Constructible Design: Merging Design, Detailing & Coordination to Mitigate Risk and Create Predictable Outcomes

Jason McFadden & Tyler Donnell, Barton Malow Company
- TOWER EXPANSION: 31 SUITES
- EXPAND: 20,480 SEATS
- EXTEND B/W SEATS: 18,000 SEATS
- RECONFIGURE B/W: 16,500 SEATS
- REBUILD ON EXISTING: 45,320 SEATS

- **NEW TOTAL GRANDSTAND SEATS: 100,300 SEATS + SUITES**

- DEMOLISH EXISTING EXCEPT FOR B/W SEATING + LOWER SEATING STRUCTURE

531 WHEELCHAIR SPACES + 531 COMPANION SPACES. HOSPITALITY + SUITES HAVE ADDITIONAL LOCATIONS.
2,000,000+ MHs to date

Average monthly pay application of $10.6MM with a peak at $20.9MM

Detailing, fabrication, galvanizing, delivery & erection of 19,000+ tons of steel

Over 1,000,000 ft. of cabling pulled, terminated and energized including 23+ miles of new utility services

1,100,000sf of concrete slab on deck poured

Installation of 40 escalators & 16 elevators

5100+ prefabricated metal stud wall panels installed

180+ prefabricated plumbing carriers delivered
Design-Build Novation

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Project Risks

- Numerous Project Stakeholders
- Existing Facility
- Phased Turnover
- Sprint Tower Demolition
- Race Events During Constructions

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Jan 2014 - July 2014

Area B Lower Bowl Seating Complete

Areas B-D, K-F steel complete

West B&W seating reconstruction complete

Areas B, J & K Slab on deck complete

6 Elevator cars inspected & complete

Areas B & K exterior skin installation begins

Injectors 1, 2, & 5 concrete stair work begins
Constructible BIM
Model for a Purpose

ALUMINUM GRANDSTANDS
REBAR DETAILING
MISCELLANEOUS METALS DETAILING

CONNECTION DESIGN

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BIM-enabled Project Management

C. Barton Malow Company will facilitate and lead the BIM Process. Barton Malow Company will be the final authority on model issues. It is the responsibility of all BIM participants to resolve discrepancies pertaining to their own model. Each Subcontractor shall purchase at its own cost licenses of Navisworks 2013 including any maintenance and software updates during the course of the Project as well as licenses of Tekla BIMsight.

D. All BIM participants are required to attend all model review meetings, are expected to be active participants and have the expertise and authority to resolve coordination issues to produce a clash-free, information-loaded model. Provide sufficient detailing manpower to meet the BIM milestones for level of development as shown on the attached Exhibit 1 Table. Required coordination participants include:

1. Site Utilities
2. Auggest Files including reinforcing steel
3. Concrete Foundations and SOG including reinforcing steel
4. Structural Steel and Stairs
5. Miscellaneous Metals – Interior and Exterior
6. Architectural Millwork/Casework
7. Metal Panels
8. Curtainwall System
9. Metal Studs and Ceilings (ACT and Studs)
10. Kitchen Equipment
11. Aluminum Grandstand System
12. Elevators and Escalators
13. Fire Protection and Equipment
14. Mechanical Plumbing & Piping and Equipment
15. HVAC Systems and Controls and Equipment
16. Electrical System and Equipment (primary)
17. Electrical System and Equipment (building)
18. Low Voltage System and Equipment

E. A Mandatory BIM Kick-Off Meeting for all participants will be set up to review:

1. Team Collaboration
2. The execution process
3. Coordination schedule
4. Establishing standard zones per system

Subcontractor:

3. The Model is not considered to be the Final Coordination Model until the A/E and Owner has approved all systems and routings.

M. Should a conflict arise during installation that was not foreseen or solved during the coordination effort, each BIM participant will work together with Barton Malow Company to find a solution that is the least impact to all trades and the project. The cost of this work will be evaluated as the problems arise, however, the party responsible for the conflict will be responsible for the cost of the fix, including the additional detailing time of all parties involved.

N. The Final Coordination Model shall be kept up to date by all participants during construction to include any project updates including as-built information and documents and be submitted to Barton Malow Company electronically in IFC, native file format and PDF form on a rolling basis. In coordination with the Supply Chain Requirements, items to be included in these files includes:

1. Barcodes will be utilized on all objects as described by the Supply Chain Requirements and refer back to the User Defined Attributes (UDA’s).
2. User Defined Attributes (UDA’s), which are set-up within each respective BIM model for every object, must contain Supply Chain Requirements (submittal approval, material installed etc.), Equipment attributes (name, location etc.), Commissioning phases (pre-commissioning, functional performance test system start-up, equipment acceptance), Manufacturer Information (name, address, contact etc.), and Warranty/Service Information (warranty, service contact etc.).
3. RFI responses are required to be incorporated into the coordinated model when design changes are necessary. RFI answered documents will be attached to the objects by Barton Malow Company.
4. Submittal documentation will be uploaded via Dropbox by all subcontractors and attached to the objects by Barton Malow Company when Submittal approval is met.
5. All documentation submissions must be in PDF form as described in Section 2.01 F.
6. The BIM will be used as an as-built for the facility. Each BIM participant is required to provide a fully updated BIM of that participant’s system incorporating all as-built conditions and any field changes.
BIM-enabled Project Management
Detail similar to scupper

Gusset Plate connector to be water tightened by using white urethane coating... box out for HSS member.
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Constructible BIM

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Added Project Scope

- Partially Completed Areas
- 3-Month Schedule
- 11 Neighborhoods
- 5 Individual Injectors
- Understanding Design Element
<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Manufacturer</th>
<th>Expected Life</th>
<th>ExObject</th>
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<tbody>
<tr>
<td>Centrifugal Roof Mounted Type 1</td>
<td>Centrifugal Roof Mounted, Motorized...</td>
<td>Greenheck</td>
<td>n/a</td>
<td>n/a</td>
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</tbody>
</table>
Finishing Strong

- Tracking by Object
- Phased Turnover
- Document Organization
- As-Built Model Completion

OWNER EXPECTATIONS

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Leverage Data & Information
Handover Management

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Handover Management

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THE FINAL LAP
WALL OF PARTNERS

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“TEAMWORK IS THE ABILITY TO WORK TOGETHER TOWARD A COMMON VISION. THE ABILITY TO DIRECT INDIVIDUAL ACCOMPLISHMENTS TOWARD ORGANIZATIONAL OBJECTIVES. IT IS THE FUEL THAT ALLOWS COMMON PEOPLE TO ATTAIN UNCOMMON RESULTS.”

- Andrew Carnegie
Challenge the traditional LOD with BIM development and focus on providing constructible solutions.

Leverage 3D PDF’s to enhance communication with field staff.

Implement solutions that drive productivity on-site.

Align and integrate best-in-class tools for the ultimate process and technology toolbox.
LIFE IN THE FAST LANE
Value Propositions of a Technology-Enabled Workforce