

Every Building Has Its Price: Finding It with Autodesk® Navisworks® Manage 2014 Quantification

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Class summary

Every building truly does have its price and one of the most time-consuming items during the estimation process is to perform and complete a building takeoff. In this lecture, we teach you how to use Navisworks Manage 2014 Quantification workflows to help you minimize your time doing takeoffs. We use 3D models (Autodesk® Revit® Architecture software) to complete our tasks in this class. You learn to understand the Navisworks Manage 2014 Quantification software interface and the tools in the software, and leave the class feeling ready to tackle the coming takeoff challenges.

Key learning objectives

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

- Learning Objective 1: Create formulas with the Resource tool
- Learning Objective 2: Use new workflows that Navisworks Manage Quantification provides
- Learning Objective 3: Explain the concepts and processes behind virtual and model takeoff
- Learning Objective 4: Analyze, validate, and export data into XLS format

Getting Started – Quantification Tools

Before we get into the hands on, lets explore some of the interface, terminology and tools we will be using today

Quantification Process Overview

Managing Design Information

3D View: 3D_Exterior_Export - Autodesk_Hospital_Architectural.rvt

Schedule: Panel Schedule - Autodesk_Hospital_Architectural.rvt

A	B	C	D	E
Family	Type	Count	Area	Manufacturer
Curtain Wall	Curtain Wall	1	78 SF	
Pilkington - Profil - Amethyst	Profilit - Amethyst	477	9693 SF	Pilkington
System Panel	Glazed	477	9693 SF	
System Panel	Glazed Spandrel	761	33944 SF	
System Panel	Glazed Spandrel	808	9394 SF	
System Panel	Glazed Spandrel - SSG	471	5567 SF	
System Panel	Glazed SSG	173	2931 SF	

Autodesk Revit

Item & Resource Management

Resource Catalog

Resources	RBS
02000 Site	1
03000 Concrete	2
04000 Masonry	3
05000 Metals	4
Rebar #3	4.4
Rebar #4	4.4
Rebar #5	4.4
Rebar #6	4.4
06000 Wood	5
2x4 Wood Studs 16" OC	5.1
2x4 Wood Studs 24" OC	5.1
2x6 Wood Studs 16" OC	5.1
2x6 Wood Studs 24" OC	5.1
07000 Thermal and Moisture...	6
08000 Door and Window	7
09000 Finishes	8
10000 Misc Specialties	9

Resource Name: Rebar #4
Description: NOTE (LENGTH)ModelW

Resource Calculations:
Variable: =
Length: =
Width: =
Thickness: =
Height: =
Perimeter: =
Area: =
Volume: =
Weight: =
Count: =
PrimaryQuantity: =

Autodesk Navisworks

Model Based Quantification

Model Takeoff

Items

Items	WBS
Substructure	A
Foundations	A.10
Structural Foundations	A.10.10
Continuous Footings 1' thick(13)	A.10.10.1
Finish Concrete - Trowel	
Formwork - Continuous Footings	
Concrete 3000 psi	
Rebar #4	
Isolated Footings 5'-0x5'-0x1'-0(33)	A.10.10.2
Isolated Footings(2)	A.10.10.2
Seal Concrete(0)	A.10.10.3
Footings (Ret) 1' thick(2)	A.10.10.1
Special Foundations	A.10.20

Status: A.10.10.1 Continuous Foot...
WBS/RBS: 2.2 Finish Concrete -
2.3 Formwork - Cont...
2.1 Concrete 3000 p...

Autodesk Navisworks

Change Analysis & Reporting

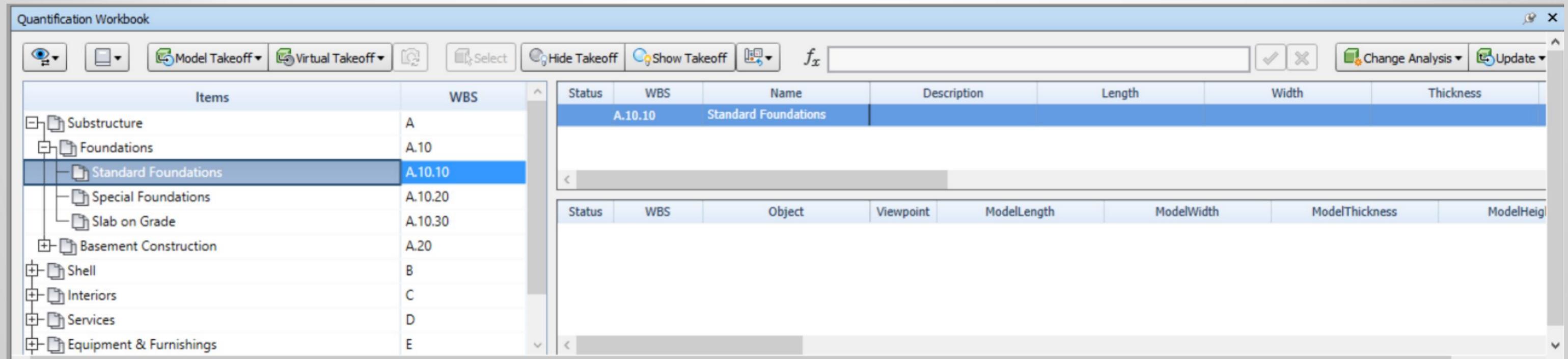
Row Labels

Row Labels	Model
Shell	
Superstructure	
Floor Construction	
Structural Framing - Beams	
C12x20.7	428.
W12x26	3152.
W16x36	19308.
W18x50	6264.
W18x60	1094.
W21x132	804.9
W21x50	7202.
W11x57	4166.
W24x84	198.3
W30x108	1049.
W30x124	357.8
W33x150	577.4
W40x147	419.9
Structural Framing - Columns	
Column 14x120	
Column 14x145	223.8
Column 14x176	
Column 14x68	
Column 14x99	
Column 3-9-4-2	
Column HSS6x6x5/16	480.0
Structural Slab - Elevated	
SOMD 6" Concrete - 3" Metal Deck	
Roof Construction	
Structural Slab - Elevated	
SOMD 3" Concrete - 2" Metal Deck	
SOMD 6" Concrete - 3" Metal Deck	
Substructure	
Basement Construction	
Basement Walls	
(blank)	
Foundation Walls (Ret) - 12" Thick	406.9
Stepped Foundation Walls - 15" Thick	1076.
Foundations	
Slab on Grade	

Autodesk Navisworks/
3rd Parties

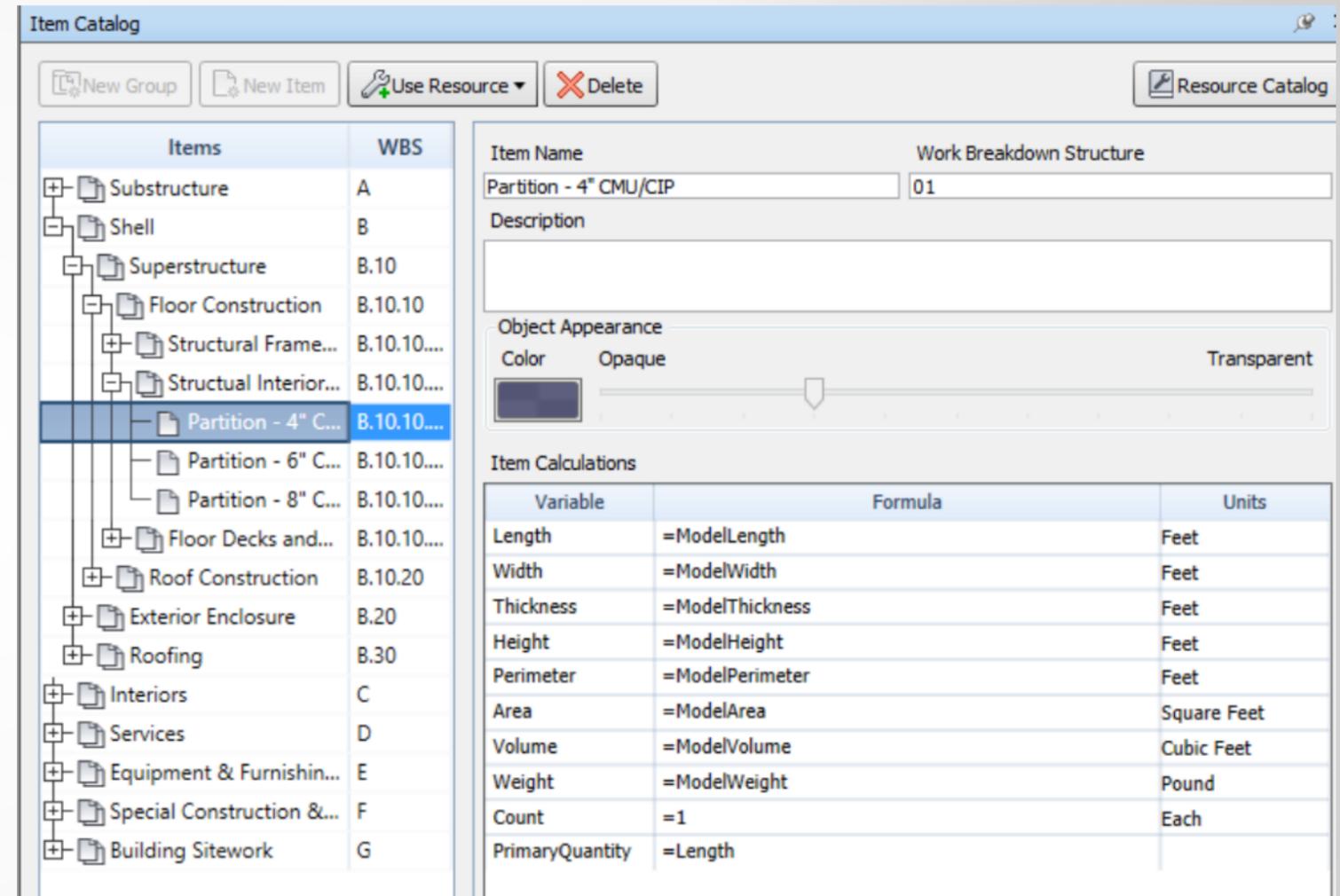
Quantification Workbook

The Quantification Workbook is the key to Navisworks Quantification and where you will perform the majority of your takeoff efforts.



Item Catalog

The Item Catalog is the organizational database for your takeoff. The Item Catalog and Resource Catalog share the same structure, a selection tree, variables pane, and general information. Items in the Item Catalog can be directly associated with a model object, such as a wall or window. Items can exist alone or can contain resources.



The screenshot displays the 'Item Catalog' software interface. On the left, a tree view shows a hierarchy of items under 'Substructure' and 'Superstructure'. The selected item is 'Partition - 4" C...', which is highlighted in blue. The right pane shows the details for this item, including its name, work breakdown structure (01), and a description field. Below the description, there is an 'Object Appearance' section with a color and opacity slider. At the bottom, an 'Item Calculations' table lists variables and their formulas.

Variable	Formula	Units
Length	=ModelLength	Feet
Width	=ModelWidth	Feet
Thickness	=ModelThickness	Feet
Height	=ModelHeight	Feet
Perimeter	=ModelPerimeter	Feet
Area	=ModelArea	Square Feet
Volume	=ModelVolume	Cubic Feet
Weight	=ModelWeight	Pound
Count	=1	Each
PrimaryQuantity	=Length	

Resource Catalog

The Resource catalog is a database of your resources for a project. Resources could be related by function and type such as materials, equipment or tools, and may include wallboard, coverings or structural components. Resources are attached to Items.

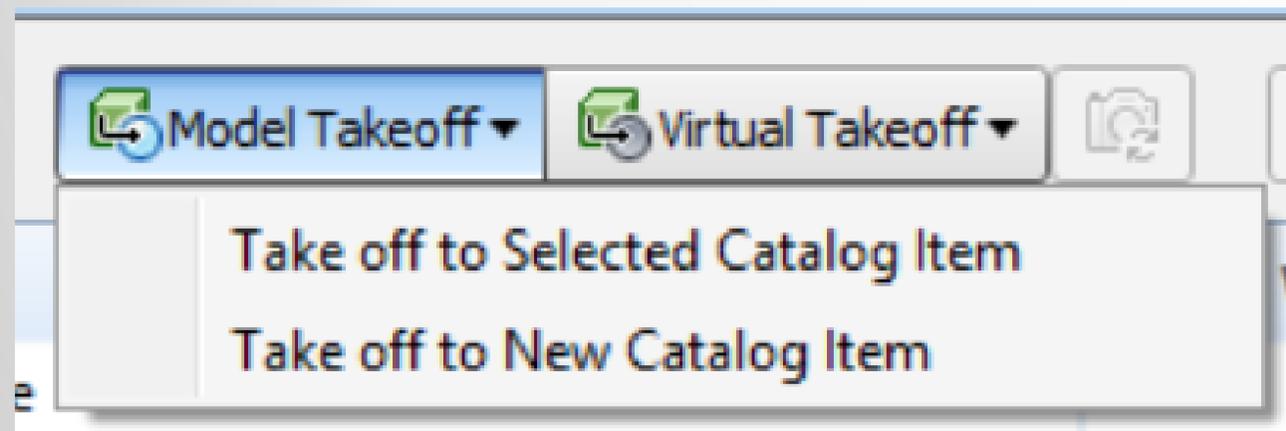
The screenshot shows the 'Resource Catalog' application window. On the left, a tree view lists resources under various categories like Concrete, Masonry, Metals, Wood, Thermal and Moisture, Door and Window, Finishes, Misc Specialties, and Site. The 'Rebar #5' resource is selected. On the right, the 'Resource Breakdown Structure' panel shows the resource name 'Rebar #5' and a value of '3'. Below this, a 'Resource Calculations' table provides formulas for various variables.

Variable	Formula	Units
Length	=ModelWidth*ModelLength*4	Feet
Width	=0.625	Inches
Thickness		
Height		
Perimeter		
Area	=3.14*(Width/2)^2	Square Inches
Volume	=Area*Length*12	Cubic Inches
Weight	=Length*1.043	Pound
Count	=1	Each
PrimaryQuantity		

Model Takeoff

Model Takeoff allows you to quantify your models from properties or selections directly in the model or Navisworks Canvas.

To carry out model takeoff, objects must be either a group, layer or model. If you try to takeoff a model object that is an instance, or if the object does not contain a GUID or properties, an error message is displayed. Ensure your workbook is in Item view before performing takeoff.

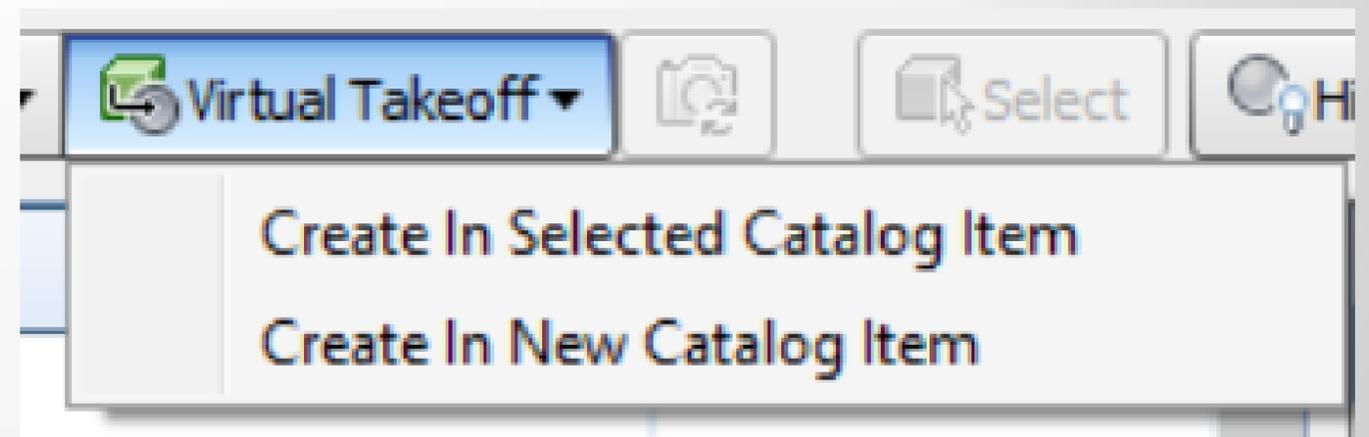


Virtual Takeoff

Virtual takeoff can be carried out when you want to add takeoff objects that are not linked to a model object or item, for example:

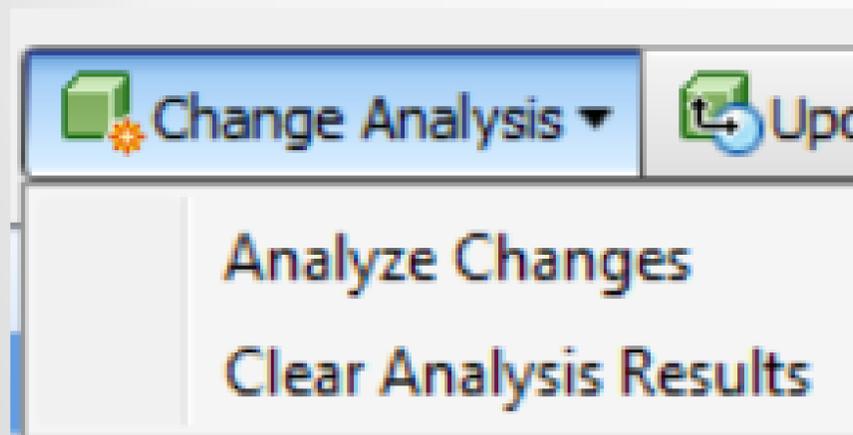
- Where an object has geometry, but has no properties
- Where an object does not have geometry, and has no properties

This could be the case if you did not save the properties from the original design application with your file, or that the object you want to takeoff does not exist in the model. In both cases, you can associate a viewpoint with the virtual takeoff object so you can navigate your way back to it during the takeoff process.



Change Analysis

Change Analysis enables you to compare changes to properties between model versions. You can then review the changes to decide whether to give approval. If you make changes to your takeoff data in a project, you receive status notifications in Quantification that highlight what has been changed and what type of change has been made.



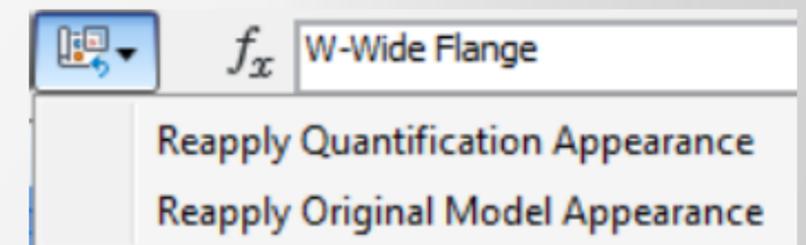
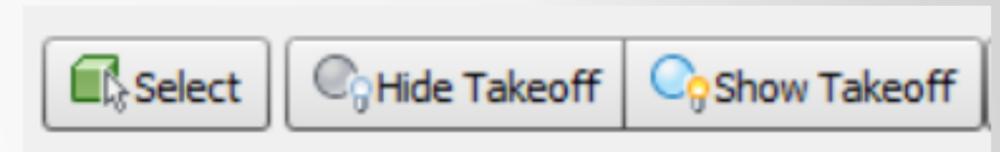
Change Analysis – Status Notifications

When an item or group is changed, a warning flag appears in the Navigation pane and a green or blue triangle appears in the cell. The overridden formula also appears in bold in the Item Catalog. Once Change Analysis is carried out, the following notifications appear in the Status column of the Quantification workbook.

Action	How Indicated	Icon	When Shown
Override	Green light in Status column		When a formula has been overridden and Change Analysis has not been run. Hover the icon to see a tooltip.
Change	Blue light in Status column		Where a model object has changed and differs from the associated takeoff item in Quantification Workbook. Hover the icon to see a tooltip.
Error	Red light in Status column		Where there are computation errors with the formula or model item. Hover the icon to see a tooltip.
Delete	Black light in Status column		Where a takeoff's model item has been deleted. Hover the icon to see a tooltip.

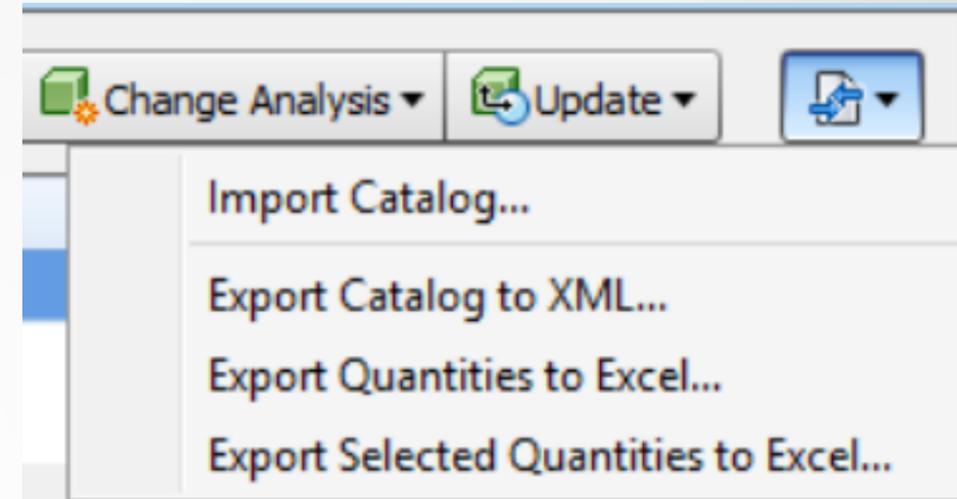
Quantification Appearances and Selection

- Select
 - Select Model items that correspond to takeoff items
- Hide Takeoff
 - Hides all items that have been takeoff
- Show Takeoff
 - Hides all model items that have not been takeoff and shows taken off items
- Quantification Appearance
 - Controls the appearance of the model



Importing and Exporting

- Use this drop down to import and export catalogs and quantities
- Catalogs can be exported to XML and opened in Excel for editing



Let' Get into Hands on Time

Open Navisworks!



Resource Formulas

Concrete 3000 PSI

- Length Formula $=\text{ModelLength}$ Units " Unspecified "
- Width Formula $=\text{ModelWidth}$ Units " Unspecified "
- Thickness Formula $=\text{ModelThickness}$ Units " Unspecified "
- Height Formula " Unspecified " Units "Unspecified"
- Perimeter Formula " Unspecified" Units "Unspecified"
- Area Formula $=\text{Length}*\text{Width}$ Units "SquareFeet"
- Volume Formula $=(\text{Length}*\text{Width}*\text{Thickness})*0.03704$ Units "CubicYard"
- Weight Formula $=\text{Volume}*4050$ Units "Pound"
- Count Formula $=1$ Units "Each"

Formwork

- Length Formula $=\text{ModelLength}$ Units "Feet"
- Width Formula $=\text{ModelWidth}$ Units "Feet"
- Thickness Formula $=\text{ModelThickness}$ Units "Feet"
- Height Formula " Unspecified " Units "Unspecified"
- Perimeter Formula " Unspecified " Units "Unspecified"
- Area Formula $=(\text{ModelWidth}+\text{ModelLength})*2*\text{ModelThickness}$ Units "Square Feet"
- Volume Formula $=\text{Area}*0.333$ Units "Cubic Feet"
- Weight Formula $=\text{Area}*9$ Units "Pound"
- Count Formula $=1$ Units "Each"

Resource Formulas

