BIM Utilization in TOKYO SKYTREE

Hiroshi Miyakawa
Obayashi Corporation
Building Construction Division
PD Center
General Manager
## Project Outline

<table>
<thead>
<tr>
<th><strong>Name</strong></th>
<th>TOKYO SKYTREE</th>
</tr>
</thead>
</table>
| **Owner** | Tobu Railway Co., Ltd.  
Tobu Tower Skytree Co., Ltd |
| **Architect** | Nikken Sekkei Ltd. |
| **Contractor** | Obayashi Corporation |
| **Location** | Oshiage, Sumida Ward, Tokyo |
| **Site Area** | 36,844m² (Tower + Podium Bldg.) |
| **Height** | 634m |
| **Structure** | Steel Frame,  
Steel Framed Reinforced Concrete,  
and Reinforced Concrete Structure |
| **Construction** | June 2008 – February 2012 |
Project Outline
Design Concept

- Triangle Transforms into Circle
- Concave and Swelling
BIM in Construction

1. Review of Complex Detail
2. BIM Utilization in Fabrication
3. Construction Sequence Simulation
4. Constructability Review
5. BIM Utilization in Accuracy Control System
1. Review of Complex Detail

Top of antenna spire (gain tower) 634 m

Second observatory 450 m

First observatory 350 m
1. Review of Complex Detail

Truss node
Detail Design — Functional Verification · Visualization — (attachments for maintenance, separate work, etc.)
● Temporary attachments

Functional Verification,
Detail Study
東京スカイツリー建設
のICT技術
2. BIM Utilization in Fabrication

Transfer BIM into the special purpose CAD in 3D-DXF format
Generate curved sheet of layout in full-scale

Installation of the curved layout
Confirm the position of 700+ studs
2. BIM Utilization in Fabrication

- Transportation simulation — gravity center, weight, and size — (feedback to steel fabrication: position of joints and lifting lugs)

Product Weight: 22.1t ⇒ OK
3. Construction Sequence Simulation

West Area
- Tobu Iseasaki Line
- 150 t CC
- West leg horizontal brace & excavation

Tower Area
- North leg excavation
- Slab concrete: top-down method
- Utility installation at planned road

East Area
- 150 t CC
- East leg horizontal brace & excavation

Kitajikken River
Excavation completed---before steel erection

Steel pile of wall foundation
Excavation completed---before steel erection
Installation of grade beam (lower part)

Grade beam
(lower part: h2,500mm)

Connection to steel pile
Installation of grade beam (lower part)
4. Constructability Review - eave soffit panel -
4. Constructability Review – eave soffit panel

SkyJuster: hoisting load control device
4. Constructability Review –eave soffit panel-
5. BIM Utilization in Accuracy Control System

- Interacting with Steel Erection Accuracy Control System
### 3D Surveying System

- **Interacting with Steel Erection Accuracy Control System**

<table>
<thead>
<tr>
<th>部材マーク</th>
<th>柱頭芯座標</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-35C1-1</td>
<td>0.00</td>
<td>16854.41</td>
<td>294500.00</td>
<td></td>
</tr>
<tr>
<td>1-35C3-A1</td>
<td>-8386.00</td>
<td>14550.87</td>
<td>294500.00</td>
<td></td>
</tr>
<tr>
<td>1-35C3-B1</td>
<td>8386.00</td>
<td>14550.87</td>
<td>294500.00</td>
<td></td>
</tr>
<tr>
<td>1-35C5-1</td>
<td>14556.72</td>
<td>8404.32</td>
<td>293500.00</td>
<td></td>
</tr>
<tr>
<td>2-35C1-1</td>
<td>-14596.33</td>
<td>-8427.20</td>
<td>294500.00</td>
<td></td>
</tr>
<tr>
<td>2-35C3-A1</td>
<td>-8408.40</td>
<td>-14537.93</td>
<td>294500.00</td>
<td></td>
</tr>
<tr>
<td>2-35C3-B1</td>
<td>-16794.42</td>
<td>-12.92</td>
<td>294500.00</td>
<td></td>
</tr>
<tr>
<td>2-35C5-1</td>
<td>-14556.70</td>
<td>8404.34</td>
<td>293500.00</td>
<td></td>
</tr>
<tr>
<td>3-35C1-1</td>
<td>14596.33</td>
<td>-8427.20</td>
<td>294500.00</td>
<td></td>
</tr>
<tr>
<td>3-35C3-A1</td>
<td>16794.41</td>
<td>-12.92</td>
<td>294500.00</td>
<td></td>
</tr>
<tr>
<td>3-35C3-B1</td>
<td>8408.41</td>
<td>-14537.92</td>
<td>294500.00</td>
<td></td>
</tr>
<tr>
<td>3-35C5-1</td>
<td>0.00</td>
<td>-16808.64</td>
<td>293500.00</td>
<td></td>
</tr>
</tbody>
</table>

- Automatic Registration
- Control Device: Laptop PC (Wi-fi embedded)
- Total Station
- Wi-fi

**Target points in 3D coordinate**
3D Surveying System

Total Station:
- Auto-rotation
- Manual confirmation

Control Device: Laptop PC (with Wi-fi)

Target:
- Reflection sheet marked during fabrication, attached on site.

Calculates points based on displacement and twist of the center of steel

Displays results and directions