



RESEARCH

FATAL ELECTRICAL INJURIES AT WORK

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FATAL ELECTRICAL INJURIES AT WORK, 2012 – 2016

FINDINGS

- A total of 739 workers died from exposure to electricity, or nearly 3 deaths every week over the five year period.
- By age group, workers aged 25 to 34 years accounted for the largest share of fatal injuries (27%), followed by workers 35 to 44 years of age (24%).
- One-fifth of victims were self-employed.
- By occupation, workers in construction and extraction occupations (47%) and installation, maintenance, and repair occupations (22%) accounted for the largest number of deaths.
- 417 of these deaths were caused by direct exposure to electricity, such as touching a live wire.
- 80% of fatal injuries from direct exposure to electricity occurred while workers were engaged in constructing, repairing, or cleaning activities.
- The leading locations for fatal injuries from direct exposure to electricity were industrial places and premises (36% of deaths) and private residences (26%).
- 308 deaths were caused by indirect exposure to electricity (contact with something unintentionally conducting electricity).
- 46% of indirect exposure victims worked in construction and extraction occupations and 21% of workers were in building and grounds cleaning and maintenance occupations, compared to 5% in this group of direct exposure victims.
- Workers who were fatally injured as a result of indirect exposure to electricity were most often engaged in construction, repairing, or cleaning activities (37%) or were using or operating tools or machinery (32%) at the time of injury.
- Fatal injuries resulting from indirect exposure to electricity most frequently occurred at private residences (41%) or industrial places and premises (23%).

TRENDS

- A total of 1,651 workers died as a result of electrical injury in the U.S. in the 10 years from 2007 – 2016.
- The annual number of fatal occupational electrical injuries followed a downward trend during this 10-year period and fatal injury totals were lower in each of the years from 2012 – 2016 (ranging from 134 fatalities to 156 fatalities) than they were in the years from 2007 – 2011 (ranging from 164 fatalities to 212 fatalities).
- Despite the drop in deaths, the trend line between 2012 and 2016 is relatively flat.
- The rates of electrical injury per million workers has also fallen over the 10 years, from a high of 1.5 per million workers in 2007 to a low of 0.9 per million workers in 2015.

KEY TAKEAWAYS

- Despite the drop in annual electrical fatalities, the injury trend has levelled off since 2012.
- Fatalities due to direct exposure to electricity indicate that work is being performed on or around energized equipment.
- Working around powerlines is an ongoing concern.
- Many fatalities involve self-employed workers or occur outside the traditional workplace, indicating a need for broader electrical safety education and oversight and innovative approaches to electrical safety training.



RESULTS

Over the five-year period from 2012 – 2016, data from the U.S. Bureau of Labor Statistics (BLS) indicate that 739 workers suffered fatal injuries as a result of exposure to electricity. Workers in construction and extraction occupations accounted for nearly half (47%) of these deaths, while another 22% of the victims worked in installation, maintenance, and repair occupations.

Electrical hazards are a potential source of injury to workers in a wide array of work settings. Occupations that routinely involve electrical work are the most obvious at-risk populations for electrical injury, but virtually any environment that utilizes electrical equipment – which is to say, most work settings – may involve exposure to hazardous electrical energy, whether due to frayed cords, faulty equipment, missing ground prongs, or some other factor. It is accordingly important for workers across industry and occupational groups to be able to recognize electrical hazards in their work environments and for employers to take appropriate steps to protect employees from electrical injury.

Information about workplace electrical injuries, including injury frequency, types of injury, and other incident details can help shed light on factors contributing to injury, while also serving to focus attention on the electrical injury problem. This report uses workplace injury data to highlight recent trends in injury occurrence in order to focus attention on the problem of workplace electrical injury and to help guide injury prevention efforts.

Sources of Injury Data for this Report

The data on workplace injuries in this report are provided by the U.S. Bureau of Labor Statistics (BLS) through the Census of Fatal Occupational Injuries (CFOI), a state-based program which uses multiple source documents to compile a count of all of the fatal work injuries taking place within each state during the calendar year. CFOI includes all private sector, public sector, and self-employed workers within its scope. CFOI data is available at the “Occupational Injuries and Illnesses and Fatal Injuries Profiles” page at the following address: <https://data.bls.gov/gqt/InitialPage>.

Types of Electrical Injury Incidents

Workplace injuries reported in CFOI are coded in accordance with the Occupational Injury and Illness Classification System (OIICS), first developed and released by BLS in 1992. OIICS includes data elements for nature of injury or illness, part of body affected, source of injury or illness, secondary source of injury or illness, and injury event or exposure. OIICS has gone through occasional revisions, with the most recent changes codified by OIICS 2.01, released by BLS in 2012. Due to these changes, data for injury events beginning in 2011 represent a break from prior years, complicating comparisons with the earlier data. The analysis in this report therefore focuses on the most recent five-year period for which data are available, 2012 – 2016.

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 and indirect exposure to electricity are each further broken down by voltage exposures of 220 volts or less, greater than 220 volts, and unspecified voltage.

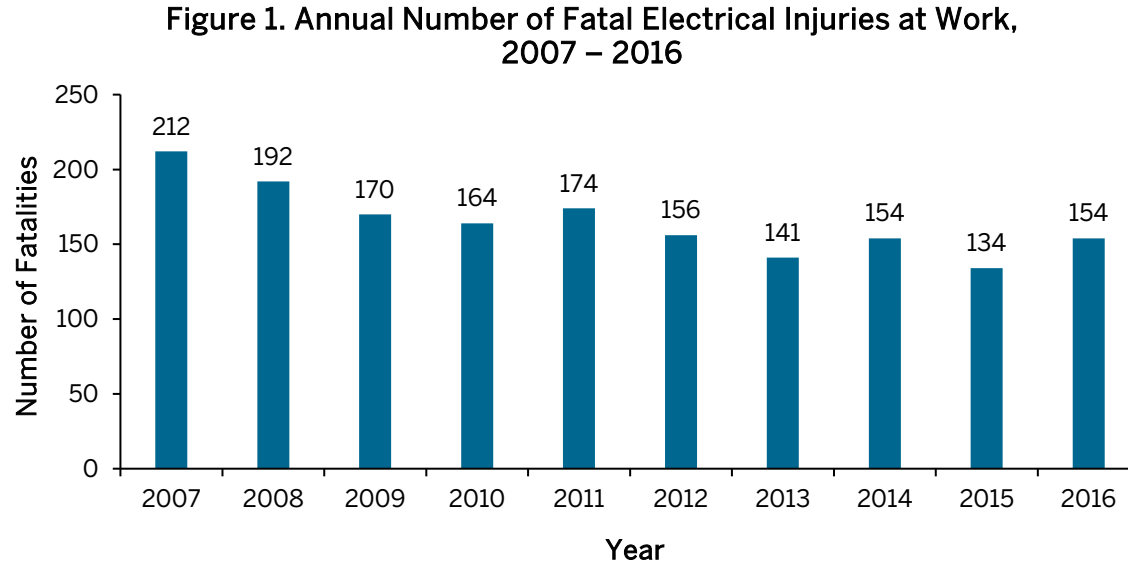
“Exposure to electricity” is an inclusive code that includes not only the types of incidents typically associated with electrical work, such as contact with electrified machinery or equipment, but also lightning strikes, contact with electrical fences, or other electrical events. Injuries resulting from contact with power lines are also included. “Direct exposure to electricity” is defined as direct contact with a power source, such as touching a live electrical wire or coming into contact with an electrical arc. “Indirect exposure to electricity,” in turn, refers to injuries resulting from contact with water, pipes, or some other material that is unintentionally conducting electricity. Workers who are electrocuted when carrying ladders that contact power lines are an example of fatal injuries from indirect exposure to electricity.

There are certain types of injuries stemming from exposure to electricity that will nevertheless be difficult to capture through the OIICS coding structure. For instance, falls that are precipitated by an electrical shock, as when a worker falls from a ladder after touching a live wire, will be coded under the injury event, “Falls, slips, trips.” An additional limitation of the coding structure is that the “Exposure to electricity” code does not allow a clear distinction between injuries due to electric shock and those due to arc flash.

FATAL ELECTRICAL INJURIES AT WORK: 2007 – 2016

Data from the CFOI indicates that a total of 1,651 workers died as a result of electrical injury in the U.S. in the 10 years from 2007 – 2016. Although changes to the OIICS coding system introduced in 2012 restrict comparisons between injuries before and after 2012, it is nonetheless possible to use electrical injury totals from each of the 10 years to illustrate the trend in electrical fatalities at work, as shown in Figure 1. Figure 1 shows that fatalities have followed a downward trend over the period, with a high point of 212 fatal electrical injuries in 2007 and a low of 134 fatalities in 2015. Annual injury totals were lower in each of the years from 2012 – 2016 than any of the five preceding years from 2007 – 2011.

Note that in Figure 1 and Figure 2, fatal electrical injuries from 2007-2010 are those coded as “Contact with electric current” under the Event code 31xxxx in OIICS 1.01.¹ The fatal injuries from 2011 – 2016 are coded as “Exposure to electricity” under Event code 51xxxx in OIICS 2.01.²

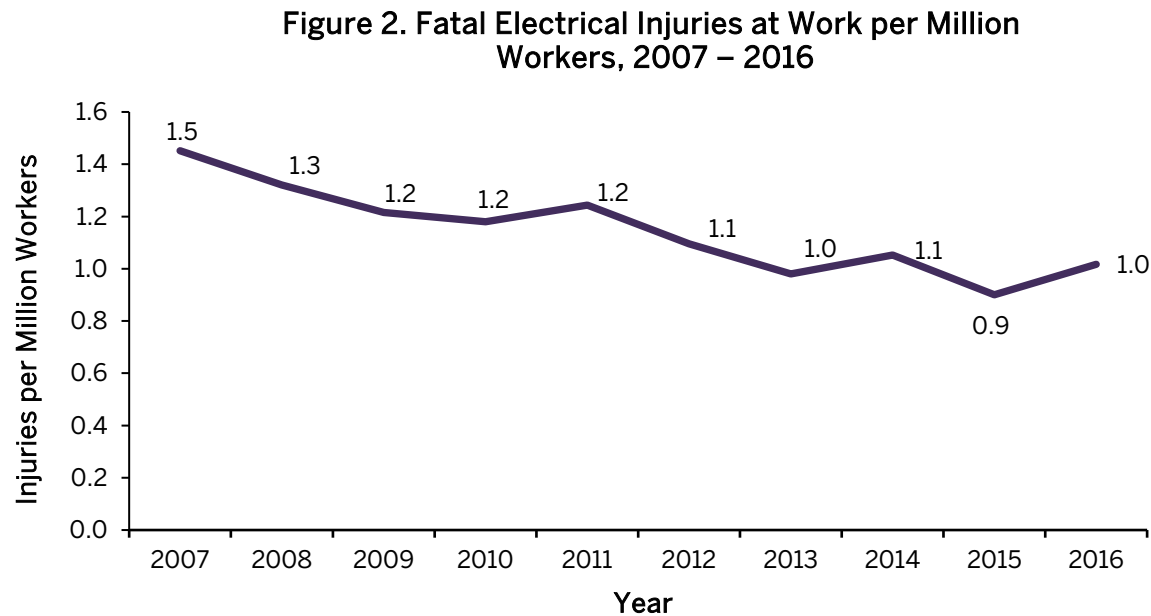


¹ Occupational Injury and Illness Classification Manual, U.S. Department of Labor, Bureau of Labor Statistics, September 2007 (https://www.bls.gov/iif/oiics_manual_2007.pdf).

² Occupational Injury and Illness Classification Manual Version 2.01, U.S. Department of Labor, Bureau of Labor Statistics, January 2012 (https://www.bls.gov/iif/oiics_manual_2010.pdf).

Since the rise or fall of work-related injuries from one year to the next can reflect changes in the size of the employed population, rather than workplace safety practices, it is also important to compare injury totals relative to underlying employment in order to standardize comparisons. To do this, we used employment data from the BLS Current Population Survey in order to calculate rates of fatal electrical injury per million workers.

The rates of fatal electrical injury from 2007 to 2016 shown in Figure 2 corroborate the downward trend in fatal electrical injuries depicted by the decline in their absolute numbers. As the data indicate, electrical injuries during this period peaked at 1.5 per 100,000 workers in 2007 and reached a low of 0.9 per million workers in 2015. As with the annual number of electrical injuries by year, the rates of electrical injury for each year from 2012 to 2016 were lower than any of the rates for the preceding five years. The general downward trend in fatal electrical injuries and injury rates between 2007 and 2016 represents a general downward trend in fatal electrical injuries identified in prior research for years between 1992 and 2009 [1, 2].



Source: Bureau of Labor Statistics, Census of Fatal Occupational Injuries.

FATAL ELECTRICAL INJURIES AT WORK: 2012 – 2016

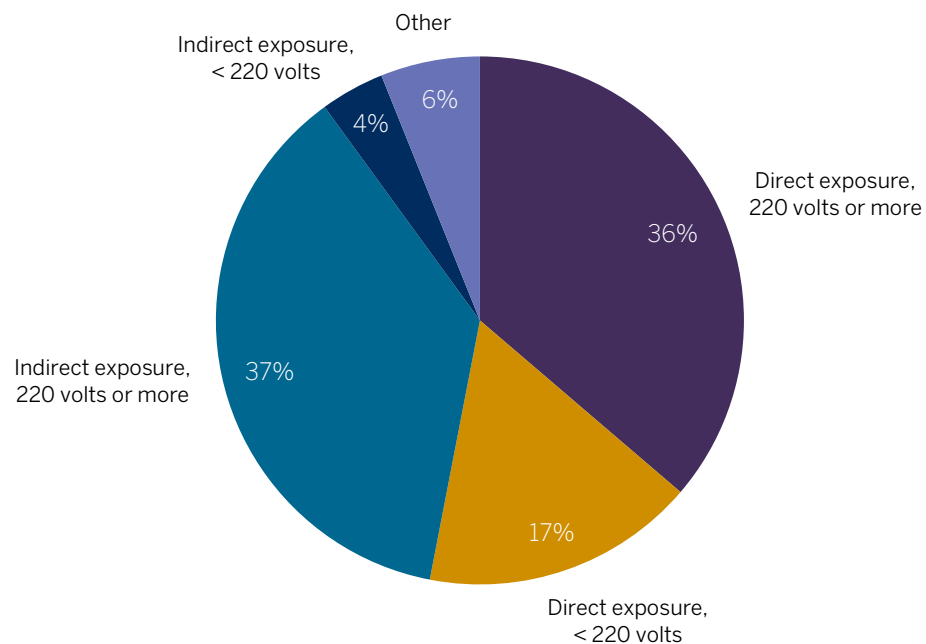
Data for 2012 – 2016 indicate that 739 workers died as a result of exposure to electricity during this five-year period. The vast majority of victims were male (99%). Many of the victims were in the prime of their working lives: 51% were 25 to 44 years old. Wage and salary workers accounted for 79% of the fatal injuries and 21% of victims were self-employed. Although 21% of electrical fatalities in 2012 – 2016 were experienced by self-employed workers, data from the BLS Current Population Survey estimate that self-employed workers represented just 6.4% to 6.7% of the civilian workforce in the U.S. between 2012 and 2015, indicating that the self-employed were at greater risk of fatal electrical injury than wage and salary workers. See Table 1 for details.

Table 1. Fatal Work Electrical Injuries by Select Worker Characteristics, 2012 – 2016

Worker Characteristic	Fatalities	Percentage
All workers	739	100%
Wage and salary workers	586	79%
Self-employed	153	21%
Gender		
Men	731	99%
Women	8	1%
Age		
18 to 19 years	7	1%
20 to 24 years	70	9%
25 to 34 years	199	27%
35 to 44 years	177	24%
45 to 54 years	167	23%
55 to 64 years	84	11%
65 years and over	30	4%
Unreported	5	1%

Source: Bureau of Labor Statistics, Census of Fatal Occupational Injuries.

Figure 3. Fatal Work Electrical Injuries by Type of Exposure, 2012 – 2016



Source: Bureau of Labor Statistics, Census of Fatal Occupational Injuries.

Type of Exposure

Figure 3 shows that 53% of fatal electrical injuries by type of exposure resulted from direct exposure to electricity and 41% from indirect exposure. Exposure was unspecified for 6% of the injuries. Indirect exposure to 220 volts or more accounted for 37% of the fatal injuries and direct exposure to 220 volts or more for 36% of the injuries, while direct exposure to less than 220 volts accounted for 17% of deaths and indirect exposure to 4% of the deaths.

Occupation

Almost half of those fatally injured through exposure to electricity in 2012 – 2016 were workers in construction and extraction occupations. Another 22% of victims were workers in installation, maintenance, and repair occupations, while 12% were workers in building and grounds cleaning and repair occupations. Workers in production occupations, management occupations, farming, fishing and forestry occupations, and transportation and material moving occupations accounted for the majority of the remaining deaths. See [Table 2](#).

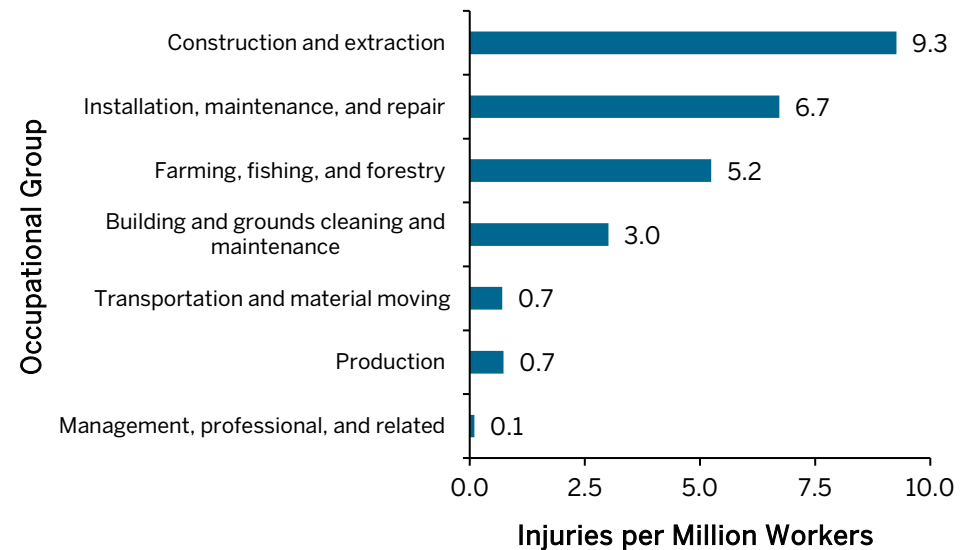
Table 2. Fatal Electrical Injuries by Occupation, 2012-2016

Occupational Group	Fatalities	Percentage
Construction and extraction occupations	346	47%
Installation, maintenance, and repair occupations	165	22%
Building and grounds cleaning and maintenance occupations	86	12%
Production occupations	31	4%
Management occupations	29	4%
Farming, fishing, and forestry occupations	27	4%
Transportation and material moving occupations	25	3%
Other occupations	30	4%
Total	739	100%

Source: Bureau of Labor Statistics, Census of Fatal Occupational Injuries.

Figure 4 shows that workers in construction and extraction occupations and those in installation, maintenance, and repair occupations also recorded the highest rates of fatal electrical injury per million workers for the 2012 – 2016 period, followed by farming, forestry, and fishing occupations and building and grounds cleaning and maintenance occupations. The fatal injury rates of construction and extraction occupations, installation, maintenance, and repair occupations, farming, fishing, and forestry occupations, and building and grounds cleaning occupations were all substantially higher than the overall electric injury fatality rates shown in Figure 2, which varied from .9 per million workers to 1.1 per million workers for these years.

Figure 4. Fatal Electrical Injuries per Million Workers by Occupation, 2012 – 2016 Five-Year



Source: Bureau of Labor Statistics, Census of Fatal Occupational Injuries.

Industry

Table 3 shows that the great majority of work-related electrical fatalities occurred in private industry, with just 3% of injuries sustained by public sector workers. Workers in the construction industry accounted for the highest number of deaths, with 374 deaths (51% of the total). Workers in the professional and business services industry sustained the second highest number of fatal injuries, with 115 deaths, followed by workers in the natural resources and mining industry (70 deaths) and trade, transportation and utilities industry (63 deaths). The manufacturing industry accounted for 47 deaths and the leisure and hospitality industry for 14 deaths.

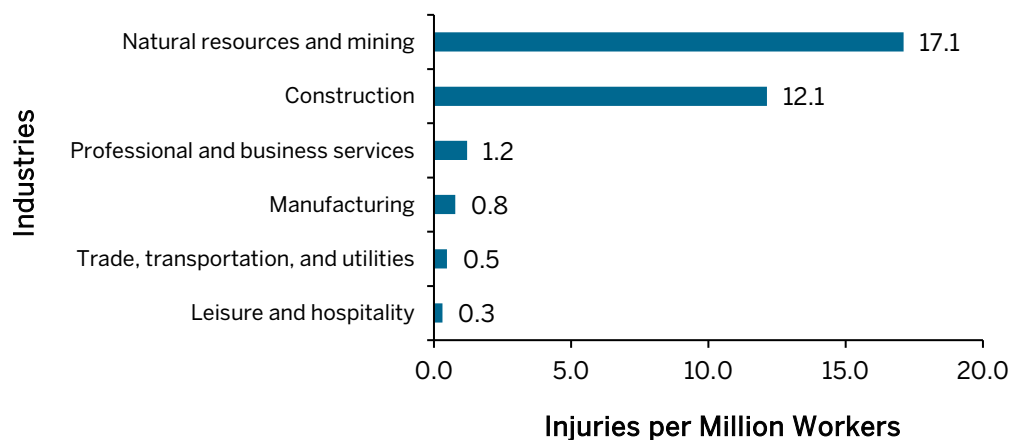
Figure 5 shows that workers in the natural resources and mining industry³ had the highest fatal electrical injury rates by industry over the 2012-2016 period, recording a rate of 17.1 per million workers. Workers in the professional and business services industry recorded an average fatal electrical injury rate of 1.2 per million workers, but workers in other industry groups recorded injury rates below the all-industry averages for 2012-2016 shown in [Figure 2](#).

Table 3. Fatal Work Electrical Injuries by Leading Industries, 2012 – 2016

Industry	Fatalities	Percentage
Private industry	717	97%
Construction	374	51%
Professional and business services	115	16%
Natural resources and mining	70	9%
Trade, transportation, and utilities	63	9%
Manufacturing	47	6%
Leisure and hospitality	14	2%
Government	22	3%

Source: Bureau of Labor Statistics, Census of Fatal Occupational Injuries.

Figure 5. Fatal Electrical Injuries per Million Workers by Select Industries, 2012-2016 Five-Year Averages



Source: Bureau of Labor Statistics, Census of Fatal Occupational Injuries.

³ Natural resources and mining industry includes: *agriculture, forestry, fishing and hunting and mining, quarrying, and oil and gas extraction*

FATAL WORK INJURIES FROM DIRECT EXPOSURE TO ELECTRICITY

Because direct and indirect exposure to electricity represent distinct types of injury events that potentially involve different populations and injury circumstances, it is useful to examine them separately in relation to some of their key characteristics.

As Table 4 indicates, 81% of the 417 workers who died as a result of direct exposure to electricity in 2012 – 2016 were wage and salary workers, while 19% were self-employed. All but four of the victims were male. Nearly three in five workers were 44 years of age or younger.

Occupation

The occupational groups for workers killed by direct exposure to electricity in 2012 – 2016 are shown in [Table 5](#). Nearly four of five victims were either workers in construction and extraction occupations or installation, maintenance, and repair occupations. Workers in building and grounds cleaning and maintenance, production, management, farming, fishing, and forestry, and transportation and material moving each accounted for less than 5% of the total deaths.

Table 4. Fatal Work Injuries from Direct Exposure to Electricity by Select Worker Characteristics, 2012 – 2016

Worker Characteristic	Fatalities	Percentage
All workers	417	100%
Wage and salary workers	338	81%
Self-employed	79	19%
Gender		
Men	413	99%
Women	4	1%
Age		
20 to 24 years	37	9%
25 to 34 years	94	23%
35 to 44 years	106	25%
45 to 54 years	102	24%
55 to 64 years	53	13%
65 years and over	20	5%
Unreported or unknown	5	1%

Source: Bureau of Labor Statistics, Census of Fatal Occupational Injuries.

Table 5. Fatal Work Injuries from Direct Exposure to Electricity by Occupation, 2012 – 2016

Occupational Group	Fatalities	Percentage
Construction and extraction occupations	197	47%
Installation, maintenance, and repair occupations	133	32%
Building and grounds cleaning and maintenance occupations	20	5%
Production occupations	19	5%
Management occupations	13	3%
Farming, fishing, and forestry occupations	7	2%
Transportation and material moving occupations	4	1%
Other occupations	24	6%

Source: Bureau of Labor Statistics, Census of Fatal Occupational Injuries.

Worker Activity

The vast majority of the victims (80%) were engaged in constructing, repairing, or cleaning activities when they were directly exposed to electricity, while one in ten were using or operating tools or machinery, as shown in Table 6. Other fatal injuries occurred while workers were engaged in physical activities (3%) or material handling operations (2%).

Table 6. Fatal Injuries from Direct Exposure to Electricity by Worker Activity, 2012 – 2016

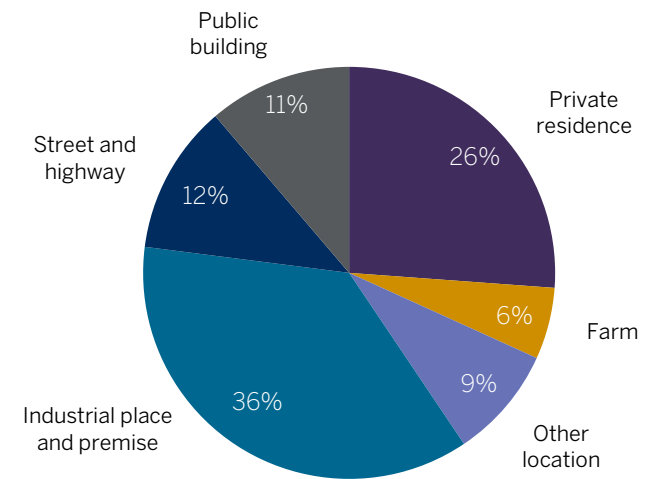
Worker activity	Fatalities	Percentage
Constructing, repairing, cleaning	334	80%
Using or operating tools, machinery	45	11%
Physical activities	11	3%
Materials handling operations	9	2%
Other activities	18	4%

Source: Bureau of Labor Statistics, Census of Fatal Occupational Injuries.

Location of Injury Event

Figure 6 shows that the highest number of fatal injuries from direct exposure to electricity in 2012 – 2016 occurred at industrial places or premises – 36% of the total. An additional one-quarter of the injuries occurred at private residences, with the remaining injuries occurring on a street or highway, at a public building, at farms, and 9% in other locations.

Figure 6. Fatal Work Injuries from Direct Exposure to Electricity by Location of Injury Event, 2012 – 2016



Source: Bureau of Labor Statistics, Census of Fatal Occupational Injuries.

Primary Source of Direct Exposure to Injury

The most frequent primary source of injury in fatal work injuries from direct exposure to electricity was machine, tool, and electrical parts, accounting for 71% of deaths, as shown in Table 7.

Machinery was the primary source of injury in another 14% of deaths, followed by containers, furniture, and fixtures, and tools, instruments, and equipment.

Table 7. Primary Source of Fatal Work Injuries from Direct Exposure to Electricity, 2012-2016

Primary source	Fatalities	Percentage
Parts and materials	297	71%
Machine, tool, and electric parts	295	71%
Machinery	57	14%
Agriculture and garden machinery	4	1%
Material and personnel handling machinery	7	2%
Containers, furniture, and fixtures	19	5%
Tools, instruments, and equipment	4	1%
Other source	40	10%
Total	417	100%

Source: Bureau of Labor Statistics, Census of Fatal Occupational Injuries.

FATAL WORK INJURIES FROM INDIRECT EXPOSURE TO ELECTRICITY

Indirect exposure to electricity resulted in the deaths of 308 workers in 2012 – 2016. To reiterate the coding guidelines for these deaths, indirect exposure generally refers to contact with something that is unintentionally electrified, such as standing in water that is conducting electricity or holding an object that comes into contact with a power line.

Table 8 shows that most victims from indirect exposure to electricity in 2012 – 2016 were wage and salary workers (77%). The 23% share of self-employed workers was somewhat higher than the 19% share of self-employed direct exposure victims. The table also indicates that a substantial share of the victims of indirect exposure to electricity were in younger age groups – 44% were 34 years of age or younger, compared to 32% of direct exposure victims in this age group. Approximately one-third (31%) of the indirect exposure victims were 45 years or older, a smaller share than the 42% in this age group of direct exposure victims.

Table 8. Fatal Injuries from Indirect Exposure to Electricity by Select Worker Characteristics, 2012 – 2016

Worker Characteristic	Fatalities	Percentage
All workers	308	100%
Wage and salary workers	236	77%
Self-employed	72	23%
Gender		
Men	304	99%
Women	4	1%
Age		
19 years or younger	2	1%
20 to 24 years	32	10%
25 to 34 years	101	33%
35 to 44 years	68	22%
45 to 54 years	60	19%
55 to 64 years	31	10%
65 years and over	7	2%
Unreported or unknown	7	2%

Source: Bureau of Labor Statistics, Census of Fatal Occupational Injuries.

Occupation

Table 9 shows the occupational groups of workers killed by indirect exposure to electricity in 2012 – 2016. Similar to victims of direct exposure to electricity, slightly less than half of those killed by indirect exposure to electricity (46%) worked in construction and extraction occupations. A substantial difference between the two types of exposure is that 21% of workers killed through indirect exposure to electricity were in building and grounds cleaning and maintenance occupations, compared to 5% in this group of direct exposure victims. A substantially smaller share of indirect exposure victims were in installation, maintenance, and repair occupations (9%), relative to direct exposure victims (32%). There were also higher shares of workers in transportation and material moving occupations (6%) and farming, fishing and forestry occupations (5%) who were fatally injured through indirect exposure to electricity than was the case with direct exposure to electricity.

Worker Activity

Workers who were fatally injured as a result of indirect exposure to electricity in 2012 – 2016 were most often engaged in construction, repairing, or cleaning activities (37%) or were using or operating tools or machinery (32%) at the time of injury, as shown in Table 10.

Table 9. Fatal Injuries from Indirect Exposure to Electricity by Occupational Groups, 2012 – 2016

Occupational Group	Fatalities	Percentage
Construction and extraction occupations	143	46%
Building and grounds cleaning and maintenance occupations	64	21%
Installation, maintenance, and repair occupations	27	9%
Transportation and material moving occupations	19	6%
Farming, fishing, and forestry occupations	15	5%
Management occupations	9	3%
Other occupations	31	10%

Source: Bureau of Labor Statistics, Census of Fatal Occupational Injuries.

Table 10. Fatal Injuries from Indirect Exposure to Electricity by Worker Activity, 2012 – 2016

Worker activity	Fatalities	Percentage
Constructing, repairing, cleaning	115	37%
Using or operating tools, machinery	99	32%
Materials handling operations	60	19%
Vehicular and transportation operations	18	6%
Physical activities	4	1%
Other activities	12	6%

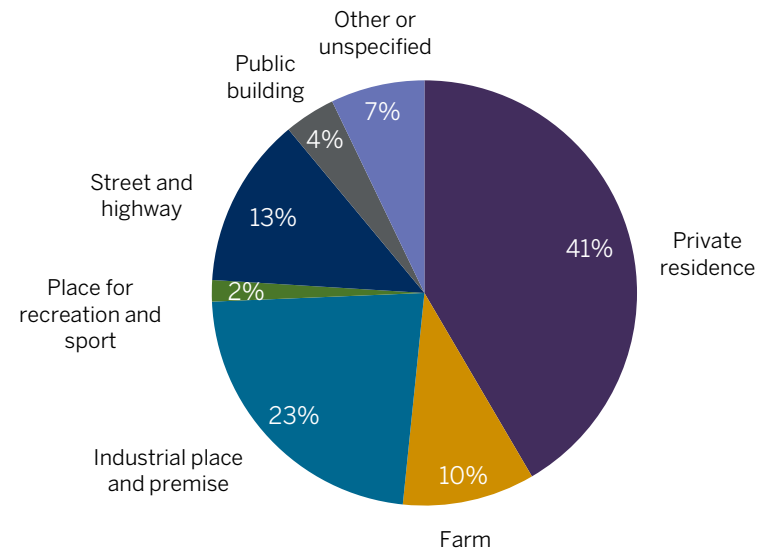
Source: Bureau of Labor Statistics, Census of Fatal Occupational Injuries.

Another 19% of workers were engaged in materials handling operations, while 6% were engaged in vehicular and transportation operations. These activities differ significantly from those of victims of direct exposure to electricity, 80% of which occurred while workers were constructing, repairing, or cleaning. It seems likely that a number of the activities at time of indirect exposure to electricity involved contact with power lines.

Location of Injury Event

Fatal injuries resulting from indirect exposure to electricity in 2012 – 2016 most frequently occurred at private residences (41%) or industrial places and premises (23%). Other injury locations included streets and highways (13%) and farms (10%), followed by public buildings (4%) and places for recreation and sport (2%). Again, these locations differ from the injury locations of fatalities from direct exposure to electricity, which more often occurred at industrial places and premises (36%) and public buildings (11%), and less often at private residences (26%) or farms (6%).

Figure 7. Fatal Work Injuries from Indirect Exposure to Electricity by Location of Injury Event, 2012 – 2016



Source: Bureau of Labor Statistics, Census of Fatal Occupational Injuries.

Primary Source of Indirect Exposure to Electricity

Table 11 shows that tools, instruments, and equipment (35%) were the most common primary source of injury in fatal injuries from indirect exposure to electricity, with ladders accounting for 14%. Vehicles were the primary source of 22% of the deaths, most of which were motorized freight hauling and utility trucks (19%). Other leading primary sources of indirect exposure deaths included machinery (14%), parts and materials (14%), structures and surfaces (6%), and trees, logs, or limbs (4%). Material and personnel handling machinery (7%) and construction, logging, and mining machinery (2%) were most often involved in machinery-related exposures.

Table 11. Primary Source of Fatal Work Injuries from Indirect Exposure to Electricity, 2012 – 2016

Primary source	Fatalities	Percentage
Tools, instruments, and equipment	109	35%
Ladders	44	14%
Vehicles	67	22%
Highway vehicles, motorized	60	19%
Trucks--motorized freight hauling and utility	58	19%
Multi-purpose highway vehicles	2	1%
Off-road and industrial vehicles--powered	3	1%
Tractors, PTOs	2	1%
Machinery	42	14%
Material and personnel handling machinery	21	7%
Construction, logging, and mining machinery	7	2%
Parts and materials	42	14%
Machine, tool, and electric parts	3	1%
Structures and surfaces	18	6%
Structures other than buildings	10	3%
Persons, plants, animals, and minerals	12	4%
Trees, logs, limbs	12	4%
Containers, furniture, and fixtures	4	1%
Total	308	100%

Source: Bureau of Labor Statistics, Census of Fatal Occupational Injuries.

CONCLUSION

Rates of fatal electrical injury showed a clear downward trend between 2007 and 2016, a hopeful indication of progress in the adoption of workplace electrical safety practices. Still, fatal electrical injuries were relatively stable between 2012 and 2016, and the fact remains that these injuries are preventable. Workers in construction and extraction occupations and installation, maintenance, and repair occupations are most at risk for electrical injury, but workers in other occupations also fall victim to electrical hazards, including production workers, transportation and material moving workers, managers, and others.

It is important that prevention efforts address the specific electrical hazards that workers are likely to face in their work environments and in the tasks they perform. Research into electrical deaths in the construction industry has shown that many fatalities occurred while victims worked on or around equipment or wiring that was needlessly energized, and emphasized that the deaths could have been prevented by turning off the power or using appropriate personal protective equipment [3]. The same research also concluded that fatal injuries involving power tools, portable lighting, and extensions cords and wires could be prevented through inspections [4]. Incidents involving workers who are not electrical workers suggest the need for broad training in electrical safety and hazard awareness.

As noted, the proportion of fatal electrical injuries experienced by self-employed workers is substantially higher than the share of self-employed workers in the workforce. There are some differences between the self-employed population represented in the Census of Fatal Occupational Injuries (CFOI) and that of the Current Population Survey which complicate comparisons, inasmuch as CFOI includes unpaid family members and some owners of incorporated businesses under the self-employed category. However, self-employed workers have been found to experience higher rates of injury than wage and salary workers in other research [5], so the findings reported here are not unusual, and it underscores a need for special efforts to promote electrical safety training and practice among self-employed workers. Workplace fatalities cause pain and hardship for family members and traumatize co-workers. In order to prevent electrical injuries, workplaces should ensure that employees are able to recognize electrical hazards, that hazards are adequately controlled, and that electrical safety practices are rigorously followed.

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: www.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: <https://www.osha.gov/SLTC/electrical/>.

TECHNICAL NOTES

Fatal electrical injury rates by occupation were calculated using employment denominators for annual civilian labor force totals available through the U.S. Bureau of Labor Force Statistics Current Population Survey, available at: <https://www.bls.gov/cps/cpsaat01.htm>.

Fatal electrical injury rates by industry were calculated using employment denominators by North American Industry Classification System (NAICS) code, available at: https://www.bls.gov/iag/tgs/iag_index_naics.htm.

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