

# Fatal and nonfatal injuries among construction trades between 2003 and 2014

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The construction industry is unique due to many highly specialized occupations within this sector. Although this industry is dangerous as a whole, workers in different occupations are at risk for various types of injuries and fatalities. This Quarterly Data Report tracks fatal and nonfatal injuries among construction trades through the economic boom, recession, and recovery in the last decade. It illustrates injury variations across selected construction trades, and highlights leading causes of fatal and nonfatal injuries in the most recent years. It also includes recently available data on height of fall.

## SECTION 1: Fatal injury trends in construction

The U.S. construction industry was hit hard by the economic recession from 2007 to 2009, but is showing signs of recovery. In 2014, 9.8 million US workers were employed in construction, a 10% increase since construction employment bottomed out in 2012 (Chart 1).

### 1. Construction employment in the United States, 2003-2014 (All employment)



### **KEY FINDINGS**

- The number of construction fatalities rose 16% from 2011 to 2014.
- The number of fall fatalities in construction jumped 15.7% from 2013 to 2014.
- Electrical power-line installers had the highest rate of fatalities, but the rate declined over the decade.
- Roofers had the highest rate of fall fatalities, and the rate of all-cause fatalities also increased over time.
- Helpers had the highest risk of overall nonfatal injuries, as well as injuries from contact with objects; and falls, slips, and trips.
- Cement masons had the highest injury rate from overexertion and bodily reaction.
- Construction laborers had the largest number of fatal and nonfatal injuries.



Source: U.S. Bureau of Labor Statistics, 2003-2014 Current Population Survey. Calculations by the authors.

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The number of work-related fatalities in construction mirrored the trend of construction employment between 2003 and 2014. The number of fatal injuries among construction workers increased from 781 in 2011 to 908<sup>1</sup> in 2014, a 16% increase over three years (Chart 2). The fatality rate dropped from 11.7 in 2003 to 9.0 in 2011 but increased to 9.3 deaths per 100,000 full-time equivalent workers (FTEs) in 2014. There were more fatal injuries in construction than any other industry in the United States in 2014, accounting for nearly 20% of the nation's 4,679 work-related deaths that year (Chart 3).



### 2. Number and rate of work-related fatalities in construction, 2003-2014 (All employment)

### 3. Number of work-related fatalities, by major industry, 2014<sup>P</sup> (All employment)



<sup>1</sup>2014 fatality data are preliminary. Detailed fatality data were not available for 2014 at the time of publication. *Note:* P = preliminary.

*Source:* Chart 2 - U.S. Bureau of Labor Statistics, 2003-2014 Census of Fatal Occupational Injuries. Numbers are from the online CFOI database. Employment data were from the Current Population Survey. Calculations by the authors. *Source:* Chart 3 - U.S. Bureau of Labor Statistics, 2014 Census of Fatal Occupational Injuries.

Numbers are from the online CFOI database.

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Falls remain the leading cause of work-related fatalities in construction. The number of fall fatalities among construction workers plunged 41% in 2010 from the peak year in 2007, and rebounded 32% from 2010 through 2014 (Chart 4). Although the 2014 data are preliminary, 353 construction workers were killed on the job due to falls, a 16% jump in just one year. The rate of fall fatalities also increased from 3.1 in 2010 to 3.6 deaths per 100,000 FTEs in 2014.



### 4. Number and rate of fatal fall injuries in construction, 2003-2014 (All employment)

*Note:* P = preliminary. In 2011, the CFOI switched to Occupational Injury and Illness Classification System (OIICS) version 2.01, which categorizes slips, trips, and falls together. In previous years, slips and trips were categorized elsewhere.



Source: U.S. Bureau of Labor Statistics, 2003-2014 Census of Fatal Occupational Injuries. Numbers are from the online CFOI database. Employment data were from the Current Population Survey. Calculations by the authors.

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Between 2011 and 2013, 868 construction workers died from falls, slips, and trips<sup>2</sup>, accounting for more than one-third (34.9%) of the 2,486 fatalities in construction (Chart 5). Transportation incidents (29.2%) and contact with objects (16.8%) were the second and the third leading causes of construction fatalities.

Since 2011, the Census of Fatal Occupational Injuries (CFOI) has collected information on the height of falls. About 20% of fatal falls were from over 30 feet from 2011 to 2013; 31% were from six to 15 feet and 8% were from less than six feet (Chart 6).



5. Distribution of fatal injuries in construction, by event, 2011-2013 total

6. Fatal falls, slips, trips in construction, by height of fall, 2011-2013 total



<sup>&</sup>lt;sup>2</sup> In 2011, the CFOI switched to Occupational Injury and Illness Classification System (OIICS) version 2.01, which categorizes slips, trips, and falls together. In previous years, slips and trips were categorized elsewhere. *Source:* Chart 5 - U.S. Bureau of Labor Statistics, 2011-2013 Census of Fatal Occupational Injuries. Numbers are from the online CFOI database.

Note: Chart 6 - 133 deaths without height information were excluded.

Source: Chart 6 - These numbers were calculated by the authors with restricted access to BLS CFOI microdata. The views expressed here do not necessarily reflect the views of the BLS.



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### **SECTION 2: Fatal injuries among construction trades**

Between 2011 and 2013, 568 construction laborers died from work-related injuries, accounting for 23% of all construction fatalities (Chart 7). Foremen had the second highest number of fatalities (295) among all construction occupations during the same period, followed by roofers (200), carpenters (167), and electricians (144).



### 7. Number of work-related fatalities, selected occupations, 2011-2013 total (All employment)



Source: Fatal injury data were generated by the authors with restricted access to BLS CFOI micro data. The views expressed here do not necessarily reflect the views of the BLS.

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Between 2011 and 2013, electrical power-line installers had the highest risk of work-related fatalities among all construction occupations, with a rate of 48.6 deaths per 100,000 FTEs, more than five times higher than all construction occupations combined (9.4 deaths per 100,000 FTEs; Chart 8). Other high-risk occupations in construction included roofers (40.7 deaths per 100,000 FTEs), excavating/loading machine operators (32.2 deaths per 100,000 FTEs), ironworkers (31.9 deaths per 100,000 FTEs), and paving/surfacing equipment operators (29.5 deaths per 100,000 FTEs).



### 8. Rate of work-related fatalities, selected occupations, 2011-2013 average (All employment)



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*Source:* Fatal injury data were generated by the authors with restricted access to BLS CFOI micro data. Employment data were from the Current Population Survey. The views expressed here do not necessarily reflect the views of the BLS. Calculations by the authors.

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The number of fatal injuries among electrical power-line installers dropped from 21 in 2003 to a period low of nine in 2009, then increased to 14 in 2013 (Chart 9). This fluctuation coincided with the employment variation in construction. Although the rate of work-related fatalities for this occupation remained higher than for overall construction, the fatality rate decreased from 68.2 in 2003 to 47.5 deaths per 100,000 FTEs in 2013. Both the number and rate of fatalities among roofers increased between 2003 and 2013. The fatality rate for roofers peaked in 2012; in 2013, the rate dropped to 42.1 deaths per 100,000 FTEs—still 50% higher than the rate in 2003 (Chart 10).



### 9. Number and rate of work-related fatalities among power-line installers, 2003-2013

10. Number and rate of work-related fatalities among roofers, 2003-2013



*Note:* Linear (Rate of deaths) on charts represent the overall trend in fatality rates during the time period. *Source:* Charts 9 and 10 - Fatal injury data were generated by the authors with restricted access to BLS CFOI micro data. Employment data were from the Current Population Survey. The views expressed here do not necessarily reflect the views of the BLS. Calculations by the authors.



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The number of fatal injuries among ironworkers decreased tremendously, from 37 in 2003 to 10 in 2013 (Chart 11). The rate of work-related fatalities for this occupation also decreased from 67.0 to 29.6 deaths per 100,000 FTEs during the same time period. Similar to ironworkers, construction laborers also experienced an enormous drop in fatalities, from 341 in 2006 to 200 in 2013 (Chart 12). In general, construction laborers had a higher fatality rate than the average for all construction occupations. However, the fatal injury rate for construction laborers decreased from 27.9 in 2003 to 14.2 deaths per 100,000 FTEs in 2013.



#### 11. Number and rate of work-related fatalities among ironworkers, 2003-2013





*Note:* Linear (Rate of deaths) on charts represent the overall trend in fatality rates during the time period. *Source:* Charts 11 and 12 - Fatal injury data were generated by the authors with restricted access to BLS CFOI micro data. Employment data were from the Current Population Survey. The views expressed here do not necessarily reflect the views of the BLS. Calculations by the authors.



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The number of work-related fatalities among welders fluctuated, but peaked in 2008 at 25 deaths (Chart 13). However, the fatal injury rate for welders remained high, with a rate of 22.9 deaths per 100,000 FTEs in 2013. In contrast, carpenters, the second largest trade in construction, had a lower fatal injury rate than the overall construction average. Both the number and rate of fatalities for carpenters plunged in 2011 and increased significantly in 2012 and 2013 (Chart 14).



#### 13. Number and rate of work-related fatalities among welders, 2003-2013





*Note:* Linear (Rate of deaths) on charts represent the overall trend in fatality rates during the time period. *Source:* Chart 13 - Fatal injury data were generated by the authors with restricted access to BLS CFOI micro data. Employment data were from the Current Population Survey. The views expressed here do not necessarily reflect the views of the BLS. Calculations by the authors.

*Source:* Chart 14 - U.S. Bureau of Labor Statistics, 2003-2013 Census of Fatal Occupational Injuries. Numbers are from the online CFOI database. Employment data were from Current Population Survey. Calculations by the authors.



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In terms of causes of death, 616 construction laborers, roofers, foremen, carpenters, and painters died as a result of falls, slips, and trips between 2011 and 2013, accounting for 71% of all fall fatalities in construction (Chart 15). Roofers had the highest risk of fall fatalities, with a rate of 33.2 deaths per 100,000 FTEs—ten times the average for all construction (3.3 deaths per 100,000 FTEs). The occupation with the second highest risk of fall fatalities was ironworkers (18.4 deaths per 100,000 FTEs), with more than twice the rate of the third riskiest occupation (welders).



### 15. Number and rate of work-related fatalities from falls, slips, trips, selected occupations, 2011-2013



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*Source:* Fatal injury data were generated by the authors with restricted access to BLS CFOI micro data. Employment data were from the Current Population Survey. The views expressed here do not necessarily reflect the views of the BLS. Calculations by the authors.

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Between 2011 and 2013, construction laborers, foremen, truck drivers, operating engineers, and highway maintenance workers had 430 fatalities from transportation incidents, accounting for 60% of all transportation-related fatalities in construction (Chart 16). While the number of transportation-related fatalities for paving/ surfacing equipment operators and excavating/loading machine operators was small, the fatal injury rates for these two occupations were the highest among all construction occupations, at 24.3 and 16.7 deaths per 100,000 FTEs, respectively.



### 16. Number and rate of work-related fatalities from transportation incidents, selected occupations, 2011-2013



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*Source:* Fatal injury data were generated by the authors with restricted access to BLS CFOI micro data. Employment data were from the Current Population Survey. The views expressed here do not necessarily reflect the views of the BLS. Calculations by the authors

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Construction laborers, the largest trade in construction, had the highest number of fatal injuries from contact with objects between 2011 and 2013 (Chart 17). Excavating/loading machine operators had the highest injury rate at 12.2 deaths per 100,000 FTEs, which was nearly seven times the rate for all construction occupations (1.6 deaths per 100,000 FTEs). Ironworkers had the second highest rate of fatalities from contact with objects (10.6 per 100,000 FTEs).

#### Number of fatalities Rate per 100,000 FTEs Excavating/loading operator 12.2 11 Ironworker 10.6 15 Welder 4.5 11 Laborer 3.9 144 Cement mason 6 3.7 Highway maintenance 3.5 Truck driver 3.1 16 Foreman 46 2.8 Plumber 2.4 28 Operating engineer 2.2 19 Electrician 0.5 Painter 0.5 Carpenter 0.5

#### 17. Number and rate of work-related fatalities from contact with objects, selected occupations, 2011-2013

Source: Fatal injury data were generated by the authors with restricted access to BLS CFOI micro data. Employment data were from the Current Population Survey. The views expressed here do not necessarily reflect the views of the BLS. Calculations by the authors.



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Between 2011 and 2013, 203 construction workers died from electrocutions (Chart 18). Of the 203 deaths, 57 were electricians and 27 were construction laborers. Electrical power-line installers had the highest death rate from electrocution (23.6 deaths per 100,000 FTEs), which was 30 times higher than for all construction occupations combined (0.8 deaths per 100,000 FTEs).



### 18. Number and rate of work-related fatalities from electrocution, selected occupations, 2011-2013



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*Source:* Fatal injury data were generated by the authors with restricted access to BLS CFOI micro data. Employment data were from the Current Population Survey. The views expressed here do not necessarily reflect the views of the BLS. Calculations by the authors.

### **SECTION 3: Nonfatal injury trends in construction**

The overall trend of nonfatal injuries in construction declined since 2003. The number of nonfatal injuries involving days away from work (DAFW) decreased by 13% from 2003 to 2007 even though all construction employment grew 18% during those years. The number of DAFW injuries plunged more than 45% between 2007 and 2011, and then increased 11% by 2013 (Chart 19). The rate of DAFW injuries also dropped to 147.1 per 10,000 FTEs—a 43% decline between 2003 and 2012, but increased to 154.7 injuries per 10,000 FTEs in 2013—5% higher than the year before and more than 50% higher than all private industries combined (99.9 injuries per 10,000 FTEs; Chart 20).



### **19.** Number and rate of nonfatal injuries resulting in days away from work in construction, 2003-2013 (Private wage-and-salary workers)

### 20. Rate of nonfatal injuries resulting in days away from work, by major industry, 2013 (Private wage-and-salary workers)





*Source:* Chart 19 - U.S. Bureau of Labor Statistics, 2003-2013 Survey of Occupational Injuries and Illnesses. *Source:* Chart 20 - U.S. Bureau of Labor Statistics, 2013 Survey of Occupational Injuries and Illnesses.

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Between 2011 and 2013, nearly a quarter million (230,840) DAFW injuries were recorded in construction (Chart 21). Contact with objects was the leading cause of nonfatal injuries in construction, accounting for more than one-third (34%) of DAFW injuries. Exertion/bodily reaction was the second leading cause of nonfatal injuries, followed by falls, slips, and trips.

# 21. Distribution of nonfatal injuries resulting in days away from work in construction, by event, 2011-2013 total (Private wage-and-salary workers)



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### **SECTION 4: Nonfatal injuries among construction trades**

In 2013, construction laborers and carpenters, the two largest trades in construction, reported 26,460 nonfatal injuries—almost one-third of all nonfatal injuries in the industry (Chart 22). Helpers had the highest injury rate among all construction occupations, with a rate of 839.1 per 10,000 FTEs. This was more than double the occupation with the next highest rate (electrical power-line installers: 390.5 per 10,000 FTEs).

# 22. Number and rate of nonfatal injuries involving days away from work, selected occupations, 2013 (Private wage-and-salary workers)





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The number and rate of nonfatal injuries from contact with objects had a similar pattern to that for all nonfatal injuries combined. Construction laborers and carpenters had the highest number of nonfatal injuries from contact with objects in 2013 (Chart 23). By far, helpers had the highest rate of injuries from contact with objects (409 per 10,000 FTEs)—2.8 times higher than the next riskiest occupation, electrical power-line installers.

#### 23. Number and rate of nonfatal injuries from contact with objects resulting in days away from work, selected occupations, 2013 (Private wage-and-salary workers)





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In 2013, more than half (53%) of injuries from overexertion in construction were attributable to five occupations: construction laborers, plumbers, carpenters, electricians, and heating and air-conditioning mechanics (12,690; Chart 24). Although the number of nonfatal injuries from this cause among cement masons was small, the rate for this occupation was the highest among all occupations (153.4 injuries per 10,000 FTEs)—more than four times that for all occupations combined (36.6 injuries per 10,000 FTEs).

# 24. Number and rate of nonfatal injuries from overexertion and bodily reaction resulting in days away from work, selected occupations, 2013 (Private wage-and-salary workers)





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In 2013, falls, slips, and trips caused 21,890 DAFW injuries. Separated by occupation, construction laborers had the largest number of nonfatal injuries from falls, slips, and trips (Chart 25). However, helpers and sheet metal workers had exceedingly elevated injury rates from falls (303.2 and 122.0 per 10,000 FTEs, respectively) when compared to the all construction average (33.6 injuries per 10,000 FTEs).

#### Number of injuries Injuries per 10,000 FTEs Helper 1,290 303.2 510 Sheet metal 122.0 Roofer 780 56.6 140 Power-line installer 53.6 1,540 Painter 51.6 Drywall 390 47.4 1,980 Electrician 46.0 Heat A/C mechanic 1,010 41.8 40.3 Carpenter 2,520 Laborer 4,340 38.8 Ironworker 110 35.8 1,160 Plumber 35.0 Truck driver 32.5 450 1,120 Foreman 28.3 Welder 150 18.1 14.2 Brickmason 140 Operating engineer 310 14.0 Construction manager 430 9.9

#### 25. Number and rate of nonfatal injuries from falls, slips, and trips resulting in days away from work, selected occupations, 2013 (Private wage-and-salary workers)



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### Conclusion

Construction fatal and nonfatal injuries increased in number and rate since the economic recovery, although the trends were downward in the last decade in general. By trade, electrical power-line installers and roofers had the highest rate of fatalities, but the overall trend was down for the former and up for the latter. While ironworkers had a much higher fatal injury rate than the construction average, the rate for this trade dropped significantly since 2003. Construction laborers, the largest construction occupation, had the highest number of fatalities, but the rate of fatalities declined in recent years.

Falls remain the leading cause of fatal injuries in construction. The preliminary numbers show that fatalities caused by falls jumped by 15.7% from 305 in 2013 to 358 in 2014—significantly higher than the increase for construction fatalities overall (6%). Although working at heights is typically accompanied by a high risk of falls, one-in-five construction fall fatalities between 2011 and 2013 resulted from falls from 10 feet or less.

Roofers and ironworkers had the highest risk of work-related fall fatalities. While paving/surfacing equipment operators had the highest rate of transportation fatalities, excavating/loading machine operators had the highest risk of fatality from contact with objects, and electrical power-line installers had an extremely high risk of electrocution. Helpers had the highest rate of nonfatal injuries within construction in 2013. They also had the highest rate of injuries from contact with objects; falls, slips and trips; and the second highest rate from overexertion and bodily reaction, where cement masons had the highest risk.

Understanding the unique hazards faced by different construction occupations is important for addressing risk factors and targeting groups with the most threat of injury.

### **Data Sources**

- Bureau of Labor Statistics, 2003-2014 Census of Fatal Occupational Injuries (CFOI).
- Bureau of Labor Statistics, 2003-2013 Survey of Occupational Injuries and Illnesses (SOII).
- Bureau of Labor Statistics, 2003-2014 Current Population Survey (CPS).



### About the CPWR Data Center

The CPWR Data Center is part of CPWR – The Center for Construction Research and Training. CPWR is a 501(c)(3) nonprofit research and training institution created by North America's Building Trades Unions, and serves as its research arm. CPWR has focused on construction safety and health research since 1990. The Quarterly Data Reports – a series of publications analyzing construction-related data, is part of our ongoing surveillance project funded by the National Institute for Occupational Safety and Health (NIOSH).

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Construction Solutions <u>http://www.cpwrconstructionsolutions.org/</u> Construction Solutions ROI Calculator <u>http://www.safecalc.org/</u> The Electronic Library of Construction OSH <u>http://www.elcosh.org/index.php</u> Falls Campaign <u>http://stopconstructionfalls.com/</u> Hand Safety <u>http://choosehandsafety.org/</u> Work Safely with Silica <u>http://www.silica-safe.org/</u>

### This QDR was revised and reposted on October 26, 2015 to remove erroneous data for Construction Manager fatalities.

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