# QUALITY

*Presented by:*

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**PCL Construction Services, Inc.**

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**“Providing a quality product that meets expectations the first time, every time”**

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# QUALITY CONTROL

# WHY WE DO IT

Safety

Schedule

Client

Morale

Cost Control

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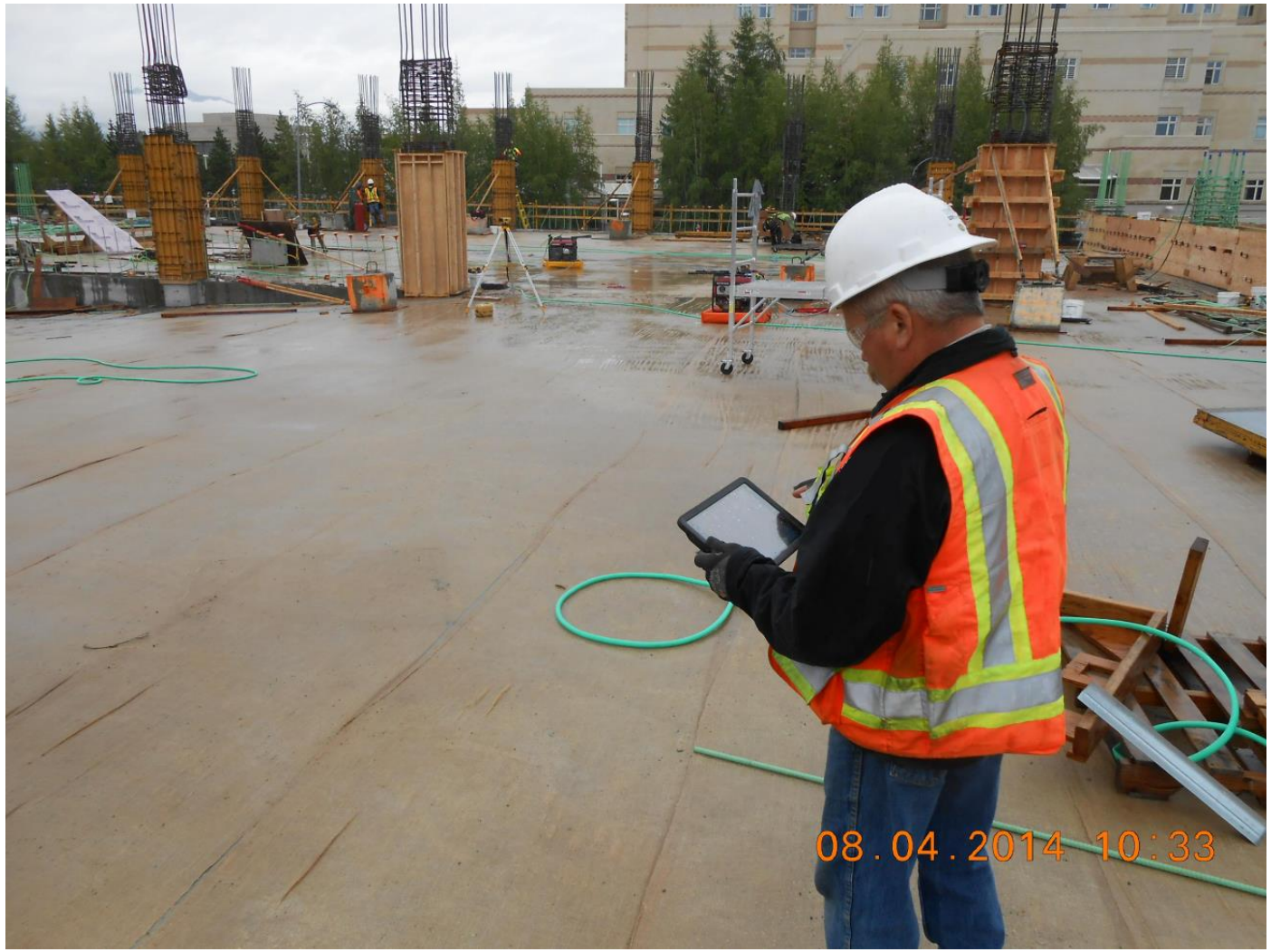
# HOW DO WE DO IT?

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# QUALITY

## ABSOLUTES

Owner Expectations Meeting

Field Pre-Installation Walk-through

Scope Quality Analysis (SQA)

Transparency Regarding Quality

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# First Step Know the Deal

- Quality projects start with understanding requirements
- Review contract, drawings, and specifications
- Identify unique requirements and concerns

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# Estimate Phase

- Outline unique requirements in scope packages to subcontractors
- Before carrying a number into a bid we recap key quality requirements with the subcontractor
- Goal is to provide a bid where all quality elements have been carried by the prime and the subcontractors

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# Award Phase

- Partnering meeting with Owner
- Execute subcontracts with key and unique project requirements written in as line items
- Develop project SQA (Scope Quality Analysis) plans that outline each scope of work
- Meet with subcontractors prior to construction to review their SQA

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# Pre-Construction Phase

- [x] Precon meeting with Owner prior to each major scope to review
  - Safety
  - Schedule
  - Approach of work
  - Tolerances
  - Inspection and testing hold points
  - Mockup or materials

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# Scope Quality Analysis (SQA)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project Number | 5730210 | Project Name | US Bank Cash Vault | SQA # | 001 | Rev # | 0 |
| Scope of Work Description | Taping/Finishing | Contractor Performing Scope | NWP | Sub tier performing Scope | | | |
| Anticipated Date of Installation | 09/06/17 | Pre-Installation Meeting Date | | Meeting Required by Spec (Y/N) | | N | |
| Mock-up Requirements: | Spec/Para | | | | | | |
| Owner Quality Concerns: | Level 4 Finish | | | | | | |
| Final Protection Measures: | Finished walls will be painted. Once walls have been finished all crews will be notified that nothing is to be set against the walls. Take pictures of walls as they are completed documenting time. | | | | | | |

| DESCRIPTION OF TASKS/STEPS | SPEC SEC. / PARAGRAPH | SPECIFICATION REQUIREMENT/ MANUFACTURERS RECOMMENDATIONS | QUALITY RISKS | QA/QC CONTROLS | HOLD POINTS | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | COORD. W/OTHER TRADES | AHJ INSPECT. REQ'D (Y/N) | 3RD PARTY TESTING /INSPECT REQ'D (Y/N) | VERIFY COMPLETE IN FIELD |
| Tape and Finish GWB panels ready for paint using automatic taping tools, hand tools, and joint compound | None Provided | Level 4 Finish | Provide a Level 4 finish | Superintendent and Project Engineer will visually inspect work as it progresses to make sure Level 4 finish is achieved. Progress Photos documenting taping/finishing. | | | | |
| Inspect level of GWB finish with painter and taper for final acceptance before priming | None Provided | Level 4 Finish | Painter begins priming before level 4 finish is completed | Walk walls ready for primer with NWP foreman and IMC foreman the level of finish is achieved before priming | Painters | No | N | Y |
| Allow painter to prime installed GWB | None Provided | Level 4 Finish | Begin painting over primer once primer is complete without touch-up | Coordinate with painters and tapers on when walls will be primed and followed up with touch up. | | | | |
| Touch-up any GWB as needed after the primer has been installed to meet final decoration standards | None Provided | Level 4 Finish | Begin painting over primer once primer is complete without touch-up | Walk walls with finisher after priming identifying areas for touch-up | | | | |
| Inspect GWB for final acceptance | None Provided | Level 4 Finish | Begin painting over primer once primer is complete without touch-up | Walk walls ready for 1st coat of paint with NWP foreman and IMC foreman to ensure the level of finish is achieved before completing painting | Painters | No | N | Y |
| | | | | | | | | |

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# Construction Phase

- [x] Field Engineering Inspections
  - iPad hold-point check sheets
  - Take pictures
  - Get signoffs
  - Confirm sampling and testing has occurred

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# NON CONFORMANCES

1

**Non-Conformance Report (NCR)**

All issues entered into BIM 360 Field

2

**Quality Incident Report (QIR)**

NCR > $2,500 impact or 1+ day on critical path

3

**Lessons Learned**

QIR or other topic that provides valuable information to other PCL'ers

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# NCR LOG

**Why do we do it?**

- Track open deficiencies
- Correct issues before they get forgotten
- Transparency with owner and subs (cloud based)
- Tracking trends

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# QUALITY INCIDENT REPORT

| 5701115 - Potala Tower Mixed-Use Project | Issue Details ID 003163 | PCL CONSTRUCTION |
|---|---|---|

| | | | |
|---|---|---|---|
| **Company** | PCL | **Status** | Closed |
| **Type** | D - QIR | **Due Date** | 08 Feb 2018 12:00 AM |
| **Author** | Josh Miller (jmiller@pcl.com) | **Author's Company** | PCL |
| **Date Created** | 08 Feb 2018 1:28 PM | **Root Cause** | Materials/Mfg Item - MM Procurement Error |

**Description**

During the first jump of the tower crane it was discovered the one of the embeds (shoe templates) was installed in the wrong orientation. This caused the jump to become delayed (jumped Wednesday compared to Sunday) as the strut length had to change, requiring multiple engineers to look at and re-approve. Work could not commence until approved by Morrow, AAI (third party) and CKC (EoR). The embed showed up multiple days late, requiring a rush install as it had to get in before rebar installation could occur.

| | |
|---|---|
| **Location** | Site |
| **Location Detail** | Tower Crane |

**Additional Properties for ID 003163**

| | |
|---|---|
| Catch vs. Incident | Incident |
| Corrective Measure | Approved as-built layout of shoe, requiring added strut length and recalculation of forces by engineer |
| CSI Code (6 digitis) | 01 00 00 |
| Estimated $ Value | 20000 |
| Identified By | C - Field |
| Reoccurrence Prevetion | Material onsite ahead of time, QC of layout, installation, and after the pour to ensure |

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# QUALITY INCIDENT REPORT

| | |
|---|---|
| | accurate placement |
| Rework: PCL Direct Equipment Cost | 0 |
| Rework: PCL Direct Labor Costs (Hourly) | 0 |
| Rework: PCL Direct Material Cost | 0 |
| Rework: PCL Indirect Cost (Pay to Sub) | 2182 |
| Rework: PCL Overhead Costs (GC's) | 0 |
| Rework: PCL Project Staff Costs (Salary) | 0 |
| Rework: Subcontractor Cost | 17818 |
| Schedule Impact (days) | 4 |
| Total Loss Amount ($) | 20000 |
| Incident Date | 16 Dec 2017 QIR ☑ |
| **Priority** | Medium |
| **Clarification needed** | ☐ |
| **Root cause** | MM Procurement Error |

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# INTERNAL COST CONTROL

Quality Incident Reports (QIR's)

- Help track trends
- Entered on BIM 360 Field
- Note the cost code affected (detailed)

*In 2017 the Seattle District had $479k in QIR costs*

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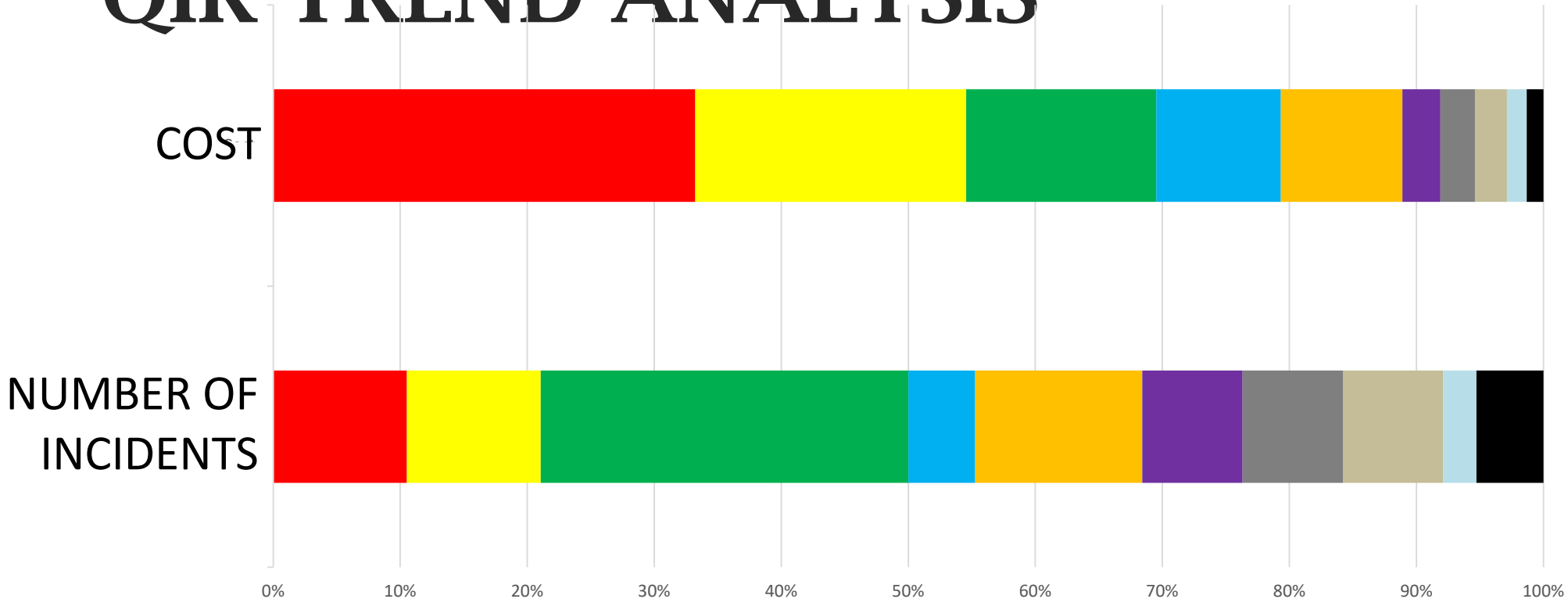
# QIR TREND ANALYSIS




- Product Protection Failure
- Work Plan Failure
- Work Error
- Buy-out Error
- Failure in Doc Control
- Procurement Error
- Design Coordination
- Communication/Info Failure
- Behavioral
- Design Errors & Omissions

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# RECOGNITION AND FEEDBACK

- Monthly Subcontractor Surveys
- Monthly Subcontractor Evaluations
- Owner Surveys
- Quality Crew of the Month
- Quality Subcontractor of the Month

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# TECHNOLOGY

- 3D Modeling
- 360 Degree Cameras
- Laser Scanning
- Drone Inspections

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# 3D MODELING

- Allows us to check for MEP conflict

- Workers can view model in the field to confirm:
  - ✓ Dimensions
  - ✓ Embeds
  - ✓ Penetrations

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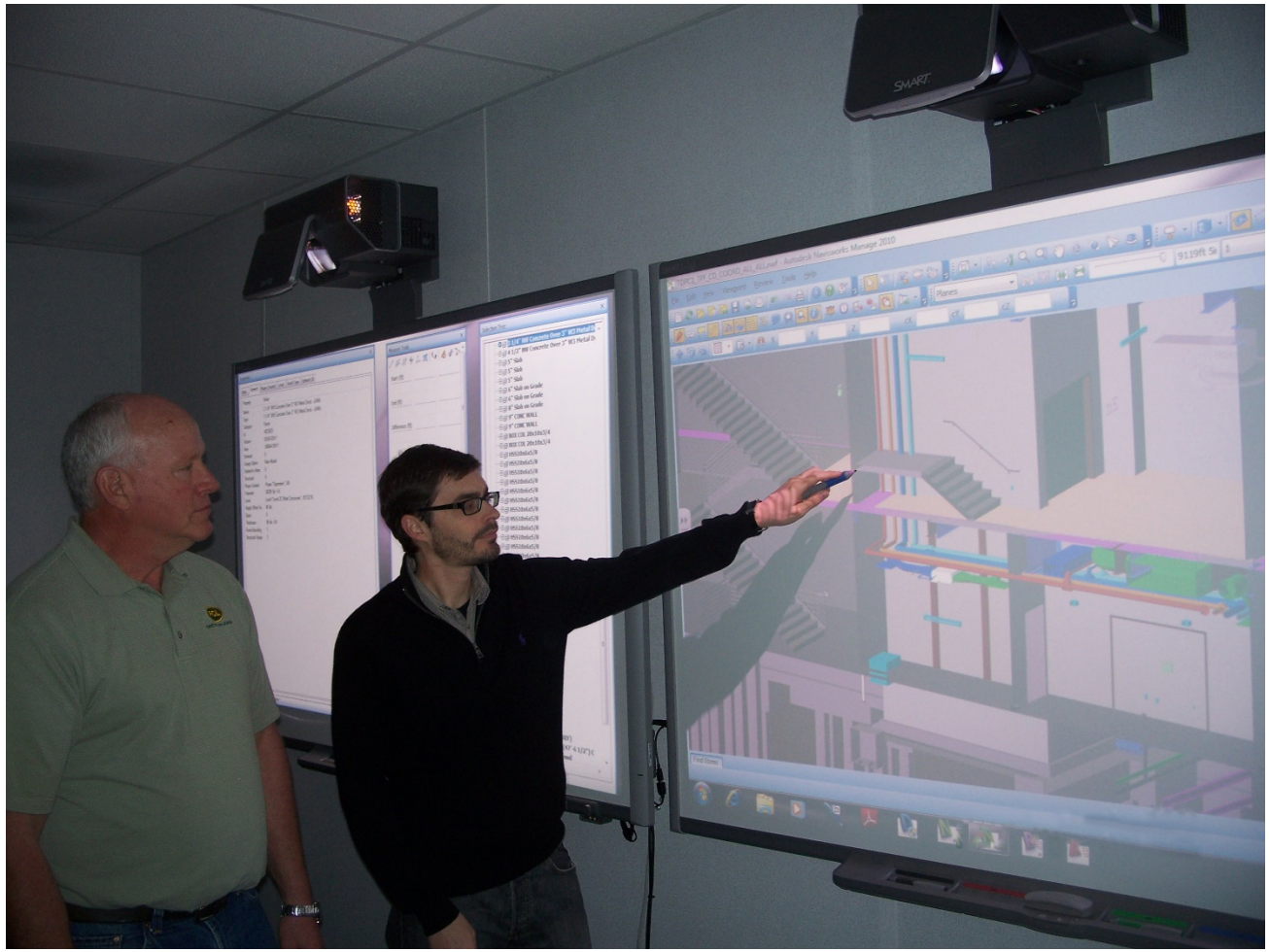
# 3D MODELING

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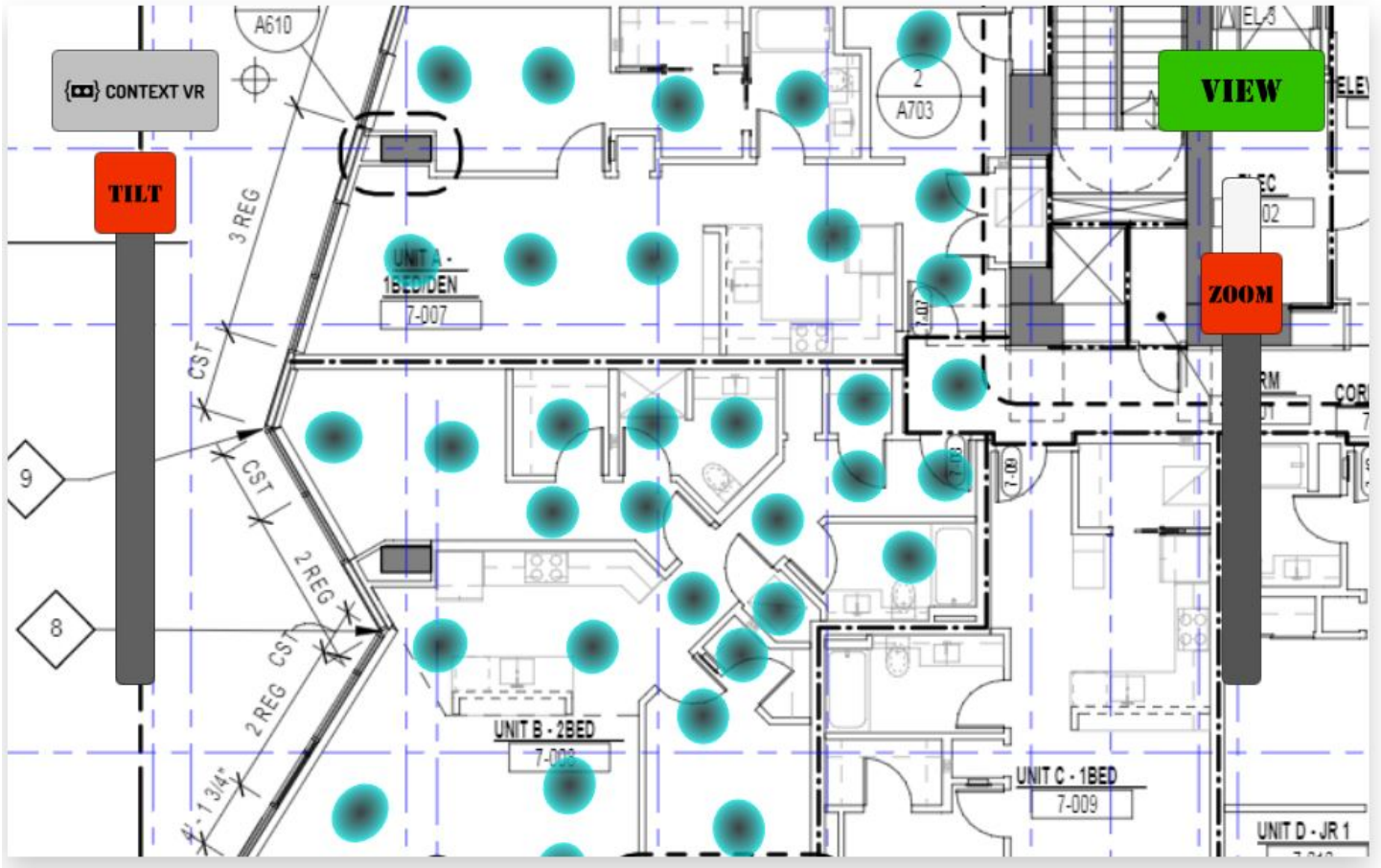
# 360 DEGREE CAMERA

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# 360 DEGREE CAMERA

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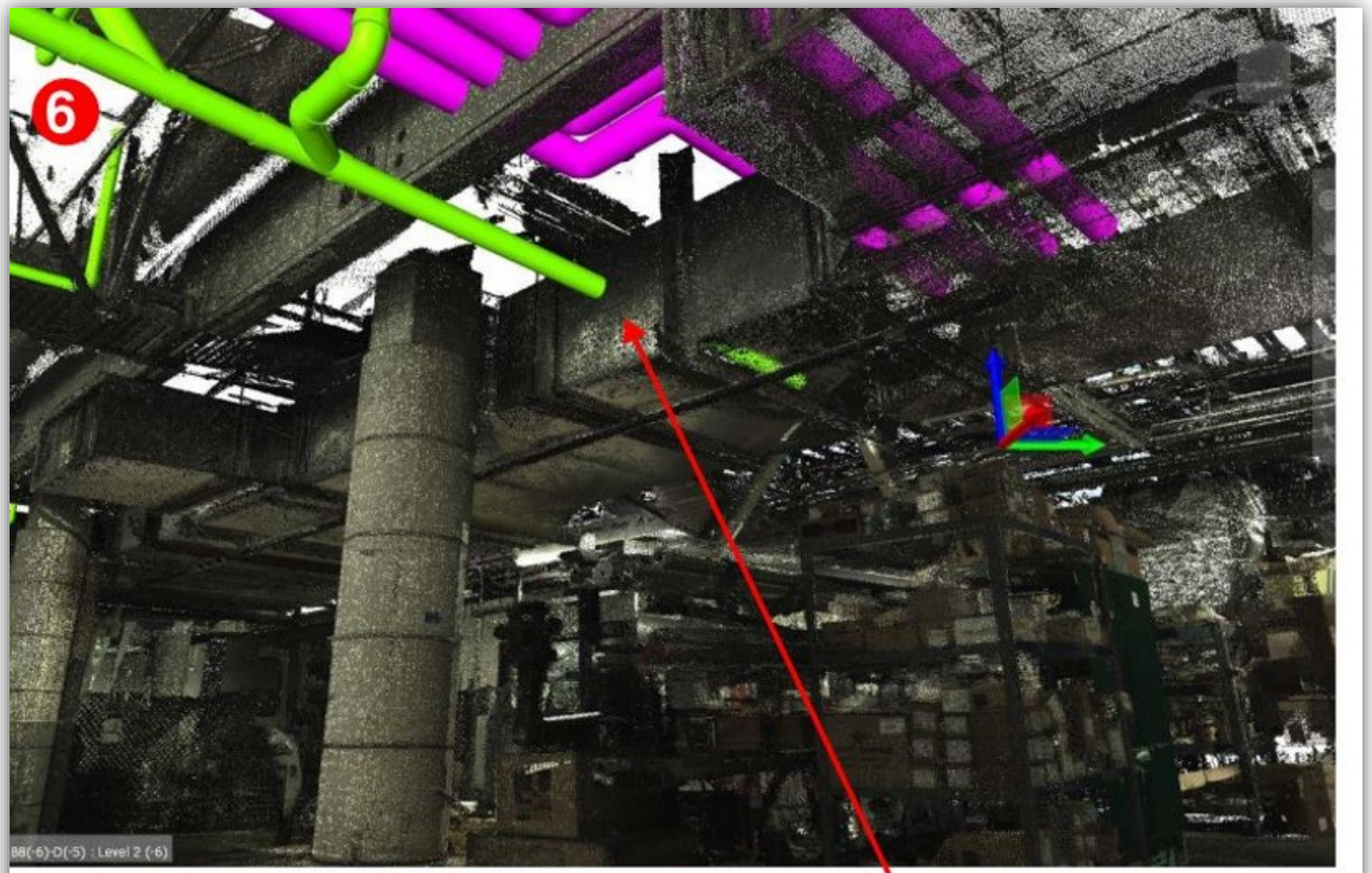
# LASER SCANNING




DESIGN DRAWING LOCATION OF SLOPED WASTE TRUNK CONFLICTS WITH DUCT. IF RE-ROUTING BELOW DUCT, NEED TO CONSIDER LOW HEIGHT CLEARANCE OVER LONG DISTANCE TO EXISTING CONNECTION

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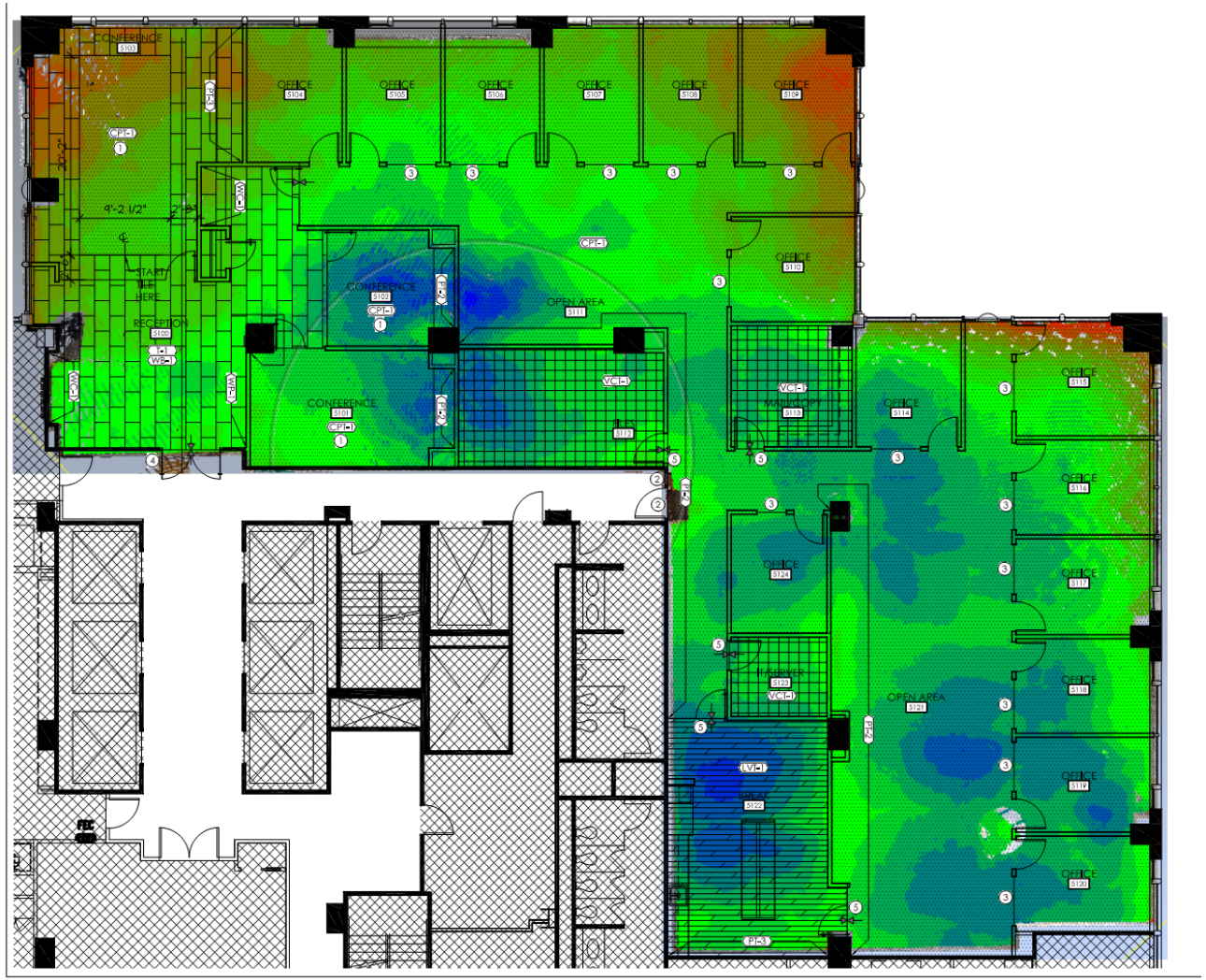
# LASER SCANNING

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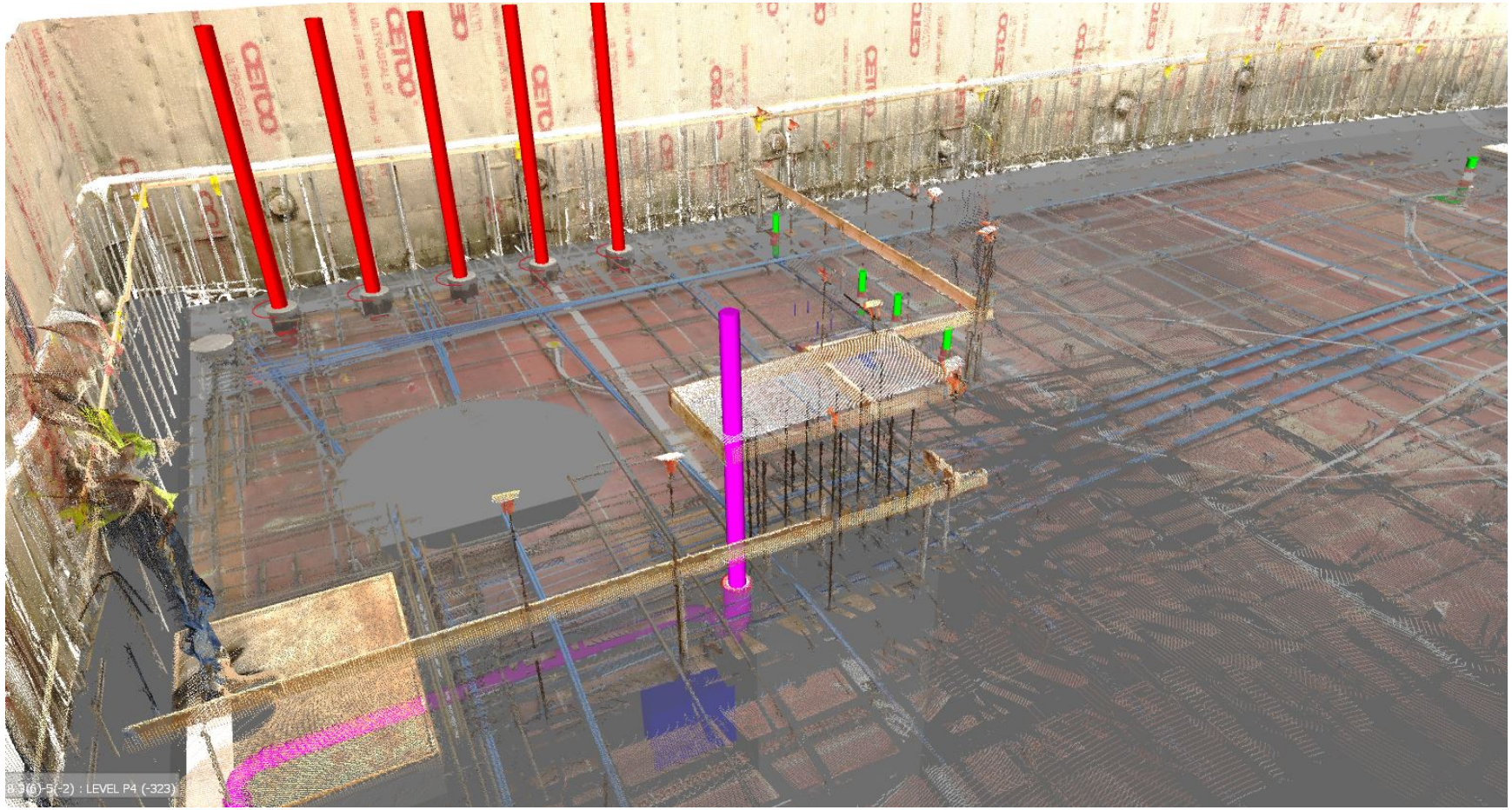


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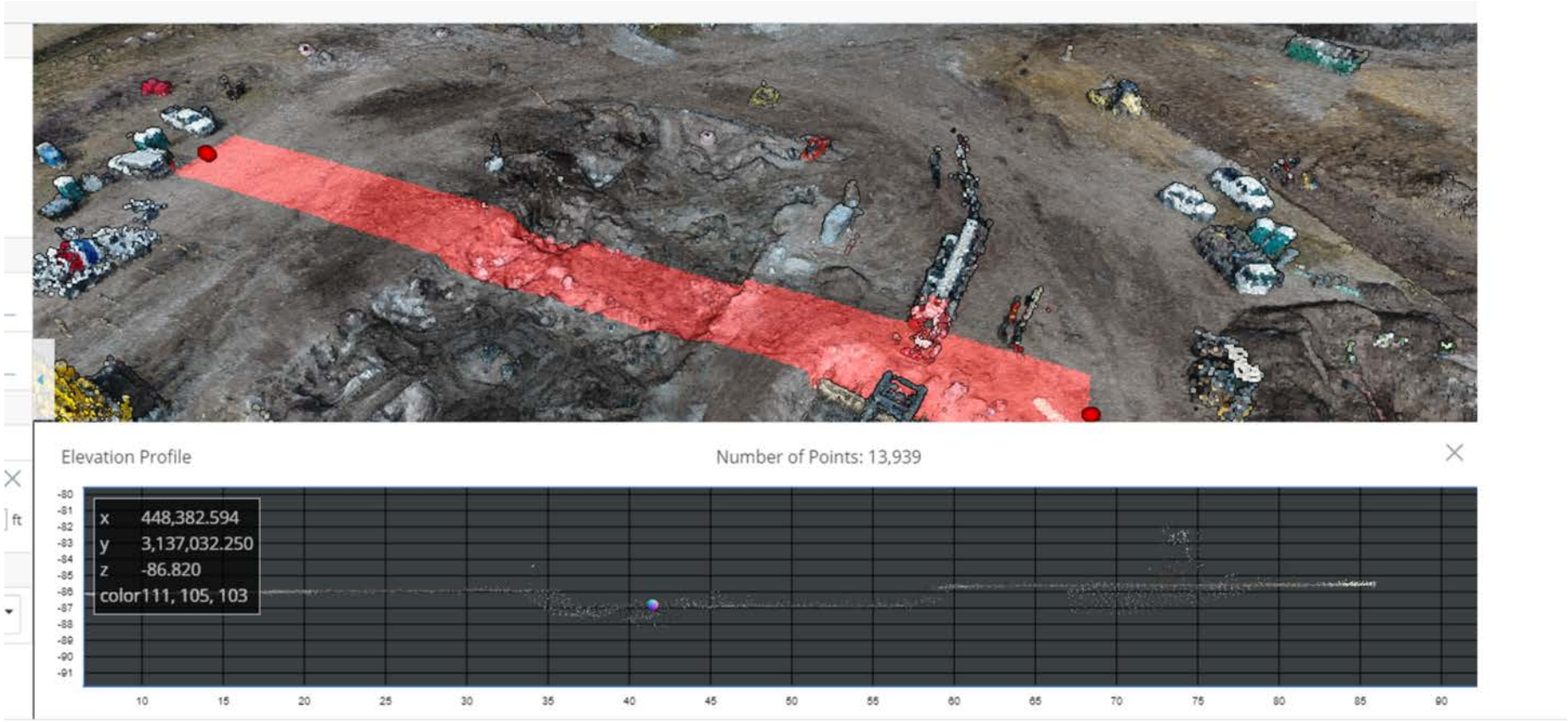
# DRONE INSPECTION

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# QUESTIONS?