

**RP 754—Process Safety Indicators for the Refining and Petrochemical Industries**  
**Questions & Responses**

The following questions were submitted to API for clarification by representatives that participated in the development of the 2nd Edition of API RP 754. Questions and Answers are informal clarifications to aide in the submission of PSE data. Past clarifications will be considered in future updates of the RP.

Please contact Lauren Coughlin (coughlinl@api.org) if you have questions about 754 Process Safety Indicators that are not addressed in the RP or following document.

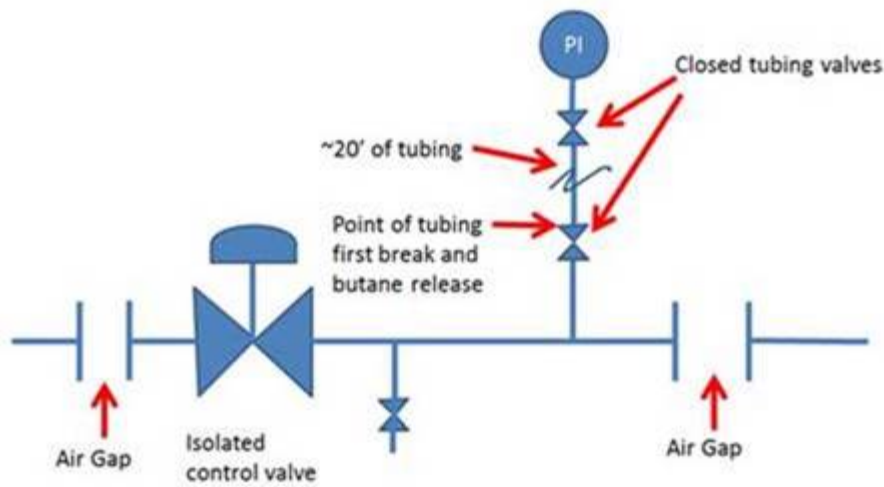
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## 1 LOPC Determination – Tubing Fitting

**Question:** A technician was working to remove a pressure gauge on what was assumed to be depressurized tubing. The upstream piping the pressure gauge tubing was connected to had been isolated, de-pressured and air-gapped so that this section of line was positively and physically isolated from the process. However, during the work to isolate the process line the section of tubing leading to the pressure gauge had been left blocked in and butane was trapped between two valves in the tubing.

When the technician broke the tubing fitting, he was splashed with the trapped butane, ultimately resulting in an OSHA recordable incident.



Would your company consider this a PSE? Does the fact the section of piping the tubing was connected to had been physically isolated from the process (with air-gap) rather than just isolated make this scenario different from Example 28 in [API RP 754 2nd edition](#) or Example 31 from [API's February 2nd, 2012 RP 754 Question and Answer webpage](#)?

28) A portion of piping is being prepared for maintenance. The line is drained, and isolation is verified. At some point prior to the first flange break, the line accumulated liquid due to a leaking valve. If the volume of material that leaked back into the isolated line is greater than the Tier 1 Table 1 or Table 2 TQs in any one-hour period, would this be considered a LOPC and subsequently a Tier 1 or Tier 2 PSE?

- Since there was no LOPC, this is not a Tier 1 or Tier 2 PSE. The material remained within the piping designed to contain it.
- If the flanges were opened and the LOPC resulted in injury, fire/explosion, or a TQ release, then it would be classified as a PSE.

31) This is an expansion of Example #18 (RP 754) in Loss of Primary Containment: A heat exchanger is taken off-line for cleaning. All the valves connecting the exchanger to the rest of the process are closed and tagged under the Energy Isolation procedure. A maintenance technician working under a work permit begins opening the exchanger for cleaning. Although the operator who isolated the exchanger and the maintenance technician reviewing the Energy Isolation believed the exchanger to be empty, one kilogram of hot liquid remained in a low point. When the flange at this low point is opened by the maintenance technician, the hot liquid runs onto her arm resulting in a burn that causes a Days Away from Work injury. Is this a PSE since the exchanger had been isolated from the process at the time the hot liquid was released?

- This is a Tier 1 PSE. Closure of valves and even installation by blinds does not recategorize equipment such that it is not part of a "process" as defined in 3.1.23. The

release was unplanned and uncontrolled, making the event a Loss of Primary Containment that resulted in Tier 1 PSE consequences.

**Response:** Closure of valves and even installation by blinds does not re-categorize equipment such that it is not part of a “process” as defined in 3.1.23. The release was unplanned and uncontrolled, making the event a Loss of Primary Containment that resulted in Tier 2 PSE consequences due to the OSHA recordable injury experienced. Air gapping the equipment does not re-categorize it as not part of the process. Additionally, the release was unplanned and uncontrolled and resulted in an OSHA recordable injury, thus it is a PSE 2.

## 2 Relief System “Exemption”

### **Question:**

You have a heat exchanger with ethylene on the tube side and water on the shell. There is a safety valve on the shell which is designed to protect the shell from over pressuring in the event of a tube rupture. The safety valve discharge is routed to the atmosphere via a high discharge point, such that dispersion modeling indicates that it is a “safe location”.

A tube ruptures and the valve relieves. The ethylene is dispersed, and consequences 2-4 do not occur. However, water is carried along with the ethylene and the water “rains out”. The water is cool/ambient and there is no risk of thermal burns to personnel.

*If the material which “rains out” as a result of a relief system discharge is non-hazardous (water in this scenario), does that invalidate this exemption such that the event must be reported as a T1 (or T2) PSE? RP-754 language*

*An engineered pressure relief (e.g. PRD, SIS, or manually initiated emergency depressure) discharge, of a quantity greater than or equal to the threshold quantities in Table 1 [or 2] in any one-hour period, to atmosphere whether directly or via a downstream destructive device that results in one or more of the following four consequences:*

1. Rainout
2. Discharge to a potentially unsafe location
3. An on-site shelter in place or on-site evacuation, excluding on-site shelter in place or site evacuation
4. Public protective measures (e.g. road closure) including precautionary public protective measures

**Response:** The release and subsequent rainout of the cool water would not be classified as a PSE 1 or PSE 2 because there is no process safety issue related to this release. Said another way, there is no Threshold Quantity for cool water.

The 4 consequences for release from a pressure relief valve must be considered and consequences 2 through 4 clearly do not apply. Rainout is intended to apply to a material with the potential to cause harm (Definition 3.1.25) which would not apply to cool water. If this logic were not applied then any release through a downstream destructive device or directly to the atmosphere containing any water, including water vapor, would eventually “rain out” the water making the exemption meaningless. If the water that was raining down was hot (I’d use any temperature hotter than 130 F), then it would be considered rainout of a material with the potential to cause harm.

## 3 Volume Definition

**Question:** Pg. 12 Table 2 - Tier 2 Material Release Threshold Quantities states that the Threshold Release Quantity (outdoor release) for a Threshold Release Category 6 Material is 100 kg (220 lb.) or 0.7 bbl. What is the API std definition for volume of 1bbl in gallons? I understand that there is a clause in the

table that states it's recognized that quantities given in kg and lb. and bbl. are not exactly equivalent and that companies should select one of the pair and use it consistently. In our specific situation we had two threshold release category 6 outdoor LOPCs that meet tier 2 criteria by weight w/ a simple conversion of gal to lbs.

However, if barrels are used instead there is confusion on what the std volume is in gals i.e. oil barrel = 42-gal, dry barrel = 26.3-gals, fluid barrel = 31.5 gals. If you take 220 lbs. and divide by the weight of 1 gal of water in lbs. you get roughly 26.3 gals. Using this logic, one could conclude the definition of a barrel in gal for API RP 754 reporting purposes is 26.3 gals.

**Response:** The standard conversion factor for barrels to gallons is 42 gallons. In our company we have standardized by using the barrel criteria for liquid releases and pound or kilogram criteria for gaseous releases. Please note that Table 1 and Table 2 state: "Companies should select one of the pair and use it consistently for all recordkeeping activities."

#### 4 DOT Packing Group II

**Question:** Would a chemical classified by its Safety Data Sheet as a DOT Packing Group II that is required to be marked as a corrosive liquid UN1760 but does not meet the API std definition for moderate or strong acid/base (PH = 11) be classified as a Tier I threshold release category 6 and Tier 2 threshold release category 6 because it's a Packing group II material that does not meet the definition of a moderate/acid or base. I'm looking for clarification because the material is considered corrosive, but it does not meet the API std as a moderate base by PH.

**Response:**

If the material is aqueous:

- A chemical with a pH of 11 would not be a strong acid/base, nor would it be a moderate acid or base, by definition of each.
- In this case the hazard of the chemical is expressed by the pH. Since its pH does not put it in the strong acid/base, or the moderate acid/base bucket, it is concluded that it is not a material of concern from a process safety standpoint. Specifically, in this case, the Category 6 criteria exclude acids and bases when considering Other Packing Group II materials.
- The note on the bottom of the tables is meant to explain the Packing Group of a material is only to be used if the other criteria (toxicity, flammability, and corrosivity) do not provide a determination for the material. In this case, the corrosivity of the material is defined by its pH of 11, which puts in outside of the materials of concern for either a Tier 1 or Tier 2 PSE.

If the material is not aqueous:

- pH is generally a good indicator of corrosivity of aqueous solutions, but not for all materials. Guidance from the Environmental Resource Center states, "Although pH might be a good indicator of potential corrosivity, unlike EPA, the DOT regulations do not specify pH ranges for corrosivity."
- The definition of moderate acids/bases in API 754 is "Substances with  $\text{pH} \geq 1$  and  $< 2$ , or  $\text{pH} > 11.5$  and  $\geq 12.5$ , or more precisely, substances that cause full thickness destruction of intact skin tissue within an observation period up to 14 days starting after the exposure time of 60 minutes or less, but greater than three minutes, consistent with Globally Harmonized System of Classification and Labeling of Chemicals (GHS) Skin Corrosion Category 1B."

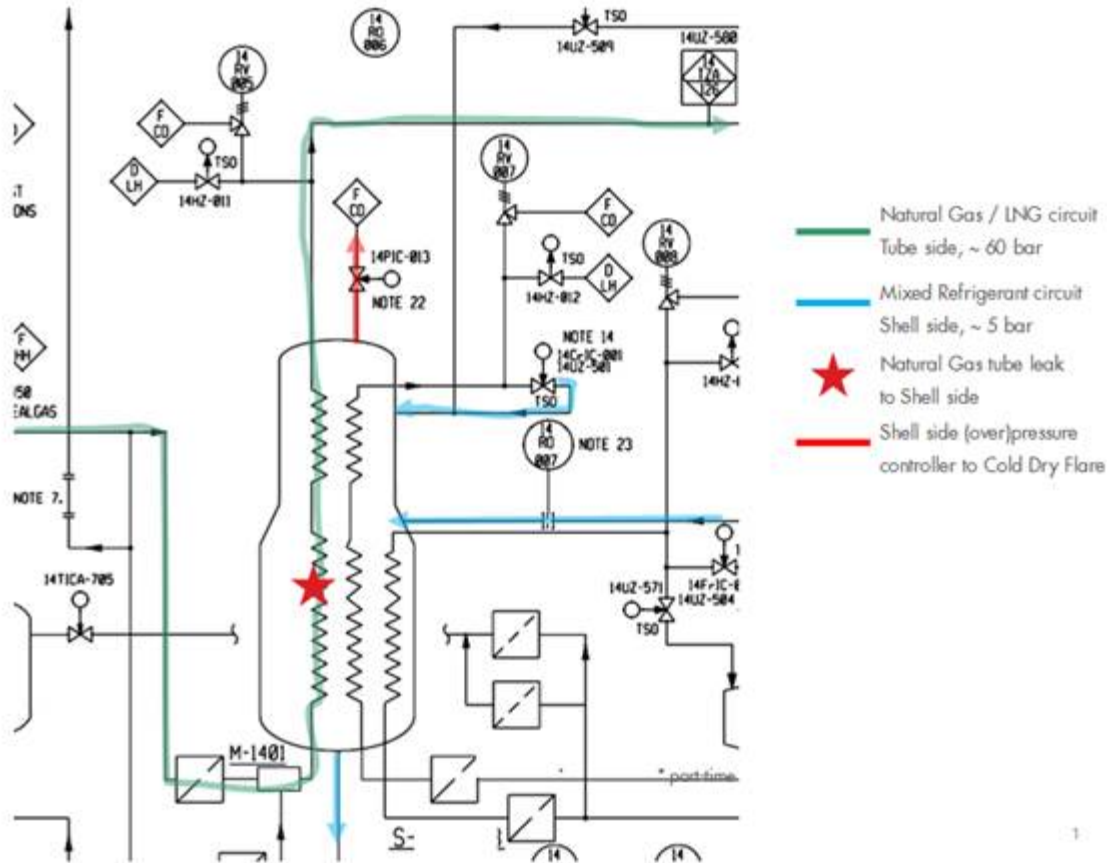
- The definition used by DOT for corrosive liquid consistent with Packing Group II marked as UN1760 is “A material is corrosive if it can cause full thickness destruction of intact skin within 14 days after an exposure time of up to 4 hours; or a material that will corrode steel or aluminum surfaces at a rate greater than ¼ inch per year.” This goes beyond GHS Class 3.2, Category 1B consistent with the API 754 definition of moderate acids/bases as stated above because it is inclusive of Category 1C.
- One cannot conclude whether a non-aqueous liquid labeled as UN 1760 corrosive liquid – Packing Group II meets the definition of a “moderate base” based on that information alone. Its GHS classification must be determined because the Hazard Statement Code of H314 includes materials less corrosive than the definition of moderate acid/base.

## 5 Heat Exchanger – Gas Migration

**Question:** There was an incident involving a potential failure of multiple tubes in a heat exchanger resulting in gas migrating from the tube side to the shell side. Although the quantity of gas that migrated from the tube side to the shell side is more than the threshold quantity for a Tier 2 or a Tier 1, the gas was all directed to the flare.

The natural gas migrating from the tube side to the shell side (the mixed refrigerant system) was all contained and sent to the flare (where a pressure controller on the top of the vessel [see the red line on the drawing] acted to send excess inventory to the Cold Dry Flare system). There was no release to the atmosphere except the flaring

Below is a sketch to help to clarify the discussion. The heat exchanger shell side fluid is the Mixed Refrigerant (MR) at around 3-6 bara (bar absolute). The pressure on the tube side is higher, for the natural gas (NG) circuit (shown in green) around 60 bara. In case of a NG tube leak, high pressure natural gas will flow into the shell side and start pressurizing the MR circuit. The heat exchanger shell side is protected by RVs (in the bottom outlet, not shown), but before that a pressure controller on the top of the vessel (red line) will act to send excess inventory to the Cold Dry Flare system. This gives the flaring of leaked natural gas via the mixed refrigerant system that we’re currently seeing.



The incident did not result to any of the following

- an employee, contractor or subcontractor “days away from work” injury and/or fatality;
- a hospital admission and/or fatality of a third-party;
- an officially declared community evacuation or community shelter-in-place;
- a fire or explosion resulting in greater than or equal to 100,000 of direct cost to the Company;
- a pressure relief device (PRD) discharge to atmosphere whether directly or via a downstream destructive device (such as the flare)

that results in one or more of the following four consequences:

- Rainout;
- discharge to a potentially unsafe location;
- an on-site shelter-in-place;
- public protective measures (e.g. road closure);

or

- an employee, contractor or subcontractor recordable injury;
- a fire or explosion resulting in greater than or equal to \$2,500 of direct cost to the Company;
- a pressure relief device (PRD) discharge to atmosphere whether directly or via a downstream destructive device (like the flare)

that results in one or more of the following four consequences:

- Rainout;
- discharge to a potentially unsafe location;
- an on-site shelter-in-place or on-site evacuation, excluding precautionary on-site shelter-in-place or on-site evacuation;



— *public protective measures (e.g. road closure) including precautionary public protective measures;*

We consider this as LOPC (which is a Tier 3 – Other LOPC) due to the unplanned event (tube failure causing a migration of gas from tube side to the shell side), but we think that it is neither a Tier 1 nor a Tier 2 as the gas migrating from the tube side to the shell side all went to the flare which did not result to any of the consequences highlighted above. I refer you to the attached Examples 78 and 79 from API RP 754 where releases to the flare are neither T1 nor T2 as it did not result to any of the 4 listed consequences.

<p>78) An upset causes a PRD to open and release fuel gas to the facility flare system. The flare system works properly and combusts the vapor release that came from the PRD. This is not a Tier 1 or Tier 2 PSE since the PRD release was routed to a downstream destructive device that functioned as intended (i.e. did not cause one of the four listed consequences).</p> <p>A company may record this as a Tier 3 challenge to the safety system.</p>	<p>Not a Tier 1 or Tier 2 PSE</p> <p>§5.2, Tier 1 Definition and Table 1</p> <p>§6.2, Tier 2 Definition and Table 2</p>
<p>79) If a relief valve releases a Tier 1 or 2 threshold quantity and liquid is carried over to the flare drum knockout, but no release to atmosphere in the form of rainout occurs, would you count it as Tier event?</p> <p>The four consequences associated with a release to a downstream destructive device are assessed at the discharge point of the downstream destructive device. In this case, there was no rainout from the flare stack, and assuming none of the other three consequences was realized, then this event would not be a PSE.</p> <p>A company may choose to record this event as a Tier 3 challenge to a safety system.</p>	<p>Not a Tier 1 or Tier 2 PSE</p> <p>§5.2, Definition</p>

**Response:**

Since ‘primary containment’ is defined as, ‘A tank, vessel, pipe, truck rail car, or other equipment designed to keep material within it, typically for the purposes of storage, separation, processing, or transfer of material.’, the tube failure that results in gas migrating from the tube side to the shell side is an LOPC. However, in reviewing the LOPC, the release did not cross the process boundary since the gas was contained within the shell side of the exchanger, therefore it was not a release ‘from a process’ (as required to be a Tier 1 or a Tier 2), and therefore is not a PSE 1 or PSE 2. It is a leak within a process and not from a process. A company may choose to take this LOPC as a PSE 3.

**6 Total Work Hours**

**Question:** Do you exclude hours from major construction projects from your exposure hours when figuring out your PSE Rates? We do not, we use all employee and contractor hours for work within the refinery fence line. Our thought behind this is that construction work within a refinery can, and has, caused process safety events. Wondering what others do?

<p><b>3.1.51.</b> <b>total work hours</b> Total employee, contractor, and subcontractor hours worked minus the hours associated with major construction projects. This is the same number typically used to calculate occupational injury and illness rates.</p> <p><b>3.1.52</b></p>
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**Response:**

By the definition of ‘total work hours’, the hours associated with major construction projects, (i.e., Large scale investments with specific, one-time project organizations created for design, engineering, and construction of new or significant expansion to existing process facilities.), are to be excluded. Typically, major construction projects within existing process facilities are done in an area that does not present an opportunity to cause a process safety event, or be affected by a process safety event, even if they are



done within the fence line of the facility. Some major construction project work, like tie-ins to existing process units, may present an opportunity to cause, or be involved in, a process a safety event. However, these hours are typically small compared to a facility's total work hours and therefore would have little to no impact on the PSE rate calculation. Note: Many times, the hours for major construction projects are tracked separately and therefore it is rather simple to exclude them. If collected together, the combined number can still be used to calculate the PSE rate.

## 7 Responsible Party: Molten Sulfur Overflow Resulting in Injury

**Question:** A service provider (Company A) tanker overflowed molten sulphur during loading releasing approximately 85kg of product onto a non-permeable surface via the overflow pipe. The spilled product was cleaned-up and there was no damage to the environment, however the contractor road tanker driver sustained burns to both feet which resulted in days away from work.

The tanker belongs to Company A, who is contracted by the refinery's shareholder customer. The contractor road tanker driver is employed by Company A. The loading system is owned by the refinery and is equipped with an automated switch which closes the loading valve every 5 minutes. The refinery owned equipment is operated and maintained properly.

The contractor road tanker driver must reset this automated switch in order to continue loading. The contractor road tanker driver must be at the loading dock during loading in order to open or close the automated loading valve. At this position, he can safely see the level in the truck when it approaches the maximum working level. The maximum working level is clearly indicated by a physical device inside the loading hatch. The contractor road tanker driver does the loading i.e. opens and closes the automated loading valve and monitors the level during loading. So, the loading is under the control of the contractor road tanker driver.

*Is the LOPC which resulted in a days away from work injury (hence a Tier 1 PSE) belong to the refinery's shareholder customer (that has the contract with Company A who owns the tanker and the employer of the road tanker driver) or the refinery itself?*

**Response:**

Section 1.2 of API-754 states that, "This recommended practice applies to the responsible party." The responsible party is, "The party charged with operating the facility in a safe, compliant, and reliable manner." The responsible party maintains this accountability regardless of who causes an event. Based on the information provided, the Tier 1 PSE belongs to the refinery. It is important to remember that the note included with the definition for responsible party in API-754 includes a reminder that the responsible party is determined prior to any PSE.

## 8 Table 2—Tier 2 Material Release Threshold Quantities

In reference to threshold category 2-7, threshold category 2-8, and the notation under table 2 which states: "In determining the Threshold Release Category for a material, one should first use the toxic (TIH Zone) or flammability (Flash Point and Boiling Point) or corrosiveness (Strong Acid or Base vs. Moderate Acid or Base) characteristics. Only when the hazard of the material is not expressed by those simple characteristics (e.g. reacts violently with water) is the UNDGL Packing Group used."

**Question:** If the incident involves a release of about 900 kg sulfur with a flash point of 392F and released at 275F, will this fall under Threshold Category 2-8 with at TQ of 2,000 kg, and therefore NOT a Tier 2 PSE, or should it fall under Threshold Category 2-7 because sulfur has a Packing Group III material and therefore an API Tier 2 PSE because 900 kg release is higher than the TQ of 200 kg. The notation says, one should first use the TIH Zone for which sulfur is not applicable, or flammability (Flash Point is

392F and although it is released at 275F, both temperatures are above 200F). Since the hazard of the material is already expressed under flammability, is this then the criterion to use instead of the packing group and therefore NOT a Tier 2 PSE?

A similar question is raised if the release is bitumen (asphalt) of about 800 kg with a flash point of 446F and released at 250F, will this fall under Threshold Category 2-8 with at TQ of 2,000 kg, and therefore NOT a Tier 2 PSE, or should it fall under Threshold Category 2-7 because bitumen (asphalt) has a Packing Group III material and therefore an API Tier 2 PSE because the 800 kg release is higher than the TQ of 200 kg. The notation says, one should first use the TIH Zone for which bitumen is not applicable, or flammability (Flash Point is 446F and although it is released at 250F, both temperatures are above 200F). Since the hazard of the material is already expressed under flammability, is this then the criterion to use instead of the packing group and therefore NOT a Tier 2 PSE?

**Response:**

Using the flash point and the release temperature of the molten sulfur and bitumen (asphalt), the flammability of both materials is outside of the criteria described in T1/2-5, T1/2-6, T1/2-7 and T2-8, and therefore there is no threshold quantity for these two materials. Boiling points, flash points and release temperature describe the flammability of the material of concern, therefore it is appropriate to use these criteria identify the release category. Since the flammability for molten sulfur and bitumen are described and are outside of the PSE 1 and PSE 2 criteria, it is not necessary to consider other criteria, such as Packing Group. Neither of these releases would be a Tier 1 or 2 PSE. A company may choose to categorize these releases as a Tier 3 PSE.

If, however, either molten sulfur or bitumen were released above their flash points, the threshold quantity for the release would be based on T2-7 and T1-7, since the flash points are > 140F and the material was released above its flash point.

## 9 Uncontrolled Release of Vapors – Flash Fire

**Question:** A flash fire occurred during top loading diesel in a third-party carrier truck. The driver suffered burns as he was situated atop the truck compartment at the manhole per loading procedures. He is hospitalized for his injuries. No liquid volume spilled and no significant damage to equipment. The fire may have started due to static ignition and/or switch loading. Vapors are expected to be present in normal top loading operations. My question to you is would you categorize this as an **uncontrolled** release of vapors? If so, why since this is normal procedure? Is this a PSE or would you classify this as an occupational event?

**Response:** When the ignition occurred, the flame front inside the vessel expanded the gases in the vapor space causing them to exit the manway at a much faster rate (and much hotter) than what would be considered “normal operation”, and therefore it was an unplanned and uncontrolled release. This would be a PSE Tier 1.

## 10 Removal Level Transmitter

**Question:** Two (2) contractors contacted chemicals (a combination of alcohol and potassium hydroxide) during the removal of a level transmitter (LT) from a process equipment. One of the contractors was tasked to do a general work and the other was tasked to check the level transmitter. As they were not tasked to remove the transmitter itself, they were only wearing their normal Fire-Retardant Clothing (FRC). They are not the ones who are performing the removal of the equipment but were providing assistance. The workers who were directly involved in the equipment removal were in proper PPE (chemical suit, gloves, etc.).

These 2 contractors assisted in the LT removal during which remnant chemicals (alcohol and potassium hydroxide) in the LT nozzle fell off into the drip tray causing a splash onto them. The 2 contractors used a safety shower about 200 meters away from the incident site allowing the chemicals to stay on their skin for prolonged period. The incident resulted to a recordable injury to the 2 contractors.

Do you classify this incident as a personal safety or process safety event?

Is the release of remnant chemical into the drip tray LOPC? If so, which API Tier does it belong, Tier 2 or Tier 3-Other LOPC?

**Response:**

If the material which fell into the drip tray was at a quantity and rate that was “expected” (i.e., it was a planned and controlled release), this would be a personal safety event and not a PSE.

## 11 Solid Releases – Lime Power

**Question:** We recently had a release in one of our refineries of Lime powder as it was being loaded into a hopper connected to the process. What is the normal protocol for handling solid releases? Would this be in scope?

**Response:** Solid materials are treated the same way as liquids or gases. If the solid material has a T1 or T2 TQ, and you have an LOPC of that material in an hour or less, it counts.

## 12 Piping Component

**Question:** Company A owns a pipeline that has been out of service for 2 years. The pipeline runs from Company A’s facility to a marine terminal owned by the government. Company A is in the process of cleaning up and decommissioning the line for removal via a pigging operation. During the course of this operation, 23 bbls of T2-8 material (FP > 60C, released < FP) is released in an hour due to a failure of a piping component. The failure does not occur on Company A’s property but on the government’s property. The entire release is contained in a concrete bunker on the government’s property. Since this line has been out of service for a number of years, no longer connected to the process, and the spill did not occur on Company A’s property, is this a PSE?

**Response:**

The scenario says that the material’s FP is > 60 C. However, we don’t know if the FP is also < 93 C. If the FP of the material is < 93 C, then it is a T2-8 material that was then released below its FP. If not < 93 C, then it is not a T2-8 material, and like molten sulfur or asphalt, the spill/release cannot be a Tier 2 and could be captured as a Tier 3.

Assuming its FP is > 60 C, and < 93 C, this release is unplanned and uncontrolled and is greater than the T2-8 TQ, and therefore is a PSE Tier 2 release. The fact that the line is out of service, and has been for several years, and is no longer connected to the process, does not re-categorize equipment such that it is no longer part of a process. Fully de-inventorying the line at the time of de-commissioning would have made it no longer part of the process.

To be considered no longer part of the process, the unused line should have been cleaned and positively isolated (blind or air gap) from the process. Isolation by block valves is insufficient; valve leak. Company A is the responsible party; therefore, it doesn’t matter that the release occurred on government property. The only way it would fall to the government would be if there was a pre-existing contractual agreement that made the government the responsible party for the portion of the line on their property.

### 13 Truck Rack Sales Tank

**Question:** Tank 210 is a jet fuel tank that is used for unit rundown service and as a Truck Rack sales tank. As a jet fuel sales tank, the tank must be certified prior to custody sales. The tank has double block and bleed/drain isolation on each pipeline to the tank. The isolation block valves are car sealed closed and the bleed/drain valves are car sealed open. The double block and bleed/drain system keeps any product from entering the tank and contaminating the certified product. The bleed/drain system is a closed system where the drained material is contained in an underground piping to an oily water sump system with a pump that transfers the material to an oily water collection/skim tank.

On Day 1, Tank 210 was finished as a jet fuel sales tank. A 3rd party inspector was on site to break the car seals and return the tank to unit rundown service. The 2" bleed/drain valves were inadvertently left open on the jet fuel rundown line to Tank 210 after the car seals were removed.

On Day 2, the jet fuel rundown was routed into Tank 210. The 2" bleed/drain valves were still open at this time. Jet fuel drained to the oily water sump system through the open 2" bleed/drain valves until discovered a few days later. This allowed jet fuel to drain directly to the closed drain system consisting of an Underground Piping, a Unit 1 Oily Water Sump with a sump pump and an Oily Water Collection/Skim Tank 106. The oil was separated from the water and then pumped from Tanks 106 to Tank 503, which is a crude oil tank that accepts refinery slop oil. The draining of Jet Fuel in this closed system is designed for collection and routinely used for that purpose. No jet fuel was ever spilled to the ground. There was no harm to people, to the environment, or assets.

We understand that it this is an LOPC event because leaving the bleed/drain valve inadvertently open was an unplanned event. Since draining of the material was into a closed system, would you consider this an API Tier 1 or Tier 2 if the drained material exceeded the threshold, or an API Tier 3 – Other LOPC event?

**Response:**

Since the draining was to a closed system, even though it was unplanned, this would not be considered an LOPC. Please see example 28 for draining to a closed drainage system. For contrast, please see example 34 for draining to an open drainage system.

### 14 Planned Release with exceeded quantity

**Question:** A plant discovered a drip leak on a section of piping containing a material with a T1/T2 TQ. In order to evacuate the piping to repair the leak, they set up a temporary water scrubber and intended to blow the line clear with nitrogen to the scrubber. The effluent from the scrubber (mostly water) overflows flows to a trench which flows to a sump, then to a tank which is pumped to wastewater treatment.

After some time had passed, they realized that the line had not yet cleared. They learned through a drop in a tank liquid level that a valve - which connected that tank to the piping they wanted to clear - was allowing material to pass from the tank into the piping that they were trying to clear. Consequently, they inadvertently transferred a T1 TQ of the material through the sump to their wastewater tank.

This is a situation where the release was planned and controlled, but the quantity exceeded what was planned. There were no additional risks to personnel, i.e., no additional odors, exposure risks or fire risks beyond what there would have been had the intended quantity been removed from the piping.

Would your company classify this as a T1 PSE?

**Response:**

There was no release 'from the process' and therefore it is not a PSE Tier 1 or Tier 2 since the Tier 1 and Tier 2 definition includes, "...release of any material, ... from a process...".

## 15 Vessel overfill with no consequences

**Question:** One of the questions (see Q23 below) in the FAQs (Rev 2-22-2012) refers to an overfill on a vessel which is connected to another vessel through a pipe where the overfill is contained (no releases to the atmosphere), no injury, no hospital admission, no officially declared evacuation, no fire/explosion. The answer to Q23 was that there is no LOPC in this event since the material remained in some type of primary containment (though may not be the one intended). This may be a Tier 3 PSE as a Safe Operating Limit Exceedance if a Safe Operating Limit had been identified for the level on this vessel. As this incident has a similarity to the incident in the question below (the draining of Jet Fuel in the closed system is designed for collection and routinely used for that purpose. No jet fuel was ever spilled to the ground. There was no harm to people, to the environment, or assets), should it also then be classified as a Tier 3 (other LOPC) instead of a Tier 1 or a Tier 2?

23. If there is an overfill (exceeding the TQ in Table 1) on a vessel but this vessel is connected to another vessel through a pipe or a fixed hose and the overfill is contained (no release to the atmosphere) and there are no consequences (no release to the atmosphere, no injury, no hospital admission, no officially declared evacuation, no fire/explosion), is this LOPC? Is this a PSE? There is no LOPC in this event since the material remained in some type of primary containment (though maybe not the one intended). This may be a Tier 3 PSE as a Safe Operating Limit Exceedance if a Safe Operating Limit had been identified for the level on this vessel.

**Response:** Yes, typically companies would count this as a PSE Tier 3 as a Safe Operating Limit exceedance.

## 16 Definition of Direct Cost

### **Question:**

Equipment requires disassembly to inspect and determine if the equipment is fit for service following an LOPC fire. The inspection of that equipment cost \$100,000 but no damage is found requiring additional repairs. Is the \$100,000 included in Direct Cost?

#### **3.1.15**

##### **direct cost**

Cost of repairs or replacement, cleanup, material disposal, and acute environmental cost associated with a fire or explosion. Direct cost does not include indirect costs, such as business opportunity, business interruption and feedstock/product losses, loss of profits due to equipment outages, costs of obtaining or operating temporary facilities, or costs of obtaining replacement products to meet customer demand. Direct cost does not include the cost of repairing or replacing the failed component leading to LOPC if the component is not further damaged by the fire or explosion. Direct cost does include the cost of repairing or replacing the failed component leading to LOPC if the component failed due to internal or external explosion or overpressure.

**Response:** Inspections costs do not count toward the total since they are not a cost of repair or replacement, cleanup, material disposal, or acute environmental cost.

## 17 Applicability in first edition vs second edition

### **Question:**

Regarding API RP 754 1st edition (2010):

A. "Applicability chapter" - item 1.2 shown bellow



**“1.2 Applicability 1**  
 This RP was developed for the refining and petrochemical industries, but may also be applicable to other industries with operating systems and processes where loss of containment has the potential to cause harm. Applicability is not limited to those facilities covered by the OSHA Process Safety Management Standard, 29 CFR 1910.119 or similar national and international regulations.  
 At colocated facilities (e.g. industrial park), this recommended practice applies individually to the companies that own and operate the processes and not to the site as a whole.  
**Events associated with the following activities fall outside the scope of this RP and shall not be included in data collection or reporting efforts:**  
 a) **releases from pipeline transfer operations occurring outside the process or storage facility fence line;**  
 b) marine transport operations,  
 c) truck or rail operations, except when the truck or rail car is connected to the process for the purposes of feedstock or product transfer, or if the truck or rail car is being used for on-site storage;  
 d) vacuum truck operations, except on-site truck loading or discharging operations, or use of the vacuum truck transfer pump;  
 e) routine emissions that are allowable under permit or regulation;  
 f) office, shop and warehouse building events (e.g. office fires, spills, personnel injury or illness, etc.);  
 g) personal safety events (e.g. slips, trips, falls) that are not directly associated with on-site response to a loss of primary containment (LOPC) event;  
 h) LOPC events from ancillary equipment not connected to the process (e.g. small sample containers);  
 i) quality assurance (QA), quality control (QC) and research and development (R&D) laboratories (pilot plants are included);  
 j) retail service stations; and  
 k) on-site fueling operations of mobile and stationary equipment (e.g. pick-up trucks, diesel generators, and heavy equipment).”

➡ So, we understand the RP 754 exclude the LOPC events in pipeline outside the facility site  
 B. The same 1<sup>st</sup> version (2010) has the annex A –number 39 example (bellow)

<u>Category</u>	<u>Example</u>	<u>Tier 1/2/3</u>
<b>Company Premises PSEs with Multiple Outcomes Pipelines</b>	39) A DOT covered pipeline that is owned, operated, and <u>maintained</u> by Company A crosses through Company B's property. The DOT covered line has a 1500 lb release within an hour from primary containment of flammable gas and causes a fire resulting in greater than \$25,000 damage to Company A's equipment. This is not a PSE for Company B since the pipeline is not owned, operated or maintained by Company B. This would be a transportation incident for Company A.	Not a PSE §1.2, <u>Applicability</u>

➡ So, we understand the LOPC above, from Company A’s DOT covered line, it is not a Company B PSE event neither for Company A, which may be appropriated as a transportation incident for Company A since the event occurred outside store facility fence into the area of Company B.

**Now, let’s go to the 2nd edition (2016)**

A. Whose §1.2 Applicability item says: **“Events associated with the following activities fall outside the scope of this RP and shall not be included in data collection or reporting efforts:**

- a) **releases from transportation pipeline operations outside the control of the responsible party;**
- b) *marine transport operations, except when the vessel is connected or in the process of connecting or disconnecting to the process;*
- c) *etc.....”*

B. The 2nd edition has a specific chapter to pipelines and terminal operations and A.2 Applicability item is shown bellow

**“A.2 Applicability**  
 This RP applies to the responsible party. At collocated facilities (e.g. industrial park), this recommended practice applies individually to the responsible parties and not to the facility as a whole.  
 Events associated with the following activities **fall outside the scope of this RP and shall not be included in data** collection or reporting efforts:  
 a) marine transport operations, except when the vessel is connected or in the process of connecting or disconnecting to the process;  
 b) truck or rail operations, except when the truck or rail car is connected or in the process of connecting or disconnecting to the process, or when the truck or rail car is being used for on-site storage;  
 NOTE Active staging is not part of connecting or disconnecting to the process; active staging is not considered on-site storage; active staging is considered part of transportation.  
 c) vacuum truck operations, except on-site truck loading or discharging operations, or use of the vacuum truck transfer pump;  
 d) routine emissions from permitted or regulated sources;  
 NOTE Upset emissions are evaluated as possible Tier 1 or Tier 2 PSEs per Section 5.2 and Section 6.2.  
 e) office, shop, and warehouse building events (e.g. office fires, spills, personnel injury or illness, etc.);  
 f) personal safety events (e.g. slips, trips, falls) that are not directly associated with on-site response or exposure to a loss of primary containment (LOPC) event;  
 g) LOPC events from ancillary equipment not connected to the process (e.g. small sample containers);  
 h) quality assurance (QA) and quality control (QC) laboratories; and  
 i) on-site fueling operations of mobile and stationary equipment (e.g. pick-up trucks, diesel generators, and heavy equipment).”

➡ So, we understand that this 2<sup>nd</sup> edition **do not exclude** releases events **from pipeline transfer operations outside the process or storage facility fence line;**

C. Let’s go now to the Annex E PSE Examples and Questions, example 65

Example / Question	Tier 1/2
65) A DOT covered pipeline that is owned, operated, and maintained by Company A crosses through Company B’s property. The DOT covered line has a 1500 lb release within an hour from primary containment of flammable gas and causes a fire resulting in greater than \$100,000 damage to Company A’s equipment. This is not a PSE for Company B since the pipeline is not owned, operated or maintained by Company B. <b>This would be a transportation incident for Company A.</b>	Not a Tier 1 or Tier 2 PSE §1.2, Applicability.

Finally, That’s our doubt -

- a) The §1.2 from 2<sup>nd</sup> edition says the only the events which are outside the control of the responsible party are excluded.
- b) If our interpretation above is correct, the "Company A" for the number 65 example has the control of the DOT.

The question is: why the example is not considered a “Company A" PSE but incident transportation?

**Response:** Example 65 is a PSE. However, the intent of Example 65 is to illustrate which Company and what type of facility should record the PSE. From a Company B perspective, the PSE belongs to Company A. From a Company A perspective, the PSE belongs to Company A’s DOT pipeline operations versus Company A’s refining or petrochemical operations. If Annex A were adopted by Company A, thereby requiring that API-754 apply to its petroleum pipeline and terminal operation, then Company A would report the PSE with a facility type of ‘pipeline and terminal’.

## 18 IBC Release of Epoxy Resin

An operator of the night shift was taking an IBC with Araldite GY287 from hot box 8 for the upcoming production in R3. The operator lifted the IBC from the upper right hot box shelf with the new FLT 5. While moving the truck straight backwards (for lowering the fork) the rear wheels crossed the depression at the road. The fork/IBC started swinging and the IBC got tilted in the narrow shelf box. The IBC slipped from the fork towards the hot box. This was unrecognised by the FLT driver since he looked backwards. When leaving the box completely the IBC turned over and dropped to the ground. The top lid opened and the IBC released the warm epoxy resin. Due to the cold temperatures (around 0°C) the resin gelled quickly. The emergency procedure was started immediately. The area was cleaned up



completely by the day shift. No residues left on the ground. Line managers were notified and informations for the incident investigation were gathered immediately.

1. **Question:** Does it impact the PSE determination whether the container is sitting still (and therefore may be considered on-site storage) or it has started being moved by a truck?  
**Response:** A process safety event is an unplanned or uncontrolled release of any material from a process; a process includes active warehouses. Whether the raw materials, intermediates, or finished products are stationary or moving to and from or within the active warehouse, all are considered part of the process. As described, this event would qualify as a process safety event. It would then need to be compared against the Tier 1 and Tier 2 consequences to determine if it qualifies as either-or Tier 1 PSE or Tier 2 PSE.
2. **Question:** The container is in the process of being transported to the unloading area. Is it therefore considered a 'transportation event', OR is it considered part of the process for some other reason, such as the hot box is considered a step in the process to prepare the material for use?  
**Response:** Transportation events involve over the [public] road movement and 'active staging' which involves truck or railcars waiting to be unloaded where the delay to unloading is associated with physical limitations with the unloading process or the reasonable availability of manpower. As described, nothing in this scenario is related to involve over the [public] road movement and 'active staging', and therefore would not be considered a transportation event.
3. **Question:** If the material has instead been in route from an onsite warehouse to the unloading area, would it be considered a transportation event, instead of a PSE?  
**Response:** No. No difference; the onsite warehouse would still be classified as an active warehouse, and therefore part of the process.
3. **Question:** If the container was damaged while in the hot box (before it started moving), would the container be considered in on-site storage, and therefore the event is a PSE?  
**Response:** Yes. The hot box is an extension of the active warehouse concept. From a process perspective, an active warehouse is equivalent to on-site storage of raw materials, intermediates, or finished products and is considered part of the process.
4. **Question:** If the material was not destined to be used in the site process, but was instead to be transported offsite to a customer, would the event then be considered a transportation event, not a PSE?  
**Response:** Possibly. While the material is sitting in the on-site warehouse, it is an active warehouse and is considered part of the process. Therefore, any LOPC within the warehouse would be evaluated against the Tier 1 and Tier 2 PSE criteria. However, once the material is loaded on a truck for transport to the offsite customer, it would become part of the transportation network and would not be a PSE.

## 19 Coke Drum Collapse – OSHA Recordable Injury

**Question:** A coke drum had been isolated from live process. After the pilot hole was cut the coke pit crane operator accessed the structure to begin the normal process of moving coke within the Coke Pit for removal from the facility. As part of the normal beginning of shift process, the crane operator was outside of the crane conducting a visual inspection of crane components prior to use. Per procedure the crane must have a pre-operational inspection that must be performed in the maintenance pad area. Per

procedure, the crane operator must be inside the cab of the crane when the drum heads are open unless evacuation is required.

Normal crane procedures require that the crane be idled in a specific area of the coke pit known as the "maintenance pad" when personnel are parking the crane for any reason including shift change. Per procedure the crane operator must always enter and exit the crane from its stored position in the maintenance pad. Per procedure, whenever the crane is not in operation and the crane operator leaves the chair, the crane must be parked in the barricaded area on the crane maintenance pad. Per procedure the crane will be entered and exited from the structural platforms on the 4th level of the structure at the west end of the crane runway. The intent is that the crane will be outside of any potential areas that could be affected by coke cutting activities. For reasons not yet understood, on this day, the crane was parked directly in front of the drum that was being cleaned.

At this time the coke bed inside the coke drum experienced a collapse. While infrequent, these bed collapses do happen. During a bed collapse, the remaining coke and cutting water exit the bottom head of the drum quickly and often violently. The coke drums, the coke drum structure, the coke pit, and the coke crane are all designed for these events. Coke, water, and steam exited the bottom head of the drum, with hot water contacting the exposed employee causing several second degree burns and an OSHA recordable injury.

The site believes there are two specific reasons why this incident should not be deemed a Process Safety Event. First, the cleaning of isolated drums is considered a maintenance activity, similar to cleaning exchangers or other equipment that is isolated from process. Second, the event was not unplanned, nor was it an uncontrolled release. The coke pit is designed and built to contain steam/hot water/coke during decoking activities, and these sort of drum collapses are anticipated. As mentioned above, there are specific rules around operation of the bridge crane during decoking activities; the injured employee should not have been inspecting the outside of the bridge crane during decoking of the drum where the crane was located.

**Response:** This scenario is determined to be a PSE and is included as an example in the 2nd edition:

7) During a routine, planned catalyst recharge activity, steam is introduced into the reactor at a specified pressure, and a slide valve below the tray is opened to dump the catalyst. During the catalyst dump a worker stepped up to the reactor flange to pull out the slide valve-pin from the reactor and some hot catalyst came out through the pin sleeve/flange resulting in the worker receiving a recordable thermal burn injury from the hot catalyst. The injured worker was not the one assigned to perform this task, so was not wearing all the appropriate PPE. The release of the hot catalyst was planned, but it was not controlled since it contacted an unprotected worker; therefore, this would be a Tier 2 PSE based upon the recordable injury.

In addition:

- All aspects of Maintenance are in scope for Mode of Operation per 10.4.4.c.iv. (c, d and h) and 10.4.4.c.vii.
- The exclusion for isolation from the process only applies to new construction that has never seen the process:
  - j) new construction that is positively isolated (e.g. blinded or air gapped) from a process prior to commissioning and prior to the introduction of any process fluids, and that has never been part of a process;

## 20 Treatment of Waste

**Question:** Should waste be treated any differently from raw materials, intermediate, or products?

**Response:** Waste would not be treated any differently. The definition of ‘material’ does not differentiate between waste or product or intermediary product. Any LOPC would therefore be judged against the PSE criteria. Additionally, there is nothing in the Applicability section that excludes waste processes from the scope of API-754. The definition of ‘process’ includes waste water treatment plants as one of the examples, so, other waste should also be included.

**Question:** If waste should be treated the same but if waste is only disposed of once a month, would drums of waste that are in the accumulation area be considered Active staging and therefore be exempt from the API standard?

**Response:** No. Waste drums would not be considered ‘active staging’ since the definition of active staging includes only trucks or rail cars.

**Question:** Are tote/ drums pads that are curbed open area but not technically warehouses, also be considered as active warehouses based on the storage of chemicals?

**Response:** Yes. The accumulation of drums should be considered an ‘active warehouse’ based upon the principle that is included in the note in the ‘active warehouse’ definition. From a process perspective, an active warehouse is equivalent to a bulk storage tank. Rather than being stored in a single large container, the raw materials, intermediates, or finished products are stored in smaller containers (e.g. totes, barrels, pails, etc.)

## 21 Hydrogen Furnace Tube Leak

**Question:** A furnace tube inside a hydrogen furnace develops a leak in a tube. The material released is a blend of hydrogen and steam and is consumed inside the box. During the release, the pressure of the leak causes some refractory to spall off the side of the furnace and fall onto a burner. The flame from the burner is redirected to where it comes out of the register and causes damage to an electrical conduit feeding a temperature instrument. The cost of the repairs to the conduit exceed \$2500. No repairs to the furnace skin are necessary and the refractory repairs are < \$2500. No other negative consequences occurred. Is this a Tier 2 PSE?

Initial Thoughts: It’s not a PSE 2 because the damage to the conduit was not a direct cause of a fire or explosion from the leak source. If the repairs to the furnace skin and/or refractory exceed \$2500, then yes. Instead the damage was a result of the refractory falling and redirecting the flame outside the box. Thoughts?

**Response:** It does not really matter that there was a complicated chain of events that led to the ultimate consequence – the event was unplanned and uncontrolled. Most, if not all, incidents have such a chain of events. The Tier 1 and Tier 2 language asks whether a LOPC resulted in one of the consequences. It doesn’t require the LOPC to directly cause one of the consequences. In this case, there was an LOPC of hydrogen that resulted in > \$2500 fire damage; therefore, this is a Tier 2 PSE. Since the hydrogen was consumed in the fire, there is no need to look at TQ for release amounts

## 22 Tier 1 Severity Weighting

**Question:** I have a clarifying question regarding Severity Weighting for Tier 1 LOC’s. We are beginning to calculate these for our Tier 1 LOC’s in 2017. However, not having the history behind the creation of the consequence category for LOC’s we wanted to make sure we are reading the table correct.

In Table D.1 – Tier 1 PSE Severity Weighting, the footnote points to the fact that we must calculate the amount of material released “outside of secondary containment”. So, for example, if we spill 100 bbls of mogas to secondary containment (and nowhere else) the severity weighting only applies to the

vapors coming off the gasoline and not the total volume correct? Therefore, we must calculate the rate at which the vapors are being liberated to the atmosphere within a one-hour period and use that number to properly score it correct and not the total volume of the spill?

**Response:** Only the vapor quantity would be used to calculate the Material Release factor. The liquid is contained in secondary containment; it is only the vapors that escape secondary containment. If (say) 10X the TQ of liquid gasoline was released to a secondary containment (assume a diked area), but it is calculated that less than 1X the TQ of flammable vapor was liberated from the liquid pool as a result, then (assuming no other consequences) this would be a T1 PSE with a severity weighing of zero.

## 23 Halon Release – Fire Suppression System

**Question:** As the result of a faulty sensor, there was an unplanned release of Halon from the fire suppression system indoors. The quantity released exceeded the Tier 1 threshold quantity for a Category 7 UNDG Class 2, Division 2.2 material.

However, per RP 754 Annex G.4, for a multi-component stream to be considered an asphyxiant (UNDG Class 2, Division 2.2 material), it must contain less than 12% oxygen by volume. Based upon the design of the fire suppression system, the release of Halon would result an indoor oxygen concentration of 17.8% by volume. In other words, the multi-component gas (air and Halon indoors) is not less than 12%; therefore, it is not an asphyxiant and therefore not a Tier 1 PSE.

Is this release a Tier 1 PSE?

**Response:**

This scenario is not a Tier 1 PSE.

The reference and use of Annex G in this scenario is incorrect. The threshold release categories in RP 754 are based upon the classification on the material released and not the resulting atmosphere created by the release. The purpose of Annex G is to help the reader determine the threshold release category of a multicomponent material. Halon (Bromotrifluoromethane) itself is not a multicomponent gas; therefore, Annex G does not apply.

The SDS for Halon lists it as a UNDG Class 2, Division 2.2 material. The fact that the fire suppression system is designed so that the resultant release atmosphere within the protected area is not oxygen deficient (from a human perspective) doesn't change the release category of the Halon. Halon is a Category 7 material.

However, the Category 7 determination is moot in this scenario. The definition of Tier 1 requires that the LOPC be from a process. While the fire suppression system is a mitigation barrier associated with the process, it is not part of the process. Therefore, this scenario is not a Tier 1 PSE because there was

no LOPC from a process.

Table D.1—Tier 1 Process Safety Event Severity Weighting

Severity Points	Consequence Categories				
	Safety/Human Health <sup>a</sup>	Direct Cost from Fire or Explosion	Material Release Within Any 1-Hr Period <sup>a</sup>	Community Impact	Off-Site Environmental Impact <sup>b, c</sup>
1 point	<ul style="list-style-type: none"> <li>— Injury requiring treatment beyond first aid to an employee, contractor, or subcontractor. (Meets the definition of a US OSHA recordable injury.)</li> </ul>	<ul style="list-style-type: none"> <li>— Resulting in \$100,000 ≤ Direct Cost Damage &lt;\$1,000,000.</li> </ul>	<ul style="list-style-type: none"> <li>— Release volume 1× ≤ Tier 1 TQ &lt; 3× outside of secondary containment.</li> </ul>	<ul style="list-style-type: none"> <li>— Officially declared shelter-in-place or public protective measures (e.g. road closure) for &lt;3 hours, or</li> <li>— Officially declared evacuation &lt;3 hours.</li> </ul>	<ul style="list-style-type: none"> <li>— Resulting in \$100,000 ≤ Acute Environmental Cost &lt;\$1,000,000.</li> </ul>
3 points	<ul style="list-style-type: none"> <li>— Days Away From Work injury to an employee, contractor, or subcontractor, or</li> <li>— Injury requiring treatment beyond first aid to a third party.</li> </ul>	<ul style="list-style-type: none"> <li>— Resulting in \$1,000,000 ≤ Direct Cost Damage &lt;\$10,000,000.</li> </ul>	<ul style="list-style-type: none"> <li>— Release volume 3× ≤ Tier 1 TQ &lt; 9× outside of secondary containment.</li> </ul>	<ul style="list-style-type: none"> <li>— Officially declared shelter-in-place or public protective measures (e.g. road closure) for &gt; 3 hours, or</li> <li>— Officially declared evacuation &gt; 3 hours &lt; 24 hours.</li> </ul>	<ul style="list-style-type: none"> <li>— Resulting in \$1,000,000 ≤ Acute Environmental Cost &lt;\$10,000,000, or</li> <li>— Small-scale injury or death of aquatic or land-based wildlife.</li> </ul>
9 points	<ul style="list-style-type: none"> <li>— A fatality of an employee, contractor, or subcontractor, or</li> <li>— A hospital admission of a third party.</li> </ul>	<ul style="list-style-type: none"> <li>— Resulting in \$10,000,000 ≤ Direct Cost Damage &lt;\$100,000,000</li> </ul>	<ul style="list-style-type: none"> <li>— Release volume 9× ≤ Tier 1 TQ &lt; 27× outside of secondary containment.</li> </ul>	<ul style="list-style-type: none"> <li>— Officially declared evacuation &gt; 24 hours &lt; 48 hours.</li> </ul>	<ul style="list-style-type: none"> <li>— Resulting in \$10,000,000 ≤ Acute Environmental Cost &lt;\$100,000,000, or</li> <li>— Medium-scale injury or death of aquatic or land-based wildlife.</li> </ul>
27 points	<ul style="list-style-type: none"> <li>— Multiple fatalities of employees, contractors, or subcontractors, or</li> <li>— Multiple hospital admission of third parties, or</li> <li>— A fatality of a third party.</li> </ul>	<ul style="list-style-type: none"> <li>— Resulting in ≥\$100,000,000 of direct cost damages.</li> </ul>	<ul style="list-style-type: none"> <li>— Release volume ≥ 27× Tier 1 TQ outside of secondary containment.</li> </ul>	<ul style="list-style-type: none"> <li>— Officially declared evacuation &gt; 48 hours.</li> </ul>	<ul style="list-style-type: none"> <li>— Resulting in ≥ \$100,000,000 of Acute Environmental Costs, or</li> <li>— Large-scale injury or death of aquatic or land-based wildlife</li> </ul>

<sup>a</sup> Where there is no secondary containment, the quantity of material released from primary containment is used. Where secondary containment is designed to only contain liquid, the quantity of the gas or vapor being released and any gas or vapor evolving from a liquid must be calculated to determine the amount released outside of secondary containment.

<sup>b</sup> Judging small, medium or large scale injury or death of aquatic or land-based wildlife should be based on local regulations or Company

## 24 Railcar Overflow – Molten Polypropylene

**Question:** An Operator was inside the control room monitoring the totalizer for a railcar that was being loaded. When the Operator went outside to visually check the final loading per procedure, he discovered the railcar had overfilled. He immediately shut off the loading to prevent any further loss of containment.

It is a railcar overfilled with molten polypropylene. Spilled about 3200 lbs. on the railcar and ground. This material has a flash point above 200C and was loaded just below 200C. The SDS lists a flammability

hazard of 1 but it does not match any of the flash point criteria in the threshold quantity table. We were ready to conclude that it does not have a threshold quantity. Then we saw this statement in the SDS:  
SECTION 14: Transport information

Important Note: Shipping descriptions may vary based on mode of transport, quantities, package size, and/or origin and destination. Consult your company's Hazardous Materials/Dangerous Goods expert for information specific to your situation.

DOT

Class 9, Packing Group III when liquid is offered for transport or is transported, in bulk packaging, at or above 100°C and below its flash point; otherwise, not regulated.

Possible Shipping Description(s):

UN 3257 Elevated temperature liquid, n.o.s. (molten resin) 9 III

Does this SDS statement as a Packing Group III when shipped in a molten state, put it in the Threshold Group 7 or 8?

**Response:** No. Reference the note in Tables 1 and 2, (see below). As described in the note, if the toxic, flammability or corrosiveness of the material is known, then these characteristics are used to categorize the material. Only when the hazard of the material is not expressed by these characteristics is the UNGL Packing Group used.

Excerpt from Table 1 and 2: In determining the Threshold Release Category for a material, one should first use the toxic (TIH Zone) or flammability (Flash Point and Boiling Point) or corrosiveness (Strong Acid or Base vs. Moderate Acid or Base) characteristics. Only when the hazard of the material is not expressed by those simple characteristics (e.g. reacts violently with water) is the UNGL Packing Group used.

Based on the flash point being above 200C, this material is outside of the flammability characteristics listed in Table 2, and therefore cannot be a PSE 2 (or a PSE 1) regardless of the amount released.

Additional Information: UNDG and DOT classifications are based upon many considerations applicable to the transport of materials. In this case, the concern is the hot/molten material could burn someone versus a process safety risk represented by toxicity, fire/explosion, or corrosivity. Also, if someone had been injured as a result of the LOPC, then the classification would be based upon the severity of the injury.

## 25 Threshold Quantity – Sodium Hydroxide

**Question:** I have a question on the threshold quantity for 18 % Sodium Hydroxide solution. We had an incident where 2400 lbs. (in first hr.) of 18% of sodium hydroxide solution was released from a primary containment. 18% Sodium Hydroxide solution has a pH of greater than 12.5, which makes it a strong base. It has a UN number of 1824 packing II.

To determine, if the released qty of 18% sodium hydroxide solution has exceeded the threshold qty, do I use information from material threshold quantities as listed in table 1 & 2 (of Appendix A) or compare the back calculated the released qty. to the threshold quantity of the dry component weight?

**Response:** Since the material has a pH of greater than 12.5, this material is, by definition, a strong base and therefore the threshold quantities of Categories T1-7 or T2-7 would apply. Since the release was 2400 lbs. in the first hour, this exceeds the TQ for Tier 2 PSE, but is less than the TQ for Tier 1 PSE. The released quantity of the solution would be used vs the dry component weight.

## 26 Hardener – LOPC/Classification

**Question:** We apparently now have a “process” that involves a service group going off-site. This entails fairly large quantities of epoxy resins and hardeners mixed with aggregates to recoat bridges and roads



etc. We had a LOPC involving a hardener on one of these jobs that sprayed one of our employees. The material is very corrosive. Fortunately, the employee was not hurt badly, but the injury did involve a couple of days off. Some of our organization wants to take this as a process safety event. Also related to this event, I was asked what the threshold release quantity classification (TRC) for the chemical was. (We apparently make some or all the ingredients at one or more facilities). The CCPS PSE tool referenced in RP 754 does not have any of these chemicals listed. So, RP 754 guidance is all we have.

This hardener is a mixture of several materials (all of which involve lots of letters and numbers in the names). The SDS\* provide some LC50 information (Acute Toxicity inhalation cat 2, 3, and 4) for some of the “ingredients”, as well as overall Skin Corrosion (1B) and Serious Eye Damage (Cat 1) classifications.

\* The categories in parentheses are the GHS/OSHA 1910.1200 classifications. Not RP 754 categories since the “old” UNDG classifications are not directly aligned with the GHS/OSHA 1910.1200 labeling/classification criteria.

RP 754 provides a footnote on how to determine the threshold quantity classification, but it’s not totally clear on how to address this when the UNDG information is somewhat limited. What is really needed is a cross-reference from the TIH A, B, C, D RP 754 classes to the GHS/OSHA 1910.1200 classifications. (ANNEX F of RP 754 helps with this to some extent.) Likewise, corrosivity can be cross-referenced however it will not line up with the RP 754 acids and bases criteria. (Note none of the chemicals in the above example are acids or bases, even though several of them and the mixture is quite corrosive to skin and eyes).

Part of the problem is the packing class criteria results than a different TRC than the acid and base guidance. pH is not applicable and packing class result in corrosivity classifications other than the acid/base classifications.

**Response:** This would not classify as a PSE since the release was not from a process. Per API-754, a ‘process’ is defined as:

Production, distribution, storage, utilities, or pilot plant facilities used in the manufacture of petrochemical and petroleum refining products. This includes process equipment (e.g. reactors, vessels, piping, furnaces, boilers, pumps, compressors, exchangers, cooling towers, refrigeration systems, etc.), storage tanks, active warehouses, ancillary support areas (e.g. boiler houses and waste water treatment plants), on-site remediation facilities, and distribution piping under control of the Company.

Since your recoating process is not the manufacturing of a petrochemical or petroleum refining product, it does not constitute a process in accordance with API-754.

If this release had been from a process, as defined by API-754, then it would be classified as a Tier 1 PSE based upon the DAWFC injury.

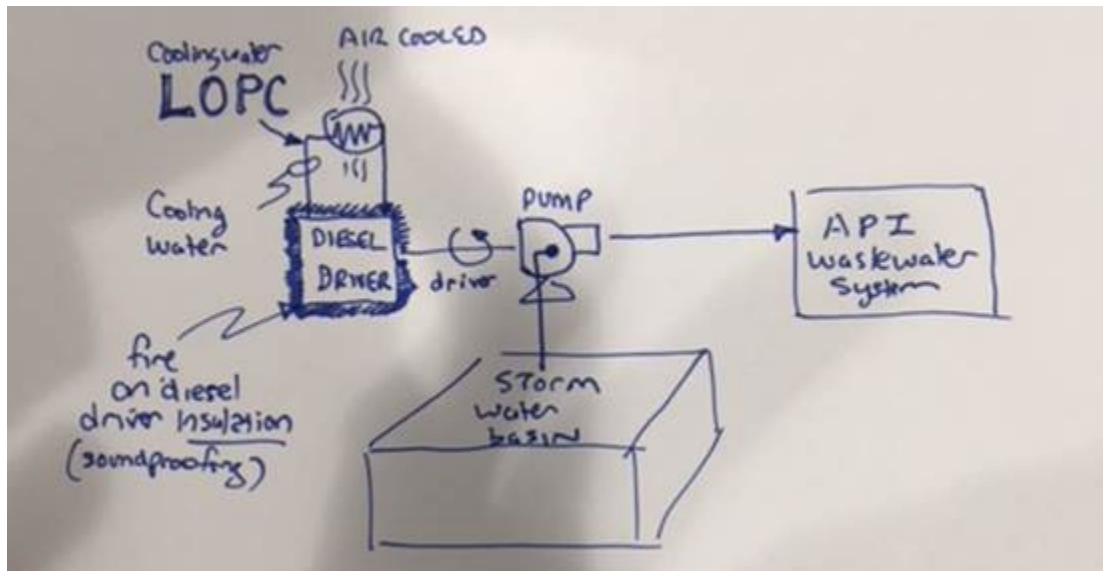
It is commendable that the company has worked to identify the Material Release Category based upon existing guidance. The Industry Learning & Outreach Sub-team is appreciative of your query.

## 27 Hot Exhaust Fire      January 2018

### **Question:**

- We experienced a fire > Tier 2 direct costs on a diesel driven portable pump
- Pump was transferring storm water to the WWTP API Separator, the pump itself or storm water was not involved
- It is suspected (but not 100% confirmed) that the fire occurred before LOPC
- The LOPC occurred on the cooling water side of the diesel driven pump, driver side not pump side
- Fire occurred on the driver of the diesel pump due to hot exhaust igniting soundproofing





**Response:**

- The fire was not the result of an LOPC . . . “Fire occurred on the driver of the diesel pump due to hot exhaust igniting soundproofing”; therefore, not a process safety event.
- The LOPC that was caused by the fire did not result in any of the Tier 1 or Tier 2 consequences; therefore, not a process safety event.

## 28 Water Boot to Sewer Box January 2018

**Question:** I had a question related to the following incident we experienced:

- Operator was draining a water boot to a sewer box through a hydrocarbon hose.
- After the operator blocked in the hose and was walking away, the vapors in the sewer box ignited off at a nearby heater.

I am of the opinion that this was a loss of primary containment since it was unplanned and uncontrolled. Can you please let me know based on the incident you review if I am off base with this qualification?

There is a motion that since this was being drained to a sewer box, this is to be considered secondary containment and I don't really buy that position.

**Response:**

The draining was either uncontrolled or put into a system that was not designed to handle what was drained, as evidenced by the fact that a release of vapor came from the sewer and ignited. Based on the vapor release, there was no containment and the LOPC and subsequent fire should be classified based on the direct cost of the fire. Had the draining been to a system (closed or open) designed for the service that would have not resulted in a vapor release, then there would be no LOPC. (For a related example, see #35 in API-754.)

## 29 Epoxy Resin February 2018

**Question:** Would the following qualify as a Tier 1/2 Process Safety Event?

A release of 5,000 lbs of Epoxy Resin released at 100C. No injury or other consequences, release only.

TIH-does not apply, no vapor

Flammability

>200C B.P.

>200C F.P

Corrosiveness- pH 7

Packing Group III

**Response:**

Since the process safety hazards are described by the epoxy resin's boiling point (>200 C) and flash point (>200 C), and these values put it outside of any of the Tier 1 or Tier 2 release categories, this event is neither a Tier 1 nor a Tier 2 PSE. A company could choose to classify this as a Tier 3 PSE. Please note, as described in the note at the bottom of Table 1 and Table 2 of API-RP-754, 'In determining the Threshold Release Category for a material, one should first use the toxic (TIH Zone) or flammability (Flash Point and Boiling Point) or corrosiveness (Strong Acid or Base vs Moderate Acid or Base) characteristics. Only when the hazard of the material is not expressed by those simple characteristics (e.g., reacts violently with water) is the UNDG L Packing Group used.' In this case, since the hazard of the material is expressed in terms of flammability by the boiling point and flash point, those can be used to pick the Threshold Release Category, or in this case to show that it is outside of any Threshold Release Category of concern for Tier 1 or Tier 2 PSEs. As such, the packing group classification need not be applied.

## 30 Permitted Emissions Source from Propylene Truck February 2018

**Question:** A propylene truck unloading spot is designed so that there is vent piping directly downstream of the hoses. When the transfer is complete and the main piping is blocked, the pressure is vented off the hoses prior to disconnecting. The vent is to atmosphere at a height of approximately 100 feet. Since the hoses are routinely vented to this stack, it is a permitted emissions source for propylene. The PHA on this system identified the potential for these valves to leak. In response to the PHA: 1) a flow limiting orifice was added to the vent line to reduce the maximum potential flow rate of liquid propylene, 2) a knock-out pot was added at the base of the 100 ft stack to prevent liquid release to atmosphere, and 3) a dispersion analysis was done to verify that a propylene release at 100 ft does not create a hazard to on-site personnel or the off-site community.

Following an unload, an employee forgot to close the hose vent valve. When the subsequent propylene truck was unloaded, the employee did not notice that the vent valve was open and this allowed liquid propylene to flow into the vent system during the unload step. The amount of propylene released exceeded the threshold quantity for a Tier 1 PSE. There was no rainout, no on-site shelter-in-place, no evacuation, no public protective measures, and the discharge was previously proven to be to a safe location.

Should this be considered an "upset emission" - if so, it is not a PSE or should this be considered a Tier 1 PSE?

**Response:**

Since this is an upset emission from a permitted source, as described in your scenario, and the release exceeded the threshold quantity for a Tier 1 PSE, the next test is whether or not any of the four

consequences occurred as a result of the release. Since, as you explained, there was no rainout, no on-site shelter-in-place, no evacuation, no public protective measures, and the discharge was previously proven to be to a safe location, this release would not be considered a PSE Tier 1 or Tier 2.

### 31 Indoor/Outdoor Disparity February 2018

**Question:** A level transmitter failed on an API storage tank containing 3% metal hydroxide solution. The solution pH is greater than 12.5 (category T1-7). The tank overflowed and release 150 gallons (575 kg) of the strong base into an indoor containment area that was designed for the event. The release quantity was less than the threshold quantity for an outdoor release (2000 kg) but greater than the threshold quantity for an indoor release (200 kg). While the disparity between indoor/outdoor TQ makes sense for some T1-7 components such as combustible liquids and asphyxiants, it does not seem to fit for non-volatile acids and bases.

Should the indoor/outdoor distinction apply to non-volatile releases (e.g. acids and bases) where the severity index would be zero as defined by the standard? If there is no risk of inhalation, the hazards seem to be equivalent whether indoor or outdoor.

**Response:**

This is a good point and can be considered in the 3rd Edition of API-754, however, as the TQs are defined in the 2nd Edition, this would be classified as a Tier 1 PSE based on the release amount exceeding the indoor TQ for a T1-7 material.

### 32 Acrylonitrile Manufacturing Unit March 2018

**Question:** An acrylonitrile manufacturing unit had an unplanned, SIL2 activated shutdown which caused absorber off-gas (AOG) to release through a regulated, engineered vent system. The discharge of this vent system can result in a potential hazard to personnel if certain elevated structures are occupied at the time of the release. No injuries or exposures occurred, and there was no shelter in place or onsite/offsite evacuations. The venting occurred over a time period of 65 minutes. The release vented to atmosphere and consisted of the following materials:

Acrylonitrile	0.5 lbs.
Hydrogen Cyanide	3.0 lbs.
Acetonitrile	95 lbs.
Propylene	430 lbs.
Propane	960 lbs.
Carbon Monoxide	2500 lbs.
Carbon Dioxide	6500 lbs.

**Response**

Since this unplanned and uncontrolled release was from an engineered pressure relief system, the amount of hazardous material that was released through the engineered vent system must be reviewed against the threshold quantities for each of the materials listed to determine if any TQ was surpassed. As an example, adding up the propane and propylene results in 1390 lbs, which is over the TQ for a flammable gas (Category T1-5) of 1100 lbs. Since it was released from an engineered pressure relief system and resulted in a discharge to a potentially unsafe location, i.e., certain elevated structures, this should be classified as a PSE Tier 1 event. The fact that the elevated structures were not occupied at the time is irrelevant in making the determination. (See Examples 76 and 77 for related events.) In considering whether elevated structures should be considered as unsafe locations, one of the key

criteria is ease of access. For example, if an elevated platform is accessible by stairs and requires no special permission or permitting, it is easily accessed and should be considered an unsafe location if a harmful release does reach it. Similarly, if an elevated structure is accessible by permanent ladders and requires no special permission or permitting, it should also be considered an unsafe location if a harmful release does reach it. Conversely, if an elevated platform requires special permission or permitting, it is not easily accessible and should only be considered an unsafe location if it were actually occupied at the time of the release.

### 33 Responsible Party for Ammonia March 2018

**Question:** A manufacturing company uses anhydrous ammonia in its process and this raw material is fed via pipeline directly from the ammonia supplier to the plant. The plant has recently taken ownership of this pipeline which extends many miles from the battery limits of the plant to the supplier. The plant maintains proper permitting and regulatory requirements for the pipeline under PHMSA. The pipeline developed a leak between the plant and supplier in an undeveloped area and released anhydrous ammonia into the ground and air. Ammonia flow was stopped and air monitoring in the area was immediately set up. It was determined that air quality was at safe levels. Several nearby structures were evacuated as a precaution. The area was zoned off for response operations until the release was stopped. Local, state, and regulatory authorities were notified and kept abreast of the incident. Within 72 hours, an environmental control device designed to flare emissions was installed over the leak. Emissions were flared for several days until the pipeline was de-inventoried for repair. A total of 287,000 pounds of anhydrous ammonia was released over 279 hours. No injuries or exposures occurred.

**Response:**

Since the manufacturing plant has taken ownership of the pipeline from the ammonia supplier, it is the 'responsible party' per API-754. Section 1.2, Applicability, Section a) states, 'Events associated with the following activities fall outside the scope of this RP and shall not be included in data collection or reporting efforts: releases from transportation pipeline operations outside the control of the responsible party.' Therefore, since the pipeline is within the control of the responsible party, an LOPC from the pipeline shall be classified using the Tier 1 and/or Tier 2 criteria.

The first question to be answered is whether any of the Tier 1 or Tier 2 criteria were a result of the release. Since 'Several nearby structures were evacuated as a precaution.', would qualify as a Tier 1 event since there was 'an officially declared community evacuation'. This would still be the case even if there were only a 'precautionary community evacuation.'

Regardless of the community evacuation, another criteria to be addressed is the amount of anhydrous ammonia released versus the TQ for ammonia. In this case the material released was anhydrous ammonia which is a Threshold Release Category 4 material and has a Tier 1 TQ of 440 lbs, and a Tier 2 TQ of 44 lbs in any one-hour period. The amount of ammonia released prior to the installation of the control device to flare the emissions, shall be compared to these TQ values to determine the proper PSE Tier

### 34 CO Both Flammable and Toxic

March 2018

**Question:** Lets say this mixture of gases is sent to the vent.. but the ONLY chemical exceeding the TQ is Carbon Monoxide.... With our guidance from API 754 being to ... “follow the rules of DOT49CFR 173.2a... or the UN Recommendations..... “ Would this still be a Process Safety Tiered event? DOT classifies carbon monoxide as Carbon Monoxide “Compressed”.. Being that the carbon monoxide coming out of the vent is not “compressed’ , would this apply? Also, we are aware that CO is also flammable.. so would that definition apply?

**Response:**

As is noted in Note (a) of Tables 1 and 2, ‘many materials exhibit more than one hazard.’ This is the case for CO since it is a flammable gas and a toxic inhalation hazard. Let’s deal with the toxic inhalation hazard first.

A review of the SDS for CO shows and LC50 of 1807ppm (4hr). Using Annex F, this puts CO in the TIH Zone C Material category. As shown in Tables 1 and 2, the Threshold Quantity (TQ) for TIH Zone C is 220 lb or 22 lb, respectively. Since this release was from an engineered pressure relief system, two criteria must be satisfied for this release to be a Tier 1 or Tier 2 PSE. First, the TQ for TIH Zone C must be exceeded. Second, the release must involve one of the four additional consequences, i.e., rainout; discharge to a potentially unsafe location; an on-site shelter-in-place or on-site evacuation, excluding precautionary on-site shelter-in-place or on-site evacuation; or public protective measures (e.g., road closures) including precautionary public protective measures.

Since the TQs for the TIH Zone C material are lower than the flammable gas TQs, there is no need to review the flammable gas TQs.

### 35 Diluted Bitumen

March 2018

**Question:** We recently had an initiating event where we had reverse flow of Diluted Bitumen from a rundown line to a plant area resulting in lifting multiple PVRVs at elevation and releasing liquid Diluted Bitumen to grade and drained to a designated area. During the reverse flow, Diluted Bitumen backflowed into a jumper drain line that was not in service prior to or during the release and was expected to be empty. This line had an integrity issue (i.e. crack in the line) and the backflow of Diluted Bitumen into this line resulted in a leak of this material.

My inquiries are as follows:

1. Should the release of Diluted Bitumen from the multiple PVRVs and leaked line be counted as a total of **one** LOPC for this event
2. Should we count the multiple PVRVs release as one LOPC event and the leak from the jumper drain line (that was not in service prior to or during the release and was expected to be empty) as another LOPC event resulting in total count of **two** LOPCs for this event.
3. Should we count the multiple PVRV releases as multiple LOPCs and leak from the jumper drain line (that was not in service prior to or during the release and was expected to be empty) as another LOPC resulting in a total count of **three or more** LOPCs for this event depending on the number of PVRVs.

If proximity need to be considered for this specific event i.e. multiple PVRVs, please assume the releases are all within 100 ft of each other.

Please let me know your thoughts and rationale for the LOPC Tier count.

**Response:**

The first concern with any LOPC is whether there were any direct consequences, (i.e., harm to people, fire/explosion damage, shelter-in-place, community impact). If there were none then the LOPC is categorized using the threshold release category (TRC) and the greatest quantity released in any one-hour period. Since, in this example, there is no discussion of any of the direct consequences, this response will focus on the TRC and the quantity released.

Typically, bitumen has a flash point above 200 degrees F, so it falls above the flash point range for T2-8, so regardless of the release temperature, it would not be a PSE Tier 2 no matter the amount released as long as there no direct consequences. If its flash point is above 140F and it is released at a temperature above the flash point, then it would be classified using the threshold quantity of T2-7 or T1-7.

Tier 1 and Tier 2 PSE are always viewed from the perspective of the LOPC. In this case we had two distinct LOPC mechanisms; one from the crack in the out-of-service line and one from the PRD's. Grouping multiple LOPCs is possible dependent upon the specifics of the releases. For example, if there had been multiple leak locations in the out-of-service line occurring in the same vicinity, and that would potentially impact the same population, they would be considered one LOPC. They would be considered separate LOPCs if they had occurred in separate locations, or if they could impact different populations. Likewise, multiple RV's that act as a system would be considered a single LOPC; whereas, individual RV's on individual lines and vessels would be multiple LOPCs. Each LOPC would be judged against the appropriate criteria (i.e. RVs judged against the RV criteria).

### 36 Solids Release A April 2018

**Question:** With API 754 focus apparently more towards liquids and gases (toxicity, flammability, corrosivity) that can cause a process safety event upon LOPC, how much does API 754 apply to solids in general (only one specific reference to solids/dusts in API 754). For a solid material that is not explosive, flammable in state released, violently water reactive, pyrophoric, or potentially evolves a toxic gas upon LOPC (based on toxic gas release rate), etc., would Tier 1 or Tier 2 thresholds apply?

**Response:**

API-754 was developed as an industry tool to gain consistency with releases with the potential to cause harm from a process safety standpoint. The Threshold Quantities were developed as a surrogate for whether the release 'could have caused' a process safety issue. For the purpose of a release of a solid material, as in this example, the Packing Group can be used to determine the TQ to apply. If a solid material is released that is not explosive, flammable, violently water reactive, or evolves a toxic gas upon release, then per the note in Table 1 or Table 2, a check of the UNDG Packing Group should be made to see if it falls in Packing Group I, II or III materials. If it does, then the appropriate TQ per Table 1 or 2 would apply. If it does not fall into one of those Packing Groups, then it would not be a Tier 1 or Tier 2. For example, if it were an infectious substance (Hazard Class 6), Packing Group III would apply and the TQs shown in Tables 1 and 2 would apply.

### 37 Solids Release B April 2018

**Question:** For solids that are an inhalation hazard, would the release form (particle size) impact the applicability? For small particle sizes (<10 micron), this is a respirable range. Larger than 10 micron

particle size is typically considered to not be respirable (see UN DG Part 2 2.2.61.13). Would the toxic inhalation hazard threshold release quantity be based on the amount of material released that is smaller in diameter than 10 microns? (this seems similar to Annex E Table E5, example 50)

**Response:**

If a solid material is released with particle sizes <10 micron, this would be treated as an inhalation hazard since this particle size is respirable as you mentioned per UNDG Part 2.2.2.61.13. Based on this, the material can be determined to fit into TIH Zone A, B, C, or D. Regarding the release quantity, only the amount of material that is respirable would be considered.

### 38 pH Not Defined Property April 2018

**Question:** For corrosivity, the primary criteria listed in API 754 is pH. For solids and non-aqueous liquids, pH is not a defined property. However, DOT and UN DG both use a skin thickness destruction test over specified periods of time. For a material where pH is not defined, can Hazard Class 8 Packing Group I material be considered a strong acid/base, a Hazard Class 8 Packing Group II material be considered a moderate acid/base, and Hazard Class 8 Packing Group III be considered as not having a threshold quantity unless involved in an injury, lost time, fatality? Similar to steam/hot water/compressed air.

**Response:**

Assuming that there was not injury, lost time, fatality or other direct Tier 1 or Tier 2 consequence, for solids and non-aqueous solutions, since pH is not a defined property, the other properties of toxic inhalation hazard and flammability would be considered first, in accordance with the note at the bottom of Tables 1 and 2. Assuming that those criteria do not apply to the released material, then the UNDG Packing Group classification would be used. If the material is not a Packing Group I, II or III material, then regardless of the amount released, it would not be a Tier 1 or Tier 2 PSE.

### 39 Oxidizer Definition April 2018

**Question:** What about materials classified as an “oxidizer”? They typically support combustion/make it more likely but wouldn’t be flammable by themselves. If released along with something else that would then release a flammable or toxic gas, then would the evaluation be based on the flammable/toxic gas evolved from that interaction?

**Response:**

If an oxidizer were released, it would fall into Packing Group III (Hazard Class 5) and the associated Threshold Quantity (TQ) in Tables 1 and 2 would be used. In addition, both Tables 1 and 2 include UNDG Class 2, Division 2.2 materials in Threshold Release Category T1-7 and T2-7 respectively. UNDG Class 2, Division 2.2 materials are defined in Section 3.1.53.

If two, or more, materials are released but neither of them represents a hazard expressed by any of the threshold release quantities, but the combination of the chemicals has the potential to react and form a material that is covered by the criteria in the Threshold Release Categories in Tables 1 or 2, then the product of that reaction is used to determine the PSE Tier level. A good example of this is shown in the second paragraph of section G.4 of Annex G.

### **Active Staging Definition (Submitted April 10)**

The active staging definition (3.1.3) only references trucks waiting to be unloaded. The vast majority of the truck traffic at the terminals are waiting to be loaded. I know those trucks should be empty and you wouldn’t expect a PSE release while they’re waiting to pull into the loading rack, but you might be surprised at how many times they show up with heels in their compartments that could be



spilled. There is also residual pressure in the truck compartments that is typically relieved into our vapor handling system once the truck is connected, but there is potential for this pressure to release while waiting to pull into the rack.

## 40 Connecting and Disconnecting Process April 2018

### **Question:**

#### PART 1:

At what point does the process of connecting start? Some potential options:

- a. When the truck enters our property
- b. When it parks in the bay and the driver gets out
- c. When the air brakes are activated (we don't chock the wheels in our loading racks; there's "curbing/speed bumps" to prevent roll-aways)
- d. When the first connection of our equipment is made to the truck (this is typically the grounding cord connection)
- e. When the first loading hose is being connected to a compartment.

#### PART 2:

At what point does the process of disconnecting end? Some potential options:

- f. Past guidance: when a loading hose is disconnected from a truck compartment and a release occurs, we only count it as a PSE if the release is from our loading hose. If the release is from the truck, we do not count it as a PSE. This is the applied even if other compartments still have loading hoses connected.
- g. When the last of our equipment is disconnected from the truck (this is typically the grounding cord or the vapor hose) No.
- h. When the driver gets into the truck with the purpose of exiting the bay
- i. When the truck exits our property

Keep in mind that the above applies to bottom loaded trucks. There would need to be some definitions that are applicable to top-loaded trucks, too (like at our asphalt facilities).

### **Response:**

Per Section 1.2.c., truck or rail transport operations are excluded from consideration under API-754 except when the truck or rail car is connected or in the process of connecting or disconnecting to the process, or when the truck or rail car is being used for on-site storage. Examples 69, 70 and 71 provide some specific examples of transport vehicle scenarios. The point of clarification regarding this question deals specifically with the transition between transportation and being part of the process, or in the words of Section 1.2.c, '...or in the process of connecting or disconnecting to the process...'. 'In the process of connecting...' means when the transport vehicle is positioned in the loading/unloading area and the wheel chocks are place or, for those that do not use wheel chocks, when the air brakes are set. "in the process of ... disconnecting..." ends when the wheel chocks are removed or when the air break are released. Using these more specific criteria will show consistency with Example 72.

## 41 Saltwater Blowdown May 2018

**Question:** While an employee was blowing down a saltwater strainer, the PVC saltwater piping failed, causing the operator to stumble backwards and hit his head on adjacent equipment causing a

recordable injury. The saltwater is non-hazardous (~60F degrees) and the employee was sprayed with the water but that's not what caused the injury.

The saltwater normally drains to the atmosphere (sewer). The broken PVC piping caused it to discharge to the atmosphere at a different location than normal.

Is this a loss of primary containment and subsequent process safety event (PSE)?

This is normally an open-ended line to atmosphere at grade. It is always left cracked open until the operators blowdown, and then open wide. It's essentially a plastic extension to the cast iron strainer blowdown valve.

**Response:**

In this example, the pressure of the saltwater blowdown will be important in determining whether this should be classified as a PSE 2 due to the recordable injury.

Starting backward, since there was a recordable injury, this can be classified as a PSE 2. It does not have to be the released material that causes the injury for it to be considered a PSE 2. See Example 11 in API-754 for additional information. In the example, a worker was injured after falling down some stairs while running away from a fire. Even though the released material and fire did not cause the injury, the person was injured because of the release. In this scenario, similarly, the employee was injured because the release caused him to stumble and hit his head.

The question then becomes, 'Was it a loss of primary containment?'. Since a loss of primary containment (LOPC) is defined in Section 3.1.23, as, 'An unplanned or uncontrolled release of any material from primary containment, including non-toxic and non-flammable materials (e.g., steam, hot water, nitrogen, compressed CO<sub>2</sub>, or compressed air).', it is clear that non-toxic and non-flammable releases can result in PSE Tier 1s or 2s. A review of the definition of 'material', Section 3.1.25, shows that the substance released must have the 'potential to cause harm due to its chemical (e.g., flammable, toxic, corrosive, reactive, asphyxiate) or physical (e.g., thermal, pressure) properties. Since the salt water did not have the potential to cause harm due to its chemical properties, nor did it have the potential to cause harm due to its thermal properties, those could rule it out as a 'material'. However, if the salt water system pressure was sufficient to cause harm, (e.g. laceration or off balance if struck), and the failure caused the operator to become alarmed and stumble, one would conclude that the failure and subsequent release did have the potential to cause harm, and therefore would be a LOPC under the API-754 definition. Therefore, the LOPC would be considered a PSE 2 due to the recordable injury.

## 42 Tube Leaks in Heat Exchangers      June 2018

**Question:** Following up on the Webinar discussion this morning, we've had discussions here about tube leaks in heat exchangers, and whether or not those should be considered LOPCs for reporting purposes. There are multiple scenarios:

1. A hydrocarbon leak into a cooling water system is considered an LOPC. The severity of the LOPC is considered the same as a release directly to the atmosphere.
2. A non-volatile (i.e., heavy) hydrocarbon leak into a steam condensate system was not considered an LOPC, as it did not result in a "release" (?) of the hydrocarbon, even though it resulted in a non-desirable mess. It did not pose a threat of a catastrophic event (though the refinery manager would probably argue the point).

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3. Similarly, an exchanger that resulted in hydrocarbon/hydrocarbon contamination that remained within a distillation column and off-spec products was not considered an LOPC.

In a variation of the theme, there was an instance of a vessel containing two phases—aqueous and non-aqueous. The aqueous phase overflowed the vessel, resulting in a carryover of corrosive material into equipment that was not intended for that purpose. Would that overflow constitute an LOPC?

We didn't get a chance to discuss this during the webinar, so I'd appreciate input from your teams. I'm not presuming any "correctness" of our current thinking. Thanks.

**Response:**

The three scenarios you provide are appropriate interpretations of the requirements. In answering this question on the aqueous phase overflow, let us first assume that the corrosive material was a strong acid/base or a moderate acid/base per the definitions of 3.1.1 or 3.1.2. Since the corrosive material carried over to equipment that was not designed to handle the material, this would be considered an LOPC. At this point a review of the maximum 1-hour leak volume would be compared to the TQ for Threshold Release Categories T1-7, T2-7 or T2-8, as appropriate.

## 43 Carbon Monoxide August 2018

**Question:** Gases vented through an engineered pressure relief system and reaching a potentially unsafe location; .. but the ONLY chemical exceeding the TQ is Carbon Monoxide.... With our guidance from API 754 being to ... "follow the rules of DOT49CFR 173.2a... or the UN Recommendations..... "

Would this still be a Process Safety Tiered event?

DOT classifies carbon monoxide as Carbon Monoxide "Compressed" ..

Being that the carbon monoxide coming out of the vent is not "compressed" , would this apply?

Also, we are aware that CO is also flammable.. so would that definition apply?

**Response:**

As is noted in Note (a) of Tables 1 and 2, 'many materials exhibit more than one hazard.' This is the case for CO since it is a flammable gas and a toxic inhalation hazard. Let's deal with the toxic inhalation hazard first.

A review of the SDS for CO shows an LC50 of 1807ppm (4hr). Using Annex F, this puts CO in the TIH Zone C Material category. As shown in Tables 1 and 2, the Threshold Quantity (TQ) for TIH Zone C is 220 lb or 22 lb, respectively. Since this release was from an engineered pressure relief system, two criteria must be satisfied for this release to be a Tier 1 or Tier 2 PSE. First, the TQ for TIH Zone C must be exceeded. Second, the release must involve one of the four additional consequences, i.e., rainout; discharge to a potentially unsafe location; an on-site shelter-in-place or on-site evacuation, excluding precautionary on-site shelter-in-place or on-site evacuation; or public protective measures (e.g., road closures) including precautionary public protective measures.

Since the TQs for the TIH Zone C material are lower than the flammable gas TQs, there is no need to review the flammable gas TQs.

In addition to this review of CO, a review should also be done of all hazardous chemicals released regardless of whether the amount exceeded the specific TQ, to determine if the total of the fractions of

TQ for each chemical released as part of the mixture, equaled or exceeded 100%. See note 'd' of Table 1 and Table 2, and also reference Example 49 of the 2<sup>nd</sup> Edition of API-754.

#### 44 Epoxy Resin, Aniline, Sodium Bisulfite August 2018

**Question:** It would be helpful if you could assist in determining if these should be PSEs.

Scenario:	An unplanned/uncontrolled release of 5,000 lbs of CHEMICAL is released at 35°C. No injury or other consequences. Release only		
	<b>Chemical 1</b>	<b>Chemical 2</b>	<b>Chemical 3</b>
	<b>Epoxy Resin</b>	<b>Aniline</b>	<b>40% Sodium Bisulfite</b>
<b>UN Code</b>	UN 3082	UN 1547	UN 2693
<b>Physical State</b>	Liquid	Liquid	Liquid
<b>TIH</b>	N/A (no vapor)	N/A (no vapor)	N/A (no vapor)
<b>Boiling Point</b>	>200°C	183°C	104°C
<b>Flash Point</b>	>200°C	76°C	N/A
<b>pH</b>	7	8.1	4
<b>Packing Group</b>	III	II	III
<b>Class</b>	9	6.1	8
<b>In CCPS App?</b>	Not in App	T1-6/T2-6	T1-7/T2-7

#### **Response:**

##### Chemical 1 – Epoxy Resin

Since the release did not result in an injury or any of the direct consequences for a Tier 1 or Tier 2, it is then reviewed for whether the release amount exceeded any of the Threshold Release Category (TRC) Threshold Quantities (TQ). Since this material does not meet the toxicity, flammability or corrosivity criteria in Tables 1 or 2, and although it carries a PG III designation, its Class is 9 which is a miscellaneous class not related to process safety concerns; therefore, it would not be categorized as a PSE 1 or 2.

##### Chemical 2 – Aniline

For Aniline, the Toxic Inhalation Hazard is N/A. The packing group class indicates toxic or infectious; toxic could be oral or dermal, so using the packing group designation is appropriate.

An errata for the 3<sup>rd</sup> edition is to include “(excluding acids/bases)” for T1-7 and T2-7 Other Packing Group III Materials as we have done for Other Packing Group I Materials in T1-5 / T2-5 and Other Packing Group II Materials in T1-6 / T2-6. The committee specifically located strong and moderate acids/bases in the threshold release table.

In this case, since the release did not result in an injury or any of the direct consequences for a Tier 1 or Tier 2, it is then reviewed for whether the release amount exceeded any of the Threshold Release Category (TRC) Threshold Quantities (TQ). Even though the material does not meet the toxicity, flammability or corrosivity criteria in Tables 1 or 2, it is a Packing Group II material, with a Hazard Class of 6, i.e., Toxic and Infectious. Therefore, it would fall into Threshold Release Category T1-6/T2-16.

### Chemical 3 – 40% Sodium Bisulfite

Since the release did not result in an injury or any of the direct consequences for a Tier 1 or Tier 2, it is then reviewed for whether the release amount exceeded any of the Threshold Release Category (TRC) Threshold Quantities (TQ). This material's hazard, corrosivity, is expressed by the corrosivity criteria of Tables 1 and 2, but since it is not a strong, nor a moderate, acid/base, it does not fit into any of the Threshold Release Categories, and therefore has not Threshold Quantity. Even though it is a Packing Group III material with a Hazard Class of 6 for being Corrosive Substance, it would not be accurate to categorize this material as a T1-7/T2-7 since it is a weak acid/base. For sodium bisulfite, the packing group class is for corrosive; the pH of 4 is corrosive, but it does not qualify as a strong or moderate acid.

### 45 Mercury TQs August 2017

**Question:** Based on the attached SDS, does **mercury** have T1/T2 threshold quantities? It is not currently on the list in the CCPS PSIE tool. It has pretty benign NFPA HFS ratings (2-0-0) but has a fairly low LC50 for inhalation and it's listed as a PG III (HC 6.1.8) material. That could lead you to three different conclusions.

**Response:**

The release of mercury can be considered in two different ways.

If the release were in a manner that results in toxic vapors, then the toxic vapor table in Annex F would be used. Based on using the toxicity information to classify a release of mercury that results in mercury vapors, the LC50 value in the SDS of  $<27\text{mg}/\text{m}^3$ , which equates to 3.2ppm, puts mercury as TIH Hazard Zone A, per Annex F of RP 754. Therefore, the TQs in Tables 1 and 2 for TIH Zone A Materials apply to any mercury vapor releases.

If the release were in a liquid form, the SDS shows mercury as a Packing Group III material, with a Hazard Class of 8 (corrosive.) Therefore, the release would be classified against the T1-7 or T2-7 threshold quantities.

### 46 Injuries Despite PPE September 2018

**Question:** One of our divisions is asking for a third-party review of the following events. Could you let me know if these two events classify as a Tier 1 or Tier 2 PSE?

**Event #1**

An associate was sprayed in the eyes with caustic while draining it into a container, resulting in a scratch to the cornea in one eye and whitening of the membrane in the other. Immediate treatment was given, and the associate was transported to a hospital where eye irrigation and drops were administered. The associate was wearing eye goggles, but the caustic was drained from the wrong location, where it was at a higher pressure than expected. This resulted in a lost time injury.

**Response:**

This is a loss of primary containment since it is an uncontrolled release of material from primary containment. It was uncontrolled since it was able to spray the associate in the eyes. The caustic draining was planned, but it became uncontrolled when the operator opened the wrong

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drain. Presumably, the draining procedure and required PPE were enough to prevent injury to the operator; however, they were insufficient for the higher pressure drain location resulting in a DAWFC. The event was uncontrolled and resulted in a “days away from work” injury, so it is a Tier 1 event.

#### Event #2

An associate was draining residual polyol chemicals from a casting machine when the material, which is kept at 230 F (110 C), contacted the skin through the gap between the glove and sleeve while also soaking into the thermal protective sleeve that was being worn. This resulted in a second degree burn to the back of his hand and wrist, along the forearm. The associate washed the affected area and applied cream to reduce discomfort prior to being sent for offsite treatment where 10 days away from work was prescribed.

The components of the formulation are degassed and heated in to the casting machine tanks (in this case up to 4 components). The components are fed in to the tanks by vacuum. Periodically, it is necessary to change the formulation, so the tanks have to be emptied. The incident occurred whilst draining the Polyol tank that acts as the feed tank to the casting injection head.” I believe this meets the definition of API-754, Section 3.1.37 since this is “production” for the site in question. Please take this additional information into consideration.

#### **Response:**

The draining operation was planned, and the use of PPE for protection against possible exposure during the draining operation was planned. The fact that someone was injured does not automatically mean that the release was uncontrolled. In this case, the injury was the result of the ineffective design or use of PPE. This is an occupational safety issue rather than a process safety issue.

### 47 Crude Spill in Truck Tract August 2018

**Question:** Considering that [our company] will participate in the PSE 2018 report that API performs, I would like comment to you on a doubt regarding an incident, at the beginning of this year during the loading process of a truck tract, a release of 0.07 barrels of crude was presented through the hatch of the central compartment of the vehicle, the spill of fluid only affected the walls of the truck tract, without affecting the environment or people and the economic impact was less than 10,000 USD.

This is because the employee in charge started the loading process and did not notice opening the front hatch, as he did not take into account the verification or the opening of the curtains of the compartments, which causes the overflow of the fluid.

We want to know, under the API standards, how this incident looks, and if it should be considered as a process safety event, thanks

#### **Response:**

While there were neither environmental or people impacts, this was still an unplanned release. Since the amount of material released was not equal to or greater than the threshold quantity for a T1-6 or T2-6 material, this release would not be classified as a PSE Tier 1 or Tier 2. A company may choose to classify this as PSE Tier 3.

## 48 Coker Operator Steam Burn Incident August 2018

### Question:

#### **Background**

This particular Coking operation is a batch process that heats vacuum tower bottoms in a furnace. The furnace outlet feeds a vertical coke drum where solid coke drops out while more valuable products exit the top of the drum to the fractionation tower. The coke left in the drum after switching feed to another drum is cooled with water before the coke cutting process begins. After cooling, the drum is opened on the top and a drill stem is inserted to drill a pilot hole to facilitate cutting. The cut coke exits out the bottom of the drum through a solid gated delta valve into awaiting rail cars located underneath the drum to receive the coke. The coke is dumped into a rail car and the volume in the car is regulated by an operator observing the level in the railcar from the loading shack. The railcar is then moved to a staging area where the contents are transferred to a truck and transported to the 3rd party coke loading facility.

#### **Incident Description**

The day of the incident the Loading Operator at a Coker was burned by steam while responding to a partial spill of coke that overflowed from the railcar in which it was being dumped. The spill occurred while cutting the initial hole in the drum. The drum was open at the top and bottom. The drums on the Coker dump directly into railcars.

Permission to open the Delta valve on the drum was given by the Console Operator and the cutting water pump was started to begin drilling the initial hole. The Loading Operator confirmed that he was going up top to close the Delta valve.

Shortly thereafter the Loading Operator reported over the radio that he had been burned by steam. He reports being by near the coke drum and then being at the stairwell. His burns resulted in a day away from work case.

The Loading Operator was injured because he was in the vicinity of an open coke drum during a coke cutting operation in which a major fallout of coke and hot water occurred. Steam generated from the water and the hot coke presumably came up through the grating on the second deck from beneath him. The water is a combination of the quench water remaining in the drum and any water in the sluice and railcar. The apparent large volume of water left in the drums during the quenching and/or cutting operation certainly contributed to the volume of steam generated when the coke drum fell out.

The coke drum had excess water within it due to an abnormal occurrence. It appeared based on interviews that the coke drum had an initial drop of some coke and water and then the fallout occurred which was a substantial amount of hot coke, water and steam. The steam cloud created went across the entire coke structure (4 coke drums) and was caused by the coke/water/steam mixture, hot coke hitting water in the railcar and hot coke coming in contact with water on the ground. After the incident, pictures showed the coke was piled on the ground level below the structure that held two coke drums and other equipment. It was a massive cleanup effort.

Red lights flash when coke cutting occurs which are supposed to indicate an exclusion zone. Procedures were lacking. The operator was not positioned in his normal location for this job due to some issues. Normally, he is in a shed that shields him from the hazards and contains an actuator to remotely close the valve on the coke drum. In this case, the operator was positioned near the stairs on the ground level to observe the operation.



**Response:**

This is a Tier 1 PSE. Coke drum cutting is a defined mode of operation for the coking process. It is normally executed in a planned and controlled manner; however, something very unusual and very substantial occurred during this particular coke cutting operation resulting in an “uncontrolled” release of material from the process and a “days away from work” injury.

## 49 Responsibility of 2 Pipeline Companies October 2018

**Question:** Two pipeline companies share a common right of way. The pipelines are independently operated by each company. Company A’s pipeline experiences a LOPC leading to a Tier 1 fire and explosion that subsequently causes Company B’s pipeline to also have a Tier 1 LOPC. Both companies follow Annex A in API RP 754. The Applicability section of Annex A does not include an exclusion for damage cause by another party. Examples 65 and 98 discuss responsibility between companies, and in each case it appears the determination of which company records a PSE is based on responsibility for the asset. In the case of the two pipeline companies sharing a right of way, would each company record a PSE since each is responsible for their own asset, even though Company B’s LOPC would not have occurred had it not been impacted by Company A’s LOPC event?

**Response:**

Cause is never a factor in determining the responsible party. As defined in RP 754 Company A and Company B are the responsible parties for their respective pipelines. Each pipeline experienced a LOPC; each company would classify and report their LOPC.

## 50 Acids and Bases in Determining TC October 2018

**Question:** The question pertains to how are acid & base solutions handled regarding the determination of the threshold quantity. One company I worked for counted the entire mass of solution (provided the pH ranges were met) in determining whether or not a threshold quantity had been spilled. Another company used the concentration of the solution determine the amount of acid or base on a neat basis, and then compared the neat acid/base quantity to the TQ’s for Tier 1 or Tier 2.

Example: 6000 lb spill of 27% w/w HCl

Company 1: 6000 lb spill of 27% HCl strong acid, 6000 lbs > 4400 lb TQ, therefore Tier 1 event.

Company 2: 6000 lb spill of 27% HCl = 1620 lbs neat HCl. 1620 lbs is > 440 lbs but < 4400 lbs, therefore Tier 2 event.

Essentially, Company 2 uses the example # 49 in the Appendix of 754 for mixtures where the water contributes 0 to the TQ to justify calculating a neat acid basis and neglecting the water.

In reading Annex G.8, I interpret that to mean that the entire solution is counted towards the threshold quantity, which would be consistent with Company 1’s approach.

So my question is, what is the official, correct API interpretation when dealing with acidic/basic solutions? Or, if there is not an official position on this, what is your opinion as a trusted colleague? I want to ensure we start recording this correctly from the start.

**Response:**

RP 754 Annex G describes the appropriate application of the threshold release categories to multicomponent releases. Specifically G.8 describes the treatment of solutions. "A solution is a homogeneous mixture composed of only one phase. In such a mixture, a solute is a substance dissolved in another substance, known as a solvent. The properties of the solution are used to determine the Threshold Release Category that applies to the released stream as a whole. When the properties or hazards of a solution are unknown, a company may use the properties or hazards of the solute and solvent separately and the released quantities to determine the applicable Threshold Release Category and threshold release quantity."

The pH of the 27% HCl solution is known and would be used to categorize the entire solution as a strong acid (TRC 7). The 6000 lb release exceeds the Tier 1 threshold release quantity of 4400 for a TRC 7 material; therefore, this is a Tier 1 PSE.

If the pH of the 27% HCl solution was not known, then the assessment would be based upon the solute and solvent properties and quantities separately. In this case, the solute is gaseous HCl which is a Toxic Inhalation Hazard Zone C material (TRC 3) with a Tier 1 threshold release quantity of 220 lbs. The neat quantity of HCl in the solution is 1620 lbs which exceeds the TRC 3 Tier 1 threshold release quantity again making this a Tier 1 PSE.

## 51 Misfilling Biocell      November 2018

**Question:** We had an "interesting" incident last week while I was away and I'm looking for a bit of guidance on whether API 754 would even apply. While preparing one of our large gasoline storage tanks for some tank integrity work, through a combination of errors, a large volume of gasoline and cleaning chemical was removed from the tank and then dumped into our biocell. The material was removed from the tank via vacuum truck and then dumped out of the vac truck into the biocell. There was no "loss of containment" per se, it was an intentional movement of hydrocarbon, however the end result was putting gasoline where we do not want it. Had those moving the material to the biocell actually asked our environmental team for approval to put the material in the biocell, they would have been directed otherwise. We use the biocell for interim treatment of impacted soils prior to properly disposing of it offsite. Would this be considered a tier 1 or 2 event?

Just to clarify the two issues we had classifying the event: 1) the tank operators knew there was some hydrocarbon but the project team believed the tank to be fully deinventoried per past practice and visual inspection, and 2) the biocell is designed for handling some hydrocarbon, but was overwhelmed and released vapours resulting in reports of employee impact not requiring first aid.

The volume of gasoline was well above tier 1 TQ, but just inches of height in the tank.

Questions:

- Was this an LOPC, due to the fact the project team believed the tank to be virtually gasoline free?
- What volume of what material should be considered with respect to the release at the biocell: a) full volume of gasoline, b) estimated evaporated portion of gasoline, c) benzene evaporated portion, d) some other?

**Response:**

The transfer of gasoline and cleaning chemical from the storage tank to the biocell was not an LOPC since it was neither unplanned nor uncontrolled. However, since the biocell was designed to handle

some hydrocarbon, but was not able to handle the amount of hydrocarbon put into it, there was an unplanned and uncontrolled release of vapour from the biocell. The volume and types of material released as vapours should be calculated and compared to the Threshold Quantity for the appropriate Threshold Release Category material(s).

## 52 Cost of Replacement after Fire

December 2018

**Question:** If you have a small fire and your equipment works fine afterwards, but it is determined that for potential reliability reasons only, they want to replace a small piece of cable, is that considered in the cost total for the event? What if they decided that for ease of use, they would run 50' of new cable instead of repairing the 2 that was damaged?

**Response:**

The cost of replacing the unit not directly damaged by the fire is not part of the cost, based on the definition of direct cost in the RP 754 (see definition below). In this case, the event did not damage all 50' of cable, and the direct cost would be the cost to repair *only* the section of cable that was damaged. If the cost was lower to replace the entire cable than to do a partial repair of the damaged piece, then it is reasonable to consider the cost of the 50' cable replacement the direct cost.

***direct cost***

*Cost of repairs or replacement, cleanup, material disposal, and acute environmental cost associated with a fire or explosion. Direct cost does not include indirect costs, such as business opportunity, business interruption and feedstock/product losses, loss of profits due to equipment outages, costs of obtaining or operating temporary facilities, or costs of obtaining replacement products to meet customer demand. Direct cost does not include the cost of repairing or replacing the failed component leading to LOPC if the component is not further damaged by the fire or explosion. Direct cost does include the cost of repairing or replacing the failed component leading to LOPC if the component failed due to internal or external explosion or overpressure.*

## 53 Vent Drain PRD

January 2019

**Question:** We recently had an event where during a truck offloading into a tank, it overflowed liquid out of a gooseneck vent on top of the vessel that is piped to a drain during a pressure purge of the offloading hose as shown in Figure 1 below. Based on API RP754, if the scenario does not satisfy the order of Tier 1 or 2 consequences, the last criteria we evaluate it against is the release threshold quantity and so with the mentioned LOPC incident, we classified the Tier level based on the threshold quantity. A question that was raised by a colleague is that if the aforementioned LOPC incident for example is classified as Tier 1 or 2 based on threshold quantity because it is an LOPC overflow scenario through a vent into a drain, what happens if we have a similar scenario but instead of the liquid overflow through the vent to the drain, the liquid is released through a PRD and the PRD discharge is piped to the drain and it doesn't meet any of the 4 PRD discharge consequences outlined in API RP754, it is categorized as a Tier 3 Demand on the Safety System. Can you provide me with an explanation as to why the difference in the LOPC classification (Tier 1 or 2 vs. Tier 3) for a similar event except one is through a vent drain and the other is through a PRD and it is routed to the same location? I am hoping

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with your insight, I can provide a better explanation than we want to align with API PR754 and be consistent with how other industry peers classify Tier levels of their LOPCs.

Figure 1:

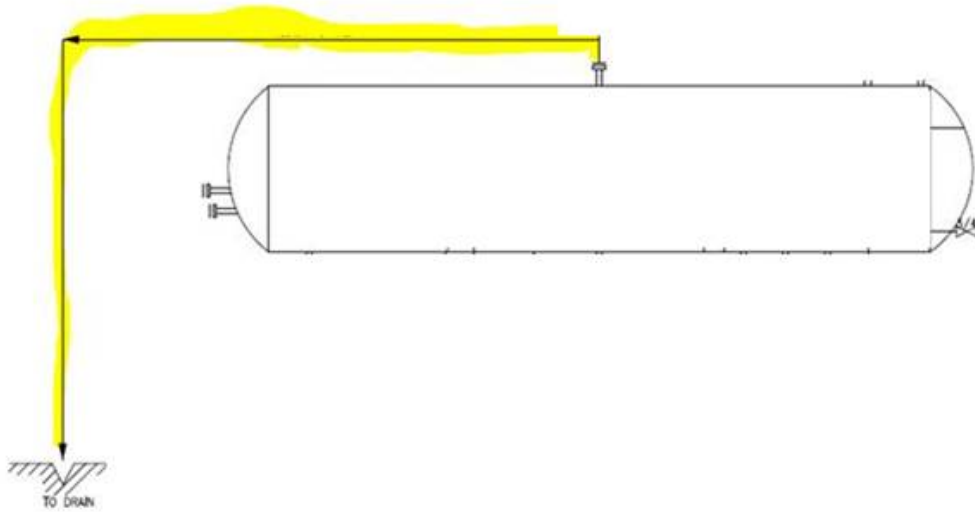
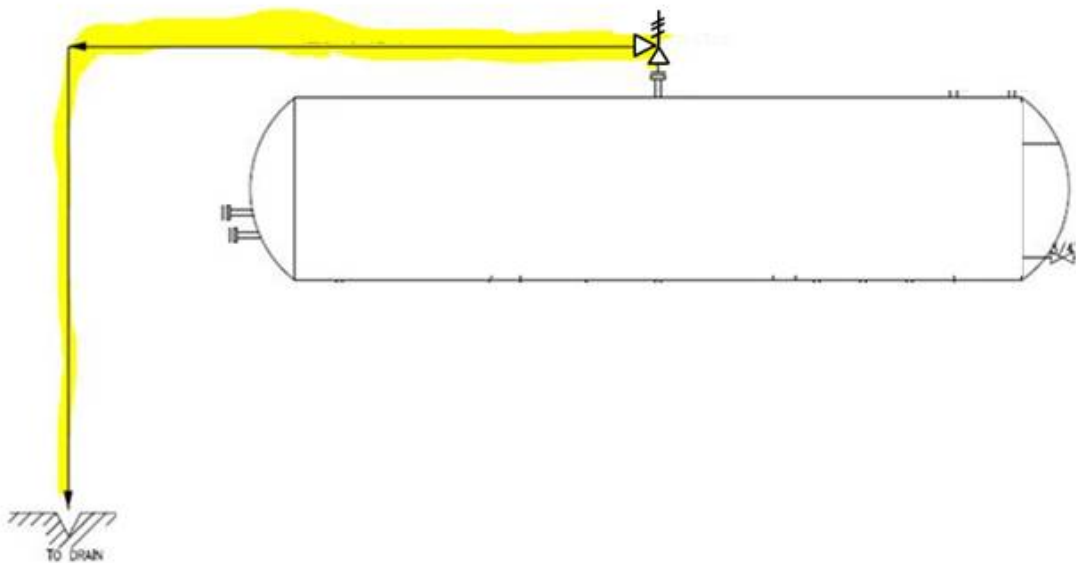


Figure 2:



**Response:**

An open vent is the simplest form of pressure relief; therefore, there is no difference between the release through the goose neck vent piped to the drain and the PRD piped to the drain. Both would be

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evaluated against the four negative consequences and whether or not the Tier 1 or Tier 2 threshold quantity had been exceeded. Examples 54 deals with release to atmosphere from a PRD, additionally, example 59 deals with PRDs (including vents) in liquid or two-phase service.

## 54 Naphtha Inventory February 2019

The attached document contains information for this event, which was classified as a Tier 2 release category 6 based on the flash point and packaging group.



PSE Classification.pdf

**Question:** Can you please review this classification and let me know if you support our determinations?

**Final Answer:**

The SDS indicates both flammability and health hazards, but the predominant hazard from a process safety perspective is flammability. Therefore, the flash point and the boiling point are used to determine the proper threshold release category. Based upon the SDS values for flash point (<-18 C, 0.40 F) and boiling point (≥20 C, 68 F), the material would be classified as Threshold Release Category 5 material. Although not used in the determination, this classification is also consistent with the SDS Packing Group I designation.

## 55 Cost of Fire-fighting February 2019

**Question:** My company established API-754 to measure process safety indicators at all levels and we are following this document to classify all process safety events within the company. I have a question about the Direct Cost (I noticed that there is a minor modification in the direct cost definition in the recent revision). My question is not addressed in API-754 document and [API-754 Interpretation Questions](#) and I would appreciate if you can assist us in clarifying this point to us.

Can you please clarify if the cost of firefighting (e.g. cost of foam, fire extinguishers, firefighters man-hours) is included or excluded in the calculation of the direct cost from fire.

**Response:** Direct cost does not include the cost of the actual firefighting.

## 56 Portable Frac Tank LOPC & Injury March 2019

Incident Description:

Eight (8) Frac tanks were staged to store additional caustic (sodium hydroxide) for strike contingency. Two third party (frac tank vendor) workers were working on the tanks. Rain water / snow had accumulated in the flexible containment placed under each tank. Workers somehow got wet. After leaving the site, one later discovered a significant burn to his foot, resulting in a OSHA recordable, days away from work injury due to surgery & hospitalization. The second worker had a minor skin irritation on his leg that required first aid treatment. The accumulated water in two of the eight containments was determined to have a pH of 13. Both frac tanks were found to have been leaking.

I am still evaluating the details before a final classification can be made, but here is my logic so far:

- 1) The frac tanks holding sodium hydroxide solution at the FCC are temporary storage tanks and are part of the process as defined in 3.1.37.

#### 3.1.37

process

Production, distribution, storage, utilities, or pilot plant facilities used in the manufacture of petrochemical and petroleum refining products. This includes process equipment (e.g. reactors, vessels, piping, furnaces, boilers, pumps, compressors, exchangers, cooling towers, refrigeration systems, etc.), storage tanks, active warehouses, ancillary support areas (e.g. boiler houses and waste water treatment plants), on-site remediation facilities, and distribution piping under control of the Company.

- 2) Frac tanks, unlike vac trucks, tanker trucks and railcars, don't need to be connected to the process to be part of the process. This is because they are not mobile storage. While the tanks are mobile, they are not delivered full or shipped full. Therefore, active staging does not apply to frac tanks. In other words, if the leak occurs while not connected, an argument cannot be made that they are in transportation. They are only used for additional "on-site storage".

#### 3.1.3

active staging

Truck or rail cars waiting to be unloaded where the only delay to unloading is associated with physical limitations with the unloading process (e.g. number of unloading stations) or the reasonable availability of manpower (e.g. unloading on daylight hours only, unloading Monday through Friday only), and not with any limitations in available volume within the process. Active staging is part of transportation. Any truck or rail cars waiting to be unloaded due to limitations in available volume within the process are considered on-site storage.

- 3) The sodium hydroxide solution in the secondary containment was found to have a pH of 13 which is a strong base.

#### 3.1.2

acids/bases, strong

Substances with pH <1 or >12.5, or more precisely, substances that cause full thickness destruction of intact skin tissue within an observation period up to 60 minutes starting after the exposure time of three minutes or less, consistent with GHS Skin Corrosion Category 1A. [19]



- 4) The injured person can be considered a third party worker versus a contractor/subcontractor.

3.1.49

third-party

Any individual other than an employee, contractor or subcontractor of the Company [e.g. visitors, non-contracted delivery drivers (e.g. UPS, U.S. Mail, Federal Express), residents, etc.].

3.1.9

contractor and subcontractor

Any individual not on the Company payroll, whose exposure hours, injuries, and illnesses occur on site.

- 5) The injury resulted in hospitalization and days away from work.

3.1.10

days away from work injury

Work-related injuries that result in a person being unfit for work on any day after the day of the injury as determined by a physician or other licensed health professional. "Any day" includes rest days, weekend days, vacation days, public holidays, or days after ceasing employment.

3.1.22

hospital admission

Formal acceptance by a hospital or other inpatient health care facility of a patient who is to be provided with room, board, and medical service in an area of the hospital or facility where patients generally reside at least overnight. Treatment in the hospital emergency room or an overnight stay in the emergency room would not by itself qualify as a "hospital admission."

- 6) The LOPC estimated amount will be calculated to determine if it exceeds the threshold amount for a Tier 2 (440 lbs / 41.5 gal) or Tier 1 (4400 lbs / 415 gal).

- 7) The LOPC resulted in a PSE

3.1.7

containment, primary

A tank, vessel, pipe, truck, rail car, or other equipment designed to keep material within it, typically for the purposes of storage, separation, processing, or transfer of material.

3.1.23

loss of primary containment

LOPC

An **unplanned or uncontrolled release of any material from primary containment**, including non-toxic and nonflammable materials (e.g. steam, hot water, nitrogen, compressed CO<sub>2</sub>, or compressed air).

3.1.39

process safety event

PSE

An unplanned or uncontrolled release of any material including non-toxic and non-flammable materials (e.g. steam, hot water, nitrogen, compressed CO<sub>2</sub>, or compressed air) from a process, or an undesired event or condition, that under slightly different circumstances, could have resulted in a release of material.

8) Using an injury basis, the Tier 1 PSE classification is defined as follows:

5.2.1 Tier 1 Definition

A Tier 1 Process Safety Event (T-1 PSE) is a loss of primary containment (LOPC) with the greatest consequence as defined by this RP. **A T-1 PSE is an unplanned or uncontrolled release of any material**, including non-toxic and non-flammable materials (e.g. steam, hot water, nitrogen, compressed CO<sub>2</sub> or compressed air), **from a process that results in one or more of the consequences listed below.**

5.2.2 Tier 1 Consequences

- An employee, contractor or subcontractor “days away from work” injury and/or fatality.
- **A hospital admission and/or fatality of a third-party.**

9) A Tier 1 PSE allows a severity rating which, if applicable, would need to be determined. In this case, it would possibly be 9 points for safety and the release amount is still being estimated.

**Question:** Can you please review this classification and let me know if you support our determinations?

**Response:**

This would be considered a LOPC as you have concluded with your analysis. Tier 1 determination is appropriate due to an employee, contractor or subcontractor “days away from work” injury and/or fatality.

It does not change the conclusion, but a couple clarifications on your analysis:

1. Frac Tank as on-site storage. In this case, since the frac tanks were located at the FCC unit and were filled with caustic for use in the process, they would be considered on-site storage even though they were not directly connected to the process. However, RP 754 Annex E Example 96 describes a situation where a frac tank was used for draining crude oil from equipment. In that example, the frac tank was physically located in the process area, was disconnected from the process, but was awaiting transport to dispose of the drained material. In the example, this was equated to the use of a vacuum truck; therefore, the LOPC was a transportation event rather than a PSE. Example 96 also includes an alternative scenario where the crude oil was to be

transferred back into the process rather than being transported for disposal. In the alternate scenario, the frac tank is considered on-site storage and the LOPC evaluated as a PSE.

2. Frac Tank personnel as contractors or third party. In this case, the LOPC resulted in both a days-away-from-work injury and a hospitalization; therefore, the distinction between contractor and third-party doesn't matter for the Tier determination. However, the Frac Tank workers fit the definition of a contractor or subcontractor better than the definition of a third party. The Frac Tank workers were performing work in the form of setup in the process area; whereas, third-party individuals do not perform work in the process area. The distinction does matter when determining the PSE Severity Weighting. This would suggest 3 points for a contractor/subcontractor rather than 9 points for a third party should be assigned for the safety consequence associated with this event consistent with Table D.1 of the 2<sup>nd</sup> edition of API RP 754.

## 57 Shaking Scrubber Fan April 2019

### **Question:**

At one of our process units, it was discovered that the scrubber fan was shaking at an extremely high and dangerous level. The mounting bracket for the fan had broken. Catastrophic failure, machine damage and human injury were possible.”

Our interpretation: There was no LOPC but we thought this should be reported as Process Safety Event Tier 3 as a challenge to safety systems. The closest reference that can be related to in API RP 754 for a PSE Tier 3 is Item 7.2.2 which is about “Primary Inspection or Testing Results Outside Acceptable Limits. The discovery of the scrubber fan shaking is the “inspection”. The fan shaking at an extremely high and dangerous level with the mounting bracket for fan broken appear to meet the condition that it is outside acceptable limits.

Questions: Do you agree that the incident is a PSE Tier 3 (Challenge to Safety System)?

Or, Would you consider the incident as a PSE Tier 4 (Operating Discipline and Management System Deficiency)?

### **Response:**

I would classify this as a PSE Tier 3 ‘operation outside of safe operating limits’ (Section 7.2.1 of 754). Even though the facility may not have had an established safe operating limit for fan vibration, it could have and maybe should have had one. Another option would be Section 7.2.2, Primary Containment Inspection or Testing Outside of Acceptable Limits. This may be a bit of a stretch since the fan is not ‘primary containment’.

I think a PSE 3 is more appropriate because a Tier 3 PSE typically represents a challenge to the barrier system that progressed along the path to harm but is stopped short of a Tier 1 or Tier 2 PSE consequence. A Tier 4 PSE is meant to be management system type failures or weaknesses.