Direct Design ⇔ Revit Import/Export

Structural Masonry Design With BIM

A Preview

Russ Peterson
Ensoltech
russp@ensoltech.com
Overview

Questions to answer:
• What is Direct Design?
• What is Direct Design Software?
• How will the interaction with Revit look?
• What is the time line for this initial phase of the project?
• What does the future hold for this project?
Direct Design Handbook
(TMS 403)

- New design standard from The Masonry Society
- Developed by TMS Design Practices Committee
- Based on TMS 402 & ASCE 7
- Streamlines design process for common buildings
- Currently undergoing major enhancement
Direct Design Software
www.DirectDesignSoftware.com

- Based on Direct Design Handbook (TMS-403)
- Joint venture with NCMA
- Initial version released five years ago
- Currently version 2.0
- Version 3 in development
- Version 3 based on TMS 403-17
DDS Modeling Environment
DDS Design Results

- Software details reinforcement and control joints
- The goal is to get this information into the Revit model
Revit Schedules

- Actual modeling of rebar/grout/etc. in Revit is complicated
- Initial version of this will use schedules
- Future phase may create actual model artifacts

### Wall Opening Reinforcement Schedule

<table>
<thead>
<tr>
<th>Wall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall @ Grid Line A between Grids 1 &amp; 3</td>
</tr>
<tr>
<td>Wall @ Grid Line 1 between Grids A &amp; B</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opening #</th>
<th>Opening Size</th>
<th>E Bar Size</th>
<th>J Bar Size</th>
<th># J Bars (left)</th>
<th># J Bars (right)</th>
<th>B Bars (#)</th>
<th>O Bar Size</th>
<th>O Bar Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No. 5</td>
<td>No. 5</td>
<td>2</td>
<td>2</td>
<td>No. 5 (1)</td>
<td>No. 4</td>
<td>40&quot;</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>No. 5</td>
<td>No. 5</td>
<td>2</td>
<td>1</td>
<td>No. 5 (2)</td>
<td>No. 4</td>
<td>40&quot;</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>No. 5</td>
<td>No. 5</td>
<td>3</td>
<td>2</td>
<td>No. 7 (2)</td>
<td>No. 5</td>
<td>32&quot;</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>No. 5</td>
<td>No. 6</td>
<td>2</td>
<td>2</td>
<td>No. 5 (1)</td>
<td>No. 5</td>
<td>32&quot;</td>
<td></td>
</tr>
</tbody>
</table>
Step 1: Model Walls/Openings

- Create model in Revit
- Building plan layout in place (walls)
- Openings in place
- Block information not required
Step 2: Export from Revit

- Choose DDS Export command
- (command installed by add-in)
Step 3: Import Into DDS

- Choose Revit Import command
- Choose from list of exported files
Step 4: Wall Filtering

- Some walls in the Revit model may not be included in the Direct Design Software model.
- Some walls violate Direct Design constraints and are filtered automatically.
- User may choose to remove some walls that are non-structural.
Step 5: Additional DDS Inputs

- Enter things that aren’t imported from the Revit model
- Mainly loading inputs
- Minor structural geometry information

### ASCE 7-10 Criteria

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk Category</td>
<td>II</td>
</tr>
<tr>
<td>Ground Snow Load (pg)</td>
<td>20 psf</td>
</tr>
<tr>
<td>Wind Speed (V)</td>
<td>90 mph</td>
</tr>
<tr>
<td>Exposure Category</td>
<td>B</td>
</tr>
<tr>
<td>Site Class</td>
<td>D</td>
</tr>
<tr>
<td>Spectral Accel-1sec (S1)</td>
<td>0.50</td>
</tr>
<tr>
<td>Spectral Accel-short (Ss)</td>
<td>0.50</td>
</tr>
</tbody>
</table>
Step 6: DDS Process Runs

- Performs calculations & produces detailed drawings

**Story 3 Force**

Vertical distribution factor \( C_{v3} \), Equation 12.8-12, p. 91:

\[
C_{v3} = \frac{w_3 h_3^k}{\sum w_i h_i^k} = \frac{(333.33 \text{ k})(32.00 \text{ ft})^{1.00}}{22,000.00 \text{ ft k}} = 0.48
\]

Lateral seismic force \( F_3 \), Equation 12.8-11, p. 91:

\[
F_3 = C_{v3} V = (0.48)(197.33 \text{ k}) = 95.68 \text{ k}
\]

**Summary of Story Loads**

- 95.68 k
- 65.70 k
- 35.88 k
- 197.33 k
Step 7: Export to Revit

- Choose Revit Export command
- Export file is created for Revit to read
Step 8: Revit Import

- Choose DDS Import command
- (command installed by add-in)
- Add-in reads the import file and generates schedules
Step 9: View Schedules in Revit

- Schedule for wall reinforcement
- Schedule for opening reinforcement
- Schedule for control joints

### Wall Distributed Reinforcement Schedule

<table>
<thead>
<tr>
<th>Wall</th>
<th>Horizontal</th>
<th>Vertical</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>H Bar Size</td>
<td>H Bar Spacing</td>
</tr>
<tr>
<td>Wall @ Grid Line A between Grids 1 &amp; 3</td>
<td>No. 5</td>
<td>32”</td>
</tr>
<tr>
<td>Wall @ Grid Line B between Grids 1 &amp; 3</td>
<td>No. 5</td>
<td>32”</td>
</tr>
<tr>
<td>Wall @ Grid Line 1 between Grids A &amp; B</td>
<td>Bed Joint Reinf.</td>
<td>16”</td>
</tr>
<tr>
<td>Wall @ Grid Line 3 between Grids A &amp; C</td>
<td>Bed Joint Reinf.</td>
<td>16”</td>
</tr>
</tbody>
</table>
Time Line

- Not started yet, other than design
- DDS 3.0 just being completed
- Development to begin this summer
- Initial completion by The Masonry Society Fall Meeting
- Final completion by year end
Future Phase

- Been discussed for 2018
- Import: Bring more things into the DDS model, further reducing user input
- Export: Push true modeling information into Revit, rather than schedules
Thank You

www.DirectDesignSoftware.com