2021 ANNUAL PERFORMANCE REPORT

CENTER FOR OFFSHORE SAFETY

SEPTEMBER 2022

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RUSSELL HOLMES
Senior Director
Center for Offshore Safety

September 2022

Center for Offshore Safety Annual Performance Report

2020 was a year with unforeseen challenges that tested our resolve as the COVID-19 pandemic impacted the lives of every person across the globe. This Annual Performance Report (APR) focuses on data from 2021 which showcased the natural gas and oil industry rebounding and adjusting to the "new normal."

As part of this rebound, members of the Center for Offshore Safety (COS) saw an increase in offshore work hours – up 11MIL over 2020 – representing 73% of all U.S. Outer Continental Shelf (OCS) activity. This increase in the number of hours worked was not at the expense of safety. In fact, as you'll see in this report, COS members had fewer serious incidents in 2021 vs 2020.

As an industry, one of our goals, embedded in the core mission of COS, is continual improvement. The collection and reporting of this data is a demonstration of our members' commitment to transparency and our desire to learn from incidents. However, since each safety statistic represents our colleagues, friends, and family members, the data shared in this APR serves as a solemn reminder that our work continues toward achieving a goal of zero incidents.

COS was established more than a decade ago to improve safety operations for the offshore natural gas and oil industry and our commitment to providing tools and support for companies in the U.S. OCS remains strong.

I thank all COS members for their contributions to and participation in this annual report and for their ongoing dedication to continual improvement through safety and environmental management systems.

Sincerely,

Russell Holmes

Senior Director, Center for Offshore Safety

11M

more offshore work hours than in 2020

73%

of all U.S. Outer Continental Shelf (OCS) activity is represented by COS Members

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1.0 COS MEMBERS AND PARTICIPANTS

COS MEMBERS

OPERATORS

- Apache
- Arena Offshore
- BP E&P
- Chevron USA
- Enven
- Equinor
- ExxonMobil
- Hess
- Murphy E&P
- Occidental Petroleum
- Quarter North Energy
- Shell International E&P
- TOTALEnergies
- Woodside Energy (formerly BHP)

SERVICE COMPANIES

- Baker Hughes
- Halliburton
- Oceaneering
- SEMPCheck
- SubSea7

RIG CONTRACTORS

- Helmerich & Payne
- Valaris

ASSOCIATIONS

- ASQ
- IADC
- IMCA
- MSRC
- NOIA
- OMSA
- OOC
- OPITO

For this APR, 100% of eligible COS Operators and 86% (6 of 7) of COS Contractors shared Safety Performance Indicator (SPI) and/or Learning from Incidents and Events (LFI) data for the 2021 Reporting Year.

COS members listed above as Associations do not provide data.

2.0 INTRODUCTION

COS is designed to promote the highest level of safety for offshore drilling, completions, and operations through leadership and effective management systems addressing communication, teamwork, and independent third-party auditing and certification. COS enables operational excellence, in part, by enhancing and continuously improving industry's safety and environmental performance and stimulating cooperation within industry to share learnings. In the context of this report, the term safety is inclusive of personal safety, process safety, health, security and environmental safety.

This COS Annual Performance Report (APR) provides information shared by its members under the following COS programs:

- Safety Performance Indicators (SPI)
- Learning from Incidents and Events (LFI)

The COS member data provided through the LFI and SPI programs enable continual improvement of performance-based management systems.

The SPI originated from high-level bow-tie risk models of major hazards, developed within COS, that cover both process safety and personal safety. The information can be used for driving improvement and, when effectively acted upon, contribute to reducing risk of major incidents by identifying weaknesses in barriers intended to prevent the occurrence or recurrence of incidents and mitigate consequences. The scope of the SPI data covers COS member wells, projects, and production facilities and operations in the U.S. Outer Continental Shelf (OCS).

The data collected via the SPI program ranges from **SPI 1** (fatality, injury to five or more from a single incident, loss of well control, etc.) and **SPI 2** (injury to four or less from a single incident, direct damage ≥ $25,000, etc.) to **SPI 10** (dropped objects potential results). The full list of SPI collected by COS can be found in section 4 of this report.

The LFI program covers the same scope, but also allows for the submission of data for incidents and events which occur outside the U.S. OCS. The main objective of the LFI program is to provide COS members a mechanism for sharing information from incidents that meet the criteria for an **SPI 1** or **SPI 2**, as well as High Value Learning Events (**HVLE**).

Publication of SPI and LFI Program data began in 2014, reflecting 2013 performance. Reporting is voluntary and data confidentiality is maintained through a process administered by the API Statistics department.

3.0 EXECUTIVE SUMMARY

ABOUT THE REPORT

The COS Annual Performance Report (APR) for 2021 provides an accounting of safety-related incidents and events at facilities operating on the U.S. Outer Continental Shelf (OCS).

Members voluntarily submit data for the APR to support COS' mission to provide the highest level of safety for the U.S. offshore natural gas and oil industry. Through the analysis of data, COS strives to identify areas for improvement in the management of risk through safety management systems for the operation of offshore wells, projects, and production facilities in the U.S. OCS.

Member data in the report comes from two key COS programs: the Safety Performance Indicators program, or SPI, and the Learning from Incidents and Events program, or LFI. Both programs identify and monitor areas where the industry can improve safety on the U.S. OCS. While COS began collecting this data in 2013, the data presented in this APR reflects the most recent 5 years – 2017-2021.

This yearly performance report is an example of COS' commitment to open communication and transparency of safety information, building collaboration, communication, and sharing regarding safety between the industry, regulators, and the public.

KEY FINDINGS FROM 2021 DATA

- COS members reported just over 11 million more work hours for 2021 compared to 2020. Despite this increase in work hours, the number of **SPI 1** and **SPI 2** incidents decreased from 70 in 2020 to 40 in 2021. This is a rate decrease of 41% from 2020.
- There were four work-related fatalities for the U.S. OCS in 2021; one was from an incident reported by a COS member company.
- Process Safety Events, both Tier 1 and Tier 2, were down 35% compared to 2020. Tier 1 PSE were down from 8 in 2020 to 6 in 2021. Tier 2 PSE were down from 23 in 2020 to 14 in 2021.
- 100% of COS Operators reported zero Level 1 or Level 2 Well Control Incidents. One Level 1 Well Control Incident was reported by a COS Contractor member for 2021, described as "No failures of equipment or procedures. Naturally-occurring shallow water flow during riser-less drilling operations."
- The 12 reported **SPI 2C** mechanical lifting incidents represent a 50% decrease in the number of **SPI 2**-level lifting incidents from the 25 and 23 reported in 2020 and 2019. When the additional 11MIL work hours are factored in, this represents a 64% decrease in the frequency of **SPI 2**-level lifting incidents.
- The frequencies for DART and RIIF (**SPI 7** Days Away from Work, Restricted Work or Transfer and **SPI 8** Recordable Injury and Illness Frequency), which in 2020 were the lowest reported to COS since data collection started in 2013, have returned to pre-COVID levels, comparable to 2017-2019.
- Of the 40 **SPI 1** and **SPI 2** incidents reported by COS Operators, 14 incidents (35%) included failure of equipment as a contributing factor.
- For the 43 U.S. OCS incidents reported to the LFI program, the three areas most frequently identified for improvement were: Operating Procedures or Safe Work Practices (37%); Process or Equipment Reliability (30%); and Quality of Task Planning and Preparation (26%).

Year	2017	2018	2019	2020	2021
COS U.S. OCS Work Hours (Millions)	37.3	41.7	44.2	34.5	45.9

3.1 SPI AND LFI DATA AT-A-GLANCE

FIGURE 3.1: SPI 1 and SPI 2 Frequency

For details of SPI and LFI data, see sections 4 and 5 of this report.

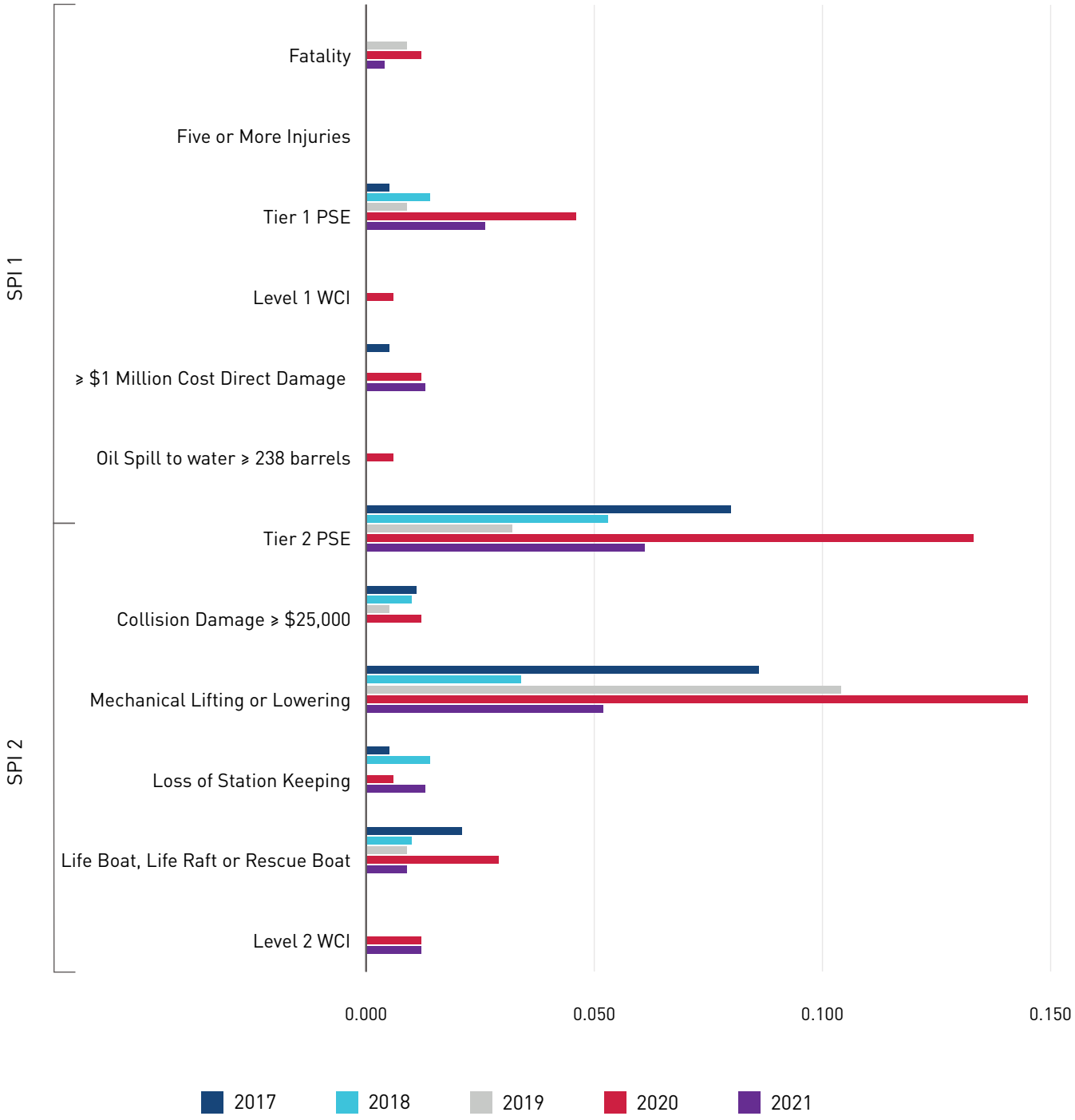
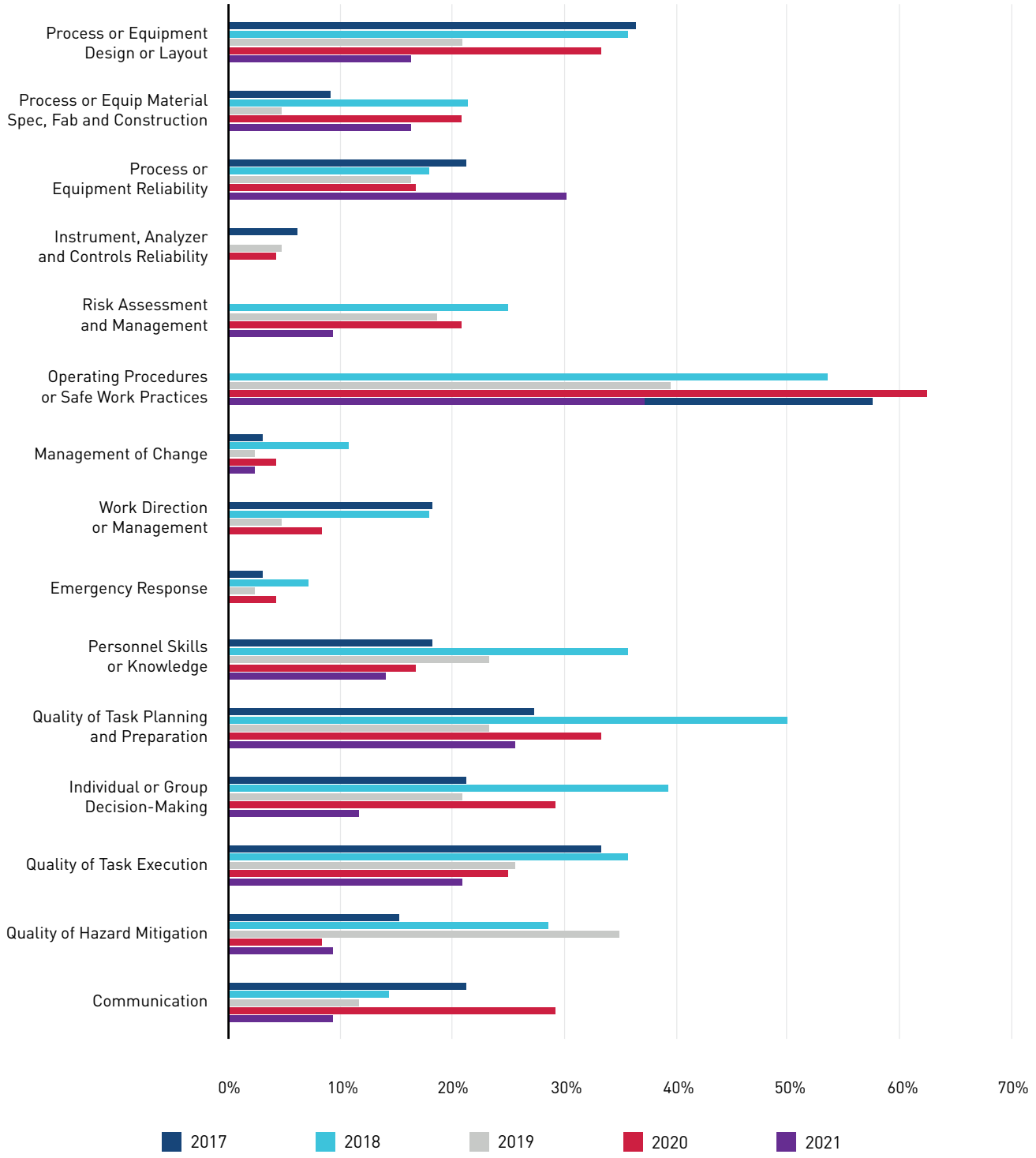


FIGURE 3.2: SPI 1 and SPI 2 Counts

		2017	2018	2019	2020	2021
SPI 1	Fatality	0	0	2	2	1
	Five or More Injuries	0	0	0	0	0
	Tier 1 PSE	1	3	2	8	6
	Level 1 WCI	0	0	0	1	0*
	>$1 Mil Direct Damage	1	0	0	2	3
	Oil Spill ≥238 bbl	0	0	0	1	0
SPI 2	Tier 2 PSE	15	11	7	23	14
	Collision Damage ≥$25k	2	2	1	2	0
	Mechanical Lifting or Lowering	16	7	23	25	12
	Loss of Station Keeping	1	3	0	1	3
	Lifeboat, Life Raft or Rescue Craft	4	2	2	5	2
	Level 2 WCI	0	0	0	2	0

**There was one Level 1 Well Control Incident (WCI) reported by a COS Contractor Member. As the charts and graphs in this APR represent data reported by COS Operator Members, this Level 1 WCI is not represented in the tables and graphs.*

FIGURE 3.3: LFI Areas for Improvement (U.S. OCS Only)



NOTE – LFI submittals typically identify more than one AFI for any given incident. The graph above illustrates the percent of times an AFI was identified relative to the number of LFI forms submitted for U.S. OCS. Because the number of AFI exceeds the number of LFI forms, the sum of the percentages will be > 100%.

3.2 COS ACCOMPLISHMENTS FOR 2021

Below are highlights of COS activities and accomplishments for 2021

3.2.1 SEMS AUDIT SERVICE PROVIDER (ASP) ACCREDITATION PROGRAM

In accordance with the Memorandum of Understanding signed in 2015, COS is currently the only accreditation body authorized by BSEE to accredit SEMS ASP pursuant to 30 CFR 250, Subpart S. They are:

- ABS Quality Evaluations
- CICS-Americas
- DNV Business Assurance
- ERM Certification and Verification Services
- M&H Auditing

A list of accredited ASP is maintained at **centerforoffshoresafety.org**

3.2.2 SEMS AUDIT AND CERTIFICATE PROGRAM

SEMS Certificates demonstrate that an organization has satisfactorily completed a Safety and Environmental Management System (SEMS) audit conducted by an accredited ASP and meets the requirements of API Recommended Practice 75, 3rd Edition.

As of the publication of this APR, the following companies have successfully attained or re-attained a COS SEMS Certificate:

- Anadarko Petroleum Corporation
- Arena Offshore, LP
- BHP Billiton Petroleum
- BP E&P, Inc.
- Cameron International
- Chevron U.S.A, Inc. (Deepwater Assets)
- Cobalt International Energy, LP
- ConocoPhillips Company
- Equinor U.S.A E&P, Inc.
- ExxonMobil Production Company
- Helmerich & Payne International Drilling Co.
- Hess Corporation
- Marathon Oil Company
- Murphy E&P, Co.
- Noble Energy
- Shell E&P Co.
- Pacific Drilling Services, Inc.
- Schlumberger
- Statoil Gulf Services, LLC.

A list of certificates is maintained at **centerforoffshoresafety.org**

In early 2020, COS modified procedures for SEMS Certificates to allow non-COS member companies to obtain COS SEMS Certificates. The modified procedures also allow operations outside the U.S. OCS to obtain SEMS Certificates.

The updated procedures, *COS-2-05 Requirements for COS SEMS Certificates*, are available for download at **centerforoffshoresafety.org**.

3.2.3 COS SAFETY LEADERSHIP AWARD

The winners of the 2021 COS Safety Leadership Awards were:

OPERATOR WINNER

Journey to Reduce High Potential Dropped Objects on Production Assets

CONTRACTOR WINNER

Time 2 Refocus: Mindfulness Techniques

In addition to Shell and Baker Hughes, the following were the finalists in the Operator and Contractor categories:

OPERATOR FINALISTS

Simplified Bowties

Contractor Scorecard

CONTRACTOR FINALISTS

Risk Management: 5 Checks to Go

Adapting a Safety Leadership Development Program during a Pandemic: BOLD for Supervisors

COS Safety Leadership Award finalists' presentations are available on the COS website: **centerforoffshoresafety.org/announcements_page/SLA**.

3.2.4 COS SAFETY LEADERSHIP AWARD

In 2021, COS published the following documents. These documents are all available for free download via the COS website – **centerforoffshoresafety.org**. The new and updated documents are:

- *COS-1-09/RP 75, 3rd edition, Guidance for Conducting SEMS Audits*
- *COS-3-01 Guidelines for Leadership Site Engagement, 2nd edition*
- *COS-3-07 Guidance for the Development of an Effective Crane Maintenance Tracker (CMT)*
- *COS-3-08 Guidance on Verifying Existing Barriers*

COS held the following events in 2021 with the purpose of educating industry on published good practices along with other topics relevant to offshore safety. Recordings of COS webinars can be viewed on the COS website.

- COS Webinar: Leadership Site Engagement, May 26, 2021
- COS Webinar: Guidance for Conducting SEMS Audits, June 23, 2021
- COS Webinar: Bureau of Safety & Environmental Enforcement (BSEE) Risk Based Inspections (RBI) – Using Data to Drive Performance, July 22, 2021
- COS Webinar: Guidance for the Development of an Effective Crane Maintenance Tracker, August 12, 2021
- COS Half-Day at OTC, August 19, 2021
- COS Webinar: Annual Performance Report for the 2020 Reporting Year, September 9, 2021
- 9th Annual COS Forum, October 27, 2021
- COS Webinar: Process Safety Fundamentals, November 4, 2021
- COS Webinar: Verifying Existing Barriers, November 11, 2021

3.2.5 COS SAFETY SHARES

As part of the COS commitment to the mission of promoting safe operations by sharing industry knowledge, COS created the COS Safety Shares Program. In 2021 COS added 10 new Safety Shares to its library of available Shares:

- *COS2020002 Poor Communication Leads to Total Facility Shutdown*
- *COS2020005 Unstable Load Results in Injury*
- *COS2020009 55lb Valve Falls 15ft in Dropped Object Near Miss*
- *COS2020010 59lb Brake Falls Off Catwalk in Line-of-Fire Near Miss*
- *COS2020012 Slips Not Set Results in Dropped Casing Joint*
- *COS2020013 Misdirected Blowdown to Maintenance Vent through 3-Way Valve Resulting in Flammable Gas Release*
- *COS2020016 Lock-Out Tag-Out Process Not Executed Causing a Fault Out*
- *COS2020017 Corrosion Results in Door Coming Off Aluminum Container*
- *COS2020029 Inadequately Maintained Windsock Falls to Deck Creating a Dropped Object Hazard*

A complete list of COS Safety Shares are publicly available at **centerforoffshoresafety.org**, with more under development.

4.0 SAFETY PERFORMANCE INDICATORS

4.1 INTRODUCTION

COS members share Safety Performance Indicator (SPI) data with COS through the SPI program. Reporting is voluntary and data confidentiality is maintained through a process administered by the API Statistics department before submittal to COS. COS maintains a full record of anonymous data collected beginning in 2013. The data reported in this APR represents the five most recent years – 2017-2021. A normalization factor of work hours is utilized to enable year-to-year comparisons. A list of SPI collected is presented in Figure 4.1 below.

FIGURE 4.1: Safety Performance Indicators (SPI)

SPI 1 is the frequency of incidents that resulted in one or more of the following:

A. Fatality
B. Five or more injuries in a single incident
C. Tier 1 process safety event
D. Level 1 Well Control Incident - Loss of well control
E. ≥ $1 million direct cost from damage to or loss of facility / vessel / equipment
F. Oil spill to water ≥ 10,000 gallons (238 barrels)

SPI 2 is the frequency of incidents that do not meet the SPI 1 definition but have resulted in one or more of the following:

G. Tier 2 process safety event
H. Collision resulting in property or equipment damage > $25,000
I. Mechanical Lifting or Lowering Incident
J. Loss of station keeping resulting in a drive off or drift off
K. Life boat, life raft, rescue boat event
L. Level 2 Well Control Incident - Multiple Barrier Systems Failures and Challenges

SPI 3 is the number of SPI 1 and SPI 2 incidents that involved failure of one or more pieces of equipment as a contributing factor.

SPI 4 is a crane or personnel/material handling operations incident.

SPI 5 is the percentage of planned critical maintenance, inspection and testing (MIT) completed on time. Planned critical MIT deferred with a formal risk assessment and appropriate level of approval is not considered overdue.

SPI 6 is number of work-related fatalities.

SPI 7 is the frequency of days away from work, restricted work, and job-transfer injury and illnesses (DART).

SPI 8 is the frequency of recordable injuries and illnesses (RIIF).

SPI 9 is the frequency of oil spills to water ≥ 1 barrel.

SPI 10 is the severity potential of incidents involving a dropped object.

SPI 1 – SPI 5 are based on structured assessments of major hazards facing the offshore industry. **SPI 6-9** are indicators historically reported by industry and are not directly related to the structured assessment work. **SPI 10** was introduced for the 2019 reporting year and is based on the severity-potential calculator developed by *DROPSOnline*.[1]

Certain characteristics of the data reported for **SPI 1** and **SPI 2** incidents limit some aspects of the analysis and trending. An incident may have consequences that meet both **SPI 1** and **SPI 2** definitions but are not counted in both classifications. The higher consequence drives the classification. For example, a collision that results in > $1 Million Direct Damage Cost meets the **SPI 1E** definition, but also meets the **SPI 2B** consequence of Collision Resulting in > $25,000 in Damage. However, to prevent the duplication of data, per the SPI program structure, it is only counted as an **SPI 1E** incident and not an **SPI 2B** collision.

Although definitions used for some of the SPI are the same or similar to regulatory definitions, the numbers in this report will not necessarily match regulatory data due to this report being based on COS member company data and not all companies operating on the U.S. OCS.

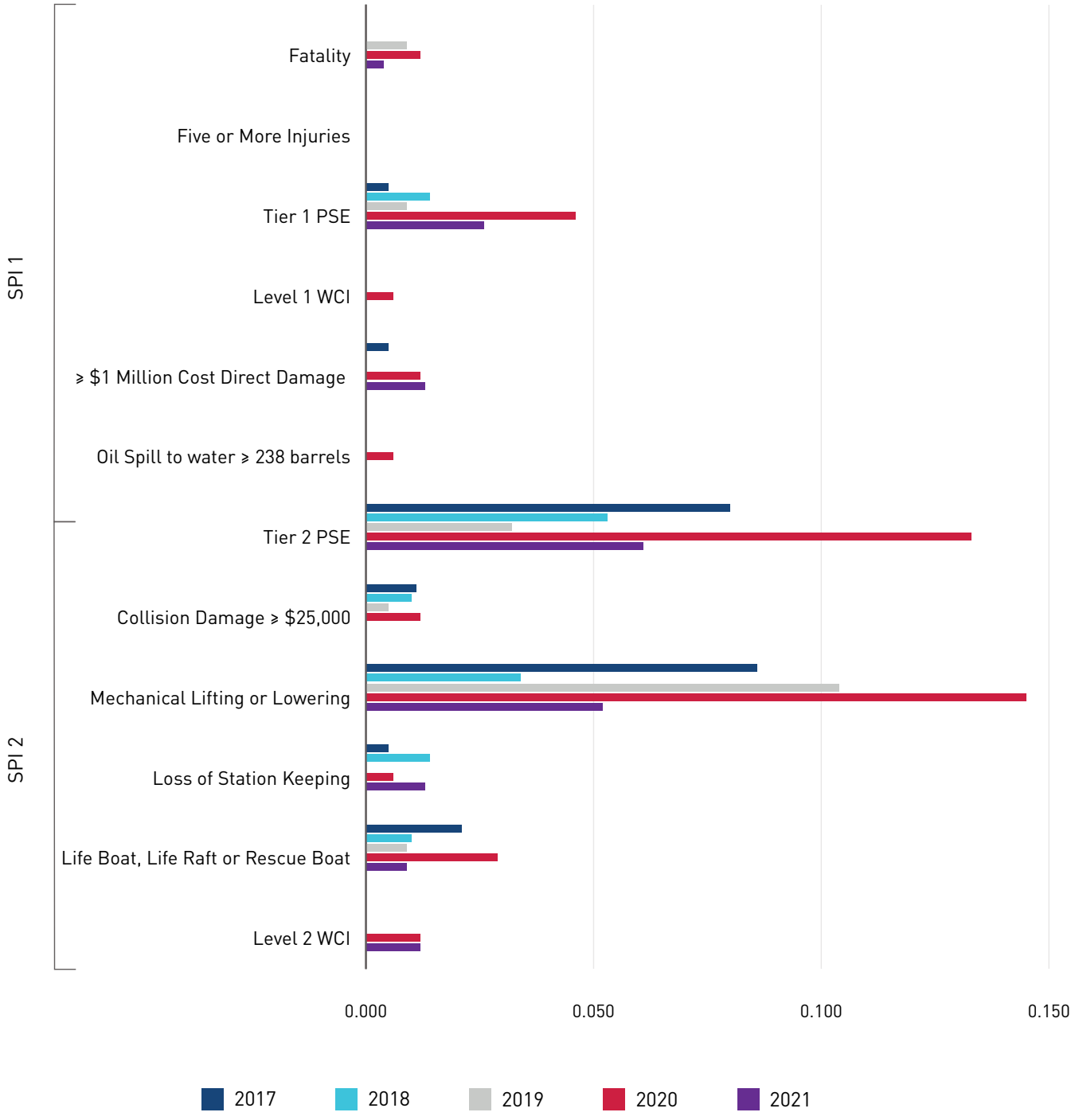
4.2 SUMMARY

This report provides COS member data for 2017-2021. The data reported for 2021 represents more than 45MIL Operator and Contractor work hours in the U.S. OCS. Work hours are reported only by Operators for work occurring within 500 meters of their facilities.

REPORTING YEAR	COS U.S. OCS WORK HOURS (MILLIONS)
2017	37.3
2018	41.7
2019	44.2
2020	34.5
2021	**45.9**

[1] *Dropped Objects Prevention Scheme Online* **dropsonline.org**

FIGURE 4.2: SPI 1 and SPI 2 Incident Frequency



Operator members reported ten **SPI 1** incidents for 2021. The cited outcomes of these ten incidents were one involving a Fatality (**SPI 1A**), six resulting in Tier 1 Process Safety Events (PSE) (**SPI 1C**), and three incidents resulting in > $1MIL damage (**SPI 1E**). Zero incidents involving either ⩾ 5 Injuries in a Single Incident (**SPI 1B**), Level 1 Well Control Incident (WCI) (**SPI 1D**), or Oil Spill ⩾ 10,000 gallons (**SPI 1F**) were reported.

In addition to the above, one Level 1 WCI (**SPI 1D**) was reported by a COS Contractor member for 2021. Per COS data submittal guidelines, to prevent duplication of data, COS Operators report all incidents that occur within 500m of their lease for both Operator and Contractor facilities and employees. A COS Contractor only reports an **SPI 1** or **SPI 2** incident if it occurs while they are working on the lease of a non-COS member Operator or outside the 500m zone of a COS member Operator.

Operator members also reported 30 **SPI 2** incidents for 2021, as compared to 56 for 2020. For the 30 reported incidents, the cited outcomes were 14 resulting in Tier 2 PSE (**SPI 2A**), 12 Mechanical Lifting or Lowering Incidents (**SPI 2C**), three incidents resulting in a Loss of Station Keeping (**SPI 2D**), and two Lifeboat, Life Raft, or Rescue Boat Events (**SPI 2E**). Zero incidents resulting in Collision Damage > $25,000 (**SPI 2B**) or Level 2 WCI (**SPI 2F**) were reported.

The 14 Tier 2 PSE (**SPI 2A**) reported in 2021 was down compared to the 23 reported in 2020.

The 12 incidents involving Mechanical Lifting or Lowering (**SPI 2C**) is a decrease of 50% from the 25 incidents reported in 2020. The additional 11MIL work hours reported means the rate was decreased by 64% from 0.15 for 2020 to .05 for 2021.

The three Loss of Station Keeping Resulting in Drive Off or Drift Off (**SPI 2D**) incidents for 2021 is up slightly compared to the one reported in 2020.

The two Lifeboat, Life Raft, or Rescue Boat Events (**SPI 2E**) reported is down from five reported last year.

Of the 40 total **SPI 1** and **SPI 2** incidents reported by Operators for 2021, 14 involved Failure of Equipment as a Contributing Factor (**SPI 3**), or 35%.

The 2021 number of Incidents Involving Cranes or Personnel/Material Handling (**SPI 4** – of which **SPI 2C** is a subset based on severity of consequences) was 143, compared to 163 for the prior year. If we again take the additional 11MIL work hours into account, while the number of incidents decreased by just 20, those 20 represent a frequency decrease of 35% from 0.95 in 2020 to 0.62 in 2021.

For Operators (8 of 14) that submitted **SPI 5** data (Percentage of Planned Critical Maintenance Completed on Time), the combined average for 2021 was 89%. This is a slight decrease from the average of 90% reported for 2020.

Additionally, for Contractors that shared **SPI 5** data (5 of 7), the combined average for 2021 was 98%, a slight increase from the 97% reported for 2020.

One Fatality (**SPI 6**) was reported for 2021.

The combined Days Away from Work, Restricted Work and Transfer of Duty Rate (DART) (**SPI 7**) reported for 2021 was 0.25, which is up compared to 0.16 reported in 2020. The 2021 rate is comparable to the rates from 2017-2019.

The combined Recordable Injury and Illness Frequency (RIIF) (**SPI 8**) reported for 2021 was 0.41. Similar to the **SPI 7** rate, this is also up compared to 2020's rate of 0.28, but comparable to 2017-2019.

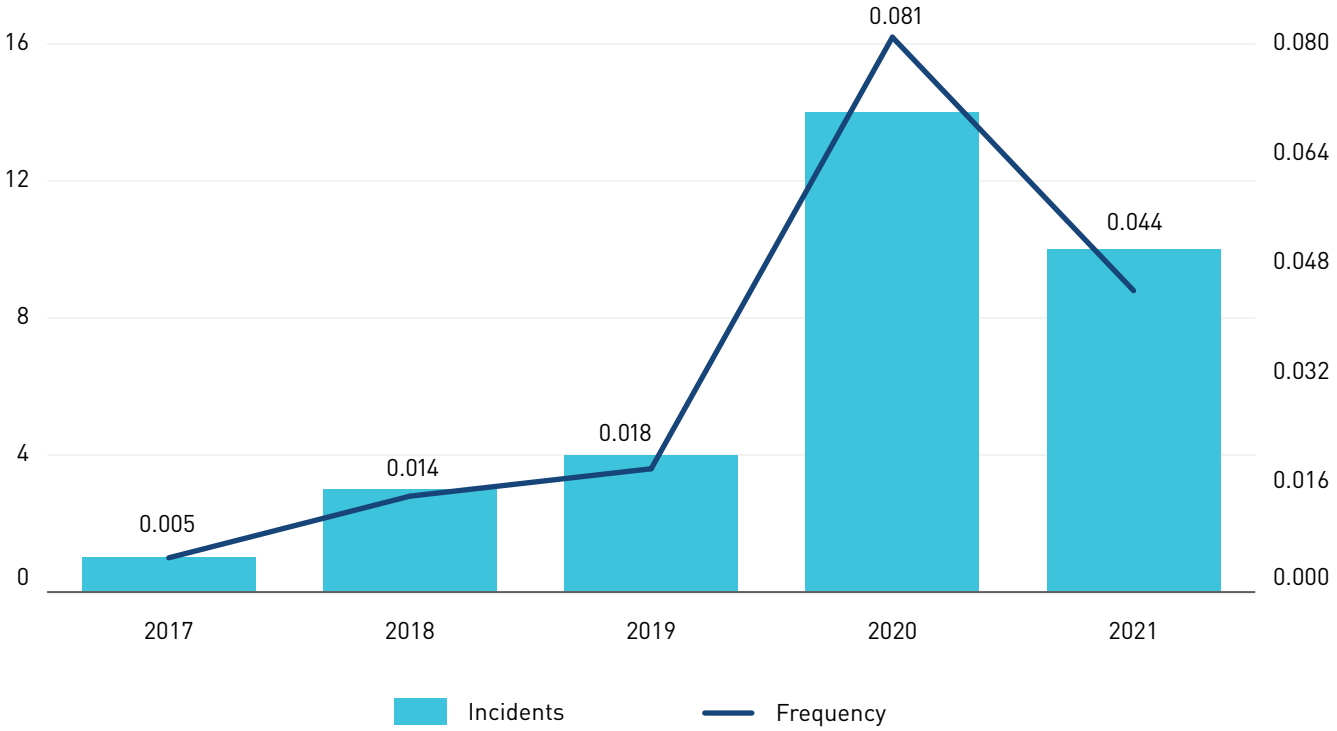
COS members reported seven Oil Spills to Water ⩾ One Barrel (**SPI 9**) for 2021, the same as reported in 2020, but up from the one for 2019 and five for 2018. Although the number of incidents remained static, due to the additional 11MIL work hours reported for 2021, the frequency decreased from 0.04 in 2020 to 0.03 for 2021.

4.3 SPI 1 RESULTS AND TRENDS

SPI 1 is the frequency of incidents that resulted in one or more of the following:

A. Fatality
B. Five or more injuries in a single incident
C. Tier 1 process safety event
D. Level 1 Well Control Incident - Loss of well control
E. ≥ $1 million direct cost from damage to or loss of facility, vessel and/or equipment
F. Oil spill to water ≥ 10,000 gallons (238 barrels)

FIGURE 4.3: SPI 1 Count and Frequency



- Participating Operator members reported ten **SPI 1** for 2021, compared to 14 for 2020.
- The decreased number of **SPI 1** incidents combined with the increased work hours resulted in a frequency of 0.044 for 2021. This is down almost 50% compared to the .081 for 2020.

FIGURE 4.4: SPI 1 Incident Count per Sub-Group

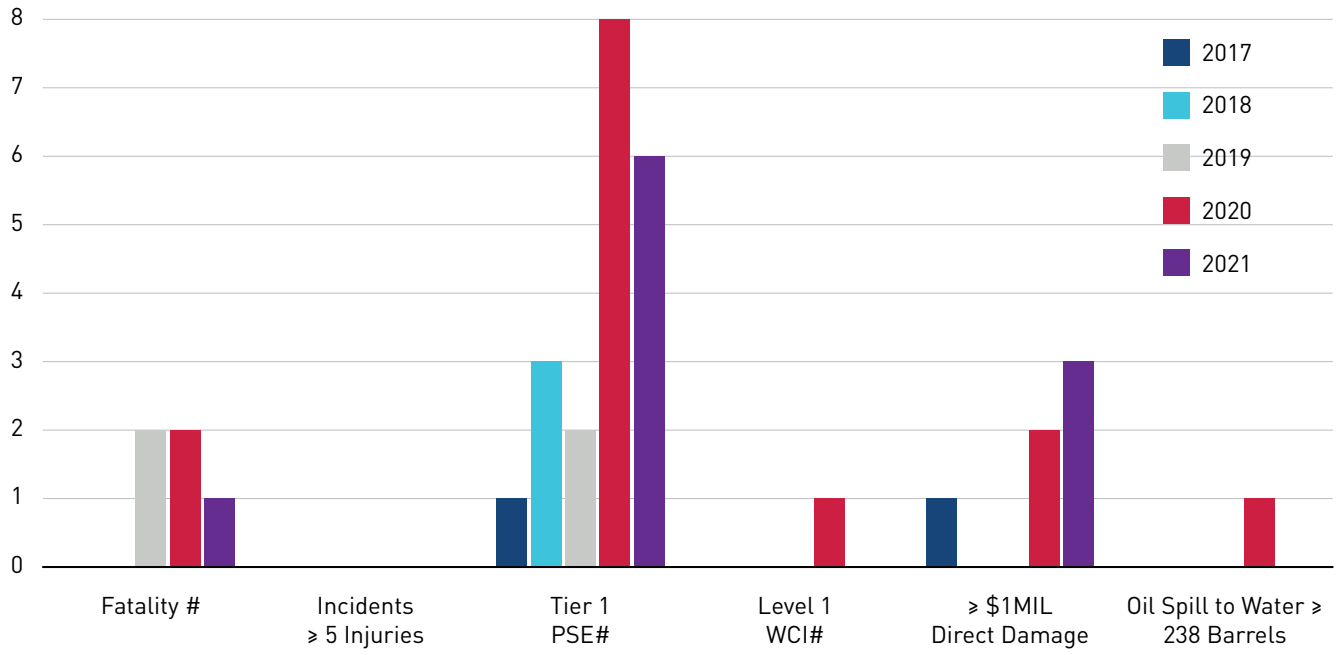
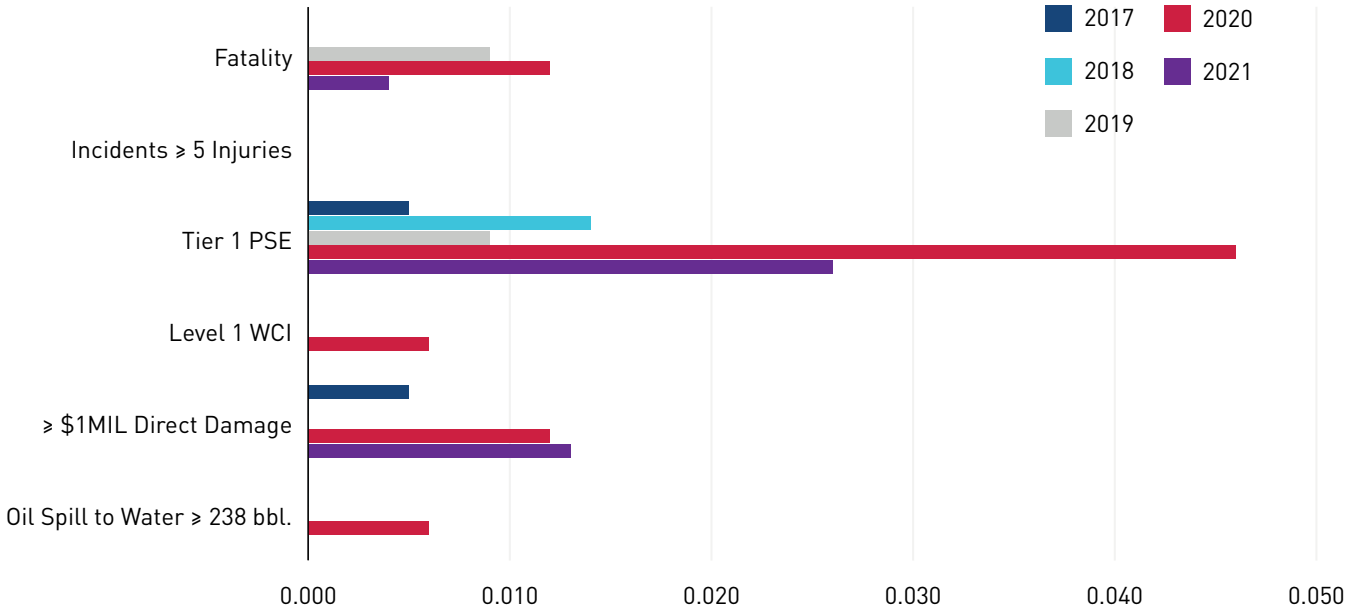


FIGURE 4.5: SPI 1 Incident Frequency per Sub-Group



- The ten **SPI 1** incidents reported by COS Operators were one incident involving a Fatality (**SPI 1A**), six incidents resulting in a Tier 1 PSE (**SPI 1C**), and three incidents resulting in > $1 Million Direct Costs Damage (**SPI 1E**).
- Zero incidents resulting in ≥ 5 Injuries in a Single Incident (**SPI 1B**), Level 1 WCI (**SPI 1D**), or Oil Spill to Water ≥ 238 barrels (**SPI 1F**) were reported by COS Operators for 2021.
- One Level 1 WCI (**SPI 1D**) was reported by a COS Contractor. Being reported by a COS Contractor member means the incident occurred on the lease of a non-COS member Operator, or outside the 500m zone of a lease.

4.4 SPI 2 RESULTS AND TRENDS

SPI 2 is the frequency of incidents that do not meet the SPI 1 definition but have resulted in one or more of the following:

A. Tier 2 process safety event

B. Collision resulting in property or equipment damage ≥ $25,000

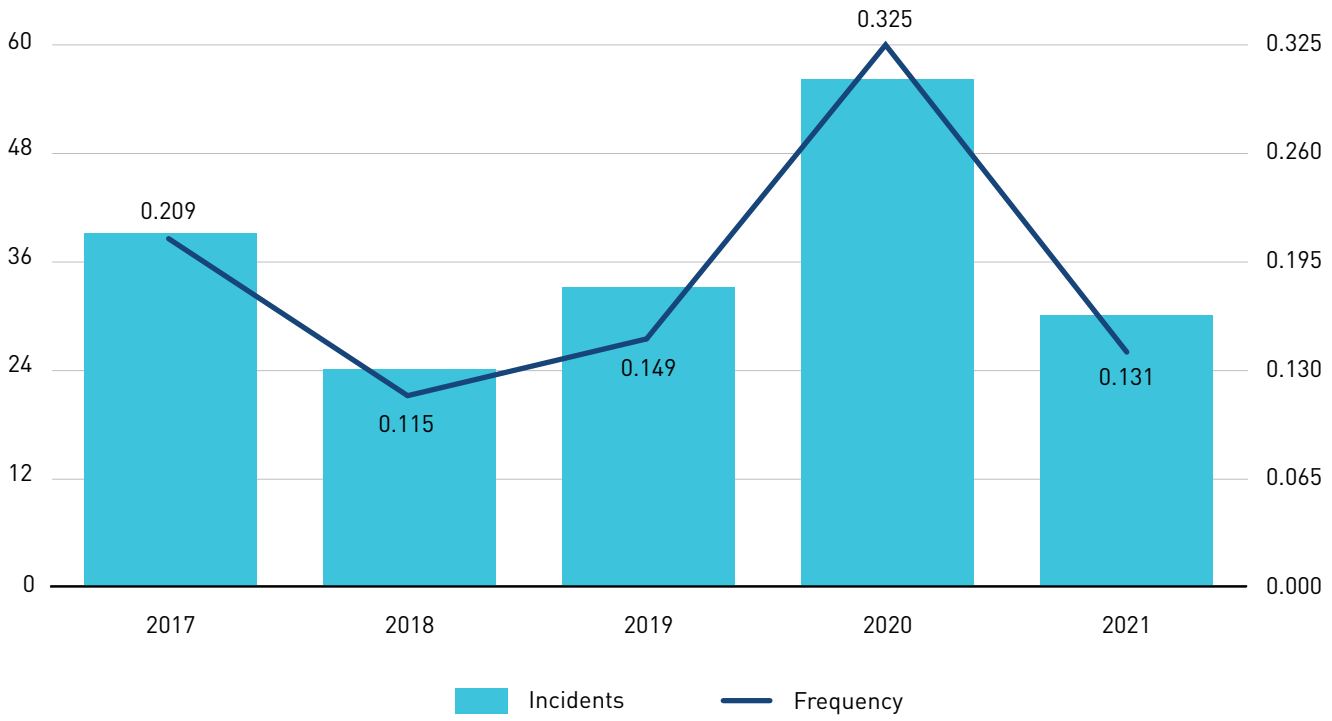
C. Mechanical Lifting or Lowering incident

D. Loss of station keeping resulting in a drive off or drift off

E. Life boat, life raft, rescue boat event

F. Level 2 Well Control Incident - Multiple Barrier Systems Failures and Challenges

FIGURE 4.6: SPI 2 Count and Frequency



- Participating members reported 30 **SPI 2** for 2021, compared to 56 for 2020 and 33 for 2019.
- Taking into account the additional 11MIL work hours for 2021, the 26 fewer incidents represent a 60% decrease in the frequency of **SPI 2** incidents from a rate of 0.325 in 2020 to 0.131 in 2021. The frequency is calculated per 200,000 work hours.

FIGURE 4.7: SPI 2 Incident Count per Sub-Group

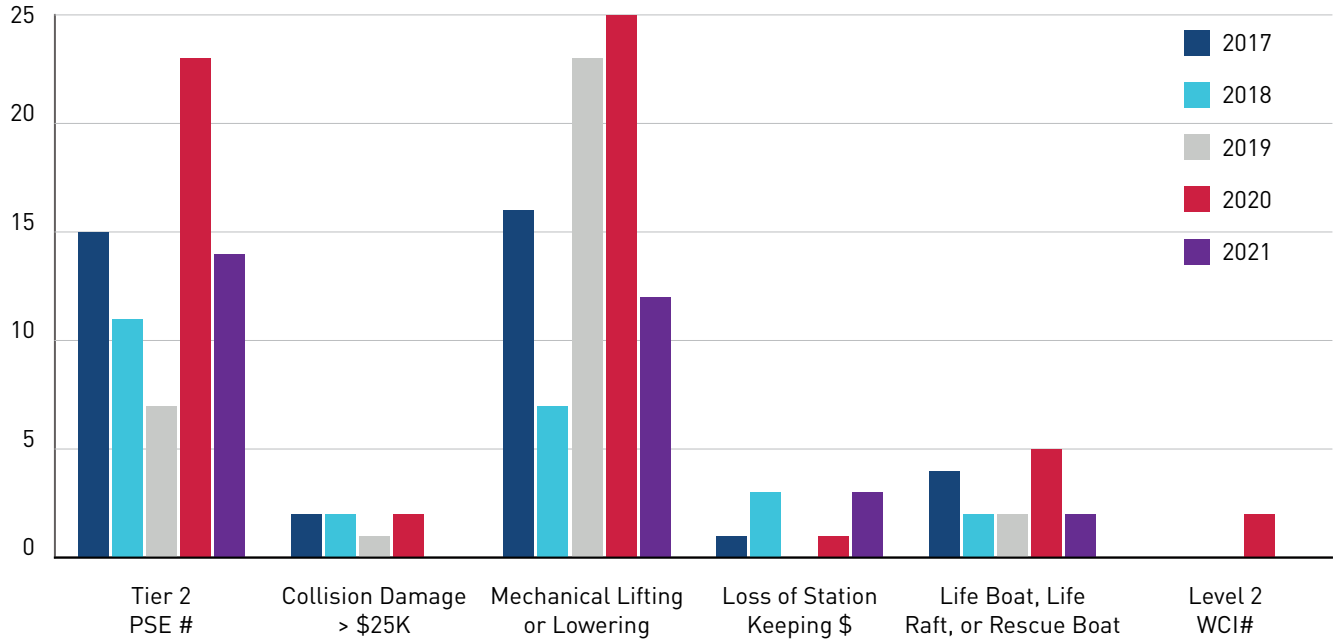
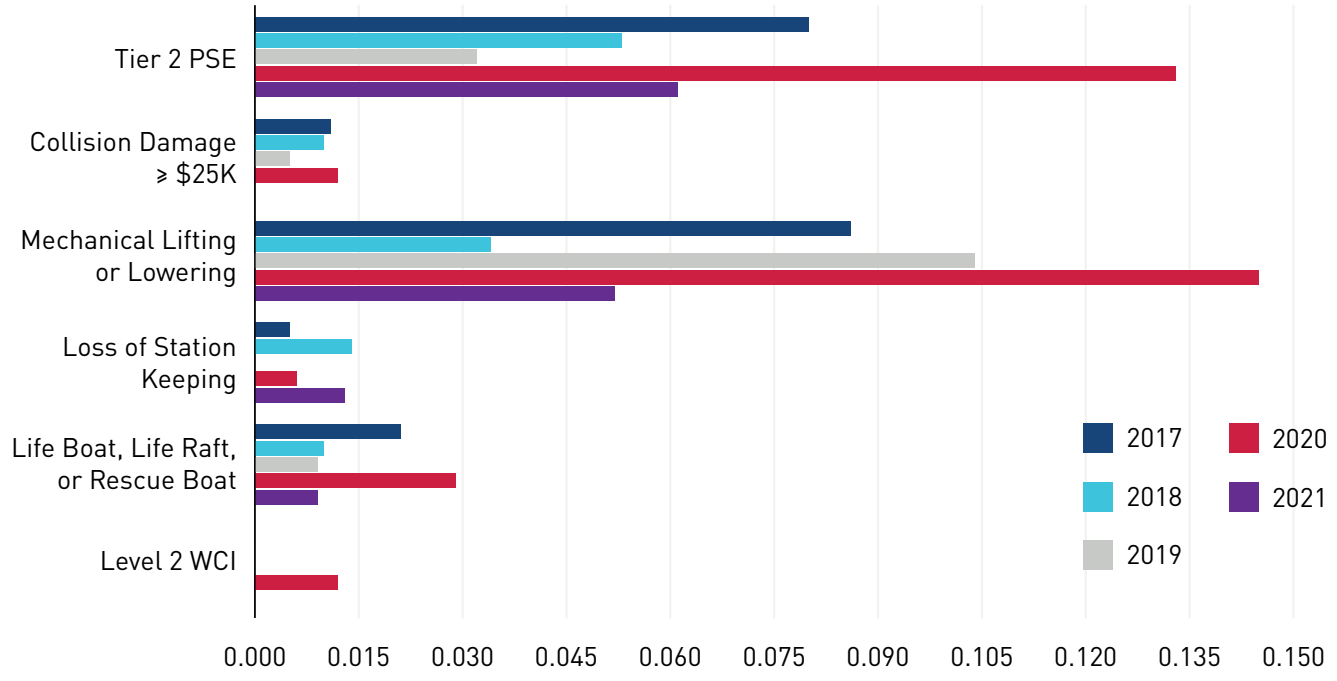


FIGURE 4.8: SPI 2 Frequency per Sub-Group



- Of the 30 **SPI 2** reported for 2021, the consequences were 14 Tier 2 PSE (**SPI 2A**), 12 Mechanical Lifting or Lowering Incidents (**SPI 2C**), three Loss of Station Keeping incidents (**SPI 2D**), and two Lifeboat, Life Raft, or Rescue Boat Events (**SPI 2E**).
- Zero incidents resulting in Collision Damage > $25,000 (**SPI 2B**) or Level 2 Well Control Incidents (**SPI 2F**) were reported for 2021.
- The 14 Tier 2 PSE (**SPI 2A**) reported for 2021 are down 39% from the 23 reported in 2020.
- The 12 incidents involving Mechanical Lifting or Lowering (**SPI 2C** – a subset of **SPI 4**) reported for 2021 is a 50% decrease from the 25 reported for 2020. This 50% decrease in the number of incidents represents a 64% decrease in the frequency of incidents.
- Two Lifeboat, Life Raft, or Rescue Boat Events (**SPI 2E**) were reported for 2021. This is down from the five reported for 2020, but it is in line with the two incidents reported in both 2019 and 2018.

4.4.1 SPI 2C CRANE INCIDENT DATA

In response to a challenge to industry from the Bureau of Safety and Environmental Enforcement (BSEE) in 2021 to "reduce offshore lifting incidents by 50%," the COS Lifting Subcommittee formed a work group to determine what additional information might be collected following an offshore lifting incident that would aid industry in identifying gaps or trends.

The decision was made to focus this supplemental data collection on offshore crane incidents that met the severity criteria to be considered an **SPI 2C** incident. An **SPI 2C** is an offshore mechanical lifting incident that resulted in one or more of the following consequences:

- Four or less recordable injuries in a single incident that occurs during the lift
- Between $25,000 and $1MIL direct damage to or loss of an asset (including the load itself)
- A loss of primary containment of a material meeting a Tier 2 Process Safety Event threshold quantity
- A dropped load that strikes live process equipment

COS members reported a total of 12 **SPI 2C** events for 2021, nine of which involved a crane. The members reporting these nine **SPI 2C** crane incidents submitted a supplemental form with details of each incident, the type of equipment used, type of lift being performed at the time of the incident, and any resulting injuries.

The data from these supplemental forms are presented below. Since this is the first year this data has been collected, it is too soon to seek trends or identify gaps.

FIGURE 4.9: SPI 2C Cranes – Facility and Crane Types

FACILITY AND CRANE TYPES	# OF INCIDENTS
Facility Types	
Fixed (bottom supported) Structure	4
Floating Platform Structure	3
Ship-hulled Vessels	2
Crane Types	
Folding Boom	1
King Post Mounted Lattice Boom	2
Pedestal Mounted Lattice Boom	1
Swing Bearing Mounted Lattice Boom	5

FIGURE 4.10: SPI 2C Cranes – Lift Types

LIFT TYPES	# OF INCIDENTS
Onboard/Static	4
Offboard/Dynamic	4
Non-Lifting (Maintenance)	1
Routine	5
Non-Routine	3
Non-Lifting (Maintenance	1
Material Handling	8
Pipe Handling	0
Personnel Handling	0
Non-Lifting	1

FIGURE 4.11: SPI 2C Cranes – Failures of Equipment

FAILURE OF EQUIPMENT	YES	NO	N/A
Mechanical (e.g., Hoist and Slewing Brake System)	1	7	1
Structural (e.g., Boom Heel Pins or Boom Jib Section)	0	8	1
Rigging (e.g., Hook Block Assembly or Bridle Assembly)	1	7	1
Below the Hook (e.g., Shackles, Slings, or Personnel Baskets)	1	7	1

FIGURE 4.12: SPI 2C Cranes - Injuries

INJURIES – 4 OF 9 INCIDENTS INCLUDES INJURIES	# OF INCIDENTS
Riggers	3
Rope Access Workers (multiple)	1
Major Injury	3
Minor Injury	1
Slight Injury	1
Head Injury	1
Torso (front or back) Injury	1
Arms/Hands	3
Legs/Feet	2

NOTE – The total count of injuries may be greater than the number of incidents reported, as one incident can have multiple injuries.

4.5 TIER 1 AND TIER 2 PROCESS SAFETY EVENT CONSEQUENCES

Tier 1 and Tier 2 PSE are determined by assessing the consequences of a loss of primary containment (LOPC) event against defined thresholds (see Appendix 1). If it meets or exceeds a threshold, then it is classified as either a Tier 1 PSE or a Tier 2 PSE, but not both. In 2014, participating COS members began sharing consequence data for reported Tier 1 and Tier 2 PSE to help industry learn from incidents.

Consequence data was collected for the six Tier 1 PSE (**SPI 1C**) shared for 2021, with the following reported consequences:

- One resulting in a Days Away from Work injury
- Four resulting in a Non-Toxic Material Release
- One resulting in a Toxic Material Release
- One resulting in an Indoor Release
- Five resulting in an Outdoor Release

Consequence data was collected for the 14 Tier 2 PSE (**SPI 2A**) reported for 2021, with the following reported consequences:

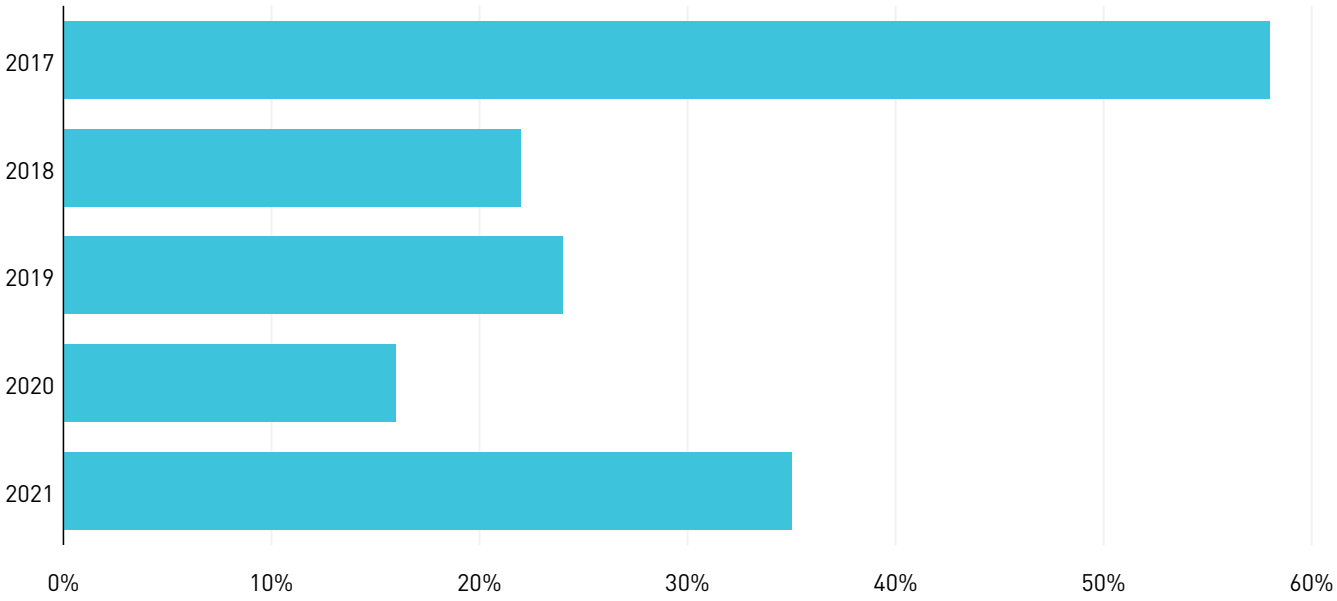
- One resulting in a fire
- Twelve resulting in a Non-Toxic Material Release
- Thirteen resulting in an Outdoor Release

Note – The total count of PSE consequences may be greater than the number of incidents reported, as one incident can have multiple consequences.

4.6 SPI 3 RESULTS AND TRENDS

SPI 3 is the number of SPI 1 and SPI 2 incidents that involved failure of one or more pieces of equipment as a contributing factor.

FIGURE 4.13: SPI 3 % Equipment Failure as a Contributing Factor



- Of the 40 **SPI 1** and **SPI 2** incidents reported by COS Operators for 2021, 14 involved failures of equipment as a contributing factor (**SPI 3**), or 35%. This is the highest percentage reported since the 58% reported in 2017.

FIGURE 4.14: SPI 3 Failure Rates by Equipment Category

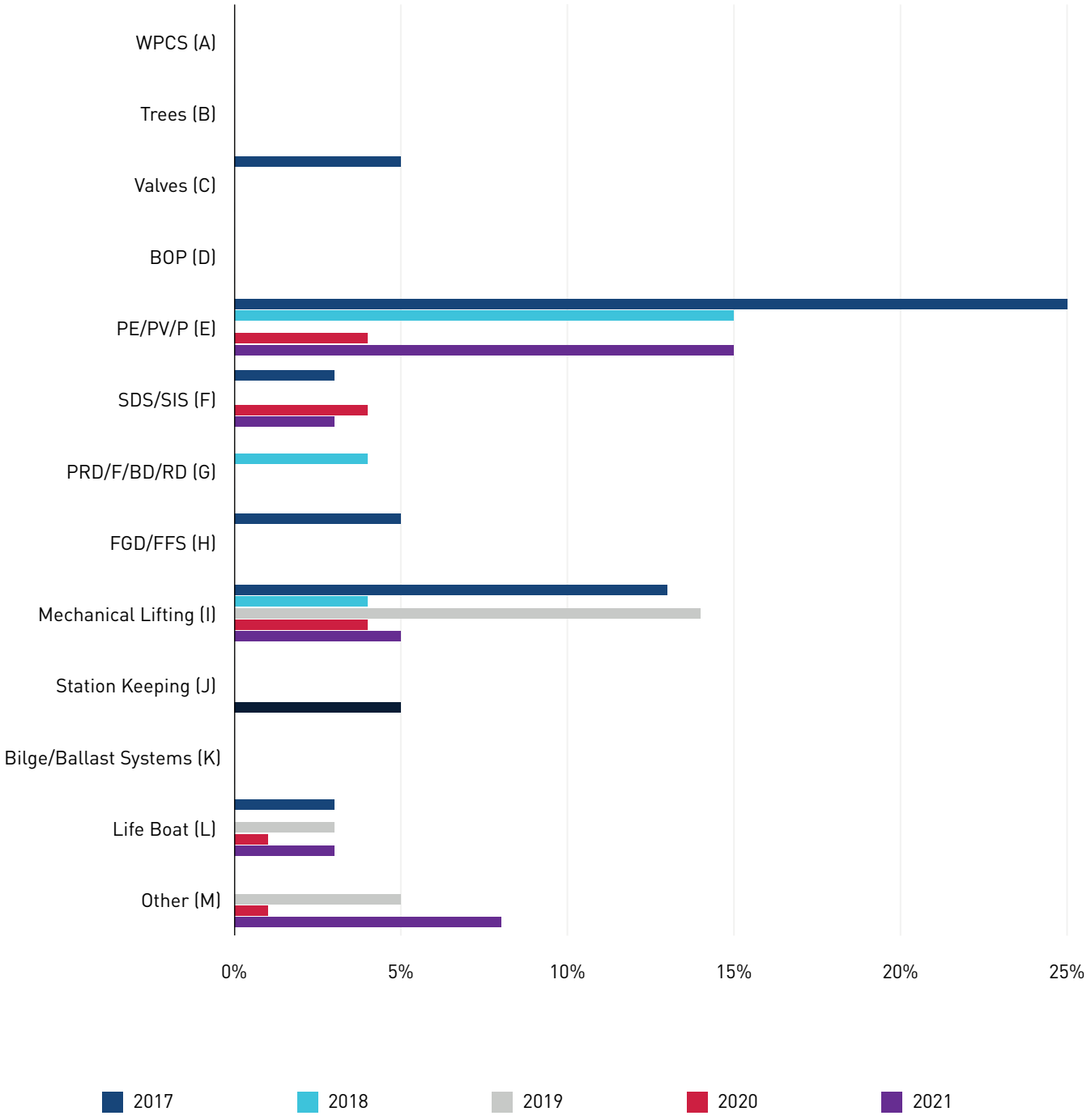


FIGURE 4.15: SPI 3 Incident Counts by Equipment Category

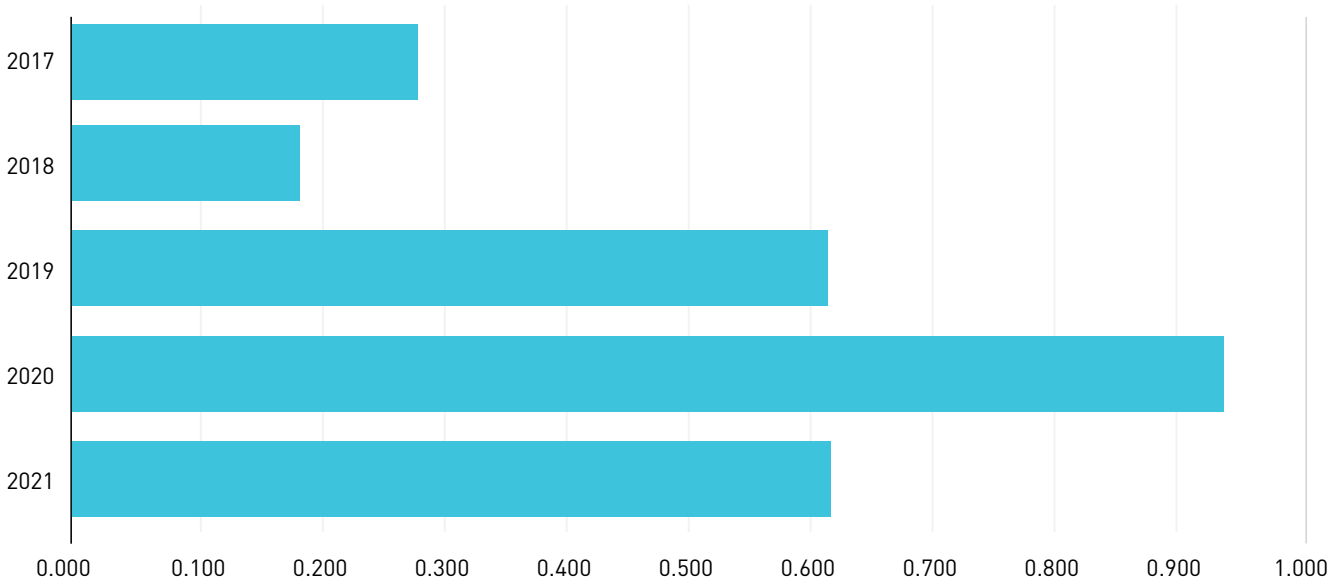
Equipment	2017 Failures (Count)	2018 Failures (Count)	2019 Failures (Count)	2020 Failures (Count)	2021 Failures (Count)
A - Well Pressure Containment System (WPCS)	0	0	0	0	0
B - Christmas Trees	0	0	0	0	0
C - Downhole Safety Valves (Valves)	0	0	0	0	0
D - Blowout Preventers and Intervention Systems (BOP)	0	0	0	0	0
E - Process Equipment/Pressure Vessels/Piping (PE/PV/P)	10	4	0	3	6
F - Shutdown Systems/Automated Safety Instrumented Systems (SDS/SIS)	1	0	0	3	1
G - Pressure Relief Devices/Flares/Blowdown/ Rupture Disks (PRD/F/B/RD)	0	1	0	0	0
H - Fire/Gas Detection and Fire Fighting Systems (FGD/FFS)	2	0	0	0	0
I - Mechanical Lifting Equipment/Personnel Transport Systems	5	1	5	3	2
J - Station Keeping Systems	0	0	0	0	2
K - Bilge/Ballast Systems	0	0	0	0	0
L - Lifeboat/Life Raft/Rescue Boat/Launch and Recovery Systems	1	0	1	1	1
M - Other	0	0	2	1	3

- The most frequently cited system with equipment failure contributing to an **SPI 1** or **SPI 2** incident was Process Equipment/Pressure Vessels/Piping. This system was cited in 6 of the 14 incidents, or 43%.
- For the three incidents which cited M-Other, the submitting company indicated the failures were of air compressors used in utility service.

4.7 SPI 4 RESULTS AND TRENDS

SPI 4 is a crane or personnel/material handling operations incident.

FIGURE 4.16: SPI 4 Crane or Personnel / Material Handling Frequency



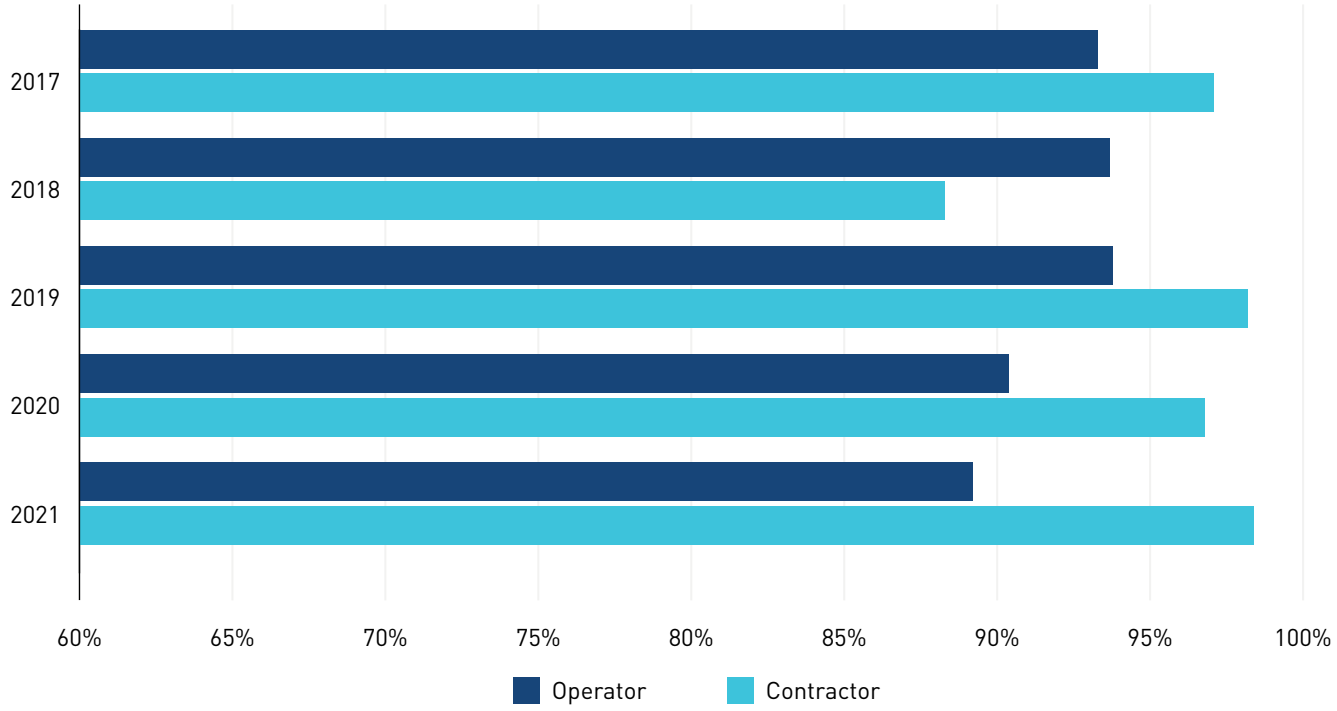
- The number of incidents Involving Cranes or Personnel/Material Handling (**SPI 4**) reported for 2021 was down 20 from those reported in 2020. Due to the increased number of work hours, the frequency decreased 35% from 0.95 to 0.62.

	2017	2018	2019	2020	2021
Count	53	39	137	163	143
Rate	0.284	0.187	0.620	0.945	0.623

4.8 SPI 5 RESULTS AND TRENDS

SPI 5 is the percentage of planned critical maintenance, inspection, and testing (MIT) completed on time. Planned critical MIT deferred with a formal risk assessment and appropriate level of approval is not considered overdue.

FIGURE 4.17: SPI 5 % Planned Critical MIT Completed on Time



- For Operators (8 of 14) reporting **SPI 5** data, the combined average for 2021 was 89.2%, ranging from 72.4% to 100%. This is a slight decrease from the data reported for 2020 (average 90.4%, ranging from 80.8% to 96.9%).
- For Contractors (5 of 6), the combined average for 2021 was 98.4%, ranging from 95.2% to 100%, which represents a slight increase from the data reported for 2020 (average 96.8%, ranging from 95.3% to 100%).
- The **SPI 5** average, when combined for Operators and Contractors, was 98.37% for 2021. This is in line with the 92.5% for 2020 and slightly down from the 94.9% reported for 2019.

NOTE – each company defines what maintenance, inspection and testing tasks qualify as "critical."

4.9 SPI 6–9 RESULTS AND TRENDS

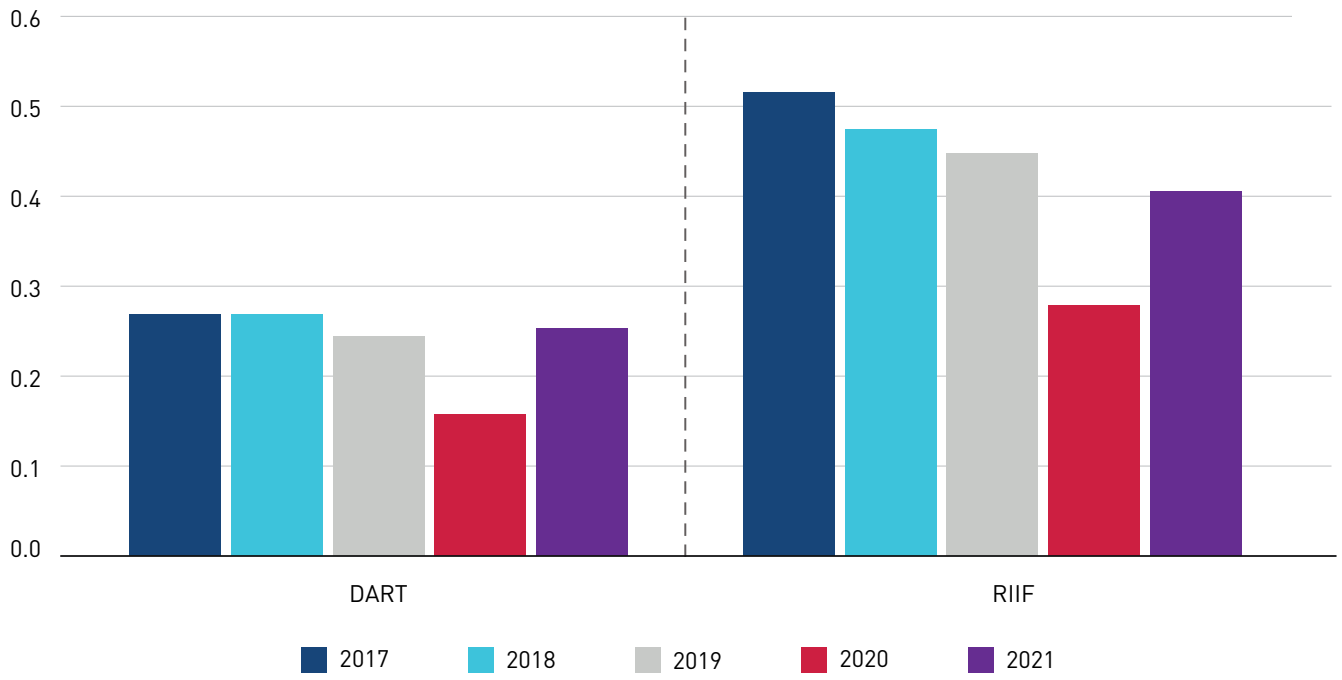
SPI 6 is number of work-related fatalities

SPI 7 is the frequency of days away from work, restricted work, and job-transfer injuries and illness (DART)

SPI 8 is the frequency of recordable injuries and illnesses (RIIF)

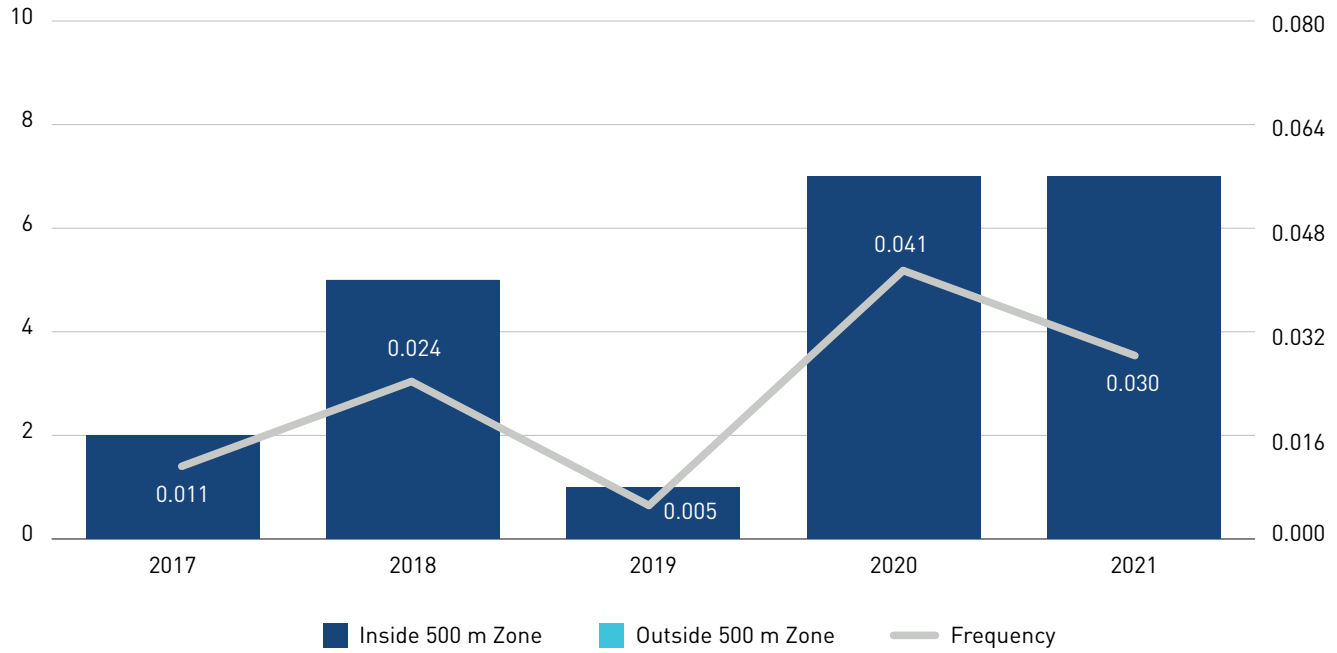
SPI 9 is the frequency of oil spills to water ≥ 1 barrel

FIGURE 4.18: SPI 7 DART and SPI 8 RIIF Rates



- One Fatality (**SPI 6**) was reported for 2021. A total of seven Fatalities have been reported to COS over nine years of reporting.
- The combined Days Away from Work, Restricted Work and Transfer of Duty Rate (DART) (**SPI 7**) reported for 2021 was 0.253 which is an increase from 0.157 reported in 2020, but similar to the rates reported for 2017-2019.
- The combined Recordable Injury and Illness Frequency (RIIF) (SPI 8) reported for 2021 was 0.405 which is an increase from 0.278 reported in 2020, but similar to the rates reported for 2017-2019.
- For the first time this year, COS members also reported the number of COVID-related DART or RIIF. Combined COS members reported 53 COVID-related DART and RIIF. These 53 cases are not included in the DART and RIIF data in Figure 4.18 above.

FIGURE 4.19: SPI 9 Count of Oil Spills to Water ≥ One Barrel

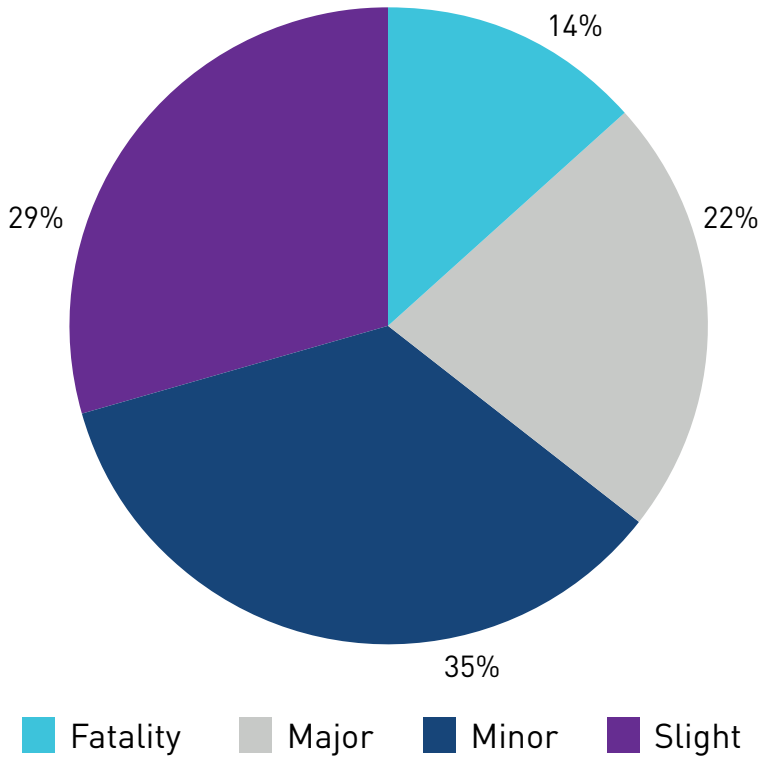


- Seven Oil Spills to Water ≥ One Barrel (SPI 9) reported for 2021 is the same as reported for 2020.
  - The 2020 APR lists nine SPI 9. Upon further review, one COS member updated their data and the correct number is seven.
- Due to the increase in the number of work hours, although the number of SPI 9 was the same as reported for 2020, the frequency decreased 27% from 0.041 for 2020 to 0.030 for 2021.

4.10 SPI 10 RESULTS

SPI 10 is the severity potential of incidents involving a dropped object.

FIGURE 4.20: SPI 10 Dropped Objects *Potential*

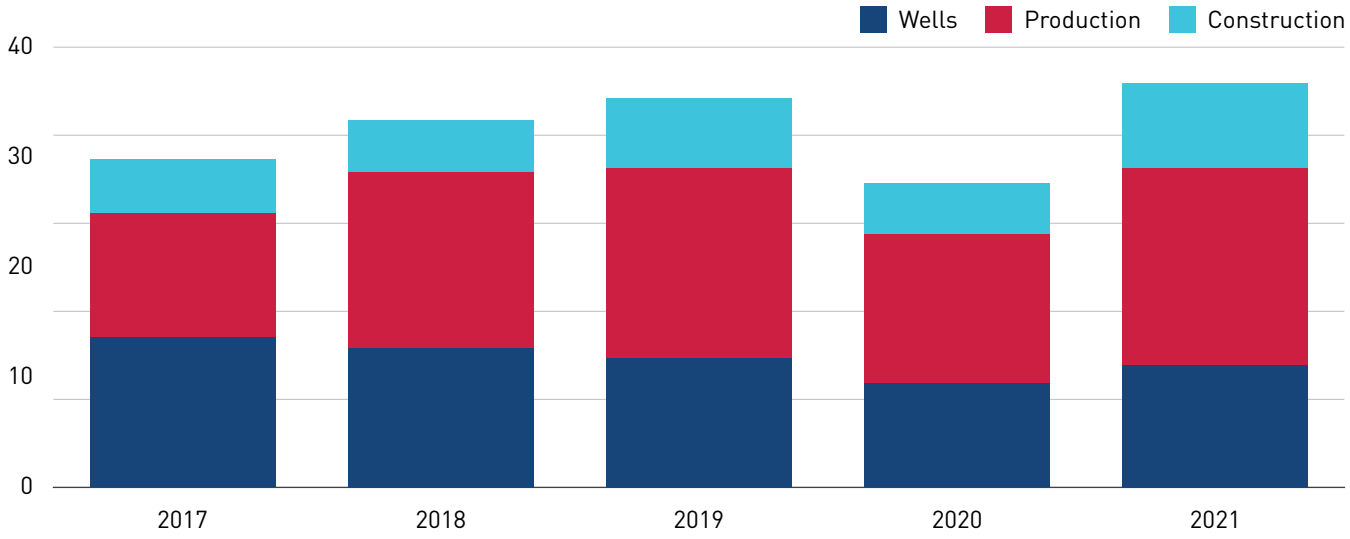


Based on observations in previous COS annual reports, COS began collecting Dropped Object Potential (SPI 10**) information from members for the first time for the 2019 reporting year. For the 2020 reporting year, COS added a fifth data point asking how many of the dropped objects reported resulted in zero harm.*

- Similar to **SPI 5**, data for **SPI 10** is reported by both COS Operator and Contractor members. The data from COS Operators reflect all drops on or within 500m of their lease and may include data from COS Contractors. Data reported by COS Contractors reflect dropped object incidents which occurred while working on the leases of non-COS Operators or outside the 500m zone.
- **SPI 10** represents the potential - not actual - results of incidents involving a dropped object. A total of 213 dropped object incidents were reported for 2021 COS Operators reported 188 and COS Contractors reported 25. Of these 213 incidents, 14% had the potential to result in a fatality, 22% had the potential to result in a major injury, 35% had the potential to result in a minor injury, and 29% had the potential to result in a slight injury.
- Of the 213 dropped objects incidents, 162 (76%) resulted in zero harm.
- The definitions for potential fatality, potential major, potential minor, and potential slight are based on those developed by the DROPSOnline network. Additional details can be found in Appendix 1.

4.11 NORMALIZATION FACTOR (WORK HOURS)

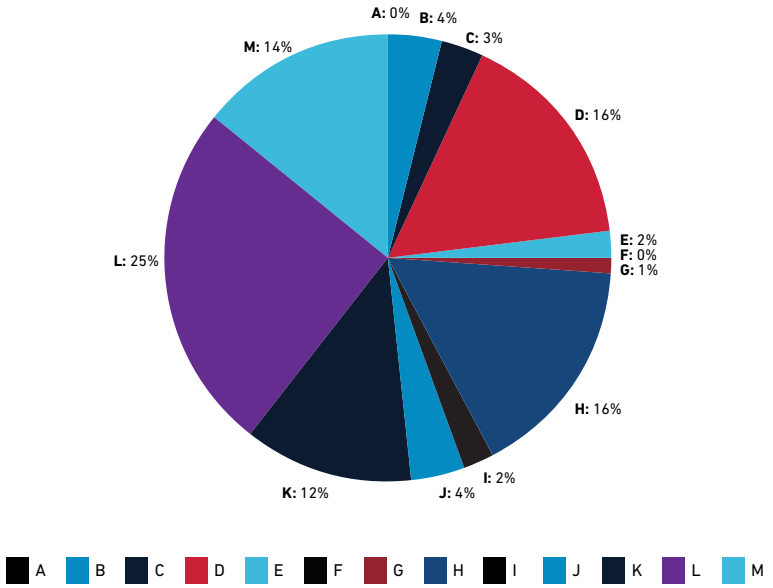
FIGURE 4.21: Work Hours (Millions) by Operation Type



- The data reported for 2021 represents more than 45-million Operator and Contractor work hours on the U.S. OCS. This is an increase to hours reported for 2020 and consistent with and a little above the pre-COVID numbers from 2018-2019.
- Work hours for both Operators and Contractors are reported only by Operators for work occurring within 500 meters of their facilities.

Year	2017	2018	2019	2020	2021
COS U.S. OCS Work Hours (Millions)	37.3	41.7	44.2	34.5	45.9

FIGURE 4.22: 2021 Work Hours per COS Operator



- Five COS Operators accounted for 84% of the total work hours reported by COS members for 2021.

5.0 LEARNING FROM INCIDENTS AND HIGH-VALUE LEARNING EVENTS

5.1 INTRODUCTION

The Learning from Incidents and Events (LFI) Program was established to provide a means for COS members to share and learn from incidents and High Value Learning Events (**HVLE**) that occur in offshore operations. Reporting is voluntary and data confidentiality is maintained through a process administered by the API Statistics department before submittal to COS.

While COS maintains a full record of data collected beginning with 2013 data, the data reported in this APR represents the five most recent years. The LFI section of this report provides an analysis and comparison of the **SPI 1**, **SPI 2**, and **HVLE** LFI data submitted for reporting years 2017-2021 and includes learnings from the 2021 reporting year data that can be shared within companies to potentially prevent recurrence of similar or more severe incidents.

FIGURE 5.1: SPI 1, SPI 2, and HVLE Definitions

SPI 1 is the frequency of incidents that resulted in one or more of the following:

A. Fatality
B. Five or more injuries in a single incident
C. Tier 1 Process Safety Event
D. Level 1 Well Control Incident - Loss of well control
E. ≥ $1 million direct cost from damage to or loss of facility / vessel / equipment
F. Oil spill to water ≥ 10,000 gallons (238 barrels)

SPI 2 is the frequency of incidents that do not meet the SPI 1 definition but have resulted in one or more of the following:

A. Tier 2 Process Safety Event
B. Collision resulting in property or equipment damage ≥ $25,000
C. Mechanical Lifting or Lowering Incident
D. Loss of station keeping resulting in drive off or drift off
E. Lifeboat, life raft, rescue boat event
F. Level 2 Well Control Incident - Multiple Barrier Systems Failures and Challenges

HVLE is an event that may be considered by a COS member or the industry for use as a reference in process hazard analyses, management of change, project design, risk assessment, inspection, operating procedures review and / or training.

LFI data submittals include 3 key fields:

- **Description of the Incident or HVLE:** A brief explanation of activities, conditions, and acts leading up to, during and after the incident or **HVLE**, including sufficient details to facilitate clear understanding.
- **Areas for Improvement (AFI):** A selection of pre-determined general categories and subcategories. Submitters have the option to add comments to provide further clarity and content.
- **Lessons Learned:** Companies outline their incident investigation conclusions with the goal being to reduce the likelihood of similar incidents.

Within the AFI fields, submitters choose from three general categories and 15 sub-categories. Multiple AFI can be selected for a single incident or event. The three general categories are:

- **Physical Facility, Equipment, and Process:** Enhancements in the quality of the physical process and equipment design, layout, material specification, fabrication, or construction were highlighted for improvement.
- **Administrative Processes:** Enhancements in the quality, scope, or structure of administrative processes for managing various aspects of work execution were highlighted for improvement.
- **People:** Enhancements to the personnel actions linked to the execution of work tasks were highlighted for improvement.

5.2 SUMMARY

The effectiveness of this program is dependent on active participation by COS members to facilitate maximum learning opportunities through:

- Timely sharing of quality information from incidents and **HVLE** that meet the reporting criteria; and
- Reviewing submitted incidents and **HVLE**, along with other data in this report, to identify and implement applicable learnings appropriate to different levels and functions within their own organizations.

The LFI data presented in this report includes information from 51 LFI submittals received for the 2021 reporting year, with 43 of the reported incidents and **HVLE** occurring on the U.S. OCS and eight occurring at international locations.

Due to the voluntary nature of the LFI program, this is not an all-inclusive list of incidents or **HVLE** which have occurred in any given year. COS members use their discretion in selecting which incidents or **HVLE** to share via this program. Given this, while the data below is displayed as a comparison of data submitted for each of the last five years, the percent increase or decrease from year-to-year is not necessarily indicative of an incident trend.

FIGURE 5.2: Count of LFI Reports by Location

Location	2017	2018	2019	2020	2021
U.S. OCS	33	27	43	24	43
U.S. Onshore / State Waters	12	4	4	3	0
International	8	0	5	5	8
TOTAL	53	31	52	32	**51**

FIGURE 5.3: Count of LFI Reports by Incident or Event Category

Year	2017	2018	2019	2020	2021
COS **SPI 1**	0	2	1	7	**6**
COS **SPI 2**	8	11	10	6	**16 (+ 9*)**
HVLE	25	14	32	11	**21**
TOTAL	33	27	43	24	**43 (+ 9*)**

NOTE – Beginning with the 2021RY APR, data for* ***SPI 2C* *incidents that involved a crane are collected via an SPI supplemental form in lieu of an LFI form. Details may be found in section 4.4.1.*

A review of the 2021 reporting year LFI data (U.S. OCS only) identified the top reported activity types as:

- Production Operations – Normal, Routine (30%)
- Maintenance, Inspection and Testing (26%)
- Drilling Operations – Normal, Routine (14%)

The top three AFI identified for 2021 were:

- Operating Procedures or Safe Work Practices (37%)
- Process or Equipment Reliability (30%)
- Quality of Task Planning and Preparation (26%)

Across all nine reporting years, Operating Procedures or Safe Work Practices was the most frequently identified AFI. The 37% reported for 2021 is down from the 63% reported for 2020 and is the lowest reported from 2017-2021.

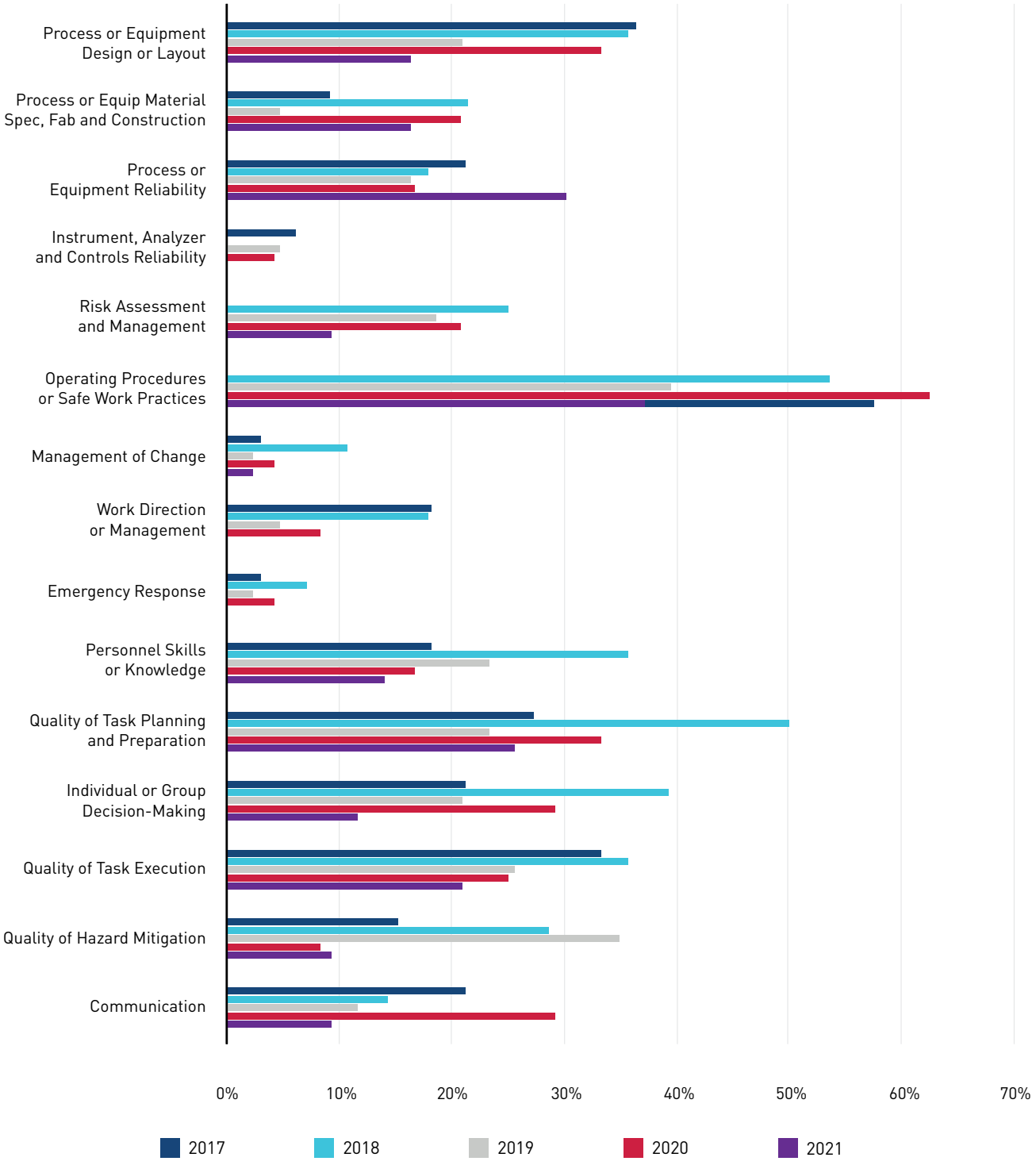
Additional review of the 2021 data identified the following as common threads through many of the LFI submittals:

- Mechanical Lifting or Lowering
- Process Safety Events
- Dropped Objects

FIGURE 5.4: Area for Improvement Distribution (U.S. OCS Only)

Area for Improvement	2017	2018	2019	2020	2021	5-yr Avg
Operating Procedures or Safe Work Practices	57.6%	53.6%	39.5%	62.5%	37.2%	**50.1%**
Quality of Task Planning and Preparation	27.3%	50.0%	23.3%	29.2%	25.6%	**31.9%**
Process or Equipment Design or Layout	36.4%	35.7%	20.9%	33.3%	16.3%	**28.5%**
Quality of Task Execution	33.3%	35.7%	25.6%	25.0%	20.9%	**28.1%**
Individual or Group Decision-Making	21.2%	39.3%	20.9%	29.2%	11.6%	**24.4%**
Personnel Skills or Knowledge	18.2%	35.7%	23.3%	16.7%	14.0%	**21.6%**
Process or Equipment Reliability	21.2%	17.9%	18.6%	16.7%	30.2%	**20.4%**
Quality of Hazard Mitigation	15.2%	28.6%	34.9%	8.3%	9.3%	**19.2%**
Communication	21.2%	14.3%	11.6%	29.2%	9.3%	**17.1%**
Risk Assessment and Management Process	0.0%	25.0%	18.6%	20.8%	9.3%	**14.7%**
Process or Equipment Material Specification, Fabrication and Construction	9.1%	21.42%	4.7%	20.8%	16.3%	**14.5%**
Work Direction or Management Process	18.2%	17.9%	4.7%	8.3%	0.0%	**9.8%**
Management of Change Process	3.0%	10.7%	2.3%	4.2%	2.3%	**4.5%**
Emergency Response Process	3.0%	7.1%	2.3%	4.2%	0.0%	**3.3%**
Instrument, Analyzer and Controls Reliability	6.1%	0.0%	4.7%	4.2%	0.0%	**3.0%**

FIGURE 5.5: Areas for Improvement Distribution (U.S. OCS only)



NOTE - LFI submittals typically identify more than one AFI for any given incident. The graph above illustrates the percent of times an AFI was identified relative to the number of LFI forms submitted for U.S. OCS. Because the number of AFI exceeds the number of LFI forms, the sum of the percentages will be > 100%.

5.3 SEMS ELEMENTS

A primary focus of COS is on safety and environmental management systems (SEMS), based on API RP 75 *Development of a Safety and Environmental Management Program for Offshore Operations and Facilities*, 3rd Edition, which is incorporated into federal regulations administered under BSEE jurisdiction.

It was with this focus in mind that COS added a new question to the LFI forms that members submit, "Choose all that apply - SEMS elements, per API RP 75 4th ed - related to this incident." This same question was also included on the **SPI 2C** Crane incident supplemental data form (section 4.4.1).

As mentioned in section 5.2, COS members use discretion in selecting incidents to report to the LFI program. Therefore, while this data is interesting and useful, it should not be viewed as all-inclusive or necessarily indicative of a trend.

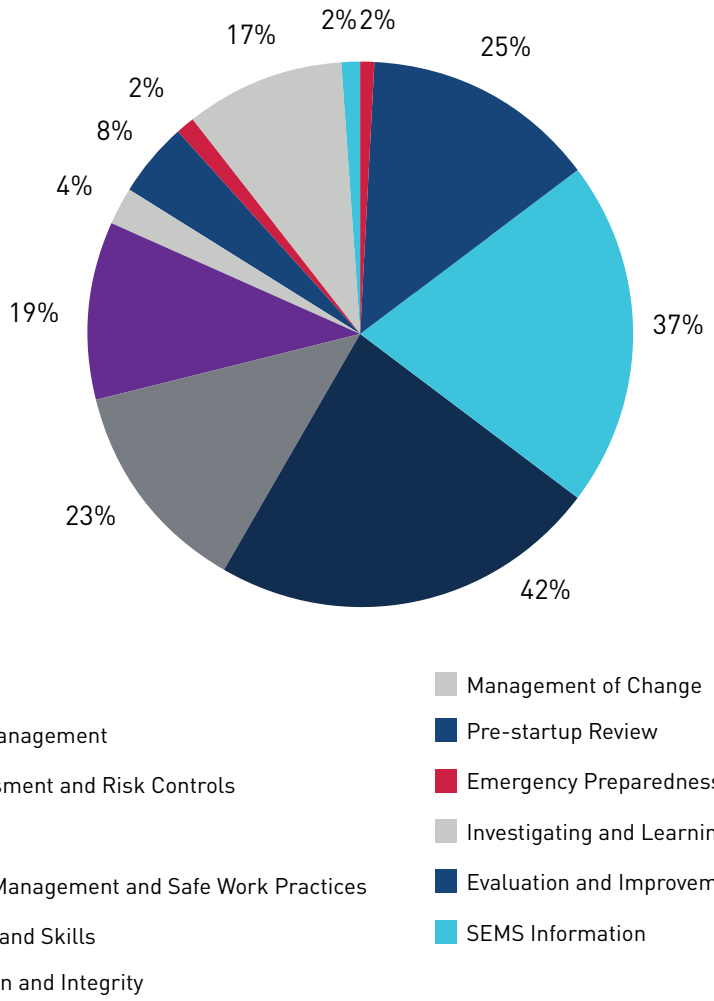
Below is the breakdown of SEMS elements selected for the 43 U.S. OCS LFI reports plus the nine **SPI 2C** Crane incident reports:

FIGURE 5.6: SEMS Elements - Table

SEMS ELEMENTS	# OF TIMES SELECTED	% OF INCIDENTS
Leadership	1	2%
Interface Management	0	0%
Risk Assessment and Risk Controls	13	25%
Procedures	19	37%
Safe Work Management and Safe Work Practices	22	42%
Knowledge and Skills	12	23%
Asset Design and Integrity	10	19%
Management of Change	2	4%
Pre-Startup Review	4	8%
Emergency Response and Preparedness	1	2%
Investigating and Learning from Incidents	9	17%
Evaluation and Improvement of SEMS	0	0%
SEMS Information	1	2%

NOTE - LFI and **SPI 2C** *Crane incident submittals may identify more than one SEMS element for any given incident. The table above and graph below illustrates the selection of SEMS elements identified relative to the number of LFI and* **SPI 2C** *Crane forms submitted for U.S. OCS. Because the number of SEMS elements may exceed the number of LFI forms and* **SPI 2C** *Crane forms, the sum of the percentages will be ≥ 100%.*

FIGURE 5.7: SEMS Elements - Chart



5.4 2021 LEARNINGS

As noted in Section 5.2, Mechanical Lifting or Lowering, Process Safety, and Dropped Objects were sited in many of the incidents and events reported in the 2021 LFI reports, plus the nine **SPI 2C** Crane incident submittals (section 4.4.1). Selected learnings from these submittals are excerpted below.

The charts and graphs earlier in this section reflected data for U.S. OCS incidents and **HVLE** only. In addition to these U.S. OCS LFI submittals, the following sections may include learnings from international incidents and **HVLE**.

5.4.1 MECHANICAL LIFTING OR LOWERING

Five of the 51 LFI submittals (four U.S. OCS and one International) listed the primary activity type at the time of the incident or **HVLE** as Mechanical Lifting or Lowering for 2021. A sixth report was submitted for a lifting incident that occurred while the primary activity type was Drilling Operations – Normal, Routine.

As noted in section 4.4.1 of this report, COS added an additional data collection mechanism for data from crane incidents that met the criteria to be considered an **SPI 2C** Mechanical Lifting or Lowering Incident. The supplemental **SPI 2C** crane data collected from members includes both numerical data (section 4.4.1) and narrative data - similar to an LFI submittal. This narrative data includes incident descriptions as well as details of mitigative actions taken at the time of the incident and preventive actions taken after to prevent a recurrence or similar incident.

The following incident descriptions and learnings are excerpted examples relating to Mechanical Lifting or Lowering:

Incident Description: In preparations for moving the SPAR and drilling/completion riser (DCR) to a new well, the drill crew was in the process of removing the pump deck hatch covers to allow for removal of the choke and kill lines from the Tensioner Joint (TJ). The crew removed the west side hatch covers successfully without incident. As they began to hoist up the first hatch cover on the east side, the hatch cover next to it flipped over towards a crew member landing on his left foot. The crew stopped the job, contacted rig leadership and the employee was evaluated by Safety Medic. The employee was sent to a shore based medical facility for further evaluation.

- **Learnings:**
  - **AFI – Process or Equipment Design or Layout:** Design/modify hatch covers for pump deck to eliminate lifting difficulties and potential stored energy exposure.
  - **AFI – Risk Assessment and Management:** Update the JSA to identifying the exposure and mitigation of stored energy being applied to hatch covers and add job steps to "maintain secondary retention cables on the hatch covers that are not being hoisted."
  - **AFI – Operating Procedures or Safe Work Practices:** Update MPD rig up and BOP rig up procedures to include securing MPD and Blind shear hoses to TJ to eliminating the exposure of stored energy applied to hatch covers.

Incident Description: Support Vessel arrived at the Platform with miscellaneous deck cargo, including 2 grocery boxes loaded on the aft deck behind a large generator. The grocery boxes were approximately 12' x 12' x 12', weight unknown, and the generator was "at least as tall as" the grocery boxes. The Vessel conducted the appropriate drift tests and was ready to begin cargo operations. However, weather delayed the operation for a few hours.

As agreed by all involved, when the grocery boxes were to be offloaded, the crane would keep the crane hook slightly aft of the center of the grocery boxes to ensure the lift would clear the deck in case of sea states and swells.

The crane hook was fit with a short tagline to aid in pulling the hook to the D-ring without requiring personnel to touch the hook. Deck Hand (DH) #1 was holding this short line while DH #2 was holding the D-ring for connection. As DH #1 was pulling the hook to DH #2 for connection, the Vessel fell off a swell. This caused the hook to rise relative to the vessel. Because the hook was not centered over the grocery box, DH #1 was pulled toward the grocery box. He did not release his grip on the line tied to the hook, and as the hook rose, it caught on the edge of the grocery

box, lifting the grocery box up 5-6 Inches. Because DH #1 had been pulled toward the grocery box as the vessel fell off the swell, his steel-toed boot ended under the load. The load was then hooked up successfully and the crane immediately lifted the box, and DH #1's steel-toed boot was released. DH #1 was evaluated by the Captain, and it was found that there was no injury to his foot.

- **Learnings:**
  - **AFI – Quality of Task Planning and Preparation:** Loading cargo in such a way that the D-ring was located between cargo, which obstructed the Captain's view during cargo operations JSA for the operation did not identify line of fire hazards
  - **AFI – Quality of Task Execution:** Failure to identify risks associated with holding the crane hook when the Vessel movement made doing so hazardous.

Incident Description: Crane 3 (SE) was parked with boom orientation…over water to the east side of platform. Crane 4 (NE) moved a cargo container from the upper utility deck to the lower utility deck so that a valve could be loaded into the cargo container. The boom was at a high elevation for the swing around and then boomed down to place the load on the deck further to the south.

After the valve was loaded into the cargo container on the lower deck, the crane operator in Crane 4 lifted the load and began swinging the load overboard to the east. The crane boom on Crane 4 was at a lower boom angle when departing with the load as it was compared to coming in with the load previously. As the load was being swung outward to the east, Crane 4 boom contacted the stationary Crane 3 boom.

Lifting operations were stopped and a stop work was issued platform wide. East side of the platform was cleared and barricaded. Crane mechanic made assessments on Crane 3 and Crane 4.

Crane 3 was parked within the swing radius of Crane 4. Crane 4 was swung towards Crane 3 to avoid swinging Crane 4 over people and process. The crane crew believed that cradling the crane would have obstructed the overflow tote tank farm Crane 4 access.

Only institutional knowledge of where to park Crane 3 when not in the crane cradle existed. The Crane Operator believed that Crane 4 was clear of Crane 3 swing path.

Crane Operator was given the "All Clear." The Crane Operator believed that "All Clear" meant that his load and boom were both clear of all obstacles. The DSP believed that "All Clear" meant that the load and lines were clear of all obstacles. Crane 4 boom partially obstructs the operator's view on swings to the left.

- **Learnings:**
  - **Corrective Actions to repair/mitigate reported incident:** The cargo basket was set back down on the lower deck. Crane 4 and crane 3 were returned to cradles and parked. Further assessment and any necessary repairs were made before returning crane 4 and crane 3 back to service.
  - **Lessons Learned/Actions to mitigate recurrence:**
    - Develop and communicate safest boom angle and heading for all pedestal cranes to be parked when not in their rest. Must be overboard, out of helicopter exclusion zones, and limit exposure to other boom collision threats.
    - Ensure that training) covers boom collision incident and barriers in place to mitigate future occurrences (Boom Parking, Crane Operator Responsibilities, Flagger Responsibilities).
    - Evaluate value of installing anti-collision logic to Cranes.
    - Close gaps on Flagger requirements with respect to personnel with less than 6 months with new company, or new to asset, or without an official Flagger assessment.

5.4.2 PROCESS SAFETY EVENTS (PSE)

Eighteen of the 51 LFI submittals (17 U.S. OCS and one International) described PSE (six Tier 1 PSE and ten Tier 2 PSE and two **HVLE**). For these incidents, the reported Activities at the time of the Drop were:

- Production Operations – Normal, Routine – 10 of 18 (56%)
- Maintenance, Inspection and Testing – 3 of 18 (17%)
- Startup or Shutdown Operations – 2 of 18 (11%)
- Drilling Operations – Normal, Routine – 1 of 18 (6%)
- Material Transfer or Displacement – 1 of 18 (6%)

The remaining incident did not indicate an Activity type.

For these 18 incidents, the most frequently sited AFI were:

- Process or Equipment Reliability – 9 of 18 (50%)
- Operating Procedures and Safe Work Practices – 6 of 18 (33%)
- Personnel Skills or Knowledge – 5 of 18 (28%)
- Process or Equipment Design or Layout, Risk Assessment and Management, and Individual or Group Decision Making – 4 of 18 (22% each)

The following incident descriptions and learnings are excerpted examples of learnings for PSE:

Incident Description: While shutting down the Recycle Gas Compressor (RGC), gas was intended to be directed to flare and was instead inadvertently released to the atmospheric vent via a 3-way valve. Shortly after the blow down valve opened, the control room received notification of a loud noise and visible gas cloud on top of the cooler deck. Subsequent response by deck operators confirmed the RGC blowdown and relief header was aligned to a local vent via a 3-way valve instead of to flare. In [*month*] 2018, the gear operator and position indicator were removed from the 3-way valve due to inoperability of the gear operator. The 3-way valve was operated for the next year and a half using a pipe wrench. Also during that time the position indicator was manually manipulated to indicate valve alignment. On [*date*] 2020, a new gear operator was installed misaligned with the valve ball. What was believed to be alignment to flare was alignment to vent and what was believed to be alignment to vent was a blocked-in configuration.

- **Learnings:**
  - **AFI – Process or Equipment Design or Layout:** 3-way valves, which can freely rotate when a gear operator is removed, were installed as part of original design. A factory marking that is only visible if the gearbox is removed for maintenance was incorrect from the vendor leading to a repair reassembly that caused operations to believe the valve alignment was different than its actual state.
  - **AFI – Risk Assessment and Management:** The 5-year HAZOP process was inconsistent in identifying the risk and barriers to prevent the atmospheric releases and an Incident Causation Pattern Analysis completed in 2020 did not seem to have resulted in any action plan.
  - **AFI – Operating Procedures or Safe Work Practices:** Multiple processes designed to both identify High Risk Hazard threats and barriers and maintain those barriers in the field had inconsistencies in execution. Those processes included an out of date locked open, locked closed (LOLC) valve register, a lock out tag out (LOTO) process that did not identify valves as LO or LC.
  - **AFI – Management of Change:** Failure to execute a MOC (3-way valves and the associated actuator and position indicator were not flagged as safety critical elements (SCE) in the system which influenced the decision to remove critical parts of the assembly and operate without a MOC).

- **Additional Comments:** The organization was unable to embed learnings from three Tier 1 or 2 gas release events that occurred between 2014 and 2019 related to 3-way valves to avoid repeating similar gas releases via 3-way valves. The Learning from Incident system did not improve field personnel awareness of the previous incidents.

Incident Description: While pumping [chemical] to holding tank. Operator noticed a seep on the threaded section of a cam lock fitting. He removed the safety pins to be able to tighten the connection. Once he started tightening the cam lock connection, while the pump was still pumping, the connection came apart. Operator was struck in the face and body with chemical. The safety glasses he was wearing were knocked off his face. Pump was shut down immediately by another operator.

- **Learnings:**
  - **AFI – Individual or Group Decision-Making:** Improper decision making or lack of judgment – Platform personnel have become accustomed to wearing only safety glasses during chemical transfer as they feel that the chemical is contained, and they are not exposed to the hazard. Lack of proper PPE – PPE was noted in the JSA/SDS but not utilized during the job.
  - **AFI – Quality of Hazard Mitigation:** Preventative maintenance not completed. Strainer on chemical line clogged and there is no known scheduled change out or clean out maintenance.
  - **AFI – Communication:** Lack of communication – Communication between the two chemical transfer personnel about changes to the operations (leak) was not conducted. IP decided to tighten connection without consulting the other operator to see if there was pressure on the line. STOP work authority – leak noticed, change in JSA/Job.
  - **Lessons Learned:**
    - Ensure that all personnel understand the hazards of transferring chemicals.
    - Continue to emphasize in the JSA and morning safety meetings that during chemical transfer you shall review the SDS prior to conducting the job.
    - Ensure proper communication methods are established during the JSA.
    - Ensure that STOP work is utilized when there is a change in the job scope.
  - **Recommendations**
    - Establish a PM for all chemical strainers or remove it if it is not needed.
    - Consider adding the Chemical Representatives on board to assist in the chemical transfers and handling or ensure that the chemical champion on location has the proper training.
    - Update the management system training to include policy specific PPE for chemical handling.

Incident Description: A flash fire occurred from inside the closed pile (drain sump) on offshore platform. The closed pile was isolated and had been opened as part of a maintenance activity to replace the pile pump. A team was removing the closed pile pump string from the caisson when the vapor inside the closed pile ignited resulting in a short (~3 seconds) fire occurring out the top of the closed pile. One of the workers received burns to their hand and forearm as a result of the fire.

- **Learnings:**
  - **AFI – Risk Assessment and Management:** Pile pump was replaced. Work conducted in accordance with critical procedure and modified head fitted to pile to allow more effective purging in future change outs.
  - **AFI – Operating Procedures or Safe Work Practices:** Review & update procedure to capture:

- Update prestart checklist with Work Management System critical controls e.g., purging / <4% vol gas test / isolations / Zero Energy
- Explicit iron sulfide controls for wetting down & oxygen exclusion
- Explanation of hazards associated with injecting foam with oxygen and environmental implications of using a fire hose
- Equipment available for wetting down piles
- Risk assessment of pile change procedure

- **AFI – Work Direction or Management:** Created report that captures the quarterly deep dives which includes reason for deep dive, focus area and actions stemming from the deep dives. The deep dives will be facilitated by the Work Management System advisor and involve cross site resources to review permits / Work Management System processes across a sample size sufficient to identify trends.
- **AFI – Personnel Skills or Knowledge:** Communication/training package created and shared
- **AFI – Communication:** Communication/training package created and shared

- **Additional Comments:** Never underestimate the energy associated with low-pressure high-volume systems (e.g., cargo tanks). Perceived Low Impact incidents require appropriate and timely investigation to avoid surprises. Ensure Marine Systems Integrity has the same level of scrutiny and attention similar to other topside systems. Step-up on Facility Marine and Survivability systems knowledge and competencies. Site type: Incident occurred on a FPSO (Floating Production, Storage, and Offloading) Facility.

Incident Description: During platform startup, the sales gas compressors were on recycle while waiting for enough gas generation to start feeding gas to the sales line. Because the sales gas compressors were recycling, there was a drop in gas temperature which resulted in more liquid dropping out of the gas than normal. The liquid in the sales gas coalescer, began to increase. Operators lowered the liquid level in the coalescer using a maintenance drain line to the low-pressure flare header. The blind on the high-pressure side of the maintenance drain valve was in the open position (for normal operation this blind should be in the closed position). The operator removed the car seal from the valve to open it.

Draining the coalescer into the flare header, resulted in a pressure increase in the low-pressure flare header that allowed flare gas to back flow through the low pressure flare header into the oil crankcase of an offline compressor that vented to atmosphere through the vented crankcase cap. There was a check valve in the low-pressure flare header line from the offline compressor's oil crankcase; however, the flapper came incorrectly installed from the supplier.

The crank case vented for a short duration and did not result in a Tier 2 PSE.

- **Learnings:**

  - **AFI – Process or Equipment Material Specification:** Check valve flapper was not identified as being incorrectly installed as part of platform commissioning.
  - **AFI – Process or Equipment Reliability:** Maintenance drain valve blind was in the incorrect position for normal operations per the Piping and Instrumentation Drawings (P&IDs).
  - **AFI – Risk Assessment and Management:** Operations personnel did not realize the potential hazards of breaching a high pressure/low pressure interface at the maintenance drain valve.

- **AFI – Individual or Group Decision Making:** Valves that should only be opened to allow for maintenance were used for operations.
- **AFI – Quality of Task Execution:** The car seal/locked valve procedure was not followed.

5.4.3 DROPPED OBJECTS

Fourteen of the 51 LFI submittals (ten U.S. OCS and four International) included Dropped Objects as an actual or potential consequence for 2021. For these incidents, the reported Activities at the time of the Drop were:

- Drilling Operations – Normal, Routine – 6 of 14 (43%)
- Mechanical Lifting or Lowering – 3 of 14 (21%)
- Production Operations – Normal, Routine – 1 of 14 (7%)
- Maintenance, Inspection and Testing – 1 of 14 (7%)
- Diving – 1 of 14 (7%)

The two remaining incidents which included a Dropped Object listed "Other" as the Activity Type.

For these 14 incidents which included a Dropped Object, the most frequently sited AFI were:

- Operating Procedures and Safe Work Practices – 7 of 14 (50%)
- Quality of Task Planning and Preparation – 7 of 14 (50%)
- Quality of Task Execution – 5 of 14 (36%)

The following incident descriptions and learnings are excerpted examples of learnings for Dropped Objects:

Incident Description: Mud was observed leaking from a casing running tool as it was being made up to the landing string. The Driller started to back out the stand to rack it back and investigate the leak, when the mud swivel hose from the casing running tool caught on the bails causing the hose connections to fail and the hose dropped to the rig floor. The rig floor red zone was clear and all personnel were in the safe step back area.

- **Learnings:**
  - **AFI – Process or Equipment Design or Layout:** The need for secondary retention on the casing running tool mud swivel drain hose was not identified during the design phase. The casing running tool assembly procedure was required to be updated to reflect use of fittings and secondary retention.
  - **AFI – Risk Assessment and Management Process:** The need to have checks for the identification of potential dropped objects on vendor equipment prior to being transported offshore for use was not outlined in Operator's requirements or process steps.

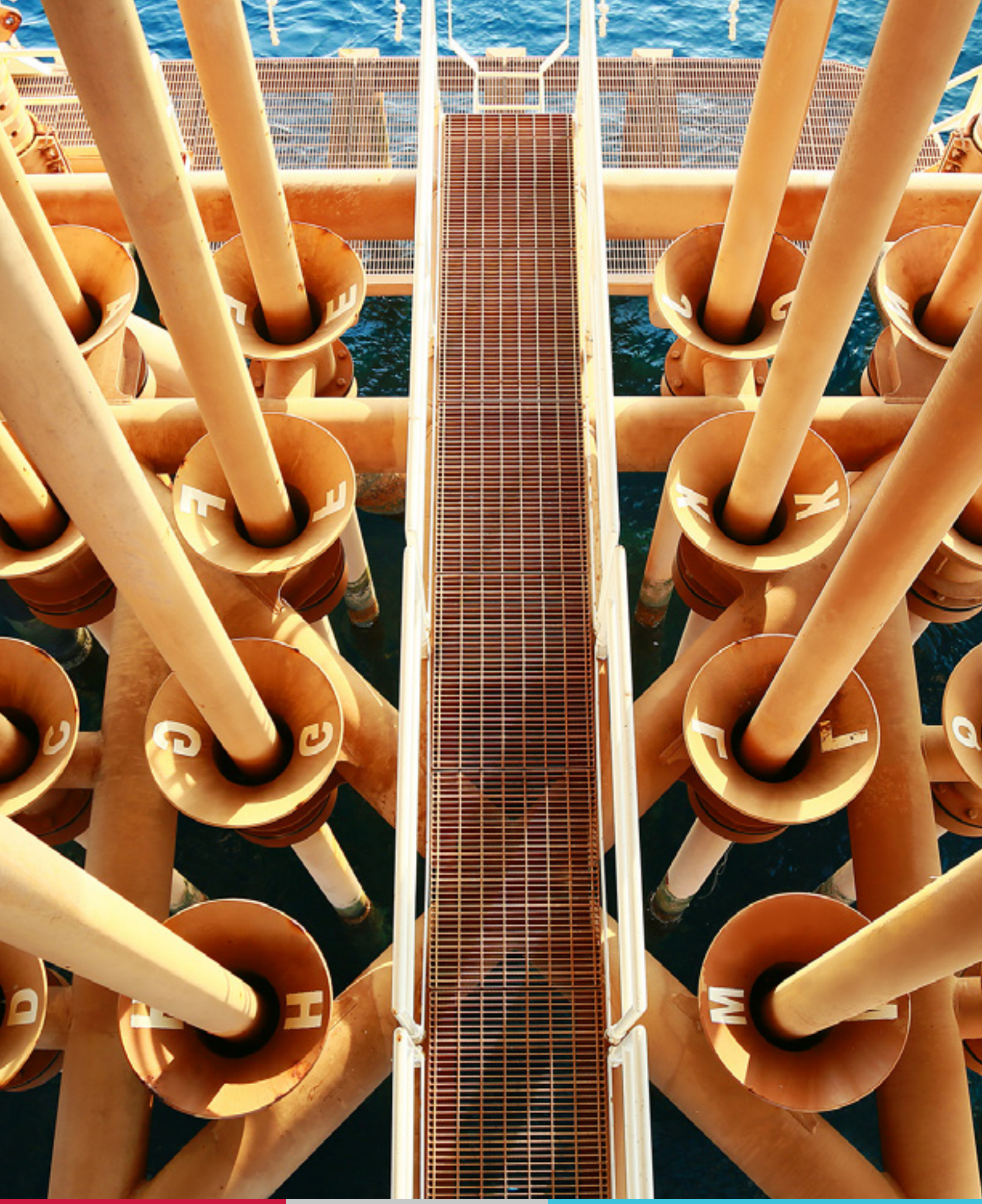
    A check for potential dropped objects and review of vendor dropped object assessments to be added to the quality assurance process for tools and equipment prior to transport and use offshore.
  - **AFI – Quality of Task Planning and Preparation:** The [employee] failed to follow their management system requirements by not utilizing the applicable third party equipment checklist. [Employee] to obtain additional guidance on the use and implementation of this checklist.

Incident Description: The Assistant Driller was in the process of traveling the [pipe handling equipment] to the forward end of the derrick, to get the next stand, when he heard a loud sound and immediately stopped the operation. It was determined that a clamp weighing 1.63lbs had fallen from the [pipe handling equipment], falling 80 feet onto the drops shed then bouncing off, and finally resting on the base of the [pipe handling equipment]. It was determined that the clamp had come loose due to the nuts being not of the correct locking type and are subject to loosening over time due to the constant vibration of the [pipe handling equipment]. The loose clamp possibly could have been detected earlier, prior to failure with more frequent drops inspections.

- **Learnings:**
  - **AFI – Process or Equipment Reliability:** Incident investigation found causal factors of equipment / tool(s) failure.
  - **AFI – Quality of Task Planning and Preparation:** Investigation Report found that a causal factor was found for failure to check equipment or tool(s).
  - **AFI – Quality of Hazard Mitigation:** Investigation found that Human Causal Factors included inadequate hazard controls.
  - **Additional Comments:**
    - *Failure to check equipment or Tools* Current Frequency of inspection failed to detect the loosening of the nuts on the bolt to cause the dropped object. Increasing the frequency of inspection and including this inspection process with regular routine maintenance procedures such as the "Slip and Cut "JSA.
    - *Equipment Tools failure* Nuts on clamp bolts had become loose over time and due to the nuts not having the proper locking features allowed the clamp to become a dropped object. Inspections need to include the identification of the required areas that require the replacement with suitable locking nuts. Drops inspections of the [pipe handling equipment] needs to be increased in frequency and specifically focused on identifying that the retaining nuts are of the proper locking type that will prevent nuts from backing off of bolts due to vibration. An opportunity to ensure that this inspection is completed on a Monthly basis and this step to be included on the Slip and Cut JSA.

Incident Description: A 41 lb. light fixture fell ~28 feet to a walkway on the deck below. No one was in the area at the time of the incident. The bracket that secures the fixture to the structure broke, causing it to fall.

- **Learnings:**
  - **AFI – Process or Equipment Reliability:** Investigation of the fixture and similar brackets indicate that failure was most likely not due to corrosion. The bracket design and single anchor point allowed the metal to flex over time and break due to the weight of the light fixture.
  - **AFI – Operating Procedures or Safe Work Practices:** Inspect ALL other facilities for similar issues and complete any needed repairs. Increase frequency of focused hazard hunts to identify potential for dropped objects. Incorporate visual inspection of fixtures into existing FIMS inspections. Evaluate installation of alternative mounting options and/or tethers.



APPENDIX 1 SPI DEFINITIONS & METRICS

SPI No.	SPI Definition	SPI Metric	Reporting Entity
SPI 1	Number of work-related incidents resulting in one or more of the following consequences: A. Fatality: One or more fatalities. B. Injury to 5 or more persons in a single Incident C. Tier 1 Process Safety Event: (API RP 754/IOGP Report 456 Tier 1 Process Safety Event) An unplanned or uncontrolled release of any material, including non-toxic and non-flammable materials (e.g., steam, hot condensate, nitrogen, compressed CO2, 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; ▪ a hospital admission and/or fatality of a third-party; ▪ an officially declared community evacuation or community shelter-in-place; ▪ a fire or explosion resulting in greater than or equal to $25,000 of direct cost to the Company; ▪ a pressure release device (PRD) discharge to atmosphere whether directly or via a downstream destructive device that results in one or more of the following four consequences: ▪ liquid carryover ▪ discharge to a potentially unsafe location ▪ an onsite shelter-in-place ▪ public protective measures and a PRD discharge quantity greater than the threshold quantities in IOGP Report 456 Part E in any one-hour period; or ▪ A release of material greater than the threshold quantities described in IOGP Report 456 Part E in any one-hour period. D. Level 1 Well Control Incident: Loss of well control ▪ Uncontrolled flow of formation or other fluids resulting in: ▪ Seabed/surface release. ▪ Underground communication to another formation or well. ▪ Includes shallow water flows that result in damage or loss of facilities/equipment ▪ Excludes planned shallow gas mitigation operations. E. $1 million or greater direct cost from damage to or loss of facility / vessel / equipment (excludes costs associated with downtime or production loss). F. Oil spill to water > or equal to 10,000 gallons (238 barrels)	# of **SPI 1** incidents/ total work hours * 200,000	COS Operator for all incidents within the 500-meter zone and for incidents to direct employees while offshore COS Contractor for incidents outside the 500-meter zone while offshore

SPI No.	SPI Definition	SPI Metric	Reporting Entity
SPI 2	Frequency of work-related incidents that do not meet the definition of a **SPI 1** incident but have resulted in one or more of the following: A. Tier 2 Process Safety Event: (API RP 754/IOGP Report 456 Tier 2 Process Safety Event) An unplanned or uncontrolled release of any material, including non-toxic and non-flammable materials (e.g., steam, hot condensate, nitrogen, compressed CO2, 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: ▪ An employee, contractor or subcontractor recordable injury; ▪ A fire or explosion resulting in greater than or equal to $2,500 of direct cost to the Company; ▪ A pressure release device (PRD) discharge to atmosphere whether directly or via a downstream destructive device that results in one or more of the following four consequences: ▪ liquid carryover ▪ discharge to a potentially unsafe location ▪ an onsite shelter-in-place ▪ public protective measures and a PRD discharge quantity greater than the threshold quantity in IOGP Report 456 Part E in any one-hour period; or ▪ a release of material greater than the threshold quantities described in Tables D-F in any one-hour period. B. Collision that results in property or equipment damage > $25,000 C. Incident Involving Mechanical Lifting ▪ A mechanical lifting (or lowering) incident that results in one or more of the following consequences. Mechanical lifting includes lifts of an asset or personnel (personnel transfer and man-riding). ▪ Consequences: ▪ Four or less recordable injuries in a single incident that occurs during the lift ▪ Between $25,000 and $1 million direct damage to or loss of an asset (including the load itself) ▪ A loss of primary containment of a material meeting a Tier 2 Process Safety Event threshold quantity ▪ A dropped load that strikes live process equipment ▪ Not included: ▪ Lifting incident resulting only in a first aid injury ▪ Lifting incident resulting only in direct damage to an asset (including the load itself) < $25,000 ▪ Lifting incident resulting only in a slipped load ▪ Dropped load or object into the water valued at < $25,000 ▪ Manual lifting incidents D. Loss of station keeping resulting in drive off or drift off defined as a malfunction or improper operation of the dynamic positioning system E. Life boat, life raft, or rescue boat event that resulted in a recordable injury or equipment damage or malfunction during life boat, life raft, or rescue boat operations or that take it out of service. F. Level 2 Well Control Incident ▪ One barrier system within the well design failed and other barrier system(s) either failed or were challenged beyond design capacity resulting in an influx without uncontrolled flow.	# of **SPI 2** incidents / total work hours * 200,000	COS Operator for all incidents within the 500-meter zone and for incidents to direct employees while offshore COS Contractor for incidents outside the 500-meter zone while offshore

SPI No.	SPI Definition	SPI Metric	Reporting Entity
SPI 3	Number of **SPI 1** and **SPI 2** incidents that involved failure of one or more of equipment as a contributing factor. COS Equipment categories: A. Well pressure containment system B. Christmas trees C. Downhole safety valves D. Blow out preventer and intervention systems E. Process equipment/pressure vessels, piping F. Automated safety instrumented systems / shutdown systems G. Pressure relief devices, flare, blowdown, rupture disks H. Fire/gas detection and fire-fighting systems I. Mechanical lifting equipment/personnel transport systems J. Station keeping systems K. Bilge/ballast systems L. Life boat, life rafts, rescue boats, launch and recovery systems M. Other	Number of **SPI 1** and 2 incidents involving failure of equipment / total number of **SPI 1** and 2 incidents * 100	COS Operator for all incidents within the 500-meter zone and for incidents to direct employees while offshore COS Contractor for incidents outside the 500-meter zone while offshore
SPI 4	Crane or personnel/material handling operations defined as a failure of the crane itself (e.g., the boom, cables, winches, ball ring), other lifting apparatus (e.g., air tuggers, chain pulls), the rigging hardware (e.g., slings, shackles, turnbuckles), or the load (e.g., striking personnel, dropping the load, damaging the load, damaging the facility). Reference *MMS NTL 2019-N05*.		

SPI 5	Number of planned critical maintenance, inspections and tests completed on time.
	
	• A planned task can be deferred if a proper risk assessment was completed and approved, and a new due date set.
	• COS Equipment:
	  ▪ Well pressure containment system
	  ▪ Christmas trees
	  ▪ Downhole safety valves
	  ▪ Blow out preventer and intervention systems
	  ▪ Process equipment/pressure vessels, piping
	  ▪ Automated safety instrumented systems / shutdown systems
	  ▪ Pressure relief devices, flare, blowdown, rupture disks
	  ▪ Fire/gas detection and fire-fighting systems
	  ▪ Mechanical lifting equipment/personnel transport systems
	  ▪ Station keeping systems
	  ▪ Bilge/ballast systems
	  ▪ Life boat, life rafts, rescue boats, launch and recovery systems
	  ▪ Other
		Number of critical maintenance, inspections and tests tasks completed on time / number of critical maintenance, inspections and tests tasks planned * 100	COS Owner of Equipment

SPI No.	SPI Definition	SPI Metric	Reporting Entity
SPI 6	Number of work-related fatalities	Number of work-related fatalities	COS Operator when within the 500-meter zone and for direct employees while offshore COS Contractor when outside the 500-meter zone while offshore
SPI 7	Number of DART injuries and illnesses. BSEE defines DART injuries or illnesses as those that resulted in "Days Away from work, Restricted duty, and Job Transfer' outcomes.	# DART / total work hours * 200,000	COS Operator when within the 500-meter zone and for direct employees while offshore (same as reported on BSEE-0131 Form)
SPI 8	Number of recordable injuries and illnesses	Number of recordable injuries and illnesses/ total work hours * 200,000	COS Operator when within the 500-meter zone and for direct employees while offshore (same as reported on BSEE-0131 Form)
SPI 9	Number of spills greater or equal to 1 barrel that enter the water	Number of spills > or equal to 1 barrel / total work hours * 200,000	COS Operator for all spills within the 500-meter zone COS Contractor for spills outside the 500-meter zone while offshore
SPI 10	▪ Number of dropped objects and their severity per the DROPSONLINE Calculator (**dropsonline.org/resources-and-guidance/drops-calculator**) ▪ Potential Fatality ▪ Potential Major ▪ Potential Minor ▪ Potential Slight ▪ Number of dropped objects resulting in zero harm	Number of dropped objects per severity / total number of dropped objects reported	COS Operator for all dropped objects within the 500-meter zone COS Contractor for dropped objects outside the 500-meter zone while offshore
Work Hours	▪ For offshore workers, the hours worked are calculated on a 12-hour work day. Work hours are collected in the following categories: ▪ Total U.S. OCS construction workforce hours inside 500-meters ▪ Total U.S. OCS well workforce hours inside 500-meters ▪ Total U.S. OCS production workforce hours inside 500-meters ▪ Total U.S. OCS workforce hours inside 500-meters		COS Operator when within the 500-meter zone (same as reported on BSEE-0131 Form)

APPENDIX 2 SPI 3 EQUIPMENT DEFINITIONS

Equipment	Equipment Definition	Source of Definition
Well Pressure Containment System	The casing and wellhead (with cement support and isolation where applicable) and tubing, tubing hardware and tubing hanger represent the equipment below the BOP or Christmas Tree comprise the "well pressure containment system", and as such represent the ability to contain pressure when a BOP or Christmas Tree has been closed.	COS Definition
Christmas Trees	Equipment attached to the uppermost connection of the wellhead or tubing spool to contain wellbore fluids in both the tubing and in the annular space between the casing and tubing during producing operations. The subsea tree may provide locations where nitrogen and chemical additives can be injected into the annulus or tubing string. The tree consists of assembled equipment that includes a wellhead connector, valves, choke, tree cap, and control system to operate the various components.	API RP 96 and API Specification 6A
Downhole Safety Valves	Downhole safety valve: A device installed in a well below the wellhead with the design function to prevent uncontrolled well flow when actuated, e.g. SSCSV or SCSSV. Subsurface controlled subsurface safety valve (SSCSV): An SSSV actuated by the pressure characteristics of the well. Surface controlled subsurface safety valve (SCSSV): An SSSV controlled from the surface by hydraulic, electric, mechanical, or other means.	API 14C (Appendix G - Definitions)
Blow Out Preventer and Intervention Systems	Equipment installed on the wellhead or wellhead assemblies to contain wellbore fluids either in the annular space between the casing and the tubulars, in the tubulars or in an open hole during well drilling, completion, and testing operations. For the purposes of SPI data collection, this also includes pressure control equipment used in intervention operations, such as wireline and coiled tubing BOPs, lubricators etc.	API 53 with COS Addition
Process Equipment, Pressure Vessels and Piping	Process Equipment/Pressure vessel: A container associated with drilling, production, gathering, transportation, and treatment of liquid petroleum, natural gas, natural gas liquids, associated salt water (brine) designed to withstand internal or external pressure above ambient conditions. This definition includes containers used for pressurized storage of toxic and hazardous chemicals. Piping system: An assembly of interconnected pipes that are used to convey, distribute, mix, separate, discharge, meter, control, or snub flows of hydrocarbons or toxic and hazardous chemicals.	API 510 API 570

Automated Safety Instrumented Systems / Shutdown Systems	Automated Safety Instrumented System - a system implementing one or more safety functions, with specified safety integrity level(s), that detect abnormal process conditions and take automatic, necessary actions to achieve or maintain a safe state for the process with respect to a hazardous event. Shutdown Systems - a system of manual stations that, when activated, will initiate the shutting in (isolation and cessation) of all process stations of a platform production process and all support equipment for the process. May also be integrated with Fire and Gas Detection systems for automatic initiation..	IEC 61511 API 14C
Pressure Relief Devices, Flare Systems, Blowdown Systems, Rupture Disks	Pressure Relief Device – A device actuated by inlet static pressure and designed to open during emergency or abnormal conditions to prevent a rise of internal fluid pressure in excess of a specified design value. The device also may be designed to prevent excessive internal vacuum. The device may be a pressure relief valve, a non-reclosing pressure relief device, or a vacuum relief valve. Flare System – used to safely dispose of relief gasses in an environmentally compliant manner through the use of combustion. Blowdown System - a collection of controls, valves and pipes that allow controlled depressurization of liquid or gas pressure contained within a process, piping, or pressure vessel to reduce or eliminate pressure induced stresses during a time of potential heat weakening of vessels and piping, as well as a reduction of the inventory of fuel present on the facility. Rupture Disk – A pressure containing, pressure and temperature sensitive element of a rupture disk device. A rupture disk device is a non-reclosing pressure relief device actuated by static differential pressure between the inlet and outlet of the device and designed to function by the bursting of a rupture disk. A rupture disk device includes a rupture disk and a rupture disk holder.	API RP 520-521 API 14G
Fire and Gas Detection and Fire Fighting Systems	Manual fire alarms (pull stations), call stations, and audible alarms / beacons Automatic Fire Detection Systems - The primary function of an automatic fire detection system is to alert personnel of the existence of a fire condition and to allow rapid identification of the location of the fire. The detection system(s) may be used to automatically activate emergency alarms, initiate Emergency Shutdown (ESD), isolate fuel sources, start fire water pumps, shut-in ventilation systems, and activate fire extinguishing systems such as gaseous agents, dry chemical, foam or water. The types of fire detectors commonly used on offshore platforms are as follows: • Flame Detectors - e.g., Infrared (IR) Detectors, Ultraviolet (UV) Flame Detectors, Combination IR/UV) • Heat Detectors – e.g., Fusible Plugs or links, Heat-pneumatic or Thermistor Sensors, Rate of Rise Detectors, Fixed Temperature Detectors • Products of Combustion / Smoke Detectors – e.g., Ionization Detector, Photoelectric Detector	API 14G NFPA Fire Protection Handbook for Gas Detection

Fire and Gas Detection and Fire Fighting Systems	Gas Detection System – The primary function of a fixed gas detection system is to alert personnel to the presence of flammable gasses, toxic gasses, or a combination of both. • Flammable Gas Detection – designed to respond to a broad range of hydrocarbon gasses / vapors (e.g., methane, ethane, propane and vapors from the evaporation of hydrocarbon liquids). The predominant sensors for flammable gas detection in general, normally occupied spaces are the infrared (IR) sensor or the catalytic bead sensor. • Toxic Gas Detection – many gas detection systems include both flammable gas and toxic gas detection for hydrogen sulfide, sulfur dioxide, and fluorine in the same system. The semiconductor and electrochemical sensors are most commonly used for the detection of the toxic gasses. • Excludes portable gas monitoring instruments. Fixed fire-fighting systems include the following: fire water pumps & drivers, distribution piping, fire hoses, stations, and nozzles, water spray systems / monitors, foam systems (fixed or portable), dry chemical systems, gaseous systems (e.g., CO2, Halon, FM-200 & FE-13, Inergen), and water mist / fine water spray systems. Fire water systems are installed on offshore platforms to provide exposure protection, control of burning, and/or extinguishment of fires. The basic components of a fire water system are the fire water pump, the distribution piping, the hose / nozzle, and deluge / sprinkler system. Additives such as foaming agents may be included to aid in extinguishing flammable liquid fires. Excludes portable fire extinguishers.	
Mechanical Lifting Equipment / Personnel Transport Equipment	Crane (includes base mounted drum winches) - a type of machine, generally equipped with a hoist, wire ropes or chains, and sheaves, that can be used both to lift and lower materials and to move them horizontally. Includes: • Boom chords, foot pins, hoist (hydraulics and brakes), lift cylinder, sheave assembly, stops, tip extension or jib, pendant lines • Counterweights • Gantry, mast or A-frame pins • Hook block • Overhaul ball • Main hoist (hydraulics and brakes) • Auxiliary hoist (hydraulics or brakes) • Pedestal or crane base • Load management system (MIPEG, CCM-7000 etc.) • Crane safety system (anti two block, high & low angle kick outs) Top Drive - a device used on a drilling rig to actually rotate the drill pipe in order to drill the well. Includes main drill line hoist (hydraulics or brakes), crown-o-matic, top drive track, assembly rollers or wheels and bearings, hydramatics or hydromatics. Pipe racking system (PRS) including main hoist (hydraulics or brakes), track, hydraulic system, claws or fingers.	API RP 2C & ASME B30 Series

Mechanical Lifting Equipment / Personnel Transport Equipment	Drawworks, Air Hoists, Tuggers Chain fall - a type of hoist with a chain attached to a fixed raised structure or beam and used to lift very heavy objects. Includes clutch, brake and sprocket. Rigging Accessories including hooks, chains, shackles, slings (below the hook), wire rope, D-ring, elevators, bails	
Station Keeping Systems	The station keeping systems for a floating structure are typically a single point mooring, a spread mooring, vertical tension legs, or a dynamic positioning (DP) system. • Single point mooring components may include but not limited to: hoisting system, hawser, swivels, roller bearings, risers, u-joint connectors, counter weights, chain, chain table, wire rope, synthetic rope, connecting hardware, clump weight, buoy, and anchor. • Spread mooring components: winch / windlass, chain jack, brakes, power, fairlead, wire rope, synthetic rope, connecting hardware, clump weight, buoy, and anchor • Vertical tension leg moorings are used by TLPs or tension leg platforms and are comprised of: mooring tendons, seafloor foundations • Dynamic positioning system consists of components and systems acting together to achieve reliable position keeping capability. The Dynamic-positioning system includes the power system (power generation and power management), thruster system and Dynamic Positioning control system.	Used partial definitions from: API RP 2SK and Marine Technology Society (MTS)
Bilge/Ballast Systems	The vessel structure, machinery, piping, or controls related to ballast movement, watertight integrity and stability.	Det Norske Veritas (DNV)
Life Boat, Life Rafts, Rescue Boats and Launch and Recovery Systems	Life Boat / Survival craft is a craft capable of sustaining the lives of persons in distress from the time of abandoning the ship. Rescue boat is a boat designed to rescue persons in distress and to marshal survival craft. A life raft is an inflatable appliance which depends upon non-rigid, gas filled chambers for buoyancy and which is normally kept not inflated until ready for use. Launch and Recovery Systems - systems used to deploy or retrieve a lifeboat, life raft, or rescue boat. Components may include but not limited to: Winch, fall wire (lifting wire), sheaves (pulleys), davits, davit arms, connecting hardware, secondary securing method (gripes, safety pendants), cradle, lifting points, releasing hook(s), brake, brake release, power source to winch / davit / davit arm, free fall railing.	Used partial definitions from: International Maritime Organization – Safety of Life at Sea (IMO SOLAS) and USCG CFR 46.199 and 46.108

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