

G+ Global Offshore Wind Health & Safety Organisation

2021 incident data report



G+ Global Offshore Wind
Health & Safety
Organisation

www.gplusoffshorewind.com

About the G+ Global Offshore Wind Health & Safety Organisation

Offshore wind power is the primary technology helping to meet the global low carbon challenge. With costs falling, deployment of offshore wind and employment in the sector are rising dramatically. This places an obligation on operators to observe the very highest standards of health and safety.

G+ is the global health and safety organisation for the offshore wind industry. The Energy Institute provides the secretariat and supports the ongoing work of the G+.

We bring together business leaders, health and safety experts and organisations operating in the offshore wind industry to drive good practice and promote world-class safety performance across the sector.

Through an evidence-based approach, we ensure key emerging risks are mitigated through co-operation and shared learnings, aiming for the highest levels of health and safety standards being pursued throughout the life cycle of offshore wind farms.

We engage on important industry matters by facilitating discussion and bringing together industry stakeholders to speak with one voice for the offshore wind industry.

The G+ has four main strands of work: incident data, good practice guidance, sharing learnings through Toolbox and a safe by design programme.

For more information, please visit www.gplusoffshorewind.com

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Introduction from the chair:

It gives me great pleasure, in my first year as Chair of the G+ Global Offshore Wind Health and Safety Organisation, to introduce our annual incident data report. Collaboration across the membership in the collection, analysis and sharing of health and safety information is the cornerstone of the G+. It gives us an understanding and awareness of the real health and safety issues our industry is facing and forms the basis for an evidence-based work programme.

As global leaders within renewable energy, I am proud of the role we have in accelerating and sustaining the transition to renewable, and sustainable energy. Despite the challenges of the COVID-19 pandemic, 2021 has seen a substantial increase in offshore wind farm installed capacity and construction projects globally. Our development, construction and operational activities have increased, with hours worked up by around 30%. And as more offshore wind farms become operational, the potential exposure to hazards associated with operating in offshore environments will continue to increase. This makes our role as leaders in the industry ever more important to minimise exposure to these hazards, drive world class safety performance and ensure the safety of our workforce.

With our industry thriving, the number of hours worked in 2021 is the highest on record. Despite this, the number of recordable injuries is the second lowest on record. The result is that 2021 is the second year running with a decrease in the total recordable injury rate (3.15) and lost time injury frequency (1.52), representing a 16% and 11% decrease respectively. This is a testament to the commitment of G+ members to ensuring the safety of our workforce remains our top priority.

However, incidents do still occur. 2021 saw a continuing trend with lifting operations and manual handling as the top work processes where incidents occur, and the nacelle and CTV remain the top two incident areas. These are topics that the G+ is aware of and already has ongoing workstreams to address. The data presented throughout the report not only underpin our work programme, but also provide a richness and depth of understanding on what the real issues are.

Despite 2021 being the safest year on record, we are aware of the potential risks highlighted in this report. First aid injuries are an area of concern and there has been a substantial increase in the number of incidents involving emergency response medical evacuations and dropped objects. The G+ is working to address these issues in our work programme. We are also rolling out a series of self-assessment forms to enable our members to better understand and improve the implementation of G+ good practice guidelines across their organisations, helping us to deliver industry wide safety understanding and culture.

2022 will be an exciting year for the G+. The offshore wind industry will continue its global growth, and we will continue our fundamental focus on improving the health and safety performance of the industry on a global level. We very much look forward to building on the momentum we have in reducing injury frequency and promoting our good practice guidelines internationally. This will be the 9th G+ annual incident data report, and thanks to the open collaboration between our members, we now have a wealth of data. We are undertaking a review of our reporting process to better understand the real issues behind incidents and the drivers that improve safety performance. I would like to thank all those who contribute to our work for your continued efforts to promote world class health and safety performance in our industry.

Jakob Nielsen

Chair - G+ Global Offshore Wind Health and Safety Organisation
Director of Offshore Wind, Vattenfall



Overview of G+ member sites



represents areas where G+ members have development, project or operation sites present

The G+ member companies submit incident data on a quarterly basis, which is then anonymised for analysis by the Energy Institute and published each year for wider review and scrutiny. Throughout the year, quarterly reports are issued to the G+ Board and European Focal Group for detailed review and interrogation in order to identify key risk areas and to inform the G+ work programme. Deep Dive data meetings are also held quarterly, drawing on the expertise within G+ member companies, scrutinising the industry's performance, and determining the risk areas that need particular focus and attention. An annual data reporting review meeting is held to assess the whole process and implement improvements. Each year, the template used for data collection is reviewed, streamlined, and enhanced in line with industry feedback to improve the process continually. A full list of the incidents included in the G+ report, which includes information submitted by G+ members and associates, is published on the G+ website.

2021 highlights

2021 Key facts and figures

Key facts

780	reported incidents and injuries ¹
0	fatalities
50	total lost work day injuries
62	incidents resulting in an emergency response or medical evacuation
434	incidents occurred on operational sites ³
301	incidents occurred on construction sites ⁵
44	incidents occurred on development sites ⁷

Top three work process

98	incidents during lifting operations ²
74	incidents during manual handling
55	incidents during access/egress

Incident areas

289	incidents occurred in a turbine ⁴
274	incidents occurred on vessels ⁶
150	incidents occurred onshore ⁸

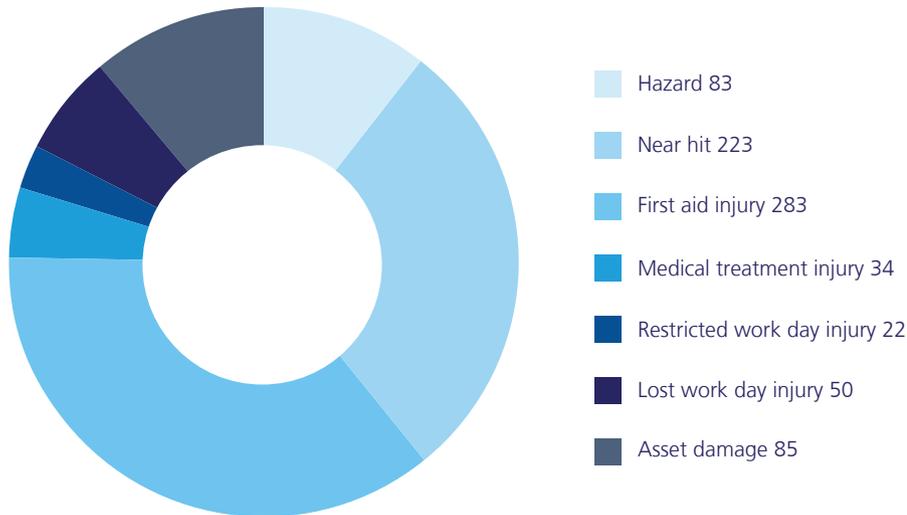


Figure 2: 2021 incident consequence summary

¹ Throughout this report, injuries will denote the number of injured people and incidents will denote the number of occurrences that led to or potentially led to an injury. Injuries are defined as a person requiring first aid, medical treatment, restricted workday, or lost workday.

^{2,3,4,5,6,7,8} See Annex A for the definitions of these terms

Safety statistics for 2021⁹

	2015	2016	2017	2018**	2019	2020	2021
Hours worked*	21,220,000	21,726,000	26,815,000	25,359,000	22,374,000	25,318,000	32,342,000
Fatalities	0	0	0	0	0	0	0
Lost work day injuries	41	43	49	39	62	43	50
Restricted work day injuries	32	35	30	34	23	30	22
Medical treatment injuries	53	42	78	45	38	22	34
Total	126	120	157	118	123	95	106
Total recordable injury rate (TRIR)	5.94	5.52	5.85	4.65	5.50	3.75	3.28
Lost time injury frequency (LTIF)	1.93	1.98	1.83	1.54	2.77	1.70	1.55

In 2021 there was a 28% increase compared to 2020 in the number of hours worked, making it the highest on record. This was mainly due to the hours worked on projects under construction, which increased from 14.9 million hours to 19.1 million hours. We are expecting a gradual and continued increase in hours worked as more offshore wind farms become operational.

Against the backdrop of increased operational hours during 2021 we saw a commensurate increase in the number of recordable injuries on the previous year. Despite this, it was still the second-lowest number of recordable injuries on record. This can be credited to the work that G+ members have continued to undertake in training, learning, and facilitating collaboration across the entire industry.

An increase was observed in the number of lost workdays and the number of medical treatment injuries in 2021. However, because of the corresponding increase in hours worked, these remain below the historical average per hour worked. On another positive note, despite increased hours worked, restricted workdays actually fell compared to the previous year, contributing to a much lower TRIR in 2021. TRIR and LTIF fell to 3.28 and 1.55, respectively, making 2021 the lowest on record.

TRIR

The number of recordable injuries (fatalities + lost workday injuries + restricted workday injuries + medical treatment injuries) per 1 000 000 hours worked.

LTIF

The number of recordable injuries (fatalities + lost workday injuries) per 1 000 000 hours worked.

*Hours worked rounded up to the nearest 10,000

⁹ Safety statistics before 2019 reflect the number of incidents, not injuries.

High potential incidents and injuries

The G+ classifies incidents, injuries, near misses or hazards as high potential if they had the potential to cause, or caused, a fatality or a life-changing injury. In 2021 there were a total 204 high potential incidents and injuries recorded. The majority of these incidents were based on high potential hazards and near misses (79%), incidents that involved injuries and asset damage were significantly fewer (21%) as shown in figure 4.

Despite the increased number of hours worked, the number of high potential incidents and injuries remained the same as the previous year. In 2021 there was an 80% decrease in high potential incidents occurring from 'walking from A to B'. High potential hazards and first aid injuries during walking from A to B decreased to zero, while near misses decreased by 67%. Moreover, high potential incidents during access and egress decreased by 24% (44) for working at height. The improvements made within these work processes are a testament to the efforts undertaken by G+ members in these areas, as they built on past learning and experience. Several G+ members are running campaigns individually to tackle high potential incidents and injuries.

Disappointingly, high potential incidents in 'civil works onshore including excavations' increased by 175% (11) when compared to 2020 records (4). This is especially disappointing given that not all onshore civil hours are included in the G+ dataset as in some countries the work is undertaken by the grid operator and G+ doesn't have access to all these hours. The G+ dataset also showed an increase in high potential hazards in electrical systems (working with), which increased by 10% compared to 2020. Further increases in high potential incidents were observed in, working with mechanical systems, working with hand tools/power tools, and surveys (geophysical, environmental, and meteorological). In 2021, G+ set up a joint workstream with 'SafetyOn' to address the risks associated with onshore civil construction works in the wind industry, and as a result, a good practice guideline has been drafted and will be published in 2022.

Since 2020, G+ has been sharing learnings from high potential incidents with the global energy industry via Toolbox, which holds incident lessons and safety information to help frontline workers return home safely. In addition, G+ has set up Focal Groups in the APAC and North America regions, to add to the existing European group, to share knowledge and experience in order to enable new markets to avoid incidents which occurred during the early stages of the offshore wind industry in Europe. To facilitate this, the G+ Good Practice Guidance has been translated into multiple languages. G+ has also rolled out self-assessment forms to allow its members to assess the level of compliance of sites across the globe against the G+ good practice guidelines.

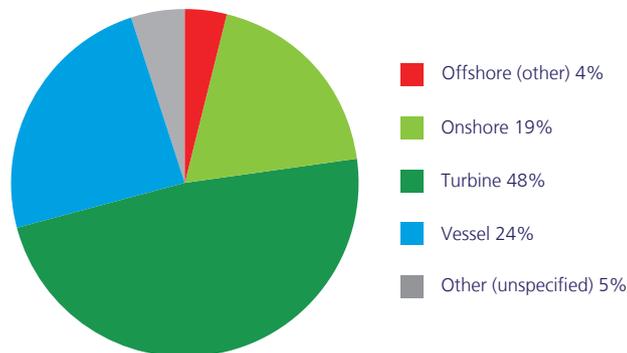


Figure 3: High potential incidents and injuries – area summary

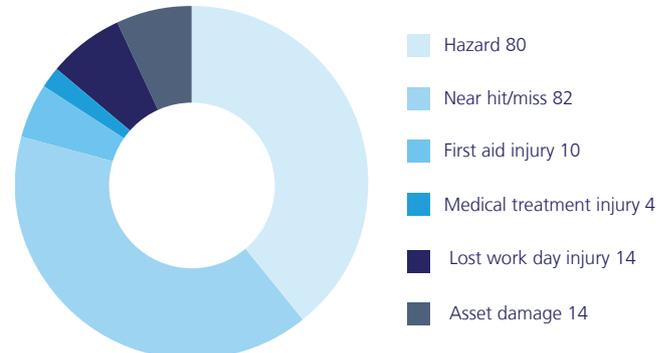
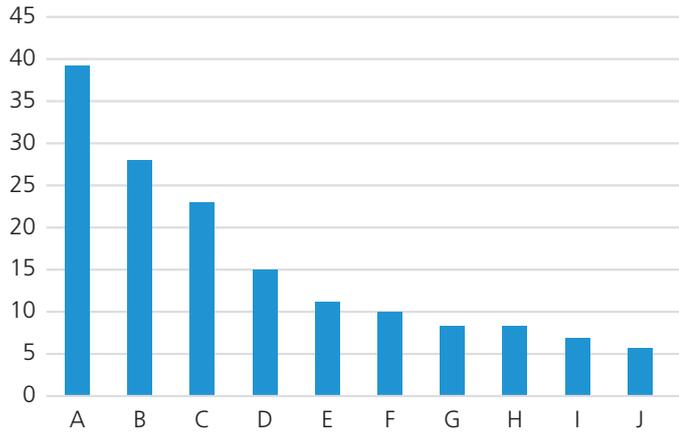


Figure 4: High potential incidents and injuries

High potential incidents and injuries (continued)



Key

- A Lifting operations
- B Working at heights
- C Electrical systems (working with)
- D Routine maintenance
- E Civil works onshore including excavations
- F Access/egress
- G Transfer from/to vessel
- H Vessel operation (including jack-ups and barges)
- I Hand tools/power tools (working with)
- J Davit crane operations

Figure 5: High potential – Top 10 work process breakdown

Incident area analysis: Nacelle

The nacelle remains the area with the greatest number of accumulated historical incidents from 2014 to date. In 2021, the nacelle was the incident area with the most incidents and injuries, amounting to 91. This is an increase of 16% from 2020 and the third-highest total on record. The number of recordable injuries in 2021 was 9; this is the lowest on record and a 47% reduction from the previous year. These improvements can be attributed to improved turbine design and maintenance practices to decrease the exposure to hazards and the standardisation of procedures within the turbine.

Most incidents within the nacelle involved lifting operations, which increased by 53% from the previous year. There were 30 high potential incidents that occurred within the nacelle in 2021, which is an 88% increase from 2020 and is also the third-highest on record.

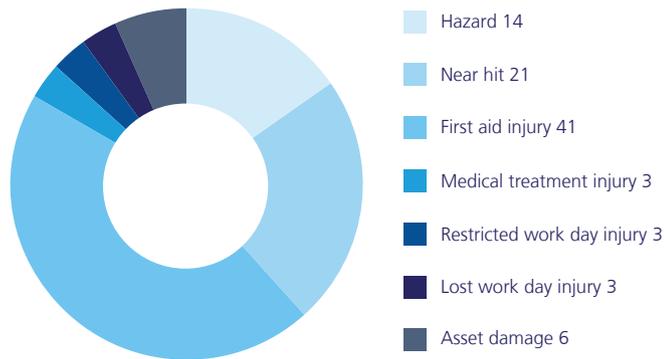


Figure 6: Nacelle – actual consequence

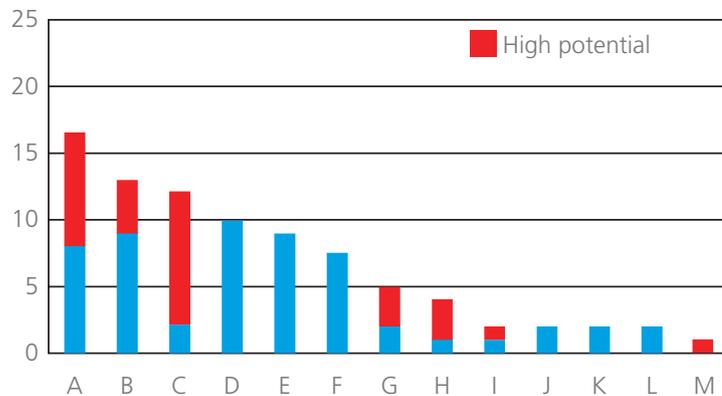


Figure 7: Nacelle - work process breakdown

Key	
A	Lifting operations
B	Routine maintenance
C	Electrical systems (working with)
D	Manual handling
E	Hand tools/power tools (working with)
F	Walking from A to B
G	Mechanical systems (working with)
H	Access/egress
I	Operating plant and machinery
J	Catering/cleaning
K	Confined spaces (working in)
L	Replacing major components
M	Chemicals and hazardous substances (working with)

Incident area analysis: Crew transfer vessels (CTVs)

CTVs were the second-highest incident area in 2021, with 85 incidents. This is an increase of 8% from 2020. A total of 18 high potential incidents occurred onboard CTVs, matching last year's number and equalling the lowest on record.

Most incidents during CTV operations occurred during transit (19), where 32% of these were high potential incidents. 9 incidents involved lifting during CTV operations which is a 125% increase from the previous year, 44% of these incidents were high potential.

CTVs are used to transfer personnel to and from offshore wind farms regularly. Therefore, incidents involving CTVs can have a wide-reaching area of impact and can affect many individuals. In recognition of the importance CTVs play in the offshore wind industry, G+ set up a new workstream for 2022, collaborating with partner organisations and vessel contractors to improve safety onboard CTVs. The workstream focuses on factors such as fatigue, manning levels, and vessel suitability. It is hoped that the workstream will raise awareness among the workers on this topic and positively impact the safety statistics going forward.

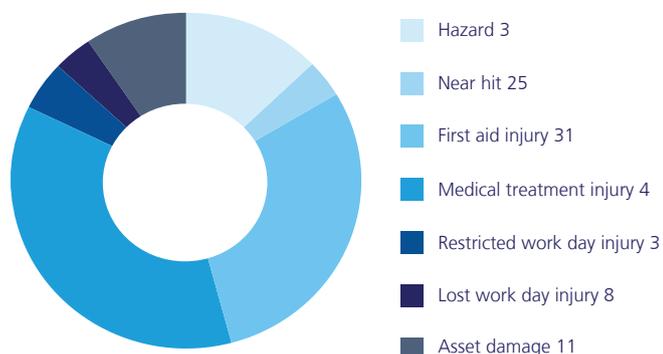


Figure 8: CTVs- actual consequence

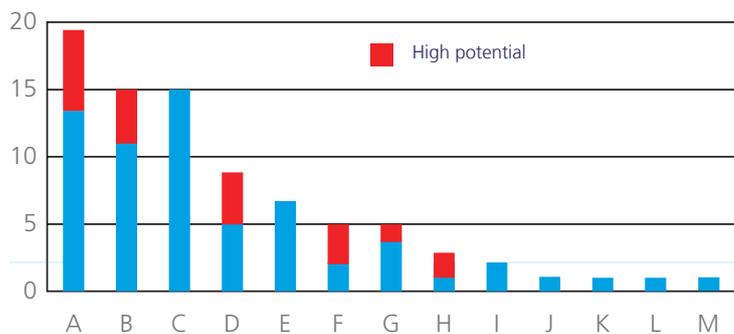


Figure 9: CTVs - work process breakdown

Key	
A	Transit by vessel
B	Vessel operation (including jack-ups and barges)
C	Transfer from/to vessel
D	Lifting operations
E	Manual handling
F	Access/egress
G	Walking from A to B
H	Routine maintenance
I	Catering/cleaning
J	Commuting
K	Davit crane operations
L	Operating plant and machinery
M	Painting/blasting

Emergency Response or Medical Evaluation (ERME)

In 2021, 62 incidents required ERME, a 215% increase compared to the previous year (24). Of these 62 incidents, one incident involved medical evacuations of three people, and six incidents were categorised under two different work processes.

In addition, 18% of ERMEs were classified as high potential incidents. Despite the significant increase in the total number of ERMEs, this is the lowest share of high potential incidents on record. This can be attributed to improvements in a range of work processes which previously had resulted in at least one or two high potential ERME incidents annually as reported by G+ members.

In 2019, G+ published its good practice guidance on integrated offshore emergency response (IOER). G+ is in the process of revising this document to review the global guidance and develop appendices for APAC and the US. This will supplement the existing guidance by providing information on region/country-specific frameworks for emergency response.

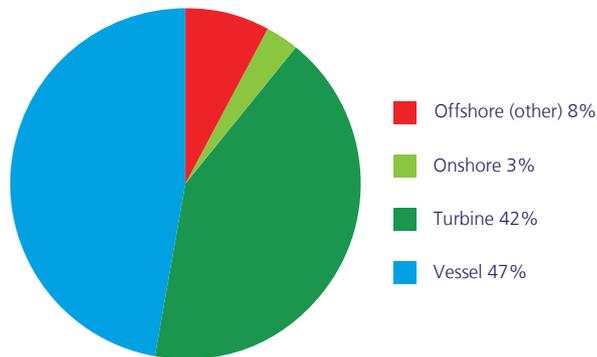


Figure 10: incident area from which ERME took place

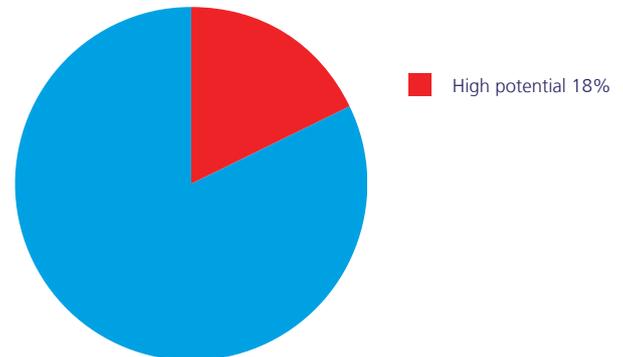


Figure 11: Percentage of ERME incidents that were classified as high potential

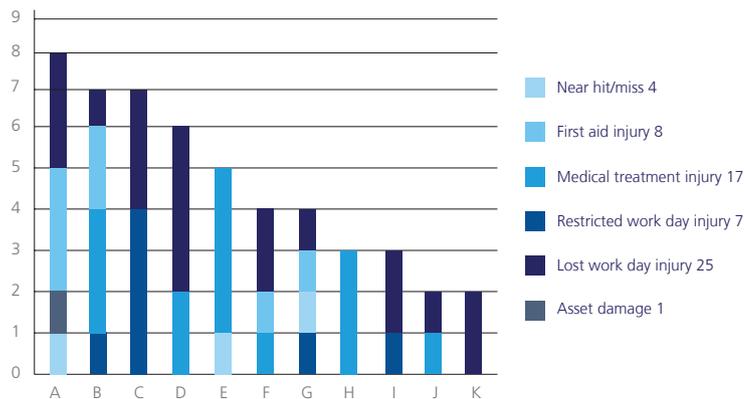


Figure 12: Work process breakdown of ERME by actual consequence of the incident

Key	
A	Vessel operation (including jack-ups and barges)
B	Hand tools/power tools (working with)
C	Manual handling
D	Walking from A to B
E	Lifting operations
F	Electrical systems (working with)
G	Transfer from/to vessel
H	Business travels
I	Mechanical systems (working with)
J	Routine maintenance
K	Working at heights

Lost workday injuries

A total of 50 lost workday injuries were reported in 2021, representing a 16% increase on 2020. This resulted in 2021 having the second-highest number of lost workday injuries on record.

46% (23) of lost workday injuries occurred inside the turbine, predominantly in the tower, where 30% (7) of the injuries occurred. 14 incidents which caused lost workday injuries were classified as high potential incidents, the second-highest on record and a 40% increase on 2020. Most incidents that caused a lost workday took place during manual handling activities, the same as in 2020. 78% of these manual handling activities resulted in back injuries.

G+ conducted a critical task analysis, as part of the research on physical fitness standards for offshore wind technicians, in partnership with the University of Portsmouth. Manual handling was classified as one of the most physically demanding and frequent tasks for offshore wind technicians. In 2022, a new G+ workstream has been set up to develop a video campaign that highlights manual handling risks and demonstrates the best operating procedures for manual handling tasks.

G+ published a case study in 2020 to provide a summary of key learnings and requirements for effective prevention of manual handling and ergonomics related incidents in the offshore wind industry. The case study is based on the analysis of incidents, assessment of a sample of activities, a systematic review of regulatory requirements, and observations of good practice and stakeholder engagement.

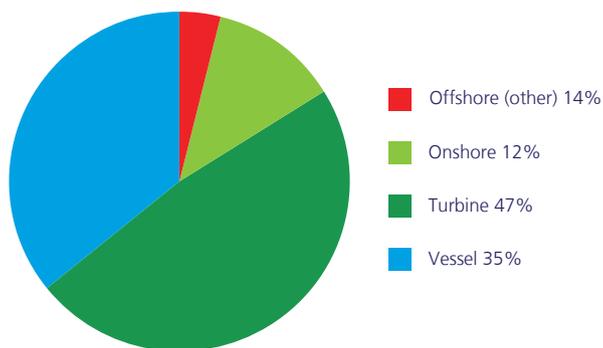


Figure 13: Lost work day injuries - incident area breakdown

Lost workday injuries (continued)

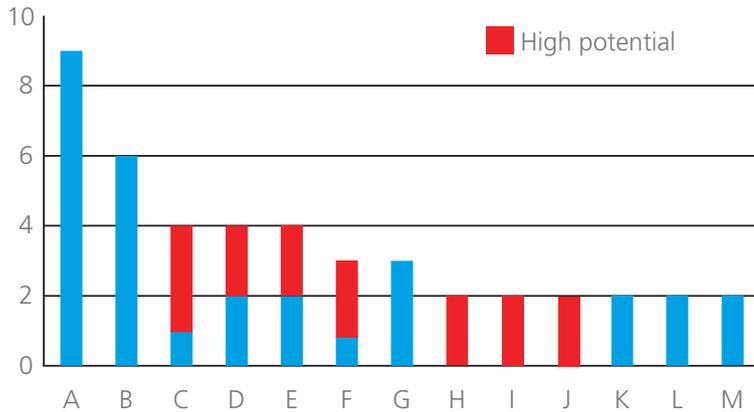


Figure 14: Lost work day injuries - work process breakdown with high potential injuries identified

Key

A	Manual handling
B	Walking from A to B
C	Operating plant and machinery
D	Access/egress
E	Hand tools/power tools (working with)
F	Vessel operation (including jack-ups and barges)
G	Lifting operations
H	Climbing/rope access
I	Electrical systems (working with)
J	Working at heights
K	Mechanical systems (working with)
L	Routine maintenance
M	Training/drills/team building events

First aid injuries

In 2021, a total number of 283 first aid injuries were recorded, representing a 41% increase from the number of injuries recorded in 2020 (201). This is the highest number of first aid injuries recorded in a year since 2014. This can be attributed to increasing operational hours. Despite observing an increase in the number of first aid injuries, the proportion of high potential injuries in this category was only 4%, the same as the rate observed in 2020.

When the locations of first aid injuries were analysed, it was observed that 37% of first aid injuries occurred on the turbine. Of the first aid injuries located on the turbine (106), 39% were in the nacelle (41), 15% were first aid injuries located in the hub and blades (16), and 14% were found in the tower (15). Furthermore, 35% of the total first aid injuries occurred on vessels. 4% of the recorded first aid injuries were classified as high potential injuries.

Looking at the top three work processes, it was observed that manual handling, walking from A to B, and hand tools/power tools (working with) presented the highest rates of incidents. Unfortunately, in 2021, first aid injuries during manual handling have increased by 54% (54) compared to 2020 (35). Similarly, the recorded number of first aid injuries during walking from A to B has doubled (36) compared to 2020 (18). On a positive note, none of these first aid injuries was categorised as high potential incidents.

Considering the fact that there have already been some awareness campaigns focussing specifically on manual handling risks, G+ members are already taking measures to tackle this issue, and the results achieved validate the importance of continuing such efforts. Additionally, in order to raise awareness on protecting hands when working with hand tools/power tools, training videos are made available via the Toolbox.

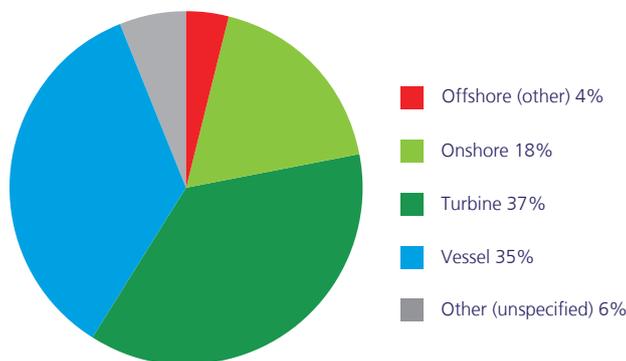
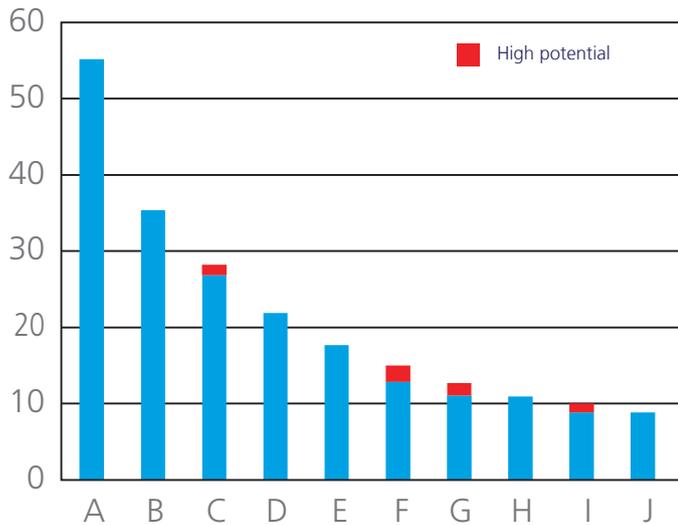


Figure 15: First aid injuries - incident area breakdown

First aid injuries (continued)



Key

- A Manual handling
- B Walking from A to B
- C Hand tools/power tools (working with)
- D Access/egress
- E Catering/cleaning
- F Routine maintenance
- G Lifting operations
- H Vessel operation (including jack-ups and barges)
- I Transit by vessel
- J Civil works onshore including excavations

Figure 16: First aid injuries - work process breakdown with high potential injuries identified

Incident data summary: Work Process

The G+ data reporting mechanism has 38 work process categories. Figure 15 shows the top 10 work processes, with the proportion of high potential incidents identified. Lifting operations, manual handling and vessel operations (including jack-ups and barges) were the top three work processes where incidents occurred. This is similar to the trends of former years.

The main work process in 2021 was lifting operations which showed an increase of 4% compared to the number of incidents in 2020 (94). Although not in the top ten work processes, there has also been a significant (122%) increase in incidents during davit crane operations which validates the importance of addressing safety challenges during lifting operations. It may also suggest that it would be a good idea to revisit the actions in the G+ Safe by Design workshop on davit cranes.

Building on the decrease observed in access and egress incidents in 2020, a further 23% decrease was also achieved in 2021. When the data was further analysed, it was understood that in 2021, the reduction observed in access and egress processes is proportional to the increased numbers recorded when walking A to B. In 2019, in order to improve the granularity of the dataset 'walking from A to B' category was introduced. It is clear that G+ members are embracing this change as a 48% increase was observed in incident numbers in the category 'walking from A to B' in 2021, while the sum of the two categories remained at similar levels.

On a positive note, in 2021 there was a 28% decrease in working at height incidents compared to 2020. With this reduction, 2021 incidents whilst working at heights became the lowest on record since 2014. This can be attributed to the significant effort that G+ members have put into procedures, training and learning.

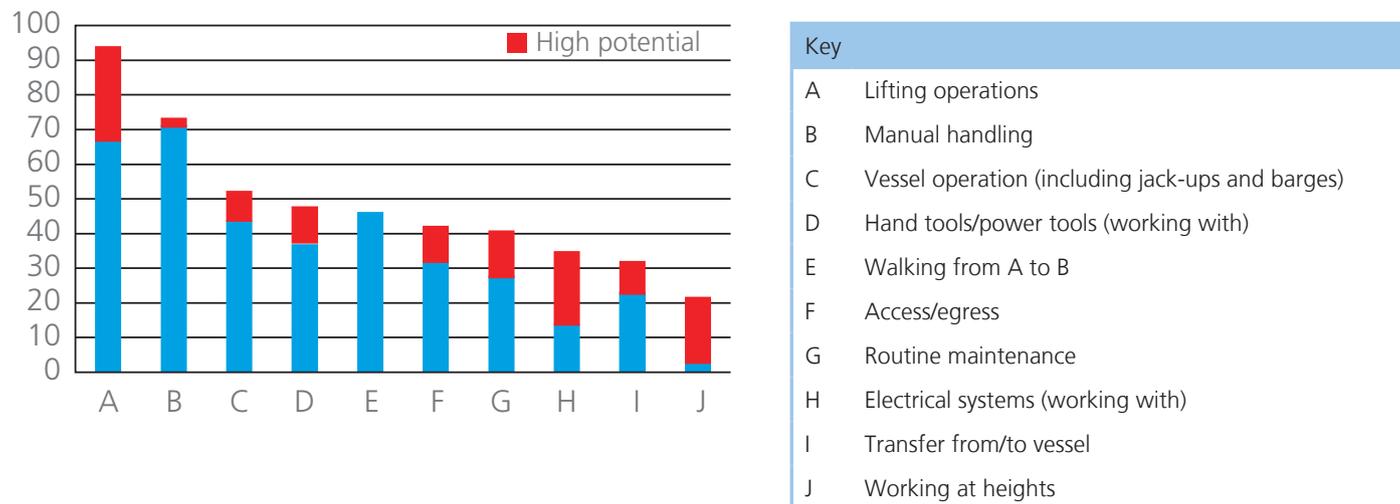


Figure 17: Work process - top 10 work processes with high potential incidents identified

Work process analysis: Lifting operations

In 2021, the highest number of incidents and injuries occurred during lifting operations. Incidents during lifting operations increased by 4% (94) compared to last year (98). Most of the incidents reported under lifting operations were near misses (44), hazards (17), and asset damage (16) incidents. Furthermore, eight cases of recordable injuries were recorded during lifting operations this year which is similar to numbers observed in previous years.

Since 2017, lifting operations have been the work process with the highest number of high potential incidents every year. During lifting operations, high potential incidents (39) in 2021 increased when compared to 2020 (37). However, when further analysed, it was understood that this increase in high potential incidents is mainly due to better reporting of near hit/miss cases. Compared to last year, G+ members reported 54% more near hit/miss cases, which is a positive outcome and can be the result of an improved safety culture in G+ members, who have started to report more incidents in the workplace.

G+ held a workshop on material handling, focusing on behavioural aspects and planning routine lifts. The workshop report, when published, can be taken by anyone in the industry and compared against their projects. Further, G+ has set up a new workstream in 2022 to address the risks associated with routine low complexity lifts and consider the quality of the lift plans and personnel competency. These activities show the commitment of G+ and its members to continue collaborating with the industry to further improve the safety of offshore wind activities globally. There is also close collaboration with IMCA on this topic.

Operational sites were a higher area of concern in 2021 as 53% of lifting operation incidents occurred during that phase. Most injuries during lifting operations were first aid injuries (13). The highest number of lifting operation incidents observed in 2021 was related to the jack-up vessel/ barge area, with a 40% increase compared to 2020.

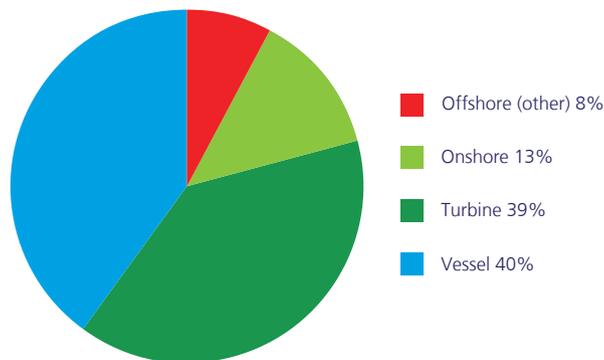


Figure 18: Lifting operations - incident and injury area summary

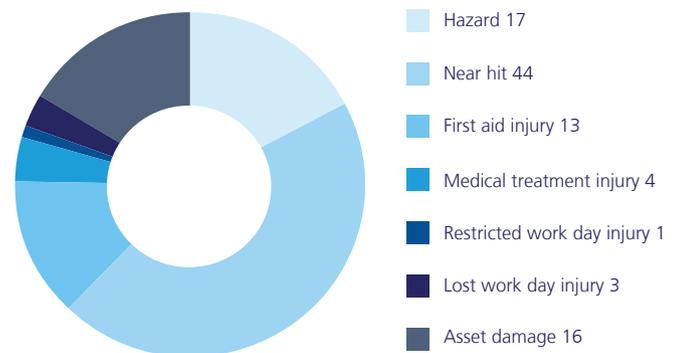


Figure 19: Lifting operations - incident consequence

Work process analysis: **Lifting operations** (continued)

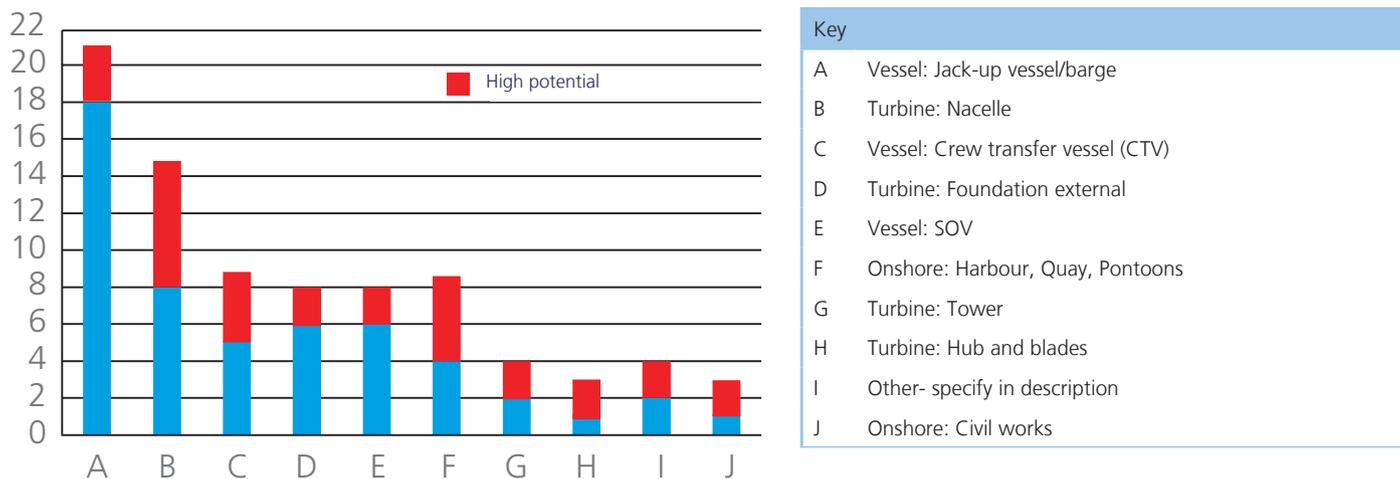


Figure 20: Lifting operations- incident area breakdown with high potential incidents identified

Work process analysis: **Manual handling**

Manual handling was the second-highest work process in 2021 with 74 incidents reported, which is a 23% increase from 2020 (60) and the second-highest on record. This was mainly due to an increased number of first aid injuries during manual handling processes. Most of the incidents that occurred during manual handling were first aid injuries (54). This was a 54% increase from 2020 (35), with the highest number of first aid injuries occurring during manual handling activities on record.

On the contrary, total recordable injuries (17) during the manual handling process decreased by 10% compared to 2020 (19). Following this, the G+ data was further analysed, and it was observed that none of the first aid injuries was categorised as high potential incidents. Furthermore, in 2021 only one near hit/miss incident during manual handling was categorised as high potential, which is three down from 2020. This may again indicate that reporting culture is developing amongst G+ members which will facilitate establishing a better learning culture.

During the G+ Stakeholder Forum 2022, a breakout group was held on manual handling, where a broad range of participants from across the industry came together to share their experience and expertise on how manual handling activities can be made safer. It reported that additional information on injured body parts could be collected separately to enhance learning from these incidents. It was also understood that the majority of manual handling incidents occur during routine tasks. A short pre-task risk assessment and training to facilitate the implementation of such measures were recommended.

The G+ have set up a section on the website to disseminate important information on incidents and potential hazards so that the lessons learned can help prevent incidents occurring elsewhere in the industry. A manual handling case study is also available which explains the causes of an incident and key safety learnings.

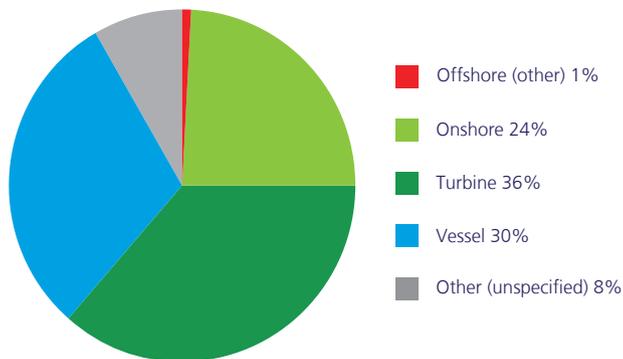


Figure 21: Manual handling – incident and injury area summary

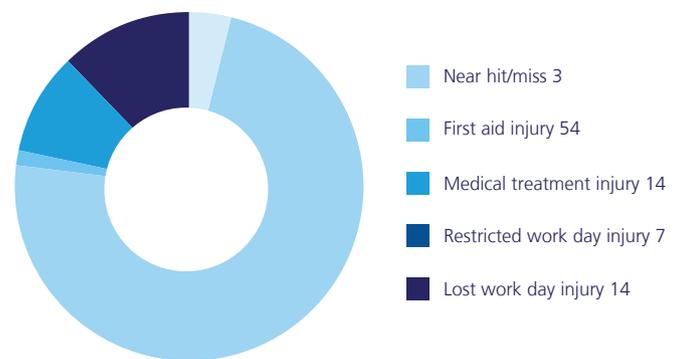


Figure 22: Manual handling - incident consequence

Work process analysis: **Manual handling** (continued)

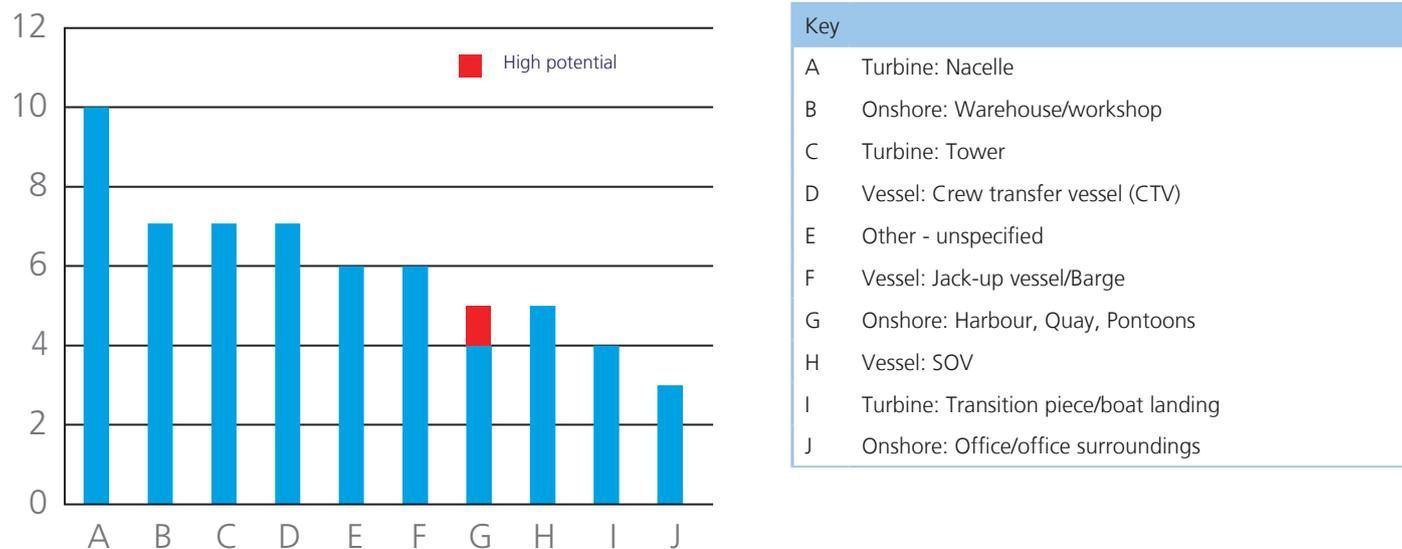


Figure 23: Manual handling - incident area breakdown with high potential incidents identified

Dropped objects incidents

In 2021, 113 incidents involved dropped objects. This is the second-highest number on record and a 41% increase from 2020 (80). 42% of incidents involving dropped objects were classified as high potential incidents. The number of high potential dropped object incidents in 2021 (47) increased by 88% compared to 2020 (25).

The majority (65%) of the dropped object incidents are near/hit misses. 2021 saw a 90% increase in near hit/miss incidents compared to the previous year (39). Furthermore, restricted workday injuries decreased to zero for 2021, which follows the trend from 2020 (3).

When the locations of dropped object incidents were analysed, it was observed that turbine was the main incident area category (50%) followed by vessel (30%).

Dropped object incidents are important because of their high potential consequences. Disappointingly, 2021 showed an increase in dropped object incidents. G+ will monitor this closely and increase learning from the dataset. The G+ published its good practice guideline reliable securing booklet for offshore wind, with the support of DROPS, to assist all stakeholders in establishing better levels of health and safety standards within offshore wind farms.

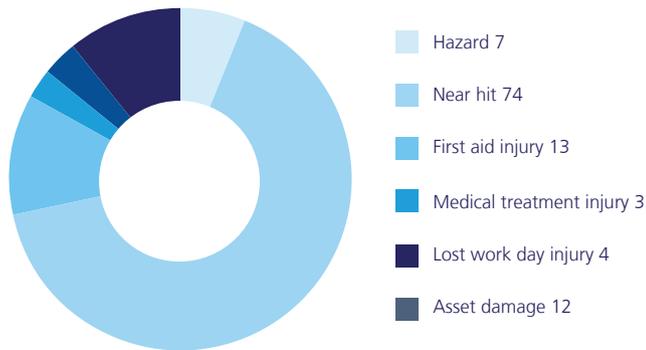


Figure 24: Dropped objects - incident consequence

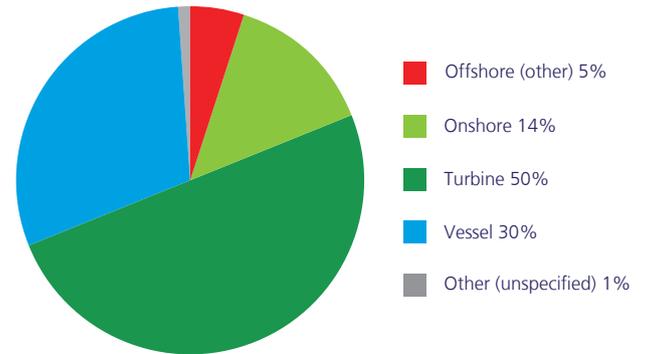
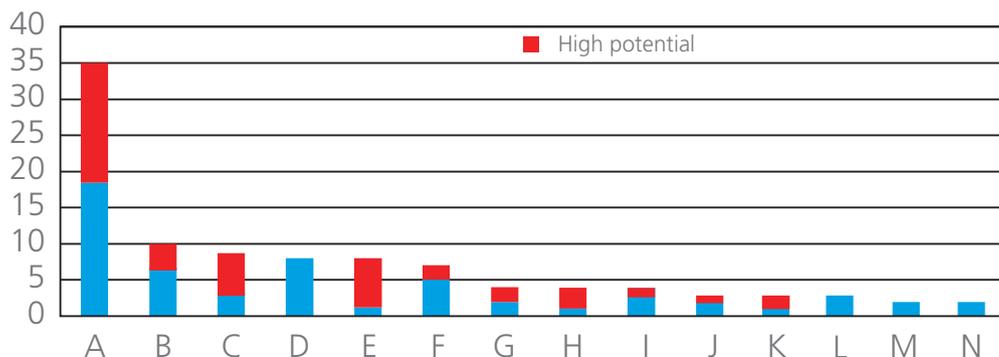


Figure 25: Dropped objects – incident and injury area summary

Dropped objects incidents (continued)



Key

A	Lifting operations
B	Access/egress
C	Routine maintenance
D	Transfer from/to vessel
E	Working at heights
F	Hand tools/power tools (working with)
G	Operating plant and machinery
H	Davit crane operations
I	Manual handling
J	Climbing/ rope access
K	Mechanical systems (working with)
L	Vessel operation (including jack-ups and barges)
M	Surveys (geophysical, environmental, meteorological)
N	Office work

Figure 26: Dropped objects - work process breakdown with high potential incidents identified. Work processes with 2 or more dropped objects.

Construction and operational sites

G+ member offshore wind farms comprise projects which are in either the development, construction, operational or decommissioning phases. These are defined as:

Development site: Development and consenting phase of the project.

Construction/project site: Construction and commissioning.

Operation site: Site in operation, producing power. (Note: Turbines will often be commissioned and handed over to ops. as soon as they are built. In case a site has both project and operational activities, the incident should be evaluated to determine what activity was performed and classified accordingly).

Decommissioning: Wind farm decommissioning activity.

In the below figure (Figure 27) a breakdown of 2021 incident data was shown by the top 10 work processes of operational offshore wind farms against those sites which are still under construction, in a comparative manner. It is recognised that the types of activities and nature of operations will differ from one lifecycle phase to another but similarities in data may point out common problem areas.

The top four work processes per number of incidents in operation sites are: lifting operations, manual handling, routine maintenance and working with hand/power tools. On the other hand, the top four work processes per number of incidents on construction sites correspond to: lifting operations, vessel operation (including jack-ups and barges), manual handling and working with hand/power tools. It is observed that in both site types, work processes that involve lifting operations and manual handling are important. Although the ranking orders are different, 3 out of 4 of the top processes are common between operation sites and construction sites.

22% of all construction site incidents were classified as high potential incidents, which is 11 % below 2020 (33%). This difference was driven by the reduced number of high potential incidents reported by the Netherlands and Taiwan during construction

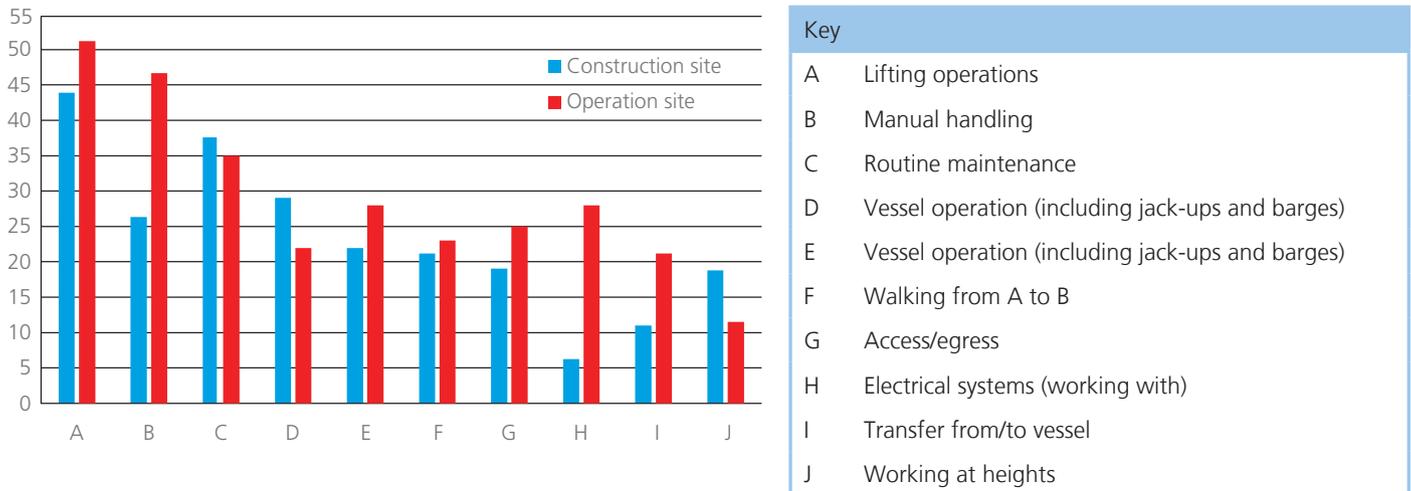


Figure 27: Work process - construction/operation site breakdown

Construction and operational sites (continued)

G+ is also collecting data on hours worked per site type to improve the interpretation of the data. Figure 26 shows that in 2021, construction sites had a lower TRIR and LTIF than operational sites, which is in line with former years. Positively, TRIR and LTIF have mostly decreased in both site types, being a testament to the positive safety enhancement work of G+ and its members. The only exception is the LTIF for construction sites, which has slightly increased since 2020 (+0.04).

	Construction	Operations
Hours worked	19,117,397	9,092,450
TRIR	1.94	6.71
LTIF	0.84	3.74

Figure 28: Worked hours – construction/operation site breakdown

Country profiles

G+ collates incident data from sites situated in Denmark, France, Germany, the Netherlands, Sweden, Taiwan, the United Kingdom, and the United States. The incident profile of different countries, in which the G+ members operate, varies according to the activities in each country. However, examining the top three work processes by the number of incidents in different countries in Figures 27 to 34, it can be seen that access/egress, lifting operations and manual handling were the most common top three work processes¹⁰

Please explore our dataset on the G+ website to further analyse country profiles

	Number of sites*	Asset damage	First aid injury	Hazard	Lost work day injury	Medical treatment injury	Near hit/miss	Restricted work day injury	Total	Hours (million)**	TRIR/LTIF
Denmark	19	1	18	1	6	1	7	1	35	1.5	5.4/4.0
France	3	16	4	0	2	2	28	0	52	1.6	2.5/1.2
Germany	21	5	33	2	12	5	13	4	74	2.8	7.5/4.28
Sweden	2	0	0	0	0	0	1	2	3	0.1	19.5/0.0
Taiwan	3	0	7	17	1	3	1	2	31	6.5	0.9/0.2
The Netherlands	4	0	1	2	0	0	5	0	8	0.9	0/0
UK	99	60	200	54	26	20	163	12	535	15.3	3.79/1.7
United States	9	0	16	0	1	1	2	0	20	2.2	0.9/0.5

* Number of sites refers to number of G+ member sites that reported incidents in 2019

** Hours worked in offices with multiregional operations cannot be attributed to a specific country.

Figure 29: Country profiles - the actual consequences, worked hours, LTIF and TRIR

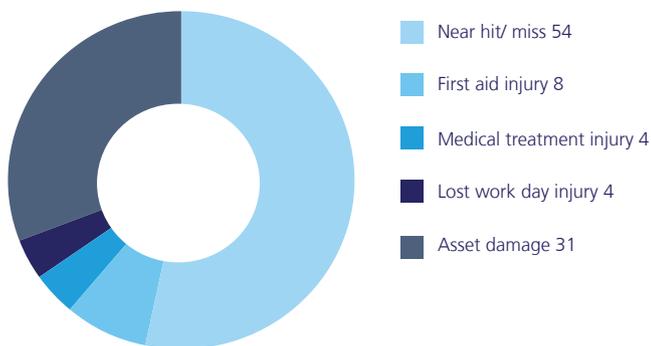
Denmark



Figure 30: Denmark's incident consequence profile and top three work processes

¹⁰ Only profiles of countries with over 5 incidents will be shown

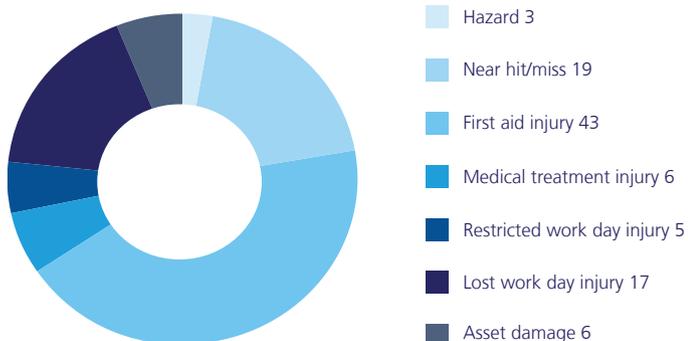
France



France 52 incidents	
Vessel operation (including jack-ups and barges)	33%
Lifting operations	13%
Operating plant and machinery	12%

Figure 31: France's incident consequences profile and top three work processes

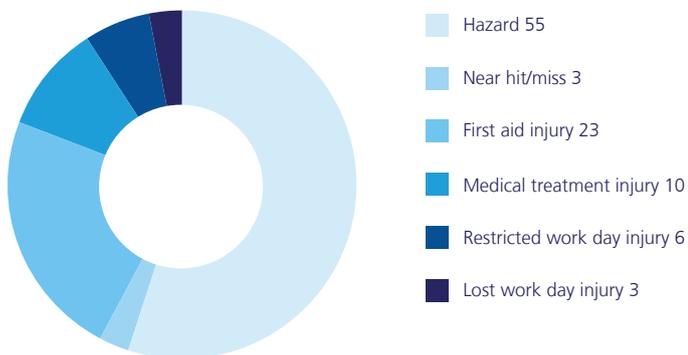
Germany



Germany 74 incidents	
Manual handling	14%
Routine maintenance	9%
Hand tools/power tools (working with)	8%
Walking from A to B	8%

Figure 32: Germany's incident consequences profile and top three work processes

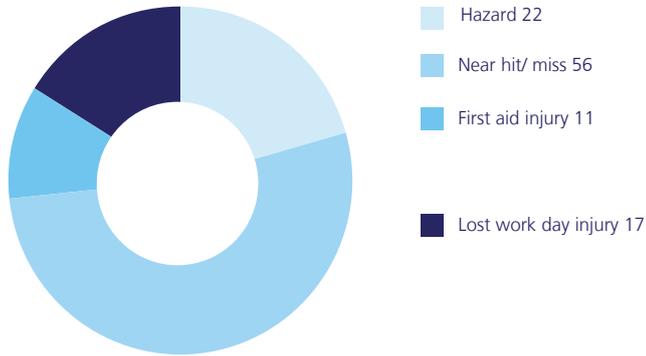
Taiwan



Taiwan 31 incidents	
Working at heights	39%
Lifting operations	10%
Commuting	6%
Hot works	6%
Walking from A to B	6%

Figure 33: Taiwan incident consequences profile and top three work processes

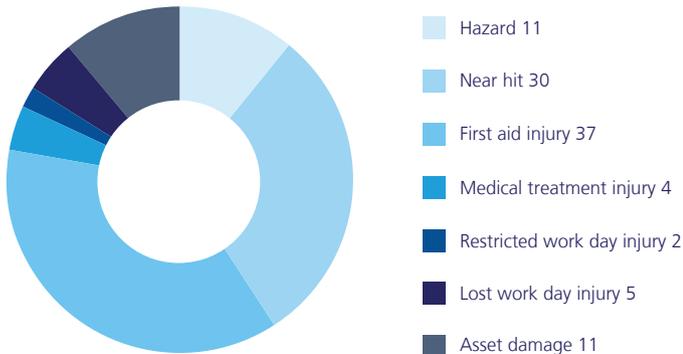
The Netherlands



The Netherlands 8 incidents	
Lifting operations	38%
Working at heights	25%
Flight operations	13%
Vessel operation (including jack-ups and barges)	13%
Transit by vessel	13%

Figure 34: The Netherlands' incident consequences

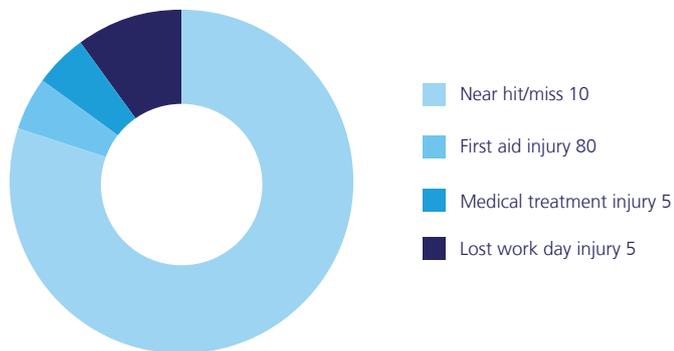
United Kingdom



UK 535 incidents	
Lifting operations	15%
Manual handling	11%
Hand tools/power tools (working with)	7%

Figure 35: United Kingdom's incident consequences profile and top three work processes

United States



UK 535 incidents	
Lifting operations	15%
Manual handling	11%
Hand tools/power tools (working with)	7%

Figure 36: United States' incident consequences profile and top three work processes

Conclusions and next steps

The G+ incident data is published on a yearly basis to provide an overview of the safety occurrences in that specific year in a structure which is consistent with previous years. This allows stakeholders to learn from past incidents and accidents effectively. This is a crucial step in providing key information and trends to stakeholders transparently and openly. The purpose is to create an effective safety learning culture and enable improvements to the offshore wind industry's health and safety performance. It is also thought to be useful to new entrants and markets.

The G+ exists to drive world class health and safety performance through robust practices and transparent reporting. Despite various challenges introduced by the global pandemic, the offshore wind industry has continued to grow steadily. The data presented in this report reflects this growth and shows that working hours have increased by around 30%. As more offshore wind farms become operational, we expect that number of hours will also increase gradually. Despite the increase in operational hours, TRIR (3.28) and LTIF (1.55) rates are the lowest on record. This year's data also showed that recordable injuries in 2021 are the second-lowest.

Through the G+ initiative, the offshore wind industry shared lessons learnt from incidents via Toolbox and benefitted from various support material, including good practice guidelines and safe by design workshops to achieve safety enhancements. Safety learnings from this report underpin our work programme and are shared across G+ members and the wider industry. The incident data remains the key driver of the G+ workstreams. In 2021, the top two work processes (i.e. lifting operations and manual handling) and top two incident areas (i.e. Nacelle and CTVs) were the same as the previous year. This underpins the areas G+ is working on but also shows we need to improve on how to get it implemented and get the message across. The G+ will continue collaboration with its partners using learnings from this report and increase efforts to drive world class health and safety performance.

With expanding operations in the Asia Pacific and North American regions, G+ has been expanding its data collection from incidents in these regions and we now have G+ secretariat in these regions. Lessons learned from the data will create the evidence to develop tailored strategies and solutions suitable for all regions. We will continue to demonstrate global leadership in offshore wind health and safety through our work programme.

This report presents the snapshot of safety occurrences under key headlines, but the G+ dataset is a live dataset which evolves with the collaboration and input from its members. The G+ encourages further data analysis and welcomes queries from interested stakeholders.

Annex A – Glossary

Throughout the report, some terms are used to mean a group of work processes or incident areas. The definitions of these terms are as follows:

²Lifting operations	Lifting operations comprise the following work processes: lifting operations and rigging/slinging/banking. They do not include davit crane lifting operations or cable pull/winch operations.
³Operational site	Site in operation producing power
⁴Turbine	The turbine includes internal and external foundations, hub and blades, nacelle, service lift, tower, transition piece/boat landing areas, external and internal foundations, helicopter area and yaw gear space.
⁵Construction site	Site under construction and commissioning.
⁶Vessels	Vessels include accommodation vessels, cable installation vessels, crew transfer vessels (CTVs), diving vessels, fast rescue crafts (FRCs), guard vessels, jack-up vessel/barge, service operation vessels (SOVs), survey vessels and tugs.
⁷Development site	Development and consenting phase of the project
⁸Onshore	Onshore areas include public roads/areas, car parks, harbour/quay/pontoons, excavations and civil works, administration, offices, warehouses and workshops, substations, and WTG assembly.
Offshore	Offshore areas include offshore accommodation platform, offshore meteorological mast, and offshore substation areas.

The following incident consequence definitions have been used in the G+ dataset:

Fatality	An incident that involves death as a result of a work-related incident or occupational illness. Deaths that occur after an incident but are a direct consequence of an incident are to be included.
Hazard	A hazard is a condition or a situation where there is a potential to cause an incident. It is important to remember that nothing has happened, and no impact/harm has occurred. Only hazards which are considered to be of high potential are included.
Near hit/near miss	A near hit or miss is any incident which could have resulted in a work-related accident but did not, either by chance or timely intervention.
First aid	An incident which requires simple treatment that is self-administered or by a first aider, doctor or nurse but does not result in lost time or long-term medical care.
Medical treatment	An incident not severe enough to be reported as a fatality, lost work day incident or restricted work day incident, but which is more severe than requiring simple first aid treatment.
Restricted work day	An incident that does not result in a fatality or a lost work day but does result in a person being unfit for the full performance of the regular job on any work on any day after the occurrence of the occupational injury.
Lost work day	Non-fatal incident that involves a person being unfit to perform any work on any day after the occurrence of the occupational injury. 'Any day' includes rest days, weekend days, leave days, public holidays, or days after ceasing employment. Asset damage An event where there is damage to plant, equipment or facilities (no injury to persons).

High potential incident

High potential incidents are incidents or near misses that have the potential to cause a fatality/life-changing injury

The following statistical definitions have been used in the G+ incident data analysis:

Total recordable injury rate (TRIR) The number of fatalities, lost work day incidents, restricted work day incidents and medical treatment injuries per million hours worked.

Lost time injury frequency (LTIF) The number of fatalities and lost work day incidents per million hours worked.

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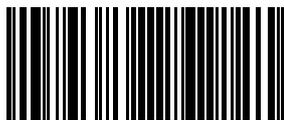
61 New Cavendish Street
London W1G 7AR, UK

+44 (0)20 7467 7100
info@energyinst.org

www.energyinst.org

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