



National Institute of
BUILDING SCIENCES

Off-Site Construction
Council

Report of the Results of the **2018 Off-Site Construction Industry Survey**





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BUILDING SCIENCES

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Off-Site Construction Council

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Introduction

In 2014, the National Institute of Building Sciences Off-Site Construction Council conducted a survey to gain an understanding of how the building industry is using off-site construction techniques. Three years later, the Council determined it needed an update to see how use has changed. In January of 2018, the Council issued a new survey.

This document, *The Report of Results of the 2018 Off-Site Construction Industry Survey*, compiles the results. It provides an update on who is using off-site construction in the industry and how it is being used, as well as the perceived benefits and challenges of using off-site construction in projects. This data, as an update from the 2014 survey, will gauge how the Council can continue to educate and support the industry in implementing off-site construction practices.

Thanks go to the Off-Site Construction Council for issuing this report. Special thanks go to Ryan E. Smith, professor at Washington State University and past chair of the Off-Site Construction Council, and his colleague, Kambaja D. Tarr at the University of Utah, for their efforts to engage respondents and compile the survey results.



Henry L. Green, FAIA
President
National Institute of Building Sciences

Report of the Results of the 2018 Off-Site Construction Industry Survey

The National Institute of Building Sciences Off-Site Construction Council defines off-site construction as the planning, design, fabrication and assembly of building elements at a location other than their final point of assembly onsite. An integrated planning and supply chain optimization strategy characterize off-site delivery.

From heating, ventilation and air-conditioning (HVAC) duct fabrication to full volumetric modules delivered to a site and assembled, off-site prefabrication in the construction sector continues to grow, impacting projects at an increasing rate. With the ongoing shortage of skilled craft workers (which exceeded 2 million in 2017), prefabrication in a controlled, off-site environment may become a necessity for many U.S. contractors attempting to remain competitive with a lower-skilled workforce. Despite the need and increasing demand, uncertainties accompany the utilization of off-site construction, as with any new process or technology innovation.

In 2014, the National Institute of Building Sciences Off-Site Construction Council initially conducted a survey to identify the opportunities and challenges associated with the use of off-site construction processes and technologies in the United States and gain an understanding of how the National Institute of Building Sciences can foster the utilization of off-site construction to support the achievement of high-performance buildings.

In January 2018, the Off-Site Construction Council conducted a follow-up survey to analyze the evolution and perceptions of the use of off-site construction in the United States. This report compares the most recent results to those of the survey conducted in 2014. The Council, which recognizes that the transition from site-built to off-site construction will require a profound change in business planning and organizational development, is committed to gathering and sharing knowledge from off-site stakeholders of the current state of practice.

The National Institute of Building Sciences distributed the survey through its communications network. In addition, Off-Site Construction Council members disseminated the survey request to their personal contacts. Finally, the survey was sent to the University of Utah Integrated Technology in Architecture Collaborative construction industry professional database of 23,000 contacts. This report summarizes the survey responses.

A total of 205 participants responded to the 2017 Off-Site Construction Council survey; 312 participants responded to the 2014 survey. Their answers, which were anonymous, are shown in the aggregate only. The results demonstrate the markets, benefits and barriers, as well as next steps to be taken by the Council.

The companies who responded provide a variety of different services, including construction management/general contracting (24.75% in 2018; 46.7% in 2014), engineering (21.72% and 38.3%), trade contracting (2.53% and 27.3%), architecture (87.88% and 15.0%), and owners/developers (10.10% and 8.3%). (Question 10, 2018; Question 12, 2014)

The survey respondents also indicated where off-site construction is most often being utilized. The participants (who could select multiple categories), are using off-site elements for commercial construction (53.85% in 2018; 57% in 2014), for industrial (33.33% and 51%), for healthcare (31.28% and 45%), for education (30.26% and 37%), for multi-family (38.46% and 24%), for hospitality (18.46% and 23%) and single-family (18.46% and 8%). The 2018 survey also included an additional building type for off-site construction, data centers, which 11.28% of respondents indicated they used off-site to develop (Question 14, 2014; Question 12, 2018).

Most respondents (87.62% in 2018; 93% in 2014) indicated utilizing off-site fabricated components to some degree over the past 12 months (Question 1, 2018; Question 1, 2014), while (81.63% and 83%) expected to utilize off-site construction more often or the same amount in the next 12 months (Question 7, 2018; Question 9, 2014).

In both the 2018 and 2014 surveys, respondents delineated the perceived and realized benefits of off-site construction to project performance. The primary benefit identified in both surveys is a reduced overall project schedule, specifically the duration of the construction phase. Other realized benefits noted from the survey include the quality of the product and cost effectiveness (Questions 4 and 5, 2018; Questions 5 and 6, 2014).

Respondents to the 2014 survey experienced improved project stakeholder collaboration when employing off-site methods. According to 78% of respondents, off-site construction requires moderately higher or significantly higher levels of stakeholder engagement. However, the increased integration and collaboration throughout the delivery process can result in higher quality and reduced changes throughout construction (Question 6, 2018; Question 7 and, 2014). These benefits respondents recognized in this survey confirm previous findings by McGraw-Hill Construction.

The surveys also reveal the barriers and challenges to implementing off-site construction. According to respondents, one of the most significant barriers is transportation, specifically how far away the factory is located from the construction site. The need for clear program requirements for the building was also seen as a major challenge (Question 2, 2014). Construction culture and late design changes were the most significant barriers (Question 2, 2018). In addition, respondents in both surveys qualitatively noted that some projects, particularly those with long spans, may not be suited for utilizing pre-fabricated elements and that each project has unique requirements that must be met through an appropriate technical solution. Survey respondents also indicated that unions might hinder off-site utilization with non-union factory labor.

Both surveys point to the potential issues that the lack of supply chain integration can present for off-site construction. The building component fabrication industry is maturing and will require time to integrate more effectively with site-built work. In addition, contractors are learning how to manage off-site products for assembly on-site. Interestingly, respondents stated that the most significant barrier to off-site construction is the culture of design and construction. Comments indicated that late design changes, lack of collaboration and an adversarial climate for project delivery leads to difficulties in realizing the benefits of off-site construction.

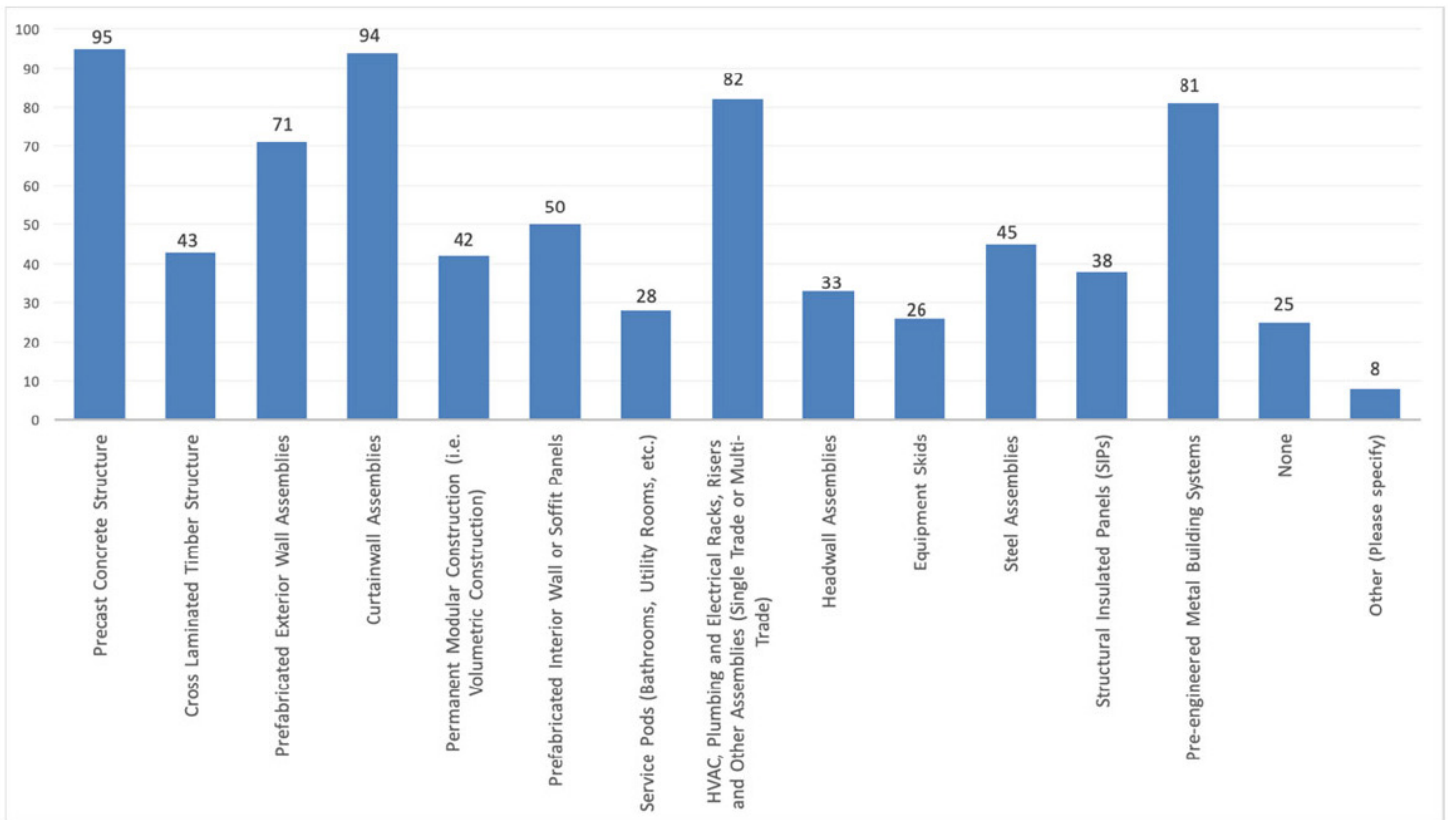
A significant finding from the survey pinpoints who is making the decisions regarding off-site use. According to the 2018 and 2014 surveys, respondents indicated that the construction manager (CM) or general contractor (GC) (a combined 47.67% in 2018 and 57.1% in 2014) is the one who most often decides to implement off-site construction. This is followed by designers, including architects and engineers (A/E) (a combined 63.22% and 51.5%), then the clients (41.97% and 27.9%) and others, primarily subcontractors (21.24% and 20.9%). (The survey team speculated this represents component fabricators, such as sheet metal suppliers, when prefabrication is held within a single subcontract agreement.) This finding is informative and suggests that additional education is needed for current decision makers (i.e. CM/GC and A/E), as well as owners, who have the potential to demand the use of off-site construction (Question 3, 2018; Question 4, 2014).

The barriers and challenges to off-site construction indicated in this survey point to gaps in building project stakeholder knowledge (Questions 8 and 9, 2018; Questions 10 and 11, 2014). To fill this deficiency, the Off-Site Construction Council plans to distribute future industry-focused surveys to obtain additional data on the state of prefabrication in the construction sector. In addition, the Council has developed webinars, whitepapers and other resources to provide implementation knowledge for the building industry. This content can be found at the Off-Site Construction Council resources page at: www.nibs.org/page/oscc_resources.

To learn more about the Off-Site Construction Council, including how to get involved, visit www.nibs.org/oscc.

QUESTION 1

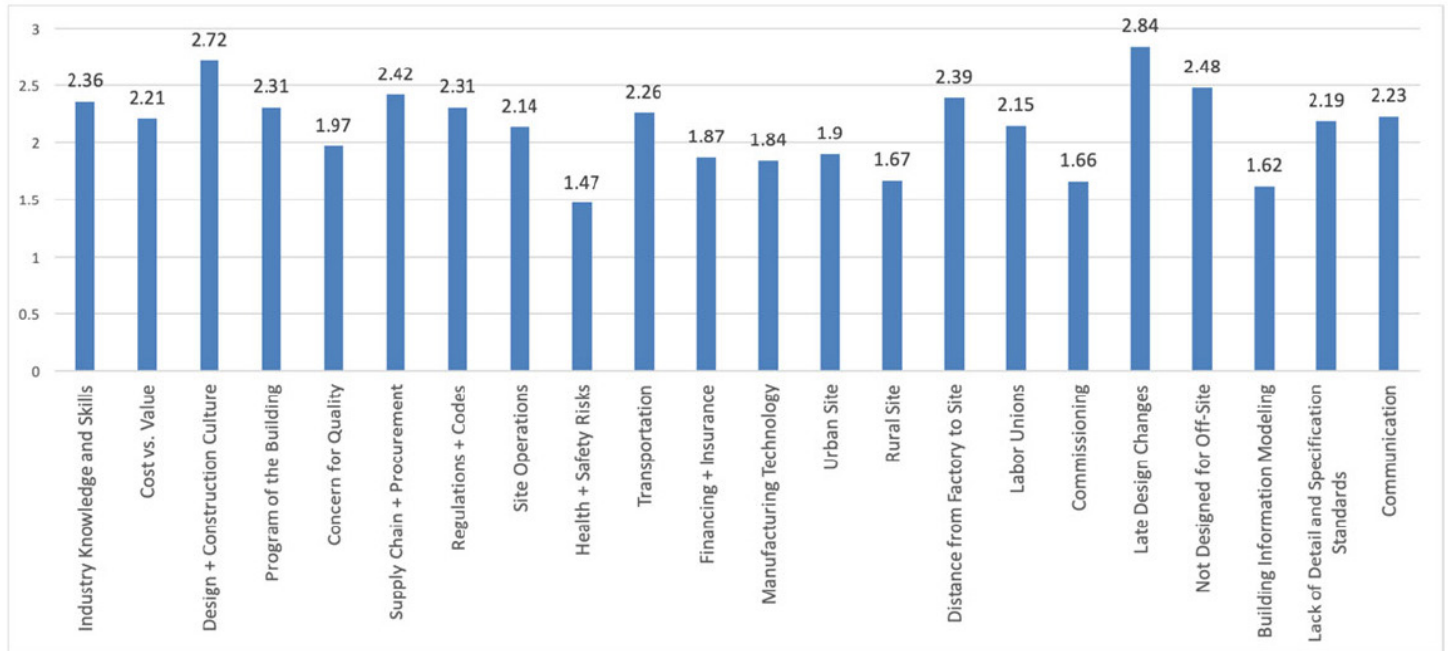
My company has incorporated the following off-site elements in one or more projects in the last 12 months:



Responses reflect the number of answers to the question. Respondents may select more than one option.

QUESTION 2

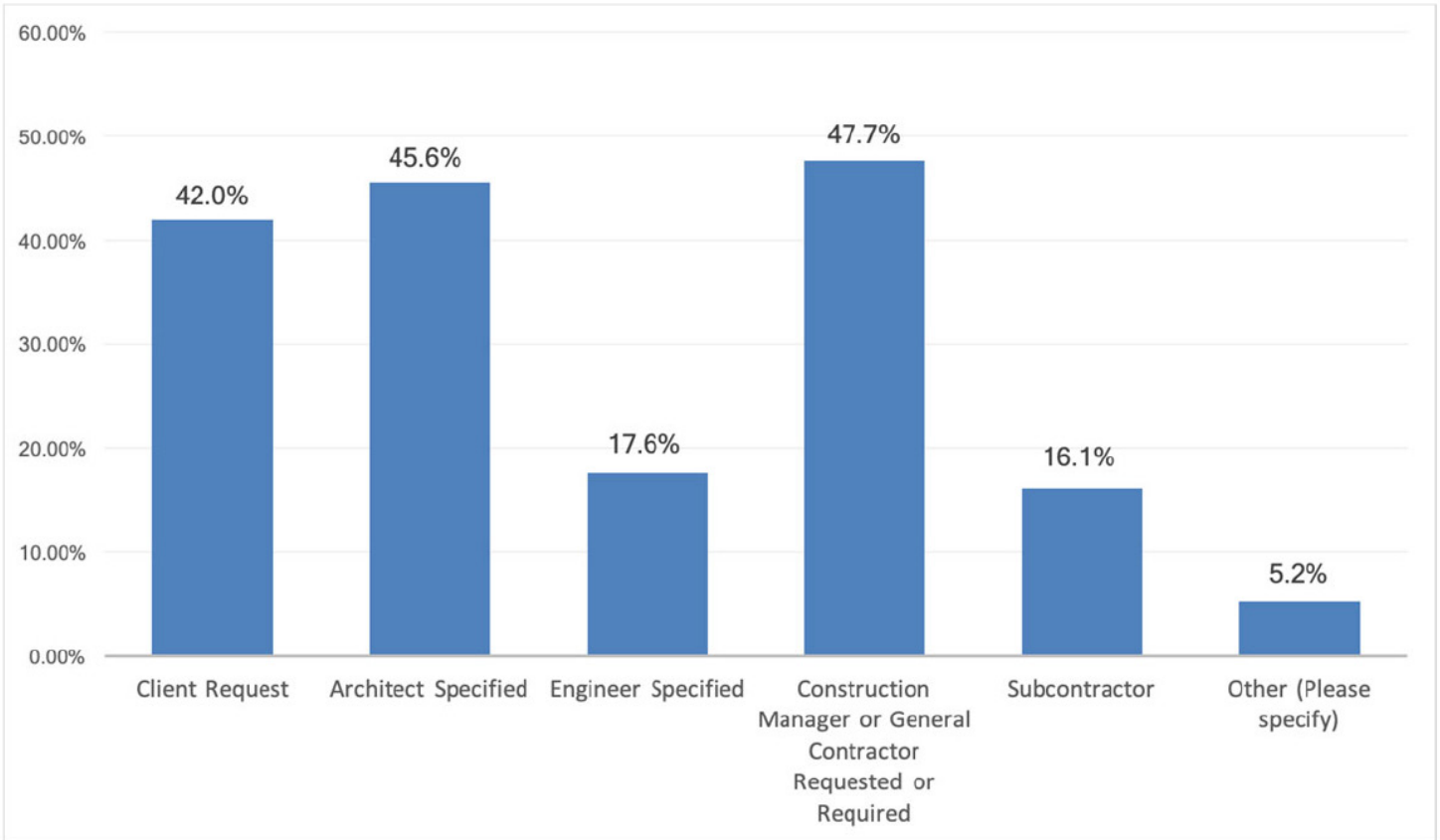
Rate the barriers to implementing off-site construction:



The rating reflects the average out of 4 possible degrees of barrier responses: Significant (3), Moderate (2), Small (1) and No Barrier (0).

QUESTION 3

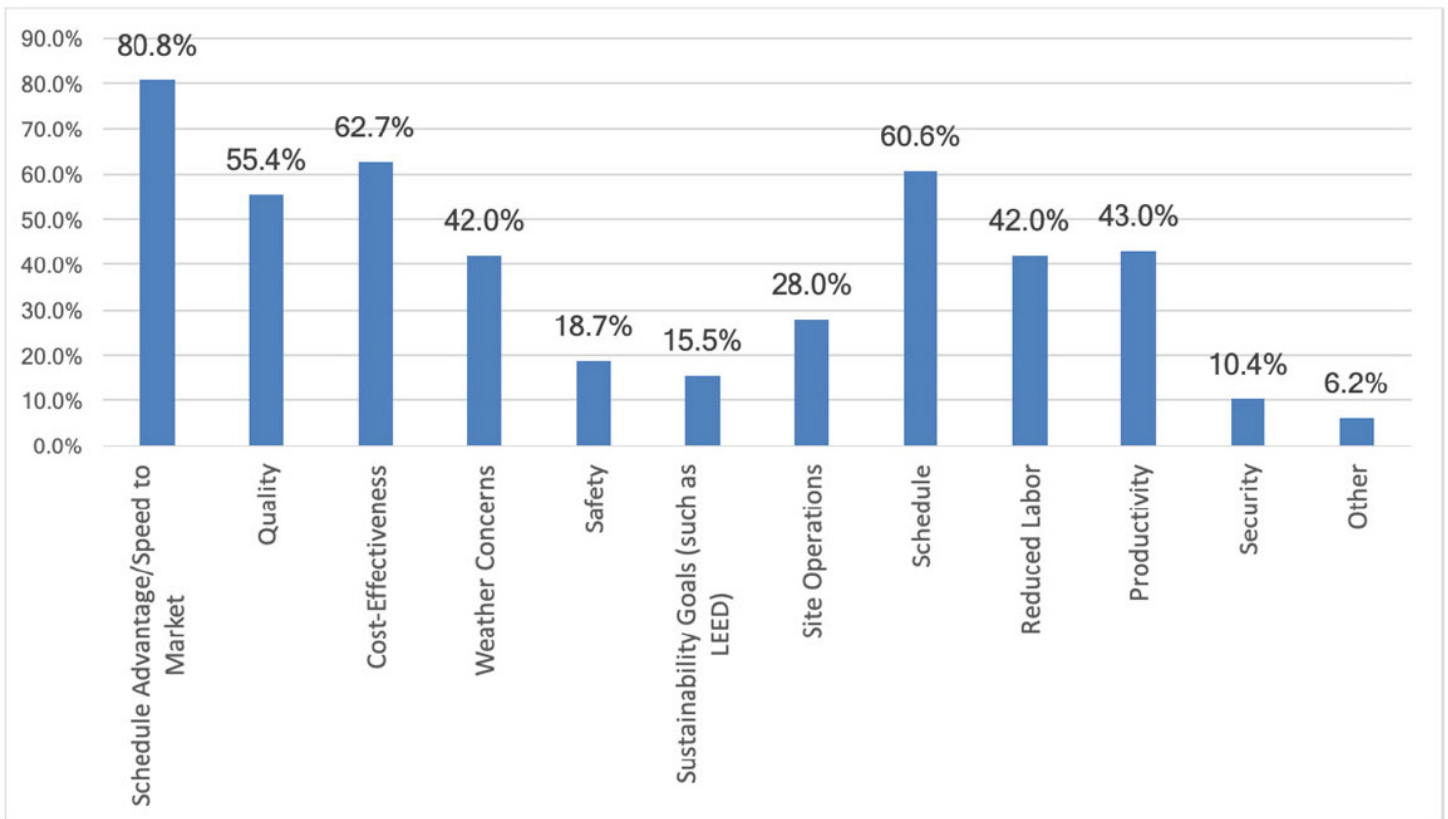
During the project planning phase, who was responsible for the decision to use off-site construction?



Most responses in the “Other” category were either “all of the above” or “the subcontractor suggested using off-site construction.”

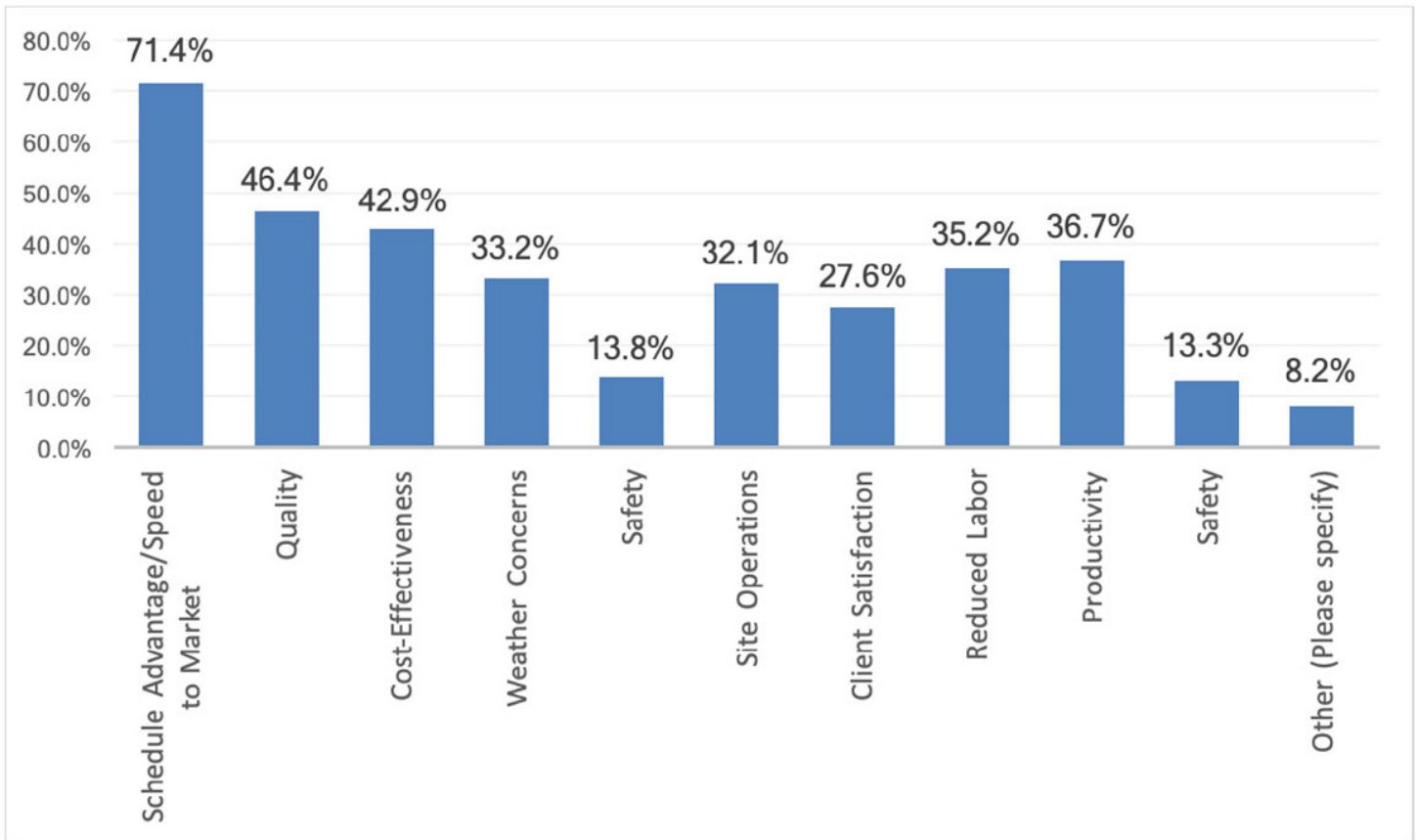
QUESTION 4

Considering your most successful experience with off-site construction, what were the pre-construction expected benefits of using off-site?



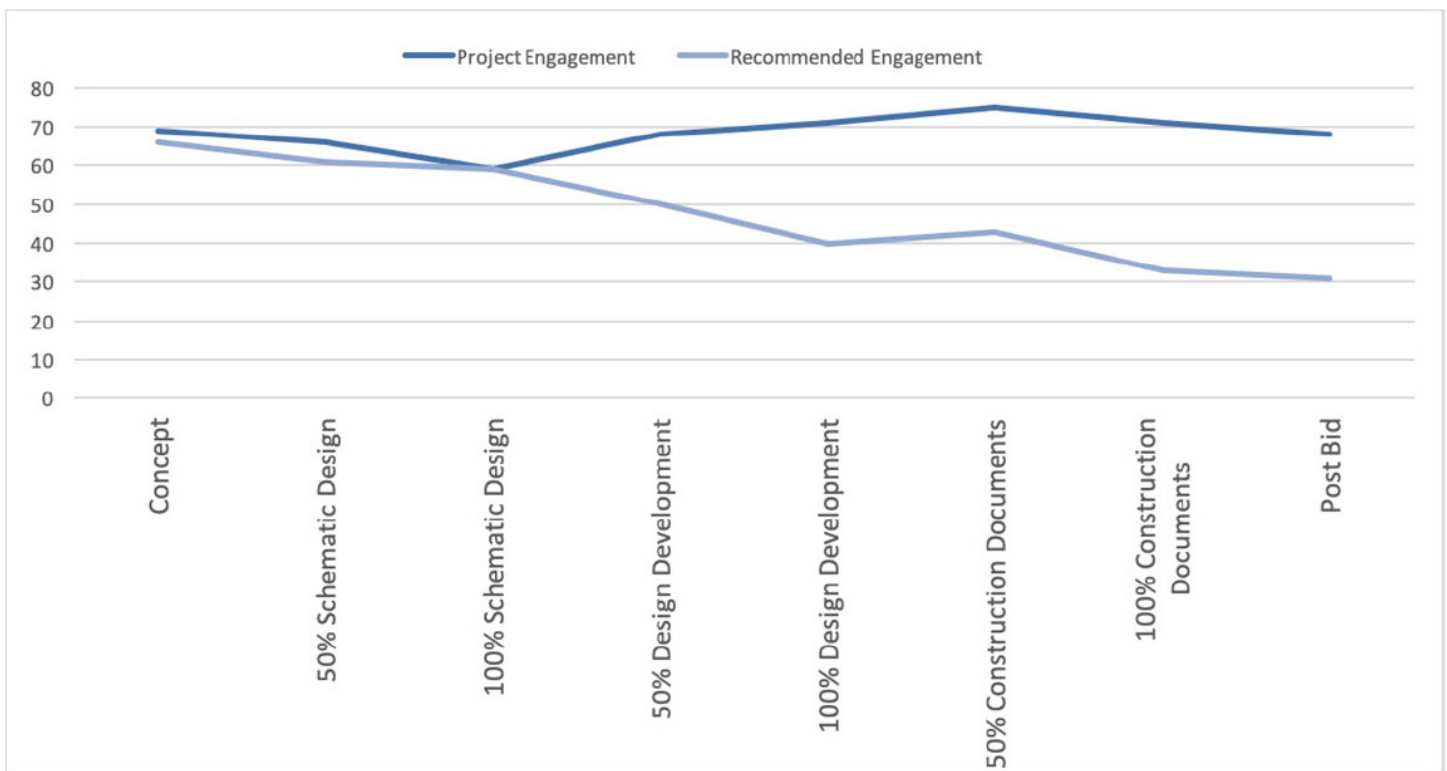
QUESTION 5

For this project, what were the actual benefits realized by using off-site construction?



QUESTION 6

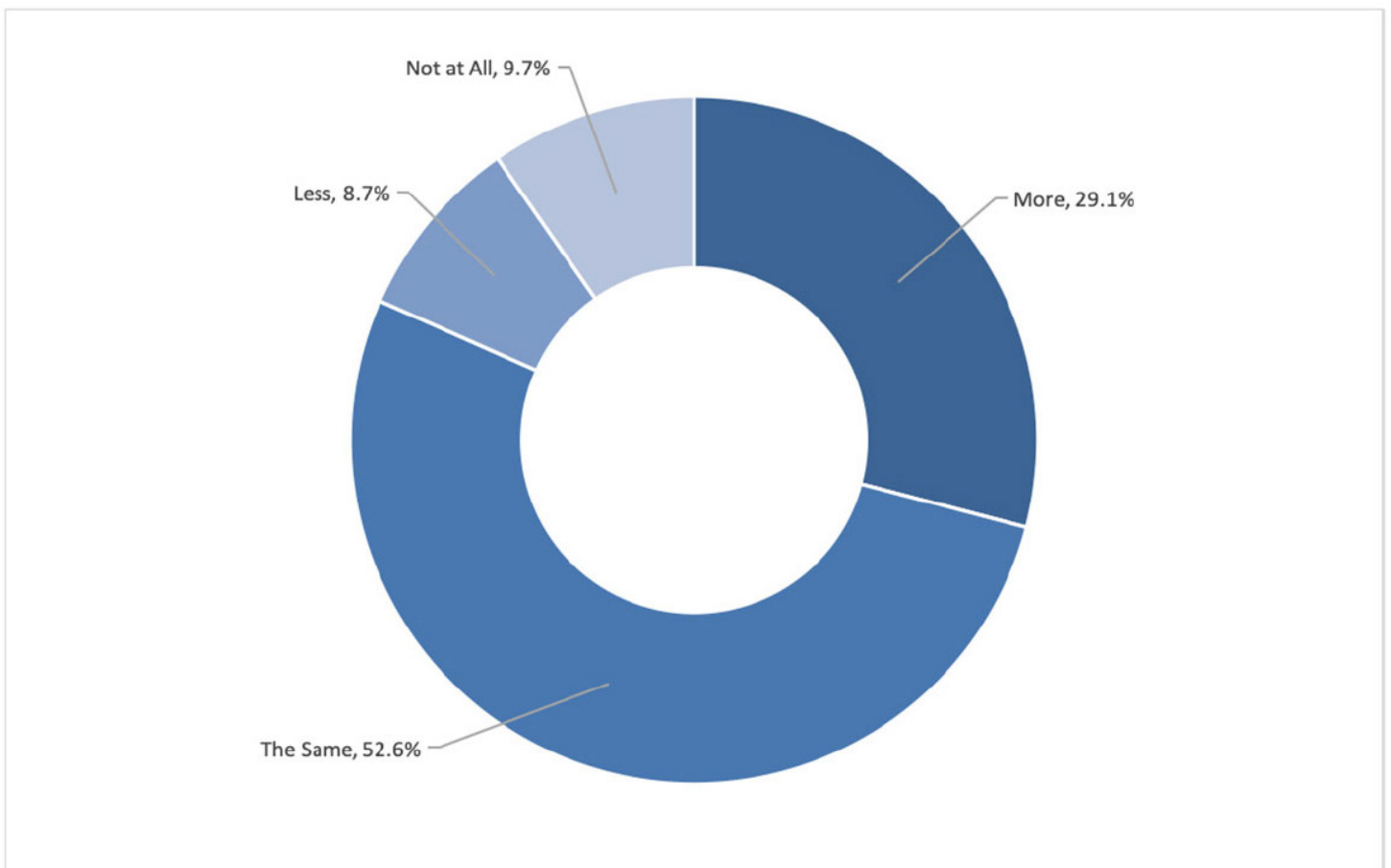
For the considered project, when did you collaborate with the contractor performing the off-site work and, based on your experience, when do you recommend engaging the off-site contractor?



The results of this question show that, based on their experience, the respondents recommend engaging the off-site contractor prior to 50% Design Development to ensure the value of off-site construction.

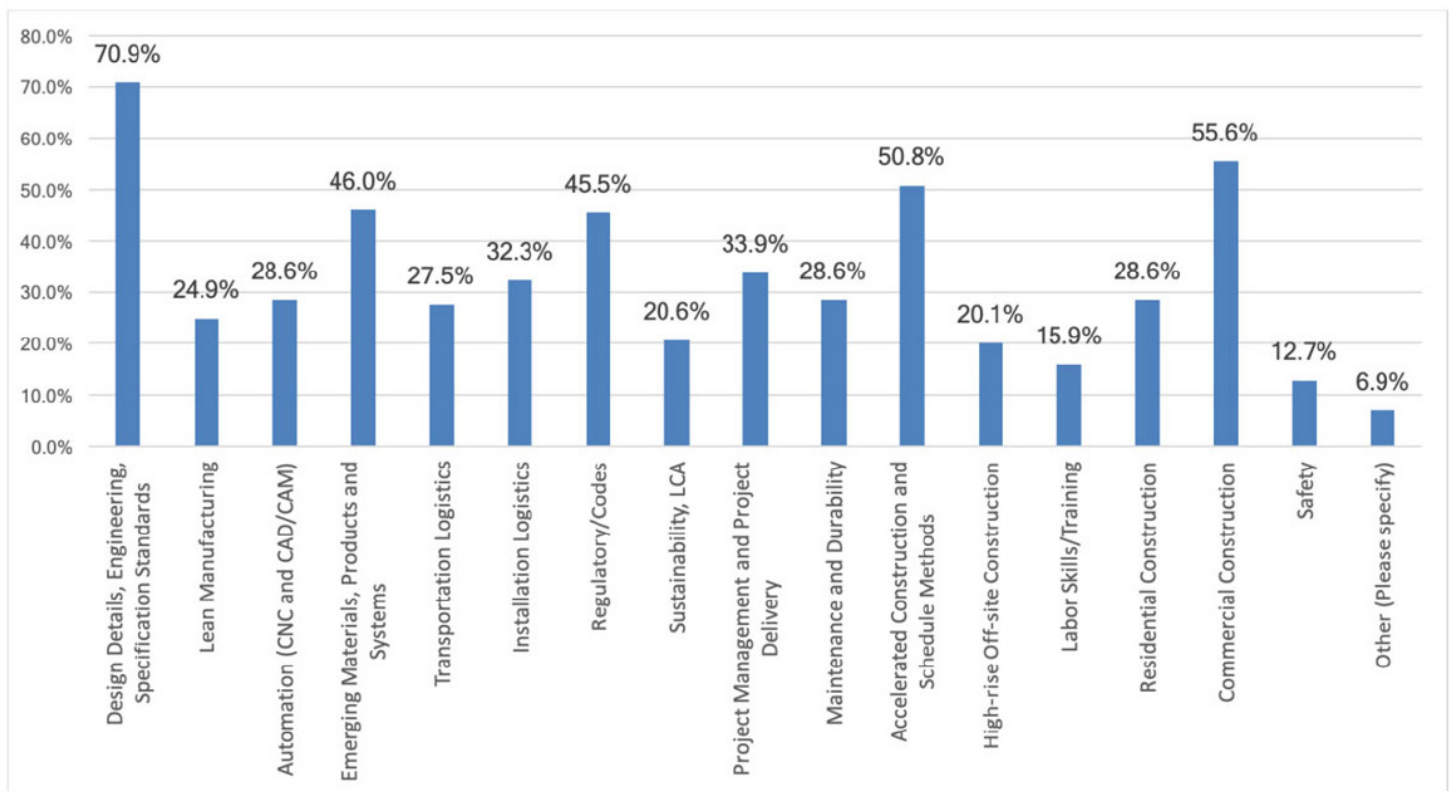
QUESTION 7

In the next 12 months, how often do you anticipate using off-site construction?



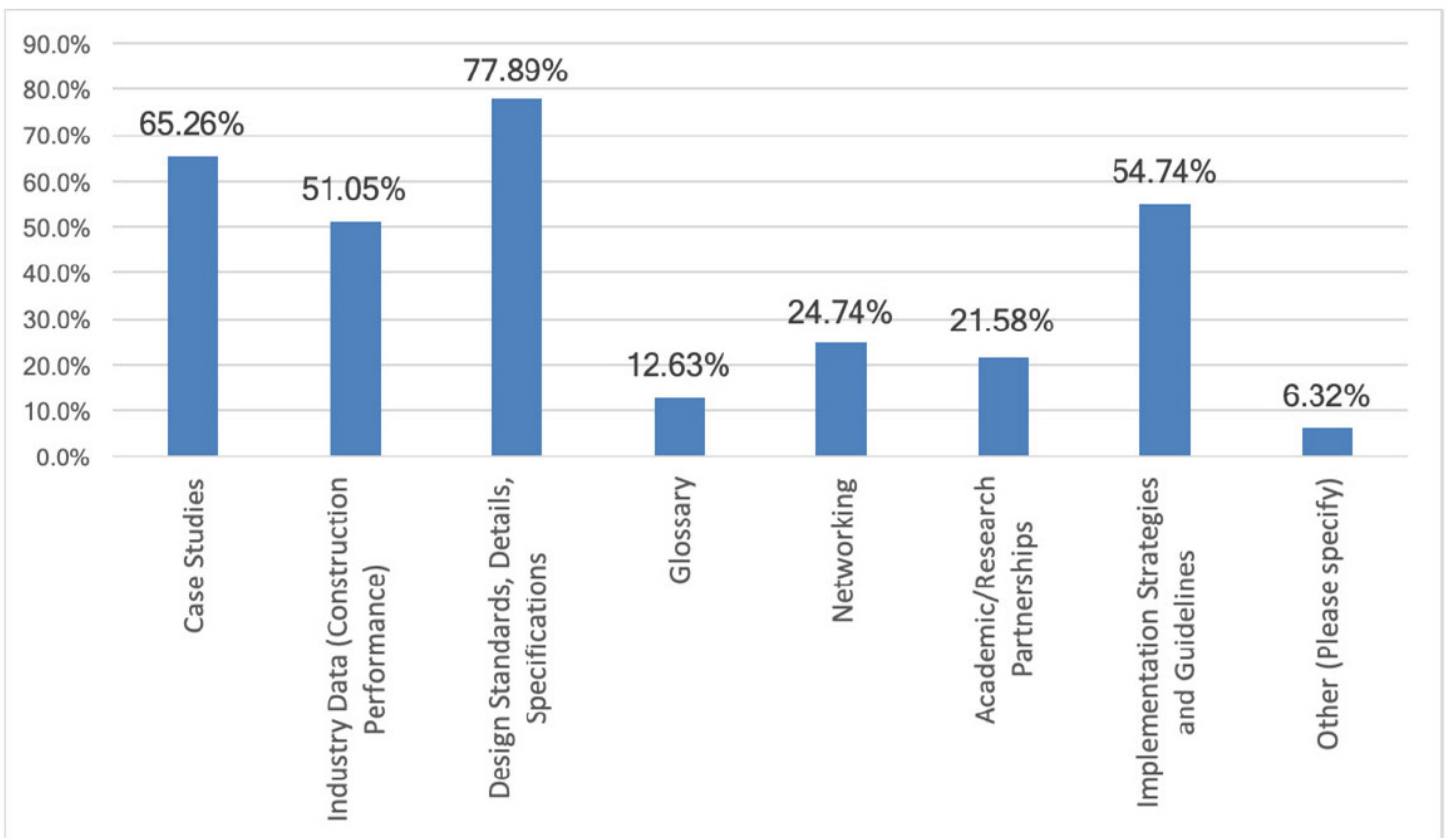
QUESTION 8

What aspects of off-site design and construction information and data are you interested in?



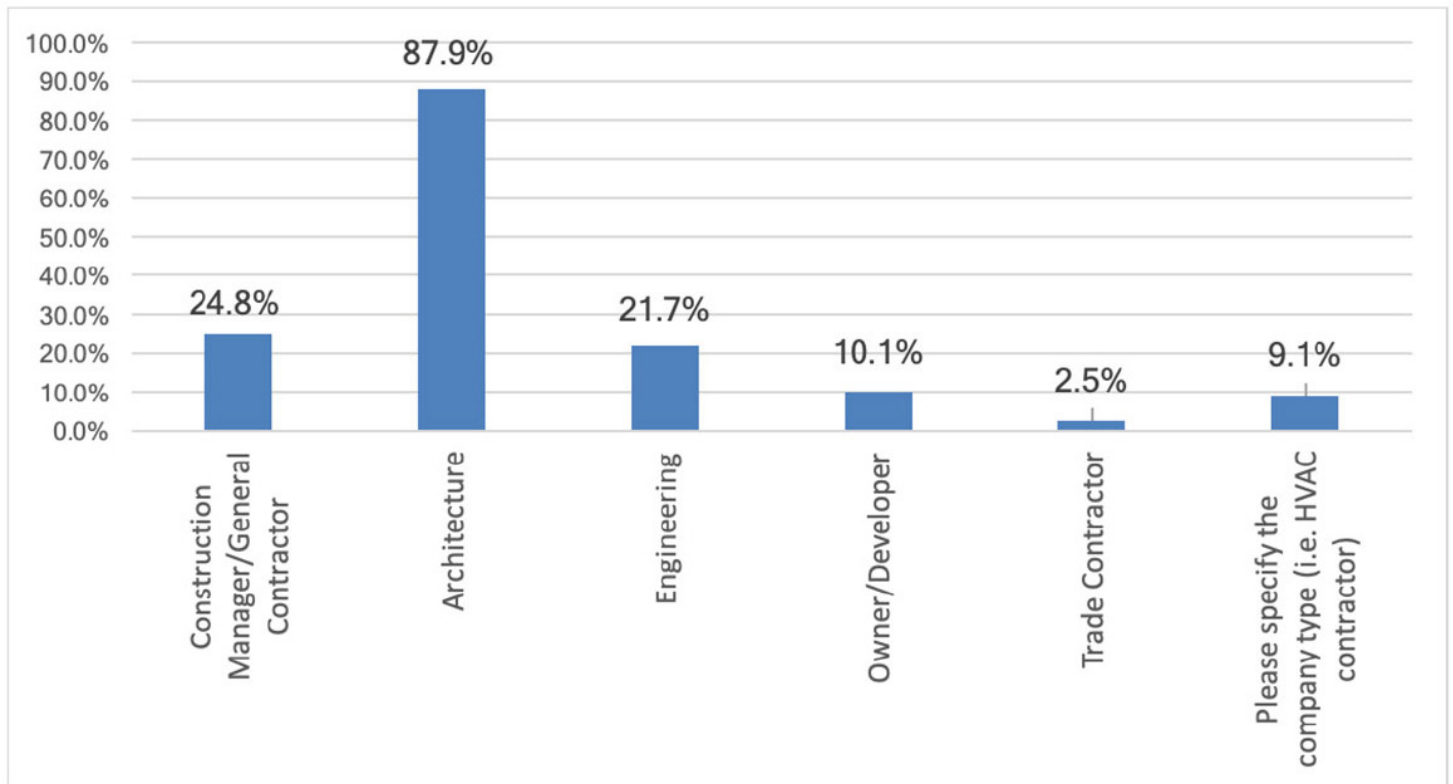
QUESTION 9

What types of support could the National Institute of Building Sciences Off-Site Construction Council offer that would benefit your company’s utilization of off-site construction?



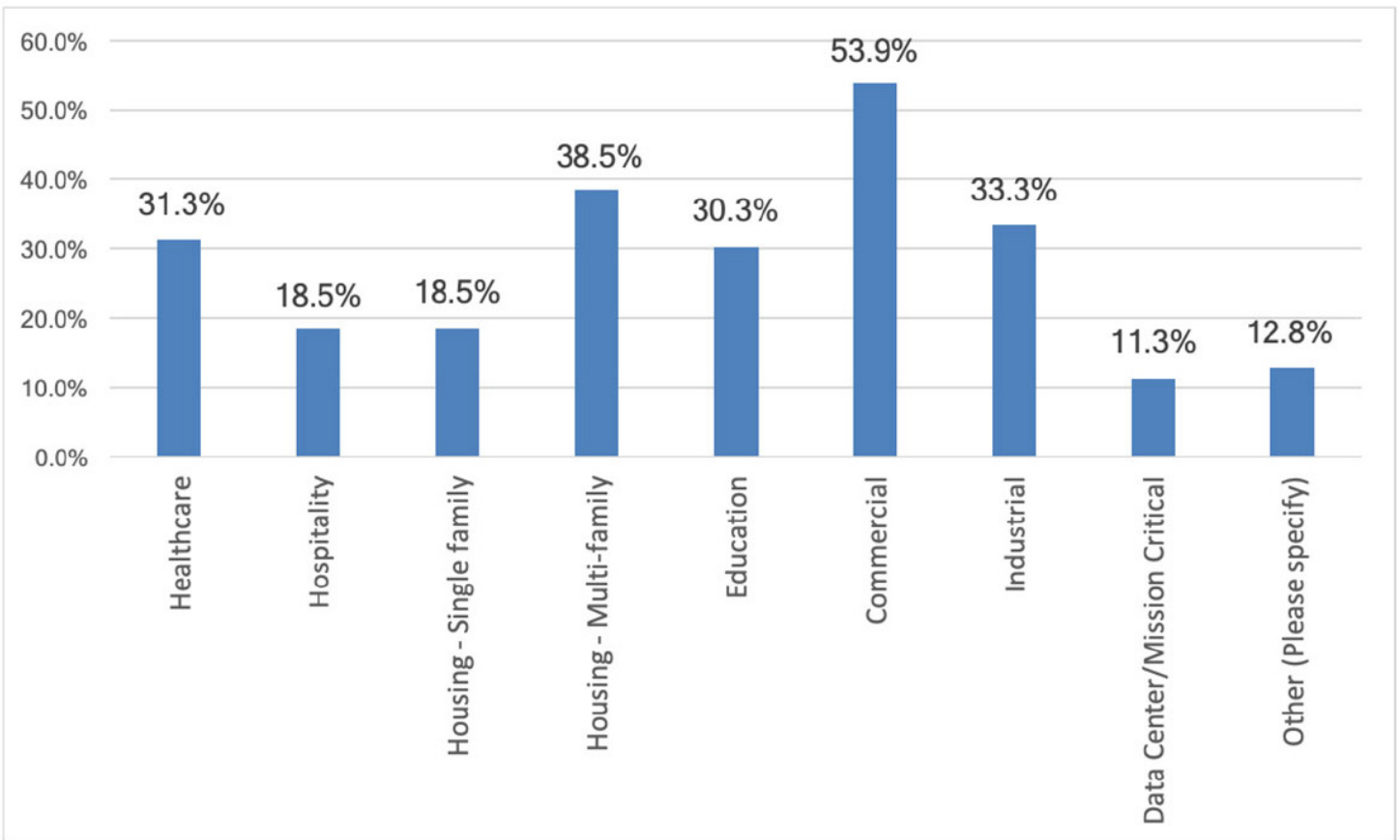
QUESTION 10

What are the primary services your company offers?



QUESTION 11

For what project types has your company utilized off-site construction?



QUESTION 12

In which state(s) was/were the project(s) that utilized off-site construction located?

State	Number of Projects in State
Alabama	3
Alaska	2
Arizona	7
Arkansas	2
California	21
Colorado	6
Connecticut	3
Delaware	4
Florida	34
Georgia	5
Hawaii	1
Idaho	6
Illinois	7
Indiana	8
Iowa	5
Kansas	1
Kentucky	2
Louisiana	4
Maine	1
Maryland	10
Massachusetts	10
Michigan	10
Minnesota	2
Mississippi	5
Missouri	6

State	Number of Projects in State
Nebraska	3
Nevada	2
New Hampshire	2
New Jersey	12
New Mexico	2
New York	15
North Carolina	9
North Dakota	3
Ohio	18
Oklahoma	4
Oregon	7
Pennsylvania	1
Rhode Island	4
South Carolina	4
South Dakota	1
Tennessee	4
Texas	12
Utah	8
Vermont	1
Virginia	8
Washington	30
West Virginia	2
Wisconsin	4
Wyoming	5
Canada	4

About the Off-Site Construction Council:

The U.S. off-site design and construction industry has made significant advances in implementing processes and materials to build and deliver more sophisticated and complex facility types by virtue of system prefabrication, unitization, modularization and panelization. More and more owners are turning to off-site methods for multi-story wood construction, steel framed structures, healthcare facilities, educational structures and large-scale military projects. As an industry, however, owners, architects, engineers and contractors up until now have lacked an unbiased source for evaluating the applicability and potential benefits for use of such methods, for determining where and when fabrication is appropriate, and for identifying the range of choices inherent in integrating and collaborating with fabricators.

The National Institute of Building Sciences Off-Site Construction Council (OSCC) serves as a research, education and outreach center for relevant and current information on off-site design and construction for commercial, institutional and multifamily facilities.

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About the Institute:

The National Institute of Building Sciences is a non-profit, non-governmental organization that successfully brings together representatives of government, the professions, industry, labor and consumer interests, and regulatory agencies to focus on the identification and resolution of problems and potential problems that hamper the construction of safe, affordable structures for housing, commerce and industry throughout the United States. Authorized by the U.S. Congress, the Institute provides an authoritative source and a unique opportunity for free and candid discussion among private and public sectors within the built environment. The Institute's mission to serve the public interest is accomplished by supporting advances in building sciences and technologies for the purpose of improving the performance of our nation's buildings while reducing waste and conserving energy and resources.



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