Standard Interpretations

07/12/2006 - PSM compliance for ammonia refrigeration systems.

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- **Standard Number:** 1910.38; 1910.119; 1910.119(d)(3)(i); 1910.119(d)(3)(ii); 1910.119(e)(3); 1910.119(j)(6)(i); 1910.119(j)(6)(ii); 1910.119(k)(2); 1910.119(l)(2)(i); 1910.119(l)(4); 1910.119(l)(5); 1910.119(m)(3); 1910.119(o)(1); 1910.120; 1910.134; 1910.147; 1910.147(c)(4)(ii)

July 12, 2006

Mr. E. C. Palmer, Jr.
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Dear Mr. Palmer:

This is in response to your letter dated August 22, 2004, to the Occupational Safety and Health Administration (OSHA) regarding several questions pertaining to OSHA standards, including OSHA Process Safety Management (PSM) standard at 29 CFR 1910.119. You indicated in your letter that your consulting group provides environmental and safety consultation in the PSM area. You also indicated that majority of your clients operate ammonia refrigeration systems to provide cooling necessary to the production of food products. This letter constitutes OSHA's interpretation only of the requirements discussed and may not be applicable to any questions not delineated within your original correspondence. We apologize for the delay in our response. Your paraphrased questions, scenarios, and our responses are provided below.

Question 1: How long should Management of Change (MOC) documentation be kept under the PSM standard?

Response 1: As you may know, the safe operation of chemical processes is based in part on the original design or design basis/intent of a process. The original design and design intent are used in the chemical industry as the basis for the fabrication, installation, start-up, operation, maintenance, and changes to a process. The development and use of the original design and design intent are *recognized and generally accepted good engineering practice* (RAGAGEP) for covered processes and are explicitly required by OSHA PSM standards such as 1910.119(d)(3)(i)(D);[1] and 1910.119(d)(3)(i)(F);[2] and 1910.119(j)(6)(ii).[3] ther OSHA PSM standards implicitly require the employer to develop and use the original design and design intent, such as 1910.119(d)(3)(i)(A)[4] and 1910.119(d)(3)(i)(C);[5] 1910.119(d)(3)(ii);[6] and 1910.119(j)(6)(i).[7]

Consequently, it is important for continued safe operation that when employers contemplate changes to covered processes they have access to the original design or design intent for that process and its equipment. This is especially true as a result of high turnover of personnel who are responsible for the safety of these processes and who must know the design history and design intent, including any subsequent changes. Employers need this information so they may safely address the technical basis [1910.119(l)(2)(i)] for any new MOC procedure and to determine, as a result, whether the safety and health impacts [1910.119(l)(2)(ii)] of any new MOC procedure have been adequately determined.

As PSM is a performance-oriented standard, 29 CFR §1910.119(l) does not explicitly specify the manner and the duration for which an employer must maintain MOC[8] documentation. Because the original design, design intent, and all subsequent changes are important for the continued safe operation of a covered process, pursuant to 29 CFR 1910.119(l)(4) MOCs addressing chemicals and equipment would become part of the *Process Safety Information* (PSI) , giving employers a documented record of, not only the original design and design intent of the covered process, but also providing a record of all changes to the process that are of importance to those responsible for safe operation and maintenance and to those that may need to consider future changes to the process. Consequently, MOCs for chemicals or equipment in a covered process must be retained for the life of the process through their incorporation in the PSI pursuant to 29 CFR §1910.119(l)(4).

If an employer conducts an MOC related to changing procedures and practices [1910.119(l)(5)], OSHA would only require the employer to retain that particular MOC procedure until it is incorporated into the next process hazard analysis (PHA) revalidation or update required by 1910.119(e)(6). Therefore, in this case the MOC retention time is based on the PHA revalidation schedule which is established through consultation with employees [1910.119(c)(2)] and could be up to a maximum of 5 years.

Many times MOCs utilize a large amount of background materials as part of the research and decision making process for the conduct of a MOC. If these background materials are not required to be retained by another OSHA standard, e.g., 1910.119(d), OSHA would not require the employer to retain these materials beyond the time when the MOC is incorporated into the next PHA update or revalidation.

Further, per 1910.119(o)(1), OSHA expects the employer to audit a representative number of the MOC procedures it has conducted. Therefore, the employer's MOC retention practices need to assure that a statistically-significant number of representative MOC procedures is available to be audited during the next compliance audit cycle conducted by the employer.

The document retention requirements listed above are consistent with industry RAGAGEP. For example, the Center for Chemical Process Safety (CCPS) of the American Institute of Chemical Engineers[9] states that documentation for the design intent/basis of equipment should be available for the life of the process. CCPS also provides[10] RAGAGEP for MOC records retention and purge schedules. CCPS information on retaining and purging MOC documents include that, at a minimum, the MOC information should be retained up to the next PHA update or revalidation; that no purging of MOC documents be carried out before the next audit; and that there should be a definition and identification process for MOC documents which need to be retained for regulatory purposes and that these documents should not be purged.

Question 2: Can the facility start a new MOC log after the completion of the 5-year revalidation Process Hazard Analysis (PHA)?

Response 2: OSHA does not require an "*MOC log.*" OSHA only requires that MOC procedures be implemented whenever a specified change other than a *replacement-in-kind,* is contemplated. However, OSHA recommends that an employer utilize some type of tracking process, preferably a computer database, to assure that all MOC procedures are appropriately managed. This is especially important where employers have many MOC procedures in various stages of completion, e.g., under review, on-going, completed.

Scenario: A facility repairs a piece of equipment by replacing a part. The initial MOC lists the change to be "replacement-in-kind." The facility maintenance manager/engineer, after reviewing the change, determines that the change was a "replacement-in-kind."

Question 3: For the above scenario, is there any requirement for documenting and maintaining a file to prove to an inspector that the change was in fact a "replacement-in-kind"?

Response 3: No — not with respect to 1910.119(l). Employers are not required to conduct an MOC when changes are *replacement-in-kind*.

However, OSHA's PSI standard, 1910.119(d)(3), requires that employers compile information related to equipment which is part of the process. This includes all component parts, whether the components are original or replacement (replacement-in-kind or replacements with different design specifications) parts.

This is consistent with the RAGAGEP for maintaining up-to-date and accurate data for PSM-covered equipment. For example, CCPS[11] states that maintaining this information is an important element of any facility PSM effort. CCPS states that the useful service life for process equipment includes maintenance, repair, modification, and replacement among other activities. CCPS explains that, typically, the amount of PSM-related equipment information grows through the equipment/process life cycle, which includes some of the life cycle steps listed. CCPS further states that the generation, compilation, and protection of this information is important and is to be available to appropriate personnel.

Question 4: The *Hot work permit* program under the PSM rule does not specify any record retention period. Is there any requirement to maintain a file of old or closed hot work permits so that an inspector can verify that the program is being followed?

Response 4: The PSM standard does not require employers to maintain a file of old or closed hot work permits. 1910.119(k), *Hot work permit,* does not require hot work permit record retention beyond completion of the hot work operations. Paragraph 1910.119(k)(2) states in part, ". . . *The permit shall be kept on file until completion of the hot work operations*."

However, to comply with provisions under paragraph 1910.119(o)(1)[12], an employer must audit the procedures and practices required by PSM and assure they are adequate and are being followed. Since hot work permits are part of the hot work procedure, OSHA expects that employers would audit a statistically-valid number of hot work permits to assure they were completed and implemented per their procedure. This practice is consistent with industry auditing safe work practices such as CCPS[13], which states, for example, that the auditor should sample maintenance records to verify that work authorizations and safe work (e.g., hot work) permits have been completed as required. Due to the performance-oriented nature of PSM, how the employer audits its hot work permits/procedure, or any procedure, is a matter of assuring performance (i.e., procedures are developed, adequate, and are being implemented), rather than a matter of OSHA specifying how compliance audits are to be conducted. One way to audit hot work permits to evaluate compliance with 29 CFR 1910.119(k) is to complete the audit before the permits are discarded.

Question 5: Is there any requirement under the PSM rule for an hourly employee (system operator) to be a member of the Process Hazard Analysis Team, Audit Team, or Incident Investigation Team?

Response 5: OSHA's PSM standards relating to team composition requirements for PHA, incident investigation, and audit teams are 1910.119(e)(4)[14], 1910.119(m)(3)[15], and 1910.119(o)(2)[16], respectively. Membership on any of these specified teams is not based on compensation. Rather, these team composition requirements are based on an employee's knowledge of and experience with the process which is undergoing a PHA, being investigated, or being audited.

With respect to the PHA team composition requirements, the standard requires that the team *include at least one employee who has experience and knowledge specific to the process being evaluated*. This provision is in addition to the requirement that the PHA team consist of individuals with *expertise in engineering and process operations.* This employee (*who has experience and knowledge specific to the process being evaluated*) must in all cases be from the facility and must be intimately familiar with the process.[17]

For incident investigation team composition, OSHA standard 1910.119(m)(3) requires that the team include *at least one person knowledgeable in the process involved*. In this case a *person knowledgeable* could be, for example: 1) an employee that has in depth awareness of how the process actually functions, such as an operator or maintenance person; or 2) a person, such as a process engineer or operations supervisor, with knowledge related to how the process being investigated is designed or is supposed to work.

With respect to team composition requirements for *Compliance Audits* required by 1910.119 (o)(2), a team approach (although recommended in non-mandatory Appendix C of the PSM standard) is not required when conducting audits to verify compliance with the PSM standard. Paragraph 1910.119(o)(2) states, "*The compliance audit shall be conducted by at least one person knowledgeable in the process*."

Note that the phrase, "*knowledgeable in the process,"* contained in 1910.119(o)(2) means the same as discussed in the above paragraphs related to requirements for persons knowledgeable in the process for incident investigation teams. For *Compliance Audits* the person must have knowledge of the process being audited.

To assure a complete and statistically valid audit, OSHA recommends, but does not require, that the audit team have at least one member familiar with the auditing methodology which will be used to audit the process. When OSHA evaluates the employer's audit, the factors that will be considered in the overall performance of the employer's compliance with this requirement [1910.1119(o)(2)] are the methodology used and the experience and background of the audit team member(s).

Finally, OSHA's standard 1910.119(c)(1) requires employers to implement an employee participation written plan of action. If this plan of action requires an "hourly" employee(s), then OSHA requires the employer to implement that plan of action and provide the specified number of individuals with appropriate backgrounds on the teams.

Scenario: A facility has assigned valve identification numbers to all valves in a system and has tagged those valves with that identification number. It utilizes that valve identification number in its standard operating and mechanical integrity procedures.

Question 6: For the scenario above, does the facility also have to use the valve numbers in its lockout/tagout procedures, or may it use generic procedures, which merely state for example — close the suction valve and the discharge valve, i.e., generic procedures?

Response 6: Section 1910.147(c)(4)(ii) states, in part, that the procedures must clearly and specifically outline their scope, purpose, and authorization, and the rules and techniques employees are to use for controlling hazardous energy, including, but not limited to, specific procedural steps for shutting down, isolating, blocking, and securing machines or equipment to control hazardous energy. In other words, the procedures must be documented in sufficient detail and provide enough direction so that employees can effectively follow the procedure and determine how to safely perform the servicing and maintenance activities. The lack of procedural clarity and specificity can result in employees failing to isolate the key valves, permitting exposure to the hazardous energy during the servicing or maintenance work.

Simply listing valves by their functionality (such as suction valve, discharge valve, etc.) may lead to confusion and error with respect to those valves that must be closed to effectively isolate hazardous energy, due to inadequate employee direction. Therefore, one way to meet this performance requirement, for the scenario above, would be to use the valve numbers in their lockout/tagout procedures to identify the particular valve(s) that must be closed, since these numbers are already integrated into the company's system procedures. In most situations involving piping systems such as those you have described, it will be necessary to identify the particular valve(s) that must be closed to effectively isolate hazardous energy before beginning the servicing and/or maintenance activity.

Alternatively, if an employer develops a generic procedure for the machines/equipment in its establishment and incorporates supplemental means to address the specific elements contained in paragraph 1910.147(c)(4)(ii) for individual (or groups of similar) machines/equipment, the use of a generic procedure is acceptable. Some employers use checklists, placards, a work order system, or work authorization permit system to comply with the specificity provisions of the standard. These checklists, placards etc., when used in conjunction with a generic energy control procedure, would meet this performance-oriented requirement if: (a) the procedure and the supplement meet the requirements contained in this standard; and (b) if there is sufficient information to provide employees with adequate direction such that employees effectively can follow the procedure and safely perform the servicing and maintenance activities. Among other methods, this may be accomplished through the use of a system that links the specific valve(s) to be isolated via a numbering system or through a graphic style procedure(e.g., placards) that depicts the specific valve (s) to be isolated to a particular servicing and maintenance activity.

Question 7: Is there any requirement for two hazardous chemical release drills per year?

Response 7: There is no explicit OSHA requirement for the number of chemical release drills to be conducted each year. However, if an employer requires its employees to take some action in response to the release of *a highly hazardous* chemical (HHC), these actions must be addressed in the employer's PSM "procedures or plans" (i.e., 1910.119(f) —

Operating Procedures, 1910.119(n) — *Emergency Planning and Response*). If the employer determines drills are needed to assure that employees are adequately trained in those procedures, then OSHA requires the employer to include those drills in their procedures and plans, and the employer must also ensure that employees are trained in those procedures.

For example, 1910.119(n), *Emergency Planning and Response* requires employers to *". . . establish and implement an emergency action plan* (EAP) *for the entire plant in accordance with the provisions of 29 CFR 1910.38(a) . . . ,*" and also states, "*Employers covered under this standard may also be subject to the hazardous waste and emergency response provisions contained in 29 CFR 1910.120(a), (p) and (q).*" Therefore, if the employer's EAP required by 1910.38(a) contains provisions for conducting any type of drills, OSHA would require the employer to implement/conduct those drills. Likewise, employers subject to 1910.120(a), are required by 1910.120(l)(2)[18] to have an emergency response plan (ERP) which includes specified minimum elements. Again, if the employer's ERP includes provisions for conducting any type of drills, OSHA would require the employer to implement/conduct those drills. The same logic applies for 1910.120(p)(8)(i) and 1910.120 (p)(8)(ii), Emergency Response Plan for certain operations conducted under the Resource Conservation and Recovery Act of 1976 (RCRA); and for 1910.120(q)(1) and 1910.120(q) (2), Emergency Response Plan development and implementation requirements.

CCPS[19] provides information on planning for on-site emergencies. It states that drills and exercises are the most effective way to train personnel, test equipment, and ensure the validity of the response plan and procedures. It lists five types of drills which can be utilized for training purposes. Any of these drills could be customized to simulate the release of hazardous chemicals from any aspect of your facility.

Question 8: Is there any requirement for pulmonary function tests to be provided by the employer, in conjunction with annual respirator fit test and medical evaluation?

Response 8: OSHA's Respiratory Protection Standard at 1910.134(e) provides minimum requirements for medical evaluation that employers must implement to determine an employee's ability to use a respirator before the employee is fit tested or required to use the respirator in the workplace. One of these requirements is that the employer must select a physician or other licensed healthcare provider (PLHCP) to evaluate the employee's ability to wear a respirator, either by evaluating the employee's answers to a medical questionnaire, which is similar to the one provided in Appendix C of the standard, or by performing a physical examination, or both. The PLHCP determines the extent of the evaluation necessary based in part on the employee's responses and/or the type of respirator expected to be worn. The employer must obtain from the PLHCP a written recommendation regarding the employee's ability to use a respirator.

The pulmonary function test is not specifically required by the standard. However, the PLHCP may require a pulmonary function test to be performed as part of the evaluation before the written recommendation is given for a particular employee to wear a respirator. The employer must provide additional medical evaluations if, for example, the PLHCP, supervisor, or the respirator program administrator informs the employer that an employee needs to be reevaluated or if an employee reports medical signs or symptoms that are related to the ability to use a respirator.

Scenario: The OSHA — Armor Swift-Eckrich Settlement Agreement stated that various bulletins published by the International Institute of Ammonia Refrigeration (IIAR) and standards published by the American National Standards Institute (ANSI) would be utilized as RAGAGEP for the ammonia refrigeration systems. However, the latest ANSI/IIAR standard 2-1999 specifically limits the application of this standard to systems built or modified after the date of the standard.

Question 9: Which ANSI/IIAR standard will OSHA deem to be applicable to a system built prior to 1999?

Response 9: If an employer was in compliance with PSM for a process built before 1999, then it will have PSI which shows the design codes and standards employed for the equipment in its covered process, 29 CFR §1910.119(d)(3)(i)(F). Additionally, all equipment in the covered process was designed, fabricated, installed, operated, inspected/tested/maintained, and changed per some RAGAGEP. To manage and ensure this, employers have documented per 1910.119(d)(3)(ii) that the equipment complies with RAGAGEP. This documentation established the "fitness-for-duty" for the equipment and

became the baseline for all future operation, inspection/testing/maintenance, and change. Once this baseline has been established and the employer follows all PSM requirements including all applicable RAGAGEP, OSHA generally does not require the employer to upgrade its covered equipment to meet a change in a latter version of some RAGAGEP. The only exception to this would be if the equipment was being changed and an applicable RAGAGEP required that the equipment be updated to meet the latest version of the RAGAGEP. It is important that employers identify and document RAGAGEP for covered equipment, as that is the basis for managing the safety of the equipment over its lifetime.

Therefore, if the employer documented that it used ANSI/IIAR 2 — 1992 as one of the codes and standards it employed [per 1910.119(d)(3)(i)(F)] for some aspect of a covered process which was started-up in 1994, and if the employer documented that the covered process met the RAGAGEP requirements of 1910.119(d)(3)(ii), OSHA would not require the employer to comply with the requirements of ANSI/IIAR 2 — 1999. This assumes the employer has followed all PSM requirements and there are no equipment updates or changes required by ANSI/IIAR 2 — 1999 or some other latest version of an applicable RAGAGEP.

Scenario: The IIAR and equipment manufacturers have historically recommended that "hydrostatic relief protection" be provided for evaporative condensers and ammonia pumps and piping sections. However, the new American National Standards Institute (ANSI)/IIAR 2 — 1999 standard, in subsection 7.3.4, has created an exception from compliance with the hydrostatic relief requirements as follows: "*b. use of trained technicians to isolate liquid-containing parts of the system.*" Refrigerating Engineers and Technicians Association (RETA) has started to teach this practice as well.

Question 10: Has OSHA taken a position with regard to the elimination of safety devices based on "trained operators"?

Response 10: Your scenario addresses a requirement in ANSI/IIAR 2 related to the control of an over-pressure hazard created when equipment containing liquid ammonia (NH_3) is isolated. Isolated equipment has potential to be over-pressured due to thermal expansion effects of the liquid which can result in rupture and loss of containment from the equipment (liquid expansion hazard). As you mentioned, ANSI/IIAR 2 contains requirements to address this hazard. Given the serious nature of the liquid expansion hazard, you question whether the administrative control alternative listed in ANSI/IIAR 2 — 1999, Section 7.3.4 is adequate to control this hazard. You also question whether OSHA accepts administrative controls exclusively when engineering controls, i.e., safety devices, are also identified as a control measure for the same hazard/condition.

It is important to understand that the ammonia refrigeration industry, through ASHRAE 15, ASME 31.5 and ANSI/IIAR-2, has identified this liquid expansion hazard as a hazard with potentially serious/catastrophic consequences. The use of trained operators/technicians can reduce the probability that a part of a liquid-filled NH_3 system might be incorrectly isolated. However, if the system relies exclusively on a trained operator to ensure safe operations, operator or procedural deficiencies (e.g., improper isolation of the equipment due to an operator error, inadequate procedure, inadequate supervision, communication error, etc.), may result in a catastrophic release because there is no other means to control/relieve the overpressure. Therefore, OSHA does not accept the use of trained technicians/operators as the sole means to control this hazard.

The 1992 edition of ANSI/IIAR 2, Section 5.4.1.4 addressed the liquid expansion hazard. Requirement 5.4.1.4 of ANSI/IIAR 2 — 1992 allowed only the use of a liquid pressure-relief device (safety system/engineering control) to control this hazard. There was no provision for utilizing a trained technician/operator (administrative control) as the sole control of the hazard. This hazard and the probability of a catastrophic release of NH_3 have not significantly changed between the 1992 and 1999 editions of ANSI/IIAR 2. The two subsequent editions of ANSI/ASHRAE 15 (2001 and 2004), the *Mechanical Refrigeration Safety Code,* did not recognize the use of trained technicians/operators as a means to control this hazard. In fact, they specified pressure-relief devices as the exclusive means of control. Additionally, ASME Code 31.5 — 2001[20] — *Refrigeration Piping and Heat Transfer Components*, requires through Section 501.4.2 *Fluid Expansion Effects (Increased Pressure)* that, "*Consideration must be given to expansion of liquid refrigerant trapped in or between closed valves and a means provided to prevent overpressure."*

For OSHA PSM-covered processes, including NH_3 refrigeration processes, employers must conduct a process hazard analysis (PHA) to *identify, evaluate and control* the hazards of the process. With respect to the liquid expansion hazard, OSHA expects employers to address this hazard in all the various locations in a covered process where this hazard might exist. For this hazard, the employer's PHA must address, among other requirements:

- The hazards of the process (e.g., the deviation or initiating event which could lead to an overpressure struck-by hazard due to flying equipment debris; toxic hazard; or fire/explosion hazard due to the release and ignition of an ignitable concentration of NH_3) — 1910.119(e)(3)(i);

- The identification of any previous incident which had a likely potential for catastrophic consequences (e.g., the release of NH_3 through a hydrostatic relief device due to thermal expansion of isolated liquid between equipment; a "near-miss" involving the discovery of a liquid-filled isolated NH_3 line which was incorrectly identified and taken out-of-service in an area of the process where the temperature of the liquid NH_3 would be expected to rise to a potentially hazardous level) — 1910.119(e)(3)(ii);

- The engineering controls and administrative controls applicable to the hazard (e.g., what controls are in-place and what safeguards exist that would likely prevent an incident from occurring following an initiating event. Such identified safeguards might include hydrostatic relief devices or piping designed to contain the effects of overpressure caused by maximum thermal expansion of the liquid) — 1910.119(e)(3)(iii);

- Consequence of failures of engineering or administrative controls (e.g., trained operators inadvertently isolate a portion of the system which has no other means to prevent overpressure of the system resulting in equipment rupture and loss of containment from the system with possible employee injuries/death; a check valve is located on the upstream side of a solenoid valve, and when the solenoid valve is de-energized, the liquid between the check valve and the solenoid is trapped, possibly leading to an overpressure condition resulting in loss of containment from the system and possible employee injuries/death.) — 1910.119(e)(3)(iv); and

- Human factors (e.g., trained operators respond to address a problem in another area of the plant, leaving an isolated liquid NH_3 line in an area where significant thermal expansion of the liquid would be expected in a short time; due to a confusing piping arrangement which was not (or incorrectly) labeled, a trained technician isolates the wrong section of the process resulting in the isolation of a liquid-filled section of piping which undergoes rapid thermal expansion of the liquid and a rupture in the piping; because of a communication error with his supervisor, a trained technician incorrectly isolates a liquid-filled NH_3 line in an area of the facility where thermal expansion of the NH_3 would be expected.) — 1910.119(e)(3)(vi).

If a liquid expansion hazard exists and the only safeguard to protect against this hazard is the use of trained operators/technicians, then OSHA would not consider this hazard to be adequately controlled, as required by 1910.119(e). After addressing the liquid expansion hazard in the PHA, the employer must address and resolve any of the PHA team's findings and recommendations [1910.119(e)(5)]. Employers could abate this hazard and address and resolve the PHA finding/recommendation by installing the hydrostatic relief device(s) required by ANSI/IIAR 2 — 1999, Section 7.3.4(a)

In conclusion, equipment overpressure hazards can have serious consequences including releases of *highly hazardous chemicals* involving multiple employee deaths. Three national consensus standards recognize and address equipment overpressure due to the liquid expansion hazard. In view of the nature of this hazard and the abatement/controls prescribed by the national consensus standards, the hazard control alternative of exclusively using trained technicians (administrative controls) to adequately control this hazard would not be in compliance with OSHA's 1910.119(e) standard for controlling the hazards of the process.

Thank you for your interest in occupational safety and health. We hope you find this information helpful. OSHA requirements are set by statute, standards, and regulations. Our

interpretation letters explain these requirements and how they apply to particular circumstances, but they cannot create additional employer obligations. This letter constitutes OSHA's interpretation of the requirements discussed. Note that our enforcement guidance may be affected by changes to OSHA rules. Also, from time to time we update our guidance in response to new information. To keep apprised of such developments, you can consult OSHA's website at http://www.osha.gov. If you have any further questions, please feel free to contact the Office of General Industry Enforcement at (202) 693-1850.

Sincerely,

Edwin G. Foulke, Jr.

[Corrected 10/17/2007]

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[1] 1910.119(d)(3)(i)(D) — "*Relief system design and design basis*" [back to text]

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[2] 1910.119(d)(3)(i)(F) — "*Design codes and standards employed*" [back to text]

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[3] 1910.119(j)(6)(ii) — "*Appropriate checks and inspections shall be performed to assure that equipment is installed properly and consistent with design specifications and the manufacturer's instructions.*" [back to text]

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[4] 1910.119(d)(3)(i)(A) — "*Materials of construction*" — While this standard requires employers to have this information, it is also implicit that the design of the equipment includes the appropriate materials of construction for the type of service the equipment will be involved with. [back to text]

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[5] 1910.119(d)(3)(i)(C) — "*Electrical classification*" — While this standard requires employers to have this information, it is also implicit that the electrical classification is based on a specific design or design intent. [back to text]

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[6] 1910.119(d)(3)(ii) — "*The employer shall document that equipment complies with recognized and generally accepted good engineering practices.*" While this standard requires employers to have documented information, it is also implicit that the documented information for the equipment in the process is based on an appropriate design or design basis among other parameters. [back to text]

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[7] 1910.119(j)(6)(i) — "*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.*" While this standard requires employers to assure that equipment as fabricated is suitable for the process application for which it will be used, it is also implicit that to attain that assurance an employer will need to compare the fabrication to some design or design intent. [back to text]

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[8] MOC requirements (including documentation) apply only to changes that are other than "replacement in kind." [back to text]

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[9] *Guidelines for Process Safety Documentation,* Center for Chemical Process Safety (CCPS) of the American Institute of Chemical Engineers, 1995, Chapter 8, Paragraph 8.3.2, which includes a subsection titled, *Design Basis for Equipment Selection* (pgs. 125-127). [back to text]

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[10] *Guidelines for Process Safety Documentation,* (CCPS of the American Institute of Chemical Engineers, 1995, Chapter 10 — *Management of Change*, Paragraph 10.4.4 — *Records Retention and Purge Schedules* (pg. 188). [back to text]

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[11] *Guidelines for Process Safety Documentation,* Center for Chemical Process Safety (CCPS) of the American Institute of Chemical Engineers, 1995, Chapter 8, Paragraph 8.2.2 *Process Equipment Integrity as Part of Process Safety Management* (pgs. 124-125). [back to text]

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[12] 1910.119(o)(1) — *Employers shall certify that they have evaluated compliance with the provisions of this section at least every three years to verify that the procedures and practices developed under the standard are adequate and are being followed.* [back to text]

[13] *Guidelines for Auditing Process Safety Management Systems*, AIChE-CCPS, 1993 (pgs. 78 and 79). [back to text]

[14] 1910.119(e)(4) — *The process hazard analysis shall be performed by a team with expertise in engineering and process operations, and the team shall include at least one employee who has experience and knowledge specific to the process being evaluated. Also, one member of the team must be knowledgeable in the specific process hazard analysis methodology being used.* [back to text]

[15] 1910.119(m)(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.* [back to text]

[16] 1910.119(o)(2) — *The compliance audit shall be conducted by at least one person knowledgeable in the process.* [back to text]

[17] From OSHA PSM Final Rule Preamble [57 *Federal Register* 6378] ". . . *OSHA believes it is important to note that in all situations, the team performing the process hazard analysis must include at least one employee from the facility who is intimately familiar with the process."* [back to text]

[18] 1910.120(l)(2) is required by 1910.120(a)(2)(ii) [*Hazardous substance clean-up operations within the scope of paragraphs (a)(1)(i) through (a)(1)(iii) of this section must comply with all paragraphs of this section except paragraphs (p) and (q)*] which in turn requires 1910.120(b)(4)(ii)(H) [*An emergency response plan meeting the requirements of paragraph (l) of this section for safe and effective responses to emergencies, including the necessary PPE and other equipment.*]. [back to text]

[19] *Guidelines for Technical Planning for On-Site Emergencies*, AIChE-CCPS, 1995 (pgs. 165-166 and 179-183). [back to text]

[20] The scope of this ASME standard states, "*500.1 Scope . . . . 500.1.1 This Code prescribes requirements for the materials, design, fabrication, assembly, erection, test, and inspection of refrigerant, eat transfer components . . . . ."* [back to text]

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