High Concrete Group Brings Award-Winning Project to Life

Constructible Models and Revolutionary Collaboration Tools Enabled Project Efficiency and Accuracy on the 1200 Intrepid Project

Solutions

Tekla Structures
overview

High Concrete Group, LLC is a family owned company that has delivered precast concrete structures for nearly 50 years. With the company’s constant strive for innovation, use of award winning technology and first rate service and support, High Concrete demonstrates the qualities that were required to bring the revolutionary 1200 Intrepid Structure to life.

THE COMPANY

High Concrete Group, LLC is a family owned company that has delivered precast concrete structures for nearly 50 years. The company’s innovation, award winning technology, first rate service and support are the reason that High Concrete Group is the leading producer of architectural and structural precast and the nation’s largest product of precast concrete parking structures. High Concrete Group provides structure and enclosure systems, components and accessories for virtually every kind of project including corporate, cultural, government, educational, multi-unit residential, sports stadiums and arenas, retail and warehouse structures, including several exceptionally complex buildings.

The company’s precast products are produced in two plants located in Denver, PA and Springboro, Ohio that pour a total combined 9,500 square feet of concrete daily. The precast company create constructible models for 80 percent of its projects to LOD 400 (Level of Development), something it relies on Trimble’s Tekla Structures BIM software to make possible. An avid adopter of 3D modeling for accuracy and collaboration, High Concrete Group’s policy states that every design be created using BIM. So naturally, when the precast company was tapped to help bring a 92,000 square-foot office building at 1200 Intrepid Avenue to life, it was up for the challenge. They were also rewarded for their work as this project was name the 2016 Harry H. Edwards Industry Advancement Award from the PCI Institute.
COLLABORATING ON COMPLEX DESIGN

Located at the Navy Yard’s Corporate Center in Philadelphia, a master-planned development within the Navy Yard encompassing approximately 1.35 million square feet, the Intrepid building is constructed entirely of flat concrete panels. Each piece is set at an angle, so the composition gradually becomes a curving wall with mesmerizing optical effects that make the front wall appear as though it is falling to the ground like a row of dominos. Three sides of the structure are conventional flat walls, while the east facade has a variety of radii, ranging from just over 320 feet at the ground floor to just over 8,900 feet at the parapet of the roof. While innovative, the design was complex. The team at Bjarke Ingels Group designed the building’s facade to resemble the curve of ships docked in the Navy Yard, which was constructed through strategic stacking of High Concrete Group’s precast panels, with only lateral connections to steel, in a basket-weave pattern. The flowing and curved shape of the Intrepid building required significant cantilevering and structural load analysis, with one facade not only varying in radius at each level, but also tilting outward as much as 23.5 degrees. Tekla Structures allowed High Concrete Group to easily collaborate with designers, eliminate interferences and ensure the curving precast concrete panels would align properly. The team collaborated with architects by easily importing and exporting models into and out of Tekla Structures. After the final model was agreed upon with the design team, the Tekla Structures 3D model was exported and also used by the window contractor to detail the building’s custom windows. “We couldn’t have done the Intrepid project in 2D. Tekla Structures made a significant impact on our success by allowing us to collaborate, save time, reduce costs and work efficiently with all of the project stakeholders.”

- Dave Bosh, Design Team Leader, High Concrete Group
INCREASING ACCURACY

The Intrepid building’s precast concrete façade had to transfer the gravity loads directly through the precast concrete panels to the foundations, so the structural steel system was embedded into the precast concrete panels. To prevent a progressive collapse, if one connection should fail, each panel was engineered with a safety backup connection.

High Concrete Group modeled the exterior steel of the Intrepid building in Tekla Structures to determine connection hardware requirements and identify interference with supporting structures. The team also modeled all embeds and rebar to determine interferences within the piece.

When it came time to set the panels in place, conventional elevation drawings couldn’t be used due to the various radii used on the façade. Tekla Structures enabled High Concrete Group to set data points within their constructible model at the interior corner of each panel and provide the erector with export layout data, which was then imported into a robotic total station onsite. As a result, erection of the façade, which was estimated to take a month, only took two and half weeks. Even with the complexity of the façade, the project was completed free of engineering issues and misaligned connections onsite.
DRIVING EFFICIENCY

High Concrete Group produces piece drawings as well as project and piece level Bill of Materials (BOM) using Tekla Structures. The team ran reports out of Tekla Structures and then loaded them, through an automated process, into SAP, the company’s ERP system. With Tekla Structures, High Concrete Group’s BOM were more accurate and delivered three weeks earlier, giving the company more time to purchase and prepare supplies.

“Creating the production drawings and BOMS is faster using Tekla Structures. We save about 80 percent in BOMS over traditional 2D methods for a project.”

- Thomas Beam, 3D BIM Specialist of High Concrete Group.
SHARING ACCURATE, CONSTRUCTIBLE INFORMATION

High Concrete Group sub-contracts about 20% of their engineering work. With Tekla Model Sharing they are able to share the workload and speed up the collaboration with external project parties. Different offices can work on the same project even without network connection, create and update information using the same model and share changes effectively. With Tekla Model Sharing, High Concrete Group was able to speed up collaboration with other project stakeholders because only the changes made to the model are synced. This process is much faster and the data can be accessed from anywhere, at anytime.

“Modeling to LOD400, where we model the entire precast structure completely and accurately, with all the hardware and reinforcement, means our project files are very large. Before Tekla Model Sharing, we were spending a lot of time waiting on a program to process the data because the files were so big.”

To confirm these efficiency gains, the company conducted a time study at the end of 2016 to see if model sharing would speed up its process and if so, by how much. The results from the study showed performance increased by 75 percent when the team used Tekla Model Sharing to collaborate on design compared to the former workflow of using multiple users on the same project.
LOOKING FORWARD

High Concrete Group has begun using laser projection in production to speed up locating openings, form sides and embeds to their forms. Production workers can line up the form edges with the laser line and quickly place concrete embeds to their location within the forms. This eliminates the need for measuring tapes, decreases reliance on production piece drawings and reduces errors. The information the lasers use to project the location of a piece is a direct export from Tekla Structures, so there is a minimal impact to the engineering department.

“Importing the Tekla Structures model into our LAP laser system, we’re saving one hour of form setup time per mark and we’ve reduced file creation time by 90 percent,” said Beam. “We can generate the projection file by simply exporting precast specific data from the Tekla model and releasing that file to production, a process that only take a minute per piece. Without the model, we would need to input the laser projection data manually. That would cost us approximately 10 minutes or more per piece. On a job that has hundreds of pieces, those minutes add up to a lot of money.”

High Concrete Group has been a Trimble customer and used Tekla Structures for well over a decade. The Intrepid project received the 2016 Harry H. Edwards Industry Advancement Award from the PCI Institute.

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Together we are shaping a smarter future for construction

TEKLA SOFTWARE BY TRIMBLE

Trimble is a technology company with a vision of transforming the way the world works. Trimble’s construction offering ranges from total stations to advanced software, giving the industry tools to transform planning, design, construction and operation of buildings. The company also has products for trades like logistics and agriculture.

TRIMBLE BUILDINGS

In addition to Tekla, Trimble Buildings brands include names like SketchUp and Manhattan Software, targeting architects, engineers, fabricators, MEP contractors, general contractors and construction managers, and building owners. The software solutions promote constructible models and collaboration. Trimble Buildings offering blend groundbreaking innovations and practical features, helping the industry achieve transformative results.

TEKLA SOLUTIONS

Tekla software is at the heart of the design and construction workflow, building on the free flow of information, constructible models and collaboration. It is the people who make the difference, while Tekla gives tools for realizing projects around the world from housing and bridges to factories and skyscrapers. Good communication and elimination of waste make the industry more sustainable and cost effective, improve your projects and in the end your customers’ happiness.

- **Tekla Structures** is the most developed Building Information Modeling software on the market. It makes accurate, constructible modeling of any structure possible.
- **Tekla Structural Designer** gives engineers the power to analyze and design buildings efficiently and profitably.
- **Tekla Tedds** automates repetitive structural calculations.
- **Tekla BIMsight** is a free professional tool for construction project collaboration allowing anyone combine models, check for clashes and share information.
- **Tekla Field3D** is an easy-to-use 3D tool for utilizing Building Information Models on mobile devices.

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