CASE STUDY IN PREFABRICATION

MIAMI VALLEY HOSPITAL SOUTHEAST TOWER ADDITION
This document provides an overview of the benefits realized using project specific prefabrication™ in constructing major portions of a large hospital project.

**PROJECT SCOPE**

The Miami Valley Hospital Southeast Tower Addition project involved the new construction of a 480,000 SF, 12-story hospital in the middle of a dense, urban medical campus. The 180-patient bed facility included five redundant patient floors, three operating rooms and five cath labs.

**PROJECT VALUE**

$152,000,000

**SCHEDULE**

Completed in 28.5 months

**PROJECT SPECIFIC PREFABRICATION™ (PSP)**

The design/ construction management team saw the opportunity to capture significant efficiencies using off-site prefabrication of major building components. Following a series of brainstorming meetings among the owners/designers/construction team, key subcontractors were brought on in a design-assist role to provide the benefit of their expertise and to assist in the construction of mock-ups for end-user feedback. Incorporating the intellect from each of these project stakeholders, the team determined that MEP corridor racks, patient bathroom “pods” and patient header/footer walls presented the best opportunities for prefabrication.
BENEFITS OF PROJECT SPECIFIC PREFABRICATION™

LEAN CONSTRUCTION

The primary driver for investigating PSP™ was to determine if there were efficiencies that would benefit the project. By using the prefabrication process, the project benefited from:

- higher production rates
- lower labor cost
- significant minimization of waste

Higher Production Rates

Prefabrication work took place in a temperature-controlled warehouse three miles from the project site. Work that typically may have taken place on a ladder—500 feet above the ground in the midst of a chaotic job site—took place at waist height in a quiet environment that felt empty given the expanse of space available. Furthermore, the prefabrication work involved significant repetition allowing not only workers to become more efficient, but also system components to be pre-measured, cut and assembled prior to delivery at the warehouse. This was a “2nd-tier” level of prefabrication. Because of these various efficiencies, productivity rates soared. The electrician’s project manager stated that his crew was running 600 LF of conduit a day, approximately three times what he would expect on a conventional job site.

Lower Labor Cost

Traditionally with union labor, shop wages operate at a separate scale from field wages. The prefabrication process benefited as shop labor averaged approximately 80% that of field labor. (Admittedly, this benefit of these savings was largely off-set by the cost of warehouse space and shipping building components to the site.)

Waste Minimization

The repetition of work and predictable conditions of the prefabrication environment also enabled work crews to be highly efficient with materials. Benchmarking from past conventional projects, the staff estimated six dumpster pulls from the prefabrication site. In the end, the crew did not even fill one dumpster through the duration of the prefabrication process. The project received a LEED innovation point for this accomplishment.

SAFETY

As is evidenced by Graphic 1 on the next page, the Miami Valley Hospital Southeast Tower Addition drastically out-performed the typical safety metrics for a project of its size and complexity. The cause can best be attributed to two factors:

- The nature of work in the prefabrication warehouse
- The impact of removing work activities from the job site

Prefabrication Warehouse

The warehouse was a temperature-controlled environment, unexposed to storms, extremely sunny days or harsh winds. The work took place at waist height, never involving a ladder or extended periods of squatting or reaching. At its peak labor, the warehouse housed 18 workers. All of these conditions created a worker-friendly environment that proactively prevented accident prone conditions. No injuries occurred during the six months of work at the warehouse.
On-Site Impact

By performing assembly of all the interior building components for five patient floors, the use of PSP™ drastically reduced the number of workers who would ever step foot on-site (see Graphic 2). In effect, this shrunk the overall “size” of the project. Furthermore, those workers who were onsite were able to work in a quieter, less crowded environment than they otherwise would not have. Again, these conditions enabled the project to drastically out-perform peer projects of similar size and complexity.

Graphic 2: Reduced # of Hours On Site (and reduced peak)
QUALITY CONTROL

Although it is difficult to quantify the benefit of potential problems that never took place because they were prevented, it is clear that the enhanced quality control opportunities enhanced the overall project. These benefits included:

- Controlled environment
- Opportunity for 360 degree inspection of work
- Overall project cleanliness

**Controlled Environment**

As has been discussed, the warehouse was a controlled environment, protected from temperature extremes and inclement weather. This ensured that workers were able to easily detect, locate and repair system leaks for nearly all pipe connections.

**Inspection of Work**

Because all work took place at waist height, workers were able to visually inspect completed work from every angle, ensuring there were no defects or errors. Potential problem areas such as duct installation and loose fittings could be clearly surveyed and verified.

**Cleanliness**

A clean site is a safe and high quality site. The cleanliness of the warehouse environment enhanced the overall project. It ensured that all duct and pipe could be cleaned and capped prior to delivery to the job site, thus mitigating potential risks from contamination.

LESSONS LEARNED

- Early collaboration of all project team members, including design-assist subcontractors, was crucial to an effective planning process
- Utilization of BIM is imperative to an effective prefabrication process. Prefabricated components were built within the model to validate design and identify potential clashes or other issues.
- The Miami Valley Hospital Southeast Addition project is an excellent case study because it provided a variety of benefits from the use of Project Specific Prefabrication™. However, five floors of redundant patients rooms is not essential for the use of prefabrication. In addition to repetition, tight project sites, active facilities with minimal down-time and fast-track projects all have opportunities to benefit from the use of prefabrication.