Serious Injury & Fatality Insights

A Cross-Industry Analysis of Data and Best Practices

2023 EDITION

About ISN®

Established in 2001, ISN is the global leader in contractor and supplier information management. ISN's global platform with data-driven products and services helps companies manage risk and strengthen relationships. Our goal is to bring together our network of more than 750 Hiring Clients and 78,000 active contractors and suppliers to promote continual improvement in contractor management and strive for a safe work environment for everyone.

Headquartered in Dallas, Texas, ISN has additional offices in Los Angeles, New York City, Midland, Calgary, Dubai, Toronto, Montréal, Mexico City, London, Sydney, Perth, Auckland and Paris. ISN takes pride in leading efforts to improve the efficiency and effectiveness of contractor management systems and in serving as a forum for sharing industry best practices among our members.

As active members of the National Safety Council's Campbell Institute and with a team of HSE professionals with more than 1,800 years of combined experience who hold a variety of global certifications and designations, ISN stays current with industry best practices and is ready to assist Hiring Clients, contractors and suppliers with their HSE management.

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Serious Injury & Fatality Insights – A Cross-Industry Analysis of Data and Best Practices

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Introduction

Since 2021, ISN has prioritized both educating our customers on the value of recording Serious Injury and Fatality (SIF) events and analyzing reported data to identify impactful trends and insights. In this version of ISN's SIF White Paper, 2022 data was added to our previous five-year exploration of subscribed contractor customer data to provide an even more in-depth analysis. This data was acquired through both self-reported questionnaires in ISNetworld as well as data verified by our Health, Safety and Environmental Review and Verification Services team.

As both employers and employees return to a sense of normalcy in a post COVID-19 workplace, we will examine the last six years of data in conjunction with specific industry spotlights focused on 2022 data. In line with similar trends found by the National Safety Council (NSC) in 2021, this White Paper will focus on Mining, Oil and Gas, Manufacturing, and Transportation & Warehousing industries as these are among the top industries for total deaths and life altering events [1]. We will also explore the Utilities industry and its trend of lower SIF events. ISN's analysis will help examine how incidents are affecting these industries, what unique challenges are being faced, and the potential solutions that apply regardless of work scope. In addition, as Leading Indicators and other new methods of hazard recognition continue to be at the forefront of best practice discussions, our analysis will explore the use of such techniques and how they can benefit a variety of industries to drive down the number of SIF occurrences.

Highlights from this White Paper

- Although 2020's COVID outbreak maintained elevated hospitalization cases, **2022 is showing a stabilization of cases and statistics** that are beginning to return to pre-pandemic data sets.

- 2022 data shows a return of **Sprains, Strains and Tears as the number one incident reported** by contractors from all industries, replacing Fractures and Dislocations.

- In 2022, **Transportation and Warehousing averaged the second highest average Days Away from Work** at 95 days per case.

- **The Upstream–Onshore sector of Oil and Gas recorded a fatality rate of 9.5**, the highest of all industries evaluated.

- In contrast to other industries, **the most affected body part in the Manufacturing industry was Lower Extremities.** In addition, Manufacturing also experienced a high average number of days away from work per case.

- **89% of all SIF cases for Mining in 2022** were classified as Days Away from Work .

- In 2022, **Utilities maintained the lowest average days away from work per case** when compared to all other ISN Hiring Client industries.

- New offerings such as the Empower App and enhanced visibility into High Energy Operations **can help effectively mitigate SIF risk for all customers.**

1.0 Collection of SIF Data

In the last iteration of this White Paper, *Serious Injury and Fatality Insights – A Five-Year Exploration of Contractor Incidents,* the report focused on SIF trends across all industries over a five-year period. Leveraging this same methodology, this White Paper will narrow the focus to evaluate specific SIF trends in five industries and provide recommendations to support mitigating risk.

Although different industries have established specific definitions for Serious Injuries, ISN continues to align with the Occupational Safety and Health Administration (OSHA)'s definition of a serious injury when assessing contractor reported data. The definition includes any work-related fatality, in-patient hospitalization, amputation, or loss of an eye. Maintaining this stance creates a consistent environment where data can be accurately compared year over year to effectively identify injury trends and provide action-oriented solutions.

Definition of a SIF: Any work-related fatality, in-patient hospitalization, amputation, or loss of an eye.

2.0 SIF Analysis Through Machine Learning

Through ISNetworld's United States Questionnaire, more than 50,000 U.S. contractor companies reported SIF information between 2017 and 2022. As of December 2022, five percent of these contractors reported a SIF in the last six years and provided their OSHA 300 Logs and 300A Summaries for verification within ISNetworld.

Continuing the approach from the early 2023 White Paper, the ISN Data Science Team applied a machine learning model* to this data set to predict which incidents reported by ISN contractors over the past six years were likely to have been serious injuries based on the incident description and outcome. Fatalities were identified using the case classification on OSHA 300 Logs.

ISN recognizes there are limitations and challenges with this approach. Since the data source is OSHA 300 Logs from thousands of different companies, there are unique reporting styles, languages and varying levels of detail in the description of each incident. In some cases, due to lack of detail or redaction for privacy, the model is unable to determine the exposure or outcome of the case. Additionally, this approach only accounts for OSHA recordable incidents to determine SIFs based on events that resulted in injury or illness. ISN believes the output provides valuable insights into past events that can help understand where SIFs may occur in the future.

**ISN's Data Science Team developed a novel, deep learning text classification model to classify contractors' incidents. The model was trained on OSHA's severe injury dataset and incorporates input from ISN's HSE professionals to ensure accurate classification.*

3.0 SIF Data Trends

Before diving into industry-specific trends, an analysis on all available SIF data was conducted to help us better understand performance across all industries. This approach allowed us to identify key areas such as the most common type and nature of event as well as the potential likelihood of a SIF to occur based on company size.

ISN's analysis of the recordable incidents from 2017 – 2022 yielded the below results:

3,143
Contractors Companies Reported SIFs

127,470
Recordable Incidents Extracted

23,830*
SIF Cases Identified

316**
Six-Year SIF Rate

871
Fatalities

20,582
Hospitalizations

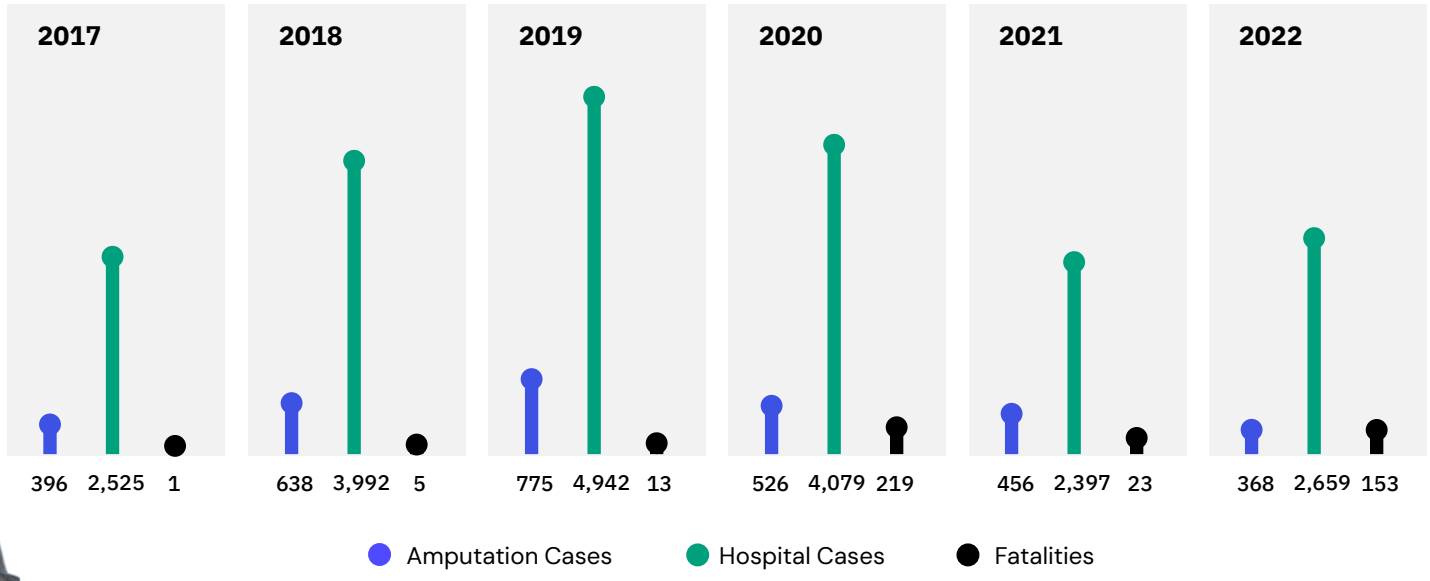
3,154
Amputations

0
Eye Losses

**Counts in each SIF category may not add up to total SIF incidents, as the same incident can be included in multiple categories.*

***SIF rate calculation – ([total # of serious injuries*) + (total # of fatalities)] x 200,000,000) / (# of exposure hours). Calculated for 100,000 workers with a normalizing constant of 200,000,000 to provide better visual representation.*

Figure 3.1 Incident Types by Year



Over the data's six-year span, an interesting trend was identified with hospitalization cases. Although 2020's COVID outbreak resulted in elevated hospitalization cases, despite the downturn in work activity, 2022 shows a stabilization of cases with statistics that begin to return to pre-pandemic data sets. In addition, 2022 saw the lowest number of amputation cases in the last six years. Unfortunately, the number of fatalities drastically increased.

With organizations returning to pre-pandemic operations and workforces ramping back up to full capacity, several factors play into why we are seeing SIF data for 2022 fluctuate. These factors include a stabilization of exposure hours, temporary and new workforces, as well as a re-learning period from significant dips in work activity. To help us better understand the underlying issues, ISN took a deeper look into the specific events and natures that make up SIF occurrences.

Figure 3.2 Top Three Incident Events by Year

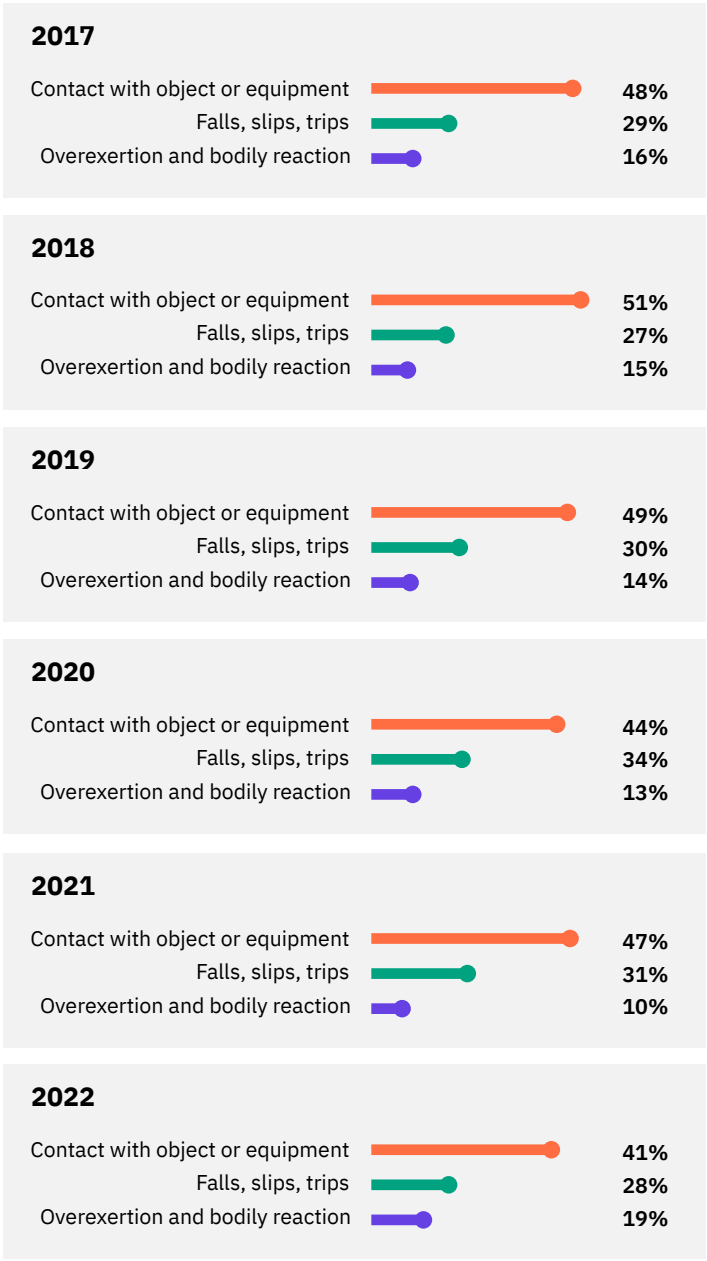
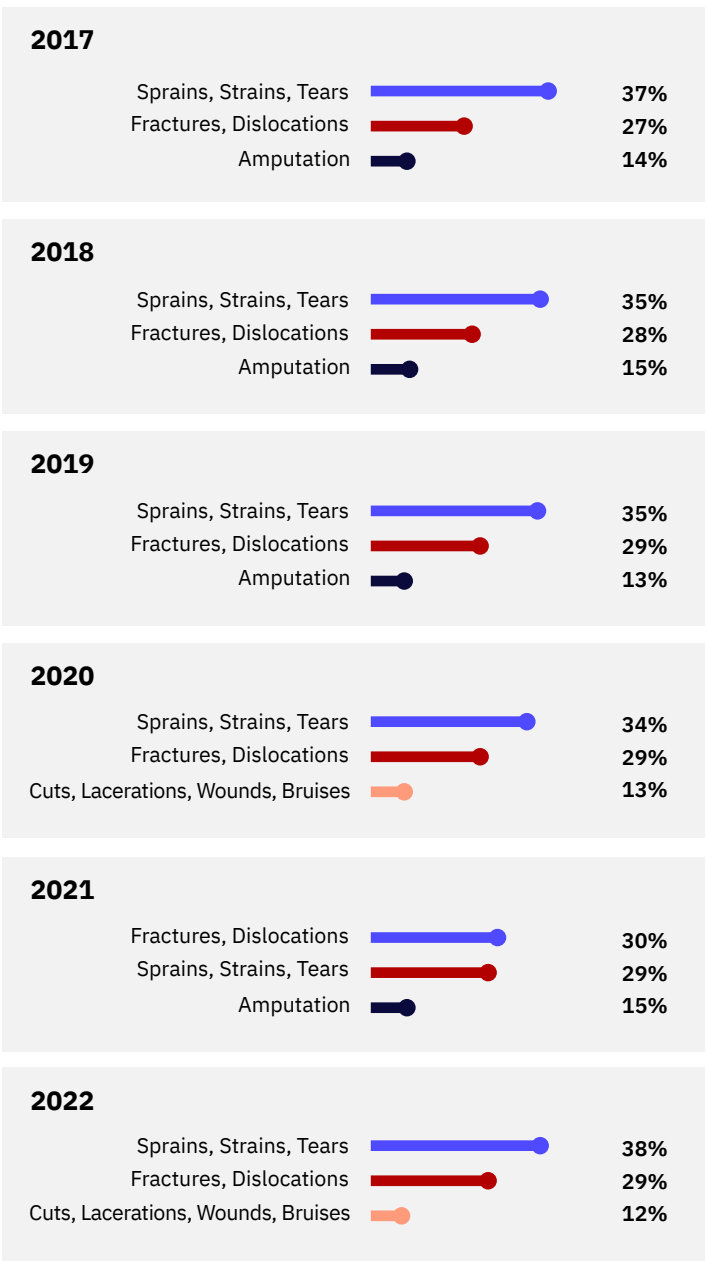


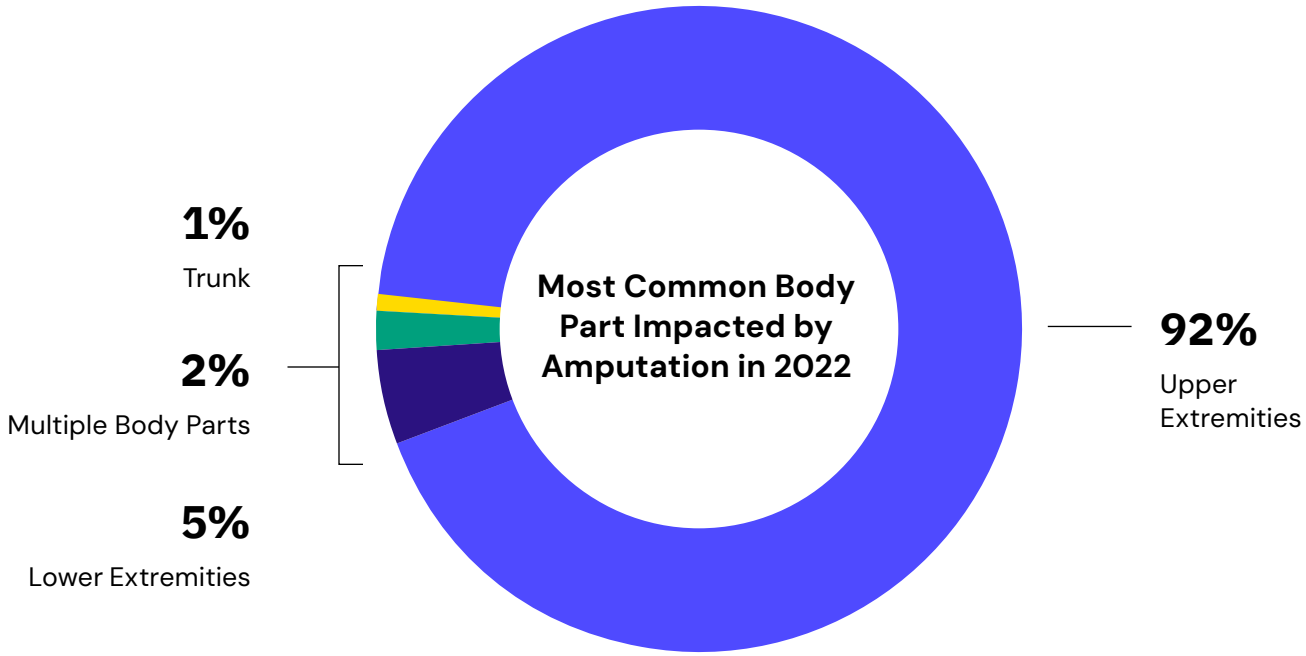
Figure 3.3 Top Three Incident Natures by Year



As depicted by Figure 3.2, the top event, year over year, continues to be Contact with Object or Equipment closely followed by Falls, Slips, Trips.

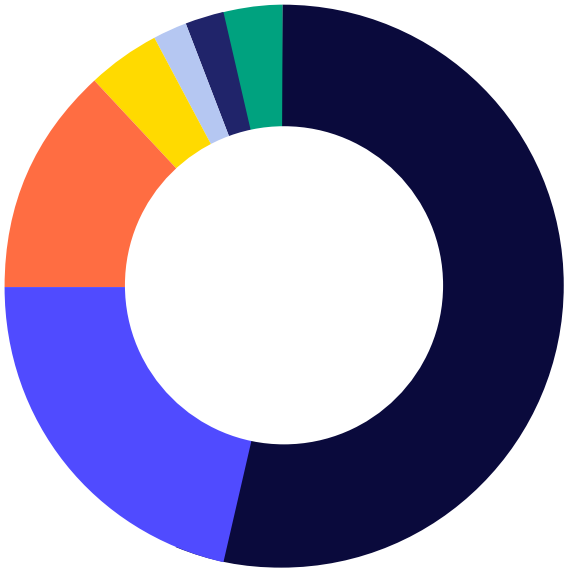
After an anomaly in 2021, Figure 3.3 shows 2022 brought a return of Sprains, Strains and Tears as the number one incident nature. This can be explained by a variety of factors such as crushing from equipment, poor ergonomics and, most notably, an aging workforce. According to the Bureau of Labor Statistics (BLS), the employment of older workers is growing, with those aged 75 years and older expected to grow by 96.5 percent over the next decade [14]. Older workers are more prone to injuries through falls, leading to tears in muscles, ligaments, hernias etc., ultimately resulting in surgery, hospital stays, and extensive evaluations. These events, combined with pre-existing conditions and overall worker complacency, can lead to an uptick in SIF occurrence for any type of business. Tailoring occupational safeguards around this aging workforce demographic is one of many ways to take the first step in decreasing the number of Sprains, Strains and Tears for your workforce.

Figure 3.4 **Most Common Body Part Impacted by Amputation in 2022**



As previously mentioned, although 2022 data reflects the lowest number of amputations in a six-year period, the vast majority (92%) of all amputations involved the Upper Extremities (Figure 3.4) with almost 71% caused by Contact with an Object or Equipment. Similarly, Contact with Object or Equipment accounted for 55% of fatalities, depicted by Figure 3.5, while the second most common cause of fatalities was Trips, Slips and Falls at 21%.

Figure 3.5 2022 Fatality Breakdown by Event Category



- **55%** Contact with object or equipment
- **21%** Falls, slips, trips
- **13%** Overexertion & bodily reaction
- **04%** Exposure to harmful substances or environments
- **02%** Violence & other injuries by persons or animals
- **02%** Fires & explosions
- **03%** Other

Figure 3.6 2022 Key SIF Statistics by Company Size

	Firm Size Class (group)	
Contractor Count	1 - 99 Employees	208
	100 - 249 Employees	209
	250 - 999 Employees	283
	1000+ Employees	212
Fatalities	1 - 99 Employees	55
	100 - 249 Employees	37
	250 - 999 Employees	36
	1000+ Employees	24
Fatality Rate	1 - 99 Employees	354
	100 - 249 Employees	77
	250 - 999 Employees	17
	1000+ Employees	2
SIF Cases	1 - 99 Employees	276
	100 - 249 Employees	337
	250 - 999 Employees	721
	1000+ Employees	1,751
SIF Rate	1 - 99 Employees	2,150
	100 - 249 Employees	809
	250 - 999 Employees	390
	1000+ Employees	210

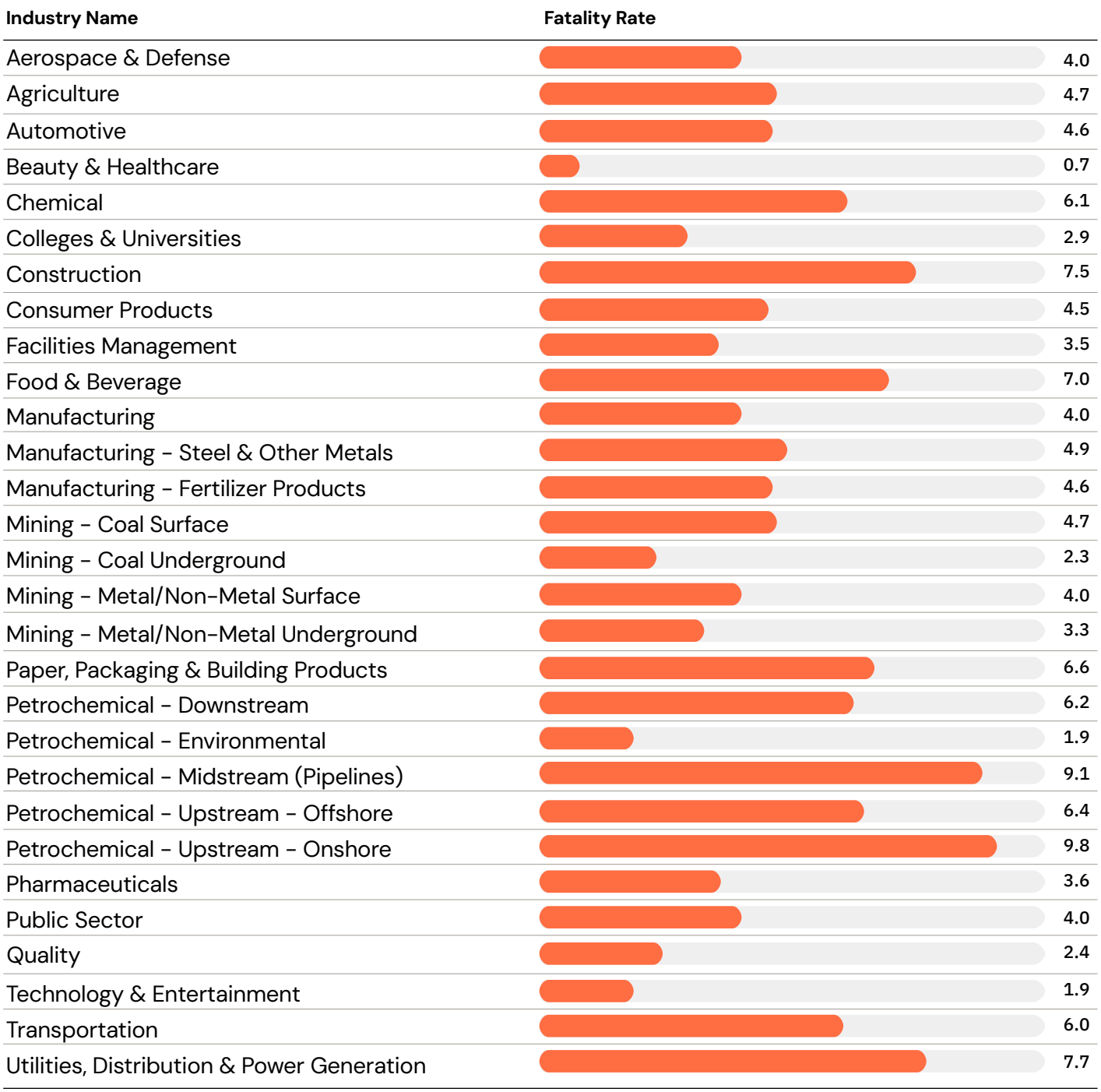
ISN's analysis also considered the connection between company size and the likelihood of a SIF occurrence. Interestingly, as depicted by Figure 3.6, the group with the highest rate of fatalities is not correlated with the largest company size, but rather small and mid-size corporations. Much like Total Recordable Incident Rate (TRIR), smaller companies who have a SIF event occur are seeing the biggest impact in their overall SIF rate for each serious injury and fatality event. Regardless of company size, SIF's have a significant impact on both the affected individual and the organization.

We often hear from small and midsize organizations that they do not have a dedicated Health and Safety Professional on staff, which can present additional challenges as they try to maintain a safe workplace. Recognizing individual level training opportunities and identifying the most effective content and delivery method is one such challenge. As a result, ISN offers a library of online training courses through our Learning Management System (LMS) that firms of any size can access and implement. These can not only satisfy client requirements but can also be used as a companywide training tool. The LMS tool includes training from respected providers such as the National Safety Council, MEA Energy Association, and the National Center for Construction Education and Research (NCCER) to ensure employees have access to relevant and lifesaving safe work practice information. In addition to LMS, all ISN customers can leverage the Incident Management Tool which allows contractors to track and store information on recordable and near miss events, including serious injuries. This tool was designed to help identify root causes and implement corrective actions without the use of additional software. This benefit helps provide additional insight on potential and actual event occurrences by encouraging a consistent investigation methodology as well as increased visibility via access to a dashboard that tracks company-level incident trends.

4.0 Analysis of SIF and Fatality Rate by Industry

In addition to looking at aggregate data, it is valuable to analyze and share data by Hiring Client industry, as differing hazard and environmental factors present their unique challenges. Figure 4.1 demonstrates fatality rates by industry for 2022. The following section will review data and trends in five top industries – Transportation, Oil and Gas, Manufacturing, Mining and Utilities.

Figure 4.1 **2022 Fatality Rate by Client Industry**

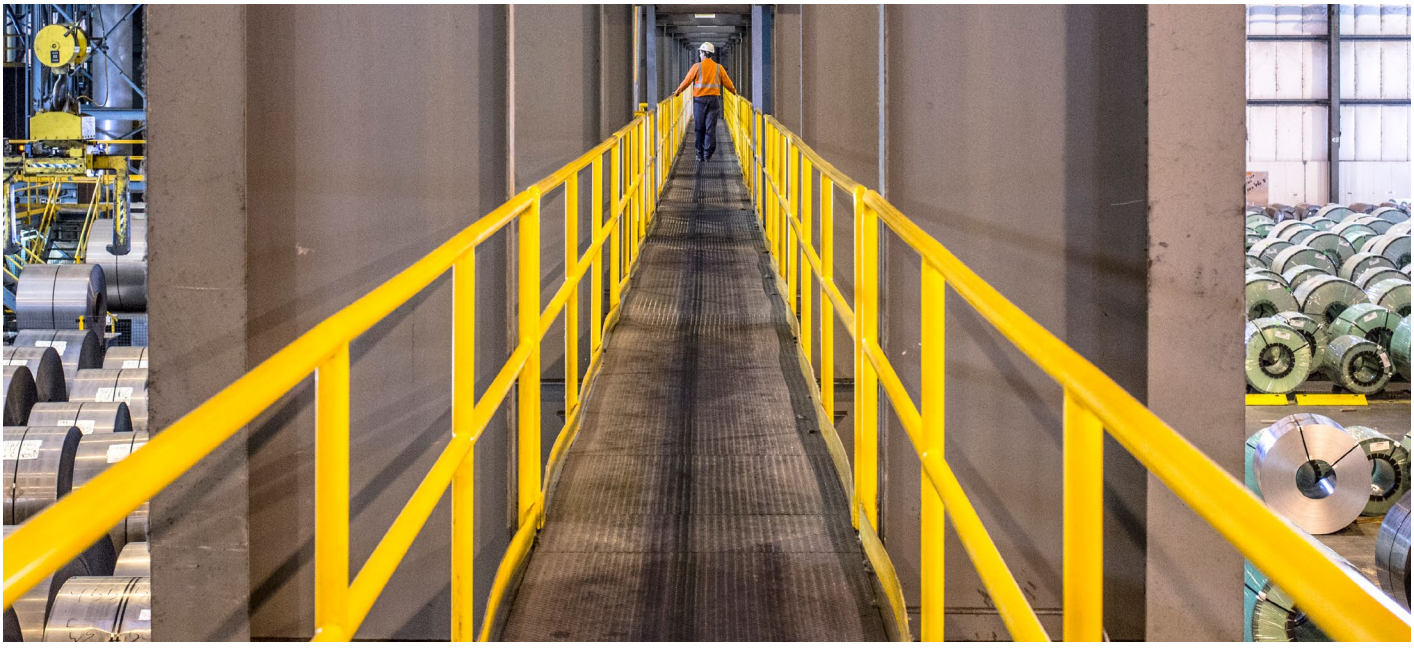


Industry Name	Fatality Rate
Aerospace & Defense	4.0
Agriculture	4.7
Automotive	4.6
Beauty & Healthcare	0.7
Chemical	6.1
Colleges & Universities	2.9
Construction	7.5
Consumer Products	4.5
Facilities Management	3.5
Food & Beverage	7.0
Manufacturing	4.0
Manufacturing - Steel & Other Metals	4.9
Manufacturing - Fertilizer Products	4.6
Mining - Coal Surface	4.7
Mining - Coal Underground	2.3
Mining - Metal/Non-Metal Surface	4.0
Mining - Metal/Non-Metal Underground	3.3
Paper, Packaging & Building Products	6.6
Petrochemical - Downstream	6.2
Petrochemical - Environmental	1.9
Petrochemical - Midstream (Pipelines)	9.1
Petrochemical - Upstream - Offshore	6.4
Petrochemical - Upstream - Onshore	9.8
Pharmaceuticals	3.6
Public Sector	4.0
Quality	2.4
Technology & Entertainment	1.9
Transportation	6.0
Utilities, Distribution & Power Generation	7.7

Figure 4.2 2022 DART by North America Industry Classification System (NAICS) Code

How are incidents impacting work for each industry sector?

NAICS Code	Average Days Away from Work	Average Days on Transfer/Restriction
56 - Administrative and Support and Waste Management and Remediation Services	97	11
48 - 49 Transportation & Warehousing	95	7
21 - Mining, Quarrying, and Oil and Gas Extractions	88	17
44 - 45 Retail Trade	84	52
11 - Agriculture, Forestry, Fishing & Hunting	80	59
42 - Wholesale Trade	77	10
31 - 33 Manufacturing	76	7
23 - Construction	75	16
53 - Real Estate & Rental and Leasing	66	26
54 - Professional, Scientific & Technical Services	62	46
81 - Other Services (Except Public Administration)	62	15
22 - Utilities	47	4



Transportation

Human factors continue to be an overwhelming contributor to transportation related deaths.

According to the National Highway Traffic Safety Administration (NHTSA), 10,626 traffic fatalities occurred at roadway intersections in the US in 2020, representing 27% of total road traffic deaths. The same year, the National Institute for Occupational Safety & Health (NIOSH) estimated that 1000 U.S. workers driving or riding in a motor vehicle on a public road died in a work-related crash (accounting for 22% of all work-related deaths). The Department of Transportation (DOT) is proposing to use artificial intelligence and machine learning technologies with the hope of using real time data collection to predict future intersection conditions to help identify unsafe environments or events to implement the most effective safety interventions [4]. Based on our data shown in Figure 4.2, these technological updates could result in significant changes as Transportation and Warehousing ranked the second highest Days Away from Work in 2022 sitting at an average of 95 Days.

Looking beyond significant technological advancements, human factors continue to be an overwhelming contributor to transportation related deaths. The DOT incorporates strict regulations including capping how many hours drivers can operate a motor vehicle in a week, ensuring qualified drivers are hired, and implementing stringent training requirements for high-risk work, such as the transportation of hazardous materials. Nationwide Insurance states, **"compared to personal motorists, commercial truck drivers are 23 times more likely to cause an accident when texting at the wheel, seven times more likely when reaching for their electronic devices, and six times more likely when dialing a phone"** [11]. This statistic was supported by our model as well - based on job titles, drivers were the second most likely group to experience a SIF Event.

To help combat SIF events within the Transportation industry, ISN developed an industry specific written program matrix to aid in the pre-qualification screening process of contractors. Obtaining visibility into the internal procedures for programs such as Commercial Vehicle Operations, Journey Management, and Fit for Duty are a strong foundation to bridge gaps in this sector. Paired with a successful rollout of Driver Safety training and strong driver pre-qualification, can result in a more equipped workforce which can lead to positive safety statistic results.

Oil & Gas

Oil and Gas makes up the largest contractor base within ISNetworld. Contractors connected to Hiring Clients in the Oil and Gas industry reported over 2,300+ SIF cases with 122 resulting in a fatality. ISN explored the 2022 data to identify factors that may have an impact on the increased fatality rate. Oil and Gas operations can be classified into sectors (Upstream, Midstream, Downstream) and the tasks and hazards in each can vary. The Upstream-Onshore sector of petrochemical operations include work tasks that carry higher risks. These risks include struck-by accidents, fires/explosions, caught-in accidents, falls to lower level, chemical exposure, etc. **Industry contractors reported a 9.5 fatality rate as depicted in Figure 4.3.** This is closely followed by Midstream operations. Downstream and Upstream-Offshore sectors reported lower rates, but the environmental sector had the lowest 2022 rate in the industry.

According to the Fatalities in Oil and Gas (FOG) database publication released by the CDC, the most common phases of operation in worker fatalities were Production (17.7%) and Roadway (16.2%). Followed by Well Servicing, Intervention, or Workover (14.3%) and Drilling Operations (14.0%) [6]. These job tasks include individual workers in roles such as technicians, drillers, drivers and roustabouts. ISN analyzed job titles commonly associated with reported SIF cases and identified that technicians, laborers and floormen consistently make up the top categories year after year, as shown by Figure 4.4. Additionally, these incidents are leading to higher average numbers of Days Away from Work and Days on Transfer/Restriction per case compared to other industries (Figure 4.2). These statistics highlight the need to ensure safe work practices are understood and followed by individuals at all levels of an organization, but especially those on the front lines. The International Association of Oil and Gas Producers identifies nine lifesaving rules to help prevent SIFs in the industry. This includes obtaining authorization prior to bypassing safety controls, and rules relating to confined spaces, driving, energy isolation, line of sight, hot work, safe lifting, work authorization and working from heights [15]. By placing focus on these rules, we can help mitigate the potential for serious incident outcomes.

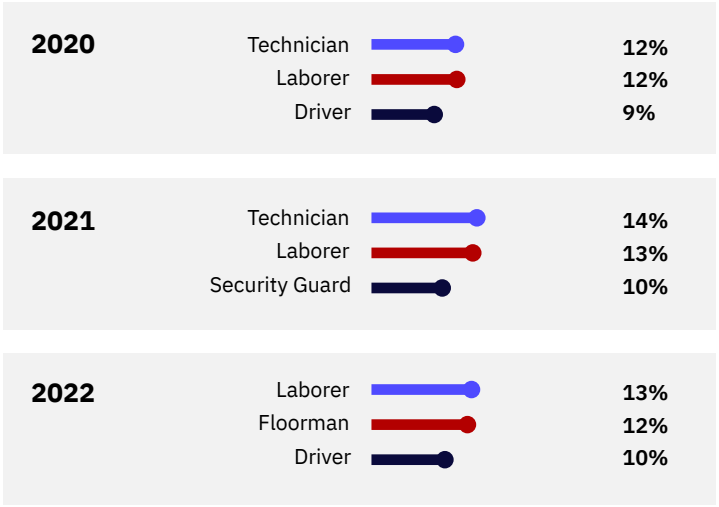
Outside of the lifesaving rules, the safety and monitoring of lone workers has emerged as a focal point within the industry. Although lone workers face similar hazards when working with peers, working alone can increase the likelihood and severity of incidents (14). If employees experience a fall, gas exposure, or another hazard that renders them unconscious or physically unable to remove themselves from a hazardous environment, coworkers are not present to assist and may not even know this event has occurred. As an additional layer of protection, 28% of Oil and Gas contractors in ISNetworld have submitted a Lone Worker written program based on Client requirements. This program captures the vital elements needed to ensure effective oversight and trigger lighting fast response times in the event of a life-critical rescue situation.

Oil and Gas workers spend the bulk of their time exposed to hazard rich environments; this often leads to a significant amount of time away from work. This calls for an emphasis on compliance to certify employees are properly qualified and trained before performing work. Within ISNetworld, Contractors are able to track and train their employees through the Training Qualifications (TQ) tool. This is a tool for contractors and clients to monitor the competency of employees entering sites to verify they have the skills and knowledge to complete the job assignments safely and effectively.

Figure 4.3 2022 Oil & Gas Fatality Rates

	Contractor Count	Fatality Rate
Petrochemical - Downstream	396	6.2
Petrochemical - Environmental	39	1.9
Petrochemical - Midstream (Pipelines)	541	9.0
Petrochemical - Upstream - Offshore	131	5.8
Petrochemical - Upstream - Onshore	401	9.5

Figure 4.4 2022 Oil & Gas Top 3 Job Titles



As Oil and Gas workers have some of the highest exposure rates across all industries, there is a need for greater attention to compliance and ensuring they are properly qualified and trained before performing work.

Manufacturing

Even with the wide variety of hazards and risks in the Manufacturing industry, ISN's analysis shows that overall SIF rates have been below average compared to other industries. According to the National Safety Council, Manufacturing is an industry most at risk to Contact with Object or Equipment resulting in a high number of deaths and injuries [13]. Referring back to figure 4.2, the average number of Days Away from Work for each case in the Manufacturing industry is 76 days (about two and a half months) with Days on Transfer or Restriction at seven days per case. With the lower Days on Transfer or Restriction, this could indicate that injured employees are not returning to work in a different capacity but off the job altogether.

An interesting statistic found during the analysis is around the most common type of body part affected. Whereas Upper Extremities are the most frequent body part affected in 2022 for all industries, Manufacturing, as shown by Figure 4.6, has lower extremities as the most commonly affected body part. Although a wide variety of factors could be at play here, according to our model and Figure 4.5 the most frequent injuries to lower extremities were related to Sprains, Strains and Tears.

Figure 4.5 2022 Manufacturing Nature of Events

Figure 4.6 2022 Body Parts Affected

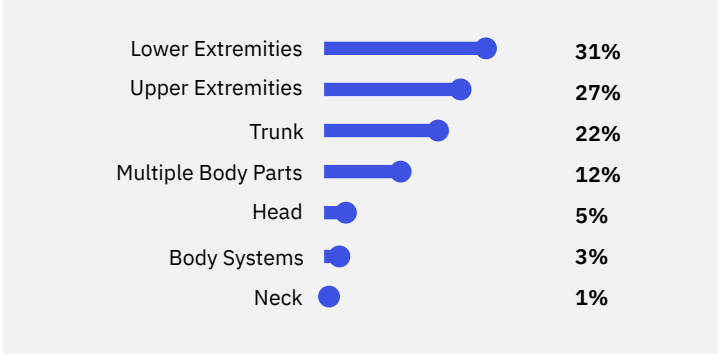


Figure 4.7 Monthly Trend of SIFs in Manufacturing

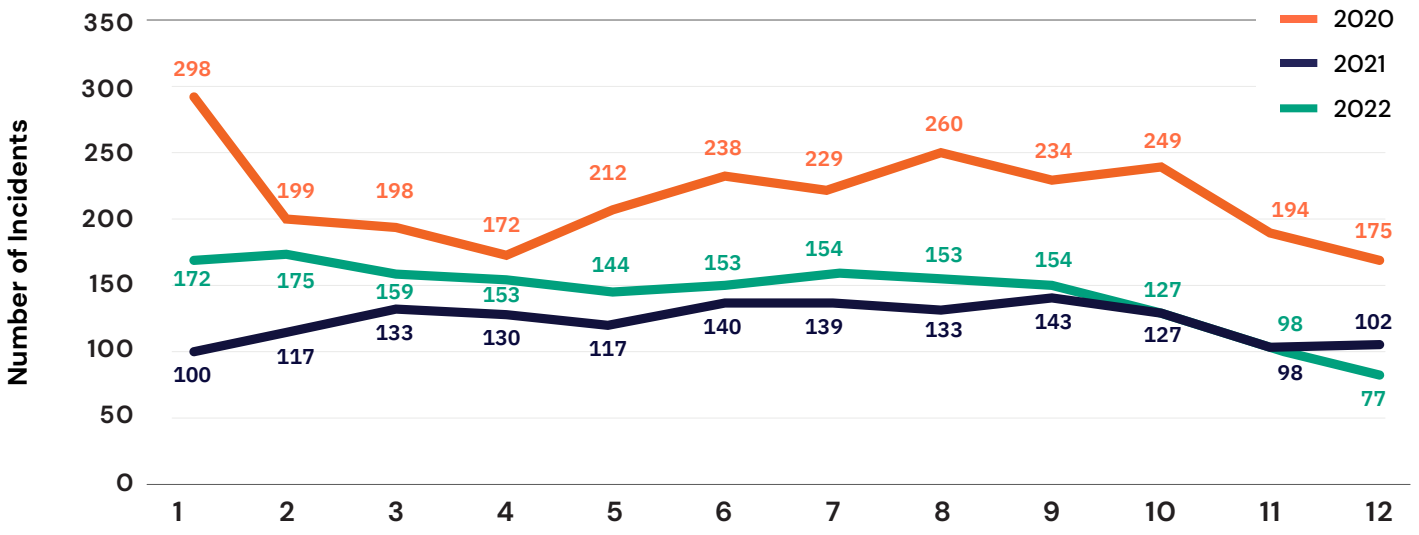
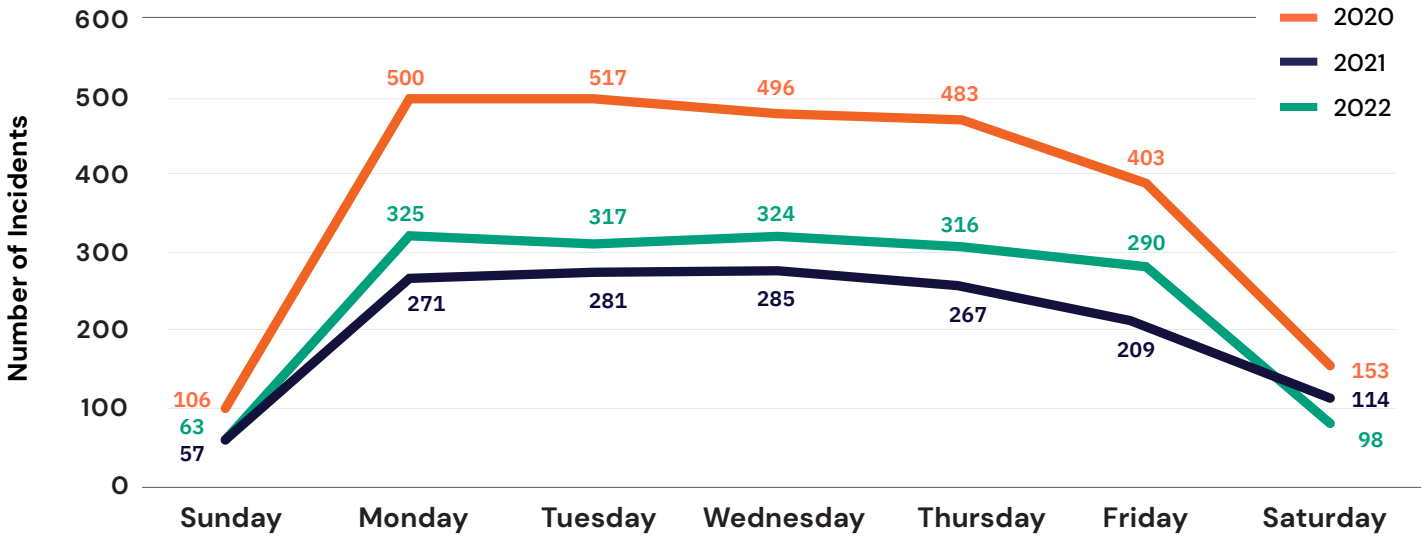
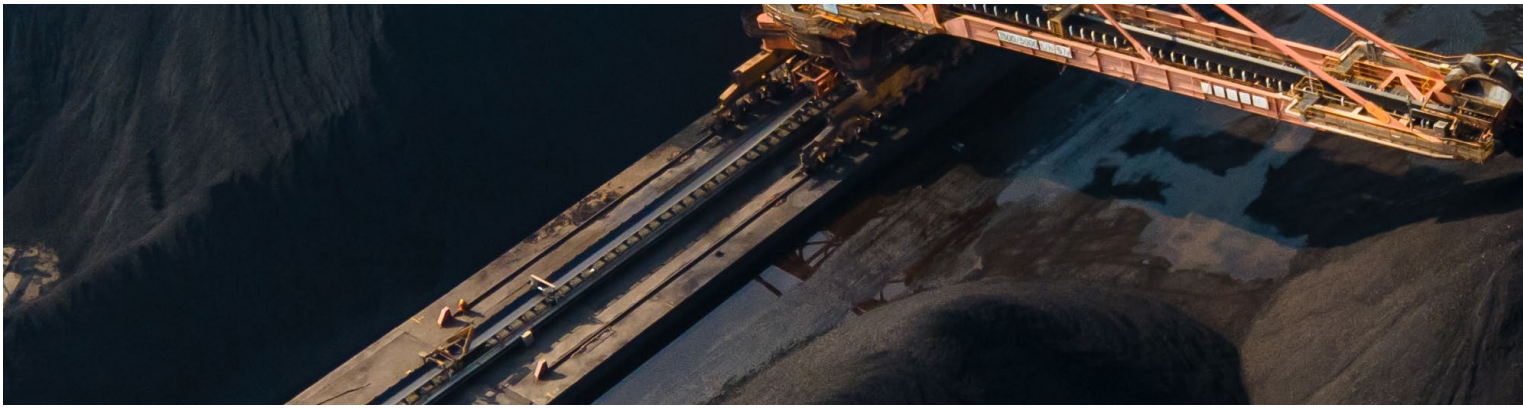


Figure 4.8 Weekly Trend of SIFs in Manufacturing



Looking at the trends depicted in Figures 4.7 and 4.8, the beginning of the year and the summer months indicate an uptick in SIF events. The weekday outlook reveals its own behavior with higher amounts of SIF cases occurring on Monday, remaining steady throughout the week and a sharp decrease on the weekends, which could be due to the lack of work performed on these days.

There are ways to mitigate these incidents and work to reduce human error through several National Safety Council recommendations. These recommendations include ensuring proper training is conducted when operating equipment and ensuring proper personal protective equipment (PPE) is worn, specifically steel toe boots to protect worker lower extremities [13]. To help provide and track training for individual workers, ISN's online Learning Management System (LMS) can help workers stay up to date with relevant trainings, such as Manual Handling and Vehicle and Equipment Operating Safety.



Mining

Mining operations present some of the most hazardous and unpredictable work environments. ISN took the opportunity to use 2022 data to help determine what factors and events make up the most severe incidents and what preventative steps can be taken moving forward.

Figure 4.9 2022 Top Events Classifications for Mining - Surface

What are the event categories?

Which body parts are affected?

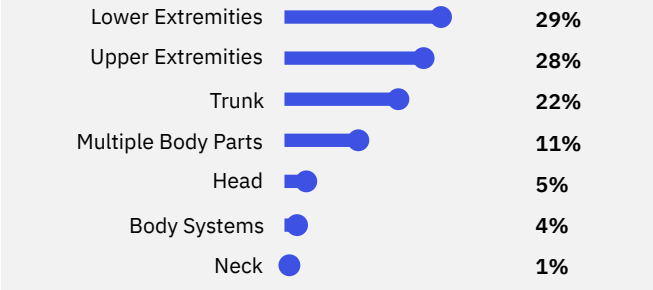


Figure 4.10 2022 Top Event Classifications for Mining - Underground

What are the event categories?

Which body parts are affected?

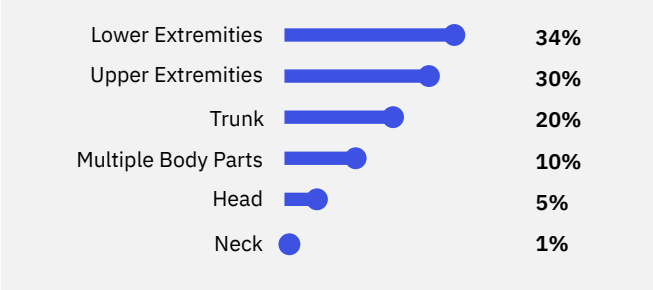
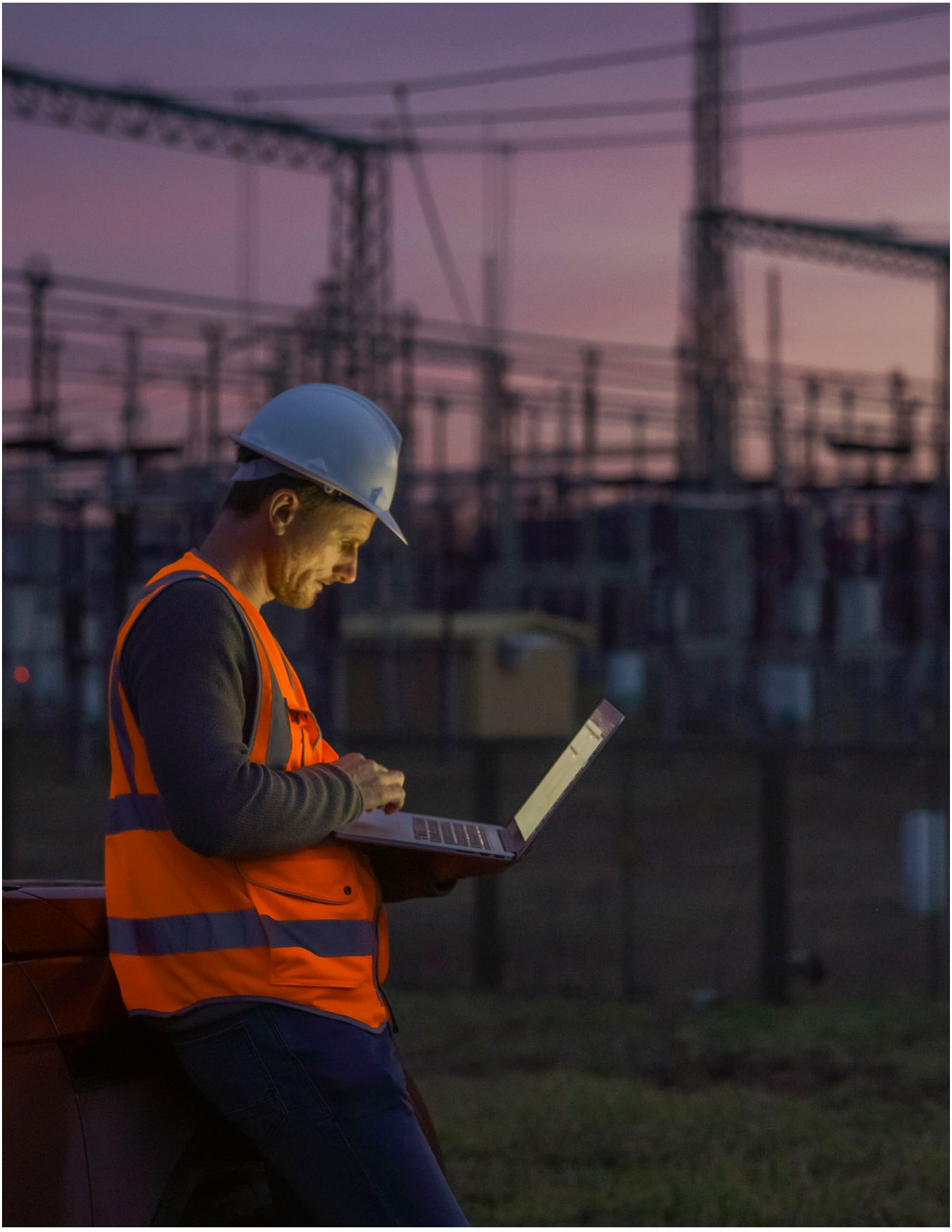


Figure 4.11 Mining 2022 SIF Classification

822	23	34	37
Days Away from Work	Fatalities	Job Transfer/Restriction	Others

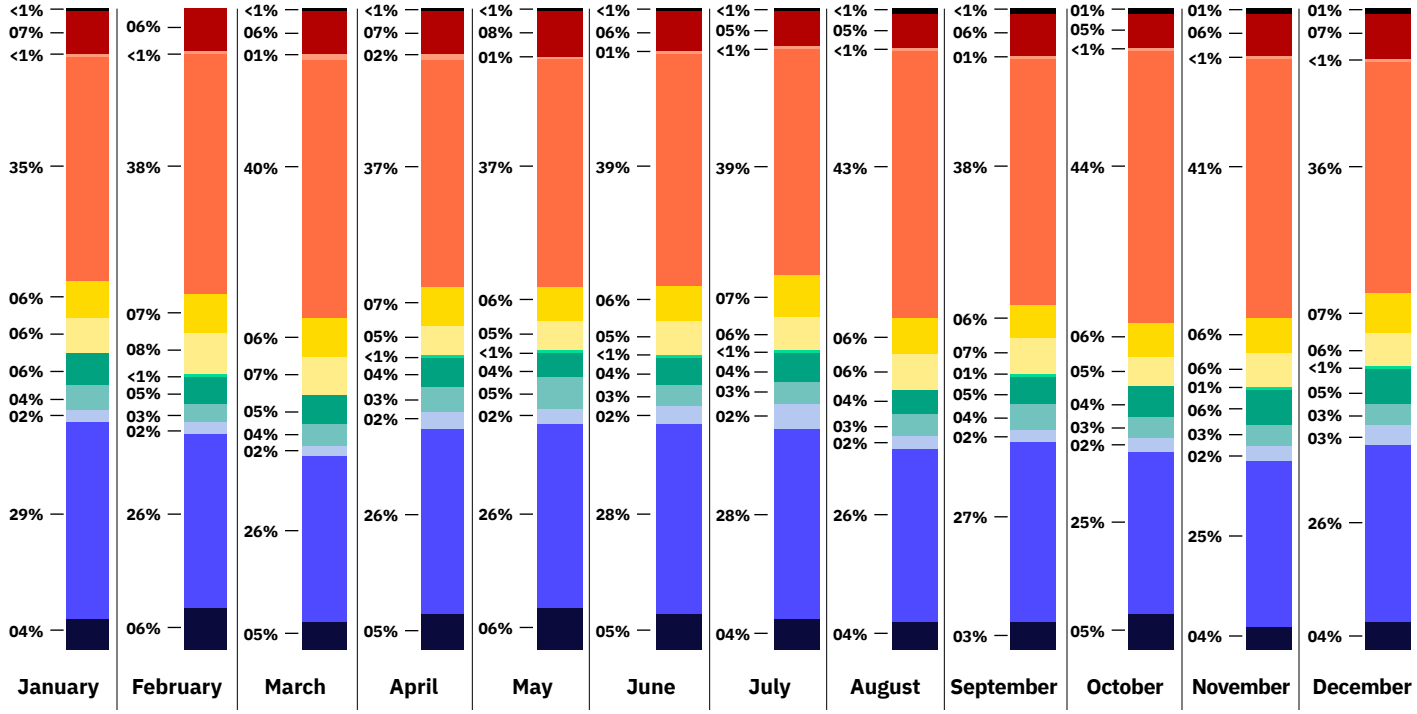
According to the Mine Safety and Health Administration (MSHA) and NIOSH, the leading causes of reportable incidents in Mining are tied to falling from heights, contact with heavy machinery, and exposure to hazardous chemicals [8]. Figures 4.9 and 4.10 showcase ISN's data model evidenced a similar pattern with the most common event identified as Contact with Object or Equipment, closely followed by Falls, Slips and Trips. Although similar in event classification, a notable difference between Surface and Underground mining can be seen with the body parts affected – upper and lower extremities.

When looking further into these events to determine what the most common outcomes were, ISN found that the greatest impact to the industry was Days Away from Work making up 89% of all cases in 2022 as depicted by Figure 4.11. In addition, Figure 4.2 shows that not only are most cases classified as Days Away from Work but each of these cases has an average of 88 days (about three months) away from the job resulting in a significant number of injured workers not actively performing work. When evaluating ways to mitigate risk and avoid injuries to miners' extremities, MSHA recommends a variety of best practices. For risks pertaining to falling from heights, providing walkways and platforms with handrails that provide safe access is crucial. In addition to safe and secure accessways, another important life saving measure is providing fall protection to all miners who may work at an elevated height and ensure secure anchor points are always used [9]. To reduce accidents associated with contact with heavy machinery and equipment, MSHA recommends inspecting all machinery prior to use, monitoring and maintaining roadways and berms where equipment may be used, using spotters and barriers to avoid unnecessary entry/crossing, and confirming all machinery is powered off and secured when finished [7]. To effectively identify and mitigate risks pertaining to all aspects of mining operations, pre-job safety briefings and Job Hazard Analyses (JHA) are integral practices safety professionals can use daily to help workers stay vigilant.



Utilities

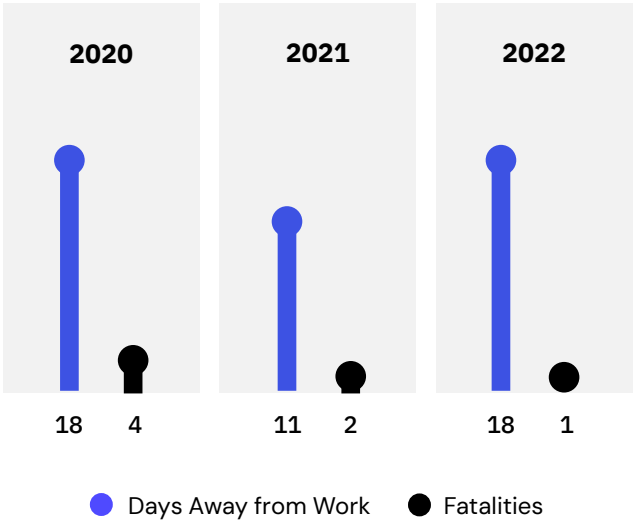
Figure 4.12 Percentage Total SIFs by Month and NAICS Code



- 11 - Agriculture, Forestry, Fishing and Hunting
- 21 - Mining and Oil & Gas Extraction
- 22 - Utilities
- 23 - Construction
- 31 - 33 Manufacturing
- 42 - Wholesale
- 44 - 45 Retail Trade
- 48 - 49 Transportation & Warehousing
- 53 - Real Estate & Rental and Leasing
- 54 - Professional, Scientific & Technical Services
- 56 - Administrative & Support and Waste Management and Remediation Services
- 81 - Other services, Except Public Administration

As shown by Figure 4.12, the Utilities industry consistently accounts for less than one percent of total SIF's reported month over month. With over 1,200 industry contractors reporting SIF information and 7,716 cases identified, serious events are occurring but at a lower rate than many other industries. There has also been a decline in fatalities over the past three years. This is reflected by Figure 4.13, as fatalities have dropped by half each year from 2020 to 2022. It's important to note that this follows the overall trend for all ISN contractors for 2021 and 2022.

Figure 4.13 Utilities SIF Classification



The Utilities Industry has moved the needle in the health and safety space regarding implementation of leading indicators and high-hazard work analysis. STKY™ – or "Stuff That can Kill You" is an emerging method for hazard identification and remediation where crews focus on significant events that release or transfer energy that cannot be safely dispersed. This leads organizations to make procedural and technological advancements to help ensure employees will fail safely [5]. Looking back to Figure 4.2, out of twelve NAICS Codes assessed in 2022, Utilities maintained the lowest Average Days Away from

The importance of high hazard energy control is paramount to OSHA, considering 13% of all citations were related to hazardous energy from October 2021 through September 2022.

Work, despite operating within an industry that is routinely exposed to hazardous environments. The importance of high hazard energy control is paramount to OSHA, considering 13% of all citations were related to hazardous energy from October 2021 through September 2022. **This heightened focus is evidenced by the fact that citations were issued on 50% of all inspections related to the control and operations of high hazard energy** [12].

The concepts from the Energy Wheel (Figure 5.1 discussed on the next page) have potential to positively impact SIF reduction efforts in other industries if tactfully executed. When analyzing SIF events through a training lens, Utilities, Distribution and Power Generation account for 43% of all Lockout Tagout training courses completed within ISN across all industries. The high energy focused training could prove to have noteworthy implications with SIF events each year.

5.0 Identification of Leading Indicators

As SIF's continue to be a focal point, organizations are focusing on the drivers of serious injuries and fatalities while simultaneously moving away from traditional lagging indicators, such as TRIR or DART, and prioritizing identification, control, and elimination methods for major energy sources. An emerging tool that several ISN clients are leveraging as a part of the SIF reduction framework is the Energy Wheel.

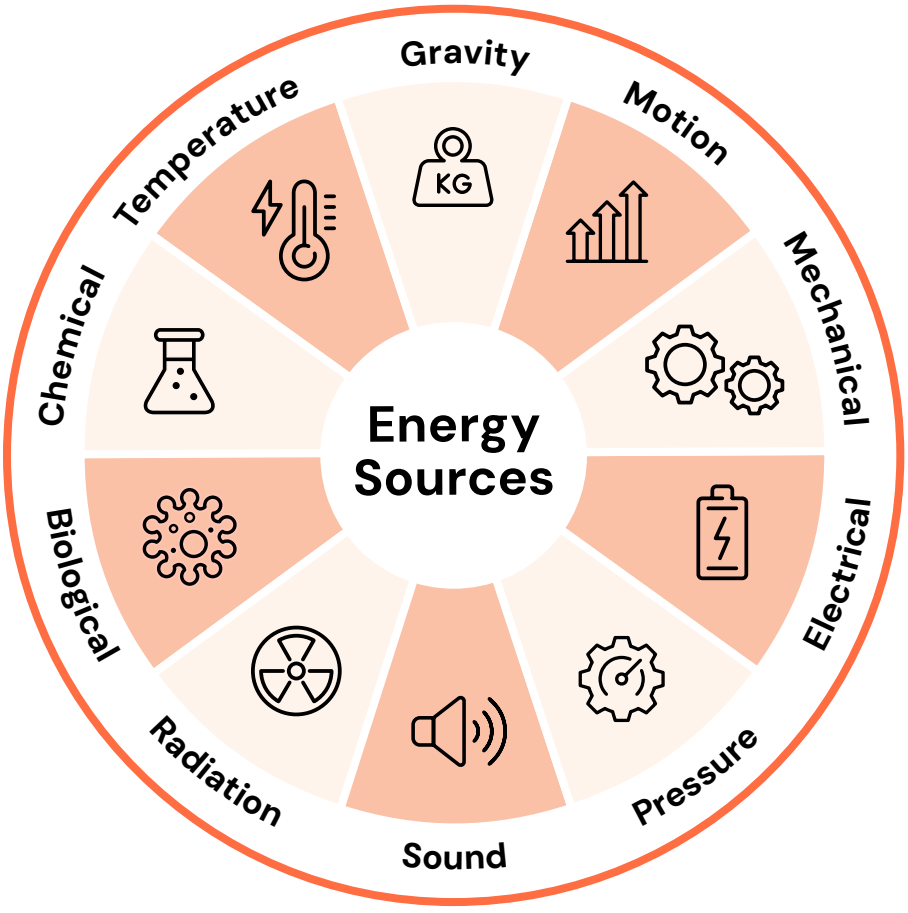


Figure 5.1 Using the Energy Wheel for Leading Indicators

The Energy Wheel improves hazard recognition skills by an average of approximately 30%.

- Based upon two years of full-time pilot testing by researchers at the University of Colorado and Virginia Tech

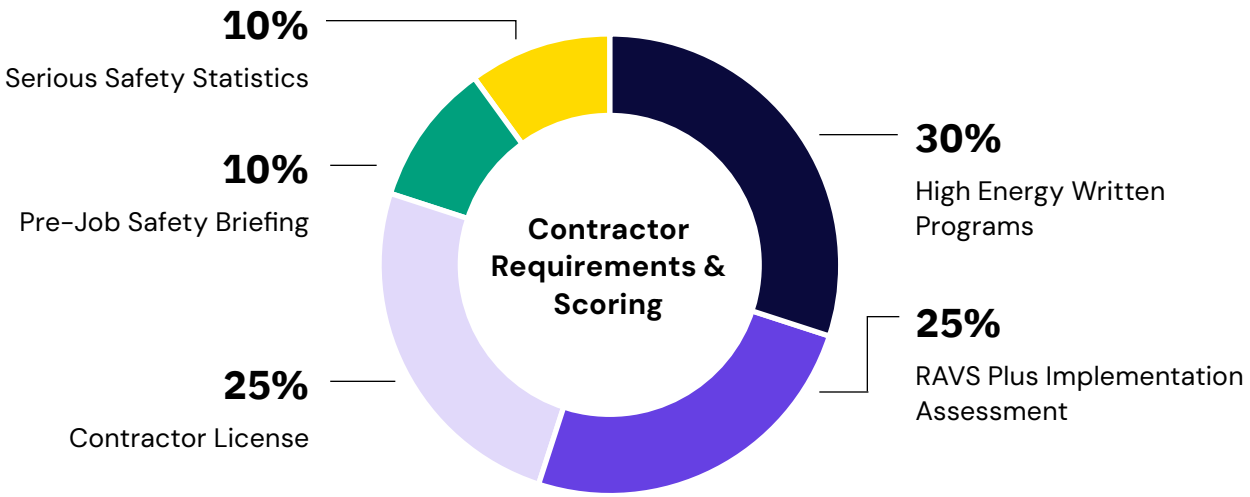
The Energy Wheel, developed by Matthew R. Hallowell, outlines how ten critical energy mechanisms commonly manifest themselves in the workplace. These sources of energy include Gravity, Motion, Mechanical, Electrical, Pressure, Sound, Radiation, Biological, Chemical, and Temperature [3]. The wheel's components can add structure and strategy to pre-job evaluations. Modeling hazard and risk assessment tools after the Energy Wheel can function as a catalyst for injury reduction, specifically around SIF's. Ultimately, the anatomy of the Energy Wheel contributes to the removal of the human error element from the overall risk equation.

Several ISN Hiring Clients have moved towards a more balanced evaluation as they move away from TRIR, and some are leveraging High Energy hazards as their principal system. Rather than evaluating contractors on traditional lagging indicator criteria, their lens has shifted to assessing:

- Written programs related to high hazard work
- Tracking State Contractor License documentation at a company-level as proof of competency
- Evaluating employees at the individual level by collecting training qualifications
- Having organizations participate in a RAVS Plus Implementation Assessment
- Tracking SIF history

By focusing on isolating all energy sources and balancing leading indicators, a robust due diligence evaluation through ISN's suite of tools can be established. From the company level down to the individual, organizations can intimately scrutinize the competency of contractors to safely perform work.

Figure 5.2 High Energy Scorecard



Additional Requirements:

- TQ Review
- Client Required Acknowledgement
- Evaluation Tool

Provies insight into:

- High Hazard Work Types
- Training/Education
- Safety Rules/Procedures
- Company and Individual Level Qualifications

GRADE	POINTS
A – Mature High Energy Hazard Recognition	**85 – 100**
B – Developing High Energy Hazard Recognition	**70 – 85**
C – Lacking High Energy Hazard Recognition	**60 – 70**
F – Needs Improvement - Evaluation / Audit Required	**0 – 60**

ISN has leveraged the critical energy aspect of the Energy Wheel to develop a scorecard that can indicate the capacity of contractors to effectively manage hazardous energy. Evaluating the competency of organizations and individuals through tools like Contractor License and Training Qualifications (TQ), Hiring Client organizations can quickly ascertain the inherent risk level of contractors performing work. When paired with leading indicators, such as the RAVS Plus Implementation Assessment, visibility into the company culture, systems, tools, and processes reveals how equipped contractors are to reduce the elevated risk of their operations. To aptly meter the individual level worker element, ISN has specifically devoted resources to engineer a path forward for Hiring Clients to track beyond the collection of company level data.

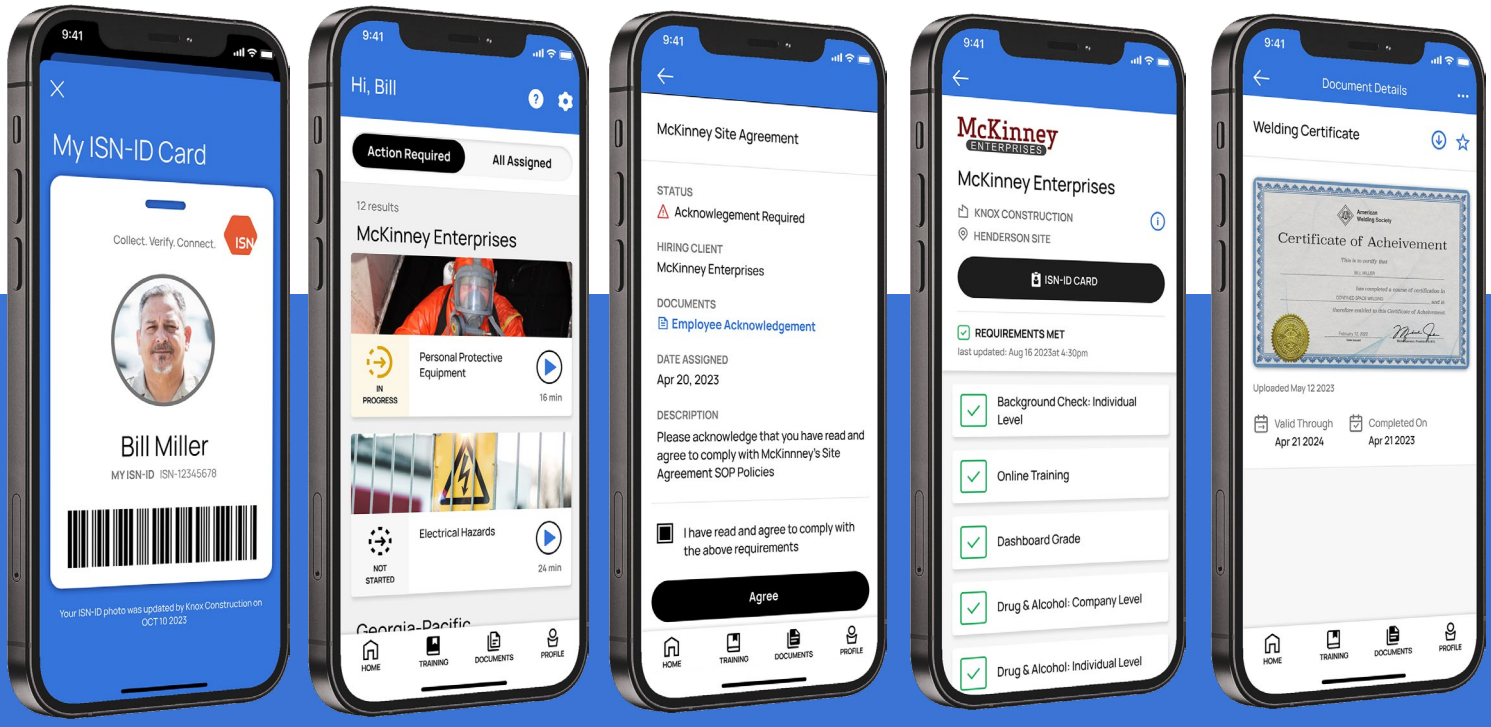
6.0 Engaging the Worker

Empower™

Empower is a mobile app designed specifically for workers to give quick and easy access to job site requirements, reduce overreliance on contractor company administrators, and promote a more connected workforce. The app seamlessly integrates jobsite requirements onto employee's phones to help ensure they maintain all the necessary trainings and credentials to obtain access to job worksites. Additionally, the app empowers workers to complete training on-the-go, upload their own credentials and/or licenses in a digital wallet, minimize project delays and downtime due to gaps in workforce requirements, and promote a more connected workforce by pairing Empower with ISN's world class contractor management platform, ISNetworld.

Key Features

- **Access** your digital ID cards
- **Complete** assigned training on-the-go
- **Review** client policies and procedures
- **Check** jobsite compliance status
- **Store & share** certificates/licenses



Additionally, Empower provides mobile access to our digital training library which is delivered via our Learning Management System (LMS). Nearly 40,000 Online Trainings have been completed via Empower in 2023 YTD with an additional 5,200+ LMS courses completed in 2023 YTD across an array of training topics (261 unique trainings).

Empower provides quick and easy access to job site requirements, reduce overreliance on contractor company administrators, and promote a more connected workforce.

Additional Considerations:

Employees are the strongest advocates for their safety by exerting Stop Work Authority when safety violations are observed. Employers should clearly communicate the Stop Work Authority expectation to all employees. Well recognized Industry Organizations, such as the American Petroleum Institute (API), National Safety Council (NSC), and The Campbell Institute, actively recognize the obligation to stop work whenever employees believe the working conditions or behaviors are unsafe. When evaluating contractor companies on the individual level, the Training Qualifications (TQ) Tool provides an additional level of verification for specific skills that require licensure or a verification of competency. This insight ensures that employees performing high risk work have been adequately vetted to ensure competency to perform related tasks.

7.0 Conclusion

ISN is devoted to developing avenues for organizations to meet their safety goals.

Establishing a risk management system is often viewed as a foundational pillar in curtailing the number and severity of injuries. As organizations pursue a workplace with the common goal to remove the presence of hazardous conditions, the identification of critical energy sources, followed by the implementation of effective mitigation controls, will diminish instances of injuries in the workplace. The inability of companies to adequately identify critical energy mechanisms is likely a contributing factor of SIF rates remaining constant, while overall injury rates have shown steady decline. However, improved visibility into hazard recognition and identification can generate more impactful pre-job risk assessments, which forces risk reduction action from front-line and senior leadership. When paired with the development of workers through a strong company culture, training on workplace hazards, and competency evaluations for high hazard work, employees will be able to help establish positive health and safety outcomes. ISN is devoted to developing avenues for organizations to meet their safety goals. Anchoring Environmental Health and Safety Management Systems to real-time data trends supports the most important goal - employees return home safely to their families each day.

Appendix: Sources

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For More Information:

Main: +1 214 303 4900

Email: InfoRequest@isn.com

Website: isn.com