Project Summary

Skidmore, Owings & Merrill LLP (SOM) is one of the world’s leading architecture, urban design, and engineering firms. Since 1936, SOM has completed over 10,000 projects around the world and won more than a thousand awards for quality and innovation. “We’re best known for designing some of the world’s tallest buildings, including the Sears Tower in Chicago, the Jin Mao Tower in Shanghai, and the Burj Dubai skyscraper in Dubai City,” says SOM Partner Carl Galioto, FAIA. SOM has also led industry adoption of building information modeling, an innovative approach that closely integrates architectural and engineering design and documentation processes.

That’s why SOM was chosen to design One World Trade Center: The Freedom Tower, the first building to rise on the site of the former World Trade Center. At 1,776 feet, this elegant structure of shimmering glass will contain more than 2.2 million square feet of commercial and public space, including world-class restaurants, observation decks, and a state-of-the-art broadcast facility. Everything in the new tower will incorporate the highest standards of design, safety, sustainability, and quality. To realize such a large and symbolically important project, SOM and engineering firms WSP Cantor Seinuk and Jaros Baum & Bolles (JB&B) worked closely with Autodesk Consulting to implement the Revit® building information modeling platform.

The Challenge

Since the construction of the original World Trade Center in the late 1960s and early 1970s, much has changed in the building industry. Advances in design technology and project workflow integration have enabled architects and engineers to create buildings faster and more efficiently than ever before. Yet, because each discipline typically relies on its own design tools and proprietary formats, sharing those designs with other disciplines and reusing the data they contain often involve time-consuming duplication of work and needless errors.
Using Revit Architecture, SOM delivered construction documents for over 2 million square feet—with time to spare.

High-Stakes Building
On a project as complex as the Freedom Tower, these potential challenges were magnified by fast-track schedules, a heightened need for security, and the vast number of architects, engineers, and builders involved. In addition, other stakeholders—who lacked access to CAD software required an easy way to access accurate and current project information for quick approval of key decisions. At every step, there was little room for errors or costly delays.

Tremendous Complexity
“There were also numerous technical challenges,” says Galioto. “For example, we had to integrate the building into the entire below-grade One World Trade Center complex. That involved tremendous interdependency with other buildings and utilities.”

The Solution
“We needed the right tool for working on this extraordinary project,” says Galioto. After a competitive software selection process, SOM chose Revit® Architecture software as the project’s primary architectural design tool. One important factor in the decision was the software’s seamless integration with the other two components of the Revit building information modeling platform, Revit® Structure and Revit® MEP software. “Revit helps fulfill a dream we’ve had since the 1980s—architects, engineers, and builders all working from a single, integrated digital model that contains all project information,” says Galioto. “Autodesk shares that vision, and, like us, also views BIM as a tool that is useful far beyond the design process, through construction, fabrication, and facility management.”

Work the Way You Think
At the heart of the Revit platform is building information modeling, a digital approach to building design, delivery, and management. Designers, architects, engineers, and production teams all use industry-specific tools while working on the model. As they design, Revit automatically creates all other corresponding project information, including accurate floor plans, elevations, sections, quantity takeoffs, area calculations, schedules, and more. And once they update the model, all the other disciplines have access to accurate and complete information about the entire project.

Outperform Expectations
“We started off cautiously,” says Galioto. “Our initial plan was to use Revit Architecture—complemented by AutoCAD® software—to model only the building’s complex subgrade levels. But because Revit Architecture performed so well, we quickly expanded its use to the entire project.”

Learn from the Source
During this process, Autodesk Consulting provided invaluable assistance to SOM and the architectural team. “Implementing this new technological paradigm posed unique challenges,” says James Vandezande, Associate and Digital Design Manager at SOM. “Autodesk Consulting helped us work through them and organize the entire project much more efficiently.”

Get Organized—From the Ground Up
That’s why SOM decided to split The Freedom Tower into five separate projects—base, tower core and structure, base enclosure, main tower enclosure, and spire—in addition to the MEP and structural models. This division helped define a clear interdisciplinary workflow and also made it easier for the design teams to meet deadlines for separate bid packages.

Spend More Time on Design
Once fully implemented, the new software quickly demonstrated its value. “Traditionally, in the construction document submittal process, we spend an enormous amount of time on quality assurance tasks,” says Vandezande. “But with Revit Architecture, we can bring the 3D production model into the conference room—a place where it never existed before. That enables us to spend more time on collaboration and design, and less on the process of coordination.”

Vastly Improve Coordination
“We used to gather around the drawings on the table with a box of red pencils whenever we had to coordinate very complex or tight-fitting areas of a building, such as the lobby or mechanical room,” says Galioto. “Now, we can open the model on a plasma screen and zoom right in to whatever area we’re working on.”
virtually eliminated. “Revit Structure has helped us dramatically improve project coordination,” says Guerrero. “It has also significantly reduced coordination time by enabling us to incorporate last-minute changes on the fly and have those changes carried throughout all of our documents.”

Easily Make Changes
When we need to make changes—anywhere in the model—the Revit parametric change engine automatically coordinates the entire set of drawings,” says Guerrero. “Using traditional software, we would have to pick up all those changes manually, and it’s very easy to miss a few when working with a large set of drawings. You don’t have that problem with Revit Structure. The model really coordinates itself; it’s a tremendous time-saver.”

Improve Accuracy
The Revit platform has proved equally valuable to the project’s structural engineering firm, WSP Cantor Seinuk. “BIM has opened up new methods of communication with contractors and subcontractors—methods that were unheard of just a few years ago,” says Charles Guerrero, Vice President at Cantor Seinuk. “Using Revit Structure, we’re able to incorporate the architectural model into our structural model and easily see if any clashes exist.”

Get More Done—Faster
And, because all of the disciplines are working from the same data, time wasted on translation is

Minimize Change Orders
Once up to speed, JB&B engineers were able to leverage the Revit platform’s increased levels of coordination and clarity for additional benefits. “In particular, as a direct result of using Revit MEP, we saw a drastic reduction in change orders,” says Timothy Fu, a Mechanical Engineer at JB&B. “That’s where MEP engineers typically lose the most time—and that’s where the Revit platform offers us the greatest advantage.”

See Clearly
To complete this monumental project on time, SOM and the engineering firms also relied upon other Autodesk® products, including Autodesk® 3ds Max® visualization software. “Design visualization is another important aspect of this project,” says Vandezande. “People are really driven by the visual experience of architecture.” Smooth integration between Revit Architecture and 3ds Max helped the designers from dbox, a full-service advertising and design studio, represent all aspects of this groundbreaking project with exceptional clarity. “It helped us understand quickly and clearly what Skidmore, Owings & Merrill’s design intentions were,” says dbox founder, James Gibbs.
Revit Architecture software helps architects design higher-performing buildings and meet sustainable design goals.

The Result
On June 28, 2007, SOM completed architectural documentation for the project using Revit Architecture. The submission, which involved more than 500 sheets of drawings and roughly 2.2 million square feet of total construction space, was a major accomplishment. “Best of all, we executed it nearly flawlessly --and with time to spare before the deadline,” says Galioto.

Better Buildings
Autodesk --and its expertise in design software, project collaboration, and consulting services --was a significant factor in helping SOM and its engineering partners reach this point. “The Revit platform helps us visualize projects as they will really be constructed,” says Galioto. “That means we can design better buildings --buildings that are more efficient, are higher performing, and, consequently, that also help us meet our sustainable design goals. It’s nothing short of a revolution.”

Greater Efficiency
“We think going from a 2D, computer-based environment to BIM will really transform the way we work and make everything more efficient,” adds Fu, “Using Revit MEP, we’re able to coordinate all of the mechanical, electrical, and plumbing services right up front with the architect, the structural engineer, and any other consultants.”

Significant Competitive Advantage
“The industry in general is going this direction,” says Guerrero, “The Revit platform absolutely provides us with an enormous competitive business advantage. There’s no doubt about it.”

Industry-Leading Consulting from Autodesk
Throughout the entire process, Autodesk Consulting was an integral part of the team. “Autodesk is an internal partner and a consultant in this process,” says Galioto. “They’ve been great.”


Revit Structure has given us an enormous competitive advantage. It has significantly decreased coordination time by enabling us to incorporate last-minute changes on the fly and have those changes carried throughout all of our documents.

—Charles Guerrero
Vice President
WSP Cantor Seinuk