

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

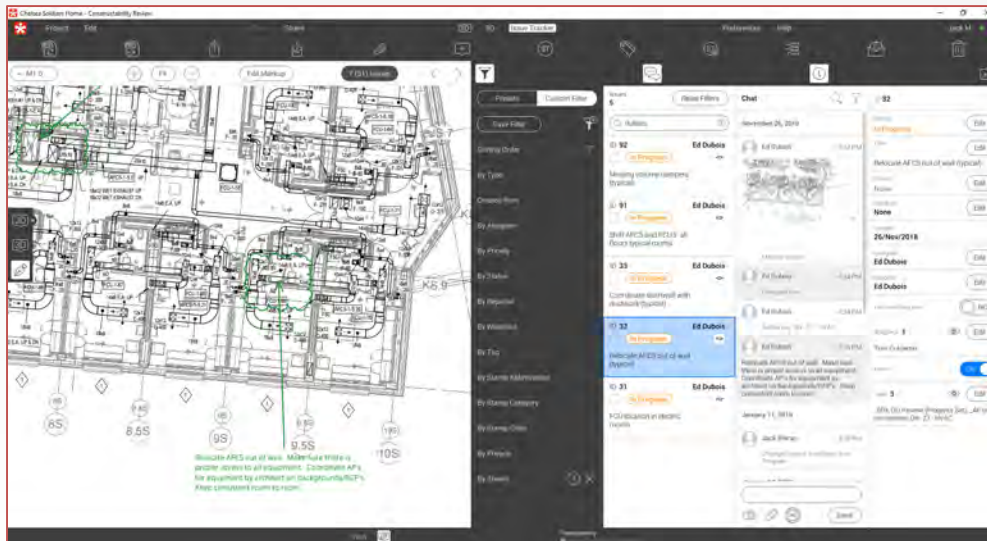
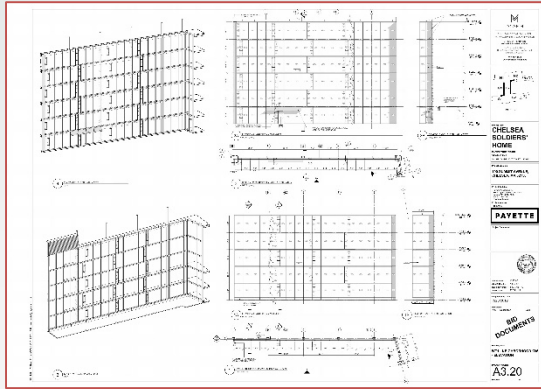
National Top 400 Contractor - *Engineering News-Record*

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

65% of our work comes from repeat clients

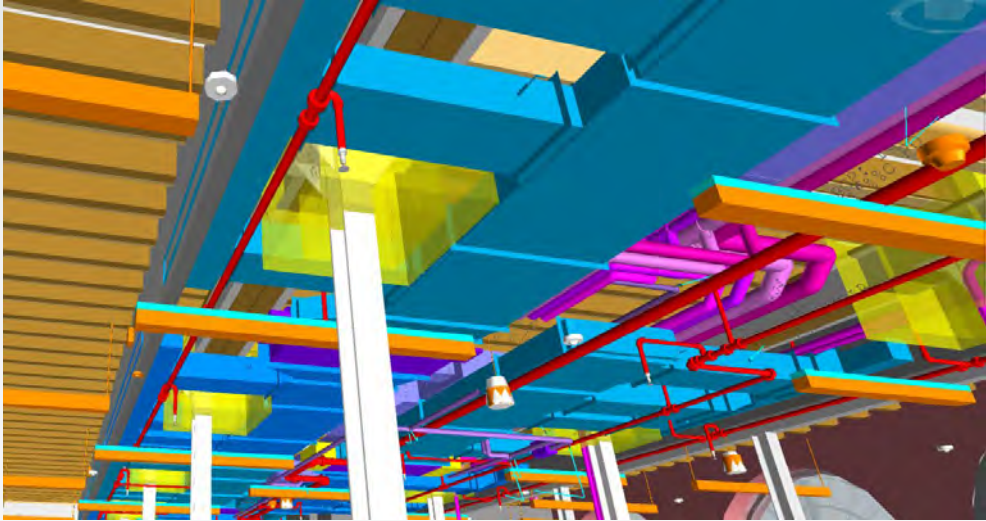
- Goals-based document
- Project specific
- Created in partnership with owner, design and construction teams
- Describes project goals and how BIM/VDC will support them
- Outlines specific project requirements & timelines
- Sets roles, responsibilities
- Establishes processes, standards and protocols

Preconstruction: Improved Tracking of Issues

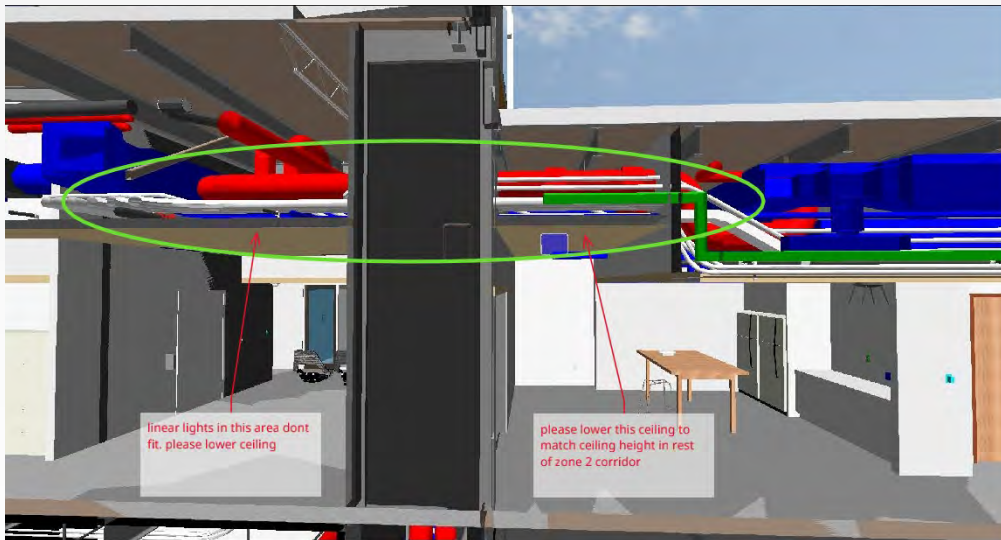


- Utilize 3D models as well as 2D documents
- Used for constructability reviews, value management, etc.
- Identifying & tracking issues in context
- Track issues by tag (division, discipline, etc.)

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



Reality Capture - Drones

Sign Up Log in Export

Divco West 3.20.19
Mar 20, 2019

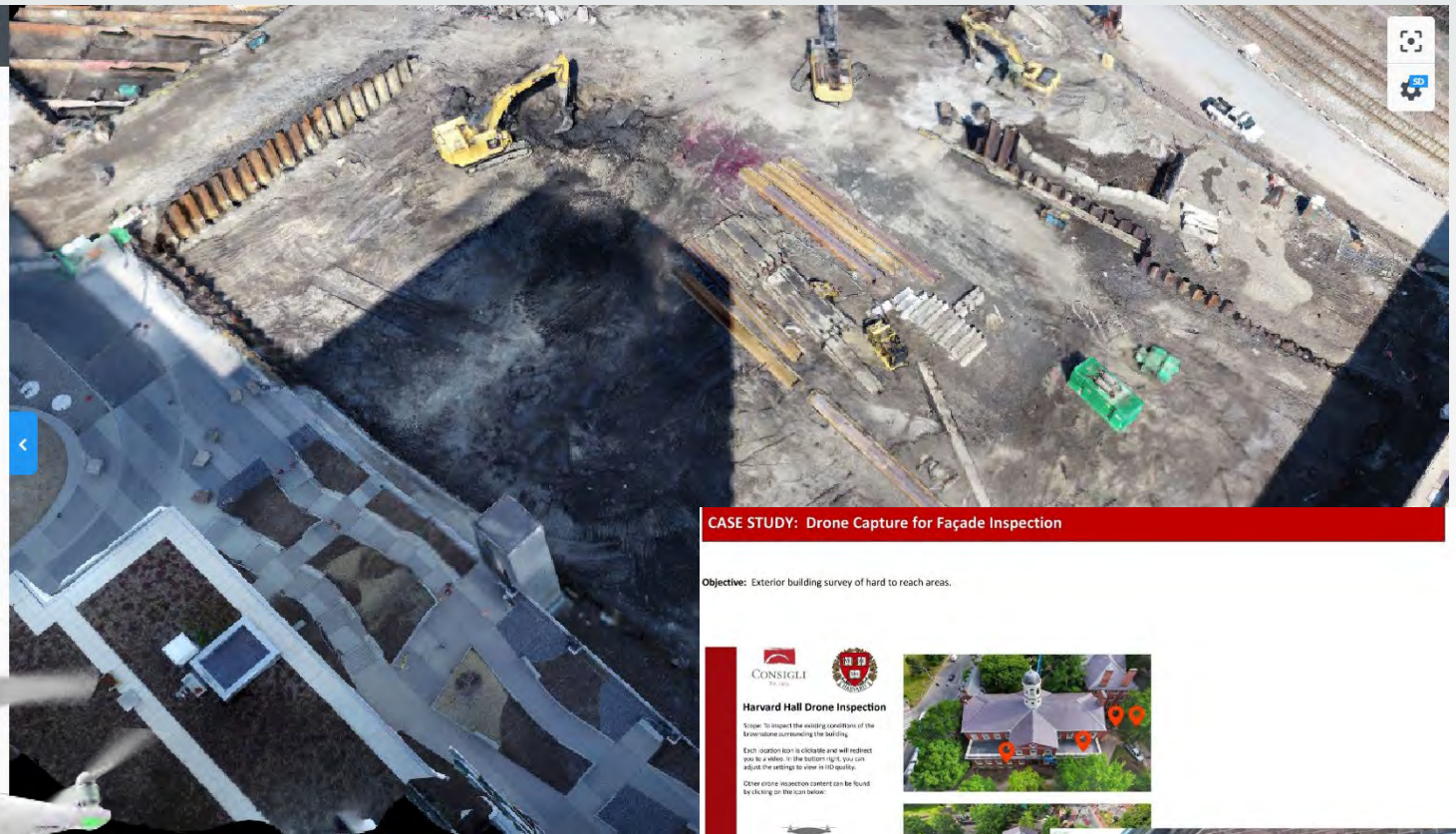

This map expires Jun 21, 2019 Upgrade Now

2D Map 3D Model

Plant Health Elevation

Point Cloud

Images (264)



CASE STUDY: Drone Capture for Façade Inspection

Objective: Exterior building survey of hard to reach areas.



Harvard Hall Drone Inspection

Scope: To inspect the existing condition of the brick masonry surrounding the lead line.

Each location icon is clickable and will redirect you to a video. In the bottom right, you can adjust the settings to view in 3D together.

Other drone inspection content can be found by clicking on the icon below:

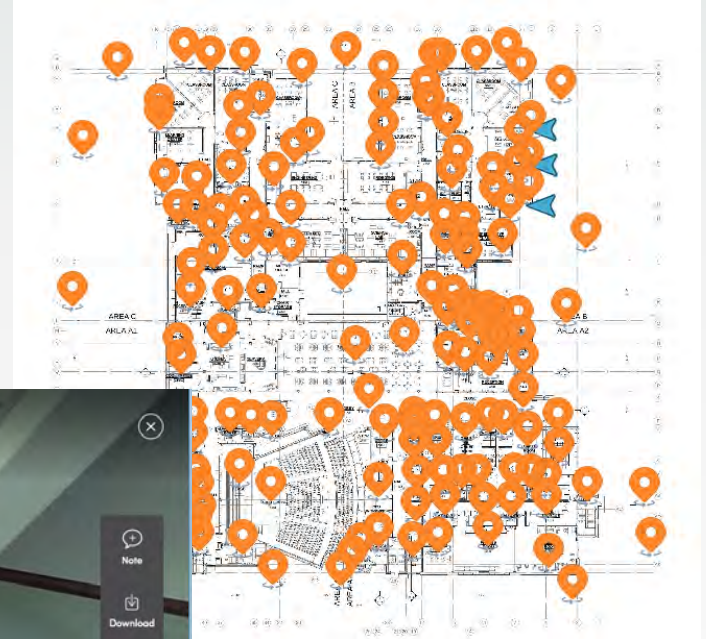


*We recommend right-clicking each icon and opening a new tab for each.



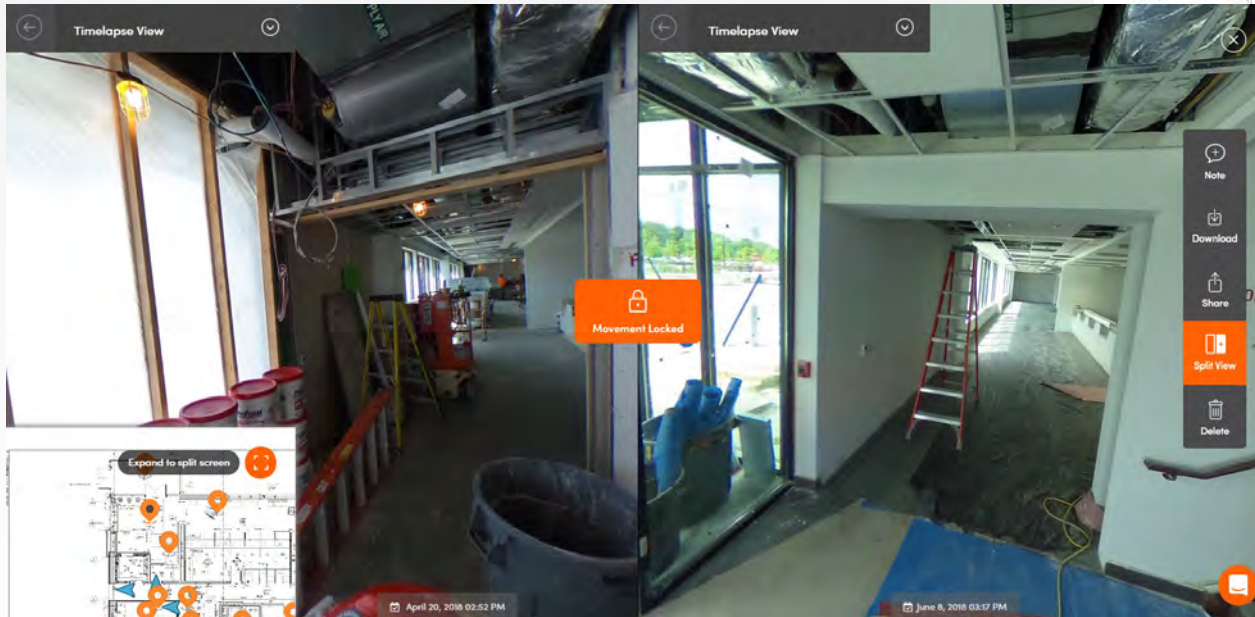
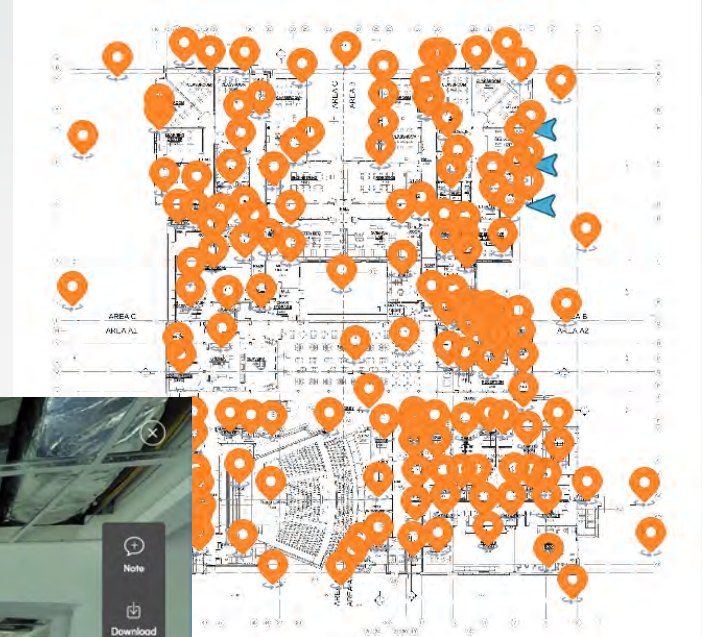
Reality Capture – Photo Management

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



Reality Capture – Photo Management

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- Standard and 360d photos tied to floor plans
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VDC/ TECHNOLOGY BEST PRACTICES: REALITY CAPTURE



Smithsonian Renwick Gallery

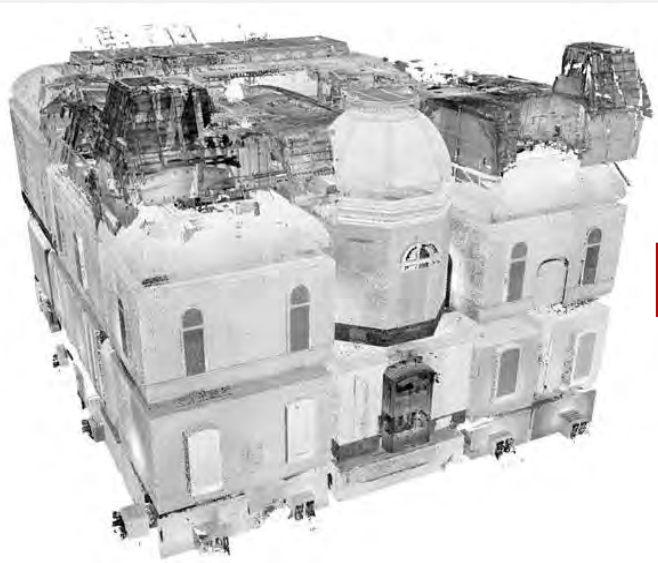
Life Safety and Accessibility Upgrades
New Mechanical Systems
Window Replacement
Restoration of Gallery Spaces

Design Team:
Westlake Reed Leskosky
Woods Peacock Engineering

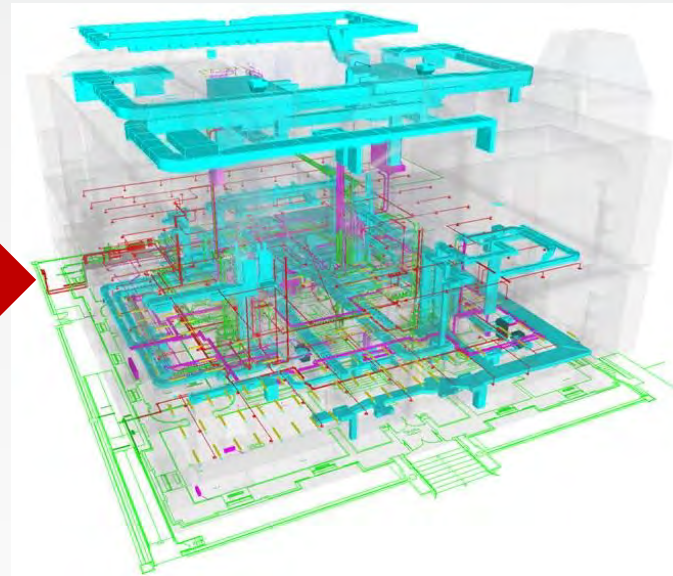
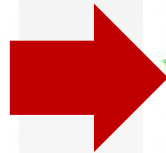
Completed 2015

VDC/ TECHNOLOGY BEST PRACTICES: REALITY CAPTURE

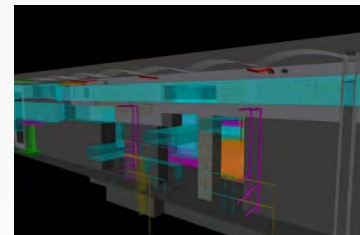
- All design documents were 2D
- Project “needed” to be coordinated in 3D



Laser Scan of Existing Conditions



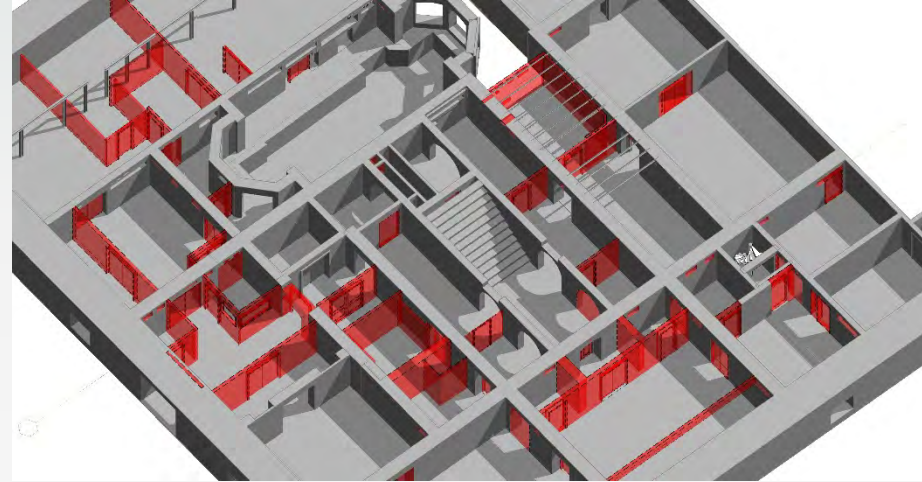
M/E/P/F Coordination



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

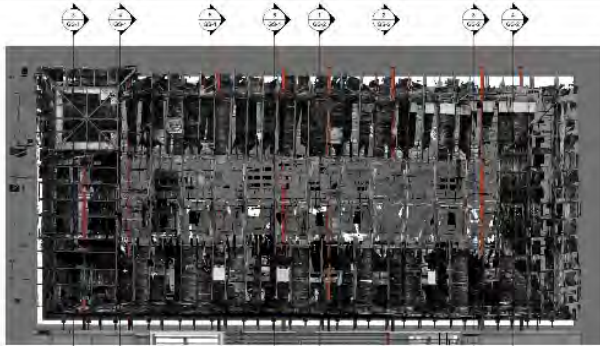
- (8) Structural Steel Trusses
- Support up to 80,000 lbs to provide flexibility for future art installations
- No visible impact to existing architecture (ceiling, laylight, roof)

VDC/ TECHNOLOGY BEST PRACTICES: REALITY CAPTURE



Scan of Attic above Grand Salon

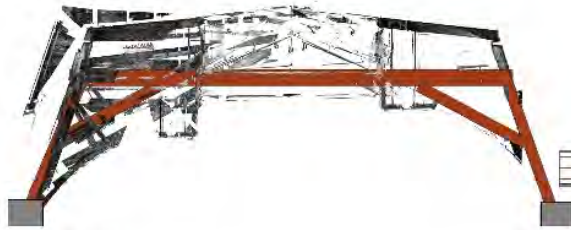
VDC/ TECHNOLOGY BEST PRACTICES: REALITY CAPTURE



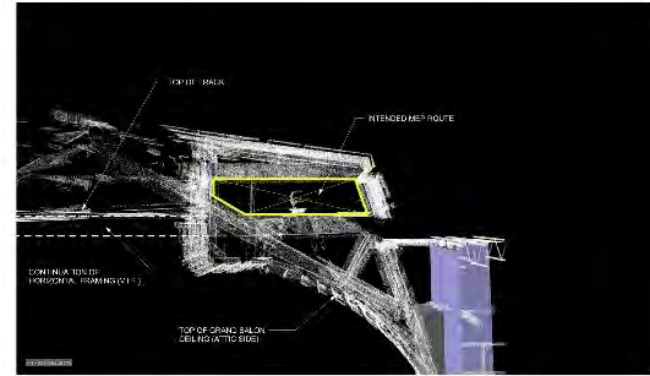
01 GRAND SALON ROOF FRAMING
1/4" = 1'-0"



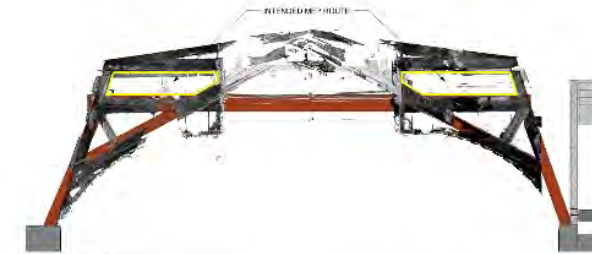
02 Section 1
1/4" = 1'-0"



03 Section 2
1/4" = 1'-0"



04 GRAND SALON ROOF FRAMING
1/4" = 1'-0"

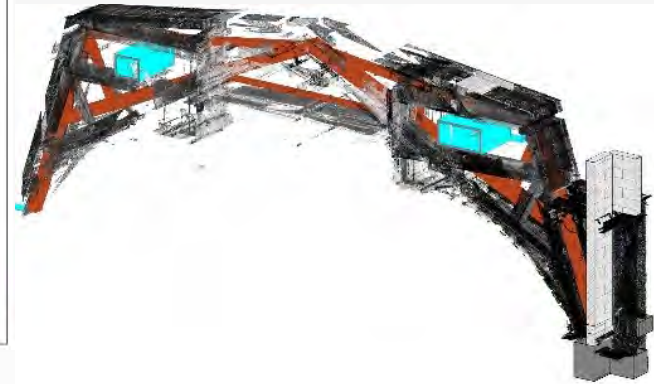
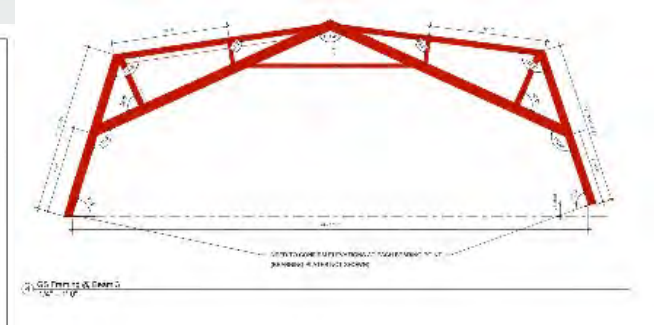
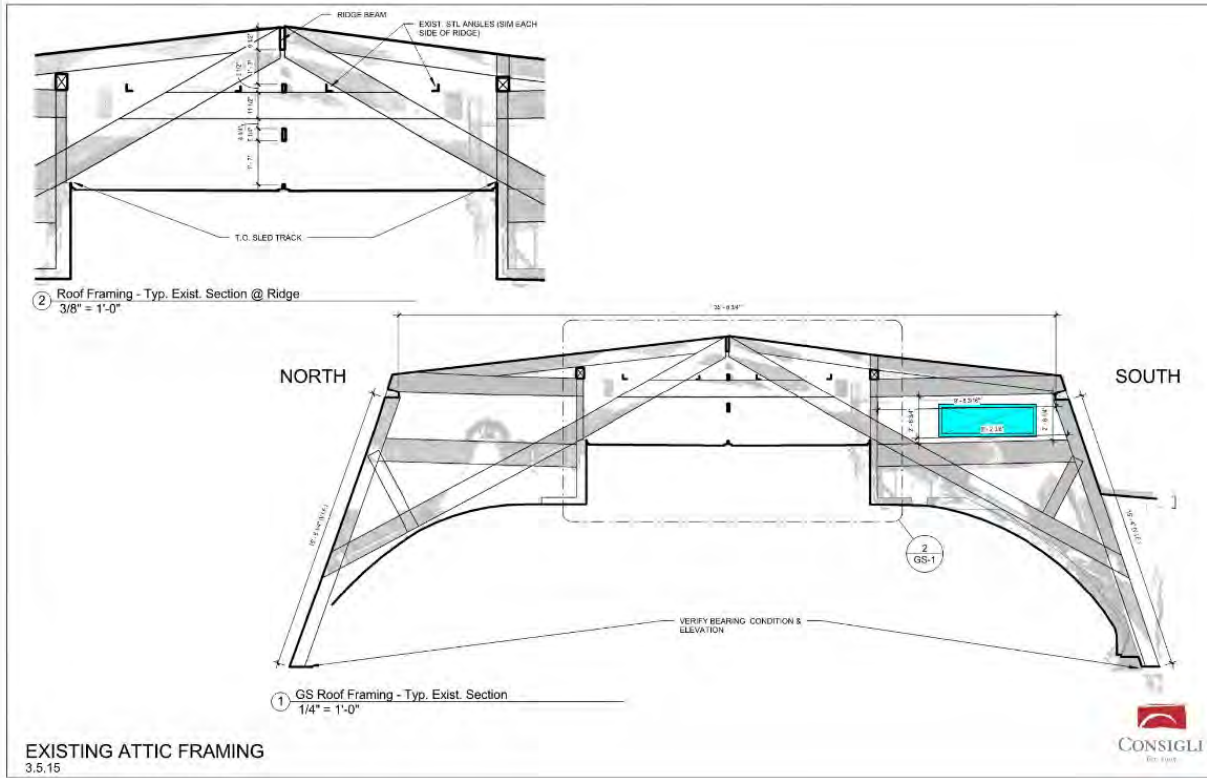


05 Section 3
1/4" = 1'-0"



06 Section 4
1/4" = 1'-0"

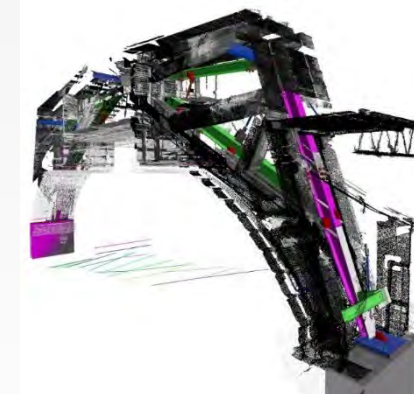
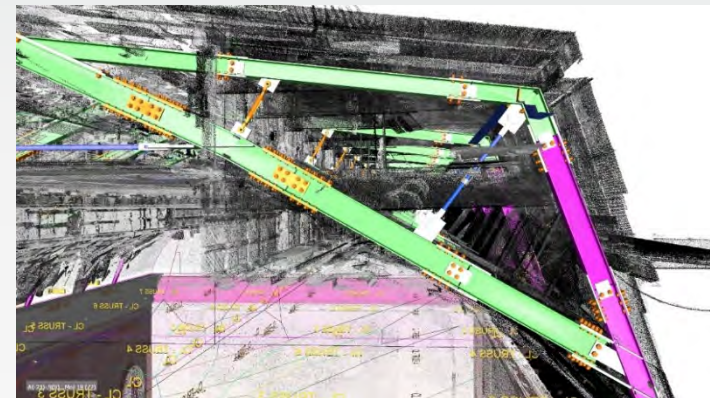
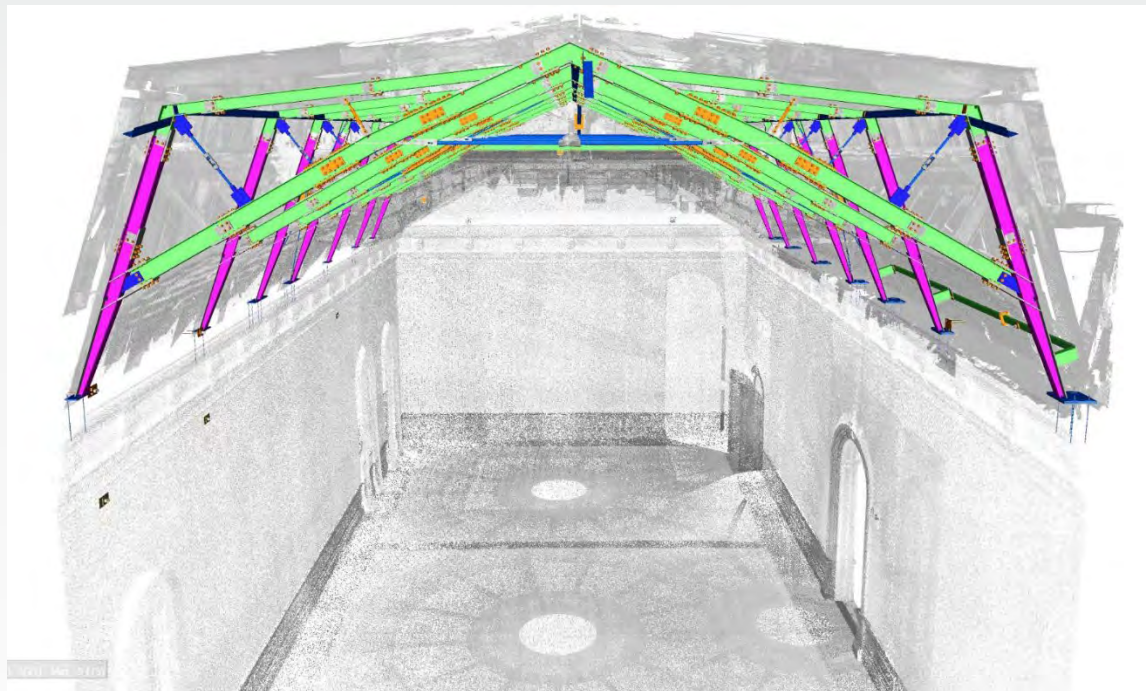
VDC/ TECHNOLOGY BEST PRACTICES: REALITY CAPTURE





CONSIGLI
Est. 1905

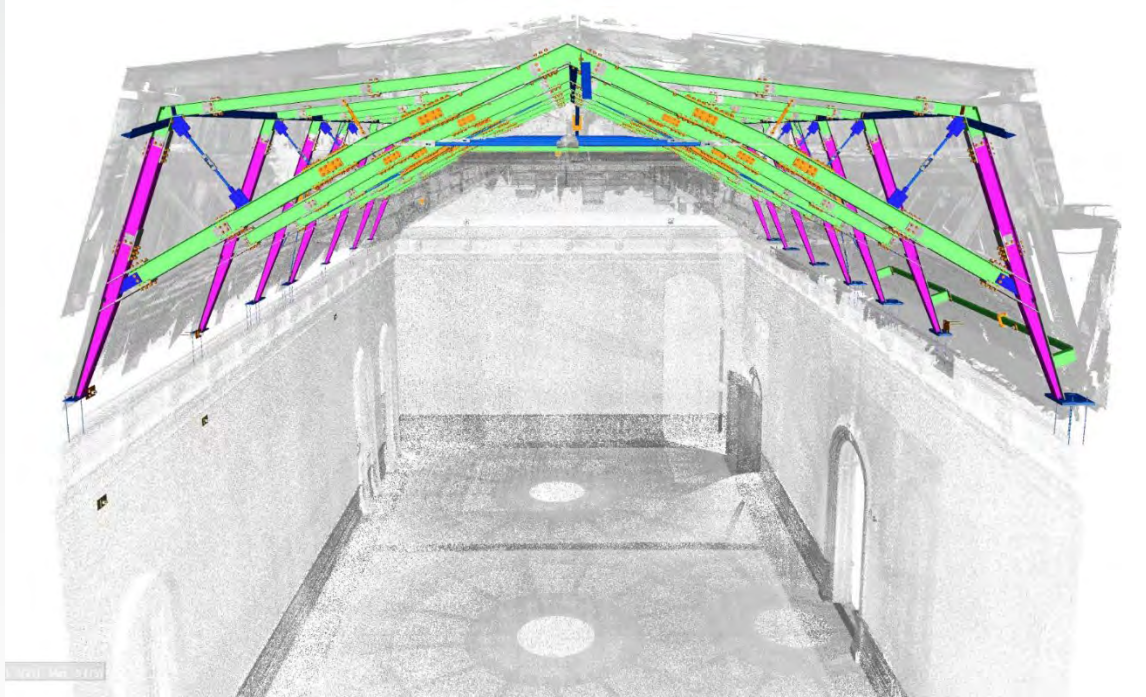
Smithsonian Renwick Gallery



Smithsonian Renwick Gallery

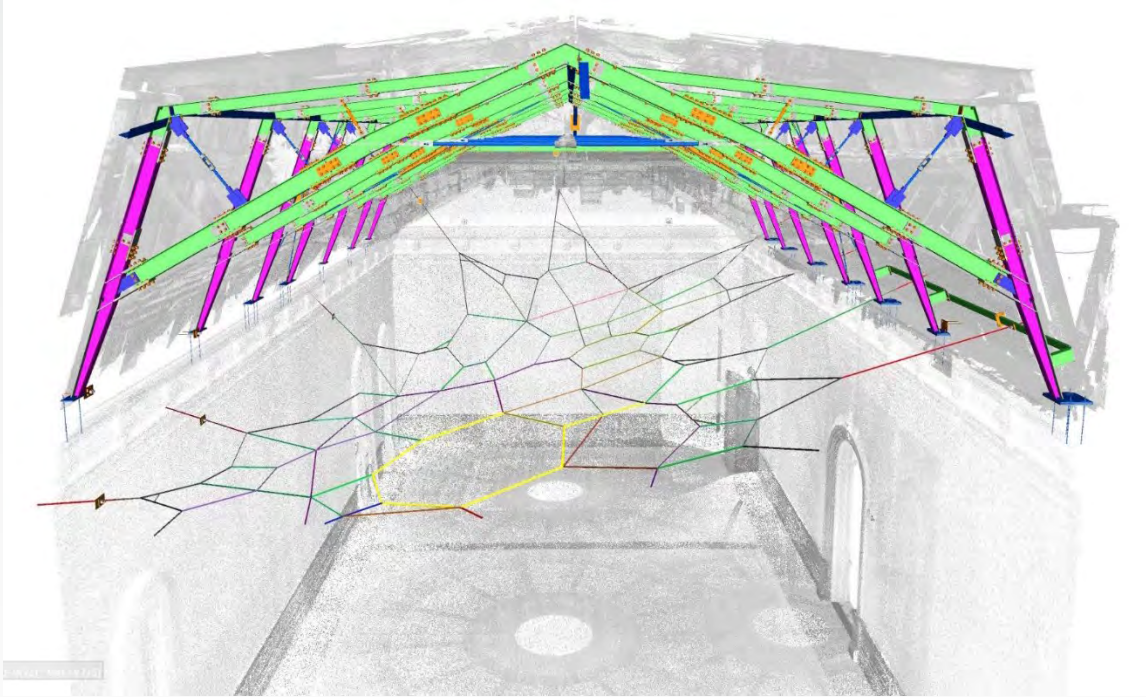


VDC/ TECHNOLOGY BEST PRACTICES: REALITY CAPTURE



Coordination of Temporary Art Installation: 1.8 by Janet Echelman





Coordination of Temporary Art Installation: 1.8 by Janet Echelman



VDC/ TECHNOLOGY BEST PRACTICES: REALITY CAPTURE



1.8 by Janet Echelman



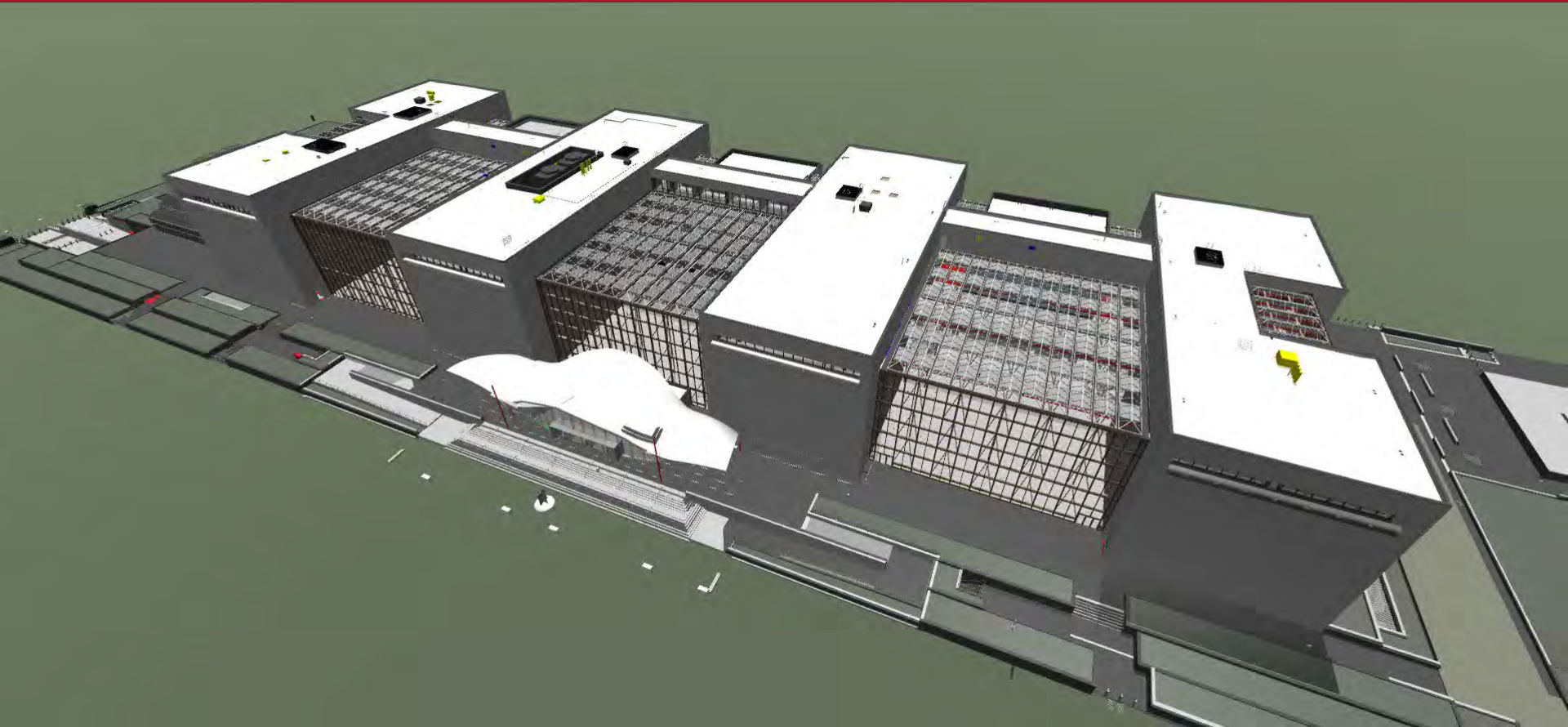


Smithsonian

Smithsonian Institution's National Air and Space Museum Revitalization



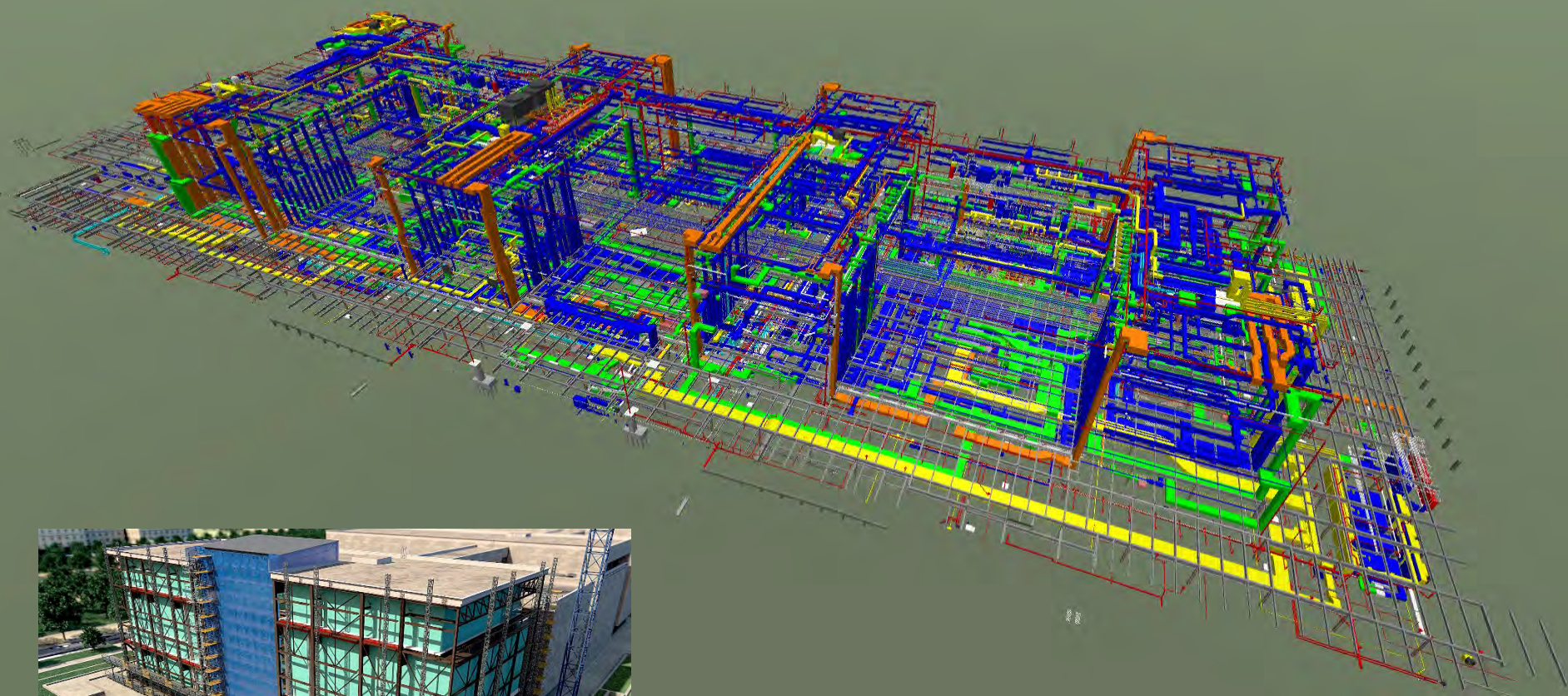
- Exterior envelope replacement, incl. stone façade, curtainwall & skylights
- Full MEP replacement/ upgrade
- Upgrade security monitoring
- New exhibits
- Interior architectural modifications
- Structural modifications
- Site work – including 2 in ground cisterns and fountain
- Terrace and entrance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



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



CONSIGLI
Est. 1905



STURUCTURAL STEEL
REINFORCEMENT

2018 2019 2020 2021 2022 2023 2024



Smithsonian

Smithsonian Institution's National Air and Space Museum Revitalization



Smithsonian

National Air and Space Museum Mall Building Revitalization

Building Information Modeling Project Execution Plan (BIM PxP) Preconstruction & Construction Phases

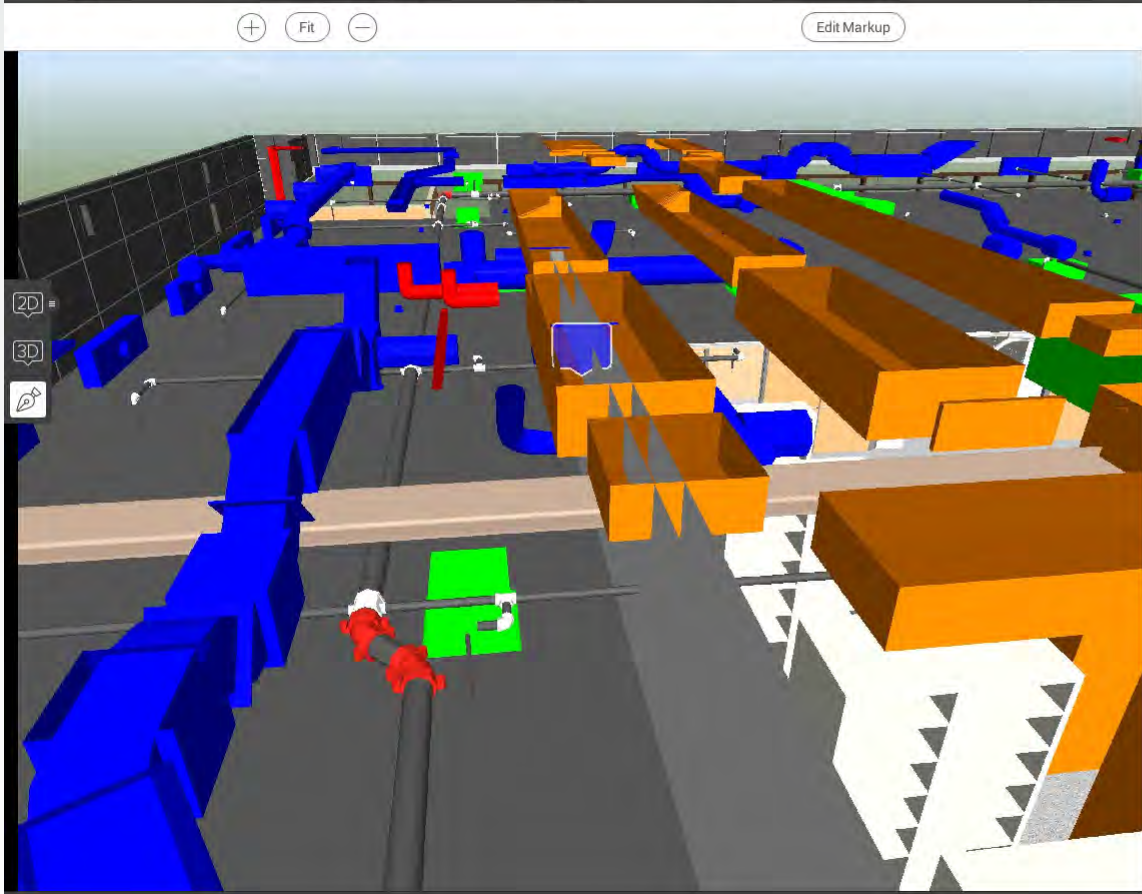


Rev4.14.17

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



- Issues 21
- enough room between beam and wall for 10"x10" duct.
- ID 99 ARCHITECT In Progress
2nd floor Zone 1C - Cable Tray clearance requirements cannot be met here. Duct is ...
- ID 67 ARCHITECT In Progress
These 5 pipes (8" HR, 8" HS, 4" SSW, and 3/4" Hydronic pipe w/ insulation) all seemi...
- ID 84 Jason Krumins In Progress
Open Area 3109B - Cast Iron Stormwater piping in located below skylights. Can it be hu...
- ID 91 Jason Krumins Solved
3rd Floor Zone 1 (Storage 3107) - Duct runs parallel with wall and there is little r...
- ID 89 Jason Krumins Solved
Ex. Server Rm (P12) - Is 3' of clearance above the servers acceptable?
- ID 80 Jason Krumins Solved
Storm drain is exposed

Chat


11:46 AM
Changed assignee to Damian Trostinetzky.

11:47 AM
Changed assignee to Robert Fink

11:47 AM
Changed assignee to Susan Moores
Added watcher: Susan Moores

11:48 AM
Changed status from In Progress to Solved

11:48 AM
Changed status from Solved to In Progress

12:18 PM


12:18 PM

ID 91

Status **Solved** Edit

Title Edit

3rd Floor Zone 1 (Storage 3107) - Duct runs parallel with wall and there is little room to relocate duct. Please confirm that the top of this wall can be below the duct.

Priority **Critical** Edit

Deadline **None** Edit

Created **28/Mar/2019**

Assignee **Jason Krumins** Edit

Reporter **Jason Krumins** Edit

I am watching this NO

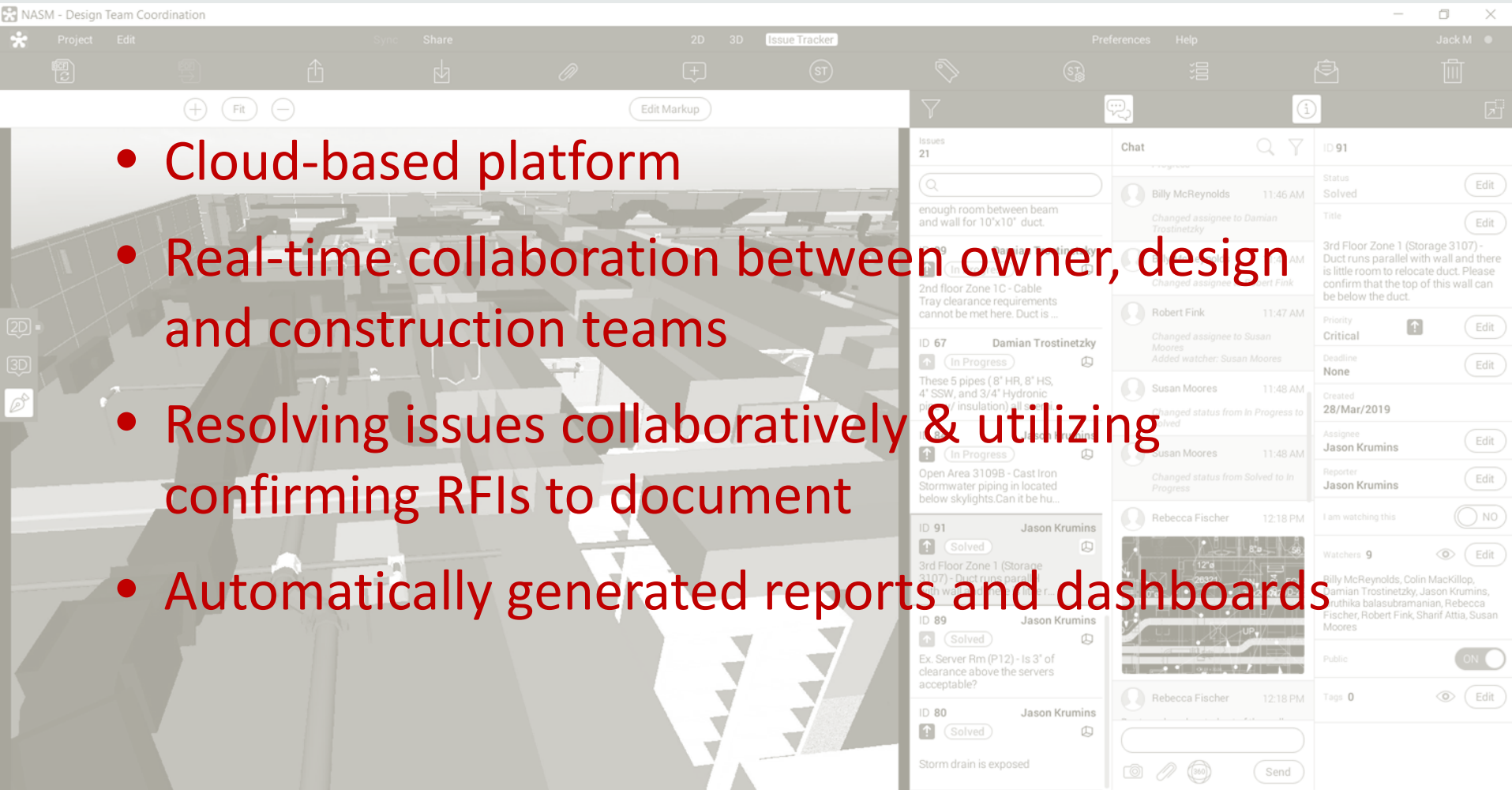
Watchers **9** Edit

Billy McReynolds, Colin MacKillop, Damian Trostinetzky, Jason Krumins, kiruthika balasubramanian, Rebecca Fischer, Robert Fink, Sharif Attia, Susan Moores

Public ON

Tags **0** Edit

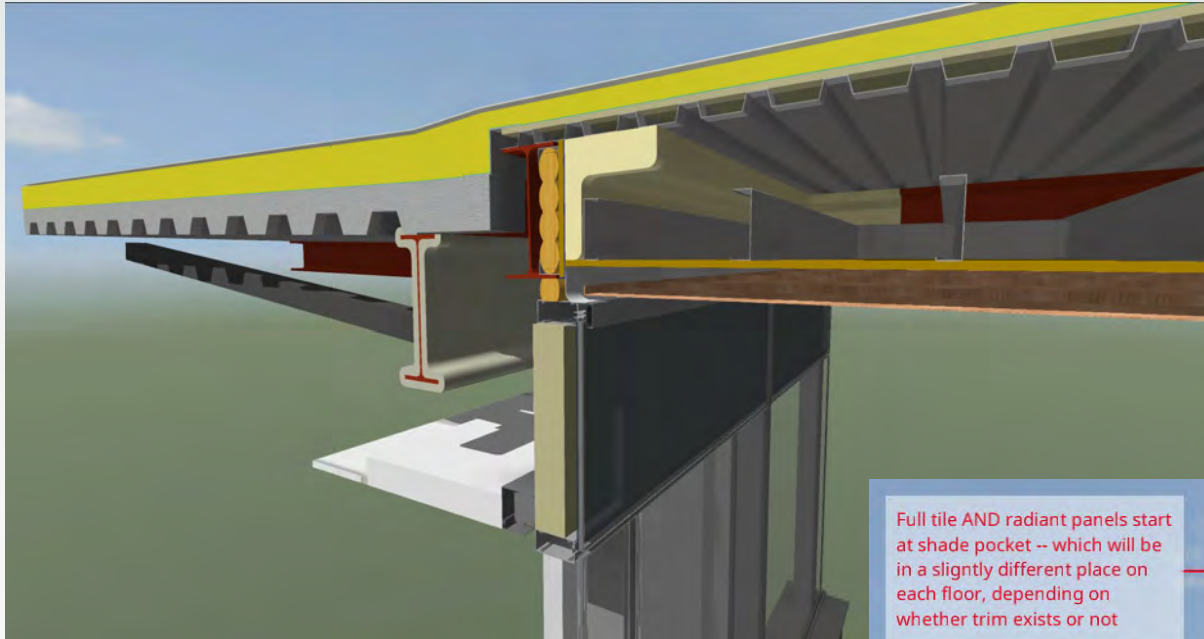
Send



The screenshot displays the NASM software interface. On the left, a 3D architectural model of a building is shown with various components highlighted. On the right, an 'Issue Tracker' panel is visible, listing several issues with their IDs, statuses, and assignees. The interface includes a top navigation bar with options like 'Project', 'Edit', 'Sync', 'Share', '2D', '3D', 'Issue Tracker', 'Preferences', and 'Help'. A toolbar with various icons is located below the navigation bar. The issue tracker panel shows a list of issues, including 'enough room between beam and wall for 10'x10' duct.', '2nd floor Zone 1C - Cable Tray clearance requirements cannot be met here. Duct is ...', 'These 5 pipes (8" HR, 8" HS, 4" SSW, and 3/4" Hydronic pipe / insulation) all ...', 'Open Area 3109B - Cast Iron Stormwater piping in located below skylights. Can it be hu...', '3rd Floor Zone 1 (Storage 3107) - Duct runs parallel with wall and there is little room to relocate duct. Please confirm that the top of this wall can be below the duct.', 'Ex. Server Rm (P12) - Is 3' of clearance above the servers acceptable?', and 'Storm drain is exposed'.

- 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

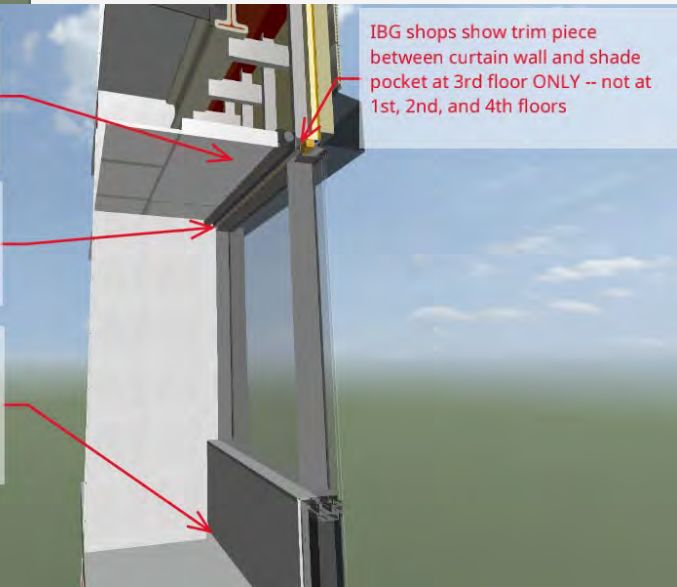
Virtual Reality – Virtual Mockups



Full tile AND radiant panels start at shade pocket -- which will be in a slightly different place on each floor, depending on whether trim exists or not

Confirm that shade pocket extends into narrow slot between column box-out and curtain wall

Note that if 4 3/4" CW sill trim is always used, as per IBG shop drawings, an unbuildable condition may result between furring wall and column box-out



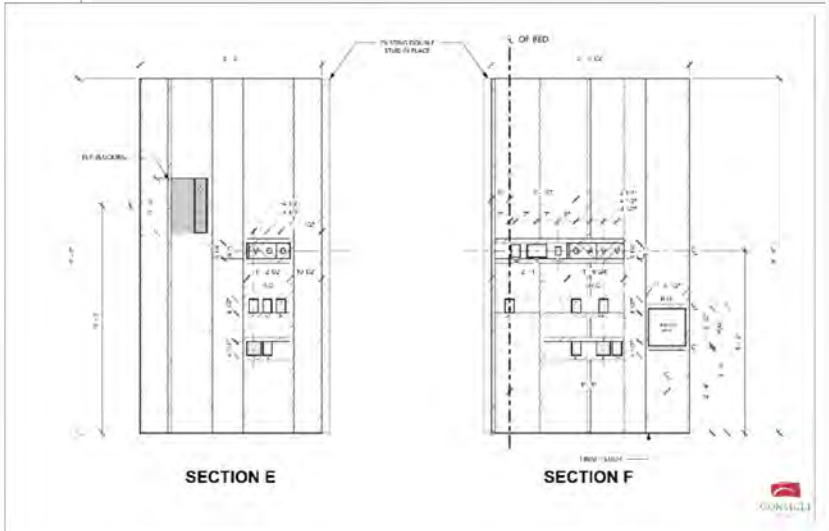
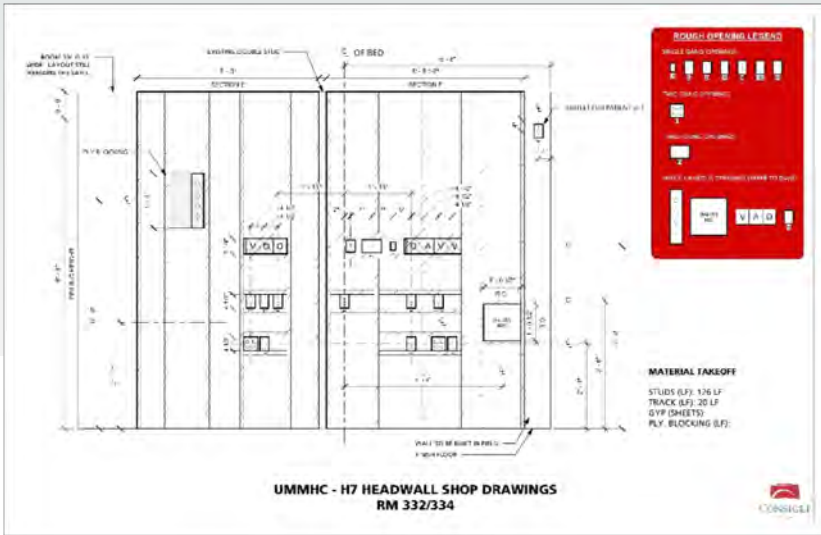
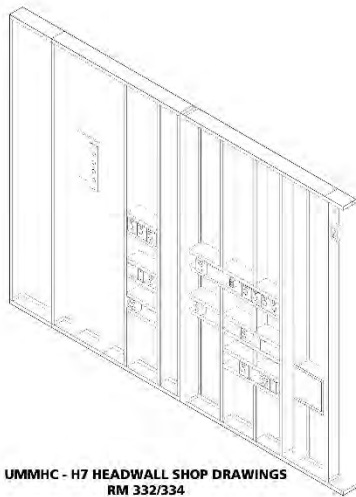
IBG shops show trim piece between curtain wall and shade pocket at 3rd floor ONLY -- not at 1st, 2nd, and 4th floors

Virtual Reality – Visualization/ Virtual Mock Ups

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

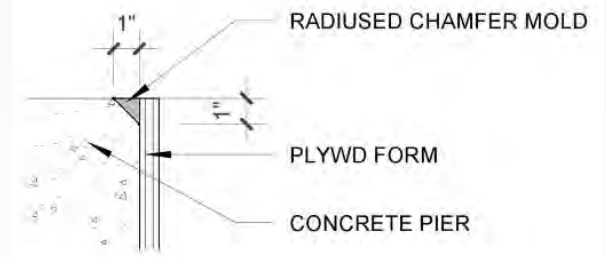
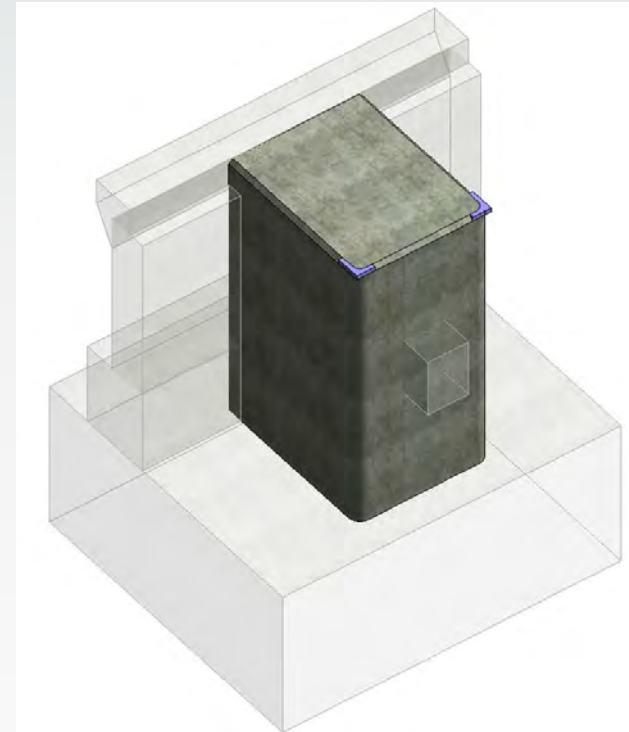
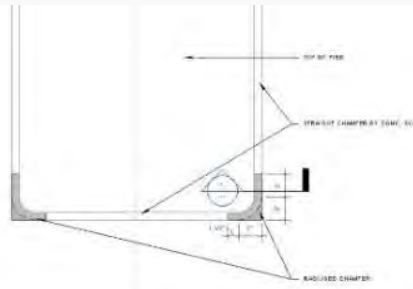
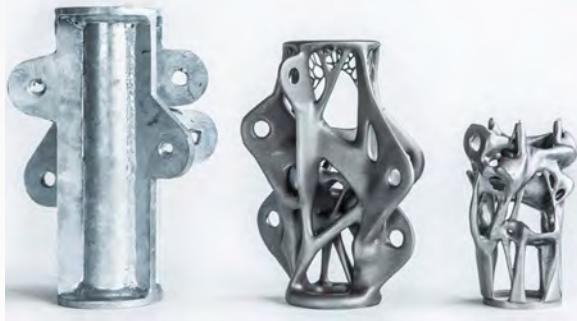
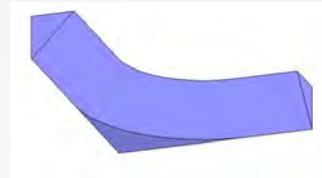


SUPPORT OF PREFABRICATION

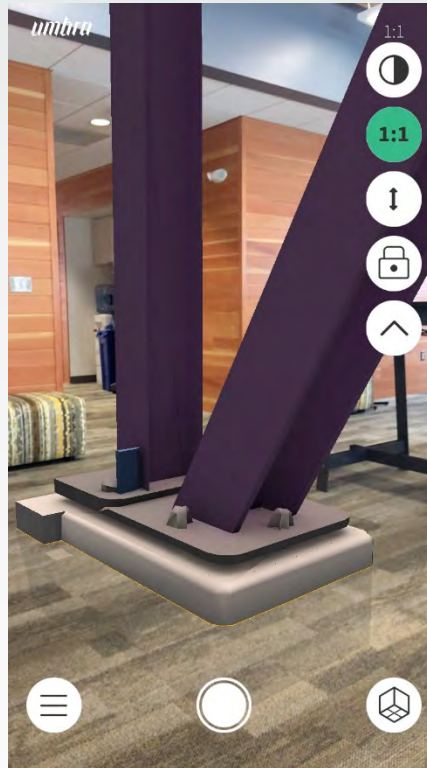


3D PRINTING

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

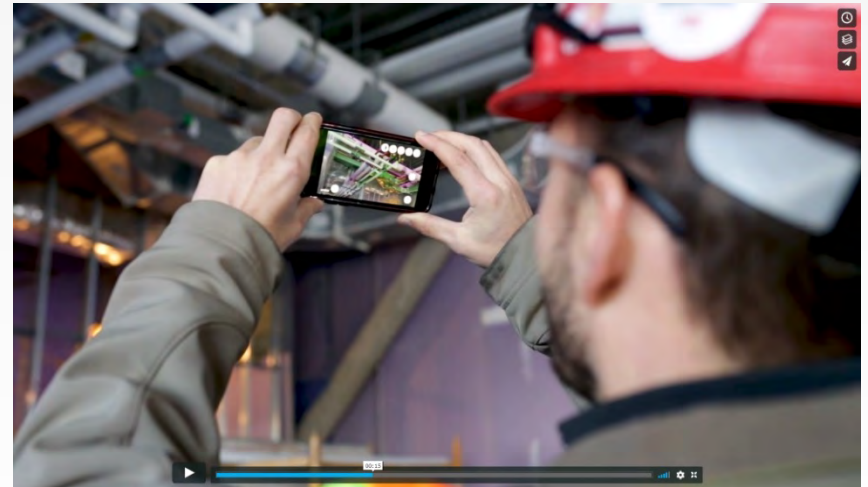
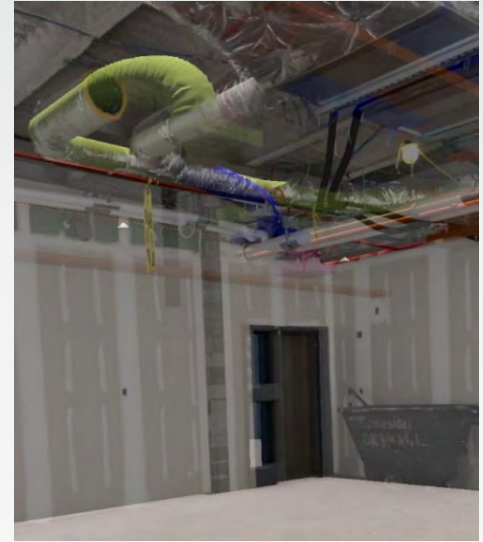


VIRTUAL/ AUGMENTED/ MIXED REALITY (VR/AR)

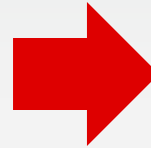
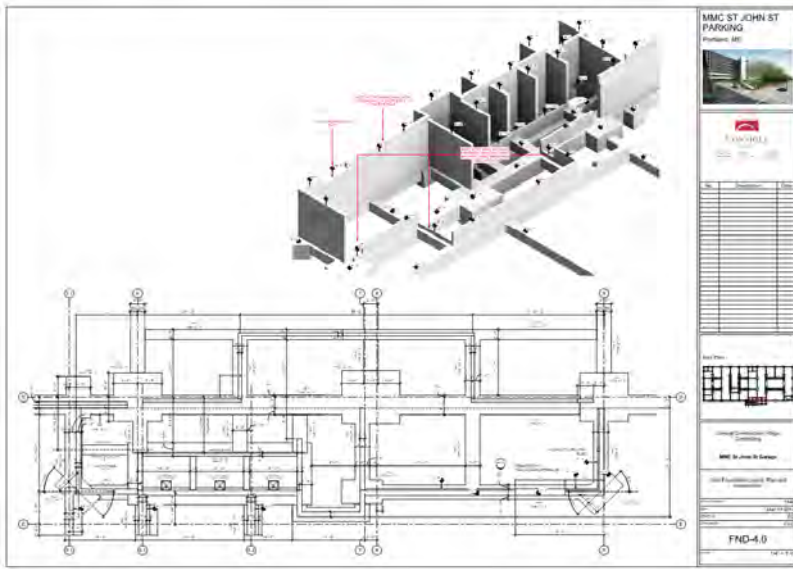


Superimpose digital information (models) on reality using tablet or smart phone.

- Compare coordinated model to installed work
- See what should have been built or will be built at specific times
- FM Deliverable



ROBOTIC FIELD LAYOUT



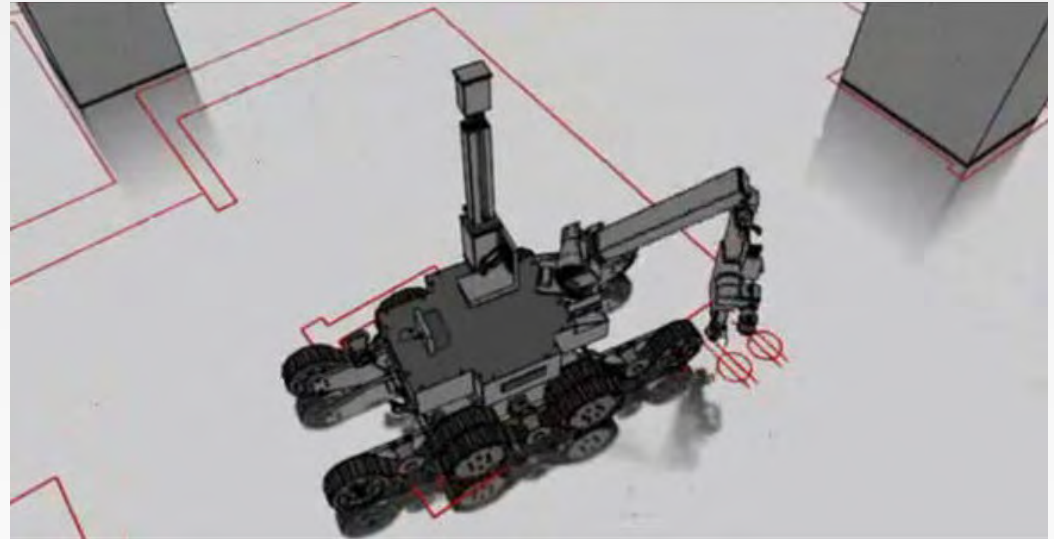
Components Modeled in Revit

Imported to Layout Tool



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

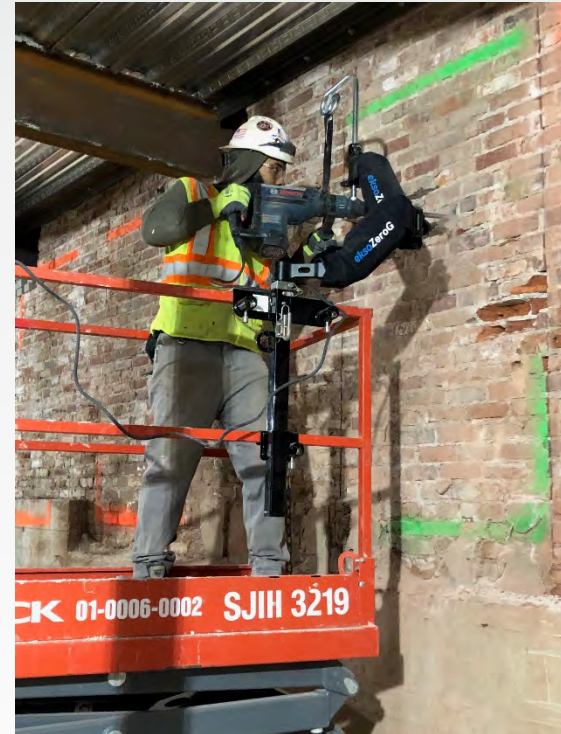


Relieves physical burden of tools on workers to reduce injury & fatigue



EksoVest

5-15 lbs lift assist per arm



EksoZeroG

Lift or scaffold-mounted
supports up to 36lb payload

LOOKING AHEAD



SMARTVID.IO

 **spot-r**
by triax™

indus.ai
CONSTRUCTION INTELLIGENCE

 **ALICE**

amazon alexa



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Questions?
