2022 ANNUAL PERFORMANCE REPORT

SEPTEMBER 2023

CENTER FOR OFFSHORE SAFETY

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September 2023

Center for Offshore Safety

The U.S. offshore natural gas and oil industry continues to show signs of recovery from the challenges of the COVID-19 pandemic.

Work hours reported by COS Member Operators for 2022 were the highest reported since 2015, while at the same time important Safety Performance Indicators (SPI), such as the number of Tier 1 and Tier 2 Process Safety Events, continue to trend downward.

While the number of important SPI continues to trend downward, we must not lose sight of the fact that even one safety incident is one too many. Each of the numbers and data points on the following pages represent real people who are hard at work to provide the energy our world needs.

This report also includes data from the most recent 3-year cycle of Safety and Environmental Management System (SEMS) audits provided to COS by the Bureau of Safety and Environmental Enforcement (BSEE). This SEMS audit data reminds us that we must maintain our focus on safe operations and continuous improvement.

COS and our members remain steadfast in our mission to share knowledge and lessons learned through COS good practice documents, SEMS audit guidance, and active committees and subcommittees.

This year COS extended our programs to allow companies with operations outside the U.S. Outer Continental Shelf (OCS) to earn a COS SEMS Certificate upon successful completion of the SEMS audit and corrective action process. By extending the COS SEMS Certificate program to an international audience, COS continues to support this vital industry and share its good practices globally.

Similarly, COS is actively reaching out to companies involved in the burgeoning offshore wind industry. Whether it is guidance on how to effectively audit safety and environmental management systems, write effective operating procedures, or learn from past events, COS is prepared to assist newcomers to the offshore environment.

The work of COS would not be possible without our dedicated members. I thank all COS members for their participation in this annual report and for their ongoing commitment to continual improvement through safety and environmental management systems.

Sincerely,

Russell Holmes

Russell Holmes, COS Senior Director

RUSSELL HOLMES
Senior Director
Center for Offshore Safety

8.8M

more offshore work hours than in 2021

76%

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

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1.0 COS MEMBERS AND PARTICIPANTS

OPERATORS

Apache, Arena Offshore, bp, Chevron, equinor, ExxonMobil, HESS, Murphy Exploration & Production Co., OXY, QuarterNorth Energy, Shell, TALOS Energy, TotalEnergies, Woodside Energy

RIG CONTRACTORS

Helmerich & Payne, Inc., Valaris

SERVICE COMPANIES

Baker Hughes, Halliburton, Oceaneering, SEMP Check Proven Expertise, subsea 7

BOARD AFFILIATES

IADC, NOIA America's Offshore Energy Industry, OOC

For this APR, 100% of eligible COS Member Operators and Contractors shared Safety Performance Indicator (SPI) and/or Learning from Incidents and Events (LFI) data for the 2022 Reporting Year.

COS members listed above as Affiliates do not provide data.

2.0 INTRODUCTION

COS' objective is 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 the industry's safety and environmental performance and stimulating cooperation within the 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), and
- 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 and personal safety. The information can be used for driving improvement and, when effectively acted upon, contribute to reducing the 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, Tier 1 Process Safety Event (PSE), loss of well control, etc.) and SPI 2 (Tier 2 PSE, collision resulting in direct damage ≥ $25,000, loss of station keeping, 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 allows for the submittal of data for incidents and events that occur outside the U.S. OCS. The main objective of the LFI program is to provide COS members with 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.

For this APR, in addition to SPI and LFI data, anonymized SEMS Audit data for 47 regulatorily required SEMS Audits completed between January 2020 and December 2022 was supplied to COS by the Bureau of Safety and Environmental Enforcement (BSEE). BSEE removed Identifying information before sharing the data to ensure confidentiality and reduce any bias. As provided, the information was organized by SEMS element and finding categories: Non-Conformances, Areas of Concern, Opportunities for Improvements, and Good Practices. In addition, an expert group applied further analytical methodologies to identify trends, cross-element issues, and other insights into industry performance.

3.0 EXECUTIVE SUMMARY

ABOUT THE REPORT

The COS Annual Performance Report (APR) for 2022 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 data analysis, COS strives to identify areas for improvement in risk management through safety management systems for the operation of offshore wells, projects, and production facilities on 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 – 2018-2022.

In addition to the SPI and LFI data, this year's APR includes an analysis of 47 regulatorily required SEMS Audits completed between 2020-2022. This analysis of SEMS audit reports, including both COS member and non-member data, provides insight into the maturity levels of SEMS programs throughout the U.S. OCS. These insights will help COS and industry determine where to focus safety efforts for continual improvement.

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 2022 DATA

- COS members reported more than 54 million work hours for 2022, representing 76% of all U.S. OCS's natural gas and oil activity. This is an increase of 8.8 million work hours compared to 2021 and 20 million more than 2020.
- There were 30 combined SPI 1 and SPI 2 incidents reported by COS Member Operators for 2022, down from 40 in 2021 and 70 in 2020. This is a rate decrease of 37% from 2021 and 73% from 2020.
- COS members reported zero incidents involving a fatality for 2022.
- The rate of combined Tier 1 and Tier 2 Process Safety Events (PSE) per 200k work hours reported by COS Member Operators was down by 58% compared to 2021 and down 80% compared to 2020.
- 100% of COS Member Operators reported zero Level 1 or Level 2 Well Control Incidents.
- The 14 SPI 2C Mechanical Lifting Incidents represent a slight increase from the twelve reported in 2021.
- The frequencies for DART (Days Away from Work, Restricted Work, or Transfer) and RIIF (Recordable Injury and Illness Frequency) are the second lowest reported over the 5 years covered in this APR. The only lower year was 2020, at the height of COVID-19 precautions and testing.
- Of the 30 SPI 1 and SPI 2 incidents reported by COS Member Operators, 16 (53%) included equipment failure as a contributing factor. This is the highest percentage reported since 2017 (58%).
- Four SEMS elements accounted for 54% of the cited Deficiencies (Non-Conformities and Areas of Concern) noted in the 2020-2022 audit cycle data: Assurance of Quality and Mechanical Integrity, Safe Work Practices, Hazards Analysis, and Operating Procedures. These same elements accounted for 51% of the Deficiencies in the previous audit cycle.

- For the 64 U.S. OCS incidents reported to the LFI program, the three areas most frequently identified for improvement were: Operating Procedures or Safe Work Practices (40%); Risk Assessment and Management Process (31%); and Facility or Equipment Design or Layout (25%).

Year	2018	2019	2020	2021	2022
COS U.S. OCS Work Hours (Millions)	41.7	44.2	34.5	45.9	54.7

3.1 SPI AND LFI DATA AT-A-GLANCE

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

FIGURE 3.1-1: SPI 1 and SPI 2 Frequency

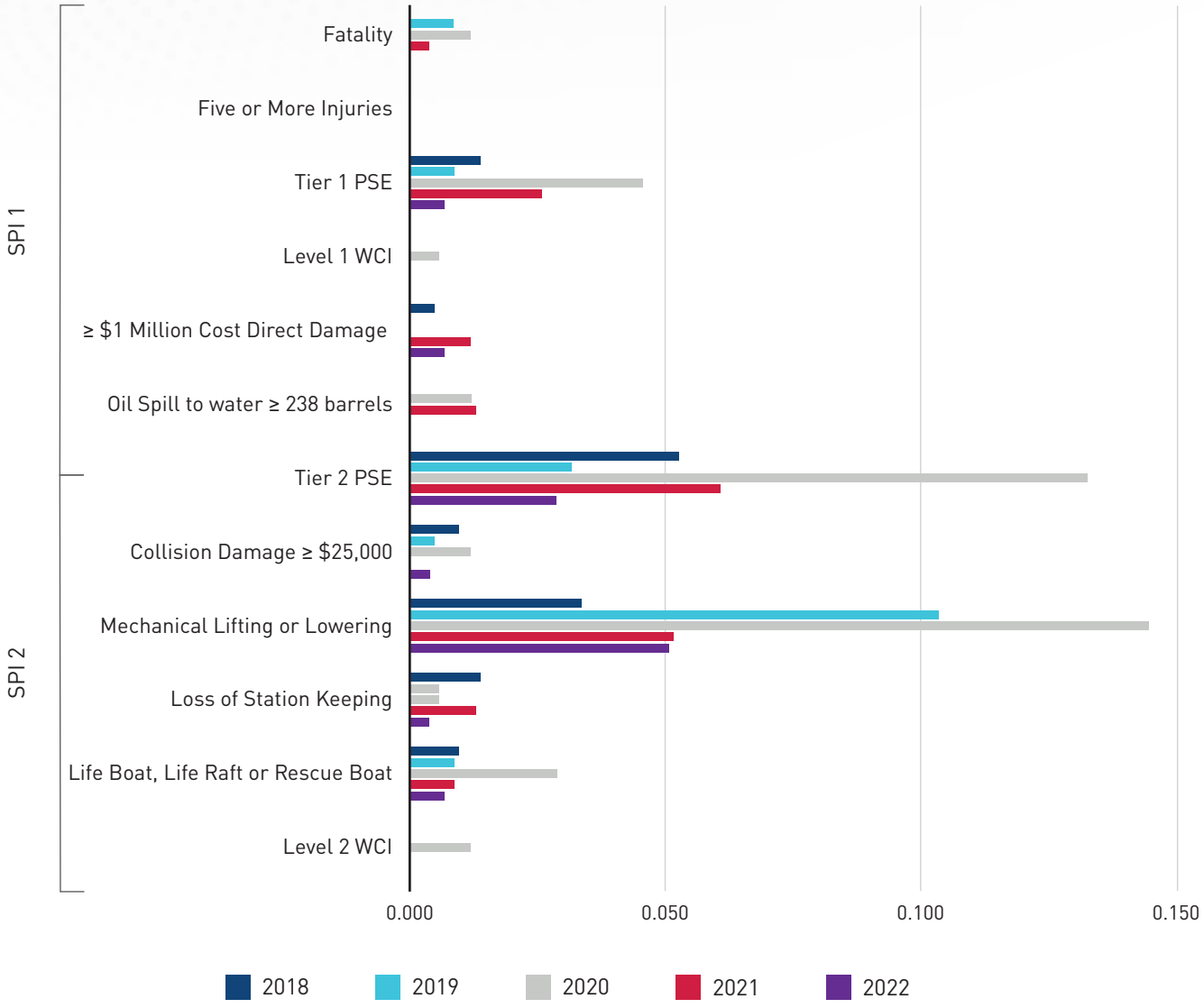
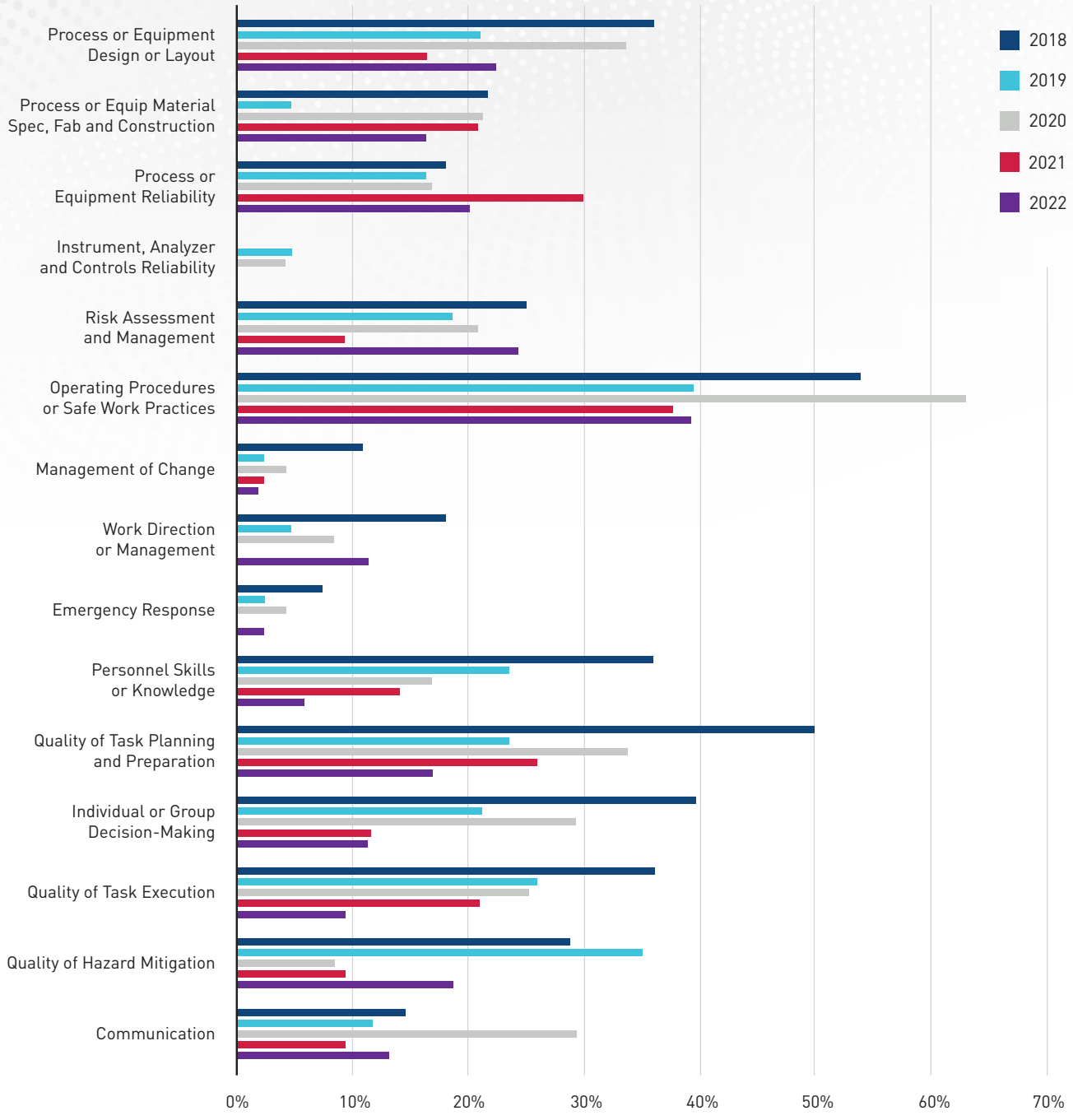


FIGURE 3.1-2: SPI 1 and SPI 2 Counts

		2018	2019	2020	2021	2022
SPI 1	Fatality	0	2	2	1	0
	Five or More Injuries	0	0	0	0	0
	Tier 1 PSE	3	2	8	6	2
	Level 1 WCI	0	0	1	0*	0
	≥$1 Mil Direct Damage	0	0	2	3	2
	Oil Spill ≥238 bbl	0	0	1	0	0
SPI 2	Tier 2 PSE	11	7	23	14	8
	Collision Damage ≥$25k	2	1	2	0	1
	Mechanical Lifting or Lowering	7	23	25	12	14
	Loss of Station Keeping	3	0	1	3	1
	Lifeboat, Life Raft or Rescue Craft	2	2	5	2	2
	Level 2 WCI	0	0	2	0	0

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

FIGURE 3.1-3: 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 2022

Below are highlights of COS activities and accomplishments for 2022

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.

As of the publication of this APR, four ASP have been fully accredited:

- ABS Quality Evaluations
- CICS-Americas
- DNV GL Business Assurance
- ERM Certification and Verification Services

A list of accredited ASP is maintained at COS website: **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. With publication of COS' Requirements for COS SEMS Certificates in 2020, companies that are not members of COS could obtain a SEMS Certificate. In January 2023, Kosmos Energy became the first company that was not a member of COS to be awarded a SEMS Certificate.

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
- Enven Energy Corporation
- Equinor U.S.A E&P, Inc
- ExxonMobil Production Company
- Helmerich & Payne International Drilling Co.
- Hess Corporation
- Kosmos Energy
- 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 COS companies that have been awarded COS SEMS Certificates is maintained at COS website: **centerforoffshoresafety.org**.

COS recently modified procedures for SEMS Certificates to allow companies operating outside the U.S. OCS to obtain COS SEMS Certificates.

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

3.2.3 COS SAFETY LEADERSHIP AWARD

The winners of the 2022 COS Safety Leadership Awards were:

ExxonMobil

Enhancing Process Safety through Scenario Based Assessments

OCEANEERING®

Onshore Remote Operations

In addition to ExxonMobil and Oceaneering, the following were the finalists in the Operator and Contractor categories:

OPERATOR FINALISTS

Frontline Work Execution Implementation / Journey

QUARTER NORTH ENERGY

2021 BSEE Crane Incident Reduction Initiative

CONTRACTOR FINALISTS

Baker Hughes

Pressure Risk Management – Barrier Selection Tool

danos PRODUCING CONFIDENCE

Danos Safety Program

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

3.2.4 COS PUBLICATIONS & WEBINARS

In 2022, 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-1-06/RP 75, 3rd Ed, *Guidance for Developing a SEMS Audit,* 2nd Ed
- COS-1-07/RP 75, 3rd Ed, *Guidance for Developing a SEMS Corrective Action Plan,* 2nd Ed
- COS-1-08/RP 75, 3rd Ed, *SEMS Audit Report Format and Guidance,* 2nd Ed
- COS-1-09/RP 75, 3rd Ed, *Guidance for Conducting SEMS Audits,* 2nd Ed
- COS-1-09/RP 75, 4th Ed, *Guidance for Conducting SEMS Audits*
- COS-1-10 *Guidance for Conduction Remote SEMS Audits*
- COS-2-05 *Requirements for SEMS Audit Certificates with International Addendum*
- COS-3-05/RP 75, 4th edition, *COS/OOC Guidance on SEMS Interfaces*

COS held the following events in 2022 with the purpose of educating the industry on the published good practices along with other topics relevant to offshore safety. Recordings of the COS webinars can be viewed on the COS website.

- March 2022 – 2022 COS Outlook Webinar
- May 2022 – COS Half-Day at the Offshore Technology Conference (OTC)
- Sept 2022 – 10th Annual COS Forum
- Sept 2022 – COS Annual Performance Report for the 2021 Reporting Year Webinar

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. As of this writing, COS has added three new Safety Shares to its library of available Shares, with more anticipated prior to the end of the year:

- 2023-001 *Misaligned 3-Way Valve Leads to Atmospheric Release*
- 2023-002 *Inadequate PPE During Transfer Leads to Chemical Exposure*
- 2023-003 *Miscommunication During Crane Maintenance Leads to Injury*

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

3.3 COS OUTREACH AND COMMUNICATION ACTIVITIES - SEPTEMBER 2022-SEPTEMBER 2023

A foundational pillar of the Center for Offshore Safety is Sharing Industry Knowledge. In support of this pillar, COS Senior Director Russell Holmes and other staff actively pursue opportunities to introduce the Center for Offshore Safety to a broader audience. Below are highlights of these outreach activities since publication of last year's COS Annual Performance Report.

OCT 2022	Speaker	Brazil National Agency of Petroleum, Natural Gas, and Biofuels (ANP) Meeting, Virtual
FEB 2023	Speaker / Moderator / Exhibitor	American Clean Power (ACP) Operations, Maintenance and Safety Conference, Orlando, FL
MAR 2023	Speaker	UK MCE Deepwater Development Conference & Exhibition, London, UK
MAR 2023	Exhibitor	International Partner Forum (IPF) Offshore Wind Conference, Baltimore, MD
APR 2023	Exhibitor	International Association of Drilling Contractors (IADC) HSE&T Conference and Exhibition, Houston, TX
MAY 2023	1/2 Day Program Sponsor / Exhibitor	Offshore Technology Conference (OTC), Houston, TX
MAY 2023	Exhibitor	ACP CLEANPOWER 2023 Conference and Exhibition, New Orleans, LA
JUN 2023	Speaker	Surinamese Offshore Oil & Gas Environment and Safety Workshop, Virtual
AUG 2023	Facilitator	Offshore Operators Committee (OOC) Leadership Workshop, Lafayette, LA
SEP 2023	Exhibitor	2023 Society of Petroleum Engineers (SPE) Offshore Europe, Aberdeen, Scotland
SEP 2023	Speaker	2023 World Petroleum Congress, Calgary, AB, Canada

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. The data reported in this APR represents the five most recent years – 2018-2022. A normalization factor of work hours is utilized to enable year-to-year comparisons. A list of SPI collected is presented below.

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 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

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 the 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** – **SPI 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 from operations on the U.S. OCS only.

Per COS data submittal guidelines, to prevent duplication of data, COS Member Operators report all incidents that occur within 500m of their lease for both Operator and Contractor facilities and employees. A COS Member 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.

Throughout this SPI portion of the report, work hours are used as the normalization factor to determine frequencies and rates. As a result, the charts and graphs in the following pages represent data reported by COS Member Operators. In the case where a COS Member Contractor has reported data from incidents that occurred when working for a non-COS Member Operator or which occurred outside of the 500m zone of a COS Member Operator lease, those data will be bulleted below the corresponding SPI information.

This report provides COS member data for 2018-2022. The data reported for 2022 represents more than 54 million Operator and Contractor work hours on the U.S. OCS. Work hours are reported only by COS Member Operators for work occurring within 500m of their facilities.

REPORTING YEAR	COS U.S. OCS WORK HOURS (MILLIONS)
2018	41.7
2019	44.2
2020	34.5
2021	45.9
2022	54.7

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

4.2 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)

Operator members reported four **SPI 1** incidents for 2022, as compared to ten for 2021. The cited outcomes of these four incidents were two resulting in Tier 1 Process Safety Events (PSE) (**SPI 1C**), and two resulting in ≥ $1MIL damage (**SPI 1E**). Zero incidents involving either a Fatality (**SPI 1A**), ≥ Five 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.

FIGURE 4.2-1: SPI 1 Count and Frequency

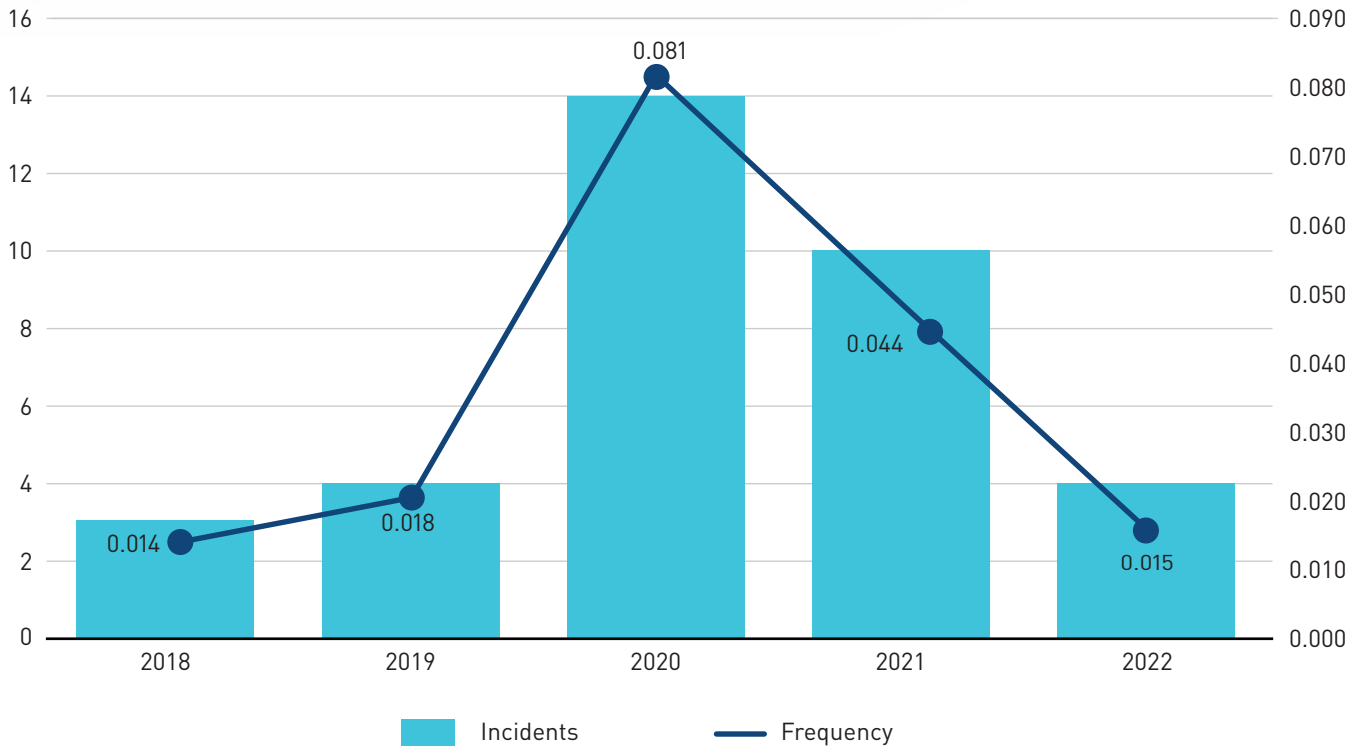


FIGURE 4.2-2: SPI 1 Count per Sub-Group

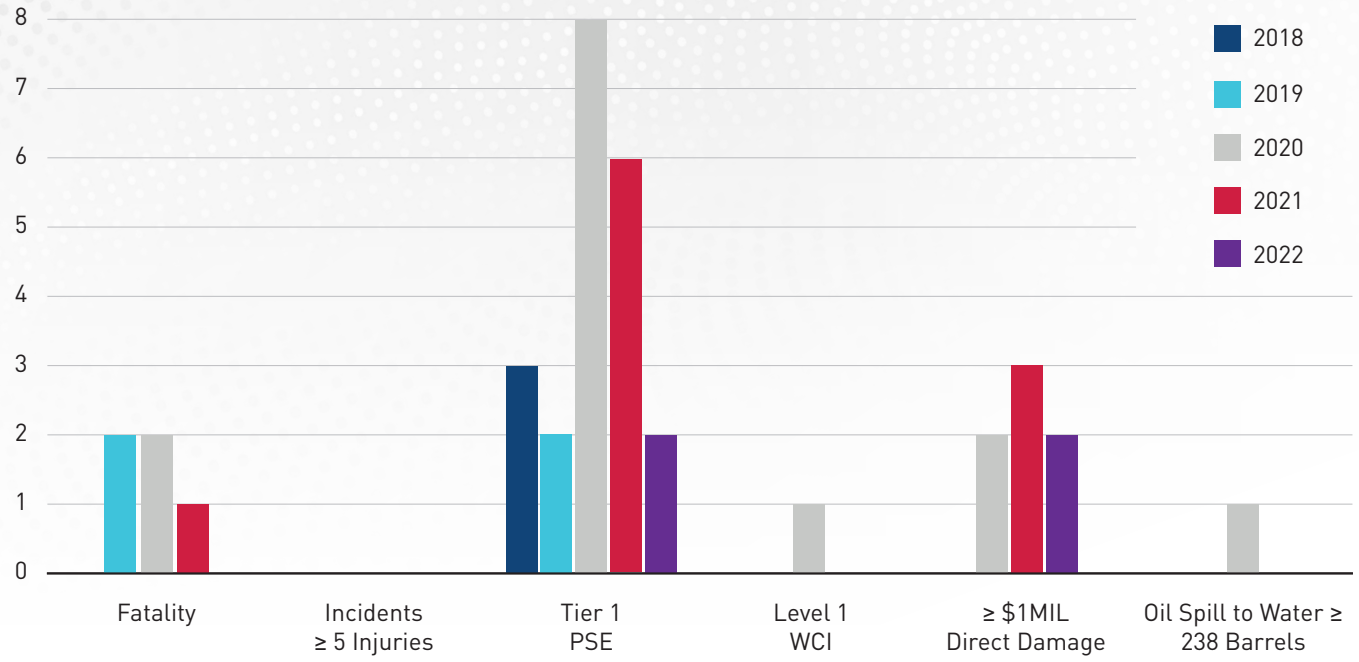
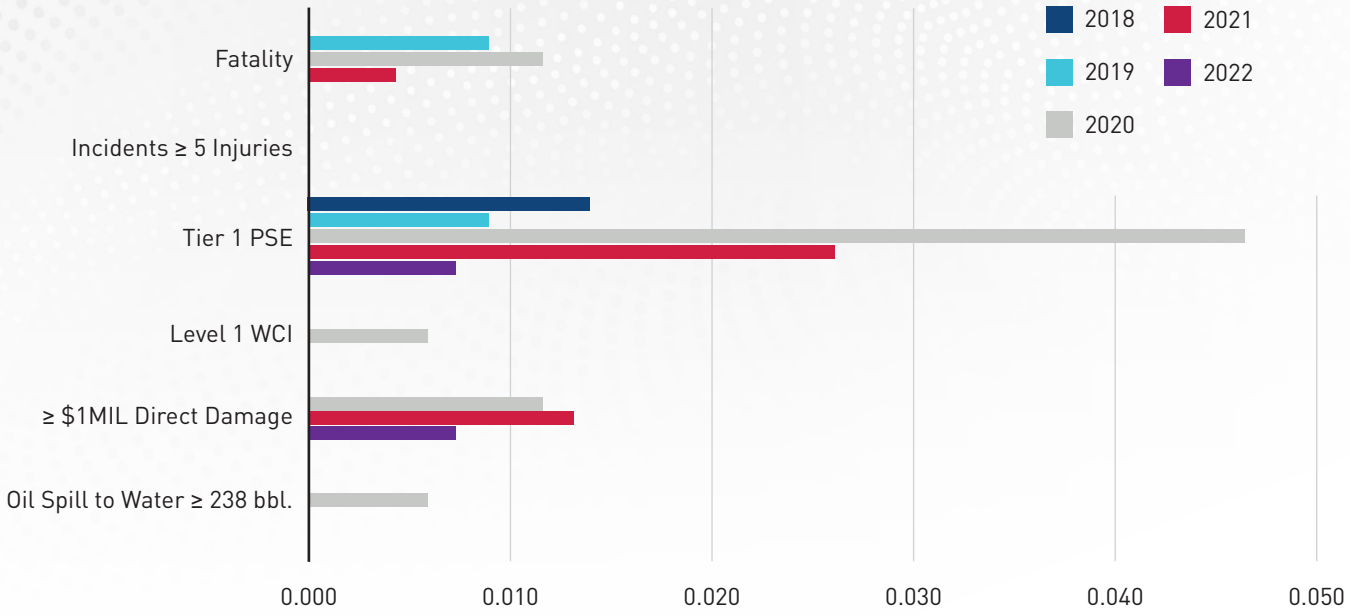


FIGURE 4.2-3: SPI 1 Incident Frequency per Sub-Group



4.3 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

Operator members reported 26 **SPI 2** incidents for 2022, as compared to 30 for 2021. For the 26 reported incidents, the cited outcomes were eight resulting in Tier 2 PSE (**SPI 2A**), one resulting in a Collision Damage ≥ $25,000 (**SPI 1B**), 14 Mechanical Lifting or Lowering Incidents (**SPI 2C**), one incident resulting in a Loss of Station Keeping (**SPI 2D**), and two Lifeboat, Life Raft, or Rescue Boat Events (**SPI 2E**). Zero incidents resulting in a Level 2 WCI (**SPI 2F**) were reported.

The eight Tier 2 PSE (**SPI 2A**) reported in 2022 was down compared to the 14 reported in 2021 and 23 reported in 2020.

While the 14 incidents involving Mechanical Lifting or Lowering (**SPI 2C**) reported for 2022 is a slight increase from the 12 incidents reported in 2021, when the additional 8.8 million work hours reported are taken into account, the frequency change is minimal from .052 incidents per 200,000 work hours for 2021 to .051 for 2022.

The one Loss of Station Keeping Resulting in Drive Off or Drift off (**SPI 2D**) incident for 2022 is down compared to the three reported in 2021.

The two Lifeboat, Life Raft, or Rescue Boat Events (**SPI 2E**) reported is the same number as reported in three of the last four years. The exception was 2020 when five Lifeboat, Life Raft, or Rescue Boat Events (**SPI 2E**) were reported.

FIGURE 4.3-1: SPI 2 Count and Frequency

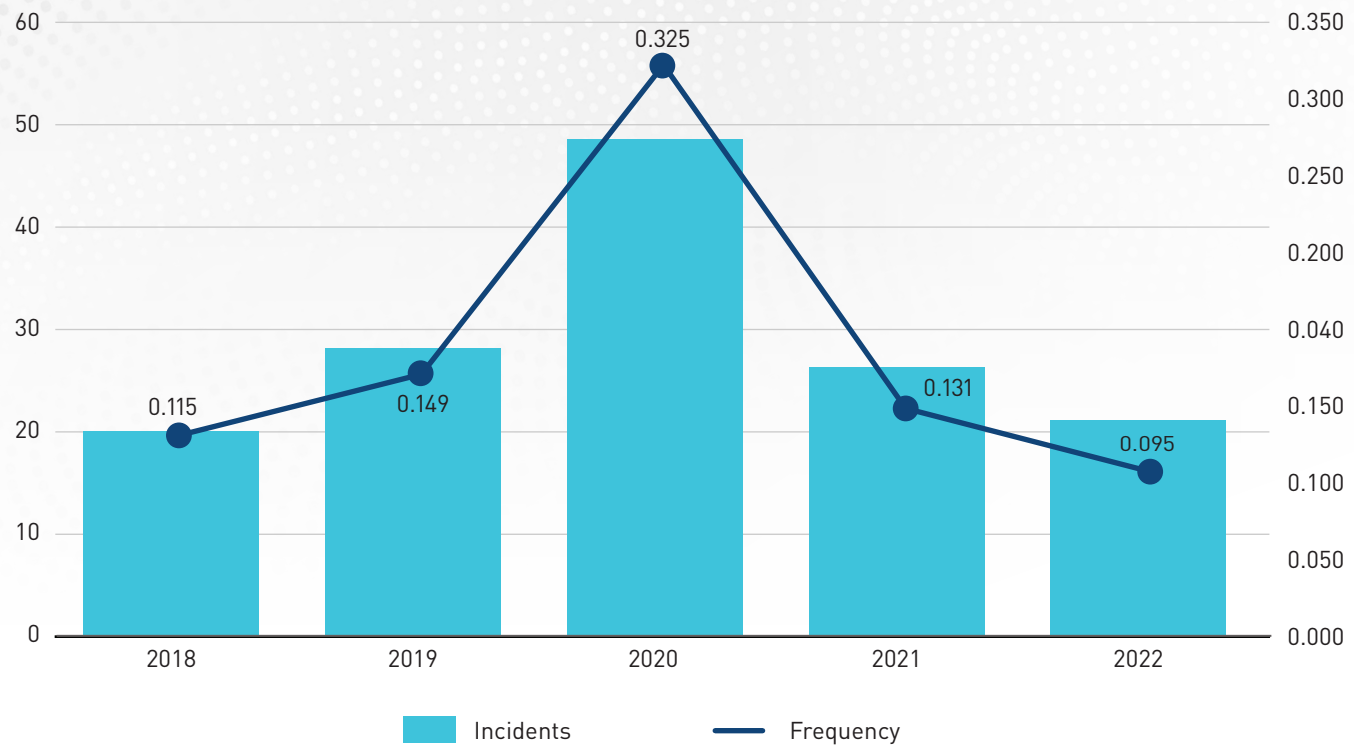
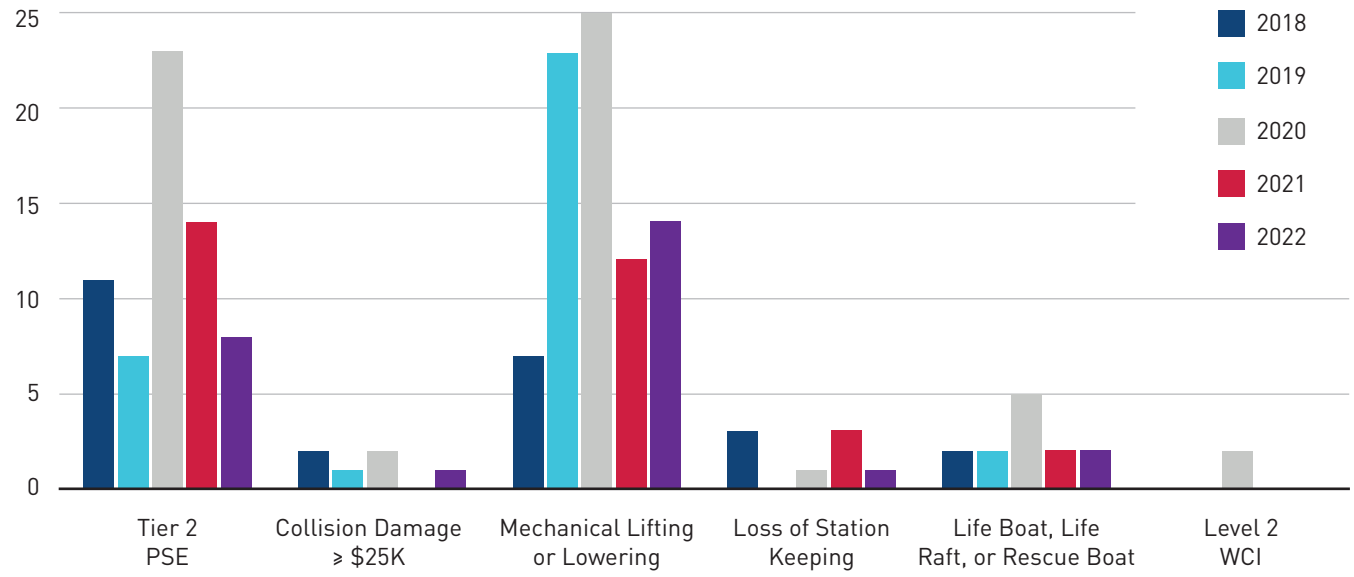
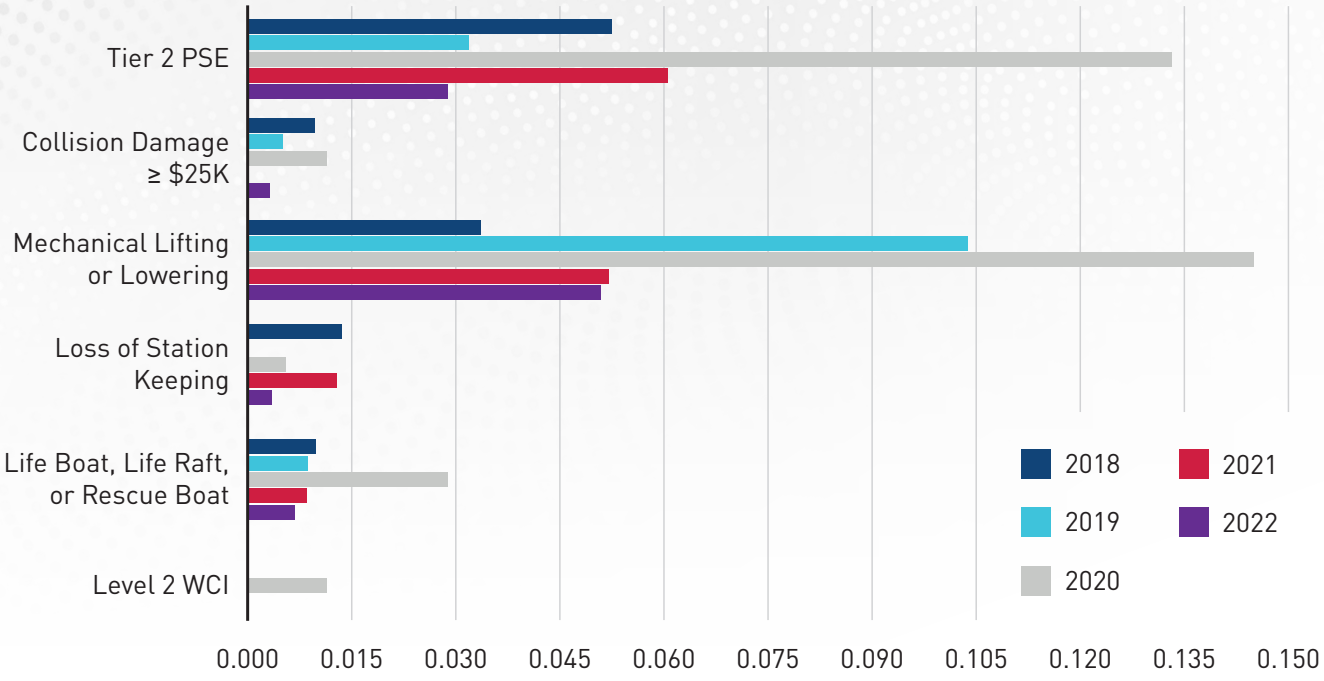


FIGURE 4.3-2: SPI 2 Count per Sub-Group



In addition to the data submitted by COS Member Operators, COS Member Contractors reported three Tier 2 PSE (**SPI 2A**), one Collision resulting in Damage ≥ $25,000 (**SPI 2B**), and one Mechanical Lifting or Lowering Incident (**SPI 2C**). These incidents are not reflected in the frequency calculations as work hours for non-COS Member Operators are not reported to COS.

FIGURE 4.3-3: SPI 2 Frequency per Sub-Group



4.3.1 SPI 2C CRANE INCIDENT DATA

Starting in 2021, COS began collecting additional data for offshore Mechanical Lifting Incidents involving cranes that met the severity criteria to be considered an **SPI 2C** incident in response to a challenge to industry from the Bureau of Safety and Environmental Enforcement (BSEE) to "reduce offshore lifting incidents by 50%."

An **SPI 2C** is an offshore mechanical lifting incident that resulted in one or more of the following consequences:

- Four or fewer 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

COS members reported a total of 15 **SPI 2C** events for 2022 (14 reported by COS Member Operators and one Reported by a COS Member Contractor), eight of which involved a crane. The members reporting these eight **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 2022 represents only the second year this data has been collected, it is too soon to seek trends or identify gaps.

FIGURE 4.3-4: SPI 2C Cranes - Facility Types

	2021	2022
Fixed (bottom supported structure)	4	0
Floating Platform Structure	3	4
Self-elevating Marine Vessels	0	1
Ship-hulled Vessels	2	3

FIGURE 4.3-5: SPI 2C Cranes - Crane Types

	2021	2022
Fixed Length Box Boom Crane	0	1
Folding Boom	1	4
King Post Mounted Lattice Boom	2	3
Pedestal Mounted Lattice Boom	1	0
Swing Bearing Mounted Lattice Boom	5	0

FIGURE 4.3-6: SPI 2C Cranes - Lift Types

		2021	2022
I	Onboard/Static	4	5
	Offboard/Dynamic	4	2
	Non-Lifting (Maintenance)	1	1
II	Routine	5	6
	Non-Routine	3	1
	Non-Lifting (Maintenance)	1	1
III	Material Handling	8	4
	Pipe Handling	0	2
	Personnel Handling	0	1
	Non-Lifting	1	1

FIGURE 4.3-7: SPI 2C Cranes – Failures of Equipment

	2021			2022		
	YES	NO	N/A	YES	NO	N/A
Mechanical (e.g., Hoist and Slewing Brake System)	1	7	1	0	8	0
Structural (e.g., Boom Heel Pins or Boom Jib Section)	0	8	1	0	8	0
Rigging (e.g., Hook Block Assembly or Bridle Assembly)	1	7	1	0	8	0
Below the Hook (e.g., Shackles, Slings, or Personnel Baskets)	1	7	1	0	8	0

FIGURE 4.3-8: SPI 2C Cranes - Injuries

		2021	2022
	Number of Incidents with Injuries	**4**	**3**
I	Riggers	3	2
	Personnel on Transfer Basket	0	1
	Rope Access Workers	1	0
II	Major Injury	3	1
	Minor Injury	1	2
	Slight Injury	1	0
III	Head	1	1
	Torso (front or back)	1	0
	Arms/Hands	3	2
	Legs/Feet	2	0

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

4.3.2 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 two Tier 1 PSE (**SPI 1C**) shared for 2022, with the following reported consequences:

- Two resulting in a Pressure Relief Device (PRD) discharge directly to atmosphere

Consequence data was collected for eight Tier 2 PSE (**SPI 2A**) reported by COS Member Operators and three Tier 2 PSE reported by COS Member Contractors for 2022, with the following reported consequences:

- One resulting in a PRD discharge directly to atmosphere
- One resulting in a PRD discharge with the consequence of an on-site shelter-in-place
- Nine resulting in non-toxic material releases
- Four 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.

4.4 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.

Of the 30 total **SPI 1** and **SPI 2** incidents reported by COS Member Operators for 2022, 16 involved Failure of Equipment as a Contributing Factor (**SPI 3**), or 53%.

FIGURE 4.4-1: SPI 3 Equipment Failure as a Contributing Factor

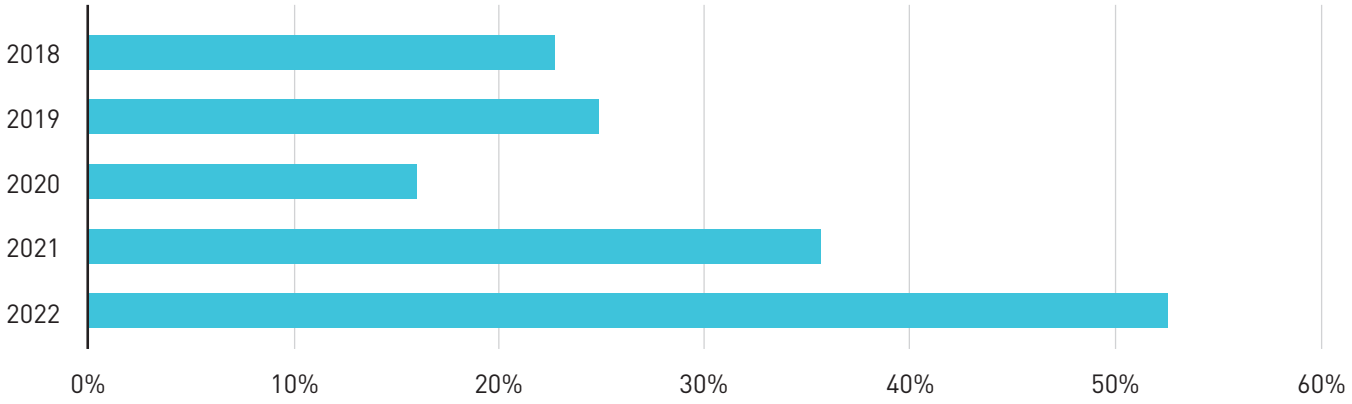


FIGURE 4.4-2: SPI 3 Failure Rates by Equipment Category

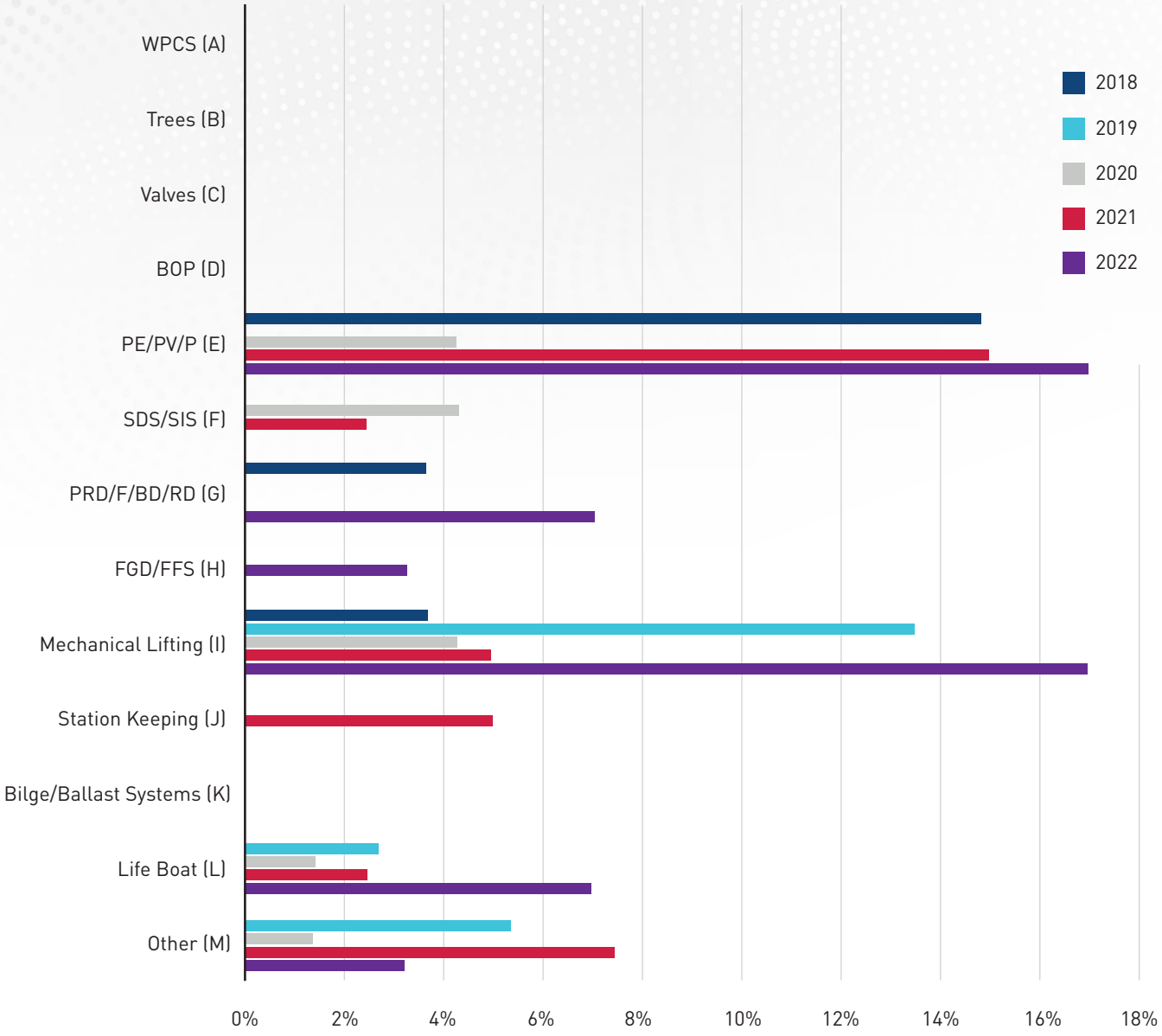


FIGURE 4.4-3: SPI 3 Incident Counts by Equipment Category

EQUIPMENT	2018 FAILURES (COUNT)	2019 FAILURES (COUNT)	2020 FAILURES (COUNT)	2021 FAILURES (COUNT)	2022 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)	4	0	3	6	5
F - Shutdown Systems/Automated Safety Instrumented Systems (SDS/SIS)	0	0	3	1	0
G - Pressure Relief Devices/Flares/Blowdown/ Rupture Disks (PRD/F/B/RD)	1	0	0	0	2
H - Fire/Gas Detection and Fire Fighting Systems (FGD/FFS)	0	0	0	0	1
I - Mechanical Lifting Equipment/Personnel Transport Systems	1	5	3	2	5
J - Station Keeping Systems	0	0	0	2	0
K - Bilge/Ballast Systems	0	0	0	0	0
L - Lifeboat/Life Raft/Rescue Boat/Launch and Recovery Systems	0	1	1	1	2
M - Other	0	2	1	3	1

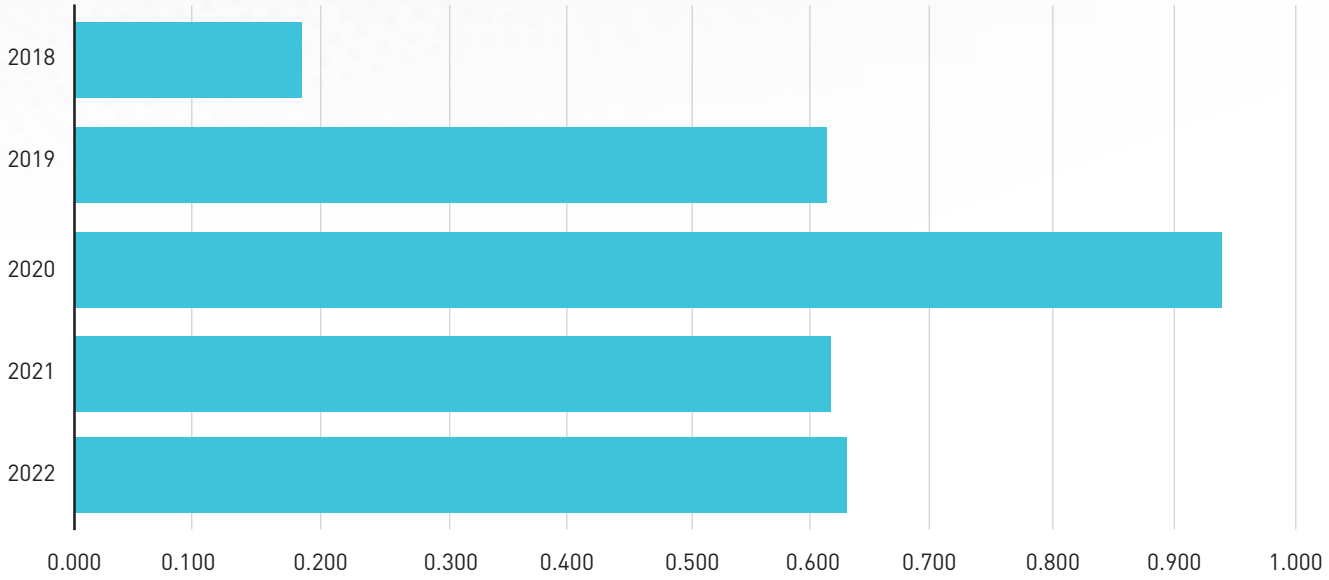
The two most frequently cited systems with equipment failure contributing to an **SPI 1** or **SPI 2** incident were Process Equipment/Pressure Vessels/Piping and Mechanical Lifting Equipment/Personnel Transport Systems. These systems were cited in 10 of the 30 incidents, or 33%.

4.5 SPI 4 RESULTS AND TRENDS

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

The 2022 number of Incidents Involving Cranes or Personnel/Material Handling (**SPI 4** – of which **SPI 2C** is a subset based on severity of consequences) reported by COS Member Operators was 174, compared to 143 for the prior year. While the number of incidents increased by 31, when the additional 8.8 million work hours are considered, there is only a slight increase in frequency from 0.62 incidents in 2021 to 0.64 in 2022.

FIGURE 4.5-1: SPI 4 Crane or Personnel / Material Handling Frequency



NOTE: In 2019, BSEE issued MMS NTL 2019-N05 which greatly expanded the definition of what was required to be reported for offshore lifting incidents.

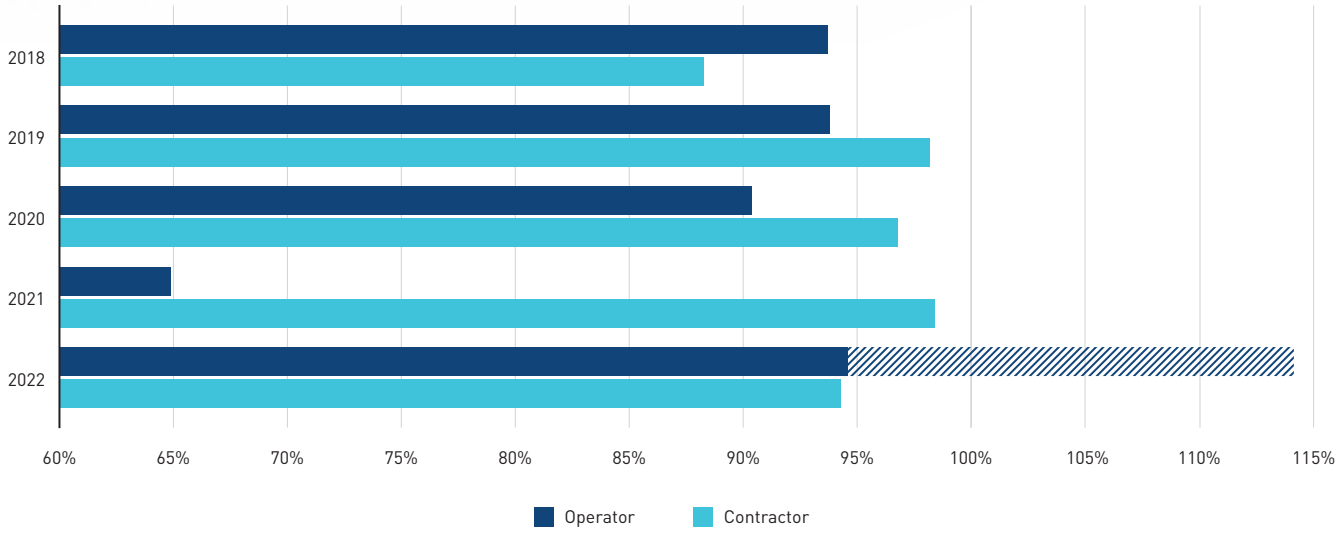
4.6 SPI 5 RESULTS AND TRENDS

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.

For seven of the eight COS Member Operators that submitted **SPI 5** data (Percentage of Planned Critical Maintenance Completed on Time), the combined average for 2022 was 95%. This is an increase from the average of 89% reported for 2021. The eighth COS Member Operators that submitted data for **SPI 5**, due to internal tracking methods, reported completing 243% of their planned critical maintenance for 2022. When added to the other seven COS Member Operators' data, this brings the average for all COS Member Operators for 2022 up to 113%.

For COS Member Contractors that shared **SPI 5** data (5 out of 7), the combined average for 2022 was 95%, a slight decrease from the 98% reported for 2021.

FIGURE 4.6-1: SPI 5 Planned Critical MIT Completed on Time



NOTE: Each company defines what maintenance, inspection and testing tasks qualify as "critical."

4.7 SPI 6-9 RESULTS AND TRENDS

SPI 6 is the 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

Zero COS Member Operators reported Incidents with Fatality (**SPI 6**).

The combined Days Away from Work, Restricted Work and Transfer of Duty Rate (DART) (**SPI 7**) reported for 2022 was 0.18, which is down compared to 0.25 reported in 2021. To allow data comparisons with pre-2020 rates, the data for **SPI 7** does not include DART cases due to COVID-19.

The combined Recordable Injury and Illness Frequency (RIIF) (**SPI 8**) reported for 2022 was 0.32. Similar to the **SPI 7** rate, this is also down compared to 2021's rate of 0.41. Also similar to **SPI 7**, the data for **SPI 8** does not include RIIF attributable to COVID-19.

COS Member Operators reported five Oil Spills to Water ≥ One Barrel (**SPI 9**) for 2022, down from the seven reported for 2021. Although the number of incidents only decreased by two, due to the additional 8.8 million work hours reported for 2022, the frequency decreased from 0.030 in 2021 to 0.018 for 2022.

FIGURE 4.7-1: SPI 7 DART and SPI 8 RIIF Rates

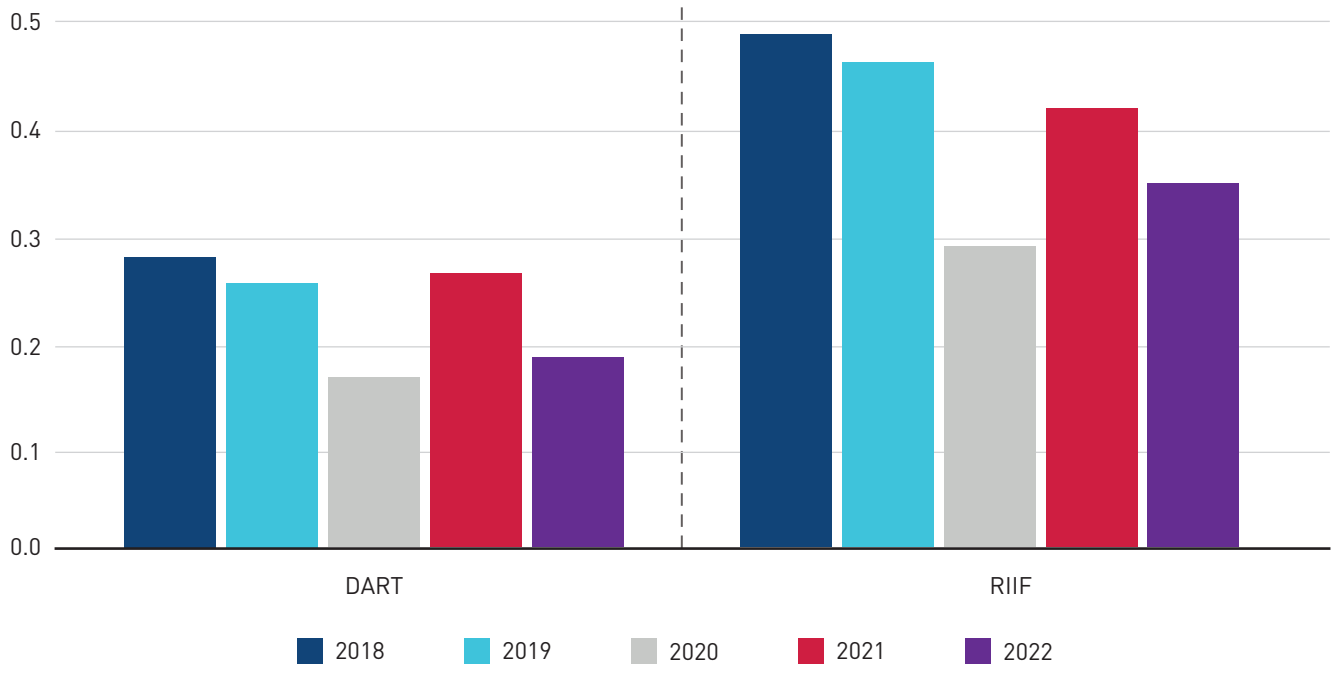
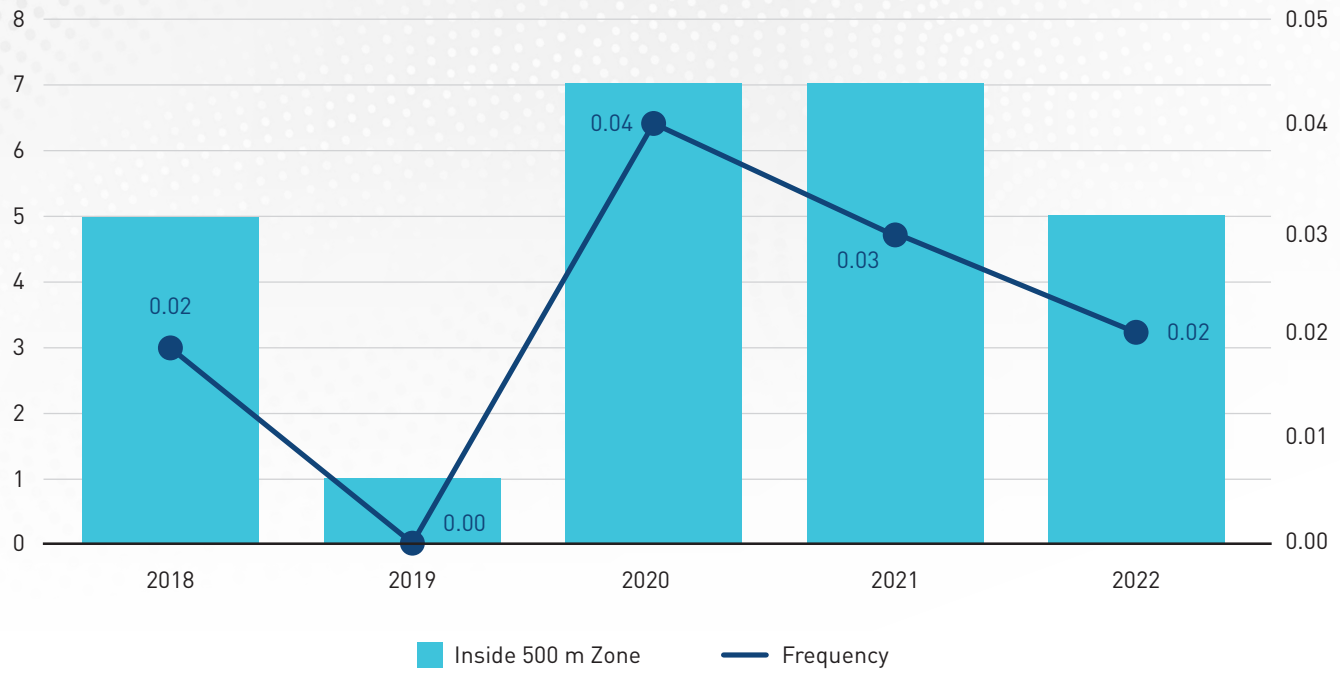


FIGURE 4.7-2: SPI 9 Count of Oil Spills to Water ≥ One Barrel



NOTE: For 2020 vs 2021, although the number of SPI 9 incidents was the same for both years, the increase in the number of work hours for 2021 resulted in a frequency decrease of 27% from 0.041 to 0.030.

4.8 SPI 10 RESULTS

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

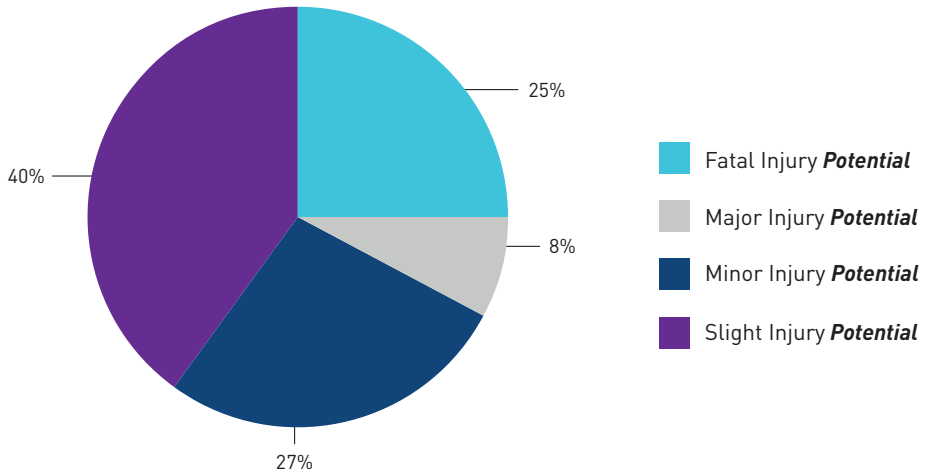
Similar to SPI 5, data for SPI 10 is reported by both members. The data from COS Member Operators reflect all drops on or within 500m of their lease and may include data from COS Member Contractors. Data reported by COS Member Contractors reflect dropped object incidents which occurred while working on the leases of non-COS Member Operators or outside the 500m zone.

SPI 10 represents the *potential* - not actual - results of incidents involving a dropped object. A total of 305 dropped object incidents were reported for 2022. COS Member Operators reported 280 and COS Member Contractors reported 25. Of these 305 incidents, 25% had the *potential* to result in a fatality, 8% had the *potential* to result in a major injury, 27% had the *potential* to result in a minor injury, and 40% had the *potential* to result in a slight injury.

Of the 305 dropped objects incidents, 255 (84%) 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.

FIGURE 4.8-1: SPI 10 Dropped Object Potential *(not actual)* Results



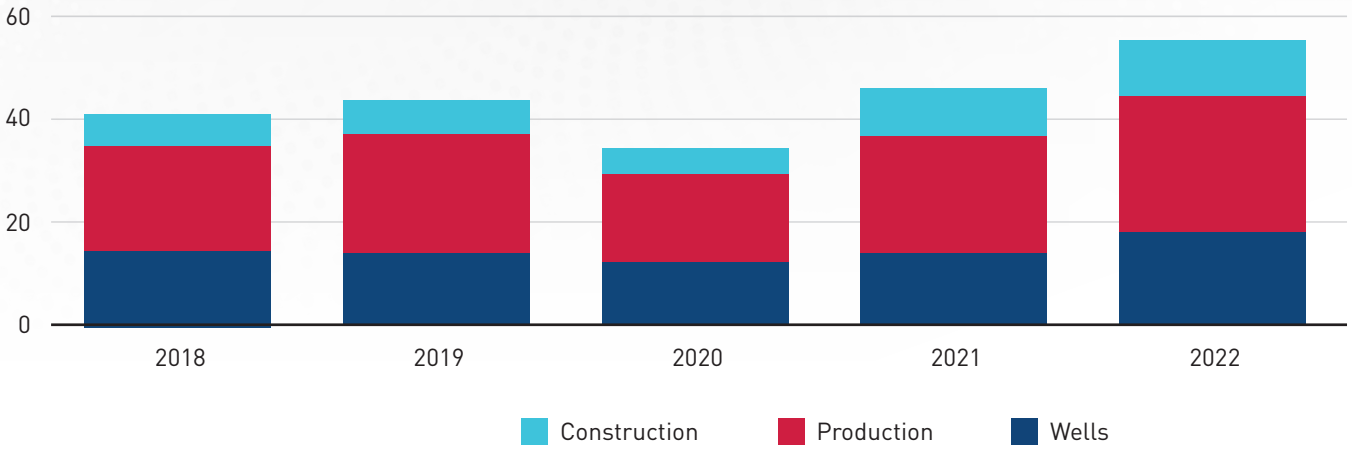
**Based on observations in previous COS annual reports, COS began collecting Dropped Object Potential (SPI 10) information from members for the first time for the 2019 reporting year. For the 2020 reporting year, COS added a fifth data point asking how many of the dropped objects reported resulted in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

4.9 NORMALIZATION FACTOR (WORK HOURS)

The data reported for 2022 represents more than 54 million COS Member Operator and Contractor work hours on the U.S. OCS. This is the highest number of work hours reported since 2015 and represents 76% of all natural gas and oil activity on the U.S. OCS.

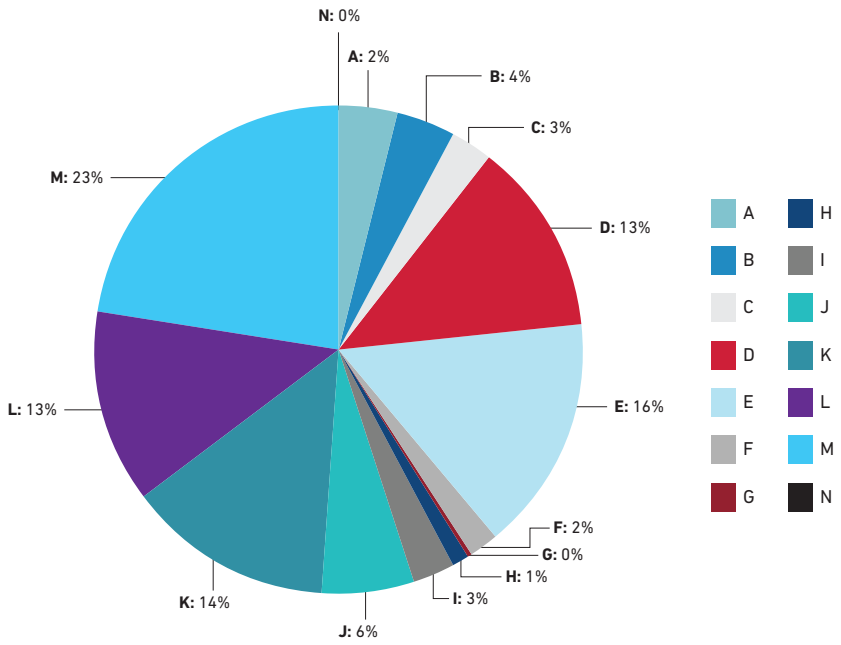
Work hours for both COS Member Operators and Contractors are reported only by Operators for work occurring within 500m of their facilities.

FIGURE 4.9-1: Work Hours (Millions) by Operation Type



YEAR	2018	2019	2020	2021	2022
COS U.S. OCS Work Hours (Millions)	41.7	44.2	34.5	45.9	54.7

FIGURE 4.9-2: 2022 Work Hours per COS Operator



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). 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 2018-2022 and includes learnings from the 2022 reporting year data that can be shared within companies to potentially prevent recurrence of similar or more severe incidents.

The data are comprised of the reported learnings from SPI 1 and SPI 2 incidents, as well as those from HVLE. A summary of the definitions for SPI 1, SPI 2, and HVLE are presented below.

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 4 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 so that the situation and operations underway at the time of the incident can be understood.
- **Corrective Actions to Repair / Mitigate Reported Incident:** Actions taken at the time of the incident to mitigate the consequences and secure the equipment and facility.
- **Lessons Learned / Actions to Mitigate Recurrence:** Actions taken as a result of this incident to prevent it from happening again.
- **Areas for Improvement (AFI):** A selection of pre-determined general categories and subcategories. Submitters had the option to add comments to provide further clarity and content.

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:

- 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 64 LFI submittals received for the 2022 reporting year, with 54 of the reported incidents and HVLE occurring on the U.S. OCS and ten occurring at international or onshore 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 a trend.

FIGURE 5.2-1: Count of U.S. OCS LFI Reports by Incident or Event Category

YEAR	2018	2019	2020	2021	2022
COS SPI 1	2	1	7	6	5
COS SPI 2	11	10	6	16	20
HVLE	14	32	11	21	29
TOTAL	**27**	**43**	**24**	**43**	**54**

FIGURE 5.2-2: Count of LFI Reports by Location

LOCATION	2018	2019	2020	2021	2022
U.S. OCS	27	43	24	43	54
U.S. Onshore / State Waters	4	4	3	0	4
International	0	5	5	8	6
TOTAL	**31**	**52**	**32**	**51**	**64**

A review of the 2022 reporting year LFI data (U.S. OCS only) identified the top reported activity types as:

- Drilling Operations – Normal, Routine (28%)
- Production Operations – Normal, Routine (22%)
- Mechanical Lifting (not involving cranes) (19%)
- Maintenance, Inspection and Testing (13%)

In addition to the topics mentioned above, the top AFI identified for (U.S.OCS) 2022 were:

- Operating Procedures or Safe Work Practices (39%)
- Risk Assessment and Management Process (24%)
- Design or Layout of Facility or Individual Piece of Equipment (22%)
- Facility or Equipment Reliability (20%)
- Quality of Hazard Mitigation (18%)

Across all ten reporting years, Operating Procedures or Safe Work Practices was the most frequently identified AFI. The 39% reported for 2022 is up from the 37% reported for 2021 but is still down from the 63% reported for 2020.

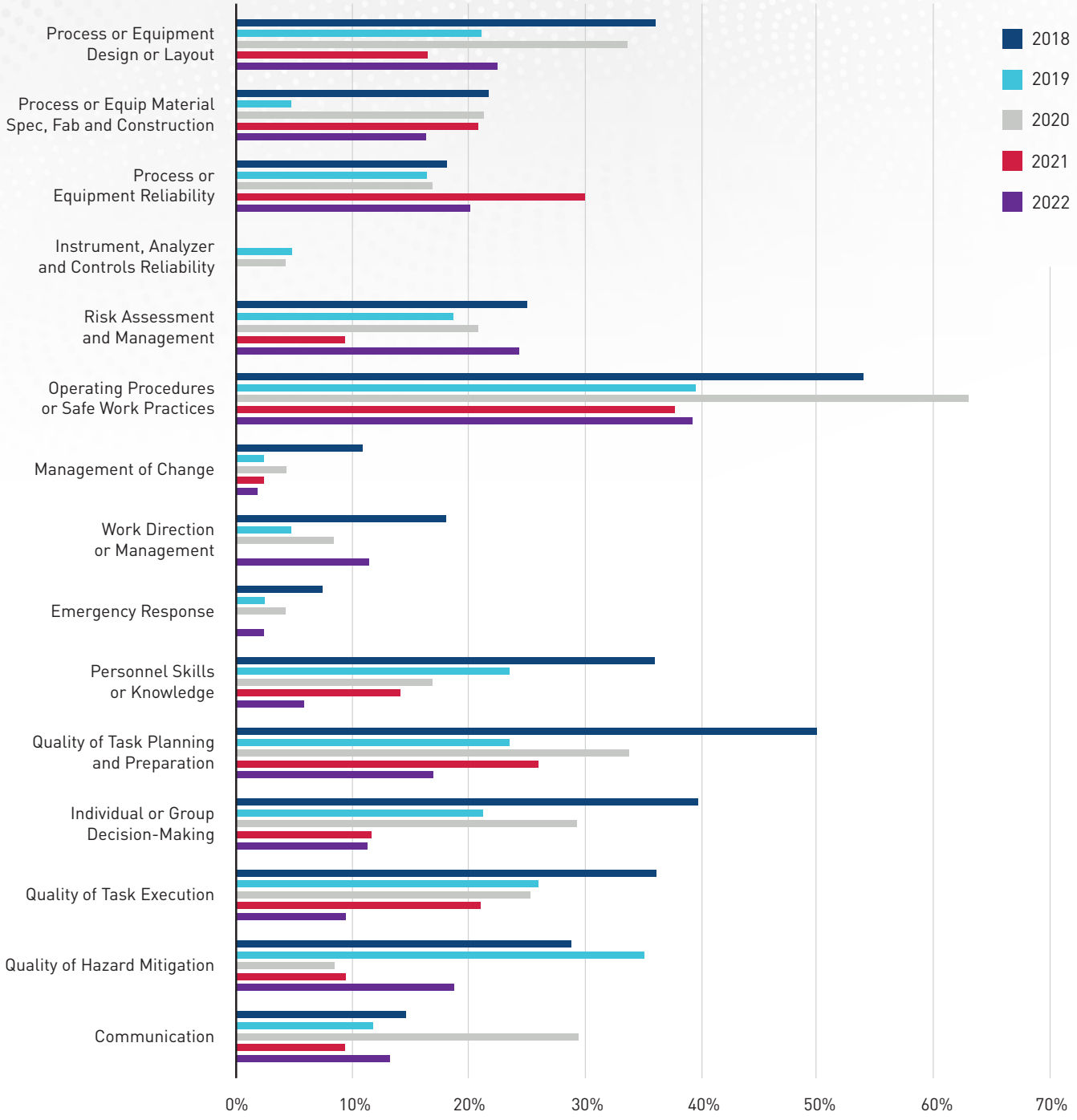
Additional review of the 2022 data identified the following as common threads through many of the 54 U.S. OCS LFI submittals:

- Dropped Objects (26%)
- Use of Stop Work Authority (13%)
- Corrosion (7%)

FIGURE 5.2-3: LFI Areas for Improvement Distribution (U.S. OCS Only)

AREA FOR IMPROVEMENT	2018	2019	2020	2021	2022	5-YR AVG
Operating Procedures or Safe Work Practices	53.6%	39.5%	62.5%	37.2%	**38.9%**	**46.3%**
Quality of Task Planning and Preparation	50.0%	23.3%	29.2%	25.6%	**16.7%**	**29.0%**
Facility or Equipment Design or Layout	35.7%	20.9%	33.3%	16.3%	**22.2%**	**25.7%**
Quality of Task Execution	35.7%	25.6%	25.0%	20.9%	**9.3%**	**23.3%**
Individual or Group Decision-Making	39.3%	20.9%	29.2%	11.6%	**11.1%**	**22.4%**
Facility or Equipment Reliability	17.9%	18.6%	16.7%	30.2%	**20.4%**	**20.8%**
Quality of Hazard Mitigation	28.6%	34.9%	8.3%	9.3%	**18.5%**	**19.9%**
Risk Assessment and Management Process	25.0%	18.6%	20.8%	9.3%	**24.1%**	**19.6%**
Personnel Skills or Knowledge	35.7%	23.3%	16.7%	14.0%	**5.6%**	**19.1%**
Facility or Equipment Material Specification, Fabrication and Construction	21.4%	4.7%	20.8%	16.3%	**14.8%**	**15.6%**
Communication	14.3%	11.6%	29.2%	9.3%	**13.0%**	**15.5%**
Work Direction or Management Process	17.9%	4.7%	8.3%	0.0%	**11.1%**	**8.4%**
Management of Change Process	10.7%	2.3%	4.2%	2.3%	**1.8%**	**4.3%**
Emergency Response Process	7.1%	2.3%	4.2%	0.0%	**1.8%**	**3.1%**
Instrument, Analyzer and Controls Reliability	0.0%	4.7%	4.2%	0.0%	**0.0%**	**1.8%**

FIGURE 5.2-4: LFI 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, *Recommended Practice for the 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 starting with 2021 Reporting Year data, 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 (see 4.3.1).

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 54 U.S. OCS LFI Reports plus the eight SPI 2C Crane incident reports:

FIGURE 5.3-1: 2021-2022 Selected SEMS Elements

SEMS ELEMENTS	2021	2022	2-YR AVG
# of LFI + SPI 2C Crane Submittals	52	62	114
Leadership	1.9%	6.5%	4.4%
Interface Management	0.0%	3.2%	1.8%
Risk Assessment and Risk Controls	25.0%	33.9%	29.8%
Procedures	36.5%	32.3%	34.2%
Safe Work Management and Safe Work Practices	42.3%	51.6%	47.4%
Knowledge and Skills	23.1%	14.5%	18.4%
Asset Design and Integrity	19.2%	25.8%	22.8%
Management of Change	3.8%	3.2%	3.5%
Pre-Startup Review	7.7%	6.5%	7.0%
Emergency Response and Preparedness	1.9%	1.6%	1.8%
Investigating and Learning from Incidents	17.3%	16.1%	16.7%
Evaluation and Improvement of SEMS	0.0%	0.0%	0.0%
SEMS Information	1.9%	0.0%	0.9%

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 incident 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%.

5.4 2022 LEARNINGS FROM LFI REPORTS AND CRANE INCIDENT REPORTS

The charts and graphs earlier in this section reflected LFI 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 or Onshore incidents and HVLE, as well as the eight SPI 2C Crane incident submittals (Section 4.3.1) – a total of 72 reported incidents and events. Selected learnings from these submittals are excerpted below.

As noted in Section 5.2, Dropped Objects, Use of Stop Work Authority, and Corrosion were sited in many of the incidents and events reported for 2022.

Note that throughout this section the incident descriptions and lessons learned are presented as written in the LFI and SPI 2C Crane incident reports submitted to COS.

5.4.1 DROPPED OBJECTS

Sixteen of the LFI and Crane incident submittals (22.2%) included a dropped object as either the cause or result of an incident. For these incidents, the reported Activities at the time of the drop were:

- Drilling Operations – Normal, Routine – 9 of 16 (56.2%)
- Production Operations – Normal, Routine – 3 of 16 (18.8%)
- Simultaneous Operations (SIMOPS) – 2 of 16 (12.5%)
- Helicopter Landing or Take-Off – 1 of 16 (6.3%)
- Maintenance, Inspection, and Testing – 1 of 16 (6.3%)
- Mechanical Lifting or Lowering – 1 of 16 (6.3%)

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

Incident Description: A Platform Worker was breaking off a solenoid on a dry tree using a hammer, when a 3.5-lb metal piece of a solenoid broke off and fell. The Worker was on the crow's nest of the dry tree platform and was almost complete with the work, as this was his last solenoid to change. The dropped object landed on the grating of the crow's nest (5 ft below), then fell straight down and hit a flange under the crow's nest (10 ft below), then fell at an angle down to the top of a scaffolding setup (40 ft below), then fell at an angle in the opposite direction, coming to rest on the Plus-Ten Deck grating. Three Contractors were in the general area on the Plus-10 Deck, under 3 levels of scaffolding, approximately 10 ft from where the object landed.

- **Corrective Actions to Repair / Mitigate Reported Incidents:** A safety stand down was held with the Crew to review the incident and reconfirm SIMOPS procedures.
- **Lessons Learned / Actions to Mitigate Recurrence:**
  - An internal investigation was conducted to gather evidence, pictures, and statements. A Safety One-pager was developed and shared throughout the Organization.
  - Reinstalled kick plates on the crow's nest platform and ensured the same for all other platforms.
  - Reinforced that all project work involving potential SIMOPS at various heights within the well bay area must be confirmed with a single, accountable Point of Contact (Project Leader) prior to entering the well bay area. If Project Leader is unavailable, the OIM must give permission or not, based on a physical check of the SIMOPs at the time of the work.
- **Areas for Improvement:**
  - **Work Direction or Management Process:** Improved clarity of responsibilities for SIMOPS work.
  - **Communication:** The JSA referenced the risk of dropped objects from overhead; however, the Worker on the crow's nest did not know that there were 3 Workers on the Plus-10 Deck since they were under the scaffolding.

Incident Description: During the install of a new umbilical lubricator, the lubricator fell to deck. The umbilical lubricator had been installed to the point of tightening the umbilical. When the umbilical tightened, it shook. The motion was enough to cause the swing bolts and wing nuts to loosen/open allowing the lubricator to fall to deck. The tool weighs 18lbs and fell ~13ft. There was no one in the area and a safe zone was established as part of pre-job planning. There were 3 technicians assigned to the task.

- **Corrective Actions to Repair / Mitigate Reported Incidents:** Implemented the use a short lanyard with carabiner as secondary means of DROPS prevention and DROPS retention. Added secondary retention requirement to JSEA at the time of the incident in the field to complete the job.

- **Lessons Learned / Actions to Mitigate Recurrence:** Add a permanent short style lanyard with carabiner as secondary means of DROPS prevention and DROPS retention to the lubricator. Develop a standard operating procedure for installing umbilical lubricators that include two retention methods. Update JSEA and risk assessment to reflect the newly identified DROPS hazards and controls. Update all other existing lubrication heads with secondary DROPS retention per the new standard operating procedure.
- **Areas for Improvement:**
  - **Risk Assessment and Management Process:** Updated risk assessment and JSEA to reflect newly identified vibration hazard and added DROPS control to include secondary retention.
  - **Operating Procedures or Safe Work Practices:** Developed standard operating procedure for installation of umbilical lubricators that include steps for retention of identified DROPS components.

Incident Description: An aluminum cart was lost overboard. The cart was waiting to be moved to a scrap metal basket staged on the LQ roof near a handrail. Rotor wash from a landing helicopter blew the cart over a handrail outward into the Gulf of Mexico (approximately 220' below). One of the helicopter pilots saw the cart go over the handrail and reported it to the HLO personnel immediately after landing. The cart weighed approximately 60 lbs.; the dimensions were 24"x66"x60". The deck immediately below is 41' from the LQ roof.

- **Corrective Actions to Repair / Mitigate Reported Incidents:** Formal Training of [Helicopter Landing Officers] HLOs: A current gap has been identified [location] that there has been a high turnover in personnel who were performing HLO duties, and many personnel have not been through formal HLO training. Instead, they received on-the-job training. [Location] Aviation is working to close this gap and it has been confirmed that new training has in-depth rotor wash awareness.
- **Lessons Learned / Actions to Mitigate Recurrence:**
  - Helideck [Standard Operating Procedures] SOPs / Manuals Currently [... do] not have any standard operator procedures / manuals / or checklist for HLOs to reference for performing their duties A solid understanding and visual of the risks of all individuals on platform on the understanding of extent of rotor wash / downdraft.
  - Personnel did not assume the cart weighing 60 pounds would have been blown over a handrail, 20 feet out overboard due to its size and weight. Crews did not recognize the wind turbulence created by helicopter would be strong enough to lift the cart over the handrail of where the cart was stored in a semi-tucked away location.
- **Areas for Improvement:**
  - **Risk Assessment and Management Process:** HLO's to begin attending HLO training at Training Facility. This training is an upgrade / more rigorous than previous training and will improve HLO Competencies. The HLO training covers detailed information with videos of the helicopter rotor downwash effects on the helideck and surrounding area.
  - **Operating Procedures or Safe Work Practices:** Aviation to finish development of Helideck SOP/ Roles & Responsibilities / Manuals for HLOs to utilize/implement across ... Production facilities. The manual will extensively cover downwash in the following areas:
    - Daily Helideck & Helideck Equipment Readiness Inspection
    - Helicopter Pre-Arrival Checks
    - Helicopter Pre-Departure Checks
    - Flight Check-In Process
    - Engine Start / Rotor Engagement Process

5.4.2 USE OF STOP WORK AUTHORITY

Eight of the LFI and Crane incident submittals (11.1%) included reference to the use, or lack of use, of Stop Work Authority. For these incidents, the reported Activities at the time of the incidents were:

- Drilling Operations – Normal, Routine – 2 of 8 (25%)
- Production Operations – Normal, Routine – 2 of 8 (25%)
- Other – 2 of 8 (25%)
  - Construction
  - Well Plug & Abandonment
- Confined Space Entry – 1 of 8 (12.5%)
- Simultaneous Operations (SIMOPS) – 1 of 8 (12.5%)

The following incident descriptions and learnings are excerpted examples of learnings for Use of Stop Work Authority (see Corrosion (Section 5.4.3) for additional excerpts referencing Use of Stop Work Authority):

Incident Description: During the disposal of expired paint products, a worker mixed epoxy resin and solidifier in a container. In a second container, Carboline epoxy paint A & B components were mixed. Finally, the two containers were mixed into a five-gallon bucket and placed in a paint locker. Five minutes later, the worker noticed smoke coming from the locker. The worker placed the bucket into a larger container filled with water and left. Twenty minutes later, the worker's supervisor noticed white smoke coming from the container and called the control room. The platform was shut down and personnel mustered. The worker added more water to the container enroute to his muster station, but the smoking did not stop until later when the mixture was covered with fire retardant powder.

- **Corrective Actions to Repair / Mitigate Reported Incidents:** The scene was secured and an "all-clear" was given. A safety stand down was conducted with the full crew.
- **Lessons Learned / Actions to Mitigate Recurrence:** Share learning across all crews during weekly safety meeting. Refresher training session on Stop Work Authority for all crews.
- **Areas for Improvement:**
  - **Risk Assessment and Management Process:** Permit and JSA updated to address the risk of mixing products and what to do in the event of an exothermic reaction.
  - **Operating Procedures or Safe Work Practices:** Paint Policy updated to address procedure for mixing paints for disposal.
  - **Work Direction and Management Process:** Fabric maintenance vendor supplied with a dedicated computer to create Permit to Work packs in Operator system. Permit and JSA updated to address the risks of mixing products.
  - **Emergency Response Process:** Refresher training held on reporting all incidents to [Operations] OPS.
  - **Quality of Task Planning and Preparation:** Permit title did not mention mixing of products JSA did not cover the risk of mixing products can cause a chemical reaction JSA did not state the importance of following manufactures guidelines when mixing products JSA did not state that different manufactures products should never take place [of Safety Data Sheets (SDS)] for all the products being mixed were not attached to the permit.
  - **Communication:** Initial smoldering event was not reported to OPS.

Incident Description: A crew of 3 technicians was tasked with installing a deployment guide funnel onto guide wires. The crew successfully installed the forward guide wire and proceeded on to the installation of the aft guide wire. The aft guide wire was not near the deployment guide funnel and in order to proceed, the crew made the decision to use a rig air tugger that was nearby. They attached a shackle to the wire and tied a rope to the top of the shackle

to prevent it from riding up the guide wire. As they were pulling tension with the air tugger, the rope broke, and the shackle was able to travel up the wire. This resulted in the deployment guide funnel pivoting approximately 3 to 4 feet towards a technician. The technician was not struck by the item, nor was there any damage to any equipment.

- **Corrective Actions to Repair / Mitigate Reported Incidents:** The crew held a stand down after the near hit occurred. The crew notified appropriate operations personnel on both the rig and onshore. Developed a plan to have rig crew operate the air tugger.
- **Lessons Learned / Actions to Mitigate Recurrence:** Updated work instructions/procedures. MOC created to capture changes in work scope. Risk assessment/JSEA updated to address use of air tugger and assigned rig personnel to operate tugger.
- **Areas for Improvement:**
  - **Risk Assessment and Management Process:** Risk assessment and JSEA updated to address use of air tugger and assigned rig personnel to operate tugger.
  - **Operating Procedures or Safe Work Practices:** Work instruction/procedures updated to include air tugger operations and clarify trained and authorized personnel to operate tugger.
  - **Quality of Task Planning and Preparation:** Crew did not do a pre-job review, site assessment, or planning session.
  - **Additional Comments:** Since there was no pre job site visit the opportunity to identify the placement of the guide wires ahead of time was missed. A similar incident occurred in 2020, where the crew had difficulty installing the guide wires due to their placement. The guide funnels are placed every 500 feet onto the cables. The crew used a tugger that was not owned by their company but was near the work area. Stop Work Authority was not used before the task began. The crew should have received prior approval to use the air tugger and had rig personnel operate it.

Incident Description: On [date], the lift boat [name] had just completed spotting a cement plug on [well] and were removing knock-ups from casing and tubing outlets. During this time a contract worker was tasked with cleaning a cement mixer with a low-pressure water hose. As the he was spraying down the inside of the mixer from the hatch position, he noticed water was not draining from the vessel due to blockage in the drain. He then proceeded to climb into the open top mixer, with the power unit still connected and running, in an attempt to remove the blockage. As he dislodged the material from the bottom of the mixer, the blade assembly was freed and began to rotate, causing the hose to become entangled in the mixing blades, preventing the worker from exiting the vessel. The worker began shouting for help and nearby personnel immediately shut down the engine and helped to remove the worker. No injuries resulted from the incident.

- **Corrective Actions to Repair / Mitigate Reported Incidents:** There were no observable warning signs to Confined Space Hazards, which is a regulatory requirement. The contract worker was a short-service employee (SSE) with limited experience, and he failed to recognize the immediate hazards. Direct supervision was not present at the time of the event.
- **Lessons Learned / Actions to Mitigate Recurrence:** Stop Work Authority was exercised and a Safety Stand down was implemented with all personnel. Investigation commenced. Notification of the incident and lessons learned was shared with all field personnel. The Permit to Work has been modified to include open top tank entry. Signage is being installed on all [...] open top tanks including cement mixers. A safety alert has been drafted and will be distributed upon final approval.
- **Areas for Improvement:**
  - **Risk Assessment and Management Process:** The Permit to Work has been modified to include open top tank entry.
  - **Communication:** Signage is being installed on all [...] open top tanks including cement mixers. A safety alert has been drafted and will be distributed upon final approval.

5.4.3 CORROSION

Four of the LFI and Crane incident submittals (5.6%) included reference to Corrosion. Note, all three of the excerpts below also reference the use, or lack of use, of Stop Work Authority. For these incidents, the reported Activities at the time of the incidents were:

- Maintenance, Inspection, and Testing – 1 of 4 (25%)
- Mechanical Lifting or Lowering – 1 of 4 (25%)
- Other - 1 of 4 (25%)
- Simultaneous Operations (SIMOPS) – 1 of 4 (25%)

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

Incident Description: While the Crane Operator was lowering tools, two Construction Crew Members (using the buddy system) were on the Plus-Ten Deck to assist with tool movement. The most senior of the two was directing and assisting with crane ops, while the other observed for safety. The tool basket was being lowered under the direction of the Supervisor on the Drilling Deck to the Plus-Ten Deck using the port crane. The load was stopped for transfer of direction from the Supervisor on the Drilling Deck to the Senior Crew Member on the Plus-Ten Deck. At that time, the 2nd Crew Member was steadying the load with a tagline. The load was located approximately at chest level, and, because it was undergoing slight movement from wind, the Individual Involved decided to move to the opposite side of the load to hold the second tagline and help steady the load. To stay out of the line of fire underneath the load, he tested the grating in the port side caisson with one foot, and then he fully stepped onto the grating. Upon placing his full weight on the grating, the 2 sections of angle iron securing the grating to the inside of the caisson gave way on the side where he stepped. The Individual Involved fell back but was able to catch the top of the caisson with his arms while partially being supported by the angled grating still attached on the opposite side of the caisson. He held himself in place by pushing his back against one side of the caisson with one foot pushing against the partially attached grating. The 2nd Crew Member heard the event and was immediately able to grab the Individual Involved by the harness. The Individual Involved pushed off the partially attached grating, and, with the assistance of the 2nd Crew Member, he exited the caisson and rolled onto the Plus-Ten Deck. No one was injured.

- **Corrective Actions to Repair / Mitigate Reported Incidents:**
  - The job was stopped and the Crew Member reported to his Supervisor after checking himself for injury. After ensuring the Crew Member was uninjured, the Construction Supervisor confirmed the job had been stopped and notified the Platform OIM. The OIM then shut down all work and called for a safety stand down and meeting to assess the incident.
  - The loose grating and angle irons were removed from the middle port side caisson, and the open hole was covered with scaffolding boards secured to the Plus-Ten Deck by wire. The middle caisson on the starboard side was also secured with the same method.
- **Lessons Learned / Actions to Mitigate Recurrence:**
  - Design and install a barrier around the open caissons to prevent personnel access. Remove existing grating inside caissons.
  - Review existing grating inspection program for frequency, scope, location identification, evaluation methodology, documentation, and corrective action/resolution. Identify and correct gaps to ensure that the grating inspection program is comprehensive, prevents future grating failures, and identifies any needed modifications for safety and accessibility.
  - Review the Work Requirement for crane operations to ensure requirements are sufficient to cover blind lifts, limited access locations, taglines, and push poles – specifically around hazard recognition, pre-planning, and personnel positioning for proper load stabilization.
  - Evaluate the need to write separate permits/JSAs for activities involving blind lifts, restricted access, or non-routine activities.

- **Areas for Improvement:**
  - **Design or Layout of a Facility or Individual Piece of Equipment:** Grating inside caisson was not designed for human occupancy; however, there were no barricades or indications not to enter the caisson.
  - **Facility or Equipment Reliability:** It was determined that an underlying cause of this incident was excessive corrosion at grating support welds and support structures, and that multiple inspections either missed or excluded the caisson grating, or only visual surface inspections were performed.
  - **Quality of Task Planning and Preparation:** Pre-job planning did not identify risks associated with personnel positioning when receiving the load.

Incident Description: A facilities crew was working on board the [platform] when a pipe dislodged from beneath the deck and fell to a lower level. The event was witnessed by a deckhand and a contractor who were stationed aboard the [motor vessel] at the time. Stop Work was called, the crew evacuated the platform, and an inquiry began. A JSA and top-side work site inspection had been conducted prior to the work proceeding; however, lower decks and piping were not inspected for this task. Upon investigation it was discovered an estimated seven-foot section of a drain system had broken loose and fallen to a lower level. Further examination reveals a portion of the pipe came to rest on production piping. No injuries resulted from the incident.

- **Corrective Actions to Repair / Mitigate Reported Incidents:** Stop Work Authority was exercised, and the platform was evacuated by the crew. Construction crew performed site inspection facilitated the removal of additional unstable components.
- **Lessons Learned / Actions to Mitigate Recurrence:** A safety standdown was conducted by site leadership and EHS. Although this condition was challenging to identify, it highlighted the importance of continual site and workplace walkdowns and inspections. Always look above, beneath, behind, and below.
- **Areas for Improvement:**
  - **Facility or Equipment Reliability:** Corroded section of piping fell from above deck during decommissioning activities.
  - **Operating Procedures or Safe Work Practices:** Safe Work Practices should include pre-job risk assessment of facilities and ensure exclusion zones are properly delineated.

Incident Description: On [date], the [lift boat] was in the process of extracting a 15' pup joint from a well bore with a crane and lowering it down onto the top deck of [location], where P&A crews detached it from the fast line. The crane operator was cleared and began repositioning the boom to repeat the task, when suddenly personnel heard a loud bang emanating from the unattended well bay deck below them. Upon investigation it was determined that a bolt-on type beam having dimensions of 7.5' L x 14" W weighing approximately 220 lbs. was dislodged out of its seat and fell from below the grating approximately 20', striking the well bay deck. [Platform] had been identified as a high-risk platform based on its condition; due to observance of the red zone policy no personnel or equipment were in the drops cone of exposure and no injuries resulted from the event.

- **Corrective Actions to Repair / Mitigate Reported Incidents:** Advanced stages of corrosion of bolting areas on both ends of the beam are attributed as the primary cause of the incident. Activity from work being performed on top deck may have dislodged the beam.
- **Lessons Learned / Actions to Mitigate Recurrence:** Stop Work Authority was exercised, and the platform was evacuated by the crew. Conducted Safety Standdown with all personnel. Operations are currently shut down and all personnel are removed from the platform awaiting Construction Team arrival for further inspection and corrective measures, if required.

- **Areas for Improvement:**
  - **Risk Assessment and Management Process and Quality of Hazard Mitigation:** [Platform] had been identified as a high-risk platform based on its condition; due to observance of the red zone policy no personnel or equipment were in the drops cone of exposure and no injuries resulted from the event.
  - **Communication:** Conducted Safety Standdown with all personnel. Operations are currently shut down and all personnel are removed from the platform awaiting Construction Team arrival for further inspection and corrective measures, if required.

6.0 SEMS AUDITS

6.1 BACKGROUND

BSEE issued its Workplace Safety Rule, also known as the Safety and Environmental Management Systems (SEMS) regulations, in October 2010, requiring all Operators operating in the U.S. Outer Continental Shelf (OCS) to develop, implement and audit a SEMS. The SEMS Audits are meant to verify that companies have established, implemented, and maintained a SEMS throughout their U.S. OCS operations, as well as identify areas where the companies are improving or are deficient. Operators were required to complete the first round of audits by November 15, 2013, and at least every three years after. This meant that for most operators, the second round of audits was completed by the end of 2016, the third round by the end of 2019, and the fourth round by the end of 2022.

COS commenced both a SEMS Certificate program and an Audit Service Provider (ASP) Accreditation program in October 2012 to support its mission of improving safety and environmental performance and in conjunction with the SEMS regulatory requirements. The COS SEMS Certificate program was established to recognize COS member companies who conducted their SEMS Audits and completed their Corrective Action Plan (CAP), if applicable, to the satisfaction of the ASP. The Audit Service Provider Accreditation Program was established to create a consistent, standardized set of requirements for ASP and their auditors to increase confidence and effectiveness of the audits. The program documents can be found on the COS website: **centerforoffshoresafety.org** under the SEMS Audit Providers tab on the ASP Requirements page.

Subsequent changes to the SEMS regulatory requirements (often referred to as SEMS II) in April 2013 led to additional requirements regarding stop work authority, ultimate work authority, employee participation, and reporting of unsafe conditions. Additional requirements regarding SEMS Auditing were also added, including incorporating selected COS documents, the need for an Accreditation Body to accredit Audit Service Providers, and requiring all SEMS Audits conducted after June 2015 to be directed by an Accredited ASP. COS is currently the only recognized Accreditation Body; as such, all regulatory required SEMS Audits must be conducted by a COS-accredited ASP.

In 2014, COS requested COS Member Operators share the results of their second round. This data was analyzed to identify performance trends and learning opportunities. These conclusions, along with the underlying data, were reported publicly in the first COS APR in 2014. In 2017, COS again requested COS Member Operators to share the results of their second round of SEMS Audits. The information requested was more extensive to better help identify trends and learnings. Also, where appropriate, the results of both rounds were compared to identify additional trends in longer-term performance. In 2020, COS made the decision to request SEMS Audit Results from BSEE to allow for a more comprehensive overview of the state of the industry SEMS programs. COS again requested this data in 2023.

6.2 SEMS AUDIT DATA BY CLASSIFICATION TYPE

For the 47 SEMS audit reports submitted to BSEE from 2020-2022, 223 Non-Conformances, 226 Areas of Concern, and 121 Opportunities for Improvement were identified. Typically, Deficiencies (Non-Conformances and Areas of Concern) represent either less than satisfactory fulfillment of a requirement, or a requirement that is only marginally being met but could lead to a non-conformity if additional actions are not taken. Of note:

- Four SEMS Elements account for 55% of the Deficiencies – Assurance of Quality and Mechanical Integrity, Safe Work Practices, Hazards Analysis, and Operating Procedures.
- In addition, 220 Good Practices were also identified; these were analyzed separately to identify learnings. Over 85% of the Good Practices identified were considered by the reviewers to be statements of conformance indicating functional and effective areas within SEMS. The remaining 15% were considered by the COS review team as being potentially helpful to share across the wider industry.

Figure 6.2 - 1 shows the distribution of the count of Non-Conformances and Areas of Concern as reported per SEMS Element. Figure 6.2 - 2 is the same data represented in tabular form. Figure 6.2 - 3 compares this data to the data from the last audit cycle.

FIGURE 6.2-1: 2020-2022 Finding by SEMS Element and Deficiency Type – U.S. OCS (Counts)

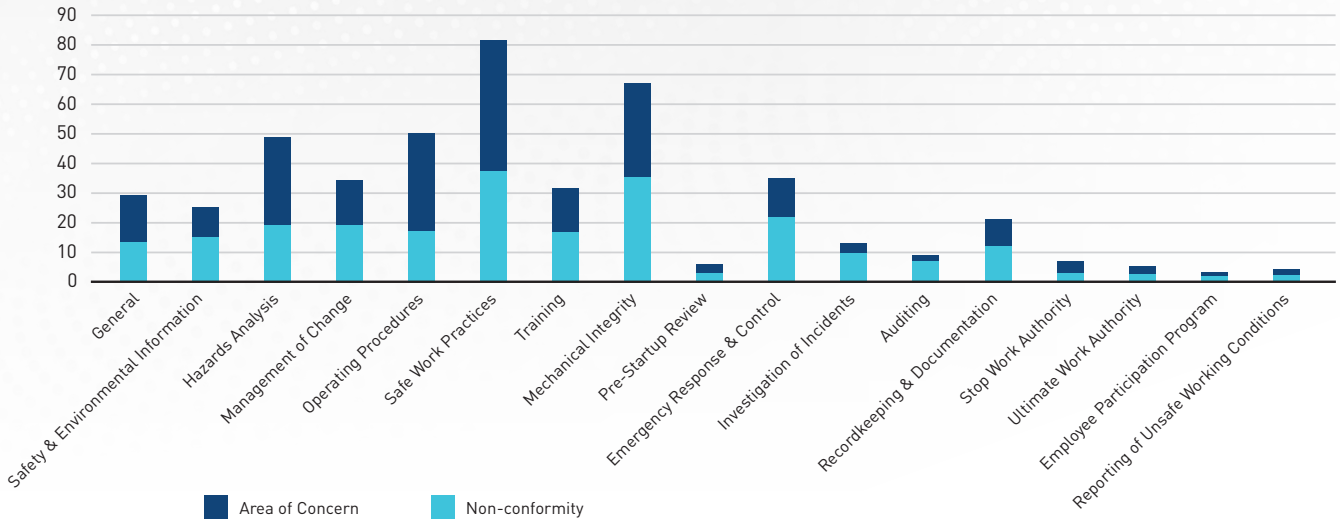
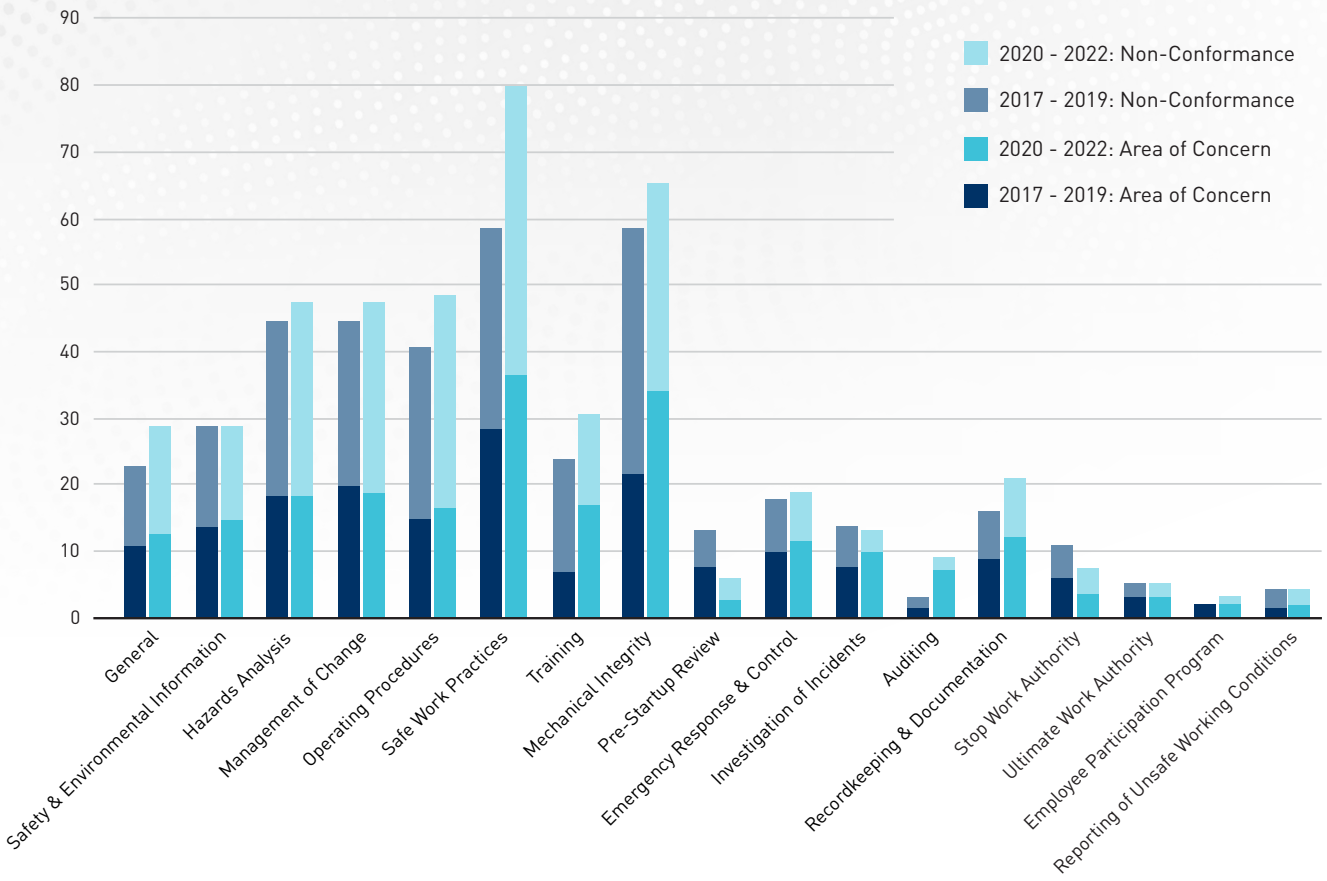


FIGURE 6.2-2: 2020-2022 Finding by SEMS Element and Deficiency Type – U.S. OCS (Counts)

SEMS ELEMENT	# OF NON-CONFORMANCES	# OF AREAS OF CONCERN
General	16	13
Safety and Environmental Information	10	15
Hazards Analysis	29	19
Management of Change	15	19
Operating Procedures	32	17
Safe Work Practices	43	37
Training	14	17
Mechanical Integrity	31	35
Pre-Startup Review	3	3
Emergency Response and Control	7	12
Investigation of Incidents	3	10
Auditing	2	7
Recordkeeping and Documentation	9	12
Stop Work Authority	4	3
Ultimate Work Authority	2	3
Employee Participation Program	1	2
Reporting of Unsafe Working Conditions	2	2

FIGURE 6.2-3: Audit Cycle Comparison of Deficiencies by SEMS Element – U.S. OCS (Counts)



6.3 SEMS AUDIT DATA BY SEMS MATURITY

As stated before, Deficiencies (Non-Conformances and Areas of Concern) typically represent either less than satisfactory fulfillment of a requirement, or a requirement that is only marginally being met but could lead to a non-conformity if additional actions are not taken. As such, further analysis of these findings may help industry more sustainably and collaboratively close gaps and improve SEMS performance. Figure 6.3 - 1 shows the breakdown of Non-Conformances and Areas of Concern distributed by SEMS Element.

Please note that the term going forward in this report, "Deficiency" will be used to encompass both Non-Conformances and Areas of Concern.

As stated earlier, it was determined that different analytical methods could add additional value and help identify useful insights. One method that was developed was to better understand the maturity of SEMS implementation across the industry to more clearly understand in what phase of SEMS maturity the breakdown occurred. This was done by a small group of audit and SEMS subject matter experts and involved some level of judgment.

The methodology followed was:

- Every Deficiency was analyzed to understand if the issue was in the Establish, Implement, or Maintain maturity phase of the SEMS
- Implement was further broken down to understand if the issue was in the actual implementation of the requirement or in the documentation (policy, practice, procedure, etc.):
  - Implement means to put the requirement into action

- Document means to appropriately document the action, update necessary documents, and allow appropriate access to documents

- If multiple maturity phases could be chosen for a single Deficiency, the earliest phase on the maturity scale was selected.
  - For example, for a finding where personnel were noted using an outdated procedure because they did not have access to the updated procedure, only Implementation was selected.

To make it easier to align, understand, and communicate, the below was used as shorthand:

- Establish – Do you say what you do?
- Implement
  - Implement – Do you do what you say?
  - Document – Do you document what you do, update documents appropriately, and provide access to the right people?
- Maintain – Do you confirm your SEMS is working as designed and review and act when you say you will?

Figure 6.3 - 1 shows the 2020-22 distribution of Deficiencies per SEMS Maturity phase. Figure 6.3 - 2 compares the overall number of Deficiencies per SEMS Maturity Phase for 2017-19 (RY 2019) and 2020-22 (RY 2022). Figures 6.3 – 3-6 further break down this comparison data and show it by SEMS Maturity Phase per SEMS element.

FIGURE 6.3-1: 2020-22 Deficiencies by SEMS Maturity Phase – U.S. OCS (Percentages)

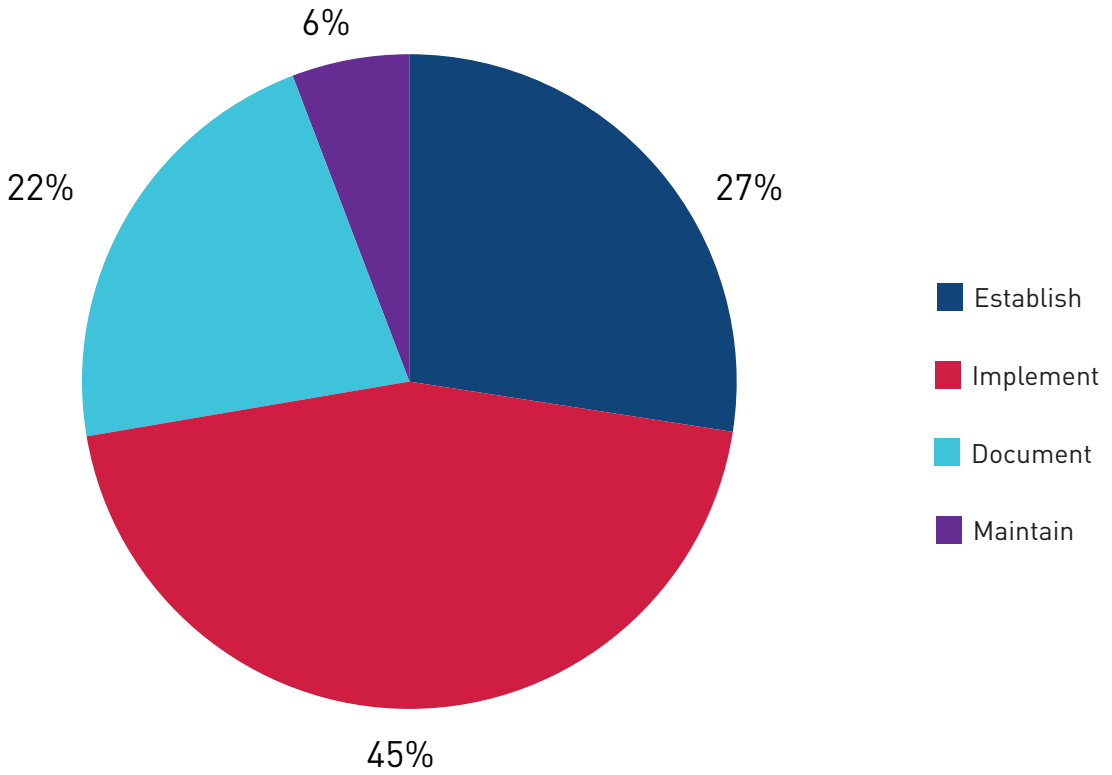


FIGURE 6.3-2: Audit Cycle Comparison of Deficiencies by SEMS Element – U.S. OCS (Counts)

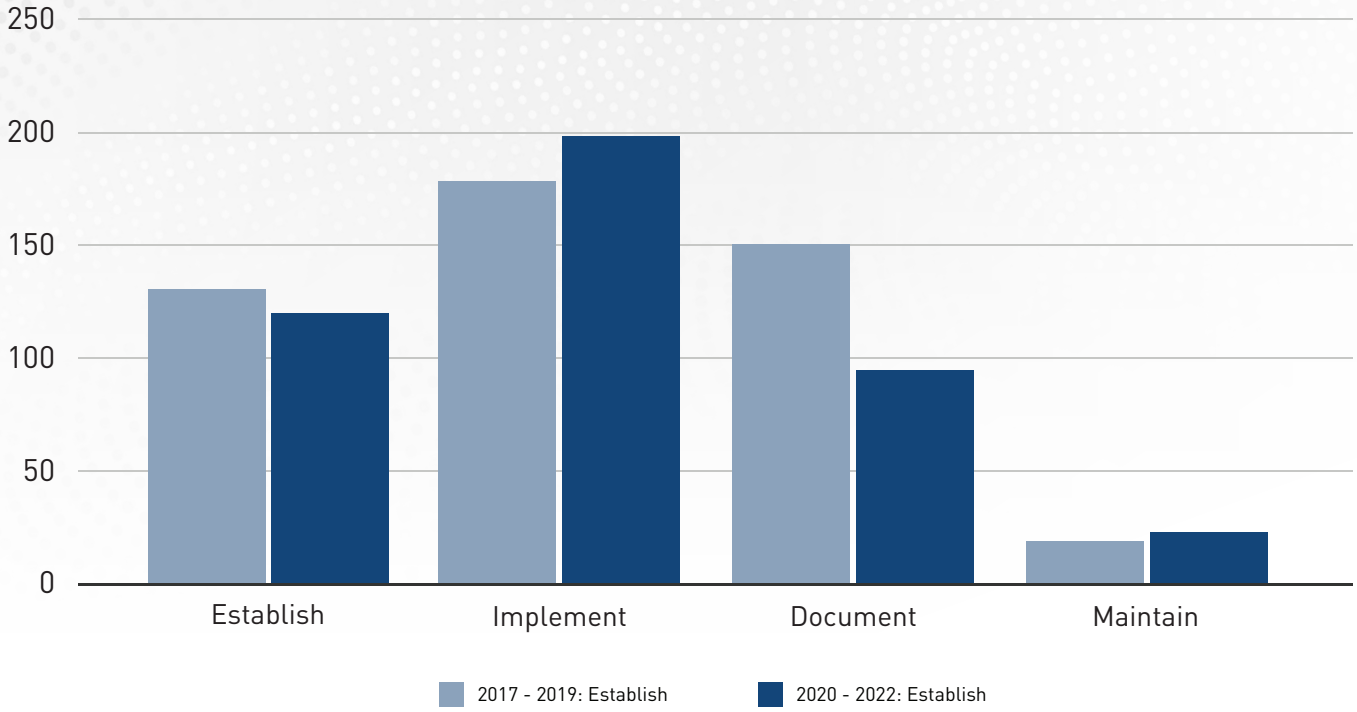


FIGURE 6.3-3: Audit Cycle Comparison of Deficiencies by SEMS Element – U.S. OCS (Counts)

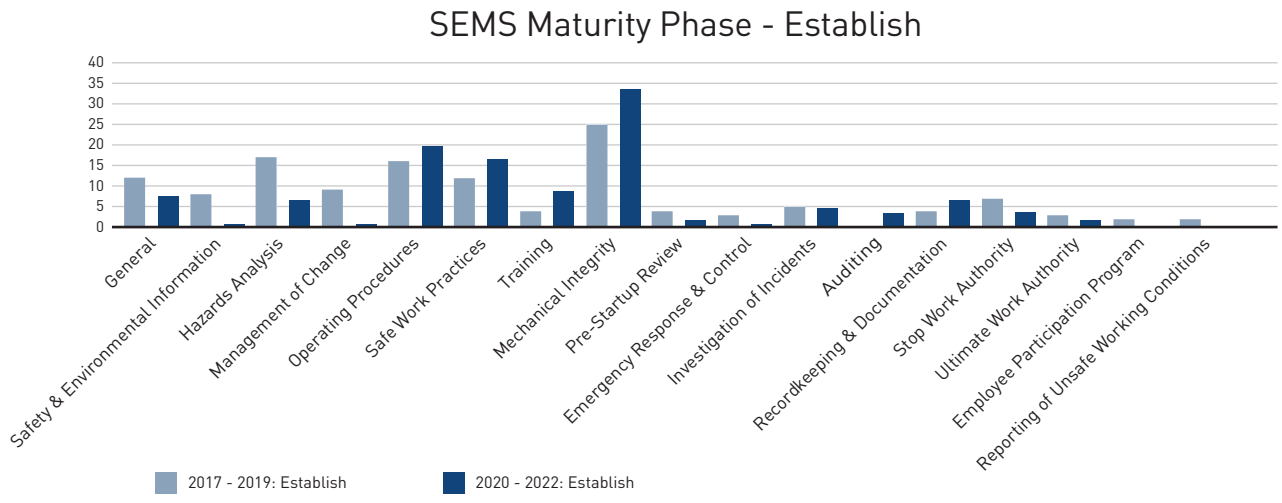


FIGURE 6.3-4: Audit Cycle Comparison of Deficiencies by SEMS Element – U.S. OCS (Counts)

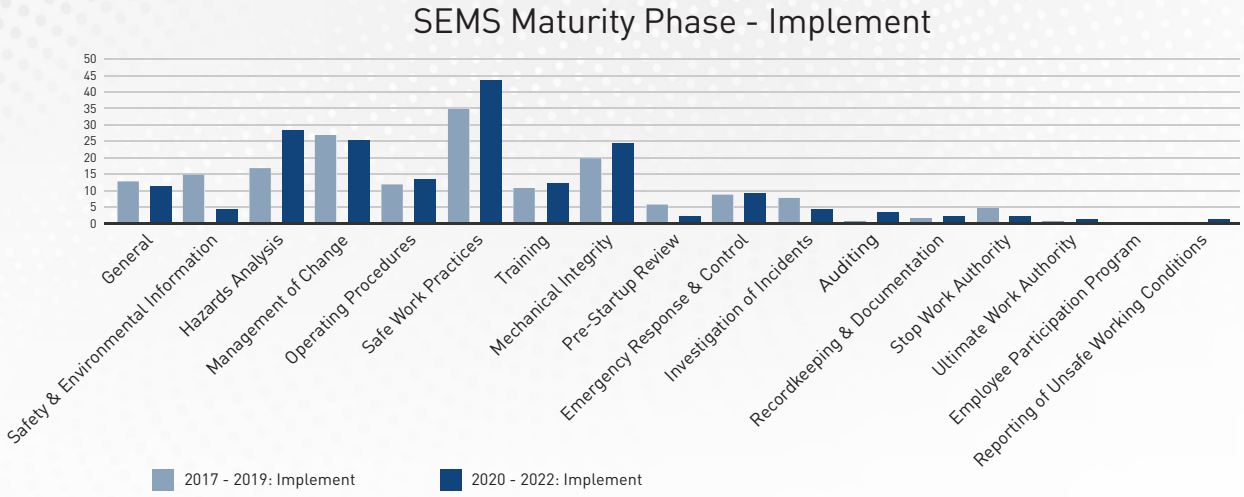


FIGURE 6.3-5: Audit Cycle Comparison of Deficiencies by SEMS Element – U.S. OCS (Counts)

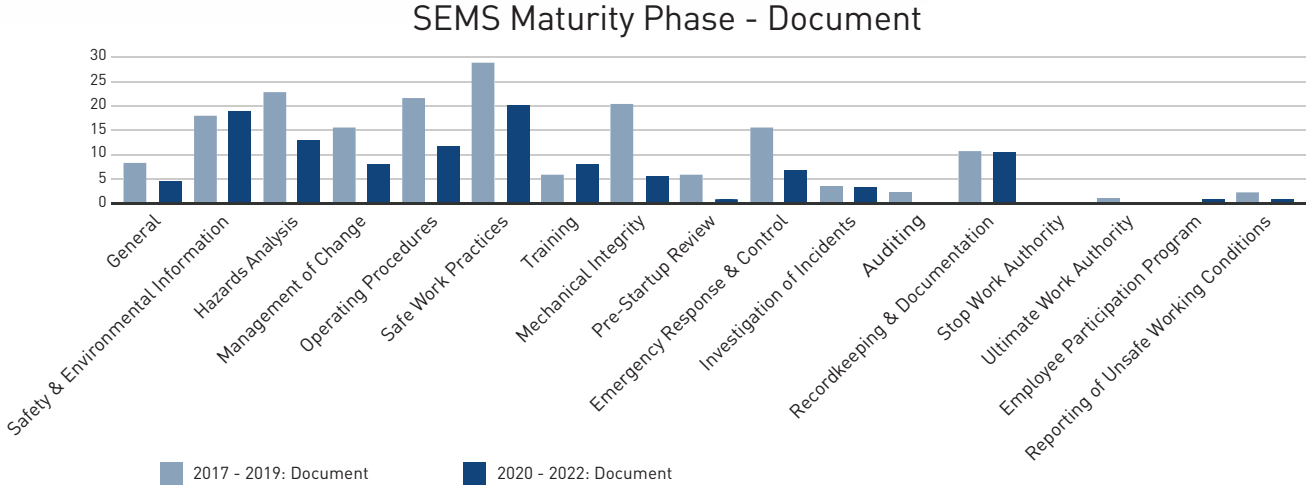
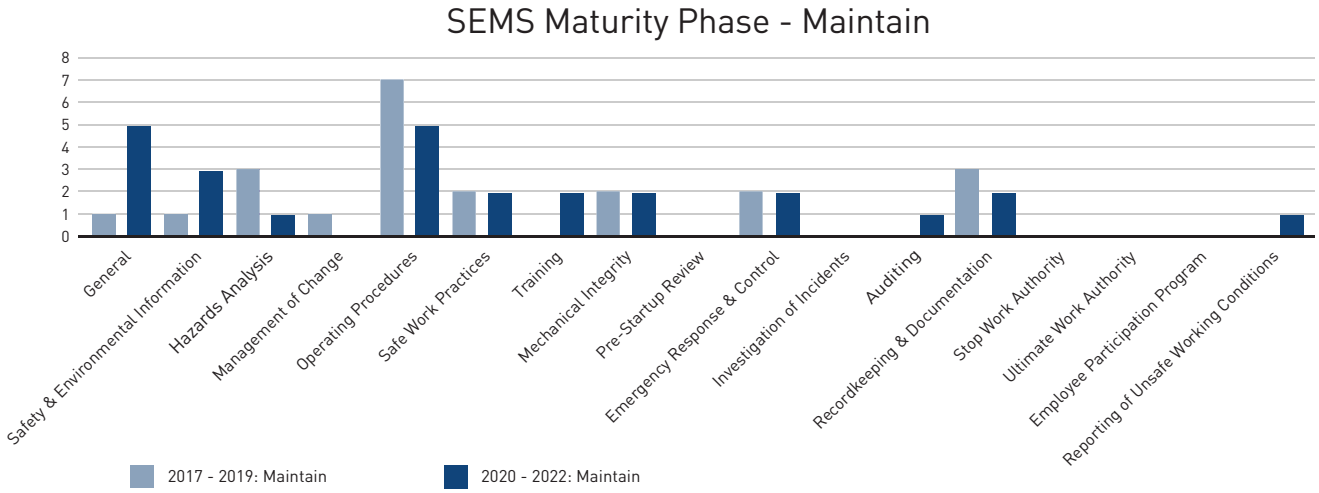


FIGURE 6.3-6: Audit Cycle Comparison of Deficiencies by SEMS Element – U.S. OCS (Counts)



The analysis identified that:

- 27% (123/449) of Deficiencies were determined to be in the Establish phase and typically represent issues with:
  - Processes missing requirements (e.g., training checklists not including all necessary training, Bridging Agreements not including all company requirements, etc.),
  - Process missing (e.g., no oversight for the inspection and testing programs, maintenance procedures not developed for all critical equipment, etc.),
  - Unclear or inconsistent expectations (e.g., company's requirements for contractors unclear, additional definition needed on how to document action closure, etc.).
- 45% (201/449) of Deficiencies were determined to be in the Implement phase and typically represent issues with:
  - Executing work as designed (e.g., not always using required checklists, using the wrong tools, etc.),
  - Inconsistencies in the execution of work processes (e.g., inconsistent use of processes, incomplete training, etc.).
- 22% (98/449) of Deficiencies were determined to be in the Document phase and typically represent issues with:
  - Lack of access to current documents (e.g., use of outdated drawings, up-to-date procedures not being accessible from the platform, etc.),
  - Illegible or incomplete documents and records (e.g., incomplete JSA, not having the correct SDS on site, not recording analysis and critique of emergency drills for improvement opportunities, incomplete records of management reviews, etc.).
- 6% (26/449) of Deficiencies were determined to be in the Maintain phase and typical represent issues with:
  - Not conducting management reviews or not following up on outcomes of management reviews.
  - Documents not being reviewed on schedule.

6.4 SEMS AUDITS – INSIGHTS

Based on the provided SEMS Audit data, there were four (4) SEMS Elements that encompassed over 54% of the Deficiencies. These four elements were further analyzed for additional insights and to identify common themes; these elements are:

- Hazards Analysis
- Operating Procedures
- Safe Work Practices
- Assurance of Quality and Mechanical Integrity of Critical Equipment

The results of the analysis and selected findings, as well as common themes, for each these SEMS Elements are included below.

6.4.1: HAZARDS ANALYSIS

- There were 48 Deficiencies for Hazards Analysis, which represents 11% of all Deficiencies (48/449).
- The top SEMS maturity phases noted for Deficiencies in Hazards Analysis were Implement (60%) (29/48), followed by Document (23%) (11/48), and Establish (15%) (7/48).
- Further textual analysis of the Deficiencies identified the following common themes:
  - 58% (28 of 48) involved the Hazards Analysis not being fully implemented or not being followed up on.
  - 38% (18 of 48) involved issues in Job Safety Analysis (JSA) processes, including inconsistent application of JSA, inconsistent direction on how and when to complete JSA, and a failure to implement controls and identify hazards
  - 4% (2 of 48) were specifically related to documentation and recordkeeping issues


SWK

6.4.2: OPERATING PROCEDURES

- There were 49 Deficiences for Operating Procedures, which represents 11% of all Deficiencies (49/449).
- The top SEMS maturity phases noted for Deficiencies in Operating Procedures were Establish (41%) (20/49), followed by Implement (29%) (14/49), and Document (20%) (10/49).
- Further textual analysis of the Deficiencies identified the following common themes:
  - 40% (20 of 49) involved inaccurate or not current procedures, primarily involving procedures that were outdated, were not updated when deemed necessary by an MOC, did not contain the clarity needed for personnel to follow them, or personnel on site not having access to the current procedures
  - 35% (17 of 49) involved needed or required procedures not existing
  - 18% (9 of 49) involved inconsistent or incomplete reviews of procedures, including reviews that did not occur per schedule, reviews that did not occur in the prescribed manner, and/or a lack of systemic process to review procedures
  - 6% (3 of 49) involved personnel not following written procedures

6.4.3: CONTRACTOR SELECTION AND SAFE WORK PRACTICES

- There were 80 Deficiencies for Safe Work Practices, which represents 18% of all Deficiencies (80/449).
- The top SEMS maturity phases noted for Deficiencies in Contractor Selection and Safe Work Practices were Implement (55%) (44/80), followed by Document (21%) (17/80) and Establish (21%) (17/80).
- Further textual analysis of the Deficiencies identified the following common themes:
  - 29% (23 of 80) involved issues with contractor selection and performance evaluation
  - 40% (32 of 80) involved safe work instructions; the majority of these issues involved missing or inaccurate or out-of-date safe work practices
  - 13% (10 of 80) involved hazardous materials; the majority of these issues involved incorrect storage of hazardous materials, mislabeled storage, and missing SDS.
  - 6% (5 of 80) involved incorrect or unavailable PPE.

6.4.4: ASSURANCE OF QUALITY AND MECHANICAL INTEGRITY OF CRITICAL EQUIPMENT

- There were 66 Deficiencies for Assurance of Quality and Mechanical Integrity, which represents 15% of all Deficiencies (66/449).
- The top SEMS Maturity phases noted for Deficiencies in Assurance of Quality and Mechanical Integrity were Establish (52%) (34/66), followed by Implement (38%) (25/66), and Document (8%) (5/66).
- Further textual analysis of the Deficiencies identified the following common themes:
  - 44% (29 of 66) involved incomplete Mechanical Integrity processes and procedures. Many of these involved processes that were not yet established.
  - 24% (16 of 66) involved not following established Mechanical Integrity processes and procedures; several of these involved not addressing corrosion issues,
  - 20% (13 of 66) involved equipment testing and inspection; these involved instances where there was no testing or inspection requirement or the requirements were not being followed.
  - 11% (7 of 66) involved issues where corrective action plans were not being followed up on or actions not being completed.

6.4.5: SEMS AUDITS – GOOD PRACTICES

There were 220 Good Practices identified in the 2020-2022 SEMS Audit data provided. Of these, 85%, were classified by the reviewers as being statements of conformance indicating a functional and effective SEMS. Further analysis identified 32 Good Practices as being potentially helpful to share across the wider industry. The most noteworthy of these are included below. These were selected based on the applicability to wider industry and/or the uncommon nature of the practice. Note that the items are presented as written in the findings data received from BSEE.

GENERAL

- A midday pause for safety meeting is held daily to see if any of the projects initiated at tower change have changed and require additional evaluation
- Management conducts a shift change safety meeting at the heliport prior to the new crew going offshore at every shift

SAFETY AND ENVIRONMENTAL INFORMATION

- Annual audit of facility drawings and P&IDs

SAFE WORK PRACTICES AND CONTRACTOR SELECTION

- Collision avoidance systems installed on fork lifts operating on a drill ship
- A comprehensive safety harness and lanyard pre-use inspection checklist documents the equipment used for each job.
- A Comprehensive lifting device management system was observed, with lifting devices (slings, chain hoists, stingers, etc.) securely stored in a 10-feet shipping container, controlled by an in/out register, traceable model and serial numbers, and color-coded recertification tags.
- Operators perform monthly inspections and inventory of PPE in each of the facilities.
- The Activity Integration SIMOPs Schedule provides facility leadership with a detailed and long-lead view of upcoming work such that potential SIMOPS can be managed, aligned with a similarly front-end loaded permit-to-work and task risk assessment pipeline that aims to reduce break-in work, provide a high level of visibility of the planned and actual work, and assist with the identification of potential conflicts.

TRAINING

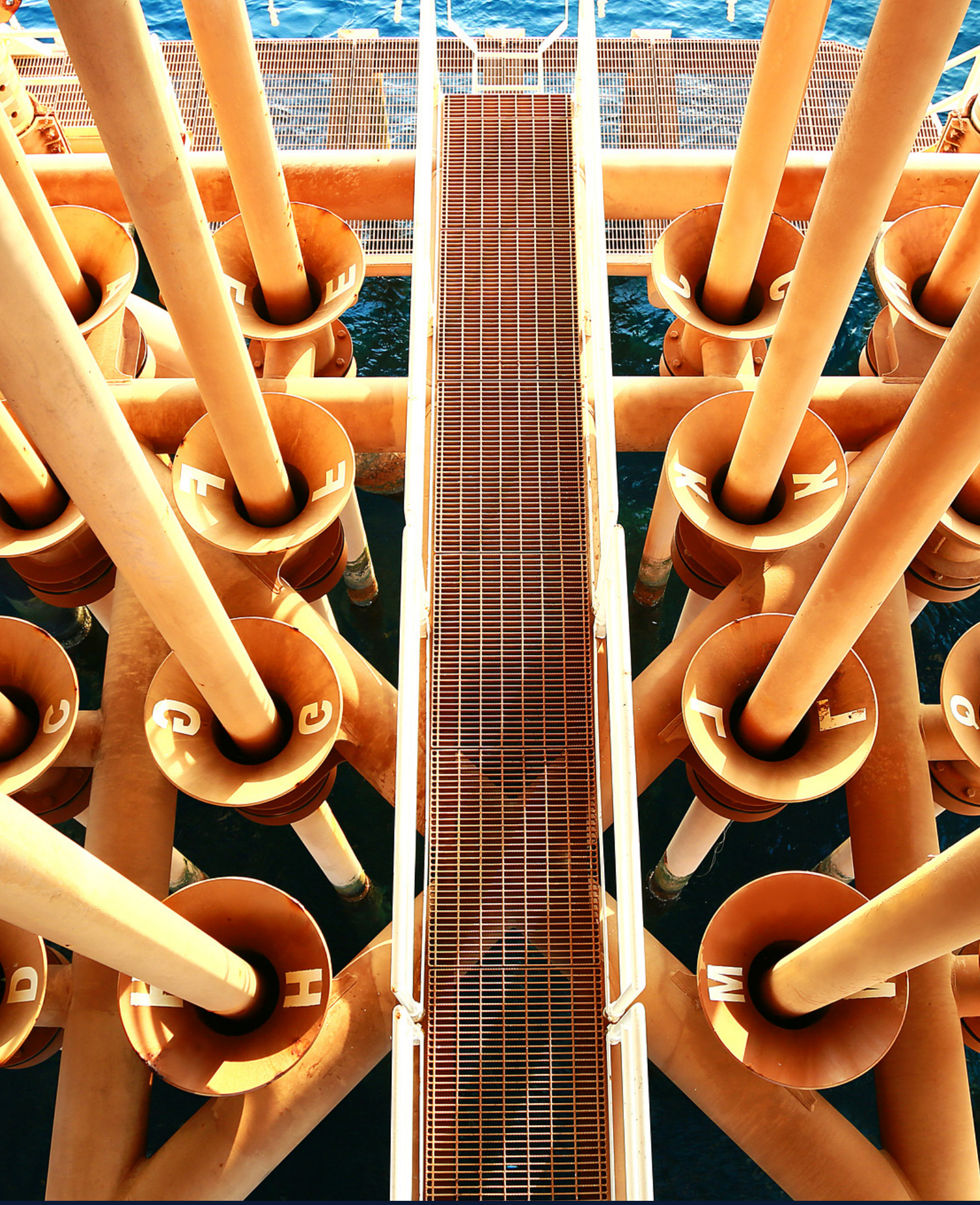
- [OPERATOR] had established a goal of ensuring that all operators and technicians must complete 100% of required training by the end of each quarter. [OPERATOR] ensured accountability of training requirements by distributing monthly and quarterly completion/Deficiency/renewal reports to operators, technicians, support staff and management.

EMERGENCY RESPONSE AND CONTROL

- The Control Room has a designated input screen to track workers going in and out of columns

STOP WORK AUTHORITY

- SWA effectiveness evaluated by daily & weekly reviews by HSE specialists – looking for trends – documented in a weekly report
- As an example of SWA, a testimonial is given during onsite rig orientation by an employee that is powerful and drives home that the SWA process does not involve reprisal.



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

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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

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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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