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Improving Prefabrication and Field Productivity with Design Standardization

by *Stephane McShane*



Subcontractors and specialty trade contractors may be on the lookout for that silver bullet that will quickly and easily solve the problems of accelerating prefabrication and field productivity, but unfortunately, there is no quick and easy fix. There is, however, widespread agreement that prefabrication can save money. The percentage may vary, but the truth is the solution requires a focused effort and a bit of a paradigm shift.

Prefabrication allows for assemblies to be manufactured in controlled conditions, utilizing specialized tooling and equipment to expedite fabrication. Escalating the use of prefabrication can save significant labor dollars, but many contractors have difficulty making this happen. Challenges can usually be solved with an enterprise level shift in how prefabrication operations are managed.

When does your firm begin selecting the assemblies to prefabricate on a project? The most common answer is that the products to be prefabricated are determined by those who will be installing them. In other words, the contractor bids a project, perhaps even designs the project, wins the project, and then turns it over to the operations group to build. Then, the operations team determines what could be prefabricated. Many even have a “prefab catalog” to help them visually flip through and choose products. This methodology has put a cap on what will run through your prefabrication shop, limited by the knowledge of the person looking through the catalog. In the case of this example, does this particular foreman know everything that the prefab shop can do? Does the foreman have confidence in the ability of the design and prefab group

to produce a high quality, usable assembly? Is there an adversarial relationship to overcome between the prefabrication shop and the field? Stated differently, is there an “us vs. them” mentality entrenched in the notion that the prefabrication shop is taking work away from the field? Organizations that have one or more of these challenges normally have severe limitations on how much they can prefabricate.

Regardless of what markets your organization serves, the choices on what products can be built in a prefabrication shop should be made prior to the award of the job, prior to designing the job, even prior to estimating the job. This should be done with some internal analysis by determining who your customers are, what their needs are, and how your design group, prefabrication shop and field installation teams can solve them.

The Path to Design Standardization

STEP 1: Define Your Customers

Who are your customers? When is the last time you ran an analysis of your clients to see who you work for, and the revenue for each? How many projects did you build with them? What was the average project size? What scope or service did you provide to those clients?

STEP 2: Determine Your Customers' Needs

Next, identify your clients' needs. What vertical markets do they serve? Some examples of vertical markets may be health care, industrial, commercial, institutional, and educational. Is the market changing? Will their needs change? Are certain markets decreasing while others are on the upswing? Which markets do you want to focus on moving forward? This is critical, as the products you would install inside a

hospital may be entirely different than those products that you would install inside a strip mall.

STEP 3: Discuss What Products to Prefab

Next, define standard assemblies. This involves having structured conversations with all levels of operations, including those who install the actual products, to determine what could be regularly prefabricated within a vertical market. Remember, the desired result is an increase in field productivity, so ask the installation experts for their ideas.

STEP 4: Create Standard Assemblies

Now, develop standard designs for these products. Using a team approach comprising a cross section of operations staff, discuss and develop the parts and pieces to be utilized in each assembly. The team should have some field personnel involved, because they

have tremendous insight as to what materials work well.

How many standard assemblies should you develop? Design standardization simply boils down to the standard assemblies that you will utilize in the majority of the projects inside any given vertical market sector. This does not mean thousands of assemblies whose pictures appear in a 3-inch thick catalog of prefab materials. Start by finding the 80 percent solution. Within a given vertical market, identify those assemblies that can be used in 80 percent of the projects within that market. From there, develop a standard design for that assembly. A standard assembly should have the ability to have options, or slight changes to the design that can be noted as optional equipment, not designated as a completely new standard design. This enables you to limit the quantity of "standard assemblies" by allowing the use of options on a limited amount of



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assemblies. For example, a standard electrical box assembly might include a wall bracket, a box, 1/2-inch plaster ring, a ground pigtail, and a 15-foot piece of MC cable with a connector at the end. An option to this standard assembly might be to have a 20-foot piece of MC cable in lieu of the 15-foot piece, or a 5/8-inch plaster ring in lieu of a 1/2-inch mud ring. This would limit the amount of standard designs and give you the ability to build repeatable, scalable, productive processes in your prefabrication facilities and only manage the changes of options from the standards.

During this process, you should also establish your preferred manufacturer for each of the parts and pieces used in the standard assemblies. The fewer manufacturers you can utilize, the better. Although there will be exceptions where a different manufacturer or product must be used, these will become the company standard materials and all efforts will be made to utilize this standard whenever possible. The use of consistent materials has some significant benefits. The first is that the workers in the field will see the same products over and over, thus reducing the learning curve on efficient installation of the product. Second, it becomes easy to include the standard materials in a purchasing agreement with the vendors for orders for the prefabrication shop and the field across the entire portfolio of similar work, thus increasing the buying power of the organization. Third, this will limit the amount of materials in the submittal package. While engineers may push back, requiring whatever products they specify, you may choose a material that is equal to, or even superior to the average required by that vertical market. In doing an analysis, you may find that the cost of a more expensive or higher quality material item is more than offset by the labor savings in the prefab shop and in the field.

The field and the prefab shop should utilize the same manufacturer and material in order to minimize the time spent on the learning curve.

By doing this for each vertical market you intend to serve, you will quickly come up with your standard assembly lists, complete with standard manufacturer's part numbers and quantities needed to build these assemblies. You can then design the workflow, specialized tooling, material handling, and kitting/packaging requirements for these standard assemblies to maximize the productivity inside of your prefabrication operation.

Driving the Throughput

Now, it is time to drive the use of these standard assemblies into the design and estimating process. Move the decision-maker for what will be prefabricated from the field operations team to the estimating and design group.

Estimating Database Synchronization

The standard assemblies should be created inside your estimating database and used as the standard for takeoff. When an estimator has completed his or her work, you can quickly and easily obtain a preliminary count of those assemblies that could be manufactured for a project, broken down by the phases and areas that the estimator utilized.

Design Standardization

The standard assemblies can be built into the design department's standards and utilized during the design-build, design-assist, value engineering, or internal design and layout process. Since design occurs prior to field installation, this is the prime time to determine what should and should not be prefabricated. In that way, drawings that are designed for the field can be created with

your standard assemblies already incorporated into them, thus facilitating their use and driving significantly higher throughput in your prefabrication operations.

By following this process, you have identified your customer base, what vertical markets they serve, what products can be used in the majority of those projects, and defined standard assemblies that fit the needs of those markets. You have standardized the manufacturers and products to be utilized in the organization to maximize the benefit of vendor partnership agreements. You have embedded these standard assemblies into both your estimating and design departments in order to drive the increased use of prefabrication and standardization earlier in the lifespan of the project. When you couple this long list of benefits with the increase in field productivity by them seeing the same assemblies created from the same materials, packaged in the same way, delivered in the same manner, and shown on the design drawings in a consistent fashion, the return on investment becomes ever more attractive.

Stephane McShane is an associate director at Maxim Consulting Group responsible for the evaluation and implementation processes with her clients. She works with construction-related firms of all sizes to evaluate business practices and assist with management challenges. With a large depth of experience working in the construction industry, McShane is keenly aware of the business and, most specifically, operational challenges firms' face. Her areas of expertise include leadership development, organizational assessments, strategic planning, project execution, business development, productivity improvement, and training programs. McShane is an internationally recognized speaker, mentor, author, and teacher.