DesignGroup
Shelley Metz Baumann Hawk

Customer Success Story

Autodesk® Revit® Architecture
Autodesk® Revit® Structure

We are already recognized as a leader in sustainability; now we are combining that expertise with BIM. Revit Architecture software definitely has a place in our long-term business strategy.

—Brian P. Skripac
Associate AIA, LEED AP
BIM Technology Manager
DesignGroup

Design better, greener buildings.

Using Autodesk BIM solutions, two Ohio firms collaborate on a sustainable design for the Grange Insurance Audubon Center.

Audubon Center: rendering from entry. Courtesy of DesignGroup.

Project Summary

Two of Ohio's top design firms recently collaborated on the Grange Insurance Audubon Center, a sustainably designed 18,000-square-foot urban ecology learning center in the Scioto Audubon Metro Park just south of downtown Columbus, Ohio. The center includes a library/bird viewing area, classrooms, and administrative offices organized around a central exhibit space as well as an outdoor amphitheater and native plant demonstration gardens.

For architectural design services, the National Audubon Society engaged DesignGroup, a 60-person design firm specializing in architecture, interior design, planning and programming, and sustainable design. Consulting engineering firm Shelley Metz Baumann Hawk (SMBH) provided structural engineering services. Together, these firms used building information modeling (BIM) with Autodesk® Revit® Architecture software and Autodesk® Revit® Structure software to develop a facility that fulfilled the client's aesthetic goals, while successfully meeting all budgetary and programmatic requirements. The center opened to the public in August 2009.

The Challenge

Located on a brownfield site owned by the city of Columbus, the Audubon Center serves as a model for sustainable design and environmental education, incorporating an energy-saving passive solar design and a variety of other green features, including ground source heat pumps, low-water-usage plumbing, and a multitude of durable and recycled materials.

The project's LEED® Silver certification target was complicated by a variety of issues, including poor soil quality. "For many years, the site had been used to store impounded automobiles, as well as out-of-service light poles, old rebar, and other unneeded materials," says Michael Bongiorno, AIA, LEED AP, and project designer from DesignGroup. To determine the required depth of clean fill, DesignGroup had to work closely with the U.S. Environmental Protection Agency (EPA).

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By integrating the architectural and structural models, the team minimized the need for coordination meetings.

The building design itself is architecturally and structurally quite complex. “The first floor is a cast-in-place concrete structure that is supported by auger cast piles,” says Stephen Metz, PE, LEED AP and principal at SMBH. “Above that are a structural steel frame and a roof with a laminated tongue-in-groove three-inch pine deck.” The building also incorporates extensive amounts of glass, exposed structural elements, and a variety of striking aesthetic features, including a sundial and artful downspouts that channel water into an onsite rain garden.

To complete the project on time, DesignGroup and SMBH had to work closely with a variety of stakeholders, including major donor Grange Insurance, the National Audubon Society, the state of Ohio, and the city of Columbus, which assumed the cost of constructing the pervious parking areas, bike paths, and swale walkways.

The Solution

One of the firm’s first goals was orienting the building to maximize exposure to sunlight. “The site is located on a long sliver of land,” says Bongiorno. “We arranged the building at a high point along a strong, east-west axis to facilitate a passive solar orientation.” This location also provides views of the Scioto River to the south and the downtown skyline to the north.

After selecting a site and further clarifying the project’s programmatic elements during the predesign phase, DesignGroup began using Revit Architecture software as a modeling tool to study design options early in the schematic design phase. Advanced Solutions Inc., from Columbus, Ohio, served as DesignGroup’s Autodesk Authorized Reseller.

Because much of the building’s structure is exposed, early integration of SMBH’s structural model with the architectural model was an important part of the design process. “DesignGroup wanted to give the interior a very bold appearance,” says Metz. “We had to work closely with their designers to understand how they wanted the building to appear and what the owner wanted.” Close integration between the two models minimized the need for lengthy coordination meetings.

Revit Structure software helped SMBH visualize many elements of the design that would have been difficult to extrapolate from a 2D architectural drawing. “By rotating the model and zooming in as needed, we were able to determine how to best place the structural elements, even on the extremely complex building façade and roof,” says Metz.

More Easily Make Design Changes

Near the completion of the schematic design phase, DesignGroup had to make design changes to accommodate budgetary restrictions and requests by members of the owner’s fund-raising team. Using the model, DesignGroup identified eight appropriate add alternatives—including a designed vegetative roof—for presentation to the client.

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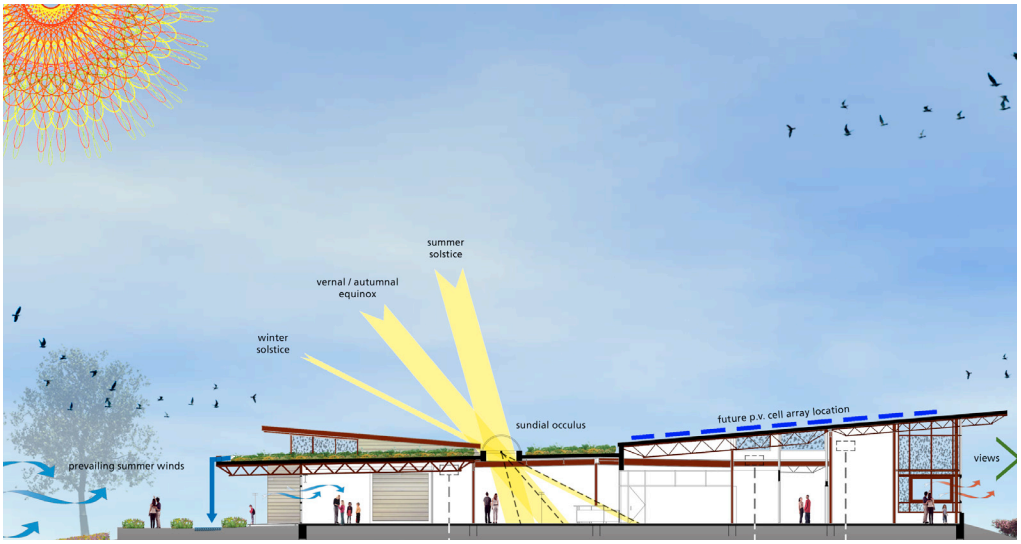
>
> —Michael Bongiorno, AIA, LEED AP
> Project Designer
> DesignGroup

As the designers created these options, Revit Architecture software automatically updated the rest of the model. “We did not have to rely on the traditional change-and-redraw method while making the design changes,” says Bongiorno. “We knew that if we changed a detail, Revit Architecture software would automatically update the elevations and floor plans. Using traditional 2D design tools, the changes we made in the schematic design phase would have taken notably longer.” In addition, because all of the structural elements were present in the model, the team did not have to waste time sketching out details and scenarios.

Throughout this process, the cost estimator was able to closely monitor how the different design options would impact the project budget. “He had access to accurate, 3D images of the project’s interior and exterior conditions,” says Brian P. Skripac, Associate AIA, LEED AP, and BIM technology manager at DesignGroup. “That helped him identify the appropriate alternates.”



Audubon Center: north/south section at oculus. Courtesy of DesignGroup.

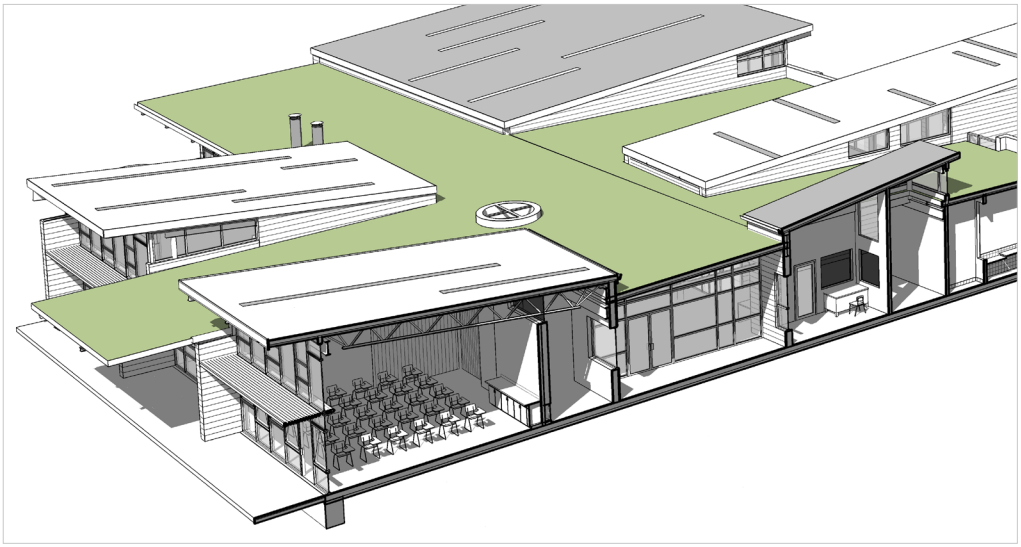
In another instance, during design development, close coordination between the structural and architectural models helped the team react more quickly to a suggested cost-saving measure that required dropping the steel bearing height two feet—ordinarily an extremely disruptive and time-consuming process.

"Using Revit Architecture software, we studied numerous ways that we could change the height of the roof," says Bongiorno. "As we experimented, we passed on our results to the cost estimator, who used them to create comparative cost models that immediately showed the impact of the different design options." DesignGroup also shared the model with SMBH, helping the structural engineers react to the proposed changes and move the structure accordingly.

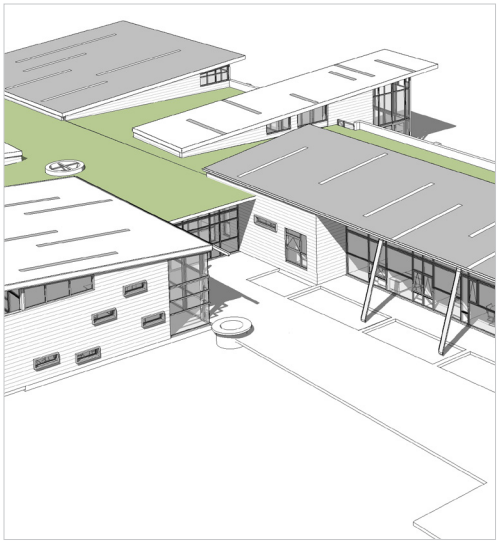
Create Compelling Visualizations

To communicate design intent, DesignGroup used Revit Architecture software to create compelling visualizations for key project stakeholders, such as Heather Starck, director of the Grange Insurance Audubon Center. "Heather was not interested in reading architectural plans," says Bongiorno. "She wanted to see what it would be like to experience the completed building."

Using the model, DesignGroup prepared a virtual walk-through of the center. While viewing it, Starck asked a series of what-if questions about the design. Using Revit Architecture software, DesignGroup implemented client changes on the fly and provided fast feedback, helping the client to make firm design decisions before leaving the meeting. "That process would have been much more time consuming and less accurate in a traditional 2D environment," says Bongiorno. "It absolutely helped improve our relationship with the client."



Audubon Center: section through classroom. Courtesy of DesignGroup.



Audubon Center: overall perspective. Courtesy of DesignGroup.

Practice Low-Tech Green Building

"The Audubon Center is actually a very low-tech building," says Bongiorno. DesignGroup designed it, first and foremost, as a passive solar building, and then added a range of sustainable features, including low-flow, low-water-usage plumbing; waterless urinals; and a ground source heat pump system that relies upon the stable temperature of the earth to help control temperatures within the facility.

Revit Architecture software played an instrumental role in helping DesignGroup understand how different sun angles would impact the building façade and interior spaces. As a result, the team could more accurately design the building's roof overhangs and window shadings to help both control sunlight and reduce summer heat gain.

The software's solar study function helped DesignGroup to design an attractive add alternate. "We used Revit Architecture software to design a rooftop oculus that would cast a shadow onto a sundial on the floor below it," says Bongiorno. The sundial includes special markings that denote the summer and winter solstices, as well as the fall and spring equinoxes.

To work efficiently, the building's ground source heat pump HVAC system required a substantial number of operable windows. DesignGroup used Revit Architecture software's scheduling capabilities to quantify and calculate the minimum operable opening area requirements and then included appropriately sized openings as design elements in the defined curtain wall pattern.

DesignGroup found the model comprehensive enough to supply project data and calculation information needed for LEED documentation. In fact, much of this data was readily available as a simple by-product of the team's design process. "There were a lot of points when we were able to quickly generate data to support certification," says Skripac.

With help from the Autodesk Revit platform, the team completed the project on time, under budget, and at a high level of coordination and quality.

The Result

Because DesignGroup completed construction documents on time, under budget, and at a high level of coordination and quality, the owner was able to accept all of the add-alternate design options, including the vegetated roof and sundial. Although the client does not plan to integrate the model with facilities management software, the Audubon Center will use the model to create an interactive digitally fabricated site model as part of a permanent exhibit that explains the many sustainable features associated with the building and the surrounding site.

"The BIM approach helped everyone understand the building much earlier in the design process," says Skripac. "We did not have to generate 2D plans and elevations and roof plans to describe it to all of the other disciplines. It really helped us make better-informed decisions earlier in the project and avoid issues during construction."

The Autodesk® Revit® platform also helped the project team improve overall design quality. "The relationship between the structural and architectural systems on this building is one of the cleanest I have ever seen," says Bongiorno. "And this was only our first project using both models at once."

New Business Opportunities

"Revit Structure software has been a big help for us in developing better client relationships and new business opportunities," says Metz. "When we adopted BIM three years ago, we were one of the first, if not the first, structural firms in town to adopt Revit Structure software." Now that more firms are beginning to use the software, SMBH has a valuable three-year head start. "We can present our two firms as a single team that has experience collaborating in a BIM environment. That is a huge business advantage."

Adopting BIM was part of a larger effort within DesignGroup to maximize the use of technology. "It is a significant business driver for us," says Skripac. "We are already recognized as a leader in sustainability; now we are combining that expertise with BIM." Currently, DesignGroup creates 100 percent of its documents using the BIM process. "Revit Architecture software definitely has a place in our long-term business strategy."

For its work on this project, DesignGroup received the Committee on the Environment's 2008 Sustainable Design Award for Un-Built Projects from both the Columbus and Cincinnati Chapters of the AIA. Originally, the project team sought to achieve LEED Silver certification on the project. "It looks like we are at the higher end of Silver and could potentially achieve LEED Gold," says Bongiorno.

Audubon Center: exterior fireplace. Courtesy of DesignGroup.

For more information visit, **www.autodesk.com/bim** and **www.autodesk.com/sustainabledesign**.

Audubon Center: Autodesk Revit Structure model. Courtesy of SMBH.

Revit Structure software helps give us the ability to explore multiple big-picture structural solutions. That facilitates informed decision-making earlier in the process and helps to reduce costs.

—Stephen Metz, PE, LEED AP
Principal
Shelley Metz Baumann Hawk

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