Walk-in Slide: AU 2014 Social Media Feed

1. Click on the link below, this will open your web browser

http://aucache.autodesk.com/social/visualization.html

2. Use “Extended Display” to project the website on screen if you plan to work on your computer. Use “Duplicate” to display same image on screen and computer.

Mining concrete- how to modify a concrete model for quantification and 4D simulation

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Class summary

From a General Contractors perspective, using concrete design models for quantity takeoffs can be a frustrating and sometimes futile exercise. Design models are seldom built to mimic site construction and more often than not, contain very little relevant embedded information. With some simple modification and customization, we can pull valuable information while facilitating downstream Navisworks 4D utility.

Key learning objectives

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

- • Learn how to quickly modify concrete models to represent actual construction in order to better ensure more accurate information
- • Learn how to create and add custom materials into existing families to automate formwork quantity extraction
- • Learn how to break up a concrete model to use in Navisworks software 4D simulations
- • Discover how custom parameters in Revit software can be capitalized on by Navisworks software search sets

Clark Builders

- <1B Volume in 2014
- Commercial, Industrial, Residential
- 75% DB – 20% CM – 5% DBB
- Self perform Concrete
- Partnership with Turner Construction since 2013

Outline

- Auditing the model
- Modifying the geometry
- Performing the QTO- workarounds

concrete volume and *formwork contact area* of: **strip footings, pad/raft footings, core walls, one sided foundation walls, columns, slab on grade, suspended slabs, ramp walls and ramp soffit area.**

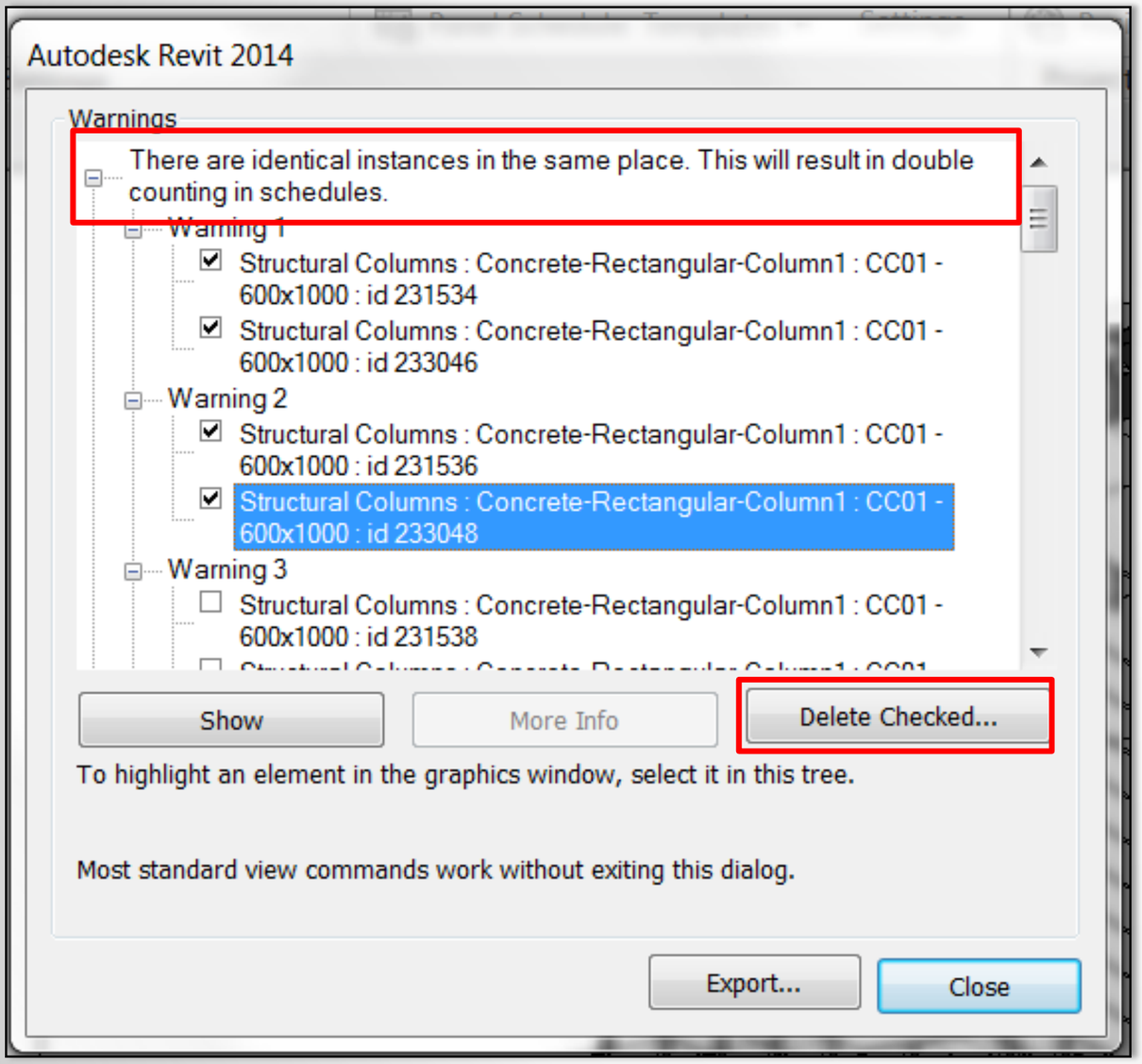
- Dividing model up for a 4D
- Linking geometry into Navisworks Timeliner

Auditing Geometry

Common issues

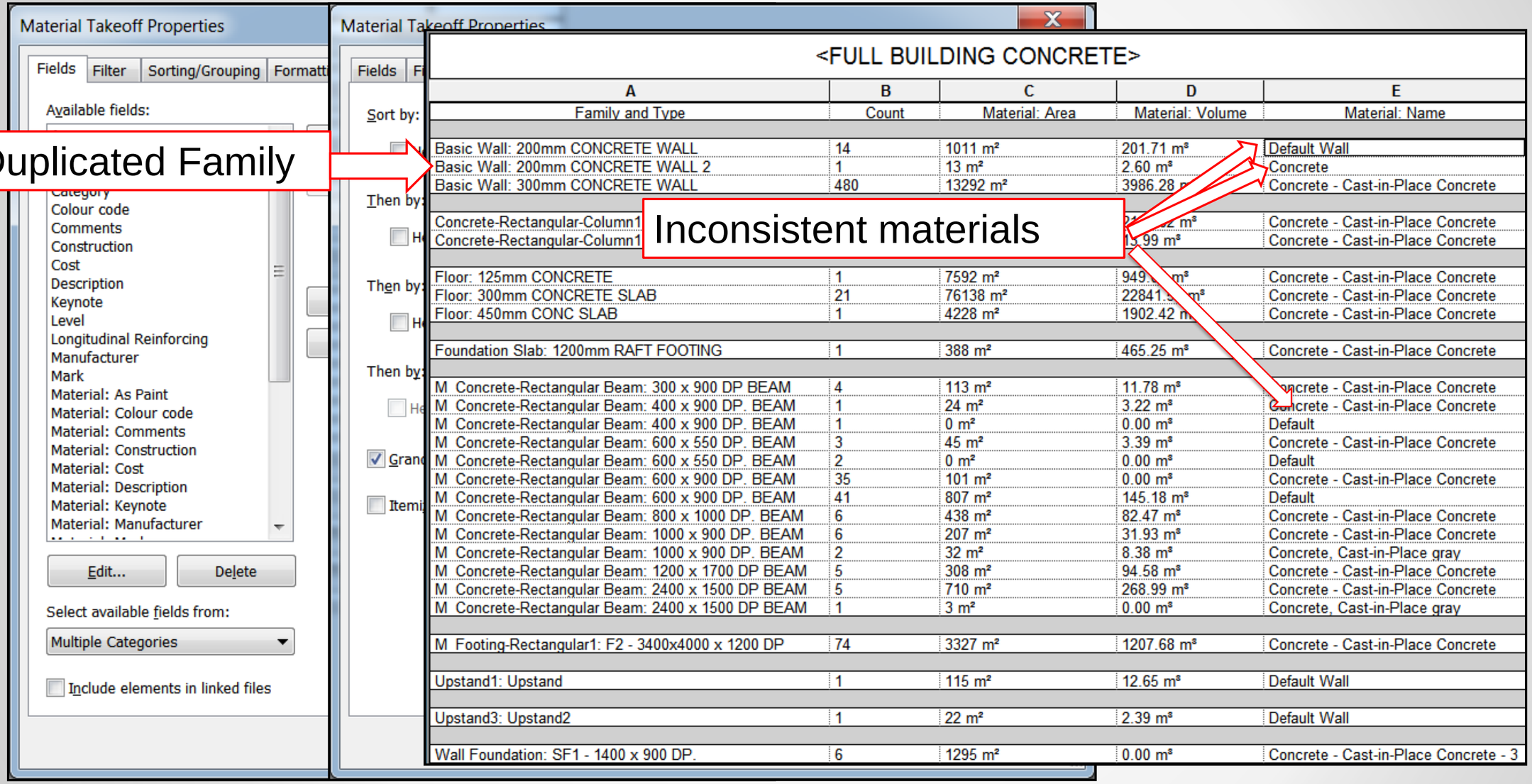
- Duplicated elements (columns, overlapping walls, beams…)
- Constraints
- Joined or Unjoined geometry
- Inconsistent Materials
- Family Categories

Warnings

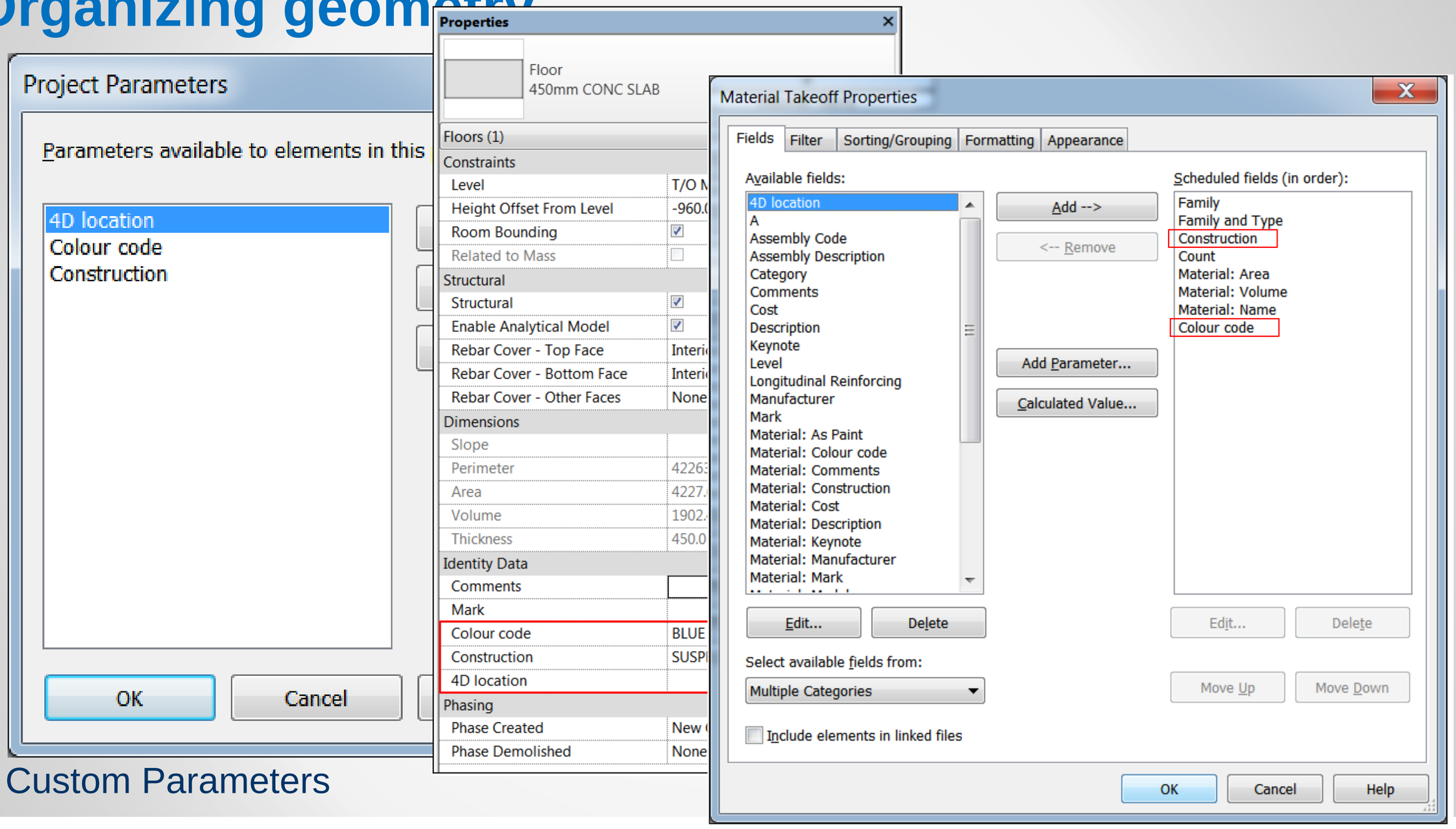


Go through the warnings to find the duplicated elements that are not obvious in a visual check

Isolating hidden problems



Organizing geometry



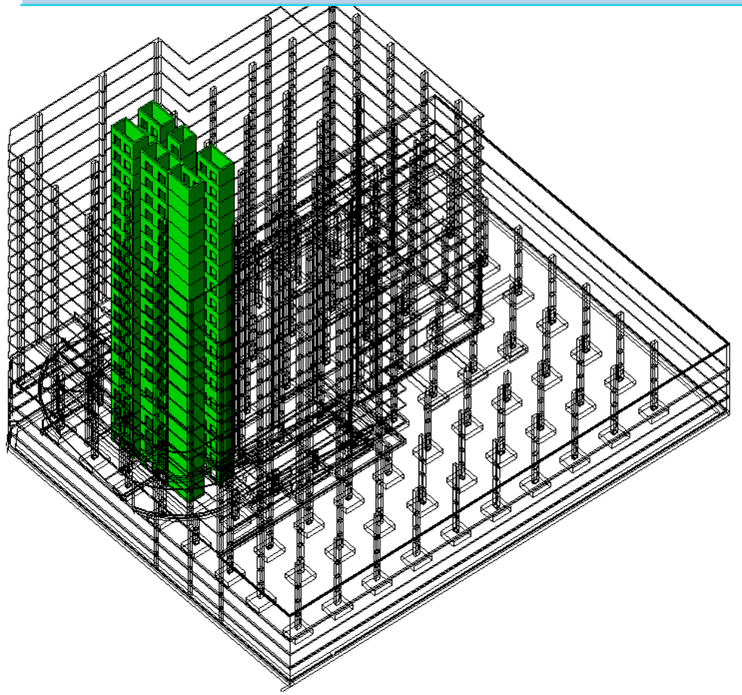
Custom Parameters

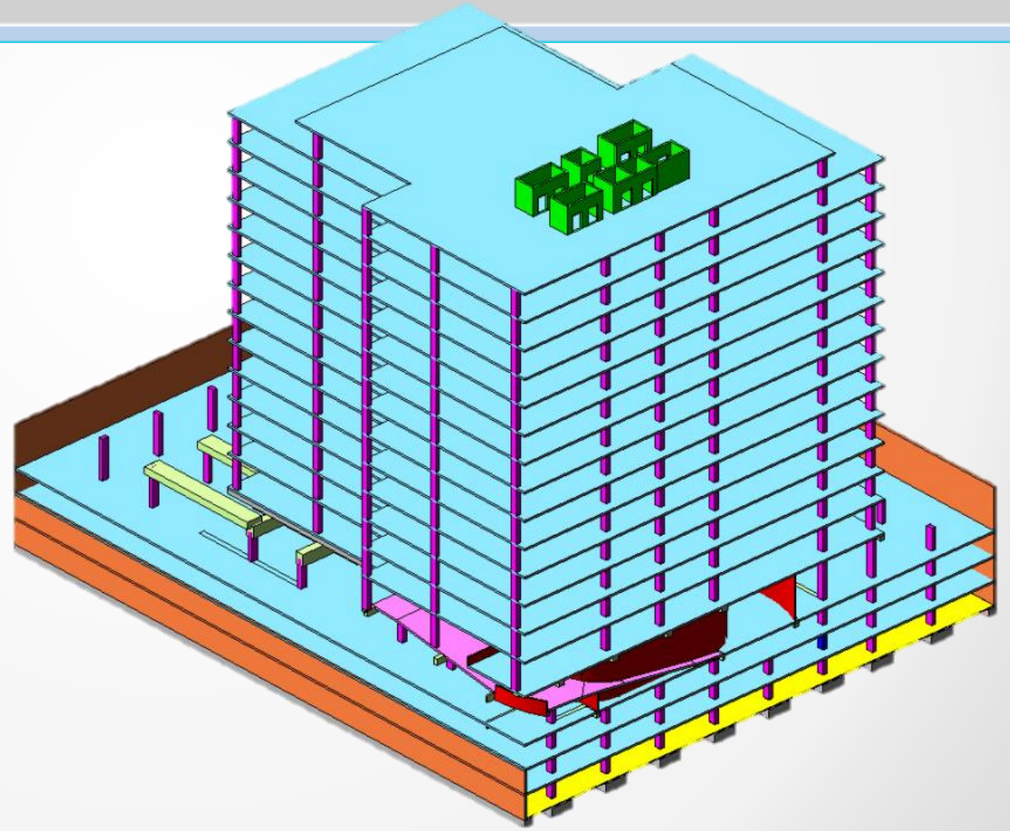
Organizing geometry

Schedule: CORE WALLS - RTC

<CORE WALLS>

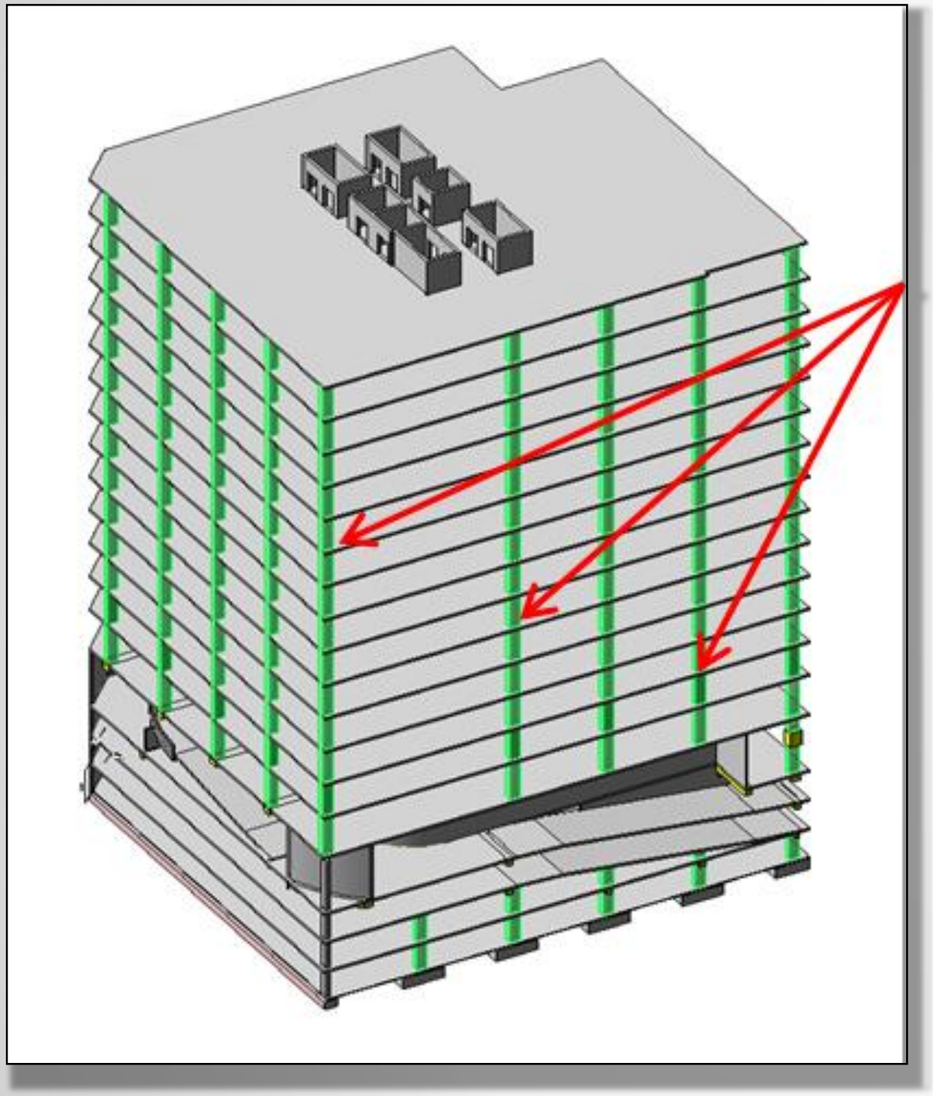
A	B	C	D	E
Family and Type	Construction	Material: Volume	Material: Name	Colour code
Basic Wall: 300mm CONCRETE WALL	CORE WALLS	2180.36 m³	Concrete - Cast-in-Place Concrete	GREEN





Custom Parameters

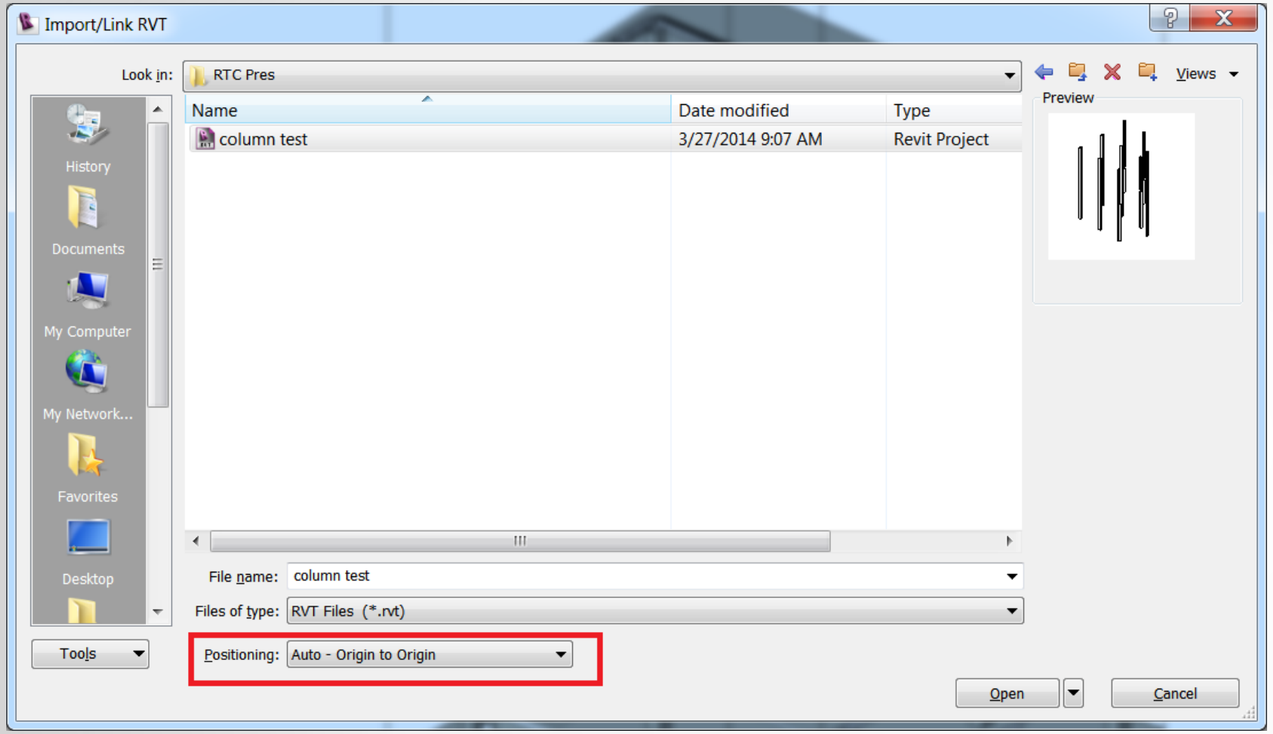
Modifying geometry - *Columns*



Columns that run the full height of the building show up fine in the 2D views, but will throw off quantities

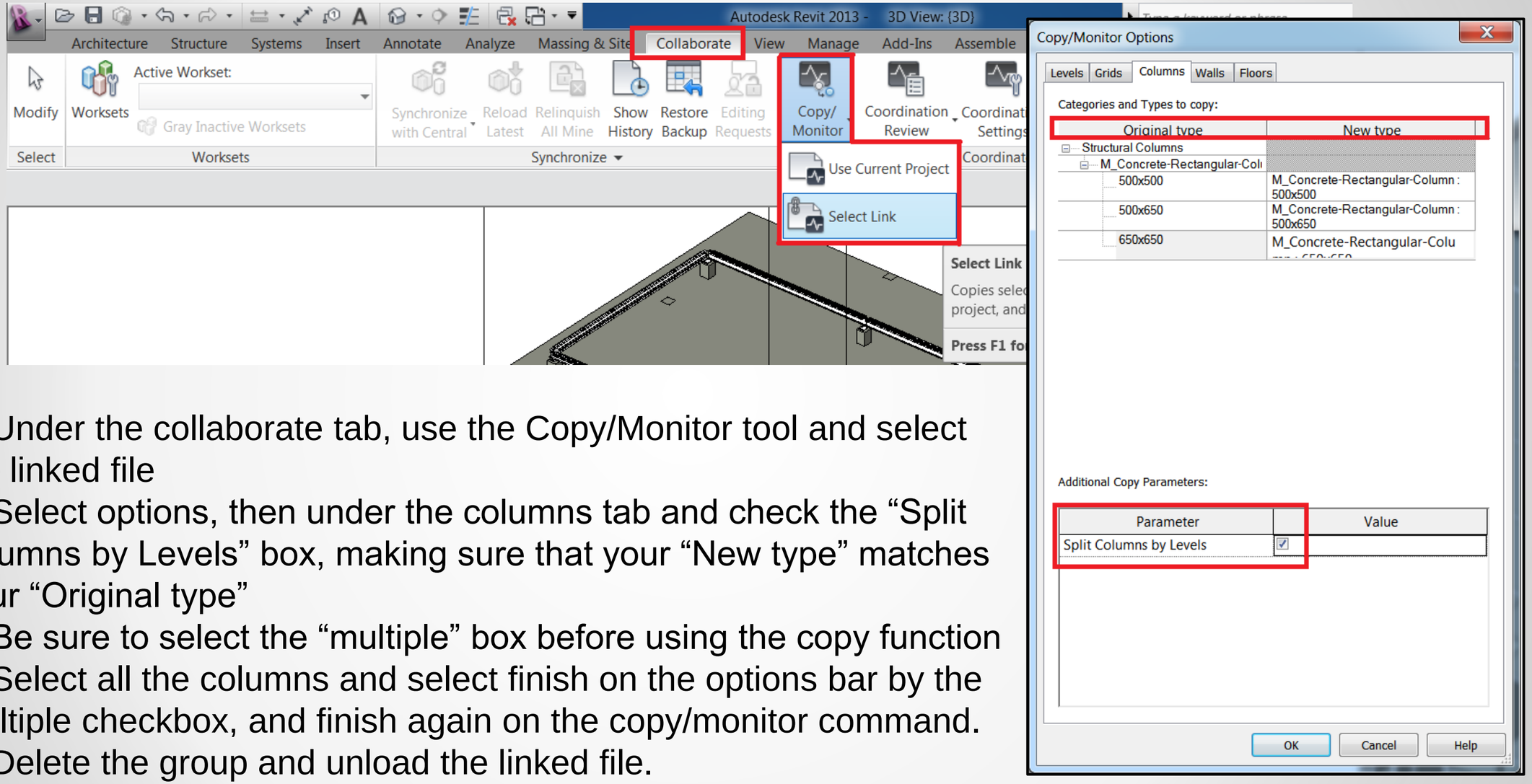
1. Volume of Concrete and area of formwork are both affected
2. Geometry is insufficient for 4D analysis

Modifying geometry - *Columns*



1. Select and group all the columns you want to split.
2. Find the group you just created in the Project Browser and save it as a separate rvt. file
3. Link that rvt. file into your project making sure it's positioning is origin to origin

Modifying geometry - *Columns*



4. Under the collaborate tab, use the Copy/Monitor tool and select the linked file

5. Select options, then under the columns tab and check the “Split columns by Levels” box, making sure that your “New type” matches your “Original type”

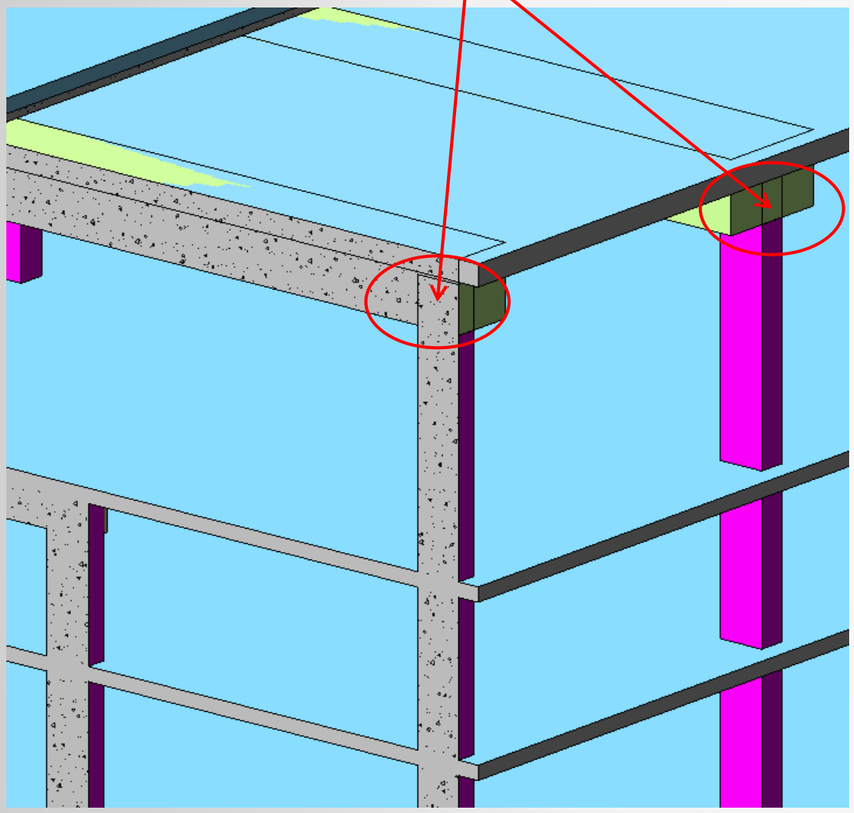
6. Be sure to select the “multiple” box before using the copy function

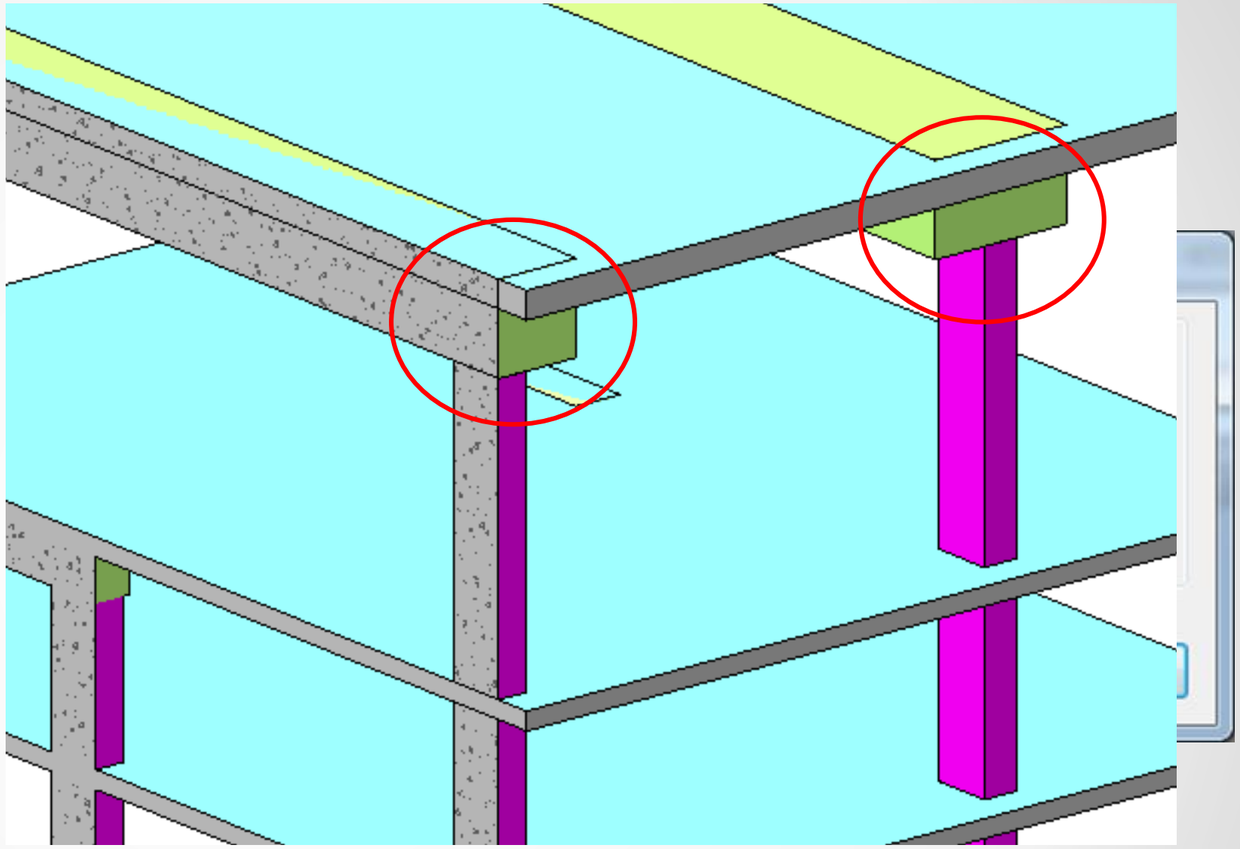
7. Select all the columns and select finish on the options bar by the multiple checkbox, and finish again on the copy/monitor command.

8. Delete the group and unload the linked file.

Modifying geometry - *Columns*

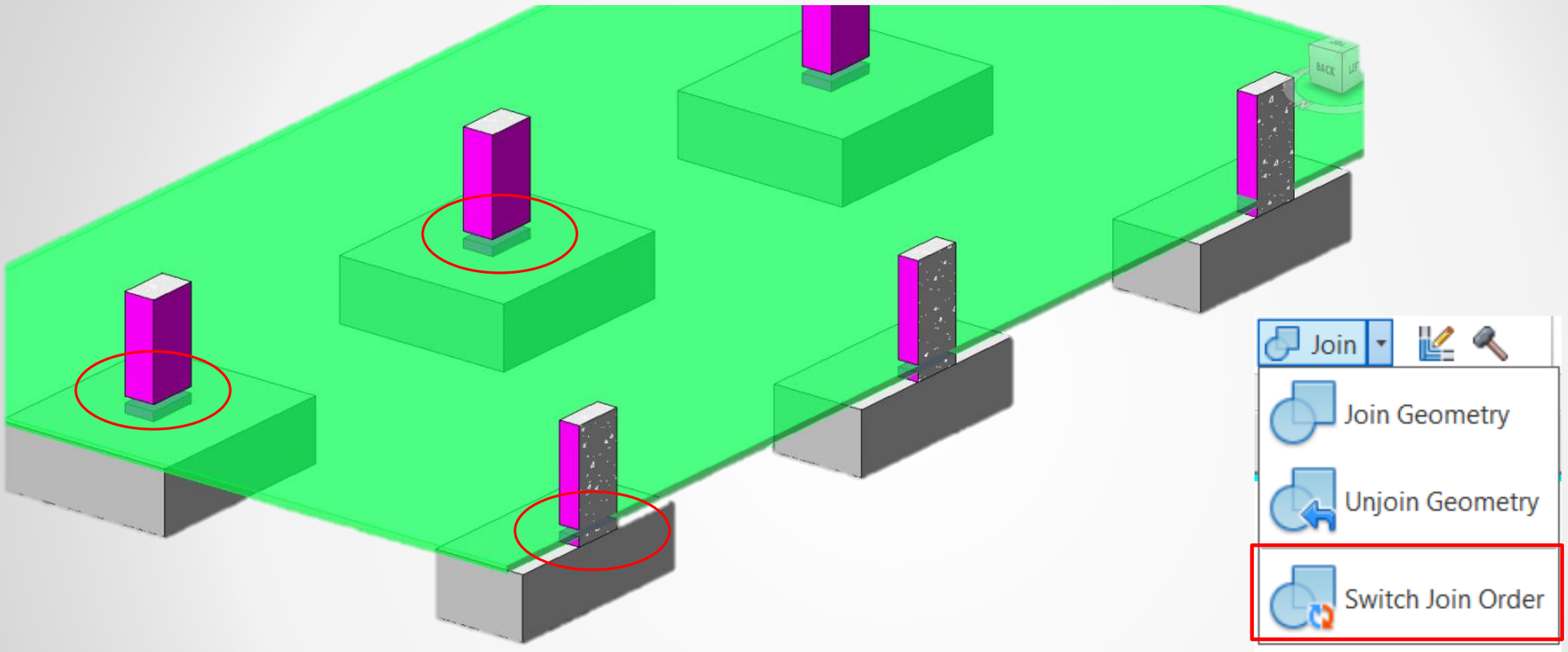
Column constraints default to top of slab





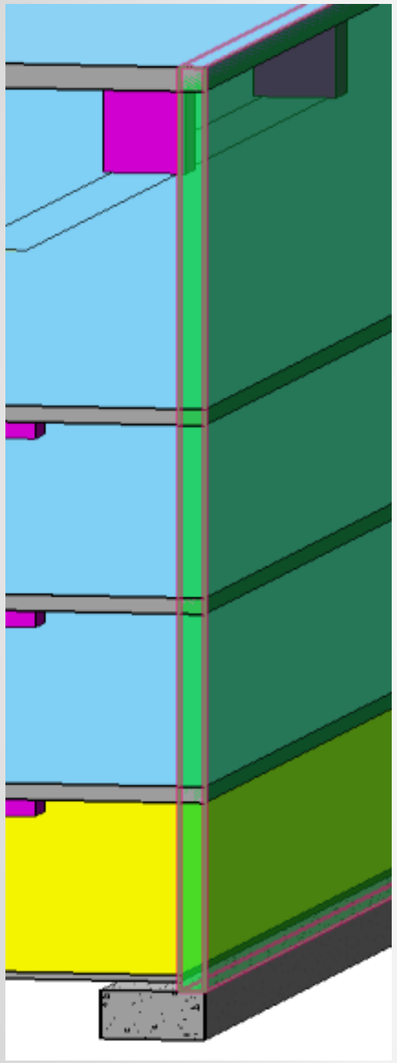
1. **Detach column if attached to slab/beam**
2. **Set top offset lower than bottom of beam**
3. **Attach Top to beam**

Modifying geometry - *Columns*



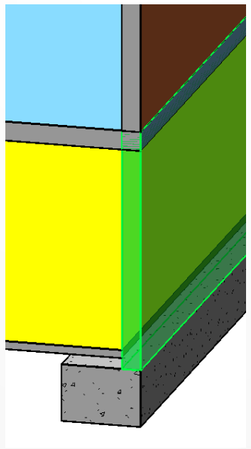
1. Switch join order
2. Grab a coffee…

Modifying geometry -*Walls*

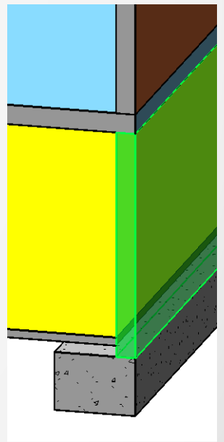


Walls that run the full height of the building show up fine in the 2D views, will not throw off quantities if geometry is joined properly, but again is insupportable for 4D analysis later.

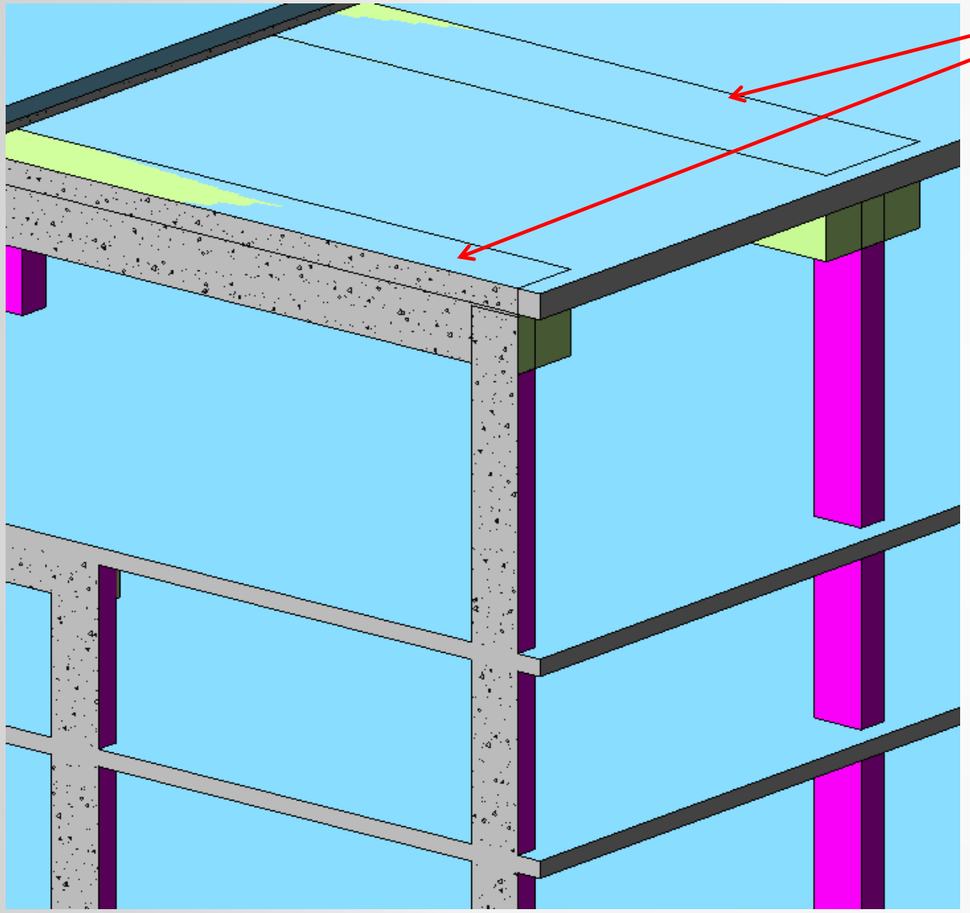
Can be solved with **Split** tool



And modifying the constraints

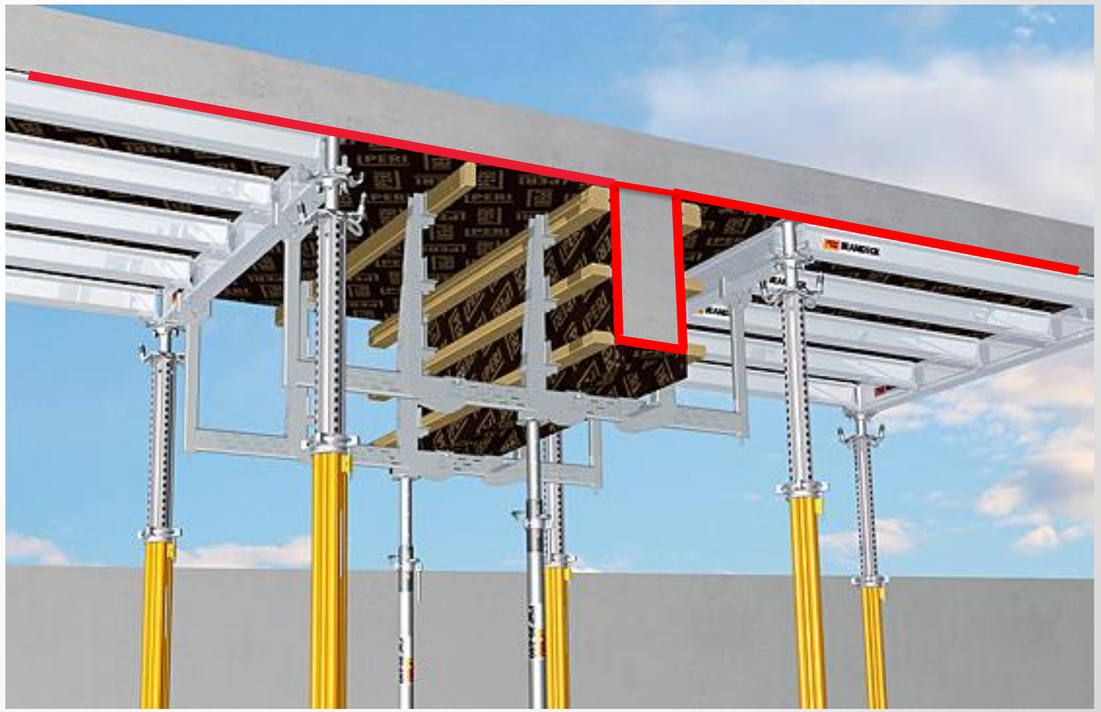


Modifying geometry



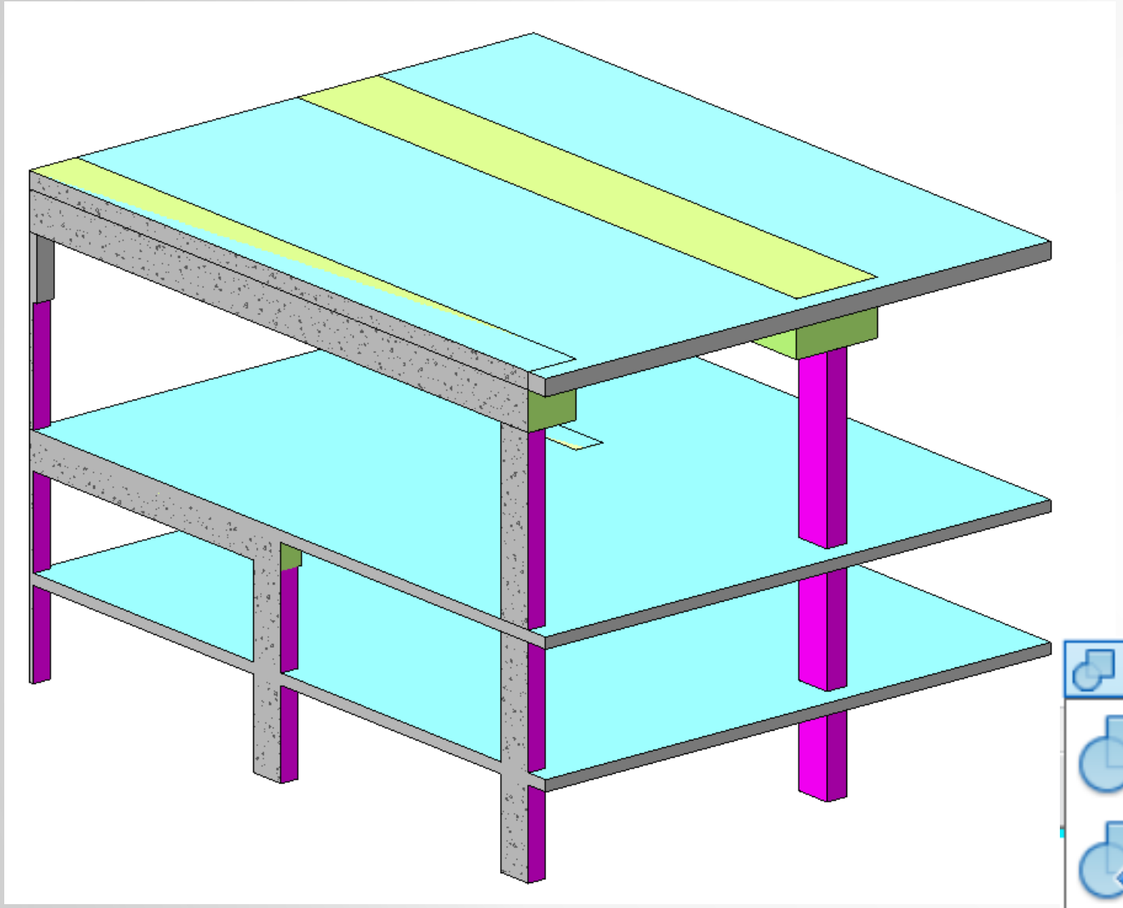
Beams not joined with slab

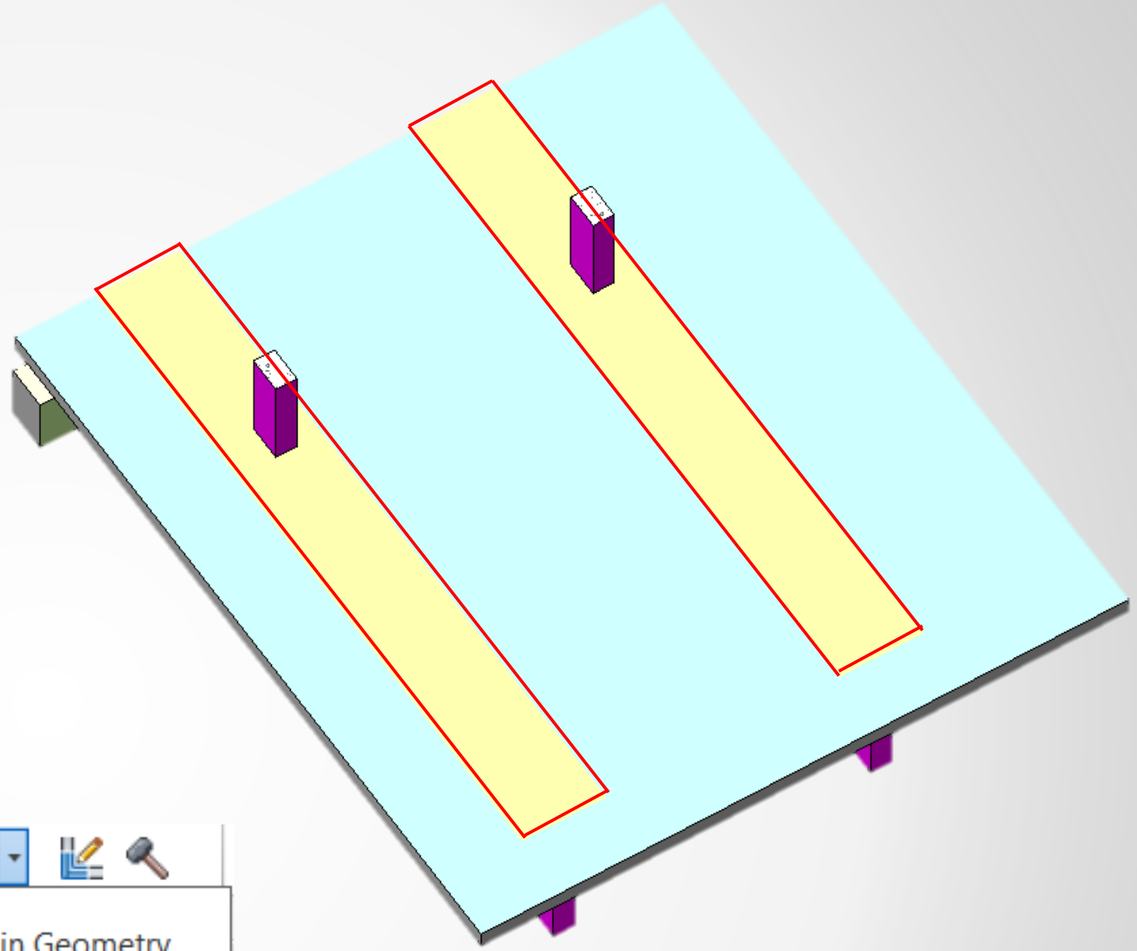
Beams

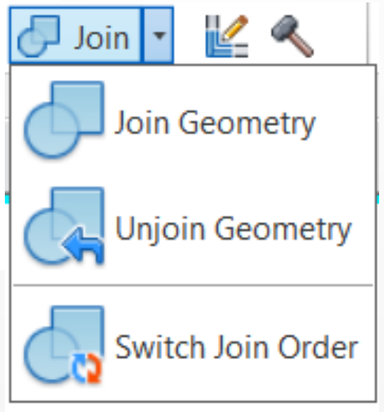


http://www.peri-usa.com/index.cfm

Modifying geometry







1. Join Geometry
2. SWITCH JOIN ORDER!

Beams

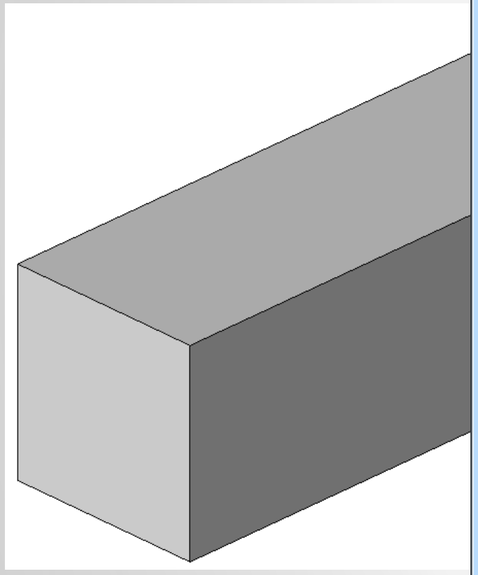
Quantifying

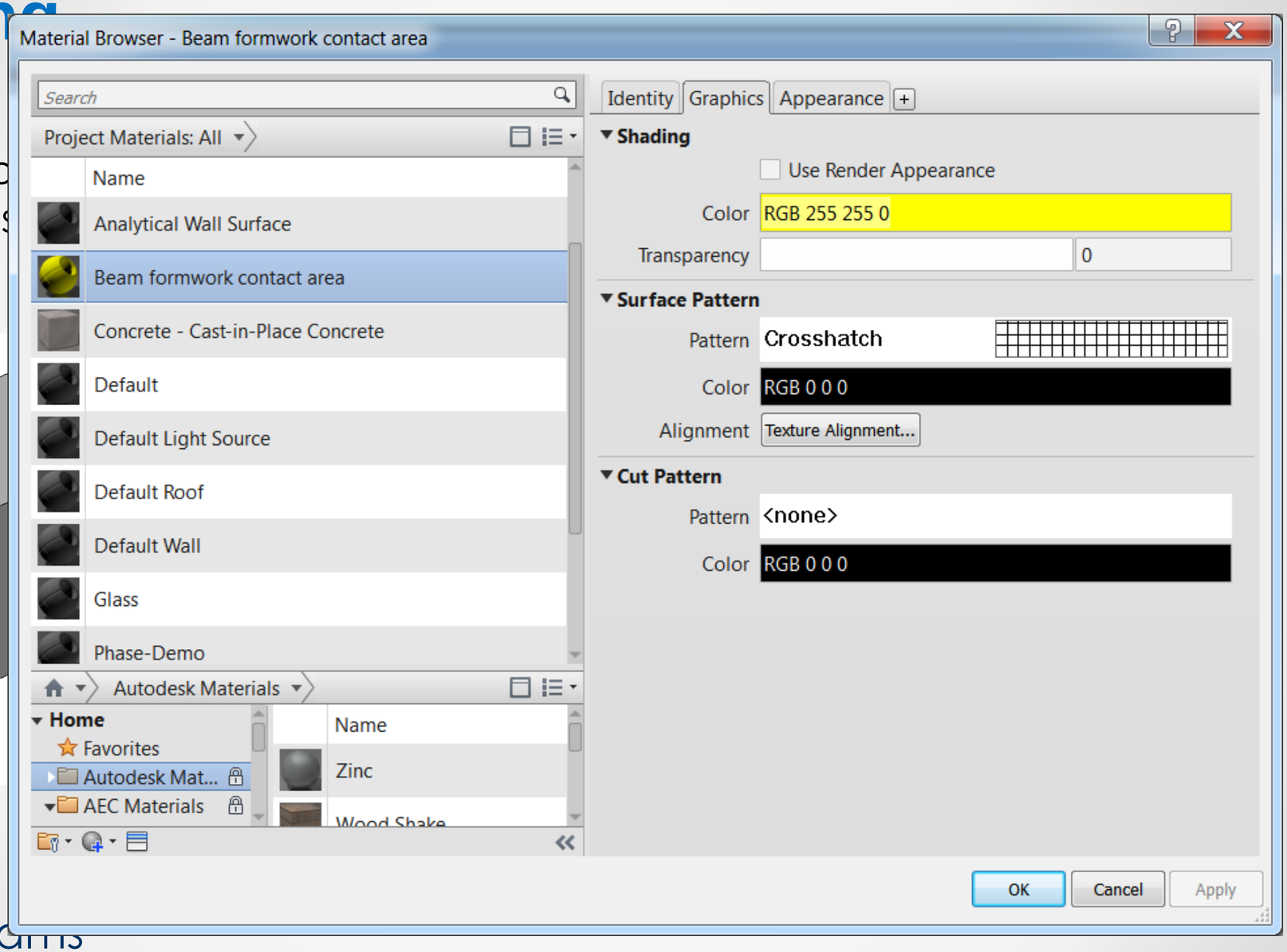
FULL BUILDING CONCRETE					
A	B	C	D	E	F
Family and Type	Construction	Count	Material: Volume	Material: Name	Colour code
Basic Wall: 200mm CONCRETE WALL	RAMP WALLS	15	204.31 m³	Concrete - Cast-in-Place Concrete	RED
Basic Wall: 300mm CONCRETE WALL	CORE WALLS	460	2180.36 m³	Concrete - Cast-in-Place Concrete	GREEN
Basic Wall: 300mm CONCRETE WALL	ONE SIDED FOUNDATION	20	1804.18 m³	Concrete - Cast-in-Place Concrete	ORANGE
Concrete-Rectangular-Column1: CC01 - 600x1000	COLUMNS	811	1817.56 m³	Concrete - Cast-in-Place Concrete	MAGENTA
Concrete-Rectangular-Column1: CC01 - 800x1000	COLUMNS	186	535.93 m³	Concrete - Cast-in-Place Concrete	MAGENTA
Floor: 125mm CONCRETE	SLAB ON GRADE	1	942.90 m³	Concrete - Cast-in-Place Concrete	YELLOW
Floor: 300mm CONCRETE SLAB	RAMP SLAB	3	289.29 m³	Concrete - Cast-in-Place Concrete	PINK
Floor: 300mm CONCRETE SLAB	SUSPENDED SLAB	17	21567.22 m³	Concrete - Cast-in-Place Concrete	BLUE
Floor: 450mm CONC SLAB	SUSPENDED SLAB	1	1947.55 m³	Concrete - Cast-in-Place Concrete	BLUE
Foundation Slab: 1200mm RAFT FOOTING	RAFT SLAB	1	465.25 m³	Concrete - Cast-in-Place Concrete	GREY
M_Concrete-Rectangular Beam: 300 x 900 DP BEAM	BEAM	4	11.71 m³	Concrete - Cast-in-Place Concrete	LIGHT GREEN
M_Concrete-Rectangular Beam: 400 x 900 DP. BEAM	BEAM	1	3.22 m³	Concrete - Cast-in-Place Concrete	LIGHT GREEN
M_Concrete-Rectangular Beam: 600 x 550 DP. BEAM	BEAM	3	5.86 m³	Concrete - Cast-in-Place Concrete	LIGHT GREEN
M_Concrete-Rectangular Beam: 600 x 900 DP. BEAM	BEAM	41	144.77 m³	Concrete - Cast-in-Place Concrete	LIGHT GREEN
M_Concrete-Rectangular Beam: 800 x 1000 DP. BEAM	BEAM	6	81.07 m³	Concrete - Cast-in-Place Concrete	LIGHT GREEN
M_Concrete-Rectangular Beam: 1000 x 900 DP. BEAM	BEAM	6	56.16 m³	Concrete - Cast-in-Place Concrete	LIGHT GREEN
M_Concrete-Rectangular Beam: 1200 x 1700 DP BEAM	BEAM	5	95.53 m³	Concrete - Cast-in-Place Concrete	LIGHT GREEN
M_Concrete-Rectangular Beam: 2400 x 1500 DP BEAM	BEAM	5	321.07 m³	Concrete - Cast-in-Place Concrete	LIGHT GREEN
M_Footing-Rectangular1: F2 - 3400x4000 x 1200 DP	PAD FOOTING	74	1207.68 m³	Concrete - Cast-in-Place Concrete	GREY
			33681.60 m³		

Concrete volume

Quantifying

-Beam formwork co
-A faster option is us

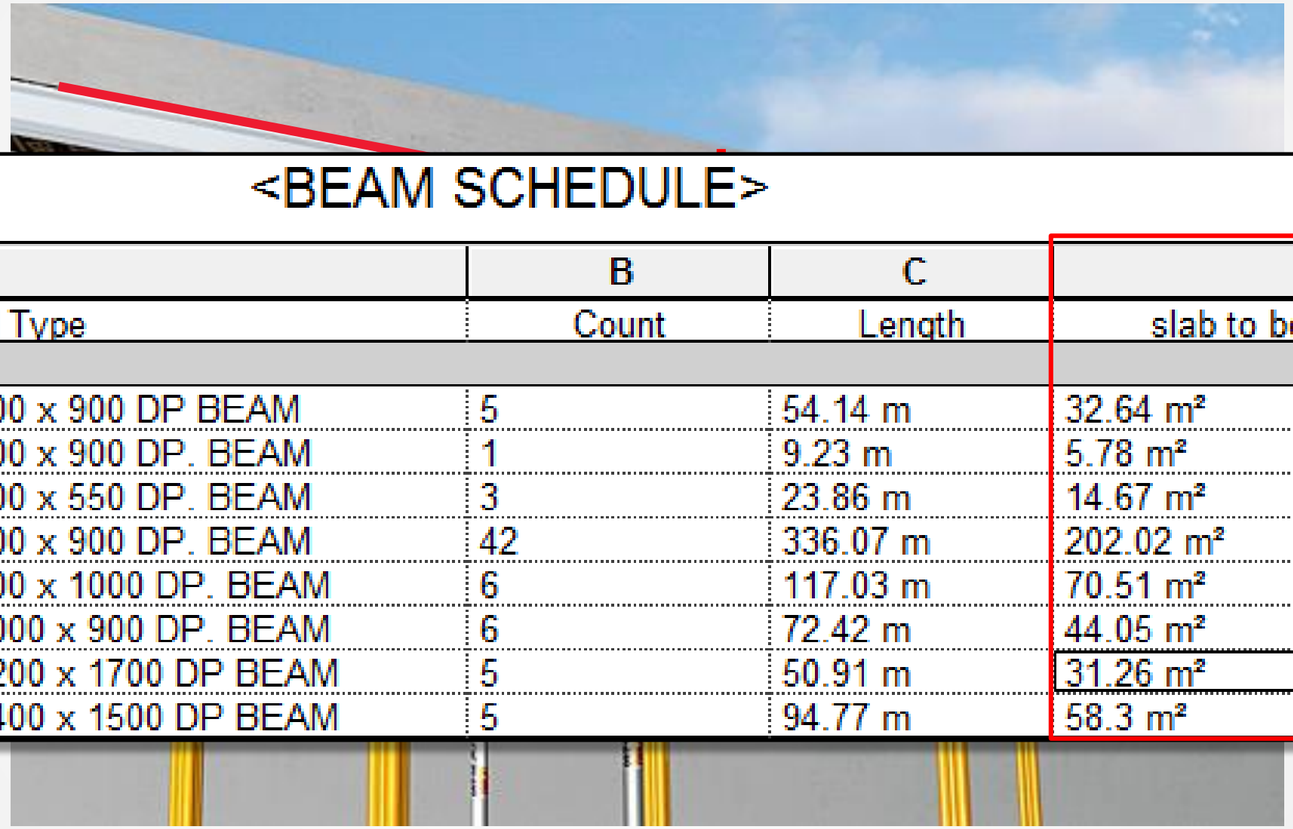




Formwork Beams

Quantifying

2(W x ST) + 2(L x ST) x Count = slab to beam contact



<BEAM SCHEDULE>

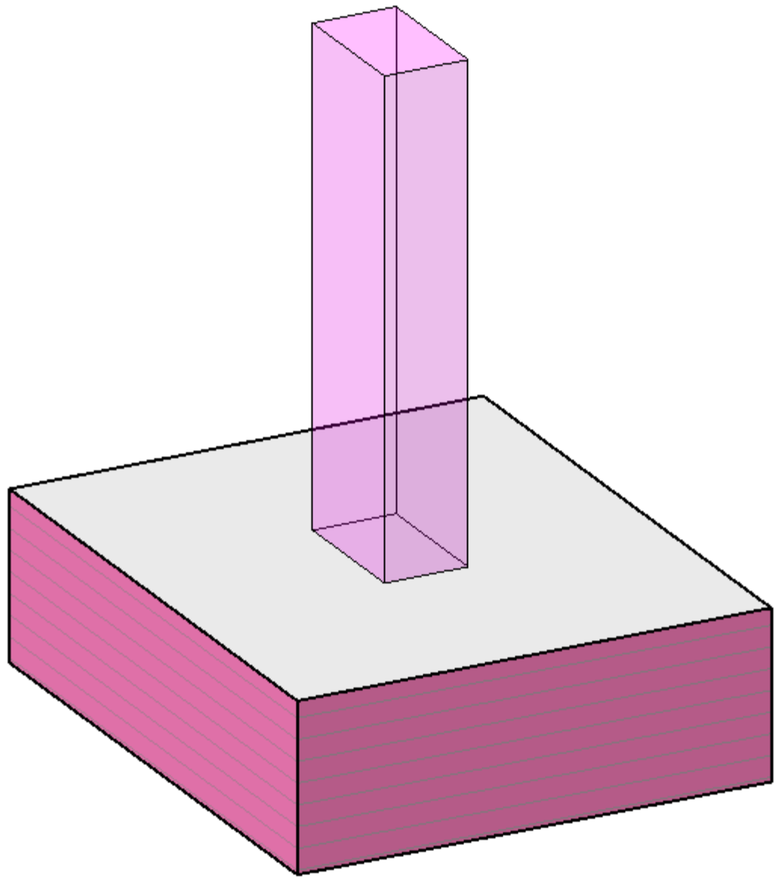
A	B	C	D
Family and Type	Count	Length	slab to beam contact
M Concrete-Rectangular Beam: 300 x 900 DP BEAM	5	54.14 m	32.64 m²
M Concrete-Rectangular Beam: 400 x 900 DP. BEAM	1	9.23 m	5.78 m²
M Concrete-Rectangular Beam: 600 x 550 DP. BEAM	3	23.86 m	14.67 m²
M Concrete-Rectangular Beam: 600 x 900 DP. BEAM	42	336.07 m	202.02 m²
M Concrete-Rectangular Beam: 800 x 1000 DP. BEAM	6	117.03 m	70.51 m²
M Concrete-Rectangular Beam: 1000 x 900 DP. BEAM	6	72.42 m	44.05 m²
M Concrete-Rectangular Beam: 1200 x 1700 DP BEAM	5	50.91 m	31.26 m²
M Concrete-Rectangular Beam: 2400 x 1500 DP BEAM	5	94.77 m	58.3 m²

http://www.peri-usa.com/index.cfm

Formwork Beams

Quantifying

A		F
Construction		Comments
COLUMNS	68	TO FLOOR
COLUMNS	8	TO FLOOR
COLUMNS	74	TO FLOOR
COLUMNS	11	TO BEAM
COLUMNS	59	TO FLOOR
COLUMNS	10	TO BEAM
COLUMNS	53	TO FLOOR
COLUMNS	2	TO FLOOR
COLUMNS	40	TO FLOOR
COLUMNS	82	TO FLOOR
COLUMNS	41	TO FLOOR
COLUMNS	41	TO FLOOR
COLUMNS	41	TO FLOOR
COLUMNS	41	TO FLOOR
COLUMNS	41	TO FLOOR
COLUMNS	41	TO FLOOR
COLUMNS	41	TO FLOOR
COLUMNS	41	TO FLOOR
COLUMNS	47	TO FLOOR
COLUMNS	47	TO FLOOR
COLUMNS	47	TO FLOOR
COLUMNS	47	TO FLOOR
COLUMNS	34	TO FLOOR
Grand total: 916		



or contact
nwork)

ontact

Formwork Columns

Quantifying

<BEAM FORMWORK CONTACT AREA>

A	B	C	D
Family and Type	Count	Material: Name	Material: Area
M_Concrete-Rectangu			
M_Concrete-Rectangu			
M_Concrete-Rectangu			
M_Concrete-Rectangu			
M_Concrete-Rectangu			
M_Concrete-Rectangu			
M_Concrete-Rectangu			

<COLUMN FORMWORK CONTACT AREA>

A	B	C	D
Family and Type	Count	Material: Name	Material: Area
Concrete-Rectangular-Column1: CC01 - 600x1000	811	Column formwork contact area	9703 m²
Concrete-Rectangular-Column1: CC01 - 800x1000	186	Column formwork contact area	2483 m²

<PAD FOOTING FORM CONTACT AREA>

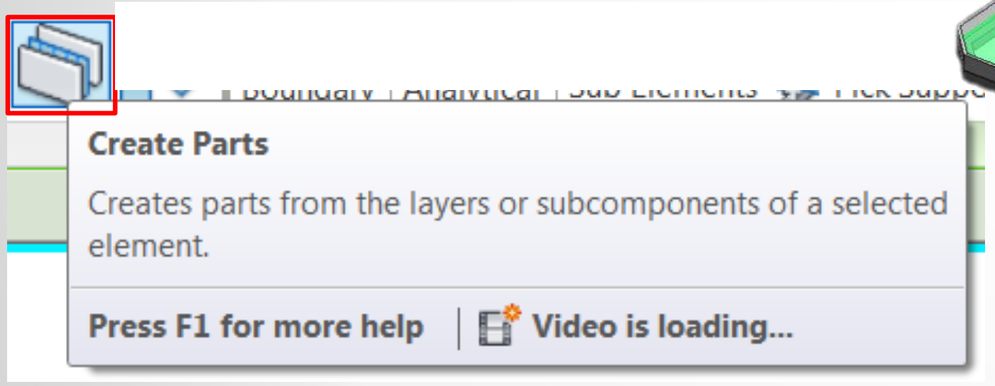
A	B	C	D
Family and Type	Count	Material: Name	Material: Area
M_Footing-Rectangular1: F2 - 3400x4000 x 1200 DP	66	Pad footing formwork contact area	1172 m²
M_Footing-Rectangular1: F2 - 4000x4000 x 1400 DP	8	Pad footing formwork contact area	179 m²
			1351 m²

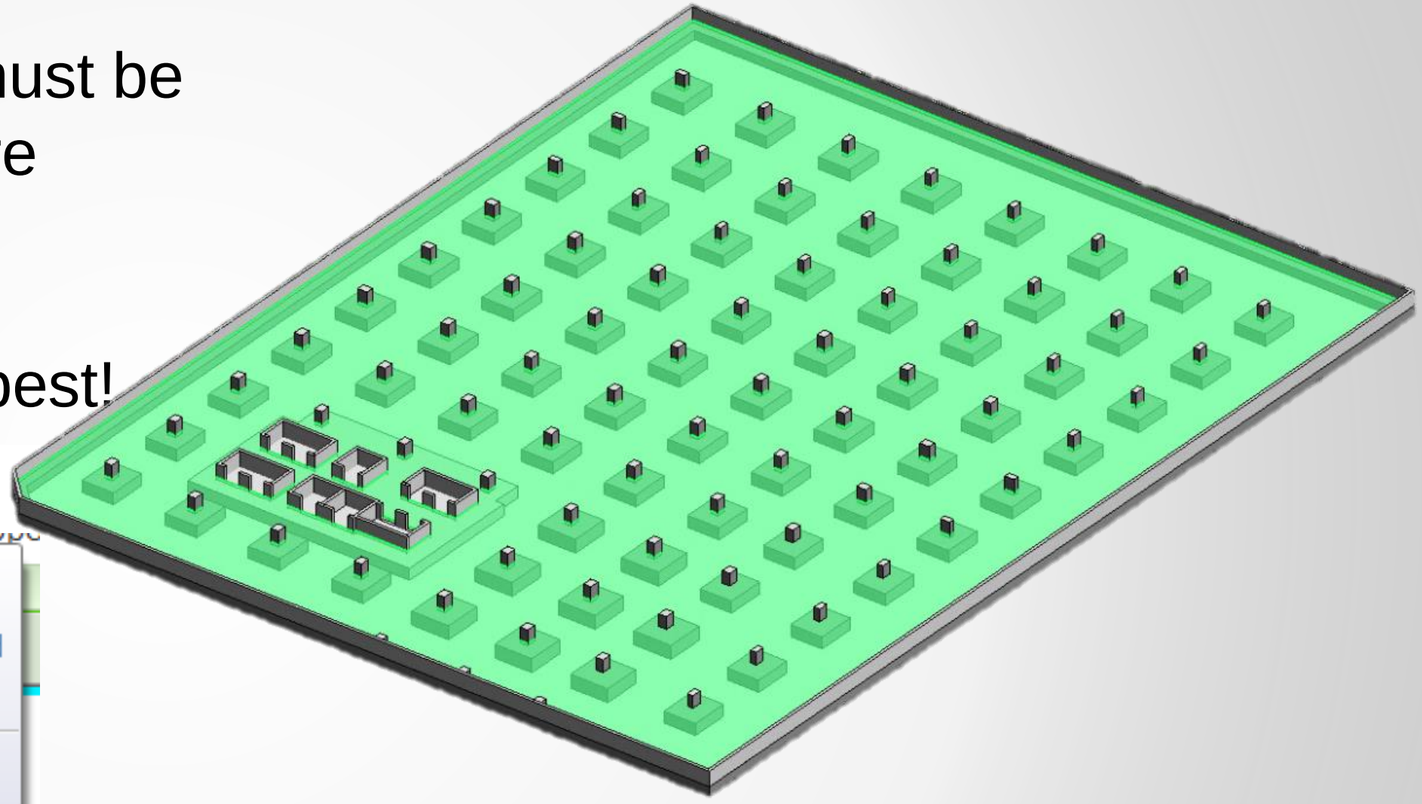
- **Strip footing** = 2 * (Length / 1 m² * Foundation Thickness)
- **Core walls** (two sides of area) = (Area / 1) *2
- **1 Sided Foundation walls** = Area (system family is one sided by default)
- **Suspended slabs** = Area (as long as geometry is joined right)

Separating geometry

- For a 4D analysis geometry must be broken up and identified before exporting into Navisworks.

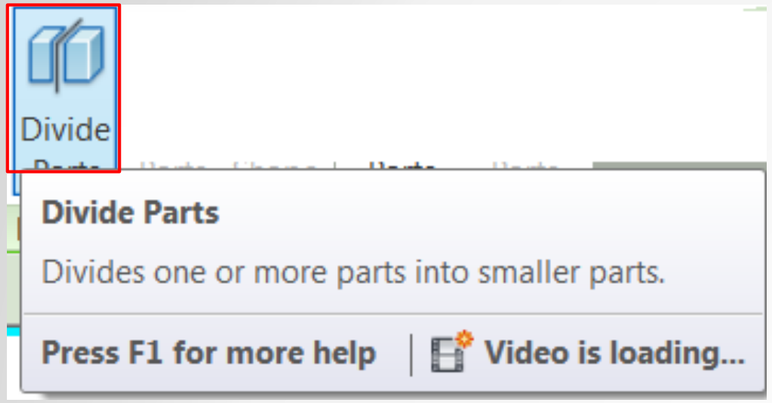
- For this, the parts tool works best!

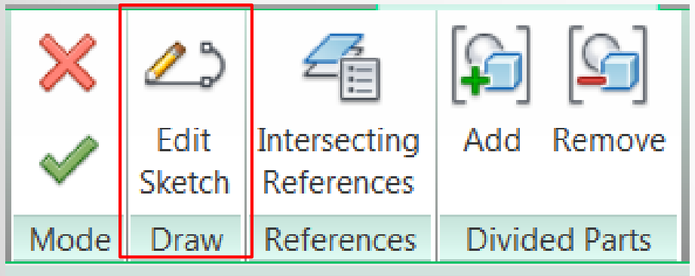


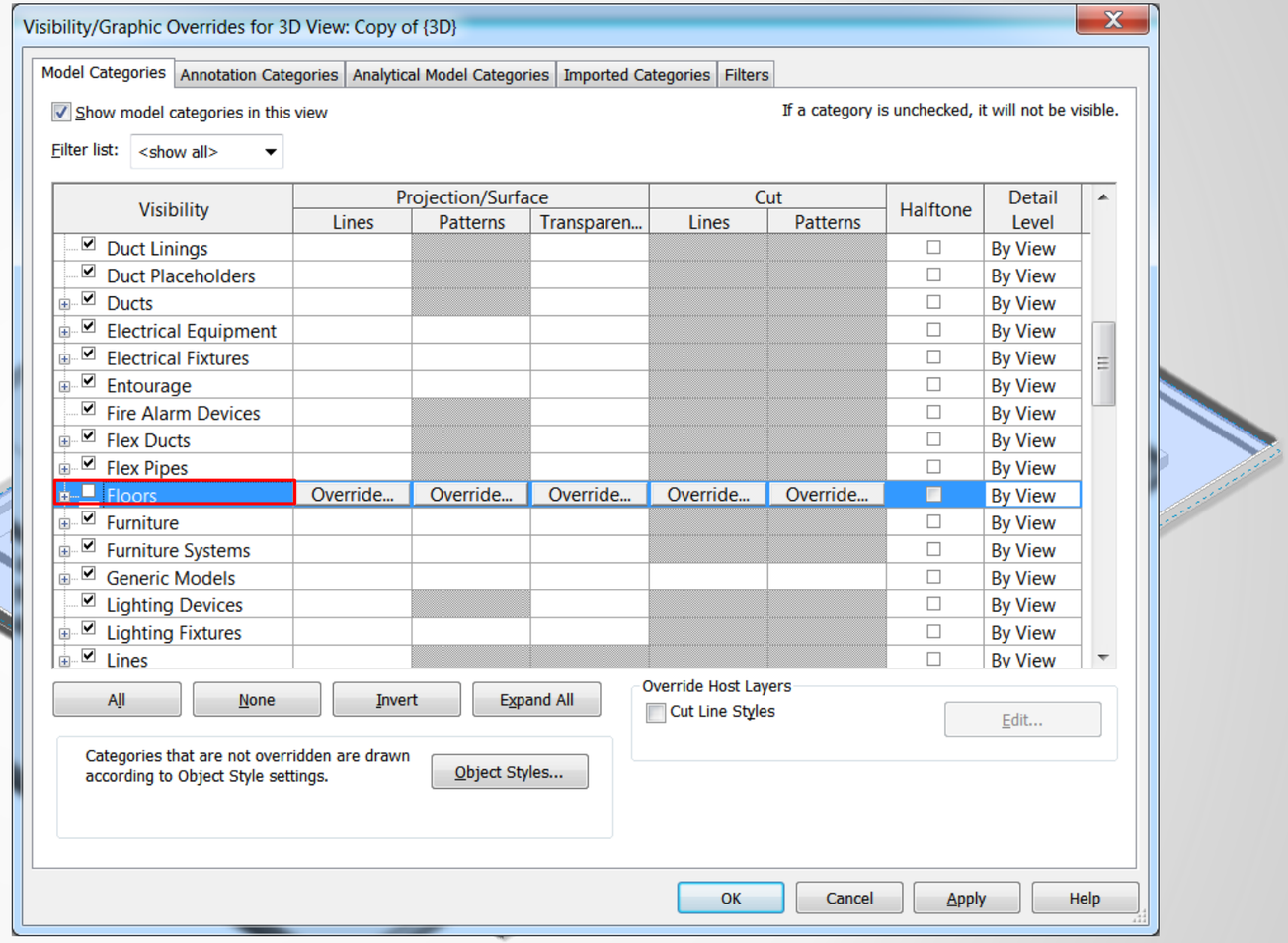


Slab Pours

Separating geometry

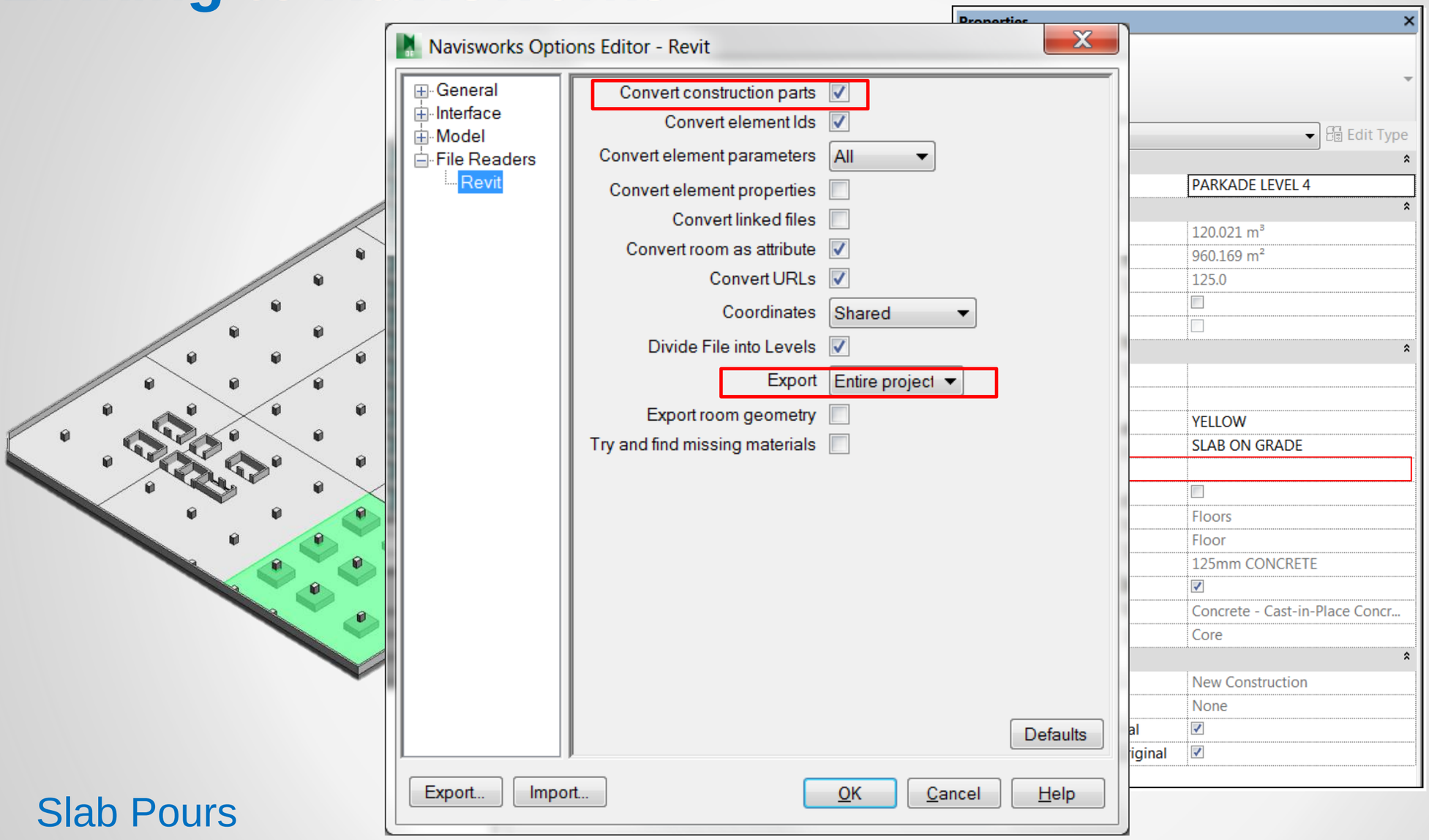






Slab Pours

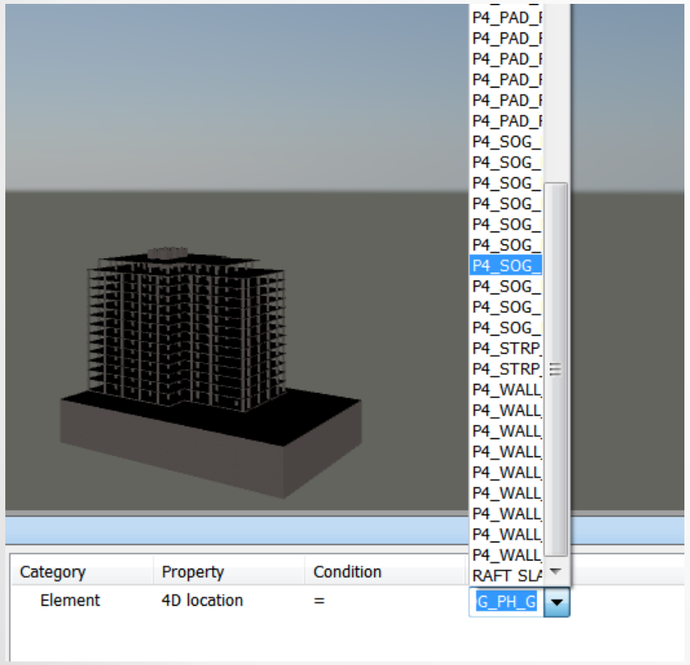
Linking to Navisworks

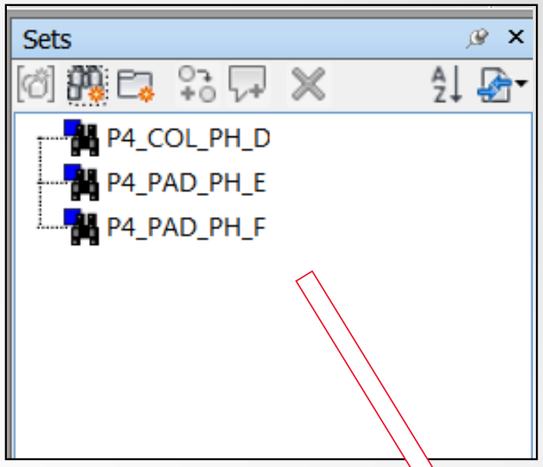


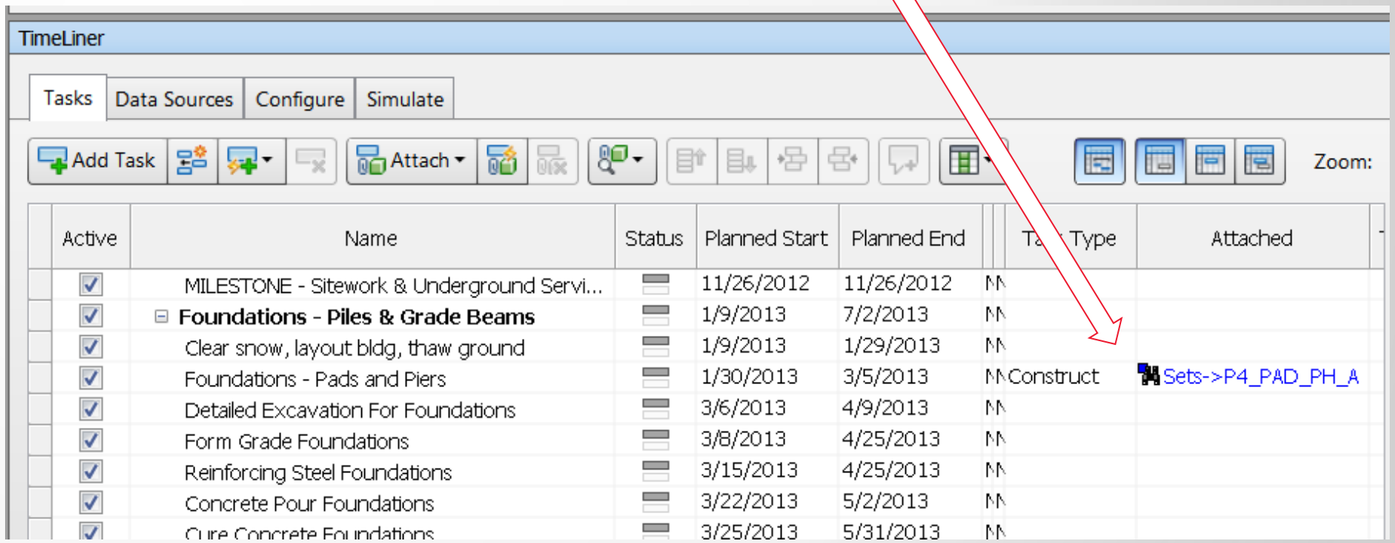
Slab Pours

Linking to Navisworks

- Existing MS Project or Primavera schedule
  - Utilize search sets to attach geometry
  - Search sets will retain selection if Revit model is updated



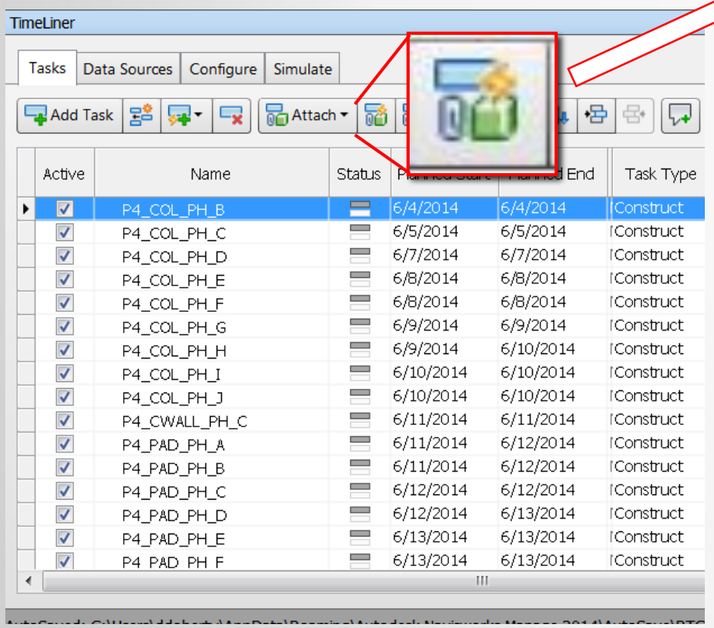




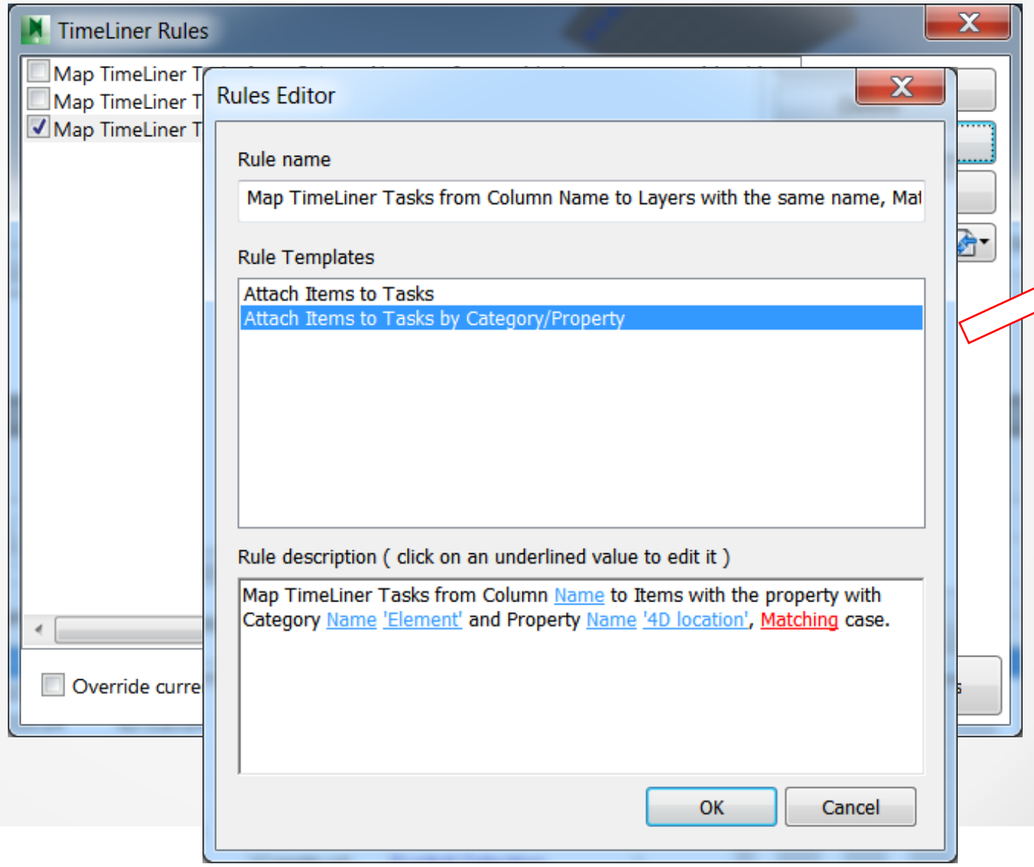
Linking to Navisworks

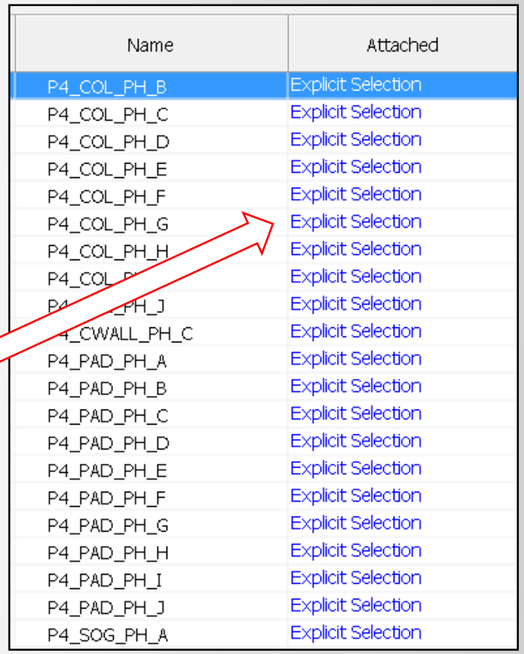
- Create new schedule tasks and durations
  - Utilize **auto-attach using rules** to expedite 4D creation

Task names match **4D location** names



Auto attach





Session Feedback

- Via the Survey Stations, email or mobile device
- AU 2015 passes given out each day!
- Best to do it right after the session
- Instructors see results in real-time

Questions?