

One Model to Rule Them All: Using Revit to Produce Multiple Analytical Energy Models

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Class summary

This class will present techniques for using Revit to rapidly produce analytical geometry models for use in various energy modeling programs and Autodesk Simulation CFD

Key learning objectives

At the end of this class, you will have:

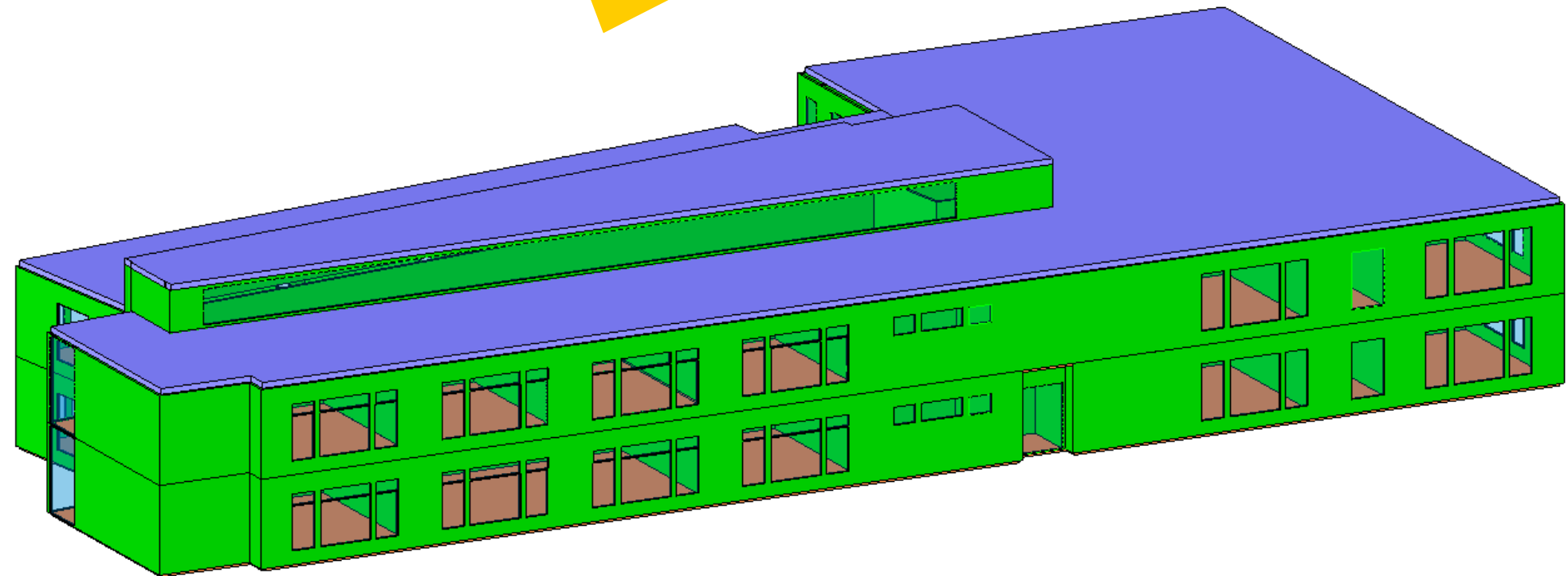
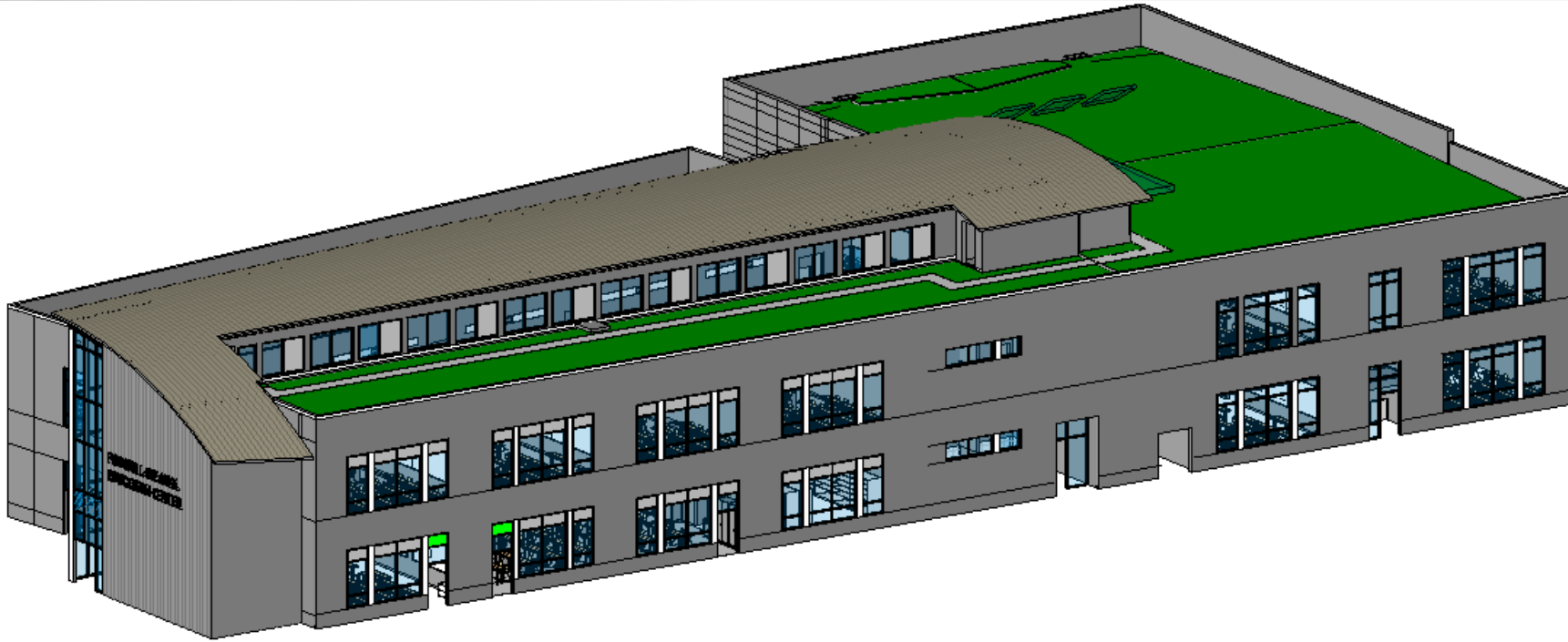
- Learned how to use the Revit software workflow for rapidly building an analytical model from an architectural model
- Learned how to use Revit software and the Green Building Studio service to export to multiple energy analysis programs
- Learned how to use Revit software to quickly import a full lighting design into an energy model
- Learned how to use Revit software to create CFD boundary condition geometry

Why?



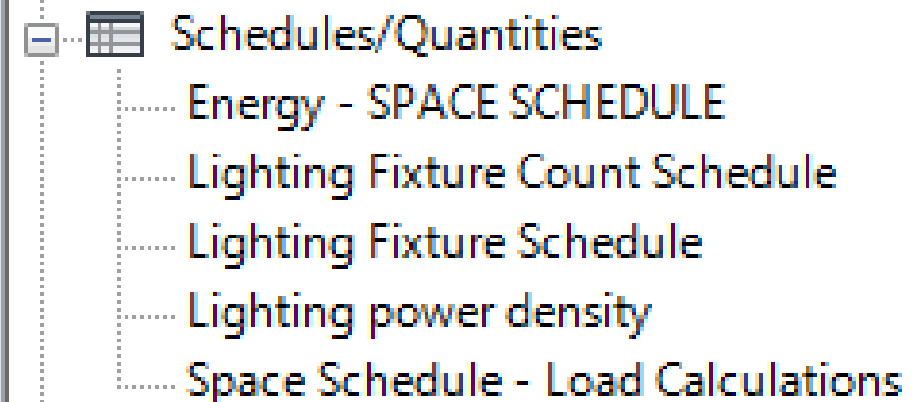
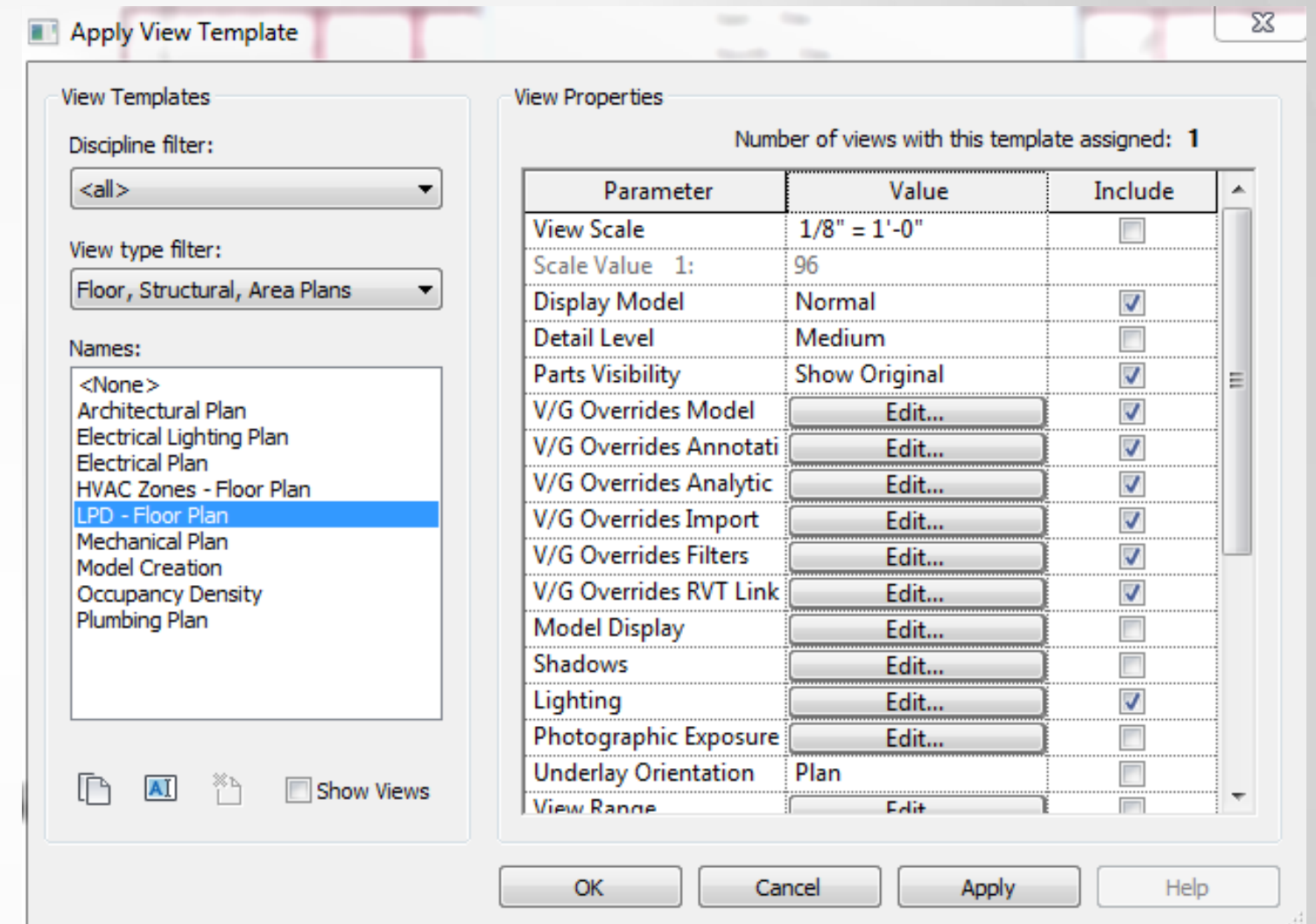
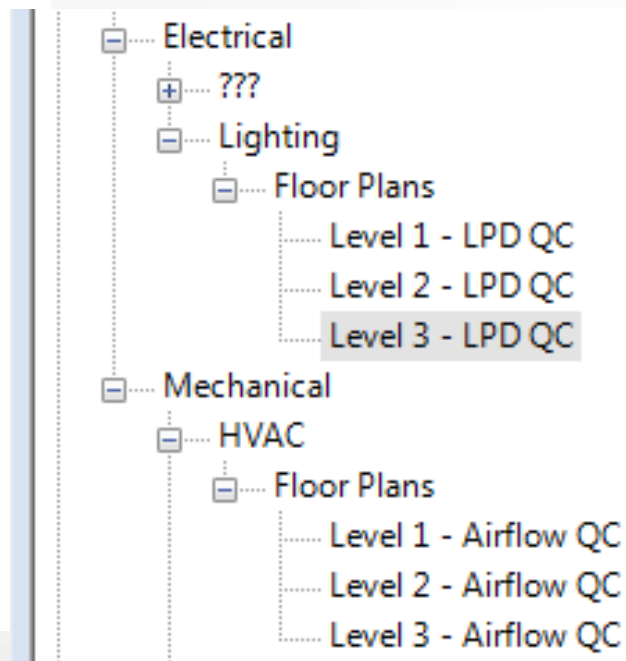
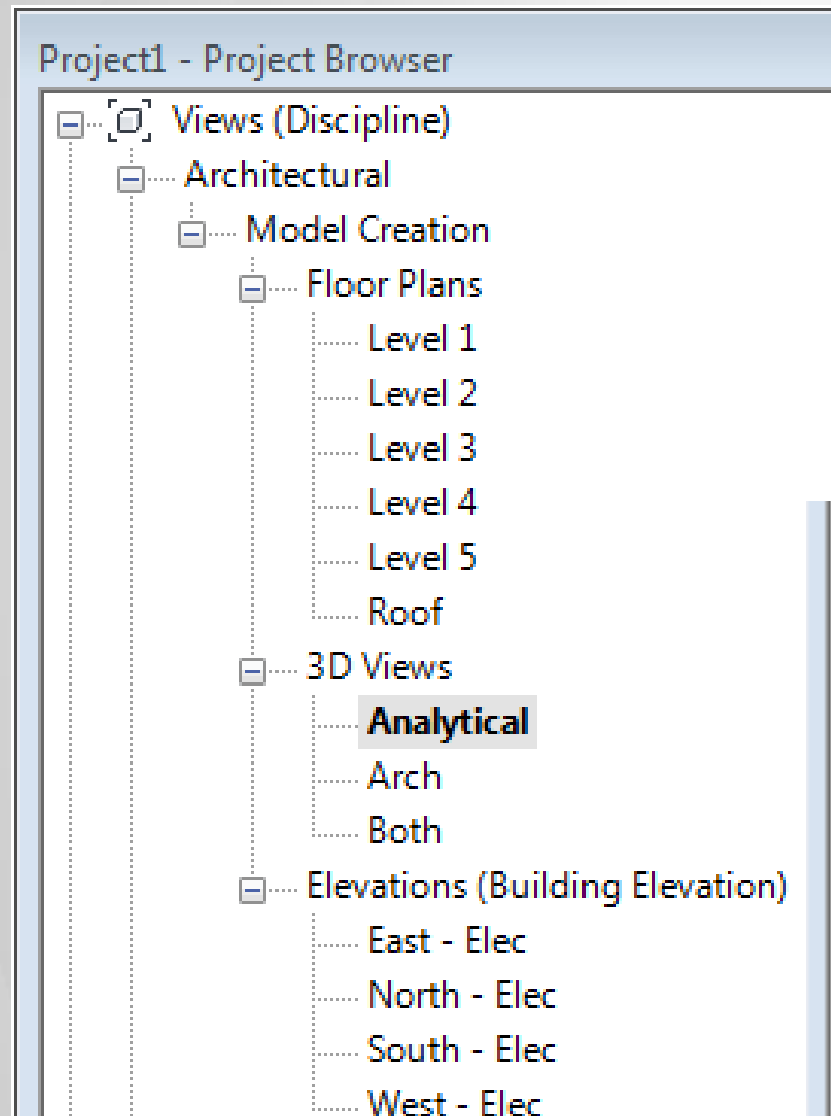
Rapid Creation of Analytical Model Geometry

Creating Analytical Model from Detailed Model

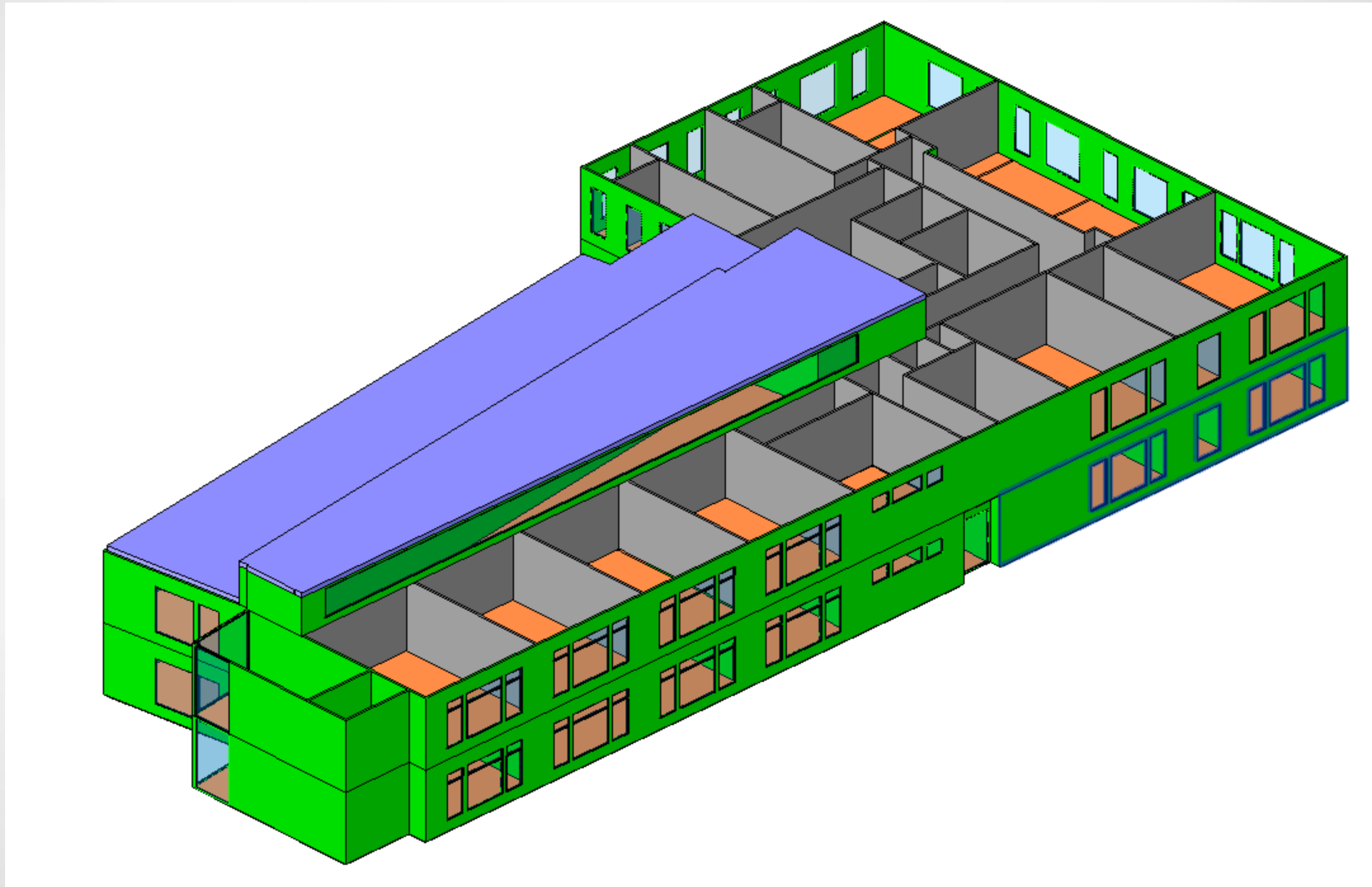


Project Template File

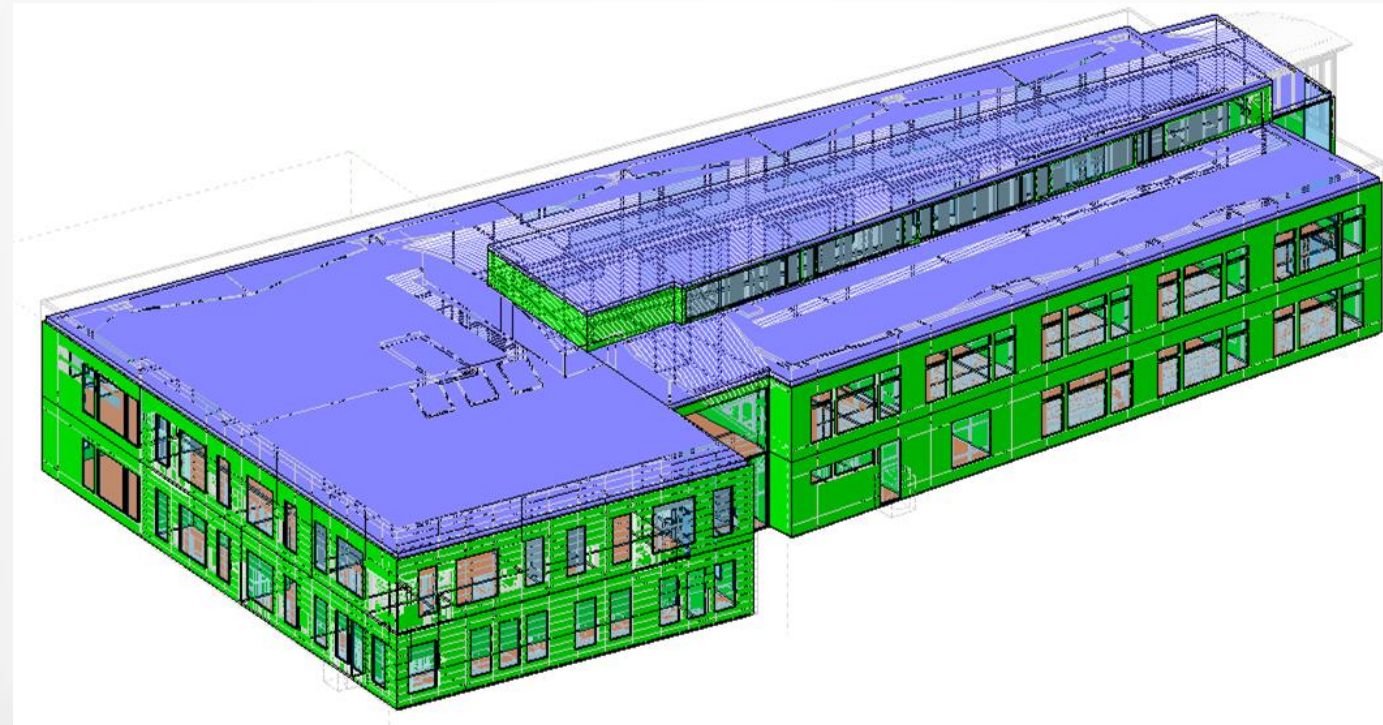
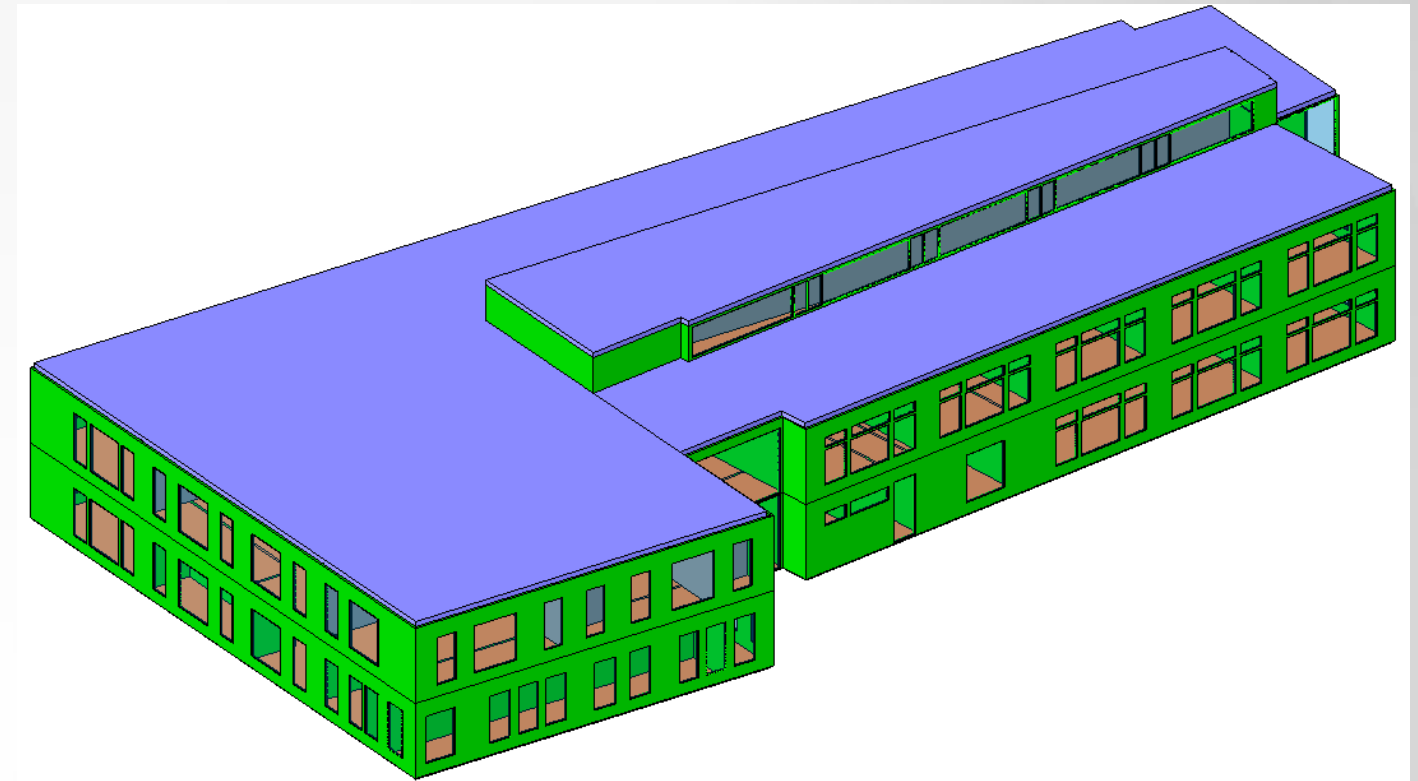
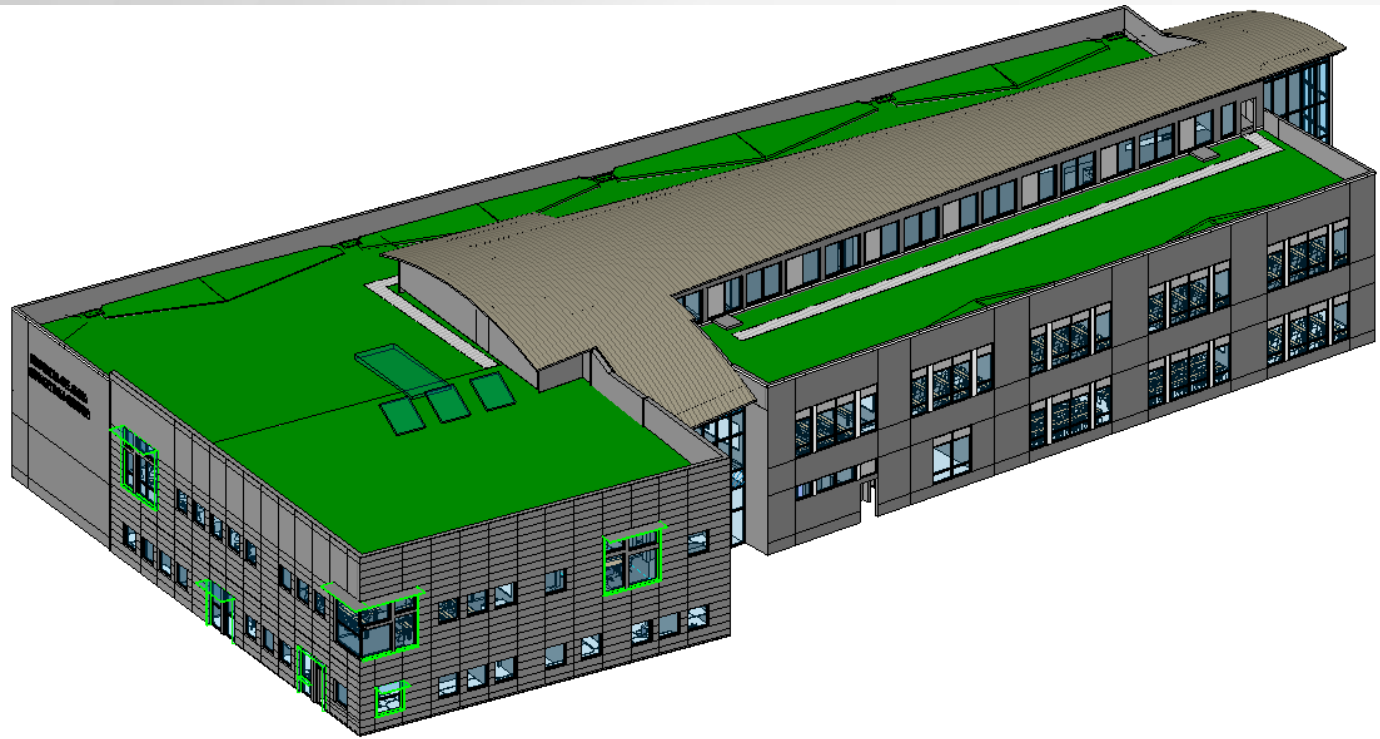
Commonly used views and schedules



Envelope Families



Predefined Views



Predefined Schedules

Schedule Properties

Fields Filter Sorting/Grouping Formatting Appearance Embedded Schedule

Available fields:

- Design HVAC Load per area
- Design Other Load per area
- Floor Reflectance
- Heat Load Values
- Latent Heat Gain per person
- Lighting Calculation Luminaire Plan
- Lighting Calculation Workplane
- Lighting Load Units
- Limit Offset
- Number of People
- Occupancy Unit

Scheduled fields (in order):

- Name
- Number
- Level
- Area
- Volume
- Zone
- Space Height
- Specified Lighting Load per area
- Specified Power Load per area

Add --> <-- Remove

Add Parameter... Calculated Value...

Edit... Delete

Select available fields from:

Spaces

☐ Include elements in linked files

OK Cancel Help

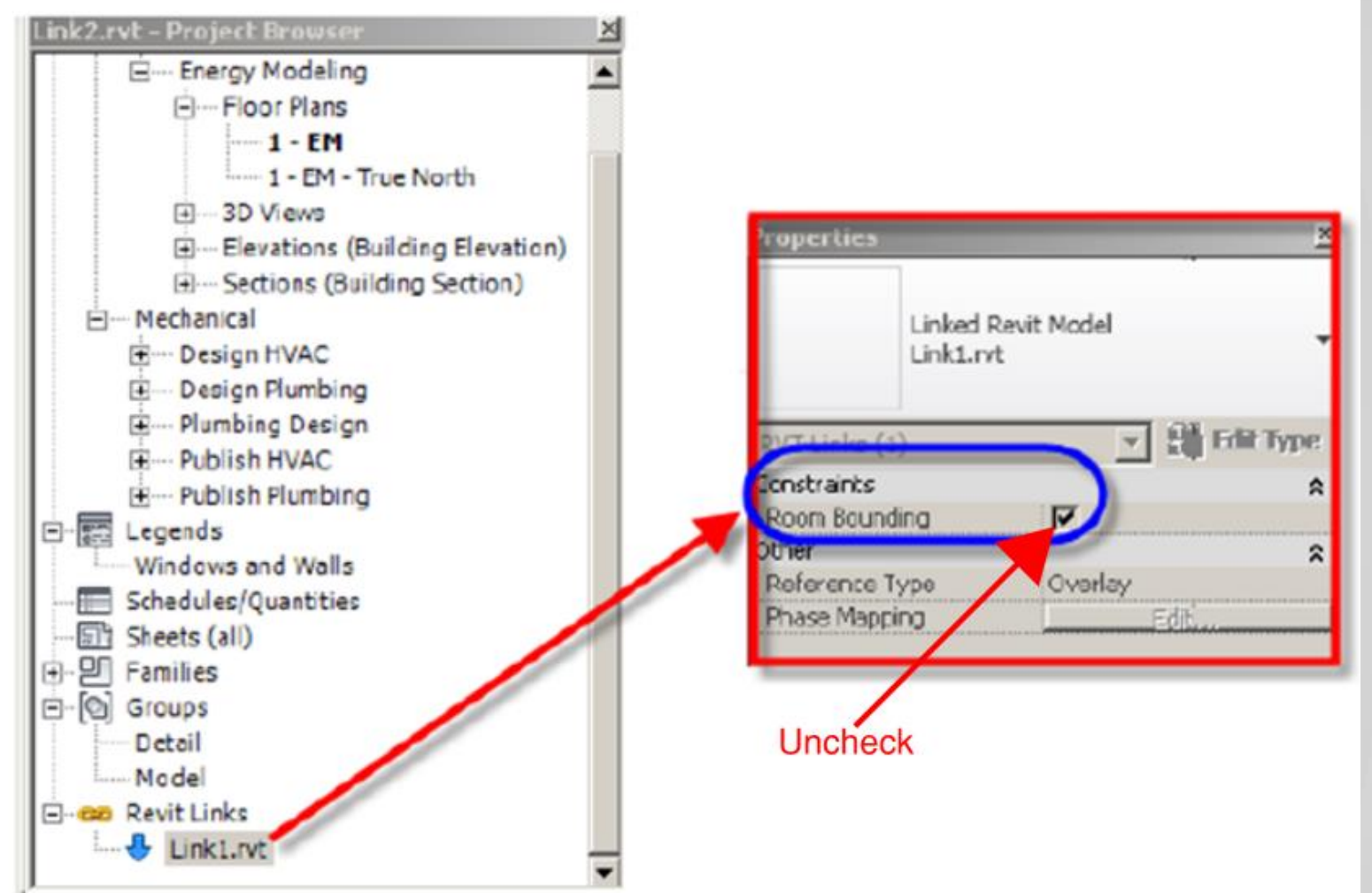
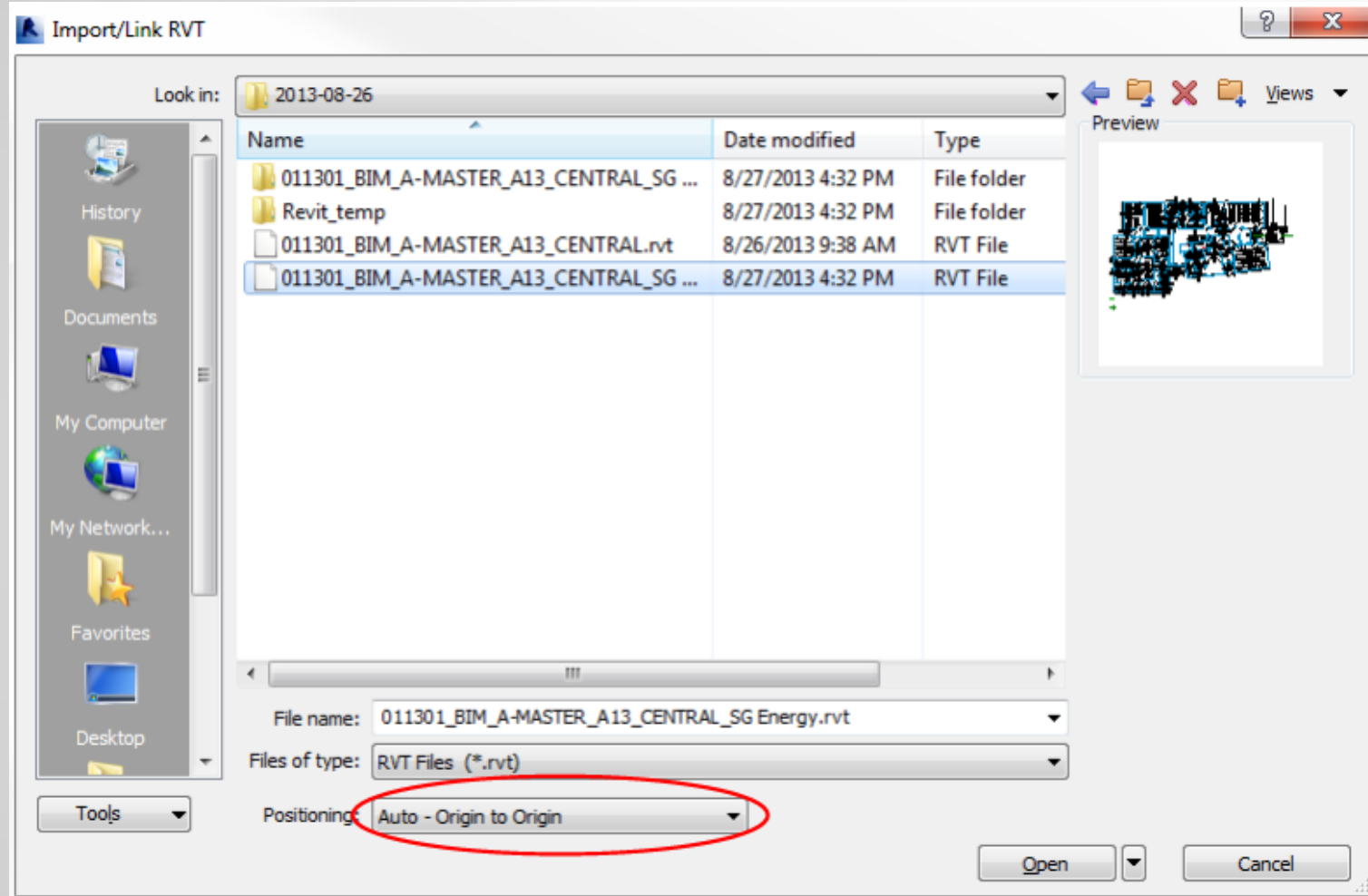
Energy - SPACE SCHEDULE								
Name	Number	Zone	Level	Area	Volume	Space Height	Specified Lighting Load	Specified Power
WOMEN	114	1-WOMEN 114	Level 1	628 SF	9101.61 CF	14' - 6"	0.65 W/ft ²	0.80 W/ft ²
STORE	107C	1-STORE 107C	Level 1	150 SF	2172.48 CF	14' - 6"	0.65 W/ft ²	0.80 W/ft ²
STORAGE	113	1-STORAGE 113	Level 1	188 SF	2719.01 CF	14' - 6"	0.65 W/ft ²	0.80 W/ft ²
STORAGE	108	1-STORAGE 108	Level 1	905 SF	13121.59 CF	14' - 6"	0.65 W/ft ²	0.80 W/ft ²
STAIR 2	132	1-STAIR 2 132	Level 1	459 SF	6648.30 CF	14' - 6"	0.65 W/ft ²	0.80 W/ft ²
STAIR 1-1	140-1	1-STAIR 1-1 140-1	Level 1	464 SF	6722.79 CF	14' - 6"	0.65 W/ft ²	0.80 W/ft ²
SOUTH VEST	131	1-SOUTH VEST 131	Level 1	216 SF	3131.93 CF	14' - 6"	0.65 W/ft ²	0.80 W/ft ²
SECURITY	115D	1-SECURITY 115D	Level 1	201 SF	2911.28 CF	14' - 6"	0.65 W/ft ²	0.80 W/ft ²
RESTRM	115A	1-RESTRM 115A	Level 1	119 SF	1725.51 CF	14' - 6"	0.65 W/ft ²	0.80 W/ft ²
PARTNERING	115	1-PARTNERING AREA 115	Level 1	2490 SF	36101.05 CF	14' - 6"	0.65 W/ft ²	0.80 W/ft ²
OFFICE	126B	1-OFFICE 126B	Level 1	322 SF	4673.83 CF	14' - 6"	0.65 W/ft ²	0.80 W/ft ²
OFFICE	115K	1-OFFICE 115K	Level 1	510 SF	7393.87 CF	14' - 6"	0.65 W/ft ²	0.80 W/ft ²
OFF	111A	1-OFF 111A	Level 1	172 SF	2490.13 CF	14' - 6"	0.65 W/ft ²	0.80 W/ft ²

Creating Analytical Geometry for Energy Modeling

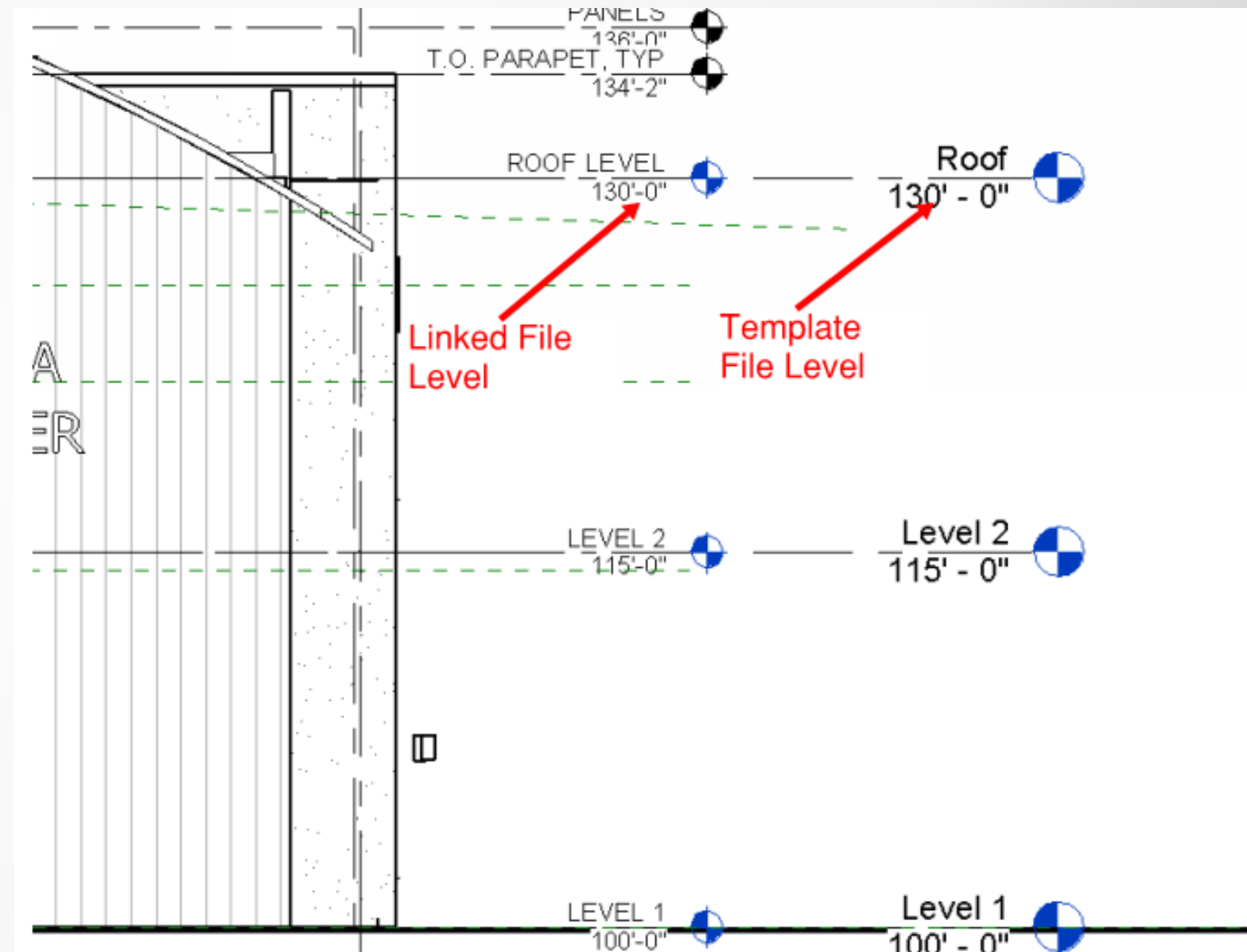
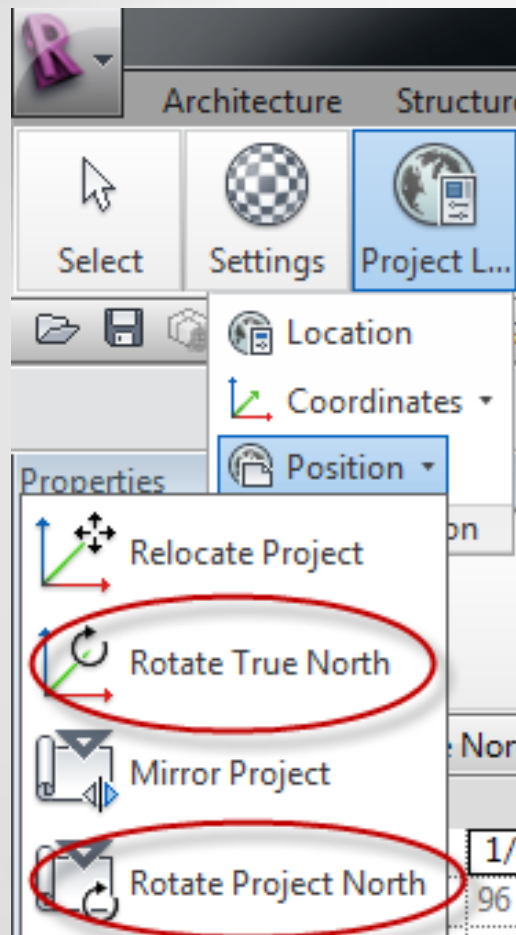
General Modeling Rules

- Keep it simple!
 - Rectangular zoning
 - No doors (unless more than 10% of wall area)
 - Don't model columns, shafts, non-bounding elements
- Align surfaces (ignore small offsets)
- Don't use design options (use separate models)
- Use native families (in-place families don't export)

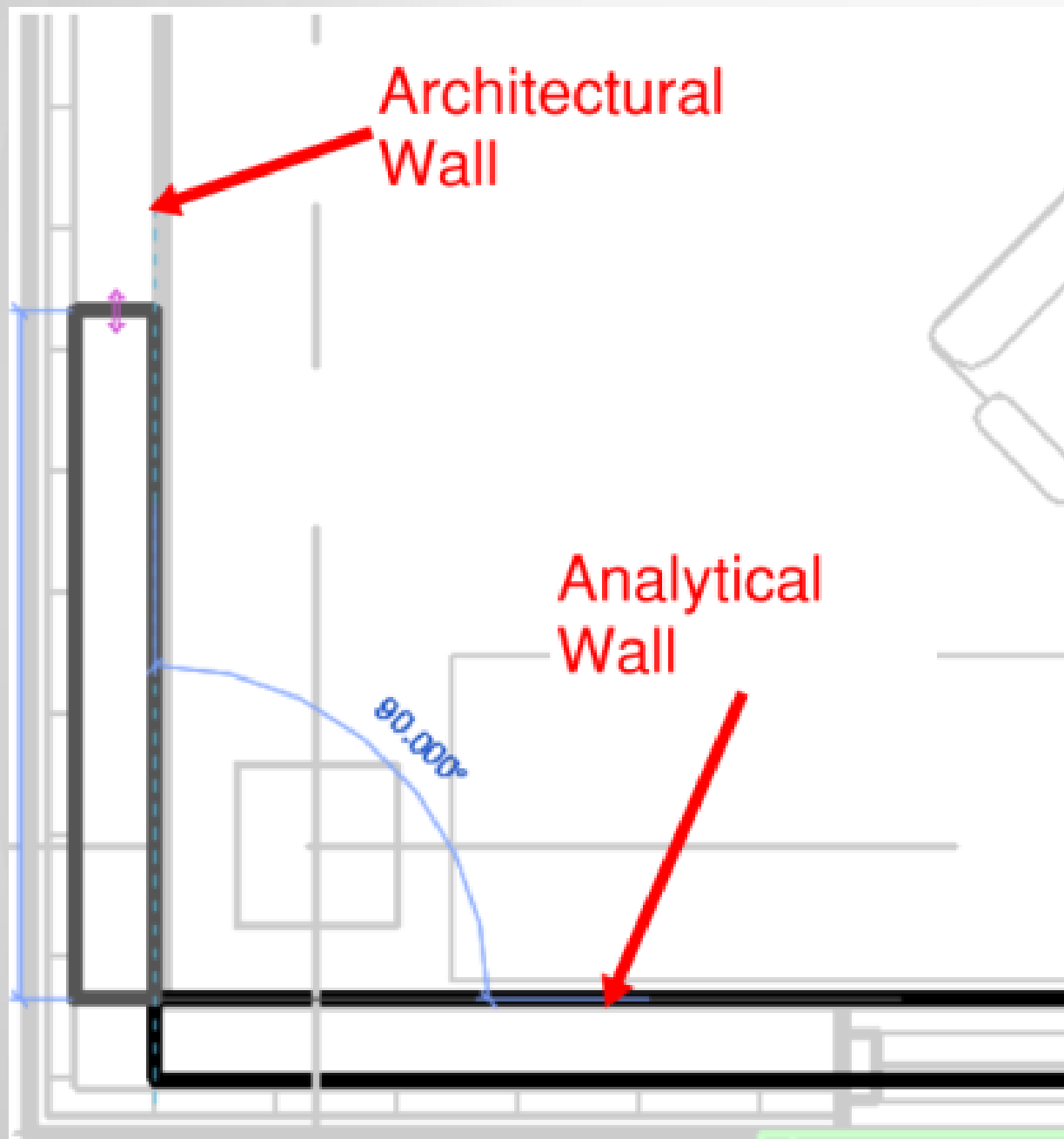
Step 1 – Link Architectural Model



Steps 2 and 3 – Set Orientation and Align Levels

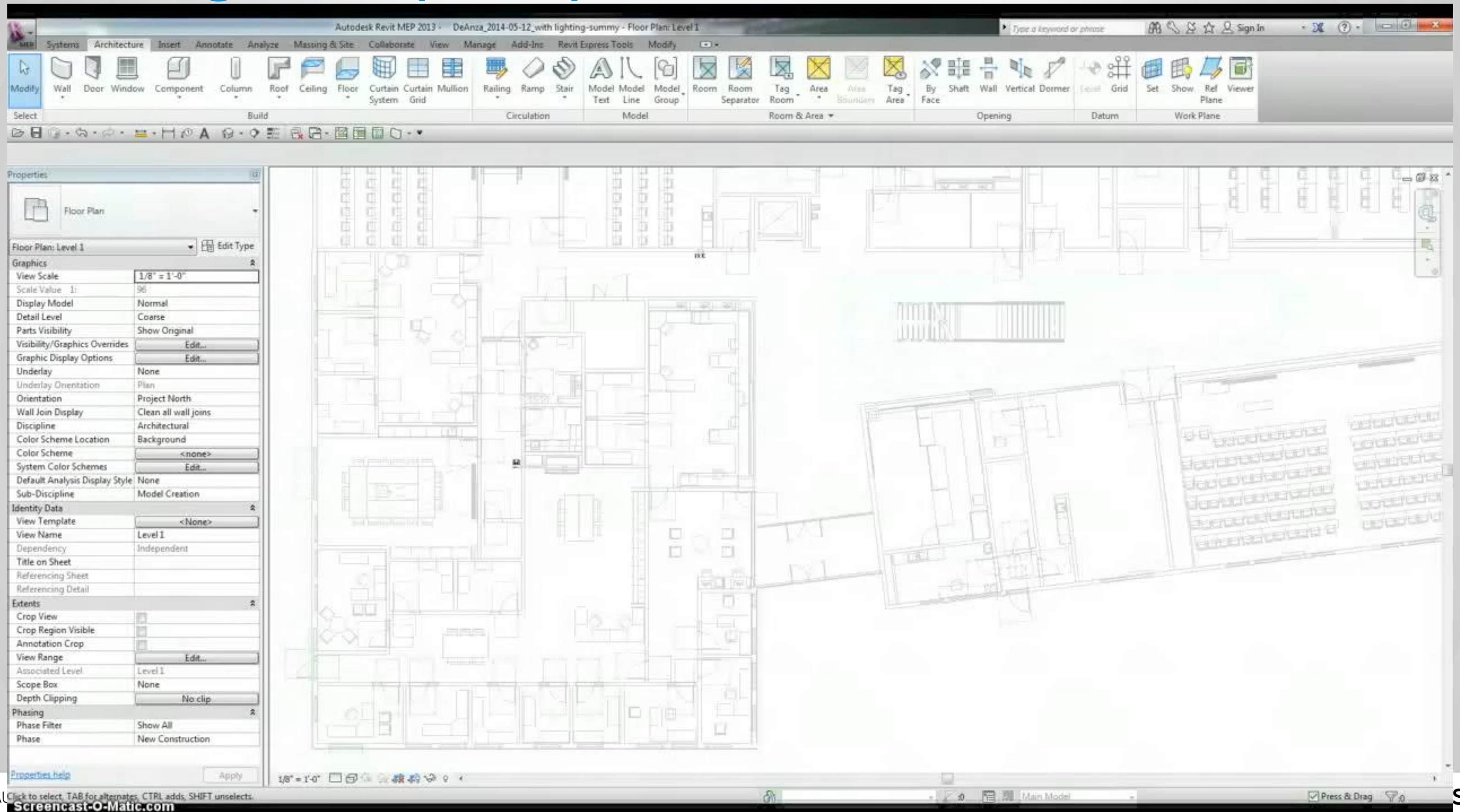


Step 4 – Draw Exterior Walls and Floors



Properties	
Basic Wall Generic Exterior - 6"	
New Walls Edit Type	
Constraints	
Location Line	Finish Face: Interior
Base Constraint	Level 1
Base Offset	0' 0"
Base is Attached	<input type="checkbox"/>
Base Extension Distance	0' 0"
Top Constraint	Up to level: Level 2
Unconnected Height	13' 0"
Top Offset	0' 0"
Top is Attached	<input type="checkbox"/>
Top Extension Distance	0' 0"
Room Bounding	<input checked="" type="checkbox"/>
Related to Mass	<input type="checkbox"/>
Structural	
Structural	<input type="checkbox"/>
Enable Analytical Model	<input type="checkbox"/>
Structural Usage	Non-bearing
Dimensions	
Area	
Volume	
Identity Data	
Comments	
Mark	
Energy Analysis	
Wall Orientation	
Other	
Extensions.Parameters	

Drawing Walls (video)



Drawing Floors (video)

Autodesk Revit MEP 2013 - DeAnza_2014-05-12_with lighting-summy - Floor Plan: Level 1

Systems Architecture Insert Annotate Analyze Massing & Site Collaborate View Manage Add-Ins Revit Express Tools Modify

Modify Wall Door Window Component Column Roof Ceiling Floor Curtain System Grid Mullion Railing Ramp Stair Model Model Text Model Line Model Group Room Room Separator Tag Room Area Area Boundary Tag Area By Face Shaft Wall Vertical Dormer Level Grid Set Show Ref Viewer Plane

Select Build Circulation Model Room & Area Opening Datum Work Plane

Properties

Floor Plan

Floor Plan: Level 1 Edit Type

Graphics

View Scale: 1/8" = 1'-0"

Scale Value: 1: 96

Display Model: Normal

Detail Level: Coarse

Parts Visibility: Show Original

Visibility/Graphics Overrides: Edit...

Graphic Display Options: Edit...

Underlay: None

Underlay Orientation: Plan

Orientation: Project North

Wall Join Display: Clean all wall joins

Discipline: Architectural

Color Scheme Location: Background

Color Scheme: <none>

System Color Schemes: Edit...

Default Analysis Display Style: None

Sub-Discipline: Model Creation

Identity Data

View Template: <None>

View Name: Level 1

Dependency: Independent

Title on Sheet

Referencing Sheet

Referencing Detail

Extents

Crop View: ☐

Crop Region Visible: ☐

Annotation Crop: ☐

View Range: Edit...

Associated Level: Level 1

Scope Box: None

Depth Clipping: No clip

Phasing

Phase Filter: Show All

Phase: New Construction

Properties help Apply

1/8" = 1'-0"

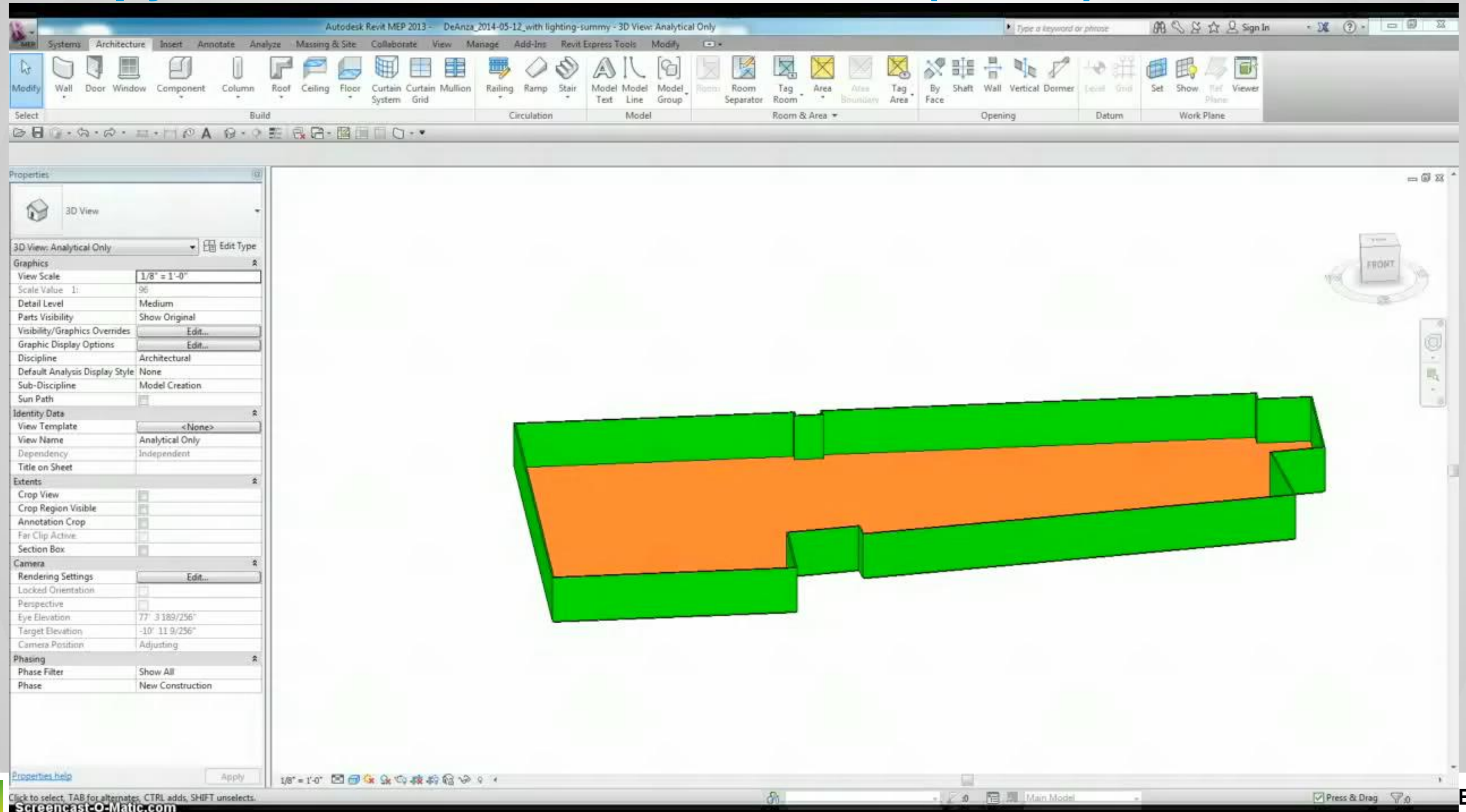
RVT Links: Linked Revit Model: 011301_BIM_A-MASTER_A13_CENTRAL_140509.rvt: 3: location <Not Shared>

ScreenCast-O-Matic.com

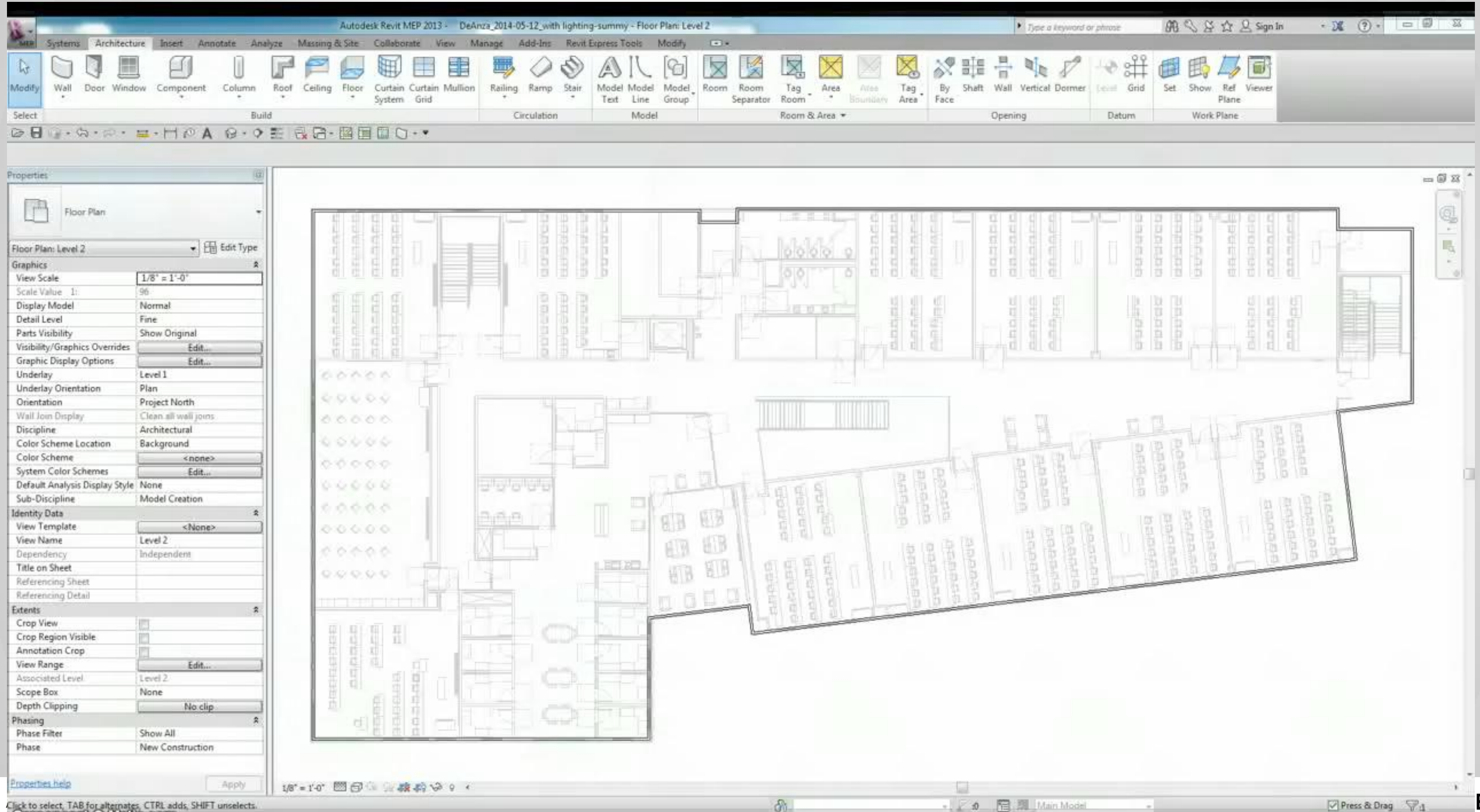
Press & Drag

SK

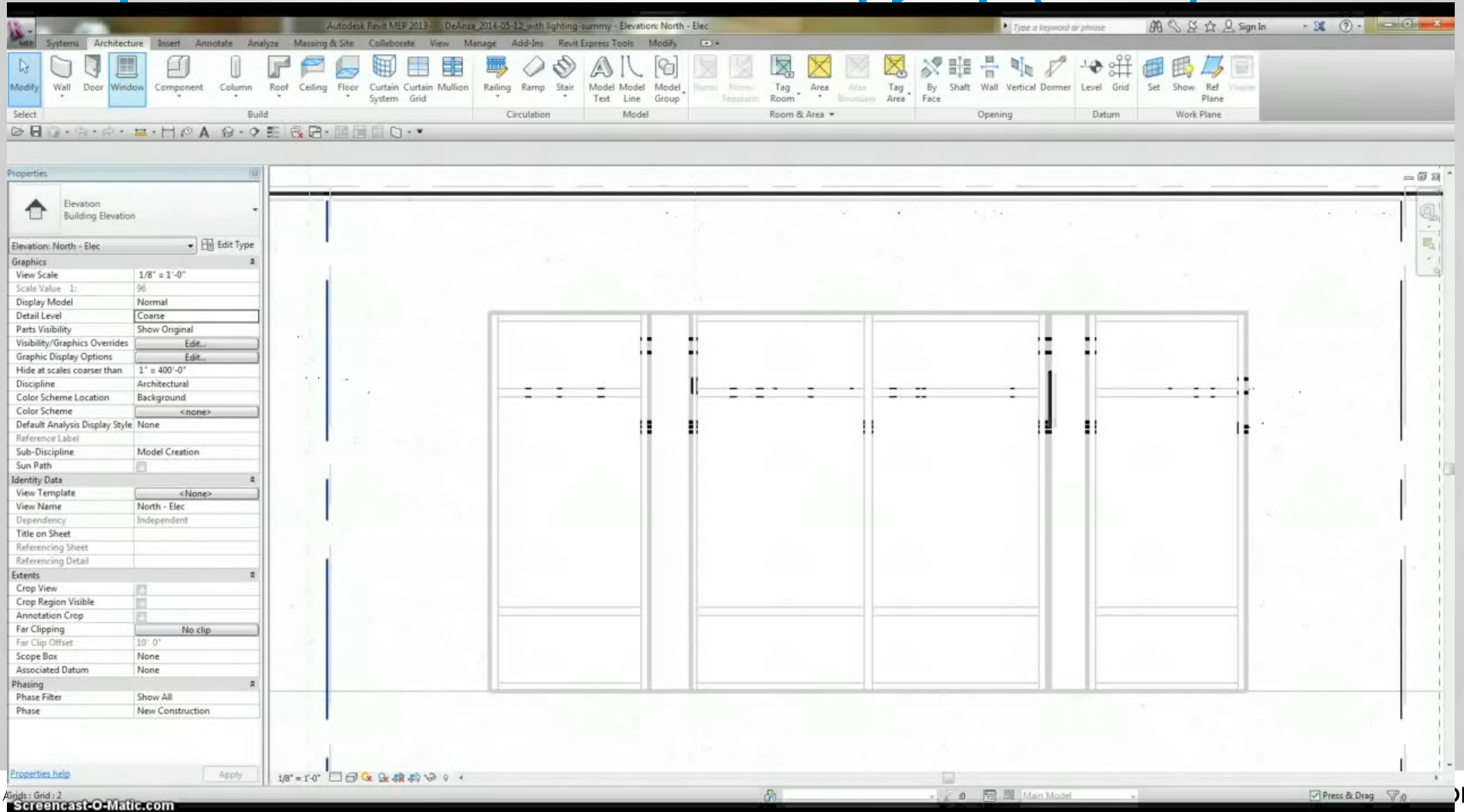
Copy and Paste Walls and Floors (video)



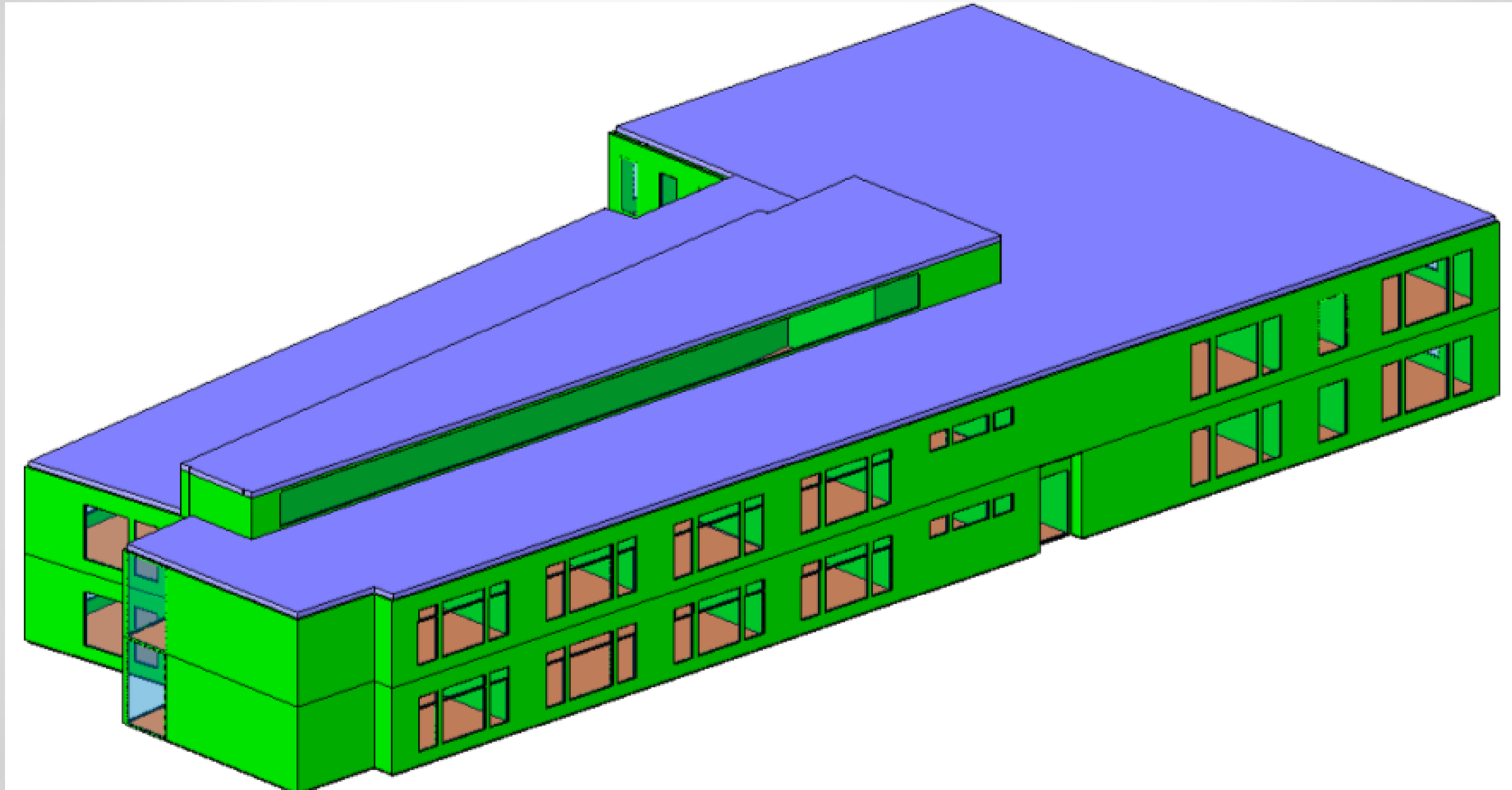
Drawing Roofs (video)



Step 5 – Draw Windows and Copy Up (video)

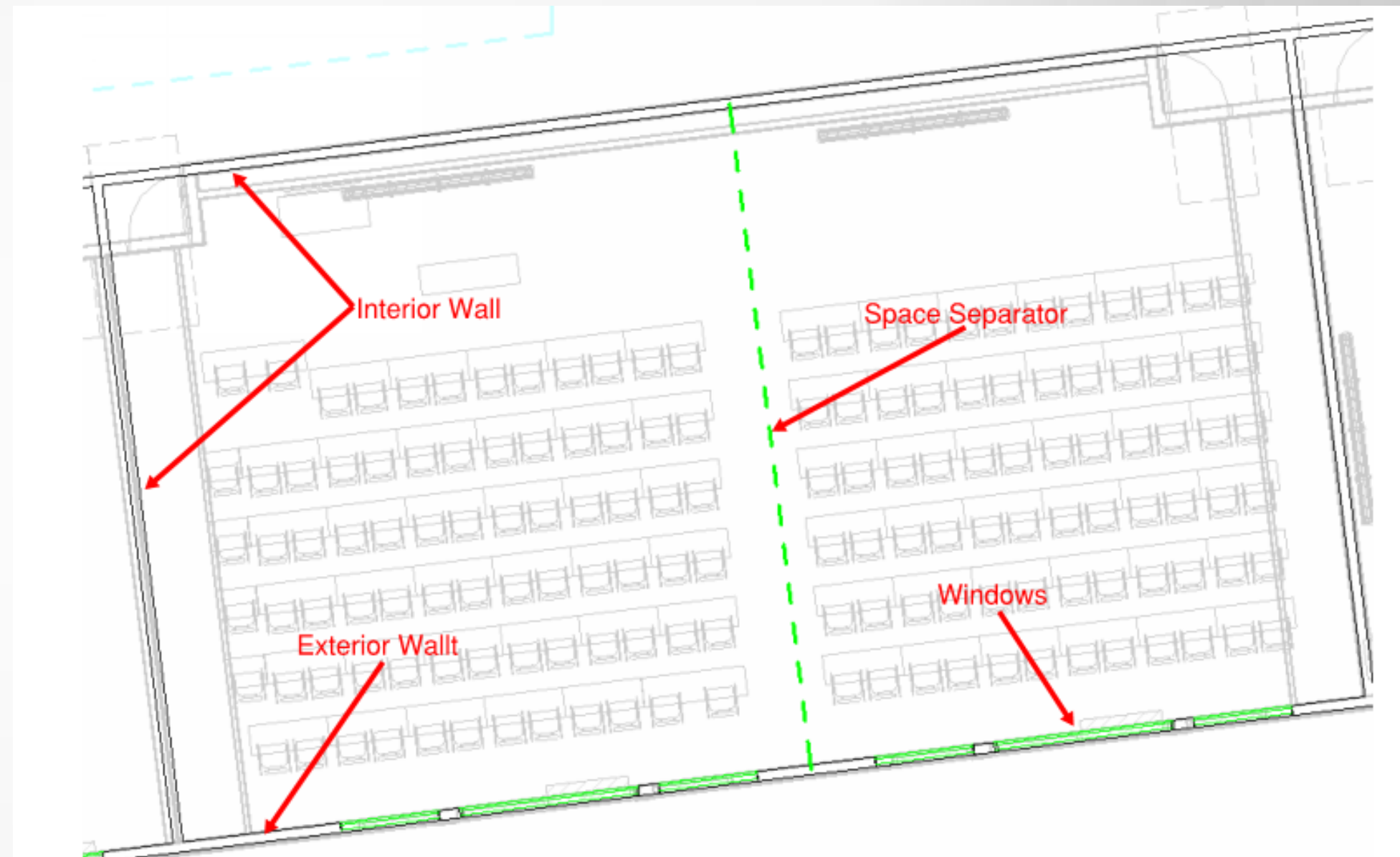


Progress So Far



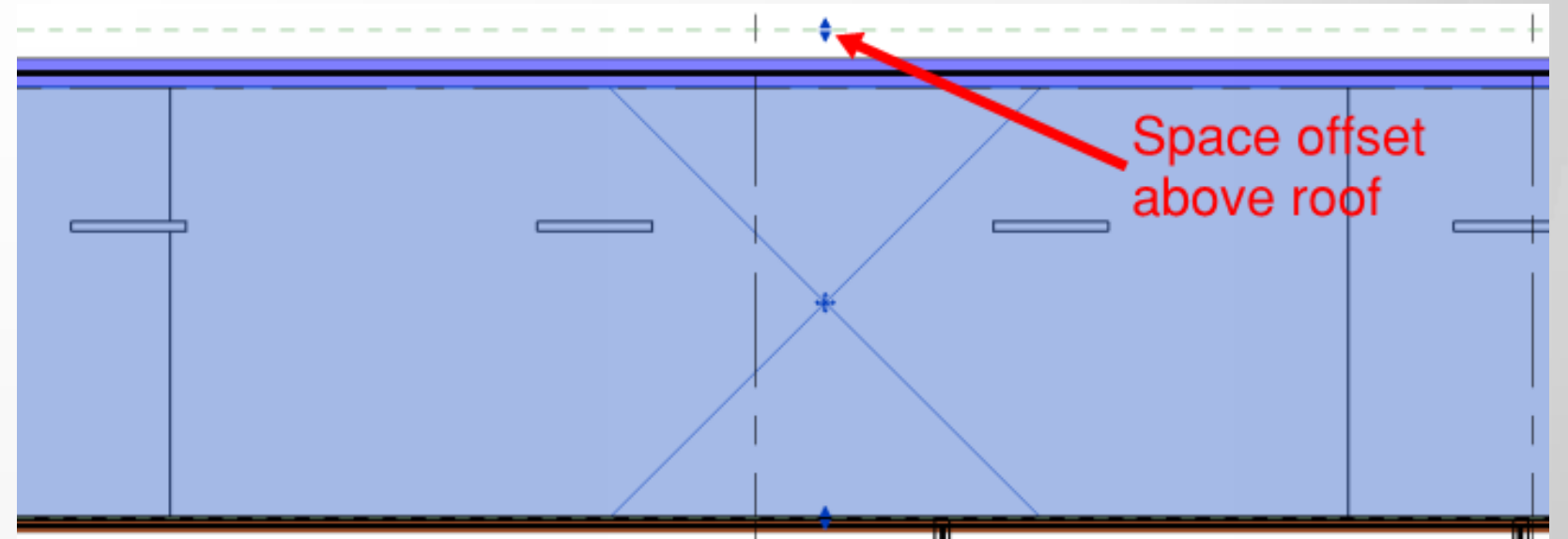
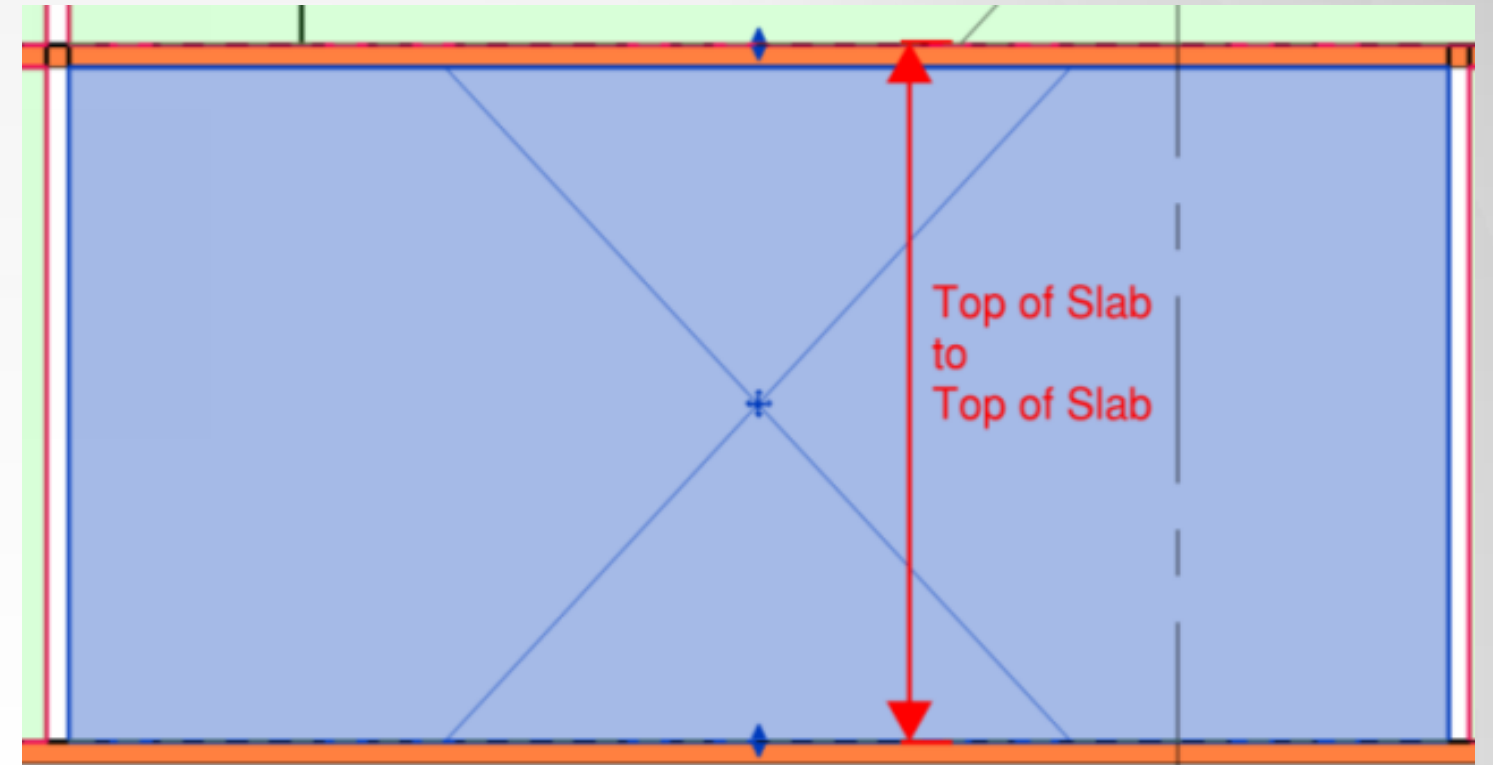
Step 6 – Zoning the Model

- Use walls and space separators to define thermal zones
- Use the “Place Spaces Automatically” tool

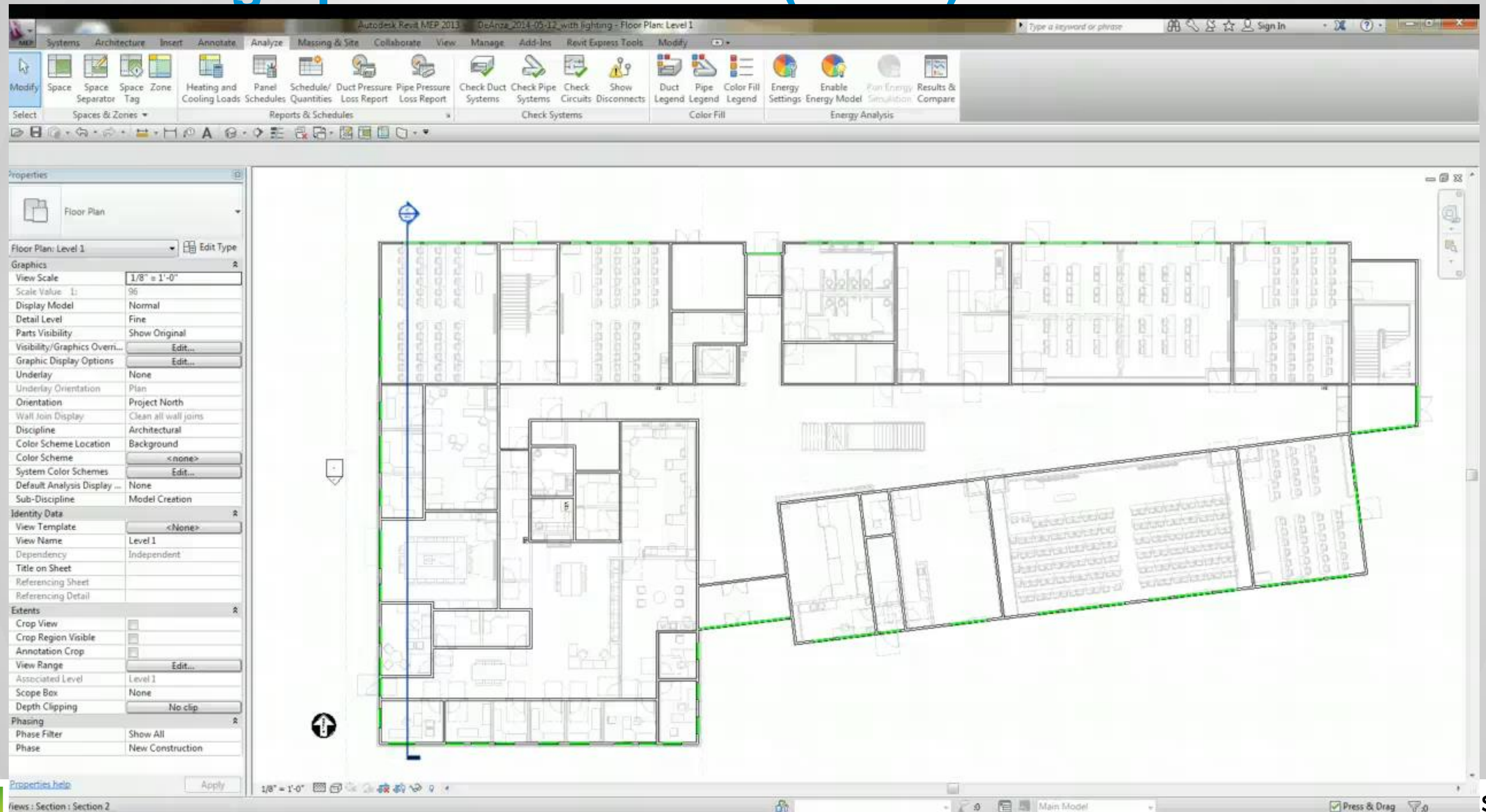


Zoning Tips

- Create one HVAC zone for every Space
- Make sure space limits go from floor-to-floor
- For top floor spaces, use a limit offset

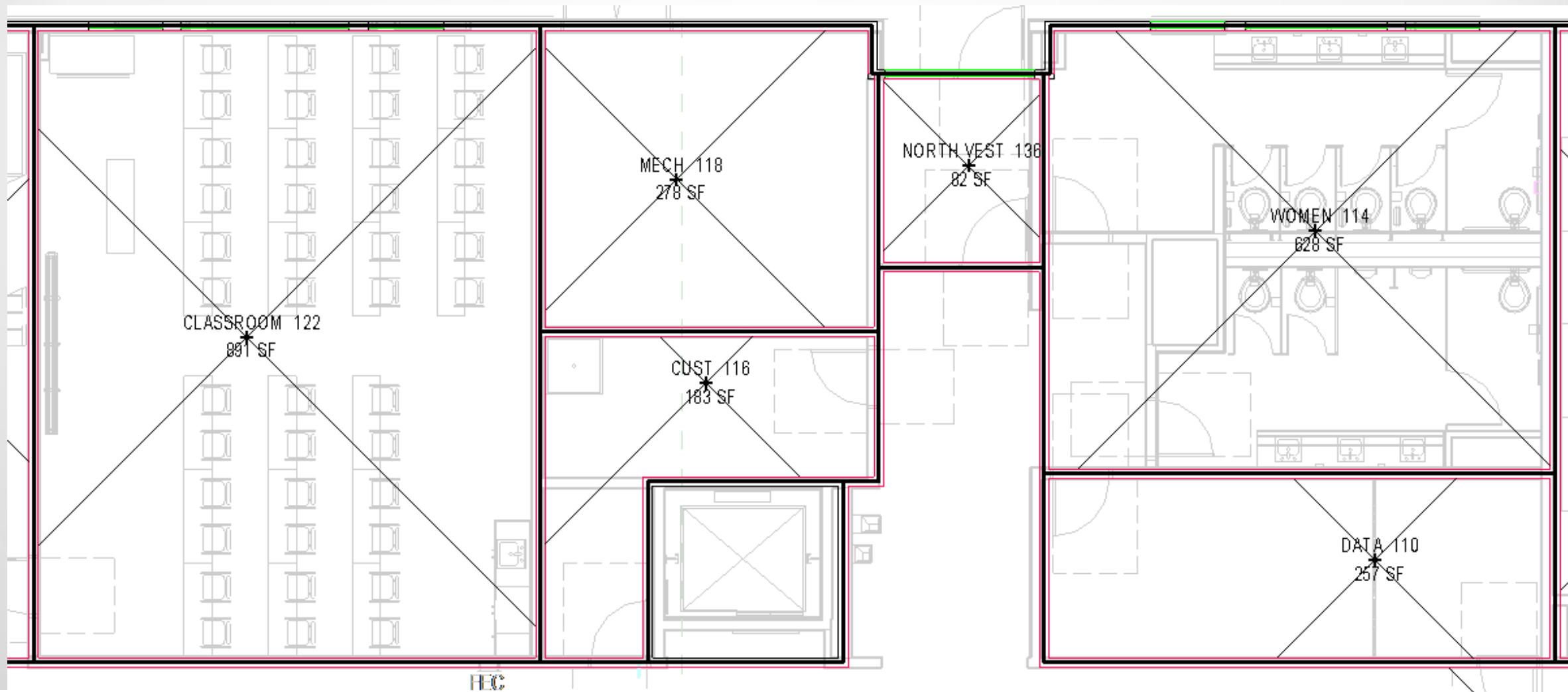


Creating Spaces and Zones (video)



Step 8 – Space and Zone Naming

- Name = Occupancy type
- eQUEST uses the Zone name
- Trace uses the Space name
- IES-VE uses a combination of space name and number



Naming Tools

- Space Naming Utility (grabs names from arch model)
- Custom Tools – Create Zones



Energy - SPACE SCHEDULE										
Room: Name	Room: Numb	Name	Number	Zone	Level	Area	Volume	Space Height	Specified Lightin	Specified Power
WOMEN	114	WOMEN	114	1-WOMEN 114	Level 1	628 SF	9101.61 CF	14' - 6"	0.65 W/ft²	0.80 W/ft²
STORE	107C	STORE	107C	1-STORE 107C	Level 1	150 SF	2172.48 CF	14' - 6"	0.65 W/ft²	0.80 W/ft²
STORAGE	113	STORAGE	113	1-STORAGE 113	Level 1	188 SF	2719.01 CF	14' - 6"	0.65 W/ft²	0.80 W/ft²
STORAGE	108	STORAGE	108	1-STORAGE 108	Level 1	905 SF	13121.59 CF	14' - 6"	0.65 W/ft²	0.80 W/ft²
STAIR 3	131	STAIR 2	132	1-STAIR 2 132	Level 1	459 SF	6648.30 CF	14' - 6"	0.65 W/ft²	0.80 W/ft²
STAIR 1	140	STAIR 1-1	140-1	1-STAIR 1-1 140-1	Level 1	464 SF	6722.79 CF	14' - 6"	0.65 W/ft²	0.80 W/ft²
SOUTH VES	132	SOUTH VEST	131	1-SOUTH VEST 131	Level 1	216 SF	3131.93 CF	14' - 6"	0.65 W/ft²	0.80 W/ft²
SECURITY	115D	SECURITY	115D	1-SECURITY 115D	Level 1	201 SF	2911.28 CF	14' - 6"	0.65 W/ft²	0.80 W/ft²
RESTRM	115A	RESTRM	115A	1-RESTRM 115A	Level 1	119 SF	1725.51 CF	14' - 6"	0.65 W/ft²	0.80 W/ft²

Step 9 - Load Parameters in Revit

Properties

Spaces (1) Edit Type

Volume 8837.80 CF

Computation Height 0' 0"

Identity Data

Number 128

Name CONFERENCE

Room Number 128

Room Name CONFERENCE

Comments

Phasing

Phase New Construction

Energy Analysis

Zone 1-CONFERENCE 128

Plenum ☐

Occupiable ☒

Condition Type Heated and cooled

Space Type <Building>

Construction Type <Building>

People Edit...

Electrical Loads Edit...

Calculated Heating Load Not Computed

Design Heating Load 0.00 Btu/h

Calculated Cooling Load Not Computed

Design Cooling Load 0.00 Btu/h

Properties help

Apply

Electrical Loads

Lighting

Values: Specified

☐ Load: 396.18 W

☒ Load Density: 0.65 W/ft²

Contribution to plenum (if exists):

20.00%

Power

Values: Specified

☐ Load: 487.60 W

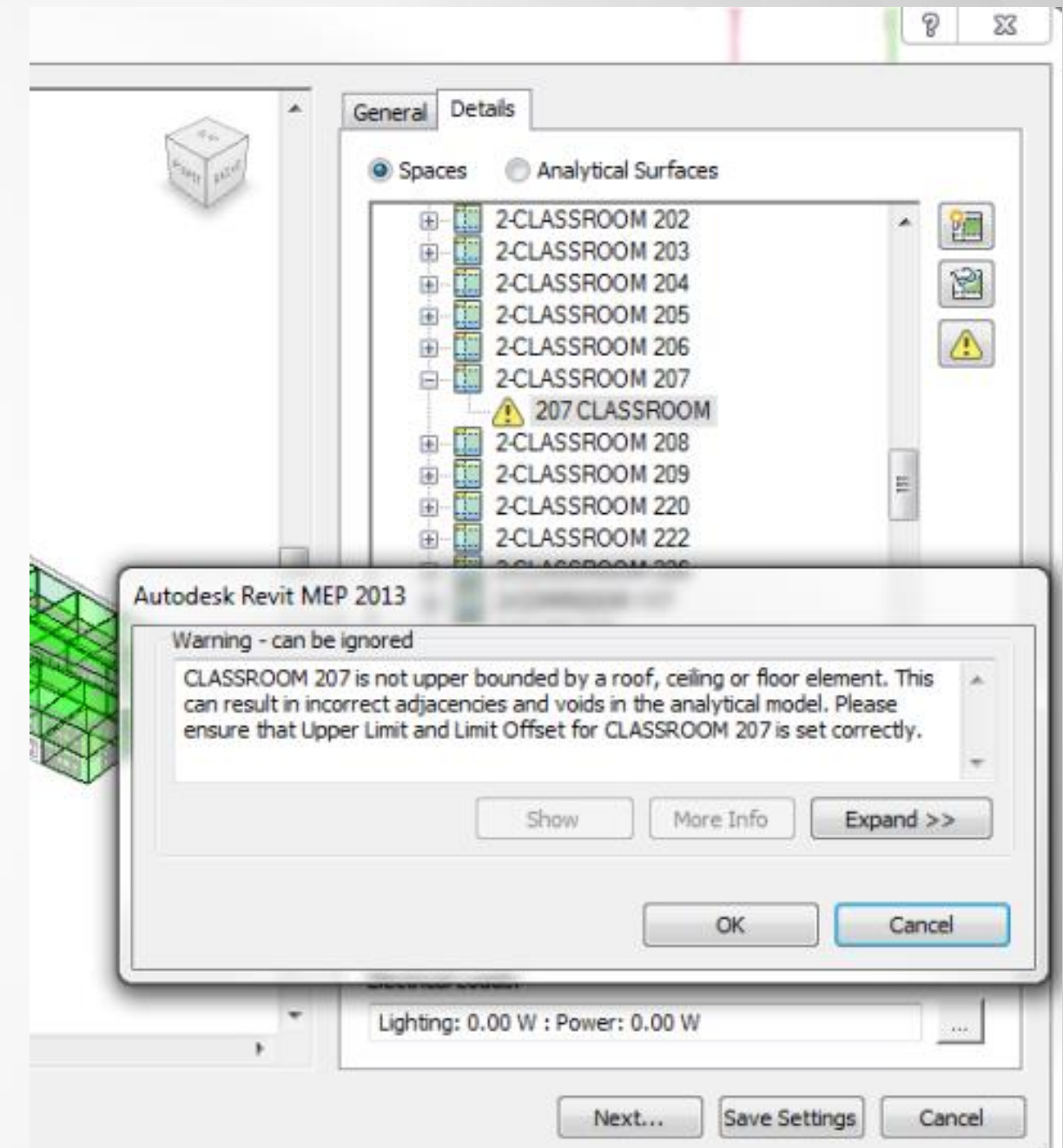
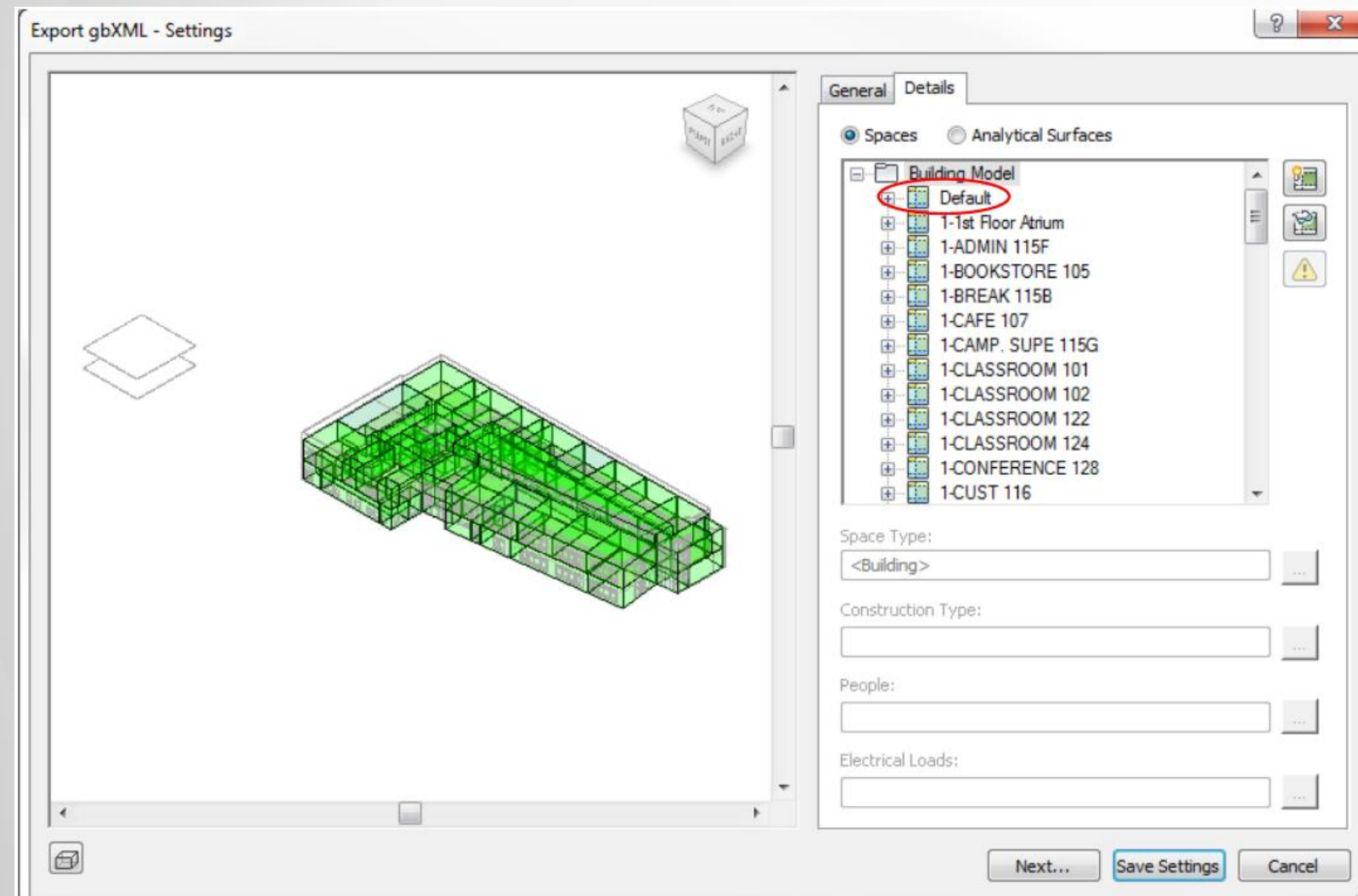
☒ Load Density: 0.80 W/ft²

OK Cancel Help

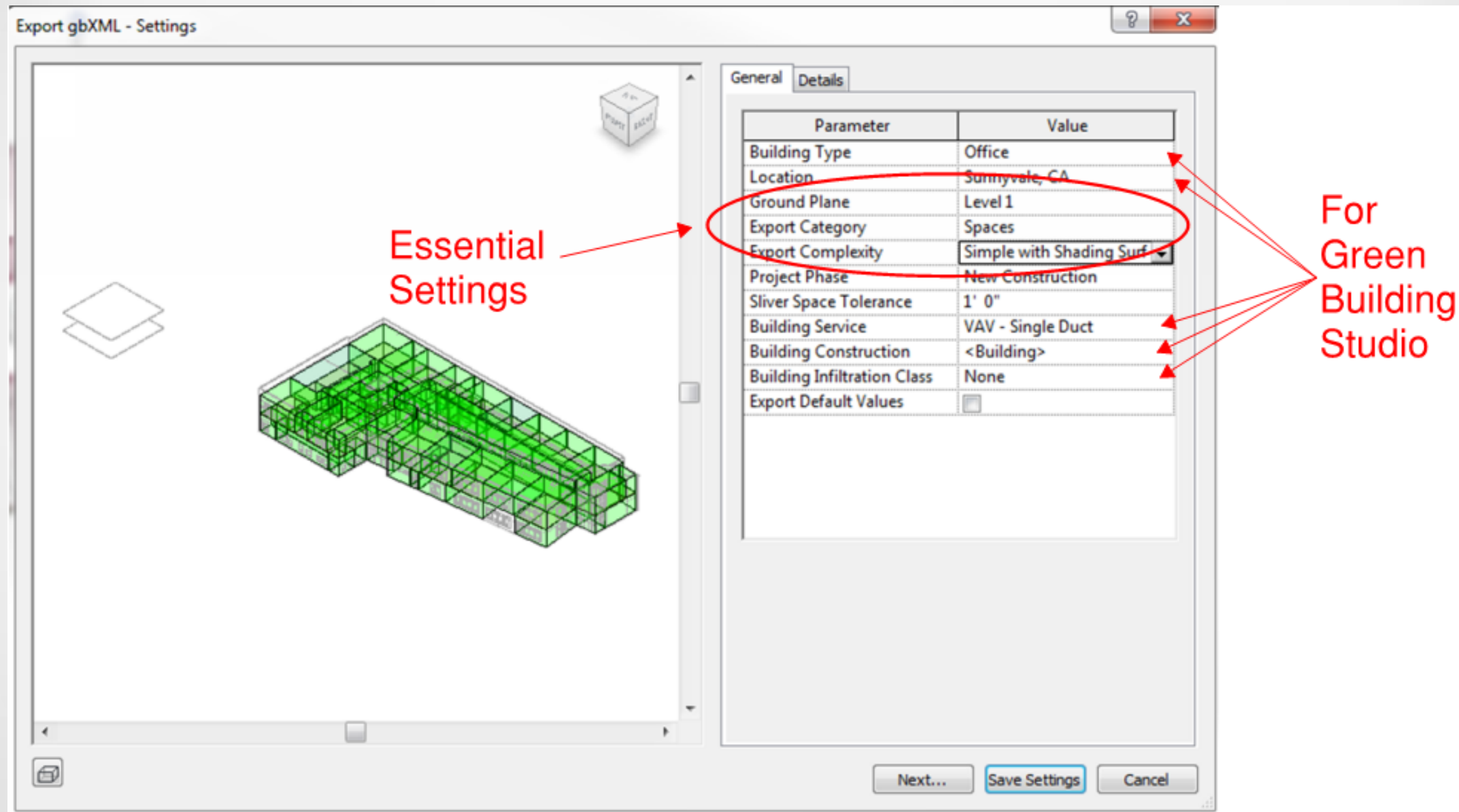
Energy - SPACE Load Schedule		
Name	Specified Lighting Load per area	Specified Power Load per area
1st Floor Atrium	0.65 W/ft ²	0.10 W/ft ²
2nd Floor Atrium	0.65 W/ft ²	0.01 W/ft ²
ADMIN	0.65 W/ft ²	0.80 W/ft ²
ASSESS CENTER	0.65 W/ft ²	0.80 W/ft ²
BOOKSTORE	0.65 W/ft ²	0.50 W/ft ²
BREAK	0.65 W/ft ²	1.00 W/ft ²
CAFE	0.65 W/ft ²	5.00 W/ft ²
CAMP. SUPE	0.65 W/ft ²	0.20 W/ft ²
CLASSROOM	0.65 W/ft ²	0.80 W/ft ²
CLASSROOM	0.65 W/ft ²	0.80 W/ft ²
CLASSROOM	0.65 W/ft ²	0.80 W/ft ²

Step 10 – QCing the Analytical Model

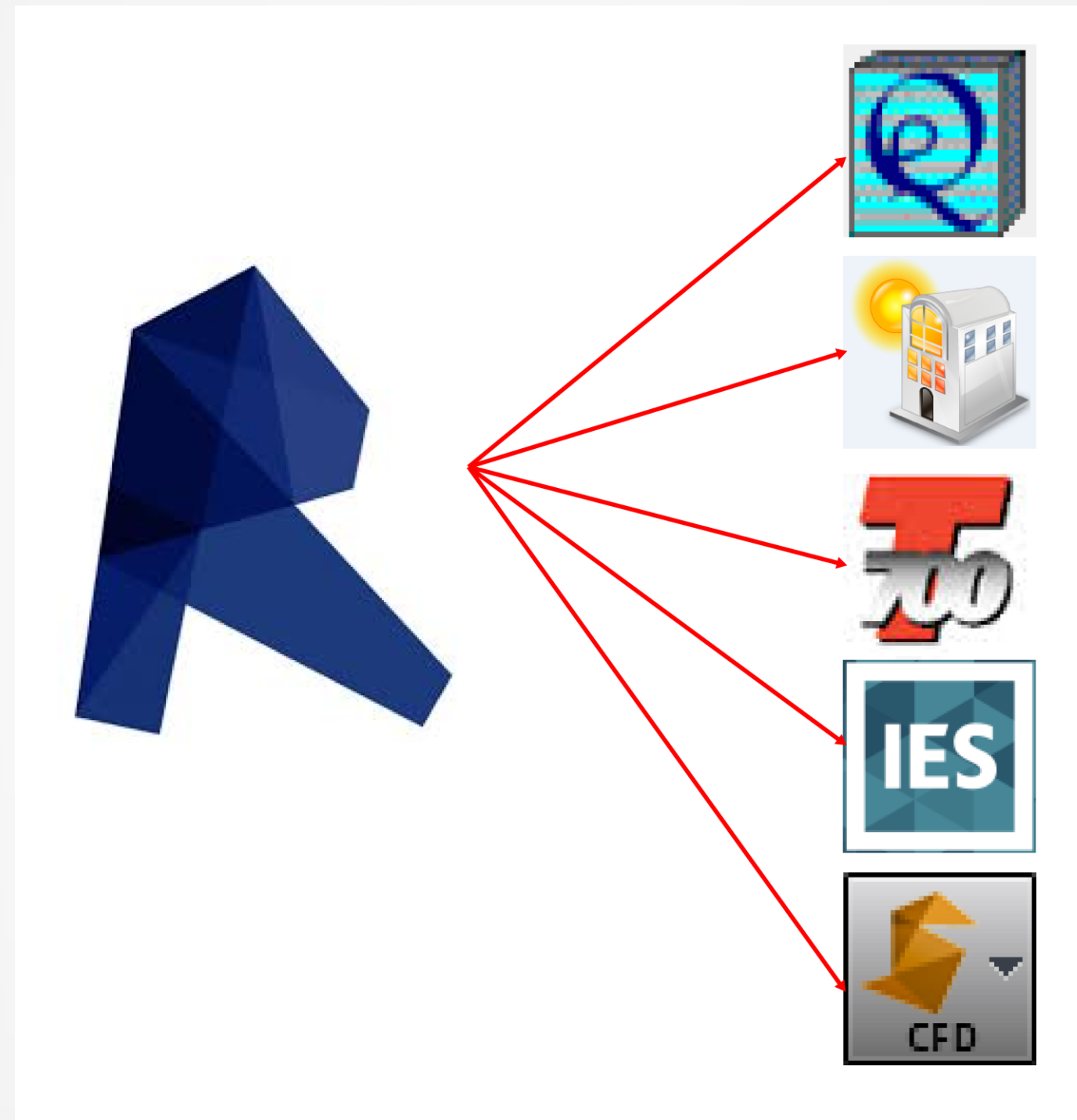
Energy - SPACE SCHEDULE							
Name	Number	Zone	Level	Area	Volume	Space Height	Occupia
BOOKSTORE	105	Default	Level 1	775 SF	11236.36 CF	14' - 6"	✓
WOMEN	114	1-WOMEN 114	Level 1	628 SF	9101.61 CF	14' - 6"	✓
STORE	107C	1-STORE 107C	Level 1	150 SF	2172.48 CF	14' - 6"	✓
STORAGE	113	1-STORAGE 113	Level 1	188 SF	2719.01 CF	14' - 6"	✓



Step 11 – Export gbXML

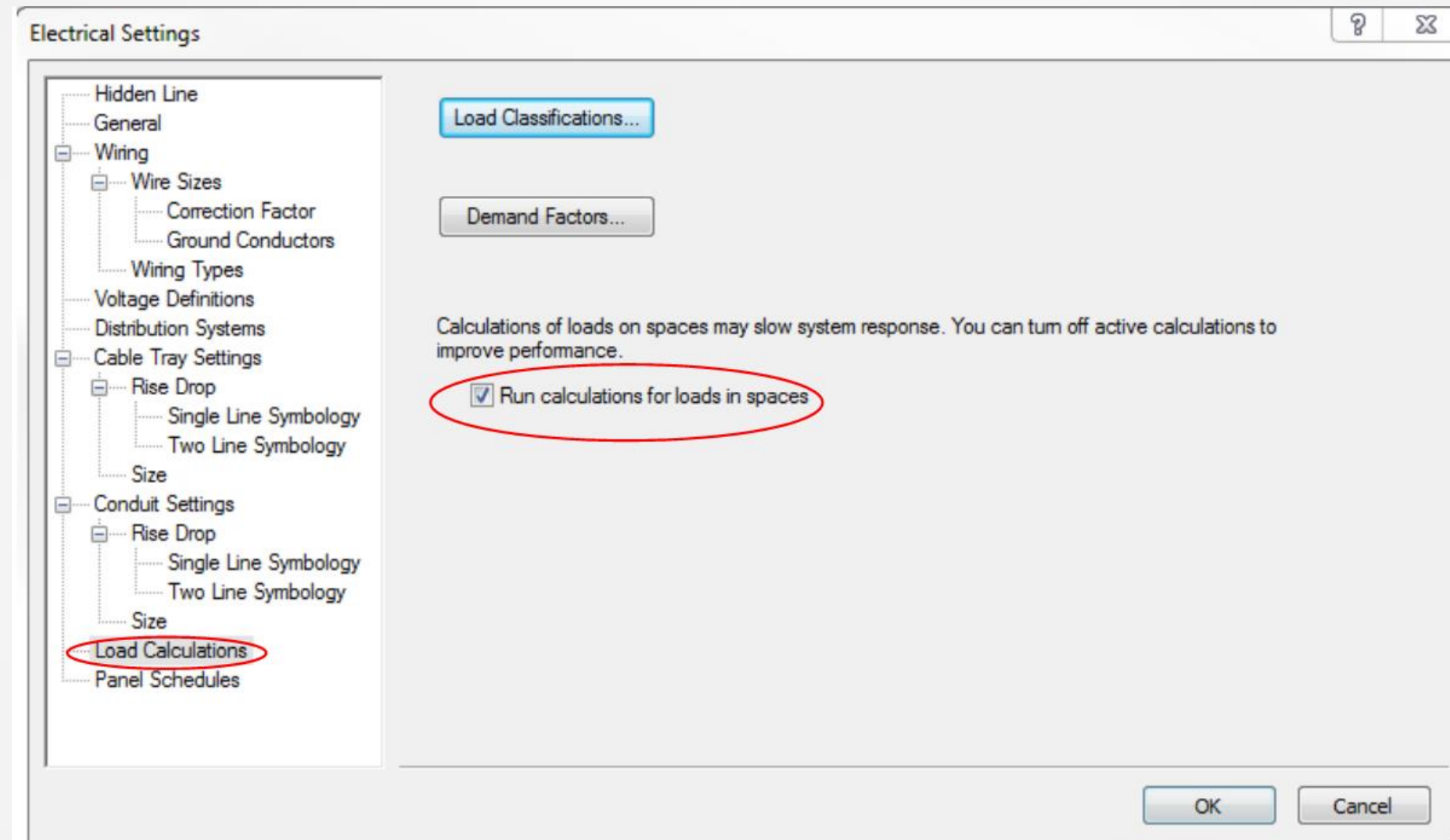


You're Done!



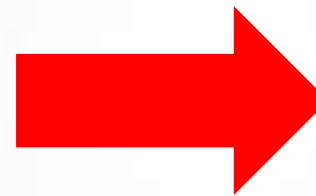
Importing a Revit Lighting Design into Analytical Model

Electrical Settings



Space Settings

Energy Analysis	
Zone	Default
Plenum	<input type="checkbox"/>
Occupiable	<input checked="" type="checkbox"/>
Condition Type	Heated and cooled
Space Type	<Building>
Construction Type	<Building>
People	Edit...
Electrical Loads	Edit...
Calculated Heating Load	Not Computed
Design Heating Load	0.00 Btu/h
Calculated Cooling Load	Not Computed
Design Cooling Load	0.00 Btu/h



Electrical Loads

Lighting

Values: **Actual**

☐ Load: 342.00 W

☐ Load Density: 0.37 W/ft²

Contribution to plenum (if exists):

20.00%

Power

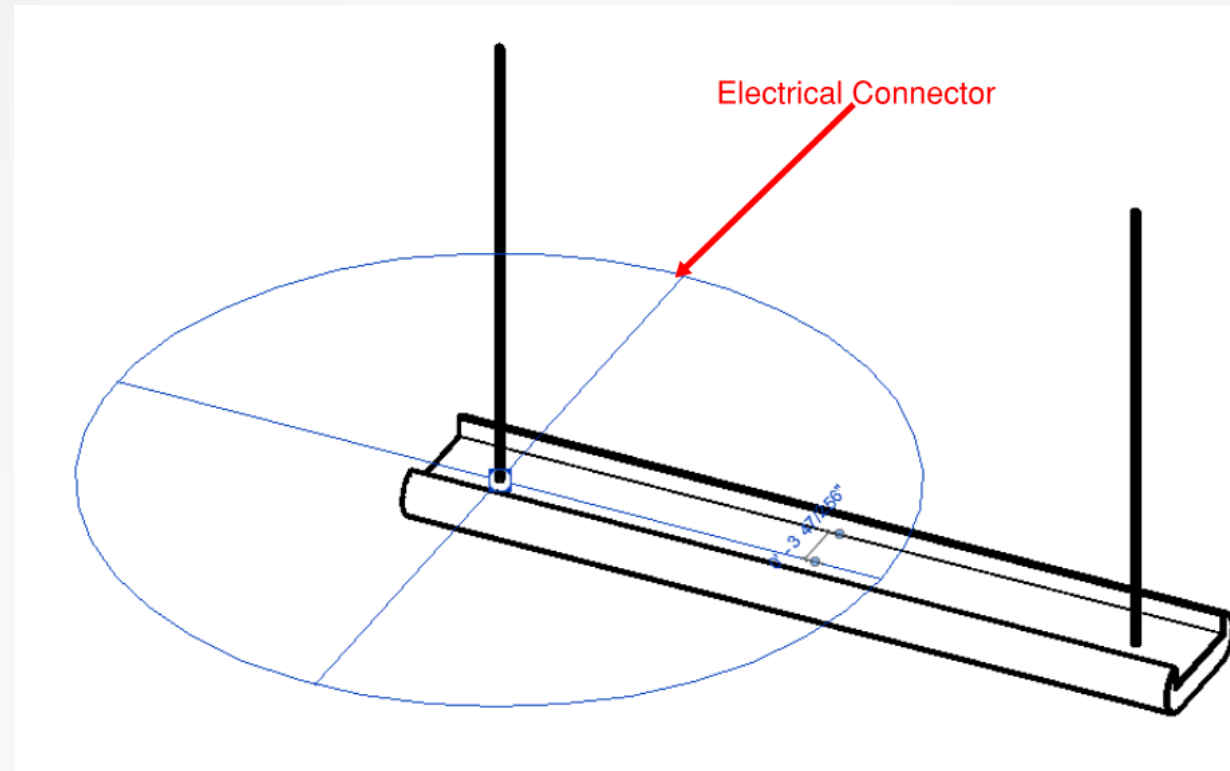
Values: **Specified**

☐ Load: 746.22 W

☒ Load Density: 0.80 W/ft²

OK Cancel Help

Electrical Connector and Load Classification



Properties

Connector Element (1) Edit Type

Electrical - Loads	
System Type	Power - Balanced
Number of Poles	1
Power Factor State	Lagging
Load Classification	Lighting
Load Sub-Classification...	
Voltage	120.00 V
Apparent Load	57.00 VA
Power Factor	1.000000
Identity Data	
Utility	
Connector Description	

Load Classifications

Load classification types

Lighting

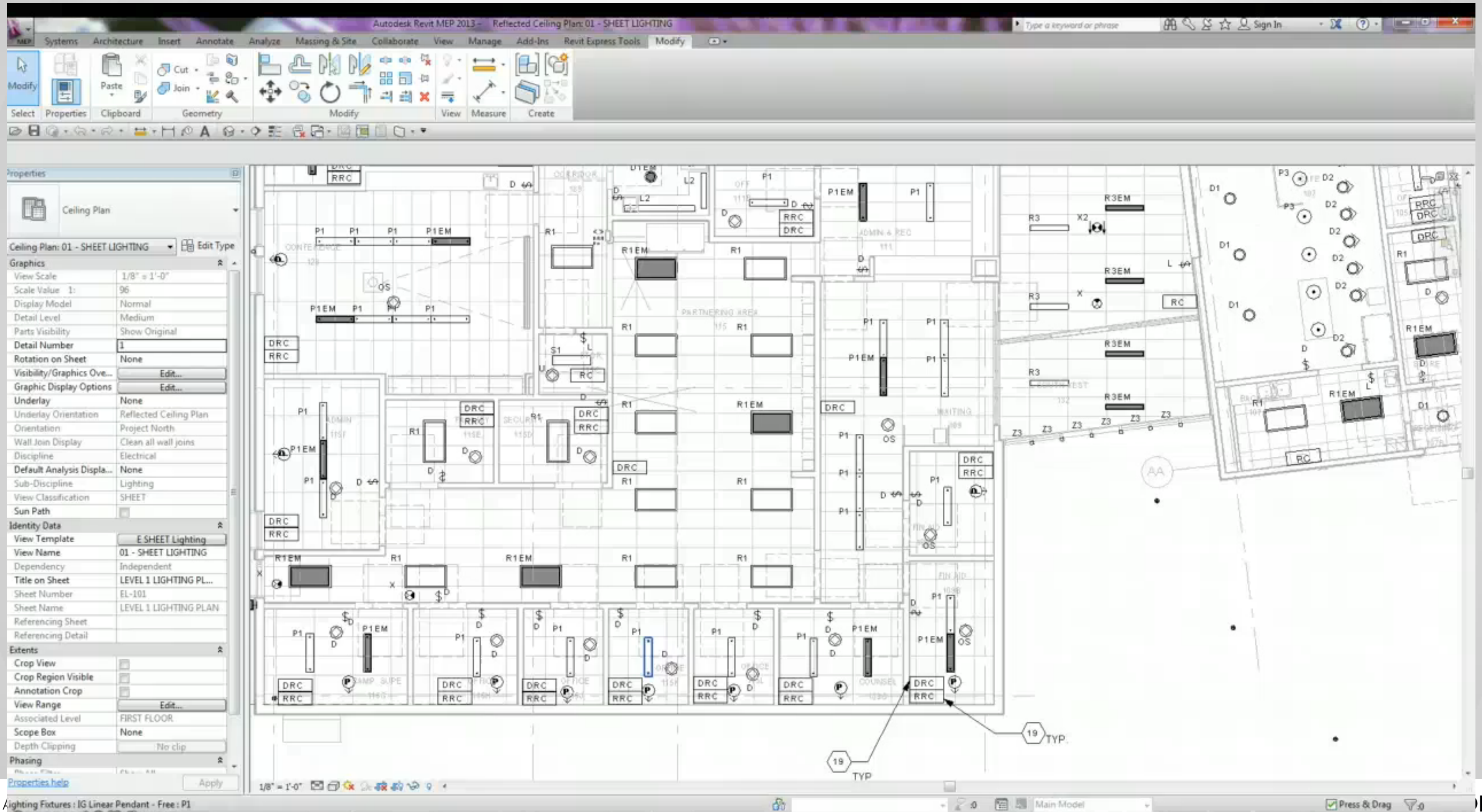
Name: Lighting

Demand factor: Lighting

Select the load class for use with spaces: Lighting

OK Cancel

Copy and Paste Fixtures (video)



General Rules and Tips

- Fixtures Must Touch Space
- Fixtures only Visible in Electrical Discipline
- Actual lighting power exports through gbXML
 - But not to IES-VE ☹

Space Properties

Currently Active Space: Zone Type: Conditioned

Basic Specs | Equipment | Infiltration | Daylighting | Contents | Lighting

Lighting Data Input Method:

	Power Density (W/ft ²)	Power (kW)	Lighting Type	Schedule	Light to Space (ratio)	Light to Adj Spc (ratio)	Light to Return (ratio)	Rad F Thi Spa
1	1.199		Sus Fluor	LightSched-45	1.00		0.00	
2	n/a	n/a	Sus Fluor	- undefined -	n/a	n/a	n/a	
3	n/a	n/a	Sus Fluor	n/a	n/a	n/a	n/a	
4	n/a	n/a	Sus Fluor	n/a	n/a	n/a	n/a	
5	n/a	n/a	Sus Fluor	n/a	n/a	n/a	n/a	

Task Lighting

Schedule:

Power Density: W/ft²

Power: kW

Workplane Height: ft

Power Summary

	W/ft ²	kW
Overhead Lighting:	1.199	0.75
Task Lighting:	0.000	0.00
Misc. Equipment:	1.040	0.65

QCing the Lighting Design with Schedules

Lighting Fixture Count Schedule	
Type Mark	Count
A1	36
B1EM	6
B2	21
B2EM	6
D1	10
D1EM	14
D2	8
L2	2
L3EM	22
P1	85
P1EM	27
P3	5
R1	113
R1EM	54
R2	7
R3	41
R3EM	27
S1	23
S1EM	8
W1	4
Z3	14
Z5	1
Z6	3

Lighting Fixture Schedule		
Type	Apparent Load	Space Name
1		
Z6 ext sconce	26.00 W	
Z6 ext sconce	26.00 W	
Z6 ext sconce	26.00 W	
3		
22		
B1EM	37.00 W	1st Floor Atrium
B1EM	37.00 W	1st Floor Atrium
2		
R3	18.00 W	1st Floor Atrium
R3	18.00 W	1st Floor Atrium
R3	18.00 W	1st Floor Atrium
R3	18.00 W	1st Floor Atrium
R3	18.00 W	1st Floor Atrium
R3	18.00 W	1st Floor Atrium
R3	18.00 W	1st Floor Atrium
R3	18.00 W	1st Floor Atrium
R3	18.00 W	1st Floor Atrium
R3	18.00 W	1st Floor Atrium
R3	18.00 W	1st Floor Atrium

QCing the Lighting Design with Color Schemes

Properties

Floor Plan

Floor Plan: Level 1 - LPD QC

Graphics

View Scale: 1/8" = 1'-0"

Scale Value: 1: 96

Display Model: Normal

Detail Level: Medium

Parts Visibility: Show Original

Visibility/Graphics O...: Edit...

Graphic Display Opti...: Edit...

Underlay: None

Underlay Orientation: Plan

Orientation: Project North

Wall Join Display: Clean all wall joins

Discipline: Electrical

Color Scheme Location: Background

Color Scheme: LPD QC

System Color Schemes: Edit...

Default Analysis Disp...: None

Sub-Discipline: Lighting

Sun Path: ☐

Identity Data

View Template: <None>

View Name: Level 1 - LPD QC

Dependency: Independent

Title on Sheet

Referencing Sheet

Referencing Detail

Extents

Crop View: ☐

Crop Region Visible: ☐

Annotation Crop: ☐

View Range: Edit...

Associated Level: Level 1

Apply

Edit Color Scheme

Schemes

Category: Spaces

(none)

Zone Names

Occupancy Density

Supply Airflow

LPD QC

Scheme Definition

Title: LPD QC

Color: ☐ By value ☒ By range

Edit Format... 1234.57 W/ft²

At Least	Less Than	Caption	Visible	Color	Fill Pattern	Preview	In Use
	0.40 W/ft²	Less than 0.	<input checked="" type="checkbox"/>	RGB 255-	Solid fill		Yes
0.40 W/ft²	0.80 W/ft²	0.40 W/ft² -	<input checked="" type="checkbox"/>	Green	Solid fill		Yes
0.80 W/ft²	1.00 W/ft²	0.80 W/ft² -	<input checked="" type="checkbox"/>	Yellow	Solid fill		Yes
1.00 W/ft²		1.00 W/ft² o	<input checked="" type="checkbox"/>	Red	Solid fill		Yes

Options

☐ Include elements from linked files

OK Cancel Apply Help

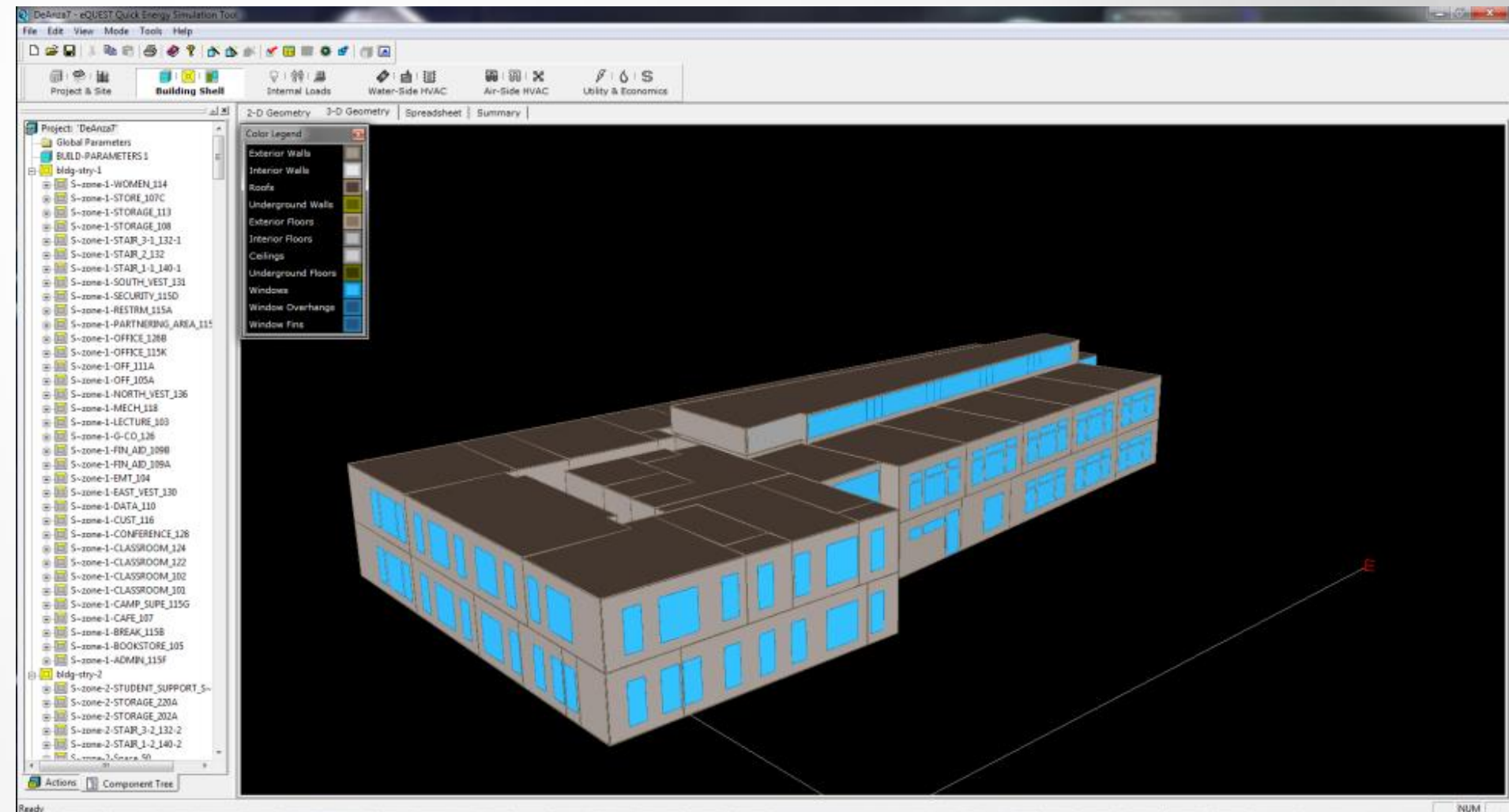
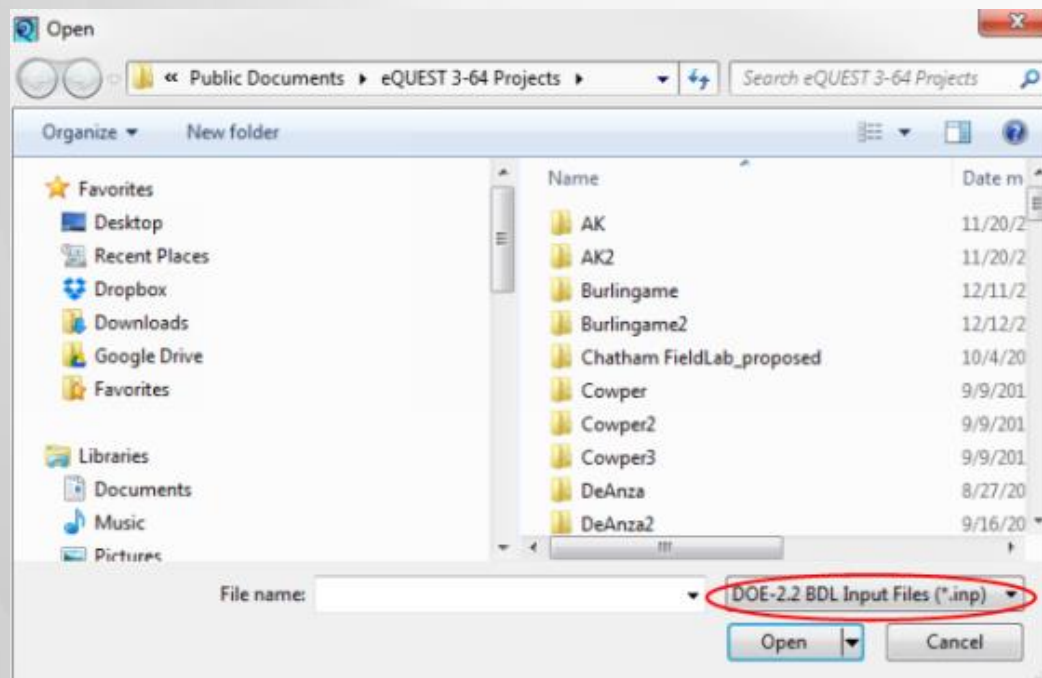
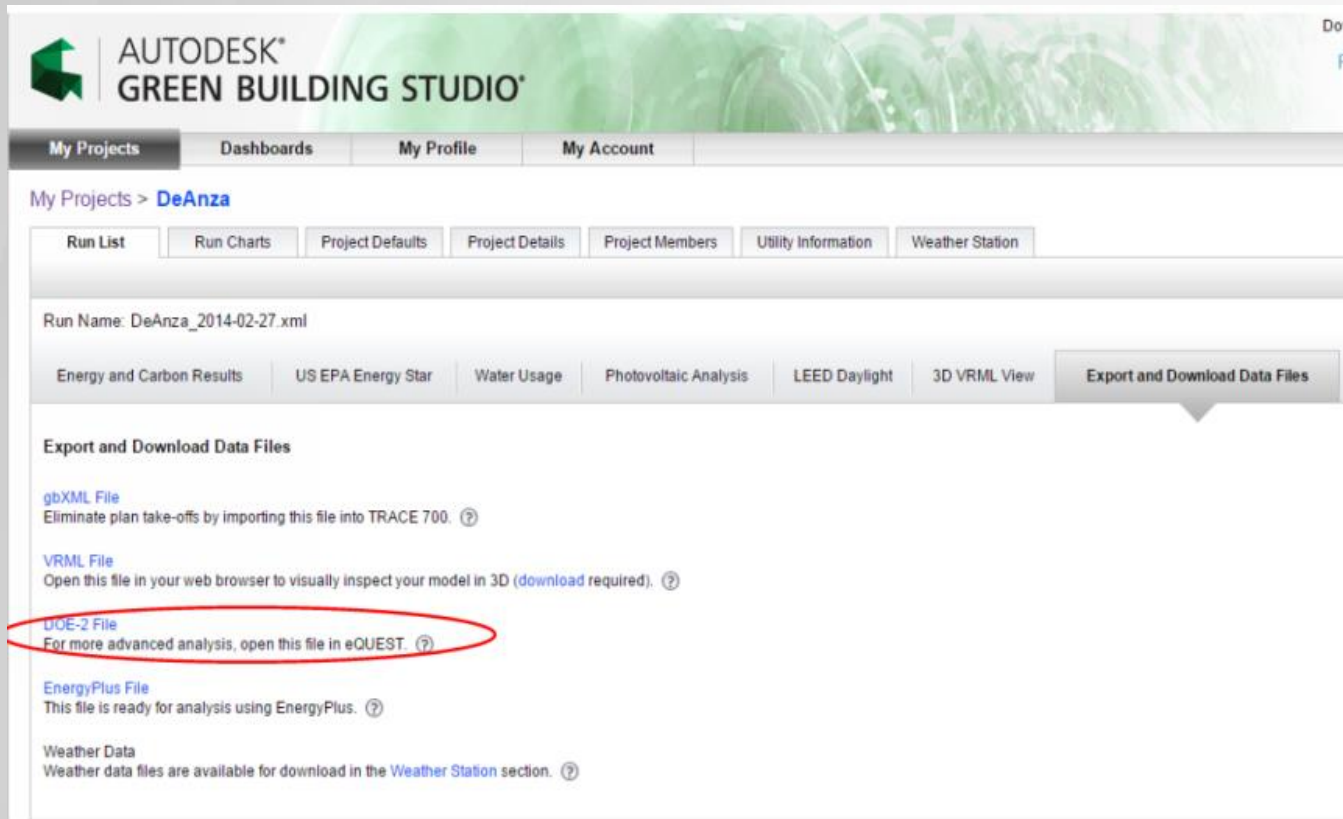
QCing the Lighting Design with Color Schemes



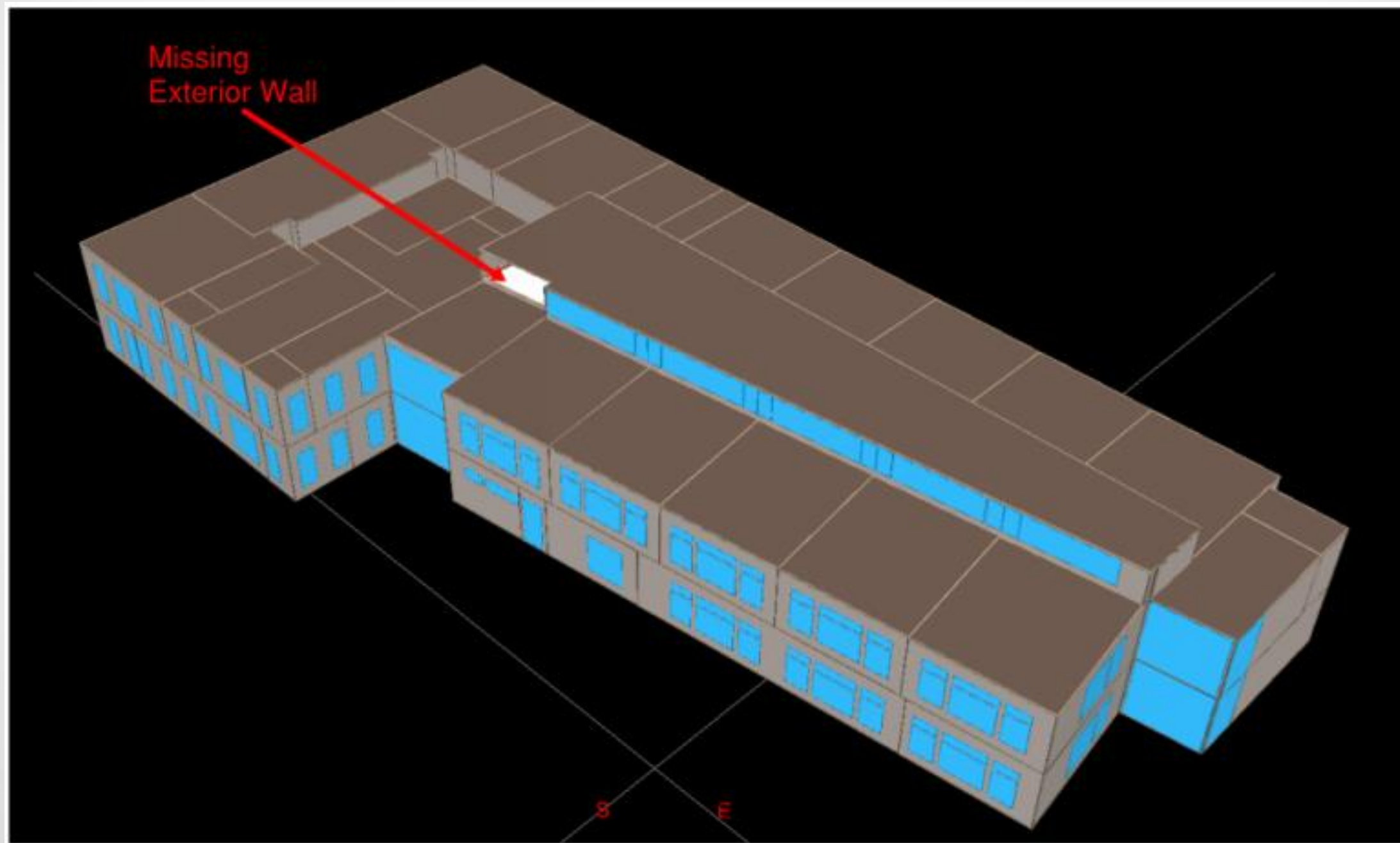
Importing the Analytical Model into Simulation Software

Importing to eQUEST via Green Building Studio

<https://gbs.autodesk.com/>



Importing to eQUEST via Green Building Studio



Importing to eQUEST via Green Building Studio

Space Properties

Currently Active Space: **S~zone-1-WOMEN_114** Zone Type: Conditioned

Basic Specs | Equipment | Infiltration | Daylighting | Contents | **Lighting**

Lighting Data Input Method: **Power Definition**

	Power Density (W/ft2)	Power (kW)	Lighting Type	Schedule	Light to Space (ratio)	Light to Adj Spc (ratio)	Light to Return (ratio)	Rad F Thi Spa
1	1.199		Sus Fluor	LightSched-45	1.00		0.00	
2	n/a	n/a	Sus Fluor	- undefined -	n/a	n/a	n/a	
3	n/a	n/a	Sus Fluor	n/a	n/a	n/a	n/a	
4	n/a	n/a	Sus Fluor	n/a	n/a	n/a	n/a	
5	n/a	n/a	Sus Fluor	n/a	n/a	n/a	n/a	

Task Lighting

Schedule: - undefined -

Power Density: n/a W/ft2

Power: n/a kW

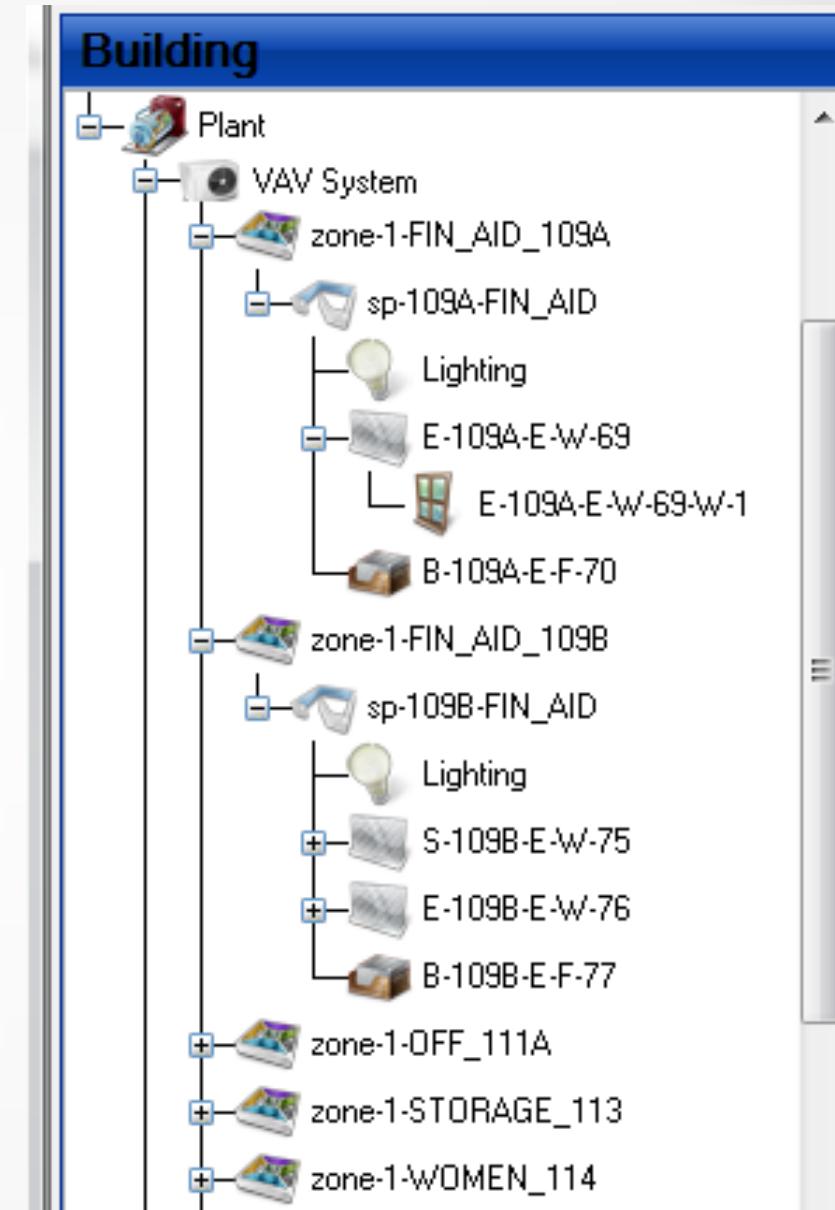
Workplane Height: n/a ft

Power Summary

	W/ft2	kW
Overhead Lighting:	1.199	0.75
Task Lighting:	0.000	0.00
Misc. Equipment:	1.040	0.65

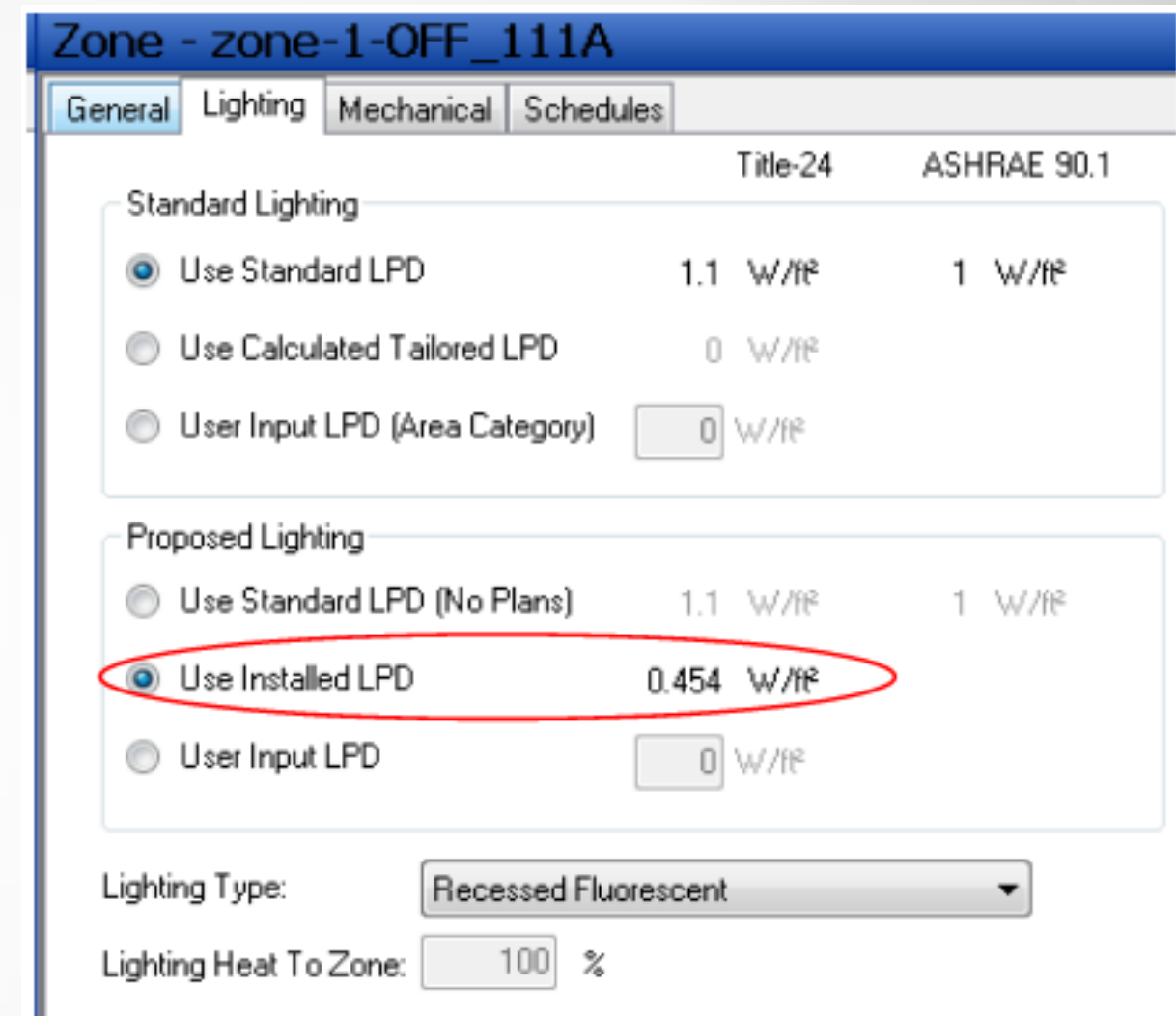
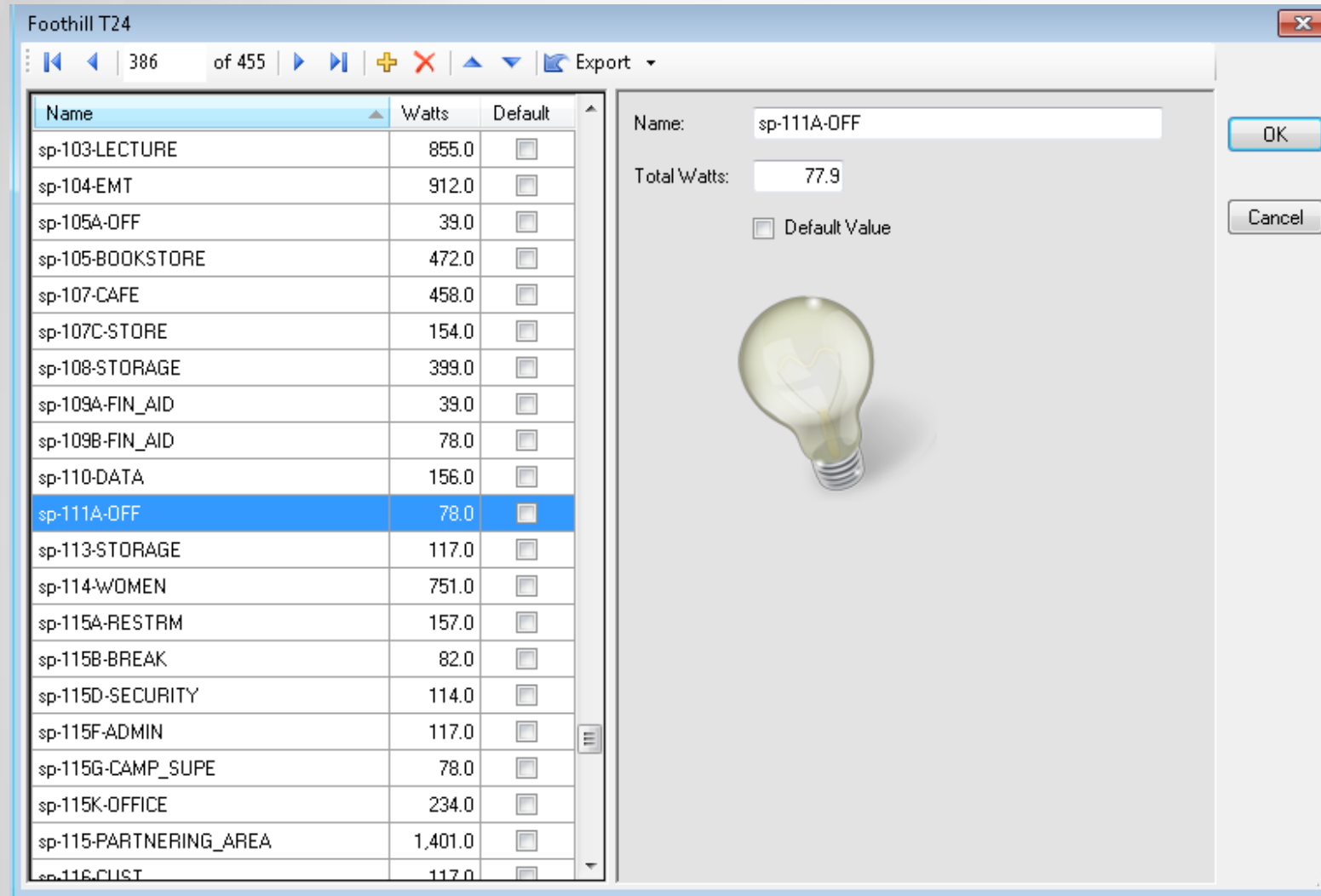
Importing to EnergyPro

- Much easier than eQUEST for compliance
- Import gbXML directly
 - Including load parameters and actual lighting wattage
- Use fixture count schedule for compliance documentation



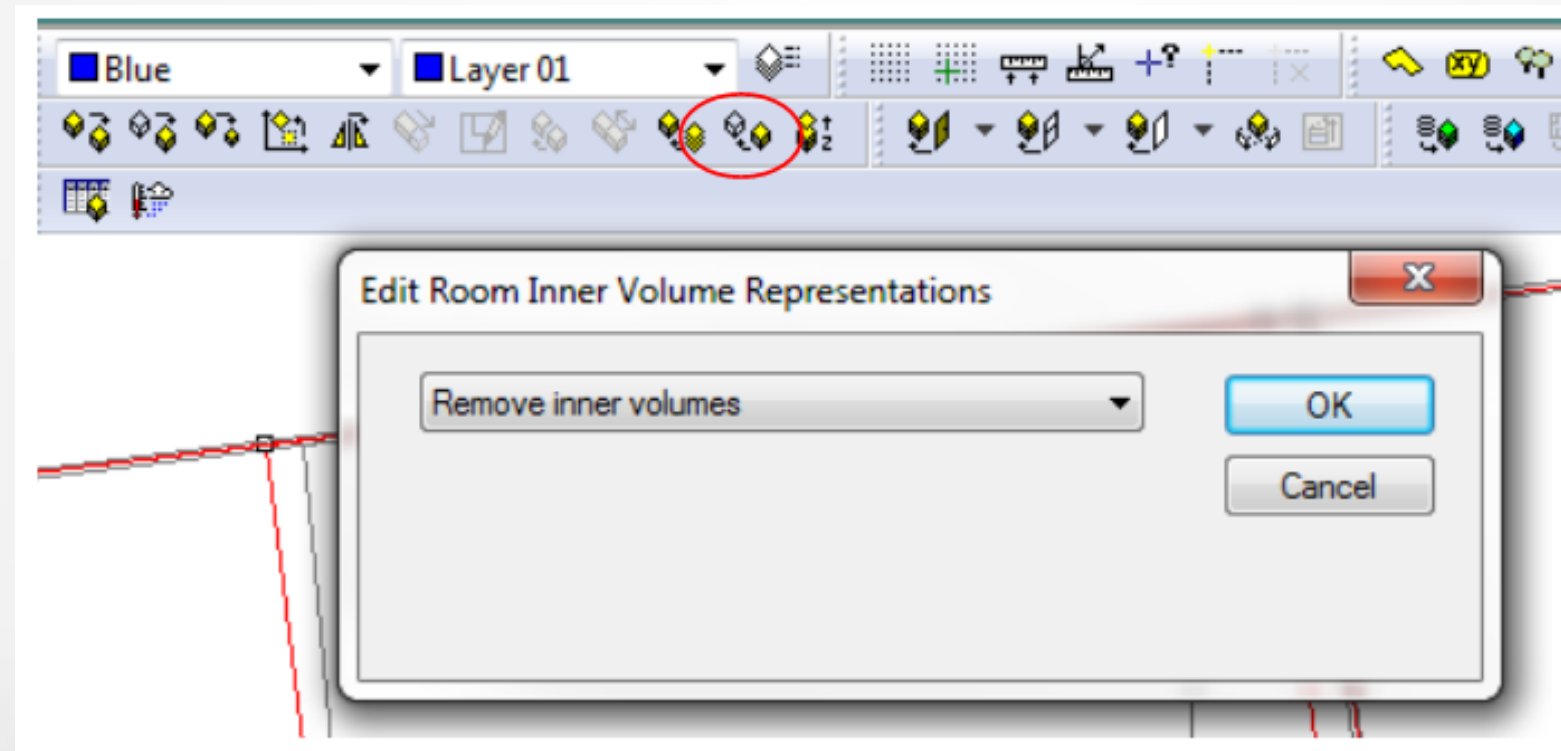
Lighting Fixture Count Schedule	
Type Mark	Count
A1	36
B1EM	6
B2	21
B2EM	6
D1	10
D1EM	14
D2	8
L2	2
L3EM	22
P1	85
P1EM	27
P3	5
R1	113
R1EM	54
R2	7
R3	41
R3EM	27
S1	23
S1EM	8
W1	4
Z3	14
Z5	1
Z6	3

Importing to EnergyPro

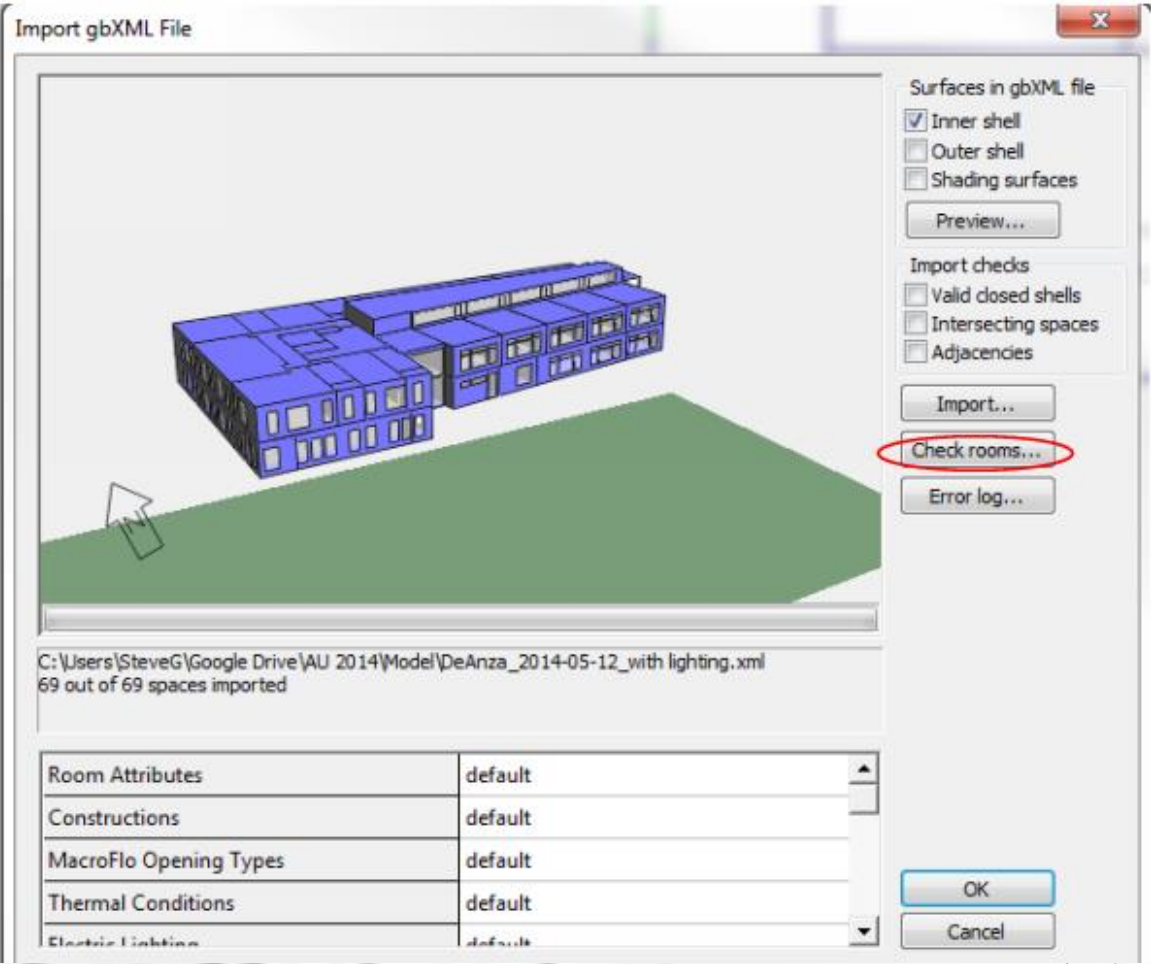


Importing to IES-VE

- Import gbXML directly
- Remember to remove inner volumes
- Load parameters don't import



IES-VE – Geometry Validation



bimimport Report

File Edit

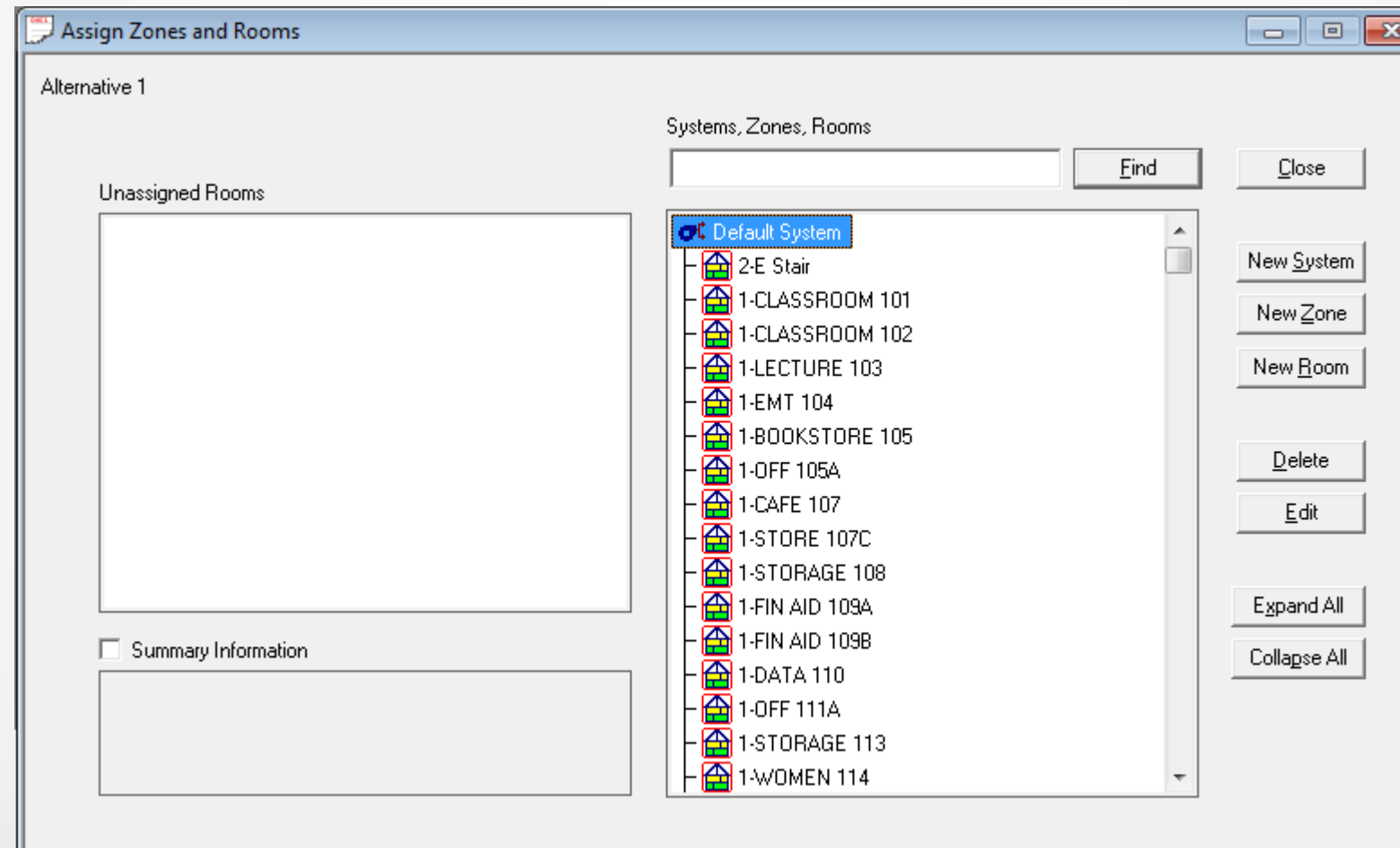
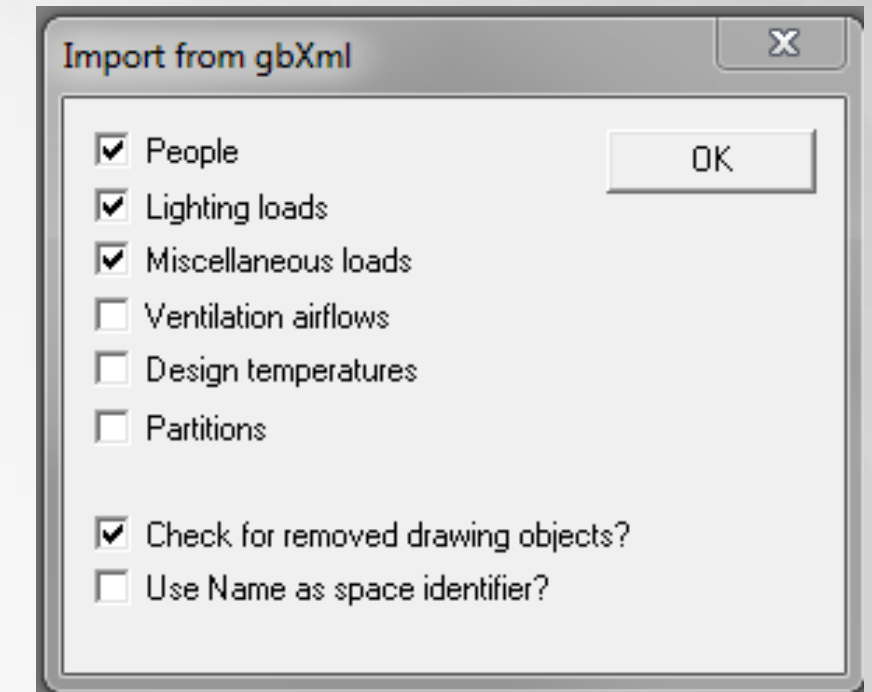
BIM Source package:
Adjacency Separation Distance (m): 0.100

Room (space)			Raw (space boundaries in file)						Processed (space boundaries after tidy)						Other issues			
BIM ID	Imported ID	Name	Bounded	Unmatched edges [1]	Missing area (m ²) [2]	Missing area ratio	Floor area (m ²) [3]	Volume (m ³)	Bounded	Unmatched edges [1]	Missing area (m ²) [2]	Missing area ratio	Floor area (m ²) [3]	Volume (m ³)	Corrections made	Intersections OK	Adjacencies OK	Adjacency issues
00802682	00802682	sp-50-E_Stair	✗	16	0.233	0.001	0.000	209.985	✗	16	0.000	0.000	43.843	210.294		•	•	
00799895	00799895	sp-101-CLASSROOM	✗	8	171.873	0.502	0.000	261.934	✓	0	0.000	0.000	83.117	392.902	1 outer ceiling surface(s) reversed	•	•	
00799110	00799110	sp-102-CLASSROOM	✗	12	178.532	0.507	0.000	272.083	✗	6	0.000	0.000	86.397	408.124	1 outer ceiling surface(s) reversed	•	•	
00799893	00799893	sp-103-LECTURE	✗	14	382.837	0.592	0.000	583.443	✗	10	0.000	0.000	187.044	875.164	4 outer ceiling surface(s) reversed	•	•	



Importing to Trane Trace

- Import gbXML directly
- Chose load parameters



Import Load Calc from Trace Back into Revit

Properties

Spaces (1) Edit Type

Actual Lighting Load 0.68800 kW

Mechanical Flow

Specified Supply Airflow 242.58

Calculated Supply Airflow 242.58

Actual Supply Airflow 0.00

Return Airflow Specified

Specified Return Airflow 0.00

Actual Return Airflow 0.00

Specified Exhaust Airflow 0.00

Actual Exhaust Airflow 0.00

Dimensions

Area 1134.88 SF

Perimeter 176' 5 71/256"

Unbounded Height 15' 0"

Volume 17023.17 CF

Computation Height 0' 0"

Identity Data

Number 211

Name STUDENT SUPPORT ...

Room Number 211

Room Name STUDENT SUPPORT SP...

Comments

Phasing

Phase New Construction

Energy Analysis

Zone 2-STUDENT SUPPORT S...

Plenum ☐

Occupiable ☒

Condition Type Heated and cooled

Space Type <Building>

Construction Type <Building>

People Edit...

Electrical Loads Edit...

Calculated Heating Load 4727.63 Btu/h

Design Heating Load 4727.63 Btu/h

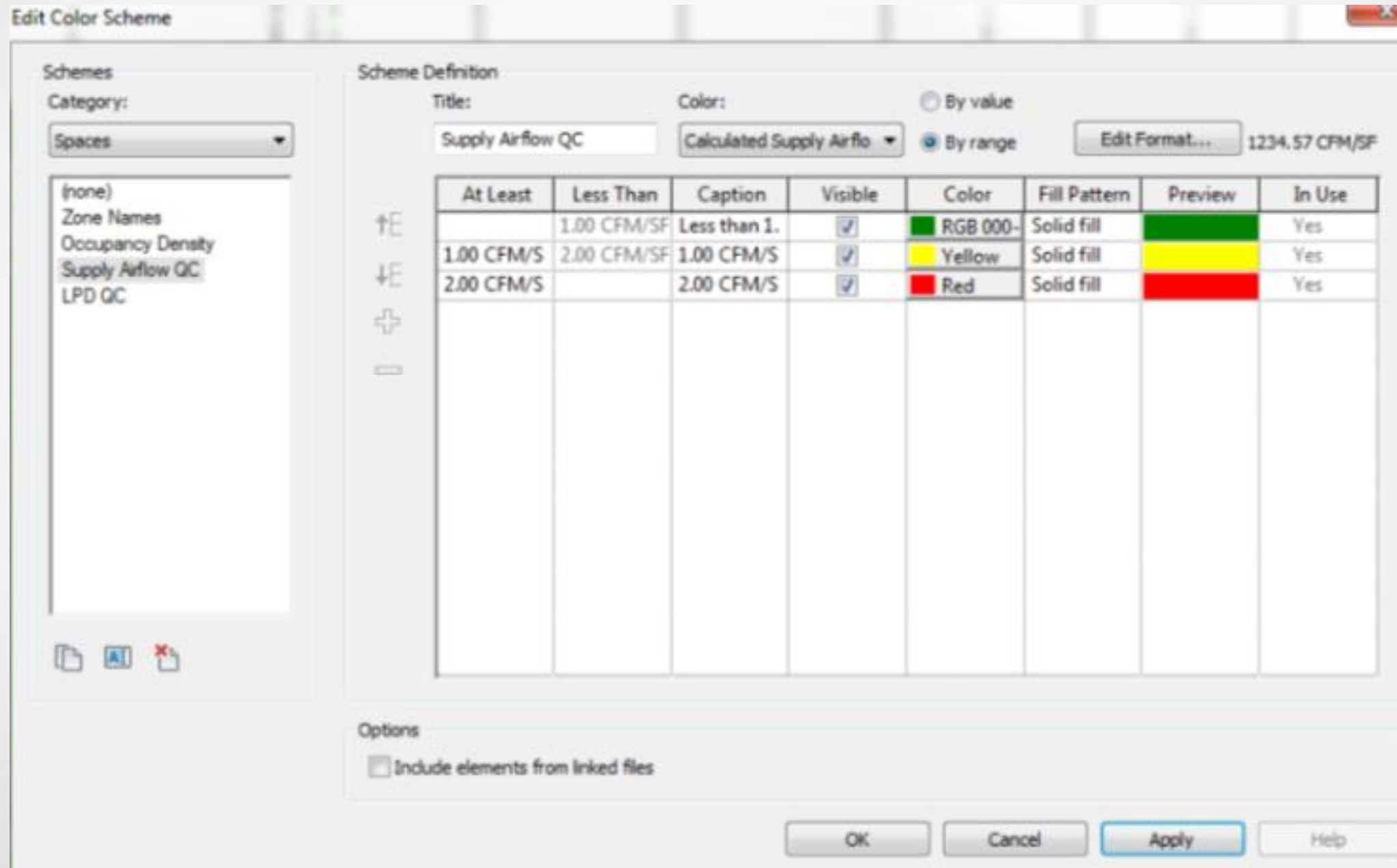
Calculated Cooling Load 5397.17 Btu/h

Design Cooling Load 5397.17 Btu/h

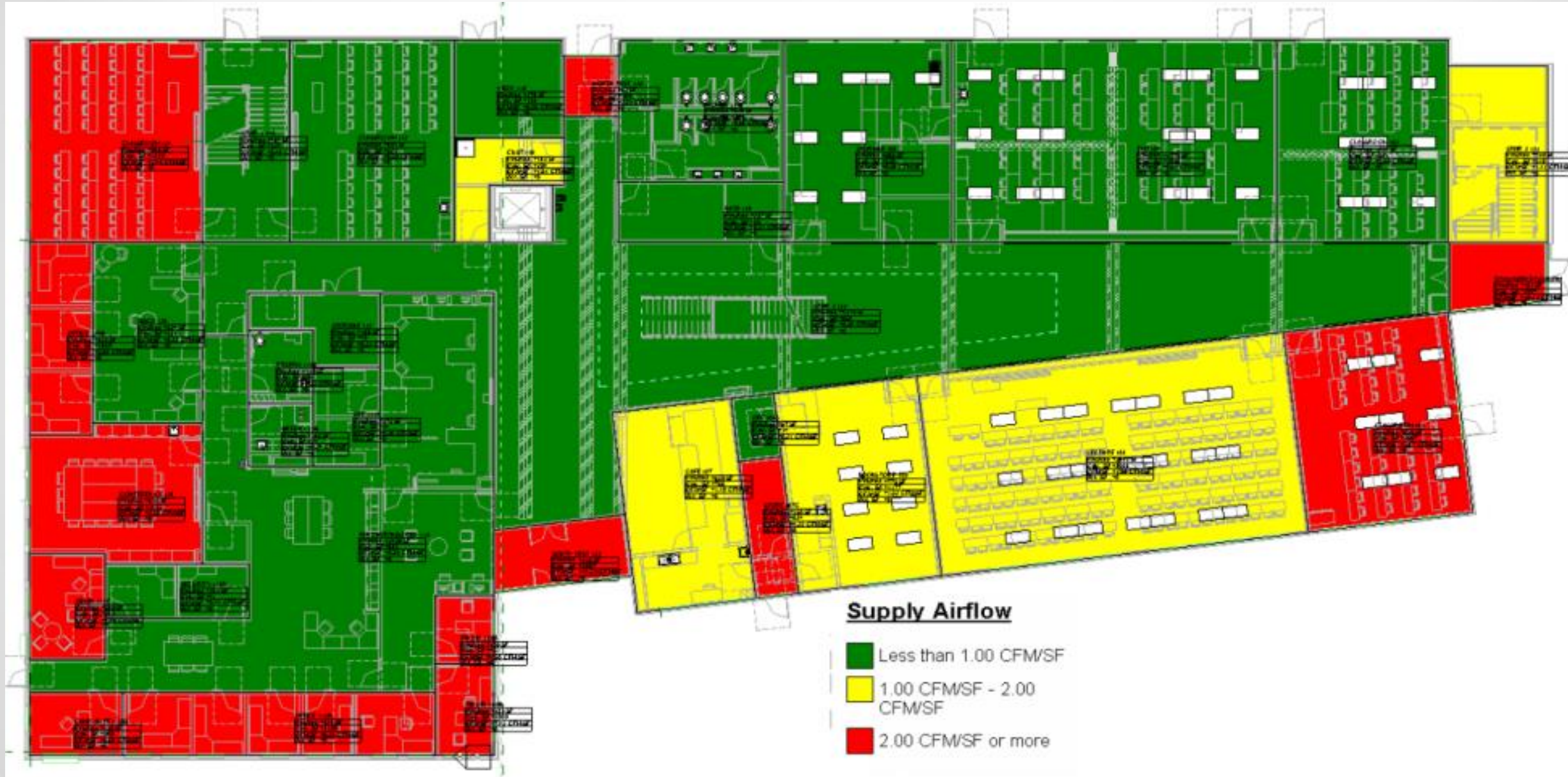
Properties help Apply

GROUP STUDY 211K
Rm.Area = 723 SF
Calc. SA = 1364
CFM/SF = 1.89 CFM/SF
Clg Load = 30337.4 Btu/h
Htg Load = 8629.6 Btu/h

QCing Load Calc Using Color Schemes



QCing Load Calc Using Color Schemes

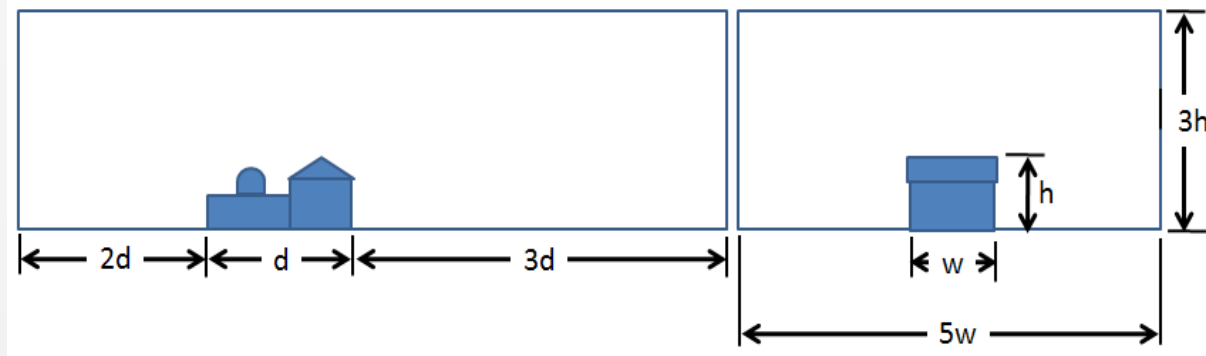
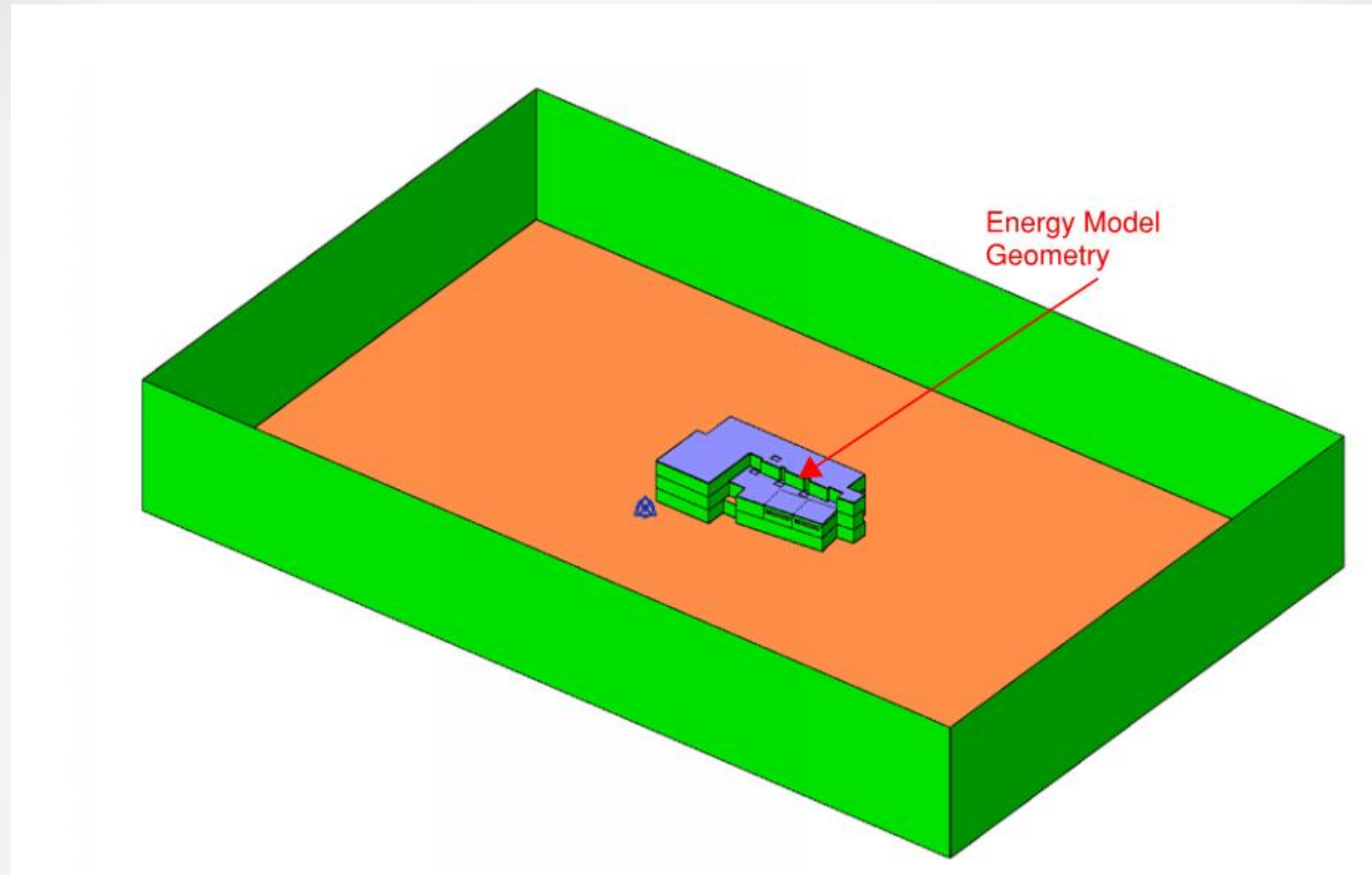


Using Revit to Create CFD Geometry and Boundary Conditions for Autodesk Simulation CFD

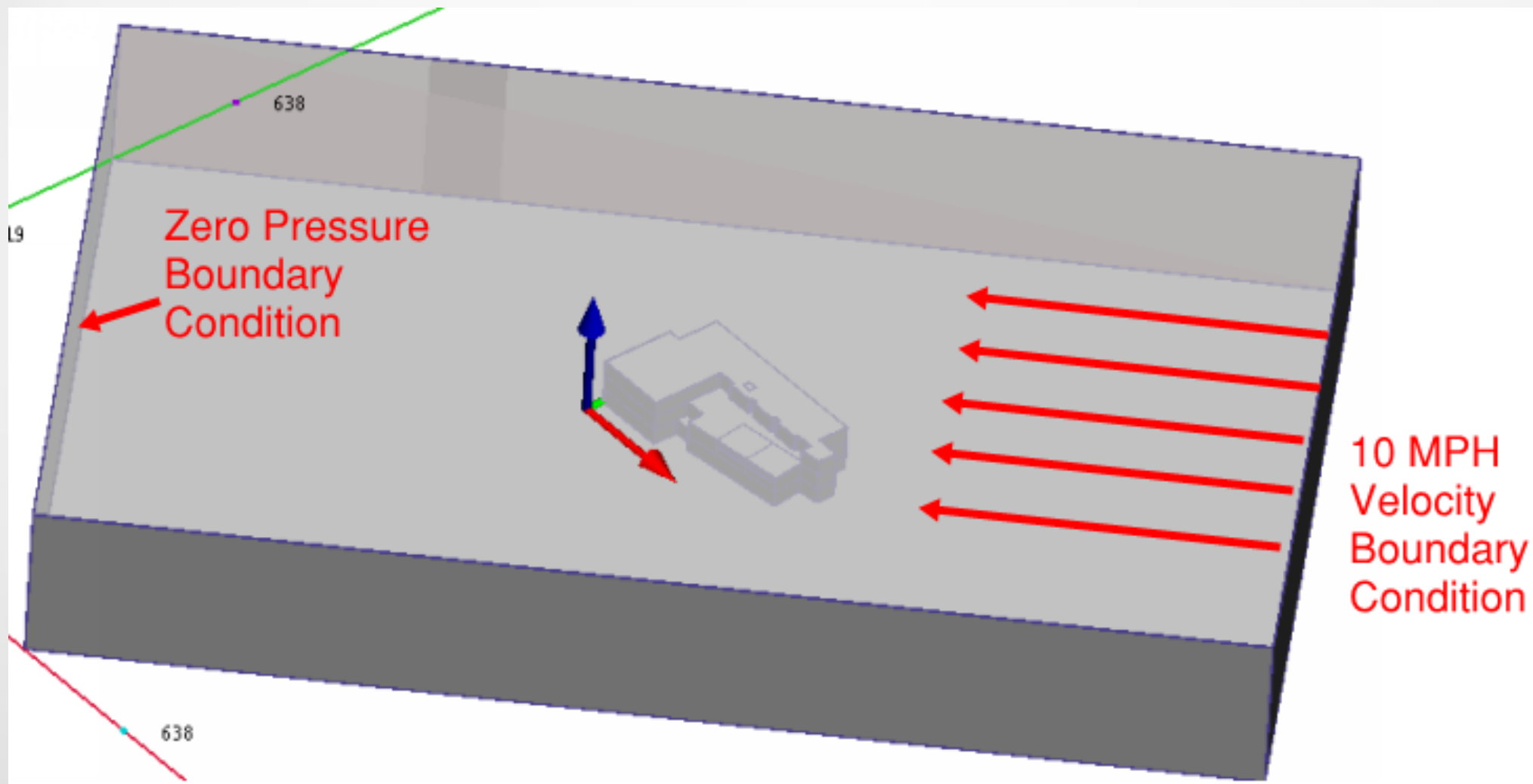
General Rules

- Export from 3D view (using Revit plugin)
 - Only visible elements will export
- Keep it simple
 - Align walls
 - Avoid gaps
- Each Revit component results in independent boundary surface
- Create exterior volumes using walls roofs, and floors

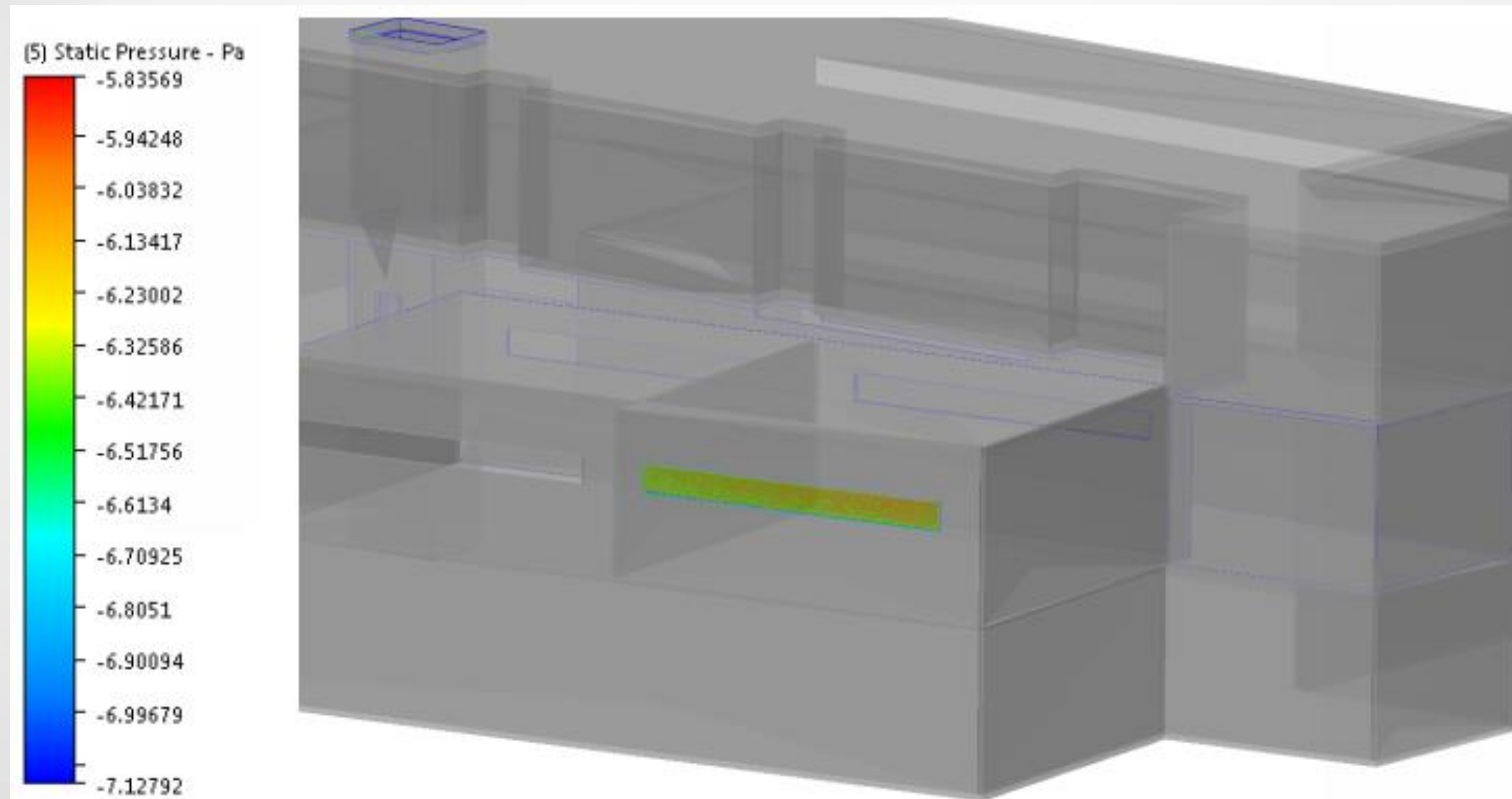
External Flow Models – Geometry in Revit



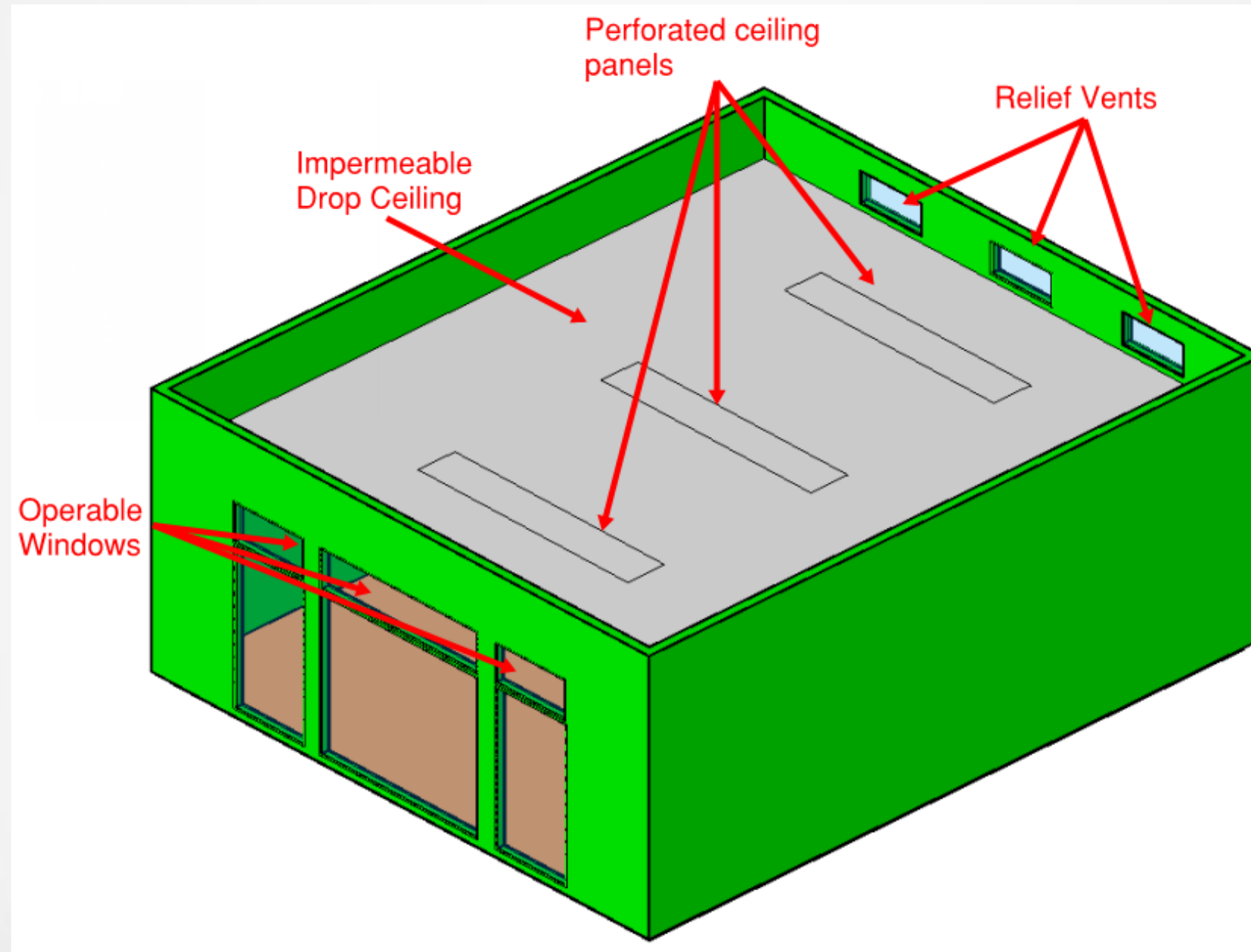
External Flow Models – Boundary Conditions in Simulation CFD



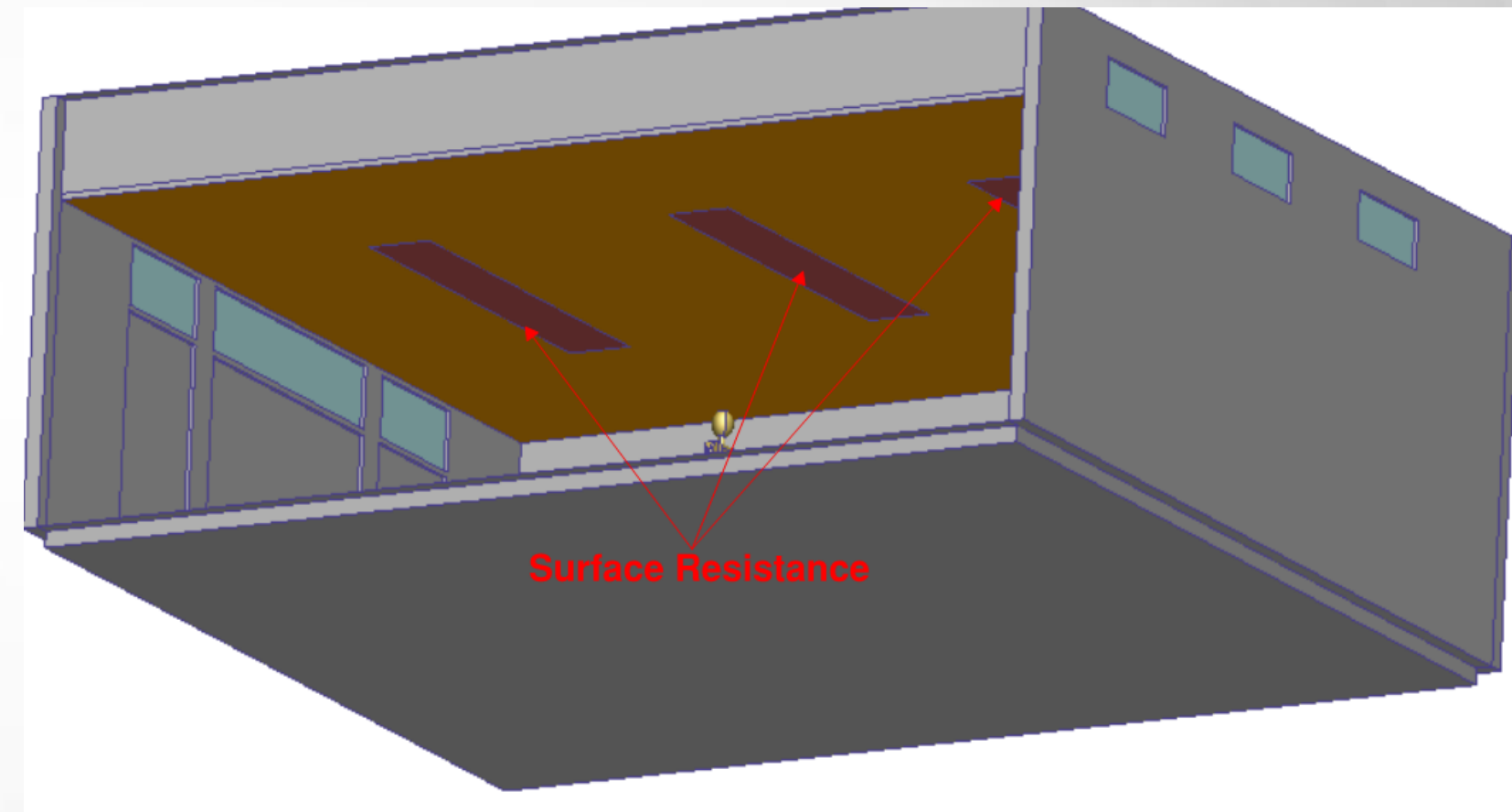
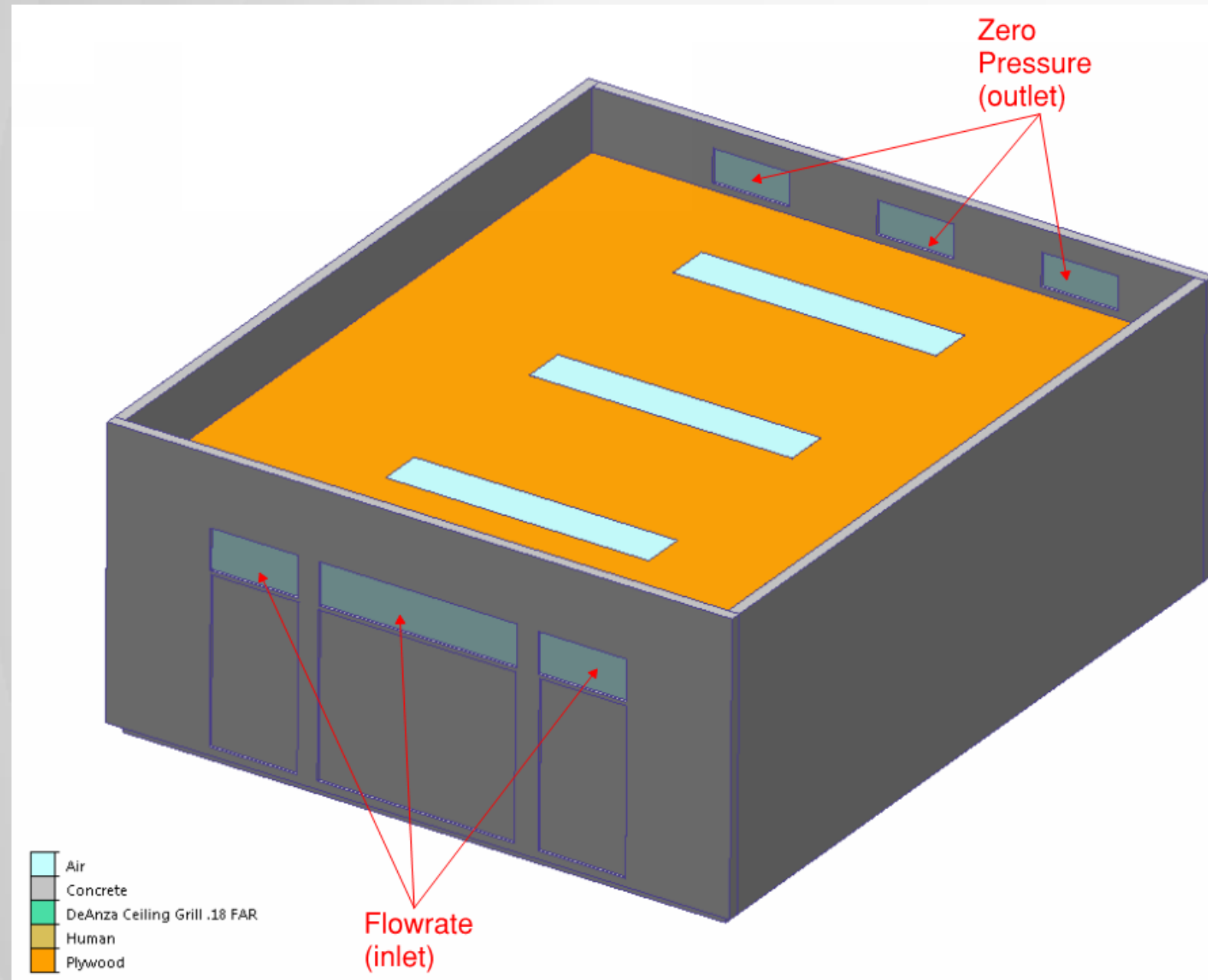
External Flow Models - Results



Internal Flow Models – Boundary Conditions in Revit

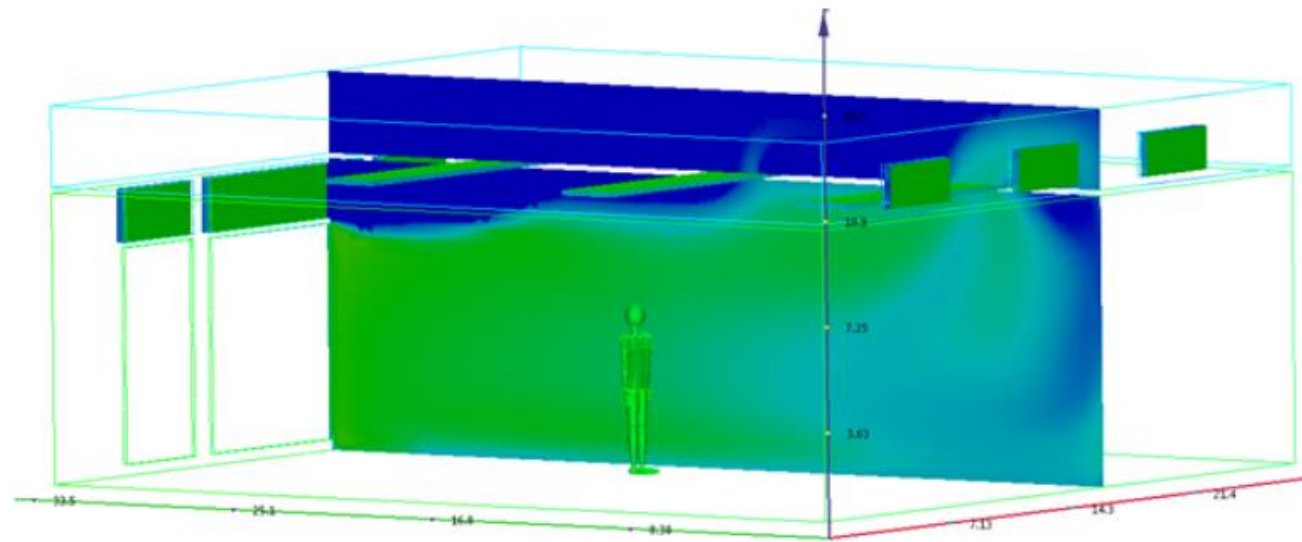
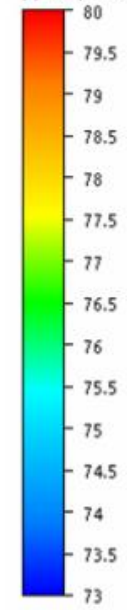


Internal Flow Models – Apply Boundary Conditions in Simulation CFD

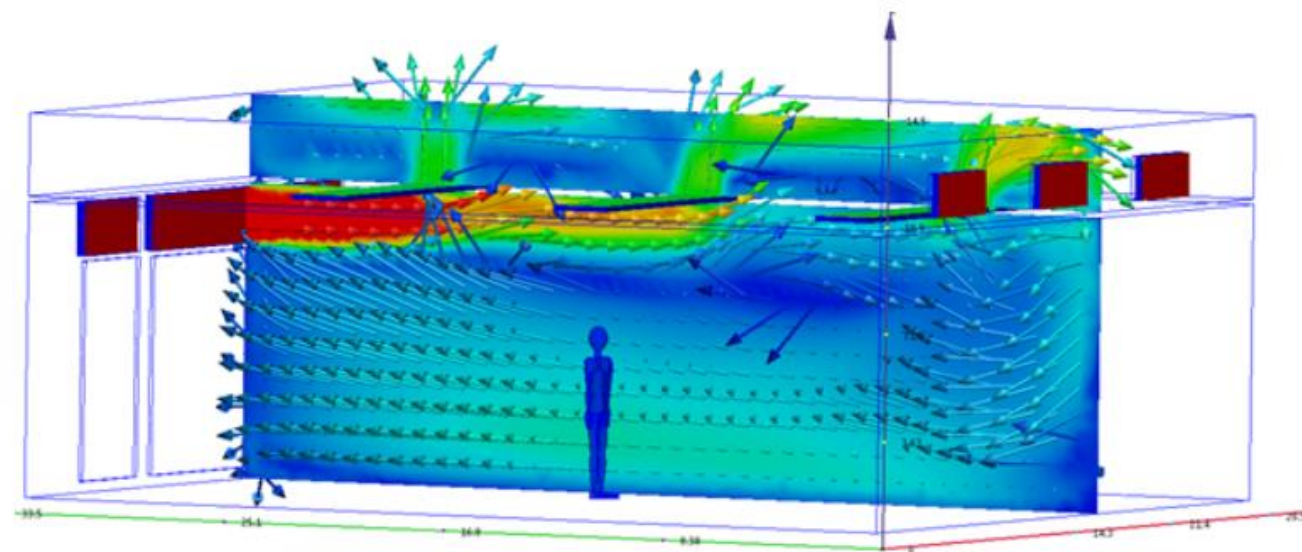
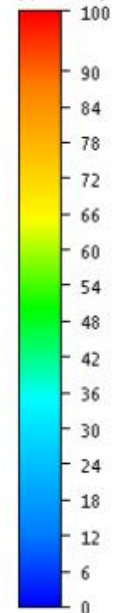


Internal Flow Models - Results

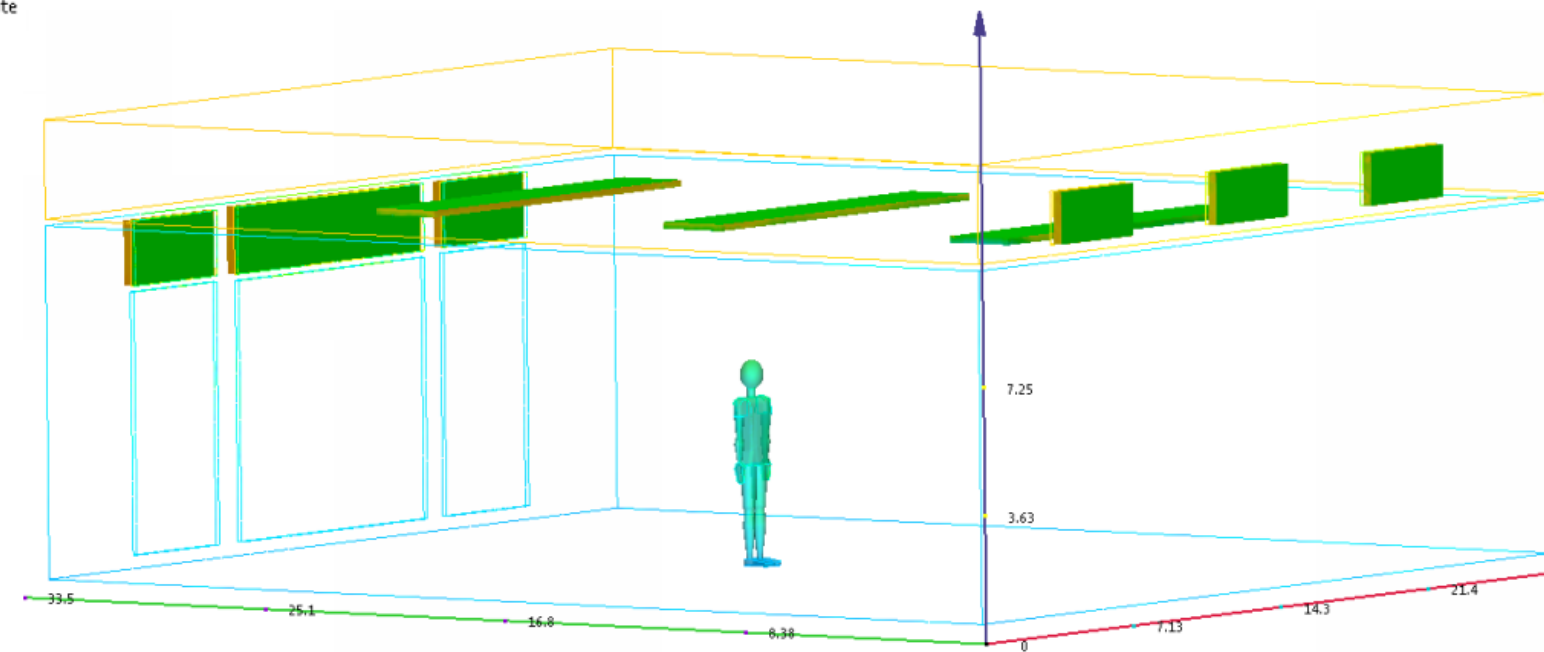
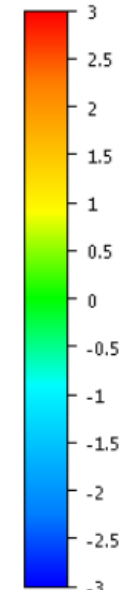
(6) Temperature - Fahrenheit



(1) Velocity Magnitude - ft/min



(12) Predicted Mean Vote



Thank You!!

Questions?

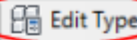


Attic

Envelope Families

Properties

Basic Wall
Generic Interior - 6"

Walls (1)  Edit Type

Constraints

Location Line	Wall Centerline
Base Constraint	Level 2
Base Offset	0' 0"
Base is Attached	<input type="checkbox"/>
Base Extension Distance	0' 0"
Top Constraint	Up to level: Roof
Unconnected Height	15' 0"
Top Offset	0' 0"
Top is Attached	<input type="checkbox"/>
Top Extension Distance	0' 0"
Room Bounding	<input checked="" type="checkbox"/>
Related to Mass	<input type="checkbox"/>

Structural

Structural ☐

Enable Analytical Model ☐

Structural Usage Non-bearing

Dimensions

Length	34' 0 25/128"
Area	502.74 SF
Volume	251.37 CF

Identity Data

Comments

Mark

Phasing

Phase Created	New Construction
Phase Demolished	None

Energy Analysis

Wall Orientation

Other

Extensions.Parameters

[Properties help](#)

Type Properties

Family: System Family: Basic Wall

Type: Generic Interior - 6"

Type Parameters

Parameter	Value
Construction	
Structure	<input type="button" value="Edit..."/>
Wrapping at Inserts	Do not wrap
Wrapping at Ends	None
Width	0' 6"
Function	Interior
Graphics	
Coarse Scale Fill Pattern	
Coarse Scale Fill Color	Black
Materials and Finishes	
Structural Material	<By Category>
Identity Data	
Keynote	
Model	
Manufacturer	
Type Comments	
URL	
Description	
Assembly Description	Fixed Partitions

<< Preview

Edit Assembly

Family: Basic Wall

Type: Generic Interior - 6"

Total thickness: 0' 6" Sample Height: 20' 0"

Resistance (R): 0.0000 (h·ft²·°F)/BTU

Thermal Mass: 0.0000 BTU/°F

Layers

EXTERIOR SIDE					
	Function	Material	Thickness	Wraps	Structural Material
1	Core Boundar	Layers Above	0' 0"		
2	Structure [1]	<By Categor...	0' 6"	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Core Boundar	Layers Below	0' 0"		

INTERIOR SIDE

Default Wrapping

At Inserts: Do not wrap At Ends: None

Modify Vertical Structure (Section Preview only)

<< Preview