AUTODESK **UNIVERSITY** 2015

RC11173

Structural Steel & Concrete Analysis Through 3D Scanning

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Company: McCarthy Building Companies

Philip Lorenzo
Company: Rithm

Learning Objectives

- Logistically Analyze How to Carry Out Field Scanning
- Comprehend Field & Office Best Practices for Laser Scanning Workflows
- Apply Expedited Data Analysis Workflows for:
  - Steel Monitoring
  - Concrete Topography
  - Concrete Monitoring
- Grasp Benefits of Using Laser Scanning from Client & Management Perspectives

Description

We will discuss how McCarthy Building Companies, Inc., has unlocked the power of the precision and accuracy of laser scanning for investigating structural deviations throughout the construction process. By capitalizing on Autodesk, Inc., products, along with custom tools, we have discovered workflows that enable us to quickly calculate steel cambers and monitor deformation before and after concrete pours. We have also capitalized on scan data to generate topographic maps on concrete slabs in order to help guide flooring operations, such as grinding, the use of flooring material, and the setting of door heights, eventually using this data for AISC, ASTM, and ADA Inspection Standards. This discussion will go over the benefits of obtaining this data in terms of cost control, reduction of rework, post hand-off client sustainability, and added value to a project, along with the associated startup costs and resources involved in performing these tasks.

Your AU Experts

After completing his Bachelor of Science in Civil Engineering degree, ***Joshua Ryan Engelbrecht*** *began working for McCarthy Building Companies as a VDC Engineer, where he had completed 2 summer internships as a Project Engineer prior to graduating. Since being hired full-time in McCarthy's VDC Group, Josh has worked on various projects in the Northern California area as well as a site in Texas. He has carried out all 2014-2015 3D Scanning projects for these jobsites, completing all field scanning and point cloud registration and analysis.*

Philip Lorenzo *graduated with his ddegree in Civil Engineering immediately beginning employment at McCarthy Building Companies, helping build Kaiser Permanente's flagship hospital in Oakland, CA. McCarthy had big dreams and aggressive technology implementation goals for this project and in 2011 they acquired their first FARO laser scanner. Philip quickly found that using OEM software to extract the*

information they needed from the scan data and deliver actionable information to his superiors was both tedious and time consuming. Philip founded RITHM, creating plugins which simplify and automate these workflows for the masses. He offers training and consulting services related to 3D laser scanning and speaks at various conferences throughout the country.

Outline

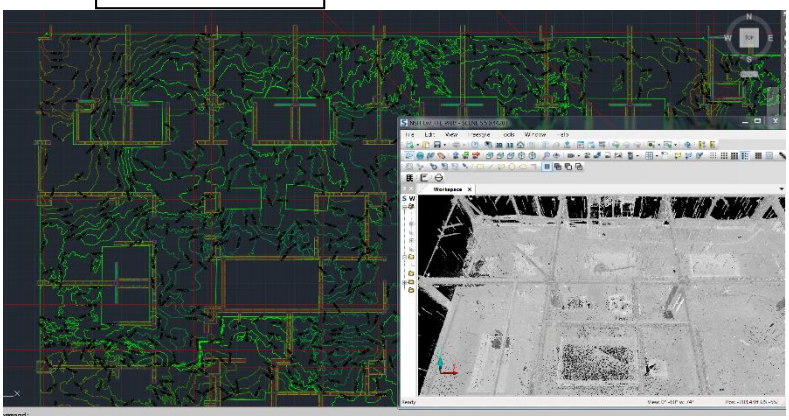
I. Laser Scanning In Construction
   A. Why General Contractors use Laser Scanning
   B. Laser Scanning vs. Conventional Survey Methods *(Then vs. Now)*
   C. Execution (What, How, Why?)
   D. Challenges Faced With Laser Scanning In Construction

II. Laser Scanning Techniques
   A. General Workflows
      1. Field Scanning – What to Look For
         a. Jobsite Conditions
         b. Survey Control
         c. Scheduling & Jobsite Phases
         d. Deck Pour Sequencing
         e. Fireproofing Example
      2. Office Registration & Point Cloud Analysis
         a. Cloud-to Cloud *(Targetless Registration)*
         b. Transformation to Model *(Surveyor-less Registration)*
         c. Tying in Survey Control *(The Divine Privilege)*

III. Laser Scanning Deliverables
   A. Steel Monitoring – Design Camber vs. Field Camber
      1. What is it? – End-Center-End Elevations & Compare to Design
      2. Value? – Ensure Proper Installation & Structural Engineer Approval
   B. Concrete Topography *(As-built)*
      1. What is it? – Highs/Lows & Increments in Elevation
      2. Value? – Fill Material, Concrete Grinding, Setting Door Swings
   C. Concrete Monitoring *(Reshore)*
      1. What is it? – Scan Prior & After Reshore Removal
      2. Value? – Deck Cambering & Settling
         a. Cantilever Example
   D. Wet Concrete Scanning
      1. What is it? – Highs/Lows & Increments in Elevation
      2. Value? – Can Fix While Concrete Is Still Workable
      3. How does this differ from Concrete Topography?

IV. Innovating Laser Scanning Applications
   A. Decking Modeling
   B. Standards
      1. ASTM Revision
      2. USIBD Level of Accuracy
      3. ADA Inspection

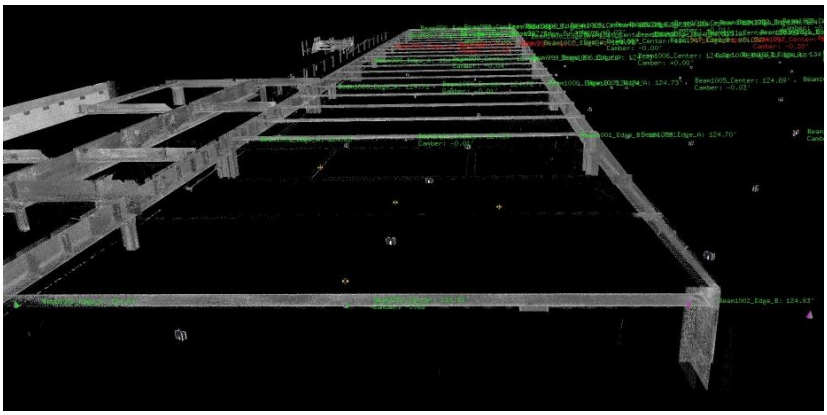
Floor Flatness



Survey Control



Steel Camber



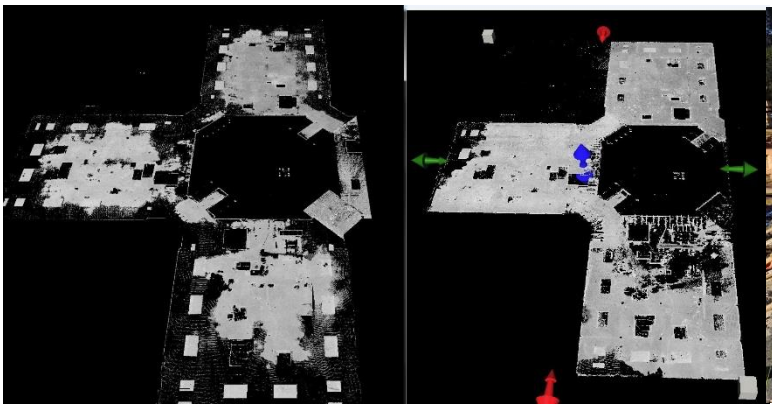
Standards

ASTM INTERNATIONAL

AMERICAN INSTITUTE OF STEEL CONSTRUCTION AISC FOUNDED 1921

aci American Concrete Institute®

Reshore Comparison



Wet Concrete

