

Trends in Workplace Electrical Injury

Comprehensive data on work-related electrical injuries is essential for prevention efforts. The Bureau of Labor Statistics, U.S. Department of Labor, maintains separate databases for fatal and non-fatal work-related injuries, and these provide information about the types of workers who have experienced injury from electrical hazards, the work activities when injury occurred, the occupations and industries of injured workers, demographic information on injury victims, and other key descriptors that are useful in identifying injury trends and areas of concern. As further described below, fatality data is collected through the Census of Fatal Occupational Injuries, a surveillance system that draws upon multiple information sources. Data on non-fatal injuries is available through the Survey of Occupational Injuries and Illnesses (SOII), which collects data from a sample of employers each year, utilizing employer records of occupational injury and illness to generate injury and illness estimates (U.S. Bureau of Labor Statistics 2009). Injuries which must be recorded by employers include injuries resulting in days away from work, restricted work or transfer to another job, medical treatment beyond first aid, loss of consciousness, or significant injury otherwise diagnosed by a physician or other licensed health care professional.

We utilized these databases to compile data on electrical injury over time, focusing our analysis on injuries over the most recent 10-year period for which data was available. It is important to note in reviewing this information that workers in particular occupations, including those who commonly work with electrical hazards, may be employed in a variety of different industries. While, the construction industry employs the highest number of electricians, for instance, electricians are also found in service, manufacturing, transportation and public utilities, and other industries. In addition, as the following data will show, those who experience electrical injury cover an array of occupations and industries.

Fatal Work-Related Electrical Injuries, 1992–2013

Data on fatal electrical injuries is available from the Census of Fatal Occupational Injuries (CFOI), introduced by the Bureau of Labor Statistics in 1992 in order to create a comprehensive count of fatal occupational injuries in the United States through the use of multiple source documents. CFOI collects information of fatal work injuries in each state from multiple source documents, including death certificates, workers' compensation records, data from federal agencies, and newspaper reports, and used them to assemble a comprehensive fatal injury profile of workers. The use of multiple information sources is credited with the creation of a more comprehensive injury database than would be available through a single data source, and CFOI for this reason has been endorsed by both the National Safety Council and the National Center for Health Statistics as the data source for fatal worker injuries (U.S. Bureau of Labor Statistics 2009).

Between 1992 through 2013, CFOI recorded a total of 5587 fatal electrical injuries, an average of 254 fatal electrical injuries each year. Of these injuries, 5527 (99 % of the total) were reported to be electrocutions, while less than one percent of the fatalities were due to burns. The sum of electrocutions and burns is slightly less than the total number of electrical injuries because some information for some injuries may not be reported or because the data does not meet publication criteria. It should be noted that the data for 2013 is preliminary data and the total number of injuries could increase if additional fatalities are reported before the data is finalized.

As Fig. 1 indicates, the number of fatal injuries due to electrical events has fallen steadily and quite consistently over the past two decades. From 1992 through 1996, the initial 5 years of the CFOI program, there were an average of 327 fatal electrical injuries each year. In the most recent 5-year period, from 2009 through 2013, the number had fallen to an average of 161 fatal electrical injuries per year, a 51 %

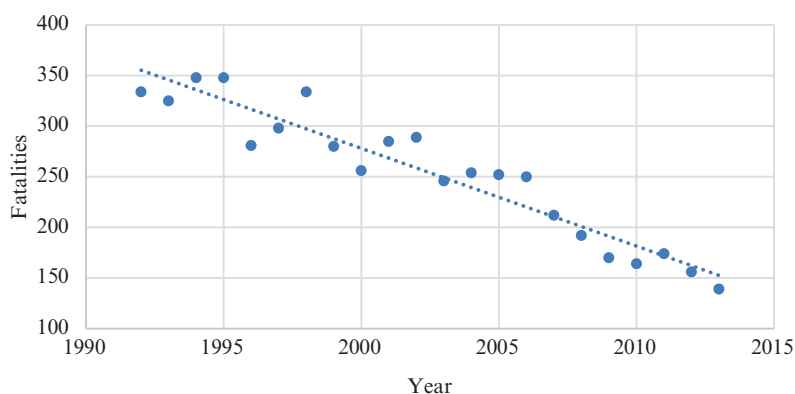


Fig. 1 Fatal work-related electrical injuries in the United States, 1992–2013

decrease between the initial and latest reporting periods. CFOI data include a number of key characteristics that provide additional detail on the injured workers, the injury events, and the injuries. Because occasional changes in the coding system can complicate comparisons over the entire course of CFOI reporting, we will confine a more detailed analysis to the years from 2004 through 2013, the most recent 10-year period of CFOI data.

One concerning trend in the electrical fatality data over the entire CFOI reporting period is that the share of fatal electrical injuries experienced by Hispanic workers is higher in the most recent years of reporting than it was the initial years of reporting. Of the 1636 electrical fatalities that were recorded from 1992 through 1996, 178 (11 %) were experienced by Hispanic workers. In the most recent 5-years of CFOI data, from 2009 through 2013, the Hispanic share of electrical fatalities doubled, to 22 %, of the total (175 of 803 fatalities). The Hispanic share of electrical fatalities is also disproportionately high relative to the percentage of the U.S. labor force that is Hispanic, which stood at 16 % in 2012 (U.S. Bureau of Labor Statistics 2013). This data clearly suggests that special efforts may be needed to target electrical safety training to Hispanic workers.

Analysis of Electrical Fatalities, 2004–2013

In the 10-year period from 2004 through 2013, CFOI recorded 1962 fatal electrical injuries. The data show a clear decline in electrical injuries over the 10-year period, with 1159 fatalities taking place in the first half of the period (2004–2008) and 803 in the second half (2009–2013), a 31 % decrease. The downward trend was consistent, with drops occurring from 1 year to the next in 8 of the 10 years. As with the complete compilation of CFOI data, nearly all of the fatal injuries were electrocutions (99 %), with 19 of the injuries (1 %) classified as burns.

Industry and Occupation

Information is available to identify the leading industries and occupations in which electrical fatalities occur. The total number of work-related electrical fatalities from 2004 to 2013 is broken down by industry in Fig. 2.

As might be anticipated, the vast majority of electrical fatalities took place in the construction industry, with a total of 923 fatalities. There is an evident downward trend in the number of electrical fatalities in construction over the period observed, from 122 fatalities in 2004 to 71 fatalities in 2013, with fatalities in 7 of the 10 years lower than the year previous.

The second highest share of electrical fatalities by industry was in professional and business services, with 258 fatalities. In general, there was considerable fluctuation in the number of fatalities on a year to year basis, with no clear

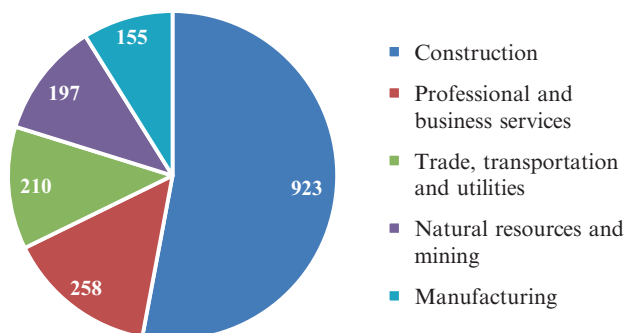


Fig. 2 Work-related electrical fatalities, by industry, 2004–2013, total

downward trend. The trade, transportation, and utilities industry recorded the third highest electrical fatality total, with 210 fatalities, and the number of fatalities again showed a general decline. The fourth highest injury total was in the natural resources and mining industry, with 197 fatal electrical injuries, with considerable year-to-year fluctuation, followed by the manufacturing industry, with 155 fatalities. Fatalities in manufacturing showed a general decline, with some year-to-year fluctuation. These trends are illustrated in Fig. 3.

It is also useful to look at injury data by occupation, since each industry encompasses a number of employees performing different work tasks. The total number of work-related electrical fatalities from 2004 to 2013 is broken down by occupation in Fig. 4.

Workers employed in construction and extraction occupations recorded the highest number of fatal electrical injuries from 2004 through 2013, with 897, with a clear downward trend over the course of the 10-year period. The second highest fatal injury total was in installation, maintenance, and repair occupations, with 464 injuries, and there was a general decline in yearly injury totals in this occupational category. Employees in building and grounds cleaning and maintenance occupations received the third highest total of fatal electrical injuries, with 207 injuries, with yearly totals showing slight fluctuations from year to year. The other occupations with the highest electrical injury totals were transportation and material moving occupations, with 108 fatalities, production occupations, with 104 fatalities, and management occupations, with 101 fatalities. Fatalities among transportation and material moving occupations showed a consistent decline from 2004 through 2013, but fatalities in production and management occupations were more variable. These trends are illustrated in Fig. 5.

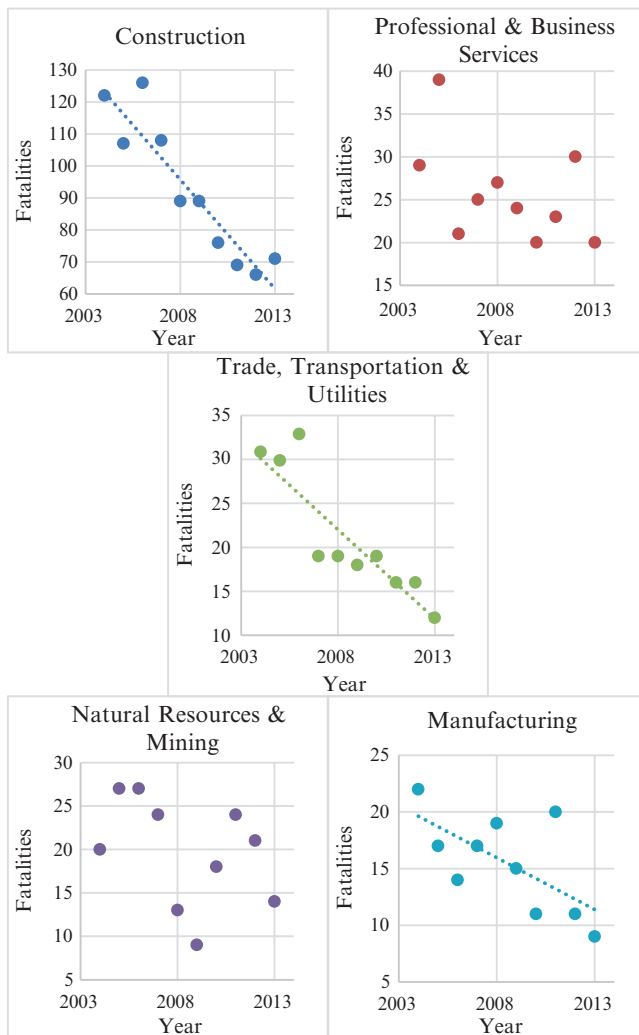


Fig. 3 Work-related electrical fatalities trends by industry, 2004–2013

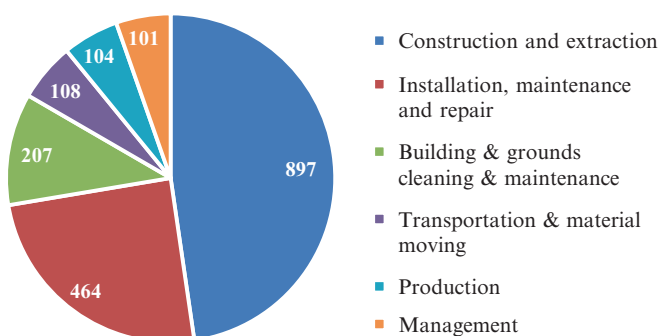


Fig. 4 Work-related electrical fatalities, by occupation, 2004–2013, total

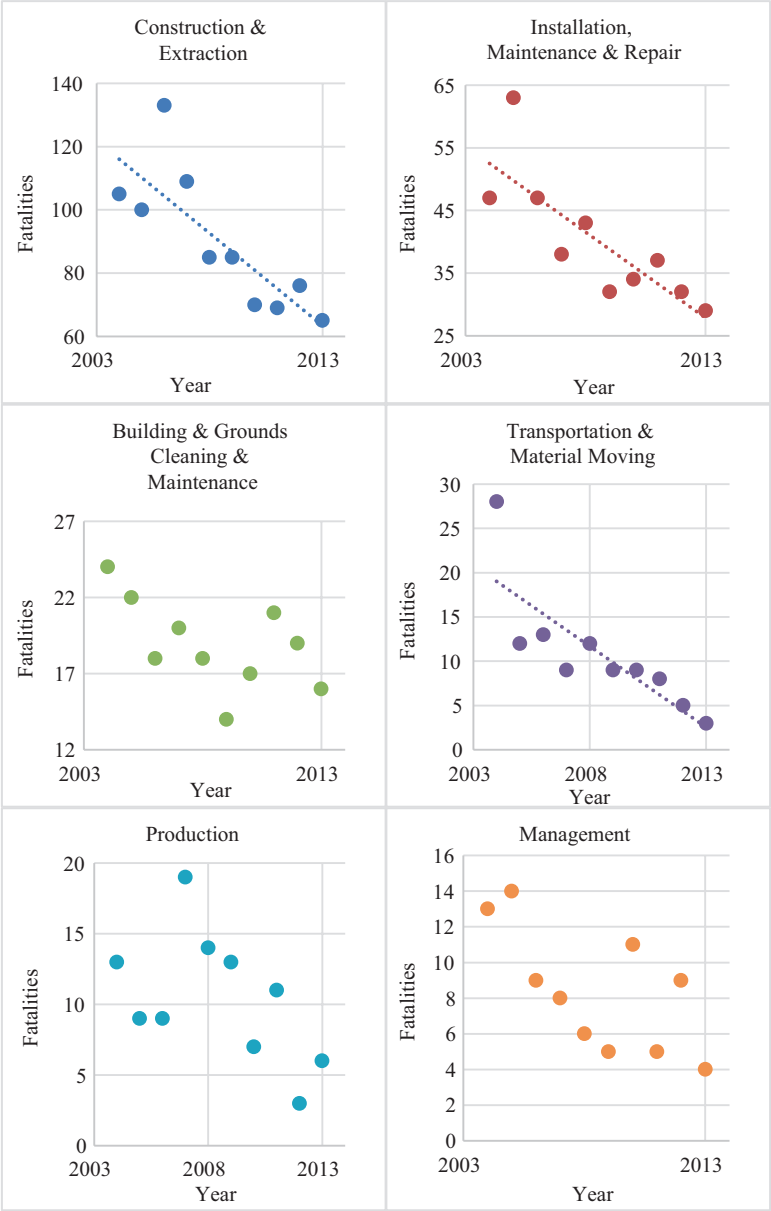


Fig. 5 Work-related electrical fatalities trends by occupation, 2004–2013

Work Activity While Injured

More than three in five of the fatal electrical injuries (66%) occurred while the worker was engaged in a constructing, repairing, or cleaning activity, and one-fifth occurred while the worker was using or operating tools or machinery. Workers were engaged in materials handling operations in 8% of the injury events. Other worker activities included vehicular and transport operations (3%) and physical activities (3%). This breakdown of total fatalities by worker activity for the years 2004–2013 is presented in Fig. 6 below.

The number of fatal events that involved constructing, repairing, or cleaning dropped by 31% between the 2004–2008 period and the 2009–2013 period, and fatal events that involved using or operating tools, machinery showed a similar decline (32%). There was also a less robust decline in events involving materials handling operations, with 10% fewer events recorded between the respective 5-year periods.

Primary Source

In more than two of five of the fatal electrical injuries (43%), the primary source of the injury event was identified as machine, tool, electric parts, with machinery serving as the primary source of the injury in 17% of the events, 6% of which involved material handling machinery. Tools, instruments, equipment were the source of 15% of fatal injuries, and trucks were the source of 5% of the injuries. The number of fatal electrical injuries involving tools, instruments, equipment between 2009 and 2013 was 38% lower than it was between 2004 and 2008, while fatal injuries involving machinery fell by 33%, and injuries in which machine, tool, electric parts fell by 25%. Fatal injuries in which trucks were the primary source of injury fell by 14%, although these represented a comparatively small portion of the electrical fatality total.

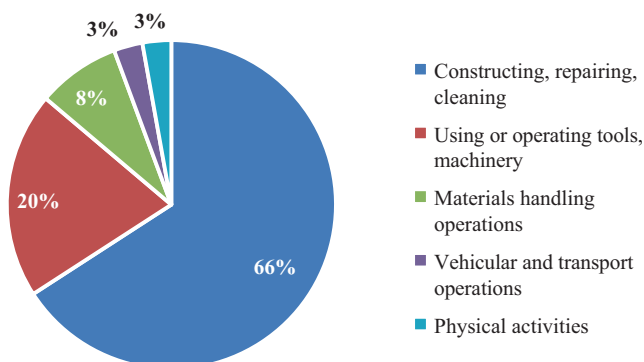


Fig. 6 Work-related electrical fatalities, by worker activity, 2004–2013, total

Worker Characteristics

The vast majority of workers who suffered fatal electrical injury were males, accounting for 1938 of 1962 fatalities (99 %). Workers aged 25–34 experienced the greatest share of fatal electrical injuries (28 %), while 25 % of the fatally injured workers were in the 35–44 age group, with another 22 % in the 45–54 age group. There were 271 electrical fatalities of workers who were 24 years of age and younger, 14 % of the total, while workers aged 55–64 accounted for 8 % of the injuries and workers 65 or older for 3 % of injuries.

Wage and salary workers comprised 82 % of the fatally injured workers, with self-employed workers representing the remaining 18 % of the victims. Research has shown that self-employed workers are at higher risk of fatal injury than wage and salary workers (Pegula 2004). In the time period in this analysis, the total number of fatal electrical injuries experienced by wage and salary workers between 2009 and 2013 was 33 % lower than it was between 2004 and 2008, while there was a less substantial drop in the number of fatalities in the self-employed group, 20 %.

Additional Injury Event Information

Within the broad injury event classification, CFOI provides a more detailed breakdown of injury events that provide additional differentiation between electrical injury events. For data prior to 2011, the broad injury event classification, “Contact with electric current,” includes more detailed codes that distinguish between different forms of contact: “Contact with electric current of machine, tool, appliance, or light fixture,” “Contact with wiring, transformers, or other electrical components,” “Contact with overhead power lines,” “Contact with underground buried power lines,” and “Struck by lightning.” There are also codes for contact with electric current that is unspecified or not elsewhere classified.

For data beginning in reference year 2011, a new coding system (the Occupational Injury and Illness Classification System, version 2.01) introduces a new coding structure. A new code for electrical injury is designated “Exposure to electricity,” and this distinguishes between “Direct exposure to electricity” and “Indirect exposure to electricity.” When sufficient information is available, events can be further distinguished as “Direct exposure to electricity, 220 V or less,” “Direct exposure to electricity, greater than 220 V,” “Indirect exposure to electricity, 220 V or less,” and “Indirect exposure to electricity, greater than 220 V.” Direct exposure to electricity is categorized as direct contact between the power source and the person, as when a person touches a live wire or comes into direct contact with an electric arc. Indirect exposure to electricity refers to instances when a conductive material touches a source of electricity, such as when a ladder touches a power line or electricity is transferred to a worker through a wet surface.

Fatal Electrical Injuries, 2004–2010

Over the 7 years from 2004 through 2010, CFOI data indicate that there were 1494 fatal injuries caused by contact with electric current. Almost half of these injuries (680 injuries, 46 %) involved contact with overhead power lines. The other leading causes of fatal injuries were “contact with wiring, transformers, or other electrical components,” with 430 injuries (29 %) and “contact with electric current of a machine, tool, appliance, or light fixture,” with 268 injuries (18 %). There were 12 fatalities due to contact with underground power lines. These injuries and 39 injuries that were not elsewhere classified or unspecified are not analyzed further. The breakdown by injury event of the total fatal electrical injuries for the period 2004–2010 is shown in Fig. 7.

Industry and Occupation: Contact with Overhead Power Lines

By occupation, workers who worked in construction and extraction occupations experienced the highest number of fatal injuries involving contact with overhead power lines, with 298 fatalities, 44 % of the total. Workers in installation, maintenance, and repair occupations experienced 125 fatalities (18 %), while building and grounds cleaning and maintenance occupations accounted for 111 fatalities (16 %), and transportation and material moving occupations for 59 fatalities (9 %). Other occupations included workers in farming, forestry and fishing, with 21 fatalities (3 %) and management occupations, with 16 fatalities (2 %). This breakdown is illustrated in Fig. 8.

By industry, 332 of the 680 fatal injuries caused by contact with overhead power lines were in the construction industry, 49 % of the total, and 249 of these injuries were experience by workers in service providing industries (37 %). Within the service

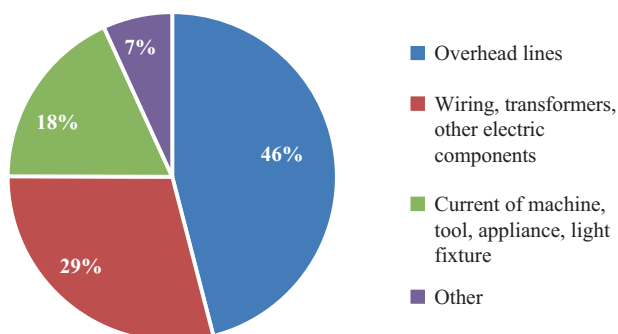


Fig. 7 Fatal electrical injuries by injury event, 2004–2010

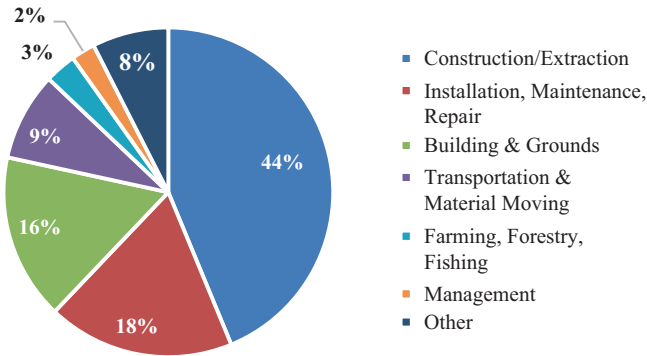


Fig. 8 Fatal electrical injury from contact with power lines by occupation, 2004–2010

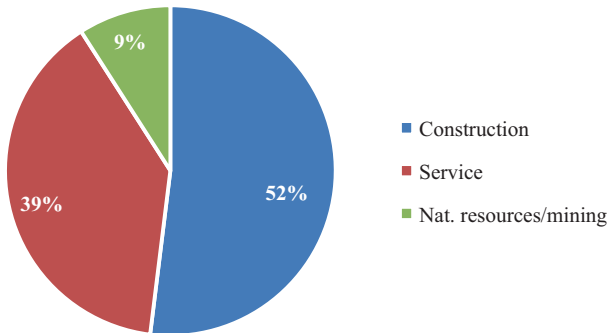


Fig. 9 Fatal electrical injury from contact with power lines by industry, 2004–2010

providing industries, workers in professional and business services accounted for 128 fatalities involving contact with overhead power lines, and workers in trades, transportation, and utilities experienced 82 fatalities. The natural resources and mining industry accounted for 58 fatalities, 9% of the total. This breakdown is illustrated in Fig. 9.

Industry and Occupation: Contact with Wiring, Transformers, or Other Electrical Components

Workers in construction and extraction occupations also recorded the highest number of fatalities due to contact with wiring, transformers, or other electrical components, with 249 of the 430 fatalities (58%) in this event category. Installation, maintenance, and repair occupations were the other leading occupational group, with 95 fatalities, 22% of the total. Workers in management occupations and production occupations each experienced 13 fatalities, together accounting for 6% of fatalities caused by contact with wiring, transformers, or other electrical components. This is shown in Fig. 10.

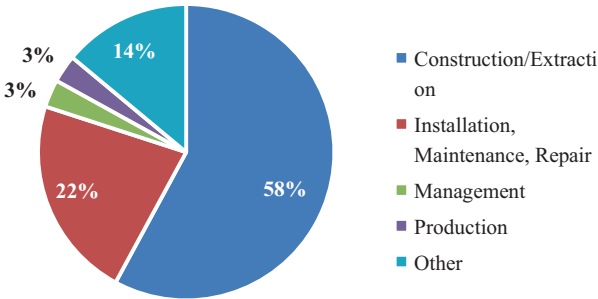
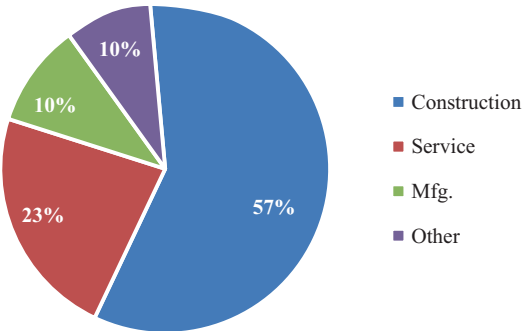


Fig. 10 Fatal electrical injury from contact with wiring, transformers, electrical components by occupation, 2004–2010

Fig. 11 Fatal electrical injury from contact with wiring, transformers, electrical components by industry, 2004–2010



By industry, 247 of the 430 fatalities (57 %) occurred in the construction industry, 99 (23 %) were in service providing industries, and 44 (10 %) were in the manufacturing industry. This breakdown is illustrated in Fig. 11. Within the service providing industries, 48 of the 99 injuries due to contact with wiring, transformers, or other electrical components were in trade, transportation, and utilities industries, with the remaining 51 fatalities in a variety of other service industries.

Contact with Electric Current of Machine, Tool, Appliance, or Light Fixture

Relative to the other electrical injury event categories, there were proportionally fewer workers in construction and excavation occupations who were fatally injured due to contact with electric current of machine, tool, appliance, or light fixture, with

Fig. 12 Fatal electrical injury from contact with machine, tool, appliance, light fixture by occupation, 2004–2010

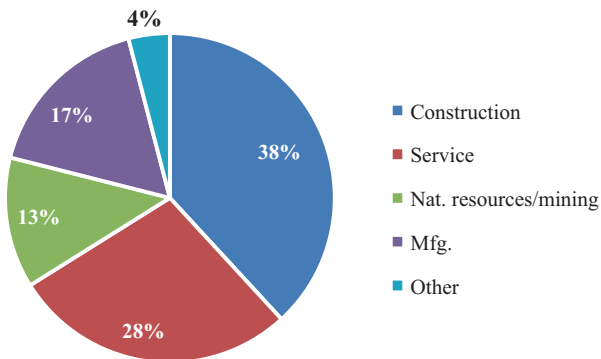
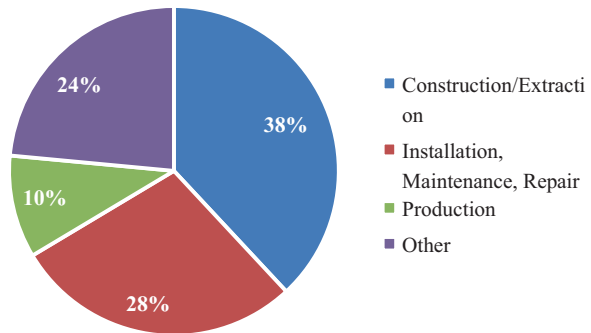


Fig. 13 Fatal electrical injury from contact with machine, tool, appliance, light fixture by industry, 2004–2010

102 injuries, 38 % of the total for this event. Workers in installation, maintenance, and repair occupations accounted for 76 fatal injuries (28 %) and workers in production occupations for another 27 fatal injuries, 10 %. Almost one-quarter of the fatal injuries (63 injuries, 24 %) were divided among a variety of other occupations. This is shown in Fig. 12.

By industry, workers in the construction industry recorded 101 fatal injuries resulting from contact with electric current of machine, tool, appliance, or light fixture (38 %), and workers in service providing industries suffered 74 fatal injuries (28 %), with 45 injuries in the manufacturing industry sector (17 %) and 34 injuries (13 %) of workers in natural resources and mining industries. This breakdown is illustrated in Fig. 13. Of the 74 fatalities in service providing industries, 18 were in trade, transportation, and utilities sector, with the majority of service sector fatalities taking place in a number of other service providing industries.

Fatal Electrical Injuries, 2011–2013

CFOI data for the years from 2011 through 2013 show that there were 469 fatal injuries due to exposure to electricity over this 3-year period. Of these, 255 of the injuries (54 %) resulted from direct exposure to electricity, and 201 injuries (43 %) resulted from indirect exposure to electricity. An additional 13 fatalities (3 %) were not included in either category, shown in Fig. 14.

Information on voltage was available for 422 electrical fatalities, 90 % of the total. As would be expected, the majority of these fatalities involved exposure to electricity of greater than 220 V — 331 fatalities, representing 78 % of the fatalities with known voltage (71 % of all electrical fatalities in this period). However, the CFOI data indicate that exposure to electricity at voltages of 220 V or less can also be fatal, with 91 fatalities at this level over the 3 years, 22 % of fatalities with known voltage and 19 % of all electrical fatalities over this period, shown in Fig. 15. The majority of the fatal injuries at 220 V or less involved direct exposure to electricity (70 of 91, 77 %), and these represented more than one-quarter (27 %) of the 255 fatalities due to direct exposure to electricity.

Fig. 14 Fatal electrical injury events, 2011–2013

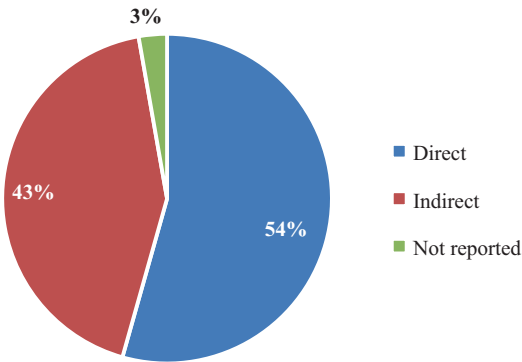
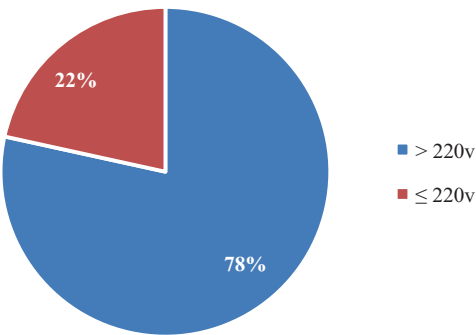


Fig. 15 Fatal electrical injury events by voltage, known voltage, 2011–2013



Work Activity While Injured

The vast majority of workers who were fatally injured through direct exposure to electricity were engaged in a constructing, repairing or cleaning activity, accounting for 195 of the 255 injuries (76%). Another 15 % of the fatal injuries resulting from direct exposure to electricity were using or operating tools or machinery (38 fatal injuries). Constructing, repairing, or cleaning was also the leading activity for workers who were fatally injured through indirect exposure to electricity, but with a considerably smaller share of injuries—41 % (82 of 201 fatal injuries). Workers were using or operating tools or machinery in another 31 % of fatal injuries from indirect exposure to electricity (63 fatal injuries), while 40 workers were fatally injured through indirect exposure to electricity while engaged in materials handling (20 %). This is illustrated in Fig. 16.

Industry and Occupation

Nearly half (47 %) of the workers whose fatal injuries resulted from direct exposure to electricity were in construction and extraction occupations (119 of 255 fatal injuries), with 28 % from installation, maintenance, and repair occupations (72 fatal injuries), and 7 % from building and grounds cleaning and maintenance occupations (17 fatal injuries). Workers in construction and extraction occupations accounted for 43 % of the injuries that resulted from indirect exposure to electricity (86 of 201 fatal injuries), followed by workers in buildings and grounds cleaning and maintenance, with 39 injuries (19%), farming, fishing, and forestry occupations, with 21

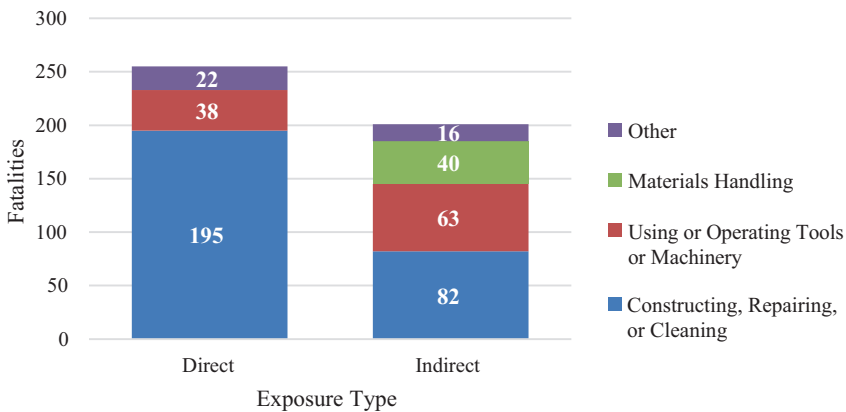


Fig. 16 Fatal electrical injury events by work activity

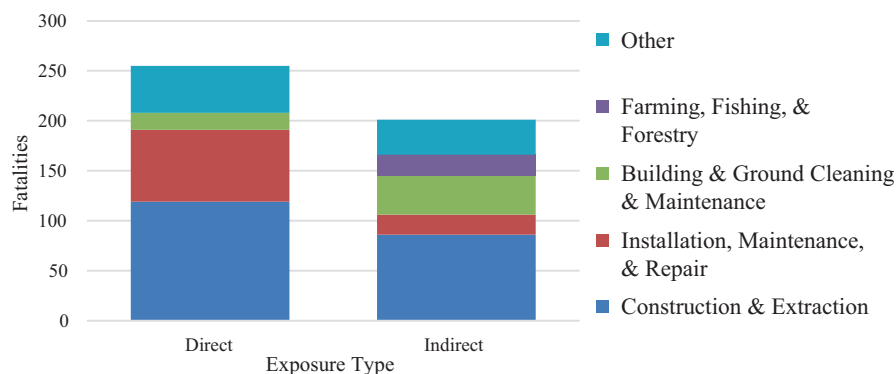


Fig. 17 Direct and indirect fatal exposure to electricity, by occupation, 2011–2013

fatal injuries (10 %), and installation, maintenance, and repair occupations, with 20 fatal injuries (10 %). This is shown in Fig. 17.

By industry, 45 % of the workers fatally injured from direct exposure to electricity were in the construction industry (116 of 255 fatal injuries), with 28 % of workers in service providing industries (72 fatal injuries), workers in the natural resources and mining industry with 11 % (28 fatal injuries), and manufacturing industry workers, also with 11 % and 28 fatal injuries.

Of the fatal injuries in the service providing industries, 27 workers were in professional and business services and 26 workers were in trade, transportation, and utilities. The construction industry also accounted for the highest number of fatal injuries through indirect exposure to electricity, with 41 % (82 of 201 fatal injuries), followed by service providing industries (36 %, 72 fatal injuries), and natural resources and mining with 15 % (31 fatal injuries). Workers in professional and business services accounted for the vast majority of fatalities in the service providing industries (46 of 72 fatalities). Workers in trade, transportation, and utilities accounted for another 16 of the service sector fatalities from indirect exposure to electricity. This is illustrated in Fig. 18.

Non-fatal Workplace Electrical Injuries, 2003–2012

In addition to maintaining data on fatal work injuries through the Census of Fatal Occupational Injuries, the U.S. Bureau of Labor Statistics also maintains data on non-fatal occupational injuries. This section will focus on the most recent 10-year period for which injury data is available, which for non-fatal injuries is the period from 2003 through 2012. We will note that, as with the fatal injury data, a new coding system was introduced beginning in reference year 2011, the Occupational Injury Illness and Injury Classification System (OIICS) version 2.01. Among the changes, the primary event

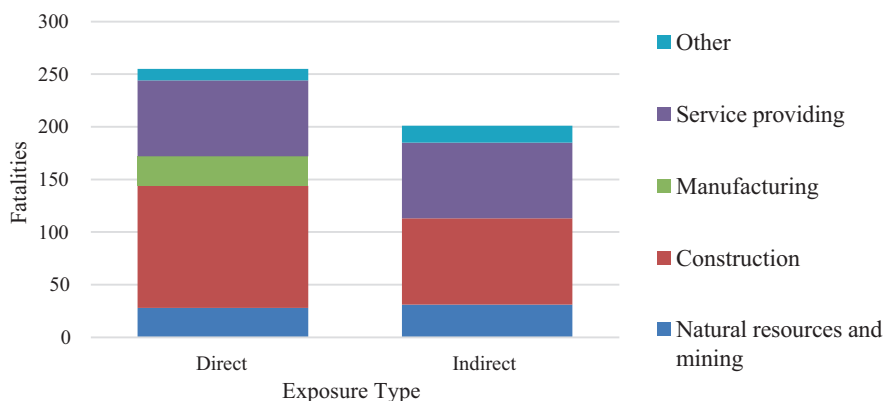


Fig. 18 Direct and indirect fatal exposure to electricity, by industry, 2011–2013

code for electrical injury events changed from “contact with electric current” to “exposure to electricity,” with additional code changes for classifying electrical injury events at greater levels of detail, as already indicated in the analysis of electrical fatality data. In light of these changes, we will include data on electrical injuries for 2011 and 2012 since these capture the most recent electrical injury experiences, but will separately analyze 2003 through 2010 data for much of the analysis.

Electrical Injuries 2003–2010: Contact with Electrical Current

In the 8 years from 2003 through 2010, there were 20,150 non-fatal injuries to workers resulting from contact with electric current. Although male workers experienced the vast majority of these injuries, the gender disparity was less pronounced than it was in the case of fatal injuries, with males accounting for 81 % of non-fatal injuries and female workers for 19 %. Workers in the 25–34 age group experienced the highest proportion of injuries, with 27 % of the total, while 26 % of injuries were experienced by workers in the 35–44 age group, 22 % by workers in the 45–54 age group, 6 % by workers in the 55–64 age group, and 1 % by workers who were 65 years of age or older. Workers in younger age groups accounted for nearly one-fifth of non-fatal injuries, with 13 % of the injuries experienced by workers aged 20–24 and 5 % of injuries by workers who were 16–19 years of age. This is illustrated in Fig. 19.

Industry and Occupation, 2003–2010

By occupation, workers in construction and extractive occupations experienced the greatest share of non-fatal electrical injuries over the 2003 through 2010 period, with 30 % of the total. Results by occupation appear in Fig. 20 below. Workers in

Fig. 19 Non-fatal electrical injuries, contact with electric current, 2003–2010

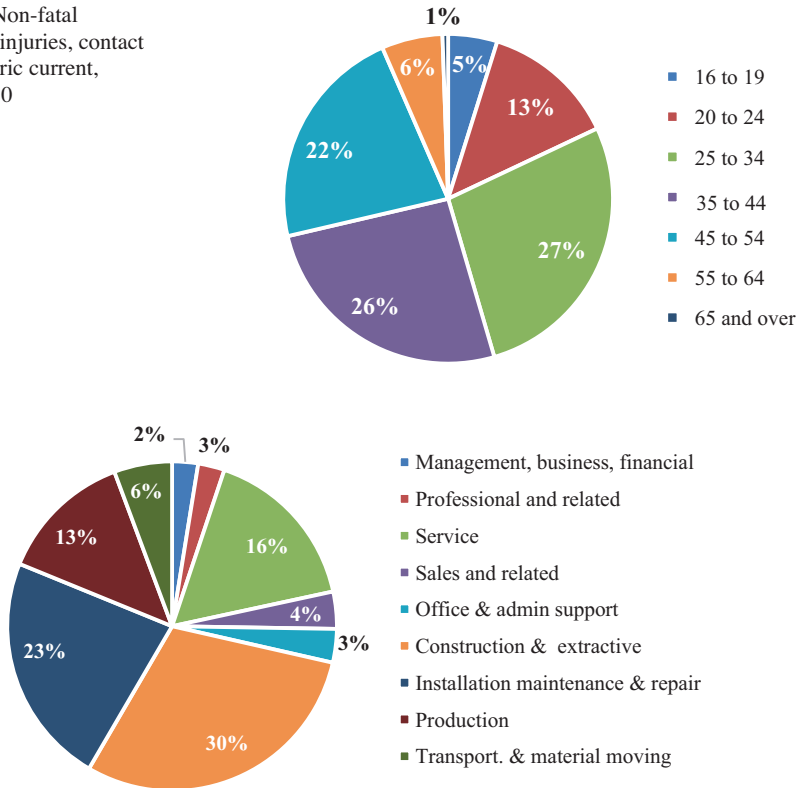


Fig. 20 Non-fatal electrical injuries, 2003–2010, by occupation

installation, maintenance, and repair occupations had nearly a quarter of the injuries (23%), with another 16% of the injuries among workers in service occupations, 13% among production occupations, and 6% among workers in transportation and material moving occupations. Workers not typically associated with electrical injury accounted for the remaining injuries, including workers in sales and related occupations (4%), workers in management, business, and financial occupations (3%), workers in professional and related occupations (3%), and workers in office and administrative support occupations (3%).

By industry, the construction industry contributed the greatest share of non-fatal electrical injuries from 2003 through 2010, with 26% of the total. Another 16% of injuries were in the trade, transportation, and utilities sector, with 7% of these in retail trade, 4% in wholesale trade, and 4% in utilities, while the manufacturing industry accounted for 15% of injuries. Other service industry sectors with notable shares of electrical injury included leisure and hospitality (8% of injuries), accommodation and food services (7% of injuries), education and health services (6% of injuries), and administrative and support and waste management and remediation services (4%). The major results by industry are presented in Fig. 21.

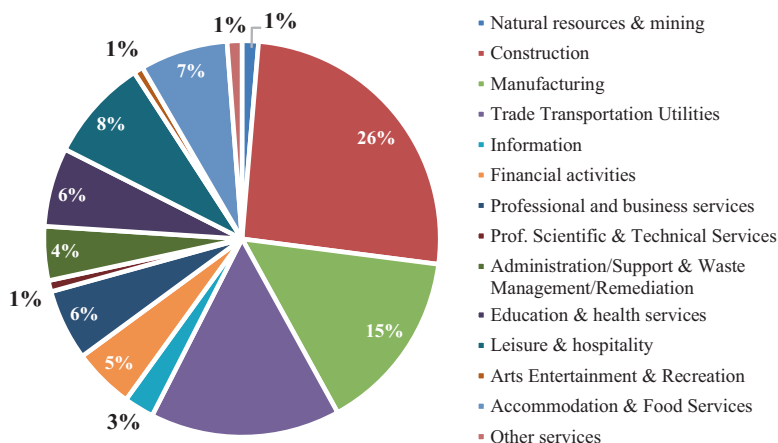


Fig. 21 Non-fatal electrical injuries, 2003–2010, by industry

Injury Trends, 2003–2010

In order to get a sense of changes in the non-fatal injuries within the 2003–2010 timeframe, we compared injury totals for the 3 years at the start of this period (2003 through 2005) to the totals over the 3 years at the end of the period (2008 through 2010) along a range of descriptive categories.

Overall, total non-fatal electrical injuries between 2008 through 2010 were 12 % lower than the total between 2003 and 2005. Among males, there were 15 % fewer injuries, while injuries among female workers rose 1 %. By age, there were 32 % fewer injuries among 16–19 and the 35–44 year age groups, and there were 14 % fewer injuries among workers aged 45–54. The number of injuries increased by 5 % among workers aged 55–64 years and by 28 % among workers aged 45–54. There was no change in the 16–19 year age group. Because data was not available for 3 years in the 65 years of age and over age group, no comparisons were made. This data can be seen in Table 1.

The greatest decreases in occupational categories were among production occupations, with a 48 % reduction in total injuries, transportation and material moving occupations, with a 44 % decrease, sales and related occupations, with a 21 % decrease, and construction and extraction occupations, with a 19 % decrease. Total injuries were 4 % higher for workers in installation, maintenance, and repair occupations, 5 % higher for professional and related occupations, 12 % for service occupations, and 42 % higher for office and administrative support occupations (Table 2).

By industry sector, injuries were 65 % lower in wholesale trade, 48 % lower in administrative and support and waste management and remediation services, 45 % lower in retail trade, 41 % lower in trade transportation and utilities, 43 % lower in

Table 1 Change in non-fatal electrical injuries, 2003–2005 vs. 2008–2010

	2003–2005	2008–2010	Pct. change
Total	7990	7000	–12 %
Male	6510	5540	–15 %
Female	1410	1420	+1 %
Age			
16–19	320	320	–
20–24	950	650	–32 %
25–34	2370	2030	–14 %
35–44	2230	1510	–32 %
45–54	1500	1920	+28 %
55–64	420	440	+5 %

Table 2 Change in non-fatal electrical injuries, 2003–2005 vs. 2008–2010, by occupation

	2003–2005	2008–2010	Pct. change
Professional and related	190	200	+5 %
Service	1250	1400	+12 %
Sales and related	290	230	–21 %
Office and administrative support	190	270	+42 %
Construction and extractive	2370	1920	–19 %
Installation maintenance and repair	1820	1890	+4 %
Production	1220	640	–48 %
Transportation and material moving	550	310	–44 %

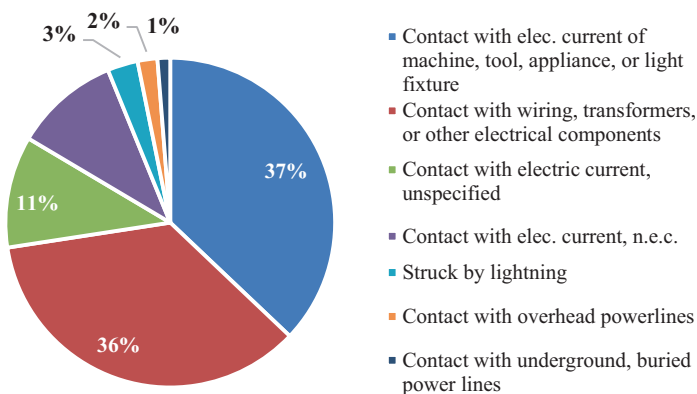
natural resources and mining, 38 % lower in health care and social assistance, 37 % lower in manufacturing, and 10 % lower in utilities. There was a 153 % increase in total injuries in the accommodation and food services sector between the 3-year periods, as well as a 75 % increase in injuries in the leisure and hospitality industry sector between the 3-year periods (Table 3).

Leading Electrical Injury Events, 2003–2010

Among the 20,150 non-fatal injuries due to contact with electric current from 2003 through 2010, shown in Fig. 22, the leading injury event was “contact with electric current of machine, tool, appliance, or light fixture,” with 37 % of the total (7450 injuries), followed by “contact with wiring, transformers, or other electrical components,” with 35 % of the total (7130 injuries). The other injury events included “contact with electric current, unspecified,” “contact with electric current, not elsewhere classified,” “struck by lightning,” “contact with overhead power lines,” and

Table 3 Change in non-fatal electrical injuries, 2003–2005 vs. 2008–2010, by industry

	2003– 2005	2008– 2010	Pct. change
Goods producing industries	4100	3010	–27 %
Construction	2380	1940	–18 %
Manufacturing	1580	990	–37 %
Natural resources and mining	140	80	–43 %
Service providing industries	3890	4000	+3 %
Trade transportation and utilities	1700	1010	–41 %
Wholesale trade	480	170	–65 %
Retail trade	710	390	–45 %
Utilities	310	280	–10 %
Professional and business services	690	420	–39 %
Administrative and support and waste mgmt. and remediation services	580	300	–48 %
Education and health services	690	460	–33 %
Health care and social assistance	610	380	–38 %
Leisure and hospitality	480	840	+75 %
Accommodation and food services	300	760	+153 %

**Fig. 22** Non-fatal electrical injuries, 2003–2010 by injury event

“contact with underground, buried power lines.” It is worth noting that “contact with overhead powerlines,” which was the cause of over 40 % of fatal electrical injuries, accounted for only 2 % of the non-fatal injuries, indicating that this type of electrical event is overwhelmingly fatal (Brenner and Cawley 2009).

The more detailed analysis which follows will focus on contact with electric current of machine, tool, appliance or light fixture and contact with wiring, transformers, or other electrical components because the other injury events either fall outside the purview of *NFPA 70E* or do not specify the injury event.

Contact with Machine, Tool, Appliance or Light Fixture

The leading cause of non-fatal electrical injuries was “contact with electric current of machines, tools, appliances, or light fixtures” with 7450 injuries from 2003 through 2010. As Fig. 23 indicates, these injuries have been trending downward, with the exception of a dramatic increase in 2009. The vast majority of these (70 %, 5230 injuries) were experienced by males and 30 % (2200 injuries) by females. The proportion of injuries experienced by female workers is higher than is the case in other electrical injury events.

Industry and Occupation

Workers in service occupations experienced the greatest number of injuries over the 2003–2010 period (1720 injuries, 23 %), followed by workers in installation, maintenance, and repair occupations (1690 injuries, 23 %), and workers in production occupations (1470 injuries, 20 %). Relative to other electrical injury events, construction occupations accounted for a comparatively small share of injuries in this category, with 13 % of the total. Sales and related occupations and office and related occupations each had 6 % of the injuries, followed by transportation and material moving occupations with 4 %, professional and related occupations (3 %), and management, business, financial, with 1 %. This is illustrated in Fig. 24. Cumulatively, white collar occupations accounted for nearly 40 % of injuries caused by contact with machine, tool, appliance, or light fixture from 2003 through 2010.

By industry, 4630 (62 %) of these injuries were in service producing industries, with the largest shares in retail trade (930 injuries, 12 %), leisure and hospitality

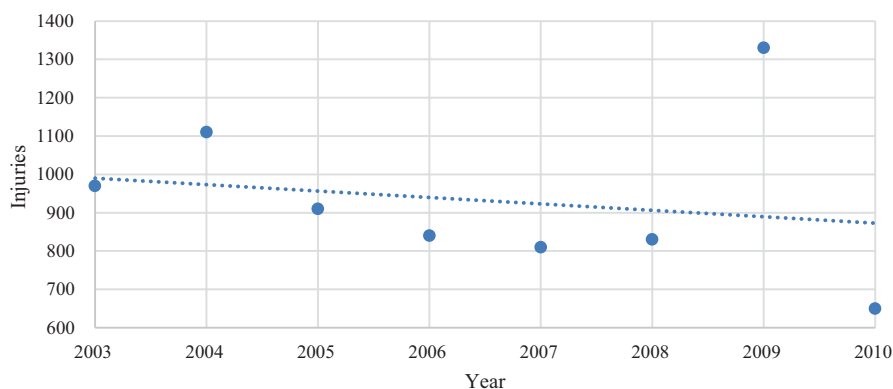


Fig. 23 Non-fatal electrical injuries, 2003–2010, contact with electric current of machine, tool, appliance, or light fixture

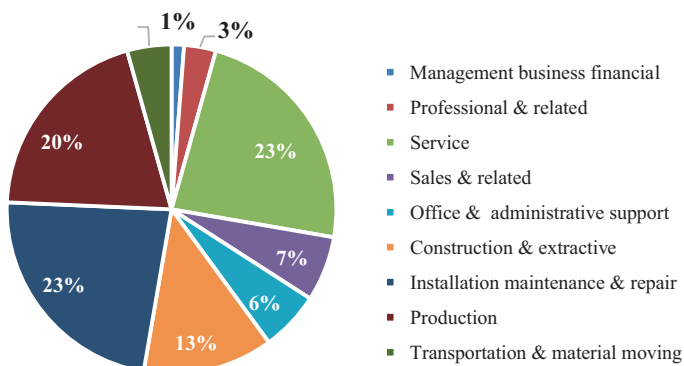


Fig. 24 Non-fatal electrical injuries due to contact with electric current of machine, tool, appliance, or light fixture, 2003–2010

(910 injuries, 12 %), financial activities (850 injuries, 11 %), education and health services (780 injuries, 10 %), and professional and business services (300 injuries, 4 %). Goods producing industries accounted for 2820 (38 %) of the injuries, 1720 (23 %) of which were in manufacturing and 1080 (14 %) in construction.

Number of Days Away from Work

The number of missed work days provide some insight into the seriousness of electrical injury. Almost two of five workers (2940 injuries, 39 %) who experienced electrical injury as a result of contact with machine, tool, appliance, or light fixture were away from work for 6 or more days due to injury; 17 % of these (1290 injuries) involved 31 or more days, while 4 % (300 injuries) involved 21–30 days, 7 % (550 injuries) 11–20 days, and 11 % (800 injuries) involved 6–10 days. Approximately one-quarter of injuries (1770 injuries, 24 %) resulted in just 1 day away from work, while 17 % (1280 injuries) involved 2 days, and 19 % (1450 injuries) 3–5 days.

Contact with Wiring, Transformers, or Other Electrical Components

The second leading non-fatal injury event is “contact with wiring, transformers, or other electrical components.” The vast majority of workers who experienced electrical injury through contact with wiring, transformers, or other electrical components were males (6440 of 7130 injuries, 90 %). Workers in the 25–34 year age group accounted for 1910 (27 %) of these injuries, while workers in the 35–44

year age group accounted for 1730 injuries (24 %) and the 45–54 year age group for 1560 injuries (22 %). There were 1220 injuries among workers in the 20–24 year age group (17 %), a higher proportion of injuries for this age group than was the case for all injuries involving contact with electric current (12 %) or for injuries due to contact with machine, tool, appliance, or light fixture (10 %). Workers in the 55–64 year age group accounted for 380 injuries (5 %) of injuries and 16–19 year olds for 160 injuries (2 %).

Industry and Occupation

Electrical injuries due to contact with wiring, transformers, or other electrical components, shown in Fig. 25, were primarily borne by workers in construction and extraction occupations (42 %) and installation, maintenance, and repair occupations (27 %). Other leading occupational groups included service occupations (10 %) production occupations (8 %), management, business, and financial occupations (4 %), and transportation and material moving occupations (4 %).

By industry, goods producing industries accounted for 3990 of these injuries (56 %), with 2900 (41 %) of these in construction and 1010 (14 %) in manufacturing. There were 3170 injuries due to contact with wiring, transformers, or other electrical equipment in service providing industries (44 %), with 540 of these (8 %) in administrative and support and waste management and remediation services, 480 in accommodation and food services (7 %), 480 in utilities (7 %), 260 in health care and social assistance (4 %), and 250 in wholesale trade (4 %).

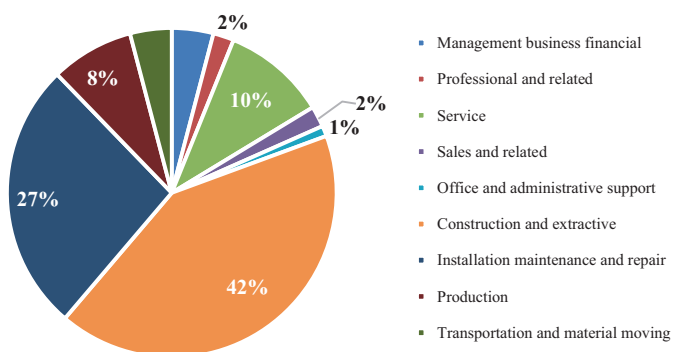


Fig. 25 Non-fatal electrical injuries due to contact with wiring, transformers, other electrical equipment, 2003–2010

Number of Days Away from Work

Nearly one quarter of workers (1670 injuries, 23 %) who experienced electrical injury through contact with wiring, transformers, or other electrical components from 2003 through 2010 missed 31 or more days of work, while 470 of those injured (7 %) missed 21–30 days, 700 (10 %) missed 11–20 days, and 800 (11 %) missed 6–10 days. Hence, 51 % of workers missed more than 1 week of work due to these injuries, and 40 % missed 2 weeks or more. Another 17 % of workers (1180 injuries) missed 3–5 days of work, with 12 % missing 2 days (830 injuries), and 20 % missing 1 day of work (1430 injuries).

Electrical Injuries 2011–2012: Exposure to Electricity

BLS data indicate that there were 3950 non-fatal injuries due to exposure to electricity during the combined reporting years of 2011 and 2012. As shown in Fig. 26, more than half of these injuries (2090 injuries, 53 %) resulted from direct exposure to electricity and 28 % of them (1120 injuries) resulted from indirect exposure to electricity. There also were 730 injuries (19 %) in which direct or indirect exposure could not be specified. In the analysis below, we will present summary information on overall injuries due to exposure to electricity, and we will follow that by separately analyzing injuries resulting from direct exposure to electricity and injuries resulting from indirect exposure to electricity.

Similar to the gender distribution in non-fatal injuries from 2003 through 2010, male workers accounted for 84 % of these injuries and female workers for 16 % of the injuries. In the age distribution, shown in Fig. 27, the 25–34 year age group received 26 % of non-fatal injuries, while 22 % of injuries were in the 35–44 age group, 28 % in the 45–54 age group, 7 % in the 55–64 age group, and 2 % aged 65 and older. In the younger age groups, 16–19 year-olds accounted for 1 % of injuries and 20–24 year-olds for 14 % of injuries.

By occupation, the highest share of injuries during the 2011–2012 period were installation, maintenance, and repair occupations (1260 injuries, 32 %), construction and occupation occupations (930 injuries, 24 %), service occupations (580 injuries, 15 %), and production occupations (460 injuries, 12 %). Other leading groups included transportation and material moving occupations (220 injuries, 6 %) and management, business, and financial occupations (140 injuries, 4 %). By industry, nearly three of five injuries (2330 injuries, 59 %) were in service providing industries, with 41 % (1630 injuries) in goods producing industries. Within the service industries, 920 injuries (23 %) were in trade, transportation, and utilities, 430 injuries (11 %) were in leisure and hospitality, 330 injuries (8 %) were in education and health services, and 310 injuries (8 %) were in professional and business services.

Nearly one-quarter of the injuries (900 injuries, 23 %) resulted in 31 or more days away from work, with another 6 % (230 injuries) involving 21–30 days away

Fig. 26 Non-fatal injuries from exposure to electricity, 2011–2012

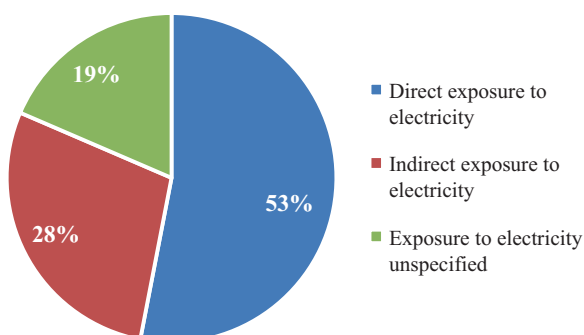
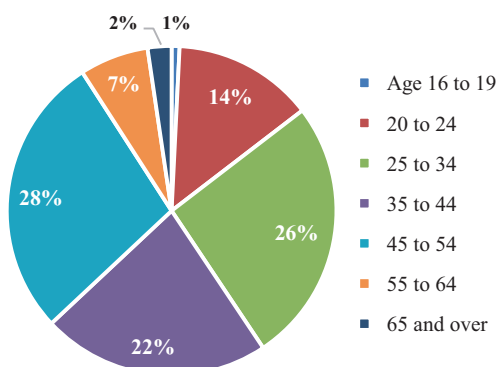


Fig. 27 Non-fatal injuries from exposure to electricity by age, 2011–2012



from work, 10 % (410 injuries) involving 11–20 days from work, and another 10 % (410 injuries) involving 6–10 days away from work. Of the injuries that involved a week or less from work, 15 % (580 injuries) involved 3–5 days, 14 % (560 injuries) involved 2 days, and 23 % (920 injuries) involved 1 day.

Direct Exposure to Electricity, 2011–2012

Of the 2090 reported non-fatal injuries due to direct exposure to electricity in 2011 and 2012, 680 of these (33 %) resulted from exposure to 220 V or less, while 230 (11 %) resulted from exposure to greater than 220 V, and 1180 of the injuries (56 %) resulted from direct exposure to electricity that was unspecified.

There were some differences along age and gender lines by the type of exposure. Female workers accounted for a greater share of the injuries (21 %) involving direct exposures at 220 V or less, while males experienced all of the injuries at greater than 220 V and 92 % of the injuries of unspecified direct exposure to electricity. An interesting observation with respect to age is that 43 % of workers injured at 220 or greater volts and 43 % of those injured from unspecified voltage were 20–34 years of age, while 25 % of workers injured at 220 V or less were in this age group. A

Table 4 Non-fatal injuries from direct exposure to electricity by age and gender, 2011–2012

	Direct exposure		>220 V		220 V or less		Unspecified	
Total:	2090	100 %	230	11 %	680	33 %	1180	56 %
Men	1870	89 %	230	100 %	540	79 %	1090	92 %
Women	230	11 %	0	0 %	140	21 %	80	7 %
Age								
16–19	20	1 %	–	–	–	–	–	–
20–24	230	11 %	30	13 %	60	9 %	130	11 %
25–34	560	27 %	70	30 %	110	16 %	380	32 %
35–44	460	22 %	50	22 %	130	19 %	280	24 %
45–54	560	27 %	40	17 %	270	40 %	270	23 %
55–64	140	7 %	–	–	50	7 %	80	7 %
65 and over	40	2 %	–	–	–	–	40	3 %

Table 5 Non-fatal injuries from direct exposure to electricity, by occupation

	>220 V		220 V or less		Unspecified	
Management business financial	–	–	30	4 %	–	–
Computer engineering and science	–	–	20	3 %	–	–
Service	30	13 %	120	18 %	110	9 %
Sales and related	–	–	–	–	20	2 %
Office and administrative support	–	–	–	–	20	2 %
Farming fishing and forestry	–	–	–	–	20	2 %
Construction and extraction	110	48 %	100	15 %	440	37 %
Installation maintenance and repair	–	–	250	37 %	330	28 %
Production	–	–	90	13 %	150	13 %
Transportation and material moving	–	–	–	–	60	5 %

greater share of workers injured at 220 V or less were 45–54 years of age (40 %) than those injured at greater than 220 V (17 %) or at unspecified exposure (23 %) (Table 4).

Data for occupational categories are incomplete, but they nevertheless indicate that workers in construction and extraction occupations comprise a greater share of injuries when direct exposure to electricity is greater than 220 V (48 %) or unspecified (37 %) than at 220 V or less (15 %). Installation, maintenance, and repair occupations accounted for 37 % of injuries at 220 V or less, compared to 28 % of injuries due to unspecified direct exposure to electricity in this occupational group and no reported injuries in the exposure at 220 V or greater. These and other results by occupation are shown below, in Table 5.

By industrial sector, injuries at 220 V or less were more likely to be in service providing industries (63 %), while injuries due to exposure to greater than 220 V were largely in construction (48 %), as were injuries resulting from unspecified exposure to electricity (34 %). Approximately one-fifth of injuries at 220 V or less

Table 6 Non-fatal injuries from direct exposure to electricity by industry

	>220 V		220 V or less		Unspecified	
Goods producing industries	120	52 %	260	38 %	680	58 %
Mining (3)	—	—	—	—	—	—
Construction	110	48 %	150	22 %	400	34 %
Manufacturing	20	9 %	110	16 %	260	22 %
Service providing industries	110	48 %	430	63 %	490	42 %
Wholesale trade	—	—	110	16 %	—	—
Retail trade	—	—	80	12 %	60	5 %
Trade, transportation, utilities	50	22 %	220	32 %	190	16 %
Professional and business services	—	—	—	—	150	13 %
Admin. and support and waste management and remediation services	—	—	—	—	70	6 %
Health care and social assistance	—	—	90	13 %	50	4 %
Arts entertainment and recreation	30	13 %	—	—	—	—
Accommodation and food services	—	—	60	9 %	80	7 %

were in construction (22 %) and another 16 % were in manufacturing. The principal service providing industries in which injuries at 220 V or less occurred included wholesale trade (16 % of injuries), health care and social assistance (13 %), retail trade (12 %), and accommodation and food services (9 %). The principal service sector industries with injuries at greater than 220 V were trade, transportation, and utilities (22 % of these injuries) and arts, entertainment, and recreation (13 %), while trade, transportation, and utilities also accounted for 16 % of injuries resulting from unspecified direct exposure to electricity. See Table 6 below for direct exposure injuries by industry.

The largest share of injuries involving 31 or more days away from work were those due to unspecified direct exposure to electricity (30 % of injuries) or exposure to greater than 220 V (26 % of injuries), but 18 % of injuries resulting from direct exposure to 220 V or less also involved 31 or more days away from work. Another 18 % of the unspecified direct exposure injuries involved 11–30 days away from work, compared to 9 % of injuries resulting from greater than 220 V and 9 % of injuries resulting from 220 V or less. Injuries due to exposure to 220 V or less had the greatest share of injuries involving 6–10 days away from work, 18 %, compared to 9 % of injuries from unspecified direct exposure and 9 % of injuries from greater than 220 V. Nearly one-quarter (24 %) of injuries due to 220 V or less involved a single day away from work, as did 22 % of unspecified direct exposure injuries and 17 % of injuries at greater than 220 V (Table 7).

Table 7 Non-fatal injuries from direct exposure to electricity, by days from work

	>220 V		220 V or less		Unspecified	
Cases involving 1 day	40	17 %	160	24 %	260	22 %
Cases involving 2 days	30	13 %	100	15 %	90	8 %
Cases involving 3–5 days	30	13 %	110	16 %	140	12 %
Cases involving 6–10 days	20	9 %	120	18 %	110	9 %
Cases involving 11–20 days	20	9 %	20	3 %	130	11 %
Cases involving 21–30 days	—	—	40	6 %	80	7 %
Cases involving 31 or more days	60	26 %	120	18 %	350	30 %

Indirect Exposure to Electricity, 2011–2012

There were 1120 injuries due to indirect exposure to electricity from the combined totals of BLS data for 2011 and 2012. The share of injuries that were female workers was higher for indirect exposure to electricity (21 %), than was the case with direct exposure (11 %). Within the separate injury event categories, one-third of injuries were experienced by female workers (33 %) when the form of exposure was unspecified, and 26 % of injuries from exposure to 220 V or less were experienced by women. All indirect injuries that resulted from exposure to 220 V of electricity or greater were experienced by male workers. There were no reported injuries among workers 16–19 years of age or workers who were age 65 and older. The highest share of injuries from exposure to greater than 220 V was among workers aged 20–24, with 41 % of the total, while workers aged 45–54 accounted for the highest share of injuries at 220 V or less, also 41 % of total. Workers aged 25–34 years had the highest share of injuries when exposure was unspecified (40 %), and another 26 % of workers injured by unspecified indirect exposure to electricity were 35–44 years of age. Among the remaining workers injured by exposure to greater than 220 V, workers aged 25–34 received 18 % of the injuries, while workers aged 35–44, 45–54, and 55–64 each accounted for 9 % of injuries. The remaining injuries from indirect exposure to 220 V or less were divided between workers aged 20–24 (20 %), 35–44 (18 %), and 25–34 (8 %) (Table 8).

We will note that the available information on occupation, industry, and days away from work for indirect exposure injuries is incomplete, particularly for injuries at greater than 220 V. We nonetheless report the information for the three exposure categories because they provide a useful profile for comparisons and because they are substantially complete for exposures at 220 V or less, an area of particular interest.

By occupation, nearly seven of ten reported injuries at greater than 220 V were in construction and extraction occupations (68 %), with another 14 % in installation, maintenance, and repair occupations and 9 % in transportation and material moving occupations. By comparison, only 4 % of workers who were injured from indirect exposures at 220 V or less were in construction and extraction occupations, as were 5 % of workers who experienced unspecified indirect exposure to electricity (Table 9).

Table 8 Non-fatal injuries from indirect exposure to electricity by age and gender, 2011–2012

	Indirect exposure		>220 V		220 V or less		Unspecified	
Total:	1120	100 %	220	22 %	490	44 %	420	38 %
Men	880	79 %	210	100 %	400	82 %	280	67 %
Women	240	21 %	—	—	90	18 %	140	33 %
Age								
20–24	220	20 %	90	41 %	100	20 %	20	5 %
25–34	260	23 %	40	18 %	40	8 %	170	40 %
35–44	240	21 %	20	9 %	90	18 %	110	26 %
45–54	300	27 %	20	9 %	200	41 %	80	19 %
55–64	70	6 %	20	9 %	—	—	—	—

Table 9 Non-fatal injuries from indirect exposure to electricity, by occupation, 2011–2012

	>220 V		220 V or less		Unspecified	
Healthcare practitioners and technical	—	—	20	4 %	—	—
Service	—	—	70	14 %	90	21 %
Construction and extraction	150	68 %	20	4 %	20	5 %
Installation maintenance and repair	30	14 %	280	57 %	100	24 %
Production	—	—	40	8 %	90	21 %
Transportation and material moving	20	9 %	30	6 %	30	7 %

Over half of workers injured at 220 V or less were in installation, maintenance, and repair occupations (57 %), while 14 % were in service occupations, 8 % in production occupations, 6 % in transportation and material moving occupations, and 4 % in healthcare and technical occupations. Workers in installation, maintenance, and repair occupations (24 %), production occupations (21 %), and service occupations (21 %) had the largest shares of injuries from unspecified indirect exposures to electricity, followed by transportation and material moving occupations (7 %).

Goods producing industries accounted for 64 % of injuries at greater than 220 V, with 59 % of these in trade, construction. Of the injuries from exposure to 220 V or greater in service providing industries, the leading industry was trade, transportation, and utilities, with 9 % of injuries. By contrast, the vast majority of injuries due to exposure to 220 V or less were in service providing industries (80 % of reported injuries). Over one-third of these were in trade, transportation, and utilities (35 %), with 18 % in real estate and leasing, and 8 % in accommodation and food services. The injuries in goods producing industries in this exposure category, were evenly split between construction and manufacturing, each with 10 % (Table 10).

The majority of injuries from unspecified indirect exposure to electricity were also in service providing industries (69 %), with 19 % of these in accommodation and food services, 14 % in health care and social assistance, 10 % in administrative and support and waste management and remediation services, and 7 % in transportation and warehousing. Of the 31 % of the injuries in goods producing industries, 21 % were in manufacturing and 5 % were in construction.

Table 10 Non-fatal injuries from indirect exposure to electricity, by industry, 2011–2012

	>220 V		220 V or less		Unspecified	
Goods producing industries (2)	140	64 %	100	20 %	130	31 %
Construction	130	59 %	50	10 %	20	5 %
Manufacturing	0	0 %	50	10 %	90	21 %
Service providing industries	70	32 %	390	80 %	290	69 %
Trade transportation and utilities (4)	20	9 %	170	35 %	50	12 %
<i>Retail trade</i>	–	–	170	35 %	–	–
<i>Transportation and warehousing (4)</i>	–	–	–	0 %	30	7 %
Real estate and rental and leasing	–	–	90	18 %	–	–
Admin. and support and waste management and remediation services	–	–	–	–	40	10 %
Health care and social assistance	–	–	30	6 %	60	14 %
Accommodation and food services	–	–	40	8 %	80	19 %

Table 11 Non-fatal injuries from indirect exposure to electricity, by days away from work 2011–2012

	>220 V		220 V or less		Unspecified	
Cases involving 1 day	30	14 %	50	10 %	120	29 %
Cases involving 2 days	0	0 %	190	39 %	50	12 %
Cases involving 3–5 days	90	41 %	20	4 %	80	19 %
Cases involving 6–10 days	0	0 %	30	6 %	20	5 %
Cases involving 11–20 days	0	0 %	130	27 %	20	5 %
Cases involving 21–30 days	0	0 %	0	0 %	50	12 %
Cases involving 31 or more days	70	32 %	50	10 %	70	17 %

Finally, some differences are observed with respect to days away from work following indirect exposure to electricity, with results presented in Table 11 below. Nearly one-third of the reported injuries (32 %) due to indirect exposure at greater than 220 V resulted in 31 or more days away from work, while 41 % resulted in 3–5 days away from work, and 14 % involved 1 day away from work.

Even when injuries resulted from indirect exposures of 220 V or less, 27 % of injuries resulted in 11–20 days away from work, and 10 % involved 31 or more days, with another 6 % resulting in 6–10 days away from work, and 4 % in 3–5 days of missed work. Approximately two of five of these injuries (39 %) involved 2 days away from work, and 10 % involved 1 day away from work. When injuries resulted from an unspecified indirect exposure to electricity, 17 % of the reported injuries involved 31 or more days away from work, 12 % involved 21–30 days, 5 % involved 11–20 days, 5 % involved 6–10 days, 19 % involved 3–5 days, 12 % involved 2 days, and 29 % involved 1 day.

Electrical Injury Rates, 2003–2012

Our review of data from the Bureau of Labor Statistics (BLS) clearly shows a fairly consistent drop in the number of fatal electrical injuries over the past 10 years, as well as a drop in total non-fatal electrical injuries since 2009 relative to the prior years. Such reductions are encouraging and have a number of obvious social benefits. However, in addition to examining the total number of electrical injuries over the last 10 years in order to understand changes over time and identify areas of potential concern, it is also important to get a sense of injury rates, since these take into account the size of the underlying population. In isolation, reductions in the number of injuries could stem from changes in employment and simply reflect a decline in the pool of workers exposed to electrical hazards, rather than any improvement in electrical safety practices. Incidence rates of injuries per 10,000 full time employees are available from BLS for non-fatal electrical injuries, and these provide an alternative basis for examining electrical injury trends over the period of study. Unfortunately, incidence rates are not available for fatal electrical injury events.

As already seen, BLS introduced a new coding system for classifying injury events for injuries beginning in reference year 2011. For overall electrical injury incidence rates—“contact with electric current” in the years 2003 through 2010, and “exposure to electricity” in 2011 and 2012—we will consider the separate codes to represent a common injury event. The distinct sub-codes for injury events between the respective coding periods do not allow such comparisons. Our review of electrical injury incidence rates will be limited here to rates at the industry level. Since 2011 also publishes incidence rates by age, gender, occupation, and other variables of potential interest, but since this information is not available for prior years, we will not include it in our analysis.

BLS data indicate that overall incidence rates for non-fatal electrical injury across all industry did not change between 2003 through 2009, remaining at 0.3 injuries per 10,000 full-time workers for each of the 7 years, so year to year changes in total injuries during this period are not reflected in rates of injury. However, the non-fatal injury incidence rate dropped to 0.2 in 2010 and 2012, so it will be important to see if this reflects a declining trend in the next few years.

As indicated in Fig. 28, although overall injury incidence rates were unchanged between 2003 and 2009, there were changes within specific industries and industry sectors, and these are worth noting. Not surprisingly, the construction industry and the utilities industry had the consistently highest electrical injury incidence rates over the course of the 10 years, with rates substantially higher than the all-industry rate every year. The utilities industry had the highest rate in 9 of these years, with the construction having a slightly higher rate in 2011, and with real estate and rental and leasing sharing the highest rate in 2008. Real estate and rental and leasing had the highest injury rate (2.2) in 2009.

There were no clear trends in the injury rates in utilities and construction, with reductions in the rates in 1 year regularly followed by increases. In general, however,

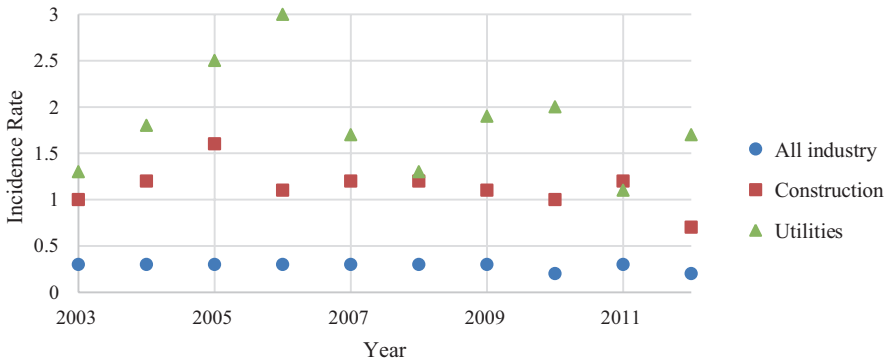


Fig. 28 Electrical injury incidence rates, construction & utilities, 2003–2012

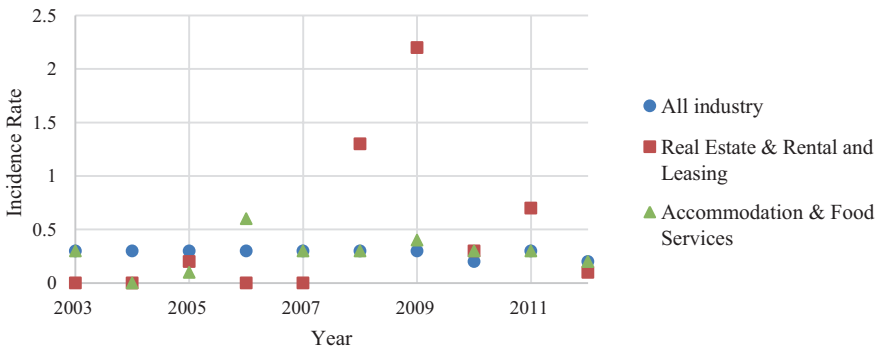


Fig. 29 Electrical injury incidence rates, real estate & food services, 2003–2012

the rates in these industries were lower in recent years than they were at the beginning of the study period, particularly for utilities. The electrical injury rates in manufacturing over the last 8 years have been lower than they were in 2003 and 2004 (0.4 in each year) and have been similar to the exceeded the all industry during this period.

We have made prior mention of the somewhat surprising degree to which electrical injuries take place in service industries other than utilities, and the rates of electrical injury in real estate and rental and leasing are another indication that the service sector is an area for attention. In addition to real estate and rental and leasing—which recorded injury rates well above the all-industry average in 2008, 2009, and 2011, after having none in the prior 5 years—the accommodation and food services industry and the information sector have recorded rates that exceeded the all-industry averages in individual years, but these higher rates are not sufficiently consistent to draw conclusions at this point. This is shown in Fig. 29. While the injuries in the service sector include electricians and other tradespeople who are not in service occupations, it is also likely that greater numbers of workers with no electrical safety training are being exposed to electrical hazards as a result of the growth in service sector employment.

Occupational Injuries From Electrical Shock and Arc
Flash Events

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