether the “knowledgeable person” will serve as an actual auditor or in an advisor role, and then identify the person who will fulfill this role.

1.5.2 General Qualifications of Auditors and Audit Team Leaders

ISO-19011, the general ISO guidance for auditing quality and environmental management systems (ISO, 2002), devotes considerable attention to the attributes, qualifications, and experience of auditors. The portions of this guidance appropriate to PSM auditors are summarized below. Many of the same attributes and technical skills are also described in OSHA’s Process Safety Management Guidelines for Compliance (OSHA, 1993).

1.5.2.1 Auditors

In order for a facility/company to have any confidence in the results of a PSM audit, and to rely on these results to confirm that its PSM program is working properly, or to use those results to make changes to the program, person(s) performing the audit should be competent to do this work. This competence is based on the demonstration of the following:

- The personal attributes of the auditor(s); and

- The knowledge and skills gained through the education, work experience, auditor training, and audit experience.

Personal attributes. Auditors should possess the personal attributes that will enable them to act in accordance with the principles of auditing. An auditor should (ISO, 2002):

- Be ethical, i.e., be fair, truthful, sincere, honest, and discreet.
- Be open-minded, i.e., be willing to consider alternative ideas or points of view.
- Be diplomatic, i.e., be tactful in dealing with people.
- Have an even disposition, i.e., not have a volatile personality.
- Be observant, i.e., be actively aware of physical surroundings and activities.
- Be perceptive, i.e., be instinctively aware of and able to understand situations.
- Be versatile, i.e., be able to adjust readily to different situations.
- Be tenacious, i.e. be persistent, focused on achieving objectives.
- Be decisive, i.e., reach timely conclusions based on logical reasoning and analysis.
- Be self-reliant, i.e., act and function independently while interacting effectively with others.
- Be naturally curious, i.e., display inquisitiveness or healthy skepticism.
- Have stamina, i.e., not tire easily during PSM audits, which are physically demanding and often involve long days.
- Have a “thick skin,” i.e., the ability to be strongly challenged and remain calm and professional.

These attributes are a function of the character and personality of the people themselves and not their acquired skills and experience. While these attributes are desirable qualities for any type of work, they are particularly important for auditors. The nature of PSM audits often requires that auditors interpret what they are seeing and hearing against a set of requirements that are highly performance based, with very little in the way of mandatory, specific, or prescriptive performance measures. The ability to successfully perform a PSM audit often requires convincing organizations and the persons being audited that the auditor’s interpretations are correct. Several attributes listed above are necessary to accomplish this. Being tenacious without giving offense is also a delicate skill. Often auditors will hear a response to a question and instinctively know that they are not hearing the complete story or an answer to a different question than the one they asked. To continue to probe until revealing all relevant facts is required but will sometimes frustrate the person being interviewed. The difference between continuing to address an issue with additional questions and “cross-examining” an interviewee is a delicate balance that a successful auditor must master.

Technical skills and knowledge relevant to auditing. In addition to having the desirable personal attributes, auditors should have technical knowledge and skills in the following areas (ISO, 2002):

- Plan and organize the work effectively, so that the audit is conducted within the agreed time schedule.
- Prioritize and focus on matters of significance.
- Collect information through effective interviewing, listening, observing, and reviewing documents, records, and data.
- Understand the appropriateness and consequences of using sampling techniques for auditing.
- Verify the accuracy of collected information.
- Confirm the sufficiency and appropriateness of audit evidence to support audit findings and conclusions.
- Assess those factors that can affect the reliability of the audit findings and conclusions.
- Use work documents to record audit activities.
- Prepare input to audit reports.
- Maintain the confidentiality and security of information.
- Communicate effectively, both verbally and in writing (for international audits this might require foreign language skills or the use of interpreters).
- Understand and use process safety terminology and language.
- Understand process safety management auditing principles and their application.
- Have general process knowledge, i.e., a basic understanding of the design, operation, maintenance, emergency response, and administration of the type of facility being audited. PSM auditors are not required to be experts in any of these facets of the facility being audited, but they should have knowledge deep enough to be able to interpret the requirements, as described by the audit criteria, to the technology and operations of the facility being audited.
- Auditors should be computer literate.

Applicable laws, regulations, and other requirements relevant to process safety. PSM auditors should be thoroughly familiar and conversant with, and be able to work within, the process safety requirements that apply to the organization being audited. This would include all applicable process safety local, regional, and national codes, laws, and regulations, as well as contracts and agreements, international treaties and conventions, and other requirements to which the company and facility are subject or to which they ascribe.

Ability to successfully interpret the governing requirements. Auditors of PSM programs should be able to comprehend the organization's operational context with respect to the governing requirements of the regulations; voluntary consensus standards; local, regional, and national codes, contracts, and agreements;

international treaties and conventions; internal company policies; and other relevant process safety requirements to which the organization ascribes and that apply to the facility being audited. Specifically, auditors should thoroughly understand the following:

- Application of PSM program management systems to different organizations.
- Interaction between the elements of the PSM program management system.
- Process safety management system standards, applicable procedures, or other management system documents used as audit criteria.
- Recognizing differences between and priority of the different process safety management systems or reference documents that may affect a given facility.
- Application of the management systems or reference documents to different audit situations.
- Application of their interpretive ability with respect to the cultural and social customs of the facility as they apply to the PSM program, its design, and its implementation. These cultural and social customs may be starkly different between U.S. domestic facilities and those that are overseas, even within the same parent company.

The ability to properly interpret how performance-based process safety requirements apply to the specific facility being audited is the most important technical skill a PSM auditor should possess. Questions of interpretation during a specific audit are usually answered collaboratively within the audit team. The audit team leader, as well as company legal staff (if they are available), play an important management role in this area. This is also why audit findings and recommendations (when recommendations are included) are carefully vetted (see Sections 2.3.6 and 2.4.2).

1.5.2.2 Audit Team Leader

In addition to the skills required of auditors, the team leader of a PSM audit should have greater knowledge and skills in audit leadership to facilitate the efficient and effective conduct of the audit as follows:

- Plan the audit and make effective use of resources during the audit.
- Lead the audit meetings (opening, daily closeout, and final closeout meetings).
- Organize and direct audit team members to ensure that the audit protocol is followed and completed consistently with the agreed-to audit scope.
- Lead the audit team to generate the findings and recommendations (when recommendations are included).
- Prevent and resolve conflicts.

- Represent the audit team in communications with facility/company senior management and legal staff about the how the audit has been planned and is being conducted, as well as the nature of the audit findings and recommendations.
- Prepare and complete the audit report.

To perform PSM audits successfully, auditors and audit team leaders should have the following education, work experience, training, and audit experience:

- They should have completed an education sufficient to acquire the knowledge and skills described above.
- They should have PSM-related process safety work experience that contributes to the development of the knowledge and skills described above. This work experience should be in a technical, managerial, or professional position involving the technology and operations they will be expected to audit. Part of the work experience should be in a position where there is either responsibility for or participation in PSM program activities.
- They should have completed auditor training that contributes to the development of the knowledge and skills described above. This training may be provided by the person's own organization or by an external organization.
- If at all possible, they should have audit experience in process safety. This experience should have been gained under the direction and guidance of an auditor who is competent as an audit team leader in process safety.
- Audit team leaders should have participated in several PSM audits before being assigned to lead one.

1.5.2.3 Obtaining Audit Skills

Audit team leaders and team members usually obtain these skills via one or more of the following methods:

- Formal training in PSM programs and their interpretations.
- Formal training in auditing, either conducted internally by the company/facility, or externally.
- Successful service as a facility PSM manager/coordinator.
- Successful service as a PSM consultant.
- Successful service as an observer or assistant auditor during PSM audits.
- Successfully service as an audit team member (for qualification as an audit team leader).

Company/facility PSM audit procedures should describe the training and experience necessary for qualification as an audit team leader and member, how these skills are obtained, and how much experience is required in each skill before the prospective team leader or member can perform these duties independently.

In summary, PSM auditors should be expert in PSM, that is, skilled in interpreting the PSM regulatory requirements for different types of operations; skilled in designing or recommending the design of policies, practices, and

programs that comprise PSM programs; skilled in performing audits; and unbiased and objective for the audits they are assigned to perform. Most of these skills are obtained via experience and some through training. Sometimes, an audit team at a specific facility will require the assistance of subject matter experts to help assess the technical aspects of a particular PSM program practice.

1.6 CERTIFICATION OF AUDITORS

There are no requirements that PSM auditors be certified to perform their work, with one exception. Persons performing audits for RCMS® or RC14001® certification must be certified third-party auditors in accordance with ACC procedure RC205.04 (ACC, 2008), which requires that the auditors be certified by either the Board of Environmental, Health, and Safety Auditor Certifications (BEAC) (www.beac.org) or RABQSA International, Inc. (a merger of the Registrar Accreditation Board and The Quality Society of Australasia International on January 1, 2005) (www.rabqsa.com). Neither organization certifies auditors specifically in process safety. BEAC has a health and safety auditor certification, but it is designed to certify knowledge and skills in a broad range of occupational safety and health topics. The environmental auditor certifications of both organizations focus on environmental management systems (EMS) as required by RC14001. Although the types of events of concern in a process safety/risk management program are covered by RC14001 EMSs, neither of these programs is designed specifically as a process safety management system. The general auditing principles of this standard are applicable to PSM audit programs and the standard is referenced and used in this book; however, it does not address PSM audits specifically. Note that these auditor certifications are required for those that perform the third-party audits supporting certification under the program itself. However, those that perform internal periodic RCMS program audits that are part of the Plan-Do-Check-Act management system are not required to be certified auditors.

ISO 17024 (ISO, 2003) is the new globally accepted benchmark for personnel certification and focuses on defining and examining the competence of personnel and the competence of the examiners of personnel. RABSQA certifications conform to ISO 17024.

1.7 PSM AUDIT CRITERIA AND PROTOCOLS

In creating PSM audit programs, criteria should be established by which the programs will be measured. These criteria should be developed and then described, along with their basis and rationale, in the management system procedure for the auditing programs. The audit criteria form a reference point against which the design and implementation of PSM programs are assessed. The criteria form the basis for compiling a protocol for each individual facility audit.

Audit protocols are the written documents provided to the auditors that guide their fieldwork. Audit protocols are referred by different terms: audit checklist, audit questionnaire, audit work plan, audit guide, etc. Audit “protocol” is used

herein because it is the most common term. The protocol will contain the questions/criteria that should be used to collect the necessary evidence to draw cogent conclusions about the status of PSM programs. Most PSM audit protocols are arranged so that a separate list of questions/criteria is developed for each PSM program element, although it is not mandatory that it be formatted in this manner.

While there are many pre-designed PSM audit protocols available, including one in this book, readers should review these protocols carefully to customize them for use in a specific company. The following should be considered when customizing a protocol for use:

- The scope of each individual audit will determine which of the questions/criteria are to be used (see Section 2.1.2).
- The generic protocol must meet the purpose, scope, and guidance of not only the PSM audit program, but also individual audits.
- Generic protocols must be modified to include the company- and facility-specific requirements of PSM-related policies and procedures.
- Any local PSM regulatory requirements missing from the generic protocol must be included. For example, a few counties and municipalities in the United States have their own PSM regulations. Also, generic protocols designed primarily for use in the United States will require significant revision for use in international locations.
- Questions or auditor guidance that summarizes any PSM citations issued to the company as well as any citation information from other companies that the user becomes aware of should be included.
- The protocol should provide guidance to auditors on sampling and testing, both for records to review and for people to interview.
- Well-crafted PSM audit protocols contain the necessary guidance for the auditor so that the types of records to be reviewed, people to be interviewed, and observations to be made are described. This helps the auditor interpret the requirements in the audit question/criteria for the facility being audited. The guidance should also provide enough information so that the auditor can compare what he/she is seeing and hearing in the field to the guidance and decide if there is a finding or not.
- When formulating audit questions, it is important to write them in a format so that the answers always follow the same convention. For example, if the answer to an audit question would be “Yes,” it should always mean the same thing, e.g., that the facility is meeting the requirement posed by the question completely. All audit questions should be prepared so that a “Yes” always indicates a positive aspect of a PSM program. Conversely, a “No” or “Partial” answer should always indicate a finding. Although this is the normal convention used in most EHS audit protocols, the opposite context could be used. What is important is that a PSM audit protocol uses a consistent convention.

- PSM audit protocols are prepared in a wide variety of designs; however, most of them are electronic documents using either word processing or spreadsheet formats.

Sections 1.7.2 and 2.1.3 provide more detailed guidance on selecting PSM audit criteria and questions for inclusion in an audit protocol, and Section 2.3.5 provides additional guidance on audit sampling.

1.7.1 Scope of PSM Audit Criteria and Questions

Measuring PSM program efficacy has typically been a compliance-related activity because in the United States process safety has become, to a large extent, synonymous with OSHA PSM. The CCPS *Guidelines for Risk Based Process Safety* (CCPS, 2007c) explains what a complete PSM program requires, as well as some of the voluntary consensus PSM programs that focus on a management system approach rather than just an enumeration of performance-based requirements. Also, incorporating these additional requirements into the PSM program typically adds substantial value to an organization by way of improved operability, reliability, quality, etc. Performance-based requirements almost always contain many inferred issues, unclear interpretative issues, incomplete rules for documentation, and other important considerations that should be sorted out when the audit criteria are being developed. The key inferred issues that should be examined in a PSM program are as follows:

- Interpretation of the requirements;
- Good practices, successful practices, common practices, and best practices;
- Level of acceptable practice;
- Management systems and internal controls;
- Process safety culture;
- Documentation; and
- Compliance requirements vs. criteria from related guidance.

The audit criteria/questions derived from these inferred issues, together with the compliance criteria/questions, constitute the scope of the criteria/questions included in PSM audit programs. The compliance criteria/questions are relatively straightforward to identify; however, they may require significant interpretation to audit successfully. The related criteria will require quite a bit of thought and planning before inclusion in a PSM audit, because including them may establish a performance requirement that does not exist. The interpretation of the compliance requirements does the same thing. The audit criteria/questions should flow from the defined and agreed-to program requirements and not the other way around.

1.7.1.1 Interpretation of the Requirements

Since PSM program requirements are largely performance-based, it is necessary that each company and facility with a PSM program successfully interpret the requirements that drive the program within the context of their business. Even

when process safety regulations are applicable, there is much room for interpreting what compliance with those regulations means. For example, in asset integrity and reliability, what does “Inspection and testing shall follow recognized and generally accepted good engineering practices” mean for a particular site? In hazard identification and risk analysis, what does “facility siting” mean for different sites? In RCMS[®], what does “information sharing” mean? Neither the audit criteria can be developed nor the program measured until the governing requirements have been interpreted (or defined) for the facility under consideration. Although the basic meaning of an interpretation will not change for different facilities, the manner in which the interpretation is accomplished or reflected in a particular PSM program might vary somewhat from company to company. The regulators and custodians of voluntary consensus PSM programs have published clarifications and interpretations of various PSM issues. In addition, facilities and their parent companies (if any) have often interpreted how the requirements apply to their specific facilities and operations. Therefore, the audit criteria should include tests of whether the interpretations have been made properly.

Even if interpretations from government regulators have become good/common/successful practices, questions about the impact of these interpretations upon compliance obligations remains. For example, if a majority of facilities or companies have adopted an interpretation as a standard practice, then is it a requirement? The answer to this question raises complex legal issues. Specifically, a government agency like OSHA may state that a provision of a performance standard like the PSM standard requires a facility to take certain actions. The issues raised by this type of interpretation include whether OSHA is essentially promulgating a new requirement or whether it is simply providing an interpretation of an existing requirement. In general, an OSHA interpretation of a provision in a performance standard may become a *de facto* requirement as long as the interpretation is reasonable.

Despite these legal complexities, the performance of a successful PSM audit dictates that the specific requirements of the performance-based standards be delineated and audited against, and it often makes sense to audit against interpretations, voluntary consensus standards, and other related criteria. In addition, distinguishing in the audit report between regulatory requirements and “good, common, or successful practices” is important. For example, in HIRAs, it is a very common practice to apply a qualitative risk-ranking scheme to identified hazard scenarios. Most HIRA practitioners have used these risk measurement methods for many years and they have truly become a common practice. Several years ago OSHA issued a written interpretation stating that the use of qualitative risk-ranking schemes fulfills the requirement in the PSM Standard (under the PHA element) that PHAs address “A qualitative evaluation of a range of the possible safety and health effects of failure of controls on employees in the workplace.” Does this interpretation by OSHA establish a firm requirement? As stated below, OSHA will likely look for their use in PHAs.

In this book, interpretations issued by regulators have been treated as related criteria because until either they have been formally included in the PSM Standard or

the Occupational Safety and Health Review Commission (OSHRC), an administrative law body independent from OSHA, has ruled that they can be enforced as written, they could be challenged upon appeal and found to be invalid interpretations of the regulations. The evolution of interpretations to good, successful, or common practices and their treatment in PSM audits is discussed below.

1.7.1.2 Good, Successful, Common, and Best Practices

In determining how the PSM requirements should be interpreted for a given facility, several important issues will likely be encountered. The following issues can, for some facilities and companies, represent significant dilemmas for establishing their PSM program:

- When does a good practice or common practice in process safety become a “requirement” in process safety?
- What should be considered a “best practice” in process safety?
- How should the contents of one facility’s PSM program be compared to the program contents of another facility?
- Is such comparison appropriate, especially when formulating PSM audit criteria?

These are often difficult questions. However, some customary practices and assumptions regarding these issues have evolved over time. Typically, regulators like the “safety in numbers” concept and will expect to see a facility adopt a process safety practice that has been demonstrated as successful over time at other facilities with similar operations, equipment, or hazards/risks. At the very least, they will expect a clear rationale as to why the practice has not been adopted and how the same hazard/risk has been abated using some other method. Regulators put great stock in solutions to common process safety problems (and other EHS problems as well) that have been voluntarily developed by industry without a formal requirement or directive from the regulating agency. This is particularly true when the common solution has been reached on a consensus basis and written down. Some regulators will expect to see the same philosophy employed when only one company or facility adopt a particularly clever or successful practice, and some regulators will wait until enough companies or facilities have adopted the practice before considering it a good, successful, or common practice.

Does this mean that such a practice becomes a requirement? Certainly, regulatory action cannot be taken (i.e., citations, fines, other official penalties) without the practice having been formally included in the relevant regulations. However, regulators often expect such practices to be adopted and can “get their way” without resorting to penalties by having the company or facility agree in writing to adopt the practice in return for other regulatory considerations. However, this does not mean that good, successful, or common practices are mandatory or compliance requirements. The custodians of the voluntary consensus PSM programs typically do not have the same expectations of their members or adherents, and do not attempt to get one company to adopt another’s process safety practices.

An example of this type of common or successful practice is vibration monitoring of rotating equipment. No industry-consensus RAGAGEP requires vibration monitoring, and not all original equipment manufacturer (OEM) manuals for rotating equipment recommend that it be performed. However, many chemical/processing facilities periodically measure the vibration of their rotating equipment. In many cases, this practice has been adopted for equipment reliability reasons not directly related to process safety, and in some cases the adoption has several rationales, including the reduction of process safety related risks. When the OEM does recommend periodic vibration monitoring of its equipment, that could easily be interpreted as a RAGAGEP requirement; however, it would then be a requirement only for that manufacturer's equipment. But what about other rotating equipment in the same or similar service manufactured by others?

The phrase "best practice" is a very common term in industry, often used synonymously with "good/common/successful" practice. However, the term "best practice" implies that a particular practice is better than all other options. Care should be taken in labeling a practice as a "best practice" without some evidence that it is in fact superior to other solutions to the problem.

Not all good, successful, or common practices are of equal importance and possible impact. Some of these practices simply represent useful or clever improvements in how certain PSM issues are documented or described in a management system procedure; however, some of them have more impact on process safety risk reduction. Some of these practices have also been derived from written clarification of regulations and, while not mandatory, certainly indicate how the regulators believe a certain part of PSM should be practiced. Some of the practices derived from written regulatory clarifications and interpretations have become common industry practices in PSM. Therefore, some of the good, successful, or common practices have evolved into a widely known and followed level of acceptable practice. These practices and guidelines are informal in nature; however, both industry personnel and government regulators often form conclusions or judgments regarding conformance to them. In particular, some regulators have concluded that these are recognized and generally accepted practices formulated by industry or that they represent best practices, and expect to see them in place because they have seen them in several other locations. Of course, an informal practice, regardless of how long it has been practiced or its effectiveness, does not have the same impact as a formal, documented RAGAGEP that is published and maintained by a consensus industry organization. However, some regulators, auditors, and PSM practitioners tend to treat these informal practices and guidelines in the same manner and use them to define levels of acceptable practice. Auditors and PSM practitioners should not interpret an informal level of acceptable practice as a mandatory requirement. Most of them deserve strong consideration for being implemented; however, each facility must have the flexibility to design its own approach to implementing a PSM program. Several examples of PSM practices or guidance that have evolved into informal levels of acceptable practice include the following:

- *PSM Applicability.* The use of the commercially available concentration to determine whether a toxic or reactive chemical should be included in the PSM program has evolved into a level of acceptable practice for this issue. OSHA has included this clarification in the PSM Compliance Directive (OSHA Instruction CPL 02-02-45). Although the PSM Standard itself has not been changed to reflect this clarification, industry has adopted it as a level of acceptable practice.
- *Hazard Identification and Risk Analysis.* It is a very common, although not a universal practice to apply qualitative risk-ranking schemes during the conduct of HIRAs to prioritize the risks identified and any recommendations to reduce those risks. This has been a common and successful practice in industry for many years and is used to satisfy the regulatory requirement that the HIRA include a qualitative evaluation of the range of possible safety and health effects of the failure of controls on employees in the workplace. Many companies with PSM programs have designed risk-ranking schemes that fit their own needs. Approximately 10 years after the adoption of the PSM Standard, OSHA issued a written clarification on this issue, describing a qualitative risk-ranking scheme as one method (and a common method) for satisfying that requirement, thereby informally ratifying an industry practice that had been in place for many years. Therefore, the use of risk-ranking schemes in HIRAs has become a level of acceptable practice.

Any risk reduction measure, including good, successful, or common PSM practices, should also be consistent with the “as low as reasonably practicable” (ALARP) principle so that resources are applied wisely and the highest risks receive the most attention. In addition, the evaluation of PSM management systems and the internal controls they attempt to impose is performed using related audit criteria. This is because the requirement for such management systems is not a compliance requirement.

In summary, PSM audit criteria should include related criteria that examine whether widely adopted, well-known, and well-regarded practices have been adopted at the facility being audited. However, this is a voluntary practice rather than a regulatory requirement. Collectively, good, successful, common, and best practices are referred to in this book as “related criteria.”

1.7.1.3 Management Systems and Internal Controls

Most PSM program requirements, both regulatory standards as well as voluntary consensus standards, do not explicitly require that procedures be written, approved, and implemented to manage all process safety activities. Most requirements simply require that an activity or an element be carried out. However, without carefully designed and implemented management systems, i.e., a Plan-Do-Check-Act approach, it is very difficult to successfully organize, execute, and control most PSM program activities. In addition, functional PSM management systems that impose the appropriate internal controls also serve to institutionalize the PSM activities they address so that PSM activities become embedded in the

facility's or company's everyday technical business practices. Institutionalizing PSM practices helps ensure that as personnel change responsibilities and jobs the practices remain in place. In assessing the strengths and weaknesses of management systems, auditors typically look for the following characteristics for management systems and the internal controls:

- The existence of written policies, procedures, and plans for each PSM program element. These policies, procedures, and plans should impose adequate administrative controls and requirements. These documents institutionalize the management system practices necessary to ensure that activities are carried out in an organized and consistent manner.
- Written PSM policies, procedures, and plans that are formally approved, issued, and maintained in a controlled manner.
- Clearly defined responsibilities in the written policies, procedures, and plans.
- An adequate system of authorizations that reflects the criticality of the tasks and activities.
- Capable personnel throughout the organization (i.e., adequate training for the activities of each element).
- Division of duties to avoid organizational conflicts of interest and to establish the necessary checks and balances as appropriate.
- Auditable documentation of the activities.
- Periodic internal verification that activities are being carried out in accordance with the management system procedures.
- Management review activities that adjust the program requirements by carefully reviewing the verification activity results (and provide a closure of the Plan-Do-Check-Act management system loop).

Evaluating each of these characteristics usually requires significant judgment on the part of the auditor since there are no widely accepted standards to use as a guide to what constitutes acceptable internal controls. Many auditors will rely on the audit criteria for guidance about what constitutes satisfactory internal PSM controls. Therefore, audit questions should seek to confirm procedures are in place for each element of a PSM program. Further, these procedures should characterize appropriate internal controls for each element in question. Except where a PSM program element explicitly requires a management system procedure/plan (e.g., MOC, workforce involvement/employee participation), the requirement that each element of a PSM program have management system procedures with internal controls to plan and control its activities are related criteria and not compliance requirements.

1.7.1.4 Process Safety Culture

The investigation of process safety incidents, when conducted thoroughly, often reveals root causes that are related to the process safety culture in the company or at the facility involved. The proper culture in which a PSM program thrives at a facility is established by many of the characteristics of the “softer” side of how

EHS-related programs are designed, implemented, and monitored. Some of these characteristics are dependent on human resources, financial operations, management commitment, leadership, and other nontechnical policies and practices that underpin how the company or facility functions. The *CCPS Guidelines for Risk Based Process Safety* (CCPS, 2007c) examines this topic in detail, both as a distinct element of a PSM program and how it affects the success (or nonsuccess) of the other elements as well. Therefore, the related audit criteria for a PSM program should include an examination of process safety culture. As important as it is, process safety culture is not a mandatory requirement. Chapters 3 and 5 address the topic of auditing process safety culture in more detail.

1.7.1.5 Documentation

In several places in the OSHA PSM Standard, documentation is explicitly required. For example, in paragraph (j)(4) of the standard, test and inspection records are required, and the regulation stipulates the minimum information that must be recorded. However, in most PSM Standard and RMP Rule elements, the requirement for documentation is inferred. This is consistent with the nature of performance-based regulations, of which the PSM Standard and RMP Rule are prime examples. Several examples of the inferred PSM Standard documentation requirements and their impacts include the following:

- The MOC element requires that a MOC procedure be developed and implemented; however, it does not contain an explicit requirement for MOC forms or other records that will demonstrate compliance with that procedure. How will the technical reviews and authorizations that are central to the purpose of the MOC be useable without recording them? The MOC program would not be functional without a formal system of documentation to record its execution.
- The PSSR element requires that certain items be checked and verified prior to start-up of new or modified processes; however, there is no explicit requirement that PSSR forms or other records proving these items were checked before each start-up be maintained.
- Paragraph (e)(3) of the PHA element requires that the studies address certain technical issues; however, there is no explicit requirement that PHA worksheets or reports be generated to show that these issues were discussed. Given the enormity of technical information generated in a PHA of even a modestly complex process, it is not reasonable to expect the study participants to remember all the causes, consequences, safeguards, risk rankings, and other important information that captures the discussions and shows how the chosen PHA method was applied to each process studied.
- Paragraph (e)(7) of the PHA element states that PHAs shall be retained for the life of the process. Without PHA reports and/or worksheets, then what is to be retained? Unless a record of each PHA is created and maintained, facilities will not be able to retain their PHAs. There is a very

strong inference in this requirement that some sort of report or written record result from the PHA.

- Although the resolution of the PHA recommendations must be documented in accordance with paragraph (e)(5) of the PHA element, without PHA reports and detailed PHA worksheets, it will be very difficult to resolve those recommendations because much technical information generated during the PHA discussions, underpinning the recommendations and providing the rationale for making them, will be missing. Personnel assigned to resolve the recommendations often do not actually participate in the PHA that generated them. Therefore, they will be unaware of what hazards/risks created the recommendations.

Without PHA reports and detailed PHA worksheets from the previous PHA, it will be impossible to revalidate each PHA every five years in accordance with paragraph (e)(6). The personnel who participated in the previous PHA cannot be expected to remember all of the detail from the previous study, and in a five-year period it is likely that some personnel will no longer be employed at the facility in question.

While several states provide more detailed documentation requirements for specific pieces of PSM-related information, the requirements are, for the most part, also performance-based and contain many inferred documentation requirements. The voluntary consensus PSM programs are even less prescriptive about documentation than the regulatory programs.

Inferred PSM program documentation requirements could mean the information retained in the memories of the people who undertook the PSM program activities. PSM audits would then be performed by thoroughly interviewing these personnel. Interviewing personnel to test their recollection of PSM activities that took place months or even years ago is not practical, and an effective evaluation of compliance would require no memory “gaps.” Clearly, the administration of a PSM program where the records are based mostly on a system of “folklore” is not practical. The unreliability of human memory, personnel changes, job transfers, retirements, resignations, reductions-in-force, and other human relations events would conspire to make a documentation system based on the memories of those involved in the activities of the PSM program completely unworkable. A review of the PSM Standard preamble as well as the nonmandatory Appendix C PSM program guidance clearly contains numerous instances where guidance states that PSM activities should be documented, even when the PSM Standard itself does not require explicit documentation. While the preamble and Appendix C are not the PSM regulation themselves and citations cannot be written against them, they are published in the Federal Register and Code of Federal Regulations. They are important PSM guidance documents that not only indicate OSHA’s intent and thought processes, but also explain the rationale for the final content of the regulations.

The other end of the PSM documentation interpretation spectrum can be captured by the uncompromising phrase “if it isn’t written down, it never

happened.” While this mantra may be satisfying to some because it infers that for a PSM program to be successfully implemented, every single PSM-related activity must be completely recorded in the most detailed fashion. This philosophy is not practical, nor is it necessary. A properly designed management system for PSM elements or activities within those elements should selectively define what should be documented and how this should be done. The documentation so defined should enable those responsible for the PSM elements, as well as those with an understanding of the element, to have enough information to both continue the activities in an efficient manner and provide adequate evidence that allows a complete and fair evaluation of the PSM element periodically. This evaluation includes formal audits, as addressed in this book, as well as informal, internal assessments to check that ongoing activities are being carried out properly. Documentation that exceeds supporting these goals or any others established by the facility or company is unnecessary. Beyond the practical functioning of the PSM program, the process safety risk—both regulatory and actual—will be increased without a well-designed and implemented management system for PSM program documentation. A strong system of PSM program documentation is also an important component of a sound PSM culture.

In order for the PSM program to operate in a practical manner and be institutionalized within each facility/company, the program must include defined, consistently applied methods of documentation for its key activities, even when those documentation requirements are inferred and not explicitly stated in the governing regulations. However, the format, content, level of detail, style, and method of documentation (i.e., hard copy or electronically maintained records) can be chosen by each facility or company based on its own recordkeeping culture, capabilities, and resources. In other words, for a PSM program to be successful it should lean in the direction of the “if it wasn’t written down, it never happened” mantra, but it does not need to be as absolute as that statement implies.

Therefore, PSM auditors should expect to find some level of documentation for each activity that accomplishes a requirement in an audit protocol, including the compliance criteria. Facilities should create a clear trail of records describing what happened and when for each PSM-related activity. CCPS has published separate guidance (CCPS, 1995) on PSM program documentation that is not intended to be a regulatory compliance guide, but rather is intended to foster the proper documentation practices so that the time and effort invested in PSM program element activities are retained and reinvested. The CCPS RBPS Guidelines (CCPS, 2007c) also provides guidance on this important topic.

Chapters 3–24 contain detailed guidance for auditors to evaluate both the explicit and inferred requirements for PSM documentation. Both the key PSM program activities, as well as the nature of the documentation that should exist for those activities, are described. In situations where the governing PSM regulations (if any) specify neither the information to be documented nor the format or content of the records, auditors will have to determine whether the documentation methods and records presented meet the inferred documentation requirements, and provide

enough information, together with the interviews and observations, to be able to draw cogent conclusions regarding the quality of the PSM program being evaluated.

1.7.1.6 Compliance vs. Related Audit Criteria

In assembling the audit criteria, the following two types of measures generally emerge:

- Compliance criteria and questions—those criteria/questions that measure the minimum level of a successful PSM program and examine mandatory issues.
- Related criteria and questions—those criteria/questions that examine inferred, interpretative, comparative, benchmarking, and cultural issues and generally do not examine issues that are considered mandatory.

When government process safety regulations exist, the categorization of criteria/questions as compliance vs. related is relatively straightforward. However, there are still some important interpretative issues to resolve.

- If the company or facility has voluntarily established in its own management system procedures process safety requirements that exceed the requirements of the relevant regulations or are different from them, these requirements should be considered as compliance issues and the audit criteria/questions derived from them should be so categorized. Many regulators have historically treated these requirements as mandatory, and some of them have issued citations for facilities that do not follow their own procedures. This conclusion could vary between regulators, and these citations, like any other, may not survive upon appeal or may be deleted or modified during negotiation with the regulators.
- What constitutes compliance when performance-based requirements are found in the governing regulations or other programs driver(s)? Simply converting these general performance-based requirements into questions/criteria will not assist the auditors in using such criteria consistently. Each separate use of this type of criteria could very easily result in different findings and recommendations. When the audit questions/criteria are developed from performance-based requirements, further auditor guidance or additional, more detailed follow-up questions are needed in order for the auditors to perform their work in a consistent manner.

If the PSM program is completely voluntary, the company or facility process safety management systems will determine which audit criteria are compliance requirements and which are related criteria. For example, if the facility is located in the United States but is not an ACC or SOCMA member, and is not subject to the PSM or RMP regulations, there will be no externally imposed drivers for the PSM program, with the exception of the general duty clause (GDC). The GDC, which is included directly in the Occupational Safety and Health Act of 1970, authorizes OSHA to require that employers “furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees.” OSHA may issue citations using the GDC even when no specific regulations exist to cover a perceived health and safety issue. If the company or

facility has voluntarily established a PSM program in a proactive manner to be prudent because it uses, stores, or manufactures hazardous materials, then whatever written requirements it has established would constitute the compliance requirements in its PSM audit criteria. Issues that may be compliance for other facilities because of an external driver(s) might be considered a related issue for a facility with a completely voluntary PSM program. The contents and requirements of the PSM systems form the basis for defining which audit criteria are compliance criteria and which are related criteria. Compliance, in this context, means that whatever process safety drivers the company has ascribed to or is required to follow sets the definition of which audit criteria are compliance requirements and which are related criteria. In the examples described above where the PSM program is voluntary, its existence might be considered a level of acceptable nonmandatory practice. However, by voluntarily deciding to design and implement a PSM program in writing via various policies and procedures, the existence as well as the contents and requirements imposed by those policies and procedures result in them being generally treated as compliance requirements.

The criteria and guidance described in this section and in subsequent chapters do not represent exclusive solutions to PSM program coverage, design, implementation, or interpretation. They represent the collective experience of many people in the chemical/processing sector who have performed many PSM audits, and the consensus opinion resulting from that experience. The compliance criteria are derived from the regulations that govern PSM programs in the United States; however, these regulations are all performance-based. Performance-based regulations are goal oriented and there may be multiple pathways to fully complying with them. Therefore, there may be alternate, but equivalent interpretations and solutions to the issues described in the compliance tables, particularly the auditor guidance presented.

The inclusion of the related criteria in no way infers that these criteria must be implemented for a PSM program to be successful, nor does it infer that a PSM program will be deficient without them. As with the compliance criteria, there may be other, more appropriate solutions for an individual facility or company. In addition, the use of the related criteria in a PSM audit is intended to be completely voluntary and not a mandatory requirement. They should be used cautiously and with careful planning so that they do not inadvertently establish unintended performance standards. Consensus should be sought within and between facilities and their parent companies before these criteria are used. Finally, the related criteria and guidance offered for consideration are neither endorsements of nor agreements with the written or verbal clarifications made by the regulators, PSM citations issued against the regulations, other PSM guidance published by the regulators, or the successful or common PSM practices used by any given company.

1.7.2 Sources of PSM Audit Criteria and Questions

The major driver(s) for the PSM program, whether external regulations, external voluntary consensus programs, or an internal voluntary PSM program, should be the principal source for the audit criteria/questions. These include the following:

- Domestic federal process safety regulations, e.g., PSM Standard and/or RMP Rule (OSHA, 1992) (EPA, 1996) for facilities in the United States
- Domestic state and local process safety regulations for facilities in states or other jurisdictions with such laws or regulations, e.g.,
 - New Jersey Toxic Catastrophe Prevention Act (NJ, 1986)
 - California Accident Release Prevention (CalARP) (CA, 2004)
 - California OSHA (CalOSHA) Process Safety Management of Acutely Hazardous Materials (CA, 1999)
 - Contra Costa County (California) Industrial Safety Ordinance (CCC, 2000)
 - Delaware Extremely Hazardous Substances Risk Management Act (DE, 2006)
 - Nevada Chemical Accident Prevention Program (NV, 2005)
 - Washington Safety Standards For Process Safety Management Of Highly Hazardous Chemicals (WA, 2001)
- International process safety regulations for companies with facilities in countries with such laws or regulations, e.g.,
 - Council of the European Union Directive (Seveso II) (CEU, 1996)
 - International Labor Organization Prevention of Major Industrial Accidents (ILO, 1993)
 - United Kingdom Control of Major Accident Hazards (COMAH) (UKHSE, 2005) (the UK's promulgation of the European Union's Seveso II directive)
 - Mexican Integral Security and Environmental Management System (MX, 1998)
 - Canadian Environmental Protection Agency—Environmental Emergency Planning (CAN, 2003)
 - Australian National Standard for the Control of Major Hazard Facilities (AUS, 2002)
 - Korean OSHA PSM Standard (KO, 2005)
 - Malaysia Department of Occupational Safety and Health (DOSH) Ministry of Human Resources Malaysia (MA, 1994)
 - Taiwan Article 26 of the Labor Inspection Law, promulgated in 1994
- Voluntary consensus EHS programs containing PSM provisions, e.g.,
 - ACC RCMS® (ACC, 2004)
 - ACC RC14001 (ACC, 2005)
 - ISO-14001 (ISO, 1996)

- CCPS RBPS element chapters (although definition of specifics will be required by each company that adopts the RBPS approach to process safety)
- Company and facility process safety management system policy and procedure contents

There can be more than one major driver. Many facilities in the United States are subject to both the PSM Standard and the RMP Rule, and are also required to follow, as a condition of membership, one of the voluntary consensus PSM programs such as the ACC RCMS[®] or SOCMA ChemStewardSM programs.

Beyond the primary driver(s), it is recommended that the audit criteria also include related criteria from other sources that will allow an examination of how well the PSM program compares with process safety criteria from a variety of other nonmandatory sources. This will provide an indication if, and how far, the PSM program being audited exceeds minimal/compliance levels. The sources of related criteria can include:

- *OSHA Compliance Directive (CPL) for PSM (OSHA, 1994)*. The PSM CPL document contains OSHA's enforcement guidance for the PSM Standard. Appendix A of the CPL document contains OSHA's PSM audit checklist. This checklist is simply the PSM regulation converted into questions (i.e., "The employer shall . . ." becomes "Has the employer . . ."), with some additional guidance and examples included for some of the questions. This checklist is often referred to as the PQV (Program Quality Verification) checklist. Appendix B of the CPL document is the repository for interpretations and clarifications of the PSM Standard. This document has not been updated since 1994 except to renumber the document, and the Appendix B clarifications represent OSHA's thinking very early in the implementation of the PSM Standard. However, many of these early interpretations and clarifications have become common practice in PSM. As with any written clarification, the question of enforceability is pertinent. OSHA cannot issue citations against one of its own instructions, only the regulations themselves as they are published in the Code of Federal Regulations. However, as stated, OSHA's interpretations of the requirements of a performance standard like the PSM standard may be used to show that a facility failed to comply.
- *Written clarifications of the regulatory or voluntary PSM consensus standards for process safety*. ACC has published interpretations of the RCMS[®] technical specification (ACC, 2004 and ACC, 2005); however, most voluntary consensus PSM standards do not have supplemental guidance such as ACC's. On the regulatory side, OSHA has issued a large number of written interpretations of the PSM Standard since 1992. These are letters in response to questions submitted in writing by those that are covered or suspect that they might be covered by the PSM Standard, internal OSHA memoranda interpreting the standard for its field offices, and case law related to PSM (e.g., rulings of the OSH

Review Commission and OSHA's response to them). Also, EPA has published a set of Frequently Asked Questions (FAQ) regarding the RMP Rule on its website. The issue of enforceability described for OSHA's PSM Compliance Directive applies to other written forms of interpretation and clarification as well. As stated, OSHA and EPA cannot cite employers for violating this regulatory guidance, but can use it as evidence to show that a facility has failed to meet the performance criteria in the standard or regulation. Also, state and local process safety regulations often overlap with federal requirements, creating the possibility of differences of interpretation between different agencies, each with their own regulatory agenda and priorities. Therefore, why should PSM audit questions/criteria include this information? Although the guidance contained in this source of audit questions/criteria is not mandatory, it indicates the thinking and intent of the regulators regarding the design and implementation of the process safety regulations they are responsible for enforcing, and should be included as a possible source of related criteria/questions.

- *Verbal clarifications of the regulatory or voluntary consensus PSM standards for process safety.* Regulations are developed in accordance with strictly defined administrative procedures, which generally involve public notice and comment on regulatory proposals (unless the agency in question has administrative order authority granted via statutes that does not involve public notice and comment). Therefore, regulators generally may not verbally impose requirements not already contained in regulations. Also, the verbal response to a given question from one regulator may differ greatly from another from the same agency. Therefore, verbal interpretations and clarifications should not be taken as verbatim guidance nor be regarded as final or official. However, OSHA and EPA employees have presented them in open forum on several occasions for the express purpose of answering questions on the PSM Standard and RMP Rule for the regulated community. OSHA's PSM Standard and EPA's RMP Rule are performance-based regulations for which there are many successful pathways to compliance. Most of these opportunities for open forum verbal clarification took place in the early-mid 1990s, and some of the answers to PSM-related questions presented at that time have evolved into common industry PSM practices. For example, the use of qualitative risk-ranking matrices in PHA to fulfill the requirement that a "qualitative evaluation of the range of possible safety and health effects of failure controls on employees in the workplace" (paragraph (e)(3)(vii) of the PSM Standard) was mentioned in a response to a question in one of these early PSM question-and-answer sessions with OSHA, and it remained an unwritten clarification until 2005 when OSHA issued a written letter of clarification on the subject. Opportunities for individual dialogue with those regulators directly responsible exist for a given facility on an ongoing basis. Like written interpretations and clarifications, verbal

guidance provided by regulators indicates their thinking on a particular issue, and the person providing the answer(s) may or may not be the regulator that should be satisfied for a specific facility. Therefore, verbal interpretations and clarifications represent a source of related audit criteria. Caution should be exercised when using verbal clarifications. Because they are not official positions of the regulating agency, as responsibilities change within those agencies opinions might change.

- *Process safety regulation citations issued by regulators.* Although PSM and RMP final citations might appear to be a source of compliance-related audit criteria, they should be treated as sources of related criteria for several reasons. First, what constitutes a violation of a process safety regulation in one jurisdiction may be acceptable in another jurisdiction of the same agency. For example, OSHA and EPA have 10 regions, and they do not enforce the PSM Standard in a totally consistent manner. Second, for OSHA regulations, 26 of the states have been granted enforcement power by federal OSHA (known as state-plan states), and the state regulators may have different interpretations, as well as different levels of process safety expertise and experience, resulting in widely varying opinions on what is citable. Third, state and local process safety regulations often overlap with federal requirements, creating the possibility of differences of opinion between agencies on the acceptability or unacceptability of a particular facet of a facility's single PSM program intended to comply with multiple process safety regulations. For example, a facility in New Jersey may be subject to New Jersey's Toxic Catastrophe Prevention Act (TCPA) regulations, which incorporate EPA's RMP Rule, and the federal OSHA PSM Standard (New Jersey is not a state-plan state). The same might be true of facilities in Delaware. In Contra Costa County, California, a facility could be subject to Contra Costa County's Industrial Safety Ordinance (ISO), the California Accident Release Prevention (CalARP) regulations, and California OSHA's (CalOSHA) Process Safety Management regulations. Fourth, regulatory agency priorities can, and often do, change with time, the political landscape, and government budgets. These priorities will have a profound effect on the enforcement practices of a regulating agency charged with enforcing process safety regulations. In summary, process safety citations certainly indicate where someone has been penalized for deficiencies in their PSM program, and all concerned should be aware of those mistakes and not repeat them (especially in the same jurisdiction). However, it is recommended that citations be treated as a source of related audit criteria.
- *Publicly available incident reports of process safety-related accidents.* The reports issued by the Chemical Safety Board (CSB), which are generally very thorough, describe the root causes of accidents that are process safety-related and meet CSB criteria for investigation. CSB also focuses on the programmatic and cultural root causes. For some accidents that are

considered seminal events, a special commission or board has been established to independently investigate the circumstances and contributors of the accident, e.g., the Baker Commission (Baker, 2007) following the Texas City accident in 2005 (which was convened to examine the PSM programs in BP's North American refineries), and the Piper Alpha accident in 1988 (HM, 1990). These publicly available reports might represent a valuable resource for deriving PSM audit criteria.

- *Publicly available incident reports of accidents that do not involve chemicals or are in other industry sectors but have relevance for PSM programs.* Generally, the root causes of these accidents include strong contributions from weak management systems or have significant cultural contributors. Both of these issues are very important in process safety. For example, both the Challenger (Rogers, 1986) and the Columbia (NASA, 2003) space shuttle disasters include lessons learned regarding managements systems and cultural issues relevant for the chemical/processing industry, and the reports of these two events should be used as a source for related audit criteria.
- *Internal incident reports, including those from other facilities within the same company describing process safety incidents and near misses.* BP's investigation of the Texas City accident is an example (BP, 2005). Near misses represent particularly valuable learning opportunities because the causes of process safety incidents are experienced without having to suffer through the consequences. Therefore, the incident reports of process safety incidents should be used as a source for related audit criteria.
- *Special emphasis programs established by government agencies to examine a specific industry sector, a specific set of process safety questions, or a specific type of process safety hazard/risk.* Three examples of such programs are the National Emphasis Program (NEP) for PSM in the refining sector published by OSHA in June 2007 (OSHA, 2007a), the NEP for PSM in the chemical sector published by OSHA in July 2009 (OSHA, 2009a), and the NEP also published by OSHA for combustible dusts in October 2007 (OSHA, 2007b). OSHA has defined a number of issues, along with specific audit questions to examine them, as a result of the accident at the BP refinery in Texas City in March 2005. These issues and the associated enforcement questions are published in OSHA compliance directives entitled *Petroleum Refinery Process Safety Management National Emphasis Program (NEP)* (OSHA, 2007a) and *PSM Covered Chemical Facilities National Emphasis Program* (OSHA, 2009a). Special emphasis programs are often designed to instruct compliance officers how to evaluate a particular provision in a standard and when to issue citations. As such, special emphasis programs may be useful in developing audit criteria. NEP issues have been treated in this book as related guidance because the NEP program interpretations have not yet been tested in either the administrative or judicial processes. Although OSHA would be precluded from issuing a citation against the published instructions for the special emphasis programs, the instructions

often are intended to allow a closer examination of an existing requirement in the regulations, and the citations, if warranted, would be issued against that regulatory requirement. Therefore, it may be prudent to regard these special emphasis programs as nonmandatory compliance requirements until an appeal demonstrates differently.

- *Safety cases.* Within the European Union, a different approach has evolved, which is captured by the “safety case” philosophy. That is, under the Seveso II directive each facility establishes its level of safety in a safety report and constructs a major accident prevention policy (MAPP) based on the identified risk rather than just implementing a prescriptive set of requirements set out by a regulatory agency. For companies/facilities that utilize this philosophy for setting their PSM program requirements, the MAPP would represent a source of questions/criteria for PSM audits. The safety report could also be used for this purpose.
- *Good, successful, and common industry PSM practices.* As stated in Section 1.7.1, good, successful, and common industry practices in PSM may be relevant because regulators may consider them standard industry practices. They may simply be good ideas where one company or facility discovered a particularly clever way of solving a process safety problem or making an improvement to the design or implementation of a process safety activity. These practices may come to the attention of the company via the open literature, in ad hoc conversation with colleagues from other companies at a meeting or conference, via the work of a consultant who has worked widely in the industry and has seen many different ways to continuously improve PSM programs, or via other ways. However these ideas become known, they should be carefully reviewed, and if found to be applicable and suitable for a given company and facility, considered for use as a source of related audit criteria. The use of these criteria helps benchmark a PSM program against practices that have proven to be successful and/or common. Some good/common practices have evolved into levels of acceptable practice as described in Section 1.7.1.

The inclusion of audit criteria and questions derived from related sources, particularly those issued by governments (e.g., written clarifications and the CPL/NEP documents), should be used carefully. These criteria are usually generic in nature, but since many were formulated based on a specific situation, or on a company’s or a facility’s specific PSM program, they may not apply universally.

1.7.3 Changes to Audit Criteria

PSM audit criteria are not static. They should be updated to reflect new thinking in process safety. New or modified process safety regulations will certainly add different criteria; new/modified voluntary consensus PSM program requirements will emerge; clarifications by regulators or custodians of voluntary programs will be issued; the investigation of major accidents will alter process safety thinking and practices collectively—some of them in a substantial way. New consensus

RAGAGEPs will be issued that present new ways of improving the technology of process safety (e.g., new facility siting-related guidance, e.g., API RP 75, API RP 752 and 753). Citations may be issued that have to be applied company-wide on a national basis to forestall the possibility of a repeat finding for the company. The audit criteria for the PSM program of a given company or facility should react to this new or modified thinking and methods. A facility or corporate party should be assigned the responsibility of keeping audit protocols current and comprehensive. Changes should be processed using the document control procedures in place, and should be reviewed by appropriate parties, for example, the PSM coordinator, the PSM committee/working group, corporate or site counsel, and others as required before being approved for use.

While PSM or auditing procedures that contain the audit criteria are living entities, the timing of any changes should be carefully planned. For example, if periodic PSM audits are required and multiple facilities must be audited, it may not be advisable to alter the audit questions/criteria during a given audit cycle. That way, each facility in a given cycle of audits will be evaluated against the same questions/criteria. This consistency within an audit cycle may be important if the audits are to be graded, or if the results will be used to develop company-wide PSM policies or procedures. For some companies, consistent audit protocols within an audit cycle are not an important consideration.

1.8 AUDIT REPORTING

The management system procedure for the PSM audit program should address audit reports. In designing the reporting process and executing the actual preparation of reports, there are a number of issues to consider, each of which is discussed below.

1.8.1 Audit Report Content

Each company should establish the requirements for the format, content, and level of detail for each section and subsection of PSM audit reports, and should publish these requirements in the audit program management system procedure. The chosen report format and contents should be consistent with the objectives of the audit program. There is no single correct definition for the format and content of an audit report. However, it is important that once the report requirements have been decided upon, subsequent audits produce reports that are consistent with them. It can be confusing and misleading for both facility managers and senior executives when different audit teams within a company include different types of information in their respective audit reports.

For facilities performing PSM audits to comply with OSHA's PSM Standard or EPA's RMP Rule, this is one of the few PSM or RMP elements where a written report for the element activities is an explicit requirement. In 29 CFR §1910.119(o)(3) it states: "A report of the findings of the audit shall be developed." However, no regulation provides any further detail as to the format or content of the audit report.

In general, PSM audit reports have several potential audiences, depending on the purpose(s) of the audit:

- Management, both local and corporate;
- Technical reviewers, both local and corporate;
- Regulators;
- Insurance carriers;
- ISO registrars;
- Legal; and
- Facility employees (while the full report may not commonly be divulged, the overall results of the report are often communicated to facility personnel, and there is a requirement under the Workforce Involvement element to provide access to all information required to be developed under the standard).

Since the reports might have to satisfy the needs of several types of readers and users, they should be structured to meet their various needs. Therefore, a consistent report format should be used to facilitate review and use of the report by these multiple audiences.

A suggested outline for PSM audit reports is described below. Although this nonmandatory outline contains information that fully explains the why, when, who, and how of the audit, as well as the results (along with recommendations if they were within the scope of work for the audit team to formulate), the reports must satisfy any governing regulatory and internal audit procedure requirements. For the OSHA PSM Standard, the findings and the date of the audit would be the minimum information contained in the audit reports. However, to place the findings and conclusions in the proper context, facilities and companies should consider including some or all of the information described below in their PSM audit reports:

Executive Summary

Glossary of Terms

1. Introduction
2. Purpose, Scope, and Guidance
3. Audit Approach
4. Audit Findings
5. Appendices
 - A. Description of Audit Technique
 - B. Action Items
 - C. Audit Worksheets
 - D. Action Plan
 - E. Audit Protocol (unless this is included with the audit worksheets)
 - F. Audit Sampling and Testing Plan

Each section of the suggested outline is described as follows:

- *Executive Summary.* The Executive Summary is targeted for management, who typically does not have the time to review the audit report in detail, at least not initially. The Executive Summary should provide a brief overview of the what, when, where, why, who, and how of the audit, as well as a brief summary of the key findings. It is usually one to three pages in length. It is best written after the remainder of the report has been drafted.
- *Glossary of Terms.* This section of the report defines acronyms and abbreviations used in the report.
- *Introduction.* The Introduction provides a brief description of the facility and PSM program being audited, and then describes the contents of the report by section. Sometimes disclaimers, if necessary, are included here. The dates of the audit are often included here.
- *Purpose, Scope, and Guidance.* This section of the report describes:
 - The reasons(s) the study is being performed (e.g., OSHA or EPA compliance audit, PSM baseline audit, company-required audit, RC14001[®] certification, RCMS[®] certification).
 - The scope of study including:
 - The units and processes that were reviewed during the audit. If the facility was too large to include all of the units and processes in the PSM program in the scope of the audit, those units and processes designated as representative units, along with the rationale for making those choices should be described. If representative units were not used, the sampling strategy used to ensure that large facilities were audited completely.
 - Which PSM program elements were included in the scope of the audit.
- *Audit Approach.* This section of the report includes the following:
 - Identification of the activities that took place during the audit, i.e., planning, opening meeting, daily briefings, closing meeting, etc.
 - List of the audit criteria used. For example, if the purpose of the audit was to perform a triennial audit to comply with OSHA PSM, did the audit also evaluate related criteria?
 - Identification of the audit protocols used, including the sources of the questions/criteria, and the allowable/used answers to the protocol questions for the audit being reported.
 - A brief description of how the audit was conducted (a more detailed description of how the audit was conducted is sometimes included in an appendix).
 - Identification of the audit team members, including their name, title, affiliation, area of expertise, and the elements of the PSM program they audited.

- Description of the facility personnel interviewed. This can be accomplished by including the numbers of management and nonmanagement personnel interviewed, or by describing the types of positions interviewed. Care should be exercised not to reveal the specific people interviewed because the interviewees, particularly the nonmanagement employees, would most likely not want to be identified by name or title in the report.
- Identification of any facility events or activities that were observed as part of the audit.
- *Audit Findings.* This section is generally a summary discussion of findings. It usually focuses on the findings rather than the positive results, but in many reports statements that describe particularly strong aspects of the PSM program are included. The total number of questions posed during the audit, the number of questions that resulted in deficiency findings, and a number of recommendations may be helpful to include. Tables displaying the protocol question answers by program element, or number of deficiency findings by program element are useful summarizations of the audit data and may assist reviewers to understand the overall results and the context of findings. See Section 1.8.5. for a description of the grading of audits where this type of qualitative and quantitative information is described in more detail. Other descriptions or displays of any trends or patterns in the results are often useful and informative. If the audit was limited in scope and complexity, or if the number of deficiency findings is small, this section of the report can include a complete listing of all the findings. An appendix that contains the full audit worksheets so to include all findings and recommendations in the text report would be redundant. This section of the report should also highlight any situations that may require immediate action, if any such situations were identified during the audit.
- *Appendices.* In general the appendices for an audit report provide related supplemental information but does not involve information or conclusions from the actual conduct of the audit, or contain information that is too detailed or voluminous to include in the body of the report. Typical audit report appendices include the following:
 - A description of audit technique and protocol used (typically a boilerplate description).
 - A listing of the documents and records reviewed during the audit (usually by PSM program element).
 - The detailed worksheets from the protocol that contain findings of the audit.
 - The recommendations based on the findings, if the formulation of recommendations was one of the objectives of the audit.
 - The actual audit protocol used, unless this is included as part of the audit worksheets.

- The audit sampling and testing plan to explain the audit’s sampling strategy in terms of statistical validity and common sense results.

See Appendix B for examples of audit report formats.

Other issues to consider when preparing PSM audit reports include the following:

- Some companies prefer to document their audits by exception. That is, the audit report only includes those audit criteria/questions where findings resulted, and the other criteria/questions that were satisfied would not appear in the report.
- If not documenting PSM audits by exception, companies should establish guidance for how the satisfied criteria/questions are to be presented. That is, if the answer to an audit question is “Yes,” is it necessary to provide explanatory remarks? In general, the criteria/question itself along with a positive answer or comment usually suffice; however, there may be the need or desire to amplify these responses with additional information. The management system procedure should provide the necessary guidance for when this should be done so that is practiced consistently.
- Companies should have a policy for handling repeat findings in their PSM audit reports. Repeat findings are specific items that have recurred in successive audits (e.g., a 2006 audit finding against open recommendations from a 2004 PHA that still had not been addressed by the time of the 2009 audit), continuing evidence of similar previously cited management system failures (e.g., the recommendations from the 2004 PHA were closed before the 2009 audit, but others from a 2007 PHA are still open). A repeat finding is important because the same PSM shortcoming has occurred in consecutive audits and is an indication that some facet of the PSM program is not functioning and that this is a chronic problem. If a government regulator discovers these repeated findings, then a significant citation could result, and repeated findings could also have an adverse impact on civil litigation. The potential liability of having repeat findings reported explicitly should be weighed against the importance of facility management knowing that these issues exist. Perhaps another way to report these findings is to include them but assign the recommendation(s) a higher priority rather than explicitly stating in the report that the finding is a repeat finding from the previous audit. However the report is worded for these items, if they occur, it is very important that they be included in the report so that the proper action can be taken to prevent any successive recurrences of the same finding.
- All PSM audit reports should be dated. As discussed in Section 1.4.2 the time between audits can be measured several different ways; however, in order to assess the time, the audit report should contain the date of the audit and what the date represents.
- Some PSM audits are performed to comply with government regulations, for example, the audits required by paragraph (o) of OSHA’s PSM

Standard. Any deficiency against a compliance requirement will have to be corrected, and since the audit is required by the regulations, both the finding and its correction become a compliance issues. During its inspections OSHA may request to see reports for audits that are required by their regulations. However, some PSM issues that are not compliance issues may be identified during the audit, either because the auditor discovered them while assessing compliance issues or because the audit protocol contained questions designed to evaluate related criteria simultaneously. Because related criteria are not explicitly required by regulation, they are not required to be in a document that a regulator would review. Therefore, any findings associated with related questions in the audit protocol can be addressed in a report separate from the compliance report; thus, the report of related findings would not have to be divulged to a regulator.

- The review process for PSM audit reports should be defined in the audit program management procedure. Reasonable time limits for reviewing draft audit reports and returning comments should be established so that the facility has the opportunity to correct any factual errors that slipped past the on-site activities of the audit but does not result in extended delays in the issuance of the final audit report. Most disputes in the content of a PSM audit report will not involve straightforward factual issues, but will mostly be related to interpretations of performance-based governing requirements. A process to resolve these interpretations and any findings and recommendations that result from them should be established so that this process is consistent with the company's process safety philosophy and management system procedure, and is applied consistently. Regulatory interpretation processes should include company and facility PSM/EHS, regulatory affairs, legal, and management personnel, and the results of their work should be internally published and disseminated to those managing the company's PSM programs, as well as those who audit them.
- Audits that are performed pursuant to PSM regulations must contain certain information required by those regulations. For example, the requirement under OSHA's PSM Standard, paragraph (o) that "The compliance audit shall be conducted by at least one person knowledgeable in the process" creates an implicit requirement that the audit report, which is the only document that will be used to assess compliance by the regulators and future auditors, clearly indicates who that person was. The PSM Standard also requires that the audit be performed "at least once every three years." As stated earlier, the only way for a regulator or future auditor to determine if this time period has been met is for the audit reports to clearly indicate the dates and how they are defined. The PSM Standard also requires that "Employers shall certify that they have evaluated compliance with the provisions of this section . . . to verify that the procedure and practices developed under the standard are adequate and are being followed." This means that the PSM audit

must address each element of the PSM Standard. Again, the only way to show compliance with this requirement is to clearly include each element of the PSM program in the audit report and how it was audited. The same would be true of company- or site-specific PSM program requirements. If there is a company or site procedure governing PSM audits, then the audit reports documenting compliance with those requirements should clearly indicate how those requirements were satisfied.

- Audits performed under the attorney-client privilege should be marked or annotated in accordance with the instructions of counsel. Otherwise, most PSM audit reports are marked “Confidential” to remind recipients that they should not be shared widely, especially external to the company.

1.8.2 Distribution of Reports

Once PSM audit reports have been prepared, they should be distributed to appropriate parties. Some of these parties will simply review them and may offer comments. Other parties will need to study the reports more closely in order to begin planning follow-up action. Distribution of the audit reports may be determined by corporate policy. Typically, the recipients of the audit reports include the manager of the facility being audited, and at least one level of supervision above that manager. In some organizations, the distribution may be more extensive. In many companies, the corporate process safety manager (if assigned) will also receive the draft reports. The PSM audit management system procedure should specify the distribution of the reports.

Because of concerns for the sensitivity or confidentiality of audit reports, other persons and organizations external to the company should not receive copies, unless there is a compelling reason and a conscious decision is made to do so. Internal distribution should be controlled to the extent possible; however, the requirements of the workforce involvement and trade secrets provisions of the PSM program should also be observed (see Chapter 8). Audits conducted under legal privilege must also have limited distribution, as directed by legal counsel. When there are concerns for protecting a legal privilege, some companies prefer to have audit report distribution managed by their legal staff. Some companies number the copies distributed so that they can retrieve them. In recent years report distribution has become complicated by the use of electronic means to generate and distribute documents. It is now almost a universal practice to use word processing software and e-mail to accomplish these tasks, and this has greatly increased both the efficiency and speed for document management. However, copies of document may reside on each computer or server used in the process of developing and distributing the documents, and once something is e-mailed the sender loses any semblance of control over its further distribution. For those that require a higher level of document control, password protection may be used.

This same sensitivity about the documentation of audit findings has sometimes led to the suggestion that audit findings be reported only orally rather than in writing. That approach is not recommended as the sole means of reporting audit results. To effectively resolve the audit findings and for tracking and follow-up of the resulting recommen-

ditions, written reports are necessary. However, it is common for the audit team to communicate their findings orally to facility management before leaving the site.

1.8.3 Language of Audit Reports

When writing PSM audit reports, it is important that great care be taken to use appropriate wording. Audit reports should clearly communicate the findings and observations of the audit team. However, they should be worded carefully so as not to imply findings or observations that are not intended or not supported by the evidence collected, or that create unwarranted legal/regulatory liabilities. Alternate wording that conveys the same technical meaning but that avoids possible legal difficulties can often be found. In addition preferred and nonpreferred wording styles and phrasing are often developed for companies as part of their audit programs, and that guidance should be followed if available. The following is general guidance for wording audit reports, including the audit worksheets:

- The facts should be reported clearly and concisely. Every finding or statement should be supportable.
- Findings should have the following characteristics:
 - Findings should be written in the form of a statement of fact and should not be written in the form of a recommendation (i.e., findings should not contain the words “should” or action-related verbs). Recommendations, if within the scope of audits, should be written as separate statements.
 - Findings should be based on only factual evidence; speculation should be avoided.
 - Findings should not be based on anecdotal evidence, e.g., a statement made by one person. However, a pattern that emerges from personnel interviews could constitute a finding.
 - Findings should be actionable; i.e., a finding for which a measurable and closable recommendation cannot be found is not a useful finding.
 - Findings should be focused on systemic issues (rather than on just the symptoms).
 - Findings should use wording and language that is understandable by site personnel and senior management, and avoid jargon or acronyms that do not have common usage in the facility or company in question. Findings should be written in consistent tense (either past or present) and person (either first or third person) in a given audit report.
 - Findings should be accompanied by sufficient evidence and specific detail to clearly demonstrate why the requirements were not satisfied.
 - Findings should not use absolute terms (e.g., “never” or “all”) in findings unless these terms can be supported by evidence.
 - Findings should not use intensifiers (e.g., “very,” “extremely,” “particularly,” “hardly,” “scarcely”) as these terms are not objective.
 - Findings should not focus criticism on individuals or their mistakes. Avoid the use of names or titles in findings.

- Findings should include details of sampling methodology wherever possible. (e.g., “of the 25 documents reviewed, 5 showed . . .” or “1 file in every 10 was reviewed . . .”).
- Findings should not reference staffing levels and budgets. Audit reports should report the findings as they are supported by the facts discovered by the auditors and address only the requirements contained in the audit criteria or questions. Underlying reasons and secondary causes for an audit finding should be investigated as part of the follow-up process for the findings and recommendations.
- Entries in worksheet should be accurate and complete but as concise as possible. The borderline between concise and complete should be carefully considered. The report should be complete enough so that the intended audiences can clearly understand what has been identified and concluded, but should not contain extraneous information that does not explicitly apply to the audit question being answered. It may be necessary to err on the side of completeness in order for all reviewers of the report to understand the finding without any confusion.
- Do not use worksheets as “electronic scrap paper.” Be careful with the use of the “REMARKS” or “COMMENTS” columns of audit worksheets if they are available or can be inserted. These columns should not be used to provide supplementary findings, conclusions, or amplifications or clarifications of the findings or conclusions. These columns should only be used to provide administrative information about the audit question, finding, or recommendation such as a reference, document number, person interviewed, date of observation, etc.
- Record only audit team consensus opinions and conclusions in the audit report and worksheets. Unlike HIRAs and other hazard analyses, which are performed by a team concurrently, audits team members usually perform their work independently, and then present their findings, conclusions, and recommendations (when recommendations are formulated by the audit team) to the remainder of the team and the audited facility separately. Therefore, achieving consensus in an audit is not the same as in a HIRA, but it still should be achieved. Dissenting opinions are not allowed in audit reports or worksheets. As in other aspects of process safety, consensus means that those involved can all live with the finding, conclusion, or recommendation, even though they all may not completely agree with it.

Table 1.3 provides guidance on language to avoid in audit reports, and examples of appropriate report phrasing.

Table 1.3 Examples of Audit Report/Worksheet Phrasing

<i>Do not say . . .</i>	<i>When you mean . . .</i>
"The plant does not have . . ."	"We were unable to confirm that . . ." "We were unable to determine that . . ." "The audit team was not able to verify . . ." "Plant personnel were unable to locate copies of . . ." "The plant did not provide . . ."
". . . is a violation of law"	"The . . . procedure did not include some of the provisions contained in . . ."
". . . practice is found to be negligent."	"records did not include some of the information required by . . ."
". . . was a sloppy operating practice"	"operating practice was not in accordance with approved Procedure . . ."
"It appears that . . ." "We think . . ." "It seems that . . ." "We feel . . ." "We believe . . ."	"The . . . did not . . ."
"The . . . records were incredibly deficient." "The . . . was totally noncompliant with . . ." "The . . . program was the worst observed." "The level of documentation of . . . was awful."	"The . . . records did not contain the information required by . . ." "The . . . program did not contain the provisions required by . . ." "The . . . documentation did not include . . ."
". . . must be . . ." ". . . shall be . . ."	". . . should be . . ."

The following is other guidance with regard to sensitive wording and the examples in Table 1.3:

- Several of these terms have special meanings in a legal environment, e.g., "negligent" or "negligence" is a legal concept in the assignment of liability, and should be avoided.
- Do not use words that directly infer illegality or are legal conclusions, e.g., "criminal," "violation," "liable," "perjured," or "fraudulent."
- Any wording that indicates the deficiencies were not mistakes but intentional acts should be avoided, e.g., "intentional," "willful," or "deliberate." These situations have disciplinary implications within the company, and possibly legal ones as well. Any investigation of intentional behavior or actions should be performed outside the PSM audit.
- Colorful language to characterize deficiencies, such as "stupid" or "dumb," should be avoided. In addition to being unprofessional, such

language may cause undue attention on a deficiency that is no more important than any of the other in the audit.

Common pitfalls in composing PSM audit findings are presented below in the form of examples. These have been adapted from the pitfalls presented in Cahill et al., *Environmental, Health, and Safety Audits, 8th ed.* (Cahill, 2001).

- “The Asset Integrity program was deficient and could be improved. This is a serious concern.” (The AI program deficiencies are not described. “This is a serious concern” is not a fact. It is a conclusion that is not appropriate in an audit finding.)
- “Sizing calculations for 5 pressure relief valves were not available.” (Which five valves?)
- “Electrical classification drawings were not available for the chemical storage tank farm. The possibility of a flammable release and vapor cloud explosion is high in this area.” (The second sentence is not a fact and is speculative. Describe the possible consequences of findings at the closing meeting or another forum.)
- “Not all of the maintenance personnel have received training in an overview of the process and its hazards.” (“Not all” is not definitive enough. Which maintenance personnel have not received the training?)
- “An operator stated that inside operators occasionally leave the control room during their shift to attend training meetings in violation of facility policy.” (This is hearsay evidence and should not be included in a finding. Also, “violation” or “violate” is a legal conclusion and should be avoided.)
- “The emergency response plan should be improved to reflect the most up-to-date information.” (This is a recommendation, not a finding. What is deficient about the emergency response plan? “Should be improved” is soft language and is not specific.)
- “It appears that operating procedures are not annually certified.” (Simply state the facts; “appears” is not appropriate wording.)
- “There are insufficient safeguards included in the 2007 alkylation unit PHA.” (“Insufficient” is not specific or appropriate wording.)
- “Based on a review of their training files, it appears that Robert Jones, Dana Standish, and Jennifer Perry have not received annual HAZWOPER 24 hour refresher training.” (“Appears” is not appropriate wording. Using the names of individuals in written findings is not an appropriate audit practice.)
- “Almost all of the contractors currently doing work on-site do not have documented pre-qualification forms in the file.” (“Almost all” is not appropriate wording.)

Audit reports and worksheets should be subjected to internal legal review to ensure that the wording of the documentation does not cause any of the problems enumerated above.

1.8.4 Audit Document Retention

The management system procedure for the PSM audit program should establish the policy on the retention of final and draft audit reports as well as backup records (including working papers and correspondence). There is little formal industry guidance on retention policy for PSM audit documents, with the exception of OSHA's PSM Standard, which states, in 29 CFR §1910.119(o)(5) that "Employers shall retain the two most recent compliance audit reports." The SEMP program for offshore platforms requires that audit reports be retained until the completion of the next audit.

The retention of field notes, working papers, interview notes, copies of records and procedures that support the findings, and other "temporary" documents should be retained only as long as it takes to issue the final audit reports, unless there are extenuating circumstances that compel their retention for a longer period. After that, the proper disposal—shredding or burning—of these documents should be arranged. In addition, drafts and review/mark-up copies of the audit text report and worksheets should be disposed of once the final audit report has been issued. The disposal of all this documentation should also include the deletion of electronic files and e-mails stored on various computers and other electronic media (e.g., flash drives, CDs, backup servers). There is no legal, regulatory, or technically valid reason to retain any of the temporary documents associated with a PSM audit, unless they are subject to a subpoena. In fact, these temporary documents can represent potential legal problems. Field notes, marked-up versions of the report, or other such documents may contain information different from the consensus final audit reports. This is not unusual, as the audit team and audited facility work through their differences of opinion. In a court setting, attempting to explain these differences of opinion may be very difficult, and even a single statement in an auditor's notes may be given great weight in that setting when in reality it is not important to the final audit findings or recommendations.

1.8.5 Grading of Audits

Some companies have elected to establish formal assessment or grading systems for their PSM audits. This is often done when a company has multiple facilities subject to the same PSM program requirements. This can be accomplished either quantitatively or qualitatively.

1.8.5.1 Quantitative Grading

The quantitative assessment or grading of PSM audits is usually accomplished by assigning a value, or number of "points," to each question/criterion. Some questions/criteria may be assigned a point value that is different from others, thereby indicating its importance in relation to the others, which can further be indicated by assigning weighting factors to the individual questions/criteria, the program elements, or both. For example, the questions/criteria for the MOC element may be assigned a weighting factor higher than the employee participation element, or certain MOC questions may have different weights than other MOC

questions. Rules and assumptions are also established for awarding the points for each question so that each member of the audit team does this consistently. For example, if a question has a total value of five points, then zero points could be assigned if the facility had not achieved any progress towards implementing what is required by that question. The same question could be awarded five points if the facility had fully implemented what is required by the question and the interview, record review, and/or observation activities of the audit confirmed that it was fully implemented and functional. If the facility had made partial progress towards implementing what was required by that question, then a score of two, three, or four points could be awarded based on rules established in advance, e.g., two points could be assigned if 25 percent of the progress had been achieved, three points if 50 percent had been achieved, and four points if 75 percent had been achieved.

The number of points can be determined by element and for the entire audit. The final score for the audit can then be calculated as a ratio of the total points awarded to the total points available for each element and for the entire audit.

Numerically grading audits makes comparisons between facilities subject to identical PSM program requirements easier, and it provides an objective measure of PSM program improvement or degradation from one audit to another. An important potential disadvantage of numerically grading audits is that it fosters competition between facilities and focuses facility and company management more on the score and not the nature of the audit findings that created the score. This is a natural and unavoidable outcome of quantitatively assessing PSM audits.

In addition, in order to create a single numerical grade, all audit questions/criteria have to represent either compliance requirements or related criteria, but not a mix of both. It is not possible to accurately combine compliance and related-criteria issues in the same score. If a quantitative assessment system is implemented and it is desired to audit both related criteria and compliance criteria, it will be necessary to grade and report them separately. Also, when PSM audits are numerically assessed, dedicated audit teams should be used, if possible, to help ensure consistency of assigned scores among all facilities being audited in a given audit cycle. If possible, some of the same auditors should also be assigned from one audit cycle to the next, so that there is some consistency in the numerical assessments between audits from different cycles. This will allow a more objective comparison of the improvement or degradation of the PSM program that quantitative assessments permit.

1.8.5.2 Qualitative Grading

Qualitative assessment or grading of PSM audits is usually accomplished by establishing a set of qualitative grades or categories and then assigning each audit finding and its recommendation(s) (when recommendations are formulated by the audit team) to a category. This creates a qualitative measure of importance that is not numerically based but ranks the findings and recommendation by their relative importance in the PSM program and the process safety risk compared to other audit findings/recommendations. A simple example of such a system is a high-medium-

low qualitative assessment scheme. Each of these three categories would be assigned qualitative definitions in a manner similar to the qualitative severity, likelihood, and risk ranking schemes used in HIRAs. Each finding and recommendation would then be assigned one of these qualitative measures. The results of the PSM audit as a whole are sometimes assigned a measure, although sometimes only the individual findings are assessed. This is a difference in qualitative versus quantitative assessment systems, where in the quantitative systems the grades are almost always numerically combined to render an overall grade.

The same cautions described for quantitative assessment systems for PSM audits apply for qualitative assessment systems, although the lack of numerical scores generally tempers some of the competition and focus-only-on-the-score issues. However, there can be some pressure on auditors to not assign certain categories of qualitative grades because of the perceived severity of the category, and sometimes facilities/companies impose inflexible timeframes on the correction of the findings associated with the qualitative assessment categories that are difficult to achieve.

1.8.6 Certification of Audits

OSHA's PSM Standard, in 29 CFR §1910.119(o)(1), requires that "Employers certify that they have evaluated compliance with this section" This requirement is repeated in EPA's RMP Rule in 40 CFR §68.79. These regulations, however, provide no further guidance as to what "certify" means or how it should be performed and documented, what certification language is acceptable, nor who should be the certifier. However, common practice suggests that certification of PSM audits subject to the PSM Standard means that a signature and date affixed to a document attest that the audit was performed, often done by including a certification page in the compliance audit report. A PSM audit intended to satisfy OSHA's PSM Standard or EPA's RMP Rule that did not result in any findings would still be required to be certified. Appendix C contains some sample certifications. Audit reports of findings from only the related criteria would not require certification because these reports would generally not be made available for review by a regulator. There are no stipulations as to who should sign the certification; the PSM Standard only says that "Employer shall certify" Therefore, each company or facility should designate an appropriate person in its PSM audit management system procedure. Typical choices are the plant or facility manager, EHS manager, PSM manager/coordinator, or the audit team leader. However, these are not mandatory choices, and others could be designated.

An important concept here is that the PSM compliance audit report is not being certified—the PSM audit is being certified. Therefore, it is not necessary that the certification documentation be included in the audit report, although most facilities file their audit certifications with the audit reports as a matter of convenience.

The other voluntary consensus PSM programs do not require certification of PSM audits. However, a similar but not identical requirement exists in ACC's RCMS[®] program, where certification under the program is achieved via a third-

party audit performed by a certified auditor (see Section 1.6). This is different than the regulatory requirement under PSM/RMP. Each ACC member is required to achieve RCMS[®] certification according to a schedule published by ACC.

1.9 AUDIT FOLLOW-UP

1.9.1 Action Plan

The recommendations from a PSM audit should be resolved in a careful, timely, and documented manner. The definition of “timely” in this context is provided in the Glossary and is not limited to any particular duration. The difficulty and complexity of resolving and implementing the audit recommendations should be addressed based on the specifics of each recommendation on a case-by-case basis. PSM auditors should determine how facilities have defined “timely,” how they have applied their definition, and if the definition and its application for each recommendation are reasonable and defensible. This is a crucial function of any viable PSM program, and the same concept extends beyond audit recommendations to any PSM-related recommendation or action item, e.g., those arising from PHAs, incident investigations, or emergency drill critiques. PSM audits required by regulation must properly execute this step of the audit program. For example, OSHA’s PSM Standard, in 29 CFR §1910.119(o)(4), requires that “The employer shall promptly determine and document an appropriate response to each of the findings of the compliance audit, and document that deficiencies have been corrected.” There are also possible legal ramifications for ignoring audit recommendations. However, in most cases, the resolution of the recommendations generated by the audit findings is not considered part of the audits themselves but is a key part of the PSM audit program.

Following issuance of final audit reports, an action plan should be developed, which should include the timetable for resolving the recommendations generated by the audits, and the person responsible for each indicated action. Accordingly, the action plan represents both a project schedule for the follow-up activity, and if needed, an internal control document that can be used to monitor the status of corrective action. If the audit generated findings that require urgent action, then the recommendations associated with these findings should be addressed even before the final audit reports are issued and the action plans are formulated.

The action plans should be developed by the manager(s) responsible for the audited facility or operation. This individual is ultimately responsible for the PSM program at the facility, and should take responsibility for enhancements based on audit results. There should be an established system for review and approval of the action plan by appropriate levels of management documented in the PSM audit program management system procedure.

1.9.2 Management System for Resolution and Tracking of Audit Action Items

In most cases, the recommendations generated by the audit are managed in a tracking system, database, or other management system that is designed to accumulate and manage recommendations and actions from other process safety activities (e.g., HIRAs, incident investigations, emergency response drill critiques). In some organizations, PSM audit recommendations are managed with a system devoted to all EHS-related recommendations and action items. If the audit was conducted as part of an overall EHS compliance assurance program audit, the EHS audit findings may be managed in a single corporate system. If this is the case, PSM audit recommendations will be co-mingled with environmental, health, occupational safety, and other PSM recommendations and action items. Such systems usually involve computerized records and systems, but this is not mandatory.

The characteristics of management systems designed to track and manage recommendations generated by process safety or EHS activities include the following:

- *Schedule.* The management system for audit recommendations should have a defined schedule that describes the various dates for resolving the recommendation as well as implementing the final action item(s). The scheduled dates should be *timely and reasonable*. Within the context of process safety, these terms mean that the scheduled dates for resolution and implementation should be commensurate with the scope, complexity, and risk of the finding being corrected. The definition of “timely” would differ for a recommendation to confirm the design basis of the facility’s relief devices and a recommendation to change the wording to the incident investigation procedure. In some cases the resolution and implementation of recommendations may take months and even years, particularly if large-scale changes are necessary to fundamental process safety elements, e.g., if the operating procedures have been found to be wholly deficient. Recommendations involving large capital projects can also take a long time to resolve and implement, although programmatic audits such as PSM audits generally do not result in recommendations that involve large engineered projects (see Section 2.4.2). Some of them, however, may involve a significant amount of technical work, e.g., a recommendation to confirm the design basis of the facility’s relief devices or a recommendation to implement the SIS Standard. Conversely, some PSM audit recommendations should be relatively quick to resolve and implement. For example, if a change to the incident investigation procedure is recommended as necessary during the audit, that recommendation should be completed in a relatively short period of time, probably measured in a few months, depending on the document control process in effect at the facility or company. If the facility is large, and a number of people are required to review procedural changes (or when the document is a corporate or division procedure), consensus may take time to achieve. The approval process, plus the implementation steps,

including training a large group of people, can result in a relatively simple procedural change taking months to approve and implement.

- *Responsibility.* The management system for audit recommendations should identify who is responsible for each step of the resolution and implementation process. It is recommended that responsibilities be described in terms of actual names or titles and that department/group/discipline names not be used. Assigning a recommendation to “Operations,” for example, is too broad of an assignment and does not allow specific tracking of the recommendation.
- *Status.* The management system for audit recommendations should provide a clear indication of the status of the recommendation, e.g., complete, pending technical review, awaiting final disposition, overdue, rejected. The system should also be designed to allow supplemental information describing the rationale for decision-making to be entered, attached, referenced, or linked. Rationales are the technical, administrative, regulatory, policy, or financial analyses that support the decisions being made about the recommendation. This will consist of a variety of different types of documents including drawings, calculations, reports, HIRA worksheets/reports, spreadsheets, or text documents.
- *Sorting and filtering.* The management system should be capable of sorting and filtering by schedule, responsibility, and status data, so that periodic metrics can be produced and reviewed. In particular, the management system should easily produce a list of recommendations where the required action has exceeded the scheduled dates and are overdue for resolution or implementation.
- *Computerized system.* While not mandatory, it is recommended that the system for managing audit recommendations be computer based. Software-based management systems offer many advantages, including ease of entry and modification of data; ease of access for those in distant locations who need to see and work with the information; ease of sorting, filtering, and reporting of the data and its variations; ease of storage; and ease of quick information retrieval and transmission over a wide area. However, if a single facility has a very small number of audit recommendations to manage at any given time, it is possible to manage them using a manual, paper-based system. More sophisticated computerized systems will retain a record of who made a modification to the database, as well as what and when it was made; allow e-mail reminders to be sent automatically to those who have roles and responsibilities in the follow-up process; and generate summary reports for periodic management review.
- *Security.* The management system should be capable of controlling access and editing capability. While PSM programs have employee participation/involvement elements, access to the audit recommendations management system should be limited to employees and those contractors whose jobs require access. In addition, the ability to edit certain fields in the system should be limited to those who need to enter or manipulate the

information. For example, the ability to delete or reject a recommendation or edit a due date should be limited to only a few persons. Using a computer-based system allows this type of need-to-know, need-to-edit access control.

- *Communication.* The management system should facilitate the communication of audit results. This includes making basic audit results available to the employees and certain contractors as part of employee participation goals, as well as for use in process safety-related training and other similar activities.

On a regular basis, the tracking system should be updated to indicate which items are complete and the status of other items. As items are completed, the final action taken and the date closed should be documented and kept on file. Periodic (usually quarterly or monthly) updating of tracking systems is often made, but more or less frequent updates may be chosen. This follow-up process ensures that the company documents its intent for resolving the recommendations and the completion of the work, and provides assurance to management that the appropriate steps are being taken and their timing.

The rejection process for audit recommendations should be addressed in the PSM audit management system procedure. The procedure should describe the following rejection provisions:

- The criteria allowed for rejecting audit recommendations;
- The escalation process if the recommendation fits within pre-defined risk or cost parameters, or if the reviewers cannot reach consensus on the disposition of the recommendations; and
- The documentation requirements for rejecting audit recommendations.

There may be other provisions addressing the rejection of PSM- or EHS-related recommendations that are contained in the facility or company procedures. The process for rejecting PSM audit recommendations should be consistent with these provisions.

The rejection criteria for PSM audit recommendations should be reasonable, defensible, and not based solely on potential cost impact. Possible costs should be considered but only when weighed against other pertinent factors, such as the risk to be abated, the feasibility of the recommendations, and the accuracy and completeness of the input information used to formulate the recommendations. See Chapters 10 and 21 for a discussion of the rejection criteria for HIRA and incident investigation recommendations, particularly audit criteria 10-R-29 and 20-R-7, which are derived from clarifications offered by OSHA in the PSM Compliance Directive (OSHA, 1994) on this subject.

1.9.3 Verification Audits

Some facilities and companies (usually larger entities) have chosen to extend the PSM audits to include verification or follow-up audits. When the items in the action plan have been completed, another audit is performed to confirm that the

action items have been actually completed in the manner specified in the action plan or in an equivalent manner. This activity can be formal, documented, and performed by second or third parties, or it can be more of an informal check performed by facility personnel. In some companies, an independent group performs these verification audits to help preserve impartiality and prevent conflicts of interest. The scope of verification audits, as their name implies, is usually limited to the items in the final action plan resulting from the original PSM audit. Verification audits are generally not used as an opportunity to perform additional PSM program auditing. The objectives of the verification audits are fairly narrow and usually limited to reviews of PSM-related policies, procedures, as well as some records and field observations to ensure that the original audit action items have actually been closed properly. It is not unusual to find that the facility's interpretation of what constitutes successful closure of an action item differs from the interpretation of an outside knowledgeable party. Also, the facility may have arbitrarily and improperly rejected an audit recommendation or action item. Verification audits are not mandatory requirements and require the allocation of additional resources. However, they are an effective way to ensure that PSM audit action items are followed-up and closed properly.

1.10 QUALITY ASSURANCE

Quality assurance is an important issue in a PSM audit program. Those being audited and those relying on the results should have confidence that the program is being carried out in a consistent and thorough manner.

The development of performance criteria for the audit program is one method of helping to assure quality. Criteria for an acceptable audit often evolve as the audit program develops. The types of issues addressed in the performance criteria for a PSM audit program might include the following:

- The existence and functionality of a PSM program or PSM audit management system procedure;
- Audit team composition;
- Auditor qualifications;
- The conduct of PSM audits, including interviews, records and document reviews, sampling, observations, and informing the audited facility on the results;
- The wording of audit reports;
- Audit records; and
- Audit follow-up.

Independent review of the audit process is another quality mechanism sometimes used in audit programs. This may be done during or after the PSM audits themselves, and is often accomplished in the following manner: The reports, follow-up, and other aspects of previous audits are reviewed by treating the audit program as another element of the PSM program. A set of protocol questions

representing the criteria will be required. In some programs, an independent quality assurance person accompanies the audit team on some fraction of the audits to observe the audit process, but this is rare. In other cases, the audit reports and worksheets are reviewed by someone not involved in the audit who can provide a second check for accuracy and completeness. The independent check need not be performed by someone external to the company, merely by someone not involved in the audits being reviewed.

Periodic critiques and evaluations of the PSM audit program can be helpful in identifying program weaknesses. Such reviews can be performed by a task force comprised of employees not involved in the audit program, by the company internal audit function, by a group of external peers (e.g., an auditor from another company), or by an outside consultant. This overall review on a periodic basis is a good way to avoid the audit program devolving into a “check the box” activity.

There are numerous factors that can result in a poor quality audits. They include the following:

- *Lack of or a poor audit management system procedure.* Without such a procedure the audit program will be missing direction and consistency. Audits will be performed according to the personal decisions of the audit team leader and/or the audited facility. Documentation will likely not properly record the activity, and follow-up will likely not occur in a timely fashion, if it happens at all.
- *Inadequate planning.* There are a number of issues that should be resolved to adequately plan for PSM audits (see Section 2.1.1). In particular, the purpose of the audit and its guidance (i.e., “ground rules” and assumptions) should be carefully thought out, discussed, and documented. If these details are not attended to properly, the audits will be difficult to perform or the results may be flawed and not fulfill the desired purposes or follow the specified guidance. To prevent this from occurring, ensure that the audit planning process is described in the audit management procedure and that a written audit plan addressing all items required by the procedure is issued for each audit.
- *Improperly selected audit team.* Auditors that are improperly trained, have little or no experience in process safety, or little experience auditing PSM programs will not perform this work well. In particular, the ability to accurately interpret what the governing PSM program requirements mean for the facility being audited is a key skill. Also, auditors with conflicts of interest or bias will allow these issues to interfere with producing a fair, accurate, and comprehensive assessment. To prevent these problems from occurring, the minimum skill/experience and potential conflicts of interest issues for PSM auditors should be addressed in the audit management system procedure, as well as in the training that auditors should receive before performing this work.
- *Inadequate time.* While there will always be pressure to perform PSM audits as quickly as possible, both to reduce the costs and to reduce the time

that facility personnel must devote to supporting the audits, adequate time must be allocated to performing the audits, given the scope of the PSM program and the number of processes and units included in the program. The time allotted for an audit and the planned staffing should be compared with the scope and guidance of the audit, particularly the selection of which criteria/questions will be used in advance to ensure the goals of the audit can be accomplished given the time and resources allotted.

- *Key information not available.* The audits will be hampered if information that is needed to properly perform them and answer all of the protocol questions cannot be found. This may indicate a basic problem with the PSM program itself, and if the information cannot be found, then findings are likely. Proper planning can prevent this from occurring by locating in advance the information needed to support the audit.
- *Facility staff not available for interviews.* Not having the key management or nonmanagement personnel available will, as with unavailable information, result in incomplete audits. Some audit work may have to be deferred until the necessary persons become available. Sometimes this happens due to unforeseen events despite adequate planning, and sometimes it happens because of poor planning. All facility and other company personnel needed for interviews should be identified and advised of their required participation in advance.
- *Poor data gathering.* Poor auditing technique on the part of the auditors, whether it is poor interviewing techniques, inadequate sampling, or incorrect interpretation of the information collected versus the intent and scope of the protocol questions, will result in flawed audits. Proper experience and training of the auditors will help alleviate this problem.
- *Inadequate documentation.* Audit reports and worksheets that do not adequately describe what occurred during the audits, or that describe the findings and/or recommendations in a manner that is factual wrong or in a manner that cannot be understood by anyone but the auditor, will be of little use after the audit is completed. A quality review of the final work products of the audits can help alleviate this problem. The audit team leaders usually manage this aspect of audit quality, but may appoint other audit team members or have external staff (e.g., legal) available to assist on a large or lengthy audit.
- *Inadequate follow-up.* If the recommendations from well-performed PSM audits are not resolved, the time and resources spent on performing the audits will have been wasted. Including a properly designed tracking system in the PSM audit program, as described in Section 1.9.2, along with regular and careful review by management of the status of the recommendations, will alleviate this problem.

Chapter 2 describes how individual audits are conducted. Many of the issues discussed in that chapter provide remedies to the problems associated with PSM audit quality.

1.11 SUMMARY

The design of a PSM audit program requires a number of choices on issues such as scope, frequency, staffing, reporting, follow-up, and quality assurance. While there is no single best way to structure a program that will be uniformly effective for all organizations, it is important to clearly define program goals and settle on a consistent approach before beginning a program of PSM audits. A final caution: auditing cannot guarantee that a PSM program is well designed or that it is functioning properly, any more than inspections can guarantee product quality. PSM program quality cannot be “audited-in.” The PSM program must be properly managed and controlled to be successful.

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CONDUCTING PROCESS SAFETY MANAGEMENT PROGRAM AUDITS

The conduct of a PSM audit consists of a number of different activities, not all of which take place on-site. The entire process of any given audit can be separated into the following four basic phases:

- Activities to plan the audit;
- The collection of data and initial evaluation of that data against the audit criteria by the auditors while on-site, and for some audits, the issuance of a draft report and resolution of findings/recommendations and finalization of action items and their due dates;
- Work to complete the evaluation of the data, prepare a draft report, and resolve comments to issue the final report; and
- Post-audit work consisting of resolution and implementation of the final recommendations.

2.1 AUDIT PLANNING

As with many process safety activities, especially those that involve multiple simultaneous participants and organizations, careful planning is critical to conducting a successful and smooth-running PSM audit. Not paying adequate time and attention to the general steps recommended in planning a PSM audit as follows can compromise the quality of the audit and result in wasted time and effort:

- Gathering preparatory information about the facility and its PSM program;
- Defining audit purpose, scope, and guidance (see Section 2.1.2);
- Developing the audit protocol (see Section 2.1.3);
- Selecting the audit team (see Section 2.1.4);
- Establishing the audit schedule (see Section 2.1.5);
- Making an advance visit to the facility to be audited, if necessary;
- Arranging logistics for the audit; and
- Allocating resources.

The above-referenced sections provide guidance on issues that should be included in the PSM audit program management system procedure and should be applied in the planning of an individual PSM audit. This chapter focuses on planning a PSM audit to be performed in the United States. Audits performed at international facilities require additional planning considerations. Appendix H provides additional guidance for planning PSM audits facilities in other countries or for U.S. companies with international operations.

2.1.1 Gathering Preparatory Information

The audit team members will require a substantial amount of information to acclimate themselves to the facility and its PSM program, and to directly support the audit activities. Most of this information is process safety information (PSI) within the PSM program itself, but there are other documents and records that will also be needed. It is often useful to request that the facility being audited, either as part of the audit plan (see Section 2.1) or separately, complete a questionnaire that elicits necessary information. Examples of PSM audit-planning questionnaires are shown in Appendix F.

2.1.1.1 Process Information

The audit team should obtain information about the facility, its operations, and the chemicals present on-site. This is very useful background information that will allow off-site auditors to understand the process safety risks, and will support other audit planning decisions, such as choosing representative units, if this is deemed necessary. The sampling of records/documents and people should be selected from the representative units, which are then considered typical of all covered units (see Section 2.3.3 for a more thorough discussion of representative units). Process information consists of brief descriptions of facility process operations, flows, chemicals, and control systems, if these are available. Also, a facility plot plan to illustrate the location of different operations and process safety and control system components is useful.

2.1.1.2 PSM Program Information

Obtaining information about the facility's PSM program will allow the audit team to begin to understand how the PSM program is designed and implemented at the facility and, more importantly, how the drivers for the PSM program were interpreted during its design. If this information is obtained in advance, it may be possible, depending on the criteria to be used for the audit, to actually begin some of the audit before arriving on-site. For example, if there are questions/criteria in the audit protocol that examine whether a procedure exists for a PSM program element and its characteristics (these are mostly contained in the related criteria/questions), it may be possible to answer these questions merely by reviewing the procedure and comparing its contents to the protocol questions/criteria without the need to interview anyone. Some parts of the audit protocol related to the design of the PSM program can be answered in this manner, but this is not true for those questions/criteria addressing implementation issues.

The audit team should request the overall process safety policy document for the facility, plus the first-level procedure that exists for each program element, if they exist. For example, the facility procedure that describes how HIRA/PHA studies are planned, organized, conducted, documented, and reviewed if it exists, should be requested. Sometimes companies or facilities combine these procedures into a single document or process safety manual. Electronic versions should be requested because they make for easier searching. It is not necessary to receive every procedure associated with, referenced by, or used in the PSM program. For example, it is not necessary to receive detailed maintenance procedures or every operating procedure. Instead, a representative sample of these types of procedures is typically reviewed.

The following is a list of typical information an audit team leader might gather in advance of the audit and distribute to the audit team for familiarization and acclimation to the facility, its materials/chemicals, and its operations:

- *Previous process safety program audit report*—copies of the full reports from previous audits.
- *Audit action plan*—status report on the resolution of previous audit recommendations.
- *Process safety program requirements*—copies of applicable federal, state, local, or international regulations, or voluntary consensus PSM program requirements, i.e., the primary drivers for the PSM program.
- *Corporate policies*—copies of applicable process safety corporate policies, standards, and guidelines that supplement or describe the implementation of the basic PSM program requirements.
- *Facility policy manuals and plans*—copies of the current first-level policy or procedure document for each PSM program element, plus the tables of contents from additional supplemental facility safety manuals, emergency plans, and other documents covering process safety policies, procedures, and reporting requirements.
- *Facility organization*—current facility organization chart annotated to illustrate line and staff responsibility for all process safety areas under review, and to identify key site contacts.
- *Incident listing*—a list of process safety incidents occurring over the last three years.
- *Incident reports*—investigation reports for recent incidents and near misses involving PSM program chemicals, processes, or equipment.
- *PHA reports and status of recommendations*—the most recent PHA(s) and recommendation status report (if these are in an electronic format that the auditors can open).
- *Asset integrity and reliability manual/procedures*—the high-level asset integrity procedure for the facility and the next level of procedures that define the program details, e.g., the inspection, test, and preventive maintenance procedure.

- *RMP submittal*—if RMP will also be part of the scope of work, the most recent RMP submittal.

Much of the information describing the facility's PSM program may be available to the audit team in advance via the facility's portal on the company intranet, or the facility may be able to provide electronic links to this information.

2.1.2 Audit Purpose, Scope, and Guidance

The purpose, scope, and guidance of each individual audit should be established. General guidance for defining these terms is provided in Sections 1.2, 1.3, and 1.4, respectively. This is a very important step in planning a PSM audit. The decisions made during this planning step drive nearly all other planning decisions as well as the conduct of the on-site activities themselves. The nature of the audit protocol to be used, what types of auditor expertise that will be needed, and the choice of representative units (if used) are derived from the purpose, scope, and guidance of the audit. Additional advice in establishing the scope and guidance of individual PSM audits is presented in this section.

2.1.2.1 Individual PSM Audit Purpose and Objectives

Section 1.2 describes the typical purposes and objectives of PSM audits. Often the purpose of a particular audit is obvious, or appears to be so. Regardless, it is very important that the precise purpose(s) and objective(s) of any given audit be defined and documented. In this way, all the expected requirements and the parties that expect them will be satisfied. Knowing exactly what the purpose(s) and objectives(s) are will also have a strong influence on the scope and guidance of each individual audit.

2.1.2.2 Individual PSM Audit Scope

When defining the scope of individual PSM audits, a number of factors should be considered, including the following:

- *Company policies.* Company policies or procedures may specify which sites, plants, processes, or units are to be included in PSM audits, and what elements are to be audited. See the sections below for a more detailed description of these issues.
- *Regulatory requirements* Any process safety regulations that apply to the facility will dictate what must be included in the audit. In general, all the processes and operations covered by the process safety regulations will have to be included in the audits. However, not all parts of all processes may be audited with the same level of detail for every element. Also, if only some of a facility's processes are covered by process safety regulations, the audit scope may (or may not) be confined only to those processes.
- *Resource limitations.* A practical consideration in defining the scope of a PSM audit program, and the scope of individual audits is the availability of resources. The scope should be adjusted, within the available resources, to develop a program that addresses the range of operations

and the risks. However, regulatory requirements cannot be sacrificed to satisfy resource constraints. The resources must be adjusted to accommodate legal or regulatory requirements.

- *Time available.* The time available for the audit should also be considered in designing the audit program scope. It is better to perform a thorough audit with a narrower scope than to perform a hurried, incomplete audit with a broader scope. The on-site portion of most PSM audits are budgeted to fit within one workweek or less, except for very large facilities, or when the PSM audit is being conducted as part of a broader EHS-related audit. In addition to the on-site conduct of the audit, planning the audit and generating the audit report take time. The audit team leader may also require additional time for project management activities as well as meetings and presentations of the results to management or others.
- *Nature of operations and risks.* While any facility that is covered under a voluntary or regulatory PSM program should be within the scope of a PSM audit program, the scope of an individual audit will vary somewhat. In determining exactly what processes/units will be included in the audit, the nature of the facility operations and the risks associated with them must be considered. Clearly, those units that contain the most hazardous toxic, flammable, or reactive materials, and those units or areas that have had process upsets, near misses, or incidents, will usually receive the most attention during an audit. However, the nature of the operations is also an important consideration in choosing what to audit. For example, large, complicated chemical processing units are typically of high interest, while a waste water treatment plant, even if it uses a cylinder of chlorine or hydrogen peroxide as a treatment chemical, might not be as critical because of the inventory and operating conditions. Conversely, a large warehouse with a very large inventory of toxic or flammable materials might be of more critical interest than the small processing unit nearby that blends and packages the materials stored in the warehouse, because there may be fewer safeguards in the warehouse and therefore, the severity and likelihood of a release may be higher for the warehouse.

The following discussion on representative units amplifies further the factors that should be considered when choosing processes and units for a particular audit. In medium-to-large facilities with PSM programs, there are generally multiple processes or units covered by that program. If there are 20–25 complex processing units included within the scope of the PSM program (as would be typical of an oil refinery) and there are 15–25 elements in the program, the amount of potential auditing is almost always beyond the available time and resources. Therefore, to reduce the audit to a manageable scope, the choices are the following:

- Audit some elements of the PSM program in all covered process and units, or
- Audit all elements of the PSM program in some of the process and units.

In many instances, the latter choice is selected (however, see discussion below on all elements versus specific elements). Consequently, the lead auditor and audit coordinator for the site should decide which units will be chosen as representative units. A representative unit is a unit or part of a unit covered by the PSM program that is being audited in lieu of and as a representative of all covered units. Representative units are loose boundaries that are selected to do the following:

- Sample records for verifying the procedures governing each element of the PSM program. For example, when the HIRA element is being audited, the HIRAs, risk/hazard assessments, or equivalent studies for the representative units are selected for review with respect to the criteria for that element. When the Asset Integrity element is being audited, the inspection, test, and preventive maintenance records for the representative units will be selected.
- Sample persons to interview, particularly the nonmanagement operations and maintenance workers. In general, most of the employee interviews will be conducted with personnel from the representative units.

Some elements of the PSM program are designed and implemented to be site-wide, e.g., Emergency Management, Workforce Involvement, and Incident Investigation. For these elements, representative units usually have little meaning, except that the operators and maintenance technicians interviewed work in the representative units. Often the MOC program is applied as a site-wide procedure even though some processes and units on-site are not included in the PSM program and have negligible risk of a large-scale process safety incident. The reason for this is to establish the philosophy and importance of MOC site-wide and to help obviate the sometimes-difficult interpretations regarding whether the MOC procedure is applicable in a given situation. Sometimes other PSM elements are implemented beyond the boundaries of the PSM program (and typical representative units during audits) for simplicity and because it makes sense, e.g., Emergency Management.

In selecting the representative units, the following factors are relevant:

- *Level of risk.* The processes and units with the highest risk, as described in the HIRAs, risk/hazard assessments, or equivalent analyses, should be considered for selection. For example, if an oil refinery is the subject of the audit and that refinery has an alkylation unit that uses hydrofluoric (HF) acid, it will likely represent the processes in the refinery with the highest risk. In the case of HF alkylation units the high risk is generally driven by the consequences of release. In a chlor-alkali manufacturing facility, the highest risk is usually found in the tank farm or storage area where the chlorine is stored prior to shipment, or in the loading rack area where large numbers of full chlorine rail cars are staged prior to switching. In the case of chlor-alkali loading operations, the risk may be driven by the possible consequences, as well as the higher likelihood of release (a degree of human operations). The choice of representative units should incorporate both the consequence and likelihood components the

risk. Another consideration in estimating the likelihood of release is the incident history of the unit, as described below. Other factors in evaluating units to be chosen as representative units are reactivity hazards and RMP worst case/alternative release scenario results. A caution: Always selecting the units with higher potential consequences as representative units may neglect those with lower consequences of release and result in them not being audited in detail for a lengthy period of time.

- *Age.* The oldest processes and units should be considered for selection. In general, there are factors associated with older process equipment and units that increase the risk. However, another consideration for some elements might cause a newer unit to be selected. It may be more relevant to examine MOC records for newer units that reflect the current MOC procedure and practices.
- *Incident history.* Processes or units with significant process safety-related incident history should be considered for selection, particularly those with a significant number of near misses.
- *Audit history.* There may be some processes or units in a large facility that have never been selected to be part of an audit before, or have not been selected for a lengthy time. These units should be given consideration as representative units to ensure that they receive adequate audit attention. In addition, units where a significant history of audit findings exists or where deficiencies have been discovered frequently in other PSM activities should be given consideration as representative units. For example, oil movement and storage (OMS) units of oil refineries sometimes have a large number of overdue inspection, testing, and preventive maintenance (ITPM) tasks, P&IDs that are not accurate and up-to-date, and operating procedures that are not up-to-date. For this reason, OMS areas/units are often selected in refinery PSM audits as representative units.
- *Availability.* Sometimes the PSM audit unavoidably has to be scheduled when one or more plant processes or units are undergoing a turnaround or other maintenance period. During these focused maintenance activities, people and often many records will not be available and little or no time can be devoted to activities such as audits because of the intense work pace and aggressive schedules associated with these activities. If the audit must be performed during one of these maintenance periods, it is recommended that the representative units not include one of the units undergoing maintenance, even if it strongly meets one or more of the other selection criteria.

Another question is how many representative units need to be chosen. Experience has shown that typically, two to four units should be enough to provide an adequate sampling of records and personnel that meet the selection criteria described above. This, of course, depends on the size of the facility and how many units there are; for a very large refinery with ~80 units, two to four units might not be adequate, and a larger number of units might be needed to sample enough of the

refinery to evaluate the PSM program adequately. Another option for this facility might be to increase the frequency of auditing to annual and leave each audit at two to four units, making sure each audit focused on a different two to four units.

It is also useful to look at the organization of the facility and determine how many “operating areas” exist. An operating area would be a collection of technically related processing units (i.e., they all perform similar operations, e.g., initial processing of crude oil in a refinery), and where there is common management across the processes within that operating area. Often, all the processes within an operating area share the same management system procedures (although each process will have its own SOPs) and usually share a common control room. These are sometimes referred to as business units. If there are four operating areas or business units, then a unit in each operating area should be examined. If there are 10 operating areas, then 10 units should be audited. This will help the auditor find issues associated with the differences in management and supervision in the various operating areas. The representative units do not have to follow the battery limit boundaries shown on plant drawings. The planners for the audit should have the flexibility to adjust the boundaries to obtain the best selection of records and personnel to support the purpose, scope, and guidance of the audit. In addition, it must be stressed that the auditors are not absolutely limited to the records and personnel in the representative units in a given audit. They may select records and procedures from other processes, units, or operations if they feel there is important information that should be evaluated by venturing beyond the representative unit boundaries. The representative units should never be considered as hard boundaries for the auditors during a PSM audit.

An alternative strategy to selecting representative units when dealing with large facilities with multiple units is to audit every covered unit, but only cover certain PSM elements in them. This ensures that each covered unit or process receives some audit activity during each PSM audit cycle. Table 2.1 depicts how such a strategy can be employed for a notional large refinery with 17 processing units in three different operating areas for an audit of OSHA’s PSM Standard. Note that some elements are marked as plant-wide and some marked as unit-specific. Plant-wide elements are those that have lesser relevance from an applications standpoint and consist of cross-unit activities. For example, emergency planning is generally not a unit-specific activity, although special emergency procedures may be applicable to only specific units. Generally, it is not necessary or desirable to sample those elements across units. Also, there are usually policies and procedures in the unit-specific elements that are applicable for the entire facility, e.g., certain mechanical integrity procedures for ITPM. Auditors will need to become familiar with the contents of these procedures for these elements before sampling the records and personnel in specific units.

For a discussion of the documentation of the representative unit selections and on sampling of records from them, see Sections 2.1.2.3 and 2.3.5 on audit plans and sampling. Chapters 4–25 also discuss specific issues that should be included in an audit of those elements. Inclusion of these issues in the audit may influence the selection of representative units, or how they are defined.

Regardless of the number of processes, units, or equipment included in the PSM program, each element of the program must be audited. Therefore, 15–25 different programmatic elements require auditing whether the facility PSM program includes 50 large complex processes or whether the facility consists of one small, simple blending process. In most PSM audits all elements are audited during a single contiguous period. Some facilities, however, have chosen to spread out the activities over an extended period of time so that each element is audited at least once during the specified interval period (see Section 1.4 for a discussion of audit frequency), but the time and resources are spread out and not concentrated in a short period. Some companies and facilities have found this method of scheduling audits easier to manage.

In summary, the definition of the audit scope presents several options. As an alternative to the representative unit concept described herein, a facility might decide to audit all PSM program elements in only one unit, including those elements that are site-wide activities. Although this is not the optimum scope choice, it is sometimes unavoidable due to time, resources, or other constraints. In such cases, it is highly advisable that the audit team spot-check the application of the PSM management system in other units to ensure that it is applied, even if time or resource restrictions do not allow a full application of the sampling and testing scheme of the audit to other units.

Whichever method of defining the scope is chosen, the most important factor is that the scope be as representative as possible of PSM procedures and practices in place at the facility and that if a statistically valid sampling of the PSM program cannot be achieved, then the scope of the audit focus on those processes and operations that dominate the risk presented by the facility.

2.1.2.3 Individual PSM Audit Guidance

The guidance (or ground rules) to be employed at individual PSM audits should be established as follows:

- The duration of the on-site portion of the audit—the plant staff that will be audited must be aware of the time period(s) when their assistance will be required so that the audit activities can be completed.
- The concerns of interested parties, e.g., a union that represents the nonmanagement work force at a facility, and how this will affect interviews.
- The communication (to the audit team) of any significant changes to the facility or its parent organization or its operations since the last PSM audit, and how these changes might affect the conduct of the audit.

- The review and vetting process to generate approved findings and recommendations (when recommendations are formulated by the audit team).
- Confirmation of the audit team's scope of work while on-site, i.e., will recommendations be formulated during the on-site portion of the audit or as a separate activity, will due dates be generated as part of the on-site audit activities, and will the draft and/or final audit reports be generated while on-site or as a separate activity.
- Confirmation of the PSM audit questions/criteria to be included in the audit. See Section 2.1.3 for guidance and issues to consider when selecting which questions/criteria to use in a given audit.
- Description of the sampling and testing methods to be used during the audit to select documents and records for review. See Section 2.3.3 for more information on sampling and testing strategies.

2.1.3 Audit Protocol

The protocol for the specific audit being planned should be established. Using the guidance contained in Section 1.7, finalize the criteria to be used for the audit in question. At this point, the protocol can be developed in the following two basic styles:

- The criteria can be converted into questions, and the protocol will contain the audit questions, the answers to those questions, the findings (if any), and optionally the recommendations to correct the deficiencies identified in the findings; or
- The criteria can be used directly, and the protocol will contain the criteria, the findings (if any), and optionally the recommendations to correct the deficiencies identified in the findings.

All compliance criteria or questions should be used, if at all possible, because this represents the minimum level of evaluation that should be performed. To cover all compliance audit criteria will require several experienced auditors and adequate time. If it is not possible to address all compliance issues, the audit report and the certification should carefully note which compliance questions in the protocol were not included. By documenting what was covered and not covered in each audit, the planning for the next audit can ensure that criteria not covered in the previous audit are addressed.

The purpose, scope, and guidance of each audit will determine the related criteria/questions that will be used. Given the large amount of work to be performed to include all criteria described in Chapters 4–25, it will likely be necessary to select which criteria/questions will not be included in a given audit, given the typical time and resource constraints. To cover all the related criteria/questions would require additional auditors or extra days in the audit schedule to accomplish for even a modestly sized facility (see Section 2.1.4). Often, facilities or companies will select only the related criteria/questions associated with certain PSM elements to be audited, or certain related criteria/questions they believe represent more important issues. The following questions will need to be answered when determining to what extent related criteria/questions will be used:

- Will all related criteria/questions be used?
- Will the related criteria/questions for only certain PSM program elements be used?
- Will only certain types of related criteria/questions be used, for example, only those in each element that evaluate the documentation requirements, only those that evaluate the contents of the management system procedure for the elements, or only those that the company or facility believe represent level-of-acceptable-practice issues?
- Is a review of process safety culture within the scope and guidance of the audit? If so, a list of criteria/questions related to process safety culture will need to be formulated, and there should be a list of representatives of senior management and possibly persons from human resources (HR) who will need to be interviewed. At a minimum the facility manager, and quite possibly the person(s) he or she reports to should be interviewed to adequately examine the cultural aspects of the PSM program at the company or facility. The inclusion of the related criteria/questions does not infer that an organization that uses them in a PSM audit has officially or unofficially adopted them for use in the design or implementation of their PSM program.

Beyond selecting the audit criteria/questions themselves, the manner in which they will be used is also part of establishing the protocol for each audit. For example, the criteria may be converted into questions:

- What will be the allowable answers to the audit questions?
- What will be the rules and assumptions for assigning these answers?

The following guidance is provided for allowable answers to PSM audit questions and the rules and assumptions for using them:

“Yes” or “Complete”	This answer should only be used when the requirement of the audit question has been fully met by the facility in both design and implementation.
“No” or “None”	This answer should only be used when the requirement of the audit question has not been met in any way, e.g., zero progress.
“Partial” or “Incomplete”	This answer should only be used when the requirement of the audit question has been met partially. For example, if the site has prepared a written procedure for process hazard analyses, but has not implemented the procedure yet, a “Partial” answer would be recorded for this question. If a question asks if there is an ITPM plan for a particular type of equipment, and there is no such plan, but the facility is performing documented periodic ITPM tasks on that

equipment, the answer to that question could be recorded as “Partial.” That is because in order to perform ITPM tasks some planning has to occur. If it has not been institutionalized in writing, then it is informal.

“Not Applicable” This answer should only be used when the audit question is not applicable to the facility being audited, or the purpose, scope, or guidance do not require that the question be used.

“Not Used/Not Observed” This answer should only be used when the audit question was not used during the audit due to time or resource constraints.

- If the audit is to be graded, the rules for assigning grades to each criteria/question in the protocol and the weighting for each criteria/question and/or each element should be established. See Section 1.8.5 for a discussion of grading PSM audits.
- The audit protocol can be categorized to allow easy sorting and filtering of the questions and the findings. Possible categorizations include:
 - PSM element
 - Type of criteria/question, e.g., compliance vs. related
 - Source of criteria/question, e.g., written clarification, citation, good/common industry practice
- The sampling and testing scheme to be used in applying the protocol during the audit should be determined. Audit sampling and testing is described more fully in Section 2.3.3.
- A list of PSM program activities that the audit team will wish to observe should be included in the protocol, usually in the sampling and testing plan, to alert the facility. This can be compared to a schedule of which of these events will be taking place during the on-site audit period. The facility is usually not asked to schedule or reschedule events just for the purposes of the audit; rather the audit team will take advantage of any events that are occurring in accordance with normal facility schedules and operations. Examples of these events and activities include the following:
 - Intermittent or temporary operations that are not routine
 - HIRA/PHA sessions
 - Emergency response drill or exercises
 - Testing of employee alarms systems, which are often tested weekly, and is easy to observe by spreading the audit team out around the site, especially indoors and in normally noisy areas
 - Actual hot work
 - Other safe work practice usage, such as line/equipment breaking, confined space entry, etc.

- Pre-start-up safety review meetings
- MOC review meetings
- Shift change for control room and field operators (sometimes referred to as “inside” and “outside” operators respectively)
- Safety meetings or similar events where PSM issues are on the agenda
- Contractor safety training (the audit team itself might be subjected to this training to begin the audit)
- Off-shift inspection of facilities (particularly to observe emergency response provisions). Most facilities appear much different after dark, and lighting of escape/evacuation routes and visibility of wind direction indications is pertinent.

2.1.4 Audit Team Selection

Using the guidance in Section 1.5.2, and the purpose, scope, and guidance of the audit, the lead auditor and the remaining audit team personnel will have to be selected. The following factors should be considered when selecting the audit team for a specific audit:

- Consistent with the audit purpose, scope, and guidance, particularly on how the protocol was designed for a given audit (see Section 2.1.3), determine the number of auditors that will be needed given the time allotted. Small to medium facilities will require two or three auditors to accomplish an audit where only compliance questions/criteria are addressed. If a significant number of related criteria are also to be addressed, then one or two auditors should be added. For a large facility with a large number of units, an audit team of four or five people would be required, with two or three additional personnel if a significant number of related criteria are also to be addressed. Otherwise, additional time will need to be scheduled. These are estimates; experience and the nature of the protocol developed for each audit will determine how many auditors are required.
- Consistent with the guidance in Section 1.6, eliminate to the absolute extent possible any actual or perceived conflicts of interest or biases for the audit team with respect to the facility being audited.
- If multiple facilities are being audited in the same cycle, consideration should be given to using the same team or part of the same team (particularly the audit team leader) to perform all the required audits. This helps ensure that the audit protocol is applied consistently across the facilities and allow comparisons of results to be valid. If the same team or part of the same team is used, and grading or comparisons between facilities is important, the auditors should be assigned to audit the same elements to help provide consistent audits of the different facilities. Use of the same PSM audit protocol does not ensure that the audits will be done the same because there is always a fair amount of interpretation required by the auditors due to the performance-based nature of the governing requirements.

- If the audit will include a special emphasis on one element of the PSM program, for example, asset integrity or emergency management, additional auditors in those areas will be required.
- Auditors should be dedicated to the task at hand during the entire audit, barring emergencies, and should not have other duties to perform during the audit.
- The company/site PSM audit management system procedure may contain provisions that will dictate how audit teams are composed as well as the company/site employee participation plan.

In addition to the number of auditors, audit teams should be properly resourced in the following other ways:

- If it is possible, the audit team leader should consider the need to have backup auditors designated in case scheduling conflicts or unforeseen events occur. These events can sometimes occur right before an audit is to begin and planning for how the work will be redistributed and/or having backup auditors assigned can make these events as nondisruptive as possible. The backup team members can usually be released from this commitment when the audit team composition is confirmed and certainly once the audit starts. If designating in advance backup auditors for the entire team is not possible, the audit team leader should at least try to arrange backups for auditors who bring specialized subject matter expertise to the audit.
- If possible, there should be one other audit team member who is considered qualified by training and experience to function as the audit team leader in case the team leader cannot begin or continue in his/her assigned role.

Although the audit team members should be chosen based on their impartiality and their skills and expertise, the availability of desired internal auditors always plays a role in the composition of PSM audit teams. This may result in the loss of some impartiality or less desirable skill level on the audit team. The availability of internal auditors usually plays a more prominent role in smaller companies because there are fewer people to choose from. The effects of availability can be minimized by having a cadre of trained and experienced auditors to choose from for any given audit and carefully planning the schedule well in advance to allow the use of desired auditors.

2.1.5 Audit Schedule

The schedule of activities that will satisfy the audit purpose, scope, and guidance should be established. The two following scheduling situations need to be resolved during the planning of a PSM audit:

- 1) The overall date(s) of the audit, as determined by policy or regulation, and by facility operations. This usually involves satisfying a deadline date derived from the regulations or voluntary consensus PSM program that drives the audit. In addition, the facility should be in a normal mode of

operation, that is; it should not be in a turnaround or maintenance outage. The availability of facility personnel of all disciplines during such maintenance periods is severely limited. With enough advance planning, any deadline dates can generally be satisfied and other planning considerations successfully managed (e.g., availability of audit staff and facility personnel).

- 2) The scheduling within a given audit for the on-site audit activities within the overall time allotted. This includes the following activities:
 - Identifying key facility contacts (e.g., PSM element stewards) and matching them to the auditor(s) for their respective element(s) as far in advance of the audit as possible.
 - Creating the audit schedule. There are several options for doing this:
 - Some companies develop very detailed schedules during the planning of an audit where each activity, i.e., the interviews, records/document reviews, and observations, are assigned a specific actual time period during the audit, along with the site personnel who will participate in each of these activities.
 - Alternatively, other companies and sites pre-plan the schedule for the first one or two days of the audit and establish the schedule for the remaining days after the audit starts and the other commitments of the facility personnel who must support these activities are more firmly known.
 - Still other companies and facilities simply plan how much time will be needed for each activity and choose the day and time for them when the audit team arrives on-site.

Each method has its advantages and disadvantages. Detailed pre-planning is warranted when the number of activities defined by the purpose, scope, and guidance are too numerous to wait until the arrival of the audit team. This is particularly true when the PSM program is being audited at the same time as other EHS programs and activities and the audit team is large. However, a very detailed schedule may require significant revision because of last-minute changes in personnel availability or other events unrelated to the audit. If the audit purpose, scope, and guidance and the size of the facility dictate that only a limited number of people need to be interviewed, it may be possible to simply establish the approximate time needed for each interview and leave the actual scheduling until the audit team arrives.

- The schedule for the first day will include some administrative tasks, such as security badges, safety orientation/training for the audit team, a facility tour, opening meeting, etc. See Section 2.2.1 for a description of the opening meeting.
- A daily meeting among the audit team should be scheduled. This should precede the daily meeting with the facility staff. The purpose of this meeting is to discuss possible findings in advance of presenting

them to the facility, both to present them technically to the other auditors for their response and to help streamline the facility meeting. This meeting is particularly important as the audit team gets larger.

- A daily meeting with facility staff should be scheduled. *This is a very important on-site audit activity.* This meeting can take place at any convenient time during the day, although it is usually held later in the afternoon. The day-to-day operational schedule and tempo of the facility and the scheduling of regular operational, maintenance, and management meetings primarily determine whether the audit daily meeting is held in the afternoon or morning. This is because the daily audit meeting and these other facility activities often involve many of the same people, and interferences should be avoided to maximize participation. Most, but not all, facility meetings are held in the morning to begin the workday. Holding the daily audit meeting in the afternoon allows the preliminary findings to be presented while they are very fresh in the auditors' minds, and allows changing the audit schedule while there is still some time before the next day to inform all concerned. Lunch and other informal occasions also afford an opportunity to share observations and issues with facility staff. See Section 2.2.2 for a description of the daily meeting with facility
- The closing meeting should be scheduled as soon as possible to ensure that all personnel who need to be debriefed on the results can be present. Ideally, the closing meeting should be scheduled as close as possible to the end of the on-site audit activities to maximize the time available for the audit team to interview people and review records. Auditing that takes place after the closing meeting might change some of the preliminary findings described at the closing meeting, which is usually attended by facility senior management. Therefore, this should be avoided if possible. If the closing meeting cannot be the final activity while on-site, the closing meeting should be considered interim and, if possible, another briefing scheduled to present the final findings and recommendations (when recommendations are formulated by the audit team). See Section 2.2.3 for a description of the closing meeting.
- If the audit scope and guidance or the company's PSM audit policy requires that a draft or final audit report be left with the facility before the audit team departs, then time must be provided to support these activities in the overall schedule, and the closing meeting scheduled after they are completed. Producing a draft audit report will require enough time for the auditors to review and refine their input, including the wording of the findings and recommendations. Producing a final report before departure will require additional time for significant discussion and negotiation with facility staff for each and every finding and recommendation (if the audit team is responsible for producing recommendations).

See Sections 2.2.1, 2.2.2, and 2.2.3 for additional guidance for the opening, daily, and closing meetings.

2.1.6 Advance Facility Visit

An advance visit to the facility being audited is usually not required. However, if the facility is particularly large, and/or the audit scope and guidance are broad and complicated, an advance visit may be warranted. PSM audits in merger and acquisition situations may also require an advance visit. If an advance visit is deemed necessary, the following issues should be resolved during the visit:

- Brief site personnel, particularly the facility manager, the PSM program coordinator/manager, and other relevant staff, about the audit program goals, methods, and procedures and how the audit will be conducted.
- Confirm that the facility knows who will be interviewed so that the schedules for these persons are arranged to support the audit.
- Gather documents that will be distributed to the audit team in advance so they might acclimate themselves to the PSM program elements they will be auditing. See Section 2.3.1 for a list of the types of information to be gathered.
- Collect population data to help in the preparation of a sampling and testing plan.
- Confirm logistical arrangements.

2.1.7 Audit Logistics

The audit team typically requires the following logistical support:

- There should be a dedicated space to use as a workroom. This should be a conference room, training room, or empty office large enough to comfortably accommodate the entire audit team plus facility personnel for daily meetings. Alternatively, a workspace and a separate conference room or rooms for meetings and/or interviews should be provided.
- If the facility will present documents and records to the audit team via an intranet website or other electronic data management system, the audit team will need temporary access to the network and intranet site, or access to the computers of the facility's employees. However, constantly relying on a facility employee to log on to the system each time access is needed might slow down the audit. Given current cyber-security rules in effect at many companies, this is a logistical issue that needs to be resolved well in advance.
- The process for making copies of documents and records should be known in advance by the audit team.
- The process for requesting additional interviews or field observations should be established.

- A facility employee should be appointed to coordinate the logistical needs of the audit team, particularly if the audit team is large and/or the audit will be lengthy.
- The audit team should be provided with a list of facility contacts and their phone numbers.
- Information regarding site access and security rules (all auditors should have a photo ID). If unescorted access cannot be granted to the site for the audit team, escorts will be necessary. If the facility is covered by Department of Homeland Security or U.S. Coast Guard security regulations, unescorted access should be granted in accordance with those regulations.
- The schedule of facility working times for personnel and shift-change times should be known.
- There should be an understanding of routine facility activities such as daily production meetings.
- Transportation to/from the facility as well as inside the facility should be determined. For a particularly large facility, this will require vehicles and drivers.
- Information on personal protective equipment (PPE) required on-site should be provided to the auditors. The audit team leader should determine the specific safety rules that the audit team will need to comply with, for example, safety equipment, facial hair, requirements for safety shoes and fire retardant clothing (if required), and then inform all audit team members of these requirements. If some facilities require more detailed safety training to enter certain units or areas (e.g., HF alkylation units in refineries), or if special PPE must be worn, e.g., hydrogen sulfide monitors or escape respirators for toxic gas releases, then arrangements must be made in advance to provide this equipment and any special training that goes with it to the audit team.
- Auditors that are employees of the company owning/operating the audited facility will likely desire network connections for their laptop computers. Therefore, the audit team workroom selected should have this capability.
- Food and beverages are at the discretion of the audited facility; however, it is advisable to bring lunch into the facility rather than go out. This saves significant time.

2.1.8 Allocation of Resources

Section 2.1.4 covers selecting audit team members. If the team members were not selected with a particular PSM element assignment in mind, the elements they will audit should be assigned in advance. The scheduled time allocated for the audit and the number of auditors, their expertise, as well as the scope and guidance of the audit will determine these assignments. Auditors should be assigned based on their process safety experience as well as their auditing experience. Assigning someone to audit asset integrity and reliability who has no working experience in this aspect of process safety will likely result in a flawed audit of this element.

There are several schools of thought on making these assignments, two of which are shown in Tables 2.2 and 2.3.

Table 2.2 Possible Assignments of Auditors to PSM Elements—
Programmatic Groupings

Grouping	PSM Elements to Be Assigned to an Auditor
Related PSM Elements	Several elements are more closely interrelated than others, and should be assigned to the same auditor if possible. For example, Asset Integrity and Reliability, Compliance with Standards, and Process Knowledge Management are all very closely related. However, Asset Integrity and Reliability is such a broad element covering so many activities that it may be advisable to assign this element to one auditor with no other responsibilities if possible. This is particularly important if this element is to receive special focus during the audit.
Related to Safety and Health Programs	Several of the elements are closely related to other safety and health programs and procedures, such as Emergency Management and Safe Work Practices, and can be grouped together.
Related to Operators	Operating Procedures and Training and Performance Assurance are closely related and can be grouped together.
Related to MOC	MOC and portions of Operational Readiness are frequently combined in one facility management system procedure because the MOC procedure often encompasses the operational readiness requirements for change.

Table 2.3 Possible Assignments of Auditors to PSM Elements—
RBPS Element Groupings

RBPS Pillar	PSM/RBPS Elements to Be Assigned to an Auditor
Commit to Process Safety	Process Safety Culture, Compliance with Standards, Process Safety Competency, Workforce Involvement, Stakeholder Outreach
Understand Hazards and Risks	Process Knowledge Management, Hazard Identification and Risk Analysis
Manage Risks	Operating Procedures, Safe Work Practices, Asset Integrity and Reliability, Contractor Management, Training and Performance Assurance, MOC, Operational Readiness, Conduct of Operations, and Emergency Management
Learn from Experience	Incident Investigation, Measurement and Metrics, Auditing, Management Review and Continuous Improvement

Using the RBPS pillar groupings, however, will likely require that more than one auditor be assigned to the Manage Risk elements because of the number of elements in that pillar, and as stated previously, Asset Integrity and Reliability can easily consume the attention and efforts of one auditor.

2.1.9 Audit Plan

Once the planning issues described in Sections 2.1.2–2.1.8 have been addressed and decisions made regarding them, an audit plan that documents these decisions should be generated. In addition, the audit plan should define the following for each PSM program element:

- The documents and records that will be reviewed.
- The sampling and testing plan.
- Which persons (by title/position) will be interviewed, and the approximate amount of time that those interviews will take.

Appendix D provides templates of audit plans that can be used for this purpose.

Once the audit plan has been drafted, it should be transmitted to the facility. This allows the facility to properly plan for the audit. The following are planning actions for the facility to arrange:

- The facility can begin to compile a preliminary schedule for the on-site portion of the audit if the site is responsible for doing this. Facility personnel who will be interviewed during the audit should clear their calendars of other activities during their designated interview times if possible.
- The date and time of the opening and closing meetings can be tentatively scheduled. Advance scheduling for these two events is advisable because facility management's attendance is desired and their time is sometimes difficult to schedule. The starting and tentative ending time of the daily meeting should also be scheduled.
- The process safety manager/coordinator will need to devote a substantial amount of his/her time during on-site auditing activities.
- The information identified in the audit plan that will be reviewed by the audit team, i.e., documents (procedures, policies, plans) and records (evidence that the policies and procedures are being followed), should be located. See Section 2.1.1 for a description of this information. Except for those documents requested by the audit team leader in advance, it is not necessary that copies be made of all of this material. For audit planning purposes, it is sufficient that its location and/or custodian are known. The auditors will request copies of selected documents and records as they review them and conduct interviews to support findings and conclusions.
- The facility should designate a contact person to coordinate the collection of background material and the scheduling of interviews. If the audit is intended to satisfy OSHA's PSM regulation, this role may already have been designated as part of the "knowledgeable" person's duties.

2.2 ON-SITE AUDIT ACTIVITIES

On-site activities of PSM audits consist of gathering, recording, and evaluating audit data and information by the audit team, with the participation and cooperation of on-site personnel. In most cases this process begins on the first day the audit team arrives, and even during a pre-visit by some of the auditors if such a visit is made. Often times, PSM-related policies and procedures are forwarded to the audit team for reading ahead of time. This is mostly for acclimation purposes and to save some time during the on-site portion of the audit. However, as stated in Section 2.1.1, it is possible for some auditing to occur during this on-site preparation period. This is particularly effective when the on-site work period of the audit team must be limited for some reason, or the scope or objectives of the audit are very broad and the available on-site time may not be sufficient to answer adequately all the protocol questions. In addition, audits in international locations may absorb more time than those in a domestic location for U.S.-based audit teams. Appendix H provides additional guidance for conducting PSM audits in international locations, particularly for conducting interviews.

2.2.1 The First Day

On the first day of an audit a number of administrative and orientation activities takes place. Depending on the size of the facility, these can consume a half-day or more and the auditors may not do much direct auditing on the first day. The optimum order of these activities is shown below; however, the availability of vehicles and tour guides, and the timing of the facility morning production, maintenance, or management meetings (if they occur) can all affect the order of these activities.

The first activity that normally occurs when the audit team arrives on-site is safety and security orientation. This can vary depending on how the facility or its parent company categorizes auditors and how the audit team is composed, i.e., all internal company employees, a combination of internal and external personnel, or all external auditors. Security badges are issued and escorting requirements consistent with the facility's security program are explained. Some facilities require full contractor training for audit teams, and some facilities only require that auditors go through a visitor orientation. Because the contractor management element contains questions/criteria related to contractor training and orientation before they begin work, the auditor assigned to that element should pay particular attention to this activity and can actually begin collecting audit information during this time.

Opening meeting. The first audit related activity is usually the opening meeting. The main purpose of the opening meeting is to brief facility personnel on the purpose, scope, and key ground rules for the audit. Another key purpose is to introduce the audit team members to a number of the people they will be working with during the audit.

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The attendees who should be invited to the opening meeting include the following:

- The entire audit team.
- Facility management, including the plant/site manager (i.e., the senior employee of the company on-site who is responsible for the facility being audited).
- The managers who directly report to the facility manager. These usually can be limited to the disciplines whose departments or groups will be directly affected by the audit. For example, the financial manager and business/marketing manager can usually forego attending the opening meeting.
- The EHS staff, in particular the process safety manager/coordinator.
- For OSHA PSM audits, the “knowledgeable” person, unless this person is one of the auditors.
- Facility point of contact for interviews, documents, records, etc. (if not one of the other people described).
- Union representative (steward, president of the local), if the nonmanagement work force is represented and it is a practice of the facility/company to have union leadership at the opening meeting.

Although the opening meeting is an opportunity for the free flow of information, the audit team should control the meeting, in particular the audit team leader should lead the meeting. While welcoming remarks, introductions, and a brief overview of the site by facility management is appropriate, the agenda of the audit team should be the primary driver for the opening meeting. The following items should be covered during the opening meeting:

- Explanation of the purpose, scope, guidance, approach, and the overall audit process.
- Explanation of audit approach (i.e., records/document review, interviews, observations, etc.).
- Explanation of the difference between compliance and related audit questions/criteria and how each will be used in the audit.
- Discussion of the interview schedule and how nonmanagement employees will be interviewed.
- Scheduling of daily debriefings and the closing meeting.
- Discussion of logistical needs, including computer access, unless these have already been resolved.
- Discussion of what work, operations, and other events will occur on-site during the audit, such as maintenance or construction activities, hot work (if any), site work schedules, shift changes, PSM activities such as PHAs, emergency drills, etc.
- Generation and review of draft findings and recommendations (when recommendations are formulated by the audit team).

- Explanation of security and escorting requirements.
- Discussion of any expectations about the audit that the facility feels the audit team needs to know.
- Explanation of how observations or local attention items outside the scope of the audit will be reported to the facility. See also Section 2.4.
- Any special sensitivities about the audit that the facility feels the audit team needs to be made aware.

Although there are a number of items to cover, the opening meeting should be succinct and last no more than 30–45 minutes. If at all possible, any issue requiring extended discussion should be conducted outside the meeting between the parties that need to resolve the issue. An opening meeting that bogs down in protracted discussions will put the audit immediately behind schedule and can leave the facility with the impression that the audit will be disorganized.

Facility overview. The facility staff should provide an overview of site operations and the PSM program. Optimally, this should occur before the facility tour. Along with any management system procedures provided in advance, this allows the audit team to develop a working understanding of the facility's PSM program and the management systems and policies that control it. Auditors should not begin interviewing persons and reviewing records without a thorough understanding of these management systems. This is also an opportunity for the audit team to be briefed on incidents in PSM processes since the last audit, and to understand the status of the previous PSM audit recommendations. This activity can be combined with or immediately precede or follow the opening meeting.

Facility tour. After the opening meeting, the audit team typically is given a facility tour. The purpose of the tour is to familiarize the audit team with the general size and layout of the site, allow the audit team to observe the general condition of facility equipment, and observe where project construction and significant maintenance activities are occurring (if any). The tour is sometimes taken in a vehicle, particularly in large facilities, to allow it to occur expeditiously, simplify PPE requirements (often not required if everyone remains in the vehicle), and simplify safety and security training that may be required. For example, in oil refineries with hydrofluoric acid alkylation units (a likely choice as a representative unit), special training is usually required to cross the unit battery limits. The following should be accomplished on the tour:

- The representative units, if designated, should be visited.
- A visit to the control room, or a typical control room if the facility has more than one control room, should be included in the audit.
- The auditor who has been assigned to the contractor management element should have an opportunity to observe if the conditions described in the orientation are being followed, unless the audit team members are considered as visitors and only receive the visitor orientation.

Although the facility tour is an opportunity for the audit team to begin to collect information that may generate or support a finding, it is usually not an opportunity to conduct detailed interviews of the person(s) conducting the tour.

2.2.2 Daily Meetings

It is strongly recommended that the entire audit team meet among themselves and also with facility representatives each day during the on-site portion of the audit as described in Section 2.2. The participants in this meeting from the facility usually include the process safety manager/coordinator and persons with the functional responsibility for the PSM program elements that will be discussed at the meeting (and who were interviewed that day). There are multiple purposes for this meeting, including the following:

- *Discuss preliminary findings.* This is an opportunity to discuss the preliminary findings discovered that day and to allow the facility to redirect the auditors to other persons to interview or records to review; this is part of the vetting process for the findings (see Section 2.3.5.4). All potential findings are reviewed in detail along with their supporting evidence. The auditors should be prepared to describe why they believe the issue represents a possible finding (and why a meeting of just the audit team before the daily meeting is advisable). This is primarily a communication forum. If any lengthy discussion or debate is necessary about an audit issue, it should be held between the auditor who discovered it and appropriate facility personnel outside the daily meeting. Any PSM program issue discussed at these daily meetings should not be considered closed or final in any way.
- *Confirm the next day's agenda.* Confirm the audit agenda for the following day (records to be reviewed, people to interviewed, etc.).
- *No surprises.* The daily meetings help ensure that there are no surprise findings at the closing meeting.

It is not necessary that a large group of people attend this meeting, but those facility personnel with knowledge about the PSM program elements being discussed that day should attend, as well as the process safety coordinator/manager. Often, senior facility management attends one or more of these daily meetings to gain a feel for how the audit is progressing.

2.2.3 Closing Meeting

At the end of the on-site portion of the audit, a meeting is held with the site to present the audit team's preliminary findings. Like the opening meeting's agenda, the agenda of the closing meeting should be controlled by the audit team and should cover the following issues:

- Brief restatement of the audit purpose, scope, and objectives.
- Overall summary of the audit, stressing the top one or two most important findings.

- Review of the significant or summarized findings for each PSM element. It is usually not possible to cover every finding in a reasonable period of time. Therefore, covering the most important findings, while summarizing the remainder of them, is recommended. However, if the facility or company desires a detailed recitation of each finding at the closing meeting, if this is specified in their audit management system procedure, or if it is their habit and culture, then this can be done, but the closing meeting may be lengthy. If the audit was graded, the element and overall grades should be described, including a discussion of why the grades were assigned.
- Distinguish between those findings that are compliance items and those that are from the related criteria/questions.
- To the extent possible and within the time allowed, stress the most positive results of the PSM program that were identified.
- Discussion of the process for generating, reviewing, and issuing the audit report.
- Explanation of the follow-up and closure of audit recommendations.

The audit team should set aside time to review the findings and decide which ones warrant discussion at the closing meeting. If time does not allow an audit team meeting to plan the closing meeting and presentation, then the audit team leader should meet with each auditor individually to make this determination. If the daily meetings have been held as scheduled and all the findings have been vetted thoroughly, this should not be a difficult task. In any case, neither the audit team nor the facility should be surprised by what is being presented at the closing meeting. The facility participants in the closing meeting should be the same ones who attended the opening meeting plus any others the facility believes should hear the audit results. The facility/plant manager should be in attendance at the closing meeting if at all possible. If this is not possible, the audit team leader should find a way to personally brief the facility/plant manager at another time or location, even if via telephone. The facility PSM staff, even when well intentioned, will communicate the results with their own interpretation and emphasis. Therefore, facility management should hear the audit results directly from the audit team. If the individual findings are being presented, the individual team members should brief their own findings instead of all of them being briefed by the team leader because they are best suited to describe what they saw and heard. However, if the closing meeting is more a description of the overall results, the grading (if the audit was graded), relative comparisons with other audits, etc., then the team leader will likely give the brief. This would be appropriate for large audit teams or where the scope of the audit was very broad.

The audit team should be courteous and thank the site for its cooperation and support (assuming this is true); however, do not dwell so much on thanking the facility that the final message regarding the findings and their importance is diluted. Also, while it is advisable to mention what portions of the PSM program are working well, the closing meeting must, as a necessity, focus on the findings. This is because the site must clearly understand these shortcomings and their basis.

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This may take some time to explain and will require that the auditors be prepared to succinctly present not only the findings they have chosen to discuss but also the background information that explains their context and significance.

It may be necessary to respond to challenges by the facility staff at the closing meeting. The resolution of disagreements normally takes place at the daily meetings and in separate meetings or interviews between the audit team and affected facility personnel. Even if agreement is reached in concept, the audit team may still face challenges to the findings at the closing meeting. See Section 2.3.5.7 for more information on dealing with challenges and pushback from the facility being audited.

The audit team may have to address repeat findings during the closing meeting. Because of the importance of repeat findings, both in terms of some aspect of the PSM program not working and the possible regulatory exposure, the facility needs to know about these findings and their importance. The audit team leader should address this issue carefully with facility management.

Nearly all facility/plant managers will want to know how the results of their audit compare with other facilities within the company and with industry in general. If the audit has been graded, then the answer to this question will be partially described in a specific grade. Audit team leaders should stress the cautions associated with these audit grades, especially quantitative grades, as described in Section 1.8.5. The team leader should be prepared to address this comparison issue qualitatively but should clearly describe the cautions involved with making any such comparisons. In general, categorizing high-level areas, such as PSM recommendation resolution status, ITPM task overdue status, or the PSM elements themselves, as above average, average, or below average can be made as long as the audit team leader has enough recent PSM audit experience to make them confidently. Any more detailed comparisons should be avoided.

The closing meeting is usually presented verbally, sometimes with the aid of presentation slides. Using slide material is acceptable as long as their creation does not become a major effort in itself and does not reduce the amount of time that the auditors have to complete actual audit activities.

Some companies have policies or practices to present draft reports with the facility at or before the closing meeting, and some companies do not leave any documentation with the facility. There are advantages and disadvantages to both practices. If a draft or final report is to be submitted to the facility before the audit team leaves the site, additional time will need to be added to the on-site portion of the audit. If the report is required to be in final form, and the audit team is also making recommendations, that additional time will have to include discussion time with the facility to reach consensus on the findings and recommendations. If this activity is part of the scope of the audit, the additional time needed to accomplish it can be measurable. However, if any documentation is left with the facility, all parties should clearly understand the assumptions and ground rules associated with the status of that documentation; how it may or may not change; how it will be reviewed, finalized, and approved; and the time frames for those steps.

If it is necessary to delay the closing meeting beyond the last day of the on-site portion of the audit, this can usually be accommodated, but a lengthy delay should be avoided while all the information, its context, and supporting documents are immediately at hand. Also, the logistics of reconvening the audit team may be difficult and expensive and re-coordinating the facility attendance may also be difficult. Therefore, a delayed closing meeting should be avoided if possible. The planning process for the audit should allow for sufficient time for the auditors to complete their work, including the review and vetting of the findings and the production of any required presentations and/or reports.

If the facility attendees at each daily meeting during the audit are the same people that would be invited to the closing meeting, including the facility/plant manager and his or her leadership team, and by the end of the last daily meeting all the audit team's sampling and testing are complete and the facility personnel have heard all the preliminary findings, it may be possible to do without a formal closing meeting. Although this rare given the daily availability of senior facility personnel, it is possible and has occurred. Also, the expectations and requirements regarding submitting audit reports to the facility, making comparisons, and other information that the facility or company expects to be discussed or transferred at the closing meeting may preclude this from occurring. However, the more complete the discussions and attendance that occur at the daily meetings will result in a shorter and more concise closing meeting.

The actual on-site activities to collect the information to perform the audit, i.e., the interviews of persons, review of documents and records, and the observation of events and conditions are described in Section 2.3.

2.2.4 Audit Assessment

Another important activity is to assess the audit, which is helpful in modifying the audit program, training and selection of auditors, and other related criteria. If time permits, a communal discussion among the audit team should be held towards the end of the on-site portion of the audit to discuss the following issues: the adequacy and accuracy of the planning process, scheduling issues, the availability of documentation in advance of the audit (and how this helped save time or its unavailability cost time), adequacy of the skills of the audit team, logistical problems that affected the audit, adequacy of communications among the team and between the team and the facility, difficulty (if any) in generating findings or recommendations, pushback issues from the facility, and any training that is needed as a result of the audit. If the discussion of these or any other issues cannot be held on-site while the team is together and their comments would be fresh, than every attempt should be made to conduct it post-audit as soon as possible via teleconference or other means.

2.3 GATHERING, RECORDING, AND EVALUATING AUDIT DATA AND INFORMATION

During the on-site audit, each audit team member gathers data to evaluate the facility's PSM systems for the PSM program elements they are assigned. If the scope of the audit is broad, or the sampling and testing plan contains a large amount of information to gather, teams of auditors may be assigned to the same topic or element. If these sub-teams are formed, this should be addressed in the audit planning process to ensure that no overlap has occurred in record review or interviews and that the sampling and testing plan has been completely satisfied. The techniques used to gather audit data are discussed in this section.

2.3.1 Data-Gathering Methods and Sources

The three primary methods of gathering data in a PSM audit include the following:

- Interviewing (both with management personnel and nonmanagement personnel in the field)
- Document and record reviews
- Field observations

While more extensive and scientifically based types of data-gathering methods are possible, these three methods are those used in EHS related auditing. This is because most of the data to be gathered is programmatic and not statistical or physical.

2.3.1.1 Interviews

In general, the record and document reviews and observations are used to verify what has been presented to the auditor during interviews. Therefore, interviewing is perhaps the most frequently used means of collecting audit data. Here, the auditor asks facility personnel questions, both formally (e.g., via the questions from the audit protocol) and informally (e.g., through discussions). Interviews and discussions usually provide a starting point from which the auditor begins to evaluate a particular PSM program element or sub-element. This initial interview generally takes place with the facility employee with the primary functional responsibility for each PSM program element (usually a management employee). Then, either further interviews with other people, or record reviews and observations confirm what has been presented during this initial interview. This is the ideal order of auditing activities; however, sometimes the availability of personnel or other factors dictate that the record reviews and observations have to take place before interviewing personnel.

Before conducting this initial interview for a PSM program element, the auditor should read and understand (as much as possible from the document alone) how the management system procedure for the PSM element works at the facility question. If time can be set aside in the audit plan for sufficient early review of the facility PSM policies and procedures, this should be considered. If this time is not built into the plan or is limited, auditors should try to find some time before the initial interview to read through the governing procedure and understand what

issues the interview should be focused on. Often the first part of an interview with the person with primary responsibility for a PSM element will consist of a discussion or overall summary of how the element works and how the management system is applied.

For most PSM elements a series of interviews will result from the initial interview, depending on the size of the facility and how PSM responsibilities have been assigned. For some elements, such as Asset Integrity and Reliability, this can be a total of 20–30 persons who might have to be interviewed to obtain the information needed. The initial interview can be lengthy for some elements, such as Asset Integrity and Reliability. Most of the time, the response to questions by the auditor and the review of a document or record provided by the person being interviewed provide a satisfactory explanation, or reveal a finding. That is, the combination of an interview, records verification, and/or observations will provide enough information for the auditor to draw a conclusion and a determination of the status of the protocol item at the facility. For some protocol items, interviews with persons subordinate to the initial interviewee, or with someone in another group, discipline, or department, are required to obtain a full explanation of a topic, including interviews with nonmanagement personnel. The subdivision of responsibility will also influence how many people need to be interviewed to understand as much as possible how a particular process safety issue is managed. For example, the person with primary responsibility may have a direct report who handles that issue, and upon interviewing that person, the auditor is then directed to a third person who actually maintains the records associated with that activity. This “pyramid” of people to interview can be quite broad at its base when all the activities and their participants are expanded.

In evaluating information gained through interviews and discussions an auditor should consider the following factors:

- The level of knowledge or skill of the individual questioned concerning the topic.
- The objectivity of the questioned person(s).
- The consistency of each response with each other and with other audit data.
- The logic and reasonableness of the response.

As the auditors gain familiarity with the facility operations and organization, they will become more adept at choosing the right person to question and in evaluating the answers. However, information generated through interviews may not be as reliable as information generated in other ways. Although the respondent may not intentionally deceive the auditor, it is human nature for facility managers and staff to want to describe facility practices in the best possible light. In addition, facility personnel may have inherent blind spots or biases of which they are simply unaware. The reliance placed on data obtained through interviews will vary, based on the factors discussed above, but heavier weight generally is accorded information generated by other means. This caution must be balanced by the perspective provided by human observations. Human/verbal input is critical in an audit because the PSM program may look great on paper but has not been put into

practice or does not include all employees who participate in the program activities. An auditor should seek additional information whenever he or she judges a person's response to be uninformed, biased, or otherwise unreliable. In all matters, the auditor should not rely on a single source of data but should obtain additional information from independent sources. The protocol should be designed to elicit and search for confirming information. Interviewing people during audits is described in more detail in Section 2.3.1.1.

Finally, much useful information can be obtained during an audit through casual conversations with various people. These conversations can take place in the field, at the coffee pot, in the lunch room, etc. Such information should be corroborated with information collected during other interviews, record reviews, and observations. However, they can lead the auditor in a different and sometimes more productive direction, or they can help the auditors more effectively focus questions toward others. Such informal opportunities should not be overlooked, and are not a devious way to collect information during an audit. When government representatives conduct regulatory audits, they often look for opportunities to informally meet with facility employees (although the facility may closely control informal access to its employees).

2.3.1.2 Document and Record Reviews

In addition to interviewing persons, another primary method of gathering audit information and data is reviewing records and documents. Although these two terms both infer something written down, they have different meanings within the context of this book, as follows:

- Documents are policies, procedures, and other written guidance that provide direction on how to organize, execute, document, and otherwise manage process safety activities. Examples include the MOC procedure and the Incident Investigation procedure.
- Records are the written results of following the actions and requirements contained in the documents. They comprise the written evidence that the PSM program is being executed and managed in accordance with the approved requirements. Examples include ITPM records, training records, and records of the annual certification for the standard operating procedures.

Not all PSM program elements contain explicit requirements for documentation. Many of these requirements are inferred. However, without a strong system of PSM program documentation it will be nearly impossible to adequately audit a PSM program. See Section 1.7.1 for further discussion of mandatory and inferred documentation.

PSM auditors will spend a large portion of their time before arriving on-site and while on-site reviewing documents and records. The audit protocol will contain a number of questions about the content of the PSM program procedures (i.e., the documents) to determine if these procedures and policies include provisions to address certain issues, accomplish certain activities, and document things in certain ways. These documents and records will usually comprise a mix

of hard copy and electronic files. Some auditors prefer to review hard copies, which may require obtaining paper copies, and others prefer using the electronic versions. It is sometimes easier to perform this work using the electronic version of the documents, which allows the auditor to quickly find desired key phrases and words using the search/find feature of the software. This is particularly true for lengthy documents.

Auditors should be sure to note the exact version and/or issue date of each record or document reviewed. This allows an exact reference point for the documents reviewed during the audit. It is not necessary to keep a copy of each document reviewed, as long as the specific document is properly referenced and can be accessed later when needed.

Auditors should not become overwhelmed by record reviews. There may be potentially thousands of records that can be reviewed. The sampling strategies presented in Section 2.3.3 describe methods for choosing records to audit. Representative units and the chronology of the records help develop this strategy. In addition, if the facility or company has established a PSM metrics program, this might also be a good source of records to review, i.e., the metrics themselves as well as the documents and records used to generate them.

If the PSM program procedures are new or have very recently been revised and have not yet generated a significant number of records, the auditors will have to evaluate the results of their review only on what is available. This might result in audit results that could be considered somewhat preliminary. For example, a procedure that has been used for six months might not have generated enough activity and records to be able to fully evaluate its effectiveness. This is another reason to carefully record the revision and date of each document reviewed, so that the results of the audit can be understood in the proper context.

Auditors should prepare lists of the records or the types of records to be reviewed for each PSM program element in advance of the on-site portion of the audit and include these lists in the audit plan. However, the facility should not be informed of the specific records that will be examined. For example, the audit plan will indicate that pressure vessel thickness measurement records will be examined, but not for which pressure vessels. It is not necessary for the facility to produce special copies of the documents and records for the purpose of the audit. Auditors should use the original or master copy. Records can be examined in situ or brought to the auditors in a conference room. If records are brought to the auditor's workspace, care should be taken to ensure that the chosen records create no bias in the sampling.

2.3.1.3 Observations

Observations consist of the physical examination of events or conditions, and can be a reliable source of gathering audit data. Where knowledge of how specific operations are conducted or the condition of equipment is important, it is desirable for the auditor to observe them. Observations can also be made of many process safety-related activities, as described in Section 2.1.3. The audit team will

generally not request that any of these activities be scheduled specifically for the audit, but will observe them on an as-available basis. The auditors should decide on how much or how long to observe operations, equipment, and activities on a judgmental sampling basis. In order to draw valid conclusions about the facility's HIRA practices, it would not be necessary to observe an entire six-hour study session, particularly if the auditor has experience leading HIRAs. Some operations, such as a shift turnover, can be observed in their entirety because they occur in a relatively short period of time. Auditor should use their judgment to decide when they have seen enough. Sampling pieces of equipment to inspect to support Asset Integrity conclusions should follow the same sampling guidance described in Section 2.3.3. Auditors should also take care when observing activities or operations being performed by people to try to view unbiased and representative practices. Some people, when they know they are being observed, might perform in a different manner.

Photographing or videotaping field observations are not typical PSM audit practices. Just as tape recording an audit interview is not a good practice (see Section 2.3.2.1), videotaping people's observations is not a good idea either. Videotaping or photographing equipment may have its merits, especially if a lot of equipment must be observed. However, auditors should be aware that images of chemical/processing facilities are sensitive security issues and there may be company or facility security rules that preclude this type of activity, as well as government security regulations that must be observed. If the audit team desires to create images of the facility or its personnel while they engage in operational or PSM activities, arrangements for this should be made in advance while planning the audit.

2.3.2 Audit Interviews

The term "interview" is used to encompass the full range of oral communication throughout the audit process. In fact, a large volume of information compiled during typical audit "interviews" is usually gained through various conversations with facility personnel. Regardless of the setting, duration, degree of formality, or position in the organization of those that are interviewed, audit interviews follow a common pattern consisting of the following steps:

- planning;
- opening;
- conducting;
- closing; and
- documenting.

Even informal conversations, e.g., in the lunchroom, may contain some of these steps, although they are usually unplanned and the information collected during them is usually on an ad hoc basis rather than as a planned and scheduled activity. Interviewing is a dynamic rather than a scripted process, one that will be somewhat different for each paired interviewer and interviewee.

The interviewing of nonmanagement personnel may be a prescribed process when a union represents them. Sometimes nonmanagement personnel or their representatives will request that the union steward or another union official be present during the interview, in a similar manner to when union members are interviewed by regulators during their inspections.

The following basic process should be helpful in establishing a framework for the overall process and increasing the effectiveness of the interviewer's on-site activities. The emphasis is placed on the interaction that develops between interviewer and interviewee rather than strictly on the mechanics of the interview process.

2.3.2.1 Planning the Interviews

Auditors need to interview those who are accountable for the programs, those who actually do the work in the programs, and then those who can provide an opinion on whether it's actually being done and on how well it is being done. This will include a range of people: facility management and nonmanagement personnel as well as contractors (if they are available). Prior to conducting the interviews, the auditors should identify the personnel to be interviewed, determine the questions to be asked, outline what is to be accomplished, and determine how the effectiveness of the interview will be maximized.

Determine who should be interviewed. Interviews with personnel that span the spectrum of responsibility will be required during a PSM audit. These include the following:

- The person with functional responsibility for each PSM program element, likely management employees, should be interviewed. This is one of the primary ways the auditors learn about the PSM program at the facility, how it works, and how it is managed. The auditors can and should thoroughly review the pertinent documents prior to their arrival on-site, but the only way to gain a complete understanding of the PSM program is to meet with the people responsible for executing its activities, ask them questions, and hold a detailed dialogue with them about the program.
- In addition to the initial list of persons and first interviews of them, other personnel in each element will be identified for interviewing. These will also be mostly management personnel, but may include some nonmanagement personnel.
- Nonmanagement personnel will be interviewed to verify the information collected from the other interviews as well as from record review. The primary objective of interviewing the nonmanagement employees is to confirm whether key PSM-related policies and procedures, especially those that are site-wide, and the operating procedures are being followed as written, and to ensure that the different groups and disciplines are not interpreting and using these procedures in a different manner. It will be necessary to determine how many of these verification interviews will be required, and which personnel should be interviewed. A representative sample of interviews with nonmanagement personnel should be

conducted, depending on the scope and complexity of the PSM program, the available time to conduct the audit, and the number of auditors. In general, the nonmanagement personnel to be interviewed will be drawn from those who work in the representative units, if representative units are used. The types of nonmanagement personnel that should be considered for interviews include the following:

- The nonmanagement personnel will consist of process operators, maintenance personnel, and others as appropriate.
 - Members of the emergency response teams should be interviewed, if facility personnel respond to emergency events.
 - Members of PHA teams should be interviewed to determine their understanding of how hazards are identified, if their concerns are heard, etc.
 - Security or other personnel controlling facility access may be interviewed regarding contractor safety since these personnel may be the initial point of contact at a facility and may conduct contractor safety training.
 - The number of interviews with nonmanagement personnel may vary from a few to several dozen depending on the scope and complexity of the PSM program and the facility, the available time to conduct the audit, and the number of auditors.
- Every effort should be made to interview employees from different shifts. Given the shift rotations and schedules used by many facilities, this should be possible.

Determine the questions to be asked. For management personnel, the interview questions will generally come directly from the audit protocol for the element for which the interviewee is responsible. For nonmanagement personnel, the goal is to verify other information being gathered. Therefore, the auditors should compile a targeted list of questions covering all PSM program elements whose objectives are to determine whether or not the PSM program is functioning as it is written. Also, because the amount of time available for each nonmanagement interview tends to be limited, the questions sometimes have to be selected carefully to elicit the desired information in a short period of time. Appendix E contains a list of possible interview questions for nonmanagement personnel to use as a starting point for these interviews. Because patterns of information collected from interviews help confirm other information rather than one statement made by an interviewee, the auditors should try to use the same approximate question list for conducting interviews of nonmanagement personnel to help ensure consistency in the information being elicited and collected. However, this is *not* meant to infer that any interviews should be scripted. Auditors should be free to ask whatever questions they need to ask to determine how the PSM program is functioning.

Plan the general logistics of the interviews, using the following guidelines:

- For management personnel, obtain a brief understanding of the current titles, responsibilities, and reporting relationships of the persons to be

interviewed. An organization chart or other document describing how the facility is organized should answer some of these questions in advance, but will not give the auditor a true feel for the job responsibilities.

- Whenever possible, establish a specific time and duration for the interviews, keeping in mind the interviewee's other commitments and work schedule. Interviews with nonmanagement personnel should be limited, if possible, to approximately 30–45 minutes so as to avoid difficulties with finding coverage for the interviewees who are operators.
- Decide where the interviews will be conducted. The interviewees, particularly nonmanagement personnel, will usually feel more comfortable in their own working environment. Conducting interviews of process operators in a paneled conference room that resembles a boardroom may intimidate the interviewees. Create an atmosphere of privacy: The interview locations should be in enclosed spaces and should not take place in open, common areas such as lunchrooms or shops where other people are likely to be working or using the space. Also, when interviewing management personnel, back-up information that verifies what is being said is usually more easily and quickly accessible in the space of the person responsible for it, rather than in a remote location. Wherever the interviews are conducted, the auditor should ensure that the environment is comfortable for everyone.
- Interviews should be one-on-one activities, and should not give the perception that the audit team is “ganging up” on an interviewee. However, when interviewing management personnel, more than one auditor is generally acceptable. Also, it is usually not advisable to have the supervisor and/or manager of the interviewees present, as the employees may not be as open with the interviewer or may feel like they have to provide the “right” answer. Also, having personnel present from the company who are senior in the organizational structure of the company is not advisable, even if these personnel are not in the interviewee's direct chain-of-command.
- If the interview is with a represented employee, determine if a union representative will participate in the interview and who this person will be.

Choose the auditors who will perform the interview. Although certain auditors are better than others in conducting interviews, all members of the audit team will have to conduct some interviews during the audit, particularly of management personnel within their assigned elements. If possible, new auditors should observe auditors who are seasoned interviewers to learn their techniques and approach to this important activity.

Choose the method and manner of recording information during interviews. Audit interviews should be recorded on paper. The use of a manual notebook should not create an intimidating atmosphere during an audit interview. However, the taking of copious notes so that the interviewee thinks that a verbatim transcript is being taken may intimidate the interviewee. If the interviewee appears to be overly interested in what is being written down by continuously glancing at the

notes or by attempting to read what is being written, then the auditor should take this as a sign that the interviewee is growing uncomfortable with the manner in which the information is being recorded. It is not necessary to have a verbatim, or even highly detailed account of what the interviewee says, unless they are providing a large amount of detailed data verbally, e.g., numerical test results. In most cases, the main points made by the interviewee are what auditors need to preserve in their field notes. The use of notebook computers to record interview information may intimidate some people, perhaps nonmanagement personnel more. The perception of notes being recorded like a court transcript should be avoided, and the use of a computer during an audit interview can convey this perception. The use of tape or video recorders should be strictly avoided.

2.3.2.2 Opening the Interview

Perhaps the most crucial aspect of any interview is the opening communication, both verbal and nonverbal. While the total duration of the opening may be brief, the quality of information gathered during an interview is closely related to the interviewee's sense of comfort. To build the desired sense of comfort and confidence, auditors should follow a few basic guidelines:

- *Introduce yourself.* The auditor should begin by introducing himself/herself (including some background), explaining why the audit team is at the facility, and briefly recapping the purpose and scope of the audit. The purpose of the interview should also be stated. For management personnel this will be mostly to learn certain facts about the PSM program element for which the interviewee is responsible or plays a role. For nonmanagement personnel this will be mostly to verify information that is being collected by other means. The purpose of nonmanagement interviews is not to see if someone else being interviewed is giving contradictory information. Such a purpose, even if hinted, will not likely foster a comfortable or confident interview environment.
- *Ensure appropriateness of time.* To enhance rapport, confirm with the interviewee that the time is convenient (i.e., "Is this a good time for you?"), in order to minimize the chances of being cut short or interrupted. As part of this approach, inform the interviewee of the estimated amount of time likely to be needed.
- *Explain how the information will be used.* Explain that the primary purpose of the discussion is to help the auditor develop a complete understanding of how the facility manages its process safety activities, not to try to "test" the interviewee's knowledge (i.e., the interview is not an oral exam) or to conduct a job performance evaluation (i.e., the interview is not intended to find fault with the interviewee's operating practices). Explain that specific individuals' comments will be kept confidential when findings are reported. Ensure that the interviewee understands that names of interviewees will not be included in the audit report, and that specific information collected will not be attributed to any particular interviewee. Although the facility generally knows which

personnel were interviewed, and in the case of management personnel the nature of the discussions can be easily determined from the audit worksheets, there should not be any easy way to re-construct the interviews of the nonmanagement personnel, or cross-reference any response or collected information to any specific interviewee. Advise interviewees that it is acceptable if they do not know the answer to the question asked. They can say that they do not know or suggest asking the question to someone else.

- *Request a brief overview of the interviewee's job.* Experience has shown that even if an auditor is seeking answers to specific audit protocol questions, it is always desirable to begin each interview by asking the person to spend a few minutes explaining how he/she fits into the overall organization at the facility and what his/her principal responsibilities are. Before asking specific questions, it is also a good idea to ask the interviewee to describe how the particular PSM program element works, who does what, and how the element activities are documented. This allows the interviewer to more fully understand how that element is executed and managed and also to compare what is being described verbally to what the documents describe. This will help identify additional questions that will need to be posed to clear up any discrepancies between what is being described verbally and what is presented in the procedures. This is also a way to get an interviewee who may be a bit defensive or leery of the interview to start talking and open up by asking them to talk about a familiar topic.

2.3.2.3 Conducting the Interview

After establishing a comfortable setting and some degree of rapport with the interviewee, the auditor should shift the emphasis to obtaining specific information, including the following examples:

Gather detailed information. Probe for answers to specific questions, using follow-up questions to help ensure that the answers are addressing the question under consideration. To ensure that the information gained is useful, pay attention to concreteness, respect, and constructive probing. There are three types of questions that auditors can ask: open-ended questions, closed questions, and leading questions.

- Open-ended questions do not have boundaries associated with the responses. An open-ended question generally results in the “telling of a story”; e.g., “How does this procedure work?” Valid information can and usually is provided in response to an open-ended question, but it is more difficult to interpret and sometimes must be separated from a large amount of extraneous information by the listener.
- Closed questions are those with clear-cut and very distinct answers—almost “yes/no” responses are sought; for example, “Has the Alkylation Unit PHA been revalidated yet?” Although the answers to closed

questions are easier to interpret than opened-ended questions, they only provide a small amount of information and no background or context. However, sometimes, that level of information is exactly what the auditor needs to determine.

- Leading questions drive the conversation and the response in a pre-determined direction. Leading questions should be avoided if possible because they may confuse the interviewee or elicit information that really does not answer the question the auditor needs answered. However, sometimes a leading question can help get a conversation back on track, if it is asked in the right way and at the right time.

Concreteness or specificity of response. The most effective way to obtain specific and concrete responses is for the auditor to ask specific and concrete questions, i.e., closed questions. Vague queries generally result in nonspecific responses that are seldom useful. However, the interview should not evolve into a legalistically styled cross-examination, where respondents are not allowed to amplify their remarks or provide background information they believe is relevant. The auditor must control the interviewing process both to elicit concrete answers and to limit the discussion to relevant issues.

Respect. There are few more direct communications of respect than the commitment of the auditor to understand the interviewee's responses. That is, the auditor should focus on the information being given while deferring critical judgments about the respondent or the answers. Inadequate or incomplete answers often do not indicate that the interviewee lacks the ability to respond adequately, or is being purposely evasive, but rather that he/she is anxious about the interview, or that the question is open to more than one interpretation. Helping the interviewee to clarify and/or deepen his/her responses communicates respect and interest and provides a vehicle for eliciting specific responses.

Constructive probing. Constructive probing is often necessary, especially when interviewees provide responses that are inconsistent, conflicting, or suspected of being incomplete. When questioned about the apparent inconsistencies, respondents are usually able to explain them satisfactorily. It is important, though, that the auditor phrase inquiries to focus on the data rather than confronting or criticizing the respondent; that is, the effect of the inquiry should not be to criticize interviewees for being inconsistent, but rather to enlist their help in clarifying the information. Also, direct questions that are accusatory in nature should be avoided. For example, regarding the MOC element, the auditor will want to probe to determine if unauthorized changes are being made. However, asking an interviewee, particularly a nonmanagement employee, "Do you make unauthorized changes in the plant without using MOC?" is not the correct way to phrase such a probing question. A better approach is to pose a scenario to see if the interviewee responds with the correct (and hoped-for) response. For example, for MOC, "It's 2:00 AM on a Saturday morning and a part needs to be replaced but the replacement-in-kind part is not available. What would you do?" This is an open-ended question, but is not accusatory in nature.

If the interviewer is not sure if the MOC practice has been applied, several such scenarios can be used.

Active listening. The auditor should summarize or paraphrase the information learned frequently during the interview. Called active listening, this translates the interviewee's responses and statements to ensure they have been understood correctly. In summarizing, pay particular attention to distinctions or refinements the interviewee offers in response to the auditor's summary. Active listening shows interest in the information being offered, while also allowing the auditor to ensure that answers have been understood properly.

Provide feedback, as appropriate. The interviewee may request feedback at various stages in the interview process. Because policies may vary from company to company regarding making recommendations and suggestions directly to facility personnel, auditors should understand those policies prior to providing feedback to facility personnel. Critical judgments should be avoided.

Do not exceed the agreed-upon time limit without checking. A statement such as "This is taking a bit longer than I told you it would" or "Would another 10 minutes be okay?" would suffice. Re-schedule if necessary.

Cautions. As an auditor, both verbal and nonverbal communications with the interviewee are important. The quality of information gathered during an interview is closely related to the interviewee's sense of comfort. The following provides some guidance:

- *Maintain eye contact.* This connotes interest in and attention to what is being said, and allows the auditor to more easily read body language.
- *Maintain the right distance.* Do not sit or stand too close or too far; too close can create a sense of discomfort and too far may hamper the communication and may also give the perception of a courtroom environment, which is to be avoided.
- *Mirror the interviewee.* Approximately matching the tone, tempo, and body position of the interviewee can foster rapport between the interviewer and interviewee if it is done in an unobtrusive manner and does not look calculated. Also, the interviewee can feel that he/she is being mocked if this is not done right; therefore, audit interviewers should use this technique very carefully.
- *Business cards.* Presenting cards with most employees is acceptable, particularly management employees who are likely to exchange cards. However, this should not be done in a formal way or give an impression of officiality or officiousness that will start the interview on the wrong foot. Also, offering business cards to nonmanagement employees who do not typically have them may be seen as intimidating or officious. Sometimes cards are left with nonmanagement employees when they request a way to reach out to the auditor after the interview if needed or desired.
- *Auditor reactions.* Positive or negative reaction to what the interviewee is saying should be avoided, particularly with nonmanagement personnel.

While positive reaction can help improve the atmosphere of the interview, it should only be offered when the auditor is sure it warranted. A finding that is derived from interviews where the auditor offered effusive praise for the PSM practices will be interpreted as misleading by the facility. Negative reactions should generally be avoided during the interview/data gathering stage of an audit. However, in some situations, when interviewing those management personnel with functional responsibility for a PSM element, the auditor's initial conclusions, if the auditor is on very firm ground, can be revealed to the interviewee. This can help avoid surprise at the daily meeting when the auditor describes a finding that resulted from the interview and the interviewee is confronted with the finding for the first time in front of his/her peers or superiors. Hearing about it in the privacy of his/her own office can help alleviate this surprise factor. Reactions can be also conveyed verbally via statements of amazement or disbelief, or nonverbally with facial expressions such as frowns, scowls, wide-eyed looks, as well as sudden shifts of body position. This is not to mean that the auditor must remain so still and expressionless so as to resemble a statue, but the auditor's opinions and conclusions about what is being said, positive or negative, should not be on display during the interview unless it is intended.

- *Use of silence.* In U.S. culture there is a low tolerance for silence during conversations. However, when conducting an interview, auditors should refrain from attempting to fill in those silences by clarifying or rephrasing the question, or asking a new question. Silence can be used to focus both the attention of the interviewee and get them to formulate their response without any inadvertent coaching from the auditor. Auditors who jump in during a silent period will also interrupt the interviewee's thought process. Auditors should develop a strong tolerance for silence during interviews and be patient. Inquiring whether the question was clear and understood is acceptable, and silence should not be so uncomfortable for the interviewee that they feel like they are being interrogated.
- *Argument.* Do not argue with interviewees. Always be professional and courteous. If a possible finding comes up during a discussion with a management employee and immediate pushback from the interviewee occurs, politely defer a resolution until later and leave the subject to go on to the next question as easily as you can. In this situation, regardless of how the auditor feels about the validity of the possible finding, the auditor should stress that this is a preliminary conclusion and that the interviewee should be left to feel like the discussion ended with "let's agree to disagree for now" conclusion and that their opinion has been heard.

The guidance presented above generally applies to audit interviews in domestic locations. However, when conducting interviews in international locations, the customs and courtesies of the country should be observed so as not to inadvertently give offense. See Appendix H for additional guidance on conducting international audits.

2.3.2.4 Closing the Interview

It is particularly important to close each interview in a concise, timely, and positive manner. To ensure that the interview is productive and effective, end on a positive note. Thank the interviewee for his/her time (and cooperation, candor or insights, where appropriate). In this way, the auditor will not only set a positive tone for subsequent interviews if they are necessary, but also help create a good impression of the entire audit team. In concluding the interview or discussion, it is often useful to ask a question such as "Do you have any questions for me?" This is also a good time to exchange business cards or leave one with an interviewee so that contact information for the auditor is readily available if needed. If there is going to be a need for a follow-up interview this should be clear between the auditor and the interviewer, although the time and place may not be able to be confirmed at that time.

2.3.2.5 Documenting Interview Results

The process of documenting interview results begins early in the interview, perhaps with a casual comment that the auditor hopes the interviewee does not mind if some notes are taken to help the auditor remember the information discussed. Then, immediately following the interview, take time to review working papers to ensure they accurately and completely reflect the information obtained during the interview.

Many of the concepts and guidance presented in Section 2.3.4 on audit interviews are also included in Greeno et al., *The Environmental, Health and Safety Auditor's Handbook* (Greeno et al., 1987).

2.3.3 Sampling and Testing Strategies and Techniques

Because auditing basically constitutes a check on, or verification of, the implementation of PSM systems at a specific location, audit team members generally take a sampling approach to examining large populations of records or interviewing groups of employees to make a determination regarding compliance. Testing involves verifying that the sampled information is valid. Testing can be performed by retracing data or information (i.e., physically checking against the status of the sampled information against equipment, operations, etc.), independent computation of results, and confirmation using another source of data or information. For example, in the Process Knowledge Management element P&IDs are required. The auditor will select a sample of P&ID sheets to be verified by actually comparing them to the as-built condition of the equipment that they depict. Like sampling, the testing should be planned in advance (see Section 2.1), however, sometimes, during tours and field observations auditors see things that they decide should be tested and these ad hoc testing and sampling activities are then added to their scope of work.

Despite the fact that sampling is a well-established aspect of auditing, selecting appropriate sampling methods and sample sizes can be difficult. Thus, the auditor must exercise considerable care when selecting a sampling method to

gather information. If, for example, the sampling method does not adequately represent the population under review, the information gathered can be misleading and cause the auditor to draw a biased, inaccurate, or unsubstantiated conclusion. To help ensure that each sample selected is appropriate and defensible, auditors typically follow six basic steps:

- 1) *Determine the objective of the protocol step being conducted.* What particular aspect of a regulatory requirement or internal policy will be reviewed? The answer to this question, although at times obvious, helps the auditor to identify clearly the boundaries of the population under review.
- 2) *Identify the population under review.* What is the population of records, employees, etc., that needs to be reviewed? What segments of that population are relevant to the audit? For example, when verifying the existence of a preventive maintenance program, the first step is to identify all the types of equipment that potentially should have been covered.

Auditors should be careful to avoid bias in the sampling. Independent records should be used whenever possible to develop the sample. For example, in reviewing training records it is not wise to start with a sample developed from a stack of training records provided by the facility training coordinator. The training records available to the facility coordinator will likely only reflect those who have been trained (or, more precisely, those with completed training records). To gather data about the extent of training and training records, it would be more desirable to start with a roster of personnel in the group/department and develop a sample of employees who should have been trained. Then, the training records could be reviewed to help determine whether each employee in the sample had been trained.

The final task is this step it to identify the sampling frame of interest and eliminate any potential bias in it. The frame of interest represents the boundaries of the records selected for review. It may be defined by dates (e.g., the last three years) or the type of record (the status of all HIRA/PHA recommendations). Consider the following questions:

- Was the auditor in control of selecting the frame of interest? Auditors should be careful of being “steered” away or towards certain records.
- From what records was the population under review identified?
- Are other data missing that would influence the sampling frame selection?

Records for review will usually be selected from the representative units, if these have been used in the audit. For example, in the Asset Integrity and Reliability element, inspection, test, and preventive maintenance (ITPM) records from the representative units will be selected. However, ITPM records are voluminous and cannot be reviewed in total. Therefore, information from records should be gathered through sampling a portion of a whole collection (population) of items. The methods by which

auditors select the sample can affect the validity of the sample and of the conclusions reached. It is important to minimize sampling bias and to obtain as representative a sample as possible. Auditors must maintain control of the sample selection. More detailed information about sampling strategies and techniques is described in Section 2.2.5. Some records do not require sampling. For example, process hazard analyses may be very few in number, particularly in a facility that does not have a large number of processes included in the PSM program. In some facilities, there may be few process safety incident reports (although this could indicate a problem with properly reporting and investigating near misses).

When selecting records for review that chronologically extend over a lengthy period of time, auditors should concentrate on more recent records. The typical time period for selection is the three-year period preceding the audit. For example, ITPM records of piping inspections that are fifteen years old are not as relevant as the most recent piping inspection records. Archived process safety information, such as old, superseded P&IDs or old relief device design basis calculations that have been revised should not be selected for review. The latest and effective version of these records should be reviewed. Also, the initial PHAs performed 15–20 years previously may not represent the latest practices in PHA for the facility/company and more recent studies should be reviewed in lieu of these older studies. However, if the original PHAs from that time have been revalidated (and not re-done), the older PHA records still comprise a portion of the current PHA. The status of recommendations made in all PHAs is of interest and should be determined. Chapters 3–24 provide guidance for each PSM program element on what documents and records should be reviewed during a PSM audit.

If the PSM program procedures are new or have very recently been revised and have not yet generated a significant number of records, the auditors will have to evaluate the results of their review only on what is available. This might result in a preliminary evaluation. This is another reason to carefully record the revision and date of each document reviewed, so that the results of the audit can be understood in the proper context.

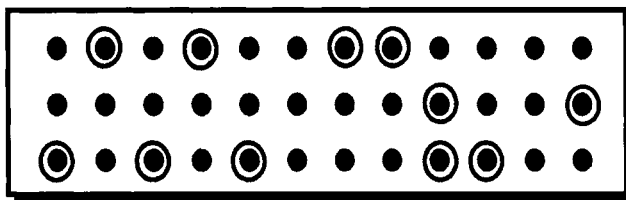
- 3) *Determine the sampling method to be employed.* Samples selected by an auditor are usually judgmental, i.e., not supported by a calculated statistical basis, but may be aided by a systematic selection strategy (see Figure 2.1). Judgmental sampling is when the auditor “judges” when he/she has detected a pattern in the results of the records being reviewed and therefore has reviewed enough of them and can draw a valid conclusion from that pattern. This ability comes from experience in reviewing the same types of records looking for the same characteristics. A sample developed largely on the basis of the auditor’s judgment may be appropriate where the size or nature of the population makes a systematic sample difficult or unreasonable to obtain. A systematic sample is one

selected through the use of a defined process chosen to represent the population that is being reviewed. Numerous methods are available to select a sample for review, as shown in Figure 2.1, but no one method is correct for all situations. The systematic sampling methods depicted in Figure 2.1 include the following:

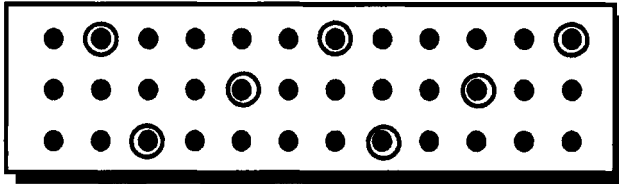
- Random
 - Interval
 - Block
 - Stratification
- 4) *Determine the sample size.* The appropriate sample size can be determined either on the basis of the auditor’s judgment or statistically, depending on the goals and methods of the audit program. In most audit situations, it may be desirable as well as adequate to review only 10-20% of the population. For very large populations, however, evaluating a sample size that represents 10% of the population may be too cumbersome or too time-consuming. In such cases, the auditor may want to select a smaller sample, but should be sure that the sample is large enough to allow reasonable conclusions to be drawn, or otherwise be aware of the limitations inherent in drawing conclusions from the sample selected. Table 2.1 in Section 2.1.2.2 shows how the sampling might be planned for a large multi-area, multi-unit facility to ensure that at least each area is sampled for at least one PSM element.
- 5) *Document the sample, strategy, and methodology employed.* To assure management that a reasonable audit was conducted and to ensure quality control of the sampling process, the auditor should be prepared to indicate why the particular sample was selected.

Figure 2.1 Examples of Systematic Sampling Methods

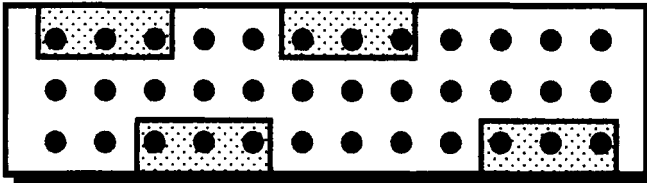
Random: Select items purely by chance



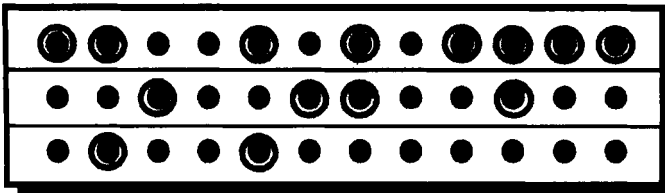
Interval: Select every n th item starting randomly. As such, the data obtained should be sufficient to force a conclusion to be drawn and enable that same conclusion to be drawn by different people.



Block: Block sampling selects certain segments of the facility or employee population (e.g., months starting with J, records numbered 23–37).



Stratification: Involves arranging items by categories based on the auditor's judgment of risk, and then selecting a certain number of items from each category (e.g., new versus experienced employees, first shift versus third shift, etc.)



Although judgmental sampling often suffices well for most PSM audits, there are more formal methods that can be employed that are statistically based. Much work has been done in recent years in product quality on sampling strategies for final or intermediate products to find the optimum level of inspection to detect flaws. Another scheme for determining sample size developed by Arthur D. Little and published in *The Environmental, Health, and Safety Auditor's Handbook* (Greeno et al., 1987), and derived from acceptable quality level tables is presented in Table 2.4. Table 2.5 provides an example sampling strategy for a multi-unit facility.

Table 2.4 Suggested Audit Sample Sizes

Size of Population	Suggested Minimum Size of Sample		
	A ¹	B ²	C ³
2–10	100%	100%	30%
11–25	100%	39%	17%
25–50	53%	21%	16%
51–100	26%	13%	9%
101–250	17%	12%	6%
251–500	13%	5%	3%
501–1000	6%	3%	2%
>1000	2–3%	2%	1–2%

Notes:

1. Suggested minimum sample size for a population being reviewed that is considered to be extremely important in terms of verifying compliance with applicable requirements, and/or is of critical concern to the organization in terms of potential or actual impacts associated with noncompliance.
2. Suggested minimum sample size for a population being reviewed that will provide additional information to substantiate compliance or noncompliance, and/or is of considerable importance to the organization in terms of potential or actual impacts associated with noncompliance.
3. Suggested minimum sample size for a population being reviewed that will provide ancillary information in terms of verifying overall compliance with a requirement.

- 6) *Adjusting the sample size.* Another approach to sampling and testing is to adjust the sample size as the audit progresses and the results start to accumulate. The initial results can be analyzed for patterns and the sample sizes calibrated during the audit to sample more or less as appropriate. A variant of adjusting the sample sizes during the audit is to adjust the audit findings and recommendations to require that the facility continue the sampling as part of their follow-up to determine if the same deficiencies exist in areas of the facility that could not be sampled while the audit team was on-site. This approach is particularly appropriate when the facility is very large and/or the audit team or their allotted time is limited due to resource constraints.

For example, if the facility is very large with multiple operating areas and individual units and cannot be sampled widely during the allotted on-site time, the findings and actions might be generated as follows:

- If the evidence exists in only one unit in one area, the evidence documented in the finding will be specific to the unit where it was found and the deficiency will need to be corrected in that unit.
- If the evidence is found in more than one unit in one area (e.g., Units #2 and #5 in the East Plant), the evidence documented in the finding will need to be corrected in the units where it was actually found, and the facility should be required to conduct a documented investigation to determine the extent of the issue in the entire operating area (e.g., across the East Plant), with a subsequent plan documented and completed to resolve the issue across the entire East Plant.
- If the evidence is found in at least one unit in all operating areas (e.g., Units #2 and #5 in the East Plant, Units #1 and #4 in the West Plant, and Unit #2 in the South Plant), the evidence documented in the finding will need to be corrected for the areas/units where it was found, and a documented investigation should be conducted to determine the extent of the issue across the entire facility, with a subsequent plan documented and completed to resolve the issue across the entire facility. For example, if a PHA revalidation is overdue or was performed late in one area, it would be appropriate to require the facility do investigate the dates of all PHAs to see if the issue is isolated to the area audited or pervasive throughout the facility.

In summary, sampling in PSM audits is usually accomplished using judgment based on experience and “comfort” level. What this means is, based on the auditor’s experience sampling evidence, they will reach a level of satisfaction that they have sampled enough information when a pattern has emerged which doesn’t seem to be changing with each additional record reviewed or person interviewed. For example, if an auditor is reviewing piping inspection records and after reviewing 50 of 750 records, a certain finding has emerged which keeps occurring at about the same rate, and the auditor has seen this pattern of findings before in piping inspection records, then the decision to terminate the sampling can usually be made with confidence that the conclusion drawn and the finding generated from

that conclusion are accurate. However, there are statistically based sample methods that some companies and facilities employ that establish formal rules for the sampling technique and sample sizes. See Section 2.3.5 for a discussion of the sufficiency and adequacy of the data and information gathered.

2.3.4 Recording Audit Data and Information

The data and information collected during the audit are recorded in various places, depending upon the desires and habits of the individual auditors. This collection of information is referred to as field notes or working papers. Field notes consist of the following:

- Hard copies of the audit protocol with hand-written annotations.
- Electronic copies of the audit protocol with the auditors initial notes, conclusions, and observations. Some PSM auditors essentially fill-out their protocols electronically as they conduct interviews, make field observations, and review records. These early electronic notes are not final findings and are considered field notes or working papers.
- Electronic or hard copies of facility PSM policies and procedures with or without annotations.
- Electronic or hard copies of facility PSM records with or without annotations.
- Electronic or hand-written notes made by auditors as they conduct interviews, make field observations, and review records.

For most PSM auditors, their field notes or working papers is a combination of the auditor-created records described above.

However individual auditors prefer to keep field notes, they should be careful to record:

- The title, revision, and issue date of each document they review. If the documents were reviewed by reading them in their electronic media, the cyber storage location (e.g., computer/network drive and file folder string or URL should also be recorded).
- The title and date of each record they review. It may also be necessary to record the storage location of the record in order to identify it later. If the records were reviewed by reading them in their electronic media, the cyber storage location (e.g., computer/network drive and file folder string or URL should also be recorded).
- The number of records sampled for each type of records reviewed.
- The name, title, and date/time of each person they interview.
- The date, time, and location of each observation that they make.

The combination of verbal information provided by interviewees and written information found in documents, records, and observations should form the basis for each finding produced by each auditor. The auditors should be able to trace each finding in the draft audit report to this information in their field notes.

Auditors should not rely on their memories! Record data and information as it is collected or noted. Also write down audit action items as they occur. Auditors should keep a running “to do” list and make sure that each item has been completed before they leave the site on the last day. Trying to gather audit data and information after the on-site portion of the audit has ended is very difficult. Do not think that your memory will serve you well later. Keep a hand-written notebook or an electronic equivalent. With the widespread use of electronic recordkeeping and document management systems, there is a tendency among some auditors to believe that they have complete field notes if they ask for and receive a copy of electronically managed procedures and records from the facility. This is not true. There is a large amount of information gathered by an auditor that must be recorded manually.

2.3.5 Evaluating Audit Data and Information

As fieldwork is completed, it is important to determine whether the information gathered by the auditor during the fieldwork is sufficient to support the objectives of the audit and the conclusions of the auditor. The evaluation of PSM audit field data and information is performed to:

- Determine what information should result in a finding, and then compose the draft finding.
- Determine if enough data and information has been collected to substantiate the draft finding.
- Determine if the data and information that has been collected is adequate.
- Determine if the data and information collected by other auditors agrees with or conflicts with the finding, or modifies the finding (i.e., the vetting of the finding).
- Assess the internal controls.

In evaluating the data and information collected, the audit team will have to deal with the facility’s response to the draft findings, including the attempted resolution of the findings while the audit is still ongoing and pushback from the facility.

2.3.5.1 Generating and Composing Findings

Once data gathering is complete, the data are evaluated to identify audit findings. For the purposes of this book, a finding is defined as a conclusion, reached by the audit team based on the data collected and analyzed during the audit that represents a deficiency in the PSM program. The complete finding consists of the statement describing the gap between the requirement represented by the audit criteria or question, which is the conclusion drawn by the auditor based on the facts, and the evidence that supports the conclusion from the data and information collected. If audit questions are used in the protocol it would also include the answer to the question, i.e., Yes, No, Partial, Not Applicable, Not Observed/Used. The finding does not include any recommendation(s) made to correct the deficiency.

Audit teams usually make preliminary evaluations of their data throughout the audit and compare notes at the end of each day. Most audit teams then devote time at the end of the audit, which can be substantial, to jointly discuss, evaluate, and finalize these tentative audit findings. The audit team confirms that there is sufficient data to support all findings, identifies trends in findings that may be more significant than the individual deficiencies, and summarizes each finding in a way that most clearly conveys its significance. The auditor should be careful in reaching conclusions based on single data points, including interviews, and should strive to confirm preliminary findings using other data sources. All findings should reflect the consensus of the audit team.

PSM auditors will be faced with a number of situations in any given audit where they have to decide whether a collection of facts represents a finding or not, and whether a collection of facts represents a compliance finding or is a finding from the related criteria. Some of these situations are clear findings, e.g., if a facility has created written SOPs for only half of their applicable operations, or the SOPs are missing any safety and health information (as required by the PSM Standard), there is clearly a finding in the SOP element. However, if the SOPs appear to be incomplete with respect to level of detail, this situation will require more checking by the auditor and will likely include the opinions of the operators on the usability of the SOPs. By the end of the audit, the auditor may still not have collected enough information so that the situation is absolutely clear, and will be faced with a decision on whether to write a finding or not. In these cases, the assistance of the remaining audit team members should be sought. Another situation that is common: In response to an auditor's question multiple interviewees state that the facility accomplishes the PSM activity described in an audit criteria or question, but cannot produce the records that verify the accomplishment. If the records are not produced by the end of the on-site portion of the audit, then a finding should be written. The recommendation(s) can be written to reflect that the original records cannot be produced to satisfy the required actions, or if they still cannot be located the activity should then be accomplished again and properly documented. Appendix I presents a number of situations that PSM auditors are likely to encounter where a dilemma exists and a decision must be made about whether a finding exists or not.

If audit questions are used, all questions answered "No" or "Partial" are considered findings and should have an accompanying explanation. It is possible, and it is appropriate, to generate multiple findings for the same protocol question. This can occur for several reasons:

- Multiple occurrences of the same finding under the same question. For example, in Asset Integrity and Reliability if 50 pieces of equipment have overdue inspection, test, or preventive maintenance (ITPM) tasks, then there could be 50 possible findings in response to one question about overdue ITPM. However, in a situation such as this, it is more common to group the overdue ITPM tasks into perhaps three findings, one for each of the three typical groups performing ITPM tasks (i.e., inspection,

maintenance, and instrument/electrical), or by equipment type. The 50 overdue ITPM tasks would then be partitioned under each finding.

- Groupings of several findings from sub-questions under the parent question to streamline the findings. For example, if in a given PSM audit there is a parent question under Training and Performance Assurance asking if a written management system procedure to govern the training and qualification of process operators with 13 sub-questions that ask additional detailed questions about the content and/or implementation of the procedure. If there is such a procedure but there are findings for 7 of the 13 sub-questions, then all 7 of these findings might be grouped under the parent question.

Often questions that are answered “Yes,” indicating full compliance with the meaning and intent of the question, will not be accompanied by a written positive finding because the audit question and the “Yes” answer provide adequate information. This practice should be followed if the protocol is detailed enough so that each question covers only a small and narrow topic. Audit protocol questions that are answered “N/A” (not applicable) should be explained in the worksheet so that the reason they are not applicable is clear, unless the reason is overtly obvious. For example, under Compliance with Standards, if there is a question that asks if the PSM program covers the dock and marine loading systems, and the facility is not located on a navigable body of water, this question would be not applicable upon simple inspection and the answer would not require further explanation.

The findings should be carefully written by the auditors. The following guidance is provided to aid auditors when they compose their findings:

- Findings are verified statements of fact that draw a conclusion about the condition or status of some aspect of the PSM program. Findings should be stand-alone statements that describe the facts and describe a conclusion that will allow a reader familiar with the PSM element of the facility under consideration to understand what is deficient and why.
- The finding should clearly describe the evidence that caused the auditor to conclude that a finding exists. Because there will be occasions where the amount of evidence reviewed is large, the auditor will have to find easily understood ways of summarizing the evidentiary facts. Some companies require that everything seen, heard, or reviewed by the auditors be included completely in the findings because their legal staffs regard each detailed piece of evidence as a compliance issues and thus requires them to be documented. Other companies require only a summary of this (sometimes voluminous) information in the audit finding with the details being provided separately so that the facility can correct each occurrence of the summarized finding and also verify that each item has been closed. The context is also important in summarizing the facts. For example, if 50 piping inspection records were reviewed out of 350 available, those overall statistics should be included in the wording of the finding. However, unless it is absolutely necessary to list the actual record reviewed by their piping or line number, the inclusion of this level of

detail would create very lengthy findings. The detail of which specific piping circuits were included in the 50 reviewed could be supplied separately to the facility. However, if the finding is unique to one piece of equipment or one procedure, the equipment number, procedure number, etc. should explicitly describe it. The facility will need to know the detailed evidence in order to correct the findings and close them properly.

- Do not combine compliance and related criteria findings or evidence in the same finding statement.
- A finding can consist of multiple sentences. Too often, auditors try to compose lengthy, complex findings in one sentence. This usually results in a finding that is difficult to read and understand.
- Do not try to fit the finding in the space in the protocol provided. Since most protocols are electronic documents in their final form, it is not necessary to “squeeze” a finding that is, by necessity, lengthy or somewhat complicated into a given space. Err on the side of completeness.
- Often, the protocol will contain the reference or source for the question, e.g., a citation for the OSHA PSM Standard. This provides the reader with the information to be able to understand what regulatory statement the finding is being written against. However, if the protocol doesn’t provide this information clearly, or if it is necessary to cite the source of the finding in order to make it completely understandable, or if the finding will be separated from the protocol and be reported elsewhere, then include the citation in the wording of the finding.
- Acronyms should be spelled out with their first use in a given finding, unless the auditor is certain that the term is so common within the company or facility that it will not cause confusion. If the findings will be separated from the protocol and the first use of an acronym is in the audit question, the acronym should be spelled out in the finding.
- Since audit findings are often removed from their original reports and accumulated with those from other facilities in a multi-facility company, it is advisable to include the name of the facility and the equipment or procedure number in the wording of the finding, unless the facility can be identified by some other means in the consolidated records.

Finally, auditors should not modify or delete findings because of the suspected ultimate disposition of the finding. The severity of the finding, and its classification (if they are classified or assigned rankings of any sort), the nature of the recommendations that may correct the finding, including the possible costs, should not be factors in deciding whether a certain set of facts gathered during the audit represents a finding. Sometimes findings are difficult to include because they (and the corrective actions that would logically follow from the them) are counter to the prevailing process safety culture, or they have been repeat findings at the facility being audited or at other facilities, and the facility(ies) involved, or the parent company chose not to resolve them. It is sometimes very difficult for audit teams, particularly first and second party auditors, to separate themselves from these influences, but it is necessary to obtain a true and objective evaluation of the

design and implementation of the PSM program at the facility being audited. If the facts support a finding, and those facts are complete from a sufficiency and adequacy viewpoint, the finding should stand.

See Section 1.8.3 for a discussion on the language and phrasing to be used in composing findings.

2.3.5.2 Sufficiency of Data and Information Gathered

Auditors, particularly those who lack extensive experience, frequently wonder whether they have collected enough information and the right kind of information to substantiate their understanding of a facility's PSM programs and management systems. The sampling and testing plan is formulated during the planning of an audit and should provide the necessary guidance to the auditors that helps assure that a sufficient amount of evidence is collected. Sampling and testing plans should be revised and refined with each use so that they include the accumulated experience of each audit where they are used and are improved to help provide this assurance. However, even if they have fulfilled the provisions in the sampling and testing plan, auditors should evaluate the information collected and determine whether they have collected enough data and information to support their findings. Listed below are some tips for determining how much audit evidence is enough. An auditor has probably gained enough information if the following conditions exist:

- Auditors should be careful to not draw conclusions without having sampled records from each operating area of the facility being audited. Some records will be created and managed by groups who do not have area-specific responsibilities, for example, the Inspection group that performs ITPM task on pressure vessels, tanks, and piping. However, some records, particularly those created and maintained by Operations might have different levels of quality between operating areas or even between units.
- If judgmental sampling was used, which is typical, a pattern from the review of records and interviews resulted in a confident opinion in the auditor about the conclusions drawn.
- The auditor has made observations that provide further evidence of how the PSM program has been implemented.
- If the auditor understands how the management system for the PSM activity is designed to work and how that management system has been implemented, and has a firm understanding, based on the evidence, if the internal controls intended by the management system are working or not.
- If the bottom of the pyramid of people who have responsibility for the activities in question has been reached and these persons have been interviewed. The auditor understands any difference of opinion that he/she has discovered during these interviews and has resolved those differences.

2.3.5.3 Adequacy of Data and Information Gathered

The following four properties define the adequacy of information. The last requirement, persuasiveness, also refers to its sufficiency. Additional information gathering may be necessary if these four properties are not satisfied.

- *Relevance.* Information gathered during a PSM audit should produce a flow of logic from the auditor's discoveries to the conclusions drawn. Thus, examinations of a sample of MOC packages/records could constitute evidence that these process changes were handled appropriately in terms of the MOC requirements. However, this would not support the supposition that all changes within the facility have, in fact, been reviewed and documented.
- *Freedom from bias.* Information used to reach conclusions must be free from any influence that would make one decision more attractive than another or that would exclude information supporting the alternative decision. Bias can arise from the source of the information or from the auditor's choice of items to examine. The answers received when interviewing management about their adherence to particular procedures may be biased, because it would be in management's best interest to appear competent and efficient. If an auditor decided to examine a random sample of available safety records without first determining that available records represented all transactions, the sample might be biased. Also, observations collected during a brief walk-around are likely to omit data points that are less accessible or visible and could, therefore, not be representative.
- *Objectivity.* Objective data should lead two auditors examining the same information to reach the same conclusion. If, based on available information, two auditors reach different conclusions about a facility's compliance with particular requirements, then the information lacks objectivity and, therefore, is unreliable or insufficient for a decision, or the auditors may be biased and resolution is necessary to reach a decision.
- *Persuasiveness.* Information is persuasive when it forces a conclusion to be drawn and when different people reach that same conclusion. The persuasiveness may come from the volume of data, from the type of data, and from the source of the data. The parties that must be persuaded are the audit team leader, the rest of the audit team, sometimes external parties such as legal representatives, as well as the facility personnel. See the discussion on the vetting of findings for more guidance on this topic.

2.3.5.4 Vetting of Findings

Each auditor assigned to audit the PSM program element being considered will develop findings. However, each finding should be reviewed by the audit team to ensure that it is valid and worded properly so that is clearly stated and understood and follows the policies of the company or facility for wording such statements (if any exist). This review consists of the following steps/parties:

- Other auditors who are evaluating related elements should review the findings of the auditor(s) of those elements. For example auditors assigned to the Asset Integrity and Reliability and Process Safety Knowledge elements will both be auditing engineering records and other process safety information and should review each other's findings in this area.
- The remainder of the audit team should be exposed to each finding so that the collective expertise of the team can be used to review the findings. This is usually accomplished at the daily audit team meeting.
- The audit team leader should thoroughly review each finding for both appropriate wording and coordination with the findings of the other auditors.
- If company procedures require, legal staff should review each finding to ensure that the wording does not generate any problems. If review by groups or persons outside the audit team are required appropriate time should be set aside for this activity.

It is possible to combine several of these steps, particularly when the audit teams are small, and when legal review is not required.

2.3.5.5 Assessing Internal Controls

The characteristics of the management systems that provide internal controls should be evaluated to determine if they are institutionalized and working properly. These characteristics are as follows:

- Are there approved written policies, procedures and plans for each program element as necessary to control the activities in a consistent manner? Do the policies, procedures and plans impose adequate administrative controls and requirements?
- Are the responsibilities for the PSM program element clearly defined?
- Is there an adequate system of authorizations for the PSM program activities that is commensurate with the importance of the activities?
- Have the personnel throughout the organization been adequately trained to carry out the activities of each PSM program element?
- Is there an adequate division of duties to avoid organizational conflicts of interest to establish the necessary checks and balances that are appropriate given the importance of the activities?
- Are the PSM program element activities clearly documented?
- Is there internal verification that the PSM program element activities are being carried out in accordance with the management system procedures?
- Are defined metrics being used to periodically measure key PSM activities to help determine if the PSM program is functioning properly?
- Are there management reviews of the PSM program element activities that provide a closure of the feedback loop by adjusting the program requirements?

These questions regarding the adequacy of the internal controls for the management systems should be evaluated individually, but also collectively. That is, they should be evaluated to determine if the PSM program “works” in an overall fashion and is working on a consistent basis. Is the management system imposing a level of control that results in a functional and robust PSM program element? Is the intent of the element being realized? For example, are changes being adequately controlled as a result of applying the MOC procedure? The related audit criteria in Chapters 3–24 provide additional guidance as assessing the management systems and their internal controls via the related audit criteria.

2.3.5.6 Closing of Findings During On-Site Portion of the Audit

Often, a site will attempt to remove a finding by correcting it before the on-site portion of the audit is complete. In these cases, the finding should be retained because that is what the audit team discovered as part of their work and the deficiencies identified in the PSM program were real and required correction. Also, there may be a systemic problem behind a simple PSM finding that is more fundamental and whose correction may require additional thought and planning. If the finding is immediately closed, the opportunity to identify and correct this systemic problem may be lost. However, if the finding is corrected in this manner, the finding can stand alone without any recommendations, or the recommendations can be closed while on-site and so indicated in the audit report. Although this is the recommended approach for correcting findings during the audit, each company should develop its own rules on this topic and then apply them consistently.

2.3.5.7 Pushback from the Audited Facility

In nearly all PSM audits, the auditors and the audit team will confront some disagreement over the findings and recommendations. In nearly all of these occurrences, the audit team and the facility will be able to reach consensus on the correct interpretation of the audit protocol criteria/questions and how they apply to specific situations at the facility. Sometimes, however, the disagreement is sharper and includes a level of frustration that makes it difficult, if not impossible, to reach consensus. When this occurs, the audit team and the facility will have to “agree to disagree,” the audit team’s conclusions should be included in the audit report, and the issues where consensus cannot be reached referred to a different and often higher level in the organization for resolution. Hopefully, this does not occur often within a given organization. If it does occur often, not only should the PSM program in the organization be scrutinized for institutional and cultural flaws, but also the training, qualification, and assignment of the auditors and team leaders should be examined carefully. Also, the PSM audit protocols being used should also be reviewed to identify possible systemic problems in the way the audits are being conducted.

The types of facility pushback that PSM auditors encounter are summarized below along with an explanation of possible resolutions:

- Strong statements requesting that the auditor cite the specific item being argued in the governing regulations, i.e., “Show me in the regulations where it says . . .” Because PSM regulations are highly performance-

based it is sometimes difficult to trace a specific finding back to the paragraph that requires the activity that is being found deficient. For example, in the Process Knowledge Management and AI element elements the following two requirements appear:

- “The employer shall document that the equipment complies with recognized and generally accepted good engineering practices.”
- “Inspection and testing procedures shall follow recognized and generally accepted good engineering practices.”

These are very broad, wide-reaching regulatory requirements that can potentially be the basis for many types of findings on both the design/construction as well as the ITPM of the equipment. Auditors should be prepared to show the trail through the relevant RAGAGEPs that generate each finding. Where the finding is based on a broadly common or general industry practice in PSM, i.e., a level of acceptable practice, the auditor must be prepared to explain why the facility practice is not equivalent to that practice. If the auditor cannot establish this direct link, or cannot establish a link that is supportable, this should result in a compliance finding becoming a related finding.

- Statements similar to “Why is this a finding now when it wasn’t a finding three years ago.” As frustrating as this situation is for the facility, there may be a number of reasons why this occurs: different auditors with different specialized skill areas, lack of time in the previous audit to address the issue, different protocol, an actual change in the audited area versus what existed during the previous audit, changes in facility operations or conditions, etc. It happens more often when third parties perform an audit and bring a new perspective, which is sometimes fresh, but also jarring to some degree. This is particularly true when PSM practices at the facility have been in place for a long time and everyone at the facility believes they are the correct practices. Auditors will have to explain the reasons for these differences in results to the facility if they know the reasons. Often, the present audit team will not understand how the previous audit team did their work and cannot speculate on why something was not identified previously.
- Statements challenging findings because a regulator didn’t have the same finding in a recent inspection. The notion in this case is that if the regulators didn’t find fault with an aspect of the PSM program it must be good enough to comply with the governing regulations. The lack of findings by government inspectors is not a firm indication that all is well with a PSM program. Regulators can be from either the federal or state governments, and within states may be from labor, health, or other departments. The perspectives, PSM skills and experience, focus areas, and interpretations between different regulators can vary widely. The PSM audit protocols used by most of the regulators are very general and are usually question versions of the performance-based regulations.

- Statements that indicate that the facility believes that the results of the audit are focusing on minor or trivial matters in what are otherwise thought to be sound PSM programs. While this may appear to the facility that the audit team is being overly picky, an audit that has a preponderance of relatively minor findings can actually be an indicator of a sound PSM program. For example, if there are only a few training records that are missing and there are no apparent systemic problems with the training program, this can be viewed as a positive result. Sometimes, in this type of situation, even if the facility understands the context, there may be some pushback to then ignore the minor findings. Audit teams should resist this temptation because even minor findings are still findings and should be corrected. This reaction can also be an indicator of a flawed process safety culture and the nascent beginning of normalization of deviance. A discussion on evaluating process safety culture is contained in the chapter and also in Chapter 4.
- Statements that reveal surprise and frustration of a finding in a topic that the facility or company personnel had no knowledge about. This can occur in technical areas that are included in the PSM regulations, but are not explicitly defined, e.g., facility siting and human factors in HIRA. They can also occur in the very broad performance-based requirements in Asset Integrity and Process Knowledge Management about following the relevant RAGAGEPs. For example, how positive material identification (PMI) becomes a requirement for facilities with alloy materials of construction. As with the previous example about regulatory application, the auditor should be prepared to lead the facility personnel through the interpretation of how the technical issue became a requirement for the facility. If the auditor cannot do this completely and convincingly, the finding may have to be changed to a related one.
- Statements challenging the need for findings on topics that the facility regularly reports as part of PSM metrics or another PSM evaluation program. An example of this type of pushback is overdue ITPM tasks in the AI program. The site might feel that since they are regularly reporting the number or percentage of tasks that are overdue, these PSM program deficiencies should be exempt from inclusion in PSM audit results. While the presence of a well-designed PSM metrics programs is a positive cultural indicator, the reporting of PSM metrics periodically does not fulfill the requirement in many PSM regulatory programs, as well as voluntary PSM programs to conduct periodic audits. An audit is a formal assessment against a pre-approved and consensus protocol of the quality of the design and implementation of a PSM program. PSM metrics report on the ongoing key performance indicators. The corrective actions and follow-up processes for these two different measurement systems are likely to be different, with different priorities, assignment of responsibilities, and timing.
- The facility believes that its PSM program is a model because it is a VPP Star site. Attaining VPP Merit or Star status represents a significant safety and health achievement for a facility and its parent company, if there is

one. It also represents a very significant amount of work performed over an extended period of time to improve safety and health programs. It required a degree of cooperation between labor and management (if there is a union) that may have been difficult to obtain but was successfully obtained, usually with much hard work. Consequently, there is usually a large amount of facility-wide pride in having achieved VPP Merit or Star status and that pride is well deserved. Also, the on-site and company reputation of the safety and health manager has usually been established as a direct result of this achievement. However, as also presented in Dilemma #3 in Appendix I, VPP program status is not always a good indicator of the quality of a PSM program. It depends on how thoroughly the VPP inspection team reviewed the PSM program. Typically, it is not given a thorough review because of the large number of safety and health program elements that are typically covered in a VPP inspection, and the tendency of most VPP inspection teams to focus more on occupational safety and health issues. If the site is adamant about this point, the auditor should ask to review the original and subsequent VPP inspections to determine if the particular item in question was explicitly reviewed during the VPP inspection process.

- Sometimes an auditor and audit team leader are confronted with a collection of facts that represents a finding, but they know, from previous audits or PSM activities, the possible nature of the corrective actions that will be required, or from the prevailing process safety culture that the finding is a nonstarter. In other words, it will not be received well by either the site or the parent company, and that reception will be along the lines of “We’ve already decided that.” Why are you bringing this up again?” or “There’s no energy for doing that here.” These types of reactions, which are likely to be forceful and frustrated, can have an effect on the decision making process of an audit team, particularly first and second party audits teams, where there may be some organizational relationship between the auditors and the management of the facility. The facility/company may not be aware of recent interpretations, citations, or other factors that may alter a previous conclusion. Valid findings with supporting evidence should be included in the audit report. The audited facility can make a determination of how to respond to the finding.
- Another form of pushback is statements that change during the audit by interviewees. During a one-on-one interview, an interviewee provides verbal information that indicates a possible issue. However, during a daily debrief, when the auditor reports the issue as a possible finding, the same interviewee revises his/her statement that contradicts what was stated during the interview. Most people will feel somewhat uncomfortable when information is being reported in an open forum in the presence of their colleagues and possibly the people to whom they report about possible PSM program deficiencies in areas for which they are responsible. This can sometimes happen at the closing meeting where the facility manager may be hearing the findings for the first time. The

auditor must then reconcile the two different statements. Auditors can help prevent this from occurring by obtaining further information, either from other interviewee results or documented evidence that corroborates the original interview, which is required in any case to declare the issue a finding. Information from one single interview should not be used to create a finding, even a preliminary one. One purpose of the daily debriefs is to bring information about emerging issues to the facility's attention as soon as possible, however, this should be tempered somewhat by reporting preliminary information that might be embarrassing to someone on the facility staff. If the auditor believes that the issue revealed during the interview is important enough that it requires discussion at a daily debrief, then he/she should make it clear to the interviewee that they will be discussing it at the next debrief and why they feel it is so important. At least the interviewee will not then be surprised to hear it in open forum.

- Efforts by the facility to divert the auditors from certain areas, records, or people, or to consume the auditors' time on nonproductive activities. If the audit team senses that these situations are occurring, they must take firm control of the audit agenda and schedule. The audit team leader should be prepared to intercede when this happens. If the audit team cannot be satisfied by the end of the allotted time on-site, findings should be generated that state that certain information was not available for review. It is even more important that requests to the site in situations such as these be made calmly and professionally.

Performing a PSM audit when the process safety culture at a given facility or parent company is poor presents a difficult challenge to the auditors. Repeated (and sometimes emotional) statements like "Doing this will put us out of business . . ." will sometimes result from this culture. See the discussion below and Chapter 4 for additional indicators of poor process safety culture and guidance on assessing it. When these indicators are present, the pushback experienced by the audit team will be more frequent, and often stronger. In these cases, the audit team leaders will find themselves acting as a referee frequently during the audit and some issues may not be resolvable at the facility.

In individual interviews, daily meeting, closing meetings, the audit report, or any other forum where the audit results are being communicated, the audit team must be able to explain their findings clearly and thoroughly with supporting facts, and must do so in a professional manner, even when challenges result. The auditors must be sure that they correctly understand the objections of the facility. The evidence they are using to draw their conclusions must be sufficient and adequate as described previously. If the audit team has its facts straight and has correctly interpreted how those facts result in a finding given the governing requirements, challenges, when and if they occur, can be met calmly and rationally.

2.3.5.8 Evaluating Process Safety Culture

Process safety culture is a critical component of any PSM program. The common attitudes, work habits, customs, and assumptions about process safety create the environment in which the PSM program exists will determine, to a large degree, whether a well-designed PSM program can be successfully implemented. Even if examining the process safety culture is not a formal part of the scope of a given audit, the auditors need to understand the underlying culture in which the PSM program operates at the facility and its effects. The culture will have a profound impact on whether the management systems in place at the facility and the internal controls they are intended to impose are functional. Indicators of poor process safety culture include: widespread belief across the spectrum of employees that catastrophic releases can't happen at the facility, allowing the normalization of deviance, clear indications from senior site managers that PSM is not a priority, minimalist PSM policies, practices, and procedures. This often culminates in the type of pushback from the facility described above.

To accomplish a meaningful audit of this topic will require an examination of values. This is more difficult than assessing the other PSM program elements because it will involve collecting a great deal of opinion rather than just objective facts. The examination of actual behaviors is more straightforward and uses traditional auditing techniques because it involves reviewing and evaluating the factual results that result from those behaviors.

In order to formally evaluate this vital topic, auditors will need to collect information mostly from interviews and, to some degree from record review. Chapter 4 provides additional detail about auditing process safety culture and provides some objective measures of whether the culture is sound.

2.3.6 Formulating Recommendations

If the audit team is responsible for formulating recommendations, this activity usually begins on-site. Sometimes the preliminary recommendations are formulated on-site, and sometimes the audit team is responsible for reaching consensus with the facility and producing the final recommendations. PSM audit recommendations tend to be programmatic in nature rather than related to modifying the design of the equipment, although some of them may involve evaluation of confirmation of the design or that the equipment conforms to the governing RAGAGEPs. There may also be a significant number of audit recommendations that relate to the inspection, testing, and preventive maintenance of the equipment. Therefore, the recommendations may require a significant amount of engineering or technical work to resolve. Also, since many audit recommendations will be focused on correcting deficiencies in PSM program policies, practices, and procedures, or the documentation of process safety activities this can affect the interpretation of what "timely" means when resolving and implementing audit recommendations. The following guidance is provided for this task:

- PSM audit recommendations should be consistent with as low as reasonably practical or ALARP principles so that resources are applied

wisely and the findings that are commensurate with the highest risks receive the most attention.

- Recommendations should be worded completely but concisely so that they can be removed from the worksheet and still be understood. Recommendations become action items that other people will have to resolve. The recommendations should be read and then judged if they can “stand alone.” For example:
 - Incomplete: “Consider changing operating procedures”
 - Complete: “Consider changing the operating procedures to provide a warning statement to check the level in V-21 before opening the olefins feed valve”
- If another recommendation has already been made that will correct a second finding, then a reference to the previous recommendation, and/or, a statement that “No further recommendations” or similar wording can be used if desired. The recommendation column or section of the audit worksheet or finding sheets should not be left blank.
- There may be findings for which no corrective action is necessary. This can be a valid response to an audit finding. For example, if the previous PSM audit was not certified as required by regulation, and the PSM audit procedure addresses this topic clearly, a recommendation to certify it three years later will not have any real meaning. If, however, the PSM audit procedure does not mention certification and does not specify a method and format for certifying the audits, then a recommendation to provide such guidance in the procedure would be pertinent. This helps correct a systemic problem. If it is determined that no action is necessary as the result of an audit finding then this should be clearly noted to avoid reviewers reaching the conclusion that the finding was ignored. Again, this type of entry is preferable to leaving the recommendation column/section blank.
- Recommendations should not be in the form of a question. If there is detailed research or other similar work that must be performed before a final corrective action can be recommended, then the recommendation from the audit can be to “investigate” or “evaluate” some technical area. For example, if the design of the relief system is suspected of not being in accordance with the governing RAGAGEP (e.g., API RP 520), then the recommendation should be to compare the design against the contents of the RAGAGEP and correct any deficiencies found. The recommendation should not be simply a question that leaves the issue of the relief system design in the air.
- Audit recommendations to complete the examination of a group of records to uncover further deficiencies beyond those found by the audit team in their sampling plan are appropriate. If the audit team sampled a dozen P&ID sheets and discovered errors on all twelve, a recommendation for the facility to check the remainder and correct any deficiencies found would be appropriate.

- Recommendations should not duplicate other process safety practices, policies, or procedures that are designed specifically to be ongoing activities and are already specified by procedure or policy. For example, if an Asset Integrity and Reliability finding is that inspection, test, and preventive maintenance tasks are overdue, making a recommendation to simply “perform ITPM tasks on time” does not provide any guidance to the facility on how to correct the root cause of the finding, and repeats a written requirement that already exist at the facility, i.e., the published ITPM schedule. A recommendation to correct the root causes(s) of the finding should be made, for example, changing the ITPM scheduling practices so that more senior management review is required if certain ITPM tasks are deferred, or if the problem is severe or chronic categorizing overdue ITPM task as AI program deficiencies that require a formal and documented resolution process.
- The use of imperative language for audit recommendations can be applied to the basic action needed to correct the finding without constraining the facility or company to a particular solution. However, the use of imperative language for the “how” part of the recommendation should be used carefully. Many PSM practitioners prefer to use predicating terms such as “Consider...” to describe the detailed actions that are necessary to correct the problem. This provides the facility/company with the flexibility to modify initial recommendations more easily. However, an important caution is needed as part of this guidance—prefacing an audit recommendation with the word “Consider” *does not* mean that the recommendation is optional, and that doing nothing is an acceptable course of action. It also *does not* mean that simply thinking about how to correct the deficiency without actually taking concrete action is an acceptable way to resolve the recommendation. It does mean that the idea stated in the report can be modified if a better idea is formulated and proposed later. The finding still has to be corrected. For this reason, some auditors prefer to use terms such as “Consider . . .” only for related recommendations associated with findings from related criteria/questions, and use imperative wording for compliance-related recommendations. The use or nonuse of prefacing terms such as “Consider” are both valid approaches to wording audit recommendations. Whichever approach is chosen it should be applied consistently, and rules should be established in the PSM audit management system procedure that define what they mean and how they are to be used. An example of the use of prefacing statements in the wording of audit recommendations is as follows:
 - *Finding.* The olefins unit HIRAs do not include a qualitative evaluation of the range of safety and health effects.
 - *Recommendation.* At the next revalidation of the olefins unit HIRAs include a qualitative evaluation of the range of safety and health effects of the hazard scenarios identified during the study. Consider using a qualitative 5 X 5 severity, likelihood, and risk ranking

scheme as published by CCPS *Guidelines for Hazard Evaluation Procedures, 3rd ed.* (CCPS, 2007b).

PSM audit recommendation should be subjected to the same review process that has been described for findings (see Section 2.3.5). Since most audit teams formulate recommendations as part of their scope of work, they can be vetted in the same way and at the same time as the findings. If the recommendations are formulated after the audit team leaves the site, the review process described for findings will have to be modified for the recommendations because the audit team will not likely be able to convene again as a group, although the review of the recommendations by other members of the team can be managed using e-mail or conference call if necessary.

2.4 POST-AUDIT ACTIVITIES

Post-audit activities consist of the following:

- Preparing and issuing the audit report.
- Formulating action plans.
- Disposition of written information generated or collected during the audit.

2.4.1 Preparing the Audit Report

After the on-site audit work is complete, the audit team must complete its report and sometimes monitor the completion of an action plan to address audit findings. The audit team usually prepares a draft report, resolves comments as the report is reviewed, and then issues the final report. Some companies prepare a draft of the audit report on-site, but this will require additional time on-site to prepare the document after the audit team thoroughly vets the findings and recommendations. The draft report, which consists of the detailed results and a text report summarizing the entire activity, is usually written or supervised by the audit team leader. The detailed results describe the findings and recommendations (if recommendations are included in the scope of a given audit) and are usually contained in completed audit protocol worksheets, detailed findings sheets, or a similar type of record. Each auditor is usually responsible for completing the protocol worksheets for the PSM program elements they were assigned to audit and submitting them to the audit team leader. The draft undergoes review and comment before a final report is issued. Each company will have its own review process for audit reports. In most cases, the audit team and the audited facility have an opportunity to review the report at the draft stage. In many companies, reviewers include a predefined group, which may include other experienced auditors (peer reviewers), technical and regulatory specialists, and sometimes the company's legal staff. The purpose of the review process is to assure that the report is clear, concise, and factual. Section 1.8.3 provides detailed guidance on the content and language of audit reports.

If the audit worksheets are going to be included in the audit report, the following guidance is provided to help make them a more useful product:

- The final entries should be complete statements and avoid the use of unknown acronyms and jargon. The final worksheets should not be in the form of shorthand field notes if there are to be part of the report.
- Avoid the extensive use of referencing statements in the audit worksheets, such as “Same as Question #B.3.1.” Audit worksheets will be difficult to follow if this practice is used extensively. Each audit question/criteria, its answer (if the question format is used), explanation(s), and recommendation(s) should be a self-contained set of information (i.e., a finding) to the extent possible. The only common exception to this practice is in the Recommendation column of the worksheets where a recommendation that applies to multiple findings. Sometimes a reference is made to the first place in the audit report/worksheets where the recommendation is entered for all instances where that recommendation is applicable. This is because audit recommendations are often extracted from the audit report or worksheets and are deposited in a separate tracking system or database and repeated recommendations are not desired in this separate system.
- Blanks should not be left in the audit worksheets unless the reason for the blank entry is very obvious. For example, the Answer column of the worksheet (if audit questions are being used) should never be blank. If the audit question is not applicable or for some reason was not used, at a minimum, the Answer column of the worksheet should indicate that. Also, the reason or rationale for questions that are answered “not applicable” and “not used” should be recorded unless it is clearly obvious why this is so. For example, if the question applies only oil and gas exploration and production operations, and the facility being audited is a specialty chemical plant, it would not be necessary to explain why the question is not applicable.

2.4.2 Formulating Actions Plans

As with other process safety activities, PSM audits will result in recommendations that then become action items. Within the context of PSM audits these are sometimes referred to as corrective actions. The action items/corrective actions are the specific things done by the facility or company to correct the findings.

Subsequent to issuance of the audit report, the audited facility or unit should prepare an action plan for resolution of the recommendations as described in Section 1.9.1. If the audit generated findings that require urgent action, then the recommendation(s) associated with these findings should be addressed even before the final audit report is issued and the action plan is formulated. The action plan should indicate what is to be done, who is responsible for doing it, and when it is to be completed. The action plan is an important step, both ensuring and demonstrating that audit findings are being addressed. Section 1.9.2 provides further guidance on the follow-up of PSM audits and how the resolution and implementation process for action items is managed. In most PSM audits, the action plan is developed after the on-site portion of the audit. However, in some

cases, this step in the audit process is accomplished while the audit team is still on-site, in which case, adequate time must be provided in the audit schedule to allow for vetting of the audit team's recommendations and then the negotiation, and agreement on the final corrective actions and their due dates.

The role of the auditors with respect to the action plan differs among companies. In some companies the auditors receive copies of the action plan as well as periodic (e.g., monthly or quarterly) progress updates and are responsible for tracking the resolution of exceptions. In other companies, the auditors receive a copy of the action plans simply to complete their files, and then have no further role (until the next audit). Auditors are sometimes asked to review the action plan to ensure it addresses the intent of the findings. While either approach can be effective within the context of a well-designed program, it is always the responsibility of facility management, and not the auditors, to develop and implement the action plan. Some companies use verification or confirmation auditors to monitor the process being made against the action plan (see Section 1.9.3), while other companies require that such progress be reported periodically without external verification. When third party auditors have been used to perform the audit, they usually end their involvement in the process with the submission of the final audit report.

2.4.3 Disposition of Field Notes/Working Papers

Auditors' working papers, field notes, and other supporting documentation usually do not become part of the permanent audit report or record. These documents and records are used in preparation of the final report. After the issuance of the final report they should be disposed of properly. This includes the deletion of electronic versions from the auditor's computers. If auditors are subject to the recordkeeping requirements of the company or facility being audited, they should follow such requirements for disposition of their records. However, if the company or facility does not specify requirements for disposition of field notes and working papers, the above guidelines should be followed (see Section 1.8.4).

2.5 SUMMARY

The use of sound audit techniques is crucial to an efficiently conducted, thoroughly performed audit. Both the audit techniques and the procedures that describe them should be carefully designed to achieve consistency between auditors within a given audit, as well as between different PSM audits. In addition, auditors must understand the purpose, scope, and guidance of each audit and the techniques that best achieve these goals. This understanding is attained through a combination of training and most importantly, through experience.

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3

PSM APPLICABILITY

This element is called “application” in the OSHA PSM Standard. In many state regulatory PSM programs it is also called applicability. It is called applicability here based on popular usage. In the voluntary consensus PSM programs, applicability is not explicitly included as an element of the program. PSM applicability is an element of the RBPS accident prevention pillar Commit to Process Safety. RMP applicability is covered in Chapter 24.

3.1 OVERVIEW

In order to establish an effective process safety program, one must first determine which facilities, units, processes, or activities will be included in the program. Applicability may be dictated by federal, state, or local regulation; company policy; or voluntary consensus standards. An effective audit will include an examination of the process safety program boundaries at a particular facility to be sure they have been appropriately defined. The purpose of this chapter is to provide guidance that will allow an auditor to assess the decisions that have been made with respect to PSM program applicability.

In Section 3.2, both compliance and related audit criteria are presented, along with guidance for auditors in applying the criteria. A full explanation of compliance and related audit criteria is presented in Chapter 1 (see Section 1.7). The inclusion of the related criteria in no way infers that these criteria must be implemented for a PSM program to be successful, nor does it infer that a PSM program will be deficient without them.

3.2 AUDIT CRITERIA AND GUIDANCE

The detailed requirements for the applicability of OSHA’s PSM Standard, EPA’s RMP Rule, and several state PSM regulatory programs, as well as other common voluntary consensus PSM programs, are presented in this section. The audit

criteria described below are examined by auditors using the guidance and performing the following audit activities:

- Interviewing the person(s) at the facility who have the responsibility for determining PSM applicability (usually the PSM Manager/Coordinator) and those personnel who were involved in making the final decisions regarding the applicability of the PSM program.
- Reviewing records that describe what units, processes, or equipment are included and *not included* in the PSM program and the rationales for those decisions. This information, if it has been formally documented, is often found in the facility PSM Applicability Procedure, PSM general procedure, or introduction/first section of the PSM manual. Other records and documents that will help determine if the boundaries of the PSM, RMP, or voluntary consensus program have been properly determined include the following:
 - List of all chemicals at a facility (may need to limit based on on-site quantity)
 - List of covered chemicals
 - List or brief description of all processes at a facility
 - List or description of PSM-covered processes and equipment
 - Rationale for covered and noncovered processes
 - Rationale for any claimed regulatory exemptions
 - Description of process safety management system.
- Carefully touring the facility to observe how and where toxic, reactive, and flammable chemicals are used and stored.

Auditors should also carefully examine the PSM applicability requirements found in the procedures of the company/facility being audited. As stated in Section 1.7.1, these could be interpreted as compliance requirements by regulators and could be subject to citations if they are not being followed. Auditors should confirm, via interviews, records and document reviews, and field observations, that the requirements of the facility or company PSM applicability procedures have been implemented as specified. Findings should be generated if the company/facility-specific provisions are not followed.

See the Guidance for Chapters 3–24 in the Introduction for the definition of the abbreviations shown in this chapter's tables used to indicate the source of the criteria.

3.2.1 Compliance Requirements

3.2.1.1 U.S. OSHA PSM

The audit criteria, shown in Table 3.1, should be used by the following:

- Readers in the United States covered by the PSM Standard or RMP Rule
- Readers who have voluntarily adopted the OSHA PSM program

- Readers whose companies have specified OSHA PSM requirements in non-U.S. locations.

Table 3.1 lists the audit criteria and auditor guidance related to PSM Applicability pursuant to OSHA PSM.

Table 3.1 U.S. OSHA PSM Audit Criteria Guidance

Audit Criteria	Source	Guidance for Auditors
<p>3-C-1. All processes that involve a chemical listed in Appendix A of 1910.119 at or above the threshold quantities specified in the standard are included in the PSM program.</p>	<p>PSM [(a)(1)(ii)]</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • OSHA PSM definition of "process": any activity involving a highly hazardous chemical including any use, storage, manufacturing, handling, or the on-site movement of such chemicals, or combination of these activities. For purposes of this definition, any group of vessels that are interconnected and separate vessels that are located such that a highly hazardous chemical could be involved in a potential release shall be considered a single process. • "Interconnected" means hard piping or flexible hoses. Valves do not constitute isolation of connectivity, but blinds or spool pieces do disconnect inventories of high hazardous chemicals. Also, there are no minimum times for connections to be in place for processes or equipment to be considered interconnected. For example, temporary connections that exist only to manufacture one product for several weeks per year would constitute interconnectivity. • "Located" means any other process or equipment containing highly hazardous chemicals in close proximity to another process or equipment containing the same highly hazardous chemicals such that an event in one of the processes or equipment can cause the release of the highly hazardous chemicals in the other processes or equipment. "Co-located" is often a term

Audit Criteria	Source	Guidance for Auditors
		<p>Table 3.1 – Continued</p> <p>used to describe the same situation. For example, a near-by single fire or explosion could simultaneously compromise both inventories. Generally, any tanks or vessels that share the same secondary containment should be considered to be co-located.</p> <ul style="list-style-type: none"> <li>• Appendix A of the PSM Standard contains several materials that are typically used commercially in mixtures with water; however, Appendix A specifies that only the anhydrous form of the material needs to be considered when determining PSM applicability. These materials are: HCl, and HF (Appendix A specifies hydrogen chloride, and hydrogen fluoride). <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> <li>• Auditors should review PSM program procedures, policies, and practices to determine if the PSM program boundaries have been established so as to include all the toxic or reactive materials that are listed in Appendix A of the PSM Standard that meet or exceed the threshold quantities (TQ). <li>• Auditors should review facility chemical lists to see if processes using Appendix A chemicals are included in the program. If not, the rationale for exclusion should be reviewed. <li>• Auditors should perform field observations to confirm that processes and equipment containing Appendix A materials at or above the TQs that have been included in the PSM program. <li>• Auditors should take a thorough tour of the site, make note of any containers of PSM-covered toxic/reactive materials, and check to determine if the PSM elements have been applied to

Audit Criteria	Source	Guidance for Auditors
<p>3-C-2. All processes that involve a flammable liquid or gas on-site in one location, in a quantity of 10,000 pounds are included in the PSM program.</p>	<p>PSM [(a)(1)(ii)]</p>	<p>those processes.</p> <p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • See criteria 3-C-1 for a definition of "process" and its important terms. Highly hazardous chemicals include flammable materials. • For the purposes of the OSHA PSM Standard, flammable is defined in the HAZCOM regulations (1910.1200) as: a liquid: with a flashpoint less than 100 degrees F, or a gas with an LFL which is less than or equal to 13% by volume, or an LFL-UFL difference of greater than or equal to 12% by volume regardless of LFL. • A mixture of liquid materials is considered flammable and included if the flash point of the mixture is less than 100 degrees F, except any mixture having components with flashpoints of 100 degrees F or higher, the total of which make up 99 percent or more of the total volume of the mixture. This includes mixtures of hydrocarbons and water. The flammability of a mixture should be confirmed via testing and/or engineering calculations. Also, the mixture in question cannot become flammable due to varying, abnormal, or upset process conditions. • OSHRC ruling (the Meer Case): Flammable liquids stored in atmospheric storage tanks without benefit of active cooling that are connected to an otherwise covered process do not have to be considered part of the covered process, although some earlier OSHA verbal and written clarifications indicated otherwise. • OSHRC ruling (Motiva Corporation): Interconnections between a facility with more than 10,000 lbs of flammables to a facility with less than 10,000 lbs of flammables do not invoke PSM coverage for the

Audit Criteria	Source	Guidance for Auditors
		<p>Table 3.1 – Continued</p> <p>facility with less than 10,000 lbs unless an event in one of the facilities can affect the other. For example, a truck loading rack located at some distance from a refinery that supplies would not be covered by PSM if the rack facility did not have greater than 10,000 lbs of flammable materials. The interconnectivity and proximity considerations should be in processes/equipment on contiguous property to invoke coverage.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review written PSM program procedures, policies, and practices to determine that the PSM program boundaries have been established so as to include all of the flammable materials that are required to be included by the PSM Standard that meet or exceed the 10,000 lb threshold quantities (TQ). • Auditors should review facility chemical lists to see if processes using flammable chemicals are included in the program. If not, the rationale for exclusion should be reviewed. • Auditors should conduct field observations to confirm that processes and equipment that contain PSM flammable materials at or above the TQs have been included in the PSM program. • Auditors should take a thorough tour of the site, make note of any containers of PSM-covered flammable materials, and check to determine if the PSM elements have been applied to those processes.
3-C-3. Facilities that manufacture explosives and pyrotechnics are PSM covered.	1910.109 (k)(2), (3)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The use or storage of explosives does not invoke PSM coverage; only the manufacture of them does. Unless auditors are performing

Audit Criteria	Source	Guidance for Auditors
		<p>a PSM audit of an explosives manufacturing facility, it is not likely that they will encounter the manufacture of explosives in other chemical/processing facilities.</p> <ul style="list-style-type: none"> In the United States, explosives are defined in 29 CFR §1910.109 (OSHA) and in 49 CFR Chapter I and 49 CFR §172.101 (DOT). <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> If the facility manufactures explosives, auditors should take a thorough tour of the site, make note of any containers of explosives, and check to determine if the PSM elements have been applied to those processes. This would include both manufacturing and storage areas for explosives.

Audit criteria for the applicability provisions of the RMP Rule are described in Chapter 24.

3.2.1.2 U.S. State PSM Programs

If the PSM program being evaluated is pursuant to a state PSM regulation, then the specific applicability requirements for that regulatory program should be followed. In general, these overlap somewhat with the federal OSHA PSM and EPA RMP requirements, but often there are state-specific requirements, even if the state has received authority to enforce federal regulations (i.e., the state is an OSHA state plan state or has received implementing agency status for the RMP Rule from EPA). The state-specific applicability requirements are presented for the following state:

- New Jersey
- California
- Delaware

Table 3.2 lists the audit criteria and auditor guidance related to PSM Applicability pursuant to state regulations.

Table 3.2 U.S. State PSM Audit Criteria Guidance

Audit Criteria	Source	Guidance for Auditors
<p><i>New Jersey Toxic Catastrophe Prevention Act (TCPA)</i> 3-C-4. An owner or operator of a stationary source that has an amount greater than or equal to a threshold</p>	<p>N.J.A.C. 7:31-1.1</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The NJ TCPA regulations include materials that were designated by the original TCPA

Audit Criteria	Source	Guidance for Auditors
<p>Table 3.2 – Continued</p> <p>quantity of a regulated substance in a process, as determined under §68.115 as determined under N.J.A.C. 7:31-6, shall comply with the requirements of this part. New Jersey has received implementing agency status from U.S. EPA for the RMP Rule in the state of New Jersey. Therefore, the RMP Rule has been combined with New Jersey's TCPA regulation. Several provisions of the original TCPA regulation have remained in effect because the enabling legislation for the TCPA requires these provisions. This includes the applicability of the combined RMP/TCPA Rule and the list of covered chemicals.</p>		<p>enabling legislation. Some of these materials are not included in the federal RMP Rule or have different threshold quantities (TQs). See N.J.A.C. 7:31-6.3, Table 1, Part A.</p> <ul style="list-style-type: none"> • The NJ TCPA regulations include reactive materials, both as individual materials and functional groups of materials. See N.J.A.C. 7:31-6.3, Table 1, Part D. The TQ for reactive materials and groups is determined by their heat of reactions. • Reviews of written TCPA program procedures, policies, and practices indicate that the TCPA/RMP program boundaries have been established so as to include all materials listed in N.J.A.C. 7:31-6.3 that meet or exceed the TQ. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct field observations to determine if the processes and equipment that contain TCPA materials at or above the TQs have been included in the TCPA program. • Auditors should take a thorough tour of the site, make note of any containers of TCPA-covered materials, and check to determine if the other TCPA elements have been applied to those processes.
<p><i>Delaware Accidental Release Prevention Regulation</i></p> <p>3-C-5. An owner or operator of a stationary source that has more than a threshold quantity of a regulated substance in a process, as determined under Section 5.115, shall comply with the requirements of this regulation. Delaware has received implementing agency status from U.S. EPA for the RMP Rule in the state of Delaware. Therefore, the RMP Rule has been combined with Delaware's EHS regulation. Several provisions of the original EHS regulation have remained in effect because the enabling legislation for</p>	<p>Delaware Code, Chapter 77, Section 5.10</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The applicability and TQ determination guidance for Delaware's EHS regulation are the same as described for the federal RMP Rule. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review written Delaware EHS program procedures, policies, and practices indicating that the EHS/RMP program boundaries have been established so as to include all of the materials that are listed in Chapter 77, Section 5.10 that meet or exceed the

Audit Criteria	Source	Guidance for Auditors
the EHS requires these provisions.		<p>TQs.</p> <ul style="list-style-type: none"> • Auditors should conduct field observations to determine if the processes and equipment that contain EHS materials at or above the TQs have been included in the Delaware EHS program. • Auditors should take a thorough tour of the site, make note of any containers of EHS-covered materials, and check to determine if the other EHS elements have been applied to those processes.
<p><i>California OSHA—Process Safety Management of Acutely Hazardous Materials</i></p> <p>3-C-6. Guidance:</p> <ul style="list-style-type: none"> • These regulations shall apply to a process which involves a chemical at or above the specified threshold quantities listed in Appendix A or a process which involves a flammable liquid or gas. California uses the same definition of flammable as OSHA. • Flammable liquids stored or transferred in atmospheric tanks that are kept below their normal boiling point without benefit of chilling or refrigeration are exempted. • Hydrocarbon fuels used solely for workplace consumption (e.g. comfort heating propane, gasoline for motor vehicle refueling) if such fuels are not part of a process containing another acutely hazardous chemical covered by section 5189. • These regulations do not apply to retail facilities. • These regulations do not apply to oil or gas well drilling or servicing operations. • These regulations do not apply to normally unoccupied remote facilities. • Explosives manufacturing 	<p>California Code of Regulations, Title 8, Section 5189</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The applicability and TQ determination guidance for the CalOSHA PSM regulations are the same as described for the OSHA PSM Standard.

Audit Criteria	Source	Guidance for Auditors
<p>Table 3.2 – Continued operations shall comply with the provisions of Article 119 and these orders.</p> <ul style="list-style-type: none"> • The installation of explosive devices, such as explosive bolts, detonating cords, explosive actuators, squibs, heating pellets, and similar small exploding devices into finished products or devices that are not intended to explode and the repackaging of explosives are not considered manufacturing operations and are not covered by Section 5189. • Explosives pre -manufacturing and post -manufacturing research and testing activities listed below are not covered by Section 5189 provided they are conducted in a separate, nonproduction research or test area or facility, and do not have the potential to cause or contribute to a release or interfere with mitigating the consequences of a catastrophic release from the explosive manufacturing process: <ul style="list-style-type: none"> – Product testing and analysis which is not a part of any production sampling and testing of the explosive manufacturing process; – Chemical and physical property analysis of explosives and propellants and pyrotechnics formulations; – Scale -up research chemical formulations to develop production quantity formulations; – Analysis of age tests conducted on finished products; – Failure analysis tests conducted on pre-manufactured or finished products; – X -raying; – Quality assurance testing 		

Audit Criteria	Source	Guidance for Auditors
<p>(not including the extraction of samples from an active explosive manufacturing production process);</p> <ul style="list-style-type: none"> – Evaluating environmental effects, such as hot, cold, jolt, jumble, drop, vibration, high altitude, salt and fog; and – Assembly of engineering research and development models. 		
<p><i>California Accidental Release Prevention Program (CalARP)</i> 3-C-7. CalARP requirements:</p> <ul style="list-style-type: none"> • The requirements of this chapter apply to an owner or operator of a stationary source with more than a threshold quantity of a regulated substance in a process. Regulated substances are listed in three separate tables in Section 2770.5 of the Rule. • If a stationary source has a process with more than a threshold quantity of a regulated substance as listed in Table 1 or 2 of Section 2770.5, the owner or operator shall comply with the provisions of the Rule. • If a stationary source has a process with more than a threshold quantity of a regulated substance as listed in Table 3 of Section 2770.5, and the AA makes a determination pursuant to Section 25534 of HSC that an RMP is required, the owner or operator shall comply with the appropriate provisions of the Rule. • If a stationary source has a process with more than a threshold quantity of a regulated substance as listed in Tables 1 or 2 and Table 3 of Section 2770.5, the owner or operator shall comply with the provision of the Rule. 	<p>California Code of Regulations, Title 19, Section 2735.4</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The applicability and TQ determination guidance for the CalARP Rule are the same as described for the federal RMP Rule, except that the CalARP Rule also includes solids and other hazardous materials that must be included in RMP programs in California. These additional materials are described in Section 2770.5, Table 3 of the Rule.

3.2.2 Related Criteria

The purpose of providing these related criteria is to give auditors additional guidance for evaluating PSM programs with respect to issues that go beyond the strict compliance requirements presented above, and in large part represent industry good practices regarding the scope and applicability of PSM programs, or in some cases applicability practices that have become common. Some of the related criteria have reached the status of a level of acceptable practice because of their widespread, accepted, and successful use over an extended period of time. Auditors and PSM practitioners should carefully consider implementing this guidance, or at least designing an approach that is similar in nature. See the Glossary and Section 1.7.1 for a more complete discussion of the meaning and use of level of acceptable practice. Table 3 presents related audit criteria regarding PSM Applicability.

Table 3.3 Related Audit Criteria - PSM Applicability

Audit Criteria	Source	Guidance for Auditors
<p>3-R-1. The PSM program is applied to the equipment, processes, systems, and operations that have the risk potential to cause process safety incidents at the facility if released.</p>	<p>WCLAR (2/28/97) RBPS GIP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The equipment, processes, systems, and operations included in the scope of the Table 3.3 – Continued PSM program should be based on the risk as identified in the HIRAs, risk assessments, LOPAs/SIL analyses, or other analytical activities that are designed to identify and prioritize the process safety related hazards/risk associated with the equipment and its operation. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HIRAs, risk assessments, LOPAs/SIL analyses, or other analytical activities and compare the results of these studies to the boundaries of the PSM program to determine if the application of the PSM program is appropriate to the process safety risk. The applicability may be extended to processes or equipment containing materials that extend beyond those listed in the PSM Standard if the risk from the release of those materials warrants inclusion.

Audit Criteria	Source	Guidance for Auditors
3-R-2. Commercial grade solutions of highly hazardous chemicals are used as a threshold for determining applicability.	CPL	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Commercial grades are pure or nearly pure for many materials. However, some common materials that are included in Appendix A of the PSM Standard, e.g., nitric acid and hydrogen peroxide are available in a range of concentrations. OSHA intends for the list of chemicals in Appendix A of the regulation to apply to the pure or commercial grade of that chemical. The commercial grade is the maximum concentration of the Appendix A chemical that is commercially available and shipped. The catalogues of the manufacturers and distributors of these chemicals should be consulted to determine the commercial grade. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> If a facility has not included a highly hazardous chemical in its PSM program, auditors should check the solution strength or concentration of the material on-site and then compare it to a catalogue for the manufacturer or distributor of that material to determine if the on-site materials meets or exceeds the commercial grade listed.
3-R-3. The term "commercial grade" includes reagent grades.	WCLAR (3/21/94)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> In cases where different maximum concentrations for commercial and reagent grades are typically shipped, the lower of the two maximum concentrations (and any concentration greater) is intended to be covered by the PSM standard.
3-R-4. Storage areas for highly hazardous chemicals are excluded from consideration on the basis of segregation only if events in one storage area cannot affect another storage area and the threshold quantity is not exceeded.	CPL	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> If a storage area of toxic, reactive, or flammable materials has been segregated administratively (i.e., by procedure) from other Appendix A chemicals or flammable materials, it should not be close enough so that an event

Audit Criteria	Source	Guidance for Auditors
		<p>Table 3.3 – Continued</p> <p>in the excluded storage area involving the subject materials could affect other storage areas of PSM-regulated materials.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct field observations to determine if the administrative controls that are in place to manage the highly hazardous chemical inventory of processes, equipment, or storage areas below the TQs are working properly. • Auditors should take a thorough tour of the site, make note of any containers of Appendix A chemicals or flammable materials, and check to determine if the administrative controls are actually working as specified and that the inventories do not exceed the TQs in any storage area so treated.
<p>3-R-5. Groups of vessels containing toxic/reactive highly hazardous chemicals that are separate but interconnected and which are located such that a highly hazardous chemical could be involved in a potential release are considered as a single process.</p>	CPL	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • When determining whether a PSM TQ has been exceeded for an Appendix A chemical or flammable material, inventories in interconnected vessels containing these materials should be accumulated and compared to the TQs. • Flammable materials in interconnected vessels are evaluated differently in that vessels/tanks used to store flammable materials at atmospheric pressure without the benefit of active cooling are not to be counted when determining if the 10,000 lb TQ for flammable materials has been met. This is the Meer case decision by the OSHRC. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct field observations to determine if equipment that is separate but interconnected has been included in the PSM program if it contains Appendix A

Audit Criteria	Source	Guidance for Auditors
		<p>chemicals or flammable materials and the inventory is at or above the 10,000 lb TQ.</p> <ul style="list-style-type: none"> Auditors should take a thorough tour of the site and make note of any interconnected containers of Appendix A chemicals or flammable materials check to determine if the other PSM elements have been applied to that equipment.
<p>3-R-6. Hazardous waste treatment, storage and disposal [TSD] facilities permitted under the Resource Conservation and Recovery Act (RCRA) are included when PSM threshold quantities are exceeded.</p>	<p>CPL</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Coverage of processes, equipment, or materials under RCRA (or any other EHS regulation) does not, by itself, affect PSM applicability. If the facility materials that trigger RCRA coverage are also Appendix A chemicals or flammable materials (either toxic, reactive, or flammable) and the amounts on-site exceed the PSM TQs, then the processes/equipment containing these materials should be included in the PSM program. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should conduct field observations to determine if hazardous waste treatment, storage and disposal (TSD) facilities permitted under RCRA have been included in the PSM program if they contain highly hazardous chemicals or flammable materials and the inventory is at or above the 10,000 lb TQ. Auditors should take a thorough tour of the site and make note of any RCRA containers of flammable materials and check to determine if the PSM elements have been applied to those containers or equipment.
<p>3-R-7. Facilities containing highly hazardous chemicals can be exempted as normally unoccupied and remote facilities if other facilities or employees are unaffected by an event at the unoccupied remote facility.</p>	<p>CPL WCLAR (12/10/93) (5/29/98) (2/16/05)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> In order to claim the PSM exemption for a facility being unoccupied and remote, an event at the facility for which the exemption is claimed cannot, due to proximity, affect another

Audit Criteria	Source	Guidance for Auditors
		<p>Table 3.3 – Continued facility and its employees.</p> <ul style="list-style-type: none"> If a facility has been exempted from the PSM program because it is considered remote and unoccupied, the occupancy rate should be less than 1.5 hours/workday and 14.5 hours/workweek and the site is not the permanent assigned work location of an employee. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should take a tour of any facility or part of it that is claimed to be remote and unoccupied to determine its occupancy rate, its status as an assigned work location, and whether any event at the remote location can affect other processes or equipment included in the PSM program.
<p>3-R-8. Laboratory/research operations involving at least the threshold quantity of one or more toxic/reactive highly hazardous chemicals are included in the PSM program.</p>	CPL	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Laboratories are not considered exempt from PSM applicability because of the nature of their operations, which often involve the use of toxic, reactive, and flammable materials in small quantities even if they are not production facilities. Pilot plants, which are generally larger than laboratories and smaller than production facilities, are not exempt from PSM applicability simply because they are research facilities. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should tour all labs and pilot plants to determine if the TQs for any Appendix A chemicals or flammable materials have been met or exceeded in any container in these facilities (keeping in mind the definition of “process”). If so, the auditor should check to see if the other PSM elements have been applied to the labs or pilot plants.

Audit Criteria	Source	Guidance for Auditors
3-R-9. Toxic/reactive highly hazardous chemicals in Appendix A of the PSM Standard are considered individually when determining whether the toxic TQs have been met or exceeded.	WCLAR (7/18/94)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Inventories of combinations or mixtures of toxic/reactive highly hazardous chemicals are not used to determine if the TQ has been met, except where Appendix A of the PSM Standard specifies a mixture or concentration for the material. Appendix A chemicals are considered individually and the commercial grade concentration is used to determine PSM applicability.
3-R-10. Paint cans, aerosols, and paint mixing and blending operations are included within the scope of the PSM Standard when the threshold quantity for flammable materials is exceeded.	CPL	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Warehouse storage of flammable materials in paints (i.e., solvents) should be included in the PSM program if the final paint products have flash points less than 100 degrees F and the quantity of the materials exceeds the 10,000 lb TQ for flammables in one storage location such that a single event could involve more than 10,000 lb. However, paint storage may fail under the atmospheric storage exemption. The warehouse storage of paints in pressurized aerosol cans would be included in the PSM program if the propellants in the aerosol cans are flammable gases as defined by the HAZCOM regulations and the quantity of the propellants exceeds the 10,000 lb TQ for flammables in one storage location such that a single event could involve more than 10,000 lb. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should tour any paint manufacturing or storage facility to determine if the TQ for flammable materials has been met, and if so, that the other PSM elements have been applied to the paint manufacturing or storage areas.
3-R-11. Retail facilities containing highly hazardous chemicals or	CPL	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> End users include other

Audit Criteria	Source	Guidance for Auditors
<p>Table 3.3 – Continued</p> <p>flammable materials are exempted if they derive at least 51 percent of their income from sales to the end users of its product.</p>		<p>businesses and members of the consumer public.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors examining a facility that has retail operations should tour these facilities and check records to determine if 51 percent or greater of the income is derived from sales to end users, and if not, that the retail facilities containing Appendix A chemicals or flammable materials have been included in the PSM program.
<p>3-R-12. 55-gallon drum and totes containing flammable materials are exempt from coverage under the PSM Standard.</p>	<p>CPL WCLAR (9/27/94)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Drum and tote storage of flammable materials are considered atmospheric storage and therefore exempt from the PSM Standard. • If a storage area for drums or totes of flammable materials is located such that a fire or explosion in the storage area can impact processes included in the PSM program, then the drum/tote storage area would be subject to the PSM Standard as well if it were not moved. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should tour any storage areas for 55-gallon drums or totes that contain flammable materials to determine if the TQ has been met and to assess whether or not the storage area can affect other processes or equipment included in the PSM program due to its proximity. If so, the auditor should check to see if the flammable chemical storage area has been included in the PSM program.

Audit Criteria	Source	Guidance for Auditors
<p>3-R-13. Quantities of flammable liquids in storage are considered part of the process if they are sufficiently near the process that an explosion, fire, or release could reasonably involve the storage area combined with the process in quantities sufficient to meet or exceed the threshold amount of 10,000 lbs.</p>	<p>WCLAR (2/25/95) (2/15/94)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Proximity is a valid consideration when determining PSM applicability. If a quantity of flammable materials below the 10,000 lb TQ is in close proximity to another quantity of flammables that is above or below the TQ such that a fire or explosion involving the smaller quantity could impact the other, adjacent quantity, then the quantities should be aggregated and both should be included in the PSM program if the TQ is met. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should tour any storage areas for flammable liquids to determine if the storage area can affect other processes or equipment included in the PSM program due to its proximity. If so, the storage area may be PSM covered.
<p>3-R-14. Furnaces, boilers, heaters, etc. that provide process heat that are fueled by flammable liquids or gases, regardless of the quantity of fuel, and used in otherwise covered processes are included in the PSM program. This does not apply to fired boilers that produce steam.</p>	<p>WCLAR (1/8/93)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Fired heaters handling process fluids that are toxic, reactive, or flammable as defined by the PSM Standard should be included in the PSM program even though the quantity of fuel or process fluid would not individually exceed the TQ for the material. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should tour the process areas to determine if there are any fired heaters/furnaces burning PSM-covered materials and the if the TQ for these materials has been met or exceeded including any interconnections to other processes included in the PSM program. If so, the other PSM elements have been applied to the fired heaters/furnaces.
<p>3-R-15. Missile and rocket propellants that are Class A, Class B, or C explosives as classified by DoT (or the numbered classification DoT</p>	<p>WCLAR (1/31/94)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The manufacture of missile and rocket propellants should be

Audit Criteria	Source	Guidance for Auditors
<p>Table 3.3 – Continued system for explosives) have been included in the PSM program.</p>		<p>included in the PSM program. Other uses or storage of these propellants would not be included.</p>
<p>3-R-16. There is a management system/procedure for screening new processes and chemicals for possible PSM coverage.</p>	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • A procedure or other document/record that describes how new chemicals introduced to the site are screened for possible PSM applicability should be available for review by auditors. • This is especially important for multi-purpose batch facilities and pilot plants where processes and chemicals tend to be more transient. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review facility or company procedures for introducing new chemicals to determine if they address PSM program applicability.
<p>3-R-17. There is a documented rationale for processes and systems that are included and/or excluded from the PSM program.</p>	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • A procedure or other document/record that describes the PSM applicability for the facility and explains how it was determined should be available for review by auditors. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should compare the contents of the PSM applicability procedure to the scope of the remainder of the PSM program elements. For example, have HIRAs been performed for all of the processes within the PSM boundary defined in the procedure?
<p>3-R-18. If a material is both an Appendix A chemical and a flammable material, the lower of the Appendix A TQ or 10,000 lb is used.</p>	WCLAR (3/21/94)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review of the list of PSM-covered chemicals to determine if a material is listed in Appendix A and is also a flammable material; the lower of the Appendix A TQ or 10,000 lb should be used.

Audit Criteria	Source	Guidance for Auditors
<p>3-R-19. Administrative controls can be used to limit inventories for the purposes of determining PSM applicability.</p>	<p>WCLAR (6/1/94)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Documentation that proves administrative control of inventories work exists; however, physical backups to the administrative controls are not required. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should conduct field observations to determine if administrative controls used to limit inventories of PSM-covered materials below the TQs actually work in practice. Auditors should check the inventories of Appendix A chemicals or flammable material not included in the PSM program because the inventories are limited by administrative controls.
<p>3-R-20. Transportation containers containing highly hazardous chemical are considered part of the process when connection to a process is made and the container is used as storage vessel.</p>	<p>WCLAR (7/11/94)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> When a transportation container, e.g., rail cars, tank trucks, tube trailers, whose inventory of an Appendix A chemical or flammable material exceeds the TQ is connected to a process and does not unload but serves as a storage vessel in the process, it should be included in the facility PSM program, even if the facility/company does not own the container. The most common example of this use of a transportation container is chlorine rail cars that are connected directly to a process at a rail siding and stay connected until empty. Other Appendix A chemicals or flammable material are sometimes delivered and connected in this manner, e.g., boron trifluoride and ethylene (in tube trailers). <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should conduct field observations to determine if Appendix A chemicals or flammable materials stored in transportation containers on-site that are connected directly to a

Audit Criteria	Source	Guidance for Auditors
		<p>Table 3.3 – Continued covered process are included in the PSM program.</p> <ul style="list-style-type: none"> Auditors should take a thorough tour of the site, make note of any transportation containers of PSM-covered materials connected to covered process that meets or exceeds the TQ, and then compare what is found in the field to the list of covered equipment.
<p>3-R-21. Pipeline systems containing highly hazardous chemical(s) or flammable materials that exceed their respective TQ are included up to where DOT regulations begin.</p>	<p>WCLAR (10/30/92)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> When a PSM-regulated material is delivered to or shipped from the facility, the pipeline and its inventory of PSM-regulated material are included in the PSM program up to the location in the pipeline where DOT regulations apply. This is usually an isolation valve or a flow metering station, but there may be another boundary. This location may be inside or outside the property line of the facility. It may be necessary to obtain a supplementary drawing or document that defines this location in the pipeline. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check the HIRA results to determine if they confirm these pipeline boundaries. Auditors should conduct field observations to determine if PSM-covered materials in pipelines on-site that are connected to a covered process are included in the PSM program. Auditors should take a thorough tour of the site, make note of any pipelines containing PSM-covered materials that are connected to covered process, and then compare what is found in the field to the list of covered equipment.
<p>3-R-22. The boundaries of processes included in the PSM program are extended as far as the potential for a catastrophic release exists, without regard to the presence of active</p>	<p>WCLAR (2/28/97)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> For example, where a reactor is designed to consume all hazardous chemicals if the reaction completes normally.

Audit Criteria	Source	Guidance for Auditors
safeguards.		<p>then the downstream equipment might be excluded from the PSM program. However, if there are failures of active safeguards that could result in a threshold quantity of a PSM-covered chemical migrating to the downstream equipment, it should be included in the PSM program.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check the HIRA results to determine if they confirm these boundaries. • Auditors should review the P&IDs of covered processes against the list of PSM-covered equipment to determine if the processes or storage downstream of equipment where PSM-covered materials are reacted completely (i.e., consumed, except for trace amounts) is included in the PSM program as far as the potential for a catastrophic release exists, without regard to the presence of active safeguards.
3-R-23. The boundaries of covered processes included in the PSM program are extended as far into interfacing utility systems as the potential for a catastrophic release exists if the utility system equipment fails.	WCLAR (3/10/94) (9/14/95) (1/31/08)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The HIRA results should confirm where the failure of a utility system has the potential for causing a release of Appendix A chemicals or flammable materials. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review P&IDs of covered processes against the list of PSM-covered equipment to determine if the utilities systems are included in the PSM program as far into interfacing utility systems as the potential for a catastrophic release exists if utility system equipment fails. • Auditors should compare the results of the HIRAs and the review of the P&IDs to the list of processes/systems included within the scope of the PSM program to determine if the utilities whose failure can cause

Audit Criteria	Source	Guidance for Auditors
		<p>Table 3.3 – Continued</p> <p>or contribute to the release of highly hazardous chemicals or flammable materials are included in the program.</p>
<p>3-R-24. Docks with piping and systems that contain Appendix A chemicals or flammable materials that are connected to processes that are included in the PSM program should also be included in the PSM program. Docks, dock equipment, and dock employees should be included in the PSM program. The USCG will cover the ship/barge, afloat equipment, and afloat employees.</p>	<p>WCLAR (10/31/96) VCLAR</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Equipment containing Appendix A chemicals or flammable materials that is fixed to land should be included in the PSM program, while equipment that is fixed to an afloat asset, such as a ship or barge, would be included in the USCG's regulatory programs and not included in the PSM program. The dock structure itself should be included in the same manner as structural components supporting process equipment (e.g., a pipe rack or vessel skirt) are included in the PSM program. • Docks connected to a bulk petroleum storage terminal with atmospheric storage of flammables are not included in the PSM program, unless some other type of activity is involved that would meet the PSM definition of a process, such as mixing or blending of petroleum products. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check the HIRA results to determine if they confirm the PSM boundary, which is usually the ship connection fitting of a flexible loading arm. • Auditors should conduct field observations to determine if the docks, dock equipment, and dock employees involving PSM-covered materials are included in the PSM program. • Auditors should take a thorough tour of the site, make note of any dock equipment and operations involving PSM-covered materials connected to covered process that meet the TQ, and then compare what is found in the field to the list of covered equipment.

Audit Criteria	Source	Guidance for Auditors
<p>3-R-25. For equipment on-site whose failure could contribute to a catastrophic release of Appendix A chemicals or flammable materials and is not owned by the employer, the company with the exposed employees has included the equipment in its PSM program. This usually means the host company/facility.</p>	VCLAR	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Processes/equipment containing Appendix A chemicals or flammable materials that are owned by another company but are at the facility under consideration should be included in the PSM program. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should conduct field observations to determine if processes/equipment containing Appendix A chemicals or flammable materials that are owned by another company but are at the facility under consideration are included in the PSM program. Auditors should take a thorough tour of the site, make note of any processes/equipment containing contain Appendix A chemicals or flammable materials that are owned by another company but are at the facility under consideration, and then compare what is found in the field to the list of equipment included in the PSM program.
<p>3-R-26. Out-of-service or decommissioned equipment that can still contribute to a catastrophic release has been included in the PSM program.</p>	VCLAR	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> To be removed from the PSM program, the decommissioned equipment should be mechanically isolated (not with valve closures but with blanks), electrically isolated, and completely de-inventoried of contain Appendix A chemicals or flammable materials, including residues. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should conduct field observations to determine if out-of-service or decommissioned equipment that can still contribute to a catastrophic release is included in the PSM program. Auditors should take a thorough tour of the site, make note of any out-of-service or decommissioned equipment

Audit Criteria	Source	Guidance for Auditors
		<p>Table 3.3 – Continued</p> <p>that can still contribute to a catastrophic release, and then compare what is found in the field to the list of covered equipment.</p>
<p>3-R-27. Hazardous waste incinerators and black liquor boilers are included when they burn contain Appendix A chemicals or flammable materials and the TQ amount has been met or exceeded.</p>	<p>WCLAR (12/21/92) (6/9/93)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • A hazardous waste incinerator (or thermal oxidizer) or a black liquor-recovery boiler (usually found in the pulp/paper industry) that are regulated under environmental regulations is not exempt from the PSM Standard if the TQ of Appendix A chemicals or flammable materials is met or exceeded in the equipment, or if it is connected to an otherwise regulated process (except for the Meer exception of interconnected flammable inventories). <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct field observations to determine if hazardous waste incinerators and black liquor boilers are included in the PSM program when they burn Appendix A chemicals or flammable materials. Auditors should take a thorough tour of the site, make note of any hazardous waste incinerators that burn Appendix A chemicals or flammable materials, and then compare what is found in the field to the list of covered equipment.
<p>3-R-28. Unloading operations and equipment involving Appendix A chemicals or flammable materials are included in the PSM program if the deliveries are not by cargo transport motor vehicle (CTMV) as governed by DOT regulations, the deliveries are not unloaded at atmospheric pressure, and the deliveries involve operations other than just transfer of the material only (although the delivery operation would be exempt even if the delivered material is blended with stored materials, e.g.,</p>	<p>WCLAR (9/8/93) (5/17/95)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The vehicle involved in the loading/unloading of Appendix A chemicals or flammable materials should be an approved DOT CTMV. Auditors should check unloading operations to determine if the trucks used are DOT-regulated CTMVs and not unregulated vehicles that are used for internal transfers only (and would not be able to operate on public roads).

Audit Criteria	Source	Guidance for Auditors
butane with gasoline).		<ul style="list-style-type: none"> DOT's jurisdiction ends and OSHA's jurisdiction begins at the connection between the hose from the CTMV and the process when unloading contain Appendix A chemicals or flammable materials. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> If the facility has pipelines that either start or end on-site, auditors should review facility documents to determine where the exact location of PSM and DOT regulatory responsibility transfer occurs.
3-R-29. Natural gas processing facilities are included in the PSM program.	WCLAR (10/30/92)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> OSHA has stated that it will not apply PSM at "transmission and distribution processes" already regulated by DOT/OPS. The American Gas Association (AGA) interprets "transmission and distribution" to include pipelines, storage, compression, propane-air facilities, and LNG. OSHA still says that a "natural gas processing facility" would be covered by PSM, e.g., a compression station. A natural gas processing facility would be different from a natural gas well, which would be exempt from the PSM Standard. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Natural gas transmission and distribution facilities regulated by DOT/OPS would not be subject to the PSM Standard. Auditors should check to determine if natural gas processing facilities within the scope of the audit are regulated by DOT/OPS.
3-R-30. Natural gas recovered at a landfill (that exceeds the 10,000 lb flammable TQ) and is used or stored in a process is included in the PSM program.	WCLAR (6/16/94)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The recovery of the natural gas from the landfill mass is not subject to the PSM Standard; however, if the natural gas is processed, e.g., compressed into a pipeline system, it should be included in the PSM program if it meets or exceeds the flammable TQ. If the natural gas is recovered,

Audit Criteria	Source	Guidance for Auditors
		<p>Table 3.3 – Continued</p> <p>not stored, but is burned on-site (e.g., electric power generation), it would be exempt from the PSM Standard.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct field observations to determine if natural gas recovered at a landfill that meets or exceeds the 10,000 lb flammable TQ and is used or stored in a process is included in the PSM program. • Auditors should take a thorough tour of the site, make note of any natural gas recovered at a landfill that meets or exceeds the 10,000 lb flammable TQ, and then compare what is found in the field to the list of covered equipment.
<p>3-R-31. Additional reactive materials at the site have been evaluated when determining the boundaries of the PSM program.</p>	<p>GIP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Reactive materials are those defined in the CCPS book <i>Essential Practices for Managing Chemical Reactivity Hazards</i> or some equivalent method/program, and should be included in the PSM program. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct field observations to determine if any processes including reactive materials at the site as defined using the criteria in the CCPS book on reactivities are included in the PSM program. Auditors should take a thorough tour of the site, make note of any reactive materials at the site, and then compare what is found in the field to the list of covered equipment. • Auditors should review the HIRAs, risk assessments, LOPAs/SIL analyses, or other activities that include analyses of reactive materials and compare the results of these studies to the boundaries of the PSM program to determine if the application of the PSM program should be extended to

Audit Criteria	Source	Guidance for Auditors
		include additional reactive materials.
3-R-32. Indoor processes and equipment where unoxidized dusts can be suspended and dust explosions are possible are included in the PSM program.	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Unoxidized organic and metal dusts represent significant explosion hazards, and the indoor processes containing or producing these dusts should be included in the PSM program. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should conduct field observations to determine if any processes that contain explosive dusts (metal or organic unoxidized dusts) are included in the PSM program. Auditors should take a thorough tour of the site, make note of any processes that contain explosive dusts, and then compare what is found in the field to the list of covered equipment. Auditors should review the HIRAs, risk assessments, LOPAs/SIL analyses, or other activities that include analyses of indoor unoxidized dust releases and explosions, and compare the results of these studies to the boundaries of the PSM program to determine if the application of the PSM program should be extended to include dust explosion hazards.

3.2.3 Voluntary Consensus PSM Programs

The following voluntary consensus PSM program requirements are described below:

- The requirements published for the offshore oil platform sector in the Safety and Environmental Management Program (SEMP), a voluntary program designed by API and endorsed by the Minerals Management Service of the Department.
- Responsible Care Management System (RCMS)[®] published by the American Chemistry Council.
- RC14001 Environment, Health, Safety and Security Management System, published by the American Chemistry Council.

Table 3.4 presents voluntary consensus audit criteria regarding PSM Applicability.

Table 3.4 Voluntary Consensus Audit Criteria – PSM Applicability

Audit Criteria	Source	Guidance for Auditors
<p><i>SEMP</i></p> <p>3-R-33. The Safety & Environmental Management Practice (SEMP) program is a voluntary program between Outer Continental Shelf (OCS) operators and the U.S. Minerals Management Service (MMS). The American Petroleum Institute has produced a voluntary standard, API RP 75, to provide guidance on implementing a SEMF for OCS operators.</p>	API RP 75	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • API RP 75 does not specify any chemicals or similar applicability guidance. The applicability of SEMF is determined by the type of operation, i.e., offshore oil platforms.
<p><i>Responsible Care Management System</i></p> <ul style="list-style-type: none"> • 3-R-34. Implementation of Responsible Care is an Table 3.4 - Continued obligation of membership for ACC member and Partner companies. The obligations of ACC member companies to implement Responsible Care occur within their U.S. asset base. 	RCMS Technical Specification	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The applicability of ACC's RCMS program is not based on the presence of specific chemical or certain types of operations, but is a condition of membership in ACC.
<p><i>RC14001</i></p> <p>3-R-35. Guidance: The organization shall establish, document, implement, maintain, and continually improve an environmental management system in accordance with the requirements of this International Standard and determine</p>	RC14001 Technical Specification	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The applicability of the RC14001 program is not based on the presence of specific chemical or certain types of operations, but is a voluntary program for those facilities that desire to have ISO 14001 registered environmental

Audit Criteria	Source	Guidance for Auditors
<p>how it will fulfill these requirements.</p> <p>The RC14001 Technical Specification combines the elements of the American Chemistry Council's Responsible Care initiative with those of the Environmental Management Systems—Specifications With Guidance for Use Standard, ISO 14001, adopted by the International Organization For Standardization (ISO) in 1996 and amended in 2004. RC14001 enables a company to obtain, through an application and audit process, a certification that its management system conforms to both the ISO 14001 and Responsible Care® requirements.</p>		<p>management system.</p>

3.3 AUDIT PROTOCOL

The process safety program audit protocol introduced in Appendix A and available online (See page xiv for information on how to access this resource) provides detailed questions that examine the issues described in Section 3.2.

REFERENCES

- American Chemistry Council, *RCMS® Technical Specification*, RC101.02, March 9, 2005
- American Chemistry Council, *RCMS® Technical Specification Implementation Guidance and Interpretations*, RC101.02, January 25, 2004
- American Chemistry Council, *RCMS® Technical Specification Implementation Guidance and Interpretations Appendices*, RC101.02, January 25, 2004
- California, California Code of Regulations, Title 8, Section 5189, CalOSHA, November 1985
- Center for Chemical Process Safety (CCPS), *Guidelines for Risk Based Process Safety*, American Institute of Chemical Engineers, New York, 2007 (CCPS, 2007c)
- Delaware, *Accidental Release Prevention Regulation*, Delaware Department of Natural Resources and Environmental Control/Division of Air and Waste Management, September 1989 (rev. January 1999)
- Department of Interior, Minerals Management Service, Safety and Environmental Management Program (*SEMP*), 1990
- Environmental Protection Agency (USEPA), 40 CFR §68, *Accidental Release Prevention Requirements: Risk Management Programs Under Clean Air Act Section 112(r)(7)*; Final Rule, June 21, 1996
- New Jersey, *Toxic Catastrophe Prevention Act* (N.J.A.C. 7:31), New Jersey Department of Environmental Protection, June 1987 (rev. April 16, 2007)

- Occupational Safety and Health Administration (OSHA) 29 CFR §1910.119, *Process Safety Management of Highly Hazardous Chemicals, Explosives and Blasting Agents; Final Rule*, Washington, DC, February 24, 1992
- Occupational Safety and Health Administration (OSHA) Publication 3133, *Process Safety Management Guidelines for Compliance*, Washington, DC, 1993
- Occupational Safety and Health Administration (OSHA) Instruction CPL 02-02-045 CH-1, *PSM Compliance Directive*, Washington, DC, September 13, 1994
- Occupational Safety and Health Administration (OSHA) Instruction CPL 03-00-004, *Petroleum Refinery Process Safety Management National Emphasis Program*, June 7, 2007 (OSHA, 2007b)
- Occupational Safety and Health Administration (OSHA) Directive 09-06 (CPL 02), *PSM Chemical Covered Facilities National Emphasis Program*, July 27, 2009 (OSHA, 2009a)

4

PROCESS SAFETY CULTURE

This element has no direct corresponding element in OSHA PSM and EPA RMP programs or state regulatory PSM programs; however, process safety culture is recognized to be a critical foundation for a successful PSM program. Process Safety Culture is an element of the RBPS accident prevention pillar Commit to Process Safety.

4.1 OVERVIEW

The Process Safety Culture element (referred to as culture) is the combination of individual and group values and behaviors that determine the manner in which PSM is managed. It underlies and supports everything that happens in a PSM program. It is the reason why a PSM program is successfully implemented or not, because the culture of the organization will strongly influence every decision and action to establish the right cultural underpinning. This means winning people's "hearts and minds" with respect to PSM.

A culture develops as individuals in an organizational group identify certain expectations, attitudes, and behaviors that provide common benefit to the group (in this case, attitudes and behaviors that support the goal of managing process risk). In this context, the group consists of a collection of people, either at the company or facility level, or both, who hold, or are expected to hold, the same beliefs, attitudes, and behaviors. A group includes senior management, middle management and supervisory personnel, and nonmanagement personnel. To the extent that contractors are subject to the PSM program procedures and are responsible for carrying out certain provisions of them, they too would be considered part of the group, particularly resident contractors. As the group reinforces such desired attitudes and behaviors, and becomes accustomed to their benefit, these attitudes and behaviors become integrated into the group's value system. The process safety culture of an organization is arguably the most significant determinant of how it will approach process risk control issues, and PSM management system failures can often be linked to cultural deficiencies.

Accordingly, enlightened organizations are increasingly seeking to identify and address such cultural root causes of PSM performance problems.

Investigations of catastrophic incidents have often identified common process safety culture weaknesses that were often found in other serious incidents. For example, investigations have typically found the following PSM culture issues:

- Clear expectations and enforcement of high standards regarding PSM process safety performance do not exist; i.e., poor performance is overlooked and not corrected (could involve operations and/or management-level performance).
- PSM activities become “check-the-box” activities wherein the mere accomplishment of the task(s) is the primary objective rather than the information obtained or lessons learned about the PSM program.
- Facility/company personnel do not maintain a sense of vulnerability with respect to their operations; i.e., the use of hazardous materials becomes routine, familiarity leads to a (false) sense of security.
- Open and effective communications do not exist vertically or horizontally in the organization.
- Timely responses to PSM issues and concerns do not occur; e.g., PSM recommendations and action items are not resolved in a timely manner and PSM-related tasks are chronically overdue.
- The normalization of deviance is allowed to prevail. Normalization of deviance occurs when deviations or abnormal/out-of-specification conditions (either process/equipment related, or programmatic) are allowed to exist and persist to the point that the abnormality becomes normal.

PSM-related management systems and their associated policies and procedures may include adequately detailed instructions that properly reflect the desired intent of an organization. However, successful execution of the procedures will require that properly trained individuals understand the importance of the underlying intent, believe in reasons for the procedures and what they require, accept their responsibility under the procedures, and appreciate that taking an unacceptably risky shortcut would be wrong and inconsistent with the values of the group. Therefore, a sound culture should underlie the management systems if the procedures are to be successfully implemented.

The values of the group (e.g., corporation, plant, shift team) can help shape the attitudes of the individual, which in turn play a significant role in determining individual behaviors. A sound culture provides its members with the necessary values by helping them understand why strict adherence to procedures is the “right thing to do.” While PSM management systems may be heavily reliant upon procedures, no practical procedure can anticipate and address every situation. Therefore, a sound culture also prepares members to respond in a fashion consistent with the group’s values when faced with a situation that is not explicitly covered by the written policies and procedures.

Consequently, a sound culture is essential to maximizing the benefits associated with results from the implementation of each PSM program element. The CCPS book *Guidelines for Risk Based Process Safety* provides more detailed guidance on establishing a sound process safety culture.

Nonmandatory audit criteria for Process Safety Culture are described in Section 4.2. A full explanation of compliance and related audit criteria is presented in Section 1.7.

4.2 AUDIT CRITERIA AND GUIDANCE

Although the Employee Participation element of the OSHA's PSM Standard contains the requirement that the employees must be consulted on the design and implementation of the PSM program, none of the PSM regulatory programs explicitly contain process safety culture elements that include a full treatment of this topic. Therefore, all guidance presented in the remainder of this chapter is related criteria. With the exception of the CCPS *Guidelines for Risk Based Process Safety*, most of the other voluntary consensus references are silent with respect to explicit process safety culture requirements. Auditing of employee participation issues is addressed in Chapter 7, Workforce Involvement.

The purpose of providing these criteria is to provide auditors with guidance for evaluating PSM programs with respect to issues that go beyond the strict compliance requirements presented above, and in large part represent industry good practices, or in some cases practices that have become common. Some of the related criteria have reached the status of a level of acceptable practice because of their widespread, accepted, and successful use over an extended period of time. Auditors and PSM practitioners should carefully consider implementing this guidance, or at least designing an approach that is similar in nature. See the Glossary and Section 1.7.1 for a more complete discussion of the meaning and use of level of acceptable practice.

See the Guidance for Chapters 3–24 in the Introduction for the definition of the abbreviations shown in the following tables that are used to indicate the source of the criteria.

The audit criteria for process safety culture are presented below. These criteria are derived from the following:

- Good industry practice in PSM and RMP
- The Safety and Environmental Management Program (SEMP) guidance
- The Responsible Care Management System® of the American Chemistry Council
- The Responsible Care® Process Safety Code
- CCPS's Guidelines Book, Risk Based Process Safety.

The inclusion of these criteria in no way infers that these criteria are required for a PSM program to be successful, nor does it infer that a PSM program will be

deficient without them. There may be other, more appropriate solutions to the issues described by these criteria for an individual facility or company. In addition, their use in a PSM audit is intended to be completely voluntary.

Auditors should also carefully examine the process safety cultural requirements found in the procedures of the company/facility being audited. As stated in Section 1.7.1 these could be interpreted as compliance requirements by regulators and could be subject to citations if they are not being followed. Auditors should confirm, via interviews, records and document reviews, and field observations, that the requirements of the facility or company procedures have been implemented as specified. Findings should be generated if the company/facility-specific provisions are not being followed.

Table 4.1 presents the audit criteria and guidance for auditors regarding general cultural issues.

Table 4.1 General PSM Cultural Issues

Audit Criteria	Source	Guidance for Auditors
<i>Relevant stakeholders are involved in developing a positive, trusting, and open process safety culture within the facility.</i>		
4-R-1. Mechanisms exist that effectively promote and facilitate two-way communication between managers and all relevant stakeholders.	CCPA PANEL	<p><u>Background information for Auditors:</u></p> <ul style="list-style-type: none"> • The relevant stakeholders include management, nonmanagement, and contract employees; employee representatives; contract employers; and where appropriate, members of the community in close proximity to company facilities. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check to determine if there is a method for employees to report PSM-related criteria confidentially. This method should not be strictly local, e.g., a suggestion box. • Auditors should conduct interviews with all levels of the organization, from senior management down to the nonmanagement personnel, to determine if effective two-way communication channels exist.
4-R-2. There is a process to review the effectiveness of existing plant-level process safety related policies, practices, and procedures that have	CCPA PANEL	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review PSM audit reports to determine if the

Audit Criteria	Source	Guidance for Auditors
a significant potential to affect stakeholders.		audits have evaluated the effectiveness of the PSM policies and procedures that have been implemented, conclusions have been formed about the effectiveness of the PSM program, and recommendations have been made to improve the effectiveness of the PSM programs. PSM effectiveness is different from implementing the policies and procedures as written.
4-R-3. There are means to develop and implement new plant-level process safety goals, policies, practices, and procedures that take into account stakeholder interests and input.	CCPA PANEL	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review PSM policies and procedures to determine if they contain provisions for collecting input from all relevant stakeholders (the Workforce Involvement element will treat this topic more thoroughly for the facility employees).
4-R-4. There is a process to review the effectiveness of safety committees in promoting process safety and as a means to develop and execute a plan to improve such effectiveness.	CCPA PANEL	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should interview middle management and other management employees, as well as nonmanagement personnel, to determine if the safety committee is an effective forum for discussing and improving the PSM program. • Auditors should check if the safety committee minutes are reviewed periodically to determine whether the suggestions, action items, and other conclusions are being used to improve safety and process safety programs. • Auditors should check if the safety committee minutes are reviewed periodically to determine whether process safety issues are being reviewed and discussed when appropriate.
4-R-5. The facility distinguishes clearly between acceptable and unacceptable employee acts so that the vast majority of unsafe acts or conditions can be reported without	PANEL	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should conduct interviews and review policies and procedures to determine whether management has

Audit Criteria	Source	Guidance for Auditors
<p>Table 4.1 - Continued fear of punishment.</p>		<p>defined unacceptable behavior and whether the work force understands acceptable and unacceptable behavior at the facility.</p> <ul style="list-style-type: none"> • Auditors should conduct interviews with management and nonmanagement personnel and review minutes of meetings to determine if management has stressed that unsafe acts or conditions are not to be tolerated but has also firmly indicated that no Table 4.1 – Continued punishment or other negative actions will result from anyone reporting unacceptable behavior.
<p>4-R-6. Sharing of information that will reduce safety risks occurs without fear of punishment.</p>	PANEL	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should interview management and nonmanagement personnel and review minutes of meetings to determine whether management has stressed that sharing of information that will reduce safety risks will occur with no punishment or other negative actions. • Auditors should interview management and nonmanagement personnel to determine if employees are uncomfortable or if they understand that there will be no retribution for reporting unsafe acts or conditions.
<p>4-R-7. There is a climate in which workers are encouraged to ask challenging questions without fear of reprisal, and workers are educated, encouraged, and expected to critically examine all process safety tasks and methods prior to performing taking them.</p>	PANEL	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should interview management and nonmanagement personnel who have participated in HIRAs, incident investigations, audits, and other PSM activities that are designed to identify problems with the processes covered by the PSM program, and with the PSM program itself, to determine if there has been a climate that fosters and accepts for evaluation critical (but constructive) comments, results, and findings. Nobody who has participated in these activities should feel that certain

Audit Criteria	Source	Guidance for Auditors
		findings or results were not welcome or were being purposely suppressed.
4-R-8. Anonymous process safety culture surveys are conducted periodically to measure the effectiveness of efforts to improve process safety culture.	PANEL	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should check any available verbal or written process safety culture surveys to determine if the results are consistent with the interviews conducted.
4-R-9. The company is an industry leader in process safety by taking a leading role in industry process safety organizations and activities and sharing results and learnings with the industry.	CCPA PANEL	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should check with the PSM manager/coordinator to determine if the parent company for the site is a member of appropriate industry organizations given their business and actively participates in their activities. Examples of such organizations include CCPS, MKOPSC, DIERS, API, NFPA, etc.
4-R-10. There is stability of personnel in nonmanagement or management positions.	GIP	<u>Background Information for Auditors:</u> <ul style="list-style-type: none"> High turnover in a short period of time could indicate job frustration resulting from not being listened to, an unsafe culture, or other similar problems. <u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors interview co-workers of personnel who have resigned (since the last audit) to determine whether the resignations were prompted, in part, by frustrations over not being listened to, particularly with respect to safety or process safety issues.
4-R-11. Relevant stakeholders are involved in developing a positive, trusting, and open process safety culture within the facility.	PANEL	<u>Background information for Auditors:</u> <ul style="list-style-type: none"> The relevant stakeholders include management, nonmanagement, and contract employees; employee representatives; contractors; and, where appropriate, members of the community in close proximity to company facilities. <u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should interview all

Audit Criteria	Source	Guidance for Auditors
		levels of the organization, from senior management to nonmanagement personnel, to determine if the process safety culture at the facility is positive, trusting, and open. Determining whether or not this is true will require that mutual trust exists between the interviewer and the interviewees and that the interviewees be open and honest with the interviewer.
4-R-12. Decommissioned equipment that still represents process safety risk is not allowed to remain in place for lengthy periods of time without recommissioning or dismantling it.	CCPA GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should determine how long equipment included in the PSM program has been decommissioned but is still in place.

Table 4.2 displays audit criteria and guidance for auditors regarding RBPS cultural indicators.

Table 4.2 RBPS Cultural Indicators

Audit Criteria	Source	Guidance for Auditors
<i>PSM is treated as a core value and not an ancillary program that can be suspended, abated, or otherwise set aside during times when business is slow.</i>		
4-R-13. The core PSM values are written down and stressed in training and other forums.	CCPA RBPS	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should check that there is a company or facility document that describes PSM as a core value. • Auditors should check minutes of meetings and agenda for safety meetings or other training and information forums to determine if PSM as a core value has been described to facility personnel. • Auditors should interview facility personnel to determine if PSM as a core value has been described in safety meetings or other training and information forums. • Auditors should conduct observations to determine if safety and PSM represent a core

Audit Criteria	Source	Guidance for Auditors
		<p>value. For example, if auditors are able to attend safety meetings, they can determine the tone of the discussions, the level of cooperation between middle management and nonmanagement personnel, whether PSM issues are discussed, and whether the personnel participating in the meeting believe in what they are doing or are just attending because they have to. Other, more casual observations can also be revealing, such as graffiti on safety bulletin boards or defaced signs and labels at the facility. These types of observations should be combined with information from interviews and record reviews before firm conclusions can be drawn.</p>
<p>4-R-14. PSM leadership is visible, active, and consistent in its support for PSM programs and objectives. This leadership philosophy extends down through the ranks of middle management within the organization.</p>	<p>CCPA RBPS</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should interview middle management and supervisory personnel to determine whether there is no difference of opinion or interpretation of PSM as a core value. For example, if PSM is treated correctly in company documents but the facility manager treats it differently, this would indicate an important difference of interpretation.
<p>4-R-15. The normalization of deviance has not become a prevalent attitude or a habitual behavior.</p>	<p>CCPA RBPS</p>	<p><u>Background information for Auditors:</u></p> <ul style="list-style-type: none"> Normalization of deviance means that out-of-specification equipment or operational conditions are allowed to remain in place without being quickly corrected, or a slowly increasing range of unacceptable conditions becomes tolerated because nothing adverse occurs; or near misses are not interpreted and treated as near failures but as successes because total and adverse failures did not occur. Therefore, over time, these conditions become "normal" and the larger risk represented by them becomes normal and

Audit Criteria	Source	Guidance for Auditors
		<p>Table 4.2 - Continued acceptable.</p> <ul style="list-style-type: none"> • Normalization of deviance is a very important factor in process safety culture. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review Asset Integrity records, work orders, and other documentary evidence to determine if process and equipment deviations are allowed to linger for unreasonable periods of time without adequate explanation or rationale, and without temporary safety measures being implemented. • Auditors should evaluate root causes within incident reports for recurrence. If similar incidents continue, the true root causes have not been identified or fixed, which could indicate a normalization of deviance mentality. • Auditors should interview facility middle management and nonmanagement personnel to determine if the normalization of deviance is prevalent and not thought to represent a higher risk. For example, is there an attitude that risks do not have to be reduced as far as they can be? Is there an attitude that fires are considered commonplace and are a "fact of life" in the plant and therefore can be tolerated as is?
4-R-16. The organization maintains a sense of vulnerability regarding their chemicals/materials and operations.	RBPS	<p><u>Background information for Auditors:</u></p> <ul style="list-style-type: none"> • The loss of a sense of vulnerability means that, over time, the high inherent risks associated with using certain chemicals under certain conditions is forgotten because the operations along with their associated risks become routine, and the heightened sense of what can truly go wrong is forgotten or minimized. The erosion of a sense of vulnerability is exacerbated in

Audit Criteria	Source	Guidance for Auditors
		<p>complex engineered systems by the relatively low frequency of occurrence of catastrophic events.</p> <ul style="list-style-type: none"> A sense of vulnerability is a very important factor in process safety culture. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should interview facility middle management and nonmanagement personnel to determine if there is a high degree of awareness of process hazards, their potential consequences, and a continual healthy respect for them. A sign that this sense of vulnerability is not present is the notion that major PSM incidents are not a significant day-to-day concern because they have never happened at the facility.
4-R-17. PSM activities are valued and used to reduce risk.	RBPS	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should interview facility middle management and nonmanagement personnel to determine if HIRAs, incident investigations, and audits are useful activities and not activities that periodically have to be endured.
4-R-18. Periodic PSM activities that are mandatory have not become "check-the-box" activities.	RBPS	<p><u>Background information for Auditors:</u></p> <ul style="list-style-type: none"> "Check-the-box" activities are those where mere completion of the activity is considered more important than what is learned from the activity or its completeness. Performing a PSM audit on time with little regard to its quality, its insights, or the nature of the follow-up is an example of a "check-the-box" activity. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should interview middle management responsible for PSM activities that occur periodically (such as HIRAs, audits, and refresher training for operators) to determine if these activities are regarded as activities to simply complete, regardless whether the

Audit Criteria	Source	Guidance for Auditors
		<p>Table 4.2 – Continued</p> <p>activity was performed and documented properly and thoroughly and anything was actually learned from it (i.e., simply checking it off the list of things to do).</p> <ul style="list-style-type: none"> • Auditors should interview personnel responsible for executing these PSM activities (audit and HIRA team leaders/members, etc.) to determine if there is strong management support for, interest in, and appreciation of these activities. • Auditors should review records to determine if PSM activities that typically take a long time to complete were performed in an unusually short period of time, which would indicate that they were “check-the-box” activities; for example, a full PSM audit of a large facility such as an oil refinery that took only 1–2 days to complete with a very small audit team or a HIRA of a major project, such as the addition of a major processing unit, that took only one session to complete. The auditor must carefully understand the defined scope of work involved in such activities before drawing such a conclusions. • Auditors should evaluate the incident reports and HIRAs for depth. A superficial analysis may indicate a “check-the-box” mentality.
4-R-19. There is a healthy questioning and learning environment at the facility.	RBPS	<p><u>Auditor Activities:</u></p> <p>Auditors should interview facility middle management and nonmanagement personnel to determine if the attitude of “That’s the way we’ve always done things” is not prevalent and the healthy questioning of risks, hazards, and if the policies, practices, and procedures intended to reduce them occur regularly.</p> <ul style="list-style-type: none"> • Auditors are cautioned that interviews with some personnel

Audit Criteria	Source	Guidance for Auditors
		<p>may lead one to believe that the interviewee has been trying to bring a risk or hazard to the attention of management but has been frustrated by a perceived lack of interest or action (the employee may tell the auditor "I've been telling them this forever"). This may indicate that the interviewee has been ignored and his/her concern has not been evaluated properly, which is a PSM cultural problem. However, it may indicate that the interviewee simply did not agree with the results of the evaluation, which may or may not indicate a cultural problem.</p>
<p>4-R-20. There is a strong emphasis on promptly recognizing and reporting nonstandard conditions to permit the timely detection of "weak signals" that might foretell safety issues.</p>	<p>CCPA RBPS</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should interview facility middle management and nonmanagement personnel to determine if process programmatic problems are indirect indicators of problems in the PSM program or are contributors to near misses; are not investigated/ or evaluated properly; or are not allowed to linger. This issue is closely related to the normalization of deviance.
<p>4-R-21. A system of mutual trust exists.</p>	<p>RBPS</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should interviews facility middle management and nonmanagement personnel to determine the following: <p>Employees trust managers to "do the right thing" in support of PSM. Managers trust employees to shoulder their share of responsibility for PSM performance, and to report potential problems and concerns. Peers trust the motivations and behaviors of peers. Employees have confidence that a just system exists where honest errors can be reported without fear of reprisals.</p>

Audit Criteria	Source	Guidance for Auditors
<p>4-R-22. PSM problems are resolved and corrective actions implemented in a timely manner.</p>	<p>RBPS</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review recommendation/action item follow-up records to determine if the following activities occur in a timely manner: <ul style="list-style-type: none"> – The follow-up of HIRA recommendations. – The follow-up of the recommendations from root cause investigations of actual incidents and near misses. – The follow-up of recommendations from PSM audits. – The follow-up and correction of all Asset Integrity equipment and programmatic deficiencies. • The follow-up and correction of recommendations from the critiques of emergency drills, exercises, and actual activations of the emergency response plan. • In this context, “timely” means that resolution or corrective action plans are promptly determined, the recommendations are resolved quickly, and the implementation of the final action is completed in a time period that is reasonable given the complexity of the action and the difficulty of implementation. The timing of resolution plan development and completion of each recommendation should be evaluated on a case-by-case basis. • This aspect of PSM program administration is also examined during the audit of individual PSM elements, but problems with follow-up of recommendations are also a possible indication of poor process safety culture.
<p>4-R-23. A priority is placed on the timely communication and response to learnings from incident investigations, audits, HIRAs, etc.</p>	<p>CCPA RBPS</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review records of safety meetings and other training or information forums to

Audit Criteria	Source	Guidance for Auditors
		<p>determine if the resolution of PSM-related recommendations and action items is communicated to those individuals whose jobs are affected by the resolutions, including resident contractors where appropriate.</p> <ul style="list-style-type: none"> Auditors should interview facility middle management and nonmanagement personnel to determine if the resolution of PSM-related recommendations and action items is communicated to those individuals whose jobs are affected by the resolutions.
<p>4-R-24. Discrepancies between practices and procedures (or standards) are resolved in a timely manner to prevent normalization of deviance.</p>	RBPS	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should compare records from audits, field observations of contractors or facility performance, and other evaluations of performance with procedures to determine if when discrepancies between procedures and actual practices exist, the discrepancies are quickly resolved and not allowed to linger.

Table 4.3 displays the audit criteria and guidance for auditors relating to PSM leadership.

Table 4.3 PSM Leadership

Audit Criteria	Source	Guidance for Auditors
<p><i>Corporate management as a group sets the PSM "tone at the top" and establishes appropriate expectations regarding PSM performance.</i></p>		
<p>4-R-25. Expectations are translated into measurable goals designed to move the company toward the achievement of excellence in PSM performance.</p>	CCPA PANEL	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review written mission/vision statements, written overall goals and objectives statements, or similar documents for the company or facility to determine if the PSM expectations of senior management have been translated into specific objectives. The evaluation of the

Audit Criteria	Source	Guidance for Auditors
		performance goals and objectives is covered separately.
4-R-26. Decisions about corporate-level initiatives, operations, financial performance, resource allocation, capital projects, personnel changes, compensation, and other aspects of operations visibly and tangibly demonstrate a commitment to PSM excellence.	CCPA PANEL	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review company procedures governing operations, financial performance, resource allocation, capital projects, personnel changes, compensation, and other aspects of operations to determine if, where appropriate, the PSM impacts on the activities and how they are to be managed. In particular, HR policies governing personnel assignments and compensation procedures, budget approval procedures, and project approval procedures should be examined by the auditors.
4-R-27. Steps have been taken to promote greater continuity of site managers and other site leaders having significant PSM leadership roles at facilities.	CCPA PANEL	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should examine the turnover rate of facility managers, EHS managers, and PSM coordinators/managers to determine if people in these positions are being changed out too rapidly such that they do not have adequate time to learn their responsibilities. In particular, plant/facility managers who have been assigned for a relatively short period, primarily to fulfill a specific step in his/her career path, may not have the time, nor probably the inclination, to develop the knowledge required to adequately understand a performance-based program such as PSM nor to place a high level of priority onto the PSM program. If they are not in the assignment very long, they also may very likely not experience the results of their own decisions and how they may impact process safety.

The audit criteria and guidance for auditors relating to leadership monitoring of PSM program is displayed in Table 4.4.

Table 4.4 Leadership Monitoring of PSM Programs

Audit Criteria	Source	Guidance for Auditors
<i>The facility or company leadership monitors key indicators of PSM program health.</i>		
4-R-28. Key PSM program metrics are established and reported to leadership on a periodic basis.	CCPA PANEL	<p><u>Background information for Auditors:</u></p> <ul style="list-style-type: none"> PSM metrics refer to an established set of data and information that represents either a leading indicator (i.e., the data or information can help predict an impending PSM event, failure, or problem) or a lagging indicator (the data or information is descriptive of a Table 4.4 – Continued PSM event, failure, or problem that has already occurred). PSM metrics should be collected on a consistent periodic basis according to well-defined rules and assumptions, and reported forward to an appropriate level of management where they can be analyzed, discussed, and acted upon. The periodicity should be balanced between receiving a measure of PSM program health often enough to head off potential problems before they become significant, and the work associated with collecting, analyzing, and meeting to discuss the metrics. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review procedures and policies to determine if the company or facility has established a set of PSM program metrics. Auditors should review procedures and policies to determine if these metrics are specific to PSM activities and are <i>not</i> the traditional metrics used to measure occupational safety programs, such as EMR, injury rates, etc. The lagging performance indicator(s) include the following types of events: all fires (except incipient fires in areas that are strictly administrative), all explosions, all releases of flammable or toxic materials, and all injuries/fatalities that relate to PSM events.

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"> • Auditors should interview facility middle management to determine if the metrics are known and if the measurement methods are understood by personnel responsible for reporting the metrics or their input data. • Auditors should review periodic PSM metrics data to determine if the system for collecting the data, producing the final metrics, and reporting them is not being “gamed” to artificially indicate a PSM program status that is not completely accurate; and that up-to-date metrics describe the true status of the PSM program. • Auditors should review the periodic PSM metrics data to determine if the metrics chosen and the methods of measurement are capable of indicating changes rapidly and clearly enough to be of use by management to evaluate performance and to make corrections when required. • Chapter 21 contains more detail on PSM metrics.
4-R-29. Reports on open PSM action items are delivered to line management on a periodic basis.	PANEL	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the periodic PSM metrics to determine whether they include PSM action items and their status.
4-R-30. There is a periodic management review system that monitors important aspects of PSM performance and systems on prescribed frequencies.	PANEL	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review records to determine that the PSM metrics are periodically summarized in a written report, and that the time between reports is reasonable. The periodicity should be frequent enough so that problems are identified as quickly as possible, but not so frequent that the collection and reporting of the metrics becomes a major burden that has a significant impact on getting the PSM-related work done. The periodicity of collecting and reporting PSM metrics should also be based on the periodicity of some PSM activities being

Audit Criteria	Source	Guidance for Auditors
		<p>measured so that relevant data is available and enough time elapsed allowing important changes in the metrics to develop.</p> <ul style="list-style-type: none"> Auditors should review the PSM metrics reports and minutes of meetings of facility management to determine that PSM metrics are periodically discussed and that action/corrective items are assigned based on the reported results. Chapter 21 contains more detail on PSM metrics.
<p>4-R-31. The company board of directors monitors the status and progress of the company's PSM program. If the company is not publicly traded and no board of directors exists, the owner(s) or those designated by the owner(s) should perform this role.</p>	<p>PANEL</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review redacted board of directors or committee meeting minutes to determine if company-level PSM metrics are reported to the board, evaluated, and discussed, and appropriate action items are assigned as a results of these reports.

Table 4.5 illustrates the audit criteria and guidance for authors relating to PSM knowledge and expertise.

Table 4.5 PSM Knowledge and Expertise

Audit Criteria	Source	Guidance for Auditors
<p><i>A system has been developed and implemented to ensure that executive management, line management above the site level, and all site personnel, including managers, supervisors, workers, and contractors, possess an appropriate level of PSM knowledge and expertise.</i></p>		
<p>4-R-32. Site senior management understands the technical aspects of PSM and how the PSM Standard is interpreted for the site/company.</p>	<p>PANEL</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should interview company/facility senior management (EHS manager and above) to determine if common PSM terms and language are understood. <p>Auditors should interview company/facility senior management (EHS manager and above) to determine if these senior personnel understand the</p>

Audit Criteria	Source	Guidance for Auditors
		<p>Table 4.5 – Continued</p> <ul style="list-style-type: none"> • PSM requirements; how these requirements are interpreted for the company, facility, and its operations; the activities that meet the requirements; and the current status of the PSM program. • The level of knowledge of senior management does not need to be at the same level of detail and understanding as those individuals who have direct responsibility for the design and implementation of the PSM program. • Auditors should determine if the facility or company has developed and implemented a training program (or made use of external training forums) for senior management that is consistent with the level of PSM knowledge they are expected to have.
<p>4-R-33. Middle management, including EHS managers and the PSM manager/coordinator understand the technical aspects of PSM and how the PSM Standard is interpreted for the site/company.</p>	<p>PANEL</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should interview company/facility EHS managers and the PSM manager/coordinator to determine if these personnel understand, at a detailed level, the PSM requirements; how these requirements are interpreted for the company, facility, and its operations; the activities that meet the requirements; and the current status of the PSM program. • Auditors should determine if the facility or company has developed and implemented a training program (or made use of external training forums) for middle management that is consistent with the level of PSM knowledge they are expected to have. PSM coordinators should have received formal training in PSM, the PSM regulations that affect the facility (if any), and specialized training in other PSM topics if they will perform the activities themselves (e.g., HIRA

Audit Criteria	Source	Guidance for Auditors
<p>4-R-34. Personnel with support or peripheral roles in the PSM program understand the technical aspects of PSM, as it applies to their jobs.</p>	GIP	<p>facilitation, auditing).</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should interview company/facility personnel who have support or peripheral roles in the PSM program (e.g., purchasing, HR, engineering) to determine if they understand common PSM terms and language. • Auditors should interview personnel who have support or peripheral roles in the PSM program to determine if they understand the PSM requirements of their roles and how their jobs affect the functionality of the PSM program. • The level of knowledge of support personnel need not be at the same level of detail and understanding as those who have direct responsibility for the design and implementation of the PSM program. • Auditors should determine if the facility or company has developed and implemented a training program (or made use of external training forums) for personnel with support or peripheral roles in the PSM program that is consistent with the level of PSM knowledge they are expected to have given their PSM program duties.
<p>4-R-35. The nonmanagement work force understands the technical aspects of PSM, as it applies to their jobs.</p>	PANEL	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should interview nonmanagement personnel to determine if they understand common PSM terms and language. • Auditors should interview nonmanagement personnel who have support or peripheral roles in the PSM program to determine if they understand the PSM requirements of their roles and how their jobs affect the functionality of the PSM program. • The level of knowledge of nonmanagement personnel

Audit Criteria	Source	Guidance for Auditors
		<p>need not be at the same level of detail and understanding as those who have direct responsibility for the design and implementation of the PSM program.</p> <ul style="list-style-type: none"> Auditors should determine if the facility or company has developed and implemented a training program (or made use of external training forums) for nonmanagement personnel at the awareness level of PSM.
4-R-36. There is a continuing PSM training and education curriculum for all personnel, appropriate to their responsibilities and roles in the PSM program.	PANEL	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review records from safety meetings and other training and information forums, as well as the training records, to determine if PSM training and education are performed on a regular basis.

In Table 4.6, the audit criteria and guidance for auditors relating to PSM accountability and expectations are presented.

Table 4.6 PSM Accountability and Expectations

Audit Criteria	Source	Guidance for Auditors
<p><i>Strengthen accountability and responsibility for PSM performance in executive management and in the managerial and supervisory reporting line. Delegations of authority and related accountabilities are made with operational clarity and specificity about PSM expectations and performance criteria.</i></p>		
4-R-37. PSM performance goals, objectives, and expectations are included in performance contracts, employee goals and objectives, and discretionary compensation arrangements for line managers, supervisors, and workers.	CCPA PANEL	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review copies of employee performance goals, employment contracts, or other documents (blank forms or redacted documents) that establish employee or contractor performance objectives to determine if PSM goals are assigned to those employees or contractors whose responsibilities include PSM program elements or parts of them. (Senior and middle management

Audit Criteria	Source	Guidance for Auditors
		<p>employees should be assigned the primary responsibilities for these PSM elements.)</p> <ul style="list-style-type: none"> Auditors should determine if the PSM performance goals indicated on the forms are verifiable objectives and the means by which the company or facility will achieve them are identified. The metrics or other means by which performance is measured are defined in the performance forms or the procedure that governs their use.
4-R-38. There is no confusion over who is responsible for what in the PSM program.	CCPA PANEL	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review job descriptions, performance goals documents (blank forms or redacted documents), or the PSM program applicability or high-level policy/procedure to determine if the responsibility for each PSM element, and its sub-parts, is clearly defined. Auditors should interview middle management personnel to determine that there is no confusion over who is responsible for each PSM element and that the boundaries between these responsibilities are well understood. For instance, if the performance of HIRAs is the responsibility of one person, but the communication of the results is the responsibility of another person, these expectations should be clearly understood.
4-R-39. A significant portion of the total compensation of line managers and supervisors is contingent on satisfactorily meeting PSM performance indicators and goals.	PANEL	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review performance records (redacted if appropriate) to determine if progress on PSM goals is evaluated regularly and promptly in accordance with the procedure that defines how this assessment is to be accomplished. Auditors should review HR procedures and interviews with senior management or HR to

Audit Criteria	Source	Guidance for Auditors
		determine if PSM performance is translated into salary decisions.
4-R-40. A significant portion of the variable pay plan for nonmanagerial workers is contingent on satisfactorily meeting PSM performance objectives.	PANEL	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review HR policies and procedures defining how bonuses and other variable/incentive-based compensation schemes to determine if they incorporate PSM performance, where appropriate.
4-R-41. PSM performance and leadership are significant considerations in career advancement and succession planning.	PANEL	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review HR policies and procedures defining how advancement and succession planning decisions are made to determine if they incorporate PSM performance and experience, where appropriate.
4-R-42. PSM accountabilities are defined for each level of management and supervision in operational terms that are understood, and then enforced.	CCPA PANEL	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should interview senior and middle management to determine if PSM performance and accountability are enforced.

The audit criteria and guidance for auditors relating to PSM line management are displayed in Table 4.7.

Table 4.7 Line Management of PSM

Audit Criteria	Source	Guidance for Auditors
<i>PSM program leadership has been formally designated.</i>		
4-R-43. A company-level PSM leader has been designated.	PANEL	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review company organization documents (charts and/or policies) to determine if the formal responsibility for the company's PSM programs has been assigned. • Auditors should review company organization documents (charts and/or policies) to determine if the company leader provides strategic guidance on PSM direction for all facilities, and

Audit Criteria	Source	Guidance for Auditors
		<p>facilitates consistent PSM implementation across the facilities.</p> <ul style="list-style-type: none"> Auditors should review company organization documents (charts and/or policies) and credentials to determine if the PSM leader has substantial knowledge and experience in PSM and sufficient positional authority to contribute meaningfully to the most significant decisions, financial or otherwise, made at all levels above the facility level that affect PSM performance at those sites. This position can be either full time or part time, depending on the size of the company, the number of facilities included in the PSM program, and the applicability and complexity of the company PSM program.
4-R-44. A facility PSM leader has been designated.	PANEL	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review facility organization documents (charts and/or policies) to determine if the formal responsibility for the facility's PSM programs has been assigned. Auditors should review company organization documents (charts and/or policies) to determine if the lead PSM person at each site has a joint reporting relationship with the facility manager and with the company PSM leader. (The facility leader should reside in the facility line organization and report jointly to the company PSM leader and to the facility manager.) This position can be either full time or part time, depending on the size and complexity of the facility, and the applicability and complexity of the PSM program.

Table 4.8 displays the audit criteria and guidance for auditors relating to BP Texas City investigation cultural indicators.

Table 4.8 BP Texas City Investigation Cultural Indicators

Audit Criteria	Source	Guidance for Auditors
4-R-45. The working environment is characterized by acceptance to change.	TXC	<p><u>Background information for Auditors:</u></p> <ul style="list-style-type: none"> • Indicators of resistance to change include: <p>The “not invented here syndrome” where changes to procedure and policy are not accepted because they were developed somewhere else or by someone else.</p> <p>Bureaucratic inertia where too many people have to implement a programmatic change.</p> <p>Inadequate training and explanation of the changes (especially why the change is necessary).</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should interview senior and middle management, and nonmanagement personnel, to determine if changes to processes, as well as programmatic changes (i.e., changes to policies, practices, and procedures), are difficult to implement because of a cultural resistance to change.
4-R-46. Plant PSM policies, practices, and procedures followed are consistently followed.	TXC	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review PSM records and interview middle management and nonmanagement personnel to determine if facility personnel ignore policies and procedures that have been approved for use and do their jobs in ways they are used to and are comfortable and easy.
4-R-47. Employees are empowered to suggest or initiate improvements.	TXC	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review MOC records and incident investigation reports/records to determine if changes are originated by employees at all levels of seniority. • Auditors should interview middle management and nonmanagement personnel to

Audit Criteria	Source	Guidance for Auditors
		determine if suggestions are appropriately considered and resolved.
4-R-48. The workplace culture is outward looking and open to initiatives or learning from sources external to the site.	TXC	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should determine if company or facility personnel have attended industry forums on PSM, such as CCPS conferences, and if there is some evidence that the ideas from these forums have been evaluated for applicability and possible use at the company or facility. • An indicator that the facility or company is inward looking is the aforementioned "not invented here syndrome."
4-R-49. Leadership has a firm understanding of risk and PSM in general, and accepts the identification of high-risk levels.	TXC	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should interview middle management and nonmanagement personnel to determine if leadership does not attempt to lower the identified risks arbitrarily due to their own misunderstanding of them or for other reasons.

The Safety and Environmental Management Program (SEMP) is a voluntary program between the offshore oil exploration and production (E&P) industry and the U.S. Department of the Interior, Minerals Management Service (MMS). Oil platforms located on the outer continental shelf (OCS) are regulated by MMS, not OSHA. A voluntary PSM program developed by API and published in API RP-75 allows OCS facilities to implement a PSM program that is not regulatory but is recognized by MMS as a good industry practice for that sub-sector. The Leadership and Commitment audit criteria below are part of API RP-75 and may also be obtained at www.mms.gov/sempr. Since this is a voluntary program, these criteria, shown in Table 4.9, are presented as related criteria. Table 4.9 shows the SEMPR PSM cultural guidance requirements.

Table 4.9 SEMPR PSM Culture Guidance Requirements

Audit Criteria	Source	Guidance for Auditors
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Audit Criteria	Source	Guidance for Auditors
<p>Table 4.9 – Continued</p> <p><i>SEMP</i></p> <p>4-R-50. Management has assigned management program authority, responsibility, and accountability throughout the organization's structure.</p>	<p>RP 75, 1.2.2.a.</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review HR policies, performance evaluation forms, or similar documents to determine if specific management program functions included in organizational responsibilities have been assigned and evaluated.
<p>4-R-51. Performance standards for responsible managers, supervisors, and other personnel include measures for management program effectiveness.</p>	<p>RP 75, 1.2.2.c.</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review HR policies, performance evaluation forms, or similar documents to determine if there are goals and objectives for organizational units that include specific safety and environmental management metrics. • Auditors should review HR records to determine if there are copies of performance standards with program measures. • Auditors should interview employees to determine if there is evidence of employee understanding regarding their level of responsibility in achieving performance standards.
<p>4-R-52. Management has taken effective steps in demonstrating its support for the organization's management program.</p>	<p>RP 75, 1.2.2.h.</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should interview employees to determine if SEMP-endorsement documents are readily available to employees. • Auditors should interview employees to determine if there is a high level of management awareness of the program's goals and performance measures. • Auditors should interview employees to determine if there is a clear understanding in management of functional and resource requirements for sustaining the program.

Audit Criteria	Source	Guidance for Auditors
4-R-53. Employee input was requested and considered in developing the elements of the organization's management program.	RP 75, 1.1	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should interview managers and supervisors and nonmanagement personnel to determine if there is collaboration of qualified personnel at different levels in the organization in the development of the SEMP program.

4.3 POSING QUESTIONS TO AUDIT PROCESS SAFETY CULTURE

To accomplish a meaningful audit of culture will require an examination of values—a task that is more difficult than the examination of other PSM program elements because it will involve collecting a large number of opinions about how various personnel “feel” about PSM-related issues rather than just collecting objective facts. In order to gather information on this vital topic, auditors will need to rely heavily upon information collected mostly from interviews and, to some degree, from record reviews. However, to completely answer some key audit questions and draw any valid conclusions from those answers about the process safety culture at the facility, multiple interviews will have to be conducted across the hierarchy of the organization. A single opinion, or even several opinions, about a single cultural issue may not be adequate to form a conclusion, and there may be no direct evidentiary records to examine. For example, to answer the important cultural question “Has the facility lost a sense of vulnerability with respect to the PSM hazards that exist?” the auditor will have to conduct interviews with the entire spectrum of employees at the site, including senior management, middle management, and nonmanagement personnel. There are generally no records that can verify the accuracy of the opinions expressed during interviews in response to this question.

In each interview dealing with cultural issues, the auditor should attempt to ask questions that are purposefully indirect. For instance, the following questions might be used to probe the “sense of vulnerability” issue:

- Do you believe that a catastrophic release is possible at the plant?
- Do you think that the likelihood of such an event is about the same as a meteor striking the plant or an airplane accidentally crashing into the plant?
- If the facility has highly toxic chemicals on-site, do you think that an accident with significant off-site consequences is possible at this plant?

If the risks at the facility are significant, and the answers to these and similar questions paint a picture that the site employees have become desensitized to those risks, then the auditor may conclude that the answer to the root question regarding a sense of vulnerability is “no” or “partial.” The reason the entire hierarchy of

employees should be asked these questions is that management may believe that the risks have been successfully abated, but direct supervisory and/or the nonmanagement employees may have a different opinion or perspective based on their knowledge and/or experience.

In a second example, to answer the cultural question “Has the facility allowed the normalization of deviance?” the auditor should interview the same hierarchy of employees as in the previous example, plus review incident records and equipment maintenance records to confirm the results of the interviews. The auditor could search the records for evidence that improperly investigated incidents had occurred or that appropriate recommendations had not been offered during the investigations to address the root cause(s). Various maintenance records such as work order priorities; equipment deficiency logs and records; safety feature bypass/removal logs; and inspection, test, and preventive maintenance records should be examined to see if there are indications that the equipment deficiencies or bypassed/removed safety features were allowed to exist for unreasonable amounts of time and whether or not their correction/ and restoration were not accorded the proper priority.

A third example might be the cultural question “Are PSM metrics reported and reviewed by management on a periodic basis?” The auditor would first check records such as the agendas for management/staff meetings to determine if PSM metrics are on the agenda, and then check the meeting minutes from these activities to determine if the discussions resulted in any follow-up actions. Interviews with senior and middle management would attempt to determine, respectively, the following:

- If the senior management believes the discussion of this data is useful, valued, and given an appropriate priority
- If middle management considers the presentation of this data is received in a positive manner or whether there is consternation about discussing it in this forum.

A fourth example might be the cultural question “Are PSM program goals and objectives included in employee Key Performance Indicators (KPI) or other formal performance goals?” The auditor would first check the policies and procedures for preparing performance evaluations for those with PSM responsibilities, and then spot-check the actual written goals for several middle management personnel with PSM responsibilities. This review may be difficult to complete because of the desire to preserve confidentiality regarding sensitive human resources information. In this case, requests should be made for examples of redacted copies. Interviews should be conducted with both senior and middle management to determine if such performance goals are established and then used in actual written and verbal performance evaluations.

4.4 AUDIT PROTOCOL

The PSM program audit protocol available online (see page xiv for information on how to access this resource) provides detailed questions that examine the criteria described in Section 4.2.

REFERENCES

- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations*, RC101.02, January 25, 2004
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations Appendices*, RC101.02, January 25, 2004
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- Center for Chemical Process Safety (CCPS), *Guidelines for Risk Based Process Safety*, American Institute of Chemical Engineers, New York, 2007 (CCPS, 2007c)
- Chemical Safety and Hazard Investigation Board, *Investigation Report—Refinery Explosion and Fire, BP Texas City*, Texas March 23, 2005, March 20, 2007
- Department of the Interior, Minerals Management Service, *Safety and Environmental Management Program (SEMP)*, 1990
- National Aeronautics and Space Administration, *Columbia Accident Investigation Board Report*, Washington, DC, August 2003
- Rogers, W.P. et al., *Report of the Presidential Commission on the Space Shuttle Challenger Accident*, Washington, D.C, June 6, 1986

5

COMPLIANCE WITH STANDARDS

This element has no direct corresponding element in OSHA PSM and EPA RMP programs or state regulatory PSM programs; however, it is inferred in several OSHA PSM/EPA RMP elements, such as Process Safety Information and Mechanical Integrity where compliance with recognized and generally accepted good engineering practices is required. This RBPS element also infers compliance with the applicability provisions of the PSM regulations. This is covered in Chapter 3 of this book. Compliance with Standards is an element of the RBPS accident prevention pillar Commit to Process Safety.

5.1 OVERVIEW

Compliance with relevant standards, codes, regulations, and laws (i.e., standards) consists of a system to identify, develop, acquire, evaluate, disseminate, and maintain an archive of applicable standards, codes, regulations, and laws that affect process safety. The standards system addresses both internal and external standards, national and international codes and standards, and local, state, and federal regulations and laws. The system makes this information easily and quickly accessible to potential users. The standards element of a PSM program interacts in some fashion with every other RBPS management system element. Standards comprise the main drivers for the PSM program being audited, as well as the source of many of the requirements for the individual program elements.

The Compliance with Standards element interfaces significantly with other PSM program elements. The primary interfaces include the following:

- Process Knowledge Management (Chapter 9)—documenting that the processes and equipment included in the PSM program comply with the relevant RAGAGEPs.

- Safe Work Practices (Chapter 12) —compliance with any additional regulations that govern them (e.g., OSHA’s Lockout/Tagout Standard, as well as the fire protection requirements contained in Section 1910.252(a)).
- Asset Integrity and Reliability (Chapter 13)—the inspection, testing, and preventive maintenance program should follow the relevant RAGAGEPs when choosing ITPM tasks and their frequencies.
- Training and Performance Assurance (Chapter 15)—operators, maintenance personnel, and other affected personnel should be trained in accordance with relevant laws and regulations (e.g., emergency response training under the HAZWOPER regulation).
- Emergency Management (Chapter 19)—emergency response plans should comply with any additional regulations that govern them (e.g., OSHA’s HAZWOPER regulation, as well as the emergency action plan requirements contained in Section 1910.38(a)).

Related audit criteria, along with guidance for auditors in applying the criteria, are presented in Section 5.2. A full explanation of compliance and related audit criteria is presented in Chapter 1 (see Section 1.7). The criteria and guidance described in these sections do not represent exclusive solutions to PSM program coverage, design, implementation, or interpretation. They represent the collective experience of many people in the chemical/processing sector who have performed many PSM audits, and the consensus opinion resulting from that experience.

The inclusion of related criteria does not infer that these criteria must be implemented for a PSM program to be successful, nor does it infer that a PSM program will be deficient without them. There may be other, more appropriate solutions for an individual facility or company. In addition, the use of the related criteria in a PSM audit is intended to be completely voluntary, and not a mandatory requirement in any way. They should be used cautiously and with careful planning so that they do not inadvertently establish performance standards that are not intended. Consensus should be sought within and among facilities and their parent companies before these criteria are used. Finally, the related criteria and guidance offered for consideration are not endorsements of nor agreements with the written or verbal clarifications made by the regulators, PSM citations issued against the regulations, other PSM guidance published by the regulators, or the successful or common PSM practices in any given company’s PSM program from which they are derived.

5.2 AUDIT CRITERIA AND GUIDANCE

The detailed requirements for the applicability of OSHA’s PSM Standard and EPA’s RMP Rule, as well as for state PSM programs, are presented in Chapter 3. In addition, direct references to laws, regulations, codes, standards, and recognized and generally accepted good engineering practices (RAGAGEP) are addressed in the relevant chapter. Requirements that address general issues regarding standards’ knowledge and maintenance are also included.

The purpose of providing these criteria is to provide auditors with guidance for evaluating PSM programs with respect to issues that go beyond the strict compliance requirements presented above, and in large part represent industry good practices, or in some cases practices that have become common. Some of the related criteria have reached the status of a level of acceptable practice because of their widespread, accepted, and successful use over an extended period of time. Auditors and PSM practitioners should carefully consider implementing this guidance, or at least designing an approach that is similar in nature. See the Glossary and Section 1.7.1 for a more complete discussion of the meaning and use of level of acceptable practice.

The audit criteria described below are examined by auditors performing the following audit activities as provided by the guidance:

- Interviewing the persons at the facility who have the responsibility for maintaining internal and external codes and standards that govern the design, project management, and operations activities at the facility. These will generally be process/project engineers, the engineering manager, or the technical manager at the facility.
- Reviewing the document control system used to maintain the codes and standards, as well as some of the document themselves.

Auditors should also carefully examine the compliance with standards requirements found in the procedures of the company/facility being audited. As stated in Section 1.7.1 these could be interpreted as compliance requirements by regulators and could be subject to citations if they are not being followed. Auditors should confirm, via interviews, records and document reviews, and field observations, that the requirements of the facility or company procedures have been implemented as specified. Findings should be generated if the company/facility-specific provisions are not being followed.

See the Guidance for Chapters 3–24 in the Introduction for the definition of the abbreviations shown in the following tables that are used to indicate the source of the criteria. Table 5.1 presents the audit criteria and guidance for auditors regarding Compliance with Standards.

Table 5.1 Audit Criteria and Guidance for Auditors - Compliance with Standards

Audit Criteria	Source	Guidance for Auditors
5-R-1. A management system exists to properly identify, interpret, and maintain the relevant internal and external codes, standards, and other documents that set forth either requirements or guidance followed in the design, operations, and maintenance of processes and equipment included in the PSM program.	CCPA RBPS	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should confirm, via interviews and record reviews, that the relevant internal and external codes and standards for the facility have been identified and documented (the engineering, projects, technical manager(s), or persons in similar positions are the most

Audit Criteria	Source	Guidance for Auditors
		<p>Table 5.1 - Continued</p> <p>likely interviewees for this topic:</p> <ul style="list-style-type: none"> - Those that define PSM applicability requirements (see Chapter 3) - Those that define equipment design, construction, and operations requirements (i.e., Process Safety Knowledge and Asset Integrity issues—see Chapters 9 and 13) - Those that define training requirements (i.e., operator training and emergency response training—see Chapters 15 and 19) - Those that identify special or unique hazards applicable to the facility. For example, if the facility manufactures, stores, or uses chlorine the Chlorine Institute standards are likely applicable at the facility. If combustible dusts exist at the facility, the NFPA standards dealing with this important topic would be relevant. <ul style="list-style-type: none"> • Auditors should confirm, via interviews and record reviews that the relevant internal and external codes and standards have been properly interpreted for the facility, its chemicals/materials, and its operations, and interpretations have been documented. The engineering, projects, technical manager(s) or persons in similar positions are the most likely interviewees for this topic. • Auditors should confirm that a document control system is in place to keep the relevant codes and standards up-to-date. • Changes to external codes and standards should be monitored to ensure that the facility is always up-to-date on the status of the codes and standards. • This can include existing

Audit Criteria	Source	Guidance for Auditors
		<p>documentation management systems, in which case the relevant codes and standards should be formally issued and approved documents at the facility.</p> <ul style="list-style-type: none"> • Auditors should confirm, via interviews and training record reviews, that facility personnel have been trained in the codes and standards requirements and are competent to execute the requirements. • Auditors should confirm, via interviews and record reviews, that each relevant internal and external code and standard is assigned as the "owner" within the facility or company. For example, the PSM manager/coordinator will likely be assigned "owner" of those codes and standards that define PSM applicability for the facility. The maintenance manager, asset integrity manager, or engineering manager might be assigned as the "owner" for those RAGAGEPs related to equipment design and testing/inspection (e.g., the ASME Boiler and Pressure Vessel Code, API-510). • Auditors should confirm, via interviews and record reviews, that there is a program that checks for adherence to the applicable standards. This can be part of a PSM audit if the audit scope and methods cover the applicable standards thoroughly. In a PSM audit the PSK and AI elements cover the standards (i.e., RAGAGEPs) that apply to the equipment.
5-R-2. Contractors are familiar with the codes and standards that govern their work.	RBPS	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The contractor hiring and vetting process should determine if the contractors hired for operations, maintenance, project, or training work understand the codes and standards that govern their work (part of the Asset Integrity elements and/or the Contractor Management—see Chapters 13

Audit Criteria	Source	Guidance for Auditors
		<p>Table 5.1 - Continued and 14).</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the documentation submitted by the contractor during pre-qualification to determine if the contractor understands the codes and standards that govern the work. • Auditors should interview contractor personnel working at the facility, particularly supervisors and engineers, to determine if they understand the codes and standards that govern their work.

5.3 AUDIT PROTOCOL

The process safety program audit protocol introduced in Appendix A and available online (see page xiv for information on how to access this resource) provides detailed questions that examine the issues described in Section 5.2.

REFERENCES

- American Chemistry Council, *RCMS[®] Technical Specification*, RC101.02, March 9, 2005
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations*, RC101.02, January 25, 2004
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations Appendices*, RC101.02, January 25, 2004
- California, California Code of Regulations, Title 8, Section 5189, CalOSHA, November 1985
- Center for Chemical Process Safety (CCPS), *Guidelines for Risk Based Process Safety*, American Institute of Chemical Engineers, New York, 2007 (CCPS, 2007c)
- Department of the Interior, Minerals Management Service, Safety and Environmental Management Program (SEMP), 1990
- Occupational Safety and Health Administration (OSHA) Instruction CPL 03-00-006, *Combustible Dust National Emphasis Program*, Washington, DC, October 18, 2007 (OSHA, 2007b)

6

PROCESS SAFETY COMPETENCY

This element has no direct corresponding element in OSHA PSM and EPA RMP programs or state regulatory PSM programs; however, the concept of understanding technical information and successfully using that knowledge to make cogent risk decisions is a component of several voluntary consensus PSM programs.

6.1 OVERVIEW

The Process Safety Competency element (PSC) is the combination of three interrelated actions: (1) continuously improving knowledge and competency, (2) ensuring appropriate information is available to people who need to know it, and (3) consistently applying what has already been learned.

Process safety competency is closely related to the both the Process Safety Knowledge and Training elements. Whereas the knowledge element provides the means to catalog, store, and retrieve information so that it can be accessed on request, and the training element helps reinforce information included in procedures and training materials, the PSC element involves increasing the body of knowledge and, when applicable, pushing newly acquired knowledge out to appropriate parts of the organization independent of any request.

PSC differs from Process Safety Knowledge (Chapter 9), which is the process of collecting data and information. The main product of PSC is an understanding and proper interpretation of the knowledge so that the organization can apply the knowledge, make better decisions, and increase the likelihood that when personnel are faced with abnormal situations they will take proper action. Information developed under Process Safety Knowledge and understanding developed through PSC underpin the entire PSM program. The CCPS book *Guidelines for Risk Based Process Safety* provides more detailed guidance on developing Process Safety Competency.

Related audit criteria, along with guidance for auditors in applying the criteria, are presented in Section 6.2. A full explanation of compliance and related audit criteria is presented in Chapter 1 (see Section 1.7).The criteria and guidance

described in these sections do not represent exclusive solutions to PSM program coverage, design, implementation, or interpretation. They represent the collective experience of many people in the chemical/processing sector who have performed many PSM audits, and the consensus opinion resulting from that experience.

The inclusion of related criteria in no way infers that these criteria must be implemented for a PSM program to be successful, nor does it infer that a PSM program will be deficient without them. There may be other, more appropriate solutions for an individual facility or company. In addition, the use of the related criteria in a PSM audit is intended to be completely voluntary, and not a mandatory requirement in any way. They should be used cautiously and with careful planning so that they do not inadvertently establish unintended performance standards. Consensus should be sought within and among facilities and their parent companies before these criteria are used. Finally, the related criteria and guidance offered for consideration are not endorsements of or agreements with the written or verbal clarifications made by the regulators, PSM citations issued against the regulations, other PSM guidance published by the regulators, or the successful or common PSM practices in any given company's PSM program from which they are derived.

6.2 AUDIT CRITERIA AND GUIDANCE

None of the PSM regulatory programs explicitly contain process safety competency elements that include a full treatment of this topic. Therefore, all requirements presented in the remainder of this chapter are considerations derived from related criteria. However, many of the activities identified herein are also part of the Process Safety Knowledge element and that element has a number of compliance requirements (see Chapter 9). With the exception of the CCPS RBPS Guidelines, the other voluntary consensus PSM programs are silent with respect to explicit PSC requirements.

The audit criteria described below are examined by auditors using the guidance provided by performing the following audit activities:

- Interviewing personnel at the facility who have overall responsibility for various aspects of the Process Safety Competency program. These persons include operations, maintenance, safety, engineering, human resources, and management personnel.
- Interviewing front-line personnel, including operators and maintenance technicians, to verify that these elements are in place. Many PSC issues can only be verified through use of confidential interviews, as these issues are primarily cultural/behavioral in nature, relating to the knowledge and understanding of plant personnel.
- Reviewing any written policies or procedures associated with PSC. Sometimes issues may be embedded in procedures for other PSM elements, such as Process Safety Knowledge, and Training.
- Reviewing any records associated with PSC. These may be available on a case-by-case basis; many of these issues may not necessarily be

documented. Records for PSC may take the form of policy statements or organization charts showing lines of responsibility for PSC issues.

The purpose of these criteria is to provide auditors with guidance for evaluating PSM programs with respect to issues that in large part represent industry good practices, or in some cases practices that have become common. Some of the related criteria have reached the status of a level of acceptable practice because of their widespread, accepted, and successful use over an extended period of time. Auditors and PSM practitioners should carefully consider implementing this guidance, or at least designing a similar approach. See the Glossary and Section 1.7.1 for a more complete discussion of the meaning and use of level of acceptable practice.

Auditors should also carefully examine the PSM competence requirements found in the procedures of the company/facility being audited. As stated in Section 1.7.1 these could be interpreted as compliance requirements by regulators and could be subject to citations if they are not being followed. Auditors should confirm, via interviews, records and document reviews, and field observations, that the requirements of the facility or company PSM applicability procedures have been implemented as specified. Findings should be generated if the company/facility-specific provisions are not being followed.

See the Guidance for Chapters 3–24 in the Introduction for the definition of the abbreviations shown in the following tables that are used to indicate the source of the criteria. Table 6.1 presents the recommended related audit criteria and guidance for auditors regarding PSC.

Table 6.1 Audit Criteria and Guidance for Auditors - PSC

Audit Criteria	Source	Guidance for Auditors
6-R-1. Objectives for improving process safety competency are established by department; objectives, along with periodic updates on progress toward achieving objectives, are widely available.	RBPS	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should confirm that the training programs have been established with the following characteristics: <p>Written objectives have been developed: plant-wide policies, along with department-specific objectives.</p> <p>Objectives are measurable and documented in key individual's annual performance plans</p> <p>Objectives are tied to overall business performance.</p>
6-R-2. An internal owner/champion is appointed for PSC issues.	RBPS	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review training or PSM-related policies or procedures, or job descriptions, to determine that an internal owner/champion has been appointed for PSC issues.

Audit Criteria	Source	Guidance for Auditors
<p>Table 6.1 – Continued</p> <p>6-R-3. A group, department, or discipline within the organization is identified with the primary responsibility for maintaining and enhancing PSC.</p>	RBPS	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • PSC is generally limited to ensuring compliance with regulations and industry standards. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm the existence of a management system document that details the PSC program.
<p>6-R-4. Responsibility (if not the primary responsibility) for maintaining PSC is specifically included in the job description of the process safety manager or PSM coordinator.</p>	RBPS	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that the management system document identifies key responsibilities. • Auditors should interview the PSM manager/coordinator, and a review of job description and duties should indicate that process safety competency is within his/her job scope.
<p>6-R-5. Responsibility for maintaining PSC for each PSM element is included in the job description of the appropriate personnel within the organization.</p>	RBPS	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that the management system document identifies key responsibilities. • Auditors should interview those persons who have PSM element functional responsibility, and a review of their job descriptions/duties indicate that process safety competency is within their job scope for the element for which they are responsible.
<p>6-R-6. Responsibility for maintaining PSC on a corporate basis is assigned to a formal network representing a broad range of functions within the company.</p>	RBPS	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that the management system document identifies key responsibilities for PSC. • Auditors should review documentation of corporate PSC activities, such as the corporate PSC committee, minutes of PSC meetings, and where PSC is a topic in facility and corporate PSM meetings.
<p>6-R-7. Activities that are likely to support progress toward PSC learning objectives have been identified and funded.</p>	CCPA RBPS	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Aspects of a learning plan include: <ul style="list-style-type: none"> – Incorporates the results of

Audit Criteria	Source	Guidance for Auditors
		<p>uncertainty cataloguing; i.e., ask what else might need to be known and what benefits information would provide.</p> <ul style="list-style-type: none"> – Presents approaches for testing assumptions and resolving uncertainties through experimentation and learning. – Prioritizes assumption-testing tasks and defines a path forward. – Provides a means to log efforts to maintain PSC. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check that learning/training plans or similar documents exist. • Auditors' interviews with the PSM manager/coordinator, training managers/coordinators should indicate that learning activities that enhance process safety competency are approved.
6-R-8. A longer term (3–5 years) learning plan has been established for PSC work activities.	CCPA RBPS	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check that a written plan to promote PSC is included in the facility/business unit strategic plan. • Auditors should check that budgets have been established to support development and implementation of new initiatives that support the plan. • Auditors should check that key personnel are assigned to tasks that support the long-term plan.
6-R-9. The facility works to identify and promote activities that help create, acquire, interpret, transfer, and retain knowledge.	CCPA RBPS	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm via interviews with operations, maintenance and other personnel that the organization intentionally tries to identify opportunities to improve competency through learning. • Auditors should confirm via interviews with training personnel that the organization evaluates the likely benefits that might be realized and, on that basis,

Audit Criteria	Source	Guidance for Auditors
		<p>Table 6.1 – Continued</p> <p>develops and funds a plan to promote learning in a targeted manner.</p>
<p>6-R-10. A technology steward is assigned to each type of process within the organization.</p>	<p>RBPS</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • This role often involves coordinating work done by others; it is rare that one single person has the range of skills necessary to address the range of different types of knowledge and experience needed. Normally, this is a part-time assignment for a senior engineer or technologist who has been closely involved with the process and its technology for many years. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review training or PSM-related policies or procedures or job descriptions to confirm that a technology steward has been appointed for PSC issues.
<p>6-R-11. The technology stewards are assigned to proactively monitor research and potential code changes that are directly relevant to process safety and the process.</p>	<p>RBPS</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should interview the technology stewards to confirm their awareness of the industry state-of-the-art in their respective area(s) of assignment. Examples include research on chemical interactions and corrosion issues, standards changes being considered by ASME, new fire protection standards being considered by NFPA, etc. Voluntary consensus standards such as ISO 14001/RC14001 and OSHAS 18001, if they are applicable, require that the facility determine if there are changes applicable to the company/facility. These changes may come from national organizations (OSHA, EPA), industry groups (ASME, API, ASNT, NIST), or local authorities (fire department, building inspector). • This activity may be performed on a corporate basis; if so, auditors should look for

Audit Criteria	Source	Guidance for Auditors
		<p>evidence of communication to/from the facility.</p> <ul style="list-style-type: none"> This work may overlap with work done under the Compliance with Standards element (see Chapter 5).
<p>6-R-12. The facility has created and maintains a technology information manual that documents the history of the process as well as knowledge that is critical to maintaining process safety competency.</p>	<p>CCPA RBPS</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> This manual, or collection of information, may overlap with the information compiled under the Process Safety Knowledge, Asset Integrity, and MOC elements. This manual is likely to be a collection of legacy technical data and information, including the original engineering/project "books" that the original engineering or construction firm issued to the facility, plus project data and information that has been created since as the process/ equipment has been modified. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check that a technology information manual exists.
<p>6-R-13. Copies of all significant reports and engineering documents related to a process are maintained by the technology steward in a designated location.</p>	<p>CCPA RBPS</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The process safety knowledge is maintained in a library or organized location(s). This "location" may be hard copy, electronic, or both. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should inspect the PSK library or repository of information.
<p>6-R-14. A formal system exists to capture certain documents, and the documents are indexed or filed in a retrievable manner.</p>	<p>RBPS</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Information is maintained in a controlled register or filing system that is available to all affected personnel. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check that a formal system exists to capture certain PSM documents.
<p>6-R-15. The basis for past design, operational, and maintenance decisions is documented in a</p>	<p>CCPA RBPS</p>	<p><u>Background Information for Auditors:</u></p> <p>The collection and preservation of this historical information may</p>

Audit Criteria	Source	Guidance for Auditors
retrievable manner.		<p>Table 6.1 – Continued</p> <p>overlap with the information compiled under the Process Safety Knowledge, Asset Integrity, and MOC elements.</p> <ul style="list-style-type: none"> • Since many decisions in PSM programs are made on the basis of the operational and maintenance history of the facility, it is important that this history be preserved. This is particularly important when large gaps in time have occurred and different people are making decisions. For example: <p>“Step 4.3 of the procedure was inserted because of a note we received from the valve manufacturer about”</p> <p>“We specifically use a NAMCO valve in this application with a pneumatic operator because they used an electric operator and”</p> <p>“The basis for testing the reactor pressure control functions are”</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check that past design, operational, and maintenance decisions are documented in a retrievable manner.
6-R-16. The technology documents are included in the scope of the facility’s formal document control system, and there is an established process for reviewing and approving changes to the manual, which includes review/approval by the appropriate technology steward.	CCPA RBPS	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that the technology documents are formally issued and approved facility documents. • Alternatively, the changes to the technology documents are controlled using the MOC program.
6-R-17. Information is stored in a manner accessible from anywhere within the company.	CCPA RBPS	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm the following: <ul style="list-style-type: none"> – Most information is stored on computer networks that can be accessed from anywhere within the company. – There is an index/register of documents.

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"> - Information is searchable by key words or phrases. - Information is stored in a manner accessible from anywhere within the company and access to this information is open to those who need it.
6-R-18. A means exists to quickly locate technical information, facilitate maintenance of existing information, and file new information in a logical manner.	CCPA RBPS	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm the following: <ul style="list-style-type: none"> - A standard structure for the technology and supporting process safety related information is provided. - Technical personnel who routinely add or revise documents help maintain the structure. - Related documents include active links or cross-references, which are routinely maintained and updated. - Someone is assigned the task of managing the technology and supporting process safety related information/data. - Auditors should check that technical information can quickly be located.
6-R-19. Initial and refresher training is provided to technical support personnel to ensure they are aware of information contained in the technology information or document system, as well as how the information is structured.	CCPA RBPS	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review training records and other means of communication to confirm that training is provided to technical support personnel on and management of technology information. • Auditors should interview appropriate personnel to test their knowledge of the technical manual and information transfer system.
6-R-20. New information is transmitted to all affected personnel in a timely and targeted manner.	RBPS	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the means of communication to confirm that technology information is disseminated promptly and thoroughly. • Auditors should interview Table

Audit Criteria	Source	Guidance for Auditors
		<p>6.1 – <i>Continued</i> appropriate personnel to confirm that new information is transmitted to all affected personnel in a timely and targeted manner.</p>
<p>6-R-21. The technology steward annually reviews copies of change logs to ensure relevant changes have been captured in the technology information.</p>	RBPS	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm the following: <ul style="list-style-type: none"> – The technology documents are formally issued and approved facility documents. – Alternatively, the changes to the technology documents are controlled using the MOC program. – Auditors should check copies of change logs to determine how often relevant changes have been captured.
<p>6-R-22. The technology steward is notified of all changes, determines if the technology information should be updated, and makes changes or signs off on others' making changes.</p>	RBPS	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm the following: <ul style="list-style-type: none"> – The technology documents are formally issued and approved facility documents. – Alternatively, the changes to the technology documents are controlled using the MOC program.
<p>6-R-23. The technology steward spends time in operating units to gain firsthand knowledge of how each unit is operating and to identify opportunities for improvement in each unit.</p>	RBPS	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should interview technology stewards and operating staff to confirm evidence of firsthand knowledge of the units by the technology steward.
<p>6-R-24. A succession-planning program is in place and extends throughout the organization. The objectives of the program include: maintaining the organization's PSC and critical knowledge through transitions, and enhancing PSC over time.</p>	CCPA RBPS	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm the following: <ul style="list-style-type: none"> – A succession plan exists at the facility or company that includes the technology steward position. – Succession planning may overlap with activities that are part of the formal

Audit Criteria	Source	Guidance for Auditors
<p>6-R-25. Succession-planning efforts extend into the technical and staff functions, including process safety professionals.</p>	<p>CCPA RBPS</p>	<p>process safety culture program.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm the following: <ul style="list-style-type: none"> – A succession plan is in place to expose individuals to process safety principles with the intent of developing a baseline level of competence throughout the technical organization, and resulting in a number of qualified candidates available to fill process safety vacancies. – Succession planning may overlap with activities that are part of the formal process safety culture program. – The succession-planning program covers technical and staff functions, including process safety professionals.
<p>6-R-26. Personnel participate in industry associations and other networks that provide insight into how process safety is managed at other companies.</p>	<p>CCPA RBPS</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm the following: <ul style="list-style-type: none"> – There is evidence that employees attend and participate in industry technical meetings and exchanges. – Employees take leadership roles in technical or trade associations so that the company can influence practices throughout industry, and stay abreast of changes and improvements. – The process safety manager/coordinator has received the proper training and that this process is continuing. – These activities may overlap with those that are part of the formal process safety culture program. – Facility personnel participate in industry

Audit Criteria	Source	Guidance for Auditors
		<p>Table 6.1 – Continued associations and other networks, particularly the process safety manager/coordinator.</p>
<p>6-R-27. Objectives established in the competency plan are periodically compared to the benefits derived.</p>	<p>RBPS</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm the following: <ul style="list-style-type: none"> – Objectives are documented in key individual's annual performance plans. – Status of ongoing efforts to maintain and enhance PSC is a standing agenda item at periodic management meetings. – There is a formal management review process to determine what measurable benefits have been achieved, and compare the actual benefits to planning goals. – These activities may overlap with those that are part of the formal process safety culture program. – Objectives established in the competency plan are periodically compared to the benefits derived.
<p>6-R-28. Process safety and technical staff query personnel at the operating-unit level to determine Table 6.1 – Continued what needs remain unmet from their perspective.</p>	<p>RBPS</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check that evidence exists that process safety professionals and other technical personnel jointly work with operating units to identify needs, understand the potential benefits associated with meeting the needs, and try to make a "case" for new initiatives (or continuation of existing initiatives) based on an understanding of risk and how the plans may affect risk. • These activities may overlap with those that are part of the formal process safety culture program.
<p>6-R-29. Periodic reviews with senior management and key personnel from operating areas result in adjustments</p>	<p>RBPS</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check for

Audit Criteria	Source	Guidance for Auditors
to plans or resources provided to various plans/activities		evidence of a formal process to periodically evaluate and adjust priorities and resources, which are adjusted for work activities that support PSC in a logical and transparent manner. <ul style="list-style-type: none"> • These activities may overlap with those that are part of the formal process safety culture program.

6.2.1 Voluntary Consensus PSM Programs

The following voluntary consensus PSM program requirements for conduct of operations are described below:

- The requirements published for the offshore oil platform sector in the Safety and Environmental Management Program (SEMP), a voluntary program designed by API and endorsed by the Minerals Management Service of the Department
- Responsible Care Management System (RCMS)[®] published by the American Chemistry Council
- RC14001 Environmental Management System, published by the American Chemistry Council.

Table 6.2 describes the PSC audit criteria and guidance for auditors relating to SEMP programs.

Table 6.2 Audit Criteria and Guidance for Auditors - SEMP

Audit Criteria	Source	Guidance for Auditors
<i>SEMP</i> 6-R-30. A system is in place whereby results of investigations are distributed to similar facilities and/or appropriate personnel within the organization.	RP 75, 11.3.1	<u>Background Information for Auditors:</u> <ul style="list-style-type: none"> • Example expectations: A written plan requiring the systematic distribution of investigation results. • Incident investigations of root causes are examined to see if there are common threads or trends and the results are shared with facility personnel.
6-R-31. The policy shall be relevant to the nature, scale and impact of the organization's operations, products and processes.	RCMS Element 1.2	<u>Background Information for Auditors:</u> <ul style="list-style-type: none"> • Characteristics of a good management system include: <ul style="list-style-type: none"> – A system to regularly assess relevance of the company's policy based on changing circumstances and internal and external requirements.

Audit Criteria	Source	Guidance for Auditors
		<p>Table 6.2 – Continued</p> <ul style="list-style-type: none"> – A system to review policy triggered by changes in the company's operations, products, and processes.

6.3 AUDIT PROTOCOL

The PSM program audit protocol available online (see page xiv for information on how to access this resource) provides detailed questions that examine the criteria described in Section 6.2.

REFERENCES

- American Chemistry Council, *RCMS[®] Technical Specification*, RC101.02, March 9, 2005
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations*, RC101.02, January 25, 2004
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations Appendices*, RC101.02, January 25, 2004
- California, California Code of Regulations, Title 8, Section 5189, CalOSHA, November 1985
- Center for Chemical Process Safety (CCPS), *Guidelines for Risk Based Process Safety*, American Institute of Chemical Engineers, New York, 2007 (CCPS, 2007c)
- Department of the Interior, Minerals Management Service, *Safety and Environmental Management Program (SEMP)*, 1990

7

WORKFORCE INVOLVEMENT

This element is called Employee Participation in OSHA PSM and EPA RMP programs. In many state regulatory PSM programs it is also called Employee Participation. In the voluntary consensus PSM programs it is generally referred to as employee involvement. Workforce Involvement is an element of the RBPS accident prevention pillar Commit to Process Safety. This chapter also addresses trade secrets.

7.1 OVERVIEW

Personnel at all levels and in all positions in an organization should have roles and responsibilities for enhancing and ensuring the safety of the organization's operations. Some personnel may not be aware of potential opportunities to contribute to the safety of operations. Some organizations may not effectively tap into the full expertise of their personnel and, worse, may even discourage personnel who might be seeking to contribute through what the organization views as a "nontraditional role." Workforce Involvement provides a system to facilitate the active participation of company and contractor personnel in the design, development, implementation, and continuous improvement of the PSM program.

Workforce Involvement requires developing a written plan of action regarding the participation of all relevant personnel; consulting with these personnel on the development of each element of the PSM program; and providing personnel (and their representatives when they are unionized) access to all information required to be developed under the PSM program. In this context, "workforce" has an expansive meaning. It refers to all personnel to whom the PSM program applies, or those personnel who have or desire to have input in its design or implementation. This may include, in addition to those personnel who operate and maintain the processes included in the PSM program, engineering or other technical personnel who design, install, or specify the operations of the process equipment administrative personnel who support the implementation of procedures used in the PSM program; or resident contractors who perform the same or similar roles as

some full-time employees in the PSM program. The workforce includes both nonmanagement and management employees. The involvement of nonemployees in PSM program activities should be governed by applicable human resources procedures and guidelines.

Workforce Involvement provides for collaborative relationships between management and personnel at all levels of the organization with respect to the input provided by personnel. It is not intended to create a system whereby any individual or group can dictate the content of the PSM program; however, for Workforce Involvement to succeed, management should provide due and fair consideration of suggestions of all personnel.

The concept of consultation appears frequently in Workforce Involvement programs. Consulting means the proactive elicitation of opinion and facts regarding the design and implementation of the PSM program through the use of two-way communication. This communication may be verbal, written, or a combination thereof. Two-way communications may occur face-to-face during meetings or during discussions between personnel, and may also occur in writing, including e-mail. PSM program consultation does not stop when the program policies and procedures are first developed and implemented, but continues throughout the life of the PSM program.

Although personnel from most facility groups and disciplines play some role in the development and implementation of all the PSM program elements, the Workforce Involvement element interfaces significantly with other PSM program elements. The primary interfaces include the following:

- Process Knowledge Management (Chapter 9)—operators, maintenance personnel, and other personnel often conduct field checks of information contained in the Process Safety Knowledge, e.g., walking down P&IDs, confirming car seals on relief device isolation valves.
- Hazard Identification and Risk Management (Chapter 10) —HIRAs are performed by teams that comprise a spectrum of the work force, including nonmanagement workers, and relevant personnel are informed of the actions resulting from the HIRAs.
- Operating Procedures (Chapter 11)—the operators are often involved in developing the SOPs, at least as reviewers.
- Safe Work Practices (Chapter 12)—SWPs affect the daily activities of nearly all personnel. The operations and maintenance personnel often initiate SWP permits.
- Training and Performance Assurance (Chapter 15)—operators, maintenance personnel, and other personnel often help develop and deliver training.
- MOC (Chapter 16)—operators, maintenance personnel, and other personnel sometimes initiate MOCs and often review them.
- Operational Readiness (Chapter 17)—operators, maintenance personnel, and other personnel participate in pre-start-up safety reviews.

- Emergency Management (Chapter 19)—emergency response teams are comprised of a spectrum of the work force, including nonmanagement workers.
- Incident Investigation (Chapter 20)—investigations are performed by teams that comprise a spectrum of the work force, including nonmanagement workers, and relevant personnel are informed of the results of incident investigations.

Sections 7.2 and 7.3 present compliance and related audit criteria, along with guidance for auditors in applying the criteria. A full explanation of compliance and related audit criteria is presented in Chapter 1 (see Section 1.7). The criteria and guidance described in these sections do not represent exclusive solutions to PSM program coverage, design, implementation, or interpretation. They represent the collective experience of many people in the chemical/processing sector who have performed many PSM audits, and the consensus opinion resulting from that experience. The compliance criteria are derived from the regulations that govern PSM programs in the United States; however, these regulations are all performance-based. Performance-based regulations are goal oriented and there may be multiple pathways to fully complying with them. Therefore, there may be alternate interpretations and solutions to the issues described in the compliance tables in this chapter that are equivalent to those included, particularly the auditor guidance presented.

The inclusion of the related criteria in no way infers that these criteria must be implemented for a PSM program to be successful, nor does it infer that a PSM program will be deficient without them. As with the compliance criteria, there may be other, more appropriate solutions for an individual facility or company. In addition, the use of the related criteria in a PSM audit is intended to be completely voluntary and not a mandatory requirement in any way. They should be used cautiously and with careful planning so that they do not inadvertently establish unintended performance standards. Consensus should be sought within and among facilities and their parent companies before these criteria are used. Finally, the related criteria and guidance offered for consideration are not endorsements of or agreements with the written or verbal clarifications made by the regulators, PSM citations issued against the regulations, other PSM guidance published by the regulators, or the successful or common PSM practices in any given company's PSM program from which they are derived.

7.2 AUDIT CRITERIA AND GUIDANCE

The detailed requirements for Workforce Involvement of OSHA's PSM Standard, EPA's RMP Rule (referred to in those regulations as Employee Participation), and several state PSM regulatory programs, as well as for other common PSM program voluntary consensus PSM programs, are presented herein. The requirements contained in 29 CFR §1910.119(p), Trade Secrets, are also addressed in this chapter.

The audit criteria described below are examined by auditors using the guidance provided by performing the following audit activities:

- Interviewing the person at the facility who has the responsibility for developing and managing the Workforce Involvement program. This person is usually the PSM coordinator/manager.
- Interviewing a wide spectrum of employees and resident contractors.
- Reviewing the written Workforce Involvement plan and the documents and records that show how it has been implemented.

Auditors should also carefully examine the Workforce Involvement (and Trade Secrets) requirements found in the procedures of the company/facility being audited. As stated in Section 1.7.1 these could be interpreted as compliance requirements by regulators and could be subject to citations if they are not being followed. Auditors should confirm, via interviews, record and document reviews, and field observations, that the requirements of the facility or company Workforce Involvement (and Trade Secrets) procedures have been implemented as specified. Findings should be generated if the company/facility-specific provisions are not being followed.

See the Guidance for Chapters 3–24 in the Introduction for the definition of the abbreviations shown in the following tables that are used to indicate the source of the criteria.

7.2.1 Audit Criteria and Guidance Compliance Requirements

The audit criteria should be used by the following:

- Readers in the United States covered by the PSM Standard or RMP Rule
- Readers who have voluntarily adopted the OSHA PSM program
- Readers whose companies have specified OSHA PSM requirements in non-U.S. locations.

Table 7.1 presents the audit criteria and guidance for auditors relating to Employee Participation pursuant to OSHA PSM and EPA RMP.

Table 7.1 OSHA PSM and ERA RMP Audit Criteria and Auditor Guidance – Employee Participation

Audit Criteria	Source	Guidance for Auditors
7-C-1. A written plan of action exists regarding the implementation of employee participation in PSM.	PSM (c)(1) RMP 68.83	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The employee participation plan may be a section in the PSM manual or overall procedure, or it may be a stand-alone procedure. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with employees to determine if the provisions of the employee participation plan are being executed.
7-C-2. Consultation with employees and their representatives on the	PSM	<u>Background Information for Auditors:</u>

Audit Criteria	Source	Guidance for Auditors
conduct and development of process hazards analyses has occurred.	(c)(2) RMP 68.83	<ul style="list-style-type: none"> • The PHA reports should list the participants in each PHA. • The PHA reports should indicate that a multi-functional group of nonmanagement and management personnel participated in each study. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with employees to determine if they have participated in PHAs.
7-C-3. Consultation with employees and their representatives on the development and implementation of other elements of the PSM standard has occurred.	PSM (c)(2) RMP 68.83	<p><u>Background Information for Auditors</u></p> <ul style="list-style-type: none"> • Documentation examples might include the following: <ul style="list-style-type: none"> – Procedure revision blocks or other implementation records indicate that nonmanagement employees were involved in their development. – Training records indicate that nonmanagement and management personnel were involved in implementing PSM program policies and procedures. – Audit reports indicate that nonmanagement and management personnel were involved in performing the audits – Incident investigation reports indicate that nonmanagement and management personnel were assigned to investigation teams. • Examples of documentation might include the following: <ul style="list-style-type: none"> – Procedure revision blocks or other implementation records indicate that nonmanagement employees were involved in their development. – Training records indicate that nonmanagement and management personnel were involved in implementing PSM program policies and procedures. – Audit reports indicate that nonmanagement and management personnel were involved in audits.

Audit Criteria	Source	Guidance for Auditors
		<p>Table 7.1 – Continued</p> <ul style="list-style-type: none"> – Incident investigation reports indicate the nonmanagement and management personnel were assigned to investigation teams. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with personnel to determine if the provisions of the employee participation plan are being executed. • Auditors should review the minutes of meetings or other documentation to determine if the employees have been consulted with on the development and implementation of the PSM program elements. • Auditors should check the rosters of emergency response teams to confirm that the nonmanagement and management personnel were assigned to or volunteered for these teams. • Auditors should check the rosters of emergency response teams to confirm that the nonmanagement and management personnel were assigned to or volunteered for these teams.
7-C-4. Employees and their representatives have been provided access to process hazard analyses and to all other information required by the PSM Standard.	PSM (c)(3) RMP 68.83	<p><u>Background Information for Auditors</u></p> <ul style="list-style-type: none"> • The employee participation or another PSM program procedure should describe how the employees will have access to PSM program documents and information. • Access does not mean that completely open access is provided 24/7. PSM program information can be physically safeguarded. However, any information employees require to perform their jobs, or any information they request should be provided. This includes off-hours periods. For example, if certain engineering drawings and calculations are normally in a

Audit Criteria	Source	Guidance for Auditors
		<p>locked office or cabinet, and that information is required or requested during off hours, there should be some reasonable way that the information can be retrieved.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should conduct interviews with nonmanagement employees to determine if the access provisions of the employee participation plan are being executed.

Table 7.2 presents audit criteria and auditor guidance for Trade Secrets pursuant to OSHA PSM and EPA RMP.

Table 7.2 Audit Criteria and Auditor Guidance for Trade Secrets - OSHA PSM and EPA RMP

Audit Criteria	Source	Guidance for Auditors
<p>7-C-5. Employers shall make all information necessary to comply with the section available to:</p> <ul style="list-style-type: none"> Those persons responsible for compiling the process safety information (required by paragraph (d) of the PSM standard), Those assisting in the development of the process hazard analysis (required by paragraph (e) of the PSM standard), Those responsible for developing the operating procedures (required by paragraph (f) of this section), Those involved in incident investigations (required by paragraph (m) of this section), Those involved in emergency planning and response (paragraph (n) of this section). Those involved in compliance audits (paragraph (o) of this section). 	PSM (p)(1)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Employers should make the information available without regard to possible trade secret status of such information. The employer may require persons to whom trade secret information is made available to enter into confidentiality agreements not to disclose the information as set forth in 29 CFR §1910.1200. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should interview employees, particularly nonmanagement employees to determine if process safety related or operational information has been kept from them because it was a trade secret.
<p>7-C-6. Employees and their designated representatives have access to trade secret information contained within the process hazard</p>	PSM (p)(3)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Employee access to information deemed by the facility or

Audit Criteria	Source	Guidance for Auditors
analysis and other documents required by the PSM standard.		<p>company to be trade secret information is subject to the rules and procedures set forth in 29 CFR §1910.1200(i)(1)–(12).</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> If the facility or company has declared that some information constitutes a trade secret, auditors should review records that show the requirements of the HAZCOM regulations have been met when employees have requested access to trade secret information.

If the PSM program being evaluated is pursuant to a state PSM regulation, then the specific process safety knowledge requirements for that regulatory program should be followed. In general, these overlap somewhat with the federal OSHA PSM and EPA RMP requirements, but often there are state-specific requirements that should be met, even if the state has received authority to enforce federal regulations (i.e., the state is an OSHA state plan state or has received implementing agency status for RMP implementation). The state-specific applicability requirements for the following states are presented herein:

- New Jersey
- California
- Delaware

Table 7.3 displays the audit criteria and auditor guidance relating to Workforce Involvement pursuant to U.S. state PSM programs.

Table 7.3 U.S. State PSM Audit Criteria and Auditor Guidance Relating to Workforce Involvement

Audit Criteria	Source	Guidance for Auditors
<p><i>New Jersey Toxic Catastrophe Prevention Act (TCPA)</i> 7-C-7. The NJ TCPA regulations do not add any different or unique workforce involvement requirements beyond those described for the PSM Standard and RMP Rule.</p>	<p>N.J.A.C. 7:31-4 (68.83)</p>	<ul style="list-style-type: none"> No further guidance.
<p><i>Delaware Accidental Release Prevention Regulation</i> 7-C-8. The Delaware EHS regulations do not add any different or unique workforce involvement requirements beyond those described for the PSM Standard and</p>	<p>Delaware Code, Chapter 77, Section 5.83</p>	<ul style="list-style-type: none"> No further guidance.

Audit Criteria	Source	Guidance for Auditors
RMP Rule.		
<p><i>California OSHA—Process Safety Management of Acutely Hazardous Materials</i></p> <p>7-C-9. The CalOSHA PSM regulations include workforce involvement provisions in other program elements as follows:</p> <ul style="list-style-type: none"> • A copy of the process safety information and communication shall be accessible to all employees who perform any duties in or near the process. • Upon request of any worker or any labor union representative of any worker in the area, the employer shall provide or make available a copy of the employer's RMPP. • The final report containing the results of the hazard analysis for each process shall be available in the respective work area for review by any person working in that area. • The employer shall consult with the affected employees and where appropriate their recognized representatives on the development and conduct of hazard assessments performed after the effective date of this section. Affected employees and where applicable their representatives shall be provided access to the records required by this section. • A copy of the operating procedures shall be readily accessible to employees who work in or near the process area or to any other person who works in or near the process area. • The employer shall establish and implement written procedures to maintain the ongoing integrity of process equipment and appurtenances. These procedures shall include 	<p>California Code of Regulations, Title 8, Section 5189</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Auditors should interview personnel to determine if the PSI is accessible. • "Timely" in this context means that the response to employee concerns and any resulting resolution or corrective action plans are promptly determined, and the recommendations are resolved quickly and the implementation of the final action is completed in a reasonable time period given the complexity of the action and the difficulty of implementation. The timing of resolution plan development and completion of each recommendation should be evaluated on a case-by-case basis. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Interview personnel to determine whether the RMPP has been provided if requested. • Interview personnel to determine if they have been consulted with on the development and conduct of hazard assessments and provided access to the hazard assessments records. • Interview operators to determine if they have been provided access to the SOPs. • Interview maintenance personnel and others to determine if they are allowed to identify and report potentially faulty or unsafe equipment, record their observations and suggestions in writing, and have their concerns been responded to in a timely manner. • Interview personnel to determine if they have been provided access to the information required in the mechanical integrity

Audit Criteria	Source	Guidance for Auditors
<p>a method:</p> <ul style="list-style-type: none"> – for allowing employees to identify and report potentially faulty or unsafe equipment; and – to record their observations and suggestions in writing. <ul style="list-style-type: none"> • The employer shall respond regarding the disposition of the employee's concerns contained in the report(s) in a timely manner. • The employer shall provide employees and their representatives access to the information required in the subsection (j)(1) (i.e., mechanical integrity procedures). • The employer shall prepare a report and either provide a copy of the report or communicate the contents of the report to all employees and other personnel whose work assignments are within the facility. 		<p>procedures.</p> <ul style="list-style-type: none"> • Interview personnel to determine if they have been provided with a copy of incident investigation reports or the results of the reports have been communicated to them. • Determine how each facility has defined and applied "timely," and if the definition and its application are reasonable and defensible.
<p><i>California Accidental Release Prevention Program</i> 7-C-10. The CalARP regulations do not add any different or unique workforce involvement requirements beyond those described for the PSM Standard and RMP Rule.</p>	<p>California Code of Regulations, Title 19, Section 2760.10</p>	<ul style="list-style-type: none"> • No further guidance.

7.2.2 Related Criteria

The purpose of providing these criteria is to provide auditors with guidance for evaluating PSM programs with respect to issues that go beyond the strict compliance requirements presented above, and in large part represent industry good practices in workforce involvement, or in some cases practices in workforce involvement that have become common. Some of the related criteria have reached the status of a level of acceptable practice because of their widespread, accepted, and successful use over an extended period of time. Auditors and PSM practitioners should carefully consider implementing this guidance, or at least designing an approach that is similar in nature. See the Glossary and Section 1.7.1 for a more complete discussion of the meaning and use of level of acceptable practice.

Table 7.4 lists the audit criteria and auditor guidance for Workforce Involvement pursuant to related criteria.

Table 7.4 Related Audit Criteria and Auditor Guidance - Workforce Involvement

Audit Criteria	Source	Guidance for Auditors
<p>7-R-1. The employer has consulted with contractors to the same extent that they consult with direct hire employees if the contractor employees fulfill one the following roles:</p> <ul style="list-style-type: none"> • Process operator. • Perform routine maintenance. • Routinely interface with the MOC program. • Participate in activities pursuant to the mechanical integrity program. • Has unique process knowledge concerning the operation, maintenance, or safe performance of any portion of a covered process. • Routinely interfaces with the facility's safe work practices. 	CPL	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Consultation with contractors who perform work or engage in activities specified in Appendix B of the CPL can be limited to resident contractors, i.e., those contractors who work every day at the facility in the same role, but who are employed by another company. • The workforce involvement plan should indicate how resident contractors will be included in the plan and how they will be consulted if the contractor employees fulfill one of the following roles: is a process operator; performs routine, periodic preventive maintenance; has a role in the MOC program, has a role in approving hot work permits (HWP); or has unique process knowledge, or routinely interfaces with the facility's safe work practices. • Due to co-employment precautions, direct interface with contractor employees may be restricted for the purposes of consulting with them on the PSM program. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Conduct interviews with nonmanagement employees and contractors to determine if resident contractors who fulfill one of the key roles in the PSM program are consulted in the same or in an equivalent manner as full-time employees.
<p>7-R-2. Access is provided to process hazard analyses and all other information to be developed under this standard to employees of covered contractors, to the same extent that it must provide access to direct hire employees, if similarly situated.</p>	CPL	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The intent of access under this standard is for the information to be made available for employees and their representatives in a reasonable manner. Reasonable access may require providing copies or loaning documents. Access may be provided using

Audit Criteria	Source	Guidance for Auditors
		<p>Table 7.4 – Continued</p> <p>hard copy or electronic means. If electronic means are used, employees should be provided with user IDs, passwords, and other cyber security measures that allow them to access the information. Hard-copy documents may be placed in common areas or other staffed locations for employees to read. The trade secret provision of the standard permits the employer to require confidentiality agreements before providing the information. In this context, access does not mean unfettered access on a 24/7 basis, except for some key information such as operating limits and SOPs. Where specific information is required to be accessible on a continuous basis, this issue is addressed in the relevant chapter.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Conduct interviews with resident contractors to determine if they have access to HIRAs and other PSM-related information.
7-R-3. Access to the workforce involvement plan is provided during off hours.	VCLAR	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The workforce involvement plan or another PSM program document should describe how access to PSM-related documents and information is provided during off-hours. • Although PSM-related documents and information do not have to be provided in open-access areas, if they are kept in a secured area after hours, access should be provided to a supervisor or other person who works during off-hours periods. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Conduct interviews with nonmanagement employees and contractors to determine if PSM-related information could be accessed during off-hours per the provisions of the workforce involvement plan.

Audit Criteria	Source	Guidance for Auditors
7-R-4. Employees are consulted on the preparation of the written workforce involvement plan.	VCLAR	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The workforce involvement plan or another PSM program document should describe how the plan was developed and how employees were consulted during its preparation. The plan should also describe how employees are consulted on the PSM program content and implementation on an ongoing basis. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Conduct interviews with nonmanagement employees and contractors to determine if nonmanagement employees participated in the development of the workforce involvement plan.
7-R-5. Employees (including contractor employees) have been informed of their rights of access to PHAs and other PSM information.	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The workforce involvement plan or another PSM program document should describe the access rights that employees (and contractors) have to PSM-related information. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Conduct interviews with nonmanagement employees and contractors to determine if they have been informed of their rights of access to HIRAs and other PSM information.
7-R-6. Employees have been trained and educated in PSM.	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Review training records to determine if PSM overview training has been given to the work force at large. Conduct interviews with employees to determine if they are familiar with the concepts and practices of PSM.

Audit Criteria	Source	Guidance for Auditors
7-R-7. The workforce involvement activities have been documented.	VCLAR	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Several methods of documentation of workforce involvement activities can be used, including minutes of meetings where PSM program issues are discussed or training is provided, training session sign-in sheets or similar records, reports of PSM activities (e.g., HIRA reports or incident investigation), documentation from the use of suggestion boxes, etc. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Review workforce involvement documentation.
7-R-8. The employer has established system and protocols to be used to respond to employee suggestions and concerns.	RBPS	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> A method should be available for employees and contractors to submit their PSM concerns and suggestions confidentially. A suggestion box (that serves process safety as well as general safety or other concerns may be used), e-mail, or other communications method(s) may be used. The method used should not just be a local means of communication. Protocols detail who receives and responds to suggestions and concerns; the time permitted for response should be detailed. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Conduct interviews with nonmanagement employees and contractors to determine if management responds in a timely manner to their PSM-related concerns or suggestions.
7-R-9. If safety committees are used to satisfy employee participation requirements, both management and employees are represented on the committee.	3133	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Review safety meeting minutes, attendance records, or similar records to determine if both nonmanagement and management personnel participate in the meetings.
7-R-10. The written employee participation plan-of-action includes	NEP	<p><u>Auditor Activities:</u></p>

Audit Criteria	Source	Guidance for Auditors
information on how the employees will be consulted on how often refresher training is needed.		<ul style="list-style-type: none"> Confirm that refresher training in the PSM program is being provided on a periodic basis for the workforce at large.

Table 7.5 lists the audit criteria and auditor guidance for Trade Secrets pursuant to related criteria.

Table 7.5 Related Audit Criteria and Auditor Guidance - Trade Secrets

Audit Criteria	Source	Guidance for Auditors
7-R-11. There is a written policy on the provision of access to trade secrets for PSM.	GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Review written document(s) that describe the company or site trade secret policy. If there are no trade secrets, this should be documented.
7-R-12. There is a written procedure for the provision of trade secret information.	GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Review the trade secret policy to determine how it is enforced. A trade secret procedure may include information on confidentiality agreements, which is required to sign such agreements, and example forms.
7-R-13. Trade secret claims are substantiated.	GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Review trade secret claims to determine if they have been substantiated per the requirements in 29 CFR §1910.1200(i).

7.2.3 Voluntary Consensus PSM Programs

The following voluntary consensus PSM program requirements for Asset Integrity are described below:

- The requirements published for the offshore oil platform sector in the Safety and Environmental Management Program (SEMP), a voluntary program designed by API and endorsed by the Minerals Management Service of the Department.
- Responsible Care Management System (RCMS)[®] published by the American Chemistry Council.
- RC14001 Environmental Management System, published by the American Chemistry Council.

Table 7.6 Related Voluntary Consensus PSM Programs Audit Criteria and Guidance for Auditors – Workforce Involvement

Audit Criteria	Source	Guidance for Auditors
<p><i>SEMP</i></p> <p>7-R-14. The SEMP program does not contain any explicit workforce involvement requirements.</p>		<ul style="list-style-type: none"> No further guidance.

Audit Criteria	Source	Guidance for Auditors
<p><i>Responsible Care® Management System (RMCS)</i></p> <p>7-R-15. Consistent with the RC Guiding Principles, the organization shall establish and maintain processes to provide information on health, safety, security and</p> <p>Table 7.5 – Continued</p> <p>environmental risks and pursue protective measures for employees, the public and other key stakeholders.</p>	<p>RCMS Technical Specification Elements 3.2 and 3.6</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Review RCMS program documents to determine if they include a policy or procedure that describes how information on health, safety, security, and environmental risks and protective measures are communicated to the employees (as well as to the public and other key stakeholders).
<p>7-R-16. The organization shall establish and maintain employee involvement in the development, communication, and implementation of the Responsible Care® Management System.</p>	<p>RCMS Technical Specification Elements 3.2 and 3.6</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> This element addresses the involvement aspect of the implementation, operation, and accountability section, a key element in the technical specification. It addresses the need for employee involvement in all aspects of the Responsible Care program, including development, communication, and implementation. Characteristics of a good management system include the following: Clear evidence of employee involvement in all aspects of the organization's Responsible Care management system, including significant representation from nonmanagement or front-line employees. Specific evidence of employee involvement in the development of Responsible Care programs, goals, targets, and objectives.

Audit Criteria	Source	Guidance for Auditors
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<p>RC14001 7-R-17. Ensure employee involvement in the development, communication, and implementation of Responsible Care programs.</p>	<p>RC14001 Technical Specification RC151.03 4.4.3</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Conduct interviews with personnel to determine if they have been solicited about the design and implementation of the RC program. • Review the minutes of meetings or other documentation to determine if the employees have been consulted with on the development and implementation of the RC program elements.
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7.3 AUDIT PROTOCOL

The process safety program audit protocol available online (see page xiv for information on how to access this resource) provides detailed questions that examine the issues described in Section 7.2.

REFERENCES

- American Chemistry Council, *RCMS[®] Technical Specification*, RC101.02, March 9, 2005
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations*, RC101.02, January 25, 2004
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations Appendices*, RC101.02, January 25, 2004
- California, California Code of Regulations, Title 8, Section 5189, CalOSHA, November 1985
- Center for Chemical Process Safety (CCPS), *Guidelines for Risk Based Process Safety*, American Institute of Chemical Engineers, New York, 2007 (CCPS, 2007c)
- Delaware, *Accidental Release Prevention Regulation*, Delaware Department of Natural Resources and Environmental Control/Division of Air and Waste Management, September 1989 (rev. January 1999)
- Department of the Interior, Minerals Management Service, Safety and Environmental Management Program (SEMP), 1990
- Environmental Protection Agency (USEPA), 40 CFR §68, *Accidental Release Prevention Requirements: Risk Management Programs Under Clean Air Act Section 112(r)(7)*; Final Rule, June 21, 1996
- New Jersey, *Toxic Catastrophe Prevention Act (N.J.A.C. 7:31)*, New Jersey Department of Environmental Protection, June 1987 (rev. April 16, 2007)
- Occupational Safety and Health Administration (OSHA) 29 CFR §1910.119, *Process Safety Management of Highly Hazardous Chemicals, Explosives and Blasting Agents; Final Rule*, Washington, DC, February 24, 1992
- Occupational Safety and Health Administration (OSHA) Publication 3133, *Process Safety Management Guidelines for Compliance*, Washington, DC, 1993

- Occupational Safety and Health Administration (OSHA) Instruction CPL 02-02-045 CH-1, *PSM Compliance Directive*, Washington, DC, September 13, 1994
- Occupational Safety and Health Administration (OSHA) Instruction CPL 03-00-004, *Petroleum Refinery Process Safety Management National Emphasis Program*, June 7, 2007 (OSHA, 2007a)
- Occupational Safety and Health Administration (OSHA) Directive 09-06 (CPL 02), *PSM Chemical Covered Facilities National Emphasis Program*, July 27, 2009 (OSHA, 2009a)

8

STAKEHOLDER OUTREACH

This element has no direct corresponding element in OSHA PSM and EPA RMP programs or state regulatory PSM programs; however, it is called Stakeholder Outreach or by a similar title that refers to stakeholder concerns and input in many voluntary consensus PSM programs. The element represents good industry practice, driven primarily by the American Chemistry Council's Responsible Care® program. Stakeholder Outreach is an element of the RBPS accident prevention pillar Commit to Process Safety.

8.1 OVERVIEW

The Stakeholder Outreach element is intended to provide a process for identifying, engaging, and maintaining good relationships with appropriate external groups that have a stake in the success of the PSM program. This is accomplished through the establishment and execution of policies, programs, and activities to provide information to identified stakeholders regarding the facility's PSM and emergency response programs (as well as other aspects of facility operations such as environmental programs), and to solicit feedback in order to determine whether stakeholder outreach efforts are effective in maintaining positive perceptions and a sense of trust regarding facility risks, process safety management and emergency response programs, and performance. Stakeholder outreach can encompass a wide array of activities; however, the degree to which this element is implemented at a facility is dependent on facility risks, history (e.g. incidents, relationship with local community), available resources, and organizational culture. Stakeholder outreach requires not only an organizational commitment to safe operations, but also a commitment to communicate and obtain input from key stakeholders regarding the facility's process safety, emergency preparedness, and other relevant efforts. By promoting openness and responsiveness, stakeholder outreach is intended to build the trust and commitment necessary to support the facility's "license to operate" both during normal operations and when an event occurs (CCPS, 2007c).

The primary objective of this element is to establish a dialogue with key stakeholders that can be affected by facility operations, particularly during an incident. This includes community members, businesses (including other industry), emergency responders, government officials, and nongovernmental agencies such as environmental or community service groups. It involves the following basic elements (CCPS, 2007c):

- Identification of communication and outreach needs
- Conduct of communication/outreach activities
- Following through on commitments and actions

The Stakeholder Outreach element interfaces significantly with other PSM program elements. The primary interfaces include the following:

- Hazard Identification and Risk Management (Chapter 10)—HIRAs identify which hazards and risks should be discussed with stakeholders.
- Emergency Management (Chapter 19)—emergency response plans should be coordinated with off-site agencies and organizations that will play a role in any response.

In Section 8.3, related audit criteria are presented, along with guidance for auditors in applying the criteria. A full explanation of compliance and related audit criteria are presented in Chapter 1 (see Section 1.7). The criteria and guidance described in these sections do not represent exclusive solutions to PSM program coverage, design, implementation, or interpretation. They represent the collective experience of many people in the chemical/processing sector who have performed many PSM audits, and the consensus opinion resulting from that experience.

The inclusion of related criteria in no way infers that these criteria must be implemented for a PSM program to be successful, nor does it infer that a PSM program will be deficient without them. There may be other, more appropriate solutions for an individual facility or company. In addition, the use of the related criteria in a PSM audit is intended to be completely voluntary and not a mandatory requirement in any way. The related criteria should be used cautiously and with careful planning so that they do not inadvertently establish unintended performance standards. Consensus should be sought within and among facilities and their parent companies before these criteria are used. Finally, the related criteria and guidance offered for consideration are not endorsements of or agreements with the written or verbal clarifications made by the regulators, PSM citations issued against the regulations, other PSM guidance published by the regulators, or the successful or common PSM practices in any given company's PSM program from which they are derived.

8.2 AUDIT CRITERIA AND GUIDANCE

There are no detailed requirements for Stakeholder Outreach established in OSHA's PSM Standard, EPA's RMP Rule, or state PSM regulatory programs, except for making risk management plans available to the public (which is

accomplished by providing them to government agencies, which in turn make them available). The RMP Rule contains a requirement that risk management plans, including the off-site consequence analysis, be presented to the public in an open meeting. This was to have been accomplished within the first year following the original submission of the RMP, and then such activities were to be voluntary. Following the events of September 11, 2001, the public disclosure of RMP information, particularly the off-site consequence analysis, is recognized by government and industry to be counter to current philosophy regarding the security of chemical/processing facilities; open meetings have not occurred since.

The audit criteria described below are examined by auditors using the guidance provided by performing the following audit activities:

- Reviewing the facility Responsible Care®, EHS policy, or equivalent to verify its existence and that it contains applicable provisions related to stakeholder outreach.
- Interviewing public affairs or other management personnel at the facility who have overall responsibility for the Stakeholder Outreach program, in order to determine the scope of the program as well as key activities and communications mechanisms.
- Determining whether there is a written program or plan for scheduled stakeholder outreach activities.
- Interviewing personnel who participate in community outreach activities, including EHS and operations managers. Employees who participate in community outreach activities (particularly those who also participate as community members) should also be interviewed to verify the extent of community outreach activities.
- Reviewing any records associated with stakeholder outreach activities. These may be in the form of meeting minutes, newsletters, etc. Records of surveys or other community feedback activities, as well as documentation that concerns or recommendations related to the facility and its outreach efforts have been addressed, should be reviewed. At a minimum, submission of the Risk Management Plan (as well as any updates) to appropriate government agencies should be verified.
- For facilities that participate in the American Chemistry Council's RCMS or RC14001 programs, a third-party certification audit may have been conducted. Since these efforts explicitly require Stakeholder Outreach programs, these audits should have verified that these provisions are in place. In addition, the periodic management review required by these programs should include an evaluation of stakeholder outreach efforts, with opportunities for improvement identified for follow-up.

Auditors should also carefully examine the stakeholder outreach requirements found in the procedures of the company/facility being audited. As stated in Section 1.7.1 these could be interpreted as compliance requirements by regulators and could be subject to citations if they are not being followed. Auditors should confirm, via interviews, records and document reviews, and field observations, that

the requirements of the facility or company stakeholder outreach procedures have been implemented as specified. Findings should be generated if the company/facility-specific provisions are not being followed.

See the Guidance for Chapters 3–24 in the Introduction for the definition of the abbreviations shown in the following tables that are used to indicate the source of the criteria.

8.2.1 Compliance Requirements

Table 8.1 presents the audit criteria and auditor guidance for the compliance requirements relating to Stakeholder Outreach.

Table 8.1 Compliance Audit Criteria and Guidance for Auditors - Stakeholder Outreach

Audit Criteria	Source	Guidance for Auditors
8-C-1. The Risk Management Plan is made available to the public.	RMP 68.210	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> This requirement is met through submission of the Risk Management Plan to the EPA, which makes it available to the public via public reading rooms. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> See Chapter 24 for further guidance on auditing RMP programs.

8.2.1.1 U.S. State PSM Programs

If the PSM program is being evaluated pursuant to a state PSM regulation, then the specific stakeholder outreach requirements for that regulatory program should be followed. The state specific applicability requirements for the following states are presented below:

- New Jersey
- California
- Delaware

Table 8.2 shows the audit criteria and auditor guidance for Stakeholder Involvement pursuant to state requirements.

Table 8.2 Audit Criteria and Guidance for Auditors Regarding Stakeholder Involvement Pursuant to State Requirements

Audit Criteria	Source	Guidance for Auditors
<i>New Jersey Toxic Catastrophe Prevention Act (TCPA)</i> 8-C-2. The NJ TCPA regulations do not add any different or unique	N.J.A.C. 7:31	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> In addition to submission to the EPA, the RMP must also be submitted to the NJ DEP;

Audit Criteria	Source	Guidance for Auditors
stakeholder outreach requirements beyond those established in the federal RMP Rule.		<p>however, there is no state provision for making the RMP publicly available.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • See Chapter 24 about the public disclosure of RMP information.
<p><i>Delaware Accidental Release Prevention Regulation</i></p> <p>8-C-3. The Delaware EHS regulations do not add any different or unique stakeholder outreach requirements beyond those established in the federal RMP Rule.</p>	Delaware Code, Chapter 77	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • In addition to the EPA, the RMP must also be submitted to DE NRC; however, there is no state provision for making the RMP publicly available. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • See Chapter 24 about the public disclosure of RMP information.
<p><i>California OSHA—Process Safety Management of Acutely Hazardous Materials</i></p> <p>8-C-4. The Cal OSHA PSM regulations do not add any different or unique stakeholder outreach requirements beyond those established in the federal RMP Rule.</p>	California Code of Regulations, Title 8, Section 5189	<ul style="list-style-type: none"> • No further guidance.
<p><i>California Accidental Release Prevention Program</i></p> <p>8-C-5. The CalARP regulations do not add any different or unique stakeholder outreach requirements beyond those established in the federal RMP Rule.</p>	California Code of Regulations, Title 19, Chapter 4.5, Section 2775.5	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • In addition to the EPA, the RMP must also be submitted to the “Administering Agency,” (the local agency responsible to implement the CalARP Program), which will make it publicly available and solicit public comment, as well as conduct a public hearing on the RMP, if warranted. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • See Chapter 24 about the public disclosure of RMP information.

8.2.2 Related Criteria

The purpose of providing these criteria is to give auditors guidance for evaluating PSM programs with respect to issues that go beyond the strict compliance requirements presented above, and in large part represent industry good practices, or in some cases practices that have become common. Some of the related criteria have reached the status of a level of acceptable practice because of their widespread, accepted, and successful use over an extended period of time. Auditors and PSM practitioners should carefully consider implementing this guidance, or at least designing an approach that is similar in nature. See the

Glossary and Section 1.7.1 for a more complete discussion of the meaning and use of level of acceptable practice.

Table 8.2 identifies audit criteria and auditor guidance for related criteria relating to Stakeholder Involvement.

Table 8.2 Related Audit Criteria and Auditor Guidance - Stakeholder Involvement

Audit Criteria	Source	Guidance for Auditors
<p>8-R-1. Communication and outreach needs have been identified.</p> <ul style="list-style-type: none"> • Relevant stakeholders have been identified. • Appropriate scope has been defined. 	<p>CCPA RBPS GIP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Based on the situation at the facility, appropriate stakeholders have been identified and the scope of communication and outreach activities determined. Stakeholders can include public officials, community members, businesses, nonprofit service agencies, and other neighbors and community groups. A higher risk facility (based on potential for off-site impact, proximity of neighbors, safety and environmental history, previous relationship with community, etc.) will generally need a more robust stakeholder outreach effort. • Scope of outreach activities should relate to process safety and emergency response issues at a minimum in order to help assure stakeholders that the facility is doing what is necessary to protect the health and safety of the community. Other community concerns (e.g. environmental related) should also be included in the scope of communication and outreach activities. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should interview the process safety or risk management manager/coordinator to determine if the stakeholders for the PSM/RMP program have been identified. Auditors should then confirm that this has been documented in some fashion.
<p>8-R-2. Appropriate communications/ outreach activities have been</p>	<p>CCPA RBPS</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Any of a number of mechanisms

Audit Criteria	Source	Guidance for Auditors
<p>conducted.</p> <ul style="list-style-type: none"> • Appropriate communications pathways have been identified. • Appropriate communications tools have been developed. • Appropriate information has been shared. • External relationships have been maintained. 	GIP	<p>for stakeholder outreach and communications can be employed, including use of a Community Advisory Panel (CAP) or similar mechanism comprised of community representatives. Communication through the media should also be considered, including contact information for stakeholders to provide feedback or obtain additional information. This is especially important when an incident has occurred at the facility.</p> <ul style="list-style-type: none"> • Communications tools can take the form of meetings, newsletters, websites, group presentations, or other means. • Relevant information should be shared via established mechanisms, and there should be evidence of an ongoing relationship with key stakeholders, either formally or informally. The nature and degree of this ongoing relationship should again be based on the level of risk at the facility and the historic relationship with the community (e.g. a higher risk facility should have regularly scheduled, formal meetings or other activities with a CAP or other groups of key stakeholders). • Participation of nonmanagement company employees in stakeholder outreach activities should be encouraged. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should interview the process safety or risk management manager/ coordinator to determine if there has been communications with off-site stakeholders regarding the risk represented by the facility. Auditors should then confirm that this has been documented in some fashion. • Auditors should confirm that there has been communication with the Local Emergency

Audit Criteria	Source	Guidance for Auditors
		<p>Planning Committees (LEPC) for the region of the facility. This can be minutes of meeting or other forms of documentation.</p>
<p>8-R-3. Follow-through on commitments and actions have been conducted.</p> <ul style="list-style-type: none"> • Commitments to stakeholders have been met and feedback received. • Stakeholder concerns have been shared with management • Outreach encounters have been documented. 	<p>RBPS GIP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The established communications mechanisms should allow stakeholders an opportunity to express concerns regarding facility operations, safety, or other issues to management personnel, either directly or indirectly. This may take the form of a telephone hotline, e-mail, interactive web page, face-to-face meetings, or other means. <p>Table 8.2 – Continued</p> <ul style="list-style-type: none"> • Outreach activities should be documented, e.g., via meeting minutes, and a mechanism established to ensure that follow-up on next steps is completed. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review objective evidence to verify that information or other requests made of the facility by stakeholders have been fulfilled. This can be verified via meeting minutes or through interviews with facility and stakeholder representatives.

8.2.3 Voluntary Consensus PSM Programs

The following voluntary consensus PSM program requirements for Stakeholder Outreach are described below:

- The requirements published for the offshore oil platform sector in the Safety and Environmental Management Program (SEMP), a voluntary program designed by API and endorsed by the Minerals Management Service of the Department.
- Responsible Care Management System (RCMS)[®] published by the American Chemistry Council.
- RC14001 Environmental Management System, published by the American Chemistry Council.

Table 8.3 enumerates the audit criteria and auditor guidance relating to Stakeholder Involvement pursuant to voluntary consensus PSM programs.

Table 8.3 Related Voluntary Consensus PSM Programs Audit Criteria and Guidance for Auditors - Stakeholder Involvement

Audit Criteria	Source	Guidance for Auditors
<p><i>Responsible Care® Management System (RCMS)</i></p> <p>8-R-4. Senior management has developed, documented and implemented a policy for the organization that recognizes Responsible Care, and has communicated it to employees and stakeholders including members of the public.</p> <p>The RCMS policy promotes openness with stakeholders.</p>	<p>RCMS Technical Specification</p> <p>Section 1 Policy & Leadership</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • In addition to members of the community surrounding the facility, RCMS includes the following in the definition of stakeholders: <ul style="list-style-type: none"> – Commercial partners – Regulators – Nongovernmental organizations (NGOs) – Employees. • Employee outreach is addressed in Chapter 7, Workforce Involvement • The policy should be reviewed to confirm that it includes a commitment to openness with stakeholders. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should verify that a written policy covering EHS and including a commitment to Responsible Care or Responsible Care Guiding Principles has been established and communicated. • Auditors should preview the policy to confirm that it includes a commitment to openness with stakeholders.
<p>8-R-5. The facility has a process in place to assess stakeholder perspectives.</p> <p>The facility has established Responsible Care® goals, objectives, and targets based upon its prioritized risks, stakeholder input and regulatory, legal and other Responsible Care® related requirements to which it subscribes with time frames and responsibilities for accomplishment. These goals, objectives, and targets shall be established for each relevant function and shall reflect the organization's commitment to continuous improvement.</p>	<p>Section 2 Planning</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • At a minimum, there should be a mechanism to periodically obtain input from key stakeholders regarding their perception of the facility's environmental, health, and safety programs and performance. This can be accomplished via a formal survey (normally conducted by an independent third party) or through ongoing outreach efforts (e.g., using a CAP or similar mechanism). • The auditor should verify that the results of this process are evaluated and acted upon where appropriate. This

Audit Criteria	Source	Guidance for Auditors
		<p>Table 8.3 – Continued</p> <p>includes using this feedback to help establish goals, objectives, and targets for continuous improvement in EHS performance and operation of the RCMS.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review relevant documentation and conduct interviews to verify that results of this process are evaluated and acted upon where appropriate. This includes using this feedback to help establish goals, objectives, and targets for continuous improvement in EHS performance and operation of the RCMS.
<p>8-R-6. The facility has established and maintained processes to:</p> <ul style="list-style-type: none"> Seek and incorporate public input regarding products and operations. Provide information on health, safety, security, and environmental risks and pursue protective measures for employees, the public and other key stakeholders. The facility has established and maintained dialogue with employees and other stakeholders about: Relevant risks, and the facility's impact on human health, safety, security and the environment. Its Responsible Care® Management System. Plans for improving the facility's performance. 	<p>Section 3 Implementa- tion, Operation and Accountabil- ity</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Any of a number of mechanisms for stakeholder outreach and communications can be employed, including use of a Community Advisory Panel (CAP) or similar mechanism comprised of community representatives. Relevant information should be shared via mechanisms established, and there should be evidence of an ongoing relationship with key stakeholders, either formally or informally. The nature and degree of this ongoing relationship should again be based on the level of risk at the facility and the historic relationship with the community (e.g., a higher risk facility should have regularly scheduled, formal meetings, or other activities with a CAP or other groups of key stakeholder). Plans for improving the facility's performance may come from periodic management reviews, incident investigations, audits, and other means. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should verify that an ongoing stakeholder outreach

Audit Criteria	Source	Guidance for Auditors
		<p>effort has been implemented based on the risks presented by the facility. The primary purpose of this program is to provide a two-way process for sharing of relevant information about the facility's operations, products, associated EHS (and security) risks, and RCMS with identified key stakeholders, and to obtain, assess, and (where appropriate) act on feedback to improve stakeholder perception and trust regarding risks presented by the facility.</p>
<p>8-R-7. The facility has regularly evaluated the effectiveness of its communications programs with its stakeholders.</p> <p>The facility has identified and investigated incidents and accidents, mitigated any adverse impacts, identified root causes, completed corrective and preventive actions, and shared key findings with relevant stakeholders.</p>	<p>Section 4 Measurement, Preventive and Corrective Action</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Approaches used to measure stakeholder communications effectiveness may include formal surveys, door-to-door discussions, simple surveys at local community events, focus groups, CAP meetings, and other methods. Results of these formal surveys should be used to modify and improve the facility's communications programs. • Incidents should be investigated (see Chapter 20); key incident investigation findings should be communicated to appropriate stakeholders as part of ongoing stakeholder outreach activities. This can be verified through minutes of meetings, presentations, newsletters, or interviews with community and facility representatives. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review minutes of meetings, presentations, or newsletters or conduct interviews with community and facility representatives to verify that incident investigations and their findings have been communicated to appropriate stakeholders.
<p>8-R-8. Responsible Care Management System performance has been periodically reported to stakeholders.</p>	<p>Section 5 Management Review and Reporting</p>	<p><u>Background Information for Auditors:</u></p> <p>A periodic management review of the performance and effectiveness of the RCMS should be conducted and</p>

Audit Criteria	Source	Guidance for Auditors
		<p>Table 8.3 – Continued</p> <p>reported to identified stakeholders, including recommendations for continuous improvement. This should include a review of policies, goals and objectives, and other elements of the RCMS.</p> <ul style="list-style-type: none"> • The management review can be accomplished through meeting minutes, policy and objective updates, or other evidence where senior management has been briefed on the current status of the RCMS. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that a periodic review of the RCMS has been reported to the appropriate stakeholders. The PSM/RMP manager or coordinator should be interviewed for this purpose.

Audit Criteria	Source	Guidance for Auditors
<p><i>RC14001</i></p> <p>8-R-9. An environmental policy has been established which is available to the public.</p> <p>The policy is supported by fostering openness in dealing with stakeholders, taking into account public and employee inputs.</p> <p>The policy is supported by fostering openness in dealing with stakeholders, taking into account public and employee inputs.</p>	<p>RC14001 Technical Specification RC151.03 4.2 Environmental Policy</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Verify that a written policy that covers EHS and includes a commitment to Responsible Care or Responsible Care Guiding Principles. • In addition to members of the community surrounding the facility, the RCMS definition of stakeholders includes the following: <ul style="list-style-type: none"> – Commercial partners – Regulators – Nongovernmental organizations (NGOs) – Employees • Employee outreach is addressed in Chapter 7, Workforce Involvement • Review the policy to confirm that it includes a commitment to openness with stakeholders. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review written documentation and conduct interviews to verify that a written

Audit Criteria	Source	Guidance for Auditors
		<p>policy covering EHS that includes a commitment to Responsible Care or Responsible Care Guiding Principles has been established and communicated.</p> <ul style="list-style-type: none"> Auditors should review the policy to confirm that it includes a commitment to openness with stakeholders.
<p>8-R-10. The facility has established and maintained systems to assess concerns of stakeholders.</p> <p>The facility has established a process for communication, outreach, and dialogue with stakeholders about relevant risks, the organization's impact on human health and the environment, and about environmental, health, safety, and security performance and future plans.</p> <p>The facility has evaluated the effectiveness of its communications programs with its stakeholders.</p>	<p>RC14001 Technical Specification RC151.03 4.4.3 Communications</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Any of a number of mechanisms for stakeholder outreach and communications can be employed, including use of a Community Advisory Panel (CAP) or similar mechanism comprised of community representatives. Relevant information should be shared via mechanisms established, and there should be evidence of an ongoing relationship with key stakeholders, either formally or informally. The nature and degree of this ongoing relationship should again be based on the level of risk at the facility and the historic relationship with the community (e.g., a higher risk facility should have regularly scheduled, formal meetings or other activities with a CAP or other groups of key stakeholders). The primary purpose of this program is to provide a two-way process for sharing of relevant information about the facility's operations, products, associated EHS (and security) risks, and RCMS with identified key stakeholders, and to obtain, assess, and (where appropriate) to act on feedback to improve stakeholder perception and trust related to risks presented by the facility. Approaches used to measure stakeholder communications effectiveness may include formal surveys, door-to-door discussions, simple surveys at local community events, focus groups, CAP meetings, and other methods. Results of these formal

Audit Criteria	Source	Guidance for Auditors
		<p>Table 8.3 – Continued</p> <p>surveys should be used to modify and improve the facility's communications programs.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review relevant documentation and conduct interviews to verify that an ongoing stakeholder outreach effort has been implemented based on the risks presented by the facility.

8.3 AUDIT PROTOCOL

The process safety program audit protocol introduced in Appendix A and available online (see page xiv for information on how to access this resource) provides detailed questions that examine the criteria described in Section 8.2.

REFERENCES

- American Chemistry Council, *RCMS[®] Technical Specification*, RC101.02, March 9, 2005
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations*, RC101.02, January 25, 2004
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations Appendices*, RC101.02, January 25, 2004
- California, California Code of Regulations, Title 8, Section 5189, CalOSHA, November 1985
- Center for Chemical Process Safety (CCPS), *Guidelines for Risk Based Process Safety*, American Institute of Chemical Engineers, New York, 2007 (CCPS, 2007c)
- Department of the Interior, Minerals Management Service, *Safety and Environmental Management Program (SEMP)*, 1990

9

PROCESS KNOWLEDGE MANAGEMENT

This element is called Process Safety Information (PSI) in OSHA PSM and EPA RMP programs. In many state regulatory PSM programs, it is also called process safety information. In the voluntary consensus PSM programs, it is generally referred to as safety or process information. In this chapter the information itself will be referred to as Process Safety Knowledge (except in the compliance context), whereas the program to develop and maintain the knowledge will be referred to as Process Knowledge Management. Elsewhere in this book, when referring to information developed in this element, the term Process Safety Knowledge will be used. Process Knowledge Management is an element of the RBPS accident prevention pillar Understand Hazards and Risks.

9.1 OVERVIEW

The Process Knowledge Management element primarily focuses on information related to process chemicals, technology, and equipment that is recorded in written documents such as the following:

- Written technical documents and specifications;
- Engineering drawings and calculations;
- Specifications for design, fabrication, and installation of process equipment; and
- Other written documents such as material safety data sheets (MSDSs).

The Process Knowledge Management element involves work activities associated with compiling, cataloging, and making available the necessary data. This data can be stored and maintained in hard copy, electronic format, or a combination of both. However, knowledge implies understanding, not simply compiling data.

The primary objective of this element is to maintain accurate, complete, and understandable information that can be accessed on demand, and includes work activities to ensure that the information is kept current and accurate, stored in a manner to facilitate retrieval, and is accessible to employees who need it to perform their process safety-related duties.

The Process Knowledge Management element interfaces significantly with other PSM program elements. It is a foundational PSM program element for understanding the hazards and risks because it provides the written body of technical information upon which the design of the other PSM program elements depends. The primary interfaces with other elements include the following:

- Hazard Identification and Risk Analysis (Chapter 10)—up-to-date Process Safety Knowledge is required to conduct accurate HIRAs; otherwise the HIRA teams will be analyzing incorrect design and other system information to draw conclusions about the risks.
- Operating Procedures (Chapter 11)—the knowledge and technical information appear in many places in the operating procedures, most notably, the safe upper and lower limits for the equipment, and the set points and other operating parameters of the safety systems.
- Asset Integrity and Reliability (Chapter 13)—the planning of the inspection, testing, and preventive maintenance program relies heavily on the Process Safety Knowledge in order to plan both corrective and preventive/predictive maintenance tasks.
- Training and Performance Assurance (Chapter 15)—the contents of the training program for operators and other personnel are developed using the process safety knowledge, e.g., operating limits and parameters.
- MOC (Chapter 16)—up-to-date Process Safety Knowledge is required in order to support the generation of MOCs because MOCs must address the technical soundness of proposed changes and assess the potential safety and health impacts of the proposed changes, and the Process Safety Knowledge must be updated pursuant to a change being implemented.

In Sections 9.2 and 9.3, compliance and related audit criteria are presented, along with guidance for auditors in applying the criteria. A full explanation of compliance and related audit criteria is presented in Chapter 1 (see Section 1.7). The criteria and guidance described in these sections do not represent exclusive solutions to PSM program coverage, design, implementation, or interpretation. They represent the collective experience of many people in the chemical/processing sector who have performed many PSM audits, and the consensus opinion resulting from that experience. The compliance criteria are derived from the regulations that govern PSM programs in the United States; however, these regulations are all performance-based. Performance-based regulations are goal oriented and there may be multiple pathways to fully complying with them. Therefore, there may be equivalent, alternate interpretations

and solutions to the issues described in the compliance tables in this chapter, particularly the auditor guidance presented.

The inclusion of the related criteria in no way infers that these criteria must be implemented for a PSM program to be successful, nor does it infer that a PSM program will be deficient without them. As with the compliance criteria, there may be other, more appropriate solutions for an individual facility or company. In addition, the use of the related criteria in a PSM audit is intended to be completely voluntary, and not a mandatory requirement in any way. They should be used cautiously and with careful planning so that they do not inadvertently establish unintended performance standards. Consensus should be sought within and among facilities and their parent companies before these criteria are used. Finally, the related criteria and guidance offered for consideration are not endorsements of or agreements with the written or verbal clarifications made by the regulators, PSM citations issued against the regulations, other PSM guidance published by the regulators, or the successful or common PSM practices in any given company's PSM program from which they are derived.

9.2 AUDIT CRITERIA AND GUIDANCE

The detailed requirements for Process Knowledge Management of OSHA's PSM Standard, EPA's RMP Rule (referred to in those regulations as Process Safety Information, or often simply as PSI), and several state PSM regulatory programs are presented herein.

The audit criteria described below are examined by auditors using the guidance provided by performing the following audit activities:

- Interviewing the person at the facility who has the responsibility for creating and managing process safety knowledge. This person generally works in the facility engineering or technical department, and can include engineers and computer-aided drafting (CAD) personnel. Project engineers generally compile and maintain this knowledge for engineered projects, at least until project records are turned over to the engineering or maintenance department. Certain process safety knowledge documents related to safety or fire protection issues are often maintained by the safety manager.
- Reviewing a number of engineering records and work products that result from the design and construction of engineered projects.
- Comparing the contents of engineering records to the as-built, as-operated condition of the equipment in the field.

Auditors should also carefully examine the process safety knowledge requirements found in the procedures of the company/facility being audited. As stated in Section 1.7.1, these could be interpreted as compliance requirements by regulators and subject to citations if they are not being followed. Auditors should confirm, via interviews, records and document reviews, and field observations, that the requirements of the facility or company process safety knowledge procedures

have been implemented as specified. Findings should be generated if the company/facility-specific provisions are not being followed.

See the Guidance for Chapters 3–24 in the Introduction for the definition of the abbreviations shown in this chapter's tables used to indicate the source of the criteria.

9.2.1 Compliance Requirements

The audit criteria should be used by the following:

- Readers in the United States covered by the PSM Standard or RMP Rule.
- Readers who have voluntarily adopted the OSHA PSM program.
- Readers whose companies have specified OSHA PSM requirements in non-U.S. locations.

Table 9.1 lists the audit criteria and auditor guidance related to Process Knowledge Management pursuant to OSHA PSM and EPA RMP.

Table 9.1 OSHA PSM and EPA RMP Audit Criteria and Guidance for Auditors - Process Safety Information

Audit Criteria	Source	Guidance for Auditors
<p>9-C-1. The employer shall complete a compilation of written process safety information before conducting any process hazard analysis required by the standard. The compilation of written process safety information is to enable the employer and the employees involved in operating the process to identify and understand the hazards posed by those processes involving highly hazardous chemicals.</p>	<p>PSM [d] RMP 68.65</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • PSI is written information, which means it is recorded in a document. This does not mean one single document, nor does it mean that the PSI must be in hard-copy format. Electronic storage of PSI is acceptable. However, operating limits and other data embedded in control systems as set points, display values, etc. do not constitute written PSI. • PSI is information and data. It is not a specific type of document, except where the governing regulations specify a type of document. For example, a "P&ID" is a specific type of document; however, "ventilation system design" and "process chemistry" are not specific types of documents, but types of information that must be maintained as PSI. Facilities and companies may designate any document or combination of documents that clearly and legibly describes the type of information required when the regulations do not identify a specific type of document. Once

Audit Criteria	Source	Guidance for Auditors
		<p>the documents have been designated or created, they become part of the collection of PSI at the facility.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review PHAs and the dates on the PSI referenced in the PHAs to determine if the PSI used in the studies pre-dates the PHAs. Auditors should conduct interviews with PHA team members to determine if complete PSI was available for use in the PHAs.
<p><i>Information pertaining to the hazards of the highly hazardous chemicals in the process shall consist of at least the following:</i></p>		
<p>9-C-2.</p> <ul style="list-style-type: none"> Toxicity information Permissible exposure limits Physical data Reactivity data Corrosivity data Thermal and chemical stability data Hazardous effects of inadvertent mixing of different materials that could foreseeably occur 	<p>PSM [(d)(1)(i)-(vii)] RMP 68.65</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> This information is usually contained in a Material Safety Data Sheet; however, it may be maintained elsewhere if the facility desires. Since MSDSs are required by a separate OSHA regulation (HAZCOM) and are produced by the individual companies that manufacture (or sometimes distribute) the chemicals, they are not of uniform contents and quality. Material hazards information may be contained in in-house or consultant lab reports, vendor property and handling guides, or standard technical references that contain properties of materials (e.g., Perry's Handbook, Sax, Patty's Guide, CRC Handbook). Sometimes the information related to the hazardous effects of inadvertent mixing of different materials is maintained in a table or matrix that indicates what combinations of materials at the facility result in hazardous mixtures. Some MSDSs include this information as well. These or other methods of documenting the hazardous effects of inadvertent mixing of different materials can be used to satisfy this requirement. Not every possible

Audit Criteria	Source	Guidance for Auditors
		<p>Table 9.1 – Continued</p> <p>combination of chemicals in nature must be described, nor every possible combination of the chemicals on-site. The foreseeability of chemicals that can possibly mix includes those materials in containers that have any sort permanent or temporary interconnection and those where storage proximity, even for temporary periods of time, could cause the mixing to occur. The grade of the property, the phase of the materials, possible external events (e.g., transportation), as well as possible human errors (e.g., due to similar labeling or color markings of the containers) should be taken into account to define "foreseeability" for each combination of materials.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should sample MSDSs for the highly hazardous chemicals at the facility. If the MSDSs do not contain all the required PSI about the hazards of the chemicals/materials, auditors should request that the facility produce the documents designated as PSI to fill the gaps in the MSDSs.
<p><i>Information concerning the technology of the process shall include at least the following:</i></p>		
<p>9-C-3. Block flow diagrams or simplified Process Flow diagrams.</p>	<p>PSM [(d)(2)(i)(A)] RMP 68.65</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> A block flow diagram (BFD) may show the major process equipment and interconnecting process flow lines and show flow rates, stream composition, temperatures, and pressures when necessary for clarity. The block flow diagram is a simplified diagram. There are no industry standards for the content of a BFD. Process flow diagrams (PFD) are more complex and typically show all main flow streams including major control valves to enhance the understanding of the process, as well as pressures and temperatures on all feed and product lines into and out of all

Audit Criteria	Source	Guidance for Auditors
		<p>major vessels, inlet and outlet piping of heat exchangers, and points of pressure and temperature control. There are no industry standards for the content of a PFD.</p> <ul style="list-style-type: none"> • Although the symbols on most PFDs are common from facility to facility, many companies have created symbols for unique equipment in their processes. There are several consensus standards published by ANSI (ANSI/ASME Y14 series), ISO (ISO 10628-1997), and ISA (S5.3-1983) addressing the use of symbols, format, content, and revision of engineering drawings; however, these standards are not mandatory for PFDs of processes included in PSM programs. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check that current PFDs or BFDs are available for the processes included in the PSM program. There are usually engineering group/department drawings and can be hard copy or CAD documents. • Auditors should check that the flow streams depicted on the PFDs match the flow streams shown on the P&IDs or the actual system in the field.
9-C-4. Process chemistry.	PSM [(d)(2)(i)(B)] RMP 68.65	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The process chemistry can be original research documents that show the chemical reactions in detail, or they may be simpler documents that describe the chemistry of the process in a manner that facility personnel can more easily understand, e.g., a portion of an operator training manual on the process that describes the chemistry, or training presentation material on the same topic. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that a description of the process chemistry in the processes included in the PSM program has

Audit Criteria	Source	Guidance for Auditors
		<p>Table 9.1 – Continued been included in the PSI.</p>
<p>9-C-5. Maximum intended inventory.</p>	<p>PSM [(d)(2)(i)(C)] RMP 68.65</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The maximum intended inventory can be shown on engineering documents that describe the inventory of facility vessels and storage tanks along with the inventory described in the PFDs, or it can be included in operational documents such as logs or lab inventory records, or in environmental documents used to report chemical inventories to state regulators (i.e., SARA Title III Tier II reports). <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that inventory data is being maintained as PSI for the processes included in the PSM program, and that the inventory data represents the maximum intended inventories. • Auditors should confirm that the maximum intended inventory information is maintained as process safety information and should agree with the inventory information that was used in the PHAs when releases of these materials were evaluated. • Auditors should compare the maximum inventory data in the PSI and the values assumed in the PHAs to determine if they are consistent.
<p>9-C-6. Safe upper and lower limits for such items as temperatures, pressures, flows or compositions.</p>	<p>PSM [(d)(2)(i)(D)] RMP 68.65</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The safe upper and lower limits refer to process/equipment design limits, not quality-related operating limits. Sometimes these values are referred to as design limits (e.g., design pressure, design temperature), but they can also

Audit Criteria	Source	Guidance for Auditors
		<p>include runaway reaction temperatures, maximum storage temperatures, minimum coolant flows, etc.</p> <ul style="list-style-type: none"> The safe upper and lower limits are recorded in the SOPs, on the P&IDs, and in other design, engineering, or project documents. It is not mandatory that the limits be accumulated on one document; however, whatever combination of documents contains the safe upper and lower limits would then be considered PSI. Some facilities have created separate documents, such as operating limit tables, consequences of deviation (CoD) tables, or similarly titled documents that combine several types of required PSI into one document. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the documents containing the safe upper and lower limits to confirm that they are not quality-related operating limits, that the information covers all modes of operation such as normal, start-up, shutdown, etc. (if the information is different for these operating modes) and that the documents are maintained as PSI. Auditors should compare limits in the distributed control system to the safe upper and lower limits to ensure the equipment limits are not exceeded. Auditors should look at the limits in the operating procedures and the safe operating limits to ensure that the equipment limits are not exceeded.
<p>9-C-7. An evaluation of the consequences of deviations, including those affecting the safety and health of employees.</p>	<p>PSM [(d)(2)(i)(E)] RMP 68.65</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The evaluation of the consequences of deviating from the safe upper and lower limits is usually found in the PHAs, and the information is included in operating procedures and/or training documents. This makes the PHAs also part of the PSI for the facility. Some facilities have created

Audit Criteria	Source	Guidance for Auditors
		<p>Table 9.1 – Continued</p> <p>separate documents, such as operating limit tables, consequences of deviation (CoD) tables, or similarly titled documents that combine several types of required PSI into one document and include the consequences of deviations.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the document designated by the facility that contains the consequences of deviations to determine if it is complete. • Auditors should spot-check the contents of this document with the contents of other documents that also contain PSM-related consequences, such as the PHAs (unless the PHAs are the designated document).
<p><i>Information pertaining to the equipment in the process shall include:</i></p>		
<p>9-C-8. Materials of construction.</p>	<p>PSM [(d)(3)(i)(A)] RMP 68.65</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The materials of construction are usually included on the P&IDs, equipment fabrication drawings, equipment specifications and data sheets, or equipment design calculations or, for piping, in the line specifications. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the document designated by the facility that contains the materials of construction.
<p>9-C-9. Piping and instrument diagrams (P&ID).</p>	<p>PSM [(d)(3)(i)(B)] RMP 68.65</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • P&IDs are sometimes referred to as flow diagrams, mechanical flow diagrams, system schematics, or other names. • P&IDs are not to-scale one-line schematics of a process/system that show the following: <ul style="list-style-type: none"> – All of the mechanical equipment. – The interfaces with other processes/systems.

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"> - The interfaces between the mechanical equipment and the instrumentation and controls equipment. - All relief valves and devices, including set points and sizes are shown. - Description of the piping, including its size, flow direction, identification number, and piping specification. - Typically, the fail-safe position of control valves. - Often, the design ratings of the equipment, including design pressures, temperatures, materials of construction, power ratings of rotating equipment, and other similar information. <ul style="list-style-type: none"> • Although the symbols on most P&IDs are common from facility to facility, many companies have created symbols for unique equipment in their processes. There are several consensus standards published by ANSI (ANSI/ASME Y14 series), ISO (ISO 10628-1997), and ISA (S5.3-1983) addressing the use of symbols, format, content, and revision of P&IDs (and other engineering drawings); however, these standards are not mandatory for P&IDs of processes included in PSM programs. • P&IDs may be final CAD-quality or approved drawings, or they may be marked-up (i.e., "red-lined") drawings awaiting input to the CAD system. It is the accuracy and legibility of the P&IDs that is most important. The use of CAD systems to maintain P&IDs (or any other engineering drawing or record) is not mandatory. Manual drawing management systems are acceptable. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check that current P&IDs are available for the processes included in the PSM program. There are usually

Audit Criteria	Source	Guidance for Auditors
		<p>Table 9.1 – Continued engineering group/department drawings and can be hard copy or CAD documents. P&IDs should be evaluated by auditors on two levels: 1) the P&IDs contain all the information they should (based on company or industry standards) and are complete (this is a higher-level review of drawings themselves); and 2) auditors should select one or more P&IDs from the processes included in the scope of the audit and field check to determine if it reflects the as-built condition of the process it depicts.</p>
9-C-10. Electrical classification.	PSM [(d)(3)(i)(C)] RMP 68.65	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Electrical classification (outside the United States, often called "zoning" or "hazardous area classification") refers to the design of electrical and other equipment in those areas where flammable or combustible materials are stored or handled to prevent ignition sources from initiating fires and explosions. In the United States, and outside the United States where NFPA's standards have been adopted, these design specifications are provided by NFPA. These areas are often depicted on a plot plan(s) of the facility, but this is not mandatory. Text documents that describe the same information clearly would also be acceptable. These records are often found in engineering files, but sometimes the safety manager or fire chief maintains them. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the electrical classification drawings or documents for accuracy. Also, physically check one or more areas of the facility to make sure the actual design of equipment and vehicles adheres to the classification requirements.
9-C-11. Relief system design and design basis.	PSM [(d)(3)(i)(D)] RMP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Relief systems are any device, collection of devices, and/or systems that are intended to

Audit Criteria	Source	Guidance for Auditors
	68.65	<p>control or relieve excess pressure. These include relief valves of various operating types (e.g., spring-loaded, pilot-operated), rupture disks, conservation/breather vents, rupture pins, vacuum breakers, liquid seals, blowout plugs, relief device discharge vent/effluent systems, flares, as well as the piping, valves, vessels, and other components such as knockout drums or containment vessels connected to these devices that constitute relief systems.</p> <ul style="list-style-type: none"> • The relief system design basis refers to the scenario or event that governed the design of the relief system or device, e.g., an external fire (a common governing event), exothermic reaction, or loss of power. This design basis is usually recorded in the relief system/device design documents, which may be the calculations that determined the capacity and set point of the system or device, a summary of those calculations, or a data sheet for the system/device that summarizes all this information and was used to purchase the system/device. • The relief system/device design is governed by the relevant RAGAGEPs for this type of equipment, which is typically API RP520/521 for most chemical/processing facilities, or a company-specific equivalent. NFPA-30 may also apply for flammable liquid storage systems. Also, special design considerations for some relief devices, such as two-phase flow, may be required because of the possible operating conditions of device. The RAGAGEP that governs two-phase flow design is contained in the procedures and tools published by the Design Institute for Emergency Relief Systems (DIERS), which is sponsored by AIChE. Some companies and engineering contractors have developed their own version of these procedures

Audit Criteria	Source	Guidance for Auditors
		<p>Table 9.1 – Continued</p> <p>and tools.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> <li>• Auditors should review engineering or project records to determine if the original design basis for the relief systems (including blow-down systems) was changed and the relief system design was not re-assessed. Examples of conditions that may have changed since the original design and installation of the relief systems include new or modified products, increased throughput in the unit(s) that relieve the blow-down(s), additional relief streams routed to the system, relief systems originally designed only to handle lighter-than-air vapor emissions that now have liquids or heavier-than-air vapors routed to the system, additional equipment, a new unit, or occupied structures that have been sited near a blow-down stack or flare in a manner not addressed in the original design or design basis. <li>• Auditors should check to determine if the relief device/system PSI includes a listing of possible overpressure scenarios that may occur and the reasoning for defining those that are credible. For each credible overpressure scenario, calculations should have been performed to determine the case that governs the design of the relief system. These credible scenarios can be fairly straightforward, such as a loss of a pressure regulator, or can be much more complex scenarios, such as an exothermic runaway reaction or a gas-generating reaction. The calculations that are performed should indicate the following: <ul style="list-style-type: none"> <li>– The basis for the calculation. <li>– The type of discharge being evaluated (vapor, liquid, two-phase). <li>– The methodology being

Audit Criteria	Source	Guidance for Auditors
		<p>utilized in the calculations (which are typically the methods described in API RP 520/521 or NFPA-30, or company equivalent procedures).</p> <ul style="list-style-type: none"> - Any utilized software should be referenced, whether it is a commercially available program or in-house software. - All the physical properties that were used in the calculations as well as all the major assumptions. In complex cases the determination of the physical properties may be a significant challenge, and proper documentation of the approach taken to evaluate the physical properties should be included if these properties are not easily referenced values. <ul style="list-style-type: none"> • Auditors should check the PSI for the relief system design and design basis, which also includes the relevant inlet and outlet piping system design or evaluation as well as the design of any downstream effluent handling equipment such as vent headers, knock-out pots, containment vessels, quench tanks and flares, etc. • Auditors should check to ensure that the full design information is included in the engineering or project files, or is otherwise available to the facility/company. This information should not just be in the custody of an engineering company or contractor that performed the work. • Auditors should check the set points, capacities, and other design information in the files against the nameplates on the relief devices in the field to ensure consistency. • Auditors should check relief device inlet and discharge valves in the field to ensure they are not closed if the device is in service.

Audit Criteria	Source	Guidance for Auditors
		<p>Table 9.1 – Continued</p> <ul style="list-style-type: none"> • Auditors should check that car seals and similar devices installed to help control the positions of relief device inlet and discharge valves are in place if the device is in service. • If there are any blow-down systems installed in the facility that are not discharged to a closed vent or flare system, auditors should check that the engineering or project records contain the original design and design basis for each blow-down system.
9-C-12. Ventilation system design.	PSM [(d)(3)(i)(E)] RMP 68.65	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Ventilation design refers to the design of those heating, ventilation, and air conditioning (HVAC) systems that are important to process safety. It does not refer to those HVAC systems that create or maintain comfortable working conditions. Examples of those ventilation systems that are important to process safety include the following: <ul style="list-style-type: none"> • The engineered HVAC features of buildings that will be occupied when an evacuation or shelter-in-place order is given and serve to separate outdoor air from indoor air. These features include isolation dampers, intake fans, recirculation systems, pressurization systems, fixed/portable emergency air breathing systems, and the controls that detect, activate, and maintain the separation desired. • Control system or electrical equipment space temperature and humidity controls, if high temperature or humidity would affect equipment performance. • Air-flow or inert gas purging systems used to control flammable atmospheres in enclosed structures or in equipment. • Temperature controls for storage spaces of temperature-sensitive

Audit Criteria	Source	Guidance for Auditors
		<p>chemicals.</p> <ul style="list-style-type: none"> • Ventilation systems for spaces where toxic chemicals are produced, stored, or used, e.g., the ventilation system for chlorine cell areas. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check to ensure that these features are documented in engineering design specifications for the HVAC systems, field engineering records, or installation records from the HVAC contractor. Records related to the comfort features of the HVAC systems in occupied buildings are not of interest here, although the records related to the separation and comfort features of the HVAC systems may be commingled. These are generally difficult documents to find. • Auditors should check to ensure that the original or most recent specifications for ventilation systems are still valid, e.g., the number of persons that a fixed emergency air breathing system was designed to support, and the time limits on system operation given the number of people using it. • Auditors should check in the field that control room or other structures pressurization systems are functioning properly. • If the emergency air breathing system air was synthetically produced, auditors should check to determine if the system is being sampled periodically to ensure that the breathing air is within specifications.
9-C-13. Design codes and standards employed.	PSM [(d)(3)(i)(F)] RMP 68.65	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The codes and standards employed in the design of the facility processes/equipment are usually shown on the P&IDs, equipment fabrication drawings, equipment specifications and data sheets, or equipment design calculations. Although a list or index of engineering and construction standards used by

Audit Criteria	Source	Guidance for Auditors
		<p>Table 9.1 – Continued</p> <p>the company or facility would show the same standards, it would not be related to the processes/equipment where they were used (unless the index is annotated to shown this relationship).</p> <ul style="list-style-type: none"> • Design codes and standards are included in the recognized and generally accepted good engineering practices (RAGAGEPs) used to design and construct the facility. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check the document(s) designated by the facility that describe the codes and standards used to design and build the facility to determine if this list is complete and that the codes and standards referenced are the appropriate ones.

Audit Criteria	Source	Guidance for Auditors
<p>9-C-14. Material and energy balances for processes built after May 26, 1992.</p>	<p>PSM [(d)(3)(i)(G)] RMP 68.65</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Material balances show all the mass inputs and outputs of continuous or batch processes and are generated during the preliminary or conceptual process design and then updated as the project proceeds. Project/process engineering records should contain this information. • Energy balances show the same type of information for heat and/or power. Some of the energy balance data is generated during the process design, but much of it is related to the design and specification of the utility systems (e.g., power, steam, cooling water). • Material and energy balances are part of the original design of the facility and unless the facility received an overall modification (e.g., a large de-bottlenecking) may not have been changed since the original design. These documents are sometimes difficult to locate. Also, they may be hard-copy records, or embedded in process design software output or process simulation software. They are not required unless the process was built after May 26, 1992. In this context, "built" means placed into operation. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check to see that material and energy balances exist for processes built after May 26, 1992. In this context "built" means placed into service.
<p>9-C-15. Safety systems (e.g. interlocks, detection or suppression systems).</p>	<p>PSM [(d)(3)(i)(H)] RMP 68.65</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The safety systems are systems and devices that protect people from processes that have exceeded or are about to exceed their safe upper or lower limits. Examples include the following: <ul style="list-style-type: none"> – The controls and safety instrumented systems as well as the other controls, indications, alarms, trips, interlocks, and other safety

Audit Criteria	Source	Guidance for Auditors
		<p>Table 9.1 - Continued features that control or</p> <ul style="list-style-type: none"> - protect the process. Nearly all the control equipment consists of electronic or electrical control systems. However, it may include mechanical systems and devices. This knowledge can be shown on many types of the documents, including circuit diagrams, control logic diagrams, interlock tables, as well as the P&IDs and text descriptions of these systems and features. - Equipment or systems intended to detect or suppress reactions or chemical releases, e.g., quench systems, rapid neutralization systems, reaction kill injection systems, and vapor cloud knock-down systems. - Equipment or systems intended to detect or mitigate vapor releases, e.g., LEL or ammonia detectors and HF deluge systems. - Secondary containment systems. - Inerting systems. - Fire protection equipment (e.g., sprinkler systems, firewater supply equipment). - Explosion or blast panels or explosion suppression systems. - Uninterruptible power supplies. - Any other safeguard credited in a PHA. - The safety systems should be depicted on P&IDs or other documents that describe how the system works, its set points, its control features, etc. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should determine what systems and equipment constitute safety systems for the facility and

Audit Criteria	Source	Guidance for Auditors
		<p>processes. These are contained in the PHAs, SOPs, or safety system tables or lists. Process or project descriptions or manuals (i.e., the project "books") sometimes contain this information or some of it. Auditors should then check if the safety systems that are described in these document(s) are PSI.</p>
<p>9-C-16. The employer shall document that equipment complies with recognized and generally accepted good engineering practices.</p>	<p>PSM [(d)(3)(ii)] RMP 68.65</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Recognized and generally accepted good engineering practices (RAGAGEPs) consist of consensus industry codes, standards, and recommended practices that govern the design and construction of equipment in the PSM program. RAGAGEPs are often embedded in or referenced by state or municipal laws or regulations governing the various pieces of equipment. • Company engineering and construction standards are not generally RAGAGEPs because they only apply to one company or facility, and therefore are not consensus industry standards. However, most of them refer to consensus RAGAGEPs and are the equivalent of a RAGAGEP for the company or facility; they should be followed. • The design codes and standards documented to satisfy (d)(3)(i)(F) are part of the RAGAGEPs used to design, build, and operate the facility processes covered under the PSM program. • Processes and equipment included in the PSM program should be properly designed and installed to operate safely within the upper and lower limits described in the PSI. Many facilities or companies possess and maintain a set of engineering and installation specifications that conform to the relevant RAGAGEPs. These may be local documents, company-wide documents, company adaptations of industry consensus design/project processes, legacy procedures and specifications (i.e., from a previous owner if they are

Audit Criteria	Source	Guidance for Auditors
		<p>Table 9.1 – Continued</p> <p>still applicable), specifications from engineering and installation contractors, or a combination of these sources. Sometimes the relevant RAGAGEPs were used directly to govern the design and installation work.</p> <ul style="list-style-type: none"> • Used/refurbished equipment, when employed, should meet the original OEM specifications for performance, given the current service conditions. • For example, if used/refurbished valves have been purchased from a repair shop or similar source the repairs or refurbishment should not have voided the OEM original design specifications for pressure retention or other characteristics. • A formal fitness-for-service evaluation may be needed to confirm that the used equipment design basis will meet the new service conditions. • See the QA part of Mechanical Integrity in Chapter 13 for a discussion of the boundary between engineering and fabrication/installation and the auditing boundary between Mechanical Integrity and PSI. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review engineering and project files to verify that the equipment included in the PSM program has been adequately designed for the current service conditions. This may be satisfied by the original engineering or project files, or the technical files associated with projects that modified the process or its equipment subsequent to its original design and installation. These files take the form of individual files for each piece of equipment or system (i.e., equipment files), project files containing the design documents for multiple pieces of equipment, or often project books. Multi-volume sets of project books have historically been a common

Audit Criteria	Source	Guidance for Auditors
		<p>method for third-party engineering firms to transfer hard-copy project documentation to their clients when larger projects are complete. They are often found in engineering department files or libraries, but sometimes have been turned over to maintenance. In some facilities or companies a separate technical staff is responsible for maintaining these documents. Auditors should be aware that the format, level of detail, and completeness of these files varies widely, and if third-party engineering firms were involved, the documentation transferred post-project will be controlled by the contract between the two parties. If the engineering was performed by operating company's technical staff, the documentation that confirms the proper design may be less formal, may be less complete, and may not be filed in an equipment or project file, but may still be in the personal possession of the engineer(s) who performed the work. This is particularly true of smaller projects. The types of engineering records likely to document which RAGAGEPs were used include the following:</p> <ul style="list-style-type: none"> - Purchase orders for project equipment. - Engineering work orders. - Fabrication specifications and QA records (e.g., fabrication drawings, hydrostatic/pneumatic test reports, mill test reports, weld travelers, hold and witness point tests and inspections records, radiographic examination of welds, NDT reports, stress relief reports). - U-1A forms for pressure vessels. - Calculations or data sheets for relief devices and systems. - Project engineering files that contain the calculations,

Audit Criteria	Source	Guidance for Auditors
		<p>Table 9.1 – Continued design reports, design drawings, and/or data sheets for other project equipment.</p> <ul style="list-style-type: none"> – Engineering/design standards for equipment types. • Auditors should review project records for when used equipment is employed on an engineered project (if applicable). Confirm that appropriate engineering and/or testing has been accomplished, approved (for some equipment in some states an approval by a jurisdiction may be required), and documented demonstrating that the used equipment meets the new intended service conditions. • Auditors should be aware that recent engineering work may have been performed using various software products, both commercial programs as well as those that are proprietary to the company using them. The records associated with the use of design or engineering software should also be in the custody of the facility/company, and this output may be printed out, stored electronically, or both. • While not expected to re-engineer, reverse engineer, or replicate any of the actual engineering work itself, auditors are to draw a conclusion regarding whether the relevant RAGAGEPs have been used to design and construct the processes and equipment (also see Section 1.1). If there is any question about the technical accuracy of this information, a finding and recommendation should be formulated for the facility or company to actually perform the re-engineering to confirm the accuracy of the design.
9-C-17. For existing equipment designed and constructed in accordance with codes, standards, or practices that are no longer in general use, the employer shall determine and document that the	PSM [(d)(3)(iii)] RMP 68.65	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Design codes and standards no longer in general use refer to RAGAGEPs that have been revised or those that have gone

Audit Criteria	Source	Guidance for Auditors
<p>equipment is designed, maintained, inspected, tested, and operating in a safe manner.</p>		<p>out of publication. Revisions to RAGAGEPs are issued by the organization that maintains them to: 1) update the practices contained in them, and 2) to correct previous errata. When revised RAGAGEPs are received, the facility or company should have a process in place to review the revisions to determine their impact on the equipment in the PSM program. Subject-matter experts or other qualified personnel (including contractors if necessary) should perform this review and publish the impacts to all parties of the facility or company affected by them along with a recommended course of action.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check for evidence that RAGAGEP revisions have been reviewed and the results of that review communicated to those parts of the facility or company that are affected, along with a recommended course of action. This may be in the form of the following: <ul style="list-style-type: none"> – Revisions to an equivalent company/ facility standard that addresses the same technical area. – Revision blocks on engineering drawings that indicate a modification has been made pursuant to a RAGAGEP change. – MOCs. – Engineering department reports. – Engineering department transmittals. – Memos. – E-mails. – A combination of these methods. • Auditors should interview the engineering manager, technical manager, project manager(s), or other person(s) who have the responsibility for executing

Audit Criteria	Source	Guidance for Auditors
		engineered projects at the facility to understand how this process works. Interviews with engineering contractors may also be necessary, particularly if the facility or company relies on the design and installation procedures and specifications of an engineering contractor (typical for small companies). The goal of these interviews is to gain an understanding of how the process works at the facility or company. Record reviews will be necessary to confirm what is learned during the interviews.

9.2.1.1 U.S. State PSM Programs

If the PSM program being evaluated is pursuant to a state PSM regulation, then the specific process safety knowledge requirements for that regulatory program should be followed. In general, these overlap somewhat with the federal OSHA PSM and EPA RMP requirements, but often there are state-specific requirements that should be met, even if the state has received authority to enforce federal regulations (i.e., the state is an OSHA state plan state, or has received implementing agency status for the RMP Rule from EPA). The state-specific applicability requirements for the following states are presented below:

- New Jersey
- California
- Delaware

Table 9.2 shows the audit criteria and auditor guidance for Process Knowledge Management pursuant to state requirements.

Table 9.2 U.S. State PSM Audit Criteria and Guidance for Auditors - Process Safety Information

Audit Criteria	Source	Guidance for Auditors
<p>Table 9.2 – Continued</p> <p><i>New Jersey Toxic Catastrophe Prevention Act (TCPA)</i></p> <p>9-C-18. Reactivity data applicable to the process in which an EHS is being used, handled, stored or generated that includes the following:</p> <p>Flash point up to 200 degrees Fahrenheit (and method used), flammable limits (lower explosive limit and upper explosive limit), extinguishing media, special fire</p>	<p>N.J.A.C. 7:31-4.1</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Records where chemical properties are included should contain this extra reactivity data required in New Jersey. This information may be included in the MSDS, but most MSDSs do not contain this data. • The additional reactivity data may be included in the records that describe the process

Audit Criteria	Source	Guidance for Auditors
<p>fighting procedures, and unusual fire and explosion hazards.</p> <p>Thermodynamic and reaction kinetic data including: heat of reaction, temperature at which instability (uncontrolled reaction, decomposition, and/or polymerization) initiates, and rate of energy release data at that temperature.</p> <p>Data regarding any incidental formation of byproducts that are reactive and unstable.</p>		<p>chemistry or other research records.</p> <ul style="list-style-type: none"> The additional reactivity data may have to be obtained from the manufacturer of the material, or tests may need to be conducted. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check to see that reactivity data exists in engineering or project records, MSDSs, or other records describing the properties of the chemicals on-site, or basic chemistry information if the facility has materials that are defined in the TCPA as reactive.
<p><i>New Jersey Toxic Catastrophe Prevention Act (TCPA)</i></p> <p>9-C-19 Electrical one-line diagrams relevant to the covered process and its potential releases.</p>	<p>N.J.A.C. 7:31-4.1</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Electrical one-line diagrams depict the schematic of the electrical power supplies for the facility from the source of the power to the loads, including transformers, switchgear, and other major electrical equipment. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check that the facility has up-to-date electrical one-line diagrams available.
<p><i>New Jersey Toxic Catastrophe Prevention Act (TCPA)</i></p> <p>9-C-20 Site plan.</p>	<p>N.J.A.C. 7:31-4.1</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check that the facility has up-to-date site or plot plans available.
<p><i>New Jersey Toxic Catastrophe Prevention Act (TCPA)</i></p> <p>9-C-21 Firewater system piping diagrams relevant to the covered process and its potential releases.</p>	<p>N.J.A.C. 7:31-4.1</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check that the facility has up-to-date firewater system piping diagrams available.
<p><i>New Jersey Toxic Catastrophe Prevention Act (TCPA)</i></p> <p>9-C-22 Sewer system piping diagrams relevant to the covered process and its potential releases.</p>	<p>N.J.A.C. 7:31-4.1</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check that the facility has up-to-date sewer system piping diagrams available.
<p><i>New Jersey Toxic Catastrophe Prevention Act (TCPA)</i></p> <p>9-C-23 External forces and events data.</p>	<p>N.J.A.C. 7:31-4.1</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> External forces and events data consist of information about events to which the facility might be susceptible to but that originate outside the TCPA-covered

Audit Criteria	Source	Guidance for Auditors
		<p>processes, e.g., weather-related or transportation-related events.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check that the facility has up-to-date external forces and events data available.
<p><i>Delaware Accidental Release Prevention Regulation</i></p> <p>9-C-24. The Delaware EHS regulations do not add any different or unique process safety information requirements beyond those described for the PSM Standard and RMP Rule.</p>	<p>Delaware Code, Chapter 77, Section 5.65</p>	<ul style="list-style-type: none"> No further guidance.
<p><i>California OSHA—Process Safety Management of Acutely Hazardous Materials</i></p> <p>9-C-25. In addition to the information required for equipment for the OSHA PSM Standard and EPA RMP Rule, the process safety information shall also include:</p> <p>Electrical supply and distribution systems.</p>	<p>California Code of Regulations, Title 8, Section 5189</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check electrical supply and distribution systems, which should be found in the engineering or project records. These are typically shown on electrical one-line diagrams,
<p><i>California Accidental Release Prevention Program</i></p> <p>9-C-26. The CalARP regulations do not add any different or unique process safety information requirements beyond those described for the PSM Standard and RMP Rule.</p>	<p>California Code of Regulations, Title 19, Section 2760.1</p>	<ul style="list-style-type: none"> No further guidance.

9.2.2 Related Criteria

The purpose of providing these criteria is to provide auditors with additional guidance for evaluating PSM programs with respect to issues that go beyond the strict compliance requirements presented above, and in large part represent industry good practices in process safety knowledge, or in some cases practices in process safety knowledge that have become common. Some of the related criteria have reached the status of a level of acceptable practice because of their widespread, accepted, and successful use over an extended period of time. Auditors and PSM practitioners should carefully consider implementing this guidance, or at least designing an approach that is similar in nature. See the Glossary and Section 1.7.1 for a more complete discussion of the meaning and use of level of acceptable practice.

Table 9.3 identifies audit criteria and auditor guidance for related criteria relating to Process Knowledge Management.

Table 9.3 Related Audit Criteria and Auditor Guidance - Process Knowledge Management

Audit Criteria	Source	Guidance for Auditors
9-R-1. The up-to-date process safety knowledge is kept for the lifetime of the process.	CCPA CPL	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check that process safety knowledge is maintained as long as the process exists and is included in the PSM program. However, this does not mean that all process safety knowledge ever created for the process has to be maintained—superseded knowledge documents can be archived or discarded.
9-R-2. Process safety knowledge for decommissioned equipment is retained if the equipment remains in place.	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check that process safety knowledge is available for decommissioned equipment unless it has been dismantled or demolished, although scheduled reviews for accuracy and updates can be abated as long as the equipment configuration has remained static. Process safety knowledge for decommissioned equipment should show any modifications made to the process to place it in a decommissioned state.
9-R-3. If used equipment has been employed in the process, its suitability for the intended service has been confirmed by engineering records supplied with the equipment from its previous owner(s), or by engineering and/or testing performed by the company or facility.	CPL	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The requirements for determining the suitability of used equipment should be included in a project or engineering procedure. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check that project records where used equipment has been employed include analysis and/or testing that the used equipment is suitable for the service where it has been applied.
9-R-4. The PSI contains material and energy balances for each process included in the PSM program.	GIP	<p><u>Auditor Activities:</u></p> <p>Auditors should review engineering and project records to determine if material and energy balances are</p>

Audit Criteria	Source	Guidance for Auditors
		<p>Table 9.2 – Continued</p> <p>available for each process included in the PSM program, not just those that were built after May 26, 1992 (processes built after that date should have this PSI available as a compliance requirement).</p>
<p>9-R-5. A management system procedure is in place for the process safety knowledge.</p>	<p>CCPA RBPS GIP</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check to determine if a process knowledge management procedure is in place and if it includes the following provisions for the management of the process safety knowledge: <ul style="list-style-type: none"> – What information should be collected and at what level of detail. – A list or road map that describes the process safety knowledge, the type of media that is used to store it, where it is stored, etc. – How information is to be collected. – Who is responsible for collecting the various types of information. – How the information will be kept up-to-date. – Who is responsible for maintaining the information. – How information about required updates in other PSM elements will be accessible to those who need it. – How information will be communicated to those who need it.
<p>9-R-6. If the process safety knowledge is stored, maintained, and used in an electronic data management system, employees have been provided with the training necessary to access the computer and the data.</p>	<p>CCPA GIP</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check if each potential user should be granted a user ID and password to the computer system to allow access to electronically stored process safety knowledge. This may be a group user ID and/or password. • Auditors should conduct

Audit Criteria	Source	Guidance for Auditors
		<p>interviews with nonmanagement personnel and contractors to determine if they have received training in how to access and operate the electronic data management system where the Table 9.3 – Continued</p> <p>process safety knowledge resides.</p> <ul style="list-style-type: none"> Auditors should check that electronically stored and managed process safety knowledge has been backed up and a hard copy is available if the electronic system fails.
<p>9-R-7. For batch operations, a PFD is provided for each batch (i.e., a separate PFD drawing for each batch or one PFD drawing with separate documents such as a batch sheet or records for each batch with the appropriate process conditions).</p>	VCLAR	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check PFDs for batch operations if they exist at the facility being audited. A separate PFD is not necessary for each batch recipe. A single PFD drawing together with other documents that describe the process conditions for each recipe may be maintained.
<p>9-R-8. The process safety knowledge documents include a date.</p>	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the process safety knowledge to ensure that the date it was approved is marked on the document.
<p>9-R-9. In addition to process safety knowledge specified by various regulations, additional knowledge should be maintained as appropriate based on the process safety related risk.</p>	CCPA VCLAR GIP RBPS	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The facility/company project procedures are usually found in an engineering procedures/manual and/or a capital projects manual. Sometimes the capital projects manual only covers the stage-gate process for proposing and approving a project. The execution stage is only one of the stages in such a process and the engineering details are left to other procedures or specifications. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check to see if process safety knowledge is being maintained if the knowledge is important to understanding, preventing, detecting, or mitigating process

Audit Criteria	Source	Guidance for Auditors
		<p>Table 9.3 – Continued</p> <p>safety risk. Auditors should first review the HIRAs for the processes to determine which equipment is important to process safety. The cause and safeguards columns of the HIRAs should contain this information. Possible process safety knowledge that should be maintained include the following:</p> <ul style="list-style-type: none"> <li>– The engineering work (e.g., calculations, studies, design reports) that underlie the development of the design/specification data sheets that support the purchasing process. <li>– Plot plan(s). <li>– Fire protection system P&IDs and/or other design documents. <li>– Calculations of secondary containment capacity. <li>– Electrical one-line diagrams or other records that show how equipment is powered. <li>– Electrical grounding and bonding diagrams. <li>– Diagrams or other records that describe equipment, building, and area drainage systems. <li>– Descriptions or properties related to special hazards, e.g., pyrophoric properties, shock sensitivity, chemical stabilization material properties (including removal of the stabilizer). <li>– Thermodynamic and calorimetric data. <li>– Data that describes the deflagration and detonation flame speed and overpressure. <li>– Industrial hygiene data for the materials. <li>– Decomposition temperatures. <li>– Adiabatic reaction temperatures and

Audit Criteria	Source	Guidance for Auditors
		<p>corresponding pressures.</p> <ul style="list-style-type: none"> - Separation equipment design and design basis (e.g., reflux ratio needed to maintain safe operation). - Diagrams/plans or tables the describing the maximum distances to overpressures and radiant heat zones from explosions and fires. - Mechanical data/design basis for process equipment. - Shop fabrication drawings for process equipment that was uniquely fabricated for purpose. - Piping isometric drawings. - Instrument data sheets or equivalent records. - Heat exchanger data sheets. - Data sheets or equivalent records for pumps, motors, and other rotating equipment. - Performance curves/data for rotating equipment. - Design data and capacity ratings for lifting equipment whose failure could contribute to process safety incidents. <ul style="list-style-type: none"> • Auditors should spot-check one or more project records to determine that engineering data and assumptions used are appropriate and that the engineering work is conducted in a manner that uses standard, referenced engineering methodologies. • Auditors should check the engineering and project files to determine if the appropriate process safety knowledge is being maintained. These files are maintained by engineering, maintenance, document control, or a combination of these groups.
9-R-10. Process safety-critical	CCPA	<u>Background Information for Auditors:</u>

Audit Criteria	Source	Guidance for Auditors
<p>equipment is clearly identified to operational and other staff and managed as such.</p>		<p>Table 9.3 – Continued</p> <ul style="list-style-type: none"> The process knowledge management system should clearly identify to facility personnel which equipment is important to process safety and which information describes this equipment. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check for some engineering or other record that identifies which equipment at the facility is important to process safety.
<p>9-R-11. If changes have been made to the process which involve the introduction of new process chemistry or unique hazards that did not exist before the change, a new material and energy balance should be created.</p>	<p>WCLAR (9/25/95)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review MOCs and the process safety knowledge affected by the changes to confirm that when new process chemistry is introduced or the process chemistry introduces new or unique hazards that have not been present in the process, the documentation of the process chemistry is revised as well.
<p>9-R-12. The design history files for pressure vessels contain at least the following PSI.</p> <ul style="list-style-type: none"> Design documents including, but not limited to: <ul style="list-style-type: none"> pressure vessel identification number and description contents and specific gravity design operating temperature and pressure overall dimensions nozzle schedule corrosion allowance post weld heat treatments type of support testing procedures to be used painting and insulation requirements fabrication documents such as welding procedures, welder qualifications, code calculations, manufacturer's data reports, and heat treatment reports Installation documents such as pressure testing records. 	<p>NEP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> A typical pressure vessel file in the engineering, maintenance, or project records will include the information shown in this criteria, plus other pertinent information, e.g., repair forms and records, welding procedures used for these repairs, purchase orders for the vessel and its repairs, qualification records for the shop and individuals that performed the repairs, and PMI records. Fitness-for-service evaluations are recommended when the pedigree of a pressure vessel is lost; i.e., its U-1A form is lost and the nameplate of the vessel in the field is no longer legible. In these cases, the procedures contained in API RP-579 should be followed to restore the design basis for the pressure vessel. This is a

Audit Criteria	Source	Guidance for Auditors
<ul style="list-style-type: none"> • Fitness-for-service assessment documents (if such assessments have been performed). 		<p>formal regulatory requirement in some of the states that regulate unfired pressure vessels and would be a compliance issue in this case.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check that engineering, project, or maintenance records include appropriate design and installation records, most important, the U-1A form. Such records should include the following: <ul style="list-style-type: none"> – Pressure vessel identification number and description. – Contents and specific gravity. – Design operating temperature and pressure. – Overall dimensions. – Nozzle schedule. – Corrosion allowance. – Post-weld heat treatments. – Type of support. – Testing procedures to be used. – Painting and insulation requirements. – Fabrication documents such as welding procedures, welder qualifications, code calculations, manufacturer's data reports, and heat treatment reports. – Installation documents such as pressure testing records. – Fitness-for-service assessment documents (if required).
<p>9-R-13. For piping circuits, is there information in the MI piping inspection procedures or other PSI that indicates:</p> <ul style="list-style-type: none"> • the original installation date • the specification, including the materials of construction and 	NEP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • A typical piping system design file in the engineering, maintenance, or project records will include the information shown in this criteria, plus other pertinent information, e.g., repair forms and records, welding

Audit Criteria	Source	Guidance for Auditors
<p>strength levels</p> <ul style="list-style-type: none"> • the original thickness measurements • the locations, dates, and results of all subsequent thickness measurements • the retirement thickness of the circuit • the piping service class per API 570, Section 6.2) • the previous repairs and replacements • the pertinent operational changes (e.g., changes in service, operations outside normal limits). 		<p>procedures used for these repairs, purchase orders for the piping and its repairs, qualification records for the shop and individuals that performed the repairs, and positive material identification (PMI) records.</p> <p><u>Auditor Activities:</u></p> <p>Auditors should check that engineering, project, or maintenance records include appropriate design and installation records for piping. Such records should include the following:</p> <ul style="list-style-type: none"> • The original installation date. • The specification, including the materials of construction and strength levels. • The original thickness measurements. • The locations, dates, and results of all subsequent thickness measurements. • The retirement thickness of the circuit. • The piping service class per API 570, Section 6.2. • The previous repairs and replacements. • The pertinent operational changes (e.g., changes in service, operations outside normal limits).
<p>9-R-14. Replacement piping is suitable for its process application.</p>	<p>NEP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Engineering or project records indicate that the appropriate RAGAGEP was used for the design of replacement piping. These could include ANSI/ASME B31.1 (Power Piping Code—steam), ANSI/ASME B31.3 (Process Piping Code—most chemical/processing applications), ANSI/ASME B31.5 (Refrigeration Piping Code), and equivalent company or facility piping design standards. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review engineering or project records

Audit Criteria	Source	Guidance for Auditors
		to determine that replacement piping has been subjected to PMI tests to confirm its material of construction.

These related criteria for process safety knowledge should also be considered for inclusion in PSM programs mandated by states or other jurisdictions because they affect equipment, policies, practices, procedures, and other aspects of facility operations that are important to process safety.

9.2.3 Voluntary Consensus PSM Programs

The following voluntary consensus PSM program requirements for process knowledge management are described below:

- The requirements published for the offshore oil platform sector in the Safety and Environmental Management Program (SEMP), a voluntary program designed by API and endorsed by the Minerals Management Service of the U.S. Department of the Interior.
- Responsible Care Management System (RCMS)[®] published by the American Chemistry Council.
- RC14001 Environmental Management System, published by the American Chemistry Council.

Table 9.4 lists audit criteria and auditor guidance relating to process knowledge management pursuant to voluntary consensus PSM programs.

Table 9.4 Related Voluntary Consensus PSM Programs Audit Criteria and Guidance for Auditors - Process Knowledge Management

Audit Criteria	Source	Guidance for Auditors
<p><i>SEMP</i></p> <p>9-R-15. The management program requires that a compilation of safety and environmental information be developed and maintained for the subject facility.</p>	API RP 75, 2.1	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check for a written plan that requires a compilation of information for each off-shore facility and spells out what information to collect and retain.
<p>9-R-16. The management program requires that documentation be retained on process and mechanical design.</p>	API RP 75, 2.1	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check for a written plan requiring that a compilation of process and mechanical design information be made and spelling out what information to collect and retain.
<p>9-R-17. The management program requires that process, mechanical, and facilities design information be</p>	API RP 75, 2.1	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check for a written plan requiring retention

Audit Criteria	Source	Guidance for Auditors
<p>Table 9.4 – Continued retained for the life of the facility.</p>		<p>of the above design information for the life of the facility.</p>
<p>9-R-18. If the management program allows common documentation for simple or nearly identical facilities within the same field, it requires that site-specific differences be addressed.</p>	<p>API RP 75, 2.1</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check for a written plan addressing site-specific differences in common information.
<p>9-R-19. Process design information is included in the program as follows:</p> <ul style="list-style-type: none"> • Simplified process flow diagram (safety flow diagram or simplified P&ID, or equivalent). • Acceptable upper and lower limits for temperature, pressure, flow, and composition, where applicable. • Process design material and energy balances, where available. 	<p>API RP 75, 2.2 RP14J, 6.2.1; 30 CFR §250 RP 75, 6.2.2.1; 30 CFR §250 RP 75,2.2.2; RP14J, 6.2.2</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check, via field verification that information required by the written plan is available. • Auditors should check, if process design material and energy balances are unavailable, that this information has been developed in sufficient detail to support the hazards analysis. Information of this type is typical for facilities more complicated than the normal oil and gas production platform, i.e., cryogenic and LNG facilities. For normal production facilities, such information is not required.
<p>9-R-20. The management program requires that mechanical and facilities design information be documented.</p> <ul style="list-style-type: none"> • Piping and instrument diagrams (P&IDs), or equivalent. • Electrical area classification drawing. • Equipment arrangement drawings (layout). • Basis for relief valve sizing information. • Description of alarm, shutdown, and interlock systems (RP 14C safe chart). • Description of well control system. • Fire protection and safety equipment information. • Emergency evacuation procedures. • Material safety data. 	<p>API RP 75, 2.1 API RP 75, 2.3.1</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check, via field verification, that information, as required by the written plan, is available. • Auditors should check to see if the description of the well control system should be depicted on a RP 14C safe chart. • Auditors should check to determine if fire protection and safety equipment information are depicted on a station bill or safety equipment layout drawing. • Auditors should check that emergency evacuation procedures are included on a station bill or USCG-approved emergency evacuation plan. • Auditors should check to ensure that material safety data for all

Audit Criteria	Source	Guidance for Auditors
		chemicals and process fluids are depicted on material safety data sheets.
9-R-21. If a memorandum of agreement or memorandum of understanding (MOU) is in use by the operator, the management program requires that it conform to the applicable requirements of the flag state and classification society.	API RP 75, 2.3.2	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should determine if an international Load Line Certificate, a USCG Certificate of Inspection, an IMO MODU Code Certificate, or an International Oil Pollution Prevention Certificate exists.
9-R-22. The facility was designed consistent with the applicable consensus codes and standards in effect at the time it was built.	API RP 75, 2.3.3	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should check that there is evidence of suitability such as RP 14C review, relief analysis, hazards analysis, etc.
9-R-23. If code or standard conformance cannot be verified or does not exist, the suitability of the design for intended use was documented.	API RP 75, 2.3.4	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should ensure that there is suitable engineering analysis or documented successful prior operating experience.
9-R-24. The consideration of human factors was included in the design of new facilities or major modifications.	API RP 75, 2.3.5	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should check to see if there is suitable evidence in the form of a human factors study or human factor assessments embedded in the design reviews or hazards analyses for the facility.

Audit Criteria	Source	Guidance for Auditors
<i>Responsible Care® Management System (RMCS)</i> 9-R-25. The organization shall maintain current product and process information related to potential hazards and their associated risks.	RCMS Technical Specification, Element 2.2	<u>Background Information for Auditors:</u> <ul style="list-style-type: none"> This element requires the need to have a process to ensure that risk information for products and manufacturing processes is kept current and provides a sound basis for performing risk assessment. For example, it requires a process for keeping P&IDs current so that when a HIRA is performed accurate results can be achieved. <u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should check whether product information includes results of physical/chemical, toxicology and environmental data reviews used in the hazard

Audit Criteria	Source	Guidance for Auditors
		<p>determination process, MSDSs, product brochures, technical bulletins, storage and handling</p> <p>Table 9.4 – Continued</p> <p>instructions, training, and other appropriate information.</p> <p>Auditors should check whether process information includes HIRA results, piping and instrument diagrams (P&IDs), safe operating procedures, MOC procedures, and other</p> <p>Table 9.4 – Continued</p> <ul style="list-style-type: none"> • information.

Audit Criteria	Source	Guidance for Auditors
<p><i>RC14001</i></p> <p>9-R-26. Establish, implement and maintain procedures to manage product and process information.</p>	<p>RC14001 Technical Specification RC151.03 4.3.1</p>	<ul style="list-style-type: none"> • No further guidance.

9.3 AUDIT PROTOCOL

The process safety program audit protocol introduced in Appendix A and available online (see page xiv for information on how to access this resource) provides detailed questions that examine the issues described in Section 9.2.

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10

HAZARD IDENTIFICATION AND RISK ANALYSIS

This element is called Process Hazard Analysis in OSHA PSM and EPA RMP programs. In many state regulatory PSM programs it is also called process hazard analysis. In the voluntary consensus PSM programs it is generally referred to as hazard or risk assessment. Hazard Identification and Risk Analysis is an element of the RBPS accident prevention pillar Understand Hazards and Risks.

10.1 OVERVIEW

The Hazard Identification and Risk Analysis (HIRA) element focuses on the analytical process for identifying hazards and evaluating the risk of processes—throughout their life cycle—to make certain that risks to employees, the public, or the environment are consistently controlled within the organization’s risk tolerance.

A range of tools is available for the identification and evaluation of hazards, including the following:

- Simple hazard identification
- Qualitative analysis, e.g.,
 - Hazard and operability analysis (HAZOP)
 - What-if/checklist analysis
 - Failure modes and effects analysis (FMEA) and failure modes, effects, and criticality analysis (FMECA)
- Quantitative analysis, e.g.,
 - Layer of protection analysis (LOPA)
 - Fault tree analysis
 - Event tree analysis
 - Dispersion and consequence analysis

HIRA encompasses the entire spectrum of analytical techniques, from qualitative to quantitative. A process hazard analysis (PHA) is a HIRA that meets specific regulatory requirements in the United States. The HIRA element includes work activities associated with conducting analyses, addressing the recommendations raised by these analyses, and communicating results to facility personnel. This element complements the Process Safety Knowledge element in that Process Safety Knowledge documentation should be available and up-to-date in order to conduct a meaningful and realistic HIRA. The outcomes from a HIRA may be used in other areas of process safety, for example, in the development of Consequences of Deviation tables for Operating Procedures, and in the determination of design scenarios for relief device sizing.

The recommendations from HIRAs require careful resolution and may represent changes to the processes/equipment, as well as to process safety related policies, practices, and procedures. The output of the HIRA also provides valuable information about what equipment and process safety practices either cause the relevant hazards, or safeguard against them. Therefore, the results of HIRAs should be reconciled with the scope and applicability of all other relevant PSM program elements to ensure that the design of these elements reflects those equipment and practices that are critical to the risk.

The HIRA element interfaces significantly with other PSM program elements. Because it is a foundational PSM program element for understanding the hazards and risks of a process, it serves as an important and necessary input to the design of the other PSM program elements. The primary interfaces with other elements include the following:

- Workforce Involvement (Chapter 7)—HIRAs are one of the primary means to foster employee participation in the PSM program as personnel serve as HIRA team members.
- Process Knowledge Management (Chapter 9)—knowledge/information should be reviewed for accuracy and updated if necessary prior to a HIRA. HIRA teams use this information to understand and assess process hazards and controls.
- Operating Procedures (Chapter 11)—the significant hazards identified in a HIRA are often included in the operating procedures as warnings, cautions, or safe operating limits. Procedures are often used during HIRAs to understand the operation being assessed.
- Training and Performance Assurance (Chapter 15)—the training program for operators and other personnel should include information on the hazards identified in the HIRAs.
- Asset Integrity and Reliability (Chapter 13)—the selection of equipment to be included in the AI program should rely on the identification during HIRAs of the equipment whose failure could result in or contribute to a process safety incident.
- MOC (Chapter 16)—HIRAs, while not mandatory, may be performed to assess the impact of a proposed change on process safety. Resolution of

recommendations made during a HIRA may require use of the MOC process. MOC forms are often reviewed during HIRA revalidations.

- Operational Readiness (Chapter 17)—operational readiness review activities require HIRAs for new processes.
- Emergency Management (Chapter 19)—emergency response planning should consider the hazard scenarios identified in the HIRAs.
- Incident Investigation (Chapter 20)—HIRAs are sometimes performed as part of or as a result of the investigation process for a process safety incident. Incident investigations are reviewed during HIRA revalidations.

In Sections 10.2 and 10.3, compliance and related audit criteria are presented, along with guidance for auditors in applying the criteria. A full explanation of compliance and related audit criteria are presented in Chapter 1 (see Section 1.7).

The criteria and guidance described in these sections do not represent exclusive solutions to PSM program coverage, design, implementation, or interpretation. They represent the collective experience of many people in the chemical/processing sector who have performed many PSM audits, and the consensus opinion resulting from that experience. The compliance criteria are derived from the regulations that govern PSM programs in the United States; however, these regulations are all performance-based. Performance-based regulations are goal oriented and there may be multiple pathways to fully complying with them. Therefore, there may be alternate interpretations and solutions to the issues described in the compliance tables in this chapter that are equivalent to those included, particularly the auditor guidance presented.

The inclusion of the related criteria in no way infers that these criteria must be implemented for a PSM program to be successful, nor does it infer that a PSM program will be deficient without them. As with the compliance criteria, there may be other, more appropriate solutions for an individual facility or company. In addition, the use of the related criteria in a PSM audit is intended to be completely voluntary and not a mandatory requirement in any way. They should be used cautiously and with careful planning so that they do not inadvertently establish unintended performance standards. Consensus should be sought within and among facilities and their parent companies before these criteria are used. Finally, the related criteria and guidance offered for consideration are not endorsements of or agreements with the written or verbal clarifications made by the regulators, PSM citations issued against the regulations, other PSM guidance published by the regulators, or the successful or common PSM practices in any given company's PSM program from which they are derived.

10.2 AUDIT CRITERIA AND GUIDANCE

The detailed requirements for PHA of OSHA's PSM Standard, EPA's RMP Rule, several state PSM regulatory programs, as well as for other common PSM program voluntary consensus PSM programs are presented below.

The audit criteria described below are examined by auditors using the guidance provided by performing the following audit activities:

- Interviewing the person(s) at the facility who have the responsibility for managing, facilitating, and following up on PHA activities.
 - The person managing PHA generally works in the facility EHS, engineering, or technical department and is usually the PSM manager/coordinator.
 - Persons facilitating PHA studies may be plant personnel or contractors. In-house PHA facilitators usually are engineering personnel, but sometimes operations or other personnel are trained and skilled at performing these types of studies. PHA facilitators also typically produce the PHA reports.
 - Persons participating in PHA studies include engineers, operations supervision, operators, maintenance personnel, safety personnel, and others as needed to adequately identify and evaluate the risks. These individuals should have insight into the conduct of the PHAs in terms of thoroughness, time expended, etc.
 - Persons following up on PHA recommendations usually include operations and engineering personnel at a minimum. Operations personnel will more likely be charged with implementing organizational or procedural recommendations, while engineering personnel will be involved in implementing recommendations that require project involvement or capital expenditures. Other facility and company personnel may also have responsibility for PHA follow-up depending on the nature of the recommendations. Either the PSM manager/coordinator or an administrative person usually maintains/manages the tracking system/database that is used to manage the PHA recommendations.
- Reviewing the company or facility PHA procedure, if one exists, to determine the requirements and guidance established for performing PHAs.
- Reviewing PHA reports for content and thoroughness.
- Reviewing the PHA schedule to determine if any PHAs (or revalidations) have been missed or performed late.
- Reviewing the status of PHA recommendations, including the actual completion dates and the time elapsed from the date of the study.
- Verifying in the field that completed PHA action items have been installed as described in the PHA action tracking system (and MOC records).
- If possible, observing a PHA in progress.

Auditors should also carefully examine the PHA requirements found in the procedures of the company/facility being audited. As stated in Section 1.7.1, these could be interpreted as compliance requirements by regulators and could be subject to citations if they are not being followed. Auditors should confirm, via interviews, records and document reviews, and field observations that the

requirements of the facility or company PHA procedures have been implemented as specified. Findings should be generated if the company/facility-specific provisions are not being followed.

See the Guidance for Chapters 3–24 in the Introduction for the definition of the abbreviations shown in the following tables that are used to indicate the source of the criteria.

10.2.1 Compliance Requirements

The audit criteria should be used by the following:

- Readers in the United States covered by the PSM Standard or RMP Rule.
- Readers who have voluntarily adopted the OSHA PSM program.
- Readers whose companies have specified OSHA PSM requirements in non-U.S. locations.

Table 10.1 describes the audit criteria and auditor guidance for PHA pursuant to OSHA PSM and EPA RMP.

Table 10.1 OSHA PSM and EPA RMP Audit Criteria and Guidance for Auditors – Process Hazard Analysis

Audit Criteria	Source	Guidance for Auditors
<p>10-C-1. Initial PHAs have been performed on processes covered by the PSM Standard. The PHAs shall be appropriate to the complexity of the processes and shall identify, evaluate, and control the hazards involved in the process.</p>	<p>PSM [(e)(1)] RMP 68.67</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check that an initial PHA has been performed for each process covered by the PHA Standard. Auditors should check to ensure that the definition of the processes has not caused any gaps between PHAs that resulted in PSM-covered equipment not being studied in one of the PHAs. • Auditors should check that the PHA methodology chosen for each PHA is commensurate with the complexity of the process and of sufficient rigor to identify the hazards. For example, a simple checklist may not be an adequate methodology for a refinery hydrogen fluoride (HF) alkylation unit PHA. • Auditors should check the following: <ul style="list-style-type: none"> – The recommendations are commensurate with the hazards/risks identified, the status of the existing protective measures, and ALARP principles.

Audit Criteria	Source	Guidance for Auditors
		<p>Table 10.1 – Continued</p> <ul style="list-style-type: none"> – Recommendations are not mandatory for every hazard identified. – If there are hardware/equipment solutions to reducing risks that are specifically required by relevant RAGAGEPs, and these are not present, they have been recommended. – Operator actions/administrative safeguards are not relied upon exclusively when the hazards/risks are high.
<p>10-C-2. A priority order has been determined and documented for conducting the PHAs on the processes covered by the PSM program. The priority order was based on a rationale that considered:</p> <ul style="list-style-type: none"> • Extent of process hazards • Number of potentially affected employees • Age of the process • Operating history 	<p>PSM [(e)(1)] RMP 68.67</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Initial PHAs should have been conducted in the 1992–1997 time frame when the OSHA PSM standard was first promulgated. Since PHA reports should be kept for the life of the process, an auditor should be able to follow the chronology of PHA reports back to the initial unit PHA. • The priority order for performing the initial PHAs is a moot issue at this time. The order that was used for performing the initial PHAs established the schedule that determines when PHA revalidations are currently scheduled and performed. Depending on the purpose, scope, and objectives of the audit, a finding that a priority order for the initial PHAs was not established can be created for completeness; however, that finding would not be accompanied by a recommendation. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that initial PHAs were performed. However, at this point the priority order is not as important as it would have been when the PSM Standard was adopted as a regulation.

Audit Criteria	Source	Guidance for Auditors
10-C-3. All of the initial process hazard analyses have been completed.	PSM [(e)(1)(iv)] RMP 68.67	<ul style="list-style-type: none"> No further guidance.
10-C-4. PHAs conducted after May 26, 1987, but before May 26, 1992, that were used as initial PHAs meet the requirements of paragraph (e) of the PSM standard.	PSM [(e)(1)(v)] RMP 68.67	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> If PHAs performed prior to the adoption of the PSM Standard were used as initial PHAs, they should be superseded by PHA revalidations at five-year intervals from the initial PHA, and although these initial studies should be available, their contents are no longer up-to-date. If PHAs performed prior to the adoption of the PSM Standard were used as initial PHAs and those studies contained omissions and deficiencies, they should have been corrected in subsequent revalidated PHAs. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> If the initial PHAs were not performed per the schedule specified in the PSM Standard, producing findings at this point will not serve a useful purpose and should be avoided.
10-C-5. One or more of the following methodologies has been used to determine and evaluate the hazards of the process being analyzed: HAZOP, What-If, What-If/Checklist, Checklists, FMEA, FTA, or an appropriate equivalent methodology.	PSM [(e)(2)] RMP 68.67	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> An equivalent PHA methodology that is not specifically one of the typical techniques described in the regulations may be used. However, if a company or facility has used a method that they have designed on their own, it should, at a minimum, address the same issues described in audit criteria 10-C-6 through 10-C-12. If an appropriate equivalent PHA methodology has been used, the rationale for its use and a justification for its equivalency should be documented. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check that PHA reports indicate PHAs have been performed using one of the defined methodologies specified in the PSM

Audit Criteria	Source	Guidance for Auditors
		<p>Table 10.1 – Continued regulation(s) that apply to the processes at the facility.</p>
<p>10-C-6. The PHA(s) address the hazards of the process.</p>	<p>PSM [(e)(3)(i)] RMP 68.67</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • This requirement essentially defines the completeness standard for a PHA. The auditor should review the PHA against a copy of the P&ID for the process used during the PHA to ensure that all pertinent equipment was included in the PHA. • Other sources of information, as available, should be used to determine if all hazards have been addressed. For example, a process description may indicate that high-pressure hydrogen is used in the process; the PHA should be reviewed to see if the hazards associated with high-pressure hydrogen have been addressed. Incident reports, including those that describe near misses, should be compared to the PHA worksheets to determine if the incident history was used to generate hazards (also see criteria 10-C-7). <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check the PHA against a chemical/material inventory for the process, in particular the maximum intended inventory documented under the Process Safety Information (PSI) element to ensure that all chemicals/materials have been included in the PHA. • Auditors should check the PHA to determine if the root/salient hazard issue has been identified in each hazard scenario. For example, if incompatible materials can credibly be mixed in node/subsystem, there should be a discussion of reactivity and its possible effects. If a particular

Audit Criteria	Source	Guidance for Auditors
		<p>node/subsystem includes fired equipment, pertinent mechanical issues such as refractory failure should appear in the PHA worksheets. The Cause (HAZOP studies) or What-If Question (What-If studies) columns should include identification of the root/salient issues, and the Consequence column should describe the effects.</p>
<p>10-C-7. The PHA(s) address any previous incident that had likely potential for causing catastrophic consequences in the workplace.</p>	<p>PSM [(e)(3)(ii)] RMP 68.67</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • A review of the PHA reports indicates that actual incidents resulting in a release of chemicals/materials included in the PSM program and resulting in catastrophic consequences or identified as near misses were included in PHAs of the processes where the incident occurred. • The auditor should compare the incident reports for units where PHAs are being reviewed to ensure that the PHAs included investigated incidents and near misses.
<p>10-C-8. The PHA(s) address engineering and administrative controls applicable to the hazards and their interrelationships such as appropriate application of detection methodologies to provide early warning of releases. (Acceptable detection methods might include process monitoring and control instrumentation with alarms, and detection hardware such as hydrocarbon sensors.)</p>	<p>PSM [(e)(3)(iii)] RMP 68.67</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Credible safeguards are those that are functional; address the detection, prevention, or mitigation of the hazards; and are independent from the identified hazards. • Engineering safeguards are those that are hardware based, for example, interlocks, trips, alarms, LEL or toxic gas detectors, spare or redundant installed equipment (e.g., spare pumps), fire protection equipment, and other safety systems. Chronically overdue inspection, testing, and preventive maintenance (ITPM) tasks for hardware safeguards might invalidate their credibility. • Administrative controls are those that are based on operating procedures or rely on human action to function, e.g., published ITPM tasks that are

Audit Criteria	Source	Guidance for Auditors
		<p>Table 10.1 – Continued</p> <ul style="list-style-type: none"> being performed on time. Emergency response plans, inventory limits in operating procedures, etc. also apply as administrative controls. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check that PHA reports indicate that credible engineering and administrative controls (often referred to as safeguards) have been identified in the PHAs as they relate to and are applicable to the hazards identified.
10-C-9. The PHA(s) address the consequences of failure of engineering and administrative controls.	PSM [(e)(3)(iv)] RMP 68.67	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check that the consequences included in the PHA are the worst-case consequences, i.e., the consequences assuming that all of the safeguards fail. For example, the worst-case scenario for a release of flammable vapors in a confined area is generally a vapor cloud explosion.
10-C-10. The PHA(s) address facility siting.	PSM [(e)(3)(v)] RMP 68.67	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Facility siting has been defined by OSHA as the spatial relationship between the locations of the hazards and the locations of persons who work on-site (i.e., defined work locations where people are assigned to work). The emerging practice is that PHAs include an analysis of this spatial relationship. There are a number of ways to address facility siting: Some facilities/companies have performed detailed quantitative facility siting analyses to determine the explosion, fire, and/or toxic gas impact zones. Most of the time these quantitative studies are performed separate from the PHAs themselves. If these separate quantitative studies represent the only facility siting work performed by the site, or if

Audit Criteria	Source	Guidance for Auditors
		<p>they have been formally incorporated into the PHAs by reference, they should be revalidated every five years, which the auditor should check to see has been done (these quantitative studies are usually treated as one-time activities and are not typically revalidated or updated). Typical changes requiring revalidation of these quantitative facility-siting studies include changes in the occupancy rates of existing buildings, construction of new occupied buildings on-site (e.g., a new control room building, a new employee locker room/changing building), removal or change in location of occupied buildings or structures, and process changes that have modified the inventories or locations of flammable or toxic materials studied. A quantitative facility-siting analysis is not mandatory but will suffice for addressing the topic if it has been performed.</p> <ul style="list-style-type: none"> • Facility siting may be addressed qualitatively by completing a facility-siting checklist for the occupied locations within the scope of the process being studied. Checklist questions are answered with detailed information regarding processes, spacing, blast overpressures, structural integrity, etc. The checklist should be included in the PHA documentation, and any recommendations arising from using the checklist should be included in the list of recommendations from the PHA. PHAs that simply note that some hazard scenarios may have possible health effects on the occupants of control rooms or other structures, without appropriate safeguards, qualitative risk rankings, and recommendations (if appropriate) does not constitute a complete facility-

Audit Criteria	Source	Guidance for Auditors
		<p>Table 10.1 – Continued siting analysis.</p> <ul style="list-style-type: none"> • Facility siting may be addressed as a specific deviation in each node of the PHA. If handled this way, the auditor should examine PHA worksheets for evidence that facility siting was addressed in sufficient depth. In other words, there should be some findings, consequences, and safeguards listed under a facility-siting deviation if the Table 10.1 – Continued PHAs used the HAZOP methodology, or appropriate What-If questions if the What-If methodology was used. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check the PHA reports to determine if facility siting has been included in some manner in the PHA process for each process included in the PSM program. • Auditors should check to ensure that if the facility uses occupied temporary structures or trailers, they have been sited in a location that is not vulnerable to overpressure or damaging thermal radiation, nor is the structure vulnerable to toxic vapor ingress. To confirm this, a quantitative fire/explosion and/or dispersion analysis would be required for each such use, unless the site has performed a general quantitative facility-siting analysis and has already defined the safe zones for these temporary structures. Auditors should confirm in the field that the occupied structures are in the safe zones.
10-C-11. The PHA(s) address human factors.	PSM [(e)(3)(vi)] RMP 68.67	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Human factors have been defined by OSHA as 1) human error, and 2) human factors engineering issues that affect human performance. • Human factors may be

Audit Criteria	Source	Guidance for Auditors
		<p>addressed by completing a human-factors checklist for the covered process. The checklist should be included in the PHA report, and any recommendations arising from the checklist should be included in the list of recommendations from the PHA.</p> <ul style="list-style-type: none"> Human factors may be addressed as a specific deviation in each node of the PHA. If handled this way, the auditor should examine PHA worksheets for evidence that human factors were addressed in sufficient depth. In other words, there should be some findings, consequences, and safeguards listed under the human-factors deviation, and both human-error and human-factors engineering issues should be addressed. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check that the PHA reports indicate that human factors have been included in some manner in the PHA process for each process included in the PSM program.
<p>10-C-12. The PHA(s) includes a qualitative evaluation of a range of possible safety and health effects of failure of controls on employees in the workplace.</p>	<p>PSM [(e)(3)(vii)] RMP 68.67</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Although the most common industry method of accomplishing this qualitative evaluation is a qualitative ordinal risk-ranking scheme, it is not mandatory that such a scheme be used. If a particular site can demonstrate another method distinguishing between the hazards being identified and uses this method to help make decisions and prioritize the PHA results, it may be acceptable. For example, the site may use a high/medium/low scale to describe the range of possible safety and health effects. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check PHA reports to determine if the PHAs include a qualitative evaluation that allows the results to be

Audit Criteria	Source	Guidance for Auditors
		<p>Table 10.1 – Continued prioritized in some manner.</p>
<p>10-C-13. The PHA(s) have been performed by teams with expertise in engineering and process operations.</p>	<p>PSM [(e)(4)] RMP 68.67</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Job titles do not always indicate technical skills, and the PHA documentation should describe the expertise that each team member brought to the study. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check PHA reports to determine if the PHA teams include, at a minimum, at least one representative with expertise in engineering and one representative with expertise in operations (there could be one team member with expertise in both engineering and operations). • Auditors should compare the types and nature of the hazards in the process and from a review of the PHA reports determine if the teams had the appropriate expertise to perform a complete study.
<p>10-C-14. At least one PHA team member had experience and knowledge specific to the process being evaluated.</p>	<p>PSM [(e)(4)] RMP 68.67</p>	<p><u>Background Information for Auditors</u></p> <ul style="list-style-type: none"> • This does not mean that a nonmanagement employee, such as an operator, is a mandatory PHA team member. An operations supervisor would suffice. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check the PHA reports to determine if the PHA teams included at least one member who actually worked in the process being studied.

Audit Criteria	Source	Guidance for Auditors
<p>10-C-15. At least one PHA team member was knowledgeable in the specific PHA technique being used.</p>	<p>PSM [(e)(4)] RMP 68.67</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Although common practice, formal training courses for PHA team leaders are not mandatory. • Refer to company/site-specific requirements to confirm any specific requirements that need to be satisfied. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check the PHA reports to determine if the PHA team leaders were knowledgeable based on a combination of formal training and/or experience that the team leader obtained before leading the studies being audited. The qualifications of the PHA team leader should be judged on the merits of each case.
<p>10-C-16. A system has been established to promptly address the team's findings and recommendations.</p>	<p>PSM [(e)(5)] RMP 68.67</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • "Address" means to track the status, resolution, and implementation of recommendations and the action items that result from the resolutions. Although it is common practice to use a spreadsheet, database, or other electronic means of managing PHA recommendations, it is not mandatory that the management system be computerized. • Although "promptly" is not specifically defined, the resolution should occur within a reasonable amount of time, i.e., within a relatively short period after the approval of the final PHA report. The auditor should consider the specifics of each recommendation when determining whether or not the resolution was conducted promptly. The resolution process for recommendations associated with high risk-hazard scenarios should begin as soon as the PHA sessions are completed and the PHA results have been reviewed for completeness, or even before if the risk warrants. <p><u>Auditor Activities:</u></p>

Audit Criteria	Source	Guidance for Auditors
		<p>Table 10.1 – Continued</p> <ul style="list-style-type: none"> Auditors should check that there is a management system in place to address the PHA recommendations. This can be a hand-written or electronic method.
<p>10-C-17. Recommendations have been resolved in a timely manner.</p>	<p>PSM [(e)(5)] RMP 68.67</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Since the resolution is an analytical and planning process where the final disposition of the recommendation is determined, it should begin within a relatively short period after the approval of the final PHA report. For example, recommendations that require extensive outlay of capital or a unit shutdown or turnaround for implementation might take several years to close. However, in these cases, the need for interim measures should be assessed. If interim measures have been recommended, the auditor should ensure that these measures are in place and functioning as expected. Recommendations that are administrative in nature and involve no hardware modifications should be resolved and closed within a short period of time. The auditor should consider the specifics of each recommendation when determining whether or not the resolution was conducted promptly. In addition, evaluation of the time period for completing the implementation of the action items stemming from the resolution of the recommendations should consider the complexity of the action item and the difficulty of its implementation on a case-by-case basis. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the PHA recommendation management system to determine if PHA recommendations have been resolved within a time period that is consistent with the complexity of the recommendation and the difficulty of implementation. Auditors should conduct field

Audit Criteria	Source	Guidance for Auditors
		<p>observations to determine if recommendations have been implemented as documented in the recommendations management system.</p> <ul style="list-style-type: none"> Auditors should determine how each facility has defined "timely," how they have applied their definition, and if the definition and its application are reasonable.
<p>10-C-18. The resolution of the recommendations has been documented, the actions that were taken have been documented, and the actions have been completed as soon as possible.</p>	<p>PSM [(e)(5)] RMP 68.67</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Recommendations should not be considered "closed" in the management system until they are actually implemented, e.g. writing a work order to complete work does not constitute the work actually being completed. A properly closed work order might indicate that the action item is closed. Other indicators of action item closure are closed MOCs, revision blocks on engineering drawings indicating completed changes, PSSR records, or other engineered project records. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the PHA recommendation management system to determine if it provides, or refers to, sufficient information so that the auditor can verify the current status of each recommendation, including recommendations that have been rejected or modified. Auditors should determine if the PHA recommendation management system indicates that the final recommendations have become action items and those action items are documented. Auditors should check that recommendations are not considered "closed" in the management system until they are actually implemented, e.g., writing a work order to complete work does not constitute the work actually being completed.

Audit Criteria	Source	Guidance for Auditors
<p>Table 10.1 – Continued</p> <p>10-C-19. A written schedule has been developed for when actions are to be completed.</p>	<p>PSM [(e)(5)] RMP 68.67</p>	<p><u>Auditors Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check that PHA recommendations are assigned a target due date for resolution and/or closure.
<p>10-C-20. The actions have been communicated to those employees whose work assignments are in the process and who might be affected by the recommendations or actions.</p>	<p>PSM [(e)(5)] RMP 68.67</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Adequate communications may include a number of formats: face-to-face briefings, e-mails or intranet postings to employees, posted hard-copy information, handouts, or agenda topics during safety meetings. If face-to-face briefings (separate or safety meetings) are thoroughly documented, these should serve as sufficient evidence alone that the results were adequately communicated. If e-mails or intranet postings to employees, posted hard-copy information, or handouts are used to communicate the results, auditors should interview employees to determine if the employees received the communication. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with employees to determine if they have been informed about the action from the PHAs.
<p>10-C-21. At least every five years after the completion of the initial PHA(s), the PHA(s) have been updated and revalidated to assure that the PHA(s) is consistent with the current process. The PHA(s) shall be updated and revalidated based on their completion date.</p>	<p>PSM [(e)(6), (e)(1)(v)] RMP 68.67</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The specified basis for measuring the period between PHA revalidations is the completion date of the previous PHA. However, there are several methods that can be used to measure the completion date for PHAs. These measurement periods are summarized below along with guidance on common usage: <ul style="list-style-type: none"> – The ending date of the last PHA sessions. This is the most easily determined date and should be the most common date used. – The date of the last PHA

Audit Criteria	Source	Guidance for Auditors
		<p>report. Since PHA reports can sometimes take significant time to be approved and issued, there may be a significant gap in time between the last PHA session and the issuance of the final report. Therefore, this method is not often used and is not recommended.</p> <ul style="list-style-type: none"> - The date that the recommendations from the last PHA were resolved. Like PHA reports, the resolution of PHA recommendations may take significant time and there may be a sizeable time gap between the last PHA session and the approval of the course of action to be followed for the recommendations. Therefore, this method is not often used and is not recommended. - The date that the recommendations from the last PHA were approved. Since some recommendations may take years to implement, this method is not often used and is not recommended. <ul style="list-style-type: none"> • Although the completion date of the PHA is specified in the regulation, if this method is used to measure the revalidation period, and the time between the start date and the completion date is long, the PHA may not meet another PHA requirement—that the revalidated PHA reflects the current design and operation of the process. For example, if the original PHA took 12 weeks to complete, and the end date of the PHA was used, there may have been changes made to the process or incidents that occurred in those 12 weeks and may not then be included in the next revalidation.

Audit Criteria	Source	Guidance for Auditors
		<p>Table 10.1 – Continued</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review PHA reports to determine if PHA revalidation reports are available for each covered process. The revalidation reports for a given process should follow each other in intervals that do not exceed five years. • Auditors should compare the dates between PHAs for process included in the PSM program to determine if the period between studies is within five years. Although the regulations specify using the completion date of the PHA, if another date has been used (e.g., the starting date of the PHA) and the PHAs have been performed regularly within five-year periods using that alternate date, this is the most important aspect of the revalidation timing (i.e., the regular nature of the scheduling). However, in this case auditors should formulate a finding and recommendation to adjust the measurement date to the completion date at the next revalidation of the PHA(s) in question). • Auditors should review the PHA reports to determine if the PHAs are based on the most recent P&IDs, operating procedures, MOCs issued for the process being studied, incident reports for the process being studied, and any other documents or records that describe the current status of the process. • Auditors should match dates of the PHA documentation to the P&IDs and other information used to support the PHA to determine that the generation of the information pre-dates the PHA but was the most up-to-date information available at the time of the study.

Audit Criteria	Source	Guidance for Auditors
10-C-22. PHA(s) have been updated and revalidated teams meeting the same qualifications as the initial PHA(s).	PSM [(e)(6)] RMP 68.67	<u>Background Information for Auditors:</u> <ul style="list-style-type: none"> • Job titles do not always indicate technical skills and the PHA documentation should describe the expertise that each team member brought to the study. <u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review PHA reports to determine if the PHA revalidation teams meet the same qualification requirements as the initial PHAs.
10-C-23. PHA(s) and updates or revalidations for each process, as well as the documented resolution of recommendations have been retained for the life of the process.	PSM [(e)(7)] RMP 68.67	<u>Background Information for Auditors:</u> <ul style="list-style-type: none"> • Initial and revalidation PHA reports, or equivalent documentation, should be available for review. • The auditor should be able to trace the PHA reports, or equivalent documentation for a process from the initial PHA through each five-year revalidation. <u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review the PHA recommendation management system to determine if the resolution and closure records for all PHA recommendations have been retained.

10.2.1.1 U.S. State PSM Programs

If the PSM program being evaluated is pursuant to a state PSM regulation, then the specific process safety knowledge requirements for that regulatory program should be followed. In general, these overlap somewhat with the federal OSHA PSM and EPA RMP requirements, but often there are state-specific requirements that should be met, even if the state has received authority to enforce federal regulations (i.e., the state is an OSHA state plan state, or has received implementing agency status for the RMP Rule from EPA). The state-specific applicability requirements for the following states are presented below:

- New Jersey
- California
- Delaware

This section includes guidance on performing Inherently Safer Technology (IST) reviews because New Jersey as well as a local jurisdiction in California includes this review as a regulatory requirement. The audit criteria included herein, which is from New Jersey's Toxic Catastrophe Prevention Act (TCPA)

regulations, can be used to audit IST reviews that are not compliance requirements but have been performed voluntarily. New Jersey has recently separated the requirement for an IST review from this element and created a separate section of the TCPA regulation containing these requirements. Since this book does not have an explicit chapter addressing IST, the New Jersey criteria for IST reviews are presented in this chapter.

Table 10.2 shows the audit criteria and auditor guidance for Stakeholder Involvement pursuant to state requirements.

Table 10.2 U.S State Audit Criteria and Guidance for Auditors – Process Hazard Analysis

Audit Criteria	Source	Guidance for Auditors
<p><i>New Jersey Toxic Catastrophe Prevention Act (TCPA)</i></p> <p>10-C-24. Identification of extraordinarily hazardous substance (EHS) equipment subject to the assessment, the points of possible EHS release, the corresponding approximate quantity of an instantaneous EHS release or the rate(s) and duration of a continuing EHS release, either steady or nonsteady state, and the corresponding cause of the EHS</p> <p>Table 10.2 – Continued</p> <p>release. Estimates of the quantity or rate and duration of a release shall be based on actual release mechanisms and shall reflect the operating procedures, safeguards, and mitigation equipment and procedures, planned for new or modified covered processes, or in place for existing covered processes.</p>	<p>N.J.A.C. 7:31-4.2</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> In addition to traditional qualitative PHA analyses, the NJ TCPA regulations require that a quantitative hazard assessment accompany the PHA, in which the release rates of the EHS(s) are calculated, dispersion analyses performed to estimate the consequences at various distances, and risk reduction measures are included if these results reach certain thresholds. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the TCPA PHA reports to determine if the quantitative hazard assessment has been performed.
<p>10-C-25. Consideration of toxicity, flammability and reactivity for EHSs which appear in N.J.A.C. 7:31-6.3(a), Table I, Parts A and/or B as a toxic substance, Part C as a flammable substance and/or Part D as an reactive hazard substance (RHS) or RHS mixture. The owner or operator shall consider both the explosive/flammability hazard and the capability to generate a toxic EHS, as applicable to the RHS or RHS mixture and process in which it is handled.</p>	<p>N.J.A.C. 7:31-4.2</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> NJ TCPA requires consideration of reactive chemicals and types of reactive materials to be included in the PHA and risk assessment. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the TCPA HIRA reports to determine if reactive hazard substances (RHS) have been properly analyzed and when toxic and/or flammable materials can be generated from the reactions of the RHSs they have been included in the

Audit Criteria	Source	Guidance for Auditors
		HIRA and risk assessment.
<p>10-C-26. Identification of all scenarios of toxic, flammable, and reactive hazards that have a potential offsite impact for the endpoint criteria defined using a consequence analysis consisting of dispersion analysis, thermal analysis or overpressure analysis. The following parameters shall be used for the consequence analysis:</p> <ul style="list-style-type: none"> • 1.5 meters per second wind speed and F atmospheric stability class; • All parameters listed for alternative scenarios at 40 CFR §68.22(c) through (g); • As applicable to the scenario being analyzed, the endpoint criteria of ten (10) times the toxicity endpoint as designated at N.J.A.C. 7:31-2.1(c)2; 1750 thermal dose units (equivalent to 17 kW/m² for 40 seconds); five psi overpressure; or the lower flammability limit. As an alternative to using the ten (10) times toxicity endpoint as designated at N.J.A.C. 7:31-2.1(c)2, the value of five (5) times the Acute Toxicity Concentration (ATC) may be used for toxic release scenarios. • As applicable to the scenario being analyzed, the endpoint criteria of five times the toxicity endpoint as designated at N.J.A.C. 7:31-2.1(c)2.; 1200 thermal dose units (equivalent to 15 kW/m² for 40 seconds); or 2.3 psi overpressure. As an alternative to using the five times toxicity endpoint as designated at N.J.A.C. 7:31-2.1(c)2, the value of the ATC may be used for toxic release scenarios. 	N.J.A.C. 7:31-4.2	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the TCPA HIRA reports and supplemental documentation to determine if it supports the final HIRA and if the risk assessment report indicates that the correct release scenarios have been derived from the qualitative HIRA, and where representative release scenarios have been selected, that these scenarios envelope the other scenarios they represent. • Auditors should review the TCPA HIRA reports and supplemental documentation that supports the final HIRA and risk assessment report to determine if it indicates that the specified consequence analysis parameters and endpoint of concern have been used in the hazards assessment.

Audit Criteria	Source	Guidance for Auditors
<p>Table 10.2 – Continued</p> <p>10-C-27. The owner or operator shall identify all release scenarios that have an offsite impact of the endpoint criteria specified. For each release scenario that has an offsite impact of the endpoint criteria specified, the owner or operator shall perform an evaluation of state-of-the-art, including alternative processes, procedures or equipment which would reduce the likelihood or consequences of an EHS release.</p> <p>For each release scenario that has an off-site impact of the endpoint criteria specified, the owner or operator shall:</p> <ul style="list-style-type: none"> • Perform an evaluation of state-of-the-art, including alternative processes, procedures or equipment which would reduce the likelihood or consequences of an EHS release; or • Determine the likelihood of release occurrence. If likelihood of release occurrence is $\geq 10^{-4}$ per year, the owner or operator shall perform an evaluation of state-of-the-art, including alternative processes, procedures or equipment which would reduce the likelihood or consequences of an EHS release. If the likelihood of release occurrence is $\leq 10^{-4}$ per year, no further assessment is required. 	<p>N.J.A.C. 7:31-4.2</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the TCPA HIRA reports and supplemental documentation that supports the final HIRA and risk assessment report to determine if for each release scenario where there were off-site impacts (i.e., endpoints exceed the facility boundary), either one of the following was performed: <ul style="list-style-type: none"> – a state-of-the-art (SOA) review of the scenario, or – a determination of the frequency of release. – If the frequency of release is $\geq 10^{-4}$ per year, a SOA review is required. If the release frequency is $\leq 10^{-4}$ per year, no SOA review is required. – A review of the TCPA HIRA reports and supplemental documentation that supports the final HIRA and risk assessment report indicates that the failure rate data specified by NJDEP has been used to determine the release frequency, or if different data has been used, it is appropriate to the equipment failure contributors of the release scenario.
<p>10-C-28. The owner or operator shall develop a risk reduction plan for the release scenarios requiring state-of-the-art evaluation.</p>	<p>N.J.A.C. 7:31-4.2</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the TCPA HIRA reports to determine if a risk reduction plan has been formulated and included in the report when a SOA review was required.
<p>10-C-29. The following documentation from the HPA with risk assessment shall be maintained:</p> <ul style="list-style-type: none"> • Table(s) of the process hazard analysis results giving the release point and corresponding 	<p>N.J.A.C. 7:31-4.2</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The TCPA regulation requires that the HIRA and risk assessment reports contain certain information. <p><u>Auditor Activities:</u></p>

Audit Criteria	Source	Guidance for Auditors
<p>release scenario of the potential basic (initiating) and intermediate event sequences, the corresponding estimated quantity or rate and duration of releases, and the recommended resolution action based upon 40 CFR §68.67(e).</p> <ul style="list-style-type: none"> • Table(s) summarizing each potential off-site release scenario identified that includes: <ul style="list-style-type: none"> – Scenario identification number and brief description. – The rate and duration, or quantity, of potential release. – The distance to the endpoint determined in (b)3iii and (b)3iv above and the respective distance to the nearest property line. – The release likelihood determined pursuant to (c)2ii above, if applicable. • Information from the dispersion modeling that includes: <ul style="list-style-type: none"> – The identification of the dispersion model used. – Printouts of the dispersion model inputs and outputs, if a dispersion model other than the lookup tables provided in the EPA's RMP Offsite Consequence Analysis Guidance current as of the time of modeling was used. – An explanation why any risk reduction measures identified in (c) and (d)1 have not been included in the risk reduction plan. • A statement of completion for each risk reduction measure in the risk reduction plan or an explanation of any changes made for each measure in the risk reduction plan. <p>The owner or operator of a covered process shall prepare a report of the process hazard analysis with risk assessment. The report shall include</p>		<ul style="list-style-type: none"> • Auditors should review the final TCPA HIRA and risk assessment report to determine if the required data has been included.

Audit Criteria	Source	Guidance for Auditors
<p>Table 10.2 – Continued</p> <p>the following:</p> <ul style="list-style-type: none"> – An identification of the covered process that is the subject of the process hazard analysis with risk assessment; the name, position and affiliation of persons who performed the process hazard analysis with risk assessment; the date of completion; and the methodology used. – A description of each scenario identified. – The risk reduction plan developed. 		
<p><i>New Jersey Toxic Catastrophe Prevention Act (TCPA) 7:31-3.6 Inherently Safer Technology Review</i> 10-C-30. By September 2, 2008 for each covered process at the stationary source, the owner or operator shall complete an initial inherently safer technology review and shall prepare and submit to the Department an inherently safer technology review report. An inherently safer technology review report completed pursuant to the Best Practices Standards at TCPA/DPCC Chemical Sector Facilities, November 21, 2005 (http://www.nj.gov/dep/rpp/brp/), prior to the effective date of this rule may be submitted to comply with this requirement.</p>	<p>N.J.A.C. 7:31-3.6</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • NJ facilities covered by the TCPA regulation must perform an initial IST review by September 2, 2008, unless they have already performed this review pursuant to the prescriptive order issued by the NJ Attorney General on November 21, 2005. Certain TCPA-covered facilities received this order in order to help reduce the security risk to the chemical industry in NJ. CCPS has published an updated <i>Inherently Safer Chemical Processes: A Life Cycle Approach</i> (CCPS, 2007f). <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the NJ IST review reports to determine if the initial IST reviews were completed by September 2, 2008, unless the review was already accomplished pursuant to the NJ Prescriptive Order for security issued on November 21, 2005.
<p><i>New Jersey Toxic Catastrophe Prevention Act (TCPA) 7:31-3.6 Inherently Safer Technology Review</i> 10-C-31. The owner or operator shall update the inherently safer technology review submitted on the same schedule as the hazard review updates required by 40 CFR §68.50(d) incorporated at N.J.A.C. 7:31-3.1(a) are updated for each</p>	<p>N.J.A.C. 7:31-3.6</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review NJ IST review reports to determine if the initial IST reviews in NJ have been updated at least biennially.

Audit Criteria	Source	Guidance for Auditors
<p>covered process at the stationary source, including each new covered process brought on line since the date of the previous inherently safer technology review. The owner or operator shall address the inherently safer technologies that have been developed since the last inherently safer technology review. Unless an update for a major change is required pursuant to 40 CFR §68.50(d), incorporated at N.J.A.C. 7:31-3.1(a), the first inherently safer technology review update shall not be required until two years after the date of the initial inherently safer technology review.</p>		
<p><i>New Jersey Toxic Catastrophe Prevention Act (TCPA) 7:31-3.6 Inherently Safer Technology Review</i> 10-C-32. Each inherently safer technology review shall be conducted by a team of qualified experts convened by the owner or operator, whose members shall have expertise in environmental health and safety, chemistry, design and engineering, process controls and instrumentation, maintenance, production and operations, and chemical process safety.</p>	<p>N.J.A.C. 7:31-3.6</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the NJ IST review reports to determine if the reviews are performed by teams. • Auditors should review the NJ IST review reports to determine if the IST review teams had expertise in environmental health and safety, chemistry, design and engineering, process controls and instrumentation, maintenance, production and operations, and chemical process safety.
<p><i>New Jersey Toxic Catastrophe Prevention Act (TCPA) 7:31-3.6 Inherently Safer Technology Review</i> 10-C-33. Each inherently safer technology review shall identify available inherently safer technology alternatives or combinations of alternatives that minimize or eliminate the potential for an EHS release. Using any available inherently safer technology analysis method, this review shall include, at a minimum, an analysis of the following principles and techniques:</p> <ul style="list-style-type: none"> • Reducing the amount of EHS material that potentially may be released. • Substituting less hazardous materials. • Using EHSs in the least hazardous process conditions 	<p>N.J.A.C. 7:31-3.6</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review NJ IST review reports and worksheets (or other detailed IST review records) to determine if the four strategies of IST—minimization, substitution, moderation, and simplification—were examined in the IST review.

Audit Criteria	Source	Guidance for Auditors
<p>Table 10.2 – Continued or form.</p> <ul style="list-style-type: none"> • Using EHSs in the least hazardous process conditions or form. • Designing equipment and processes to minimize the potential for equipment failure and human error. 		
<p><i>New Jersey Toxic Catastrophe Prevention Act (TCPA) 7:31-3.6 Inherently Safer Technology review 10-C-34.</i> Each inherently safer technology review shall include a determination of whether each of the inherently safer technologies identified is feasible. For purposes of this determination, feasible means capable of being accomplished in a successful manner, taking into account environmental, public health and safety, legal, technological, and economic factors.</p>	<p>N.J.A.C. 7:31-3.6</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should view NJ IST review reports to determine if the feasibility of each IST alternative has been addressed.
<p><i>New Jersey Toxic Catastrophe Prevention Act (TCPA) 7:31-3.6 Inherently Safer Technology review 10-C-35.</i> The owner or operator shall prepare and submit a report that documents each inherently safer technology review required by this section. The report shall include:</p> <ul style="list-style-type: none"> • An identification of the covered process that is the subject of the review; a list of the review team members with name, position, affiliation, responsibilities, qualifications and experience for each; the date of report completion; and the inherently safer technology analysis method used to complete the review. • The questions asked and answered to address the inherently safer technology principles and techniques. • A list of inherently safer technologies determined to be already present in the covered process. • A list of additional inherently safer technologies identified. 	<p>N.J.A.C. 7:31-3.6</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review NJ IST review reports to determine if the reports contain the required information and that they have been submitted to the NJDEP.

Audit Criteria	Source	Guidance for Auditors
<ul style="list-style-type: none"> • A list of the additional inherently safer technologies selected to be implemented and a schedule for their implementation. • A list of the inherently safer technologies determined to be infeasible. • A written explanation justifying the infeasibility determination for each inherently safer technology determined to be infeasible. The owner or operator shall substantiate the infeasibility determination using a qualitative and quantitative evaluation of environmental, public health and safety, legal, technological, and economic factors. 		
<p><i>Delaware Accidental Release Prevention Regulation</i> 10-C-36. The Delaware EHS regulations do not add any different or unique HIRA requirements beyond those described for the PSM Standard and RMP Rule.</p>	Delaware Code, Chapter 77, Section 5.67	<ul style="list-style-type: none"> • No further guidance.
<p><i>California OSHA—Process Safety Management of Acutely Hazardous Materials</i> 10-C-37. The employer may utilize other hazard analysis methods recognized by engineering organizations or governmental agencies. In the absence of the common methodologies, the employer may utilize a hazard analysis method developed and certified by a registered professional engineer for use by the process hazards analysis team.</p>	California Code of Regulations, Title 8, Section 5189	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • If HAZOP, What-If, Checklist, FMEA, or FTA is not used, then the auditor should review the HIRA reports to determine if either: <p>A HIRA method recognized by engineering organizations or governmental agencies was used, or A hazard analysis method developed and certified by a registered professional engineer was used.</p>
<p><i>California OSHA—Process Safety Management of Acutely Hazardous Materials</i> 10-C-38. The employer shall consult with the affected employees and where appropriate their recognized representatives on the development and conduct of hazard assessments performed after the effective date of this section. Affected employees and where applicable their representatives shall be provided access to the records required by</p>	California Code of Regulations, Title 8, Section 5189	<ul style="list-style-type: none"> • See Chapter 7, Workforce Involvement.

Audit Criteria	Source	Guidance for Auditors
<p>Table 10.2 – Continued this section.</p>		
<p><i>California OSHA—Process Safety Management of Acutely Hazardous Materials</i> 10-C-39. The facility shall assure that the recommendations are evaluated in a timely manner or implement an alternative resolution which appropriately addresses the degree of hazard posed by the scenario.</p>	<p>California Code of Regulations, Title 8, Section 5189</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Alternative recommendations may be substituted as long as the same level of risk abatement is achieved. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the HIRA reports and the system used to manage HIRA recommendations to determine if the recommendations were resolved and closed in a reasonable amount of time (see previous compliance criteria and guidance for what constitutes “reasonable”).
<p><i>California Accidental Release Prevention Program</i> 10-C-40. The CalARP regulations do not add any different or unique HIRA requirements beyond those described for the PSM Standard and RMP Rule.</p>	<p>California Code of Regulations, Title 19, Section 2760.2</p>	<ul style="list-style-type: none"> No further guidance.

10.2.2 Related Criteria

The purpose of providing these criteria is to provide auditors with additional guidance for evaluating PSM programs with respect to issues that go beyond the strict compliance requirements presented above, and in large part represent industry good practices in process safety knowledge, or in some cases practices in process safety knowledge that have become common. Some of the related criteria have reached the status of a level of acceptable practice because of their widespread, accepted, and successful use over an extended period of time. Auditors and PSM practitioners should carefully consider implementing this guidance, or at least designing an approach that is similar in nature. See the Glossary and Section 1.7.1 for a more complete discussion of the meaning and use of level of acceptable practice.

Table 10.3 identifies audit criteria and auditor guidance for related criteria relating to HIRA.

Table 10.3 Related Audit Criteria and Auditor Guidance – Hazard Identification & Risk Analysis

Audit Criteria	Source	Guidance for Auditors
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Audit Criteria	Source	Guidance for Auditors
<p>10-R-1. Planning the revalidation of HIRAs has considered the following issues:</p> <ul style="list-style-type: none"> • Changes in the process since the last HIRA. • Incidents and near misses in the process since the last HIRA. • New requirements since the last HIRA. • Omissions & deficiencies in the last HIRA. 	<p>GIP CIT</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review HIRA procedures and planning documents for specific HIRAs to determine if the following sources of change were considered in establishing the scope of HIRA revalidations: <ul style="list-style-type: none"> MOCs in the process since the last revalidation. Minor changes to P&IDs that collectively may represent hazards worthy of study, Changes to utility or other interfacing systems that do not trigger use of the facility MOC procedure. Maintenance and work orders. Capital and noncapital project records. Actions taken as a result of incidents/incident investigations, HIRAs and audits. Interviews with facility staff regarding other possible changes. • Auditors should review HIRA procedures and planning documents for specific HIRAs to determine if the following sources of incident information were considered in establishing the scope of HIRA revalidations: <ul style="list-style-type: none"> Written reports for actual incidents that occurred in the process since the last revalidation. Written reports for near misses that have occurred in the process since the last revalidation. Interviews with facility staff and nonmanagement workers for possible near misses that have occurred in the process since the last revalidation. Emergency response drill/exercise critiques. Emergency work orders. Unplanned activation of safeguards (not during inspection or testing) as an indication of a near miss. • Auditors should review HIRA procedures and planning documents for specific HIRAs to determine if the following

Audit Criteria	Source	Guidance for Auditors
		<p>Table 10.3 – Continued</p> <p>sources of new requirements were considered in establishing the scope of HIRA revalidations:</p> <ul style="list-style-type: none"> – New PSM-related regulations issued since the last revalidation. – New clarifications to PSM-related regulations issued since the last revalidation. – HIRA-related citations issued since the last revalidation by Table 10.3 – Continued regulators. – New PSM-related requirements issued by the company or facility since the last revalidation. – New industry guidance on HIRA-related criteria issued since the last revalidation. – New RAGAGEPs issued since the last revalidation. <ul style="list-style-type: none"> • Auditors should review HIRA procedures and planning documents for specific HIRAs to determine if omissions and deficiencies in the last study were considered in establishing the scope of HIRA revalidations. These HIRA problems are generally identified during PSM audits, but other quality reviews of HIRA work may have been performed, or incident investigations may have discovered omissions and deficiencies in the HIRAs. • The CCPS book, <i>Revalidating Process Hazard Analyses</i> (CCPS, 2000h), provides additional guidance on how revalidations should be performed
10-R-2. There is a HIRA management system procedure to describe how the studies will be planned, organized, conducted, followed-up, and documented.	CCPA GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check determine if the HIRA procedure should be a formal controlled facility or company document and approved for use. • Auditors should review the management system procedure

Audit Criteria	Source	Guidance for Auditors
		<p>to determine if it addresses the following areas:</p> <ul style="list-style-type: none"> - When HIRA are performed at the facility, e.g., regular periodic HIRAs for the process included in the PSM program, project HIRAs (see Chapter 13), the use of HIRA in the MOC program (see Chapter 16), HIRAs for special situations such as the decommissioning of equipment in the PSM program, etc. - Which HIRA methods are acceptable for use at the facility. - Revalidation of HIRAs. - Scheduling of HIRAs. - Responsibilities for the HIRA program. - The training and qualification of HIRA team leaders. - The selection of HIRA teams. - Risk ranking scheme to be used in facility HIRAs. - Method recording HIRAs. - The format, content, generation, review, and approval of HIRA reports, - The process and management system used for the follow-up of HIRA recommendations. - The process for rejecting HIRA recommendations. - HIRA documentation retention.
<p>10-R-3. The HIRA methodology selection rationale is appropriate to the hazards and risks to be identified and the potential use of the results, and the selection of the HIRA methodology(ies) used have been documented.</p>	<p>CCPA GIP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • If the process(es) being analyzed are not covered by PSM regulatory programs, the HIRAs have been performed using HAZOP, What-If, Checklist, What-If/Checklist, FMEA, FTA, as well as Bow-Tie Analysis, Layer of Protection Analysis (LOPA), Safety Integrity Level (SIL) Analysis, or the Dow Fire and Explosion Index (FEI) or Chemical Exposure Index (CEI) as appropriate. Auditors should

Audit Criteria	Source	Guidance for Auditors
		<p>Table 10.3 – Continued</p> <p>understand how the facility/company selected the HIRA employed and determine if it was appropriate to the use the results. Multiple methodologies may be appropriate to use. For example, HAZOP, LOPA, and SIL are common techniques used when SIS selection and achieving the target SIL is the purpose of the HIRA, or when analyzing a process to determine the needed or desired number of independent protection layers (IPL). Often the HAZOP is used to select the SISs/SIFs, and LOPA or SIL are used to perform the SIL study for those control functions/systems designated as SISs/SIFs. SIL Analyses are logic-based analyses intended to calculate reliability of a SIS/SIF (expressed as the probability of failure on demand). Several different calculation techniques can be used for this purpose, including FTA, Markov equations, and others. Although the techniques listed above are the most commonly used, there are other HIRA methods available that may be appropriate to the facility's needs.</p> <ul style="list-style-type: none"> In Europe, safety reports and safety cases serve the same purpose as a HIRA, and often include quantitative analysis of the pertinent hazards. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the HIRA procedure and/or HIRA reports to determine if the selection rationale for the HIRA methodology is documented or followed a defined process.
10-R-4. The HIRAs address the various types of hazards of the process(es) that have been studied.	GIP CIT VCLAR	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review HIRA reports to determine if the following types of hazards and hazard scenarios have been included in the HIRAs when appropriate, given the design and operation of the processes:

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"> <li>– Equipment failure, human errors, and external events, even when multiple safeguards for causes are installed to prevent their occurrence. <li>– Multiple jeopardy. This can be accomplished by 1) describing the multiple failures in the cause/WI column, or 2) describing the initiating event in the cause/WI column, the unprotected, worst case consequences in the consequence column, and then listing all the credible equipment and human/procedural safeguards in the safeguards column. <li>– Include, at a minimum, possible fires, explosions, and toxic releases as consequences. <li>– Common cause failures, when these are possible. <li>– Domino effects, when these are possible. <li>– Failure of utilities that interface with the covered process (both globally to the whole process and locally to individual equipment). <li>– Other global causes of hazards such as transportation events, weather-related events, other external events, etc. <li>– Start-up of the unit after turnaround. <li>– Hazards associated with emergency shutdown under conditions where emergency shutdown is required. <li>– Emergency operations. <li>– Normal shutdown. <li>– Are failures of safeguards considered as the causes of hazard scenarios? For example, a stuck open relief valve would be a

Audit Criteria	Source	Guidance for Auditors
		<p style="text-align: center;">Table 10.3 – Continued</p> <p>cause of less flow.</p> <ul style="list-style-type: none"> The identification of hazards was performed consistently when deciding whether causes were credible. Consistency of approach can be evaluated by a review of the HIRA worksheets/documentation and by interviews with HIRA team members.
<p>10-R-5. The HIRAs address other known hazards, e.g., material incompatibility and reactivity, high level of hydrocarbon liquid in blowdown drums, etc. (where applicable).</p>	<p>GIP NEP</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review HIRA reports to determine if the applicable (and possible) material incompatibilities have been included in the HIRAs. Auditors should review HIRA reports to determine if a high level of hydrocarbon liquid in blowdown drums has been included in the HIRAs where applicable.
<p>10-R-6. The HIRAs address the adequacy of the existing relief system design with respect to changes in unit throughput since the last HIRA, whether or not previously addressed by MOC at the time of the increase in throughput (where applicable).</p>	<p>NEP</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review HIRA reports to determine if the adequacy of the existing relief system design with respect to changes in unit throughput has been included in the HIRAs where applicable.
<p>10-R-7. The HIRAs address the accidental closure or failure of intervening valves upstream or downstream of any relief device(s), rendering the device(s) nonfunctional (where applicable).</p>	<p>NEP</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review HIRA reports to determine if the accidental closure or failure of intervening valves upstream or downstream of any relief device(s) has been included in the HIRAs where applicable.
<p>10-R-8. The HIRAs address whether relief devices, including blowdowns, which discharge to atmosphere through open vents, discharge to a safe location (where applicable).</p>	<p>NEP</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review HIRA reports to determine if the safe atmospheric discharge of relief devices, including blowdowns, has been included in the HIRAs where applicable.
<p>10-R-9. The HIRAs address the control of flammable material in relief discharge equipment (longer discharge piping, atmospheric stacks, blowdowns, etc.) that may</p>	<p>NEP</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review HIRA reports to determine if control of flammable material in relief discharge equipment that vent

Audit Criteria	Source	Guidance for Auditors
contain flammable concentrations or hot, heavier-than-air, or liquid hydrocarbons, which vent directly to atmosphere (where applicable).		directly to atmosphere has been included in the HIRAs where applicable.
10-R-10. The HIRAs address deviations involving pressure vessels (e.g., high flow into a pressure vessel).	NEP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review HIRA reports to determine if deviations involving pressure vessels (e.g., high flow into a pressure vessel) have been included in the HIRAs where applicable, including the identification of the applicable safeguards for these deviations, and examination of the design, operations, inspection, and maintenance of the safeguards.
10-R-11. The HIRAs include emergency work orders as a source of possible previous incidents.	CIT	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review HIRA reports to determine if emergency work orders as a source of possible previous incidents have been included in the HIRAs where applicable.
10-R-12. The HIRA facility siting analysis includes consideration of the characteristics of occupied structures that could increase the severity of likelihood of injuries to personnel who work inside those structures.	CPL GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review HIRA reports and/or facility-siting checklists to determine if the following characteristics of occupied structures have been included in the HIRA facility-siting analysis where applicable: <ul style="list-style-type: none"> – Location of ignition sources with respect to occupied structures. – Potential for domino effects. – Types of construction of occupied structures. – Fire protection facilities for occupied structures. – Capabilities of occupied structures to resist explosions. – Capabilities of occupied structures to resist fire. – Drainage facilities for occupied structures. – Location of fresh air intakes for occupied structures and ability to

Audit Criteria	Source	Guidance for Auditors
		<p>Table 10.3 – Continued protect personnel inside from toxic gas ingress.</p> <ul style="list-style-type: none"> – Location of occupied buildings with respect to plant hazards (the mere reference to existing equipment-to-equipment spacing standards is not sufficient to perform a facility-siting analysis). • The CCPS books, <i>Evaluating Process Plant Building for External Fires and Explosions</i> (CCPS, 1996) and <i>Electrostatic Ignition of Fires and Explosions</i> (CCPS, 1997) provide additional information regarding the analysis of facility-siting issues.
<p>10-R-13. The HIRA human factors analysis includes various human factors engineering issues that affect human performance.</p>	<p>CCPA CPL GIP CIT</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review HIRA reports and/or human factors checklists to determine if human factors engineering issues that affect human performance have been included in the HIRAs where applicable, e.g.,: <ul style="list-style-type: none"> – Human errors identified as causes of hazard scenarios. – Environmental conditions on personnel. – Clarity of procedures. – Design of equipment. – Accessibility of controls/equipment. – Readability of displays. – Clarity and simplicity of displays/operator-to-equipment interface. – Clarity of signs/labeling. – Emergency response actions of personnel. – Extended or unusual work schedules. – Lighting. – Automatic instrumentation versus manual procedures (i.e., the number and complexity of manual tasks compared to the time required to perform them).

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"> – Operator feedback from controls and indications. – Line breaking mistakes. – Improper lockout and isolation of process equipment. – Insufficient knowledge (training level and frequency of training). – Workload/fatigue of personnel. – Stress, emotional state of operators. – Equipment characteristics (hard to turn valves). – Conflicting priorities. – Policy/practice discrepancies. <ul style="list-style-type: none"> • The CCPS books, <i>Guidelines for Preventing Human Error in Process Safety</i> (CCPS, 1994) and <i>Human Factors Methods for Improving Performance in the Process Industries</i> (CCPS, 2007e), provides additional information regarding the analysis of human error issues.
10-R-14. The HIRAs address other human factors issues such as equipment that is described in procedures having the same identifier in both the written procedures and the marking/labeling in the field.	NEP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review HIRA reports to determine if labeling mismatches between procedures and field labels have been included in the HIRAs where applicable.
10-R-15. The HIRAs address other human factors issues such as the identification and evaluation of 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.	NEP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review HIRA reports to determine if situations where field personnel would expose themselves to hazards if they followed the provision of the operating procedures have been included in the HIRAs where applicable.
10-R-16. The HIRAs address other human factors issues such as task underload/overload and frequency, including tasks required to control	CPL NEP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review HIRA reports to determine if task underload and overload, and

Audit Criteria	Source	Guidance for Auditors
<p>Table 10.3 – Continued</p> <p>upset conditions, and the time required to complete them, given the operating conditions.</p>		<p>task frequency have been included in the HIRAs where applicable.</p>
<p>10-R-17. The HIRAs address other human factors issues such as the identification and evaluation of situations where control room operators need to perform calculations during upset or emergency operating situations.</p>	NEP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review HIRA reports to determine if situations where control room operators need to perform calculations during upset or emergency operating situations have been included in the HIRAs where applicable.
<p>10-R-18. The HIRAs address other human factors issues such as the clarity of signs, including emergency exit route signs.</p>	NEP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review HIRA reports to determine if the clarity of signs, including emergency exit route signs have been included in the HIRAs where applicable.
<p>10-R-19. The HIRAs address global events and issues that are appropriate to the processes, equipment, and operations being studied.</p>	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review HIRA reports to determine if a global node/system has been included in the HIRAs that examines the following general or common events and issues, as appropriate: <ul style="list-style-type: none"> – External events (e.g., weather-induced events, transportation-related events, events that cascade from nearby facilities). – Equipment aging factors (e.g., effects of wear, corrosion and similar effects due to the age of the equipment). – Common utility failures (e.g., global loss of power, cooling water, air, nitrogen). – Common human factors issues, e.g., control room human factors. – Common facility-siting issues.

Audit Criteria	Source	Guidance for Auditors
<p>10-R-20. The HIRAs address a qualitative evaluation of a range of possible safety and health effects of failure of controls on employees in the workplace (i.e. a risk ranking scheme, or equivalent).</p>	<p>WCLAR (2/1/05) GIP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The use of layer of protection analysis (LOPA) as part of the HIRA process adds an additional level of semi-quantitative analysis to a qualitative risk ranking methodology. LOPA is often used by facilities/companies as part of SIS/SIL analysis or to determine the required or desired number of IPLs. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review HIRA reports to determine if a qualitative risk-ranking matrix scheme was used to fulfill the requirement for a qualitative evaluation (with severity, likelihood, and risk assigned relative levels) as follows: <ul style="list-style-type: none"> – The risk-ranking matrix covered minor effects to worst credible cases, based on the failure of engineering and administrative controls. – The ranking or prioritization scheme was applied consistently.
<p>10-R-21. The discussions of each issue in the HIRA (i.e. causes and consequences of hazards, safeguards, risk ranking, and recommendations) were conducted in the presence of the team</p>	<p>WCLAR (10/31/96)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should interview HIRA team members to determine if the discussions of each issue in the HIRA (i.e., causes and consequences of hazards, safeguards, risk ranking, and recommendations) were conducted in the presence of the team.
<p>10-R-22. The technical makeup of HIRA teams is appropriate to the specific processes being studied.</p>	<p>GIP 3133</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review HIRA reports to determine if they include a description of the participants of the HIRA and provide enough information to ascertain the technical expertise that each team member brought to the study. Beside engineering and operations, other typical representatives on HIRA teams include the following:

Audit Criteria	Source	Guidance for Auditors
		<p>Table 10.3 – Continued</p> <ul style="list-style-type: none"> – Maintenance personnel. – Safety. – Lab. – Contractors or vendors that possess specialized process knowledge for licensed technology or self-contained skid units. – Personnel to support the global discussions, e.g., fire protection, emergency response, and transportation/logistics.
<p>10-R-23. HIRA team leaders are properly trained, qualified, and chosen.</p>	<p>GIP</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review HIRA reports, organization charts, and training records to determine the following: <ul style="list-style-type: none"> – HIRA team leaders have received formal training in HIRA (external or internal training), and that training is documented. – HIRA team leaders have participated in HIRAs as team members before facilitating a study. – HIRA team leaders have been impartial for the studies they led, confirmed in interviews with HIRA team members.
<p>10-R-24. Quality control reviews are performed on HIRAs.</p>	<p>GIP</p>	<p><u>Auditor Activities:</u></p> <p>Auditors should review HIRA reports, worksheets, or other HIRA project documentation to determine if the results of the HIRA, particularly the basic HIRA worksheets, which document the actual team discussions, have been subjected to a quality control review before being considered finalized.</p>
<p>10-R-25. A report is produced for each HIRA study.</p>	<p>GIP</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review HIRA reports to determine if each HIRA has been fully documented in a written report. These reports should have the following characteristics: <ul style="list-style-type: none"> – The HIRA reports should follow a standard format. If

Audit Criteria	Source	Guidance for Auditors
		<p>there is a facility/company HIRA procedure, it should include a standardized format.</p> <ul style="list-style-type: none"> - The HIRA reports should be dated, and the dates of the process safety knowledge should pre-date the HIRA itself. - The reports should contain a description of the HIRA technique(s) used. - The HIRA reports should identify the team leader. - The HIRA reports should identify the team members and their areas of technical expertise. The HIRA report should contain a listing or table with team member names, affiliation, group/department represented, and areas of expertise. - The HIRA reports should categorize the results to indicate how each area to be addressed has been included (or indicate these areas in some other way). - The results of the HIRA should be prioritized. - The HIRA reports should indicate or include which process safety knowledge (PSK) was used in the study. - The HIRA documentation should include annotated P&IDs or other drawings that indicate how the processes under consideration were subdivided for study. These drawings are sometimes voluminous and are not attached to the HIRA report itself but maintained separately.
10-R-26. Employees have access to the PHA results. If the process safety knowledge is stored, maintained, and used in an electronic data management system, employees	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should interview employees to determine if they have been afforded access to the HIRA results if desired.

Audit Criteria	Source	Guidance for Auditors
<p>Table 10.3 – Continued and contractor employees have been provided with the training necessary to access the computer and the data.</p>		<ul style="list-style-type: none"> • If the HIRA documentation is maintained electronically, auditors should confirm that potential users have been granted a user ID and password to the computer system to allow them to access electronically stored process safety knowledge. This may be a group user ID and/or password. • Auditors should interview nonmanagement personnel and contractors to determine if they have received training in how to access and operate the electronic data management system where the process safety knowledge resides.
<p>10-R-27. If HIRAs were performed on groups or families of products, the differences between groups were analyzed properly.</p>	3133	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • When HIRAs are performed on processes that make families or groups of products with the same or similar properties and hazards, auditors should review HIRA reports to determine if the HIRAs for the family or group are representative of the properties of the products, and the range of design and operating conditions of the processes.
<p>10-R-28. If the HIRAs were performed using a previous study or trade association generic study as a starting point, the process and site variations from the reference study were examined properly.</p>	3133	<p><u>Auditor Activities:</u></p> <p>When HIRAs are performed using a previous study or trade association generic study as a starting point, auditors should review HIRA reports, the properties of the chemicals/materials, and the design and operating conditions of the process to determine if these HIRAs have been modified as necessary to reflect facility-specific characteristics.</p>
<p>The 10-R-29. HIRA recommendations have been managed properly.</p>	CCPA GIP CPL	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • When required, HIRA recommendations are rejected properly. OSHA considers an employer to have “resolved” the team’s findings and recommendations when the employer either has adopted the recommendations or has justifiably declined to do so. An employer can justifiably decline

Audit Criteria	Source	Guidance for Auditors
		<p>to adopt a recommendation where the employer can document, in writing and based upon adequate evidence, that one or more of the following conditions is true: 1) the analysis upon which the recommendation is based contains material factual errors; 2) the recommendation is not necessary to protect the health and safety of the employer's own employees, or the employees of contractors; 3) an alternative measure would provide a sufficient level of protection; or 4) the recommendation is infeasible.</p> <ul style="list-style-type: none"> • When rejecting recommendations due to their infeasibility, the following guidance should be used: <ul style="list-style-type: none"> – Implementation of the recommendation would increase risk. – The recommendation cannot be implemented due to physical limitation, e.g., moving a control room or equipment to land that is not owned by the company. – The laws of physics and chemistry do not allow the recommendation to be designed. – Cost alone should be not used as a criterion for deciding if a recommendation is infeasible unless the costs will be extreme in relation to the value of the process. – Other feasible recommendations should be considered to address the original hazard and risk identified in the HIRA. • When rejected, the resolutions are communicated to the HIRA team and any subsequent recommendations of the team expeditiously resolved. <p><u>Auditor Activities:</u></p>

Audit Criteria	Source	Guidance for Auditors
		<p>Table 10.3 – Continued</p> <ul style="list-style-type: none"> • Auditors should review recommendation tracking system records to confirm that there is a management review of the HIRA findings and recommendations. • Auditors should review recommendation tracking system records to confirm that the final actions to be taken are documented and assigned to responsible individuals. • Auditors should review temporary MOCs, work orders, and/or other records that document the implementation of interim protective measures, as warranted, to mitigate hazards when long-term implementation of action items is scheduled. • Auditors should check that periodic status reports of HIRA recommendation status are produced and reviewed by management. • Auditors should check to determine if there is a written procedure that defines the steps to be taken when HIRA recommendations are rejected. The facility/company should not be using ad hoc processes for rejecting HIRA recommendations. • Auditors should review HIRA reports and the records of the system used to manage the HIRA recommendations to determine if the HIRA recommendations have been properly managed.

Audit Criteria	Source	Guidance for Auditors
10-R-30. A published schedule is in place for revalidating HIRAs.	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Although the revalidation date is supposed to be measured from the completion date of the previous HIRA, use of the starting date for the previous PHA is fairly common. The most important aspect of PHA revalidation timing for auditors to review is that the revalidations occur on a regular five-year cycle. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check to determine if a written HIRA revalidation schedule has been created and updated, particularly if there are multiple studies that must be managed at the facility.
10-R-31. HIRAs are revalidated at a schedule that identifies potential hazards before they become process safety incidents or near misses.	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should compare the revalidation frequency to the frequency of process safety incidents or near misses to determine if a revalidation frequency of less than five years is warranted by the risk.
10-R-32. HIRAs are not being documented "by exception."	CIT	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The term "by exception" means that only information that fits a certain definition is documented and not all of the information that was generated by the activity. For HIRAs, this most commonly happens when only those hazard scenarios that resulted in a recommendation(s) are documented and no others. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review HIRA reports, particularly the HIRA worksheets, to determine if all of the HIRA discussions have been documented and not just those that result in a recommendation. Indications of this include the following: the worksheets contain hazard scenarios where no recommendation is recorded; or deviations, causes, and

Audit Criteria	Source	Guidance for Auditors
		consequences that are not significant are not documented when they occur.
<p><i>Inherently Safer Technology</i></p> <p>10-R-33. The HIRA program should contain provisions for the analysis and incorporation of inherently safer technologies (IST). The analysis of current processes with respect to IST strategies is usually accomplished in the HIRA element, or in studies that are similar to HIRAs.</p>	<p>CCPA GIP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • In the preliminary phase of an engineered project, the IST strategies of <i>substitution</i> and <i>moderation</i> should be addressed. The preliminary or conceptual phase is the most optimum time in the life cycle of the equipment to explore whether a substitution for a less hazardous chemical can be accommodated. Substituting an alternate technology that eliminates the risk altogether, if possible, is even better. Since the basic process design is when the process parameter operating ranges are determined, the preliminary design phase is also the best time to examine whether the process can be moderated, that is, can it be designed to operate less energetically, with lower temperatures, pressures, and flow rates. CCPS has published an updated <i>Inherently Safer Chemical Processes: A Life Cycle Approach</i> (CCPS 2007f). • As late as the detailed design phase of an engineered project, the IST strategies of <i>minimize</i> and <i>simplify</i> may be able to be employed. <i>Minimization</i> refers to operating with lesser inventories of hazardous materials. Sometimes, it is necessary to accommodate this IST strategy earlier in the process design; however, sometimes inventories are set by transportation or purchasing needs and not by the process technology. Therefore, it may be possible to reduce the inventory of hazardous chemicals after the basic process technology has been chosen. <i>Simplification</i> refers to making the process more tolerant of

Audit Criteria	Source	Guidance for Auditors
		<p>human error. Therefore, during the detailed design, when the equipment details are being specified, it should be possible to closely examine the human factors aspects of the project and employ the simplification strategy.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review project records to determine if the IST concepts have been formally evaluated during the engineering phase of projects using IST studies or similar reviews. IST activities may be part of the scope of other PSM elements, such as Process Safety Knowledge and Asset Integrity, or organized separately. • Auditors should check to determine if IST is part of the engineered project process and if IST studies that address the four IST strategies have been performed and documented.

10.2.3 Voluntary Consensus PSM Programs

The following voluntary consensus PSM program requirements for safe work practices are described below:

- The requirements published for the offshore oil platform sector in the Safety and Environmental Management Program (SEMP), a voluntary program designed by API and endorsed by the Minerals Management Service of the U.S. Department of the Interior.
- Responsible Care Management System (RCMS)[®] published by the American Chemistry Council.
- RC14001 Environmental Management System, published by the American Chemistry Council.

Table 10.4 presents the audit criteria and auditor guidance relating to HIRAs pursuant to voluntary consensus PSM programs

Table 10.4 Related Voluntary Consensus PSM Program Audit Criteria and Guidance for Auditors - HIRA

Audit Criteria	Source	Guidance for Auditors
SEMP 10-R-34. What are the management	API RP 75, 3.1	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • A written plan for scheduling

Audit Criteria	Source	Guidance for Auditors
program requirements for scheduling and performance of HIRAs?		<p>Table 10.4 – Continued</p> <p>and performing HIRAs exists.</p> <ul style="list-style-type: none"> • A policy or program guidance governing scheduling and performing HIRAs exists.
10-R-35. Have HIRAs been completed?	API RP 75, 3.1	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • HIRA records that show that the studies have been completed. • Interviews with responsible or operating personnel indicate that the studies have been completed. • Facility records of completed HIRAs exist.
10-R-36. Have all completed HIRAs followed one or more methodologies such as those recommended in API RP 14J or other acceptable methodologies appropriate to the risk of each facility?	API RP 75, 3.1	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Written declaration of HIRA methodology used and the rationale for using it exists. • HIRA records that show what methodology used exist. • HIRA records of analyses of production equipment exist.
10-R-37. Has a prioritization scheme been established for conducting HIRAs for existing facilities?	API RP 75, 3.1	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • A written plan exists showing the order of facilities to be analyzed and the considerations used to prepare the schedule. • Program guidance showing the factors to be used to determine the priority order of HIRAs exists.
<p>10-R-38. Have HIRAs performed on new or modified facilities given special consideration to the following:</p> <ol style="list-style-type: none"> a. Previous experience with a similar facility? b. Design circumstances, such as changes in the design team or the design itself, after the project was underway? c. Unusual facility location, design or configuration, equipment arrangement, or emergency response considerations? <p>Table 10.4 – Continued</p> <ol style="list-style-type: none"> d. Any findings that needed to be brought to resolution before startup or that required immediate attention? 	API RP 75, 3.1	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • HIRA reports for new facilities that show consideration of these items exist. • Program guidance requiring consideration of these items exists.

Audit Criteria	Source	Guidance for Auditors
e. Operating procedures and practices, including simultaneous operations guidelines?		
10-R-39. Has a program been established to ensure that the most recent HIRAs reflects the current process and any changes made to the facility?	API RP 75, 3.1	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Written guidance establishing policy for periodic updates at reasonable intervals and setting forth a schedule exists. • HIRA reports showing that updates have occurred exist.
10-R-40. Has a program been established to ensure that HIRAs are reviewed periodically and updated, as appropriate?	API RP 75, 3.1	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Written procedures requiring review intervals from 5 years for high-priority facilities to 10 years for low-priority facilities exist.
10-R-41. Did the hazards analysis team include members knowledgeable in disciplines such as engineering, operations, design, process, safety, environmental, and other specialties as appropriate?	API RP 75, 3.1	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • HIRA records showing qualifications for team members or the rationale or their selection exist. • Interviews with those responsible for selecting team members indicate appropriate reasons for selections.
10-R-42. Was at least one person on the hazards analysis team knowledgeable in the HIRA methodologies employed?	API RP 75, 3.1	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • HIRA records that show the qualifications for team members exist.
10-R-43. If only one person performs the HIRA, what selection criteria are in place to ensure an impartial view?	API RP 75, 3.1	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Written guidance with selection criteria exists.
10-R-44. Does the management program require that findings of HIRAs be documented in written reports that describe the hazards that were identified and the recommended steps taken to address them?	API RP 75, 3.1	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Program guidance that describes the report content exists. • HIRA reports that show the findings and recommendations exist.
10-R-45. Does the management program require that findings and follow-up actions of HIRAs be communicated to appropriate personnel?	API RP 75, 3.1	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Evidence of a system for distributing and communicating the results of HIRAs exists. • Personnel interviews indicate that these results were communicated.
10-R-46. Does the HIRA program require that pre-start-up conditions or	API RP 75, 3.1	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Written guidance mandating

Audit Criteria	Source	Guidance for Auditors
immediate hazardous conditions be corrected?		<p>Table 10.4 – Continued</p> <p>these corrections exist.</p> <ul style="list-style-type: none"> • HIRA reports and follow-ups showing that these corrections are made exist. • Operating personnel interviews indicating these corrections were made.

Audit Criteria	Source	Guidance for Auditors
<p><i>Responsible Care® Management System (RMCS)</i></p> <p>10-R-47. The organization shall have a system to identify and evaluate potential health, safety, security and environmental hazards and assess and prioritize the risks associated with those hazards for new and existing products and processes, changes to existing products and processes, the distribution and use of raw materials and products, and activities associated with its operations.</p>	<p>RCMS Technical Specification, Element 2.1</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • This element addresses the Assessment aspect of the Planning Section. It requires a company to have risk assessment systems for products, manufacturing processes, and distribution-related criteria. Specifically, it requires that a company have systems to review and prioritize risk for new, existing, and changes to existing products and processes; and requires that it look at transportation and distribution risk associated with raw materials and finished products. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check for the following characteristics of a good management system: <p>Systems to identify, assess and evaluate risk for:</p> <ul style="list-style-type: none"> ▪ new products, ▪ existing products, and ▪ changes to existing products. <p>Systems to identify, assess and evaluate risk for:</p> <ul style="list-style-type: none"> ▪ new processes, ▪ existing processes, and ▪ changes to existing processes. <p>Systems to identify, assess, and evaluate risk for the transport, distribution, and use of:</p> <p>Table 10.4 - Continued</p> <ul style="list-style-type: none"> ▪ raw materials, and ▪ finished products.

Audit Criteria	Source	Guidance for Auditors
<i>RC14001 Requirements</i> 10-R-48. Establish, implement and maintain procedures to manage product and process information.	RC14001 Technical Specification RC151.03 4.3.1	<ul style="list-style-type: none"> • No further guidance.

10.3 AUDIT PROTOCOL

The process safety program audit protocol introduced in Appendix A and available online (see page xiv for information on how to access this resource) provides detailed questions that examine the issues described in Section 10.2.

REFERENCES

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- Center for Chemical Process Safety (CCPS), *Guidelines for Preventing Human Error in Process Safety*, New York, 2004 (CCPS, 1994)
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- Center for Chemical Process Safety (CCPS), *Guidelines for Chemical Process Quantitative Risk Assessment, 2nd ed.*, American Institute of Chemical Engineers, New York, 2000 (CCPS, 2000a)
- Center for Chemical Process Safety (CCPS), *Guidelines for Hazard Evaluation Procedures, 3rd Edition*, American Institute of Chemical Engineers, New York 2007 (CCPS, 2007b)
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- Delaware, *Accidental Release Prevention Regulation*, Delaware Department of Natural Resources and Environmental Control/Division of Air and Waste Management, September 1989 (rev. January 1999)
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- The International Society for Measurement and Control, *Functional Safety: Safety Instrumented Systems for the Process Industry Sector—Part 1: Framework, Definitions, System, Hardware and Software Requirements*, ANSI/ISA-84.00.01-2004 Part 1 (IEC 61511-1 Mod), Research Triangle Park, NC, 2004
- New Jersey, *Toxic Catastrophe Prevention Act (N.J.A.C. 7:31)*, New Jersey Department of Environmental Protection, June 1987 (rev. April 16, 2007)
- Occupational Safety and Health Administration (OSHA) 29 CFR §1910.119, *Process Safety Management of Highly Hazardous Chemicals, Explosives and Blasting Agents; Final Rule*, Washington, DC, February 24, 1992
- Occupational Safety and Health Administration (OSHA) Publication 3133, *Process Safety Management Guidelines for Compliance*, Washington, DC, 1993
- Occupational Safety and Health Administration (OSHA) Instruction CPL 02-02-045 CH-1, *PSM Compliance Directive*, Washington, DC, September 13, 1994
- Occupational Safety and Health Administration (OSHA) Instruction CPL 03-00-004, *Petroleum Refinery Process Safety Management National Emphasis Program*, June 7, 2007 (OSHA, 2007b)
- Occupational Safety and Health Administration (OSHA) Directive 09-06 (CPL 02), *PSM Chemical Covered Facilities National Emphasis Program*, July 27, 2009 (OSHA, 2009a)

11

OPERATING PROCEDURES

This element is called Operating Procedures in OSHA PSM and EPA RMP programs, as well as in many state regulatory PSM programs and voluntary consensus PSM programs. In some cases, it is referred to as Standard Operating Procedures. Operating Procedures is an element of the RBPS accident prevention pillar of Manage Risks.

11.1 OVERVIEW

Operating procedures are written instructions (both hard copy and electronically stored documents) that contain the approved methods for operating the processes included in the PSM program. These methods include the steps necessary to perform the required operations, as well as supplemental information needed to safely conduct operations. Well-written operating procedures describe the process, hazards, tools, personal protective equipment, and controls in sufficient detail that operators understand the hazards, can verify that controls are in place, and can confirm that the process responds in an expected manner. In addition, procedures should describe abnormal and upset conditions and the operations that take place during those conditions, including emergency shutdown and when/how it should be executed. The operating procedures should also address other operating modes and situations, such as normal shutdown, shifting between operating modes (e.g., to/from catalyst regeneration), temporary operation as applicable (e.g., operating with a specific equipment item out of service or with feeds temporarily stopped), transitions between products, periodic cleaning of process equipment, preparing equipment for certain maintenance activities, and other activities routinely performed by operators. Within the context of this chapter the terms “operating procedures” and “standard operating procedures” (SOP) are used synonymously.

The SOP element interfaces significantly with other PSM program elements. The primary interfaces include the following:

- Workforce Involvement (Chapter 7)—operators are usually involved in reviewing SOPs before they are issued.

- Process Knowledge Management (Chapter 9)—knowledge/information should be reflected accurately in the SOPs, in particular the safe upper and lower limits of the processes.
- Hazard Identification and Risk Analysis (Chapter 10)—the SOPs should include steps to avoid the hazards identified during the HIRAs, as well as the consequences of deviations, particularly in the warning and caution statements written into the SOPs. Procedures are often used during HIRAs to understand the operation being assessed.
- Safe Work Practices (Chapter 12)—in order to use the SWPs, the processes should be prepared properly for the anticipated work. Placing the processes in the appropriate mode of operation to support these situations requires the use of the SOPs.
- Asset Integrity and Reliability (Chapter 13)—in order to perform preventive or corrective maintenance, the processes should be placed in the appropriate operating mode for the anticipated work, or the equipment configuration must be changed to accommodate the work. Placing the processes in the appropriate mode of operation to support maintenance requires the use of the SOPs.
- Training and Performance Assurance (Chapter 15)—operators should be trained thoroughly in the content of the SOPs. The SOPs should form the technical basis for the training and qualification program.
- MOC (Chapter 16)—changes may result in new or modified SOPs and/or temporary procedures for temporary changes.

In Sections 11.2 and 11.3, compliance and related audit criteria are presented, along with guidance for auditors in applying the criteria. A full explanation of compliance and related audit criteria are presented in Chapter 1 (see Section 1.7). The criteria and guidance described in these sections do not represent exclusive solutions to PSM program coverage, design, implementation, or interpretation. They represent the collective experience of many people in the chemical/processing sector who have performed many PSM audits, and the consensus opinion resulting from that experience. The compliance criteria are derived from the regulations that govern PSM programs in the United States; however, these regulations are all performance-based. Performance-based regulations are goal oriented and there may be multiple pathways to fully complying with them. Therefore, there may be alternate interpretations and solutions to the issues described in the compliance tables in this chapter that are equivalent to those included, particularly the auditor guidance presented.

The inclusion of the related criteria in no way infers that these criteria must be implemented for a PSM program to be successful, nor does it infer that a PSM program will be deficient without them. As with the compliance criteria, there may be other, more appropriate solutions for an individual facility or company. In addition, the use of the related criteria in a PSM audit is intended to be completely voluntary, and not a mandatory requirement in any way. They should be used cautiously and with careful planning so that they do not inadvertently establish

unintended performance standards. Consensus should be sought within and among facilities and their parent companies before these criteria are used. Finally, the related criteria and guidance offered for consideration are not endorsements of or agreements with the written or verbal clarifications made by the regulators, PSM citations issued against the regulations, other PSM guidance published by the regulators, or the successful or common PSM practices in any given company's PSM program from which they are derived.

11.2 AUDIT CRITERIA AND GUIDANCE

The detailed requirements for the Operating Procedures element included in the OSHA PSM Standard, EPA RMP Rule, and several state PSM regulatory programs are presented herein, as well as for other common voluntary consensus PSM programs. The audit criteria described below are examined by auditors, using the guidance provided, by performing the following audit activities:

- Interviewing the persons at the facility who have the responsibility for managing the development, review, approval, and maintenance of the facility's operating procedures. These persons generally work in the facility operations or production department. In many facilities, procedures are written by engineering personnel, with review by operators. In some facilities, operators with good writing skills write the operating procedures.
- Reviewing the operating procedures for units included in the PSM program. Not all modes of operations for which operating procedures are required may be applicable to certain types of processes, and SOPs for these modes would not be required. For example, initial start-up for existing continuously operating processes would be moot after that operation is completed, and subsequent start-ups would be governed by the start-up after turnaround or emergency shutdown procedures. Also, temporary operations are not applicable or allowed for some processes. However, in batch processes used to manufacture multiple (and changing) products would require an initial batch procedure/recipe when a new product is introduced and made for the first time.
- Interviewing the operators of the units where the operating procedures were reviewed to determine if actual operating practices match the contents of the procedures and if there are written procedures to cover all routine tasks.
- Reviewing the records that address the annual certification of the accuracy of the operating procedures.
- Observing operators performing operations described in the SOPs.

Auditors should also carefully examine the SOP requirements found in the procedures of the company/facility being audited. As stated in Section 1.7.1, these could be interpreted as compliance requirements by regulators and could be subject to citations if they are not being followed. Auditors should confirm, via

interviews, records and document reviews, and field observations, that the requirements of the facility or company procedures for the SOPs have been implemented as specified. Findings should be generated if the company/facility-specific provisions are not being followed.

See the Guidance for Chapters 3–24 in the Introduction for the definition of the abbreviations shown in the following tables that are used to indicate the source of the criteria.

11.2.1 Compliance Requirements

The audit criteria should be used by the following:

- Readers in the United States covered by the PSM Standard or RMP Rule.
- Readers who have voluntarily adopted the OSHA PSM program.
- Readers whose companies have specified OSHA PSM requirements in non-U.S. locations.

Table 11.1 describes the audit criteria and auditor guidance for Operating Procedures pursuant to OSHA PSM and EPA RMP.

Table 11.1 OSHA PSM and EPA RMP Audit Criteria and Guidance for Auditors - Operating Procedures

Audit Criteria	Source	Guidance for Auditors
11-C-1. The employer shall develop and implement written operating procedures	PSM (f)(1) RMP 68.69	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The operating procedures are written text documents, and not merely the graphical term displays on a DCS. • If checklists are provided for certain operations that summarize the important or relevant portions of the SOPs, they are officially part of the approved SOPs and not ad hoc documents. • If operating logs are completed by the operators as a result of following the SOPs, they are officially part of the approved SOPs and not ad hoc documents. • If other work instructions are referenced by the SOPs, they are officially part of the approved SOPs and not ad hoc documents. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with operators to determine if written procedures

Audit Criteria	Source	Guidance for Auditors
		<p>exist for all routine tasks.</p> <ul style="list-style-type: none"> • Auditors should review the operating procedures to determine if they are written documents, maintained either in hard-copy or electronic format. • Auditors should interview operators to determine if the SOPs are the approved documents for operating the processes and that ad hoc documents are not used in lieu of the approved SOPs (e.g., documents, manuals, or other training aids that were distributed as part of the operator training program). • Auditors should conduct field observations of the control room and other locations where operators have access to the SOPs to determine if unapproved or ad hoc operating documents are not present.
<p>11-C-2. The employer shall develop and implement written operating procedures that provide clear instructions for safely conducting activities involved in each covered process.</p>	<p>PSM (f)(1) RMP 68.69</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The operating procedures cover all operations or tasks required to safely operate the process in its intended manner. For example, if sampling is required, then the operating procedures should include the sampling operations (at least as they affect the process—the lab operations to analyze the sample might be covered elsewhere). • If the operators rely more on training documents than the approved operating procedures, that is a strong indication that the approved operating procedures do not provide clear instructions and are not understandable by those that are expected to use them. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should interview the operators to determine if SOPs exist for all routine and nonroutine tasks that have been identified to date. <p>In batch processes, if the SOP</p>

Audit Criteria	Source	Guidance for Auditors
		<p>Table 11.1 – Continued</p> <p>also serves as a batch ticket or record, then auditors should check to ensure that they are filled in completely.</p> <ul style="list-style-type: none"> • Auditors should interview operators to determine if they can understand the SOPs as written.
<p>11-C-3. The employer shall develop and implement written operating procedures . . . consistent with the process safety information</p>	<p>PSM (f)(1) RMP 68.69</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the SOPs to determine if they are consistent with the appropriate PSI, particularly the safe upper and lower limits, and information describing the safety systems (e.g., set points of key control functions, interlock limits, trip points). • Auditors should review the contents of the SOPs and selected process safety information to determine if they match.
<p>11-C-4. The operating procedures shall address . . . initial start-up.</p>	<p>PSM (f)(1)(i)(A) RMP 68.69</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Initial start-up procedures may not be applicable for certain types of processes, e.g., continuously operating processes that completed their first start-up. However, batch processes may require ongoing initial start-up procedures because of product changes that may occur in such processes. • For some processes, the initial start-up and normal start-up procedures are the same and consist of identical tasks. In some cases, the initial start-up of a process is managed during the commissioning of the process or during the pre-start-up safety review (see Chapter 13, Asset Integrity and Reliability and Chapter 17, Operational Readiness), and a special procedure is developed and approved for the initial start-up. • Initial start-up may be part of the commissioning program for a

Audit Criteria	Source	Guidance for Auditors
		<p>new or modified process.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the operating procedures to determine if they include instructions for initial start-up activities, such as preparation of process lines, instruments, and utilities; any required pre-start-up equipment tests, dryout of equipment, inerting/purging of equipment or lines, valve positioning, warm-up phase, initial startup steps, etc.
11-C-5. The operating procedures shall address . . . normal operations.	PSM (f)(1)(i)(B) RMP 68.69	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the operating procedures to determine if they include instructions for normal, day-to-day operations (e.g., steady state conditions, key parameters to be monitored, means and steps to detect out of specification conditions, and steps to make necessary adjustments).
11-C-6. The operating procedures shall address . . . temporary operations.	PSM (f)(1)(i)(C) RMP 68.69	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Temporary operations may be inapplicable or not allowed for some processes. Temporary operations for some facilities may be addressed in separate operating procedures. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the operating procedures to determine if they include temporary operations, where these are necessary to operate the process (e.g., holding periods, safety feature or other equipment bypass, reduced rates/capacity, temporary operations during certain emergency situations such as loss of control systems/features, temporary loss of utilities such as loss of power, sampling, purging/inerting, and procedures reflecting temporary MOCs).
11-C-7. The operating procedures shall address . . . emergency Table	PSM (f)(1)(i)(D)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Emergency shutdown for some

Audit Criteria	Source	Guidance for Auditors
<p>11.1 – Continued</p> <p>shutdown including the conditions under which emergency shutdown is required, and the assignment of shutdown responsibility to qualified operators to ensure that emergency shutdown is executed in a safe and timely manner.</p>	<p>RMP 68.69</p>	<p>facilities may be addressed in separate operating procedures.</p> <ul style="list-style-type: none"> • The difference between “emergency shutdown” and “emergency operations” is that the emergency shutdown procedures are those that are intended to rapidly place the process in a safe and stable condition when process conditions warrant because the margin for process safety has become reduced significantly and a catastrophic event is imminent without the shutdown. Emergency operations are continued operations of a process under upset conditions but an emergency shutdown is not necessary. • Emergency shutdown may also be required for the loss of key utilities or support systems, e.g., nitrogen, loss of instrument air, loss of steam, loss of cooling water, loss of process water, as well as the loss of feed, or the loss of the DCS or DCS displays. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should determine which conditions, upsets, losses, or other abnormal would require an emergency shutdown and confirm that operating procedures have been developed and implemented for these situations. The PHAs and other hazard/risk assessments should provide this information. • Auditors should review the operating procedures to determine if they include appropriate steps for the rapid and safe shutdown of the process, e.g., actuation of emergency shutdown, discrete emergency shutdown steps, and assignment of responsibilities for emergency shutdown steps. • Auditors should review the emergency shutdown procedures or the emergency shutdown section of the

Audit Criteria	Source	Guidance for Auditors
		<p>operating procedures to determine if the responsibility for executing the emergency shutdown has been explicitly assigned in the procedure(s).</p> <ul style="list-style-type: none"> Auditors should review the operating procedures to determine if they include the conditions under which emergency shutdown is required; this is often provided as process parameter values and also as hazardous condition (e.g., fire or toxic release).
<p>11-C-8. The operating procedures shall address . . . emergency operations.</p>	<p>PSM (f)(1)(i)(E) RMP 68.69</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The difference between "emergency shutdown" and "emergency operations" is that the emergency shutdown procedures are those that are intended to rapidly place the process in a safe and stable condition when process conditions warrant because the margin for process safety has become reduced significantly and a catastrophic event is imminent without the shutdown. Emergency operations are continued operations of a process under upset conditions but an emergency shutdown is not necessary. Operation under emergency conditions for some facilities may be addressed in separate operating procedures. Emergency conditions may also include loss of key utilities or support systems, e.g., power, nitrogen, instrument air, steam, cooling water, process water, as well as the loss of feed, or the loss of the DCS or DCS displays. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should determine which conditions, upsets, losses, or other abnormal would require operations under emergency situations and confirm that operating

Audit Criteria	Source	Guidance for Auditors
		<p>Table 11.1 – Continued</p> <p>procedures have been developed and implemented for these situations. Otherwise, an emergency shutdown should be necessary. The PHAs and other hazard/risk assessments should provide this information.</p> <ul style="list-style-type: none"> • Auditors should review the operating procedures to determine if they include the appropriate tasks for operating the process during an upset condition, if this is necessary and appropriate (e.g., for control when safe upper or lower limits are exceeded, such as activation of a reactor quench system). These emergency actions are often automatically initiated by control system interlocks or ESDs.
11-C-9. The operating procedures shall address . . . normal shutdown.	PSM (f)(1)(i)(F) RMP 68.69	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Normal shutdown for some facilities may be addressed in separate operating procedures. • For some processes (usually simpler processes), a normal shutdown and an emergency shutdown may require the same steps and be contained in the same procedure. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the operating procedures to determine if they include the appropriate tasks to shut down the process under nonemergency conditions (e.g., steps to conduct a controlled shutdown may include cool-down requirements, removal of excess inventories, and considerations for shutdown during the change of shift).
11-C-10. The operating procedures shall address . . . start-up following a turnaround, or after an emergency shutdown.	PSM (f)(1)(i)(G) RMP 68.69	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Start-up of the process following a turnaround or after an emergency shutdown for some facilities may be addressed in separate operating procedures. <p><u>Auditor Activities:</u></p>

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"> Auditors should review the operating procedures to determine if they include the appropriate tasks to start up the process following a turnaround (i.e., shutdown period for maintenance) or after an emergency shutdown, if this type of start-up is different from a normal start-up.
11-C-11. The operating procedures shall address . . . operating limits.	PSM (f)(1)(ii) RMP 68.69	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Operating limits include values or ranges of values within which the process parameters should be maintained. These values are usually associated with preserving product quality; however, they may also incorporate the safe upper and lower limits of the process, or other important limits. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the operating procedures to determine if they include the appropriate operating limits for the process parameters (e.g., pressure, temperature, flow, time, composition). Auditors should conduct field observations to determine if the process is operating within the operating limits specified in the SOPs and that the limits are within the equipment design limits specified in the PSI (observe process parameters on the DCS screen or in history trends and verify the readings are within the operating limits specified in the SOPs).
11-C-12. The operating procedures shall address . . . consequence of deviations.	PSM (f)(1)(ii)(A) RMP 68.69	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The consequences of deviation will often include both safety-related impacts as well as product quality/operability-related impacts. The safety-related impacts should match those described in the PHAs. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the operating procedures to determine whether they include

Audit Criteria	Source	Guidance for Auditors
		<p>Table 11.1 – Continued</p> <p>statements that describe what the impacts will be if deviations from the operating limits occur, either in the text of the procedure steps themselves or as separate warnings or cautions.</p>
<p>11-C-13. The operating procedures shall address . . . steps required to correct or avoid deviation.</p>	<p>PSM (f)(1)(ii)(B) RMP 68.69</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the operating procedures to determine if they include the steps required to correct or avoid deviations from the safe operating limits.
<p>11-C-14. The operating procedures shall address . . . safety and health considerations: properties of, and hazards presented by, the chemicals used in the process.</p>	<p>PSM (f)(1)(iii)(A) RMP 68.69</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The properties and hazards of the chemicals may be included in the operating procedures explicitly or by referencing other process safety information that contains the same information, e.g., the MSDS. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the operating procedures to determine if they include the properties of and hazards presented by the chemicals used in the process. • Auditors should verify that operators are able to obtain MSDS or other referenced information.
<p>11-C-15. The operating procedures shall address . . . safety and health considerations: precautions necessary to prevent exposure, including engineering controls, administrative controls, and personal protective equipment.</p>	<p>PSM (f)(1)(iii)(B) RMP 68.69</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Exposure prevention information may be included in the operating procedures explicitly or by referencing other process safety information that contains the same information, e.g., the MSDS. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the operating procedures to determine if they include the precautions necessary to prevent exposure to process chemicals, including engineering controls, administrative controls, and personal protective equipment.

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"> • Auditors should verify the following: The operators can locate PPE required by the SOPs. The required PPE is in good condition. Fixed safety equipment, such as eye washes and safety showers, is operational. However, PSM auditors should not duplicate any checks made as part of other safety and health audits. • If the MSDSs are referenced in the SOP (i.e., the information from the MSDSs is not replicated in the SOPs), auditors should verify that the operators are able to obtain a MSDS. • Auditors should review the types of engineering controls that are in place to prevent exposure (e.g., room ventilation, hoods, toxic gas detection), and verify that the operating procedures address them. MSDSs may list recommended engineering controls but will not indicate what is actually in place. • Auditors should review the types of administrative controls that are in place to prevent exposure (e.g., procedures limiting access), and verify that the operating procedures address them. MSDSs may list recommended engineering controls but will not indicate what is actually in place.
11-C-16. The operating procedures shall address . . . safety and health considerations: control measures to be taken if physical contact or airborne exposure occurs.	PSM (f)(1)(iii)(C) RMP 68.69	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Exposure control measure information may be included in the operating procedures explicitly or by referencing other process safety information that contains the same information, e.g., the MSDS. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the operating procedures to determine if they include the control measures to be taken if physical contact with or airborne exposure to process chemicals occurs.

Audit Criteria	Source	Guidance for Auditors
<p>Table 11.1 – Continued</p> <p>11-C-17. The operating procedures shall address . . . safety and health considerations: quality control for raw materials and control of hazardous chemical inventory levels.</p>	<p>PSM (f)(1)(iii)(D) RMP 68.69</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • In the context of PSM, quality control refers to contamination of raw materials or other conditions that could contribute to a process safety incident, and not product quality concerns, although management systems implemented to ensure product quality are often used to ensure the quality of raw materials. For instance, a facility might require its unloading operators to check the following items for a truck shipment of a raw material: certificate of analysis, chemical identity specified on the shipping papers, seal number listed on the shipping papers versus the seal number on the dome lid, etc. Another example might be a facility that requires independent confirmation by a second operator that the correct chemical has been staged for charging to a reactor (in those instances where an incorrect charge could lead to a process safety incident). • Inventory controls in the operating procedures also refer to practices intended to manage inventories of chemicals that could contribute to a process safety incident. In many cases, the instructions provided to operate the process (maintain feed rates, temperatures, levels, etc.) will result in control of hazardous chemical inventories. In some cases, administrative processes may be used to limit hazardous chemical inventory. An example might be a facility that will only allow one full cylinder of an Appendix A chemical on-site at any given time. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the operating procedures to determine if they include the quality control for raw materials and control of hazardous chemical inventories. • Auditors should verify that the

Audit Criteria	Source	Guidance for Auditors
		<p>quality control and inventory information for which controls are provided in the operating procedures match the information analyzed in and the results of the PHAs.</p>
<p>11-C-18. The operating procedures shall address . . . safety and health considerations: any special or unique hazards.</p>	<p>PSM (f)(1)(iii)(E) RMP 68.69</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Examples may include potential hazards resulting from runaway reactions, decomposition, partial or incomplete reactions, overcharge, out-of-sequence charge, spontaneous combustion of materials at ambient conditions, low auto-ignition temperature, as well as other hazardous conditions such as ionizing radiation exposure, dust hazards, thermal exposure, excessive noise, asphyxiation, etc. • It is not necessary that the unique or special hazards be addressed in a separate section of the operating procedures. They may be addressed in warning or caution statements, in separate notes embedded in the operating steps, or in other ways. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the operating procedures to determine if they include unique or special hazards associated with the process.
<p>11-C-19. The operating procedures shall address . . . safety and health considerations: safety systems and their functions.</p>	<p>PSM (f)(1)(iv) RMP 68.69</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Safety system information may be summarized in a table or listing of the safety features/functions and should include the following types of features at a minimum and as applicable: <ul style="list-style-type: none"> – Trips – Interlocks – Alarms – Secondary containment – Relief devices – LEL or toxic gas detectors – Fire protection systems

Audit Criteria	Source	Guidance for Auditors
		<p>Table 11.1 – Continued</p> <ul style="list-style-type: none"> – Explosion vent panels – Explosion suppression systems – Flame arrestors – Emergency isolation valves – Ventilation systems, and – Uninterruptible power supplies. <ul style="list-style-type: none"> • A description of the purpose and operation of the safety systems/functions should be included and describe set points and allowable operations when safety systems are out of commission. • The procedures may reference other documents that include this information. If so, operators should be able to readily access and understand the information. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the operating procedures to determine if they include a description of the safety systems and what they protect against. • Auditors should conduct field observations to determine if the safety features described in the SOPs are installed and operational.
11-C-20. Operating procedures shall be readily accessible to employees who work in or maintain a process.	PSM (f)(2) RMP 68.69	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • If the official version of the SOPs is electronically stored and maintained, then at least one hard copy of the procedures should be available in the control room or another readily accessible location in the event that power or the computers/network containing the procedures is lost. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct field observations in key operating locations (e.g., the control room for the process) to determine if the latest approved versions of electronic or hard-copy SOPs

Audit Criteria	Source	Guidance for Auditors
		<p>are available.</p> <ul style="list-style-type: none"> If the official version of the SOPs is electronically stored and maintained, then auditors should confirm that the operators and others who need access to the SOPs have the user IDs and passwords necessary to access them on the computer. Auditors should confirm that the operators are able to access the SOPs.
<p>11-C-21. The operating procedures shall be reviewed as often as necessary to assure that they reflect current operating practice, including changes that result from changes in process chemicals, technology, and equipment, and changes to facilities.</p>	<p>PSM (f)(3) RMP 68.69</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Operating procedures shall be reviewed periodically to ensure that they represent the as-built, as-operated condition of the process and supporting systems. A review does not necessarily mean a line-by-line evaluation of the SOP content. MOCs may be used as a guide to determine what portions of the SOP should be examined. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the operating procedures or supporting records (e.g., MOC records) to determine if they have been reviewed periodically to ensure that they represent the as-built, as-operated condition of the process and supporting systems. Auditors should conduct interviews with operators to determine if the operating procedures are reviewed often enough to keep them up-to-date.
<p>11-C-22. The employer shall certify annually that these operating procedures are current and accurate.</p>	<p>PSM (f)(3) RMP 68.69</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The annual certification of the accuracy of operating procedures should contain a signature and date. The signature does not have to be an original signature, but may be a name, initials, or other indication of the person who is performing the certification. The annual certification of the

Audit Criteria	Source	Guidance for Auditors
		<p>Table 11.1 – Continued</p> <p>accuracy of operating procedures may be contained in the procedure documents themselves or in separate records.</p> <ul style="list-style-type: none"> <li>• The annual certification of the accuracy of operating procedures should indicate that they are conducted on a rolling 12-month basis; i.e., the procedures should not be certified on Jan. 1 of one year and Dec. 31 of the following year. <li>• The record of the annual certification of the SOPs may be a consolidated record. Individual certification records for each SOP are not required. For example, an index of the SOPs annotated to show the certification date for each procedure or a similar record can be used. A blanket statement that the SOPs have been reviewed without an attached index or a list of the SOPs reviewed, while not a complete record, would also suffice. <li>• If other nonoperating procedure documents are incorporated into the procedure by reference, e.g., MSDSs, they are not required to be certified annually, but these referenced documents should be subject to a formal and periodic review and update requirement. If the site is ISO-registered, then the periodic document review and approvals specified in the ISO program can be used. Referencing documents in procedures is an increasingly common practice, especially when the operating procedures are maintained electronically, because of the ability to insert document links in the electronic procedures. This document management practice streamlines the operating procedures and allows pertinent information to be maintained in only one document rather than multiple documents. <p><u>Auditor Activities:</u></p>

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"> • Auditors should review the annual certification of the accuracy of operating procedures to determine if they contain a signature and date. • Auditors should review the annual certification of the accuracy of operating procedures to determine if they are conducted on a rolling 12-month basis; i.e., the procedures should not be certified on Jan. 1 of one year and Dec. 31 of the following year. • Auditors should interview those individuals who conducted the annual review and certification to understand how it was accomplished and how this compares to the certification records. • If other nonoperating procedure documents are incorporated into the operating procedures by reference, auditors should determine if they are subject to formal and periodic reviews and update; the auditor can also spot-check the referenced documents to determine if they are current and accurate.

Criteria for Safe Work Practices, which are included in the PSM Standard in the Operating Procedures element, are included in Chapter 12.

11.2.1.1 U.S. State PSM Programs

If the PSM program being evaluated is pursuant to a state PSM regulation, then the specific process safety knowledge requirements for that regulatory program should be followed. In general, these overlap somewhat with the federal OSHA PSM and EPA RMP requirements, but often there are state-specific requirements that should be met, even if the state has received authority to enforce federal regulations (i.e., the state is an OSHA state plan state, or has received implementing agency status for the RMP Rule from EPA). The state-specific applicability requirements for the following states are presented below:

- New Jersey
- California
- Delaware

Table 11.2 shows the audit criteria and auditor guidance for Operating Procedures pursuant to U.S. state requirements.

Table 11.2 U.S. State PSM Audit Criteria and Guidance for Auditors - Operating Procedures

Audit Criteria	Source	Guidance for Auditors
<p><i>New Jersey Toxic Catastrophe Prevention Act (TCPA)</i></p> <p>11-C-23. Operating procedures shall be written in English in a manner that the EHS operators of the process can understand. If the EHS operators do not understand English, the operating procedures shall be written in the language that the operators can understand.</p> <ul style="list-style-type: none"> • The standard operating procedures shall include the following: <p>A process description defining the operation and showing flows, temperatures, pressures, or a reference to a document with this information.</p> <p>Sampling procedures addressing apparatus and specific steps involved in the taking of samples.</p> <p>Log sheets and checklists where appropriate to the operation.</p> <p>A statement as to the number of EHS operators required to meet safety needs for each operation with requirements for shift coverage.</p> <p>A requirement that an EHS operator be in attendance at the stationary source, be able to acknowledge alarms and take corrective action to prevent an accident at all times during EHS handling, use, manufacturing, storage, or generation except:</p> <ul style="list-style-type: none"> ▪ During chlorination of water using chlorine vapor out of a supply vessel, if the Department determines that chlorine monitoring equipment is provided with alarms reporting to a continuously attended station whose personnel are trained to take action to prevent an EHS accident and the online supply vessel total capacity is less than 2,100 pounds. ▪ During EHS storage requiring refrigeration, circulation, agitation or inert 	<p>N.J.A.C. 7:31-4.3</p>	<p><u>Auditor Guidance:</u></p> <ul style="list-style-type: none"> • Auditors should determine if there are process operators who are not fluent enough in English to be able to read the SOPs and understand them. If there are such operators, the SOPs should be written in English and in the first language of the non-English-speaking operators. • Auditors should check the SOPs to confirm that they include: a process description, sampling procedures, log sheets and checklists, number of EHS operators to operate the process safely, a requirement that an EHS operator be in attendance at the stationary source (unless the process meets the exemptions for this specified in N.J.A.C. 7:31-4.3), and a table of contents or a system to index each SOP.

Audit Criteria	Source	Guidance for Auditors
<p>gas blanketing, if the Department determines that EHS monitoring equipment is provided with alarms reporting to a continuously attended station whose personnel are trained to take action for an appropriate response, or a risk assessment demonstrates that an EHS operator is not necessary onsite during the specified activity.</p> <ul style="list-style-type: none"> ▪ During storage not requiring refrigeration, circulation, agitation or inerting, if the Department determines that EHS monitoring equipment is provided with alarms reporting to a continuously attended station, or a risk assessment demonstrates that an EHS operator is not necessary onsite during the specified activity. ▪ Notwithstanding any other applicable State and/or Federal requirements, during mechanical refrigeration using anhydrous ammonia within a closed loop system, if the Department determines that anhydrous ammonia detection monitoring equipment is capable of automatically isolating, shutting down, and emptying EHS equipment and is provided with alarms reporting to a continuously attended station whose personnel are trained to take action to prevent an EHS accident <p>A table of contents or a system to index each covered process's standard operating procedures.</p>		
<p><i>Delaware Accidental Release Prevention Regulation</i> 11-C-24. The Delaware EHS regulations do not add any different or unique Operating Procedures requirements beyond those described for the PSM Standard and RMP Rule.</p>	<p>Delaware Code, Chapter 77, Section 5.69</p>	<ul style="list-style-type: none"> ▪ No further guidance.

Audit Criteria	Source	Guidance for Auditors
<p><i>California OSHA—Process Safety Management of Acutely Hazardous Materials</i></p> <p>11-C-25. The CalOSHA PSM regulations do not add any different or unique Operating Procedures requirements beyond those described for the PSM Standard and RMP Rule.</p>	<p>California Code of Regulations, Title 8, Section 5189</p>	<ul style="list-style-type: none"> No further guidance.
<p><i>California Accidental Release Prevention Program</i></p> <p>11-C-26. The CalARP regulations do not add any different or unique Operating Procedures requirements beyond those described for the PSM Standard and RMP Rule.</p>	<p>California Code of Regulations, Title 19, Section 2760.3</p>	<ul style="list-style-type: none"> No further guidance.

11.2.2 Related Criteria

The purpose of providing these criteria is to provide auditors with additional guidance for evaluating PSM programs with respect to issues that go beyond the strict compliance requirements presented above, and in large part represent industry good practices in process safety knowledge, or in some cases practices in process safety knowledge that have become common. Some of the related criteria have reached the status of a level of acceptable practice because of their widespread, accepted, and successful use over an extended period of time. Auditors and PSM practitioners should carefully consider implementing this guidance, or at least designing an approach that is similar in nature. See the Glossary and Section 1.7.1 for a more complete discussion of the meaning and use of level of acceptable practice.

Table 11.3 identifies audit criteria and auditor guidance for related criteria relating to Safe Operating Procedures.

Table 11.3 Related Audit Criteria and Auditor Guidance - Operating Procedures

Audit Criteria	Source	Guidance for Auditors
<p>11-R-1. The emergency shutdown procedures (ESP) specify the conditions that require an emergency shutdown</p>	<p>NEP</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the ESPs or emergency shutdown section of the operating procedures to determine if the process conditions (i.e., process parameter values) that require emergency shutdown are specified.
<p>11-R-2. The ESPs specify that qualified operators are assigned</p>	<p>NEP</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the ESPs

Audit Criteria	Source	Guidance for Auditors
authority to shutdown the process units.		<p>or emergency shutdown section of the operating procedures to determine if the qualified operators have the authority to shut down the process units.</p> <ul style="list-style-type: none"> • Auditors should interview process operators to determine if they have the authority to shut down the process units on their own when the specified conditions are reached.
11-R-3. The emergency operating procedures (EOP) identify the "entry point," i.e., the initiating/triggering conditions or operating limits 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 EOP have been exceeded.	NEP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the EOPs or emergency operations section of the operating procedures to determine if they include the initiating/triggering conditions or operating limits 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 EOP have been exceeded. • Auditors should conduct interviews with operators to determine if they <p>Table 11.3 – Continued understand the EOP trigger points.</p>
11-R-4. The normal operating procedures (NOP) list the normal operating limits or "exit points" from the NOPs to the EOPs; the steps operators should take to avoid deviations/upsets; and the precautions necessary to prevent exposures, including engineering and administrative controls and PPE.	NEP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the NOPs to determine if they include the normal operating limits or "exit points" from the NOPs to the EOPs; the steps operators should take to avoid deviations/upsets; and the precautions necessary to prevent exposures, including engineering and administrative controls and PPE. • Auditors should interview process operators to determine if they understand the NOP-to-EOP "exit points."
11-R-5. There is a facility/company management system procedure in place for managing the operating procedures.	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should determine if there is a facility/company management system procedure in place for managing the operating procedures and if the procedure covers the following

Audit Criteria	Source	Guidance for Auditors
		<p>Table 11.3 – Continued</p> <p>aspects of developing and maintaining the procedures:</p> <ul style="list-style-type: none"> <li>• The standard format and table of contents, including rules for titles, procedure numbers, etc. <li>• Description of content and level of detail (e.g., how much of the operating steps can be left to training of the operators without providing detailed content). <li>• The scope of the operating procedures, i.e., what operating modes and tasks/activities should be included in the procedures. The facility operations for which SOPs are developed should be based on the risk as identified in the HIRAs, risk assessments, LOPAs/SIL/IPL analyses, or other analytical activities designed to identify and prioritize the hazards/risk associated with the equipment and its operation. <li>• How specific regulatory requirements (e.g., consequences of deviation, safety and health considerations, etc.) will be addressed. <li>• The development process of the procedures, including designation of the personnel who actually write them. <li>• How the procedures are reviewed, including designation of the personnel who are responsible for the reviews. <li>• How the operating procedures are formally approved for use. <li>• How the operating procedures are stored and distributed. <li>• How the operating procedures are modified (i.e., including appropriate reference to the MOC process). <li>• How the annual certification is to be accomplished and documented. <li>• How the operators are involved in the preparation and/or review

Audit Criteria	Source	Guidance for Auditors
11-R-6. There is a maintained listing and index of all approved operating procedures and safe work practices.	GIP	<p>of the operating procedures.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should determine if an electronically stored or hard-copy index of the approved operating procedures and safe work practices exists and is maintained as a formally issued and approved document at the facility.
11-R-7. The operating procedures are detailed enough for the operations they control and the operators that will have to use them.	VCLAR	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The following informal “tests” can be applied to determine if the operating procedures are written with a sufficient level of detail: <ul style="list-style-type: none"> – Could a previously qualified operator use them in a safe manner after a leave of absence? – Can they be understood by operator trainees without the presence of a qualified operator? <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should interview operators to determine if the operating procedures have sufficient detail that allow them to be useful documents.
11-R-8. The operating procedures are written in a style and language that is understandable to employees who will use them.	3133	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Although it is not necessary that the reading comprehension level of the operators be formally measured, a useful benchmark is that the average U.S. newspaper is written at the sixth grade reading level. Interviews with the operators should probe the comprehension level of the operating procedures to determine if the operators find them to be understandable documents. <p><u>Auditor Activities:</u></p> <p>Auditors should determine that the operating procedures are written at a reading comprehension level that is appropriate to the personnel</p>

Audit Criteria	Source	Guidance for Auditors
		<p>Table 11.3 – Continued</p> <p>(i.e., the operators, primarily) who will use them.</p> <ul style="list-style-type: none"> Auditors should conduct interviews with operators to determine if the operating procedures provide practical instructions that can be understood.
11-R-9. The operating procedures are written to facilitate training of operators.	3133	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the operator-training program to determine if the operating procedures are actually used as training documents. Auditors should conduct interviews with operators to determine if they were trained using the approved operating procedures and not separate training manuals that summarized and simplified the operating procedures.
11-R-10. The responsibilities for each task or activity in the operating procedures are clearly assigned.	CIT	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the operating procedures to determine if they clearly describe the responsibility for accomplishing each task/activity.
11-R-11. If data is to be recorded when using the operating procedures, it is clearly identified	3133	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> This will normally not be applicable for operating procedures for a continuous process or those that only provide instructions on how to operate equipment and do not also serve as a production or quality record; an exception is for recording of daily rounds. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the operating procedures to determine if where data is to be recorded as part of using the procedure is clearly identified and if space or separate forms are provided to record the data.

Audit Criteria	Source	Guidance for Auditors
11-R-12. The operating procedures are published so that information is easy to find quickly by those who will use them.	GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review the operating procedures to determine if they are published in such a way that the information in them can be located quickly, particularly the EOPs (e.g., use of colored tabs, electronic links).
11-R-13. The operating procedures are reviewed by engineering staff to ensure they are accurate.	3133	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should determine if the operating procedures have been reviewed by engineering and other technical personnel to ensure they are accurate. • Auditors should review the operating procedures to look for examples of engineering or technical additions to the operating procedures that, although correct, may be too complicated or advanced for operators to place into context.
11-R-14. The operating procedures are prepared in a second language, if necessary, for workers not fluent in English.	3133	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should interview operators to determine if the first language of some of the operators is not English, and if the operating procedures are also written in the first language of these operators. This does not mean that the operating procedures should be written in another language if the operators are bilingual in English and another language, but only when they do not read English.
11-R-15. The operating procedures address storage and transfer operations to the extent that these operations are not covered by DOT.	CIT	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review the operating procedures to determine if they include movement, storage and transfer operations (e.g., tank truck/rail car movement, loading or unloading, tank farm operations, and pipeline operations) where these activities are not covered by DOT.
11-R-16. The operating procedures contain appropriate information regarding the hazards of the	CIT 3133	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review the operating procedures to

Audit Criteria	Source	Guidance for Auditors
processes.		<p>determine if they include the following information regarding the hazards of the process:</p> <p>Warnings or cautions included in the operating procedures that were generated from the consequences of deviation. Every consequence cannot be included as a special warning or they will lose their significance.</p> <p>The consequences of deviations in the operating procedures are consistent with those identified in the PHAs.</p> <p>Alarms and instrument readings are included that are pertinent if an upset condition occurs</p> <p>Other hazards not related to chemical exposure are included, such as physical hazards, temperature, noise, and pressure.</p>
11-R-17. The operating procedures include a cover or sign-off sheet showing the date the procedure was written, who prepared it, and who approved it for use.	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the operating procedures to determine if they include a cover sheet or other format that indicates who prepared and approved the operating procedures, and the date(s) these events occurred.
11-R-18. As an alternative to a specific annual review, the MOC program can be used for this purpose if it adequately addresses required changes to the operating procedures when changes occur to the processes.	WCLAR (3/9/94)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> If an annual certification is prepared indicating that the MOC process is used for this purpose, and it is found that the operating procedures are not current and accurate, this indicates both an MOC problem and a problem with the annual certification of operating procedures. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the operating procedures and the MOC process to determine if they adequately cover changes to the operating procedures when changes occur to the equipment/processes, such that each hardware change is accurately reflected in the procedures as they occur.

Related criteria for Safe Work Practices are included in Chapter 12.

11.2.3 Voluntary Consensus PSM Programs

The following voluntary consensus PSM program considerations for Safe Operating Procedures are described below:

- The considerations published for the offshore oil platform sector in the Safety and Environmental Management Program (SEMP), a voluntary program designed by API and endorsed by the Minerals Management Service of the Department.
- Responsible Care Management System (RCMS)[®] published by the American Chemistry Council.
- RC14001 Environmental Management System, published by the American Chemistry Council.

Table 11.4 presents audit criteria and auditor guidance relating to Safe Operating Procedures pursuant to voluntary consensus PSM programs.

Table 11.4 Voluntary Consensus PSM Program Audit Criteria and Guidance for Auditors - Operating Procedures

Audit Criteria	Source	Guidance for Auditors
<p><i>SEMP</i> 11-R-22. The management program specifies a process for identifying necessary operating procedures.</p>	<p>API RP 75, 5.1</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review a copy of the written plan describing requirements. • Auditors should find evidence of awareness of plan requirements among applicable operating personnel.
<p>11-R-23. The management program specifies where the written operating procedures are maintained.</p>	<p>API RP 75, 5.1</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review a copy of the written plan describing requirements. • Auditors should find evidence of awareness of plan location among applicable operating personnel. • Auditors should determine if there is demonstrated employee access to the procedures.
<p>11-R-24. The management program requires that the following major modes of operations be considered:</p> <ol style="list-style-type: none"> start-up, shutdown, normal operations, temporary operations, emergency shutdown and isolation, and normal shutdown and isolation. 	<p>API RP 75, 5.2.b</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review a copy of the written plan describing requirements. • Auditors should review a copy of procedures containing the required operating modes.

Audit Criteria	Source	Guidance for Auditors
<p>Table 11.4 – Continued</p> <p>11-R-25. The management program requires operating procedures to address operating limits that outline consequences of process deviation and steps required to correct or avoid deviations.</p>	API RP 75, 5.2.c	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review a copy of the written plan describing requirements. • Auditors should review a copy of procedures containing the described requirements.
<p>11-R-26. The management program requires written guidance for discharge limitations or rules governing the disposal of materials.</p>	API RP 75, 5.2.d.4	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review documentation describing the requirements. • Auditors should find evidence of awareness of requirements among applicable operating personnel. • Auditors should review a copy of procedures containing the described requirements. • Auditors should review a copy of written guidance governing proper disposal of materials or by-products to the environment. • Auditors should review written guidance addressing the types of effluent or materials.
<p>11-R-27. The management program requires informing and training personnel on the operating procedures.</p>	API RP 75, 5.3	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review a copy of the written guidance describing requirements. • Auditors should find evidence of awareness of guidance requirements among applicable operating personnel. • Auditors should review an example or demonstration of training described in the plan.
<p>11-R-28. The management program includes a process or defined method to review operating procedures periodically to verify they reflect current and actual operating practices. The methodology requires evaluating the degree of hazard an operating procedure may present. The methodology specifies an operating procedure review frequency.</p>	API RP 75, 5.3	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review documentation of the process or methodology. • Auditors should find evidence of awareness of requirements among applicable operating personnel. • Auditors should review documentation showing that the requirements are being met.

Audit Criteria	Source	Guidance for Auditors
11-R-29. The management program requires review, documentation, and communication of operating procedure changes to personnel.	API RP 75, 5.3	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review a copy of the written guidance describing requirements. • Auditors should find evidence of awareness of requirements among applicable operating personnel. • Auditors should review documentation that the requirements are being met.

Audit Criteria	Source	Guidance for Auditors
<i>Responsible Care® Management System (RMCS)</i> 11-R-30. The RCMS Guidance does not add any different or unique Operating Procedures requirements beyond those described for the PSM Standard and RMP Rule.	RCMS Technical Specification, Element 2.2	<ul style="list-style-type: none"> • No further guidance.

Audit Criteria	Source	Guidance for Auditors
<i>RC14001</i> 11-R-31. Establish and maintain operating and maintenance procedures sufficient to ensure safe operations and the achievement of the policy, objectives, targets and programs.	RC14001 Technical Specification RC151.03 4.4.6	<ul style="list-style-type: none"> • No further guidance.

11.3 AUDIT PROTOCOL

The audit protocol introduced in Appendix A and available online (see page xiv for information on how to access this resource) provides detailed questions that examine the criteria described in Section 11.2.

REFERENCES

- American Chemistry Council, *RCMS® Technical Specification*, RC101.02, March 9, 2005
- American Chemistry Council, *RCMS® Technical Specification Implementation Guidance and Interpretations*, RC101.02, January 25, 2004
- American Chemistry Council, *RCMS® Technical Specification Implementation Guidance and Interpretations Appendices*, RC101.02, January 25, 2004

- California, California Code of Regulations, Title 8, Section 5189, CalOSHA, November 1985
- Center for Chemical Process Safety (CCPS), *Guidelines for Risk Based Process Safety*, American Institute of Chemical Engineers, New York, 2007 (CCPS, 2007c)
- Delaware, *Accidental Release Prevention Regulation*, Delaware Department of Natural Resources and Environmental Control/Division of Air and Waste Management, September 1989 (rev. January 1999)
- Department of the Interior, Minerals Management Service, *Safety and Environmental Management Program (SEMP)*, 1990
- Environmental Protection Agency (USEPA), 40 CFR §68, *Accidental Release Prevention Requirements: Risk Management Programs Under Clean Air Act Section 112(r)(7)*; Final Rule, June 21, 1996
- New Jersey, *Toxic Catastrophe Prevention Act (N.J.A.C. 7:31)*, New Jersey Department of Environmental Protection, June 1987 (rev. April 16, 2007)
- Occupational Safety and Health Administration (OSHA) 29 CFR §1910.119, *Process Safety Management of Highly Hazardous Chemicals, Explosives and Blasting Agents; Final Rule*, Washington, DC, February 24, 1992
- Occupational Safety and Health Administration (OSHA) Publication 3133, *Process Safety Management Guidelines for Compliance*, Washington, DC, 1993
- Occupational Safety and Health Administration (OSHA) Instruction CPL 02-02-045 CH-1, *PSM Compliance Directive*, Washington, DC, September 13, 1994
- Occupational Safety and Health Administration (OSHA) Instruction CPL 03-00-004, *Petroleum Refinery Process Safety Management National Emphasis Program*, June 7, 2007 (OSHA, 2007a)
- Occupational Safety and Health Administration (OSHA) Directive 09-06 (CPL 02), *PSM Chemical Covered Facilities National Emphasis Program*, July 27, 2009 (OSHA, 2009a)

12

SAFE WORK PRACTICES

This element is also called Hot Work Permits in OSHA PSM and EPA RMP programs, as well as in many state regulatory PSM programs. The Operating Procedures element requires that lockout/tagout, confined space, and opening process equipment and piping procedures exist, but does not specify any details for them. Audit criteria for these Safe Work Practices (SWP) are also included in this chapter rather than Chapter 11 because they relate to SWPs more than operating procedures. Voluntary consensus PSM programs do not explicitly address this element. Safe Work Practices is an element of the RBPS accident prevention pillar Manage Risks.

12.1 OVERVIEW

The Safe Work Practices element is designed to control process and personnel hazards associated with nonroutine work. The Asset Integrity element includes procedures for performing routine repair, inspection, testing, and preventive maintenance tasks on process equipment, and the Operating Procedures element addresses routine process operations procedures (which should include safe operating practices). Safe Work Practices address those situations that are not routine and usually call for the use of safe work permits, which provide for case-by-case hazard analysis, hazard prevention and control (including risk mitigation such as PPE), review, and approval.

By its nature, nonroutine work carries with it the potential for unrecognized hazards that sometimes has led to a catastrophic incident. Nonroutine operations are any operations that are not covered by an approved procedure, e.g., operating, maintenance, and emergency. Establishing safe work practices helps minimize the potential for unrecognized hazards and provides appropriate measures to ensure they are controlled. OSHA regulations address a number of safe work practices, not all of which are related to process safety nor are included or referenced in PSM or RMP regulations. The extent to which safe work practices are audited is determined by

each company. At a minimum, safe work practices related to hot work are subject to detailed audit, due to the potential for fire or explosion associated with the presence of flammable or combustible materials. Regulatory requirements for hot work are addressed in OSHA Standard 1910.252(a) Cutting, Welding, and Brazing. Other safe work practices (lockout/tagout (LOTO), confined space entry, opening process piping and equipment, and personnel entry into process areas) are required in the Operating Procedure element, but there are no specific requirements for these procedures in the PSM Standard. The lockout/tagout (LOTO) and confined space entry SWPs are governed by separate OSHA Standards (Sections 1910.147 and 1910.146, respectively) and those standards provide the detailed requirements for these two programs. Opening of process equipment and piping is also addressed by Section 1910.147 (Control of Hazardous Energy) and is sometimes included in a facility's lockout/tagout program.

The primary objective of this element is to ensure that an integrated system of procedures and permits is established to protect workers from hazards and prevent the sudden release of hazardous materials or energy (CCPS, 2007c). Safe work practices require that nonroutine jobs follow established procedures, which include identifying hazards associated with the job and taking proper steps to ensure they are controlled. Responsibilities for each step should be included in the written procedure; a written permit may also be used. The written permit serves as a checklist, which provides assurance, as well as documentation, that key elements of safe work practice are being followed. It also serves as a communication tool, usually between maintenance/construction workers and operations personnel, and sometimes between personnel in different shifts (if the permits are allowed to span shifts). In addition, it provides a mechanism that facilitates review and approval by appropriate levels of management, usually based on risk. Permits help minimize the potential that a step will be forgotten, and serves as an acknowledgement by all involved of the hazards and their control measures. Safe work practices are generally based on regulatory requirements at a minimum, with additional measures included based on good industry practice and facility experience.

Although there is no specific Safe Work Practices element specified for OSHA PSM and EPA RMP programs, nor in many state regulatory PSM programs, there are requirements and references to several safe work practices within individual PSM/RMP elements.

The SWP element interfaces significantly with other PSM program elements. The primary interfaces include the following:

- Process Knowledge Management (Chapter 9)—equipment identification, lockout/tagout (LOTO), and MSDS data should be accurate to allow efficient implementation of Safe Work Practices.
- Operating procedures (Chapter 11)—the operating procedure element requires that certain SWPs be in place. The required SWPs also supplement the procedures contained in the SOPs.
- Asset Integrity and Reliability (Chapter 13)—most ITPM and nearly all repair maintenance would not be possible to perform safely without

lockout/tagout, confined space, line breaking, and other SWPs. Maintenance personnel should also be thoroughly trained in the SWPs.

- Training and Performance Assurance (Chapter 15)—the operators should be thoroughly trained in the SWPs.

In Sections 12.2 and 12.3, compliance and related audit criteria are presented, along with guidance for auditors in applying the criteria. A full explanation of compliance and related audit criteria is presented in Chapter 1 (see Section 1.7). The criteria and guidance described in these sections do not represent exclusive solutions to PSM program coverage, design, implementation, or interpretation. They represent the collective experience of many people in the chemical/processing sector who have performed many PSM audits, and the consensus opinion resulting from that experience. The compliance criteria are derived from the regulations that govern PSM programs in the United States; however, these regulations are all performance-based. Performance-based regulations are goal oriented and there may be multiple pathways to fully complying with them. Therefore, there may be alternate interpretations and solutions to the issues described in the compliance tables in this chapter that are equivalent to those included, particularly the auditor guidance presented.

The inclusion of the related criteria in no way infers that these criteria must be implemented for a PSM program to be successful, nor does it infer that a PSM program will be deficient without them. As with the compliance criteria, there may be other, more appropriate solutions for an individual facility or company. In addition, the use of the related criteria in a PSM audit is intended to be completely voluntary and not a mandatory requirement in any way. They should be used cautiously and with careful planning so that they do not inadvertently establish unintended performance standards. Consensus should be sought within and among facilities and their parent companies before these criteria are used. Finally, the related criteria and guidance offered for consideration are not endorsements of or agreements with the written or verbal clarifications made by the regulators, PSM citations issued against the regulations, other PSM guidance published by the regulators, or the successful or common PSM practices in any given company's PSM program from which they are derived.

12.2 AUDIT CRITERIA AND GUIDANCE

The detailed requirements for safe work practices in OSHA's PSM Standard, EPA's RMP Rule, and several state PSM regulatory programs are presented below, as well as for other common PSM program voluntary consensus PSM programs.

The audit criteria described below are examined by auditors using the guidance provided by performing the following audit activities:

- Interviewing the persons at the facility with overall responsibility for safe work permits, who usually work in the EHS department, and generally the safety and health portion of that department.

- Reviewing the written procedures for safe work practices to confirm their existence and to determine their scope and application.
- Reviewing a representative number of completed safe work permits, where applicable, to verify that they are completed properly and have the requisite review and approval signatures.
- Reviewing training files and interview operations and maintenance personnel (especially those who conduct welding and cutting operations for hot work, gas testing, LOTO/isolation, or fire watches) to verify that they have received training on safe work practices and that the training is used consistently.
- Conducting field observations to examine actual SWP permits and work.

Auditors should also carefully examine the SWP requirements found in the procedures of the company/facility being audited. As stated in Section 1.7.1, these could be interpreted as compliance requirements by regulators and could be subject to citations if they are not being followed. Auditors should confirm, via interviews, records and document reviews, and field observations, that the requirements of the facility or company SWP procedures have been implemented as specified. Findings should be generated if the company/facility-specific provisions are not being followed.

See the Guidance for Chapters 3–24 in the Introduction for the definition of the abbreviations shown in the following tables that are used to indicate the source of the criteria.

12.2.1 Compliance Requirements

The OSHA PSM Standard and EPA RMP Rule explicitly reference the following Safe Work Practices covering the following activities:

- Hot work
- Lockout/tagout (control of hazardous energy)
- Confined space entry
- Opening process equipment or piping
- Control over entrance into a covered process by maintenance, contractor, laboratory, or other support personnel.

Of these, detailed process safety requirements are established only for hot work, including reference to the OSHA Cutting, Welding, and Brazing Standard, 29 CFR §1910.252(a). The Operating Procedures element lists lockout/tagout (control of hazardous energy), confined space entry, opening process equipment or piping, and control over entrance into a covered process SWPs as being required, but does not establish any detailed requirements for them. However, there are other detailed OSHA standards for control of hazardous energy (Section 1910.147), confined space entry (§1910.146), and opening process equipment (an element of control of hazardous energy in Section 1910.147). The PSM Standard and RMP Rule provide these three as examples of safe work practices that should be established to control hazards during operations, but do not preclude the establishment of others. See

Section 12.3 for a discussion of other possible SWPs. The scope of most PSM audits usually includes a detailed review of the hot work permit requirements and control of entry/egress SWP (see Chapter 11, Operating Procedures), but only that the lockout/tagout, confined space entry, and line/equipment opening SWPs are in place. The detailed review of these three SWPs is usually within the scope of a safety and health (i.e., occupational safety) audit.

See the Guidance for Chapters 3–24 in the Introduction for the definition of the abbreviations shown in the following tables that are used to indicate the source of the criteria. The audit criteria should be used by the following:

- Readers in the United States covered by the PSM Standard or RMP Rule.
- Readers who have voluntarily adopted the OSHA PSM program.
- Readers whose companies have specified OSHA PSM requirements in non-U.S. locations.

Table 12.1 describes the audit criteria and auditor guidance for Hot Work Permits pursuant to OSHA PSM and EPA RMP.

Table 12.1 OSHA PSM and EPA RMP Audit Criteria and Guidance for Auditors – Hot Work Permits

Audit Criteria	Source	Guidance for Auditors
12-C-1. A hot work permit has been issued for hot work operations conducted on or near a covered process.	PSM 1910.119 (k)(1) RMP 68.85	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The hot work permit may be part of another permit, e.g., general work permit. May also be referred to as a “fire permit.” • A permit implies a checklist that includes certain information, including nature of the work, safety measures taken, and approvals. The permit should not be completed and approved by the same person; independent review and approval should be required. • Although hot work nominally applies to operations associated with use of open flame, hot surface, or spark-producing operations (e.g., cutting, welding, brazing), this definition may extend to any situation that violates the electrical classification of an area in which flammable or combustible materials may be present, including dusts. This could include use of nonrated equipment such as extension cords, power tools, internal combustion engines, even cell

Audit Criteria	Source	Guidance for Auditors
		<p>Table 12.1 – Continued phones, pagers, cameras, or portable radios. A separate, streamlined permit is often used for this type of equipment, or, in some cases, no permit is required but a procedure exists. However, even though these activities are relatively low risk, provisions for combustible gas monitoring should be established to ensure that there is no hazardous condition that could be ignited by a small electrical spark.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the HWP procedure and/or the HWP form to determine if hot work is defined for the facility in question.
12-C-2. The hot work permit indicates the date(s) authorized for hot work and identifies the object on which hot work is to be performed.	PSM 1910.119 (k)(2) RMP 68.85	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review completed HWPs to determine if the date(s) authorized for hot work, the identification of the object on which hot work is to be performed, and the identification of the work location are included on the permits.
12-C-3. The hot work permit documents that the fire prevention and protection requirements in 29 CFR §1910.252(a) have been implemented prior to beginning the hot work operations.	PSM 1910.119 (k)(2) RMP 68.85	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> In addition to requiring a hot work permit, PSM and RMP reference the OSHA Cutting, Welding, and Brazing Standard 1910.252, which provides a detailed list of provisions for ensuring the safety of hot work operations. This standard is intended for use not only in hazardous locations where flammable and combustible materials are handled and stored, but also in areas or buildings where combustible materials are stored, used, or were used in the construction of the building, and could be ignited by improperly controlled hot work. Although the PSM standard states that the hot work permit should document that the

Audit Criteria	Source	Guidance for Auditors
		<p>requirements of 1910.252(a) have been implemented, it may be impractical to design a permit form that includes all these requirements. The permit should include the most important/relevant requirements; however, a written hot work permit procedure and/or associated employee training should include all these requirements.</p> <ul style="list-style-type: none"> • The OSHA Cutting, Welding, and Brazing Standard applies to all facilities, not only those covered by process safety management; therefore, some provisions may not be applicable. • Fire watches are generally required whenever cutting, welding, grinding, or other slag-generating hot work is performed, both to ensure that the work area is safe and to call for help or stop the job if a fire or an unsafe situation develops. • In several cases, the Standard refers to responsibilities of the "Supervisor." In many cases, these responsibilities have been delegated to nonmanagement operations or maintenance personnel for some hot work operations. • Combustible floors include use of wood-planked scaffolding. • Scheduling of hot work operations to avoid ignition of combustibles refers to the concurrent activities such as draining, purging, or opening of lines that contain flammables. • Special provisions apply to performing hot work on closed containers that contained flammables to prevent potential for pressure buildup and auto-ignition. Proper cleaning, purging, and venting of such containers are called for. • Hot work (and other) permits should be suspended when appropriate.

Audit Criteria	Source	Guidance for Auditors
		<p>Table 12.1 – Continued</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP and related procedures and conduct interviews to confirm that the requirements of 1910.252(a) have been addressed (see below). • Auditors should review the HWP procedures or other documents to determine if the facility has defined what situations are considered “appropriate” and direct that HWP’s be suspend when they occur. The HWP procedure or permit should also define who has the authority to stop work (basically anyone discovering a problem warranting stoppage). Examples include a facility emergency affecting the area where the hot work is located, or an evacuation alarm. Extended delays in the start or completion of the hot work may also be an appropriate situation.
<p><i>Fire protection and hot work provisions referenced from 1910.252(a)</i></p>		
<p>12-C-4. Where there are floor openings or cracks in the flooring that cannot be closed, cracks or holes in walls, open doorways, or open or broken windows, precautions are taken so that no readily combustible materials will be exposed to sparks.</p>	<p>1910.252 (a)(2)(i)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Where there are floor openings or cracks in the flooring that cannot be closed, cracks or holes in walls, open doorways, or open or broken windows, precautions are taken so that no readily combustible materials will be exposed to sparks. • Auditors should conduct field observations to confirm that where there are floor openings or cracks in the flooring that cannot be closed, cracks or holes in walls, open doorways, or open or broken windows, precautions are taken so that no readily

Audit Criteria	Source	Guidance for Auditors
		combustible materials will be exposed to sparks.
12-C-5. Suitable fire extinguishing equipment is maintained in a state of readiness for instant use.	1910.252 (a)(2)(ii)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • For example, if fire hoses are provided, they are charged or can be charged very quickly by the fire watch. If uncharged, the fire watch should be able to see the valve, the valve should be at the same elevation as the fire watch, the valve should be within immediate reach, and the hot work should not be between the valve and the fire watch. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Suitable fire extinguishing equipment is maintained in a state of readiness for instant use. • Auditors should conduct field observations to confirm that suitable fire extinguishing equipment is maintained in a state of readiness for instant use. For example, if fire hoses are provided, they are charged or can be charged very quickly by the fire watch. If uncharged, the fire watch should be able to see the valve, it should be at the same elevation as the fire watch, the valve should be within immediate reach, and the hot work should not be between the valve and the fire watch (if hot work is occurring during the audit that allows this to be observed).
12-C-6. Fire watches are required whenever welding or cutting is performed in locations where other than a minor fire might develop.	1910.252 (a)(2)(iii)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • A fire watch is defined as persons other than those performing the hot work who are primarily responsible for fighting a minor fire that might develop during the hot work and communicating to others that a fire has developed.

Audit Criteria	Source	Guidance for Auditors
		<p>Table 12.1 – Continued</p> <p>Fire watches should not be assigned administrative or other duties that distract from their primary responsibilities. They should also not be assigned to be a fire watch for multiple hot work locations unless the locations are so close that the fire watch can easily monitor both locations and has been equipped to handle minor fires at the multiple locations. Although there are no spatial limits on what constitutes "close," simply being able to see both hot work locations from a single place is not acceptable.</p> <ul style="list-style-type: none"> • A minor fire would be one that can be controlled (or extinguished) by one person without the assistance of others. The fire watch should be provided with appropriate fire-extinguishing equipment and the training to use it. Any fire that cannot be controlled by one properly equipped and trained fire watch is not a minor fire. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: fire watches are required whenever welding or cutting is performed in locations where other than a minor fire might develop. • Auditors should conduct field observations to confirm that fire watches are stationed whenever welding or cutting is performed in locations where other than a minor fire might develop (if hot work is occurring during the audit that allows this to be observed).
12-C-7. Fire watches are required if appreciable combustible material, in building construction or contents, is closer than 35 feet to the point of operation.	1910.252(a)(2)(iii)(A)(1)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection

Audit Criteria	Source	Guidance for Auditors
		<p>provision is included in either the procedure or the permit: Fire watches are required if appreciable combustible material, in building construction or contents, is closer than 35 feet to the point of operation.</p> <ul style="list-style-type: none"> Auditors should conduct field observations to confirm that fire watches are stationed if appreciable combustible material, in building construction or contents, is closer than 35 feet to the point of operation (if hot work is occurring during the audit that allows this to be observed).
<p>12-C-8. Fire watches are required if appreciable combustibles are more than 35 feet away but are easily ignited by sparks.</p>	<p>1910.252(a)(2)(iii)(A)(2)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Fire watches are required if appreciable combustibles are more than 35 feet away but are easily ignited by sparks. Auditors should conduct field observations to confirm that fire watches are stationed if appreciable combustibles are more than 35 feet away but are easily ignited by sparks (if hot work is occurring during the audit that allows this to be observed).
<p>12-C-9. Fire watches are required if there are wall or floor openings within a 35-foot radius which expose combustible material in adjacent areas, including concealed spaces in walls or floors.</p>	<p>1910.252(a)(2)(iii)(A)(3)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Fire watches are required if there are wall or floor openings within a 35-foot radius that expose combustible material in adjacent areas, including concealed spaces in walls or floors. Auditors should conduct field observations to confirm that fire watches are stationed if there

Audit Criteria	Source	Guidance for Auditors
		<p>Table 12.1 – Continued</p> <p>are wall or floor openings within a 35-foot radius that expose combustible material in adjacent areas, including concealed spaces in walls or floors (if hot work is occurring during the audit that allows this to be observed).</p>
<p>12-C-10. Fire watches are required if combustible materials are adjacent to the opposite side of metal partitions, walls, ceilings, or roofs and are likely to be ignited by conduction or radiation.</p>	<p>1910.252(a)(2)(iii)(A)(4)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Fire watches are required if combustible materials are adjacent to the opposite side of metal partitions, walls, ceilings, or roofs and are likely to be ignited by conduction or radiation. • Auditors should conduct field observations to confirm that fire watches are stationed if combustible materials are adjacent to the opposite side of metal partitions, walls, ceilings, or roofs and are likely to be ignited by conduction or radiation (if hot work is occurring during the audit that allows this to be observed).
<p>12-C-11. Fire watches have fire extinguishing equipment readily available and are trained in its use.</p>	<p>1910.252(a)(2)(iii)(B)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Fire watches have fire extinguishing equipment readily available. • Auditors should conduct field observations to confirm that fire watches have fire extinguishing equipment readily available (if hot work is occurring during the audit that allows this to be observed). • Auditors should review training records to confirm that persons

Audit Criteria	Source	Guidance for Auditors
		<p>assigned as fire watches have been trained in the use of the fire-extinguishing equipment. This may be equipment other than simply fire extinguishers.</p> <ul style="list-style-type: none"> Auditors should conduct interviews with fire watches to confirm that they understand their responsibilities, what to do if a fire develops, and how to use the fire protection equipment they have been equipped with (if hot work is occurring during the audit that allows this to be observed).
<p>12-C-12. Fire watches are familiar with facilities for sounding an alarm in the event of a fire.</p>	<p>1910.252 (a)(2)(iii)(B)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should conduct field observations to confirm that fire watches have alarm activation immediately available or have communication with those who do (if hot work is occurring during the audit that allows this to be observed). Auditors should conduct interviews with fire watches to confirm that they understand how to sound an alarm or communicate with others if needed (if hot work is occurring during the audit that allows this interview to take place).
<p>12-C-13. Fire watches watch for fires in all exposed areas, try to extinguish fires only when obviously within the capacity of the equipment available, or otherwise sound the alarm.</p>	<p>1910.252 (a)(2)(iii)(B)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the HWP procedure and/or the HWP form to confirm that appropriate cautions for fire watches against trying to fight fires beyond their capability are included in either the procedure or the permit. Auditors should conduct interviews with fire watches to confirm that they understand how to distinguish between fires they can handle and those that they cannot handle and should sound an alarm or communicate first in any case.

Audit Criteria	Source	Guidance for Auditors
<p>Table 12.1 – Continued</p> <p>12-C-14. A fire watch is maintained for at least a half hour after completion of welding or cutting operations to detect and extinguish possible smoldering fires.</p>	<p>1910.252 (a)(2)(iii)(B)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the 1910.252(a) fire protection provision is included in either the procedure or the permit: A fire watch is maintained for at least a half hour after completion of welding or cutting operations to detect and extinguish possible smoldering fires. • Auditors should conduct field observations to confirm that a fire watch is maintained for at least a half hour after completion of welding or cutting operations to detect and extinguish possible smoldering fires (if hot work is occurring during the audit that allows this to be observed). • Auditors should conduct interviews with fire watches to confirm that they understand they are required to remain on duty for at least 30 minutes after the hot work has been completed (if hot work is occurring during the audit that allows this to be observed).
<p>12-C-15. Hot work permits are authorized by an individual responsible for hot work operations.</p>	<p>1910.252 (a)(2)(iv)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Personnel authorized to approve hot work permits may be operations or maintenance supervisory personnel, but may also be individual operators or maintenance technicians. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure or form to confirm that persons authorized to approve hot work operations are designated. • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Hot work permits are authorized by an

Audit Criteria	Source	Guidance for Auditors
		<p>individual responsible for hot work operations.</p> <ul style="list-style-type: none"> Auditors should conduct field observations of active hot work permits to confirm that permits are authorized by an individual responsible for hot work operations (if hot work is occurring during the audit that allows this to be observed).
<p>12-C-16. Before cutting or welding is permitted, the area is inspected by the individual responsible for authorizing cutting and welding operations</p>	<p>1910.252 (a)(2)(iv)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Before cutting or welding is permitted, the area is inspected by the individual responsible for authorizing cutting and welding operations. Auditors should conduct field observations to confirm that, before cutting or welding is permitted, the area is inspected by the individual responsible for authorizing cutting and welding operations (if hot work is occurring during the audit that allows this to be observed).
<p>12-C-17. The individual designates precautions to be followed in granting authorization to proceed, preferably in the form of a written permit.</p>	<p>1910.252 (a)(2)(iv)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: The individual designates precautions to be followed in granting authorization to proceed, preferably in the form of a written permit. Auditors should conduct field observations of active and completed hot work permits to confirm that the individual designates precautions to be followed in granting authorization to proceed, preferably in the form of a written permit (if hot work is occurring during the audit that

Audit Criteria	Source	Guidance for Auditors
		<p>Table 12.1 – Continued allows this to be observed).</p>
<p>12-C-18. Precautions are taken when there are combustible materials on floors or the floors are made of combustible material.</p>	<p>1910.252 (a)(2)(v)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Precautions are taken when there are combustible materials on floors or the floors are made of combustible material. • Auditors should conduct field observations to confirm that precautions are taken when there are combustible materials on floors or the floors are made of combustible material (if hot work is occurring during the audit that allows this to be observed).
<p>12-C-19. Floors are swept clean of combustible material for a radius of 35 feet.</p>	<p>1910.252 (a)(2)(v)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Floors are swept clean of combustible material for a radius of 35 feet. • Auditors should conduct field observations to confirm that floors are swept clean of combustible material for a radius of 35 feet (if hot work is occurring during the audit that allows this to be observed).
<p>12-C-20. Combustible floors are kept wet, covered with damp sand, or protected by fire-resistant shields.</p>	<p>1910.252 (a)(2)(v)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Combustible floors are kept wet, covered with damp sand, or protected by fire-resistant shields. • Auditors should conduct field observations to confirm that

Audit Criteria	Source	Guidance for Auditors
		combustible floors are kept wet, covered with damp sand, or protected by fire-resistant shields (if hot work is occurring during the audit that allows this to be observed).
12-C-21. Where floors have been wet down, personnel operating arc welding or cutting equipment are protected from possible shock.	1910.252 (a)(2)(v)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Where floors have been wet down, personnel operating arc-welding or cutting equipment are protected from possible shock. • Auditors should conduct field observations to confirm that, where floors have been wet down, personnel operating arc-welding or cutting equipment are protected from possible shock (if hot work is occurring during the audit that allows this to be observed).
12-C-22. Cutting and welding are not permitted in areas not authorized by management.	1910.252 (a)(2)(vi)(A)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Cutting and welding are not permitted in areas not authorized by management. • Auditors should conduct field observations to confirm that cutting and welding are not permitted in areas not authorized by management.
12-C-23. Cutting and welding are not permitted in areas in sprinklered buildings while such protection is impaired.	1910.252 (a)(2)(vi)(B)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Cutting and welding are not permitted in areas in buildings with sprinklers while such protection is impaired.

Audit Criteria	Source	Guidance for Auditors
		<p>Table 12.1 – Continued</p> <ul style="list-style-type: none"> Auditors should conduct field observations to confirm that cutting and welding are not permitted in areas in buildings with sprinklers while such protection is impaired (if hot work is occurring during the audit that allows this to be observed).
<p>12-C-24. Cutting and welding are not permitted in the presence of explosive atmospheres (mixtures of flammable gases, vapors, liquids, or dusts with air), or explosive atmospheres that may develop inside uncleaned or improperly prepared tanks or equipment which have previously contained such materials, or that may develop in areas with an accumulation of combustible dusts.</p>	<p>1910.252 (a)(2)(vi)(C)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Cutting and welding are not permitted in the presence of explosive atmospheres (mixtures of flammable gases, vapors, liquids, or dusts with air), or explosive atmospheres that may develop inside uncleaned or improperly prepared tanks or equipment that have previously contained such materials or that may develop in areas with an accumulation of combustible dusts. Auditors should conduct field observations to confirm that cutting and welding are not permitted in the presence of explosive atmospheres (mixtures of flammable gases, vapors, liquids, or dusts with air), or explosive atmospheres that may develop inside uncleaned or improperly prepared tanks or equipment that have previously contained such materials, or that may develop in areas with an accumulation of combustible dusts (if hot work is occurring during the audit that allows this to be observed).
<p>12-C-25. Cutting and welding are not permitted in areas near the storage of large quantities of exposed, readily ignitable materials such as bulk sulfur, baled paper, or cotton.</p>	<p>1910.252 (a)(2)(vi)(D)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the

Audit Criteria	Source	Guidance for Auditors
		<p>permit: Cutting and welding are not permitted in areas near the storage of large quantities of exposed, readily ignitable materials such as bulk sulfur, baled paper, or cotton.</p> <ul style="list-style-type: none"> Auditors should conduct field observations to confirm that cutting and welding are not permitted in areas near the storage of large quantities of exposed, readily ignitable materials such as bulk sulfur, baled paper, or cotton (if hot work is occurring during the audit that allows this to be observed).
12-C-26. Where practicable, all combustibles are relocated at least 35 feet from the work facility.	1910.252 (a)(2)(vii)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Where practicable, all combustibles are relocated at least 35 feet from the work facility. Auditors should conduct field observations to confirm that where practicable, all combustibles are relocated at least 35 feet from the work facility (if hot work is occurring during the audit that allows this to be observed).
12-C-27. Where relocation is impracticable, combustibles are protected with flameproofed covers or otherwise shielded with metal or asbestos guards or curtains.	1910.252 (a)(2)(vii)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Where relocation is impracticable, combustibles are protected with flame-proof covers or otherwise shielded with metal or asbestos guards or curtains. Auditors should conduct field observations to confirm that where relocation is impracticable, combustibles are protected with flame-proof covers or otherwise shielded

Audit Criteria	Source	Guidance for Auditors
		<p>Table 12.1 – Continued</p> <p>with metal or asbestos guards or curtains (if hot work is occurring during the audit that allows this to be observed).</p>
<p>12-C-28. Ducts and conveyor systems that might carry sparks to distant combustibles are suitably protected or shut down.</p>	<p>1910.252 (a)(2)(vii)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Ducts and conveyor systems that might carry sparks to distant combustibles are suitably protected or shut down. • Auditors should conduct field observations to confirm that ducts and conveyor systems that might carry sparks to distant combustibles are suitably protected or shut down (if hot work is occurring during the audit that allows this to be observed).
<p>12-C-29. Where cutting or welding is done near walls, partitions, ceilings or roofs of combustible construction, fire-resistant shields or guards are provided to prevent ignition.</p>	<p>1910.252 (a)(2)(ix)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Where cutting or welding is done near walls, partitions, ceilings or roofs of combustible construction, fire-resistant shields or guards are provided to prevent ignition. • Auditors should conduct field observations to confirm that, where cutting or welding is done near walls, partitions, ceilings or roofs of combustible construction, fire-resistant shields or guards are provided to prevent ignition (if hot work is occurring during the audit that allows this to be observed).
<p>12-C-30. If welding is to be done on a metal wall, partition, ceiling or roof, precautions are taken to prevent ignition of combustibles on the other side due to conduction or radiation, preferably by relocating</p>	<p>1910.252 (a)(2)(x)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the

Audit Criteria	Source	Guidance for Auditors
combustibles.		<p>procedure or the permit: If welding is to be done on a metal wall, partition, ceiling or roof, precautions are taken to prevent ignition of combustibles on the other side due to conduction or radiation, preferably by relocating combustibles.</p> <ul style="list-style-type: none"> Auditors should conduct field observations to confirm that, if welding is to be done on a metal wall, partition, ceiling or roof, precautions are taken to prevent ignition of combustibles on the other side due to conduction or radiation, preferably by relocating combustibles (if hot work is occurring during the audit that allows this to be observed).
12-C-31. If welding is to be done on a metal wall, partition, ceiling, or roof, and combustibles are not relocated, a fire watch on the opposite side from the work is provided.	1910.252 (a)(2)(x)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: If welding is to be done on a metal wall, partition, ceiling, or roof, and combustibles are not relocated, a fire watch on the opposite side from the work is provided. Auditors should conduct field observations to confirm that, if welding is to be done on a metal wall, partition, ceiling, or roof, and combustibles are not relocated, a fire watch on the opposite side from the work is provided (if hot work is occurring during the audit that allows this to be observed).
12-C-32. Welding is not attempted on a metal partition, wall, ceiling or roof having a combustible covering nor on walls or partitions of combustible sandwich-type panel construction.	1910.252 (a)(2)(xi)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Welding is not attempted on a metal partition, wall, ceiling, or roof having a combustible covering nor

Audit Criteria	Source	Guidance for Auditors
		<p>Table 12.1 – Continued</p> <p>on walls or partitions of combustible sandwich-type panel construction.</p> <ul style="list-style-type: none"> Auditors should conduct field observations to confirm that welding is not attempted on a metal partition, wall, ceiling, or roof having a combustible covering nor on walls or partitions of combustible sandwich-type panel construction (if hot work is occurring during the audit that allows this to be observed).
<p>12-C-33. Cutting or welding on pipes or other metal in contact with combustible walls, partitions, ceilings or roofs is not undertaken if the work is close enough to cause ignition by conduction.</p>	<p>1910.252 (a)(2)(xii)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Cutting or welding on pipes or other metal in contact with combustible walls, partitions, ceilings, or roofs is not undertaken if the work is close enough to cause ignition by conduction. Auditors should conduct field observations to confirm that cutting or welding on pipes or other metal in contact with combustible walls, partitions, ceilings, or roofs is not undertaken if the work is close enough to cause ignition by conduction (if hot work is occurring during the audit that allows this to be observed).
<p>12-C-34. Management has established areas for cutting and welding, and has established procedures for cutting and welding in other areas, based on fire potentials of plant facilities.</p>	<p>1910.252(a) (2)(xiii)(A)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Management has established areas for cutting and welding, and has established procedures for cutting and welding in other areas, based on fire potentials of plant facilities.

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"> • Auditors should conduct field observations to confirm that management has established areas for cutting and welding, and has established procedures for cutting and welding in other areas, based on fire potentials of plant facilities. • Auditors should conduct interviews with welders or welding supervisors to confirm that they understand where at the facility hot work can occur with and without a hot work permit.
12-C-35. Management has designated an individual responsible for authorizing cutting and welding operations in areas not specifically designed for such processes.	1910.252(a)(2)(xiii)(B)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Management has designated an individual responsible for authorizing cutting and welding operations in areas not specifically designed for such processes. • Auditors should conduct field observations to confirm that management has designated an individual responsible for authorizing cutting and welding operations in areas not specifically designed for such processes.
12-C-36. Management ensures that cutters or welders and their supervisors are suitably trained in the safe operation of their equipment and safe use of the process.	1910.252(a)(2)(xiii)(C)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Management ensures that cutters or welders and their supervisors are suitably trained in the safe operation of their equipment and safe use of the process. • Auditors should conduct interviews with welders or welding supervisors to confirm that they understand the

Audit Criteria	Source	Guidance for Auditors
		<p>Table 12.1 – Continued</p> <p>provisions of the hot work permit procedure. Auditors may also review training records or welding certifications.</p>
<p>12-C-37. Management advises all contractors about flammable materials or hazardous conditions of which they may not be aware.</p>	<p>1910.252(a)(2)(xiii)(D)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Management advises all contractors about flammable materials or hazardous conditions of which they may not be aware. • Auditors should conduct interviews with contractors to confirm that they understand the hazards they will face during hot work and the provisions of the hot work permit procedure (also see Chapter 14, Contractor Management).
<p>12-C-38. The supervisor is responsible for the safe handling of the cutting or welding equipment and the safe use of the cutting or welding process.</p>	<p>1910.252(a)(xiv)(A)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: The supervisor is responsible for the safe handling of the cutting or welding equipment and the safe use of the cutting or welding process.
<p>12-C-39. The supervisor determines the combustible materials and hazardous areas present or likely to be present in the work location.</p>	<p>1910.252(a)(xiv)(B)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: The supervisor determines the combustible materials and hazardous areas present or likely to be present in the work location. • Auditors should conduct field

Audit Criteria	Source	Guidance for Auditors
		<p>observations to confirm that the supervisor determines the combustible materials and hazardous areas present or likely to be present in the work location (if hot work is occurring during the audit that allows this to be observed).</p>
<p>12-C-40. The supervisor has the work moved to a location free from dangerous combustibles. If the work cannot be moved, the supervisor has the combustibles moved to a safe distance from the work or has the combustibles properly shielded against ignition.</p>	<p>1910.252(a) (2)(xiv)(C) (1)-(2)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: The supervisor has the work moved to a location free from dangerous combustibles. If the work cannot be moved, the supervisor has the combustibles moved to a safe distance from the work or has the combustibles properly shielded against ignition. • Auditors should conduct field observations to confirm that the supervisor has the work moved to a location free from dangerous combustibles. If the work cannot be moved, the supervisor has the combustibles moved to a safe distance from the work or has the combustibles properly shielded against ignition, if appropriate (if hot work is occurring during the audit that allows this to be observed).
<p>12-C-41. The supervisor sees that cutting and welding are so scheduled that plant operations that might expose combustibles to ignition are not started during cutting or welding.</p>	<p>1910.252(a) (2)(xiv)(C)(3)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: The supervisor sees that cutting and welding are so scheduled that plant operations that might expose combustibles to ignition are not started during cutting or welding. • Auditors should conduct field observations to confirm that the

Audit Criteria	Source	Guidance for Auditors
		<p>Table 12.1 – Continued</p> <p>supervisor sees that cutting and welding are so scheduled that plant operations that might expose combustibles to ignition are not started during cutting or welding, if appropriate (if hot work is occurring during the audit that allows this to be observed).</p>
<p>12-C-42. The supervisor secures authorization for the cutting or welding operations from the designated management representative.</p>	<p>1910.252(a)(2)(xiv)(D)</p>	<p>Auditor Activities:</p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: The supervisor secures authorization for the cutting or welding operations from the designated management representative. • Auditors should conduct field observations of active and completed permits indicate that the supervisor secures authorization for the cutting or welding operations from the designated management representative.
<p>12-C-43. The supervisor determines that the cutter or welder secures his approval that conditions are safe before going ahead.</p>	<p>1910.252(a)(2)(xiv)(E)</p>	<p>Auditor Activities:</p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: The supervisor determines that the cutter or welder secures his approval that conditions are safe before going ahead. • Auditors should conduct field observations to confirm that the supervisor determines that the cutter or welder secures his approval that conditions are safe before going ahead (if hot work is occurring during the audit that allows this to be observed).

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12-C-44. The supervisor determines that fire protection and extinguishing equipment are properly located at the facility.	1910.252(a) (2)(xiv)(F)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: The supervisor determines that fire protection and extinguishing equipment are properly located at the facility. • Auditors should conduct field observations to confirm that the supervisor determines that fire protection and extinguishing equipment are properly located at the facility (if hot work is occurring during the audit that allows this to be observed).
12-C-45. The supervisor, where fire watches are required, sees that they are available at the facility.	1910.252(a) (2)(xiv)(G)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: The supervisor, where fire watches are required, sees that they are available at the facility. • Auditors should conduct field observations to confirm that the supervisor, where fire watches are required, sees that they are available at the facility (if hot work is occurring during the audit that allows this to be observed).
12-C-46. Cutting or welding is permitted only in areas that are or have been made fire safe.	1910.252(a) (2)(xv)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Cutting or welding is permitted only in areas that are or have been made fire safe. • Auditors should conduct field observations to confirm that cutting or welding is permitted only in areas that are or have

Audit Criteria	Source	Guidance for Auditors
		<p>Table 12.1 – Continued</p> <p>been made fire safe (if hot work is occurring during the audit that allows this to be observed).</p>
<p>12-C-47. When work cannot be moved practically, as in most construction work, the area is made safe by removing combustibles or protecting combustibles from ignition sources.</p>	<p>1910.252(a) (2)(xv)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: When work cannot be moved practically, as in most construction work, the area is made safe by removing combustibles or protecting combustibles from ignition sources. • Auditors should conduct field observations to confirm that when work cannot be moved practically, as in most construction work, the area is made safe by removing combustibles or protecting combustibles from ignition sources (if hot work is occurring during the audit that allows this to be observed).
<p>12-C-48. No welding, cutting, or other hot work is performed on used drums, barrels, tanks or other containers until they have been cleaned so thoroughly as to make absolutely certain that there are:</p> <ul style="list-style-type: none"> • No flammable materials present or any substances such as greases, tars, acids, or other materials which when subjected to heat, might produce flammable or toxic vapors. • Any pipe lines or connections to the drum or vessel are disconnected or blanked. • All hollow spaces, cavities or containers are vented to permit the escape of air or gases before preheating, cutting or welding. • Containers are purged with inert gas (recommended). 	<p>1910.252(a) (3)(i)–(ii)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: No welding, cutting, or other hot work is performed on used drums, barrels, tanks or other containers until they have been cleaned so thoroughly as to make absolutely certain that there are: <ul style="list-style-type: none"> – No flammable materials present or any substances such as greases, tars, acids, or other materials which when subjected to heat, might produce flammable or toxic vapors. – Any pipe lines or connections to the drum or vessel are disconnected or blanked. – All hollow spaces, cavities or containers are vented to permit

Audit Criteria	Source	Guidance for Auditors
		<p>the escape of air or gases before preheating, cutting or welding.</p> <ul style="list-style-type: none"> - Containers are purged with inert gas (recommended). • Auditors should conduct field observations to confirm that welding, cutting, or other hot work is performed on used drums, barrels, tanks or other containers only after the appropriate precautions regarding cleaning, venting, and purging have been observed (if hot work is occurring during the audit that allows this to be observed).
<p>12-C-49. When arc welding is to be suspended for any substantial period of time, such as during lunch or overnight, all electrodes are removed from the holders and the holders carefully located so that accidental contact cannot occur and the machine is disconnected from the power source.</p>	<p>1910.252(a) (4)(i)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: When arc welding is to be suspended for any substantial period of time, such as during lunch or overnight, all electrodes are removed from the holders and the holders carefully located so that accidental contact cannot occur and the machine is disconnected from the power source. • Auditors should conduct field observations to confirm that when arc welding is to be suspended for any substantial period of time, such as during lunch or overnight, all electrodes are removed from the holders and the holders carefully located so that accidental contact cannot occur and the machine is disconnected from the power source (if hot work is occurring during the audit that allows this to be observed).
<p>12-C-50. In order to eliminate the possibility of gas escaping through leaks or improperly closed valves, when gas welding or cutting, torch valves are closed and the gas supply</p>	<p>1910.252(a) (4)(ii)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the HWP form to confirm that the following 1910.252(a) fire

Audit Criteria	Source	Guidance for Auditors
<p>Table 12.1 – Continued</p> <p>to the torch positively shut off at some point outside the confined area whenever the torch is not to be used for a substantial period of time, such as during lunch hour or overnight. Where practicable, the torch and hose are removed from the confined space.</p>		<p>Table 12.1 – Continued</p> <p>protection provision is included in either the procedure or the permit: In order to eliminate the possibility of gas escaping through leaks or improperly closed valves, when gas welding or cutting, torch valves are closed and the gas supply to the torch positively shut off at some point outside the confined area whenever the torch is not to be used for a substantial period of time, such as during lunch hour or overnight. Where practicable, the torch and hose are removed from the confined space.</p> <ul style="list-style-type: none"> • Auditors should conduct field observations to confirm that in order to eliminate the possibility of gas escaping through leaks or improperly closed valves, when gas welding or cutting, torch valves are closed and the gas supply to the torch positively shut off at some point outside the confined area whenever the torch is not to be used for a substantial period of time, such as during lunch hour or overnight. Where practicable, the torch and hose are removed from the confined space (if hot work is occurring during the audit that allows this to be observed).
<p>12-C-51. Hot work permits have been kept on file until completion of the hot work operations.</p>	<p>PSM 1910.119 (k)(2) RMP 68.85</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the HWP procedure and/or the completed HWP forms to confirm that the following 1910.252(a) fire protection provision is included in either the procedure or the permit: Hot work permits have been kept on file until completion of the hot work operations. • Auditors should conduct field observations to confirm hot work permits have been kept on file until completion of the hot work observations (if hot work is occurring during the audit that

Audit Criteria	Source	Guidance for Auditors
		allows this to be observed).
<i>The following criteria are from the Operating Procedures element of the PSM Standard but are included because they relate more to Safe Work Practices than to Operating Procedures.</i>		
12-C-52. The employer shall develop and implement safe work practices to provide for the control of hazards during operations such as lockout/tagout; confined space entry; opening process equipment or piping.	PSM (f)(4) RMP 68.69	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Unless the purpose, scope, and objectives of the PSM audit have been extended to include a detailed audit of the contents and implementation of the lockout/tagout LO/TO, confined space, and line/equipment opening SWPs, only the existence of the SWP is usually checked. Detailed reviews of these SWPs are usually included in the scope of general safety and health audits. In some cases, the SWPs are embedded in another SWP such as a general work permit SWP. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the safe work practices (SWP) to determine if lockout/tagout (LO/TO), confined space entry, and line/equipment opening SWPs exist. A SWP generally includes a permit process. Auditors should conduct field observations to determine if the LO/TO, confined space entry, and line/equipment opening SWPs have been implemented. Auditors should ensure that evidence that the permits are issued and followed exists.
12-C-53. The employer shall develop and implement safe work practices to provide for the control over entrance into a facility by maintenance, contractor, laboratory, or other support personnel.	PSM (f)(4) RMP 68.69	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> A SWP should exist for controlling the entry and egress of employees who are not directly assigned to work in a manufacturing unit. This process is used to support emergency response headcount procedures, to properly maintain control of the process, and to help ensure the safety of nonoperators if a known safety risk were present or if the unit was conducting a

Audit Criteria	Source	Guidance for Auditors
		<p>particularly hazardous operation such as start-up, venting or clean-up of hazardous materials, or lifting of heavy equipment.</p> <ul style="list-style-type: none"> • This SWP should be applied to all employees who are not directly assigned to work in a manufacturing unit, including facility/company maintenance, engineering, and management personnel. • The control of process entry can be accomplished with a hard-copy or electronic log, a whiteboard that shows who has entered the process, electronic access card, or another method (more than one method may be used). Many facilities establish the control point as the control room or another location where field operators are stationed. However, the control point may be in any site location that is convenient. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should ascertain that a SWP exists for controlling the entry and egress of employees who are not directly assigned to work in a process area as an operator, and that the SWP is applied to all nonoperator personnel at the facility, including management, engineering, lab, and other facility personnel.
12-C-54. These safe work practices shall apply to employees and contractor employees.	PSM (f)(4) RMP 68.69	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the SWPs to determine if contractors fall within the scope and/or application of the SWPs. • Auditors should review the actual SWP implementation documents (i.e., the permits) to determine if they have been applied for contractor work on-site.

12.2.1.1 U.S. State PSM Programs

If the PSM program being evaluated is pursuant to a state PSM regulation, then the specific process safety knowledge requirements for that regulatory program should be followed. In general, these overlap somewhat with the federal OSHA PSM and EPA RMP requirements, but often there are state-specific requirements that should be met, even if the state has received authority to enforce federal regulations (i.e., the state is an OSHA state plan state, or has received implementing agency status for the RMP Rule from EPA). The state-specific applicability requirements for the following states are presented below:

- New Jersey
- California
- Delaware

Table 12.2 shows the audit criteria and auditor guidance for SWPs pursuant to U.S. state requirements.

Table 12.2 U.S. State PSM Audit Criteria and Guidance for Auditors - Safe Work Practices

Audit Criteria	Source	Guidance for Auditors
<p><i>New Jersey Toxic Catastrophe Prevention Act (TCPA)</i> 12-C-55. The New Jersey TCPA regulations do not add any different or unique safe work practices requirements beyond those established in the federal PSM Standard and RMP Rule.</p>	<p>N.J.A.C. 7:31-4.3</p>	<ul style="list-style-type: none"> • No further guidance.
<p><i>Delaware Accidental Release Prevention Regulation</i> 12-C-56. The Delaware EHS regulations do not add any different or unique safe work practices requirements beyond those established in the federal PSM Standard and RMP Rule.</p>	<p>Delaware Code, Chapter 77, Section 5.69</p>	<ul style="list-style-type: none"> • No further guidance.
<p><i>California OSHA—Process Safety Management of Acutely Hazardous Materials</i> 12-C-57. The Cal OSHA regulations do not add any different or unique safe work practice requirements beyond those established in the federal PSM Standard and RMP Rule.</p>	<p>California Code of Regulations, Title 8, Section 5189</p>	<ul style="list-style-type: none"> • No further guidance.
<p><i>California Accidental Release Prevention Program</i> 12-C-58. The CalARP regulations do not add any different or unique safe work practice requirements beyond</p>	<p>California Code of Regulations, Title 19, Section</p>	<ul style="list-style-type: none"> • No further guidance.

Audit Criteria	Source	Guidance for Auditors
those established in the federal PSM Standard and RMP Rule.	2760.3	

12.2.2 Related Criteria

The purpose of providing these criteria is to provide auditors with additional guidance for evaluating PSM programs with respect to issues that go beyond the strict compliance requirements presented above, and in large part represent industry good practices in process safety knowledge, or in some cases practices in process safety knowledge that have become common. Some of the related criteria have reached the status of a level of acceptable practice because of their widespread, accepted, and successful use over an extended period of time. Auditors and PSM practitioners should carefully consider implementing this guidance, or at least designing an approach that is similar in nature. See the Glossary and Section 1.7.1 for a more complete discussion of the meaning and use of level of acceptable practice.

Table 12.3 identifies audit criteria and auditor guidance for related criteria relating to hot work permits.

Table 12.3 Related Audit Criteria and Auditor Guidance - Hot Work Permits

Audit Criteria	Source	Guidance for Auditors
12-R-1. There is a written management system procedure for controlling hot work.	GIP CPL RBPS	<p><u>Auditor Activities:</u></p> <p>Auditors should review the hot work procedure to confirm that it addresses the following issues:</p> <ul style="list-style-type: none"> • Provides a definition of hot work (i.e., any spark producing operation, including welding, brazing, grinding, burning, exposure of energized electrical conductors, etc.). • Requires a hot work permit to be issued for hot work operations conducted on or near a covered process. • Defines exceptions to the policy, with examples. • Defines when and how the permit is to be completed. • Designates the level of authority/responsibility for approval of permit. • Describes the training of persons designated as qualified to prepare permits in the permit issuance procedures.

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"> • Describes the training of fire watches. • Includes requirement for performing flammable gas testing prior to initiation of hot work. • Includes requirements for testing and ensuring proper calibration of instruments for performing flammable gas measurements. • Describes the training of personnel authorized to perform gas tests for permitting purposes. • Includes requirements for suspending permits when appropriate (e.g., during emergencies). • Describes the authorization requirements, including a requirement to re-issue the permit following a suspension due to an emergency alarm. • Establishes the maximum duration authorized for a permit. • Provides direction on the posting (i.e., locations) of permits during the hot work job. • Describes notification requirements so that operating personnel are aware of where work could affect the safety of the process. • Describes required periodic inspection requirements when the HWP is in effect. • Describes the steps to be followed once the hot work is complete to provide closure of the HWP. • Describes the HWP retention requirements beyond the completion of the hot work to satisfy audit requirements, training, HWP procedure updates, etc. • Provides an example of a permit form and an explanation of how each block/field is completed. • Requires periodic retesting for flammable atmospheres, if appropriate. • On completion of hot work, specifies steps to be followed to provide closure for those who need to know the job is completed

Audit Criteria	Source	Guidance for Auditors
		<p>Table 12.3 - Continued and that equipment can be returned to normal includes, if appropriate, exceptions to the policy such as the following:</p> <ul style="list-style-type: none"> ▪ Work performed in a maintenance shop after equipment has been properly decontaminated. ▪ Hot work performed in designated welding areas. ▪ When flammable or combustible materials are not present (e.g., during a shutdown). <ul style="list-style-type: none"> • Describes the training on gas testing equipment. The training should be specific to the type of equipment used and should include field testing, calibration and proper use of the equipment, and the records of calibration. The HWP procedure can refer to the procedure that controls this activity. • Describes the periodic inspection requirements include retesting • for the presence of combustible or flammable gases. Continuous gas monitoring provides the best means to detect this hazard so that hot work can be stopped to prevent ignition. • The auditor should review the written HWP management system policies, procedures, and plans to confirm that they include the following elements: <ul style="list-style-type: none"> – Clearly defined responsibilities. – An adequate system of authorizations that reflects the criticality of the tasks and activities. – Capable personnel throughout the organization (i.e., adequate training for hot work activities, including inspection of areas and completion of permits).

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"> - Division of duties to avoid organizational conflicts of interest to establish the necessary checks and balances as appropriate. - Documentation of the activities. - Internal verification that activities are being carried out in accordance with the management system procedures. - Management review activities that provide a closure of the feedback loop by adjusting the program requirements by carefully reviewing the verification activity results.
<p>12-R-2. The hot work permit documents the following prior to beginning the hot work operations:</p> <ul style="list-style-type: none"> • Specifies the effective date with start and stop times. • Specifies any required PPE. • Signatures of the person completing the form and the person approving the permit. 	<p>GIP CPL</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The individual completing the form (and attesting to the safety measures in place) should be different than the one approving the permit. The approvers should satisfy themselves that appropriate safety measures have been taken and approve any exceptions to the established safe work practice. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that the HWP specifies the effective date with start and stop times and any required PPE. • Auditors should confirm that the individual completing the HWP form (and attesting to the safety measures in place) should be different than the one approving the permit.
<p>12-R-3. A flammable gas test is performed prior to initiation of hot work if the supervisor determines that such a test is necessary, and that periodic re-testing is performed when appropriate and as described in the HWP procedure.</p>	<p>GIP</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct field observations of active and completed permits to confirm that flammable gas tests are performed and the results documented when the supervisor determines that such tests are necessary.

Audit Criteria	Source	Guidance for Auditors
12-R-4. Testing instruments for performing flammable gas measurements are correctly calibrated	GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should review the procedures for calibrating flammable gas testing instruments, records of such calibration tests (e.g., calibration stickers on portable gas detectors), and interview those who calibrate such instruments to confirm that flammable gas testing instruments are correctly calibrated.
12-R-5. Hot work permits are suspended when appropriate.	GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should conduct field observations of active and completed permits to confirm that they have been suspended as described in the HWP procedure.
12-R-6. Completed hot work permits are kept long enough to provide adequate documentation to support PSM audits.	WCLAR (7/12/06)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Completed permits should be maintained for a period of time that allows facility personnel to internally review them and identify deficiencies or patterns in how they are completed, and for a period of time that allows PSM audits to be performed. This is generally at least a month following completion of the work, but generally not longer than a year, and some period in between.
12-R-7. The employer audits hot work permits to assure the procedure/practice is being followed per the employer's requirements.	NEP	<u>Background Information for Auditors:</u> <ul style="list-style-type: none"> Auditors should check if the facility audits hot work permits often enough to ensure that the procedures and practices are being followed.

Table 12.4 presents audit criteria and auditor guidance for related criteria for other SWPs.

Table 12.4 Related Audit Criteria and Guidance for Auditors - Other Safe Work Practices

Audit Criteria	Source	Guidance for Auditors
12-R-8. A general work permit program is in place.	GIP	<u>Background Information for Auditors:</u> <ul style="list-style-type: none"> A general work permit or safe work permit can be used as a

Audit Criteria	Source	Guidance for Auditors
		<p>hazard analysis tool for all nonroutine work, including maintenance and construction. This is also a mechanism to facilitate communication between work groups, particularly operations and maintenance/construction.</p> <ul style="list-style-type: none"> • A general work permit may incorporate provisions for hot work, lockout/tagout, confined space entry, opening process equipment, and other safe work practices. In other cases, it identifies the need for separate permit(s) to cover the hazards. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that a general work permit process is in place, or is included in another SWP.
<p>12-R-9. A vehicle use and use of other ignition sources in covered process areas (except cutting, welding and brazing) program is in place.</p>	<p>GIP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Use of spark- or heat-producing equipment other than cutting, welding, brazing, and other work involving open flames or sparks in electrically classified areas should be covered by a safe work permit (may be part of hot work permit system). • At a minimum, combustible gas testing should be conducted for such operations to ensure that a hazardous atmosphere does not exist. • 29 CFR §1910.178, Powered Industrial Trucks includes requirements for the use of forklifts in hazardous areas. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that a vehicle use SWP is in place, or is included in another SWP.
<p>12-R-10. An excavation permit program is in place in and around process areas.</p>	<p>GIP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Excavation safety is addressed in 29 CFR §1926 Subpart P, which is designed primarily to prevent personnel injury due to excavation collapse. • An excavation safety program should include measures to identify underground piping and

Audit Criteria	Source	Guidance for Auditors
		<p>Table 12.4 – Continued equipment and take appropriate measures to prevent inadvertent contact by excavation equipment that could cause damage and release.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that an excavation SWP is in place or is included in another SWP.
12-R-11. A pressurized gas cylinders storage, movement, and use permit program is in place.	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • OSHA requirements for handling compressed gas cylinders are found in 29 CFR §1910.101. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that a pressurized gas cylinders storage, movement, and use SWP is in place or is included in another SWP.
12-R-12. A safety feature bypass or removal from service procedure or permit program is in place.	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Removal of safety devices from service (generally done temporarily) should be managed to ensure prompt restoration and safety while the device is out of service. This may be addressed in the MOC program. See also Chapter 13, Asset Integrity & Reliability and Chapter 16, MOC. • Applicable safety devices are alarms, interlocks, shutdown systems, pressure relief systems, or other design features that are designed to detect, prevent, or mitigate a hazard scenario and are so identified in HIRAs. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that a safety feature bypass or removal SWP is in place or is included in another SWP or procedure.
12-R-13. An electrical/high voltage safety permit program is in place.	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • OSHA requirements for electrical safe work practices are addressed in 29 CFR §1910 Subpart S.

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"> NFPA 70E includes requirements for electrical work practices. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should confirm that an electrical/high voltage safety SWP is in place or is included in another SWP.
12-R-14. A fire protection system impairment permit program is in place.	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Impairment of fire protection systems, like other safety devices, require proper management and communication to ensure prompt return to service and to ensure safety while the system is out of service. This may be addressed in the MOC program. This applies to any part of the fire protection system, including fire pumps, fire water reservoirs, fire mains, and fixed firefighting systems. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should confirm that a fire protection system impairment SWP is in place or is included in another SWP.
12-R-17. A permit program for elevated work/fall protection is in place.	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> OSHA requirements for fall protection are addressed in 29 CFR §1926 Subpart M (construction standards). <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should confirm that a elevated work/fall protection SWP is in place or is included in another SWP.
12-R-18. A permit program for roof access is in place.	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Fall protection from roofs is addressed in 29 CFR §1910.26 Subpart M. A permit system may be in use to control access to roofs where vent stacks and associated hazardous emissions (either routine or nonroutine) can expose personnel. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should confirm that a

Audit Criteria	Source	Guidance for Auditors
		<p>Table 12.4 – Continued</p> <p>roof access SWP is in place or is included in another SWP.</p>
12-R-19. A permit program for hot tapping of lines and equipment is in place.	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • API RP 2201, Safe Hot Tapping Practices in the Petroleum & Petrochemical Industries provides recommended industry practice for hot tapping. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that a roof access SWP is in place or is included in another SWP.
12-R-20. A permit program for the use of explosives/blasting agents is in place.	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • OSHA general industry requirements for use of explosives and blasting agents are addressed in 29 CFR §1910.109. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that a SWP is in place for the use of explosives/blasting agents or is included in another SWP.
12-R-21. A permit program for lifting over process equipment is in place.	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • OSHA requirements for operation and maintenance of cranes and hoists are addressed in 29 CFR §1926.179 (construction standards). • Although requirements for safe operation of cranes are designed to prevent their failure or nonoperation, good risk management procedures would also call for consideration of shutting down and evacuating process systems over which critical lifts are being made. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that a lifting SWP is in place or is included in another SWP.
12-R-22. A permit program for hydroblasting is in place.	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Good industry practices are established for hydroblast cleaning of equipment, primarily for personnel safety. <p><u>Auditor Activities:</u></p>

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"> Auditors should confirm that a hydroblasting SWP is in place or is included in another SWP.
12-R-23. A permit program for the use of powered aerial platforms is in place.	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> OSHA general industry requirements for use of vehicle-mounted elevating and rotating work platforms can be found in 29 CFR §1910.67. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should confirm that a SWP is in place for the use of powered aerial platforms or is included in another SWP.
12-R-24. A permit program for scaffold use is in place.	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> OSHA general industry requirements for scaffolding are addressed in 29 CFR §1910.28, as well as 29 CFR §1926 Subpart L (construction standards). <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should confirm that a SWP is in place for the use of scaffolding or is included in another SWP.
12-R-25. Safe work practices for activities where hazards may be introduced are provided as necessary and appropriate (other than LO/TO, confined space entry, hot work permits, and line opening/breaking).	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> SWPs are provided for facility operations and activities where occupational and process safety hazards can be introduced. Examples include (as appropriate): <ul style="list-style-type: none"> General work permit. Vehicle use. Excavation. Storage, movement, and use of pressurized gas cylinders. Bypass or removal from service of a safety feature. Electrical/high voltage safety. See Chapter 11 for more guidance on other SWPs that might be appropriate. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the facility safety manual or other documents to determine which facility activities warrant a SWP

Audit Criteria	Source	Guidance for Auditors
		Table 12.4 – Continued and if they have been provided.
12-R-26. Shift turnover is a formal process where certain information is exchanged between operators just ending their shift and those just starting their shift about plant, unit, and equipment status.	GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should conduct observations of shift turnover to determine the following: • The turnover is conducted in the workspace of the personnel involved. • The oncoming shift carefully reviews any operations or activities that are ongoing and should be continued or completed by the oncoming shift and any abnormal conditions. • The turnover includes a log or list of activities that are ongoing or were completed during the previous shift. • The turnover is documented in a log or similar record (which can be electronic or hard copy).
12-R-27. Operating logs, where used, should provide an immediate indication that the process is not operating properly.	GIP	<u>Background Information for Auditors:</u> <ul style="list-style-type: none"> • Operating logs should include the acceptable range of values for each recorded parameter, not just the actual value. • Hand-held electronic devices employed to record and transmit operating parameters using wireless technology to a logging system are acceptable. Note that these devices can also be used to record maintenance-related data such as go/no-go vibration readings. <u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review operating logs to determine if they are completed in full and reviewed by supervisory personnel.

12.2.3 Voluntary Consensus PSM Programs

The following voluntary consensus PSM program requirements for safe work practices are described below:

- The requirements published for the offshore oil platform sector in the Safety and Environmental Management Program (SEMP), a voluntary program designed by API and endorsed by the Minerals Management Service of the U.S. Department of the Interior.
- Responsible Care Management System (RCMS)[®] published by the American Chemistry Council.
- RC14001 Environmental Management System, published by the American Chemistry Council.

Table 12.5 lists audit criteria and auditor guidance relating to SWPs pursuant to voluntary consensus PSM programs.

Table 12.5 Voluntary Consensus PSM Program Audit Criteria and Guidance for Auditors - Safe Work Practices

Audit Criteria	Source	Guidance for Auditors
<p><i>SEMP</i></p> <p>12-R-25. The safe work practices specifically cover crane operations.</p>	<p>RP 75, 6.2</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • OSHA requirements for operation and maintenance of cranes and hoists are addressed in 29 CFR §1926.179 (construction standards). <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that a SWP for crane operations is in place.
<p>12-R-26. A work authorization system is implemented for the following tasks:</p> <ul style="list-style-type: none"> • opening of equipment and piping • lockout and tagout of electrical and mechanical energy sources • hot work and other work involving ignition sources • confined space entry • crane operations 	<p>RP 75, 6.2</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • In addition to safe work practices required by the federal PSM Standard and RMP Rule, the SEMP explicitly calls for a work authorization (i.e., permit) system. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that a work authorization permit process is in place.
<p>12-R-27. The work authorization system provides for adequate communication of these activities, including unfinished work, to shift change and replacement personnel.</p>	<p>RP 75, 6.2</p>	<ul style="list-style-type: none"> • No further guidance
<p>12-R-28. The management program contains provisions for updating the safe work practices to meet the most current applicable federal, state, or local regulations.</p>	<p>RP 75, 6.2</p>	<ul style="list-style-type: none"> • No further guidance
<p>12-R-29. There is a process in place for hazardous material communication and management that conforms to regulatory requirements.</p>	<p>RP 75, 6.3</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • This relates to the facility's hazard communication program (HCP), which is required by OSHA under 29 CFR §1910.1200. <p><u>Auditor Activities:</u></p>

		<ul style="list-style-type: none"> Auditors should confirm that a HAZCOM process is in place.
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Audit Criteria	Source	Guidance for Auditors
Responsible Care[®] Management System (RCMS) 12-R-30. No additional Safe Work Practice provisions are included in the RCMS program.	No corresponding element exists in the RCMS Technical Specification	<ul style="list-style-type: none"> No further guidance

Audit Criteria	Source	Guidance for Auditors
RC14001 12-R-31. No additional safe work practice provisions are included in the RC14001 program.	No corresponding element exists in the RC14001 Technical Specification	<ul style="list-style-type: none"> No further guidance.

12.3 AUDIT PROTOCOL

The process safety program audit protocol introduced in Appendix A and available online (see page xiv for information on how to access this resource) provides detailed questions that examine the issues described in Section 12.2.

REFERENCES

- American Chemistry Council, *RCMS[®] Technical Specification*, RC101.02, March 9, 2005
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13

ASSET INTEGRITY AND RELIABILITY

This element is called Mechanical Integrity in OSHA PSM and EPA RMP programs. In many state regulatory PSM programs it is also called Mechanical Integrity, although in some programs it is called Maintenance, or is referred to using variations of this term. In the voluntary consensus PSM programs it is generally referred to as Maintenance or Inspection and Testing. Asset Integrity and Reliability is an element of the RBPS accident prevention pillar Manage Risk.

13.1 OVERVIEW

The Asset Integrity and Reliability element (asset integrity or AI) involves the systematic implementation of activities necessary to ensure that important equipment will be suitable for its intended application throughout its life. Specifically, work activities related to this element focus on (1) preventing a catastrophic release of a hazardous material or a sudden release of energy and (2) ensuring high availability (or dependability) of critical safety or utility systems that prevent or mitigate the effects of these types of events (CCPS, 2007c). This element of a process safety program spans the entire life cycle of the facility equipment—from preliminary design to decommissioning—and encompasses a wide range of facility activities and responsibilities. This element includes, but is not limited to, inspection, testing, and preventive maintenance (ITPM), and it is not the sole responsibility of maintenance. Typically, asset integrity activities are performed by a broad spectrum of facility groups, departments, and individuals. Typical responsibilities include but are not limited to maintenance (ITPM, repairs, practical training of maintenance personnel), engineering (project design, construction, and management; developing standards for equipment design, installation and start-up), safety (certain types of training of maintenance personnel), purchasing (project materials and spare parts management), operations (implementation of safe work permits and preparation for maintenance, bypass/removal of safety features, reporting equipment operational problems or failures, and in some facilities day-to-day maintenance tasks such as lubrication or

vibration monitoring), and document control (issuance and maintenance of procedures).

Asset integrity is one of the more difficult process safety program elements to successfully implement. All process safety regulatory and voluntary consensus programs are performance-based; however, these programs generally present their asset integrity requirements in very broad and hard-to-interpret language. The following two examples illustrate this issue:

Example #1. In the OSHA PSM Standard and EPA RMP Rule, the regulations state: “Inspection and testing procedures shall follow recognized and generally accepted good engineering practices.” Interpreting that simple and broad statement into specific ITPM tasks and frequencies for each piece of equipment included in the asset integrity program is a daunting task for some facilities. To accomplish what is required by this provision of the regulations, the following questions should be resolved:

- What are the relevant recognized and generally accepted good engineering practices (RAGAGEPs) for the type of equipment under consideration?
- What if there are multiple RAGAGEPs that apply to the type of equipment under consideration?
- What is the hierarchy of RAGAGEPs if there are multiple ones that apply? Which one takes precedence?
- What if there are no published RAGAGEPs that apply to the type of equipment under consideration?
- Can the equipment history for the type of equipment under consideration at the facility serve as a RAGAGEP? If so, what documentation is needed to do this?
- What if the manufacturer makes no recommendation with respect to ITPM tasks or frequencies (the PSM Standard specifically points to the manufacturer as the source for ITPM frequency data, and also directs that more frequent ITPM be performed if the equipment history warrants it)?
- Can the frequency be extended beyond the manufacturer’s recommendation if there is a clearly documented equipment history of sufficient length and detail to support the extension?
- Does the basis for selecting the ITPM tasks and frequencies have to be documented?

Example #2. The OSHA PSM Standard and EPA RMP Rule state: “The employer shall train each employee involved in maintaining the ongoing integrity of process equipment . . . in the procedures applicable to the employee’s job tasks to assure that the employee can perform the job tasks in a safe manner.” The auditor should think about how the facility addresses the following issues:

- Which employees are involved in the ongoing maintenance of process equipment?
- What are the procedures applicable to the employee’s job tasks?
- Does the training on these procedures merely consist of the basic maintenance training program, or is additional/specialized training required?
- What craft skills are required to understand and use the maintenance procedures?
- Where do these craft skills come from?
- Does “training” in this context also include “qualification”?
- What, if any, outside or separate certifications of training or qualification are required to perform asset integrity activities?
- What, if any, outside or separate certifications of training or qualification can be used to waive specific training or qualification requirements at a facility?

For the most part, the remainder of the asset integrity requirements, both in regulatory and voluntary consensus process safety programs, require the same level of interpretation and clarification in order to 1) provide written guidance to perform the required activities, 2) assign responsibilities for these activities, and 3) implement them on an ongoing basis consistently. The other elements of process safety programs also require significant interpretation, but the Asset Integrity element requires a significantly greater level of interpretation. The CCPS books, *Guidelines for Mechanical Integrity Systems*, and *Guidelines for Risk Based Process Safety*, provide more detailed guidance on interpreting the requirements associated with asset integrity.

Another important issue that should be successfully resolved: What equipment should be included in the AI program? Although the relevant process safety regulations provide guidance on the basic equipment types that must be included (see Section 13.2.1.5), the results of HIRAs, as well as other applicable analytical activities (e.g., QRAs, LOPAs), should be reconciled with the list of AI-covered equipment to ensure that equipment critical to process safety has been included in the program. An examination of the causes and safeguards identified during these studies may likely identify additional equipment not explicitly listed in the applicable regulations to be included in the AI program. See Section 13.2.1.5 for additional guidance for selecting equipment for inclusion in the AI program based on its contribution to the risk.

The AI element interfaces significantly with other PSM program elements. The primary interfaces with other elements include the following:

- Process Knowledge Management (Chapter 9)—knowledge/information is a primary planning tool for the AI program, particularly in the selection of the inspection, testing, and preventive maintenance (ITPM) program tasks and frequencies.

- Hazard Identification and Risk Analysis (Chapter 10)—the selection of equipment to be included in the AI program should rely on the identification during HIRAs of the equipment whose failure could contribute to a process safety incident, or the equipment that serves as a safeguard against (i.e., to prevent or mitigate) such incidents, in addition to equipment that may be required to be in the AI program by the governing regulations.
- Contractor Management (Chapter 14)—contractors perform much of the work in the AI program, including ITPM, project, installation activities, and others.
- Safe Work Practices (Chapter 12)—SWPs are necessary to execute much of the work in the AI program, including ITPM, corrective maintenance, and project work, e.g., hot work permits.
- MOC (Chapter 16)—managing AI deficiencies requires the use of MOC, as does the implementation of engineered projects, and MOC should also be used to manage changes to inspection, testing, and preventive maintenance frequencies and procedures.
- Operational Readiness (Chapter 17)—verifying equipment was installed according to plan, standards, etc. before start-up.
- Emergency Management (Chapter 19)—equipment relied upon in the emergency response plan should be maintained as part of the AI program.

In Sections 13.2 and 13.3, compliance and related audit criteria are presented, along with guidance for auditors in applying the criteria. A full explanation of compliance and related audit criteria are presented in Chapter 1 (see Section 1.7). The criteria and guidance described in these sections do not represent exclusive solutions to PSM program coverage, design, implementation, or interpretation. They represent the collective experience of many people in the chemical/processing sector who have performed many PSM audits, and the consensus opinion resulting from that experience. The compliance criteria are derived from the regulations that govern PSM programs in the United States; however, these regulations are all performance-based. Performance-based regulations are goal oriented and there may be multiple pathways to fully complying with them. Therefore, there may be alternate interpretations and solutions to the issues described in the compliance tables in this chapter that are equivalent to those included, particularly the auditor guidance presented.

The inclusion of the related criteria in no way infers that these criteria must be implemented for a PSM program to be successful, nor does it infer that a PSM program will be deficient without them. As with the compliance criteria, there may be other, more appropriate solutions for an individual facility or company. In addition, the use of the related criteria in a PSM audit is intended to be completely voluntary and not a mandatory requirement in any way. They should be used cautiously and with careful planning so that they do not inadvertently establish unintended performance standards. Consensus should be sought within and among facilities and their parent companies before these criteria are used. Finally, the

related criteria and guidance offered for consideration are not endorsements of or agreements with the written or verbal clarifications made by the regulators, PSM citations issued against the regulations, other PSM guidance published by the regulators, or the successful or common PSM practices in any given company's PSM program from which they are derived.

13.2 AUDIT CRITERIA AND GUIDANCE

The Asset Integrity element under the OSHA PSM Standard and EPA RMP Rule is called mechanical integrity, and it includes several of the sub-elements that are discussed in detail in this chapter. If the facility/company has Asset Integrity procedures that specify requirements in addition to those shown in the following tables, or if their Asset Integrity procedures include requirements that are described in this book as related items, those requirements should be treated as compliance criteria for the purposes of auditing them. If the facility/company specifies a certain provision in its own procedures that is above and beyond what the regulations require, the regulators will treat them as compliance requirements and can issue citations to the company if those requirements are not being followed. AI programs are described in more detail in the CCPS book *Guidelines for Mechanical Integrity Systems* (CCPS, 2006).

Auditors should also carefully examine the AI requirements found in the procedures of the company/facility being audited. As stated in Section 1.7.1, these could be interpreted as compliance requirements by regulators and could be subject to citations if they are not being followed. Auditors should confirm, via interviews, records and document reviews, and field observations, that the requirements of the facility or company AI procedures have been implemented as specified. Findings should be generated if the company/facility-specific provisions are not being followed.

See the Guidance for Chapters 3–24 in the Introduction for the definition of the abbreviations shown in the following tables that are used to indicate the source of the criteria.

13.2.1 Compliance Requirements

There are a few compliance issues in the Asset Integrity program that overlap with the Process Knowledge Management element (also called Process Safety Knowledge or PSK). In OSHA's PSM Standard, there are several provisions in the PSK element that impose the same requirements. These provisions include the following:

- Section 1910.119(d)(3)(ii): "The employer shall document that equipment complies with recognized and generally accepted good engineering practices."
- Section 1910.119(d)(3)(iii): "For existing equipment designed and constructed in accordance with codes, standards, or practices that are no longer in general use, the employer shall determine and document that the equipment is designed, maintained, inspected, tested, and operating in a safe manner."

These two provisions are very similar to the Mechanical Integrity Quality Assurance (QA) section in the PSM Standard that requires the following:

- Section 1910.119(j)(6): “In the construction of new plants and equipment, the employer shall assure that equipment as it is fabricated is suitable for the process application for which they will be used.”

In both elements of the PSM Standard there is a requirement to properly design and fabricate the equipment included in the PSM program. In the PSK chapter, there are audit criteria that address the requirement that the proper RAGAGEPs should be used when designing the equipment. In the AI element, appropriate engineering/design activities clearly should precede the fabrication of any equipment. For the purposes of this book, the proper application of the RAGAGEPs during the design of the equipment is covered under the PSK element, while the proper application of the RAGAGEPs during the fabrication of the equipment is covered under the AI element. The boundary between design and fabrication is when the purchasing of the equipment has begun using the results of the final approved design. In this context “fabrication” refers not only to unique, one-off fabrications, such as for a new pressure vessel, but also commodity items such as piping, valves, relief devices, and instruments that are usually procured not as individually fabricated items, but from a catalogue by part or item number.

For older equipment designed and built using RAGAGEPs that have expired or superseded by more current versions, checks of the new RAGAGEPs should be performed to confirm that changes to the equipment meet the requirements of the RAGAGEP that was in use when the change was made, and to confirm that any errors in the previous versions of the RAGAGEPs are checked to determine if they affect the equipment in service. Fitness-for-service evaluations, which involve engineering analysis and/or testing and are required to confirm that the equipment will meet the intended service application, may be required when either new RAGAGEPs are issued or when used or relocated equipment is employed on an engineered project. For the purposes of this book and its guidance, the management of RAGAGEPs no longer in service is considered a PSK activity, whereas fitness for service evaluations are included in the AI program.

See the Guidance for Chapters 3–24 in the Introduction for the definition of the abbreviations shown in the following tables that are used to indicate the source of the criteria. The audit criteria shown in the tables in this chapter should be used by:

- Readers in the United States covered by the PSM Standard or RMP Rule.
- Readers who have voluntarily adopted the OSHA PSM program.
- Readers whose companies have specified OSHA PSM requirements in non-U.S. locations.

13.2.1.1 Applicability

AI is the only PSM program element that specifies the types of equipment that should be included within the program. All other elements of a PSM program rely on the applicability determination of the program itself to define what

processes/equipment are affected. The audit criteria described below for AI applicability issues are examined using the guidance provided by performing the following audit activities:

- Interviewing the person at the facility who has the singular responsibility for developing and organizing the AI program (i.e., an AI coordinator, AI manager, or equivalent title). This person generally works in the maintenance, engineering, or technical department, and is often the manager of these departments or a department that combines these two functions.
- Reviewing the general AI policy or procedure document that describes the criteria for choosing the equipment to be included in the AI program.
- Reviewing a list of equipment in the AI program. In many cases, a single list of AI-covered equipment does not exist. This is because the maintenance organizations in most chemical/processing facilities are split into as many as three distinct groups: an inspection group that has responsibility for fixed equipment such as vessels, tanks, and piping; a maintenance group that has responsibility for rotating equipment; and an instrument/electrical (I/E) group that is responsible for controls systems and electrical power distribution equipment. Relief devices are sometimes the responsibility of the inspection group, and sometimes the responsibility of the I/E group. In some facilities a separate group of people is responsible for the maintenance of the relief devices. AI programs cross these boundaries; therefore, a single list of AI-included equipment often does not exist. It is not a compliance requirement that such a list be compiled.
- Reviewing P&IDs and other design documents to determine if the AI equipment lists are complete.

Certain types of equipment are required to be covered by an AI program. However, this equipment as well as other equipment critical to process safety should be identified in HIRAs (process hazard analyses (PHAs), layer of protection analyses (LOPAs), or other similar analytical studies) as being critical to process safety and should also be included in the process safety program (see Chapter 10). Equipment is critical to process safety when its failure can cause or contribute to a catastrophic event involving the release of the chemical or materials covered by the process safety program, or if the equipment provides a safeguard against such an event.

Auditors should keep in mind with respect to AI applicability that once a process or individual equipment has been determined to be included in the AI program, *all* of the AI requirements become operative, not just the inspection, testing, and preventive maintenance (ITPM) requirements. Therefore, the requirements for written maintenance procedures, training and qualification of the personnel that perform ITPM and corrective maintenance, AI deficiency management, and AI quality assurance provisions are all applicable to that equipment.

Table 13.1 describes the audit criteria and auditor guidance for the applicability of Asset Integrity pursuant to OSHA PSM and EPA RMP.

Table 13.1 OSHA PSM and EPA RMP Audit Criteria and Guidance for Auditors – Asset Integrity Applicability

Audit Criteria	Source	Guidance for Auditors
<p>13-C-1. Pressure vessels are included in the MI [mechanical integrity] program.</p>	<p>PSM [(j)(1)(i)]</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Pressure vessels are those containing highly hazardous chemicals that are designed to operate at elevated pressures (above 15 psig following the ASME definition of a pressure vessel), even if they may be actually operating at pressures below 15 psig, or even at ambient conditions. All these containers, without regard to operating pressure or ASME/ National Board registry status, should be included in the MI program. • Pressure vessels also include the shell side of many heat exchangers. The tube side of a heat exchanger is sometimes treated as piping and sometimes as a separate component. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Review MI equipment list(s), lists of fixed equipment included in the ITPM program, and/or documents that describe the fixed equipment or its ITPM in the MI program. These documents should list or describe the pressure vessels included in the MI program. • Review P&IDs and check to see if pressure vessels identified on the P&IDs are included in the MI program.
<p>13-C-2. Storage tanks are included in the MI program.</p>	<p>PSM [(j)(1)(i)]</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Review MI equipment list(s), lists of storage tanks included in the ITPM program, and/or documents that describe the storage tanks or its ITPM in the MI program. These documents should list or describe the storage tanks included in the MI program. • Storage tanks are often designed to operate at atmospheric or low pressures. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review P&IDs to

Audit Criteria	Source	Guidance for Auditors
13-C-3. Piping systems including piping system components are included in the MI program.	PSM [(j)(1)(ii)]	<p>see if storage tanks identified on the P&IDs are included in the MI program.</p> <p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Piping systems and their appurtenances should include the following types of equipment and components: <ul style="list-style-type: none"> – Piping, both aboveground and underground piping. – Flanges connecting sections of piping or piping system components. – Gasket materials that seal pipe flanges and form part of the pressure boundary of the piping. – Bolts, studs, and other mechanical devices that seal pipe flanges and form part of the pressure boundary of the piping. – Welds connecting sections of piping or piping system components that form part of the pressure boundary of the piping. – Seals in piping systems such as expansion joints and other couplings. – Filters. – Strainers. – Nozzles. – Flexible hoses. – Valves, including remotely or manually operated valves, check valves, excess flow valves, etc. – Sight glasses. – Heat exchangers—shell and tube sides, to the extent they are not considered to be vessels. – Fired heaters and furnaces that heat highly hazardous chemicals. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review MI equipment list(s), lists of piping and piping system components included in the ITPM program, and/or documents that describe

Audit Criteria	Source	Guidance for Auditors
		<p>Table 13.1 – Continued</p> <p>the piping and piping system components or its ITPM in the MI program. These documents should list or describe the criteria for included piping and the equipment and appurtenances connected to piping that are included in the MI program.</p> <ul style="list-style-type: none"> • Auditors should select piping sections identified on the P&IDs included in the PSM program to see if these piping sections are included in the MI program.
<p>13-C-4. Relief and vent systems and devices are included in the MI program.</p>	<p>PSM [(j)(1)(iii)]</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Relief systems are designed and intended to control overpressure or underpressure that represents a potential loss of containment of the equipment the relief device is protecting. These pressures are referred to as maximum allowable working pressure (MAWP), design pressure, or design vacuum. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review MI equipment list(s), lists of relief and venting systems and devices included in the ITPM program, and/or documents that describe the relief systems and devices or its ITPM in the AI program. These documents should list or describe the criteria for relief systems and devices included in the AI program. Some facilities classify relief systems and devices as fixed equipment, and some facilities classify them as instrumentation/control equipment. • Auditors should confirm that relief/vent systems and devices include the following: Relief valves (spring-operated or pilot-operated). Safety valves (spring-operated or pilot-operated). Rupture disks or pins.

Audit Criteria	Source	Guidance for Auditors
		<p>Conservation/breather vents.</p> <p>Relief headers that collect the discharges of relief valves and rupture disks into common piping systems.</p> <p>Depressurizing systems consisting of vent valves that control pressure and the piping systems that collect and discharge these vent flows.</p> <p>Flare system components including flare piping valves, flare tips/burners, and knockout drums (knockout drums are sometimes considered pressure vessels for the purposes of MI).</p> <p>Atmospheric blowdown drums and stacks.</p> <p>Blowout panels.</p> <p>Quench systems (if the quench system is intended to reduce pressure).</p> <p>Closed vent containment vessels (i.e., a blowdown drum that vents to a closed system).</p> <ul style="list-style-type: none"> Auditors should review P&IDs to see if relief systems identified on the P&IDs are included in the MI program.
<p>13-C-5. Emergency shutdown systems are included in the MI program.</p>	<p>PSM [(j)(1)(vi)]</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> In general, most ESDs in a process are also Safety Instrumented Systems (SIS). However, this may not always be true. The process of determining which control functions qualify as SISs is described in the RAGAGEP ANSI/ISA S84.01, <i>Safety Instrumented Systems for the Process Industries</i>. This RAGAGEP is the U.S. implementation of an international specification, IEC 61508/61511. Performing the analyses prescribed in these RAGAGEPs may result in some, none, or all of the control functions previously classified as ESDs to be treated as SISs. CCPS has also published <i>Guidelines for Safe and Reliable Instrumented Protective Systems</i> (CCPS, 2007d) on the

Audit Criteria	Source	Guidance for Auditors
		<p>Table 13.1 – Continued</p> <p>same topic.</p> <ul style="list-style-type: none"> • The facility or company should be following the guidance contained in ANSI/ISA S84.01-1996 or 2004, the international equivalents (IEC 61508/61511), or an equivalent company standard to identify, classify, design, install, and maintain ESDs/SISs. If this RAGAGEP is not being used, the facility or company should have an equivalent internal process that accomplishes the same thing. This process should have the following characteristics: <ul style="list-style-type: none"> – ESDs/SISs consist of electronic, electrical, or mechanical control systems and devices, or a combination of these types of components that are designed to place a process in a safe and stable state rapidly when pre-determined input conditions to that control system are detected. ESDs/SISs are designed to operate when other controls and safety features have not abated the conditions that require automatic and rapid control action to control the event. An ESD/SIS system consists of detection components (i.e., sensors), logic solvers, and final controlled elements. – The process for classifying and specifying the ESDs/SISs contains a designation of a Safety Integrity Level (SIL) for each ESD/SIS as described in ANSI/ISA S84.01-1996 or 2004. The SIL is a numerical target of ESD/SIS functional reliability. The process should also contain calculations to determine if the ESDs/SISs meet the

Audit Criteria	Source	Guidance for Auditors
		<p>target SILs. If ANSI/ISA S84.01-1996 or 2004 is not being used, the internal process should contain an equivalent measure of ESD/SIS reliability and how it is met. The SIL calculations, or records of equivalent measures, should be reviewed.</p> <ul style="list-style-type: none"> - ESDs that are designated as SISs in accordance with ANSI/ISA S84.01-1996 or 2004 should be independent of any other control system or device. Some older ESDs that are intended to perform the same function are not completely independent. However, the 2004 version of S84.01 allows some logic solvers to do both, provided there is clear distinction between the programs controlling the process and the programs controlling the ESDs. In those cases, the independence may be subtle. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review MI equipment list(s), lists of ESD instrumentation/control equipment that are included in the ITPM program, and/or documents that describe the ESD instrumentation/control equipment or its ITPM in the MI program. These documents should list or describe the criteria for ESD instrumentation/control equipment that are included in the MI program. • Review the P&IDs and other documentation that was used/generated during the PHA and check to be sure the SISs have been included in the MI program.
<p>13-C-6. Controls, including monitoring devices and sensors, alarms, and interlocks are included in</p>	<p>PSM [(j)(1)(v)]</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Non-ESD/SIS controls consist

Audit Criteria	Source	Guidance for Auditors
the MI program.		<p>Table 13.1 – Continued</p> <p>of electronic, electrical, or mechanical control systems and devices, or a combination of these types of components that are designed to do the following:</p> <ul style="list-style-type: none"> – Control the process automatically or manually. – Control the operation of certain equipment (i.e., portions of the process) only when certain conditions exist, i.e., interlocks. – Shut down equipment automatically or manually, i.e., trips. – Provide local or remote (i.e., control room) indications and alarms of process conditions for the operators. – Detect an actual release of hazardous materials (i.e., area monitors for combustible or toxic materials). <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Review MI equipment list(s) and lists of non-ESD/SIS instrumentation/control equipment that are included in the ITPM program. These documents should list or describe the criteria for non-ESD/SIS instrumentation/control equipment that are included in the MI program. • Auditors should review P&IDs and check if controls identified on the P&IDs are included.
13-C-7. Pumps are included in the MI program.	PSM [(j)(1)(vi)]	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Pumps include rotating and other equipment designed to transfer highly hazardous chemicals or flammable materials or otherwise directly support a PSM-included operation (i.e., the fan on an air-cooled condenser or the agitator on a reactor), including the following:

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"> - Pumps (transferring liquids). - Compressors. - Blowers/fans. - Agitators. - Drivers for pumps, compressors, blowers, agitators, i.e., motors, turbines, engines. - Nonrotating transfer equipment such as eductors or other devices operating via venturi effects. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review MI equipment list(s), lists of rotating equipment included in the ITPM program, and/or documents that describe the rotating equipment or its ITPM in the MI program. These documents should list or describe the criteria for rotating equipment included in the MI program. • Auditors should review P&IDs and check if pumps identified on the P&IDs are included in the MI program.

13.2.1.2 Written Procedures

AI programs should include written procedures that describe, in appropriate detail, the ITPM and repair tasks. These are maintenance equivalents of operating procedures; however, they do not require the same format, content, or review/certification as SOPs. The audit criteria described below for AI written procedures issues are examined using the guidance provided by performing the following audit activities:

- Interviewing the person at the facility who has the responsibility for developing and maintaining maintenance procedures. This person generally works in the maintenance, engineering, or technical department and may be the maintenance manager or a supervisor-level person who is responsible for these procedures. Because as many as three different groups may be responsible for equipment in most chemical/processing facility maintenance organizations, each shop or group (i.e., inspection, maintenance/rotating equipment, I/E) may be responsible for its own procedures. Interviews with each of these groups will be necessary to determine the status of the maintenance procedures.

- Reviewing the general AI policy or procedure document that describes how maintenance procedures are developed, reviewed, approved, issued, and maintained, if such a document exists.
- Reviewing samples of ITPM and repair procedures in each of the shops/groups.
- Interviewing inspectors, rotating equipment technicians, pipefitters, welders, I/E technicians, etc. about their understanding and use of maintenance procedures.

Table 13.2 describes the audit criteria and auditor guidance for AI written procedures pursuant to OSHA PSM and EPA RMP.

Table 13.2 OSHA PSM and EPA RMP Audit Criteria and Guidance for Auditors – Asset Integrity Written Procedures

Audit Criteria	Source	Guidance for Auditors
13-C-8. Written procedures have been established and implemented to maintain the ongoing integrity of process equipment.	PSM [(j)(2)]	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Written maintenance procedures are the written documents that provide the work instructions to the maintenance personnel on specifically how to perform their assigned tasks. • These procedures may be any of the following: <ul style="list-style-type: none"> Manuals provided by the original equipment manufacturer (OEM). Procedures written by the facility/company. Contractor-provided procedures. Documents obtained from other generic sources. A combination of the above. • An index of maintenance procedures (if one exists) should indicate if the facility has a complete set of these procedures. • Supporting procedures for ITPM and repair maintenance tasks, such as welding procedures, nondestructive testing (NDT), and test equipment operation (e.g., operation of vibration monitoring equipment) should also be provided. <p>Table 13.2 – Continued</p> <ul style="list-style-type: none"> • MI program procedures should be treated as controlled documents and maintained

Audit Criteria	Source	Guidance for Auditors
		<p>accurate and up-to-date.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the index of maintenance procedures to determine if written task instructions exist for all the ITPM or corrective maintenance tasks the facility maintenance personnel or contractors are assigned to perform. • Auditors should select several safety-related components from PHAs, audit interviews, P&IDs, or field observations and locate the maintenance procedures that apply to them. • Auditors should check that the MI program written procedures are accurate and up-to-date, including those documents that are OEM manuals or are otherwise prepared by outside organizations. • Interviews with facility maintenance personnel indicate that written procedures exist, from some source, for the ITPM and repair maintenance tasks that they have been assigned to perform.

13.2.1.3 Training and Qualification

AI programs should include provisions for training and qualification of the personnel who will perform the tasks included in the program. The audit criteria described below for AI training and qualification issues are examined using the guidance provided by performing the following audit activities:

- Interviewing the persons at the facility with the responsibility for training maintenance personnel. This person generally works in the maintenance department. Some facilities designate a maintenance trainer or similar position whose primary responsibility is to determine what training is needed and then to make arrangements for providing it. This can be a nonmanagement or management person, and sometimes this is the same person who is responsible for the maintenance procedures. Because of the three-way split of equipment responsibility in most chemical/processing facility maintenance organizations, each shop or group (i.e., inspection, maintenance/rotating equipment, I/E) may be responsible for its own training. Interviews with each group will be necessary to determine the content and status of the maintenance training program

- Reviewing the general AI policy or procedure document that describes how maintenance personnel are trained and qualified to perform their jobs, if such a document exists.
- Reviewing training records for the maintenance personnel. These records will usually be found in two general locations: the shop/group for craft skills training, and the safety department for training on safe work practices. Training records are sometimes maintained by HR.
- Interviewing inspectors, rotating equipment technicians, pipefitters, welders, I/E technicians, etc. about their training and qualifications.

Table 13.3 describes the audit criteria and auditor guidance for AI training and qualification pursuant to OSHA PSM and EPA RMP.

Table 13.3 OSHA PSM and EPA RMP Audit Criteria and Guidance for Auditors – Asset Integrity Training & Qualification

Audit Criteria	Source	Guidance for Auditors
13-C-9. The maintenance personnel are required to receive training in an overview of the process and its hazards.	PSM [(j)(3)]	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Process overview training is similar to the basic training about the processes and equipment given to the process operators but usually in a condensed form. It consists of general information about how the process operates, what chemicals/materials are used in the process and their properties and hazards, the temperatures, pressures, and other process parameters that might introduce hazards. This training does not have to be a recurring training event; it only has to be given once. This training is <i>not</i> an overview of the process safety management program. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review materials used to provide process overview training and the process for keeping this information/training up-to-date to determine if the process functions as designed. • Auditors should review training records, especially for maintenance personnel who are "loaned out" or have moved from one area to another. • Auditors should review the training curriculum for

Audit Criteria	Source	Guidance for Auditors
		<p style="text-align: right;">Table 13.3 – Continued</p> <p>personnel to see if it includes process overview training.</p>
<p>13-C-10. The maintenance personnel are required to receive training in the procedures applicable to the employee's job tasks to assure that the employee can perform the job tasks in a safe manner.</p>	<p>PSM [(j)(3)]</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the training records for facility maintenance personnel to determine if their training includes the following topics and qualifications that relate to the procedures that they have been assigned to execute and the tasks and activities contained in those procedures. Maintenance personnel can also include operators if they are assigned to perform maintenance tasks. Examples of typical operator-performed ITPM tasks are lubrication, filter media changes, and collection of high-level vibration data using hand-held devices. – The necessary craft skills the facility maintenance personnel will need to actually carry out the work. These skills may be obtained locally in a company apprentice program (rare these days), state-company cooperative apprentice programs, union apprentice programs, junior college or community college job skills training programs, vocational schools, documented military experience, previous industrial maintenance experience, or other sources of craft skills training and qualification. – Administrative tasks specified in the maintenance procedures that the maintenance personnel are required to perform. For example, if the procedures require that the maintenance personnel enter their time, parts, results, or other

Audit Criteria	Source	Guidance for Auditors
		<p>Table 13.3 – Continued information into a computerized maintenance management system (CMMS), then they should receive training on the hardware and software.</p> <ul style="list-style-type: none"> – Welding on pressure vessels (R-stamp welder certifications per ASME boiler and pressure vessel code). This is a certified qualification. – Welding processes on pressure retaining boundaries, such as piping systems. The ANSI/ASME B31.3 piping code requires that welders be qualified in accordance with the ASME boiler and pressure vessel code. This is a certified qualification and should consist of initial qualification records from a source qualified to examine and certify welds, and welding continuity records that show how the welder's qualifications are maintained. If production welds are used to extend the qualification of welders then a welding continuity log or similar record should exist that shows that at least once in a six-month period each welder has performed a successful weld in each welding process (technique, metal, etc.) for which they are qualified. A welding shop supervisor or similar person usually maintains these records. – Level I or II nondestructive testing technician per ASNT certifications or equivalent records established by an in-house or contractor Level III NDT technician. This is a certified qualification. – Pressure vessel inspector qualifications in

Audit Criteria	Source	Guidance for Auditors
		<p>accordance with API-510 or another regulatory/consensus standard (e.g., certified National Board pressure vessel inspector). This is a certified qualification.</p> <ul style="list-style-type: none"> - Storage tank inspector qualifications in accordance with API-653 or another regulatory/consensus standard. This is a certified qualification. - Piping inspector qualifications in accordance with API-570 or another regulatory/consensus standard. This is a certified qualification. - Level I or II vibration monitoring qualifications in accordance with the Vibration Institute standards or an equivalent alternative. This is a certified qualification. <ul style="list-style-type: none"> • Auditors should confirm that maintenance personnel are provided with training on the safe work practices that the maintenance personnel will have to use to execute the maintenance procedures, e.g., <ul style="list-style-type: none"> - Hot work permits. - Lockout/tagout. - Confined space entry. - Line and vessel opening. - Control over entrance to a facility. • Many facilities also have a general work permit procedure in place that either supplements these basic SWPs, or in some cases, embeds them. Individual facilities may also have other safe work practices (e.g., fall protection, excavation permits, electrical safety, lifting over active equipment or piping, safety feature bypass/removal) that are necessary for the maintenance personnel to

Audit Criteria	Source	Guidance for Auditors
		<p>Table 13.3 – Continued</p> <p>perform their duties. Some of these additional safe work practices include permits and some do not.</p> <ul style="list-style-type: none"> • If contractors perform maintenance tasks, auditors should review records to determine if the qualifications of these personnel have been confirmed before they have been allowed to perform the work. These may be business-related records or contractor employer training records. This is particularly true for those qualifications for which an external certification is required (as indicated above). This confirmation may be part of the contractor safety program (see Chapter 14). To confirm that the training and qualifications described above have been provided/achieved, the following types of records should be reviewed: <ul style="list-style-type: none"> – List of qualified maintenance personnel. – Records of maintenance personnel training. – Certification documents for employees with special qualifications. • Auditors should interview facility maintenance personnel (in each of the three main maintenance groups, or other organizational groupings) to determine if they have received craft skills training on the tasks they are assigned to perform, as well as on an overview of the process and its hazards, and on the safe work practices they are required to follow. A shop or field inspection/walk-through could be completed in which a person is observed performing a specific task and their training/certification records are checked. • If vessel alterations have been made, auditors should check the welding certification

Audit Criteria	Source	Guidance for Auditors
		documentation of the person who made the alteration.

13.2.1.4 Inspection and Testing

Inspection and testing means any recurring task performed to maintain the integrity of the AI-covered equipment in an acceptable state. It also includes preventive maintenance, referred to as ITPM. The audit criteria described below for AI ITPM issues are examined using the guidance provided by performing the following audit activities:

- Interviewing the persons at the facility who has the responsibility for planning, scheduling, executing, approving, and documenting ITPM activities. This person is usually the maintenance manager or subordinate. Some facilities designate a maintenance planner/scheduler who assists in that aspect of the ITPM program and publishes/issues the ITPM schedule and also usually has some responsibility for collecting the results. This can be a nonmanagement or management person. Because of the three-way split of equipment responsibility in most chemical/processing facility maintenance organizations, each shop or group (i.e., inspection, maintenance/rotating equipment, I/E) will be responsible for its own ITPM program, even if a single computerized maintenance management system (CMMS) is being used by all three groups. Interviews with the supervisors or the planners/schedulers of each of these groups will be necessary to determine the status of the ITPM program. Relief devices and systems are sometimes assigned to I/E and sometimes to the fixed equipment/inspection group.
- Reviewing the AI policies, plans, or procedures that describe the ITPM tasks, their frequencies, and rationales for making those choices. Sometimes these documents also describe the ITPM documentation requirements, as well as the training/qualification requirements necessary to perform this work. These documents should be consistent with the governing RAGAGEPs for the equipment.
- Reviewing ITPM records for the equipment included in the ITPM program. These records will be found in the CMMS used to plan, schedule, and document the ITPM task, or in hard-copy records for these tasks stored in the shop or maintenance department, or in a combination of these locations.
- Interviewing inspectors, rotating equipment technicians, pipefitters, welders, I/E technicians, etc. about tests and inspections of covered equipment.

Table 13.4 describes the audit criteria and auditor guidance for AI program inspection and testing pursuant to OSHA PSM and EPA RMP.

Table 13.4 OSHA PSM and EPA RMP Audit Criteria and Guidance for Auditors – Asset Integrity Testing & Inspection

Audit Criteria	Source	Guidance for Auditors
13-C-11. Inspections and tests are performed on process equipment.	PSM [(j)(4)(i)]	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Although nearly all equipment included in the MI program should be subject to some periodic, recurring ITPM tasks(s), there may be some equipment for which the RAGAGEP or risk-based inspection (RBI) program indicates no indicated ITPM. However, if there is a law or regulation, consensus RAGAGEP, a manufacturer's recommendation that indicates ITPM should be performed, or the operating history of the equipment indicates that ITPM is necessary to maintain the ongoing integrity of the equipment, then ITPM should be scheduled and performed for the equipment. <p><u>Auditor's Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review ITPM records/reports to see that the appropriate tasks are being performed on equipment in the MI program. It is often easier to check for equipment that is not being subject to ITPM. • Auditors should review the PHA(s) and choose several equipment items from the PHAs that are identified as causes of hazard scenarios or, just as important, as safeguard against the hazards. Auditors should verify that the ITPM tasks have been scheduled and completed on this equipment. • Auditors should check to determine if the ITPM is being performed according to the published schedule, and that the specified ITPM tasks are not overdue.
13-C-12. Inspection and testing procedures shall follow recognized and generally accepted good engineering practices.	PSM [(j)(4)(ii)]	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • RAGAGEPs that specify ITPM tasks for process equipment consist of the following:

Audit Criteria	Source	Guidance for Auditors
		<p>Law or regulation, such as state pressure vessel regulations.</p> <p>Consensus RAGAGEPs, such as those published by ASME, ANSI, API, NFPA, IIAR, etc.</p> <p>Manufacturer's recommendations.</p> <ul style="list-style-type: none"> • Where RAGAGEPs are not available for the equipment in question, then other sources of data and information should be used to establish the ITPM tasks to be performed. These sources may include the following: <ul style="list-style-type: none"> – Documented operating history of the equipment at the facility. – Documented operating history of the equipment at other facilities in the chemical/processing sector. – Documented operating history of the equipment in other industry sectors. – Insurance company recommendations, only as they apply to process safety issues or incidents. • Specific guidance for common equipment types: <ul style="list-style-type: none"> – Pressure vessels. External and internal visual inspections and wall thickness measurements are required for pressure vessels by jurisdictional pressure vessels laws or regulations, API-510, NB-23, and other relevant RAGAGEPs applicable to pressure vessels. The retirement thickness and remaining life calculations for pressure vessels are required by API-510. – Storage tanks. External and internal visual inspections and wall thickness measurements (including floor scans) are performed for storage tanks as required by jurisdictional storage tank

Audit Criteria	Source	Guidance for Auditors
		<p>laws or regulations, API-653, and other relevant RAGAGEPs applicable to storage tanks. The retirement thickness and remaining life calculations for storage tanks are required by API-653.</p> <ul style="list-style-type: none"> <li>– Piping. External visual inspections and wall thickness measurements are required for piping as required by jurisdictional piping laws or regulations, API-570, and other relevant RAGAGEPs applicable to piping. The retirement thickness and remaining life calculations for piping are required by API-570. <li>– Valves (i.e., remotely operated valves that are critical to process safety and are the final controlled elements in SISs). Functional tests of valves that are the final controlled elements in SISs required per ANSI/ISA S84.01 or equivalent standards. <li>– Heat exchangers. The shell or tube sides of heat exchangers that are also pressure vessels should follow the RAGAGEPs for pressure vessels. In addition, if the tube side is not a pressure vessel, the tube and tube sheet integrity of heat exchangers should be assessed via an appropriate methodology (e.g., NDT, eddy current testing), and other tasks recommended by API RP 572, TEMA, or the manufacturer are included. <li>– Inspections for corrosion under insulation (CUI) including chloride stress corrosion cracking under insulation are required for pressure vessels and piping per API-510 and

Audit Criteria	Source	Guidance for Auditors
		<p>API-570 respectively.</p> <ul style="list-style-type: none"> - Fired heaters/furnaces that heat process materials. External and internal visual inspections, tube thickness measurements, refractory inspections, and stack/flue inspections on fired process heaters are required by API RP 573, the manufacturer, and other relevant RAGAGEPs applicable to fired heaters. - Relief devices and any other systems or devices that are used protect a vessel or process from excess pressure by removing or relieving liquid or gas from that vessel or system. <ul style="list-style-type: none"> ▪ The ITPM performed on relief valves includes pre-disassembly testing, disassembly and repair of internals, and post-reassembly testing of the set point and operating parameters as required by API RP 576 and API-510, the manufacturer, or other relevant RAGAGEPs. ▪ Rupture disks that are primary relief devices are inspected and/or replaced periodically in accordance with the manufacturer's recommendations or the operating history, as well as those that isolate relief valves from exposure to process materials. ▪ Low pressure relief devices such as conservation vents, breather vents, emergency vents, and vacuum breakers are inspected, tested, calibrated/adjusted, and/or cleaned periodically in accordance with the manufacturer's recommendations or the operating history. ▪ Flame arrestors in vent systems are

Audit Criteria	Source	Guidance for Auditors
		<p>Table 13.4 – Continued inspected/cleaned periodically in accordance with the manufacturer's recommendations or the operating history.</p> <ul style="list-style-type: none"> ▪ Vent headers and other collection systems for flammable vapors, including flare systems, undergo periodic testing or inspection, e.g., thickness measurements of flare towers via NDE, particularly at the base where water can collect. Flare towers are examined thermographically while operating, and flare tips are examined periodically. – Emergency shutdown devices/safety instrumented systems/functions. ANSI/ISA S84.01-2004 requires that appropriate ITPM tasks be performed for ESD/SIS equipment that will help determine that the target SIL is being achieved. Tests of ESD/SIS functions should be performed so that the final controlled element, e.g., a control valve or pump, is activated. Activating some final elements will cause a plant or unit shutdown. In these cases, the testing of these functions should be scheduled to coincide with planned shutdowns or other methods employed to ensure that the final element functions properly in response to the control signals. – Other control systems and devices that are important to process safety, i.e., are not provided solely to control product quality, process efficiency or other nonprocess safety criteria. These trips, interlocks, alarms, indicators, and

Audit Criteria	Source	Guidance for Auditors
		<p>other control devices should be periodically tested in accordance with the manufacturer's recommendations, or in a way that provides assurance that the system or device will function as intended upon demand.</p> <ul style="list-style-type: none"> - Pumps/rotating equipment. Pumps/rotating equipment should be periodically inspected, tested, and maintained in accordance with the manufacturer's recommendations, or if the manufacturer has not made any recommendations, in a way that provides assurance that the equipment will function as intended. This might include visual inspections, vibration monitoring, lube oil sampling, overspeed trip tests, or other tasks that are recommended by the manufacturer. - Facilities or companies may have internal procedures that refer to consensus RAGAGEPs or describe equivalent programs that specify these and other ITPM tasks and methods of documentation. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the ITPM program procedures, the CMMS used to plan and schedule the ITPM tasks, and the ITPM records to determine if the relevant RAGAGEP(s), where these are available for the equipment in question, have been followed when the ITPM tasks were chosen.
13-C-13. The ITPM frequencies are consistent with applicable manufacturers' recommendations and good engineering practice, and more frequently if determined to be necessary by prior operating	PSM [(j)(4)(iii)]	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • If the SIS Standard (ANSI/ISA S84.01-1996 or 2004) has been implemented at the facility, it is important that the auditor and

Audit Criteria	Source	Guidance for Auditors
experience.		<p>Table 13.4 – Continued</p> <p>the facility understand that the ITPM frequencies for SISs have been established using an acceptable level of risk as defined by the target SIL levels specified by the facility/company. Therefore, if the SIL-established ITPM task is overdue, or if the frequency of it is extended using nonprocess safety considerations (e.g., extending turnaround schedules), then the facility may be in an intolerable risk zone. Therefore, the frequencies of ITPM tasks for SISs, many of which must wait for a turnaround or other shutdown period, cannot be extended without checking to determine if the SIL calculation will be voided resulting in a risk tolerance/SIS failure rate that may not be acceptable.</p> <ul style="list-style-type: none"> • If risk-based inspection (RBI) has been implemented at the facility, it is important that the auditor and the facility understand that the extension of ITPM frequencies using RBI may consume most, if not all, of the residual risk tolerance that existed by using rule-based ITPM frequencies. Rule-based frequencies are those that have been determined from the RAGAGEPs directly and are usually based on the calendar rather than on the risk or the equipment performance. The frequencies are established in a RBI program based on an acceptable level of risk. Therefore, if the RBI-established ITPM task is overdue, or if the frequency of it is extended using nonprocess safety considerations (e.g., extending turnaround schedules), then the facility may be in an intolerable risk zone. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the ITPM procedures, the CMMS

Audit Criteria	Source	Guidance for Auditors
		<p>used to plan and schedule the ITPM tasks, or the ITPM records to determine the following:</p> <ul style="list-style-type: none"> - The same RAGAGEPs that define the ITPM tasks have been used to determine the frequencies of the ITPM tasks. In some cases, there is no RAGAGEP to provide definitive guidance on ITPM frequencies. In these circumstances, the operating history, the risk of failure, and other internal standards should be used to determine the appropriate frequency. - If warranted by the performance of the equipment, then the ITPM tasks should be performed more frequently. In practice, some ITPM task frequencies for many facilities will be extended beyond the frequencies recommended by the manufacturer when the documented operating indicates that such an extension is acceptable. In some cases, the frequency suggested by the manufacturer is not conservative, e.g., for relief devices and instrumentation, because they are assuming clean service. Auditors should carefully review the basis for choosing the ITPM frequencies to determine if it is reasonable. - If the ITPM frequencies for vessels and piping are determined as part of an RBI program, the RBI program should follow the guidelines contained in API 580 (API-2000b) and API RP 581 (API-2000c).

Audit Criteria	Source	Guidance for Auditors
<p>13-C-14. The results of each inspection and test have been documented, and the documentation includes, at a minimum:</p> <ul style="list-style-type: none"> • Date, • Name of person performing the task, • Serial number or other identifier of the equipment, • Description of the task, and • Results of the task. 	<p>PSM [(j)(4)(iv)]</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review ITPM records to determine if they include the five minimum types of information required. For simple, go/no go, or other similar tasks, e.g., lubrication, the results of the task may be indicated with check marks or other notations that merely indicate that the task was completed successfully. Some tasks require data or other supplemental information to indicate successful completion, e.g., thickness measurements on vessels or piping. • ITPM records may be electronic, paper based, or a combination of both.

13.2.1.5 Equipment Deficiencies

An equipment deficiency is defined as any equipment condition that does not meet the approved design limits of the equipment or the approved operating procedures for the equipment. Examples of such deficiencies include the following:

- ITPM results that are out-of-specification, e.g., wall thickness measurements on vessels, tanks, or piping that are at or below retirement thickness, rotating equipment vibration readings that are at the alert values, instrumentation that cannot be calibrated properly, etc.
- Bypassed or removed safety features (mechanical, electrical, or controls) without an appropriate temporary MOC, bypass procedure/permit, or other formal approval. Safety features that were bypassed or removed using such a procedure or temporary MOC that exceed their allowable removal time period should be considered deficiencies.
- Equipment that is operating outside its approved limits, such as throughput that are higher than designed, or temperatures and pressures that are above or below their approved limits.
- Equipment that is operating in a defective or failed manner, e.g., process or utility fluid leaks that exceed predefined rates.

The audit criteria described below for AI equipment deficiency issues are examined using the guidance provided by performing the following audit activities:

- Interviewing the persons at the facility who have the responsibility for monitoring and resolving AI equipment deficiencies. This is usually the maintenance, engineering, or technical manager. However, auditors will often discover that no single person has been assigned this responsibility and that AI equipment deficiencies are not recognized as such and are

treated in a routine manner (i.e., without assigning a higher priority to it) by each shop or group that is responsible for the equipment.

- Reviewing the general AI policy or procedure document that describes the process for managing AI equipment deficiencies, if such a document exists.
- Reviewing the ITPM records for evidence of deficiencies that have not been properly resolved.
- Reviewing the safety feature bypass logs or permits for evidence of deficiencies that have not been properly resolved.
- Interviewing operators, inspectors, rotating equipment technicians, pipefitters, welders, I/E technicians, etc. about how equipment deficiencies are handled.
- Field observations to look at the general condition of equipment (bird's nest or other obstruction in relief device outlet, "rigged" bypasses of safety systems, switches valved out, etc.).

Table 13.5 describes the audit criteria and auditor guidance for AI equipment deficiencies pursuant to OSHA PSM and EPA RMP.

Table 13.5 OSHA PSM and EPA RMP Audit Criteria and Guidance for Auditors – Asset Integrity Deficiencies

Audit Criteria	Source	Guidance for Auditors
<p>13-C-15. Deficiencies have been corrected in equipment that are outside acceptable limits (defined by the process safety information) before further use or in a safe and timely manner when necessary means are taken to assure safe operation.</p>	<p>PSM [(j)(5)]</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Deficiencies are any condition that exceed the limits described in the PSI, or any other out-of-specification conditions of the equipment. Examples include the following: <ul style="list-style-type: none"> Operation of an occupied structure as a safe refuge when the pressurization system for the structure is out-of-service. ITPM results that are outside acceptance criteria except when equipment adjustments are allowed by procedure and are performed by the inspector as part of the inspection or test. Process or utility fluid leaks that meet certain conditions Operation outside the process design or operating limits Bypassed or impaired control functions or other safety features. The use of pipe clamps or similar devices to temporarily stop process leaks.

Audit Criteria	Source	Guidance for Auditors
		<p>Table 13.5 – Continued</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct field observations to determine if there are deficiencies in equipment included in the MI program. Examples of these observations are the following: <ul style="list-style-type: none"> – The level of corrosion on exposed metal surfaces. This may not be an explicit deficiency because metals form corrosion layers to protect the base metal. However, excessive external corrosion that significantly reduces the thickness of the metal may be a deficiency. – Insulation condition. This condition may not be a deficiency by itself unless the operating conditions are affected by damaged or missing insulation. – Condition of foundations, structures, and supports for tanks, vessels, piping, and rotating equipment, where structural equipment is included in the MI program. – Obvious and large scale vibrations that can be seen by looking at piping and pipe supports (“Feeling” for vibration levels is not an accurate way to gauge vibration problems. Vibration monitoring records should be used to determine these problems. However, vibrations that can be visually detected generally indicate problems). – Condition of secondary containments, if structural equipment is included in the MI program. – The amount and severity of steam, water, and oil leaks, and chemical odors. While leakage of materials not

Audit Criteria	Source	Guidance for Auditors
		<p>covered by the PSM program, such as water, may not be a direct indication of a problem, such conditions may indicate more serious problems with other covered equipment. The leakage of chemicals covered by the PSM program should be considered a deficiency.</p> <ul style="list-style-type: none"> • If the permanent correction of deficiencies has been deferred, and further operations were necessary with the deficiency in place, auditors should check to determine if temporary safety measures were provided where appropriate. An example of a deferred correction would be a thickness measurement on a piping circuit that reveals that the piping has reached its retirement thickness and the pipe circuit will be replaced in an upcoming maintenance outage period. A formal and documented evaluation should be performed to determine whether temporary safety measures are warranted. If temporary safety measures are not implemented, there should be some record that shows that they were evaluated and not needed. Examples of temporary safety measures include, but are not limited to the following: <ul style="list-style-type: none"> – Additional instrumentation to monitor the process. – Additional personnel to operate and monitor the process. – Lowering critical process parameters such as flow, temperature, or pressure. – Increased ITPM frequency. – Adjusting trip, interlock, and/or alarm set points to provide added protection. – Lowering the set point of overpressure protection equipment such as relief valves, automatic vents,

Audit Criteria	Source	Guidance for Auditors
		<p>Table 13.5 – Continued etc.</p> <ul style="list-style-type: none"> – Isolating an area to reduce traffic and/or occupancy. – Reducing the speed limit to reduce piping vibration (on a pipe chase connected to a vehicle bridge, for instance). <ul style="list-style-type: none"> • Auditors should review MOC records, work orders, and other documents to confirm that the deficiencies have been properly reported and evaluated, temporary safety measures have been provided when warranted, and the deficiencies have been resolved properly. • Auditors should conduct field observations of open deficiencies show that the temporary safety measures, when required, are being strictly adhered to.
<p>13-C-16. Deficiencies in equipment outside acceptable limits have been corrected in a timely manner.</p>	<p>PSM [(j)(5)]</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Definition for auditors: “timely” in this context means that resolution or corrective action plans for MI deficiencies are promptly determined, and the recommendations are resolved quickly and the implementation of the final action is completed in a time period that is reasonable given the complexity of the action and the difficulty of implementation. The timing of resolution plan development and completion of each recommendation should be evaluated on a case-by-case basis. PSM auditors should determine how each facility has defined “timely,” how they have applied their definition, and if the definition and its application are reasonable and defensible. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review MOC records, work orders, and other documents to confirm that the deficiencies have been resolved properly within a reasonable amount of time.

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"> Auditors should note deficiencies that exist and have not been identified or treated as deficiencies, or deficiencies that have been identified but have been in place for an unreasonably long period of time while the unit/process/equipment is still operating; these may be considered to have not been resolved in a timely manner.

13.2.1.6 Quality Assurance

Within the context of MI, quality assurance (QA) does not refer to product quality or ISO quality programs. Essentially, the QA requirements involve establishing an institutionalized and documented process for the following activities:

- Fabricating, receiving, installing, and commissioning the equipment in the AI program. These are essentially the activities that occur during engineered projects, but they may occur at other times such as during equipment repair.
- Spare parts and materials used in the equipment. The concern here is that the right parts or materials are being used in the right applications, and not the economics or other administrative aspects of the warehouse operation.
- A more recent development in MI QA is the widespread use of Positive Material Identification (PMI) techniques to confirm the composition of alloy materials prior to installation. A relatively recent RAGAGEP has been published by API on this topic (API RP 578 (API 1999)), which requires that PMI be the primary method of identifying alloy materials (in lieu of mill test reports or other paperwork) and that existing alloy materials already installed in processes be confirmed using PMI.
- The employment of used equipment in process safety covered processes. If the equipment is not accompanied by complete design basis documentation, then appropriate engineering analysis and testing should be performed to establish the design basis for the new intended application. This is often referred to as a fitness-for-service evaluation. This set of activities essentially re-establishes or confirms the engineering pedigree of the equipment before use. For pressure vessels, a method of conducting a fitness-for-service evaluation is specified in API RP 579. This RAGAGEP is often mandated by law or regulation in states that regulate unfired pressure vessels.
- The repair, alteration, or re-rating of pressure vessels and the relief valves that protect them.

The audit criteria described below for AI QA issues are examined by auditors using the guidance provided by performing the following audit activities:

- Interviewing the person at the facility who has the responsibility for organizing and executing engineered projects for the facility/company. This person is usually the engineering or technical manager. Sometimes a manager of projects or similar responsibility is assigned to a single person. Unlike the ITPM and other MI issues previously described, auditors are likely to find in most chemical/processing facilities that there is a single person or department responsible for project engineering and management. Unless the facility or parent company is very large, or the projects being examined are very large, a single person usually has both programmatic and technical responsibility for executing and documenting any given project.
- Interviewing the project/process engineers who perform the design and/or supervise the project construction work, or supervise/monitor the contractors that perform this project work.
- Interviewing the person responsible for operating the spare parts warehouse. This person is usually part of the maintenance or purchasing departments.
- Interviewing the person responsible for performing Positive Material Identification (PMI). For warehouse stock materials, this person may be assigned to the inspection group that performs ITPM on fixed equipment, but may be assigned to the warehouse itself. PMI of project materials may be the responsibility of engineering personnel or contractor personnel who manage project materials, or the facility warehouse personnel.
- Interviewing mechanics about the quality assurance program, the process they use to determine which spare parts are needed for repairs, and what they do if a part they need is not readily available.
- Reviewing the general facility or company policy(ies) or procedure(s) for managing engineered projects. Many companies have a capital projects procedure because of the need to have a staged gate review and approval process to obtain funding for capital projects. Procedures for smaller projects that fall within the facility manager's fiscal approval authority (either capital or expense funds) are generally managed using local procedures. These procedures often address the administrative, but not the technical aspects of engineered projects.
- Reviewing the engineering and construction technical specifications and guidance used by the site or company. These may be legacy specifications from the company that originally designed and constructed the facility, or they may be corporate specifications. Some companies have adopted and modified generic industry engineering and construction specifications, and some companies have developed their own specifications.
- Reviewing the project files for engineered projects.
- Making field observations of spare parts in shops or warehouses.

AI program QA requirements are as follows. Note that fabrication is assumed, for the purposes of this book, to begin when the results of the final, approved design are used to support the technical aspects of the purchasing process for the equipment, i.e., the specification of the technical requirements of the procurement. Fabrication does not include the business, financial, or other nonprocess safety activities that take place during the procurement of equipment. See Chapter 9, Process Knowledge Management, for the compliance requirements that apply to the design phase of a project.

Table 13.6 describes the audit criteria and auditor guidance for AI quality assurance pursuant to OSHA PSM and EPA RMP.

Table 13.6 OSHA PSM and EPA RMP Audit Criteria and Guidance for Auditors – Asset Integrity Quality Assurance

Audit Criteria	Source	Guidance for Auditors
<p>13-C-17. In the construction of new plants and equipment, the equipment as it is fabricated is suitable for the process application for which it will be used.</p>	<p>PSM [(j)(6)(i)]</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Fabrication specifications, if provided by the company or by contractors, refer to, incorporate, or are equivalent in technical content to the appropriate industry consensus RAGAGEPs. These may be legacy specifications from a previous owner, if they are still applicable and are accurate; they may be specifications provided by an engineering or construction contractor; or they may be generic industry specifications that have been modified for use by the company or at a particular facility. If the company or facility does not have permanent fabrication specifications, the equipment fabrication process may be documented on a project-by-project basis. In many cases, fabrication specifications are also included in the same RAGAGEP as the design specifications, but sometimes they are separately documented. For example, the welding requirements for pressure vessels and piping are included in one RAGAGEP (Section VIII of the ASME B&PV Code and ANSI/ASME B313.3, respectively). • The facility/company fabrication procedures, if provided, are

Audit Criteria	Source	Guidance for Auditors
		<p>Table 13.6 – Continued</p> <p>usually found in an engineering procedures/manual or capital projects manual.</p> <ul style="list-style-type: none"> • RAGAGEPs include codes, standards, recommended practices, and other guidance published by trade and professional organizations. The same type of guidance can sometimes be found in internally developed procedures. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • To determine if the appropriate fabrication specifications were used, auditors should review the following types of records (some of this information may also be reviewed as part of the process safety information element—see Chapter 9): <ul style="list-style-type: none"> – Purchase orders for project equipment. – Engineering work orders. – Fabrication specifications and QA records (e.g., fabrication drawings, hydrostatic/pneumatic test reports, mill test reports, weld travelers, hold and witness point test and inspection records, radiographic examination of welds, PMI reports, NDT reports, stress relief reports). – U-1A forms for pressure vessels. – Calculations or data sheets for relief devices and systems. – Project engineering files that contain the calculations, design reports, design drawings, and/or data sheets for other project equipment. – Engineering/design standards for equipment types. • Auditors should check for the following: <ul style="list-style-type: none"> – Positive Material

Audit Criteria	Source	Guidance for Auditors
		<p>Identification (PMI) checks of project alloy materials (i.e., noncarbon steel) are made during the receipt, fabrication, or installation phase of a project in accordance with API RP 578. These materials are used in the following components: piping, piping components such as flanges, fittings, nipples, etc.; valves; and equipment such as filters, strainers, heat exchanger bodies, etc.</p> <ul style="list-style-type: none"> - Project engineering, fabrication, or installation records show that there are records documenting the PMI checks that have been accomplished. - PMI devices are being calibrated or adjusted as specified by the manufacturer. For most devices a set of known alloy test samples are available with the device and before each use the device is tested against the type of alloy to be tested.
<p>13-C-18. Appropriate checks and inspections are performed to assure that equipment is installed properly and consistent with the design specifications and the manufacturer's recommendations.</p>	<p>[(j)(6)(ii)]</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The installation of equipment is conducted in a manner that conforms to the approved design and the appropriate construction specifications. The facility should have a set of local or corporate construction specifications for the equipment installed at the facility. These may be legacy specifications from a previous owner, if they are still applicable and are accurate. They may also be from an engineering contractor, construction contractor, an equipment manufacturer, or a combination of any of these sources. If the company or facility does not have permanent fabrication specifications, the equipment fabrication process may be documented on a project-by-project basis. • Commissioning activities should

Audit Criteria	Source	Guidance for Auditors
		<p>Table 13.6 – Continued</p> <p>be performed for new or modified installations. Some or all of the following commissioning activities may be required: nondestructive tests; hydrostatic or other pressure tests; verification that pressure relief devices are installed and supported properly, that their relief set points are correct, and that the relief valve discharges are routed to safe locations; flushes with water/water batches; electrical continuity/ground tests; software checks; initial calibrations of I/E equipment, trip/interlock tests; initial alignments of rotating equipment; rotational checks; initial lubrication; verification that fixed safety features for personnel safety are in place; and other activities leading up to the first operation of the new equipment are complete and documented. Installation and initial start-up procedures should be prepared for each project.</p> <ul style="list-style-type: none"> <li>• Repairs performed on equipment preserve the original design and installation specifications. <li>• Repairs, alterations, and re-ratings on certified equipment (e.g., pressure vessels) are performed in accordance with the relevant RAGAGEPs, e.g., ASME B&PV Code, API-510, National Board requirements, or jurisdictional requirements. <li>• Repairs, alterations, and re-ratings on certified equipment are performed and inspected by personnel who are qualified to perform and inspect those repairs, particularly welds. <li>• Repairs and modifications on relief valves that protect pressure vessels are performed in accordance with the relevant RAGAGEPs, e.g., ASME B&PV Code, API RP 576, National Board requirements, or jurisdictional requirements.

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"> • Repairs on noncertified equipment should be performed in accordance with the relevant RAGAGEPs. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check to determine if the appropriate construction specifications were used by reviewing the following types of records: <ul style="list-style-type: none"> – Maintenance work orders (small projects may use work orders to document design. – Project engineering files. – Construction standards for equipment types. – Project installation records (e.g., construction punch lists, pre-start-up safety review documentation, weld records, radiography, and other NDT records) that provide evidence that the installation conformed to the approved design. – Project commissioning test records (e.g., system flush and water batching records, hydrostatic or other pressure integrity test records, leak testing of connections, testing of relief devices, function testing of instrumentation and controls, fire and gas detection systems, and emergency shutdown systems, rotational checks, functional testing of rotating equipment, integrity checks of coatings, linings, and refractory). • If project installation activities are in progress auditors should observe them to the extent possible to determine if the construction is proceeding in accordance with the specified standards and procedures. • If project-commissioning activities are in progress, auditors should observe them to

Audit Criteria	Source	Guidance for Auditors
		<p>Table 13.6 – Continued</p> <p>the extent possible to determine if the process/equipment commissioning is proceeding in accordance with the specified standards and procedures.</p> <ul style="list-style-type: none"> • Auditors should review facility procedures to determine if a process exists to manage repairs and replacements to equipment included in the MI program. This usually centers around a work order system, which is generally a component of the CMMS that is used to manage the planning and scheduling of ITPM work.
<p>13-C-19. Maintenance materials, spare parts and equipment are suitable for the process application for which they will be used.</p>	<p>[(j)(6)(iii)]</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The focus during an audit of the management of the spare parts of a MI program is on the procedures and practices that ensure that the right part is used in the right application. The audit should not focus on the economic aspects of the warehouse operation. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that a process exists to order, receive, inspect, identify, store, and disburse spare parts and materials to help ensure that these materials are used in the correct application. The economics of the warehouse operation or inventory control activities that are related to the economics or value of the spare parts and materials are not of concern during a PSM audit. • Auditors should confirm that part numbers are assigned to spare parts, that those numbers are affixed to the parts or their storage locations, and that work orders containing the same part numbers are used to disburse the parts. • Auditors should check to determine if there is any storage of unlabeled surplus, used, or salvaged parts and materials, and if so, that they are

Audit Criteria	Source	Guidance for Auditors
		<p>evaluated, labeled, and stored in a manner that is equivalent to new parts.</p> <ul style="list-style-type: none"> • Auditors should check to determine if spare parts and materials are proactively monitored for expiration dates and removed from inventory to preclude inadvertent use. • Auditors should check to determine if equipment, materials, and parts are being purchased by purchase orders or contracts that state, reference, or otherwise use the appropriate technical specifications and/or RAGAGEPs. • Auditors should check to determine if equipment, materials, and parts purchased by contractors meet the same requirements as material specified and purchased by the host facility/company. • Auditors should check to determine if the management of consigned materials to third parties has the same controls as facility-purchased/owned materials. • Auditors should review the spare parts inventory system and records and observe the warehouse and maintenance shops to confirm that spare parts and materials are stored and controlled in the proper manner (i.e., there is no unlabeled storage). • Auditors should sample a number of spare parts and materials and review the process from receipt, receipt inspection, storage in the warehouse, disbursement from the warehouse, and through to return to the warehouse (if applicable). • Auditors should review procedures/policies for keeping the spare parts inventory system up-to-date (i.e., changes resulting from capital projects,

Audit Criteria	Source	Guidance for Auditors
		<p>MOCs, etc.).</p> <ul style="list-style-type: none"> • Auditors should review procedures/policies for obtaining spare parts when a part is no longer available (what process is used to identify/specify alternate, equivalent parts and does it include appropriate engineering review/approval, MOC, etc.). • Auditors should interview warehouse and purchasing personnel to understand practices for ordering and stocking spare parts. • Auditors should interview maintenance personnel to understand the process for determining the specifications of the parts to be used during maintenance (gaskets, rupture discs, etc.).

13.2.1.7 U.S. State Requirements

If the PSM program being evaluated is pursuant to a state PSM regulation, then the specific Asset Integrity requirements for that regulatory program should be followed. In general, these overlap somewhat with the federal OSHA PSM and EPA RMP requirements, but often there are state specific requirements that should be met, even if the state has received authority to enforce federal regulations (i.e., the state is an OSHA state plan state or has received implementing agency status for RMP implementation). The state specific-applicability requirements for the following states are presented below:

- New Jersey
- California
- Delaware

Table 13.7 shows the audit criteria and auditor guidance for Asset Integrity pursuant to state requirements.

Table 13.7 U.S. State PSM Audit Criteria and Guidance for Auditors - Asset Integrity

Audit Criteria	Source	Guidance for Auditors
<p><i>New Jersey Toxic Catastrophe Prevention Act (TCPA)</i> 13-C-20. The owner or operator shall implement a system for maintaining accurate records of all inspections, breakdowns, repairs and</p>	<p>N.J.A.C. 7:31-4.5</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the computerized maintenance management system (CMMS) or other medium for planning, scheduling, and recording the

Audit Criteria	Source	Guidance for Auditors
<p>replacements of EHS equipment with the means of data retrieval and analysis to determine the frequency of inspections and tests and to evaluate equipment reliability.</p>		<p>results of MI-related tasks to decide if the system provides data that enables the facility to determine the frequency of inspections and tests and to evaluate equipment reliability. Such indications include calculations of the mean time between failure (MTBF) or mean time to repair (MTTR) or similar measures of equipment failure rate, and the use of those measures to determine the frequency of inspections and tests.</p>
<p><i>Delaware Accidental Release Prevention Regulation</i> 13-C-21. The Delaware EHS regulations do not add any different or unique requirements beyond those described for MI programs in the PSM Standard and RMP Rule.</p>	<p>Delaware Code, Chapter 77, Section 5.73</p>	<ul style="list-style-type: none"> No further guidance.
<p><i>California OSHA—Process Safety Management of Acutely Hazardous Materials</i> 13-C-22. The employer shall establish and implement written procedures to maintain the ongoing integrity of process equipment and appurtenances. These procedures shall include a method:</p> <ol style="list-style-type: none"> 1) for allowing employees to identify and report potentially faulty or unsafe equipment; and 2) to record their observations and suggestions in writing. 3) the employer shall respond regarding the disposition of the employee's concerns contained in the report(s) in a timely manner. 	<p>California Code of Regulations, Title 8, Section 5189(j)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review mechanical integrity procedures to determine if they include provisions for employees to report equipment failures, as well as to make suggestions. Auditors should review records to determine that the facility has responded to employee concerns in a timely manner. Timely, in this context, has the same meaning that it does for other PSM-related activities. The complexity and scope of the concern plays a role in determining the amount of time it takes to resolve the concern.
<p><i>California Accidental Release Prevention Program</i> 13-C-23. The CalARP regulations do not add any different or unique operational readiness requirements beyond those described for pre-startup safety reviews in the PSM Standard and RMP Rule.</p>	<p>California Code of Regulations, Title 19, Section 2760.5</p>	<ul style="list-style-type: none"> No further guidance.

13.2.2 Related Criteria

The purpose of providing these criteria is to provide auditors with additional guidance for evaluating PSM programs with respect to issues that go beyond the strict compliance requirements presented above, and in large part represent industry good practices in AI, or in some cases AI practices that have become common. Some of the related criteria have reached the status of a level of acceptable practice because of their widespread, accepted, and successful use over an extended period of time. Auditors and PSM practitioners should carefully consider implementing this guidance, or at least designing an approach that is similar in nature. See the Glossary and Section 1.7.1 for a more complete discussion of the meaning and use of level of acceptable practice.

In addition to the regulatory requirements for asset integrity described above, OSHA has defined a number of issues, along with specific audit questions to examine them, as a result of the accident at the BP refinery in Texas City in March 2005. The program established to explore these issues is referred to as the National Emphasis Program (NEP). The NEP issues that are relevant to asset integrity are as follows:

- *Relief system design*—relief device design and design basis documentation, evaluation of relief devices during MOC, safe discharge of relief devices that relieve directly to the atmosphere, evaluation of relief devices during HIRAs, use of correct RAGAGEPs in relief device design, treatment of isolation valves upstream and downstream of relief devices, relief device ITPM, and flare systems.
- *Blowdown drums and vent stacks*—blowdown drum and vent stack design and design basis documentation, evaluation of original blowdown drum and vent stack design versus current conditions, evaluation of blowdown drum and vent stack discharges during HIRAs, safe discharge of blowdown drums and vent stacks, ITPM of blowdown drum and vent stack instrumentation, blowdown drum and vent stack quench system design, and blowdown drum and vent stack operating procedures and training.
- *Pressure vessel*—pressure vessel design and design basis documentation, pressure vessel safety systems, lined and unlined pressure vessel ITPM, pressure vessel condition/thickness monitoring location (CML/TML) selection, evaluation of and testing for corrosion under insulation for insulated pressure vessels, pressure vessel repair, and evaluation of changes to pressure vessels during MOC.
- *Piping*—piping design and design basis documentation, use of correct RAGAGEPs in piping design, piping ITPM including anomalies in piping ITPM data, evaluation of and testing for corrosion under insulation for insulated piping (as appropriate), piping condition/thickness monitoring location (CML/TML) selection, evaluation of piping installation, positive material identification (PMI) of replacement piping materials, and the qualification of piping inspectors and welders.
- *Deficiency management*—evaluation of relief devices, pressure vessels, and piping for the absence of deficiencies.

- *Employee participation*—the employer can demonstrate how they consulted employees to develop the AI element.

13.2.2.1 General Issues

Table 13.8 describes the recommended related audit criteria for general AI issues.

Table 13.8 Related Audit Criteria and Guidance for Auditors - General AI Issues

Audit Criteria	Source	Guidance for Auditors
13-R-1. The maintenance program is a preventive or predictive program, rather than corrective in nature.	CPL	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The maintenance program at a chemical/processing facility is one part of an AI program; however, it is the core of the program. The maintenance philosophy should be one that is designed to maintain the ongoing integrity of the key equipment in a manner that does not delay maintenance activities until equipment failures have occurred, but is designed to discover impending failures and to keep the equipment operating so that it functions as designed on a continuous basis. Repairs and corrective maintenance are part of an AI program, but the primary maintenance philosophy should be preventive or predictive in nature. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that an ITPM program exists and that it is functioning and that it includes the equipment in the AI program.
13-R-2. An overall Asset Integrity program management system policy or procedure should be developed and implemented that describes how the AI program is developed, organized, executed, modified, and documented.	CCPA GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check to determine if there is a general policy or procedure governing the AI program that addresses the following issues: <ul style="list-style-type: none"> – The practices and activities included in the program. – How the regulatory requirements for asset integrity are interpreted and clarified for the facility. – The equipment included

Audit Criteria	Source	Guidance for Auditors
		<p>(and excluded) in the program, and rationale for inclusion or exclusion of this equipment. Equipment included in the AI program should be based on the risk as identified in the HIRAs, risk assessments, LOPAs/SIL analyses, or other analytical activities that are designed to identify and prioritize the hazards/risk associated with the equipment and its operation.</p> <ul style="list-style-type: none"> - Defines the assignment of unique identification numbers, or other method of distinguishing the equipment (with appropriate markings or tags on the equipment itself). - How to add/delete equipment from the program. - Who is responsible for the program practices and activities. - The training and qualification requirements for maintenance personnel. - Reference to the other procedures that provides guidance on the asset integrity program. - Recordkeeping requirements. - Retention policies for ITPM records. - How new versions of RAGAGEPs will be evaluated and incorporated into the asset integrity program. - How program procedures are maintained to be up-to-date. - Adoption of formal change control policies and procedures (e.g., the facility MOC program) for ITPM frequencies. - Definition of the

Audit Criteria	Source	Guidance for Auditors
		<p>computerized maintenance management system (CMMS) used to plan, schedule, and collect data in support of ITPM activities.</p> <ul style="list-style-type: none"> - The metrics used to measure asset integrity practices and activities, how they will be reported, and how often they will be reported.

13.2.2.2 Applicability

Table 13.9 presents the recommended related audit criteria for AI applicability.

Table 13.9 Related Audit Criteria & Guidance for Auditors - AI Applicability

Audit Criteria	Source	Guidance for Auditors
<p>13-R-3. Additional equipment critical to PSM is included in the AI program. Equipment that is important to process safety but is not explicitly listed in the regulatory/voluntary consensus program requirements should also be included in the Asset Integrity program.</p>	<p>WCLAR (5/25/94) (11/30/94) (12/7/95) CIT GIP PRE APPC CCPA</p>	<p><u>Background Information for Auditors:</u></p> <p>The Hazard Identification and Risk Analysis (HIRA) studies, QRAs, LOPAs, SIL analyses, and other hazard/risk assessments should be used to determine the importance of the equipment to process safety. If the failure of the equipment can cause or contribute to a catastrophic release of process safety-covered materials, or the equipment is a safeguard that detects, prevents, or mitigates such releases, then the equipment is important to process safety and deserves consideration for inclusion in the asset integrity program. Common examples of such equipment include the following:</p> <ul style="list-style-type: none"> • Trucks, rail cars, tube trailers, or other transportation containers connected directly to a process safety covered process and being used essentially as storage tanks or vessels. <p>Structural components that support the weight or movement of, rotating or other equipment that is otherwise included in the program (e.g., foundations, anchors, bolts, guy wires, pipe supports). The structural equipment that supports the</p>

Audit Criteria	Source	Guidance for Auditors
		<p>Table 13.9 – Continued</p> <p>weight or movement of tanks, vessels, and piping are required to be inspected externally in accordance with API-510, API-653, and API-570 respectively and are compliance requirements. See audit criteria 13-C-22.</p> <ul style="list-style-type: none"> <li>• Electrical distribution equipment whose failure could contribute to a catastrophic release (e.g., circuit breakers, switchgear, voltage, current, and frequency controls, uninterruptible power supplies, emergency power generation and distribution equipment). <li>• Other critical utility systems that interface with the covered processes and whose failure could contribute to a catastrophic release (e.g., cooling water in a process that is vulnerable to runaway/exothermic reactions). <li>• Fixed and mobile fire protection equipment. <li>• Secondary containment systems, berms, and other equipment that would limit the spread of or mitigate an actual liquid release. <li>• Critical ventilation systems in those structures designated as safe havens or assembly points during an emergency, or in structures that will remain staffed after an evacuation for operational purposes. <li>• Employee alarm system(s) (also see Chapter 19, Emergency Management). <li>• Test, measuring and evaluation (TM&E) equipment used to conduct ITPM tasks for other ESDs, SISs, and control equipment included in the MI program such as calibrations, adjustments, and other activities where a measurement of a parameter is required and the accuracy of the calibration or adjustment of the process instrument relies on the accuracy

Audit Criteria	Source	Guidance for Auditors
		<p>of the TM&E equipment. These devices are typically volt meters or similar electrical/electronic devices, calibrators, etc.</p> <ul style="list-style-type: none"> • Equipment referred to in the emergency response plan (ERP) or necessary to execute the provisions of the ERP. • Cathodic protection systems on equipment critical to process safety. • Mobile/fixed lifting equipment (cranes, hoists, etc.) whose failure could result in a catastrophic release of hazardous chemicals (i.e., lifting equipment in the process areas, and not lifting equipment in shops). • Stacks, chimneys, and flare towers associated with equipment critical to process safety. • Marine loading arms and hoses containing process safety covered materials or marine arms and hoses critical to process safety. • Any other system or device deemed to be critical to process safety, such as quench systems, chemical neutralization systems, rapid dump systems, vapor knockdown/deluge systems, etc. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check to determine if the AI program also includes equipment not explicitly covered by the governing regulations but critical to process safety. The results of the HIRA should be used by the facility or company as a guide for determining what equipment and systems are critical to process safety. The equipment identified in the HIRA that contributes to hazard scenarios either as a cause (i.e., when it fails) or as a safeguard should be considered for inclusion in the MI program, including

Audit Criteria	Source	Guidance for Auditors
		critical utility systems.
13-R-4. The equipment included in the AI program should be compiled into a prioritized list.	APPC GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review AI program records to determine if a list of equipment is included in the AI program. There may be separate lists for the major types of equipment, i.e., fixed equipment, rotating equipment, I/E equipment. Although it is advisable that a facility maintain this list electronically to facilitate its maintenance, this is not a requirement. • Auditors should check to determine if the AI program equipment is prioritized primarily by risk, failure rate, or some other metric relevant to process safety. Other factors can be used to prioritize the equipment in the AI program, i.e., equipment reliability or process efficiency, but not at the expense of factors related to process safety.

13.2.2.3 Written Procedures

Table 13.10 shows the related audit criteria for AI written procedures.

Table 13.10 Related Audit Criteria and Guidance for Auditors - AI Written Procedures

Audit Criteria	Source	Guidance for Auditors
13-R-5. Maintenance procedures follow a common format and contain common pertinent information.	GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review ITPM and corrective maintenance procedures to determine if the format and content of maintenance procedures include the following: <ul style="list-style-type: none"> • Data to be recorded. • Health and safety precautions to be taken, SWPs to be followed, and PPE to be worn. • Configuration of the plant or equipment and approvals needed to perform the tasks. • Practices, codes, and standards

Audit Criteria	Source	Guidance for Auditors
		<p>that govern the work.</p> <ul style="list-style-type: none"> Provisions for inspecting the job when work is completed to ensure the equipment is safe to start up.

13.2.2.4 Training and Qualification

Table 13.11 lists the recommended related audit criteria for AI training and qualification.

Table 13.11 Related Audit Criteria and Guidance for Auditors – Ai Training and Qualification

Audit Criteria	Source	Guidance for Auditors
<p>13-R-6. The facility AI procedures address who or what group is authorized by the employer to conduct relief valve inspection, testing and repair, including the qualifications and credentials required for those conducting the inspection, testing, and repair.</p>	NEP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review relief device/system ITPM, contractor, purchasing, or other maintenance procedures and approved contractor lists to determine who is authorized to conduct relief valve inspection, testing, and repair, including the qualifications and credentials required for those conducting the inspection testing and repair.
<p>13-R-7. The facility AI procedures list required piping inspectors' qualifications, welders' qualifications for welding on process piping, and when qualified welding procedures are required.</p>	NEP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review welding procedures and training procedures for welders and piping inspectors to determine if the procedures address piping inspectors' qualifications, welders' qualifications for welding on process piping, and when qualified welding procedures are required, including requirements that are derived from the appropriate RAGAGEPs (e.g., ASME B&PV Code via ANSI/ASME B31.3 for welding, API-570 for piping inspectors).
<p>13-R-8. The facility should have a training program management system procedure for maintenance personnel.</p>	CCPA GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should confirm that a written management system procedure for training and qualifying maintenance personnel has been developed and implemented that includes:

Audit Criteria	Source	Guidance for Auditors
		<p>Table 13.11 – <i>Continued</i></p> <ul style="list-style-type: none"> – Provisions for entry requirements into maintenance positions, e.g., education, previous training, qualification, or position, licenses required, physical attributes, and reading comprehension level that are appropriate to the required positions (assuming that these are not already defined in collective bargaining agreements, if such an agreement is applicable). – Applicability (which maintenance positions) of training. – Classroom/informative training to be completed for each position. – Practical/on-the-job (OJT) training to be completed for each maintenance position, including the actions and conditions for practical factors under which the employee will demonstrate competence or knowledge as well as what is acceptable performance. – Examination requirements. – Granting of final qualification for each position. – Maintenance refresher training. – How the frequency of refresher training will be determined. – Training/qualification documentation requirements. – Duration of training/qualification period. – The required qualifications for trainers. – The names or positions of individuals who authorize the completion of training requirements, including

Audit Criteria	Source	Guidance for Auditors
		final qualification. – How qualification or certification can expire or be lost, if appropriate.
13-R-9. The maintenance training programs addresses the use of PPE.	CCPA GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should review maintenance-training records to determine if the prospective maintenance personnel were trained in the proper use of PPE.
13-R-10. If maintenance personnel will operate equipment to prepare it for maintenance tasks, the maintenance training program addresses the safe use of engineering controls (i.e., safeguards).	CCPA GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should review maintenance-training records to determine if the prospective maintenance personnel were trained in the safe use of engineering controls (i.e., safeguards) and if maintenance personnel will operate equipment to prepare it for maintenance tasks. This is normally accomplished by operators.
13-R-11. The maintenance training program addresses emergency evacuation and response.	CCPA GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should review maintenance-training records to determine if the prospective maintenance personnel were trained in emergency evacuation and response.
13-R-12. The maintenance training program covers/includes routine and nonroutine work authorization activities.	CCPA GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should review maintenance-training records to determine if the prospective maintenance personnel were trained in routine and nonroutine work authorization activities.
13-R-13. The maintenance training program addresses appropriate training on the hardware and software that the operators would be expected to use (If the operators access procedures and other key information electronically).	CCPA GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should review maintenance-training records to determine if the prospective maintenance personnel were trained on the hardware and software that they would be expected to use (if the maintenance personnel access procedures and other key information electronically).

Audit Criteria	Source	Guidance for Auditors
<p>Table 13.12 – Continued</p> <p>13-R-14. The facility should provide training for maintenance personnel on additional topics that are relevant to their work.</p>	<p>CCPA GIP APPC</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that the training program for the maintenance personnel includes the following: <ul style="list-style-type: none"> – Administrative tasks that the maintenance personnel are required to perform (such as use of the CMMS). – MOC. – Emergency response. – Use of special equipment or unique tools. • Auditors should interview facility maintenance personnel to determine if they have received appropriate training in other topics relevant to their work.
<p>13-R-15. The facility should provide refresher training for maintenance personnel on a periodic basis.</p>	<p>CCPA GIP PRE APPC</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review lists of training topics for maintenance personnel and training records to determine if the maintenance personnel have received periodic refresher training on process overview, SWPs, and training necessary to maintain their craft skills as appropriate. • If the maintenance personnel are included routinely when process changes occur, the recurring process overview training could be waived in lieu of training given pursuant to each MOC, although it still may be good to repeat process overview training at some frequency.

13.2.2.5 Inspection, Testing, and Preventive Maintenance

Table 13.12 presents the recommended related audit criteria for AI ITPM.

Table 13.12 Related Audit Criteria and Guidance for Auditors – AI Inspection, Testing, and Preventive Maintenance

Audit Criteria	Source	Guidance for Auditors
<p>13-R-16. ITPM management system procedures, practices, or plans for</p>	<p>CIT GIP</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the index

Audit Criteria	Source	Guidance for Auditors
<p>related equipment follow the recognized and generally accepted good engineering practices and include the ITPM tasks contained in the those documents. These procedures, practices, or plans should also contain provisions to properly plan the work, control the work, and collect, document, and analyze the results.</p>	<p>RBPS</p>	<p>of ITPM procedures (if one exists) to determine if the facility has a complete set of these procedures.</p> <ul style="list-style-type: none"> • Auditors should review the ITPM plans/procedures to determine if that they contain the following provisions: <ul style="list-style-type: none"> – ITPM tasks to be performed for each piece of equipment, the frequency for these tasks, and the rationale or basis for making these choices. – The ITPM procedures, plans, or record forms should provide the criteria for acceptable ITPM results. – Where appropriate, the ITPM plans or procedures should include guidance for determining remaining life for equipment, particularly the wall thickness of pressure retaining equipment. – The ITPM plans or procedures should specify which work instructions are to be used for each ITPM task. – Where contractors are used to perform ITPM work, they should be formally approved contractors. (See Chapter 14, Contractor Management.) – If the ITPM plans or procedures include defined grace periods for the ITPM tasks, they should be reasonable. The grace period should not exceed approximately 10 percent of the base interval up to base intervals of annual, and should be less than 10 percent for longer intervals than annual. – The ITPM plans or procedures should include a system to collect equipment-operating data and analyze the history of

Audit Criteria	Source	Guidance for Auditors
		<p>Table 13.12 – Continued</p> <p>the data for trends.</p> <ul style="list-style-type: none"> <li>– Test and inspection records should be kept for the life of the process for long-term tasks such as vessel and piping wall thickness measurements (often checked approximately every 5 years) and internal vessel inspections (often checked approximately every 10 years). Records may be kept for shorter periods of time for less frequent tasks (i.e., weekly lube oil checks). Records retention policies should be defined in the overall program guidance. <li>– A maintenance management system (preferably an electronic or computerized system) should be in use at the site to manage the ITPM program activities. <li>– The maintenance management system(s) used to plan and schedule ITPM work should be capable of providing a report of overdue ITPM tasks. <li>– All maintenance repair tasks should be managed using the same maintenance management system. The system should be capable of accepting work requests for reporting equipment problems, generating work orders to affect the repairs after review and approval, and providing documentation of the repairs. <li>– If a reliability-centered maintenance (RCM) program has been established, the ITPM frequencies determined by the RCM program should be reconciled with the frequencies determined

Audit Criteria	Source	Guidance for Auditors
		from RBI or rule-based determinations.
<p>13-R-17. ITPM management system procedures, practices, or plans for related equipment follow the recognized and generally accepted good engineering practices and include the ITPM tasks contained in those documents.</p>	<p>CCPA WCLAR (5/25/94) (11/30/94) (12/7/95) GIP PRE</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The ITPM tasks for specialized or unique equipment should follow the RAGAGEPs for that equipment or other guidance available that is technically relevant. • If not specified by the manufacturer (thereby making it a compliance requirement), visual inspections, vibration monitoring, lube oil sampling, overspeed trip tests, or functional tests that will confirm that the rotating equipment is operating properly should be scheduled, performed, and documented. Vibration monitoring has become a successful and common industry practice that has become a level of acceptable practice. • If steam is a critical utility to process safety, external and internal visual inspections and tube thickness measurements should be performed for boilers as required by jurisdictional boilers laws or regulations, the ASME B&PV Code, and other relevant RAGAGEPs applicable to boilers. Note that boiler design, construction, operation, and maintenance are regulated in all 50 U.S. states. • Trucks, rail cars, tube trailers, or other transportation containers connected directly to a PSM-covered process and being used as storage tanks or vessels require periodic inspection and pressure testing as specified by the Department of Transportation (DOT). The host facility/company does not have to perform these ITPM tasks themselves but should confirm that the company that owns the transportation container has performed them and that the container is marked with the current results, or records attesting to the same

Audit Criteria	Source	Guidance for Auditors
		<p>Table 13.12 – Continued</p> <p>have been provided. A container that lacks evidence of the successful completion of these tests should not be connected to facility processes. A review of operating or unloading procedures may be necessary to confirm this stipulation.</p> <ul style="list-style-type: none"> • Structural components that support the weight or movement of tanks, vessels, piping, rotating equipment, or other equipment otherwise included in the program (e.g., foundations, anchors, bolts, guy wires, pipe supports). Visual inspections should be made of the structural equipment at the same time the supported equipment is inspected visually/externally. It is not necessary to designate structural equipment as separate equipment in the AI program, but in some specialized cases it may be appropriate to do so. Other ITPM tasks such as thickness testing or other tests for structural integrity may be appropriate. • Electrical distribution equipment whose failure could contribute to a catastrophic release (e.g., circuit breakers, switchgear, voltage, current, and frequency controls, uninterruptible power supplies, emergency power generation and distribution equipment). The tasks specified in NFPA-70B (Maintenance Supplement to the National Electric Code) or the InterNational Electrical Testing Association (NETA) guidance should be scheduled, performed, and documented, e.g., periodically measuring the electrical resistance to grounding/bonding systems. • Other critical utility systems that interface with the covered processes and whose failure could contribute to a catastrophic release. The tasks specified by the manufacturer, governing

Audit Criteria	Source	Guidance for Auditors
		<p>RAGAGEPs or appropriate for the operating history of the equipment or risk of its failure should be scheduled, performed, and documented. For example, if cooling water is a critical utility for a process, the rotating equipment in the cooling water system should be maintained in the same manner as the process rotating equipment containing highly hazardous chemicals, the electrical equipment in the cooling water system should be maintained as specified in NFPA-70B or NETA guidance, and the instrumentation and controls equipment in the cooling water system should be maintained in the same manner as other instrumentation and controls that are important to process safety.</p> <ul style="list-style-type: none"> • Fixed and mobile fire protection equipment. The tasks specified in NFPA-25 (water-based fire protection equipment), NFPA-72 (fire alarms), NFPA-10 (fire extinguishers), and other NFPA standards appropriate for the types of fire protection equipment at the facility should be scheduled, performed, and documented. These NFPA standards are often embedded in jurisdictional law or regulation, usually at the state or municipal level. However, if the jurisdictional requirements specify different requirements, they should be performed and documented. • Other standby/on-demand equipment that is process safety related, e.g., an emergency generator (NFPA-110). • Secondary containment systems, berms, and other equipment that would limit the spread of or mitigate an actual liquid release. Visual inspections that assess containment penetrations, erosion of the containment wall (for earthen berms), cracks in the containment wall, etc. should be scheduled, performed, and

Audit Criteria	Source	Guidance for Auditors
		<p>Table 13.12 – Continued documented. Sometimes these types of inspections are required as part of environmental group activities.</p> <ul style="list-style-type: none"> • Area monitors that would detect an actual release of PSM materials (such as combustible gas analyzers/LEL detectors). Area detectors should be inspected/serviced periodically according to the manufacturer's recommendations. • Critical ventilation systems such as the following: <ul style="list-style-type: none"> ▪ Those structures designated as safe havens or indoor assembly points during emergency, or structures that will remain staffed after an evacuation for operational purposes. Tests of shutdown/isolation provisions for critical ventilation systems should be scheduled, performed, and documented. ▪ Those systems that provide air temperature control for heat-sensitive materials (i.e., peroxides). ▪ Those systems that are activated when a release occurs to reduce flammability and/or toxicity hazards in an enclosed area. • Employee alarm system(s). Periodic tests of the employee alarm system(s) should be scheduled, performed, and documented. These tests are routinely performed on a frequent basis by the Safety Department, Security or those who manage the emergency response plan/program. Employee alarm systems may also require other periodic maintenance tasks as recommended by the manufacturer or by operating history. Also see Chapter 19, Emergency Management. Employee alarm systems are required to be tested as a compliance issue. However, employee alarm system ITPM

Audit Criteria	Source	Guidance for Auditors
		<p>tasks are not required to be formally included in the AI program.</p> <ul style="list-style-type: none"> • Cathodic protection systems on equipment that is critical to process safety. Cathodic protection systems should be calibrated periodically according to the manufacturer's recommendations or NFPA-70B. • Mobile/fixed lifting equipment (cranes, hoists, etc.) whose failure could result in a catastrophic release of process safety covered materials (i.e., lifting equipment in the process areas, and not lifting equipment in shops). Lifting equipment should be calibrated periodically according to jurisdictional requirements or the manufacturer's recommendations. • Stacks, chimneys, and flare towers associated with equipment that is critical to process safety. Visual inspections and thermography (to detect leaks) should be scheduled, performed, and documented. If thermography is performed on heat-generating mechanical equipment such as heaters and flares, it is often performed by the same personnel who perform thermography on critical electrical equipment. • Marine loading arms and hoses containing hazardous chemicals or marine arms and hoses that are critical to process safety. Visual inspections and other tasks specified by the USCG, other jurisdictions, or the manufacturer's recommendations should be scheduled, performed, and documented. • Any other system or device that is deemed to be critical to process safety, such as quench systems, chemical neutralization systems, rapid dump systems, vapor knockdown/deluge

Audit Criteria	Source	Guidance for Auditors
		<p>Table 13.12 – Continued</p> <p>systems, etc. Visual inspections and functional tests specified by jurisdictional requirements or the manufacturer should be scheduled, performed, and documented.</p> <ul style="list-style-type: none"> • RAGAGEPs can include those codes, standards, and other guidance published by trade and professional organizations, as well as internally developed standards and procedures that provide the same guidance. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review ITPM procedures and ITPM records that should indicate the tasks are being performed in accordance with the RAGAGEPs described when the equipment is included in the AI program.
<p>13-R-18. The ITPM management system procedures or plans for related equipment specify frequencies consistent with applicable manufacturers' recommendations and good engineering practice for the following equipment types.</p>	<p>CCPA GIP</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review of the ITPM procedures, the CMMS used to plan and schedule the ITPM tasks, or the ITPM records to determine the following: <ul style="list-style-type: none"> – The same RAGAGEPs that define the ITPM tasks relevant for compliance-related equipment in the AI program are used to determine whether the frequencies of the ITPM tasks for related equipment is appropriate. In some cases, there is no RAGAGEP to provide definitive guidance on ITPM frequencies. In these circumstances, the operating history, the risk of failure, and internal standards should be used to determine the appropriate frequency. – If warranted by the performance of the equipment, the ITPM tasks should be performed more frequently. In practice, some ITPM tasks at many facilities are extended

Audit Criteria	Source	Guidance for Auditors
		beyond the ITPM frequencies recommended by the manufacturer when the documented operation indicates that such an extension is acceptable.
13-R-19. Special Damage Mechanisms—ITPM activities should be scheduled and performed that will detect corrosion associated with special corrosion mechanisms if the equipment is vulnerable to them.	GIP APPC	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditor should interview the person(s) responsible for planning the ITPM program for fixed equipment (e.g., the chief inspector or maintenance manager) and should review ITPM plans, records, or procedures indicating that special corrosion mechanisms have been considered when choosing ITPM tasks. Common special damage mechanisms that deserve consideration include the following: <ul style="list-style-type: none"> – Chloride stress corrosion cracking (chloride stress corrosion cracking under insulation is a compliance requirement because API-510 and API-570 specify that this mechanism be examined). – Hydrogen embrittlement/attack. – Wet hydrogen sulfide cracking. – Corrosion at pipe trunions or other hard contact points. – Erosion at points in piping and valves where high velocity and/or high solids content makes erosion a suspect damage mechanism. – Corrosion under saddles used to support equipment (i.e., horizontal tanks). • Auditor should review ITPM records for fixed equipment to determine if the tasks chosen to examine these mechanisms have been performed.
13-R-20. The results of each inspection and test of related equipment have been documented, and the documentation includes, at a	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditor should review ITPM records to determine if they include the five minimum types of

Audit Criteria	Source	Guidance for Auditors
minimum: <ul style="list-style-type: none"> • Date, • Name of person performing the task, • Serial number or other identifier of the equipment, • Description of the task, and • Results of the task. 		information required. For simple go/no go, or other similar tasks, e.g., lubrication, the results of the task may be indicated with checkmarks or other notations merely showing that the task was completed successfully. Some tasks require data or other supplemental information to indicate successful completion, e.g., thickness measurements on vessels or piping.
13-R-21. If risk based inspection (RBI) programs have been used to establish the ITPM tasks and frequencies for facility equipment, the RBI program should be thoroughly planned and documented. The use of RBI is voluntary.	GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • If risk-based inspection (RBI) programs have been established to determine the ITPM tasks and frequencies for vessels and piping, auditors should review the RBI procedures, RBI studies, and ITPM records for vessels and piping. These reviews should indicate that the following: <ul style="list-style-type: none"> – The RBI studies should include all of the relevant damage and failure mechanisms (e.g., corrosion mechanisms) that are applicable to the equipment. The RBI studies should be compared with results of previous incidents and ITPM results to confirm this. – The RAGAGEPs for establishing RBI programs are API RP 580 (API 2000b) and API RP 581 (API-2000c) and should be followed with respect to the conduct and documentation of the RBI program. – The RBI studies should be periodically revalidated (approximately every 5 years). – The results of the RBI studies should be reconciled with the HIRA studies. – The same caution regarding overdue ITPM tasks when the frequencies have been established using RBI is pertinent for

Audit Criteria	Source	Guidance for Auditors
		related equipment as for compliance-related equipment.

13.2.2.6 Deficiencies

Table 13.13 presents the recommended related audit criteria for AI deficiencies.

Table 13.13 Related Audit Criteria and Guidance for Auditors – AI Deficiencies

Audit Criteria	Source	Guidance for Auditors
13-R-22. There is no anomalous data in the piping ITPM results 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).	NEP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the piping ITPM records to determine if there is anomalous data in the piping ITPM results that has not been resolved. For example, if there are either piping circuits that have suddenly reached their retirement thickness, or circuits where the next inspection date is in the past, and the projected retirement date suddenly is a very far distant date when the past retirement dates were much closer, these data should be reviewed to determine if they represent actual physical problems or are incorrect results generated due to data entry errors. Such anomalous data should not be allowed to simply remain in piping, tank, or vessel inspection records without being reconciled and resolved.
13-R-23. Additional situations that may warrant treatment as an AI deficiency are considered.	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Given their importance, the following situations should be considered as possible AI deficiencies: <ul style="list-style-type: none"> – Overdue ITPM tasks. – Fire protection equipment that is not functioning at its rated capacity or is otherwise impaired. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the definition and treatment of additional situations as potential AI deficiencies as described above.

Audit Criteria	Source	Guidance for Auditors
<p>Table 13.13 – Continued</p> <p>13-R-24. A management system procedure exists to report, evaluate, control, and close AI deficiencies.</p>	<p>CCPA GIP</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review facility/company procedures to determine if a written procedure to manage AI deficiencies has been implemented. This procedure should address the following: <ul style="list-style-type: none"> – Definition of deficiencies. – Identification and reporting of deficiencies. – Evaluation of deficiencies, including a process for providing temporary safety measures. – Permanent correction. – Documentation of this entire process. – Log of deficiencies. • Such a procedure can and should make use of existing management system procedures and processes, e.g., work order systems to report and document the permanent closure of deficiencies, temporary MOCs to install and remove temporary safety measures, and repair procedures that describe how equipment repairs, modifications, and replacements will be reported, initiated, authorized, and executed.

13.2.2.7 Quality Assurance

Table 13.14 shows the recommended related audit criteria for AI quality assurance.

Table 13.14 Related Audit Criteria and Guidance for Auditors – AI Quality Assurance

Audit Criteria	Source	Guidance for Auditors
<p>13-R-25. Engineered projects should be organized and executed with procedures and activities to analyze the risk associated with the project and to review and approve the design.</p>	<p>CCPA GIP</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review facility/company engineered project procedures to determine if they include the following provisions:

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"> – An engineering procedure, project manual, or similar document that describes the overall approval, organization, execution, management, and documentation of engineered projects. – Requirements for formal documented project design reviews. – Requirements for project HIRA studies that include analyzing the potential on-site and off-site risk presented by the project. – Requirements for analyzing the potential on-site and off-site risk presented by the project. – Technical requirements for purchasing asset integrity covered equipment. – Requirements for the receipt, storage, and inspection of project equipment prior to installation. – Requirements for documenting project installation and commissioning activities, including turnover inspections and commissioning activities.
13-R-26. Equipment/project files are maintained for each engineered project.	CCPA GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Project records are typically turned over to engineering, maintenance, or other appropriate groups at the end of a project and are available for further use. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review project records to determine if engineering and installation records are maintained for each project, particularly "as built" drawings, certifications of coded vessels (i.e., U-1A forms), and materials of construction.
13-R-27. Equipment to be installed should be labeled clearly and Table	CCPA	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review project

Audit Criteria	Source	Guidance for Auditors
<p>13.14 – Continued installation jobs need to be properly inspected in the field for use of proper materials and procedures.</p>	APPC GIP	<p>records to determine if qualified craftsmen are used to perform the construction.</p> <ul style="list-style-type: none"> • Auditors should review project records to determine if appropriate gaskets, packing, bolts, valves, lubricants, and welding rods were used during the construction. • Auditors should review project records to determine if procedures for installation of safety devices were appropriate (i.e., the torque on the bolts on rupture disc installations, uniform torque on flange bolts, proper installation of pump seals, etc). • Auditors should conduct field observations of project installations to determine if material is labeled.
<p>13-R-28. Construction crews are qualified and supervised by capable individuals.</p>	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should interview contractor construction personnel working at the facility being audited, particularly supervisors and engineers, to determine if they understand the codes and standards that govern their work. • Auditors should review the qualifications of contractor construction crews to determine if they have the appropriate skills, particularly where certified skills are required (e.g., welding).
<p>13-R-29. The decommissioning of AI processes and equipment, particularly when the equipment will be left wholly or partially in place, should be treated like an engineered project.</p>	CCPA GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Decommissioned equipment is defined in this context as equipment that is shut down and removed from production, but will be left in place for some period of time before re-commissioning or demolition. Equipment that has no operational use and is not projected to be re-commissioned should be dismantled as soon as possible (see Chapter 4). • To safely remove decommissioned equipment from the process safety

Audit Criteria	Source	Guidance for Auditors
		<p>program, the following minimum actions should be specified:</p> <ul style="list-style-type: none"> – Mechanical isolation using blanks, spool pieces, or capped piping (not closed valves). – Electrical isolation from power supplies and control systems via lockout/tagout. – HIRA studies of the decommissioned state. – Complete and clear documentation of the as-left condition. <ul style="list-style-type: none"> • There should be a decommissioning management system procedure that specifies the minimum activities performed for the safe shutdown and removal of critical equipment from the process safety program. This procedure, if it exists, should be reviewed. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditor should conduct field observations of decommissioned equipment to determine, at a minimum, if blanks or other positive mechanical isolation is in place.
13-R-30. A written procedure/manual should be developed and implemented that describes how the spare parts warehouse is operated.	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • A procedure that governs warehouse operations should address the following issues: <ul style="list-style-type: none"> – Material receipt and inspection. – Storage of parts. – Labeling of parts and storage locations. – Disbursement of parts, including off-hours issues. – Management of shelf life. – Re-entry into inventory of surplus materials (if allowed). – Management of loose/free issue materials to ensure that they are applied correctly. – Management of consigned materials to third parties to ensure that the proper

Audit Criteria	Source	Guidance for Auditors
		<p>controls are maintained for this material.</p> <ul style="list-style-type: none"> • If the quality of parts is a problem, it may be appropriate to conduct audits of the equipment supplier's facilities to better assure proper purchases of required equipment suitable for its intended service. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should determine if a written management system procedure exists for the operation of the spare parts warehouse.
<p>13-R-31. Contractors that perform AI program activities should be approved.</p>	<p>GIP APPC</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • A process to formally approve contractors that support or perform AI program activities should address the following (see also Chapter 14, Contractor Management): <ul style="list-style-type: none"> – Approved contractors' lists that include the names of those contractors pre-approved to provide goods and services to the facility, including engineering, construction, ITPM, project services (e.g., PMI, inspection, QA, project material management), project materials, and stock spare parts/materials. – Many of the contractors that perform these vital services are resident or embedded contractors; that is, they work at the facility in the same capacity every workday but are employees of another company. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should determine if contractors that perform AI QA program activities, such as engineering, construction, project management, testing/inspection, PMI, etc. are on the facility's approved contractor list.

These related criteria for AI should also be considered for inclusion in PSM programs mandated by states or other jurisdictions because they effect equipment, policies, practices, procedures, and other aspects of facility operations that are important to process safety.

13.2.3 Voluntary Consensus PSM Programs

The following voluntary consensus PSM program requirements for Asset Integrity are described below:

- The requirements published for the offshore oil platform sector in the Safety and Environmental Management Program (SEMP), a voluntary program designed by API and endorsed by the Minerals Management Service of the Department.
- Responsible Care Management System (RCMS)[®] published by the American Chemistry Council.
- RC14001 Environmental Management System, published by the American Chemistry Council.

Table 13.15 lists the related audit criteria and auditor guidance relating to Asset Integrity pursuant to voluntary consensus PSM programs.

Table 13.15 Related Voluntary Consensus PSM Program Audit Criteria and Guidance for Auditors - Asset Integrity

Audit Criteria	Source	Guidance for Auditors
<p><i>SEMP</i></p> <p>13-R-32. The management program requires that procedures are in place and implemented so that critical equipment for the facility is designed, fabricated, installed, tested, Table 13.15 – Continued inspected, monitored, and maintained in a manner consistent with appropriate service requirements, manufacturer’s recommendations, or industry standards.</p>	<p>RP 75 8.1</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should determine if design, fabrication, and installation specifications that prescribe industry standards of practices are used. • Auditors should determine if written procedures and schedules for the testing, inspection, and maintenance of critical equipment exist.
<p>13-R-33. Written procedures for procurement of critical equipment are developed as part of the overall quality and asset integrity assurance program to verify equipment compliance with applicable design and material specifications. For example, a documented process exists for confirming that procured critical equipment conforms to applicable design and material specifications.</p>	<p>RP 75 8.2</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should determine if a documented process for confirming that procured critical equipment conforms to applicable design and material specifications exists.

Audit Criteria	Source	Guidance for Auditors
<p>Table 13.15 – Continued</p> <p>13-R-34. Written quality control procedures and specifications for critical equipment have been established and implemented to confirm, during the fabrication stage, that materials and construction are in accordance with the design specifications. For example, a documented process exists for confirming that fabricated critical equipment conforms to applicable design and material specifications.</p>	<p>RP 75 8.3</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should determine if a documented process for confirming that fabricated critical equipment conforms to applicable design and material specifications exists.
<p>13-R-35. Maintenance programs are established and implemented to include appropriate inspection and testing for critical equipment to sustain ongoing asset integrity. For example, program guidance exists that governs required inspection intervals, acceptable inspection results, and a process for resolving inspection findings to manage integrity risks.</p>	<p>RP 75 8.5</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should determine if program guidance governing required inspection intervals, acceptable inspection results, and a process for resolving inspection findings to manage integrity risks exists.
<p>13-R-36. Maintenance activities are structured to enhance safety and protect the environment. For example, maintenance procedures exist that address potential safety and environmental hazards as part of their development and performance.</p>	<p>RP 75 8.5</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should determine if maintenance procedures that address potential safety and environmental hazards as part of their development and performance exist.
<p>13-R-37. The maintenance program applies to both the operator and/or contract personnel involved in maintenance. For example, integrity maintenance processes exist that address the roles and responsibilities of involved employees (operator and contract).</p>	<p>RP 75 8.5</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should determine if integrity maintenance processes that address the roles and responsibilities of involved employees (operator and contract) exist.
<p>13-R-38. The maintenance program includes:</p> <ul style="list-style-type: none"> • Procedures and work practices to maintain the asset integrity of equipment. • Training of maintenance personnel in the application of the procedures, relevant hazards, and safe work practices. • Quality assurance and control procedures to verify that maintenance materials and 	<p>RP 75 8.5</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review maintenance and ITPM procedures to determine if the appropriate procedures and work practices are implemented. • Auditors should conduct interviews with maintenance personnel to determine if they have received the training necessary to perform their jobs. • Auditors should review the MOC

Audit Criteria	Source	Guidance for Auditors
<p>spare equipment and parts meet design specifications.</p> <ul style="list-style-type: none"> • A system to confirm that maintenance personnel are qualified. • Procedures to review all changes to the maintenance program in accordance with MOC. 		<p>procedure and records to determine if changes to the AI program are controlled and managed using MOC, e.g., changes to ITPM tasks, changes to ITPM frequencies (particularly extensions), changes to maintenance procedures.</p> <ul style="list-style-type: none"> • Auditors should review warehouse operations to determine if procedures are in place to ensure that the right part is used in the right application, including matching part numbers in storage to a part number on a work order, and monitoring shelf lives of parts where they have expiration dates.
<p>13-R-39. The testing, inspection, and monitoring programs include:</p> <ul style="list-style-type: none"> • A list of critical equipment and systems that are subject to inspection and testing. The list specifies the method and interval of testing and inspection, acceptable limits, and criteria for passing the test or inspection. • Testing and inspection procedures follow commonly accepted standards and codes. • Documentation of completed testing and inspection addressing the following: Pressure vessel testing and inspection documentation is retained for the life of the equipment. All other documentation is retained for a minimum of 2 years or as needed with regard to: <ul style="list-style-type: none"> ▪ Frequency of testing, inspection, and preventive maintenance. ▪ Requirements of regulatory agencies. ▪ Requirements for the preparation or revision of hazards analysis. • Procedures to document and correct critical equipment deficiencies or operations that 	<p>RP 75 8.6</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review maintenance and ITPM procedures or records to determine if there is a list of equipment included in the AI program. • Auditors should review maintenance and ITPM procedures or records to determine if testing and inspection procedures follow commonly accepted standards and codes. • Auditors should review maintenance and ITPM procedures or records to determine if ITPM records are kept for a minimum of two years, and pressure vessel ITPM records are kept for the life of the process. • Auditors should review of maintenance and ITPM procedures or records to determine if there are procedures to document and correct critical equipment deficiencies. • Auditors should review of maintenance and MOC procedures or records to determine if changes in tests and inspections are controlled.

Audit Criteria	Source	Guidance for Auditors
<p>Table 13.15 – Continued are outside acceptable limits.</p> <ul style="list-style-type: none"> • A system for reviewing and authorizing changes in tests and inspections. 		

Audit Criteria	Source	Guidance for Auditors
<p>Table 13.15 – Continued <i>Responsible Care® Management System (RMCS)</i> 13-R-40. The RCMS does not add any unique AI program requirements.</p>	RCMS Technical Specification, Element 2.2	<ul style="list-style-type: none"> • No further guidance.

Audit Criteria	Source	Guidance for Auditors
<p><i>RC14001</i> 13-R-41. RC14001 does not add any unique AI program requirements.</p>	RC14001 Technical Specification RC151.03 4.3.1	<ul style="list-style-type: none"> • No further guidance.

13.3 AUDIT PROTOCOL

The audit protocol introduced in Appendix A and available online (see page xiv for information on how to access this resource) provides detailed questions that examine the issues described in Section 13.2.

REFERENCES

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- American Petroleum Institute, *Fitness For Service*, API RP-579. American Petroleum Institute, Washington, DC, 2000 (API, 2000a)
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- American Petroleum Institute (API) *Pressure Vessel Inspection Code: In-Service Inspection, Rating, Repair, and Alteration*, API 510, 9th ed., Washington, DC, June 2006
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- Department of the Interior, Minerals Management Service, *Safety and Environmental Management Program (SEMP)*, 1990
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- New Jersey, *Toxic Catastrophe Prevention Act (N.J.A.C. 7:31)*, New Jersey Department of Environmental Protection, June 1987 (rev. April 16, 2007)

- Occupational Safety and Health Administration (OSHA) 29 CFR §1910.119, *Process Safety Management of Highly Hazardous Chemicals, Explosives and Blasting Agents; Final Rule*, Washington, DC, February 24, 1992
- Occupational Safety and Health Administration (OSHA) Publication 3133, *Process Safety Management Guidelines for Compliance*, Washington, DC, 1993
- Occupational Safety and Health Administration (OSHA) Instruction CPL 02-02-045 CH-1, *PSM Compliance Directive*, Washington, DC, September 13, 1994
- Occupational Safety and Health Administration (OSHA) Instruction CPL 03-00-004, *Petroleum Refinery Process Safety Management National Emphasis Program*, June 7, 2007 (OSHA, 2007a)
- Occupational Safety and Health Administration (OSHA) Directive 09-06 (CPL 02), *PSM Chemical Covered Facilities National Emphasis Program*, July 27, 2009 (OSHA, 2009a)

14

CONTRACTOR MANAGEMENT

This element is also called Contractors or Contractor Safety in OSHA PSM and EPA RMP programs, as well as in many state regulatory PSM programs and voluntary consensus PSM programs. Contractor Management is an element of the RBPS accident prevention pillar of Manage Risks.

14.1 OVERVIEW

Improperly managed contractors can significantly increase the risk associated with process maintenance and operations, so contractors require special attention when working in a facility. This need is emphasized by the fact that contractors are often involved in more hazardous work, such as construction or specialty repairs. The John Gray Institute investigated the aftermath of the accident at Phillips Chemical in Pasadena, Texas, in October 1989 and recommend to OSHA that a Contractor Safety element be included in the draft PSM Standard (JGI, 1991). The scope of this element generally involves contractors doing construction, maintenance, renovation, turnaround, or specialty work (e.g., tank cleaning), but the concepts presented in this chapter may be applied to any contractors performing physical work on or adjacent to a process unit. A contractor management program should start with the screening and selection of contractors that perform tasks that could potentially impact process safety. Each company should establish criteria for determining which contractors are acceptable from a safety standpoint and which are not. Using these criteria to screen and select contractors will help ensure that only contractors that demonstrate a commitment to safety, have an established safety and health program of their own, and are able to demonstrate good safety performance are allowed to work in a facility.

The effective management of contractors from a process safety perspective requires the following activities:

- Host company actions/responsibilities
- Contract employer actions/responsibilities.

A well-managed contractor safety program provides assurance that these two sets of activities/responsibilities are established and in place. Under OSHA PSM and EPA RMP, the host employer is required to periodically evaluate the performance of contract employers in fulfilling their duties related to contractor safety and process safety. Although contract companies are typically required to meet high safety standards before they are considered for hire, it is important that actual performance against these standards be verified. In this way, contract employers become accountable for fulfilling their own safety responsibilities (e.g., training), not just for complying with the requirements of the host employer. The pre-hire and ongoing safety evaluation of contract employers can be conducted by the host employer or by a selected third party.

In many cases, the host employer will take on certain responsibilities (e.g., providing a facility-specific orientation including overview of hazards, safety rules, emergency response provisions, etc.) rather than relying on the contract employer to do so. In some cases, third-party organizations have been established to provide such services as training, contractor safety program evaluation, and reporting of safety performance data. Where multiple companies in the same area use the same contract employer, efficiency can be improved since each host employer does not have to perform these tasks. Relevant information is often made available to participating host employers via the Internet. The use of third parties for these evaluations and/or training is not mandatory.

The Contractor Management element interfaces significantly with other PSM program elements. The primary interfaces include the following:

- Operating Procedures (Chapter 11)—if contractors are hired as operators, they will be required to use the operating procedures.
- Safe Work Practices (Chapter 12)—contractors included in the scope of the regulation are subject to the conditions of SWP permits for nearly all work they perform at a facility, and they sometimes have a role in the completion and approval of SWP permits.
- Asset Integrity and Reliability (Chapter 13)—contractors perform a large share of the preventive and corrective maintenance at many facilities. In addition, contractors play a significant role in the design and installation phases of engineered projects.
- Training and Performance Assurance (Chapter 15)—contractors should be trained to perform the work they are hired to perform. Some training is provided by the contractor employer, and some is provided by the host employer.
- MOC (Chapter 16)—contractors whose work is affected by changes should be informed of and trained in those changes.
- Operational Readiness (Chapter 17)—contractors often play a role in completing the pre-start-up safety review for a project or equipment/facility change.

- Emergency Management (Chapter 19)—contractors should be trained in the applicable provisions of the emergency action plan and sometimes fulfill various emergency response roles.
- Incident Investigation (Chapter 20)—contractors are involved in incident investigations when they were involved in the incident.

In Sections 14.2 and 14.3, compliance and related audit criteria are presented, along with guidance for auditors in applying the criteria. A full explanation of compliance and related audit criteria are presented in Chapter 1 (see Section 1.7). The criteria and guidance described in these sections do not represent exclusive solutions to PSM program coverage, design, implementation, or interpretation. They represent the collective experience of many people in the chemical/processing sector who have performed many PSM audits, and the consensus opinion resulting from that experience. The compliance criteria are derived from the regulations that govern PSM programs in the United States; however, these regulations are all performance-based. Performance-based regulations are goal oriented and there may be multiple pathways to fully complying with them. Therefore, there may be alternate interpretations and solutions to the issues described in the compliance tables in this chapter that are equivalent to those included, particularly the auditor guidance presented.

The inclusion of the related criteria in no way infers that these criteria must be implemented for a PSM program to be successful, nor does it infer that a PSM program will be deficient without them. As with the compliance criteria, there may be other, more appropriate solutions for an individual facility or company. In addition, the use of the related criteria in a PSM audit is intended to be completely voluntary and not a mandatory requirement in any way. They should be used cautiously and with careful planning so that they do not inadvertently establish unintended performance standards. Consensus should be sought within and among facilities and their parent companies before these criteria are used. Finally, the related criteria and guidance offered for consideration are not endorsements of or agreements with the written or verbal clarifications made by the regulators, PSM citations issued against the regulations, other PSM guidance published by the regulators, or the successful or common PSM practices in any given company's PSM program from which they are derived.

14.2 AUDIT CRITERIA AND GUIDANCE

The detailed requirements for contractor management included in the OSHA PSM Standard, EPA RMP, several state PSM regulatory programs as well as for other voluntary consensus PSM programs are presented below.

The audit criteria described below are examined by auditors using the guidance provided by performing the following audit activities:

- Interviewing the persons at the facility who have the responsibility for managing the evaluation, presence, training, and auditing of contractors on-site. These persons may work in maintenance, EHS, purchasing, or another department, depending on the organization of the company or

facility being audited. If a third-party organization manages these tasks for the facility, these interviews should include representatives of the third-party organization.

- Reviewing certain contractor management documents related to the training and orientation of contractors, as well as contractor injury and illness records that are often maintained by the safety manager.
- Reviewing contractor pre-hire evaluations and purchasing procedures.
- Interviewing contractors to determine if they have received appropriate orientation and training regarding the hazards they will face at the facility, the emergency action plan and their role in it, and the safety and work rules of the facility, including the SWP permitting processes to which they will be subject. Two types of contractors will often be present at a site: resident or embedded contractors who work at the site every day in the same capacity and work very closely with host site personnel, and contractors whose work on-site is more infrequent (e.g., shutdown work or even one-time only jobs). For the purposes of a PSM audit, resident and nonresident contractors are subject to the same requirements.
- Observing contractor orientation (either on-site or at the location of a third-party organization that handles this task for the facility).
- Observing contractors working in the field to see if they follow the safety rules of the facility (e.g., PPE, control over entrance to a facility, other safe work practices).

Auditors should also carefully examine the contractor management requirements found in the procedures of the company/facility being audited. As stated in Section 1.7.1, these could be interpreted as compliance requirements by regulators and could be subject to citations if they are not being followed. Auditors should confirm, via interviews, records and document reviews, and field observations, that the requirements of the facility or company contractor management procedures have been implemented as specified. Findings should be generated if the company/facility-specific provisions are not being followed.

See the Guidance for Chapters 3–24 in the Introduction for the definition of the abbreviations shown in the following tables that are used to indicate the source of the criteria.

14.2.1 Compliance Requirements

The following audit criteria should be used by the following:

- Readers in the United States covered by the PSM Standard or RMP Rule.
- Readers who have voluntarily adopted the OSHA PSM program.
- Readers whose companies have specified OSHA PSM requirements in non-U.S. locations.

Table 14.1 describes the audit criteria and auditor guidance for the host employer's contractor safety responsibilities pursuant to OSHA PSM and EPA RMP.

Table 14.1 OSHA PSM and EPA RMP Audit Criteria and Guidance for Auditors - Host Employer's Contractor Responsibilities

Audit Criteria	Source	Guidance for Auditors
<p>14-C-1. The PSM Contractor Management program has been applied to contractors performing the following types of work on or adjacent to a covered process:</p> <ul style="list-style-type: none"> • maintenance or repair • turnaround • major renovation • specialty work 	<p>PSM (h)(1) RMP 68.87</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Although many types of contractors perform various services at many facilities, the general criteria for being included in the facility contractor management program are that the contractors work <i>on or adjacent</i> to a process. This means that they work on the process equipment or equipment or facilities that are close enough to the processes containing the highly hazardous chemicals that their work might affect those processes. Therefore, contractors performing construction, demolition, and equipment installation may be included, even if the work does not directly involve a process that is included in the PSM program. Contractors hired by different organizations within the host facility (e.g., engineering, project groups, purchasing, maintenance) should all follow the same requirements. • Other contractors that perform work related to process safety, but does not include work on equipment or facilities, do not have to be included in the contractor management program. Examples of these types of contractors are: engineering contractors, process safety consultants, etc., even if they are granted unescorted access to the facility. • Contractors providing incidental goods or services such as janitorial, landscaping, office support, food and drink, laundry, delivery or other supply services do not have to be included in the contractor management program. <p>Table 14.1 – Continued</p>

Audit Criteria	Source	Guidance for Auditors
		<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that, at a minimum, any contractor or subcontractor that does physical work on or adjacent to any PSM-covered processes is included in the contractor safety program. • Auditors should interview the PSM manager/coordinator and any other persons responsible for contractor safety, e.g., purchasing, maintenance, engineering. Auditors should then review records to confirm that these contractors have been identified.
<p>14-C-2. When selecting a contractor, the employer has obtained and evaluated information regarding the contract employer's safety performance and programs.</p>	<p>PSM [(h)(2)(i)] RMP 68.87</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Auditors may find that in some regions of the United States where there is a concentration of chemical/processing facilities, a third-party organization (e.g., industry-sponsored contractor consortium or contractor evaluation service) has been established to periodically obtain and evaluate information regarding the safety performance and programs of contract employers that provide services to the chemical/processing sector in the region. These third-party organizations then provide reports of the information they have collected and evaluated, thereby relieving their member companies from having to perform this work and maintain the records. The use of these third-party organizations, even if they exist in a particular region, is not mandatory. • At a minimum, the information collected should allow the facility to evaluate the prospective contractor's safety performance and the contents of their safety program. The two performance measures most commonly used are the OSHA Total Incident Rate (TIR) and the Experience

Audit Criteria	Source	Guidance for Auditors
		<p>Modification Rate (EMR), which is calculated by the contract employer's insurance company for use in determining their worker's compensation insurance rates. These measures can be compared against average figures based on the nature of the company's work to determine the relative performance against their peers and/or against a standard established by the host employer.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should request a list of contract employers working in or near processes included in the PSM program and determine whether or not they are covered by the regulation. • Auditors should review host/facility procedures/policies to determine who is responsible for completing the assessment and how it is to be done (acceptance criteria, etc.). If a third-party organization performs the evaluations on behalf of the facility being audited, a visit and interview to the third party's offices should be conducted to ascertain if the organization is following the facility's requirements, and whether there are any conflicts of interest that could affect their impartiality. • Auditors should review contract employer records to confirm that the facility has obtained and evaluated information about the contract employer before hiring them, including those of a third-party organization if one is performing the evaluations on behalf of the facility. • Auditors should review the evaluations for a variety of contract employers, including those contractors whose work at the facility is infrequent (perhaps including specialty or <p>Table 14.1 – Continued</p>

Audit Criteria	Source	Guidance for Auditors
<p>14-C-3. The employer has informed contract employers of the known potential fire, explosion, or toxic release hazards related to the contractor's work and the process.</p>	<p>PSM [(h)(2)(ii)] RMP 68.87</p>	<p>turnaround contractors), to confirm that they meet requirements.</p> <p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Contract employee orientation regarding the hazards at the facility may be conducted using face-to-face briefings, video presentations, computer-based training (CBT), or other appropriate means. • Auditors may find that in many regions of the United States where there is a concentration of chemical/processing facilities, a third-party organization has been established to provide common hazard-related training, and conduct facility-specific hazard related training using materials supplied by the facilities. These third-party organizations then provide the contract employees with credentials that document completed training. This relieves their member facilities from having to perform this work and maintain the records. The use of these third-party organizations, even if they exist in a particular region, is not mandatory. • Some companies provide more specific information regarding potential hazards related to the contractor's work via safe work processes (control over entry, work permits, etc.). <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the site and process-specific training that is provided to assess the comprehensiveness and clarity of the content and to be sure the information is up-to-date, including the training given by a third-party organization if one is performing the training on behalf of the facility. • Auditors should review sign-in logs (for contract employees covered by the regulation), choose some names, and check to be sure training has been

Audit Criteria	Source	Guidance for Auditors
		<p>completed as required.</p> <ul style="list-style-type: none"> Auditors should conduct interviews with contract employees to confirm that they have received information regarding the hazards of the facility prior to beginning work. If possible, auditors should interview contract employees working in the field to see if they can demonstrate an understanding of the hazards of the process.
<p>14-C-4. The employer has explained to contract employers the applicable provisions of the emergency action plan.</p>	<p>PSM [(h)(2)(iii)] RMP 68.87</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Contractor orientation regarding the emergency action plan at the facility may be conducted using face-to-face briefings, video presentations, CBT, or other appropriate means. Auditors may find that in many regions of the United States where there is a concentration of chemical/ processing facilities, a third-party organization has been chosen to provide facility-specific emergency action training using materials supplied by the facilities as described above. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should interview contract employees to confirm that they have received information regarding the facility emergency action plan prior to beginning work. If possible, auditors should interview contract employees working in the field to see if they can demonstrate an understanding of key elements of the emergency action plan for the area in which they are working (how they will be notified if there is a need to evacuate, where they are supposed to go, evacuation routes, etc.).
<p>14-C-5. The employer has developed and implemented safe work practices to control the access, presence, and exit of contract employees to process units.</p>	<p>PSM [(h)(2)(iv)] RMP 68.87</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Contract employees should be required to report their entry and exit by notation in a log, electronic pass card, or other

Audit Criteria	Source	Guidance for Auditors
		<p>similar method.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should conduct field observations to confirm that contractor entry and exit to/from the process areas is controlled in accordance with the written safe work practice. Auditors should verify that contract employees working in an area have signed in and out as required.
<p>14-C-6. The employer has periodically evaluated the performance of contract employers in fulfilling their responsibilities under the contractor management requirements of the PSM Standard (see Table 14.2).</p>	<p>PSM [(h)(2)(v)] RMP 68.87</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The host facility should periodically evaluate the contract employer to determine if the contract employer is fulfilling all of its responsibilities under OSHA PSM and EPA RMP, including training on the necessary craft skills, safe work practices, hazards faced at host employer's facilities, emergency response; proper documentation of the training; observance of all facility safety rules; and that contractor employers advise the facility of hazards caused by, or encountered by, the contractor employers' work. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review host company/facility procedures/policies to determine who is responsible for completing these evaluations, how often they are to be done, and how they are to be done (what will be checked and how it will be checked). Auditors should verify that all contract employer obligations specified in paragraph (h)(3) of the regulation are considered. Auditors should review completed evaluations to confirm that they have been conducted in accordance with requirements.
<p>14-C-7. The employer has maintained a contract employee injury and illness log related to the contractor's work in process areas.</p>	<p>PSM [(h)(2)(vi)] RMP 68.87</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The host employer should either maintain a contractor injury and illness log, or obtain copies of

Audit Criteria	Source	Guidance for Auditors
		<p>the contractor's injury and illness log for work performed at the host employer's facility.</p> <ul style="list-style-type: none"> The format of the contractor injury and illness log may be an OSHA 300 log, or a separate record developed by the company/facility. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review contractor injury and illness logs to confirm that they have been maintained properly.

Table 14.2 describes the audit criteria and auditor guidance for contractor employer's responsibilities pursuant to OSHA PSM and EPA RMP. Note that normally these questions are not applicable if a host employer is being audited, unless there are contract employer's administrative offices on-site or close by such that they can be conveniently visited.

Table 14.2 OSHA PSM and EPA RMP Audit Criteria and Guidance for Auditors - Contractor Employer's Responsibilities

Audit Criteria	Source	Guidance for Auditors
<p>14-C-8. The contract employer assures that each contract employee is trained in the work practices necessary to safely perform his/her job.</p>	<p>PSM [(h)(3)(i)] RMP 68.87</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The contract employer should provide training in the job skills that their personnel need to perform the services they are hired to provide. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the contract employer's training program to confirm that the correct skills are being imparted with respect to the host site being audited. Auditors should review the training program (required competencies) for a given craft or skill and verify that contract employees working in the field have properly completed the prescribed training. Auditors should conduct interviews with contract employees to confirm that the training in craft skills is adequate to enable them to <p>Table 14.2 – Continued</p>

Audit Criteria	Source	Guidance for Auditors
		<p>Table 14.2 – Continued perform their jobs in a safe manner.</p>
<p>14-C-9. The contract employer assures that each contract employee is instructed in the known potential fire, explosion, or toxic release hazards related to his/her job and the process, and in the applicable provisions of the emergency action plan.</p>	<p>PSM [(h)(3)(ii)] RMP 68.87</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with contract employees to confirm that the contract employer's process for making sure this instruction is completed as required. • Auditors should review the contract employer or third-party contractor management provider documentation to confirm that the appropriate training has been provided. • Auditors should conduct interviews with contract employees to confirm that they have been trained in the known potential fire, explosion, or toxic release hazards related to their jobs and the covered processes, as well as the applicable provisions of the emergency action plan for the locations where they work. • If possible, auditors should interview contract employees working in the field to confirm that they understand the hazards of the process and the emergency action plan for the area in which they are working.
<p>14-C-10. The contract employer has documented that each contract employee has received and understood the training required by the contractor management paragraph of the PSM Standard. The contract employer has prepared a record which contains the identity of the contract employee, the date of training, and the means used to verify that the employee understood the training.</p>	<p>PSM [(h)(3)(iii)] RMP 68.87</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the contract employer or third-party contractor management provider documentation to confirm that the appropriate training has been provided, is properly documented, and that a reasonable method has been used to verify that the contract employee understood the training (i.e., a written test, demonstration of competency, etc).
<p>14-C-11. The contract employer assures that each contract employee follows the safety rules of the facility, including the safe work practices required by the PSM Standard (e.g.</p>	<p>PSM [(h)(3)(iv)] RMP 68.87</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review contract employer inspection records/checklists to confirm

Audit Criteria	Source	Guidance for Auditors
lockout/ tagout, confined space entry, opening process equipment or piping and control over entrance into a facility).		that they perform periodic evaluations of their employee's performance in the field and that the evaluations include appropriate criteria/checks.
14-C-12. The contract employer advises the host employer of any unique hazards presented by the contract employer's work, or of any hazards found by the contract employer's work.	PSM [(h)(3)(v)] RMP 68.87	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • In many cases, a general safe work permit is used to identify hazards associated with all nonroutine work, including that of contract employees. This practice provides a mechanism for both the host company and the contract employee to discuss hazards associated with the work, including means to mitigate the hazard. Safe work practices are covered in more detail in Chapter 12. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews to confirm that, at a minimum, a mechanism exists for contract employees to report hazards they identify at the facility during their work. • Auditors should review the contract employer safety manual to confirm that actual incidents and near misses experienced by the contract employees are formally investigated and that the host site receives a copy of the incident report. • Auditors should conduct interviews with contract employees to determine how they report hazards and whether they perceive these mechanisms as effective.

14.2.1.1 U.S. State PSM Programs

If the PSM program being evaluated is pursuant to a state PSM regulation, then the specific contractor management requirements for that regulatory program should be followed. In general, these overlap somewhat with the federal OSHA PSM and EPA RMP requirements, but often there are state-specific requirements that should be met, even if the state has received authority to enforce federal regulations (i.e., the state is an OSHA state plan state, or has received implementing agency status for the RMP Rule from EPA). The state-specific applicability requirements for the following states are presented below:

- New Jersey
- California
- Delaware

Table 14.3 shows the audit criteria and auditor guidance for Contractor Management pursuant to state requirements.

Table 14.3 U.S. State PSM Audit Criteria and Guidance for Auditors - Contractor Management

Audit Criteria	Source	Guidance for Auditors
<p><i>New Jersey Toxic Catastrophe Prevention Act (TCPA)</i> 14-C-13. The New Jersey TCPA regulations do not add any different or unique Contractor Management requirements beyond those described for the PSM Standard and RMP Rule.</p>	<p>N.J.A.C. 7:31-4.8</p>	<ul style="list-style-type: none"> • No further guidance.
<p><i>Delaware Accidental Release Prevention Regulation</i> 14-C-14. The Delaware EHS regulations do not add any different or unique Contractor Management requirements beyond those described for the PSM Standard and RMP Rule.</p>	<p>Delaware Code, Chapter 77, Section 5.87</p>	<ul style="list-style-type: none"> • No further guidance.
<p><i>California OSHA—Process Safety Management of Acutely Hazardous Materials</i> 14-C-15. The CalOSHA PSM regulations do not add any different or unique Contractor Management requirements beyond those described for the PSM Standard and RMP Rule.</p>	<p>California Code of Regulations, Title 8, Section 5189</p>	<ul style="list-style-type: none"> • No further guidance.
<p><i>California Accidental Release Prevention Program</i> 14-C-16. The CalARP regulations do not add any different or unique Contractor Management requirements beyond those described for the PSM Standard and RMP Rule.</p>	<p>California Code of Regulations, Title 19, Section 2760.12</p>	<ul style="list-style-type: none"> • No further guidance.

14.2.2 Related Criteria

The purpose of providing these criteria is to provide auditors with additional guidance for evaluating PSM programs with respect to issues that go beyond the strict compliance requirements presented above, and in large part represent industry good practices in process safety knowledge, or in some cases practices in

process safety knowledge that have become common. Some of the related criteria have reached the status of a level of acceptable practice because of their widespread, accepted, and successful use over an extended period of time. Auditors and PSM practitioners should carefully consider implementing this guidance, or at least designing an approach that is similar in nature. See the Glossary and Section 1.7.1 for a more complete discussion of the meaning and use of level of acceptable practice.

Table 14.4 identifies audit criteria and auditor guidance for related criteria relating to the host facility and Contractor Management.

Table 14.4 Related Audit Criteria and Auditor Guidance - Host Facility Contractor Management

Audit Criteria	Source	Guidance for Auditors
14-R-1. The Contractor Management program has been applied to subcontractors.	CPL	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the contractor management procedure to confirm that the program applies to contractors and subcontractors alike. If the facility has assigned the responsibility of evaluating and training/orienting the subcontractors to the general contractor, then auditors should review the procedures and records of the general contractor to determine if they meet the host facility's requirements.
14-R-2. The facility has a written management system procedure for the selection of contractors and administration of their work onsite.	GIP 3133 NEP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that a management system procedure for contractor safety is in place and it covers the following topics: <ul style="list-style-type: none"> – Provides definitions of which types of vendors of goods or services will be considered as contractors for the purposes of PSM, with facility-specific examples. – Describes the process used to obtain information on injury and illness rates when prescreening contractors. – Describes the process used to evaluate the contract employer's PSM

Audit Criteria	Source	Guidance for Auditors
		<p>Table 14.4 – Continued metrics program, if they have one.</p> <ul style="list-style-type: none"> – Describes the process used to obtain contract employer references when prescreening them. – Ensures that the contractor has the appropriate job skills, knowledge, and certifications (e.g., for pressure vessel welders) when prescreening them. – Describes the process used to evaluate the work methods and experience of prospective contractors when prescreening them. – Describes the process used to evaluate the financial status of prospective contractors when prescreening them. – Includes or references a list of approved contractors. – Identifies the personnel who are responsible for administering the contractor safety program. – Includes criteria that will be used to evaluate the safety program and performance of prospective contractors. – Provides for periodic re-evaluation of existing contractors. – Describes how facility/unit information will be provided to contractors. – Describes how evaluations of contractor performance in the field will be conducted. – Describes how evaluations of the contractor's fulfillment of its responsibilities under PSM will be conducted. – Describes how equivalent training will be given to contractors who fulfill certain roles (process operators, routine

Audit Criteria	Source	Guidance for Auditors
		<p>preventive maintenance, approval role in SWPs, approval role in MOCs, etc.), and how that training will be documented.</p> <ul style="list-style-type: none"> – Documents the prescreening evaluations and re-evaluations of potential contractor's safety performance and programs. – Defines requirements for substance abuse testing and/or background checks if the facility performs or requires these tests for contractors.
<p>14-R-3. Contractors are informed, prior to the initiation of the contractor's work, of:</p> <ul style="list-style-type: none"> • The facility safe work practice procedures. • Other facility work rules applicable to the contractor's work. • The method(s) of reporting contractor-discovered hazards to the host facility's organization. • The provision of this information to contractors has been documented. 	<p>GIP NEP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • SWP policies are provided to the contractors, either at the facility or by the third-party contractor management organization. Other information that is important when performing physical work at the facility should also be provided. • Contractors should acknowledge and agree to adhere to company on-site safety requirements. • A periodic (e.g., annual) re-orientation may be required for all contract employees. They may be provided with dated access badges that expire when the safety orientation expires, prohibiting entrance until a re-orientation is completed. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with contractor employees to confirm that this information has been provided to them.
<p>14-R-4. The safe work practice (permit) program that controls the entrance, presence, and exit of contract employees to process units (or another site program) includes the following provisions:</p> <ul style="list-style-type: none"> • Badges, distinctive clothing, or distinctive PPE are issued to contractors so that their Table 	<p>GIP NEP</p>	<p><u>Background Information for Auditors:</u></p> <p>Facility personnel, particularly operations, should have an accurate account of what work is being performed by contractors in their area of responsibility during each shift. This is usually accomplished by having the appropriate</p>

Audit Criteria	Source	Guidance for Auditors
<p>14.4 – Continued</p> <ul style="list-style-type: none"> • presence can be easily detected and monitored by host facility personnel. • The program ensures that those personnel designated as responsible for the contractor's work as well as other operations, supervisory and management personnel are aware of nonroutine contractor work. • The program provides records that can be used to show which contractor personnel are (or were) in the covered process at any given time. 		<p>personnel, specifically an operator, counter-sign any permits issued to contractors in their unit.</p> <ul style="list-style-type: none"> • In parallel with the use of various safe work permits, many facilities also use regularly scheduled (e.g., daily, weekly, or monthly) work/project and contractor work briefings/meetings for various engineering, project, maintenance, and operations supervisory personnel to keep them up-to-date. • The facility should keep completed SWPs for enough time to allow auditors to confirm that operations personnel are aware of contractor work via the permits issued to them. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review records to confirm that they include minutes of meetings held to brief facility personnel on contractor work. • Auditors should review the contractor entry/exit records versus the approved contractor's list to confirm that all contractors are using the entry/exit procedures.
<p>14-R-5. There is a program in effect to periodically evaluate that the contract employer is fulfilling their regulatory responsibilities and any additional expectations that may be imposed by the host facility.</p>	<p>GIP NEP</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review contractor management program records to confirm that the evaluations of contractor PSM performance are consistently completed (timing between evaluations, content of evaluations, etc.) and documented. • Auditors should review relevant documentation and conduct interviews to confirm that contractor safety performance in the field is evaluated as necessary. • Auditors should review contractor management program records to confirm that these evaluations of field

Audit Criteria	Source	Guidance for Auditors
		<p>performance are documented.</p> <ul style="list-style-type: none"> Auditors should review relevant documentation and conduct interviews to confirm that additional expectations imposed by the host facility are included in contract employer evaluations.
<p>14-R-6. The host employer has ensured, through periodic evaluations, that the training provided to contract employees by the contract employer is equivalent to the training required for direct hire employees who perform the same/similar tasks, including</p> <ul style="list-style-type: none"> Process operators Employees who perform routine preventive maintenance Employees who fulfill a role in the facility's MOC program Employees who fulfill a role in the facility's safe work permitting processes Employees who have unique process knowledge 	CPL	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> In this context, "filling a role" in the MOC and SWP programs means that the contractors have signatory authority in those programs, not that they are simply subject to the provisions of those programs. Many facilities have not included contractors in the same training, safety meeting, and other PSM program activities due to potential co-employment issues. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the contractor management procedures/policies to determine how the evaluation of training equivalency is conducted. Auditors should review contractor management program records to confirm that this evaluation of training equivalency is documented in some way.
<p>14-R-7. If the host employer has identified deficiencies in the performance of contract employers, action has been taken to correct the deficiencies.</p>	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Routine periodic meetings between company and contractor management personnel may be used as a mechanism to review safety performance (including compliance with company safety requirements as well as incidents and unsafe behaviors) and take appropriate corrective/preventive action. Such meetings can also be used to identify possible deficiencies in the host employer's safety programs. A recognition program for contract employers and/or employees may also be used to

Audit Criteria	Source	Guidance for Auditors
		<p>reward good/improved safety performance.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with purchasing, safety, or other personnel who manage contractors at the facility to confirm that, when performance deficiencies are discovered in the field, contract employees and/or employers are properly counseled. When repeated deficiencies occur with the same contract employees and/or employers, they are dismissed from the facility and forbidden from being awarded further work. • Auditors should review contractor management program records, specifically the approved contract employers list, if one exists, to confirm when contract employers and/or employees have been barred from working at the facility.

Table 14.5 identifies recommend related audit criteria and auditor guidance relating to the contractor employer and Contractor Management. Note that normally these questions are not applicable if a host employer is being audited, unless there are contract employer administrative offices on-site or close by such that they can be conveniently visited.

Table 14.5 Related Audit Criteria and Auditor Guidance - Contractor Employer and Contractor Management

Audit Criteria	Source	Guidance for Auditors
<p>14-R-8. The contractor employer has a written plan describing their safety program.</p>	<p>GIP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Most contractors have a safety manual that should have been submitted to the host facility/company when information was collected about the contract employer's safety program for pre-hire screening purposes (or for periodic evaluation of contract employer performance). <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check to

Audit Criteria	Source	Guidance for Auditors
		determine if the contractors have submitted their safety manual or an equivalent document(s) to the host facility.
14-R-9. In addition to the training required by paragraph (h)(3) of the PSM Standard, contract employees receive additional training from their employer, as necessary, to prepare them to work at facilities in the chemical/ processing sector.	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> This training should include MOC procedures, safe work practices, and other PSM-related procedures at the worksites they normally service. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check to determine that the contractor employers have provided training in PSM-related topics such as MOC and SWPs.
14-R-10. The contract employer assures that each contract employee follows the safety rules of the host facility, including the safe work practices.	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> This assurance should be provided by periodic inspections of contract employees by the contract employer's supervisory or inspection personnel. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Review of contract employer records should indicate that these inspections are documented.

14.2.3 Voluntary Consensus PSM Programs

The following voluntary consensus PSM program requirements for contractor management are described below:

- The requirements published for the offshore oil platform sector in the Safety and Environmental Management Program (SEMP), a voluntary program designed by API and endorsed by the Minerals Management Service of the U.S. Department of the Interior.
- Responsible Care Management System (RCMS)[®] published by the American Chemistry Council.
- RC14001 Environmental Management System, published by the American Chemistry Council.

Table 14.6 lists audit criteria and auditor guidance relating to contractor management pursuant to voluntary consensus PSM programs.

Table 14.6 Voluntary Consensus PSM Program Audit Criteria and Guidance for Auditors - Contractor Management

Audit Criteria	Source	Guidance for Auditors
<p><i>SEMP</i></p> <p>14-R-11. The management program provides guidelines for the selection and performance evaluation of contractors.</p>	<p>API RP 75, 6.1, 6.4</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should ensure that written processes or procedures exist for use in selecting contractors and evaluating their performance. • Auditors should ensure that written guidelines exist that delineate the types of information to collect concerning the contractor's policies, practices, and performance.
<p>14-R-12. The management program requires an agreement between the host company and the contract employer on the appropriate safety and environmental management policies at the host facility(ies).</p>	<p>API RP 75, 6.1</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should ensure that written guidelines requiring such agreements exist. • Auditors should ensure that there is evidence that such agreements have been made (written documents, purchase orders/contracts, statements by contractors, etc.).
<p>14-R-13. The management program requires that information regarding a contractor's method of selecting subcontractors be obtained and evaluated.</p>	<p>API RP 75, 6.4</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should ensure that written guidelines exist requiring the review of contract employer processes for selecting subcontractor(s). • Auditors should ensure that contract employer documents, e.g., purchase orders/contracts, include review of subcontractor(s).
<p>14-R-14. Management has a system in place that ensures that its contractors have policies and practices consistent with the organization's management program.</p>	<p>API RP 75, 1.1, 1.2.2.b.</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review procedures to determine that the contractor management system requires pre-employment screening and oversight of the contractor's environmental performance. • Auditors should review procedures to determine if there is an evaluation system requiring review of the contractor's safety and environmental management policies and practices.

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"> Auditors should interview contractor employees to determine if they are aware of safety and environmental management policies.

Audit Criteria	Source	Guidance for Auditors
<p><i>Responsible Care[®] Management System (RMCS)</i></p> <p>14-R-15. The organization shall conduct reviews of the Responsible Care performance of carriers, suppliers, distributors, customers, contractors and third party providers, commensurate with risk, for use in qualification reviews.</p>	<p>RCMS Technical Specification, Element 4.5</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Performance and qualification reviews should be handled through a survey and follow-up system. There should be a system to: 1) qualify and select, 2) share risk information with, and 3) track performance of each commercial partner company and provide feedback for performance improvement. The organization may be involved in consortia that "pre-qualify" potential commercial partners, addressing key EH&S considerations. These arrangements are acceptable and encouraged, as long as they address the intent and expectations of RCMS. Verify that a documented qualification system is in place for each type of commercial partner, and that this system specifically includes Responsible Care performance as a key component of the qualification and selection process. Verify that the organization conducts periodic reviews of commercial partner performance, and shares this information with them. Where possible, interview commercial partners to assess their knowledge of company qualification and performance tracking systems.

Audit Criteria	Source	Guidance for Auditors
<p><i>RC14001</i></p> <p>14-R-16. The organization shall establish and maintain a system to:</p>	<p>RC14001 Technical Specification</p>	<ul style="list-style-type: none"> No further guidance.

Audit Criteria	Source	Guidance for Auditors
<p>Table 14.6 – Continued</p> <ul style="list-style-type: none"> • Provide appropriate guidance, information and training requirements to carriers, distributors, customers, contractors and third party providers on the risks and hazards of the organization's products and processes, and for receiving such information from suppliers on goods and services used by the organization. • Includes environmental, health, safety and security performance for the qualification and selection of suppliers, carriers, distributors, contractors, and third-party providers; commensurate with risk. 	RC151.03 4.4.6	
14-R-17. Review the environmental, health, safety and security performance of carriers, suppliers, distributors, customers, contractors and third party providers.	RC14001 Technical Specification RC151.03 4.5.2	<ul style="list-style-type: none"> • No further guidance.

14.3 AUDIT PROTOCOL

The process safety program audit protocol introduced in Appendix A and available online (see page xiv for information on how to access this resource) provides detailed questions that examine the issues described in Section 14.2.

REFERENCES

- American Chemistry Council, *RCMS[®] Technical Specification*, RC101.02, March 9, 2005
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations*, RC101.02, January 25, 2004
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations Appendices*, RC101.02, January 25, 2004
- California, California Code of Regulations, Title 8, Section 5189, CalOSHA, November 1985
- Center for Chemical Process Safety (CCPS), *Guidelines for Risk Based Process Safety*, American Institute of Chemical Engineers, New York, 2007 (CCPS, 2007c)
- Delaware, *Accidental Release Prevention Regulation*, Delaware Department of Natural Resources and Environmental Control/Division of Air and Waste Management, September 1989 (rev. January 1999)

- Department of the Interior, Minerals Management Service, *Safety and Environmental Management Program (SEMP)*, 1990
- Environmental Protection Agency (USEPA), 40 CFR §68, *Accidental Release Prevention Requirements: Risk Management Programs Under Clean Air Act Section 112(r)(7)*; Final Rule, June 21, 1996
- John Gray Institute (JGI), *Managing Workplace Safety and Health: The Case of Contract Labor in the U.S. Petrochemical Industry*, July 1991
- New Jersey, *Toxic Catastrophe Prevention Act (N.J.A.C. 7:31)*, New Jersey Department of Environmental Protection, June 1987 (rev. April 16, 2007)
- Occupational Safety and Health Administration (OSHA) 29 CFR §1910.119, *Process Safety Management of Highly Hazardous Chemicals, Explosives and Blasting Agents; Final Rule*, Washington, DC, February 24, 1992
- Occupational Safety and Health Administration (OSHA) Publication 3133, *Process Safety Management Guidelines for Compliance*, Washington, DC, 1993
- Occupational Safety and Health Administration (OSHA) Instruction CPL 02-02-045 CH-1, *PSM Compliance Directive*, Washington, DC, September 13, 1994
- Occupational Safety and Health Administration (OSHA) Instruction CPL 03-00-004, *Petroleum Refinery Process Safety Management National Emphasis Program*, June 7, 2007 (OSHA, 2007a)
- Occupational Safety and Health Administration (OSHA) Directive 09-06 (CPL 02), *PSM Chemical Covered Facilities National Emphasis Program*, July 27, 2009 (OSHA, 2009a)

15

TRAINING AND PERFORMANCE ASSURANCE

This element is called Training in OSHA PSM and EPA RMP programs. In many state regulatory PSM programs it is also called Training. In the voluntary consensus PSM programs it is generally referred to as Training. Training and Performance Assurance is an element of the RBPS accident prevention pillar Manage Risks.

15.1 OVERVIEW

A consistently high level of human performance is a critical aspect of any process safety program. Without an adequate training and performance assurance program, a facility can have no confidence that work tasks will be done consistently in accordance with approved procedures and practices. Training is instruction on how to do a job and the task requirements and methods. It may be provided in a classroom, via computer-based training (CBT), and/or in the field on a practical basis, and its objective is to enable workers to meet minimum initial performance standards and to maintain their proficiency. Performance assurance is the means by which workers demonstrate they have understood the training and can apply it in practical situations. Performance assurance is an ongoing process to ensure that workers meet performance standards and to identify where additional training is required.

In the context of the compliance and related guidance information presented herein, a training program refers not only to the instruction provided and the completion of those activities associated with the instruction but also includes the successful completion of the performance assurance portion of this element, which infers that the prospective operators have “qualified” in the position for which they have been trained and that the qualification has been approved.

The Training and Performance Assurance element interfaces significantly with other PSM program elements. There are training requirements or needs in all

PSM program elements. However, the primary interfaces with other elements include the following:

- Hazard Identification and Risk Analysis (Chapter 10)—the results of HIRAs should be communicated to those personnel whose jobs are affected by the results.
- Operating Procedures (Chapter 11)—the operators should be trained thoroughly on the contents of the SOPs.
- Asset Integrity and Reliability (Chapter 13)—the maintenance personnel should be thoroughly trained on the contents of the corrective and preventive maintenance procedures. In addition, there are several specialty training and qualification needs that should be obtained to support AI activities such as welding, pressure vessel, tank, and piping inspections, nondestructive testing, vibration monitoring, etc.
- MOC (Chapter 16)—personnel whose jobs are affected by changes should be trained in the changes prior to startup.
- Operational Readiness (Chapter 17)—operational readiness review activities require that training be accomplished prior to start-up.
- Emergency Management (Chapter 19)—there is a number of emergency action plan and HAZWOPER training requirements that support emergency response plans.
- Incident Investigation (Chapter 20)—personnel should be trained in the lessons learned from incident investigations.

In Sections 15.2 and 15.3, compliance and related audit criteria are presented, along with guidance for auditors in applying the criteria. A full explanation of compliance and related audit criteria are presented in Chapter 1 (see Section 1.7). The criteria and guidance described in these sections do not represent exclusive solutions to PSM program coverage, design, implementation, or interpretation. They represent the collective experience of many people in the chemical/processing sector who have performed many PSM audits, and the consensus opinion resulting from that experience. The compliance criteria are derived from the regulations that govern PSM programs in the United States; however, these regulations are all performance-based. Performance-based regulations are goal oriented and there may be multiple pathways to fully complying with them. Therefore, there may be alternate interpretations and solutions to the issues described in the compliance tables in this chapter that are equivalent to those included, particularly the auditor guidance presented.

The inclusion of the related criteria in no way infers that these criteria must be implemented for a PSM program to be successful, nor does it infer that a PSM program will be deficient without them. As with the compliance criteria, there may be other, more appropriate solutions for an individual facility or company. In addition, the use of the related criteria in a PSM audit is intended to be completely voluntary and not a mandatory requirement in any way. They should be used cautiously and with careful planning so that they do not inadvertently establish unintended performance standards. Consensus should be sought within and among

facilities and their parent companies before these criteria are used. Finally, the related criteria and guidance offered for consideration are not endorsements of or agreements with the written or verbal clarifications made by the regulators, PSM citations issued against the regulations, other PSM guidance published by the regulators, or the successful or common PSM practices in any given company's PSM program from which they are derived.

15.2 AUDIT CRITERIA AND GUIDANCE

The detailed requirements for the Training and Performance Assurance program for the process operators contained in OSHA's PSM Standard, EPA's RMP Rule, and several state PSM regulatory programs, as well as for other common voluntary consensus PSM programs are presented below. This chapter addresses training and performance assurance as it applies to the operators only. Chapter 6 also addresses the PSM competence of personnel. Also, see Chapters 13 and 19 for the compliance and nonmandatory training requirements for maintenance personnel and emergency responders, respectively. These and other chapters, as described in Section 15.1, also address training for other facility personnel on various PSM topics where appropriate.

The audit criteria described below are examined by auditors using the guidance provided by performing the following audit activities:

- Interviewing the persons at the facility with the responsibility for managing the development and execution of the facility's operator training program. These persons are or generally work in the facility's operations or production department, although sometimes the training function reports through human resources.
- Reviewing the training records of the operators.
- Reviewing the operating procedures for units included in the PSM program against the contents of the operator-training program to determine if the contents of the operating procedures were used in its design.
- Interviewing and observing the operators to determine if they understood the training and if it prepared them to carry out their duties.

Auditors should also carefully examine the training requirements found in the procedures of the company/facility being audited. As stated in Section 1.7.1, these could be interpreted as compliance requirements by regulators and could be subject to citations if they are not being followed. Auditors should confirm, via interviews, records and document reviews, and field observations, that the requirements of the facility or company training procedures have been implemented as specified. Findings should be generated if the company/facility-specific provisions are not being followed.

See the Guidance for Chapters 3–24 in the Introduction for the definition of the abbreviations shown in the following tables that are used to indicate the source of the criteria.

15.2.1 Compliance Requirements

The audit criteria should be used by the following:

- Readers in the United States covered by the PSM Standard or RMP Rule.
- Readers who have voluntarily adopted the OSHA PSM program.
- Readers whose companies have specified OSHA PSM requirements in non-U.S. locations.

Table 15.1 describes the audit criteria and auditor guidance for operator training pursuant to OSHA PSM and EPA RMP.

Table 15.1 OSHA PSM and EPA RMP Audit Criteria and Guidance for Auditors - Operator Training

Audit Criteria	Source	Guidance for Auditors
<p>15-C-1. Initial training. Each employee presently involved in operating a process, and each employee before being involved in operating a newly assigned process, shall be trained.</p>	<p>PSM (g)(1)(i) RMP 68.71</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Initial training is the training that established the qualification of the operators in each position. • An employee "involved in operating a process" is anyone who actually operates the process equipment. This can include the operators themselves, but also maintenance personnel, supervisors, engineering personnel, contractors, or anyone else who actually performs tasks that operate the equipment. In most cases, interviews should be conducted to confirm who actually operates the equipment and under which circumstances. A common example in facilities where the operators are union represented is that management and nonrepresented personnel are trained and qualified to become operators in case a strike occurs. This would require that the nonrepresented personnel receive the same training as the normal operating staff. • Maintenance personnel would have to be trained as operators if they operate the equipment to prepare it for maintenance, i.e., shut down the equipment or place it in a mode of operation where maintenance can be performed. However, if the operators perform these

Audit Criteria	Source	Guidance for Auditors
		<p>preparatory tasks, then the maintenance personnel would not need to be trained as operators.</p> <ul style="list-style-type: none"> • Personnel who observe or monitor the processes and their conditions do not need to be trained as operators. • Personnel who give direct orders to those operating the process should be trained to a level that is consistent with their role in the operations; however, these personnel do not require the same training program as the operators themselves. In most cases, however, auditors will discover that because of the employment progression in many facilities, in order to become an operations supervisor who directs the operators, that person will have had to be trained and qualified in the operators' positions he/she will direct prior to being promoted. However, this may not be the case for engineering personnel or supervisors or managers who did not have operations experience. • The training requirements for maintenance personnel are described in Chapter 13 (Asset Integrity and Reliability). <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should interview personnel, including the operations manager/production manager, and operations supervisors to determine who is considered an operator. Specifically, auditors should determine, via interviews, if supervisors, management personnel, engineering personnel, or anyone else outside of the cadre of qualified operators has the authority to direct operations. This should include strike assignments, if the nonmanagement work force is represented by a union. Sometimes, the list of qualified operators is documented on a

Audit Criteria	Source	Guidance for Auditors
<p>15-C-2. In lieu of initial training for those employees already involved in operating a process on May 26, 1992, an employer may certify in writing that the employee has the required knowledge, skills, and abilities to safely carry out the duties and responsibilities as specified in the operating procedures.</p>	<p>PSM (g)(1)(ii) RMP 68.71</p>	<p>Table 15.1 – Continued roster, overtime authorization list, or other records.</p> <p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The process of certifying that an operator does not require initial training because he had the required knowledge, skills, and abilities to safely carry out the duties and responsibilities specified in the SOPs prior to May 26, 1992, is often referred to as "grandfathering." • The grandfathering of the initial training should be certified in writing, and as with other certifications required by the PSM Standard, a signature and date should be provided in the certification. Review of operator training records should indicate that anyone whose initial training was grandfathered is certified properly. • If the facility has chosen to interpret the refresher-training requirement (see criteria 15-C-8) as a recertification or re-qualification requirement, then the grandfathering of operator initial training becomes a moot issue. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review operator initial and refresher training records to determine how the facility or company has interpreted the refresher-training requirement and whether the initial training for any operators was grandfathered. If so, there should be documentation for this decision that explains the rationale for granting the grandfathered training.
<p>15-C-3. The training shall include an overview of the process.</p>	<p>PSM (g)(1)(i) RMP 68.71</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The overview of the process should include how the process works, including the safety systems. <p><u>Auditor Activities</u></p>

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"><li>• Auditors should review operator- training records to determine if the operators whose initial training was not grandfathered received training in an overview of the process.

Audit Criteria	Source	Guidance for Auditors
<p>Table 15.1 – Continued</p> <p>15-C-4. Each employee shall be trained in the operating procedures as specified in the Operating Procedures element.</p>	<p>PSM (g)(1)(i) RMP 68.71</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The portion of the initial training that covers the SOPs should include the following: <ul style="list-style-type: none"> – Steps for each operating phase. – Initial start-up. – Normal operations. – Temporary operations (if applicable). – Emergency shutdown. – Emergency operations. – Normal shutdown. – Start-up following a turnaround or emergency shutdown. – Operating limits. – Consequences of deviations. – Steps required to correct or avoid deviations. – Properties of, and hazards presented by, the chemicals used in the process. – Precautions necessary to prevent exposure, including engineering controls, administrative controls, and personal protective equipment. – Control measures to be taken if physical contact or airborne exposure occurs. – Quality control for raw materials and control of hazardous chemical inventory levels. – Any special or unique hazards. – Safety systems and their functions. • The initial training on the SOPs may be classroom, CBT, practical (i.e., on-the-job), or in other settings such as simulators. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review operator-training records to determine if the operators whose initial training was not grandfathered received training in the contents of the SOPs. • Auditors should review the training content to determine if it reflects the current operating procedures.

Audit Criteria	Source	Guidance for Auditors
15-C-5. The training shall include emphasis on the specific safety and health hazards applicable to the employee's job tasks.	PSM (g)(1)(i) RMP 68.71	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The initial training should include the properties and hazards of chemicals used and precautions for preventing exposure. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review operator-training records to determine if the operators whose initial training was not grandfathered received training in the safety and health hazards of the process.
15-C-6. The training shall include emphasis on the emergency operations including shutdown applicable to the employee's job tasks.	PSM (g)(1)(i) RMP 68.71	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review operator-training records to determine that the operators whose initial training was not grandfathered received training in emergency operations including shutdown.
15-C-7. The training shall include emphasis on the safe work practices applicable to the employee's job tasks.	PSM (g)(1)(i) RMP 68.71	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> SWPs include lockout/tagout, confined space entry, hot work permits, line/equipment opening, and any other SWPs that the facility has in place. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review operator-training records to determine if the operators whose initial training was not grandfathered received training in the relevant SWPs.
15-C-8. Refresher training shall be provided at least every three years, and more often if necessary, to each employee involved in operating a process to assure that the employee understands and adheres to the current operating procedures of the process.	PSM (g)(2) RMP 68.71	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The content and scope of the refresher training is not specified and can be developed by each facility based on its needs. However, the requirement that the operators understand and adhere to the operating procedures indicates that the refresher training content should focus on the operating procedures in place at the time the training is given. Some facilities and companies have chosen to interpret the requirement for triennial refresher training as an opportunity to re-

Audit Criteria	Source	Guidance for Auditors
		<p>Table 15.1 – Continued</p> <p>qualify the operators in their positions and have designed the refresher training to accomplish this, including classroom/CBT training, practical/on-the-job (OTJ) training, and exams. Some facilities refer to this type of refresher training as “recertification” of operator training. Those that interpret the operator training requirements as recertification or requalification do so based on their own choice, not based on an OSHA or an industry consensus interpretation. Refresher training should be documented as described in audit criteria 15-C-10.</p> <ul style="list-style-type: none"> • There are several criteria that can be used to measure the three-year refresher-training period. The applicable regulations do not specify a particular time measurement method. These various measurement periods are summarized below along with guidance on common usage: <ul style="list-style-type: none"> – The starting date of the last refresher training. This is the most common used and easily understood method of measuring the 3 year training cycle, although it is not mandatory. – The ending date of the last refresher training sessions. – The requalification date (if refresher training is used to re-qualify the operators). <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review operator-training records to determine if the operators have received refresher training at least once every three years.
15-C-9. The employer, in consultation with the employees involved in operating the process, shall determine the appropriate frequency of refresher training.	PSM (g)(2) RMP 68.71	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The records that would document the consultation with the operators will vary widely, and may include minutes of safety or other meetings, written surveys conducted at such

Audit Criteria	Source	Guidance for Auditors
		<p>meetings, e-mail surveys of the operators, questions added at the end of a training session quiz, etc. Such records should be available for each refresher training cycle.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should interview operators and review available records to determine if they have been consulted on the frequency of refresher training.
<p>15-C-10. The employer shall ascertain that each employee involved in operating a process has received and understood the training required by this paragraph.</p>	<p>PSM (g)(3) RMP 68.71</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The same requirement exists for refresher training for all employees. • For test questions that are missed, ask how retraining to achieve correct understanding is accomplished. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review operator-training records to determine if the operators whose initial training was not grandfathered as well as operator refresher training have been examined in some fashion. This may be a written exam, oral exam, practical demonstration, simulator demonstration, or a combination of these or other testing methods.
<p>15-C-11. The employer shall prepare a record which contains the identity of the employee, the date of training, and the means used to verify that the employee understood the training.</p>	<p>PSM (g)(3) RMP 68.71</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review operator-training records to determine if the operators whose initial training was not grandfathered have a training record, either individual or collectively, that includes, at a minimum, the following information: <ul style="list-style-type: none"> – The identity of operators receiving training. – The date of each training activity. – The means used to ascertain that operators understood the training. – The same records are

Audit Criteria	Source	Guidance for Auditors
		required for refresher training.

15.2.1.1 U.S. State PSM Programs

If the PSM program being evaluated is pursuant to a state PSM regulation, then the specific training performance and assurance requirements for that regulatory program should be followed. In general, these overlap somewhat with the federal OSHA PSM and EPA RMP requirements, but often there are state-specific requirements that should be met, even if the state has received authority to enforce federal regulations (i.e., the state is an OSHA state plan state, or has received implementing agency status for the RMP Rule from EPA). The state-specific applicability requirements for the following states are presented below:

- New Jersey
- California
- Delaware

Table 15.2 shows the audit criteria and auditor guidance for Training and Performance Assurance pursuant to state requirements.

Table 15.2 U.S. State PSM Audit Criteria and Guidance for Auditors – Operator Training

Audit Criteria	Source	Guidance for Auditors
<p><i>New Jersey Toxic Catastrophe Prevention Act (TCPA)</i></p> <p>15-C-12. The owner or operator of a covered process shall provide a written job description which includes the duties and responsibilities for each EHS operator position. The training program shall specify the qualifications required for the personnel responsible for training EHS operators.</p>	N.J.A.C. 7:31-4.4	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review training, operations, or HR records to determine if a written job description including the duties and responsibilities for each EHS operator position exists. • Auditors should review training program procedures or job descriptions to determine if the qualifications required for the personnel responsible for training EHS operators have been defined.
<p><i>Delaware Accidental Release Prevention Regulation</i></p> <p>15-C-13. The Delaware EHS regulations do not add any different or unique Training & Performance Assurance requirements for operators beyond those described for the PSM Standard and RMP Rule.</p>	DE Code, Chapter 77, Section 5.71	<ul style="list-style-type: none"> • No further guidance.
<p><i>California OSHA—Process Safety Management of Acutely Hazardous Materials</i></p>	CCR, Title 8, Section 5189	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • See Chapter 13 for guidance on the training and qualification of

Audit Criteria	Source	Guidance for Auditors
<p>15-C-14. The CalOSHA PSM regulations specify that the same Training & Performance Assurance requirements described for operators in the PSM Standard and RMP Rule also apply to maintenance personnel (see Chapter 13).</p> <ul style="list-style-type: none"> • The CalOSHA PSM regulations operator training requirements do not include a grandfather clause for operators in lieu of initial training. • The employer, after the initial or refresher training shall prepare a certification record which contains the identity of the employee, the date of training, and the signatures of the persons administering the training. 		<p>maintenance personnel.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review operator-training records to see that the signatures of the persons administering the training are included.
<p>Table 15.2 – Continued</p> <p><i>California Accidental Release Prevention Program</i></p> <p>15-C-15. The CalARP regulations do not add any different or unique Operating Procedures requirements beyond those described for the PSM Standard and RMP Rule.</p>	<p>CCR, Title 19, Section 2760.3</p>	<ul style="list-style-type: none"> • No further guidance.

15.2.2 Related Criteria

The purpose of providing these criteria is to provide auditors with additional guidance for evaluating PSM programs with respect to issues that go beyond the strict compliance requirements presented above, and in large part represent industry good practices in process safety knowledge, or in some cases practices in process safety knowledge that have become common. Some of the related criteria have reached the status of a level of acceptable practice because of their widespread, accepted, and successful use over an extended period of time. Auditors and PSM practitioners should carefully consider implementing this guidance, or at least designing an approach that is similar in nature. See the Glossary and Section 1.7.1 for a more complete discussion of the meaning and use of level of acceptable practice.

Table 15.3 identifies recommended related audit criteria and auditor guidance for Training Performance and Assurance.

Table 15.3 Related Audit Criteria and Auditor Guidance - Training Performance and Assurance

Audit Criteria	Source	Guidance for Auditors
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Audit Criteria	Source	Guidance for Auditors
<p>Table 15.3 – Continued</p> <p>15-R-1. The definition of an operator, their roles and responsibilities, and their place in the chain of command is defined.</p>	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review training program procedures or other documents to determine if the job duties and responsibilities of an operator have been defined in writing, along with the definition of the chain of command for the operators. That is, who do the operators take orders from regarding the operation of the processes when they are on duty, and what are the training and qualification requirements of those who can direct the operators while they are on duty? • Auditors should interview operators to determine if there is no confusion as to who can direct them (i.e., give them mandatory orders) while they are on duty.
<p>15-R-2. The grandfather certifications (if used) describe the rationale for granting the grandfathered qualifications.</p>	CPL	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the grandfathered certification documents to determine if they describe the rationale for granting the grandfathered operator qualifications.
<p>15-R-3. The grandfathered qualifications are still valid for all positions worked by each operator (for those veteran employees that have been grandfathered for each position for which they were qualified on May 26, 1992).</p>	CPL	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the current training and qualification requirements or training records for the operators to determine that the skills and knowledge to currently qualify as an operator have not changed substantially since those operators were grandfathered, or the differences in skill and knowledge have been adequately covered in refresher training.
<p>15-R-4. The refresher training for operators is separate from any training received as part of the MOC or pre-startup safety review programs.</p>	CPL	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review operator-training records to determine if the operators have received refresher training that is separate from any training

Audit Criteria	Source	Guidance for Auditors
<p>15-R-5. There is a management system procedure for the training and qualification of the operators.</p>	<p>CCPA GIP 3133</p>	<p>received pursuant to changes via the MOC program.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review procedures and management systems to determine if a management system procedure exists and has been implemented to manage the training and qualification of the operators. The procedure should cover the following topical areas: <ul style="list-style-type: none"> – Applicability of the training program, i.e., which positions and operations should be included in the operator-training program. The operations included in the operator-training program should be based on the risk as identified in the HIRAs, risk assessments, LOPAs/SIL analyses, or other analytical activities that are designed to identify and prioritize the hazards/risk associated with the equipment and its operation. – The operator positions to be trained. – Entry requirements for each operator position (e.g., education, previous training, qualification, or position, licenses required, physical attributes, and reading comprehension level) that are appropriate to the required positions. – Classroom topics to be covered for each prospective operator. – Practical/OJT topics to be covered or demonstrated by each prospective operator. – Duration of training/qualification period. – The required qualifications for trainers. – The goals and objectives to be achieved (in clear measurable terms) tailored

Audit Criteria	Source	Guidance for Auditors
		<p>Table 15.3 – Continued to each of the specific training modules or segments.</p> <ul style="list-style-type: none"> – Actions and conditions for practical factors under which the employee will demonstrate competence or knowledge as well as what is acceptable performance. – How refresher training will be planned and conducted. – How the frequency of refresher training will be determined. – The names or positions of individuals who authorize the completion of training requirements, including final qualification. – The format and management of operator training records.
15-R-6. The operator training addressed the use of PPE.	CCPA CIT	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review operator-training records to determine if the prospective operators were trained in the proper use of PPE.
15-R-7. The operator training addressed the safe use of engineering controls (i.e. safeguards).	CCPA CIT	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review operator-training records to determine if the prospective operators were trained in the safe use of engineering controls (i.e., safeguards).
15-R-8. The operator training addressed emergency evacuation and response.	CCPA CIT	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review operator-training records to determine if the prospective operators were trained in emergency evacuation and response.
15-R-9. The operator training covers/includes routine and nonroutine work authorization activities.	CCPA GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review operator-training records to determine if the prospective operators were trained in routine and nonroutine work authorization activities.

Audit Criteria	Source	Guidance for Auditors
15-R-10. The operator training addressed appropriate training on the hardware and software that the operators would be expected to use (If the operators access procedures and other key information electronically).	CCPA GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should review operator-training records to determine if the prospective operators were trained on the hardware and software that the operators would be expected to use (if the operators access procedures and other key information electronically).
15-R-11. Refresher training is provided more often than triennially if deemed necessary based on the risk, and on incidents and near misses.	CCPA GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should conduct interviews with operators to determine if the refresher-training frequency has been adjusted based on needs, the risk presented by the process hazards, and incidents and near misses that have occurred.
15-R-12. The operators have been consulted regarding the content of the refresher training.	GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should conduct interviews with operators to determine if the operators have been consulted regarding the content of the refresher training (consultation on the frequency of refresher training is a compliance requirement).
15-R-13. If the operators are not fluent in English, the training was delivered in the language that they speak.	3133	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should conduct interviews with operators to determine if the training was delivered in languages other than English if the operators are not fluent in English.
15-R-14. Acceptability criteria were established for the "means" used to ensure that the operators understood the training.	3133	<u>Background Information for Auditors:</u> <ul style="list-style-type: none"> The method chosen to determine if the operator understood the training received should have some acceptance criteria associated with it. This can be a numerical grade, a simple pass/fail criterion, or other method. <u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should review the training procedure or training records to determine if acceptability criteria have been established.

Audit Criteria	Source	Guidance for Auditors
<p>Table 15.3 – Continued</p> <p>15-R-15. A plan of action was documented for those prospective operators who did not pass the exam.</p>	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review training procedures and operator-training records to determine if a plan was documented for those prospective operators who did not pass the exam. • Auditors should conduct interviews with operators to determine if they did not pass the exam, that a plan of action was developed to address the areas where they were deficient.
<p>15-R-16. The training records document each training activity.</p>	CCPA GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review operator-training records to determine if each training activity has been described.
<p>15-R-17. The training records document the results of each exam given to the operators.</p>	CCPA GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review operator-training records to determine if the results of each exam given to the operators are documented.
<p>15-R-18. The training records document the name of person(s) conducting training.</p>	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review operator-training records to determine if the name of person(s) conducting training is documented.
<p>15-R-19. The training records document the name, signature, and date of person authorizing final qualification.</p>	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review operator-training records to determine if the name, signature, and date of person authorizing final qualification are documented.
<p>15-R-20. Training programs are periodically evaluated to see if the necessary skills, knowledge, and routines are being properly understood and implemented by the trained employees.</p>	CCPA 3133	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with the manager of the operator-training program to determine if the training programs are periodically evaluated, and there are records to document those evaluations.
<p>15-R-21. After the evaluations, if the trained employees were found not to</p>	3133	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct

Audit Criteria	Source	Guidance for Auditors
be at the level of knowledge and skill that was expected, the training program was revised, and retraining provided, or more frequent refresher training sessions provided until the deficiencies were resolved.		interviews with the manager of the operator-training program to determine if when the evaluations revealed deficiencies in the operator-training program, the program was revised and remedial training or additional refresher training was provided, and there are records to document those evaluations.
15-R-22. The operators were consulted on how to best improve the training process.	3133	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should conduct interviews with the manager of the operator-training program to determine if the training program evaluations included the operator's input. • Auditors should conduct interviews with operators to determine if they were consulted on how best to improve the training process.
15-R-23. Instructors are qualified to conduct the training.	CCPA	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should check training records to determine the qualification levels of the instructors that conduct operator training. The documentation may be in the form of resumes/CVs, training management system procedures, or other records that describe the qualifications of the instructors.

15.2.3 Voluntary Consensus Programs

The following voluntary consensus PSM program requirements for training performance and assurance are described below:

- The requirements published for the offshore oil platform sector in the Safety and Environmental Management Program (SEMP), a voluntary program designed by API and endorsed by the Minerals Management Service of the U.S. Department of the Interior.
- Responsible Care Management System (RCMS)[®] published by the American Chemistry Council.
- RC14001 Environmental Management System, published by the American Chemistry Council.

Table 15.4 lists audit criteria and auditor guidance relating to Training Performance and Assurance pursuant to voluntary consensus PSM programs.

Table 15.4 Voluntary Consensus PSM Program Audit Criteria and Guidance for Auditors - Training Performance and Assurance

Audit Criteria	Source	Guidance for Auditors
<p><i>SEMP</i></p> <p>15-R-24. The management program requires a documented training plan to ensure that all affected personnel are trained to work safely and are Table 15.4 – Continued aware of environmental considerations in accordance with their job responsibilities.</p>	<p>API RP 75, 7.1</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should identify the existence of a documented process for determining training needs. • Auditors should identify the existence of a written organization policy regarding training of affected personnel. • Auditors should identify inclusion of provisions in the plan for retraining of affected personnel if changes in facilities or procedures warrant.
<p>15-R-25. Affected employees have received training that addresses operating procedures pertaining to their jobs, safe work practices, and emergency response and control measures.</p>	<p>RP 75, 7.1, 7.2.1, 7.2.2, 7.3</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should identify written training program establishing minimum levels of training in the areas cited. • Auditors should review written requirements for the types of training found in RP 75,7.2.1. • Auditors should examine training records for the type of training specified above. • Auditors should obtain verification of training through employee interviews.
<p>15-R-26. Affected employees have systematically received training as mandated by regulatory agencies.</p>	<p>RP 75, 7.2.2, 7.3</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should identify a process in place for ensuring regulatory training compliance. • Auditors should review written requirements for the types of training found in RP 75,7.2.2. • Auditors should review training records for the type of training specified above. • Auditors should obtain verification of training through employee interviews.
<p>15-R-27. A process is in place to verify that personnel training is adequate and effective and is</p>	<p>RP 75, 7.1</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the documented process for

Audit Criteria	Source	Guidance for Auditors
provided by qualified instructors.		screening qualifications for training instructors. <ul style="list-style-type: none"> • Auditors should review the documented process for verifying that training content has been retained by employees (i.e., exams).
15-R-28. The organization has developed qualification criteria for each job and related training.	RP 75, 7.2.2	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review written qualification criteria for each job and associated training plan. • Auditors should review records substantiating that required training elements are being met for affected positions.
15-R-29. There is a system in place for documenting that appropriate training was completed and the results recorded.	RP 75, 7.1	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should ensure there is a documentation system in force for tracking training records.
15-R-30. Evidence of training is readily available.	RP 75, 7.1	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review training records, which should be readily available for inspection.
15-R-31. There is a process within the training plan for determining the need for and delivering periodic refresher training to affected personnel.	RP 75, 7.3	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should find evidence of periodic assessment (either testing or on-the-job) of understanding of and adherence to current operating procedures. • Auditors should examine a process in place to verify that required knowledge and skills have been retained.

Audit Criteria	Source	Guidance for Auditors
<i>Responsible Care® Management System (RMCS)</i> 15-R-32. The organization shall have a process in place to identify training needs and establish and maintain effective training to address Responsible Care related job requirements.	RCMS Technical Specification, Element 3.4	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Because this element addresses the training aspect of the implementation, operation, and accountability section, auditors should determine whether training programs are designed to achieve the goals, objectives, and targets established as well as to comply with legal and other Responsible Care-related

Audit Criteria	Source	Guidance for Auditors
		<p>Table 15.4 – Continued</p> <p>requirements.</p> <ul style="list-style-type: none"> <li>• Auditors should identify training needs and programs. While it is specific to Responsible Care-related job requirements, normal operations and maintenance training to maintain a safe workplace should also be addressed. <li>• Auditors should look for characteristics of a good management system including the following: <ul style="list-style-type: none"> <li>– A system to identify and communicate training needs for employees. <li>– Effective training programs to address training needs that includes competency testing where appropriate. <li>– A system to track completed training versus training requirements. <li>• Auditors should ensure that the training system includes identification of training needs, delivery of training programs, competency testing, and evaluation of effectiveness. <li>• Auditors should ensure that training programs are established for new employees as well as ongoing training efforts for all employees. Auditors should identify employee orientation programs that stress Responsible Care-related criteria. <li>• Auditors should review training needs that are documented for each job function throughout the company. Typically a training matrix or database is used to identify training needs for each employee based on job category and responsibilities. <li>• Auditors should ensure that an organization maintain its training records by employee. This can also be done through a paper-tracking system or a database. <li>• Auditors should examine a company's use of computer-

Audit Criteria	Source	Guidance for Auditors
		<p>based training (CBT) to train employees, especially related to Responsible Care issues. This can be effective as most systems provide built-in tracking and competency testing.</p> <ul style="list-style-type: none"> Auditors should ensure that training programs identify hazards and risks of individual work activities, related responsibilities and consequences of departure from accepted practices, as well as the individual's role in the management system.

Audit Criteria	Source	Guidance for Auditors
<p><i>RC14001</i> 15-R-33. The organization shall ensure that any person(s) performing tasks for it or on its behalf that have the potential to cause a significant environmental impact(s) identified by the organization is (are) competent on the basis of appropriate education, training or experience, and shall retain associated records.</p>	<p>RC14001 Technical Specification RC151.03 4.4.2</p>	<ul style="list-style-type: none"> No further guidance.
<p>15-R-34. The organization shall identify training needs associated with its environmental aspects and its environmental management system. It shall provide training or take other action to meet these needs, and shall retain associated records.</p>	<p>RC14001 Technical Specification RC151.03 4.4.2</p>	<ul style="list-style-type: none"> No further guidance.

15.3 AUDIT PROTOCOL

The process safety program audit protocol introduced in Appendix A and available online (see page xiv for information on how to access this resource) provides detailed questions that examine the criteria described in Section 15.2.

REFERENCES

- American Chemistry Council, *RCMS[®] Technical Specification*, RC101.02, March 9, 2005
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations*, RC101.02, January 25, 2004
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations Appendices*, RC101.02, January 25, 2004

- California, California Code of Regulations, Title 8, Section 5189, CalOSHA, November 1985
- Center for Chemical Process Safety (CCPS), *Guidelines for Risk Based Process Safety*, American Institute of Chemical Engineers, New York, 2007 (CCPS, 2007c)
- Delaware, *Accidental Release Prevention Regulation*, Delaware Department of Natural Resources and Environmental Control/Division of Air and Waste Management, September 1989 (rev. January 1999)
- Department of the Interior, Minerals Management Service, *Safety and Environmental Management Program (SEMP)*, 1990
- Environmental Protection Agency (USEPA), 40 CFR §68, *Accidental Release Prevention Requirements: Risk Management Programs Under Clean Air Act Section 112(r)(7)*; Final Rule, June 21, 1996
- New Jersey, *Toxic Catastrophe Prevention Act (N.J.A.C. 7:31)*, New Jersey Department of Environmental Protection, June 1987 (rev. April 16, 2007)
- Occupational Safety and Health Administration (OSHA) 29 CFR §1910.119, *Process Safety Management of Highly Hazardous Chemicals, Explosives and Blasting Agents; Final Rule*, Washington, DC, February 24, 1992
- Occupational Safety and Health Administration (OSHA) Publication 3133, *Process Safety Management Guidelines for Compliance*, Washington, DC, 1993
- Occupational Safety and Health Administration (OSHA) Instruction CPL 02-02-045 CH-1, *PSM Compliance Directive*, Washington, DC, September 13, 1994
- Occupational Safety and Health Administration (OSHA) Instruction CPL 03-00-004, *Petroleum Refinery Process Safety Management National Emphasis Program*, June 7, 2007 (OSHA, 2007a)
- Occupational Safety and Health Administration (OSHA) Directive 09-06 (CPL 02), *PSM Chemical Covered Facilities National Emphasis Program*, July 27, 2009 (OSHA, 2009a)

16

MANAGEMENT OF CHANGE

This element is called Management of Change (MOC) in OSHA PSM and EPA RMP programs, as well as in many state regulatory PSM programs and voluntary consensus PSM programs. MOC is an element of the RBPS accident prevention pillar Manage Risks.

16.1 OVERVIEW

Changes to processes are made for a variety of reasons, including but not limited to the manufacture of new products, improved efficiency, modified throughput, operability, and safety. Changes can range from large facility expansions or new facilities to minor changes in chemicals, technology, equipment, or procedures. Any change that represents a deviation from the original design, fabrication, installation, or operation of a process should be managed using the MOC program. Even relatively minor changes, if not properly managed, can have the potential to result in catastrophic consequences. Changes should be controlled to ensure that safety or health hazards are not unintentionally introduced, and to make sure that documentation and systems required by other process safety management program elements are updated accordingly.

A minimum of five types of changes, whether temporary or permanent, should be managed at any location: process chemicals, process technology, process equipment, procedures, and facilities (i.e., buildings, structures, utility systems, or other items that support process equipment or are important to process safety, e.g., from a facility-siting standpoint).

Organizational changes, which can include substitution of personnel, elimination or addition of positions, and reorganizations, should also be included in the MOC program. These changes can have an impact on process safety if they result in insufficient staff or insufficient staff skills or training, such that they hinder the management of process safety programs or result in slower or incorrect response to process upsets or other process safety related criteria. Organizational changes have an impact on the cultural and competency aspects of process safety and are therefore addressed in Chapters 4 and 6, respectively.

One of the most challenging aspects of managing change is determining that a proposed modification is in fact a change. An alteration that constitutes replacement-in-kind (and therefore is not a change) requires careful thought, definition, training, and consistent application. Once a change is identified, the application of a change control process should be initiated as described in the facility's MOC procedure, or in equivalent change-control processes defined in other procedures for special situations. A "one-size-fits-all" MOC procedure is not a requirement. Also, many companies/facilities have chosen to combine the MOC and Operational Readiness elements because the activities and drivers for these elements are so closely related.

The MOC element interfaces significantly with other PSM program elements. The primary interfaces include the following:

- Process Knowledge Management (Chapter 9)—knowledge/information should be updated following a change.
- Hazard Identification and Risk Analysis (Chapter 10)—HIRAs, while not mandatory, may be performed to assess the impact of a proposed change on process safety. Also, the implementation of recommendations resulting from a HIRA may require use of the MOC process, and finally, MOC documentation is often reviewed during HIRA revalidations to determine what changes warrant study during the revalidation.
- Operating Procedures (Chapter 11)—changes to operating procedures require the use of MOC, and operating procedures are often updated following an equipment, chemical, or facility change.
- Safe Work Practices (Chapter 12)—SWPs are often used to implement a change, and SWPs are sometimes updated following an equipment change.
- Asset Integrity and Reliability (Chapter 13)—managing AI deficiencies requires the use of MOC, as does the implementation of engineered projects. Changes (e.g., to equipment) may also necessitate changes in AI practices or procedures as well as ITPM schedules. MOC should also be used to manage changes to inspection, testing, and preventive maintenance frequencies and procedures.
- Training and Performance Assurance (Chapter 15)—operators, maintenance personnel, and other affected personnel should be informed of and trained in changes prior to start-up with the change in place.
- Operational Readiness (Chapter 17)—operational readiness review activities are often combined into the MOC procedure.

In Section 16.2, both compliance and related audit criteria are presented, along with guidance for auditors in applying the criteria. A full explanation of compliance and related audit criteria are presented in Chapter 1 (see Section 1.7). The criteria and guidance described in these sections do not represent exclusive solutions to PSM program coverage, design, implementation, or interpretation. They represent the collective experience of many people in the chemical/processing sector who have performed many PSM audits, and the consensus opinion resulting from that experience. The compliance criteria are

derived from the regulations that govern PSM programs in the United States; however, these regulations are all performance-based. Performance-based regulations are goal oriented and there may be multiple pathways to fully complying with them. Therefore, there may be alternate interpretations and solutions to the issues described in the compliance tables in this chapter that are equivalent to those included, particularly the auditor guidance presented.

The inclusion of the related criteria in no way infers that these criteria must be implemented for a PSM program to be successful, nor does it infer that a PSM program will be deficient without them. As with the compliance criteria, there may be other, more appropriate solutions for an individual facility or company. In addition, the use of the related criteria in a PSM audit is intended to be completely voluntary and not a mandatory requirement in any way. They should be used cautiously and with careful planning so that they do not inadvertently establish unintended performance standards. Consensus should be sought within and among facilities and their parent companies before these criteria are used. Finally, the related criteria and guidance offered for consideration are not endorsements of or agreements with the written or verbal clarifications made by the regulators, PSM citations issued against the regulations, other PSM guidance published by the regulators, or the successful or common PSM practices in any given company's PSM program from which they are derived.

16.2 AUDIT CRITERIA AND GUIDANCE

The detailed requirements for MOC included in the OSHA PSM Standard, EPA RMP Rule, and several state PSM regulatory programs are presented herein, as well as for other common voluntary consensus PSM programs.

The audit criteria described below are examined by auditors using the guidance provided by performing the following audit activities:

- Interviewing the person(s) at the facility who has the responsibility for managing the facility MOC program. This person is or generally works in the facility EHS, technical, or engineering department, depending on how the MOC program was developed and which group or discipline generates the most MOCs. Sometimes the PSM manager/coordinator manages the MOC program. At some facilities someone is specifically assigned this responsibility.
- Interviewing those persons responsible for:
 - Initiating the MOC process.
 - Evaluating the safety impact of proposed changes.
 - Authorizing changes.
 - Updating safety information pursuant to changes.
 - Updating operating procedures, as well as other procedures and documents pursuant to changes.
 - Training operators and other personnel pursuant to changes.

- Reviewing written MOC procedures.
- Reviewing MOC documentation for units and processes included in the scope of the audit.
- Comparing field observations of equipment modifications with MOC documentation and completed work orders; confirming temporary changes have been returned to normal; and confirming changes have been installed as approved in the MOCs.
- Reviewing process safety information, operating procedures, and other documents that should have been modified as a result of changes.
- Interviewing the facility personnel where MOCs were approved and implemented and whose jobs were affected by the changes to confirm how they were informed of/trained in the changes.

Auditors should also carefully examine the MOC requirements found in the procedures of the company/facility being audited. As stated in Section 1.7.1, these could be interpreted as compliance requirements by regulators and could be subject to citations if they are not being followed. Auditors should confirm, via interviews, records and document reviews, and field observations, that the requirements of the facility or company MOC procedures have been implemented as specified. Findings should be generated if the company/facility-specific provisions are not being followed.

See the Guidance for Chapters 3–24 in the Introduction for the definition of the abbreviations shown in the following tables that are used to indicate the source of the criteria.

16.2.1 Compliance Requirements

The audit criteria should be used by the following:

- Readers in the United States covered by the PSM Standard or RMP Rule
- Readers who have voluntarily adopted the OSHA PSM program
- Readers whose companies have specified OSHA PSM requirements in non-U.S. locations.

Table 16.1 describes the audit criteria and auditor guidance for MOC pursuant to OSHA PSM and EPA RMP.

Table 16.1 OSHA PSM and EPA RMP Audit Criteria and Guidance for Auditors - Management of Change

Audit Criteria	Source	Guidance for Auditors
16-C-1. The employer has established and implemented written procedures to manage changes (except for "replacements in kind") to process chemicals, technology, equipment, and procedures and changes to	PSM (I)(1) RMP 68.75	<u>Background Information for Auditors:</u> <ul style="list-style-type: none"> • There should be one or more written procedures covering different aspects of MOC, such as temporary changes (including safety device

Audit Criteria	Source	Guidance for Auditors
facilities that affect a covered process.		<p>bypassing); document control (for changes to operating, maintenance, safety, and other procedures); changes to processes/equipment such as projects, modifications/alteration to fixed equipment, rotating equipment, instrumentation, controls, and the use of new chemicals.</p> <ul style="list-style-type: none"> • Not all changes must be managed using the same MOC procedure (i.e., the main MOC procedure at the facility). Some change control procedures may be part of the Mechanical Integrity program, such as temporary repairs or bypassing of impaired safety devices. Other change control procedures may be part of the operating procedures, such as modifications to SOPs, or the changes to reconfigure equipment to make an occasional product or to conduct a test or experiment. Sometimes the introduction of new chemicals is handled via Hazard Communication Program procedures. Alternative change control procedures, if used, should include all the basic requirements of MOC, including a review of the impact of the change on safety and health and formal approval of the change. • The temporary or permanent modification of a valve bonnet or packing gland to reduce or eliminate leakage of volatile materials may be part of the environmental program under the Leak Detection and Repair (LDAR) program. • Procedures should be "formalized" (i.e., have an official title/document number and date/revision number and be available to all personnel who may need to use them). • For a change to be a replacement-in-kind (RIK), it

Audit Criteria	Source	Guidance for Auditors
		<p>Table 16.1 – Continued</p> <p>should meet the original technical specifications of the system or equipment. Also, changes that fall within the safe operating window defined in approved operating procedures or PSI, or are approved operations that are included in the operating procedures, are considered RIK. If a change is not “pre-approved” in a SOP or the PSI, it should be managed via the MOC process. Examples of such changes that may not meet the definition of RIK include the following:</p> <ul style="list-style-type: none"> <li>– Changes to process control software. <li>– Changes in production rates. <li>– Changes in raw materials. <li>– Equipment unavailability, such as the bypass or removal of a safety feature. <li>– New products and new product development. <li>– Changes in catalysts. <li>– Changes in operating conditions to improve yield or quality. <li>– Changes in materials of construction. <li>– Experimental equipment and procedures. <li>– Changes in alarm and interlock set point or functionality. <li>– Changes to consumable materials in the covered process such as gasket and seal materials. <ul style="list-style-type: none"> <li>• Changes to chemicals include not only the process chemicals/materials, but also other materials used in PSM-included processes, such as chemicals used to clean process equipment, catalysts, chemicals used only during start-up, etc. <li>• Any physical change that modifies system hydraulic

Audit Criteria	Source	Guidance for Auditors
		<p>conditions in any way would be considered a change. For example, a change from a ball valve to a gate valve should be managed using the MOC procedure unless there is an approved procedure or specification that allows the two types of valves to be used interchangeably.</p> <ul style="list-style-type: none"> • The MOC procedure, or another equivalent change control procedure, should be used to manage changes to operating procedures. The change control procedure should include review and approval steps, and the impact of the SOP change on safety and health. Corrections of typos, minor reformatting, etc. are generally not considered to be changes and often are not formally managed through the change management process for operating procedures. • The MOC procedure or an equivalent change control procedure should apply to changes in utility or support systems that interface with the PSM-covered processes, where failure of the changed component in the utility system could contribute to a catastrophic release. (i.e., "facilities"). <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review maintenance and engineering work orders, approved capital expenditure requests/approval for funds expenditure requests, and other project and maintenance budget records, and operating logs to determine if MOCs were written when they should have been and that the definition of RIK has been applied correctly and consistently. Other good sources for review include action items from incident investigations, audits, and PHAs. <p>Auditors should review a list of changes processed through the</p>

Audit Criteria	Source	Guidance for Auditors
		<p>Table 16.1 – Continued</p> <p>MOC procedure to confirm that the list includes changes such as valve additions, changes to control systems or PSV set points, new chemicals, etc.</p> <ul style="list-style-type: none"> • Auditors should conduct interviews of operations, maintenance, and engineering personnel to confirm that the MOC process is applied to all relevant changes. These interviews will help assess whether or not the people in a position to make and implement changes understand change definitions and requirements for managing change. Proper understanding should help ensure that no changes are made or operated without first going through the MOC process.
<p>16-C-2. The written MOC procedures assure that the technical basis for the proposed change is addressed prior to any change.</p>	<p>PSM (1)(2)(i) RMP 68.75</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The technical basis is the description, rationale, and purpose of the change (i.e., what the change is and why it is being made), including reference to engineering, research, or other technical information that formed the basis for initiating the change, as appropriate. There is usually a section on the MOC form where this information can be entered. The MOC procedure should stipulate that the technical basis be clearly documented. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review relevant records to verify that all MOCs reviewed include the technical basis for the change.
<p>16-C-3. The written MOC procedures assure that the impact of the change on safety and health is addressed prior to any change.</p>	<p>PSM (1)(2)(ii) RMP 68.75</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The MOC procedure should require that the impact of the change on safety and health be evaluated and that any identified issues be addressed prior to making the change. There should be a change review and approval process

Audit Criteria	Source	Guidance for Auditors
		<p>confirming that safety and health impacts have been addressed prior to start-up.</p> <ul style="list-style-type: none"> • A PHA is not mandatory to assess the impact of a change on safety and health. • Verify that all MOCs considered the impact of the change on safety and health. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review relevant records to verify that all MOCs reviewed included an analysis of the impact of the change on safety and health.
<p>16-C-4. The written MOC procedures assure that modifications to operating procedures are addressed prior to any change.</p>	<p>PSM (1)(2)(iii) RMP 68.75</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The MOC procedure should include provisions for updating operating procedures before a change is put into operation. • This does not necessarily mean that the SOPs have been updated and reissued in final form, but that sufficient modified and approved operating instructions are provided to operating personnel to allow them to safely operate the process following the change, even if the procedures are in draft or marked-up form. • The MOC procedure may reference other procedures that document the procedure change, review, and approval process. • The MOC documentation for each change should include (or reference other information that specifies) which procedures need to be updated. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review MOC packages that required operating procedure updates and confirm that the procedures being used by the operators include the updated information.
<p>16-C-5. The written MOC procedures require that the necessary time period for the change is addressed prior to any change.</p>	<p>PSM (1)(2)(iv) RMP 68.75</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • This item relates to the duration of changes, i.e., temporary or permanent. The MOC procedure should include a requirement that the duration of a temporary Table

Audit Criteria	Source	Guidance for Auditors
		<p>16.1 – Continued</p> <p>change be specified in writing, generally on an MOC form used to document that a change has gone through the MOC process. The MOC procedure should include a maximum duration allowed for temporary changes, beyond which additional authorizations are needed to 1) continue operating on a temporary basis, or 2) make the change permanent. There should also be a mechanism to track the status of temporary changes to ensure that they are reversed, made permanent, or extended (with proper authorization) before expiration of the temporary period.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review a list of MOCs or MOC forms to determine if there are any temporary changes that have exceeded the original or extended time period. • Auditors should review relevant records to verify that a duration has been specified for all changes (either permanent or, for temporary changes, a set time period).
<p>16-C-6. The written MOC procedures assure that the authorization requirements for the proposed change are addressed prior to any change.</p>	<p>PSM (1)(2)(v) RMP 68.75</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The MOC procedure and form should provide for approval of the change. Multiple approval steps may be involved, such as initial approval to pursue development of the change, authorization to begin construction, and approval to start up the change. The proper level of authorization should be stipulated, i.e., by title. • Some MOCs require rapid approval for operational, safety, or other reasons. Because these situations sometimes occur during off-hours when all those normally required to review and approve a MOC are not on-site, some companies have provided alternative

Audit Criteria	Source	Guidance for Auditors
		<p>approval processes in their MOC procedures. These are sometimes called "emergency MOCs," although they do not always apply to emergency situations. Often they allow for the verbal approval of MOCs by a subset of the normal group of people who would have to give their approval to authorize a change, or even by a single individual, and verbal approvals can be given over the telephone. There are no stipulations in the relevant PSM regulations for these MOC situations; however, when there are provisions for approving a MOC in this manner, they should be used sparingly and never when the normal approvers required by the MOC procedure are on-site or otherwise physically available. If allowed, the MOC procedure should clearly describe the situations under which an emergency approval can be used, the minimum documentation requirements, identify the approvers who must verbally authorize the change, and how/when the normal MOC documentation is to be prepared during the next business day(s).</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review MOC forms to confirm that the review and approval process described in the written procedure have been followed prior to the change. • If the MOC procedure allows for emergency/rapid verbal approvals of MOCs, auditors should review several of these types of MOCs to confirm that the appropriate provisions of the MOC procedure have been followed.

Audit Criteria	Source	Guidance for Auditors
<p>Table 16.1 – Continued</p> <p>16-C-7. Employees involved in operating a process and maintenance and contract employees whose job tasks are affected by a change in the process have been informed of, and trained in, the change prior to start-up the process or affected part of the process.</p>	<p>PSM (I)(3) RMP 68.75</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Some employees and contractors need to be informed of a change so they can incorporate the presence of the change into their operations safely and efficiently. Other employees and contractors will require more formal training on some changes because different or new operating practices are required and these are complex enough that simply informing these persons of the change is not adequate. Each change should be scrutinized so that the communication or training is tailored to the specifics of the change. In either case, documentation of the activity should be provided. • Communications and training for employees whose jobs are affected by changes may be accomplished in several ways, including face-to-face briefings, formal classroom or practical training sessions, e-mails or intranet postings to employees, posted hard-copy information, handouts, or agenda topics during safety meetings. Review of MOC documentation for each change should indicate that the employees and contractors whose jobs are affected by the change have been informed or and trained as necessary in the change prior to start-up. • The training or communication on the change should be provided prior to operating the changed equipment, which may occur before the actual start-up of the process. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should interview employees to confirm that they not only received the communication/ training but also understood it, especially if e-mails or intranet postings to employees, posted hard-copy

Audit Criteria	Source	Guidance for Auditors
		<p>information, or handouts were used to communicate/train affected personnel.</p> <ul style="list-style-type: none"> Auditors should interview employees whose job tasks were affected to confirm that they were informed of/trained in changes prior to operation of the changed equipment with the changes in place. This should include makeup training/communication for employees who were on vacation, sick leave, or otherwise not available when they should have initially received it.
<p>16-C-8. If a change covered by MOC results in a change to the required process safety information, such information has been updated accordingly.</p>	<p>PSM (I)(4) RMP 68.75</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The MOC documentation for each change should include (or reference other information that specifies) what process safety information needs to be updated. There may be other procedures that document the procedure change, review, and approval process, and the system(s) used to maintain PSI. Revised PSI does not have to be issued in final form before start-up; accurate, legible, marked-up PSI is acceptable on a temporary basis. There should be a management system in place to ensure that PSI is formally updated. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should select a representative number of MOC packages of different types and determine what PSI updates should have been made as a result of each change. Auditors should review the PSI (e.g., drawings, relief valve design files, MSDSs) to confirm that it was updated accordingly and that the updated version is available to and being used by operating, maintenance, and engineering personnel.

Audit Criteria	Source	Guidance for Auditors
<p>Table 16.1 – Continued</p> <p>16-C-9. If a change covered by MOC results in a change in the required operating procedures or practices, such procedures or practices have been updated accordingly.</p>	<p>PSM (I)(5) RMP 68.75</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The MOC documentation for each change should include updating of affected procedures and safe work practices, including lockout/tagout, confined space entry, opening process equipment, hot work, personal protective equipment requirements, and the emergency response plan. In some cases, a new safe work practice should be developed, for example, if the change involves introduction of a new hazard such as a radioactive source. • As with PSI that should be modified prior to a change, the final approved procedures are not required to start up the process. Accurate, legible, marked-up procedures are acceptable on a temporary basis; however, there should be evidence that the final procedures are produced at some reasonable time after start-up. • Of particular note are equipment-specific energy isolation procedures, which may be required under 29 CFR §1910.147. New equipment or changes to existing equipment require new or modified energy isolation procedures, e.g., new isolation points, and rotating equipment energy isolation. • Use of new chemicals (or new use for existing chemicals at the facility) requires a PPE hazard assessment under 29 CFR §1910.132. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should select a representative number of MOC packages that potentially impact SWPs such as hot work, energy isolation (lockout/tagout), line breaking, confined space entry, and facility entrance control. Auditors should verify that

Audit Criteria	Source	Guidance for Auditors
		<p>affected SWPs and associated procedures have been updated to reflect the changes and that the updated procedures are the ones available to and being used by operating and maintenance personnel.</p> <ul style="list-style-type: none"> • Auditors should verify that new or modified energy isolation procedures, e.g., new isolation points, rotating equipment energy isolation, for new equipment or changes to existing equipment have been developed or updated as a result of changes to process equipment. • Auditors should review relevant records to verify that the required PPE hazard assessment has been conducted for any changes in the use of covered chemicals.

16.2.1.1 U.S. State PSM Programs

If the PSM program being evaluated is pursuant to a state PSM regulation, then the specific process safety knowledge requirements for that regulatory program should be followed. In general, these overlap somewhat with the federal OSHA PSM and EPA RMP requirements, but often there are state-specific requirements that should be met, even if the state has received authority to enforce federal regulations (i.e., the state is an OSHA state plan state, or has received implementing agency status for the RMP Rule from EPA). The state-specific applicability requirements for the following states are presented below:

- New Jersey
- California
- Delaware

Table 16.2 shows the audit criteria and auditor guidance for MOC pursuant to U.S. state PSM requirements.

Table 16.2 U.S State PSM Audit Criteria and Guidance for Auditors - Management of Change

Audit Criteria	Source	Guidance for Auditors
<p><i>New Jersey Toxic Catastrophe Prevention Act (TCPA)</i> 16-C-10. If any change in the covered process or procedures results in an increase in rate,</p>	<p>N.J.A.C. 7:31-4.6</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The New Jersey TCPA regulations require that a dispersion analysis and consequence analysis be

Audit Criteria	Source	Guidance for Auditors
<p>Table 16.2 – Continued</p> <p>duration or quantity, or release frequency, the associated release scenarios and changes in rate, duration and quantity are identified.</p>		<p>conducted for release scenarios identified in the PHA with risk assessment for a TCPA-covered process. If a change to the covered process results in an increase in the potential rate, duration, or quantity of EHS (extraordinarily hazardous substance) released, then this dispersion and consequence analyses should be updated to reflect the change. This information should be available in the MOC file, or in the PHA with risk assessment file for the covered process, which should be revalidated and updated every five years.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should confirm that changes have been analyzed qualitatively and quantitatively in accordance with N.J.A.C. 7:314.6.
<p>16-C-11. For any change in the covered process or procedures that results in an increase in rate, duration or quantity, or release frequency, the associated release scenarios are analyzed in accordance with the parameters and methods required at N.J.A.C. 7:31-4.2 to determine whether a criterion endpoint defined at N.J.A.C. 7:31-4.2(b)3iv extends beyond the stationary source boundary.</p>	<p>N.J.A.C. 7:31-4.6</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The New Jersey TCPA regulations require that a dispersion analysis and consequence analysis be conducted for release scenarios identified in the PHA with Risk Assessment for a TCPA-covered process. If a change to the covered process results in an increase in the potential rate, duration, or quantity of EHS released, then this dispersion and consequence analyses should be updated to reflect the change. This information should be available in the MOC file, or in the PHA with risk assessment file for the covered process, which should be revalidated and updated every five years. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should confirm that changes have been analyzed qualitatively and quantitatively in accordance with N.J.A.C. 7:314.6.

Audit Criteria	Source	Guidance for Auditors
<p>16-C-12. If a release scenario due to the change results in a criterion endpoint extending beyond the stationary source boundary, the documentation and report required by N.J.A.C. 7:31-4.2(d) and (e) are prepared or updated for that change prior to implementing the change.</p>	<p>N.J.A.C. 7:31-4.6</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The New Jersey TCPA regulations require that a dispersion analysis and consequence analysis be conducted for release scenarios identified in the PHA with risk assessment for a TCPA-covered process. If a change to the covered process results in an increase in the potential rate, duration, or quantity of EHS released, then this dispersion and consequence analyses should be updated to reflect the change. This information should be available in the MOC file, or in the PHA with risk assessment file for the covered process, which should be revalidated and updated every five years. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that changes have been analyzed qualitatively and quantitatively in accordance with N.J.A.C. 7:314.6.
<p>16-C-13. The written MOC program should include requirements to implement appropriate safety precautions while a temporary change is in service.</p>	<p>N.J.A.C. 7:31-4.6</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • For temporary changes, the written MOC program should address the need for temporary safety precautions while a temporary change is in service, in order to minimize the risk sometimes inherent in a temporary change. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that there are appropriate safety precautions while a temporary change is in service, and that these are documented.
<p><i>Delaware Accidental Release Prevention Regulation</i></p> <p>16-C-14. The Delaware EHS regulations do not add any different or unique MOC requirements beyond those described for the PSM Standard and RMP Rule.</p>	<p>DE Code, Chapter 77, Section 5.75</p>	<ul style="list-style-type: none"> • No further guidance.

Audit Criteria	Source	Guidance for Auditors
<p><i>California OSHA—Process Safety Management of Acutely Hazardous Materials</i></p> <p>16-C-15. The California PSM regulations do not add any different or unique MOC requirements beyond those described for the PSM Standard and RMP Rule.</p>	<p>CCR, Title 8, Section 5189</p>	<ul style="list-style-type: none"> No further guidance.
<p>California Accidental Release Prevention Program</p> <p>16-C-16. The CalARP regulations do not add any different or unique MOC requirements beyond those described for the PSM Standard and RMP Rule.</p>	<p>CCR, Title 19, Section 2760.6</p>	<ul style="list-style-type: none"> No further guidance.

16.2.2 Related Criteria

The purpose of providing these criteria is to provide auditors with guidance for evaluating PSM programs with respect to issues that go beyond the strict compliance requirements presented above, and in large part represent industry good practices in MOC, or in some cases practices in MOC that have become common. Some of the related criteria have reached the status of a level of acceptable practice because of their widespread, accepted, and successful use over an extended period of time. Auditors and PSM practitioners should carefully consider implementing this guidance, or at least designing an approach that is similar in nature. See the Glossary and Section 1.7.1 for a more complete discussion of the meaning and use of level of acceptable practice.

Table 16.3 identifies recommended related audit criteria and auditor guidance for MOC.

Table 16.3 Related Audit Criteria and Auditor Guidance - Management of Change

Audit Criteria	Source	Guidance for Auditors
<p>16-R-1. The written MOC procedures include policies and plans and constitute a comprehensive management system for controlling change.</p>	<p>CCPA GIP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The written MOC management system policies, procedures, and plans should include the following elements: <p>Identification of which types of changes warrant application of the MOC procedure. The equipment, processes, operations, procedure and information changes, and other aspects of the facility included in the MOC program should be based on the risk as identified in the HIRAs, risk assessments, LOPAs/SIL</p>

Audit Criteria	Source	Guidance for Auditors
		<p>analyses, or other analytical activities that are designed to identify and prioritize the hazards/risk associated with the equipment and its operation. Many facilities and companies voluntarily choose to include all facility changes, including certain personnel changes, in the MOC program. This is done both for convenience and ease of interpretation, as well as the recognition of the importance of MOC.</p> <p>Clearly defined responsibilities.</p> <p>An adequate system of authorizations that reflects the criticality of the tasks and activities</p> <p>Table 16.3 – Continued</p> <p>Documentation of the activities.</p> <p>Internal verification that activities are being carried out in accordance with the management system procedures.</p> <p>Management review activities that provide a closure of the feedback loop by adjusting the program requirements by carefully reviewing the verification activity results.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the MOC procedure to confirm that it contains the appropriate provisions.
16-R-2. The written MOC procedure adequately defines change for the facility.	CCPA GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the written MOC procedure (or equivalent change control procedures) to confirm that it includes the following: <p>A definition of both what constitutes change for the facility and what constitutes replacement-in-kind for the facility. The definitions should also include examples.</p> <p>Definitions/examples of both temporary and permanent change situations.</p>
16-R-3. The written MOC procedure (or an equivalent change control procedure) is used to manage changes that are not explicitly required by regulation, do not meet the definition of RIK, but are important to process safety.	CCPA WCLAR (10/31/96) GIP CPL PRE	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the written MOC procedure (or equivalent change control procedures) and MOC forms to confirm that the following types of changes are managed: <ul style="list-style-type: none"> Changes to maintenance

Audit Criteria	Source	Guidance for Auditors
		<p>Table 16.3 – Continued procedures.</p> <ul style="list-style-type: none"> – Changes to testing, inspection, and preventive maintenance frequencies. – Changes in engineering or equipment specifications (although upon review of their impact these may require physical changes to the equipment that would require the use of MOC). – Computer program changes to business or other computer systems that do not interface with the processes in any way. – Extension of MOC applicability to include processes, equipment, or facilities on-site that are not explicitly covered by the PSM Standard.
<p>16-R-4. The written MOC procedure addresses appropriate environmental, health, safety (EHS), process safety, and risk management issues as appropriate and applicable to the nature of the change and the facility.</p>	<p>WCLAR (2/28/97) GIP</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • This criterion is not intended for use in evaluating actual MOCs or changes, but for the MOC procedure, forms, and other administrative tools used to manage MOCs. Some of the individual items listed in these criteria might be compliance issues for a given change; however, the presence of these items in the MOC procedure, and other paperwork as standard review items is not required. • Auditors should review the MOC procedure and forms to confirm that the following issues are addressed/included: <ul style="list-style-type: none"> – Re-analysis and re-approval of temporary changes that exceed the established time period before the time expires. – The number of times that a temporary change may be re-authorized. – Allowance for verbal approvals under certain situations, and how they are to be documented.

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"> - Requirements for evaluation of changes with respect to current vent, relief, and flare capability before a change is made. - Requirements for an evaluation of each change with respect to industrial hygiene requirements before a change is made. - Requirements for an evaluation of each change with respect to existing environmental permits and requirements before a change is made. - Maintenance review of the change and revisions to the spare parts list as a result of a change. - Review and revision of the emergency action plan and/or emergency response plan as a result of a change. - Changes to RMP program level or changes in the submitted risk management plan as a result of a change. - How recommendations from MOC reviews that might affect the design or installation of the change are suitably resolved prior to implementation of the change (i.e., a change to the change). - How the resolutions of "changes to the change" are documented. - How MOC training for the staff is documented.
<p>16-R-5. The MOC procedure includes requirements for conducting a HIRA if the impact of the change on safety and health warrants such a study, or if the change introduces a new process to the facility.</p>	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The MOC procedure should describe the criteria for requiring a HIRA and the person designated to decide whether a HIRA is required for a specific MOC. Some examples of such criteria include new toxic, reactive, or flammable chemicals that have never been used on-site; an estimated large

Audit Criteria	Source	Guidance for Auditors
		<p>Table 16.3 – Continued increase in the risk (e.g., possible offsite risk where there was none before); new or unusual process chemistry; significant increase in process conditions (e.g., pressure, temperature, flow, pH,); and significant change in chemical properties (e.g., use of highly volatile materials). Each facility should decide what potential changes in the risk/hazard profile warrant performing a HIRA when a change is proposed.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the MOC procedure and form to confirm that requirements for HIRAs are clearly defined. • Auditors should review active and completed MOCs to confirm that, when a HIRA was required, it was completed and the recommendations were resolved prior to start-up. • Auditors should conduct interviews to determine whether any new covered processes have been constructed during the audit period. At a minimum, a design stage HIRA should have been conducted and recommendations resolved prior to start-up.

Audit Criteria	Source	Guidance for Auditors
<p>16-R-6. The MOC procedure requires that the authorization(s) are required to be obtained before a change can be physically implemented.</p>	<p>CCPA GIP</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check the MOC or PSSR form to confirm that it includes an authorization to actually implement a change. This may be an explicit authorization or it may be included as part of another authorization. The MOC procedure should specify which authorization is needed to actually make the change. • Auditors should check the MOC procedure to confirm that MOCs require review/approval by more than one individual (the person who originates the change does not also approve it from an operations, engineering, safety, etc. standpoint). • Auditors should check the MOC or PSSR form to confirm that the level of authorization is specified and is normally someone above the first-line supervisory level, although that may vary based on the scope of the change and the size of the facility. Authorization may also be addressed through the pre-start-up safety review as part of the Operational Readiness element (see Chapter 17).
<p>16-R-7. A MOC form, cover sheet, or equivalent record is used to control the review and approval of proposed changes.</p>	<p>GIP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The use of MOC forms is a generally accepted practice to ensure that changes are processed and approved in accordance with the provisions in the MOC procedure, and to document that the processing has been properly accomplished. This form may be paper or electronic (including electronic online approvals). A different MOC form may be used for different types of changes, such as operating procedure changes, temporary safety device bypasses or changes to electrical or instrumentation systems. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check the MOC procedure to determine how different types of change are

Audit Criteria	Source	Guidance for Auditors
<p>16-R-8. The MOC procedure specifies how managers, supervisors, technical staff, operators, maintenance, contract employees, plus other persons who have a need to know will be informed of, and trained in the MOC procedures.</p>	GIP	<p>Table 16.3 – Continued managed with different (or the same) MOC form.</p> <p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Although there are no specific training requirements for the MOC procedure(s), the implementation of the procedure requires training of all affected personnel. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that operators, maintenance, and contract employees have been made aware of MOC definitions and program requirements to help ensure that inadvertent changes are not made. Auditors should check training records to determine if this has occurred. • Auditors should confirm that managers, supervisors, and technical staff have been trained in the details of the MOC procedure so that they understand how to follow it, including necessary reviews and approval, and how changes are tracked through the system including required documentation. Auditors should check training records to determine if this has occurred.
<p>16-R-9. The MOC procedure specifies how the MOC procedure fits into the generation of work orders or project-related documents for the actual accomplishment of changes.</p>	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The MOC procedure should address identification of changes initiated through the maintenance or project work order systems. Generally these changes should be identified by the individual who submits the work request, but another level of review and assurance should be present to minimize the potential for inadvertently making changes without initiating an MOC. There may also be provisions in the written work order management procedures, if they exist, on screening of work orders for potential changes prior to scheduling the work to be done. <p><u>Auditor Activities:</u></p>

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"> Auditors should review MOC procedures or related documents to verify that they address identification of changes initiated through the maintenance or project work order systems.
<p>16-R-10. The MOC procedure specifies the use of a MOC log or equivalent record to indicate the status of each MOC package.</p>	<p>GIP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Particularly where a large number of changes are being processed, there should be a log, database, or other system to manage changes through the process defined in the MOC procedure. The management system should include tracking of key dates to ensure that temporary changes do not extend beyond their approved time limits, and to ensure that all post-start-up items (PK and other documentation updates, minor PSSR items, etc.) are completed before the MOC file is officially closed out. The procedure should clearly define who is responsible for maintaining the log and reviewing it periodically to make sure that MOCs are processed and closed out. Any implemented MOCs that are still open after a long period of time (approximately six months or more) should be highlighted and emphasis should be placed on completing all items required for closure. "Timely" in this context means that MOCs are implemented in a time period that is reasonable given the complexity of the action and the difficulty of implementation. The timing of resolution plan development and completion of each MOC should be evaluated on a case-by-case basis. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should conduct interviews and review relevant procedures to determine how each facility has defined "timely," how they have applied

Audit Criteria	Source	Guidance for Auditors
		<p>Table 16.3 – Continued</p> <p>their definition, and if the definition and its application are reasonable and defensible.</p>
<p>16-R-11. The MOC procedure specifies the records retention for MOC packages and supporting documentation.</p>	<p>GIP WCLAR (7/12/06)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Completed MOC packages should be maintained at least until the next five-year HIRA revalidation that incorporates all changes implemented since the previous HIRA has been completed. • MOC packages/records may be retained for the life of the process and treated as PSI for changes to chemicals and equipment. • MOC packages/records for changes to procedures should be kept at least until the next HIRA revalidation. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the MOC procedures to confirm that policies regarding records retention are adequate.
<p>16-R-12. The MOC procedure ensures that time limit authorizations are addressed prior to any temporary change.</p>	<p>CCPA CPL</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors would not use this criterion to evaluate actual MOCs to see if time limits that are specified in individual MOCs have been exceeded. This is a compliance issue that should be evaluated using criterion 16-C-5. The designation of changes as permanent or temporary and the description of the time period is also a compliance issue that should be evaluated under 16-C-5. This criterion deals with maximum limits of that time and the number of times a temporary change can be re-authorized. • Auditors should verify that the MOC procedure includes establishment of time limits or maximum durations of temporary changes that are approved by appropriate management personnel.

Audit Criteria	Source	Guidance for Auditors
16-R-13. The MOC procedure includes steps/provisions needed to verify that modifications have been made as designed.	CPL	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"><li>• This verification is normally addressed in the Operational Readiness review, but some facilities use one form for the MOC and OR processes. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"><li>• Auditors should verify that this check is included in the MOC and/or OR form and that it has been consistently completed.

Audit Criteria	Source	Guidance for Auditors
<p>Table 16.3 – Continued</p> <p>16-R-14. Changes in key personnel related to process safety or other staffing/operational decisions that could impact process safety subject to MOC (i.e., Management of Organizational Change - MOOC).</p>	<p>CCPA GIP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Management of Organizational Change (MOOC) is an extension of a MOC program beyond equipment and procedure changes. It helps ensure that changes to organizations involving process safety related responsibilities are properly managed, primarily as it relates to the training and qualification of personnel. • This item can apply to management, operations, maintenance, engineering, technical, and process safety personnel. Often an organization may apply this item to the entire organization, including quality, environmental, and other areas where loss of key personnel, changes in staffing levels, or shifting of responsibilities can result in increased incident risk and potential for noncompliance. • MOOC may include functional changes to corporate staff, changes in local laboratory analysis support, changes in vacation scheduling, changes in shift staffing, changes in responsibilities of operators, changes in production schedule that would not otherwise trigger MOC requirements (changing from a 24/7 operation to a days-only operation), etc. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check to determine if the MOC procedure includes MOOC, or a separate procedure exists to handle facility organizational changes. • If a MOOC procedure exists, auditors should confirm that its provisions are being followed.
<ul style="list-style-type: none"> • 16-R-15. MOC program implementation should be an understandable and straight forward process that can be successfully used by the 	<p>GIP</p>	<p><u>Auditor Activities:</u></p> <p>Auditors should randomly select a representative number of MOC packages and confirm the following:</p>

Audit Criteria	Source	Guidance for Auditors
<p>spectrum of employees who are expected to initiate and review MOCs. The MOC documentation should provide an auditable trail that describes how each change was proposed, reviewed, approved, and implemented.</p>		<ul style="list-style-type: none"> • MOC packages and supporting information are readily accessible to employees. • The written MOC procedure and forms are not confusing and are easy to use by an average employee who might be the initiator of a change. • Different people are involved in initiating/originating MOCs. The initiator is not always the same person. • Levels of review and approval are included such that conflicts of interest are avoided. For example, the initiator of a change should not be allowed to approve the technical basis of the change or the safety assessment. • It is easy to follow a change from initiation through implementation and update of other information (process safety information, policies, practices, and procedures in the completed MOC packages). • The completed MOC packages/forms are completely filled out; i.e., there are no blank spaces or fields on the forms (or if there are blanks they are clearly marked as not applicable). • There are established time limits on how long an approved MOC can exist without being implemented before it is voided or re-reviewed and re-approved. • Responsibilities are assigned for filing change requests, training employees in the change, updating PSI and operating procedures, and ensuring the conduct of necessary safety reviews. • Steps required to return the process to its approved status when a temporary change has expired are specified.
<p>16-R-16. All changes have been implemented as described in the approved MOC.</p>	<p>CPL</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • This is verified by reviewing the Operational Readiness documentation for selected MOCs, which should include a verification that changes have been made in accordance with

Audit Criteria	Source	Guidance for Auditors
		the approved design.
16-R-17. After a change in the throughput the Hazard Identification and Risk Analysis (HIRA) team considered the adequacy of the existing relief system design with respect to the increased throughput during the next HIRA.	NEP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • If there have been any throughput changes in the covered processes since May 26, 1992, auditors should review relevant MOC packages to determine whether an evaluation of the existing relief system (including flares, scrubbers, or other mitigation devices) was necessary, and if so, whether one was conducted.

16.2.3 Voluntary Consensus PSM Programs

The following voluntary consensus PSM program requirements for MOC are described below:

- The requirements published for the offshore oil platform sector in the Safety and Environmental Management Program (SEMP), a voluntary program designed by API and endorsed by the Minerals Management Service of the U.S. Department of the Interior.
- Responsible Care Management System (RCMS)[®] published by the American Chemistry Council.
- RC14001 Environmental Management System, published by the American Chemistry Council.

Table 16.4 lists audit criteria and auditor guidance relating to MOC pursuant to voluntary consensus PSM programs.

Table 16.4 Voluntary Consensus PSM Program Audit Criteria and Guidance for Auditors - Management of Change

Audit Criteria	Source	Guidance for Auditors
<i>SEMP</i>		
16-R-18. The management program requires written procedures to identify and control hazards associated with change and maintain the accuracy of safety information.	RP 75, 4.1	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Review the written MOC procedure and verify that it includes procedures to identify and control hazards associated with changes and to update related safety information.
16-R-19. The management program requires a MOC for changes in produced fluids, process additives, product specifications, by-products, waste products, design inventories,	RP 75, 4.2	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Review the written MOC procedure and verify that it applies to changes in specified materials, inventories,

Audit Criteria	Source	Guidance for Auditors
instrumentation and control systems, or material of construction.		instrumentation and control systems, and material of construction.
16-R-20. Personnel are specified in the management program as authorized to initiate a MOC.	RP 75, 4.2	<ul style="list-style-type: none"> • No further guidance required.
<p>16-R-21. The MOC procedure addresses:</p> <ul style="list-style-type: none"> • permanent changes • temporary changes, including duration of the change • emergency changes • personnel changes 	RP 75, 4.2, 4.2.i, 4.3, 4.4 f	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the written MOC procedure and verify that it addresses the referenced changes. • Auditors should ensure that permanent changes undergo the full MOC procedure based on the nature of the change (equipment, technology, process). • Temporary changes normally do not involve update of PK since the change should be short term; however selected temporary PK revisions may be warranted based on the nature of the change (e.g., temporary throughput changes). Auditors should confirm that the MOC procedure requires that the duration of the change be specified. • Emergency changes are generally those that should be implemented without time for the normal review and documentation; however, auditors should ensure that these changes undergo some basic level of review and approval by authorized personnel. • Personnel changes should include changes in staffing levels, replacement of personnel, or redistribution of responsibilities to ensure that process safety related responsibilities are properly distributed and that responsible personnel have the qualifications and knowledge necessary for them to be able to carry out their responsibilities in an effective manner. Auditors should verify that these responsibilities are fully understood and are included in the program (e.g., via

Audit Criteria	Source	Guidance for Auditors
		Table 16.4 – Continued acknowledgement signature).
16-R-22. The management program requires a review of the effects of newly acquired or sold facilities on the organization or facilities.	RP 75, 4.3	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review the MOC program to verify that it requires such review; this requirement may be addressed in another document. • A key element of this review is that responsibilities are established for ensuring that process safety management programs are implemented and maintained. Auditors should ensure that a process safety organization is established for each facility.
16-R-23. The management program requires written procedures to ensure all steps of the MOC procedure are managed.	RP 75, 4.4	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should ensure that the MOC procedure includes a mechanism (e.g., MOC form, tracking log) for use in documenting that each applicable step of the procedure is completed for each change. This should be followed by an approval mechanism, where verification of MOC completion is acknowledged. In this way, compliance assurance is built into the MOC procedure.
16-R-24. The management program addresses appropriate consultation as part of the written procedures.	RP 75, 4.4.a, 4.4.b	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review the MOC procedure and verify that change reviews involve the appropriate knowledgeable personnel, including operations, maintenance, engineering, and safety, as appropriate. Review of changes by a team helps ensure that all potential safety hazards are identified and evaluated, and that appropriate means to control them are identified for follow-up.
16-R-25. A process is in place to ensure that follow-up items (e.g. drawing updates, procedure changes, emergency plan updates) are completed.	RP 75, 4.4.c, 4.4.e	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should verify that the MOC procedure includes mechanisms to update all relevant PK including safety and

Audit Criteria	Source	Guidance for Auditors
		operating procedures, drawings, and design information related to a change.
16-R-26. A process is in place to ensure that all personnel affected by the change are notified/trained prior to implementing the change.	RP 75, 4.4.d	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should verify that the MOC procedure includes mechanisms to communicate changes to affected personnel and/or to train them in the change and associated safety, operating and maintenance procedures. Training should be documented and tracked to ensure that all relevant personnel have been informed and/or trained. • Auditors should ensure that communication of simple changes to personnel can be completed via e-mail or a written log book. More complex changes may require more formal training, including classroom/CBT and/or hands-on training, and verification of understanding (such as through testing or observation).
16-R-27. The plan specifies who should review and approve the MOC to effect the change.	RP 75, 4.4.g	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should verify that the MOC procedure includes appropriate change review and authorization levels. Authorizations may vary based on the nature of the change (e.g., first-level supervisor approval for minor changes and management/technical approval for more significant changes).

Audit Criteria	Source	Guidance for Auditors
<p><i>Responsible Care[®] Management System (RMCS)</i></p> <p>16-R-28. The organization has a system to identify and evaluate potential health, safety, security and environmental hazards and assess and prioritize the risks associated with those hazards for new and existing products and processes, changes to existing products and</p>	RCMS Technical Specification, Element 2.1	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should verify, in addition to process-related changes, that the MOC procedure addresses changes to products, distribution and use of raw materials and products, and other activities (e.g., toll processing). RCMS calls for an initial HIRA of these operations,

Audit Criteria	Source	Guidance for Auditors
<p>Table 16.4 – Continued</p> <p>processes, the distribution and use of raw materials and products, and activities associated with its operations.</p>		<p>as well as for changes. Distribution- and product-related information should be updated accordingly.</p> <ul style="list-style-type: none"> Auditors should verify that the MOC procedure addresses security and environmental hazards/risks in addition to those for health and safety. For example, a change to a process may increase the security risk (consequences of an intentional act) due to the addition of a particular chemical. Likewise, elimination of a chemical of concern may reduce the security-related risk associated with the process.

Audit Criteria	Source	Guidance for Auditors
<p><i>RC14001 Requirements</i></p> <p>16-R-29. Procedures should be established, implemented and maintained to assess the risk for new, existing and changes to existing products, and assess the risk for new, existing, and changes to existing processes.</p>	<p>RC14001 Technical Specification RC151.03 4.3.1</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should verify that the MOC procedure addresses environmental “aspects” (hazards/risks) for activities, products, and services, in addition to those for health, safety, and security.

16.3 AUDIT PROTOCOL

The process safety program audit protocol introduced in Appendix A and available online (see page xiv for information on how to access this resource) provides detailed questions that examine the issues described in Section 16.2.

REFERENCES

- American Chemistry Council, *RCMS® Technical Specification*, RC101.02, March 9, 2005
- American Chemistry Council, *RCMS® Technical Specification Implementation Guidance and Interpretations*, RC101.02, January 25, 2004
- American Chemistry Council, *RCMS® Technical Specification Implementation Guidance and Interpretations Appendices*, RC101.02, January 25, 2004
- California, California Code of Regulations, Title 8, Section 5189, CalOSHA, November 1985

- Center for Chemical Process Safety (CCPS), *Guidelines for Risk Based Process Safety*, American Institute of Chemical Engineers, New York, 2007 (CCPS, 2007c)
- Delaware, *Accidental Release Prevention Regulation*, Delaware Department of Natural Resources and Environmental Control/Division of Air and Waste Management, September 1989 (rev. January 1999)
- Department of the Interior, Minerals Management Service, *Safety and Environmental Management Program (SEMP)*, 1990
- Environmental Protection Agency (USEPA), 40 CFR §68, *Accidental Release Prevention Requirements: Risk Management Programs Under Clean Air Act Section 112(r)(7)*; Final Rule, June 21, 1996
- New Jersey, *Toxic Catastrophe Prevention Act (N.J.A.C. 7:31)*, New Jersey Department of Environmental Protection, June 1987 (rev. April 16, 2007)
- Occupational Safety and Health Administration (OSHA) 29 CFR §1910.119, *Process Safety Management of Highly Hazardous Chemicals, Explosives and Blasting Agents; Final Rule*, Washington, DC, February 24, 1992
- Occupational Safety and Health Administration (OSHA) Publication 3133, *Process Safety Management Guidelines for Compliance*, Washington, DC, 1993
- Occupational Safety and Health Administration (OSHA) Instruction CPL 02-02-045 CH-1, *PSM Compliance Directive*, Washington, DC, September 13, 1994
- Occupational Safety and Health Administration (OSHA) Instruction CPL 03-00-004, *Petroleum Refinery Process Safety Management National Emphasis Program*, June 7, 2007 (OSHA, 2007a)
- Occupational Safety and Health Administration (OSHA) Directive 09-06 (CPL 02), *PSM Chemical Covered Facilities National Emphasis Program*, July 27, 2009 (OSHA, 2009a)

17

OPERATIONAL READINESS

This element is called Pre-Start-up Safety Review in OSHA PSM and EPA RMP programs, as well as in many state regulatory PSM programs and voluntary consensus PSM programs. Operational Readiness is an element of the RBPS accident prevention pillar Manage Risks.

17.1 OVERVIEW

The Operational Readiness element primarily focuses on ensuring the safe start-up of processes over the life of a facility. This is accomplished by performing pre-start-up readiness reviews for the following:

- New processes
- Existing processes that have been shut down for modifications
- Existing processes that have been administratively shut down for other reasons, ranging from minor, short-term shutdowns for maintenance, to extended shutdowns for maintenance turnarounds or due to lack of demand for the product or availability of raw materials.

The Operational Readiness element involves work activities associated with conducting appropriate pre-start-up readiness reviews, making start-up decisions based upon the results of the reviews, and following through on decisions, actions, and results of the reviews. Regulatory requirements require that pre-start-up safety reviews (PSSR) be conducted prior to starting up a new process or restarting a process that has undergone a modification. Therefore, this element closely complements the MOC element, and the two elements are generally audited together. However, good practice calls for the conduct of some level of PSSR prior to any start-up of a unit following shutdown. Pre-start-up reviews should also confirm the integrity of process equipment, particularly any that has undergone modifications or repair; therefore this element is linked to the Asset Integrity element.

Operational readiness reviews are intended to determine whether or not the process is safe to restart, resulting in approval to do so if warranted. If results of the review indicate that additional actions are needed to ensure readiness, a means of follow-up tracking should be in place to ensure that those actions are completed, as well as to provide assurance that actions not required for start-up but are important to ensure appropriate process safety management (e.g., updating of process safety knowledge) are also completed in a timely manner. Operational readiness reviews for larger projects are usually started months in advance of the planned start-up, whereas the operational readiness review for a smaller project may take only several hours to perform.

The Operational Readiness element interfaces significantly with other PSM program elements, including the following:

- Process Knowledge Management (Chapter 9)—knowledge/information should be updated following a change or new process.
- Hazard Identification and Risk Management (Chapter 10)—HIRAs are mandatory for new processes.
- Operating Procedures (Chapter 11)—operating procedures should usually be updated following an equipment change and new operating procedures should be provided for new processes.
- Training and Performance Assurance (Chapter 15)—operators, maintenance personnel, and other affected personnel should be informed or and trained in changes prior to equipment re-start or before the start-up of a new process.
- Management of Change (Chapter 16)—operational readiness reviews are often combined with the MOC element, and are performed as a step in the MOC process.

In Section 17.2, both compliance and related audit criteria are presented, along with guidance for auditors in applying the criteria. A full explanation of compliance and related audit criteria is presented in Chapter 1 (see Section 1.7). The criteria and guidance described in these sections do not represent exclusive solutions to PSM program coverage, design, implementation, or interpretation. They represent the collective experience of many people in the chemical/processing sector who have performed many PSM audits, and the consensus opinion resulting from that experience. The compliance criteria are derived from the regulations that govern PSM programs in the United States; however, these regulations are all performance-based. Performance-based regulations are goal oriented and there may be multiple pathways to fully complying with them. Therefore, there may be alternate interpretations and solutions to the issues described in the compliance tables in this chapter that are equivalent to those included, particularly the auditor guidance presented.

The inclusion of the related criteria in no way infers that these criteria must be implemented for a PSM program to be successful, nor does it infer that a PSM program will be deficient without them. As with the compliance criteria, there may be other, more appropriate solutions for an individual facility or company. In

In addition, the use of the related criteria in a PSM audit is intended to be completely voluntary and not a mandatory requirement in any way. They should be used cautiously and with careful planning so that they do not inadvertently establish unintended performance standards. Consensus should be sought within and among facilities and their parent companies before these criteria are used. Finally, the related criteria and guidance offered for consideration are not endorsements of or agreements with the written or verbal clarifications made by the regulators, PSM citations issued against the regulations, other PSM guidance published by the regulators, nor the successful or common PSM practices in any given company's PSM program from which they are derived.

17.2 AUDIT CRITERIA AND GUIDANCE

The detailed requirements for Operational Readiness in OSHA's PSM Standard, EPA's RMP Rule (referred to in those regulations as Pre-Start-up Safety Review, or often simply as PSSR), several state PSM regulatory programs as well as for other common PSM program voluntary consensus PSM programs are presented below.

The audit criteria described below are examined by auditors using the guidance provided by performing the following audit activities:

- Interviewing the persons at the facility who have overall responsibility for the Operational Readiness program. This person is usually the process safety manager/coordinator; however generally persons in engineering/technical and operations departments are responsible for coordinating operational readiness reviews.
- Reviewing the written procedures for operational readiness and MOC to determine the scope and application of these elements as they relate to operational readiness. Sometimes operational readiness is embedded in the MOC procedures.
- Reviewing a representative number of reports of operational readiness reviews conducted for new processes, or for existing processes following modifications, turnarounds, or extended shutdowns.
- Reviewing records to confirm that action items resulting from ORs have been completed based on priority, and that all pre-start-up actions have been completed prior to start-up.
- Reviewing training files and interview operations and maintenance personnel to verify that they have received training on changes prior to start-up.
- Reviewing safety, operating, maintenance, and emergency procedures associated with a change to verify that they have been developed or updated prior to start-up.

Auditors should also carefully examine the operational readiness requirements found in the procedures of the company/facility being audited. As stated in Section 1.7.1, these could be interpreted as compliance requirements by regulators and could

be subject to citations if they are not being followed. Auditors should confirm, via interviews, records and document reviews, and field observations, that the requirements of the facility or company operational readiness procedures have been implemented as specified. Findings should be generated if the company/facility-specific provisions are not being followed.

See the Guidance for Chapters 3–24 in the Introduction for the definition of the abbreviations shown in the following tables that are used to indicate the source of the criteria.

17.2.1 Compliance Requirements

The audit criteria should be used by the following:

- Readers in the United States covered by the PSM Standard or RMP Rule.
- Readers who have voluntarily adopted the OSHA PSM program.
- Readers whose companies have specified OSHA PSM requirements in non-U.S. locations.

Table 17.1 describes the audit criteria and auditor guidance for Pre-startup Safety review pursuant to OSHA PSM and EPA RMP.

Table 17.1 OSHA PSM and EPA RMP Audit Criteria and Guidance for Auditors – Pre-Startup Safety Review

Audit Criteria	Source	Guidance for Auditors
17-C-1. PSSRs have been performed for new facilities.	PSM (i)(1) RMP 68.77	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • PSSRs for new processes may be quite complex, with multiple checklists and signoffs for completion of various aspects of the process, e.g., electrical, instrumentation, rotating equipment, fixed equipment, fire protection. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews and review relevant records to verify that a documented PSSR has been completed by appropriate personnel for any new covered processes started up during the audit period, and that required elements were reviewed.
17-C-2. PSSRs have been conducted for modified facilities when the modification is significant enough to require a change in the process safety information.	PSM (i)(1) RMP 68.77	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The triggers for using the MOC procedure and performing a PSSR are slightly different, but will almost always coincide.

Audit Criteria	Source	Guidance for Auditors
		<p>MOCs are required when a change is not replacement-on-kind, and PSSRs are required when a change results in the modification of the PSI. It will be very difficult to find changes that required MOC but did not require PSSR or vice versa, but there may be some cases where this occurs. This is why many facilities/companies have combined their MOC and PSSR procedures into a single procedure and the PSSR is a step in the MOC process.</p> <ul style="list-style-type: none"> Minor changes may not require much in the way of verification, e.g., they may not involve changes to procedures or require training of personnel. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the MOC log or other MOC records (see Chapter 16) and verify that a PSSR has been conducted for a representative sample of changes listed.
17-C-3. A PSSR has been performed prior to the introduction of highly hazardous chemicals to a process.	PSM (i)(2) RMP 68.77	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review completed PSSRs to confirm that they were conducted prior to start-up or the introduction of highly hazardous chemicals to the process, whichever occurs first, and that follow-up action items required for start-up were completed prior to start-up.
17-C-4. PSSRs have confirmed that construction and equipment is in accordance with design specifications	PSM (i)(2)(i) RMP 68.77	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Construction of fabricated equipment (e.g., pressure vessels) may have been conducted by project personnel at the vendor's shop, and the verification of its proper fabrication may have been conducted there. If this is the case, separate reports or records are likely to have been issued documenting the shop inspections. Various disciplines may be involved in verifying that equipment in their field has

Audit Criteria	Source	Guidance for Auditors
		<p>Table 17.1 – Continued</p> <p>been installed properly, e.g., electrical, instrumentation, rotating equipment, fixed equipment, fire protection.</p> <ul style="list-style-type: none"> Any deficiencies noted during the review should be documented and brought to closure prior to start-up (unless specifically waived as not being necessary to safely start-up). <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should conduct field inspections of installed equipment to confirm that it has been built and installed in accordance with design drawings and specifications. This confirmation should be documented in a PSSR report or equivalent documentation.
<p>17-C-5. PSSRs have confirmed that safety, operating, maintenance, and emergency procedures are in place and are adequate.</p>	<p>PSM (i)(2)(ii) RMP 68.77</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Safety, operating, maintenance and emergency procedures affected by a change should be developed or modified as appropriate prior to start-up. Temporary procedures or markups are acceptable; however, these should be made permanent in a timely manner following start-up prior to MOC closure. "Timely" in this context means that the permanent modification of procedures is completed in a reasonable time period given the complexity of the action and the difficulty of modification. Each situation should be evaluated on a case-by-case basis. Auditors should determine how each facility has defined "timely," how they have applied their definition, and if the definition and its application are reasonable and defensible. Changes to procedures are not always necessary as a result of a change, particularly minor changes. However, all changes need to be evaluated for procedural impacts prior to implementation. Changes to emergency

Audit Criteria	Source	Guidance for Auditors
		<p>procedures may include those in the SOPs as well as those in the site emergency response plan, for example, if a new highly hazardous chemical has been introduced to the site.</p> <ul style="list-style-type: none"> • Some procedures, such as those related to periodically verifying asset integrity, may not be required prior to start-up; however, a mechanism should be in place to ensure that they are completed in a timely manner prior to MOC closure. • This confirmation should be documented in a PSSR report. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review documentation to confirm that the necessary procedures were in place prior to start-up. By the time the audit occurs, temporary procedures or red-line/marked-up procedures may have been replaced with the permanent changes. Auditors should also check to confirm that the permanent procedure changes were made in a reasonable amount of time after start-up.
<p>17-C-6. For new facilities, PSSRs have confirmed that PHAs have been performed and recommendations have been resolved or implemented before start-up.</p>	<p>PSM (i)(2)(iii) RMP 68.77</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with operations personnel to determine whether any new facilities (processes) have been started up during the audit period. If so, the PHA for the new process as well as the system used to track PHA recommendations should be reviewed (see Chapter 10). • Auditors should review relevant documentation to confirm that all PHA recommendations have been resolved or implemented prior to start-up. Resolution includes a decision as to whether the recommendation is required prior to start-up or can wait until afterwards. • Auditors should review relevant documentation to confirm that recommendations required prior to start-up were implemented

Audit Criteria	Source	Guidance for Auditors
		<p>Table 17.1 – Continued</p> <p>prior to start-up and that others have been completed in a timely manner following start-up, prior to project closure.</p>
<p>17-C-7. PSSRs have confirmed that modified facilities meet the requirements contained in the MOC program.</p>	<p>PSM (i)(2)(iii) RMP 68.77</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • PSSR is usually best audited in combination with the MOC program (see Chapter 16). This allows the simultaneous review of compliance with MOC and PSSR requirements. • Although PSSR and MOC are separate PSM elements, many companies and facilities have combined the two elements in one procedure or practice. If so, they should be audited together. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review relevant documentation to confirm that the provisions of the MOC program have been followed prior to start-up of modified processes.
<p>17-C-8. PSSRs have confirmed that training of each employee involved in operating a modified process has been completed.</p>	<p>PSM (i)(2)(iv) RMP 68.77</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Some changes may not require formal operator training; however, at a minimum there should be some type of communication to operations personnel that a change has been made. The training or communication on the change should be provided prior to operating the changed equipment, which may occur before the actual start-up of the process. • Training may be formal classroom, CBT, or hands-on format, or may be in the form of reading and signing off on pertinent MOC information. Training should include any changes to SOPs made as a result of the change. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review MOC-related training documentation and interview operations personnel to verify that they

Audit Criteria	Source	Guidance for Auditors
		have received appropriate training on changes prior to start-up. <ul style="list-style-type: none"> • Auditors should also review records to assure that operators who were on vacation, sick leave, or otherwise absent when training was provided prior to start-up.

17.2.1.1 U.S. State PSM Programs

If the PSM program being evaluated is pursuant to a state PSM regulation, then the specific process safety knowledge requirements for that regulatory program should be followed. In general, these overlap somewhat with the federal OSHA PSM and EPA RMP requirements, but often there are state-specific requirements that should be met, even if the state has received authority to enforce federal regulations (i.e., the state is an OSHA state plan state, or has received implementing agency status for the RMP Rule from EPA). The state-specific applicability requirements for the following states are presented below:

- New Jersey
- California
- Delaware

Table 17.2 shows the audit criteria and auditor guidance for Pre-startup Safety reviews pursuant to state requirements.

Table 17.2 U.S. State PSM Audit Criteria and Guidance for Auditors – Pre-Startup Safety Review

Audit Criteria	Source	Guidance for Auditors
<i>New Jersey Toxic Catastrophe Prevention Act (TCPA)</i> 17-C-9. For each new covered process, the facility has conducted a safety review of the design for new EHS equipment prior to construction and documents that the design of the covered process follows design and operating standards as reflected in the process safety information.	N.J.A.C. 7:31-4.7	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review project or other records to confirm that new processes have been subjected to a safety review of the design. • Auditors should review safety review reports to confirm that they contain the required information.
17-C-10. A written report has been prepared for each safety review performed for a new covered process.	N.J.A.C. 7:31-4.7	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review project or other records to confirm that new processes have been subjected to a safety review of the design and that a written safety report has been prepared.

Audit Criteria	Source	Guidance for Auditors
<p>Table 17.2 – Continued</p> <p>17-C-11. The safety review design report has included the following:</p> <ul style="list-style-type: none"> • The date of the report and an identification of the covered process, the process safety information, and standard operating procedures reviewed • An identification of the codes and standards upon which the covered process design and operations were based • The names of the persons who performed the safety review • The deviations from the design and operating codes and standards that were found with an appropriate description of the resolution of each 	<p>N.J.A.C. 7:31-4.7</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review safety review reports to confirm that they contain the required information.
<p>17-C-12. For each new covered process or modified covered process, the owner or operator has conducted and documented a pre-startup safety review prior to placing the covered process into EHS service.</p>	<p>N.J.A.C. 7:31-4.7</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review project or other records to confirm that new processes have been subjected to a PSSR.
<p>17-C-13. A written report has been prepared for each pre-startup safety review performed for a new or modified covered process.</p>	<p>N.J.A.C. 7:31-4.7</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review project or other records to confirm that new processes have been subjected to a PSSR and that a written PSSR has been prepared.
<p>17-C-14. The pre-startup safety review report has included the following:</p> <ul style="list-style-type: none"> • The date of the report and an identification of the covered process. • Documentation that: 1) the installation has been made in accordance with the approved design, 2) safety, operating, maintenance, and emergency procedures are in place and adequate, 3) for new stationary sources that a PHA has been performed and the PHA recommendations have been resolved or implemented before startup and all the requirements of the MOC procedure have 	<p>N.J.A.C. 7:31-4.7</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review PSSR reports to confirm that they contain the required information.

Audit Criteria	Source	Guidance for Auditors
<p>been satisfied, and 4) operators have been trained have been completed prior to the startup of the new or modified covered process.</p>		
<p><i>Delaware Accidental Release Prevention Regulation</i> 17-C-15. The Delaware EHS regulations do not add any different or unique operational readiness requirements beyond those described for pre-startup safety reviews in the PSM Standard and RMP Rule.</p>	<p>DE Code, Chapter 77, Section 5.77</p>	<ul style="list-style-type: none"> No further guidance.
<p><i>California OSHA—Process Safety Management of Acutely Hazardous Materials</i> 17-C-16. In addition to the requirements in the OSHA PSM Standard and EPA RMP Rule, the Pre-Startup Safety Review has involved employees with expertise in process operations and engineering. The employees have been selected based upon their experience and understanding of the process systems being evaluated.</p>	<p>CCR, Title 8, Section 5189</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review completed PSSRs to confirm that they have included personnel with expertise in process operations and engineering.
<p><i>California Accidental Release Prevention Program</i> 17-C-17. The CalARP regulations do not add any different or unique operational readiness requirements beyond those described for pre-startup safety reviews in the PSM Standard and RMP Rule.</p>	<p>CCR, Title 19, Section 2760.7</p>	<ul style="list-style-type: none"> No further guidance.

17.2.2 Related Criteria

The purpose of providing these criteria is to provide auditors with additional guidance for evaluating PSM programs with respect to issues that go beyond the strict compliance requirements presented above, and in large part represent industry good practices in process safety knowledge, or in some cases practices in process safety knowledge that have become common. Some of the related criteria have reached the status of a level of acceptable practice because of their widespread, accepted, and successful use over an extended period of time. Auditors and PSM practitioners should carefully consider implementing this guidance, or at least designing an approach that is similar in nature. See the Glossary and Section 1.7.1 for a more complete discussion of the meaning and use of level of acceptable practice.

Table 17.3 identifies the recommended related audit criteria and auditor guidance for Operations Readiness.

Table 17.3 Related Audit Criteria and Auditor Guidance - Operations Readiness

Audit Criteria	Source	Guidance for Auditors
<p>17-R-1. There is an Operational Readiness (OR) management system procedure in place that applies to the following situations:</p> <ul style="list-style-type: none"> • Temporary shutdowns (e.g., as precautionary measure such as due to an impending hurricane). • Maintenance turnarounds (with or without modifications). • Extended shutdowns (with or without modifications), e.g., due to business reasons. 	<p>CCPA 3133 RBPS GIP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Written OR management system policies, procedures, and plans should include the following elements: • Clearly defined responsibilities. • An adequate system of authorizations that reflects the criticality of the tasks and activities. • Capable personnel throughout the organization (i.e., adequate training for OR activities). • Division of duties to avoid organizational conflicts of interest to establish the necessary checks and balances as appropriate. • Documentation of the activities. • Internal verification that activities are being carried out in accordance with the management system procedures. • Management review activities that provide a closure of the feedback loop by adjusting the program requirements by carefully reviewing the verification activity results. <p><u>Auditor Activities:</u></p> <p>Auditors should review the OR management system procedure to determine if it includes the following provisions:</p> <ul style="list-style-type: none"> • The scope of the OR procedure. The equipment, processes, and operations included in the OR program should be based on the risk as identified in the HIRAs, risk assessments, LOPAs/SIL analyses, or other analytical activities designed to identify and prioritize the hazards/risk associated with the equipment and its operation. The OR program should include the

Audit Criteria	Source	Guidance for Auditors
		<p>replacement of equipment and the recommissioning of equipment that has been previously decommissioned but left in place.</p> <ul style="list-style-type: none"> • Defines when ORs are required. • Provides a means for identifying modifications that may require an OR. • Specifies what should be checked in an OR. At a minimum, the following issues should be included: <ul style="list-style-type: none"> ▪ Process control, emergency shutdown, and safety systems have been tested. ▪ Equipment is properly isolated from other systems not yet ready for start-up. ▪ Equipment has been cleaned or flushed, where appropriate, and cleaning materials have been removed. ▪ Equipment lineup has been verified as secure and has been released to operations for start-up. ▪ Leak tightness has been verified. ▪ Emergency response equipment is in place and training has been completed. ▪ New or modified equipment has been included in the AI program. ▪ Oxygen freeing of equipment, as appropriate (before leak tightness). ▪ Removal of nonessential personnel from the area. ▪ Verification of appropriate staffing levels (including personnel on upcoming shifts if transient extends beyond shift). • Specifies the OR form, checklist, or other medium to be used to record the review. • Requires physical verification and documentation of completion of OR activities prior to start-up. • Requires periodic on-site inspections conducted during construction phase to verify that installation is in Table 17.3 – Continued

Audit Criteria	Source	Guidance for Auditors
		<p>Table 17.3 - Continued</p> <p>accordance with design.</p> <ul style="list-style-type: none"> • Requires establishment of an ongoing punch list of items that need to be completed prior to start-up. • Requires documentation, correction, and communication of deficiencies identified at any stage of safety review. • Requires written approval of the OR by appropriate individuals following confirmation that all pre-start-up actions have been completed, indicating that start-up may proceed. • Requires retention of OR documentation for a specified time period. • Defines how OR items can be deferred if the technical conclusion is that they are not necessary to safely support the start-up of the equipment/process. The OR procedure should also define the rules for how these post-start-up items are closed-out, including any time limits or operational conditions that are appropriate. Auditors should review completed ORs and confirm that these deferred items have been closed within a reasonable length of time. • Open recommendations are reviewed and resolved if possible prior to start-up: <ul style="list-style-type: none"> ▪ From incident investigations ▪ From compliance audits ▪ From previous PHAs on the process not associated with the particular start-up in question (not applicable for new facilities) • Follow-up tracking of OR action items that are to be completed following start-up.
17-R-2. ORs are documented.	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review OR documentation to confirm that it includes the following: • In a separate OR report. This might be particularly appropriate for large projects where the equipment commissioning activities that are included in the

Audit Criteria	Source	Guidance for Auditors
		<p>PSSR may take months to complete and represent many different events.</p> <ul style="list-style-type: none"> • As a checklist or other record that is part of the OR procedure. • As a checklist or set of steps that are part of the MOC form. • An equivalent record that describes what was done during the OR.
<p>17-R-3. Initial/periodic refresher training on OR procedures is provided to affected personnel.</p>	<p>GIP RBPS</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Those involved in conducting or participating in OR activities (primarily operations, engineering, and maintenance personnel) should receive in-depth training in conducting ORs. This is usually included in in-depth training on MOC procedures. • Refresher training should be provided on a frequency generally not to exceed three years. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that OR training is included in the overall safety and health/process safety training program. This is usually included in MOC awareness training provided to all employees.

Audit Criteria	Source	Guidance for Auditors
17-R-4. Decisions and actions resulting from the OR are communicated to appropriate personnel.	GIP RBPS	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Personnel affected by a change, including operations, maintenance, and engineering personnel (including contractors) should be informed of changes including their status relevant to OR. Conditions preventing start-up should be communicated along with planned corrective actions, and start-up should not proceed without proper management approval after verification that all pre-start-up required items have been completed. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should confirm via interviews that the results of the PSSRs are communicated to the appropriate personnel and that records exist to document this activity.
17-R-5. Follow-up actions resulting from ORs are tracked to completion, including those not required prior to startup.	GIP RBPS	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should confirm that a mechanism is in place (e.g., database, spreadsheet, or other form) to document that action items identified in the OR are completed. Review action items from ORs for selected changes and confirm that they have been completed as scheduled.

17.2.3 Voluntary Consensus PSM Programs

The following voluntary consensus PSM program requirements for process knowledge management are described below:

- The requirements published for the offshore oil platform sector in the Safety and Environmental Management Program (SEMP), a voluntary program designed by API and endorsed by the Minerals Management Service of the U.S. Department of the Interior.
- Responsible Care Management System (RCMS)[®] published by the American Chemistry Council.
- RC14001 Environmental Management System, published by the American Chemistry Council.

Table 17.4 lists audit criteria and auditor guidance relating to Operations Readiness pursuant to voluntary consensus PSM programs.

Table 17.4 Voluntary Consensus PSM Programs Audit Criteria and Guidance for Auditors - Operations Readiness

Audit Criteria	Source	Guidance for Auditors
<p><i>SEMP</i> 17-R-6. Pre-startup reviews confirm that the following criteria are met:</p> <ul style="list-style-type: none"> • Manufacturer recommendations and instructions have been reviewed. • Safety, environmental, operating, maintenance, and emergency procedures are in place and adequate. • Safety and environmental information has been updated. • Safe work practices have been reviewed and updated as necessary. 	<p>RP 75, 9.1</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review relevant pre-start-up review documentation to confirm the following: <p>A written plan has been developed which includes consideration of these criteria.</p> <p>Completed pre-start-up reviews show consideration of these criteria.</p>

Audit Criteria	Source	Guidance for Auditors
<p><i>Responsible Care® Management System (RMCS)</i> 17-R-7. No additional OR provisions are included in the RCMS program.</p>	<p>RCMS Technical Specification, Element 2.1</p>	<ul style="list-style-type: none"> • No further guidance.

Audit Criteria	Source	Guidance for Auditors
<p><i>RC14001</i> 17-R-8. No additional OR provisions are included in the RC14001 program.</p>	<p>RC14001 Technical Specification RC151.03 4.3.1</p>	<ul style="list-style-type: none"> • No further guidance.

17.3 AUDIT PROTOCOL

The process safety program audit protocol introduced in Appendix A and available online (see page xiv for information on how to access this resource) provides detailed questions that examine the criteria described in Section 17.2.

REFERENCES

- American Chemistry Council, *RCMS® Technical Specification*, RC101.02, March 9, 2005
- American Chemistry Council, *RCMS® Technical Specification Implementation Guidance and Interpretations*, RC101.02, January 25, 2004
- American Chemistry Council, *RCMS® Technical Specification Implementation Guidance and Interpretations Appendices*, RC101.02, January 25, 2004

- California, California Code of Regulations, Title 8, Section 5189, CalOSHA, November 1985
- Center for Chemical Process Safety (CCPS), *Guidelines for Risk Based Process Safety*, American Institute of Chemical Engineers, New York, 2007 (CCPS, 2007c)
- Delaware, *Accidental Release Prevention Regulation*, Delaware Department of Natural Resources and Environmental Control/Division of Air and Waste Management, September 1989 (rev. January 1999)
- Department of the Interior, Minerals Management Service, *Safety and Environmental Management Program (SEMP)*, 1990
- Environmental Protection Agency (USEPA), 40 CFR §68, *Accidental Release Prevention Requirements: Risk Management Programs Under Clean Air Act Section 112(r)(7)*; Final Rule, June 21, 1996
- New Jersey, *Toxic Catastrophe Prevention Act (N.J.A.C. 7:31)*, New Jersey Department of Environmental Protection, June 1987 (rev. April 16, 2007)
- Occupational Safety and Health Administration (OSHA) 29 CFR §1910.119, *Process Safety Management of Highly Hazardous Chemicals, Explosives and Blasting Agents; Final Rule*, Washington, DC, February 24, 1992
- Occupational Safety and Health Administration (OSHA) Publication 3133, *Process Safety Management Guidelines for Compliance*, Washington, DC, 1993
- Occupational Safety and Health Administration (OSHA) Instruction CPL 02-02-045 CH-1, *PSM Compliance Directive*, Washington, DC, September 13, 1994
- Occupational Safety and Health Administration (OSHA) Instruction CPL 03-00-004, *Petroleum Refinery Process Safety Management National Emphasis Program*, June 7, 2007 (OSHA, 2007a)
- Occupational Safety and Health Administration (OSHA) Directive 09-06 (CPL 02), *PSM Chemical Covered Facilities National Emphasis Program*, July 27, 2009 (OSHA, 2009a)

18

CONDUCT OF OPERATIONS

This element has no direct corresponding element in OSHA PSM and EPA RMP programs or state regulatory PSM programs; however, the concept of executing operations in a structured and disciplined manner is an underlying, if not formal, concept of all PSM programs, and a component of several voluntary consensus PSM programs. This element will be referred to as Conduct of Operations. Conduct of Operations is an element of the RBPS accident prevention pillar of Manage Risks.

18.1 OVERVIEW

The Conduct of Operations element primarily focuses on ensuring adequate operational discipline in all areas and at all levels of the organization in order to ensure safe and reliable operations (operational excellence). This element is closely linked to process safety culture (Chapter 4) as well as other RBPS elements, including operating procedures, safe work practices, asset integrity and reliability, and training and performance assurance. This is accomplished through the establishment and execution of operational and management systems to ensure consistent performance of critical tasks. It requires an organizational commitment to safe, reliable, and consistent operations, as well as a culture that espouses these values. Conduct of operations applies to all work activities, not just those in the operations department (CCPS, 2007c).

The primary objective of this element is to establish a framework of controls that implements an in-depth strategy to ensure that process operations remain within safe operating limits and conditions. It involves the following basic elements (CCPS, 2007c):

- Controlling operations activities
- Controlling the status of systems and equipment
- Developing required skills/behaviors
- Monitoring organizational performance

Although written policies or procedures may be established for some of these issues (e.g., shift turnover, control of access and occupancy, standards of behavior), most of these issues are primarily behavioral in nature. These issues are best verified through interviews with operating, maintenance, engineering, safety, human resources, and management personnel. In some cases, associated records may also be available to review. Some auditing or inspections may also be performed, e.g., for housekeeping or safe work practices.

The Conduct of Operations element interfaces significantly with other PSM program elements, including the following:

- Process Knowledge Management (Chapter 9)—accurate knowledge/information should be in place in order to operate the processes correctly.
- Operating Procedures (Chapter 11)—accurate operating procedures should be in place in order to operate the processes correctly. Following the SOPs when operating the process is also important.
- Safe Work Practices (Chapter 12)—accurate SWPs should be in place in order to operate and maintain the processes correctly and safely. Following the SWPs is also important.
- Asset Integrity and Reliability (Chapter 13)—executing AI activities requires management systems in place to ensure that these activities are performed, documented, reviewed, and approved in a consistent and correct manner.
- Training and Performance Assurance (Chapter 15)—operators, maintenance personnel, and other affected personnel should be trained properly, including refresher training in order to operate the processes correctly.

In Section 18.2, the related audit criteria are presented, along with guidance for auditors in applying the criteria. A full explanation of compliance and related audit criteria is presented in Chapter 1 (see Section 1.7). The criteria and guidance described in these sections do not represent exclusive solutions to PSM program coverage, design, implementation, or interpretation. They represent the collective experience of many people in the chemical/processing sector who have performed many PSM audits, and the consensus opinion resulting from that experience.

The inclusion of related criteria neither infers that these criteria must be implemented for a PSM program to be successful, nor does it infer that a PSM program will be deficient without them. There may be other, more appropriate solutions for an individual facility or company. In addition, the use of the related criteria in a PSM audit is intended to be completely voluntary and not a mandatory requirement in any way. They should be used cautiously and with careful planning so that they do not inadvertently establish unintended performance standards. Consensus should be sought within and among facilities and their parent companies before these criteria are used. Finally, the related criteria and guidance offered for consideration are not endorsements of or agreements with the written or verbal clarifications made by the regulators, PSM citations issued against the regulations, other PSM guidance published by the regulators, or the successful or

common PSM practices in any given company's PSM program from which they are derived.

18.2 AUDIT CRITERIA AND GUIDANCE

There are no detailed or formal requirements for conduct of operations established in the OSHA PSM Standard, the EPA RMP Rule, or state PSM regulatory programs; however, the concepts of proper conduct of operations are inferred in these regulatory programs.

The audit criteria described below are examined by auditors using the guidance provided by performing the following audit activities:

- Interviewing personnel at the facility who have overall responsibility for various aspects of the conduct of operations program. These persons can include operations, maintenance, process safety, engineering, human resources, and management personnel.
- Interviewing front-line personnel, including operators and maintenance technicians, to verify that these elements are in place. Many conduct of operations issues can only be verified through use of confidential interviews, as these issues are primarily cultural/behavioral in nature, relating to the actual performance of activities on a day-to-day basis. These elements should also be present in formal training programs, although some may be simply established as accepted practice, i.e., "the way things are done."
- Reviewing any written policies or procedures associated with each conduct of operations issue. Sometimes issues may be embedded in procedures for other PSM elements.
- Reviewing any records associated with each conduct of operations issue. These may be available on a case-by-case basis; many of these issues may not necessarily be documented.
- Conducting field observations of the following operations:
 - Operator rounds.
 - Operations or maintenance activities controlled by permits (e.g., hot work and other SWPs, bypass of safety features).
 - Shift turnover.
 - Radio discipline.
 - Daily and weekly meetings to coordinate operations and maintenance planning.
 - Plant manager meetings.
 - Shift supervisors communicating with their subordinates.
 - Housekeeping.
 - Consistent use of PPE (especially where signage states it is required).

- Status of signage (excessive or ignored).
- Upkeep of billboards and postings.
- Nature of conversations between employees/peers in work locations like control rooms and security points (professional, work related).
- The use of personal cell phones and PDAs for nonwork-related communications.

The purpose of providing these criteria is to provide auditors with guidance for evaluating PSM programs with respect to issues that go beyond the strict compliance requirements presented above, and in large part represent industry good practices, or in some cases practices that have become common. Some of the related criteria have reached the status of a level of acceptable practice because of their widespread, accepted, and successful use over an extended period of time. Auditors and PSM practitioners should carefully consider implementing this guidance, or at least designing an approach that is similar in nature. See the Glossary and Section 1.7.1 for a more complete discussion of the meaning and use of level of acceptable practice.

Auditors should also carefully examine the conduct of operations requirements found in the procedures of the company/facility being audited. As stated in Section 1.7.1, these could be interpreted as compliance requirements by regulators and could be subject to citations if they are not being followed. Auditors should confirm, via interviews, records and document reviews, and field observations, that the requirements of the facility or company conduct of operations procedures have been implemented as specified. Findings should be generated if the company/facility-specific provisions are not being followed.

See the Guidance for Chapters 3–24 in the Introduction for the definition of the abbreviations shown in the following tables that are used to indicate the source of the criteria.

18.2.1 Related Criteria

Table 18.1 describes the recommended related audit criteria and auditor guidance for Conduct of Operations.

Table 18.1 Related Audit Criteria and Guidance for Auditors - Conduct of Operations

Audit Criteria	Source	Guidance for Auditors
<p>18-R-1. Systems are in place to control operational activities:</p> <ul style="list-style-type: none"> • The written SOPs reflect actual, current operating practice (see Chapter 11). • Safe operating limits and limiting conditions for operations are adhered to. • Safe work practices are followed. • Qualified workers are used (see Chapter 15). • Adequate personnel resources are assigned to conduct approved operations. • Communications between workers are formalized. • Communications between process units are formalized (particularly where the operations are integrated and the units are interconnected). • Communications between shifts is formalized. • Communications between work groups are formalized. • Access and occupancy is controlled. 	<p>RBPS GIP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The equipment and processes that warrant close control of operations should be based on the risk as identified in the HIRAs, risk assessments, LOPAs/SIL analyses, or other analytical activities that are designed to identify and prioritize the hazards/risk associated with the equipment and its operation. • SOPs are clearly defined and written and are followed as written. • Communications includes formal meetings to discuss operations, maintenance and related special activities or issues, with written communications to all affected personnel (e.g., via e-mail or log book). • Inter-shift communications are particularly important to ensure that the incoming shifts (especially operators) are thoroughly prepared to conduct/continue safe and effective operations. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with operators and field observations to confirm that the processes are operated in accordance with the written approved operating procedures and not on an ad hoc basis. The safe upper and lower limits of the process are not exceeded without the use of MOC. • Auditors should conduct field observations to confirm that nonroutine operations such as start-up, shutdown, and other transient modes of operations, particularly for continuously operating processes, are conducted in a careful, deliberate manner, with full supervision required present

Audit Criteria	Source	Guidance for Auditors
		<p>Table 18.1 – Continued</p> <p>and in accordance with the approved operating procedure for the activity. Auditors should not request that such operations be scheduled only because of the audit.</p> <ul style="list-style-type: none"> <li>• Auditors should conduct field observations to confirm that safe work practices and the permit conditions that result from using the SWPs are being followed. <li>• Auditors should interview operators indicate that the training and qualification process is relevant and in accordance with approved operating procedures. <li>• Auditors should interview operators and other personnel to confirm that adequate resources have been assigned to support the operations, maintenance, engineering, and EHS activities of the facility. Resources not only include personnel, but also include materials and equipment (e.g., computers/software, tools, communications equipment, test and inspection equipment). <li>• Auditors should conduct field observations to confirm that communications are formal. This includes verifying that verbal messages are received and understood, usually by repeating them back to the sender. Feedback should also be provided to confirm that a requested action has been completed or situation verified. <li>• Auditors should attend plant manager meetings, daily meetings between operations and maintenance to coordinate activities, and monitor radio communications to determine if communications are formal. <li>• Auditors should conduct field observations to confirm that shift turnover is a formal process where certain

Audit Criteria	Source	Guidance for Auditors
		<p>information is exchanged between outgoing and incoming personnel (particularly operators) about facility, unit, and equipment status. A logbook should be used to document key activities and issues occurring during each shift.</p> <ul style="list-style-type: none"> • Auditors should conduct field observations to confirm that communication between work groups generally takes the form of written maintenance work orders, permits, batch sheets, purchase orders, etc. Use of verbal orders for critical activities (e.g., nonroutine activities such as turnarounds and construction) should be minimized. • Auditors should conduct field observations to confirm that control of access and occupancy does not mean simply signing in and out, but also contacting, informing, and receiving permission, including safety precautions, from operating personnel prior to entering process areas.
<p>18-R-2. Systems are in place to control the status of systems and equipment:</p> <ul style="list-style-type: none"> • Equipment/access ownership and access protocols are formalized. • Equipment status is monitored. • Good housekeeping is maintained. • Labeling is maintained. • Lighting is maintained. • Instruments and tools are maintained. 	<p>RBPS GIP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The events, milestones, or other conditions that shift responsibility temporarily from one group to another should be clearly defined and there are administrative processes in place to acknowledge the shift of responsibility. Auditors should focus on equipment where the ownership/responsibility is difficult to define such as pipelines, common vent headers, or emergency systems such as scrubbers and flares. • The safety and housekeeping inspection program should include a system to ensure that corrective and preventive actions are taken to address deficiencies. Random, unannounced inspections should be included. • Periodic inspections should be conducted to verify that labeling

Audit Criteria	Source	Guidance for Auditors
		<p>Table 18.1 – Continued</p> <p>is being maintained; the program should include a system to ensure that deficient labeling is corrected.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with operators, maintenance, and other personnel to confirm that the ownership/responsibility for all process equipment and related facilities (e.g., utilities, fire protection systems) has been formally established for each life-cycle phase of an operation (e.g., construction, operation, maintenance, decommissioning) between operations and maintenance before and after repair work is conducted, including verification that equipment is properly prepared for maintenance and for return to operations. • Auditors should conduct employee interviews and field observations to confirm that periodic operator rounds are conducted to monitor equipment and take critical readings to verify accuracy of remote-reading instruments. • Auditors should conduct employee interviews and field observations to confirm that a formal safety and housekeeping inspection program has been established providing management or other third party confirmation that work areas and equipment are being maintained in a clean, organized, and well-maintained manner. • Auditors should conduct field observations to confirm that a piping and equipment labeling and/or color coding program has been established, generally as part of the facility's Hazard Communication Program (HCP) per OSHA 1910.1200. • Auditors should conduct employee interviews and field

Audit Criteria	Source	Guidance for Auditors
		<p>observations to confirm that routine inspections of process area lighting are conducted with provisions for prompt correction of inoperative lighting.</p> <ul style="list-style-type: none"> • Auditors should conduct employee interviews and field observations to determine that process instrumentation are maintained in good working order, with periodic calibration tests, preventive maintenance, and timely reporting and repair of malfunctioning instrumentation. Operators must be able to rely on instrumentation in order to ensure reliable operations.
<p>18-R-3. Systems are in place to develop required skills/behaviors:</p> <ul style="list-style-type: none"> • Observation and attention to detail is emphasized. • A questioning/learning attitude is promoted. • Workers are trained to recognize hazards. • Workers are trained to self-check and peer-check. • Standards of conduct are established. 	<p>RBPS GIP</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review operator and maintenance training programs to determine the following: <ul style="list-style-type: none"> – Proficient use of workers' basic senses to observe process and equipment conditions has been emphasized. – When something abnormal has been observed, workers have been trained to question the condition so that it can be explained or corrected. – Training on hazard recognition has been provided to personnel, including recognition of process-related hazards. – The completed tasks have accomplished their objective (including cross-checking by peers for critical operations) and have been included in worker training. • Auditors should conduct employee interviews and review relevant policies to verify that professional standards of conduct have been established for all workers, including the following: <ul style="list-style-type: none"> – Arriving to work on time

Audit Criteria	Source	Guidance for Auditors
		<p>Table 18.1 – Continued</p> <ul style="list-style-type: none"> – Working cooperatively with peers and other work groups – Honest recording of data/reliable dealing with others. <ul style="list-style-type: none"> • Auditors should conduct field observations to confirm that nonwork-related activities (e.g., watching television, surfing the internet, texting/calling on personal cell phones or PDAs) are not occurring. Employee training and contractor/visitor orientations should emphasize these prohibitions. • Auditors should conduct field observations to confirm that disruptive behaviors (e.g., fighting, horseplay, discrimination, harassment) are not occurring. Employee training and contractor/visitor orientations have emphasized these prohibitions.
<p>18-R-14. Systems are in place to monitor organizational performance:</p> <ul style="list-style-type: none"> • Accountability is maintained. • Continuous improvement is emphasized. • Fitness for duty is maintained. • Field inspections are conducted. • Deviations are corrected immediately. 	<p>CCPA RBPS GIP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • A formal system for performance management should be established for workers at all levels, including establishing expectations, goals and objectives, periodic performance reviews, recognition/rewarding of good performance, and corrective actions (e.g., training, coaching, discipline) for poor performance. This program should be separate from the PSM audit program. • A commitment to continuous improvement towards operational excellence should be in place, with recognition of good performance, sharing of best practices and lessons learned, and implementation of leading-edge technology. • A formal drug and alcohol policy should be in place, including random and for-cause testing of substance abuse. An employee assistance program (EAP) should

Audit Criteria	Source	Guidance for Auditors
		<p>be offered to assist employees with drug, alcohol, and other personal issues that can impair their ability to work safely.</p> <ul style="list-style-type: none"> • A program to prevent impairment due to fatigue should be established, including limiting the amount of overtime an individual can work in a given time period. • A program should be in place to ensure fitness for duty from a physical ability standpoint (e.g., ability to lift, climb ladders, work in confined spaces). • Frequent unannounced inspections by peers, supervisors, or management should be conducted to confirm proper preparation of jobs, adherence to safe work practices, and completion of assigned tasks. • Deviations from established safe work practices and other facility standards should be documented, addressed, and corrected immediately; otherwise they encourage others to do so and result in a situation where normalization of deviation becomes acceptable. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct employee interviews and review relevant policies to confirm that written performance management systems are in place and are adequate.

18.2.2 Voluntary Consensus PSM Programs

The following voluntary consensus PSM program requirements for conduct of operations are described below:

- The requirements published for the offshore oil platform sector in the Safety and Environmental Management Program (SEMP), a voluntary program designed by API and endorsed by the Minerals Management Service of the U.S. Department of the Interior.
- Responsible Care Management System (RCMS)[®] published by the American Chemistry Council.
- RC14001 Environmental Management System, published by the American Chemistry Council.

Table 18.2 lists audit criteria and auditor guidance relating to conduct of operations pursuant to voluntary consensus PSM programs.

Table 18.2 Voluntary Consensus PSM Program Audit Criteria and Guidance for Auditors - Conduct of Operations

Audit Criteria	Source	Guidance for Auditors
<p><i>SEMP</i></p> <p>18-R-15. SEMP programs contain the following high-level characteristics:</p> <ul style="list-style-type: none"> • Management has taken effective steps in demonstrating their support for the organization's management program. • There is a documented management program for the organization's operations that includes, as a minimum, all elements of API RP 75. • Management has issued a directive requiring all affected personnel to operate in accordance with the management program. • Management has assigned management program authority, responsibility, and accountability throughout the organization's structure. • Performance standards for responsible managers, supervisors, and other personnel include measures for the management program effectiveness. • Employee input was requested and considered in developing the elements of the organization's management program. • Management has instituted a system of periodic audits to ensure Table 18.2 – Continued <p>that the management program is up to date and operating effectively.</p> <ul style="list-style-type: none"> • Management has a system in place that ensures that contractors have policies and practices consistent with the organization's management program. 	<p>RP75, 1.1, 1.2.2</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Also see Chapter 4, Process Safety Culture. • These high-level issues surround the overall process safety management program established under SEMP. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that the SEMP program has been incorporated into the EHS program of the facility/platform and that it is written.
Audit Criteria	Source	Guidance for Auditors

Audit Criteria	Source	Guidance for Auditors
<p><i>Responsible Care® Management System (RMCS)</i></p> <p>18-R-16. No additional Conduct of Operations provisions are included in the RCMS program.</p>	<p>RCMS Technical Specification</p>	<ul style="list-style-type: none"> • No further guidance.

Audit Criteria	Source	Guidance for Auditors
<p><i>RC14001</i></p> <p>18-R-17. Section 4.4.6, Operational Control:</p> <ul style="list-style-type: none"> • The organization has identified and planned those operations that are associated with the identified significant environmental aspects consistent with its environmental policy, objectives and targets, in order to ensure that they are carried out under specified conditions, by: <ul style="list-style-type: none"> – Establishing, implementing and maintaining a documented procedure(s) to control situations where their absence could lead to deviation from the environmental policy, objectives and targets. – Stipulating the operating criteria in the procedure(s). – Establishing, implementing and maintaining procedures related to the identified significant environmental aspects of goods and services used by the organization and communicating applicable procedures and requirements to suppliers, including contractors. – Operating and maintenance procedures sufficient to ensure safe operations and the achievement of the policy, objectives, targets and programs. 	<p>RC14001 Technical Specification</p> <p>RC151.03 4.4.6</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • These issues relate to environmental management; however, they could also be applied to process safety management. • The primary focus of these requirements is to ensure that there are documented procedures for deviating from established procedures, e.g., MOC (including temporary MOC), written authorizations by designated level of management. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that the RC14001 program has identified and planned those operations that represent high risk.

18.3 AUDIT PROTOCOL

The process safety program audit protocol introduced in Appendix A and available online (see page xiv for information on how to access this resource) provides detailed questions that examine the criteria described in Section 18.2.

REFERENCES

- American Chemistry Council, *RCMS[®] Technical Specification*, RC101.02, March 9, 2005
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations*, RC101.02, January 25, 2004
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations Appendices*, RC101.02, January 25, 2004
- California, California Code of Regulations, Title 8, Section 5189, CalOSHA, November 1985
- Center for Chemical Process Safety (CCPS), *Guidelines for Risk Based Process Safety*, American Institute of Chemical Engineers, New York, 2007 (CCPS, 2007c)
- Department of the Interior, Minerals Management Service, *Safety and Environmental Management Program (SEMP)*, 1990

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EMERGENCY MANAGEMENT

This element is also called Emergency Planning and Response in OSHA PSM and EPA RMP programs. It is referred to in the same way in many state regulatory PSM programs and voluntary consensus PSM programs, or in a similar way using variations of that title such as Emergency Response, Emergency Response Planning, etc. Emergency Management is an element of the RBPS accident prevention pillar of Manage Risks.

19.1 OVERVIEW

Emergency management embraces a wide range of planning and response activities aimed at mitigation or control measures for process upsets, fires, explosions, spills, chemical releases, and other sudden, unplanned events that might result in damage or loss. Each facility should have a plan for handling foreseeable emergencies, based on knowledge of facility hazards from process knowledge (PK), HIRA studies and other sources.

Depending on the size and nature of the facility, emergency management may range from primarily planning for emergency response by outside responders, with minimal response by facility personnel (except to maintain their own safety and safety of the facility), to full in-house emergency response capability, with comprehensive fire, medical, rescue, hazardous material response, and incident management capabilities. In any event, each facility should have a written emergency action plan and/or emergency response plan detailing the activities that should be undertaken in the event of an emergency. The plan should include means of identifying, reporting, and communicating emergency conditions to all potentially affected personnel so they can evacuate, shelter-in-place, or take other appropriate measures to ensure their own safety (i.e., an emergency action plan). The plan should also include provisions for mobilizing appropriate resources, whether in-house or public, mutual aid or contract response agencies. An overall plan of action is necessary to ensure that all personnel are accounted for and that provisions are in place to search for, locate, and rescue missing personnel. The

extent of actual response procedures will depend on the extent to which the facility provides the emergency response resources. Qualified outside response agencies should have their own procedures, training, and well-maintained emergency response equipment, but if the response relies mainly on external agencies, then these should be made aware of the specific scenarios and risks, and have adequate training and resources (e.g., to respond to a fire scenario at a petrochemical plant, specific firefighting foam may be required which need special application equipment and training).

Training is a key element in emergency management in order for all personnel to understand their role and know exactly what to do in the event of an emergency. More specialized training is required for those who will actually respond to incidents, including fire training, hazardous materials response, search and rescue, first aid and emergency medical treatment, and incident command. In general, annual training and emergency drills are necessary to help ensure that everyone maintains proficiency and can respond effectively and efficiently. Critiques of responses during drills, exercises, and especially during actual emergencies are an excellent way to identify improvement opportunities and assess the actual facility readiness for an emergency. Emergency plans should be kept up-to-date and should be revised as needed following drills, actual incidents, and when changes occur in the facility, including changes in personnel and facility hazards that could affect the plan.

The auditor should verify that the following basic elements of emergency response planning are in place:

- Identification of hazards and potential emergencies that could occur at the facility (e.g., fire, explosion, hazardous material release, utility failure) with corresponding detailed required emergency response resources (e.g. water, foam).
- Personnel education and training.
- Emergency action plan/emergency response plan.
- Inspection, testing, and maintenance of emergency equipment.
- Emergency drills/exercises.
- Critique of responses during drills/exercises and actual emergencies.

In reviewing emergency response planning documents, the auditor should determine whether a management system is in place to respond to a major emergency and whether planning details, such as strategy, procedures, supplies, resources, and organization, have been defined to facilitate training and to maintain the plan.

The emergency management element interfaces significantly with other PSM program elements, including the following:

- Process Knowledge Management (Chapter 9)—knowledge/information is needed to construct an emergency response plan.

- Hazard Identification and Risk Assessment (Chapter 10)—HIRAs will identify possible hazard scenarios
- Asset Integrity (AI) and Reliability (Chapter 13)—emergency response equipment should be maintained and therefore be included in the AI program.
- Training and Performance Assurance (Chapter 15)—emergency responders should be trained if the emergency plan specifies that facility employees will respond to an incident. All employees, including contractors, require training in the basic requirements of the emergency action plan.
- Incident Investigation (Chapter 20)—actual activations of the emergency action/emergency response plan will occur as a result of incidents.

In Sections 19.2 and 19.3, both compliance and related audit criteria are presented, along with guidance for auditors in applying the criteria. A full explanation of compliance and related audit criteria are presented in Chapter 1 (see Section 1.7). The criteria and guidance described in these sections do not represent exclusive solutions to PSM program coverage, design, implementation, or interpretation. They represent the collective experience of many people in the chemical/processing sector who have performed many PSM audits, and the consensus opinion resulting from that experience. The compliance criteria are derived from the regulations that govern PSM programs in the United States; however, these regulations are all performance-based. Performance-based regulations are goal oriented and there may be multiple pathways to fully complying with them. Therefore, there may be alternate interpretations and solutions to the issues described in the compliance tables in this chapter that are equivalent to those included, particularly the auditor guidance presented.

The inclusion of related criteria neither infers that these criteria must be implemented for a PSM program to be successful nor that a PSM program will be deficient without them. There may be other, more appropriate solutions for an individual facility or company. In addition, the use of the related criteria in a PSM audit is intended to be completely voluntary and not a mandatory requirement in any way. They should be used cautiously and with careful planning so that they do not inadvertently establish unintended performance standards. Consensus should be sought within and among facilities and their parent companies before these criteria are used. Finally, the related criteria and guidance offered for consideration are not endorsements of or agreements with the written or verbal clarifications made by the regulators, PSM citations issued against the regulations, other PSM guidance published by the regulators, or the successful or common PSM practices in any given company's PSM program from which they are derived.

19.2 AUDIT CRITERIA AND GUIDANCE

The detailed requirements for Emergency Planning and Response of OSHA's PSM Standard, EPA's RMP Rule, and several state PSM regulatory programs, as well as for other common voluntary consensus PSM programs are presented below.

Emergency planning and response is affected by a host of existing regulatory requirements that exist at the federal level. The OSHA PSM Standard adds very little in the way of unique requirements for emergency planning and response, but it directly or indirectly references three existing regulations: Section 1910.38(a)—Emergency Action Plans; Section 1910.165—Employee Alarm Systems; and Section 1910.120—Hazardous Waste Operations and Emergency Response (HAZWOPER). The compliance audit criteria provided in this chapter, in addition to those included in the EPA RMP rule (see Chapter 24), are derived mostly from these referenced regulations. Additional requirements for emergency planning and response may be established in state and local regulations. If a facility is required to develop an emergency response plan (ERP) under the HAZWOPER regulation and the regulations cited above have not been used to formulate the plan, the requirements of the National Response Team's Integrated Contingency Plan (ICP) guidance (to which OSHA is a signatory) can be used to formulate the ERP.

The ICP guidance, published in the Federal Register in June 1999, allows facilities that are subject to multiple federal emergency response planning regulations to develop and implement a "One Plan" ERP that will satisfy the emergency planning requirements of the following regulations:

- EPA's Oil Pollution Prevention Regulation (SPCC and Facility Response Plan Requirements)—40 CFR §112.7(d) and §112.20-.21
- MMS's Facility Response Plan Regulation—30 CFR §254
- RSPA's Pipeline Response Plan Regulation—49 CFR §194
- USCG's Facility Response Plan Regulation—33 CFR §154, Subpart F
- EPA's RMP Rule—40 CFR §68
- OSHA's Emergency Action Plan Regulation—29 CFR §1910.38(a)
- OSHA's PSM Standard—29 CFR §1910.119
- OSHA's HAZWOPER Regulation—29 CFR §1910.120
- EPA's RCRA Contingency Planning Requirements—40 CFR §264, Subpart D, 40 CFR §265, Subpart D, and 40 CFR §279.52.

The use of the ICP guidance is completely voluntary and does not remove the regulatory obligation of facilities that are subject to the above various regulations. However, it does allow an alternative form of an ERP that satisfies the above federal agencies. Also, an ICP cannot be used in lieu of the ERP requirements that are part of any state or local law or regulation. Appendix G provides a detailed protocol for use in auditing an ICP. Any findings that are derived from using the ICP audit protocol would be related findings because the ICP guidance published in the Federal Register (EPA, 1996) does not have the force of regulation. To determine if the ICP contains compliance findings it should be audited against the regulations it is intended to satisfy.

Although the HAZWOPER requirements are mandatory for sites that are covered by that regulation (29 CFR §1910.120), periodic audits of the HAZWOPER program are not a mandatory requirement of that regulation. The PSM Standard does not directly incorporate HAZWOPER, but only states that

employers covered under the PSM Standard may also be subject to the hazardous waste and emergency response provisions of Section 1910.120. Therefore, direct audits of HAZWOPER are not required under the audit provisions of the PSM Standard. However, if this regulation applies at a given site, its requirements are mandatory. Therefore, the emergency response provisions of HAZWOPER are presented herein as compliance requirements.

One aspect of the applicability of HAZWOPER that often causes confusion in PSM and RMP covered facilities is described by the following question: When do the facility's expectations for its personnel during emergencies, with respect to response to nonminor/incipient events, invoke the HAZWOPER Standard? Some believe that assignment as an operator allows that person to perform extensive response actions in the unit where that operator is assigned. The applicability section of the HAZWOPER Standard imposes an exposure test to determine when the standard applies. Therefore, the defined actions in the emergency procedures for the unit(s) involved in the event, the PPE that would have to be worn to take the expected actions, and the possible exposures to the person taking the directed actions are the criteria that should be applied when determining the applicability of the HAZWOPER Standard. This issue is described in the Table 19.1 below.

The audit criteria described below are examined by auditors using the guidance provided by performing the following audit activities:

- Interviewing the person with overall responsibility for emergency management capabilities and activities at the facility. This is usually the EHS manager, but may be a person who has specifically been assigned these responsibilities.
- Interviewing personnel at the facility who are part of the emergency response team (ERT) or group. These persons can include operations, maintenance, safety, engineering, human resources, and management personnel depending how the ERT was established.
- Reviewing the facility emergency response plan and implementing procedures.
- Reviewing any records associated with conducting emergency management activities such as drill/exercise critiques, records of ITPM for emergency equipment, training records for the ERT, etc.
- Conducting field observations of emergency management activities:
 - Emergency drills or exercises.
 - ERT training activities.
 - Audibility of emergency alarm systems across the facility.

Auditors should also carefully examine the emergency management requirements found in the procedures of the company/facility being audited. As stated in Section 1.7.1, these could be interpreted as compliance requirements by regulators and could be subject to citations if they are not being followed. Auditors should confirm, via interviews, records and document reviews, and field observations, that the requirements of the facility or company emergency

management procedures have been implemented as specified. Findings should be generated if the company/facility-specific provisions are not being followed.

See the Guidance for Chapters 3–24 in the Introduction for the definition of the abbreviations shown in the following tables that are used to indicate the source of the criteria. References in the tables below to Sections 1910.120 and 1910.1200 refer to OSHA’s Hazardous Waste Operations and Emergency response (HAZWOPER) and Hazard Communication (HAZCOM) standards, respectively.

19.2.1 Compliance Requirements

The audit criteria shown in the tables in this chapter should be used by:

- Readers in the United States covered by the PSM Standard or RMP Rule.
- Readers who have voluntarily adopted the OSHA PSM program.
- Readers whose companies have specified OSHA PSM requirements in non-U.S. locations.

Table 19.1 shows the audit criteria and guidance related to emergency action and emergency response plans pursuant to OSHA PSM.

19.2.1.1 Emergency Action and Emergency Response Plans

Table 19.1 OSHA PSM Audit Criteria and Guidance for Auditors -
Emergency Action and Emergency Response Plans

Audit Criteria	Source	Guidance for Auditors
<p>19-C-1. The employer has established and implemented an emergency action plan (EAP) for the entire facility which includes the following elements:</p> <ul style="list-style-type: none"> • For employers with more than 10 employees, the written plan is kept at the workplace and made available for employee review. • Procedures for reporting a fire or other emergency. • Procedures for emergency evacuation, including type of evacuation and exit route assignments. • Procedures to be followed by employees who remain to operate critical plant operations before they evacuate. • Procedures to account for all employees after emergency evacuation. • Procedures to be followed by employees performing rescue and medical duties. 	<p>1910.119(n) 1910.38(a), (b), (c)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • An employer with 10 or fewer employees may communicate the plan orally to employees; the employer need not maintain a written plan. • Facilities often utilize paper-based muster sheets or other headcount systems that are not “real time” for the purposes of accounting for personnel. An electronic passcard/ swipecard system would represent a real-time system for employees and possibly for contractors and visitors if they are also issued the passcards/swipecards while on-site. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the EAP to determine if it includes each of the required elements. • Auditors should review the EAP to determine if it includes or references a procedure or

Audit Criteria	Source	Guidance for Auditors
<ul style="list-style-type: none"> • Names or job titles of employees who may be contacted by employees who need further information or explanation of their duties under the plan. 		<p>document that describes the preferred means of reporting fires and other emergencies.</p> <ul style="list-style-type: none"> • Auditors should review the EAP to determine if it includes or references an emergency escape procedure that describes the emergency escape route assignments, including a description of the types of evacuation to be used in emergency circumstances. • Auditors should review the EAP to determine if it includes or references a procedure(s) to be followed by employees who remain to perform critical plant operations before they evacuate. • Auditors should review the EAP to determine if it includes or references a procedure(s) to account for all employees after emergency evacuation has been completed. • Auditors should review the EAP to determine if it includes or references a procedure or document that describes the rescue and medical duties for those employees who are to perform them. • Auditors should review the EAP to determine if it includes or references a procedure or document that includes the names or regular job titles of persons or departments who can be contacted for further information or explanation of duties under the plan. • Auditors should review the EAP to determine if it includes or references a procedure or document that includes the designated actions employers and employees should take to ensure employee safety from fire and other emergencies. • Auditors should check to ensure that where paper-based muster sheets or headcount systems that are not "real time" with respect to the facility census are

Audit Criteria	Source	Guidance for Auditors
		<p>Table 19.1 – Continued</p> <p>used that these systems are up-to-date and reflect the personnel at the facility employed at the time of the audit.</p>
<p>19-C-2. The emergency action plan includes procedures for handling small releases.</p>	<p>1910.119(n)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Although small releases do not generally lead to catastrophic consequences, the EAP should contain or reference spill response procedures that cover, at a minimum, small spills of highly hazardous chemicals or flammable materials. They are analogous to incipient fires, since it is not always obvious when a small spill is, or is not, an emergency situation. Such an event may also warrant initiating an incident investigation. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the EAP to determine if it contains or references spill response procedures that cover, at a minimum, small spills of highly hazardous chemicals or flammable materials.
<p>19-C-3. The employer has established procedures for sounding emergency alarms in the workplace.</p>	<p>1910.165 (b)(5)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • In addition to site-wide alarms, there may be local alarms that are specific to a process area or specific to different types of emergency. For example, a short series of beeps may sound for a fire and a long horn may sound for a toxic chemical release. • For those employers with 10 or fewer employees in a particular workplace, direct voice communication is an acceptable procedure for sounding the alarm provided all employees can hear the alarm. Such workplaces need not have a back-up system. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check to determine if procedures for sounding emergency alarms in

Audit Criteria	Source	Guidance for Auditors
		<p>the workplace have been established. In addition to site-wide alarms, there may be local alarms that are specific to a process area or specific to different types of emergency. For example, a short series of beeps may sound for a fire and a long horn may sound for a toxic chemical release.</p> <ul style="list-style-type: none"> For those employers with 10 or fewer employees in a particular workplace, direct voice community is an acceptable procedure for sounding the alarm provided all employees can hear the alarm. Such workplaces need not have a back-up system.
<p>19-C-4. An emergency response plan (ERP) has been developed and implemented to handle anticipated emergencies prior to the commencement of emergency response operations unless:</p> <ul style="list-style-type: none"> the employer will evacuate employees from the danger area when an emergency occurs, and will not permit any employees to assist in handling the emergency, and has provided an emergency action plan complying with 1910.38. 	<p>1910.120 (q)(1)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Facility should decide whether employees will respond to emergencies or evacuate and call for outside assistance. If the preferred option is to evacuate, an emergency action plan (EAP) in accordance with §1910.38 is required. If they intend to respond, an emergency response plan (ERP) is required which meets the requirements of §1910.120(q). If the facility is a treatment, storage, or disposal (TSD) facility under RCRA, the plan should include additional requirements under §1910.120(p). <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should conduct interviews with facility personnel to determine if the facility has chosen to respond to emergencies or to evacuate and call for outside assistance. Auditors should conduct interviews with facility personnel to determine whether or not the facility is a treatment, storage, or disposal (TSD) facility under RCRA.

Audit Criteria	Source	Guidance for Auditors
<p>Table 19.1 – Continued</p> <p>19-C-5. The plan is in writing and available for inspection and copying by employees, their representatives, and OSHA personnel.</p>	<p>1910.120 (q)(1)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should conduct interviews with employees to determine whether or not they have access to the written ERP.
<p><i>The ERP addresses, as a minimum, the following to the extent that they are not addressed elsewhere:</i></p>		
<p>19-C-6. Pre-emergency planning and coordination with outside parties.</p>	<p>1910.120 (q)(2) 1910.120 (p)(8)(ii)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Pre-emergency planning and coordination with outside parties includes arrangements that may be made with local municipalities or other industries to render aid during emergencies that may exceed the capabilities of the employer's emergency response team. These arrangements may include or involve mutual aid agreements between local industries; assistance from local police, fire, rescue, and/or emergency medical organizations; and/or pre-planning with local hospitals. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the facility ERP to determine if pre-emergency planning and coordination with outside parties has been completed.
<p>19-C-7. Personnel roles, lines of authority, training, and communication.</p>	<p>1910.120 (q)(2) 1910.120 (p)(8)(ii)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Personnel roles include designation of response levels, i.e., first responder awareness level, first responder operations level, hazmat technician level, hazmat specialist level, and on-scene incident commander. Other roles under the incident command system (ICS) should also be identified (e.g., safety officer, emergency medical, logistics, public relations). <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the facility ERP to determine if emergency response procedures include an ICS organization chart, which shows

Audit Criteria	Source	Guidance for Auditors
		lines of authority between the various roles, and specifies training requirements for each role.
19-C-8. Emergency recognition and prevention.	1910.120 (q)(2) 1910.120 (p)(8)(ii)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The plan should include definition of an emergency and how to determine whether an incident is an emergency or not. Such guidance is often qualitative in nature. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the facility ERP to determine if emergency response procedures include a definition of an emergency and how to determine whether or not an accident is an emergency.
19-C-9. Safe distances and places of refuge.	1910.120 (q)(2) 1910.120 (p)(8)(ii)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> "Safe distances" refers to the area of the facility that is considered the "cold zone" or "clean area" outside of a hazardous material incident area. This depends on the nature of the material and the extent of the release. The basis for determining the safe distances/areas should be included in the ERP or a referenced document. For example, the DOT Emergency Response Guidebook can be used to help make these determinations. Real-time dispersion modeling software could also be used to assess "safe" areas during an emergency. "Places of refuge" (or "safe havens," "shelter-in-place" locations, or areas identified by other, similar names) refer to buildings designated as emergency shelters for sheltering-in-place during a hazardous material incident. These shelters should be located at a safe distance from the incident or be designed to protect the occupants from the emergency, including fire or explosion if potential hazards

Audit Criteria	Source	Guidance for Auditors
		<p>Table 19.1 – Continued</p> <p>include flammable liquids or gases. Buildings that will be occupied when an evacuation or shelter-in-place order is given are effectively places of refuge for this purpose, even though they may not be general assembly areas. A control room or other operational space could fit this description. Any structure designated as a place of refuge should be able to rapidly and efficiently separate outdoor air from indoor air to protect those personnel that will inhabit the location during an emergency. Auditors should confirm that this important feature has been taken into account in the design of the ERP. One key indication that this has been considered in the designation of the structure as a place of refuge is that there are easily accessible and clearly labeled ventilation controllers where the ventilation system can be quickly shut down in an emergency.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the facility ERP to determine if emergency response procedures include the basis for determining the safe distances/areas. • Auditors should review the facility ERP to determine if “places of refuge” have been identified and evaluated to assure that the structure designated as a place of refuge is located at a safe distance from the incident or be designed to protect occupants from the emergency. • Auditors should conduct interviews with facility personnel who are either assigned to work in a structure designated as a place of refuge or assigned to retreat to a place of refuge to determine if they understand where and how to quickly shut down ventilations systems in the event of an emergency.

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"> Auditors should conduct field observations in structures designated as places of refuge to determine whether or not the building will rapidly and efficiently separate outdoor air from indoor air. This can be done by observing the accessibility of, labeling, and instructions for shutting down ventilation controllers.
19-C-10. Site security and control and evacuation routes and procedures.	1910.120 (q)(2) 1910.120 (p)(8)(ii)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> "Site security and control" refers to the designation of a "hot zone" (contaminated area), "warm zone" (contamination reduction area), and "cold zone" (clean area) for a hazardous material incident, as well as the means used to designate each zone and control personnel travel between each zone. Only qualified and authorized responders may enter the hot zone; the warm zone is generally used for decontamination. The cold zone is considered to be uncontaminated. Site security and control also refers to general site security during an emergency and how site access will be controlled during emergencies. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the facility ERP to determine if site security and control is addressed. Auditors should review the facility ERP to determine if evacuation routes and procedures have been provided.
19-C-11. Decontamination.	1910.120 (q)(2) 1910.120 (p)(8)(ii)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the facility ERP to determine if decontamination procedures have been provided to ensure that it is done in a safe manner and does not unnecessarily contaminate otherwise "clean" areas, equipment, or people.

Audit Criteria	Source	Guidance for Auditors
<p>Table 19.1 – Continued</p> <p>19-C-12. Emergency medical treatment and first aid.</p>	<p>1910.120 (q)(2) 1910.120 (p)(8)(ii)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the facility ERP to determine if emergency response procedures include information to provide emergency medical treatment and first aid during an emergency.
<p>19-C-13. Emergency alerting and response procedures.</p>	<p>1910.120 (q)(2) 1910.120 (p)(8)(ii)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the facility ERP to determine if procedures have been provided for alerting employees of an emergency and the appropriate responses to be taken, including identifying those that have been designated to respond.
<p>19-C-14. Critique of response and follow-up.</p>	<p>1910.120 (q)(2) 1910.120 (p)(8)(ii)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the facility ERP to determine if the methods or procedures that will be used to critique response to emergencies have been detailed.
<p>19-C-15. PPE and emergency equipment.</p>	<p>1910.120 (q)(2) 1910.120 (p)(8)(ii)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the facility ERP to determine if emergency response procedures include the PPE and emergency equipment that will be required to be used by emergency responders. Auditors should conduct field observations to compare the list of PPE and emergency equipment provided in the ERP to available PPE and emergency equipment in the field to confirm that sufficient equipment is available in the event of an emergency. Auditors should conduct interviews with personnel responsible for maintaining PPE and emergency equipment to determine if nondisposable PPE and emergency equipment undergo periodic inspection, testing, and maintenance.

Audit Criteria	Source	Guidance for Auditors
<p>19-C-16. The senior emergency response official responding to an emergency is designated as the individual in charge of a site-specific Incident Command System (ICS). All emergency responders and their communications shall be coordinated and controlled through the individual in charge of the ICS assisted by the senior official present for each employer.</p>	<p>1910.120 (q)(3)(i)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Emergency response procedures should address the "senior official" at an emergency response as the most senior official on the site who has the responsibility for controlling the operations at the site. Initially it is the senior officer on the first-due piece of responding emergency apparatus to arrive on the incident scene. As more senior officers arrive (i.e., battalion chief, fire chief, state law enforcement official, site coordinator, etc.) the position is passed up the line of authority which has been previously established.) <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the facility ERP to determine if procedures have been provided for identifying the senior emergency response official and coordination of emergency responder communications through the ICS.
<p>19-C-17. The individual in charge of the ICS shall identify, to the extent possible, all hazardous substances or conditions present and shall address as appropriate site analysis, use of engineering controls, maximum exposure limits, hazardous substance handling procedures, and use of any new technologies.</p>	<p>1910.120(q)(3)(ii)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the facility ERP to determine if there are procedures addressing the role of the ICS to identify hazardous substances or conditions present during an emergency. • Auditors should review the facility ERP to determine if various tools and information that are often referenced during an emergency are identified. This can include a reference to dispersion modeling software, MSDS or other compilation of exposure limits, procedures for handling and decontaminating specific chemicals, and technologies (i.e. techniques, equipment, processes, etc.).

Audit Criteria	Source	Guidance for Auditors
<p>Table 19.1 – Continued</p> <p>19-C-18. Based on the hazardous substances and/or conditions present, the individual in charge of the ICS shall implement appropriate emergency operations, and assure that the personal protective equipment worn is appropriate for the hazards to be encountered. However, personal protective equipment shall meet, at a minimum; the criteria contained in 29 CFR §1910.156(e) when worn while performing fire fighting operations beyond the incipient stage for any incident.</p>	1910.120(q)(3)(iii)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the facility ERP to determine if emergency response procedures address the use of PPE appropriate to the hazards encountered. • Auditors should review the facility ERP to determine if the use of PPE meeting §1910.65(e) is addressed for fire related emergencies where the facility will respond to nonincipient stage fires.
<p>19-C-19. The senior official has the authority to suspend the use of positive pressure self-contained breathing apparatus when air monitoring equipment shows that a decreased level of respiratory protection will not result in hazardous exposures to employees.</p>	1910.120(q)(3)(iv)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the facility ERP to determine if emergency response procedures address the authority for the senior official to decrease the level of respiratory protection required during the response when air monitoring indicates that doing so will not result in hazardous exposures to employees. • Auditors should conduct field observations to determine if there is sufficient inventory of air monitoring equipment that could be utilized to make this decision and/or that calibration of the equipment is current and maintained.
<p>19-C-20. The individual in charge of the ICS shall limit the number of emergency response personnel at the emergency site, in those areas of potential or actual exposure to incident or site hazards, to those who are actively performing emergency operations.</p>	1910.120(q)(3)(v)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the facility ERP to determine if emergency response procedures for site security and control ensure that only authorized personnel enter contaminated areas (i.e., hot zone and warm zone). • Auditors should review the facility ERP to determine if emergency response procedures provide the authority for the senior official to limit the number of emergency response personnel at the emergency site.

Audit Criteria	Source	Guidance for Auditors
19-C-21. Operations in hazardous areas are performed using the buddy system in groups of two or more.	1910.120 (q)(3)(v)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should review the facility ERP to determine if emergency response procedures have been specified for emergency responses to be carried out by teams that include a minimum of two people.
19-C-22. Back-up personnel are standing by with equipment ready to provide assistance or rescue.	1910.120 (q)(3)(vi)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should review the facility ERP to determine if emergency response procedures specify that backup personnel should be provided with the same level of PPE as those entering the hot zone.
19-C-23. Qualified basic life support personnel, as a minimum, are also available with medical equipment and transportation capability.	1910.120 (q)(3)(vi)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should review the facility ERP to determine if emergency response procedures specify that basic life support personnel are required in any incident where emergency response personnel enter the hot zone, in order to monitor vital signs and check for/treat symptoms of exposure.
19-C-24. A safety officer is designated by the individual in charge of the ICS and who is knowledgeable in the operations being implemented at the emergency response site, with specific responsibility to identify and evaluate hazards and to provide direction with respect to the safety of operations for the emergency at hand.	1910.120 (q)(3)(vii)	<u>Background Information for Auditors:</u> <ul style="list-style-type: none"> For emergencies that are relatively small in scope, the incident commander may fill the role of safety officer. For larger emergencies, however, a separate person would normally fill this role. <u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should review the facility ERP to determine if emergency response procedures specify that a safety officer be designated.
19-C-25. When activities are judged by the safety officer to be an IDLH and/or to involve an imminent danger condition, the safety officer shall have the authority to alter, suspend, or terminate those activities.	1910.120 (q)(3)(viii)	<u>Background Information for Auditors:</u> <ul style="list-style-type: none"> In practice, the safety officer serves as an adviser to the on-scene incident commander who generally makes this decision. Air contaminant monitoring is generally used to assess the level of contaminants to which responders may be potentially

Audit Criteria	Source	Guidance for Auditors
		<p>Table 19.1 – Continued exposed.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the facility ERP to determine if in the lines of authority section of the written emergency response plan states that the safety officer has the authority to alter, suspend, or terminate activities if he/she believes that an IDLH or imminently dangerous condition exists.
<p>19-C-26. The safety official immediately informs the individual in charge of the ICS of any actions that need to be taken to correct these hazards at the emergency scene.</p>	<p>1910.120 (q)(3)(viii)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the facility ERP to determine if emergency response procedures describe the responsibilities of the safety officer (who serves as an adviser to the on-scene incident commander).
<p>19-C-27. The senior official implements appropriate decontamination procedures when response activities have been terminated.</p>	<p>1910.120 (q)(3)(ix)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the facility ERP to determine if emergency response procedures address decontamination of personnel, PPE, tools, and equipment that is conducted as part of the response.
<p>19-C-28. Upon completion of the emergency response, it may be determined that it is necessary to remove hazardous substances, health hazards, and materials contaminated with them (such as contaminated soil or other elements of the natural environment) from the site of the incident, the employer conducting the clean-up shall ensure that either:</p> <ul style="list-style-type: none"> There is a post-emergency response plan that meets all the requirements of 1910.120(b) through (o), or There a post-emergency response plan for clean-up operations on plant property using plant or workplace employees that meets the requirements of 	<p>1910.120 (q)(11)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> There is a plan that includes the requirements of the hazardous waste provisions of the HAZWOPER regulations, or if the clean-up is done on plant property using plant or workplace employees, such employees should have completed the training requirements of the following: 29 CFR §1910.38; 1910.134; 1910.1200, and other appropriate safety and health training made necessary by the tasks that they are expected to be performed such as personal protective equipment and decontamination procedures. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should conduct field

Audit Criteria	Source	Guidance for Auditors
1910.120(q)(11)(ii).		<p>observations of equipment to be used in the performance of the clean-up work to confirm that it is in serviceable condition and that all required inspections have been completed.</p> <ul style="list-style-type: none"> Auditors should review the facility ERP or other environmental documents (e.g., SPPC plan) to determine if the plan addresses post-response cleanup activities.
19-C-29. The ERP includes procedures for informing the public and local emergency response agencies about accidental releases.	RMP 68.95(a)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the facility ERP to determine if emergency response procedures include or reference documents that include the appropriate contact information for public and local emergency response agencies.
19-C-30. The ERP includes documentation of proper first-aid and emergency medical treatment necessary to treat accidental human exposures.	RMP 68.95(a)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the facility ERP to determine if emergency response procedures include or reference procedures that describe first aid and medical treatment for accidental exposures. The MSDSs for the chemicals on-site may be referenced for this information if they include it.
<i>Additional requirements for RCRA Treatment, Storage, and Disposal (TSD) Facilities Only:</i>		
<p>19-C-31. The Emergency Response Plan contains the following additional elements to the extent they do not repeat any information already contained in the Emergency Response Plan:</p> <ul style="list-style-type: none"> Site topography, layout, and prevailing weather conditions. Procedures for reporting incidents to local, state, and federal government agencies. 	1910.120 (p)(8)(i), (p)(8)(iv)(A)	<ul style="list-style-type: none"> <u>Background Information for Auditors:</u> The ERP for RCRA TSD facilities need not duplicate any of the subjects fully addressed in the contingency plans that may be required by various permits (e.g., US EPA), provided that the contingency plan was made part of the emergency response plan. Employers who evacuate their employees from the worksite location when an emergency occurs and who do not permit any of their employees to assist in handling the emergency are

Audit Criteria	Source	Guidance for Auditors
		<p>Table 19.1 – Continued</p> <p>not required to write an Emergency Response Plan specific to RCRA TSD facilities and may maintain an emergency action plan only.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the facility ERP to confirm that it is a written portion of the employer's safety and health program, as required by §1910.120(p)(1). • Auditors should review the facility ERP to determine if emergency response procedures include or reference documents that describe the site topography, layout, and prevailing weather conditions. This information is often illustrated in a site plan, and may be found in other documents (e.g., environmental Spill Prevention, Control, and Countermeasure (SPCC) plans or RCRA permits).
19-C-32. The ERP is compatible with and integrated with the disaster, fire, and/or emergency response plans of local, state, and federal agencies.	1910.120 (p)(8)(iv)(B)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Emergency response planning should involve local, state, and federal emergency planners as appropriate (coordination with state and federal planners is rare). <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review facility emergency response documents for RCRA TSD facilities to confirm that government emergency planners were involved in the facility's planning process, and that the facility's ERP is included or referenced in the local emergency response plan.
19-C-33. The Emergency Response Plan is reviewed periodically and amended as necessary to keep it current.	1910.120 (p)(8)(iv)(D)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The ERP should be a formally issued and approved document at the facility with a periodic (e.g., annual) review frequency and provisions for updating it, particularly when facility or organizational changes occur.

Audit Criteria	Source	Guidance for Auditors
		<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the facility ERP to confirm that it is a formally issued and approved document at the facility that has been periodically reviewed. Auditors should review the facility ERP to confirm that it has been updated, particularly when facility or organizational changes occur. Employee lists from human resources may be obtained to review current employees and phone numbers against those listed in the plan.
<p><i>The following programs should be provided and implemented as part of the ERP:</i></p>		
<p>19-C-34. A safety and health program has been developed and implemented.</p>	<p>1910.120 (p)(1)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The program is designed to identify, evaluate, and control safety and health hazards in their facilities for the purposes of employee protection, to provide for emergency response as defined in the ERP, and to address as appropriate site analysis, engineering controls, maximum exposure limits, hazardous waste handling procedures, and uses of new technologies. The program should be available for inspection by employees, their representatives, and OSHA personnel. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the facility safety and health program to confirm that the safety and health program is written, and has been developed and implemented for employees involved in hazardous waste operations. Auditors should conduct interviews with facility personnel to confirm that the written safety and health program is available for inspection by employees, their representatives, and Table

Audit Criteria	Source	Guidance for Auditors
		<p>19.1 – Continued OSHA personnel.</p>
<p>19-C-35. A hazard communication program has been developed and implemented.</p>	<p>1910.120 (p)(2)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The hazardous waste exemption defined in 29 CFR §1910.1200 is applicable to this requirement. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with facility personnel responsible for hazard communication to determine if a hazard communication program meeting the requirements of 29 CFR §1910.1200 has been implemented as part of the safety and health program.
<p>19-C-36. A medical surveillance program has been developed and implemented.</p>	<p>1910.120 (p)(3)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • A medical surveillance program meeting the requirements of §1910.120(f) is required to be developed and implemented. Also see criteria 19-C-69 through 19-C-72. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review facility documents to determine if a medical surveillance program has been developed and implemented.
<p>19-C-37. A decontamination program has been developed and implemented.</p>	<p>1910.120 (p)(4)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • A decontamination program meeting the requirements of §1910.120(k) is required to be developed and implemented. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review facility documents to determine if a decontamination program has been developed and implemented.
<p>19-C-38. Decontamination procedures have been developed, communicated to employees and implemented and specifically address:</p> <ul style="list-style-type: none"> • Minimizing employee contact with hazardous substances or with equipment that has 	<p>1910.120 (k)(2), (k)(4-8)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Procedures are to be developed and implemented before any employees or equipment may enter areas on-site where potential for exposure to hazardous substances exist.

Audit Criteria	Source	Guidance for Auditors
<p>contacted hazardous substances.</p> <ul style="list-style-type: none"> • Employees leaving a contaminated area be decontaminated and that all contaminated clothing and equipment leaving an area shall be appropriately disposed of or decontaminated. • All equipment and solvents used for decontamination are decontaminated or disposed of. • Monitoring of decontamination procedures by site safety and health supervisor to determine their effectiveness, and to correct any deficiencies if procedures are found ineffective. 		<ul style="list-style-type: none"> • Protective clothing and equipment shall be decontaminated, cleaned, laundered, maintained, or replaced as needed to maintain their effectiveness. • Minimizing employee contact with hazardous substances may include having the employee whose nonimpermeable clothing becomes wetted with hazardous substances, immediately remove that clothing and proceed to the shower. The clothing shall be disposed of or decontaminated before it is removed from the work zone. • Unauthorized employees shall not remove protective clothing or equipment from change rooms. • Commercial laundries or cleaning establishments that decontaminate protective clothing or equipment shall be informed of the potentially harmful effects of exposures to hazardous substances. • Where the decontamination procedure indicates a need for regular showers and change rooms outside of a contaminated area, they shall be provided and meet the requirements of §1910.141. If temperature conditions prevent the effective use of water, then other effective means for cleansing shall be provided and used. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review facility decontamination procedures to ensure that the required items are addressed and implemented.
<p>19-C-39. Decontamination shall be performed in geographical areas that will minimize the exposure of uncontaminated employees or equipment to contaminated employees or equipment.</p>	<p>1910.120 (k)(3)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review facility decontamination procedures to ensure that the required items are addressed.

Audit Criteria	Source	Guidance for Auditors
<p>Table 19.1 – Continued</p> <p>19-C-40. A new technology program has been developed and implemented.</p>	1910.120 (p)(5)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • A program for introducing new and innovative equipment to the workplace meeting the requirements of §1910.120(o) is required to be developed and implemented. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review facility documents to determine if a new technology program has been developed and implemented.
<p>19-C-41. Procedures shall be developed and implemented for the introduction of effective new technologies and equipment developed for the improved protection of employees working with hazardous waste clean-up operations. Evaluations shall be done to determine the effectiveness of the new methods, materials, or equipment before implementing their use on a large scale for enhancing employee protection.</p>	1910.120(o)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Procedures should also be implemented as part of the site safety and health program to assure that employee protection is being maintained. • New technologies, equipment, or control measures available to industry, include the use of foams, absorbents, absorbents, neutralizers, or other means to suppress the level of air contaminants while excavating the site or for spill control. • Information and data from manufacturers or suppliers may be used as part of the employer's evaluation effort. • Evaluations completed shall be made available to OSHA upon request. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the facility procedures for new technology to determine if the program has been implemented and if evaluations are documented.
<p>19-C-42. A material handling program has been developed and implemented.</p>	1910.120 (p)(6)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that a program for handling drums or containers meeting the requirements of § 1910.120(j)(1)(ii), through (viii) and (xi), as well as (j)(3) and (j)(8) is required to be developed and implemented

Audit Criteria	Source	Guidance for Auditors
		prior to starting such work.
19-C-43. Drums and containers used during the clean-up shall meet the appropriate DOT, OSHA, and EPA regulations for the waste that they contain. US DOT specified salvage drums or containers and suitable quantities of proper absorbent shall be kept available and used in areas where spills, leaks, or ruptures may occur.	1910.120 (j)(1)(ii, vii)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review the facility material-handling program to determine if it requires the use of approved containers. • Auditors should conduct field observations to confirm that US DOT specified salvage drums or containers and suitable quantities of absorbent are available.
19-C-44. Material handling equipment used to transfer drums and containers shall be selected, positioned and operated to minimize sources of ignition related to the equipment from igniting vapors released from ruptured drums or containers.	1910.120 (j)(3)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review the facility material handling program to determine if it requires material handling equipment to be selected, positioned, and operated to minimize sources of ignition.
19-C-45. Drums and containers shall be inspected and their integrity shall be assured prior to being moved and employees exposed to the transfer operation shall be warned of potential hazards associated with the contents of the drums or containers. Movement of drums or containers shall be minimized.	1910.120 (j)(1)(iii, v, vi)	<u>Background Information for Auditors:</u> <ul style="list-style-type: none"> • Drums or containers that cannot be inspected before being moved because of storage conditions (i.e., buried beneath the earth, stacked behind other drums, stacked several tiers high in a pile, etc.) shall be moved to an accessible location and inspected prior to further handling. • Site operations shall be organized to minimize the amount of drum or container movement. <u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review the facility material-handling program to determine if it requires drums and containers to be inspected prior to movement.
19-C-46. Unlabeled drums and containers shall be considered to contain hazardous substances and handled accordingly until the contents are positively identified and	1910.120 (j)(1)(iv)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review the facility material-handling program to determine if it requires unlabeled drums and

Audit Criteria	Source	Guidance for Auditors
labeled.		containers to be managed as if they contained hazards substances until the contents are positively identified and labeled.
19-C-47. Soil or covering material shall be removed with caution to prevent drum or container rupture.	1910.120 (j)(1)(xi)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review the facility material handling program to determine if it requires soil or covering material to be removed with caution to prevent drum or container rupture.

19.2.1.2 Training

Emergency response training should be part of the overall safety and health training program. Individual training requirements should address the responsibilities assigned to each employee's role in the emergency response plan. Emergency response training programs should follow recommended practices such as those established by the National Fire Protection Association (NFPA), the National Incident Management System (NIMS), and the International Fire Service Training Association (IFSTA).

Table 19.2 shows the audit criteria and guidance related to emergency response training pursuant to OSHA PSM.

Table 19.2 OSHA PSM Audit Criteria and Guidance for Auditors - Emergency Response Training

Audit Criteria	Source	Guidance for Auditors
19-C-48. The employer has designated and trained employees to assist in the safe and orderly emergency evacuation of employees.	1910.38(e)	<u>Background Information for Auditors:</u> <ul style="list-style-type: none"> • In many facilities, the entire work force is trained in evacuation and/or shelter-in-place procedures and is responsible for assisting others in doing so. <u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review the emergency action plan to determine if it includes the designation of "evacuation coordinators," "floor wardens," or equivalent to assist with emergency evacuations. This is most common in office buildings where such roles are necessary to help ensure that all personnel (including those who are impaired in some way) are able

Audit Criteria	Source	Guidance for Auditors
<p>19-C-49. Emergency action plans are reviewed with each employee covered by the plan:</p> <p>Initially when the plan is developed or the employee is initially assigned to the job.</p> <p>Whenever the employee's responsibilities or designated actions under the emergency action plan change.</p> <p>Whenever the emergency action plan itself is changed.</p>	1910.38(f)	<p>to evacuate, including arranging for assistance.</p> <p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Training on the emergency action plan and any appropriate response procedures should be included in the new employee safety orientation program provided to all new employees. There should be a syllabus or checklist of initial safety-related training topics. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review employee training records to determine if new employees have received the orientation training on the emergency action plan. • Auditors should review employee training records to determine if employees have received training on the emergency action plan and any appropriate response procedures initially when the plan is developed, whenever the employee's responsibilities or designated actions under the emergency action plan change, and/or whenever the emergency action plan itself is changed.
<p>19-C-50. The employer explains to each employee the preferred means of reporting emergencies, such as manual pull box alarms, public address systems, radio or telephones.</p>	1910.165(b)(4)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the employee safety orientation provided to all new employees to confirm if it specifically includes a means of reporting emergencies.
<p>19-C-51. Training requirements for responders and trainers, including refresher training requirements, have been met for:</p> <ul style="list-style-type: none"> • First responder awareness level • First responder operations level • Hazardous materials technician • Hazardous materials specialist • On scene incident commander 	1910.120(q)(6)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The facility, based on expectations of personnel during emergencies with respect to response to nonminor/incipient events, has applied the HAZWOPER Standard to those personnel who are expected to respond to the event. The criteria for determination of HAZWOPER applicability are the following:

Audit Criteria	Source	Guidance for Auditors
		<p>Table 19.2 – Continued</p> <ul style="list-style-type: none"> • Mere assignment as an operator does not allow that person to perform extensive response actions in the unit where that operator is assigned. • Auditors should, review the defined actions in the emergency procedures for the unit(s) involved in the event. If those actions could result in an exposure to hazardous materials beyond the exposure that would be expected in a minor spill, incipient fire, or similar event, then the HAZWOPER Standard may apply. • Auditors should review the PPE that would have to be worn to take the directed action, and if it requires more PPE than an operator or other assigned person would wear under normal situations, then the HAZWOPER Standard may apply. • Training is based on the duties and functions to be performed by each responder in an emergency response organization. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review employee and contractor training records to confirm that each person working at a site (including contractors) that may discover or respond to a hazardous material incident has initially been trained at least to the first responder awareness level. The only exceptions may include office personnel who do not enter operating areas of the facility. • Auditors should review employee training records to confirm that each person who will actually respond to an incident has been trained as specified in the HAZWOPER regulation based on their assigned duties during the

Audit Criteria	Source	Guidance for Auditors
		<p>response. The response levels each have specific training requirements outlined in §1910.120(q), including number of hours of initial training and required competencies. These are required for initial training only.</p> <ul style="list-style-type: none"> Auditors should review employee training records to confirm that the training course syllabuses and/or competency demonstration documentation for these response levels specifically include the objectives specified in the regulation.
<p>19-C-52. A statement of training competency shall be made for employees trained at each of the following levels:</p> <ul style="list-style-type: none"> First responder operations level Hazardous materials technician Hazardous materials specialist On scene incident commander 	<p>1910.120(q) (8)(ii)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The means used to demonstrate competency should be documented and may take the form of a written test, hands-on demonstration, or verbal feedback. A certification (by the employer or its representative, such as an outside training service) should be available for each person serving in the designated roles. This is required for persons who demonstrate competency in lieu of completing training. <p><u>Auditor Activities:</u> Auditors should review employee training records to confirm that documentation of training completed is kept on file.</p>
<p>19-C-53. Annual refresher training or demonstration of competency is documented.</p>	<p>1910.120(q) (8)(ii)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review employee training records to confirm that the records specifically include a statement of the training or competency, and if a statement of competency is made, the employer should keep a record of the methodology used to demonstrate competency.
<p>19-C-54. Trainers who teach any of the subjects described in 1910.120(q)(6) have satisfactorily completed a training course for teaching the subjects they are</p>	<p>1910.120(q) (7)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Trainers may be employed by the company or work for an outside training service. There is no single

Audit Criteria	Source	Guidance for Auditors
<p>Table 19.2 – Continued</p> <p>expected to teach, such as the courses offered by the U.S. National Fire Academy, or they have the training and/or academic credentials and instructional experience necessary to demonstrate competent instructional skills and a good command of the subject matter of the courses they are to teach.</p>		<p>set of academic/training credentials, experience, or background that is mandatory. The qualifications of each HAZWOPER trainer should be evaluated based on their own merits. The types of experience and background that are most common include: field experience as a firefighter or HAZMAT responder, and completion of an academic or training program specifically addressing fire fighting and/or HAZMAT response skills. The facility or company should be able to show the auditor these qualifications.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review employee training records to verify the credentials of those who conduct HAZWOPER training.
<p>19-C-55. First Responder Awareness Level: Employees who are likely to witness or discover hazardous substance releases can demonstrate competency as a first responder at the awareness level.</p>	<p>1910.120(q)(6)(i)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with employees who are trained to the first responder awareness level, those who are likely to discover hazardous substance releases, to verify that they can demonstrate competency in the provisions listed in the first responder awareness level, including the following: <ul style="list-style-type: none"> – Understanding who are the proper authorities to notify of the release. – Understanding that they are not to take further action beyond notifying the authorities of the release. – Understanding what hazardous substances are, and the risks associated with them in an incident. – Understanding potential outcomes associated with an emergency when hazardous substances are present. – Ability to recognize the presence of hazardous

Audit Criteria	Source	Guidance for Auditors
		<p>substances in an emergency.</p> <ul style="list-style-type: none">- Ability to recognize the hazardous substances, if possible.- Understanding the role of the first responder awareness individual in the employee's emergency response plan, including site security and control and if used in the facility ERP, the U.S. Department of Transportation's Emergency Response Guidebook.- Ability to realize the need for additional resources, and make appropriate notification to the communication center.

Audit Criteria	Source	Guidance for Auditors
<p>Table 19.2 – Continued</p> <p>19-C-56. First Responder Operations Level: Employees who will take defensive action in containing and controlling a release, without actually trying to stop the release, as part of the response can demonstrate the competencies for a first responder at the operations level.</p>	<p>1910.120(q)(6)(ii)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with employees who are trained to the first responder operations level, those who will take defensive action in containing and controlling a release as part of the response, to verify that they can demonstrate the competencies for a first responder operations level, including the following: <ul style="list-style-type: none"> – Understand their function is to contain the release from a safe distance, keep it from spreading, and prevent exposures, for the purpose of protecting nearby persons, property, or the environment from the effects of the release. – Knowledge of the basic hazard and risk assessment techniques. – Knowledge of how to select and use proper PPE provided to them. – Understanding of basic hazardous materials terms. – Knowledge of how to perform basic containment, confinement, and/or control operations within the capability of their unit. – Knowledge of how to implement basic decontamination procedures. – Knowledge of relevant standard operating procedures and termination procedures for a response. • The auditor should also review training records to ensure that personnel trained to the first responder operations level have received at least 8 hours of training or have had sufficient experience to objectively demonstrate competency.
<p>19-C-57. Hazard Materials Technician: Employees who will take</p>	<p>1910.120(q)(6)(iii)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct

Audit Criteria	Source	Guidance for Auditors
<p>offensive action in containing and controlling a release, with the purpose of patching, plugging, or otherwise stopping the release, as part of the response can demonstrate the competencies for a hazardous materials (HAZMAT) technician.</p>		<p>interviews with employees who will take offensive action in containing and controlling a release as part of the response, to verify that they can demonstrate the competencies for a hazardous materials (HAZMAT) technician, including the following:</p> <ul style="list-style-type: none"> - Understanding their function is to approach the point of release in order to plug, patch, or otherwise stop the release of a hazardous substance. - Knowledge of how to implement the employer's emergency response plan. - Knowledge of the classification, identification, and verification of known and unknown materials using field survey instruments and equipment. - Ability to function within an assigned role in the Incident Command System. - Knowledge of how to select and use proper specialized chemical PPE provided to them. - Understanding of hazard and risk assessment techniques. - Ability to perform advanced control, containment, and/or confinement operations within the capability of the resources and PPE available with the unit. - Understanding of how to implement decontamination procedures. - Understanding of termination procedures. - Understanding of basic chemical and toxicological terminology and behavior. <p>• The auditor should also review</p>

Audit Criteria	Source	Guidance for Auditors
		<p>Table 19.2 – Continued</p> <p>training records to ensure that personnel trained to the HAZMAT technician level have received at least 24 hours of training and have sufficient competency in the above areas.</p>
<p>19-C-58. Hazard Materials Specialist: Employees who will respond with and support other employees who will take offensive action in containing and controlling a release as part of their response and also act as the site liaison with Federal, state, local and other government authorities in regards to site activities can demonstrate the competencies for a (HAZMAT) specialist.</p>	<p>1910.120(q)(6)(iv)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with employees who will respond with and support other employees who will take offensive action in containing and controlling a release as part of the response, to verify that they can demonstrate the competencies for a hazardous materials (HAZMAT) specialist, including the following: <ul style="list-style-type: none"> – Knowledge of how to implement the local emergency response plan. – Understanding classification, identification and verification of known and unknown materials by using advanced survey instruments and equipment. – Knowledge of the state emergency response plan. – Ability to select and use proper specialized chemical personal protective equipment provided to the hazardous materials specialist. – Understanding of in-depth hazard and risk techniques. – Ability to perform specialized control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available. – Ability to determine and implement decontamination procedures. – Ability to develop a site safety and control plan. – Understanding of chemical, radiological, and toxicological terminology and behavior. • The auditor should also review

Audit Criteria	Source	Guidance for Auditors
		<p>training records to ensure that personnel trained to the HAZMAT specialist level have received at least 24 hours of training and have sufficient competency in the above areas.</p>
<p>19-C-59. On Scene Incident Commander: Employees who will assume control of the incident scene beyond the first responder awareness level can demonstrate the competencies for an on-scene incident commander.</p>	<p>1910.120(q)(6)(v)</p>	<p><u>Auditor Activities:</u></p> <p>Auditors should conduct interviews with employees who will assume control of the incident scene beyond the first responder awareness level, to verify that they can demonstrate the competencies for an on-scene incident commander, including the following:</p> <ul style="list-style-type: none"> • Knowledge of and the ability to implement the employer's incident command system. • Knowledge of how to implement the employer's emergency response plan. • Knowledge and understanding of the hazards and risks associated with employees working in chemical protective clothing. • Knowledge of how to implement the local emergency response plan. • Knowledge of the state emergency response plan and of the Federal Regional Response Team. • Knowledge and understanding of the importance of decontamination procedures. • The auditor should also review training records to ensure that personnel trained to the on-scene incident commander level have received at least 24 hours of training and have sufficient competency in the above areas.
<p>19-C-60. Those employees who are trained as First Responders Awareness Level, First responder Operations Level, Hazardous materials technician, Hazardous materials specialist, or On scene Incident Commander have received refresher training of sufficient content and duration to maintain competency</p>	<p>1910.120(q)(8)(i)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Annual refresher training or demonstration of competency is required for all personnel who may respond to hazardous material incidents. This training may be provided via classroom, CBT, or hands-on training. There are no requirements for a

Audit Criteria	Source	Guidance for Auditors
<p>Table 19.2 – Continued or have demonstrated competency.</p>		<p>minimum number of hours of emergency response refresher training, nor is there a requirement that the refresher training be a re-certification of qualification by the employer. Refresher training courses sometimes involve one-day (8 hours) training sessions; however, this length of time is not mandatory.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review training records to confirm that each facility person qualified to fill a HAZWOPER-defined response position in the ERP has received refresher training in those skills. • Auditors should review training records to confirm that the HAZWOPER refresher training is conducted at least annually. • Auditors should review the refresher training records for each response level to confirm that it covers the key competencies specified in the HAZWOPER regulation.
<p>19-C-61. Skilled support personnel who perform emergency work are provided with a briefing that includes the use of appropriate PPE, the chemical hazards involved, and the duties to be performed.</p>	<p>1910.120(q) (4)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Skilled support personnel are not necessarily an employer's own employees who have skills that are needed temporarily to perform immediate emergency support work that cannot reasonably be performed in a timely fashion. These individuals may be exposed to the hazards at an emergency response scene are not required to meet the training requirements for regular employees. • Personnel should be given an initial briefing at the site prior to their participation in any emergency response. • The initial briefing should include instruction in the wearing of appropriate personal protective equipment, what chemical hazards are involved, and what duties are to be performed.

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"> The IC has a responsibility to ensure that skilled support personnel who are called upon to provide assistance are briefed or trained at the scene to ensure their safety and understanding of restrictions that may be placed upon their work. ICs should be interviewed to see how they accomplish this on-the-spot training. All other appropriate safety and health precautions provided to the employer's own employees should be used to assure the safety and health of these personnel. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should conduct interviews with ICs to determine how they accomplish on-the-spot training for skilled support personnel.
<p>19-C-62. Specialist employees who, in the course of their regular job duties, work with and are trained in the hazards of specific hazardous substances, and who will be called upon to provide technical advice or assistance at a hazardous substance release incident to the individual in charge, receive training or demonstrate competency in the area of their specialization annually.</p>	<p>1910.120(q)(5)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> This requirement addresses the duties of and procedures to be followed by those who respond only as technical advisers and provide information related to the chemical(s) involved. This could include company experts who provide advice at the scene of an off-site transportation incident. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review training records or other documentation to determine if this training or competency demonstration is conducted annually. If there are personnel on-site who fulfill this role, interviews can be used to determine whether this requirement is being met.
<p><i>For RCRA Treatment, Storage, and Disposal (TSD) Facilities Only:</i></p>		
<p>19-C-63. The employer shall develop and implement a training program which is part of the employer's safety and health program, for employees exposed to health hazards or hazardous substances at TSD</p>	<p>1910.120(p)(7)(i and ii)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Initial training is to be 24 hours in length and annual refresher training is to be 8 hours in length. Employees who have

Audit Criteria	Source	Guidance for Auditors
<p>Table 19.2 – Continued</p> <p>operations to enable the employees to perform their assigned duties and functions in a safe and healthful manner so as not to endanger themselves or other employees.</p>		<p>completed initial training should receive a written certificate attesting that they have successfully completed the training.</p> <ul style="list-style-type: none"> • In lieu of completing initial training, employers can show that an employee's previous work experience and/or training are equivalent to the initial training required. Equivalent training includes the training that existing employees might have already received from actual site work experience. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review training records to confirm length of annual and refresher training.
<p>19-C-64. Trainers who teach initial training have satisfactorily completed a training course for teaching the subjects they are expected to teach or they have the academic credentials and instructional experience necessary to demonstrate a good command of the subject matter of the courses they are to teach and competent instructional skills.</p>	<p>1910.120(p) (7)(iii)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should verify the credentials of those who conduct HAZWOPER training. Trainers may be employed by the company or work for an outside training service. There is no single set of academic/training credentials, experience, or background that is mandatory. The qualifications of each HAZWOPER trainer should be evaluated based on their own merits. The types of experience and background that are most common are: field experience as a firefighter or HAZMAT responder, and completion of an academic or training program specifically addressing fire fighting and/or HAZMAT response skills. The facility or company should be able to show the auditor these qualifications.
<p>19-C-65. The 1910.120(p) emergency response training plan for emergency response personnel cover the following areas:</p> <ul style="list-style-type: none"> • Pre-emergency planning and coordination with outside parties. • Personnel roles, lines of authority, training, and 	<p>1910.120(p) (7), (8)(iii)(A)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The emergency response training programs for facilities covered by RCRA as a TSD site for hazardous waste handling should provide training in the elements of the ERP and the specific topics listed. • Not all employees need to be

Audit Criteria	Source	Guidance for Auditors
<p>communication.</p> <ul style="list-style-type: none"> • Emergency recognition and prevention. • Safe distances and places of refuge. • Site security. • Evacuation routes and procedures. • Decontamination procedures. • Emergency medical treatment and first aid. • Emergency alerting and response procedures. • Critique or response and follow-up. <p>Personal Protective Equipment to be worn and procedures for</p> <p>Table 19.2 – Continued</p> <ul style="list-style-type: none"> • handling emergency incidents. • Emergency equipment. • Standard Operating Procedures. 		<p>trained to this level. If the employer divides the work force in a manner such that a sufficient number of employees who have responsibility to control emergencies have the training specified, and all other employees, who may first respond to an emergency incident, have sufficient awareness training to recognize that an emergency response situation exists and that they are instructed in that case to summon the fully trained employees and not attempt control activities for which they are not trained.</p> <ul style="list-style-type: none"> • Not all employees need to be trained to this level if arrangements have been made in advance for an outside fully trained emergency response team responds in a reasonable period and all employees, who may come to the incident first, have sufficient awareness training to recognize that an emergency response situation exists and they have been instructed to call the designated outside fully trained emergency response team for assistance. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the training syllabus for on-site responders and their training records to determine if this training has been performed and elements of the ERP and specific topics listed were included.

Audit Criteria	Source	Guidance for Auditors
<p>19-C-66. Employee members of TSD facility emergency response organizations shall also be trained to a level of competence in the following elements:</p> <ul style="list-style-type: none"> • Methods used to minimize the risk from the safety and health hazards. • Safe use of control equipment. • Selection and use of appropriate PPE. • Safe operating procedures to be used at the incident scene. • Techniques of coordination with other employees to minimize risks. • The appropriate response to overexposure from health hazards to themselves and other employees. • Recognition of subsequent symptoms which may result from overexposure. 	<p>1910.120(p)(8)(iii)(B)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The emergency response training programs for facilities covered by RCRA as a TSD site for hazardous waste handling should provide training in the elements of the ERP and the specific topics listed. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the training syllabus for on-site responders and their training records to determine if this training has been performed and elements of the ERP and specific topics listed were included.
<p>19-C-67. The employer has certified that each covered employee has attended and successfully completed the required training or has demonstrated competency.</p>	<p>1910.120(p)(8)(iii)(C)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The means of demonstrating competence may take the form of written test, hands-on demonstration, or verbal feedback. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review training records to determine if a means of demonstrating competency have been included in the training documentation. Auditors should review training records to determine if a certification (by the employer or its representative, such as an outside training service) is available for each person.

19.2.1.3 Implementation

Implementation means that all the provisions of the emergency action plan and/or emergency response plan, including associated training, are in place and functioning as intended on an ongoing basis. Also, emergency equipment is staged and ready for use so that the facility is adequately prepared to respond to an emergency.

Table 19.3 shows the audit criteria and guidance related to implementation of emergency action and emergency response plans pursuant to OSHA PSM.

Table 19.3 OSHA PSM Audit Criteria and Guidance for Auditors - Implementation of Emergency Action and Emergency Response Plans

Audit Criteria	Source	Guidance for Auditors
19-C-68. The employer must have and maintain an employee alarm system. The employee alarm system must use a distinctive signal for each purpose and comply with the requirements in 1910.65.	1910.38(d)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should conduct interviews with employees and contractors, especially those that an auditor observes in the field, to determine if they understand how they are notified of emergencies.
19-C-69. The employee alarm system shall provide warning for necessary emergency action as called for in the emergency action plan, or for reaction time for safe escape of employees from the workplace or the immediate work area, or both.	1965.165 (b)(1)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should conduct interviews with employees to determine whether or not the alarm system provides sufficient warning necessary to either provide necessary action or for safe escape from the workplace or immediate work area.
19-C-70. The employer posts emergency telephone numbers near telephones, or employee notice boards, and other conspicuous locations when telephones serve as a means of reporting emergencies.	1910.165 (b)(4)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should conduct field observations to determine if emergency numbers are conspicuously posted on telephones and message boards in the facility.
19-C-71. Where a communication system also serves as the employee alarm system, all emergency messages have priority over all nonemergency messages.	1910.165 (b)(4)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should conduct field observations to determine if emergency messages have priority over routine paging and announcements if the public address (PA) or radio systems are used for both types of communications. If this cannot be tested or observed, then verification can be made by other means such as employee interviews.
19-C-72. For employers with 10 or fewer employees in a particular workplace, if direct voice communication is used as the procedure for sounding the alarm, all employees can hear the alarm. A backup system for such workplaces	1910.165 (b)(5)	<u>Background Information for Auditors:</u> <ul style="list-style-type: none"> • Direct voice communication can be used for employee alerting only where all employees can hear the emergency communications. If not (e.g., where employees may be isolated without means of

Audit Criteria	Source	Guidance for Auditors
<p>Table 19.3 – Continued is not required.</p>		<p>communication), some other form of alarm is required.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct field observations to determine if all employees can hear emergency communications in the event of an emergency. If this cannot be tested or observed, then verification can be made by other means such as employee interviews.
<p>19-C-73. Back-up means of alarm, such as employee runners, or telephones, are provided when systems are out of service.</p>	<p>1910.165 (d)(3)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review facility alarm maintenance records to determine if the primary employee alarm system has been out-of-service, and if so, then determine, via record review or interviews, what temporary backup system was provided during that period.
<p>19-C-74. HAZMAT team members and hazardous materials specialists have received baseline physical examinations and medical surveillance as required in 1910.120(f).</p>	<p>1910.120 (q)(9)(i) 1910.120 (f)(3), (f)(5)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Medical examinations and consultations are appropriate for those who are expected to respond to hazardous materials emergencies to detect any resulting health issues, as well as to verify that they are medically approved to wear a respirator and perform expected emergency duties associated with hazardous material response. This normally involves a physical exam as well as monitoring of vital information such as blood contaminant levels. Although individual medical records are private, auditors should request a list of the qualified HAZWOPER technicians and the dates of their physicals. • Medical examinations and consultations are to be made available to employees at the following times: <ul style="list-style-type: none"> – Baseline, prior to assignment – Periodic medical surveillance (at least every 12 months unless the

Audit Criteria	Source	Guidance for Auditors
		<p>attending physician believes a longer interval, 24 months maximum)</p> <ul style="list-style-type: none"> - At the termination of employment or reassignment to an area where the employee would not be covered if the employee has not had an examination within the last six months. - As soon as possible upon notification by an employee that they have developed signs or symptoms indicating possible overexposure to hazardous substances or health hazards, or that the employee has been injured or exposed above the PEL in an emergency situation. - At additional times, if the examining physician determines that follow-up examinations or consultations are medically necessary. <ul style="list-style-type: none"> • Medical examinations and procedures are to be performed by or under the supervision of a licensed physician, preferably one knowledgeable in occupational medicine, and should be provided without cost to the employee, without loss of pay, and at a reasonable time and place. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with personnel responsible for physical examinations and medical surveillance to determine if a management system has been implemented to manage scheduling of medical exams.
19-C-75. Any emergency response employees who exhibit signs or symptoms which may have resulted from exposure to hazardous substances during the course of an emergency incident either	1910.120 (q)(9)(ii)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Medical consultation should be provided to all employees who are injured, become ill, or develop signs or symptoms due to possible overexposure to hazardous substances or health

Audit Criteria	Source	Guidance for Auditors
<p>Table 19.3 – Continued</p> <p>immediately or subsequently, are provided with medical consultation as required in 1910.120(f)(3)(ii).</p>		<p>hazards from an emergency response or hazardous waste operation.</p> <ul style="list-style-type: none"> • Medical examinations and consultations shall be made available by the employer for employees who may have been injured, received a health impairment, developed signs or symptoms that may have resulted from exposure to hazardous substances resulting from an emergency incident, or exposed during an emergency incident to hazardous substances at concentrations above the permissible exposure limits or the published exposure levels without the necessary personal protective equipment being used. • Consultation should be provided as soon as possible following the emergency incident or development of signs or symptoms and at additional times, if the examining physician determines that follow-up examinations or consultations are medically necessary. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with personnel responsible for physical examinations and medical surveillance to determine what procedures will be implemented when emergency response employees who exhibit signs or symptoms that may have resulted from exposure to hazardous substances during the course of an emergency incident.
<p>19-C-76. The medical examinations shall include a medical and work history (or updated history if one is in the employee's file) with special emphasis on symptoms related to the handling of hazardous substances and health hazards, and to fitness for duty including the ability to wear any PPE under conditions (i.e., temperature extremes) that may</p>	<p>1910.120 (q)(9)(i) 1910.120 (f)(4)(i), (f)(6)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The content of the medical examinations should be determined by the attending physician. • The employer should provide one copy of the standard and its appendices to the attending physician and in addition the

Audit Criteria	Source	Guidance for Auditors
<p>be expected at the work site.</p>		<p>following for each employee:</p> <ul style="list-style-type: none"> - A description of the employee's duties as they relate to the employee's exposure. - The employee's exposure levels or anticipated exposure levels. - A description of any PPE used or to be used. - Information from previous medical examinations of the employee which is not readily available to the examining physician. - Additional information required by §1910.134, Respiratory Protection Standard. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with personnel responsible for physical examinations and medical surveillance to determine if a management system has been implemented to communicate this information to the physician.
<p>19-C-77. The results of the medical examination shall be provided to the employee.</p>	<p>1910.120 (q)(9)(i) 1910.120 (f)(7)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The employer should provide to the employee a copy of the written opinion from the examining physician containing the following information: <ul style="list-style-type: none"> - The physician's opinion as to whether the employee has any detected medical conditions that would place the employee at increased risk of material impairment of the employee's health from work in hazardous waste operations or emergency response, or from respirator use. - The physician's recommended limitations upon the employees assigned work. - The results of the medical examination and tests if requested by the employee.

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"> - A statement that the employee has been informed by the physician of the results of the medical examination and any medical conditions that require further examination or treatment. - The written opinion obtained by the employer should not reveal specific findings or diagnoses unrelated to occupational exposure. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with personnel responsible for physical examinations and medical surveillance to determine if a management system has been implemented to communicate this information to the employees.
19-C-78. Accurate records of the medical surveillance should be maintained.	1910.120 (q)(9)(i) 1910.120 (f)(8)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Employee medical records are to be preserved and maintained, meeting the criteria of 1910.1020, for the duration of employment plus 30 years except for health insurance claims, first aid records, and medical records for employees who worked for less than one year, as long as they are provided to the employee upon termination of employment. • Employee medical records should Table 19.3 – Continued include the following: name and Social Security number; physicians' written opinions, recommended limitations and results of examinations and tests; any employee medical complaints related to exposure to hazardous substances; and a copy of the information provided to the examining physician by the employer with the exception of the standard and its appendices. <p><u>Auditor Activities:</u></p>

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"> Auditors should review employee medical records to confirm that they contain the required information. Auditors should conduct interviews with personnel responsible for maintaining medical records to determine if a records retention management system has been implemented to meet the requirements.
<i>For RCRA Treatment, Storage, and Disposal (TSD) Facilities Only:</i>		
19-C-79. Based upon the information available at time of the emergency, the employer shall evaluate the incident and the site response capabilities and proceed with the appropriate steps to implement the site emergency response plan.	1910.120 (p)(8)(iv)(F)	<ul style="list-style-type: none"> No further guidance.

19.2.1.4 Equipment

Emergency response equipment, including alarm and communications systems as well as tactical equipment such as firefighting or HAZMAT control equipment, should be identified or referenced in the emergency response plan. In the context of emergency response, equipment consists of items that are intended to be permanent (e.g., fixed or mobile firefighting equipment), and items that are more consumable in nature such as absorbent materials for spills, chemical exposure suits, bunker gear). Both types of emergency equipment should undergo periodic inspection, testing, or preventive maintenance (ITPM) to ensure availability and suitability in the event of an emergency, and the emergency equipment should be included in the AI program (see Chapter 13) or an equivalent program. There should also be a system to ensure that impaired emergency response equipment is repaired or replaced and returned to service as soon as possible.

Table 19.4 shows the audit criteria and guidance related to emergency response equipment pursuant to OSHA PSM.

Table 19.4 OSHA PSM Audit Criteria and Guidance for Auditors -
Emergency Response Equipment

Audit Criteria	Source	Guidance for Auditors
19-C-80. The employer must have and maintain an employee alarm system. The employee alarm system must use a distinctive signal for each	1910.38(d)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> The auditor should confirm that an employee alarm system is in place.

Audit Criteria	Source	Guidance for Auditors
<p>Table 19.4 – Continued purpose and comply with 1910.165.</p>		
<p>19-C-81. The alarm system provides warning for necessary emergency action as called for in the emergency action plan, or for reaction time for safe escape of employees from the workplace or the immediate work area, or both.</p>	<p>1910.165 (b)(1)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • All workplaces should have an employee alarm system that meets the requirements of §1910.165. This includes office buildings, control rooms, and other buildings where personnel are normally housed. There may be process area alarms in addition to site-wide alarms (especially for large facilities such as refineries). Alarm systems can generate electrical or electronic tones, or other noises such as those produced by steam or air whistles, air horns, electrical sirens, buzzers, or other equivalent audible signals. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • The auditor should conduct field observations to confirm that an employee alarm system is in place.
<p>19-C-82. The alarms are capable of being perceived above ambient noise and light levels by all employees in the affected portions of the workplace. Tactile devices may be used to alert those employees who would not otherwise be able to recognize the audible or visual alarm.</p>	<p>1910.165 (b)(2)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review layout drawings, plot plans, etc. to determine where speakers, horns, lights, etc. are located and confirm that periodic functional tests of the alarm system (test records, if available) include verification that each device alarmed as expected when the test was conducted. • Auditors should conduct field observations to verify that the alarm(s) can be detected in all areas of the facility, including high noise areas by field observations if a test is scheduled during the audit period. Auditors should not request that a test be conducted just for the audit. In some cases, other means of alerting (visual, tactile) are necessary where reliance on audible alarms is not feasible (e.g., due to need to wear hearing protection). This includes alerting of hearing- or

Audit Criteria	Source	Guidance for Auditors
		<p>visually impaired personnel (alternate provisions such as full-time escort can suffice). The audit team should locate themselves individually in the noisiest or most remote areas, including indoor areas of the facility (such as an electric room) to determine if the alarm can clearly be heard over ambient noise levels. Choose at least one area where hearing protection is required to be worn if possible. If this cannot be tested or observed, then verification can be made by other means such as employee interviews.</p>
<p>19-C-83. The alarm system is distinctive for each purpose of the alarm. The employee alarm shall be distinctive and recognizable as a signal to evacuate the work area or to perform actions designated under the EAP.</p>	<p>1910.165 (b)(3)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • In some facilities, there are multiple alarms such as those used to signal evacuation, fire, toxic release, or all-clear, or to designate the area in which the emergency is occurring. These alarms should be distinctive for their purpose, with written guidance describing the purpose and response required for each alarm. Alternately, an alarm may signal that a PA announcement is imminent which provides further information on the nature of the emergency. In this case, the PA system is considered part of the alarm system and is subject to the same requirements. In some cases, the PA system itself serves as the employee alarm system; it should be audible and clear to properly alert personnel of an emergency; emergency communications should have priority over nonemergency ones. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the visitor/contractor safety orientation to verify if the alarm systems are described adequately, particularly if multiple tones or sounds are used.
<p>19-C-84. The employer assures that all devices, components,</p>	<p>1910.165 (c)(1)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Steam whistles, air horns,

Audit Criteria	Source	Guidance for Auditors
<p>Table 19.4 – Continued combinations of devices or systems constructed and installed to comply with this standard are approved.</p>		<p>strobe lights or similar lighting devices, or tactile devices meeting the requirements of this section are considered to meet this requirement for approval.</p> <ul style="list-style-type: none"> • Alarm systems and their individual components should be approved by an appropriate organization such as Underwriter's Laboratory (UL), Factory Mutual (FM), etc. This is generally not an issue for an engineered alarm system purchased from a company that specializes in this type of equipment, but it can be a concern for older, nonengineered systems that are found in some older facilities. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the alarm system files to determine if the alarm system was properly designed and that design is documented. An indication that an alarm system may not have been engineered properly is the inability to obtain spare parts or the system has experienced significant reliability problems.
<p>19-C-85. The employer assures that all employee alarm systems are restored to normal operating condition as promptly as possible after each test or alarm.</p>	1910.165(c)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with employees responsible for alarm systems to verify that the alarm systems are reset or restored quickly after use, if applicable.
<p>19-C-86. Spare alarm devices and components subject to wear or destruction are available in sufficient quantities and locations for prompt restoration of the system.</p>	1910.165(c)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with employees responsible for alarm system check to determine if the alarm systems rely on components that wear or are destroyed or consumed during an alarm activation. • Auditors should conduct field observations to determine, if the facility alarm system relies on components that wear or are destroyed or consumed during an alarm activation, and whether or not there are an

Audit Criteria	Source	Guidance for Auditors
		adequate supply of these components stocked so that the alarm system can be restored to operational status quickly after use. An example of such a component would be a burst disk that functions to activate an air horn alarm.
19-C-87. The employer assures that all employee alarm systems are maintained in operating condition except when undergoing repairs or maintenance.	1910.165 (d)(1)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Alarm systems should be routinely tested and maintained in an operable condition at all times, unless undergoing maintenance or testing. Provisions should be in place to manage impairments, including use of alternate means of alerting personnel such as use of telephones or runners (direct verbal communications). These methods may be less efficient, timely, or reliable and generally should only be used for short durations while a system is out of service. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review alarm system test records (if available) and any associated procedures that describe how the alarm system tests are performed, who is responsible for completing the tests, etc., to confirm that alarm system tests are scheduled and completed according to procedure. Auditors should review alarm system test records to verify timely follow up on any deficiencies noted during tests.
19-C-88. The employer assures that a test of the reliability and adequacy of nonsupervised employee alarm systems is made every two months.	1910.165 (d)(2)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> A different actuation device is used in each test of a multi-actuation device system so that no individual device is used for two consecutive tests. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review alarm system test records to determine if nonsupervised alarm systems are tested at least bimonthly.
19-C-89. The employer assures that employee alarm circuitry installed	1910.165	<u>Background Information for Auditors:</u>

Audit Criteria	Source	Guidance for Auditors
<p>Table 19.4 – Continued</p> <p>after January 1, 1981, which is capable of being supervised is supervised and that it will provide positive notification to assigned personnel whenever a deficiency exists in the system.</p>	<p>(d)(4) 1910 Subpart L, Appendix A, Nonmandatory guidance for Subpart L, 1910.165 Employee Alarm Systems</p>	<ul style="list-style-type: none"> • Supervised alarms check themselves (diagnostically) and self-report trouble, generally to a continually attended location. • The requirements for supervising the employee alarm system circuitry and power supply may be accomplished in a variety of ways. Typically, electrically operated sensors for air pressure, fluid pressure, steam pressure, or electrical continuity of circuitry may be used to continuously monitor the system to assure it is operational and to identify trouble in the system and give a warning signal. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review alarm test records to determine if all supervised employee alarm systems are tested at least annually for reliability and adequacy. • Auditors should conduct interviews with employees responsible for employee alarm systems to determine if systems installed after 1981 are supervised. If the systems are not supervised, determine why not.
<p>19-C-90. The employer maintains or replaces power supplies as often as is necessary to assure a fully operational condition. Back-up means of alarm, such as employee runners or telephones, shall be provided when systems are out of service.</p>	<p>1910.165 (d)(3)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with employees responsible for employee alarm systems to determine what back-up systems are employed when the alarms are out of service. • Auditors should conduct interviews with employees and contractors to determine how they would be notified of an emergency in the event that the alarm system is out of service.
<p>19-C-91. The employer assures that the servicing, maintenance and testing of employee alarms are done by persons trained in the designed operation and functions necessary for reliable and safe operation of the</p>	<p>1910.165 (d)(5)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Servicing, maintenance, and testing of employee alarm systems should only be performed by qualified personnel, which can be either

Audit Criteria	Source	Guidance for Auditors
system.		<p>in-house or contract maintenance personnel. In many cases, testing of the system is accomplished by security or operating personnel who would normally activate the system in an emergency.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review employee alarm system records to determine if servicing, maintenance, and testing of employee alarm systems were performed by qualified personnel.
19-C-92. The employer assures that manually operated actuation devices for use in conjunction with employee alarms are unobstructed, conspicuous and readily accessible.	1910.165(e)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditor should conduct field observations to confirm that manually operated actuation devices such as fire alarm pull boxes and shelter in place ventilation shutdown buttons are readily accessible and unobstructed. The location of these buttons should also be reviewed. For example, if the ventilation shutdown button is located outside the control room, would it be safe in an emergency for an employee to access that button without being unnecessarily exposed to a release?
19-C-93. Chemical protective clothing and equipment to be used by organized and designated HAZMAT team members, or to be used by hazardous materials specialists, meets the requirements of paragraphs 1910.120 (g)(3 thru 5).	1910.120 (q)(10) 1910.120 (g)(3 thru 5)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> These paragraphs include requirements for the following: Selection and use of personal protective equipment to protect employees from hazards and potential hazards likely to be encountered. This PPE includes positive pressure self-contained breathing apparatus and chemical protective clothing Integrity of totally encapsulating chemical protective suits to maintain positive air pressure. Auditors should verify that a written PPE program is established which includes the use of emergency response PPE and meets the following requirements: <ul style="list-style-type: none"> PPE selection based upon

Audit Criteria	Source	Guidance for Auditors
		<p>site hazards</p> <ul style="list-style-type: none"> ▪ PPE use and limitations of the equipment ▪ Work mission duration ▪ PPE maintenance and storage ▪ PPE decontamination and disposal ▪ PPE training and proper fitting ▪ PPE donning and doffing procedures, which may be provided by the manufacturer ▪ PPE inspection procedures prior to, during, and after use ▪ Evaluation of the effectiveness of the PPE program ▪ Limitations during temperature extremes, heat stress, and other appropriate medical considerations. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct field observations to determine the condition of bunker gear, chemical protective suits, SCBA, etc., including storage conditions. • Auditors should review test records (if available) for chemical protective suits and procedure for checking their integrity to confirm that suits are tested and integrity is maintained.
<p>19-C-94. When deemed necessary for meeting the tasks at hand, approved self-contained compressed air breathing apparatus may be used with approved cylinders from other approved self-contained compressed air breathing apparatus provided that such cylinders are of the same capacity and pressure rating. All compressed air cylinders used with self-contained breathing apparatus meet U.S. Department of Transportation and National Institute for Occupational Safety and Health criteria.</p>	<p>1910.120 (q)(3)(x)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct field observations to determine if compressed breathing air cylinders have appropriate markings indicating that they meet the designated criteria.

19.2.1.5 Drills and Exercises

To be effective, emergency plans, including both emergency action plans and emergency response plans, should be rehearsed and periodically tested by emergency management exercises and drills. Otherwise, the loss of capability and readiness of personnel can go unnoticed. Post-drill/exercise critiques should be held with participation by all involved parties to identify lessons learned and areas for improvement. Auditors should note that drills/exercises of the emergency response plan are mandatory for RCRA TSD facilities that are subject to HAZWOPER §1910.120(p), but they are not mandatory for non-TSD facilities subject to HAZWOPER §1910.120(q), unless there are state or local regulations that require them, or the company/facility procedures require them. Critiques of actual emergency response are required by Sections 1910.120(p) and §1910.120(q).

Table 19.5 shows the audit criteria and guidance related to emergency response drills and exercise pursuant to OSHA PSM.

Table 19.5 OSHA PSM Audit Criteria and Guidance for Auditors -
Emergency Response Drills and Exercises

Audit Criteria	Source	Guidance for Auditors
19-C-95. The emergency response plan is rehearsed regularly as part of the overall training program.	1910.120 (p)(8)(iv)(C)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Drills are tests of one element of a facility's emergency response plan (e.g., evacuation). Exercises test one or more elements (e.g., HAZMAT release with one or more injuries). Drills and exercises should simulate as close as possible actual emergency conditions without putting personnel at undue risk or being overly disruptive of operations. Drills or exercises should be documented, with a critique conducted afterwards and documentation of lessons learned and opportunities for improvement. • If the emergency response relies fully or partially on external agencies/mutual aid, these organizations should be regularly actively involved in drills and exercises, if they agree to participate. • Emergency response exercises can also be conducted via table-top scenarios, either as a standalone activity or prior to conducting a full-scale exercise. These activities give responders

Audit Criteria	Source	Guidance for Auditors
		<p>Table 19.5 – Continued</p> <p>an opportunity to practice response procedures, assessments, and decision-making, and offer scenarios that are difficult to stage or are overly disruptive to operations.</p> <ul style="list-style-type: none"> • Drills/exercises of the ERP are required for those facilities covered by RCRA as TSD facilities. However, they are not mandatory for non-TSD facilities, unless the facility or company requires these activities, or there are state or local regulations that require them. • The HAZWOPER regulation only stipulates that the emergency response plan be rehearsed “regularly.” No specific drill/exercise frequency is specified; however, many companies complete these activities at least annually. The auditor should judge whether the frequency of emergency response drills/exercises is regular enough to satisfy the HAZWOPER regulation, given the size of the site, its risk to on-site and off-site personnel, and the complexity of the ERP. If drills/exercises are not completed at least once every year, there should be a compelling reason for the reduced frequency that is identifiable and justified. • Emergency response drills/exercises can be conducted in conjunction with other types of drills/exercises, such as those conducted to test facility security plans. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review emergency response documentation to confirm that drills or exercises are conducted regularly, with a documented critique conducted afterwards that includes lessons learned and opportunities for improvement.

Audit Criteria	Source	Guidance for Auditors
<p>19-C-96. If the ERP has been activated for an actual event, a critique has been conducted (alternatively, the critique of the emergency response is part of the incident investigation).</p>	<p>1910.120 (p)(8)(ii)(J), (q)(2)(x)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • A written critique should be generated which documents the lessons learned and any opportunities for improvement that are identified from the actual emergency response. These could include revisions to the ERP or procedures, changes to training programs, or changes to emergency response equipment or supplies. • It is not mandatory that recommendations or action items generated from an emergency response critique be tracked in a formal system, as they are for PHA or incident investigation recommendations. If the facility or company creates a recommendation as a result of an ERP critique it should receive the same level of attention as those recommendations or action items generated from a PHA. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review emergency response documentation to confirm that ERP critiques are being completed and documented. • Auditors should review emergency response documentation to confirm that critique recommendations or action items are being resolved and implemented in a manner that is similar to any other PSM-related recommendation or action item.
<p>19-C-97. Other emergency response drill/exercise requirements found in the procedures of the company/facility being audited.</p>	<p>Specific Procedure Reference</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the facility ERP to determine what other emergency response equipment requirements found in the company/facility procedures should be audited. • Auditors should conduct interviews with facility personnel to determine if other emergency response equipment requirements found in the

Audit Criteria	Source	Guidance for Auditors
		facility emergency response plan have been implemented as specified. <ul style="list-style-type: none"> • Auditors should conduct field observations to confirm that other emergency response equipment requirements found in the facility emergency response plan have been implemented as specified.

19.2.1.6 State PSM Programs

If the PSM program being evaluated is pursuant to a state PSM regulation, then the specific Emergency Management requirements for that regulatory program should be followed. In general, these overlap somewhat with the federal OSHA PSM and EPA RMP requirements, but often times there are state-specific requirements that should be met, even if the state has received authority to enforce federal regulations (i.e., the state is an OSHA state plan state, or has received implementing agency status for RMP implementation). The state-specific applicability requirements for the following states are presented below:

- New Jersey
- California
- Delaware

Table 19.6 shows the audit criteria and guidance related to emergency action and emergency response plans pursuant to state plans.

Table 19.6 U.S. State PSM Audit Criteria and Guidance for Auditors - Emergency Action and Emergency Response Plans

Audit Criteria	Source	Guidance for Auditors
<p><i>New Jersey Toxic Catastrophe Prevention Act (TCPA)</i> 19-C-98. The written ERP includes the following:</p> <ul style="list-style-type: none"> • Initial and annual refresher emergency response training for all employees in relevant procedures to implement the emergency response plan. • Performance of at least one EHS ER exercise per calendar year in accordance with the following requirements: <p>Program 2 covered processes whose employees will not respond to an EHS accident have invited at least one outside responder agency designated in the ER plan to</p>	N.J.A.C. 7:31-5.2	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The following EHS accidental releases are exempt from the notification provisions provided the EHS accident is recorded in accordance with the procedures established for EHS accident investigation: <ul style="list-style-type: none"> – An EHS release that has no potential offsite impact or that has no impact beyond the industrial complex (multi-company facility) property boundary. – An EHS release that results in no actual or potential injuries or fatalities at the facility.

Audit Criteria	Source	Guidance for Auditors
<p>participate in the ER exercise. Facility employees perform their assigned responsibilities for all ER exercises.</p> <p>All other facilities perform at least one full scale ER exercise in which the ER team and ER containment, mitigation, and monitoring equipment are deployed at a strength appropriate to demonstrate the adequacy and implementation of the plan.</p> <ul style="list-style-type: none"> • A written assessment of the ER plan and of the adequacy or need for ER equipment after each ER plan implementation or each ER exercise. • A description of the emergency notification system at the facility which includes the following requirements for reporting EHS accidents: <p>Immediate notification to the Department's emergency communications center at 1-877 WARN DEP (1-877-927-6337) by the emergency coordinator or designee of an EHS accident or imminent EHS accident at the facility. The notification includes the following information:</p> <ul style="list-style-type: none"> ▪ Company name and address of the EHS accident ▪ The name, position, and telephone number of caller ▪ The time of, or anticipated time, of the EHS accident and the projected duration ▪ The chemical name of the EHS released ▪ The actual EHS quantity or, if not known, the estimated EHS quantity and whether it will have an offsite impact ▪ Weather conditions, including wind direction and speed and expected offsite effects, if any <p>The facility emergency coordinator or designee is prepared to provide the Department's emergency communications center updates, if requested, which shall include the following information:</p>		<ul style="list-style-type: none"> – An EHS release that does not activate the emergency response plan. • This exemption does not affect any other state or federal reporting requirements. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that NJ facilities do the following: <ul style="list-style-type: none"> – Conduct initial and annual refresher training for ER team members. – Perform at least one full-scale ER drill per year. – Critique each ER drill. – Include a description of the ER notification system in the ERP.

Audit Criteria	Source	Guidance for Auditors
<p>Table 19.6 – Continued</p> <ul style="list-style-type: none"> ▪ The facility name and address. ▪ The name, position and telephone number of caller. ▪ The location of the point of EHS release, a description of the source, cause and type of EHS accident, quantity and concentration of the EHS released, and whether the EHS release is of a continuing nature. ▪ The measures taken to terminate the EHS release or to mitigate its effect, and the effectiveness of such measures. ▪ An update on weather conditions. 		
<p><i>Delaware Accidental Release Prevention Regulation</i> 19-C-99. For facilities with any regulated toxic substance held in a process above the threshold quantity, the facility is included in the community emergency response plan developed under 42 U.S.C. 11003.</p>	DE Code, Chapter 77, Section 5.90	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the community emergency response plan to verify inclusion of the facility in that plan either by obtaining a copy of the plan or by contacting the local emergency planning committee (LEPC) coordinator and asking for verification that the facility is included in the plan.
<p>19-C-100. For facilities with only regulated flammable substances held in a process above the threshold quantity, the facility has coordinated response actions with the local fire department.</p>	DE Code, Chapter 77, Section 5.90	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review facility documentation to determine if the facility has coordinated its emergency response plan with the local fire department (e.g., minutes of meetings, drills, tours).
<p><i>California OSHA—Process Safety Management of Acutely Hazardous Materials</i> 19-C-101. The CalOSHA PSM regulations do not add any different or unique Emergency Management requirements beyond those described for the PSM Standard and RMP Rule.</p>	CCR, Title 8, Section 5189(n)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The employer may use the business plan for emergency response submitted pursuant to subdivision (a) of Section 25503.5 and subdivision (b) of Section 25505 of the Health and Safety Code, to the extent that the requirements of subsection (n) are met. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review facility documentation to determine if the business plan for emergency response was submitted pursuant to subdivision (a) of Section

Audit Criteria	Source	Guidance for Auditors
		25503.5 and subdivision (b) of Section 25505 of the Health and Safety Code, meets the requirements of subsection (n).
<p><i>California Accidental Release Prevention Program</i></p> <p>19-C-102. For facilities with any regulated toxic substance held in a process above the threshold quantity, the facility is included in the community emergency response plan developed under 42 U.S.C. 11003.</p>	CCR, Title 19, Section 2765.1	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the community emergency response plan to verify inclusion of the facility in that plan by either obtaining a copy of the plan or by contacting the local emergency planning committee (LEPC) coordinator and asking them to verify that the facility is included in the plan.
<p>19-C-103. For facilities with only regulated flammable substances held in a process above the threshold quantity, the facility has coordinated response actions with the local fire department.</p>	CCR, Title 19, Section 2765.1	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review facility documentation to determine if the facility has coordinated its emergency response plan with the local fire department (e.g., minutes of meetings, drills, tours).

19.2.2 Related Criteria

The purpose of providing these criteria is to provide auditors with additional guidance for evaluating PSM programs with respect to issues that go beyond the strict compliance requirements presented above, and in large part represent industry good practices in process safety knowledge, or in some cases practices in process safety knowledge that have been common. Some of the related criteria have reached the status of a level of acceptable practice because of their widespread, accepted, and successful use over an extended period of time. Auditors and PSM practitioners should carefully consider implementing this guidance, or at least designing an approach that is similar in nature. See the Glossary and Section 1.7.1 for a fuller discussion of the meaning and use of level of acceptable practice.

19.2.2.1 Emergency Action and Emergency Response Plans

Table 19.7 identifies the recommended related audit criteria and auditor guidance for emergency action and emergency response plans.

Table 19.7 Related Audit Criteria and Auditor Guidance - Emergency Action and Emergency Response Plans

Audit Criteria	Source	Guidance for Auditors
19-R-1. The employer has decided whether plant employees will respond to emergency events, or	WCLAR (7/28/89)	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> This is a key decision to be made

Audit Criteria	Source	Guidance for Auditors
<p>Table 19.7 – Continued</p> <p>whether they will evacuate and rely on offsite responders.</p>		<p>by the facility. If facility employees will not respond, an emergency action plan and associated training is called for which meets the requirements of 29 CFR §1910.38.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the facility EAP to determine if it explicitly defines whether facility employees are expected to respond to emergencies or if they are simply to evacuate and let other organizations respond. • If the emergency response relies fully or partially on external agencies/mutual aid, auditors should request evidence that the facility has coordinated its emergency response plan with these organizations (e.g., minutes of meetings, drills, tours).
<p>19-R-2. The emergency action plan provides for distinction between incidental (small) releases and releases that require an emergency response.</p>	<p>CPL 02-02-073 NEP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The hazard scenarios for which emergency response planning is warranted should be based on the scenarios identified in the HIRAs, risk assessments, LOPAs/SIL analyses, or other analytical activities designed to identify and prioritize the hazards/risks associated with the equipment and its operation and size the response resources that will be required (e.g., water capacity, foam stock). • There are other factors that may mitigate the hazards associated with a release and its remediation, such as the training or experience of the employees in the immediate work area, the response and PPE at hand, and the pre-established standard operating procedures for responding to releases of hazardous substances. For example, a spill of solvent toluene at a facility that manufactures toluene may not require an emergency response because of the advanced knowledge of the

Audit Criteria	Source	Guidance for Auditors
		<p>personnel in the immediate vicinity and equipment available to absorb and clean up the spill. However, the same spill inside a small facility that uses toluene and with personnel who have had only the basic hazard communication training on toluene may require an emergency response by more highly trained personnel. This facility's EAP would require evacuation for all but the most minor spills, while evacuation and emergency response would be necessary only for much larger spills at the chemical manufacturing facility.</p> <ul style="list-style-type: none"> Personnel responding to an overturned aircraft leaking jet fuel would likely perform emergency response due to the significant and uncontrolled hazards posed by the aircraft and jet fuel. These personnel would be conducting operations such as fire fighting, passenger rescue, and working to stop the release of jet fuel. However, a fuel spill from a tanker truck that can be absorbed, neutralized, or otherwise controlled by employees in the immediate release area through the placement of absorbent pads may qualify as an incidental release, provided that there are no significant health or safety hazards. (If the release of jet fuel is covered by 40 CFR §300, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), an employer may be required by the EPA to follow HAZWOPER.) <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the EAP or ERP to determine if it includes guidance for determining which spills/releases can be handled by employees in the work area (nonemergency), compared to those that require assistance from outside of the work area (facility or outside responders). The latter generally constitutes

Audit Criteria	Source	Guidance for Auditors
		<p>Table 19.7 – Continued an emergency response.</p> <ul style="list-style-type: none"> Auditors should review the EAP against the contents of the SOPs to determine if the actions to be taken during an emergency, release, or upset conditions are consistent.
<p>19-R-3. The EAP includes the employer's expectations of employees' actions when either of these situations (small or large release) occurs.</p>	<p>NEP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Operations or maintenance personnel (including properly trained contractors) can respond to small releases/spills, provided that they have the proper training, PPE, and materials/tools to do so. Large releases/spills require assistance from outside responders or activation of the facility emergency response plan and response by designated and properly trained personnel in accordance with HAZWOPER regulations. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the facility EAP to determine if it includes the employer's expectations of employee's actions when either of these situations (small or large release) occurs.
<p>19-R-4. The use of floor plans or workplace maps which clearly show the emergency escape routes should be included in the emergency action plan.</p>	<p>Appendix to Subpart E of Part 1910—Exit Routes, Emergency Action Plans, and Fire Prevention Plans</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Color coding will aid employees in determining their route assignments. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the facility EAP to determine if it includes floor plans or workplace maps that clearly show the emergency escape routes.
<p>19-R-5. Employees who are physically impaired have the necessary support and assistance to get them to a safe zone in the event of an emergency.</p>	<p>3133</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should interview facility personnel responsible for the EAP to determine if the facility employs impaired personnel, or if impaired persons will be visitors or contractors. Auditors should then review the facility

Audit Criteria	Source	Guidance for Auditors
		EAP or ERP to determine if the plan addresses the needs of these personnel.
19-R-6. At the time of an emergency, employees should know what type of evacuation is necessary and what their role is in carrying out the plan.	Appendix to Subpart E of Part 1910—Exit Routes, Emergency Action Plans, and Fire Prevention Plans	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • In some cases where the emergency is very grave, total and immediate evacuation of all employees is necessary. • In other emergencies, a partial evacuation of nonessential employees with a delayed evacuation of others may be necessary for continued plant operation. • In some cases, only those employees in the immediate area of a fire or other emergency may be expected to evacuate or move to a safe area such as when a local application fire suppression system discharge employee alarm system is sounded. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with employees to determine whether they know what is expected of them in all such emergency possibilities in order to provide assurance of their safety from fire or other emergency.
19-R-7. The designation of refuge or safe areas for evacuation should be determined and identified in the plan.	Appendix to Subpart E of Part 1910—Exit Routes, Emergency Action Plans, and Fire Prevention Plans	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • In a building divided into fire zones by firewalls, the refuge area may still be within the same building but in a different zone from where the emergency occurs. • Exterior refuge or safe areas may include parking lots, open fields or streets which are located away from the site of the emergency and which provide sufficient space to accommodate the employees. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should interview employees to determine if they have been instructed to move

Audit Criteria	Source	Guidance for Auditors
		<p>Table 19.7 – Continued</p> <p>away from the exit discharge doors of the building and to avoid congregating close to the building where they may hamper emergency operations.</p>
<p>19-R-8. A detailed explanation of the rescue and medical first aid duties to be performed and by who should be developed.</p>	<p>Appendix to Subpart E of Part 1910—Exit Routes, Emergency Action Plans, and Fire Prevention Plans</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should interview employees to determine if they have been told what actions to take in these emergency situations the employer anticipates may occur in the workplace.
<p>19-R-9. If the employer's staff will respond, and the facility is subject to OSHA's HAZWOPER regulations, the emergency response plan includes the following:</p> <ul style="list-style-type: none"> Site topography, layout and prevailing weather conditions. Procedures for reporting incidents to local, State and Federal governmental agencies. 	<p>GIP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> This information is required for ERPs for RCRA TSD facilities and is GIP for others. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the facility ERP for RCRA TSD facilities to determine if site topography, layout, and prevailing weather conditions have been documented in the plan.
<p>19-R-10. The emergency action plan should address emergencies that the employer may reasonably expect in the workplace. Examples are: fire, toxic chemical releases, hurricanes, tornadoes, blizzards, floods, and others.</p>	<p>Appendix to Subpart E of Part 1910—Exit Routes, Emergency Action Plans, and Fire Prevention Plans</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Essential plant operations may include the monitoring of plant power supplies, water supplies, and other essential services that cannot be shut down for every emergency alarm. Essential plant operations may also include chemical or manufacturing processes that should be shut down in stages or steps where certain employees should be present to assure that safe shutdown procedures are completed. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the facility EAP to determine if procedures are in place for those who have been selected to remain behind to care for essential plant operations until their evacuation becomes absolutely necessary.

Audit Criteria	Source	Guidance for Auditors
<p>19-R-11. The emergency action plan should identify and consider possible abnormal weather and seismic phenomena (e.g. extreme cold, high wind, flash floods and earthquakes) in equipment and facility design and operation. Identify and comply with local building codes and zoning regulations.</p>	<p>RBPS</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the facility EAP to determine if the plan provides guidance on managing certain events such as earthquakes, hurricanes, tornados, floods, etc. as appropriate to the geographic location of the facility. • Auditors should conduct field observations to confirm that rooms or buildings designated as safe havens are visibly labeled. • Auditors should interview employees to determine if they are knowledgeable about where to seek shelter.
<p>19-R-12. Local community emergency response planners and responder organizations are included in facility emergency response planning when appropriate.</p>	<p>CCPA 3133</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Local responders include federal, state, or local (county, municipal, etc.) police, fire, emergency medical services (EMS), and other types of trained responders. Local responders can also include neighboring industries that have trained personnel and equipment that can respond via mutual aid agreements. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with facility personnel responsible for emergency planning to determine if provisions for off-site response are included in the emergency response plan.
<p>19-R-13. The ERP fits within and complements the plans of offsite organizations such as the LEPC, offsite responders, and the SERC.</p>	<p>CCPA 3133</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • This is a compliance requirement for TSD facilities under RCRA where §1910.120(p) is applicable and is GIP for others. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the facility ERP for RCRA TSD facilities to determine if the facility plan fits within and complements the plans of off-site organizations such as the LEPC, off-site responders, and the SERC. The auditor may

Audit Criteria	Source	Guidance for Auditors
		verify this by either obtaining a copy of the off-site organization's plan or by contacting the off-site organization's coordinator and asking for verification.
19-R-14. If appropriate the ERP includes provisions for informing the community about site-related hazards and what to do in case of an emergency.	CCPA	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> If the facility has events that are included in the emergency planning process that can cause off-site consequences, the ERP should include provisions for informing the community about site-related hazards and what to do in case of an emergency. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the facility ERP against the RMP or other similar analyses to determine if the community will be protected by the ERP if off-site consequences are possible.
19-R-15. The EAP (1910.38(a) or ERP (1910.120(q)(1)&(2)) includes information about the various purposes/meanings of the employee alarm notification system.	NEP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the facility EAP or ERP to determine if it includes this information (e.g., fire, evacuation, shelter-in-place, area-specific, all-clear alarms).
19-R-16. In buildings with several places of employment, employers are encouraged to coordinate their plans with the other employers in the building. A building-wide or standardized plan for the whole building is acceptable provided that the employers inform their respective employees of their duties and responsibilities under the plan.	Appendix to Subpart E of Part 1910 – Exit Routes, Emergency Action Plans, and Fire Prevention Plans	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The standardized plan need not be kept by each employer in the multi-employer building, provided there is an accessible location within the building where the plan can be reviewed by affected employees. When multi-employer building-wide plans are not feasible, employers should coordinate their plans with other employers within the building to assure that conflicts and confusion are avoided during times of emergencies. In multi-story buildings where more than one employer is on a single floor, it is essential that these employers coordinate their plans with each other to avoid conflicts and confusion. <p><u>Auditor Activities:</u></p>

Audit Criteria	Source	Guidance for Auditors
		<ul style="list-style-type: none"> Auditors should interview with facility personnel responsible for the EAP to determine if a standardized plan has been developed, or if individual plans have been coordinated with other employers.

Table 19.8 identifies the recommended related audit criteria and auditor guidance for emergency response training.

Table 19.8 Related Audit Criteria and Auditor Guidance - Emergency Response Training

Audit Criteria	Source	Guidance for Auditors
<p>19-R-17. The employer should assure that an adequate number of employees are trained and available at all times during working hours.</p>	<p>Appendix to Subpart E of Part 1910—Exit Routes, Emergency Action Plans, and Fire Prevention Plans</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> These employees act as evacuation wardens so that employees can be swiftly moved from the danger location to the safe areas. Generally, one warden for each 20 employees in the workplace should be able to provide adequate guidance and instruction at the time of a fire emergency. The employees selected or who volunteer to serve as wardens and fellow employees should be made aware of handicapped employees who may need extra assistance, such as using the buddy system, and of hazardous areas to be avoided during emergencies. Before leaving, wardens should check rooms and other enclosed spaces in the workplace for employees who may be trapped or otherwise unable to evacuate the area. <p>After the desired degree of evacuation is completed, the wardens should be able to account for or otherwise verify that all employees are in the safe areas.</p>

Audit Criteria	Source	Guidance for Auditors
		<p>Table 19.8 – Continued</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should conduct interviews with facility personnel responsible for EAPs to determine if the number of evacuation wardens is sufficient for the number of employees in the workplace and that back-ups are in place in case the primary warden is not available to assist with evacuation. Auditors should conduct interviews with facility evacuation wardens to determine if they received training and understand their responsibilities.
<p>19-R-18. Plant personnel understand what will be expected of them if they observe a fire, release, or other hazardous event.</p>	<p>GIP</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should conduct interviews with plant personnel (including contractors) who may discover a fire, hazardous material release, medical emergency, or other incident to determine if they understand their role in reporting the incident to appropriate facility personnel. Additional expectations will be based on their role in the emergency response organization (e.g., operator, fire brigade member, hazmat responder, first aid/emergency medical responder), including training (e.g., use of portable fire extinguisher) and PPE).
<p>19-R-19. The site has designated a representative to act as a spokesperson during an emergency and the spokesperson has been adequately trained on the strategy and process for dissemination information during an emergency.</p>	<p>CCPA</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the facility emergency procedures to determine if provisions for interfacing with the media during emergency situations have been provided for and that a specific person has been trained to be a media spokesperson. The person assigned these responsibilities should be adequately trained in media interface, particularly in emergency situations. Auditors should review facility training records to determine if

Audit Criteria	Source	Guidance for Auditors
		the media spokesperson has received appropriate training.
19-R-20. Plant personnel understand what will be expected of them if the plant alarm(s) sound.	GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should conduct interviews with plant personnel (including contractors) to determine if they know what actions to take in the event of an emergency alarm, including evacuation, shelter-in-place, and headcount procedures.
19-R-21. Responders (HAZMAT-trained personnel, fire brigade personnel, on scene commanders, etc.) understand what will be expected of them when the plant alarm(s) sound.	GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should conduct interviews with on-site emergency responders to determine if they understand their role in an emergency and what actions to take in the event of an emergency alarm, including reporting to the scene or fire house, donning PPE, waiting for instructions, etc.

Table 19.9 identifies the recommended related audit criteria and auditor guidance for the implementation of emergency action and emergency response plans.

Table 19.9 Related Audit Criteria and Auditor Guidance - Implementation of Emergency Action and Emergency Response Plans

Audit Criteria	Source	Guidance for Auditors
19-R-22. Contract employees have been trained per the employer's EAP or ERP. In particular, they understand the meaning of the various different alarm notifications and evacuation routes.	NEP	<u>Auditor Activities:</u> Auditors should conduct interviews with contract employees to determine if they understand the meaning of the various emergency alarms and know what action they are expected to take, including evacuation or shelter-in-place as well as headcount procedures.
19-R-23. Employees who possess qualifications that would allow them to respond only at the first responder awareness level have only responded in a manner that was within their qualifications/training.	NEP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should conduct interviews with employees that are trained only at the first responder awareness level to determine if they understand that they are not qualified to respond to incidents involving hazardous materials, but may only make

Audit Criteria	Source	Guidance for Auditors
		<p>Table 19.9 – Continued</p> <p>proper notifications.</p> <ul style="list-style-type: none"> Auditors should conduct interviews with operations personnel to determine if they understand that they may respond specifically in accordance with their SOPs, training, and PPE as part of their normal job. Generally these personnel should be trained at least to the Emergency Response Operations Level, unless they will only respond to incipient fires and minor spills.
<p>19-R-24. Employees who possess qualifications that would allow them to respond only at the first responder operations level have only responded in a manner that was within their qualifications/training, and they have they been provided all PPE necessary, including flame retardant clothing where appropriate.</p>	<p>NEP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> First responder operations level as defined by OSHA does not automatically imply operations training. Neither does operations training automatically impart first responder operations level qualification. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should conduct interviews with employees trained only to the first responder operations level to determine if they understand that they are qualified only to respond in a defensive fashion, from outside of the hot zone, to contain the hazardous material release from a safe distance. Operations personnel may respond specifically in accordance with their SOPs, training, and PPE as part of their normal job.
<p>19-R-25. Selected operations personnel who may be required to shut down processes, close emergency valves and otherwise secure operations that are not in the danger area before evacuating in the event of an emergency have been trained properly to carry out these assigned actions.</p>	<p>CPL 02-02-073</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the facility EAP, ERP, and supporting emergency procedures to determine if the documents include the actions to be taken by selected operations personnel who may be required to shut down processes, close emergency valves, and otherwise secure operations that are not in the danger area before evacuating

Audit Criteria	Source	Guidance for Auditors
		<p>in the event of an emergency.</p> <ul style="list-style-type: none"> • Auditors should conduct interviews with selected facility operations personnel who may be required to shut down processes, close emergency valves, and otherwise secure operations that are not in the danger area before evacuation in the event of an emergency to determine that these individuals have received the following: <ul style="list-style-type: none"> – have been informed of the incident command structure of an emergency (defined in the facility's emergency procedures); – are required to use adequate PPE (auditor could check availability and condition of specialized PPE); and – have been adequately trained in the procedures they are to perform. Employees who perform these operations are not considered "emergency responders." • Auditors should review the facility ERP and/or supporting emergency procedures for facilities with first responder operations level employees to determine if the procedures describe the limited action in the danger area (e.g., turning a valve) that may be taken before the emergency response team arrives. The limited action consists of the following: <p>is addressed in the emergency procedures and is otherwise within the scope of a first responder;</p> <p>requires use of adequate PPE;</p> <p>has been included in the training provided to affected employees; and</p> <p>employs use of the buddy system.</p>
19-R-26. Implementation of the evacuation plan in the field is successful with respect to available evacuation route usage, signage, illumination, and wind direction	CPL 1910.36 (b)(4)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct field observations of the evacuation routes to verify that they are not blocked, locked, or barricaded.

Audit Criteria	Source	Guidance for Auditors
visibility.		<ul style="list-style-type: none"> • Auditors should conduct field observations of the evacuation routes to verify that there are readily visible signs for evacuation routes leading to safe locations. • Auditors should conduct field observations of a representative sample of the evacuation route signs during dark conditions to verify that they are adequately illuminated. • Auditors should conduct field observations to verify that wind direction indicators are in good condition and are visible at night or in inclement weather.

Table 19.10 presents the recommended audit criteria and auditor guidance for emergency response equipment.

Table 19.10 Related Audit Criteria and Auditor Guidance -
Emergency Response Equipment

Audit Criteria	Source	Guidance for Auditors
19-R-27. Appropriate equipment is provided for the control and clean-up of minor releases.	GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should conduct field observations to verify that spill control materials such as sorbents or neutralizing agents have been provided, as well as disposal tools and containers.

Audit Criteria	Source	Guidance for Auditors
19-R-28. Emergency equipment is subject to appropriate inspection, testing, and preventive maintenance.	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The inspection, testing, and preventive maintenance (ITPM) program at the facility (part of the AI program) should include emergency equipment as appropriate. • Equipment may include fixed fire protection systems, fire truck ladders, and hose, foam concentrate that is used in fire suppression systems, chemical protective suits, etc. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review ITPM procedures to determine if the emergency equipment specified for use in the ERP, and its supporting procedures, has been included in the ITPM procedures. • Auditors should review the list of equipment in the AI program to determine if the emergency equipment has been included, or is included in an equivalent program.
19-R-29. The alarm system is easily and quickly activated from a central, continuously manned location.	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct field observations to verify that the alarm can be activated from an easily reached location during an emergency, and that the location(s) are not obstructed in any way.
19-R-30. Documentation is available to verify servicing, maintenance and testing of emergency alarm systems.	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review facility ITPM records to determine if the alarm system is operational and has been tested, serviced, and maintained as required.
19-R-31. The use of process control centers or buildings as safe areas is discouraged.	3133	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Control rooms should not be used for shelter-in-place unless they have been designed as a safe haven (e.g., protected from vapor cloud explosion overpressure, positive pressure, well sealed, ventilation system shutdown capability).

Audit Criteria	Source	Guidance for Auditors
		<p>Table 19.10 – Continued</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review facility ERP documentation to determine if control rooms have been designated as a safe haven (e.g., protected from vapor cloud explosion overpressure, positive pressure, well sealed, ventilation system shutdown capability).
<p>19-R-32. Where wind direction is important for selecting a safe route to a refuge area, wind direction indicators are provided.</p>	<p>3133 GIP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Wind direction indicators have the following characteristics: <ul style="list-style-type: none"> – They are visible throughout the process area. – They are visible at night. – Pennants, flags, windsocks, and continuously operating steam plumes are acceptable types of wind indicators. If a process related wind indicator is used there should be a backup indicator to use when the process is shut down. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should make field observations of the conditions of the wind indicators and their visibility at night or in inclement weather.
<p>19-R-33. There is an emergency operations center (EOC) for use during emergencies.</p>	<p>CCPA 3133</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Each facility should have a location designated as an emergency control center for designated management officials to manage the response to a significant incident, including communication with outside agencies, news media, corporate, etc. • The EOC is not co-located with the control room, although a separate room in the control room building would be an acceptable EOC location. Process operators should not be distracted by the type of activity that occurs in an EOC.

Audit Criteria	Source	Guidance for Auditors
		<p>The EOC should have communications with the control room, but these should be carefully managed during emergencies.</p> <ul style="list-style-type: none"> • The EOC is not co-located with the incident command post, which is usually in the field in a location that is usually close to the scene of the incident and is often a vehicle. These locations would not generally support the number of people required in an EOC and would likely expose these personnel unnecessarily. • The EOC should be located in a safe zone (i.e., in an area that can be protected from toxic gas infiltration or the effects of fires or explosions). <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct field observations to determine if the EOC is properly designed to function as a place of refuge, i.e., that outdoor air can be rapidly and efficiently separated from indoor air and that the EOC can safely support the number of people that are projected to use it during an emergency. One key indicator that this has been considered in the designation of the structure as a place of refuge is easily accessible and clearly labeled ventilation controllers where the ventilation system can be quickly shut down in an emergency. • Auditors should conduct field observations to verify that the EOC is suitably equipped with: <ul style="list-style-type: none"> – Communications equipment – Backup communications equipment – Plant drawings (layout, utilities) – Community maps – Appropriate reference materials, including MSDSs – Phone lists (company, emergency responders,

Audit Criteria	Source	Guidance for Auditors
		community, regulatory notification) – Emergency action and response plans and procedures/manuals – Listings of location of emergency equipment, including mutual aid – Access to meteorological data and any dispersion modeling data.
19-R-34. Backup communication systems are provided for use during emergencies.	GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should conduct field observations of the EOC, guard station, communications, or other location that is staffed during emergencies to determine if backup communication systems are provided. These may be radios, cell phones, additional landline telephones, etc.
19-R-35. Adequate spare emergency equipment is provided when designing emergency facilities.	GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should conduct field observations of the on-hand inventory of emergency equipment and, based on the ERP and its supporting procedures, determine if enough emergency equipment and supplies have been provided. • Auditors should conduct field observations to spot-check the material condition of emergency equipment and supplies.

Table 19.11 presents the recommended related audit criteria and auditor guidance for emergency response drills and exercises.

Table 19.11 Related Audit Criteria and Auditor Guidance -
Emergency Response Drills and Exercises

Audit Criteria	Source	Guidance for Auditors
19-R-36. For non-TSD facilities, regular drills/exercises of the ERP are conducted.	GIP	<u>Background Information for Auditors:</u> <ul style="list-style-type: none"> • Drills are tests of one element of a facility's emergency response plan (e.g., evacuation). Exercises test one or more elements (e.g., HAZMAT

Audit Criteria	Source	Guidance for Auditors
		<p>release with one or more injuries). Drills and exercises should simulate as close as possible actual emergency conditions without putting personnel at undue risk or being overly disruptive of operations. Drills or exercises should be documented, with a critique conducted afterwards, and documentation of lessons learned and opportunities for improvement.</p> <ul style="list-style-type: none"> • If the emergency response relies fully or partially on external agencies/ mutual aid, these organizations should be regularly actively involved in drills and exercises. • Common industry practice calls for at least annual drills and/or exercises to maintain the competency of facility personnel, including emergency responders; however, this frequency is not mandatory, nor is it the type of drill or exercise that should be conducted. • Emergency response exercises can also be conducted via table-top scenarios, either as a standalone activity or prior to conducting a full-scale exerciser. These activities give responders an opportunity to practice response procedures, assessments, and decision-making, and offer scenarios that are difficult to stage or are overly disruptive to operations. • Emergency response drills/exercises can be conducted in conjunction with other types of drills/exercises, such as those conducted to test facility security plans. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should observe ERP drill/exercises scheduled during the audit period to determine if it is a valid and realistic test of the ERP and its participants. Auditors should not request that

Audit Criteria	Source	Guidance for Auditors
		<p>Table 19.11 – <i>Continued</i></p> <p>these activities be staged just for the audit.</p>
<p>19-R-37. Drills or exercises are planned in advance.</p>	<p>3133</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Although planning of drills and exercises in advance has its benefits (particularly for exercises which are more complex and require more upfront planning), there is also a benefit to not broadly announcing planned exercises. This results in unplanned, unannounced drills. For well-established emergency response programs, this element of surprise more closely tests the conditions of a real emergency. It is important, however, that all personnel involved clearly understand that the drill is only a simulated emergency, and that, although normal emergency procedures should be implemented, extraordinary procedures such as shutting down a unit or notifying outside authorities should be simulated to avoid unnecessary problems. • Emergency exercises that test multiple aspects of the emergency response plan usually involve multiple agencies as well as plant personnel. Advance planning is necessary so that all parties involved can understand the scenario and their role in the response. Often as much or more benefit results from the planning of the exercise as in the actual exercise itself. Particularly with outside agencies, it is important that all parties understand and know how to carry out their emergency responsibilities. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interviews with facility personnel that plan and participate in ERP drills/exercises to determine if ERP drill/exercise advanced

Audit Criteria	Source	Guidance for Auditors
		<p>planning results in activities that test the ERP as desired, but does not create activities that do not test the participants' knowledge and capabilities.</p>
<p>19-R-38. The drills or exercises are critiqued after they are complete.</p>	<p>GIP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • A written critique should be generated, which documents the lessons learned and improvement action items identified from the drill or exercise. These could include revisions to the ERP or procedures, changes to training programs, or changes to emergency response equipment or supplies. • It is not mandatory that recommendations or action items generated from an emergency response drill/exercise critiques be tracked in a formal system, as they are for PHA or incident investigation recommendations. If the facility or company creates a recommendation as a result of an ERP critique it should receive the same level of attention as those recommendations or action items generated from an emergency response critique. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review facility ERP drill/exercise critiques to verify that they are being documented. • Auditors should review emergency response documentation to confirm that ERP drill/exercise critique recommendations or action items are being resolved and implemented in a manner that is similar to any other PSM-related recommendation or action item.
<p>19-R-39. Emergency drills are as realistic as possible.</p>	<p>CCPA GIP</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should interview facility personnel responsible for emergency drills and exercises to determine if emergency drills and exercises are scheduled to

Audit Criteria	Source	Guidance for Auditors
		<p>coincide with emergency shutdown drills to practice response to external emergencies and process upsets (if this can be accomplished safely and in a controlled manner).</p> <ul style="list-style-type: none"> • Auditors should interview facility personnel responsible for emergency drills and exercises to determine if appropriate outside organizations that are part of the facility ERP are involved in emergency drills and exercises, to the extent that these agencies agree to participate. Examples include the U.S. Coast Guard, local fire departments, neighboring industries, or other organizations with whom mutual aid agreements exist. • Auditors should interview facility personnel responsible for emergency drills and exercises to determine if the public has been advised of emergency drills and exercises, as appropriate, using the CAER process, CAP, LEPC, local newspaper or radio stations, or other appropriate means. Advising the public can alleviate concerns over the use of alarms they might hear and the use of emergency equipment they might see, causing them to believe that a real event is occurring.

19.2.3 Voluntary Consensus PSM Programs

The following voluntary consensus PSM program requirements for safe work practices are described below:

- The requirements published for the offshore oil platform sector in the Safety and Environmental Management Program (SEMP), a voluntary program designed by API and endorsed by the Minerals Management Service of the U.S. Department of the Interior.
- Responsible Care Management System (RCMS)[®] published by the American Chemistry Council.
- RC14001 Environmental Management System, published by the American Chemistry Council.

Table 19.12 lists the recommended related audit criteria and auditor guidance relating for emergency management pursuant to voluntary consensus PSM programs.

Table 19.12 Voluntary Consensus PSM Program Audit Criteria and Guidance for Auditors - Emergency Management

Audit Criteria	Source	Guidance for Auditors
<i>SEMP</i>	API Recommended Practice (RP)75	
<p>19-R-40. The emergency action plan addresses the following required elements:</p> <ul style="list-style-type: none"> • escape procedures and routes, • procedures for post-evacuation employee accounting, • process for reporting emergencies, • duties and procedures for employees who remain to operate critical equipment or perform rescue and medical duties, • identification of persons or locations to contact for more action plan information, • employee alarm systems, • fires and/or blowouts, • collisions, and • spills of hazardous material. 	RP 75, 10.2, 10.3	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • There should be clear and concise written plans including required elements and outlining roles, responsibilities, and resources necessary to effectively respond to potential emergencies. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the facility EAP to determine if it is a clearly and concisely written plan that includes required elements and outlining roles, responsibilities, and resources necessary to effectively respond to potential emergencies.
<p>19-R-41. The emergency action plan assigns authority to a qualified person at the facility for initiating emergency response and control procedures.</p>	RP 75, 10.2	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the written EAP to determine if the plan designates a person or position in charge with this responsibility for all facilities and operating areas.
<p>19-R-42. The management program requires that emergency action drills based on realistic scenarios are scheduled and conducted to involve all affected personnel.</p>	RP 75, 10.2.a., 10.2.b., 10.2.c., 10.2.d., 10.4	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the program to determine if it includes the following: <p>Written drill schedule.</p> <p>Documentation that indicates facilities are complying with schedule.</p> <p>Program guidance on the types of drills to be conducted.</p> <p>Records showing conformance to regulatory requirements on drill</p>

Audit Criteria	Source	Guidance for Auditors
		<p>Table 19.12 – Continued frequencies and types (see references).</p> <ul style="list-style-type: none"> Evidence in drill records that all facility personnel, including all contractors or visitors, have participated in drills.
<p>19-R-43. The management program requires that a critique and analysis of each drill be conducted to identify and correct weaknesses in the plan, as appropriate.</p>	<p>RP 75, 10.4</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the program to determine if it includes the following: Evidence that post drill critiques are required and occurring. Indications that the emergency action plans were modified, as appropriate, when critiques requiring plan changes were identified.
<p>19-R-44. The emergency action plan designates an emergency control center (ECC) for each facility that would provide access to the following elements:</p> <ul style="list-style-type: none"> oil spill contingency plan safety & environmental information emergency action plan 	<p>RP 75, 10.3</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the program to determine if it includes the following: Written designation of ECCs. Written SOP designating personnel of sufficient emergency action authority within the organization.
<p>19-R-45. There is an alarm system established and implemented on the facility for identifying emergencies and the alarms meet the following criteria:</p> <ul style="list-style-type: none"> Distinctive for each purpose of the alarm. Capable of being perceived above ambient noise and light levels by all employees. Distinctive and recognizable as a signal to evacuate the work area or perform actions designated under the plan Maintained in operating condition. Tested appropriately and restored to normal operating condition as soon as possible after test. Serviced, maintained, and tested by appropriately trained persons. Unobstructed, conspicuous, and readily accessible, if they are manual alarm systems. 	<p>RP 75, 10.2</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the program to determine if it includes the following: Evidence of inspection of the alarm system, including effectiveness tests. Written description of the alarm system, including schematics.

Audit Criteria	Source	Guidance for Auditors
19-R-46. The management program ensures that evacuation routes are not blocked, locked, or barricaded.	RP 75, 10.2	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should conduct field observations to verify that these routes are kept clear and functional.
19-R-47. The management program provides for readily visible signs designating evacuation routes leading to safe locations.	RP 75, 10.2	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should conduct field observations to verify that facility signs readily visible.
19-R-48. The management program provides for ensuring that operations and maintenance employees who are likely to discover a release or are assigned other emergency response duties understand and can demonstrate their duties in an emergency situation such as: <ul style="list-style-type: none"> • pipeline rupture and or spill of hazardous substances; • man overboard; • fire/explosions; and • platform abandonment. 	RP 75, 10.2	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should conduct interviews with facilities and management personnel to determine if a method for evaluating personnel emergency action performance has been implemented.

Audit Criteria	Source	Guidance for Auditors
<i>Responsible Care® Management System (RMCS)</i> 19-R-49. The organization has developed a comprehensive emergency response plan, with appropriate considerations for: <ul style="list-style-type: none"> • Notification procedures • Roles and responsibilities • Incident scenarios • Alarm procedures • Drill requirements/frequency • Community recovery needs 	RCMS Technical Specification, Element 3.2	<u>Background Information for Auditors:</u> <ul style="list-style-type: none"> • "Community recovery needs" relates to having documented plans or a policy to take care of things like housing, medical expenses, etc., in the aftermath of a catastrophic release or incident that results in evacuation, property damage, or personal injury. <u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should confirm that a ERP has been developed and implemented and that it contains the following provisions at a minimum: <ul style="list-style-type: none"> – Notification procedures – Roles and responsibilities – Incident scenarios – Alarm procedures – Drill requirements/frequency – Community recovery needs

Audit Criteria	Source	Guidance for Auditors
<p>Table 19.12 – Continued</p> <p>19-R-50. The organization's emergency response procedures include:</p> <ul style="list-style-type: none"> • appropriate considerations of communications and community recovery needs • appropriate participation in development, implementation and maintenance of community emergency preparedness plans. 	<p>RCMS Technical Specification, Element 3.2</p>	<ul style="list-style-type: none"> • No further guidance.
<p>19-R-51. Regarding transportation emergency response, the organization has developed a system to:</p> <ul style="list-style-type: none"> • Provide technical assistance to on-scene responders, with internal notification systems concerning off-site events, typically through CHEMTREC – OR – • Use contract emergency responders to physically respond to off-site emergencies involving the organization's products – OR – • Provide hands-on response by company response personnel and company equipment to off-site emergencies – OR – • A combination of the above 	<p>RCMS Technical Specification, Element 3.2</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review facility emergency response procedures or other related documentation to determine if the facility has an appropriate, documented process for responding to chemical transportation incidents, using one or more of the four approaches listed.

Audit Criteria	Source	Guidance for Auditors
<p><i>RC14001</i></p> <p>19-R-52. The organization has established, implemented and maintained a procedure(s) to identify potential emergency situations and potential accidents that can have an impact(s) on the environment and how it will respond to them.</p>	<p>RC14001 Technical Specification RC151.03 4.4.7</p>	<ul style="list-style-type: none"> • No further guidance.
<p>19-R-53. The organization shall periodically review and, where necessary, revise its emergency preparedness and response procedures, in particular, after the occurrence of accidents or</p>	<p>RC14001 Technical Specification RC151.03 4.4.7</p>	<ul style="list-style-type: none"> • No further guidance.

Audit Criteria	Source	Guidance for Auditors
emergency situations.		
19-R-54. The organization shall also periodically test such procedures where practicable.	RC14001 Technical Specification RC151.03 4.4.7	• No further guidance.

19.3 AUDIT PROTOCOL

The process safety program audit protocol available online (see page xiv for information on how to access this resource) provides detailed questions that examine the issues described in Section 19.2.

REFERENCES

- American Chemistry Council, *RCMS[®] Technical Specification*, RC101.02, March 9, 2005
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations*, RC101.02, January 25, 2004
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations Appendices*, RC101.02, January 25, 2004
- California, California Code of Regulations, Title 8, Section 5189, CalOSHA, November 1985
- Center for Chemical Process Safety (CCPS), *Guidelines for Risk Based Process Safety*, American Institute of Chemical Engineers, New York, 2007 (CCPS, 2007c)
- Delaware, *Accidental Release Prevention Regulation*, Delaware Department of Natural Resources and Environmental Control/Division of Air and Waste Management, September 1989 (rev. January 1999)
- Department of the Interior, Minerals Management Service, *Safety and Environmental Management Program (SEMP)*, 1990
- Environmental Protection Agency (USEPA), 40 CFR §68, *Accidental Release Prevention Requirements: Risk Management Programs Under Clean Air Act Section 112(r)(7)*; Final Rule, June 21, 1996
- Environmental Protection Agency (USEPA), *Federal Register* (FR 28642), Integrated Contingency Plan (ICP) Guidance, June 5, 1996
- New Jersey, *Toxic Catastrophe Prevention Act (N.J.A.C. 7:31)*, New Jersey Department of Environmental Protection, June 1987 (rev. April 16, 2007)
- Occupational Safety and Health Administration (OSHA) 29 CFR §1910.119, *Process Safety Management of Highly Hazardous Chemicals, Explosives and Blasting Agents; Final Rule*, Washington, DC, February 24, 1992
- Occupational Safety and Health Administration (OSHA) Publication 3133, *Process Safety Management Guidelines for Compliance*, Washington, DC, 1993

- Occupational Safety and Health Administration (OSHA) Instruction CPL 02-02-045 CH-1, *PSM Compliance Directive*, Washington, DC, September 13, 1994
- Occupational Safety and Health Administration (OSHA) Instruction CPL 03-00-004, *Petroleum Refinery Process Safety Management National Emphasis Program*, June 7, 2007 (OSHA, 2007a)
- Occupational Safety and Health Administration (OSHA) Directive 09-06 (CPL 02), *PSM Chemical Covered Facilities National Emphasis Program*, July 27, 2009 (OSHA, 2009a)

20

INCIDENT INVESTIGATION

This element is also called Incident Investigation in OSHA PSM and EPA RMP programs, as well as in many state regulatory PSM programs and voluntary consensus PSM programs. Incident Investigation is an element of the RBPS accident prevention pillar Learn from Experience.

20.1 OVERVIEW

Many of the concepts/precepts that define process safety management were developed in response to the tragic accidents that occurred within the chemical process industries beginning in the 1960s. Flixborough, Bhopal, and Texas City are now considered to be defining incidents with respect to process safety management because these serious accidents captured the attention and action of the industry. The investigations of these incidents identified key process safety issues used to shape process safety philosophy, thereby contributing significantly to the advancement of process safety.

The CCPS book, *Guidelines for Investigating Chemical Process Incidents, 2nd Ed.* (CCPS, 2003) identifies the following four goals for an effective incident investigation system:

- Encouraging employees to report all incidents including near misses
- Ensuring investigations identify root causes
- Ensuring investigations identify recommended preventive measures that reduce the probability of recurrence or mitigate potential consequences.
- Ensuring follow-up action to resolve incident investigation recommendations effectively.

Another goal is to ensure that there is a feedback loop from actual events and near misses back to the employees and their continued training and that key learnings from investigations are shared.

The regulatory compliance aspects of incident investigation in the OSHA PSM standard are designed to ensure relevant process safety incidents are investigated thoroughly and follow-up actions are resolved in a timely manner. The auditing function is designed to ensure that these requirements are being met. The related guidance presented in this chapter is aimed at improving the quality of the incident investigation effort.

The incident investigation element interfaces significantly with other PSM program elements. The primary interfaces with other elements include the following:

- Workforce Involvement (Chapter 7)—incident investigations are one of the primary means to foster employee participation in the PSM program by having employees serve as investigation team members.
- Hazard Identification and Risk Analysis (Chapter 10)—HIRAs are sometimes performed as part of the investigation process for a process safety incident. If the HIRA is not updated/revalidated as a result of the incident investigation process, the report will be reviewed the next time the HIRA is revalidated.
- Operating Procedures (Chapter 11)—the findings of incident investigations often result in changes to the operating procedures.
- Training and Performance Assurance (Chapter 15)—the findings of incident investigations often result in changes to the operator-training program.
- Asset Integrity and Reliability (Chapter 13)—the findings of incident investigations often result in changes to the AI program, particularly the inspection, testing, and preventive maintenance program.
- Emergency Management (Chapter 19)—the findings of incident investigations sometimes result in changes to the emergency plans or procedures.

In Section 20.2, both compliance and related audit criteria are presented, along with guidance for auditors in applying the criteria. A full explanation of compliance and related audit criteria are presented in Chapter 1 (see Section 1.7). The criteria and guidance shown in these sections do not represent exclusive solutions to PSM program design, implementation, or interpretation. They represent the collective experience of many people in the chemical/processing sector who have performed many PSM audits, and the consensus opinion resulting from that experience. The compliance criteria are derived from the regulations that govern PSM programs in the United States; however, these regulations are all performance-based. Performance-based regulations are goal oriented and there may be multiple pathways to fully complying with them. Therefore, there may be alternate interpretations and solutions to the issues described in the compliance tables in this chapter that are equivalent to those shown, particularly the auditor guidance presented.

The inclusion of the related guidance in no way infers that these considerations must be implemented for a PSM program to be successful, nor does it infer that a PSM

program will be deficient without them. As with the compliance criteria, there may be other, more appropriate solutions for an individual facility or company. In addition, the use of the related guidance in a PSM audit is intended to be completely voluntary and not a mandatory requirement in any way. They should be used cautiously and with careful planning so that they do not inadvertently establish unintended performance standards. Consensus should be sought within and among facilities and their parent companies before their use. Finally, the related guidance offered for consideration are not endorsements of nor agreements with the written or verbal clarifications made by the regulators, PSM citations issued against the regulations, other PSM guidance published by the regulators, or the successful or common PSM practices in any given company's PSM program from which they are derived.

20.2 AUDIT CRITERIA AND GUIDANCE

The detailed requirements for Incident Investigation included in the OSHA PSM Standard, EPA RMP Rule, several state PSM regulatory programs, as well as for other common voluntary consensus PSM programs are presented below.

The audit criteria described below are examined by auditors using the guidance provided by performing the following audit activities:

- Interviewing the person at the facility who has the responsibility for managing the development, review, approval, and maintenance of the facility's incident investigation procedure. This person(s) is generally the EHS manager or the safety and health manager.
- Reviewing the incident investigation procedure for the facility (this procedure is often a facility-wide document).
- Reviewing incident reports for PSM-related incidents.
- Interviewing the operators and staff to determine if all relevant incidents and near misses have been identified and investigated.
- Interviewing the operators to determine if they have been informed of the lessons learned from incident investigations.
- Reviewing the records that describe the follow-up of incident report recommendations and action items.
- Field verifying the implementation of corrective actions.

Auditors should also carefully examine the incident investigation requirements found in the procedures of the company/facility being audited. As stated in Section 1.7.1, these could be interpreted as compliance requirements by regulators and could be subject to citations if they are not being followed. Auditors should confirm, via interviews, records and incident investigation, that safety knowledge procedures have been implemented as specified. Findings should be generated if the company/facility-specific provisions are not being followed.

See the Guidance for Chapters 3–24 in the Introduction for the definition of the abbreviations shown in the following tables that are used to indicate the source of the criteria.

20.2.1 Compliance Requirements

The audit criteria should be used by the following:

- Readers in the United States covered by the PSM Standard or RMP Rule.
- Readers who have voluntarily adopted the OSHA PSM program.
- Readers whose companies have specified OSHA PSM requirements in non-U.S. locations.

Table 20.1 describes the audit criteria and auditor guidance for Incident Investigation pursuant to OSHA PSM and EPA RMP.

Table 20.1 OSHA PSM and EPA RMP Audit Criteria and Guidance for Auditors - Incident Investigation

Audit Criteria	Source	Guidance for Auditors
<p>20-C-1. The employer shall investigate each incident which resulted in, or could reasonably have resulted in a catastrophic release of highly hazardous chemical in the workplace.</p>	<p>PSM (m)(1) RMP 68.60</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • A key indicator that the relevant PSM incidents and near misses are being reported and investigated is that there is a system in place to report and investigate incidents and it appears to be functioning properly. PSM incidents and near misses are those that involved PSM-covered processes, equipment, or highly hazardous chemicals. • The incident investigation procedure/system for PSM incidents is often the same procedure/system that is also used for recommendations for non-PSM incident investigations. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should conduct interview with employees to determine if relevant PSM incidents and near misses are being investigated or if incidents are occurring and either not being reported or investigated.
<p>20-C-2. An incident investigation shall be initiated as promptly as possible, but not later than 48 hours following the incident.</p>	<p>PSM (m)(2) RMP 68.60</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The initiation of the investigation of PSM incidents does not necessarily mean that the actual collection of evidence, interviews, or other investigative activities has begun (although it is advisable to do so before evidence is compromised or memories fade).

Audit Criteria	Source	Guidance for Auditors
		<p>The initiation of the investigation may be the formal designation of the investigation team, the initiation of evidence collection, or the formal reporting of the incident. In many current incident reporting and investigation systems (which are computerized database systems), the act of reporting the incident is the entry of initial information into the reporting system. Sometimes the date and time of the initial report is manually entered or recorded, and sometimes it is automatically logged from the computer's internal clock.</p> <ul style="list-style-type: none"> • Although PSM incident reports are required to record the date of the incident and the date that the investigation began, this time limit is measured in hours. Therefore, unless the dates and times of the incident and the commencement of the investigation are recorded, the facility may not be able to confirm that it met the 48-hour limit. However, this does not mean that the times have to be recorded in the incident report. They may be recorded elsewhere, such as an electronic incident reporting system, incident investigation database, operator or supervisor logs, documents (e.g., a letter, memo, or e-mail) that authorize the initiation of the investigation, or a similar document. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check to confirm that the time between the occurrence of the PSM incident and the beginning of the incident investigation can be measured in hours. • Review PSM investigation reports and determine time between incident occurrence and start of investigation.

Audit Criteria	Source	Guidance for Auditors
<p>Table 20.1 – Continued</p> <p>20-C-3. An incident investigation team shall be established and consist of at least one person knowledgeable in the process involved, including a contract employee if the incident involved work of the contractor, and other persons with appropriate knowledge and experience to thoroughly investigate and analyze the incident.</p>	<p>PSM (m)(3) RMP 68.60</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • PSM incident investigation reports should include the titles of or roles filled by team members. • A person knowledgeable in the process does not mean that a nonmanagement employee, such as an operator, is a mandatory incident investigation team member. For example, an operations supervisor would suffice. • A contractor is required to be on the investigation team if the incident involved the work of a contractor. This does not have to be (and often should not be) the same contractor who was involved; it can be the supervisor or another contractor employee. If the contractor employer refuses to participate in the investigation of an incident that involved one or more of their employees, this refusal should be documented in the incident report. • PSM incident investigation teams should not include those personnel who will be interviewed and from whom evidence will be collected for that incident. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review PSM incident reports to ensure that teams are multi-functional as appropriate given the nature of the incident and the skills required to properly investigate it, that operators are included on the teams, and that contract employees are included as warranted. • Auditors should review training records for investigation training courses. Investigations should only be led by team leaders who are properly qualified to do so, given the nature of the incident and the investigative techniques that are required to collect and

Audit Criteria	Source	Guidance for Auditors
		<p>evaluate the evidence, interview participants, and prepare the report. Certified investigation team leaders are not required. The auditor should review the specifics of the incidents that have occurred and then review the qualifications of the persons who led the investigations.</p> <ul style="list-style-type: none"> Auditors should interview team members of PSM incident investigations to determine what experience/training they have had in the investigation process.
20-C-4. Incident reports include the date of incident.	PSM (m)(4)(i) RMP 68.60	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review PSM incident investigation reports to determine if they include the incident date.
20-C-5. Incident reports include the date investigation began.	PSM (m)(4)(ii) RMP 68.60	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review PSM incident investigation reports to determine if they include the date that the investigation began.
20-C-6. Incident reports include a description of the incident.	PSM (m)(4)(iii) RMP 68.60	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The consequences of PSM incidents should be described. Descriptions should be detailed and may be supplemented with tables, timelines, or other supporting data/information as warranted. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review PSM incident reports for descriptions of how, when, and where the incident occurred, including what personnel were involved.
20-C-7. Incident reports include the factors that contributed to the incident.	PSM (m)(4)(iv) RMP 68.60	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Determination of the causal factors of a PSM incident is usually accomplished using root cause analysis (sometimes called apparent cause analysis), for which there are several established consensus methods, ranging from fairly simple (e.g., fishbone diagrams) to more complex (proprietary methods such as TapRoot®).

Audit Criteria	Source	Guidance for Auditors
		<p>Table 20.1 – Continued</p> <p>The root cause analysis method employed should be identified in the incident report or other investigation documentation.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review PSM incident reports for findings and root cause analysis. The analysis should be deep enough to reach the true root causes, and not the last/direct causal factors.
20-C-8. Incident reports include any recommendations resulting from the investigation.	PSM (m)(4)(v) RMP 68.60	<p><u>Background Information for Auditors:</u></p> <p>Recommendations for PSM incident investigations should be detailed enough for an auditor who has reviewed the investigation report to understand the expected action. The recommendations should address the root causes. Each recommendation should include an assigned person and a target completion date. The recommendations should prevent recurrence.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review PSM incident reports to determine if they include recommendations where warranted. For most incidents, the lessons learned will indicate that recommendations are appropriate to correct the root causes or make them less frequent.
20-C-9. The employer shall establish a system to promptly address and resolve the incident report findings and recommendations.	PSM (m)(5) RMP 68.60	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The management system for resolving PSM incident investigation recommendations is often a combined system that is also used for recommendations for non-PSM incident investigations. There is a management system in place to address the PSM incident report recommendations. Address means to assign responsibility for corrective action, assign a target completion date, track the status of recommendations via

Audit Criteria	Source	Guidance for Auditors
		<p>measures/ periodic reports to management, and document what is done to resolve identified problems. Although it is common practice to use a spreadsheet, database, or other electronic means of managing incident report recommendations, it is not mandatory that the management system be computerized.</p> <ul style="list-style-type: none"> • Although promptly is not specifically defined, the resolution should occur within a reasonable amount of time. Work to resolve identified issues should begin within a relatively short period after approval of the final PSM incident report. The specifics of each recommendation should be considered by the auditor when determining whether or not the findings were resolved promptly. • The resolution process for recommendations associated with high-risk hazard scenarios should begin as soon as the PSM incident investigation is completed and the incident report has been reviewed for completeness, or even before if the risk warrants. • In some cases, corrective action may involve a relatively simple change in procedure or minor maintenance effort. Other recommendations, however, may require engineering studies or in-depth review of actual procedures and practices, and these recommendations will take longer to resolve. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should interview employees to see if they think PSM incident investigation recommendations are promptly addressed. • Auditors should field verify resolution of PSM incident investigation report recommendations.
<p>20-C-10. Resolutions and corrective actions shall be documented.</p>	<p>PSM (m)(5)</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The system used to manage

Audit Criteria	Source	Guidance for Auditors
	RMP 68.60	<p>PSM incident report recommendations contains documentation that describes the final corrective actions taken.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the management system for resolving PSM incident investigation recommendations to determine if the resolutions and corrective actions are being documented.
20-C-11. Incident reports shall be reviewed with all affected personnel whose job tasks are relevant to the incident findings including contract employees where applicable.	PSM (m)(6) RMP 68.60	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> Communication of PSM incident reports may include a number of formats including face-to-face briefings, e-mails or intranet postings to employees, posted hard-copy information, handouts, or agenda topics during safety meetings. If face-to-face briefings (separate or safety meetings) are thoroughly documented these should serve as sufficient evidence alone that the results were adequately communicated. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review available documentation regarding how PSM incident investigation reports were shared with affected employees. <p>Table 20.1 – Continued</p> <ul style="list-style-type: none"> Auditors should interview employees to determine if they not only received the communication but also understood it, especially if e-mails or intranet postings to employees, posted hard-copy information, handouts, or other methods that do not include face-to-face communications are used to disseminate the results.
20-C-12. Incident investigation reports shall be retained for five years.	PSM [(m)(7)] RMP 68.60	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review PSM incident reports to determine if they have been retained for at least five years.

20.2.1.1 U.S. State PSM Programs

If the PSM program being evaluated is pursuant to a state PSM regulation, then the specific process safety knowledge requirements for that regulatory program should be followed. In general, these overlap somewhat with the federal OSHA PSM and EPA RMP requirements, but often there are state-specific requirements that should be met, even if the state has received authority to enforce federal regulations (i.e., the state is an OSHA state plan state, or has received implementing agency status for the RMP Rule from EPA). The state-specific applicability requirements for the following states are presented below:

- New Jersey
- California
- Delaware

Table 20.2 shows the audit criteria and auditor guidance for Incident Investigation pursuant to U.S. state PSM requirements.

Table 20.2 U.S. State PSM Audit Criteria and Guidance for Auditors - Incident Investigation

Audit Criteria	Source	Guidance for Auditors
<p><i>New Jersey Toxic Catastrophe Prevention Act (TCPA)</i> 20-C-13. A description of the incident EHS accident or potential catastrophic event in chronological order providing all the relevant facts. Include the identity, amount and duration of the EHS release if these facts can be reasonably determined based on the information obtained through the investigation. Also, identify the consequences, if any, of the EHS accident or potential catastrophic event including the number of evacuees, injured, and fatalities, and the impact on the community.</p>	<p>N.J.A.C. 7:31-4.7</p>	<ul style="list-style-type: none"> • No further guidance
<p><i>Delaware Accidental Release Prevention Regulation</i> 20-C-14. The Delaware EHS regulations do not add any different or unique incident investigation requirements beyond those described for the PSM Standard and RMP Rule.</p>	<p>DE Code, Chapter 77, Section 5.81</p>	<ul style="list-style-type: none"> • No further guidance.
<p><i>California OSHA—Process Safety Management of Acutely Hazardous Materials</i> 20-C-15. In addition to the requirements of the OSHA PSM</p>	<p>CCR, Title 8, Section 5189</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The Cal OSHA reporting requirement is broader than the OSHA requirement, which is limited to "affected personnel"

Audit Criteria	Source	Guidance for Auditors
Standard and EPA RMP Rule, the incident investigation report: "shall be reviewed with all operating, maintenance, and other personnel whose work assignments are within the facility where the incident occurred."		whose job tasks are relevant to the incident findings." Cal OSHA does not limit the reporting to those with relevant job tasks.
<i>California Accidental Release Prevention Program</i> 20-C-16. The CalARP regulations do not add any different or unique incident investigation requirements beyond those described for the PSM Standard and RMP Rule.	CCR, Title 19, Section 2760.9	<ul style="list-style-type: none"> • No further guidance.

20.2.2 Related Criteria

The purpose of providing these criteria is to provide auditors with guidance for evaluating PSM programs with respect to issues that go beyond the strict compliance requirements presented above, and in large part represent industry good practices, or in some cases practices that have become common. Some of the related criteria have reached the status of a level of acceptable practice because of their widespread, accepted, and successful use over an extended period of time. Auditors and PSM practitioners should carefully consider implementing this guidance, or at least designing an approach that is similar in nature. See the Glossary and Section 1.7.1 for a more complete discussion of the meaning and use of level of acceptable practice.

Table 20.3 identifies the recommended related audit criteria and auditor guidance for related criteria for Incident Investigation.

Table 20.3 Related Audit Criteria and Auditor Guidance - Incident Investigation

Audit Criteria	Source	Guidance for Auditors
20-R-1. There is a written incident investigation procedure in place that describes the management systems to address how incident investigations are to be organized, staffed, managed, documented, reported, and how the follow-up is to be performed.	CCPA GIP	<p><u>Auditor Activities:</u> Auditors should review the facility's written PSM incident investigation procedure to determine if it addresses the following issues:</p> <ul style="list-style-type: none"> - It is not unusual that the PSM incident investigation procedure covers both occupational safety and process safety incidents. However, clear definitions and guidance for determining what incidents qualify as process safety incidents and near misses should be provided, including

Audit Criteria	Source	Guidance for Auditors
		<p>examples.</p> <ul style="list-style-type: none"> - How PSM incidents and near misses are reported. - The PSM incident investigation procedure should describe how the 48-hour limit on initiating the investigation is to be documented. - PSM incident investigation team selection. If subject-matter experts (SMEs) are needed due to the forensic work required they should be provided. - To whom the team reports. - Assignment of responsibilities during PSM incident investigations. - Designation, training, and qualifications of PSM incident investigation team leaders (i.e., at least one person with specific training and experience in leading investigations, evidence collection, incident investigation interviews, etc.). - Designation, training, and qualification of the remaining PSM incident investigation team members (i.e., at least one person knowledgeable in the process involved, a contract employee if the incident involved work of the contractor, and other persons with appropriate knowledge and experience to thoroughly investigate and analyze the incident). - Division of duties to avoid organizational conflicts of interest in PSM incident investigations; an internal verification process to ensure that PSM incident investigation activities are being carried out in accordance with management system procedures. - Management review of PSM incident investigations activities that provide a closure of the feedback loop by adjusting the program requirements and by carefully reviewing the verification activity results. - Guidance pertaining to the

Audit Criteria	Source	Guidance for Auditors
		<p>Table 20.3 – Continued</p> <p>collection of PSM incident evidence and other information, e.g., photography techniques, measurements, interviewing guidance.</p> <ul style="list-style-type: none"> – Analysis of PSM incident root cause(s). – How the findings and recommendations of PSM incident investigations will be promptly resolved (the process or system that is used to manage recommendations). – How the results of PSM incident investigation will be disseminated to those with direct PSM responsibilities and to the employees at large. – Guidance that PSM incident investigations are to be initiated as soon as possible, but no later than 48 hours following the incident and what constitutes initiation of the investigation. – Format, content, review, and approval of PSM incident investigation reports. Incident reports should be complete enough to support other PSM elements (such as review as part of a PHA revalidation), The report should be written in a manner that would allow someone who was not involved in the incident or investigation to understand the report. This completeness should be assessed by auditors reviewing incident reports. – A PSM incident log or listing. – Retention of PSM incident reports and records that show how the recommendations have been resolved.
<p>20-R-2. There is a procedure or process in place to internally report all incidents including near misses so that formal investigations can be initiated promptly, as appropriate.</p>	<p>CCPA GIP NEP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Since there is typically a high ratio of near-miss incidents to actual incidents, if the number of PSM near-miss incident investigations is not greater than the number of actual PSM incident investigations, then adequate investigation of PSM near-miss incidents may be

Audit Criteria	Source	Guidance for Auditors
		<p>suspect.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should interview employees to determine if all PSM incidents and near misses are being investigated or if PSM incidents and near misses are occurring and either not being reported or investigated. • Auditors should review PSM near-miss reports and investigations versus interview results, emergency work order review, and field observations to determine if the relevant PSM incidents and near misses that should have been investigated were reported and thoroughly investigated. • To ensure PSM near misses are being investigated, auditors should evaluate the number of near-miss incident investigations conducted versus the number of actual PSM incident investigations that have been conducted.
<p>20-R-3. Lead investigators are trained and experienced in incident investigation techniques.</p>	<p>GIP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • PSM incidents should be investigated by persons who understand the basics of evidence collection, conducting interviews after an incident, etc. • Training records should contain evidence that PSM incident investigation team leaders have received formal training in performing and leading incident investigations. • Team leaders should stay in practice to be effective. Determine if team leaders are regularly leading PSM incident investigations (several times a year). <p><u>Auditor Activities:</u></p> <p>Auditors should review the PSM incident investigation reports and the qualifications of the investigation team leaders with respect to the nature of the incidents to determine if qualified leaders were assigned</p>

Audit Criteria	Source	Guidance for Auditors
		<p>Table 20.3 – Continued</p> <ul style="list-style-type: none"> to conduct the investigations.
<p>20-R-4. Investigation team leaders are impartial for the investigations they lead.</p>	<p>GIP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The impartiality of the PSM incident investigation team, particularly the team leader, should be preserved if possible. For example, a team leader investigating a major incident should not report directly to the facility manager if possible. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review organization charts of the facility to determine that the PSM incident investigation team leaders do not have conflicts of interest and are impartial with respect to the investigation or its results. If organization charts or job descriptions cannot be used to determine this impartiality, auditors should interview PSM incident investigation team leaders and members.
<p>20-R-5. Incident investigations have been conducted for liquid hydrocarbon or hydrocarbon vapor releases from a vent stack of a blowdown drum.</p>	<p>NEP</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> If the facility has atmospheric blowdown drums for hydrocarbon overpressure relief collection, auditors should review investigation reports to ensure that any release from the blowdown drum has been investigated. Auditors should interview operators and other personnel to determine if any releases from atmospheric blowdown drums have been investigated. Auditors should review environmental logs to see if such releases have been reported and verify that these releases have been investigated, as appropriate.

Audit Criteria	Source	Guidance for Auditors
20-R-6. Incident investigations have been conducted when pressure vessels have experienced abnormal operations.	NEP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Abnormal pressure vessel operations are defined by OSHA as "process/system upsets due to high pressures or high temperatures outside the operating limits that might affect mechanical integrity of the vessel," and did or could have (near miss) resulted in a catastrophic release of a highly hazardous chemical. The opening of a relief device protecting a pressure vessel due to high or low pressure would be an example of such an abnormal operation. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should interview operators and other personnel to determine if any overpressure or over-temperature transients in the facility's pressure vessels have occurred, and if so, verify that these excursions have been investigated.
20-R-7. The incident report recommendations have been managed properly.	GIP CPL	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review PSM incident reports and the records of the system used to manage the investigation recommendations to determine if the recommendations have been properly managed. The following are characteristics of proper recommendation management: <ul style="list-style-type: none"> – There is a management review of the PSM incident findings and recommendations. – Recommendations from PSM incident investigations have been assigned to a particular individual or group for resolution. – A schedule has been developed for the resolution of PSM incident investigations. – When required, PSM incident recommendations are rejected properly. OSHA considers an

Audit Criteria	Source	Guidance for Auditors
		<p>Table 20.3 – Continued</p> <p>employer to have “resolved” the team’s findings and recommendations when the employer either has adopted.</p> <ul style="list-style-type: none"> – the recommendations, or has justifiably declined to do so. An employer can justifiably decline to adopt a recommendation where the employer can document, in writing and based upon adequate evidence, that one or more of the following conditions is true: the analysis upon which the recommendation is based contains material factual errors; the recommendation is not necessary to protect the health and safety of the employer’s own employees, or the employees of contractors; an alternative measure would provide a sufficient level of protection; or the recommendation is infeasible. – When rejecting PSM incident investigation recommendations due to their infeasibility, the following guidance should be used: <ul style="list-style-type: none"> ▪ If the risk would increase due to the implementation of the recommendation, it should be defined as infeasible. ▪ If the recommendation cannot be implemented due to physical limitation, e.g., moving a control room or equipment to a site that is not owned by the company, it should be defined as infeasible. ▪ If the laws of physics and chemistry do not allow the recommendation to be designed, it should be defined as infeasible. ▪ Cost alone should not be used as a criterion for deciding a recommendation is infeasible

Audit Criteria	Source	Guidance for Auditors
		<p>unless the costs will be extreme in relation to the value of the process.</p> <ul style="list-style-type: none"> - When PSM incident investigation recommendations are rejected, the investigation team is informed and any subsequent recommendations of the team are expeditiously resolved. - There is a written procedure that defines the steps to be taken when PSM incident investigation recommendations are rejected. The facility/company should not use ad hoc processes for rejecting these recommendations. - When warranted, interim measures are implemented, as required, to mitigate hazards when long term implementation of PSM incident investigation recommendations is scheduled. - Periodic reports of PSM incident investigation recommendation status are produced and reviewed by management.
<p>20-R-8. Incident reports are issued promptly on completion of the investigation.</p>	<p>GIP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • PSM incident investigations may sometimes require extended time, for example, if complex analysis or testing of samples or components is required, or if access to the site is restricted due to structural issues or the presence of asbestos. Interim reports are sometimes issued. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the dates of completion of PSM incident investigation reports versus the date of the incident and versus the date the investigation began to determine if the time difference is reasonable given the circumstances.

Audit Criteria	Source	Guidance for Auditors
20-R-9. Quality control reviews are performed on incident reports.	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review PSM incident investigation reports, worksheets, or other incident investigation project documentation to determine that the results of the investigation have been subjected to a quality control review before being considered finalized.
20-R-10. Employees have access to incident investigation reports.	OSHA 3133	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> In addition to reviewing PSM incident investigation findings with affected personnel, all employees should have access to archived investigation reports either via hard copy or electronic means. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should interview employees to determine if they have access to PSM incident investigation reports. Auditors should review email or hard copy records of communications to employees regarding PSM incident investigations.
20-R-11. Incident investigation feedback includes lessons learned, both from within the company and elsewhere.	CCPA	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review safety meeting minutes or other evidence where PSM incident lessons learned are disseminated to confirm that lessons learned from other parts of the company and other companies (where available) are discussed.
20-R-12. Lessons learned from incident investigations are shared with industry peers and other organizations.	CCPA	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should interview the safety manager or other personnel who have responsibility for reporting the results of PSM incident investigations to determine if the facility or company investigation results are shared with industry via CCPS or other forums.
20-R-13. Incident data is analyzed for adverse trends and corrective actions are implemented to address	CCPA	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check to determine if PSM incident data

Audit Criteria	Source	Guidance for Auditors
these adverse trends.		is analyzed for trends and that corrective actions are implemented to address these adverse trends. Evidence of this might be found in the incident investigation database or other management system used to report and investigate incidents, or it might be found in an independent record either onsite or maintained by company personnel.

20.2.3 Voluntary Consensus PSM Programs

The following voluntary consensus PSM program requirements for incident investigation are described below:

- The requirements published for the offshore oil platform sector in the Safety and Environmental Management Program (SEMP), a voluntary program designed by API and endorsed by the Minerals Management Service of the U.S. Department of the Interior.
- Responsible Care Management System (RCMS)[®] published by the American Chemistry Council.
- RC14001 Environmental Management System, published by the American Chemistry Council.

Table 20.4 lists recommended related audit criteria and auditor guidance relating to incident investigation pursuant to voluntary consensus PSM programs.

Table 20.4 Voluntary Consensus PSM Program Audit Criteria and Guidance for Auditors - Incident Investigation

Audit Criteria	Source	Guidance for Auditors
<p><i>SEMP</i></p> <p>20-R-14. Procedures for investigation of all incidents with serious safety or environmental consequences have been established by the management program.</p>	API RP 75, 11.1	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Review the written plan describing the procedures for incident investigation, including definition of the types of incidents requiring investigation.
<p>20-R-15. The management program requires investigation of all incidents that are determined by facility management to have possessed the potential for serious safety or environmental consequences.</p>	API RP 75, 11.1	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Review the written plan that requires the reporting and investigation of near misses.

Audit Criteria	Source	Guidance for Auditors
<p>Table 20.4 – Continued</p> <p>20-R-16. A system has been established to promptly document, address, and resolve the incident investigation findings and recommendations.</p>	<p>APPI RP 75, 11.1</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the following: <ul style="list-style-type: none"> – Written procedures for documenting an action plan and resolving action items. – Reports of completed investigations showing the resolution of recommended actions. – Computerized action plan tracking systems.
<p>20-R-17. Multiple incidents are analyzed for common root causes.</p>	<p>API RP 75, 11.1</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the following: <ul style="list-style-type: none"> – Written analyses of multiple incidents. – Safety alerts or other notification systems describing the results of the analyses. – Interviews with employees who have participated in these reviews indicate that multiple incidents have been analyzed for common root causes.
<p>20-R-18. Incidents are investigated by personnel knowledgeable in the process involved, investigation techniques, and other specialties that are viewed as relevant or necessary.</p>	<p>API RP 75, 11.1</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the written plan describing the knowledge, skills, and abilities necessary for investigation team members.
<p>20-R-19. Incident investigation procedures require consideration of the following:</p> <ol style="list-style-type: none"> a. nature of the incident; b. factors (human or other) that contributed to the initiation of the incident and its escalation/control; and c. recommendations identified as a result of the investigation. 	<p>API RP 75, 11.2</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the following: <ul style="list-style-type: none"> – Written procedures describing the scope and content of an investigation. – Completed investigation reports that include the content listed in items a-c.

Audit Criteria	Source	Guidance for Auditors
20-R-20. The findings of the investigation are retained for possible use in the next hazard analysis update, company audits, or for a minimum of 2 years, whichever is greater.	API RP 75, 11.3.1	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review the following: <ul style="list-style-type: none"> – Written plan stating a retention policy. – Copies of investigation reports showing retention or disposal policy.
20-R-21. A system is in place whereby results of investigations are distributed to similar facilities and/or appropriate personnel within the organization.	API RP 75, 2.2.2; API RP14J, 6.2.2	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review the written plan requiring the systematic distribution of investigation results. • Auditors should conduct interviews with appropriate personnel regarding details of the distribution system and their receipt of investigation results.

Audit Criteria	Source	Guidance for Auditors
<p><i>Responsible Care® Management System (RMCS)</i></p> <p>20-R-22. The organization shall identify and investigate incidents and accidents, mitigate any adverse impacts, identify root causes, complete corrective and preventive actions, and share key findings with relevant stakeholders.</p>	RCMS Technical Specification, Element 4.8	<u>Background Information for Auditors:</u> <ul style="list-style-type: none"> • This element addresses the Corrective Action aspect of the Performance Measurement, Corrective and Preventive Action Section. It focuses on the organization's incident investigation system, and calls for a company to identify root cause(s) of an accident or incident, implement appropriate corrective and preventive actions, and share that information with appropriate stakeholders. • Characteristics of a good management system include the following: <ul style="list-style-type: none"> – A system to investigate Responsible Care incidents with defined procedures and responsibilities, and with specific focus on root cause identification as a component of the system. – A corrective and preventive action tracking and implementation system based on incident investigation results. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the

Audit Criteria	Source	Guidance for Auditors
		<p>Table 20.4 – Continued</p> <p>incident investigation management system to confirm that it includes, at a minimum, identifying the root cause(s) of an accident or incident, implementing appropriate corrective and preventive actions, and sharing that information with appropriate stakeholders.</p>

Audit Criteria	Source	Guidance for Auditors
<p>RC14001</p> <p>20-R-23. The organization shall establish, implement and maintain a procedure(s) for dealing with actual and potential nonconformity(ies) and for taking corrective action and preventive action. The procedure(s) shall define requirements for:</p> <ol style="list-style-type: none"> a) identifying and correcting nonconformity(ies) and taking action(s) to mitigate their environmental impacts, b) investigating nonconformity(ies), determining their cause(s) and taking actions in order to avoid their recurrence, c) evaluating the need for action(s) to prevent nonconformity(ies) and implementing appropriate actions designed to avoid their occurrence, ACC: Responsible Care@14001 Technical Specification – March 2005 15 d) recording the results of corrective action(s) and preventive action(s) taken, and e) reviewing the effectiveness of corrective action(s) and preventive action(s) taken. <p>Actions taken shall be appropriate to the magnitude of the problems and the environmental impacts encountered.</p> <p>The organization shall ensure that any necessary changes are made to environmental management system documentation.</p>	<p>RC14001 Technical Specification RC151.03 4.5.3</p>	<ul style="list-style-type: none"> • No further guidance.

20.3 AUDIT PROTOCOL

The process safety program audit protocol introduced in Appendix A and available online (see page xiv for information on how to access this resource) provides detailed questions that examine the issues described in Section 20.2.

REFERENCES

- American Chemistry Council, *RCMS[®] Technical Specification*, RC101.02, March 9, 2005
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations*, RC101.02, January 25, 2004
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations Appendices*, RC101.02, January 25, 2004
- California, California Code of Regulations, Title 8, Section 5189, CalOSHA, November 1985
- Center for Chemical Process Safety (CCPS), *Guidelines for Investigating Chemical Process Incidents, 2nd Edition*, American Institute of Chemical Engineers, New York, 2003
- Center for Chemical Process Safety (CCPS), *Guidelines for Risk Based Process Safety*, American Institute of Chemical Engineers, New York, 2007 (CCPS, 2007c)
- Center for Chemical Process Safety (CCPS), *Incidents that Define Process Safety*, American Institute of Chemical Engineers, New York, 2008
- Chemical Safety and Hazard Investigation Board, Investigation Report—Refinery Explosion and Fire, BP Texas City, Texas March 23, 2005, March 20, 2007
- Delaware, *Accidental Release Prevention Regulation*, Delaware Department of Natural Resources and Environmental Control/Division of Air and Waste Management, September 1989 (rev. January 1999)
- Department of the Interior, Minerals Management Service, *Safety and Environmental Management Program (SEMP)*, 1990
- Environmental Protection Agency (USEPA), 40 CFR §68, *Accidental Release Prevention Requirements: Risk Management Programs Under Clean Air Act Section 112(r)(7)*; Final Rule, June 21, 1996
- New Jersey, *Toxic Catastrophe Prevention Act (N.J.A.C. 7:31)*, New Jersey Department of Environmental Protection, June 1987 (rev. April 16, 2007)
- Occupational Safety and Health Administration (OSHA) 29 CFR §1910.119, *Process Safety Management of Highly Hazardous Chemicals, Explosives and Blasting Agents; Final Rule*, Washington, DC, February 24, 1992
- Occupational Safety and Health Administration (OSHA) Publication 3133, *Process Safety Management Guidelines for Compliance*, Washington, DC, 1993
- Occupational Safety and Health Administration (OSHA) Instruction CPL 02-02-045 CH-1, *PSM Compliance Directive*, Washington, DC, September 13, 1994
- Occupational Safety and Health Administration (OSHA) Instruction CPL 03-00-004, *Petroleum Refinery Process Safety Management National Emphasis Program*, June 7, 2007 (OSHA, 2007a)

Occupational Safety and Health Administration (OSHA) Directive 09-06 (CPL 02), *PSM Chemical Covered Facilities National Emphasis Program*, July 27, 2009 (OSHA, 2009a)

21

MEASUREMENT AND METRICS

This element has no direct corresponding element in OSHA PSM and EPA RMP programs or state regulatory PSM programs; however, the concept of measuring the status of PSM programs is an accepted concept and a component of several voluntary consensus PSM programs. This element will be referred to as Metrics. Metrics is an element of the RBPS accident prevention pillar of Learn From Experience.

21.1 OVERVIEW

The Measurement and Metrics element establishes performance and efficiency indicators to monitor the effectiveness of the PSM program and its elements and work activities on a near-real-time basis. This element addresses indicators to be considered, how often to collect data, and what to do with the information to help ensure responsive, effective RBPS management system operation.

Process safety metrics are viewed as a critical management tool in evaluating PSM program performance. Tracking the number of process safety incidents is one measure of performance, but only tracking incidents retrospectively will not be sufficient to understand how to truly improve process safety performance. Tracking retrospective and prospective (i.e., lagging and leading) process safety system and sub-system performance is a key to understanding the day-to-day quality of execution of a PSM program. As an example, this may include data on the number of times work processes are not completed as intended, the number of upset conditions and other unintended events during processing, the number of inspections and calibrations not completed as per the schedule, and any other data deemed important to assessing the overall process safety management system performance.

Three types of PSM metrics have been identified by industry (CCPS, 2007g) as follows:

- *Lagging metrics*—a retrospective set of metrics that are based on incidents that meet the threshold of severity that should be reported as part of the industry-wide process safety metric.
- *Leading metrics*—a forward-looking set of metrics that indicate the performance of the key work processes, operating discipline, or layers of protection that prevent incidents.
- *Near miss of internal lagging metrics*—the description of less severe incidents (i.e., below the threshold for inclusion in the industry lagging metric), or unsafe conditions that activated one or more layers of protection. Although these events are actual events (i.e., a “lagging” metric), they are generally considered to be a good indicator of conditions that could ultimately lead to a severe incident.

Additional information on developing and implementing a PSM metrics program can be found in the CCPS book *Guidelines for Process Safety Metrics* (CCPS, 2009).

The Measurement and Metrics element interfaces significantly with all other PSM program elements, because the measurement of the efficacy of those elements is part of a PSM metrics program. In addition, the auditing of PSM program metrics is closely related to auditing of Process Safety Culture and Management Review and Continuous Improvement (see Chapters 4 and 23, respectively).

In Section 21.2, related audit criteria are presented, along with guidance for auditors in applying the criteria. A full explanation of compliance and related audit criteria are presented in Chapter 1 (see Section 1.7). The criteria and guidance described in these sections do not represent exclusive solutions to PSM program coverage, design, implementation, or interpretation. They represent the collective experience of many people in the chemical/processing sector who have performed many PSM audits, and the consensus opinion resulting from that experience.

The inclusion of related criteria in no way infers that these criteria must be implemented for a PSM program to be successful, nor does it infer that a PSM program will be deficient without them. There may be other, more appropriate solutions for an individual facility or company. Additionally, the use of the related criteria in a PSM audit is intended to be completely voluntary and not a mandatory requirement in any way. They should be used cautiously and with careful planning so that they do not inadvertently establish unintended performance standards. Consensus should be sought within and among facilities and their parent companies before these criteria are used. Finally, the related criteria and guidance offered for consideration are not endorsements of or agreements with the written or verbal clarifications made by the regulators, PSM citations issued against the regulations, other PSM guidance published by the regulators, or the successful or common PSM practices in any given company’s PSM program from which they are derived.

21.2 AUDIT CRITERIA AND GUIDANCE

There are no detailed requirements for metrics established in OSHA's PSM Standard, EPA's RMP Rule, or state PSM regulatory programs. Therefore, all PSM metrics issues presented below represent good industry practice (GIP abbreviation used in the following tables) that help provide support and validation to stakeholders that appropriate process safety and metrics programs are in place.

The audit criteria described below are examined by auditors using the guidance provided by performing the following audit activities:

- Reviewing the facility PSM policies/procedures, Responsible Care®, EHS policy, or equivalent to verify its existence and that it contains applicable provisions related to measuring various aspects of the PSM program periodically, reporting those measurements forward and reviewing them in a formal manner, and evaluating the results for possible follow-up action.
- Determine whether there is a written program or plan for collecting, reporting, and reviewing the measured data.
- Interviewing personnel who participate in the collection, reporting, and review of PSM metrics. This will most likely involve, at a minimum, the PSM coordinator/manager as well as others such as the EHS manager and facility manager.
- Reviewing any records associated with PSM metrics activities. These may be in the form of records that are periodically collected (e.g., a PSM “scorecard” in the form of a database, spreadsheet, memo, or presentation that lists the metrics and is modified periodically by those who collect the data for the individual metrics), meeting minutes where the metrics are reviewed and discussed, recommendation/action item tracking databases or other records that show how the review of the metrics translated into recommendations and action items and their status.
- Conducting field observations to determine if the process safety metrics are displayed.

The purpose of providing these criteria is to provide auditors with guidance for evaluating PSM programs with respect to issues that in large part represent industry good practices, or in some cases practices that have become common. Some of the related criteria have reached the status of a level of acceptable practice because of their widespread, accepted, and successful use over an extended period of time. Auditors and PSM practitioners should carefully consider implementing this guidance, or at least designing an approach that is similar in nature. See the Glossary and Section 1.7.1 for a more complete discussion of the meaning and use of level of acceptable practice.

Auditors should also carefully examine the process safety metrics requirements found in the procedures of the company/facility being audited. As stated in Section 1.7.1, these could be interpreted as compliance requirements by regulators and could be subject to citations if they are not being followed. Auditors

should confirm, via interviews, records and document reviews, and field observations, that the requirements of the facility or company process safety metrics procedures have been implemented as specified. Findings should be generated if the company/facility-specific provisions are not being followed.

See the Guidance for Chapters 3–24 in the Introduction for the definition of the abbreviations shown in the following tables that are used to indicate the source of the criteria.

Table 21.1 describes the audit criteria and auditor guidance for related criteria for Measurements and Metrics.

Table 21.1 Related Audit Criteria and Guidance for Auditors - Measurements and Metrics

Audit Criteria	Source	Guidance for Auditors
21-R-1. A management system procedure exists that specifies how PSM metrics are collected and reviewed.	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that the management system procedure for PSM metrics addresses the following: <ul style="list-style-type: none"> Definition and scope of the metrics. How often the metrics are collected and specify the tools that will be used to collect them. How the metrics are collected. Who is responsible for collecting each metric. How the data is validated to ensure that the data reported is accurate and reliable. How the metrics are reported to various audiences. How the metrics are reviewed with middle and senior management at the site and company. How the metrics are evaluated and used. How the review of the metrics translates into recommendations/action items and how those are tracked and managed. How the PSM metrics program is periodically evaluated to confirm that the correct metrics are being collected.
21-R-2. Occupational safety, environmental program, product quality, and reliability metrics are not used as measurements of the quality or efficacy of the PSM program.	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the PSM metrics to confirm that they are <i>not</i> the typical metrics used to measure occupational safety programs, such as Experience

Audit Criteria	Source	Guidance for Auditors
		<p>Modification rate (EMR), OSHA Recordable Rate, etc.</p> <ul style="list-style-type: none"> • Auditors should review the PSM metrics to confirm that they are <i>not</i> the typical metrics used to measure environmental programs, such as the number of times environmental permits are exceeded, incidents with only chronic health effects, etc. However, the same environmental data may indicate that there has been a loss of containment or control of the process, which is a valid PSM metric issue. In this case, the same environmental data is used in a different way for the purposes of measuring PSM events of interest. • Auditors should review the PSM metrics to confirm that they are <i>not</i> the metrics used to measure the quality of products or the efficiency of the processes. • Auditors should review the PSM metrics to confirm that they are <i>not</i> the metrics used to measure the reliability of the equipment, such as the number of unscheduled outages, hours of equipment downtime, cost of equipment downtime, etc. Although there is some overlap between equipment reliability and process safety (e.g., avoiding unscheduled equipment failures also generally helps avoid loss of containment events), the purposes of the two metrics programs are different.
21-R-3. PSM metrics measure the status or quality of requirements and activities required by the PSM Standard or RMP Rule, or other PSM-related regulations, or the facility's or company's own PSM-related policies and procedures.	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review of the PSM metrics to confirm that they measure PSM-related activities and requirements; i.e., they measure the quality and efficacy of PSM program elements.
21-R-4. The PSM metrics program includes measurement of the process safety culture.	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the PSM metrics to confirm that they include measurements that describe the process safety

Audit Criteria	Source	Guidance for Auditors
21-R-5. Leading metrics for the PSM program are collected and analyzed.	CCPA GIP	<p>Table 21.1 – Continued culture at the facility.</p> <p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> <li>• Leading metrics describe activities or efforts preceding or contributing to an outcome or performance with the goal of providing time and information to adjust performance to prevent undesirable outcomes such as modifications, if necessary, to control a process. Leading metrics are forward-looking in nature. Examples include PSM audit results overdue for resolution, overdue ITPM tasks, PHA recommendations overdue for resolution, incident investigation recommendations overdue for resolution, and training topics overdue. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> <li>• Auditors should review PSM leading metrics backup/source documentation (e.g., minutes of meetings, reports of PSM metrics review meetings, annotated metrics presentations recording the participants) to determine if the measured data is evaluated and then used to make adjustments in the PSM program that are warranted (i.e., the PSM leading metrics are not simply collected and reported, but are not used) to drive improvement. <li>• Auditors should interview operators/people responsible for metrics input. Compare the output of the metrics program with results of interview.
21-R-6. Lagging metrics for the PSM program are collected and analyzed.	CCPA GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> <li>• Lagging metrics show what has already happened with the goal of either replicating or modifying the performance going forward. Lagging metrics are retrospective and are based on incidents that meet the threshold of severity that should be reported as part of a process safety metric program. Examples include: the numbers and severity of process safety

Audit Criteria	Source	Guidance for Auditors
		<p>incidents (e.g., fires, releases, and explosions), the number of process safety near misses, activation of SISs or other process safety control functions).</p> <ul style="list-style-type: none"> • Lagging metrics should include near misses of PSM incidents. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review PSM lagging metrics backup/source documentation (e.g., minutes of meetings, reports of PSM metrics review meetings, annotated metrics presentations recording the participants) to determine if the measured data is evaluated and then used to make adjustments in the PSM program that are warranted (i.e., the PSM lagging metrics are not simply collected and reported, but are not used).
<p>21-R-7. The leading and lagging metrics chosen are useful and describe the status of the PSM program.</p>	<p>CCPA GIP</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Metrics should do the following: <ul style="list-style-type: none"> – Measure the PSM program quality and efficacy using an objective or unbiased scale. – Be relevant to the behavior or process being measured. – Be comparable with other similar metrics by normalizing data. Comparability may be over time, across a company, or across an industry on a global basis. – Provide an opportunity for PSM program improvement. Simply collecting data for the sake of collecting it is not useful. – Acceptable for company or legal compliance. Some government regulations prescribe specific tests and parameters to be tracked and reported. – Include sufficient data to be statistically significant (i.e., the ability to measure positive or negative change, although a statistical

Audit Criteria	Source	Guidance for Auditors
		<p>Table 21.1 – Continued</p> <p>calculation of the uncertainty of the metric is not required). The most catastrophic process safety incidents are rare occurrences. While they are worth tracking and discussing in order to avoid repeating them, a metric that generates more frequent data (an annual rate) may be more useful for improving various process safety lapses and may lead to an improvement in a company's safety culture.</p> <ul style="list-style-type: none"> • The metrics selected should provide a broad view of the health of the process safety program. Selecting a single metric will not allow for this; however, this should also be balanced with selecting too many metrics that create a burden on those charged with implementing the program. • The metrics selected should paint a real picture of the PSM program. Poorly selected metrics can have a detrimental effect by providing an unwarranted or false sense of confidence if the performance of the PSM program is viewed as more reliable than it actually is. The results of audits, inspections, process safety incident rates, near-miss rates, the root causes of near misses and actual incidents, and equipment performance should be consistent with the metrics collected and reported. Auditors should compare the metrics reported with these other data to determine if the metrics selected are the correct ones, and to ensure that the PSM metrics program is not being intentionally or unintentionally gamed to make the numbers look good. • The metrics selected are appropriate for the audience(s) intended to review them. If the

Audit Criteria	Source	Guidance for Auditors
		<p>review will occur at a corporate level only, the audience is different than if they are only reported to facility management. Auditors should interview senior site management and others who are intended to receive the metrics to determine if they meet the expectations and needs of the reviewers. If the metrics will be reviewed and used middle managers and below at the facility, auditors should confirm via interviews that their expectations and needs have been met by those metrics selected.</p> <ul style="list-style-type: none"> • The metrics collection, reporting, and analysis process should not represent an undue burden. If the resources necessary to accomplish this exceed what is being expended to actually manage and improve the PSM program, an incorrect shift in priorities has probably occurred. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should interview personnel who actually collect and report the data as well as middle managers who participate in the analysis of the metrics to ensure that the metrics themselves have not become the final purpose of collecting and reporting them. If so, the priority of the PSM metrics program has become distorted. The metrics program should produce useful information that directly supports the quality and efficacy of the PSM program.
21-R-8. The metrics collected and reported accurately reflect the status of PSM program quality and efficacy.	CCPA GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should ensure the metrics data reported forward is accurate. Auditors should select several metrics and collect the data independently to check the accuracy of what was reported. • The scope of the metrics program should be defined in writing. Auditors should review the metrics collected to ensure that the scope is being

Audit Criteria	Source	Guidance for Auditors
		<p>Table 21.1 – Continued sufficiently fulfilled.</p> <ul style="list-style-type: none"> Auditors should review the metrics records to determine if they are being collected at the specified frequency.
21-R-9. The facility or company has established PSM performance goals against which the metrics can be compared to determine performance.	CCPA GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review facility or company PSM policies or procedures that describe the metrics and their use to determine there are PSM performance goals that can be used to evaluate the metrics when they are reported.
21-R-10. Middle management at the site reviews the metrics on a periodic basis.	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review PSM metrics review activities documentation (e.g., minutes of meetings, reports of PSM metrics review meetings, annotated metrics presentations recording the participants) to determine if middle managers are party to the review discussions. This is also part of the Process Safety Culture and Management Review and Continuous Improvement elements (see Chapters 4 and 23, respectively).
21-R-11. Senior management at the site reviews the metrics on a periodic basis.	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review PSM metrics review activities documentation (e.g., minutes of meetings, reports of PSM metrics review meetings, annotated metrics presentations recording the participants) to determine if senior facility and/or company managers are party to the review discussions. This is also part of the Process Safety Culture and Management Review and Continuous Improvement elements (see Chapters 4 and 23, respectively).
21-R-12. The PSM metrics are used to benchmark within the company and with industry.	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> One of the benefits of measuring the quality and efficacy of a PSM program is to

Audit Criteria	Source	Guidance for Auditors
		<p>benchmark these measurements against those who have the same type of program. This benchmarking has produced significant improvements in other EHS areas, such as occupational safety.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should determine if the PSM metrics program of the facility has been benchmarked with those of other facilities in the company, or other companies.
<p>21-R-13. A system is in place to promptly address findings and recommendations from the review of PSM metrics.</p>	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> PSM metrics recommendations may be tracked and managed using the same system that is used for other PSM-related recommendations. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should confirm that there is a management system in place to track the status, resolution and implementation of recommendations and action items from PSM metrics reviews. Although it is common practice to use a spreadsheet, database, or other electronic means of managing these recommendations, it is not mandatory that the management system be computerized.
<p>21-R-14. Recommendations from the review of PSM metrics have been resolved in a timely manner.</p>	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the PSM metrics recommendation management system to determine if recommendations have been resolved within a time period consistent with the complexity of the recommendation and the difficulty of implementation.
<p>21-R-15. The resolutions of the recommendations from the review of PSM metrics are documented.</p>	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the PSM metrics recommendation management system to determine if it provides, or refers to, sufficient information so that

Audit Criteria	Source	Guidance for Auditors
		the auditor can verify the current status of the recommendation.
21-R-16. A written schedule has been prepared for when actions for resolving the recommendations from the review of PSM metrics will be completed.	GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review the PSM metrics recommendation management system to determine if the recommendations have been assigned a target due date for resolution and/or closure as well as responsibility for resolution/closure.
21-R-17. The resolutions of the PSM metrics recommendations (i.e., the actions to be taken) have been communicated to those employees whose jobs are in the process or who might be affected by the recommendations or actions.	GIP	<u>Background Information for Auditors:</u> <ul style="list-style-type: none"> • Adequate communications may include a number of formats including: face-to-face briefings, emails to employees, posted information, handouts, or agenda topics during safety meetings. <u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should interview employees to determine if they have been informed about the results of PSM metrics reviews.
21-R-18. The facility or company periodically evaluates the metrics being collected to confirm that they are the correct ones.	GIP	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review records to determine if periodic evaluations of the PSM metrics program are being conducted and the results used to make adjustments as necessary.

21.3 VOLUNTARY CONSENSUS PSM PROGRAMS

The following voluntary consensus PSM program requirements for Measurements and Metrics are described below:

- The requirements published for the offshore oil platform sector in the Safety and Environmental Management Program (SEMP), a voluntary program designed by API and endorsed by the Minerals Management Service of the U.S. Department of the Interior.
- Responsible Care Management System (RCMS)[®] published by the American Chemistry Council.
- RC14001 Environmental Management System, published by the American Chemistry Council.

Table 21.2 lists audit criteria and auditor guidance relating to Measurement and Metrics pursuant to voluntary consensus PSM programs.

Table 21.2 Voluntary Consensus PSM Program Audit Criteria and Guidance for Auditors - Measurements and Metrics

Audit Criteria	Source	Guidance for Auditors
<p><i>SEMP</i> 21-R-19. No provisions are included in the SEMP program for metrics.</p>	RP75	<ul style="list-style-type: none"> • No further guidance.

Audit Criteria	Source	Guidance for Auditors
<p><i>Responsible Care® Management System (RMCS)</i> 21-R-20. The organization shall regularly monitor and measure the key characteristics of its operations, products and activities that can have a significant effect on health, safety, security and the environment. This shall include the recording of information to track performance, relevant operational controls, and conformance with the organization's Responsible Care® goals, objectives, metrics and targets.</p>	RCMS Technical Specification 102.01, 4.1	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Characteristics of a good measurement and tracking program include the following: <ul style="list-style-type: none"> – A system to track all aspects related to the company's Responsible Care programs, that can include, but is not limited to: <ul style="list-style-type: none"> ▪ Health incidents ▪ Exposure data ▪ Safety incidents ▪ Process safety incidents ▪ Noncompliance with applicable legal or other Responsible Care requirements identified pursuant to element 2.3 ▪ Permit excursions ▪ Emissions ▪ Near hits/near misses ▪ Number of job safe behavior observations ▪ Commercial partner incidents/Responsible Care performance ▪ Transportation incidents ▪ Energy use ▪ Natural resource use ▪ Product use/misuse data ▪ Operational controls ▪ Production volumes ▪ Other related information including goals and objectives developed pursuant to element 2.5 ▪ Track and report mandatory

Audit Criteria	Source	Guidance for Auditors
		<p>Table 21.2 – Continued ACC performance metrics.</p> <ul style="list-style-type: none"> – A system to select, implement and track timely and appropriate corrective and preventive action(s) from: <ul style="list-style-type: none"> ▪ Incident investigation ▪ Audits ▪ Inspections ▪ Other relevant tracking systems
<p>21-R-21. The organization shall use relevant measures and records to analyze Responsible Care performance and trends.</p>	<p>RCMS Technical Specification 102.01, 4.2</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • This expands on element 4.1 to include a review of Responsible Care performance trends. Characteristics of a good management system include the following: <ul style="list-style-type: none"> – A system to maintain tracked EHS and Responsible Care performance data. – A system to regularly identify and communicate EHS and Responsible Care performance trends. – A system to verify that mandatory ACC performance metrics are tracked and reported.

Audit Criteria	Source	Guidance for Auditors
<p><i>RC14001</i> 21-R-22. The organization shall establish, implement and maintain a procedure(s) to monitor and measure, on a regular basis, the key characteristics of its operations that can have a significant environmental impact.</p> <p>The organization shall analyze trends in environmental, health, safety, security and other Responsible Care performance.</p>	<p>RC14001 Technical Specification RC151.03, 4.5.1</p>	<ul style="list-style-type: none"> • No further guidance.

21.4 AUDIT PROTOCOL

The process safety program audit protocol introduced in Appendix A and available online (see page xiv for information on how to access this resource) provides detailed questions that examine the criteria described in Sections 21.2 and 21.3.

REFERENCES

- American Chemistry Council, *RCMS[®] Technical Specification*, RC101.02, March 9, 2005
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations*, RC101.02, January 25, 2004
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations Appendices*, RC101.02, January 25, 2004
- California, California Code of Regulations, Title 8, Section 5189, CalOSHA, November 1985
- Center for Chemical Process Safety (CCPS), *Guidelines for Risk Based Process Safety*, American Institute of Chemical Engineers, New York, 2007 (CCPS, 2007c)
- Center for Chemical Process Safety (CCPS), *Process Safety Leading and Lagging Metrics*, American Institute of Chemical Engineers, New York, 2008 (CCPS, 2007g)
- Center for Chemical Process Safety (CCPS), *Guidelines for Process Safety Metrics*, American Institute of Chemical Engineers, New York, 2009 (CCPS, 2009)
- Delaware, *Accidental Release Prevention Regulation*, Delaware Department of Natural Resources and Environmental Control/Division of Air and Waste Management, September 1989 (rev. January 1999)

22

AUDITING

This element is called Compliance Audits in OSHA PSM and EPA RMP programs as well as in many state regulatory PSM programs. In most voluntary consensus PSM programs, it is referred to as Performance Measurement. Auditing is an element of the RBPS accident prevention pillar of Learn From Experience.

22.1 OVERVIEW

The Auditing element is one of the principal quality control activities in a PSM program and one of the main elements that provide opportunities for learning from experience (along with incident investigation discussed in Chapter 20). It is also the principal activity that forms the basis of the “Check” activity in the Plan-Do-Check-Act model of a management system. Since a PSM program is a collection of integrated management systems, this element is intended to determine whether the management systems in each element of the PSM program are functioning as designed. The Audit element provides a system for scheduling, staffing, effectively performing, documenting periodic evaluations of all PSM program elements, and managing the resolution of findings and corrective actions generated by the audits.

Audits are defined as systematic, independent reviews to verify conformance with prescribed requirements using a carefully defined review process both to ensure consistency and to allow the auditor to reach defensible conclusions. Therefore, an “audit of the audit” is a careful examination of how the previous audits were organized, executed, and documented, as well as the follow-up process for the recommendations.

The Auditing element interfaces significantly with all other PSM program elements in that they are periodically audited. However, the primary interfaces include the following:

- Metrics and Measurement (Chapter 21)—although PSM metrics are not mandatory, they are, like auditing, a way to measure the efficacy of the PSM program.

- Management Review and Continuous Improvement (Chapter 23)—this is another related element designed to accomplish the same general goal, that is, to measure whether or not the PSM program is working properly.

Both compliance and related audit criteria for Auditing are described in the Section 22.2. A full explanation of compliance and related audit criteria is presented in Chapter 1 (see Section 1.7).

The criteria and guidance described in these sections do not represent exclusive solutions to PSM program coverage, design, implementation, or interpretation. They represent the collective experience of many people in the chemical/processing sector who have performed many PSM audits, and the consensus opinion resulting from that experience. The compliance criteria are derived from the regulations that govern PSM programs in the United States; however, these regulations are all performance-based. Performance-based regulations are goal oriented and there may be multiple pathways to fully complying with them. Therefore, there may be alternate interpretations and solutions to the issues described in the compliance tables in this chapter that are equivalent to those included, particularly the auditor guidance presented.

The inclusion of the related criteria in no way infers that these criteria must be implemented for a PSM program to be successful, nor does it infer that a PSM program will be deficient without them. As with the compliance criteria, there may be other, more appropriate solutions for an individual facility or company. In addition, the use of the related criteria in a PSM audit is intended to be completely voluntary and not a mandatory requirement in any way. They should be used cautiously and with careful planning so that they do not inadvertently establish unintended performance standards. Consensus should be sought within and among facilities and their parent companies before these criteria are used. Finally, the related criteria and guidance offered for consideration are not endorsements of or agreements with the written or verbal clarifications made by the regulators, PSM citations issued against the regulations, other PSM guidance published by the regulators, or the successful or common PSM practices in any given company's PSM program from which they are derived.

22.2 AUDIT CRITERIA AND GUIDANCE

The detailed requirements for Auditing in the PSM Standard, RMP Rule, and several state PSM regulatory programs as well as for other common voluntary consensus PSM programs are presented below.

The audit criteria described below are examined by auditors using the guidance provided by performing the following audit activities:

- Interviewing the person at the facility who has the responsibility for developing and managing the PSM audit program. This person is usually the PSM coordinator/manager or perhaps a corporate auditor/audit manager. Interviews of others who participated in PSM audits may also be necessary.

- Reviewing the PSM audit procedure.
- Reviewing previous PSM audit reports (at least the last two audit reports for OSHA PSM and EPA RMP programs).
- Reviewing the records that show the resolution and closure of issues identified in the previous PSM audit report.

Auditors should also carefully examine the PSM audit requirements found in the procedures of the company/facility being audited. As stated in Section 1.7.1, these could be interpreted as compliance requirements by regulators and could be subject to citations if they are not being followed. Auditors should confirm, via interviews, records and document reviews, and field observations, that the requirements of the facility or company PSM audit procedures have been implemented as specified. Findings should be generated if the company/facility-specific provisions are not being followed.

See the Guidance for Chapters 3–24 in the Introduction for the definition of the abbreviations shown in the following tables that are used to indicate the source of the criteria.

22.2.1 Compliance Requirements

The audit criteria should be used by the following:

- Readers in the United States covered by the PSM Standard or RMP Rule.
- Readers who have voluntarily adopted the OSHA PSM program.
- Readers whose companies have specified OSHA PSM requirements in non-U.S. locations.

Table 22.1 describes the audit criteria and auditor guidance for Audits pursuant to OSHA PSM and EPA RMP.

Table 22.1 OSHA PSM and EPA RMP Audit Criteria and Guidance for Auditors - Audits

Audit Criteria	Source	Guidance for Auditors
22-C-1. OSHA PSM audits are certified at least every three years to verify that the procedures and practices developed under the PSM Standard are adequate and are being followed.	PSM [(o)(1)] RMP 60.79	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • In this context, certification means that a signature and a date, or electronic equivalents, are recorded somewhere that attests to the audit being completed. There may be other language, names, dates, or other information that may satisfy this requirement, but certification of regulatory records generally means a signature and a date. There is no required certification language from OSHA or EPA. • A lengthy certification that contains a summary of the audit,

Audit Criteria	Source	Guidance for Auditors
		<p>Table 22.1 – Continued</p> <p>how it was organized and conducted is also acceptable, but that detail is not explicitly required. Simple statements that the audit was conducted, along with the signature and date are also acceptable.</p> <ul style="list-style-type: none"> <li>• See Appendix C for examples of OSHA PSM audit certification statements. <li>• The certification may be included in the audit report, but it is also acceptable to include the certification in a different document. <i>The audit is being certified, not the audit report.</i> <li>• Since there is no explicit requirement for measuring the three-year period, the interval between the audits may be set several ways. Use of the start date of on-site auditing, end date of on-site auditing, and certification date are acceptable options. Since OSHA PSM audits have been required since 1995, auditors should look for a consistent interval at this point, even if an alternative date was chosen from those described above. <li>• The only portion of a RMP program that must be audited by the regulated site/company is the prevention program. The responsibility for auditing the hazard assessment and other parts of the RMP program lies with the implementing agency for RMP and not with the site that is regulated (either federal EPA or a state agency that has been granted implementing agency status) (see Chapter 24). <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> <li>• Auditors should review how the facility set the interval between the audits and determine if it results in a consistent period between audits that is less than or equal to three years day for day. Use of intervals that use only the calendar year in which the activities occur is not

Audit Criteria	Source	Guidance for Auditors
		<p>acceptable. For example an audit started on January 24, 2006, should be started by January 24, 2009, not by December 31, 2009.</p> <ul style="list-style-type: none"> Auditors should check the certification documentation of PSM audits to ensure that they are signed and dated.
<p>22-C-2. At least one person knowledgeable in the process was on the audit team.</p>	<p>PSM [(o)(2)] RMP 60.79</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> The audit report or some other record should explicitly identify at least one member of the audit team that was knowledgeable in the process. This person often acts as an advisor (ombudsman or logistics supporter) to the audit team and has specific knowledge of the process(es) being audited or general process knowledge of the facility and directs the auditors to people to interview, locations where records are kept, etc. This advisor may be a management or nonmanagement employee. If the "knowledgeable person" has actually performed audit interviews, record reviews, and is responsible for drawing conclusions and formulating audit findings, then this person, whether nonmanagement or management, should not have had any responsibility for the design or implementation of the PSM program. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the audit reports or other records to determine if at least one person knowledgeable in the process was included on each audit team.
<p>22-C-3. A report containing the findings of the audit was developed.</p>	<p>PSM [(o)(3)] RMP 60.79</p>	<p><u>Background Information For Auditors:</u></p> <ul style="list-style-type: none"> A written report of each audit should be produced for each audit, either hard copy or electronically. <p>There is no specific format or</p>

Audit Criteria	Source	Guidance for Auditors
		<p>Table 22.1 – Continued</p> <ul style="list-style-type: none">• content that is explicitly required for an OSHA PSM/EPA RMP audit report. At a minimum, the findings should be included in this report. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none">• Auditors should review the audit reports to confirm that they exist and include, at a minimum, the findings of each audit.

Audit Criteria	Source	Guidance for Auditors
<p>22-C-4. An appropriate response to each of the findings of the audit was promptly determined and documented.</p>	<p>PSM [(o)(4)] RMP 60.79</p>	<p><u>Background Information For Auditors:</u></p> <ul style="list-style-type: none"> • Recommendations should be formulated for each audit finding, but it the recommendations need not be included in the audit report. They can be documented in a separate report, database, or other medium. • The recommendations should be formulated and resolved promptly. This means that this process should be completed in a timely manner. "Timely" has the same meaning in this context as it does for recommendations in the HIRA (Chapter 10) and Incident Investigation (Chapter 20) elements. Promptly generally means within a few months for relatively simple issues such as procedural or administrative changes, but may mean more extended periods for more involved issues such as engineering studies or an in-depth review of actual procedures and practices. The findings that are generated by a PSM audit are often administrative in nature. • The facility should not wait until the next audit to start addressing recommendations from the previous audit. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check audit recommendation resolution/closure records or the tracking system used to manage them to determine how each facility has defined "timely," how they have applied their definition, and if the definition and its application are reasonable and defensible. • Auditors should check completion dates (if available) for action taken to resolve findings to help assess the timeliness of resolutions.

Audit Criteria	Source	Guidance for Auditors
<p>Table 22.2 – Continued</p> <p>22-C-5. The correction of the deficiencies has been documented.</p>	<p>PSM [(o)(4)] RMP 68.79</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should verify through record review, field observation, and/or interviews that issues were resolved as stated in the resolution documentation.
<p>22-C-6. The two most recent compliance audits have been retained.</p>	<p>PSM [(o)(5)] RMP 68.79</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> For audits intended to satisfy the OSHA PSM/EPA RMP requirement to perform a PSM compliance audit, auditors should confirm that at least the last two audit reports and associated resolution documentation are available.

22.2.1.1 U.S. State PSM Programs

If the PSM program being evaluated is pursuant to a state PSM regulation, then the specific auditing requirements for that regulatory program should be followed. In general, these overlap somewhat with the federal OSHA PSM and EPA RMP requirements, but often there are state-specific requirements that should be met, even if the state has received authority to enforce federal regulations (i.e., the state is an OSHA state plan state, or has received implementing agency status for RMP implementation). The state-specific auditing requirements for the following states are presented below:

- New Jersey
- California
- Delaware

Table 22.2 shows the audit criteria and auditor guidance for Auditing pursuant to U.S. state PSM state requirements.

Table 22.2 U.S. State PSM Audit Criteria and Guidance for Auditors - Audits

Audit Criteria	Source	Guidance for Auditors
<p><i>New Jersey Toxic Catastrophe Prevention Act (TCPA)</i></p> <p>22-C-7. The owner or operator shall verify that the process technology and equipment, as built and operated, are in accordance with the safety information prepared pursuant to 40 CFR §68.48(a) and (b):</p> <ul style="list-style-type: none"> The compliance audit report 	<p>N.J.A.C. 7:31-3.1</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check that the SOPs or other procedures as well as the DCS that contain operating limits and other process parameters match the process safety information. Auditors should review audit reports to determine if they

Audit Criteria	Source	Guidance for Auditors
<p>shall also include the scope, audit techniques, methods used and the names of the audit participants.</p> <ul style="list-style-type: none"> The owner or operator shall prepare and include in the report a written schedule for implementation of corrective actions or state that such actions have been completed. 		<p>contain the scope, audit techniques, methods used, and the names of the audit participants.</p> <ul style="list-style-type: none"> Auditors should review audit reports to determine if they include the results of the audit and a written schedule for implementation of corrective actions, or reference where this information can be found.
<p><i>Delaware Accidental Release Prevention Regulation</i> 22-C-8. The Delaware EHS regulations do not add any different or unique auditing requirements beyond those described for the PSM Standard and RMP Rule.</p>	<p>Delaware Code, Chapter 77, Section 5.79</p>	<ul style="list-style-type: none"> No further guidance.
<p><i>California OSHA—Process Safety Management of Acutely Hazardous Materials</i> 22-C-9. The California PSM regulations do not contain an audit element.</p>	<p>California Code of Regulations, Title 8, Section 5189</p>	<ul style="list-style-type: none"> No further guidance.
<p><i>California Accidental Release Prevention Program</i></p> <ul style="list-style-type: none"> 22-C-10. The CalARP regulations do not add any different or unique auditing requirements beyond those described for the PSM Standard and RMP Rule. 	<p>California Code of Regulations, Title 19, Section 2760.8</p>	<ul style="list-style-type: none"> No further guidance.

22.2.2 Related Criteria

The purpose of providing these criteria is to provide auditors with guidance for evaluating PSM programs with respect to issues that go beyond the strict compliance requirements presented above, and in large part represent industry good practices in auditing, or in some cases practices in auditing that have become common. Some of the related criteria have reached the status of a level of acceptable practice because of their widespread, accepted, and successful use over an extended period of time. Auditors and PSM practitioners should carefully consider implementing this guidance, or at least designing an approach that is similar in nature. See the Glossary and Section 1.7.1 for a more complete discussion of the meaning and use of level of acceptable practice.

Table 22.3 shows the recommended related audit criteria and auditor guidance for Audits.

Table 22.3 Related Audit Criteria and Guidance for Auditors - Audits

Audit Criteria	Source	Guidance for Auditors
22-R-1. OSHA PSM compliance audits conducted within three years of the certification date of the previous audit.	CPL	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The measurement date for an OSHA PSM/EPA RMP audit is measured from the certification date of the previous audit. • Because some companies/facilities have more complicated rules for certifying their audits that include detailed or multiple management and/or legal reviews, the time between the actual completion of the audit or the audit report and the certification date may be lengthy, in which case it may be better to measure the 3 year requirement from another date such as the beginning or end date of the audit. See Section 1.5.2 for a more detailed discussion of measuring PSM audit dates. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the time intervals that have elapsed between PSM audits to determine if they are three years in length or less. If the facility has used an anniversary date that is different from the audit certification date, this is acceptable as long as they have consistently observed the triennial requirement for performing the audits. • Auditors should compare the audit frequency to the frequency of process safety incidents or near misses to determine if an audit frequency of less than three years is warranted by the risk or process safety performance of a given area.
22-R-2. All elements of the PSM Standard have been audited.	CPL NEP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review audit reports to determine if paragraph (a), Applicability of the PSM Standard have been included in the scope of the audits.

Audit Criteria	Source	Guidance for Auditors
22-R-3. A field inspection was conducted during the audit.	CPL	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should conduct observations of key PSM events, activities, and equipment during audits whenever possible (see Chapter 2). • Auditors should check the audit reports to confirm that the evidence cited was derived from auditor work in the field as appropriate.
22-R-4. Relevant records were reviewed during the audit.	CPL	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should check the audit report or another referenced document in the report to determine if it lists or describes the documents Table 22.3 – Continued and record reviewed by the audit team. These records should be consistent with the evidence described in the findings.
22-R-5. Interviews were conducted with a cross section of management and nonmanagement personnel during the audit.	CPL	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should check the audit report or another referenced document in the report to determine if both management and nonmanagement personnel were interviewed. One way to accomplish this, beyond a simple statement that this was done, is to include the number of each type of employee, i.e., management and nonmanagement that were interviewed. Inclusion of the names, or even the titles of the person interviewed might obviate the privacy sought during audit interviews and expressed to the interviewees. This privacy is usually more important with respect to the nonmanagement employees than the management employees.
22-R-6. The employees have access to compliance audit information.	CPL	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should interview the PSM coordinator/manager of the facility to determine how PSM audit information is maintained and distributed, particularly when it is requested by an employee (also see Chapter 9, Process Knowledge

Audit Criteria	Source	Guidance for Auditors
		<p>Table 22.3 – Continued Management).</p> <ul style="list-style-type: none"> • Auditors should interview nonmanagement employees to confirm that PSM audit reports and follow-up information are available, or at least not being withheld from employees.
<p>22-R-7. A written management system procedure for organizing, conducting, and documenting PSM audits exists.</p>	<p>CCPA GIP 3133</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Auditors should check that a written procedure that describes how PSM audits are performed exists. This is typically a section or chapter in a PSM manual, or a separate procedure. This procedure should include the following: <ul style="list-style-type: none"> – Planning and conducting of audits. – Training and qualifications of auditors. – Selection and composition of audit teams. – Documentation of audits. – Follow-up on audit findings. – Retention of audit reports. – Communication of and provision of access to employees of audit results. – Certification of audits (certification means signature and date). – Requirements for periodic internal self- assessments. – Other items addressed in Chapter 1. • The audit procedure should be a formal controlled facility or company document and approved for use.
<p>22-R-8. In completed audits, a sufficient number of processes were selected for auditing, and rationale for selection of the processes that were audited has been documented.</p>	<p>CCPA GIP 3133</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check the audit reports to determine if the sampling strategy and definition of audit scope (i.e., which units or processes were audited and the possible use of representative units) is rational. This should reflect the guidance described in Chapter 2.

Audit Criteria	Source	Guidance for Auditors
22-R-9. The auditors should be qualified to perform PSM audits.	CCPA GIP 3133 APPC	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • PSM auditors should have the following characteristics and qualifications: <ul style="list-style-type: none"> – Have prior experience or training in PSM audits. – Have appropriate knowledge of process and PSM. – The team leader was knowledgeable in audit techniques. – The team leader and auditors were impartial (i.e., if possible, no day-to-day responsibilities for the audited areas, and no direct reporting function to any of the persons who have responsibility for the areas being audited or to the EHS or plant manager). – The number of auditors was appropriate for the facility audited (size and complexity of the facility, and number of processes to be audited). • See Chapter 1 for team leader and auditor qualifications. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review PSM audit reports to determine if they describe the background and qualifications of the auditors. This can be accomplished by including a brief summary of their qualifications or by including their curriculum vitae in an appendix.
22-R-10. An evaluation was conducted of the facility management policies and procedures for implementing PSM.	CCPA GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check the audit report to determine if a list all of the policies and procedures that were examined during the audit was described. • Auditors should determine if the policies and procedures were implemented as written. • Auditors should check for chronic problems in the design

Audit Criteria	Source	Guidance for Auditors
		<p>Table 22.3 – Continued</p> <p>or implementation of the PSM program or repeat findings from previous audits.</p>
22-R-11. Observations of PSM activities and events were made on an as-available basis.	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • The audit report should list all of the observations that were made during the audit. • See Chapter 2 for examples of the types of observations that are typically made during a PSM audit.
22-R-12. The PSM audit report accurately and completely describes each audit performed.	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Audit reports should be issued promptly upon the completion of the on-site portion of the audit. • Audit reports should follow a standard outline. • Audit reports should contain a description of the audit protocols used. • Audit reports should identify the team members and their areas of technical expertise. • Audit reports should categorize and prioritize the audit findings. • Audit reports should contain recommendations to correct the findings or refer to the document that contains them. It is not mandatory that the audit and its report contain recommendations; these may be formulated and published separately. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the PSM audit management procedure to determine if it specifies the report format and contents and that the audit reports follow this format. • If the recommendations are not included the audit report, auditors should confirm that they are contained in another document and can be referenced to the finding they address. • Auditors should review the time period between the last on-site

Audit Criteria	Source	Guidance for Auditors
		<p>auditing activities and the issuance of the audit report to determine if it is reasonable. The issuance of the report is the date it is considered final and the findings/recommendations can be addressed. It may not necessarily be the date that is published in the report itself, which may be the date(s) the audit was performed, or the date the report was first drafted. If the facility or company has complex or lengthy review processes that extend the time period beyond approximately one month from the end of the audit, it may not be considered reasonable, unless there are compelling, nonadministrative reasons for the delay.</p> <ul style="list-style-type: none"> • There may be urgent findings and recommendations that require more immediate resolution and should not wait for the issuance of the final report. If the audit report or other records indicate that an audit generated findings of an immediate nature, auditors should check to see how these recommendations were managed.
22-R-13. A system is in place to promptly address the team's findings and recommendations.	CCPA 3133	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • This usually consists of a database, spreadsheet, or other electronic means of prioritizing, tracking, and reporting the status of the findings/recommendations. However, paper-based management systems are acceptable if they are effective. <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check the system in place to manage PSM audit findings/recommendations to determine if it is functional. It should be similar in design and functionality to those used to manage other PSM-related findings/recommendations (assuming that they are working as intended), but a centralized

Audit Criteria	Source	Guidance for Auditors
		<p>Table 22.3 – Continued management system for all PSM recommendations and action items is not required.</p> <ul style="list-style-type: none"> • Auditors should check that the management system contains the original finding/recommendation, the date scheduled for its completion, the responsible party(ies), the final resolution (what was actually done to address the issue), and the date the corrective action was completed.
22-R-14. Periodic reports are produced on the status of actions that result from resolving the findings/recommendations.	GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should check the management system for the PSM audit findings/recommendations to confirm that it generates periodic status reports. If so, the reports for the period just preceding the audit should be available for review.
22-R-15. When required, PSM audit findings/recommendations are rejected properly.	GIP	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • The criteria for rejecting PSM audit findings/recommendations should be that same as that used for HIRA and incident investigation findings/recommendations. A finding/recommendation can be justifiably rejected if it can be documented in writing and based upon adequate evidence, that one or more of the following conditions is true: the analysis upon which the finding/recommendation is based contains material factual errors; the finding/recommendation is not necessary to protect the health and safety of the employer's own employees, or the employees of contractors; an alternative measure would provide a sufficient level of protection; or the finding/recommendation is infeasible. Where a finding/recommendation is rejected, this should be

Audit Criteria	Source	Guidance for Auditors
		<p>communicated to the audit team, and any subsequent recommendations of the team should be expeditiously resolved.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check the PSM audit procedure to determine if the criteria for rejecting PSM audit recommendations are the same criteria for rejecting PHA and incident investigation recommendations.
22-R-16. The results of the PSM audit have been communicated to affected employees.	CCPA GIP	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should check that some level of communication is made with employees that work in processes included in the PSM program regarding the conduct of PSM audits. This can be face-to-face communication (and then documented in a meeting minutes or similar records), e-mail communication to a wide audience, or other means.

22.2.3 Voluntary Consensus PSM Programs

The following voluntary consensus PSM program requirements for Auditing are described below:

- The requirements published for the offshore oil platform sector in the Safety and Environmental Management Program (SEMP), a voluntary program designed by API and endorsed by the Minerals Management Service of the U.S. Department of the Interior.
- Responsible Care Management System (RCMS)[®] published by the American Chemistry Council.
- RC14001 Environmental Management System, published by the American Chemistry Council.

Table 22.4 lists audit criteria and auditor guidance relating to Audits pursuant to voluntary consensus PSM programs.

Table 22.4 Voluntary Consensus PSM Programs Audit Criteria and Guidance for Auditors - Audits

Audit Criteria	Source	Guidance for Auditors
<p><i>SEMP</i> 22-R-17. The management program requires that it be periodically audited.</p>	<p>RP 75, 2.1</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should ensure that written guidance requiring periodic audits exists. • Auditors should ensure that reports of completed audits exist. • Auditors should ensure that an audit schedule exists.
<p>22-R-18. The scope of each audit includes determining that all the elements of RP 75 are in place, the elements incorporate the required components, and there is a method to evaluate effectiveness of the management program.</p>	<p>RP 75, 12.1.a., 12.1.b., 12.1.c.</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should ensure that written guidance delineating the content and scope of an audit exists. • Auditors should ensure that an audit plan showing scope of the audit exists. • Auditors should ensure that reports of completed audits exist.
<p>22-R-19. A management plan exists that has a method for ensuring that sufficient quantities and types of facilities are audited to validate the effectiveness of the program.</p>	<p>RP 75, 12.1</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should ensure that a written audit plan describing the method for selecting the number and types of facilities to be audited exists. • Auditors should ensure that written rationale for the method chosen exists.
<p>22-R-20. The management program audit interval does not exceed four years.</p>	<p>RP 75, 12.1</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should ensure that written guidance mandating the audit intervals exists. • Auditors should ensure that a written audit schedule exists. • Auditors should ensure that the dates of the audit reports indicate that the intervals do not exceed four years.
<p>22-R-21. The first audit of the management program was conducted within 2 years of its implementation.</p>	<p>RP 75, 12.1</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should ensure that written audit report of the first audit exists and that the audit was conducted within two years of implementing the SEMP program.

Audit Criteria	Source	Guidance for Auditors
22-R-22. The management program requires that those involved in the audit meet certain criteria to ensure sufficient knowledge of the auditing process.	RP 75, 12.1	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should ensure that written qualifications for team members are documented.
22-R-23. The findings of the audit are provided to management personnel responsible for design and implementation of the program.	RP 75, 12.1	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should ensure that written plan showing the distribution of the audit findings exists. • Auditors should conduct interviews with management personnel confirm that they receive audit findings.
22-R-24. The audit program establishes a system to determine and document an appropriate response to the audit findings and to assure satisfactory resolution.	RP 75, 12.1	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should ensure that written process for dealing with audit findings exists. • Auditors should ensure that written action plans from previous audits exist.
22-R-25. The management program requires that audit reports be retained at least until the completion of the next audit.	RP 75, 12.1	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should ensure that written guidelines on audit report retention exist. • Auditors should ensure that at least the last audit report is available.

Audit Criteria	Source	Guidance for Auditors
<p><i>Responsible Care® Management System (RMCS)</i></p> <p>22-R-26. The organization shall regularly monitor and measure the Table 22.4 – Continued key characteristics of its operations, products and activities that can have a significant effect on health, safety, security and the environment. This shall include the recording of information to track performance, relevant operational controls, and conformance with the organization's Responsible Care® goals, objectives, metrics and targets.</p>	RCMS Technical Specification Elements 4.1	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should ensure that there is a system to select, implement, and track timely and appropriate corrective and preventive action(s) from audits. • Auditors should ensure that there are tracking systems that include incident information, environmental performance data, health and safety statistics, and other relevant data. • Auditors should ensure that there is a regular review of Responsible Care goals, that there are appropriate objectives and targets to verify, and that there are timely tracking

Audit Criteria	Source	Guidance for Auditors
		<p>Table 22.4 – Continued</p> <p>mechanisms in place.</p> <ul style="list-style-type: none"> Auditors should ensure that verify that tracking systems exist in all relevant areas of Responsible Care, including other ACC performance metrics, such as distribution and product stewardship incidents, not just basic EH&S.
<p>22-R-27. The organization shall periodically evaluate its compliance with relevant health, safety, security and environmental legislation and regulations.</p>	<p>RCMS Technical Specification Elements 4.3</p>	<p>Auditor Activities:</p> <ul style="list-style-type: none"> Auditors should ensure that a system to regularly review and evaluate compliance with relevant Responsible Care expectations and applicable legal requirements is in place, i.e., an audit program. Auditors should ensure that a program to assess company and individual facilities in regard to applicable legal requirements, typically through internal or external compliance audits, is in place. Every organization requires a periodic assessment of their compliance with legislative and regulatory requirements. The best method to assure a thorough review of a company or site's compliance is the audit process. Auditors should ensure that audits are performed on a regular basis with clearly defined intervals. Schedules may be based on criteria such as time since last audit, previous audit findings, relative risk of operations, etc. A key element of a good audit program includes strong corrective action tracking systems, with results reported to senior management. Some companies use a central governance function or outside expertise to audit for compliance. Individual plant audits are also acceptable, but a compliance audit should be performed against a known standard, and goes beyond safety and environmental

Audit Criteria	Source	Guidance for Auditors
		<p>inspections. Moreover, internal assessments may be a component of the overall audit program, which usually includes audits from an external party or another department within the organization.</p> <ul style="list-style-type: none"> • Some companies have innovative compliance auditing programs that use "guest auditors" from other facilities or functional areas, provide for interaction between management and employees, and constantly challenge compliance programs. • OSHA or EPA inspections (or the like), planned or unplanned, while important, are not a part of a successful audit program.
<p>22-R-28. The organization shall periodically evaluate the effectiveness of its Responsible Care Management System to determine whether or not it has been properly implemented and maintained. Information on the results of the evaluations shall be provided to management.</p>	<p>RCMS Technical Specification Elements 4.3</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • This element of a RCMS program calls for auditing of the RCMS, not just regulatory compliance. This expectation is beyond the external RCMS certification audit, as it requires a periodic internal audit of the RCMS beyond the certification. The purpose of this systems audit is to provide senior management with reasonable assurance that the RCMS program is properly implemented/maintained. • Results of these RCMS audits should be used to provide input into senior management review in element 5.1. Characteristics of a good management system include the following: A system to internally audit the RCMS, with appropriate resources and defined schedules. <ul style="list-style-type: none"> – A corrective action processes to address identified audit findings. – Companies should internally audit their RCMS on a regular frequency. Frequency typically ranges between 3–5 years, but varies based on a number of factors, including risk of operations, size of

Audit Criteria	Source	Guidance for Auditors
		<p>Table 22.4 – Continued</p> <p>facilities, previous audit findings, etc. Audits should follow a pre-determined schedule and exist throughout the organization.</p> <ul style="list-style-type: none"> • Results of these audits should feed into the company's corrective action tracking system, and should be reported to management. • Some companies take a tiered, comprehensive approach to auditing, including elements of management systems and regulatory compliance.
<p>22-R-29. The organization shall conduct reviews of the Responsible Care performance of carriers, suppliers, distributors, customers, contractors and third party providers, commensurate with risk, for use in qualification reviews.</p>	<p>RCMS Technical Specification Elements 4.5</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • This element is a critical aspect of an organization's product stewardship, distribution, process safety and other key commercial partner interactions. It calls for performance reviews and qualification systems for all commercial partners. These may include the following: <ul style="list-style-type: none"> – Carriers – Suppliers – Distributors – Customers – Contractors – Other third-party providers as defined by the organization (waste disposal contractors, <u>tollers, contract manufacturers, warehouses, terminals, etc.)</u>
<p>22-R-30. The organization shall identify instances of <i>nonconformance</i> with the RCMS, address and investigate those instances, mitigate any adverse impacts, and initiate and complete corrective and preventive actions.</p>	<p>RCMS Technical Specification Elements 4.7</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • A system to identify and address nonconformances should be in place. It asks that an organization define responsibility for handling each nonconformance, and to develop and complete appropriate corrective and preventive actions. • Characteristics of a good management system include the

Audit Criteria	Source	Guidance for Auditors
		<p>following:</p> <ul style="list-style-type: none"> - Clearly defined responsibilities for identifying, investigating, mitigating, and correcting nonconformances. - An accessible system to effectively track nonconformances. - A system to assign and effectively track corrective and preventive actions that is accessible throughout the organization. <ul style="list-style-type: none"> • An organization should assign oversight to each instance of nonconformance for the following: <ul style="list-style-type: none"> - identification - investigation and handling - mitigation of adverse impacts - identification and initiation of any corrective or preventive actions - tracking of those actions to completion - sharing of incident information with relevant stakeholders (e.g., commercial partners, community, employees, other industry) • Auditors should ensure that when handling nonconformances, a process to periodically review the system and to evaluate the effectiveness of the corrective and preventive actions implemented is established and completed. Usually, companies manage this through existing performance tracking systems with fields for defining and assigning corrective actions.

Audit Criteria	Source	Guidance for Auditors
<p><i>RC14001</i> 22-R-31. The organization shall ensure that internal audits of the environmental management system</p>	<p>RC14001 Technical Specification RC151.03</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Audit program(s) should be planned, established, implemented, and maintained

Audit Criteria	Source	Guidance for Auditors
<p>Table 22.4 – Continued</p> <p>are conducted at planned intervals to:</p> <ul style="list-style-type: none"> • Determine whether the environmental management system: • conforms to planned arrangements for environmental management including the requirements of this International Standard; • has been properly implemented and is maintained. • Provide information on the results of audits to management. 	4.5.5	<p>by the organization, taking into consideration the environmental importance of the operation(s) concerned and the results of previous audits.</p> <ul style="list-style-type: none"> • Audit procedure(s) addressing the requirements for planning and conducting audits, reporting results, and retaining associated records should be established, implemented, and maintained to determine audit criteria, scope, frequency, and methods. • Selection of auditors and conduct of audits should ensure objectivity and the impartiality of the audits.

22.3 AUDIT PROTOCOL

The PSM audit protocol introduced in Appendix A and available online (see page xiv for information on how to access this resource) provides detailed questions that examine the issues described in Section 22.2.

REFERENCES

- American Chemistry Council, *RCMS[®] Technical Specification*, RC101.02, March 9, 2005
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations*, RC101.02, January 25, 2004
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations Appendices*, RC101.02, January 25, 2004
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- Center for Chemical Process Safety (CCPS), *Guidelines for Risk Based Process Safety*, American Institute of Chemical Engineers, New York, 2007 (CCPS, 2007c)
- Delaware, *Accidental Release Prevention Regulation*, Delaware Department of Natural Resources and Environmental Control/Division of Air and Waste Management, September 1989 (rev. January 1999)
- Department of the Interior, Minerals Management Service, *Safety and Environmental Management Program (SEMP)*, 1990
- Environmental Protection Agency (USEPA), 40 CFR §68, *Accidental Release Prevention Requirements: Risk Management Programs Under Clean Air Act Section 112(r)(7)*; Final Rule, June 21, 1996
- New Jersey, *Toxic Catastrophe Prevention Act (N.J.A.C. 7:31)*, New Jersey Department of Environmental Protection, June 1987 (rev. April 16, 2007)

- Occupational Safety and Health Administration (OSHA) 29 CFR §1910.119, *Process Safety Management of Highly Hazardous Chemicals, Explosives and Blasting Agents; Final Rule*, Washington, DC, February 24, 1992
- Occupational Safety and Health Administration (OSHA) Publication 3133, *Process Safety Management Guidelines for Compliance*, Washington, DC, 1993
- Occupational Safety and Health Administration (OSHA) Instruction CPL 02-02-045 CH-1, *PSM Compliance Directive*, Washington, DC, September 13, 1994
- Occupational Safety and Health Administration (OSHA) Instruction CPL 03-00-004, *Petroleum Refinery Process Safety Management National Emphasis Program*, June 7, 2007 (OSHA, 2007a)
- Occupational Safety and Health Administration (OSHA) Directive 09-06 (CPL 02), *PSM Chemical Covered Facilities National Emphasis Program*, July 27, 2009 (OSHA, 2009a)
- Occupational Safety and Health Administration (OSHA) Instruction CPL 02-00-148, *Field Operations Manual*, Washington, DC, March 26, 2009 (OSHA, 2009b)

23

MANAGEMENT REVIEW AND CONTINUOUS IMPROVEMENT

This element has no direct corresponding element in OSHA PSM and EPA RMP programs or state regulatory PSM programs; however, the concept of management review and continuous improvement is an underlying, if not formal, concept of all PSM programs, and a component of several voluntary consensus PSM programs. It is also a fundamental component of Plan-Do-Check-Act management systems. This element will be referred to as Management Review and is an element of the RBPS accident prevention pillar of Learn from Experience.

23.1 OVERVIEW

Management review is the periodic evaluation of whether PSM management systems are performing as intended and are producing the desired results. Formal audits are generally too infrequent (e.g., triennially for OSHA PSM audits) to be completely effective review activities. Therefore, management reviews provide the ongoing “due diligence” that fills the gap between day-to-day work activities and formal periodic audits and represent a portion of the “Check” and the “Act” parts of a Plan-Do-Check-Act management system.

Management reviews have many of the characteristics of a first-party audit as described in Chapters 1 and 22. The similarities between management reviews and audits are summarized as follows:

- Both management reviews and audits require a management system for scheduling, staffing, and effectively evaluating and reporting all PSM program elements.
- Both management reviews and audits require a management system for implementing any resulting plans for improvement or corrective action and verifying their effectiveness.

- Both management reviews and audits attempt to identify deep-rooted or subtle systemic problems, although management reviews, because they are more focused and generally examine one element at a time, can be more effective at identifying these types of problems. Both audits and management reviews strive to identify repeat findings.
- If formal PSM audits also include related criteria, including metrics, process safety culture, etc. they too can contribute information for the continuous improvement of the PSM program.

The differences between management reviews and audits are summarized as follows:

- Management reviews focus more on measuring the effectiveness of specific elements of the PSM program, as opposed to audits, which focus more strictly on the compliance status of the entire PSM program. However, PSM audits that involve an examination of related criteria, e.g., industry best/common practices in PSM (as described in the remaining chapters of this book) also measure program effectiveness.
- Management reviews are more informal than audits, which tend to be a more formal and scripted activity. Reviewers are usually freer to interpret the protocol being used and examine an area of the PSM program that perhaps would not be examined (or at least not as thoroughly) during an audit. However, the findings and recommendations generated from a management review are not less formal in importance than those generated during an audit and do not have a lesser priority.
- Management reviews provide a measurement of the PSM program against established metrics, particularly leading metrics, which may provide advance indicators of problems in the PSM program that are not immediately obvious.
- Management reviews are more frequent than formal audits, which tend to be biennial or triennial (see Chapter 1). Management reviews are typically performed on an annual or more frequent basis.
- One of the primary topical areas to examine during a management review is the nature of process safety culture, which affects the functionality of all other PSM program elements. Process safety culture is currently not a common element to examine during a PSM audit.
- Management reviews focus more on PSM program implementation activities than audits.
- Management reviews can be performed by either teams or individuals, whereas audits tend to be performed by teams (see Chapter 22).

Although all elements of the PSM program are subject to periodic management review and improvement, the management review element interfaces significantly with several other PSM program elements, which include the following:

- Auditing (Chapter 22)—PSM audits provide some of the information that is reviewed and acted upon to improve the PSM program.

- Measurement and Metrics (Chapter 21)—PSM metrics are reviewed periodically and acted upon to improve the PSM program.

In Section 23.2, related audit criteria are presented, along with guidance for auditors in applying the criteria. A full explanation of compliance and related audit criteria is presented in Chapter 1 (see Section 1.7). The criteria and guidance described in these sections do not represent exclusive solutions to PSM program coverage, design, implementation, or interpretation. They represent the collective experience of many people in the chemical/processing sector who have performed many PSM audits, and the consensus opinion resulting from that experience.

The inclusion of related criteria in no way infers that these criteria must be implemented for a PSM program to be successful, nor does it infer that a PSM program will be deficient without them. There may be other, more appropriate solutions for an individual facility or company. In addition, the use of the related criteria in a PSM audit is intended to be completely voluntary and not a mandatory requirement in any way. They should be used cautiously and with careful planning so that they do not inadvertently establish unintended performance standards. Consensus should be sought within and among facilities and their parent companies before these criteria are used. Finally, the related criteria and guidance offered for consideration are not endorsements of or agreements with the written or verbal clarifications made by the regulators, PSM citations issued against the regulations, other PSM guidance published by the regulators, or the successful or common PSM practices in any given company's PSM program from which they are derived.

23.2 AUDIT CRITERIA AND GUIDANCE

The detailed requirements for Management Review are presented below. Since no PSM regulation requires that either management reviews be conducted or that a continuous improvement program resulting from such reviews be implemented, all the requirements shown in this chapter are related requirements.

The audit criteria described below are examined by auditors using the guidance provided by performing the following audit activities:

- Interviewing the person(s) at the facility who has the responsibility for monitoring the health of the PSM program. This person is usually the PSM coordinator/manager.
- Reviewing the management review procedure.
- Reviewing previous management review reports or records.
- Reviewing the records that show the resolution of the management review recommendations.
- Reviewing the records that show the trends of the management review results.

The purpose of providing these criteria is to provide auditors with guidance for evaluating PSM programs with respect to issues that in large part represent industry good practices, or in some cases practices that have become common.

Some of the related criteria have reached the status of a level of acceptable practice because of their widespread, accepted, and successful use over an extended period of time. Auditors and PSM practitioners should carefully consider implementing this guidance, or at least designing an approach that is similar in nature. See the Glossary and Section 1.7.1 for a more complete discussion of the meaning and use of level of acceptable practice.

Auditors should also carefully examine the management review and continuous improvement requirements found in the procedures of the company/facility being audited. As stated in Section 1.7.1, these could be interpreted as compliance requirements by regulators and could be subject to citations if they are not being followed. Auditors should confirm, via interviews, records and document reviews, and field observations, that the requirements of the facility or company management review and continuous improvement procedures have been implemented as specified. Findings should be generated if the company/facility-specific provisions are not being followed.

See the Guidance for Chapters 3–24 in the Introduction for the definition of the abbreviations shown in the following tables that are used to indicate the source of the criteria.

Table 23.1 identifies the recommended related audit criteria and auditor guidance for related criteria relating to Management Review.

Table 23.1 Related Audit Criteria and Auditor Guidance - Management Review

Audit Criteria	Source	Guidance for Auditors
23-R-1. The facility or company has a written management system procedure that governs the conduct and follow-up of PSM program management reviews.	CCPA RBPS	<u>Auditor Activities:</u> Auditors should review the PSM program management review and continuous improvement procedure to determine if it covers the following topics: <ul style="list-style-type: none"> • Scheduling of review meetings and a schedule of process safety elements to be covered. • Documentation of meeting presentations and documentation of decisions and action items resulting from the meeting. • Follow-up of action items. • Communication of learnings.
23-R-2. Management reviews are conducted such that each element is reviewed at least annually.	RBPS	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review management review reports/records to determine if these reviews are performed at least annually.

Audit Criteria	Source	Guidance for Auditors
23-R-3. A protocol exists for conducting the management reviews.	RBPS	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the management review procedure to determine if it contains a protocol that describes what is to be reviewed and how the review is to be conducted.
23-R-4. PSM program effectiveness is evaluated.	RBPS	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review management review reports/records to determine if they include an examination of process safety culture. Auditors should compare PSM program effectiveness against established leading PSM metrics. Auditors should determine if PSM practices are not fully institutionalized by procedure but are functioning due to the personal diligence and drive of a particular individual.
23-R-5. Management reviews examine how facility and company changes of different types impact the effectiveness of the PSM program, that is, the robustness of the program to accommodate those changes without compromising the functionality of the program.	RBPS	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review management review reports/records to determine if the management reviews examine the following aspects of the PSM program: <ul style="list-style-type: none"> Contents and requirements of the approved PSM procedures and policies of the facility and company. Changes in or loss of key personnel and the impact of these changes on current and future PSM program effectiveness. Reorganization of the facility or company and the resulting changes in roles and responsibilities and the impact of these changes on PSM program effectiveness. Significant changes in budget or resources and the impact of these changes on PSM program effectiveness. Significant changes in the status of the facility, i.e., an addition of a new process, or significant increase in throughput can <p>Table 23.1 – Continued</p> <p>impact the effectiveness of the</p>

Audit Criteria	Source	Guidance for Auditors
		PSM program. Conversely, the contraction of the facility, its products, or throughput can also have an impact on the effectiveness of the PSM program.
23-R-6. Management review findings are reported and analyzed.	RBPS	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review minutes of meetings or other similar records to determine if the results of management reviews are reported forward and analyzed/discussed. • Interviews with management and nonmanagement personnel indicate that the results of management reviews of PSM programs are communicated widely within the facility.
23-R-7. Recommendations derived from management reviews findings are resolved in a timely manner.	RBPS	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the audit or PSM recommendation management system to determine if the management review recommendations have been resolved within a time period that is consistent with the complexity of the recommendation and the difficulty of implementation (see Chapter 10). Management review recommendations receive the same priority for resolution as any other PSM-related recommendation. • PSM auditors should determine how each facility has defined "timely," how they have applied their definition, and if the definition and its application are reasonable and defensible.
23-R-8. The resolution for management review recommendations derived from findings are tracked and managed in a manner similar to formal audit, HIRA, and incident recommendations.	RBPS	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should confirm that there is a management system in place to track the status, resolution and implementation of recommendations and action items. It is a common practice to use a spreadsheet, database, or other electronic means of managing management review recommendations, in a manner similar to other PSM-related recommendations.

Audit Criteria	Source	Guidance for Auditors
23-R-9. Management review (and possibly audit) findings are trended over time to indicate status of improvement.	RBPS	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should confirm that there are PSM-related records that show that management review data is trended over time to determine rate and degree of improvement.

23.3 VOLUNTARY CONSENSUS PSM PROGRAMS

The following voluntary consensus PSM program requirements for management review are described below:

- The requirements published for the offshore oil platform sector in the Safety and Environmental Management Program (SEMP), a voluntary program designed by API and endorsed by the Minerals Management Service of the U.S. Department of the Interior.
- Responsible Care Management System (RCMS)[®] published by the American Chemistry Council.
- RC14001 Environmental Management System, published by the American Chemistry Council.

Table 23.2 lists the recommended related audit criteria and auditor guidance relating to Management Review pursuant to voluntary consensus PSM programs.

Table 23.2 Voluntary Consensus PSM Program Audit Criteria and Guidance - Management Review

Audit Criteria	Source	Guidance for Auditors
<i>SEMP</i> 23-R-10. The SEM program does not add any additional requirements in the area of Management Review & Continuous Improvement.		<ul style="list-style-type: none"> • No further guidance.

Audit Criteria	Source	Guidance for Auditors
<i>Responsible Care[®] Management System (RMCS)</i> 23-R-11. Senior Management shall periodically review its Responsible Care Management System and take action to ensure its continuing suitability, adequacy and effectiveness. This review shall address the possible need for changes to policy, goals, objectives and other elements of the Responsible Care Management System, changing circumstances and	RCMS Technical Specification, Element 5.1	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should confirm that a system exists to periodically review the RCMS, based on performance compared with goals, targets and objectives, audit results, nonconformances, incident investigation results, policy discussions, stakeholder input, and other issues resulting from the implementation and review of the RCMS.

Audit Criteria	Source	Guidance for Auditors
<p>Table 23.1 – Continued the commitment to continuous improvement.</p>		<ul style="list-style-type: none"> • Auditors should confirm that the system includes the direct involvement of senior management in the review process. • Auditors should review meeting minutes, policy and objective updates, or other evidence that demonstrates that senior management has been briefed on the current status of the RCMS.

Audit Criteria	Source	Guidance for Auditors
<p><i>RC14001</i> 23-R-12. Top management shall review the organization's environmental management system, at planned intervals, to ensure its continuing suitability, adequacy and effectiveness.</p>	<p>RC14001 Technical Specification RC151.03 4.6</p>	<p><u>Background Information for Auditors:</u></p> <ul style="list-style-type: none"> • Input to management reviews should include the following: <ul style="list-style-type: none"> – results of internal audits and evaluations of compliance with legal requirements and with other requirements to which the organization subscribes – communication(s) from external interested parties, including complaints – the environmental performance of the organization – the extent to which objectives and targets have been met – status of corrective and preventive actions – follow-up actions from previous management reviews, changing circumstances, including developments in legal and other requirements related to its environmental aspects – recommendations for improvement. • The outputs from management reviews should include any decisions and actions related to possible changes to environmental policy, objectives, targets and other elements of the environmental

Audit Criteria	Source	Guidance for Auditors
		<p>management system, consistent with the commitment to continual improvement.</p> <p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should determine that the reviews include an assessment of the opportunities for improvement and the need for changes to the environmental management system, including the environmental policy and environmental objectives and targets. • Auditors should confirm that records of the management reviews are being retained.

23.4 AUDIT PROTOCOL

The process safety program audit protocol introduced in Appendix A and available online (see page xiv for information on how to access this resource) provides detailed questions that examine the criteria described in Sections 23.2 and 23.3.

REFERENCES

- American Chemistry Council, *RCMS[®] Technical Specification*, RC101.02, March 9, 2005
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations*, RC101.02, January 25, 2004
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations Appendices*, RC101.02, January 25, 2004
- California, California Code of Regulations, Title 8, Section 5189, CalOSHA, November 1985
- Center for Chemical Process Safety (CCPS), *Guidelines for Risk Based Process Safety*, American Institute of Chemical Engineers, New York, 2007 (CCPS, 2007c)
- Department of the Interior, Minerals Management Service, *Safety and Environmental Management Program (SEMP)*, 1990

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RISK MANAGEMENT PROGRAMS

This element has no direct corresponding element in the RBPS book. However, there are RBPS elements related to RMP requirements, for example Hazard Identification and Risk Analysis, Emergency Management, and Stakeholder Outreach. In addition, the prevention program elements of RMP all have direct counterparts in OSHA PSM programs. Several state programs have adopted the RMP program requirements as part of the process of gaining implementing agency status from the EPA for RMP within their respective states. For consistency with the language of the RMP Rule, the nomenclature will be changed in this chapter and “facilities” will be referred to as “sites.” Also, in this chapter “RMP” refers to a risk management program or the regulation requiring it (i.e., the RMP Rule in 40 CFR §68). The term “RMPlan” refers to the actual risk management plan submitted to EPA or a state implementing agency pursuant to that regulation.

24.1 OVERVIEW

In this chapter, audit criteria for the nonprevention portions of the RMP program will be presented. The auditing of the prevention program portion of RMP would use the other chapters of this book because for Program 3 RMP processes, the prevention program requirements are identical to OSHA PSM. For Program 2 RMP sites, the requirements are similar to OSHA PSM. Although these requirements are mandatory for sites that are covered by the RMP Rule (40 CFR §68), a periodic audit of the nonprevention portions of RMP programs is not a mandatory requirement for a site. The RMP Rule does contain overall RMP audit requirements, but these are the responsibility of the implementing agency, not the regulated site. However, the annual certification of an air permit issued in accordance with the Clean Air Act Amendments of 1990 infers that the RMP program (as required by Section 112(R) of the CAAA) is in place. This is not an

audit requirement but a statement that the site RMP program meets all the requirements of the RMP Rule.

The nonprevention portions of a RMP Program addressed in this chapter include the following:

- General requirements
- Applicability
- Management
- RMP submission
- Hazard assessment
- Emergency response

Although emergency response is also part of a PSM program (see Chapter 19), an RMP program's focus is the relationship between the site's emergency response plan and the corresponding plans in the community, and the sharing of information with and interface between the site and local emergency responders.

In Section 24.2, compliance RMP audit criteria are presented, along with guidance for auditors in applying the criteria. A full explanation of compliance and related audit criteria is presented in Chapter 1 (see Section 1.7). The criteria and guidance described in these sections do not represent exclusive solutions to RMP program coverage, design, implementation, or interpretation. They represent the collective experience of many people in the chemical/processing sector who have performed many PSM and RMP audits, and the consensus opinion resulting from that experience. The compliance criteria are derived from the regulations that govern RMP programs in the United States.; however, these regulations are all performance-based. Performance-based regulations are goal oriented and there may be multiple pathways to fully complying with them. Therefore, there may be alternate interpretations and solutions to the issues described in the compliance tables in this chapter that are equivalent to those included, particularly the auditor guidance presented.

24.2 AUDIT CRITERIA AND GUIDANCE

All of the RMP program audit criteria presented in the tables that follow are considered related guidance because self-auditing of them is not a mandatory requirement. However, they are presented below as compliance requirements because they are mandatory for those sites covered by the RMP Rule. Also, the EPA has published Frequently Asked Questions (FAQs) on its website to clarify the RMP Rule, its application, and how RMP programs should be developed and implemented (http://www.epa.gov/emergencies/content/rmp/caa_faqs.htm).

The audit criteria described below are examined by auditors using the guidance provided by performing the following audit activities:

- Reviewing the submitted RMP plan to EPA or the appropriate state-implementing agency for completeness.

- Reviewing the back-up documentation that exists for the inputs used in the submitted RMPlan, particularly for the hazard assessment.
- Interviewing the person at the facility who has overall responsibility for the RMP program, in order to determine the scope of the program as well as key activities and communications mechanisms. This is usually the process safety manager/coordinator, but may be someone in the environmental group because the RMP Rule is administered by EPA. Sometimes this responsibility is assigned to someone in the engineering or technical departments.
- Interviewing personnel who participate in community outreach activities, including EHS and operations managers. These typically are those site or company personnel who represent the site on the local emergency planning committee (LEPC) or the community advisory panel (CAP).
- Reviewing any records associated with outreach activities. These may be in the form of meeting minutes, newsletters, etc.

Auditors should also carefully examine the RMP requirements found in the procedures of the company/facility being audited. As stated in Section 1.7.1, these could be interpreted as compliance requirements by regulators and could be subject to citations if they are not being followed. Auditors should confirm, via interviews, records and document reviews, and field observations, that the requirements of the facility or company RMP procedures have been implemented as specified. Findings should be generated if the company/facility-specific provisions are not being followed.

See the Guidance for Chapters 3–24 in the Introduction for the definition of the abbreviations shown in the following tables that are used to indicate the source of the criteria.

24.2.1 Compliance Requirements

The audit criteria should be used by the following:

- Readers in the United States covered by the RMP Rule.
- Readers who have voluntarily adopted the RMP Rule.
- Readers whose companies have specified RMP Rule requirements in non-U.S. locations.

Table 24.1 presents the audit criteria and auditor guidance related to risk management programs pursuant to the EPA RMP.

Table 24.1 EPA RMP Audit Criteria and Guidance – Risk Management Programs

Audit Criteria	Source	Guidance for Auditors
Applicability		
<p>24-C-1. The owner or operator of the stationary source has more than a threshold quantity of a regulated substance in a process it is subject to the RMP Rule. The regulated substances and their threshold quantities are contained in 40 CFR §68.130.</p>	68.10(a)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review chemical inventory records, e.g., SARA Title III Tier 2 reports, material balances, process descriptions, other potential sources such as logistical/traffic records, and observations of transportation containers stored on-site (e.g., rail cars), and compare these lists to the list of regulated substances and their threshold quantities in 40 CFR §68.130.
<p>24-C-2. The process is eligible for Program 1 requirements if it meets all of the following:</p> <ul style="list-style-type: none"> • The process has not had, in the five years prior to submission of the RMP, an accidental release of a regulated substance where exposure to the substance, its reaction products, overpressure generated by an explosion involving the substance, or radiant heat generated by a fire involving the substance led to any of the following off-site: (a) death; (b) injury; or (c) response or restoration activities for an exposure of an environmental receptor. • The distance to a toxic or flammable endpoint for a worst-case release assessment is less than or equal to the distance to any public receptor. • The owner or operator has coordinated emergency response procedure between the stationary source and local emergency planning and response organizations. 	68.10(b)(1)-(b)(3)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Review of incident reports. • Review of offsite consequence analysis. In order to determine the applicability of the RMP Rule, it will be necessary to perform worst-case scenario off-site consequence analysis to determine if the consequences warrant. • Correspondence between the site and the LEPC and other off-site responders. • Participation in LEPC, CAP, and other forums for emergency responders. • Training on-site for local emergency responders.
<p>24-C-3. The process is a Program 3 process if it is not eligible for Program 1 and either of the following exists:</p> <ul style="list-style-type: none"> • The covered process is subject to OSHA PSM standard, 29 CFR §1910.119. 	68.10(d)(1)-(d)(2)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review PSM program applicability documents (see Chapter 3). • Auditors should review commercial, business, or other

Audit Criteria	Source	Guidance for Auditors
<ul style="list-style-type: none"> The covered process is in one of the following NAICS codes: 32211, 32411, 32511, 325181, 325188, 325192, 325199, 325211, 325311, or 32532. 		documents to determine the NAICS code(s) for the site and its processes.
24-C-4. The process is a Program 2 process if it is not Program 1 or Program 3.	68.10(c)	<u>Background Information for Auditors:</u> <ul style="list-style-type: none"> The most common types of Program 2 facilities are agricultural fertilizer retailers, publicly owned water and wastewater utilities in states that do not have a delegated OSHA program, other facilities that use substances on the EPA RMP list that are not on the OSHA PSM list (e.g., water solutions of regulated acids) and facilities that are exempt from PSM but not RMP (e.g., regulated liquid flammable substances in atmospheric storage tanks).
General Requirements		
24-C-5. The owner or operator has submitted a single RMP, which included a registration that reflects all covered processes, as provided in 68.150 to 68.185.	68.12(a)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should review RMP submit documentation to confirm that the RMP plan has been submitted.
24-C-6. For Program 1 processes audited, the owner or operator has: <ul style="list-style-type: none"> Analyzed the worst-case release scenario for the process(es), as provided in 68.25. Documented that the nearest public receptors is beyond the distance to an endpoint defined in 68.22(a). Included the scenario(s) in the RMP as provided in 68.165. Completed the five-year accident history for the process as provided in 68.42. Included the history in the RMP as provided in 68.168. Ensured that response actions have been coordinated with local emergency planning and response agencies. Included the appropriate certification statement for Program 1 processes. 	68.12(b)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should review documents that show the analyses that prove that processes at the site is eligible for RMP Program 1 status. This includes hazard assessments with appropriate off-site consequence analysis (OCA), incident reports, and the emergency response plan. The site may have a mix of Program 1, Program 2, and Program 3 processes.

Audit Criteria	Source	Guidance for Auditors
<p>Table 24.1 – Continued</p> <p>24-C-7. For Program 2 processes, the owner or operator has:</p> <ul style="list-style-type: none"> • Developed and implemented a management system as provided in 68.15. • Conducted a hazard assessment as provided in 68.20 through 68.42. • Implemented the Program 2 prevention steps provided in 68.48 through 68.60 or implemented the Program 3 prevention steps provided in 68.65 through 68.87. • Developed and implemented an emergency response program as provided in 68.90 to 68.95. • Submitted, as part of the RMP, the data on prevention program elements for Program 2 processes as provided in 68.170. 	68.12(c)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the documents that show that the processes at the site are eligible for Program 2 status. This includes documents that show the correct NAICS codes for the site. • Auditors should review the Program 2 element documents, including the management system, hazard assessment, a prevention program that meets the Program 2 requirements, and the emergency response plan.
<p>24-C-8. For Program 3 processes, the owner or operator has:</p> <ul style="list-style-type: none"> • Developed and implemented a management system as provided in 68.15. • Conducted a hazard assessment as provided in 68.20 through 68.42. • Implemented the prevention requirements provided in 68.65 through 68.87. • Developed and implemented an emergency response program as provided in 68.90 to 68.95. • Submitted, as part of the RMP, the data on prevention program elements for Program 3 processes as provided in 68.175. 	68.12(d)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the documents that show that the processes at the site are eligible for Program 3 status. This includes documents that show the correct NAICS codes for the site. • Auditors should review the Program 3 element documents, including the management system, hazard assessment, a prevention program that meets the Program 3 requirements, and the emergency response plan.
Management		
<p>24-C-9. The owner or operator has developed a management system to oversee the implementation of the risk management program elements.</p>	68.15(a)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review organization charts, job descriptions, procedures, or other documents that describes the management system for the RMP program.

Audit Criteria	Source	Guidance for Auditors
24-C-10. The owner or operator has assigned a qualified person or position that has the overall responsibility for the development, implementation, and integration of the risk management program elements.	68.15(b)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should review organization charts, job descriptions, procedures, or other documents that shows who is responsible for the RMP program at the site.
24-C-11. The owner or operator has documented other persons responsible for implementing individual requirements of the risk management program and defined the lines of authority through an organization chart or similar document.	68.15(c)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should review organization charts, job descriptions, procedures, or other documents that shows who else is involved in managing the RMP program at the site.
RMP Submission		
24-C-12. The owner or operator submitted an RMP on or before June 21, 1999.	68.10, 68.10(a)(1), 68.150(a) & (b)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should review the original submitted RMP to examine submittal date.
24-C-13. If submission was after June 21, 1999, was submittal required because: Initial listing of a regulated substance under 68.130 after June 21, 1999. A regulated substance was first present at the stationary source above the threshold quantity in a process.	68.10 & 68.150(b)(2)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should review the submitted RMP to examine the submittal date.
24-C-14. The owner or operator has revised and updated the RMP within 5 years of initial submission.	68.190(a)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should confirm the date of the last revision and update, which should be on or before June 21, 2004, and then at five-year intervals after that for most sites.
24-C-15. If required, the owner or operator has submitted a revised RMP for any of the following: <ul style="list-style-type: none"> Within 3 years after EPA first listed a newly regulated substance. No later than the date on which a new regulated substance is first present in an already covered process above a threshold quantity. 	68.190(b) (1)–(7)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should review the last submitted RMP and review of PHAs and MOCs to determine if changes that required revised PHAs and OCAs were performed. Auditors should check to see whether the facility needs to update and resubmit its RMP, or update certain program elements, such as the

Audit Criteria	Source	Guidance for Auditors
<p>Table 24.1 – Continued</p> <ul style="list-style-type: none"> • No later than the date on which a regulated substance is first present above a threshold quantity in a new process. • Within six months of a change that requires a revised PHA or hazard review. • Within six months of a change that requires a revised off-site consequence analysis. If changes in processes, quantities stored or handled, or any other aspect of the stationary source might reasonably be expected to increase or decrease the distance to the endpoint by a factor of two or more. • Within six months of a change that alters the Program level that applied to any covered process. <p>Note that corrections to RMPs to change administrative information are not considered revised RMPs and may be submitted whenever the information changes.</p>		<p>PHA/hazard review or OCA. For example, if a reportable accident occurred after the last RMP submission, the auditor should check to see whether the most recent full RMP submission has been corrected within six months with the appropriate accident information.</p> <ul style="list-style-type: none"> • Auditor should determine whether the facility has made changes that could invalidate the most recent PHA, new chemicals/process above the RQ, etc. • Auditors should review the OCA assumptions and back-up information to determine if there have been any changes in processes, quantities stored or handled, or any other aspect of the stationary source might reasonably be expected to increase or decrease the distance to the endpoint by a factor of two or more, or a new public receptor has been built in the vicinity of the site.
<p>24-C-16. The owner or operator has included information submitted as Confidential Business Information (CBI) in the RMP. If so, the provisions of 68.151 and 68.152 were followed.</p>	68.150(d)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP to determine if CBI information was included and if so, the provisions of 68.151 and 68.152 were followed.
<p>RMP: Executive Summary</p>		
<p>24-C-17. The owner or operator has included a brief description of the following elements in the executive summary of the RMP:</p> <ul style="list-style-type: none"> • The accidental release prevention and emergency response policies at the stationary source. • The stationary source and regulated substances handled. • The general accidental release prevention program and chemical specific prevention steps. • The five year accident history. 	68.155 (a)-(g)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP and should ensure that review of RMP program records confirms that the site is following what is described in the Executive Summary.

Audit Criteria	Source	Guidance for Auditors
<ul style="list-style-type: none"><li>• The emergency response program.<li>• Planned changes to improve safety.		

Audit Criteria	Source	Guidance for Auditors
<i>RMP: Registration</i>		

Audit Criteria	Source	Guidance for Auditors
<p>Table 24.1 – Continued</p> <p>24-C-18. The owner or operator has included a single registration form in the RMP which covers all regulated substances handled in covered processes. The registration includes the following data:</p> <ul style="list-style-type: none"> • Stationary source name, full address, Dun & Bradstreet number, longitude and latitude with method and description. • Corporate parent company name and Dun & Bradstreet number. • The name, telephone number and mailing address of the owner or operator. • The name and title of person or position with overall responsibility for RMP elements and implementation. • The name, title, telephone number and 24-hour number of the emergency contact. • For each covered process, the name and CAS number of each regulated substance held above the threshold quantity in the process, the maximum quantity of each regulated substance or mixture in the process, the NAICS code, and the Program level of the process. • The stationary source EPA identifier. • The number of full time employees at the stationary source. • Whether or not the stationary source is subject of 29 CFR §1910.119, OSHA's Process Safety Management Standard. • Whether or not the stationary source is subject to 40 CFR §355, the Emergency Planning Requirements of the Emergency Planning and Community Right-To-Know Act. • Whether or not the stationary source has a CAA Title V operating permit and, if so, its permit number. • The date of the last safety inspection of the stationary source by a Federal, State or Local government agency and the identity of the inspecting entity. 	<p>68.160(a)(b) (1)-(13)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP registration section to confirm that all the required information has been included and that it is accurate.

Audit Criteria	Source	Guidance for Auditors
RMP: Off-Site Consequence Analysis		
<p>Table 24.1 – Continued</p> <p>24-C-19. The RMP includes the following:</p> <ul style="list-style-type: none"> • One worst-case release scenario for each Program 1 process. • For Program 2 & 3 processes, one worst case release scenario to represent all regulated toxic substances held above the threshold quantity and one worst-case release scenario to represent all regulated flammable substances held above the threshold quantity. • For Program 2 & 3 processes, were additional worst case scenarios submitted, if required by 68.25(a)(2)(i)(iii). • For Program 2 & 3 process, was information submitted on one alternative scenario for each regulated toxic substance held above the threshold quantity and one alternative scenario to represent all regulated flammable substances held above the threshold. 	68.165(a)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP's hazard assessment section to confirm that all the required information for worst-case scenarios has been included and that it is accurate.
<p>24-C-20. The RMP includes the following information for each submitted release scenario:</p> <ul style="list-style-type: none"> • Scenario type (explosion, fire, toxic gas release, or liquid spill and vaporization). • Chemical name of released substance. • Percentage weight of the chemical in a liquid mixture (toxics only). • Physical state of substance (toxics only). • Basis of results (model name, if used). • Quantity released in pounds. • Release rate. • Release duration. • Wind speed and atmospheric stability class (toxics only). • Topography (toxics only). • Distance to endpoint. 	68.165(b) (1)–(14)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP's hazard assessment section to confirm that all the required input data for worst-case scenarios has been included and that it is accurate.

Audit Criteria	Source	Guidance for Auditors
<ul style="list-style-type: none"> • Public and environmental receptors within the distance. • Passive mitigation considered. • Active mitigation considered (alternative releases scenarios only). 		
RMP: Five-Year Accident History		
<p>24-C-21. The owner or operator has provided the five-year accident history information in 68.42 on each accident covered by 68.42. The RMP includes the following information for each reported accidental release:</p> <ul style="list-style-type: none"> • Date, time and approximate duration of the release. • Chemical(s) released. • Estimated quantity released, in pounds. • The type of release event and its source. • Weather conditions (if known). • On-site impacts. • Known off-site impacts. • Initiating event and contributing factors (if known). • Whether off site responders were notified (if known). • Operational or process changes that resulted from investigation of the release. 	68.168 68.42(b) (1)–(10)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP's site incident reports to determine if all the appropriate incidents have been included in the five-year accident history.
RMP: Prevention Program/Program 2		
<p>24-C-22. The owner or operator has included the following information for each covered process in Program 2:</p> <ul style="list-style-type: none"> • The NAICS code for the process. • The name(s) of the chemical(s) covered. • The date of the most recent review or revision of the safety information and a list of Federal or State regulations or industry specific design codes and standards used to demonstrate compliance with the safety information requirement. • The date of completion of the 	68.170 (a)–(d) 68.170 (a)–(k)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP's prevention program section to confirm that all of the required input data for Program 2 processes has been included and that it is accurate.

Audit Criteria	Source	Guidance for Auditors
<p>Table 24.1 – Continued</p> <p>most recent hazard review or</p> <ul style="list-style-type: none"> • update, including: • The expected date of completion of any changes resulting from the hazard review or update. • Major hazards identified. • Process controls in use. • Mitigation systems in use. • Monitoring and detection systems in use. • Changes since the last hazard review. • The date of the most recent review or revision of operating procedures. • The date of the most recent review or revision of training programs, including: • The type of training provided – classroom/CBT, classroom plus on the job, on the job. • The type of competency testing used. • The date of the most recent review or revision of maintenance procedures and the date of the most recent equipment inspection or test and the equipment inspected or tested. • The date of the most recent compliance audit and the expected date of completion of any changes resulting from the compliance audit. • The date of the most recent incident investigation and the expected date of completion of any changes resulting from the investigation. • The date of the most recent change that triggered a review or revision of safety information, hazard review, operating or maintenance procedures, or training. 		
RMP: Prevention Program/Program 3		
24-C-23. The owner or operator has included in the RMP information	68.175	<u>Auditor Activities:</u>

Audit Criteria	Source	Guidance for Auditors
<p>addressing 68.175(b) to 68.175(p):</p> <ul style="list-style-type: none"> • The NAICS code for the process. • The name(s) of the substance(s) covered. • The date on which the safety information was last reviewed or revised. • The date of completion of the most recent process hazard analysis (PHA) or update and the technique used, including: • The expected date of completion of any changes resulting from the PHA. • Major hazards identified. • Process controls in use. • Mitigation systems in use. • Monitoring and detection systems in use. • Changes since the last PHA. • The date of the most recent review or revision of operating procedures. • The date of the most recent review or revision of training programs, including: • The type of training provided – classroom/CBT, classroom plus on the job, on the job. • The type of competency testing used. • The date of the most recent review or revision of maintenance procedures and the date of the most recent equipment inspection or test and the equipment inspected or tested. • The date of the most recent change that triggered MOC procedures and the date of the most recent review or revision of MOC procedures. • The date of the most recent pre-start up review. • The date of the most recent compliance audit and the expected date of completion of any changes resulting from the compliance audit. 	(a)–(p)	<ul style="list-style-type: none"> • Auditors should review the last submitted RMP's prevention program section to confirm that all the required input data for Program 3 processes has been included and that it is accurate.

Audit Criteria	Source	Guidance for Auditors
<p>Table 24.1 – Continued</p> <ul style="list-style-type: none"> • The date of the most recent incident investigation and the expected date of completion of any changes resulting from the investigation. • The date of the most recent review or revision of employee participation plans. • The date of the most recent review or revision of hot work permit procedures. • The date of the most recent review or revision of contractor safety procedures. • The date of the most recent evaluation of contractor safety performance. 		
RMP: Emergency Response Program		
<p>24-C-24. The owner or operator included the following information in the RMP on the emergency response program:</p> <ul style="list-style-type: none"> • Does a written emergency response plan exist. • Does the plan include specific actions to be taken in response to an accidental releases of a regulated substance. • Does the plan include procedures for informing the public and local agencies responsible for responding to accidental releases. • Does the plan include information on emergency health care. • Date of the most recent review or update of emergency response plan. • Date of the most recent emergency response training for employees. 	68.180(a) (1)–(6)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP's emergency response section to confirm that all the required input data describing the emergency response plan has been included and that it is accurate.
<p>24-C-25. The owner or operator has provided the name and telephone number of the local agency with which emergency response activities and the emergency response plan is coordinated.</p>	68.180(b)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP's emergency response section to confirm that all the required data for the name and telephone number of the local agency with which emergency response activities

Audit Criteria	Source	Guidance for Auditors
		and the emergency response plan is coordinated has been included and that it is accurate.
24-C-26. The owner or operator has listed other Federal or State emergency plan requirements to which the stationary source is subject.	68.180(c)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP's emergency response section to confirm that all of the required information on other federal or state emergency plan requirements to which the site is subject has been included and that it is accurate.
RMP: Certification		
24-C-27. The owner or operator has submitted the certification statement in 68.12(b)(4) for Program 1 processes.	68.185(a)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP's certification section to confirm that the proper Program 1 certification has been included.
24-C-28. The owner or operator has submitted the appropriate certification statement that to the best of the signer's knowledge, information, and belief formed after reasonable inquiry, the information submitted is true, accurate, and complete for Program 2 or 3 processes.	68.185(b)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP's certification section to confirm that the proper Program 2 or 3 certification has been included.
Hazard Assessment		
Hazard Assessment: Applicability		
24-C-29. The owner or operator has prepared a worst-case scenario analysis as provided in 68.25 and completed the five year accident history as provided in 68.42.	68.2	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP's hazard assessment section to confirm that a worst-case scenario analysis and five-year accident history have been included.
Hazard Assessment: Off-Site Consequence Analysis Parameters		
24-C-30. The owner or operator has used the following endpoints for offsite consequence analysis for a worst-case scenario: <ul style="list-style-type: none"> • For toxics: the endpoints provided in Appendix A of 40 CFR §68. 	68.22(a)(1)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP's hazard assessment section to confirm that the proper toxic end points of concern have been used in the OCA.

Audit Criteria	Source	Guidance for Auditors
<p>Table 24.1 – Continued</p> <ul style="list-style-type: none"> For flammables: an explosion resulting in an over pressure of 1 psi. 		
<p>24-C-31. The owner or operator has used the following endpoints for offsite consequence analysis for an alternative release scenario:</p> <ul style="list-style-type: none"> For toxics: the endpoints provided in Appendix A of 40 CFR §68. For flammables: an explosion resulting in an over pressure of 1 psi. For flammables: a fire resulting in a radiant heat/exposure of 5 kw/m² for 40 seconds. For flammables: a concentration resulting in a lower flammability limit, as provided in NFPA documents or other generally recognized sources. 	68.22(a)(2)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the last submitted RMP's hazard assessment section to confirm that the proper flammable end points of concern have been used in the OCA.
<p>24-C-32. The owner or operator has used appropriate wind speeds and stability classes for the release analysis.</p>	68.22(b)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the last submitted RMP's hazard assessment section to confirm that the proper wind speed and stability class have been used in the OCA. Auditors should review local weather data to determine if appropriate wind speeds and stability classes were chosen.
<p>24-C-33. The owner or operator has used appropriate ambient temperature and humidity values for the release analysis.</p>	68.22(c)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the last submitted RMP's hazard assessment section to confirm that the proper appropriate ambient temperature and humidity have been used in the OCA.
<p>24-C-34. The owner or operator has used appropriate values for the height of the release for the release analysis.</p>	68.22(d)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the last submitted RMP's hazard assessment section to confirm that the proper height of the release has been used in the OCA.

Audit Criteria	Source	Guidance for Auditors
24-C-35. The owner or operator has used appropriate surface roughness values for the release analysis.	68.22(e)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should review the last submitted RMP's hazard assessment section to confirm that the proper surface has been used in the OCA.
24-C-36. Tables and models used for dispersion analysis of toxic substances appropriately account for dense or neutrally buoyant gases.	68.22(f)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should review the last submitted RMP's hazard assessment section to confirm that the dispersion analysis of toxic substances appropriately account for dense or neutrally buoyant gases in the OCA.
24-C-37. Liquids, other than gases liquefied by refrigeration only were considered to be released at the highest daily maximum temperature, based on data for the previous three years appropriate for a stationary source, or at process temperature, whichever is higher.	68.22(g)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should review the last submitted RMP's hazard assessment section to confirm that liquids, other than gases liquefied by refrigeration only were considered to be released at the highest daily maximum temperature, based on data for the previous three years appropriate for a stationary source, or at process temperature, whichever is higher in the in the OCA. Auditors should review local weather data to determine if appropriate temperatures were chosen.
Hazard Assessment: Worst Case Release Scenario Analysis		
24-C-38. The owner or operator of Program 1 processes has analyzed and reported in the RMP one worst-case scenario for each Program 1 process.	68.25(a)(1)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should review documents that show the analyses that prove that processes at the site is eligible for RMP Program 1 status. This includes hazard assessments with appropriate off-site consequence analysis (OCA), incident reports, and the emergency response plan.
24-C-39. The owner or operator of Program 2 or 3 processes has: <ul style="list-style-type: none"> Analyzed and reported in the RMP one worst-case release scenario estimated to create the greatest distance to an endpoint resulting from an accidental 	68.25(a)(2)(i)-(iii)	<u>Auditor Activities:</u> <ul style="list-style-type: none"> Auditors should review the last submitted RMP's hazard assessment section to confirm that the proper number of WCS(s) were analyzed and

Audit Criteria	Source	Guidance for Auditors
<p>Table 24.1 – Continued</p> <p>release of a regulated toxic substance from covered processes under worst-case conditions.</p> <ul style="list-style-type: none"> Analyzed and reported in the RMP one worst case scenario estimated to create the greatest distance to an endpoint resulting from an accidental release of a regulated flammable substance from covered processes under worst case conditions. Analyzed and reported in the RMP additional worst-case release scenarios for a hazard class if a worst-case release from another covered process at the stationary source potentially affects public receptors different from those potentially affected by the worst-case release scenario developed under 68.25(a)(2)(i) or 68.25(a)(2)(ii). 		submitted.
<p>24-C-40. The owner or operator has determined the worst-case release quantity to be the greater of the following:</p> <ul style="list-style-type: none"> If released from a vessel, the greatest amount held in the vessel taking into account administrative quantity. If released from a pipe, the greatest amount held in the pipe, taking into account administrative controls that limit the maximum quantity. 	68.25(b)(1)-(2)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the last submitted RMP's hazard assessment section to confirm that the proper release quantity was used in the WCS(s).
<p>24-C-41. The owner or operator has for toxic substances that are normally gases at ambient temperature and handled as a gas or liquid under pressure:</p> <ul style="list-style-type: none"> Assumed the whole quantity in the vessel or pipe would be released as a gas over 10 minutes. Assumed the release rate to be the total quantity divided by 10, if there are no passive mitigation systems in place. 	68.25(c)(1)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the last submitted RMP's hazard assessment section to confirm that the proper release rate was used in the WCS(s) for toxics released as gases.

Audit Criteria	Source	Guidance for Auditors
<p>24-C-42. The owner or operator has for toxic gases handled as refrigerated liquids at ambient pressure:</p> <ul style="list-style-type: none"> • Assumed the substance would be released as a gas in 10 minutes, if not contained by passive mitigation systems or if the contained pool would have a depth of 1 cm or less. • [Optional for owner or operator] Assumed the quantity in the vessel or pipe would be spilled instantaneously to form a liquid pool, if the released substance would be contained by passive mitigation systems in a pool with a depth greater than the 1 cm. • Calculated the volatilization rate at the boiling point of the substance and at the conditions specified in 68.25(d). 	68.25(c)(2)(i)–(ii)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP's hazard assessment section to confirm that the proper release rate was used in the WCS(s) for toxics released as refrigerated liquids at ambient pressure.
<p>24-C-43. The owner or operator has for toxic substances that are normally liquids at ambient temperature:</p> <ul style="list-style-type: none"> • Assumed the quantity in the vessel or pipe would be spilled instantaneously to form a liquid pool. • Determined the surface area of the pool by assuming that the liquid spreads to 1 cm deep, if there is no passive mitigation system in place that would serve to contain the spill and limit the surface area, or if passive mitigation is in place, the surface area of the contained liquid shall be used to calculate the volatilization rate. • Taken in account the actual surface characteristics, if the release would occur onto a surface that is not paved or smooth. • Determined the volatilization rate by accounting for the highest daily maximum temperature in the past three years, the temperature of the substance in the vessel, and the concentration of the substance if the liquid spilled is a mixture 	68.25(d)(1)–(3)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP's hazard assessment section to confirm that the proper release rate was used in the WCS(s) for toxics released as liquids at ambient temperature.

Audit Criteria	Source	Guidance for Auditors
<p>Table 24.1 – Continued</p> <p>or solution.</p> <ul style="list-style-type: none"> • Determined the rate of release to air from the volatilization rate of the liquid pool. • Determined the rate of release to air by using the methodology in the RMP Offsite Consequence Analysis Guidance, any other publicly available techniques that account for the modeling conditions and are recognized by industry as applicable as part of current practices, or proprietary models that account for the modeling conditions may be used provided the owner or operator allows the implementing agency access to the model and describes model features and differences from publicly available models to local emergency planners upon request. 		
<p>24-C-44. The owner or operator has for flammable materials assumed the quantity of the substance in a vessel(s) vaporized resulting in a vapor cloud explosion.</p>	68.25(e)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP's hazard assessment section to confirm that the proper release quantity was used in the WCS(s) for flammables.
<p>24-C-45. The owner or operator has for flammables materials assumed a yield factor of 10% of the available energy released in the explosion for determining the distance to the explosion endpoint (if the TNT-equivalent methods used).</p>	68.25(e)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP's hazard assessment section to confirm that the proper yield factor (10 percent) was used in the WCS(s) for flammables.
<p>24-C-46. The owner or operator has used the parameters defined in 68.22 to determine distance to the endpoints.</p>	68.25(f)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP's hazard assessment section to confirm that the proper endpoints of concern were used in the WCS(s).

Audit Criteria	Source	Guidance for Auditors
<p>24-C-47. The owner or operator has determined the rate of release to air by using the methodology in the RMP Offsite Consequence Analysis Guidance, any other publicly available techniques that account for the modeling conditions and are recognized by industry as applicable as part of current practices, or proprietary models that account for the modeling conditions may be used provided the owner or operator allows the implementing agency access to the model and describes model features and differences from publicly available models to local emergency planners upon request.</p>	68.25(f)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the last submitted RMP's hazard assessment section to confirm that the proper modeling technique was used in the WCS(s).
<p>24-C-48. The owner or operator has ensured that the passive mitigation system, if considered, is capable of withstanding the release event triggering the scenario and will still function as intended.</p>	68.25(g)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the last submitted RMP's hazard assessment section to confirm that passive mitigation system, if considered, were analyzed properly the WCS(s).
<p>24-C-49. The owner or operator has considered also the following factors in selecting the worst case release scenarios:</p> <ul style="list-style-type: none"> Smaller quantities handled at higher process temperature or pressure. Proximity to the boundary of the stationary source. 	68.25(h) (1)-(2)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the last submitted RMP's hazard assessment section to confirm that other required factors were considered in selecting the WCS(s).
Hazard Assessment: Alternative Release Scenario Analysis		
<p>24-C-50. The owner or operator has identified and analyzed at least one alternative release scenario for each regulated toxic substance held in a covered process(es) and at least one alternative release scenario to represent all flammable substances held in covered processes.</p>	68.28(a)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the last submitted RMP's hazard assessment section to confirm that the proper number of ARS(s) were analyzed and submitted.
<p>24-C-51. The owner or operator has selected a scenario:</p> <ul style="list-style-type: none"> That is more likely to occur than the worst case release scenario under 68.25. That will reach an endpoint off site, unless no such scenario exists. 	68.28(b) (i)-(ii)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the last submitted RMP's hazard assessment section to confirm that the more likely scenarios were selected for ARS(s) as opposed to the WCS(s).

Audit Criteria	Source	Guidance for Auditors
<p>Table 24.1 – Continued</p> <p>24-C-52. The owner or operator has considered release scenarios which included, but are not limited to, the following:</p> <ul style="list-style-type: none"> • Transfer hose releases due to splits or sudden hose uncoupling. • Process piping releases from failures at flanges, joints, welds, valves and valve seals, and drains or bleeds. • Process vessel or pump releases due to cracks, seal failure, or drain, bleed, or plug failure. • Vessel overfilling and spill, or overpressurization and venting through relief valves or rupture disks. • Shipping container mishandling and breakage or puncturing leading to a spill. 	68.28(b)(2)(i)–(v)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP's hazard assessment section to confirm that the proper types of ARS(s) were analyzed and submitted.
<p>24-C-53. The owner or operator has used the parameters defined in 68.22 to determine distance to the endpoints.</p>	68.28(c)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP's hazard assessment section to confirm that the proper release parameters defined by 68.22 were used in the ARS(s).
<p>24-C-54. The owner or operator has determined the rate of release to air by using the methodology in the RMP Offsite Consequence Analysis Guidance, any other publicly available techniques that account for the modeling conditions and are recognized by industry as applicable as part of current practices, or proprietary models that account for the modeling conditions may be used provided the owner or operator allows the implementing agency access to the model and describes model features and differences from publicly available models to local emergency planners upon request.</p>	68.28(c)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP's hazard assessment section to confirm that the proper modeling technique was used in the ARS(s).
<p>24-C-55. The owner or operator has ensured that the passive and active mitigation systems, if considered, are capable of withstanding the release event triggering the scenario and will</p>	68.28(d)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP's hazard assessment section to confirm that active passive mitigation

Audit Criteria	Source	Guidance for Auditors
be functional.		system, if considered, were analyzed properly and would survive the ARS scenario(s).
<p>24-C-56. The owner or operator has considered the following factors in selecting the alternative release scenarios:</p> <ul style="list-style-type: none"> • The five year accident history provided in 68.42. • Failure scenarios identified under 38.50 or 68.67. 	68.28(e) (1)-(2)	<p><u>Auditor Activities:</u> Auditors should review the last submitted RMP's- hazard assessment section to confirm that the proper scenarios were selected for the ARS(s).</p>
Hazard Assessment: Defining Off-Site Impacts—Population		
24-C-57. The owner or operator has estimated population that would be included in the distance to the endpoint in the RMP based on a circle with the point of release at the center.	68.30(a)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP's hazard assessment section to confirm that the estimated population that would be included in the distances to the endpoints in the RMP were based on a circle with the point of release at the center for the WCS(s) and ARS(s).
24-C-58. The owner or operator has identified the presence of institutions, parks and recreational areas, major commercial, office and industrial buildings in the RMP.	68.30(b)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP's hazard assessment section to confirm that the OCA has identified the presence of institutions, parks and recreational areas, major commercial, office and industrial buildings in the WCS(s) and ARS(s).
24-C-59. The owner or operator has used most recent Census data, or other updated information to estimate the population.	68.30(c)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP's hazard assessment section to confirm that the OCA has used most recent Census data, or other updated information to estimate the population for the WCS(s) and ARS(s).
24-C-60. The owner or operator has estimated the population to two significant digits.	68.30(d)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP's hazard assessment section to confirm that the OCA has estimated the population to two significant digits for the WCS(s) and ARS(s).
Hazard Assessment: Defining Off-Site Impacts—Environment		

Audit Criteria	Source	Guidance for Auditors
<p>Table 24.1 – Continued</p> <p>24-C-61. The owner or operator has identified environmental receptors that would be included in the distance to the endpoint based on a circle with the point of release at the center.</p>	68.33(a)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the last submitted RMP's hazard assessment section to confirm that the OCA has identified environmental receptors that would be included in the distance to the endpoint based on a circle with the point of release at the center for the WCS(s) and ARS(s).
<p>24-C-62. The owner or operator has relied on information provided on local U.S.G.S. maps, or on any data source containing U.S.G.S. data to identify environmental receptors. [Source may have used LandView to obtain information.]</p>	68.33(b)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the last submitted RMP's hazard assessment section to confirm that the OCA has relied on information provided on local U.S.G.S. maps, or on any data source containing U.S.G.S. data to identify environmental receptors for the WCS(s) and ARS(s).
Hazard Assessment: Review and Update		
<p>24-C-63. The owner or operator has reviewed and updated the offsite consequence analyses at least once every five years.</p>	68.36(a)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the last submitted RMP's hazard assessment section to confirm that the OCA has been updated at least once every five years.
<p>24-C-64. The owner or operator has completed a revised analysis and submit a revised RMP within six months of a change in processes, quantities stored or handled, or any other aspect that might reasonably be expected to increase or decrease the distance to the endpoint by a factor of two or more.</p>	68.36(b)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the last submitted RMP's hazard assessment section to confirm that the OCA has been revised and resubmitted in a revised RMP within six months of a change in processes, quantities stored or handled, or any other aspect that might reasonably be expected to increase or decrease the distance to the endpoint by a factor of two or more.
Hazard Assessment: Documentation		
<p>24-C-65. The owner or operator has maintained records of the following:</p> <ul style="list-style-type: none"> For worst-case scenarios: a description of the vessel or pipeline and substance selected, assumptions and parameters 	68.39(a)–(e)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> Auditors should review the input documents that show how the input for the OCA was derived, and modeling output from the OCA.

Audit Criteria	Source	Guidance for Auditors
<p>used, the rationale for selection, and anticipated effect of the administrative controls and passive mitigation on the release quantity and rate.</p> <ul style="list-style-type: none"> • For alternative release scenarios: a description of the scenarios identified, assumptions and parameters used, the rationale for the selection of specific scenarios, and anticipated effect of the administrative controls and mitigation on the release quantity and rate. • Documentation of estimated quantity released, release rate, and duration of release. • Methodology used to determine distance to endpoints. • Data used to estimate population and environmental receptors potentially affected. 		
Hazard Assessment: Five-Year Accident History		
<p>24-C-66. The owner or operator has included all accidental releases from covered processes that resulted in deaths, injuries, or significant property damage on-site, or known off site deaths, injuries, evacuations, sheltering in place, property damage, or environmental damage.</p>	68.42(a)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the last submitted the hazard assessment section in the RMP and incident reports for the past five years to confirm that all accidental releases from covered processes that resulted in deaths, injuries, or significant property damage on-site, or known off-site deaths, injuries, evacuations, sheltering in place, property damage, or environmental damage were included in the five-year accident history.
<p>24-C-67. The owner or operator has reported the following information for each accidental release:</p> <ul style="list-style-type: none"> • Date, time, and approximately duration of the release. • Chemical(s) released. • Estimated quantity released, in pounds. • Type of release event and its source. • Weather conditions (if known). • Onsite impacts. 	68.42(b) (1)-(10)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the last submitted RMP's hazard assessment section to confirm that all the required information was included in the five-year accident history.

Audit Criteria	Source	Guidance for Auditors
<p>Table 24.1 – Continued</p> <ul style="list-style-type: none"> • Known offsite impacts. • Initiating event and contributing factors (if known). • Whether off site responders were notified (if known). • Operational or process changes that resulted from investigation of the release. 		
Emergency Response		
Emergency Response: Applicability		
<p>24-C-68. The owner or operator of a stationary source has developed an emergency response program, unless the source need not comply.</p>	<p>CCPA 68.90(a)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the site ERP.
<p>24-C-69. If the employees of the stationary source will not respond to accidental releases of regulated substances:</p> <ul style="list-style-type: none"> • For stationary sources with any regulated toxic substance held in a process above the threshold quantity, the stationary source is included in the community emergency response plan developed under EPCRA. • For stationary sources with only regulated flammable substances held in a process above the threshold quantity, the owner or operator has coordinated response actions with the local fire department. • Appropriate mechanisms are in place to notify emergency responders when there is a need for a response. 	<p>CCPA 68.90(b) (1)–(3)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the site ERP. • Auditors should review other records such as newsletters, minutes of meetings, etc. that provide evidence that the site ERP has been coordinated with that of the local fire department. • Auditors should review employee alarm system test records.
<p>24-C-70. The owner or operator has developed and implemented an emergency response program for the purpose of protecting public health and the environment. The program includes the following elements:</p> <ul style="list-style-type: none"> • An emergency response plan which is maintained at the stationary source. • Procedures for the use of emergency response equipment and for its inspection, testing and 	<p>68.95(a) (1)–(4)</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the site ERP's emergency response section to confirm that the plan has been implemented as required in 68.95.

Audit Criteria	Source	Guidance for Auditors
<p>maintenance.</p> <ul style="list-style-type: none"> • Training for all employees in relevant procedures. • Procedures to review and update the emergency response plan to reflect changes at the stationary source and ensure that employees are informed of changes. 		
<p>24-C-71. The emergency response plan contains the following elements:</p> <ul style="list-style-type: none"> • Procedures for informing the public and local emergency response agencies about accidental releases. • Documentation of proper first aid and emergency medical treatment necessary to treat accidental human exposure. • Procedures and measures for emergency response after an accidental release of a regulated substance. 	68.95(a)(1)(i)–(iii)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the site ERP's emergency response section to confirm that the ERP contains the required elements.
<p>24-C-72. The owner or operator used a written plan that complied with other Federal contingency plan regulations or is consistent with the approach in the National Response Team's Integrated Contingency Plan Guidance ("One Plan") [Optional]. If so, does the plan include the elements provided in paragraph (a) of 68.95, and also complies with paragraph (c) of 68.95.</p>	68.95(b)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review the site ERP's emergency response section to confirm that the plan has the elements required by the One Plan guidance if that guidance was used in lieu of other regulatory requirements to develop the ERP.
<p>24-C-73. The emergency response plan has been coordinated with the community emergency response plan developed under EPCRA.</p>	CCPA 68.95(c)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review other records such as newsletters, minutes of meetings, etc. that provide evidence that the site ERP has been coordinated with that of the LEPC or other local responders.
<p>24-C-74. The owner or operator has provided to the local emergency response officials, information necessary for developing and implementing the community emergency response plan requested by the LEPC or emergency response officials.</p>	68.95(d)	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should review other records such as newsletters, minutes of meetings, etc. that provide evidence that the site ERP has been coordinated with that of the LEPC or other local responders.

24.2.1.1 U.S. State Programs

If the RMP program being evaluated is pursuant to a state RMP regulation, then the specific RMP requirements for that regulatory program should be followed. The state-specific applicability requirements for the following states are presented below:

- New Jersey
- California
- Delaware

Table 24.2 presents the audit criteria and auditor guidance regarding RMPs pursuant to U.S. state RMP requirements.

Table 24.2 U.S. State RMP Audit Criteria and Guidance for Auditors – Risk Management Programs

Audit Criteria	Source	Guidance for Auditors
<p><i>New Jersey Toxic Catastrophe Prevention Act (TCPA)</i> 24-C-75. The NJ TCPA regulations do not add any different or unique requirements beyond those established in the federal RMP Rule, except those described in the other element chapters, except that the TCPA applies to processes with some chemicals that are specific to the TCPA, including reactive materials.</p>	<p>N.J.A.C. 7:31</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should ensure that the RM has been submitted to the NJ DEP.
<p><i>Delaware Accidental Release Prevention Regulation</i> 24-C-76. The Delaware EHS regulations do not add any different or unique requirements beyond those established in the federal RMP Rule.</p>	<p>Delaware Code, Chapter 77</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should ensure that the RMP has been submitted to the DE NREC.
<p><i>California Accidental Release Prevention Program</i> 24-C-77. The CalARP regulations do not add any different or unique RMP requirements beyond those established in the federal RMP Rule except that the CalARP applies to processes with some chemicals that are specific to the CalARP.</p>	<p>California Code of Regulations, Title 19, Chapter 4.5, Section 2775.5</p>	<p><u>Auditor Activities:</u></p> <ul style="list-style-type: none"> • Auditors should ensure that, in addition to the EPA, the RMP has also been submitted to the “administering agency” (the local agency responsible to implement the CalARP Program).

24.3 AUDIT PROTOCOL

The audit protocol available online (see page xiv for information on how to access this resource) provides detailed questions that examine the criteria described in Section 24.2.

REFERENCES

- American Chemistry Council, *RCMS[®] Technical Specification*, RC101.02, March 9, 2005
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations*, RC101.02, January 25, 2004
- American Chemistry Council, *RCMS[®] Technical Specification Implementation Guidance and Interpretations Appendices*, RC101.02, January 25, 2004
- California, California Code of Regulations, Title 8, Section 5189, CalOSHA, November 1985
- Center for Chemical Process Safety (CCPS), *Guidelines for Risk Based Process Safety*, American Institute of Chemical Engineers, New York, 2007 (CCPS, 2007c)
- Delaware, *Accidental Release Prevention Regulation*, Delaware Department of Natural Resources and Environmental Control/Division of Air and Waste Management, September 1989 (rev. January 1999)
- Department of the Interior, Minerals Management Service, *Safety and Environmental Management Program (SEMP)*, 1990
- Environmental Protection Agency (USEPA), 40 CFR §68, *Accidental Release Prevention Requirements: Risk Management Programs Under Clean Air Act Section 112(r)(7)*; Final Rule, June 21, 1996

APPENDICES

Appendix A: PSM Audit Protocol

The online material that accompanies this book contains electronic versions of a PSM audit protocol developed from the audit criteria presented in Chapters 3–24. See page xiv for information on how to access this resource. The files are provided in MS Excel™ format for ease of use or conversion to other formats. The audit protocols for each element of a PSM program are shown in a separate tab of the spreadsheets. The protocols on the online material are presented on two spreadsheets in two the following formats:

- *Criteria format.* The audit criteria from Chapters 3–24 are stated as requirements (compliance) or as guidance (related).
- *Question format.* The question-based protocol was created by converting each audit criteria in Chapters 3–24 into a question

The following columns have been provided in the protocol to record audit information and results:

- *Reference.* The regulatory citation or reference source for the question or criteria. See the Guidance for Chapters 3–24 in the Introduction for the definition of the codes used for these references.
- *Type.* Either compliance (COMP) or related (REL) for each criteria or question.
- *Auditor guidance.* The guidance shown in the appropriate element chapter of the book question or criteria.
- *Answer.* The allowable answers to the audit questions (see Section 2.3.2) (question format only).
- *Comment/Finding.* The comments or explanations made by auditors in response to the questions or criteria, or the findings of the audit.
- *Evidence.* The interviews, record reviews, or field observations that substantiate the conclusion(s) stated in the Comment/Finding column (see Section 2.3.1).
- *Source of evidence.* This includes interview, record review, and observation.

- *Recommendation.* The proposed corrective action(s) for the findings. If these are final action items, the title of the column should be revised to reflect this.

The auto-filter feature of the spreadsheet has been activated to make sorting of the type, reference, or other entries more convenient.

The compliance and related criteria/questions and the auditor guidance for applying them presented in the protocols do not represent exclusive solutions to PSM program coverage, design, implementation, or interpretation. They represent the collective experience of a number of people in the chemical/processing sector who have performed many PSM audits, and the consensus opinion resulting from that experience. The compliance criteria/questions are derived from the regulations that govern PSM programs in the United States; however, these regulations are all performance-based. Performance-based regulations are goal oriented and there may be multiple pathways to fully complying with them. Therefore, there may be alternate interpretations and solutions to the issues described in the compliance criteria/questions in this protocol that are equivalent to those included, particularly the auditor guidance presented.

The inclusion of the related criteria/questions in no way infers that issues represented by them must be implemented for a PSM program to be successful, nor does it infer that a PSM program will be deficient without them. As with the compliance criteria/questions, there may be other, more appropriate solutions for an individual facility or company. In addition, the use of the related criteria/questions in a PSM audit is intended to be completely voluntary and not a mandatory requirement in any way. They should be used cautiously and with careful planning so that they do not inadvertently establish unintended performance standards. Consensus should be sought within and among facilities and their parent companies before these criteria/questions are used. Finally, the related criteria/questions and guidance offered for consideration below are not endorsements of or agreements with the written or verbal clarifications made by the regulators, PSM citations issued against the regulations, other PSM guidance published by the regulators, or the successful or common PSM practices in any given company's PSM program from which they are derived.

Appendix B: PSM Audit Report Templates

The online material that accompanies this book contains several samples of electronic templates of PSM audit reports. See page xiv for information on how to access this resource. The files are provided in MS Word™ format for ease of use or conversion to other formats. The templates presented were selected from those used by PSM auditors who helped develop this book. See Section 1.8 for additional information on the format and content of PSM audit reports.

Appendix C: Sample PSM Audit Certifications

The online material that accompanies this book contains several samples of electronic templates of PSM audit certifications. See page xiv for information on how to access this resource. The files are provided in MS Word™ format for ease of use or conversion to other formats. The certifications presented were selected from those used by PSM auditors who helped develop this book. See Section 1.8.6 for additional information on PSM audit certifications.

Appendix D: PSM Audit Plan Templates

The online material that accompanies this book contains several samples of electronic templates of PSM audit plans. See page xiv for information on how to access this resource. The files are provided in MS Word™ format for ease of use or conversion to other formats. The templates presented were selected from those used by PSM auditors who helped develop this book. See Section 2.1.9 for additional information on the format and content of PSM audit plans.

Appendix E: Interview Questions for Nonmanagement Personnel

The online material that accompanies this book contains a list of typical PSM-related questions for possible use when interviewing nonmanagement personnel. See page xiv for information on how to access this resource. The questions have been combined from several PSM elements so as to help preclude repeat interviews of the same personnel to cover the different elements where information from the nonmanagement employees would be of interest. The files are provided in MS Word™ format for ease of use or conversion to other formats. The templates presented were selected from those used by PSM auditors who helped develop this book. See Section 2.3.2 for additional information on conducting PSM audit interviews.

Appendix F: PSM Audit Planning Questionnaire

The online material that accompanies this book contains a sample questionnaire to assist in the planning process for PSM audits. See page xiv for information on how to access this resource. The file is provided in MS Word™ format for ease of use or conversion to other formats. It is intended to help solicit needed information from the facility that will be audited. The questionnaire presented was selected from those used by PSM auditors who helped develop this book. See Section 2.1 for additional information on PSM audit planning.

Appendix G: Integrated Contingency Plan (ICP) Audit Protocol

The online material that accompanies this book contains an electronic version of a protocol for use in auditing emergency response plans that have been created using the Integrated Contingency Plan (ICP), or “One Plan” guidance published by the EPA. See page xiv for information on how to access this resource. The file is provided in MS Excel™ format for ease of use or conversion to other formats. The protocol was created by converting each requirement in the published ICP guidance (61 Fed. Reg. 28641, June 5, 1996; *corrected at* 61 Fed. Reg. 31103, June 19, 1996) into a question and then adding columns to insert the answer, finding, and recommendation for each question. The source, type, and auditor guidance has also been included for each question. The use of the ICP format is not mandatory, and any findings derived from the use of the ICP audit protocol would be related findings. If an emergency response plan has been developed using the ICP format and content, it still should be audited against the regulations it is intended to satisfy to determine if there are compliance findings. Therefore, these questions have been labeled as compliance questions (i.e., REL in the Type column). The Source column code indicates that all the questions are derived from the same source, which is the guidance published in the Federal Register by the EPA. The auto-filter feature of the spreadsheet has been activated to make sorting of the type, source, or other entries more convenient.

Appendix H: International PSM Audits

For the purposes of this book, international PSM audits are defined as:

- PSM audits performed by non-U.S. companies that have PSM programs either because there are regulations in the country where the facilities are located or because the company that owns or operates the facility has voluntarily adopted a PSM program.
- PSM audits performed by U.S.-based companies of their facilities outside the United States. These facilities are owned or operated (or partially owned or operated, e.g., a joint venture) by an American parent company, and their PSM programs are prescribed by the parent company's policies and procedures. These audits are usually performed by U.S.-based or U.S.-led audit teams.

Performing PSM audits in international locations follows the same basic guidance presented in this book. The basic concepts of PSM audits described in Chapters 1 and 2 are universally applicable, whereas the guidance in the element chapters (Chapters 3–24) is more relevant to the OSHA PSM or risk-based PSM element issues. However, even some of the element audit guidance is applicable to non-U.S. PSM programs, although the compliance requirements would not likely be treated as such in non-U.S. locations.

PSM Audits Performed by Non-U.S.-Based Audit Teams

To adapt the guidance presented in the remainder of this book to the PSM programs of non-U.S. companies and their facilities, PSM audit planners should consider the following:

- Non-U.S. PSM auditors should carefully review Chapters 1 and 2 for guidance on establishing PSM audit programs and planning and executing PSM audits to determine how this guidance differs from their existing audit program guidance, if such guidance exists. If the company or facility does not have existing PSM audit program guidance, the material in these two chapters can be used to establish a PSM audit program. For example, Section 1.6 can be used to help guide the company or facility in selecting and training PSM auditors.
- The audit criteria described in Chapters 3–24 and the protocol derived from these criteria provided in Appendix A are more specific to U.S.-based PSM audits, particularly the compliance criteria and questions. Non-U.S. users of this book should substitute compliance questions in Appendix A with any national or local PSM regulations they are subject to, as well as questions from their own PSM policies, practices, or procedures as appropriate. Users should then select which, if any, of the related audit questions they wish to apply in a given audit, and also add their own related questions if they desire.
- Since the Guidance to Auditors provided in the compliance and related tables of Appendix A is based largely on U.S. PSM practices,

international users should carefully review this guidance and substitute national or local, as well as company or facility PSM program interpretations and practices as appropriate.

PSM Audits Performed by U.S.-Based or U.S.-Led Audit Teams

PSM audits performed pursuant to the PSM policies and procedures of a U.S. company on its non-U.S. facilities using audit teams consisting wholly or partially of U.S. auditors should address the following issues when planning and executing a PSM audit in a non-U.S. location:

- *Modification of protocol.* The protocol questions in Appendix A should be carefully reviewed to determine which questions require substitution from those derived from any applicable national or local PSM regulations, and which questions from the parent company's or their own local PSM policies, practices, or procedures should be added.
- *Modification of auditor's guidance.* The Guidance to Auditors provided in the compliance and related tables of Appendix A should be modified as necessary to reflect national or local, as well as company or facility PSM program interpretations and practices. The auditors will have to determine in advance how the parent company's policies and procedures will apply (they were probably developed based on U.S. requirements), and may have to reconcile them with national or local regulations.
- *Language issues.* If the audit will be performed in countries where English is not the first language, the planning process should address the need for translators. The English skills of the facility should be known and assessed in advance. Although many managerial and professional employees of international facilities speak English, their fluency may not extend to technical or regulatory language, and usually not to informal or slang terminology unless they have spent significant time working in English speaking countries. Operators, maintenance personnel, and others below the managerial tier of the facility organization may or may not have any English language skills. Audit team members from the United States or English-speaking countries will have to be aware of the English language skills of the persons they are interviewing and to refrain from the use of common or colloquial PSM-related terms and phrasing, which is not likely to be understood by local personnel, even if they do speak or understand English. Even when both the interviewer and interviewee are fluent in a common language, the possibility of misunderstanding is very high when their respective first languages are different. Also, nonverbal cues that usually indicate understanding such as nodding may not mean the same thing.
- *Local technical knowledge.* A U.S.-based PSM audit team will require personnel who have thorough knowledge of national and local regulations that pertain to PSM (if any), as well as knowledge of RAGAGEPs that apply to the facility under consideration. This includes how the

regulations and RAGAGEPs are interpreted for the facility and how they are implemented in the local political and regulatory climate. For example, auditors covering the Asset Integrity element will require knowledge of the pressure vessel design and inspection/testing requirements, unless U.S. requirements are followed.

- *Cultural issues.* Audits in international locations may be influenced by a host of cultural issues. U.S.-based PSM audit teams should be aware of the following potential cultural issues that might affect the planning and/or conduct of an audit overseas:
 - Audit planners will need to be aware of religious or cultural holidays when scheduling the audit or daily audit activities. Some of these holidays can vary even within a given country.
 - The language used to conduct the audit is a cultural issue as well as a communications issue (as described above). Auditors should also be aware that while some facility personnel may speak some English, they may be offended that the audit is being conducted largely in English.
 - Work hours and scheduling meetings may be strictly controlled in some cultures; conversely, schedules may not be strictly observed even when commitments have been made in advance.
 - In some cultures, interviews with subordinate personnel may not be possible without the personal agreement of senior personnel and all statements made by these personnel may not be official unless also stated by the person they report to. In some cultures, the types of interviews conducted to support a PSM audit would be a very formal activity, rather than the more informal atmosphere that exists in the United States and many Western cultures, even when the interviewee is represented by a labor union.
 - Labor unions exist in many countries; however, how they operate, and their relationship with their members and with management, may vary widely from country to country. Auditors should be aware in advance of these influences on how information is collected in an audit.
 - The exchange of business cards in some Asian countries is a very formal matter and is conducted in a particular manner.
 - The distance between and body positions of an interviewer and an interviewee may also be an issue that must be carefully observed in some countries. For example, in Middle Eastern cultures, crossing your legs so as to display the soles of your shoes is an act of insult.
 - Handshakes, while a common courtesy in many environments, may be offered in a different manner in different cultures.
 - The gender, religion, or ethnicity of the auditors and facility personnel and how they interact may be sensitive issues.
 - Unique local courtesies, customs, religious observances (e.g., prayer times during the workday), and other cultural practices need to be

understood by the audit team before arriving on-site so that inadvertent offense is not given that may cause strain between the audit team and facility personnel. In some countries these practices are central to the way of life and are more important than business-related issues or activities such as an audit.

- *Legal or diplomatic issues.* There may be legal or diplomatic prohibitions or limits on what kind of auditing can be performed by parent companies in locations beyond their native countries. Multinational companies would most likely be affected by such restrictions and should plan their PSM audits accordingly. Also, visas may be necessary for audit work in some countries, even though the audit will last a relatively short period of time and is not considered to be employment by the facility. Obtaining visas can be easy in some countries (they can be obtained at the airport upon arrival), and difficult in other countries (visa applicants must present themselves at the embassy or consulate of the country in question). Every country has its own legal definitions of “work” or “employment,” how long it can be done without permanent residence, if at all, and whether or not foreigners can perform this work without certain kinds of diplomatic clearance. Also, customs regulations vary widely from country to country and there may be problems regarding bringing “work” related equipment, even a laptop computer, into certain countries. If a U.S.-based company has overseas facilities, the immigration and customs rules should already be well understood by corporate staff. Audit planning should allow for the time needed to comply with immigration regulations.
- *Time required.* Because of language barriers and the need to translate documents and records into English, the time required to perform interviews and record reviews will be longer for an international audit in a non-English speaking country. It may not be possible to interview as many people as in an English-speaking environment. The audit planning process should account for this extra time. Preparation time will also be increased, both to collect information in advance and also to translate it if necessary. Modification of the PSM audit protocol, if necessary, will also require additional preparation time.
- *Logistical issues.* Audit planning should address travel and logistical issues, which will likely be more complex than for domestic audits:
 - Depending on the location, the availability of local currency and the use of credit cards may be an issue. The planning process should confirm how goods and services are paid for in the locale of interest, and what U.S. or Western credit cards can be used for business travel.
 - Lodging and subsistence should be planned in advance, if only to confirm the availability of shelter and food in local hotels and restaurants, or whether the audit team must be separately lodged and fed. Transportation to and from the facility being audited and the location where the audit team is being lodged if the facility is in a remote area. The location where the audit team is being lodged must

be prearranged if the facility is in a remote area. This is advisable to both save time and resources, but also possibly for the safety and security of the audit team.

- The State Department travel advisories should be checked regarding any travel restrictions or issues in the country of the facility.
 - The CDC or State Department should be checked regarding the need for immunizations and their timing for the projected travel area(s).
 - Finally, because so much business in today's environment is conducted using the support of e-mail and websites, intranet/Internet access for the audit team will be an advance logistical issue. This not just a matter of convenience so that the auditors can send and receive e-mail, but in many circumstances the auditors will require intranet/Internet access to transfer audit related documents, or access company or facility procedures or records.
- *Audit reports.* Although the report for an international PSM audit will likely follow the same format and content guidelines that exist for domestic audits, some companies mark their reports to indicate that the audits are protected by attorney-client privilege in order to help protect them from discovery. These legal doctrines do not exist outside the United States, or exist in different ways and with different rules for how they are applied. Also, the U.S. court system that enforces these doctrines has no jurisdiction outside the United States. Therefore, the planning process should address how this protection can and will be implemented if needed.
 - *Perspective and context.* Although PSM audits are fact-finding activities that should not be influenced by outside factors that have no direct relation to the design or implementation of the PSM program, auditors should understand that performing a PSM audit in an area of the world affected by sectarian or political strife, or where there is widespread starvation, may be a difficult activity to carry out, both for the audit team and the facility being audited. In general, socio-economic concerns are of primary importance in developing nations, rather than environmental, health, and safety concerns. Application of U.S. or European standards for PSM programs in developing nations will likely be more difficult than in North America or Western Europe.

Appendix I: PSM Audit Dilemmas

In any given PSM audit, the auditors will usually face one or more situations that represent a dilemma because the situation has not happened before or no thought has been given on how to resolve it. These dilemmas usually require the individual auditor and/or the audit team leader resolve the situation in the field. These “on the fly” resolutions require both astute judgment and practical solutions that fit not only the governing regulations or company/facility standards for PSM, but also how those mandatory requirements should be interpreted and applied to the specific design, operations, and PSM program of the facility being audited. The PSM audit dilemmas shown in this appendix are based on the experiences of seasoned auditors during actual PSM audits. Several of them are PSM adaptations of those published by Cahill et al., in *Environmental Health and Safety Audits* (Cahill, 2001).

As in the remainder of the book, compliance findings refer to those that indicate a deficiency with respect to a requirement by a relevant process safety regulation to which a facility is subject or by its own procedures or those of its parent company. See Section 1.7.1 for more information about company/facility procedures and their impact. Related findings are those that are not mandatory requirements and whose correction would improve a PSM program beyond what is minimally required by a PSM-related regulation. See Chapter 1 and the Glossary for additional discussion of these terms.

In general, there are no absolute right or wrong answers to solving these dilemmas, although in some cases a resolution might seem obvious. Often, there is a good resolution, but many times such resolution would require adoption of a policy or practice that is not a compliance requirement. This should be carefully considered before a final decision is made. Possible resolutions or conclusions to these dilemmas have been offered to readers for consideration. Additional guidance may also be found in the compliance and related audit criteria included in the PSM program element chapters (Chapters 3–24). Even when the dilemma seems to represent a compliance issue, and its resolution clear-cut, there may be substantial flexibility to craft the resolution and correct the problem. The resolution of these dilemmas, should they exist at a given facility or company, should be carefully determined on an individual basis by each user/reader of this book and the facility or company they represent. Therefore, a single, common resolution or conclusion to these situations is not appropriate for all users, and the resolutions/conclusions presented below should be carefully considered before being adopted.

1. The Management Systems Defense/Failure

Dilemma

You are performing the Asset Integrity portion of a PSM at a large petrochemical facility. While reviewing the operations of the spare parts warehouse, you notice several parts in the warehouse that have expiration dates.

There are no labels on the storage locations warning of expiration dates, nor does the inventory management software provide any information about parts with expiration dates. During the interview with the warehouse supervisor, he states that it is not necessary to track or manage expiration dates for the spare parts/material because the usage rate always results in the part being issued for use before the expiration dates is reached. However, during the warehouse walk around you notice that the expiration date on a spare chemical hose has been reached. As an auditor, what is the nature of your finding(s) and recommendation(s)?

Possible Resolution or Conclusion

The finding, which is a compliance one, is that the warehouse contains spare parts that have exceeded their shelf life. This situation certainly is a deficiency with respect to the requirement that spare parts be suitable for the process application for which they are intended. However, based on the interview with the warehouse supervisor, this situation does not appear to be a simple oversight for one chemical hose, but represents a lack of a proper management system and internal controls associated with expired spare parts. Historical usage rates may change over time as facility throughput or operations change, and reliance on them is generally not adequate to ensure parts do not expire. Since the governing regulations (i.e., the PSM Standard) do not explicitly require a management system for spare parts, the compliance finding is simply that an expired spare part was found in the warehouse. The finding regarding the lack of a management system and internal controls to deal with expired spare parts would be a related finding. See Chapter 13 for further guidance.

2. The De Minimis Sampling Issue

Dilemma

As a PSM audit team member, you have been given the responsibility to audit the Process Knowledge Management element of a specialty batch chemical facility that uses or produces a large number of chemicals, including a dozen toxic/reactive materials and several dozen flammable materials or mixtures. You have just completed your review of the MSDS file, which the PSM Coordinator has told you suffice for the process safety knowledge regarding the chemicals. MSDSs were available for all these chemicals at the facility and they were generally up-to-date. However, there was one exception: the MSDS for a flammable mixture that is created at the facility as part of the manufacturing process for a particular product was not available. This mixture is only on-site when a campaign to make the product occurs. What is the nature of the audit finding that should be documented in the report? The PSM Coordinator argues that one missing MSDS out of dozens required should not represent a finding. Should a de minimis level of sampled missing or incomplete records be considered a finding?

Possible Resolution or Conclusion

While even one missing, incomplete, or improperly completed record can constitute a finding, many auditors apply some amount of discretion in creating a finding when the potential sample size is large. In these situations, the auditor is looking for a pattern of missing, incomplete, or mistaken records before creating a finding. However, the application of this discretion has to be tempered by the importance of the issue in question. In this particular case, a missing MSDS, even for a material that is on-site for temporary periods of time, would be an important record omission because MSDSs support so many other important PSM and occupational safety and health activities, in addition to the hazard communications. Therefore, this should probably be recorded as a compliance finding, but if the auditor is confident, based on his/her sampling and testing that it is an isolated situation, the finding can be described as representing a unique situation and the recommendation would probably not include a provision to check for all other applicable MSDSs. See Chapter 9 for further guidance.

3. The VPP Defense

Dilemma

You are conducting a PSM audit of a chemical manufacturing facility. There are several PSM-covered processes at the facility. While auditing the Asset Integrity element, you discover that the internal inspections and wall thickness measurements for five pressure vessels, out of a total of two dozen pressure vessels in PSM service on-site, are overdue, in some cases by a few years. The same recurring maintenance tasks for 3 of 12 low-pressure storage tanks in PSM service are also overdue, again by a few years. The Maintenance Manager tells you that the plant is considered a safety model for the region and the facility has never been cited or threatened to be cited for overdue vessel and tank preventive maintenance. He also states that the site has been an OSHA VPP Star site for nearly 10 years, and the relationship with the local OSHA field office is excellent. Also, the facility is not in a state that regulates unfired pressure vessels. The time and effort to quickly perform the overdue vessel and tank inspections will be substantial and will result in some unscheduled down time and late product shipments because of the need for this equipment to make and store the products. The Maintenance Manager and Plant Manager are definitely opposed to incurring these production upsets on what they believe to already be a “best in class” operation. What is the nature of your findings?

Possible Resolution or Conclusion

If there are overdue ITPM tasks on important components such as pressure vessels and storage tanks, these are clear compliance findings and should always be reported by auditors as such. Pressure vessel ITPM tasks and frequencies may also be specified by state law or regulations, depending on the state, and these local laws or regulations may specify different RAGAGEPs other than API-510, for example, those published by the National Board (i.e., NB-23). The status of the

facility as a VPP site and its relationship with the local OSHA field office are not relevant with respect to the validity of this or any other finding. Auditors must be very careful when relating the VPP program to the status of the PSM program. Facilities that have achieved VPP status are usually very proud of this accomplishment; however, it should not result in a “free pass” on any valid PSM audit findings. See Chapters 2 (Section 2.3.5.7) and 13 for further guidance.

4. Practices Not Institutionalized

Dilemma 4a

You are conducting the Contractor Management of a PSM audit at a chemical plant. The PSM Coordinator tells you that a purchasing supervisor screens and approves the safety performance of prospective contractors. He has developed and implemented a pre-qualification questionnaire that includes detailed information about the contractor’s safety program and performance. The PSM Coordinator is able to show you an example of one of the completed questionnaires for a new prospective inspection contractor. When you ask to interview the purchasing supervisor so that you can learn more about the contractor pre-hire screening process and sample additional records, you are informed that the supervisor recently won the state lottery two months ago and is on an extended vacation period. To verify whether the contractor pre-screenings are being conducted properly, you request to review the computer records of them and also to review the procedure that governs contractor management. Unfortunately, facility staff cannot gain access to the records because they do not have the inspector’s password, and a contractor management procedure reflecting how the purchasing department manages contractors has not been developed yet. Calls to the supervisor are not successful; he has turned off his cell phone. How do you handle this situation as an auditor?

Possible Resolution or Conclusion 4a

A finding that the records confirming that contractor pre-qualification reviews were not available and could not be reviewed should be created because the sampling and testing for this aspect of the contractor management program could not be completed. Because the governing regulation does not explicitly require a management system procedure for this PSM element, the finding that a procedure does not exist and that the purchasing supervisor’s good practices are not institutionalized is a related finding and not a compliance finding. Alternatively, the auditor can include a recommendation (if recommendations are within the scope and objectives of the audit) to include such a management system to help correct the systemic problem. See Chapters 2 and 14 for further guidance.

Dilemma 4b

You are conducting an audit of the Process Knowledge Management portion of a specialty batch chemical plant that manufactures a diverse set of products, and functions as a toller for several different industries. New products involving new

chemicals and conditions that have not been experienced by the facility are not an unusual situation. The facility has a reputation for quickly incorporating new chemical products into their processes with very high quality. During a review of the relief device design and design basis records, you notice that many of them are not complete and do not reflect the properties and conditions imposed on the reactor relief device (rupture disks) by the current products being manufactured. The Engineering Manager states that because of the quick turnaround on product incorporations required by their customers, a full quantitative analysis of the relief device design and design basis is not possible. The pressure vessels, piping, and relief devices are all over-designed and can handle the full range of pressures and temperatures that their processes impose, and there has never been any process leak that has been traced back to an overpressure or over-temperature transient. Technical interviews with the Engineering Manager and several engineering and operations personnel involved in the introduction of new products into the facility indicate that relief device issues are studied qualitatively during MOC safety reviews and HIRAs. This includes a review of the properties of the materials and some simple lab tests that are performed on-site. Interviews with facility engineering and operations personnel involved indicate that they seem to understand the ramifications of the prospective new chemicals on reactor pressure. Reviews of operational records confirm that there have been no pressure transients that resulted in any leakage or releases. How do you handle this situation as an auditor?

Possible Resolution or Conclusion 4b

A compliance finding that relief device design and design basis process safety knowledge is missing for the currently installed reactor relief rupture disks should be created. Clearly, from the interviews and record reviews, the process for evaluating new and modified products against the relief design of the reactors is flawed; however, the governing regulations do not explicitly require a management system and internal controls for this, just that is done properly. Therefore, the auditor can include a recommendation (if recommendations are within the scope and objectives of the audit) to include such a management system to help correct the systemic problem, or alternatively, a related finding can be created to address the lack of a management system for evaluating reactor relief capability when products are changed. See Chapter 9 for further guidance.

Dilemma 4c

During the audit of the Asset Integrity element of a chemical plant PSM program, the Maintenance Manager states that the requirement for written maintenance procedures is satisfied by the original equipment manufacturer (OEM) manuals. You notice that the maintenance supervisor's and engineers' office bookshelves contain some of these manuals. Several locations in the various maintenance shops also seem to have them available. A brief review of several of them reveals that some were published decades ago and, despite the ISO 9001 certification of the facility, the manuals are not formally issued and approved documents. Is this a finding? Why or why not?

Possible Resolution or Conclusion 4c

A compliance finding that the maintenance procedures are not up-to-date should be created if the manuals are actually out-of-date with respect to the equipment and its maintenance. Maintenance personnel should be interviewed to determine if this is true. The finding should not include the fact that the ISO-9001 document control system does not include these procedures unless the ISO document control procedure specifies that the PSM-related AI procedures are within the scope of the procedure. ISO is a voluntary method of maintaining the documents, and certainly an ISO-9001 certified facility would likely elect to do that, but it is not a mandatory PSM requirement, even when the ISO certification exists, unless the facility or company has specified that it is to be used for PSM-related documents. Therefore, the findings are compliance related if a document control system covered the AI procedures (whether it is an ISO procedure or not), if no such procedure exists or it does not include PSM related documents. See Chapter 13 for further guidance.

5. Nonspecific Corporate Standards***Dilemma***

You are performing an audit of the Process Knowledge Management element of PSM at a large petrochemical facility that has both toxic and flammable materials. When you ask the PSM Coordinator for the information that describes the ventilation design basis, she hands you a file that contains only two drawings showing the routing of the ventilation ductwork for the admin building and control room building that was created by the company that installed the HVAC systems for those buildings (the facility has a central control room). When you review the PSM manual, the section on Process Safety Knowledge (PSK) merely repeats what is in the PSM Standard without any further definition or interpretation of what the information requirements mean to the facility. There are no corporate procedures that address Process Knowledge Management. The PSM Coordinator argues that two diagrams are sufficient PSK. Do you have a finding?

Possible Resolution or Conclusion

A compliance finding that the PSI for the ventilation system design was not available should be created. The context of this finding is that the facility's available information does not relate to the purpose of the governing regulations (i.e., the PSM Standard), which is to prevent catastrophic releases of certain toxic or flammable materials and their effects on facility employees. The ventilation system PSK for the central control room building and admin building (and any other occupied structure on-site) should describe how it protects the employees who work in those buildings from toxic and/or flammable vapor releases and how the system works to isolate indoor air from outdoor air during such releases. The "creature comfort" aspects of the ventilation systems design are not relevant from a PSM standpoint. See Chapter 9 for further guidance.

6. The Boundaries of PSM Programs and When Facility/ Company Requirements Exceed Regulations

Dilemma 6a

You are conducting a PSM audit of a petrochemical plant with large inventories of flammable materials. All the processes using, storing, or manufacturing these materials are included in the PSM program as defined by the facility PSM manual. The PSM manual also states that the fixed and mobile fire protection system is included in the PSM program. When reviewing the HIRAs, you notice that a HIRA of the fire protection system has not been performed, nor have any of the process HIRAs included an analysis of the fire protection system, except to list it as a safeguard. Also, the Asset Integrity program procedures do not include any ITPM information for the fire protection system. The Safety Manager states in an interview that they test the fire protection system, but a review of the test records reveals that the fire pumps have not been tested in over two years and the fire monitors are lubricated but not flow tested. The only records you can find are monthly external inspections of the sprinkler systems, some testing records by a contractor for the fire alarm system, and a lengthy list of fire extinguishers that shows the dates and technician who inspected them. You prepare two findings that state: 1) the HIRAs do not include analysis of the fire protection system failures, and 2) the AI program does not include all the ITPM tasks specified in NFPA 25 for water-based fire protection equipment. Are these appropriate findings? If yes, what are the appropriate recommendations? If not, why? See Chapters 10 and 13 for further guidance.

Possible Resolution or Conclusion 6a

The two compliance findings regarding the lack of HIRAs for the fire protection system and missing ITPM tasks required by the governing RAGAGEP for water-based fire protection systems are correct. Fire protection systems are not explicitly required to be included in a PSM program by the governing regulations, and water is not a highly hazardous chemical per those regulations. Therefore, the inclusion of these systems and equipment in the PSM program of the facility in question is voluntary. However, because the facility has defined the PSM program to include them, the other elements of PSM become compliance requirements. Also, taking credit for the fire protection system in a HIRA means that it has to be functional. If not, then a compliance finding for having an incorrect safeguard in the HIRA could also be written. See Chapters 1, 10, and 13 for further guidance.

Dilemma 6b

While auditing the AI program at a chemical plant that manufactures toxic materials covered by OSHA's PSM Standard, you determine from document reviews and interviews that the area toxic gas detectors are not included in the AI program. The fixed detectors are used to detect the same highly hazardous chemicals covered by the PSM Standard (in this case chlorine), the detectors are located inside the battery limits of the PSM-covered process and provide indications of chlorine concentration

levels and alarms if the concentrations reach pre-set limits. Therefore, they fit the definition of a control, indication, and alarm in paragraph (j)(1)(v) of the PSM Standard. Do you have a finding? Why or why not?

Possible Resolution or Conclusion 6b

Since the fixed chlorine detectors are within the process area covered by the PSM Standard, and are specifically intended to indicate an alarm when a highly hazardous chemical is released, a compliance finding should be written.

Dilemma 6c

During the same audit in Dilemma 6B, you determine from document reviews and interviews that the portable chlorine gas detectors worn by facility personnel, contractors, and visitors are not included in the AI program. Do you have a finding? Why or why not?

Possible Resolution or Conclusion 6c

Although portable toxic gas detectors provide the same type of warning as a fixed detector, these devices are not considered process equipment, but are PPE and are worn for industrial hygiene or emergency action plan purposes. Therefore, a related finding should be written if the manufacturer specifies some sort of ITPM related activity for them. However, other OSHA standards may apply in this situation.

7. Repeat Findings

Dilemma

You are auditing the HIRA element of a PSM audit. You have observed that the facility has not yet resolved 10 recommendations from a PHA performed on the Reactor #1 process two years prior to the audit. The audit report from three years ago includes the following finding: "Fifteen recommendations from the most recent HIRA on the Reactor #3 process are overdue for resolution." You have determined that none of the 10 current unresolved recommendations were overdue three years ago, and all 15 recommendations that were noted as overdue during the previous audit were resolved in the intervening three years. Is this a repeat finding? Why or why not?

Possible Resolution or Conclusion

The question in this situation is whether overdue HIRA recommendations in general in successive PSM audit cycles, and not just a particular HIRA recommendation represents a repeated finding. The OSHA Field Operations Manual (OSHA, 2009b) states that an employer may be cited for a repeated violation if that employer has been cited previously for the same *or substantially similar* conditions or hazards. Also, if an originally cited violation has at one point been abated but subsequently recurs, a citation for a repeated violation may be

appropriate (state plan citations cannot be used as a basis for repeat violations). Therefore, if overdue HIRA recommendations are findings in audits, even if they are not consecutive audits, and even if the finding is not being written for the same exact overdue recommendations, it should be treated as a repeat finding. Of course, the definition of “timely” is also relevant when determining if a recommendation is overdue. Also, the management system for the HIRA recommendations should also be reviewed to determine if they were included there. See Chapter 2 for further guidance.

8. Just-in-Time Compliance

Dilemma 8a

You are assigned to audit the hot work permit (HWP) part of the Safe Work Practices element of a PSM program. You first request a copy of the site’s hot work procedure, which is provided to you. The procedure tracks the PSM and referenced regulations exactly. However, the effective date of the procedure is three days prior to the audit you are now conducting. The facility Safety Manager admits that the procedure is brand new, that it replaced a more simplistic and informal hot work permitting process that had existed before, and that the facility had worked very hard to complete it and get it approved in anticipation of the PSM audit.

When you ask about the required training for operations and maintenance employees on the new procedure, which is one of the provisions of the new procedure, the Safety Manager tells you it is scheduled for next week. They had to wait until approval and issuance of the final procedure and could not conduct it prior to the audit. You also ask if you can review any completed hot work permits and are told that, since the procedure is so new, no completed permits are available. Next, you ask if you can observe some hot work while you are on-site. The Safety Manager says that there is no hot work scheduled for the week of the audit.

The bottom line is that they seem to be knowledgeable of the requirements and are putting an excellent program in place. It is just not fully implemented. Is there a finding here? Why or why not? If so, what would the finding be? Other than reviewing the program again on the next audit scheduled in three years, is there a way you can be sure that the program is real and not just “paper”?

Possible Resolution or Conclusion 8a

The governing regulations do not explicitly require a hot work procedure, only that a hot work permit be issued and that it address the issues in the referenced regulations—OSHA Standard 1910.252(a), Fire Protection for Welding and Brazing. Therefore, the existence of a hot work procedure is not, strictly speaking, a compliance requirement. However, since the facility has issued such a procedure its contents are compliance requirements. The finding in this case should be that not all the provisions of the approved hot work procedure have been implemented.

The fact that no hot work took place during the week of the audit is not relevant. See Chapters 1 and 12 for further guidance.

Dilemma 8b

Another auditor during the same PSM audit who is reviewing the MOC program observes that the forms for 12 active and recently completed MOCs are incomplete. Signatures are missing and various data fields on the form requiring information be entered are blank. The auditor prepares a draft finding that facility MOC procedure is not being followed, citing the specific deficient MOCs. The PSM Coordinator acknowledges the problems and proceeds to correct them by re-routing the forms to get the incomplete information and signatures inserted. Before the closing meeting the PSM Coordinator returns to the MOC auditor with copies of the 12 corrected MOCs forms and requests that the finding be deleted. Are these corrected MOCs still findings? If so, why? If not, why not?

Possible Resolution or Conclusion 8b

A fairly common situation in PSM audits is that the facility attempts to correct the findings as the on-site portion of the audit is progressing. There are two schools of thought regarding this practice:

- A simple finding that reports that the records are incomplete in a particular PSM element point only requires that the missing data be inserted for the subject records to be complete and satisfy the compliance requirement. Such findings should be able to be corrected at any time after they are discovered, and if they are corrected before the closing meeting or the issuance of the final audit report, they should not be mentioned in these forums because they are moot.
- An audit finding is a report of the conditions as the auditor found them, and the findings should be described and published as the auditor found them because that was the status of that aspect of the PSM program on the date found. The dilemma facing auditors in this situation is that a facility that strives to correct findings as they occur may be more concerned with the existence of the findings (or the number of them in a specific audit) rather than what the findings are telling them about their PSM procedures and practices. The other issue associated with this dilemma is that facilities that work hard to close findings during the audit usually feel that they are being unfairly “punished” if the audit team advocates the second school of thought. Incomplete records can be a simple oversight or they may represent a systemic problem with the procedure or practice that is generating the records in question. Strictly speaking, if the procedure is inferred rather than explicitly written and the governing regulations (if any) do not require a procedure or specify a documentation method for the activity, then the incomplete records could be related rather than compliance requirements. Therefore, auditors should attempt as much as possible to determine if there is a systemic problem so that the finding can be written to fully describe not just the evidence discovered but any

possible problems with the way the PSM procedure or activity related to the evidence in question is being practiced. It is not likely that a facility will be able to correct systemic problems during the on-site portion of an audit, given that these corrections will generally require changes to procedures, additional training, revised recordkeeping procedures, additional administrative steps, or other activities before the finding can be permanently corrected. By ensuring that all parties fully understand and agree in advance on the audit ground rules about allowing or not allowing the correction of findings during the audit, the dilemma can be resolved. See Chapters 2 and 16 for further guidance.

9. Regulatory Intent

Dilemma

In several elements of the PSM Standard, e.g., HIRA, MOC, and Incident Investigation, employers are required to inform or train employees whose jobs are affected by the outcome of the activity. You are interviewing nonmanagement employees during a PSM audit and covering this aspect of the PSM program, that is, how they are informed about the results of HIRA recommendation resolution, approved changes, and the lessons learned from incident investigations. The procedures for each of these three elements contain provisions for providing copies of the HIRA and incident reports, as well as MOCs to the operators in the control room building and requiring that they sign forms stating they have reviewed the documents and understand them. Four operators separately state that they have not been informed of the outcomes of these activities, even though they were fairly recent and each of them signed the appropriate forms. Do you have a finding here? Why or why not?

Possible Resolution or Conclusion

The meaning of the terms “communicate” (HIRA recommendations), “informed in and trained” (MOCs), and “reviewed” (incident investigation lessons learned) in the PSM Standard has been a matter of continuing debate among PSM practitioners for years. While some practitioners interpret these terms to require face-to-face training or briefings, others have interpreted them to mean that providing various forms of written information is sufficient. The governing regulations and written forms of interpretation are silent on this issue, and the actual practice of informing employees of the results of the subject PSM activities has spanned the spectrum of practitioner’s interpretations. There is no one-size-fits-all solution to this requirement and a mix of both face-to-face and written communication or training may be appropriate. In addition, the governing regulations do not require confirmation that the employees understood the information being presented to them. This is different from the Training element of the PSM Standard, where the demonstration of understanding is required. Therefore, auditors should not generate findings if face-to-face presentations of this information are not being conducted, unless the facility or company

procedures require them. Auditors should review the methods used to provide written information to employees to determine that they are proactive and contain some confirmation that each employee received the information. See Chapters 10, 13, and 20 for further guidance.

10. Stretched Definition of “Annual”

Dilemma

In November 2008 you are conducting the Asset Integrity portion of a PSM audit at an oil refinery, which has 350 employees and 50 maintenance personnel. In assessing the SWP training for the maintenance department, you note that an excellent needs assessment matrix— computerized and pretty impressive at first glance—has been developed for all applicable training modules and for all job classes of maintenance personnel. You check on 10 employee records and note that 3 of them have missed their required annual training for hot work permits or line breaking/process opening for 2008. The last recorded training on these topics for the 10 employees was in January–February 2007. The EHS training coordinator, who did not seem aware of these deficiencies, says not to worry; this was probably due to summer vacations and a short turnaround in early 2008. The employees will make up the training in December, which means that some employees will have an interval of almost two years between sessions. The EHS training coordinator argues that this meets the annual requirement for this training. Is this a finding? Why or why not?

Possible Resolution or Conclusion

In this context, “annual” in this context is interpreted to mean a rolling 365-day period and not one occurrence of an activity in successive calendar years. Therefore, competing SWP training anytime in 2007 and anytime in 2008 for a given person does not meet this definition. However, some facility PSM personnel argue that “annual” means once in the calendar year. The most common practice is to observe the rolling 365-day definition. Therefore, findings that describe exceeding this limit typically survive because it makes common sense to most people. This issue also applies to any requirement in the PSM Standard with a time limit, i.e., HIRA revalidations, compliance audits, certification of SOPs, etc. See Chapters 11 and 13 for further guidance.

11. Incomplete Compliance Audit

Dilemma

During the planning of a PSM audit at an oil refinery, six auditors were originally assigned. The weekend before the audit was to begin, one of the auditors experiences a family emergency and calls the audit team leader to remove himself from the audit. Due to the late timing, this auditor cannot be replaced and the team is short one member. The team leader splits the missing auditor’s work among the

remainder of the team. During the audit, one of the auditors is called away to two telephone conferences by her boss to deal with “urgent” issues not related to the audit. In addition, because of the loss of power (fortunately without any release), the audit team is asked to abate the audit and leave the refinery for one afternoon. As a result of these unforeseen problems the auditors were not able to address all of the compliance questions. Can the audit be certified?

Possible Resolution or Conclusion

The governing regulation requires that the audit be certified but does not describe what measure of completeness should be used for the evaluation. If the facility or company PSM audit procedures refer to or incorporate a given audit protocol, then that is the measure that should be used to determine if an audit was performed completely. The PSM Standard requires that an audit verify that the procedures and practices developed under the Standard are being followed. This infers that all PSM-related procedures and practices be audited. If all the compliance questions/criteria from a required protocol cannot be completed in the allotted time (and the reasons described in the dilemma are unforeseen and extenuating), every attempt should be made to complete the missing portions as soon as feasible. If this cannot be done, the certification should be modified to describe what was and/or was not accomplished. If this is not done, auditors reviewing the previous compliance audit should generate a finding for this situation. See Chapters 2 and 22 for further guidance.

12. PSM Program Boundaries

Dilemma 12a

While gathering information before a PSM audit of an oil refinery the team leader requests the facility procedure or document that defines the PSM boundaries of the facility, i.e., what processes and equipment are included in the PSM program, and what processes or equipment have been excluded. The PSM Coordinator reports that such a document does not exist. This was confirmed once the audit team arrived on-site. In initial interviews with several facility managers and other others with functional responsibility for PSM program elements, including the PSM Coordinator, there is a difference of opinion as to what processes/equipment/areas are included in the PSM program. Is this a finding? Why or why not?

Possible Resolution or Conclusion 12a

The fact that there is no document describing the boundaries of the PSM program and that there are verbal differences of opinion on the boundaries are not findings in and of themselves. The toxic, reactive, and/or flammable materials and their corresponding threshold values for regulatory coverage, along with the definitions of a process, mixture rules, and other applicability provisions in the governing regulations, must be used to determine whether the boundaries of the PSM program have been properly determined by a facility. In addition, guidance derived from final decisions in the appeals process, such as the Meer and Motiva decisions

for the PSM Standard, are also relevant because they have been finally adjudicated. See Chapter 3 for further guidance.

Dilemma 12b

During the same audit, the PSM Coordinator states that the manually activated vapor suppression system for the HF alkylation unit is not considered to be included in the PSM program because the system contains only water and does not share any equipment with the alkylation process itself. Is this correct? What does the phrase “critical to process safety” (or similar wording) mean?

Possible Resolution or Conclusion 12b

“Critical to process safety” means that a process, equipment, or function supports process equipment that contain the chemicals or materials included in the governing regulations and that the failure of the supporting system, equipment, or function could contribute to a catastrophic release because its failure could cause the release or helps safeguard against it. This description could arise because the equipment was included in a HIRA as a cause of a hazard scenario or as a safeguard, or it is included in a SOP or in the PSK as a safety system. However, this phrase does not appear in the governing regulations or in any formal interpretation of them. Therefore, while the formal inclusion of supporting systems and equipment critical to process safety is highly recommended, it is not a mandatory or compliance requirement. Any findings generated because these systems or equipment are not included in the PSM program would be written against related rather than compliance criteria. See Chapter 3 for further guidance.

Dilemma 12c

During the Asset Integrity portion of a chemical plant PSM audit, you discover that the facility is very sensitive to the loss of cooling water to a set of batch reactors, and rapid exothermic reactions will occur if cooling or power is lost. The facility has SISs that measure temperature and pressure and initiate an emergency shutdown on high temperature and pressure. These devices are tested regularly and the records are complete. No ITPM is performed on the cooling water system or the electrical power system that supplies it. The Maintenance Manager says it is not necessary because the facility has the SISs installed and they are tested. Is this a finding? Why or why not? See Chapter 13 for further guidance.

Possible Resolution or Conclusion 12c

Some utility systems are very important to process safety because their failure could directly contribute to a possible catastrophic release. When such is the case, there are usually multiple layers of protection for the hazard scenario in question. However, the utility system, which is the first line of defense, is one of those layers and should not be ignored when defining the PSM boundaries because there are other layers. To do so would be to consciously sacrifice the first layer of protection because by itself, it does not contain the chemicals or materials required for formal

regulatory coverage. These important utilities would probably fit the definition of “critical to process safety” shown in Dilemma 12b above and would likely be included in HIRAs as safeguards, and in the SOPs and PSK as safety systems. While this applicability philosophy is desired, it is not a mandatory requirement, and any findings generated because these critical utilities are not included in the PSM program would be written against related rather than compliance criteria. See Chapters 3 and 13 for further guidance.

13. Special Certifications

Dilemma 13a

You are auditing the Asset Integrity element of a chemical plant PSM program. The plant uses facility personnel to perform pressure vessel, storage tank, and piping inspections; and take and interpret thickness readings on this equipment, vibration monitoring for rotating equipment, and thermography of various electrical and mechanical equipment. The Maintenance Manager shows you the Level 1 and 2 NDT certifications for ultrasonic testing of the personnel who perform the pressure vessel, storage tank, and piping inspections and thickness readings. He states that these certifications are adequate to do all of this work. Is this correct? Why or why not?

Possible Resolution or Conclusion 13a

The qualifications to perform external and internal inspections and manage the thickness measurement program of pressure vessels, storage tanks, and piping require personnel that are certified for this work under API-510, API-653, and API-570, as well as the standards published by the National Board. Having the certification as a Level 1 or Level 2 technician for a particular NDT technique (e.g., ultrasonic testing) does not include the skills and credentials otherwise required by the API codes and standards described. In addition, those certified under these API codes and standards are qualified to select thickness or condition measurement locations (TMLs/CMLs), as well as to perform the code/standard calculations required to predict the remaining life of the equipment. Persons with NDT certifications are only qualified to take NDT readings using the specific technique for which they are qualified (Level 1 and 2) and interpret those readings (Level 2). Therefore, the lack of these certified qualifications for vessel, tank, and piping inspectors would be a compliance finding. See Chapter 13 for further guidance.

Dilemma 13b

The Maintenance Manager also states that the person who performs the thermography testing has been doing this work for 15 years and is as knowledgeable as anyone who could provide training on this tasks and the equipment used to perform it. Is there a finding here? Why or why not?

Possible Resolution or Conclusion 13b

The qualifications of vessel, tank, and piping inspectors, and those taking and interpreting vibration readings of rotating equipment are certified by a consensus organization (API and the Vibration Institute). These personnel are usually certified by the individual companies that make the infrared cameras. Therefore, uncertified personnel taking thermography readings should not be written as a compliance finding, but against related criteria. See Chapter 13 for further guidance.

14. Inadvertent Mixing***Dilemma***

You are performing an audit of the Process Knowledge Management element of a PSM program at a specialty chemicals facility. The facility does not have a matrix or table that shows the incompatibilities of the various chemicals that are used, stored, or manufactured on-site. Is this a finding? Why or why not?

Possible Resolution or Conclusion

Although the use of a matrix or table to show material incompatibilities on-site is a clear and easy-to-use method of documenting this information and has become a common and successful practice in Process Knowledge Management, it is not a compliance requirement. Other methods, including MSDSs (if they include information on inadvertent mixing), can be used to fulfill this requirement. See Chapter 9 for further guidance.

15. What is “Timely”?***Dilemma***

While performing a PSM audit at an oil refinery, the auditors for the HIRA, audit, and incident investigation elements notice that none of the recommendations for these elements are overdue. However, many of them have very long due dates, even for the simple recommendations (e.g., modify a procedure). Also, it appears that the due dates for many of the recommendations have been extended multiple times, and that many of the new dates were changed very shortly before the audit you are conducting. Is there a finding here? Why or why not? What does “timely” mean with respect to resolving and implementing recommendations in a PSM program?

Possible Resolution or Conclusion

Very long due dates for administrative changes such as changing the wording of a procedure fails the test of “timely” explained in Chapters 1, 2, and the Glossary. These would be compliance findings because the facility’s schedule was not being followed. However, each situation must be examined on its own merits before the compliance finding can be written. For example, a wholesale change to a

procedure that implements new or modified documentation methods requiring new software, substantial training, etc. may reasonably take more than multiple months to accomplish, whereas the changing of the wording of one warning statement in a SOP should be reasonably completed within a few months, or even less. Also, the multiple extensions indicate a breakdown in the application of “timely” in practice at the facility. Since the term “timely” has no single uniform definition that covers every situation, auditors should apply a reasonable definition on a case-by-case basis, seeking consensus from within the audit team for each situation. The last-minute extensions just before the audit are probably attempts to avoid findings without addressing the underlying issues. See Chapters 1, 2, 10, 16, 17, 20, and 22 and the Glossary for further guidance.

16. Annual SOP Certification

Dilemma 16a

You are auditing the SOP element of a chemical facility PSM program. The facility has chosen to create its SOPs so that any given procedure is as brief and focused as possible. Consequently, the facility has a large number of approved SOPs. The annual SOP certification consists of a single sheet of paper that contains a simple statement saying that the SOPs have been reviewed and are up-to-date. Is this sufficient?

Possible Resolution or Conclusion 16a

A simple one-sheet certification that does not list the SOPs being certified as accurate is sufficient to meet the compliance requirement of the governing regulations, unless the facility’s procedures specify a certification method. A successful and common practice is to use an electronic index of the SOPs and include the certification date on the index. The sampling and testing plan should provide guidance on what to review in a given audit. However, the lack of this type of certification record would be a finding against related rather than compliance criteria. See Chapter 11 for further guidance.

Dilemma 16b

In the same audit, you are informed that the SOPs are maintained electronically rather than as hard copies. In the shift to electronically maintained SOPs, the facility has included many links and references to other documents to meet the regulatory requirements for SOP content, e.g., the MSDSs for safety/health and exposure information, and to other engineering documents for information about safety systems. Are these documents that are incorporated by reference or are linked in the SOP subject to the annual certification requirement?

Possible Resolution or Conclusion 16b

A strict interpretation of the certification requirement might conclude that any document incorporated by reference or linked in a SOP would be subject to the

same annual certification requirement as the host SOP itself. However, the regulators have been silent on this issue, and no level of acceptable practice has emerged. Some PSM practitioners treat incorporated references and linked documents separately and apply a different review and verification process to them. This seems to be a sufficient practice for now. The governing regulations, particularly the PSM Standard, were adopted when current document publishing capabilities and techniques were in their infancy and not widely used (particularly document hyperlinks). The governing regulations were written upon the assumption that the SOPs were stand-alone documents that contained all the required information in one place. Document management practices have evolved well beyond that assumption. Therefore, auditors should apply a common sense approach to this complicated issue until the regulatory interpretation or industry common practice indicates a more uniform approach. If the referenced or linked documents have a periodic and recorded review process associated with them, the periodicity of that process is reasonable and that process is being observed by the facility, then findings should not be necessary in this area. See Chapter 11 for further guidance.

17. RAGAGEPs—Safety Instrumented Systems

Dilemma

You are auditing the Asset Integrity element of a chemical facility PSM program. The facility has not implemented ANSI/ISA S84.01 for safety instrumented systems (SISs). Despite the clear indication of interlocks, trips, and other automatic controls on the P&IDs and in other PSK, the facility lead control systems engineer states that the facility has no SISs or ESDs. Is this a finding? Why or why not? This dilemma could also be faced by the auditor of the Process Knowledge Management element. See Chapters 9 and 13 for further guidance.

Possible Resolution or Conclusion

ANSI/ISA S84.01 is the governing RAGAGEP for safety SISs. But like any RAGAGEP, it can be substituted with an equivalent written practice, even a company-designed practice, if it accomplishes the same goals and objectives. Several large companies in the chemical/processing sector have long-standing engineering standards in place that specify how control systems are to be defined, specified, designed, installed, and tested. These homegrown procedures offer an alternative approach to that provided in ANSI/ISA S84.01 and have been found to be acceptable. This acceptance, however, has not been made in writing, but has been obtained by its long and successful practice. Therefore, not using ANSI/ISA S84.01 is not a compliance finding if an equivalent practice is in place. However, simply declaring that there are no SISs/ESDs at the facility without a documented risk-based analytical process in place confirms it would be compliance finding.

18. RAGAGEPs—Vibration Monitoring

Dilemma

You are auditing the Asset Integrity element of an oil refinery PSM program. The facility does not perform vibration monitoring of rotating equipment. The Maintenance Manager argues that vibration monitoring would not yield useful data about the rotating equipment and that the careful engineering and maintenance the refinery performs, e.g., laser alignment of all rotating equipment, frequent oil change and analysis, frequent draining of water from lube oil systems, have virtually eliminated seal and bearing failures. Is this a finding? Why or why not? During the same audit you notice later that some, but not all of the OEM manuals for the rotating equipment recommend vibration monitoring. Does this change the finding? Why or why not? Also, if the great majority of facilities in the chemical/processing industry have adopted vibration monitoring, does that create a de facto mandatory requirement?

Possible Resolution or Conclusion

Vibration monitoring of rotating equipment has proven to be a successful asset integrity activity, and it has also become a very common, time-tested industry practice. Hence, it has become a level of acceptable practice for rotating equipment in ITPM programs. However, this status within the industry does not mean that vibration monitoring is a mandatory or compliance requirement. It is still a voluntary practice. See Chapter 13 for further guidance.

19. RAGAGEPs—Positive Material Identification (PMI)

Dilemma

You are auditing the Asset Integrity element of an oil refinery PSM program. The refinery has not implemented a program to perform PMI on existing/installed alloy materials. The refinery does perform PMI on new project and stock alloy materials. The Engineering Manager states that PMI of existing alloy materials does not apply to his facility because it is grandfathered and they have never had any corrosion failure of installed alloy materials. Is this a finding? Why or why not?

Possible Resolution or Conclusion

API RP 578 specifies that PMI be performed for new alloy material as well as for alloy material that has already been installed. This is because checks by facilities have revealed many errors in material installation prior to PMI becoming a practice in the past 5–10 years. However, API RP 578 does not require, or even recommend, that X-ray fluorescence (i.e., nuclear) methods be used. Chemical test forms of PMI are also acceptable. Facilities and companies that have established PMI programs have overwhelmingly chosen X-ray fluorescence methods due to the ease of operation, immediate results, and reduction in nuclear source size resulting in no need for an NRC license. Therefore, a compliance finding should

be generated for having no PMI program in place for existing installed alloy materials, but not for using a specific type of PMI method. See Chapter 13 for further guidance.

20. RAGAGEPs—Fired Heaters

Dilemma

You are auditing the Asset Integrity element of an oil refinery PSM program. The refinery regularly performs an external inspection of their fired process heaters, but no other ITPM. The Maintenance Manager states that this is sufficient because their heaters have the most modern and redundant burner management controls and they have never had a heater leak. Is this a finding? Why or why not?

Possible Resolution or Conclusion

The governing RAGAGEP for fired heaters is API RP 573, which specifies a number of ITPM tasks on the heater shell, tubes, flue stack, blowers, etc. NFPA 54, NFPA 85, and other NFPA standards also apply. Therefore, a compliance finding should be generated for not performing all of the ITPM tasks specified by the API RP 573. See Chapter 13 for further guidance.

21. RAGAGEPs—Thickness Measurements

Dilemma

You are auditing the Asset Integrity element of a specialty chemical plant PSM program. Most of the process equipment in the facility are constructed from corrosion resistant alloy materials such as stainless steel, hastelloy, etc. The facility takes thickness measurements of vessels, tanks, and piping every five years. None are overdue. The ITPM reports for these measurements are included in the equipment files consist of copies of the piping isometrics or sketches of the vessel and tanks that show the TML/CML and the thickness readings entered by hand. The isometrics are also annotated by hand as “satisfactory” or “no significant corrosion.” Is this a finding? Why or why not?

Possible Resolution or Conclusion

The governing RAGAGEPs for pressure vessel, tank, and piping inspections are API-510, API-653, and API-570, respectively. Each of these RAGAGEPs includes a set of calculations of the long- and short-term corrosion rates and comparison of the measured thickness to the retirement thickness. The corrosion rates are used to calculate the remaining life of the components and the set the next inspection date. If these code/standard calculations have been performed, the records of them exist, and the handwritten annotations of “satisfactory” or “no significant corrosion” are to merely summarize the calculations, then no findings would be needed. If, however, the ITPM records described above are all that exists—in other words, only the thickness measurement records exist with no

record of their required analysis in accordance with the RAGAGEPs, then a finding should be generated for the lack of analytical results associated with the pressure vessel, storage tank, and piping thickness measurements. See Chapter 13 for further guidance.

22. Used Equipment

Dilemma

You are auditing the Asset Integrity element of an oil refinery PSM program. The refinery installs used equipment on engineered projects occasionally. Neither the facility nor the parent company's project procedures or engineering specifications address used equipment in any way. Is this a finding? Why or why not?

Possible Resolution or Conclusion

The fact that the project procedures do not address used equipment is not the source of the finding in this situation. If the used equipment is not accompanied by records that clearly and adequately define its design basis and the design condition values for pressure, temperature, flow, and any other relevant process parameters, then the facility or company should perform a fitness-for-service evaluation (FFS). A FFS is a combination of engineering analysis and testing that re-establishes the design basis for equipment that has lost its documented pedigree. API RP 579 is the RAGAGEP for performing FFSs specifically for pressure vessels. Therefore, if vendor-supplied or FFS documentation does not exist for the used equipment, then a compliance finding should be generated. See Chapter 9 for further guidance.

23. Missing U-1A Forms

Dilemma

You are auditing the Asset Integrity element of an oil refinery PSM program. A review of the equipment files reveals that the U-1A form for 10 pressure vessels cannot be found. Is this a finding? Why or why not?

Possible Resolution or Conclusion

If the nameplate for the pressure vessel is still intact and readable, or a rubbing of the nameplate exists so that the National Board Registry number can be obtained, then the missing U-1A forms can be acquired via a website. If the National Board registry number cannot be obtained, then a FFS for the pressure vessel should be performed to establish its design basis, and a compliance finding should be generated for this purpose. See Chapter 9 for further guidance.

24. What Does Replacement-in-Kind Mean?

Dilemma 24a

You are auditing the MOC element of an oil refinery PSM program. The refinery manages some changes in PSM activities that would not fit the definition of being RIK but are not controlled and managed using the refinery MOC procedure. For example, you discover that the refinery controls the removal or bypass of safety features using a separate procedure from MOC. A review of the bypass procedure reveals that it requires that a form be completed that includes the technical justification for the bypass or removal, a time limit, and an approval (by the Maintenance Manager). Is there a finding here? Why or why not? See Chapter 16 for further guidance.

Possible Resolution or Conclusion 24a

The use of alternative change control procedures for different types of change situations is an acceptable practice, as long as the alternative procedures accomplish the basic requirements of MOC. In this case, the safety feature bypass procedure does not address the impact of the proposed bypass on safety and health, which is an important requirement of the MOC process. A compliance finding to modify the bypass procedure to include this analysis and a documentation of it on the permit form should be generated. See Chapter 16 for further guidance.

Dilemma 24b

During the same audit you discover that the facility definition of replacement-in-kind would not include changing an isolation valve from a ball to a gate valve, and would not require an MOC. The Engineering Manager states that this change would be considered merely a drawing symbol change and would be managed using the document control procedure for engineering drawings. Is this a finding? Why or why not?

Possible Resolution or Conclusion 24b

Any physical change to a process that alters the hydraulic characteristics, in this case the pressure drop across a different type of valve, constitutes a change subject to MOC. However, if an engineering specification allows the substitution of a ball valve with a gate valve, then this type of change is pre-approved and would not require a MOC. Valve changes are relatively minor changes but they are not replacement-in-kind, and they are not simply P&ID/drawing changes. Therefore, a compliance finding should be generated for not applying the MOC procedure to the change from a ball to a gate valve unless it is allowed via specification. See Chapter 16 for further guidance.

25. Safety Impacts of Changes

Dilemma

You are auditing the MOC element of a chemical plant PSM program. During the review of the active and recently completed MOC packages, you notice that many of them have little or no indication that a safety review of the impact of change has been conducted. On the majority of these MOCs, the only indication of the review of the safety impact is the signature of the Safety Manager. This signature is among a group of MOCs approvers and consists only of a line on the form with the title “Safety Manager” below it and a space for the date. Is this sufficient? Why or why not?

Possible Resolution or Conclusion

The governing regulations require that the safety and health impacts of proposed changes be addressed in the MOC procedure. It is not clear from the MOC form described if including the Safety Manager as one of the approvers constitutes an assessment of the safety impact of a proposed change, because approval is a different aspect of MOC. Therefore, a compliance finding should be generated for the lack of a documented analysis of the safety impact of proposed changes. See Chapter 16 for further guidance.

26. Conflicts of Interest

Dilemma

You are auditing the MOC element of a chemical plant PSM program. During the review of the active and recently completed MOC packages, you notice that great majority of them are initiated by the same person, and the same person signs the MOC form indicating that the safety review has been completed and the handwriting in the space to record the results of the safety review appears to be the same person. The same person is also one of the approvers of the MOC, and on some of the MOCs is the only approver. Is this a finding? Why or why not?

Possible Resolution or Conclusion

The MOC element of the governing regulations does not stipulate that conflicts of interest be avoided in the MOC procedure. While not advisable, it is sometimes unavoidable given the staffing, especially in small-to-medium-sized facilities. The MOC procedure should require that the MOC initiator not be an approver, or at least not the only approver, and the initiator should not be the person who assesses that impact on safety and health of the proposed change if at all possible. However, this is a related rather than a compliance finding. See Chapter 16 for further guidance.

27. Divergence of Opinion

Dilemma

You are interviewing nonmanagement employees regarding several PSM elements. The answers to your questions reveal a distinctly split opinion on a several issues. Therefore, you decide to conduct additional interviews to allow a pattern of responses to emerge. However, after these additional interviews, which have totaled 15 people, the difference of opinion is still nearly split evenly. What do you do? What do you conclude?

Possible Resolution or Conclusion

Verbal input from any interview, or multiple interviews, as is the case in the dilemma, should be confirmed by record review and/or field observations if at all possible. This is particularly true when there is a persistent difference of opinion. In this case, a finding should not be generated until the difference of opinion is reconciled by other interviews, other types of evidence, or both. See Chapter 2 for further guidance.

28. Different Analytical Activities

Dilemma

You are auditing the Asset Integrity element of the PSM program of a large petrochemical facility. During interviews with the Chief Inspector you discover that the basis for establishing the frequency of pressure vessel, storage tank, and piping inspections is a risk-based inspection (RBI) program that follows the guidance described in API RP 580/581. During interviews with the Maintenance Manager you discover that the basis for ITPM task frequencies for the rotating equipment is a reliability-centered maintenance program that uses a qualitative analytical activity to choose the frequencies; however, this analysis does not include process safety hazards or scenarios. Also, the lead instrumentation/electrical (I/E) engineer informs you that the frequencies for ITPM on this equipment were established by a committee of knowledgeable I/E supervisors and engineers many years ago but were not clearly documented. When asked if the results of these activities have been reconciled with the results of the HIRAs, all those interviewed stated that they were not aware that this had been done. The PSM Coordinator made the same statement. Is there a finding here? Why or why not? Which risk/hazard analytical activities govern activities in other PSM elements?

Possible Resolution or Conclusion

Although there is no explicit requirement that the HIRA results be directly reflected in the choices made to plan activities in the other PSM elements, the preamble of the PSM Standard infers this. Therefore, it is advisable to ensure that the other elements, particular the Asset Integrity, Emergency Management, and

SOP elements, reflect the risks identified in the HIRAs. For example, the AI program should include any of the equipment that can cause the hazard scenarios, as well as the safeguards identified in the HIRAs. However, reconciling the scope of the PSM elements with the HIRA results would not be a compliance finding, but a related finding. In the dilemma described above, however, the use of RCM information to establish the ITPM frequencies of rotating equipment would not meet the requirements that the ITPM program follow the applicable RAGAGEPs and therefore that would be a compliance finding for this practice, unless the RCM-generated ITPM frequencies are consistent with the relevant RAGAGEPs, and the HIRA results have been compared to the RCM analytical results. Also, activities that enhance the reliability of the equipment usually enhance process safety. See Chapters 10 and 13 for further guidance.

29. Distributed Control System Displays

Dilemma

You are auditing the SOP element of the PSM program of a large oil refinery. During initial interviews with the operations personnel, you are informed that the year before the audit the refinery replaced its older control systems with a centralized, very modern distributed control system (DCS). As a result of the large amount of information available from the new DCS and the user-friendly design of the DCS displays, the refinery was phasing out written SOPs for some of the operations in lieu of the DCS mimic displays of the processes and other graphical information shown on the control panel screens. Is this a finding? Why or why not?

Possible Resolution or Conclusion

Although the control room operators are likely to rely on and use the DCS displays on a constant basis, the requirement in the governing regulations is for *written* SOPs. These can be electronically managed documents, can be accessed via links or other software features from the DCS screens, or are embedded in the DCS, but they are distinct and separate documents from the displays and users screens embedded in the control system. Therefore, a compliance finding should be generated for not having written SOPs for all required processes. See Chapter 11 for further guidance.

30. Emergency Response Philosophy

Dilemma

You are auditing the SOP element of the PSM program of a small-to-moderate-sized specialty chemical plant. The emergency plan states explicitly that the emergency response policy of the facility is not to respond to spills, releases, fires, etc. where there is the possibility of an exposure beyond what would be experienced responding to an incipient fire or spill. However, the emergency section of the operating procedures (EOP) for one of the PSM-covered processes

states that if a process release occurs, the operator should report the event, then don an SCBA and other protective gear, form two-man teams with backup, and take actions (e.g., closing valves) to stop the release. The personal protective equipment (PPE) has been staged in the operating area for this possible use. The facility believes that the required actions in the EOPs do not trigger the HAZWOPER emergency response provisions. Is this a finding? Why or why not?

Possible Resolution or Conclusion

There is a very fine line between possible exposures that are considered part of operations and those that might be considered emergency response actions as defined by the HAZWOPER regulation (Section 1910.120). Each set of actions must be carefully considered on a case-by-case basis. If the actions expected of operators meet the definition under the applicability definition of HAZWOPER, then that regulation will be triggered at the facility in question. The description of the expected actions of the operators in case of a process release would meet this definition, and the statement in the emergency plan about the emergency response philosophy of the facility being not to respond is incorrect. Also, if this philosophy has been used as a basis for developing the emergency plan, it should include those parts of HAZWOPER that the facility would be expected to follow, including the training and qualification of certain facility personnel (including the operators in this case) as HAZMAT responders. Therefore, a compliance finding should be generated for the emergency plan not being prepared in accordance with the HAZWOPER regulation, Section 1910.120(p) (if the facility is a RCRA TSD facility), or Section 1910.120(q) (non-TSD facility) as appropriate. See Chapter 19 for further guidance.

31. Incidents and Near Misses

Dilemma

You are auditing operating procedures and are reviewing the inside operator's log and see an entry that indicates that a safety instrumented system was activated. The control loop functioned as designed and the process shutdown safely. A review of the incident investigation files reveals that no incident report was generated. Do you have a finding?

Possible Resolution or Conclusion

The definition of a near miss in the governing regulations is a general one, i.e., an incident that could reasonably have resulted in a catastrophic release. Any chain of events that results in the activation of the safety instrumented systems, which are usually the last line of defense for automatically preventing catastrophic releases, should be classified as a near miss and investigated properly. There is often a hesitance to do this because there is a belief by some that if the SISs worked as designed then that is what is supposed to happen and therefore a catastrophic release was not possible. This ignores the fact that one of the failures in the hazard scenario in question did occur and that the SISs were called upon to "save the

day.” This meets the definition of a near miss and therefore a compliance finding should be generated for not investigating the scenario in question. See Chapter 20 for further guidance.

32. Dealing with Facility Pushback

Dilemma

In nearly all PSM audits, the auditors and the audit team will confront some disagreement over the findings and recommendations. Most of the time, this debate can be resolved locally and consensus reached between the facility and audit team. However, in some cases, the disagreements present serious difficulties in performing and completing the audit. When this occurs, the situation represents a significant dilemma for the audit team and particularly for the team leader.

Possible Resolution or Conclusion

Section 2.3.5.7 provides additional comments and guidance on dealing with facility pushback.

Appendix J: PSM Audits During Mergers and Acquisitions

The pace of mergers and acquisitions (M&A) in the chemical/processing industry (as well as divestitures) has increased markedly in recent years. The due diligence associated with these mergers and acquisitions traditionally has focused on financial, market share, and other business-related criteria. Starting in the 1980s potential environmental liabilities were added to pre-M&A investigative activities; however, little if any attention has been paid to safety issues during due diligence activities beyond the examination of various occupational safety statistics, and there has been almost no focus on process safety. Given the high cost in direct costs, lost business, and negative media attention associated with process safety incidents, it is surprising that this is so. Therefore, a focused audit to examine the status of the PSM program is recommended for facility ownership transfers. Although a recent PSM audit performed by the selling party might seem to suffice, the buyer should perform his/her own assessment.

Although all PSM elements are important and a prospective buyer of a facility should know the status of all of them, there are several elements of particular importance in an M&A situation because of the potential significant costs of correcting problems in them for the new owner, the possible regulatory exposure for the new owner, or both. These elements include the following:

- Hazard Identification and Risk Analysis
- Operating Procedures
- Asset Integrity
- MOC
- Compliance Audits

In addition, several other aspects of the PSM program, including the ones listed below, are key indicators of its quality and should be examined during the due diligence for a property transfer.

- Status of PSM program action items and recommendations
- Internal controls
- Process safety culture

Hazard Identification and Risk Analysis

A PSM audit during the due diligence associated with an M&A situation should examine the status and quality of the HIRAs. In particular, are any of the revalidations late? Have all the HIRAs addressed the items required by governing regulations or facility/company requirements? The HIRAs should also reflect current design and operating practice. The revalidations should be reviewed to ascertain if they are merely “check the box” activities that do not adequately identify the hazard scenarios that are credible. Also, the status of recommendations should be thoroughly examined to determine if the schedule established by the selling party shows that any are overdue for resolution. The buying party should

understand what further risk reduction work, if any, is required. See Chapter 10 for additional guidance on auditing HIRAs.

Operating Procedures

A PSM audit during the due diligence associated with an M&A situation should examine the status and quality of the SOPs. The buying party should determine if the SOPs are up-to-date and represent the as-operated condition of the facility. Updating out-of-date SOPs can represent a significant amount of work, particularly if the facility has a large number of SOPs. See Chapter 11 for additional guidance on auditing SOPs.

Asset Integrity

This important element of a PSM program should be assessed in detail during the due diligence associated with an M&A situation to determine its status. In particular, the following AI program characteristics should be examined closely:

- The status of the inspection, testing, and preventive maintenance program schedule. The buying party should understand completely which PSM-related ITPM tasks are overdue and the aging of these tasks.
- The actual ITPM tasks identified and completed for the equipment are also important. If the facility being acquired failed to identify (and perform) thickness testing on pressure vessels, for example, the basic integrity/health of those vessels could be in question. This could represent a significant cost if the facility equipment is in need of major maintenance.
- The status of open AI deficiencies. The buying party should understand completely which deficiencies are open and how long they have been open.
- The status of ITPM documentation for equipment included in the PSM program.

See Chapter 13 for additional guidance on auditing AI programs.

Management of Change (MOC)

A PSM audit during the due diligence associated with an M&A situation should examine the status and functionality of the MOC program. The buying party should determine if there are changes being made to either the equipment or the SOPs without using the MOC process. In addition, auditors should determine whether the MOC procedure is being followed as written (e.g., are temporary MOCs being left in place past their expiration date), is a thorough review of the impact of proposed changes on safety and health being performed, and is documented (e.g., are all the signatures required to approve a MOC being obtained, are the procedures up-to-date and do they represent the as-operated condition of the facility). A nonfunctional MOC program can be an indicator of a

poor PSM program and it is also indicative of poor PSM culture. See Chapter 16 for additional guidance on auditing MOC programs.

Compliance Audits

The status of the recommendations from the past PSM audits should be understood by the buying party to determine if any of them are overdue for resolution. The buying party should understand what further risk reduction work, if any, is required. See Chapter 22 for additional guidance on auditing PSM audit programs.

Status of PSM Program Action Items and Recommendations

In addition to the HIRA and compliance audit recommendations described above, the status of all other PSM program recommendations should be thoroughly understood. These occur mainly as a result of incident investigations and emergency response activations and drill critiques, but may also result from other PSM activities. Overdue recommendations are particularly important because they are previously identified and known risk reduction measures that, if not resolved, could represent significant possible liability if a process safety incident occurs.

Internal Controls

Although not a compliance issue, the quality of the PSM internal controls is an important aspect of the PSM program for a buying party to understand. Are the PSM management systems functional and are they actually capable of preventing and mitigating process safety incidents? See Section 2.3.5 and the element chapters for additional guidance on auditing PSM internal controls.

Process Safety Culture

Like internal controls, process safety culture does not represent a compliance issue. However, if the underlying culture is poor, a PSM program is not likely to be functional, regardless of how well the management systems are designed. The PSM audit during due diligence should contain an examination of the process safety culture. Unlike the other PSM elements described above, which can largely be examined and cogent conclusions drawn primarily from document and record reviews, auditing process safety culture requires in-depth interviews with key facility personnel across the full spectrum of positions, from the facility manager down to the nonmanagement-paid operators and maintenance personnel. Since most of these personnel will be transferred to the buying company, they will bring their process safety culture with them. See Chapter 4 for additional guidance on auditing process safety culture.

Although the basic concepts and guidance for performing a PSM audit, described in the other chapters of this book, apply to an audit during a merger or acquisition, the following are several differences between normal, periodic PSM audits and M&A PSM audits:

- The purpose of a normal PSM audit is to determine what gaps exist between the PSM program and the voluntary and regulatory requirements for the PSM program. The purpose of an M&A PSM audit is to uncover possible flaws in a facility's PSM program design or implementation that would represent a significant cost to correct, or a significant regulatory or legal liability to the potential buyer of the facility. These are fundamentally different purposes. One is to make a PSM program better; the other to help financially protect a party from the effects of a poor PSM program.
- The scope of work should be carefully determined before the audit begins. The same issues and possible findings that might be of importance in a routine PSM audit may not have the same importance in an M&A PSM audit. For example, in the SOP element, a finding in a routine PSM audit that the SOPs had not all been certified as accurate and up-to-date in the past year would be an important finding. However, in an M&A PSM audit, this finding would be noted but would not be as important as a finding in the same element that written SOPs had not been provided for some operations. Developing and implementing SOPs that were completely missing would take more time and effort than completing a few missed annual SOP certifications. Therefore, it is likely that auditors will be directed to focus more on findings that are potentially high cost, or that may be long-lead time efforts because these are important considerations in a property transfer situation than simply understanding where there may be noncompliance issues. Again, this represents the fundamental difference in purpose between the two types of audits.
- PSM audits are planned events and all parties that will be involved in the audit, both the audit team and the facility to be audited, know well in advance how the audit will be performed, what questions will be asked, and what facility people and records will be involved. However, an M&A PSM audit takes place within the context of the facility and its parent company, or a portion thereof, that are about to be sold. This situation is likely to create some consternation among facility staff. Also, the audit is likely to be a surprise, with very little, if any advance planning by the facility. This can result in facility staff being somewhat hostile toward the audit team, or at least displaying a high degree of concern.
- Although company legal staff members are often involved in PSM audits, they are generally not audit team members directly. They may be in the background and provide overall guidance, or they may review the findings and recommendations. On an M&A PSM audit, the audit team very likely will be directly supervised by an attorney, and there may be outside counsel involved both on the audit as well as the facility or parent company legal staff. Although some normal PSM audits are performed under privilege in order to help shield the results from future discovery, it is very likely that an M&A PSM audit will be performed in this manner, further increasing the supervision by legal staff. Also, while the requirements and guidance for PSM audit team composition are

advisable, they are not mandatory in an M&A PSM audit. Therefore, auditors need to obtain objective evidence that clearly supports interviews and commentary from (perhaps soon to be ex-) employees of the facility (in some cases).

- If an imminent hazard is identified, the facility owner should be immediately informed. However, in the case of an M&A audit, outside parties will be privy to the details of the hazards and status of the PSM program, unlike a normal PSM audit, where only the company and its representatives will know the outcome.
- There is the possibility that the results of an M&A PSM audit will reveal findings that could jeopardize the impending sale. Although nearly any finding can be resolved via negotiation, findings that represent severe risks or regulatory impacts could have a dampening effect on the possible business opportunity.
- An M&A PSM audit should result in a report that is similar to any other PSM audit; however, due to the fact that the audit was performed to help validate a possible business venture, it is likely that the purpose, scope, and guidance of the audit will be different and will be driven by legal and business concerns rather than EHS concerns. The audit report will reflect these influences. Also, M&A PSM audits do not require certification.
- In a normal PSM audit, the recommendations are resolved based on their technical merit. In an M&A PSM audit, the recommendations are resolved based on negotiation between the buying and selling parties. This is a fundamental difference between the two types of audits.

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