

**AFPM & API
ADVANCING
PROCESS SAFETY**

**ANSI API RP-754
Quarterly Webinar**

June 21, 2016

*Process Safety Performance
Indicators for the Refining and
Petrochemical Industries*



 **AFPM**
American
Fuel & Petrochemical
Manufacturers

energy 

Purpose of RP 754 Quarterly Webinars

- To support broad adoption of RP-754 (2nd Edition) throughout the Refining and Petrochemical industries and other industry sectors where a loss of containment has the potential to cause harm
- To ensure consistency in Tier 1 and 2 indicators reporting in order to establish credibility and validity
- To share learning's regarding the effective implementation of Tier 1-4 lagging/leading indicators

Today's Agenda

1. Use of Severity Weighting for Tier 1 PSEs from Annex-D of RP 754 2nd Edition
2. Remaining 2016 Webinar Dates

API RP 754 Section 5.4: Optional Tier 1 PSE Severity Weighting

All Tier 1 PSEs are not equal as Tier 1 consequences are open ended on the high side. Tier 2 consequences are bounded at both high and low ends.

- Used CCPS Severity Weighting as starting point.
- Modified weighting and included in Annex D.
- Severity consequence categories:
 - Safety/Human Health
 - Direct Cost from Fire/Explosion
 - Material Release Within Any 1-Hr Period
 - Community Impact
 - Off-Site Environmental Impact
- Useful in communicating actual loss impact of a PSE Tier 1 internally within the Company
- Useful in directing risk reduction where it may have the largest impact

Annex D

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

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

Increasing Severity

PSE Tier 1 Severity: Example 1

- During startup following a maintenance outage, a distillation column was overfilled resulting in a release of 1,200 bbls of flammable liquid (Flash Point < 23°C)* in six minutes from an atmospheric relief device. The liquid release formed a flammable cloud which exploded killing 8 people, injured 47 people, and caused \$200 M in damage. A shelter-in-place order was issued for the nearby community for 2 hours. * T1 Threshold Quantity is 7 bbl.

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

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

PSE Tier 1 Severity: Example 1

- During startup following a maintenance outage, a distillation column was overfilled resulting in a release of 1,200 bbls of flammable liquid (Flash Point < 23°C)* in six minutes from an atmospheric relief device. The liquid release formed a flammable cloud which exploded killing 8 people, injured 47 people, and caused \$200 M in damage. A shelter-in-place order was issued for the nearby community for 2 hours. * T1 Threshold Quantity is 7 bbl.

Example PSE Severity Weight		
Safety/Human Health	Multiple Fatalities	27 Points
Direct Cost	\$200 M	27 Points
Material Release	≥ 27x Tier 1 TQ	27 Points
Community Impact	Shelter-in-Place < 3 hours	1 Point
Off-Site Environmental Impact	No Environmental Impact	0 Points
Tier 1 PSE Severity Weight Total		82 Points

PSE Severity Weight = 27 + 27 + 27 + 1 + 0 = 82 Points.

PSE Tier 1 Severity: Example 2

- A 10 inch process furnace outlet line failed due to undetected corrosion. The rupture released a flammable liquid that ignited immediately; the fire burned for 3 hours and caused \$30 M in equipment damage. There were no injuries, no community impact, and no off-site environmental.

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

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

PSE Tier 1 Severity: Example 2

- A 10 inch process furnace outlet line failed due to undetected corrosion. The rupture released a flammable liquid that ignited immediately; the fire burned for 3 hours and caused \$30 M in equipment damage. There were no injuries, no community impact, and no off-site environmental.

Example PSE Severity Weight		
Safety/Human Health	No injuries	0 Points
Direct Cost	\$30 M	9 Points
Material Release	All material consumed in the fire	0 Points
Community Impact	No community impact	0 Points
Off-Site Environmental Impact	No Environmental Impact	0 Points
Tier 1 PSE Severity Weight Total		9 Points

PSE Severity Weight = 0 + 9 + 0 + 0 + 0 = 9 Points.

PSE Tier 1 Severity: Example 3

- A leak in a pipe between a tank of 50% NaOH (T-1 Threshold Quantity = 14 bbl) and a pump releases 46 barrels inside the tank's dike within one hour. There are no personnel injuries, no fire/explosion damage, no community impact, and no offsite environmental impact as the dike drain valves were closed at the time of the release and all 46 barrels of caustic were recovered.

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

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

PSE Tier 1 Severity: Example 3

- A leak in a pipe between a tank of 50% NaOH (T-1 Threshold Quantity = 14 bbl) and a pump releases 46 barrels inside the tank's dike within one hour. There are no personnel injuries, no fire/explosion damage, no community impact, and no offsite environmental impact as the dike drain valves were closed at the time of the release and all 46 barrels of caustic were recovered.

Example PSE Severity Weight		
Safety/Human Health	No injuries	0 Points
Direct Cost	No Fire / Explosion	0 Points
Material Release	All material remained within secondary containment	0 Points
Community Impact	No community impact	0 Points
Off-Site Environmental Impact	No Environmental Impact	0 Points
Tier 1 PSE Severity Weight Total		0 Points

PSE Severity Weight = 0 + 0 + 0 + 0 + 0 = 0 Points.

PSE Tier 1 Severity: Example 4

- Following proper isolation of a level sensor at its root valves, an instrument technician disconnects the tubing connections to the sensor. A few drops of spent sulfuric acid (pH < 1.5) dribble onto his gloves. A few minutes later a mosquito lands on the back of his neck and he uses his gloved hand to brush it off, smearing some of the acid onto his skin. He notices the burning sensation 30 minutes later and goes to the locker room to wash off the acid and have his neck examined by site medical personnel. The technician now has chemical burns with open blisters requiring treatment beyond first aid, but no lost time.

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

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

PSE Tier 1 Severity: Example 4

- Following proper isolation of a level sensor at its root valves, an instrument technician disconnects the tubing connections to the sensor. A few drops of spent sulfuric acid (pH < 1.5) dribble onto his gloves. A few minutes later a mosquito lands on the back of his neck and he uses his gloved hand to brush it off, smearing some of the acid onto his skin. He notices the burning sensation 30 minutes later and goes to the locker room to wash off the acid and have his neck examined by site medical personnel. The area now has chemical burns with open blisters requiring treatment beyond first aid, but no lost time.

This is a trick question: Severity Weighting only applies to Tier 1 PSEs, the above is a Tier 2 PSE!

PSE Tier 1 Severity: Example 5

- During the draining of a heavy crude oil (T1 TQ = 14 bbl.) supply line a fire is ignited. The worker performing the draining was not hurt, but another worker near the draining operation began running and fell into an excavated area injuring his ankle. The injury resulted in 8 days away from work. The crude was being contained in a plastic pool that burned in the fire allowing the spill to flow across the ground and under a pickup truck and a vacuum truck valued at > \$100k that were completely destroyed. As the vacuum truck burned it spilled 30 bbl. of the heavy crude that had been pulled from the line, which ran into a gully and offsite into an environmentally sensitive wetland. Recovery of the un-combusted crude and remediation of the wetland cost an additional \$300k.

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

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

PSE Tier 1 Severity: Example 5

- During the draining of a heavy crude oil (T1 TQ = 14 bbl.) supply line a fire is ignited. The worker performing the draining was not hurt, but another worker near the draining operation began running and fell into an excavated area injuring his ankle. The injury resulted in 8 days away from work. The crude was being contained in a plastic pool that burned in the fire allowing the spill to flow across the ground and under a pickup truck and a vacuum truck valued at > \$100k that were completely destroyed. As the vacuum truck burned it spilled 30 bbl. of the heavy crude that had been pulled from the line, which ran into a gully and offsite into an environmentally sensitive wetland. Recovery of the un-combusted crude and remediation of the wetland cost an additional \$300k.

Example PSE Severity Weight		
Safety/Human Health	1 Lost Time Injury	3 Points
Direct Cost	Fire / Explosion damage between \$100k and \$1M	1 Point
Material Release	Between 1 and 3 x TQ released outside secondary containment	1 Point
Community Impact	No community impact	0 Points
Off-Site Environmental Impact	Environmental damage between \$100k and \$1M	1 Points
Tier 1 PSE Severity Weight Total		6 Points

PSE Severity Weight = 3 + 1 + 1 + 0 + 1 = 6 Points.

PSE Tier 1 Severity: Example 6

- During the unloading of gasoline from a marine vessel at a fuels terminal a tank overfill occurs. 740 bbl. of gasoline is spilled into the tank bund within one hour. Operators are alerted to the spill by gas detectors surrounding the tank farm. They are able to evacuate all areas downwind and no ignition occurs. Public roads in the area are closed for the next 5 hours as vacuum trucks are used to pick up the spilled gasoline and discharge it into another tank. Gasoline is found at the site's wastewater treating facility and Operations personnel calculate that gasoline has been leaking through the bund isolation valves at a rate of 6 bbl./hr. (1,764 lbs./hr. vs. TQ of 2,200 lbs. for TRC-6 80% of TQ) Engineers at the company headquarters estimate that 3,000 pounds/hr. Vs. TQ of 1,100 lbs. for TRC-5 of gasoline (273% of TQ) was evaporating from the surface of the spill within the bund. The combined release is 353% of the applicable TQs.

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

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

PSE Tier 1 Severity: Example 6

During the unloading of gasoline from a marine vessel at a fuels terminal a tank overfill occurs. 740 bbl. of gasoline is spilled into the tank bund within one hour. Operators are alerted to the spill by gas detectors surrounding the tank farm. They are able to evacuate all areas downwind and no ignition occurs. Public roads in the area are closed for the next 5 hours as vacuum trucks are used to pick up the spilled gasoline and discharge it into another tank. Gasoline is found at the site's wastewater treating facility and Operations personnel calculate that gasoline has been leaking through the bund isolation valves at a rate of 6 bbl./hr. (1,764 lbs./hr. vs. TQ of 2,200 lbs. for TRC-6 80% of TQ) Engineers at the company headquarters estimate that 3,000 pounds/hr. Vs. TQ of 1,100 lbs. for TRC-5 of gasoline (273% of TQ) was evaporating from the surface of the spill within the bund. The combined release is 353% of the applicable TQs.

Example PSE Severity Weight		
Safety/Human Health	No Injuries	0 Points
Direct Cost	No Fire / Explosion	0 Point
Material Release	Between 3 and 9 x TQ released outside secondary containment	3 Point
Community Impact	Public protective measures between 3 and 24 hours	3 Points
Off-Site Environmental Impact	No Environmental damage offsite	0 Points
Tier 1 PSE Severity Weight Total		6 Points

PSE Severity Weight = 0 + 0 + 3 + 3 + 0 = 6 Points.

Questions? / Discussion!

Webinar Dates

- September 13 – 11:00 am Eastern
- December 13 – 11:00 am Eastern