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A Safe Jobsite

is

a More Productive Jobsite

By
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With Contributions from Dan Waltz and Jim Ford
March 28th 2016

A safe job site is a productive job site. Any injury on the job site not only eliminates the injured worker's output, but also affects other workers' performance while they attend to the injured worker and afterward. Safety is not only economical but also is an emotional issue on any job site. Few processes and tools assure both safety and productivity simultaneously. Agile Construction®, which is based on the application of ASTM Standard E2691 was developed with productivity and safety in mind over twenty years ago. One of the main features of an Agile Construction® site is its requirement of laying out and planning the daily, weekly, and long-term job activities. Due to the attention to the detail during the development of the WBS (Work Breakdown Structure), job layout and planning automatically improves safety on the job site and reduces unforeseen incidents. Reduction of emergencies and firefighting during the project progress will help reduce the incidents and accidents on a well planned jobsite. Emergencies and firefighting, in other words lack of planning, are the top contributors to unsafe job sites.

The Bureau of Labor Statistics reports a 64 percent reduction in fatal and nonfatal injuries between 1992 and 2014 in the construction industry. The intense attention to safety on job sites is paying off. Insurance, absenteeism, and lost time are all part of the safety picture for contractors. Collaboration between contractors, electricians, GCs, and distributors to create safe environments can help improve everyone's bottom line. In addition to the fact that a safer job site is a better work environment, safety also contributes to higher productivity. Improved safety will increase the time spent on installation and project progress. Hand in hand with attention to safety, attention to productive activities will improve safety due reducing wasted movements and unplanned activities.

Safety Data

The Bureau of Labor Statistics reports data on fatal and nonfatal injuries and illnesses by North American Industry Classification System (NAICS) code. This data is collected through the Survey of Occupational Injuries and Illnesses, which is both a state and federal program in which employer's reports are collected annually from about 176,000 private industry establishments and processed by state agencies cooperating with the Bureau of Labor Statistics. Under those guidelines, nonfatal cases are recordable if they are occupational illnesses or if they are occupational injuries that involve lost work time, medical treatment other than first aid, restriction of work or motion, loss of consciousness, or transfer to another job. Employers keep counts of injuries separate from illnesses and also identify for each whether a case involves any days away from work or days of restricted work activity, or both, beyond the day of injury or onset of illness.

To assess the impact of safety in construction, we used data on "Days Away from Work" due to injury or illness. The data is available electronically for 1992 through 2014.

Hours Worked

The Bureau of Labor Statistics collects data through the Current Employment Statistics survey on number of employees and average weekly hours worked by the NAICS code. These sources were used, along with the following assumptions, to calculate the average annual hours worked in electrical construction by the same population of workers on which injuries and illnesses are reported for 1992–2014. Assumptions include the following:

- Data is not seasonally adjusted (seasonal adjustment indicates the adjustment of time series data to eliminate the effect of intrayear variations, which tend to occur during the same period on an annual basis).
- Data represent production workers (nonsupervisory).
- There are 50 working weeks per year.

Fatalities

Data on fatalities are kept by the Bureau of Labor Statistics as the Census of Fatal Occupational Injuries (CFOI) by the NAICS code. The census uses multiple sources to identify, verify, and profile fatal worker injuries. Information about each workplace fatality—occupation and other worker characteristics, equipment involved, and circumstances of the event—is obtained by cross referencing the source records, such as death

certificates, workers' compensation reports, and federal and state agency administrative reports. To ensure that fatalities are work-related, cases are substantiated with two or more independent source documents, or a source document and a follow-up questionnaire.

Nature of Injury

The data reported to the Bureau of Labor Statistics on injuries and illnesses include demographic characteristics of the injury or illness, including the following:

- By nature
- By parts of body affected
- By sources
- By events or exposures
- By hours worked before event occurred
- By day of the week event occurred
- By time of day event occurred

We used Series R1 (industries by nature) to review the nature of injuries for the construction and electrical construction industries

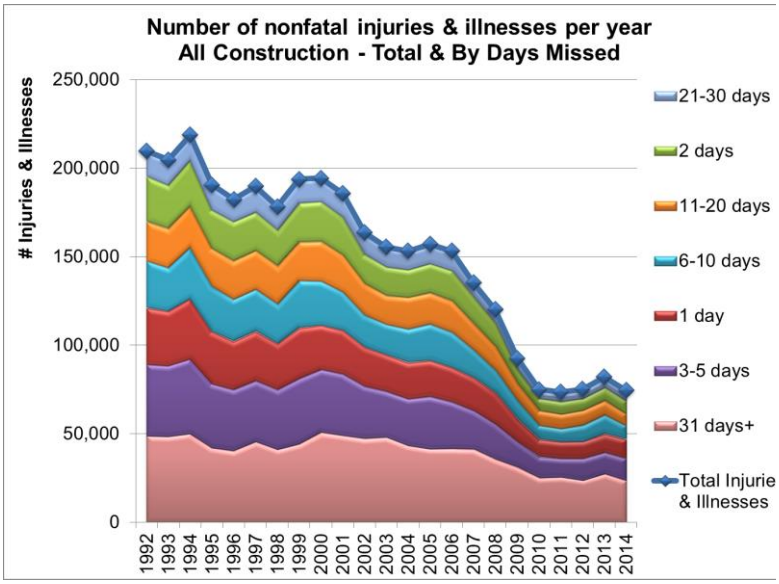

FIGURE A–1 Number of nonfatal injuries and illnesses per year for all construction totals and by days missed.

Data Analysis

Nonfatal Injuries and Illnesses

The data shows the number of cases in each category of number of days lost. Each case of an injury or illness is one occurrence for one employee, and the categories are not cumulative. In other words, in 2014, there were 10,650 cases of injury or illness in the entire construction industry that resulted in 1 day of lost work. There were 7,570 cases of injuries/illnesses that lead to 2 days of lost work.

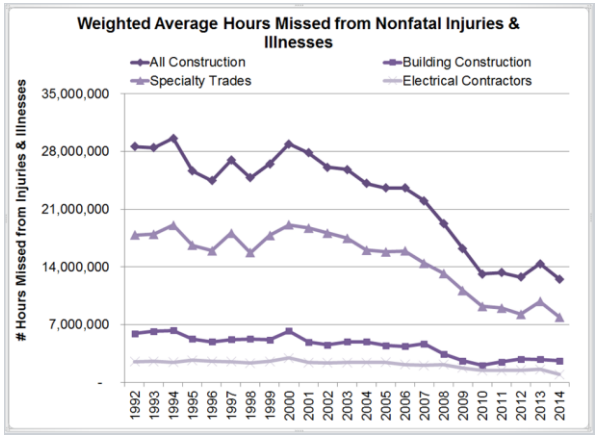

FIGURE A–2 Weighted average hours missed from nonfatal injuries and illness by NAICS code.

The trend in the number of nonfatal injuries and illnesses for all construction is shown in **FIGURE A–1**. The total number of occurrences has been decreasing. A detailed view of the categories shows that the majority of illnesses and injuries result in more than one month of lost time.

Because the data is listed by cases in each category, we calculated a weighted average of days lost to determine the impact on labor-hours. The weighted average is calculated as follows:

Weighted Average of Days Lost = (# cases of 1 day × 1)
+ (# cases of 2 days × 2) + (# cases of 3–5 days × 4)
+ (# cases of 6–10 days × 8) + (# cases of 11–20 days × 15)
+ (# cases of 21–30 days × 25) + (# cases 31 or more days × 50)

The weighted average of days lost in 2014 was 1,565,910 days. Assuming an 8-hour workday, this translates to 12,527,280 hours lost in 2014 as a result of nonfatal injuries and illnesses.

For analysis, we compared electrical construction, building construction, overall construction, and private or all industry.

The trend of hours lost, using the previous method for calculating the weighted average, is shown in **FIGURE A–2** for all construction, building construction, and electrical construction.

Specialty trades result in more days lost than building and nonbuilding construction. **FIGURE A–3** shows a pie chart of the 2014 hours missed for each component.

To further weight the impact of the lost time, we compared the lost hours to the

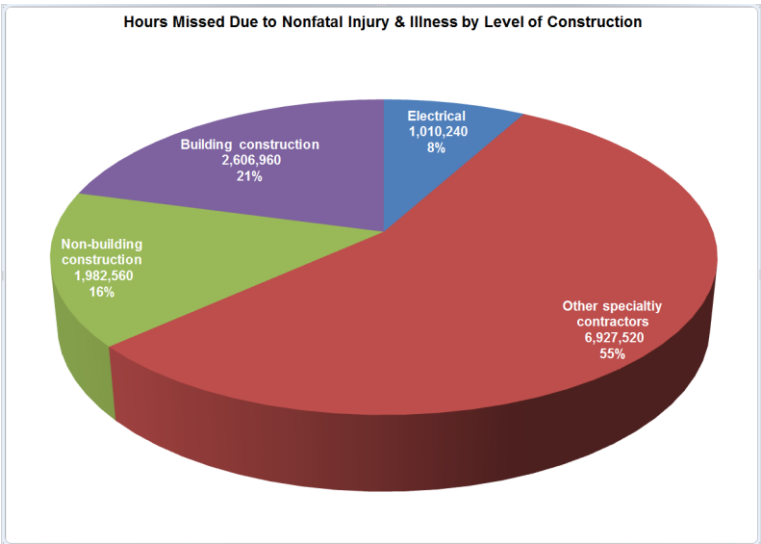

FIGURE A–3 Each construction category as a portion of the total hours missed as a result of nonfatal and illnesses in 2014

calculated hours worked in each industry. The calculation of hours worked is this:

Hours Worked = Number of Production Workers × Average Weekly Hours Worked × 50 weeks/year

Fatalities

The trend of fatalities in the construction industry is shown in **FIGURE A–4**, for overall construction, building construction, and electrical subcontracting.

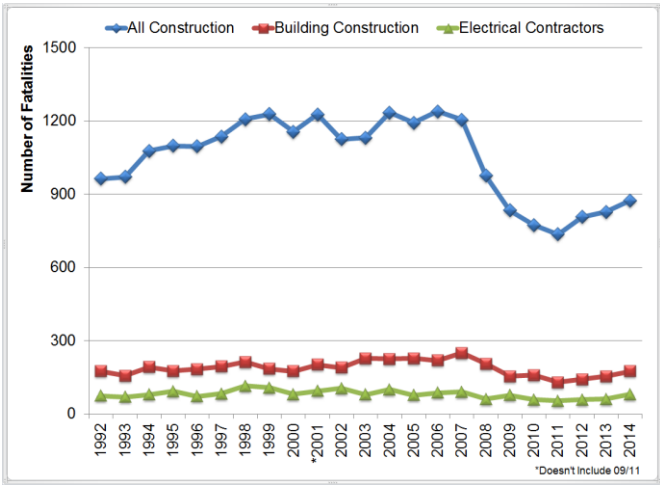

FIGURE A–4 Number of fatalities per year in construction.

Causes of Injury

FIGURE A–5 shows the nature of illnesses in the construction and electrical construction industries. The chart is ordered from largest to smallest by each category for the electrical construction industry.

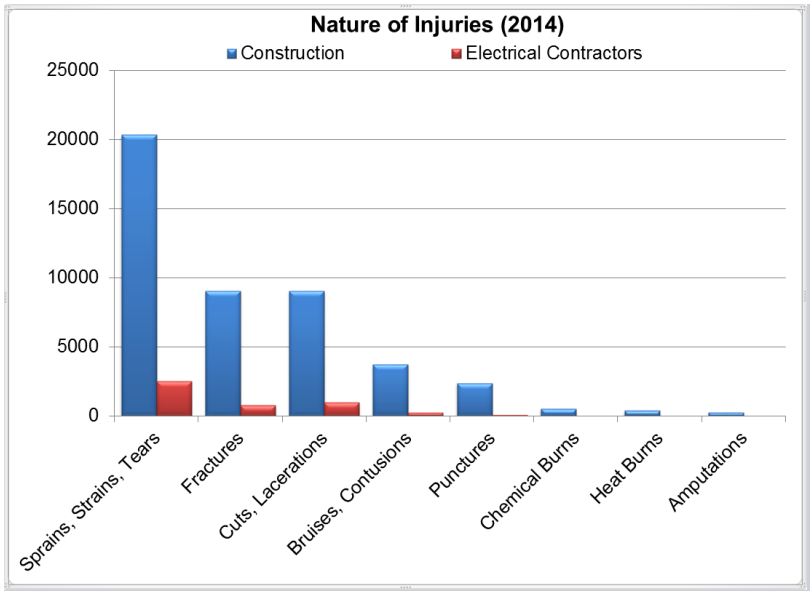

FIGURE A–5 Number of injuries in electrical construction vs. all construction.

Conclusion

In conclusion, there are a lot of safety measures that can be made to make your work environment a safe place to be. Some of which can go way beyond, hard hats, and gear, that OSHA requires. Proper training is a must, but accidents can and do happen as the above figures indicate. Proper processes in place can prepare you to handle any given situation and will help illuminate scrambling to put out fires when things do go awry. Processes like WBS™ can break down the work and identify the risk as you prepare for the job. Using ASTM's E2691 Standard on Job Productivity Measurement process (JPM or JPAC®) while the work is in progress not only records the data but analyzes it in real-time, so you

can better prepare for things to come. Short Interval Scheduling (SIS®) can help reduce the obstructions at the jobsite, by pointing them out, so you can eliminate or schedule around the obstacles that slow you down, and keep you out of harm's way.

Dr. Perry Daneshgari is the President / CEO of MCA Inc. MCA Inc is a research and implementation company that focuses on implementing process and product development, waste reduction and productivity improvement of labor, project management, estimation, accounting, and customer care. He has also published four books and an ASTM Standard for Job Productivity Measurement.

Dr. Heather Moore is Vice President of Operations for MCA Inc. She holds a Ph.D. in Construction Management from Michigan State University. Additionally she holds an MBA from University of Michigan, Flint, and a B.S.E. in Industrial and Operations Engineering from the University of Michigan, Ann Arbor. She was a contributor for the ASTM Standard E2691 "Job Productivity Measurement" and also was co-author of the newly published ASTM book "Application of ASTM E2691 Standard Practice for Job Productivity Measurement in Agile Construction®."