Off-Site Construction Case Study:
The Christ Hospital Joint and Spine Center

General Information

Building Name: The Christ Hospital Joint and Spine Center
Building Location: 2139 Auburn Ave, Cincinnati, Ohio, United States
Project Size: 365,000 sf / 33,910 m²
Building Type(s): Operating rooms, in-patient rooms, offices
Project Type: New Construction/Expansion
Delivery Method: CM at Risk
Total Building Costs:
  Design Cost: By Owner
  Construction Cost: $98 million
  Site: $2 million
  Off-site Construction: $2.8 million
  Transportation: $21,000
Cost/ft² or Cost/m²: $274/sf or $25.50/m²
Off-Site Construction Methods Used: Pre-fabricated patient room bathroom and shower pods, 2.8% of overall construction
Owner: The Christ Hospital, Deborah Hayes

Project Team

Architect: Skidmore, Owings & Merrill (SOM), Michael Lingertat
Contractor: Messer Construction, Michael Batdorf and Tony Lemen
Structural Engineer: SOM
MEP Engineer: Fosdick & Hilmer
Off-Site Construction Component Provider: PIVOTEK, Jerry Welte
Transportation: Landstar

Description

The Christ Hospital was founded in 1888 with a vision to reduce sickness and poverty in the Cincinnati, Ohio area. A group of local citizens led by James Gamble—whose soap business eventually became the Procter & Gamble company—invited Isabella Thoburn, a teacher, nurse, and missionary, to come to Cincinnati. They asked her to start a program to train deaconesses and missionaries to carry on religious, educational, and philanthropic work to alleviate the appalling poverty that existed in the city. Thoburn accepted the invitation, and in 1889 she opened a 10-bed hospital named Christ's Hospital in the West End at 46 York Street. It was moved to Mount Auburn in 1893, a nursing school was opened in 1902, and the hospital was renamed The Christ Hospital in 1904.

The Christ Hospital has celebrated many firsts over the years, including performing the first ceramic hip replacement in the United States in 1982. The new 365,000 sf Christ Hospital Joint & Spine Center provides patients even better access to care—from physical therapy for a sports injury to the most complex spine disorders. The new spine center features:
- 87 private, elegant patient rooms designed specifically for patients with joint and spine problems, with wider doorways and larger bathrooms
- Abundant natural light to promote healing and wellness
- Dedicated gathering spaces and lounges for family and visitors
- Outdoor spaces and rooftop gardens for respite and rehabilitation
• 12 operating rooms with state-of-the-art surgical suites designed under the guidance of hospital surgeons
• Finest available digital imaging equipment
• Card-swipe technology to admit and move patients
• Fully integrated electronic medical record system
• Stand-alone kiosks for patient registration and scheduling appointments
• Advanced rehabilitation facilities
• Physician and administrative offices
• Conference and training facilities

Project Goals

Overall Project Goal/Philosophy

The primary goal of the new Christ Hospital Joint & Spine Center was to provide patients better access to joint and spine healthcare from physical therapy for a sports injury to the most complex spine disorders.

Due to the demanding need for this type of healthcare the owner, The Christ Hospital, desired the facility to be constructed as quickly as possible. This entailed looking at the project from the perspective of analyzing viable options in terms of pre-fabricating components in order to achieve the design goals of increased efficiency, schedule and quality.

The project consisted of 80+ patient bathroom and shower pre-fabricated units (pods) in the south expansion of The Christ Hospital Joint and Spine Center. It included the complete architectural and mechanical systems of the bathrooms. The main driving factor for the decision to use pods was the repetition of the units to achieve a number that would result in significant quality and schedule benefits.

Secure/Safe Goal

No slipping and falling by patients in bathrooms.

Sustainable Goal

The design of the facility was based on achieving a LEED Silver rating.

Functional Goal

Control of water drainage due to requirement of no curbs in the showers.

Accessible Goal

Because this is a healthcare facility, the design had to comply with all ADA requirements and be constructed to the highest quality standards for hospitals as set forth in the specifications.

Aesthetic Goal

The new spine center had to integrate aesthetically and physically into the existing Christ Hospital. This was achieved using an elevated, enclosed pedestrian bridge and exterior materials and design similar to the existing buildings.

Other Significant Aspects of the Project

No union labor was used at Pivotek (off-site construction provider) or on the project.

Process

Design Activities

The project architect, Skidmore, Owings & Merrill (SOM) designed the new Christ Hospital Joint & Spine Center to be constructed on-site. Therefore, the traditional process of working with the owner to assess needs and requirements, preparing design documents and construction documents for bid, and general contractor selection was undertaken for this project. The project followed conventional design and specifications required for a hospital.
The suggestion to explore off-site construction was made by Messer, the general contractor, to the design team and the owner (The Christ Hospital). The overall project schedule was reviewed and it was determined that off-site construction could improve the schedule, possibly save money and produce a higher quality product. There was also a concern that labor availability for the patient bathroom and shower trades would be a challenge during the timeframe when interior finishes were occurring. The initial decision to explore pre-fabrication was made during late programming/early schematic design. The overall decision to proceed with bidding the use of prefabricated racks and patient bathrooms was made in the mid-to-late design development stage of the project when SOM had already designed the hospital for conventional construction.

The overall contract used on The Christ Hospital Joint & Spine Center was a standard AIA CM at Risk contract, for which the owner was responsible. The project delivery method used on the project for subcontractor was lump sum with competitive bidding. The subcontractors included pre-construction costs in their bids and did not break them out separately. The Pivotek contract was a standard AIA Messer subcontract agreement which was managed by Messer. The scopes of work were created to clearly define scope responsibilities.

Pre-Fabrication Analysis

Messer Construction was requested by The Christ Hospital (TCH) to undertake an analysis of the viability of utilizing pre-fabrication for the design and construction of the project. Their analysis encompassed six main elements of the project ranging from a strong positive to no benefit anticipated:

1. Materials Management Building and Connector—is a connector linking to the Material Management building where the team considered segmenting architectural and mechanical systems. The current design details Vierendeel trusses that are too large to transport. The design elements would have to be further investigated due to the impact to use modular construction. The over-riding reason for examining possible pre-fabrication was driven by the schedule to minimize impact on access to the emergency department. This is a viable option if a modified design approach is investigated.

2. Auburn Garage and Connectors—is a connector linking the Auburn Garage to the Medical Office Building and the Medical Office Building to the South Expansion where the team considered segmenting architectural and mechanical systems. Messer's recommendation was to field erect the connectors because the current connectors exceed the ability to deliver components to the site. There was no perceived benefit for modular construction for this project phase.

3. Patient Bathroom Pre-Fabricated Units (pods)—includes 60+ patient bathrooms and shower units in the South Expansion. This consideration included the complete architectural and mechanical systems of the bathrooms. The main driving factor evaluated was the repetition of the units to achieve a number that would result in significant quality and schedule benefits. This was a viable option and Messer proceeded with designing the structure and scope of work with patient bathrooms as a base bid.

4. Overhead MEP Corridor Racks and Bridge/Tunnel Racks from Materials Management Building to Joint Spine Center—include containing all mechanical, electrical, plumbing (MEP); medical gases; pneumatic tubes; etc. routed in conduits or piping systems. The main driving factors were the repetition of the racks and the length of the racks in the corridors. This was a viable option and Messer proceeded with designing the structure and scope of work for prefabricated racks.

5. Operation Room Ceilings—similar to overhead MEP corridor racks, but is limited to systems above the operating room ceilings. This option was not viable due to the lack of repetition of the systems in each operating room.

6. Medical Gas Headwalls—is the manufacture of medical gas headwall systems directly behind the patient room beds. Messer recommended implementation of this element.

The scope of this case study focuses on the Patient Bathroom Pre-Fabricated Units (pods). The pods included 60+ patient bathrooms and shower units along with the complete architectural and mechanical systems in the South Expansion. The primary driving factor that was evaluated was the repetition of the units to achieve a number that would result in significant quality and schedule benefits. The following table is a summary of the pre-fabrication analysis for the patient bathroom and shower pods.
### Construction Activities

Although there were no separate specifications for any pre-fabrication work, the pre-fabricated patient bathroom and shower pods were designed and installed as per SOM’s plans and specifications. In addition to the architect’s specifications, the pods had to be designed to eliminate racking during shipping and installation.

The shower tiles had to be five (5) tiles wide, which made tolerances critical and the unique door frame made of solid stainless steel created issues with the tiles abutting the frame after the pods were installed. The tile grout width around the frame was not consistent around the door frame and therefore often had to be redone around the frame.

Several of the pods shared a wall with a 2-hour firewall. These pods had to be built with a 2-hour firewall to achieve the rating for the stairwells. It was important to know who was responsible for building the adjacent 2-hour firewall: was it to be part of the pods or stick-built on-site? It ended up being stick-built.

Due to a unique floor drain system consisting of a metal linear drain grate that lined the edge of one side of the shower (thus eliminating the shower curb), a water flow test had to be performed to ensure the drain could handle the flow without running onto the pod floor. Tests were done with the mockup wherein the shower curtain was installed, water was turned on, and water flow was observed flowing into the grate. The shower curtain had to be installed in such a way that the water dripping off the curtain would land in the drain and not beyond it.

SOM approved the design based on the mockups, which involved several visits to Pivotek’s facility before final approval was given by the designer. The initial design did not really change except for additional walls that had to be added for constructability.

Accommodations for attaching a bariatric patient lift in the ceiling had to be made in the four bariatric pods. This slowed down the final completion of the bariatric pods due to waiting on the manufacturer of the rails for the patient lifts. On-site work had to proceed around the area where the bariatric pods were to be placed in order to stay on schedule.

Shrink-wrapped patient bathroom and shower pods were delivered 100% complete except for the exterior skin prior

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<thead>
<tr>
<th>DESCRIPTION</th>
<th>PROS</th>
<th>CONS</th>
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<tbody>
<tr>
<td><strong>Cost</strong></td>
<td>• Multiple suppliers—competitive bidding&lt;br&gt; • Bathroom pod mock-up could be used&lt;br&gt; • Lower field installation cost since work completed in factory line fashion</td>
<td>• Cost incurred earlier in project&lt;br&gt; • Minimum number of units to make prefabrication economical is 20</td>
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<td><strong>Schedule</strong></td>
<td>• Less disruption to access drives and site activities&lt;br&gt; • Structural coordination required early&lt;br&gt; • Potential schedule reduction&lt;br&gt; • Less dependent on weather</td>
<td>• Requires early decisions on design and finishes&lt;br&gt; • Late changes more difficult</td>
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<td><strong>Quality</strong></td>
<td>• Anticipated reduction of quality control punch list items&lt;br&gt; • Minimize staging of on-site materials&lt;br&gt; • LEED point(s)/LEED friendly&lt;br&gt; • Reduced on-site waste/fewer dumpsters&lt;br&gt; • Proven quality installation&lt;br&gt; • Minimum net square footage loss&lt;br&gt; • Rooms become standardized&lt;br&gt; • No limitation to upgrades or future modifications</td>
<td>• Lower tolerance for steel/concrete&lt;br&gt; • Loss of flexibility to customize rooms&lt;br&gt; • Potential for more access panels</td>
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<td><strong>Safety</strong></td>
<td>• 50% fewer on-site man-hours related to pods finishes&lt;br&gt; • Multiple pods installed in one day on average&lt;br&gt; • Fewer crafts per day on-site, reducing congestion&lt;br&gt; • Fewer crafts working on lifts</td>
<td>• Rigging and logistics planning critical due to weights and size of picks</td>
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Table 1: Pre-fabrication Analysis for patient bathroom and shower pods

After the pre-fabrication analyses were completed, the hospital was open to the new concept of pre-fabrication and had Messer Construction pursue the options that were decided to be most beneficial to the project.

During the early decision-making process, Messer made visits to several manufacturers’ facilities (during early design development stage) and took bids on the work (during final contract documents stage), with the prefabricated components as the basis of design. The designers were not on board initially and reluctant to do any re-work to accommodate the pods. SOM relied on Messer to accommodate any modifications to meet the design intent and adhere to the quality levels written in the specifications.

Therefore, the bids included a requirement for the manufacturer to incorporate any modifications necessary to tie into the base design as shown. Other weighted criteria that was considered included budget, quality of work, experience, location of the manufacturer (one of the owner’s goals was the utilization of local labor), interviews and plant tours. The final decision and actual award of prefabrication was made at the completion of the construction documents. The award of the pre-fabricated patient bathroom and shower pods was made to Pivotek, located in Cincinnati, Ohio. The Pivotek contract was a standard AIA Messer subcontract agreement with no incentives or penalties, which was managed by Messer. The pod scope of work was used to develop the MEP scopes for bidding purposes, shortly after the pod contract was awarded.
to enclosure of the building. Installation occurred prior to the start of wall framing. Due to the third floor pods being installed above the mechanical floor, steel plates had to be installed prior to setting the pods to ensure the vibration didn't carry through the pod floors. Jigs and templates were not only utilized to construct the pods, but they were also utilized to layout floor block-outs (recesses) in the slab. A 2" recess was installed in the floor slab to accommodate the pod installation. The entire bay was depressed due to timing and ease of construction. After the pod was set and levelled, concrete was poured in the recess of the pod. Often, other work had to be stopped to pour a new floor. This allowed the finished floor of the patient bathroom and shower pod to match the finish floor of the rest of the patient room to ensure a level transition from the bathroom pod to the rest of the patient room.

Periodic meetings in the form of weekly conference calls and GoTo Meetings were held to address owner concerns or issues with the process, as well as to keep the project team on schedule.

### Information and Tools

- U.S. Green Building Council’s LEED rating system for LEED Silver
- REVIT

### Products and Systems

Desired tolerances were achieved by constructing the pods with jigs and templates to achieve the final tile appearances desired and to lay out floor block-outs in the slab. The entire bay was depressed due to timing and ease of installation. Building Information Modeling was accomplished using REVIT software to design the pods and establish sight and control lines with the building's columns. The pods were set on an open slab and had to be in alignment with columns and openings in the walls.

### Off-Site Construction Process

#### Advantages

The Christ Hospital Joint and Spine Center benefited in several ways from utilizing off-site construction:

- Finding a local adequate labor force to complete the hospital was a huge challenge because the concern was that there were not enough skilled tradespeople available to construct The Christ Hospital Joint and Spine Center. This led Messer to consider off-site construction as an option.
- Pivotek’s factory had all the key tradespeople to handle construction of the pods. Permanent, skilled labor was available on a consistent basis, which helped mitigate the labor concerns.
- Pivotek’s factory efficiencies in terms of accessibility to tools and optimizing material purchases allowed the pods to be completed quickly. The punch list was completed in the factory prior to shipment of the pods.
- Pivotek’s use of jigs and templates allowed for precise adherence to strict tolerances set forth in the specifications. Defects were eliminated and change orders could be better handled at the factory rather than on-site.

#### Disadvantages

- Safety was evident at Pivotek because the laborers did not have to work at elevated levels and were not exposed to harsh weather conditions. Factory work is more regulated with respect to dust, noise, material waste, and recycling due to its enclosed temperature-controlled environment.
- The pods contributed to LEED requirements in terms of water efficiency, use of local materials, and waste reduction.
- The primary disadvantage with the patient bathroom and shower pods on this project was the lateness of the decision to utilize off-site construction and the uncertainty of success. Because SOM had designed the entire project to be stick-built, it was a bit of a challenge to convert the bathroom design and specifications to off-site construction of pre-fabricated components.
- It had to be communicated often to the project participants that finishes had to be picked out much earlier than with the traditional construction process and changes could not be made once production of the pods started. Therefore, it made it more imperative for SOM to review and accept the mockups in a timely manner.
- There was some apprehension by SOM regarding quality of the finished pods, transportation of the pods to eliminate damage in transit, and fit-out of the pods to align with the rest of the patient room. Extra effort was put forth by Messer and Pivotek in the form of reviews, inspections, answering questions, and shop visits to convince the architect that a quality product could be produced off-site. At the end of the
Schedule
The pre-fabricated bathroom pods were on the critical path because they had to be manufactured and installed before the other interior and exterior walls in the hospital could be constructed. The pods had to be transported and lifted into place and then set on an open slab using sight lines. Due to the extremely tight tolerances and alignment with surrounding construction (flooring, reveals, doors, finish trim), the pods had to be leveled after setting to accommodate building construction. The recess was installed in the slab to accommodate the pod installation. This required the finish floor of the pod to match the finish floor of the rest of the patient room to ensure a level transition from the bathroom pod to the rest of the patient room. In a conventional project, the bathroom walls, MEP and finishes would be constructed at the same time as the rest of the patient room, so there would be one space, including patient room and bathroom, rather than two separate spaces. The pods saved a lot of schedule time in terms of the punch list process because only the bathroom doors and patient room finishes had to be inspected rather than the entire room.

Total Project Duration:
Start Date: July of 2012
Substantial Completion Date: May of 2015
Design: June of 2011
Factory Time: 7 months
Site Installation: 2 weeks a floor for a total of 6 weeks
Shipping: Landstar

Landstar was a third-party contractor hired by Pivotek. They transported 10 pods per shipment for a total 9 shipments. Each shipment had 3 to 4 pods on each truck. Shipping was accomplished using a drop-deck flatbed truck. The travel distance from Pivotek to the project site was 18 miles. Because the bariatric pods were larger than the other pods, Landstar obtained non-escorted permits for transporting these pods. There was no lag time between shipments of the patient bathroom pods. They were shipped, lifted onto the appropriate floor slab of the hospital and put into place using jacks and equipment provided by Pivotek.

Quality & Safety
Number of defects associated with off-site method: None
Number of change orders on the project: 11 for Pivotek
Number of reported safety incidents: No loss time accidents
Total labor hours: 19,232, which includes design and management

The use of pre-fabricated bathroom pods ensured consistency of quality for all of the pods. Seams, grout lines, placement of bathroom fixtures, and counter heights were all in the exact same place on every pod. The use of precisely measured jigs and templates ensured that each component was built to the same exact dimension every time. Multiple inspections of mock-ups at the factory by SOM ensured that the pods met design specifications. SOM was later convinced that pre-fabrication was a viable alternative to stick-built construction.

Code Compliance
There were two levels of certification inspections performed: one for the manufacturing facility and one for the product produced by the manufacturing facility. The first was performed by the Ohio Industrialized Unit (OIU). The OIU was the governing authority that inspected and approved the Pivotek manufacturing facility to fabricate the bathroom pods. By approving the overall facility for the manufacture of a product (bathroom pods), this certification supersedes onsite inspections. OIU also approved the shop drawings for the pods.

NTA was the third-party inspection team that reviewed and approved the fabrication of the product (bathroom pods) at the Pivotek facility. An NTA inspector would look at each and every pod at different stages of construction. For example, the inspector would inspect one of the pods during the framing stage, a second one during the plumbing stage, a third one during the electrical stage, a fourth one during the finish stage, and so on. Because all of the pods are built to the same exact standards, the inspector would only have to inspect one trade on each one of the pods. He/she would not have to inspect every trade on every pod. The punch list was completed in the factory prior to shipment of the pods. Pivotek received a certification label that was installed on each pod, based on OIU and NTA review and inspections. Each pod had its own serial number and inspection certification labels were made to match with the serial numbers. Once each pod had the inspection certification label affixed to it, the building inspector at the project site did not need to inspect the pods. However, the local building inspector verified certification and final connections to the building. This was the first use of pods in the city of Cincinnati and the building inspectors had a learning process with inspections. However, no issues were encountered with this process.

The Christ Hospital Joint and Spine Center
Off-Site Construction Case Study: project, SOM was impressed and will probably be more amenable to the option of utilizing off-site construction.
Off-Site Construction Case Study:
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Because the jigs and templates were set on platforms at a comfortable height for the workers, this minimized backaches and potential injuries. Pods were moved around the factory to each trade station on rollers that could be fitted around the base of each pod in the factory. Only 1 worker per trade typically worked on a pod, thus eliminating congestion and damage. There was ample room to work around each pod. The environmentally controlled factory eliminated weather problems and delays, minimized debris, and minimized falls.

The change orders for the bathroom pods were due to SOM changing tiles, ADA seats, vanity lights, recessed paper towel holders, and countertop material. The major change order was to add 50% more pods to complete the third floor.

The major re-work issue after installation of the pods occurred with tiles adjacent to the solid stainless steel door frame. The tile grout width around the frame was not consistent around the door frame and had to be redone.

Project Results / Lessons Learned

The pre-fabricated patient bathroom and shower pods exceeded everyone’s expectations despite the learning curves and trial and errors encountered throughout the process. Nothing was sacrificed in terms of aesthetics and quality, as the pods completely met the quality level and design requirements set forth in the plans and specifications. TCH is considering future use of off-site construction in the form of constructing entire patient rooms off-site.

Although the decision to use off-site construction for part of the project ended up being a good one, there were many valuable lessons learned that could be applied to future projects:

- Early! Early! Early!—It cannot be stressed enough that the decision to use off-site fabrication must be made in the pre-design phase of the project. It is also critical to involve the owner, architect, interior designers, engineers, general contractor, off-site manufacturer, major material suppliers, and building inspector in the early stages of the project for modular construction to be successful. So many decisions have to be made early. In the case of the bathroom pods, finishes had to be selected very early because the pods were being built at the same time as the foundation and building structure activities. Due to the architect’s changes, multiple inspections by the architect to approve the pod mockup, and the need to install the pods before wall framing, the construction of the pods was on the critical path. Time was expended converting design and specifications based on stick-built construction to off-site construction of pre-fabricated components. This would be eliminated if the decision to use off-site construction was made before design starts.

- Protection of the Pods—Although the pods were shrink-wrapped for transportation, the pods still needed to be protected during construction of the adjacent patient room. After the pods were installed, workers walked on the tile floor to use the access panel to make the final MEP connections. A suggestion might be to shrink-wrap individual components within the pod (toilets, access panels) and put a transparent protective plastic film (similar to a protective film on cell phones, TV’s and microwaves) on the floors and walls that can be peeled off after construction activities are completed.

- Detailed Scope of Work—When dealing with pre-fabricated components, bid packages must be written in detail and very specifically. Work adjacent to and connecting to the pod had to be designated. For example, the MEP work and finishes that were directly related to the bathroom pods were Pivotek’s responsibility, but the MEP connections to the pods onsite where the subcontractor’s responsibility. The studs that comprised the pod were Pivotek’s responsibility, but the onsite framer was supposed to be responsible for the studs adjacent to the pod. A suggestion would be to color-code what trade is responsible for what components, whether it is from the off-site fabricator or in the field. Otherwise, work could fall through the cracks and cause unanticipated schedule delays.

- Fit-out Challenges—After the bathroom pods were delivered and installed, it was discovered that the very unique solid stainless steel door frame installed in the field created issues with the tiles of the bathroom pod abutting the frame. The tile grout width around the frame was not consistent around the door frame. The grout had to be redone around the frame. A suggestion would be to have the door frames included in the fabrication of the pods. Fit-out challenges could be minimized if the project team was committed to off-site construction in the early stages of design.

- Installation—The bathroom pods were installed by a subcontractor of Pivotek. Many of the Pivotek subcontractors building the pods in the factory were the same ones involved performing onsite construction. Pivotek provided
the jacks and equipment for moving
the pods, but the placement of the
pods and subsequent connections were
Messer’s responsibility. Pivotek was
willing to provide some training and
instruction to the laborers unfamiliar
with pods. However, since the pods
were 100% complete and were built
of materials common to commercial
construction, there were no issues other
than the levelling and floor alignment
work that needed to be done in advance
to prepare for the pod installation. It is
important to know who is responsible
for installing the pods. This is another
reason why scope definition is critical.

- **Warranty Issues**—Because there were
  few off-site fabricators of bathroom
  pods in the United States for Messer
to select from, one of the criteria for
  selecting a fabricator for the project was
  the method of dealing with warranty
  issues. Just because an off-site fabrica-
tor may be hundreds of miles away that
  factor alone should not completely
disqualify them from competing against
  a local off-site fabricator. If a distant
  off-site fabricator is selected, then it is
  suggested that the fabricator provide
local support assistance to handle war-
  ranty issues. The cost of providing local
  assistance should be in their bid.

**Estimated Cost Savings**
Because the decision to use off-site fab-
 rication of the bathroom pods was made
after the design drawings were complete
and not updated to reflect prefabrication,
the bid price was for prefabrication only
and an alternative price to conventionally
build the pods was not solicited. Messer
Construction felt that cost savings using
prefabrication were achieved in these
areas:
- General and Project Requirements
  (parking, utilities, dumpsters, cleanup)
- Reduced CM management since pods
  were built off-site in a temperature-
  controlled factory, inspected at factory,
  and punch lists were completed on
  pods before shipping
- Improved safety results due to fewer
  workers on-site because the pods were
  constructed off-site. Only 1 worker per
  trade typically worked on a pod, thus
  eliminating congestion. There was
  ample room to work around each pod.
The environmentally controlled factory
eliminated weather problems and de-
lays, minimized debris and minimized
falls.
- Reduced rework, “learning curve”,
  and management/coordinations costs
  because the Pivotek and its subcontrac-
tors built and installed the PODS
- Savings due to shortened schedule

**Ratings**
- Green Building used: Designed to LEED
  Silver
- Level achieved: LEED Certified HC 2009
  version

**Awards**
- The Christ Hospital Joint & Spine
  Center, designed by Skidmore, Owings
  & Merrill LLP (SOM), was chosen as a
  recipient of the 2016 American Institute
  of Architects (AIA) and Academy of Ar-
chitecture for Health (AAH) Healthcare
  Design Awards—an awards program
  that showcases the best of healthcare
build design and healthcare design-
- The 2016 Modern Healthcare Design
  Awards recognized The Christ Hospital
  Joint and Spine Center—a health-care
  leader in the Cincinnati region—as the
  winner of the Silver Award. September
  2, 2016. More
- The Spark Awards are an exciting
  competition created to promote great
design and its talented designers. These
  events are focused on design categories
  and disciplines. 2015 Spark: Health
  Finalist. More

**Publishing**
- [Description of The Christ Hospital Joint and Spine Center](#) from the Christ Hospital Health Network
- [“The Christ Hospital Joint and Spine Center / SOM,”](#) by ArchDaily
- [“The Christ Hospital Joint and Spine Center Opens in Cincinnati”](#), SOM [Press Release], February 24, 2016.
- [“2016 Healthcare Design Awards—The Christ Hospital Joint and Spine Center,”](#) American Institute of Architects.
- [“Grand Opening of the Joint & Spine Center,”](#) by Peggy O’Farrell. Lead Cincinnati.
- [“The Christ Hospital Health Joint and Spine Center, Skidmore, Owings Merrill,”](#) by Architect Magazine
- [“The Christ Hospital Joint & Spine Center Wins National Design Award,”](#) by Messer