

DESIGN-BUILD STATE OF PRACTICE

RECOMMENDATIONS
FOR AGENCIES AND
INDUSTRY ON EFFECTIVE
PROJECT DELIVERY

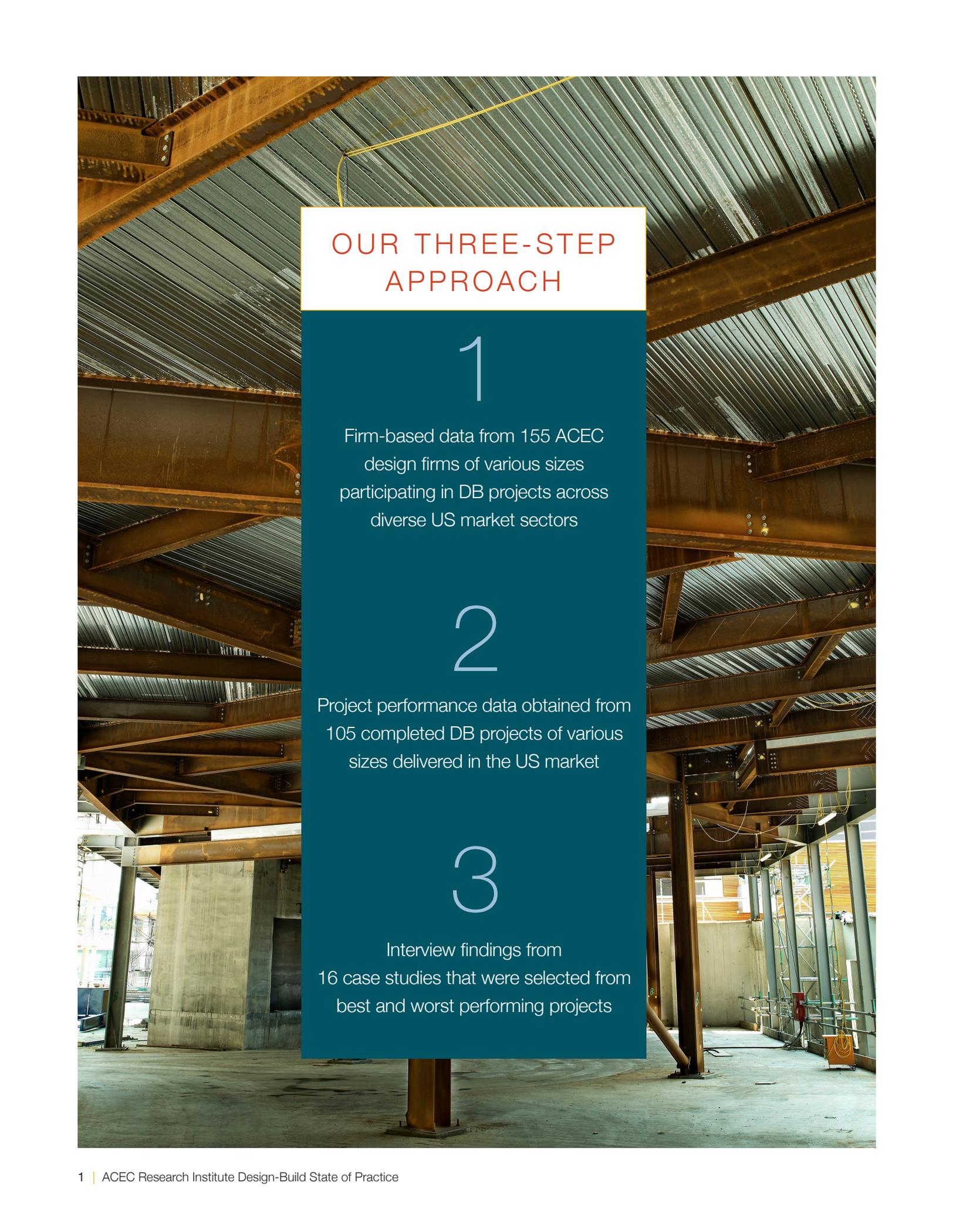
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 **ACEC** RESEARCH
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OUR THREE-STEP APPROACH

1

Firm-based data from 155 ACEC design firms of various sizes participating in DB projects across diverse US market sectors

2

Project performance data obtained from 105 completed DB projects of various sizes delivered in the US market

3

Interview findings from 16 case studies that were selected from best and worst performing projects

EXECUTIVE SUMMARY

This landmark study examines Design-Build (DB) project delivery and challenges which impact the success and harmony of the DB team and could ultimately affect the success of the project. The report highlights recommendations for engineering firms participating on DB teams, as well as owners around issues such as risk transfer, insurance requirements, and relationship building among designers, constructors, and owners to promote project harmony.

The ACEC Research Institute study—carried out in partnership with the University of Colorado—is based on a three-step approach: (1) firm-based data from 155 ACEC design firms of various sizes participating in DB projects across diverse US market sectors; (2) project performance data obtained from 105 completed DB projects of various sizes delivered in the US market; and (3) interview findings from 16 case studies that were selected from best and worst performing projects.

The data that resulted highlighted both challenges and opportunities that owners and DB team members should consider in the context of successful project delivery.

This study found that DB project volume and construction dollar values have grown over the past five years. This growth contrasts with a preference on the part of

most engineering firms sampled for traditional delivery systems such as Design-Bid-Build (DBB) and newer forms of integrated delivery such as Progressive Design-Build (PDB). Overall, experiences with DB show a tale of two extremes with respect to project harmony and success. Many firms working on smaller DB projects reported excellent or near excellent results, highlighted by a strong DB team relationship with properly balanced risk exposure. However, the data from larger projects brought to light a clear imbalance in risk transfer practices as evidenced by claims, disputes, litigation, liability gaps and surging insurance costs. These issues are particularly evident in the infrastructure sector, where large firms and the data from large projects highlight serious areas of concern regarding their experience with claims, disputes, litigation and profitability.¹

¹ Large projects are defined as those with actual costs over one hundred million dollars.

Recommendations for Owners to Enhance DB Project Performance

RISK TRANSFER: Owners should select appropriate projects for the DB delivery method. Some projects should be split into smaller pieces to avoid creating mega projects that require the formation of teams that can lack relationships, trust, and pre-existing harmony. Owners should avoid transferring outsized, inequitable risks such as upfront investigations, differing site conditions, unforeseen utility relocations, third-party approvals including environmental reviews and securing environmental permits, easement, and right of way negotiations. Projects would be executed more smoothly by an upfront execution of these tasks in a distinct contract. Owner-driven changes should be followed by payment of variations to the initial scope.

CONTRACT REVIEW: Owners should use and rely on contract templates that have worked well in the past, for DB projects specifically. Contract or specification variances must be highlighted when these differ from standards used previously by the same owner.

INSURANCE: Owners should actively discuss insurance requirements with potential design-builders. As the owner pays for project insurance—whether directly through OCIP or indirectly through PLIs and PSPLs—open dialogues are in the owner's best interest. Owners of best performing projects understood this well.

OWNER'S PROTECTIVE PROFESSIONAL INDEMNITY (OPPI): This type of insurance would enable risks and insurance policy costs to be more equitably distributed among the DB team parties, ensuring that DB will continue to be available to owners as a viable delivery method in the future.

PARTNERSHIPS AND PROJECT APPROACH: As DB requires a specialized set of skills in managing the contracts from the conception of the project, owners are encouraged to have unique DB programs or approaches, separate and distinct from DBB or other project delivery methods. Owners successfully implementing DB have well-integrated teams who are educated in DB, and the differences between DB and DBB, including seamless integration between their operation and maintenance teams, effectively engaging in early design decisions, during pursuit and after award, as questions arise.

Recommendations to the DB Team

RISK TRANSFER: Design firms, along with other DB project partners, should strive to engage with the owner on risk transfer decisions early in the project development process. The ability to engage early with the owner should be a major factor in risk review and form an important component of the ultimate project Go/No-Go decision.

CONTRACT RISK REVIEW: Design firms should engage in rigorous contract risk reviews when choosing to participate in a DB project and make informed Go/No-Go decisions. Existing relationships (or lack thereof) should be a major consideration in pursuing projects. Additionally, firms should evaluate any LOL gaps or exposures, particularly on larger projects where the data indicates the risk of claims, disputes, or litigation rises dramatically.

INSURANCE: Design firms should consider setting a firm policy to participate in DB projects based on a rigorous review and evaluation of risk transfer and subsequent contractual flow-downs. Onerous risk transfer can create insurance requirements that will strain or potentially engulf a firm's Professional Liability Insurance (PLI) limitations and put the firm's longevity at risk.

PROJECT-SPECIFIC PROFESSIONAL LIABILITY (PSPL) POLICIES: On larger, high-risk projects, firms should have candid discussions with owners, contractors, and subs to discuss the value and applicability of Project-Specific Professional Liability (PSPL) policy. In addition, firms should consult with their brokers regarding the availability and cost of a PSPL policy. Because these policies can be increasingly difficult to obtain and expensive—thus cost prohibitive in low-bid environments (particularly for smaller DB projects)—other measures should also be explored to equitably address risk as described in this report. While this strategy could be viable to large firms, however, small and medium-size firms have fewer strategic options to maneuver. Therefore, education to owners regarding these implications of imbalanced risk transfer and inability to insure become central to leading to future success. As the industry continues to address these challenges, the use of PSPL policies could become more viable than at present.

LONG-TERM PARTNERSHIPS: Design firms should seek to create long-term partnerships with other DB team members to improve risk transfer and project harmony. Design firms should cautiously consider participating on large mega projects where, due to sheer size, the use of one-time project joint ventures are formed with limited existing relationships and trust at the onset of the project.

Project performance data obtained from the 105 completed DB projects generally substantiates the previous tables from the firm survey. Project data generally show that imbalanced

risk transfer, insurance practices, and project harmony in DB present challenges to the DB team.

Ultimately, caution should be adopted when interpreting these results: one large project experiencing significant losses and conflicts could disproportionately offset multiple projects with positive performance. This highlights the negative effect that large projects are having on project participants. Implementing appropriate risk transfer on these larger projects becomes fundamental not only to society at large but also to the DB teams and professionals that deliver them.

DB Opportunities Related by ACEC Firms

MARKET GROWTH	84% reported increase in both DB volume and dollar value over the last five years. This trend is coupled with most firms preferring DBB (78%) and Progressive Design-Build (65%) over DB. This dichotomous project delivery preference is connected to the “DB challenges and hidden costs” listed below.
SATISFACTION	Approximately half of all firms, the majority of which were smaller, reported excellent or near excellent satisfaction, versus 25% who reported poor or near poor satisfaction. This drops drastically for large firms ² and the infrastructure and vertical sectors.
DB CONTINUED RELATIONSHIPS	64% reported excellent or near excellent results with recurring DB teams. Relying on DB continued relationships contextually explains how firms reduce significant risk exposure in DB through trusted alliances and partnerships. Whereas this key teaming factor may help to address unbalanced transferred risks in some DB projects, large projects with joint ventures effectively lack this alternative, exacerbating risk exposure on large infrastructure and vertical projects, particularly mega projects.

DB Challenges and Hidden Costs Related by ACEC Firms

PROFITABILITY	36% reported poor or near poor profitability. Since DB participation raises the risk profile for firms involved, higher risk-taking does not seem to be appropriately rewarded by commensurate profits.
RISK TRANSFER	59% reported contract risk allocation is inappropriate and unbalanced. These results demand wider industry awareness, education and training, and policy changes with owners through advocacy, to benefit all project participants for the long term.
INSURANCE	70% reported widespread presence of uninsurable language in DB subcontracts. 50% reported increasing costs on Professional Liability Insurance (PLI) as Project-Specific Professional Liability (PSPL) has become uncommon in DB.
HARMONY	35% of DB projects experienced claims, disputes, and/or litigation, while the majority (56%) of large projects experienced claims, disputes, and/or litigation. Small firms’ experiences are better than large and medium-size firms, due to better overall results of smaller projects for all firms.

² Small firms are characterized as having less than 20 employees, medium-size firms between 20 and 200, and large firms greater than 200 employees.

INTRODUCTION

Background and Research Motivation

The goal of this study is to identify unique design-build (DB) challenges and their impacts to effective project delivery. This report focuses on DB team³ impacts. It explores important issues for the industry such as profitability and satisfaction, risk transfer and insurance, and project harmony.⁴ From the standpoint of public agencies and other project owners, these issues impact project success, and the report identifies key recommendations for owners to attract and keep the good DB teams needed to deliver projects to the public effectively. This first-of-a-kind ACEC Research Institute study is based on a three-step approach: (1) firm-based data from 155 ACEC design firms of various sizes participating in DB projects across diverse US market sectors; (2) project performance data obtained from 105 completed DB projects of various sizes delivered in the US market; and (3) interview findings from 16 case studies that were selected from best and worst performing projects.

In this ACEC Research Institute's DB publication, the results emerge from an exhaustive DB exploration conducted at the firm level and a comprehensive examination of said completed DB projects. The units of analysis are both ACEC design firms' overall experience with DB and completed DB projects. The report's main contribution is the identification of key trends and empirical conclusions focused on owner risk management practices and engineering firms' required response. The trends and empirical analysis show that firms, especially those on large infrastructure projects have experienced claims, disputes, litigation, and uninsurable risk issues with DB over the last five years. The experience of the DB industry is reflected through the project-based results, which largely support the firm-based results. The representative case studies illustrate how best practices and well-informed DB implementation lead to strong team and project performance.

Research Approach

This research is based upon existing literature, in-depth interviews, and two industry questionnaires focused on firm experiences as well as specific project outcomes, distributed throughout the DB market, primarily including the ACEC membership and Design-Build Institute of America (DBIA) member companies. Novel DB metrics were identified through an independent literature review, confirmed through interviews with selected ACEC medium to large design firm executives, and supported by a different group of executives from the largest design companies in the US. This methodology formed the basis for developing two questionnaires, one firm-based and the other project-based. The firm-based questionnaire was sent to a wide-ranging set of ACEC member companies, ultimately collecting 155 valid firm-based responses. The project-based questionnaire was later distributed to the ACEC and DBIA memberships⁵, ultimately collecting 105 valid project responses. Finally, case studies were methodically selected from the top and bottom quartiles of project-based responses, ultimately conducting 16 empirical inquiries with targeted senior project personnel, who had firsthand project knowledge and an average of 15 years of DB experience.

The results shown in the subsequent charts specify the number of responses (n) received for any given questions and research variables. The analysis involves the use of descriptive statistics by first aggregating all responses to identify major trends, and later by segregating the data by firm size and market sectors to identify sub-trends. Market sectors were grouped into: (1) infrastructure, which includes transportation and water/wastewater; (2) buildings, which includes all building types; and (3) hybrid, which includes industrial and technology. The population demographics for the firm- and project-based results, as well as the case studies, are discussed in detail in the next section.

³ The internal DB team is primarily the team made up of prime design-builder and lead A/E consultant, but it may also include A/E subconsultants and construction subcontractors based on project size.

⁴ Project harmony is defined in this study as the absence of claims, disputes, and litigation, or otherwise any adverse legal conditions that notably strain project relationships among the DB team.

⁵ Including DBIA helped to broaden the response rate and identify more DB projects

The background of the entire page is a photograph of numerous large, black, corrugated pipes stacked in a way that their circular openings are visible, creating a grid-like pattern of dark circles. The pipes are stacked on wooden pallets, and some have handwritten markings on them. The lighting is bright, suggesting an outdoor or well-lit industrial setting.

MARKET SECTORS

1

INFRASTRUCTURE

includes transportation
and water/wastewater

2

BUILDINGS

includes all building types

3

HYBRID

includes industrial
and technology

STUDY POPULATION

Firm-Based Demographics

Table 1 shows the descriptive statistics on firm sizes. Small firms were characterized as those having less than 20 employees, medium-size firms as having between 20 and 200, and large firms as having greater than 200 employees. Table 2 shows the descriptive statistics on market sectors.

Project Demographics

The project population in this study is diverse, effectively encompassing various DB contractual involvements, market sectors, project sizes, organizational arrangements, and project types. Questionnaire participation, however, largely came from A/E firms and infrastructure projects, primarily in the transportation sector (Figure 1).

FIRM SIZES	SAMPLING (N)	% OF THE SAMPLING	FIRM SIZE DESCRIPTION
SMALL	41	27%	Number of Employees <= 20
MEDIUM	61	39%	Number of Employees >20, <=200
LARGE	53	34%	Number of Employees >200 ⁶
	155	100%	

Table 1. Number of firm-based responses by firm size.

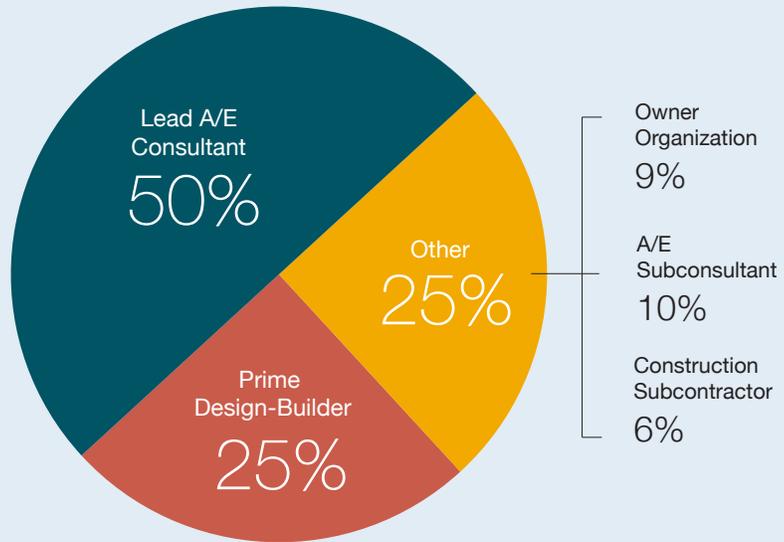
SECTOR	SAMPLING (N)	% OF THE SAMPLING	SECTOR DESCRIPTION
INFRASTRUCTURE	82	55%	Transportation and water/wastewater
BUILDINGS	45	30%	All building types
HYBRID	23	15%	Industrial and technology
	150	100%	

Table 2. Number of firm-based responses by market sector.

⁶ The size of 200 employees was chosen for large firms to maintain similar sample sizes with small and medium firms. There is a wide range of large firms in the study population with 16 firms having more than 1,000 employees and the largest firms representing approximately 50,000 employees.

Role Project Questionnaire Respondent

(n = 105)



Project Questionnaire Market Sectors

(n = 105)

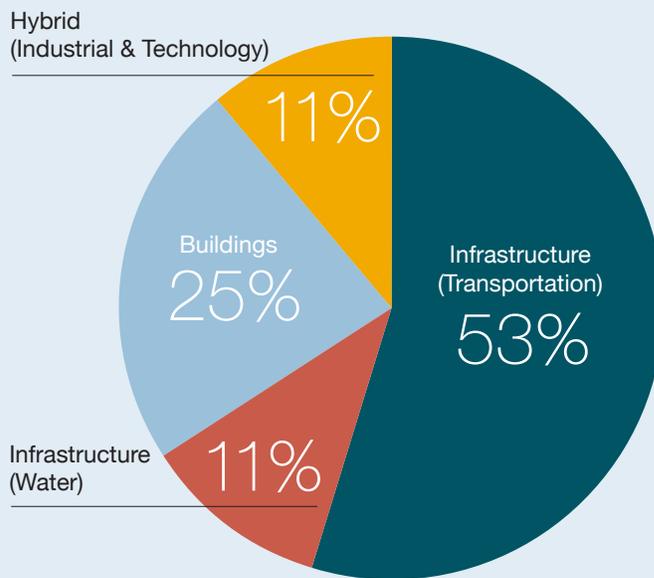


Figure 1. Project-based contractual involvement and market sector breakdown for all valid project responses included in this study.

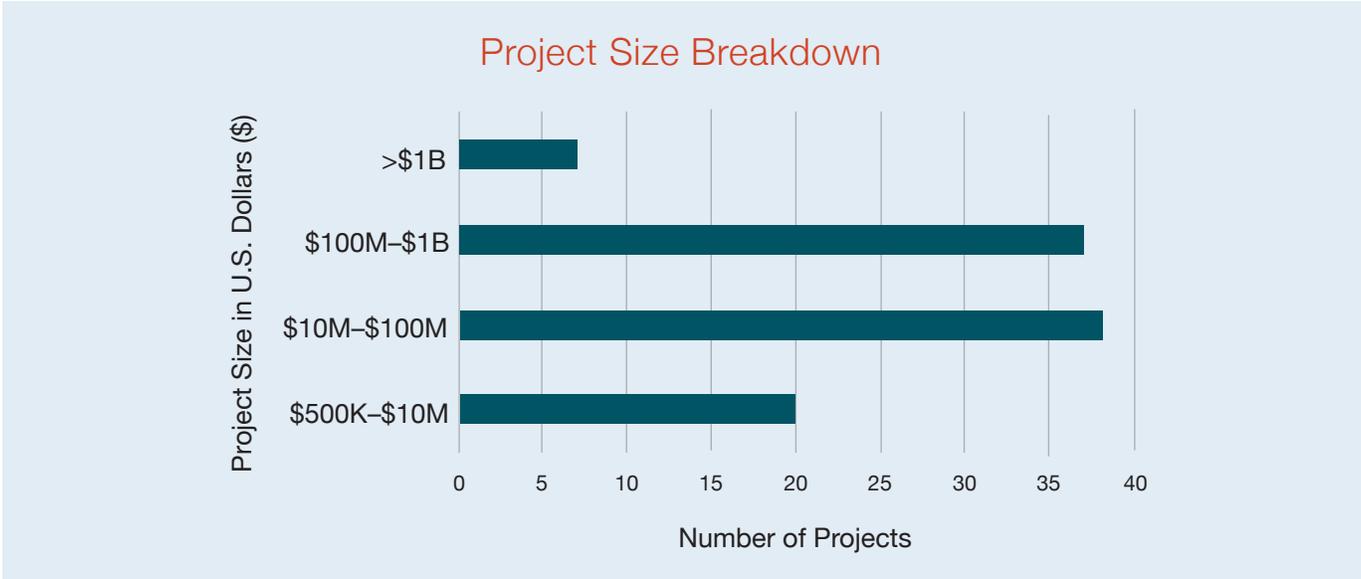


Figure 2. Project size distribution for valid project responses included in this study.

Projects varied in size from \$500,000 to \$3,900,000,000. Figure 2 above shows the project size distribution.

The data sample also includes projects with varying degrees of new construction (greenfield), refurbishment/renovation/retrofit, and maintenance, with new construction accounting for the largest proportion. Eighty-four percent (84%) of the projects were delivered to public-sector owners and the remaining 16 percent to private-sector owners. Lump sum contracting was the most prevalent contract type, while time and material (T&M—or hourly billing rates) was common for post design services.

Case Study Demographics

The case study population is representative of the various DB contractual involvements, market sectors, and project sizes. Interview participation, however, largely came from A/E firms and infrastructure projects, primarily in the transportation sector (Table 3). Nevertheless, observed best practices were found to be similar despite project demographics. This implies best practices and lessons can be applied to any market sector, project size, and contracting party.

CASE STUDY	MARKET SECTOR (N)	PROJECT SIZE (N)	CONTRACTING PARTY (N)
BEST PROJECTS	Infrastructure (Transportation): 6 Buildings: 2	<\$100M: 4 >\$100M: 4	Prime design-builder: 1 Lead A/E consultant: 6 A/E subconsultant: 1
WORST PROJECTS	Infrastructure (Transportation): 5 Infrastructure (Water): 1 Buildings: 1 Hybrid: 1	<\$100M: 3 >\$100M: 5	Prime design-builder: 1 Lead A/E consultant: 5 A/E subconsultant: 1

Table 3. Case study demographics.

DISCUSSION OF RESULTS AND SALIENT DB ISSUES

DB Growth and Participation

The number of DB projects and their dollar value have been increasing over the past five years. Figure 3 shows the results aggregated from all firm sizes and for all market sectors. These same results emerge for the infrastructure sector. When responses are grouped by large firms and the building sector, the respective DB growth increases to 92 percent and 94 percent for number of DB projects and DB dollar value.

These market findings are striking when viewed in combination with firms' preferences of project delivery method⁷ use (Figure 4). ACEC firms largely prefer Design-Bid-Build (DBB) or other integrated forms of delivery—such as Progressive Design-Build (PDB) and Integrated Project Delivery (IPD)—over DB. Preference for Construction Management/General Contractor (CM/GC) is on par with DB.

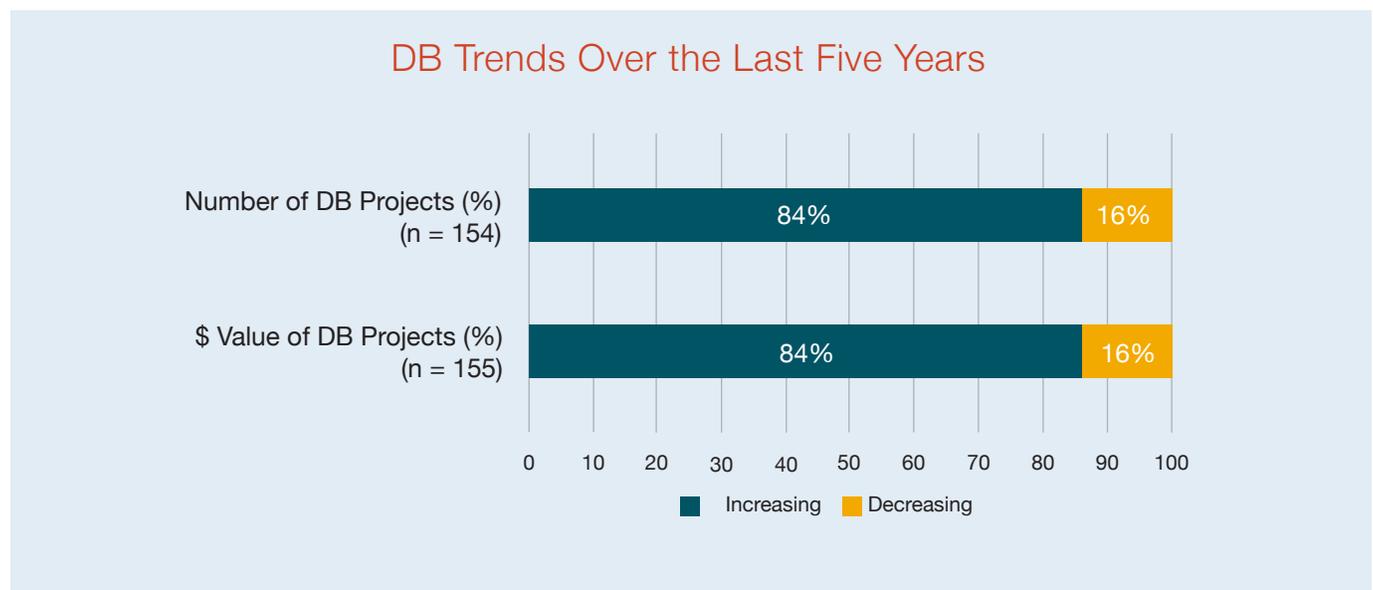


Figure 3. Firm-based responses by all firm sizes and for all market sectors on DB growth over the last five years.

⁷For a list of definitions on industry terms used throughout this report, including these project delivery methods, refer to Appendix I.

ACEC Firm Project Delivery Methods Preferences

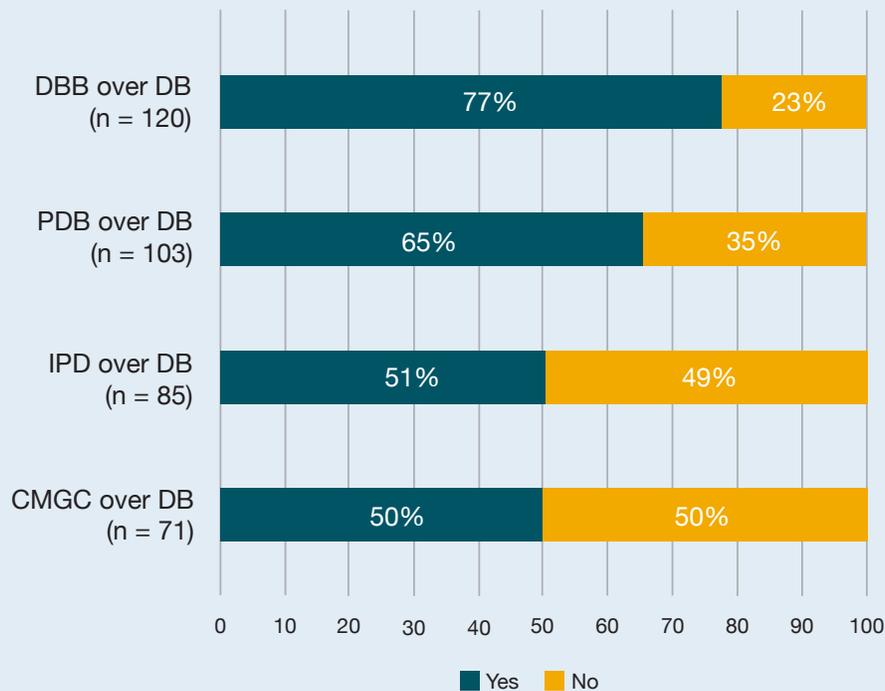


Figure 4. Firm-based responses by all firm sizes and for all market sectors on Project Delivery Methods Preferred over DB. DBB: Design-Bid-Build. PDB: Progressive Design-Build. IPD: Integrated Project Delivery. CMGC: Construction Management/General Contractor.

DB Outcomes and Satisfaction

Overall experiences with DB show a tale of two extremes on profitability and satisfaction. Figure 5 illustrates four key DB outcomes, which are grouped into three components and described next: (1) Experience with profitability and financial success; (2) DB satisfaction; and (3) DB repeat business and continued team relationships.

EXPERIENCE WITH PROFITABILITY AND FINANCIAL SUCCESS

Over one third of firm-based respondents stated their overall experience with profitability is poor or close to poor. Nearly one fourth stated their experience is neutral. In contrast, more respondents stated they have achieved a better than neutral financial success (Figure 5). To understand this dichotomy, it is important to note that a firm may achieve minimal financial success (e.g., “break even”) while not necessarily improving its profitability position with DB projects.

As DB participation raises the risk profile for firms involved, higher risk-taking does not appear to be appropriately rewarded by commensurate profits.

Case study comparisons of best and worst performing projects revealed that DB teams define their profitability targets based on the inherent project risk profile and competitiveness during project pursuit. Best performing projects exceeded their original targets—mostly because key project risks were equitably shared among the DB team or not realized at all. Some companies in both the best and worst performing groups targeted higher margins than are typical in other project delivery methods, like DBB. Case study participants said that they did this to compensate for the added risk profile; however, not all DB teams—regardless of whether they were part of the best or worst performing group—adjusted profitability targets to account for the elevated risk profiles. In effect, close

to half the companies in both groups targeted typical industry margins despite the risk disparity, which could result in more risk without commensurate reward.

In summary, this study noted key factors driving excellent profitability as follows:

- › Close-knit DB team synergies and trusted team relationships dating many years, including the entire team's understanding and familiarity with DB processes, either internally set by the DB team or externally set by the owner, or both.
- › Equitable contract negotiation and risk allocation.
- › Owner team experience in DB implementation, including reliance on clear scopes/specifications and due diligence in responding to requests for approval or information. The top owners developed DB-specific internal processes, not simply making minor modifications to traditional DBB processes.
- › DB team awareness of and core ability to manage tangential risks and contract provisions that could not be removed during negotiations from the contracts.
- › A unique focus on delivering coordinated quality through strong team communication, collaboration, and trust.
- › DB team's reliance on self-performing most of the work as appropriate.
- › Timely payments even in the face of potentially difficult change negotiations.

By contrast, poor profitability consistently resulted from: (1) poor DB team dynamics and interactions, including poorly developed or absent teaming agreements; (2) oversized or unforeseen realized risks borne by the DB team; and (3) owner deficiencies in DB implementation, including owner team dynamics, technical misses, ambiguities in RFPs, bridging documents, scopes/specifications, non-specific DB protocols, and contract documents.

DB SATISFACTION

This qualitative question explored a high-level assessment of a firm's overall experience with DB projects. One fourth of firm-based respondents stated a poor or close to poor satisfaction with DB projects while nearly the same number stated neutral satisfaction. Approximately half of respondents (52 percent) stated excellent or close to excellent satisfaction with the delivery method (Figure 5). Taken in the context of firms' preference for DBB, this is a major change in satisfaction from other delivery methods.

Case study comparisons showed that excellent DB team satisfaction was defined by the following framework:

- › The high morale and commitment of all DB parties, including prime design-builder, lead A/E consultants, design subconsultants, subcontractors, and owners.
- › A unifying team culture that felt like one DB team only, regardless of whether contracting parties belonged to different companies.
- › Active DB team engagement at the same table with the owner.
- › Clear understanding of roles and responsibilities.
- › Clarity and completeness of owner's expectations regarding project requirements.
- › Effectively translating leadership goals down to all ranks of the DB team.
- › Establishing accountability and team ownership throughout all the ranks.
- › Working with highly qualified motivated people.
- › Developing flexibility, collaboration, and alignment to adapt to changing conditions.
- › Meeting the owner's and team's expectations, due to clear consistent goals.
- › Having all the entities of the project know that if there's a stressful time, the team can hit the "time-out button" and regroup.

As one best performing project participant put it, "if you can execute projects with teams that have that behavior, it's amazing what you can do. If anyone of the partners doesn't see it that way, it's amazing how disruptive that can be. We want to work with people we enjoy. Mistakes are going to happen. But if you have strong relationships joined by shared values, mutual understanding will lead to solutions." Best performing projects not only strengthened team relationships but also led to repeat business.

By contrast, worst performing projects failed to develop satisfying team characteristics, thus leading to relationship hiatuses after project close-out, and disrupted or no future business opportunities together.

DB REPEAT BUSINESS AND CONTINUED TEAM RELATIONSHIPS

Almost two thirds of firm-based respondents stated this is excellent or close to excellent. Given the DB risk transfer imbalance to be detailed in the next subsection, this finding contextually explains how firms are choosing to reduce risk exposure, as trusted relationships and team cohesion are associated with better project results. However, continued team relationships are more likely found on small to mid-sized projects, not on infrastructure mega-projects that have unique teams such as joint ventures formed for these and have resulted in less financial rewards and substantially higher negative outcomes for the larger design firms as outlined in this study.

Case study comparisons showed that continued team relationships are the cornerstone to delivering successful DB projects. These relationships benefit from strong network effects that generate DB repeat business. Team relationships on best performing projects were referred to as central to improving profitability and satisfaction, risk transfer and insurability, and excellent project harmony. These teams were transparent and sat with the owner at the same table. Owners would be advised to make continued relationships an element of the selection process.

“As designers, we select contractors and teams that exhibit partnership behaviors, and not look at other members as commodities. We proactively research prospective teams that we have not worked with. We graciously put great effort into relationships that treat us as partners. This is what helps solve any kind of problem that may arise. Project harmony and satisfaction hinges on the personalities, and how people view each other within the team, cooperating to solve anything.”

By contrast, a significant number of worst performing projects had DB teams with unproven track relationships, changing key members throughout the project, and at least one team displayed disruptive, self-centered behaviors.

For the best performing projects, cost and schedule performance varied significantly. Projects delivered on or under budget, and on or ahead of schedule intuitively earned the owner and DB team satisfaction. However, cost and schedule growth were counter-intuitively also noted in best performing case studies. On these, owner’s directed changes or unforeseen conditions were attributed as the root causes. Crucially, however, the owner acknowledged the differing conditions and duly compensated cost and schedule variances as appropriate. In all these cases, because owners were reasonable to understand the root causes of the changes,

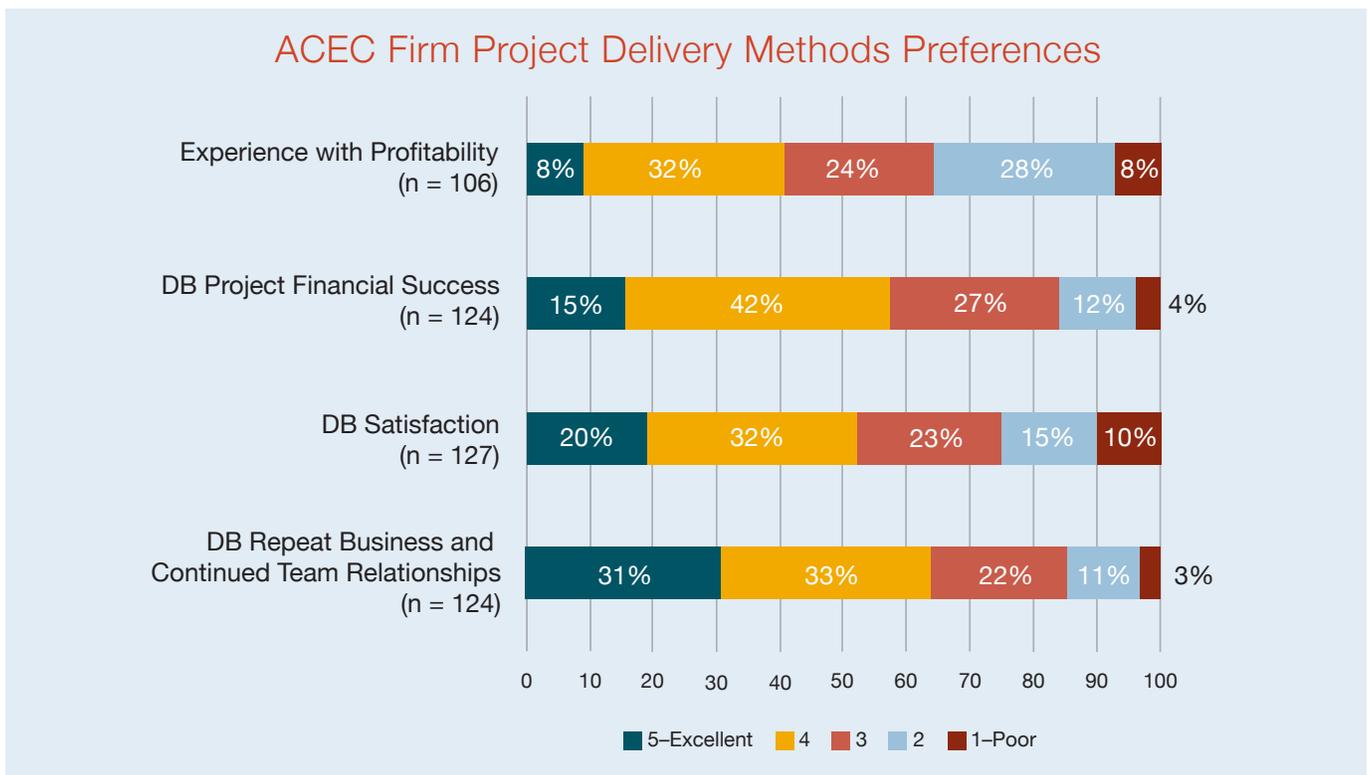


Figure 5. Firm-based responses by all firm sizes and for all market sectors on DB outcomes and satisfaction.

“ As designers, we select contractors and teams that exhibit partnership behaviors, and not look at other members as commodities.

We proactively research prospective teams that we have not worked with. We graciously put great effort into relationships that treat us as partners. This is what helps solve any kind of problem that may arise.

Project harmony and satisfaction hinges on the personalities, and how people view each other within the team, cooperating to solve anything. ”



project performance was not construed negatively through the lens of cost/schedule performance and did not affect the owner and DB team satisfaction. Such flexibility and openness enhanced success on the best performing projects. On the worst performing projects, however, cost and schedule adherence were noted in some case studies, and this alone did not lead to team satisfaction. One scenario is that DB teams absorbed costs, risk, and pressure to get to cost and schedule adherence.

This study found that cost and schedule performance metrics are only of relative importance to realizing satisfaction. For some projects, schedule is a stronger driver to satisfaction than cost is, and the inverse may also be true depending on the owner's specific project needs. While owner and DB team satisfaction did not always correlate with meeting schedule and budget targets, these indicators of project success occurred more frequently in best performing projects. Meeting key schedule milestones, in particular, leads to owner satisfaction with DB even if the overall schedule prolongs.

DB Risk Transfer: Concerning Practices

This section discusses the results pertaining to the state of the practice for: (1) DB risk transfer, (2) DB contract reviews, and (3) DB insurance. The results surfaced as an area in need of significant improvement for ACEC firms participating in DB project delivery.

DB RISK TRANSFER: STATE OF THE PRACTICE

Risk transfer practices in DB are showing very clear evidence of imbalance. Owner contract risk transfer is resulting in four negative risk allocation outcomes: (1) *Inappropriate and difficult risks for the DB team to manage*; (2) *pressure for higher contingencies (held at the contractor level) included at the time of proposal*; (3) *insufficient contingencies ultimately included due to proposals scored more heavily on price*; and (4) *inappropriate construction warranty provisions and uninsurable contract language flowed down to design partners*. Figure 6 illustrates the distribution of risk transfer responses from all firm sizes and market sectors.

1. *Inappropriate and difficult risks for the DB team to manage*: Most firm-based respondents say this occurs very frequently or commonly. Since DB participation raises the risk profile for firms involved, this appears to result in higher risk-taking that does not appear to be rewarded overall by commensurate profits. The project-based examination confirmed that 43 percent of the projects (n = 99) agreed that owner contract risk allocation resulted in inappropriate and

difficult risks for the DB team to manage. This is interpreted as an overall negative input to DB projects. Responses to this question were consistent with the inverse statement “DB contracts reasonably allocated risks to the party best able to manage” (to ensure that any given statement does not induce biases, the researchers created internal validations such as this one throughout the questionnaire).

2. *Higher contingencies included at the time of proposal:* Most firm-based respondents say this is very frequently or commonly occurring when compared to other project delivery methods in which the owner directly contracts with the design firms. Owners will need to see significant cost and time efficiencies to offset these higher contingencies to benefit from DB. There is also an opportunity for owners to change risk transfer practices and reduce these contingencies.
3. *Insufficient contingencies added despite known unbalanced risks, due to competitiveness during DB proposal:* Two thirds of firm-based respondents say this is very frequently or commonly occurring. While this finding may at first seem

contradictory when read together with item 2 above, it simply means that the added DB risks are still not being sufficiently priced, even with higher contingencies, due to market pressures. This finding most likely relates to DB team practices, as well as owner risk transfer practices, that lead to risk profiles that cannot be accurately or adequately identified, mitigated, or priced. The project-based examination confirmed that 44 percent of the projects (n = 96) agreed that insufficient contingencies were included in the price proposal to account for owner’s contract risk transfer because of the need to be price competitive at the time of proposal. This would be a negative input to DB projects. This means that almost half of the DB participants may not have proper contingencies to address DB risks. In contrast, slightly over half of the projects included sufficient contingencies regardless of competitiveness in the marketplace.

4. *Owner contracts request DB warranties that do not distinguish between construction and design warranties, resulting in construction warranties and uninsurable language flowed down to design partners:* Most firms responding agree this occurs very frequently or commonly.

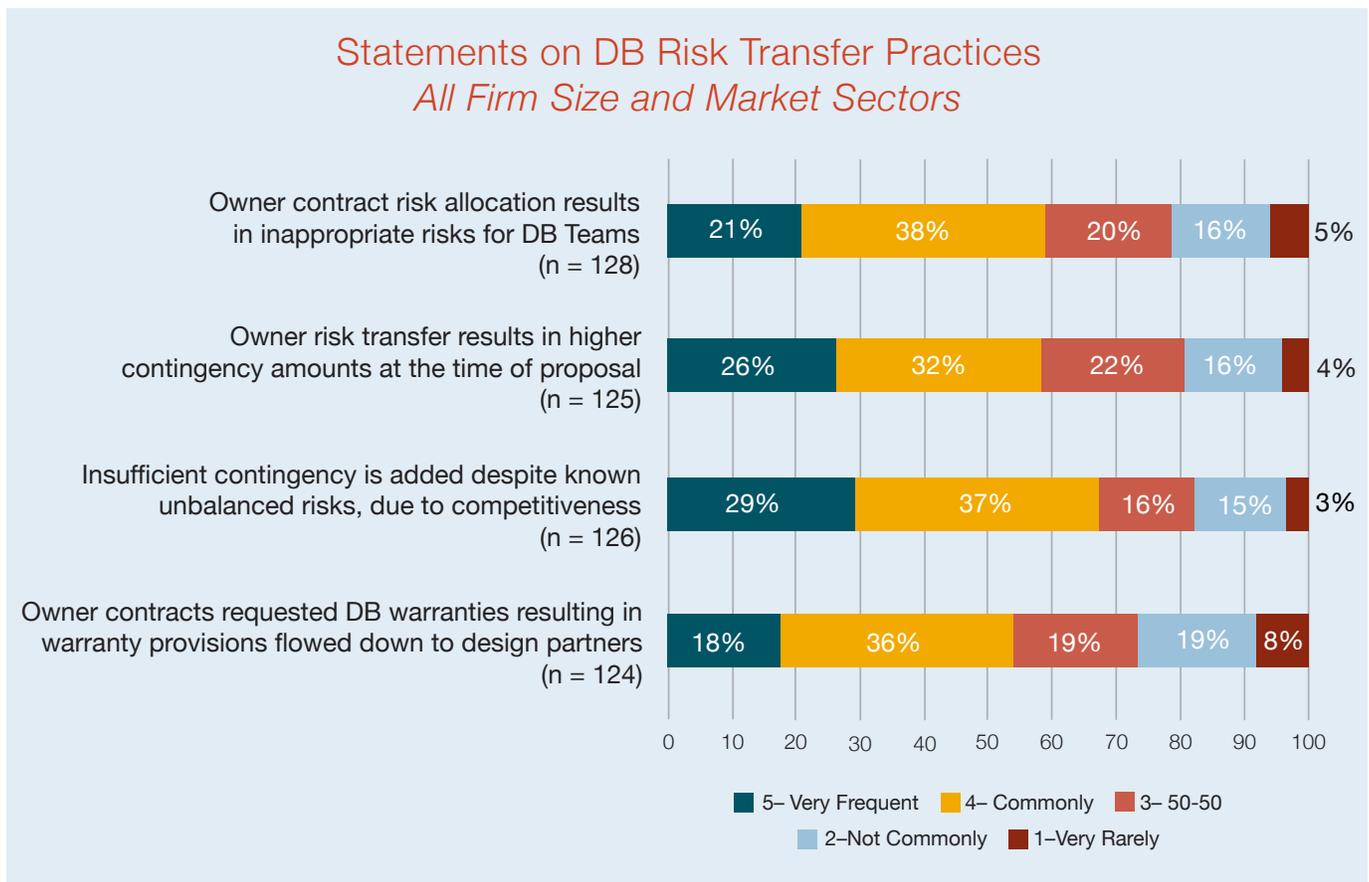


Figure 6. Firm-based responses by all firm sizes and for all market sectors on DB risk transfer practices.

It is important to note that this dynamic is not present in traditional DBB projects, because any construction warranties would be contracted separately (i.e., contractor specific provision) and not conflated within a DB contract. Sixty-four percent (64%) of the projects (n = 86) agreed that owner contracts requested warranties and did not distinguish between construction and design warranties, surely a negative trend, particularly for A/E consultants, who are experiencing elevated standards of care in DB since this would not be common in other project delivery methods.

In addition to the negative risk transfer outcomes identified above, over half (56 percent) of designers of completed projects (n = 78) disagreed that overall Limitations of Liability (LOL) were used to cap DB risks transferred through owner contracts, while 44 percent of the population agreed or somewhat agree that their DB contracts did have such caps (Figure 7).

This is relevant and negative for both lead design consultants and design subconsultants. DB participation raises the risk profile for companies involved—tangibly resulting in higher risk-taking. Therefore, projects without LOL could affect a company’s longevity by not capping project risks inequitably

borne by the DB team. Furthermore, *owner contracts rarely include provisions requiring design contracts to include limitations of liability (LOL) reductions from the prime DB contract to design subcontracts.* This undesirable dynamic results in designers incurring the identical amount of liability as the contractor, for typically approximately 10 percent to 15 percent of the potential profit. As this is relevant for both lead design consultants and design subconsultants, most firm-based respondents agree that LOL reductions occur very rarely or not commonly in DB. Figure 8 displays the distribution of all firm-based responses including all firm sizes and market sectors.

- This is concerning for design firms because, when contrasting a contractor’s budget to that of an engineering firm’s for addressing risks and liabilities, these results say that both parties may have the same LOL. For example, when the contractor has 10x the profit and 10x the insurance, and are flowing their risks down to the designer, accepting the flow-down risk could be putting the design firm’s future viability at stake.
- These results accentuate slightly with large firms and infrastructure projects (See Figures 9 and 10, respectively).

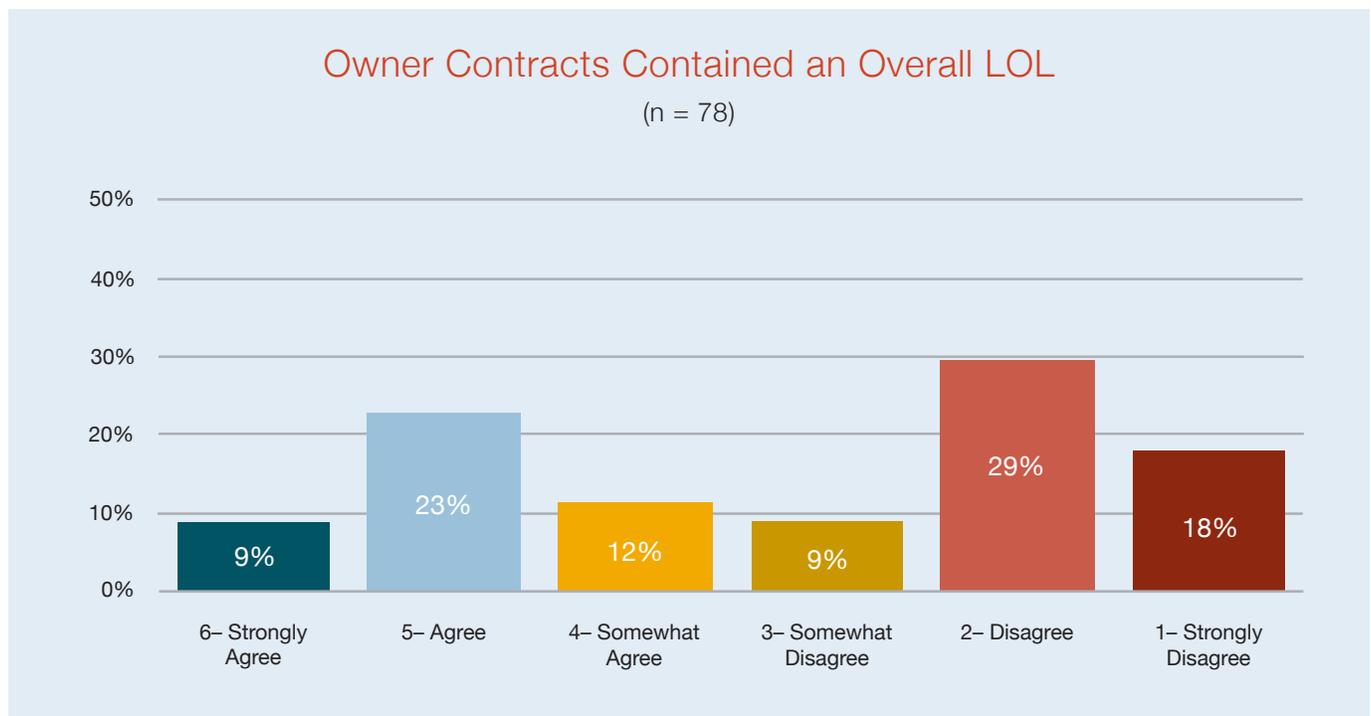


Figure 7. Project-based responses by all projects and for all market sectors on limitations of liability (LOL).

Owner Contracts Allow Flow-down LOL Reductions
from the Prime DB Contract to Design Subcontracts
All Firm Sizes and Market Sectors

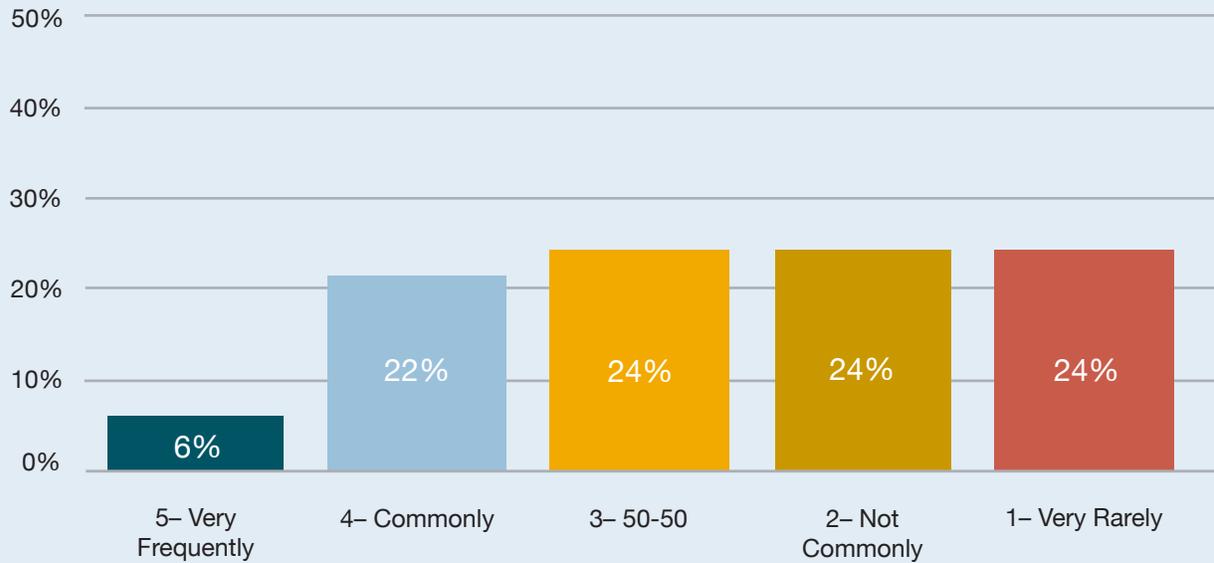


Figure 8. Firm-based responses by all firm sizes and for all market sectors on flow-down limitations of liability reductions from the prime DB contract to design subcontracts.

Owner Contracts Allow Flow-down LOL Reductions
from the Prime DB Contract to Design Subcontracts
Large Firms

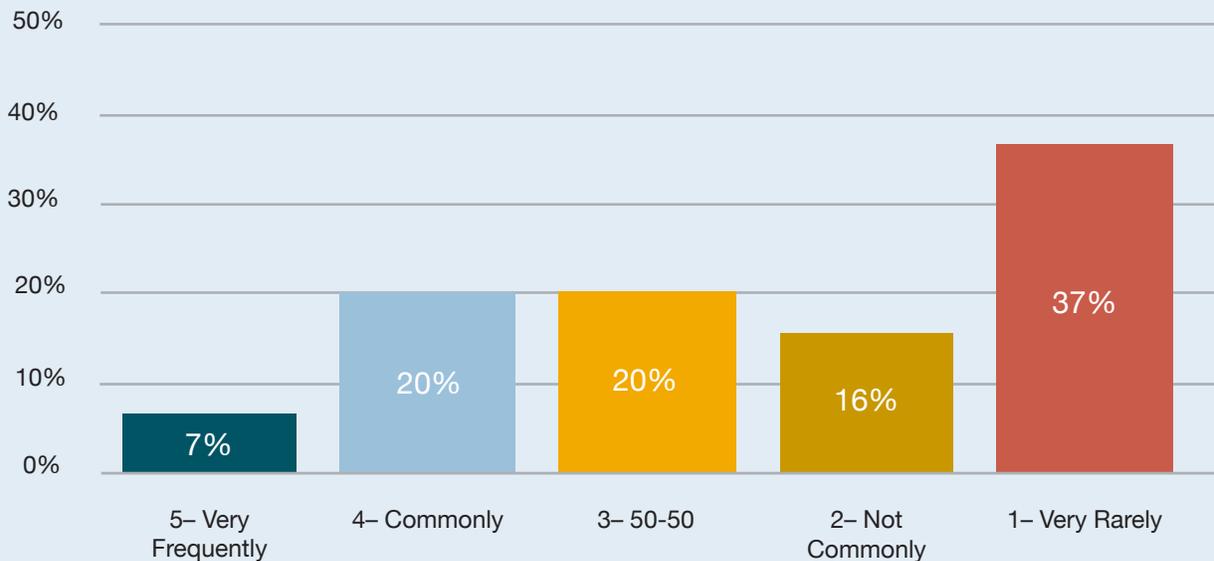


Figure 9. Firm-based responses by large firms on flow-down limitations of liability reductions from the prime DB contract to design subcontracts.

Owner Contracts Allow Flow-down LOL Reductions from the Prime DB Contract to Design Subcontracts
Infrastructure Sector

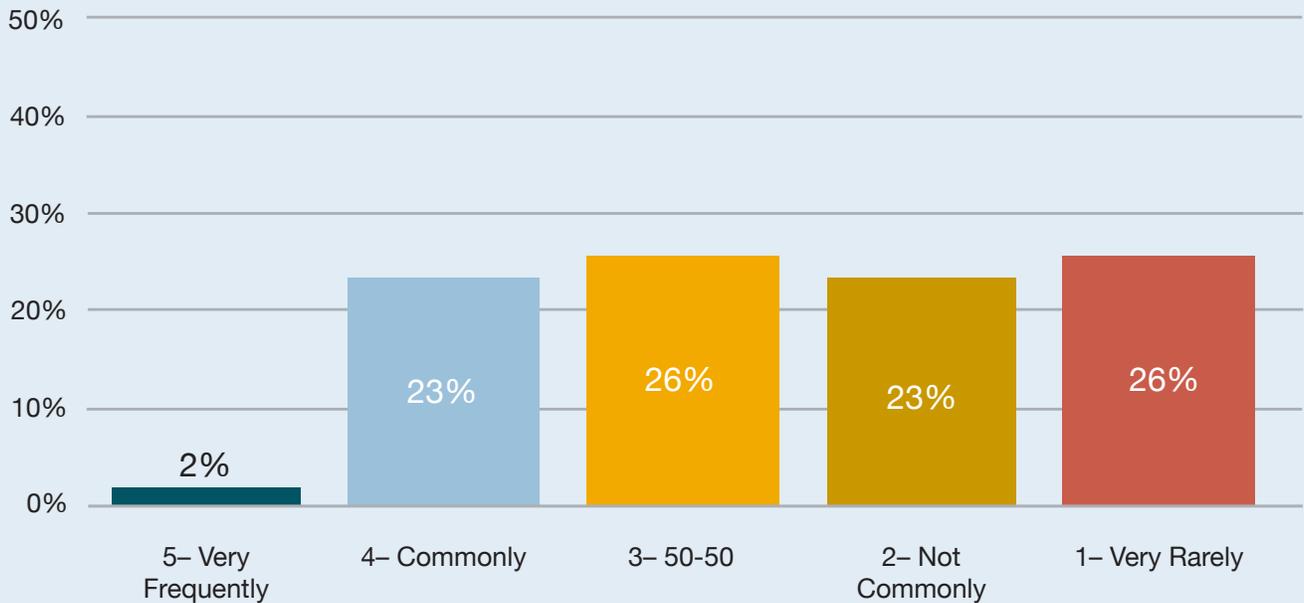


Figure 10. Firm-based responses from the infrastructure sector on flow-down limitations of liability reductions from the prime DB contract to design subcontracts.

Inequitable Flow-down Provisions were Transferred to A/E Subconsultant

(n = 95)

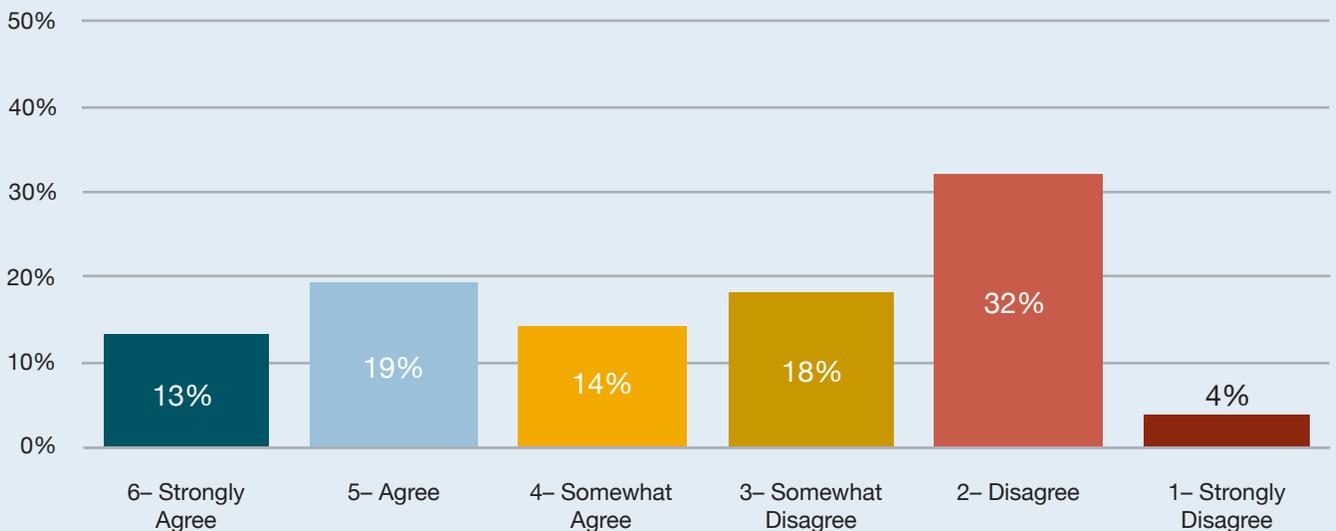


Figure 11. Firm-based responses from the infrastructure sector on flow-down limitations of liability reductions from the prime DB contract to design subcontracts.

Forty-six percent (46%) of projects (n = 95) agreed that inequitable flow-down provisions were transferred to A/E subconsultants (Figure 11). This would be a negative project input particularly for A/E consultants. Examples of such inequitable flow-down provisions include retainage lasting through the end of the project, inappropriate indemnity clauses, and liquidated damages that should not be applied to A/E consultants and their subconsultants, but which are more typical to construction contractors and their subcontractors.

The case study analysis juxtaposed risk allocation practices between best and worst performing projects. The results between the two groups are starkly different. When DB teams were asked to provide instances of inequitable risk allocation, including inappropriate flow-down provisions, elevated standard of care (SOC), and atypical risks that would not have been experienced if the project had been other than DB—the best performing group mostly answered they could not think of any, regardless of whether these risks might have come from

“Roughly 80 percent of the project questions that were ever going to arise were answered before the first shovel hit the ground.”

the owner or prime design-builder. In aggregate, best performing projects consistently had little exposure to inequitable risk allocation. In some cases, aspects of the owner master agreement may have been flowed down. However, these were reportedly not unmanageable or inappropriate for the best performing case studies.

Additionally, DB teams in the best performing projects negotiated open book among the team members to best allocate risk to the party best able to manage it. Furthermore, they fully understood the project risks and ensured proper prior documentation through comprehensive and unambiguous (1) risk registers, (2) teaming agreements that clearly shared profit and losses, and (3) all final contract documents.

As one team member stated, “DB teams must fully understand the owners’ master specs. Understand the owners’ operability and maintainability perspective, not just in documents but

in principle. Have operations and maintenance conversations very early, not towards the end. You’ve really got to know what you’re getting into; if you don’t read up and understand what the project is all about, you’re going to run into issues. What’s more, picking a partner that you’ve worked with before is key. If you haven’t worked with them before, understand who’s going to carry what risks if a claim is ever made. Grey is grey until it isn’t, at which point you must re-evaluate fairly and jointly as a team.”

The worst performing projects were consistently characterized by DB teams carrying inequitable risks such as differing site conditions, unforeseen utility relocations, third-party approvals including environmental reviews and securing environmental permits, easement and right of way negotiations, conducting upfront field investigations, and owner-driven changes followed by non-payment of variations from original scope. These risks mostly arose from deficient project knowledge, substandard DB implementation, poor RFPs and bridging documents, ambiguous upfront project requirements, or changing standards. In most of the worst performing projects, the owner played a key role in setting the leadership tone for such inequities. As a result, this study strongly urges owners to take ownership for this array of risks that typically pertain to them, and for which they are mostly suited to solve.

Notably, even typical risks can be heightened in DB due to lack of team integration, including the owner’s team. This includes operational and maintenance gaps in owner-project inputs and poor owner leadership, which can reflect in approval delays, added reviews, and lack of timeliness that are typical of DBB—but antithetical to DB—or not coordinating third-party contractors in adjacent areas affecting the contracted DB work. Characteristic team integration and collaboration in best performing project case studies, by contrast, resulted in reportedly positive impacts to all project successes. One respondent said about a complex project that “roughly 80 percent of the project questions that were ever going to arise were answered before the first shovel hit the ground.”

DB CONTRACT REVIEW: STATE OF THE PRACTICE

Design firms of different sizes are exhibiting dissimilar behaviors on internal DB contract review practices. On one end, large firms consistently involve legal experts, insurance carriers, and risk review committees before entering DB contracts; on the other end, small firms are quite irregularly doing this. Medium-size firms are in the middle of this spectrum. Figures 12 and 13 display the distribution of responses by large and small firms, respectively.

DB Contract Review Practices Large Firms

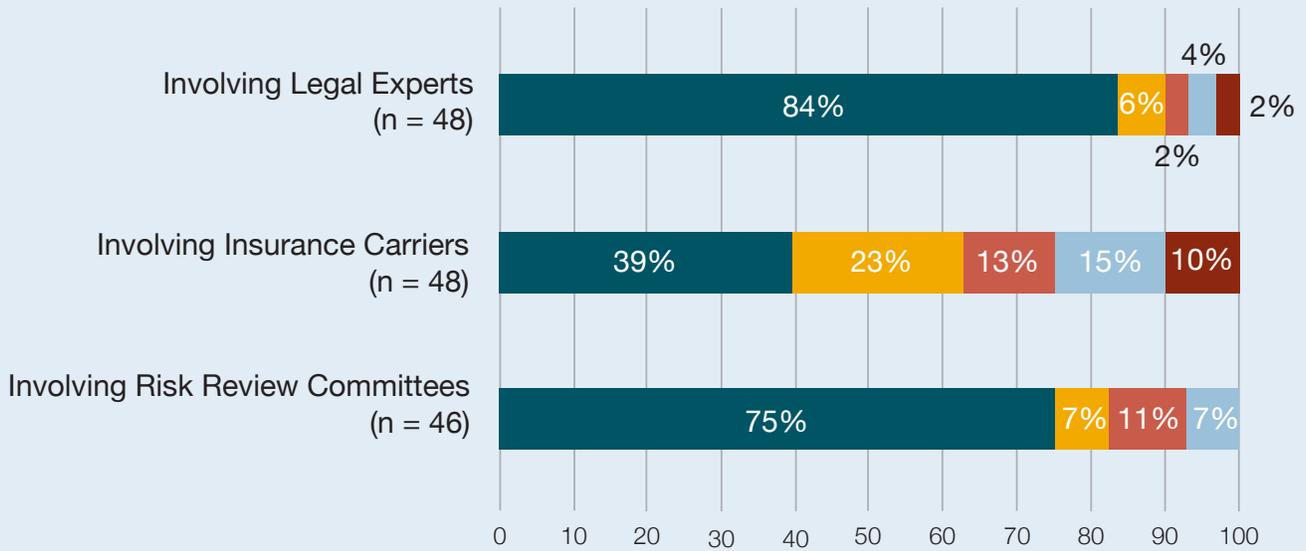


Figure 12. Firm-based responses by large firms on DB contract review practices.

DB Contract Review Practices Small Firms

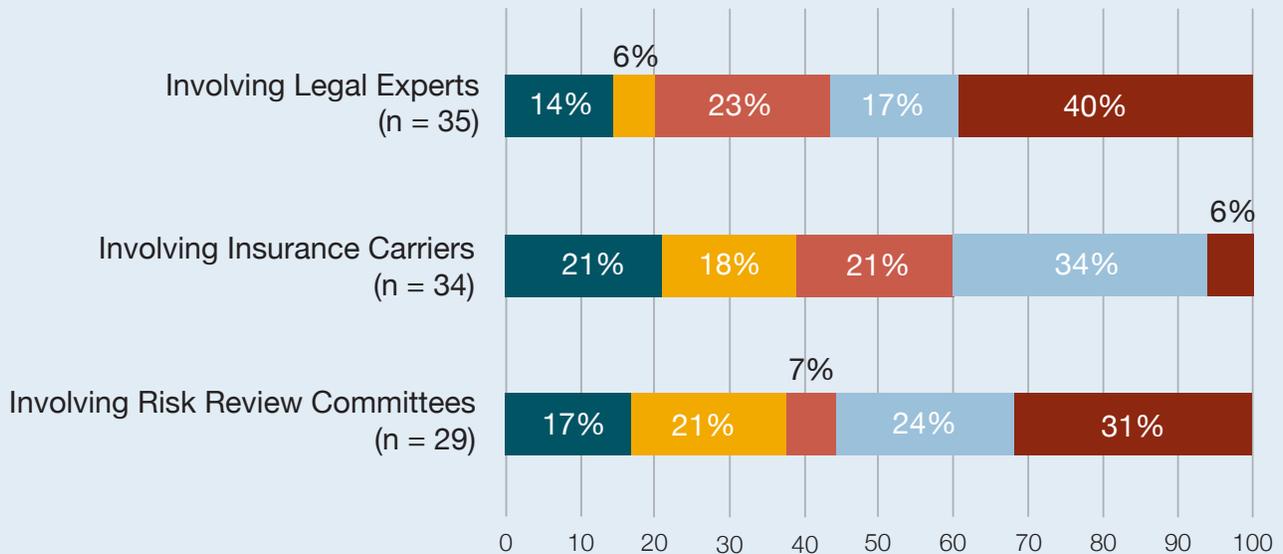


Figure 13. Firm-based responses by small firms on DB contract review practices.

- Given the level of risks assumed in DB projects and the risk allocation imbalance shown in the previous section, these results underscore the need for improvement across the industry, in particular for small and medium-size firms.
- As previously noted, contract review practices improve with large firms and conversely worsen with small firms. One possible explanation for this gap is that some small firms may be involved with less complex and/or more clearly defined design services, thus requiring less review for standard scopes of work. Alternatively, where complex services are required of small firms, these technical specialties are their core businesses and can be well packaged in familiar written scopes, not materially changing risk profiles that trigger exhaustive contract reviews. Further, small firms may also lack the resources, and may need to rely on outside counsel and external risk review advice, thus complicating the coordination to involve such teams in a timely manner. It is not well understood, however, why medium-size firms, and even small firms, despite the previous conjectures, would not consistently engage in these prudent contract review practices. With some firms, lack of resources is one component, as well as a lack of experience with negative outcomes. As flow-down provisions of large, public contracts mandate small and disadvantaged business programs to be engaged, small and medium firms are well advised to apply due diligence on contract review practices.

DB teams of best performing projects reported inviting insurers (insurance company and broker) for contract reviews. Third-party risk reviewers were also asked to participate. Final page-by-page reviews were frequently conducted with reviewing parties at the end of initial contract reviews, usually one-day workshops, with periodical checks afterwards. Some teams also reported having the same reviewing partners since the first DB project, highlighting the strength arising from continued team relationships. Other DB teams stated that insurers particularly participate in reviewing project risks only when PSPL policies are purchased.

DB teams from both case study groups recommended that the following essential list of items be negotiated in the contracts:

- Limitations of liability.
- Mutual waiver on consequential damages.
- Appropriate sub-caps on delay damages, as well as avoiding quantity guarantees.
- Insurable standard of care (including uninsurable indemnification of warranty language).

It is also recommended that clauses on the right to stop work for nonpayment, and the right to change the contract for differing field conditions, be included in DB contracts. DB teams should avoid ambiguous contract language of all type just as any indication of unilateral directives such as owner's issuing directive changes without price and payment guarantees.

Lastly, considerations should be given to including contract clauses on project managers' expertise on similar projects and familiarity with the DB team, as well as how first-time relationships are to be addressed with other members of the DB team and the owner.

DB INSURANCE: STATE OF THE PRACTICE

The combined effect of growing DB participation and the above risk transfers in DB subcontracts create two unequivocal challenges for design firms: (1) *DB subcontracts include more uninsurable contract language as of the last five years;* (2) *costs of Professional Liability Insurance (PLI) policies are going up;* and (3) *Project-Specific Professional Liability (PSPL) is uncommon in DB.* Figures 14, 15, and 16 respectively reflect these results.

1. *Uninsurable language in DB subcontracts:* Seventy percent (70%) of design firms of all sizes say they agree with this emerging DB challenge, which is relevant for both lead design consultants¹⁰ and design subconsultants.¹¹ Linking this response with inadequate DB contract review procedures by small and medium-size firms, unmanageable risks are bound to materialize. In theory, large design firms could assume liability for certain uninsurable risks that have been appropriately assessed with mitigation plans duly created and implemented; however, medium-size and small firms generally could not afford this liability given the disproportionate levels of risks, as well as the irregular risk assessment and subsequent mitigation planning.

2. *Increasing costs for Professional Liability Insurance (PLI):* Half of companies strongly or somewhat agree that PLI costs are increasing due at least in part to liability and claims associated with DB projects, projects with high (or no) LOL, and increasing DB participation (Figure 15). This number increases for large firms (57 percent) and for infrastructure sector projects (56 percent). It is not possible to determine the extent to which the PLI cost increases are driven by these factors and others. To the extent that

¹⁰ Lead design consultant: holds the main Professional Services Agreement (PSA) contract directly with the Prime Design-Builder.

¹¹ Design subconsultant: holds various types of design subcontracts directly with the Lead design consultant.

DB Subcontracts in the Last Five Years Include More Uninsurable Contract Language
All Firms and Market Sectors

(n = 132)

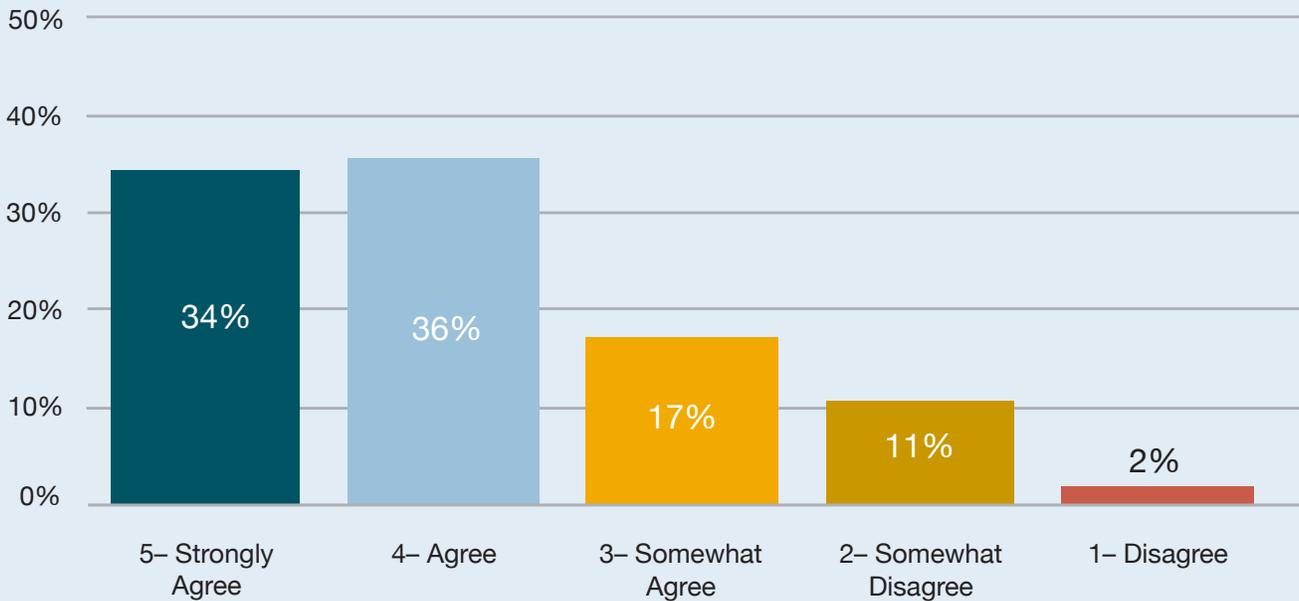


Figure 14. Firm-based responses by all firm sizes and for all market sectors on DB uninsurable subcontract language.

PLI Costs Are Increasing Due to DB and LOL
All Firm Sizes and Market Sectors

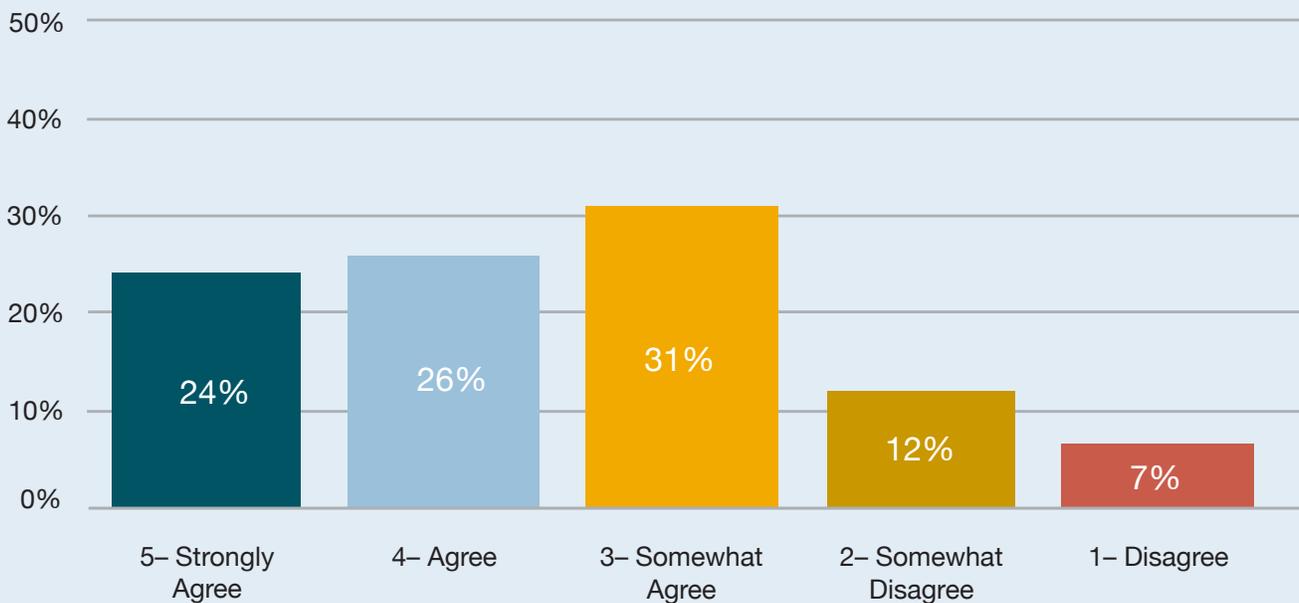


Figure 15. Firm-based responses by all firm sizes and for all market sectors on increasing Professional Liability Insurance (PLI) costs due to DB participation and Limitations of Liability (LOL).

a DB subcontract includes a high (or no) LOL, that would foreseeably increase the risk to the insurer of higher claims, which in turn would result in higher premiums. In addition, the nature of DB contracts increases the potential for claims—which in turn is likely to result in higher PLI premiums. Notably, there is a significant risk of claims against the designer by the design-builder since the design-builder’s profits depend largely on the designer’s work product and original concept design that is the basis for the DB team’s pursuit estimates. For example, if actual quantities exceed the estimates provided by the designer during the proposal pricing stage, the design-builder is more likely to file a claim against the designer than an owner would be for a similar underestimate by its designer. Errors in the design are also highly costly to the design-builder and may form a basis for claims against the designer. In addition, as noted elsewhere, the DB subcontract may include liabilities that are not covered by insurance. It seems probable that the insurer would most likely increase premiums to account for the likelihood (and recent experience) that additional claims will be filed against the policy with respect to such projects, even if the claims are ultimately held not to be covered

in LOLs or by the insurance policy. The higher prices of PSPLs even led one project executive to remark “contractors can look at PSPLs as a ‘vending machine’ or ATM.”

In parallel, this study found that DB contracts do not commonly require the contractor to obtain Project-Specific Professional Liability (PSPL) or Owner’s Protective Professional Indemnity (OPPI) policies. Figures 16 and 17 exhibit the corresponding results.

3. *Project-Specific Professional Liability (PSPL) is uncommon in DB:* Project-specific policies are typically required by owners concerned about the potential for design liability exceeding coverages available from the designer’s internal PLI, also known as practice policies, and who want to know that available insurance is not subject to dilution by claims related to other projects. PSPL also allows for joint defense and indemnity of professional liability claims against the entire design team and an efficient and cost-effective claim resolution, with reduced tension and conflict among the team during an on-going project. Project-specific policies are, however, becoming more difficult

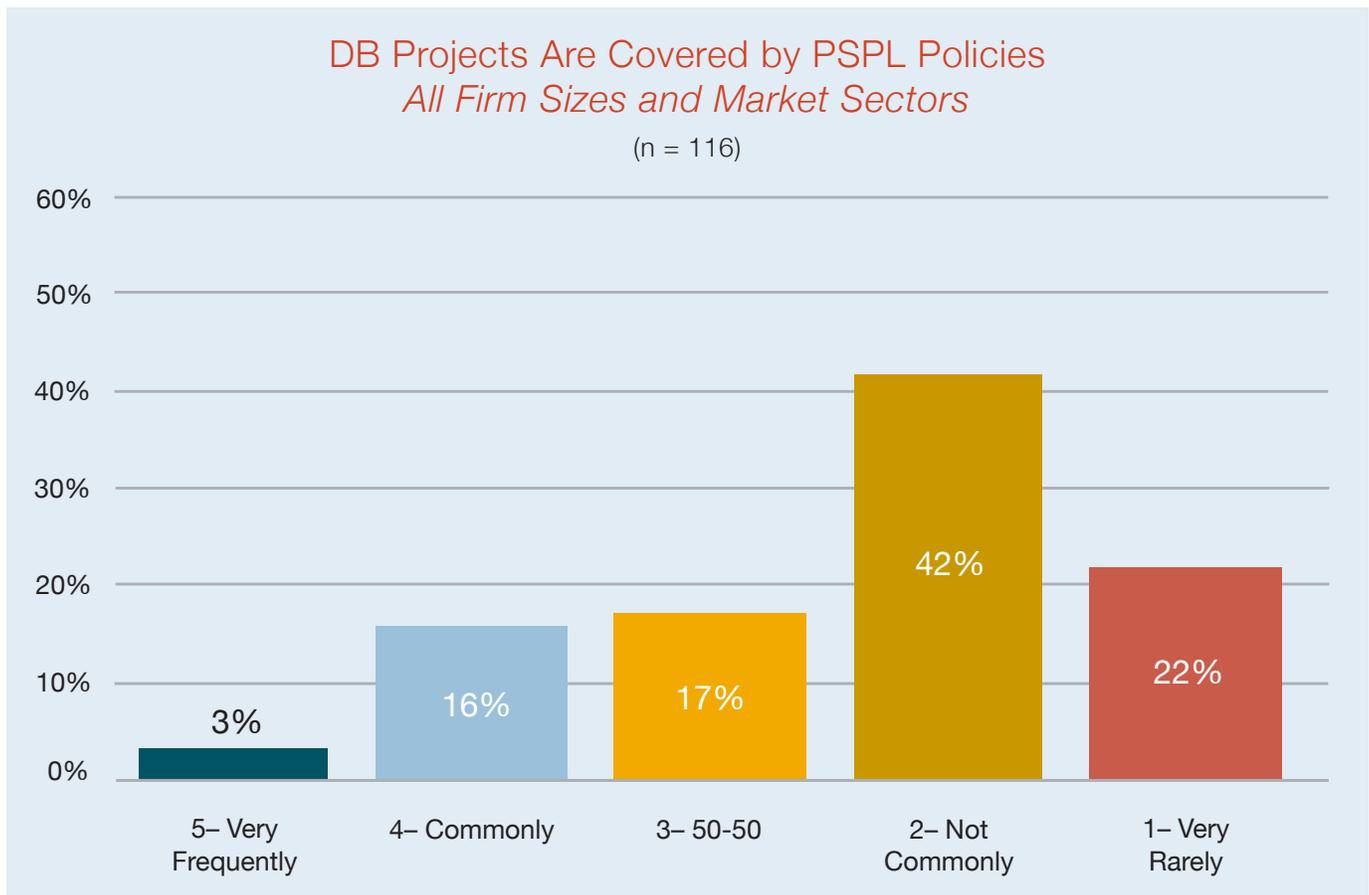


Figure 16. Firm-based responses by all firm sizes and for all market sectors on DB projects covered by Project-Specific Professional Liability Insurance (PSPL) policies.

to obtain in the current market and carry high premiums. Nearly two thirds of all respondents agree that DB projects rarely include PSPL insurance policies. Such policies are less likely to be required for the building sector (70 percent) and more likely for the infrastructure sector (55 percent)—the latter of which is likely due to the financial scale of mega-projects in the infrastructure sector. For most DB projects, liability for negligence in design would thus be covered by the designer’s practice policy, which is consistent with the increased PLI costs reported earlier.

4. Owner’s Protective Professional Indemnity (OPPI) and Contractor’s Protective Professional Indemnity (CPPI) are uncommon in DB: Almost 80 percent of all respondents agree that DB contracts rarely provide for OPPI policies. This pattern of responses repeats with small, medium-size, and large firms, and carries through all market sectors. Since OPPI offers first-party coverage that indemnifies the owner and design builder, respectively, for loss or damage due to design errors in excess of the limits available from the underlying available PLI coverage, OPPIs provide a benefit to both the design builder and the designer due to the reduced likelihood of uninsured claims by the owner. It should be noted that OPPIs do not provide direct coverage for design firms but procuring them could help reduce the burden on design team PLIs.

This firm-based assessment on DB insurance is further substantiated by the project-based analysis. The project-based analysis provides more information on Owner-Controlled Insurance Policy (OCIP) and Contractor-Controlled Insurance Policy (CCIP), which are other insurance policies available in the marketplace. However, OCIPs and CCIPs are not typically being implemented in DB, but when they are, A/E consultants are often not included as covered parties.

- *Owner-Controlled Insurance Policy (OCIP) and Contractor-Controlled Insurance Policy (CCIP):* Less than one fifth of projects are covered by OCIPs and CCIPs (Figure 18).
- *Project-Specific Professional Liability (PSPL) Indemnity:* PSPL policies are not common but are implemented more often than OCIPs and CCIPs. An in-depth analysis revealed that for two out of five projects, the lead A/E consultants ended up procuring PSPL insurance on behalf of the DB team, while prime design-builders usually procured the remainder. Owners, however, procure PSPL less than 5 percent of the time (Figure 19 and 20).
- *Professional Liability Indemnity (PLI):* Over three fourths of projects rely on existing PLI insurance (Figure 18), which in turn substantiates the results from the firm-based study, explaining why PLI costs are increasing for A/E firms.

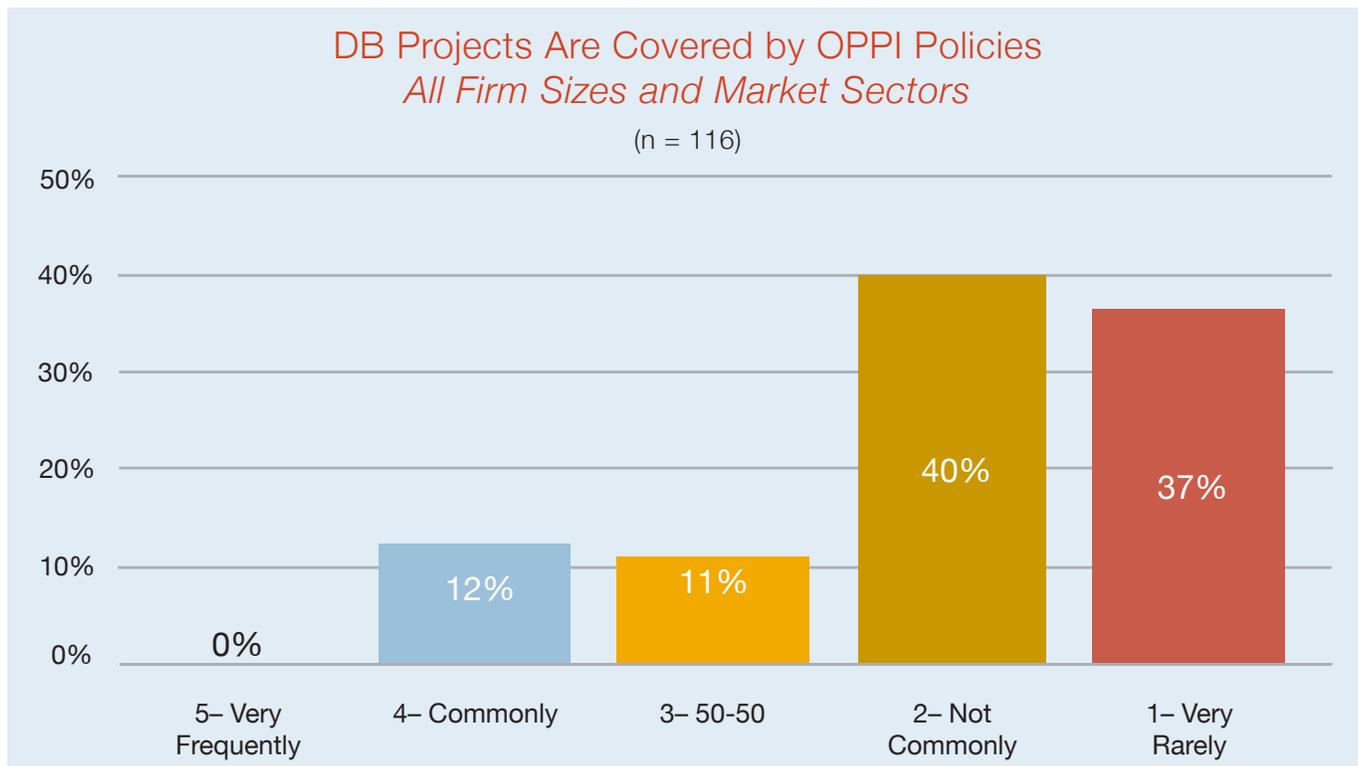


Figure 17. Firm-based responses by all firm sizes and for all market sectors on DB projects covered by Owner’s Protective Professional Indemnity (OPPI) policies.

¹² This assumes the insurer waives rights of subrogation against the design-builder and designer for an OPPI.

DB Insurance Project

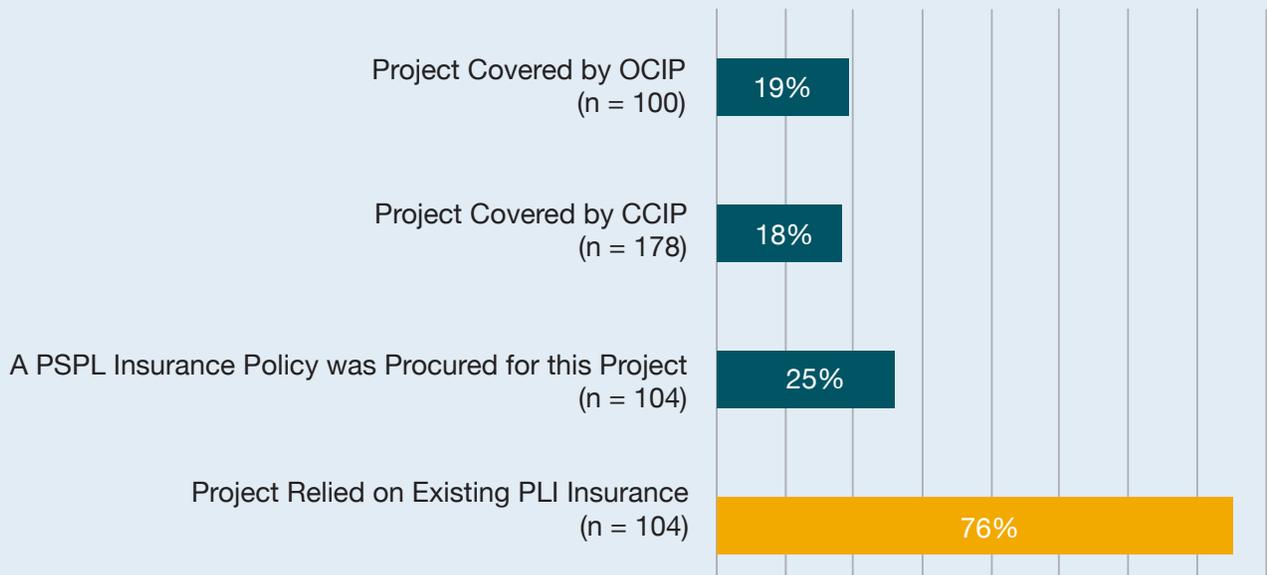


Figure 18. Project-based responses by all projects and for all market sectors on DB insurance.

Case study comparisons showed clear emerging differences between best and worst DB projects. Insurance requirements for best performing projects were characterized as industry typical—that is, not different for DB than they would have been for other delivery methods. In addition, DB teams were all reportedly fully insured considering the total project liabilities, effectively eliminating substantial risk exposure to their companies. These results are consistent with the reported balanced and equitable risk allocation practices as these two fundamental pieces are interpreted together. Simply, since DB teams from the best performing group did not have to carry unreasonable and inappropriate risks, they did not have to procure additional insurance. This in turn improved their competitive and profitability positions for future projects by reducing overhead costs to themselves and the owner. This means that widely adopting best practices through upfront, equitable risk allocation can have the aggregate effect of reversing the major trends observed over the last five years as reported earlier.

Similarly, best performing projects were characterized in all cases by having long-term relationships with their insurers and brokers. One participant said: *“have a fantastic relationship with them; it’s one of the most important relationships you can invest in. Keep them well abreast of everything that’s going on. Meet with them at least quarterly even if nothing is going on. If/when something happened, the relationship*

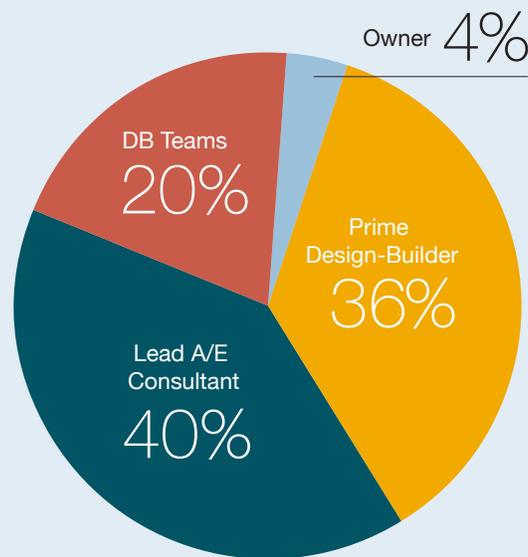
would be established, and they would know your track record.” Lastly, best performing projects shared a balanced mix of various insurance schemes, with some relying on their PLI policies, others on PSPL, and few on OCIP and CCIP. For PSPLs, the DB team either bought these policies directly through the design-builder or allowed lead A/E consultants to pass through the cost of acquiring them. In either case, DB teams from best performing projects invited insurers and legal teams to participate in key project meetings, to advise on how to reduce potentials for claims and disputes. These DB teams did not tap into PSPLs funds, which is remarkably different from worst performing projects.

Worst performing projects struggled on the very aspects that best performing projects excelled. Specifically, insurance requirements were different than industry expectations, demanding additional coverage above company limits, further increasing overhead costs to DB teams. Also, not all DB teams were fully covered, as large deductibles evidenced liability exposures. Claims filed against the insurance by other DB team members effectively elevated later PLI premiums, reducing competitiveness and DB pursuits over the long term for these DB teams.

“ Have a fantastic relationship with (your insurers and brokers); it’s one of the most important relationships you can invest in. Keep them well abreast of everything that’s going on. Meet with them at least quarterly even if nothing is going on. If/when something happened, the relationship would be established, and they would know your track record. ”

Project Party that Procured PSPL
(n = 25)

Figure 19. Project-based responses by all projects and for all market sectors on project parties procuring PSPL.



Project Party that was Covered by Procured PSPL
(n = 25)

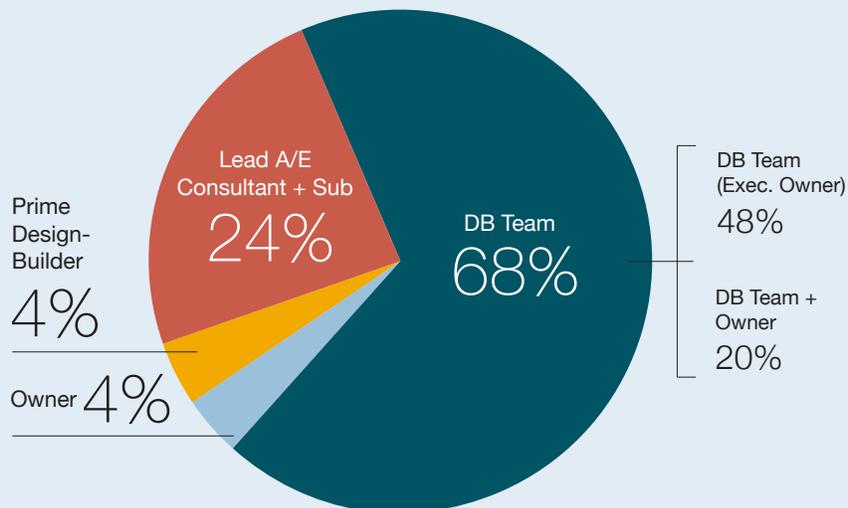


Figure 20. Project-based responses by all projects and for all market sectors on project parties being covered by PSPL.

Key recommendations extracted from discussions with all case study participants include:

- › The owner has to engage actively in insurance conversations. Ultimately, as the owner pays for project insurance—whether directly through OCIP or indirectly through PLIs and PSPLs—open dialogues are in the owner’s best interest. Owners of best performing projects understood this well.
- › DB teams must understand the owner’s insurance master policy. *“Don’t seek to make fees from duplicate policies, as some contractors do. Instead, have transparent conversations with the owner.”*
- › If the DB team does not have owner control over insurability, it must understand what level of information the owner requires be provided. *“What’s the transparency level that the owner is expecting in these cases? Is the company equipped to provide that information or do special project arrangements need to be made?”*
- › Master policies from the DB team must offer coverage for all project aspects that the team needs to be covered for. *“Understand who’s going to carry the policies and risks from big ticket items such as weather and environmental problems all the way to equipment damage. If you haven’t worked with the owner before, you must have these open and honest conversations.”*
- › Do not get complacent about having managed similar risks and insurance policies in the past. *“There may be slight project differences that demand a change on how you approach the insurability of a risk. Pause and think. Identify what’s different in this project.”*
- › Establish thresholds to determine the insurance project strategy. If a project were, for instance, above \$100M, the DB team would seek PSPL policies even if the owner does not require it; alternatively, if a PSPL cannot be procured, these best performers seek to negotiate either lower LOLs or commercial arrangements that make A/E firms free of carrying risk exposure for a negotiated amount of any professional liability issue that may arise.
- › Agree on limitations of liability on a project-by-project basis and track the company portfolio separately as a tool to evaluate overall exposure.

¹³ Large projects are defined in this study as those with actual costs over one hundred million dollars.

DB Project Harmony: Concerning Outcomes

In this report, project harmony is defined as absence of claims, disputes, and litigation, or otherwise adverse legal conditions that notably strain project relationships among the DB team; it reflects an ability of project teams and project executives to solve disputes internally and amicably. Absence of project harmony is detrimental to overall project success (i.e.: increasing costs, delaying schedules, and dampening DB participation and satisfaction). The infrastructure sector and large firms highlight significant areas of concern regarding this.

- › When the firm-based data is grouped by market sectors, nearly half of respondents in infrastructure and almost two fifths in the building sectors report poor or close to poor experiences with claims, disputes, and litigation. The poor experience in the building sector is less pronounced but still notable. Figure 21 illustrates infrastructure.
- › Similarly, over 60 percent of large firms and almost two fifths of medium-size firms reported the same poor experience, compared with one fourth of small firms. Figure 22 illustrates large firms.
- › *The state of claims and project disputes in completed DB projects:* Poor project harmony is significantly palpable in large projects.¹³ Over one third of large projects experienced claims, versus less than one fifth when the data is aggregated by all project sizes. The cost of claims among all projects ranged from \$120,000 to \$50 million per project. Worse yet, a larger share, almost half of large projects experienced disputes, versus over one fourth of all DB project sizes (Figure 23). These results clearly highlight that the incidence of project discord increases with DB contract values. The study found, perhaps slightly more brightly, that over 85 percent of these disputes were resolved relying on project-executive-level negotiations. The rest of the disputes were addressed relying on other dispute resolution mechanisms such as Dispute Review Boards (DRB) or Dispute Resolution Adviser (DRA), Mediation or Conciliation, and Adjudication. The study did not evaluate which of these methods were more effective, but case studies reasonably confirmed that project-executive-level negotiations are most effective and preferred, as these have the potential to avoid legal escalations, which are exceptionally disruptive and expensive. Disputes, even

Experience with Claims, Disputes, and Litigation in DB Infrastructure Sector

(n = 57)

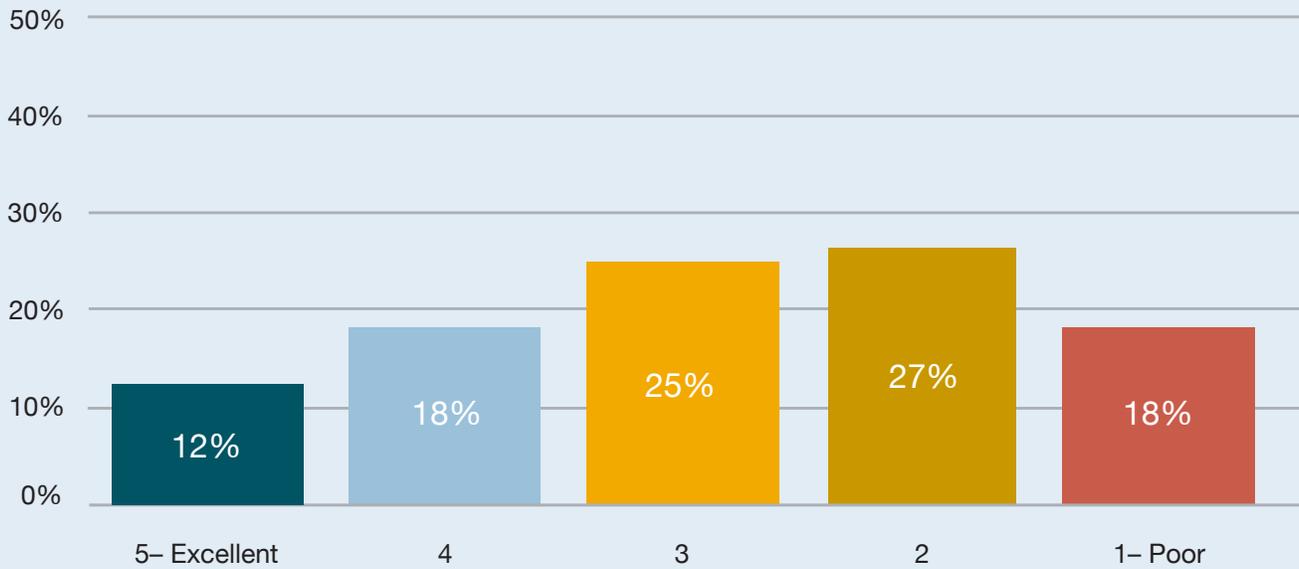


Figure 21. Firm-based responses from the infrastructure sector. Experience with claims, disputes, and litigation in DB projects.

Experience with Claims, Disputes, and Litigation in DB Large Firms

(n = 42)

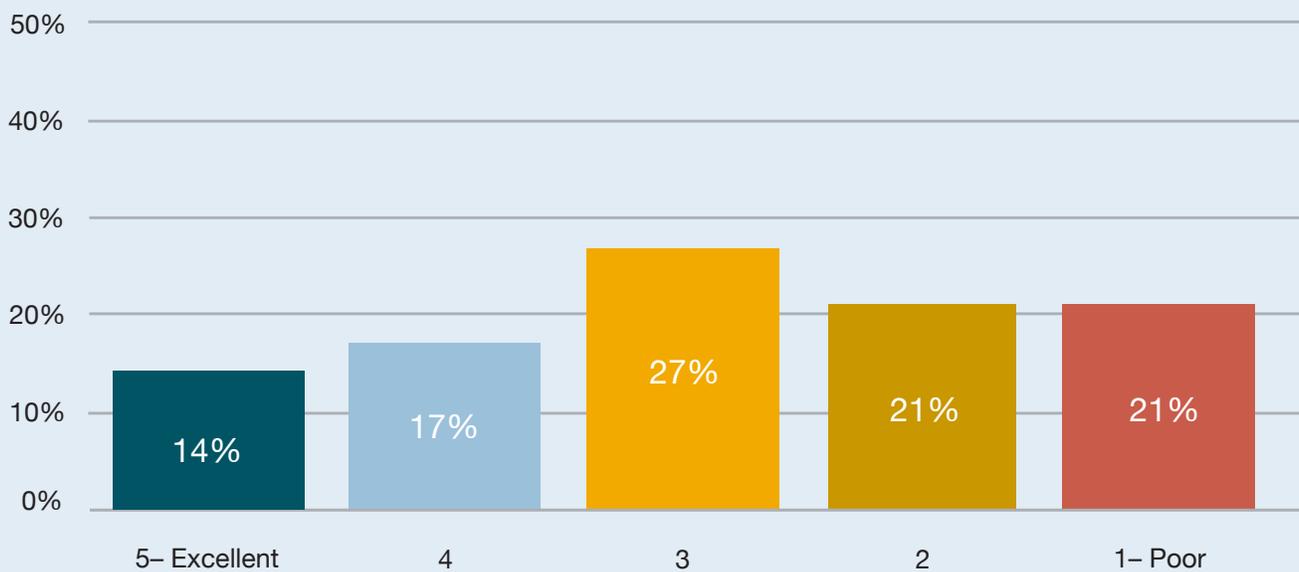


Figure 22. Firm-based responses by large firms. Experience with claims, disputes, and litigation in DB projects.

if resolved at the executive level can easily eradicate any profitability that remains on the project. Regardless of the resolution mechanisms used, even project-executive-level negotiations may lead to relationship hiatuses and loss of future business opportunities after project close-out, a finding evidenced in the analysis of worst project case studies. Similarly, an in-depth project-based analysis revealed that 54 percent of projects (n = 81) did not have contracts containing a provision in which owners agreed to fund all or a portion of disputed change directives.¹⁴ This is relevant to examine and is generally perceived negatively in DB, not only because DB raises the risk profile for companies involved, but also because it obliges project participants to adhere to change directives with established budgets that did not originally account for such work (46 percent of project owners, however, understood this asymmetry, and thus were willing to fund all or a portion of them, a general practice that reflects well-informed DB implementation by owners).

still negotiating settlements years after the project was completed. Between litigation and arbitration, the latter amounted for the most used mechanism to resolve project discord. Lower occurrence of and arbitration in DB projects would be desirable. Generally, however, the results indicate that the industry is avoiding this level of strain 89 percent of the time. These answers expressly exclude litigation involving third parties because this study deliberately sought to evaluate project harmony within the DB team. It is important to note that caution should be adopted when interpreting these results. It may be common in questionnaires such as this that respondents put forward their best projects to represent company experiences. Also, in many design firms, project personnel designated as questionnaire respondents may not be fully involved downstream with arbitration and litigation activity or settling claims and disputes. The authors believe it is possible that litigation and arbitration in DB may be higher than reported herein.

› *Litigation and arbitration activity in the DB industry:* Slightly over one tenth of completed projects experienced litigation and/or arbitration (Figure 24), with some of these

› These results ultimately highlight the negative outcomes caused by risk transfer imbalances. If continued, these undesirable outcomes may cascade to other firm sizes

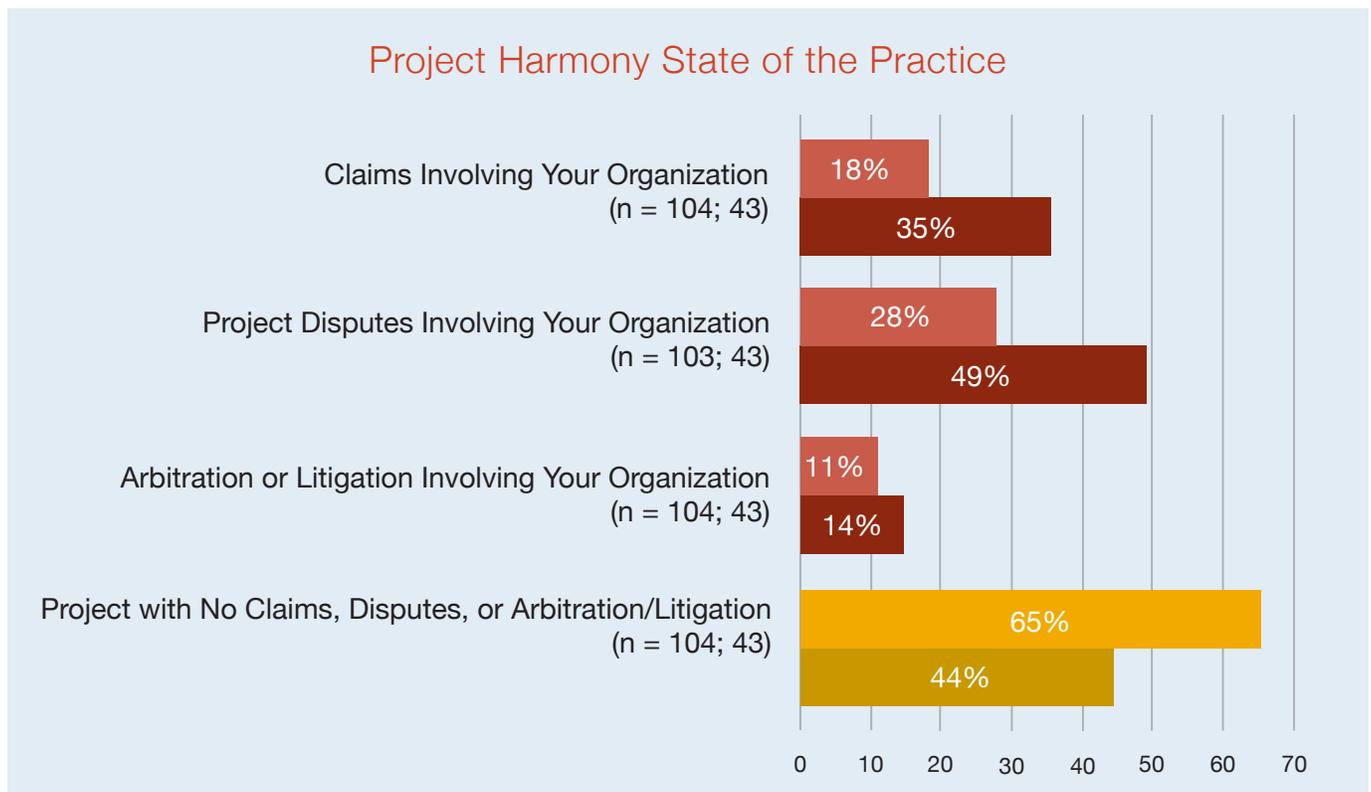


Figure 23. Project-based responses for all project sizes (top bars) contrasted by large projects (bottom bars) on claims, disputes, and arbitration/litigation. All market sectors are considered.

¹⁴ A change directive are directions from the owner that the DB team will have to figure out how to handle within the budget or justify additional costs, to be settled at a later time. Change Directives are also known as a Construction Change Directive (CCD), or force account work. In practice, change directives may occur in any project delivery method but are generally perceived negatively in DB because it raises the risk profile for companies involved, worse yet if project participants had to adhere to them with original budgets.

and market sectors, not just large firms, and building and infrastructure projects.

- The ramifications of all these combined undesirable outcomes are substantial across the industry considering both the significant growth of DB in recent years and its projected continued growth.

Case study comparisons demonstrated differences between best and worst performing DB projects. Best performing projects consistently rated project harmony as excellent. These projects did not experience claims, disputes, and litigation. Key factors enhancing project harmony were:

- Owner’s leadership and understanding of the DB process.
- Excellent DB team interdependence characterized by alignment throughout all ranks, and conflict escalation clauses embedded in contracts.
- Experienced partnering consultants with stature and respect in the industry.
- Early engagement of all DB team members, including owner operations and maintenance teams, as well as specialty subconsultants and trade subcontractors, which reportedly augmented design, constructability, and operability.

Fundamentally, owners of best performing projects consistently assumed leadership roles in setting the tone for harmony and teamwork. Owner project directors and staff were empowered and had the authority to make decisions, which by extent empowered DB teams to act on its behalf toward well communicated project goals. Owners understood that they were not meant to give directions but rather to engage in answering questions in a timely manner or indicating deviations from goals that did not meet expectations. This balanced engagement was key to harmonious success. Strong project harmony was causally linked to strong project (i.e.: cost/schedule/quality) and team performance (i.e.: profitability). DB teams avoided potential misses on project performance by spending diligent efforts to minimize possible unforeseen damages, as the owner reasonably covered for differing conditions and/or owner-directed changes. Owners did not change people during the project; they engaged cohesively and coherently. They were interested in the success of the project just as the DB team was.

As complex discrepancies and interpretations may have arisen about project requirements, best performing project case studies effectively resolved them relying on relationships and transparent discussions and/or conflict escalation clauses



Figure 24. Project-based responses by all projects and for all market sectors on litigation.

embedded in contracts for all levels of DB participation. Harmony was reportedly enhanced by past and continued relationships, reflecting in a great share of the DB team personally knowing the other team members. Growing organic relationships and partnering relied on “*design charettes and meetings not only for technical aspects but also to learn the project personalities.*” The generated trust and collaboration led to fulfilling handshake agreements that were not, only in few cases, written into contracts.

Best performing projects avoided potential claims and disputes by equitably splitting price differences on missed scope items that were not fully clear during pursuit and award. Appropriate and clear change order management helped improve conflict prevention. Both the owner and the DB team openly recognized their parts and collaborated towards improving the final product. During infrequent high-stakes negotiations, these DB teams maintained amicability, respect, and cordiality. Genuine efforts to understand root causes of discrepancies and misunderstandings led to shared, creative approaches to solving them. Pathways were always found to meet halfway as the team kept moving forward, not looking backwards.

Furthermore, these DB teams instituted varying forms of regular, full-team meetings, including technical sub-group meetings, involving all DB team parties. DB teams jointly and transparently met with the owner. Project sponsors such as project directors and executives attended key meetings. High-level executive roles helped, when needed, with negotiations and resolutions of conflicts, effectively preventing them from becoming major issues. These DB teams fully and intrinsically understood that they could resolve any issues regardless of the number. As one team stated, “*issues are always going to surface; the differentiating factor centers on how these issues are approached. For us, most issues got solved before they escalated, but all participants were focused on adhering to the escalation process. It truly worked.*”

Similarly, for the best performing projects, owners opened forums for feedback, whether directly or indirectly, the latter of which mostly relied on contract partnering agreements and external partnering consultants. Such projects retained third-party partnering consultants who were knowledgeable about all aspects of design and construction. They came during different stages of the project, assessing and resolving any current conflicts. DB teams relied on this partnering role to confide in what was working, what was not, and how the issues could be solved. The partnering consultants enjoyed in

all cases stature and respect, and tactfully resolved conflicts that may have escalated. All DB teams and owners ideally were frequently required by contract to show up to the monthly partnering meetings.

Worst performing projects rated project harmony as poor or close to poor, as these underwent costly claims, disputes, and litigation. Key factors deteriorating project harmony were:

- Lack of owner’s leadership and poor DB implementation, including lack of early engagement of operations and maintenance teams.
- Unproven DB team relationships.
- Lack of timely and joined involvement from key DB team members, including specialty subconsultants, and trade subcontractors.

Fundamentally, lack of owner leadership centered on inappropriately transferring risks, providing ambiguous statements/scopes of work, and interfering with the DB process through approval delays, added reviews typical of DBB, additional scope requests, and unaccountable operations and maintenance stakeholders’ participation. Most owners in this group were rigid to react and adapt fairly to changing project circumstances.

“Words matter very much. Relationships are critical. Some owners use the word as a hammer, good owners use the word as guidelines. Good owners rely on the expertise of DB teams to do the job. These positive dynamics empower the DB team where those owners exist. And the results are wonderful.”

Worst performing projects were also characterized by DB teams struggling with the inability to look beyond issues. Separate team members—whether from the owner, design-builder, or lead A/E—acted defensively to maximize their profits or minimize their losses. Absent early input into the pre-award design reflected in key technical misses on standards and specifications, constructability input, and joined DB team estimate reviews, prior to proposal submittal, which could have captured gaps upfront.

“If DB teams do what they said they would do and are supposed to do, it all works out fine. When things are getting off track, that’s where the weaknesses and problems spiral. Contracts need to include provisions for remediating team behaviors that deviate from what they said they would do but have not done.”



“ Words matter very much. Relationships are critical. Some owners use the word as a hammer, good owners use the word as guidelines. Good owners rely on the expertise of DB teams to do the job. These positive dynamics empower the DB team where those owners exist. And the results are wonderful. ”

CONCLUSIONS

This study has identified a set of unique DB challenges and their impacts to efficient project delivery. The nature of the uncovered issues—risk transfer imbalances, liability gaps, increasing insurance costs, decreased profitability, and lack of project harmony—demands wide industry awareness, policy changes through advocacy, more advanced risk identification and mitigation, as well as education and training. All DB team partners across the industry, including design professionals, design-builders, contractors and subcontractors, project owners, owner representatives, and government agencies, make up the group of active stakeholders that have experienced these DB challenges. This is the group of stakeholders that needs to plan, engineer, and implement future DB policy changes for the benefit of all project participants and the public good.

Inequitable DB risk transfer practices are causing clear, undesirable outcomes. The DB assessment from 155 ACEC design firms, and in particular firms involved in the infrastructure sector, illustrate that a continued negative experience with claims, disputes, and litigation will only overshadow the early DB-project-success-stories that incentivized DB growth as of today. Participation by firms in mega-projects with imbalanced risk transference should be seriously evaluated. The increased use of DB indicates that owners may not be aware of these issues. If owners are aware, however, they are gaining the short-term benefits of off-loading risk on DB teams, at the risk of overlooking the larger, detrimental effects on the industry and DB as a viable delivery method to be implemented only when the project characteristic merit such implementation decisions. The use of DB on projects that are not suited for it must be seriously evaluated by owners. Inequitable risk shifting by owners is not a viable plan for sustaining and growing the industry. An imperative need exists to revisit the current DB implementation or consider other project delivery methods—such as Progressive Design-Build (PDB) or Integrated Project Delivery (IPD)—which could inherently address the DB challenges and offer better methods for owners to realize the same benefits of an integrated approach to project delivery that controls cost and schedule, while concurrently benefiting DB teams with reduced claims, disputes, and litigation, thus increasing the satisfaction of all team members.

The nature of the uncovered issues—RISK TRANSFER IMBALANCES, LIABILITY GAPS, INCREASING INSURANCE COSTS, DECREASED PROFITABILITY, AND LACK OF PROJECT HARMONY—demands wide industry awareness, policy changes through advocacy, more advanced risk identification and mitigation, as well as education and training.

RECOMMENDATIONS

Based on this research, a list of recommendations has been developed for owners and DB teams. These recommendations come from the study findings and insightful comments provided by participants responding to the firm- and project-based questionnaires, as well as the case studies.

Recommendations for Owners

1. RISK TRANSFER

Owners fundamentally should select the right projects for DB implementation, because not all projects are suitable for it. Consideration of splitting up mega projects where possible should be seriously evaluated. Owners that do not have clear and specific DB scopes and requirements, including operations and maintenance, should develop these documents comprehensively before they can consider engaging in DB projects.

Owners should avoid transferring outsized, inequitable risks such as upfront investigations, differing site conditions, unforeseen utility relocations, third-party approvals including environmental reviews and securing environmental permits, and easement and right of way negotiations, and owner-driven changes followed by non-payment of variations.

Owners' masterplans should be communicated to the DB team even if portions of the masterplan are not contracted in the DB package. This practice has the benefit of providing a larger perspective to the DB team for addressing potential future issues. For instance, understanding future tie-ins and interactions with masterplan infrastructure must be made explicit early in all DB projects.

During the final weeks leading to submission of the RFP, owners should adhere to a minimum standard of not submitting concept or design changes materially affecting project pricing. This type of intervention greatly disrupts the DB team's effort and flow to finalize difficult and complex DB proposals.

2. PARTNERSHIPS AND PROJECT APPROACH

Owners are encouraged to have unique DB programs or approaches, separate from DBB or other project delivery methods, as DB requires a specialized set of skills in managing the contracts from the conception of the project. Owners successfully implementing DB have well integrated teams who are educated in DB, and the differences between DB and DBB, including seamless integration between their operation and maintenance teams, effectively engaging in early design decisions, during pursuit and after award, and as questions arise.

Owners should engage in DB through open forums to discuss ideas and differing site conditions with the DB teams. This should be done carefully and without interfering in the normal DB process.

Owners who develop in-house capabilities for managing DB projects directly have anecdotally tended towards better overall project results. In contrast, relying on independent owner's representative firms may lead to situations in which the owner's representative seeks to maximize its stance on the project, versus that of the DB team and the project itself, potentially leading to negative repercussions. Owner representative relationships with the DB team should be managed diligently and carefully. In some cases, companies representing the owner may request scope items not included in the original contract documents signed with the owner. This factor appears to be an area of anecdotal confusion on DB projects.

"Excellent and poor owners operate with the same specs, and somewhat with the insurance requirements. However, the organization, flexibility, and approachability of owners of successful DB projects are distinguishing factors. People do matter. Owners need to understand they need to create an empowering environment where people want to work for their organization, regardless of the project delivery method adopted."

3. CONTRACT REVIEW

Owners should rely on contract templates that have worked well in the past for DB projects. Creating unique contract agreements may cause the DB team to overlook important contract aspects due to ongoing and extensive contract reviews associated with a DB project. Contract or specification variances must be highlighted when these differ from standards used previously by the same owner.

Owners are encouraged to embrace procurement selections using Best Value, not just price, as well as contracting terms using guaranteed maximum price (or target price), rather than primarily lump sum bidding. Conscientious selection of both the procurement method and contracting terms enhances project success.

4. INSURANCE

The owner has to engage actively in insurance conversations. Ultimately, as the owner pays for project insurance—whether directly through OCIP or indirectly through PLIs and PSPLs—open dialogues are in the owner’s best interest. Owners of best performing projects understood this well.

OPPI would enable risks and insurance policy costs to be more equitably distributed among the parties, ensuring that DB will continue to be available to owners as a viable delivery method in the future. Much strategic thought relative to the use of insurance to cover project risk needs to be undertaken by the owner’s leadership.

Recommendations for the DB Team

1. RISK TRANSFER

Design firms, along with other DB project partners, should strive to engage with the owner on risk transfer or risk sharing early in the project development process. Some design firms admitted they might not be familiar with the risk transfer terms that the prime design-builder has agreed to with the owner, a practice that is not consistent with proactive and proper risk management. Consistently, it is key that contractors involve design firms during the actual procurement and subsequent negotiations with the owner. If design firms cannot be involved during the negotiation period, it is crucial that contractors integrate a designer’s risk perspective into the process. The DB team must, as a best practice, sit with the owner at the same table. This can help mitigate discrepant expectations and help

the DB team agree on the fundamental design parameters, reducing design changes that are likely to become uncompensated liabilities, resulting in project losses and discord.

2. CONTRACT RISK REVIEW

Design firms should engage in rigorous contract risk reviews when choosing to participate in a DB project. Contract review diligence should include draft owner contracts, draft sub-contracts from the prime, and should include the overall DB team’s risk assessments of the project, as well as comprehensive teaming agreements from the start. Some firms reporting DB success mentioned that their upfront review of contracts during the pursuit phase has proven invaluable to them. They added that while initial draft contracts may include increased uninsurable language, well-orchestrated negotiations have typically proven successful to remove them. Legal review of agreements prior to pursuing DB proposals is also key. Some firms do not, or cannot, invest in higher-than-normal upfront costs and later find they cannot come to terms on the contract, or that the project was incompatible to their firms’ risk profiles, or true core competencies. DB contracts must be negotiated so that the project fundamentally meets the technical and performance requirements of their firm. If this is accomplished, the design firm is better equipped to protect against subsequent changes that are outside of the clearly stated requirements. This includes negotiating post-award design change terms that are equitable and compensated on different terms such as time and material compensation vs lump sum.

3. INSURANCE

Design firms must understand the owner’s master insurance policy. If they do not have owner control over insurability, they must understand what level of information the owner requires be provided to establish transparency and meet the owner’s expectations.

4. PROJECT-SPECIFIC PROFESSIONAL LIABILITY (PSPL) POLICIES

Firms should consult with their brokers about options to reduce the strain on their practice policies due to their work on DB projects, and should take steps to encourage owners and design-builders to consider measures that will reduce the likelihood of claims and related premium increases.¹⁵ Since project owners ultimately pay for insurance costs, either as a direct passthrough or in the form of overhead expense included

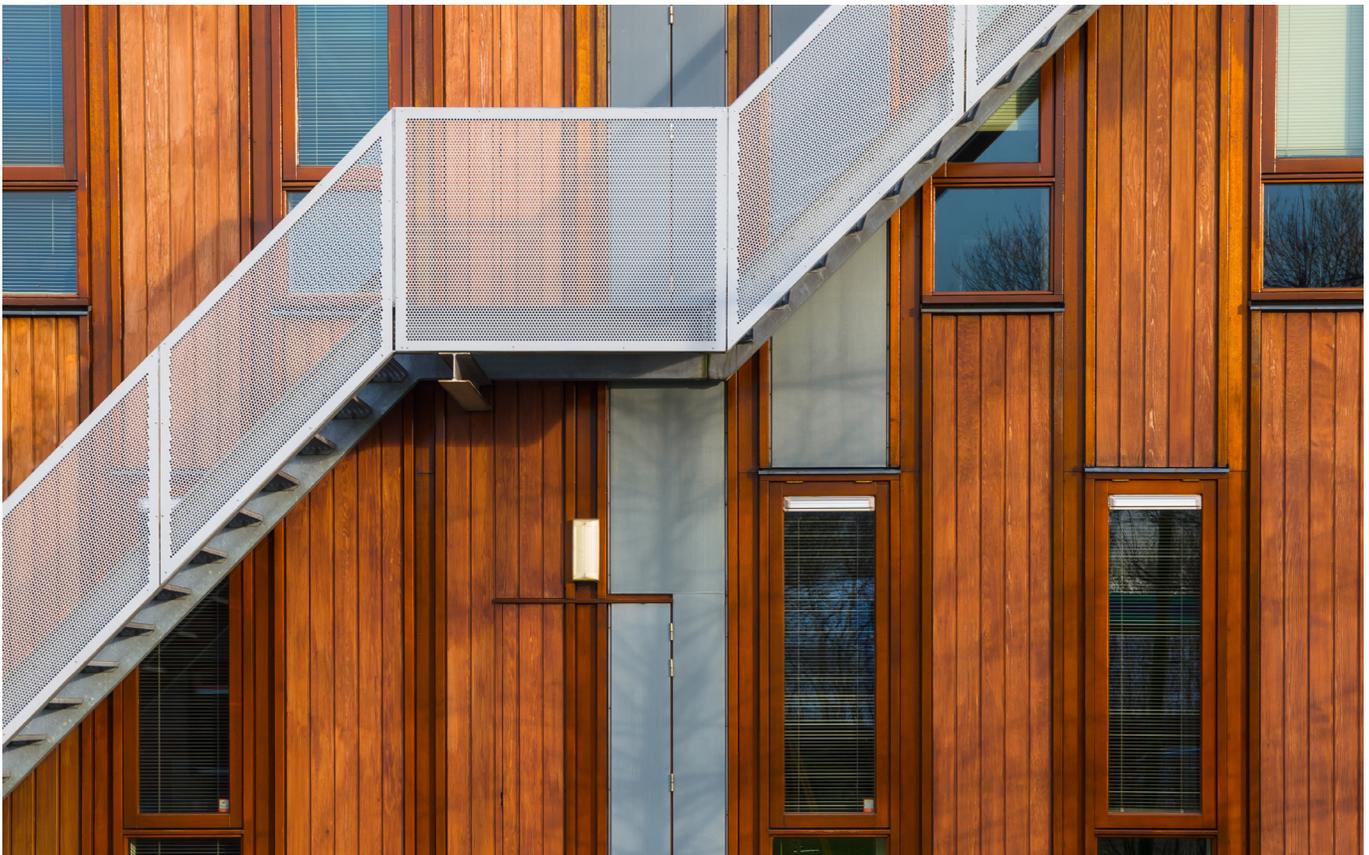
¹⁵ Designers should also, of course, adopt stringent measures to ensure the quality of their work product, including ensuring that the individuals working on the project are appropriately qualified and supervised, and should also take steps to maintain good relationships with the owner and design-builder to reduce the likelihood of claims.

in the price proposal, the owner has an interest in keeping insurance costs down. PSPLs may be a reasonable approach for some projects and offer the benefits of covering the project's entire design team, ensuring that coverage will not be diluted by claims relating to other projects, and insulating the designer's practice policy from claims relating to the project. However, many respondents commented that obtaining PSPL is becoming more difficult and expensive and involves higher deductibles. It might be appropriate for a firm to consider adopting a company policy to only pursue high risk DB projects if the project includes a PSPL to be paid by the DB team on equitable terms or if the parties are able to develop suitable alternative solutions such as use of OPPI coverage.

Firms may consider establishing thresholds to determine the insurance project strategy. If a project were, for instance, above \$100M, the DB team would seek PSPL policies even if the owner does not require it; alternatively, if a PSPL cannot be procured, firms may negotiate either lower limitations of liability or commercial arrangements that make the firms free of carrying risks for a negotiated amount of any professional liability issue that may arise. Ultimately, this study recommends that firms be fully covered for all relevant aspects of the project. Clearly, much strategic thought relative to the use of insurance to cover risk needs to be undertaken by design firms.

5. LONG-TERM PARTNERSHIPS

Design firms should seek to create long-term partnerships with other DB team members to improve risk transfer and project harmony, as well as with their insurers. Enduring partnerships are needed to gain market share in the long term. If commercial interests among the DB team are not aligned, such as designer PLI viewed by the owner and contractor as contingency funds, this environment creates a failed business relationship that brings losses and reputational harm to all project participants. These instances need to be discussed more widely across the industry. Firms need to consider that primary insurance carriers may elect to not review or underwrite the policies of firms that do not carefully select clients based on shared principles and values. These changes start with not viewing design as a commodity, but as a strategic investment that reduces overall construction and project costs, for the benefit of all project parties. Team efforts must be oriented towards the benefit of the project partnership, not to increase individual gains despite the DB team.



APPENDIX I: DEFINITIONS

Claims:

Are defined as requests by the DB team to the owner regarding extension of time, or reimbursement of additional cost, or both. Claims may also materialize within the DB team among project partners such as requests submitted to the prime design-builder by its subcontractors and engineers for additional compensation, or requests to honor contractual commitments. Claims also represent preliminary demands and notices for resolution of contractual obligations on various issues such as reimbursement for errors and omissions, compensation for damages, and others. Failure to reach resolution likely leads to dispute escalations.

Construction Management/General Contractor (CMGC):

The term CMGC has various forms depending on the state, agency, and entity that uses it. Other common terms and acronyms for the same concept include: 1) Construction Manager/General Contractor (CMGC, CM-GC, CM/GC); 2) Construction Manager-at-Risk (CMGC, CMAR, CM@R); and 3) General Contractor-Construction Manager (GCCM, GC-CM, GC/CM). This study adopted the term CMGC. This project delivery method is based on the owner first selecting and retaining the design firm, much like in a Design-Bid-Build (DBB) project. Selecting the design firm can be based on qualifications and other procurement criteria desired by the owner. In contrast with DBB, however, once the design professional is selected in CMGC, the project moves forward with the early design stages with the intent of initiating a second contract with a Construction Manager/General Contractor (CMGC) after the design process is within a range of 30 to 60 percent of the development. This step helps the CMGC and design firms to develop a working relationship while the owner retains the oversight of the entire project delivery process. The CMGC can assume the role of a construction consultant and assist with value engineering, cost estimating, and constructability reviews. This project delivery method creates opportunities to overlap the traditionally distinct phases of design and construction, allowing for compression and acceleration of construction schedules through early construction packaging. Cost certainty may be provided at an early stage for the owner, including profit-sharing agreements with other team members if the project is completed for less.

Design-Bid-Build (DBB):

Is a traditional process in the US construction industry where the owner contracts separately with a design firm and a contractor. The owner normally contracts with a design company to provide “complete” design documents. The owner or his/her agent then solicits fixed price bids from contractors to perform the work. One contractor is usually selected and enters into an agreement with the owner to construct a facility in accordance with the plans and specifications.

Design-Build (DB):

This method involves an agreement between an owner and a single entity to perform both design and construction under a single contract. Portions or all the design and construction may be performed by the entity or subcontracted to other companies.

Disputes:

Refer to claims that have not been agreed upon by the owner or owner representative as submitted by the DB team. Disputes may also materialize within the DB team among project partners such as the prime design-builder and its subcontractors. Disputes arise from differences in the interpretations of extension of time, or reimbursement of additional cost, or both, and may lead to forms of litigation.

Integrated Project Delivery (IPD):

This project delivery method has emerged as a novel approach to overcome typical challenges by integrating the technical, managerial, and financial aspects of project delivery. In other words, the interest of the owner/manager, A/E professional, builder, trade partners, and associated subs are aligned in principle. This approach allows the project stakeholders to work closely from the early stages of the project, where the most value can be created, to develop and deliver the best project for the owner for a reasonable cost, often in an expedited manner. The close collaboration helps eliminate unnecessary effort in the design and allows data sharing and collaboration directly between the design and construction teams, eliminating barriers to increased productivity in construction. The unique characteristic of this approach is that all signatories place 100 percent of their profit at risk until key performance incentives are achieved. That is, everyone in the integrated team has a common goal as well as a technical,

managerial, and financial stake in the project. This approach is expected to drive the partners to introduce innovation, technology, and efficiency measures to explore and implement opportunities in optimizing design and construction outcomes, and thus reduce cost and schedule.

Litigation:

Involves the filing of a lawsuit and requesting a determination of the dispute in a court before a judge. Most litigation does not end up in court but is resolved by the parties before a trial.

Owner's Protective Professional Indemnity (OPPI):

Is a first-party coverage policy that indemnifies the owner or design-builder against design errors for loss or damage in excess of the limits available from the underlying available PLI coverage. These policies protect the insured against design errors that occur during engineering and construction projects; they are not intended to cover the design professionals.

Professional Liability Insurance (PLI):

These insurance policies address the direct and/or vicarious liability of the insured for performed professional services. They are also referred to as practice policies.

Progressive Design-Build (PDB):

This method encourages heightened levels of collaboration between the owner, A/E professional, and design-builder

as the design is collaboratively developed in a step-by-step progression. The A/E professional and design-builder are selected by an owner early in the process before any design development.

Project Harmony:

Is defined as absence of claims, disputes, litigation, or otherwise adverse legal conditions that notably strain project relationships among the DB team.

Project-Specific Professional Liability (PSPL) Insurance:

These insurance policies are tied to a specific project and cover the designer, as the insured, from third-party claims relating to the project, including claims against the designer by the owner and the design-builder. The project-specific policy applies in lieu of the practice policy of each design team member for the covered project.

Standard of Care:

Practices and standards that reasonably prudent professionals in the same community and enjoying the same time frame would do given the same or similar circumstances.

The Internal DB Team:

Is primarily the team made up of prime design-builder and lead A/E consultant, but it may also include A/E subconsultants and construction subcontractors based on project size.

APPENDIX II: ACRONYMS

A/E: Architectural and Engineering

ACEC: American Council of Engineering Companies

AEC: Architectural, Engineering, and Construction

CCIP: Contractor-Controlled Insurance Program

CMGC: Construction Manager/General Contractor, also known as Construction Manager at Risk or CMAR

DB: Design-Build

DBB: Design-Bid-Build

IPD: Integrated Project Delivery

LOL: Contract Limitation of Liability

OCIP: Owner-Controlled Insurance Program

OPPI: Owner's Protective Professional Indemnity

PDB: Progressive Design-Build

PLI: Professional Liability Insurance

PSPL: Project-Specific Professional Liability Insurance

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The ACEC Research Institute's mission is to deliver knowledge and business strategies that guide and elevate the engineering industry and to be the leading source of knowledge and thought leadership for creating a more sustainable, safe, secure, and technically advanced built environment. The ACEC Research Institute is an independent 501c3 non-profit organization.

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ABOUT THE UNIVERSITY OF COLORADO BOULDER

The core research team from University of Colorado Boulder is comprised of Dr. Keith Molenaar and Victor Galotti.

Keith Molenaar serves as the principal investigator. Dr. Molenaar has over 25 years of experience in DB and project delivery methods research, as well as academic teaching experience in the public and private sectors. In addition, he has participated in numerous consulting projects and professional research committees. Currently, Dr. Molenaar is the dean of the College of Engineering and Applied Science at the University of Colorado Boulder and the K. Stanton Lewis Professor of Construction Engineering and Management.

Victor Galotti serves as the doctoral research associate. He has a master's degree in civil engineering and over 15 years of industry experience. He has worked as design engineer for two years, construction contractor for over five years, and owner program manager for over eight years. Mr. Galotti's practical expertise using multiple project delivery methods stemmed from delivering complex multidisciplinary projects as owner.

The ACEC Research Institute provides the engineering industry with cutting edge research, trend data, and economic analysis to help firm owners make decisions and delivers thought leadership that advances engineering's essential value to society.

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