



Safety Management in the Construction Industry 2020

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Safety Management in the Construction Industry 2020 SmartMarket Report

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About Dodge Data & Analytics

Dodge Data & Analytics is North America's leading provider of analytics and software-based workflow integration solutions for the construction industry. Building product manufacturers, architects, engineers, contractors, and service providers leverage Dodge to identify and pursue unseen growth opportunities and execute on those opportunities for enhanced business performance. Whether it's on a local, regional or national level, Dodge makes the hidden obvious, empowering its clients to better understand their markets, uncover key relationships, size growth opportunities, and pursue those opportunities with success. The company's construction project information is the most comprehensive and verified in the industry. Dodge is leveraging its 100-year-old legacy of continuous innovation to help the industry meet the building challenges of the future.

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Introduction

The construction industry has changed notably since the first safety management study was conducted by Dodge in 2012. At that point, the industry was still feeling the impact of the Great Recession. Now, it is emerging from one of the longest periods of extended growth in its history. While there are some regional differences, the volume of construction work remains high, and construction companies large and small face challenges attracting and retaining skilled workers.

Given the changes the industry has undergone, the most striking elements in the *Safety Management in the Construction Industry 2020* findings are how consistent they are with the previous studies.

■ **Contractors continue to report material benefits from safety on their projects, for their companies and for their workers.**

- These include an average of 4.2% improvement in project schedule, an average 4.4% improvement in project budget and a 9% improvement on reportable injury rates.
- In addition, over two thirds of contractors report that their safety programs improve project quality, increase their ability to contract new work and improve their standing in the industry.

■ **Jobsite workers continue to be recognized as the heart of a successful safety program, a change that first occurred in 2015, and has now remained consistent over three studies.**

■ **Toolbox talks remain the best way to communicate safety messages to the field, and provide information on safer tools, equipment, practices and materials.**

The consistency of these findings demonstrate that managing and improving safety continues to be an important priority for all contractors.

However, the new study also includes some notable changes from the previous one in 2017. Contractors now increasingly recognize that the leadership of supervisors on the jobsite is also a critical component of safety. Importantly, one means of supporting them in that role is providing Foundations for Safety Leadership training, first introduced in 2017, and the report shows a large uptick in those familiar with and using this training.

The findings also suggest that contractors are still trying to figure out how to get the most out of online training tools. They are in wide use, with over 70% of contractors reporting that they used tools like this in 2019. However, the share of safety classes conducted by midsize and large contractors actually dropped a little between 2017 and 2019. Contractors still expect that share to increase in the next two years, though, suggesting that their overall commitment to this approach remains strong.

One of the biggest changes in the industry since 2012 is in the explosion of advanced technology and digital tools to help improve safety management, and the findings indicate that contractors are highly optimistic about their potential. While no single technology in the study is used by over 20% of contractors at this point, a relatively high percentage believe that technology that was rare or unknown in 2012 like wearable devices, virtual reality and visual monitoring with artificial intelligence will have a positive impact on safety within the next three years.

Dodge Data & Analytics looks forward to partnering with CPWR on future studies, to continue to observe how these trends evolve. In addition, we thank Procore for supporting this important work.



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Dodge Data & Analytics

Stephen A. Jones leads DD&A's Industry Insights Research division. He is active in numerous industry organizations and frequently speaks at industry events around the world. Before DD&A, Jones was vice president with Primavera Systems (now part of Oracle), a global leader in project management software. Prior to that, he was principal and a Board of Directors member with Burt Hill, a major A/E firm (now merged with Stantec).



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Donna Laquidara-Carr currently provides editorial direction, analysis and content to DD&A's *SmartMarket Reports*. Prior to this position, she worked for nearly 20 years with DD&A's Dodge division, where she gained detailed insight into the construction industry.

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Left:
Kitchell Contractors establish a data-driven safety management program using online tools in the hands of their workers.

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Executive Summary

Benefits continue to emerge from an ongoing focus on engaging jobsite workers in safety, and the findings in the current study reveal new opportunities to improve that engagement.

In addition to jobsite workers, attention in the current study also shifts to supervisory leadership, as contractors continue to rely on their in-house expertise to provide safety training and recognize the project, business and workforce benefits their programs provide.

Contractors' Engagement With Safety Practices Improves Their Businesses, Project Outcomes and Workforce Issues

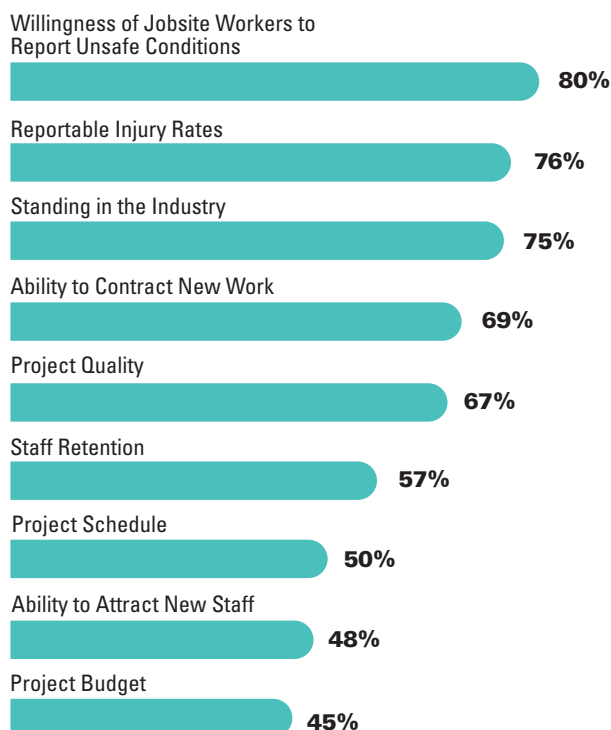
Since 2012, Dodge has asked contractors to indicate whether safety had a positive, negative or no impact on key workforce, business and project performance factors. The chart at right, which summarizes the percentage of contractors who see a positive impact from their safety management program for several key factors, clearly demonstrates that contractors continue to experience benefits by making investments in safety.

This long list, in fact, makes it clear that for a contractor to be competitive in the construction marketplace, their approach to safety should be part of their strategic planning. With more than two thirds reporting that their safety programs have a positive impact on their ability to contract new work and more than half on staff retention, contractors will find their businesses at a disadvantage if they do not continue to advance their safety programs.

It is notable, as well, that the positive impact most frequently reported by contractors from their safety programs is that they believe that their jobsite workers are willing to report unsafe conditions. The findings of this study continue to demonstrate that jobsite workers and supervisors are at the heart of a good safety program—and critical to a strong safety culture—and it is likely many of the other benefits they experience, from improved project quality to positive impacts on budget and schedule, emerge from their ability to empower jobsite workers and supervisors to actively participate in their safety programs. However, the findings also demonstrate that more can be done still to help engage workers and supervisors.

Benefits of Safety Management Programs (Percentage of Contractors Experiencing Positive Impact)

Dodge Data & Analytics, 2020



Jobsite Workers Continue to Be a Critical Part of Safety Programs, and Supervisor Leadership Is Now More Widely Recognized as Necessary

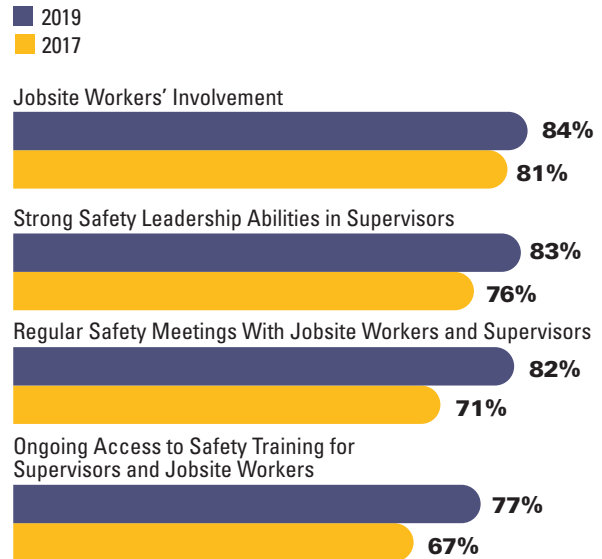
Since 2015, involving jobsite workers has topped the list of essential aspects of a world-class safety program. In 2017, it was the only item selected by over 80% of contractors, and now, two other factors are also considered essential by nearly as many: strong safety leadership by supervisors and regular safety meetings between jobsite workers and supervisors.

These findings demonstrate that the industry is giving greater attention to the role of supervisors in enhancing safety. Tools such as Foundations for Safety Leadership training for supervisors, though, while well received by those who use them, are still underutilized in the industry, with nearly half of contractors still unaware that this training option is available.

The study also reveals more opportunities to engage jobsite workers. While most contractors now expect them to respond to safety hazards onsite, far fewer are engaging workers in safety planning. Empowering and engaging workers in a proactive rather than reactive way is clearly an opportunity for the industry to improve safety outcomes.

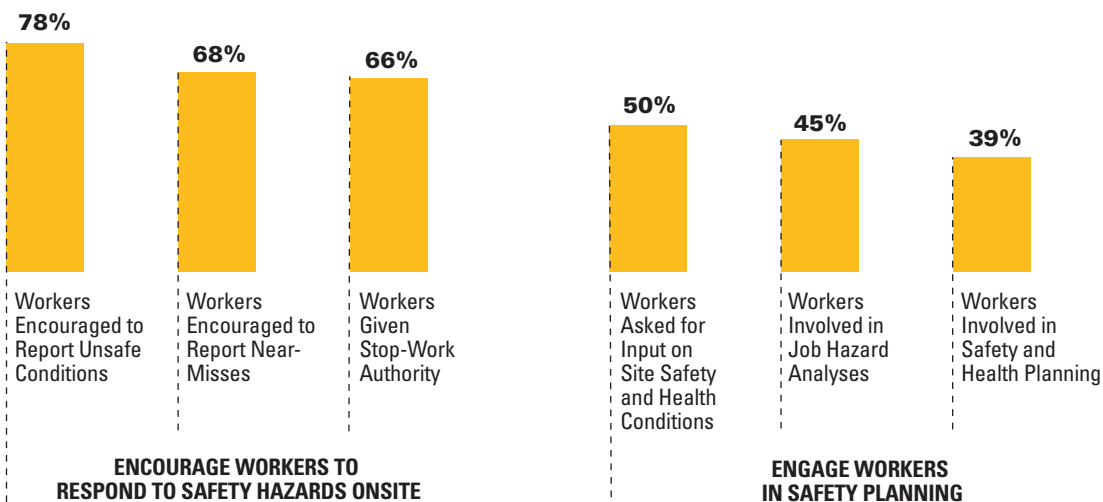
Top Aspects of a World-Class Safety Program (Percentage of Contractors Who Regard Each as Essential)

Dodge Data & Analytics, 2020



Practices Used to Involve Jobsite Workers on Projects (Percentage Using These Practices on More Than 70% of Projects)

Dodge Data & Analytics, 2020



Contractors Rely on In-House Expertise and Often on a Personal Connection for Worker Safety Training

While the previous Safety Management studies conducted by Dodge included a question on how safety training is conducted, the addition in the current study of supervisors/foremen to the list of possible options makes it clear that most companies not only rely on leadership onsite, but they also prefer the training to be conducted there. 73% of contractors report that supervisors/foremen conduct training for them, a sharp contrast to just 28% using a third-party trainer and only 13% using online or eLearning sites.

The obstacles to providing more safety training offer some insight into contractors' ongoing reliance on in-house resources and onsite training. Their biggest concern is the time needed to provide additional training, which is not surprising given shorter project schedules and endemic skilled worker shortages in the industry. In addition, the cost is a notable barrier, and most people believe outside expertise carries a cost burden.

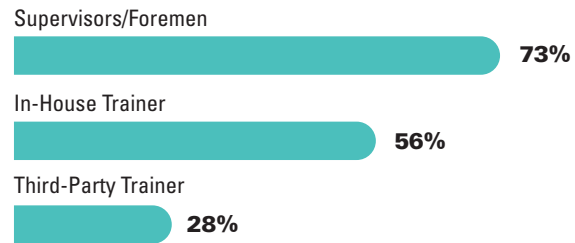
However, the third obstacle may be the most challenging for the industry to overcome in bringing more training to workers. Almost half (41%) of contractors believe that their current training is sufficient. This is despite the fact that 45% of contractors only provide safety training to their workers annually or even less frequently, and among small contractors, that percentage shoots up to 59%.

Many See Potential for Emerging Jobsite Technologies to Improve Safety

While most of the technologies included in the study are only used by a small percentage currently, many contractors believe that emerging technology like wearable devices, virtual reality, visual monitoring with artificial intelligence (AI) and drones all have the potential to improve safety in the next three years. The potential of these devices is powerful: to gather and help analyze data closer to real-time to identify hazards and to prevent injuries onsite by creating a more intuitive experience of the hazards many jobsites pose.

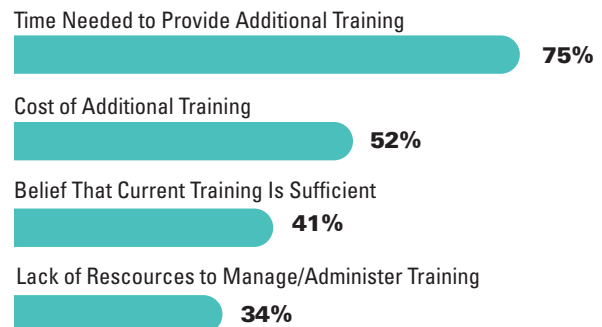
Top Means of Conducting Safety Training for Jobsite Workers

Dodge Data & Analytics, 2020



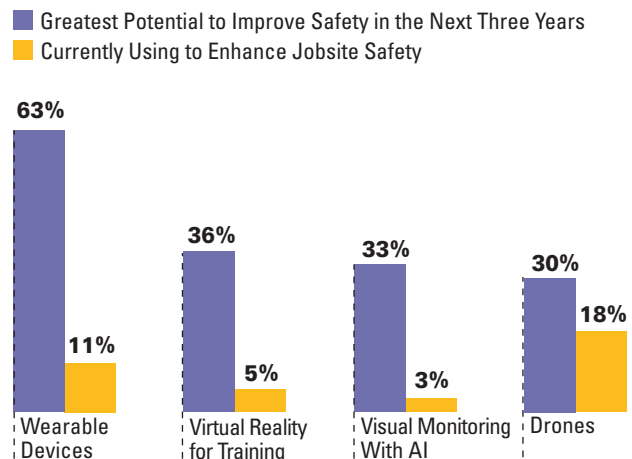
Top Obstacles to Increasing Safety Training

Dodge Data & Analytics, 2020



Top Technologies Expected to Improve Safety in the Next Three Years

Dodge Data & Analytics, 2020



Data: Introduction

Dodge Data & Analytics has now conducted four studies on safety management in the construction industry, starting in 2012. For each study, an important part of the design has been to keep a notable portion of the questions the same to allow for comparisons across all four studies to reveal interesting trends and shifts in the industry.

The current study continues to provide data exploring contractor responses to the specific activities, policies and strategies they use to improve safety, and their attitudes about which are essential to have a world-class safety program. The degree to which contractors experience business, project outcome and workforce benefits from their safety programs is examined. The frequency and means by which they provide training are presented, along with the best means that they have found to communicate about safety with workers in the field.

In addition to these ongoing topics, this research has typically featured a focus on emerging trends and practices that influence safety. Topics covered in the current report include some that were featured in previous reports, including the use of technology to improve safety, the indicators of safety culture and the use of Prevention Through Design (PtD) strategies. The reach and efficacy of programs like the Foundations for Safety Leadership Training module offered by OSHA and the Campaign to Prevent Falls, including the National Stand-Down Day. Seeing each of these areas evolve over time provides a good insight into ways that the industry can continue to support contractors in their efforts to improve their safety programs.

The overall findings reveal that contractors still see jobsite worker engagement as the heart of their safety programs, with supervisory leadership also emerging as a key factor in improving safety. Contractors continue to experience powerful benefits that are core to the success of their projects and businesses due to their investments in safety, but they also still tend to rely on internal expertise to provide safety training. They also prefer direct means of training like toolbox talks, and rely on supervisors to help them provide training to their jobsite workers.

About the Data

The data and analysis in this report are based on the responses of 314 contractors to an online survey conducted in July, August and September 2019.

Two analytical variables are used in the analysis of the data in this report. The first is type of construction company. The respondents are nearly evenly split between prime contractors (46%) and specialty trade contractors (54%). Prime contractors, which include general contractors, construction managers and design-build companies, are referred to as GCs for brevity and simplicity throughout the report since general contractors make up 76% of those respondents. The specialty trade contractor category includes a small percentage of engineering contractors.

The other analytical variable used in the analysis is the size of the company, based on the number of employees. Firms were divided into three categories:

- Small: Fewer than 20 employees
- Midsize: 20 to 99 employees
- Large: 100 or more employees

A more complete description on the methodology and response to the survey can be found in the Methodology section on page 44.

Data: Safety Culture and Practices

Aspects of a World-Class Safety Program

Since 2012, the Safety Management surveys conducted by Dodge Data & Analytics have included a question that asked contractors to identify what they believe to be the essential aspects of a world-class safety program, out of a list of 12 possible items. The chart at right shows the top seven aspects, based on those responses.

Jobsite Workers' Involvement Still Tops the List

Consistently since 2015, jobsite workers' involvement has been widely recognized as critical to a world-class safety program. In 2019, it was selected by 84%.

The Importance of Supervisors in Ensuring a World-Class Program Has Increased Since 2017

The next three options all involve supervisors: strong supervisor safety leadership abilities, regular safety meetings with jobsite workers and supervisors, and ongoing access to safety training for supervisors and jobsite workers.

- All three were selected by a much higher percentage in 2019 than in 2017, with the numbers returning to near 2015 levels for each.
- The increases in the percentages selecting strong safety leadership abilities in supervisors and regular safety meetings with jobsite workers and supervisors put these options nearly on par with jobsite worker involvement.
- Clearly these findings demonstrate an expectation of safety leadership from the jobsite in companies with a world-class safety program.

More Contractors Recognize Importance of Communication and Incident Investigation

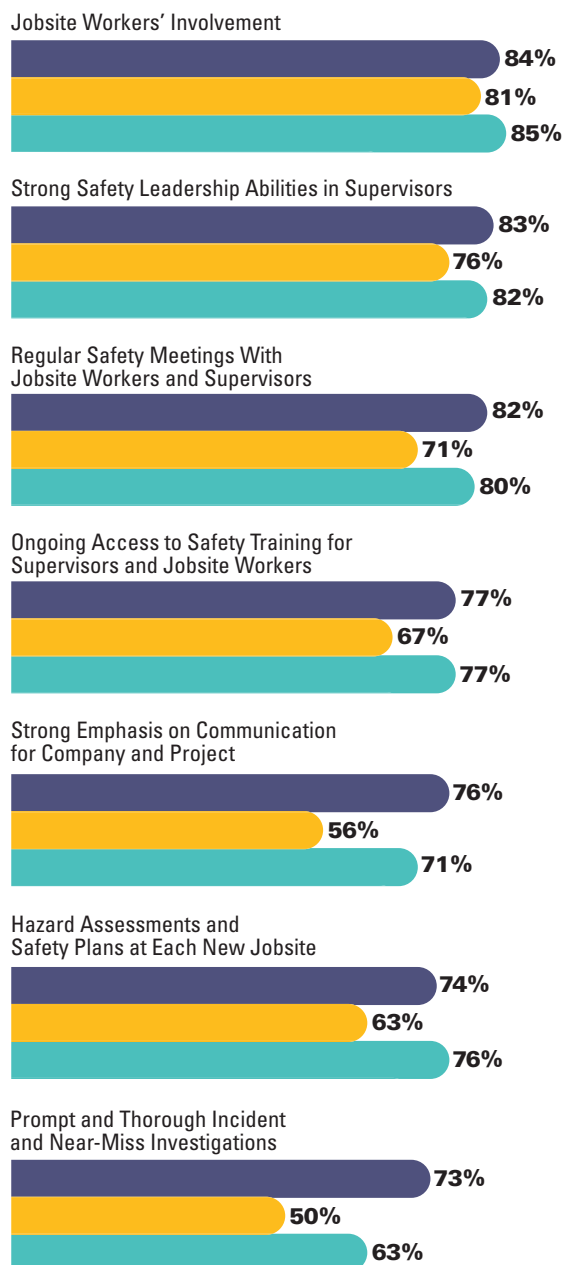
Over three quarters (76%) of contractors believe that a strong emphasis on communication for company and project is a critical part of a world-class safety program, the highest percentage since 2012. In fact, recognition of the importance of communication experienced a 20-point jump over 2017. This is likely due to good communication being essential to encourage a true safety culture.

Similarly, 73% say that prompt and thorough incident and near-miss investigation should be part of a world-class safety program, up from 50% in 2012 and 63% in 2017, demonstrating growing recognition of the importance of this practice.

Top Elements of a World-Class Safety Program (In 2015, 2017 and 2019)

Dodge Data & Analytics, 2020

■ 2019 ■ 2017 ■ 2015



Safety Culture and Practices

Aspects of a World-Class Safety Program

CONTINUED

Variation by Size of Company

A significantly higher percentage of respondents from large companies (100 or more employees) select the 12 elements of a world-class safety program as essential than do those from small companies (fewer than 20 employees). The wider recognition of the importance of more practices by larger companies is consistent with all three previous studies.

However, it appears that small companies are increasingly recognizing the importance of several safety practices. A higher percentage of respondents from small companies in 2019 identify five of the 12 aspects as essential (shown in the chart at right) than did those in 2017. All five aspects are specific practices, such as having regular safety meetings, conducting prompt and thorough incident and near-miss investigations, doing regular safety audits and establishing specific goals with associated metrics. It is possible that exposure to these being more widely used on projects may have increased their awareness of the value of these practices in improving safety performance.

Variation by Company Type

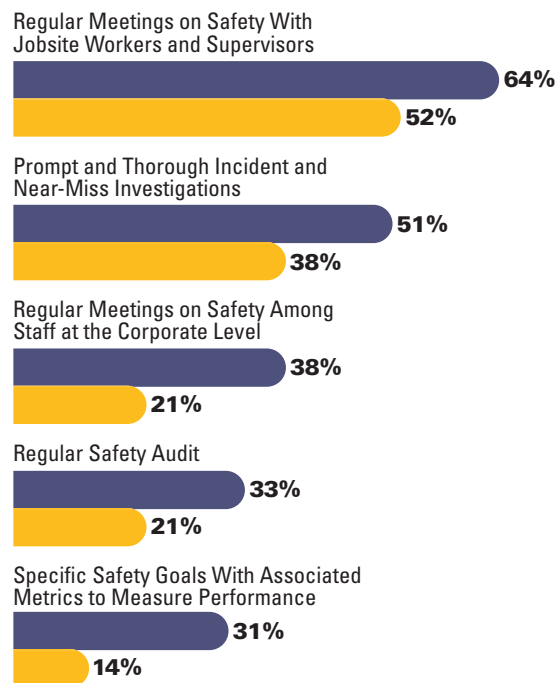
General contractors favor six of the 12 aspects of a world-class safety program more than do trade contractors, as can be seen in the table below.

Aspects of a World-Class Safety Program According to Small Contractors (Fewer Than 20 Employees)

(Changes Between 2017 and 2019)

Dodge Data & Analytics, 2020

■ 2019 ■ 2017



Aspect of a World-Class Safety Program Considered Essential by More GCs Than Trade Contractors

Aspects of a World-Class Safety Program	Percentage Who Consider Them Essential	
	GCs	Trade Contractors
Hazard Assessments and Safety Plans at Each New Jobsite	80%	69%
Prompt and Thorough Incident and Near-Miss Investigations	79%	67%
Regular Safety Audits	78%	60%
Regular Meetings on Safety Among Staff at the Corporate Level	78%	60%
Specific Safety Goals With Associated Metrics to Measure Performance	61%	46%
Safety Incentives/Recognition for Reporting Hazards and Near-Miss Reporting	50%	39%

Use of Safety Policies

Contractors were asked to indicate which of seven practices related to safety policies that they currently use. They also had the option to indicate that they did not use any of them. The chart below shows their responses, with general use indicated by the bars on the left and use by small contractors by the bars on the right for each practice.

- **Site-specific safety and health plans are the most common policies employed by contractors, followed closely by site-specific training programs.** This corresponds to the importance placed on hazard assessments and safety plans at each new jobsite as an essential practice for a world-class safety program (see page 8), and suggests that contractors widely perceive safety planning as an ongoing activity that is conducted for every new site.
- **Training for frontline supervision rounds out the top three.** Again, this reflects the renewed importance placed on site leadership in encouraging safety that emerged in the selection of the essential aspects of a world-class safety program (see page 8).
- **Policy practices in moderate use include having a formal process for safety-related corrective actions and having measurable safety goals and objectives.** Formal processes are often less widely used by small companies (see below), and this could be lowering the overall use in the industry. Measuring safety metrics continues to be a challenge for many companies.

- **Fewer than half of contractors prequalify subcontractors based on safety performance or offer safety incentives.** Prequalifying subcontractors reduces many risks, including safety ones, but even among just general contractors, it is only reported by 54%, suggesting there is potential for improving the industry through wider adoption of this policy. Safety incentives are more controversial than the other measures, which may explain their low adoption rate.

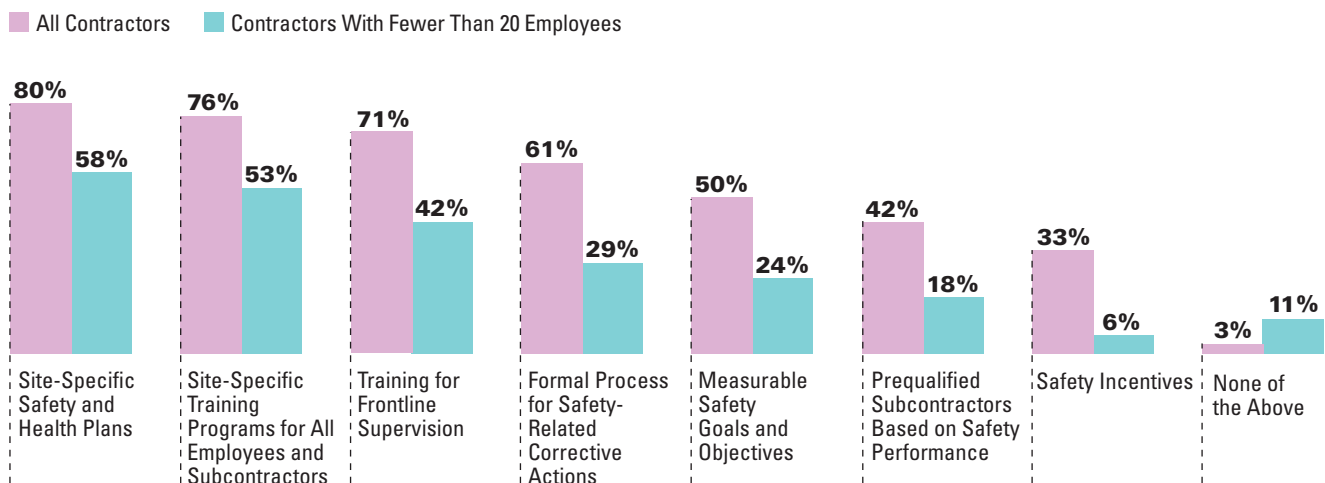
Variation by Size

As the chart reveals, small contractors use fewer practices related to safety policies than do contractors in general.

- **While the percentage reporting use of each policy differs, the ranking by use of each policy is the same for small contractors as it is for all the contractors included in the study.**
- **Nearly all small contractor (89%) use at least one of these policies, but there is wide potential for growth in use of each of these policies by small contractors.**
- **The biggest gap in use of any of the safety policies between the overall responses and those from small contractors is for having a formal process for safety-related corrective actions.** Perhaps this is due to the fact that this is the most formal policy option of the group, and policies may be more fluid in smaller companies.

Percentage of Contractors Using Safety Policies (All Contractors and Small Contractors)

Dodge Data & Analytics, 2020



Organizational Practices Used to Promote Safety

Contractors were asked to select which of seven organizational safety practices they currently use. The chart below shows their responses, with general use indicated by the bars on the left and use by small contractors by the bars on the right for each practice.

- **Maintaining an open-door policy for workers to report hazards, incidents and concerns is common practice in the industry at large, including among small companies.** This is a specific example of the role that jobsite workers can play in improving safety.
- **Including jobsite workers in safety processes is also fairly common in the industry at large.** However, even though more than half of small companies engage in this practice, there is still an opportunity for more small companies to do so.
- **70% in the industry state that they designate competent project safety personnel,** but only 51% from small companies report the same. While encouraging a culture in which every employee shares the responsibility for safety is a best practice, designated safety personnel are still very important so that the company can stay current with the latest developments affecting safety and ensure safety is prioritized by the rest of the staff.

- **Overall, the construction industry has also embraced many other organizational safety best practices,** with around two thirds stating that they do job hazard and job safety analyses (JHA/JSA) before construction begins, prompt and thorough near-miss and incident investigations and incorporate safety as a key part of their strategic planning.
- **However, more formal practices are far more common in the industry as a whole than they are in small companies.** Companies with fewer than 20 employees do not have as many formal processes in place in general, but this may put them at a disadvantage when it comes to reducing safety risks. Only about one third do JHA/JSA before construction begins, or conduct prompt and thorough near-miss and incident investigations, which makes creating a plan to manage safety risks effectively more challenging.

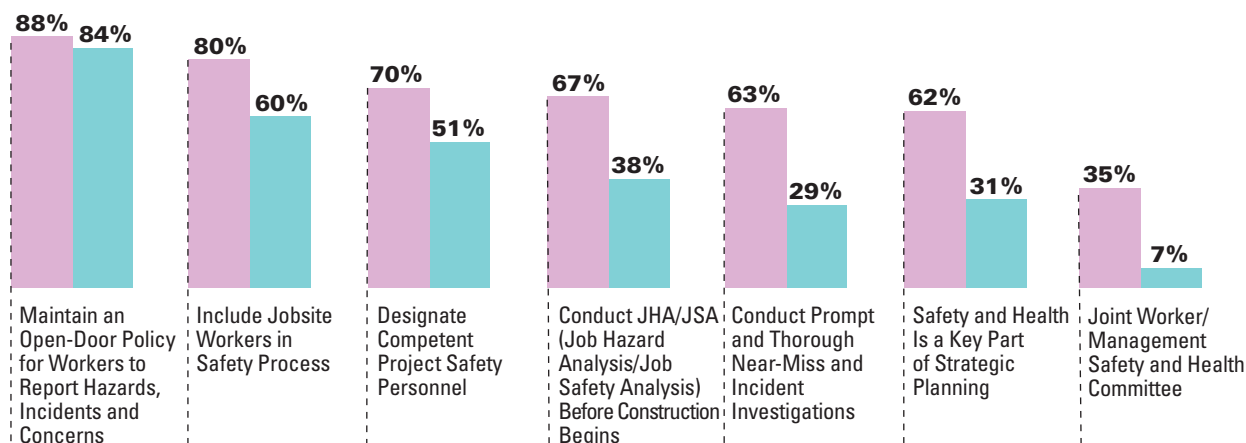
Variation by Firm Type

Significantly more GCs than trade contractors report that they maintain an open-door policy to workers, designate competent project safety personnel and conduct JHA/JSA before construction begins.

Percentage of Contractors Using Organizational Practices to Promote Safety (All Contractors and Small Contractors)

Dodge Data & Analytics, 2020

■ All Contractors ■ Contractors With Fewer Than 20 Employees



Jobsite Worker Involvement With Safety

Contractors were asked about how they engage their jobsite workers in their safety programs. The chart below lists the percentage of contractors using six of these practices on any of their projects, and the one on the opposite page lists those using these on more than 70% of their projects.

The chart below reveals that almost all contractors are using these practices at least some of the time. This demonstrates wide familiarity in the industry with all of these means of engaging jobsite workers, which, in turn, supports the possibility for wide use of each. However, the chart on page 13 reveals notable differences in the frequency with which these practices are used.

■ Workers are widely encouraged to react to and report on conditions and activity onsite.

- Over three quarters (78%) say that jobsite workers are encouraged to report unsafe conditions on over 70% of their projects.
- About two thirds also say workers are encouraged to report near-misses (68%) and are given stop-work authority (66%) on most projects.
- Half of contractors (50%) also ask for their workers' input on site safety and health conditions on most of their projects.
- The percentage of companies that are empowering workers to react to site conditions on most projects has also grown since the study in 2017, with a 7-point increase for both reporting unsafe conditions and being given stop-work authority.

- These findings suggest that contractors increasingly recognize that workers are the most familiar with the actual conditions onsite and that their feedback and ability to respond to those conditions must be encouraged if jobsites are to become safer.

■ **However, workers are less frequently encouraged to be proactively engaged in safety planning and analysis before construction begins.** Fewer than half of contractors involve workers in job hazard analysis (45%) or get workers involved in safety and health planning (39%) on the majority of their projects. This is a potential area for improvement in the industry, and the increase in the percentage who involve workers in safety and health planning since 2017 from 30% to 39% is a positive development that will hopefully continue.

Variation by Size of Company

Large companies (100 or more employees) more frequently use each of these practices to involve workers in jobsite safety than those with fewer employees. However, they still follow the same general pattern: over three quarters of large companies report that workers are encouraged to react to and report onsite conditions and activities, but fewer than 60% are engaged in safety planning and analysis before construction begins. Thus, large companies have similar opportunities to improve safety performance as smaller ones by engaging jobsite workers in safety planning and analysis more often.

Involving Jobsite Workers in Safety (Means Employed on Any Projects)

Dodge Data & Analytics, 2020

■ 2019 ■ 2017



Safety Culture and Practices

Jobsite Worker Involvement With Safety

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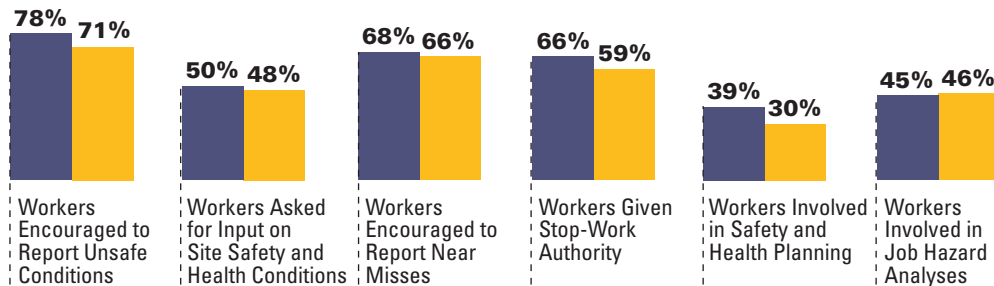
Variation by Type of Company

For the most part, general and trade contractors' responses about involving workers in jobsite safety are similar. The only notable difference is that just 2% of GCs do not ask jobsite workers for input on site safety and health conditions at all, while 9% of trade contractors report that they do not engage their workers in this way.

Involving Workers in Jobsite Safety (Means Employed on Over 70% of Projects)

Dodge Data & Analytics, 2020

2019 2017



Mentoring Subcontractors on Safety Practices

Every general contractor, construction manager and design-build firm has their own, unique approach to safety management, and all face the challenge of having the subcontractors on their projects adapt to their safety approaches. One way to manage that challenge is to mentor subcontractors on safety practices.

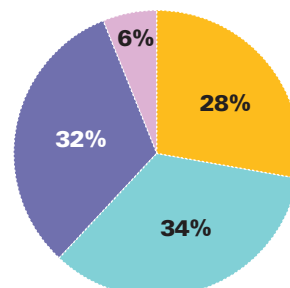
GCs/CMs/design-builders were asked how frequently they do so, and the chart at right indicates their responses. Nearly all (94%) report mentoring at least sometimes, but it is only a common practices for about one quarter (28%). Nearly the same percentage (32%) report that they do it less than 25% of the time.

It is notable that GCs with fewer than 100 employees are just as likely to mentor subcontractors as larger companies, and there is also no significant difference in the degree to which they engage in mentoring.

Frequency With Which General Contractors, Construction Managers and Design-Builders Mentor Subcontractors

Dodge Data & Analytics, 2020

- Almost Always (71% or More of Subcontractors)
- Often (25% to 70% of Subcontractors)
- Sometimes (Less Than 25% of Subcontractors)
- Do Not Mentor Subcontractors



Leading Indicators of a Safety Culture

While a strong safety culture is not something that can be directly measured, there are indicators that such a culture exists in a company based on how they encourage all of the staff and leadership to engage with safety concerns. The 2015 SmartMarket Report on Safety examined 33 indicators in eight categories. This study focuses on the top three of those categories that have the greatest impact on safety performance.

- **Training at all levels has the greatest impact on safety.** It is not only ranked in the top three by the highest percentage, but also has the largest number who rank it first. This finding demonstrates that both those at the top and the bottom of the organization need to understand how to minimize safety risks to have a vibrant safety culture.
- **Empowering and involving employees is ranked in the top three by 58%.** This finding clearly corresponds with ongoing interest in engaging jobsite workers in safety management.
- **Around 40% rank demonstrating management commitment and accountability at all levels as one of the top three ways to impact safety.** Leadership by management is critical to encourage a safety culture, as this finding clearly demonstrates.
- **Less than one third rank the final four items in the chart at right in their top three.** It is notable, though, that a relatively high percentage of those who select improving supervisory leadership in the top three rank it first. This suggests that those who prioritize improving this leadership may see more impact on safety than is perceived by those who do not.

Variation by Type of Company

For the most part, GCs and trade contractors agree about the ranking of these items, but they differ in their estimation of the impact of aligning and integrating safety as a value.

- **14% of trade contractors rank aligning and integrating safety as a value first.** This is the highest percentage of trade contractors to rank any of the indicators first, other than training at all levels.
- **It is only ranked first, though, by 7% of GCs, which places it fifth out of seventh in importance for them.**

This is a surprising finding, and one which may suggest that more trades are seeking leadership from GCs in this area on their projects.

Leading Indicators of a Safety Culture Ranked Most Impactful on Safety Performance

Dodge Data & Analytics, 2020



Safer Use of Materials Containing Isocyanates

New research conducted on isocyanates demonstrates that following best practices to minimize the hazards of exposure is critical, and that the industry needs to make sure workers are aware of the risks and how to deal with them.

The high performance of many materials used in construction are critical for achieving important project outcomes, from sustainability to reduced project schedules. However, some of these materials include chemicals that can pose serious health risks if not handled correctly. Isocyanates are a great example of this, and new research conducted at the University of Massachusetts Lowell reveals the importance of following proper safety procedures when dealing with these materials.

What Are Isocyanates?

Isocyanates are chemicals contained in spray polyurethane foam insulation and in products used when painting metal structures like bridges and water tanks as a final coating. These chemicals provide important performance benefits, and with the insulation products in particular, they have been a critical part of helping to achieve sustainable goals in buildings, according to Anila Bello, a research professor who has worked on the study.

However, Bello also points out that the risks of improper exposure are significant. “We started the project on isocyanates five years ago, [because] isocyanates are very reactive chemicals, and they have been associated with occupational asthma.” Bello explains that some workers may particularly struggle with this, because for some individuals, once they are sensitized by exposure to these chemicals,

“even a little bit of exposure would trigger the symptoms.” She compares this to poison ivy, which operates similarly. The implications of sensitization, therefore, are quite serious for both the worker and the company since workers who experience this reaction may have to leave a job because even the lowest levels of exposure will trigger increasingly severe symptoms.

Despite the fact that the symptoms of exposure are respiratory ailments, the research work in which she was engaged demonstrates that workers can experience inappropriate exposure not just from inhaling, but also from contact with the skin. This means that it is not just the original application of the insulation where the risk occurs: It also happens when workers need to manipulate the foam insulation after it has set, including trimming and removal.

Mitigating Risks

Bello states that “the industry has done a good job developing best practices” for handling these materials safely, including use of proper gloves and respirators, and making sure that the ratio of materials being mixed is exactly correct to prevent left-over isocyanates from remaining after the initial reaction that forms the insulation or coatings. However, she also sees two different kinds of challenges for the industries that most frequently deal with these materials.

■ Companies Using Spray

Polyurethane Foam Insulation:

For those applying spray insulation, the biggest challenge comes from the large numbers of small companies, which Bello refers to as “one-truck companies,” that take a course on how to apply the insulation and then set up shop. She says large companies specializing in insulation typically enforce the proper protocols, and she largely credits that to avoiding liability risks with homeowners in the properties where the insulation is being installed. However, these one-truck companies do not always maintain the same level of best practices.

■ Companies Using Coatings:

The more surprising challenge, though, comes on the coatings side. Here, most of the companies that paint structures like bridges and water tanks are quite large, but they are far less rigorous in their application of the appropriate protocols, and Bello’s research has found, through conducting urine samples of both groups, that about 58% of workers dealing with coatings are above the guidance values for isocyanates, compared with 26% of those working with insulation. Since many of the painters using these coating products are union signatories, there is a powerful opportunity for these labor unions to help engage in ensuring that workers are required to follow the proper protocols to avoid harmful exposure. ■

What Puts a Safety Program Among the Best of the Best?

Rogers O'Brien Construction

DALLAS, TEXAS



Good safety is critical on tight, complex construction sites.

Each year the construction industry recognizes outstanding safety programs across the country. Honors such as the ABC National Safety Excellence Award, the AGC Construction Safety Excellence Award, the Construction Users Roundtable Construction Industry Safety Excellence Award, EHS America's Safest Companies Award and the National Safety Council Awards highlight firms that have made an exceptional commitment to safety a cornerstone of their operations.

One such company is Texas-based general contractor Rogers-O'Brien Construction (RO). The company has won several national and regional safety awards in recent years, and in 2018 was one of only 13 firms out of some 21,000 Associated Builders and Contractors (ABC) members to win the association's National Safety Excellence Award at the pinnacle level (the highest level of safety achievement through ABC). So what makes RO's program a standout?

"Our vision is to be Texas' premier builder, delivering excellence and expertise through all aspects of

our business," says Ross Daly, the company's corporate safety director. "And that includes safety." Daly draws a distinction between priorities, which can change, and core values, which remain constant. "Safety is one of our core values," he says.

A Leading Safety Culture

Three key elements underpin the firm's safety culture. The first is buy-in from RO leadership. Exemplifying this, safety constitutes a focus in the firm's annual strategic planning, with the intention not just of improving the status quo, but of looking for transformative options as well. The firm's leaders are also consistently engaged with safety at the field level, making site visits to reaffirm the safety value and to listen for suggestions as to initiatives, practices or resources that could help support it.

As an example of this organization-level commitment, the firm has developed an innovative solution to a chronic hazard in the installation of precast panels. The danger comes as a panel is craned into position, and employees use their hands to push and pull until it's plumb against the slab. In the case that got RO's attention, a panel moved faster than expected, and, in an attempt to prevent it from striking the adjacent panel, an employee caught his hand in the pinch point between the two.

In response to the incident, RO facilitated a roundtable meeting with industry experts, including fabricators, erectors, seasoned superintendents and safety managers to find a better way. The solution they developed is a light-weight aluminum bracket complete

CONTINUED

What Puts a Safety Program Among the Best of the Best?

DALLAS, TEXAS

with proper handles; it bolts to the edge of the panel before hoisting and provides leverage for easier maneuvering. For ergonomic as well as caught-between risks, this simple yet ingenious device has made for a safer jobsite.

Trade Partner Engagement

The second element underpinning RO's safety culture is employee engagement. "While leadership commitment is vital in setting the example," says Daly, "real safety lies at the craft-level worker out there doing the work." So, rather than seeing workers' safety behaviors as problems to be fixed, RO has come to view workers' wealth of knowledge as a source of solutions. In the past, says Daly, the company tended to "talk safety down" to its trade partners, telling them how to practice it. But now, "we're pushing to flip that concept on its head," he says. "We want to hear more from our trade partners on how we run safety on our jobsite."

One way the firm does that is by sharing out weekly jobsite safety meetings among the trades. "It's so very beneficial to have an electrician tell us about their work," says AJ Chase, a project manager

at RO, "because what they do is so specialized, and electrical hazards are the ones you can't really see." Similarly, a formwork contractor might discuss rigging and signaling before a crane begins flying forms into position, helping to raise situational awareness site-wide. "Once a trade partner sees another leading the discussion, safety gets a bit more traction," says Chase. "They have more ownership of the process, and feel more valued and engaged."

Another example of employee engagement is the firm's approach to planning. From scheduling months out to ensure trades will not be stacking on top of one another on a vertical, zero-setback, urban infill project, for example, to daily pre-task planning (PTP) cards on which trade supervisors carefully detail how the risks of each of the day's activities will be handled, trade partners are essential participants in the process.

Positively Safe

The third element is the creation of an environment of trust and learning. A positive, rather than punitive, approach to safety is an aspect of successful safety leadership, but it is so critical to the success of the firm's safety culture that Daly identifies it as a key factor in its own right. RO

staff are also trained to "coach in the moment" to understand why a worker wasn't behaving safely and to help them improve. "To have that world-class safety program, accountability is essential," says Daly, "but very rarely will you punish someone into changing their behaviors." Simply disciplining an employee for a safety violation seems like an easy fix, he says, but it often papers over what is really going on. Instead, the focus should be on the system that allowed the incident or near miss to occur, and on how to make that system more robust.

An aspect of positivity around safety is the recognition and reward of safety behaviors that go above and beyond the individual's responsibility. Even if it's primarily symbolic, like a safety champion sticker and a free lunch at the food truck, the program boosts morale and provides extra opportunities to reinforce safety as a positive value.

In this context, an honor such as the pinnacle-level ABC National Safety Excellence Award represents a major achievement for the firm. "When we win an award like this, it's great to share it!" says Daly. The news goes out in company bulletins, and RO "town hall" meetings recognize the winning safety work firm-wide. The award also provides a measure of RO's safety program relative to the company's peers nationwide, and lets the firm know its efforts have earned a place among the best of the best. In addition to the recognition that the award itself represents, the process of applying for it also has value. "It allows us to reflect on what we do well," says Daly, "and to identify areas where we can still improve." ■

Total Recordable Incidence Rate (TRIR)	2015	2016	2017	2018
RO Construction Company	0.33	1.18	1.41	0.96
Days Away Restricted or Transfer Rate (DART)	2015	2016	2017	2018
RO Construction Company	0.32	0.57	1.12	0.72
Lost Workday Case Incident Rate (LWCR)	2015	2016	2017	2018
RO Construction Company	0.00	0.30	0.28	0.00

Data: Impact of Safety Practices and Programs on Business

Workforce Benefits From Improved Safety

Since the 2012 study, contractors have been asked to rate the impact of their company's safety practices on factors that impact their workforce, project performance and businesses on a five-point scale, from highly negative to highly positive. The chart at right shows the percentages in each study who find that their safety practices have a positive or highly positive impact on factors impacting their workforce, with business benefits shown on page 19 and project benefits on page 20.

Nearly all (80%) in the current study believe that their practices had a positive impact on the willingness of jobsite workers to report unsafe working conditions. The findings in this study are consistent with the previous ones, demonstrating that most contractors believe their safety programs are effective in encouraging workers to speak up.

Over two thirds of contractors (69%) have also consistently reported that their safety practices have a positive impact on reducing their reportable injury rates. This year, the average improvement noted was a 9% reduction in injury rates. It is notable, though, that those finding a positive impact on this factor have declined since 2015, when 81% rated the impact as positive. It is likely that the increased volume of work over the last few years, combined with the ongoing challenge of finding skilled workers, have decreased the effectiveness of safety programs in reducing reportable injury rates.

However, the majority of the industry still finds their programs to have this effect.

Given the workforce challenges cited above, staff retention and attraction are a particularly high priority for contractors, and safety programs appear to have an influence here as well.

- **Well over half (57%) of contractors say that their safety programs have had a positive impact on their ability to retain staff, up 13 points from the findings in 2017.**
- **While fewer contractors (47%) see an equally positive impact from their safety programs on their ability to attract new staff, the percentage is still up from the findings in 2017.**

Variation by Company Size

Respondents from large companies (100 or more employees) more frequently see positive impacts on all of these factors than do those from smaller firms.

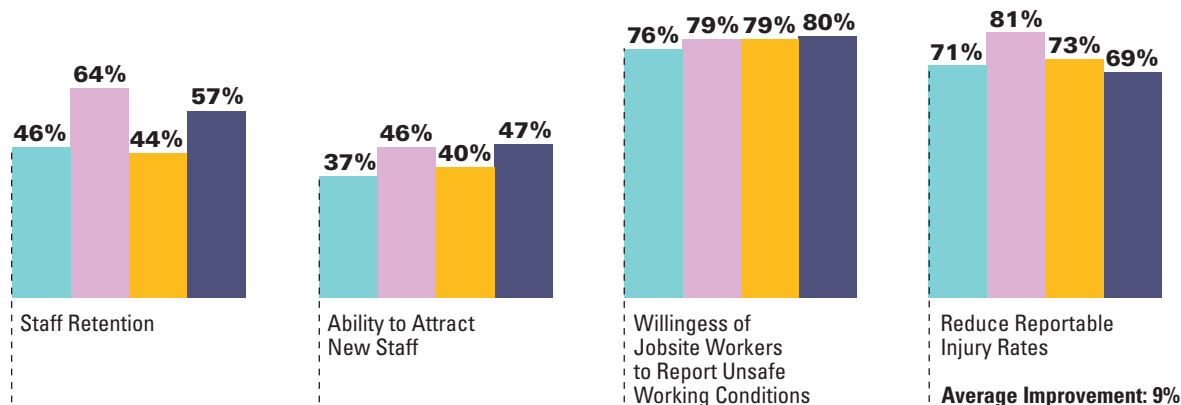
- **Willingness to report unsafe working conditions:** 90% of large companies, compared with 72% of smaller ones.
- **Reportable injury rates:** 87% of large companies, compared with 72% of smaller ones.
- **Staff retention:** 64% of large companies, compared with 50% of smaller ones.
- **Ability to attract new staff:** 64% of large companies, compared with 33% of smaller ones.

Workforce Benefits From Company's Safety Practices

(Percentage Rating the Impact of the Practices as Positive/Highly Positive for Each Benefit)

Dodge Data & Analytics, 2020

2012 2015 2017 2019



Impact of Safety Practices and Programs on Business

Workforce Benefits From Improved Safety CONTINUED

The large divide on attracting new staff may be the result of large companies being better able to capitalize on their reputation in the industry than smaller companies. The differences in impact on reportable injury rates and willingness to report unsafe working conditions are likely

due to the wider use of many safety practices by large companies, and the greater likelihood that they will be formalized into policy at these firms. The findings indicate a need in the industry to help smaller companies narrow that gap in order to improve safety as a whole.

Business Benefits From Improved Safety

Since 2012, contractors have been asked to rate the impact of their safety programs on two factors that directly impact the success of their businesses, their ability to contract new work and their standing in the industry. The percentages of contractors who have experienced a positive benefit from their safety programs on each of these factors are shown in the chart at right.

The impact of safety practices on their ability to contract new work has consistently been positive, with two thirds or more reporting that they have experienced this benefit since 2012. Other than a slight spike in 2015, the findings are also notably consistent, suggesting that this has a steady influence.

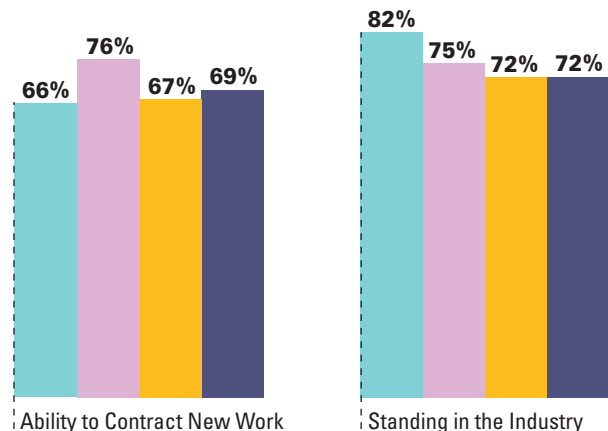
Trade contractors may need to pay particular attention to this benefit in the future as the construction industry becomes more data-driven. A proven best practice, and one encouraged by the insurance sector, is for GCs to prequalify the subcontractors they hire, and safety is often one of the criteria on which they are judged. While this is not yet widely adopted in the industry, new software tools and access to better data may make this a more common practice in the future, and trade contractors need to be sure that they can be competitive based on their safety records.

Three quarters of contractors report that they see a positive impact on their standing in the industry based on their safety programs. The frequent experience of this benefit suggests that the reputation of having good safety management practices may be necessary simply to be considered competitive.

Business Benefits From Company's Safety Practices (Percentage Rating the Impact of the Practices as Positive/Highly Positive for Each Benefit)

Dodge Data & Analytics, 2020

2012 2015 2017 2019



Project Benefits From Improved Safety

Since 2012, contractors have been asked to rate the impact of their safety programs on project benefits like project schedule, budget and quality. The chart at right shows the percentage of contractors who saw a positive impact from their safety program on each of these benefits.

The top project benefit experienced by contractors is improvement to the quality of their projects. This has consistently been the top project benefit since 2012, with 63% currently reporting that their safety program improves the quality of their projects.

Half (50%) of contractors report that they saw an improvement to their project schedule due to their safety efforts. This is the highest percentage to report this since the study was first conducted in 2012, a finding that may be influenced by the increasing challenge of skilled worker shortages. The *Commercial Construction Index*, a quarterly report featuring research from Dodge Data & Analytics, shows that over half of contractors consistently report that workforce shortages make it more difficult for them to meet their project schedules, and the percentage experiencing that challenge has increased over the last few years. Their safety programs may help contractors avoid spending time to find workers to replace those injured onsite. On average, contractors reported a 4.2% improvement in schedule from their safety programs.

Nearly half (45%) also report that they were able to perform better against the project budget due to their safety programs. Again, this is the highest percentage to report this since 2012, and it is a seven-point increase over the percentage reporting improved performance on budget two years ago. The average performance was similar to the average improvement in schedule, at 4.4%.

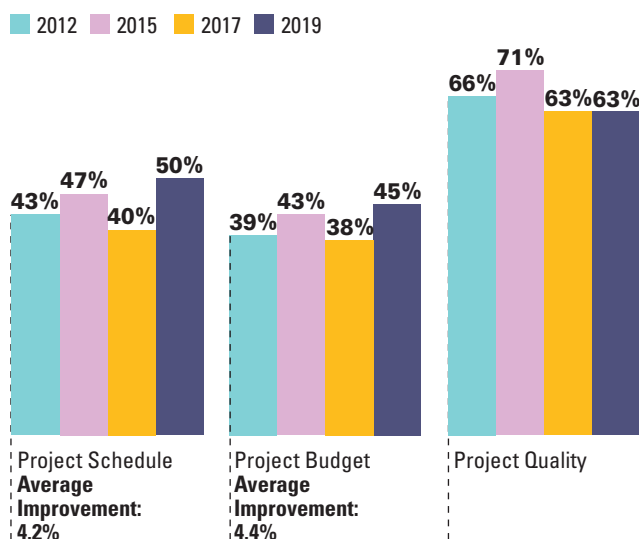
It is worth noting that very few contractors (only 11%) report that they experienced negative impacts on schedule or budget due to their efforts to improve safety, a finding consistent with the three previous studies.

Variation by Firm Type

A higher percentage of GCs report that they see a positive improvement on schedule (56%) and budget (51%) than do trade contractors (44% and 39%, respectively). A GC is responsible for the entire project, and schedule delays or budget overruns due to accidents or other issues at one point in the project may cascade through the project as a whole, so it makes sense that GCs experience these improvements more frequently than do the trades.

Project Benefits From Company's Safety Practices (Percentage Rating the Impact of the Practices as Positive/Highly Positive for Each Benefit)

Dodge Data & Analytics, 2020



Summary of Benefits From Improved Safety

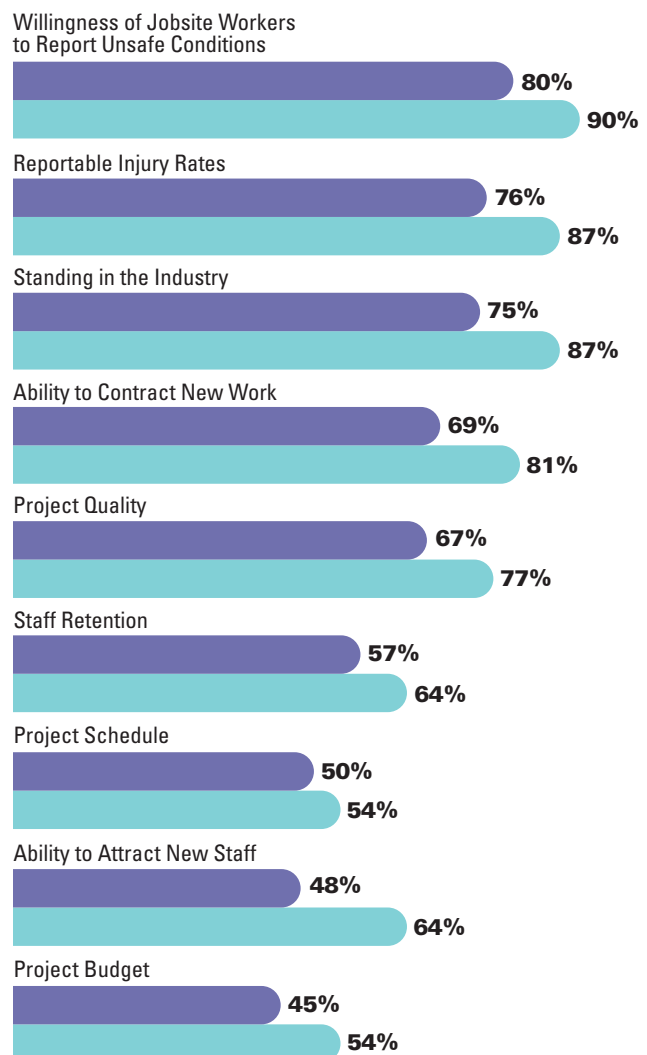
In order to provide a better understanding of the top benefits contractors experience from safety, the chart at right shows the percentage of contractors who rate their safety programs as providing a positive/highly positive impact on all the benefits included in the study. The chart features the total respondents, and it also shows the response of large companies.

- **In most cases, large companies tend to experience more benefits from their companies' safety practices than do smaller companies.** Findings of these studies consistently show that large companies tend to have more formalized programs with adoption of more safety practices, and they clearly reap the benefits from that.
- **The top benefit experienced by contractors from their safety programs is the willingness of jobsite workers to report unsafe conditions.** An even higher percentage of contractors report that this is a result of their safety programs than the percentage who report reduced injury rates, which is clearly the most direct benefit one would expect from safety. This finding further confirms the importance of jobsite worker engagement with safety to their companies.
- **The two business factors (ability to contract new work and standing in the industry) rate higher than all of the project benefits and several of the workforce benefits.** The high percentage experiencing business benefits clearly demonstrates that safety programs are an important business strategy for contractors and need to be considered as such when determining strategic planning as well as more tactical approaches to individual jobsites.

Summary of Benefits From Company's Safety Practices (Percentage Rating the Impact of the Practices as Positive/Highly Positive for Each Benefit)

Dodge Data & Analytics, 2020

- All Companies
- Large Companies (100 or More Employees)



Is Construction the Ultimate Gig Economy?

In a word, yes. The structure of the industry can put workers at greater risk, but the new attention to the gig economy and the technology that supports it also offers opportunities for improvement.

The construction industry consists of a cascade of gigs. Project by project, work flows from developer to general contractor to trade partners in a series of finite-term contracts. While permanent employees are sheltered from the industry's project-based structure, independent workers are simply the next level in the cascade. This structure makes construction hiring a natural fit for the kind of technology platforms that in recent years have transformed such transactions as booking travel and hailing a ride.

In addition to the structural fit, construction's chronic labor shortages call for innovative solutions. "We believe that the fundamental lack of a platform technology for this industry is a primary driver behind the super-inefficient labor market," says Peter Maglathlin, co-founder and CEO of Trade Hounds, an app-based social media platform designed to provide construction trades with a digital home. "Because of the project-based nature of construction, a platform technology is absolutely the best way to solve for it."

The advantages of enhanced connectivity in the construction sector are self evident: the ability for employers to staff up or down more nimbly, and for workers to access a wider range of options more conveniently. But sectors where the gig economy has already taken hold have raised questions about the erosion of worker protections.

Cause for Concern

"For all its app-enabled modernity, the gig economy resembles the early industrial age," says sociologist Alexandra Ravenelle in her recent book, *Hustle and Gig*, and she calls the trend "truly a movement forward to the past." At risk for independent workers are such essentials as health insurance, workers' compensation protections, employer contributions to Social Security and payroll taxes, paid time off, family leave protections, discrimination protections and unemployment insurance benefits. For independent construction workers, safety training can also appear on that list.

Statistics support the prediction that a gig economy will be inherently less safe than one based on stable employment. Independent workers, especially those hired at small firms, have an accident rate significantly higher than that of workers who have held their job for years, according to the Bureau of Labor Statistics.¹ In 2016 and 2017, construction accounted for the highest number of independent worker fatalities. Fatal injuries from slips, trips and falls across all industries occurred at a rate 71% higher for independent workers than for other workers, with deaths from falls to a lower level occurring at a rate twice as high. Older workers accounted for deaths among independent workers at higher rates than among other workers: 17% higher for ages 55 to 64, and 33% higher for ages 65 and older.

Factors with potential to undermine safety in construction include a gig-powered increase in the viability of marginal companies (now able to survive with a leaner core, when previously they would have failed or never launched), some of which may be too close to the edge to put time and resources into safety. Also a factor are reduced barriers to entry for workers who may be insufficiently qualified or trained, physically unfit, older and less agile, prone to substance abuse or otherwise vulnerable. In addition, a move toward increasingly transaction-based, rather than ongoing, relationships may undermine the ethic of care that a culture of safety depends on.

Reason to Hope

Despite these concerns, the advent of the gig economy in construction brings a ray of hope. With their extended reach among workers and employers, technology platforms will be well positioned to act as safety advocates. Trade Hounds, for example, has enlisted experienced tradespeople who are respected regulars on the platform to act as "ambassadors," flagging and correcting unsafe practices posted in the forum. The company is also in conversation with OSHA about reframing the safety conversation for this new medium. "We care about the workers and their safety," says Maglathlin, "so we think it's incumbent on us to help them be safe." ■

¹ Stephen Pegula and Matt Gunter, "Fatal occupational injuries to independent workers," *Beyond the Numbers: Workplace Injuries*, vol. 8, no. 10 (U.S. Bureau of Labor Statistics, August 2019), <https://www.bls.gov/opub/btn/volume-8/fatal-occupational-injuries-to-independent-workers.htm>.

Data: Data and Safety

Managing Data to Manage Safety:

Findings From Recent Studies by Dodge Data & Analytics

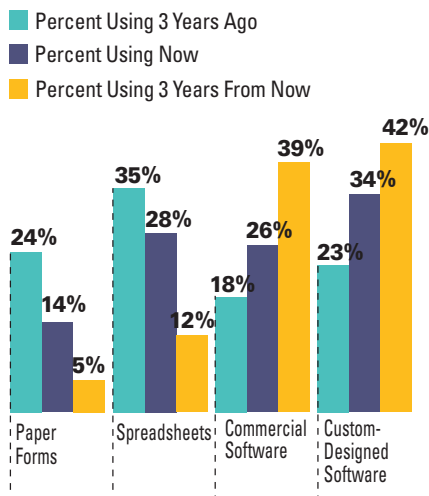
Data management will be critical to improving safety for construction, and construction firms are still in the early stages of determining how to gather, analyze and leverage data to improve safety outcomes on their projects.

As digitization becomes more widespread and more data is available, most industries are trying to determine how they can benefit from the increased availability of this data. The construction industry, though, faces unique challenges in this area, due to the siloed nature of businesses, the complexity of construction projects and the variability between projects.

Three recent studies conducted and published by Dodge Data & Analytics reveal how data is currently being gathered and analyzed to manage risk and improve project performance, and each provides some insight into how contractors gather and analyze safety data now and the potential of technology to improve those processes in the future.

Methods of Data Collection

Dodge Data & Analytics, 2020



Improving Performance With Project Data

In 2019, Dodge published the *Improving Performance With Project Data SmartMarket Report*, which included the findings of a study with 187 general and trade contractors that primarily work in the buildings sector. This study provides a benchmark on what type of data the industry is collecting and how they anticipate being able to improve analysis and increase benefits from the data they gather.

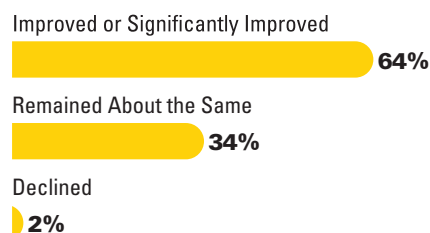
GENERAL FINDINGS

As the chart on methods of data collection reveals, contractors are in the midst of a transition in how they gather data. Two years ago, paper forms and spreadsheets dominated this process, but a shift has already begun to using commercial and custom-designed software. Within three years, most contractors expect to be largely using software as their means of data collection.

Why is this important? The most critical aspect of being able

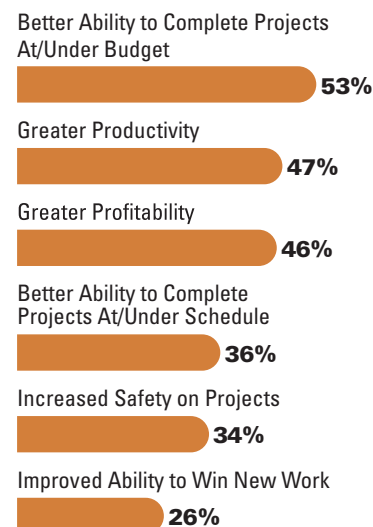
Improvements in Data Gathering and Analysis Capabilities

Dodge Data & Analytics, 2020



Top Benefits of Improved Data Gathering and Analysis Capabilities

Dodge Data & Analytics, 2020



to analyze and capitalize on data is to have data that is accurate, timely and standardized. Software can help ensure that the data gathered meets all three criteria far more effectively than paper forms or spreadsheets.

The transition noted in the data is already having an effect. Nearly two thirds (64%) of contractors report that their ability to gather and analyze data has improved. The top benefits that have resulted from these improved capabilities directly impact important key performance indicators on projects, including being better able to complete projects at/under budget, greater productivity and greater profitability.

SAFETY FINDINGS

For the data gathered on benefits, contractors were asked to select up to three top ones. The percentages in the chart reveal the greatest benefits contractors are achieving rather than the full percentage experiencing each benefit. Currently, increased safety on projects ranks in the second tier of benefits, selected by only 34%.

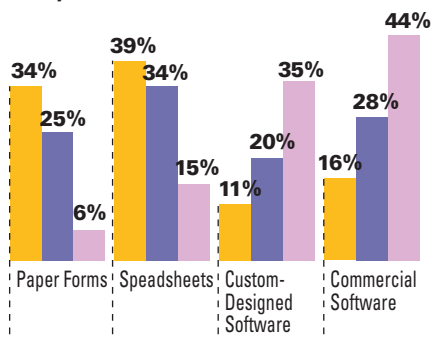
This is likely influenced by how contractors are currently tracking safety data. Currently, spreadsheets are the most common means, and paper forms are more widely used than custom-designed software. Given the reliance on paper forms and spreadsheets for safety data, it is not surprising that only one third of contractors rank safety data among their top benefits of improved data gathering and analysis in the last three years.

Means of Tracking Safety Performance Data (Past, Current and Future)

Dodge Data & Analytics, 2020

■ Three Years Ago
■ Current Method
■ Three Years From Now

Safety Data



The study also suggests that fewer contractors are prioritizing gathering safety data than project performance, payroll/man hours or productivity data. Given the importance that contractors place on improving safety on projects, this result is surprising. It is likely that the challenge of even knowing what data to gather to improve safety or even considering safety as a data-driven process contributes to this low performance.

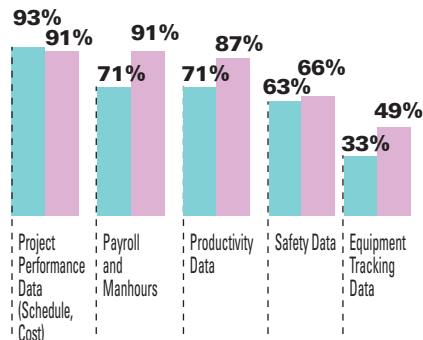
MOST IMPORTANT CAPABILITIES NEEDED TO IMPROVE DATA GATHERING AND ANALYSIS

The study also included a question on the capabilities that contractors think that they need to improve to have better data gathering and analysis. The top ones are critical because they reveal where the industry is right now. The biggest focus is on gathering accurate, prompt data that is comparable across projects in order to be able to

Percentage of Contractors Attributing High/Very High Importance to Collecting Different Types of Data

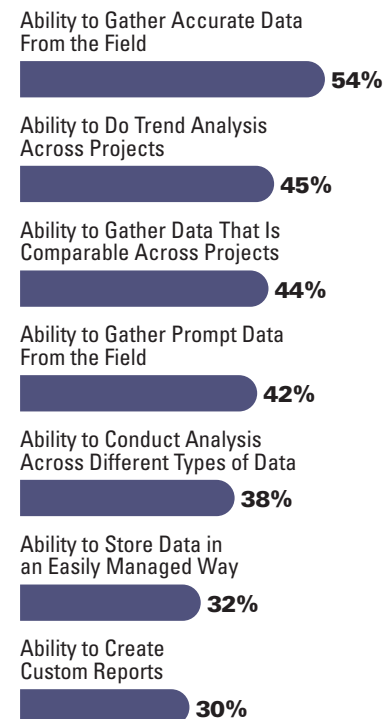
Dodge Data & Analytics, 2020

■ GC/CM/DB
■ Specialty Trades



Most Important Capabilities Needed to Improve Data Gathering and Analysis

Dodge Data & Analytics, 2020



do trend analysis across projects.

As contractors grow more sophisticated with their management of data, they will likely begin to place a greater priority on accurate, prompt and comparable safety data. See page 42 for a case study on a contractor who is beginning to tackle this challenge.

Using Technology to Improve Risk Management

In 2019, Dodge also published the *Using Technology to Improve Risk Management in the Construction Industry SmartMarket Insight*, which reports on data from a survey with 135 general and trade contractors.

This study examines the potential of technology in general—and Internet of Things (IoT) technology in particular—to help contractors manage risk onsite. One of the key benefits of IoT technology is its ability to provide clean, accurate, prompt data from the site.

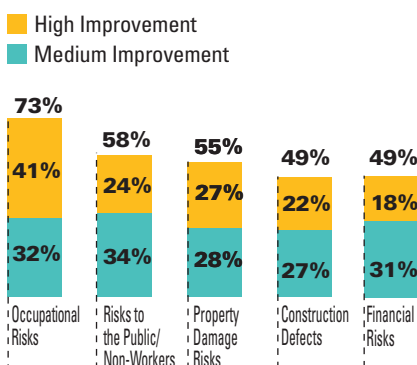
RISKS THAT IOT TECHNOLOGY WILL HELP MITIGATE

When contractors were asked to rate the degree to which they think that IoT technology can improve risk performance on projects, 73% said that they expect IoT technology to provide at least a medium level of improvement to occupational risks, and nearly half (41%) expect a high impact from this technology. Over half (58%) also think that IoT technology can reduce risks to the public, another safety area.

The findings in this Safety SmartMarket Report show that contractors anticipate a very high level in their growth in use of wearables in the next two years to help them improve safety (see page 39), and that is just one example

Types of Risk for Which IoT Can Best Improve Risk Performance

Dodge Data & Analytics, 2020



of the type of IoT technology that contractors believe will have a positive impact on safety.

CHALLENGES FOR WIDER ADOPTION OF TECHNOLOGY

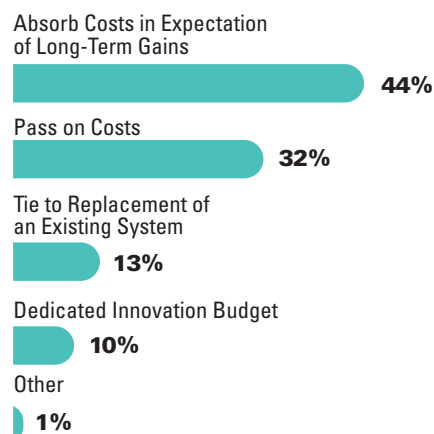
While the *Using Technology to Improve Risk Management in the Construction Industry* report reveals great optimism about the potential of emerging technologies onsite, it also reveals the barriers to wider technology adoption that must be overcome if contractors are going to be able to benefit from the exciting new developments in technology for the jobsite.

■ Budgeting for Technology:

One major issue is the ways contractors currently budget for new risk mitigation technology. The vast majority either absorb costs in expectation of long-term gains or pass on costs. Only 10% report that they have a dedicated innovation budget. This approach to technology as an added expense rather than a necessary budget

How Contractors Budget for New Project Risk Mitigation Technology

Dodge Data & Analytics, 2020



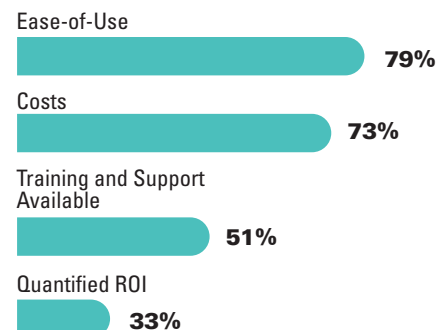
item in the company will hamper the ability of contractors to make strategic decisions on technology as part of their overall long-term planning.

■ Getting Workers to Use

Technology: One of the other most telling challenges was revealed indirectly in the findings of the study. When asked to rank the most important factors they consider when evaluating technology for implementation at their company, the highest percentage of contractors (79%), and the vast majority of them, rank ease-of-use among their top three factors. It ranks even higher than the cost of the technology, despite the fact that to make the investment, they are either going to absorb the costs or pass them on to the client, which is likely to increase their cost sensitivity. Technologies, from IoT devices to dashboards providing analysis of data gathered, need to be intuitive and easy to use for an average user to be adopted in an industry with increasingly shorter project schedules and chronic skilled worker shortage issues. ■

Most Important Factors Considered When Evaluating Technology (Ranked in Top 3)

Dodge Data & Analytics, 2020



Tackling Substance Use

To combat the opioid crisis, companies need to focus on preventing injuries.

Every year, substance use costs companies millions of dollars in reduced productivity, job turnover and increased healthcare costs, and also increases the risk of injury and death on jobsites. For years companies have worked to address the issue through drug testing and other means. The opioid crisis, however, has added new and alarming dimensions to an already complex issue.

Injuries and Opioids

More than 47,000 people died of opioid drug overdoses in 2017, the latest year for which the National Institute on Drug Abuse has data, and according to a study conducted by the Massachusetts Department of Public Health, construction workers are six times more likely to die of an opioid overdose than the average American.

A big part of the reason, researchers say, is that workers often experience injuries due to risk from accidents and physically demanding work. Medical treatment commonly includes prescription opioids. More than a third of construction workers lack access to paid sick leave, which can force injured workers to return to the jobsite before they are fully recovered. "Job security is a big concern, and that adds to mental stress in the workplace," says Ann Marie Dale, an assistant professor at the Washington University School of Medicine, whose research focuses on ergonomics and musculoskeletal disorders.

Second Chances

Even as the link between workplace injuries and opioid use has become

increasingly clear—one study found that more than 50% of people who died of an opioid overdose had suffered at least one work-related injury—the implementation of prevention and company-sponsored treatment programs has been spotty.

Historically, construction firms have managed substance use through periodic mandatory drug testing. Many maintain a zero-tolerance policy for individuals who test positive for either illicit drugs or non-reported prescription opioids. But a shrinking labor pool, combined with a growing recognition of opioids' addictive nature, is beginning to drive alternative approaches, Dale says.

She points to the local carpenters union in St. Louis, which recently updated its drug-testing policies so that individuals who fail a drug screen for opioids are allowed to return to work following drug treatment provided they continue outpatient treatment, such as counseling. Such return-to-work programs require pre-planning and additional resources, but they are a sound investment: The National Safety Council estimates that for every employee who recovers from substance abuse disorder, a company saves an average of \$3,200 a year.

Pre-Prescription Treatment

Besides employer-sponsored drug treatment and return-to-work programs, Dale says companies should focus on educating their employees and local physicians about the risks associated with opioids, and preventing the types of injuries that send workers to a physician in

the first place. Lance Murray, safety manager at MarkYoung Construction, also recommends that companies have a conversation with preferred medical advisors about their philosophy regarding prescriptions to make sure that opioids are not being prescribed where over-the-counter medication would work.

Dale says that companies should think about substance use treatment in terms of primary, secondary and tertiary treatments. Primary treatment occurs before workers are prescribed opioids and involves ergonomics training and injury-prevention programs. Turner Construction, for instance, has implemented an ergonomic, pre-task exercise routine in which crews warm up with a variety of stretches and other exercises in order to reduce the risk of injury. Secondary treatment, immediately following an injury, might include paid sick leave, company-sponsored physical therapy or non-opioid pain management strategies. Finally, tertiary treatment is then reserved for workers who develop dependencies on opioids and other substances and includes drug treatment, including rehabilitation and counseling, and employee assistance programs.

Woven throughout treatment programs, Dale says, needs to be messaging and support around substance use and help-seeking, so that employees feel comfortable taking advantage of available resources. Only by addressing the root causes of the opioid issue, including labor practices that encourage workers to continually manage pain, will the industry make strides in arresting the epidemic. ■

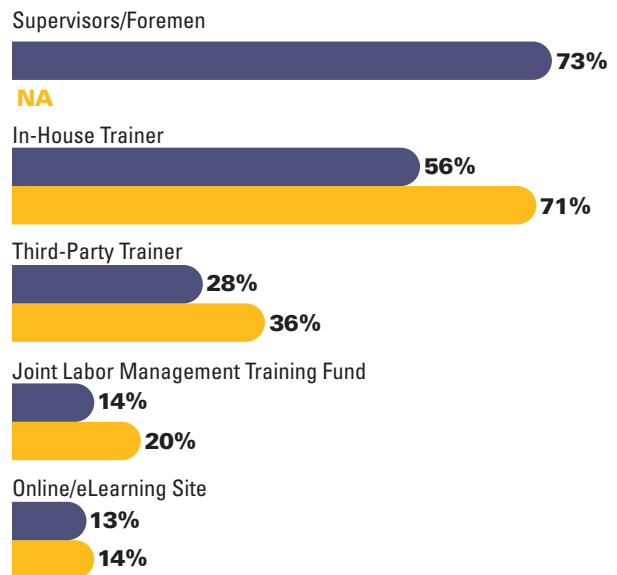
Data: Safety Training Practices

How Safety Training Is Conducted for Jobsite Workers

How Jobsite Worker Safety Training Is Conducted (Reported in 2017 and 2019)

Dodge Data & Analytics, 2020

■ 2019 ■ 2017



Contractors were asked to select all the means by which safety training is conducted for their jobsite workers, from supervisors and foremen onsite, to trainers inside and outside their company, through a joint labor management training fund or via an online/eLearning site. The chart at right shows their responses in the current study and in 2017 where applicable. One notable difference between the two studies was that the option of supervisors/foremen was added in 2019.

Nearly three quarters (73%) in the current study have supervisors/foremen conduct safety training for jobsite workers. This finding emphasizes the importance of supervisors/foremen as part of a safety strategy that we have seen elsewhere in the findings, and makes the training on foundations for safety leadership (see page 31) particularly important.

Over half (56%) also report that training is conducted by in-house trainers. This finding, combined with the previous one, demonstrates that more companies rely on their in-house expertise on safety than on outside resources. This is particularly true of large contractors (100 or more employees), where 77% report that they use in-house trainers, but even among small companies (less than 20 employees), in-house trainers are still used by 34%. That may seem like a low number, but the next most common means of conducting training for small companies (hiring a third-party trainer) is only selected by 16%, so between supervisors/foremen and in-house training, even small companies rely largely on their internal resources.

The percentage selecting in-house trainers declined between 2017 and 2019, but that may largely be attributed to the addition of supervisors/foremen as an option in the current study. It is likely that some of the 71% who selected in-house trainer in 2017 may have been placing their supervisors/foremen in that category as an internal training resource.

Hiring a third party trainer is the only other option selected by more than a quarter of the respondents. A higher percentage of GCs (35%) use this means of conducting training than trade contractors (22%), but there is no significant difference by size of company.

Joint labor management training funds and online/eLearning sites are still only used by a low percentage of respondents for supplying training, consistent with the findings in 2017.

Use of Online Training

In 2017 and in the current study, contractors were asked what percentage of their current safety training classes are conducted online and to estimate what percentage will be conducted online in two years. The chart at right shows the average percentage of safety classes reported in 2017, the current average in 2019 and the estimates in the current study for 2021. It also shows the average based on the size of the company.

The findings suggest that online training is still an evolving strategy among contractors.

- **Currently, 71% of contractors report that at least some training was conducted online, but as the chart at right reveals, most training classes are not conducted using this approach.**
- **Use of online safety classes declined among midsize and large companies between 2017 and 2019.**
- **Small companies remain at the same level between 2017 and 2019.**
- **However, all expect a notable increase in use of these classes by 2021.**

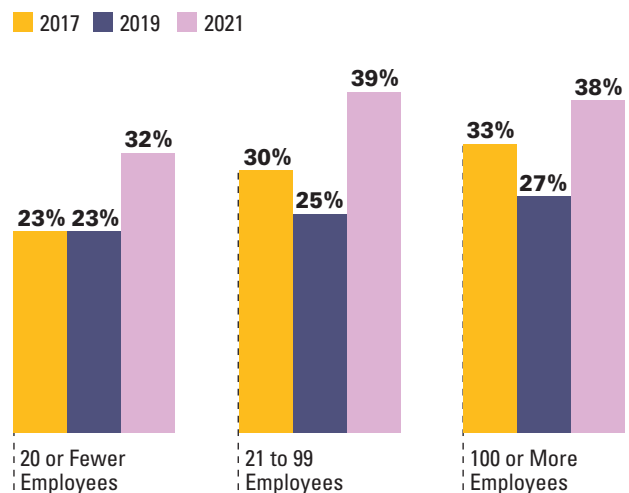
Similarly optimistic growth was expected in 2017, but clearly that has not occurred. However, the optimism expressed by contractors about their expected use of online training suggests that the industry is still very interested in the potential of this format.

To fully understand these findings, it is important to note that this question only includes the means by which the training is offered, not who is actually conducting the training. The gap between the 13% who report using an online/eLearning site (see page 27) and the 71% who report doing at least some training online suggests that online training content could be coming from a wide variety of sources, including in-house trainers, third-party trainers or by a joint labor management training fund, not just classes specifically created by eLearning vendors.

These findings, along with the reliance on supervisors and foremen to provide training, suggest that contractors still prefer a more direct, face-to-face approach to delivering safety training. The popularity of using toolbox talks (see pages 33 and 34) also supports this conclusion.

Average Percentage of Safety Training Classes Conducted/Expected To Be Conducted Online (Reported in 2017 and 2019)

Dodge Data & Analytics, 2020



Frequency of Offering Training to Jobsite Workers

Contractors were asked how frequently they offer formal safety training to jobsite workers. The chart at right shows the responses of all contractors in the study, and contrasts those with the responses from small contractors (20 or fewer employees).

Most contractors offer training at least annually, and the highest percentage (35%) offer it once a quarter or more. This finding demonstrates a high level of commitment to ongoing training of jobsite workers in the industry, which corresponds well to the importance placed on jobsite worker participation in their safety management activities (see pages 8, 11 and 12).

However, **small contractors offer training far less frequently. Only 57% offer it annually or more, compared with 69% industry-wide.** The highest percentage of small contractors (30%) say that they only offer jobsite workers safety training when required by specific demands on the site. Since most companies encourage workers to report hazards onsite, this may limit the company's ability to be certain that they are responding to all the hazards that they need to respond to, since the workers responsible for identifying the hazards only receive training when specific hazards are identified.

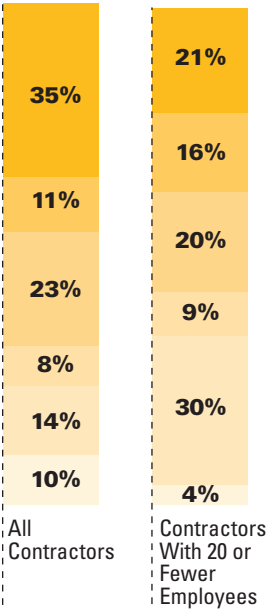
Variation by Type of Company

75% of GCs offer training to their jobsite workers annually or even more frequently, compared with 63% of trade contractors. This most likely corresponds to the finding that larger companies tend to offer formal training more frequently than do smaller ones.

Frequency of Offering Formal Safety Training to Jobsite Workers (All Contractors and Small Contractors)

Dodge Data & Analytics, 2020

- Once a Quarter or More
- Twice a Year
- Annually
- Only When Workers Are First Hired
- Only When Required by Specific Demands on the Site
- Other



Top Barriers to Increasing Safety Training

Contractors were asked to select up to three top barriers to increasing their safety training from a list of eight options. The chart at right shows the percentage of those who ranked each option as one of their top barriers.

Most contractors (75%) rank the time needed to provide additional training among the top three barriers. This finding is no surprise, especially as project schedules continue to get shorter. Since this is likely to always be an issue, people prepping training for the construction industry need to consider how it can be as unobtrusive on the workers' time as possible.

Another top barrier to increased training is the additional cost of providing it, selected by 52%. This may also be one of the drivers for why contractors of all sizes tend to rely on their internal resources for providing training rather than using third-party services or other options.

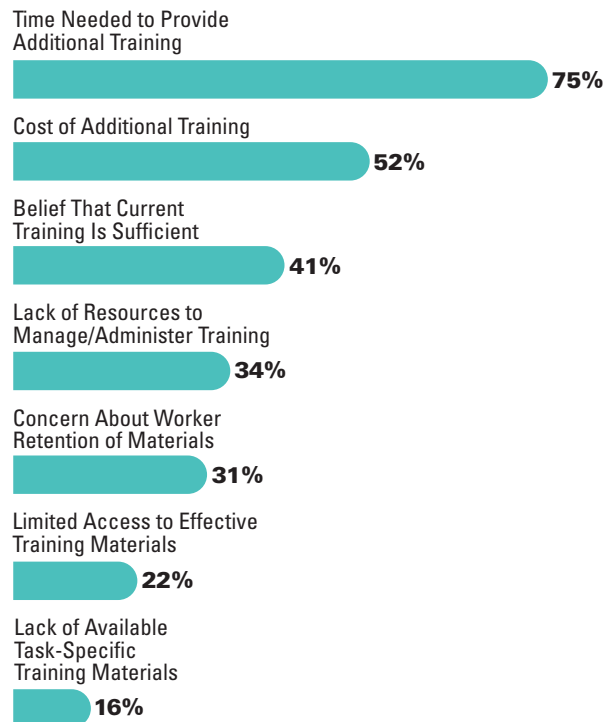
The third most frequently selected barrier may be the most difficult to overcome: 41% of contractors rank the belief that their current training is sufficient among their top three obstacles. Interestingly, there is no significant difference between the percentage of respondents from small (45%) and large (41%) companies who select this option, given the fact that large companies offer training with much greater frequency than smaller companies (see page 29). The gap between GCs (38%) and trade contractors (44%) who rank this as a top barrier is more significant. This barrier is particularly challenging, since companies must perceive the need for additional training to be willing to devote money and other resources to provide it.

Around one third rank the lack of resources to manage/administer training and concern about worker retention of materials as top barriers. In both cases, GCs more frequently consider these top barriers (37% and 34%, respectively) than do trade contractors (32% and 28%, respectively). Large contractors (32%) are far more concerned about worker retention of material than small companies (24%), but their assessment of the challenge associated with a lack of resources is about the same (35% for small companies and 37% for large ones), despite the likelihood that large companies have more dedicated safety resources than do small ones.

The lack of training materials is not considered a significant barrier by most of the contractors, with fewer than one quarter selecting either limited access to effective training materials or the lack of available task-specific training materials among their top three.

Top Barriers to Increasing Safety Training (Ranked by Respondents in the Top Three)

Dodge Data & Analytics, 2020



Foundations for Safety Leadership Training

In January 2017, the Foundations for Safety Leadership (FSL) training module was added as an elective to the OSHA 30-hour safety training course. In order to gauge the levels of familiarity with and use of this elective, and its general effectiveness, contractors were asked a few questions about it in this study, and in the previous study conducted in 2017.

First, they were asked if they have heard of FSL or have used it, and their responses from both studies are shown in the chart at the upper right.

- Contractors in 2019 are much more familiar with it than they were in 2017, with the percentage who say that they have not heard of it dropping 20 percentage points.
- In 2017 and 2019, about half of those who had heard of FSL had actually used the elective as part of their training.
- The percentage of contractors using FSL training has more than doubled since 2017, although the actual percentage is still below 20%.

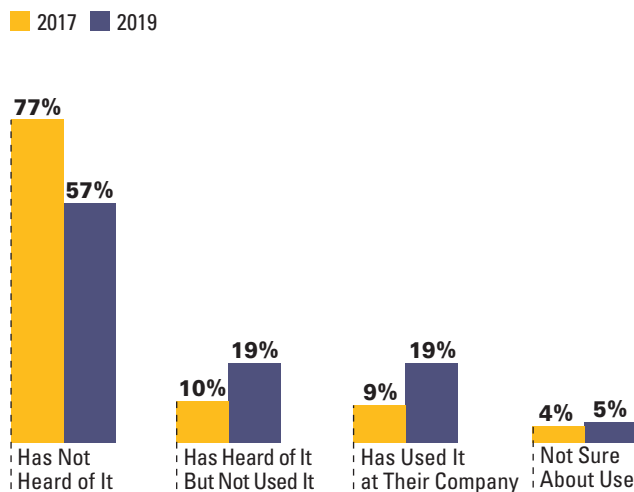
Contractors who have used FSL were also asked to rate its effectiveness for improving the safety climate on their jobsites, and nearly all (90%) of those who use it consider it effective/very effective at doing so.

Interestingly, there were no significant differences by company type or size in these findings.

The findings demonstrate that more education is needed in the industry about this resource, since over half of the respondents still have not heard of FSL. They also clearly demonstrate that increasing familiarity with this training could have a positive impact on jobsite safety.

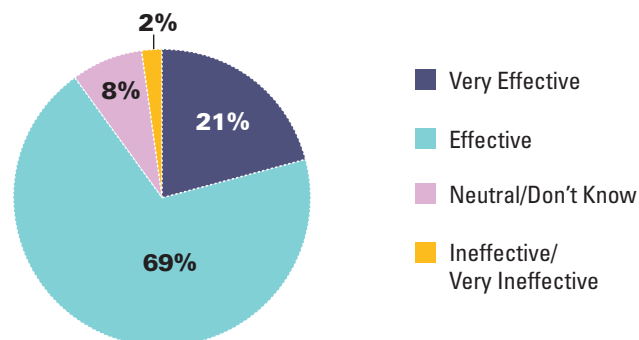
Familiarity With and Use of Foundations for Safety Leadership Training (According to Contractors in 2017 and 2019)

Dodge Data & Analytics, 2020



Effectiveness of Foundations for Safety Leadership Training for Improving Jobsite Safety Climate (According to Those Using FSL Training)

Dodge Data & Analytics, 2020



Virtual Safety Gets Real

The ability to simulate reality realistically has allowed many contractors to improve their ability to conduct safety training.

A glazing contractor arrives at a familiar jobsite, gives his safety harness a quick check as he puts it on (along with the rest of his PPE), and heads out onto the scaffolding; he clips on his safety line and gets to work. Not long after, the platform fails; the worker falls. His safety harness catches for a moment, but breaks away, and he falls again.

Fortunately, this is a virtual reality (VR) training scenario. And thanks to a surprisingly realistic simulation of working at height, this worker now has a vivid impression of what could happen the next time he overlooks a cracked safety harness ring.

Training With VR

With a screen-equipped helmet and—depending on the scenario—sensor-fitted gloves or a control console, virtual reality allows workers to interact with computer-generated 3D simulations in a way that seems real. They can conduct a full harness inspection, work at height, operate equipment and refresh or verify their training—all with realistic sensations of heights, distractions, stress and environmental hazards, or, alternatively, simplified to communicate key points. Commonly cited advantages of VR in safety training include:

- the ability to tackle risky, random, and realistic scenarios over and over again in a controlled and consequence-free environment;
- more realistic training, including job- and site-specific scenarios;

- an immersive experience that holds trainees' attention;
- suitability for the kinetic, hands-on, experiential learners that construction attracts;
- the ease with which learning can be evaluated;
- and training efficiency.

And while it's too soon for definitive studies of whether VR-based training increases information retention, some of the experience's key characteristics overlap with established retention factors, such as consistency, frequency, relevance and immersive learning.

Early Adopters

A sector leading the adoption of VR in safety training is heavy equipment operation. Mobile and tower cranes, backhoes, excavators and wheeled loaders, among others, are all available virtually. A simulator for these machines typically consists of a working basket for the trainee to stand in, VR goggles and a control panel with joysticks and switches that replicate the real ones. Colleges and trade schools, such as the Southern Alberta Institute of Technology and the Missouri Valley Line Constructors Apprenticeship and Training Program, and trade unions, such as IUOE Locals 14, 50 and 158, now rely on simulators as core components of their training and safety programs.

An organization that has successfully integrated VR into on-the-job safety training is Palo

Verde Nuclear Generating Station (PVNGS). Twice a year, each of the Arizona station's three reactors is shut down for a four- to five-week refueling process. Because it's expensive to have a reactor out of service, the trades involved need to work efficiently to get the reactor back online as soon as possible. More important, they need to work safely. A 2013 incident at Arkansas Nuclear One, in which a lifting rig collapse resulted in a death and several injuries, weighs in the memory of lift professionals in the nuclear sector. So PVNGS has made VR a cornerstone of its crane operator and signaler training safety program.

"Communication is the key to making a successful lift," the station's rigging training instructor, Bob Armstead, says in a case study generated by the simulator's maker. The VR simulator enables an operator to provide immediate feedback on an incorrect hand or voice signal, or tell a signaler where to move to be able to see properly, for a safe and effective pick. The simulator also enables qualified signalers at the station to enhance their skills. Armstead credits VR with a key role in Palo Verde's achievement of STAR status designation under ADOSH's Voluntary Protection Program.

With research from Global Market Insights predicting growth in the operator training market (to more than \$19.7 billion by 2025), in part due to improvements in VR, adoption of the technology for safety training seems set to continue. ■

Data: Communicating

About Safety

Most Effective Ways to Communicate About Safety With Jobsite Employees

Good communication can be as essential to good safety management within a company as use of personal protective equipment. Recognizing the importance of exchanging safety messages and information between the field and the office, and between senior management, employees on the ground and across an organization, several questions in the study looked at the most effective ways to communicate about safety, and where contractors get information about safety and health issues.

Contractors were asked two related but distinct questions about how they communicate with the jobsite about safety. First they were asked to rank their top three most effective ways to communicate safety messages to their jobsites from a list of seven options. They were also asked to rank the top three most effective ways to provide information about safer tools, equipment, materials and work practices to their workers.

Most Effective Means of Communicating Safety Messages to Jobsites

The chart at right shows the percentage of contractors who rank each of the means of communicating safety messages to jobsites as most effective.

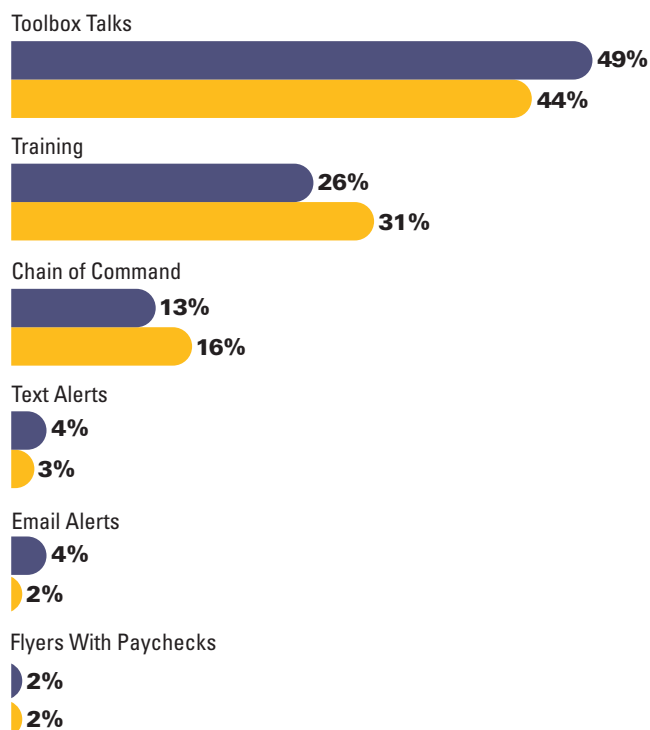
- **Toolbox talks are ranked first by nearly half of contractors, even more than ranked it first in 2017.** Toolbox talks are considered particularly effective by GCs, 58% of whom rank it first. Large companies more frequently rank it first as well, with again 58% of respondents from companies with 100 or more employees, compared with 41% of respondents from companies with fewer employees.
- **Training is the only other factor ranked first by more than one quarter, but it declined notably in the percentage of those ranking it first since 2017.** There are no notable differences by company size or type of those ranking training first.

Indirect means of communication, such as text alerts, email alerts and flyers with paychecks are ranked first by fewer than 5%, suggesting that more direct, active means of communication tend to be favored over passive ones.

Most Effective Means of Communicating Safety Messages to Jobsites (Ranked First by Contractors)

Dodge Data & Analytics, 2020

■ 2019 ■ 2017



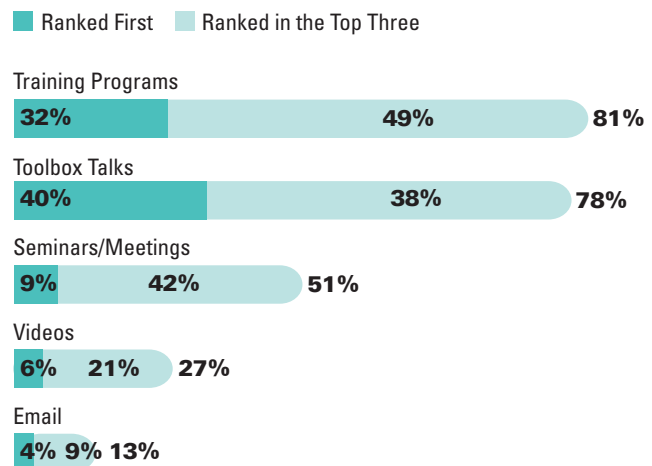
Most Effective Means of Providing Information About Safer Tools, Equipment, Materials and Work Practices

Contractors were asked to rank the top three most effective means of providing information from a list of 10 options. They included several options already asked about for safety messages, including toolbox talks, training, email and texts, but also included other options like webinars, websites, phone apps and videos. The chart at right shows the top five options that emerged from that ranking. Unlike the previous chart, where the top three and top five landed up in the same order, there are some variations between the order of items ranked first and ranked in the top three, so both sets of data are included in the chart.

- **The data clearly reveal that training programs and toolbox talks are the top means of providing this information.**
 - Toolbox talks are most frequently ranked first, but the gap between those who rank this first and those who select training programs (eight points) is much smaller than those ranking the efficacy of toolbox talks (49%) and training (26%) for delivering safety messages (23 points).
 - Training programs are most frequently ranked in the top three (81%) for providing more specific information about safer tools, equipment, materials and work practices.
- **Seminars and meetings are also considered valuable. Over half (51%) rank them in the top three. However, very few (9%) rank them first.** It is possible that the time involved to allow workers to attend them and the lack of flexibility for scheduling them around work demands may influence the lower rankings, but they are still clearly a source that contractors engage with for making sure their workers are informed about tools, equipment, material and practices that can make them safer.
- **Videos and email round out the top five, but they are ranked first very infrequently. Videos, though, did see a notable bump up in those ranking them first since the 2017 study.** While comparison between 2017 and 2019 is difficult for this question since several options were added to the 2019 study, the fact that videos increased from 1% ranking them first in 2017 to 6% in 2019 is notable, since the impact of more options is to generally cause the percentage ranking items first to decrease. The gain in those ranking videos first between 2017 and

Most Effective Means of Providing Information About Safer Tools, Equipment, Materials and Work Practices to Jobsite Workers (Ranked in the Top Three by Contractors)

Dodge Data & Analytics, 2020



2019 is likely due to workers being more acclimated to gaining instruction from videos outside of work, through YouTube and other means, and therefore being more open and interested in finding out more about safer tools, equipment, materials and work practices through this means as well on the job.

Top Sources of Safety and Health Information for Contractors

Contractors were asked to select the sources of information that they rely on for safety and health information from a list of 13 options. The chart at right shows the top nine options most frequently selected, both by all the contractors in the study, and by small contractors (fewer than 20 employees).

For contractors overall, OSHA (Occupational Safety and Health Administration) is the top source of information, relied on by 77% of contractors. Not only does OSHA issue and enforce safety regulations, but they also offer core safety training, and it is not surprising that the majority of contractors rely on them.

It is surprising, though, that only 37% of small contractors report that they rely on OSHA, which ranks it fourth among their choices. **Instead, small contractors rely most frequently on insurance companies and trade publications for their safety and health information.**

■ **Insurance companies are also the second most frequently relied upon source of information by contractors in general.** Not only do they have a vested interest in improving safety in the construction industry, but they also have more data and a broader perspective on safety best practices than any individual construction company, large or small, can possess.

■ **Trade publications rank far higher for small companies.** Organizations seeking to influence the behavior of small companies should bear in mind the importance of these publications for their efforts.

Contractor associations are also very influential on contractors in general, but less so on small companies.

Over half of contractors in the study rely on contractor associations for safety and health information, but only 36% of small contractors report the same. Small companies may be put off by the fees to be a member of an association, but they also miss the chance to be able to access additional information and resources.

Job specifications, suppliers and vendors, and manufacturers all are relied upon by a moderate percentage of contractors. These may be selected by fewer respondents because they provide narrower slices of information rather than more comprehensive approaches to safety and health.

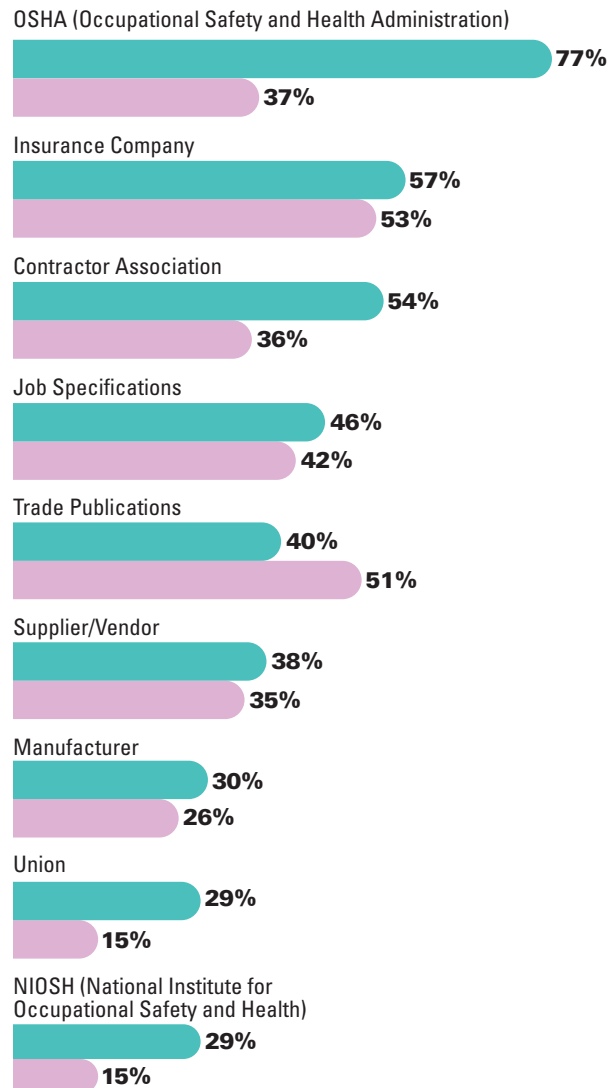
Variation by Company Type

GCs more frequently rely on trade shows and NIOSH than do trade contractors. Trade contractors more frequently rely on unions than do GCs.

Top Sources of Safety and Health Information for Contractors

Dodge Data & Analytics, 2020

■ All Contractors ■ Contractors With Fewer Than 20 Employees



Campaign to Prevent Falls in Construction

The annual Campaign to Prevent Falls in Construction, including the National Safety Stand-Down Day, helps to bring attention in the industry to one of the biggest hazards in construction. Contractors in the survey were asked whether they are aware of or have participated in the campaign or stand-down. Then all contractors, whether they participated in the Campaign/Stand-Down Day or not, were asked whether they consider campaigns like this effective or ineffective.

Participation in the Campaign and/or Stand-Down Day

Nearly half (48%) of contractors are at least aware of the Campaign to Prevent Falls in Construction and its annual Stand-Down Day. However, awareness and participation varies by size of company.

- 71% of respondents from small companies (fewer than 20 employees) said that they were either not aware of this campaign or not sure, compared with only 36% of those from large companies (100 or more employees).
- Conversely, nearly half (44%) of respondents from large companies report that they participated in these events, while only 7% from small companies did so.
- Since the percentage of those who are aware but did not participate is about the same regardless of company size, the share of participation among those who are aware is also much greater among large companies than it is among small or midsize ones.

Further research is needed to understand this response, in order to help smaller companies see the advantage of participation.

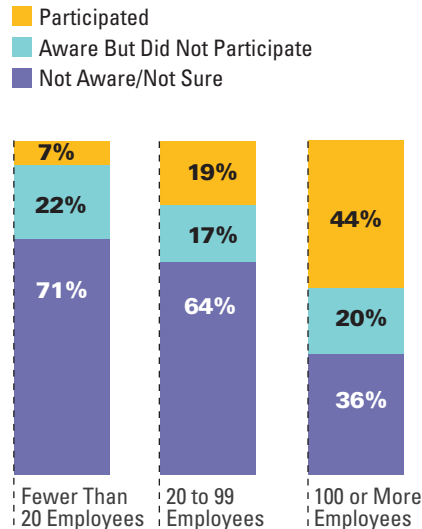
Effectiveness of Campaign

76% of contractors who participated in the campaign think that campaigns like this are effective, and only a handful (4%) believe that they are not effective. In contrast, only 58% of those who didn't participate believe that these campaigns are generally effective.

- Clearly among those with experience, participation is seen positively, but over half of the non-participants regard these campaigns as effective as well, so they are generally well-received in the construction industry.
- Among the non-participants surveyed, only 7% believe these campaigns are not effective, and 35% are neutral. This suggests that evidence of their effectiveness could engage more participants.

Awareness and Participation in the Campaign to Prevent Falls in Construction

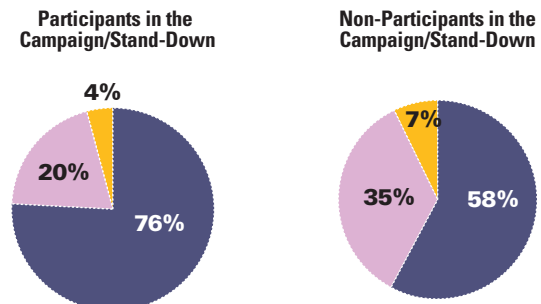
Dodge Data & Analytics, 2020



Effectiveness of Campaigns Like the Campaign to Prevent Falls in Construction

Dodge Data & Analytics, 2020

- Effective
- Neither Ineffective nor Effective
- Not Effective



Suicide Prevention: An Urgent Safety Priority

The construction industry has a high rate of suicide among its workers, and some organizations are now seeking ways to help the industry address this issue.

The construction sector is used to thinking of falls, caught-between, struck-by, and electrocution as the top hazards. Fatalities from suicide, however, outnumber deaths from those other top hazards combined by a factor of five. With 53.2 suicides per 100,000 workers (about four times the national average), construction is America's top industry for suicide in both number and rate.

Why So Many?

The demographics, culture and working conditions of construction overlap with the main risk factors for suicide. Demographically, white males in their 20s through 50s account for the majority of the nation's suicides; the construction workforce is 97.4% male and 56.9% Caucasian. Common conditions in the industry can expose that demographic to increased risk in what Keith Vitkovich, vice chairman of the Construction Industry Alliance for Suicide Prevention (CIASP), calls "a perfect storm" of factors, including:

- a culture of fearlessness and self-reliance that stigmatizes vulnerability
- family separation and isolation resulting from work-related travel
- income fluctuations from seasonal layoffs and end-of-project furloughs
- supervisory promotions with inadequate leadership training
- performance pressure related to schedule, budget and quality
- workplace disrespect and harassment
- tolerance of alcohol and substance abuse

- chronic pain
- the highest prescription opioid use of any industry
- access to lethal means

What Can Be Done?

An early adopter of suicide prevention as a workplace health and safety priority, FNF Construction, a highway contractor operating in the Southwest, has instigated an in-house program that demonstrates some of the steps industry stakeholders can take to address the issue. "We started pretty simple," Dave James, the company's chief financial officer (now retired), said in a webinar that CIASP hosted in November. They began with emails and posters to raise awareness at the office and at the jobsites, "and then we just started to talk about it," James said. For example, FNF includes articles on mental wellness and suicide prevention in the newsletters it sends to employees and industry partners; its human resources department has added the topic as a standard item in weekly health alerts; information on mental health and suicide prevention is included in the company's rotation of toolbox talks; and lunch-and-learn sessions have been well received, both by employees (who can join by webinar from the field) and subcontractors.

FNF has also changed its employee assistance program (EAP) to better serve its priorities, including suicide prevention. It has provided employees with wallet cards and charge card sleeves printed with the phone numbers for the EAP and the National Suicide Prevention Lifeline. The wallet

cards also list suicide warning signs, to give employees a better chance of being able to recognize and help a coworker at risk. "We've started down the road," says James. "There's a long way to go in the industry, for sure, but I'm pleased with what FNF has been able to accomplish in this short time period."

FNF's actions align with the STAND pledge developed by CIASP, which companies and organizations wanting to help reduce suicide in construction can sign on to. STAND is an acronym for the key components of a suicide prevention program:

- A safe culture where employees can ask for help on their own or a coworker's behalf, and connect to suicide prevention resources;
- Training that enables all employees to recognize suicide warning signs and equips them to support coworkers at risk; (A variety of training resources are available through CIASP's website.)
- Awareness that predicates conversation and action at both an organizational and individual level;
- Normalization of mental health issues, and integration of them with mainstream health and safety priorities; and
- A decrease in the industry's incidents of suicide through access to prevention resources, such as EAPs, behavioral health benefits, screening tools and crisis support.

As suicide emerges as one of construction's most significant hazards yet, "OSHA's Focus Four should really be Focus Five," says Vitkovich. ■

Data: Emerging Safety Trends

Use of Prevention Through Design by Contractors

Prevention through design (PtD) is the use of practices before construction begins that improve safety during construction. While many of those practices need to be considered by architects and engineers, there are several that contractors can engage in as well, especially if they are involved in the project well before the start of construction.

The *Safety Management in the Construction Industry 2017 SmartMarket Report* included an examination of the practices used by both designers and contractors. Only contractors were included in the current study, but to continue to explore this issue, they were asked whether they use five different PtD practices.

The pie charts at right show the percentage who state that they are using a practice that qualifies as PtD. **Nearly two thirds of general contractors (64%) report that they use a PtD practice**, a similar percentage to those who reported doing so in the previous study, where they were presented with a definition of PtD and asked if they thought they were engaging in it. Trade contractors, though, were more inclined in the previous study to agree that they use PtD based on that definition, with 66% reporting use, than in the current study to select any of the five PtD practices, with only 45% doing so.

The second chart shows the percentage of GCs and trade contractors using each of the PtD practices included in the survey. When considering these findings, please bear in mind that they cannot be directly compared with the findings in 2017, when only those who first indicated that they did PtD based on the definition were asked to identify the practices they used.

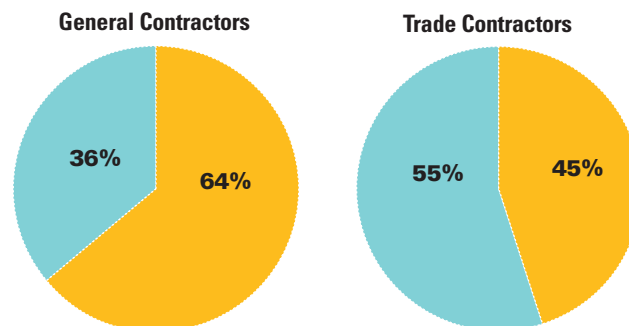
- **The top PtD measure in use is permanent safety features, which was reported by 44% of general contractors, and which was also the top measure in 2017.**
- **However, in 2017, use of BIM was reported by a lower percentage of GCs and trade contractors than use of prefabrication/modularization, but in the current study, they rank the same.**

These findings demonstrate that PtD still has a strong potential for wider use in the construction industry. Engaging contractors earlier in the project lifecycle is one way to help promote increased use of these practices.

Use of Prevention Through Design by Contractors (According to GCs and Trade Contractors)

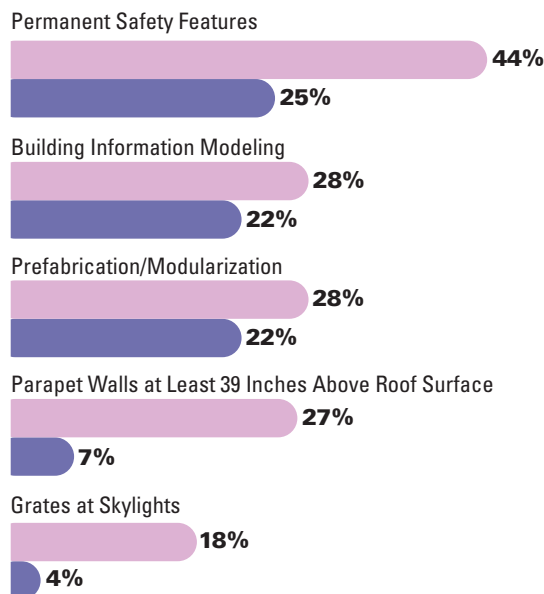
Dodge Data & Analytics, 2020

■ No ■ Yes



Use of Specific Prevention Through Design Methods

■ General Contractors ■ Trade Contractors



Use of Technology to Improve Jobsite Safety

Contractors were asked two questions about the use of technology to improve jobsite safety. First, they were asked what technologies they have in use now to enhance safety. Then, regardless of whether they use any of the technologies or not, they were asked which technologies had the greatest potential to improve safety in the next three years. For both questions, they were allowed to select as many options as apply.

■ **The top technology currently in use to improve safety are drones, and the percentage who believe that they have potential to improve safety is nearly double the percentage using them.**

- More GCs (27%) than trade contractors (9%) use drones now, and expect them to have potential to improve safety in the future (38% and 24%, respectively). It is notable, though, that the percentage of trade contractors who expect them to be useful is nearly three times those who are using them now.
- 24% of respondents from large companies (100 or more employees) report using drones, but only 4% from small companies (fewer than 20 employees) report doing so.

■ **The technology with the highest expectations by far for its potential to improve safety in three years are wearables. Even though only 11% use them now, 63% of contractors have high expectations for their impact on safety.** There are no significant differences by company type or size for this technology.

■ **Other technologies that many contractors think may improve safety in the next three years include virtual reality for training and visual monitoring with AI (artificial intelligence).** Virtual reality is currently more widely used by GCs (8%) than by trade contractors (3%), but there is no significant difference in use yet for visual monitoring with AI.

■ **40% of GCs report using at least one of the technologies included in the study to enhance safety, compared with only 24% of trade contractors.**

- Additional technologies more widely used by GCs than by trades include laser scanning (15% versus 8%), automated equipment/robotics (7% versus 1%) and augmented reality (6% versus 1%).
- The trades, though, are nearly as enthusiastic as the GCs about the potential of these technologies. Photogrammetry and augmented reality are the only technologies besides drones that have a higher percentage of GCs than trade contractors who think they have a strong potential to improve safety.

Use of Technology to Improve Jobsite Safety (Current Use and Greatest Potential to Improve in the Next Two Years)

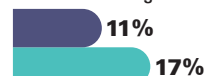
Dodge Data & Analytics, 2020

- Currently Using to Enhance Jobsite Safety
- Greatest Potential to Improve Safety in the Next Three Years

Drones (for reality capture, etc.)



Laser Scanning



Wearable Devices (e.g., smart helmet, badges with coded electronic information, etc.)



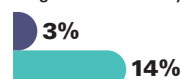
Virtual Reality for Training



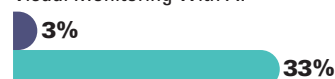
Automated Equipment/Robotics



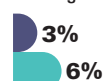
Augmented Reality



Visual Monitoring With AI



Photogrammetry



Optical Headmounted Display (e.g., Google Glass, Microsoft HoloLens)



Not Using Any Technology Listed to Promote Safety Onsite



Worker Safety in a Changing World

Mitigating the Safety Risks From Extreme Weather

Intensifying climate trends bring increasing risks for the construction industry, not only for project predictability, but for worker safety.

As the global climate crisis unfolds, regional trends already underway in the US will intensify, according to predictions from the US Global Change Research Program. Hurricane-associated storm intensity and rainfall rates will continue to rise. Wildfires and flooding will become increasingly frequent and severe. And by the end of this century, what used to be once-in-20-year extreme heat days will occur every two to three years over most of the country. All these factors create increased risk in the construction industry.

Temperature Rising

A recent study found that heat-related deaths in construction are on the rise. Over a study period from 1992 to 2016, there were 13.7 deaths per year in the last five years, up from 9.5 per year in the first 10. And while construction workers make up only 6 percent of the workforce, they account for 36% of heat-related deaths. Even when heatstroke isn't fatal, injuries can be lasting and severe. And minor heat effects, such as sweaty hands, fogged-up safety glasses, dizziness and loss of clear thinking, can increase the risk of injuries from other causes.

The numbers highlight the need for regulatory intervention, specifically a heat-related illness standard from OSHA, say the study's authors. In the meantime, examples of workplace interventions to prevent heat-related death and illness include training, planning and

preparedness, acclimatization of new or returning workers, enhanced monitoring, appropriate clothing and PPE, frequent hydration, work rotations and cooling breaks. The OSHA-NIOSH Heat Safety Tool App, which provides a real-time heat index, hourly worksite-specific forecasts, and related safety and health recommendations, can help workers schedule tasks to reduce heat impacts.

Forecast for Safety

Other climate-related safety risks include sudden changes in weather, which can leave workers scrambling for shelter or struggling to batten down a site in heavy rain and high wind. A weather safety plan that identifies and allocates pre-storm tasks and procedures can reduce risk. Examples of preparedness include monitoring the forecast over the course of the day—possibly using a weather app with push notifications—establishing a communication network to alert workers to initiate predetermined protocols and designating shelter points.

More severe potential disasters require more comprehensive planning. According to a 2018 article by construction risk engineers at Zurich Insurance, the first step is to acknowledge the possibility of disaster, and then to make a plan that is specific to a project's risk exposures. (The authors note that it is often companies working outside their region that are least prepared for weather events.) In addition

to providing for the safe location and protection of equipment, and addressing site vulnerabilities—by clearing a fire break around the site, for example, or bringing in gravel to raise site trailers above potential flood levels—the plan should provide for swift evacuation, with routes mapped out and drills conducted regularly. Post-event resumption of work should start small, with a pre-assigned team conducting a hazard assessment and developing a plan for worker safety in post-disaster conditions.

Picking up the Pieces

Work in the aftermath of extreme weather events can present unfamiliar hazards. There may be increased risk of slips, trips and falls, hazmat dust or work in confined spaces; a damaged or destroyed structure multiplies hazards even more. To help construction workers contribute safely and effectively following extreme weather and other types of calamity, OSHA, CPWR and others offer training in disaster response. The skills and awareness these programs provide will prove valuable as construction workers play an increasing role in post-disaster cleanups or volunteer their skills as aid workers in the event their community is hit. "If you show up in your PPE and you're trained and ready to contribute," says Spencer Schwegler, director of training for CPWR's program, "that's the kind of person an incident command center can use." ■

Improving Ergonomics on Jobsites

New tools are being developed to help improve ergonomics on jobsites, but perhaps the most valuable means to do so is a strong safety culture that puts the impetus on the company, rather than the worker, to improve its processes.

Attention to ergonomics is essential to reduce injuries in construction, and getting the entire industry on board with best practices means shifting from placing responsibility for proper ergonomics on the worker to the company effectively planning how to avoid potentially hazardous situations for workers.

Working Conditions Can Create Hazards

Ann Marie Dale, associate professor at Washington University School of Medicine, has been working on tools to help contractors address these issues. She has already seen the industry improve in its approach to handling ergonomic issues. "Historically," she says, "contractors would push the expectation [of dealing with ergonomics] onto the workers." She points out, though, that there are many factors on typical jobsites that put workers with the best intentions at risk. She points out that schedules are tighter, forcing workers to work faster with fewer breaks. More technically challenging buildings also often leave workers more frequently in awkward positions as they do their jobs. An aging workforce is also more vulnerable to injury. Workers often have little control over these factors.

Addressing Ergonomic Issues

Thus, while worker behavior can certainly be a factor in injuries, Dale believes it is critical that contractors recognize and plan for these added stressors on worker bodies, and not simply expect them to take responsibility for their own behaviors. She does see slow progress in this area, and points out several approaches that are improving worker safety, such as better training options on ergonomics, the strategy of offsite construction and the development of lighter materials.

However, Dale thinks far more needs to be done in terms of planning to deal with high-impact controls. She says contractors need to consider "what controls reduce risk the most" and states that this kind of consideration requires planning. She thinks large companies tend to be pretty good at this planning, especially because it has a positive impact on their bottom line. "Large companies can plan better implementation for prevention through design, purchasing equipment. They put it in their budget and think ahead about how to make sure that the work is done in a more reasonable way for workers ... The reason those large contractors do that is because the bottom line is better. Workers can work longer, they can be more efficient, they have more energy left at the end of the day to continue working, so their overall productivity is higher." In contrast, she believes that "small

contractors don't have the means" to respond in this way, that they don't tend to plan about how work processes are done and they end up pushing responsibility for this onto the worker.

Potential for Technology to Help Address Issues

In order to address this challenge, ECOP and CPWR has developed free, web-based tools that small contractors can easily access and use. However, other technologies that are currently being developed may help contractors in the future.

Josh Kanner, founder and CEO at Smartvid.io has begun to explore how to combine artificial intelligence and jobsite visuals to address ergonomic challenges. While not a standard part of their current safety suite of products, they have been able to work on custom applications using their AI, which they have named Vinnie. Vinnie can take the simplified images of workers, now represented as stick figures, and use that data to build a profile of various work habits of the team without identifying specific workers. That latter point is particularly important, to avoid shifting the responsibility back onto the workers. Kanner states that they provide guidance for the data to be used to identify trends and predict problems before they happen, with the goal of "helping the greater organization understand how a particular site is being safe or trending toward a dangerous situation." ■

Engaging Workers to Fuel a Data-Driven Safety Program

Kitchell Contractors, Inc.

PHOENIX, ARIZONA

Kitchell Contractors, Inc. is an established leader in safety in construction, as demonstrated by their participation in OSHA's Voluntary Protection Program (VPP) on all of their projects, earning star status through a rigorous, voluntary inspection of their deployment of best safety practices onsite. In their search for continual improvement in safety, though, a few years ago, they began a process to take a data-driven approach, with the goal of being able to deploy dashboards and predictive analytics. Their experience with this process reveals some useful lessons about best practices of establishing a data-driven safety program.

First, Get Quality Data

Eric Vogt, safety director at Kitchell, describes the priorities driving their decision to take a data-driven approach. "For us, it's more about visibility," he explains. "Visibility is extremely important to continuous improvement when it comes to safety. We know that hazards exist on the jobsite. However, we don't have any visibility to them. What we are doing is empowering the workers at the craft level to identify hazards with the use of technology so that we can take corrective action ... If we are able to identify those hazards, we have a better chance of eliminating the hazards on a job, which then, in turn, eliminates the potential for workers to get injured."

He has three specific goals for the technology they deployed in order to achieve that visibility: first, to eliminate paper as the means of tracking safety data; second, to provide consistent data on and between projects; third, to store and

easily recall data. Vogt explains, "We want to be able to audit our data to make sure we are doing the right thing and remaining consistent. To do those audits in the past, we would have to send somebody out to take a look at binders upon binders of paperwork and do the audits manually." Now they can use their project management software and conduct audits from their desk.

However, Carl McFarland, market sector executive at Kitchell Contractors, acknowledges that when they first undertook the initiative of using technology to provide that visibility, they got a little ahead of themselves, stating, "We thought the process was going to be a lot easier when we initially set out." He explains, "There's so much talk about the technology itself, about dashboard and predictive analytics ... What we have realized is that the whole idea of find first, collect, analyze and predict is something that you have to do in that order."

The key factor that was missing, they discovered, was having the data quality necessary to support the kind of initiatives they were planning. McFarland states, "We jumped out of the gate a little too quick ahead of our data being consistent and accurate, and we are just now getting to a point where we'll be able to report back and start to look at making data-driven decisions."

They first had to actively identify their key performance indicators, in order to even know what data to track. They then had to make sure that the tool that their workers were using to report on incidents onsite had the appropriate required fields. Those required fields—including identification of the hazard, location

of the hazard and the person responsible for the correction—were essential to their data-gathering process. Having required fields was also critical to helping to improve the accuracy and timeliness of the data, the two aspects that McFarland highlights as an essential part of data quality. But the real challenge to improving the quality of the data did not turn out to be the tool itself, but getting the workers to provide the data they needed.

Engaging Workers to Improve Data Quality

They discovered that the time invested in engaging workers and really having them understand the goals for the data being gathered was critical. Vogt explains that having people understand what the data means and why it is important is essential to overcoming a cultural hurdle about reporting. To get true quality data, they rely on workers to provide observations. However, as Vogt describes, "In the safety world, oftentimes, people think of observations as being negative." They found that they needed to explain exactly why they need more observations, and that the quality of the data is what is important to them. He found that "once [workers] started to understand more about what our goals were and what we were trying to achieve, the quality of data improved."

To get that message across to workers, Vogt describes how they "talked about it every single chance we could. In all our meetings, we talked about it. In our safety committee meetings, in our weekly meeting with safety managers, in our superintendent meetings, in our

CONTINUED

Engaging Workers to Fuel a Data-Driven Safety Program

PHOENIX, ARIZONA



Being able to do safety inspections electronically has been critical to driving higher quality safety data for Kitchell Contractors.

operations meetings. Every single one of those meetings, we talked about the importance of the quality of data. We were relentless when it came to pushing [that message]."

In fact, they are still trying to find more ways to improve data quality through increased worker engagement and willingness to provide inspections. Vogt describes how the next step is to incentivize workers to identify more hazard observations. While they are still working out the details at this time, they envision a system in which point values are assigned to observations

and inspections with some sort of incentive tied to higher point scores. The goal of this is largely to reinforce the change in perception from perceiving observations and inspections as a negative to a positive.

Another factor noted by McFarland that directly impacts worker engagement in producing quality data is the ease of use of the tools they have. Cory Thellmann, senior project engineer, explains that the digital tools they are using now are already helping with this. "To be able to do a safety inspection right on

your mobile device, instead of having to create an additional report on an Excel sheet" is a major advantage, and allows workers to more easily record an observation or a near miss. He states, "To see where we've come in five years, and what we are capable of doing in the palm of our hand, is pretty impressive."

Kitchell is already seeing the benefits of their push for better data. McFarland states that they are seeing improvement in the percentage of hazards identified. Vogt believes that the timeliness in correcting hazards has also improved. "The old way in which we identified hazards wasn't conducive to making a timely correction. We would have to document it, make phone calls and send emails to the person responsible for making the correction, and there was no follow up or way to measure the time to correction. Now, we have a way to do that, and we've seen that time from identifying the hazard to correcting it has improved greatly." While Vogt could not provide specific numbers on that improvement, McFarland states that improvement in the time to close is around a factor of 10.

Next Steps

For now, the biggest impact on improving reporting and data has been with Kitchell's own employees, but Vogt sees the next step as engaging their trade partners as effectively. "When our trade partners are using the technology tools, we want them to also improve quality of the data."

McFarland also sees potential in emerging technology that capture images more effectively, making the tools even easier to use. ■

Methodology

Safety Management in the Construction Industry Study

Dodge Data & Analytics conducted the 2019 Safety Management in the Construction Industry survey to examine multiple topics on jobsite practices related to safety management, safety practices, and communication among general contractors, construction managers, design-builders, engineering contractors and specialty trade contractors.

The research was conducted through an online survey of industry professionals from July 31 through September 24, 2019. The survey drew its responses from the following sources:

- **DD&A Contractor Panel:** This panel contains a representative sample of construction contractors across the US. The panelists are identified by many categories, including size, region, types of projects undertaken, and specialty.
- **Research Partners:** The survey was sent to members of three associations participating as research partners in the study.
 - American Road and Transportation Builders Association (ARTBA)
 - Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - The Association of Union Constructors (TAUC)

Survey Respondents

In order to gain an industry-wide perspective the survey was open to all contractors who did work in the United States in 2019. **In total, the survey had 314 complete responses.**

TYPE OF COMPANY

The following responses were received by type of company.

- **General Construction Contracting Company:** 109
- **Specialty/Trade Construction Subcontractor:** 161
- **Construction Management Company:** 13
- **Design-Build Firm:** 21
- **Engineering Contractor Firm:** 10

All prime contractors (general construction contracting company, construction management company and design-build firms) are grouped together in the analysis in this report under the heading of general contractor (GC). Engineering contractor firms are included with the specialty/trade construction subcontractors, and they are described as specialty trade contractors.

SIZE OF COMPANY

All respondents were asked how many people are typically employed at their company across all locations and all job junctions. Based on their responses, three categories were used in the analysis for the size of company.

- **Small Companies (1 to 19 people):** 55
- **Midsize Companies (20 to 99 people):** 110
- **Large Companies (100 or more people):** 149

Longitudinal Analysis

Data from this survey is used in continuation of longitudinal analysis of previous safety surveys from 2012, 2015 and 2017. All previous surveys were conducted using the DD&A Contractor Panel, and the ones in 2012 and 2017 also drew upon research partners for additional responses.

The survey primarily relied upon identical questions for longitudinal analysis. If the comparison questions did vary by year, this is pointed out in the analysis. ■

Resources

Organizations, websites and publications to help you get smarter about improving safety performance in the construction industry.

DODGE DATA & ANALYTICS

Dodge Data & Analytics

Main Website: www.construction.com

Dodge Construction Central: www.construction.com/products

Market & Competitive Intelligence: www.construction.com/products/construction-market-data

Sweets: www.construction.com/products/sweets

SmartMarket Reports: www.construction.com/toolkit/reports

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We thank our research partners for their efforts on engaging their membership to participate in this study, including the American Road and Transportation Builders Association (ARTBA), Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) and The Association of Union Constructors (TAUC).

In addition, we thank all those who participated in case studies and shared their insights and images with us.



THE CENTER FOR CONSTRUCTION
RESEARCH AND TRAINING

www.cpwrr.com

www.elcosh.org

www.cpwrrconstructionsolutions.org

http://stopconstructionfalls.com



www.procore.com

Association Research Partners

American Road and Transportation Builders Association (ARTBA): www.artba.org

Sheet Metal and Air Conditioning Contractors' National Association (SMACNA): www.smacna.org

The Association for Union Constructors (TAUC): www.tauc.org

Prevention Through Design Resources

CPWR Construction Solutions, Prevention through Design: www.cpwrrconstructionsolutions.org/hazard_solutions/ptd/prevention-through-design-ptd

National Institute for Occupational Health and Safety (NIOSH) Prevention through Design Program: www.cdc.gov/niosh/programs/ptdesign/default.html

Prevention through Design:

designforconstructionsafety.org

USGBC Prevention through Design Credit:

www.usgbc.org/credits/preventionthroughdesign

Other Resources:

BIMForum: bimforum.org

buildingSMART International:
www.buildingsmart.org

Construction Safety Council: www.buildsafe.org

International Code Council: www.iccsafe.org

Lean Construction Institute: www.leanconstruction.org

National Institute of Building Sciences: www.nibs.org

National Institute of Occupational Safety and Health: www.cdc.gov/niosh

National Institute of Standards and Building Technology: www.nist.gov

Occupational Safety and Health Administration: www.osha.gov

U.S. Bureau of Labor Statistics: www.bls.gov

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■ Design and Construction Intelligence

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