Leveraging BIM/VDC & Technology to Support Project Best Practices

Jack Moran
Manager, Virtual Design and Construction Services
Consigli Construction Co., Inc.

4th Generation, Family-Led, Employee-owned Firm, Established in 1905

Washington, DC office established 2014

Annual Volume FY 2019 (projected): $1.875b

1,200 employees, including 350+ skilled carpenters, laborers and masons.

Largest self-performing builder in New England (masonry, finish carpentry, millwork, rough carpentry, demolition, sitework, general labor, concrete)

Top Places to Work in MA, CT, ME, DC, NY

National Top 400 Contractor - *Engineering News-Record*

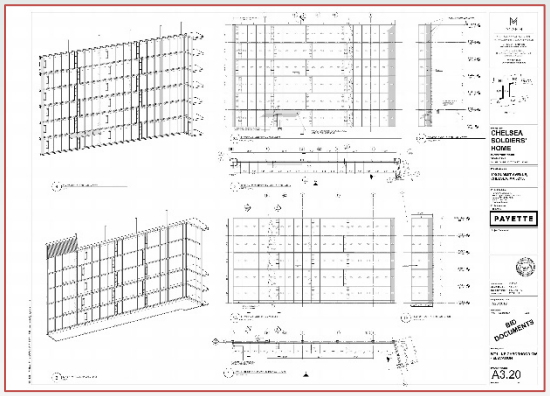
National Top 100 Green Contractor – *Engineering News-Record*

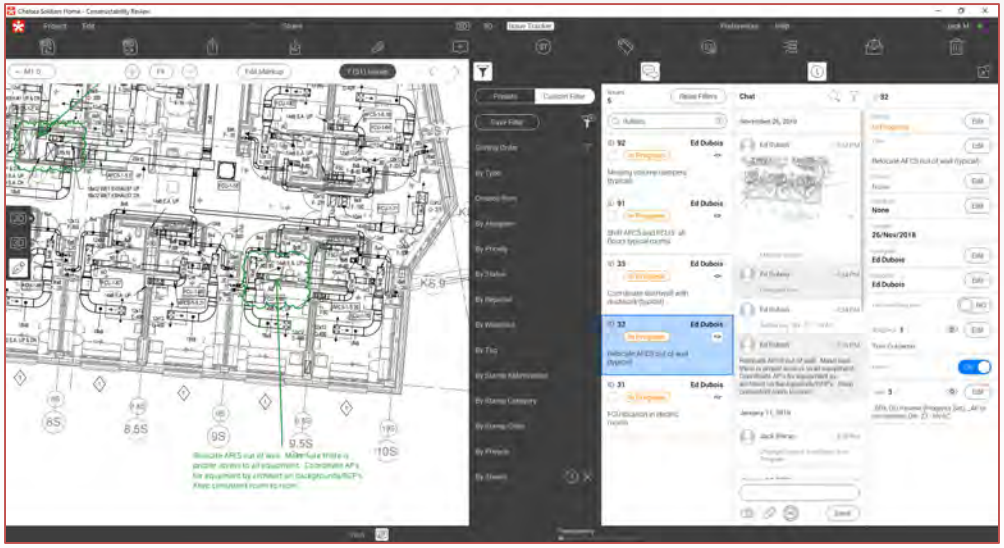
65% of our work comes from repeat clients

BIM Execution Plans

- Goals-based document
- Project specific
- Created in partnership with owner, design and construction teams
- Describes project goals and how BIM/VDC will support them
- Outlines specific project requirements & timelines
- Sets roles, responsibilities
- Establishes processes, standards and protocols

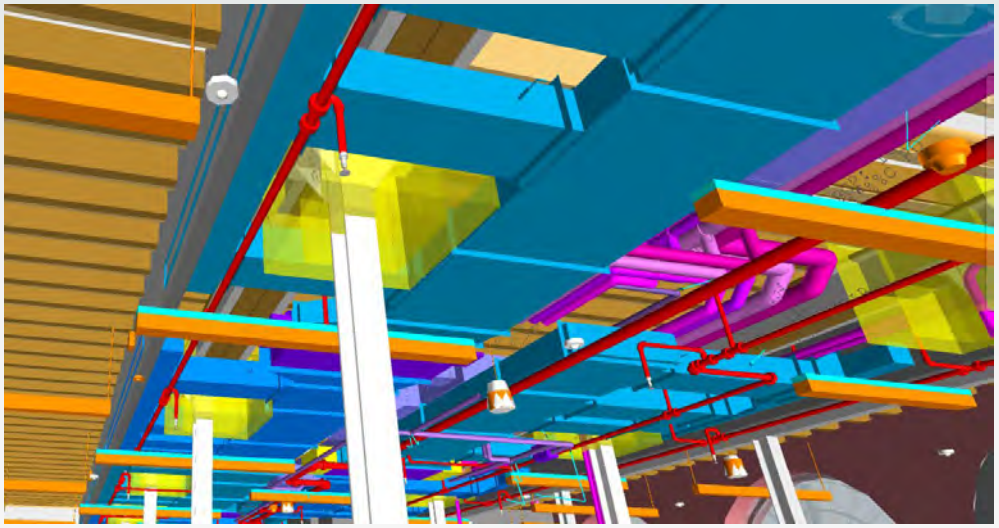
Preconstruction: Improved Tracking of Issues

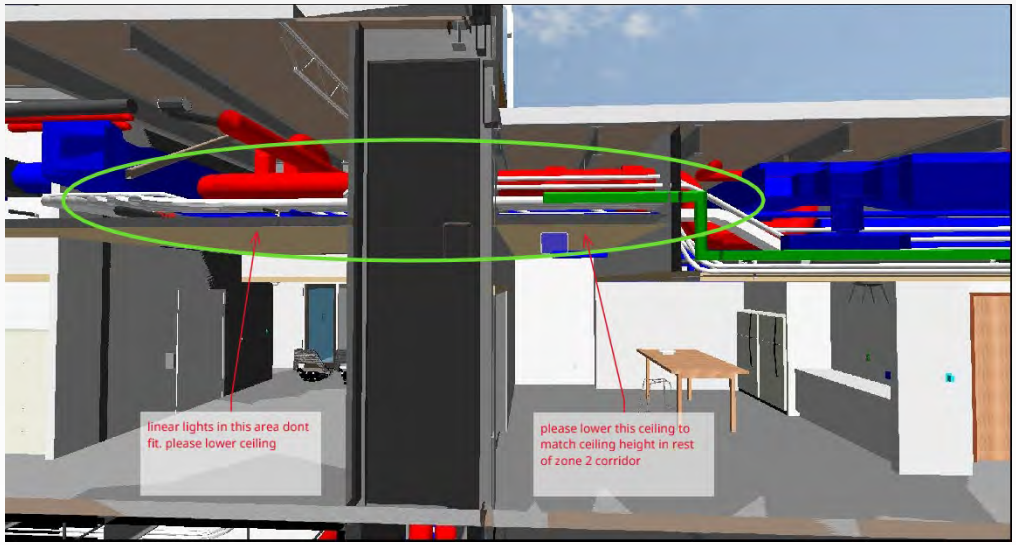




- Utilize 3D models as well as 2D documents
- Used for constructability reviews, value management, etc.
- Identifying & tracking issues in context
- Track issues by tag (division, discipline, etc.)

Preconstruction: “Pre-coordination”

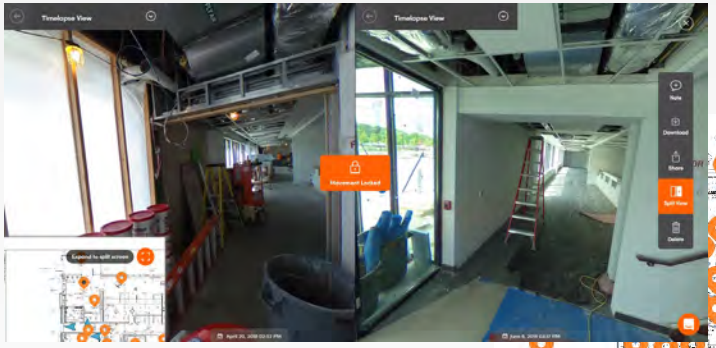


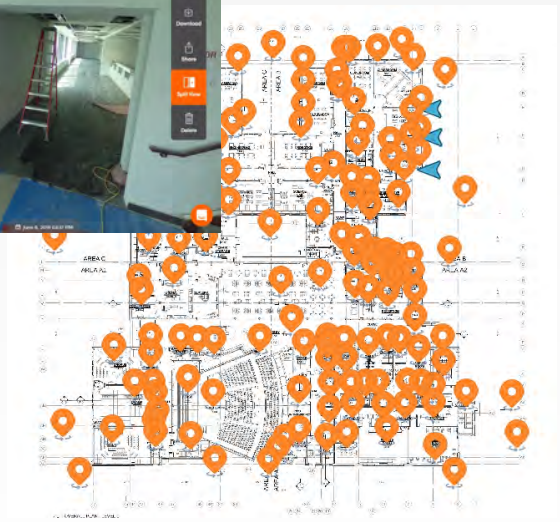


- Engage design team
- Major & typical *design* issues
- Track open issues into building systems coordination (hit the ground running)

Reality Capture

- Laser Scanning
- Matterport
- 360 Degree Cameras
- StructionSite
- Drones

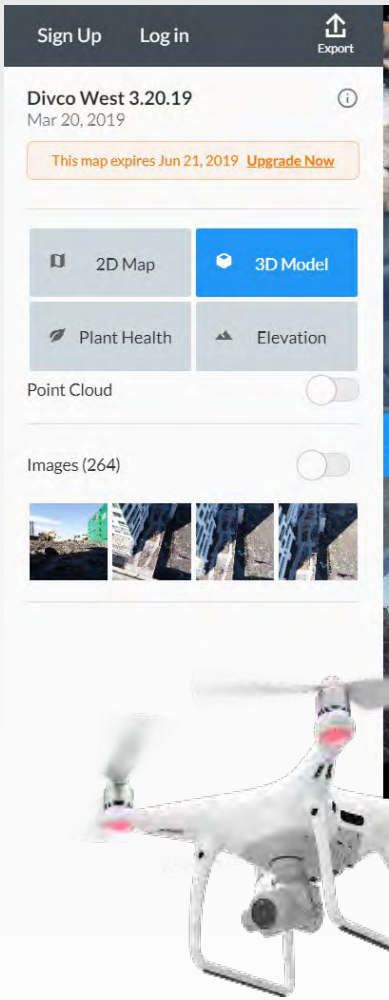


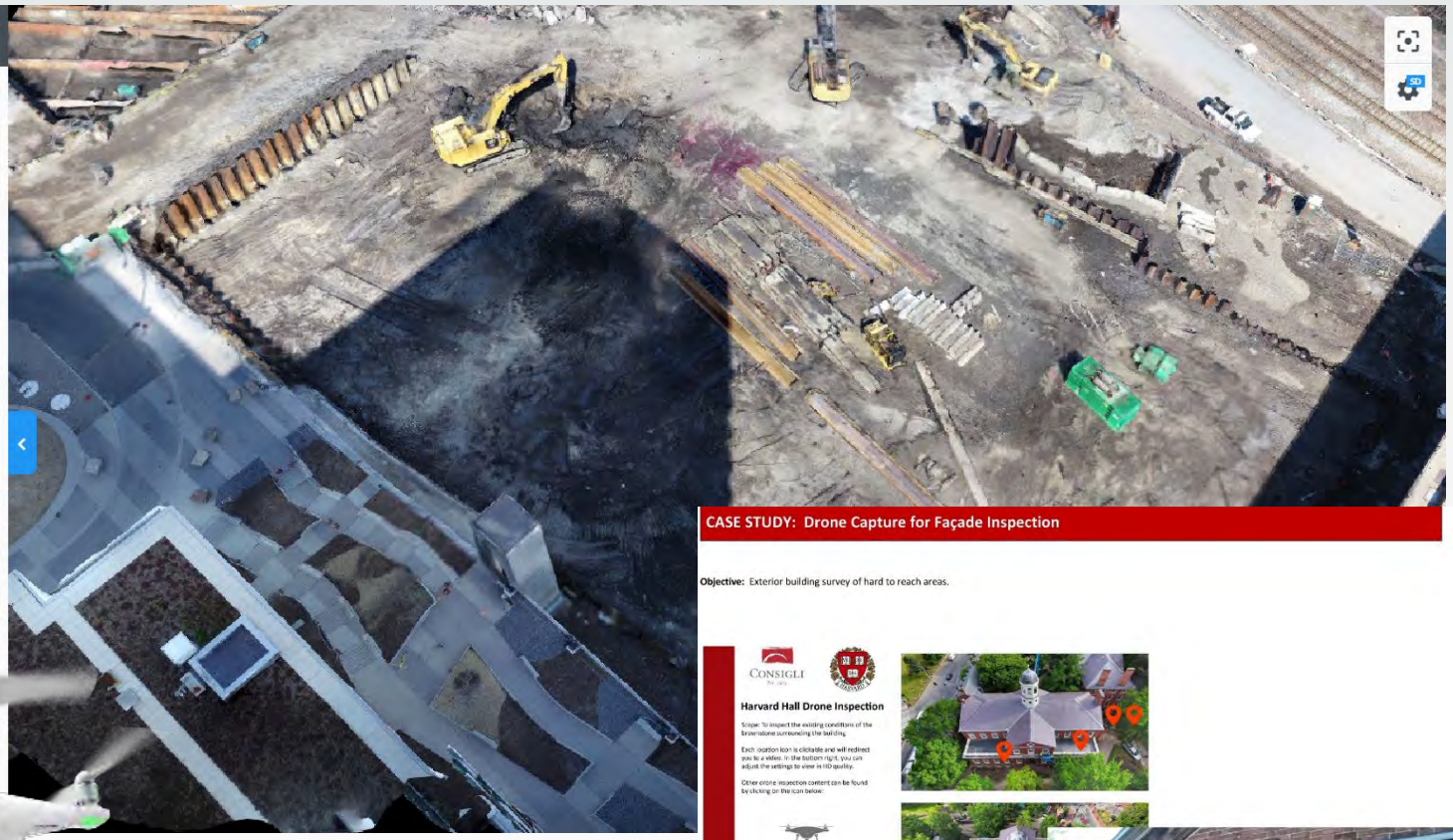


Reality Capture - Matterport

Matterport "Scans" - Existing Conditions

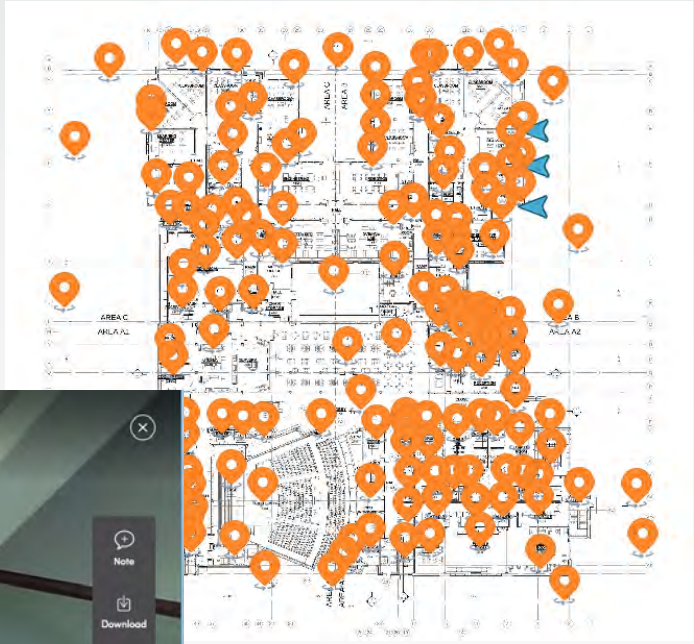
Reality Capture - Drones

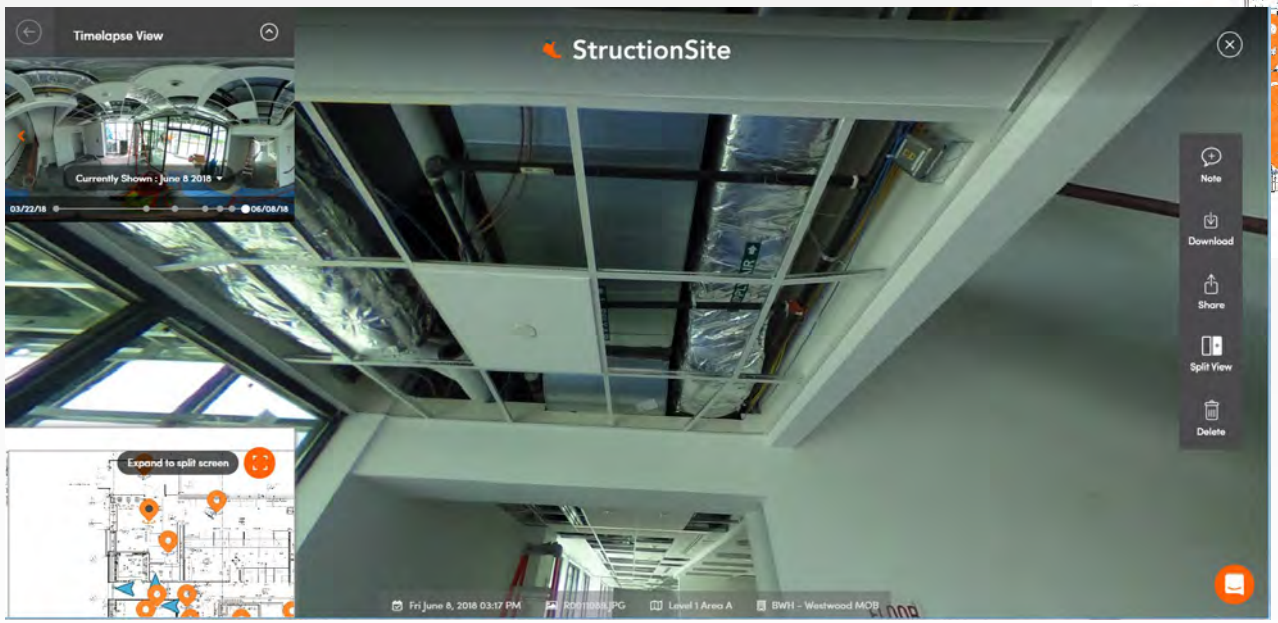




Reality Capture – Photo Management

- Ongoing documentation of project progress
- Standard and 360d photos tied to floor plans
- Integrates with Procore





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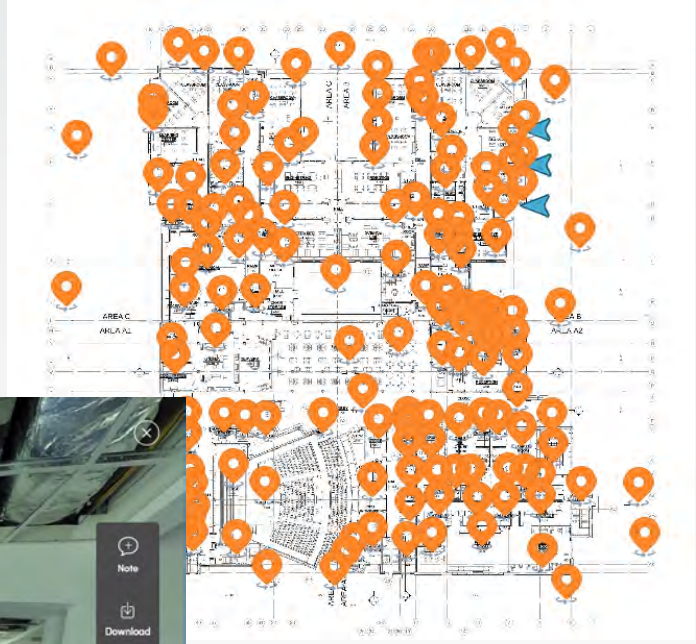
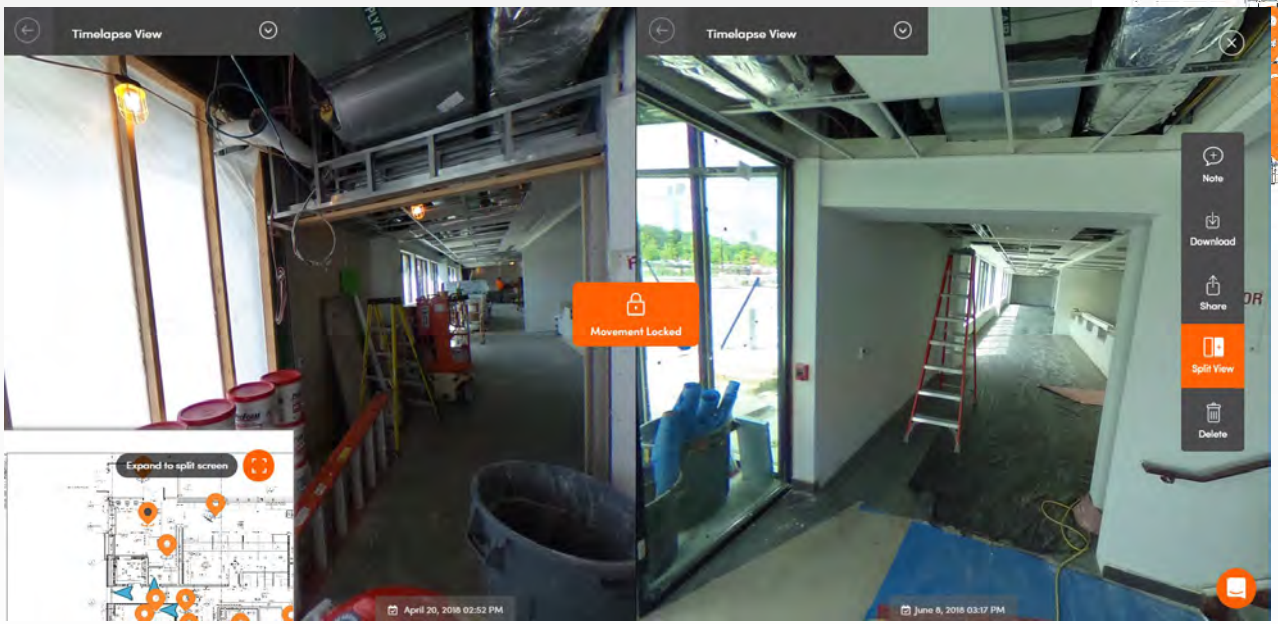




VDC/ TECHNOLOGY BEST PRACTICES: REALITY CAPTURE

Smithsonian Renwick Gallery

Life Safety and Accessibility Upgrades

New Mechanical Systems

Window Replacement

Restoration of Gallery Spaces

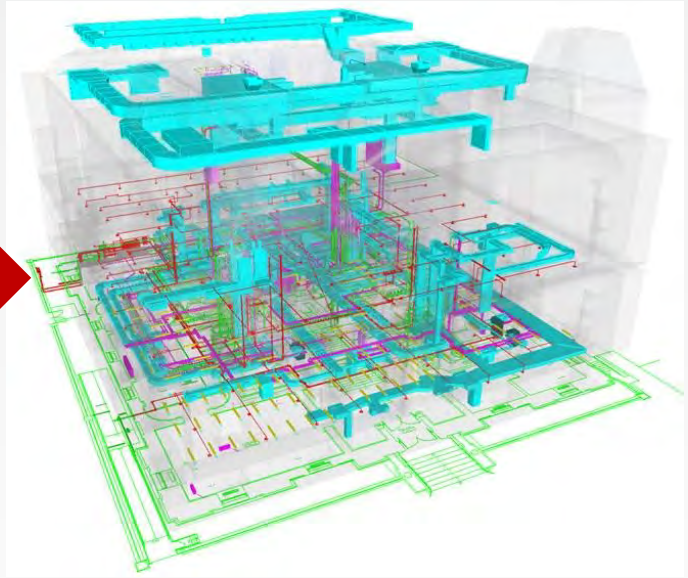
Design Team:
Westlake Reed Leskosky
Woods Peacock Engineering

Completed 2015

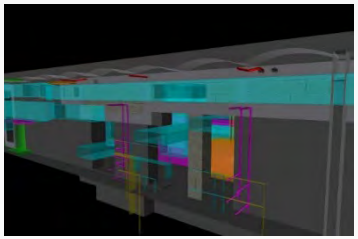
VDC/ TECHNOLOGY BEST PRACTICES: REALITY CAPTURE

- All design documents were 2D
- Project “needed” to be coordinated in 3D

Laser Scan of Existing Conditions

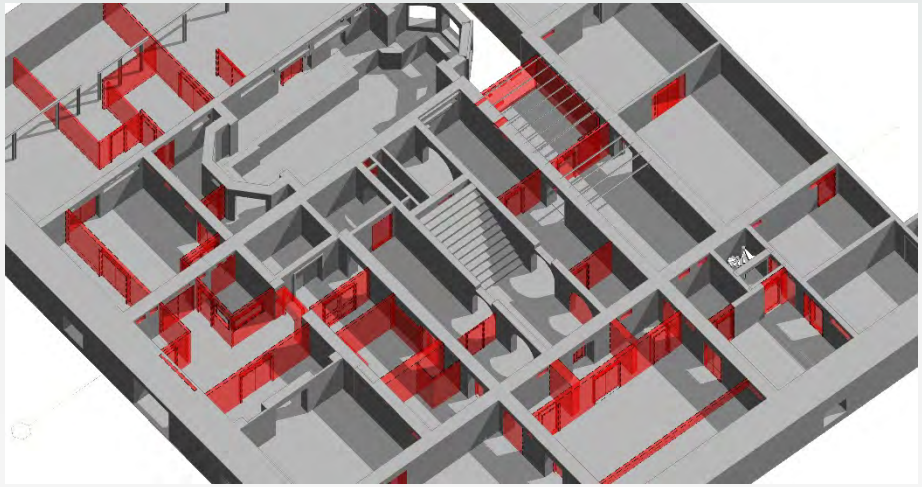


M/E/P/F Coordination



VDC/ TECHNOLOGY BEST PRACTICES: REALITY CAPTURE

- Virtually “built” the project
  - Simulated demolition
  - Modeled new architectural and structural elements



- Collaboratively identified & solved design/ constructability issues & opportunities

VDC/ TECHNOLOGY BEST PRACTICES: REALITY CAPTURE

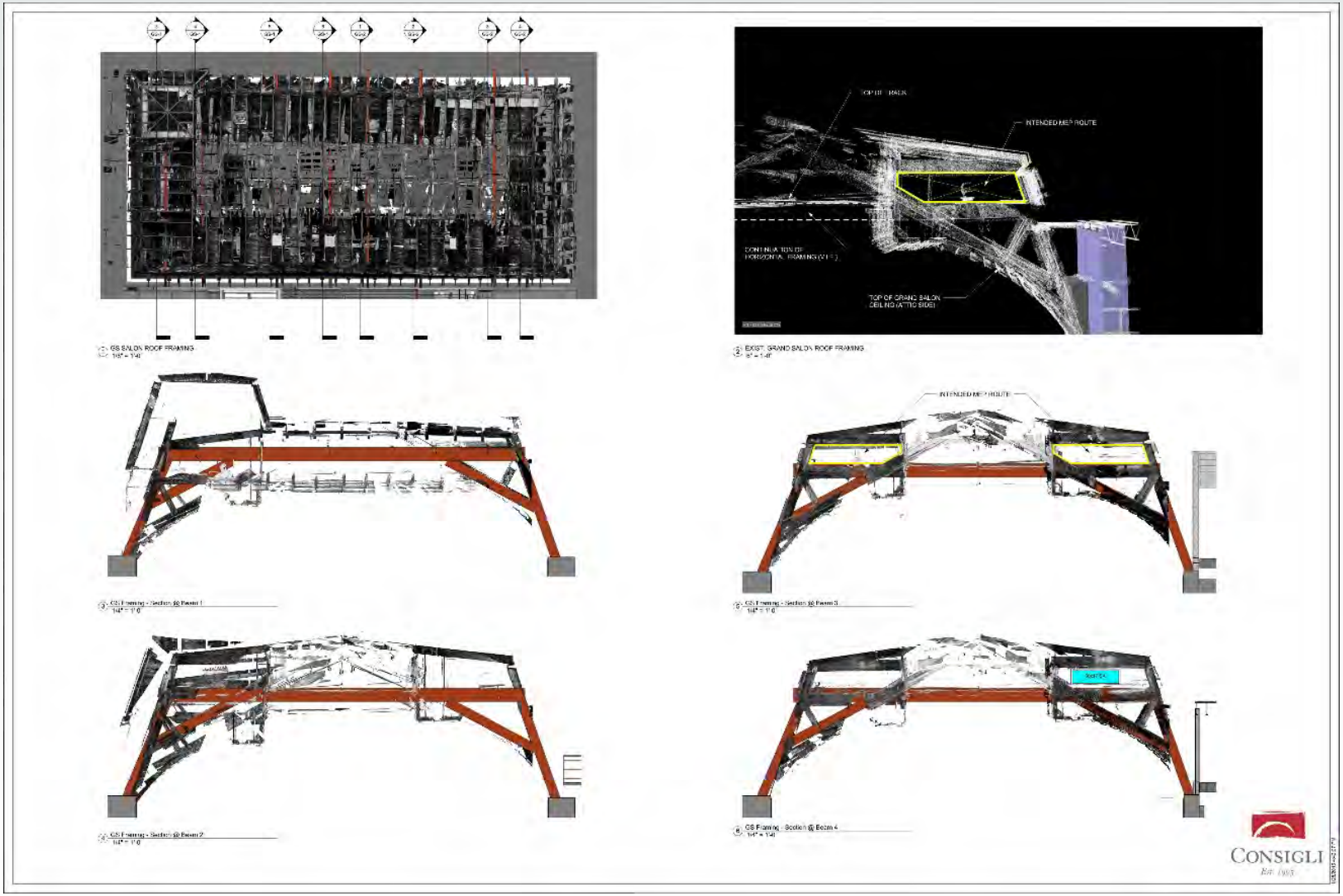
Grand Salon

- (8) Structural Steel Trusses
- Support up to 80,000 lbs to provide flexibility for future art installations
- No visible impact to existing architecture (ceiling, laylight, roof)

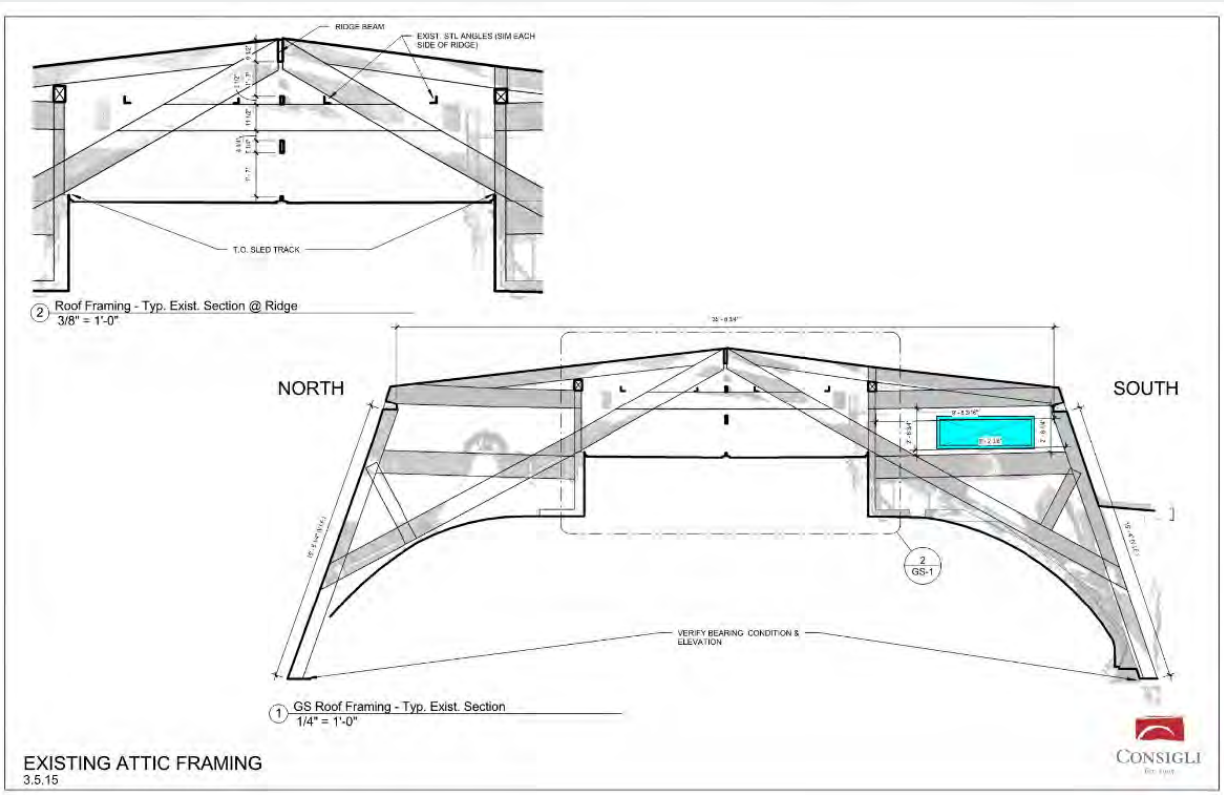
VDC/ TECHNOLOGY BEST PRACTICES: REALITY CAPTURE

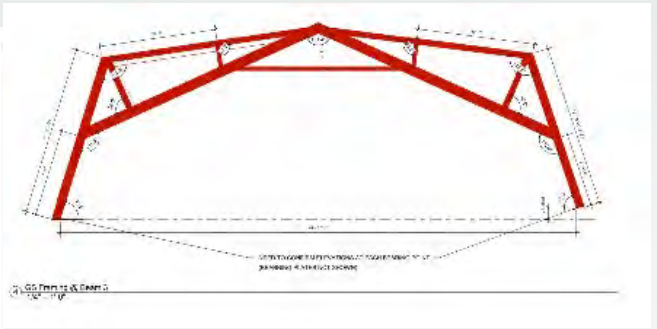
Scan of Attic above Grand Salon

VDC/ TECHNOLOGY BEST PRACTICES: REALITY CAPTURE

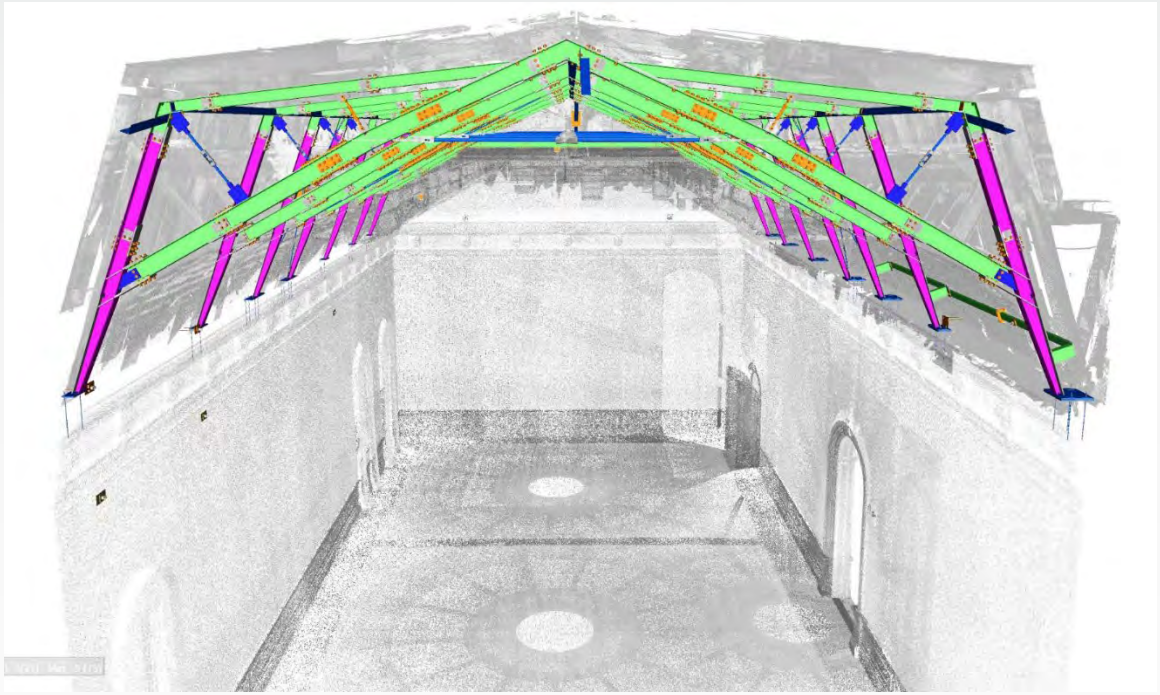


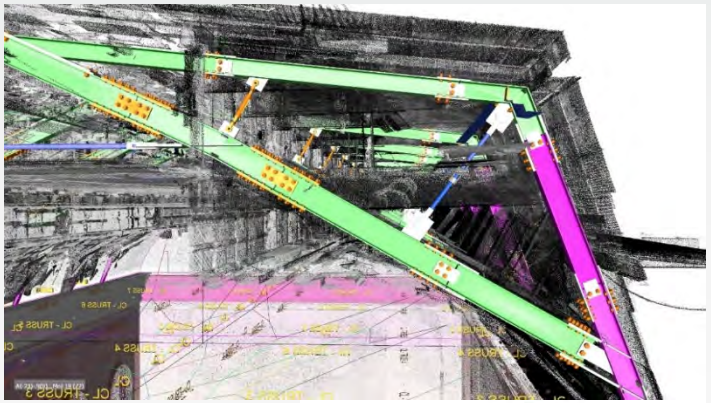
VDC/ TECHNOLOGY BEST PRACTICES: REALITY CAPTURE

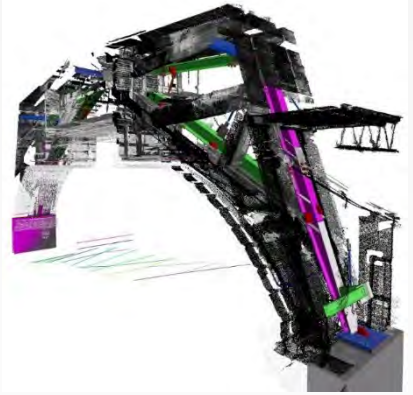




Smithsonian Renwick Gallery







Smithsonian Renwick Gallery

VDC/ TECHNOLOGY BEST PRACTICES: REALITY CAPTURE

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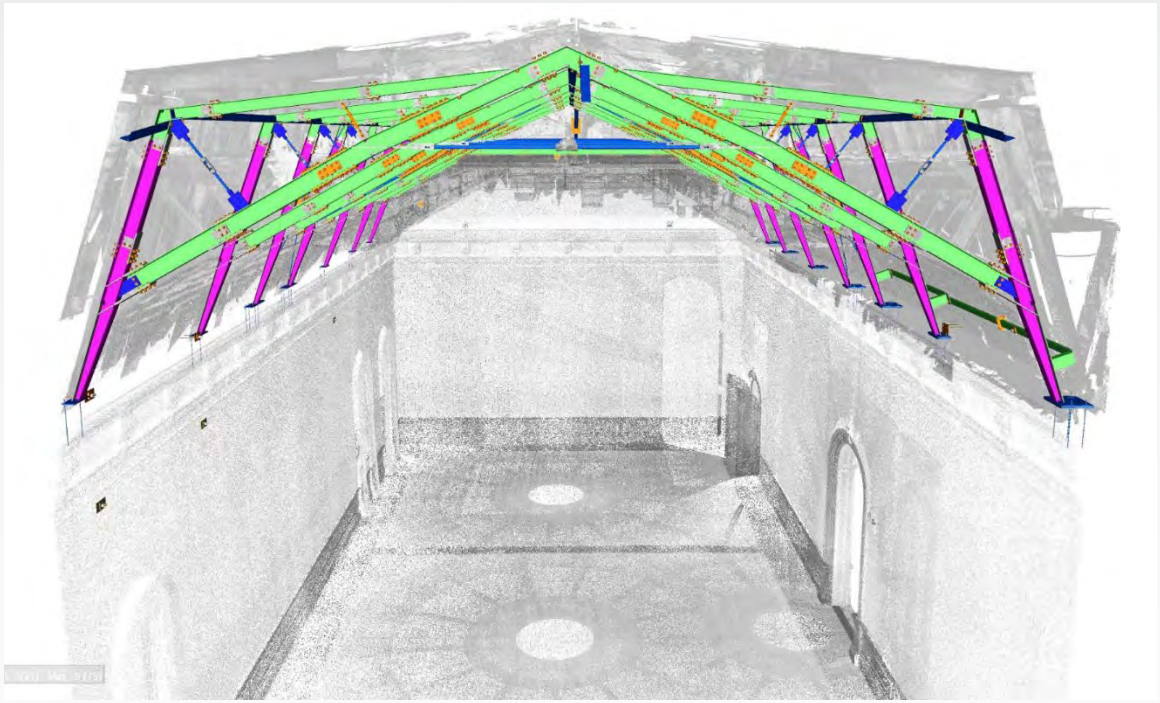
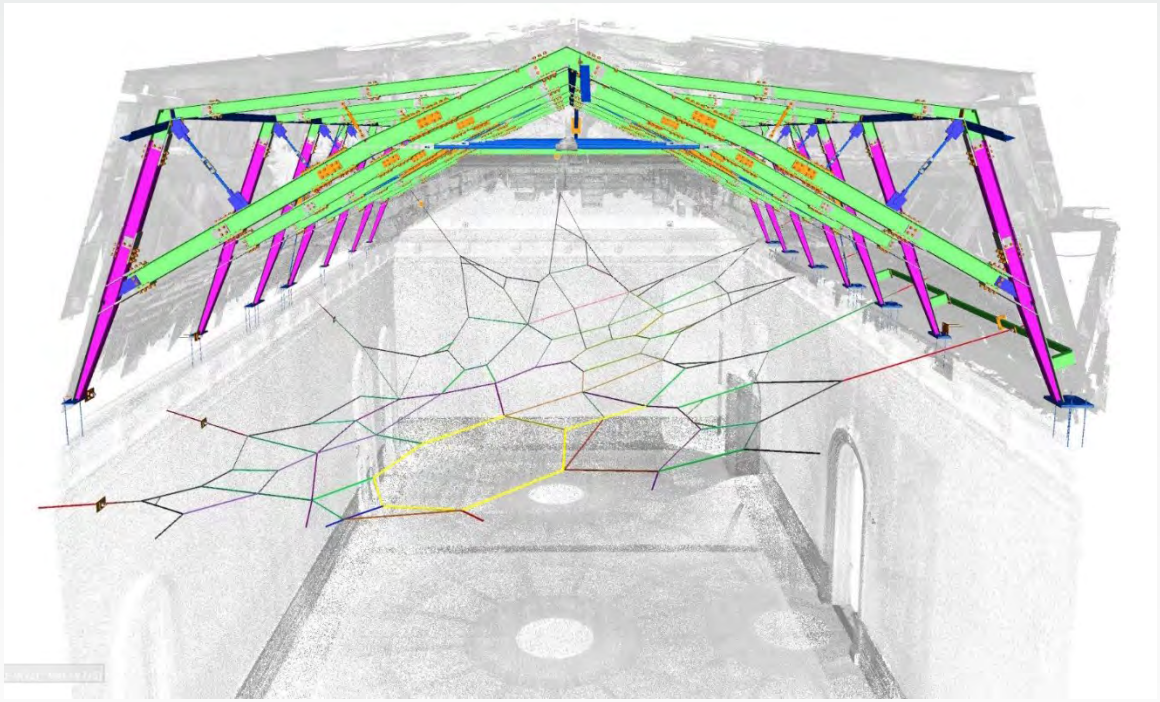


Coordination of Temporary Art Installation: 1.8 by Janet Echelman



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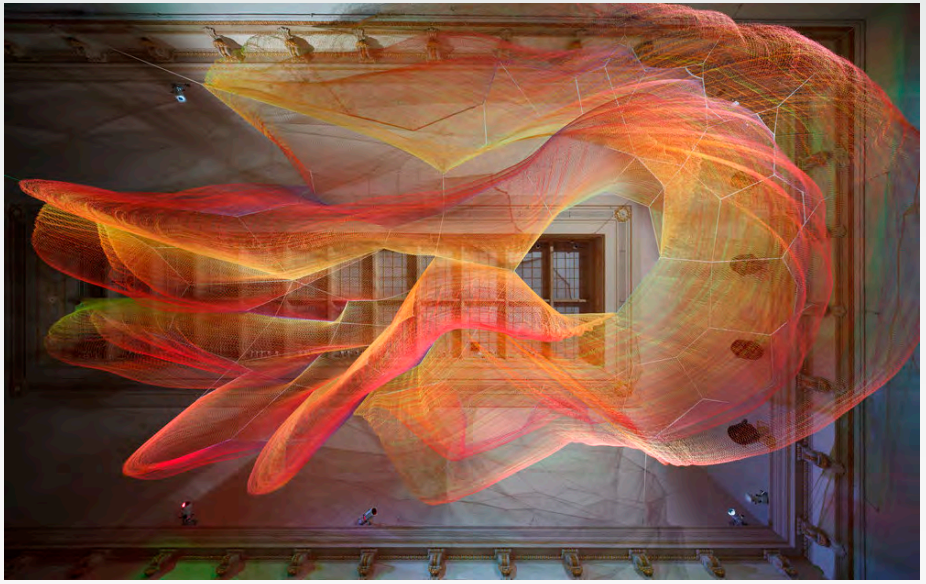
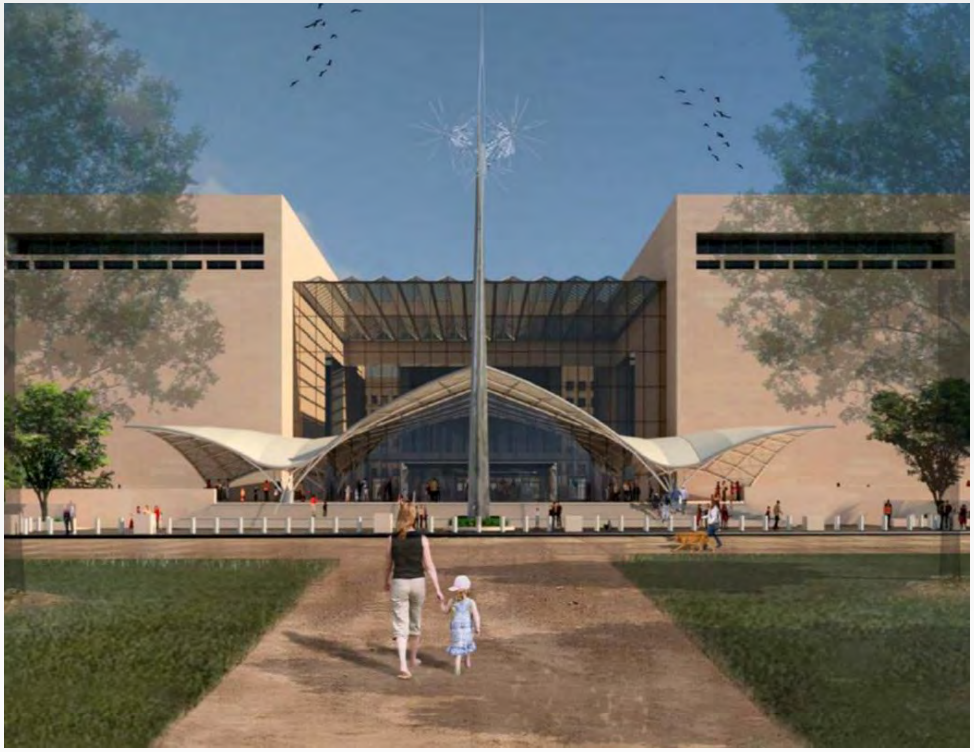


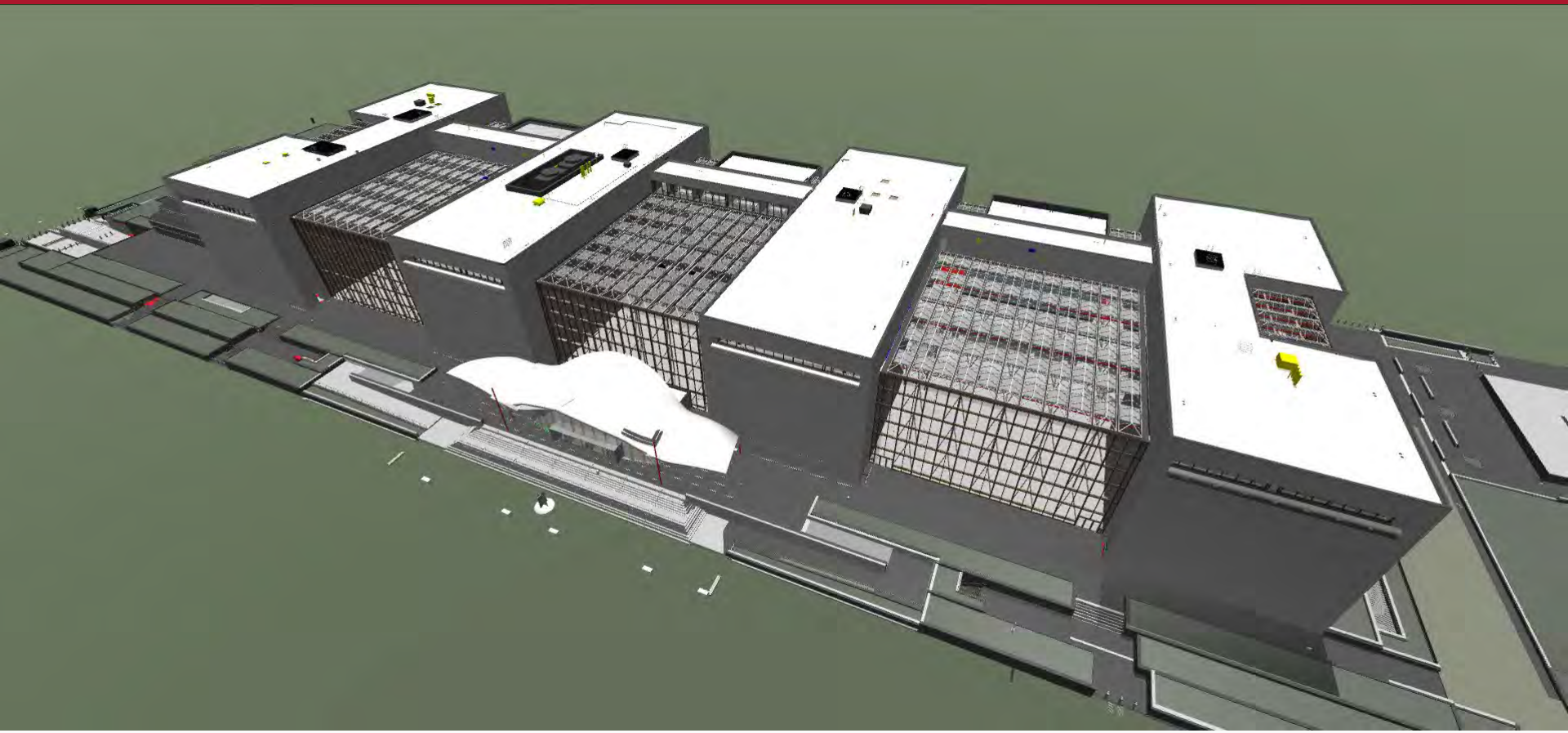
1.8 by Janet Echelman

Smithsonian Institution's National Air and Space Museum Revitalization



- Exterior envelope replacement, incl. stone façade, curtainwall & skylights
- Full MEP replacement/ upgrade
- Upgrade security monitoring
- New exhibits
- Interior architectural modifications
- Structural modifications
- Site work – including 2 in ground cisterns and fountain
- Terrace and entrance restoration
- Entry vestibule addition

QUINN EVANS ARCHITECTS | CLARK CONSTRUCTION | SMOOT CONSTRUCTION | CONSIGLI



- 20+ design models (more than 9gb)
- 3000 sheet drawing set
- 30+ trade models (to date)

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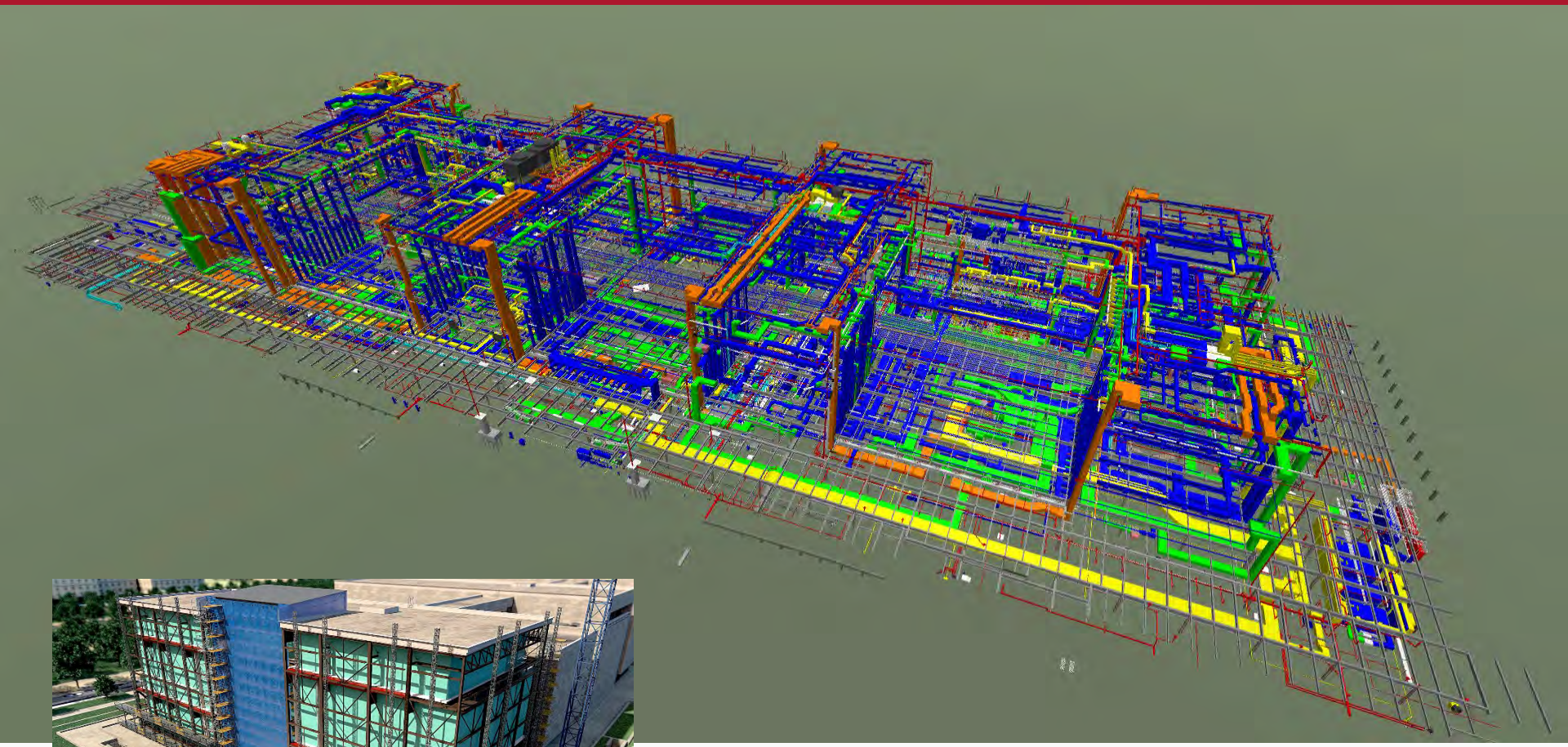

Smithsonian Institution's National Air and Space Museum Revitalization

BIM Requirements and Deliverables:

- Existing Conditions Confirmation
- Site Logistics/ Utilization Planning
- 4D Phasing/ Sequencing Planning
- Building Systems Coordination
- Record Modeling (Construction Model)
- Asset Management (including equipment taken offline)

- Regular submissions tied to pay req's

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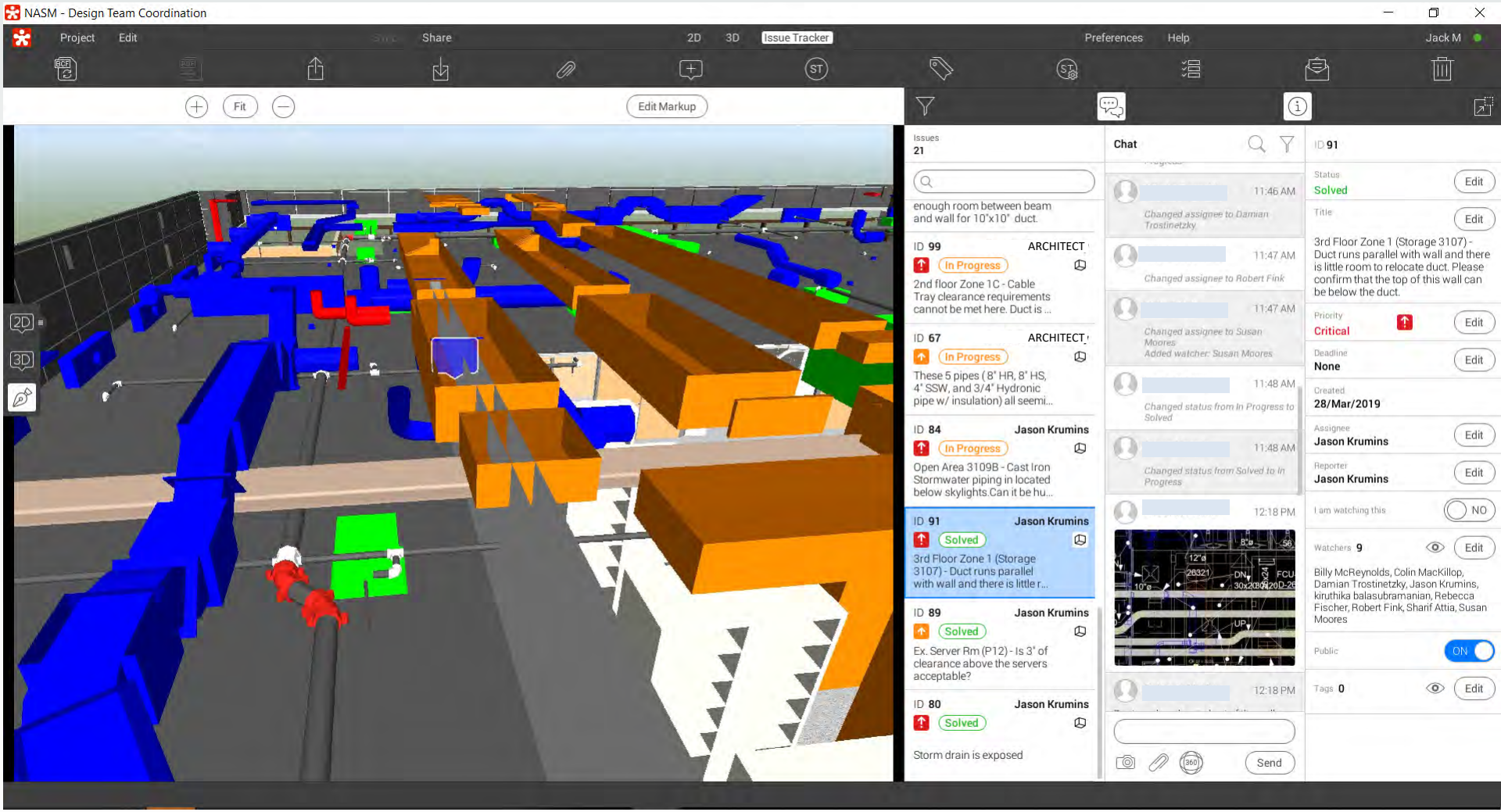

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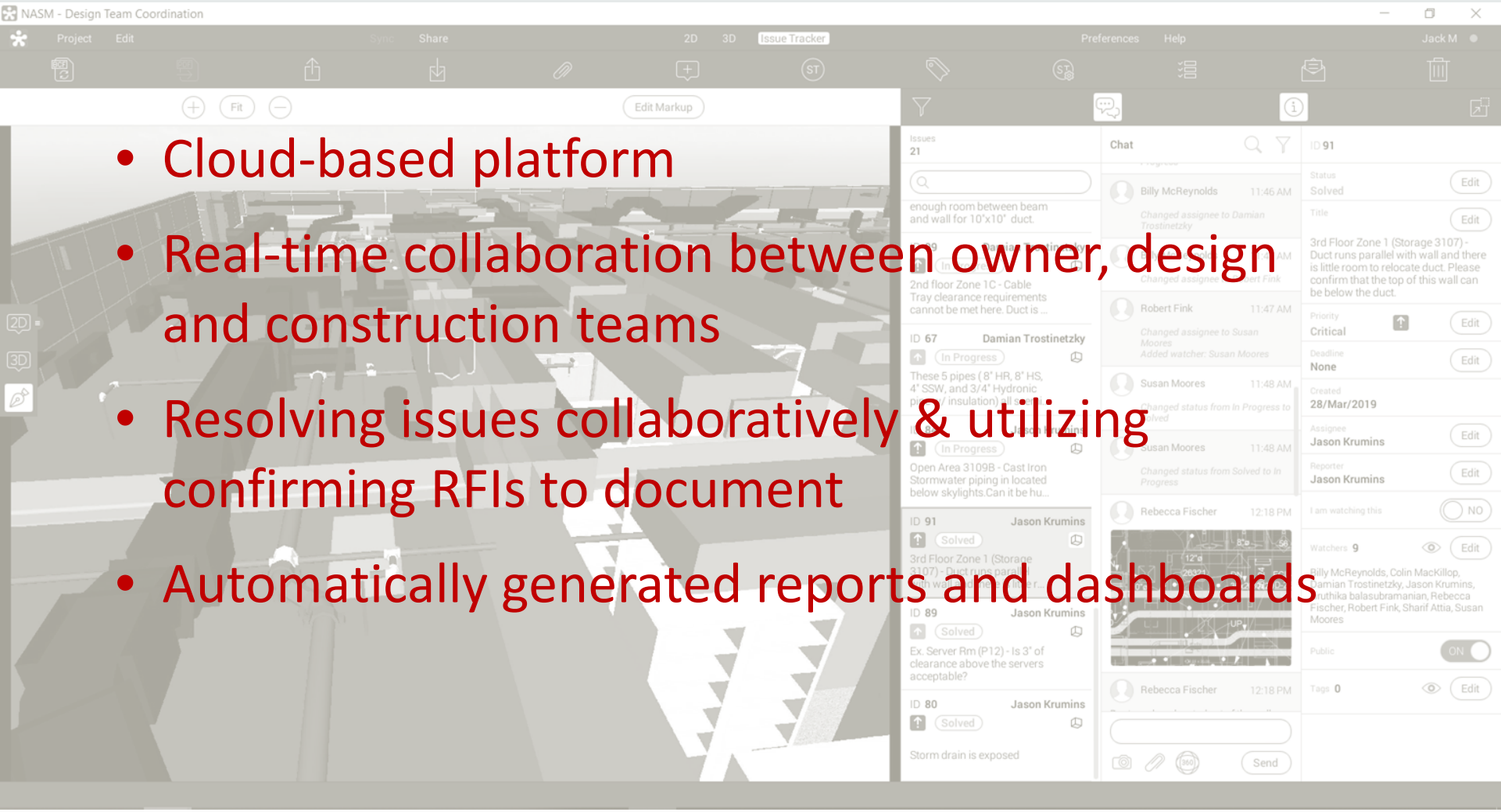
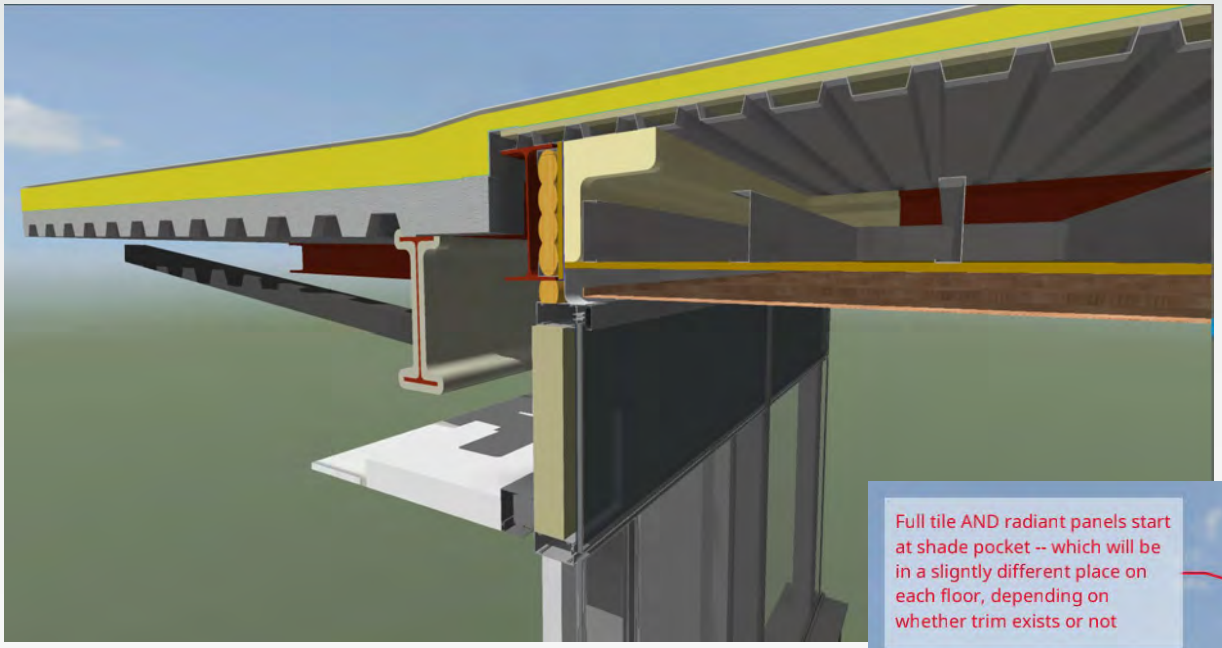
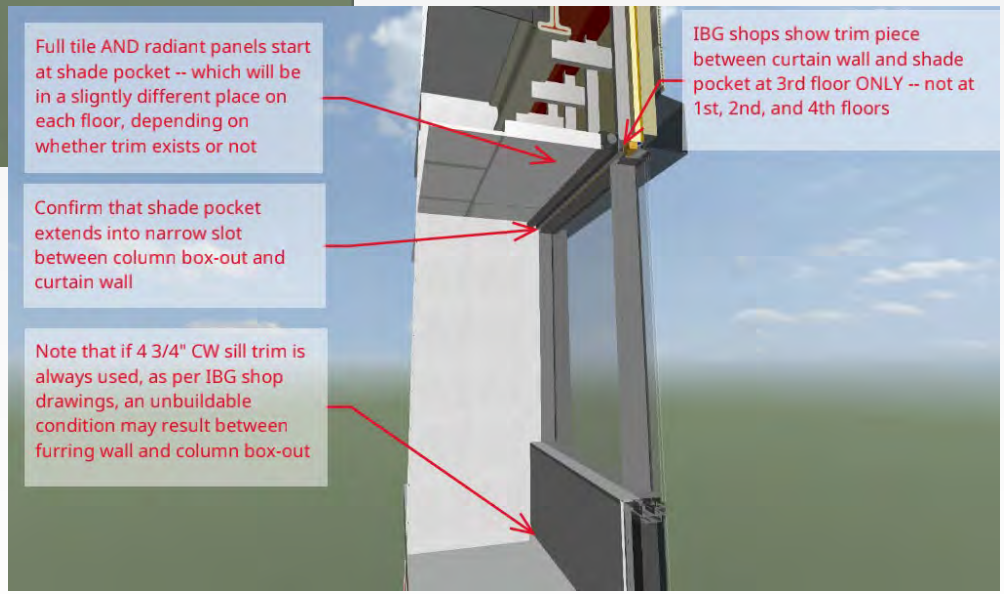


- Cloud-based platform
- Real-time collaboration between owner, design and construction teams
- Resolving issues collaboratively & utilizing confirming RFIs to document
- Automatically generated reports and dashboards

Virtual Reality – Virtual Mockups





Virtual Reality – Visualization/ Virtual Mock Ups

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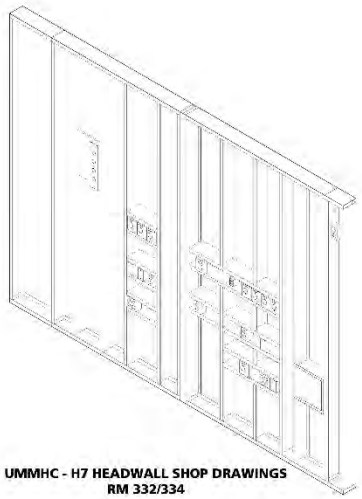
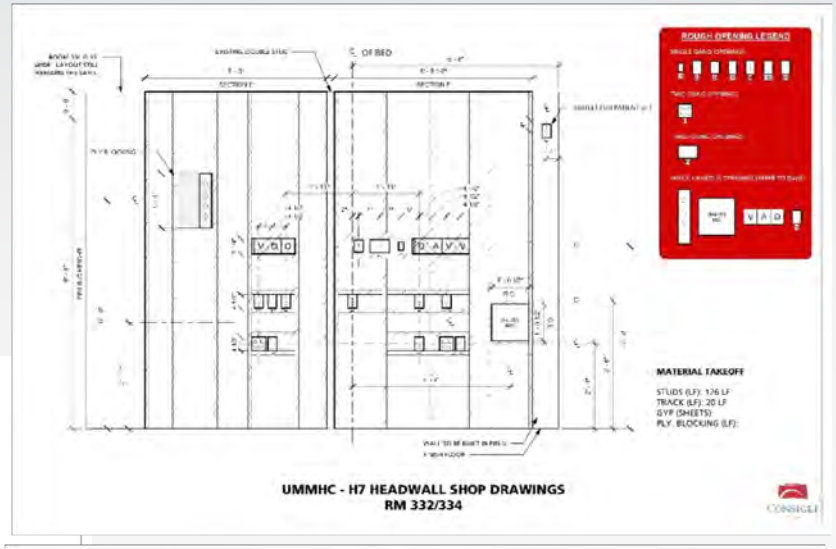
PROTYPE PATIENT ROOMS: reviewed location of equipment, call-buttons, etc. with nursing staff in immersive environment.

SUPPORT OF PREFABRICATION



UMMHC - H7 HEADWALL SHOP DRAWINGS
RM 332/334



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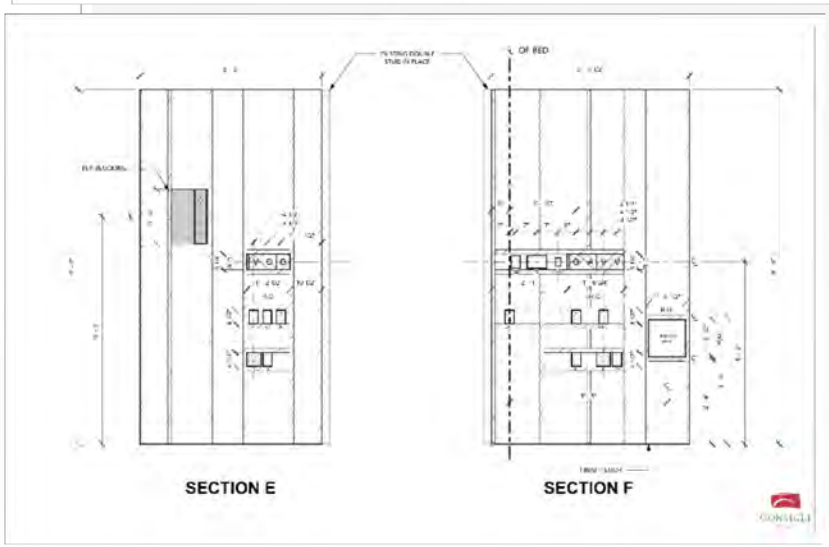
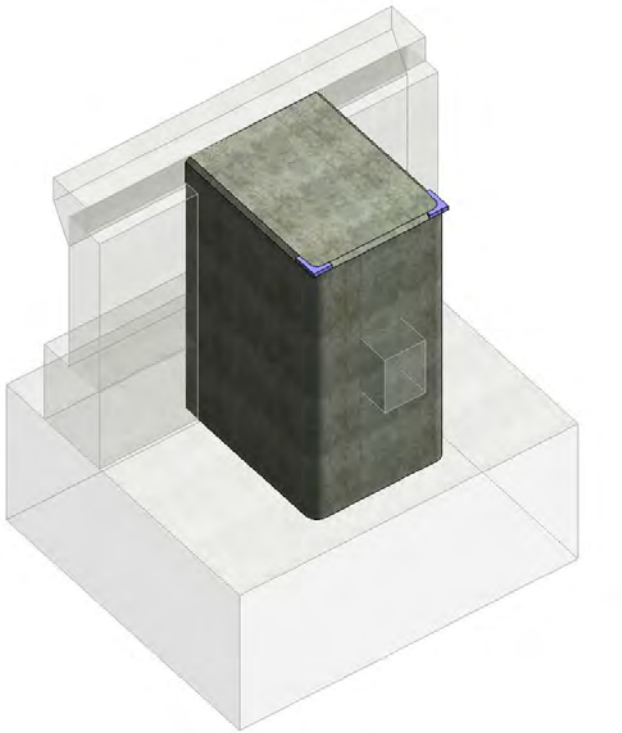
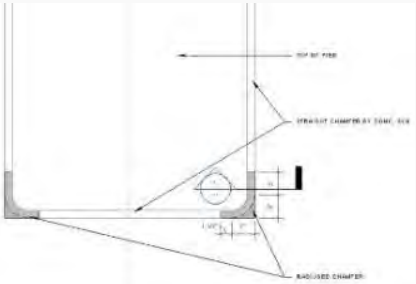
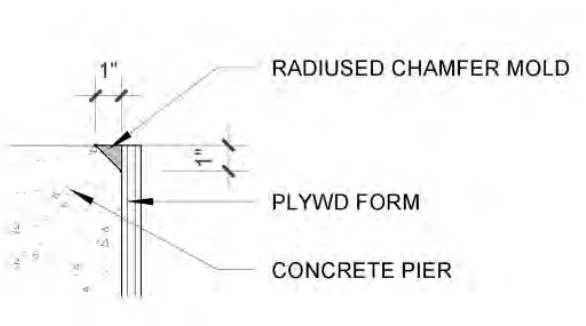


3D PRINTING

- Unique/complex concrete forms @ Colby College
- Create mock-ups
- Exploring other creative uses







VIRTUAL/ AUGMENTED/ MIXED REALITY (VR/AR)

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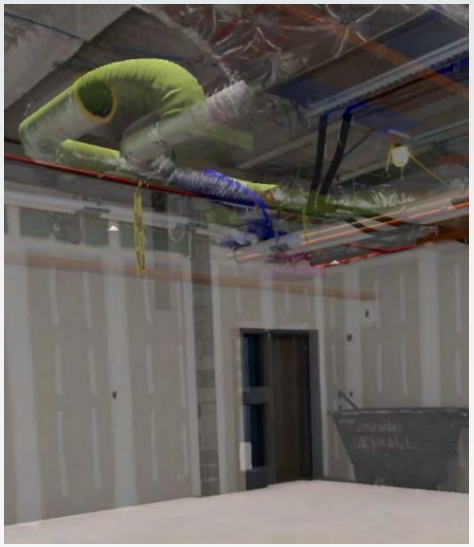
AR/VR for QA/QC

Superimpose digital information (models) on reality using tablet or smart phone.



→ Compare coordinated model to installed work

→ See what should have been built or will be built at specific times

→ FM Deliverable

ROBOTIC FIELD LAYOUT QA/QC

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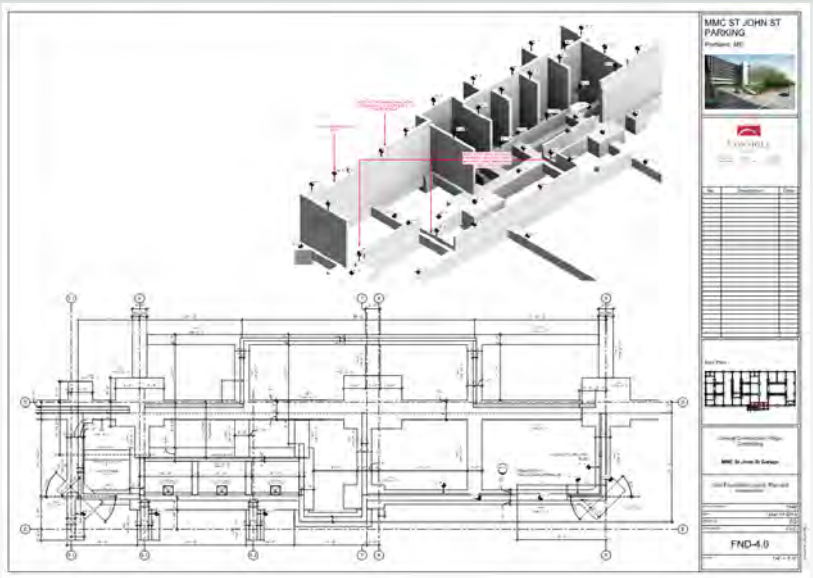

Components Modeled in Revit

Imported to Layout Tool

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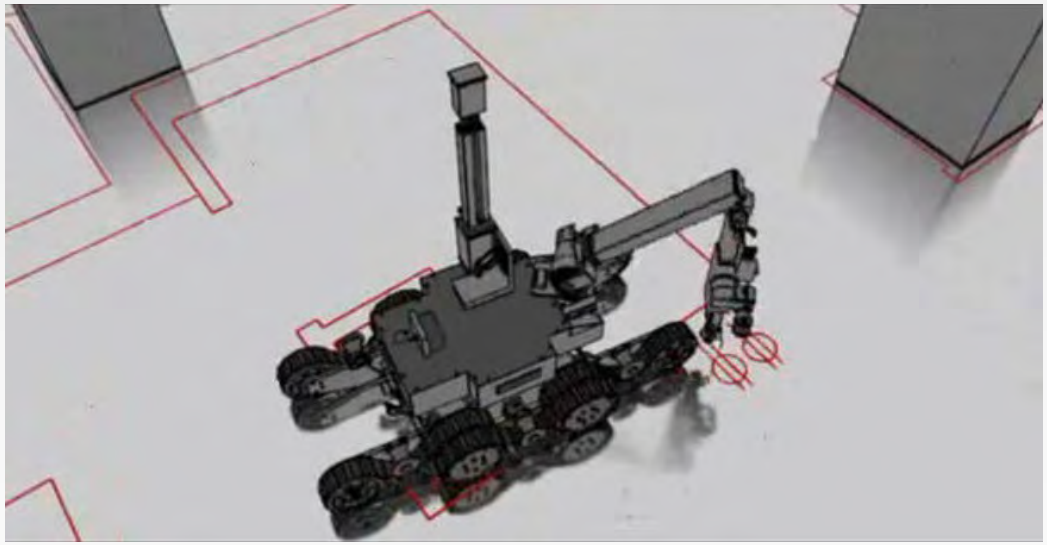
Near-Future: Robotics

- Autonomous robotic layout
- Walls, core, hanger locations
- Focusing on drywall, MEP trades
- Ability to print on slabs
- Future – ability to core slabs

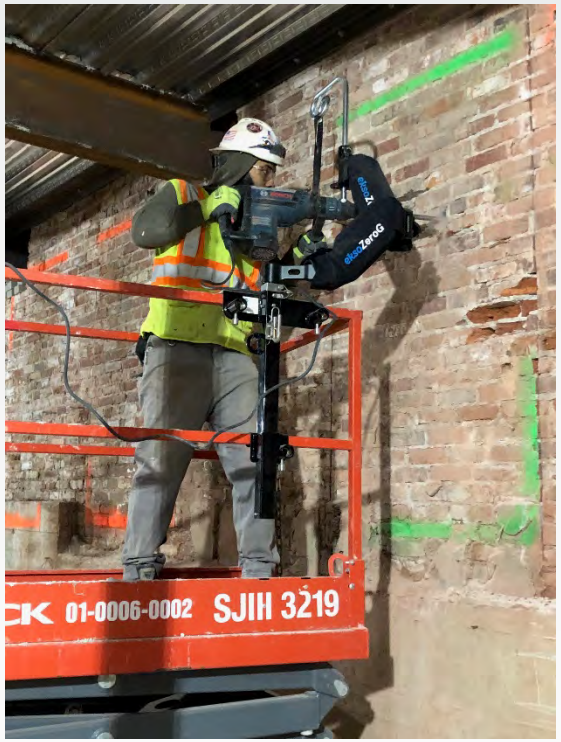


Exoskeletons

Relieves physical burden of tools on workers to reduce injury & fatigue

EksoVest

5-15 lbs lift assist per arm



EksoZeroG

Lift or scaffold-mounted supports up to 36lb payload

LOOKING AHEAD

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SMARTVID.IO

indus.ai
CONSTRUCTION INTELLIGENCE

ALICE

spot-r
by triax™

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Questions?