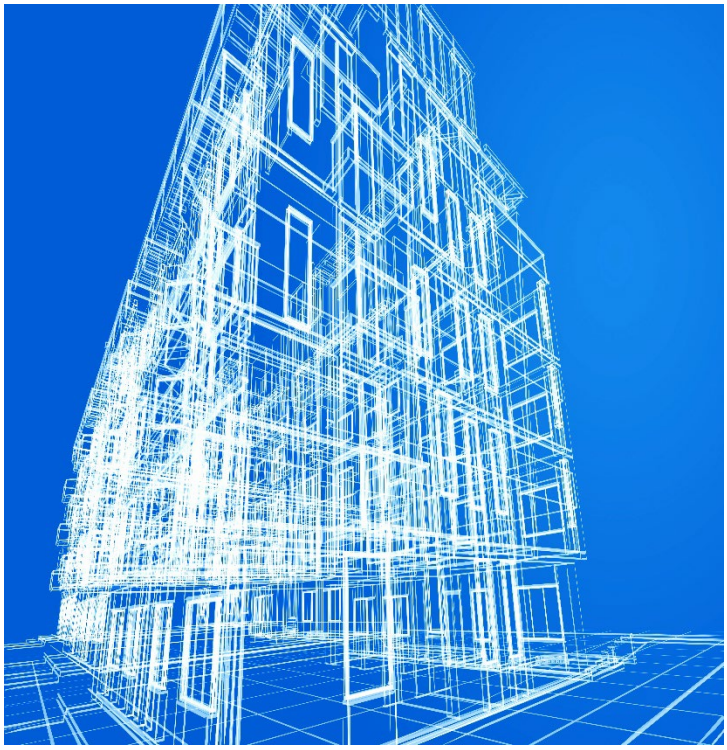
Knowledge and Use of Prevention through Design among Designers and Owners

A report on two surveys



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CPWR
THE CENTER FOR CONSTRUCTION
RESEARCH AND TRAINING

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Summary

Evidence from other countries indicates that Prevention through Design (PtD) has the potential to reduce injuries and fatalities in the U.S. construction industry. Yet PtD's adoption has been limited in the U.S., even though construction workers remain disproportionately likely to get hurt on the job. This report describes findings from two surveys—one among designers (architects and engineers) and one among owners—that looked at knowledge of and attitudes towards PtD, current use, and factors that would encourage its greater use. The surveys found that among both groups, a clearer understanding of PtD's benefits and additional resources, such as case studies of its use, would increase adoption. In addition, designers said that more information about potential liability from implementing PtD would be helpful.

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Introduction

The persistently high rates of injuries among construction workers in the U.S.—including approximately 1,000 fatalities in a typical year—have led to a continuing search for methods to make jobsites safer (Almaskati, 2024; CPWR, 2025; Hinze, 2013). One of the most promising is Prevention through Design (PtD), sometimes referred to as Safety by Design. PtD focuses on, in the words of the National Institute for Occupational Safety and Health (NIOSH), "designing out hazards, the most reliable and effective type of prevention. PtD encompasses all of the efforts to anticipate and design out hazards to workers in facilities, work methods and operations, processes, equipment, tools, products, new technologies, and the organization of work" (NIOSH, 2024).

While PtD has been used in a range of industries, including manufacturing, mining, and warehousing, construction's disproportionately high rate of occupational injuries has inspired a particularly high level of interest. The experiences of countries that require contactors to use PtD on some or all projects suggests it can have a significant impact. The construction fatality rate in England, which instituted regulations known as Construction Design Management in 2015, is approximately one-fifth of the U.S. rate (CPWR, 2025; Pothula, 2024). Similarly, Australia has the Code of Practice on the Safe Design of Structures and a fatality rate that is one-quarter of the U.S. rate. Exactly how much of this reduction can be attributed to PtD is unclear, but the differences in construction worker fatality rates are dramatic enough to suggest it may play a significant role.

Despite this evidence, PtD's adoption in the U.S. has been limited. There have been case studies of its use over the past 20 years, as well as the development of materials offering guidance for incorporating PtD into projects. Yet a 2017 study noted PtD's "slow diffusion," and an assessment last year found "that although PtD is gaining wider recognition, its application remains inconsistent" (Gambetese, 2019; Pothula 2024). Previous researchers have looked into reasons for this limited adoption, including lack of knowledge, concerns over liability (if designers get involved in safety planning, they may be sued if there is an injury on site), and concerns about extra costs and time if PtD is implemented (Gambetese, 2019; Toole, 2012).

To improve worker safety through a broader implementation of PtD, it will not be enough for more architects, engineers, and other design professionals to incorporate it into their process more consistently. It will also require business leaders—especially owners, funders, and those purchasing construction services—to recommend and even require designs that reduce occupational risks. In other words, there must be a strong *demand* for safer designs, not just a *supply* of innovative solutions. Expanding the use of PtD must focus on influence decision-makers so they recognize the value of prevention-based specifications and request them from the start of every project. This would produce a significant cultural shift: moving safety responsibility away from individual workers and embedding it into the design and planning process, with owners and investors playing a critical role in driving this change (Schulte et al., 2008).

This two-phased study was designed to continue building a better understanding of why PtD has not been adopted more widely and what communications might expand its use. It initially focused on the thinking and practices of designers—architects and engineers—since it is their methods that would need to change significantly to incorporate PtD more consistently into construction projects. CPWR sponsored a survey that examined designers' knowledge of PtD, what they perceived as barriers to its adoption, and material/information that would encourage greater use.

One of the survey's notable findings was that designers would be significantly more likely to use PtD if project owners recommended or required it. CPWR then conducted a second study evaluating owners' perceptions of PtD. While questions in the two surveys were not identical, they concentrated on level of knowledge, barriers to adoption, and factors that would encourage greater use of PtD.

Both surveys were designed to support future work to expand the use of PtD in construction. By identifying why owners and designers may not use methods that may save lives, and what information might persuade them to do so, the following findings can increase adoption of PtD, which would likely benefit the safety and health of construction workers across the country.

Methods

Both the designer and owner surveys were developed by CPWR–The Center for Construction Research and Training (CPWR) and administered by the Dodge Construction Network (Dodge). For both surveys, respondents had to hold a position in which they affected decisions made at their firm. The surveys were conducted online. To learn more about the surveys, email CPWR (cwebsite@cpwr.com).

Designer Survey

The designer survey was administered from November 1 to 23, 2021. It collected responses from 332 construction design professionals: 210 architects and 122 engineers. It was sent to a cohort identified through three sources: (1) the Dodge Architect Panel, (2) a Dodge list of engineers a third party that supplied additional engineers, and (3) engineer contacts from CPWR's internal database.

Potential architect and engineer respondents were screened based on these criteria:

- Employment at an architectural, architectural/engineering (A/E), design/build, engineering, general contractor/construction management (GC/CM), interior design or owner organization. For employment at an A/E, design build, GC/CM, interior design, or owner organization, the individual must have been working in either an architect or engineer role.
- Architects must have held one of these roles: principal, associate, design architect, project manager, staff architect, construction administrator, interior designer, or interior architect.
- Engineers must have held one of these roles: principal/executive, associate, design engineer, project engineer, staff engineer, project manager, or construction administrator.

Among the engineers, the survey looked for people working in these specialties: civil non-structural, civil structural, electrical, and mechanical/plumbing. Quotas were set at 40 per group.

Owner survey

The owner survey used the same questions as the designer survey, with minor adjustments for the different audience. It was administered to owners drawn from two sources:

- Members of the Construction Owners Association of America (COAA). This survey took place from December 16, 2024, to January 22, 2025 (n=23). This group was asked a subset of the survey questions as part of a pilot survey.
- Members of a database of owners maintained by Dodge. This survey took place from March 11-31, 2025 (n=91). This group responded to the full set of questions.

Potential respondents were screened based on these criteria:

- They must have worked at a private business (commercial or manufacturing), institutional organization, government organization, or developer that owned buildings or structures.
- Their organization has at least one construction project underway. If 1 to 2 projects, they must have typically managed at least $10 million in total value of capital construction projects in a year.

- Respondents must have had one of the following responsibilities or roles in capital projects: involved in decisions related to design and construction; make choices on capital investments; have influence on organization's annual scope of construction work; have day-to-day oversight of the construction process; and/or moderate or high influence on the design work that architects and engineers do on their organization's projects.
- They must have knowledge about how long their organization typically owns the assets it builds.

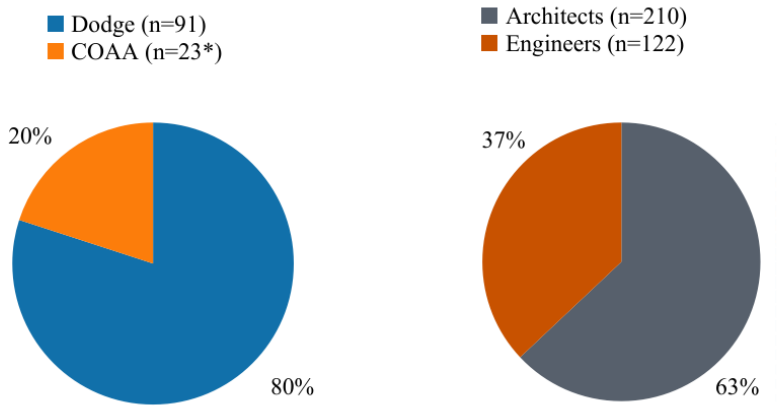
To understand whether the type of institution they were affected an owner's views and use of PtD, the survey looked at four categories:

- Private owner: Commercial Business (i.e., bank, store, hotel, recreational) or Manufacturing Business (i.e., manufacturing facility, biotech, research and development)
- Institutional organization: School, college/university, healthcare
- Government: Federal, state, or local that undertakes public buildings or infrastructure projects
- Developer: Developing new facilities, expanding existing ones, or renovating structures that they will not occupy but either sell or lease to others

Results

Most owners surveyed about Prevention through Design (PtD) were part of the Dodge cohort (80%), while COAA members made up the remaining 20% (Chart 1). Architects accounted for 63% of the respondents in the designers PtD survey, with engineers making up 37%.

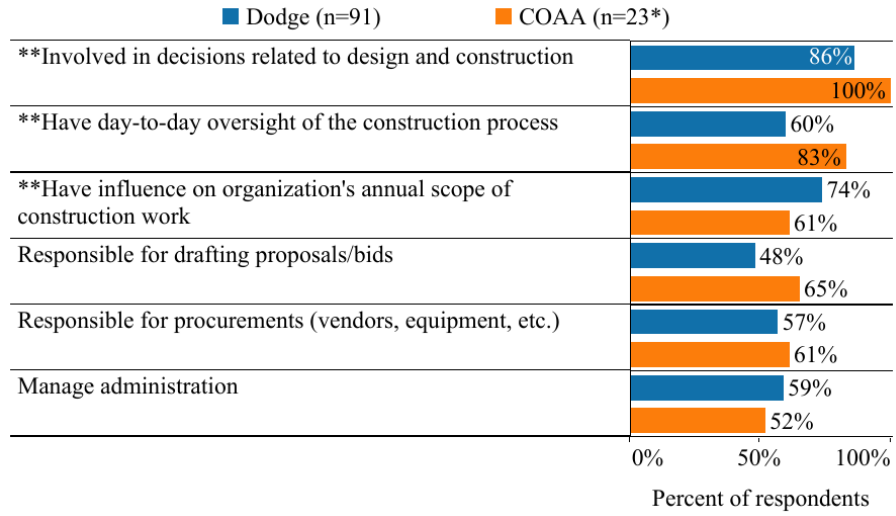
1. Owners and designers: numbers of study participants



*Small sample size, interpret with caution.

Job functions among owner respondents commonly involved construction and design decisions, oversight of the construction process, and influence on the scope of work (Chart 2). Among architects, principal (49%) and project manager (25%) were the most common job functions, while principal or executive (28%) and project engineer (23%) were most common among engineers (Chart 3).

2. Owners: Job function of respondents



Note: Respondents could select more than one job function.
*Small sample size, interpret with caution.
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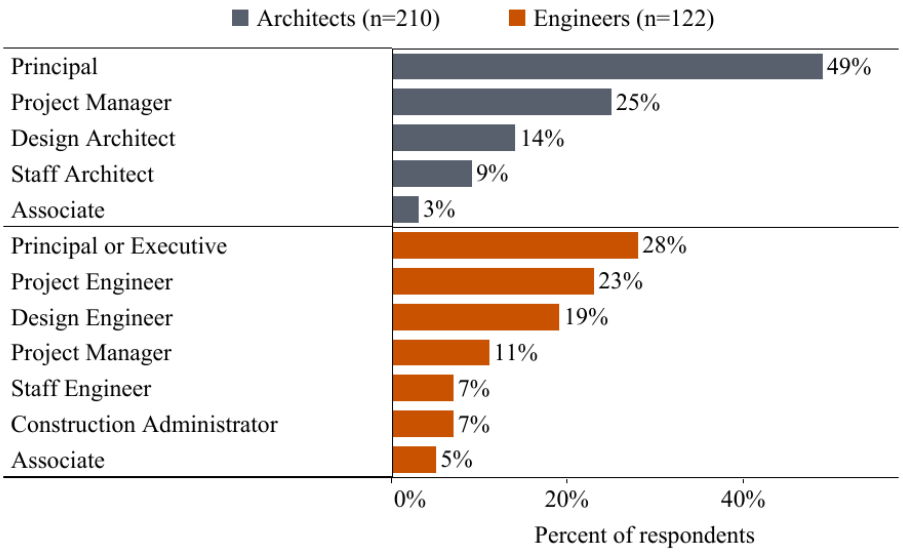
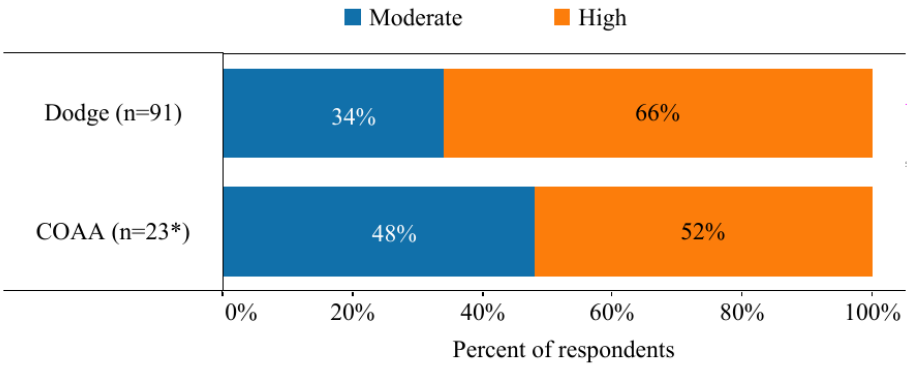
3. Designers: Job function of respondents



Regarding design influence, 66% percent of Dodge owners and 52% of COAA owners said they had a high influence on the design of their organization's projects (Chart 4).

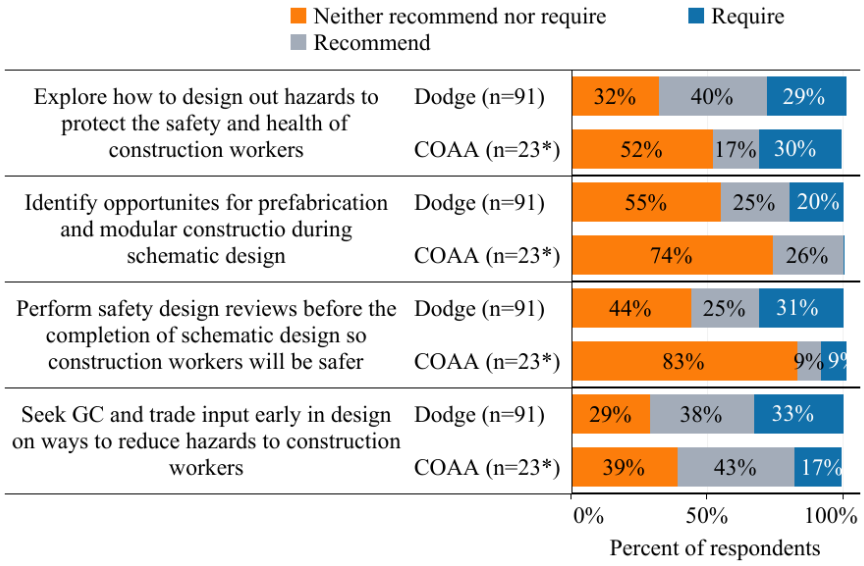
4. Owners: Influence on architect and engineer design work



*Small sample size, interpret with caution.

When asked about guidance they provide to designers for improving safety on their projects, the strategies owners were most likely to recommend or require were that designers seek GC and trade input early (Dodge: 71%, COAA: 60%) and to explore how to design out hazards to protect construction workers (Dodge: 69%, COAA: 47%; Chart 5).

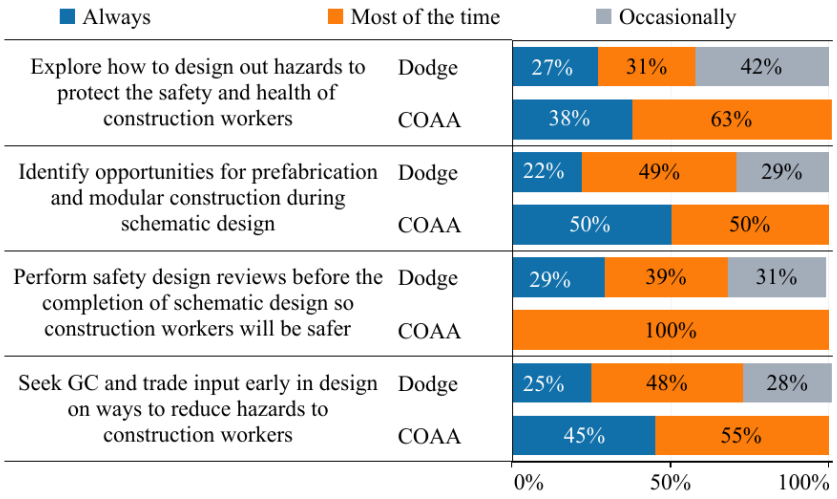
5. Owners: Guidance for Designers about Improving Safety



*Small sample size, interpret with caution.

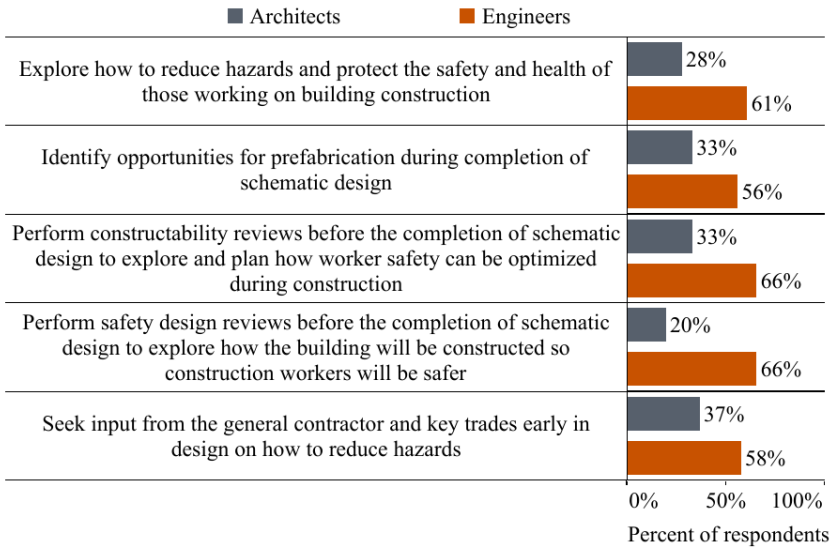
While a higher percentage of Dodge owners than COAA owners recommend or require specific design practices, COAA owners encouraged these practices more frequently than Dodge owners (Chart 6). With regard to specific practices, identification of opportunities for prefabrication and modular construction during schematic design were always recommended or required by 50% of COAA owners, while performance of safety design reviews before completion of schematic design were always recommended or required by 29% of Dodge owners.

6. Owners: Frequency of requiring or recommending certain design practices to improve safety



Designers were asked how frequently they practiced five design activities that can increase construction worker safety (Chart 7). Engineers most frequently performed constructability reviews (66%) and safety design reviews before the completion of schematic design (66%). Architects most frequently sought input from GCs and key trades early in design (37%), performed constructability reviews (33%), and identified opportunities for prefabrication (33%).

7. Designers: Frequency of certain design practices to improve safety

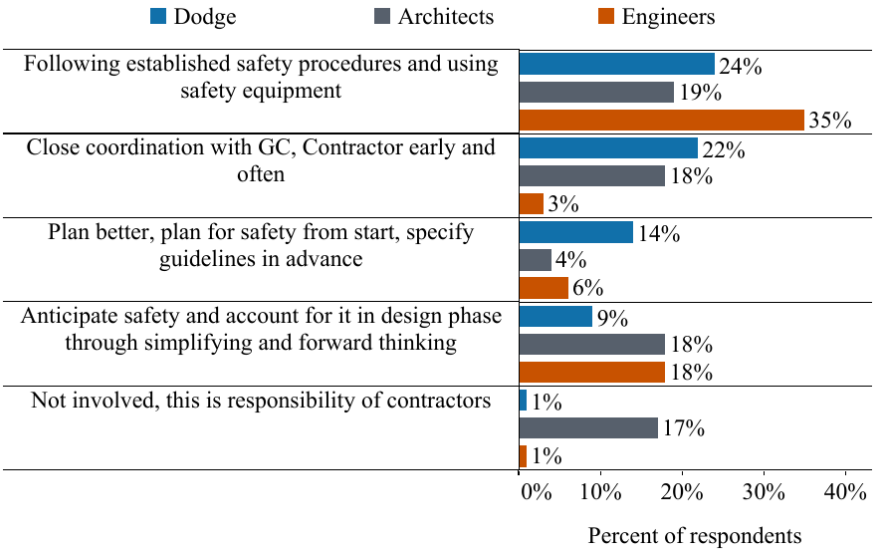


*Small sample size, interpret with caution.

Dodge owners were asked about the ways in which their organizations could influence designers to incorporate elements that reduce construction worker injuries (Chart 8). The most common responses were: following established safety procedures and using safety equipment (24%), close coordination with GCs early and often (22%), and better planning for safety and specifying guidelines in advance (14%).

Similarly, designers were asked in what ways they use design to reduce construction injuries. The most common responses were following safety procedures and using safety equipment (Architects: 35%; Engineers 19%), anticipating safety hazards and accounting for them in the design phase (Architect: 18%; Engineer 18%), and close coordination with GCs (Architect: 18%).

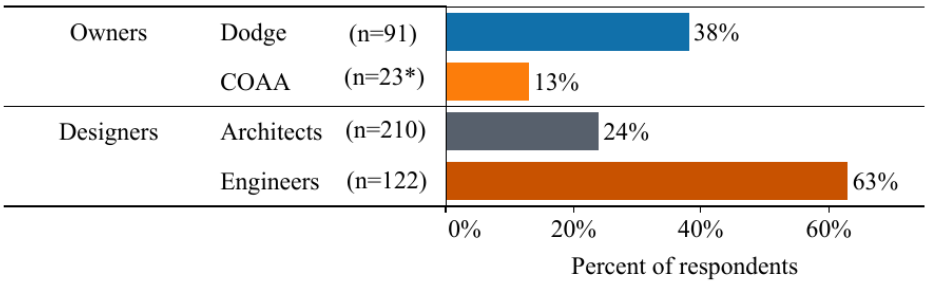
8. Owners and Designers: Methods used to reduce construction worker injuries



Both owners and designers were asked whether they were aware of PtD prior to being shown a definition (Chart 9). Dodge owners were three times as likely to be familiar with the concept as COAA owners (38% versus 13%). Similarly, engineers were over twice as likely to be familiar with the concept as architects (63% versus 24%).

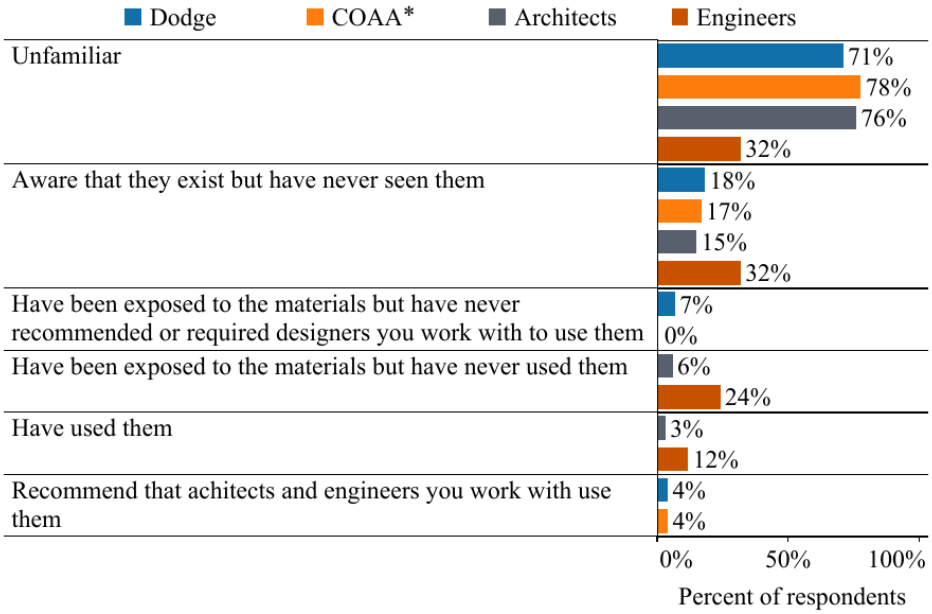
Engineers (68%) were also more likely than architects (24%) and owners (Dodge: 29%; COAA: 22%) to be familiar with NIOSH PtD training materials (Chart 10). Despite having the highest proportion of respondents familiar with these materials, only 12% of engineers reported actually using them.

9. Owners and Designers: Awareness of term "Prevention Through Design"



*Small sample size, interpret with caution.

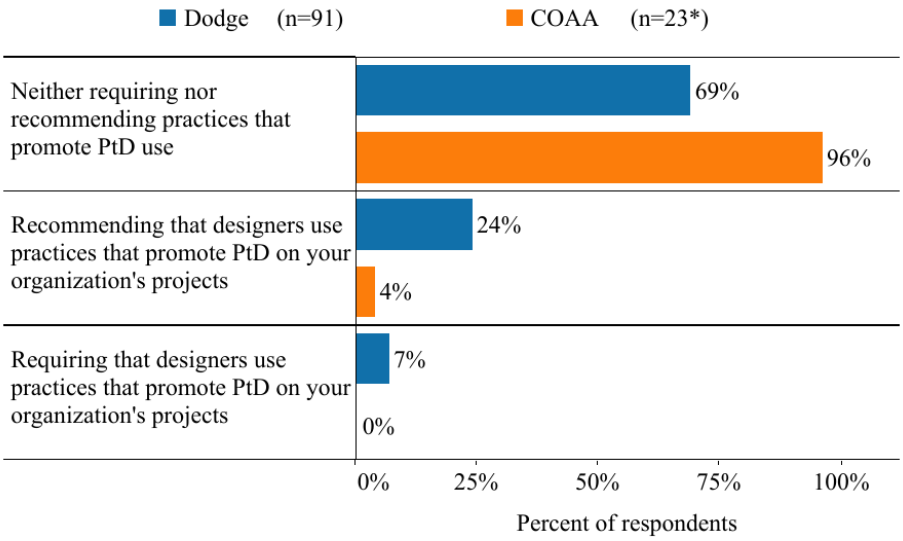
10. Owners and Designers: Familiarity with NIOSH PtD training materials



*Small sample size, interpret with caution.

In 2025, 24% of Dodge owners (n=22) reported recommending designers use practices that promote PtD on their organization's projects (Chart 11). Meanwhile, only 7% of Dodge owners (n=6) reported requiring designers to use these practices.

11. Owners: Respondents requiring or recommending designers use PtD

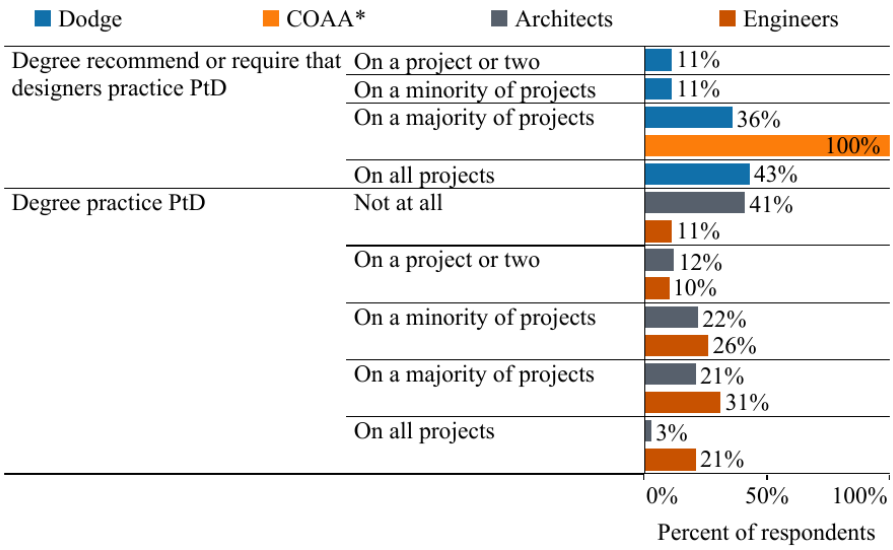


*Small sample size, interpret with caution.

Among owners who recommended or required designers practice PtD, 79% of the Dodge owners (n=28) did so on all or a majority of projects (43% and 36%, respectively; Chart 12).

Similarly, designers were asked to what degree their company practiced PtD, based on the definition. Engineers were more likely than architects to practice any level of PtD (89% versus 59%). More than half of engineers practiced PtD on a majority of or on all projects (31% and 21%, respectively), while a quarter of architects practiced PtD on a majority or on all projects (21% and 3%, respectively).

12. Owners and Designers: Use of PtD based on definition of term

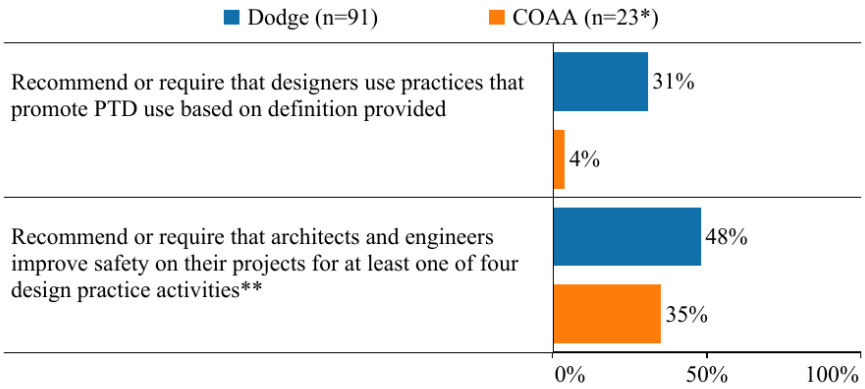


*Small sample size, interpret with caution.

Dodge owners were more likely to recommend or require designers to practice at least one of the four design practices than they were to recommend or require designers to use PtD according to the definition (48% versus 31%; Chart 13).

COAA owners showed a similar pattern. A similar observation was observed among COAA owners. However, they were nearly nine times more likely to recommend or require designers to practice at least one of the four design practices than they were to recommend or require designers to use PtD according to the definition (35% versus 4%).

13. Owners: Use of PtD based on definition vs. based on practice

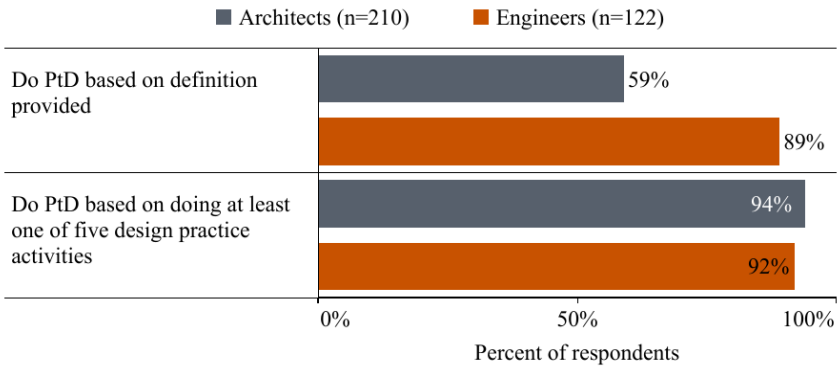


*Small sample size, interpret with caution.

**For more information about Owners, see slide 9 (by definition) and slide 6 (practices.)

The survey also compared what designers said about using PtD based on the definition and how they used PtD based on practices (Chart 14). While 59% of architects and 89% of engineers reported using PtD based on the definition, when asked about specific practices, more than nine out of ten respondents in each group used PtD when measured by specific practices: 94% of architects and 92% of engineers employed one or more of five practices listed in the survey that are generally considered to be PtD.

14. Designers: Use of PtD based on definition vs. based on practice*

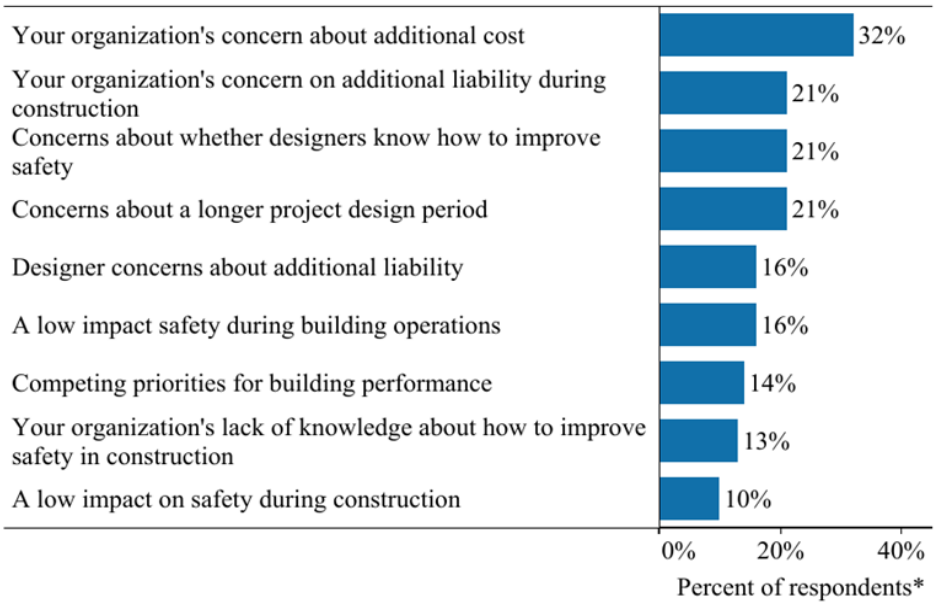


*For more information about Designers, see slide 9 (by definition) and slide 7 (practices.)

The most common barriers to Dodge owners requiring designers to use PtD were concerns about additional costs (32%), additional liability during construction (21%), designers' ability to improve safety (21%), and longer project design periods (21%; Chart 15).

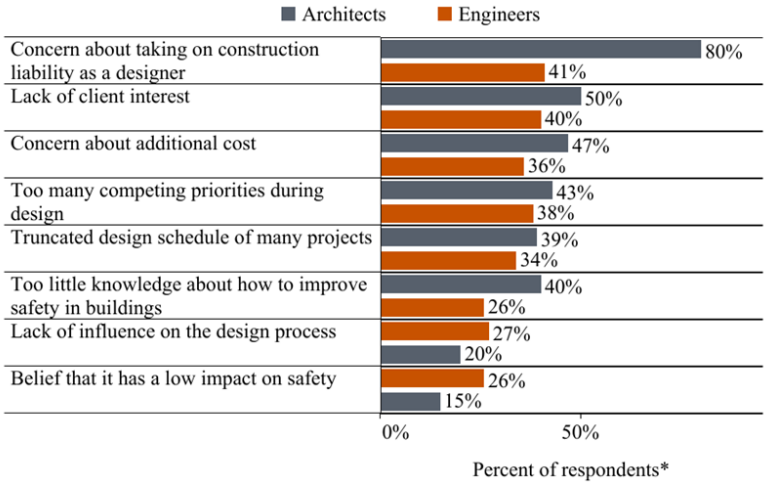
Among designers, the most common barriers to PtD practice were concerns about taking on construction liability (Architects: 80%; Engineers: 41%), lack of client interest (Architects: 50%; Engineers: 40%), concern about additional cost (Architects: 47%; Engineers: 36%), and too many competing priorities during design (Architects: 43%; Engineers: 38%; Chart 16).

15. Owners: Barriers to requiring designers to use PtD, Dodge respondents



*Reporting a significant or insurmountable obstacle

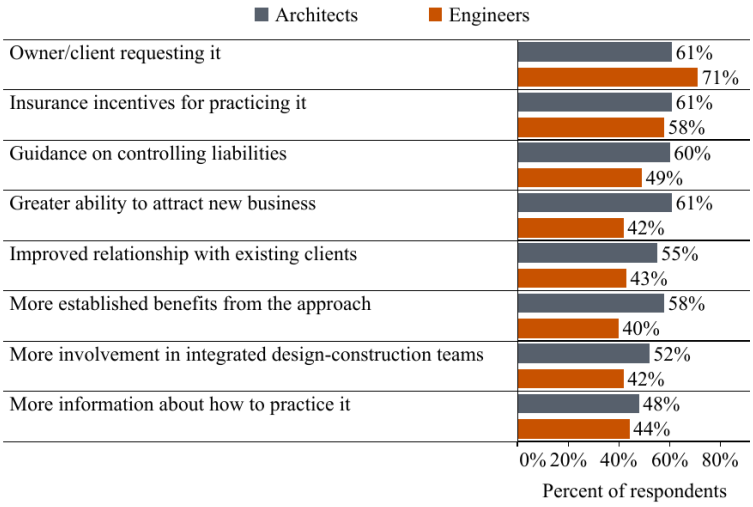
16. Designers: Barriers to PtD use



*Reporting as very high or higher barrier

Designers were asked what would encourage them to start using or use PtD more (Chart 17). The top reasons included owner/client requests (Architects: 61%; Engineers: 71%), insurance incentives (Architects: 61%; Engineers: 58%), guidance on controlling liabilities (Architects: 60%; Engineers: 49%), and greater ability to attract new business (Architects: 61%; Engineers: 42%).

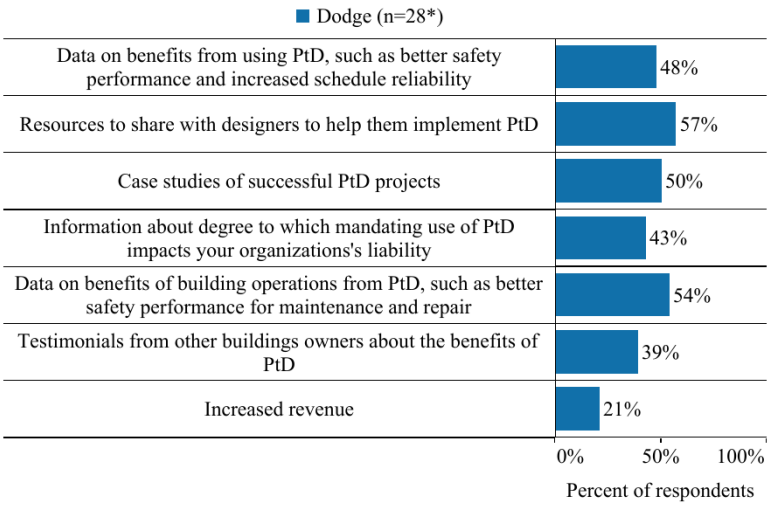
17. Designers: Reasons that would increase use of PtD



Dodge owners already recommending or requiring PtD named several resources that could increase their use of it, including educating designers on its implementation (57%) and data on its benefits for building operations (54%; Chart 18).

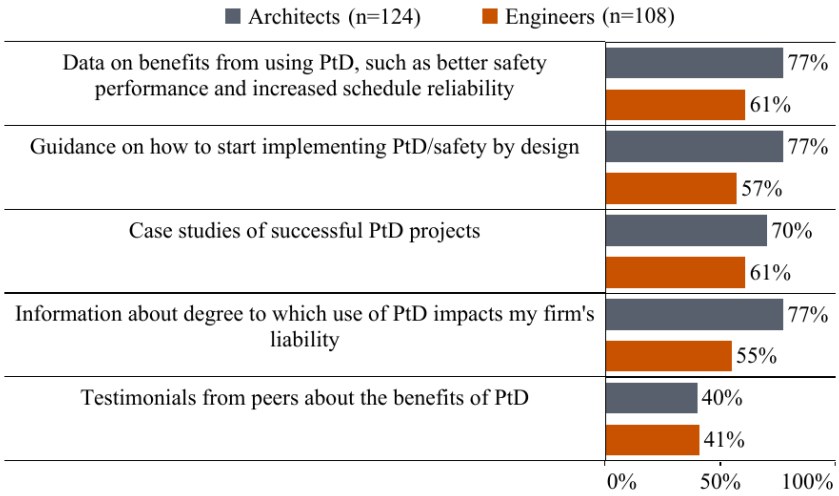
Architects and engineers who practice PtD reported that data on benefits from its use (77% and 61%, respectively) and guidance on implementation (77% and 57%, respectively) would most encourage them to increase PtD use (Chart 19). Information on how PtD impacts liability was also likely to encourage greater use among architects (77%), while successful PtD case studies were likely to encourage use among engineers (61%).

18. Owners: Reasons that would increase use of PtD



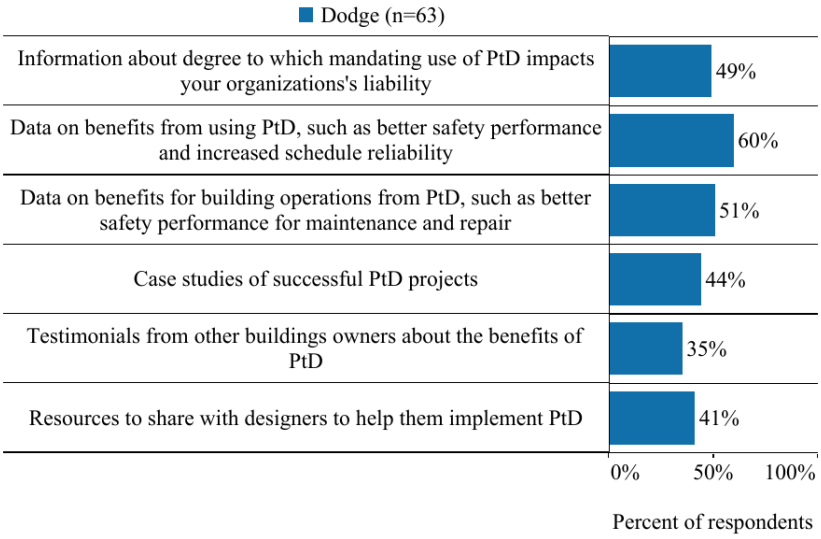
*Small sample size, interpret with caution.

19. Designers: Reasons that would increase use of PtD



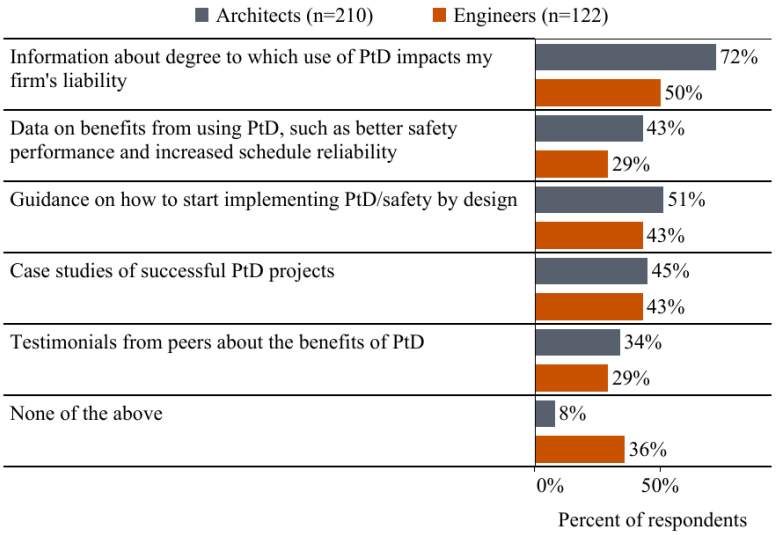
Data on benefits of PtD during construction (60%) and building operations (51%), as well as information on how mandating PtD impacts liability (48%) would be most likely to encourage Dodge owners not currently requiring or recommending PtD use to start doing so (Chart 20).

20. Owners: Information that would encourage initial use of PtD



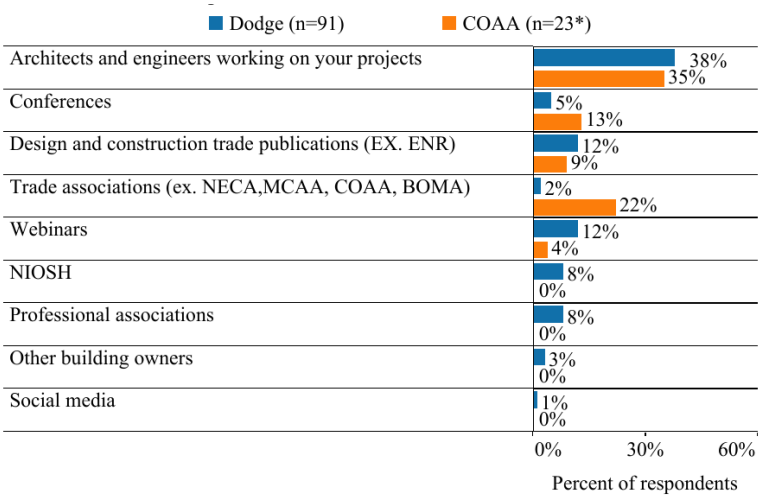
For architects and engineers not yet practicing PtD, information on how it impacts firm's liability (72% and 50%, respectively), guidance on implementation (51% and 43%, respectively), and successful PtD case studies (45% and 43%, respectively) would most inspire designers' initial use of PtD (Chart 21).

21. Designers: Information that would encourage initial use of PtD



For owners, the architects and engineers working on projects were the most helpful sources of PtD information (Dodge: 38% and COAA: 35%). Trade associations were the second most helpful source among COAA owners (22%; Chart 22).

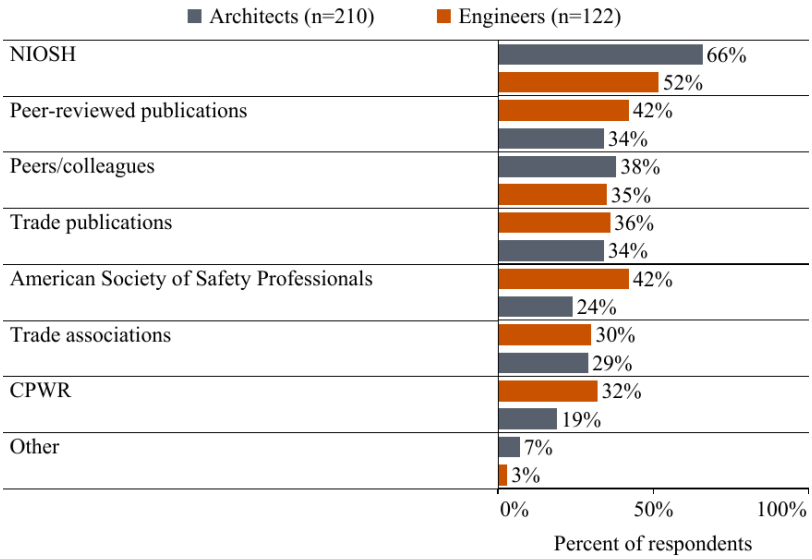
22. Owners: Most helpful sources of information on PtD



*Small sample size, interpret with caution.

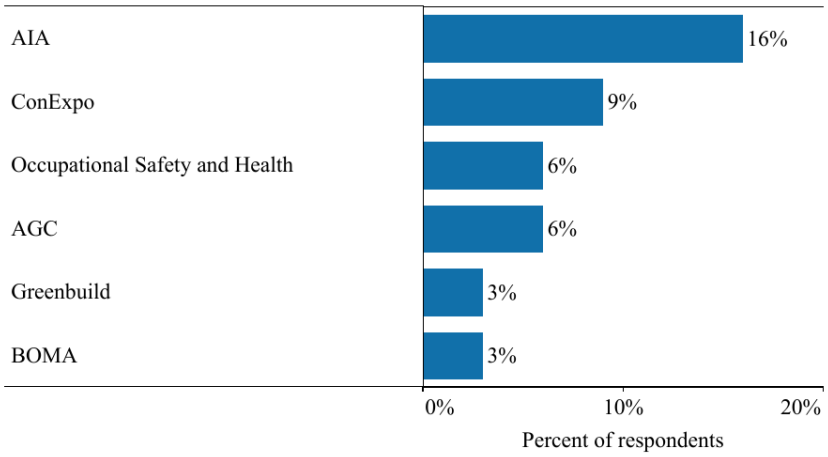
NIOSH and peers/colleagues were the most credible sources of PtD information for architects (Chart 23). Among engineers, NIOSH, peer-reviewed publications, and the American Society of Safety Professionals (ASSP) were most credible.

23. Designers: Most credible sources of information on PtD



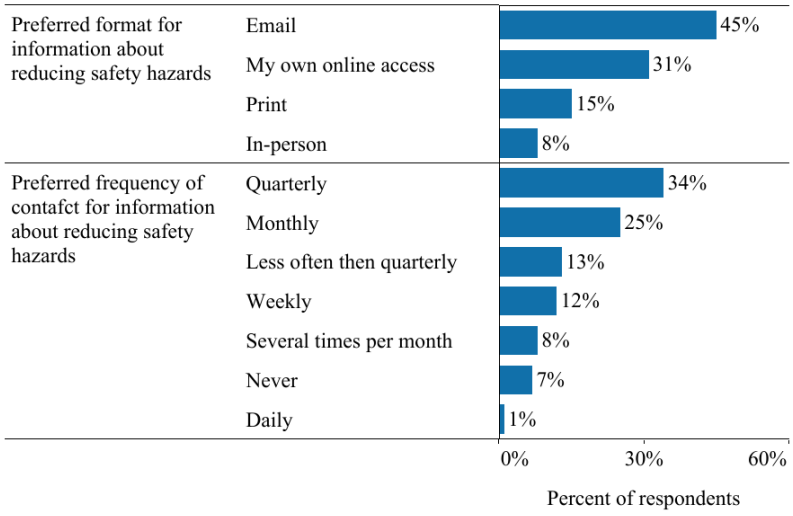
Thirty-two Dodge owners responded with the name of the conference they believed had the most useful PtD information (Chart 24). The most common responses were American Institute of Architects (16%) and ConExpo (9%).

24. Owners: Most useful conference for learning about PtD, Dodge survey



Dodge owners (n=91) were asked which format they preferred to receive information on reducing safety hazards on their projects (Chart 25). Forty-five percent preferred email, while 31% preferred accessing this information themselves online. These owners also indicated how frequently they preferred to receive this information. Most responded Quarterly (34%) or Monthly (25%), while owners with a high influence on designers' work (data not shown) preferred receiving updates less than quarterly.

25. Owners: Preferred format and frequency for receiving information about safety hazards, Dodge survey



Conclusion

The surveys of designers and owners showed that Prevention through Design is being used within the U.S. construction industry, even if those doing so do not always identify it as PtD. The surveys also suggested materials and methods that could increase adoption of PtD, such as case studies of successful implementation and communication outlets respondents follow. Given that there are already many resources that show how to employ PtD and case studies showing how it has been used in the U.S., the findings in this report suggest that efforts to increase adoption may have the greatest impact if they focus on outreach: that is, highlighting for people across the industry the benefits of PtD through trusted outlets.

References

Almaskati, D., Kermanshachi, S., Pamidimukkala, A., Loganathan, K., and Yin, Z. (2024). A Review on Construction Safety: Hazards, Mitigation Strategies, and Impacted Sectors. Open Initiatives Grant Funded Publications. https://mavmatrix.uta.edu/utalibraries_openinitiativespubs/18.

Choi, S. and Borchardt, J. (2022, October 6-7). Review of Comparisons of Prevention through Design (PtD) Approaches Between UK vs US Construction Sectors. Proceedings of the 11th Annual World Conference of the Society for Industrial and Systems Engineering, 2022 SISE Virtual Conference. https://www.ieworldconference.org/content/SISE2022/Papers/14-Choi1.pdf.

CPWR–The Center for Construction Research and Training. (2025). Fatal and Nonfatal Injuries by Industrial Country [dashboard]. https://www.cpwr.com/research/data-center/the-construction-chart-book/interactive-7th/injuries-illnesses-health/fatal-and-nonfatal-injuries-by-industrial-country/.

CPWR–The Center for Construction Research and Training. (2025). Fatal and Nonfatal Injuries in Construction [dashboard]. https://www.cpwr.com/research/data-center/the-construction-chart-book/interactive-7th/injuries-illnesses-health/fatal-and-nonfatal-injuries/.

Gambatese, J., Gibb, A., Brace, C., Tymvios, N. (2019.) Motivation for Prevention Through Design: Experiential Perspectives and Practice. Practice Periodical on Structural Design and Construction. https://hdl.handle.net/2134/27320.

Hinze, J., Hallowell, M., Baud, K. (2013, October). Construction-Safety Best Practices and Relationships to Safety Performance. Journal of Construction Engineering and Management.

https://doi.org/10.1061/(ASCE)CO.1943-7862.00007.

NIOSH. (n.d.) Prevention Through Design. https://www.cdc.gov/niosh/ptd/about/index.html.

Pothula, P., Mehrabi, D., Grau, D., Din, Z., Gibson, G. (2024.) Education, Training, & Legislation – Where do we go from here? Prevention through Design Workshop. https://ptd.engineering.asu.edu/wp-content/uploads/sites/60/2025/01/2024-Prevention-through-Design-Technical-Report-5_.pdf.

Schulte P., Rinehart R., Okun A., Geraci C., Heidel D. (2008). National prevention through design (PtD) initiative. J Safety Res 115–121. https://doi.org/10.1016/j.jsr.2008.02.021.

Toole, T., P.E. Gambatese, J., Abowitz, D. (2012.) Owners' Role in Facilitating Designing for Construction Safety. CPWR Small Study. https://www.cpwr.com/wp-content/uploads/publications/publications_Owners_Role_in_Facilitating_DfCS_Report.pdf.