### SHP Leading Design

Customer Success Story

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With BIM we can develop building design strategies that are extremely well integrated and coordinated, substantially increasing our efficiency and lessening the building time.

—Dick Thomas, AIA Vice President SHP Leading Design Executive Director, 2enCompass

# A Welcome Process Change

SHP Leading Design uses Autodesk BIM solutions to advance integrated building design, delivery, and operations.



Welcome Pavilion entrance. Image courtesy of SHP Leading Design / William Manning Photography.

#### The Firm

SHP Leading Design offers planning, architecture, interior design, engineering, construction administration, and facilities management services. Founded in 1901, the practice is based in Ohio and has more than 130 employees. In 2000, SHP and its construction partner, Messer Construction, formed 2enCompass, an integrated design and construction LLC.

SHP adopted building information modeling (BIM) with Autodesk<sup>®</sup> Revit<sup>®</sup> Architecture software and Autodesk<sup>®</sup> Revit<sup>®</sup> MEP software in 2005. The firm also uses Autodesk<sup>®</sup> Navisworks<sup>®</sup> software, Autodesk<sup>®</sup> Ecotect<sup>®</sup> Analysis software (which includes access for Autodesk Ecotect Analysis subscribers to Autodesk® Green Building Studio® web-based service), Autodesk® 3ds Max® Design software, and AutoCAD® software. As part of its commitment to BIM and integrated project delivery (IPD), SHP now uses software based on the Autodesk<sup>®</sup> Revit<sup>®</sup> platform for design, visualization, and project collaboration on all of its projects and has mandated that its consultants also use Revit-based software. In addition, 2enCompass uses Autodesk BIM solutions on all of its projects.

SHP implemented Autodesk BIM solutions throughout its organization and trained its entire staff in just 10 months. The firm received the Autodesk BIM Experience Award, recognizing SHP's innovation, leadership, and excellence in implementing BIM. SHP is also a member of Autodesk's national product advisory panel, helping shape the future of BIM solutions for the building industry.

#### **Project Challenge**

SHP used BIM in the new Welcome Pavilion at the Southern Baptist Theological Seminary in Louisville, Kentucky. The \$6.3 million addition and renovation includes an entry tower and gate house, reception hall, security offices, and a small presentation venue, and connects to new admissions and events planning offices. A new café and retail improvement were also included in the project.

This design-build project had an aggressive schedule, dictated by the seminary's 150th anniversary. "The seminary planned on using the new Welcome Pavilion as the main venue for its anniversary ceremonies," explains Dick Thomas, vice president at SHP and executive director of 2enCompass. "So our task was to design and build this facility in under a year."



# Determining accurate quantities early saved the project 15 percent of the overall cost of the steel package.

#### **The Solution**

SHP's architectural and MEP designers and its structural engineering consultant all used Revitbased software, a collaboration that enabled close, cross-discipline coordination, as well as earlier cost estimates and material orders. In addition, the project team used Navisworks software for collision detection and construction planning, helping minimize costly field changes. "Using Autodesk BIM solutions, we met the compressed schedule and the seminary opened its new Welcome Pavilion on time and within budget," says Aaron Phillips, director of technology and BIM services at SHP.

#### **Integrate Design and Construction**

SHP has been engaged in integrated practice and the concept of IPD for many years. "Our design-build experience has helped us push the concepts of IPD and BIM further than most firms," says Thomas. On the Welcome Pavilion project, for example, collaboration extended far beyond simply sharing 3D models. The project team was able to estimate, schedule, order, and prefabricate directly from the design models. "Our BIM-based design and construction methodology is all about creating high-quality design strategies in less time with greater accuracy and less financial risk for our clients," says Thomas.

#### **Estimate Quantities Earlier**

The project's extended design team included the primary subcontractors. As a result, the steel fabricator was involved early in the design process. A month after design started, the fabricator alerted the team that there was going to be a 15 percent increase in steel prices in just a few weeks.

"Based on prior experience, we knew that we could get more accurate steel estimates from our Revit Structure design models—usually to within o.5 percent of the actual quantities," explains Phillips. "So the design team quickly completed the structural design, and we calculated the steel quantities directly from the Revit Structure model." This allowed the fabricator to submit the mill order before the price increase, saving the client an estimated \$30,000 on the cost of the steel package.

#### **Increase Design Agility**

More timely and accurate quantities also provided invaluable information for managing costs. The pace of the work often meant that design and construction tracked almost parallel to one another. Three months into the project, the team discovered that the design would exceed the client's price cap by almost \$1 million. The BIM-based design, with all the pertinent building information attached, enabled the team to quickly realign the design and budget without missing a beat in the production process. "In about a week, we scaled back the project cost by adjusting the building footprint and eliminating some square footage," recalls Phillips. "Revit-based software helped us to detect the price jump early and change the design quickly."



Aerial view rendering of the Welcome Pavilion. Image courtesy of SHP Leading Design.

Both Navisworks and Revit-based software were instrumental in helping to keep field changes to a minimum and the construction schedule on track.

Aaron Phillips
Director of Technology and BIM
Services
SHP Leading Design

#### **Reduce Field Changes**

The project team used both Navisworks and Revitbased software for project coordination. The use of a common Revit platform allowed the designers to link the models of the other building disciplines into their own design environment. This helped the individual designers more easily find and correct design conflicts before they became costly field changes.

In addition, the Welcome Pavilion had to fit between two existing buildings but there were no reliable drawings for those structures. So SHP laser-scanned the important features of those buildings, such as building heights, cornice moldings, and window trims. "Then we imported that data into Revit Architecture software to create as-built models of those buildings," reports Phillips. "We used those models to coordinate and visualize the Welcome Pavilion design in the context of the adjacent buildings."

As the design progressed, the construction group used a BIM process for overall project coordination as well as construction planning. "Both Navisworks and Revit-based software were instrumental in helping to keep field changes to a minimum and the construction schedule on track," says Phillips.

#### **Connect Design and Fabrication**

To keep the project cost and schedule under control, the project team also used digital design-to-fabrication strategies for its structural steel prefabrication. "Getting accurate steel quantities early in the design phase is a good starting point," says Phillips. "On the Welcome Pavilion project, those early quantities translated into measurable cost savings for our client." But the expedited mill order was just the first step.

Once the structural design was complete, the steel fabricator imported the Autodesk Revit Structure design model into third-party software to create a specialized steel model used for detailing and fabrication. "Keeping the process digital and eliminating redundant modeling efforts certainly helped save time," says Phillips. "But more importantly, we avoided the potential errors that a manual reinterpretation of design data introduces."

SHP also uses a digital fabrication strategy when it comes to MEP systems. Its designers use Revit MEP software to automatically calculate quantity takeoffs, giving them more accurate and earlier estimates for ductwork, piping, equipment, and even insulation. Once design is complete, SHP provides the Revit MEP model to the HVAC fabricator for their sheet metal fabrication and system installation processes.



Welcome Pavilion study area. Image courtesy of SHP Leading Design.



Rendering of the Welcome Pavilion's lobby area. Image courtesy of SHP Leading Design.

#### Project Result

Not only was the new Welcome Pavilion ready in time for the seminary's anniversary celebrations, the profile of its domed roof has even been used in a new logo for the school. "The entire project could not have been accomplished without the use of BIM and IPD methodologies," says Thomas. "The use of Revit-based software by all design team members and the use of Navisworks software by our construction partner helped the project move smoothly from design to build to occupancy in the required time frame."

#### A Commitment to Industry Transformation

The Welcome Pavilion project exemplifies the commitment SHP has made to the use of BIM and IPD. The firm has effectively incorporated these transformative approaches throughout its practice and its partnerships. The firm uses Revit-based software for all of its projects and insists its consultants do likewise. "We strongly believe that the only way to achieve the full benefits of BIM is to design all aspects of the building using BIM," says Thomas. "That meant mandating the use of BIM in all of our partnerships."

#### Integrate Energy Analysis

SHP is also at the forefront of sustainable architecture. With more than half of its staff LEED accredited, SHP has been practicing sustainable design for many years on a variety of projects—particularly in the area of educational design and construction. In fact, SHP designed the first LEED Silver certified public school in Ohio back in 2006. As a routine part of its design process, the firm works with its clients to deliver the most efficient and cost-effective design possible.

To simulate and analyze energy performance in the earlier stages of design, SHP designers use the massing functions within Autodesk Revit Architecture software as well as the Autodesk Ecotect Analysis software, which includes access for its subscribers to the Green Building Studio web-based service. "By using the Revit model for integrated energy modeling and architectural design, we can brainstorm energy-saving ideas early on—when the architectural design is sufficiently pliable," says Phillips. "The building performance feedback from Autodesk Ecotect Analysis software and Green Building Studio helps us to optimize the energy efficiency of our buildings and helps our clients understand the potential savings of a greener design."

# In four years, SHP used BIM on more than 150 projects and almost \$1 billion worth of buildings.

#### **Extend BIM to Operations**

In addition to its integrated design and construction services, SHP provides integrated facilities management services to its clients—extending the benefits of BIM to building operations. "We see how BIM is changing the architectural, engineering, and construction fields," remarks Thomas. "We also see its potential for facilities maintenance."

In response, SHP has started to adapt its design services, providing owners with BIM-based as-built information for their ongoing building maintenance and operation. "We are using the building information captured in the Revit model to transfer the knowledge from the design side to the occupancy side, helping our clients be more efficient and successful in the operation of their buildings," says Thomas.

#### Establish BIM Standard

SHP also provides BIM consulting services to its academic clients such as Indiana University. "We were engaged to assist the university in transitioning from a traditional project delivery approach to a BIM environment," explains Phillips. "The first phase of this effort was to develop the university's *Building Information Modeling (BIM) Guidelines and Standards for Architects, Engineers, and Contractors*—to support IU's facility design, construction, and management needs. In the near future, SHP hopes to work with the university to establish strategies and guidelines for how BIMbased building design data can be used for its operations and facilities maintenance."

#### **BIM Excellence**

In just four years, SHP has used BIM on more than 150 projects and almost \$1 billion worth of buildings. This portfolio includes nearly \$100 million of projects executed in a fully integrated design and construction process. "With BIM we can develop building design strategies that are extremely well integrated and coordinated, substantially increasing our efficiency and lessening the building time," says Thomas. "By saving time and reducing errors, we have more time to create inspiring designs for our clients."

For more information about Autodesk BIM solutions, visit **www.autodesk.com/bim**.



Indiana University engaged SHP to develop BIM guidelines. Image courtesy of Indiana University.



Welcome Pavilion bookstore and lobby. Image courtesy of SHP Leading Design / William Manning Photography.

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Dick Thomas, AIA
Vice President, SHP Leading Design
Executive Director, 2enCompass

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