



# Getting Started with DesignPH

Webinar. May 5, 2020



bldgtyp



**Ed May** | Partner, Building-Type, LLC  
*(architect, passive house consultant, teacher)*



## Agenda [1 hour]



- The Basics
- The DesignPH Workflow
- Modeling
- Tagging
- Windows
- Exporting

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# BASICS

## Requirements



What you'll need:

- A copy of the **DesignPH** plugin
- **Sketchup 3-D** modeling software
- A copy of the **PHPP v.8 or 9** (and Excel)

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<https://foursevenfive.com/designph-2-0/>



4 HIGH PERFORMANCE BUILDING SUPPLY

SEARCH

PRODUCTS KNOWLEDGE RESOURCES ABOUT US SMART ENCLOSURE BLOG

SUPPORT LOGIN

HOME / PRODUCTS / DESIGN AND TESTING TOOLS / PHI SOFTWARE (PHPP, DESIGNPH) / DESIGNPH 2.0

**PHI**

**DesignPH 2.0**  
from \$360.00

Available only in Metric at this time. IP version in development.

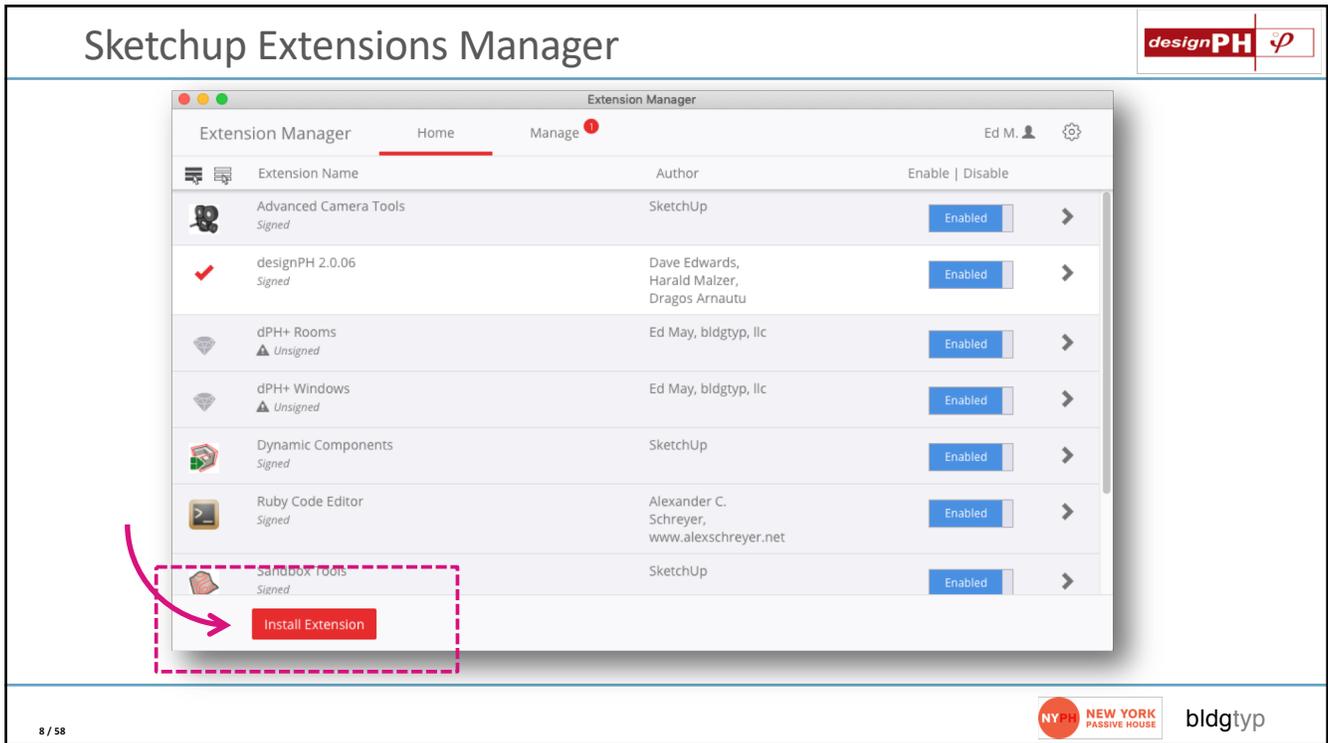
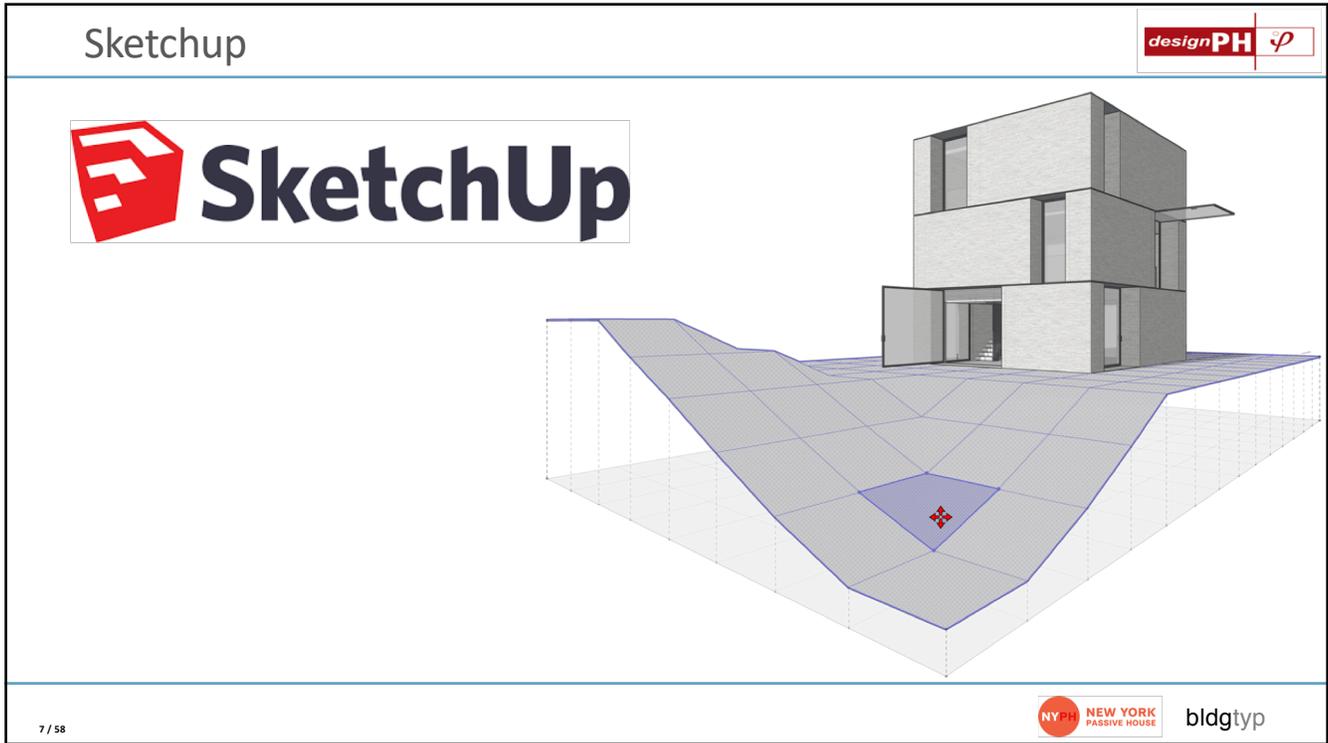
Type: Choose Options

Quantity - 1 +

ADD TO CART

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# Start DesignPH Plugin [Each time you run Sketchup]



designPH main

designPH v

2.0.06, registered to: ed.may [Unregister 2.0] [Help & Support] [Wiki Manual] [Language: EN]

Overview Results Heat balance Climate Vent.+IHG Areas U-value editor Assemblies Components Shading Export

### Heat balance

Heat flows (kWh/m²)

100  
95  
90  
85  
80  
75  
70  
65  
60  
55  
50  
45  
40  
35  
30  
25  
20  
15  
10  
5  
0

Losses Gains

15.0

- Transmission heat loss (opaque surfaces)
- Transmission heat loss (thermal bridges)
- Ventilation heat losses
- Transmission heat loss (windows)
- Non-useful heat gains
- Specific ann. heat demand
- Internal heat gains
- Solar heat gains

### Project overview

Climate was changed, please re-analyse the model to update the results!  
The model has not been analysed!

Climate [change](#)

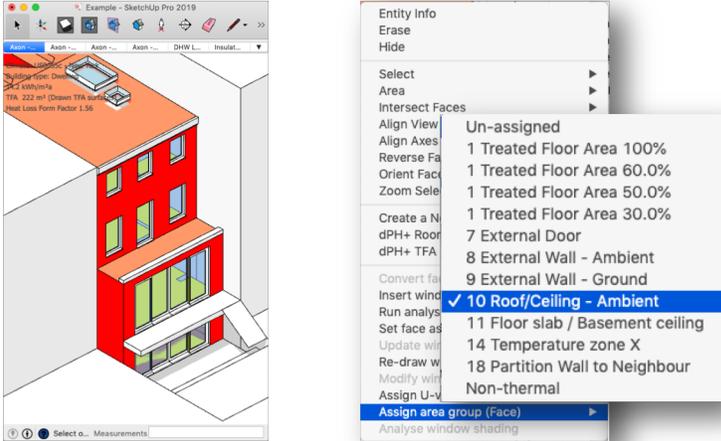
Building type [change](#)

# BASIC WORKFLOW

## DesignPH Workflow



1) Model Geometry



3) Analyze



4) Export



2) Tag Model Geometry w/ Data

Export From DesignPH.ppp

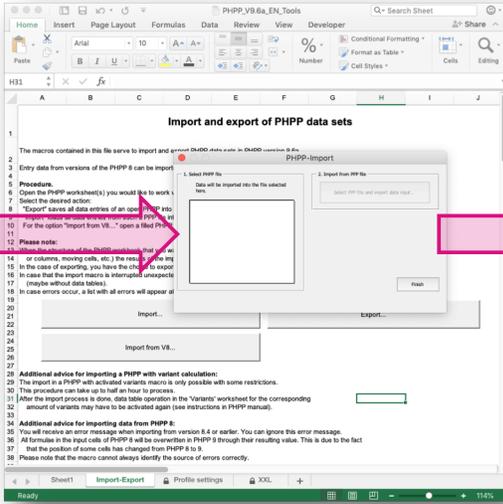
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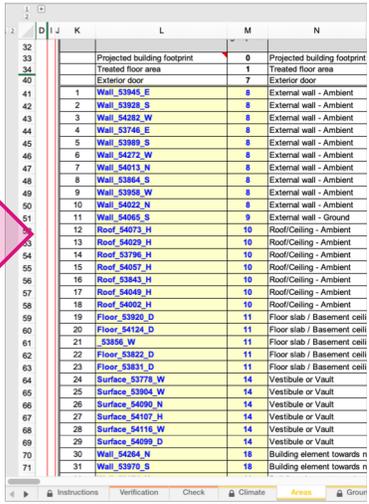

## DesignPH Workflow



5) Import



6) Complete the PHPP



Export From DesignPH.ppp

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# Modeling

Modeling is Done Using SURFACES with no thickness

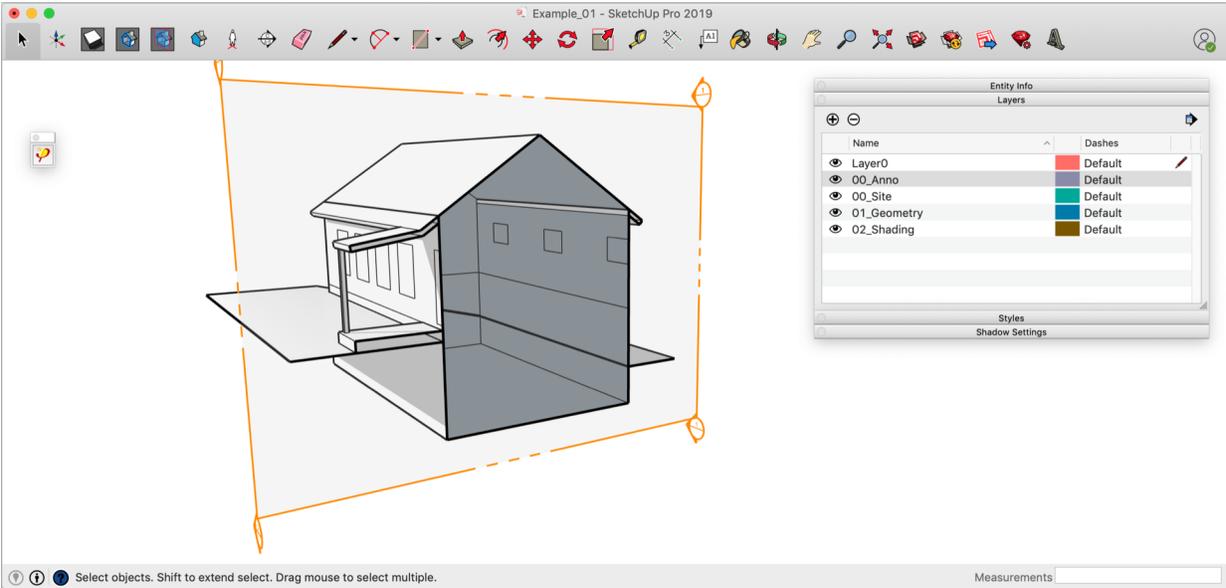
The screenshot shows the SketchUp Pro 2019 interface. The main workspace displays a 3D wireframe model of a house with a gabled roof and a front porch. The Entity Info panel on the right shows the following layers:

Name	Dashes
Layer0	Default
00_Anno	Default
00_Site	Default
01_Geometry	Default
02_Shading	Default

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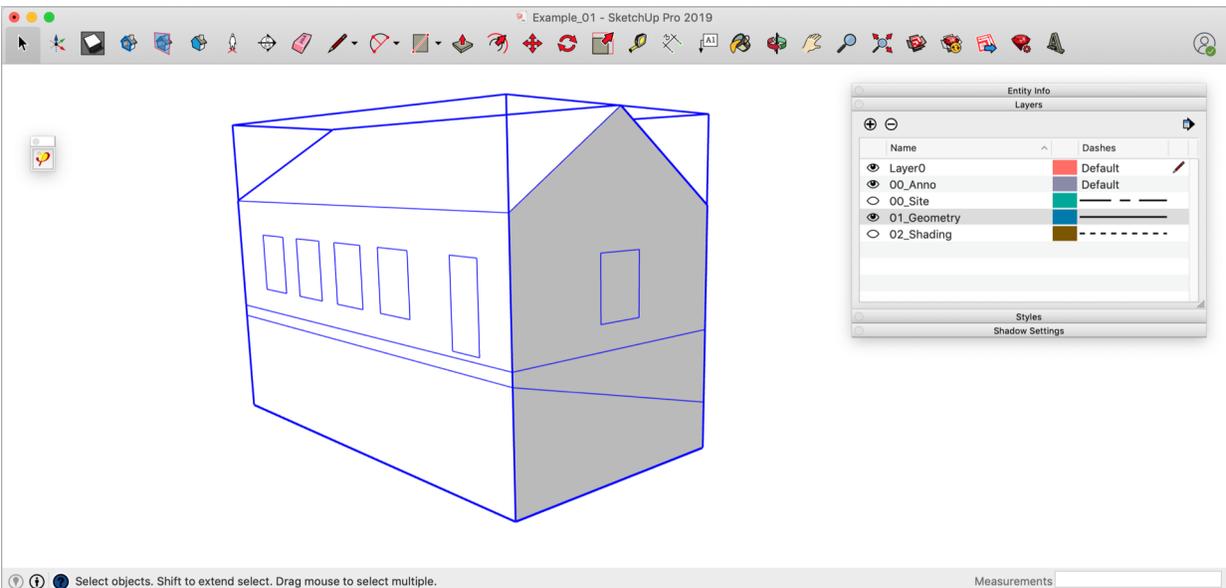
# Modeling is Done Using SURFACES with no thickness



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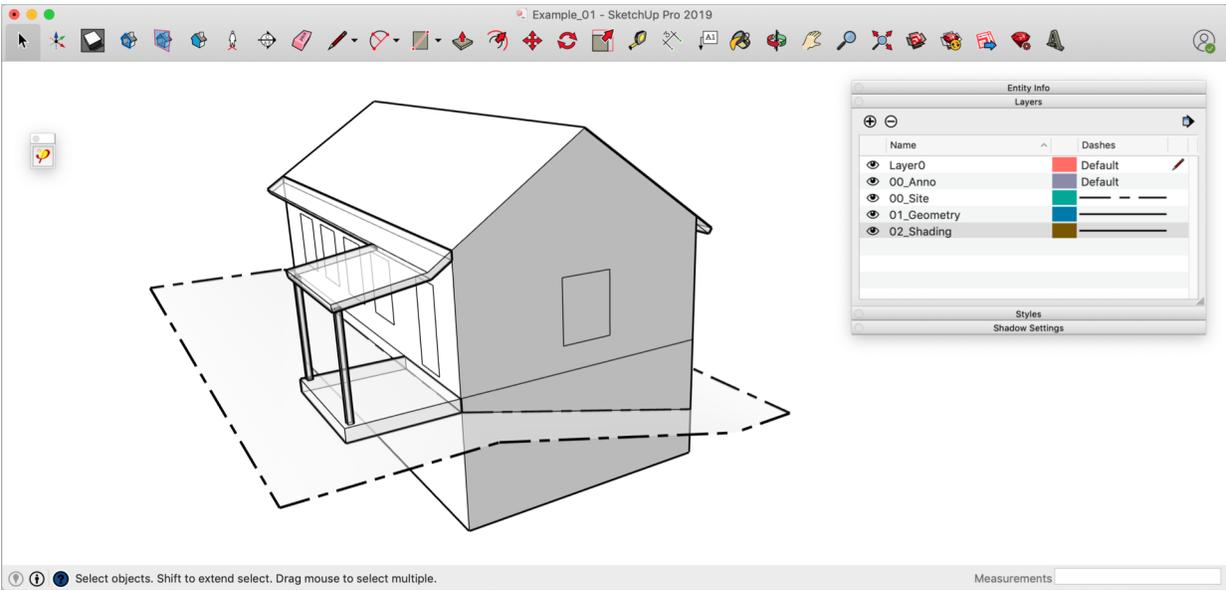
# First, Model the Thermal Zone as a Mass



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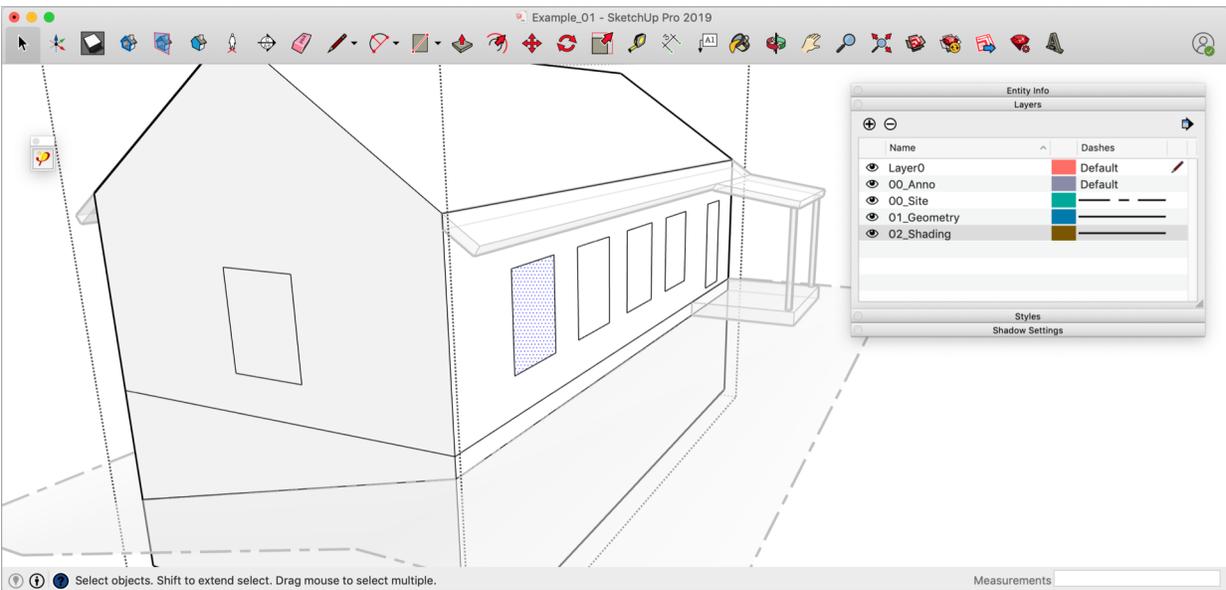
## Then Add Shading, Site, etc. in **Separate Groups**



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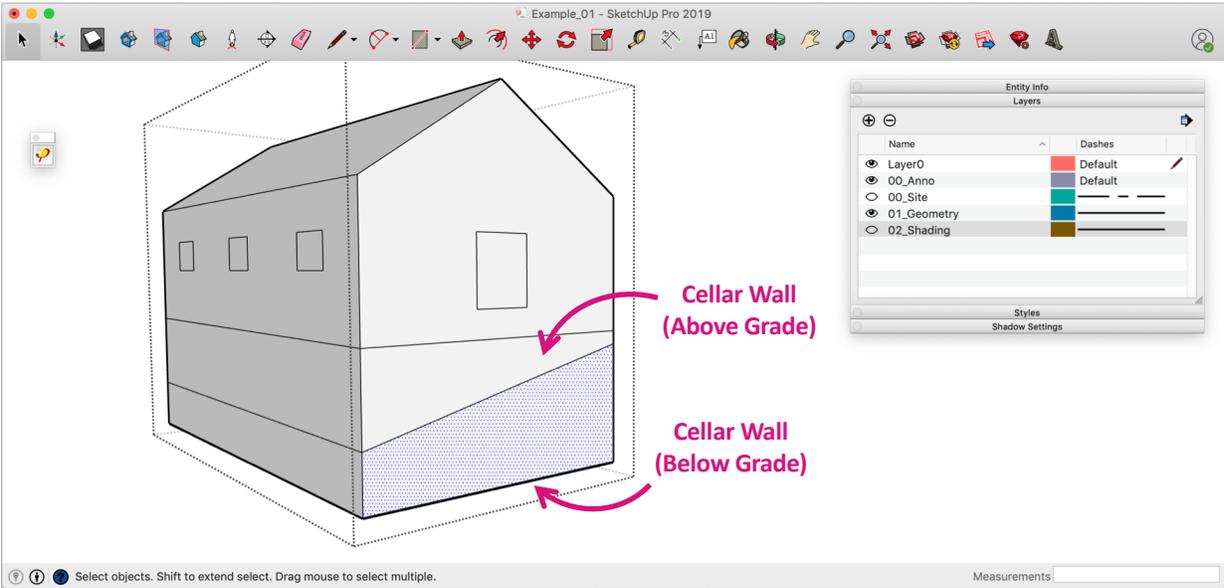
## Model Windows as Flat Planes (for now)



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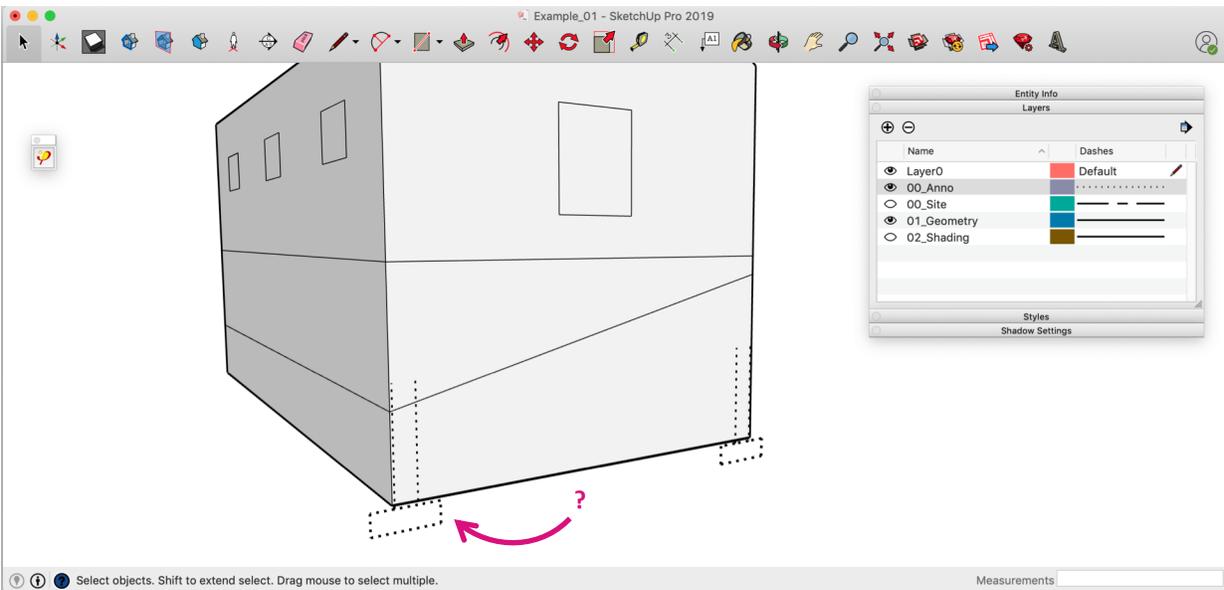
## Split Surfaces with Multiple Exposure Types (AG/BG)



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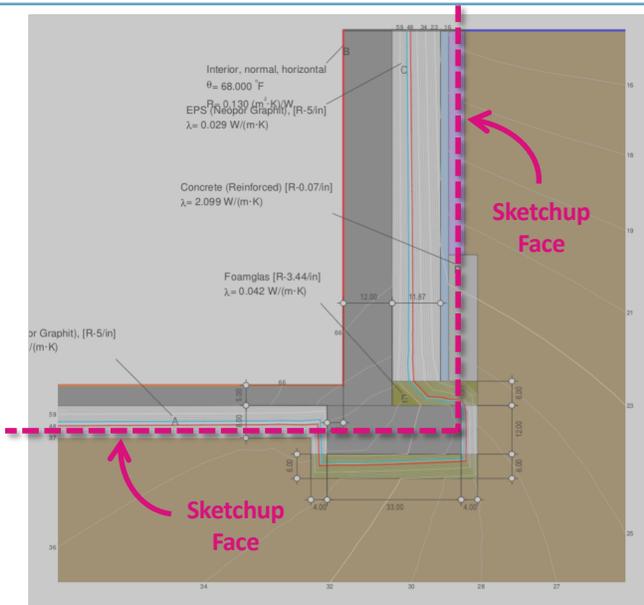
## How to Deal with the Details?



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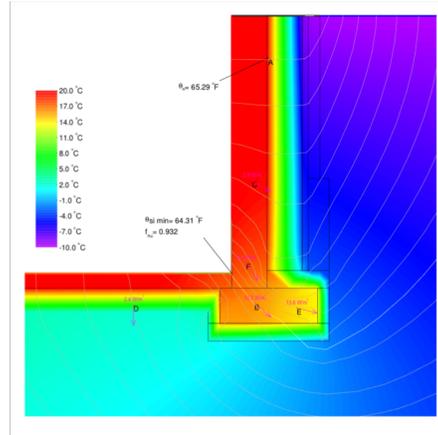


# That's What Psi-Values are For!



$$\Psi_{A-E,C,*} = \frac{31.558}{30.000} - \frac{6.642}{30.000} - \frac{21.910}{30.000} = 0.100 \text{ W/(m}\cdot\text{K)}$$

PSI



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# Tagging Surfaces

### Start by turning 'on' DesignPH

Click the DesignPH button

Hide all but the 'Geometry' Layer

Name	Dashes
Layer0	Default
00_Anno	.....
00_Site	----
01_Geometry	----
02_Shading	----

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### Wait! I don't see that button!

designPH toolbar

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# DesignPH Tools

The screenshot shows the DesignPH software interface. On the left is a vertical toolbar with various icons. The main workspace displays a 3D wireframe model of a house. On the right, a window titled 'designPH main' is open, showing a 'Heat balance' chart. The chart plots 'Heat flows (kWh/m²)' on the y-axis (0 to 100) against 'Losses' and 'Gains' on the x-axis. A red horizontal line indicates a total value of 15.0. The legend includes: Transmission heat loss (opaque surfaces), Transmission heat loss (thermal bridges), Ventilation heat losses, Transmission heat loss (windows), Non-useful heat gains, Specific ann. heat demand, Internal heat gains, and Solar heat gains.

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# DesignPH Tools

The screenshot is similar to the previous one but includes annotations. A pink arrow points from the text 'The DesignPH Dialog Window gives us access to detailed inputs for Components, Exporting and seeing the results' to the 'Components' tab in the software's menu bar. Another pink arrow points from the text 'The DesignPH Toolbar lets us access DesignPH modeling and visualization tools' to the vertical toolbar on the left.

The DesignPH Dialog Window gives us access to detailed inputs for Components, Exporting and seeing the results

The DesignPH Toolbar lets us access DesignPH modeling and visualization tools

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### Step 1: Surface Exposure Type

designPH

Entity Info

- Erase
- Hide
- Select
- Area
- Intersect Faces
- Align View
- Align Axes
- Reverse Faces
- Orient Faces
- Zoom Selection
- Create a New dPH+ Room(s)
- dPH+ Room Data
- dPH+ TFA
- Convert face to window component
- Insert window / door component
- Run analysis on selection
- Set face as ground plane
- Update window frame / glazing types
- Re-draw windows
- Modify window reveal depth
- Assign U-value (Face)
- Assign area group (Face)**
- Analyse window shading

Entity Info Layers

Name	Dashes
Layer0	Default
00_Anno	.....
00_Site	.....
01_Geometry	.....
02_Shading	.....

- ✓ Un-assigned
- 7 External Door
- 8 External Wall - Ambient**
- 9 External Wall - Ground
- 10 Roof/Ceiling - Ambient
- 11 Floor slab / Basement ceiling
- 14 Temperature zone X
- 18 Partition Wall to Neighbour
- Non-thermal

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### Step 1: Surface Exposure Type

designPH

Entity Info

- Erase
- Hide
- Select
- Area
- Intersect Faces
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- Create a New dPH+ Room(s)
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- Modify window reveal depth
- Assign U-value (Face)
- Assign area group (Face)**
- Analyse window shading

Entity Info Layers

Name	Dashes
Layer0	Default
00_Anno	.....
00_Site	.....
01_Geometry	.....
02_Shading	.....

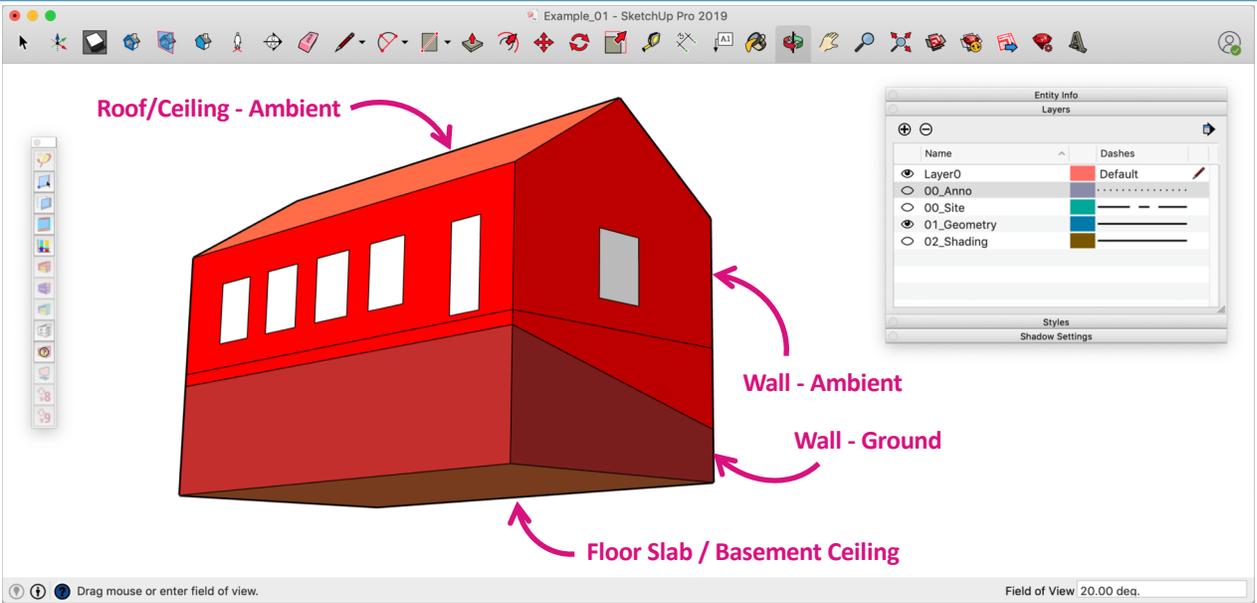
- ✓ Un-assigned
- 7 External Door
- 8 External Wall - Ambient
- 9 External Wall - Ground
- 10 Roof/Ceiling - Ambient**
- 11 Floor slab / Basement ceiling
- 14 Temperature zone X
- 18 Partition Wall to Neighbour
- Non-thermal

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## Step 1: Surface Exposure Type



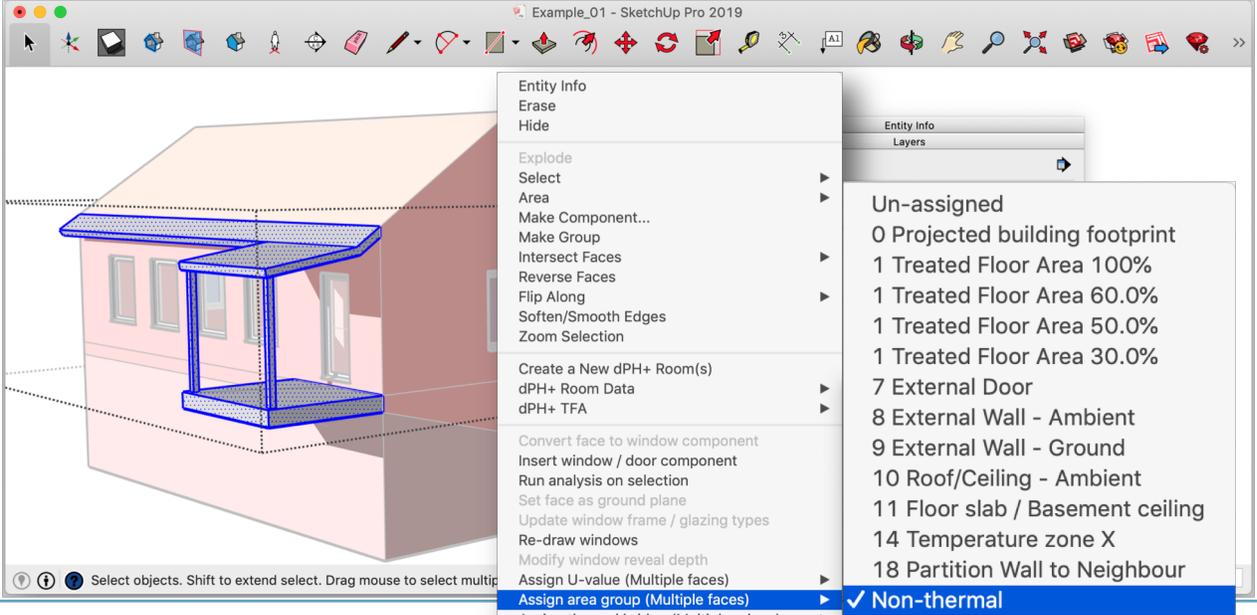


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## Shading Surfaces: 'Non-Thermal'





Entity Info	
Layers	
Name	Dashes
Layer0	Default
00_Anno	.....
00_Site	.....
01_Geometry	.....
02_Shading	.....

Entity Info	
Layers	
Un-assigned	
0 Projected building footprint	
1 Treated Floor Area 100%	
1 Treated Floor Area 60.0%	
1 Treated Floor Area 50.0%	
1 Treated Floor Area 30.0%	
7 External Door	
8 External Wall - Ambient	
9 External Wall - Ground	
10 Roof/Ceiling - Ambient	
11 Floor slab / Basement ceiling	
14 Temperature zone X	
18 Partition Wall to Neighbour	
<b>Non-thermal</b>	<b>✓</b>

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## Step 2: Surface Assembly Type



The screenshot shows the DesignPH interface. On the left, a 3D model of a house is displayed. A context menu is open over the model, with 'Assign U-value (Face)' selected. On the right, a list of surface assembly types is shown, including 'Un-assigned', '01ud [U=0.19] My New Wall Assembly', '83ud [U=0.15] PH External wall', and various other assemblies like 'PH Roof', 'PH Floor', 'PH Basement wall', etc.

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## Custom Assemblies?



The screenshot shows the 'U-value editor' interface in DesignPH. It displays the assembly name 'My New Wall Assembly' and its ID '01ud'. The interface includes a table of layers and their properties, as well as summary statistics for the assembly.

Layer	Partial surface 1	Lambda value (W/mK)	Partial surface 2 (optional)	Lambda value (W/mK)	Partial surface 3 (optional)	Lambda value (W/mK)	Thickness (mm)
1	Stucco	0.21		0.0		0.0	20.0
2	Insulation	0.04		0.0		0.0	200.0
3	Masonry	2.3		0.0		0.0	200.0
4		0.0		0.0		0.0	0.0
5		0.0		0.0		0.0	0.0
6		0.0		0.0		0.0	0.0
7		0.0		0.0		0.0	0.0
8		0.0		0.0		0.0	0.0

Summary statistics:

- Surface percentage 1: 100.0
- Surface percentage 2: 0.0
- Surface percentage 3: 0.0
- Thickness (cm): 42.0
- U-value (W/m<sup>2</sup>K): 0.187
- Error %: 0.000

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Just like PHPP, build them one layer at a time.



Layer	Partial surface 1	Lambda value (W/mK)
1	Stucco	0.24
2	Insulation	0.04
3	Masonry	2.3
4		0.0

Thickness (mm)
20.0
200.0
200.0
0.0

Thickness (cm): 42.0	<b>U-value (W/m<sup>2</sup>K): 0.187</b>
-------------------------	--

## Constructions and U-Values



designPH main

2.0.06, registered to: ed.may [Unregister 2.0] [Help & Support] [Wiki Manual] [Language: EN]

Overview Results Heat balance Climate Vent.+IHG Areas U-value editor Assemblies Components Shading Export

▼ Assemblies (default)

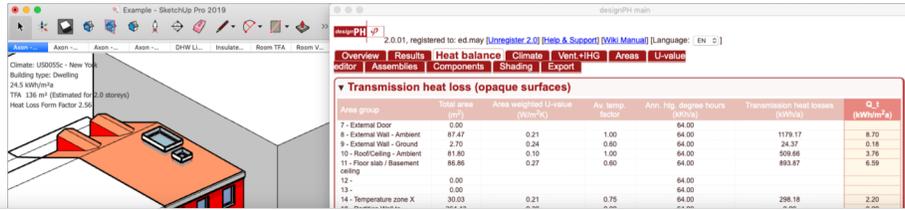
Grp. no.	Area group	Assembly no.	Assembly name	Total thickness (m)	U-value (W/m <sup>2</sup> K)
7	External Door	89ud	Wall 7 - New Dormer	0.21	0.22
8	External Wall - Ambient	83ud	PH External wall	0.42	0.22
9	External Wall - Ground	86ud	Wall 4 - Exg Brick	0.44	0.20
10	Roof/Ceiling - Ambient	84ud	Wall 8 - Cellar	0.45	0.18
11	Floor slab / Basement ceiling	85ud	Wall 3 - Partywall	0.35	0.30
14	Temperature zone X	88ud	Wall 6 - New CMU	0.33	0.24
18	Partition Wall to Neighbour	87ud	Wall 5 - New CMU	0.45	0.20

▼ Assemblies (user-defined)

ID	Assembly name	Total thickness	U-value (W/m <sup>2</sup> K)	Internal insulation?
83ud	PH External wall	0.42	0.218	<input type="checkbox"/>
84ud	Wall 8 - Cellar	0.4478	0.176	<input type="checkbox"/>
85ud	Wall 3 - Partywall	0.346	0.298	<input type="checkbox"/>
86ud	Wall 4 - Exg Brick	0.435	0.2	<input type="checkbox"/>
87ud	Wall 5 - New CMU	0.4506	0.201	<input type="checkbox"/>
88ud	Wall 6 - New CMU	0.3302	0.235	<input type="checkbox"/>
89ud	Wall 7 - New Dormer	0.21265	0.225	<input type="checkbox"/>

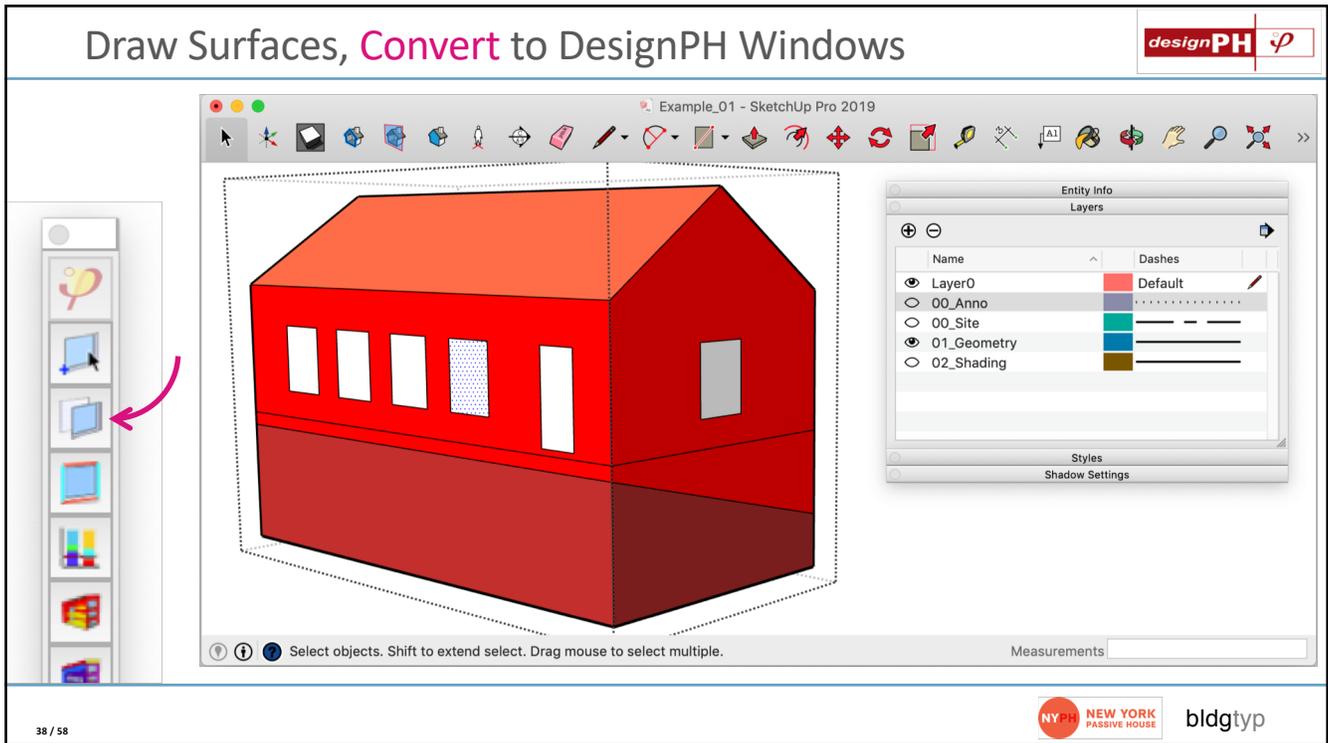
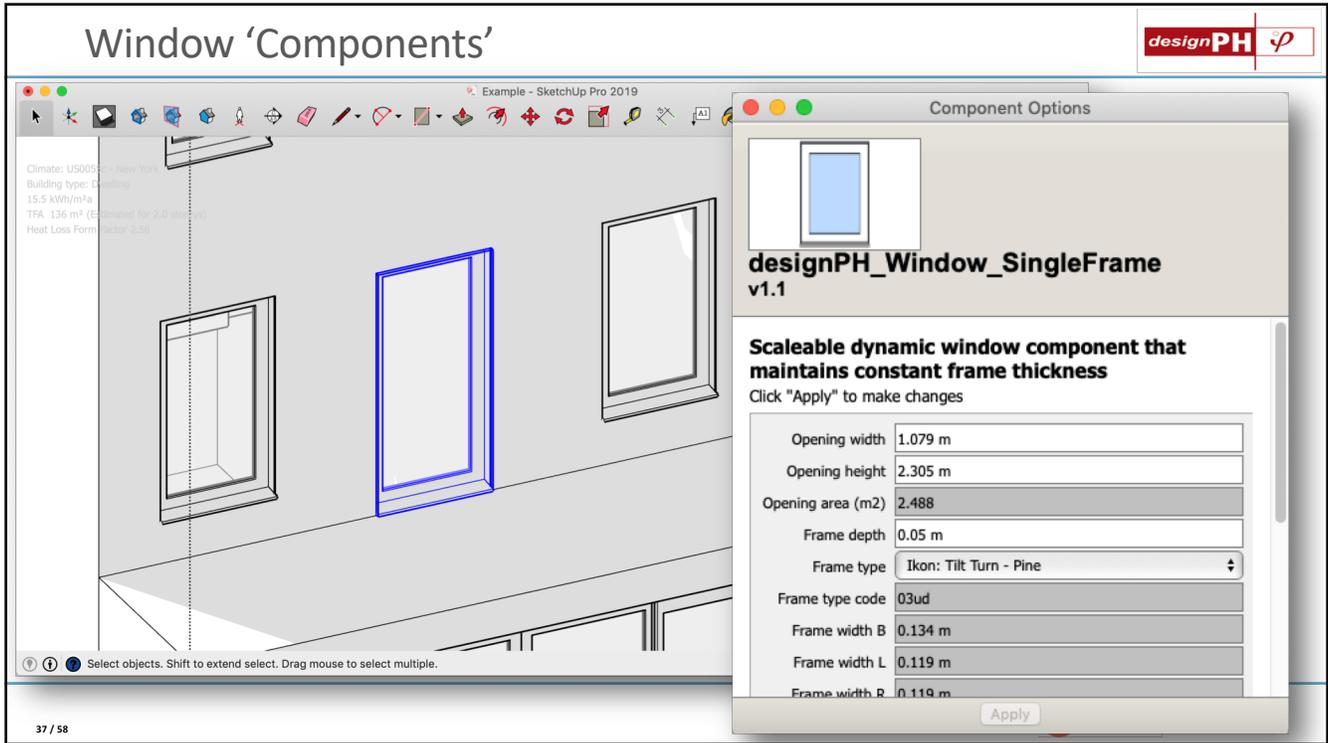
↓ show more... (10 rows hidden) ↓

# Constructions and U-Values



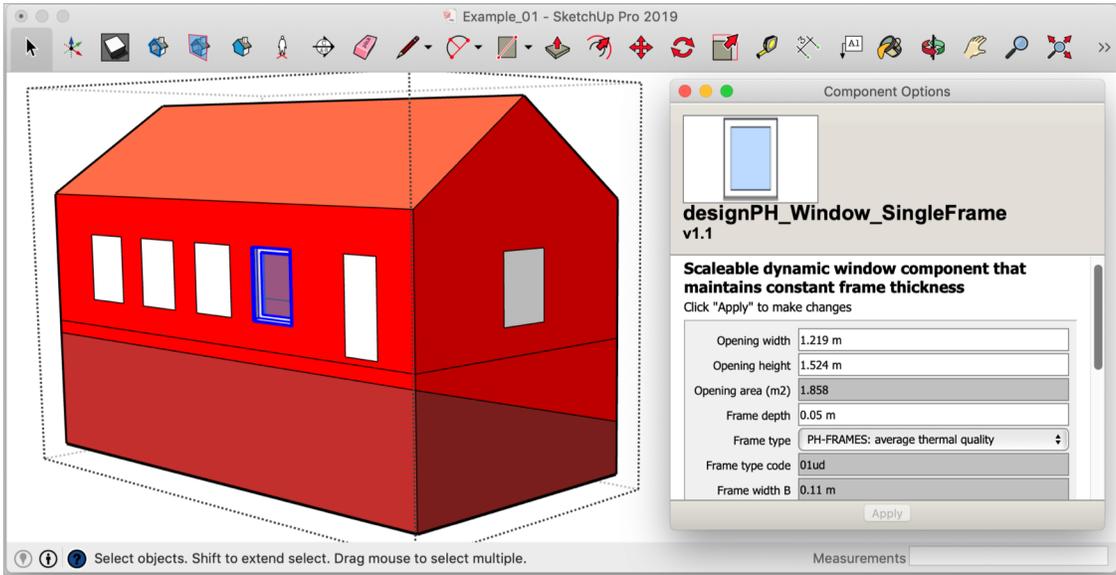
Area group	Total area (m <sup>2</sup> )	Area weighted U-value (W/m <sup>2</sup> K)	Av. temp. factor	Ann. htg. degree hours (kKh/a)	Transmission heat losses (kWh/a)	Q <sub>t</sub> (kWh/m <sup>2</sup> a)
7 - External Door	0.00			64.00		
8 - External Wall - Ambient	87.47	0.21	1.00	64.00	1179.17	8.70
9 - External Wall - Ground	2.70	0.24	0.60	64.00	24.37	0.18
10 - Roof/Ceiling - Ambient	81.80	0.10	1.00	64.00	509.66	3.76
11 - Floor slab / Basement ceiling	86.86	0.27	0.60	64.00	893.87	6.59
12 -	0.00			64.00		
13 -	0.00			64.00		
14 - Temperature zone X	30.03	0.21	0.75	64.00	298.18	2.20
18 - Partition Wall to Neighbour	264.43	0.30	0.00	64.00	0.00	0.00
<b>553.29</b>					<b>2905.25</b>	<b>21.43</b>

# Windows



## Draw Surfaces, Convert to DesignPH Windows





Select objects. Shift to extend select. Drag mouse to select multiple.

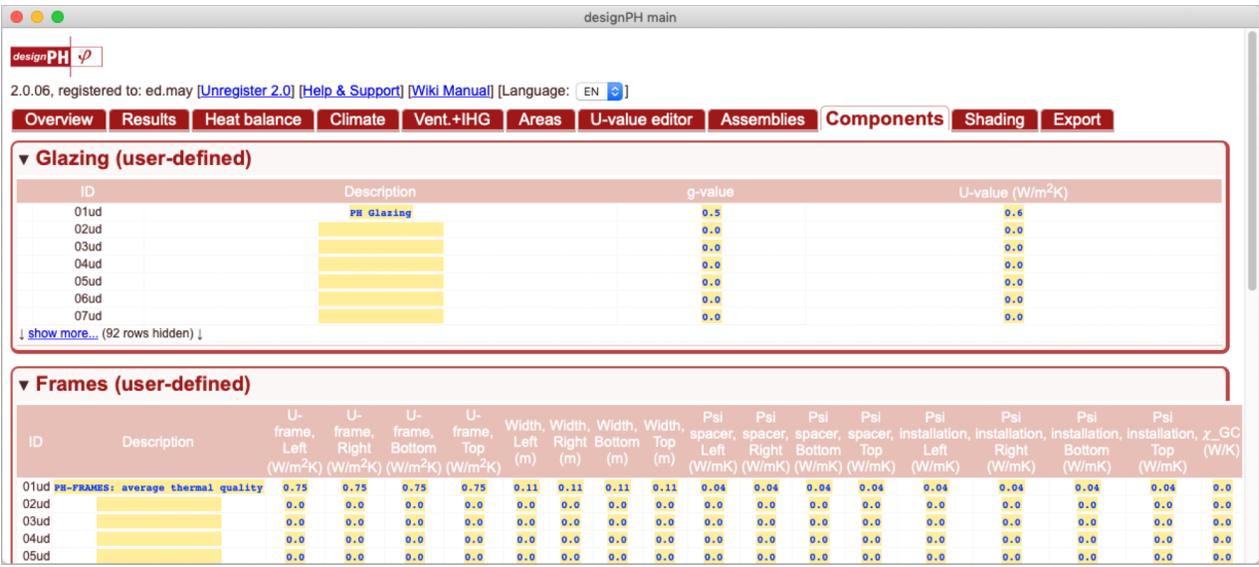
Measurements

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## Window Components: Just like PHPP





2.0.06, registered to: ed.may [[Unregister 2.0](#)] [[Help & Support](#)] [[Wiki Manual](#)] [Language: EN]

Overview Results Heat balance Climate Vent.+IHG Areas U-value editor Assemblies **Components** Shading Export

### ▼ Glazing (user-defined)

ID	Description	g-value	U-value (W/m <sup>2</sup> K)
01ud	PH Glazing	0.5	0.6
02ud		0.0	0.0
03ud		0.0	0.0
04ud		0.0	0.0
05ud		0.0	0.0
06ud		0.0	0.0
07ud		0.0	0.0

[show more...](#) (92 rows hidden)

### ▼ Frames (user-defined)

ID	Description	U-frame, Left (W/m <sup>2</sup> K)	U-frame, Right (W/m <sup>2</sup> K)	U-frame, Bottom (W/m <sup>2</sup> K)	U-frame, Top (W/m <sup>2</sup> K)	Width, Left (m)	Width, Right (m)	Width, Bottom (m)	Width, Top (m)	Psi spacer, Left (W/mK)	Psi spacer, Right (W/mK)	Psi spacer, Bottom (W/mK)	Psi spacer, Top (W/mK)	Psi installation, Left (W/mK)	Psi installation, Right (W/mK)	Psi installation, Bottom (W/mK)	Psi installation, Top (W/mK)	χ_GC (W/K)	
01ud	PH-FRAMES: average thermal quality	0.75	0.75	0.75	0.75	0.11	0.11	0.11	0.11	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.0
02ud		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
03ud		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
04ud		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
05ud		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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# Window Reveal Depth



Example - SketchUp Pro 2019

Component Options

**designPH\_Window\_SingleFrame v1.1**

Scaleable dynamic window component that maintains constant frame thickness

Click "Apply" to make changes

Opening width	1.6 m
Opening height	2.8 m
Opening area (m2)	4.48
Frame depth	0 m
Frame type	Ikon: Tilt Turn - Pine
Frame type code	03ud
Frame width B	0.134 m
Frame width L	0.119 m
Frame width R	0.119 m
Frame width T	0.119 m
Glazing type	Ikon 33.1GLE/16K/4/16K/4GLE
Glazing type code	01ud
Cill	Show
Head reveal	Show
Left reveal	Show
Right reveal	Show
Reveal depth	0.5 m

Select objects. Shift to extend select. Drag mouse to select multiple.

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# Window Mullions



Example - SketchUp Pro 2019

Component Options

No Components Selected

Select one or more components to view their options.

Select objects. Shift to extend select. Drag mouse to select multiple.

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# Window Mullions

designPH

Example - SketchUp Pro 2019

Component Options

**designPH\_Window\_SingleFrame v1.1**

Scaleable dynamic window component that maintains constant frame thickness

Click "Apply" to make changes

Opening width	1.6 m
Opening height	2.8 m
Opening area (m2)	4.48
Frame depth	0 m
Frame type	Ikon: Tilt Turn - Pine
Frame type code	03ud
Frame width B	0.134 m
Frame width L	0.119 m
Frame width R	0.119 m
Frame width T	0.119 m
Glazing type	Ikon 33.1GLE/16Kr/4/16Kr/4GLE
Glazing type code	01ud
Cill	Show
Head reveal	Show
Left reveal	Show
Right reveal	Show
Reveal depth	0.2 m

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# Window Mullions

designPH

Example - SketchUp Pro 2019

Component Options

**designPH\_Window\_SingleFrame v1.1**

Scaleable dynamic window component that maintains constant frame thickness

Click "Apply" to make changes

Opening width	1.6 m
Opening height	2.8 m
Opening area (m2)	4.48
Frame depth	0 m
Frame type	Ikon: Tilt Turn - Pine
Frame type code	03ud
Frame width B	0.134 m
Frame width L	0.119 m
Frame width R	0.119 m
Frame width T	0.119 m
Glazing type	Ikon 33.1GLE/16Kr/4/16Kr/4GLE
Glazing type code	01ud
Cill	Show
Head reveal	Show
Left reveal	Hidden
Right reveal	Show
Reveal depth	0.2 m

Select objects. Shift to extend select. Drag mouse to select multiple.

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# Window Mullions



The screenshot shows a window mullion installation table with columns for 'left', 'right', 'bottom', 'top', and ' $\Psi_{Installation}$  (Avg.)'. The table is overlaid on a SketchUp window. A pink arrow points to the first two rows of the table. The table data is as follows:

	left	right	bottom	top	$\Psi_{Installation}$ (Avg.)
	0	0	1	1	0.000
	0	0	1	1	0.000
	1	0	1	1	0.000
	0	1	1	1	0.000
	1	1	1	1	0.053
	1	1	1	1	0.054

The table also includes a header for 'Installation situation' and a note: 'user determined value for  $\Psi_{Installation}$  or '1':  $\Psi_{Installation}$  from 'Components' worksheet '0': in the case of abutting windows'. The table also has a column for 'W/(mK) or 1/0' and a column for 'W/(mK)'. The 'W/(mK) or 1/0' column has values 0, 0, 1, 1, 1, 1, 1. The 'W/(mK)' column has values 0.000, 0.000, 0.000, 0.000, 0.053, 0.054.

# Exporting

### 3) Simulate

Entity Info

Name	Dashes
Layer0	Default
00_Anno	.....
00_Site	----
01_Geometry	----
02_Shading	----

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### 3) Simulate

designPH main

designPH 2.0.06, registered to: ed.may [Unregister 2.0] [Help & Support] [Wiki Manual] [Language: EN]

Overview Results Heat balance Climate Vent.+IHG Areas U-value editor Assemblies Components Shading Export

#### Heat balance

Category	Value (kWh/m²a)
Transmission heat loss (opaque surfaces)	47.4
Transmission heat loss (thermal bridges)	11.4
Ventilation heat losses	8.5
Transmission heat loss (windows)	0.1
Non-useful heat gains	43.0
Specific ann. heat demand	13.7
Internal heat gains	10.8
Solar heat gains	15.0
<b>Total Losses</b>	<b>67.4</b>
<b>Total Gains</b>	<b>58.0</b>
<b>Net</b>	<b>-9.4</b>

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## 5) Create a NEW blank PHPP file to import into



Area no.	Building assembly description	To group No.	Assigned to group	Quantity	x ( a [m])	x ( b [m])	+	User determined [m <sup>2</sup> ]	-	User subtraction [m <sup>2</sup> ]
	Projected building footprint	0	Projected building footprint	x (	x		+		-	
	Treated floor area	1	Treated floor area	x (	x		+		-	
	Exterior door	7	Exterior door	x (	x		+		-	
1				x (	x		+		-	
2				x (	x		+		-	
3				x (	x		+		-	
4				x (	x		+		-	
5				x (	x		+		-	
6				x (	x		+		-	
7				x (	x		+		-	
8				x (	x		+		-	

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## 5) Open your 'PHPP\_V9.6a\_EN\_Tools.xlsm' File

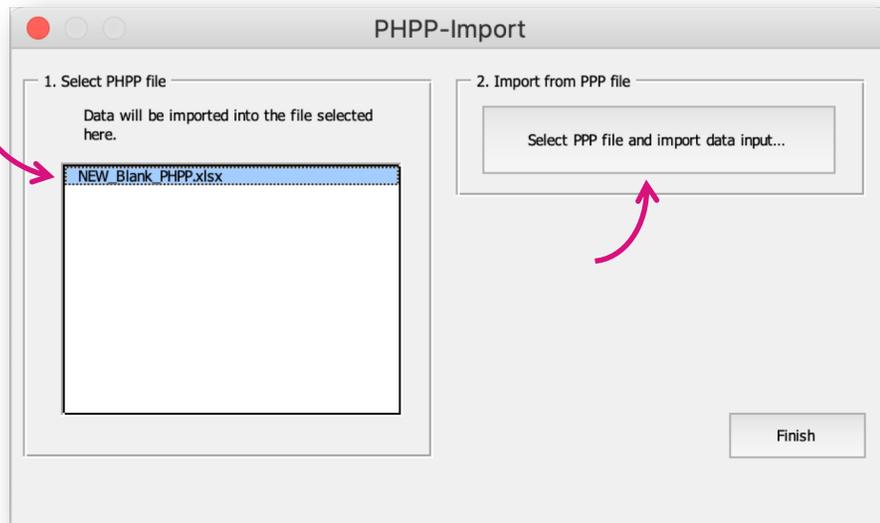
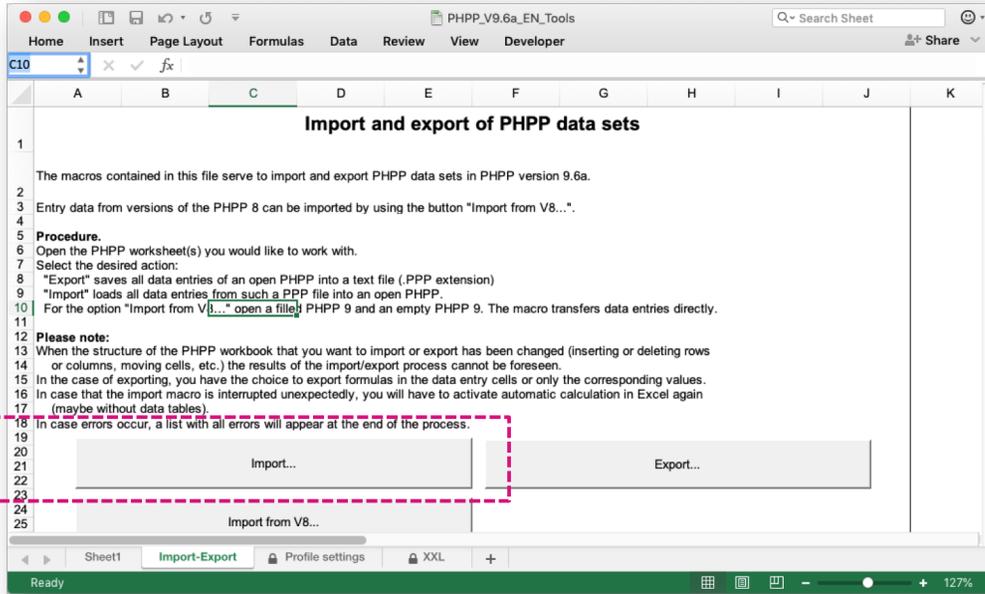


Name	Date Modified	Size	Kind
01_PHPP	Today at 3:34 PM	--	Folder
02_PHPP_Variants	Mar 3, 2018 at 3:42 PM	--	Folder
03_PHeco	Nov 24, 2018 at 3:24 PM	--	Folder
04_PHPP_Tools	Sep 7, 2019 at 12:53 PM	--	Folder
Final_protocol_worksheet_manual.pdf	Jul 9, 2016 at 10:13 PM	17 KB	Adobe PDF document
Final_Protocol_Worksheets_Ventilation.xls	Dec 1, 2018 at 9:11 AM	44 KB	Microsoft Excel 3...ksheet stationery
<b>PHPP_V9.6a_EN_Tools.xlsm</b>	Jun 20, 2017 at 9:28 AM	271 KB	Microsoft Excel...Workbook (.xlsm)
05_ERP	Dec 1, 2018 at 4:38 PM	--	Folder
PHPP 9.6a.zip	Jul 22, 2016 at 10:11 AM	32.1 MB	ZIP archive
PHPP_ComponentsPHPP9_201902_DE_EN.xlsm	Feb 28, 2019 at 2:41 PM	1.3 MB	Microsoft Excel...Workbook (.xlsm)
PHPP9_Intro_EN_2016.pdf	Jul 6, 2016 at 10:22 AM	241 KB	Adobe PDF document
README_PHPP_EN_9.6a.txt	Jul 9, 2016 at 10:12 PM	4 KB	Plain Text Document

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## 5) Click 'Import'



Note: be sure BOTH your new Blank PHPP AND the 'Tools' files are open at the same time for this to work.

## 6) We now have a filled-in PHPP file. Save it.



Area no.	Building assembly description	To group No.	Assigned to group	Quantity	x (	a [m]	x	b [m]	+	User determined [m <sup>2</sup> ]	-	User subtraction [m <sup>2</sup> ]	-
	Projected building footprint	0	Projected building footprint		x (		x		+	0.00	-		)
	Treated floor area	1	Treated floor area	1	x (		x		+	135.56	-		)
	Exterior door	7	Exterior door		x (		x		+		-		)
1	Floor_001_D	11	Floor slab / Basement ceiling	1	x (	6.50	x	1.83	+		-		)
2	Floor_002_D	11	Floor slab / Basement ceiling	1	x (	6.50	x	3.41	+		-		)
3	Floor_003_D	11	Floor slab / Basement ceiling	1	x (	6.68	x	6.50	+		-		)
4	_004_W	11	Floor slab / Basement ceiling	1	x (	6.50	x	0.45	+		-		)
5	Floor_005_D	11	Floor slab / Basement ceiling	1	x (	6.50	x	1.00	+		-		)
6	Wall_006_S	9	External wall - Ground	1	x (	1.83	x	1.47	+		-		)
7	Surface_007_W	14	0	1	x (	2.32	x	1.56	+		-		)
8	Surface_008_W	14	0	1	x (	4.94	x	2.32	+		-		)
9	Surface_009_H	14	0	1	x (	2.30	x	1.62	+		-		)

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## Things to consider...



- The 'link' between the PHPP and DesignPH is **not** 'live'. It's a one-way export from DesignPH into the PHPP.
- If you change something in PHPP, it does **not** change in the DesignPH model.
- It may (often) be easier to experiment with building variants in PHPP rather than DesignPH.
- You'll still have many inputs that need to be completed in the PHPP after import (DHW, Cooling, PER, Variants, etc...)

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## Things to consider...



- DesignPH simulation results preview in Sketchup are approximate only. PHPP is the more accurate.
- DesignPH doesn't give any preview results for cooling or Primary Energy
- DesignPH has no inputs for DHW, appliances, etc...
- DesignPH has no inputs for Non-Residential
- DesignPH is an EXPORTER. Not a replacement for the PHPP

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Questions?



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