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AMERICAN PETROLEUM INSTITUTE

GUIDE TO REPORTING PROCESS SAFETY EVENTS

1 GENERAL

1.1 Purpose

The purpose of this document is to provide guidance to refining and petrochemical companies on the collection and reporting of process safety events suitable for nationwide public reporting as defined in the American Petroleum Institute (API) Recommended Practice (RP) 754, Process Safety Performance Indicators for the Refining and Petrochemical Industries, Third Edition.

Disclaimer: This document does not preempt any federal, state or local laws regulating process safety. Therefore, nothing contained in this document is intended to alter or determine a Company’s compliance responsibilities set forth in the OSHA’s Occupational Safety and Health Act of 1970 and/or the OSHA standards themselves, or any other legal or regulatory requirement concerning process safety. The use of the term or concept “process safety” contained in OSHA regulatory requirements, or as the term may be used in other legal or regulatory contexts. In the event of conflict between this document and any OSHA or other legal requirements, the OSHA or other legal requirements should be fully implemented.

1.2 Objective

The objective of this survey is to collect information on Tier 1 and Tier 2 Process Safety Events (PSEs) as defined in API RP 754 in order to drive performance improvement.

1.3 Applicability

NOTE At joint venture sites and tolling operations, the Company should encourage the joint venture or tolling operation to consider applying this RP.

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 (see Note). 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.

NOTE To enable consistent application of this RP to other refining and petrochemical industry subsegments, informative annexes have been created to define the Applicability and Process definition for those subsegments. The user would substitute the content of those annexes for the referenced sections of this RP: Annex A—Petroleum Pipeline and Terminal Operation, Annex B—Retail Service Stations, Annex C—Oil and Gas Drilling and Production Operations.

This RP applies to the responsible party. At co-located facilities (e.g. industrial park), this RP 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) releases from transportation pipeline operations occurring 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;

   NOTE The boundary between marine transport operations and in the process of connecting to or disconnecting from the process is the first/last step in loading/unloading procedure (e.g. first line ashore, last line removed, etc.).

c) truck or rail transport 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 1 Active staging is not part of connecting or disconnecting to the process; active staging is not considered on-site storage; active staging is part of transportation.

   NOTE 2 The boundary between truck or rail transport operations and in the process of connecting to or disconnecting from the process is the first/last step in loading/unloading procedure (e.g. wheel chocks, set air
brakes, disconnect master switch, etc.).

d) vacuum truck operations, except on-site truck loading or discharging operations, or use of the vacuum truck transfer pump;

e) routine emissions from permitted or regulated sources;

NOTE Upset emissions are evaluated as possible Tier 1 or Tier 2 PSEs per 5.2 and 6.2.

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 or exposure to a LOPC event;

h) LOPC events from ancillary equipment not connected to the process;

i) quality assurance (QA), quality control (QC), and research and development (R&D) laboratories (pilot plants are included);

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;

k) retail service stations; and

l) on-site fueling operations of mobile and stationary equipment (e.g. pick-up trucks, diesel generators, and heavy equipment).

2 DEFINITIONS

For the purposes of this survey, the following definitions apply:

2.1 acids/bases, moderate

Substances with Globally Harmonized System of Classification and Labeling of Chemicals (GHS) Skin Corrosion Category 1B \(^1\) or substances with pH \(\geq 1\) and \(< 2\), or pH \(> 11.5\) and \(\leq 12.5\). Either definition may be used for classification. The GHS definition is considered more precise for skin corrosion classification; however, the availability of this measurement may preclude its use.

NOTE GHS Skin Corrosion Category 1B \(^1\) is defined as substances that cause destruction of skin tissue, namely visible necrosis through the epidermis and into the dermis in at least one animal following exposure > 3 minutes and \(\leq 1\) hour and observations \(\leq 14\) days.

2.2 acids/bases, strong

Substances with GHS Skin Corrosion Category 1A \(^1\) or substances with pH \(< 1\) or pH \(> 12.5\). Either definition may be used for classification. The GHS definition is considered more precise for skin corrosion classification; however, availability of this measurement may preclude its use.

NOTE GHS Skin Corrosion Category 1A \(^1\) is defined as substances that cause destruction of skin tissue, namely visible necrosis through the epidermis and into the dermis in at least one animal after exposure \(\leq 3\) minutes during an observation period \(\leq 1\) hour.
2.3 acids/bases, weak
Substances with GHS Skin Corrosion Category 1C [1] or substances with a pH ≥ 2 or pH ≤ 11.5. Either definition may be used for classification. The GHS definition is considered more precise for skin corrosion classification; however, availability of this measurement may preclude its use.

NOTE GHS Skin Corrosion Category 1C [1] is defined as substances that cause destruction of skin tissue, namely, visible necrosis through the epidermis and into the dermis in at least one animal after exposures > 1 hour and ≤ 4 hours and observations ≤ 14 days.

2.4 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.

2.5 active warehouse
An on-site building, structure, or designated area that stores raw materials, intermediates, or finished products used or produced by a process.

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.).

2.6 acute environmental cost
Cost of short-term cleanup and material disposal associated with an LOPC with off-site environmental impact.

2.7 Company
When designated with a capital C or "the Company," refers to the operating Company in the refining and petrochemical industries, its divisions, or its consolidated affiliates. As used in this RP, the terms “Company” and “Responsible Party” are synonymous.

2.8 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.

Primary containment also includes closed systems that have a pressure boundary such that there is no exposure of process material to the atmosphere. Where there is a pressure boundary, liquids and vapors are recovered or controlled, and at no time is material directly in contact with the atmosphere. Examples include closed drainage or collection systems, rapid deinventory systems, double-walled tanks, etc.

2.9 containment, secondary
An impermeable physical barrier specifically designed to mitigate the impact of materials that have breached primary containment. Secondary containment systems include but are not limited to tank dikes, curbing around process equipment, open drainage collection systems, trenches, pits, open sumps, the outer wall of open-top double-walled tanks, etc.
2.10 contractor and subcontractor
Any individual not on the Company payroll, whose exposure hours, injuries, and illnesses occur on site.

2.11 days away from work injury
Work-related injuries that result in employee 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.

2.12 deflagration
Propagation of a combustion zone at a velocity that is less than the speed of sound in the unreacted medium.

2.13 deflagration vent
An opening in a vessel or duct that prevents failure of the vessel or duct due to overpressure. The opening is covered by a pressure-relieving cover (e.g. rupture disk, explosion disk or hatch).

2.14 detonation
Propagation of a combustion zone at a velocity that is greater than the speed of sound in the unreacted medium.

2.15 destructive device
A flare, scrubber, incinerator, quench drum or other similar device used to mitigate the potential consequences of an engineered pressure relief [e.g. pressure-relief device (PRD), safety instrumented system (SIS), or manually initiated emergency depressurization] device release.

2.16 direct cost
Fire or explosion direct cost includes the material and labor cost of (1) in-kind repairs, replacement, or restoration of process and non-process equipment and tangible public or private property to pre-event condition whether completed or not, (2) aftermath cleanup, (3) material disposal, and (4) short-term cleanup and material disposal associated with fire/explosion emergency response efforts that result in off-site environmental impact (e.g. fire-fighting foam/water runoff).

Direct cost does not include the cost of (1) emergency response personnel, equipment, materials, and supplies utilized to manage the event or incidental damage caused by the emergency response, (2) engineering or inspection assessments to determine the extent of damage or necessary repairs, (3) opportunity upgrades to materials or technology, (4) superficial or cosmetic only damage that does not affect function or performance to company-owned process and non-process equipment, (5) indirect costs, such as business opportunity, business interruption, fines, and feedstock/product losses, (6) loss of profits due to equipment outages, costs of obtaining or operating temporary facilities, or (7) 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 fire or explosion.

2.17 employee
Any individual on the Company payroll whose exposure hours, injuries, and illnesses are routinely tracked by the Company. Individuals not on the Company payroll, but providing services under direct company supervision are also included (e.g. government sponsored interns, secondees, etc.).
2.18
explosion
A release of energy that causes a pressure discontinuity or blast wave (e.g. detonations, deflagrations, and rapid releases of high pressure, e.g. a sudden phase change of material).

2.19
facility
The buildings, containers, or equipment that contain a process.

2.20
fire
Any combustion resulting from a LOPC, regardless of the presence of flame. This includes smoldering, charring, smoking, singeing, scorching, carbonizing, or the evidence that any of these have occurred.

2.21
flammable gas
Any material that is a gas at 35 °C (95 °F) or less and 101.3 kPa (14.7 psi) of pressure and is ignitable when in a mixture of 13 % or less by volume with air or has a flammable range of at least 12 % as measured at 101.3 kPa (14.7 psi).

2.22
flash point (in petroleum products)
The lowest temperature corrected to a barometric pressure of 101.3 kPa (760 mm Hg), at which application of an ignition source causes the vapors of a specimen of the sample to ignite under specified conditions of test. Test methods include ASTM D92-12b [2], ASTM D93-15 [3], D3941-14 [4], D56-05 [5], or other equivalent test methods appropriate to the material characteristics and flash point range specified in the test procedure.

2.23
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.”

2.24
indoor release
A release within a structure composed of four walls, floor, and roof.

NOTE The potential consequences of indoor releases are magnified due to hazards associated with congestion, confinement, personnel proximity, and limitations on egress. Open doors or windows and powered or natural ventilation systems do not change the definition of indoor.

2.25
loss of primary containment
LOPC
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 CO2, or compressed air).

NOTE The duration of the material release is assessed from the beginning of the release to the end of the release, not from the beginning of the release to the containment or mitigation of the release.
2.26
major construction

Large scale investments with specific, one-time project organizations created for design, engineering, and construction of new or significant expansion to existing process facilities.

2.27
material

Substance with the potential to cause harm due to its chemical (e.g. flammable, toxic, corrosive, reactive, asphyxiating) or physical (e.g. thermal, pressure) properties.

2.28
moderate acids/bases

See acids/bases, moderate.

2.29
normal boiling point

The temperature at which boiling occurs under a pressure of 101.3 kPa (760 mm Hg). Test methods include ASTM E1719-12 [6], ASTM D86-12 [7], or other equivalent test method. For the purpose of this RP, the terms normal boiling point and initial boiling point are considered synonymous.

2.30
office building

Buildings intended to house office workers (e.g. administrative or engineering building, affiliate office complex, etc.).

2.31
officially declared

A declaration by a recognized community official (e.g. fire, police, civil defense, emergency management) or delegate (e.g. Company official) authorized to order the community action (e.g. shelter-in-place, evacuation).

2.32
oil barrel

1 oil barrel = 42 gallons = 0.159 M³.

2.33
pilot plant

An assembly of process equipment that is intended to produce the equivalent of a salable product (whether an actual sale occurs or not). The purpose of a pilot plant is to optimize the chosen chemistry, quantify process parameters to facilitate design and construction of a commercial scale facility, and determine product purity and quality standards.

2.34
precautionary (evacuation, public protective measure, shelter-in-place)

A measure taken from an abundance of caution.

- For example, a company may require all workers to shelter-in-place in response to an LOPC independent of or prior to any assessment (e.g., wind direction, distance from the LOPC, etc.) of the potential hazard to the worker.

- For example, a recognized community official (e.g., fire, police, civil defense, emergency management) may order a community shelter-in-place, evacuation, or public protective measure (e.g., road closure) in the absence of information from a company experiencing a PSE, or 'just in case' the wind direction changes, or due to the sensitive nature of the potentially affected population (e.g., school children, the elderly).
2.35
pressure relief device
PRD
A device designed to open and relieve excess pressure [e.g. safety valve (SV), thermal relief, rupture disk, rupture pin, deflagration vent, pressure/vacuum vents (PV), etc.].

NOTE A PRD discharge is a LOPC due to the nature of the unplanned release. The PRD discharge is evaluated against the consequence criteria to determine if it is a Tier 1 or Tier 2 PSE.

2.36
primary containment
See containment, primary.

2.37
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, associated ancillary equipment, etc.), storage tanks, active warehouses, support areas (e.g. boiler houses and wastewater treatment plants), on-site remediation facilities, and distribution piping under control of the Company.

2.38
process safety
A disciplined framework for managing the integrity of hazardous operating systems and processes by applying good design principles, engineering, and operating and maintenance practices.

It deals with the prevention and control of events that have the potential to release hazardous materials or energy. Such events can cause toxic effects, fire, or explosion and could ultimately result in serious injuries, property damage, lost production and environmental impact.

2.39
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 CO₂, 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.

2.40
public receptors
Off-site residences, institutions (e.g. schools, hospitals), industrial, commercial, and office buildings, parks, or recreational areas where members of the public could potentially be exposed to toxic concentrations, radiant heat, or overpressure, as a result of a LOPC.

2.41
rainout
Two-phase relief (vapor and entrained liquid) from a vent or relief device with the vapor phase dispersing to the atmosphere and the remaining liquid falling to grade or ground or the evidence that the remaining liquid has fallen to grade or ground.
2.42
recordable injury
A work-related injury that results in any of the following: death, days away from work, restricted work or transfer to another job, medical treatment beyond first aid, loss of consciousness or a significant injury diagnosed by a physician or other licensed health professional. This is an abridged version of the definition used to report days away from work injuries for OSHA [8].

2.43
Research and Development (R&D) laboratory
A facility that provides controlled conditions in which scientific or technological research, experiments, and measurement may be performed.

2.44
responsible party
The party charged with operating the facility in a safe, compliant, and reliable manner is the responsible party. In some countries or jurisdictions, the responsible party may be called the ‘duty holder’ or the party with regulatory reporting responsibility. As used in this RP, the terms “Responsible Party” and “Company” are synonymous.

NOTE   The responsible party is determined prior to any PSE. The responsible party could be the facility owner or the facility operator depending upon the relationship between the two. Is the owner or the operator responsible for the performance of the facility? Who is responsible for developing and implementing prevention programs? Who is responsible for performing the investigation and identifying and implementing corrective action following a PSE?

2.45
safety instrumented system
SIS
An instrumented protection layer whose purpose is to take the process to a safe state when predetermined conditions are violated.

2.46
secondary containment
See containment, secondary.

2.47
shelter-in-place
The use of a structure or portion of a structure and its indoor atmosphere to temporarily separate individuals from a potentially hazardous outdoor atmosphere.

2.48
strong acids/bases
See acids/bases, strong.

2.49
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.].

2.50
tolling operation
A company with specialized equipment that processes raw materials or semi-finished goods for another company.
2.51
total work hours

Total employee, contractor, and subcontractor hours at a facility worked minus the hours associated with any major construction projects (see 3.1.27 of API 754 for definition) at that facility. This is the same number typically used to calculate a facility occupational injury and illness rate.

NOTE Total work hours is used as a normalizing factor to calculate a process safety event rate. The normalized rate data can then be used to compare the performance of various size and complexity facilities, the performance of different industry sectors, and performance over time. Subtracting major construction hours from the total work hours for a facility prevents an anomaly in the rate data due to these limited duration projects with work hours that could significantly exceed the traditional work hours at a facility.

2.52
United Nations Dangerous Goods (UNDG)

A classification system used to evaluate the potential hazards of various chemicals when released, which is used by most international countries as part of the product labeling or shipping information [9]. In the United States, these hazard categories are defined in U.S. DOT 49 CFR 173.2a [10] and listed in U.S. DOT 49 CFR 172, Subpart B [11].

2.53
UNDG Class 2, Division 2.2 (non-flammable, non-toxic gases)

Non-flammable, non-toxic gases (corresponding to the groups designated asphyxiant or oxidizing), excluding air.

Asphyxiant – Gases which are non-oxidizing, non-flammable, and non-toxic, which dilute or replace oxygen normally in the atmosphere.

Oxidizing – Gases, which may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does. These gases are pure gases or gas mixtures with an oxidizing power greater than 23.5% as determined by a method specified in ISO 10156:2010(E) [12].

2.54
unsafe location

An atmospheric PRD or upset emission discharge or a downstream destructive device (e.g. flare, scrubber) discharge that results in a potential hazard to personnel, whether present or not, due to the formation of flammable mixtures at ground level or on elevated work structures, presence of toxic or corrosive materials at ground level or on elevated work structures, or thermal radiation effects at ground level or on elevated work structures from ignition of relief streams at the point of emission as specified in API 521, Section 5.8.4.4. [13]

Excluded from the definition of an unsafe location are those ground level and elevated work structure locations that have a known potential for exposure of personnel to flammable mixtures, toxic substances, corrosive materials, or thermal radiation effects if access to those locations is controlled by virtue of authorized access or hard barriers with appropriate warning signs.

NOTE The term “unsafe location” is used in the description of one of the four potential Tier 1 or Tier 2 consequences associated with an engineered pressure relief or an upset emission from a permitted or regulated source. The assumption is the discharge from the engineered pressure relief whether directly to atmosphere or via a downstream destructive device or the emission from a permitted or regulated source are engineered for safe dispersion of the release.

2.55
upset emission

Any condition that exceeds the documented permit parameters or conditions associated with routine emission from a permitted or regulated source. This could include process parameters such as temperature, pressure, volume, rate, concentration, and duration or release conditions such as timing, location, day/night, wind speed/direction, and simultaneous operations.

NOTE Upset emission applies to specific identified assets (e.g. furnace stacks) and not general or fugitive emission sources (e.g. seals, packing) that are covered under blanket or site-wide permitting.
2.56
weak acids/bases
See acids/bases, weak.

3 REPORTABLE PROCESS SAFETY EVENT

A reportable PSE is an unplanned or uncontrolled release of any material including non-toxic and non-flammable materials (e.g., steam, hot water, nitrogen, compressed CO₂, or compressed air) from a process that meets the definitions for Tier 1 or Tier 2 Indicators below.

3.1 Tier 1 Indicator Definition and Consequences

A Tier 1 PSE is a LOPC with the greatest consequence as defined by this RP. A Tier 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 CO₂ or compressed air), from a process that results in one or more of the consequences listed below.

NOTE 1 Some non-toxic and non-flammable materials (e.g. steam, hot water, or compressed air) have no threshold quantities and are only included in this definition because of their potential to result in one of the other consequences.

NOTE 2 A PRD, SIS, or manually initiated emergency depressure discharge is a LOPC due to the unplanned nature of the release. The determination of Tier 1 PSE is based upon the criteria described below.

NOTE 3 An internal fire or explosion that causes a LOPC from a process triggers an evaluation of the Tier 1 consequences. The LOPC does not have to occur first.

− 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 including precautionary community evacuation or community shelter-in-place;
− fire or explosion damage greater than or equal to $100,000 of direct cost;
− 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 in any 1-hour period, to atmosphere whether directly or via a downstream destructive device that results in one or more of the following four consequences. The threshold quantity determination is made at the discharge of the engineered PRD, while the consequence is determined when the material reaches atmosphere whether directly or via a downstream destructive device.
  • 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.
− an upset emission from a permitted or regulated source, of a quantity greater than or equal to the threshold quantities in Table 1 in any 1-hour period, 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.
− an unignited release of material greater than or equal to the threshold quantities described in Table 1 in any 1-hour period, excluding engineered pressure-relief discharges and upset emissions from permitted or regulated sources.
NOTE 1 In determining the threshold release category (TRC), a Company may choose to use either the properties of the released material based upon laboratory analysis at the time of release or the properties documented in a safety data sheet (SDS). Companies should be consistent in their approach for all LOPCs.

NOTE 2 The material hazard classification in this document is not related to piping service classes in API 570 nor any other material class descriptions in other API documents.

NOTE 3 Engineered pressure-relief discharges and upset emissions from permitted or regulated sources are special-case LOPCs with their own criteria for classification as a Tier 1 PSE.

Tables E.1 through E.16 in Annex E of API RP 754, PSE Examples and Questions, provide a wide variety of examples to assist companies in determining the proper classification of Tier 1.

Figure H.1 in Annex H of API RP 754, PSE Tier 1/Tier 2 Determination Decision Logic Tree, provides a flowchart to assist companies in determining if a LOPC is a Tier 1 or Tier 2 PSE.

Table 1 (Tier 1 and Tier 2 threshold release quantities) is organized by TRCs. Each TRC lists the specific materials included in that category using one of two material hazard classification descriptions. Option 1 primarily uses toxic inhalation hazard (TIH), DOT, and UNDG language, while Option 2 primarily utilizes GHS language. For each material involved in a LOPC, a company will determine the TRC and the corresponding threshold release quantity using one of these two descriptors. The two material hazard classification options are substantially, but not exactly, equivalent for some materials. As a result, a company may choose either option, but once chosen, they should apply that option consistently to all LOPC classifications.

When using material hazard classification Option 1 to determine the TRC, a company should first use the toxic, flammable, or corrosive characteristic of the material. If the TRC cannot be determined from these characteristics, then and only then is the packing group descriptor used.

Released materials may represent more than one hazard type (e.g. toxic, flammable, corrosive) dependent upon its composition and physical state. Annex G, Application of TRCs to Multicomponent Releases, describes the rule set for determining the TRC for a variety of multicomponent streams. When a single component has multiple hazards (e.g. toxic and flammable), the TRC category that gives the most severe tier rating should be used. Additionally, Annex F describes the process for assigning packing groups and TIH zones based upon flammability and toxicity information.

In determining the TRC, a Company may choose to use either the properties of the released material based upon laboratory analysis at the time of release, or the properties documented in a SDS. Companies should be consistent in their approach for all LOPCs.

3.2 Tier 2 Indicator Definition and Consequences

A Tier 2 PSE is a LOPC with lesser consequence. A Tier 2 PSE is an unplanned or uncontrolled release of any material, including non-toxic and non-flammable materials (e.g. steam, hot water, nitrogen, compressed CO2, or compressed air), from a process that results in one or more of the consequences listed below and is not reported as a Tier 1 PSE.

NOTE 1 Some non-toxic and non-flammable materials (e.g. steam, hot water, or compressed air) have no threshold quantities and are only included in this definition because of their potential to result in one of the other consequences.

NOTE 2 A PRD, SIS, or manually initiated emergency depressure discharge is a LOPC due to the unplanned nature of the release. The determination of Tier 2 PSE is based upon consequences and threshold quantities described below.

NOTE 3 An internal fire or explosion that causes a LOPC from a process triggers an evaluation of the Tier 2 consequences. The LOPC does not have to occur first.

− an employee, contractor or subcontractor recordable injury;
− a fire or explosion damage greater than or equal to $2,500 of direct cost;

NOTE Some companies rather than performing a detailed estimate use a simple rule-of-thumb to determine if the direct cost exceeded $2500: if the damage requires repair, then the direct cost is often at least $2500.

− an engineered pressure-relief (PRD, SIS, or manually initiated emergency depressure) device discharge, of a quantity greater than or equal to the threshold quantities in Table 1 in any 1-hour period, to atmosphere whether directly or via a downstream destructive device that results in one or more of the following four consequences. The threshold quantity determination is made at the discharge of the engineered PRD, while the consequence is determined when the material reaches atmosphere whether directly or via a downstream
destructive device.

- 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.

- an upset emission from a permitted or regulated source, of a quantity greater than or equal to the threshold quantities in Table 1 in any one-hour period, 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.

- an unignited release of material greater than or equal to the threshold quantities described in Table 1 in any 1-hour period, excluding engineered pressure-relief discharges and upset emissions from permitted or regulated sources.

NOTE 1 In determining the TRC, a Company may choose to use either the properties of the released material based upon laboratory analysis at the time of release or the properties documented in a SDS. Companies should be consistent in their approach for all LOPCs.

NOTE 2 The material hazard classification in this document is not related to piping service classes in API 570 nor any other material class descriptions in other API documents.

NOTE 3 Engineered pressure-relief discharges and upset emissions from permitted or regulated sources are special-case LOPCs with their own criteria for classification as a Tier 2 PSE.

Tables E.1 through E.16 in Annex E of API RP 754, PSE Examples and Questions, provide a wide variety of examples to assist companies in determining the proper classification of Tier 2.

Figure H.1 in Annex H of API RP 754, PSE Tier 1/Tier 2 Determination Decision Logic Tree, provides a flowchart to assist companies in determining if a LOPC is a Tier 1 or Tier 2 PSE.

### 3.3 Calculation of a PSE Rate

The Tier 1 PSE Rate shall be calculated as follows:

\[
\text{Tier 1 PSE Rate } 200,000 = \left( \frac{\text{Total Tier 1 PSE Count}}{\text{Total Work Hours}} \right) \times 200,000, \text{ or} \\
\text{Tier 1 PSE Rate } 1,000,000 = \left( \frac{\text{Total Tier 1 PSE Count}}{\text{Total Work Hours}} \right) \times 1,000,000
\]

The Tier 2 PSE Rate shall be calculated as follows:

\[
\text{Tier 2 PSE Rate } 200,000 = \left( \frac{\text{Total Tier 2 PSE Count}}{\text{Total Work Hours}} \right) \times 200,000 \\
\text{Tier 2 PSE Rate } 1,000,000 = \left( \frac{\text{Total Tier 1 PSE Count}}{\text{Total Work Hours}} \right) \times 1,000,000
\]

The choice of calculating PSE Rate utilizing either a 200,000 or 1,000,000 man hour multiplier should be consistent with the basis for calculating the Company’s occupational injury rate or public reporting conventions.

NOTE 1 Total Work Hours was chosen as the normalizing factor for PSE Rate as a balance between ready availability of the data, relevance to harm, and applicability to various refining and petrochemical operations. Other suggested normalizers such as throughput, Dow Fire and Explosion Index, etc. did not strike this balance. Total Work Hours includes employees and contractors (see 3.1.52 of API RP 754 for definition).

NOTE 2 If a company chooses to calculate an aggregated PSE Rate for their organization (e.g. segment, region, corporate), they would do so by aggregating the Total Work Hours and the PSE Count of the facilities included in the aggregation.
The choice of calculating PSE Rate utilizing either a 200,000 or 1,000,000 work hour multiplier should be consistent with the basis for calculating the Company’s occupational injury rate.

4 REPORTING TO API

During the first quarter of each calendar year, participating companies will be asked to submit data for the previous calendar year. The annual report will provide the information contained in Appendix B of this document.

An annual Process Safety Report will be issued annually by API. It will present aggregate industry data that will reflect the total number of events for U.S. refining facilities. The report will also contain a brief explanation of the data and its overall meaning.

5 REFERENCES

For complete information on Tier 1 and Tier 2 Process Safety Indicator Definitions and examples of PSEs:


For more information on chemical listings:


## APPENDIX A

### Table 1—Material Release Threshold Quantities

<table>
<thead>
<tr>
<th>Threshold Release Category</th>
<th>Material Hazard Classification Option 1</th>
<th>Material Hazard Classification Option 2</th>
<th>Tier 1</th>
<th>Tier 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRC 1</td>
<td>TIH Zone A materials</td>
<td>H330 Fatal if inhaled, acute toxicity, inhalation (ch. 3.1) (cat. 1)</td>
<td>(\geq 5 \text{ kg (11 lb)})</td>
<td>(\geq 0.5 \text{ kg (1.1 lb)})</td>
</tr>
<tr>
<td>TRC 2</td>
<td>TIH Zone B materials</td>
<td>H330 Fatal if inhaled, acute toxicity, inhalation (ch. 3.1) (cat. 2)</td>
<td>(\geq 25 \text{ kg (55 lb)})</td>
<td>(\geq 2.5 \text{ kg (5.5 lb)})</td>
</tr>
<tr>
<td>TRC 3</td>
<td>TIH Zone C materials</td>
<td>H331 Toxic if inhaled, acute toxicity, inhalation (ch. 3.1) (cat. 3)</td>
<td>(\geq 100 \text{ kg (220 lb)})</td>
<td>(\geq 10 \text{ kg (22 lb)})</td>
</tr>
<tr>
<td>TRC 4</td>
<td>TIH Zone D materials</td>
<td>H332 Harmful if inhaled, acute toxicity, inhalation (ch. 3.1) (cat. 4)</td>
<td>(\geq 200 \text{ kg (440 lb)})</td>
<td>(\geq 20 \text{ kg (44 lb)})</td>
</tr>
<tr>
<td>TRC 5</td>
<td>Flammable gases</td>
<td>H220 Extremely flammable gas, flammable gases (ch. 2.2) (cat. 1A)</td>
<td>(\geq 500 \text{ kg (1100 lb)})</td>
<td>(\geq 50 \text{ kg (110 lb)})</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H221 Flammable gas, flammable gases (ch. 2.2) (cat. 1B,2)</td>
<td>(\geq 50 \text{ kg (110 lb)})</td>
<td>(\geq 25 \text{ kg (55 lb)})</td>
</tr>
<tr>
<td></td>
<td>Liquids with normal boiling point (\leq 35 \degree \text{C (95 \degree F)}) and flash point (&lt; 23 \degree \text{C (73 \degree F)})</td>
<td>H224 Extremely flammable liquid and vapor, flammable liquids (ch. 2.6) (cat. 1)</td>
<td>(\geq 20 \text{ kg (44 lb)})</td>
<td>(\geq 20 \text{ kg (44 lb)})</td>
</tr>
<tr>
<td></td>
<td>Other Packing Group I materials (excluding acids/bases and excluding UNDG Class 1; Class 2.2; Class 4.2; Class 4.3; Class 7; and Class 9 materials)</td>
<td>H228 Flammable solid, flammable solids (ch. 2.7) (cat. 1,2)</td>
<td>(\geq 50 \text{ kg (110 lb)})</td>
<td>(\geq 50 \text{ kg (110 lb)})</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H230 May react explosively even in the absence of air, flammable gases (ch. 2.2) (chemically unstable gas cat. A)</td>
<td>(\geq 50 \text{ kg (110 lb)})</td>
<td>(\geq 50 \text{ kg (110 lb)})</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H231 May react explosively even in the absence of air at elevated pressure and/or temperature, flammable gases (ch. 2.2) (chemically unstable gas cat. B)</td>
<td>(\geq 50 \text{ kg (110 lb)})</td>
<td>(\geq 25 \text{ kg (55 lb)})</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H232 May ignite spontaneously if exposed to air, flammable gases (ch. 2.2) (cat. 1A pyrophoric gas)</td>
<td>(\geq 50 \text{ kg (110 lb)})</td>
<td>(\geq 25 \text{ kg (55 lb)})</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H250 Catches fire spontaneously if exposed to air, pyrophoric liquids and pyrophoric solids (ch. 2.9 &amp; 2.10) (cat. 1)</td>
<td>(\geq 50 \text{ kg (110 lb)})</td>
<td>(\geq 25 \text{ kg (55 lb)})</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H310 Fatal in contact with skin, acute toxicity, dermal (ch. 3.1) (cat. 1)</td>
<td>(\geq 50 \text{ kg (110 lb)})</td>
<td>(\geq 25 \text{ kg (55 lb)})</td>
</tr>
<tr>
<td>Threshold Release Category</td>
<td>Material Hazard Classification Option 1</td>
<td>Material Hazard Classification Option 2</td>
<td>Tier 1</td>
<td>Tier 2</td>
</tr>
<tr>
<td>----------------------------</td>
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<td>----------------------------------------</td>
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</tr>
<tr>
<td>TRC 6</td>
<td>Liquids with normal boiling point $&gt;35$ °C (95 °F) and flash point $&lt;23$ °C (73 °F)</td>
<td>H225 Highly flammable liquid and vapor, flammable liquids (ch. 2.6) (cat. 2)</td>
<td>≥ 1000 kg (2200 lb) or ≥ 7 oil bbl</td>
<td>≥ 1000 kg (2200 lb) or ≥ 0.7 oil bbl</td>
</tr>
<tr>
<td></td>
<td>Crude oil $&gt;15$ API Gravity (unless actual flash point available)</td>
<td>Crude oil $&gt;15$ API Gravity (unless actual flash point available)</td>
<td>≥ 100 kg (220 lb) or ≥ 0.7 oil bbl</td>
<td>≥ 50 kg (110 lb) or ≥ 0.35 oil bbl</td>
</tr>
<tr>
<td></td>
<td>Other Packing Group II materials (excluding acids/bases and excluding UNDG Class 1; Class 2.2; Class 4.2; Class 4.3; Class 7; and Class 9 materials)</td>
<td>H240 Heating may cause an explosion, self-reactive substances and mixtures and organic peroxides (ch. 2.8 &amp; 2.15) (type A) H241 Heating may cause a fire or explosion, self-reactive substances and mixtures and organic peroxides (ch. 2.8 &amp; 2.15) (type B) H242 Heating may cause a fire, self-reactive substances and mixtures and organic peroxides (ch. 2.8 &amp; 2.15) (types C–F) H271 May cause fire or explosion; strong oxidizer, oxidizing liquids and oxidizing solids (ch. 2.13 &amp; 2.14) (cat. 1) H310 Fatal in contact with skin, acute toxicity, dermal (ch. 3.1) (cat. 2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRC 7</td>
<td>Liquids with flash point $≥23$ °C (73 °F) and $≤60$ °C (140 °F)</td>
<td>H226 Flammable liquid and vapor, flammable liquids (ch. 2.6) (cat. 3)</td>
<td>≥ 2000 kg (4400 lb) or ≥ 14 oil bbl</td>
<td>≥ 100 kg (220 lb) or ≥ 0.7 oil bbl</td>
</tr>
<tr>
<td></td>
<td>Liquids with flash point $&gt;60$ °C (140 °F) released at a temperature at or above flash point</td>
<td>H227 Combustible liquid, flammable liquids (ch. 2.6) (cat. 4) [**Released at a temperature at or above flash point **] Liquids with flash point $&gt;93$ °C (200 °F) released at a temperature at or above flash point</td>
<td>≥ 200 kg (440 lb) or ≥ 1.4 oil bbl</td>
<td>≥ 100 kg (220 lb) or ≥ 0.7 oil bbl</td>
</tr>
<tr>
<td></td>
<td>Crude oil $&lt;15$ API Gravity (unless actual flash point available)</td>
<td>Crude oil $&lt;15$ API Gravity (unless actual flash point available)</td>
<td>or ≥ 1.4 oil bbl</td>
<td>or ≥ 0.7 oil bbl</td>
</tr>
<tr>
<td></td>
<td>UNDG Class 2, Division 2.2 (non-flammable, non-toxic gases) excluding air</td>
<td>H270 May cause or intensify fire; oxidizer oxidizing gases (ch. 2.4) (cat. 1) UNDG Class 2, Division 2.2 (non-flammable, non-toxic gases) excluding air</td>
<td>or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other Packing Group III materials (excluding acids/bases and excluding UNDG Class 1; Class 2.2; Class 4.2; Class 4.3; Class 7; and Class 9 materials)</td>
<td>H272 May intensify fire; oxidizer, oxidizing liquids and oxidizing solids (ch. 2.13 &amp; 2.14) (cat. 2,3) H311 Toxic in contact with skin, acute toxicity, dermal (ch. 3.1) (cat. 3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threshold Release Category</td>
<td>Material Hazard Classification Option 1</td>
<td>Material Hazard Classification Option 2</td>
<td>Tier 1</td>
<td>Tier 2</td>
</tr>
<tr>
<td>---------------------------</td>
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<td>------------------------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>TRC 8</td>
<td>Liquids with flash point &gt; 60 °C (140 °F) and ≤ 93 °C (200 °F) released at a temperature below flash point</td>
<td>H227 Combustible liquid, flammable liquids (ch. 2.6) (cat. 4) [*Released at a temperature below flash point **]</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Strong acids/bases (see definition 3.1.2)</td>
<td>H314 Causes severe skin burns, skin corrosion/irritation (ch. 3.2) (cat. 1A)</td>
<td>≥ 1000 kg (2200 lb) or</td>
<td>≥ 500 kg (1100 lb) or</td>
</tr>
<tr>
<td></td>
<td>No equivalent</td>
<td>H370 Causes damage to organs, specific target organ toxicity, single exposure (ch. 3.8) (cat. 1)</td>
<td>≥ 7 oil bbl</td>
<td>≥ 3.5 oil bbl</td>
</tr>
</tbody>
</table>

NOTE 1  It is recognized that threshold quantities given in kg or lb and bbl are not exactly equivalent. Companies should select one of the pair and use it consistently for all recordkeeping activities.

NOTE 2 Refer to 5.2.3 for guidance on selecting the correct TRC and the use of material hazard classification Option 1 and Option 2.
APPENDIX B

PSE DATA CAPTURE INFORMATION

Facility Information
The following information shall be captured for each facility:

a) type of facility (NAICS or equivalent international code);
b) corporate name;
c) company name (if different);
d) facility location/name (country, state/province, city, facility name);
e) facility identifier(s) (unique number(s) assigned by data collection groups);
f) total work hours:
   1) total hours worked by employees, and
   2) total hours worked by contractors and subcontractors.

Tier 1 PSE Information
The following information shall be captured for each Tier 1 PSE:

a) facility identifier;
b) Tier 1 PSE consequences/triggers, each Tier 1 PSE will have one or more of the following consequences (check all that apply):

   NOTE Since a Tier 1 Process Safety Event can result in one or more consequences, the total count of consequences will be equal to or greater than the total count of Tier 1 PSEs.

   1) an employee, contractor, or subcontractor “days away from work” injury and/or fatality:
      i) number of employee days away from work injuries,
      ii) number of employee fatalities,
      iii) number of contractor or subcontractors days away from work injuries,
      iv) number of contractor or subcontractor fatalities;

   2) a third party (non-employees/contractor, community members) hospital admission and/or fatality:
      i) number of third-party hospital admissions,
      ii) number of third-party fatalities;

   3) an officially declared community evacuation or community shelter-in-place including precautionary community evacuation or community shelter-in-place;

   4) a fire or explosion causing $100,000 or more in direct cost:
      i) fire,
      ii) explosion;

   5) 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 in any one-hour period, to atmosphere whether directly or via a downstream destructive device (check one):
      i) PRD, SIS, or manually initiated emergency depressure device directly to atmosphere,
      ii) PRD, SIS, or manually initiated emergency depressure device to atmosphere via a downstream destructive device;

    that results in one or more of the following four consequences (check all that apply):
    i) rainout,
    ii) discharge to a potentially unsafe location,
    iii) an on-site shelter-in-place or on-site evacuation, excluding precautionary on-site shelter-in-place or on-site evacuation,
    iv) public protective measures (e.g., road closure) including precautionary public protective measures;
6) an upset emission from a permitted or regulated source, of a quantity greater than or equal to the threshold quantities in Table 1 in any one-hour period, that results in one or more of the following four consequences (check all that apply):
   i) rainout;
   ii) discharge to a potentially unsafe location;
   iii) an on-site shelter-in-place or on-site evacuation, excluding precautionary on-site shelter-in-place or on-site evacuation;
   iv) public protective measures (e.g., road closure) including precautionary public protective measures.

7) a release of flammable, combustible, toxic, corrosive, or UNDG Class 2, Division 2.2 material from primary containment (check one):
   i) Tier 1 (Table 1) TRC 1,
   ii) Tier 1 (Table 1) TRC 2,
   iii) Tier 1 (Table 1) TRC 3,
   iv) Tier 1 (Table 1) TRC 4,
   v) Tier 1 (Table 1) TRC 5,
   vi) Tier 1 (Table 1) TRC 6,
   vii) Tier 1 (Table 1) TRC 7.

Release location (check one):
   (a) outdoor release,
   (b) indoor release.

8) Tier 1 PSE severity weight

Tier 2 PSE Information

The following information shall be captured for each Tier 2 PSE:

a) facility identifier;

b) Tier 2 PSE consequences/triggers; each Tier 2 PSE will have one or more of the following consequences (check all that apply):

   NOTE Since a Tier 2 Process Safety Event can result in one or more consequences, the total count of consequences will be equal to or greater than the total count of Tier 2 PSEs.

   1) an employee, contractor, or subcontractor recordable injury:
      i) number of employee recordable injuries,
      ii) number of contractor or subcontractor recordable injuries;

   2) a fire or explosion causing $2,500 or more in direct cost:
      i) fire,
      ii) explosion;

   3) an engineered pressure relief (PRD, SIS, or manually initiated emergency depressure) discharge, of a quantity greater than or equal to the threshold quantities in Table 2 in any one-hour period to atmosphere whether directly or via a downstream destructive device (check one):
      i) PRD, SIS, or manually initiated emergency depressure device directly to atmosphere,
      ii) PRD, SIS, or manually initiated emergency depressure device to atmosphere via a downstream destructive device;

that results in one or more of the following four consequences (check all that apply):

   i) rainout,
   ii) discharge to a potentially unsafe location,
   iii) an on-site shelter-in-place or on-site evacuation excluding precautionary on-site shelter-in-place or precautionary on-site evacuation,
   iv) public protective measures (e.g., road closure) including precautionary public protective measures;
4) an upset emission from a permitted or regulated source, of a quantity greater than or equal to the threshold quantities in Table 2 in any one-hour period, that results in one or more of the following four consequences (check all that apply):
   i) rainout;
   ii) discharge to a potentially unsafe location;
   iii) an on-site shelter-in-place or on-site evacuation, excluding precautionary on-site shelter-in-place or on-site evacuation;
   iv) public protective measures (e.g., road closure) including precautionary public protective measures.

5) a release of flammable, combustible, toxic, corrosive, or UNDG Class 2, Division 2.2 material from primary containment (check one):
   i) Tier 2 (Table 2) TRC 1,
   ii) Tier 2 (Table 2) TRC 2,
   iii) Tier 2 (Table 2) TRC 3,
   iv) Tier 2 (Table 2) TRC 4,
   v) Tier 2 (Table 2) TRC 5,
   vi) Tier 2 (Table 2) TRC 6,
   vii) Tier 2 (Table 2) TRC 7
   viii) Tier 2 (Table 2) TRC 8.

Release location (check one):
   i) outdoor release,
   ii) indoor release.

**PSE Related Information**

The following information is useful in data analysis and shall be captured for each Tier 1 and Tier 2 PSE:

a) Date and Time of Event
b) Event Description
   i. Briefly describe “what happened” and “why”. For example: “Leak on a fractionator reflux line due to external corrosion caused from a leak in a process water line dripping on the reflux line.” Another example: “LOPC from overfilling a small caustic tank due to malfunctioning level indication.”

c) Comments (optional)
d) Type of Process:
   a. Refining:
      i. Active Warehouse
      ii. alkylation, hydrofluoric (HF)
      iii. Alkylation, Sulfuric
      iv. Bitumen / Resid / Asphalt
      v. Calcining
      vi. Coking
      vii. Crude / Vacuum Distillation
      viii. Fluid Catalytic Cracking (FCC)
      ix. Flares / Flare Systems / Flare Gas Recovery
      x. Gas and Liquid Desulfurization / Treating (H₂S absorbers, amine systems, Merox)
      xi. Hydrogen
      xii. Hydrotreating
      xiii. Hydrocracking
      xiv. Isomerization
      xv. Loading / Unloading / Truck / Rail / Transport Vessel
      xvi. Marine / Jetty / Wharf
xvii. Pilot Plant
xviii. Reforming
xix. Sulfur Recovery
xx. Tank Farm / Storage Facility / Off-sites / Storage and Transfer Piping
xxi. Utilities / Steam Plant / Cogeneration
xxii. Vapor Recovery/Light Ends
xxiii. Sewer / Lift Station / Wastewater Handling, Treatment, or Disposal
xxiv. Other (describe)
b. Petrochemical:
   i. Acetic Acid and Derivatives
   ii. Active Warehouse
   iii. Amines Derivatives
   iv. Aromatics Derivatives (cumene, dis-proportionation, aromatic isomerization, linear alkylbenzene)
   v. Benzene
   vi. Butadiene
   vii. Butane
   viii. Cyclohexane
   ix. Dehydrogenation (propylene, butylenes)
   x. Diisocyanates (TDA, MDA, IPDA, etc.)
   xi. ETBE
   xii. Ethane
   xiii. Ethanol
   xiv. Ethyl Benzene and Derivatives
   xv. Ethylene and Derivatives
   xvi. Ethylene Dichloride and Derivatives
   xvii. Ethylene Oxide
   xviii. Flares / Flare Systems / Flare Gas Recovery
   xix. Formaldehyde and Derivatives
   xx. Glycols (ethylene, propylene)
   xxi. Hexane
   xii. Hexanol
   xxiii. Isobutane
   xxiv. Isobutene
   xxv. Isocyanates
   xxvi. Isopropanol
   xxvii. LNG
   xxviii. Loading / Unloading / Truck / Rail / Transport Vessel
   xxix. Methane
   xxx. Methanol
   xxi. Methyl Mercaptan
   xxxii. MTBE
   xxxiii. NGL Fractionation
   xxxiv. Paraxylene
   xxxv. Pentane
   xxxvi. Phenol
   xxxvii. Pilot Plant
xxxviii. Polyethylene
xxxix. Polypropylene
xl. Polystyrene
xli. Propane
xlii. Propylene
xliii. Propylene Oxide and Derivatives
xliv. Sewer / Lift Station / Wastewater Handling, Treatment or Disposal
xlv. Specialty Chemicals
xlvi. Styrene-Butadiene
xlvii. Synthesis Gas (CO, H2)
xlviii. Tank Farm / Storage Facility / Offsites / Storage and Transfer Piping
xlix. Toluene
   i. Utilities / Steam Plant / Cogeneration
   ii. Xylene
   iii. Other (describe)
l. Utilities / Steam Plant / Cogeneration
li. Xylene
lii. Other (describe)
e) Mode of Operation:
   a. Start-up
   b. Planned Shutdown
   c. Emergency Shutdown
   d. Normal (check one):
      i. Changing Lineups
      ii. Equipment Commissioning / Putting in Service Following Maintenance
      iii. Equipment Preparation / Taking Out of Service for Maintenance
      iv. Filling / Draining
      v. Loading / Unloading
      vi. Mixing / Handling Chemicals
      vii. Operator Performed Maintenance
      viii. Sampling
      ix. Steady State Operation
      x. Switching Equipment (e.g. pumps, filters)
      xi. Other (describe)
e. Upset
f. Turnaround
g. Routine Maintenance
h. Temporary
i. Other (describe)
f) Point of Release (Detail 1 and Detail 2 options included from AFPM’s Event Sharing database):
   a. Atmospheric Tank (fixed roof or internal / external floating roof)
      i. Process Liquids Storage, Large tank (>1320 gal/5000 L)
         1. Release from vent, overflow, or around seal on floating roof
         2. Sunk Floating Roof
         3. Leak
         4. Vacuum / Collapse
         5. Other
      ii. Process Liquids Storage, Small tank or tote (≤1320 gal/5000 L)
         1. Release from vent, overflow, or around seal on floating roof
         2. Leak
3. Vacuum / Collapse
4. Other

iii. Chemical Injection / Utility Storage Large tank (>1320 gal / 5000 L)
   1. Release from vent, overflow, or around seal on floating roof
   2. Sunk Floating Roof
   3. Leak
   4. Vacuum / Collapse
   5. Other

iv. Chemical Injection / Utility Storage Small tank or tote (≤1320 gal / 5000 L)
   1. Release from vent, overflow, or around seal on floating roof
   2. Leak
   3. Vacuum / Collapse
   4. Other

v. Other Storage

b. Blower / Fan
   i. Seal Leak
   ii. Packing Leak
   iii. Flange / Gasket Leak
   iv. Gasket Failed
   v. Flange Face Damage
   vi. Wrong Gasket
   vii. Bolts Relaxed (i.e. thermal cycle)
   viii. Loose Bolts
   ix. Other
   x. Casing Leak
   xi. Threading Fitting Leak
   xii. Fitting Thread Leak
   xiii. Fitting Body Leak
   xiv. Other
   xv. Auxiliary System Leak (i.e. tube oil)
   xvi. Other

c. Compressor
   i. Centrifugal Compressor
   ii. Seal Leak
   iii. Packing Leak
   iv. Flange / Gasket Leak
   v. Casing Leak
   vi. Threading Fitting Leak
   vii. Auxiliary System Leak (i.e. tube oil)
   viii. Other
   ix. Reciprocating Compressor
   x. Seal Leak
   xi. Packing Leak
   xii. Flange / Gasket Leak
   xiii. Casing Leak
   xiv. Threading Fitting Leak
   xv. Auxiliary System Leak (i.e. tube oil)
   xvi. Other
   xvii. Other Compressor
   xviii. Seal Leak
   xix. Packing Leak
   xx. Flange / Gasket Leak
   xxi. Casing Leak
   xxii. Threading Fitting Leak
   xxiii. Auxiliary System Leak (i.e. tube oil)
xxiv. Other
d. Cooling Tower
e. Filter / Coalesce / Strainer
   i. Housing Leak
   ii. Head / Closure Gasket Leak
   iii. Gasket Failed
   iv. Flange Face Damage
   v. Wrong Gasket
   vi. Bolts Relaxed (i.e. thermal cycle)
   vii. Loose bolts
   viii. Other
   ix. Flange / Gasket Leak
   x. Gasket Failed
   xi. Flange Face Damage
   xii. Wrong Gasket
   xiii. Bolts Relaxed (i.e. thermal cycle)
   xiv. Loose Bolts
   xv. Other
   xvi. Threading Fitting Leak
   xvii. Fitting Thread Leak
   xviii. Fitting Body Leak
   xix. Other
   xx. Other
f. Fired Boiler
   i. Steam / Water Tube Leak
   ii. Fuel Leak
   iii. Fire Box Explosion
   iv. Flange / Gasket Leak
   v. Gasket Failed
   vi. Flange Face Damage
   vii. Wrong Gasket
   viii. Bolts Relaxed (i.e. thermal cycle)
   ix. Loose Bolts
   x. Other
   xi. Threading Fitting Leak
   xii. Fitting Thread Leak
   xiii. Fitting Body Leak
   xiv. Other
   xv. Other
g. Flare / Relief System
   i. Flare System Leak (headers / drums / stack)
   ii. Relief Valve Leak
   iii. Flare Liquid Carry Over / Rainout
   iv. Atmospheric Relief Valve Discharge
   v. Other
h. Furnace / Fired Heater
   i. Process Tube Leak
   ii. Steam / Water Tube Leak
   iii. Fuel Leak
   iv. Fire Box Explosion
   v. Flange / Gasket Leak
   vi. Gasket Failed
   vii. Flange Face Damage
viii. Wrong Gasket
ix. Bolts Relaxed (i.e. thermal cycle)
x. Loose Bolts
xi. Other
xii. Threading Fitting Leak
xiii. Fitting Thread Leak
xiv. Fitting Body Leak
xv. Other
xvi. Other

i. Heat Exchanger
   i. Shell and Tube Type
      ii. Shell Leak
      iii. Tube Leak
      iv. Channel Head / Tube Sheet / Gasket Leak
      v. Flange / Gasket Leak
      vi. Repair Clamp Leak
      vii. Other
     viii. Air Cooler Type
        ix. Header Box Leak
        x. Tube Leak
        xi. Flange / Gasket Leak
        xii. Exchanger Repair Clamp Leak
        xiii. Other
       xiv. Plate and Frame
       xv. Plate / Gasket Leak
       xvi. Flange / Gasket Leak
       xvii. Exchanger Repair Clamp Leak
       xviii. Other
      xix. Other Exchanger
      xx. Shell Leak
      xxi. Tube Leak
     xxii. Channel Head / Tube Sheet / Gasket Leak
     xxiii. Flange / Gasket Leak
     xxiv. Repair Clamp Leak
     xxv. Other

j. Instrumentation
   i. Control valve
   ii. Valve Packing Leak
   iii. Valve Leak Thru
   iv. Valve Left Open
   v. Valve Body Leak
   vi. Other
   vii. Analyzer
   viii. Flow Instrument
   ix. Pressure Instrument
   x. Level Instrument
   xi. Temperature Instrument
   xii. Other

k. Piping System, Large Bore > 50 mm (2 inch) (piping, gaskets, sight glasses, expansion joints, tubing, valves)
   i. Above Ground Piping Leak, Diameter >2" (non dead leg)
   ii. Pipe Run Leak (leak in wall of pipe)
   iii. Piping Repair Clamp Leak
   iv. Flange / Gasket Leak
   v. Valve
   vi. Fitting Leak
vii. Other
viii. Below Ground Piping Leak, Diameter >2” (non dead leg)
ix. Pipe Run Leak (leak in wall of pipe)
x. Piping Repair Clamp Leak
xi. Flange / Gasket Leak
xii. Valve
xiii. Fitting Leak
xiv. Other
xv. Dead Leg Leak, Diameter >2” (either above or below ground)
xvi. Pipe Run Leak (leak in wall of pipe)
xvii. Piping Repair Clamp Leak
xviii. Flange / Gasket Leak
xix. Valve
xx. Fitting Leak
xxi. Other
xxii. Tubing Leak
xxiii. SS Tubing
xxiv. Copper Tubing
xxv. Plastic / PVC Tubing
xxvi. Other Tubing
xxvii. Hose Leak
xxviii. Braided Metal
xxix. Chemical Hose (typically plastic or polymer)
xxx. Utility Hose (typically rubber)
xxxi. Other Hose
xxii. PVC or other non-metallic pump
xxxiii. Pipe Run Leak (leak in wall of pipe)
xxxiv. Piping Repair Clamp Leak
xxxv. Flange / Gasket Leak
xxxvi. Valve
xxxvii. Fitting Leak
xxxviii. Other

I. Piping System, Small Bore ≤ 50 mm (2 inch) (piping, gaskets, sight glasses, expansion joints, tubing, valves)
i. Above Ground Piping Leak, Diameter ≤2” (non dead leg)
ii. Pipe Run Leak (leak in wall of pipe)
iii. Piping Repair Clamp Leak
iv. Flange / Gasket Leak
v. Valve
vi. Fitting Leak
vii. Other
viii. Below Ground Piping Leak, Diameter ≤2” (non dead leg)
ix. Pipe Run Leak (leak in wall of pipe)
x. Piping Repair Clamp Leak
xi. Flange / Gasket Leak
xii. Valve
xiii. Fitting Leak
xiv. Other
xv. Dead Leg Leak, Diameter ≤2” (either above or below ground)
xvi. Pipe Run Leak (leak in wall of pipe)
xvii. Piping Repair Clamp Leak
xviii. Flange / Gasket Leak
xix. Valve
xx. Fitting Leak
xxi. Other
xxii. Tubing Leak
xxiii. SS Tubing
xxiv. Copper Tubing
xxv. Plastic / PVC Tubing
xxvi. Other Tubing
xxvii. Hose Leak
xxviii. Braided Metal
xxix. Chemical Hose (typically plastic or polymer)
xxx. Utility Hose (typically rubber)
xxxi. Other Hose
xxi. PVC or other non-metallic pump
xxxiii. Pipe Run Leak (leak in wall of pipe)
xxxiv. Piping Repair Clamp leak
xxxv. Flange / Gasket Leak
xxxvi. Valve
xxxvii. Fitting Leak
xxxviii. Other

m. Pressure Vessel (drum, tower, pressurized storage)
   i. Tower
   ii. Wall / Head Leak
   iii. Flange / Gasket Leak
   iv. Threading Fitting Leak
   v. Other
   vi. Drum
   vii. Wall / Head Leak
   viii. Flange / Gasket Leak
   ix. Threading Fitting Leak
   x. Other
   xi. Pressurized Storage
   xii. Wall / Head Leak
   xiii. Flange / Gasket Leak
   xiv. Threading Fitting Leak
   xv. Other
   xvi. Other Pressure Vessel
   xvii. Wall / Head Leak
   xviii. Flange / Gasket Leak
   xix. Threading Fitting Leak
   xx. Other

n. Pump
   i. Process Pump
   ii. Seal Leak
   iii. Packing Leak
   iv. Flange / Gasket Leak
   v. Casing Leak
   vi. Threading Fitting Leak
   vii. Auxiliary System leak (i.e. tube oil)
   viii. Other
   ix. Chemical Injection / Utility Pump
   x. Seal Leak
   xi. Packing Leak
   xii. Flange / Gasket Leak
   xiii. Casing Leak
   xiv. Threading Fitting Leak
   xv. Auxiliary System leak (i.e. tube oil)
   xvi. Other
   xvii. Other Pump
   xviii. Seal Leak
   xix. Packing Leak
   xx. Flange / Gasket Leak
   xxi. Casing Leak
   xxii. Threading Fitting Leak
xxiii. Auxiliary System leak (i.e. tube oil)
xxiv. Other

o. Reactor
   i. Wall / Head Leak
   ii. Flange / Gasket Leak
   iii. Gasket Failed
   iv. Flange Face Damage
   v. Wrong Gasket
   vi. Bolt Relaxed (i.e. thermal cycle)
   vii. Loose Bolts
   viii. Other
   ix. Threaded Fitting Leak
   x. Fitting Thread Leak
   xi. Fitting Body Leak
   xii. Other
   xiii. Other

p. Other (describe)

g) Type of Material released (check one):
   a. Flammable
   b. Combustible
   c. Toxic
   d. Corrosive
   e. UNDG Class 2, Division 2.2
   f. Utilities (e.g. air, water, steam, nitrogen, etc.)
   g. Other (describe)

h) Causal Factors (select at least one, maximum of three):
   a. Change Management / MOC / PSSR
      i. Action Items Implementation LTA
      ii. Commissioning Not Authorized
      iii. Informing / Training Personnel LTA
      iv. MOC Hazard Analysis LTA
      v. No MOC
      vi. QA/QC Design and Construction LTA
      vii. Temporary MOC Past Removal Date
      viii. Updating Procedures / PSI LTA
      ix. Other (describe)
   b. Communication
      i. Ambiguous
      ii. Language Barrier
      iii. Misunderstood
      iv. No Communication
      v. Not Timely
      vi. Prework Safety Review LTA
      vii. Shift Turnover LTA
      viii. Signs, Warnings, or Labels LTA
      ix. Other (describe)
   c. Design / Construction
i. Codes and Standards, Specifications, or Practices LTA
ii. Construction Not Consistent with Design
iii. Engineering LTA
iv. Fabrication or Installation LTA
v. Wrong Material(s) of Construction
vi. Other (describe)

d. Equipment Reliability
   i. Maintenance Methodology LTA
   ii. Premature Failure
   iii. Preventive Maintenance / Testing Frequency LTA
   iv. Repair Methodology LTA
   v. Testing Methodology LTA
   vi. Other (describe)

e. Fixed Equipment Inspection
   i. Corrective Action Not Timely
   ii. Frequency LTA
   iii. Knowledge / Experience of Inspector LTA
   iv. Location LTA
   v. No Inspection
   vi. QA/QC LTA
   vii. Records LTA
   viii. Technique LTA
   ix. Other (describe)

f. Human Performance
   i. Ergonomics LTA
   ii. Human Machine Interface LTA
   iii. Physiologically Related – Fatigue, Illness, Impairment
   iv. Time Constraint / Pressure
   v. Work Environment
   vi. Workload – Physical / Mental
   vii. Other (describe)

g. Knowledge and Skills, and Experience
   i. Experience LTA
   ii. Knowledge LTA
   iii. Skills LTA
   iv. Other (describe)

h. Operating Limits
   i. No Operating Limits
   ii. Not Alarmed
   iii. Not Monitored
   iv. Operating Limits Exceeded
   v. Operating Limits Not Correct
   vi. Other (describe)
i. Procedures
   i. Operating
      1. No Procedure Available
      2. Procedure Available but Not Used / Followed
      3. Procedure Followed Incorrectly (e.g. steps out of order)
      4. Procedure Not Accurate / Clear
      5. Situation Not Covered
      6. Used Wrong Procedure
      7. Other (describe)
   ii. Maintenance
      1. No Procedure Available
      2. Procedure Available but Not Used / Followed
      3. Procedure Followed Incorrectly (e.g. steps out of order)
      4. Procedure Not Accurate / Clear
      5. Situation Not Covered
      6. Used Wrong Procedure
      7. Other (describe)
   iii. Contractor
      1. No Procedure Available
      2. Procedure Available but Not Used / Followed
      3. Procedure Followed Incorrectly (e.g. steps out of order)
      4. Procedure Not Accurate / Clear
      5. Situation Not Covered
      6. Used Wrong Procedure
      7. Other (describe)
   iv. Other (describe)

j. Risk Assessment and Incident Investigation
   i. Action Item Closure LTA or Not Timely
   ii. Incident Investigation LTA
   iii. No Risk Assessment
   iv. Risk Assessment Not Adequate
   v. Risk Assessment Not Accurate
   vi. Other (describe)

k. Safe Work Practices or Procedures
   i. Confined Space Practice or Procedure Problem LTA
   ii. Energy Control / Isolation Practice or Procedure LTA
   iii. Hot Work Practice or Procedure LTA
   iv. Line Breaking / Equipment Opening Practice or Procedure LTA
   v. Other (describe)

l. Work Monitoring
   i. Insufficient Oversight
   ii. QA/QC LTA
   iii. Rules Not Enforced
   iv. Rules Not Followed
   v. Scheduling LTA
   vi. Simultaneous Operations
vii. Working on Wrong Location
viii. Other (describe)
m. Other (describe)
APPENDIX C

PSE Tier 1 / Tier 2 DETERMINATION DECISION LOGIC TREE

An unplanned or uncontrolled release of any material, including non-toxic and non-flammable materials (e.g. steam, hot water, nitrogen, compressed CO₂, or compressed air) from a process that results in one or more of the consequences listed below:

- An employee, contractor, or subcontractor "days away from work" injury and/or fatality.
- Not a Tier 1 or Tier 2 PSE
- Yes
- Tier 1 PSE
- No

- A hospital admission and/or fatality of a third party.
- No

- An officially declared community evacuation or community shelter-in-place including precautionary community evacuation or precautionary community shelter-in-place.
- No

- A fire or explosion damage greater than or equal to $100,000 of direct cost.
- No

- An engineered pressure-relief (e.g. PRD, SIS, or manually initiated emergency depressurization) discharge or a quantity greater than or equal to the threshold quantities in Table 1, Tier 1 in any one-hour period 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 a precautionary on-site shelter-in-place or on-site evacuation;
  - public protective measures (e.g. road closure) including precautionary public protective measures.
- No

- An upset emission from a permitted or regulated source, of a quantity greater than or equal to the threshold quantities described in Table 1, Tier 1 in any one-hour period, 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 a precautionary on-site shelter-in-place or on-site evacuation;
  - public protective measures (e.g. road closure) including precautionary public protective measures.
- No

- An unignited release of material greater than or equal to the threshold quantities described in Table 1, Tier 1 in any one-hour period, excluding engineered pressure-relief discharges and upset emissions from permitted or regulated sources.
- No

Notes:
- Some non-toxic and non-flammable materials (e.g. steam, hot water, or compressed air) have no threshold quantities and are only included in the definition of Tier 1 and Tier 2 because of their potential to result in one of the other consequences.
- A pressure-relief device (PRD), safety instrumented system (SIS), or manually initiated emergency depressurization discharge is an LOPC due to the unplanned nature of the release. The determination of Tier 1 or Tier 2 PSE is based on the criteria for PRD, SIS, or manually initiated emergency depressurization discharges.
- An internal fire or explosion that causes a LOPC from a process triggers an evaluation of the Tier 1 and Tier 2 consequences. The LOPC does not have to occur first.
APPENDIX D

Tier 1 PSE Severity Weighting

Severity weighting provides additional useful information about Tier 1 PSEs that may help drive performance improvement. Table 3 describes the methodology for calculating a severity weight for Tier 1 PSEs. The severity weighting is not intended to produce an ordinal ranking of Tier 1 PSEs but rather a relative differentiation between one Tier 1 PSE and another. There is no intended or implied equating of consequences from one category to the next. Also, there is no intended or implied value judgment that a Tier 1 PSE with a higher severity score is "worse" than another Tier 1 PSE with a lower severity score.

Using Table 3, a severity weight for each Tier 1 PSE shall be calculated by summing the points associated with each consequence category.

Table 3—Tier 1 Process Safety Event Severity Weighting

<table>
<thead>
<tr>
<th>Severity Points</th>
<th>Safety/Human Health e</th>
<th>Direct Cost from Fire or Explosion</th>
<th>Material Release Within Any 1-hr Period a d e</th>
<th>Community Impact</th>
<th>Off-site Environmental Impact b c</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 point</td>
<td>Injury requiring treatment beyond first aid to an employee, contractor, or subcontractor. (Meets the definition of a U.S. OSHA recordable injury.)</td>
<td>Resulting in $100,000 ≤ direct cost damage &lt; $1,000,000.</td>
<td>Release volume $1 \times \leq \text{Tier 1 TQ} \times 3 \times \text{outside of secondary containment.}$</td>
<td>— Officially declared shelter-in-place or public protective measures (e.g. road closure) for $&lt; 3 \text{ hours}$, or — officially declared evacuation $&lt; 3 \text{ hours}$.</td>
<td>Resulting in $100,000 \leq \text{acute environmental cost} &lt; $1,000,000.</td>
</tr>
<tr>
<td>3 points</td>
<td>— Days away from work injury to an employee, contractor, or subcontractor, or — injury requiring treatment beyond first aid to a third party.</td>
<td>Resulting in $1,000,000 \leq \text{direct cost damage} &lt; $10,000,000.</td>
<td>Release volume $3 \times \leq \text{Tier 1 TQ} \times 9 \times \text{outside of secondary containment.}$</td>
<td>— Officially declared shelter-in-place or public protective measures (e.g. road closure) for $&gt; 3 \text{ hours}$, or — officially declared evacuation $&gt; 3 \text{ hours} &lt; 24 \text{ hours}$.</td>
<td>— Resulting in $1,000,000 \leq \text{acute environmental cost} &lt; $10,000,000, or — small-scale injury or death of aquatic or land-based wildlife.</td>
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<tr>
<td>9 points</td>
<td>— A fatality of an employee, contractor, or subcontractor, or — a hospital admission of a third party.</td>
<td>Resulting in $10,000,000 \leq \text{direct cost damage} &lt; $100,000,000.</td>
<td>Release volume $9 \times \leq \text{Tier 1 TQ} \times 27 \times \text{outside of secondary containment.}$</td>
<td>Officially declared evacuation $&gt; 24 \text{ hours} &lt; 48 \text{ hours}$.</td>
<td>— Resulting in $10,000,000 \leq \text{acute environmental cost} &lt; $100,000,000, or — medium-scale injury or death of aquatic or land-based wildlife.</td>
</tr>
<tr>
<td>27 points</td>
<td>— Multiple fatalities of employees, contractors, or subcontractors, or — multiple hospital admission of third parties, or — a fatality of a third party.</td>
<td>Resulting in $\geq 100,000,000 \text{ of direct cost damages.}$</td>
<td>Release volume $\geq 27 \times \text{Tier 1 TQ} \times \text{outside of secondary containment.}$</td>
<td>Officially declared evacuation $&gt; 48 \text{ hours}$.</td>
<td>— Resulting in $\geq 100,000,000 \text{ of acute environmental costs, or}$ — large-scale injury or death of aquatic or land-based wildlife.</td>
</tr>
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<tr>
<td><strong>a</strong></td>
<td>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.</td>
<td></td>
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<tr>
<td><strong>b</strong></td>
<td>Judging small-, medium-, or large-scale injury or death of aquatic or land-based wildlife should be based on local regulations or Company guidelines.</td>
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<tr>
<td><strong>c</strong></td>
<td>The severity weighting calculation includes a category for “off-site environmental impact” and injury beyond first aid (i.e. OSHA “recordable injury”) level of safety/human health impact that are not included in the Tier 1 PSE threshold criteria. However, the purpose of including both of these values is to achieve greater differentiation of severity points for events that result in any form of injury or environmental impact.</td>
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<tr>
<td><strong>d</strong></td>
<td>For the purpose of severity weighting, general paving or concrete under process equipment, even when sloped to a collection system, is not credited as secondary containment.</td>
<td></td>
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</tr>
<tr>
<td><strong>e</strong></td>
<td>Material release is not tabulated for fires or explosions. These events severity will be determined by the other consequence categories in this table.</td>
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</tr>
</tbody>
</table>
APPENDIX E

Application to Petroleum Pipeline & Terminal Operations (informative)

API 754 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, such as petroleum pipeline and terminal operations. API 754 may be applied to petroleum pipeline and terminal operations by substituting the following sections for those used in the body of this RP.

Applicability

The RP applies to the responsible party. At co-located facilities (e.g. industrial park), this RP 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;

   NOTE   The boundary between marine transport operations and connecting to/disconnecting from the process is the first/last step in loading/unloading procedure (e.g. first line ashore, last line removed, etc.).

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 1 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.

   NOTE 2 The boundary between truck or rail transport operations and connecting to/disconnecting from the process is the first/last step in loading/unloading procedure (e.g. wheel chocks, set air brakes, disconnect master switch, etc.).

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 5.2 and 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 LOPC event;

g) LOPC events from ancillary equipment not connected to the process;

h) QA and QC laboratories; and

i) on-site fueling operations of mobile and stationary equipment (e.g. pick-up trucks, diesel generators, and heavy equipment).

Terms and Definitions

process

Distribution, storage, utilities, or loading facilities used store and transport petrochemical and petroleum refining feedstocks, and products. This includes process equipment (e.g. vessels, piping, process sumps, vapor recovery systems, pumps, compressors, exchangers, pigging stations, metering stations, refrigeration systems, associated ancillary equipment, etc.), storage tanks, active warehouses, support areas (e.g. wastewater and ballast water treatment plants), on-site remediation facilities, and on-site and off-site distribution piping under control of the Company.
APPENDIX F

Application to Retail Service Stations (informative)

API 754 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 such as retail service stations. API 754 may be applied to retail service stations by substituting the following sections for those used in the body of this RP. Retail service stations dispense gasoline, diesel, biofuels, propane, compressed natural gas, and hydrogen to the public.

This RP applies to the responsible party. At co-located facilities (e.g. industrial park), this RP applies individually to the responsible parties and not to the facility as a whole.

Applicability

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) truck operations, except when the truck is connected or in the process of connecting or disconnecting to the process, or when the truck is being used for on-site storage;

   NOTE 1 Active staging is not part of connecting or disconnecting to the process; active staging is not considered on-site storage; active staging is part of transportation.

   NOTE 2 The boundary between truck or rail transport operations and connecting to/disconnecting from the process is the first/last step in loading/unloading procedure (e.g. wheel chocks, set air brakes, disconnect master switch, etc.).

b) 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 6.2 of RP 754.

c) office, shop, and convenience store events (e.g. office fires, spills, personnel injury or illness, etc.);

d) personal safety events (e.g., slips, trips, falls) that are not directly associated with on-site response or exposure to a LOPC event;

e) LOPC events from ancillary equipment not connected to the process, and releases caused by the actions of retail customers.

   NOTE Failure of the auto shutoff, in countries where 'latch' filling is permitted, that causes a spill is not considered an action of the retail customer.

Terms and Definitions

process

Storage and dispensing facilities used for retail sales of petroleum refining products and biofuels. This includes process equipment (e.g., LPG vessels, piping, hoses, pumps, compressors, exchangers, etc.), above or below ground storage tanks, active warehouses, dispensers, and LPG exchange cylinders under control of the Company.
APPENDIX G

Oil & Gas Drilling and Production Operations (informative)

API 754 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 such as oil and gas drilling and production activities. API 754 may be applied to oil and gas drilling and production operations by following the guidance provided in IOGP Report No. 456.
References

The following documents are directly referenced in this document.


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