Use of Behavioral Economics to Enhance Struck-By Prevention Planning

Nudging Construction Contractors and Workers Toward Safer Decisions

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Executive Summary

Despite longstanding efforts to improve construction safety, struck-by incidents remain a leading cause of worker injuries and fatalities. To help address persistent challenges in awareness and adoption of struck-by prevention practices, this study applied behavioral economics—specifically, the use of nudges—to enhance decision-making across multiple levels of the construction workforce. A pilot intervention was developed and tested using a structured Define, Diagnose, Design, Test framework to incorporate nudges into a Struck-by Prevention Planning Program. The intervention, developed with industry partners, included prompts, reminders, feedback, social norms, and incentives, to improve struck-by prevention planning.

The evaluation employed pre- and post-intervention surveys of workers, frontline supervisors, and upper-level managers across five construction companies. Results indicated strong support for planning practices and safety climate, with workers and supervisors reporting reductions in exposure to all major struck-by hazards post-intervention. Nudges such as signage/posters, stickers, and feedback were most widely used and rated as effective in reinforcing safety decisions. Spanish-speaking workers and supervisors reported significantly higher adoption of key planning practices following the intervention, highlighting the potential of multilingual approaches that engage all segments of the workforce. While worker- and supervisory-level engagement was high, managerial adoption varied, underscoring the need for clearer implementation strategies. These findings demonstrate that low-cost, readily available, scalable nudges, when embedded within planning frameworks and aligned with organizational context (safety climate/culture), can support improved safety decision-making on the job. Nudges offer a practical strategy for enhancing occupational safety interventions at the job site and a promising direction for policy initiatives aimed at advancing occupational safety in the construction industry.

Introduction

I. Background

Construction has one of the highest rates of occupational injuries and illnesses of any industry despite considerable research efforts to reduce construction hazards and promoting safety solutions (CPWR, 2025). As a result, safety and health researchers and practitioners are challenged to develop approaches that enhance awareness and adoption of evidence-based solutions (e.g., personal protective equipment, training, tools).

One potential approach to address this dilemma is the use of behavioral economics techniques (nudges) to complement the design and implementation of safety solutions. Behavioral economics combines concepts from economics and psychology to design techniques that influence decision-making and subsequent actions (Thaler & Sunstein, 2008). These techniques are used to "nudge" decision-makers toward better choices. In the case of construction safety, the techniques nudge individuals (i.e., contractors, forepersons, and workers) toward making choices associated with safe work practices (Sarpy et al., 2021).

Behavioral economics theories also provide insight into why individuals do not always make optimal decisions (Sunstein, 2021a). With construction safety, faulty choices include making decisions that do not protect worker safety and health. Behavioral economics recognizes that there are limitations to decision-making (time, information, knowledge, attention) that often inhibit an individual's ability to make decisions in the best/safest possible manner. These limitations lead to decision-makers relying on rules of thumb, mental shortcuts, and biases in judgements or beliefs that may interfere with making the safest decisions and practices (Corr & Plagnol, 2018).

The most common reasons for making faulty decisions involving occupational health and safety fall into five major categories (Seabury et al., 2005; Sunstein, 2021b). The first is availability bias, in which decision-makers tend to use information that is readily available and easily accessible; this often includes information that is most recent and "front of mind" to the individual. A second challenge is individuals tend to have a bias toward keeping the status quo ("that's the way it's always done around here") and avoiding change. Both indicate that decision-makers tend to prefer familiar and current choices. Third, decision-makers tend to suffer from overconfidence bias, where individuals take risks based on *perceived* ability (overconfidence) rather than *actual* ability, which may lead to riskier practices. Fourth, present bias occurs when decision-makers place a higher value on outcomes in the present (something that is more certain) than the future (which is less certain). Finally, decision-makers tend to focus more on losses (loss aversion)—that is, avoiding losing something they already have—rather than acquiring gains. These biases are particularly problematic when individuals feel safety decisions interfere with the production schedule. Safety takes a "backseat" when there is a push toward meeting production goals rather than meeting safety needs.

Specific techniques can overcome these faulty mental shortcuts and and create an enhanced decision environment (choice architecture); (Mertens et al., 2022; Tagliabue et al., 2019). For workplace safety, these techniques "nudge" the decision-makers toward safer choices and practices. The idea is that small changes in the way choices and information are presented can help workers make better (safer) decisions. It is important to note that to be considered a nudge, it must be: (1) easy to implement; (2) low cost; (3) transparent to the decision-maker; and (4) maintain freedom of choice by the decision-maker. Importantly, nudges should not be mandated or take away the decision-making freedom from the decision-maker (i.e., not a "shove"). Instead, nudges help empower the decision-maker by helping them make better informed and safer decisions and related practices.

Nudges and Construction Safety

Nudges are often used in the construction industry. Examples include hardhat stickers and posters with safety messages (reminders) and planning tools that promote best practices and take contractors step-by-step through developing safety plans (prompts). CPWR–The Center for Construction Research and Training (CPWR) conducted a literature review examining the effectiveness of using nudges to influence safety decisions and related practices in the construction industry (Sarpy et al., 2021). Surprisingly, the review found relatively few studies have examined the use of nudges to influence safety-related decisions in construction. However, the review found evidence in other industries indicating nudges' potential relevance and benefits to supplement and complement construction safety and health interventions (equipment, training, work practices). It also showed how nudges have been effectively used for various stakeholder groups across organizations (employers, supervisors, employees, customers) and, importantly, across diverse worker subpopulations, including at-risk workers.

In addition, the literature review found nudges designed to enhance occupational health and safety are used most often to influence: (1) how available information is presented (feedback, social norms); (2) how decisions are structured (incentives, prompts); and (3) how to assist decision-makers in following through with their intentions (reminders). Interestingly, the review also found that specific types of nudges are rarely used in isolation (e.g., reminders only, incentives only, or feedback only); they are most often combined to positively influence safety and health. The findings demonstrate that these techniques can be effectively tailored to address deficiencies in decision information, structure, and follow through with decision-making intentions.

Other considerations for using nudges to influence safety decisions in construction include:

- A supportive safety climate and safety culture are necessary to support nudges and related safety interventions. In other words, context matters and must be aligned with the nudges to maximize their effectiveness.
- Nudges have small to moderate influence in encouraging safer decisions and practices, with the largest effects demonstrated in the field of health.

- There is no “one size fits all” or “magic bullet” for nudges. It is important to have an appreciation of the specific decision, types of biases or heuristics (mental shortcuts that may be useful but can lead to errors in decision making) that are affecting the decision-maker, the situation or context, and the barriers to the decision-making process.

In sum, nudges are appealing because they are cost effective, can be incorporated into existing safety and health interventions, and have been proven effective in supporting safety and health decisions, practices, and outcomes across various occupational settings. These characteristics are consistent with findings from systematic reviews and meta-analysis in other fields (Mertens et al., 2022; Wang & Groen, 2020) and particularly relevant for small and resource-limited organizations, including most construction employers facing time and cost restrictions in designing and implementing safety interventions.

The findings from the literature review highlighted the need for identifying which nudges are currently in use to influence construction safety decisions, testing their effectiveness in enhancing safety decisions, and establishing a process that provides guidance on identifying and using nudges (i.e., use of combinations of nudges to enhance safety decisions). In response to this need, a systematic process was developed to guide decision-makers in applying these behavioral economics techniques. More specifically, the process facilitates the selection and design of nudges or combinations of nudges that are implemented to support interventions directed at increasing awareness and adoption of critical safety and health decisions, as well as assessing the extent to which the nudges influence safer decisions, actions, and related outcomes. Importantly, this approach allows for investigating the contextual and individual variables moderating the effectiveness of the nudges and interventions, thereby allowing for a greater understanding of the boundary conditions for their effectiveness.

This report details CPWR’s examination of the effectiveness of nudges through their integration into a pilot planning program to prevent struck-by incidents. It describes the “Define, Diagnose, Design, Test” framework CPWR and key partners used to identify appropriate types of nudges and incorporate them into the Struck-by Prevention Planning Program, as well as the methodology used to pilot test the effectiveness of those nudges as part of the larger intervention. This report also discusses their effectiveness with decision-makers across five construction companies and implications for the use of nudges to enhance awareness and adoption of safety solutions in construction.

II. Identification of Nudges and Development of the Struck-by Prevention Planning Program

Define: Identify the problem

The first step in the framework used to identify and incorporate nudges is to develop consensus among stakeholders on which safety issue to target (the problem). Generally, this involves gathering input from key stakeholders, beginning with identifying

a broad issue or problem, followed by narrowing the focus to specific decisions and actions of interest.

To support the development of the nudges and the overall planning program, and to ensure they were designed based on industry feedback, CPWR collaborated with the National Institute for Occupational Safety and Health's (NIOSH) National Occupational Research Agenda (NORA) Construction Sector Council Struck-by Work Group (Work Group), which includes representatives from employers, labor, manufacturers, other industry stakeholders, government, and academia. The Work Group was consulted on the root causes of struck-by incidents and how to encourage safer decisions and practices for preventing them (i.e., identify the problem). After much discussion, planning decisions and practices for preventing struck-by incidents were identified as the primary area for improvement. These decisions were chosen because they occur upstream in the safety decision-making process, and lack of planning was identified as a common bottleneck in the decision process for safety.

Once the root problem (lack of planning) and solution (improved planning decisions and practices) were identified, a survey was administered to contractors, workers, and other industry members to gain a greater understanding of the decisions involved in the use of planning and related safety practices to prevent struck-by incidents. The survey was developed to explore: 1) causes of struck-by injuries, barriers to prevention, and ways to raise awareness and ensure use of safe practices; 2) current measures to protect workers and the barriers to implementing controls for common struck-by hazards; and 3) knowledge of struck-by hazards, the role of planning in prevention, and the motivators, resources, and support needed to prevent incidents in construction. The report *Struck-by Hazards, Barriers, and Opportunities in the Construction Industry* details findings from this survey (Betit et al., 2022). Respondents indicated conducting job hazard analyses before work begins and periodically before a new task or type of work begins are the most frequent planning activities companies use to prevent struck-by incidents. In addition, most respondents indicated their organizations conduct and participate in job site meetings before the start of each shift to review struck-by hazards and steps being taken to prevent incidents (e.g., location and use of safety equipment, work practices, signage, and who to go to if help is needed); provide and use daily checklists or job hazard analyses before each shift; conduct and participate in training programs on struck-by hazards and prevention; and provide tools, equipment, and/or work practices on struck-by hazard prevention.

Diagnose: Understanding the context and barriers to making safer decisions
Once the problem is identified and the focus is narrowed to relevant planning decisions, it is important to map the decision context. This step involves analyzing more detailed information to identify the key barriers and underlying biases/heuristics for those decision steps. The resulting information can help determine current steps for making safety planning-related decisions, who is responsible for each decision, when and where the safety decisions are made, and who or what commonly prevents the safety decision and related safety practice from actually occurring. From this information,

potential interventions and accompanying nudges are designed to address the bottlenecks interfering with safer decisions and actions.

The safety decisions and practices used to plan for struck-by incidents were highlighted according to each of the decision biases and contextual barriers (bottlenecks) that interfere with making safer decisions. This information was generated from discussions with key informants and subject matter experts from the Work Group, as well as the 2022 survey of contractors, supervisors/managers, and workers.

The survey revealed that a lack of understanding of how to address hazards and lack of training in hazard identification and prevention were consistently impeding safety prevention efforts. Interestingly, training and providing equipment were also cited among the measures most frequently taken to protect workers from various struck-by hazards. The fact that training is a common solution, yet a lack of training was a top inhibitor of safety indicates biases or heuristics may be interfering with these safety measures.

When considering the biases that interfere with planning decisions to prevent struck-by incidents, stakeholders reported that the emphasis placed on production (getting the job done on schedule at the expense of getting the job completed safely) is one of the biggest barriers for both employers and workers. Respondents also attributed the lack of adherence to planning to decision-makers' (employers, workers) present bias and focus on loss aversion.

Complacency/inattention and lack of commitment towards safety on the job site (status quo bias) also played a role in the lack of adherence to planning. These biases are more problematic in organizations that have poor safety climates, lack formal safety training programs, and do not have peer support and managerial commitment to safety. Worth noting is that respondents also reported contractors have little control over struck-by hazards produced by other contractors on job sites. Importantly, these issues were consistently reported for safety decisions made to prevent each of the major struck-by hazards.

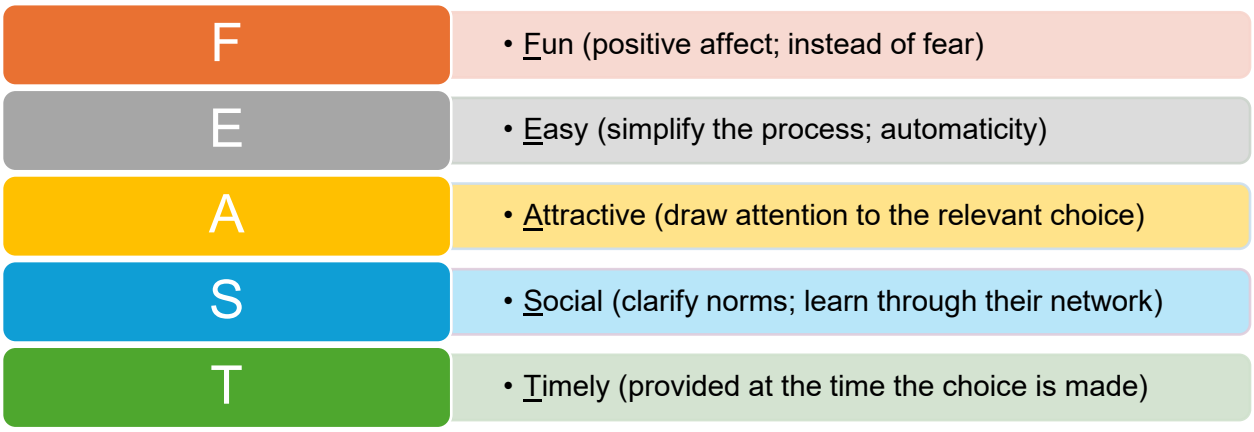
Design: Create nudges that address barriers and encourage safer decisions and practices

The next step in the process is designing nudges that address identified barriers and biases. Gathering input from various stakeholders (employers, supervisors, employees) in the design process increases buy-in and use of the interventions in the implementation stage that follows. The increased support can also facilitate a culture that enhances safety decisions at all levels of the organization and increases effectiveness.

The nudges need a number of attributes: making the safer decisions and practices easier to achieve; removing the barriers identified; eliminating the gap between safety intentions and safety actions (procrastination); and bringing attention to the immediate benefits of the safer decisions and practices. To accomplish this, the nudge or

combination of nudges incorporated into the Struck-by Prevention Planning Program were designed to be consistent with the FEAST framework (see Figure 1). This framework (Sunstein, 2021b) highlights the characteristics of nudges that are most likely to produce the desired safety-related choices. The FEAST framework suggests nudges should: generate positive responses (fun); create a simpler more automatic safety process (easy); draw attention to the relevant choice (attractive); consider the influence of others with whom they work and interact (social); and be given at the time when people are making the choice (timely).

Figure 1. The FEAST Framework for Effective Nudging



Source: Sunstein (2021b)

Several types of nudges were identified as potentially useful for addressing biases and overcoming barriers for planning decisions to prevent struck-by injuries. The following nudges were designed to integrate into the Struck-by Prevention Planning Program:

- **Prompts** use standardized explicit verbal, visual, and/or numeric information to make *previously unknown or inaccessible information* more available. For those less familiar with planning practices, prompts are designed to nudge individuals at key times to think through how and when planning decisions are made. Participating in job site meetings before the start of each shift to review struck-by hazards and the steps being taken to prevent incidents (e.g., location and use of safety equipment, work practices, signage, and who to go to if help is needed) prompt related safety decisions. It is important these prompts occur at the beginning of each shift and at the start of a new task or type of work, so to encourage the "fresh start effect" of the nudge (i.e., new beginnings tend to increase noticeability and importance). Similarly, posters and infographics that have relevant information regarding how to identify and prevent struck-by hazards should be posted near the hazard to prompt safer choices.
- **Reminders** make important information that is *already known or available* more visible and accessible. Reminders help ensure salient information is consistently used to make safer decisions and practices and can help combat procrastination. Identification of struck-by hazards and use of work practices and equipment to prevent incidents can be strengthened through verbal and written reminders that reinforce steps the individual committed to doing in planning meetings. These

messages can be provided through conversations or email and text messages. In addition, posters, infographics, and hardhat stickers can serve as useful visual reinforcements.

- **Feedback** involves providing direct and clear information to the decision-maker about the results of their safety decisions and safety practices. Feedback provides information about their use of appropriate safety decisions and reinforces the related safety practices. For example, workers should participate in a *debriefing meeting* at the end of each shift to receive feedback. The debriefing meetings should be include the entire crew so everyone gets "a voice" in the review. This participation can reinforce the steps and commitments made in implementing the plans.
- **Social Norms** provide a point of comparison by presenting information relative to others in a group. Because individuals are influenced by what others do, social norms on the jobsite influence decisions by providing cues regarding the expectations or rules within a work group. Supervisors and safety leaders on site are critical in setting and conveying relevant safety norms.
- **Incentives** involve changing decision consequences and motivators for the decision-maker. Incentives provide positive rewards for actions that promote desired safety outcomes (e.g., consistently engaging in planning decisions and activities). Importantly, effective incentives are not punitive in nature and should include small, frequent rewards for positive safety decisions and related practices.

Test: Implement the nudges and evaluate effectiveness

Once designed, the nudges are ready to be implemented at worksites and tested to determine their usefulness and effectiveness. As described in the next section, an online guide was developed to provide specific examples of nudges and considerations for their effective use. To ensure relevance and impact, the nudges and guidance for their use were tailored to address specific biases and decision bottlenecks inhibiting safer planning decisions about struck-by prevention. It is important to evaluate the use of the nudge resource by all decision-makers (workers, supervisors, managers) as well as the effectiveness of nudges in enhancing their planning decisions and practices. The findings are critical for establishing preliminary evidence that the use of nudges can effectively impact safety decisions in construction and for making any revisions needed prior to expanding their large-scale application.

Methods

I. Intervention

As described above, a pilot project was developed to test the use of behavioral economics concepts to enhance safety decision-making by incorporating them into a program to prevent struck-by incidents. The Struck-by Prevention Planning Program integrates findings from the literature review and survey, with feedback from the NORA Construction Sector Council Struck-by Work Group. It includes a planning tool, supplemental planning and training resources, and a series of nudges to encourage planning at all levels on the job.

The Struck-by Prevention Planning Program consists of three separate but complementary sections. First, a list of questions is provided to guide contractors through considering the potential struck-by hazards on a specific job before work begins, and links provide access to online hazard-specific planning and training resources. Next, a worksheet is presented to help contractors track their struck-by prevention plan. Finally, a list of recommended nudges is provided (including some in Spanish) along with guidance for their use in supporting planning efforts.

II. Participants

Contractors were recruited for the pilot through referrals from members of the NORA Struck-by Work Group, as well as postings in CPWR's monthly newsletter. The CPWR team also presented a webinar, *Struck-by Hazards, Barriers, and Opportunities in the Construction Industry,* to provide an overview of the Struck-by Prevention Planning Program and recruit participants for the pilot.

CPWR followed up with all contractors expressing interest in the pilot. There was an initial call with the safety directors of those contractors to introduce them to the pilot and walk them through the steps of the Struck-by Prevention Planning Program. During this meeting, the team instructed safety directors interested in participating to distribute two baseline surveys: one for workers and frontline supervisors and the other for upper-level managers.

In the construction industry, there is significant overlap between workers and supervisors, with many people having both roles, both doing the job and overseeing other crew members. In addition, foremen and other crew leaders often make decisions based on instruction from management and are not themselves considered the primary decision-makers. For that reason, workers and supervisors were surveyed as one cohort, and upper-level managers as the other.

III. Evaluation Measures

The baseline surveys were completed anonymously and approved by CPWR's Institutional Review Board. They were available in English and Spanish. Employers were sent QR codes that linked to online surveys in Qualtrics and Word files so they could distribute paper versions of the survey. If the contractor opted for the paper versions, completed surveys were sent back to CPWR and entered manually into Qualtrics. The baseline surveys consisted of multiple-choice and open-ended questions that asked respondents to self-report their current knowledge, practices, and procedures concerning struck-by hazards. To collect information from a range of decision-makers in each participating organization, two versions were distributed: (1) workers and frontline supervisors (15 items – see Appendix A); and (2) managers (16 items – see Appendix B).

After the baseline surveys were administered, the CPWR team held a follow-up call with each safety director to discuss how they would implement the Struck-by Prevention Planning Program. They were encouraged to pick nudges that fit their unique needs, but

they did not need to use every element of the planning program if they already had specific elements in place. When possible, a CPWR team member arranged a visit to the project site. The site visits typically lasted one day and allowed the team to better understand existing planning efforts as well as struck-by hazards unique to the project site. Based on this additional information, including contextual and organizational factors influencing safety (e.g., size of site, site congestion including pedestrians, number of workers), the team recommended specific nudges for the pilot test that fit the needs of the contractors.

A final meeting was held with safety directors at least 20 weeks later to discuss the results of the pilot, including their overall impressions of the planning program and any additional feedback they had. At the conclusion of the meeting, safety directors were asked to administer project evaluation surveys, which were also completed anonymously and approved by CPWR's IRB. The evaluation surveys were available in English and Spanish. Employers were sent QR codes to online surveys in Qualtrics as well as Word versions of the surveys so they could distribute paper versions. If the contractor opted for the paper versions, completed surveys were sent back to CPWR and entered manually into Qualtrics. The surveys contained multiple-choice and open-ended questions that asked respondents about their experience with the pilot, resources used from the Struck-by Prevention Planning Program, and ratings of overall effectiveness. Again, two versions were distributed: (1) workers and frontline supervisors (19 items – see Appendix C); and (2) managers (25 items – see Appendix D).

IV. Data Analysis

All the data analysis was conducted using SAS 9.4. Because the data did not follow a normal distribution, the Wilcoxon-Mann-Whitney test – a non-parametric t-test – was used, along with an alpha level of 0.05. Associations between categorical variables were determined using chi-square or Fisher's exact tests if cell counts were less than five. If a respondent selected "Other: Please Specify" for a question, the qualitative responses were coded with new or previously existing response categories.

Results

I. Pre-Intervention: Baseline Survey Findings

Pre-Intervention: Workers and Supervisors

Demographics

A total of 203 surveys were completed across five companies, with workers providing the largest percentage of responses (70%). The majority of responses (81%) came from one company. Most respondents reported working at their company for 1 to 5 years (47%) with many reporting shorter tenures of less than 1 year (23%) or for more than 10 years (19%). Surveys were administered in both English (82%) and Spanish (18%) to accommodate workforce diversity.

Awareness and Confidence about Struck-by Hazards

Workers and supervisors reported high levels of knowledge and confidence concerning struck-by hazards.

- 68% reported being *extremely or very knowledgeable* about struck-by hazards on job sites
- 75% said they are *extremely or very knowledgeable* in identifying and addressing these hazards

These results suggest that, while overall knowledge and confidence is strong, there is room to improve hazard-specific awareness among some segments of the workforce.

Struck-by Hazards at Worksite

The workers and supervisors identified the types of struck-by hazards they encounter at their worksites. Respondents revealed that all four typical types of struck-by hazards were encountered on worksites:

- Falling/dropped objects (89%)
- Rolling objects (63%)
- Swinging objects (55%)
- Flying objects (39%)

Planning Practices to Prevent Struck-by Incidents

Workers and supervisors reported how often they engaged in key planning actions to prevent struck-by incidents. Workers and supervisors indicated they *always or almost always*:

- Actively engage in pre-task planning at the beginning of every shift (77%)
- Participate in pre-job planning before work begins on a new project (76%)
- Conduct or participate in pre-task planning before any new task or new type of work is initiated (71%)
- Conduct or participate in daily pre-shift meetings to review struck-by hazards and preventive measures as a group (70%)
- Review/update pre-job plans frequently at safety/production meetings with crew leaders (69%*)*
- Conduct or participate in pre-lift meetings before crane use to review communication, struck-by hazards, and steps being taken to prevent incidents (68%)
- Conduct or participate in training programs on struck-by hazards and prevention (58%)

The responses reflect a high level of consistency in worker and supervisor engagement in most planning practices, with less consistency for discussions and updating of plans, and participation in training programs. The findings suggest a need to embed struck-by prevention more systematically into routine communication and planning tools.

Use of Safety Nudges

A small number of workers and supervisors reported nudges that have been used on the job to encourage safety in general (12%), with significant variation in the type of nudge:

- Signage/posters (79%)

- Stickers (50%)
- Feedback (40%)
- Email reminders about planning (26%)
- Incentives (24%)
- Text message reminders about planning (31%)

These results highlight an opportunity to increase use of nudge techniques directed at safety planning. Feedback and reminder systems may offer effective channels for reinforcing safety planning practices.

Safety Climate

Workers and supervisors reported positive and supportive safety climates in their organizations and a strong commitment to struck-by prevention. The majority of respondents indicated they *agreed or strongly agreed* that:

- My company makes planning to prevent struck-by incidents a top priority (81%)
- Management is committed to and actively involved in planning to prevent struck-by hazards (81%)
- Management prioritizes safety equally as much as quality of work and productivity (80%)
- Everyone is included in planning for struck-by hazards (74%)
- Additional resources are needed to effectively plan for struck-by hazards on their job sites (72%)

The data indicates that most workers feel strong support from leadership, with a small portion of the workforce perceiving conflicting between safety and productivity.

Pre-Intervention: Managers

Demographics

Forty-three managers representing four construction companies participated, with 74% responding in English and 26% responding in Spanish. Participating managers held a variety of leadership roles: Company Owners (20%); Safety & Health Directors (28%)*;* Project Managers (23%); Superintendents (8%); Construction Managers (8%); Directors (5%); and 10% reporting other leadership positions (e.g., COO, Regional VP, Controller*).* A similar share of managers reported working at their company for 1 to 5 years (39%) or more than 10 years (32%), with somewhat fewer reporting shorter tenures of less than 1 year (22%). They represent a mix of general (46%) and specialty subcontractors (32%), with the largest numbers being in the industrial sector (54%) and employing 1,000 or more workers (39%).

Interest in Pilot Project

Managers reported a variety of reasons for participating in the pilot program. The majority of managers indicated they were looking for:

- *General information* (not hazard specific) to *improve job planning* (61%)
- *Information on nudges* to support safety decisions and practices that reduce struck-by incidents (54%)
- Information on *reducing struck-by incidents from falling objects* (e.g., dropped tools, objects falling from heights) (49%)

Awareness and Confidence about Struck-by Hazards

Similar to workers and supervisors, managers reported high levels of knowledge and confidence concerning struck-by hazards.

- 61% reported being *extremely or very knowledgeable* about struck-by hazards on job sites
- 56% said they are *extremely or very confident* in identifying and addressing these hazards

Planning Practices to Prevent Struck-by Incidents

Managers were asked to rate how often their companies engage in key planning actions to prevent struck-by incidents. The responses reflected a high level of engagement with most practices, with variability depending on the complexity of the activity. Most managers reported frequent engagement with struck-by prevention planning activities, especially those tied to shift preparation, crane operations, and emergency response.

Training and integrating safety into costs upfront were practiced less consistently and may benefit from more structured support or leadership prioritization. In summary, managers indicated they *always or almost always*:

- Conduct pre-job planning before work on a new site begins (84%)
- Conduct pre-task planning at the beginning of every shift (81%)
- Designate and identify those in charge of and knowledgeable about rescue and treatment should an incident occur (79%)
- Hold pre-lift meetings before crane use to review communication, struck-by hazards, and steps being taken to prevent incidents (72%)
- Hold daily pre-shift meetings to review struck-by hazards and preventive measures (72%)
- Review/update pre-job plans frequently at safety/production meetings (70%*)*
- Conduct pre-task planning before any new task or new type of work is initiated (70%)
- Designate and identify those in charge of and knowledgeable about struck-by prevention at the worksite (67%)
- Include the cost of all safety- and rescue-related resources in the bid (66%)
- Conduct training on struck-by hazards and prevention (58%)

Safety Climate

Managers reported positive and supportive safety climate in their organization and a strong commitment to struck-by prevention. The majority of managers indicated they *agreed or strongly agreed* that:

- Pre-task planning is considered critical to hazard prevention (88%)
- Safety is equally important to a project's success as quality of work and productivity (86%)
- Management identifies and takes steps to correct hazardous situations on the job (86%)
- Pre-job planning is considered critical to hazard prevention (86%)
- Planning for struck-by hazards is a priority (74%)

- Management is committed to and involved in planning for struck-by hazards (74%)
- Everyone is included in planning for struck-by hazards (72%)

Use of Safety Nudges
A small number of managers reported currently using nudges to encourage safety in general (5%) and a few reported not using any nudges to encourage planning (13%). However, the use of nudges is somewhat inconsistent and indicates an opportunity for improvement through increased use of nudge techniques directed at safety planning:

- Signage/posters (69%)
- Feedback (46%)
- Stickers (36%)
- Email reminders about planning (36%)
- Incentives (28%)
- Text message reminders about planning (28%)

Planning Resource Needs
In addition, while managers stated planning activities are considered critical, the majority said their needs included:

- Additional resources to effectively plan for safety on their job sites (81%)
- Additional resources to effectively plan for struck-by hazards on their job sites (72%)

Sources of Safety Information
The overwhelming majority of managers (90%) indicated they rely on OSHA to obtain information about how to reduce struck-by incidents. Managers also report using equipment manufacturers (46%) and NIOSH (39%) as a source of information concerning struck-by prevention.

Baseline Survey Conclusions and Recommendations
This data indicates a solid foundation of safety knowledge and practices, especially in planning and hazard prevention. It serves as a baseline for measuring the relevance and effectiveness of using nudges to enhance planning efforts to prevent struck-by incidents.

II. Post-Intervention Findings

Managers, supervisors, and workers received post-intervention surveys approximately 20 weeks following initial introduction of the Struck-by Prevention Planning Program at their worksite.

Post-Intervention: Workers and Supervisors

Demographics
A total of 192 surveys were completed with a slight increase in worker participation from baseline (70%) to follow-up (77%). Only two of the five companies from baseline were

represented at follow-up, with almost all workers and supervisors employed by one company (96%). There was a noticeable increase in workers and supervisors completing the surveys in Spanish, with 33% of respondents completing the follow-up surveys in Spanish (relative gain of 75%). Consistent with baseline results, the majority of respondents have worked at their company for 1 to 5 years (41%), however, many more of the follow-up respondents reported tenures of less than 1 year (37%). Importantly, more than half of the respondents indicated they completed the baseline survey (53%), with a meaningful percentage reporting they were unsure (33%) and a smaller percentage reporting they did not complete the baseline survey (14%).

These demographic shifts (more Spanish speakers and newer workers, and most representing one company) call for consideration that any **reported changes may be influenced by individual characteristics such as language and/or be site-specific and primarily reflect the interventions used at one company**. Further, the lack of specific recall of completing baseline surveys for many post-intervention respondents also suggests the reported changes may reflect different groups of respondents. Therefore, comparisons of pre- to post- outcomes should be interpreted with caution.

Changes in Struck-by Hazards at Worksite

The workers and supervisors reported meaningful decreases in encounters with all four struck-by hazards on construction worksites over the intervention period (see Table 1). Substantial decreases were reported for struck-by hazards related to rolling and swinging objects, whereas notable decreases were cited for flying and falling/dropped objects. These positive trends indicate improved conditions at the worksite, suggesting increased emphasis and effective hazard mitigation during the intervention period.

Table 1. Percentage of Self-Reported Exposure to Struck-by Hazards by Workers and Supervisors

Hazard Type	Baseline Exposure %	Follow-up Exposure %	Relative % Change
Falling/dropped objects	89%	78%	▼29%
Rolling objects	63%	30%	▼62%
Swinging objects	55%	24%	▼65%
Flying objects	39%	24%	▼51%

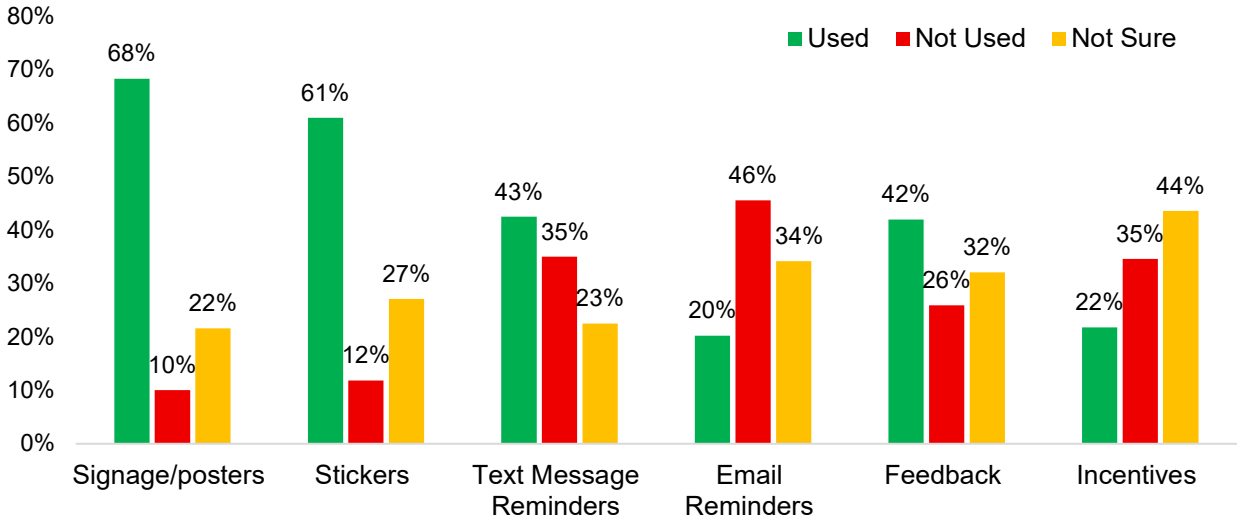
Use and Effectiveness of Nudges to Support Planning

Workers and supervisors reported the extent to which they used the nudges during the intervention and the effectiveness of the nudges in encouraging safety-related decisions and practices. The following sections details these responses.

Use of Nudges

Figure 2 shows the variations in how the nudge techniques were used, with visual cues such as signage and stickers reported most widely.

Figure 2. Percentage of Nudge Use Reported by Workers and Supervisors



Note: (in order of greatest number of responses) Signage/posters (N=139); Stickers (N=118); Text reminders (N=80); Feedback (N=81); Email reminders (N=79); Incentives (N=78).

High Adoption

- **Signage/posters** were the most widely used nudge cited by workers and supervisors. Respondents described these visual cues as danger and warning signs, signage on gates and barricades, do not enter signs, and caution off areas.
- **Stickers** were another often-used nudge. Workers and supervisors reported stickers were used across worksites to label hazardous materials as well as equipment.

Moderate Adoption

- **Text message reminders** were typically sent by foremen to the work crews. Workers described the use of messaging apps to communicate weather conditions and updates on safety.
- **Feedback** was provided to reinforce planning practices and to address questions regarding specific worksite safety situations. Respondents indicated it was also provided through group chats (e.g., WhatsApp).

Low Adoption

- **Incentives** were not frequently used but were described as using small rewards such as lunch/breakfast or a bonus to encourage safe planning practices.
- **Emails** were the least frequently used nudge. Similar to text messages, the workers reported the emails were sent by the foremen to the workers.

Effectiveness of Nudges

Workers and supervisors indicated the effectiveness of each nudge technique on influencing safer decisions and practices associated with struck-by prevention

planning (see Table 2). Most nudges were rated, on average, in the *effective to highly effective* range with signage/posters, stickers, and feedback receiving the highest ratings among respondents. It should be noted that, consistent with the usage information, a meaningful percentage of respondents indicated text and email reminders and incentives were either not applicable or they were unsure of their usage and, therefore, did not rate their effectiveness.

Table 2. Reported Effectiveness of Nudges by Workers and Supervisors

Nudge Type	Highly Ineffective	Ineffective	Somewhat Ineffective	Neutral	Somewhat Effective	Effective	Highly Effective	Not Sure	N/A
Signage/posters	3%	3%	4%	15%	7%	**33%**	**17%**	6%	12%
Stickers	1%	2%	4%	14%	2%	**31%**	**15%**	6%	**25%**
Feedback	0%	0%	2%	**20%**	3%	**21%**	9%	12%	**33%**
Text reminders	0%	0%	0%	**20%**	5%	**18%**	12%	15%	**31%**
Email reminders	0%	2%	2%	**19%**	2%	10%	8%	13%	**46%**
Incentives	0%	0%	2%	**17%**	3%	7%	**13%**	18%	**40%**

Note: N/A = Not Applicable; Signage/posters (N=118); Stickers (N=96); Feedback (N=66); Text reminders (N=61); Email reminders (N=63); Incentives (N=60)

Comparative Analyses of Use and Effectiveness of Nudges by Language of Respondents

Because the follow-up sample had a higher proportion of Spanish-speaking respondents, language was an important consideration in examining the use and effectiveness of nudges. Therefore, exploratory analyses were conducted to examine whether the language of response (English vs. Spanish) influenced the use and perceived effectiveness of the nudges among workers and supervisors.

Reported Use of Nudges by Language

To examine potential significant associations in nudge use between those reporting in Spanish versus those reporting in English, Fisher's exact tests were conducted. Results revealed **only the use of incentives was significantly associated with language,** with English-speaking respondents more frequently reporting their use ($p<0.05$). Specifically, among workers and supervisors using incentives, the use of this nudge was reported less frequently among those responding in Spanish (6%) relative to those responding in English (94%).

Reported Effectiveness of Nudges by Language

Using the Wilcoxon-Mann-Whitney test, the effectiveness ratings of each nudge were compared between workers and supervisors responding in English and those responding in Spanish. **Results revealed no statistically significant language-based differences in the effectiveness ratings for any of the six nudge techniques**.

Changes in Planning Practices to Prevent Struck-by Incidents

Workers and supervisors provided ratings of how often they engaged in key planning

actions to prevent struck-by incidents during the intervention period. **Overall, workers and supervisors reported strong engagement in planning for struck-by prevention**.

More specifically, most respondents indicated they either *always or almost always*:

Highest Engagement

- Actively engaged in pre-task planning at the beginning of every shift (74%)
- Conducted or participated in daily pre-shift meetings to review struck-by hazards and preventive measures as a group (71%)
- Participated in pre-job planning before work begins on a new project (69%)
- Conducted or participated in pre-task planning before any new task or type of work was initiated (69%)
- Reviewed/updated pre-job plans to prevent struck-by incidents frequently at safety and production meetings with crew leaders (66%)

Moderate Engagement

- Conducted or participated in training programs on struck-by hazards and prevention (63%)
- Conducted or participated in pre-lift meetings before using a crane with those involved to review communication methods, possible struck-by hazards, and steps being taken to prevent incidents (59%)

Further, **responses reflect a strong safety culture**, with the majority reporting consistent use of preventive practices, **especially related to daily and pre-shift planning**.

<u>Comparative Analyses of Planning Practices Pre- to Post-Intervention</u>

Comparative analyses were conducted to determine if the workers' and supervisors' self-reported planning practices to prevent struck-by incidents had significantly changed from baseline to follow-up. To identify significant patterns while accounting for non-normal distributions, the Wilcoxon-Mann-Whitney test was used. The results revealed that across most safety actions, the changes in struck-by planning practices were not statistically significant. This general stability suggests that most aspects of the safety practices associated with planning to prevent struck-by incidents were maintained over time but did not show measurable increases in usage from baseline to follow-up. The positive but not significant results are likely due to ceiling effects in which the respondents were already reporting high levels of engagement in the safety practices at baseline.

As previously discussed, the evaluation was complicated by demographic shifts in workers and supervisors from baseline to follow-up to a higher proportion of Spanish-speaking respondents compared to the baseline. This shift may have diluted the ability to detect true changes in strategy use over time.

<u>Comparative Analyses of Planning Practices by Language</u>

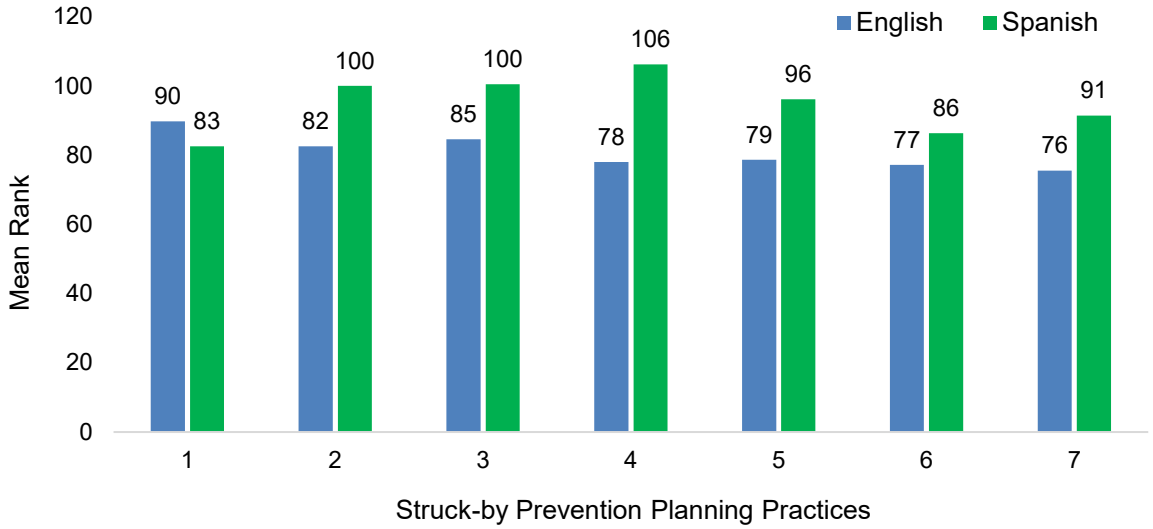
To evaluate the impact of language (English vs. Spanish) on worker-reported safe practices following a struck-by hazard prevention intervention, Wilcoxon-Mann-Whitney

tests were conducted. This non-parametric test is suitable for comparing ordinal data or non-normally distributed interval data across two independent groups. Results revealed significant differences, according to language, for most of the planning practices.

Spanish-speaking workers and supervisors reported significantly higher levels of participation in five of the seven planning practices than English speakers did (see Figure 3). These practices included:

Planning Practice 2: Reviewed/updated pre-job plans to prevent struck-by incidents frequently at safety and production meetings with crew leaders ($p<0.05$)
Planning Practice 3: Actively engaged in pre-task planning at the beginning of every shift ($p<0.05$)
Planning Practice 4: Conducted or participated in daily pre-shift meetings to review struck-by hazards and preventive measures as a group ($p<0.01$)
Planning Practice 5: Conducted or participated in pre-task planning before any new task or type of work was initiated ($p<0.05$)
Planning Practice 7: Conducted or participated in training programs on struck-by hazards and prevention ($p<0.05$)

Figure 3. Comparison of Post-Intervention Struck-by Prevention Planning Practices Reported by Workers and Supervisors by Language



Note: Significant differences in planning practices 2, 3, 4, 5, and 7.
Planning Practice 1 = Participate in pre-job planning before work begins on a new project.
Planning Practice 6 = Conduct or participate in pre-lift meetings before using a crane with those involved to review communication methods, possible struck-by hazards, and steps being taken to prevent incidents.

These findings indicate the Struck-by Prevention Planning Program may have had a greater impact on Spanish-speaking workers and supervisors as they engaged more fully in these safety and communication practices following the program. **While Spanish speakers showed significantly greater engagement in struck-by planning**

activities following the pilot program, **English-speaking workers also had relatively high scores**, suggesting the **intervention still reinforced key awareness and related safety practices for this group**. However, these results are preliminary in nature and should be interpreted with caution (i.e., use of post-test only design due to demographic shifts from baseline). In particular, alternative explanations such as linguistic nuances and cultural response tendencies (e.g., social desirability, fear of reprisal) should be given consideration.

In summary, the findings provide preliminary support for the use of visual and verbal nudges in multiple languages in enhancing positive perceptions of safety culture and the demonstration of safety planning practices associated with preventing struck-by incidents across all workforce segments.

Changes in Health and Safety at the Organizational Level

Workers and supervisors provided ratings of the extent to which their company has focused on health and safety practices since the start of the pilot project. As summarized in Table 3, **the majority of respondents reported an increased emphasis on key aspects of health and safety in their organizations**. Importantly, very few respondents indicated "backsliding" in safety in their organizations, with 3% or less indicating less emphasis.

Table 3. Percentage of Workers and Supervisors Reporting Changes in Health and Safety in Organizations

Health and Safety Practice	More Emphasis	No Change	Less Emphasis
Management prioritizing safety on the job site (N=150)	**64%**	33%	3%
Planning to prevent struck-by incidents (N=149)	**56%**	42%	2%
Inclusion of workers, supervisors, and contractors in planning to prevent struck-by incidents (N=151)	**64%**	34%	3%
Management commitment to and involvement in planning to prevent struck-by incidents (N=149)	**59%**	39%	2%

Overall, the respondents reported improvements in safety in their organizations. Notable gains were in management prioritization of safety and inclusion of workers, supervisors, and contractors in planning to prevent struck-by incidents.

These findings suggest workers and supervisors perceive the Struck-by Prevention Planning Program had a positive effect on organizational safety practices, especially in areas involving **prioritization of safety and inclusive safety practices** at all levels of the organization.

Recommending the Struck-by Prevention Planning Program

When introducing a new program or service, one indicator of customer experience and satisfaction is the use of a Net Promoter Score (NPS). Net Promoter Score is a common business metric that indicates customer experience and general support for a product or service. While the NPS scores do not provide direct insight into the use of the nudges

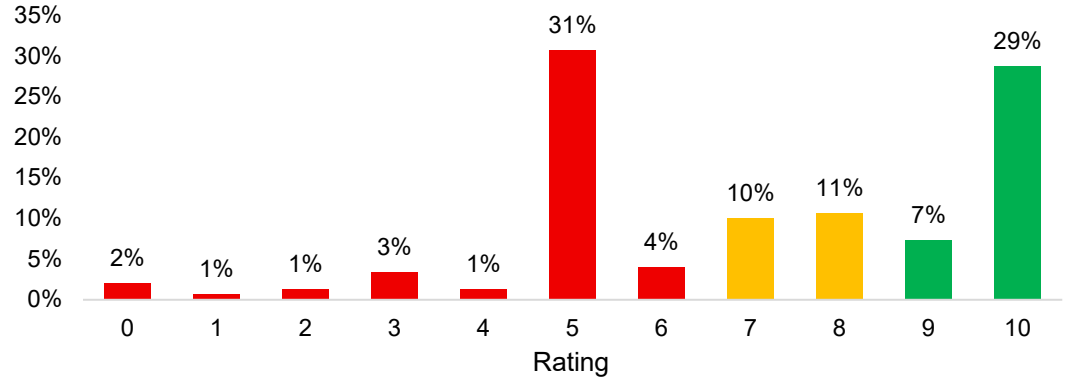
per se, they do provide a general assessment of the customer experience with the pilot program overall.

To generate this score, workers and supervisors rate their experience with the Struck-by Prevention Planning Program by indicating the likelihood they would recommend it to others on a scale ranging from 0 (Not at all likely) to 10 (Extremely likely).

From these scores, respondents are categorized as **Detractors** (ratings 0-6), who are generally less satisfied and less likely to recommend the program; **Passives** (ratings 7-8) who are generally satisfied but would not provide enthusiastic support of the program; and **Promoters** (ratings of 9-10), who are the most loyal advocates and tend to encourage participation in and support for the program.

As depicted in Figure 4, the workers and supervisors support for the pilot program can be categorized as: 43% Detractors, 21% Passives, and 36% Promoters.

Figure 4. Graphical depiction of NPS Ratings Provided by Workers and Supervisors



Note: N=150. Rating scale ranges from 0 (Not at all likely) to 10 (Extremely likely).
Red=Detractors; Yellow=Passives; Green=Promoters

The Net Promoter Score is calculated by: **NPS = % Promoters - % Detractors.**

The NPS ranges from -100 to +100. In general, a positive NPS indicates a more positive customer experience and greater support of the program, with an NPS of more than 75 categorized as “excellent.”

The **NPS for the workers and supervisors is -7** (36% - 43%).

An **NPS of -7 indicates there are marginally more Detractors than Promoters, suggesting mixed to negative sentiment in recommending the program** (see Figure 4). While this doesn’t indicate a total lack of support for the program overall, it may reflect inconsistencies in implementation, variation in perceived value, or barriers to full engagement. The number of workers and supervisors who indicated strong support as Promoters suggests the **content is valuable to some users in enhancing safety at the worksite.**

To fully interpret the NPS, workers and supervisors were asked to provide written explanations for their numerical rating. These qualitative responses, which explain why they would or would not recommend the pilot program to others, reflected a wide range of attitudes toward the program and revealed critical areas for consideration.

Workers and supervisors who provided positive sentiments highlighted the **importance of safety culture, alignment with personal safety goals, and relevant content supporting safety communication among supervisors and workers,** providing the following comments to explain their ratings:

- **The program reinforced safety culture**
  - "Safety first because our families depend on us."
  - "It's important to maintain safety in all areas and help others keep their area safe."
  - "Planning and training about struck-bys just might prevent ONE accident."
  - "Always discuss work to be performed and the safe way to complete it."
- **Program content is clear and effectively communicated**
  - "Great Program."
  - "Very informative and helpful."
- **The program was practical and effective**
  - "It has been very important and effective."
  - "It is a great program to make you safety cautious."
  - "Effective."

Those with neutral sentiments recognized **some programmatic benefit, but did not strongly endorse the program**, explaining their ratings in these ways:

- **Improvements needed**
  - "It seems good, however I think that improvement could be made with more details and incentives for the workers."
  - "It will help people in the future, but always room for improvement depending on the task."
- **Acknowledge value of program but not strong advocacy**
  - "Pretty good training."
  - "The program is good."
  - "It seems effective with good results."

The workers and supervisors who gave negative ratings provided the following reasoning, which generally reflect skepticism and/or disengagement and not necessarily a negative experience with the program:

- **No experience or participation in pilot program**
  - "Did not have CPWR Program"
  - "Was not included in this program"
  - "I did not participate in the program"
- **Lack of interest or skepticism**
  - "It's just like any other training"
- **General dissatisfaction with safety**

- "Supervisors don't help workers to work safely"

While some provided legitimate reasons for low engagement (e.g., lack of access to the pilot program), others showed general cynicism toward safety initiatives or perceived lack of relevance or support.

Overall, these results suggest **improvements to the pilot program should be considered**. The NPS scores reveal a moderately high number of Detractors, who conveyed a lack of engagement or skepticism about the pilot program. However, **a meaningful percentage of Promoters indicated the pilot program enhances safety and is a practical tool that leads to fewer accidents**. A smaller percentage of workers and supervisors were Passives, expressing uncertainty or general but moderate support. It should be noted that Passive respondents typically include those most likely to be persuaded to support the program if improvements are made.

Suggestions for Programmatic Improvements

Respondents were also asked to provide suggestions for improvements. Thematic analysis was conducted on those suggestions and the overall comments workers and supervisors provided about the program. The following are recommendations for improvement to the:

No Changes Needed. Most respondents expressed general satisfaction with the pilot program ("The program seems great"; "None, it's excellent"; "None, we are on the way"). They felt it "provides great, helpful tips" that "helps to understand hazards in the workplace and what you and your company needs to do" and "helps to keep everyone's mind on the task to stay safe and aware of the dangers." These responses from Promoters and Passives demonstrate existing support and indicate CPWR's Struck-by Prevention Planning Program is working well and requires no immediate change.

Greater Inclusion and Participation in Planning. These suggestions highlighted that broader involvement and more communication and collaboration at all levels of the organization would enhance ownership of safety and adherence to safety practices. For example, respondents said, "all workers should be involved in planning to have more input" and the need for "more open involvement," including a meeting structure that increases interaction ("continue with Wednesday safety meetings to get interaction with small groups"). These comments reveal a desire from workers and supervisors to be active partners in the safety planning efforts ("safety starts with everyone").

Enhanced Training and Reinforcement. These suggestions call for an increase in training ("more trainings and orientations are needed") as well as training design and delivery that is engaging, practical, and offered on a continuous basis. One respondent thought improved participation in identifying and documenting safety needs would lead to increased awareness and accountability for safety ("If people fill out more SORs [Schedule of Rates], that means that employees are actually being safety cautious and making sure themselves and others are working safely").

More Communication and Managerial Engagement. Several suggestions highlight opportunities to improve communication and managerial engagement. In particular, one respondent noted “better organization from management to be more clear and specific. Be more involved and be more in the field.” A recurring theme emerged for greater visibility of management support, communication, leadership in the field, and clarity of the pilot program would strengthen programmatic impact at the worksite.

Worker Competence and Accountability. A few comments reflected concern over worker readiness and proper role alignment (“Don’t let stupid people drive things they shouldn’t be. Make sure people are truly competent physically, not just on paper”). These comments also suggest a need for better oversight and alignment of worker demands and competencies.

In summary, the suggestions and comments from workers and supervisors provide both strong support for the pilot program and constructive suggestions that can be used to produce improvement. More specifically, **enhancing collaboration and involvement across all levels of the organization** and **strengthening leadership presence, including greater communication of the program** may lead to increased participation and enhance impact in future implementation cycles.

Post-Intervention: Managers

Demographics

Eighteen managers from two construction companies responded to the post-training survey, with all (100%) doing so in English. Participating managers held various roles, including: safety & health director (44%); project manager (22%); and 33% other leadership positions (e.g., vice president; director of professional services; safety professional; construction manager; and project superintendent). No respondents identified as company owners. Most of the 18 (89%) have been employed at their companies for more than one year, suggesting considerable familiarity with organizational practices [1 to 5 years (44%); 6 to 10 years (6%); more than 10 years (39%)].

Importantly, only half of respondents (50%) indicated they participated in CPWR’s baseline survey for the pilot project, while 17% reported they did not, and 33% were uncertain about their participation. The limited follow-up participation (18 managers from 2 companies, 100% responding in English) compared to the baseline survey (43 managers from 4 companies, 74% responding in English and 26% in Spanish) significantly limits the comparability and generalizability of the findings.

The vast reduction in sample size and company representation introduces potential biases and reduces confidence in drawing meaningful comparisons; it also precludes direct comparison to pre-intervention measures. Specifically, due to lower response rate, absence of Spanish-speaking respondents, lack of participation of managers from

three of the original companies, and high uncertainty about baseline participation among the post-intervention respondents, differences in post-intervention measures may reflect a different group of managers at different times rather than changes due to the intervention (i.e., shifts in manager perceptions or practices resulting from participation in the pilot program). Therefore, only post-intervention results are reported and discussed below.

Use of Program Materials

Managers were surveyed regarding their use of specific intervention components. Most (78%) reported using general (non-hazard-specific) information provided to improve pre-job planning processes, including one who had not used any of the Struck-by Prevention Planning Program materials. Managers reported positive but varied use of hazard-specific information, most notably:

- Preventing incidents from falling objects (61%)
- Reducing incidents involving rolling objects (56%)
- Addressing hazards from swinging objects (50%)

However, fewer managers reported using components such as:

- Employing safety nudges intended to support safer decision-making practices (39%)
- Preventing incidents from flying objects (39%)
- Free planning tools (39%)
- Free training materials (22%)

These findings highlight areas of strength in particular components of the intervention, particularly **general pre-job planning and specific hazards** (i.e., falling, rolling, swinging objects), while also identifying **opportunities for improved dissemination and adoption of safety nudges, additional hazard-specific information, planning tools, and training materials**.

Planning Practices to Prevent Struck-by Incidents

Managers indicated the extent to which their companies engaged in key planning actions to prevent struck-by incidents *during the study period*. The responses reflect a high to moderate level of engagement with most practices, with variations generally depending on the complexity of the activity. Respondents indicated they *always or almost always*:

Highest Engagement

- Conduct pre-job planning before beginning work on new sites (77%)
- Designate and identify those in charge of and knowledgeable about rescue and treatment should an incident occur (77%)
- Include in the bid the cost of all safety- and rescue-related resources (materials, equipment, labor) that will be needed (71%)
- Conduct pre-task planning (e.g., job hazard analysis, job safety analysis) at the beginning of every shift (71%)

- Conduct pre-lift meetings before using a crane with those involved to review communication methods, possible struck-by hazards, and steps being taken to prevent incidents (71%)

Moderate Engagement

- Conduct pre-task planning (e.g., job hazard analysis, job safety analysis) before any new task or type of work is initiated (including when returning to work after a break) (65%)
- Designate and identify those in charge of and knowledgeable about preventing struck-by incidents on the job site (59%)

Lower Frequency of Use

- Review/update pre-job plans to prevent struck-by incidents frequently at safety and production meetings with managers/supervisors/forepersons (47%)
- Conduct daily pre-shift meetings to review struck-by hazards and preventive measures (e.g., location and use of safety equipment, work practices, signage, who to go to when help is needed) (47%)
- Conduct training sessions specifically targeting struck-by hazards and prevention (41%)

This high to moderate engagement in planning activities suggests adoption of the critical practices promoted in the Struck-by Prevention Planning Program. The most consistently performed activities were associated with general pre-job planning, hazard-specific practices, and designating knowledgeable safety personnel.

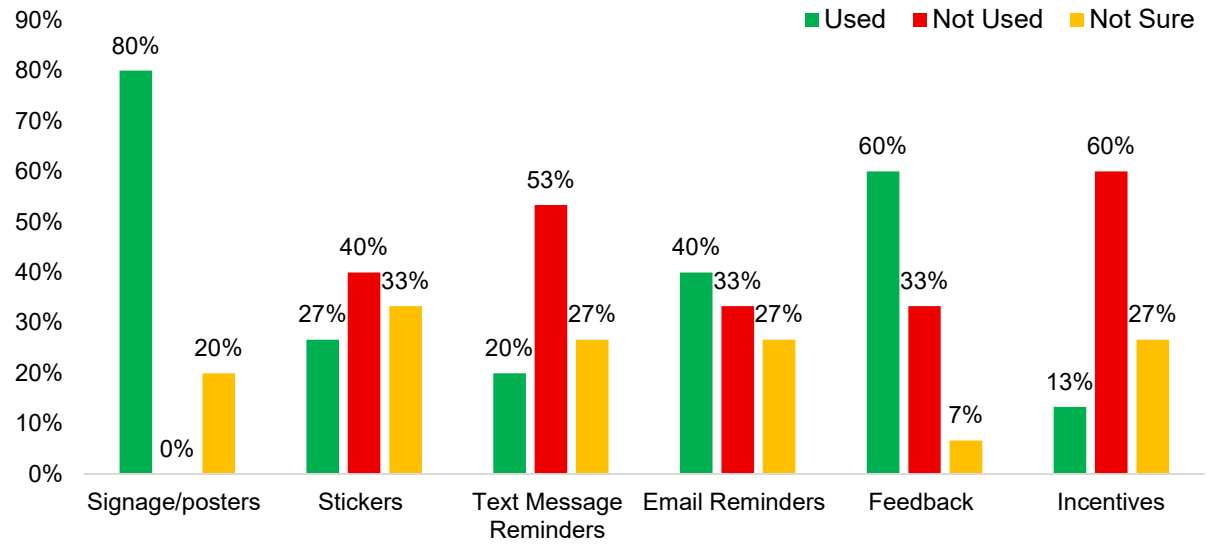
Use and Effectiveness of Nudges to Support Planning

Managers reported which nudges they used during the intervention and each nudge's influence on planning decisions and safety practices.

Use of Nudges

As depicted in Figure 5, the results suggest **varied usage among the nudge techniques.**

Figure 5. Percentage of Nudge Use Reported by Managers



Note*:* N=15

High Adoption

- **Signage/Posters** were the most consistently used nudges. Managers described distributing planning-related messaging to field leadership as part of weekly calls or messages and posting signs directly on the job site to reinforce planning practices. These low-cost, visible prompts appear to be a mainstay of communication strategies.
- **Feedback** was another commonly used strategy, with many teams incorporating it into routine discussions. Managers said they actively solicited feedback during discussions to keep planning interactive and responsive to frontline workers.

Moderate to Low Adoption

- **Email Reminders** were moderately adopted. Managers reported their company used email to communicate planning needs to safety professionals or supervisors or included reminders as part of leadership calls and EHASP (Environmental Health and Safety Planning) development.

- **Sticker** use was more limited and somewhat ambiguous. Some managers reported using labels on specific items, but the overall use was inconsistent, with one respondent simply stating, *"No."* This aligns with survey data showing over a third of respondents were unsure whether stickers had been used.
- **Text Message Reminders** were rarely implemented, despite being planned. One manager noted these messages were *"planned – not done,"* suggesting a gap between intention and execution. Others noted the method was not applicable to their context.
- **Incentives** were the least adopted strategy. Comments marked them as not applicable (*"N/A"*), suggesting they are not well integrated into current planning-related safety interventions.

The use of visual cues (signage) and interactive feedback dominated nudge strategies to promote job site planning for struck-by prevention. Digital nudges – especially text messages and email reminders **–** were either underutilized or inconsistently applied, likely due to practical or organizational barriers. The relatively infrequent use of incentives poses the question of whether logistical complexity may have interfered with its use. It should be noted that, with the exception of feedback, at least 20% to 30% of respondents indicated they were *not sure* if the nudges were used. The variations in how frequently the various nudges were used, along with frequent "not sure" ratings, underscore the need for clearer implementation protocols and enhanced communication for the intervention.

Effectiveness of Nudges

Managers also rated how effectively nudges influenced safer decisions and practices associated with struck-by prevention planning (see Table 4). **Most nudges were rated in the *effective to somewhat effective* range** with **signage/posters and feedback receiving the highest ratings among responding managers.** It should be noted that, consistent with the usage information provided by managers, over half of respondents indicated text reminders and incentives were not applicable and therefore did not rate their effectiveness.

Table 4. Reported Effectiveness of Nudges Used by Managers

Nudge	Highly Ineffective	Ineffective	Somewhat Ineffective	Neutral	Somewhat Effective	Effective	Highly Effective	N/A
Signage/posters	0%	0%	7%	13%	**53%**	20%	7%	0%
Feedback	0%	0%	7%	13%	**27%**	20%	7%	**27%**
Stickers	0%	0%	7%	7%	**27%**	7%	13%	**40%**
Text reminders	0%	0%	7%	7%	**20%**	7%	7%	**53%**
Email reminders	0%	0%	13%	7%	**27%**	13%	0%	**40%**
Incentives	0%	7%	**13%**	7%	7%	7%	0%	**60%**

Note: N=15; N/A=Not Applicable

The **following summarizes managers' use and effectiveness of each nudge,** in order of reported impact of nudge:

Signage/Posters

- **Most widely used and positively received**
- 80% rated nudge as somewhat effective to highly effective
- Overall, seen as a **moderately to highly effective** visual cue

Feedback

- **Well-received**, 53% rated nudge as somewhat effective to highly effective
- Very few negative ratings
- Feedback was typically embedded into discussions on planning topics and **promoting worker involvement**
- Viewed as **valuable for engagement**, especially in meetings

Stickers

- **Perceived as moderately effective**
- 47% rated nudge as somewhat effective to highly effective
- 40% rated nudge not applicable, indicating **limited use and impact**

Text Message Reminders

- **Perceived as a moderately useful and reliable** reinforcement tool
- 33% rated nudge as somewhat effective to highly effective
- **Often planned but not implemented**
- 53% reported nudge as not applicable

Email Reminders

- **Useful for some**, **but uneven impact**
- 40% rated nudge as somewhat effective to effective
- 20% rated nudge as neutral or somewhat ineffective
- Emails were **directed toward supervisors and safety personnel**

Incentives

- **Least used and least effective**
- 13% rated nudge as somewhat effective to effective
- 60% rated nudge as not applicable
- Incentive **use and effectiveness is unclear or very limited**

Changes in Health and Safety at the Organizational Level

Managers provided ratings of the extent to which health and safety had changed at their company since the start of the pilot project. As summarized in Table 5, managers reported a positive trend in safety practices.

Table 5. Percentage of Managers Reporting Changes in Health and Safety in Their Organization Since the Start of the Pilot Project

Health and Safety Practice	More Emphasis	No Change	Less Emphasis
Management prioritizing safety on the job site*	**53%**	47%	0%
Pre-job planning (before work on a new site begins) *	**53%**	47%	0%
Pre-task planning (e.g., pre-shift meetings, job hazard analysis) ‡	**57%**	36%	7%
Planning to prevent struck-by incidents *	**60%**	33%	7%
Everyone is included in struck-by planning (workers, supervisors, contractors) *	**53%**	40%	7%
Management commitment to and involvement in struck-by planning *	**60%**	33%	7%

Note: *N=15; ‡ N=14

Across all six items, the majority of managers (53% to 60%) reported more emphasis on safety-related practices, particularly those directly linked to planning for struck-by prevention. Notably, with respect to management prioritization of safety and pre-job planning, no respondents indicated less emphasis on safety, suggesting stable or improving organizational safety culture since participating in the pilot program. The practices most likely to see an increase in emphasis were:

- Planning to prevent struck-by incidents (60%)
- Management commitment/involvement in struck-by planning (60%)
- Pre-task planning (57%)

These health and safety practices align closely with the goals of the intervention and **suggest the planning program may have influenced awareness, commitment, and related safety planning practices among leadership**. Only one respondent cited a decrease in emphasis on the other practices, indicating some variability or resistance remains, perhaps due to site-level challenges or differences in buy-in.

Overall, these findings suggest **managers believe the Struck-by Prevention Planning Program had a positive effect on organizational safety practices, especially in areas involving planning and management engagement**. The consistency across responses suggests general uptake, although targeted follow-up is needed to assess instances where emphasis decreased.

Specific Changes in Planning or Work Practices

Managers also reported on any specific changes at their company instituted as a result of implementing the Struck-by Prevention Planning Program:

- 53% reported **no changes** were made in their company
- 27% reported their company **did make specific changes**
- 20% were **not sure** whether changes occurred at their company

Managers who reported making changes provided further insight into the nature of these efforts:

- One manager noted, *"Discuss doing safety meetings, show slides and surveys,"* indicating a move toward enhanced safety communication and structured planning discussions.
- Another response simply stated *"Training,*" suggesting a focus on workforce education as a key strategy for struck-by hazard prevention.

This pattern indicates the pilot program has led to meaningful improvements in a subset of organizations while also revealing **limitations to program uptake** (training; enhanced communication) and may point to **implementation or communication gaps** within organizations. Although findings suggest awareness improved, **relatively few managers reported their organizations implemented changes to their planning processes,** highlighting a potential gap between knowledge and implementation. While some managers cite that their company has integrated the program into their routine practices–especially through meetings and training–others may require additional support, reinforcement, or clarification on how to operationalize the planning tools. These insights can inform future technical assistance, follow-up coaching, or improvements to implementation strategies.

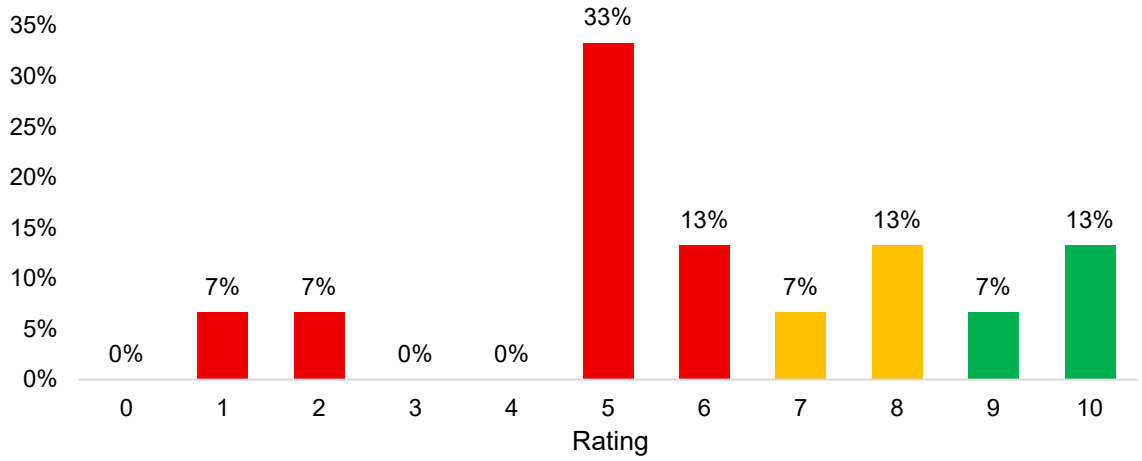
Recommending the Struck-by Prevention Planning Program

As previously described, Net Promoter Score (NPS) is a common business metric that indicates customer experience and general support for a product or service. To generate this score, managers rated their experience with the Struck-by Prevention Planning Program by indicating the likelihood they would recommend it to others on a scale ranging from 0 (not at all likely) to 10 (extremely likely). From these scores, respondents were categorized as Detractors (ratings 0-6), who were generally less satisfied and less likely to recommend the program; Passives (ratings 7-8) who were generally satisfied but would not provide enthusiastic support; and Promoters (ratings of 9-10), who would be the most loyal advocates and tend to encourage participation in and support for the program.

With the pilot program, the managers' can be categorized as 60% Detractors, 20% Passives, and 20% Promoters.

Using the NPS formula (NPS = % Promoters - % Detractors), the **NPS for the managers is -40** (20% - 60%). As depicted in Figure 6, an **NPS of -40 denotes that more respondents are unlikely to recommend the pilot program/resources than those who will strongly support the program**. A high number of Detractors suggests disengagement or skepticism about the value of the program or how it's being implemented. However, the moderate number of Promoters shows the **content is valuable to some users and is seen as a safety reinforcement tool.** It also **indicates limited involvement or uncertainty, signaling a lack of visibility, communication, or engagement**.

Figure 6. Graphical Depiction of NPS Ratings Provided by Managers



Note: N=15. Rating scale ranges from 0 (Not at all Likely) to 10 (Extremely Likely).
Red=Detractors; Yellow=Passives; Green=Promoters

The qualitative responses explaining why managers would recommend the pilot program reflect a wide range of reactions and reveal critical areas for consideration.

Managers who provided positive sentiments highlighted ease of use and importance of facilitating safety culture at all levels of the organization:

- "Great resource, material is easy to use."
- "It's good for everyone to learn ways to eliminate any hazards."

Managers who provided neutral sentiments provided the following explanations of their ratings:

- "Communication is key!"
- "Important to reach safety goals"
- "Yes"

The Passives provide insight into the managers who are most likely to respond to any program enhancements that are made.

Detractors offered the following critical or dismissive comments:

- "Wasn't directly involved and can't directly correlate, but did hear about these topics more frequently"
- "Not sure how well it would be received"
- "This is another pencil-whipped process"

While the NPS scores do not provide direct insight into the use of the nudges, they do provide a general assessment of the customer experience with the pilot program. Overall, the NPS scores **reveal a high number of Detractors, suggesting disengagement or skepticism about the program or how it's being implemented**. However, there were those who believed the pilot program shows value and an equal percentage who expressed uncertainty or general but moderate support.

Because **the majority of respondents were Detractors, improvements should be considered**. To garner greater support for the pilot program, the following recommendations are advanced:

Increase Engagement:

- Clarify expectations for implementing the pilot program, including how leadership can provide support to workers to ensure more engagement with the program.
- Reinforce messaging through supervisors or safety champions at the worksite.

Improve Communication:

- Ensure consistent communication about the purpose, benefits, and real-world impact of the program.
- Use success stories or preliminary findings to demonstrate program effectiveness.

Address Skepticism:

- Consider comments like “pencil whipped process” to examine how the program is being implemented and help improve perceptions of relevance and integration with broader organizational safety programs.

Follow-up Evaluation:

- Conduct follow-up discussions or focus groups, including Detractors, to get deeper insights into their concerns.
- Consider segmenting additional feedback by role or site to identify pattern differences.

Discussion

I. Summary of Findings

This pilot evaluation demonstrates that applying behavioral economics techniques to struck-by prevention planning holds considerable promise for strengthening safety-related decision-making at construction sites. While frontline workers, supervisors, and managers reported generally high engagement with planning practices and expressed strong safety values, the inclusion of nudges appeared to support enhanced safety awareness, more consistent communication, enhanced safety decisions, and, in some cases, meaningful reductions in perceived risk exposure. Thus, the results provide encouraging evidence of the value and feasibility of integrating nudges into construction safety programming, particularly when embedded within a broader safety planning framework that includes multiple stakeholders.

One of the most encouraging findings is that, following the intervention, workers and supervisors reported reductions in exposure to all four struck-by hazard types, with the most notable decreases in rolling and swinging objects. Although causal attribution is limited, these results suggest heightened planning and visibility around hazard mitigation contributed to improved worksite conditions. Similarly, managers reported higher rates of planning-related activities before, during, and after shifts, including pre-task meetings and hazard-specific debriefings. These practices reflect a maturing safety culture in which planning is embedded into daily routines.

II. Nudge Utilization and Impact

Across workforce groups, signage/posters, stickers, and feedback emerged as the most widely used and most positively rated nudges. Workers and supervisors reported signage and stickers were tangible visible safety cues, while feedback, when delivered through safety debriefs, served to close the loop between planning and practice. Notably, the emphasis on providing additional support through these nudges was aligned with the FEAST framework. These nudges also align with behavioral economics principles in that they are low-cost, easy to implement, and maintain freedom of choice by the decision-maker. Managers emphasized the use of signage to reinforce job site planning and reported actively embedding feedback into planning discussions. These results support continued use of simple, visible nudges to sustain hazard awareness and reinforce planning practices.

Adoption of other nudges such as text message and email reminders and incentives was more limited, which likely reflects implementation barriers (e.g., infrastructure, lack of clarity about their role in nudge delivery). Although workers and supervisors reported moderate use of texts, these messages were rated as effective nudges, particularly when delivered by familiar and trusted sources such as foremen. However, emails and incentives were seen as less impactful across all workforce groups. Incentives were among the least utilized nudges and rated as the least effective. Incentives also demonstrated the greatest divergence in use between English- and Spanish-speaking workers and supervisors, with significantly lower uptake reported among Spanish speakers. This disparity may stem from cultural perceptions of incentives, access to decision-making channels, or organizational practices in recognition and reward. These results signal a need to refine expectations for nudge use across decision-maker roles and greater exploration of contextual fit during program rollout.

III. Differences by Language and Workforce Segment

One of the most illuminating aspects of the evaluation was the increased engagement among workers and supervisors responding in Spanish. Spanish speakers reported significantly higher levels of participation in five of the seven planning practices. Although their usage of incentives was lower, their overall receptivity to other nudges and engagement in safety planning was robust. These findings suggest nudges, when designed for multilingual audiences, may help close communication and participation gaps in safety planning. The results also suggest the Struck-by Prevention Planning Program, when paired with multilingual delivery and inclusive design, can effectively reach diverse segments of the workforce.

Importantly, the study revealed positive shifts in organizational safety climate among workforce segments following the intervention. Most workers, supervisors, and managers reported increased emphasis on: prioritization of safety on the job site, inclusion of all workforce groups in safety planning for struck-by prevention, and management commitment to and involvement in struck-by planning. These areas correspond to the core components of the intervention and suggest, for at least for two

organizations, the Struck-by Prevention Planning Program helped reinforce foundational safety practices at the leadership level.

However, adoption at the managerial level was not universal. Slightly over half of managers indicated no changes were made to their company's practices, with another 20% unsure, highlighting a gap between awareness and organizational action. In qualitative responses, some managers expressed enthusiasm about the program's utility ("Great resource, easy to use"), while others were uncertain or cynical ("another pencil-whipped process"). These responses underscore the importance of implementation fidelity and leadership engagement. For nudges to have sustained impact, clear role definition, modeling, and integration with organizational safety management systems are essential.

Noteworthy differences were also observed in Net Promoter Scores (NPS) between workers/supervisors and managers. Workers and supervisors reported a slightly negative NPS of -7, whereas manager ratings resulted in a more negative NPS score of -40. For managers, this likely reflects lower perceived engagement with or visibility of the program rather than inherent resistance. In fact, many managers indicated partial use of planning tools and an interest in improved communication and alignment with broader organizational safety goals. These findings highlight a critical takeaway: implementation fidelity and internal communication may be as important as the design of the intervention itself.

IV. Limitations

While results from the pilot program are promising, several factors limited interpretation of the results:

- **Small samples and site-specific influence:** Sample demographics shifted from pre- to post- intervention. For workers and supervisors, the post-intervention included only two of the five companies, and there was a 75% relative gain in those responding in Spanish. For managers, the follow-up data came from a smaller sample, with no Spanish respondents, and represented only two organizations. The changes limited generalizability and precluded pre-post comparisons in the managerial sample.
- **Variability in baseline participation:** In both groups, a notable proportion of respondents were unsure whether they had completed the baseline survey, raising questions about continuity of participant exposure and concerns regarding self-selection and response bias.
- **High baseline engagement:** Self-reports of high levels of pre-intervention knowledge and engagement in planning practices among workers and supervisors may have led to ceiling effects, reducing sensitivity to change.
- **Managerial communication gaps:** Some managers indicated awareness of the program but limited follow-through in terms of tangible organizational changes. This disconnect may reflect either insufficient internal dissemination or a lack of structural support for broader rollout.

Despite these limitations, the evaluation yields practical insights into nudge use and safety planning that are highly relevant to the construction industry.

V. Recommendations for Program Improvement

Preliminary findings from this pilot suggest behavioral economics strategies (nudges) that emphasize visual cues and feedback can be used to effectively enhance planning practices and safety culture in construction. The intervention was particularly effective in engaging Spanish-speaking workers, indicating the importance of accessible, linguistically tailored materials.

Among managers, the results showed moderate improvements in perceived organizational safety practices, but uneven adoption of program elements. These mixed results point to the need for more structured implementation guidance and deeper leadership engagement to realize the full potential of behavioral nudging in safety planning.

Based on these findings, several general recommendations are offered:

1. **Enhance clarity and communication at all levels:** Clarify the roles of workers, supervisors, and managers in program implementation. More frequent and visible communication, actively supported by leadership, may improve understanding of this or a similar program's purpose and intended outcomes. Safety champions or field leaders can be leveraged to reinforce this messaging.
2. **Tailor delivery to diverse workforce segments:** Multilingual materials and culturally appropriate nudges should continue to be prioritized. The stronger engagement among Spanish-speaking workers indicates high receptivity when materials are accessible and relevant.
3. **Increase feedback loops and reinforce with stories:** The influence of real-time feedback is increased when tied to observed safety outcomes. Showcasing success stories, near-miss avoidances, or improvements driven by planning could increase buy-in and greater support across workgroup segments.
4. **Strengthen leadership engagement and visibility:** Several respondents requested greater managerial presence in the field. Leadership visibility paired with consistent modeling of planning practices can further reinforce the value of the Struck-by Prevention Planning Program.
5. **Refine use of incentives:** Given the low uptake and variable perceptions, incentive structures should be revisited. Small, meaningful rewards tied to team-based achievements or planning milestones may be more effective.
6. **Track fidelity and adaptation:** Future iterations should include a more structured fidelity assessment to understand how the nudges are being integrated into existing practices and further identify the contextual factors influencing desired outcomes. This can be supported through use of CPWR's supplemental "Nudging Toward Safer Decisions in Construction" guide to tailor strategies based on site-specific bottlenecks and decision-maker needs.

Conclusion

The integration of nudges into a pilot planning intervention for struck-by prevention showed promising outcomes, particularly in hazard awareness, use of related safety practices, and inclusive engagement across language groups. While implementation gaps remain, particularly among managers, the results suggest that behavioral economics techniques, when embedded into routine planning practices and delivered in contextually relevant ways, can support safer decision-making on construction sites. Ultimately, by refining how safety choices are structured and supported on site, nudges can serve as a low-cost, scalable strategy to complement traditional safety interventions. Scaling and sustaining this approach will require continued focus on leadership commitment, multilingual delivery, and iterative feedback to tailor the intervention for diverse worksites and evolving safety needs.

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Appendix A. Pilot Planning Program to Prevent Struck-by Incidents Baseline Survey (For Workers/Supervisors)

Thank you for participating in CPWR's Planning to Prevent Struck-by Incidents pilot project. The planning program is being developed to help contractors and workers plan for and implement measures to prevent struck-by incidents. The purpose of this survey is to gather information to better understand your company's current practices and procedures on struck-by hazards.

Your participation is completely voluntary, and your responses will be kept confidential. Results will primarily be used to help us guide your experience with the planning program and to give us a baseline for comparison in practices and perceptions throughout the study. No names or identifying information will be shared outside of our research team. Any reporting on results will be done as group data so that all companies and individuals remain anonymous.

The survey will take approximately 5-10 minutes to complete.

1. What is your current position? (Select one)

- ○ Construction worker
- ○ Foreperson/Supervisor
- ○ Manager

2. Which of the following struck-by hazards do you encounter on your job sites? (Select all that apply)

- ❑ Falling/dropped objects (e.g., tools, equipment)
- ❑ Flying objects from something being thrown, hurled, or propelled across a space (e.g., being struck-by a nail when a co-worker accidentally fires a nail gun or getting hit by a piece of plywood being blown around by the wind)
- ❑ Rolling objects (e.g., being struck-by heavy equipment or a vehicle)
- ❑ Swinging objects (e.g., being struck-by a swinging load from a crane)

3. How knowledgeable are you about **hazards that result in struck-by incidents** on job sites? (Select one)

- ○ Extremely knowledgeable
- ○ Very knowledgeable
- ○ Moderately knowledgeable
- ○ Slightly knowledgeable
- ○ Not at all knowledgeable

4. How knowledgeable are you about **ways to prevent struck-by incidents** on job sites? (Select one)

- ○ Extremely knowledgeable
- ○ Very knowledgeable
- ○ Moderately knowledgeable
- ○ Slightly knowledgeable
- ○ Not at all knowledgeable

5. How often do you do the following tasks related to planning to prevent struck-by incidents on job sites: (Check one option in each row)

	Never	Almost never	Occasionally	Sometimes (about 50% of the time)	Usually	Almost always	Always	Not sure	Not applicable
Participate in pre-job planning before work begins on a new project									
Review/update pre-job plans to prevent struck-by incidents frequently at safety and production meetings with crew leaders									

Actively engage in pre-task planning (e.g., job hazard analysis, job safety analysis) at the beginning of every shift									
Conduct or participate in daily pre-shift meetings to review struck-by hazards and preventive measures as a group (e.g., location and use of safety equipment, work practices, signage, who to go to when help is needed)									
Conduct or participate in pre-task planning (e.g., job hazard analysis, job safety analysis) before any new task or type of work is initiated (including when returning to work after a break)									
Conduct or participate in pre-lift meetings before using a crane with those involved to review communication methods, possible struck-by hazards, and steps being taken to prevent incidents									
Conduct or participate in training programs on struck-by hazards and prevention									

6. What types of controls do you/your company use to prevent struck-by incidents from falling objects? (Select all that apply)

- ❑ Tool tethers
- ❑ Installing decking
- ❑ Safety nets
- ❑ Catch platforms
- ❑ Canopies
- ❑ Debris chutes
- ❑ Guardrails/parapets/barriers
- ❑ Toeboards
- ❑ Barricading drop zones
- ❑ Other (please specify): _____
- ❑ None of the above
- ❑ Not applicable

7. What types of controls do you/your company use to prevent struck-by incidents from flying objects? (Select all that apply)

- ❑ Using safer tools (e.g., sequential [single shot] trigger nail guns)
- ❑ Clearing work zones for those working with pneumatic or powder-actuated tools like nail guns
- ❑ Securing materials and equipment against wind gusts
- ❑ Installing whip checks on pressurized air hoses
- ❑ Other (please specify): _____
- ❑ None of the above
- ❑ Not applicable

8. What types of controls do you/your company use to prevent struck-by incidents from rolling objects? (Select all that apply)

- ❑ Internal traffic control planning
- ❑ External traffic control planning
- ❑ Spotters
- ❑ Flaggers
- ❑ Back-up alarms
- ❑ Vehicles and equipment with proximity warning systems
- ❑ Establishing speed limits
- ❑ Clear signage
- ❑ Proper lighting when working at night
- ❑ Cones/barriers
- ❑ Equipment-only zones and/or no equipment/vehicle zones
- ❑ Other (please specify): _____
- ❑ None of the above
- ❑ Not applicable

9. What types of controls do you/your company use to prevent struck-by incidents from swinging objects? (Select all that apply)

- ❑ Restricting work zones around cranes
- ❑ Not operating during high winds or bad weather
- ❑ Following equipment load limits
- ❑ Signal persons
- ❑ Tag lines/push sticks
- ❑ Other (please specify): _____
- ❑ None of the above
- ❑ Not applicable

10. Which of the following techniques have you seen used to promote planning on your job site? (Select all that apply)

- ❑ Signage/posters
- ❑ Stickers
- ❑ Text message reminders about planning
- ❑ Email reminders about planning
- ❑ Feedback
- ❑ Incentives
- ❑ We use many of these techniques, but not specifically to encourage planning
- ❑ We do NOT use any of these techniques to encourage planning

11. To what extent do you agree with the following statements about safety and health **at your company**: (Check one option in each row)

	Strongly disagree	**Disagree**	**Somewhat disagree**	**Neither agree nor disagree**	**Somewhat agree**	**Agree**	**Strongly agree**
Management prioritizes safety equally as much as quality of work and productivity							
My company makes planning to prevent struck-by incidents a top priority							
Management is committed to and actively involved in planning to prevent struck-by incidents							
Everyone is included in planning for struck-by hazards (workers, supervisors, contractors)							
Additional resources (planning tools, training) are needed to effectively plan for struck-by hazards on our job sites							

12. Which best describes the company you work for? (Select one)
    - ○ General Contractor
    - ○ Specialty Contractor (e.g., masonry, cement, roofing, plumbing, painting, carpentry, electrical, etc.)
    - ○ Other (please specify): _____

13. How many years have you worked at this company? (Select one)
    - ○ Less than a year
    - ○ 1 - 5 years
    - ○ 6 - 10 years
    - ○ More than 10 years

14. What industry segment does your company **most frequently** work in? (Select one)
    - ○ Heavy/Civil
    - ○ Commercial
    - ○ Residential
    - ○ Industrial
    - ○ Petrochemical
    - ○ Public Sector
    - ○ Other (please specify): _____

15. How many construction workers does your company currently employ? (Select one)
    - ○ 1 - 10
    - ○ 11 - 19
    - ○ 20 - 49
    - ○ 50 - 99
    - ○ 100 - 249
    - ○ 250 - 999
    - ○ 1,000 or more
    - ○ Not sure

Appendix B. Pilot Planning Program to Prevent Struck-by Incidents Baseline Survey (For Managers)

Thank you for participating in CPWR's Planning to Prevent Struck-by Incidents Pilot Project. The planning program is being developed to help contractors plan for and implement measures to prevent struck-by incidents. The purpose of this survey is to gather information from all the contractors in the pilot to better understand current practices and procedures on struck-by hazards.

Your participation is completely voluntary, and your responses will be kept confidential. Results will primarily be used to help us guide your experience with the planning program and to give us a baseline for comparison in practices and perceptions throughout the study. No names or identifying information will be shared outside of our research team. Any reporting on results will be done as group data so that all companies and individuals remain anonymous.

The survey will take approximately 5-10 minutes to complete.

1. What is your current position? (Select one)
   - ○ Company owner
   - ○ Safety & health director (or equivalent)
   - ○ Project manager
   - ○ Other (please specify): _____

2. Why did your company decide to participate in this pilot project? (Select all that apply)

- ❑ Looking for general (not hazard specific) information to help improve pre-job planning processes
- ❑ Looking for information on reducing struck-by incidents from falling objects (e.g., dropped tools, objects falling from heights)
- ❑ Looking for information on reducing struck-by incidents from flying objects (e.g., wind-blown materials)
- ❑ Looking for information on reducing struck-by incidents from rolling objects (e.g., vehicles, heavy equipment)
- ❑ Looking for information on reducing struck-by incidents from swinging objects (e.g., cranes, materials suspended from other anchor points)
- ❑ Looking for information on nudges to support safety decisions and practices that reduce struck-by incidents
- ❑ Access to free planning tools
- ❑ Access to free training materials
- ❑ Other (please specify): _____

3. How knowledgeable are you about the **hazards that can result in struck-by incidents** on your job sites? (Select one)

- ○ Extremely knowledgeable
- ○ Very knowledgeable
- ○ Moderately knowledgeable
- ○ Slightly knowledgeable
- ○ Not at all knowledgeable

4. How knowledgeable are you about **ways to prevent struck-by incidents** on your job sites? (Select one)

- ○ Extremely knowledgeable
- ○ Very knowledgeable
- ○ Moderately knowledgeable
- ○ Slightly knowledgeable
- ○ Not at all knowledgeable

5. To what extent do you agree with the following statements about safety and health **at your company**. (Check one option in each row)

	Strongly disagree	**Disagree**	**Somewhat disagree**	**Neither agree nor disagree**	**Somewhat agree**	**Agree**	**Strongly agree**
Safety is equally as important to a construction project's success as quality of work and productivity							
We identify and take steps to correct hazardous situations on the job							
Pre-job planning (before work on a new site begins) is considered critical to hazard prevention							
Pre-task planning (pre-shift meetings, task-related job hazard analysis, etc.) is considered critical to hazard prevention							
Planning for struck-by hazards is a priority							
Everyone is included in planning for struck-by hazards (workers, supervisors, contractors)							
Management is committed to and involved in planning for struck-by hazards							
Additional resources (planning tools, training) are needed to effectively **plan for safety** on our job sites							
Additional resources (planning tools, training) are needed to effectively **plan for struck-by hazards** on our job sites							

6. How often does your company do the following when planning to prevent struck-by incidents: (Check one option in each row)

	Never	Almost never	Occasionally	Sometimes (about 50% of the time)	Usually	Almost always	Always	Not sure	Not applicable
Conduct pre-job planning before work on a new site begins									
Include the cost of all safety- and rescue-related resources (materials, equipment, labor) that will be needed in the bid									
Review/update pre-job plans to prevent struck-by incidents frequently at safety and production meetings with managers/supervisors/forepersons									
Conduct pre-task planning (e.g., job hazard analysis, job safety analysis) at the beginning of every shift									
Conduct daily pre-shift meetings to review struck-by hazards and preventive measures (e.g., location and use of safety equipment, work practices, signage, who to go to when help is needed)									

	Never	Almost never	Occasionally	Sometimes (about 50% of the time)	Usually	Almost always	Always	Not sure	Not applicable
Conduct pre-task planning (e.g., job hazard analysis, job safety analysis) before any new task or type of work is initiated (including when returning to work after a break)									
Conduct pre-lift meetings before using a crane with those involved to review communication methods, possible struck-by hazards, and steps being taken to prevent incidents									
Conduct training on struck-by hazards and prevention									
Designate and identify those in charge of and knowledgeable about preventing struck-by incidents on the job site (e.g., competent persons; lift directors)									
Designate and identify those in charge of and knowledgeable about rescue and treatment should an incident occur									

7. What types of controls does your company use to prevent struck-by incidents from falling objects? (Select all that apply)

- ❑ Tool tethers
- ❑ Installing decking
- ❑ Safety nets
- ❑ Catch platforms
- ❑ Canopies
- ❑ Debris chutes
- ❑ Guardrails/parapets/barriers
- ❑ Toeboards
- ❑ Barricading drop zones
- ❑ Other (please specify): _____
- ❑ None of the above
- ❑ Not applicable

8. What types of controls does your company use to prevent struck-by incidents from flying objects? (Select all that apply)

- ❑ Using safer tools (e.g., sequential [single shot] trigger nail guns)
- ❑ Clearing work zones for those working with pneumatic or powder-actuated tools like nail guns
- ❑ Securing materials and equipment against wind gusts
- ❑ Installing whip checks on pressurized air hoses
- ❑ Other (please specify): _____
- ❑ None of the above
- ❑ Not applicable

9. What types of controls does your company use to prevent struck-by incidents from rolling objects? (Select all that apply)

- ❑ Internal traffic control planning
- ❑ External traffic control planning
- ❑ Spotters
- ❑ Flaggers
- ❑ Back-up alarms
- ❑ Vehicles and equipment with proximity warning systems
- ❑ Establishing speed limits
- ❑ Clear signage
- ❑ Proper lighting when working at night
- ❑ Cones/barriers
- ❑ Equipment-only zones and/or no equipment/vehicle zones
- ❑ Other (please specify): _____
- ❑ None of the above
- ❑ Not applicable

10. What types of controls does your company use to prevent struck-by incidents from swinging objects? (Select all that apply)

- ❑ Restricting work zones around cranes
- ❑ Not operating during high winds or bad weather
- ❑ Following equipment load limits
- ❑ Signal persons
- ❑ Tag lines/push sticks
- ❑ Other (please specify): _____
- ❑ None of the above
- ❑ Not applicable

11. What types of nudges does your company use to **encourage planning** on the job site? (Select all that apply)

- ❑ Signage/posters
- ❑ Stickers
- ❑ Text message reminders about planning
- ❑ Email reminders about planning
- ❑ Feedback
- ❑ Incentives
- ❑ We use many of these techniques, but not specifically to encourage planning
- ❑ We do NOT use any of these techniques to encourage planning

12. Which sources do you use to get information about reducing struck-by incidents at your company? (Select all that apply)

- ❑ Insurance company
- ❑ Labor union
- ❑ OSHA (Occupational Safety and Health Administration)
- ❑ NIOSH (National Institute for Occupational Safety and Health)
- ❑ Contractor/trade association
- ❑ CPWR – The Center for Construction Research and Training
- ❑ General internet search
- ❑ Equipment manufacturers
- ❑ Other (please specify): _____

13. Which best describes the company you work for? (Select <u>one</u>)

- ○ General Contractor
- ○ Specialty Contractor (e.g., masonry, cement, roofing, plumbing, painting, carpentry, electrical, etc.)
- ○ Other (please specify): _____

14. How many years have you worked at (or owned) this company? (Select one)
    - ○ Less than a year
    - ○ 1 - 5 years
    - ○ 6 - 10 years
    - ○ More than 10 years

15. What industry segment does your company **most frequently** work in? (Select one)
    - ○ Heavy/Civil
    - ○ Commercial
    - ○ Residential
    - ○ Industrial
    - ○ Petrochemical
    - ○ Public Sector
    - ○ Other (please specify): _____

16. How many construction workers does your company currently employ? (Select one)
    - ○ 1 - 10
    - ○ 11 - 19
    - ○ 20 - 49
    - ○ 50 - 99
    - ○ 100 - 249
    - ○ 250 - 999
    - ○ 1,000 or more

Appendix C. Pilot Planning Program to Prevent Struck-by Incidents Follow-up Survey (For Workers & Supervisors)

Thank you for participating in CPWR's Planning to Prevent Struck-by Incidents pilot project. The planning program is being developed to help contractors plan for and implement measures to prevent struck-by incidents. The purpose of this survey is to gather information from all the contractors who participated in the pilot to better understand which resources from the planning program were used and their overall effectiveness.

Your participation is completely voluntary, and your responses will be kept confidential. Results will primarily be used to help us guide future use of the planning program and understand practices and perceptions throughout the study. No names or identifying information will be shared outside of CPWR's research team. Any reporting on results will be done as group data so that all companies and individuals remain anonymous.

The survey will take approximately 10 minutes to complete.

1. What is your current position? (Select one)
   - ○ Construction worker
   - ○ Foreperson/supervisor
   - ○ Manager

2. How many years have you worked at this company? (Select one)
   - ○ Less than a year
   - ○ 1 - 5 years
   - ○ 6 - 10 years
   - ○ More than 10 years

3. Did you complete CPWR's baseline survey for this pilot project? (Select one)
   - ○ Yes
   - ○ No
   - ○ I'm not sure

4. Which of the following struck-by hazards did you encounter **over the last five months** on your job sites? (Select all that apply)
   - ❑ Falling/dropped objects (e.g., tools, equipment)
   - ❑ Flying objects from something being thrown, hurled, or propelled across a space (e.g., being struck-by a nail when a co-worker accidentally fires a nail gun or getting hit by a piece of plywood being blown around by the wind)
   - ❑ Rolling objects (e.g., being struck-by heavy equipment or a vehicle)
   - ❑ Swinging objects (e.g., being struck-by a swinging load from a crane)

5. How often did you do the following tasks **over the last five months** related to **planning to prevent struck-by incidents**: (Check one option in each row)

	Never	**Almost never**	**Occasionally**	**Sometimes (about 50% of the time)**	**Usually**	**Almost always**	**Always**	**Not sure**	**Not applicable**
Participate in pre-job planning before work begins on a new project									
Review/update pre-job plans to prevent struck-by incidents frequently at safety and production meetings with crew leaders									
Actively engage in pre-task planning (e.g., job hazard analysis, job safety analysis) at the beginning of every shift									
Conduct or participate in daily pre-shift meetings to review struck-by hazards and preventive measures as a group (e.g., location and use of safety									

equipment, work practices, signage, who to go to when help is needed)									
Conduct or participate in pre-task planning (e.g., job hazard analysis, job safety analysis) before any new task or type of work is initiated (including when returning to work after a break)									
Conduct or participate in pre-lift meetings before using a crane with those involved to review communication methods, possible struck-by hazards, and steps being taken to prevent incidents									
Conduct or participate in training programs on struck-by hazards and prevention									

6. What types of controls did you/your company use **over the last five months** to prevent struck-by incidents from **falling objects**? (Select all that apply)

- ❑ Tool tethers
- ❑ Installing decking
- ❑ Safety nets
- ❑ Catch platforms
- ❑ Canopies
- ❑ Debris chutes
- ❑ Guardrails/parapets/barriers
- ❑ Toeboards
- ❑ Barricading drop zones
- ❑ Other (please specify):_____
- ❑ None of the above
- ❑ Not applicable

[Skip Question 7 if you selected "Not Applicable" for Question 6]

7. How effective was the CPWR Struck-by Planning Program in **improving your planning efforts** to prevent struck-by incidents from **falling objects**? (Select one)

- ○ Highly ineffective
- ○ Ineffective
- ○ Somewhat ineffective
- ○ Neutral
- ○ Somewhat effective
- ○ Effective
- ○ Highly effective
- ○ I'm not sure

8. What types of controls did you/your company use **over the last five months** to prevent struck-by incidents from **flying objects**? (Select all that apply)

- ❑ Using safer tools (e.g., sequential [single shot] trigger nail guns)
- ❑ Clearing work zones for those working with pneumatic or powder-actuated tools like nail guns
- ❑ Securing materials and equipment against wind gusts
- ❑ Installing whip checks on pressurized air hoses
- ❑ Other (please specify):_____
- ❑ None of the above
- ❑ Not applicable

[Skip Question 9 if you selected "Not Applicable" for Question 8]

9. How effective was the CPWR Struck-by Planning Program in **improving your planning efforts** to prevent struck-by incidents from **flying objects**? (Select one)
   - ○ Highly ineffective
   - ○ Ineffective
   - ○ Somewhat ineffective
   - ○ Neutral
   - ○ Somewhat effective
   - ○ Effective
   - ○ Highly effective
   - ○ I'm not sure

10. What types of controls did you/your company use **over the last five months** to prevent struck-by incidents from **rolling objects**? (Select all that apply)
   - ❑ Internal traffic control planning
   - ❑ External traffic control planning
   - ❑ Spotters
   - ❑ Flaggers
   - ❑ Back-up alarms
   - ❑ Vehicles and equipment with proximity warning systems
   - ❑ Establishing speed limits
   - ❑ Clear signage
   - ❑ Proper lighting when working at night
   - ❑ Cones/barriers
   - ❑ Equipment-only zones and/or no equipment/vehicle zones
   - ❑ Other (please specify):_____
   - ❑ None of the above
   - ❑ Not applicable

[Skip Question 11 if you selected "Not Applicable" for Question 10]

11. How effective was the CPWR Struck-by Planning Program in **improving your planning efforts** to prevent struck-by incidents from **rolling objects**? (Select one)
    - ○ Highly ineffective
    - ○ Ineffective
    - ○ Somewhat ineffective
    - ○ Neutral
    - ○ Somewhat effective
    - ○ Effective
    - ○ Highly effective
    - ○ I'm not sure

12. What types of controls did you/your company use **over the last five months** to prevent struck-by incidents from **swinging objects**? (Select all that apply)
    - ❑ Restricting work zones around cranes
    - ❑ Not operating during high winds or bad weather
    - ❑ Following equipment load limits
    - ❑ Signal persons
    - ❑ Tag lines/push sticks
    - ❑ Other (please specify):_____
    - ❑ None of the above
    - ❑ Not applicable

[Skip Question 13 if you selected "Not Applicable" for Question 12]

13. How effective was the CPWR Struck-by Planning Program in **improving your planning efforts** to prevent struck-by incidents from **swinging objects**? (Select one)

- ○ Highly ineffective
- ○ Ineffective
- ○ Somewhat ineffective
- ○ Neutral
- ○ Somewhat effective
- ○ Effective
- ○ Highly effective
- ○ I'm not sure

14. Please answer the following questions about the **nudges/techniques** you/your company used **over the last five months**: (Check <u>one</u> option for each question in a row)

Which of the following **nudges/ techniques** did you/your company use to **promote planning** on your job site?				Please provide additional details on how each of the nudges/techniques you selected were used.	If you/your company used the nudge/technique, how effective was it in **promoting planning** to prevent struck-by incidents on your job site?							
	Used	**Did not use**	**Not sure**		**Highly ineffective**	**Ineffective**	**Somewhat ineffective**	**Neutral**	**Somewhat effective**	**Effective**	**Highly effective**	**Not sure**
Signage/ posters												
Stickers												
Text message reminders about planning												
Email reminders about planning												
Feedback												
Incentives												

15. What **additional nudges/techniques**, if any, would be helpful in **promoting planning to prevent struck-by incidents** on your job site?

16. Have you observed any differences in safety and health at your company **over the last five months**? (Check one option in each row)

	More emphasis	**No change**	**Less emphasis**
Management prioritizing safety on the job site			
Planning to prevent struck-by incidents			
Management commitment to and involvement in planning for struck-by hazards			
Everyone is included in planning for struck-by hazards (workers, supervisors, contractors)			

17. How likely are you to recommend the CPWR Struck-by Planning Program to others? (Circle one)

Not at all likely					**Neutral**					**Extremely likely**
0	1	2	3	4	5	6	7	8	9	10

18. Please explain your rating:

19. Do you have any suggestions for improvement or additional comments about the program?

Appendix D. Pilot Planning Program to Prevent Struck-by Incidents Follow-up Survey (For Managers)

Thank you for participating in CPWR's Planning to Prevent Struck-by Incidents pilot project. The planning program is being developed to help contractors plan for and implement measures to prevent struck-by incidents. The purpose of this survey is to gather information from all the contractors who participated in the pilot to better understand which resources from the planning program were used and their overall effectiveness.

Your participation is completely voluntary, and your responses will be kept confidential. Results will primarily be used to help us guide future use of the planning program and understand practices and perceptions throughout the study. No names or identifying information will be shared outside of CPWR's research team. Any reporting on results will be done as group data so that all companies and individuals remain anonymous.

The survey will take approximately 10-15 minutes to complete.

1. What is your current position? (Select one)
   - ○ Company owner
   - ○ Safety & health director (or equivalent)
   - ○ Project manager
   - ○ Other (please specify):_____

2. How many years have you worked at (or owned) this company? (Select one)
   - ○ Less than a year
   - ○ 1 - 5 years
   - ○ 6 - 10 years
   - ○ More than 10 years

3. Did you complete CPWR's baseline survey for this pilot project? (Select one)

- ○ Yes
- ○ No
- ○ I'm not sure

4. What pieces of CPWR's Struck-by Planning Program did your company utilize? (Select all that apply)

- ❑ General (not hazard specific) information to help improve pre-job planning processes
- ❑ Information on reducing struck-by incidents from falling objects (e.g., dropped tools, objects falling from heights)
- ❑ Information on reducing struck-by incidents from flying objects (e.g., wind-blown materials)
- ❑ Information on reducing struck-by incidents from rolling objects (e.g., vehicles, heavy equipment)
- ❑ Information on reducing struck-by incidents from swinging objects (e.g., cranes, materials suspended from other anchor points)
- ❑ Information on nudges to support safety decisions and practices that reduce struck-by incidents
- ❑ Free planning tools
- ❑ Free training materials
- ❑ Other (please specify):_____

5. How often did your company do the following **during the study period** when planning to prevent struck-by incidents: (Check one option in each row)

	Never	**Almost never**	**Occasionally**	**Sometimes (about 50% of the time)**	**Usually**	**Almost always**	**Always**	**Not sure**	**Not applicable**
Conduct pre-job planning before work on a new site begins									
Include the cost of all safety- and rescue-related resources (materials, equipment, labor) that will be needed in the bid									

Review/update pre-job plans to prevent struck-by incidents frequently at safety and production meetings with managers/supervisors/ forepersons									
Conduct pre-task planning (e.g., job hazard analysis, job safety analysis) at the beginning of every shift									
Conduct daily pre-shift meetings to review struck-by hazards and preventive measures (e.g., location and use of safety equipment, work practices, signage, who to go to when help is needed)									
Conduct pre-task planning (e.g., job hazard analysis, job safety analysis) before any new task or type of work is initiated (including when returning to work after a break)									
Conduct pre-lift meetings before using a crane with those involved to review communication methods, possible struck-by hazards, and steps being taken to prevent incidents									
Conduct training on struck-by hazards and prevention									
Designate and identify those in charge of and knowledgeable about preventing struck-by incidents on the job site (e.g., competent persons; lift directors)									

Designate and identify those in charge of and knowledgeable about rescue and treatment should an incident occur									

6. What types of controls did your company use **during the study period** to prevent struck-by incidents from **falling objects**? (Select all that apply)

- ❑ Tool tethers
- ❑ Installing decking
- ❑ Safety nets
- ❑ Catch platforms
- ❑ Canopies
- ❑ Debris chutes
- ❑ Guardrails/parapets/barriers
- ❑ Toeboards
- ❑ Barricading drop zones
- ❑ Other (please specify):_____
- ❑ None of the above
- ❑ Not applicable

[Skip Question 7 if you selected "Not Applicable" for Question 6]

7. How effective was the CPWR Struck-by Planning Program in **improving your planning efforts** to prevent struck-by incidents from **falling objects**? (Select one)

- ○ Highly ineffective
- ○ Ineffective
- ○ Somewhat ineffective
- ○ Neutral
- ○ Somewhat effective
- ○ Effective
- ○ Highly effective

8. What additional information, if any, would be helpful in planning to prevent struck-by incidents from **falling objects**?

9. What types of controls did your company use **during the study period** to prevent struck-by incidents from **flying objects**? (Select all that apply)

- ❑ Using safer tools (e.g., sequential [single shot] trigger nail guns)
- ❑ Clearing work zones for those working with pneumatic or powder-actuated tools like nail guns
- ❑ Securing materials and equipment against wind gusts
- ❑ Installing whip checks on pressurized air hoses
- ❑ Other (please specify):_____
- ❑ None of the above
- ❑ Not applicable

[Skip Question 10 if you selected "Not Applicable" for Question 9]

10. How effective was the CPWR Struck-by Planning Program in **improving your planning efforts** to prevent struck-by incidents from **flying objects**? (Select one)
    - ○ Highly ineffective
    - ○ Ineffective
    - ○ Somewhat ineffective
    - ○ Neutral
    - ○ Somewhat effective
    - ○ Effective
    - ○ Highly effective

11. What additional information, if any, would be helpful in planning to prevent struck-by incidents from **flying objects**?

12. What types of controls did your company use **during the study period** to prevent struck-by incidents from **rolling objects**? (Select all that apply)
    - ❑ Internal traffic control planning
    - ❑ External traffic control planning
    - ❑ Spotters
    - ❑ Flaggers
    - ❑ Back-up alarms
    - ❑ Vehicles and equipment with proximity warning systems
    - ❑ Establishing speed limits
    - ❑ Clear signage
    - ❑ Proper lighting when working at night
    - ❑ Cones/barriers
    - ❑ Equipment-only zones and/or no equipment/vehicle zones
    - ❑ Other (please specify):_____
    - ❑ None of the above
    - ❑ Not applicable

[Skip Question 13 if you selected "Not Applicable" for Question 12]

13. How effective was the CPWR Struck-by Planning Program in **improving your planning efforts** to prevent struck-by incidents from **rolling objects**? (Select one)
    - ○ Highly ineffective
    - ○ Ineffective
    - ○ Somewhat ineffective
    - ○ Neutral
    - ○ Somewhat effective
    - ○ Effective
    - ○ Highly effective

14. What additional information, if any, would be helpful in planning to prevent struck-by incidents from **rolling objects**?

15. What types of controls did your company use **during the study period** to prevent struck-by incidents from **swinging objects**? (Select all that apply)
    - ❑ Restricting work zones around cranes
    - ❑ Not operating during high winds or bad weather
    - ❑ Following equipment load limits
    - ❑ Signal persons
    - ❑ Tag lines/push sticks
    - ❑ Other (please specify):_____
    - ❑ None of the above
    - ❑ Not applicable

[Skip Question 16 if you selected "Not Applicable" for Question 15]

16. How effective was the CPWR Struck-by Planning Program in **improving your planning efforts** to prevent struck-by incidents from **swinging objects**? (Select <u>one</u>)
    - ○ Highly ineffective
    - ○ Ineffective
    - ○ Somewhat ineffective
    - ○ Neutral
    - ○ Somewhat effective
    - ○ Effective
    - ○ Highly effective

17. What additional information, if any, would be helpful in planning to prevent struck-by incidents from **swinging objects**?

18. Please answer the following questions about the **nudges** your company used **during the study period**: (Check <u>one</u> option for each question in a row)

What **types of nudges** did your company use during the study period to **encourage planning** on the job site?				Please provide additional details on how each of the nudges you selected were used.	If your company used the nudge, how effective was it in **promoting planning** to prevent struck-by incidents on your job site?						
	Used	**Did not use**	**Not sure**		**Highly ineffective**	**Ineffective**	**Somewhat ineffective**	**Neutral**	**Somewhat effective**	**Effective**	**Highly effective**
Signage/ posters											
Stickers											

Text message reminders about planning											
Email reminders about planning											
Feedback											
Incentives											

19. What additional information concerning **nudges**, if any, would be helpful in **promoting planning** to prevent struck-by incidents?

20. Have you observed any differences in safety and health at your company since the start of the pilot project? (Check <u>one</u> option in each row)

	More emphasis	**No change**	**Less emphasis**
Management prioritizing safety on the job site			
Pre-job planning (before work on a new site begins)			
Pre-task planning (e.g., pre-shift meetings, task-related job hazard analysis)			
Planning to prevent struck-by incidents			
Everyone is included in planning for struck-by hazards (workers, supervisors, contractors)			

Management commitment to and involvement in planning for struck-by hazards			

21. Did your company institute any specific changes to planning or work practices as a result of implementing CPWR's Struck-by Planning Program? (Select one)
    - ○ Yes
    - ○ No
    - ○ I'm not sure

22. If yes, please describe:

23. How likely are you to recommend the CPWR Struck-by Planning Program to others? (Circle one)

Not at all likely					**Neutral**					**Extremely likely**
0	1	2	3	4	5	6	7	8	9	10

24. Please explain your rating:

25. Do you have any suggestions for improvement or additional comments about the program?