Validating Coordination

Present and Future
Validating Coordination: Present and Future

Virtual coordination is only as good as the field installation that follows it. With 3D Coordination now commonplace on most large vertical construction projects, the industry as a whole is bumping into a seldom talked about challenge in construction - quality assurance. We spend tens or even hundreds of thousands of dollars in man-hours developing detailed coordination models to enable pre-fabrication, reduce our schedule risks, and hopefully offer a higher level of quality to our clients. But, how much time do we spend validating that what gets installed actually matches what we coordinated? Why does it matter? How can we efficiently check installation of work and conformance to tolerances? Can laser scanning or other reality capture tools help? To explore this topic we'll show two quick case studies of projects with in-depth coordination efforts that required field validation and the interesting results that were discovered.

Learning Objectives:
1. What the current state of construction validation is.
2. What are practical requirements teams can use for construction validation.
3. What should be in BIM Execution Plans for construction validation.
Agenda

• Goals & Context
• DPR Construction Case Study
• Beck Group Case Study
• Conclusions

#BIMForumED
• 5% to 12% of a construction project’s cost is wasted on rework, schedule delays and downstream clashes.

• This doesn’t even include the costs of these errors to our owners through O&M of the building.

• We all thought 3D coordination would solve this problem – but that isn’t what the data shows.

• Instead, we still have work in the field going in without regard to the coordination models.

$450 Billion in lost profit to the industry

This stack of Benjamins is not to scale
How big is this?

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This stack of Benjamins is not to scale. Really, this *might* be a couple mill...
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Did they burn the drawings? Or use them as Kleenex? Or Charmin?
How to solve it?

• Current workflow is to spot check 5% to 10% with a total station or even a tape measure — this might be inadequate for today’s complex projects.

• Falling prices make the prospect of a laser scanner on every site economically feasible.

• UAV based photogrammetry and the multitude of hand-held mobile mapping solutions are also having dramatic effects on the cost of reality capture.

• New tools are being released every day to leverage that data to solve this problem.
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BLK360
About $16,000

Bring your lazers...
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What if?

• So, what if you could verify 100% of a given scope of work on your jobsite in the same time it takes to spot check 5% or 10% using traditional methods?

• What if you could let computers do what they’re good at and then bring in the humans for the stuff computers can’t do well?

• The answer is... you’d look like this guy -> (curly hair and all – hey, it’s what happened to me!)

Male model dressed up to look like a happy Project Manager.
Case Study - DPR

- Structural Steel
- Pre-existing foundation
- 73 scans, 5 hours in the field
- No benchmark in the field
- ~500 members analyzed
- 3 hours processing, 8 hours of review & reporting
- ~50% of steel was OOT
- 8% required follow up
• 19 members out-of-tolerance on 1st Floor
• 3 items requiring field inspection
• 39 members out-of-tolerance on 2nd Floor
• 9 items requiring field inspection
• Nearly ALL members out-of-tolerance on 3rd Floor
• 16 items requiring field inspection
• 1st Floor perimeter beam at atrium was out of Tolerance by 2”

• Currently analyzing impact on envelope
• Corner of the Building out of Square by 1” on one end of the beam
• Issue is hard to find visually in Point Cloud
• Again, this has an impact on the envelope of the building
• Steel is shown to be angled in the Model, but was installed flat in the field
• Issue was resolved within 1 day in the field because nothing else was in place yet
Case Study - BECK

- MEP/FP and Structure
- Hospital Central Utility Plant
- 13 scans, 2 hours in the field
- Benchmark in the field
- ~1000 elements analyzed
- 15 minutes processing per SOW, 30 minutes of review & reporting per SOW
- Most of the elements showed up as “Not Found”?
MECH PIPING

• Almost 100% (only 6 passing) items were outside of tolerance
• Most large (>6”) pipe was within 12”
• Most small (<6”) was “not found” – not installed anywhere close
WATER

- Not one single item installed within tolerance
- Majority of items “Not Found” signifying that it was not installed anywhere near the intended location
Conclusions

Most of the people we’ve worked with have been shocked at how often work is not installed to plan.

• Add requirements that place fiduciary responsibility on subs that ignore coordinated models during install
• Actually check on them and follow through if they consistently do so
Conclusions

This has a cost that hits the Subs, the GCs and the Owners in the pocketbook.

- A fair percentage of contingencies are set aside for these kinds of issues
- Set contract incentives like shared savings for GCs and Subs to encourage good behavior and protecting those contingencies
Conclusions

Using newer tools designed to take advantage of reality capture and coordination models has benefits over traditional QC methods

- Check everything, not just what you are most concerned about
- Far more detailed results
- Mitigate schedule and budget risk from surprises (sleeper mistakes)
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