Estimating with Navisworks Quantification

Kevin Miller & Kenny Deemer
Introductions
Kevin Miller, Ph.D.
Professor and Program Coordinator for the Construction and Facilities Management program at BYU.
Traveled around the US researching how companies use BIM.
Prior to teaching, estimated for commercial contractors.
I teach Precon Services using BIM tools.
As a construction, mining and engineering leader, Kiewit is a FORTUNE 250 company with revenues of nearly $12 billion. Kiewit, through its operating companies, brings a wealth of diverse resources and a track record for delivering the highest quality results — on budget and on schedule. Kiewit’s size and experience provides the stability, predictability and know-how our clients and partners expect — and the flexibility and overall best value they deserve.

**EMPLOYEE-OWNED**

Kiewit is one of the largest employee-owned firms in North America.

Kiewit is consistently ranked among ENR’s **TOP 5** contractors.
Where we work
Markets

OIL, GAS & CHEMICAL
- UPSTREAM
  - Offshore
  - Oil sands
- MIDSTREAM
  - Gas processing
  - Compressor & pump stations
  - Pipelines and terminals
  - LNG
- DOWNSTREAM
  - Refining
  - Petrochemicals

TRANSPORTATION
- Air
- Bridge
- Marine and port facilities
- Rail
- Roads
- Tunnels

POWER
- Gas
- AGCS
- Power delivery
- Renewables
- Nuclear
- Hydroelectric

BUILDING
- Commercial
- Data center / mission critical
- Education
- Government
- Healthcare
- Hospitality
- Manufacturing / industrial
- Mixed use / retail
- Sports and entertainment
- Transit facilities

MINING
- Contract mining
- Mine infrastructure
- Mine planning
- Ore processing
- Owned operations

WATER/WASTEWATER
- Dam
- Desalination
- Water supply
- Wastewater
Class summary

- Navisworks 2015 took a huge step forward with Quantification. Come learn how to: Create catalogs, access data properties in the model, perform 2D takeoff, create custom quantity formulas, override model quantities, export the data to Microsoft Excel.
Key learning objectives

At the end of this class, you will be able to:

- Understand the takeoff process in Navisworks.
- Develop strategies for quantity takeoff in Navisworks.
- Customize property mappings for Quantification.
- Incorporate visual strategies to verify takeoffs.
What’s Different from QTO

- It doesn’t crash!!!!!
- Richer metadata. ALL of the model information can be tapped.
- Render settings and transformations
- Better data export

- For Quantification, Navisworks Manage or Simulate is required.
Overview of Navisworks Quantification
Live Demo
Type of Takeoffs
# Quick Budget

## Conceptual Cost Model

**Project:**

**Location:** Denver, CO

**Client:**

**Estimate Cat.:** Conceptual Cost Model

### Hotel, Retail, and Parking Garage

<table>
<thead>
<tr>
<th>System Description</th>
<th>Hotel 127,695</th>
<th>Retail 15,340</th>
<th>Garage 31,794</th>
<th>Project Support 171,731</th>
<th>Total Cost/SF</th>
</tr>
</thead>
<tbody>
<tr>
<td>A10 Foundations</td>
<td>$706,473</td>
<td>$5,53</td>
<td>$38,99</td>
<td>$1,945,302</td>
<td>$11,26</td>
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<tr>
<td>A20 Basement Construction</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$674,336</td>
<td>$3,90</td>
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<tr>
<td>B10 Superstructure</td>
<td>$5,642,653</td>
<td>$44,19</td>
<td>$32,95</td>
<td>$7,928,997</td>
<td>$45,86</td>
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<tr>
<td>B20 Exterior Closure</td>
<td>$6,684,034</td>
<td>$52,34</td>
<td>$46,67</td>
<td>$8,922,152</td>
<td>$45,84</td>
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<tr>
<td>B30 Roofing</td>
<td>$301,925</td>
<td>$2,36</td>
<td>$0</td>
<td>$312,975</td>
<td>$1,81</td>
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<tr>
<td>C10 Interior Construction</td>
<td>$3,741,141</td>
<td>$29,30</td>
<td>$2,50</td>
<td>$3,858,391</td>
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<td>C20 Stairs</td>
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<td>$0</td>
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<td>C30 Interior Finishes</td>
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<td>D10 Conveying</td>
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<td>$1,219,750</td>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
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<td>D20 Plumbing Systems</td>
<td>$1,631,814</td>
<td>$12,78</td>
<td>$2,17</td>
<td>$1,824,693</td>
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<td>$25,60</td>
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<td>D50 Electrical</td>
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<td>$3,94</td>
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<td>$0,37</td>
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<td>E20 Furnishings</td>
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<td>$0,00</td>
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<td><strong>$242,37</strong></td>
<td><strong>$73,44</strong></td>
<td><strong>4,249,774</strong></td>
<td><strong>$232,14</strong></td>
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</tbody>
</table>

### Summary

- **Total Cost:** $40,121,087
- **Cost/SF:** $232.14
# Detailed Estimate

## Estimate Detail - Production - Standard Construction Project

**Cost:** Without Taxes and Insurance

<table>
<thead>
<tr>
<th>Item Code</th>
<th>Description</th>
<th>Quantity</th>
<th>UM</th>
<th>Crew</th>
<th>Production ProdUM</th>
<th>Lab Unit</th>
<th>Mat Unit</th>
<th>Eqp Unit</th>
<th>Sub Unit</th>
<th>Eqp Rent Unit</th>
<th>Temp Mat Unit</th>
<th>Other Unit</th>
<th>Total Unit</th>
<th>Total Cost</th>
</tr>
</thead>
</table>

### Miscellaneous Items

<table>
<thead>
<tr>
<th>Item Code</th>
<th>Description</th>
<th>Quantity</th>
<th>UM</th>
<th>Crew</th>
<th>Production ProdUM</th>
<th>Lab Unit</th>
<th>Mat Unit</th>
<th>Eqp Unit</th>
<th>Sub Unit</th>
<th>Eqp Rent Unit</th>
<th>Temp Mat Unit</th>
<th>Other Unit</th>
<th>Total Unit</th>
<th>Total Cost</th>
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</thead>
</table>

### Underpinning Box

<table>
<thead>
<tr>
<th>Item Code</th>
<th>Description</th>
<th>Quantity</th>
<th>UM</th>
<th>Crew</th>
<th>Production ProdUM</th>
<th>Lab Unit</th>
<th>Mat Unit</th>
<th>Eqp Unit</th>
<th>Sub Unit</th>
<th>Eqp Rent Unit</th>
<th>Temp Mat Unit</th>
<th>Other Unit</th>
<th>Total Unit</th>
<th>Total Cost</th>
</tr>
</thead>
</table>

### Mat Slab Foundation

<table>
<thead>
<tr>
<th>Item Code</th>
<th>Description</th>
<th>Quantity</th>
<th>UM</th>
<th>Crew</th>
<th>Production ProdUM</th>
<th>Lab Unit</th>
<th>Mat Unit</th>
<th>Eqp Unit</th>
<th>Sub Unit</th>
<th>Eqp Rent Unit</th>
<th>Temp Mat Unit</th>
<th>Other Unit</th>
<th>Total Unit</th>
<th>Total Cost</th>
</tr>
</thead>
</table>

*Total Miscellaneous Items*: $1,314.00

*Total Underpinning Box*: $6,590.50

*Total Mat Slab Foundation*: $26,750.20

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**Group 1: Construction Systems**

**Estimator:** Kenny Deemer

**Project Site:** U.S.A
## Scoping

**Project:** Kahului - CONRAC  
**Estimator:** Kenny Deemer

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Plug-In</th>
<th>Firm: Beachside Roofing</th>
<th>Alcat:</th>
<th>U.P.</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td></td>
<td><strong>Standing Seam Metal Roof</strong></td>
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<tr>
<td>101.007</td>
<td>Structural Design Cals for Roof</td>
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<td>$2,123,037.00</td>
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<td>PE Stamped Slat of Hawaii</td>
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<td>$507.00</td>
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<td></td>
<td>Quality Assurance Requirements per spec 1.06 A-E</td>
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<tr>
<td></td>
<td>1 Year Material warranty</td>
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<td>1&quot; High Minimum Vertical &quot;T&quot;</td>
<td></td>
<td>SF</td>
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<td>$507.00</td>
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<td>Total</td>
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<tr>
<td></td>
<td>Manufacturer Finish DUROGUARD Center Color 978 Hunter Green</td>
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<td>SF</td>
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<td>$507.00</td>
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<td>U.P.</td>
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<td></td>
<td><strong>Locations</strong></td>
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<td></td>
<td>Stair Exit Cables</td>
<td>5.589</td>
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<td>East and West Core</td>
<td>27.885</td>
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<td>South Roof</td>
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<td>North Roof</td>
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<td>Chiller Room Metal Roof - Service Yard</td>
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<td>$30,525.00</td>
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<td>Total</td>
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<tr>
<td></td>
<td>Expansion Joints at Core Areas I38/16/47/43</td>
<td>209</td>
<td>LFT</td>
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<td>$5,225.00</td>
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<td>U.P.</td>
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<td></td>
<td>Expansion Joints at S5 roof I38/15/8/47/55 North &amp; South</td>
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<td>$4,375.00</td>
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<tr>
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<td>Fitting at joint</td>
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<td></td>
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<td>Total</td>
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<td>Electrostatic Ablower</td>
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<td>Downspouts at Chiller Room Roof</td>
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<tr>
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<td>Downspouts at Glass Canopy - 08/17/43</td>
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<td>$9.00</td>
<td>$104.00</td>
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<tr>
<td></td>
<td>Flexible Rainwater Leader</td>
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<td></td>
<td></td>
<td>U.P.</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>Are you being in with internal Glass Canopy drainage?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>U.P.</td>
<td>Total</td>
</tr>
</tbody>
</table>
Familiarization
Did you get a model like this?
Or Like this
Detailed Takeoff
Search & Rescue
The Dump
Quantification from the Beginning
Detailed Takeoff Live Demo
Search Takeoff Live Demo
Why is search powerful?
Quantities now What?

- Excel Pivot Tables
- Pivot Charts
- Dashboards
- Integration with Estimating Systems
Prepping for Quantification
Navisworks Setup

- Files
  - Opening
  - Appending
  - Importing
Navisworks Setup

- File Types
  - NWC
  - RVT
  - DWG
  - DWF
  - PDF (subscription Only)
Revit Export Options

- My Preferences
  - Convert All Parameter.
  - Do NOT Divide into Levels
  - Export see next slide

- Pay attention to Section Box in Revit
Export options

- Entire Model
  - You get everything
  - You may not want Everything

  - May not want everything
    - Existing building
    - Analytical objects

- Current View
  - You don’t get everything
  - You may not want everything

  - You get what you see
    - May miss phasing objects
    - Don’t need to deal with Analytical objects

What to do with Curtain Wall Mullions?
Prepping for Takeoff in Navisworks

- Render Style - Shaded
- Display Units, Decimal Places, Selection Options
- Model Color - white
- Model Transparency – walls 15%
- Appearance Profiler – applies to all models quickly
  - Search sets can be helpful.
What do you want to takeoff?

- Determine what you want to takeoff.
- See how the objects are classified in the model.

- There are many different structures in the model.
  - Navisworks allows the user to define where it should go in the takeoff structure rather than relying the designers structure.

<table>
<thead>
<tr>
<th>Model Name</th>
<th>Estimate Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation Slab</td>
<td>Spread Footing</td>
</tr>
<tr>
<td>Wall Foundation</td>
<td>Continuous Footing</td>
</tr>
<tr>
<td>Wall</td>
<td>Foundation Wall</td>
</tr>
</tbody>
</table>
See what information is available

- Look at the object properties.
- Map the properties.
  - Height, height, W, Wt

- Review the catalog formula calculations.
  - Gyp board: Length * Height vs. Area
  - Struct Steel: Weight per foot vs Total weight.
Property Mapping

If there is a property field in the model and you may want it in the estimate, Map it.

- Weights found in different fields
- Description
- Tags – eg Wall tags, Door tags, etc
- Level/location information
- Coding structure information eg, MasterFormat, UniFormat, etc,
Double Check Mapped Values

- Values correct, great.
- Values incorrect, override the values.
Estimating Context

- Navis allows the estimator to see as much or little of the other models to understand the context of what is being taken off.
- Hide/show takeoff objects.
Catalogs

- Benefits of NOT Using a catalog
  - Rapid Takeoff
  - Works if organized by ???
Benefits of Using a catalog
- Custom formulas
- Default colors and transparency
- Alignment with estimating databases
Custom Catalogs

- Grow the catalog as you go.
- Multiple catalogs can be created and used.
- Export the catalog after a project and then it can be reused for future projects.
- Comes in with the same setup for the project.
  - If you want to come in and change the setup info for the project quick XML edit will allow that to happen
Model Updates
Model Updates
Full Circle Demo
Online Resources
Tutorials

- [http://cmfac.groups.et.byu.net/miller/cm411/help/Navis Tutorials.php](http://cmfac.groups.et.byu.net/miller/cm411/help/Navis Tutorials.php)
  - Step by Step Intro to Quantity Takeoff in Navis.
  - XML Editing Instructions.
Templates

- Excel Template to Build Catalog from scratch.

2D PDF takeoff

- 2D PDF plugin (Subscription Customers Only)
  - OR
Thank you to:

- Kenny for joining me on this presentation.
- My Contacts at Autodesk who answer my questions.
- All of the individuals and companies who are willing to let me come and learn from you.
I love my extremely powerful and yet portable computer.

https://www.youtube.com/watch?v=DqDXmwfoLuU