



# RESEARCH



## Nonfatal Work Injuries Caused by Exposure to Electricity in 2020

Richard Campbell  
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## Key findings

Data from the Survey of Occupational Injuries and Illnesses, sponsored by the U.S. Bureau of Labor Statistics, show that:

- U.S. workers in private industry and public administration suffered 2,380 nonfatal injuries caused by exposure to electricity in 2020.
- Approximately seven in 10 of the nonfatal injury victims were male (72 percent) and 27 percent were female.
- Three-quarters of the victims were 44 years of age or younger.
- One-quarter (24 percent) of injury victims had been working for their employer for less than three months at the time of injury, while 12 percent had three to 11 months of service with their employer.
- The vast majority (85 percent) of victims were injured through direct exposure to electricity at work; this is defined as direct contact with a power source, such as contact with a live electrical wire or being struck by an electrical arc.
- Eight percent of victims were injured through indirect exposure to electricity. These injuries are caused by contact with electricity via some form of conductive material.
- Workers in installation, maintenance, and repair occupations experienced the largest share of nonfatal injuries (30 percent of the total), followed by workers in service occupations (26 percent), construction and extraction occupations (20 percent), and production occupations (11 percent).
- Nearly two in five nonfatal electrical injuries resulted in more than one full week away from work; this includes 21 percent of victims who were away from work for 31 or more days.

## About this report

Employees may be exposed to a variety of electrical hazards in the course of their work that place them at risk of serious injury or death. Information about electrical injury incidents can help guide prevention efforts and identify vulnerable populations.

In this report, we profile nonfatal occupational injuries in the U.S. caused by exposure to electricity in 2020. The report draws on data from the U.S. Bureau of Labor Statistics (BLS) that is collected through its Survey of Occupational Illnesses and Injuries (SOII). Information in SOII is provided by employer reports of injuries and illnesses occurring during a calendar year. It includes a number of important details for profiling the electrical injury problem, including the demographic and occupation information of injury victims, industry in which victims were employed, details of the injury events, number of days away from work due to injury or illness, and other information.

It is important to note that SOII data do not represent a complete census of occupational injuries and illnesses but are instead collected from reports submitted by a stratified sample of private sector establishments and state and local government workplaces. Federal workplaces, self-employed workers, or agricultural establishments with 10 or fewer workers are not included in the survey. Consequently, the number of nonfatal electrical injuries reported here should be considered to represent a conservative estimate of the electrical injury problem.

Injury and injury event data are coded in accordance with the Occupational Injury and Illness Classification System (OIICS). The OIICS was first developed and released by BLS in 1992. OIICS has gone through occasional revisions, with the most recent changes codified by OIICS 2.01, released by BLS in 2012. In OIICS 2.01, electrical injuries are identified at the most general level by the injury event code titled “exposure to electricity,” followed by breakdowns according to “direct exposure to electricity,” “indirect exposure to electricity,” and “exposure to electricity, unspecified.”

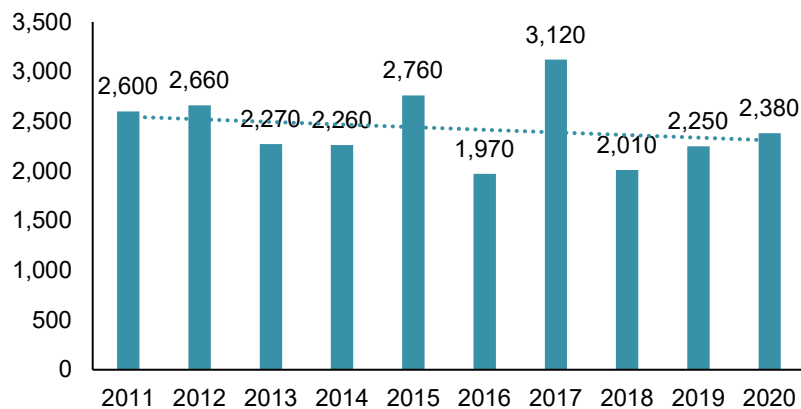
“Direct exposure to electricity” is defined as direct contact with a power source, such as touching a live electrical wire or making contact with an electrical arc. “Indirect exposure to electricity” refers to injuries resulting from contact with water, pipes, or some other material that is unintentionally conducting electricity.

## Nonfatal electrical injuries in 2020

U.S. workers in private industry and state and local government suffered 2,380 nonfatal injuries caused by exposure to electricity in 2020, according to data from the BLS. This injury total, an average of 46 injuries every week, represents a 6 percent increase over the 2,250 injuries from exposure to electricity that were reported in 2019.

As shown in Figure 1, nonfatal electrical injuries have followed a slight downward trend over a ten-year period from 2011 to 2020. However, injury totals have fluctuated from year to year and consistently total well over 2,000 injuries a year. Data on nonfatal injuries are collected by a sample survey rather than a complete census, potentially influencing year-to-year changes.

**Figure 1. Nonfatal Work Injuries Caused by Exposure to Electricity, 2011–2020.**

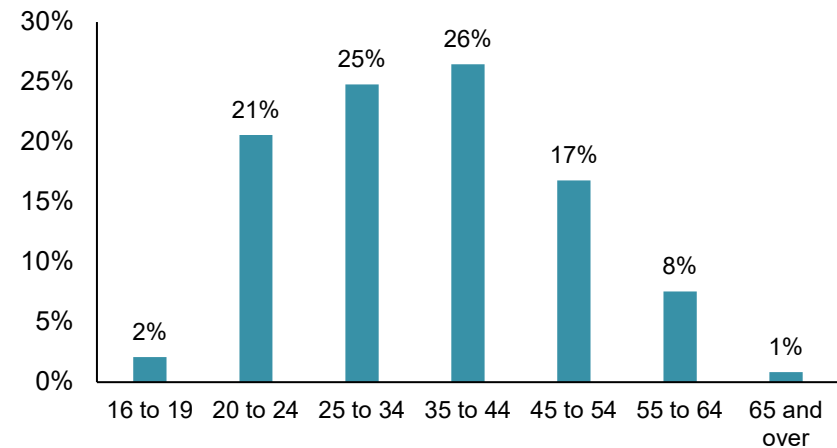


Source: Survey of Occupational Injury and Illness (all establishments).

## Victim characteristics

Approximately seven in 10 of the nonfatal injury victims were male (72 percent) and 27 percent were female. Three-quarters of the victims were 44 years of age or younger. Just over half of these victims were 35 to 44 years of age (26 percent) or 25 to 34 years of age (25 percent). One-fifth of the victims were 20 to 24 years old (21 percent).

**Figure 2. Nonfatal Work Injuries Caused by Age, 2020.**



Source: Survey of Occupational Injury and Illness (all establishments).

Limited information is available on the race or ethnicity of injury victims due to non-reporting of this information for 44 percent of victims. For incidents in which information was available, two in five victims were white (39 percent), 12 percent were Hispanic or Latino, and five percent were Black or African American.

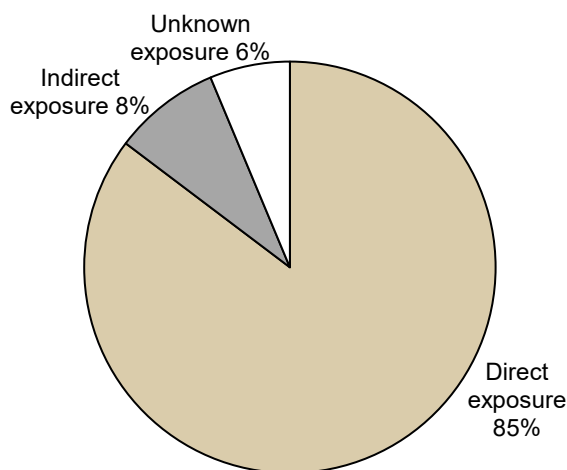
One-quarter (24 percent) of injury victims had been working for their employer for less than three months at the time of injury, while 12 percent had three to 11 months of service with their employer. One-third (33 percent) of victims had one to five years of experience and another 32 percent had more than five years of experience in their positions.



## Injury events

The vast majority (85 percent) of victims were injured through direct exposure to electricity at work. Eight percent of nonfatal injuries were caused by indirect exposure and the remaining six percent of injuries were caused by unknown forms of exposure. The Bureau of Labor Statistics identifies [direct exposure to electricity](#) as direct contact with a power source, such as contact with a live electrical wire or being struck by an electrical arc. Another eight percent of victims were injured through indirect exposure to electricity; this comprises injuries from contact with electricity via some form of conductive material. Such incidents include exposure to electricity conducted through water or when a ladder or pole held by a worker makes contact with a power line.

**Figure 3. Nonfatal Work Injuries Caused by Exposure to Electricity by Type of Exposure in 2020.**

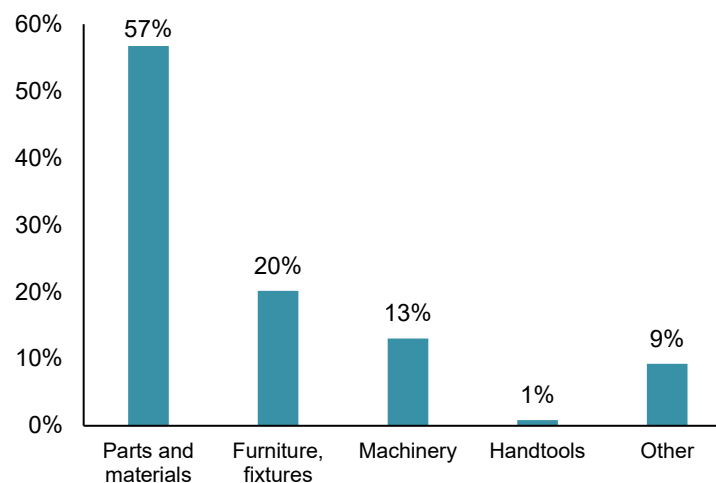


Source: Survey of Occupational Injury and Illness (all establishments).

## Sources of injury

Parts and materials were the source of injury in nearly three of five electrical injuries (57 percent), with furniture or fixtures acting as the source of another 20 percent of injuries and machinery in another 13 percent of injuries. Hand tools served as the source of injury in just one percent of injuries. The [source of injury](#) refers to the object, equipment, substance, or other factor responsible for the injury incurred by the worker or that precipitated the injury incident or exposure.

**Figure 4. Nonfatal Work Injuries Caused by Exposure to Electricity by Source of Injury in 2020.**



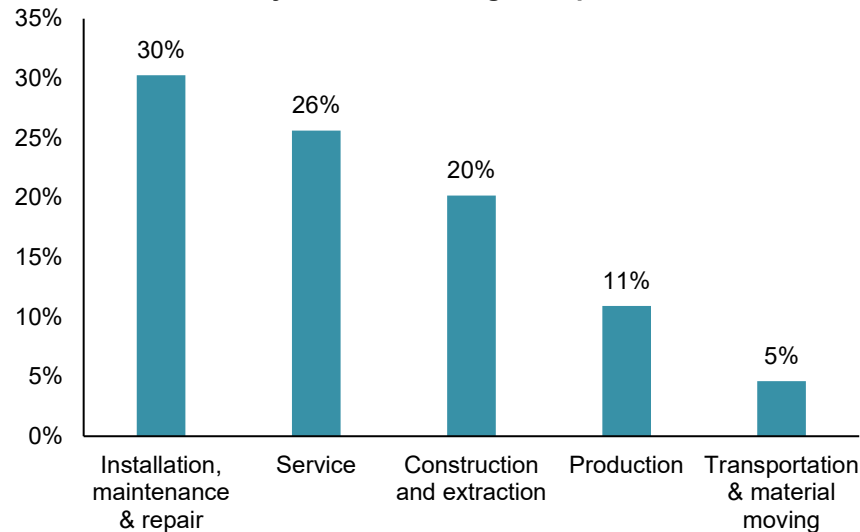
Source: Survey of Occupational Injury and Illness (all establishments).

## Occupations

Workers in installation, maintenance, and repair occupations experienced the largest share of nonfatal injuries from exposure to electricity, accounting for 30 percent of the total. They were followed by workers in service occupations (26 percent), construction and extraction occupations (20 percent), and production occupations (11 percent).

Smaller shares of injuries were experienced by management, business, financial occupations (2 percent); computer, engineering, and science occupations (2 percent); healthcare practitioners and technical occupations (2 percent); educational instruction and library occupations (1 percent); sales and related occupations (1 percent); and office and administrative support occupations (1 percent).

**Figure 5. Nonfatal Work Injuries Caused by Exposure to Electricity in 2020, Leading Occupations.**



Source: Survey of Occupational Injury and Illness (all establishments).

Some notable differences can be observed in electrical injuries by occupation in 2020 relative to those in 2019. The number of injuries among sales and related occupations and educational occupations declined by 82 percent and 73 percent, respectively. Declines were also observed in injuries among healthcare practitioners and technical occupations (-20 percent) and construction and extraction occupations (-8 percent). The most notable increases in electrical injuries were observed in transportation and material moving occupations (+83 percent) and service occupations (+45 percent). Electrical injuries

among installation, maintenance, and repair occupations and production occupations each increased by four percent.

**Table A. Nonfatal Work Injuries Caused by Exposure to Electricity by Occupation in 2019 and 2020**

Occupation	2019	2020	Percent Change
Installation, maintenance, and repair	690	720	+4%
Construction and extraction	520	480	-8%
Service	420	610	+45%
Production	250	260	-4%
Educational instruction and library	110	30	-73%
Sales and related	110	20	-82%
Transportation and material moving	60	110	+83%
Healthcare practitioners and technical	50	40	-20%
Office and administrative support	20	20	--

Source: Survey of Occupational Injury and Illness (all establishments).

## Injury rates by occupation

Greater or fewer injuries by occupation could be explained by the relative size of their underlying populations rather than any relative risk of injury. Injury rates provide a way of comparing injury experience between occupation groups by accounting for their respective levels of employments. Table B shows estimated rates of nonfatal electrical injury per 100,000 workers in 2019 and 2020 by occupation in order to compare the relative odds of electrical injury, as well as recent year-to-year comparisons in injury experience. It should be noted that these rates are estimates subject to limitations in the underlying data. In particular, injury counts are derived from surveys that do not include federal employees or self-employed workers. Also, neither the injury counts or employment totals used in calculating rates take into account the number of hours worked.

The nonfatal injury results indicate that workers in installation, maintenance, and repair occupations had the highest rates of injury of 15.6 electrical injuries per 100,000 workers. This is two and a half times the rate of those in construction and extraction occupations, which had the second highest injury rate. Workers in production occupations and service occupations, with the next highest injury rates, also showed an increase in their injury rates from 2019 and 2020. Injury rates among workers in educational instruction and library occupations and sales and related occupations, already comparatively low, declined between 2019 and 2020. Note that because injuries incurred by self-employed and federal workers are not included in injury totals, actual injury rates will be higher by an undetermined amount.

**Table B. Nonfatal Injuries per 100,000 Employees Caused by Exposure to Electricity by Occupation, 2019 and 2020**

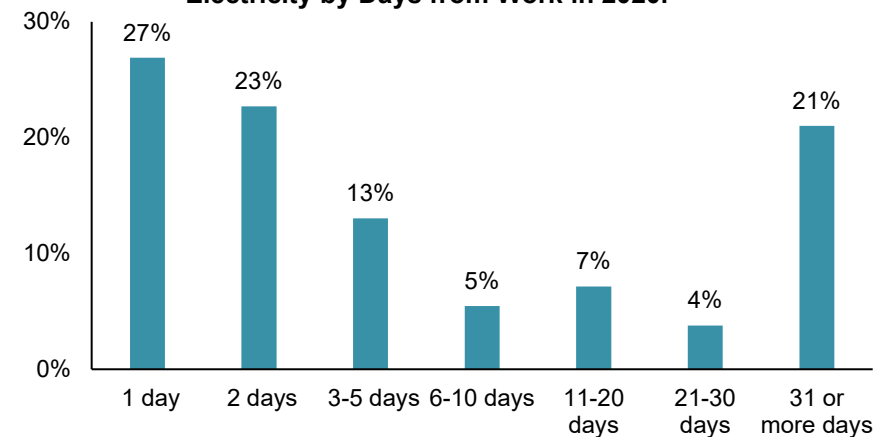
Occupation	2019	2020
Installation, maintenance, and repair	14.2	15.6
Construction and extraction	6.2	6.2
Production	2.9	3.4
Service	1.6	2.7
Transportation and material moving	0.7	1.0
Educational instruction and library	1.2	0.3
Healthcare practitioners and technical	0.5	0.4
Sales and related	0.7	0.1
Office and administrative support	0.1	0.1

Source: Injuries for the numerator are derived from the Survey of Occupational Injury and Illness (all establishments). Denominator data for number of employees by occupation are derived from Labor Force Statistics, Table 11, from the Current Population Survey for the years 2019 and 2020.

## Days missed from work

One-half of workers missed one (27 percent) or two (23 percent) days of work due to their injury. However, nearly two in five nonfatal electrical injuries resulted in more than one full week away from work; this includes 31 or more days away from work by one-fifth (21 percent) of the injury victims. Another four percent of these victims were away from work from 21 to 30 days, while seven percent of victims were away from work for 11 to 20 days. Another five percent of victims missed six to 10 days of work. Thirteen percent of those injured missed three to five days of work.

**Figure 6. Nonfatal Work Injuries Caused by Exposure to Electricity by Days from Work in 2020.**

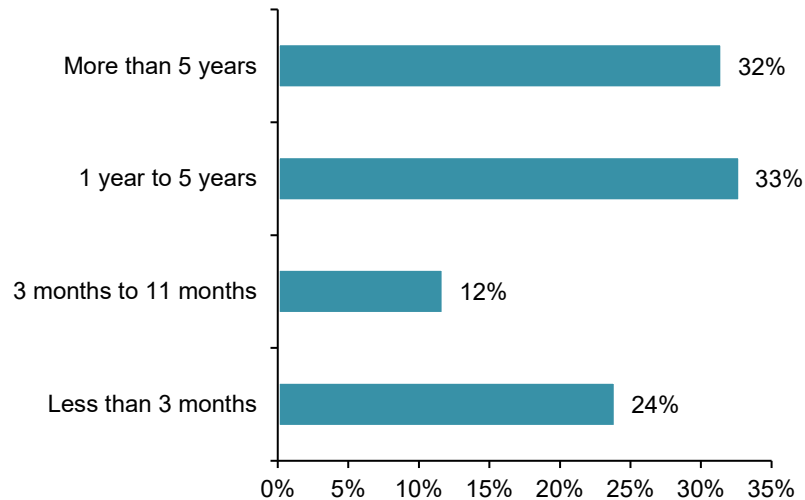


Source: Survey of Occupational Injury and Illness (all establishments).

## Length of service

One-quarter of the electrical injury victims (24 percent) worked for their employers for less than three months, while another 12 percent had between three and eleven months of service with their employer. One-third of workers had one to five years of experience (33 percent) and 32 percent had more than five years of service.

**Figure 7. Nonfatal Work Injuries Caused by Exposure to Electricity by Worker Years of Service in 2020.**



Source: Survey of Occupational Injury and Illness (all establishments).

## Discussion

Electrical injuries can be prevented through hazard awareness and by following safe work practices around electrical hazards. Although many electrical injuries are experienced by workers who perform electrical tasks, injury victims also include workers in occupations that are unlikely to be familiar with electrical hazards or to have received training in electrical safety. Electrical hazards may assume different forms in different work environments, but the reliance upon electricity and electrical products is so commonplace that safety efforts need to be expanded to include workers not typically seen to be at risk of electrical injury.

Electrical injuries can be reduced or eliminated through the use of proper safety procedures, engineering controls, training programs, personal protective equipment (PPE), and additional methods. Injuries can occur when well-meaning workers attempt to troubleshoot

equipment that is still plugged in, through the improper use of electrical cords in office environments, or when taking short-cuts with good safety practice in order to complete a job. It is critical that workers receive appropriate training for the electrical hazards they may face in their jobs, whether that involve recognizing not to use electrical equipment if wiring is frayed or ground prongs are missing, ensuring that equipment is locked and tagged out before beginning electrical work, or other safety practices. Management should be centrally involved in promoting safety training and implementation of safe work practices. Successful efforts may have to be prepared to accommodate language differences in diverse workplaces.

Expanding the awareness of electrical hazards and their potential for injury will be vital in future efforts at injury prevention. Important aspects of electrical safety training and practice are specific to the job task and workplace, but basic components include recognition that:

- Electrical equipment must be properly grounded to prevent against electrical shock.
- Electrical power tools and equipment should be maintained in good working order.
- Ground-fault circuit interrupters should be used to protect against shock.
- Live parts of electrical equipment that operate at 50 or more volts must be guarded to protect against unintentional contact.
- Job hazards, including electrical hazards, need to be identified and discussed in a pre-job analysis before beginning work.
- Workers need to receive adequate electrical safety training for their job assignments and be trained by qualified instructors. Training may need to be provided in native languages among some work populations.
- Equipment with arc flash or arc blast hazards should be isolated to ensure that only qualified workers are allowed in the area.

- Machinery must be de-energized when it needs any kind of maintenance and workers must test to ensure no charge.
- Workers need to be provided with the correct PPE for their jobs and be trained in the proper use of PPE.
- Electrical hazards must be clearly marked by signage.

## Resources on electrical safety

NFPA 70E®, *Standard for Electrical Safety in the Workplace*®, sets out requirements for safe work practices to protect workers from exposure to electrical hazards. Information and access to the document is available at [NFPA 70E®, Standard for Electrical Safety in the Workplace](#)®.

The National Institute for Occupational Safety and Health (NIOSH) has a variety of information and guidance on electrical safety, as well as links to electrical safety resources, at [cdc.gov/niosh/topics/electrical/](https://cdc.gov/niosh/topics/electrical/).

The Occupational Safety and Health Administration (OSHA) has information on electrical safety standards, hazard recognition, training opportunities, and solutions, and other information at [osha.gov/SLTC/electrical/](https://osha.gov/SLTC/electrical/).

To learn more about research at NFPA visit [nfpa.org/research](https://nfpa.org/research).

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## Supporting tables

**Table 1. Nonfatal Occupational Injuries Caused by Exposure to Electricity by Gender of Victim, 2020**

Gender	Number of Injuries	
Men	1,630	72%
Women	610	27%
Total	2,380	100%

Source: Survey of Occupational Injuries and Illnesses.

**Table 2. Nonfatal Occupational Injuries Caused by Exposure to Electricity by Age of Victim, 2020**

Age	Number of Injuries	
16 to 19	50	2%
20 to 24	490	21%
25 to 34	590	25%
35 to 44	630	26%
45 to 54	400	17%
55 to 64	180	8%
65 and over	20	1%
Total	2,380	100%

Source: Survey of Occupational Injuries and Illnesses.

**Table 3. Nonfatal Occupational Injuries Caused by Exposure to Electricity by Race or Ethnic Origin of Victim, 2020**

Race or Ethnic Origin	Number of Injuries	
White	920	39%
Hispanic or Latino*	290	12%
Black or African American	110	5%
Other race or ethnic origin	20	1%
Not reported	1,040	44%
Total	2,380	100%

\*Persons identified as Hispanic, or Latino may be of any race. The race categories shown exclude data for Hispanic and Latino workers. Cases where ethnicity is unknown are included in counts of non-Hispanic workers.  
Source: Survey of Occupational Injuries and Illnesses.

**Table 4. Nonfatal Occupational Injuries Caused by Exposure to Electricity by Exposure, 2020**

Exposure	Number of Injuries	
Direct exposure to electricity	2,030	85%
Indirect exposure to electricity	200	8%
Other or unknown exposure to electricity	150	6%
Total	2,380	100%

Source: Survey of Occupational Injuries and Illnesses.

**Table 5. Nonfatal Occupational Injuries Caused by Exposure to Electricity by Source of Injury, 2020**

Source of Injury	Number of Injuries	
Parts and materials	1,350	57%
Furniture, fixtures	480	20%
Machinery	310	13%
Hand tools	20	1%
Other or unreported	220	9%
Total	2,380	100%

Source: Survey of Occupational Injuries and Illnesses.

**Table 6. Nonfatal Occupational Injuries Caused by Exposure to Electricity by Occupation, 2020**

Occupation	Number of Injuries	
Installation, maintenance, and repair	720	30%
Service	610	26%
Construction and extraction	480	20%
Production	260	11%
Transportation and material moving	110	5%
Healthcare practitioners and technical	40	2%
Educational instruction and library	30	1%
Sales and related	20	1%
Office and administrative support	20	1%
Other occupations	90	4%
Total	2,380	100%

Source: Survey of Occupational Injuries and Illnesses.

**Table 7. Nonfatal Occupational Injuries Caused by Exposure to Electricity by Days Away from Work, 2020**

Days Away from Work	Number of Injuries	
Cases involving 1 day	640	27%
Cases involving 2 days	540	23%
Cases involving 3–5 days	310	13%
Cases involving 6–10 days	130	5%
Cases involving 11–20 days	170	7%
Cases involving 21–30 days	90	4%
Cases involving 31 or more days	500	21%
Total	2,380	100%

Source: Survey of Occupational Injuries and Illnesses.

**Table 8. Nonfatal Occupational Injuries Caused by Exposure to Electricity by Length of Service with Employer, 2020**

Length of Service	Number of Injuries	
Less than 3 months	570	24%
3 months to 11 months	280	12%
1 year to 5 years	780	33%
More than 5 years	750	32%
Total	2,380	100%

Source: Survey of Occupational Injuries and Illnesses.