

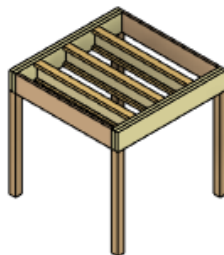


REVIT PURE PRESENTS
PAMPHLETS



ISSUE #27 / WINTER 2023

FLOOR SYSTEM



revitpure.com

© Copyright 2023 - BIM Pure Productions
by: Nicolas Catellier, Architect

PAMPHLETS COLLECTION



ISSUE #1
WORKSETS



ISSUE #2
SCHEDULES



ISSUE #3
PHASES



ISSUE #4
LINK CAD



ISSUE #5
FILTERS



ISSUE #6
VIRTUAL REALITY



ISSUE #7
3D VIEWS



ISSUE #8
PLAN NOTES



ISSUE #9
COORDINATES



ISSUE #10
SCOPE BOXES



ISSUE #11
FINISHES



ISSUE #12
LINE WEIGHTS

PAMPHLETS COLLECTION



ISSUE #13
DOORS



ISSUE #14
SHARED SITES



ISSUE #15
pyREVIT



ISSUE #16
FREE ADD-INS



ISSUE #17
SLANTED WALLS



ISSUE #18
**RAILINGS
PART 1**



ISSUE #19
**RAILINGS
PART 2**



ISSUE #20
**PHASES
PART 2**



ISSUE #21
LANDSCAPE



ISSUE #22
DYNAMO



ISSUE #23
**DOOR
SCHEDULES**



ISSUE #24
FAMILIES

PAMPHLETS COLLECTION



ISSUE #25
GROUPS
PART 1



ISSUE #26
GROUPS
PART 2



PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

WHAT IS THIS “PAMPHLET”?

Revit Pure Pamphlets are published 4 times a year by email. Each edition covers a particular Revit theme. We like to pick themes that are complex and confusing. Our job is to make these topics simple for you.

WHAT IS THIS FLOOR SYSTEM?

This is a project I have been doing in collaboration with QWEB, the Quebec Wood Export Bureau.

[Click here to download the family](#)

It is a family that contains multiple nested structural elements. It can be stretched on all directions. The joist spacing can be adjusted, and the structural depth of the system is automatically set based on the system Width.

This is a unique and innovative system I’ve never seen in Revit before. Although it is meant for modular construction, it could also be helpful in other circumstances.

In the first part, you will learn about the features of this system. Then, you will learn some tricks to build a family such as this.

Disclaimer: This family is meant for early-phase modeling. It doesn’t replace a structural engineer.



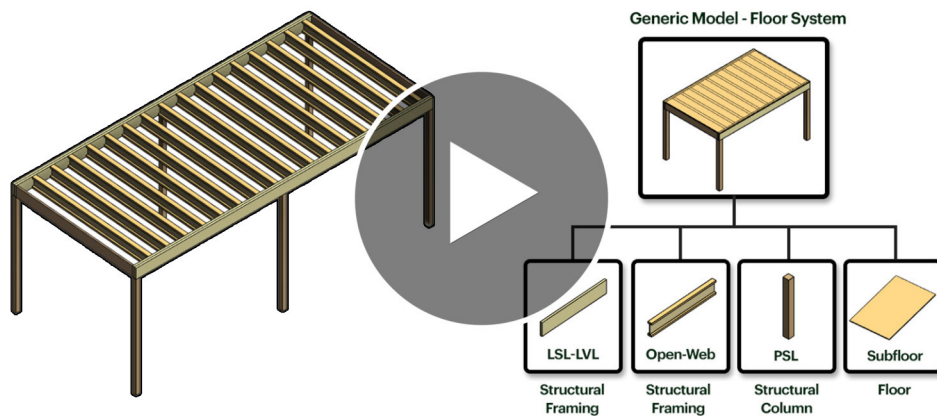
PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

WATCH THE YOUTUBE VIDEO

The topics covered in this pamphlet are covered by the video below. [Click here to watch it](#), or click the image:

FLOOR SYSTEM FAMILY



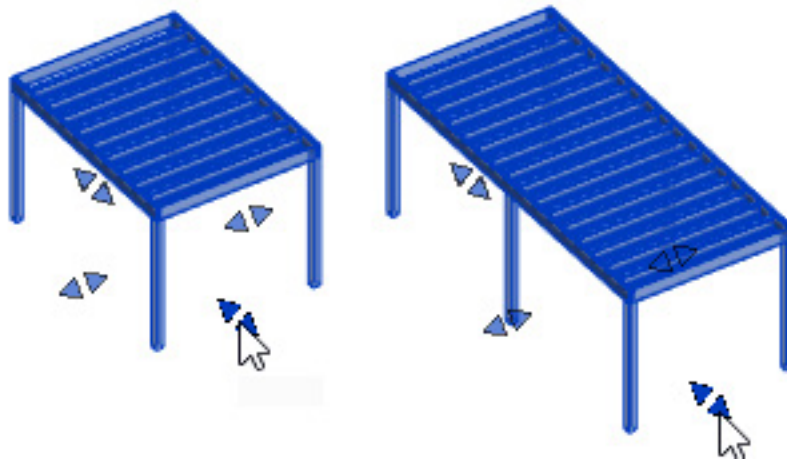


PAMPHLETS

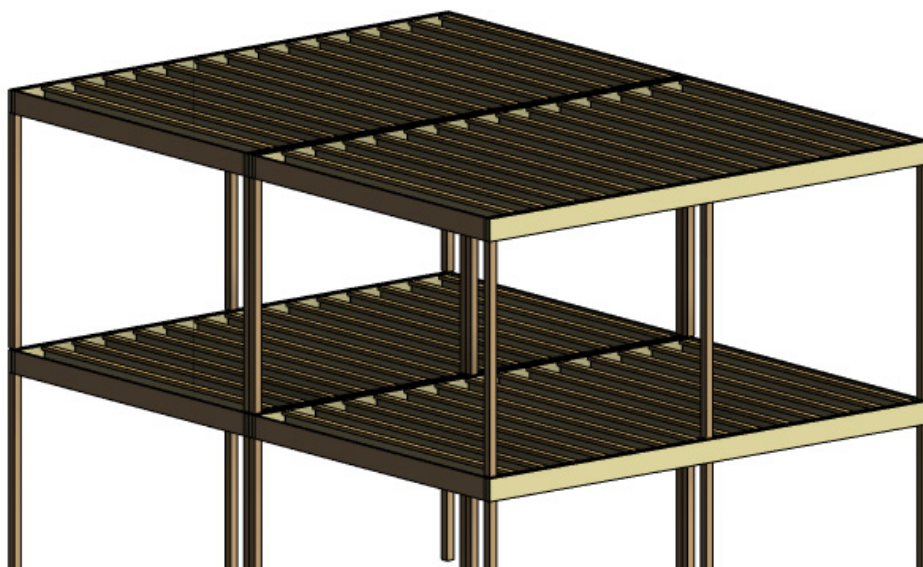
ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

THE PARAMETRIC SYSTEM

The family contains joists, beams, a subfloor, and columns. Everything is parametric! Check this out:



Why exactly should you use this family? It is meant as an early phase family to quickly model structure with real dimensions. You can copy and paste them to create a building layout:



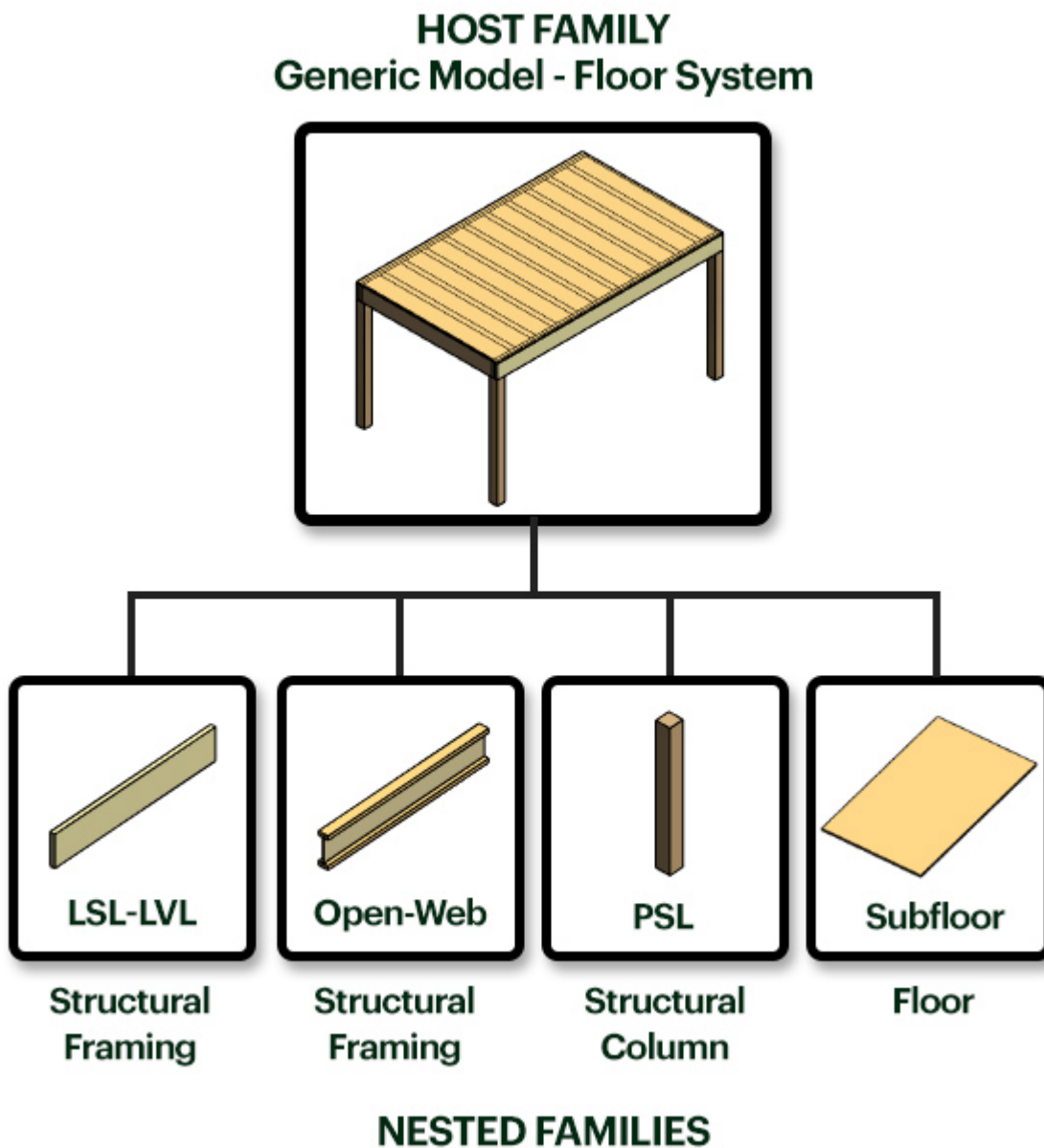


PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

1- THE FAMILY IS A GENERIC MODEL WITH NESTED STRUCTURAL FRAMING & COLUMNS

This family contains multiple nested shared components:





PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

These nested families are shared, which means they are individually part of the Revit database. Therefore, when the dimensions of the engineered floor system are changed, the schedule automatically updates.

Structural Framing					
LENGTH	DEPTH	WIDTH	VOLUME	NUMBER OF PLATES	QTY
LSL					
5'-9 1/4"	9 1/2"	1 1/4"	0.95 CF	0	2
12'-3 7/8"	9 1/2"	1 1/4"	8.13 CF	0	8
			9.08 CF	0	10
LVL					
19'-2"	9 1/2"	1 3/4"	35.41 CF	0	16
23'-0 7/8"	9 1/2"	1 3/4"	10.66 CF	0	4
			46.06 CF	0	20
Open-Web					
5'-9 1/4"	9 1/2"	3 1/2"	8.81 CF	34	17
12'-3 7/8"	9 1/2"	3 1/2"	61.99 CF	112	56
			70.79 CF	146	73
Grand total: 103			125.94 CF	146	103



PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

2- THE JOIST SPACING CAN BE ADJUSTED

In the type properties of the family, you will find the joist spacing parameter.

Dimensions	
Joist Spacing	1' 4"



Dimensions	
Joist Spacing	1' 0"



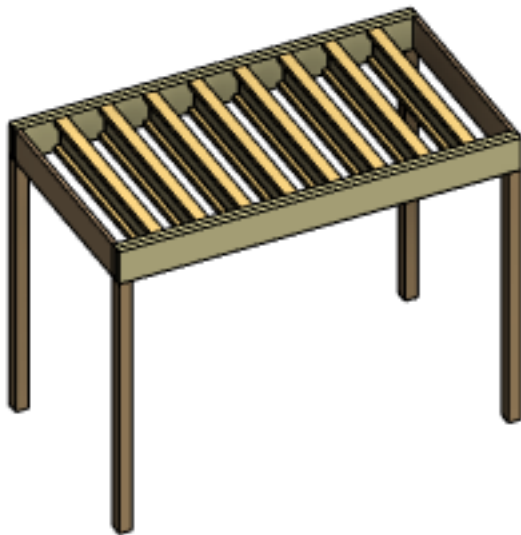


PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

3- MODIFY THE LENGTH, THE WIDTH, AND THE FLOOR-TO-FLOOR HEIGHT

In the instance properties of the system, you can modify the **Length**, the **Width**, and the **Floor-to-Floor Height**.



Dimensions	
Length	9' 0"
Width	5' 0"
Floor-to-Floor Height	7' 0"



Dimensions	
Length	6' 0"
Width	9' 0"
Floor-to-Floor Height	8' 0"

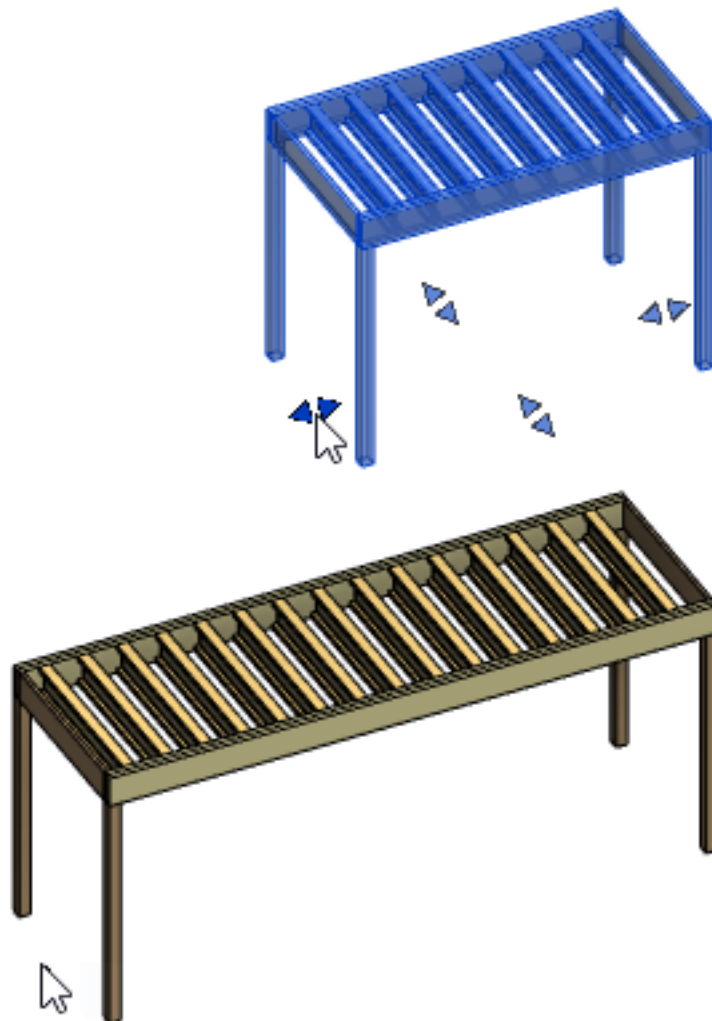


PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

4- DRAG THE BLUE ARROWS TO ADJUST THE WIDTH AND LENGTH

You can set the values of the dimensions directly in the properties, but you can also drag the blue arrows to adjust the Width and Length of the family.



A limitation of this technique is that the values are rounded to multiple digits. For better precision, type in the value.



PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

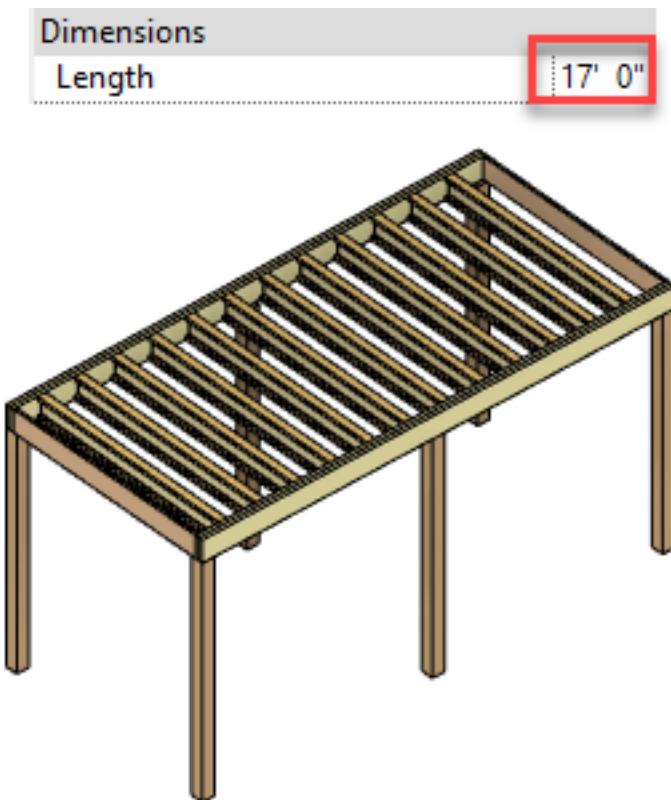
5- THE NUMBER OF COLUMNS IS AUTOMATICALLY DETERMINED

The family calculates how many columns are required based on the length.

For a Length up to 16', there are 4 columns.

Between 16' and 24', there are 6 columns.

Beyond 24' there are 8 columns.





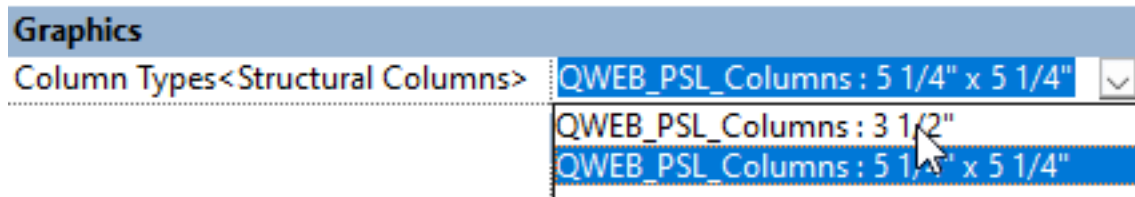
PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

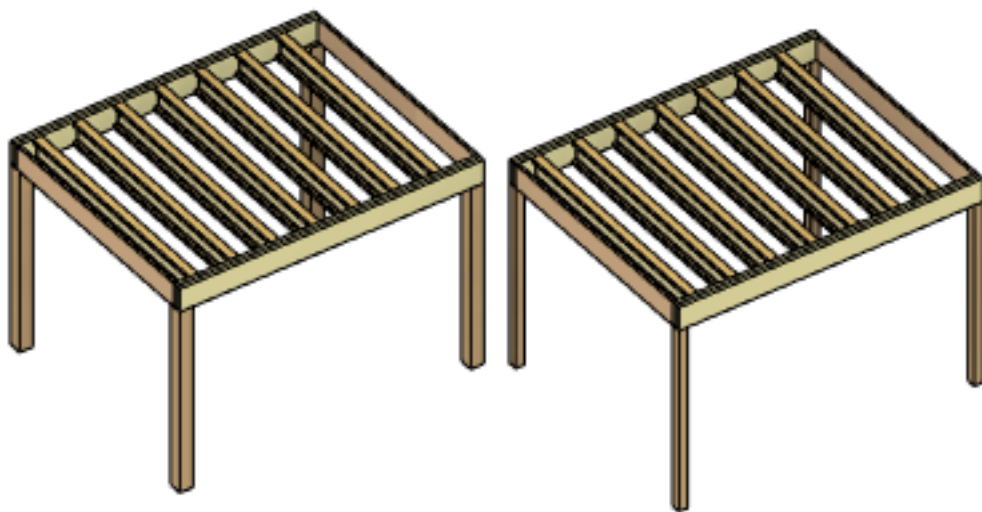
6- SWAP COLUMN FAMILIES

It is possible to switch from one structural column type to another. In this example, there are 3 1/2" and 5 1/4" PSL Columns.

To swap columns, go to the type parameters. However, make sure to pick types only from this QWEB_PSL family. If you try a different column family, you will probably get a warning or strange behavior because the family is set up differently.



The family lets you pick between different column sizing:





PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

7- AUTOMATIC STRUCTURAL DEPTH

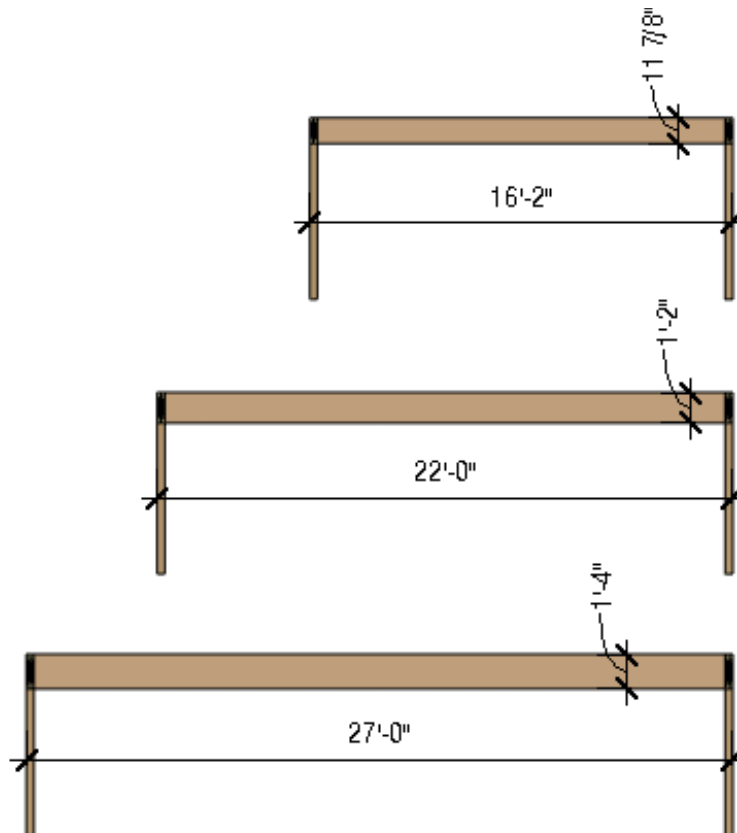
The Depth of the structural framing automatically adjusts based on the Width. Here are the spans used:

Between 0' to 16'-0" = Structure Depth: 9 1/2"

Between 16'-1" to 20' = Structure Depth: 11 7/8"

Between 20'-1" to 26'-0" = Structure Depth: 14"

Between 26'-1" to 30' = Structure Depth: 16"





PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

8- A WARNING IS DISPLAYED IF THE WIDTH IS TOO LONG

The width of this module should never go beyond 30'. If a value above 30' is entered, the structural framing disappears and a 3D text warning is displayed:

JOIST LENGTH BEYOND
CHARTED VALUE



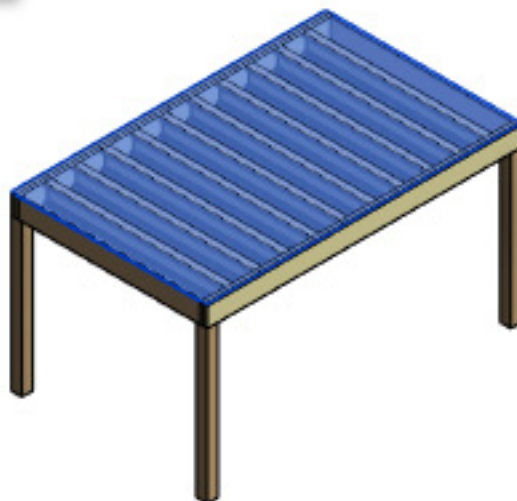
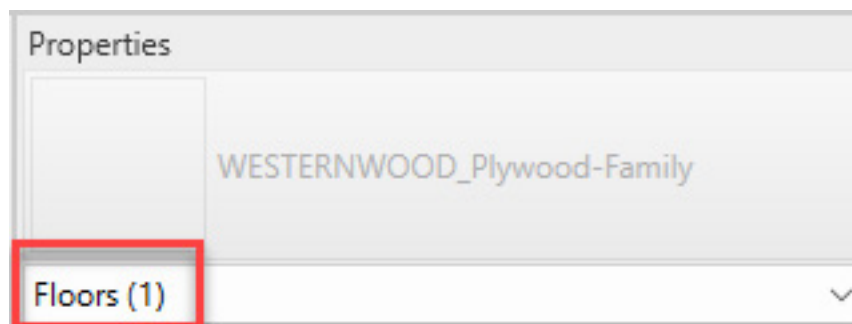
PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

9- THE SUBFLOOR IS INCLUDED AS A NESTED SHARED FAMILY

Overall, this family is in the Generic Model Category. However, it also includes a nested, shared subfloor family.

Normally, the floor category cannot be used when creating a new family. However, we've managed to create one using a super-secret trick.

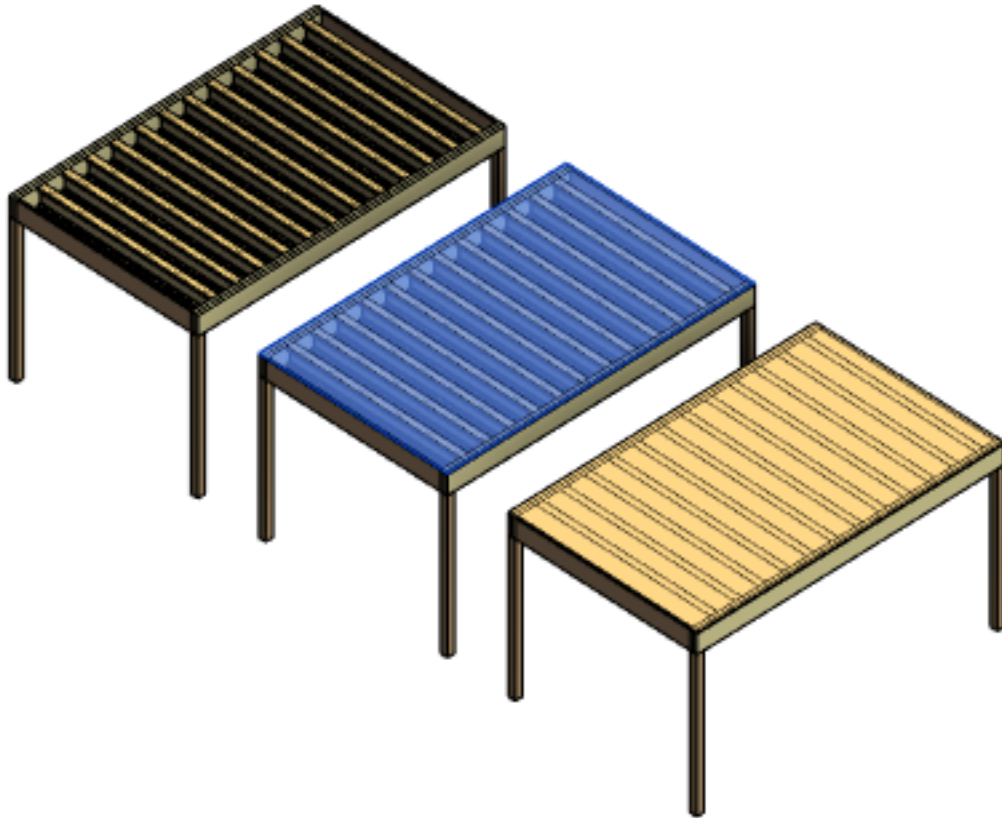




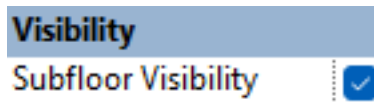
PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

You can tab-select the subfloor and hide it if you want. Also, you can use V/G menu to shut down all floors or this specific subcategory.



You can also shut down the “Subfloor Visibility” parameter in the type properties. However, this removes the subfloor entirely from the model.





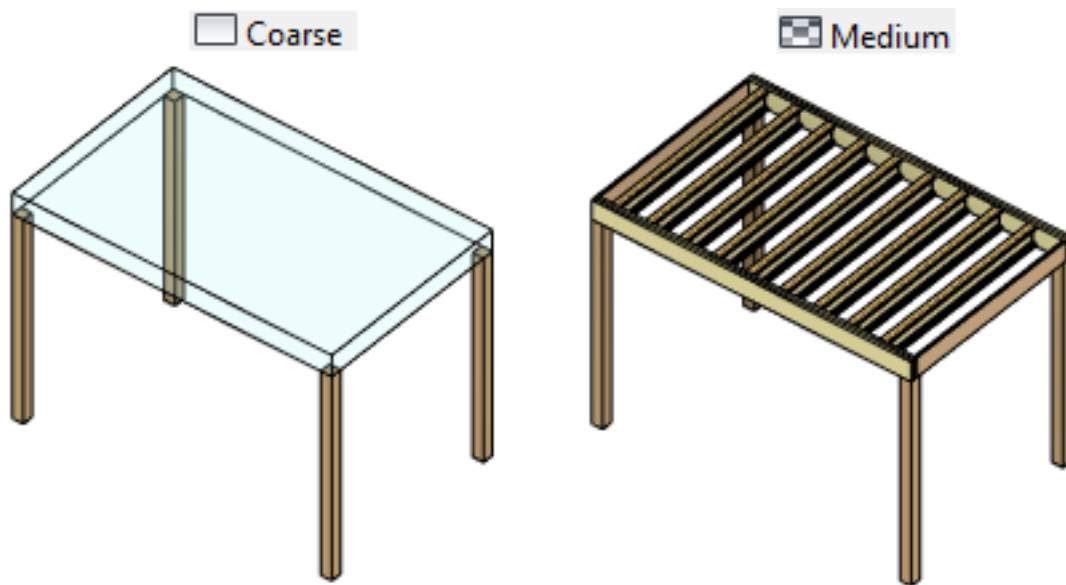
PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

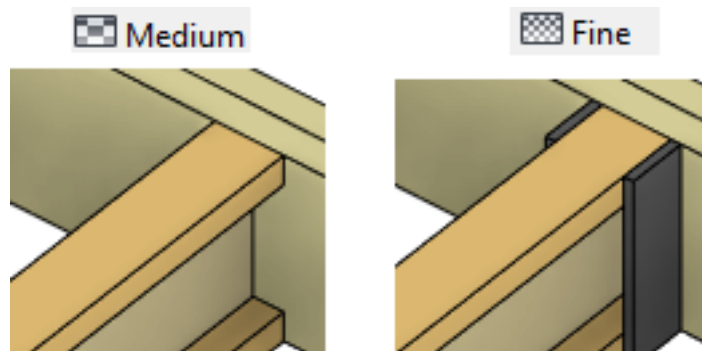
10- EACH LEVEL OF DETAIL HAS DIFFERENT INFORMATION

When using the Coarse level of detail, you will only see a translucent slab that represents the thickness of the structural system. The columns are also visible.

When using the Medium level of detail, the structural elements appear.



With the Fine level of detail, metal hangers appear for the joists.





PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

11- SCHEDULES ARE INCLUDED FOR THE NESTED STRUCTURAL COMPONENTS

The container file of this family includes 3 pre-made schedules. Obviously, these are live schedules that will automatically update if the dimensions of the structural systems are modified. First, here's a schedule that contains all columns:

Structural Columns					
COLUMN TYPE	WIDTH	DEPTH	HEIGHT	VOLUME	QTY
PSL 3 1/2"	3 1/2"	3 1/2"	6'-1 3/4"	0.52 CF	4
PSL 3 1/2"	3 1/2"	3 1/2"	7'-1 3/4"	0.61 CF	4
PSL 3 1/2"	3 1/2"	3 1/2"	8'-1 3/4"	0.69 CF	12
PSL 3 1/2"	3 1/2"	3 1/2"	9'-1 3/4"	0.78 CF	12
PSL 5 1/4"	5 1/4"	5 1/4"	6'-1 3/4"	1.18 CF	8

For the columns to be included in this schedule, they need to have the Type Comments parameter set to SYSTEM.

Fields Filter Sorting/Grouping Formatting Appearance

Filter by: Type Comments equals SYSTEM



PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

The second schedule contains all **Structural Framing** elements. Again, they need to have the **SYSTEM** value in the **Type Comments** parameter to appear here.

Structural Framing					
LENGTH	DEPTH	WIDTH	VOLUME	NUMBER OF PLATES	QTY
LSL					
7'-4 1/4"	9 1/2"	1 1/4"	3.64 CF	0	6
8'-5"	9 1/2"	1 1/4"	1.39 CF	0	2
12'-3 7/8"	9 1/2"	1 1/4"	8.13 CF	0	8
			13.15 CF	0	16
LVL					
6'-0"	9 1/2"	1 3/4"	2.77 CF	0	4
12'-8 7/8"	9 1/2"	1 3/4"	17.65 CF	0	12
19'-2"	9 1/2"	1 3/4"	35.41 CF	0	16
			55.83 CF	0	32
Open-Web					
7'-4 1/4"	9 1/2"	3 1/2"	23.78 CF	72	36
8'-5"	9 1/2"	3 1/2"	3.78 CF	10	5
12'-3 7/8"	9 1/2"	3 1/2"	61.99 CF	112	56
			89.55 CF	194	97
Grand total: 145			158.53 CF	194	145



PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

You can see that there are LSL, LVL and Open-Web types. These titles are used from the Description parameter of each structural type:

Type Comments	SYSTEM
URL	
Description	Open-Web

Finally, here is a schedule that contains all module (or full floor structural system). It includes the Mark value, the Width, the Length and the Floor-to-floor height.

MODULE SCHEDULE			
MARK	WIDTH	LENGTH	FLOOR-TO-FLOOR HEIGHT
Floor-System-Columns-3 1/2"-Span 18"			
FL1	12'-10 7/8"	19'-2"	10'-0"
FL2	12'-10 7/8"	19'-2"	10'-0"
FL3	12'-10 7/8"	19'-2"	9'-0"
FL4	12'-10 7/8"	19'-2"	9'-0"
4			
System 2 - 1" Joist Spacing			
FL5	7'-11 1/4"	12'-8 7/8"	7'-0"
FL6	9'-0"	6'-0"	8'-0"
2			
System 3 - 14" Joist Spacing			
FL7	7'-11 1/4"	12'-8 7/8"	7'-0"
FL8	7'-11 1/4"	12'-8 7/8"	7'-0"
2			
TOTAL MODULES: 8			




PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

12- THE FILE IS IN A CONTAINER WITH INSTRUCTIONS

Even the best Revit family is useless without a proper explanation. When you download the engineered floor system, it is part of a container file. The starting view includes instructions and tips on how to use the family:





REVIT CONTENT BY OFFSITE WOOD
BY THE QUEBEC WOOD EXPORT BUREAU

ENGINEERED FLOOR FAMILY V2

THANKS FOR DOWNLOADING THIS ENGINEERED FLOOR FAMILY!

This free content is provided by a mix of public and wood industry funding through the non-profit Quebec Wood Export Bureau. Here are the partners who contributed to this content:

- Offsite Wood: <https://www.offsitewood.org>
- Quebec Wood Export Bureau: <https://quebecwoodexport.com/en/>
- Revit Pure: <https://www.revitpure.com>





1- Overview

The Revit family is a BIM object that represents a structural floor system. It is designed to be used in a Revit project to create a 3D model of the floor system. The family is designed to be used in a Revit project to create a 3D model of the floor system. The family is designed to be used in a Revit project to create a 3D model of the floor system.

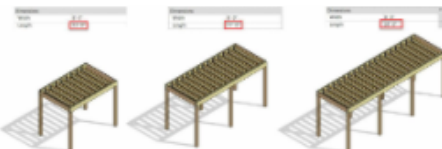
2- Dimensions

The family is designed to be used in a Revit project to create a 3D model of the floor system. The family is designed to be used in a Revit project to create a 3D model of the floor system. The family is designed to be used in a Revit project to create a 3D model of the floor system.



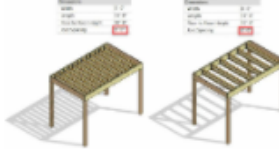
3- Automatic Number of Columns

The family is designed to be used in a Revit project to create a 3D model of the floor system. The family is designed to be used in a Revit project to create a 3D model of the floor system. The family is designed to be used in a Revit project to create a 3D model of the floor system.



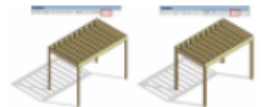
4- Automatic Joists Spacing

The family is designed to be used in a Revit project to create a 3D model of the floor system. The family is designed to be used in a Revit project to create a 3D model of the floor system. The family is designed to be used in a Revit project to create a 3D model of the floor system.




5- Swap Columns

The family is designed to be used in a Revit project to create a 3D model of the floor system. The family is designed to be used in a Revit project to create a 3D model of the floor system. The family is designed to be used in a Revit project to create a 3D model of the floor system.



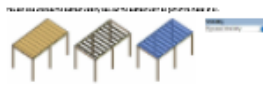
6- Automatic Structure Depth based on Width + Warnings

The family is designed to be used in a Revit project to create a 3D model of the floor system. The family is designed to be used in a Revit project to create a 3D model of the floor system. The family is designed to be used in a Revit project to create a 3D model of the floor system.



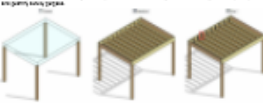
7- Subfloor Visibility

The family is designed to be used in a Revit project to create a 3D model of the floor system. The family is designed to be used in a Revit project to create a 3D model of the floor system. The family is designed to be used in a Revit project to create a 3D model of the floor system.



8- Level of Detail

The family is designed to be used in a Revit project to create a 3D model of the floor system. The family is designed to be used in a Revit project to create a 3D model of the floor system. The family is designed to be used in a Revit project to create a 3D model of the floor system.



9- Nested Shared Families = Schedulable

The family is designed to be used in a Revit project to create a 3D model of the floor system. The family is designed to be used in a Revit project to create a 3D model of the floor system. The family is designed to be used in a Revit project to create a 3D model of the floor system.

Code	Material	Height	Width	Depth	Volume	Area
COL-1	Concrete	1000	400	400	160000	160000
COL-2	Concrete	1000	300	300	90000	90000
COL-3	Concrete	1000	200	200	40000	40000
COL-4	Concrete	1000	150	150	22500	22500

Code	Material	Height	Width	Depth	Volume	Area
FRM-1	Concrete	1000	400	400	160000	160000
FRM-2	Concrete	1000	300	300	90000	90000
FRM-3	Concrete	1000	200	200	40000	40000
FRM-4	Concrete	1000	150	150	22500	22500

COULE SCHEDULE

Code	Material	Height	Width	Depth	Volume	Area
COL-1	Concrete	1000	400	400	160000	160000
COL-2	Concrete	1000	300	300	90000	90000
COL-3	Concrete	1000	200	200	40000	40000
COL-4	Concrete	1000	150	150	22500	22500

REVIT PURE - © Copyright 2023 - BIM Pure Productions Inc. 23



PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

5 SECRET REVIT TRICKS TO CREATE A STRONG, FLEXIBLE STRUCTURAL SYSTEM FAMILY

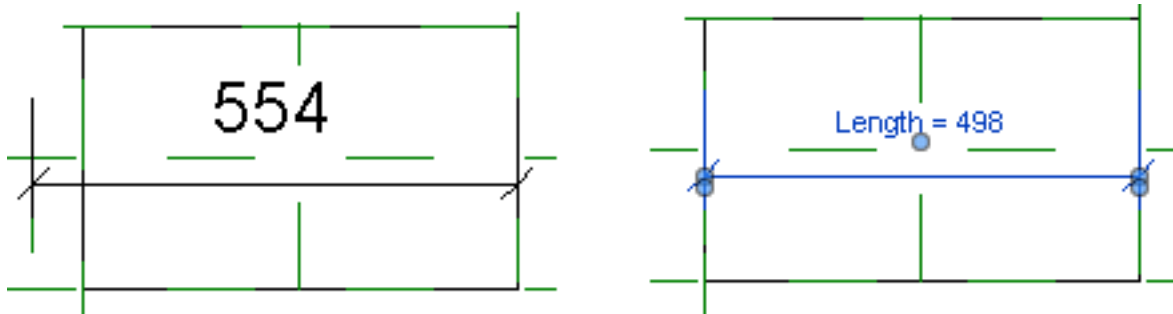
Alright, you've learned all the features from the floor system families. Now, we will lift the veil on how to reproduce some of these features. These are advanced Revit family strategies.

1- CREATE BLUE ARROWS THAT ARE VISIBLE IN 3D VIEWS

The floor system family contains blue arrows that are visible not only in plan views but also in 3D views.

To make the blue arrows visible in 3D views, set a dimension between a reference plane and a reference line (or a model line). No geometry has to be constrained to the ref. line/model line.

Assign the parameter to the dimension linked to the line.

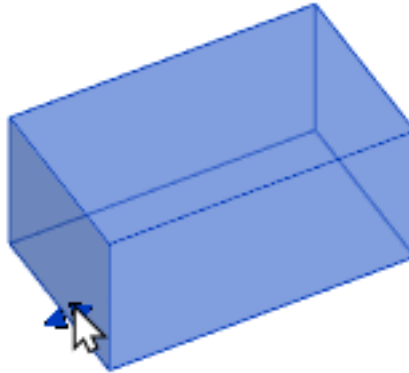




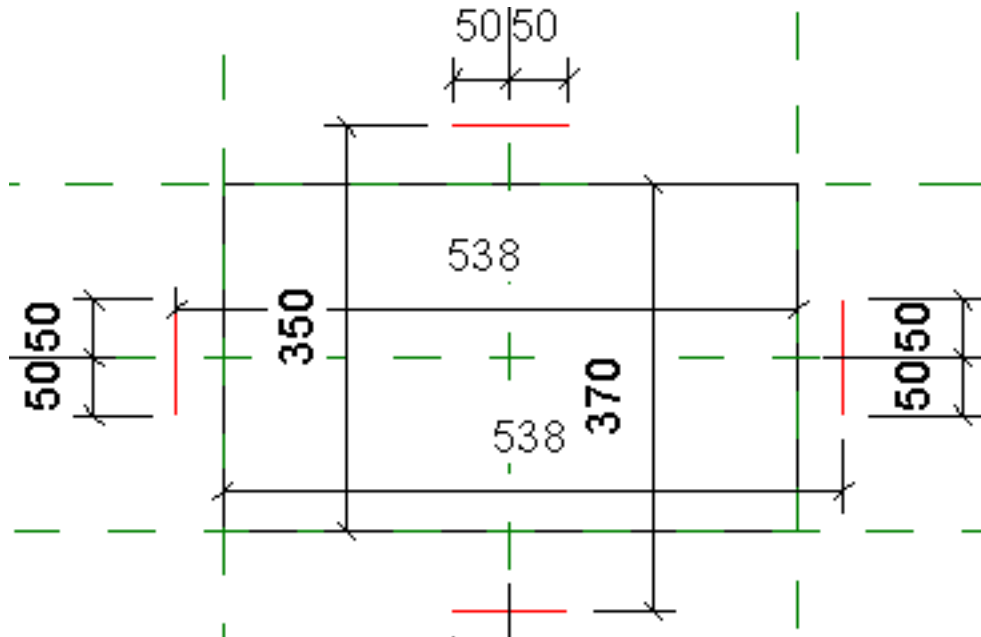
PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

In this case, you can see there is a 3D grip only on one side:



If you want 4 grips, you will have to create four reference lines (or model lines). In the image below, you can see the 4 reference lines before the dimension parameter is assigned. The reference lines are red for clarity purposes. You can add dimensions to make certain the lines are centered on each side. This ensures the 2D arrows will be centered as well.

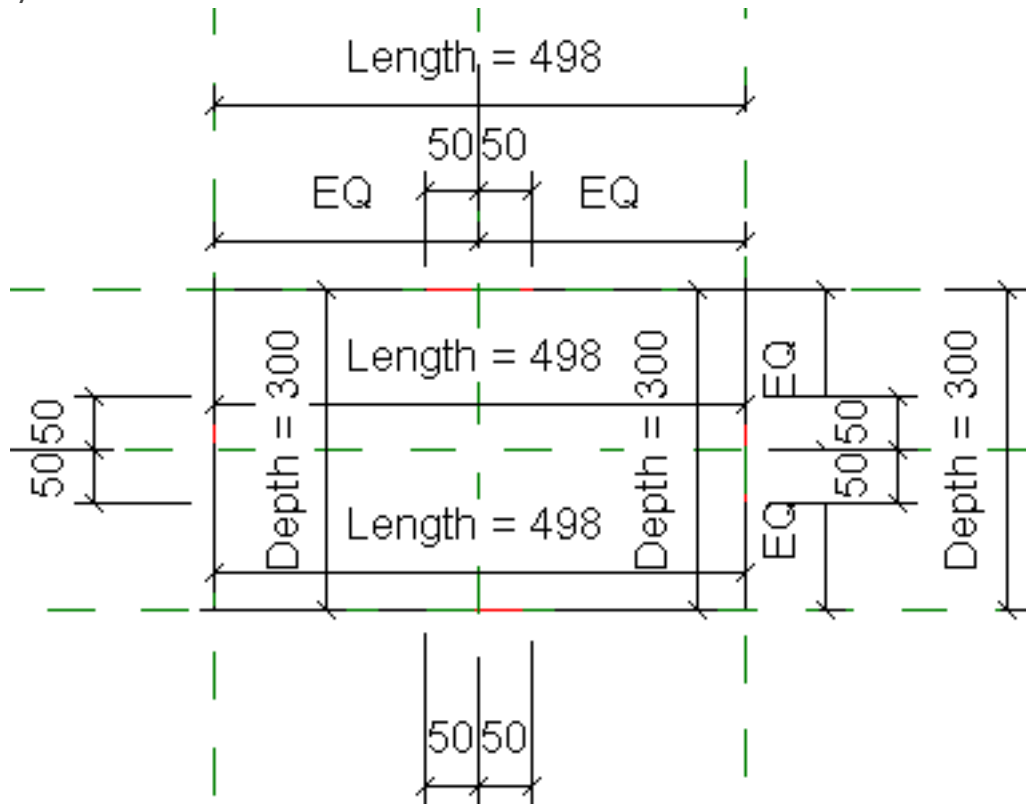




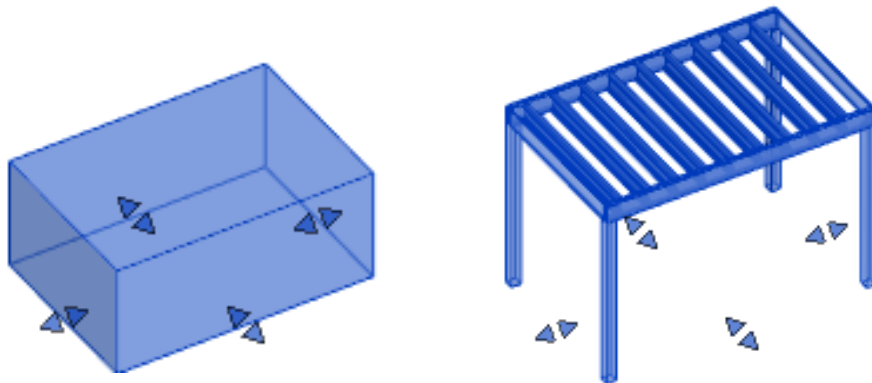
PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

Once the parameters have been added to the dimensions, the family should look like this:



You will see 4 grips in the 3D view. That's the technique we've used for the floor system family. Thanks to John Pierson for this trick!





PAMPHLETS

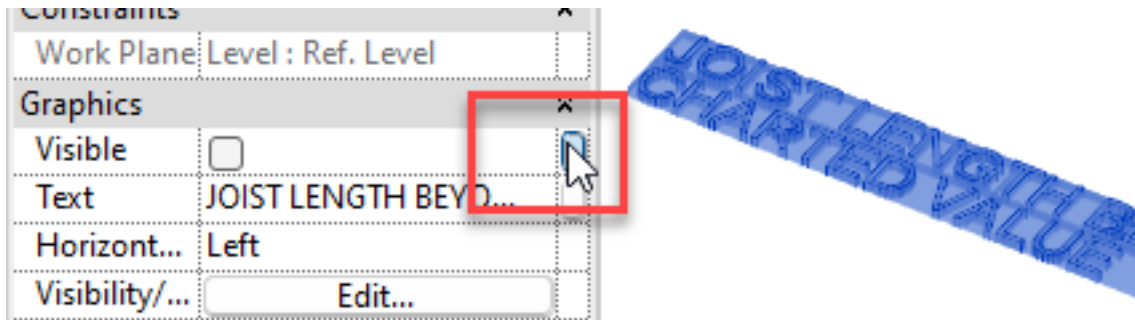
ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

2- ADD A CONDITIONAL 3D TEXT WARNING

In the floor system, this 3D text shows up when the Width goes beyond 30':

JOIST LENGTH BEYOND
CHARTED VALUE

This is a great way to warn users conditions aren't respected without breaking the family. First, create the 3D text and place it. Click on the Visibility rectangle.



Call an Instance parameter called **Warning Visibility**.





PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

Go to the Family Types menu. You must type the condition that will cause the 3D text to be visible. In this example, we want the text to display when the Width is equal to or above 30'.

Sadly, there isn't a **Greater than or equal** symbol for formulas in Revit. You have to use a workaround. Use the **not** operator and type the opposite of what you want.

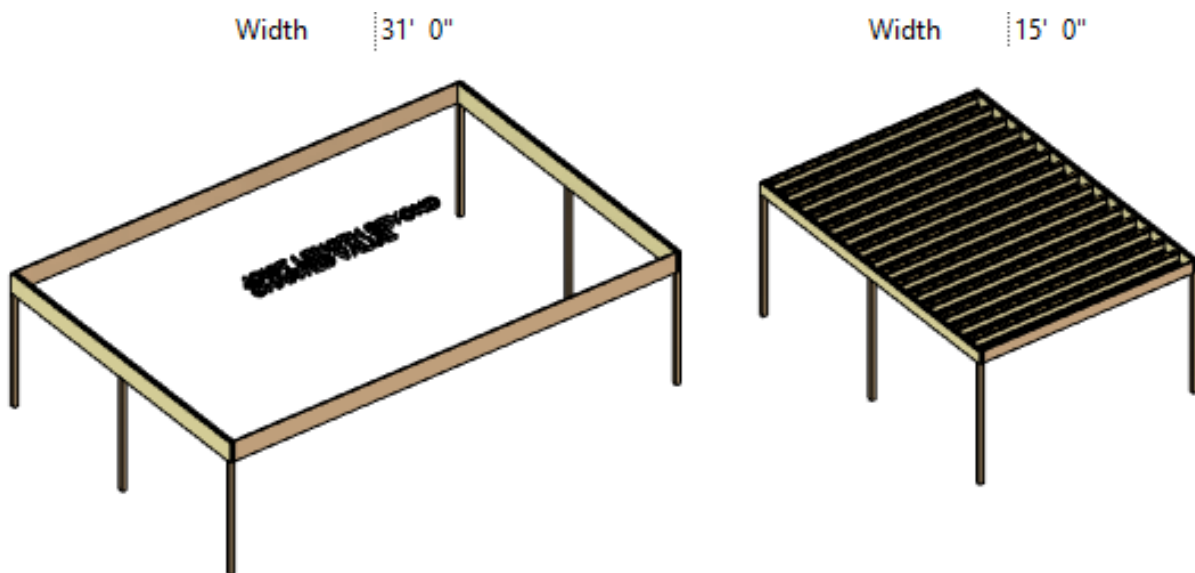
In this case, `not(Width < 30')`

Warning Visibility (default) = `not(Width < 30')`

In addition, We've set the family so the joists aren't visible if the warning is. Add this visibility parameter to the joists:

Joists Visibility (default) = `not(Warning Visibility)`

That's it! Make sure to play with the Width to ensure it works.





PAMPHLETS

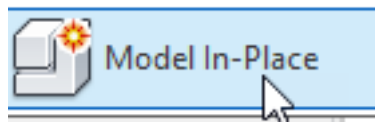
ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

3- CREATE A FLOOR NESTED FAMILY

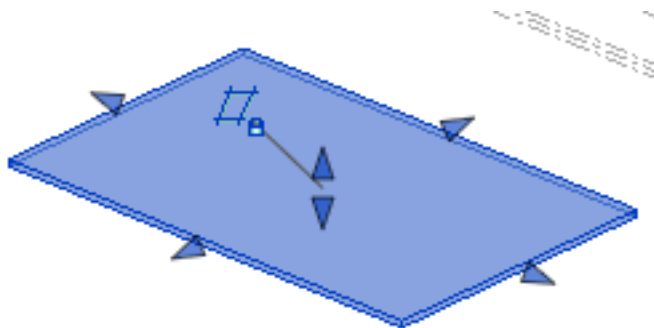
Floors are system families and cannot be created as loadable families... right?? right?

Wrong! A super-secret trick allows you to create loadable families of system families such as walls, floors, ceilings, etc. Thanks to Håvard Vasshaug for the [video explaining the secret trick](#).

In a Revit model, use the Model-In-Place tool.



Select the category you want to use and model an extrusion.



While still inside the Model In-Place tool, select the geometry and create a group.

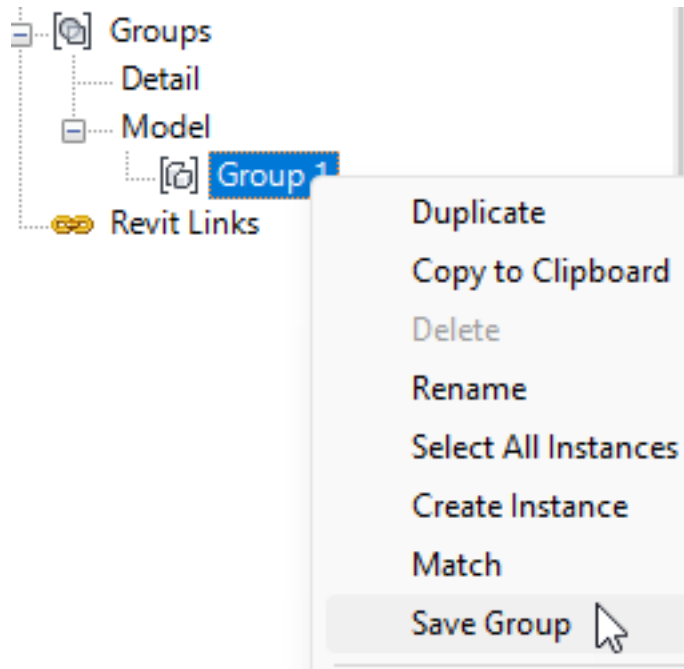




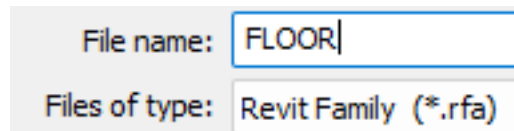
PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

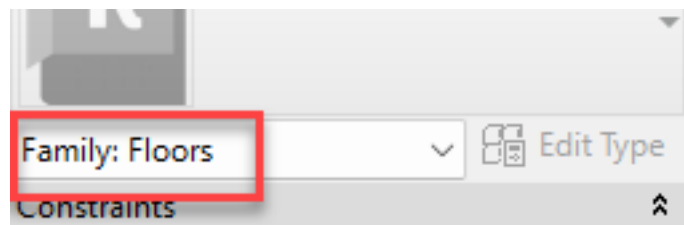
In the project browser, look at the groups. Right-click the new group and select Save Group.



This will prompt you to save the group as a .rfa family.



Open the family. It's a loadable .rfa with the Floor category!





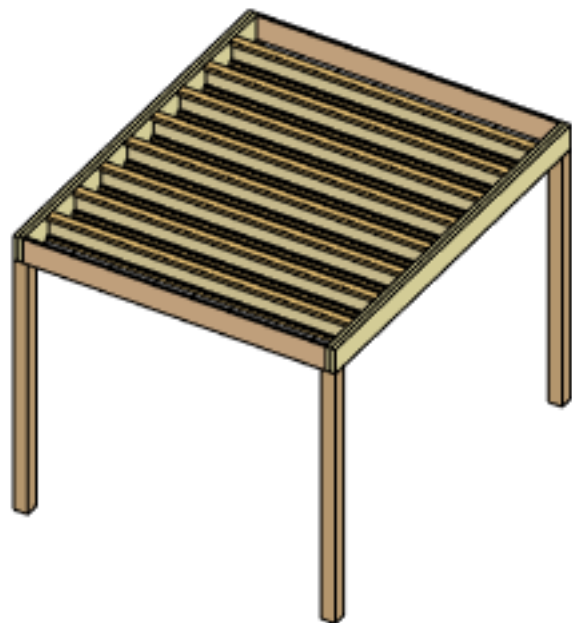
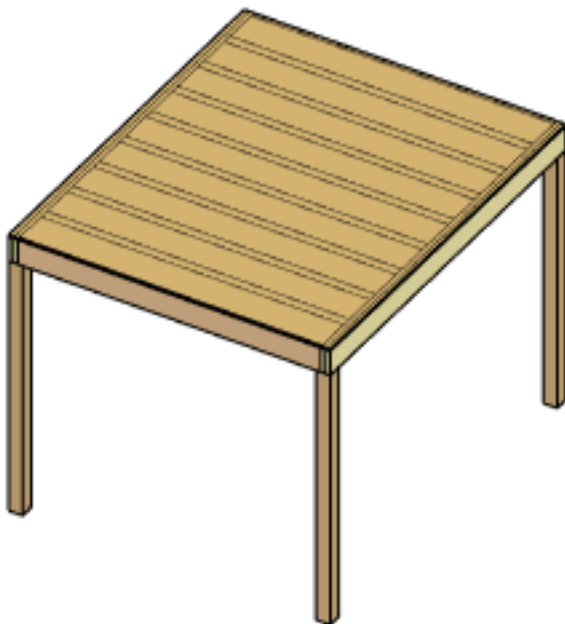
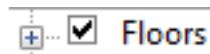
PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

You can model and change this floor family like you can with any other family. Before loading it into another family, make sure to make it **shared**.

Other	
Work Plane-Based	<input type="checkbox"/>
Always vertical	<input type="checkbox"/>
Cut with Voids Whe...	<input type="checkbox"/>
Shared	<input checked="" type="checkbox"/>

You might ask... Why it is so important to use the “floor” category? Because it allows you to use Visibility/Graphics in Revit to shut down the floor category, while keeping the rest visible. It also allows you to properly use schedules.





PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

4- USE NESTED SHARED FAMILIES FOR STRUCTURAL COMPONENTS

A family inside another family is called a nested family. A nested family can be shared, which means that it will also be loaded and created in the project independently from the host family.

Make sure that the shared parameter is active.



The biggest benefit of a nested shared family is that the elements can be scheduled independently. For example, even though the columns are nested into the main family, they will appear as individual elements in the columns schedule:

Structural Columns					
COLUMN TYPE	WIDTH	DEPTH	HEIGHT	VOLUME	QTY
PSL 5 1/4"	5 1/4"	5 1/4"	8'-1 3/4"	1.56 CF	4



PAMPHLETS

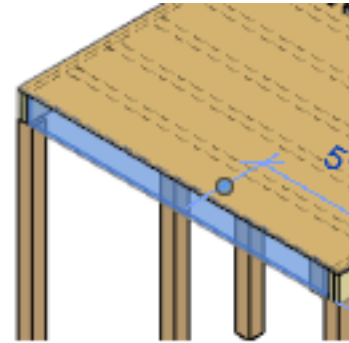
ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

A limitation of a nested shared family is that you cannot associate the type parameters.

For example, the structural framing families dimension parameters are instance-based. This allows these dimensions to automatically be adapted depending on the system's width dimension.

Dimensions	
Height	0' 9 1/2"
Length	9' 5"
Width	0' 1 1/4"

INSTANCE PARAMETERS



If you go to the type properties of this nested family, the small rectangle that allows you to associate a parameter isn't available. That's because type properties can be adjusted directly in the project.



PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

5- USE "IF" STATEMENT TO AUTOMATICALLY CHANGE STRUCTURAL DEPTH BASED ON WIDTH

On page 15, you learn that this family's structural depth automatically adjust based on the Width. This is possible by using an **if** statement. Here is the basic syntax of an if statement:

if(condition, result if true, result if false)

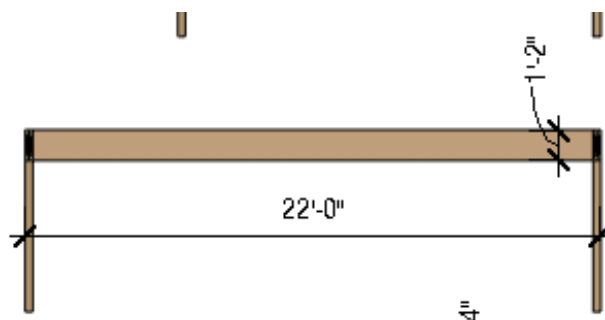
For the framing height, we use a nested if statement, which means there are multiple conditions.

Here is the formula that is used for the **Framing Height** value:

if(Width < 15' 11", 0' 9 1/2", if(Width < 19' 11", 0' 11 7/8", if(Width < 25' 11", 1' 2", 1' 4"))))

In this case, the framing height will be 9 1/2" if the Width is smaller than 15'11", 11 7/8" if the Width is smaller than 19'-11" and so on.

If you are new to formulas in Revit, this might seem a bit overwhelming, but it's not that bad.





PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

ADVANCED FAMILY STRATEGIES COURSE

Are you enjoying these family tips? We've got more for you! Revit Pure is offering a cohort-based course about advanced Revit family strategies.

Advanced Revit Family Strategies

*NICOLAS
CATELLIER*



Next cohort is on March 20th.

[Click here to learn more](#)



PAMPHLETS

ISSUE #27 / WINTER 2023 / FLOOR SYSTEM

THANKS FOR READING!

As always, send your thoughts to nick@revitpure.com. I read and answer all emails. Let me know what theme you want explored for the next edition.