October 17-19, 2016

ATLANTA, GEORGIA

Perfecting the Integration of Design Intent and Existing Conditions

A Case Study of the University of Washington’s Denny Hall Renovation
BNBuilders specializes in highly technical projects for a wide range of clients including life science, technology, healthcare, and educational organizations. We use an integrated approach to delivering our projects that relies heavily on innovation, coordination and communication.

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Denny Hall
Denny Hall

- Full interior renovation
- All systems replaced
- Exterior previously restored
• Built in 1895
• Last major renovation 1957
• 1890’s construction is heavy timber,
• Load-bearing un-reinforced masonry
• 1950’s added steel columns,
• Reinforced concrete slabs with drop beams
• $35m construction value
• 85,000 SF
• We said we could deliver the project 6 months ahead of the contracted completion date
Scope of New Work

<table>
<thead>
<tr>
<th>Structural Steel</th>
<th>HVAC</th>
<th>Electrical Lighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>Steam / Refrigeration</td>
<td>Electrical Power</td>
</tr>
<tr>
<td>Fire Protection</td>
<td>Plumbing</td>
<td>Electrical Comm</td>
</tr>
</tbody>
</table>
• How will it all fit?

...and preserve the historic feel of the building
...and avoid any structural compromise
...and stay on schedule
Investment
Early Attempts

Model Coordinates

Was

\[ Y': -4825' 9\frac{27}{28}" \]

\[ Y: -5109' 11\frac{27}{28}" + 2\frac{1}{2}" = -5109' 9\frac{3}{2}" \]

New

\[ Y: -4826' 4" \]

#10149

Cloud Loc.    Field Loc.

\[ X_0: 4826' - 89/16 \]

\[ Y_0: 5045' - 825/256 \]

\[ Z_0: 109' - 403/64 \]

#10,150

Cloud Loc.    Field Loc.

\[ X_0: 4826' - 89/16 \]

\[ Y_0: 5045' - 825/256 \]

\[ Z_0: 109' - 403/64 \]

Rotation: 1.1337°
Refinement of Process

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Refinement of Process
Field Relationship

#1 - Mech Mezzanine/ Level 4 Main

#3 - Level 3 Main
Field Relationship

• Scanning process requires communication between:
  • Superintendent
  • Model Coordinator
  • Surveyor
Timing

- Scanning must be done:
  - after abatement and demolition
  - before needed for coordination
  - while space is as clean and inactive as possible
Result

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Result

- A perfect, model-based representation of existing conditions
Result

- A perfect, model-based representation of existing conditions

- There is no real need to abstract this backward into traditional, facet-based model geometry
Solved: Unreinforced Masonry Concerns

Re-use existing slab penetration

Turn conduit up farther east to avoid existing masonry

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DROP THIS FP LINE TO RUN JUST ABOVE THE OTHER ONE SERVING THE HOSE VALVE

RISE INSIDE MINI-SHAFT
Solved: Drop Beam Sizes and Locations
Solved: Maximized Ceiling Heights

SUGGEST TO LOWER 4" TO 7'-8" TO CONCEAL FIRE PROTECTION, ELECTRICAL, AND HVAC ROUTED UNDER LOW EXISTING BEAMS.

acceptable ss/tha
SUGGEST TO LOWER 7" TO 10'-8" TO CONCEAL STEAM LINES. STEAM LINES ARE HELD TIGHT TO STEEL AT NORTH END AND GRADE DOWNWARD TOWARD TUNNEL.

acceptable: ss/tha

REFERENCE BIM COORD ITEM 150916.03 POSTED SEPTEMBER 19.
Solved: Steel Erection QC

Actual Photo

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Model Only

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Point Cloud Only
Point Cloud & Model Overlay

TEMPORARY SHORING STRUCTURE

DIRECTION OF DIAGONAL BRACING Changed via field coordination confirmed with structural engineer
Lessons Learned
Thanks!

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