

Exterior Kenilworth Ave—Colorized Point Cloud of Unity Temple's West Façade

3D LASER SCANNING + BIM MODELING

Restoring Frank Lloyd Wright's Unity Temple Using 21st Century Technology

T ruePoint was tasked with laser scanning both the interior and exterior of Frank Lloyd Wright's Unity Temple and produce a 3D BIM model for historical renovation documentation. Unity Temple is located in Oak Park, Illinois.

Challenge

The client's challenge in this case was to be able to thoroughly document the 1909 Frank Lloyd Wright masterpiece—in order to prepare

for a multi-million dollar building restoration—without compromising the building's historical identity or disrupting ongoing tourism and church activities within Unity Temple.

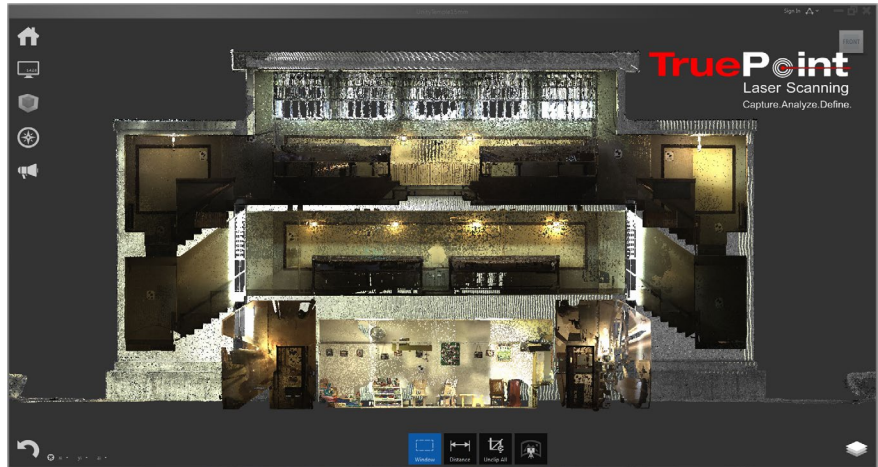
Solutions

Building Information Modeling (BIM) has become a major practice within the AEC industry, specifically for new construction, adaptive reuse, or buildout projects. But how does this practice of “build twice” translate to restoring an

early 19th century architectural marvel? By means of High Definition Surveying (HDS). HDS is a non-contact measuring tool that collects visible information of existing conditions in a fast, precise way while, at the same time, reducing damage risks and time associated with traditional measuring methods. Visible information is captured in 360 degrees, generating a 3D point cloud with accuracy up to 2 to 4mm. These point clouds ultimately become 3D virtual worlds of the building, making the method a fast and

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cost effective way to generate as-built documentation (both 2D and 3D) for project analysis and coordination. In the case of Unity Temple, TruePoint was hired for its expertise in historical preservation by means of laser scanning and BIM modeling. TruePoint's team of architects and engineers performed a comprehensive laser scan of the building's interior (temple, offices, mechanical basement, classrooms, etc.), exterior, roof, and skylights in order to capture explicit



Section North Side—Recap Colorized Point Cloud—Section of Unity Temple

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detail of Unity Temple’s current condition. TruePoint then created a 3D Revit model from the point cloud data so that the construction management firm and subcontractors (mechanical contractors, concrete restoration, architects, etc.) could investigate the building’s existing state and accurately assess their project designs for restoring Unity Temple.

Deliverables

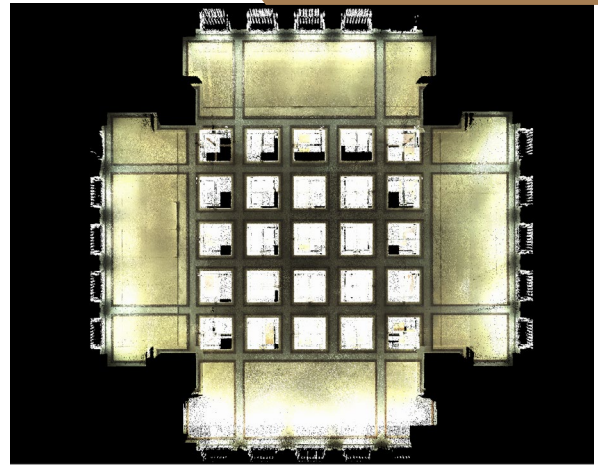
TruePoint’s deliverables to the client included a 3D Revit model of the building’s interior, exterior, roof, and skylights; a colorized point cloud in Autodesk Recap file formats (.rcp/.rcs) to be used directly in Autodesk Software (Revit, AutoCAD, Navisworks, etc.); and TruView photographs.



Ortho slice whole site—Section cut of Colorized Point Cloud



Temple Truview—TruView of Unity Temple



Clerestory windows plan ptclcd—Reflected Ceiling Plan (RCP) of Point Cloud data—Clerestory and Skylight Windows

Added Value

The colorized point cloud generated from laser scanning gave explicit detailed information that would be otherwise nearly impossible or extremely difficult to document without risking damage to the fragile

building elements. Examples of two key architectural features are the intricate window panes (e.g., clerestories, skylights) and the wood trim throughout Unity Temple. Both of these features were collected in the point cloud data in congruence with other building information (structure, mechanical systems, etc.). Additionally, TruePoint trained the client on how to create 2D elevations, sections, and a Reflected Ceiling Plan (RCP) directly from the point cloud data within AutoCAD.

These AutoCAD sheets contained precise measurements and photographs, making it quick and easy for the client to identify the exact piece and location of each element for its removal, restoration, and re-implementation. TruePoint also provided the client with TruViews. The TruView utilizes a free plug-in for Internet Explorer in order to view each scan location from the scanner's perspective. This offers a quick, easy way to take rudimentary measurements, make hyperlink notes, and perform project

collaboration, thereby reducing the hassle, time, and cost associated with on-site visits. Another added bonus of producing a comprehensive point cloud and BIM model of Unity Temple was documenting the existing mechanical room and tunnel in relation to the entire structure. Mechanical contractors and architects could then plan both demolition of the existing systems and implementation of the new systems without jeopardizing Frank Lloyd Wright's aesthetic and spatial design. ■

If you are in need of historical preservation documentation, building restoration, documentation of interior or exterior architectural features, or any other laser scanning needs, please contact TruePoint—Chicago at chicago@truepointscanning.com or 312-448-1509.

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Laser scanning interior of Unity Temple