

SAFETY AND PRODUCTIVITY

The Effects of Visibility and Planning on Safety Risk

By Michelle Wilson, Dr. Heather Moore, and Dr. Perry Daneshgari



Construction is a risky business. According to the Bureau of Labor Statistics (BLS), approximately 3 million hours per year are lost due to nonfatal injuries and illnesses in the electrical construction industry alone, and the construction industry as a whole represents over 20% of all jobsite fatalities. There can be no argument that safety must be a priority on every jobsite, but the constant shifting of priorities on the jobsite creates a fluid, dynamic, and often risky situation. Once a job is no longer progressing according to plan, the opportunities for something to go wrong begins to multiply. Accidents happen, and when they happen on the jobsite they are both costly and disruptive.

PROFITABILITY

One study conducted by MCA Inc. for a large national contractor shows the significance of the relationship between a company's jobsite safety incidents and its end of job profitability. The end of job profitability clearly decreases as the number of safety incidents on the jobsite increases (Figure 1).

Conventional wisdom might have us believe that larger jobs have more incidents, as larger jobs involve more people, hours, vehicles, equipment, tools, coordination, and money. They are inherently riskier than their smaller counterparts in terms of jobsite safety as well as financial exposure; and with more moving parts, there are more opportunities for something to go wrong.

According to the data, a jobsite with fewer safety incidents is more profitable. While this may not come as a surprise, it is somewhat surprising that the number of incidents is not directly related to the size of the job. In fact, the jobs represented showed no direct relationship between the dollar size of the job, the duration, or the hours and the number of safety incidents recorded.

PRODUCTIVITY

So what does make a difference? In another investigation, MCA Inc. found

that the differentiating feature in terms of safety incidents on the jobsite was not the number of hours or the contract size but something much more within the direct control of jobsite supervision and management. The number of safety incidents was found to be directly related to the visibility of the jobsite through the use of Agile Construction® tools and to the overall jobsite productivity. More productive jobs are safer jobs.

The results of this study, as shown in Figure 2, indicates that jobs that were visibly tracking their productivity and were operating at a level that was on par or better than planned in terms of productivity, had fewer than half the incidents per \$10 million of contract

value than jobs that were either not tracking productivity at all, or were tracking it but were not able to maintain the expected level of productivity. There was no significant difference between the latter two groups; jobs that were not operating as productively as planned did not make them any less safe than the ones that were not using visible tracking.

WHAT MAKES THE DIFFERENCE?

Visibility and planning allow the contractor to control the environment on the jobsite.

Looking at this same picture in another way, larger jobs using Agile Construction® tools and showing a positive productivity differential

FIGURE 1: Safety Incidents to Profitability

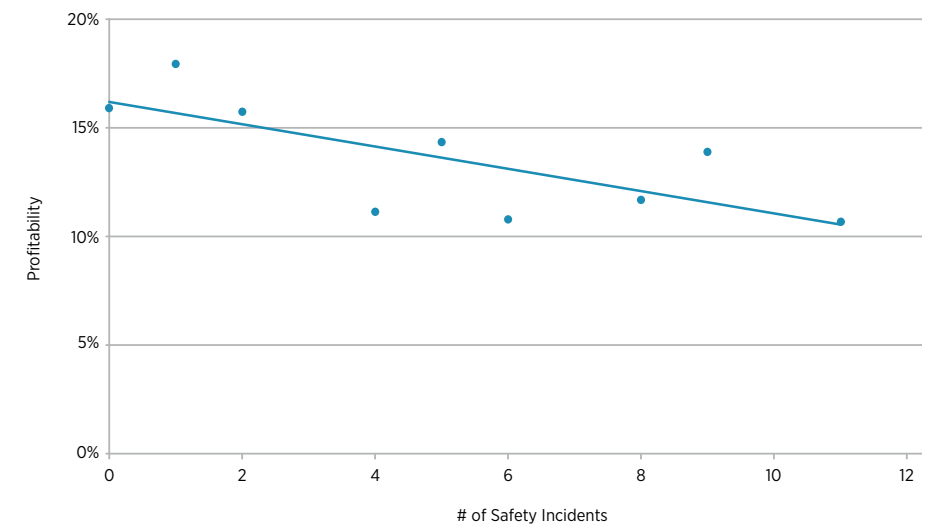
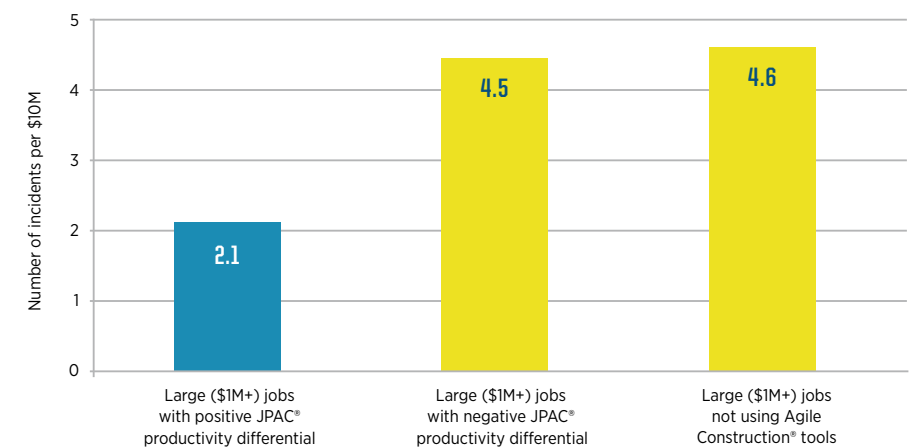


FIGURE 2: Safety Incidents per \$10 Million





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Route calls automatically via the Sprint Network based on driving status

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Associate PLEDGE controls mobile device functionality while driving.

- 1 The Sprint Network locks phones automatically if associates are driving
- 2 Calls and messages are routed to voicemail or designated representatives
- 3 Notifications for missed calls and messages are sent to driver after trip is complete



FEATURE

would be expected to experience only 1 safety incident per approximately every \$5 million in contract value, while similar large jobs would be expected to experience two or more incidents for the same \$5 million (Figure 3).

Additionally, these same jobs were simply less likely to experience safety incidents at all. Only 40% of the visibly productive jobs experienced some type of safety incident, while approximately 60% of comparable jobs had incidents (Figure 4).

Different types of work do have different levels of risk, but the results are the same. Figure 5 shows the same story across multiple divisions of a company performing different types of work in each division. In this case, the comparison is shown on field hours rather than contract dollars, but the result does not change: productive jobs have significantly fewer safety incidents across the board.

What this suggests is that most accidents or incidents are not random occurrences. They are a product of the management on the jobsite and can be controlled. By planning the job and identifying issues that prevent the job from proceeding according to plan, jobsite management and supervision have a much better opportunity to control, or at the very least plan for the entire work environment. This consequently reduces the risks associated with unknown circumstances which allow otherwise unexpected incidents to occur.

VISIBILITY

Jobs that varied significantly from the plan on a day-to-day basis were far more likely to encounter situations with what might be called "safety flags," where a potentially dangerous situation could be identified and mitigated, or even avoided altogether, through proactive intervention. The less predictably a job progressed, the more likely it was to experience jobsite safety incidents. One way in which companies can measure the predictability of the jobsite is through the use of the Agile Construction® tool Short Interval Scheduling (SIS®), which has previously been shown to have a direct correlation to measures of the jobsite

FIGURE 3: % of Jobs with Safety Incidents

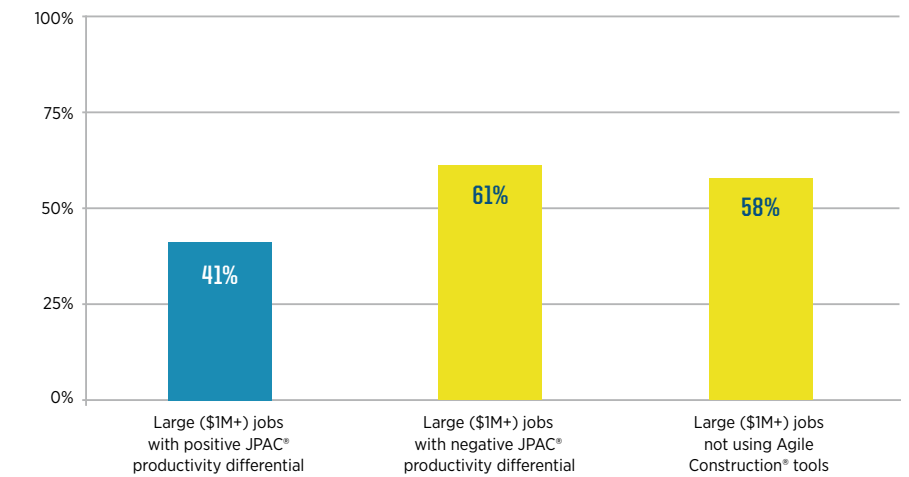


FIGURE 4: Contract \$ for 1 Incident

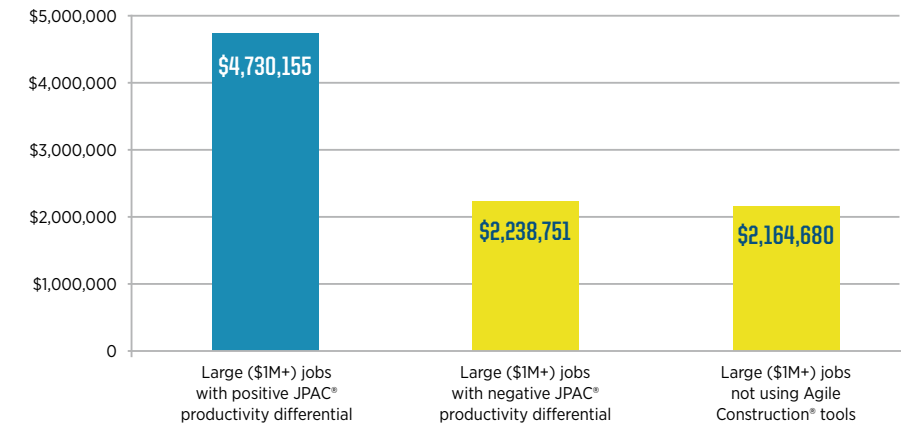
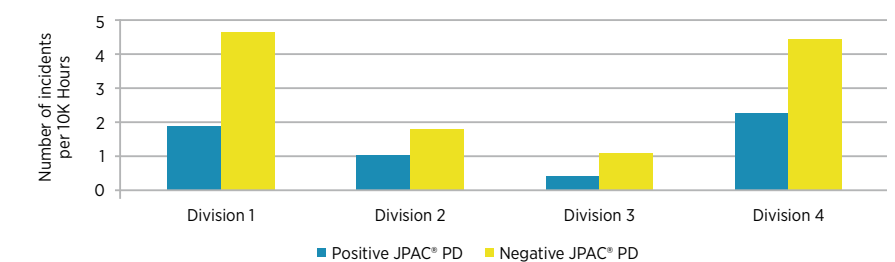


FIGURE 5: Safety Incidents per 10K Hours

Divisions with at least 3 large jobs in JPAC® (Job Productivity Assurance and Control) and both +PD and -PD



productivity (Daneshgari, Dr. Perry, [2010] *Agile Construction® for the Electrical Contractor*, MCA, Inc). The simple act of planning creates an environment where the circumstances can be controlled.

Using SIS®, one electrical contractor doing inside industrial work found that almost

10% (118 out of 1280 occurrences) of its jobsite activities that were not completed as planned were a direct attempt to avoid an unsafe situation (Figure 6). The simple identification by the crew that there was a potential safety issue was enough to suggest that an intervention needed to happen, and it gave jobsite

management the opportunity to take proactive steps to avoid an incident.

However, the other issues identified as reasons for not completing a particular planned task were not independent of safety. Shifts in priority, whether to take advantage of opportunities or to address emergencies, absenteeism, changes in manpower through moving labor onto different tasks or even different jobs, scheduling and coordination, and accessibility all introduced variability and unpredictability into their jobsites. Every obstacle that prevents work from going as planned introduces an unexpected element into the daily activity of the jobsite: different skill sets, different tooling needs, different equipment, unsecured areas, or even unexpected deliveries or the transportation of materials from one location to another in order to have the materials necessary for work on a different task or in a different area.

Depending on the type of work, weather may be a significant safety factor. Wind, lightning, extreme heat, and heavy snow all create dangerous situations that must be addressed in a way that will maintain the safety of the electricians as the true priority without sacrificing the productivity and profitability of the job. As shown in Figure 7, an electrical contractor doing utility work found 2/3 of the obstacles reported were weather related. However, the visibility of this situation again places responsibility in the hands of management, not to control the weather but to control the plan for how the work can proceed safely despite the weather. Note that here too, the direct identification of safety issues accounted once again for approximately 10% of the non-weather related obstacles, just as in the previous

example with similar reasons for unpredictability to be found among the other top obstacles that prevented the work from proceeding as planned.

A single safety incident can have devastating consequences, no matter the size of the job. However, the relationship between visibility and planning and the ultimate measures of jobsite safety and profitability can help any contractor manage the safety risks on every job no matter the size. Productivity and safety go hand in hand.

Michelle Wilson has a BS and MS in Mathematics and is a Professor at Franklin University where she teaches mathematics and statistics with a business focus in support of undergraduate, MBA and MS programs. Michelle has been a part of the MCA team since 2002, involved in research, implementation, and the development of Agile Construction® and the Agile tools. She also has been a contributing author on several research papers and articles for MCA.

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 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 was co-author of the newly published ASTM book, "Application of ASTM E2691 Standard Practice for Job Productivity Measurement in Agile Construction®." ⚡

FIGURE 6

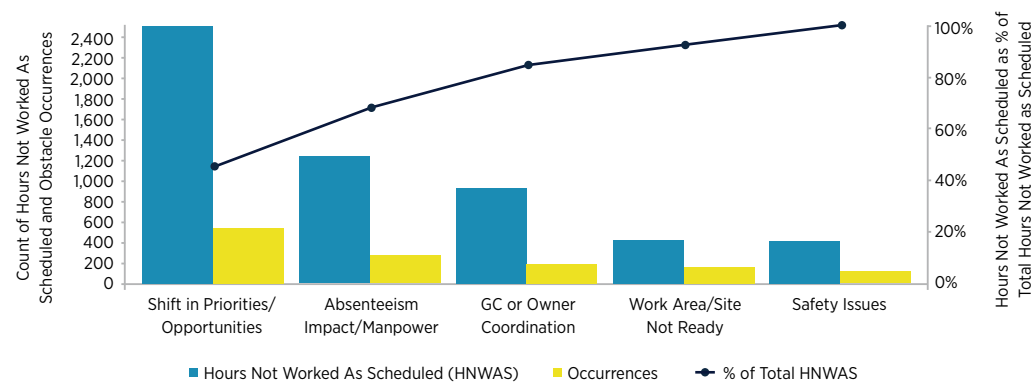
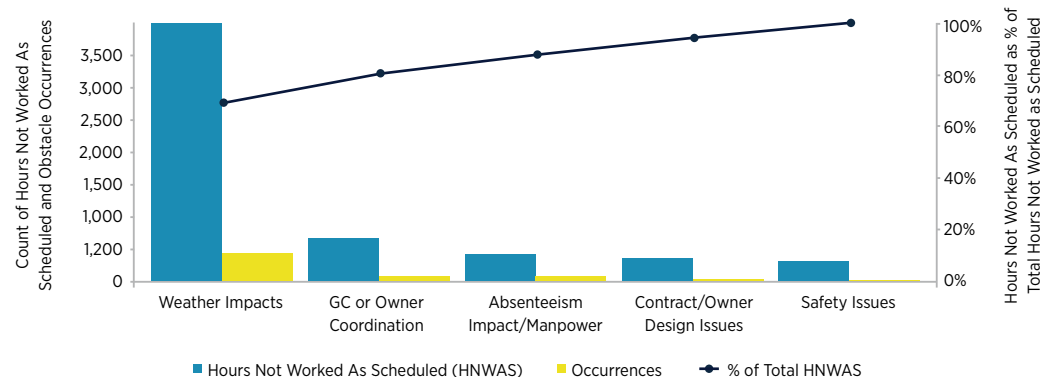
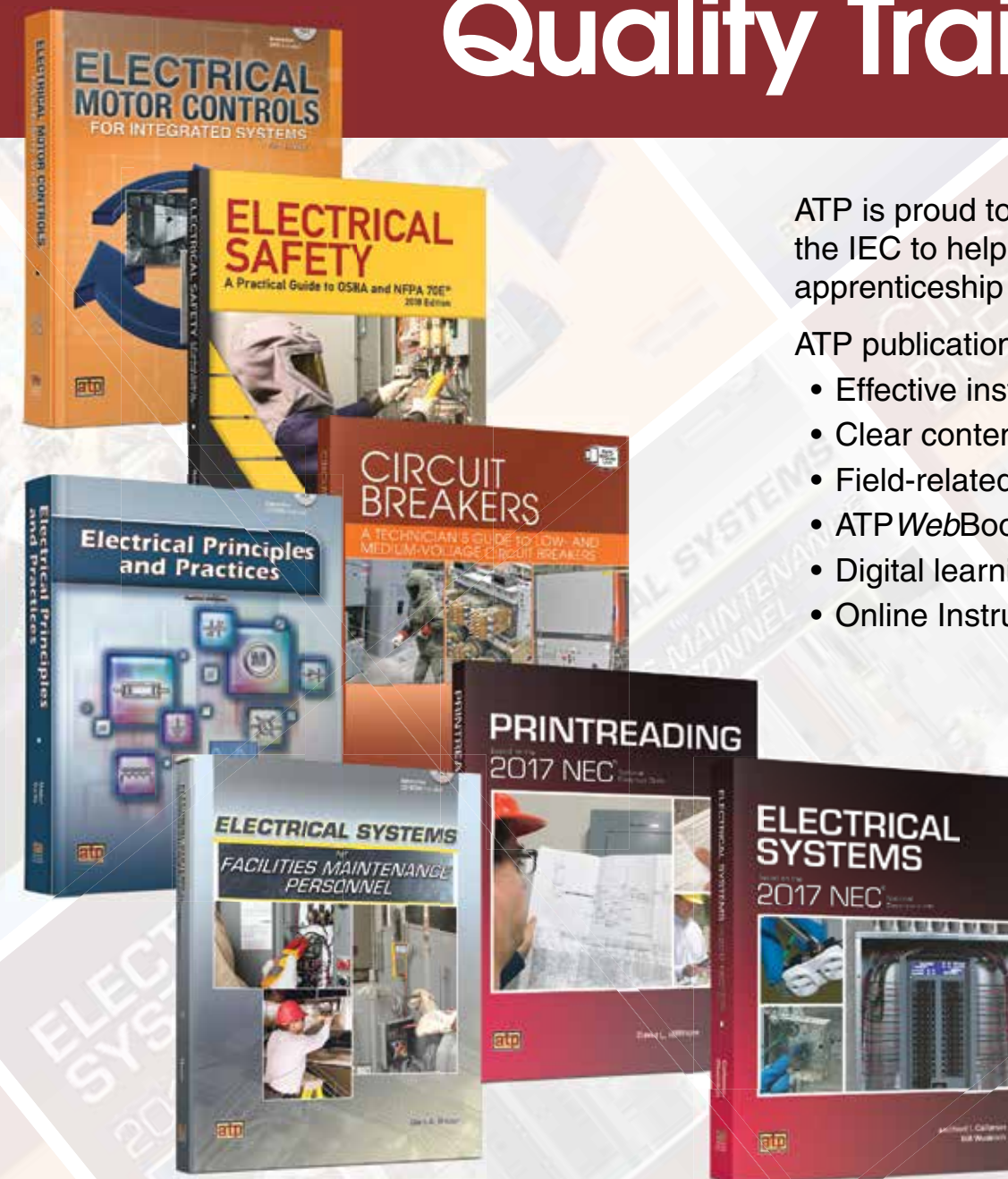


FIGURE 7



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