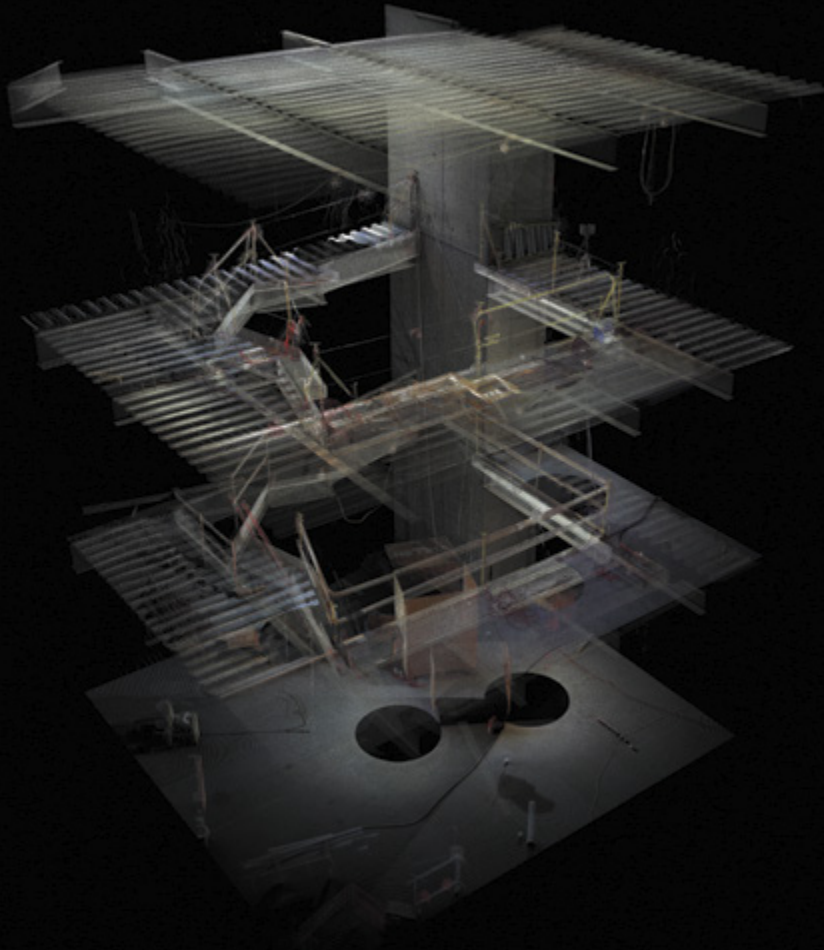




# Precise 3D Virtual Modeling Saves Time

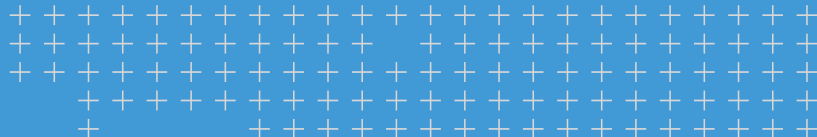


Wisconsin firm JP Cullen uses laser scanning to obtain highly accurate measurements on challenging projects.

To avoid costly work onsite, stairs for an office building were prefabricated based on precise 3D models created with scan data collected with Trimble TX5 laser scanners and processed in Trimble RealWorks and Revit.

## Solution

Trimble TX5 Laser Scanner  
Trimble RealWorks  
Autodesk Revit



# overview

To complete construction of a three-story structure in Verona, Wisconsin, an intricate stairway requiring painstaking hand measurements had to be built and installed. JP Cullen used laser scanning to improve the accuracy of the data collection efforts of the stair shaft and expedite the construction of the stairs.



Location  
Verona,  
Wisconsin, USA



## Complex Measurements are Critical

The new office building was comprised of composite metal deck on structural steel, with a truncated spiral stair wrapped around a hexagon shape as it went from level to level in the center of the building. Precision Metal Fab, the stair fabricator, planned to use a theodolite to measure the openings and capture the angles with the goal of prefabricating each set of stairs. The complex slab edge made it very difficult to get the accurate measurements required for the stairway's tight tolerances, creating a significant opportunity for error.

Since 1892, family-owned Wisconsin-based JP Cullen has been the contractor companies rely on to handle large, complex industrial jobs. Their accomplishments include

iconic projects like the Wisconsin State Capitol and Camp Randall renovations, along with the 11,400-seat Deep Space Auditorium, which won the AGC Build America Grand Award in 2015.

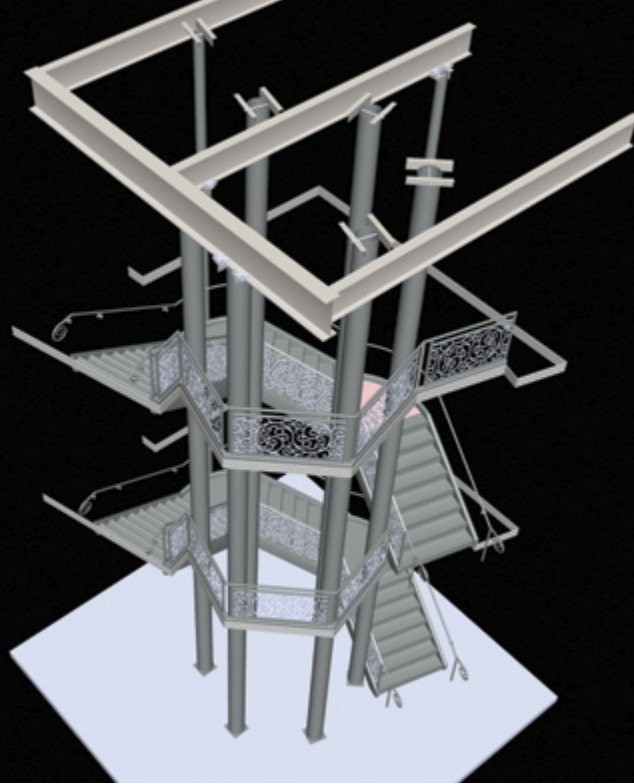
JP Cullen assessed the stairway design and decided that laser scanning would improve results by providing more precise measurements that could be used to prefabricate the stairs in less time offsite. JP Cullen bought their first laser scanner, a Trimble® CX, and Trimble RealWorks® software in 2011. The company upgraded to two Trimble TX5 laser scanners in 2013.



Leveraging laser scanning in our daily work had clear advantages. We continue to work closely with Nick DiBitetto and Ryan Fisher at BuildingPoint Midwest to stay current with all the latest technology.

**Cameron Weinbrenner, BIM manager, JP Cullen**





## Scanning Solution to the Rescue

JP Cullen used Trimble TX5s to scan all three floors around the stair opening for a complete and accurate picture of the slab edge and elevation of the concrete decks. After scanning, the scan data were registered to create a composite point cloud using Trimble RealWorks. From there, a 3D model of the slab edge, structural steel, ground floor and nearby elevator shaft was created using the point cloud data and Revit. This model was sent to Precision Metal Fab where it was used to create the fabrication model of the entire staircase, including support columns and railings.

The 10 scans took about two hours of time in the field. Registration to get a composite point cloud was completed quickly. Modeling of the stair to a point where it was ready for Precision took another two hours. Altogether, production of an as-built model used to prefabricate the set of stairs took about half a day. Each set of stairs was prefabricated as one piece in Precision's shop and shipped to the site. The entire staircase was installed in just three days. Building the stair piece by piece on site would have taken over three weeks of additional schedule to complete.

“ It would have been extremely difficult to field-build the stairs due to the complex curve of the tube steel stringers. By building a complete model with 3D scanned data in RealWorks and Revit, Precision was able to fabricate the stair in a controlled shop environment, which led to a higher quality product compared to welding each connection in the field. ”

**Josh Pearson, project manager, JP Cullen**

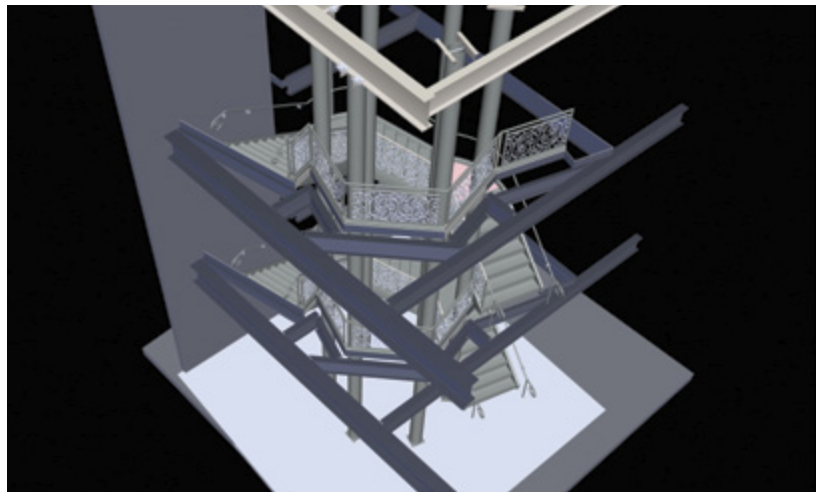
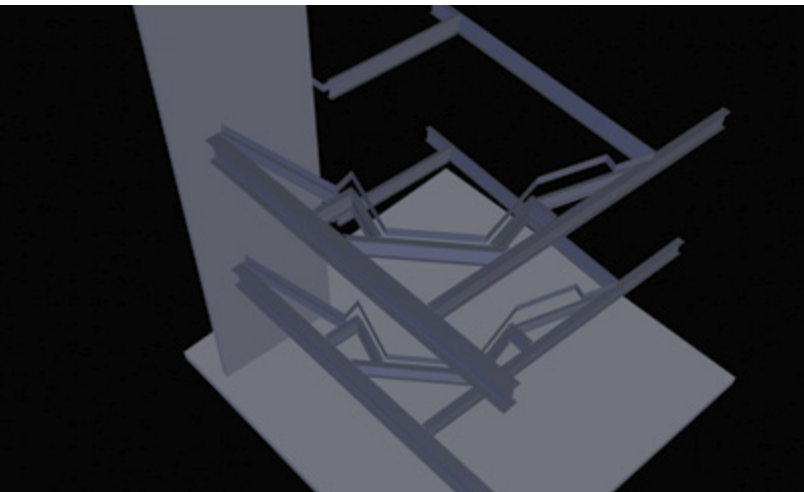


# Virtual 3D Model Results in a Perfect Fit

Based on the model of the structure, slab edge, and elevator shaft provided by JP Cullen, Precision Metal Fab created a virtual model of its intricate design—including stairs, stringers, railings and columns—that fit the space in the office building precisely. Laser scanning was a much faster and effective approach than measuring by hand.

“The benefits of using laser scanners are incredible. Using the survey-grade data that you get from the scanner helps plan the work well in advance of the installation. Components of the building can be prefabricated with the confidence it is going to get installed on time. There is no rework. There are no fire drills for unforeseen issues.”

Josh Pearson, project manager, JP Cullen



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