Pinnacle Infotech Used Laser Scanning for BIM Project

PROJECT NAME:
The G30 Project: Phase I & II - Boiler & Chiller Plant Room [Industrial Plant Room]
Project Location - Connecticut Ave NW, Washington, District of Columbia, USA

About the Project/Project Synopsis
G-30 Project consisted of Phase I & II Boiler & Chiller plant room (single level) in Washington, Columbia, USA. Shapiro & Duncan completed the detailed scan for renovation work. Pinnacle received the RCS & RCP Scan files for the development of 3D model of Architectural, Structural, Mechanical & Plumbing. The detailed level services were included in both phases of Boiler and Chiller Room.

Advantages of Using Laser Scan in this project
Pinnacle captured detailed information about an element in its physical space and allowed precise and accurate modeling and coordination. The 3D scanning process helped different stages of construction like 3D model creation, visualization and quality inspection.

Benefits of BIM Point Cloud Services for G-30 Project
- Accurate 3D model creation of individual trades for renovation from scan data, allowing more reliability and quality assurance
- During renovation, construction scan to BIM model provided a better platform for preparing further detail of design work for extension
- As Built Drawing Preparation from Point Cloud for Plan, Elevation & Section Sheet for Architectural, Structural & MP
- Improved transparency and streamlined communication with 3D visualization for quick decision making during renovation and extension Phase
- Eliminated RFI’s, work stoppage and rework by checking the accuracy and completeness of 3D Model from scan data

Application of Point Cloud Services in Various Trades
Point Cloud to BIM Service is required by the general contractor - Shapiro & Duncan, Inc for preparing various models of Architectural, Structural and MP (Mechanical, Plumbing) elements like exterior & interior walls, doors, windows, ceiling, curtain walls, floor, roof, structural column, wall, beam & slab, bracing, trusses, floor & roof framing, duct, pipes and other equipment.

Deliverables from Point Cloud to BIM Services
A. 3D BIM Model Creation at LOD 300 & 400 Level for Architectural, Structural and MP Services based on Point Cloud Scan Data used for Renovation
- 3D Models are generated using BIM based on point cloud scan data to improve transparency & streamline communication for quick decision making during As-Built Phase
- High quality Revit models ensure that Revit components are built intelligently with the practicality to serve the purpose
- The parametric families contain real world product information or performance models, necessary for running calculation analysis and simulations

B. As Built Drawing Preparation from Point Cloud for Plan, Elevation & Section Sheet for Architectural, Structural & MP
- As-Built Drawing Preparation from 3D BIM Model served as a comprehensive reference tool to facilitate future project planning including extension, renovation & redevelopment from point cloud data

FACTS AT A GLANCE:
- BIM Start Date: October, 2017
- BIM End Date: Feb, 2018
- Project Area: 10,000 sq. ft.
- Average Team Size: 8 Engineers
- Architect: Omniplan
- General Contractor: Shapiro & Duncan, Inc

Since all details pertaining to the building dimensions, erection, fabrication, elevation, materials, location, etc can be obtained from the As-Built Drawings, they can be used by the client for resolving disputes about insurance claims

Point Cloud to BIM Work Process in Revit
A. Input Requirement
B. RFIs
C. Software Applications
D. Work Process
E. QA/QC

A. Input Requirement for BIM Modeling & Drawings
- Scan data(RCS) supporting Revit
- Actual Snapshots of existing condition
- As-built drawings for some areas
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B. Raising RFIs for Various Trades
Reasons for RFIs:
- Areas hidden by equipment/elements
- Difficulty in measuring the diameter of Insulated duct/pipes
- Inconsistency between point cloud and as-built drawing

C. Supporting Point Cloud Software Used
Supporting Software Applications for Point Cloud helped to visualize and navigate the point cloud files properly. Moreover, by using these software platforms, files are compressed and dimensions are easily obtained for BIM model.

D. Work Process followed by Pinnacle
- Standard checklist followed for QA/QC
- Section views prepared in Revit for checking deviations

E. Quality Checking
- Standard checklist followed for QA/QC
- Section views prepared in Revit for checking deviations
- Trade Wise Modeling in Revit
- Preparing Clarification for Hidden Area
- Submit Complete Model for Review & Feedback
- Quality Checking for Missing Elements & Deviation between Scan & Model
- Making Assumption Log for Clarifications

Project Specialty
Scan to BIM conversation played an important role for renovation work of the existing building. We developed all required elements in 3D based on individual scan data for model creation of all trades.
Scope of Work - Our scope of work for the project included:

3D Model Creation of all elements as per point cloud

Point cloud scan files to BIM models for 2 mechanical rooms having different types of Architectural & MEP elements to be modeled with exact location & specifications according to the provided scan.

- **Architecture** – 3D model of Wall, Door, Window
- **Structure** – 3D BIM Model of Column, Beam, Slab, Equipment Pad & Wall
- **Plumbing** – 3D BIM Model Creation of Pipes, Pipe Fittings, Valve & Accessories
- **Mechanical** – 3D BIM Model of Duct, Pipe, Fitting, Valves, Accessories & Mechanical Equipment

**Trades Covered**
Architecture, Structure, Plumbing, Mechanical Piping

**LOD – 300 & 400**

**Software Used:**
- Revit 2017
- Navisworks 2017
- Autodesk Recap 360
- Newforma

**Challenges & Solutions**

**Input Inconsistencies** -
Scan not available at some places

A. Hidden area in the scan
   Solution - We made the assumption log with element id.

B. Wall not visible due to obstruction by tanks
   Solution - We continued as per the nearest visible alignment.

C. Concrete pad under boiler equipment not visible clearly
   Solution - We assumed width as 1' and maintained 1 inch Tolerance or deviation between scan and model elements.

**Pinnacle’s Value Addition**

1. Reviewed interdisciplinary coordination based on Scan data
2. Created accurate 3d model of individual trades for renovation and extension work from scan data, allowing reliability & quality assurance
3. Improved transparency & streamlined communication with 3D visualization for quick decision making during renovation & extension phase

**Client Feedback:**

“Chandan, I just wanted to pass along a thank you for the quality of the first part of the structural model that your team turned over to us yesterday. You can see by the screen shots below how much more detailed our Scan to BIM model was compared to the “As-Built” model the Structural Engineer provided. Needless to say it was an easy decision to have your team proceeds with the phase 2 structural. It was also refreshing to bring this level of detail (just a structural model) to the table in front of a new client. Keep up the great work, and we are looking forward to seeing the mechanical and plumbing portion.”

- Chris Canter, Director of Virtual Construction & Fabrication, Shapiro & Duncan

**Client Feedback:**

“Steve, Thank you for the Revit model. We have determined that we will be using our contractor’s version of the structural. They are a true as-built. See the screen shots below the first is from Arup’s model the second is from Pinnacle and the last is just a shot in the point cloud from the same location”

- Don Zeiders, Preconstruction Specialist, Shapiro & Duncan

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Project Snaps

Sample Chiller Plant Model From Scan

Sample Boiler Room Model From Scan