Using BIM to Eliminate Construction Site Hazards
Life Cycle Stage – Repair, Operations, and Maintenance
Brian Krause, Turner Construction Company

Using BIM To Eliminate Construction Site Hazards
Life Cycle Stage – Repair, Operations, & Maintenance

Brian Krause, Turner Construction Company, bkrause@tcco.com

BIM for Safety Planning in Preconstruction & Construction
BIM for Facilities Management
Implementing BIM Jobsite Safety Planning measures for Repair, Operations, & Maintenance

Safety Survey: Top 12 Most Important: BIM Overlay
12. Complete accident investigation performed
11. 30-hour OSHA card and training check of subcontractors
10. Safety scopes (scopes reviewed during procurement)
  Environmental/Operational Policy reviewed and followed
  Project pre-planning/logistics flow
  Orientation and drug screening
  Launch engagement – sub selection and prequalification
  Project setup and controls established with subs
  Housekeeping maintained on a daily basis
  SPD and Interiors trained staff
  Pre-Task Plans
  PPE – 100% Compliance

Top Loss Drivers 2007-2012

BIM Safety Group Initiative

- Developed a list of 137 items for review within the safety process through modeling
- Topics: Safety Logistics, Excavation Safety, Fall Protection, & Lift Planning
- Targeting Fall from Height and Struck by Object First
- Overlay with NYC DOB Checklist and Safe & Sustainable Onsite Checklist
- References Green approaches and Lean strategies where applicable

Copyright © Turner Construction Company 2013 All Rights Reserved. No part of this document may be reproduced without written consent from the author.
Revit Template for Model Authoring

- Typical Phases
- Model Organization & Naming Conventions
- Schedules, Legends, & Preset Views
- Detailed model library

Logistics Studies

- Traditional
- PowerPoint Template + SketchUp 3D

Maintenance of Traffic (MOT) Planning

- Brickell Citi Centre

Safety Logistics: Fire Extinguishers

- A designated 20lb type ABC fire-extinguisher shall be located
  - next to the entrance/exit to a stairwell (every floor)
  - at each elevator entrance/buck hoist (every floor),
  - one for every 3000 square feet
  - no more than 75 feet apart.
- A 20 lb type ABC fire-extinguisher shall be located within 35 feet of any fuel storage areas.
Using BIM to Eliminate Construction Site Hazards

Life Cycle Safety Stage – Repair, Operations, and Maintenance

Brian Krause, Turner Construction Company

---

### Rule Checking – Additional Confirmation

**Warning:** Fire Extinguishers are 75' apart!

---

### Rule Checking – Additional Confirmation

**Warning:** There are no fire extinguishers on the 3rd floor!

---

### Rule Checking – Additional Confirmation

**Warning:** There is no fire extinguisher close to the hoist on any floors!

---

### Safety Logistics: Material Storage

- Storage of any materials within 10' feet of a fire hydrant is strictly prohibited.
- No materials shall be stored within 10' feet of the perimeter of each level.
- Indoor storage of flammable or combustible liquids in excess of 25 gallons must be in an approved cabinet.
- Outdoor storage areas must not exceed 1100 gallons and must be graded in a manner to divert any spills away from the building.
- At a minimum, a 12" inch curb or earthen dike must surround the storage area.
- Where possible secondary containment should be used. Protection with jersey barriers is highly recommended.

---

### Safety Logistics: Material Storage

**Warning:** Material Storage is too close to Fire Hydrant!
Using BIM to Eliminate Construction Site Hazards
Life Cycle Safety Stage – Repair, Operations, and Maintenance
Brian Krause, Turner Construction Company

Safety Logistics: Fall Protection

Warning: These slab openings require edge protection!

Safety Logistics: Fall Protection

Warning: These slab openings require edge protection!

Turner 50 Point Check – Built-in Checklist

- Construction model should include elements: Constructon fence, Excavation, Ramp, Means of Egress, Gate, Flagman, Material Storage
- Gates and Flagmen should be <5’ apart in 3D
- Ramps should have a slope no greater than 25%
- Superstructure model should include elements: Slab, Slab opening, Edge protection, Horizontal netting
- All floor perimeters should have edge protection
- All openings >12” should have edge protection
- Edge protection should be minimum 42” tall
- Identify all openings >12”
- All models should contain elements: Construction Trailer, Portrait, Project Board, Security Booth
- Number of portalets on site should be based on manpower
- Confirm if erosion and sedimentation control plan is required based on site area.
- All models should include elements: Fire Hydrant, Fire Extinguisher, Hoist, Material Storage, Slab, Egress, Star
- Material storage should be >10’ from Fire Hydrant
- Material Storage should be >10’ from Building
- Fire Extinguishers should be installed on each floor
- Fire Extinguishers should have maximum 75’ separation
- Fire Extinguishers should be maximum 10’ from exit on each floor
- All models should include elements: Traffic Cones, Bollards, Safety Barricades, Safety Cables, Jersey Barriers, Steel Traffic Barriers

Implementing BIM Jobsite Safety Planning measures for Repair, Operations, & Maintenance

Model Based Safety Code Checking for Fall Prevention
- Check Model for Edge Protection Necessary
- Check Model for Slab Opening Protection Necessary

NYC DOB Safety Submissions

- 2D & 3D documentation produced simultaneously through a BIM documentation environment
- Documentation is produced with detailed information rich models from Turner’s BIM Library
- Dwf file format exported & sent to the DOB (in both 2D & 3D)
- DOB can markup & return comments in free application (Autodesk Design Review)
- Objects in model pull detail rich information from BIM (by selecting an item, you can see its properties)
- DOB and Owner can easily review project & navigate in model on a computer or a mobile device to verify field condition matches the submitted information.
Using BIM to Eliminate Construction Site Hazards  
Life Cycle Safety Stage – Repair, Operations, and Maintenance  
Brian Krause, Turner Construction Company

<table>
<thead>
<tr>
<th>Viewing in the Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>NYC DOB BIM Site Safety Standards</td>
</tr>
<tr>
<td>- NYC Department of Buildings (DOB) BIM Site Safety Submission Guidelines &amp; Standards</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Using BIM To Eliminate Construction Site Hazards Life Cycle Stage – Repair, Operations, &amp; Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>- BIM for Safety Planning in Preconstruction &amp; Construction</td>
</tr>
<tr>
<td>- BIM for Facilities Management</td>
</tr>
<tr>
<td>- Implementing BIM Jobsite Safety Planning measures for Repair, Operations, &amp; Maintenance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BIM for Facilities Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Tagged Navisworks Model with Links to Database</td>
</tr>
<tr>
<td>- Medimmune – 1200+ Model Tags linked to Digital Facilities Manual</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BIM for Facilities Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Columbia University – Cloud Synced Documents &amp; BMS link for temperature and alarm monitoring – 601 Physical Sensors, 17,075 Data Points, 2,250 Points Polled, 3,437 Documents, 14,524 Document Links</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BIM for Facilities Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>- QR Code Reader and Bar Code Scanning App to access Library &amp; Monitor</td>
</tr>
</tbody>
</table>

Copyright © Turner Construction Company 2013 All Rights Reserved.  
No part of this document may be reproduced without written consent from the author.
Using BIM to Eliminate Construction Site Hazards
Life Cycle Safety Stage – Repair, Operations, and Maintenance
Brian Krause, Turner Construction Company

• BIM for Safety Planning in Preconstruction & Construction
• BIM for Facilities Management
• Implementing BIM Jobsite Safety Planning measures for Repair, Operations, & Maintenance

Implementing BIM Jobsite Safety Planning measures for Repair, Operations, & Maintenance

• Identify causes of injury & losses in Repair, Operations, & Maintenance
  12. Complete accident investigation performed
  11. 30 Hour OSHA card and training check of subcontractors
  10. Safety scopes (scopes reviewed during procurement)
  9. Environmental Operational Policy reviewed and followed
  8. Project pre-planning/logistics flow
  7. Orientation and drug screening
  6. Launch engagement – sub selection and prequalification
  5. Project setup and controls established with subs
  4. Housekeeping maintained on a daily basis
  3. SPD and Interiors trained staff
  2. Pre-Task Plans
  1. PPE – 100% Compliance

• Timely Automated Rule Based Notification of Maintenance Issues

• Visualize Repair & Maintenance

• Automated Rule Based Notification of Repair & Operations Hazards

• Facility Repair Information Integration of Information
Using BIM to Eliminate Construction Site Hazards
Life Cycle Safety Stage – Repair, Operations, and Maintenance
Brian Krause, Turner Construction Company

Questions?
Using BIM To Eliminate Construction Site Hazards
Life Cycle Stage – Repair, Operations, & Maintenance
Brian Krause, Turner Construction Company, bkrause@tcco.com