SERA Architects

Customer Success Story

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Without the collaborative features of BIM, I cannot imagine how we would have met our design goals and our funding deadline. Autodesk BIM solutions helped us spend less time producing documents and more time on design exploration.

—Crawford Smith
BIM Specialist
SERA Architects

Accelerate project delivery.

Autodesk BIM solutions help SERA Architects redesign the Edith Green/ Wendell Wyatt federal building 30 percent faster.

Image Courtesy of Scott Baumberger.

The Project
SERA Architects, Inc. (SERA) is an architecture, interiors, and urban design/planning firm based in Portland, Oregon. Since 2005, the firm's highly integrated design approach has relied on Autodesk® Building Information Modeling (BIM) solutions to help integrate the work of its project team members. SERA Architects uses Autodesk® Revit® software to more accurately convey project information and improve the quality of project documentation. In addition, intelligent Revit models help the firm perform analyses for sustainable design; coordinate design disciplines, consultants, and subcontractors; and provide better information to its clients for their building operations and maintenance.

One of SERA's recent BIM projects is the $139 million modernization of the 18-story Edith Green/Wendell Wyatt federal building located in downtown Portland. Funded by the American Recovery and Reinvestment Act (ARRA), the U.S. General Services Administration (GSA) is completely renovating the 35-year old facility, replacing the building's outer shell and all its electrical and mechanical systems. ARRA funding requires an emphasis on applying high-performance green building design principles and the project is designed to achieve LEED® Platinum certification.

The Challenge
In 2006, GSA hired SERA Architects and Cutler Anderson Architects to redesign the aging Edith Green/Wendell Wyatt building, but due to lack of funding the project was put on hold. In the spring of 2009, with the availability of new stimulus funding, the project was considered 'shovel ready' and GSA renewed its contract with SERA Architects. The original contract called for a traditional design-bid-build project delivery, but in order to secure ARRA funding a guaranteed maximum price (GMP) was required by September 2010.

"We had to have the design at a substantial level of completion much earlier than we would have on a traditional design-bid-build project of this size," says Crawford Smith, BIM specialist for SERA Architects. "And the scope of the renovation had expanded so significantly that we essentially had to start the design from scratch." In fact, SERA Architects estimated that it would take 27 months to produce accurate pricing using a traditional contract process.

Autodesk®

Projected 48 percent reduction in field change orders.

The Solution
To accelerate the timetable and reach cost certainty by the 2010 deadline, GSA sought early input and expertise from key project members—including the contractor, the architect, the major consultants, and subcontractors—by using an integrated, collaborative delivery process. In December 2009, GSA selected a contractor to act as Construction Manager as Contractor (CMc). The project team quickly expanded to include the CMc's first- tier subcontractors. With the bulk of the project team in place, there were only eight months before the pricing deadline and the team needed to compress the design phase by 30 percent.

The primary collaborative strategies for this project included an integrated project team, colocation, and the utilization of BIM software. "The team used Revit design and documentation software for the architectural, structural, and MEP disciplines," reports Smith. "The key to our success was our reliance on a centralized, integrated project team supported by a centralized, integrated design model." In addition, the project team was collocated in the facility's office space until building demolition. "We worked in the same space and (for most of the team) in the same Revit design file, helping to greatly improve team collaboration," says Smith.

Optimize Change Management
The project team's reliance on a BIM process also improved their ability to react to changes. "When one person made a design change to the integrated Revit model, that change was automatically reflected throughout the model as well as the affected documentation," says Smith. "This helped us quickly move the design forward, improve the coordination of the design and the documentation, and control change throughout the design process."

For example, in an effort to reduce lighting costs and improve workspace aesthetics, the design team was asked to capture more daylight by raising all the ceiling heights six inches. Aided by Revit software, the project team easily accommodated this seemingly complex change request.

Improve Project Coordination
Throughout the design process, SERA Architects used the integrated Revit model as a collaborative tool to help with problem solving across disciplines. In addition, the team used Autodesk® Navisworks® Manage software to support cross-discipline coordination and formal clash detection. "Each week we imported the current Revit design models into Navisworks and then held a clash meeting," explains Smith.

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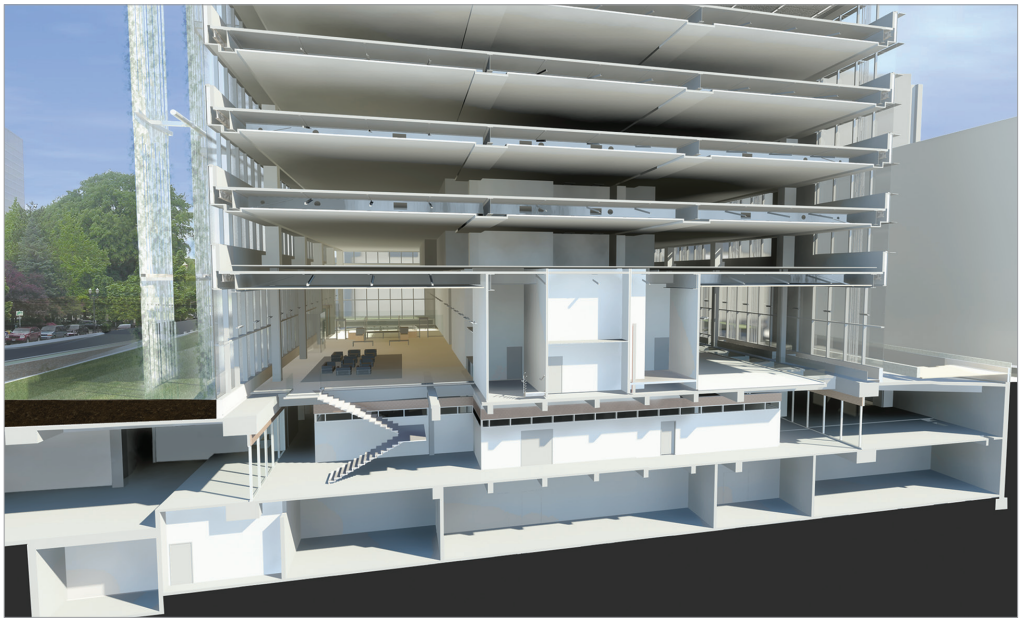
In addition to identifying and correcting interferences, the meetings helped SERA Architects gather data to develop project metrics. "During the clash meetings we got consensus from the group as to whether a clash would have slipped through to construction and resulted in a field change if it hadn't been discovered using Navisworks," says Smith. At the end of the design, a record of all those prevented errors was sent to the CMc and subcontractors, who then estimated how much time would have been lost and how much money it would have cost to fix the problems in the field.

"We averted 17 potentially costly field clashes and 21 RFI-only issues," reports Smith. "By comparing the cost estimate to fix the field issues against the cost of the software and the investment in project time for clash detection, we calculated that the use of Autodesk BIM solutions for coordination on this project helped lead to a 295 percent return on investment."



Cross section of lower levels of EGWW.
Image courtesy of SERA Architects.

Collaborating on design details.
Image courtesy of SERA Architects.

Lower level of EGWW lobby.
Image courtesy of SERA Architects.

Increase Building Performance
To meet the goals of LEED Platinum certification, the building design includes a variety of sustainable design features such as a radiant cooling and heating system, assisted by a new building skin and a shading system of exterior aluminum rods that will minimize the use of air-handling equipment. Other green features include a solar array on the roof and a 170,000-gallon cistern in the basement (a space once used as a gun range by federal agents) to store captured rainwater for toilets and landscaping.

"The only remaining parts of the original building are the floors and the structural system, which opened up a lot of opportunities to make the building more energy efficient," says Smith. "Using the Revit model for energy simulations enabled us to analyze and fine-tune the building performance."

For example, the downsized mechanical system relied on having a certain amount of shading on the curtainwall during peak insolation times. SERA Architects used the Revit design model in conjunction with Autodesk® Ecotect® Analysis software to perform daylighting and sun studies of all the building sides. "For each elevation, we analyzed the peak times and areas of the building exposed to direct sun, taking into account the shadows cast by adjacent buildings and the different positions of the sun in the sky throughout the year," says Smith. "That information was used for the shading design as well as to help size the mechanical system."

However, one of the biggest benefits of using BIM for sustainable design on this project was to facilitate collaboration within the team—helping everyone understand the green strategies and tapping their design acumen. "For example, we used the Revit model to illustrate how the new rainwater system could work and how it tied into the plumbing systems," says Smith. "This helped the project team better understand and improve on the design, and helped the client better understand what we were trying to achieve."

Measure your ROI
SERA Architects has initiated a project to measure the return on investment of using BIM, IPD, and colocation. The firm collected data from 20 of its projects (including the Edith Green/Wendell Wyatt federal building) and analyzed the data comparing three main project types:

1. Project design performed using two-dimensional drafting software with little collaboration.
2. Project design performed with one or two of the design team members using BIM software and there was some collaboration.
3. Project design performed with all design team members using BIM software and there was a high level of collaboration and some collocated work environments.

The projects were normalized by project size, allowing SERA Architects to compare projects of different sizes and complexities. In cases where data was unavailable internally, the firm sought information from its industry partners. The firm's preliminary figures are very promising. The use of BIM (project types 2 and 3 above) resulted in approximately a:

- 40 to 60% reduction in design time
- 50 to 70% reduction in construction time
- 50 to 60% reduction in change orders
- 30 to 50% reduction in RFIs

Plan for Lifecycle Management
Although the building will not be occupied until early 2013, the project team is already investigating how the building model can be used for the facility's management, operations, and maintenance. At a minimum, the team plans to hand off the model as a permanent as-built record of the facility and hopes to populate the model with the same information that would normally be included in the commissioning manual.

Relay Information Effectively
To establish the GMP before the pricing deadline, the team raced to develop the technical documents to a point where the CMc could bid the job out. BIM helped the team visualize and therefore clarify exactly how far SERA Architects needed to develop the design model and the technical documents before passing the baton to the CMc. The team used Revit software to create project 'snapshots'—deliverable packages containing traditional documentation as well as project visualizations—used by the CMc for procurement and buyout.

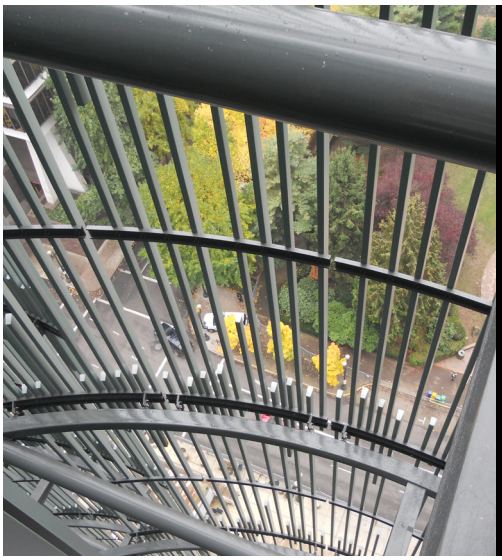
In addition, throughout the design process the project team used Revit software and Autodesk® 3ds Max® Design software to help create project visualizations that enhanced communication and improved feedback. "Model-based visualizations helped everyone—regardless of their technical background—to quickly get an understanding of the accelerated development of the building and the tenant spaces," says Smith.

For example, the building design included several large cuts in the entry-level floor slab of the building to admit natural light to the basement. Using the rendering capabilities of Revit software, SERA Architects generated a series of design visualizations to help convey the design intent for this prominent building space. "Autodesk BIM solutions helped make it easier to produce design visualizations that speed up design decisions," says Smith. "In fact, we estimate that for the cost of one hand-rendered watercolor, our firm can produce eight high-quality digital renderings."

The Result
The project team met their September 2010 deadline and the building is on track for occupancy in 2013. "Compared to a traditional project of this scope, we saved an estimated $940K in design costs—even with the increase in manpower needed to meet the accelerated schedule," reports Smith. "Without the collaborative features of BIM, I cannot imagine how we would have met our design goals and our pricing deadline. Autodesk BIM solutions helped us spend less time producing documents and more time on design exploration."

Get more information about Autodesk BIM solutions at **http://usa.autodesk.com/building-information-modeling**

System of shading "reeds" on west side of building.
Image courtesy of SERA Architects.



View through the "reeds" from inside EGWW.
Image courtesy of SERA Architects.

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