Streamlined BIM to Robotic Total Station Layout - Autodesk & Leica

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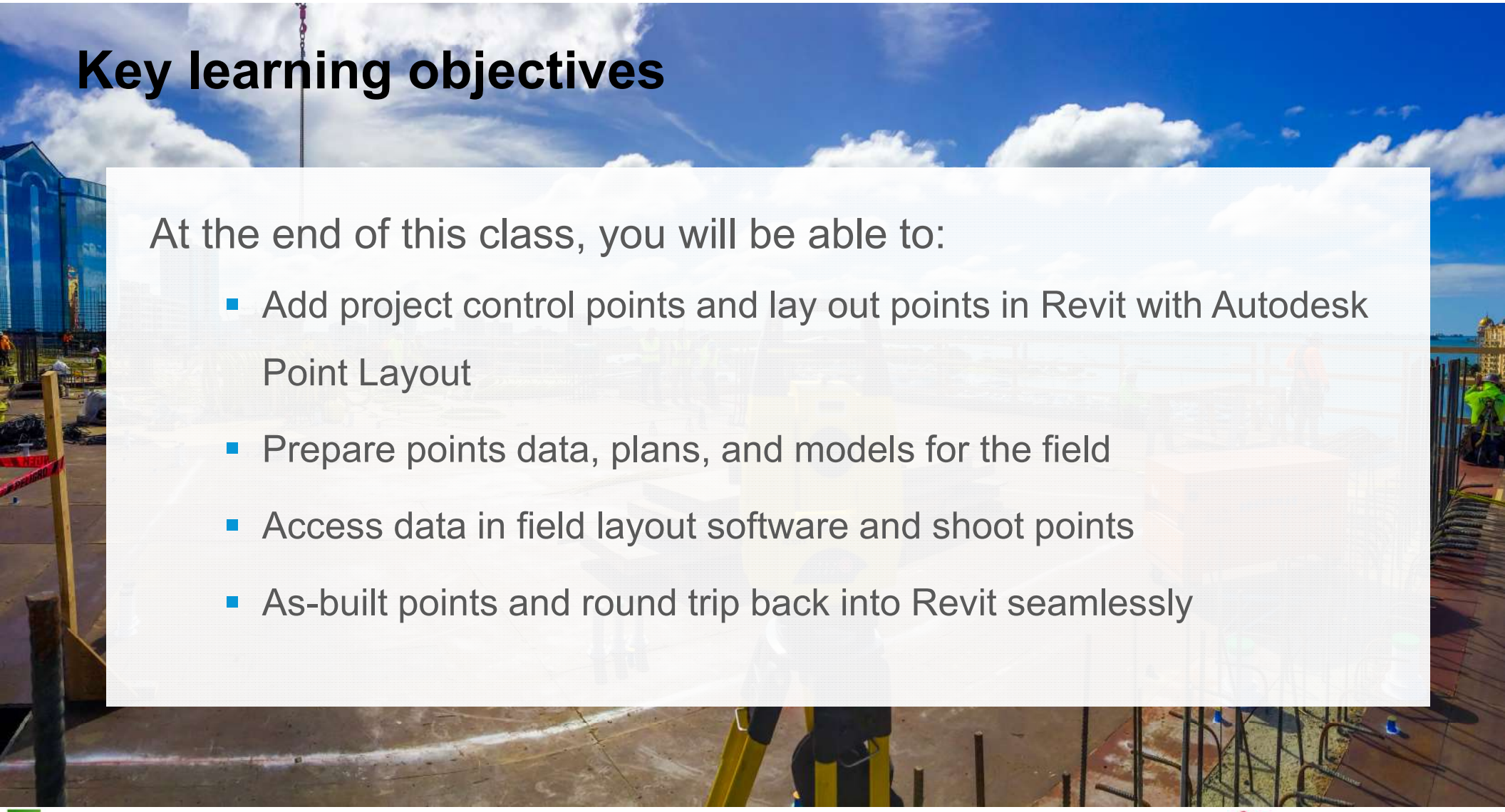
Class Summary

- Learn about construction production layout and BIM driven layout and QA
- Understand the software & subscriptions required and of the new Autodesk - Leica workflow
- Understand the data flow of the new Autodesk - Leica workflow

Key learning objectives



At the end of this class, you will be able to:

- Add project control points and lay out points in Revit with Autodesk Point Layout
- Prepare points data, plans, and models for the field
- Access data in field layout software and shoot points
- As-built points and round trip back into Revit seamlessly

Workflow Overview

BIM-to-Field Layout Workflows

BIM Robotic Construction Layout Workflows

Increase Accuracy & Speed up to 4X Over Manual Layout

Production Layout Workflow

+

BIM QA/QC Workflow

Which Solution is Right for You?

Selecting Both = Winning Combination

Production Layout Solution

- Complete Interoperability
- Flexible Data Transfer
- Full-featured Field Software
- Ruggedized Windows Tablet
- Long range Bluetooth (600’ or 1200’ radius)

+

BIM Layout / QA

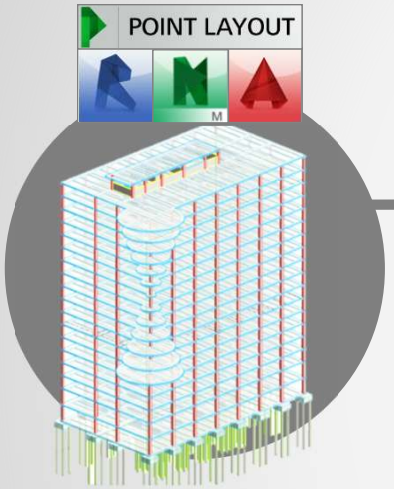
- Layout Directly from Model
- As-Built/ QA Directly to Model
- Leverage BIM 360 Glue Investment
- Wi-Fi connectivity (600’ radius)

Full-featured iCON robot 50

Software, Subscriptions & Hardware Required

Software, Subscription & Hardware Requirements

iCON Build + iCON Robot



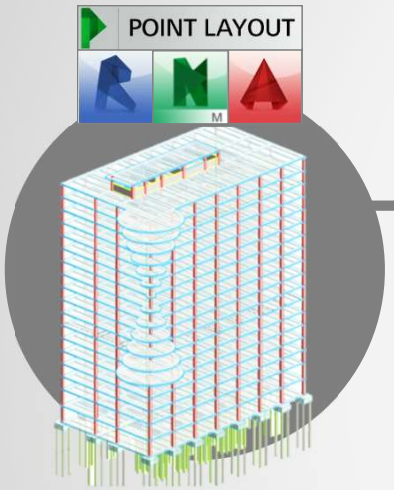
*Points from any source in .txt or .csv;
*Geometry in 2D DXF or 3D Polymesh DXF
Leica Building Link Autodesk Revit plug-in for point creation in Revit – optional (free)
*MicroSurvey Point Prep (standalone 2.5D point creator) - optional

*Leica Tablet +
iCON Build Software for controlling robot

*iCON 50 or 60 robotic total station with LR Bluetooth handle
Accessories such as prism, pole and tripod required

Software, Subscription & Hardware Requirements

BIM 360 Glue / Layout + iCON Robot



*Autodesk Revit, Navisworks or AutoCAD authoring tools required
*Autodesk Point Layout (APL) plug-in license required for adding points
*Autodesk BIM360 Glue plug-in required (free) for pushing data to BIM 360 Glue

*BIM360 Glue paid subscription required
*BIM 360 Layout iOS app required (free)
*iPad Air Required – Purchased separately from any vendor + RAM mount

*iCON 50 or 60 robotic total station with Wi-Fi handle required for BIM360 Layout & iPad connectivity
Accessories such as prism, pole and tripod required

Detailed Workflow

New Leica-Autodesk Workflow

New Leica-Autodesk Workflow

1 Add Points with Autodesk Point Layout

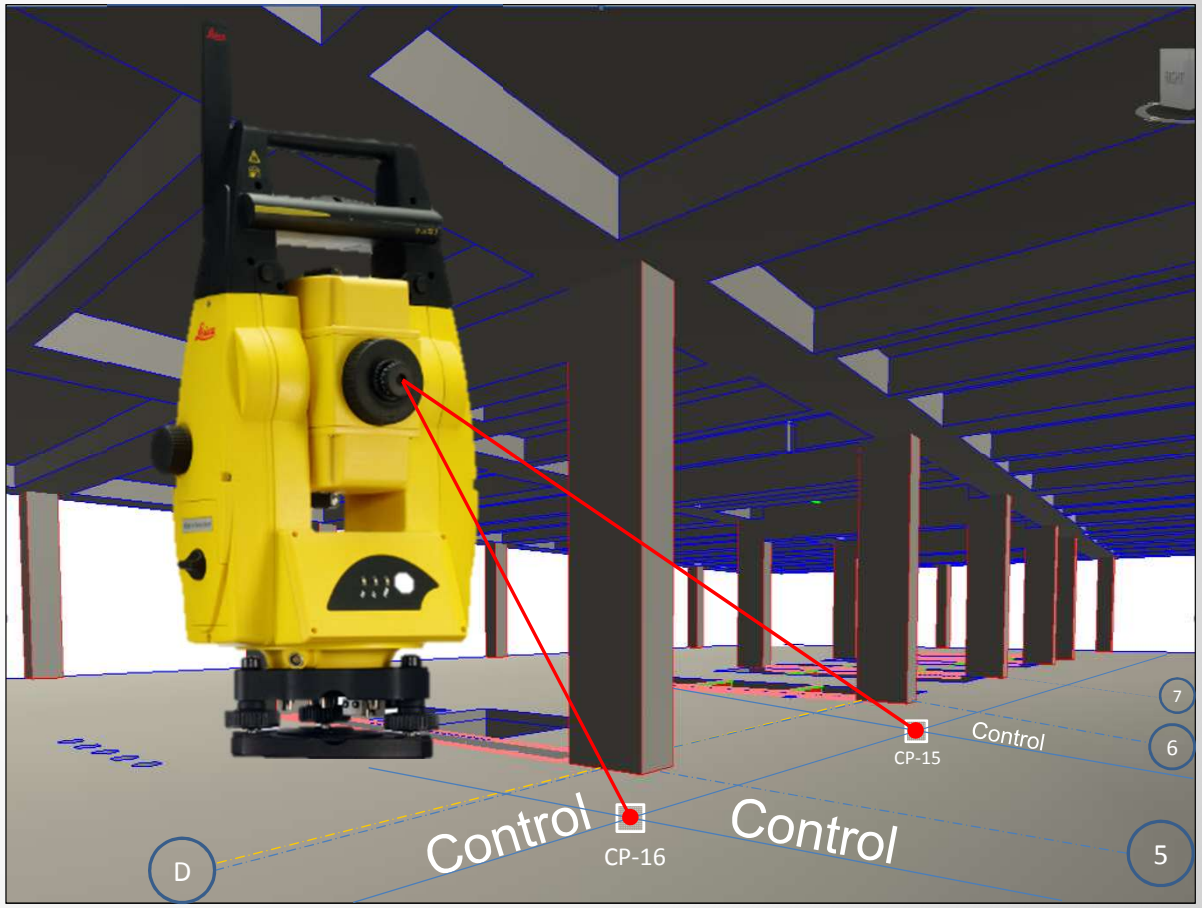
Control Points:

- Points that you add to your model that also exist in the field
- They “marry” the virtual (model) and reality (the field)
- Used for orientation of total station in the field
- Typically set by surveyors – “survey control”
- Often 5’ offsets from column grid

1 Add Points with Autodesk Point Layout

Control Points

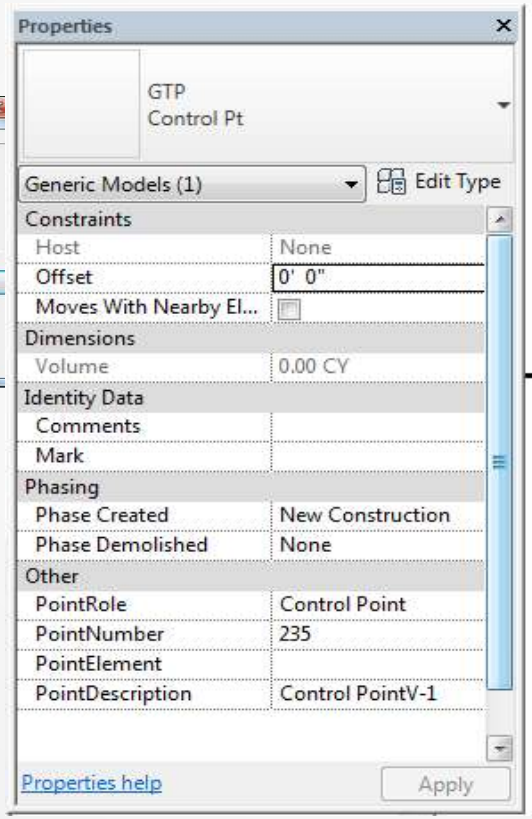
- Add 2 or more in Model
- Can use relative coordinates in Revit or set to field coordinates
- Export to Field Controller
- Shoot 2 on site
- Done!

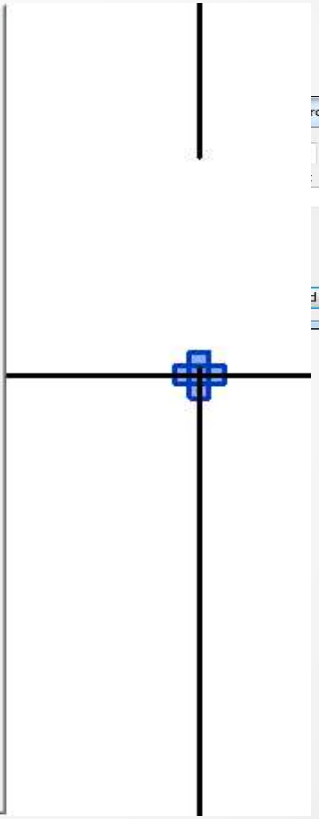


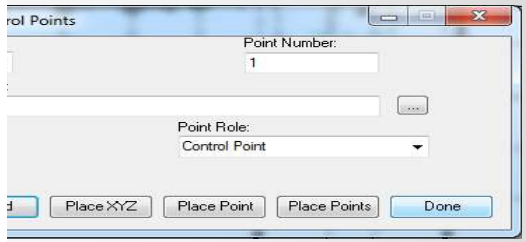
1 Add Points with Autodesk Point Layout

Create control points on a column line grid

Select Grid, then fence the grid on the screen







Select Done

1 Add Points with Autodesk Point Layout

Coordinate Systems - Tools

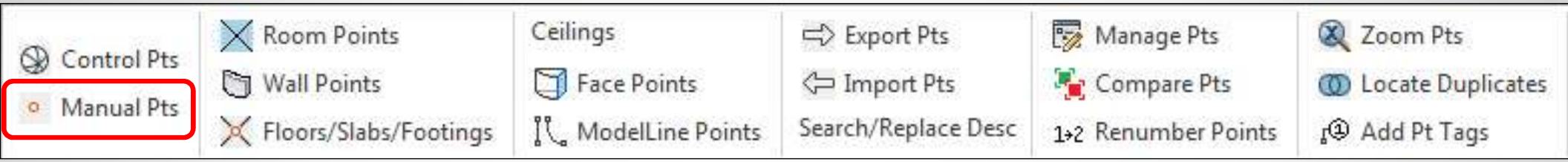
- You can choose to use the relative coordinates in Revit and take them to the field
  - Known points in the field must be digitally placed in Revit in the exact location
  - Shoot points in field during total station setup process
- Or you can set a new “alternate coordinate system” in Revit to bring field coordinates into Revit
  - Use the “Create Coordinates” tool to set the new X,Y,Z of 2 known points in the model that are in the field

1 Add Points with Autodesk Point Layout

APL POINT TYPES:

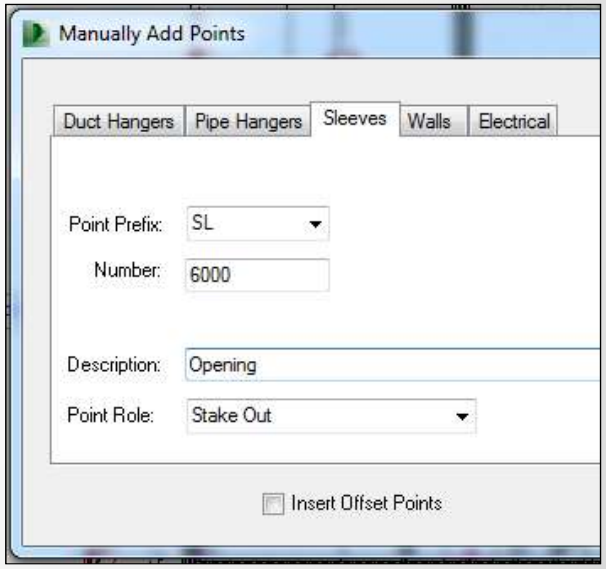
- Manual Points on Entities (virtually anything)
- Manual Points on Families
- Floors / Slabs / Footing Object Points
- Wall Object Points
- Ceiling Object Points
- MEP Pipe Object Tools
- Model Line Points
- Grid on Surface / Face Points

1 Add Points with Autodesk Point Layout



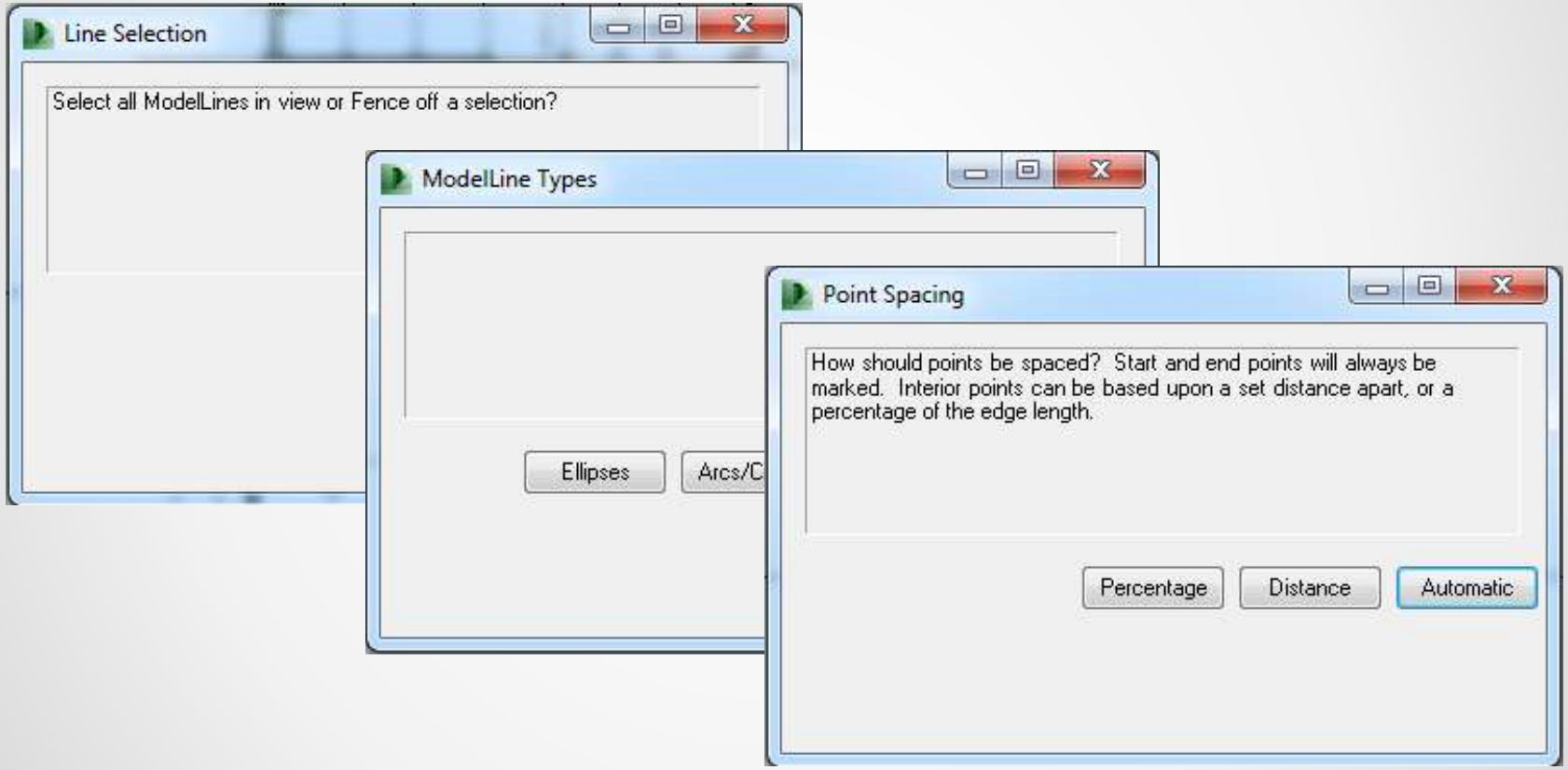
Manual Points:

- Points that you add to any Revit “family” or element
- Can add a prefix to help identify the point type
- Can add Description (travels to field)
- Can add point “role” (not important – does not travel to field)



1 Add Points with Autodesk Point Layout

Points on Model Lines

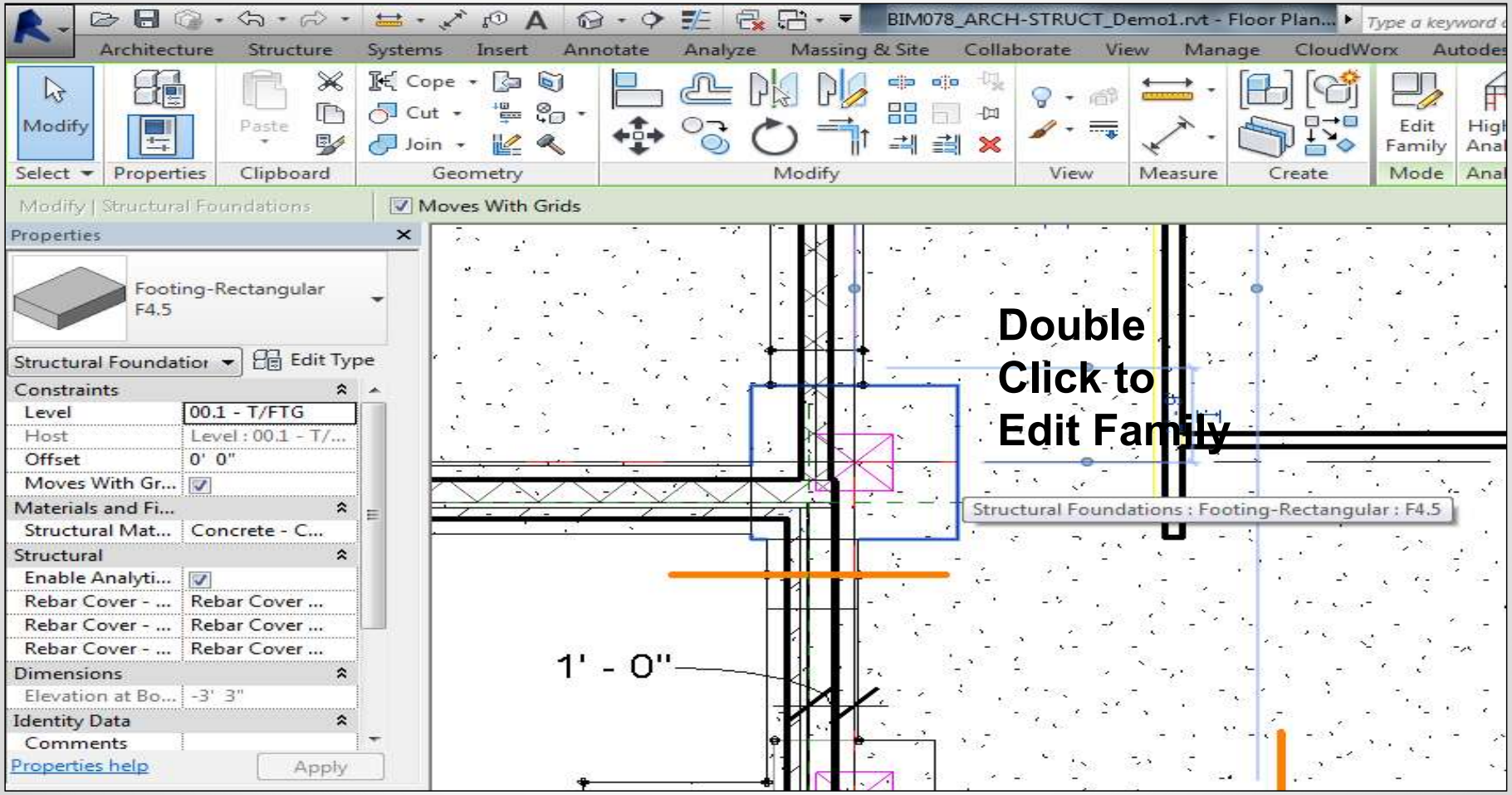


1 Add Points with Autodesk Point Layout

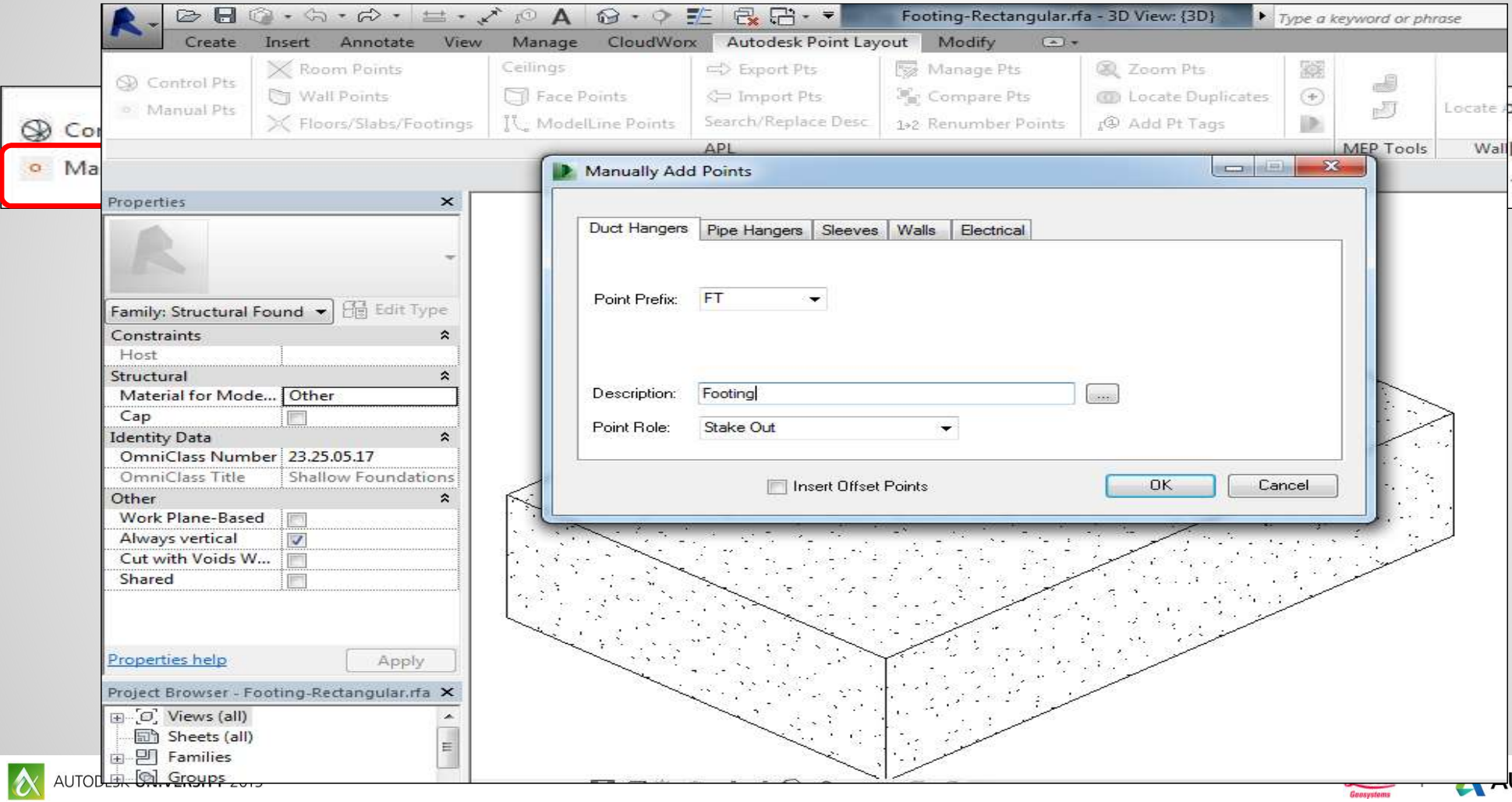
About Adding Points to Families…

…Special powers…like magic, but not really

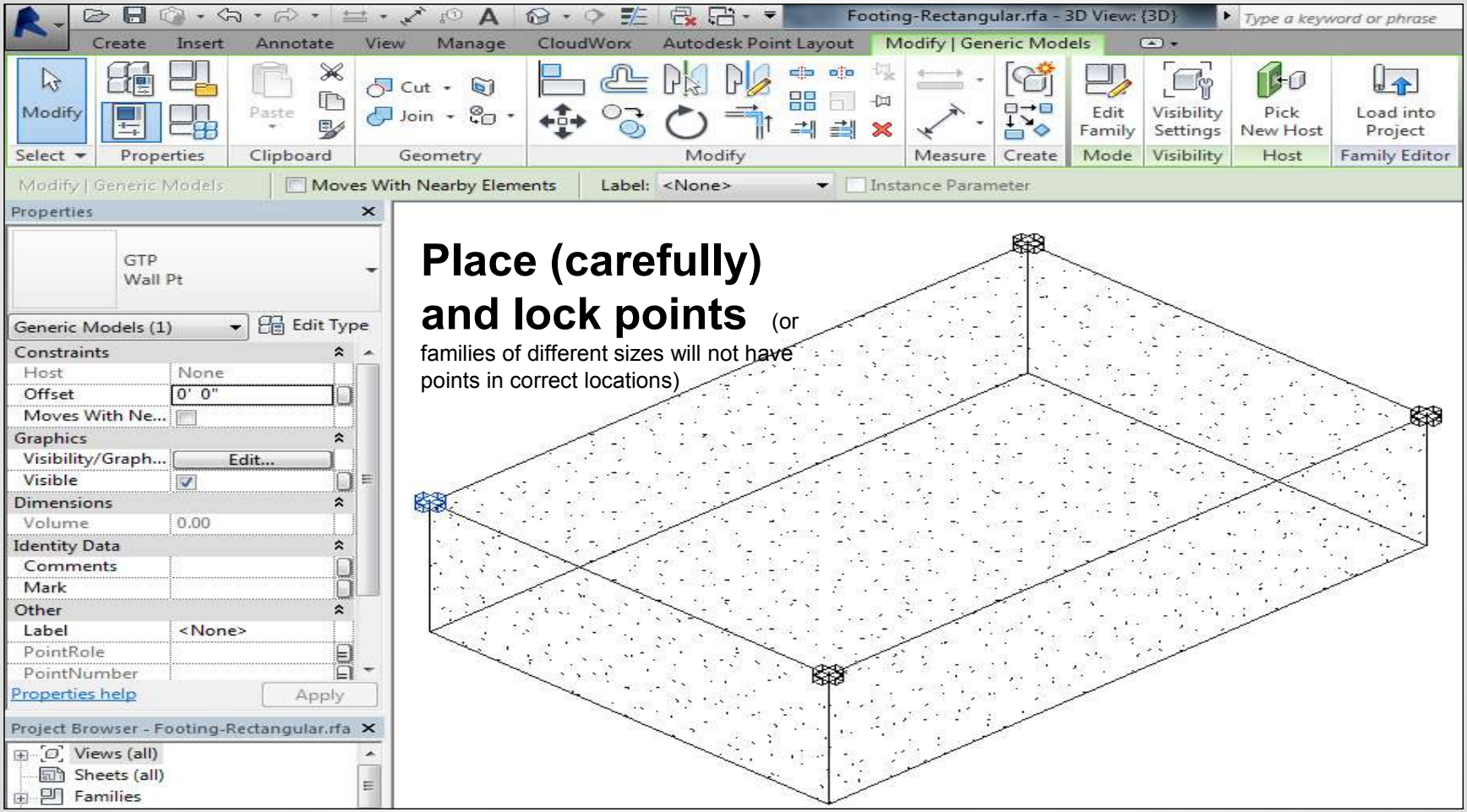
1 Add Points with Autodesk Point Layout - Families



1 Add Points with Autodesk Point Layout - Families



1 Add Points with Autodesk Point Layout - Families



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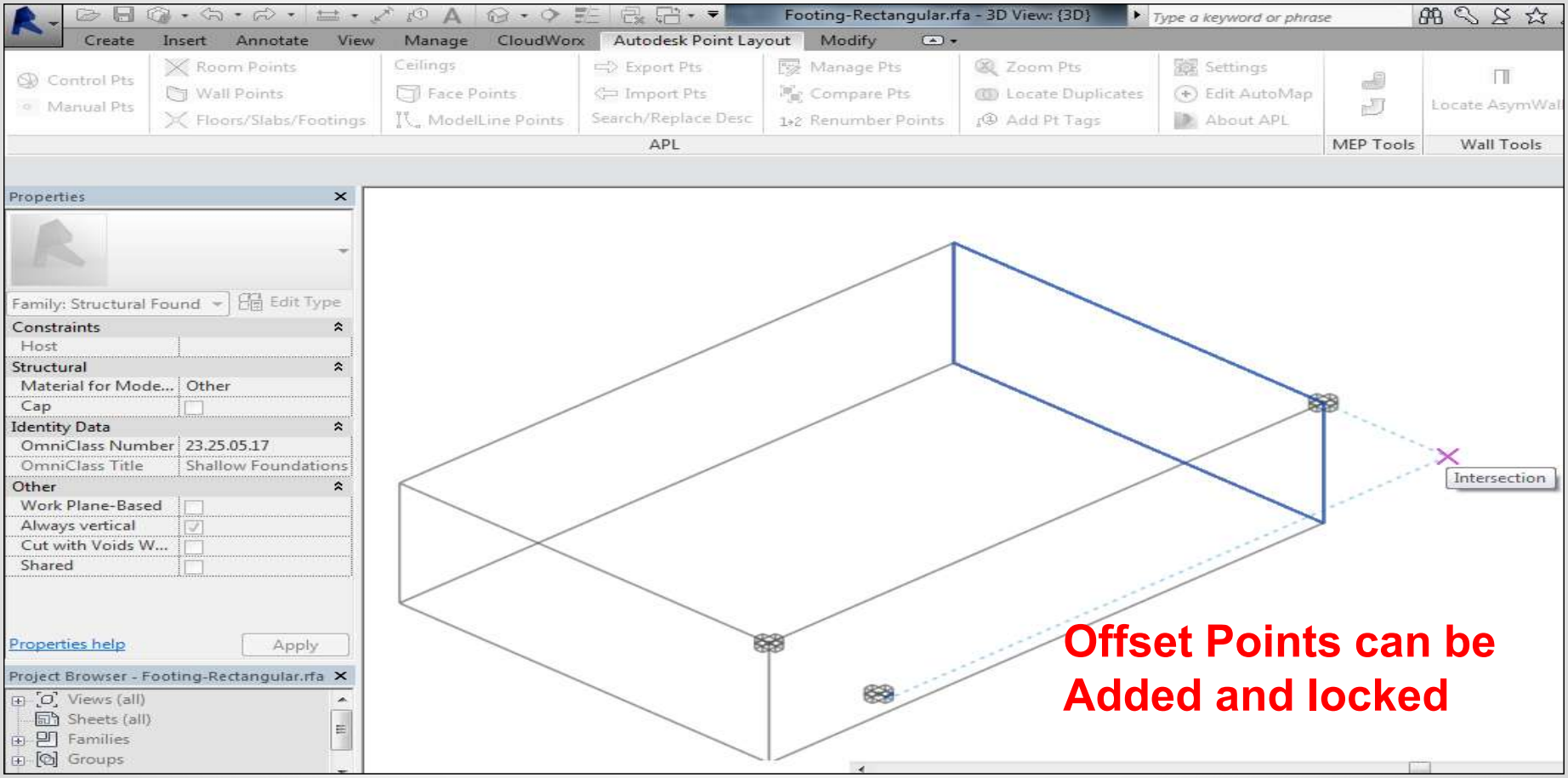
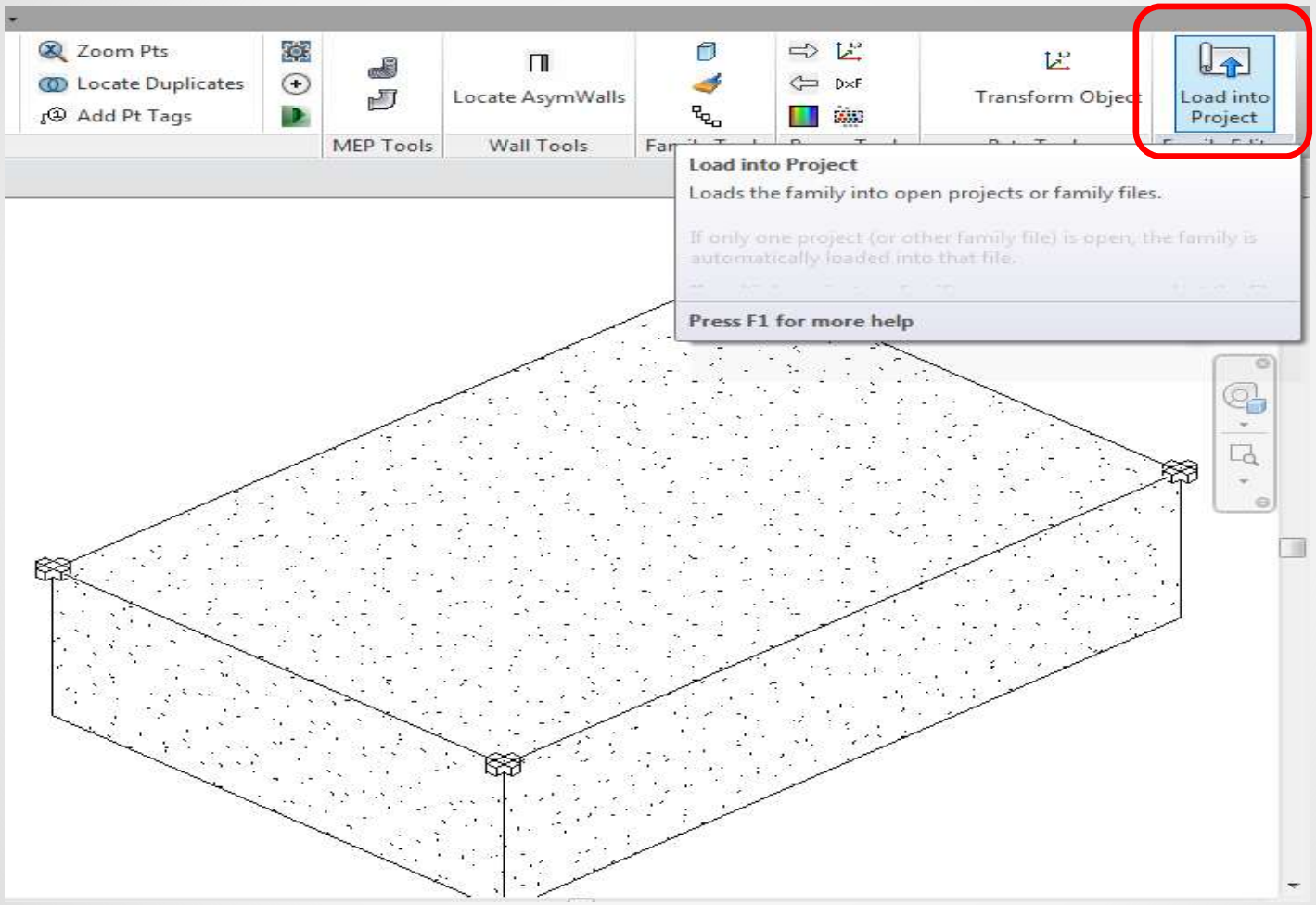


1 Add Points with Autodesk Point Layout - Families



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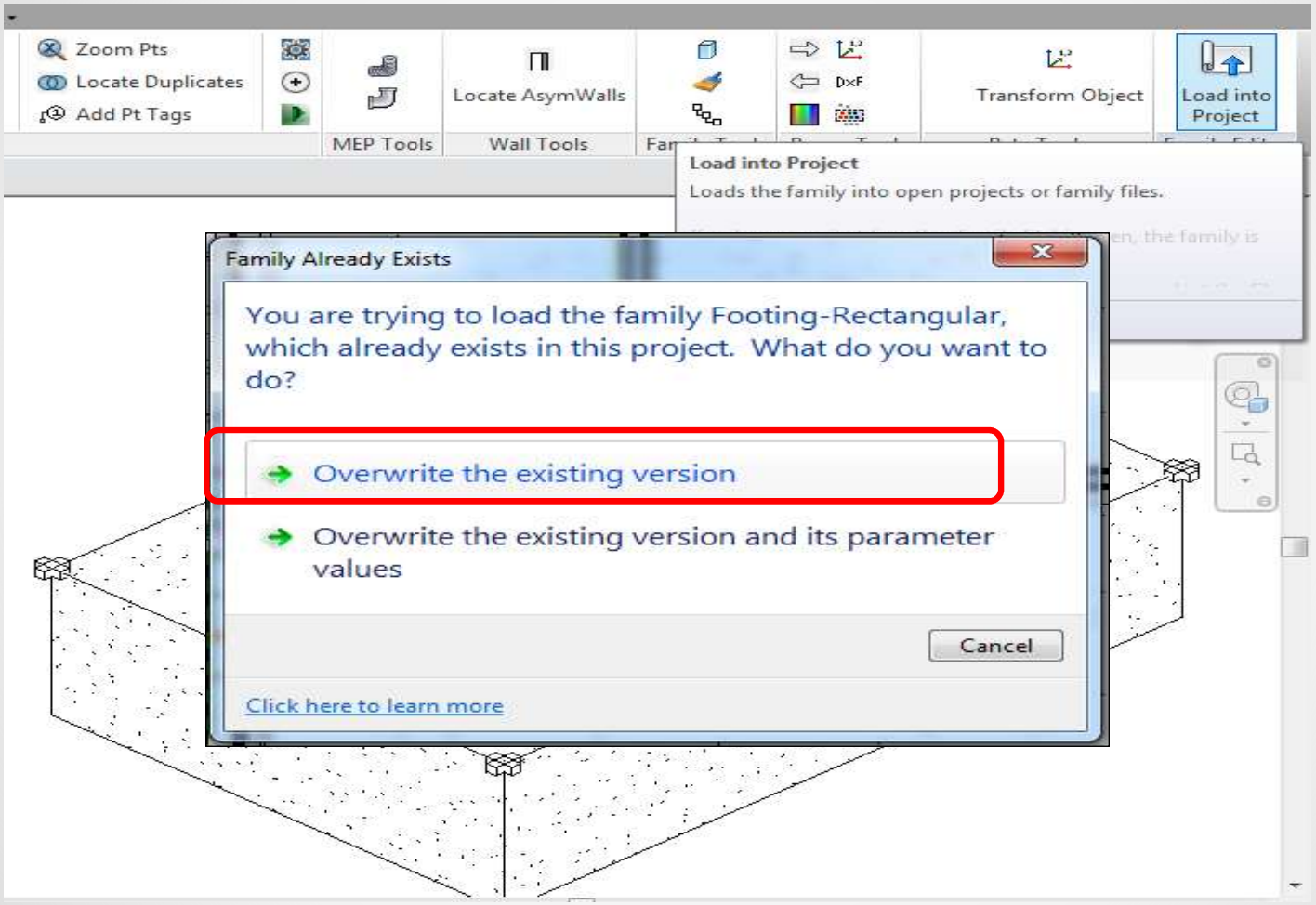
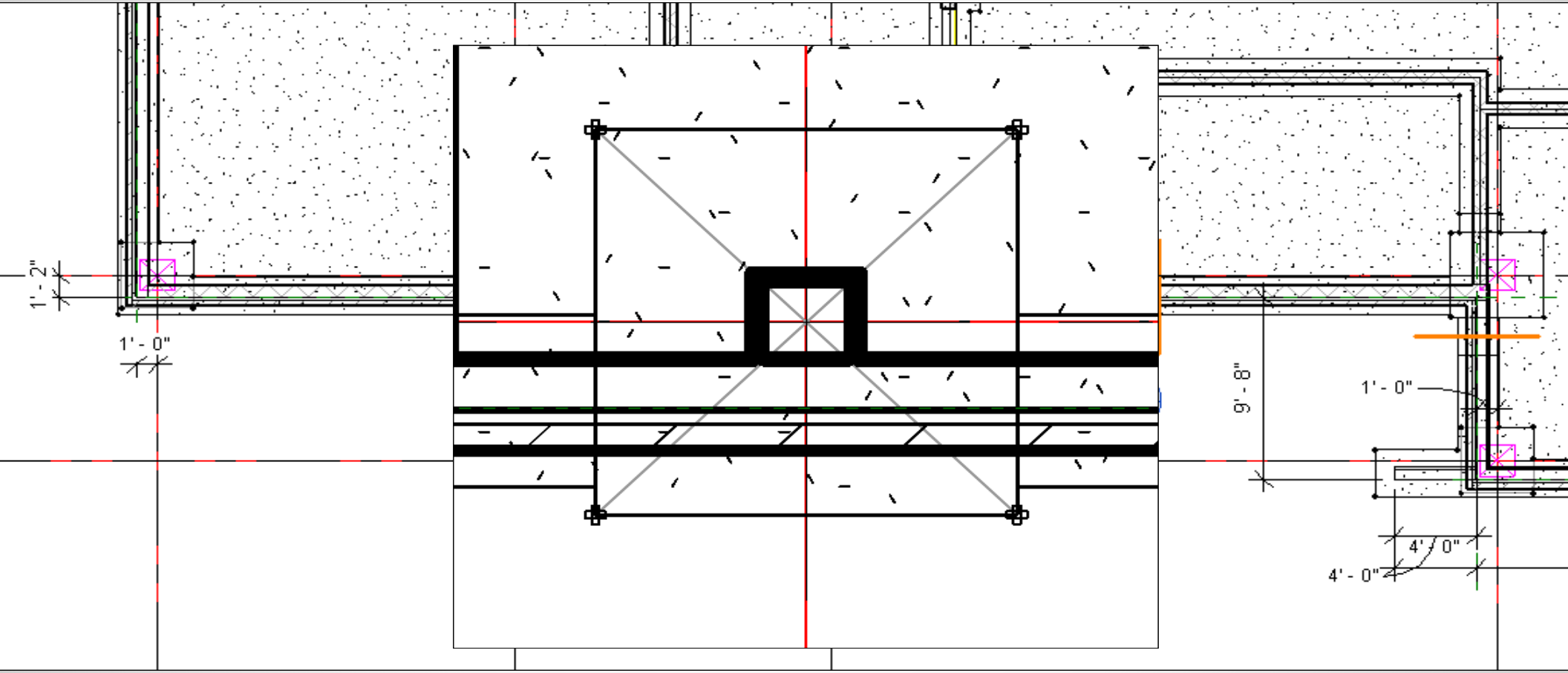


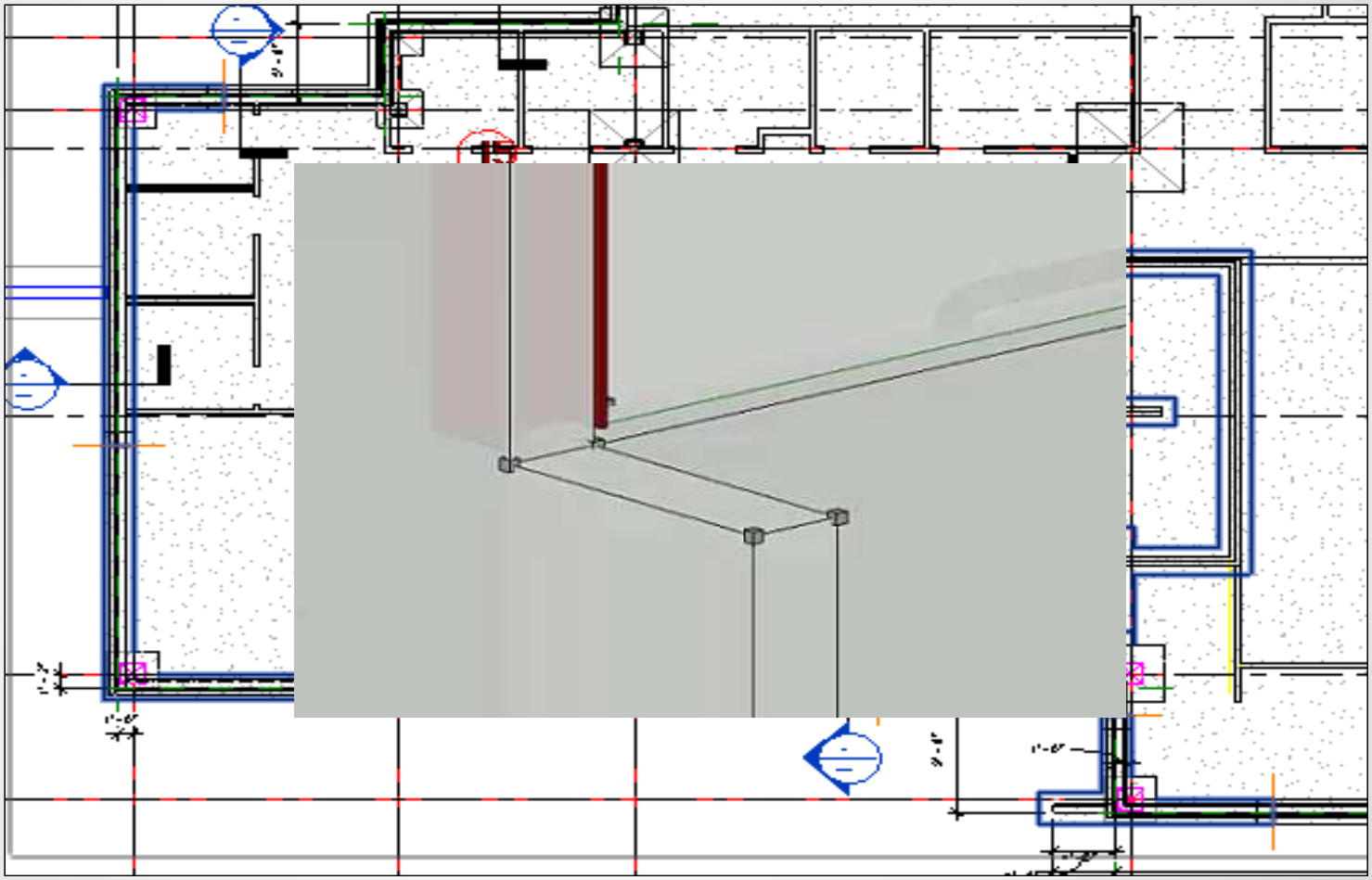
1 Add Points with Autodesk Point Layout - Families



1 Add Points with Autodesk Point Layout - Families

1 Add Points with Autodesk Point Layout - Slabs

Fence Area to Add Points



1 Add Points with Autodesk Point Layout - Walls

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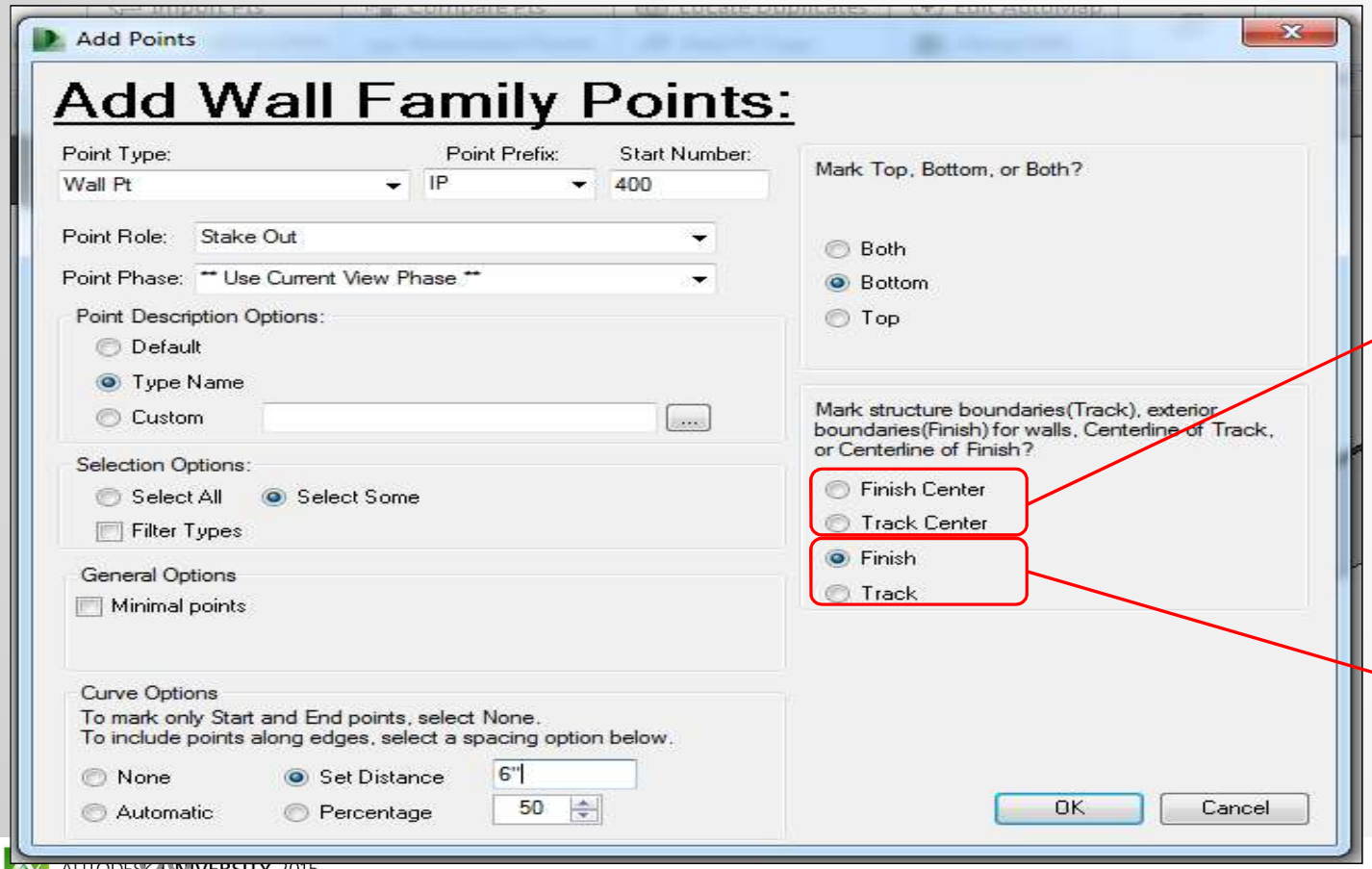
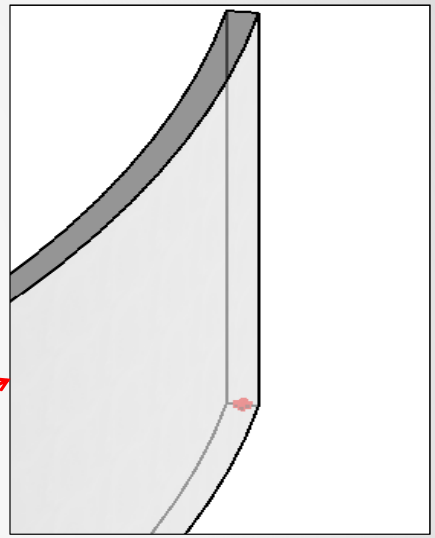
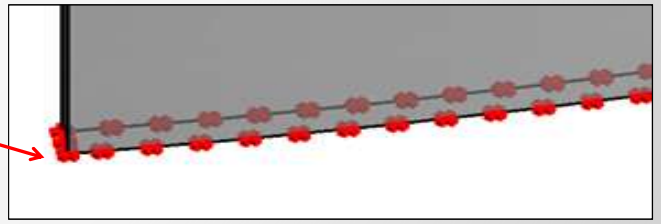
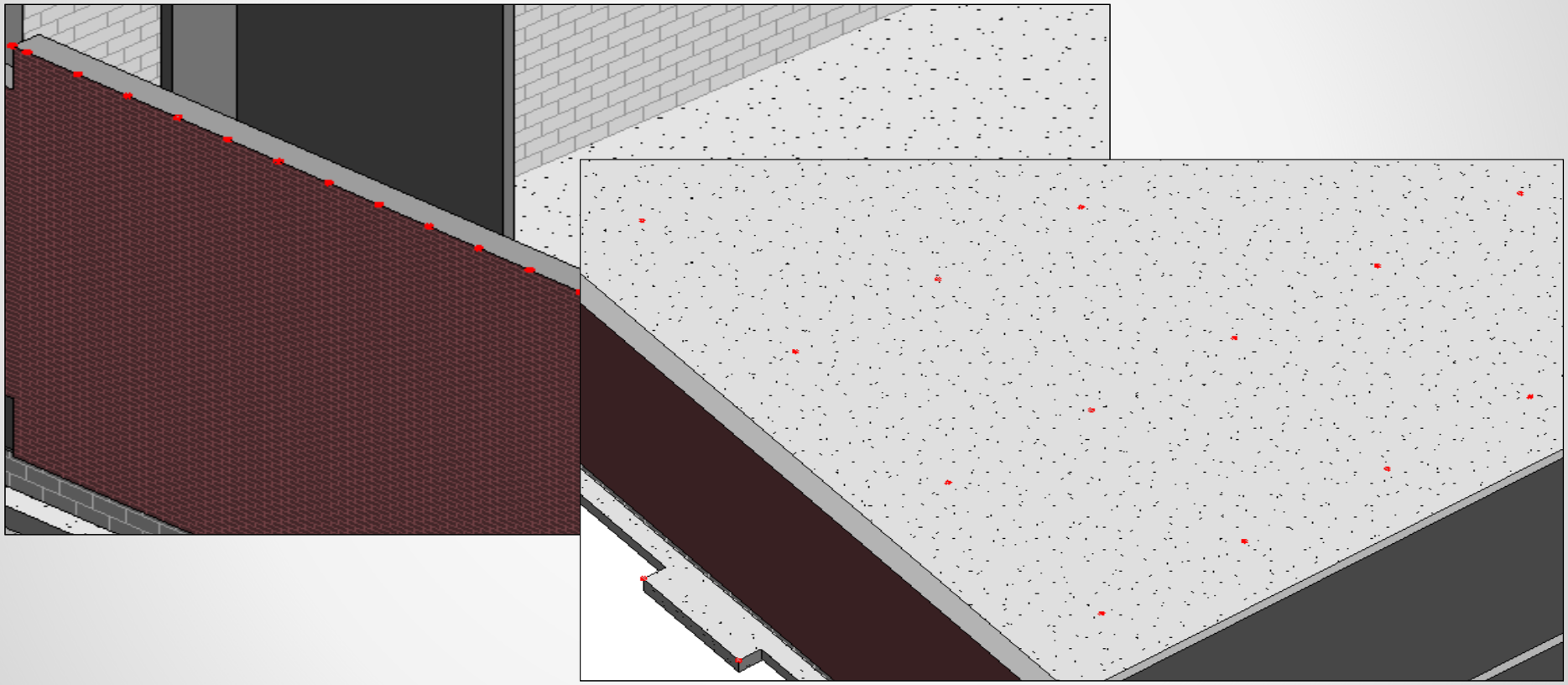




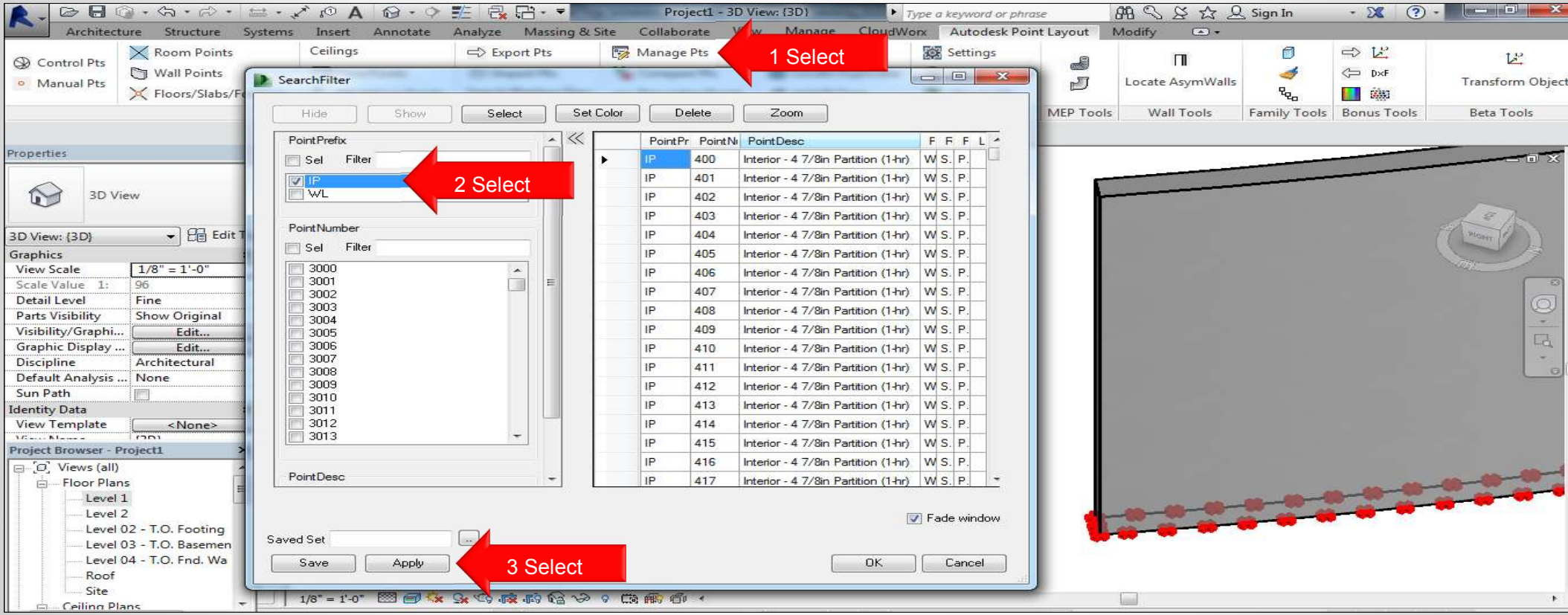


1 Add Points with Autodesk Point Layout - Surfaces

Points on Surfaces and Edges

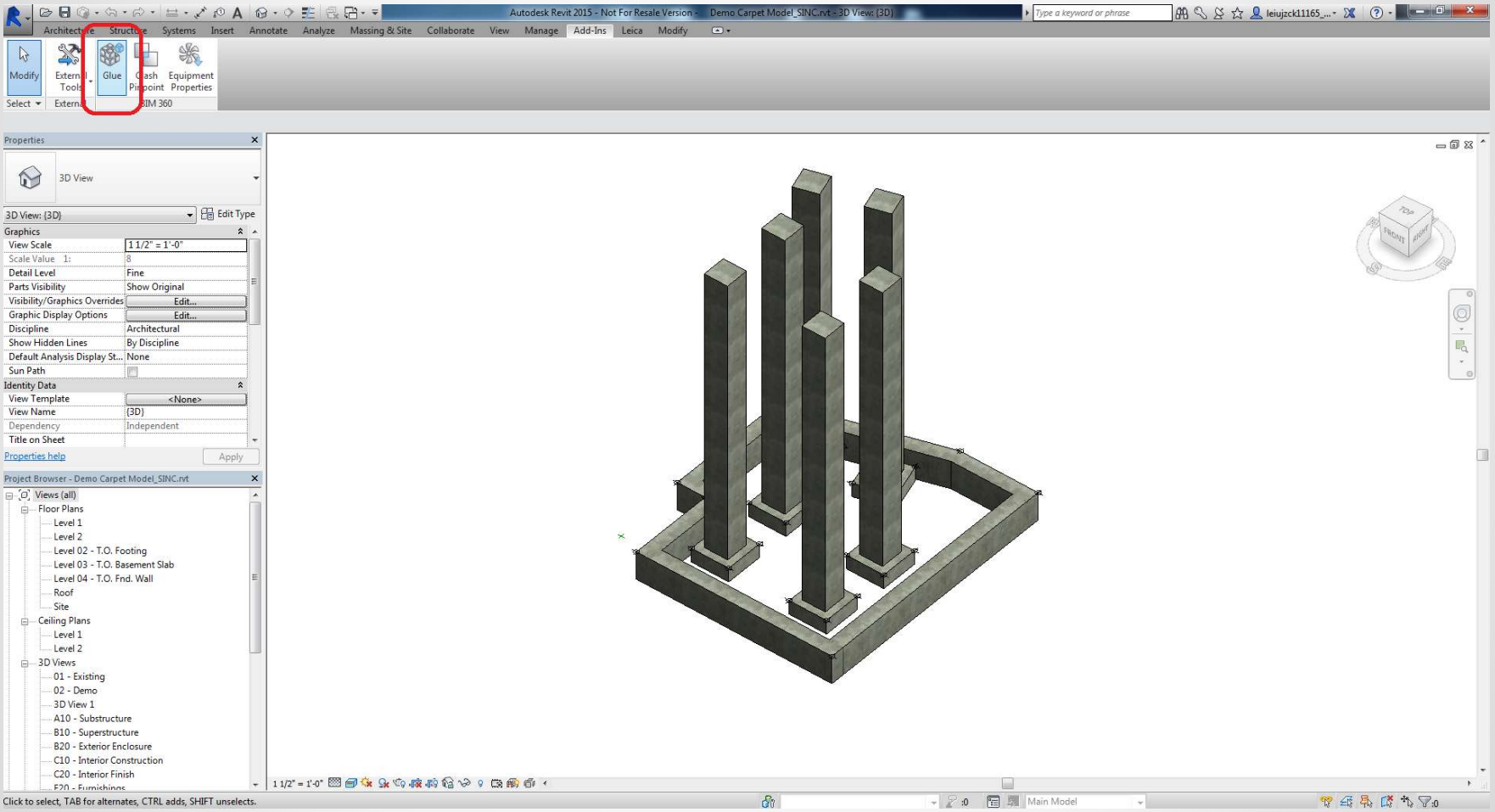


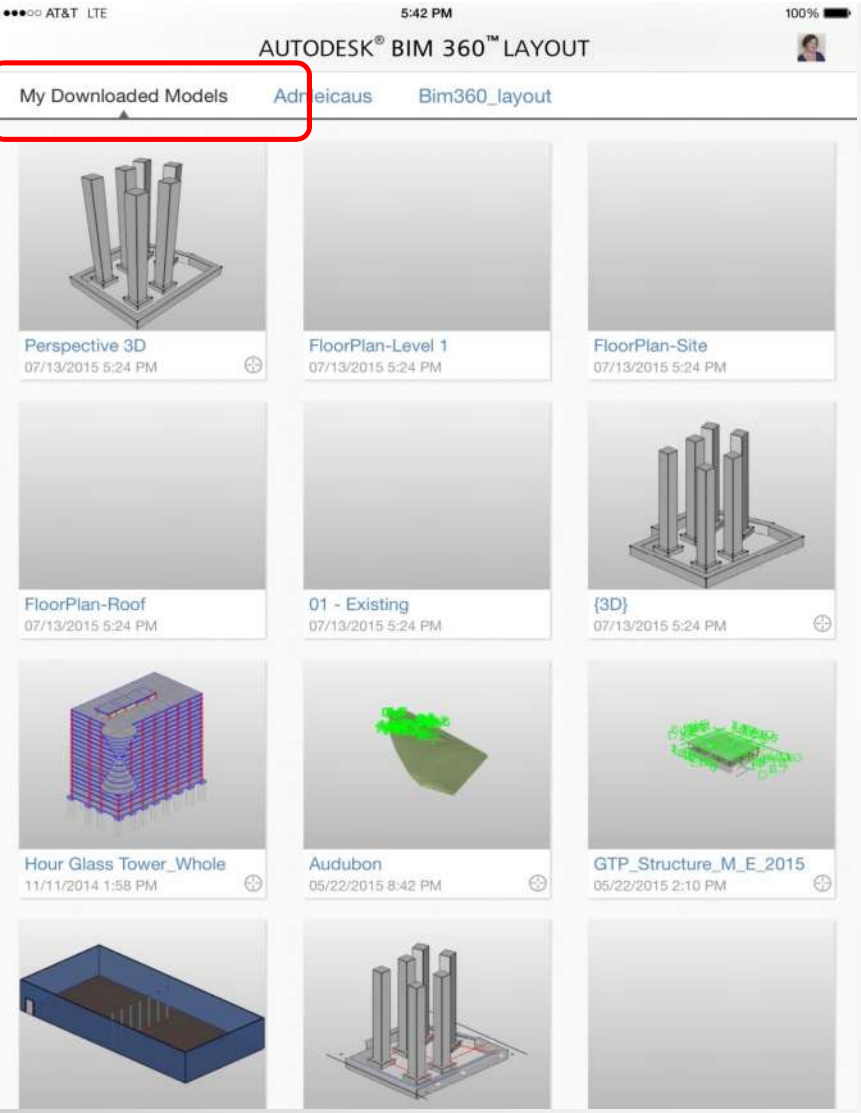
1 Add Points with Autodesk Point Layout - Walls



New Leica-Autodesk Workflow

2 Prepare & Sync Data





2 Prepare & Sync Data

Sync your BIM 360 Layout app by pulling down on the top of the screen with your finger

Download the model so it is available off line
Double tap on the model to open

New Leica-Autodesk Workflow

LIVE DEMO

3 Layout

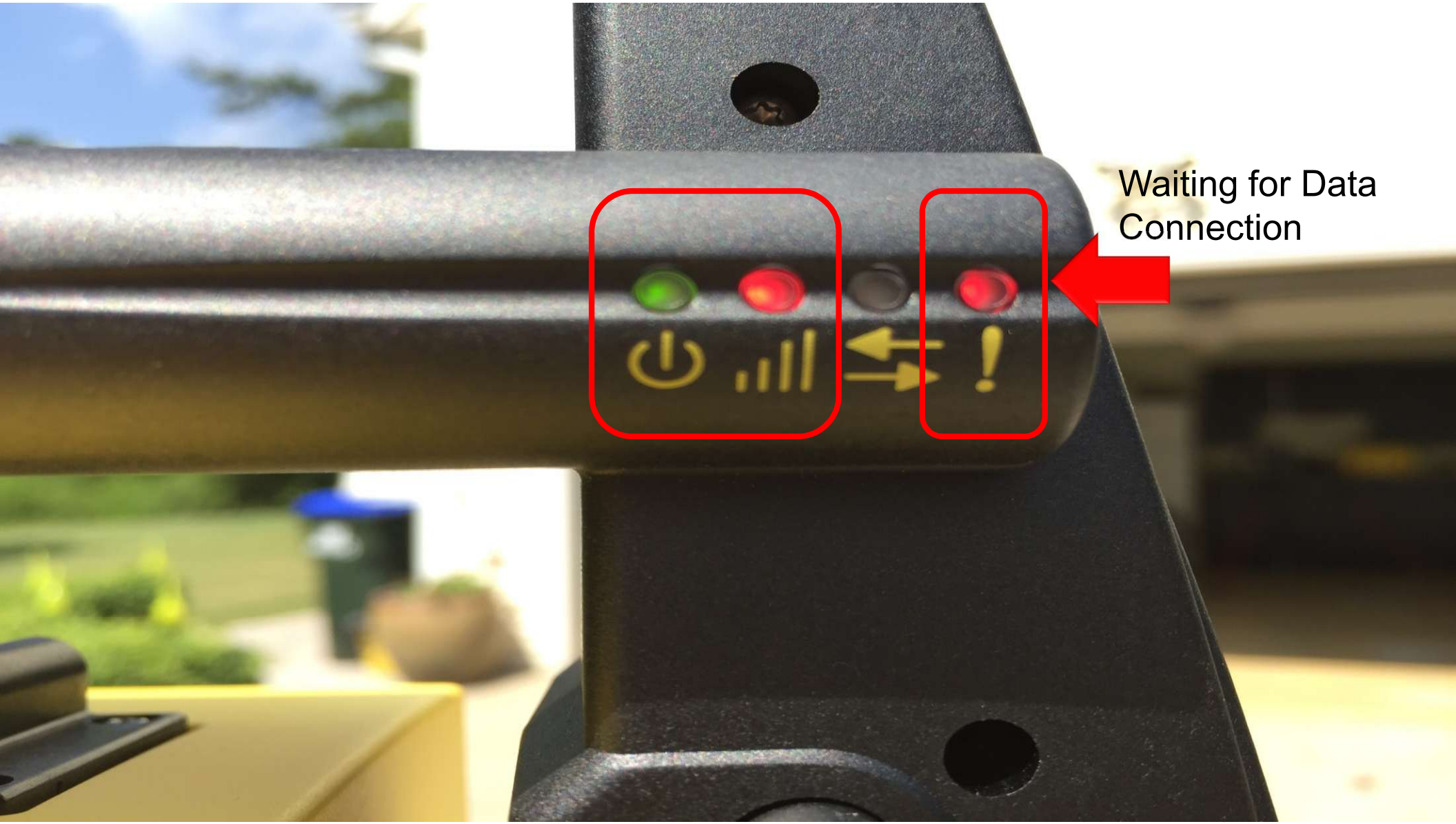
STEP 1: Prepare Robot

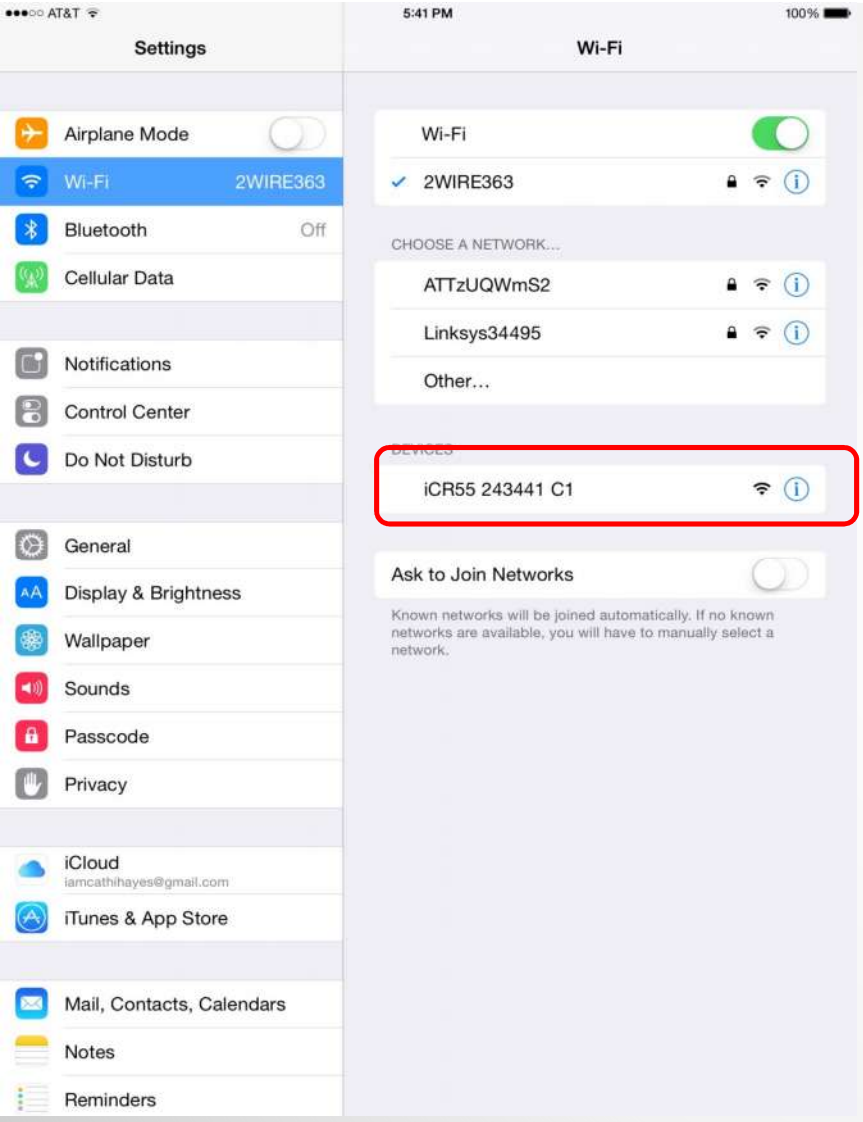
Set up Leica Robot 50 on tripod
Insert fully charged batteries
Attach Wi-Fi “handle” (CCD1) on top of robot

3 Layout

Press on button for 2 seconds to power on instrument.
If COM light is not red, hold the power button down until the COM button turns red (will cycle through all 3 communications modes)


Red
Green
TRK
COM
PWR


Waiting for Data
Connection



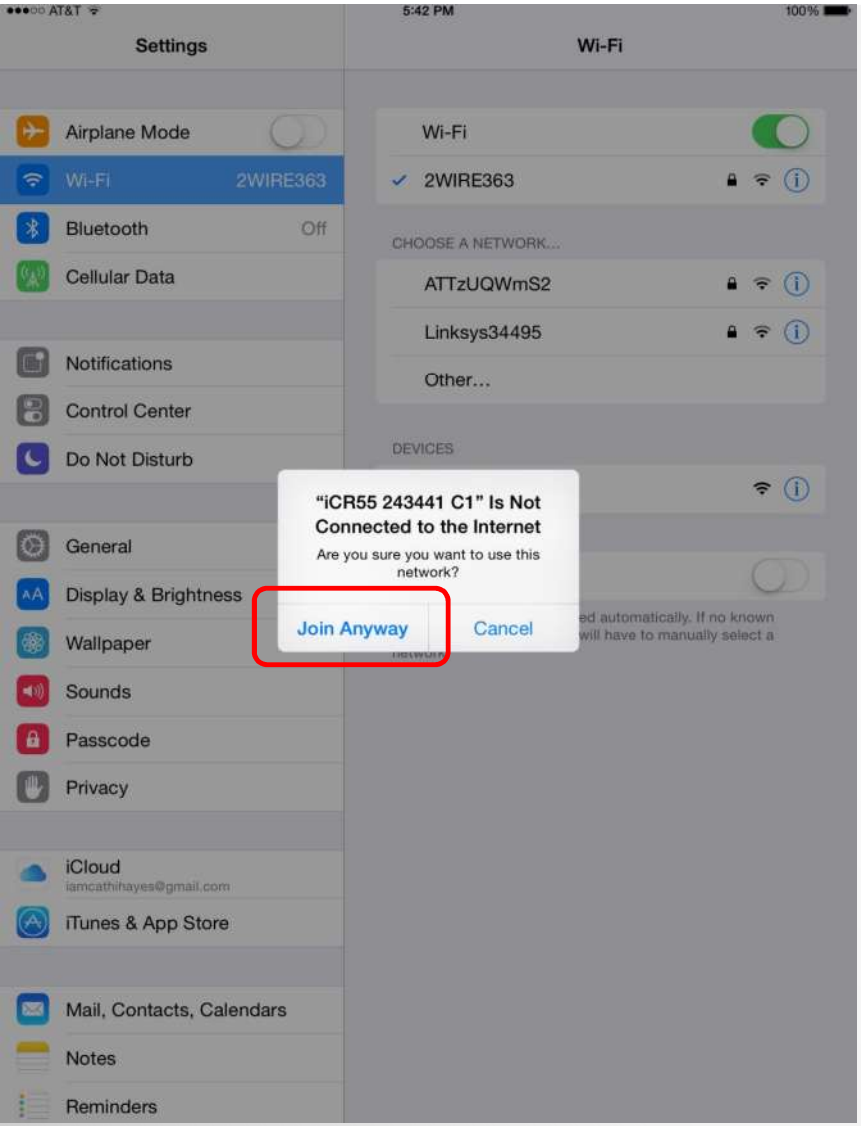
3 Layout

STEP 2: Prepare iPad Connection

Go into your iPad Settings > Wi-Fi

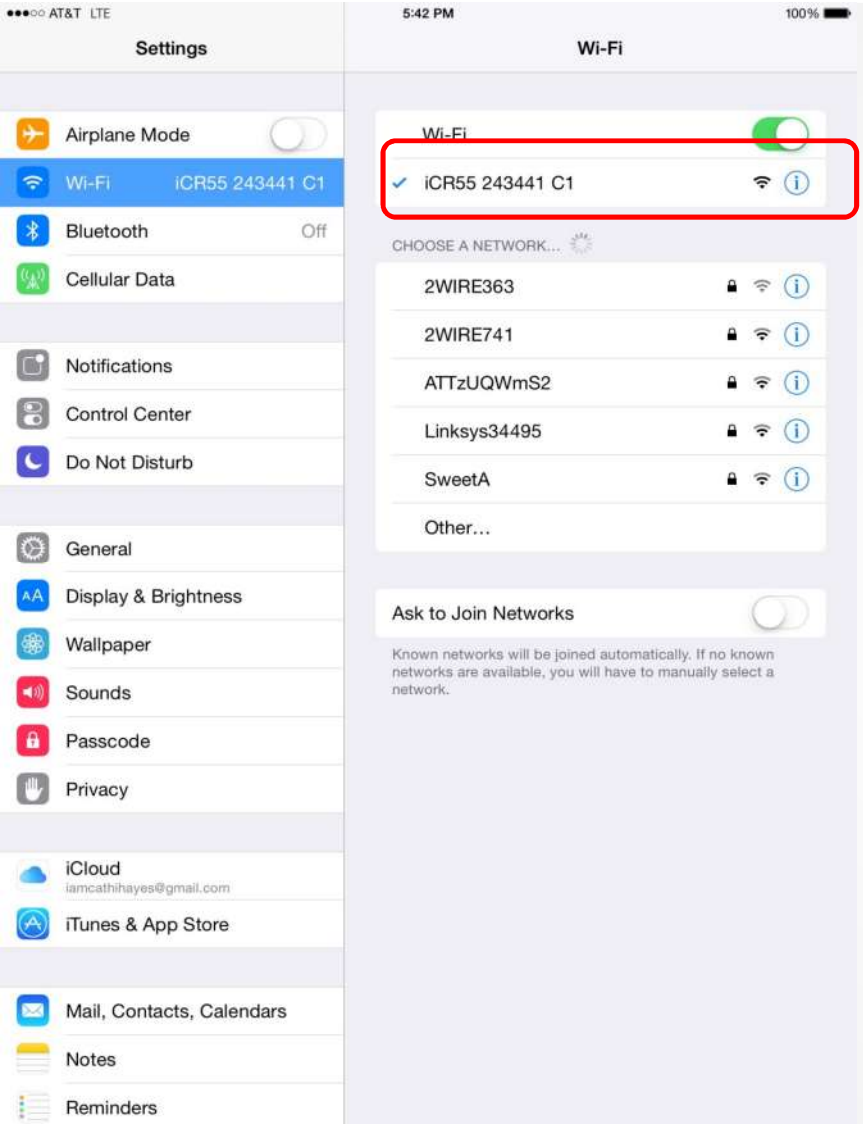
Select the iCR robot under “DEVICES”

*This step must be completed BEFORE opening the BIM 360 Layout app



3 Layout

Select “Join Anyway”

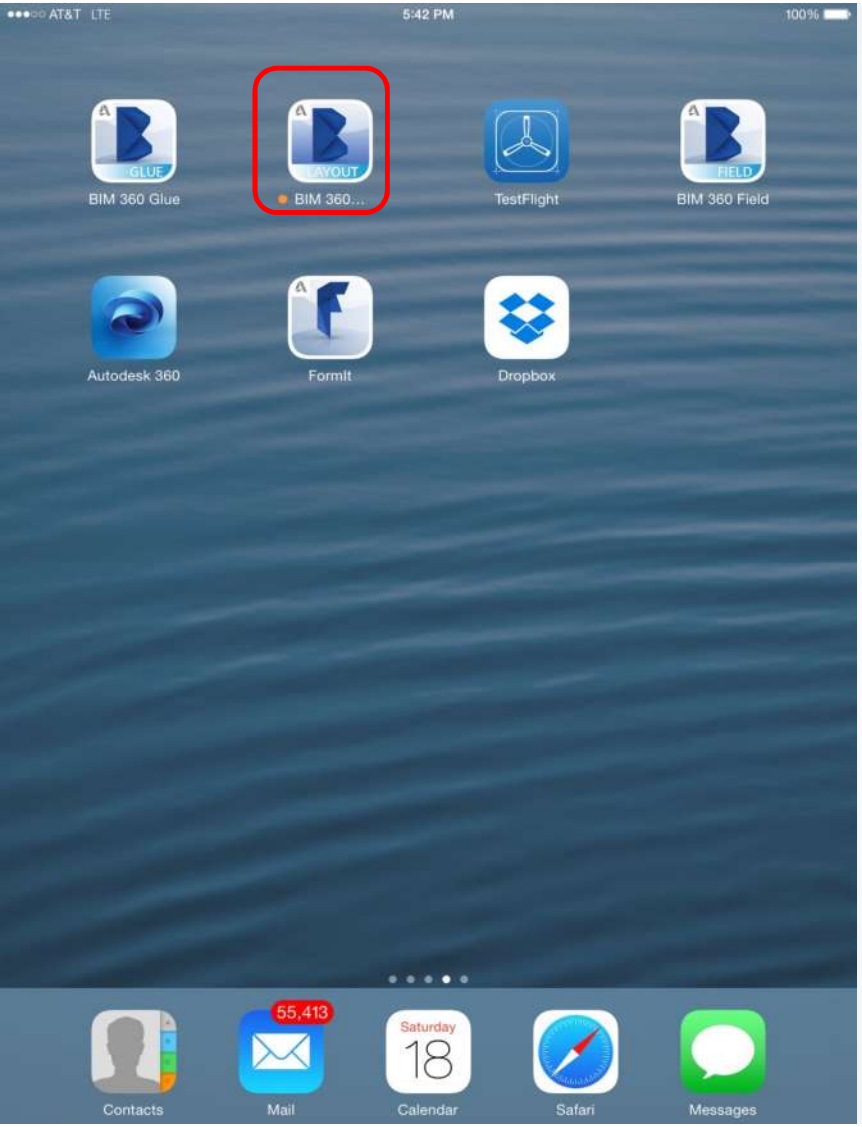


3 Layout

Communications between the iPad device and iCON robot have now been established

3 Layout


Connected
Handle Lights:
1. Green: the handle has power
2. Red: Wi-Fi signal strength
3. No light: No active communication
4. No Light - connected



3 Layout

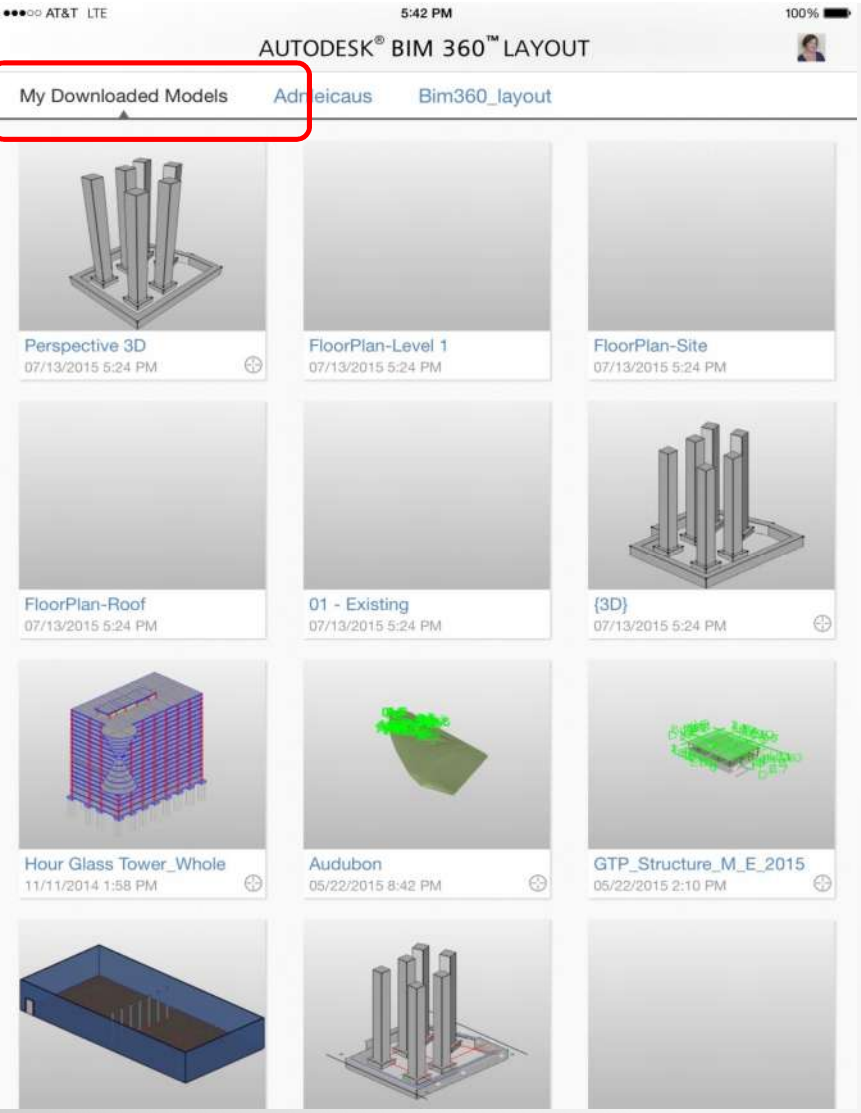
STEP 3: Prepare BIM 360 Layout

Open BIM 360 Layout

3 Layout

*Connection between iCON robot and iPad must be made before opening BIM 360 Layout app

*Project must be set up in a paid BIM 360 Glue account for access in BIM 360 Layout

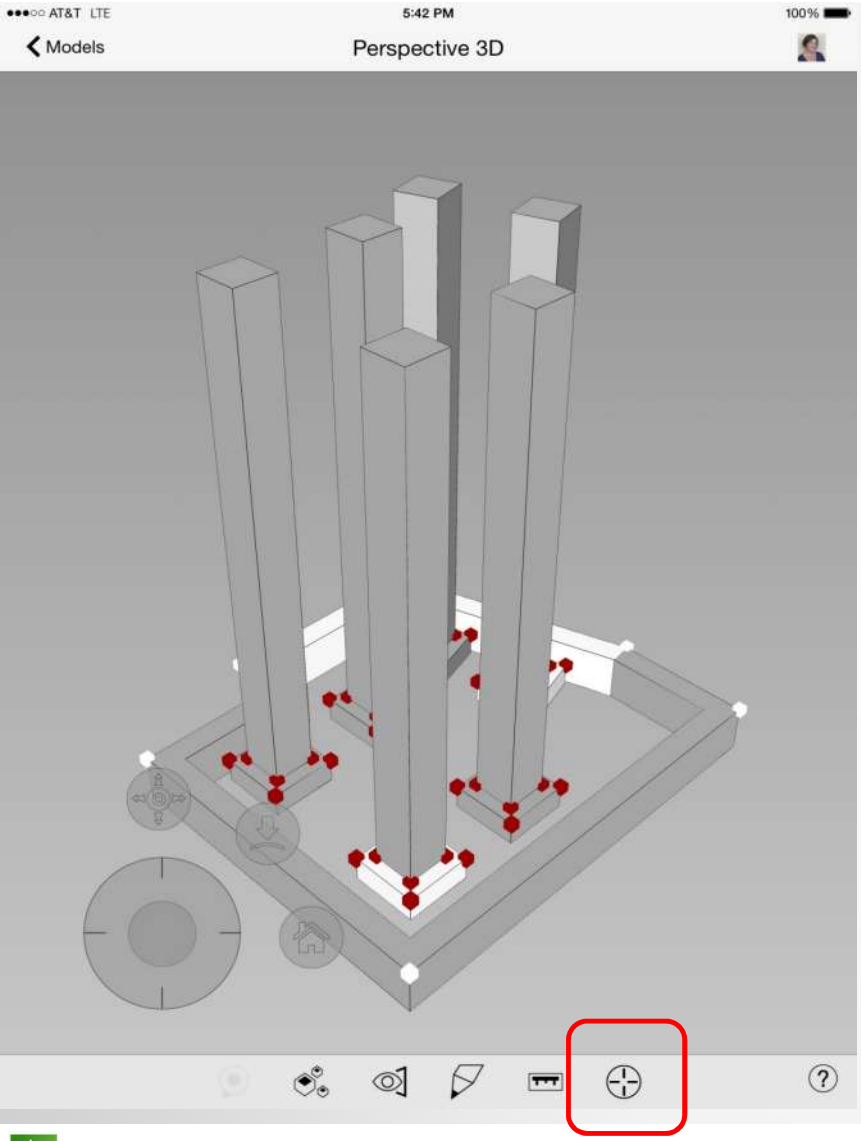


3 Layout

Sync your BIM 360 Layout app by pulling down on the top of the screen with your finger

Download the model so it is available off line

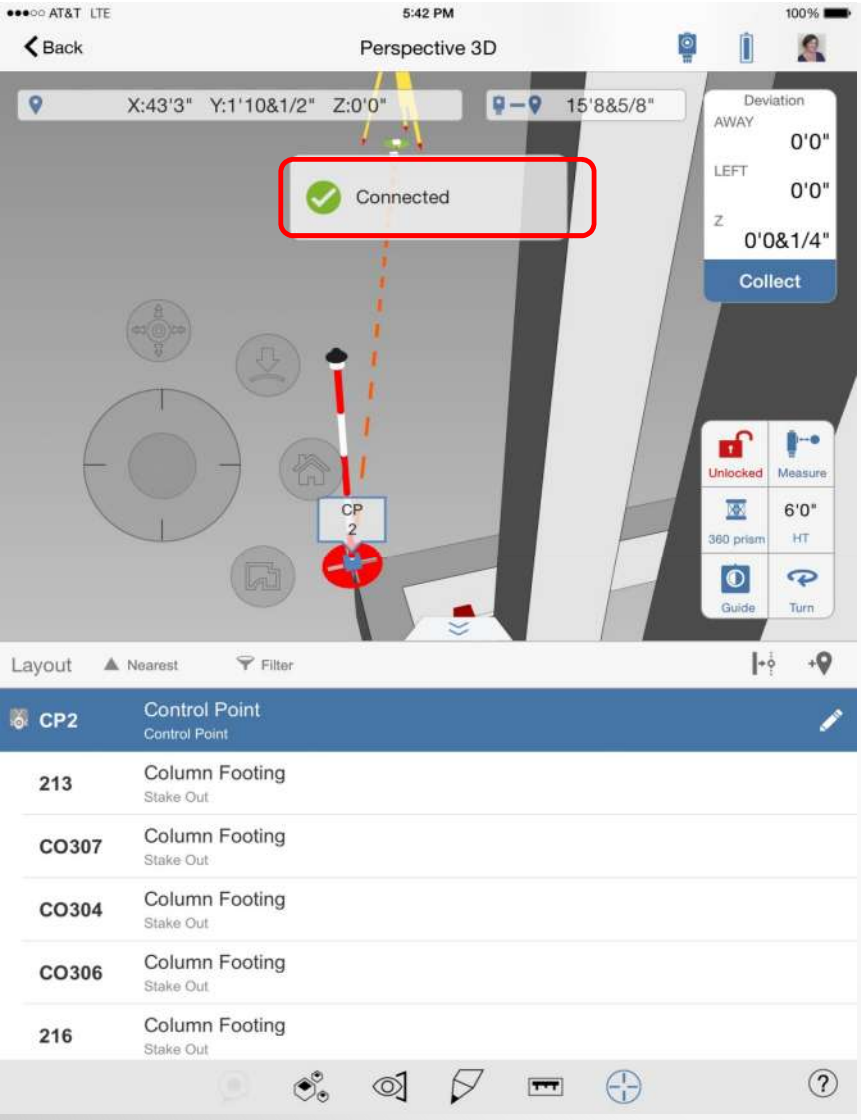
Double tap on the model to open



3 Layout

The model will appear on the iPad screen

Press the point button to expose the layout points

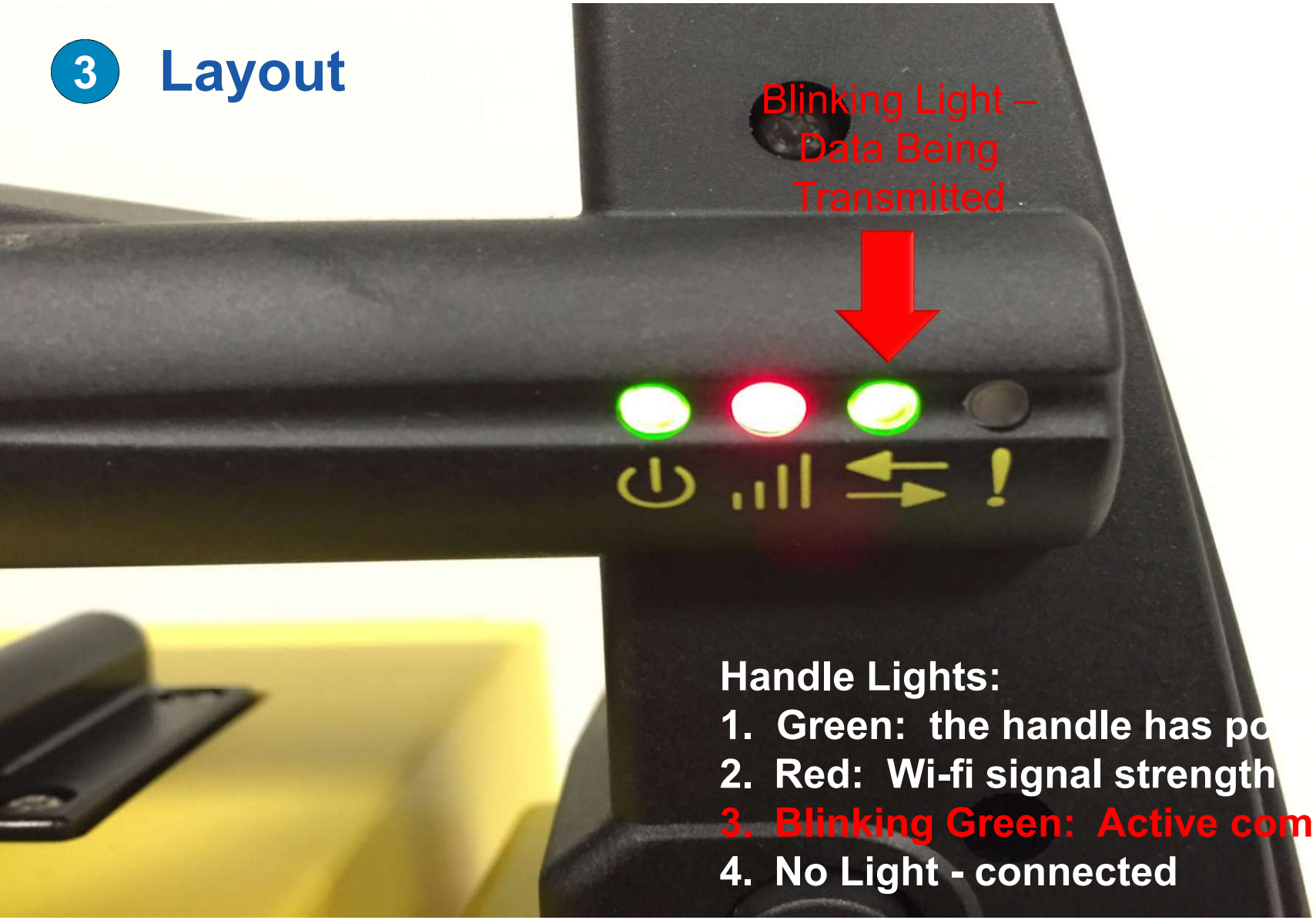


3 Layout

Pressing the point button will prompt the BIM 360 Layout app to establish data connection via the iPad Wi-Fi connection to the iCON robot 50/60

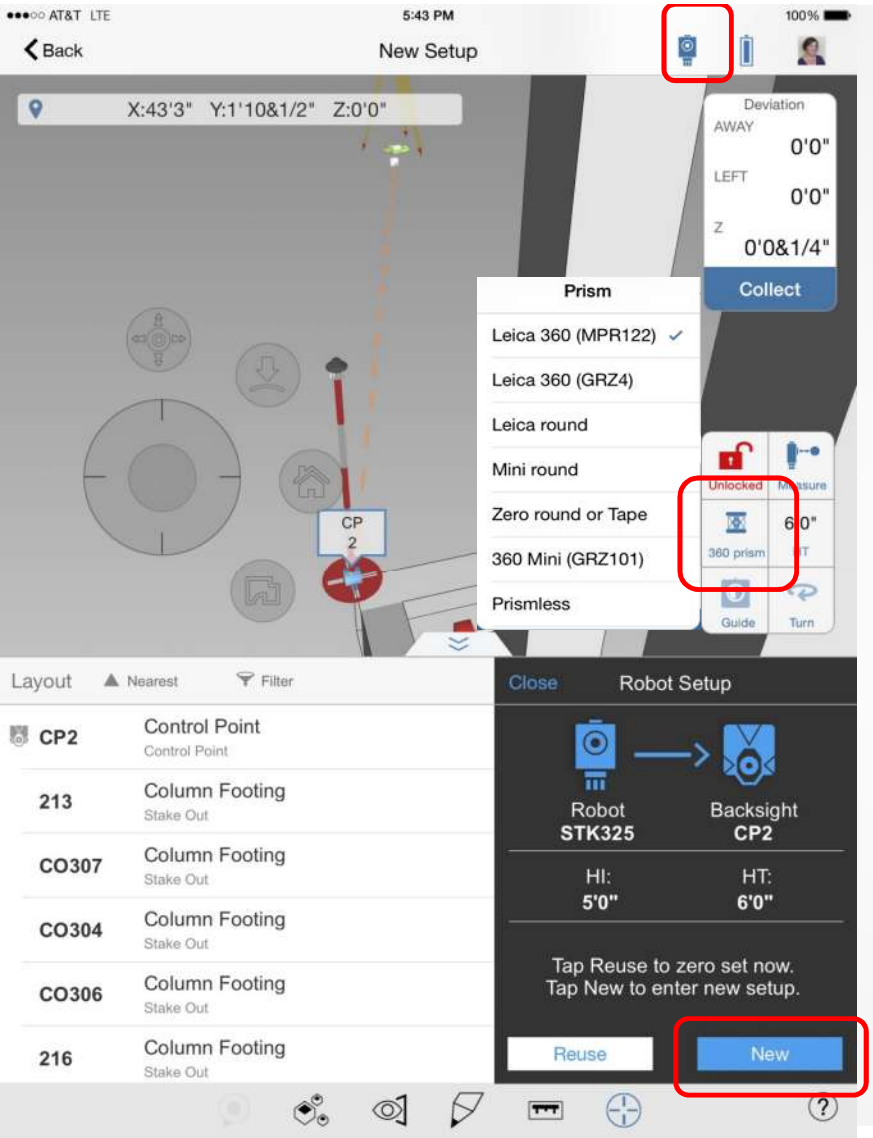
The “Connected” dialog box will appear and disappear.

3 Layout



Handle Lights:

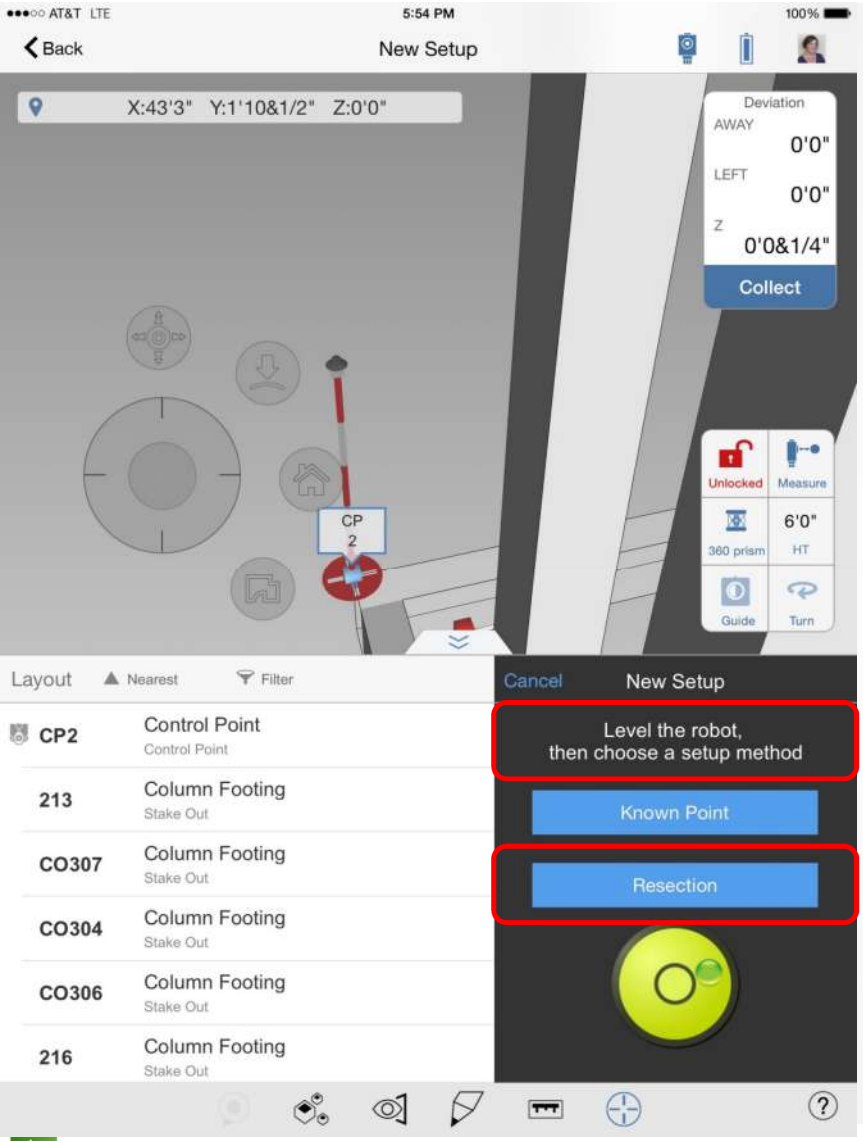
1. **Green: the handle has po**
2. **Red: Wi-fi signal strength**
3. **Blinking Green: Active communication**
4. **No Light - connected**



3 Layout

STEP: Orient Robot

Set prism type



3 Layout

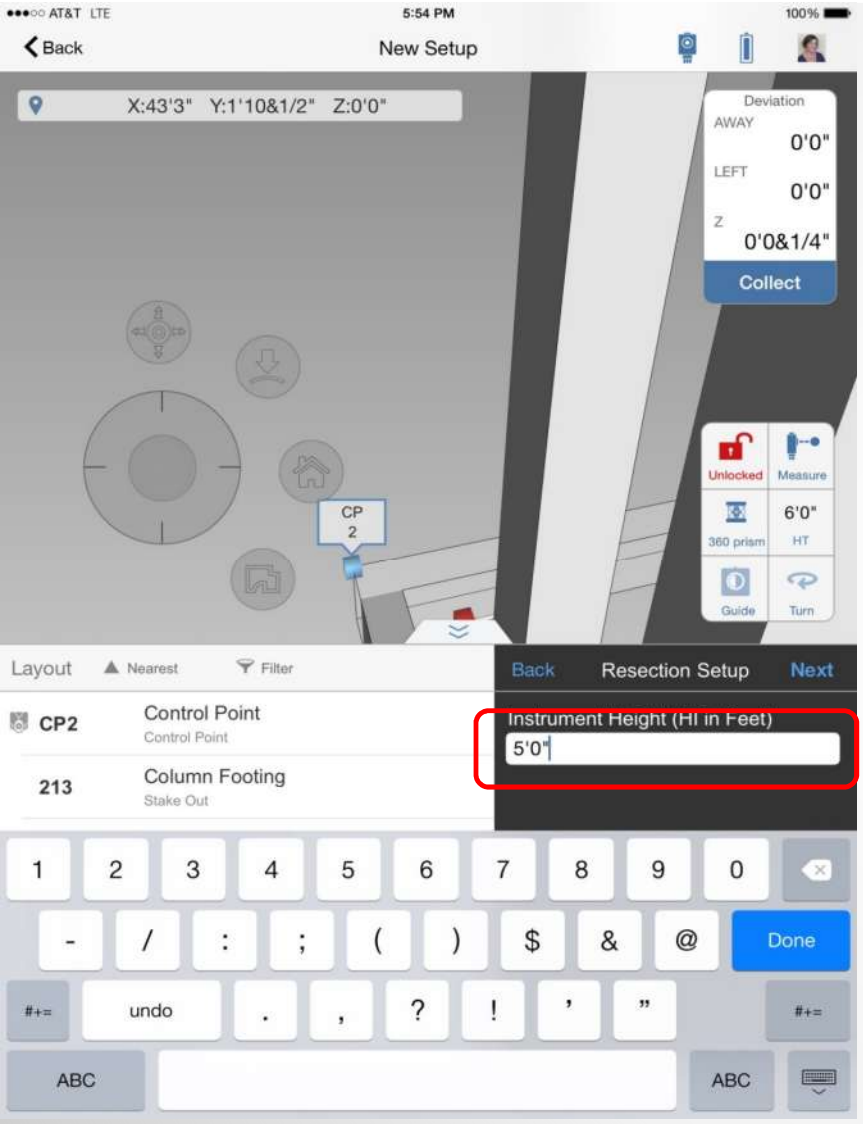
Level the iCON robot

Select your setup method.

We will use “Resection”. This means we will use 2 control points along a line.

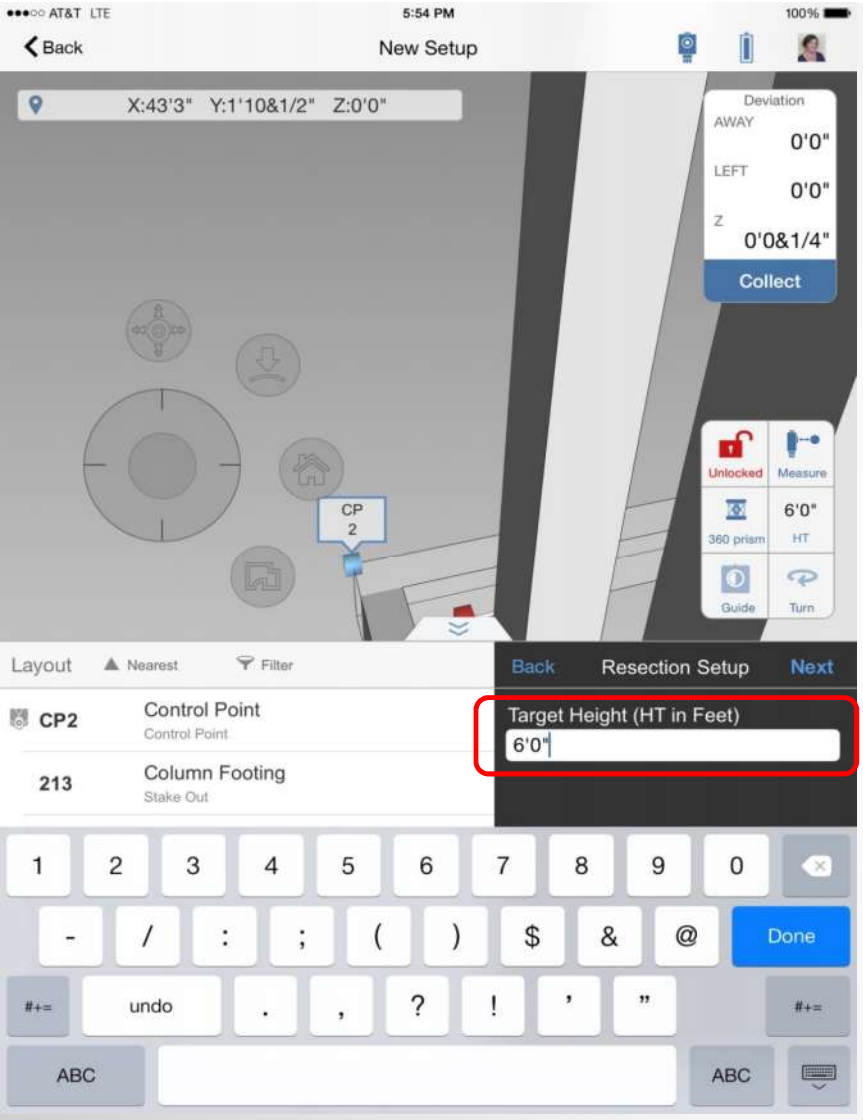
3 Layout

Level bubble on iCON 50



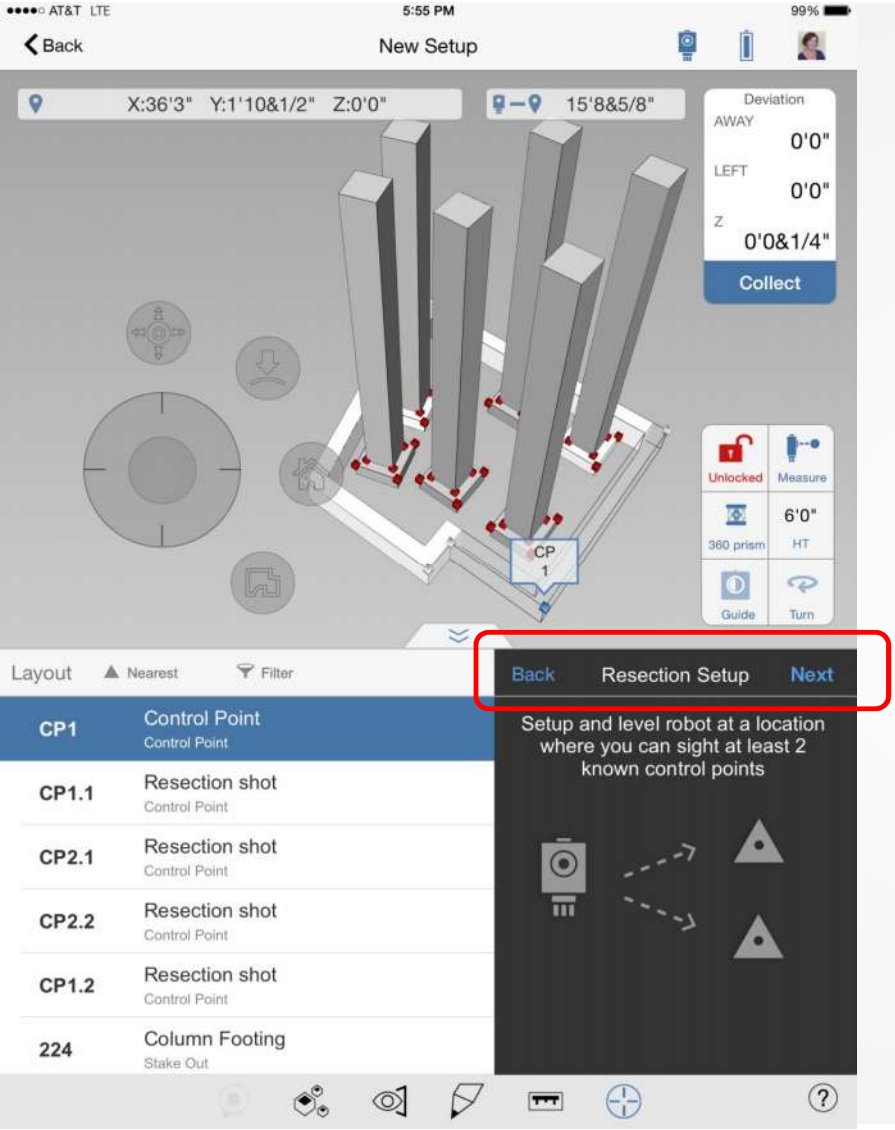
3 Layout

Set instrument height
Measure from ground to center of scope



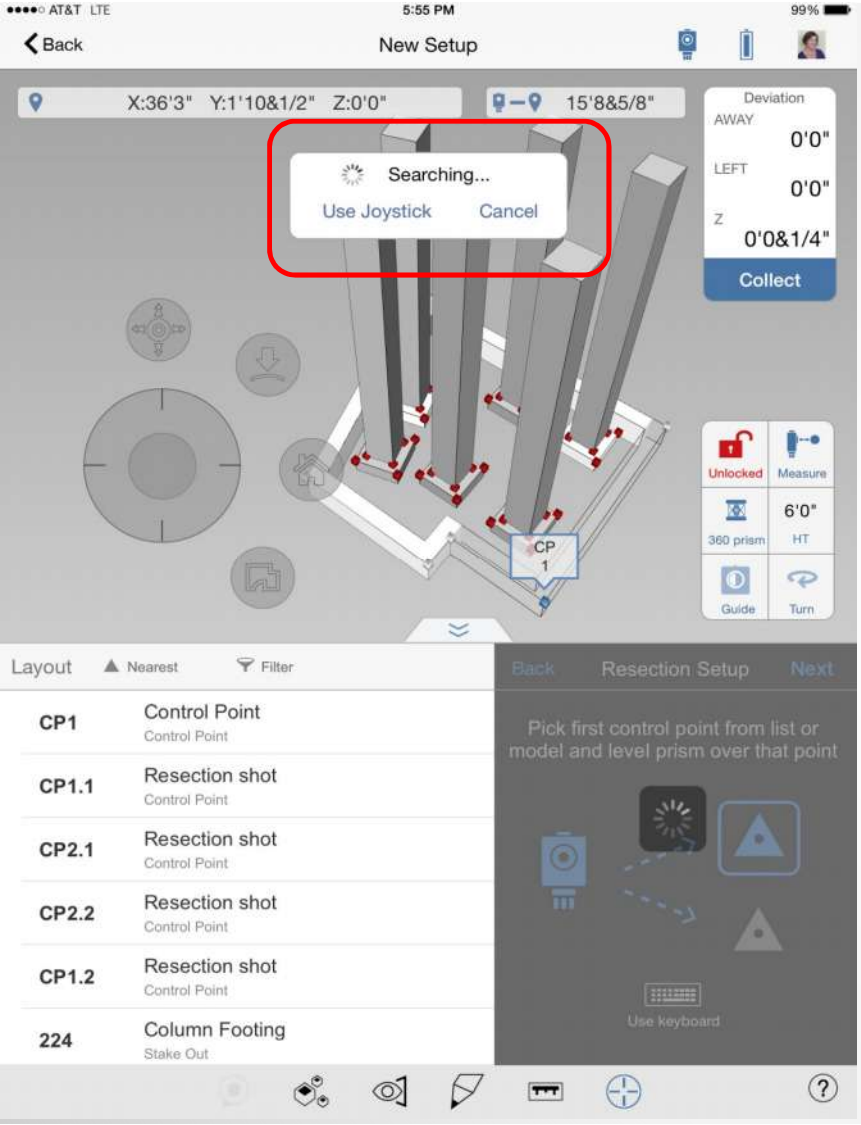
3 Layout

Set prism height to match the height of prism (is indicated on prism pole)



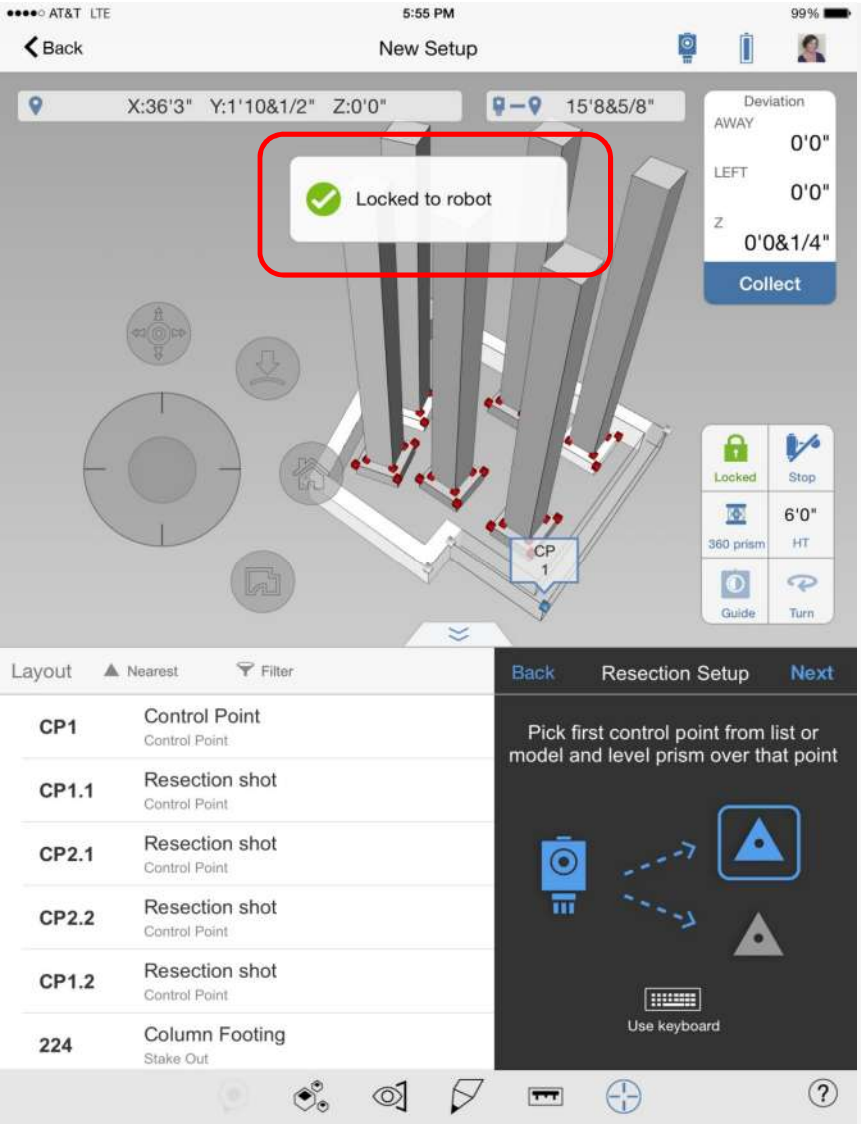
3 Layout

Setup robot where you can see 2 control points



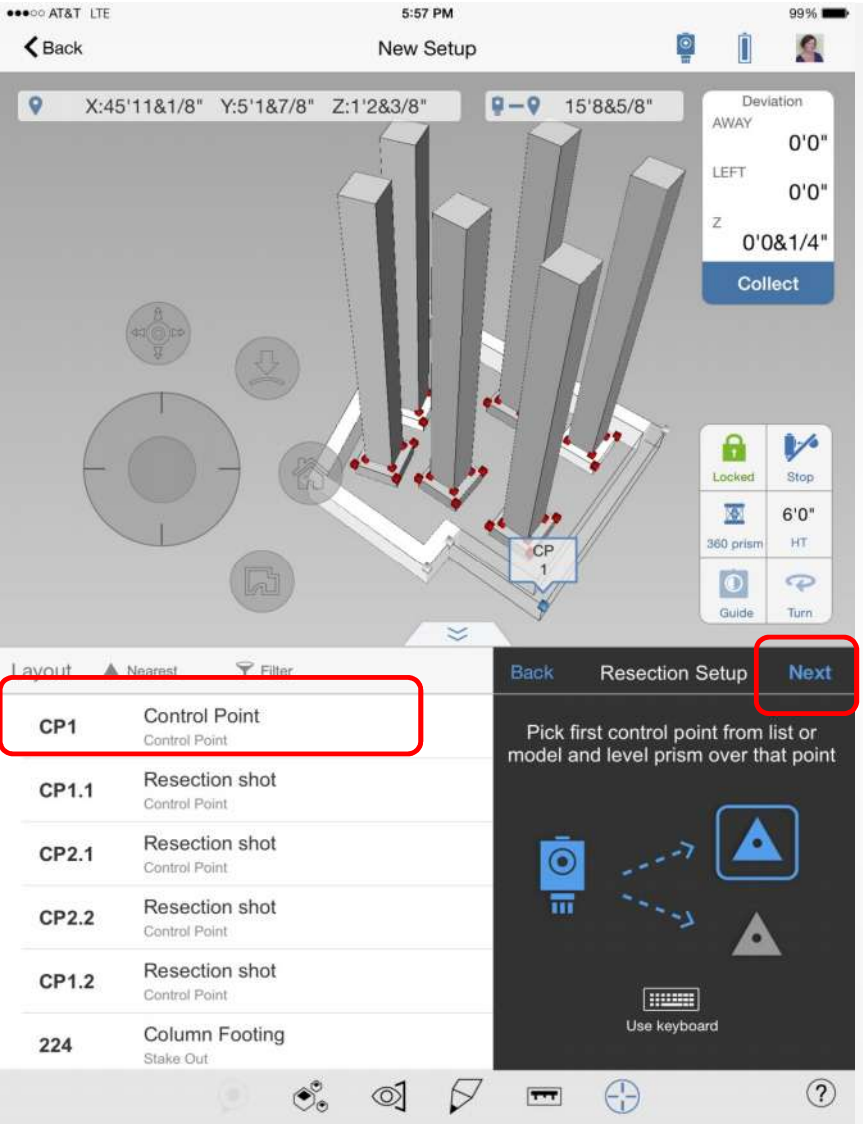
3 Layout

Software searches for prism



3 Layout

You will be notified once “locked on” to robot



3 Layout

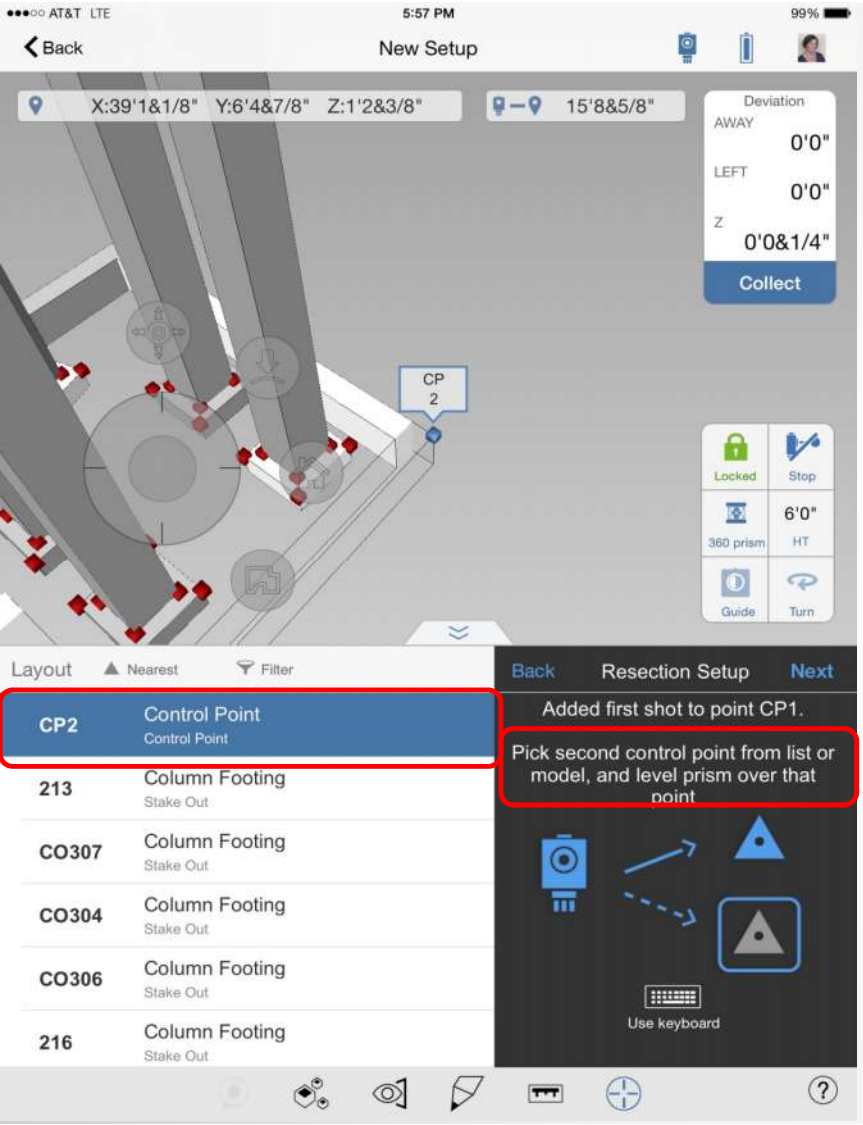
Select first control point (CP1 in this example)
Selecting next will take the measurement

3 Layout

Prism pole set up over Control Point 1

3 Layout

Prism pole leveled over CP1

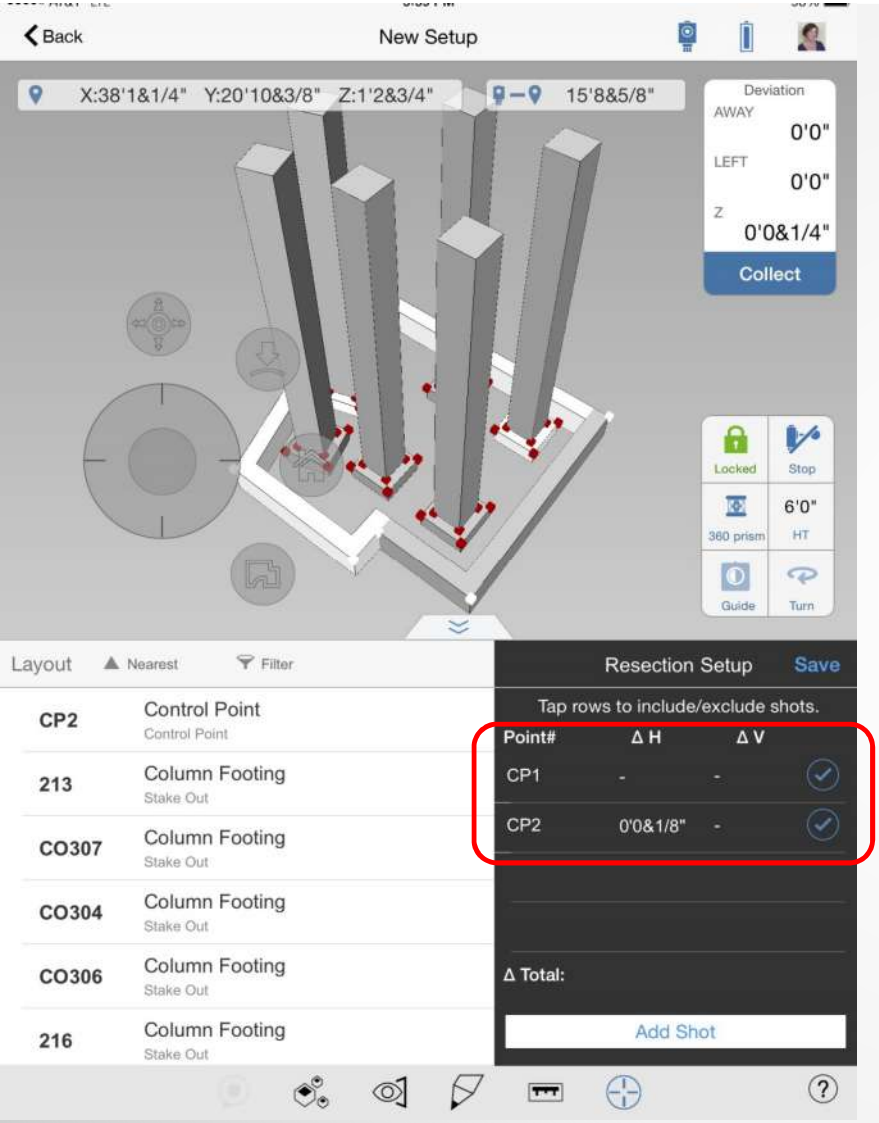


3 Layout

First control point, CP1 measured
Select second control point (CP2 in this example)

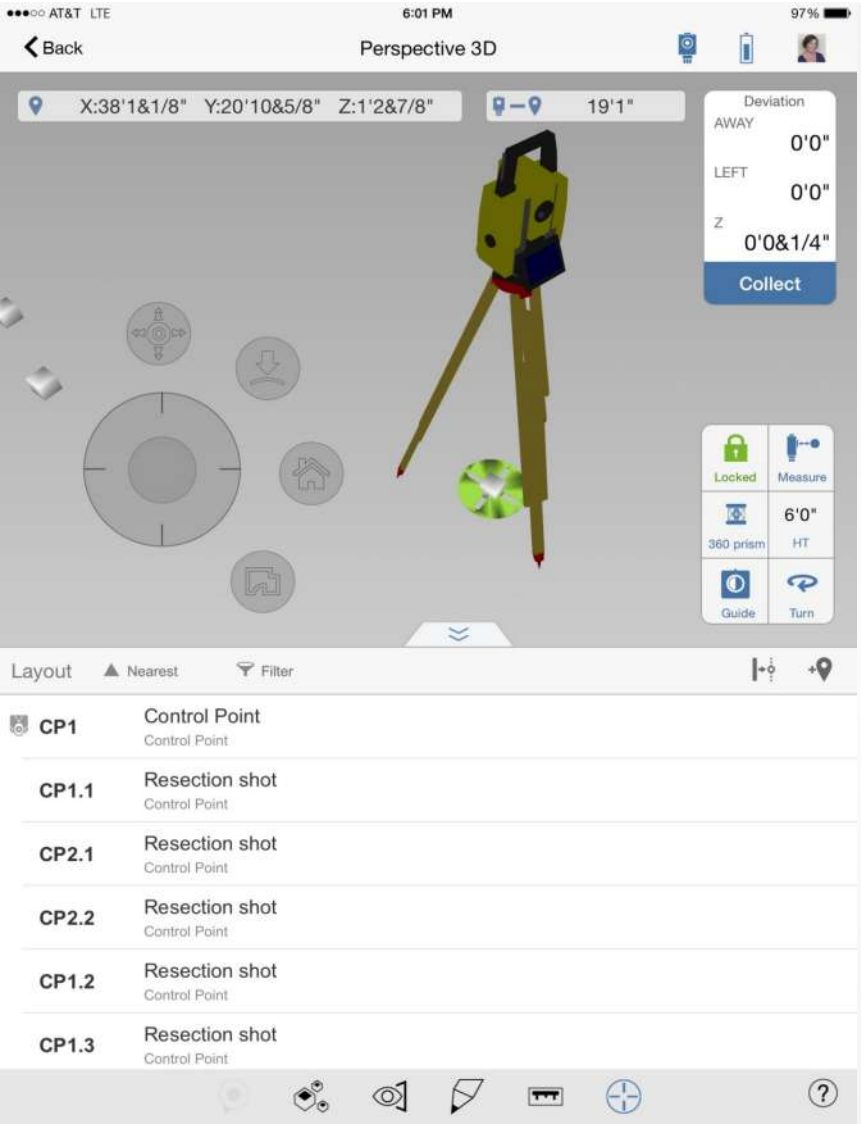
3 Layout

Prism pole on CP2



3 Layout

Both control points collected
Delta is 1/8” in the horizontal direction – that is within our tolerance, so we will continue
Select “Save” from the Resection dialog box

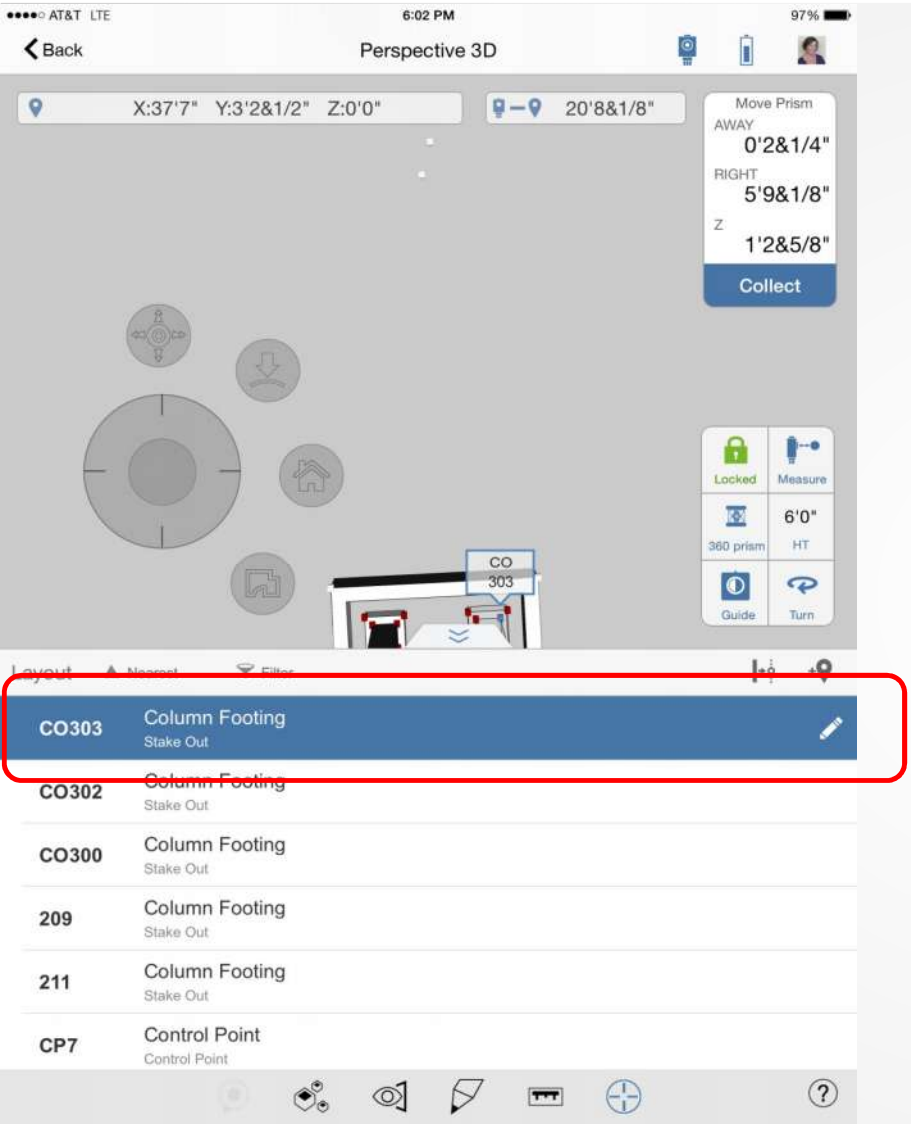


3 Layout

iCON robot model will appear in the virtual environment to match the reality.

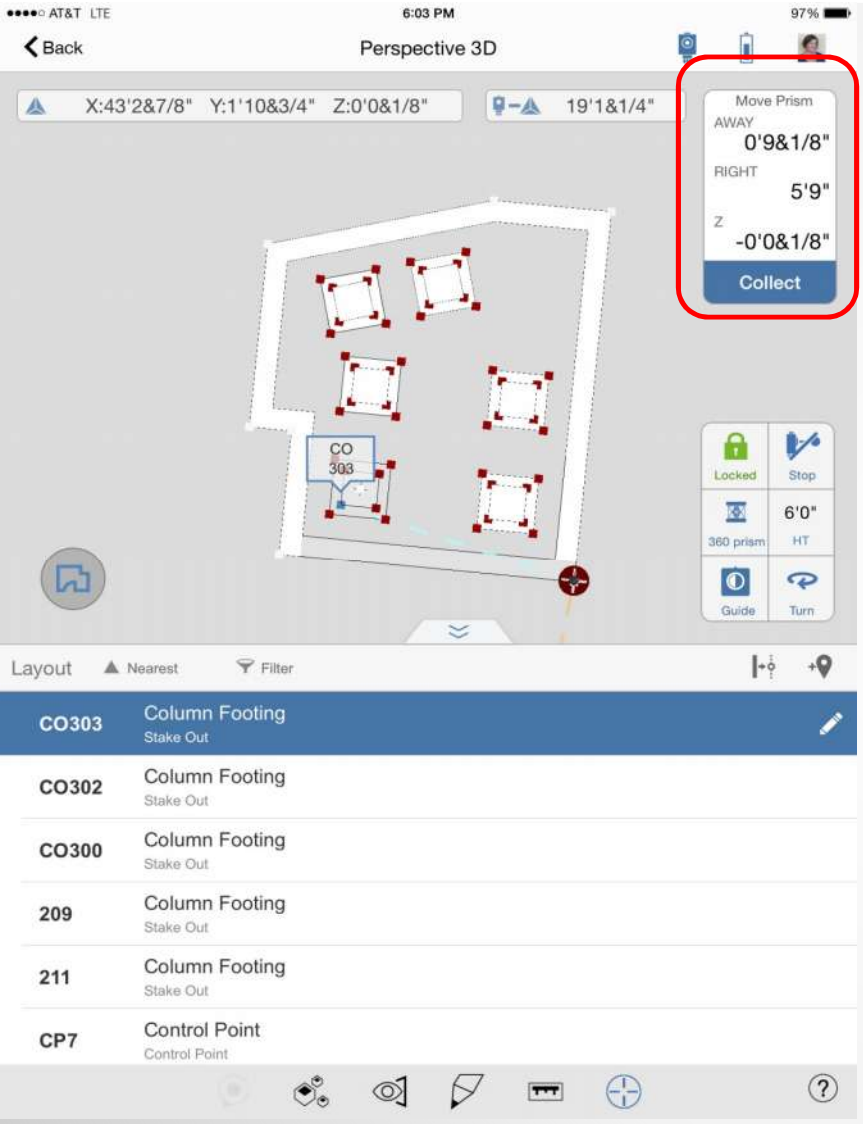
You are now ready to start laying out or back checking / QA / QC

Layout Time!



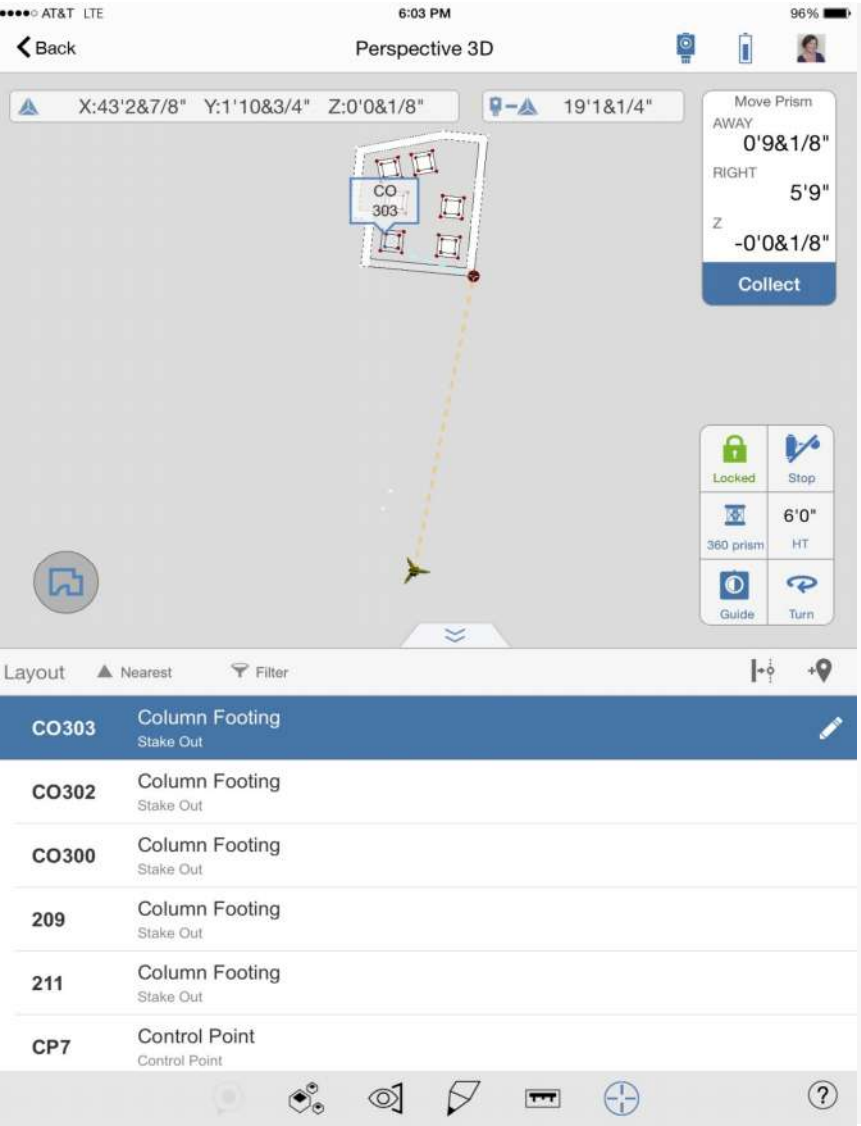
3 Layout

Select point to layout



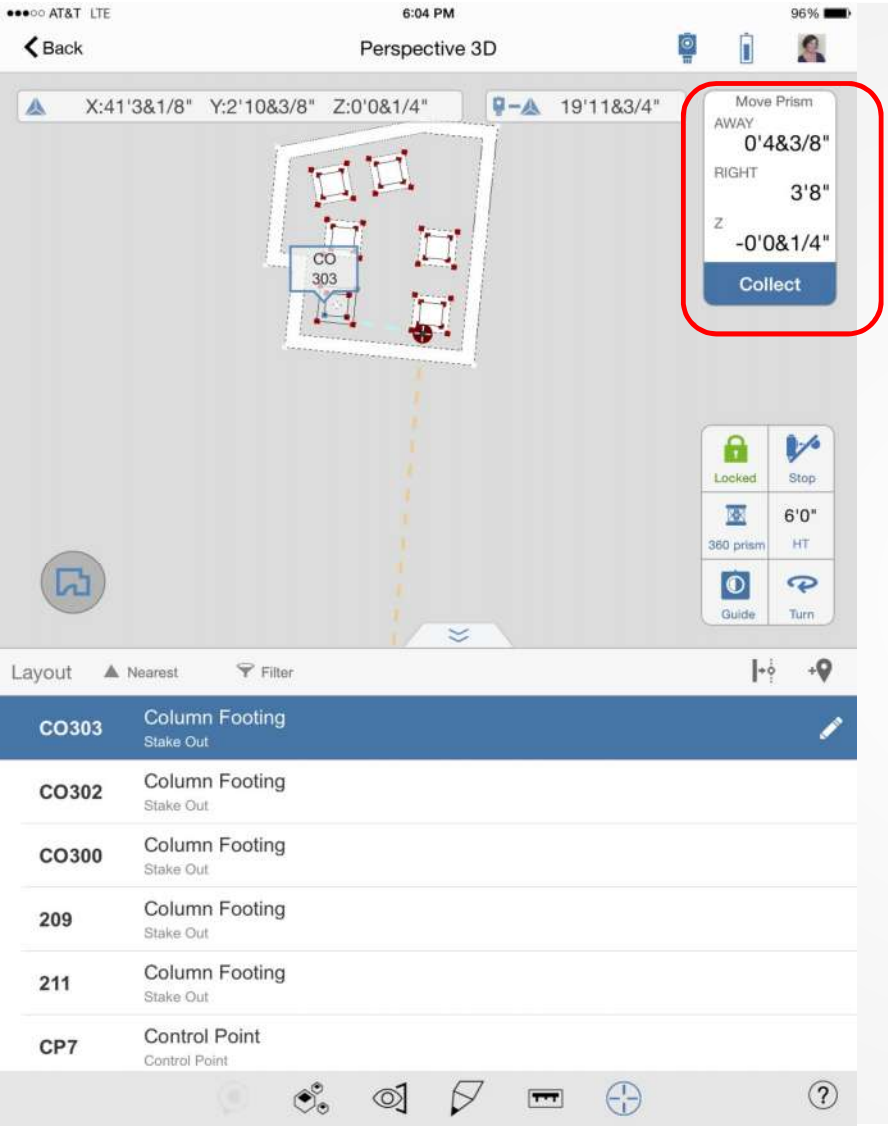
3 Layout

Once point selected, you will be guided to the point



3 Layout

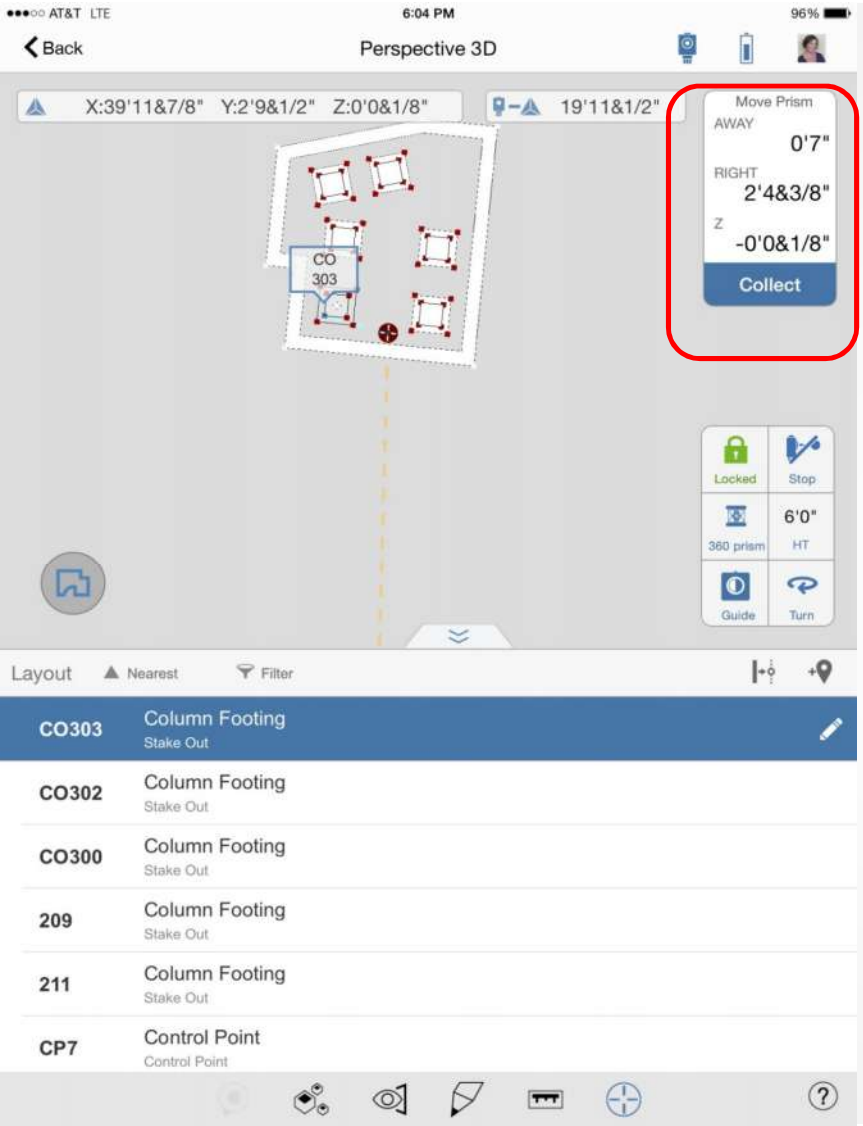
Zoomed out view



3 Layout

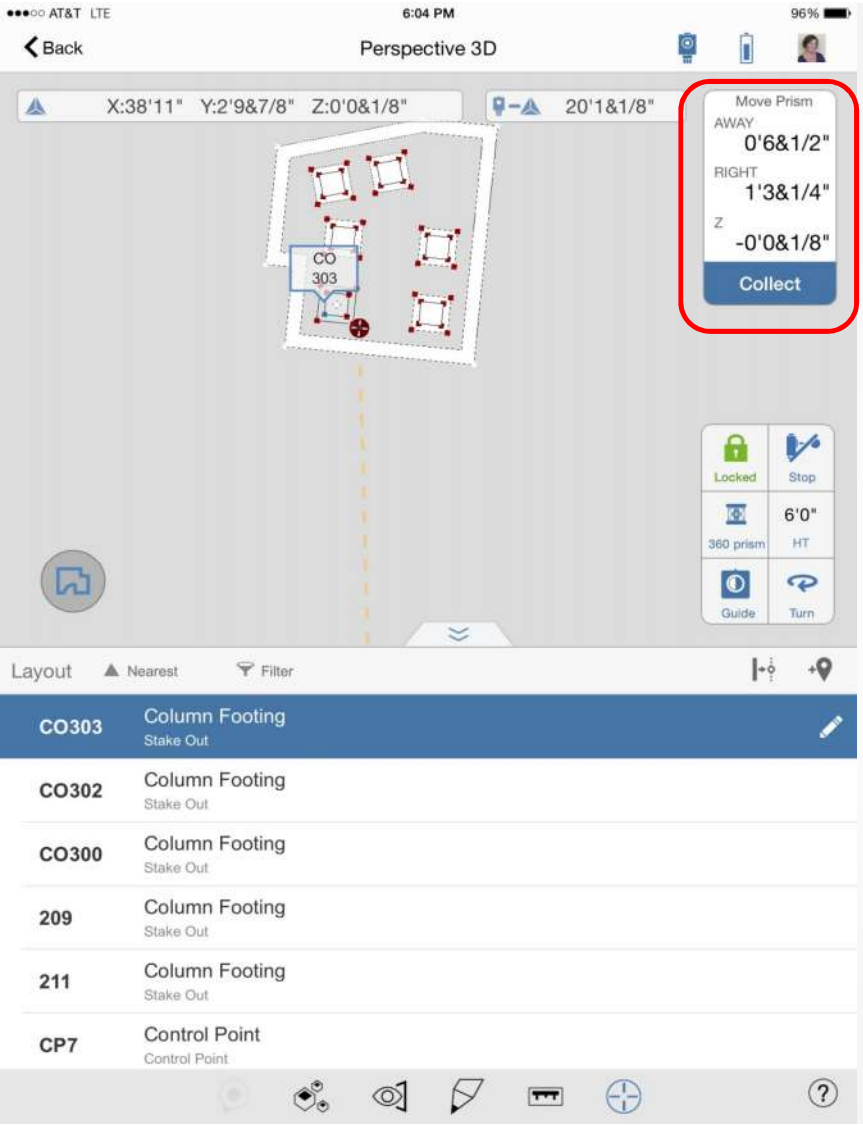
We are getting closer…

*The red circle is the prism location



3 Layout

And closer…

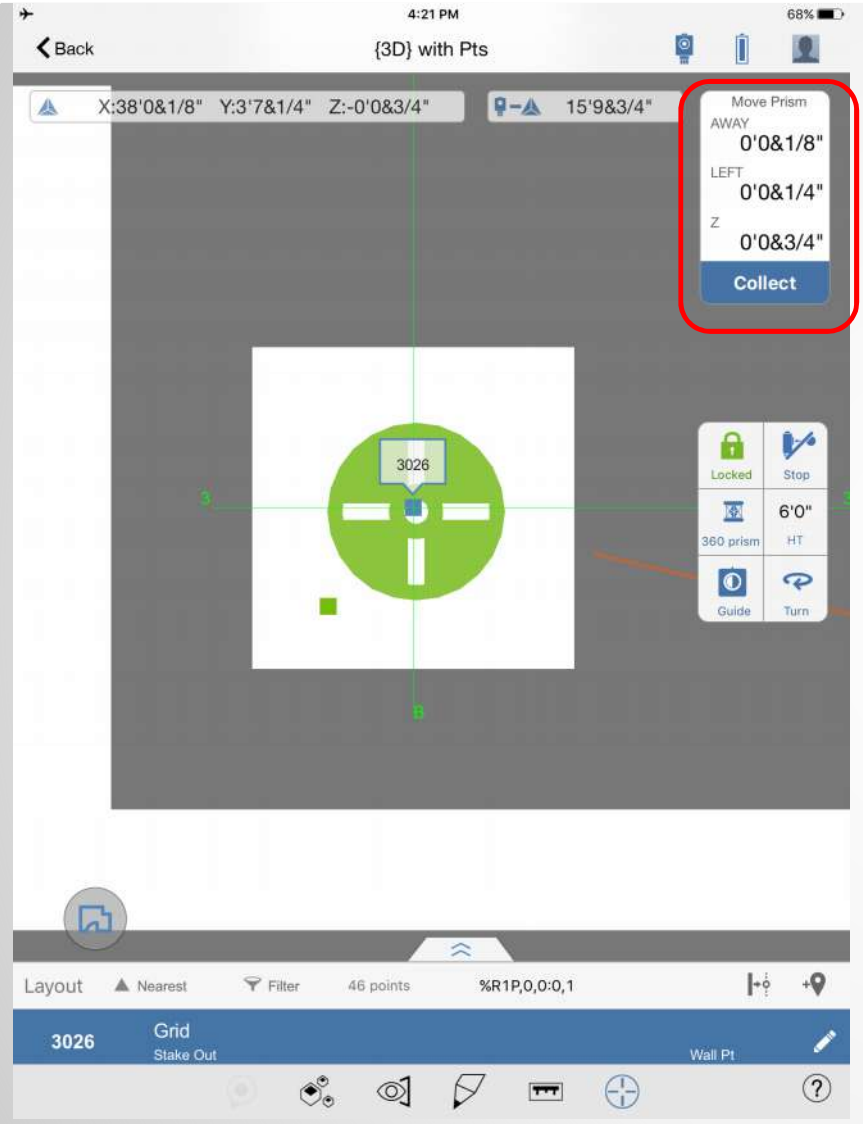


3 Layout

And closer, yet.

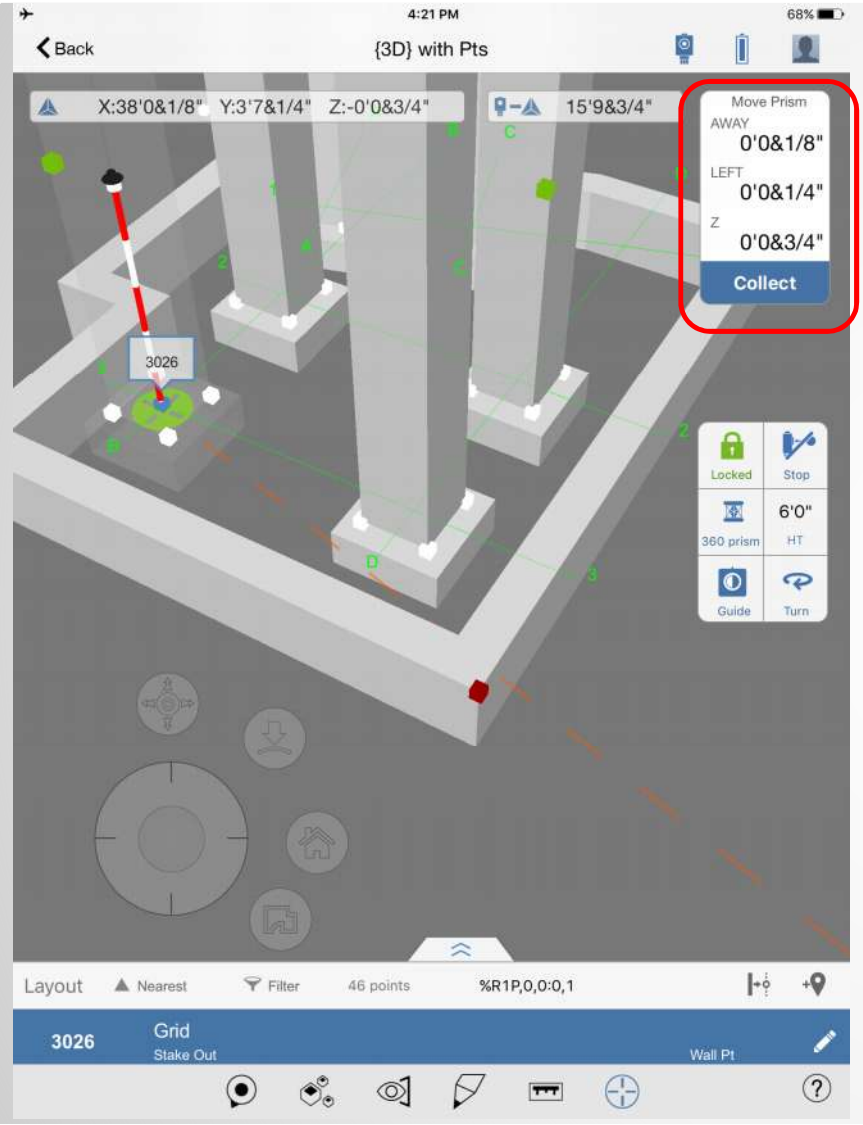
3 Layout

BINGO!



3 Layout

BINGO!



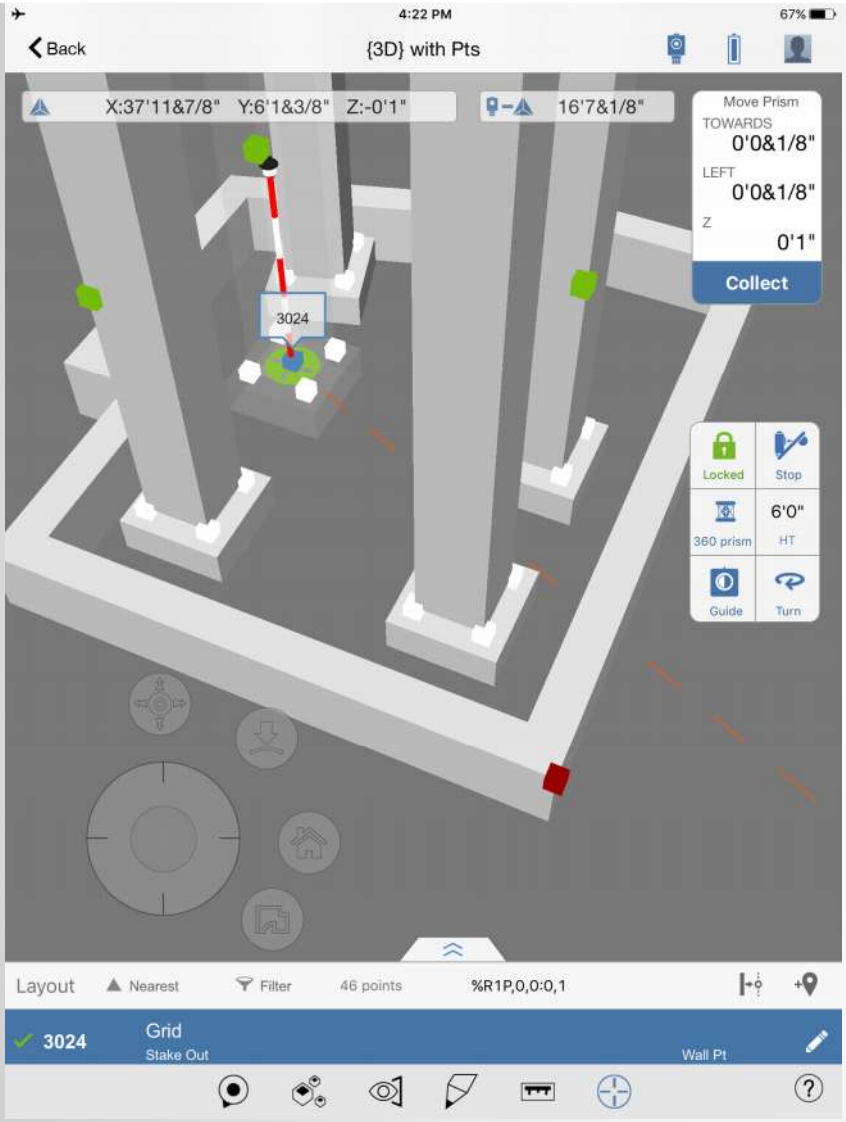
3 Layout

BINGO!

3 Layout

Speed Layout…

Column #2



3 Layout

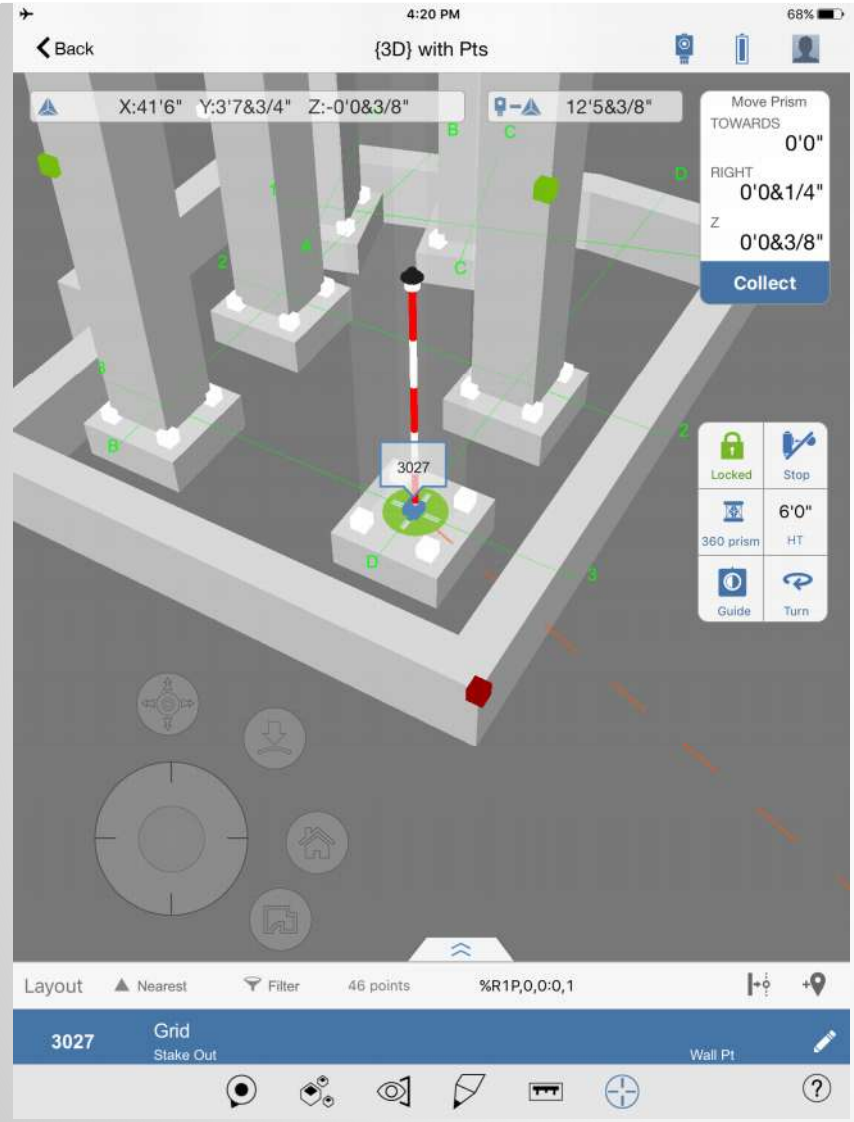
Speed Layout…

Column #2

3 Layout

Speed Layout…

Column #3

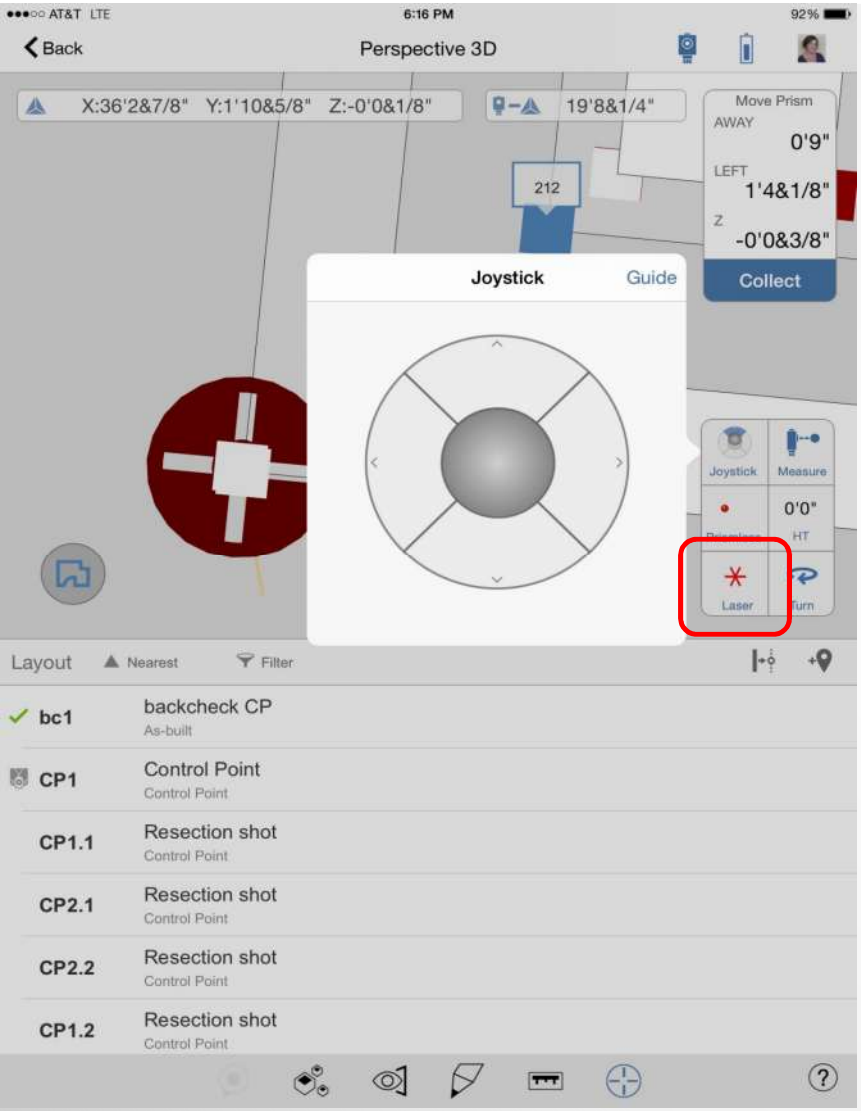


3 Layout

Speed Layout…

Column #3

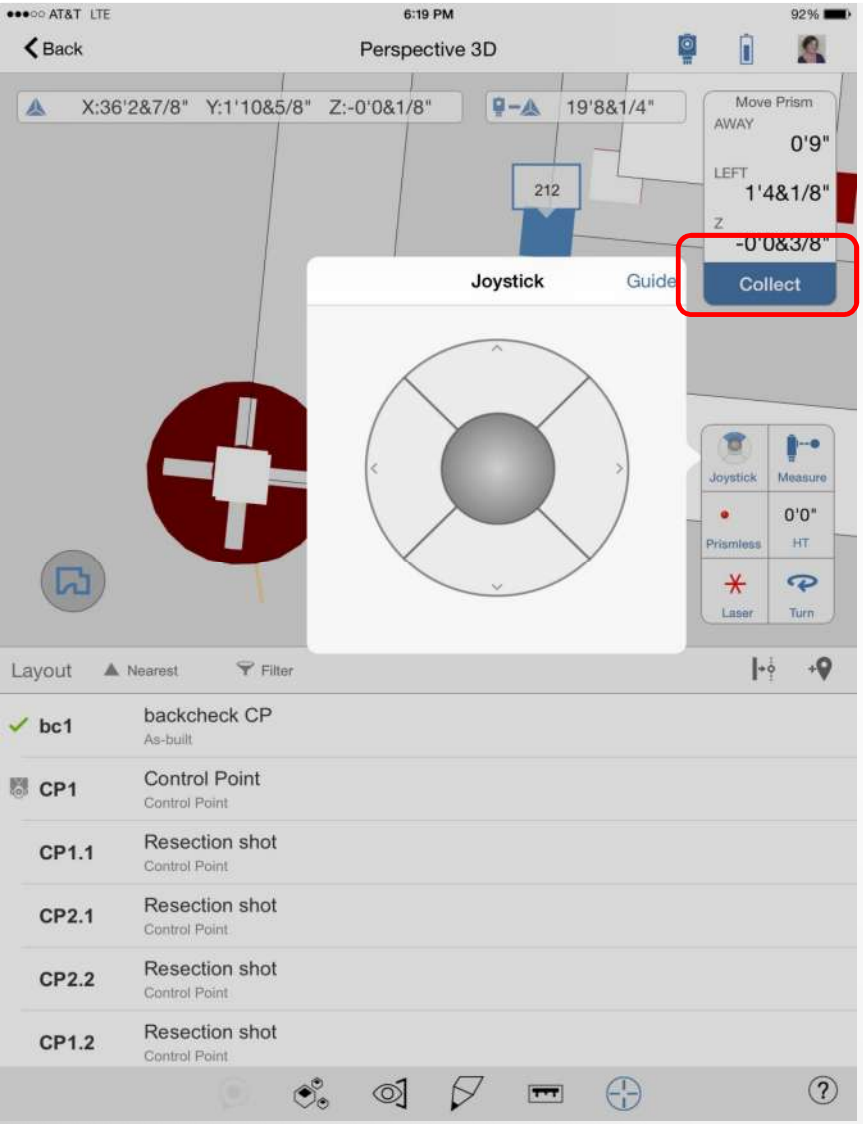
New Leica-Autodesk Workflow



4 As-Built Check

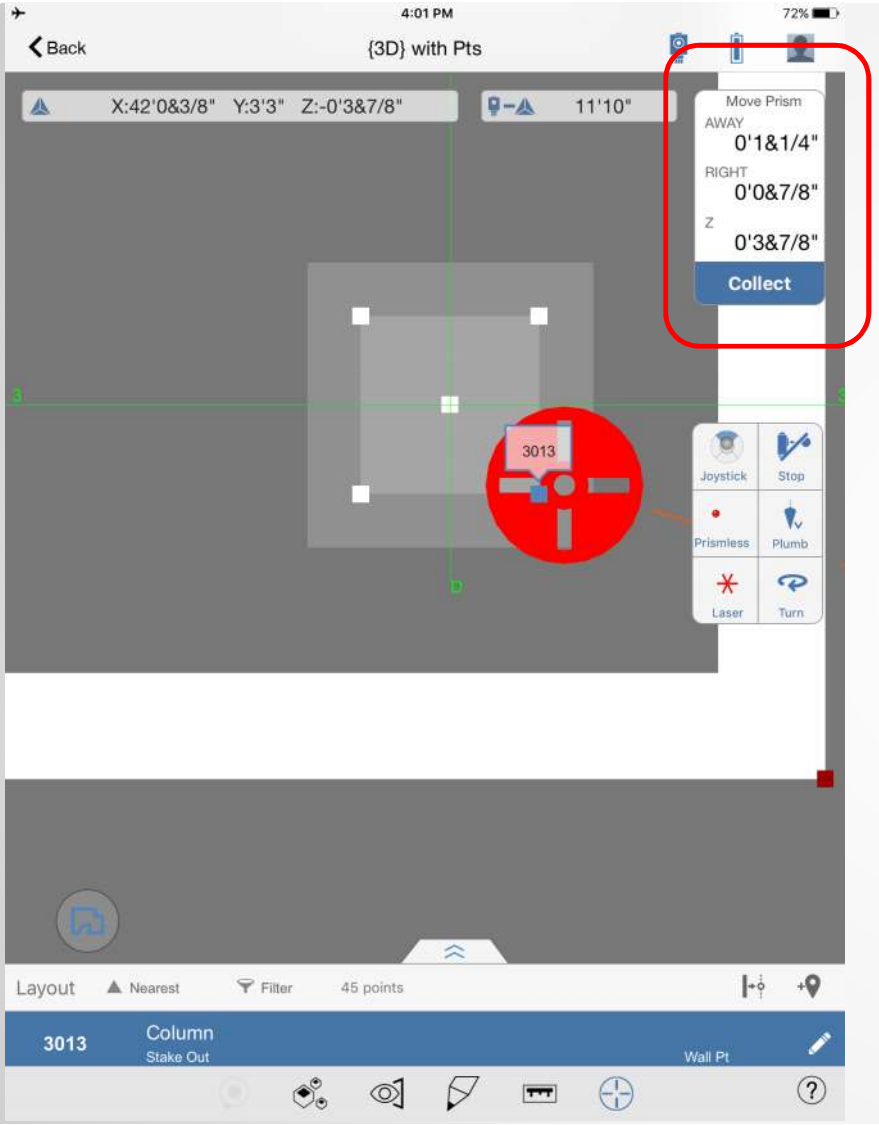
Back Check with Red Laser
Change to Prismless mode and turn on visible red laser

Activate the joystick to remote control the robot from the iPad BIM 360 Layout app



4 As-Built Check

Use the joystick to “drive” the red laser to the point to be back checked

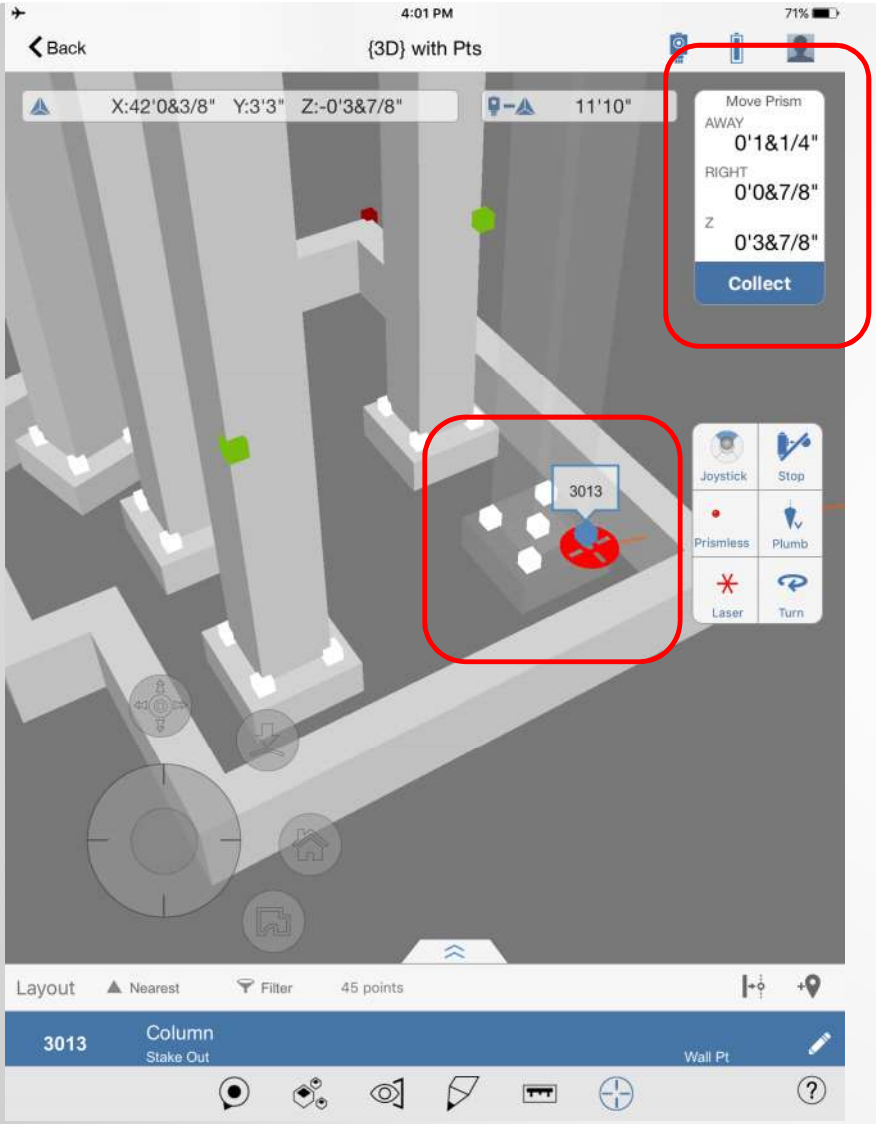


4 As-Built Check

We have navigated to Column corner…

…and we have a delta

As-built point saved



4 As-Built Check

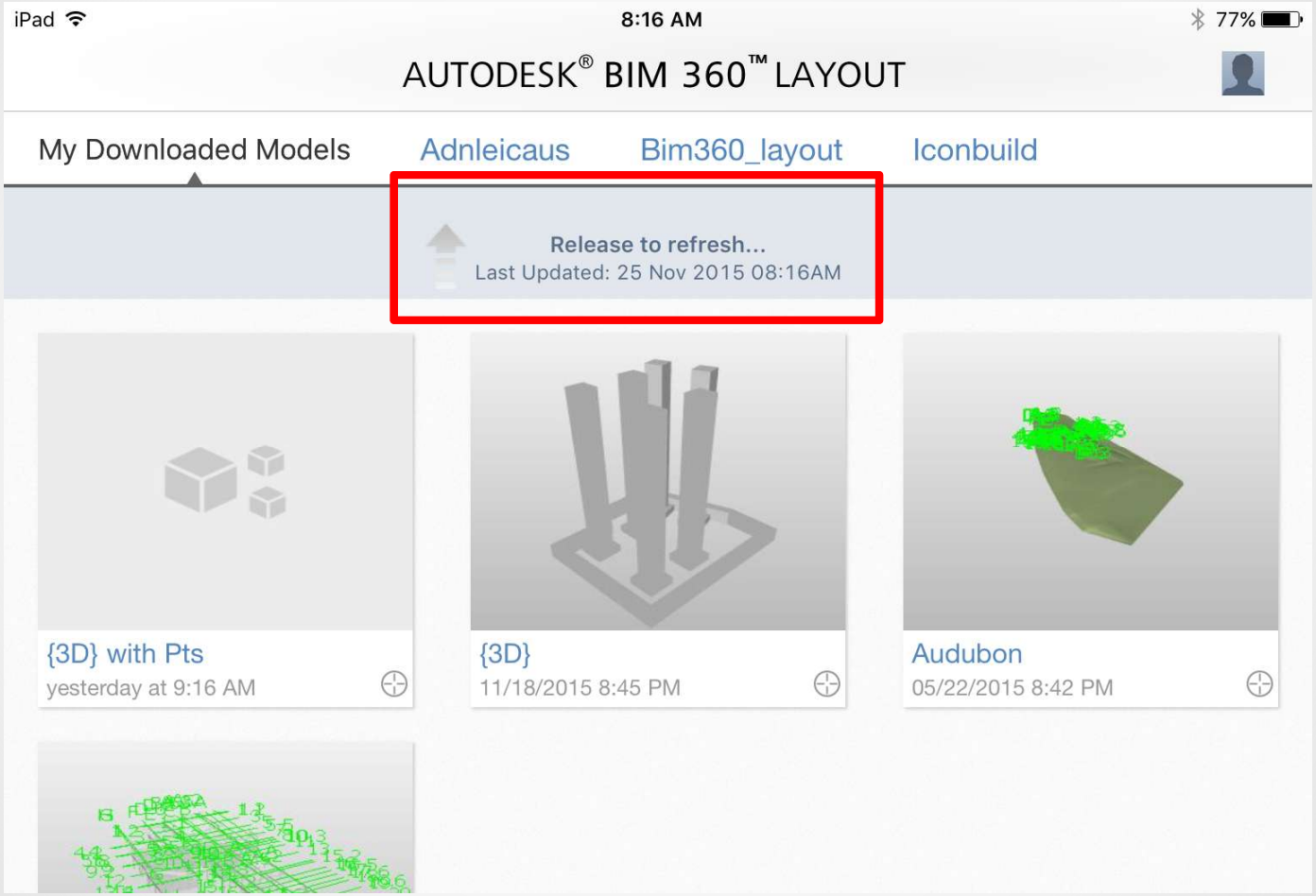
We have navigated to Column corner…

…and we have a delta

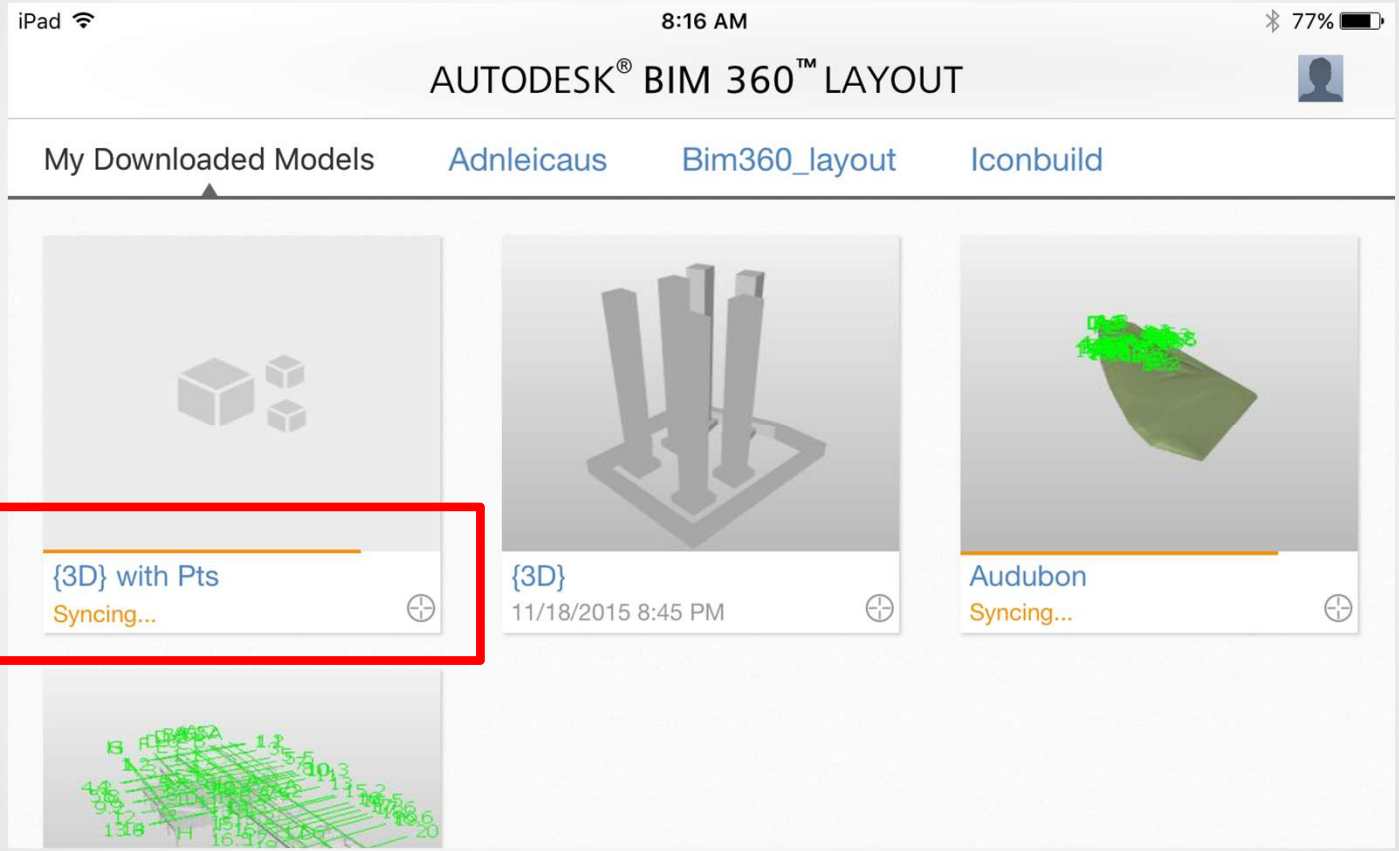
GC performs all back checks…

New Leica-Autodesk Workflow

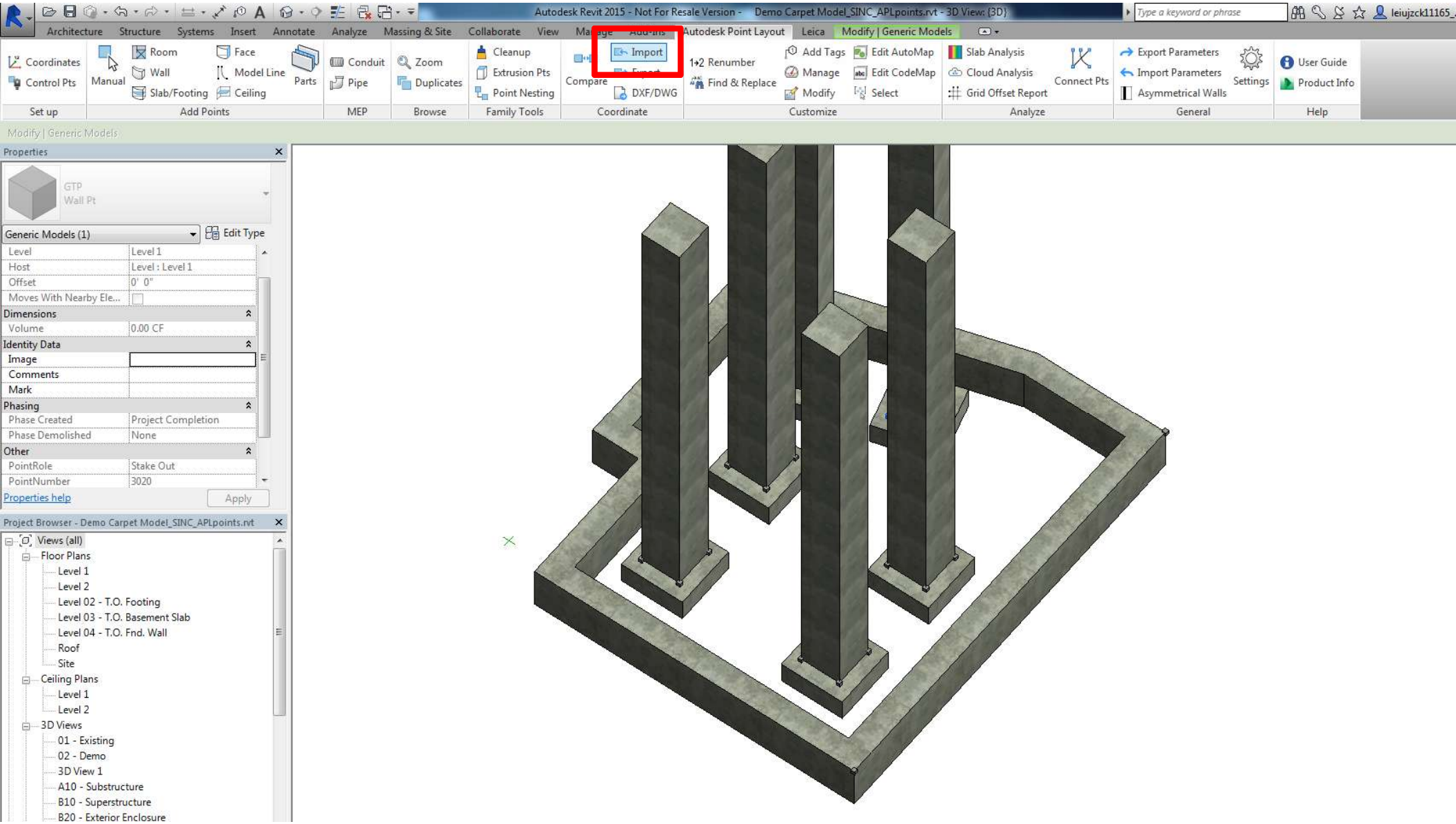
5 Sync Points



5 Sync Points



New Leica-Autodesk Workflow


Autodesk Revit 2015 - Not For Resale Version - Demo Carpet Model_SINC_APLpoints.rvt - 3D View: {3D}
Type a keyword or phrase
leiujzck11165_
Architecture
Structure
Systems
Insert
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Analyze
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Model Line
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Parts
Conduit
Pipe
Zoom
Duplicates
Cleanup
Extrusion Pts
Point Nesting
Compare
Import
DXF/DWG
1→2 Renumber
Find & Replace
Add Tags
Manage
Modify
Edit AutoMap
Edit CodeMap
Select
Slab Analysis
Cloud Analysis
Grid Offset Report
Connect Pts
Export Parameters
Import Parameters
Asymmetrical Walls
Settings
User Guide
Product Info
Set up
Add Points
MEP
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Family Tools
Coordinate
Customize
Analyze
General
Help
Modify | Generic Models
Properties
GTP
Wall Pt
Generic Models (1)
Edit Type
Level
Level 1
Host
Level : Level 1
Offset
0' 0"
Moves With Nearby Ele...
Dimensions
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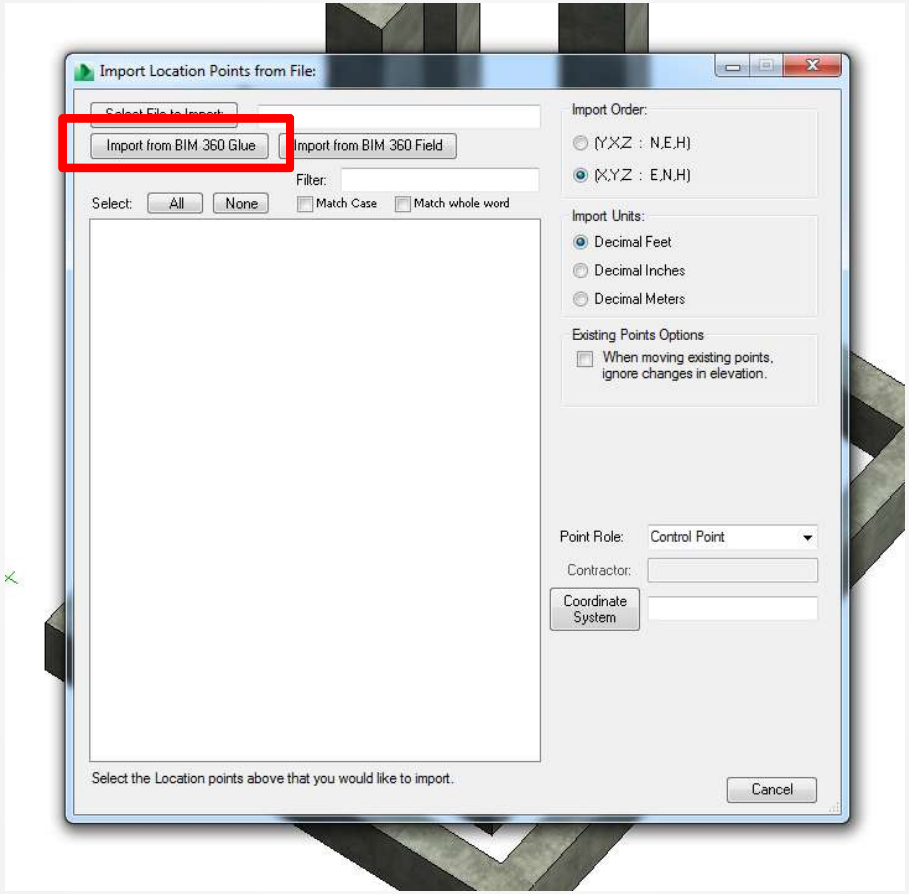
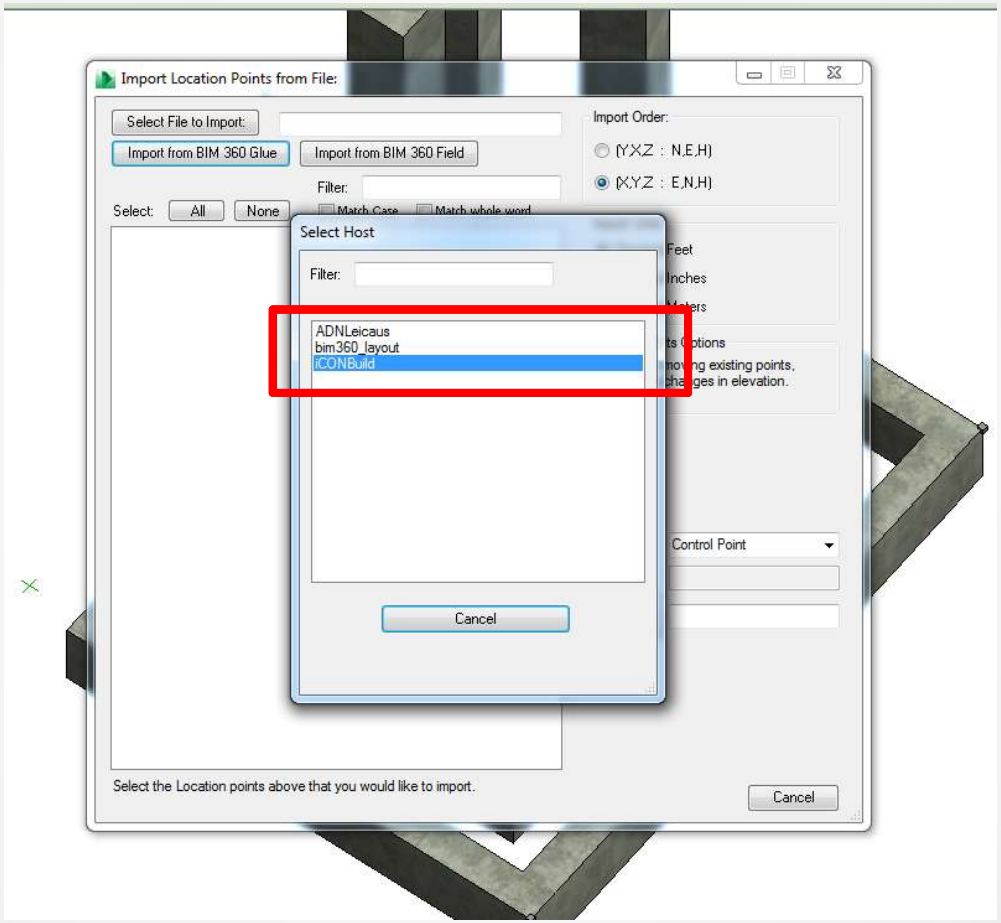
0.00 CF
Identity Data
Image
Comments
Mark
Phasing
Phase Created
Project Completion
Phase Demolished
None
Other
PointRole
Stake Out
PointNumber
3020
Properties help
Apply
Project Browser - Demo Carpet Model_SINC_APLpoints.rvt
Views (all)
Floor Plans
Level 1
Level 2
Level 02 - T.O. Footing
Level 03 - T.O. Basement Slab
Level 04 - T.O. Fnd. Wall
Roof
Site
Ceiling Plans
Level 1
Level 2
3D Views
01 - Existing
02 - Demo
3D View 1
A10 - Substructure
B10 - Superstructure
B20 - Exterior Enclosure

6 Round Trip into Revit



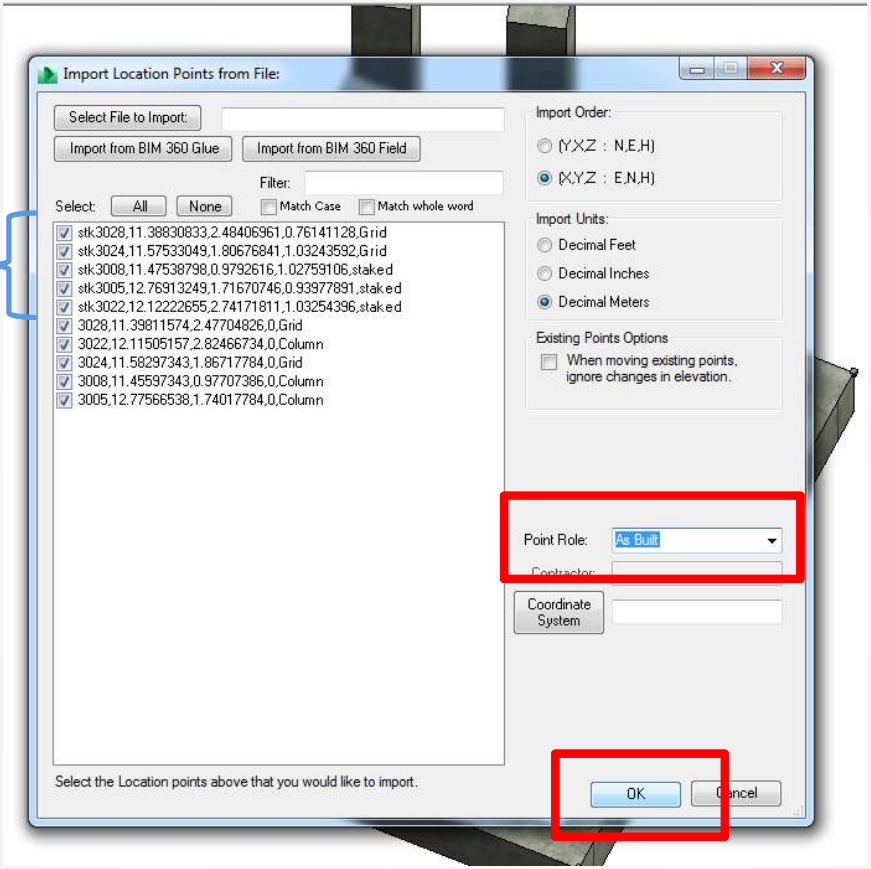
6 Round Trip into Revit



6 Round Trip into Revit

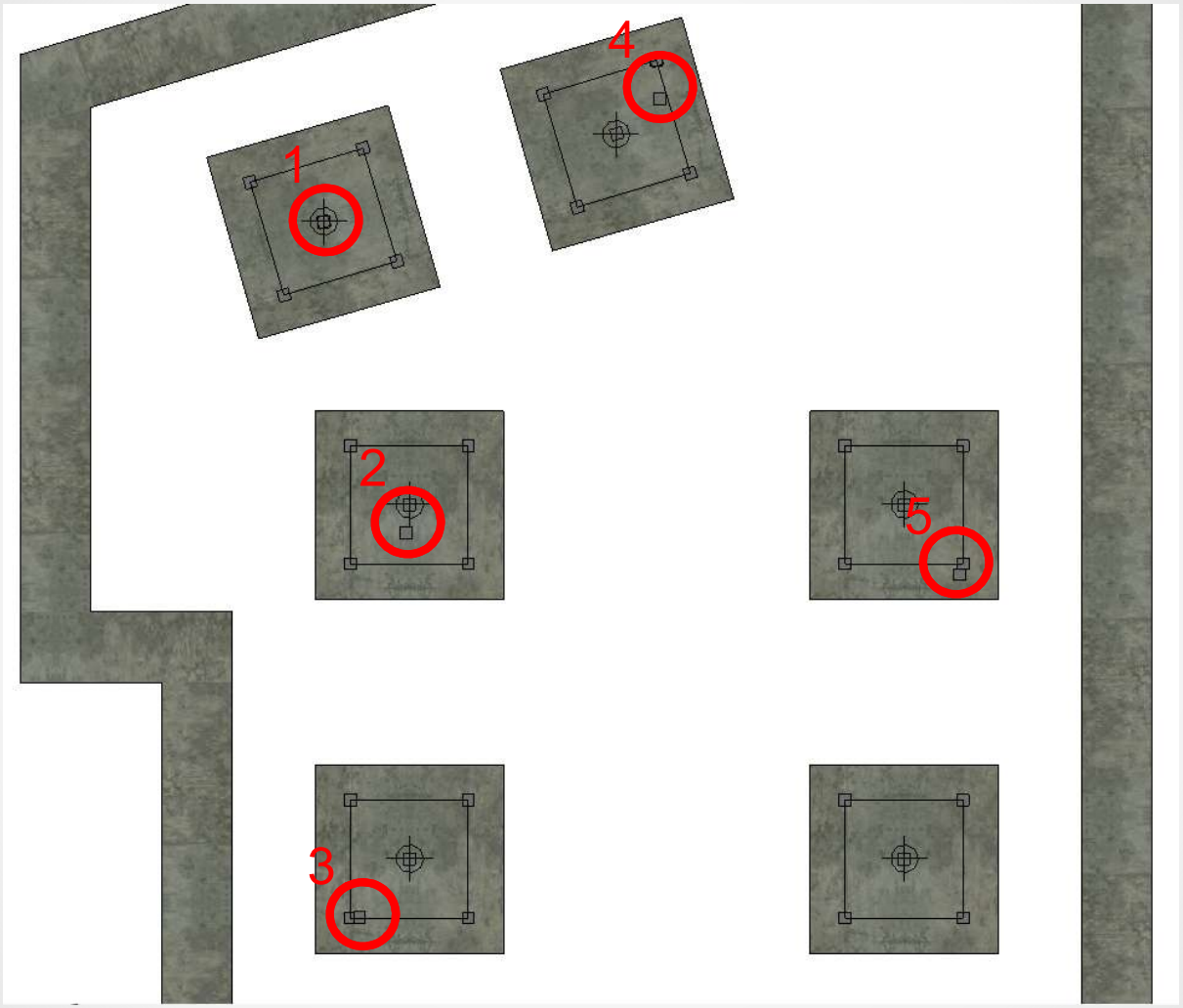
5 staked/stored pts

First 2 are Stk Grid Pts
Next 3 are Stk Col Pts



6

Round Trip into Revit



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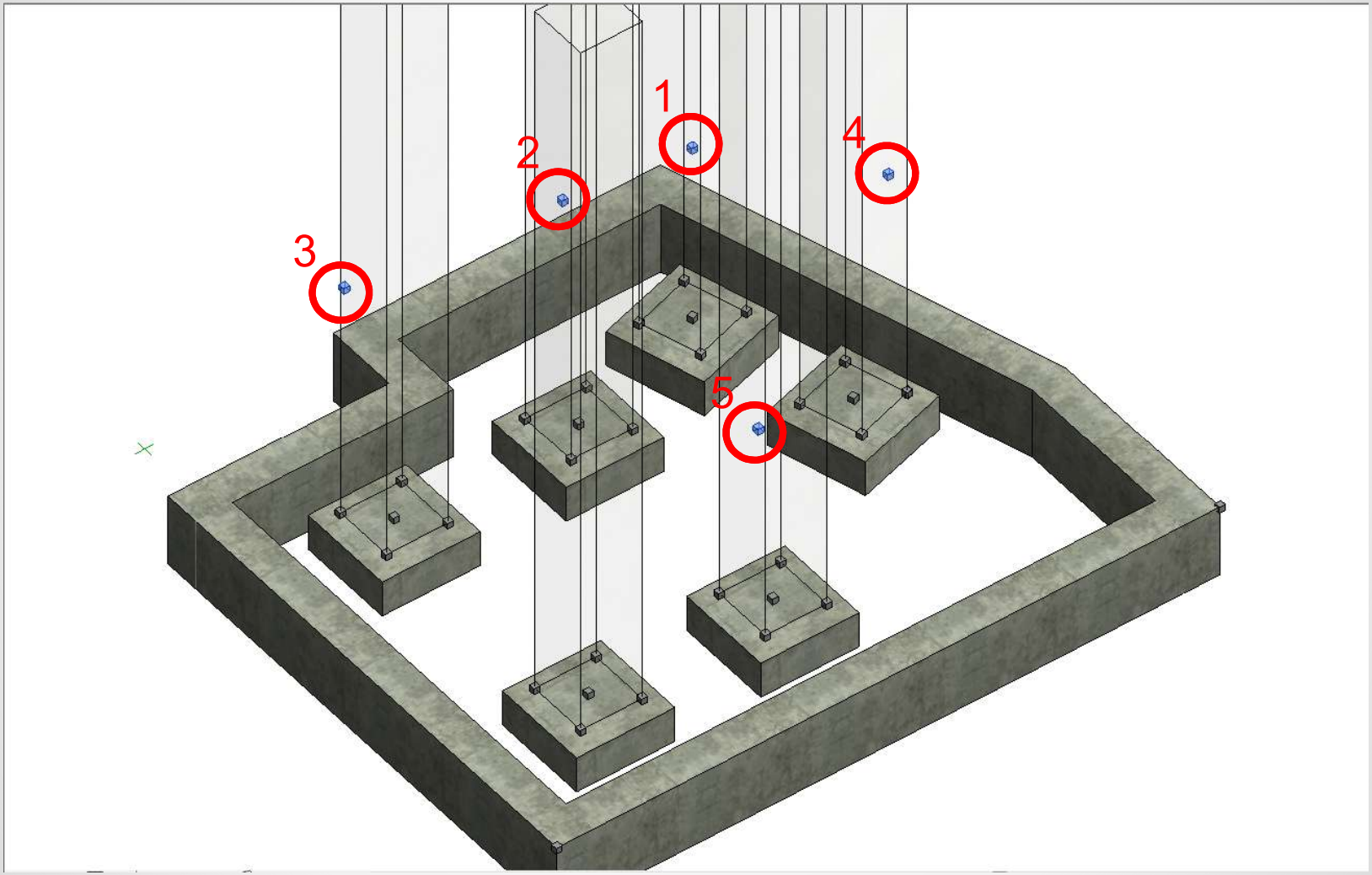
Round Trip into Revit



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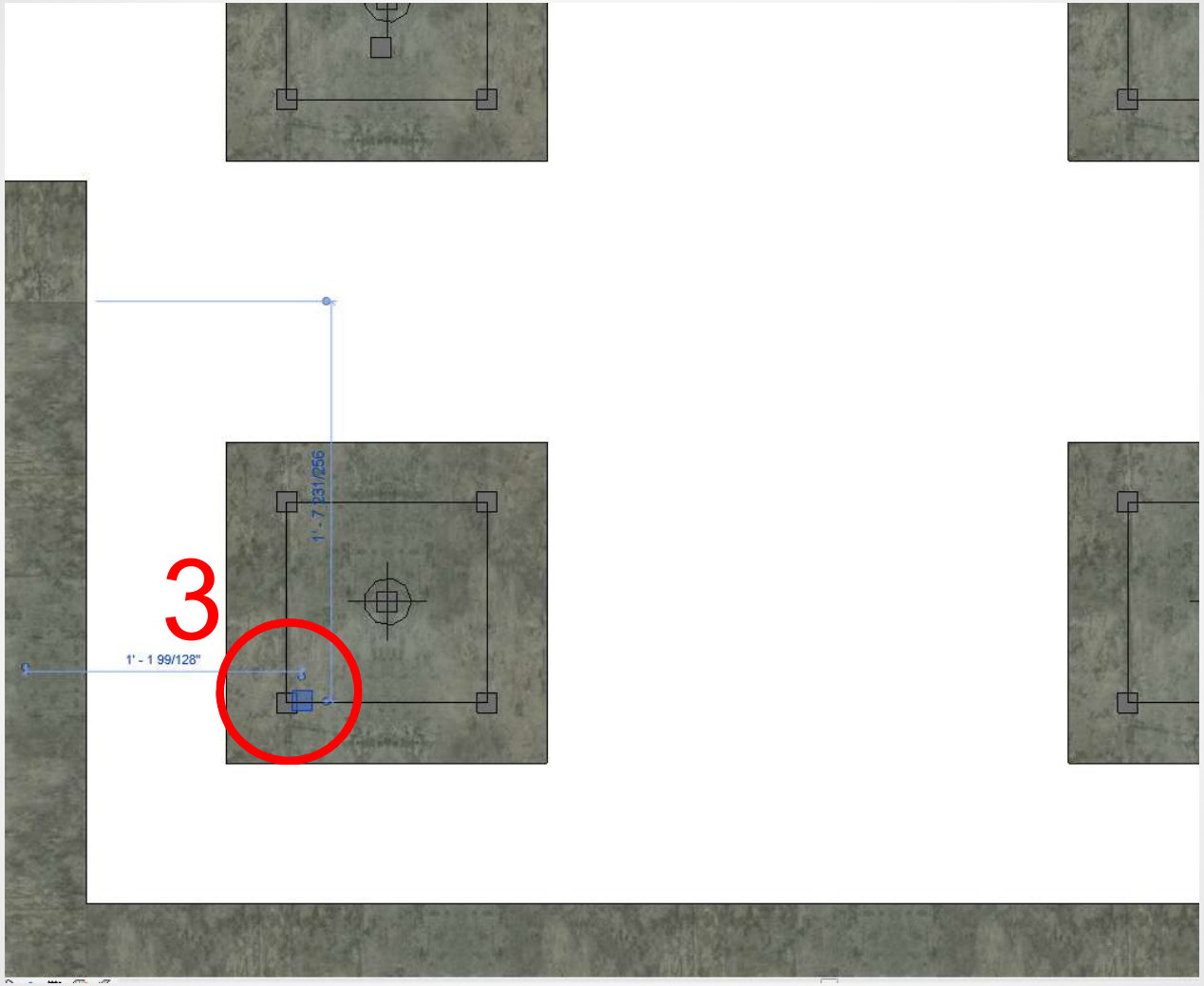
Round Trip into Revit



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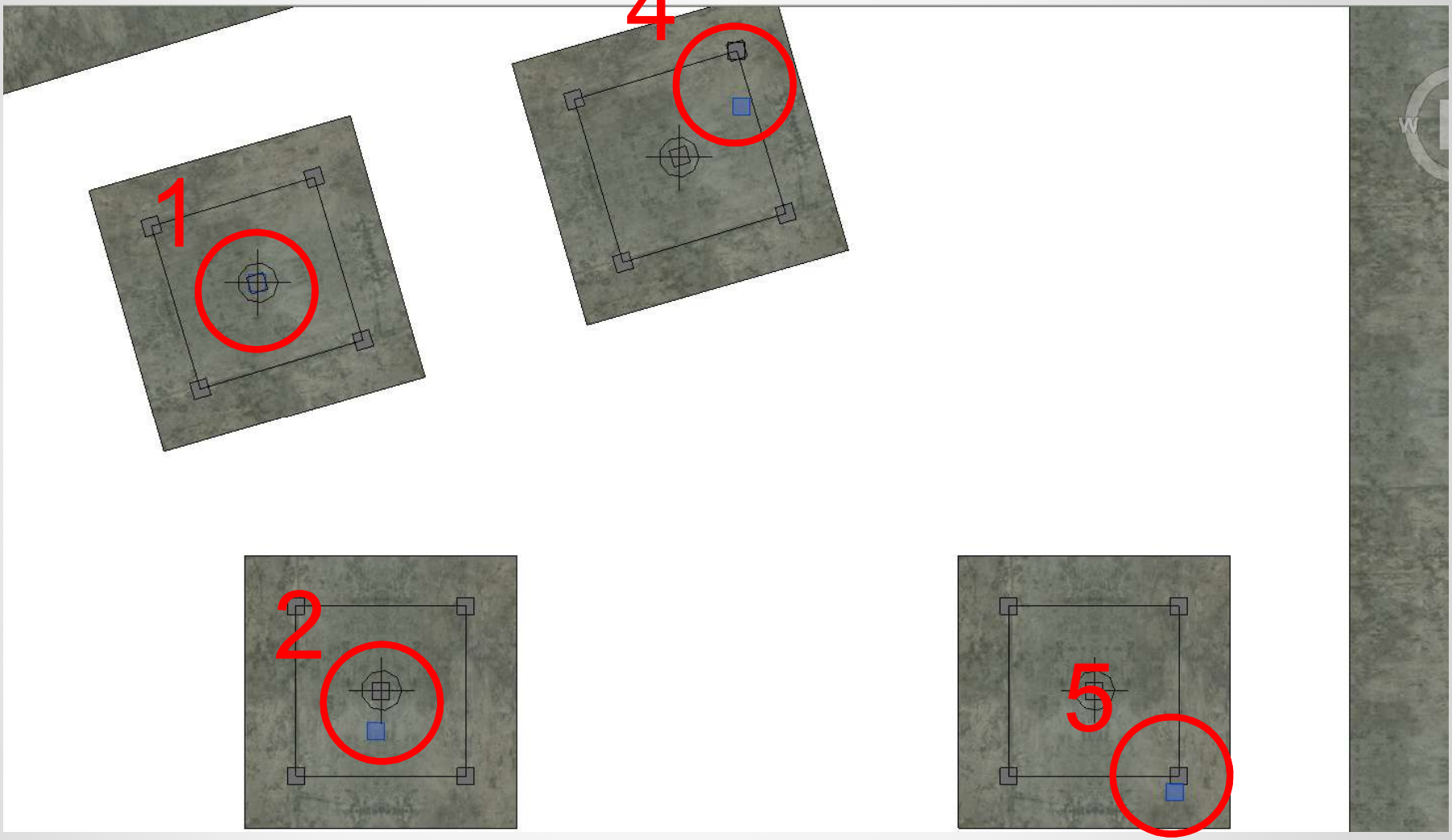
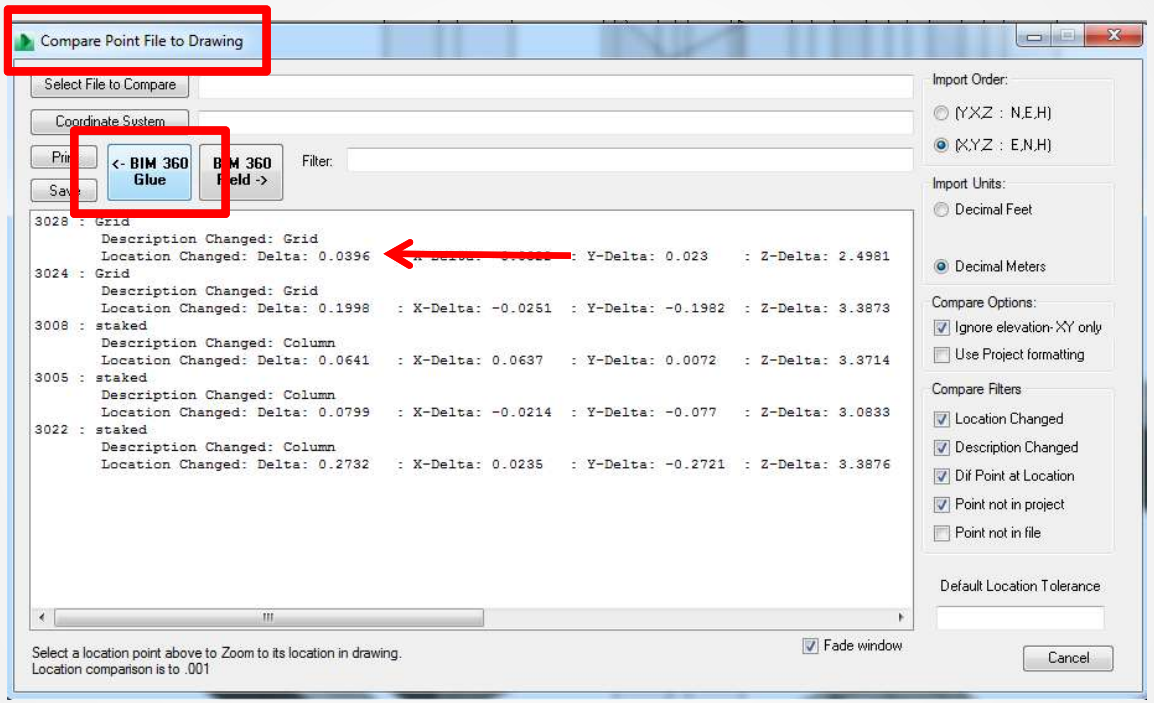
Round Trip into Revit



6 Round Trip into Revit



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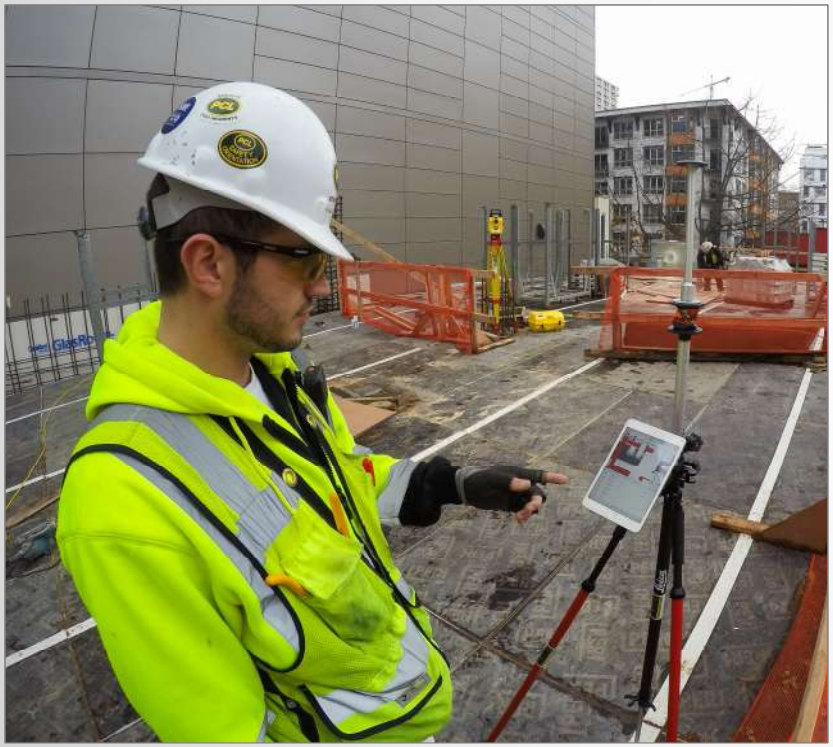

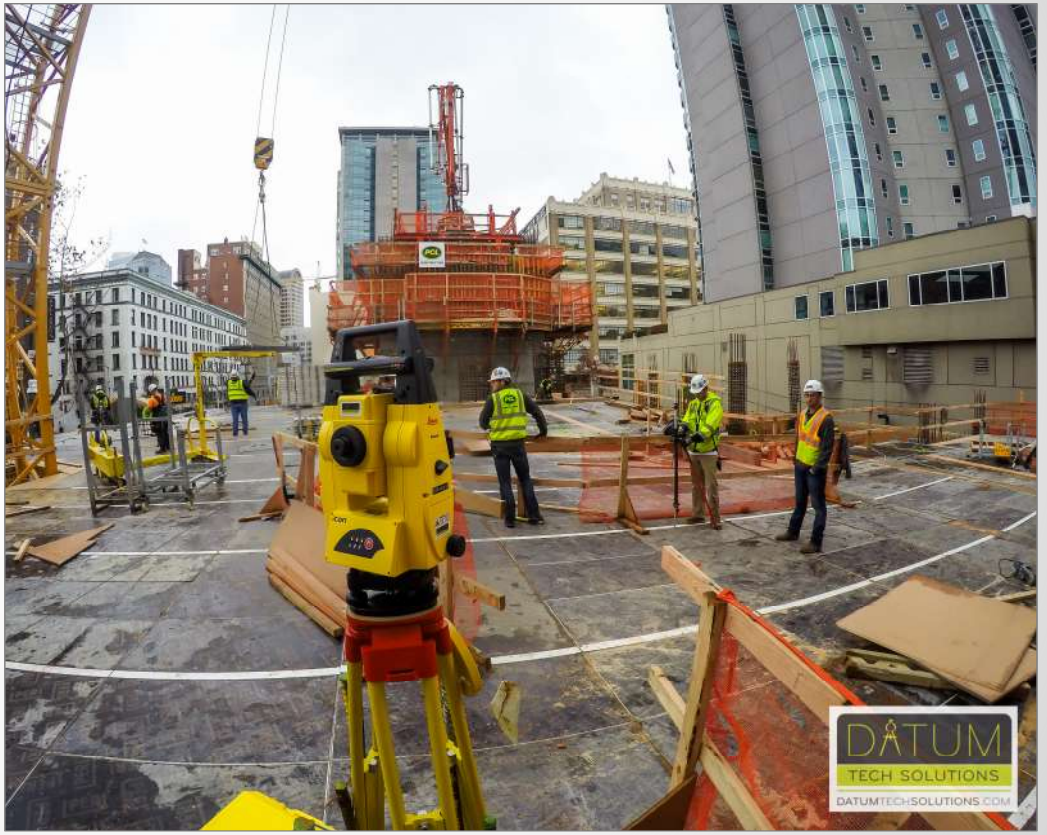

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