

American Petroleum Institute Guide to Reporting Process Safety Events Version 3.0



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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*.

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

While this survey was developed for the refining and petrochemical industries, it may also be applicable to other industries with operating systems and processes where loss of containment has the potential to cause harm¹. 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.

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

Events associated with the following activities fall outside the scope of RP 754 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;
- 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 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.

¹ To enable consistent application of RP 754 to other refining and petrochemical industry sub-segments, informative annexes were created to define the Applicability and Process definition for those sub-segments. The user would substitute the content of those annexes for the referenced sections of this document: Appendix E—Petroleum Pipeline & Terminal Operation, Appendix F—Retail Service Stations, and Appendix G—Oil & Gas Drilling and Production Operations.

- 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 Section 3.1 and 3.2.

- 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 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) 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 $\text{pH} \geq 1$ and < 2 , or $\text{pH} > 11.5$ and ≤ 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 Labelling of Chemicals (GHS) Skin Corrosion Category 1B.²

2.2

acids/bases, strong

Substances with $\text{pH} < 1$ 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.³

2.3

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 during daylight hours only, unloading Monday–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 United Nations Globally Harmonized System of Classification and Labelling of Chemicals (GHS), 1st Edition, New York and Geneva, 2003.

³ Ibid.

2.4

active warehouse

An on-site warehouse 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.).

2.5

acute environmental cost

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

2.6

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.

2.7

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.

2.8

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, drainage collection systems, the outer wall of open top double walled tanks, etc.

2.9

contractor and subcontractor

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

2.10

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.

2.11

deflagration

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

2.12

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).

2.13

detonation

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

2.14

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. PRD, SIS, or manually initiated emergency depressure) device release.

2.15

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.

2.16

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.).

2.17

explosion

A release of energy that causes a pressure discontinuity or blast wave (e.g. detonations, deflagrations, and rapid releases of high pressure caused by rupture of equipment or piping).

2.18

facility

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

2.19

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.

2.20

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 D92-12b⁴, ASTM D93-15⁵, D3941-14⁶, D56-05⁷, or other equivalent test methods appropriate to the material characteristics and flash point range specified in the test procedure.

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).

⁴ American Society for Testing and Materials, ASTM D86-12, Standard Test Method for Standard Test Method for Distillation of Petroleum Products at Atmospheric Pressure¹, West Conshohocken, PA

⁵ American Society for Testing and Materials, ASTM D93-15, *Standard Test Method for Flash Point by Pensky-Martens Closed Cup Tester*, West Conshohocken, PA

⁶ American Society for Testing and Materials, ASTM D3941-14, *Standard Test Method for Flash Point by the Equilibrium Method With a Closed-Cup Apparatus*, West Conshohocken, PA

⁷ American Society for Testing and Materials, ASTM D56-05, *Standard Test Method for Flash Point by Tag Closed Cup Tester*, West Conshohocken, PA

2.22

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.”

2.23

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).

2.24

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.

2.25

material

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

2.26

moderate acids/bases

See acids/bases, moderate.

2.27

normal boiling point

The temperature at which boiling occurs under a pressure of 101.3 kPa (760 mm Hg). Test methods include ASTM E1719-12⁸, ASTM D86-12⁹, or other equivalent test method. For the purpose of this RP, the terms normal boiling point and initial boiling point are considered synonymous.

2.28

office building

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

2.29

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).

2.30

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.

⁸ American Society for Testing and Materials, ASTM E1719-12, *Standard Test Method for Vapor Pressure of Liquids by Ebulliometry*, West Conshohocken, PA

⁹ American Society for Testing and Materials, ASTM D86-12, *Standard Test Method for Standard Test Method for Distillation of Petroleum Products at Atmospheric Pressure*¹, West Conshohocken, PA

2.31

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 those 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 process safety event, 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).

2.32

precautionary evacuation

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

2.33

precautionary public protective measure

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

2.34

precautionary shelter-in-place

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

2.35

pressure relief device PRD

A device designed to open and relieve excess pressure (e.g. safety valve, thermal relief, rupture disk, rupture pin, deflagration vent, pressure/vacuum vents, 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, 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.

2.38

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 a material.

2.40

public receptors

Offsite 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.

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.¹⁰

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 process safety event. 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 process safety event?

2.45

safety instrumented system

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 and its indoor atmosphere to temporarily separate individuals from a potentially hazardous outdoor atmosphere.

2.48

strong acids/bases

see acids/bases, strong.

¹⁰ U.S. Department of Labor, Occupational Safety and Health Administration, OSHA Recordkeeping Handbook, The Regulations and Related Interpretations for Recording and Reporting Occupational Injuries and Illnesses, OSHA 3245-01-R, 2005.