VPP PSM SUPPLEMENT B

for

Company Name
City, State

Evaluation Date

Month x, 20xx

Report Date

Month x, 20xx

VPP Evaluation Team

Name, Team Leader
Name, Backup Team Leader
Name, Safety Specialist
Name, Hygienist
Name, SGE

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Instructions for the 2013 Annual Site Evaluation Questions:

VPP participants whose operations are covered by the Process Safety Management (PSM) Standard must provide responses to each question that is applicable to their operations. Responses must cover all PSM-related operations. Please indicate that a question is "Not Applicable" if it addresses functionality outside the scope of the operations, and briefly explain why.

The questions for calendar year 2013 emphasize the elements of the employers' pressure relief systems to include process equipment, piping, vessels and valves.

Resident Contractor VPP Participants covered by the PSM standard must also provide responses to each applicable question based on the guidance contained within each question. It is understood that a Resident Contractor does not likely operate process equipment per se, but contractor operations frequently impact on the Host's PSM process-related operations. A sole reference of "Not Applicable" is not an adequate response. Resident Contractors are expected to be able to provide a narrative response to these questions based on how their operations relate to the Host's PSM programs.

Supplement B PSM Questions - 2013

VPP Annual Evaluation Questions	**List Type:** General PSM

1. **For each throughput MOC procedure conducted, did the procedure include a review/analysis of the relief system (includes relief devices, relief discharge lines, relief disposal equipment and flare system) to determine if there may be any safety and health impacts due to increased flow as a result of throughput changes which might impact the existing relief system?**

   Guidance: An MOC procedure is required anytime a change per the requirements of 1910.119(l) is considered. An MOC procedure is a proactive management system tool used in part to determine if a change might result in safety and health impacts. OSHA's MOC requirement is prospective. The standard requires that an MOC procedure be completed, regardless of whether any safety and health impacts will actually be realized by the change.

2. **After a change in the throughput in the unit(s), did the process hazard analysis (PHA) team consider the adequacy of the existing relief system design with respect to the increased throughput during the next PHA? Please provide an example of steps taken by the PHA team to address the adequacy of the relief design for the most recent throughput change.**

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

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

VPP Annual Evaluation Questions	**List Type:** General PSM

3. Does the site's PSI include the relief system design and design basis?

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

1. *Identification/descriptor of each relief device;*
2. *A listing of all equipment which will be relieved through the device;*
3. *Design pressure;*
4. *Set pressure;*
5. *Listing of all sources of overpressure considered;*
6. *Identification of the worst case overpressure scenario or relief design;*
7. *State of material being relieved (i.e.,, liquid, vapor, liquid-vapor, liquid-vapor-solid, along with an identification of the material which was the basis for the relief device selection);*
8. *Physical properties of the relieved materials, vapor rate, molecular weight, maximum relieving pressure, heat of vaporization, specific gravity and viscosity; and*
9. *Design calculations.*

Similar design and design bases PSI are required for the rest of the relief system equipment downstream from the relief devices, i.e., relief vent lines, manifolds, headers, other relief disposal equipment, and flare stack.

4. If there are intervening valves on the upstream or downstream lines to/from relief devices, is there an administrative procedure (e.g., car-seal procedure) to assure these valves are in the open position during operations? If so, has this procedure been subsequently audited?

VPP Annual Evaluation Questions	**List Type:** General PSM

5. **Does the process use flares? If so, how does the site verify that the flares have been in-service/operational when the process has been running? If the flares have not been in-service, has the site used other effective measures to relieve equipment in the event of an upset? Has an MOC procedure been used to evaluate these changes?**

6. **Is the flare design and design basis current with the process configuration and throughput? What are the procedures used to evaluate and verify this? When was this operation last evaluated?**

VPP Annual Evaluation Questions	**List Type:** General PSM

7. **From the site's list of MOCs, identify the oldest MOC procedure which might affect the integrity of one or more pressure vessels in the unit(s). Please explain/describe how the site has ensured these MOC procedures meet all 1910.119(l) requirements? (Sites with no Pressure Vessels answer with NA)**

8. **Within the last year have there been any changes to pressure vessels or other equipment changes that could affect pressure vessel integrity, such as a change to more corrosive feed, a change in the type of flange seal material used for the vessel heads or nozzles, etc.,? If so, was an MOC procedure completed prior to implementing the change? (Sites with no Pressure Vessels answer with NA)**

9. For the design and design basis calculations for pressure relief for the process, provide examples of how your site calculates the flow-induced pressure drop in the inlet piping and backpressure considerations for conventional pressure relief valves (PRVs)?

Guidance: API 520 Part 1-2008, Section 5.3.3.1.1 states, "Conventional PRVs show unsatisfactory performance when excessive backpressure develops during a relief incident, due to the flow through the valve and outlet piping. The built-up backpressure opposes the lifting force which is holding the valve open."

Section 5.3.3.1.2 states, "Excessive built-up backpressure can cause the valve to operate in an unstable manner. This instability may occur as flutter or chatter. Chatter refers to the abnormally rapid reciprocating motion of the PRV disc where the disc contacts the PRV seat during cycling. This type of operation may cause damage to the valve and interconnecting piping. Flutter is similar to chatter except that the disc does not come into contact with the seat during cycling." In general, API 520 Part 1 Section 5.3.3.1.3 provides criteria stating, "In a conventional PRV application, built-up backpressure should not exceed 10 % of the set pressure at 10 % allowable overpressure…", although certain conditions can exist to exceed 10% (See API 520 Part 1, Section 5.3.3).

The flow-induced pressure drop in the inlet piping guidance is located in API 520 Part 2-August 2003, Section 4.2.2 "Size and Length of Inlet Piping to Pressure- Relief Valves

When a pressure-relief valve is installed on a line directly connected to a vessel, the total non-recoverable pressure loss between the protected equipment and the pressure-relief valve should not exceed 3 percent of the set pressure of the valve except as permitted in 4.2.3 for pilot-operated pressure relief valves. When a pressure-relief valve is installed on a process line, the 3 percent limit should be applied to the sum of the loss in the normally non-flowing pressure-relief valve inlet pipe and the incremental pressure loss in the process line caused by the flow through the pressure-relief valve. The pressure loss should be calculated using the rated capacity of the pressure-relief valve. Pressure losses can be reduced by rounding the entrance to the inlet piping, by reducing the inlet line length, or by enlarging the inlet piping. The nominal size of the inlet piping must be the same as or larger than the nominal size of the pressure relief valve inlet connection as shown in Figures 1 through 3. Keeping the pressure loss below 3 percent becomes progressively more difficult at low pressures as the orifice size of a pressure-relief valve increases. An engineering analysis of the valve performance at higher inlet losses may permit increasing the allowable pressure loss above 3 percent. When a rupture disk device is used in combination with a pressure-relief valve, the pressure-drop calculation must include the additional pressure drop developed by the disk (see 4.6 for additional information on rupture disk devices)." Other references for this guidance include International Standards Organization (ISO) ISO 4126 Part 9 Section 6

10. **For mechanical integrity issues and deficiencies found with relief devices (e.g., poorly functioning relief valves or visual inspection deficiencies), what are the procedures to address and prevent found deficiencies to ensure safe operation? Please list RAGAGEP used and if applicable, please indicate any deviation from the RAGAGEP.**

Guidance: API 576, Section 6 provides guidance into the inspection of relief devices. Section 6.1.1 states, "Failure of pressure-relieving devices to function properly when needed could result in the overpressure of the vessels, exchangers, boilers, or other equipment they were installed to protect. A properly designed, applied, and installed pressure-relieving device that is maintained in good operating condition is essential to the safety of personnel and the protection of equipment during abnormal circumstances. The principal reason for inspecting pressure-relieving devices is to ensure that they will provide this protection.

API 576, Section 5 discusses examples of "Causes of Improper Performance". More detail is provided in this section, but a brief overview in Section 5.2.2 states, "There are many causes of damaged valve seats in refinery or chemical plant service, including the following.
a) Corrosion.
b) Foreign particles introduced into the valve inlet and pass through the valve when it opens, such as mill scale, welding spatter or slag, corrosive deposits, coke, or dirt. The particles may damage the seat contact required for tightness in most pressure-relief valves. The damage can occur either in the shop during maintenance of the valve or while the valve is in service.
c) Improper or lengthy piping to the valve inlet or obstructions in the line. These can cause a valve to chatter. The pressure under the seat may become great enough to open the valve. However, as soon as the flow is established, the built-up pressure drop in the connecting piping may be so great that the pressure under the seat falls and allows the valve to close. A cycle of opening and closing may develop, become rapid, and subject the valve seating surfaces to severe hammering, which damages the seating surfaces, sometimes beyond repair. Figure 27 and Figure 28 show seating surfaces damaged by chattering and frequent fluctuations of pressure.
d) Careless handling during maintenance, such as bumping, dropping, jarring, or scratching of the valve parts.
e) Leakage past the seating surfaces of a valve after it has been installed. This leakage contributes to seat damage by causing erosion (wire drawing) or corrosion of the seating surface and thus aggravating itself. It may be due to improper maintenance or installation such as misalignment of the parts, piping strains resulting from improper support, or complete lack of support of discharge piping. Other common causes of this leakage are improper alignment of the spindle, improper fitting of the springs to the spring washers, and improper bearing between the spring washers and their respective bearing contacts or between the spindle and disk or disk holder. Spindles should be checked visually for straightness. Springs and spring washers should be kept together as a spring assembly during the life of the spring. Seat leakage may also result from the operating pressure being too close to the set pressure of the valve.
f) Improper blowdown ring settings. These can cause chattering in pressure-relief valves. The relief valve manufacturer should be contacted for specific blowdown ring settings for liquid service and for vapor service.
g) Severe oversizing of the pressure-relief valve for the relief loads encountered can cause the valve to close abruptly, resulting in disc and nozzle seating surface damage."

VPP Annual Evaluation Questions	**List Type:** General PSM

11. What metrics for your process streams do (or did) you collect when you compile (or compiled) written process safety information (PSI) before conducting any Process Hazard Analysis.

12. For the MOC procedures conducted for the unit(s), does the procedure list the technical basis for the change and ALL potential safety and health impacts of the change prior to its implementation? Please provide an example of the most recent MOC performed at the site.

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13. Does the site's MI procedure address testing (e.g. leak testing) and repair of pressure vessels? Provide a unique example (one not used as an example in a response to the same/similar questions in any other Supplement) where the MI procedure indicates how the testing and repair will be conducted. Which personnel are authorized to do the testing and repair, and list the credentials those conducting the testing and repair must have?

14. In what process documents can the following information be found?

1. **The original thickness measurements for all piping**
2. **The locations of subsequent thickness measurements**
3. **The dates subsequent thickness measurements were taken**
4. **The results of the subsequent thickness measurements**

VPP Annual Evaluation Questions	**List Type:** General PSM

15. Do NOP list the normal operating limits or "exit points" from NOP to EOP; the steps operators should take to avoid deviations/upsets; and the precautions necessary to prevent exposures, including engineering and administrative controls and PPE? In general, what parameters are used determine the "exit points" from NOP to EOP.

16. Have all corrective actions from PHA, incident investigations, MOCs, and compliance audits been corrected in a timely manner and documented? Provide a list of all outstanding corrective actions, the date of corrective initiation, the projected completion dates, and the interim measures that are being taken to protect workers during the corrective action period

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17. How do the PHA teams identify likely human errors and their consequences? What measures have been taken (or put in place) to reduce the frequency and consequences of these errors?	
18. Based on your management of operator refresher training, how do you verify that operating employees received, completed, and understood the refresher training. For each employee who operates a process, how have you ensured that the employee understands and adheres to the current operating procedures? Additionally, what criteria are used to determine the necessary frequencies for refresher training if needed more often than the required three years?	

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VPP Annual Evaluation Questions	List Type: General PSM

19. Provide a list of actual incidents and near-miss incidents that occurred at the site within the last year. Have all factors that contributed to each of the incidents been reported and investigated?

20. How do you document and demonstrate that atmospheric discharges from blowdowns are to safe locations? What determines if a location is considered safe from atmospheric discharges from blowdowns?