

## Good Samaritan Hospital Expansion

Customer Success Story

### Project Team:

Clark/Kjos Architects  
Giffin Bolte Jurgens  
ABKJ  
CDi Engineers  
Sparling  
Skanska USA Building Inc.

Revit® Architecture

Revit® Structure

Revit® MEP

AutoCAD® Civil 3D®

Autodesk® NavisWorks®

AutoCAD® MEP

Every project involves thousands of decisions. A certain percentage of them will always be made with limited information. The Revit BIM platform enables us to minimize that percentage so there's real clarity for everyone—from building officials and engineers to nurses and physicians.

—Alex Hill  
Principal  
Clark/Kjos Architects  
Portland, Oregon

# Bolder, greener, more confident design.

## Washington's first LEED® Silver hospital meets fast-track milestones with Autodesk® BIM solutions.



Good Samaritan Hospital: Main Lobby, Glass Elevators — Courtesy of Good Sam Design Collaborative

### Project Summary

In early 2007, Multicare Health System's Good Samaritan Hospital (GSH) in Puyallup, Washington, initiated a major \$400-million expansion. When complete, this 357,000-square-foot project will transform the full-service community hospital into an ultramodern regional healthcare center, providing advanced medical services and personalized care in a warm, supportive environment. Encompassing an area equal to six city blocks, the GSH expansion is highly complex, involving a sloping site, multiple overlapping design phases, and an ambitious LEED Silver sustainable design goal.

To meet the project's aggressive fast-track schedule and avoid disrupting ongoing hospital operations, the team members had to collaborate closely and coordinate critical project data regularly—especially at project outset, when design decisions have the greatest impact on overall building performance. That's why they adopted building information modeling (BIM) software from Autodesk, including Revit® Architecture software, Revit® Structure software, Revit® MEP software, AutoCAD® Civil 3D® software, and Autodesk® NavisWorks® software.

### The Team

To achieve these ambitious goals, two formerly competing architectural firms formed the Good Sam Design Collaborative (GSDC), a joint venture between Clark/Kjos Architects and Giffin Bolte Jurgens (GBJ). "Both of us specialize in healthcare architecture, but neither could take on a project of this size alone," says Richard Adelman, project manager and associate at GBJ. "Working together made a lot of sense." GBJ is handling the interior buildout, while Clark/Kjos is designing the new patient tower's core and shell.

The fast-track project is being delivered through a phased, Guaranteed Maximum Price (GMP) contract, where cost estimates are provided as each design package is released. This approach has required close, ongoing collaboration among Skanska, the construction manager and general contractor, the architects, and the project's consulting engineering firms: ABKJ (civil and structural), CDi Engineers (mechanical/plumbing), and Sparling (electrical/technology/lighting).

# BIM enables the design team to understand clearly the overall design and make better, more informed decisions.

From the outset, the team sought an integrated design process that would allow them to make strategic decisions as quickly as possible. BIM with Civil 3D and the Revit platform was the natural technology choice for this project. With this approach, the team could manipulate a large site model incorporating several interconnected building models to clarify the implications of design choices and achieve their strategic objective of campus information modeling (CIM).

The client was also eager to adopt BIM. “GSH sees it as a way to reduce cost by reducing schedule,” says Alex Hill, a principal at Clark/Kjos. “BIM gets them into the building earlier and provides a much better sense of what they’re buying.” The Revit platform products were also well suited for exchanging files with the consultants at Sparling, who use AutoCAD® MEP software and its native DWG™ file format for electrical/lighting design.

## The Challenge

The expansion includes a 380-car parking garage, a 10,000-square-foot central utility plant, and a nine-story patient care tower joined to the existing facility by a sky-bridge. This tower will include inpatient nursing units, an emergency department, diagnostic imaging, express services, and eight operating rooms. The construction site itself slopes steeply, has many immovable boulders, and contains numerous underground utilities, communications lines, and piping—many of which were undocument-

ed. “From a civil engineering perspective, it’s been quite a challenge to retrofit this new design into an existing site with so many unknown elements,” says Paul Wilhelm, project manager at ABKJ.

## Reduce Design Conflicts

Originally, GSH planned to complete the expansion in two phases, but after careful review decided to condense the project into a single accelerated phase, delivered in multiple overlapping bid packages. This approach enables Skanska to start construction before the overall design is complete. “That means we can bring the project to market quite a bit faster—in this case almost 18 months,” says Dave Smith, senior project manager at Skanska.

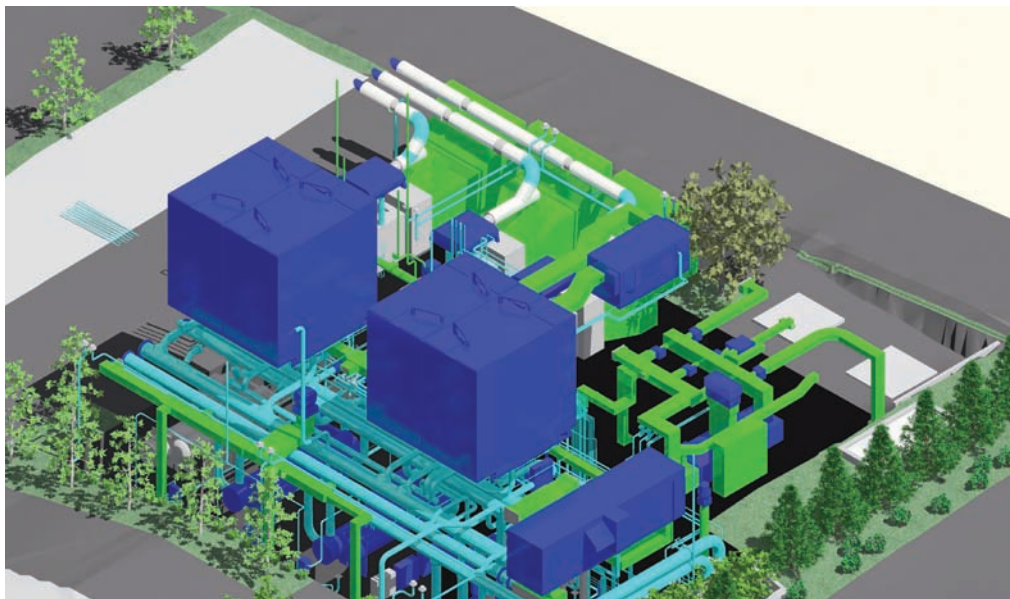
This approach puts significant pressure on the consultants to finalize the design as early as possible. “The schedule is almost breathtaking,” says Adelmann. “That’s why it’s critical that we make good design decisions up front.”

## An Ambitious Green Goal

When complete, GSH will be the first hospital in Washington to meet the requirements of LEED Silver sustainable design certification. “Hospitals are energy intensive operations, requiring rigorous environmental controls, high lighting levels, and multiple system redundancy,” says Adelmann. Achieving this certification will require close collaboration among the disciplines and a careful balancing of sustainable design strategies with

Downtime for a construction crew is very expensive. So when a crew uncovers an obstacle in the same location as our proposed design, that work stops. Using AutoCAD Civil 3D, we can make all of the required changes to pipe design, plan, and profile in minutes—not days. That is real cost savings to our client.

—Paul Wilhelm  
Project Manager  
ABKJ  
Seattle, Washington



Good Samaritan Hospital: Central Plant Mechanical System – Image Courtesy of CDI Engineers

other project requirements, including hospital safety regulations.

## The Solution

For help in implementing their first Revit BIM project, the architects turned to their authorized Autodesk reseller. “Completely training our staff on a new design tool was daunting,” says Adelmann. “Our reseller made that process smooth and uneventful.”

## Make Better-Informed Decisions

As the team began to work in Civil 3D and the Revit products, the BIM process enabled a thorough examination of the impact of site development and design choices, and also conveyed design intent more effectively. For example, during master planning, the architects had to demonstrate the visual impact of the project on the surrounding neighborhood. “Even that early, our model convinced both the planning department and the community to move forward,” says Hill.

# Designing healthy buildings is easier and more cost effective with BIM.

As the project progressed, BIM was equally useful for detailed design. “Joining the two towers via a sky-bridge was quite difficult across the site’s steep slope,” says Hill. “We also had to compensate for differing floor-to-floor heights.” Using Revit Architecture, the architects at Clark/Kjos modeled much of the existing facility and quickly resolved the issue.

## Be More Productive

To meet the fast-track schedule, the team had to work quickly. Revit Architecture helped boost productivity by automating many time-consuming tasks, such as coordinating references or scheduling the project’s thousands of doors and windows—typically a full-time job on projects this size. “Revit Architecture takes care of mundane tasks like these,” says Ishtmeet Singh, project coordinator at GBJ.

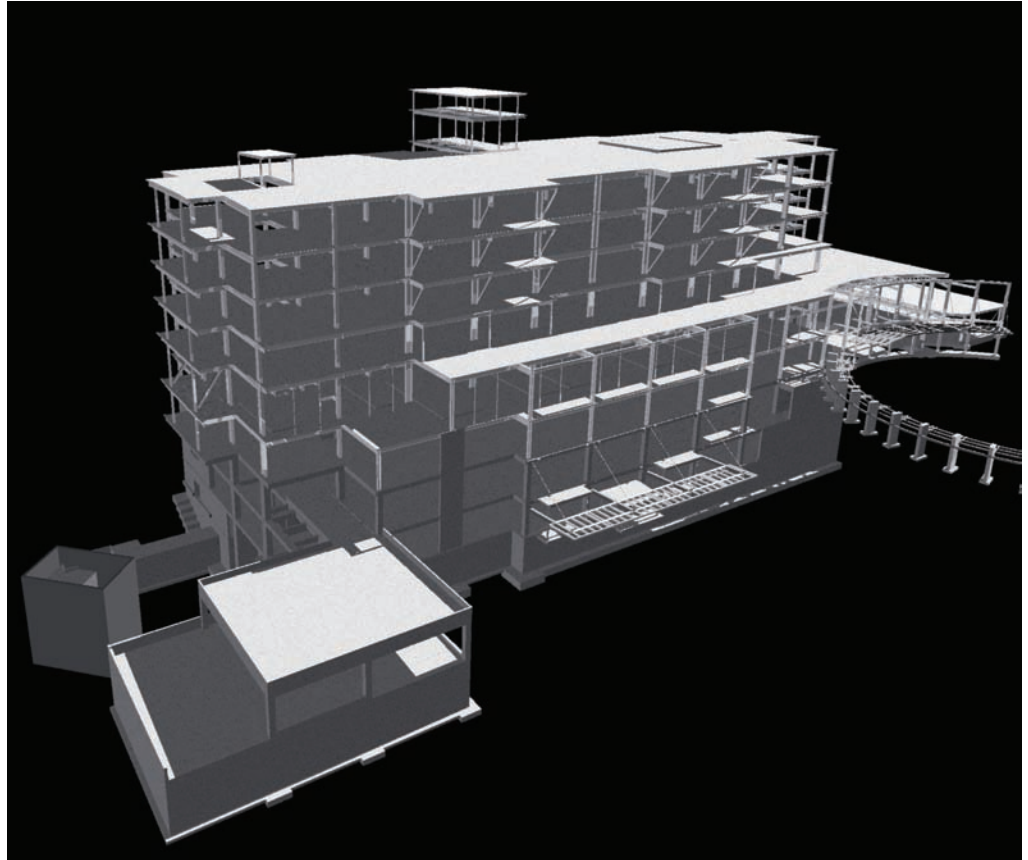
## Spend More Time on Design

By reinvesting time saved into design, the architects were able to focus more on high-value but typically second-order goals, such as enhancing families’ abilities to support patients. For instance, in the hospital’s innovative acuity-adaptable rooms—where the level of care adapts to the patient’s changing condition—GBJ used Revit Architecture to create flexible design options that offer more amenities to the visiting families, while enhancing patient care. “Revit Architecture enables us to study these issues much more thoroughly and convincingly, leading to far fewer questions from the contractor during construction and a better design,” says Hill.

Similarly, while using Revit MEP to route ductwork easily through the complex central plant, CDi engineers were able to focus more on innovative engineering design solutions for the tower, such as locating the mechanical services floor in between diagnostic and treatment and nursing floors.

## Boost Team Collaboration

To resolve questions that do arise, the architects host once-weekly interactive design sessions with the contractor and consultants via WebEx. “We pull up the Revit model, spin it around, and look at all of the architectural, structural, and mechanical elements,” says Todd Bovey, an associate at CDi. “Catching obvious clashes, like a duct running through a beam is easy.”



Good Samaritan Hospital: Patient Care Tower, Revit Model, Southwest View;  
Front View of Emergency Department and Main Entrances — Courtesy of ABKJ Engineers

At some of these meetings, the design team was able to solve complex problems quickly. For example, Clark/Kjos had to determine the precise location of the vaults at either end of the utility tunnel running from the patient tower to the central plant. Using Revit Architecture, the architects sat down with the contractor, the engineers, and a laptop and solved the problem in one meeting.

## Create Coordinated, Digital Design Information

ABKJ used Revit Structure to model the project’s highly complex structural elements. “Each beam on the roof had a different slope,” says Dihong Shao, a principal at the firm. “Revit Structure and its visual tools gave us a 3D model we could clearly see. It was great for coordination.”

## Share the Model

The electrical engineers at Sparling, using AutoCAD MEP, imported a DWG file generated from the Revit

model. “That enabled us to determine how much space our electrical conduit would require—both in the utility tunnel and throughout the hospital,” says R. Robert Bell, design technology manager at Sparling.

## Think Green

Because the BIM process automatically generates much of the information required for sustainable design analysis, designing healthy buildings is easier and more cost-effective with the Revit® platform for BIM. “The engineers understand our design more clearly, making energy modeling much easier,” says Adelmann. For example, the mechanical team used low-velocity, high-volume duct work as an integral part of its sustainability plan. “The Revit MEP model made it easier for us to visualize how the extra-large ducts would impact ceiling height, and with Revit Architecture, we refined the design so everything fit.”

# With BIM, Skanska improved collaboration, increased productivity, and significantly lowered costs.

## Resolve Issues Faster

Currently, Skanska is installing storm lines, electrical ducts, tanks, and chilled water in the ground. "All of these utilities have to go in early and in the right locations—long before the design is complete," says Smith. While digging, the builders often run into pipes not shown on any surveys. Moving such obstacles is time consuming and expensive—especially if it leads to construction crew downtime.

By referring to the AutoCAD Civil 3D model generated by the civil engineers, Skanska has been able to work around existing utilities and avoid costly delays. "In one instance, we had soil nails going in the ground," says James Yount, BIM manager at Skanska. "Through modeling some existing utilities, we discovered that the nails were within an inch of a storm drain." Using Civil 3D and its dynamic design features, ABKJ redesigned the area quickly, saving the client time and money.

## Meet Fast-Track Goals

"We see the 3D model as a way to build a mock-up of the site on the computer," says Smith. "Being able to model the existing utilities has really helped us get all pieces in the right place and stay on track. It's given us an added degree of confidence."

## See Before You Build

BIM has also significantly enhanced communication of design intent with our subcontractors, giving everyone a much better picture of the final product and enabling them to participate fully in decisions. "Viewing the model in 3D is like seeing it right in front of us in real life," says Yount. "It removes the need to interpret the contract documents."

## Find Interferences

One of BIM's strengths is its powerful interference-checking capability. "Besides being a great tool for coordination, Revit Structure was quite helpful for collision checking," says Shao. "And once we'd performed our checks using Revit Structure, we passed the model on to Skanska."

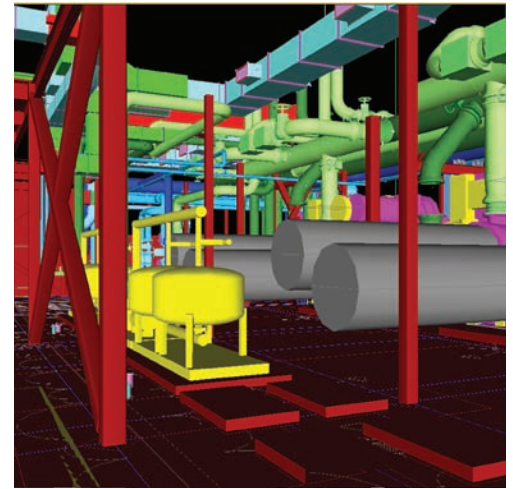
For further collision checking as well as construction planning, Skanska used Autodesk NavisWorks because it enabled the team to streamline the model and view only those qualities that affect physical coordination. "That's particularly helpful when viewing larger files," says Yount. "We can walk through them and see what's going on much faster."

## The Result

Currently, Clark/Kjos is nearing completion of construction documents for the new patient tower's core and shell. The parking garage is expected to open in mid-2009, followed by the new patient care tower in early 2011. Both architectural firms are now standardizing on Revit Architecture. GSH is also on track to achieve LEED Silver certification. Once completed, the healthcare center will consume 20 percent less water and at least 14 percent less energy than a traditionally designed hospital.

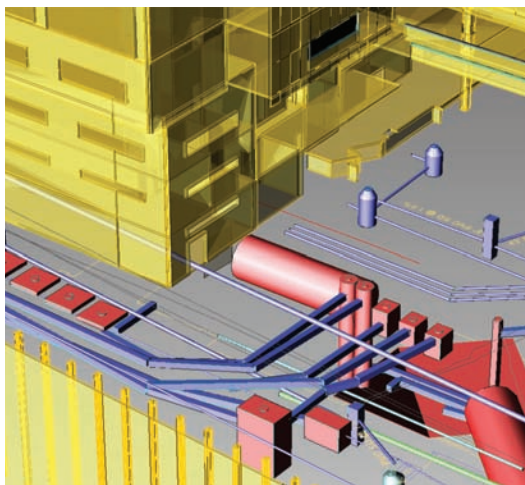
## A Better Project—Delivered Faster

"We basically replaced our entire production methodology while tackling one of the largest and most complicated projects we've ever done," says Hill. "So far, it's been highly successful—a testament to just how powerful the Revit and Civil 3D BIM solutions are."



Grey tubes indicate chiller tube clearances for future chiller tube use. BIM allows us to coordinate not only what's there but also the space to service what's there. — Courtesy of Skanska USA Building Inc.

"The model has really helped us work together as a team and understand the whole building," says Singh. "We're able to work on different parts of the same building using consistent methods because it's one model rather than disconnected pieces of information. BIM ties it all together."



We use AutoCAD Civil3D because the software is very powerful. It enables us to handle large projects with a smaller staff. In fact, our entire site civil department has only seven people, but it rivals the output of a much larger group.

—Paul Wilhelm  
Project Manager  
ABKJ  
Seattle, Washington

Image Courtesy of ABKJ Engineers