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Off-Site Construction.

Prefab. Modular. Are They the Same?

Yes. And, no. We all know the old elementary school lesson that all squares are rectangles, but not all rectangles are squares, right? That's the same concept at work here.

All relocatable modular structures are built off-site, but not all off-site construction is relocatable trailers. Off-site permanent construction is built in a controlled environment. Are you following?

"Off-site construction" as defined by the National Institute of Building Sciences as the planning, design, fabrication, and assembly of building elements at a location other than their final installed location to support the rapid and efficient construction of a permanent

structure. Such building elements are fabricated in a factory location and transported to their final location. Off-site construction is characterized by an integrated planning and supply chain optimization strategy.

Why Choose Off-Site Construction?

Projects that are restricted by a time schedule are perfect for off-site construction. Projects that have a restricted and tight site, with no or little to no construction laydown area, and have concerns about disrupting the neighborhood, are perfect for off-site construction. Off-site construction has the potential to reduce schedule and increase safety and quality.

For example, a 100,035 square foot new replacement elementary school (80,028 square foot of off-site permanent construction and 20,007 square foot site-built construction) was designed, publicly bid and completed in 13 months with 80 percent of the work executed using off-site permanent construction. The project took less time and there were no code approval problems. The students were displaced for one school year.

In addition, by incorporating the off-site permanent construction methodology, the construction of the off-site modules can take place at the same time the foundation and civil work is taking place. The cost advantage comes from a building being completed much faster, and

in a quality-controlled environment. Shortening the schedule and creating a higher-quality product is what saves money on a project. With the current oversaturated construction market and the labor shortage, the cost of off-site permanent construction is less than the full on-site construction, and coupled with a shorter construction duration is a win/win.

The key to combining the two types of construction—both off-site permanent construction and typical stick-built construction—successfully is to consider off-site permanent construction during the design phase of your project. The earlier in the project, the greater the time and cost savings and environmental benefits. A team approach, and early communication of the whole design with the construction team, greatly improves the entire process. It also helps to have people on the design team who are experts with this type of construction.

Study Results

A recent study of 17 off-site permanent construction projects found that, on average, schedules can be decreased 45 percent and costs cut 16 percent over onsite construction. Of the completed projects reviewed, there were on average 0.25 safety incidents. "These are incredible

results," said Ryan E. Smith, associate dean of research and engagement at the University of Utah and the principal researcher for the study, *Permanent Off-Site Construction: Process, Practice, Performance*.

With the recent recession, clients are being forced to cut costs at the same time that energy and green building requirements are going up, creating a greater need for alternative construction methods to be implemented.

The study is a step toward creating a model to collect data on off-site permanent construction, defined by the Off-Site Construction Council of the National Institute of Building Sciences (NIBS) as any component of a building that is assembled away from its final site location.

The study also looked at return on investment, based on comparisons to three-conventionally built jobs: a retail project, an office building, and a charter school. The developers' data was assessed using a schedule improvement of 25 percent and 50 percent faster than the actual schedule. The ROI for a 25 percent schedule reduction was an average savings of \$5.81 per square foot; for a 50 percent schedule reduction, it was \$10.93 per square foot of savings.

Internationally, prefabrication and off-site permanent construction have provided numerous

productivity benefits—specifically in the area of labor, scheduling, cost, quality, and safety. In the United States, the National Research Council has identified the expanded use of off-site permanent construction as an important method for advancing the competitiveness and productivity of the domestic construction industry over the next 20 years.

The United States 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. More and more owners are turning to off-site methods for multi-story construction, steel framed structures, health-care facilities, educational structures, and large-scale military projects.

In 2013, the National Institute of Building Sciences established the Off-Site Construction Council (OSCC) to serve as a research, education and outreach center for relevant and current information on off-site design and construction for commercial, institutional and multi-family facilities.

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