DesignPH – 06: Windows 1

Webinar. September 22, 2020

NYPH NEW YORK PASSIVE HOUSE

bldgtyp

designPH

Ed May I Partner, Building-Type, LLC

(architect, passive house consultant, teacher)

DESIGNER CERTIFIED PASSIVE HOUSE DESIGNER · CPHC · LEED GREEN ASSOCIATE · PASSIVEHOUSE CANADA · naphn North American Passive House Network · NYPH NEW YORK PASSIVE HOUSE · PHA Passive House Academy · STEVENS INSTITUTE OF TECHNOLOGY · PARSONS

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NYPH 2020 Technical Workshops

May 19th

June 2nd

June 16th

June 30th

July 21st

Sept 22nd

TBD…

DesignPH | SketchUp | PHPP | Ventilation

DesignPH 2.0 A Powerful Tool	NYPH Members	General Admission	PHI CEUs
MODULE 01 | BASIC | FOR EVERYONE			
01_Workflow: Modeling, Required Tools	Free	$ 15	1.0 EC
02_Solar: Location, Orientation, Axes, Shadow	Free	$ 15	1.0 EC
MODULE 02 | ADVANCED | FOR PASSIVE HOUSE DESIGNERS			
03_Face Assignments: Exposure Type, U-Values, Creating Assemblies	Free	$ 15	TBD
04_Face Assignments: Below Grade, Shading Context, Non-Thermal Faces	Free	$ 15	TBD
05_Assignments: Thermal Bridge, TFA Surface	Free	$ 15	TBD
06_Window: Modeling, Components, Mullions and Reveals	Free	$ 15	TBD
07_Window: Editing and Adjusting, Curtain Walls, Shading	Free	$ 15	TBD
MODULE 03 | PROFESSIONAL | FOR ENERGY MODELERS			
08_Analysis: Run Simulations, Results Tracker	TBD	$ 15	TBD
09_Shading: Analyzing Window Radiation, Trees and Irregular Shading	TBD	$ 15	TBD
10_PHPP: Exporting .PPP File, Importing .PPP File, Finish off the model in PHPP	TBD	$ 15	TBD

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Agenda [1 hour]

- Window Modeling & Geometry
- Window Components
- Window Reveals, Details

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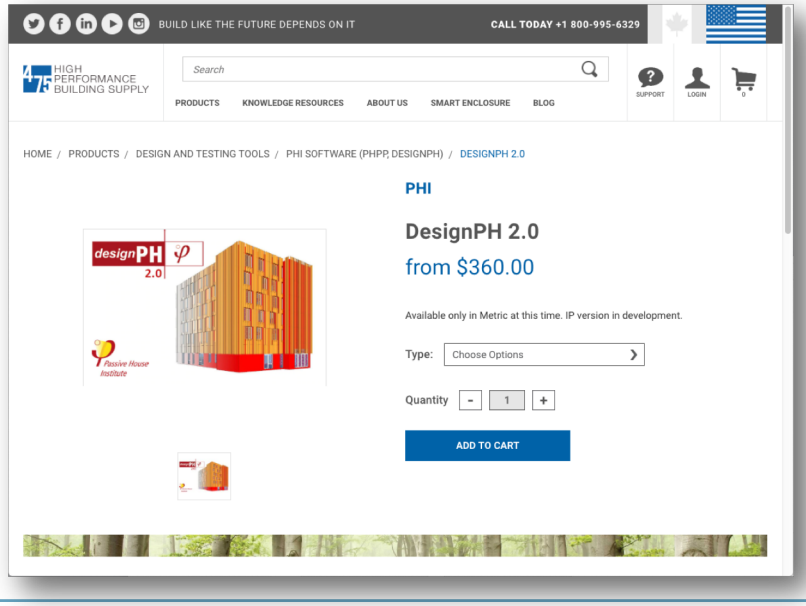
DesignPH Review

Requirements

What you'll need:

- A copy of the DesignPH 2.0 plugin
- Sketchup 3-D modeling software
- A copy of the PHPP v.8 or 9 (and Excel)

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



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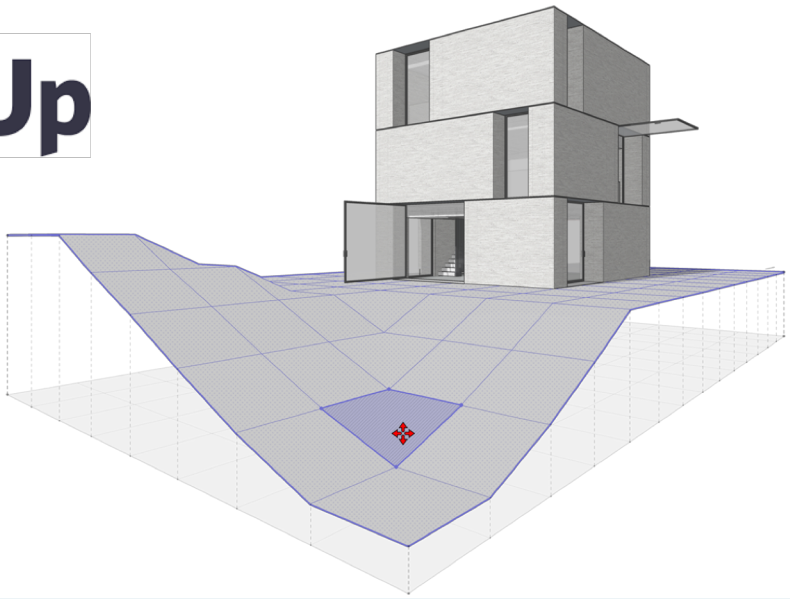
Sketchup



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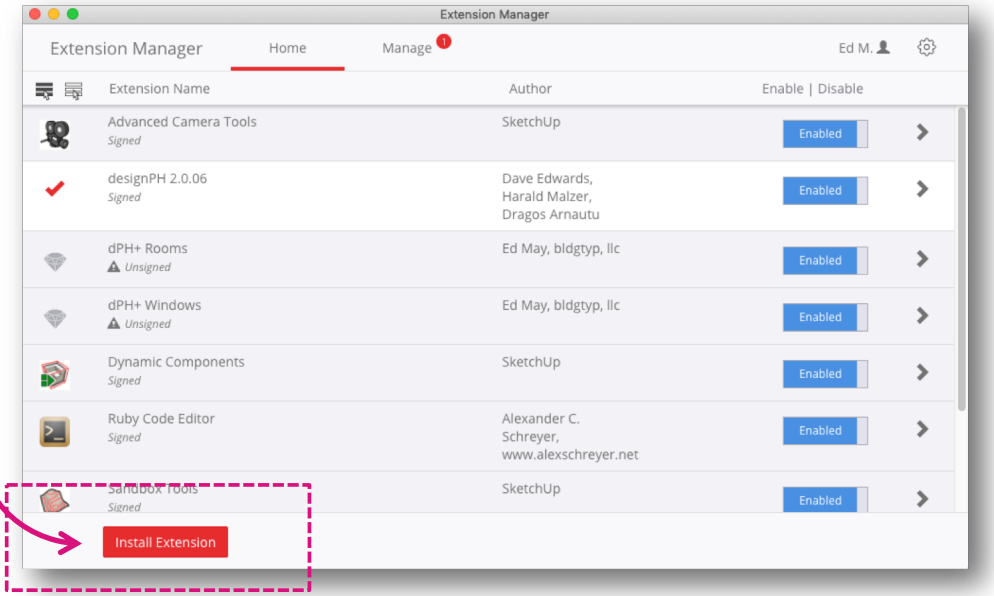
Sketchup Extensions Manager



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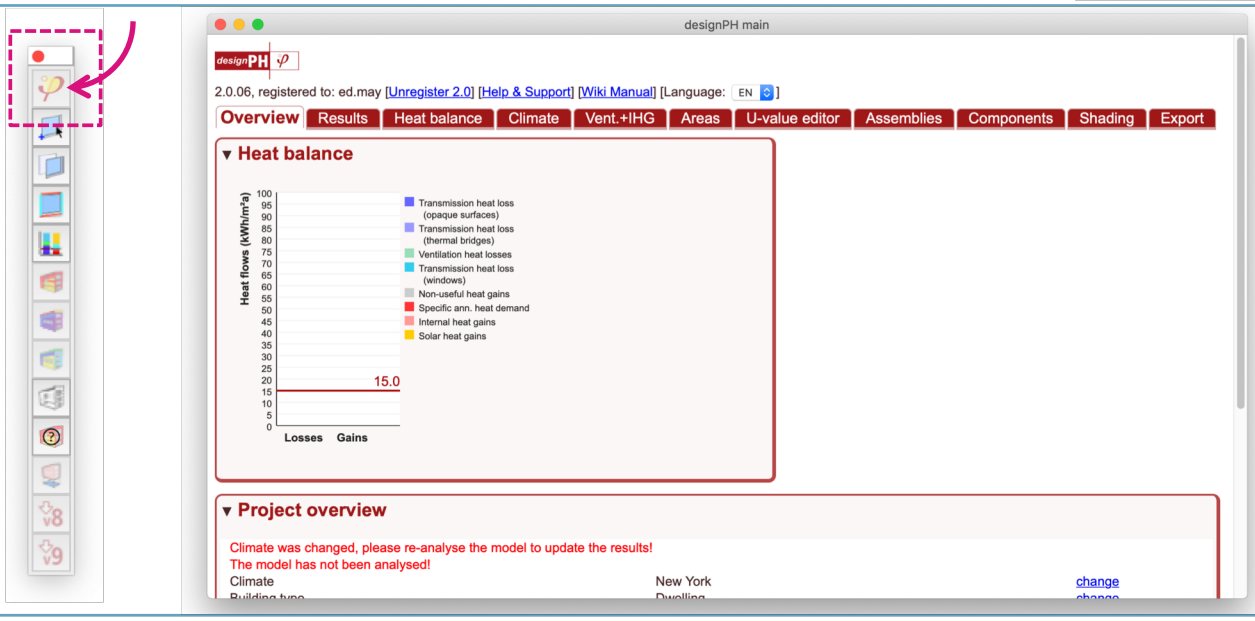
Start DesignPH Plugin [Each time you run Sketchup]



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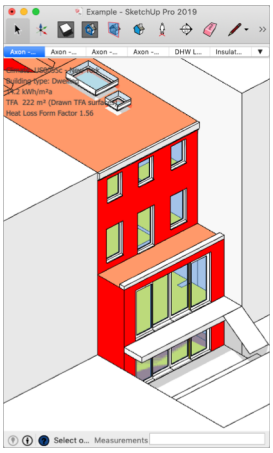
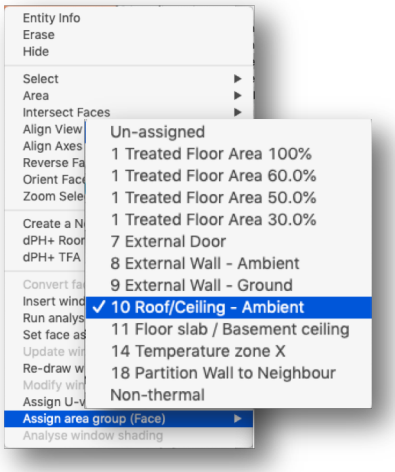
DesignPH Workflow

1) Model Geometry



2) Tag Model Geometry w/ Data



3) Analyze

4) Export

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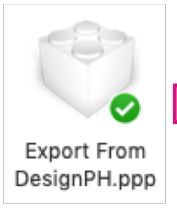
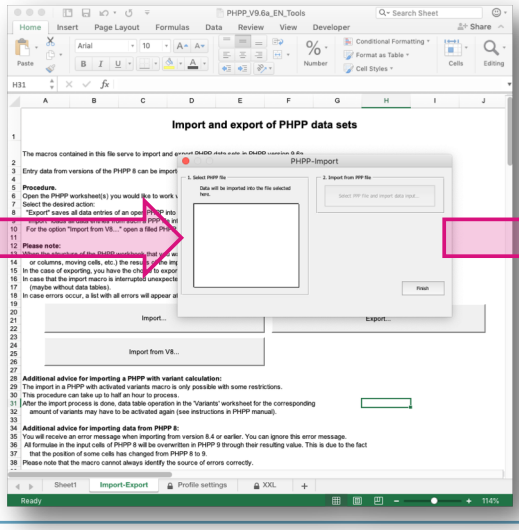
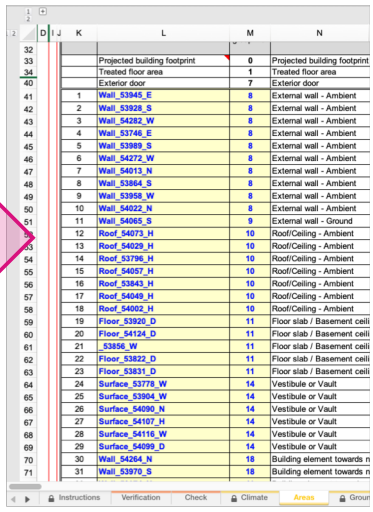
DesignPH Workflow

5) Import





6) Complete the PHPP



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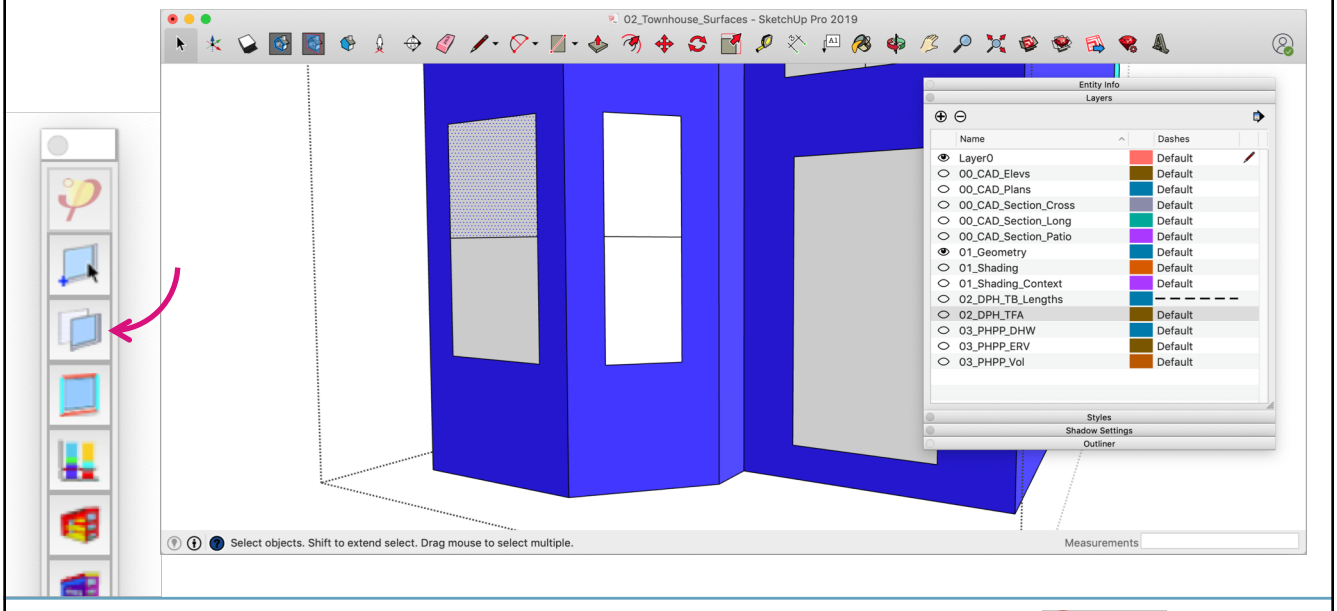
Window Modeling

Windows are ‘Built’, not Drawn

designPH



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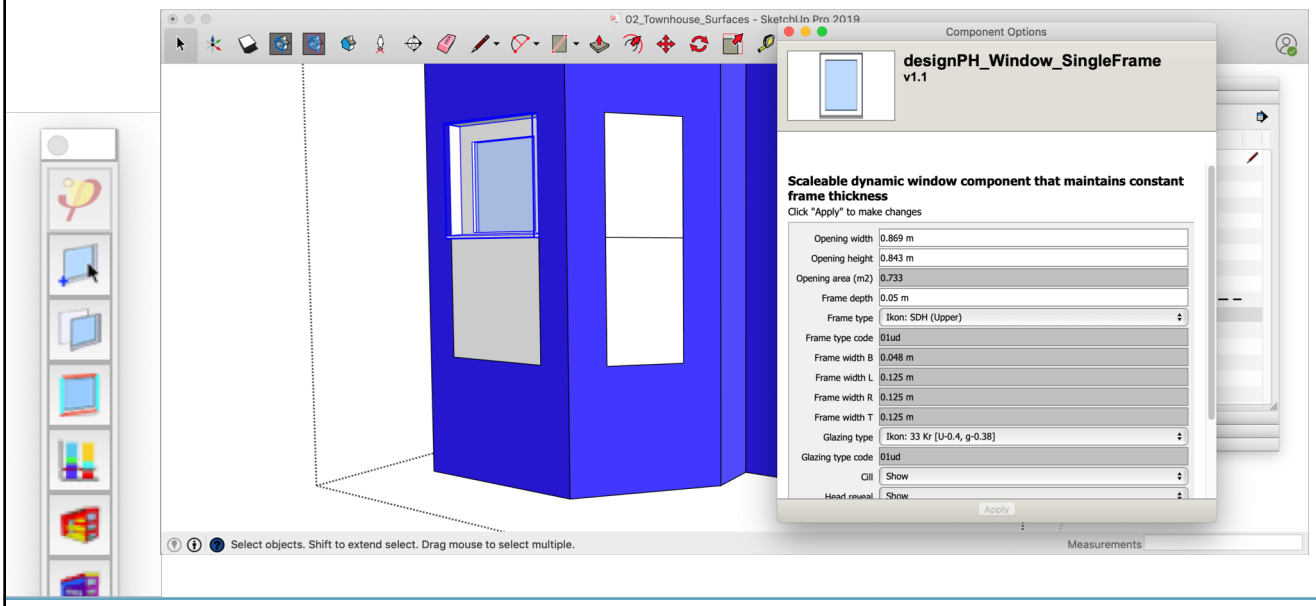
Windows are Sketchup ‘Components’



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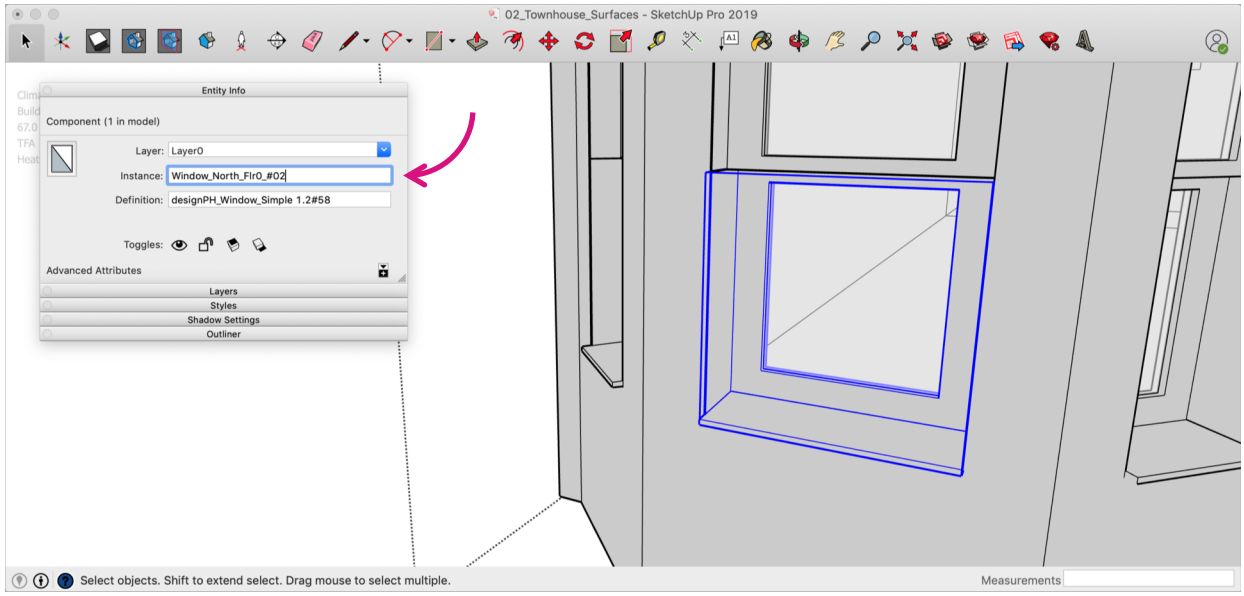
Window Naming



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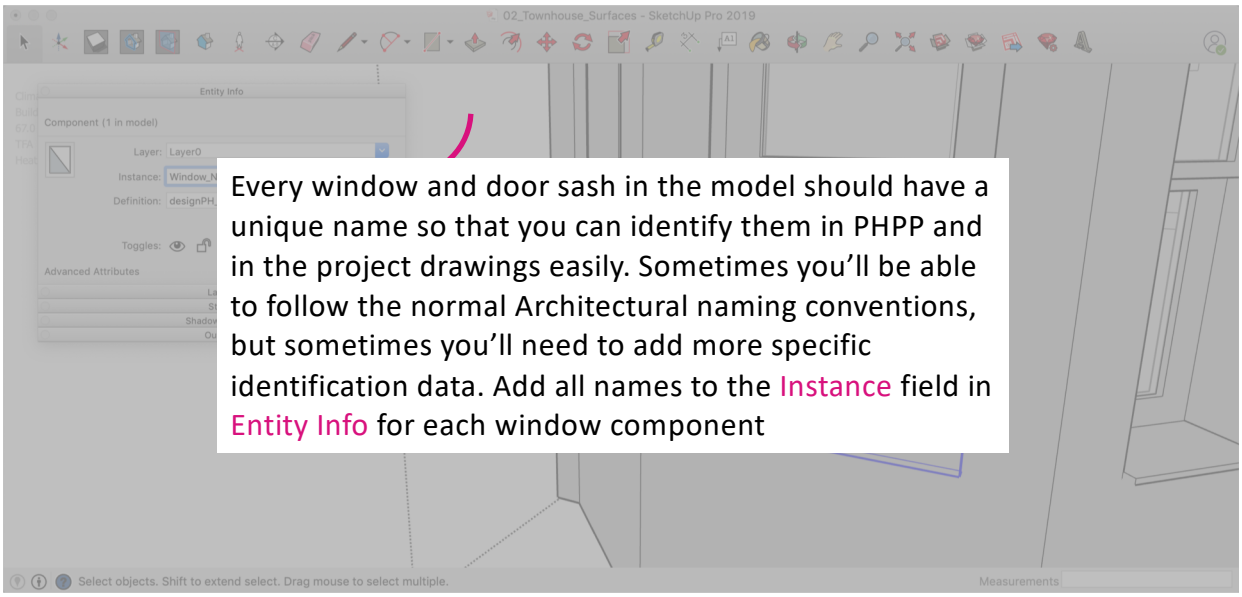
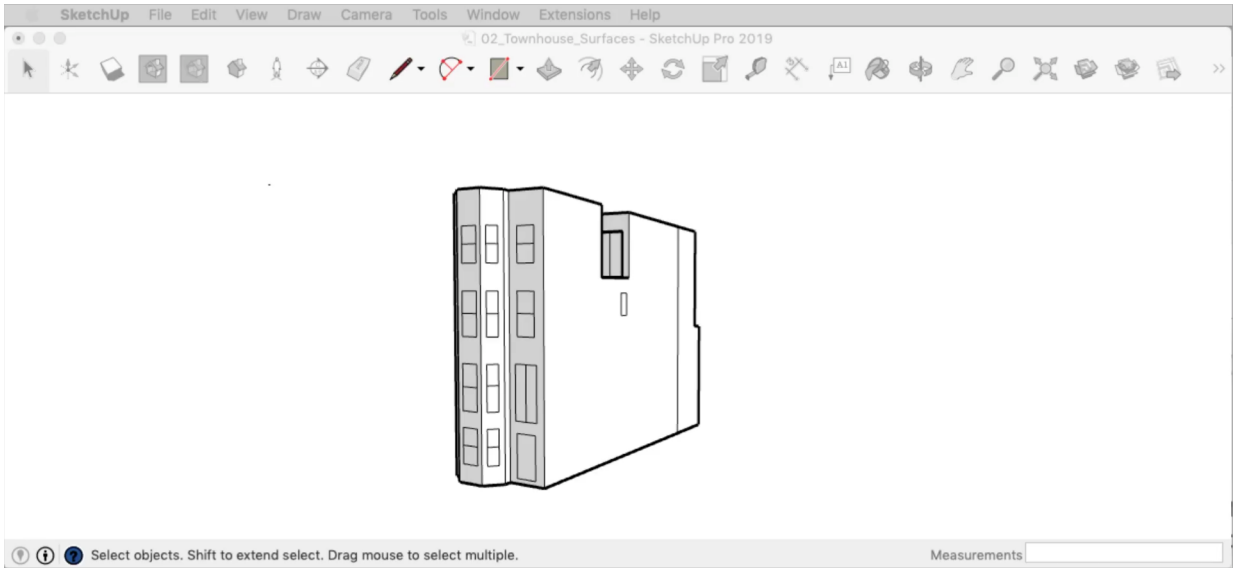
Window Naming

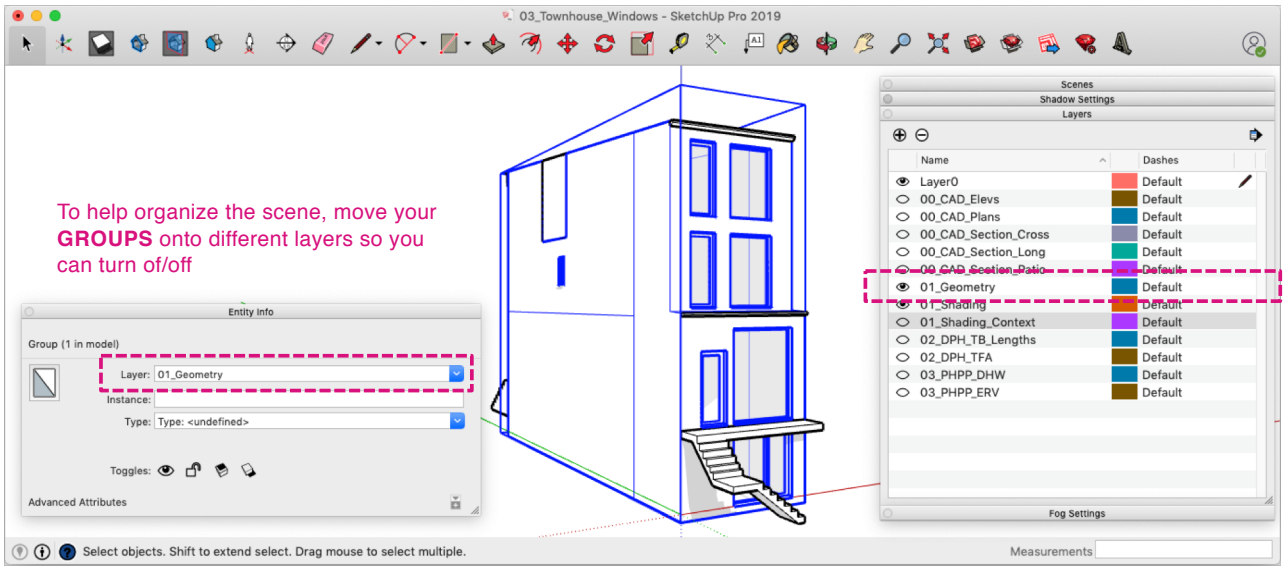


Every window and door sash in the model should have a unique name so that you can identify them in PHPP and in the project drawings easily. Sometimes you'll be able to follow the normal Architectural naming conventions, but sometimes you'll need to add more specific identification data. Add all names to the Instance field in Entity Info for each window component

Window Naming



Best Practice: Layers



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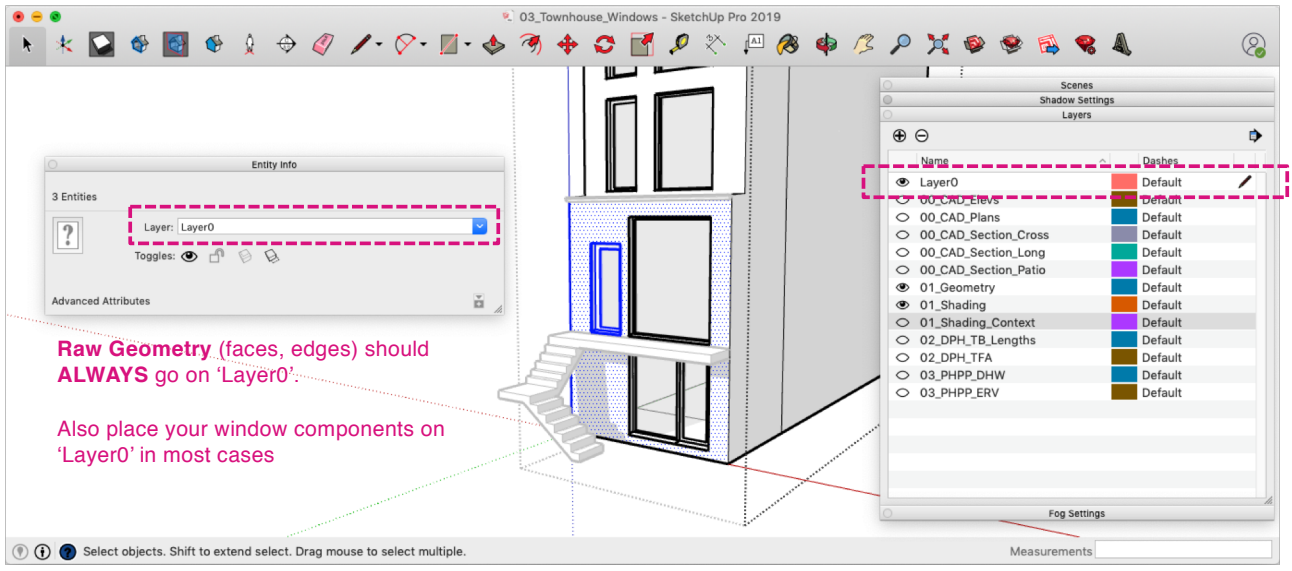
Best Practice: Layers



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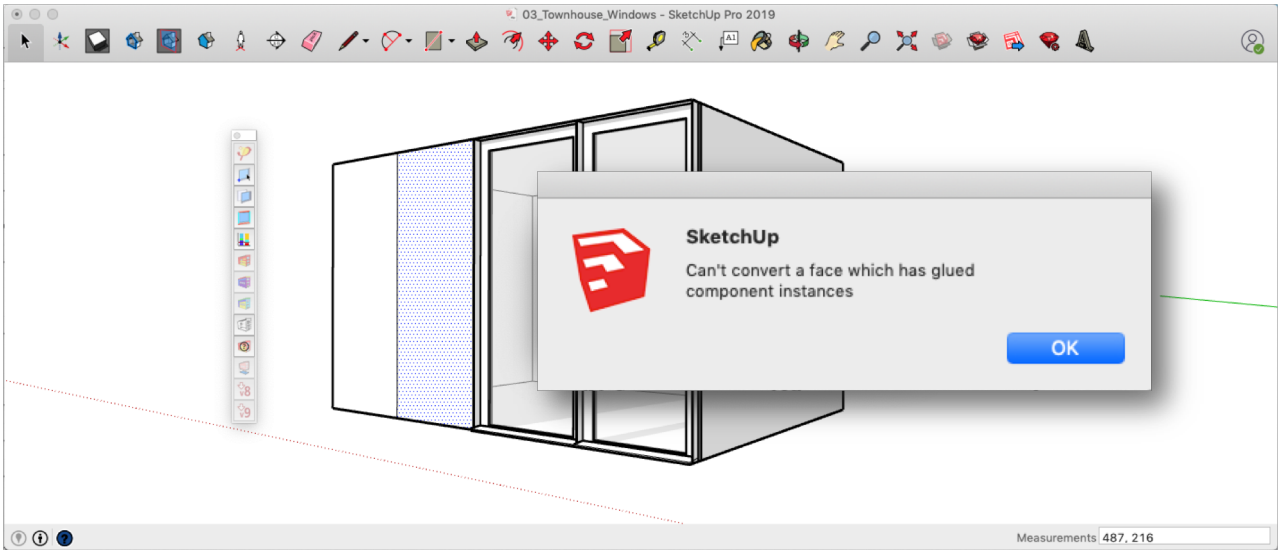
Best Practice: Window Walls



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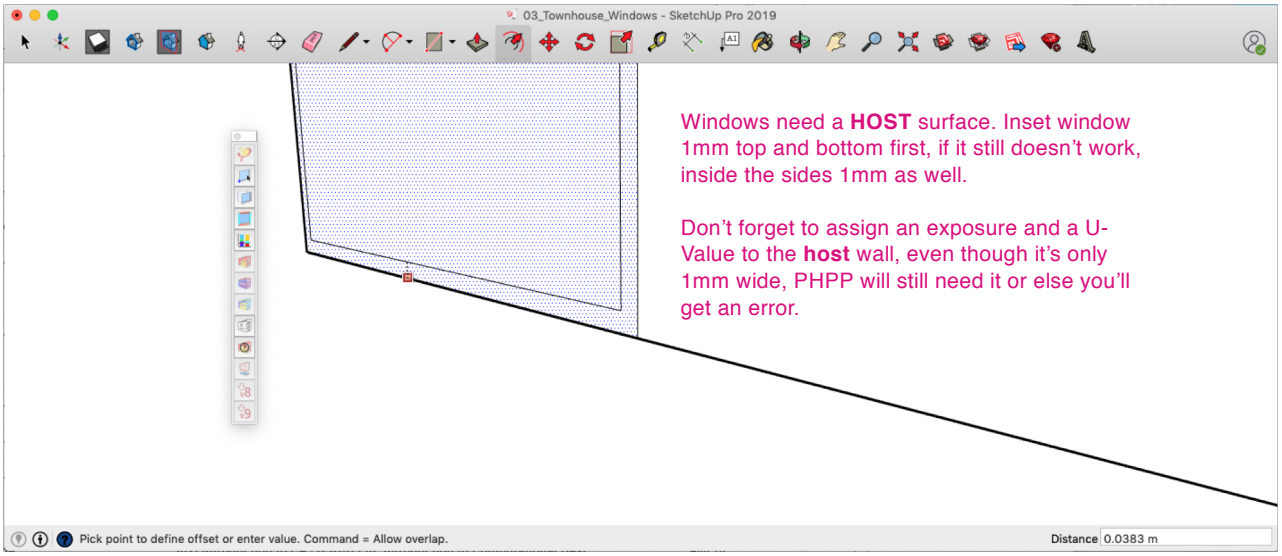
Best Practice: Window Walls



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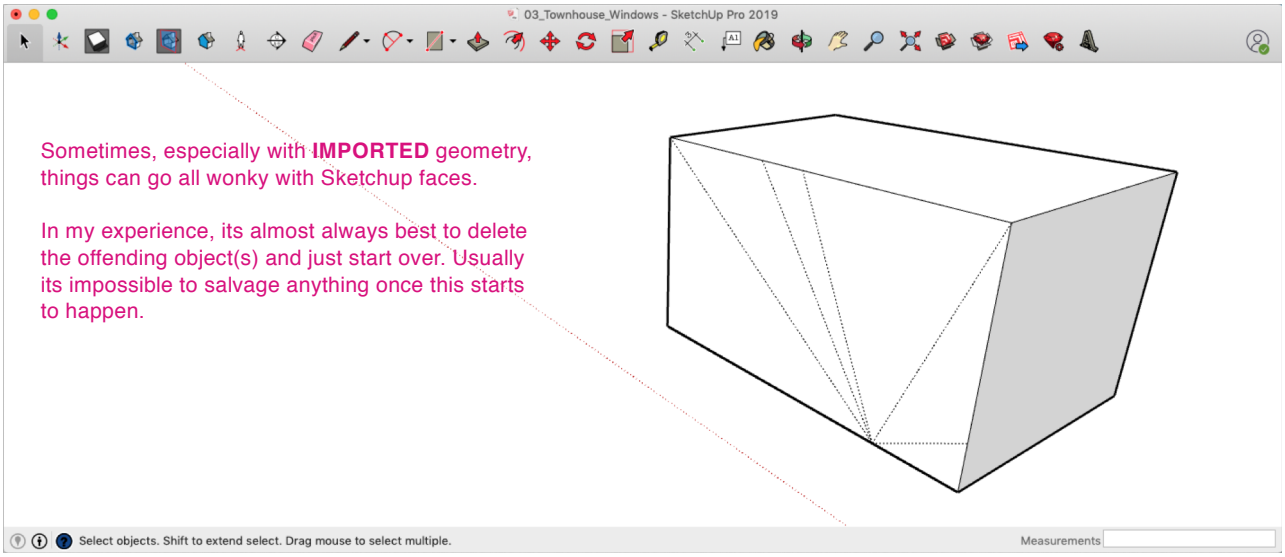
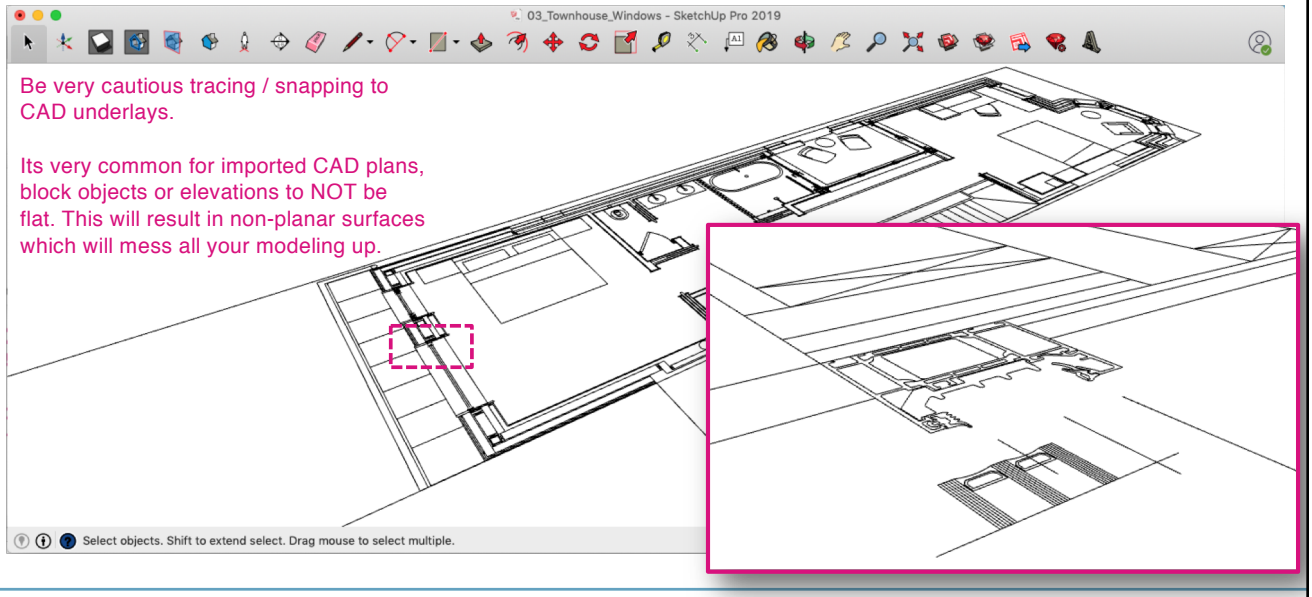
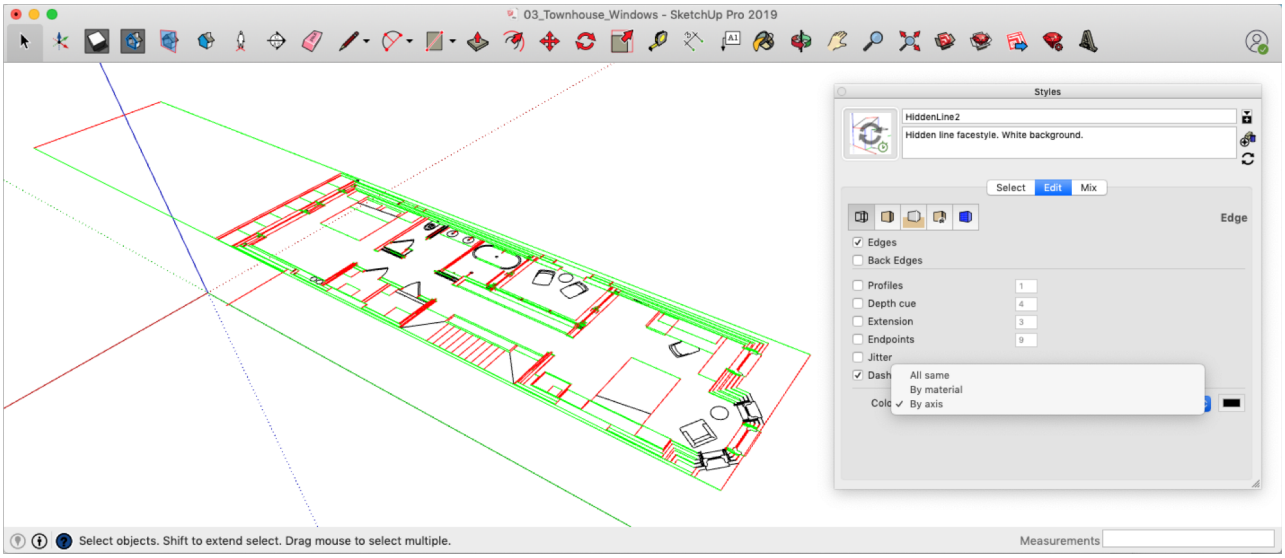
Best Practice: Facets



Best Practice: Be Careful Tracing



Best Practice: Use ‘By Axis’ to Check Underlays



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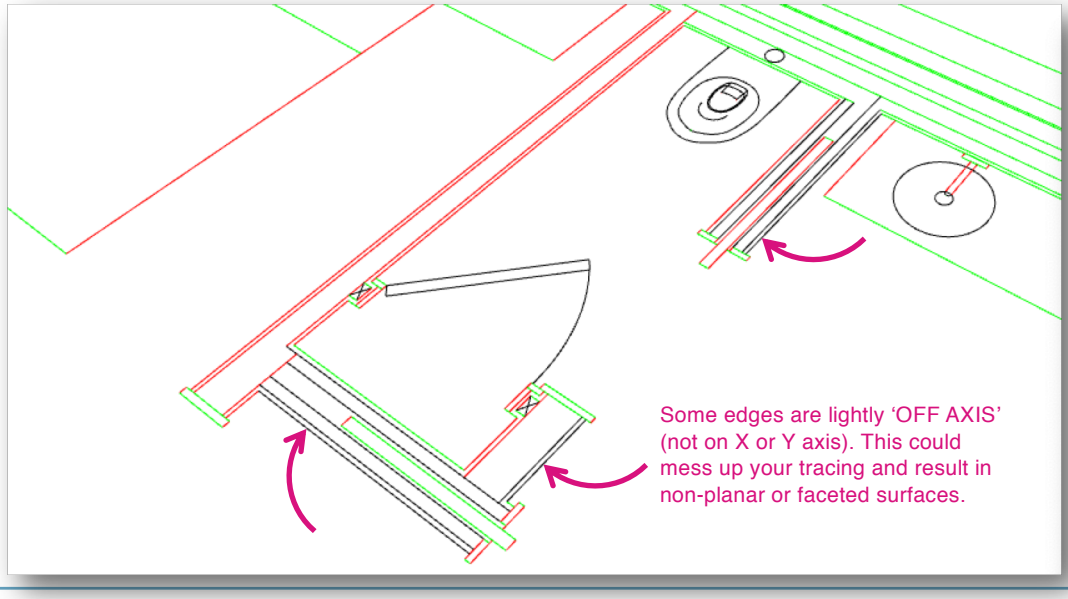
Best Practice: Use ‘By Axis’ to Check Underlays



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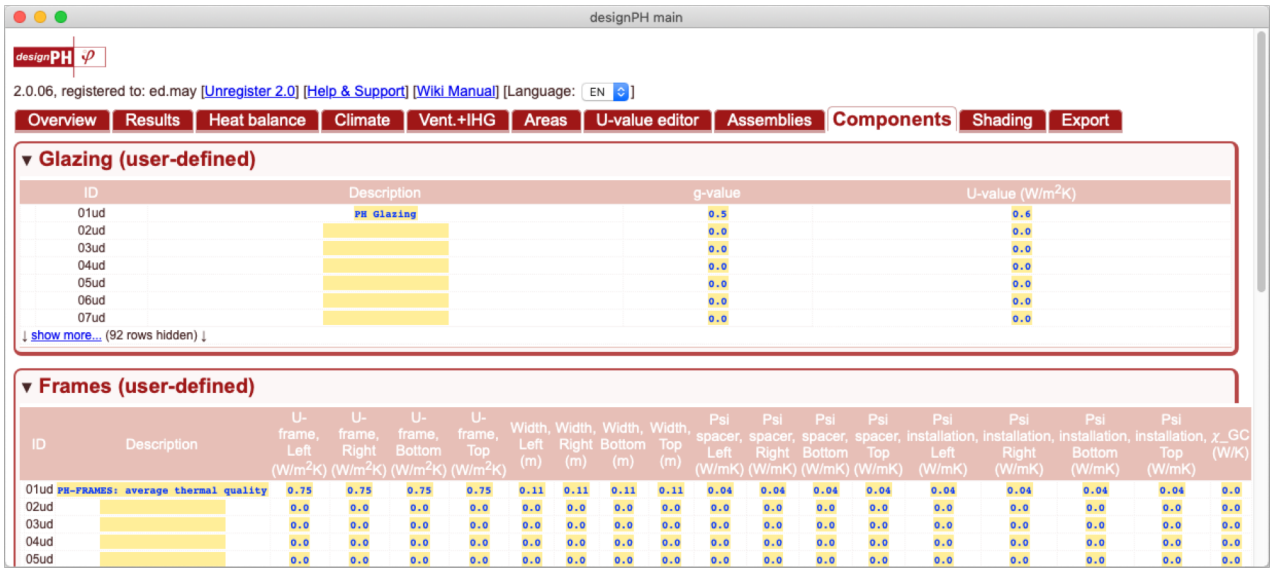
Window Components

Window Components: Just like PHPP



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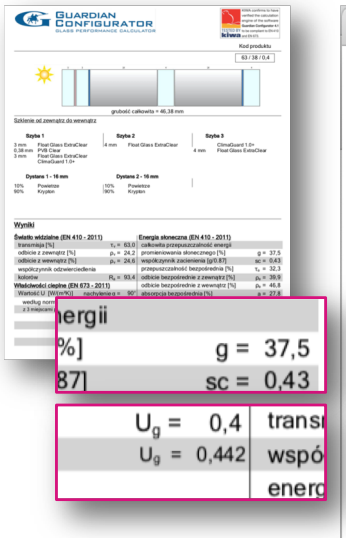
Glazing



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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/m²K)
01ud	Ikon: 33 Kr [U-0.4, g-0.38]	0.38	0.4
02ud	Ikon: Solid Door	0.0	1.5
03ud	Lamilux Glazing	0.35	0.86
04ud	Ikon: 48mm Ar [U-0.5, g-0.5]	0.5	0.5
05ud		0.37	0.5
06ud		0.5	0.6
07ud		0.0	0.0

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▶ Frames (user-defined)

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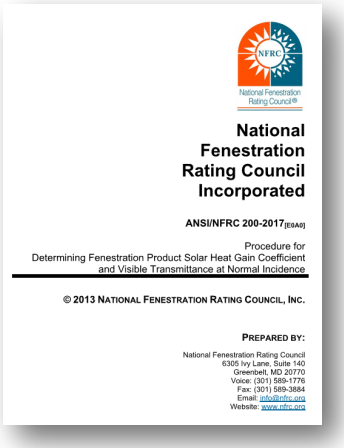
SHGC or g-Value?

NRFC 200


National Fenestration Rating Council

National Fenestration Rating Council Incorporated

ANSI/NFRC 200-2017[E0A0]

Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

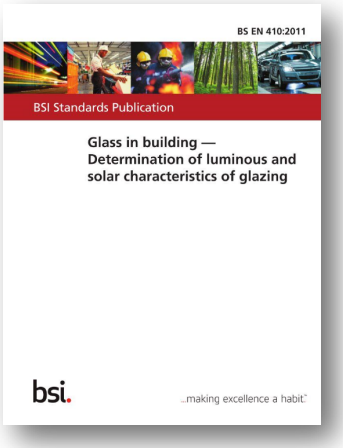
© 2013 National Fenestration Rating Council, Inc.

Prepared by:

National Fenestration Rating Council
6305 Ivy Lane, Suite 140
Greenbelt, MD 20770
Voice: (301) 589-1776
Fax: (301) 589-3884
Email: info@nfrc.org
Website: www.nfrc.org

INCLUDES the effect of the frame

EN410


BS EN 410:2011

BSI Standards Publication

Glass in building — Determination of luminous and solar characteristics of glazing

bsi.

..making excellence a habit.

Only the glass itself (COG)

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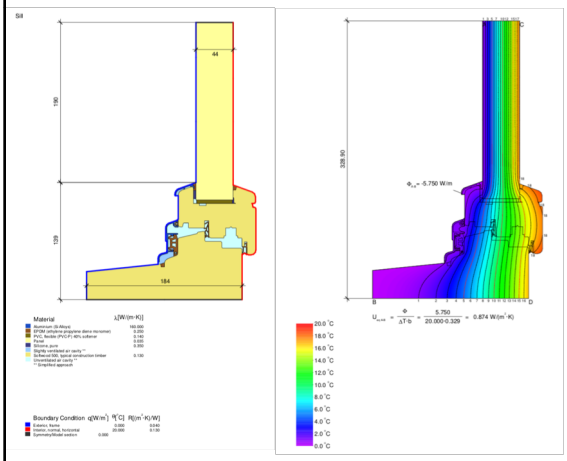
Frames

$$U_{eqA\text{-}B} = \frac{\Phi}{\Delta T \cdot b} = \frac{5.238}{20.000 \cdot 0.317} = 0.826\ W/(m^2 \cdot K)$$



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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)

▾ Frames (user-defined)

ID	Description	U-frame, Left (W/m²K)	U-frame, Right (W/m²K)	U-frame, Bottom (W/m²K)	U-frame, Top (W/m²K)	Width, Left (m)	Width, Right (m)	Width, Bottom (m)	Width, Top (m)
01ud	Ikon: SDH (Upper)	0.99	0.99	2.0	0.99	0.125	0.125	0.048	0.125
02ud	Ikon: SDH (Lower)	0.99	0.99	1.1	2.0	0.118	0.118	0.137	0.048
03ud	Ikon: French Door (Right)	1.07	0.93	1.18	1.07	0.067	0.119	0.134	0.119
04ud	Ikon: French Door (Left)	0.93	1.07	1.18	1.07	0.119	0.067	0.134	0.119
05ud	Ikon: Solid Door	1.5	1.5	1.5	1.5	0.1	0.1	0.1	0.1
06ud		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
07ud	Lamilux	0.61	0.61	0.61	0.61	0.116	0.116	0.116	0.116

↓ show more... (92 rows hidden) ↓

▸ Glazing (certified components)

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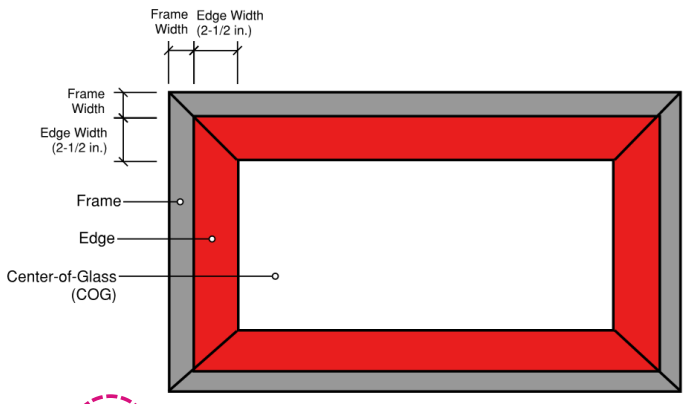
NFRC 100 Testing



$$U_{Effective} = \frac{(U_{Frame} \times Area_{Frame}) + (U_{Edge} \times Area_{Edge}) + (U_{COG} \times Area_{COG})}{Area_{Total}}$$

National Fenestration Rating Council®

National Fenestration Rating Council Incorporated

ANSI/NFRC 100-2017[E0A1]

Procedure for Determining Fenestration Product U-factors

© 2013 NATIONAL FENESTRATION RATING COUNCIL, INC.

PREPARED BY:

National Fenestration Rating Council
6305 Ivy Lane, Suite 140
Greenbelt, MD 20770
Voice: (301) 589-1776
Fax: (301) 589-3884
Email: info@nfrc.org
Website: www.nfrc.org

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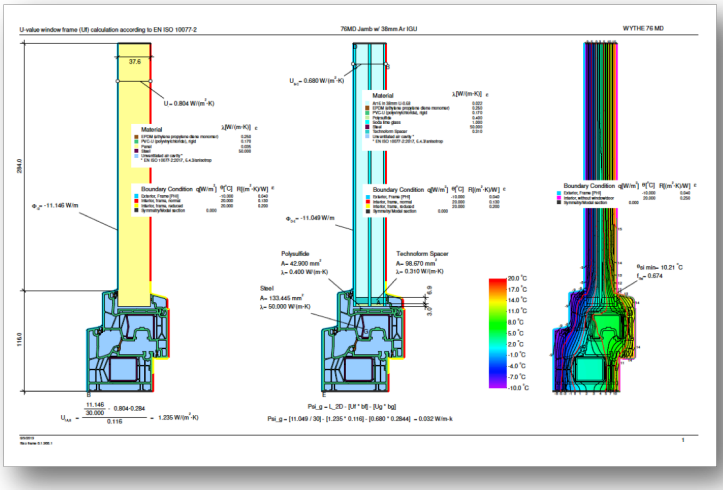
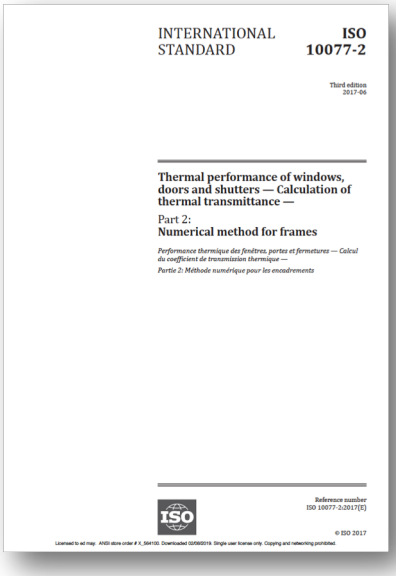
ISO 10077-2 Testing





INTERNATIONAL STANDARD **ISO 10077-2**

Third edition 2017-06

Thermal performance of windows, doors and shutters — Calculation of thermal transmittance —

Part 2:
Numerical method for frames

Performance thermique des fenêtres, portes et fermetures — Calcul du coefficient de transmission thermique —
Partie 2: Méthode numérique pour les encadrements

Reference number
ISO 10077-2:2017(E)

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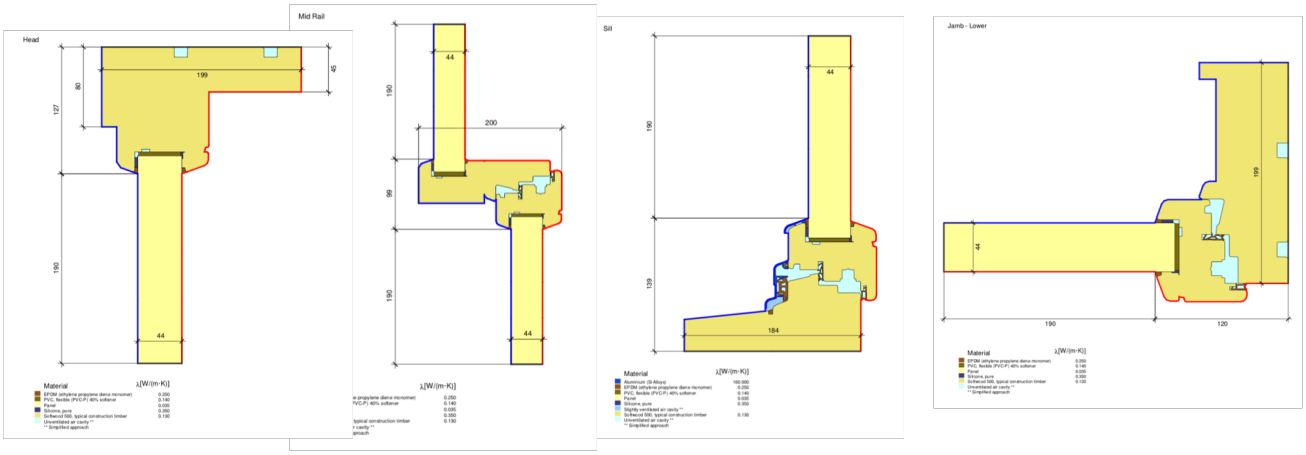
Need Values for Head, Jamb, Sill, etc…



Head	Meeting Rail	Sill	Jamb
U-0.99 W/m2k	U-2.0 W/m2k	U-1.1 W/m2k	U-0.99 W/m2k

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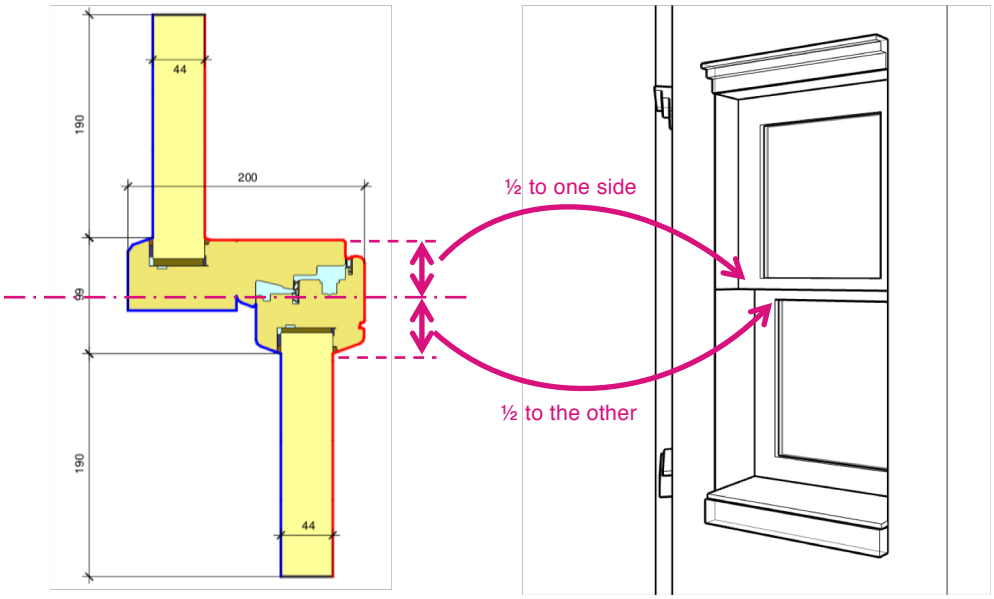
Dealing with Window Mullions



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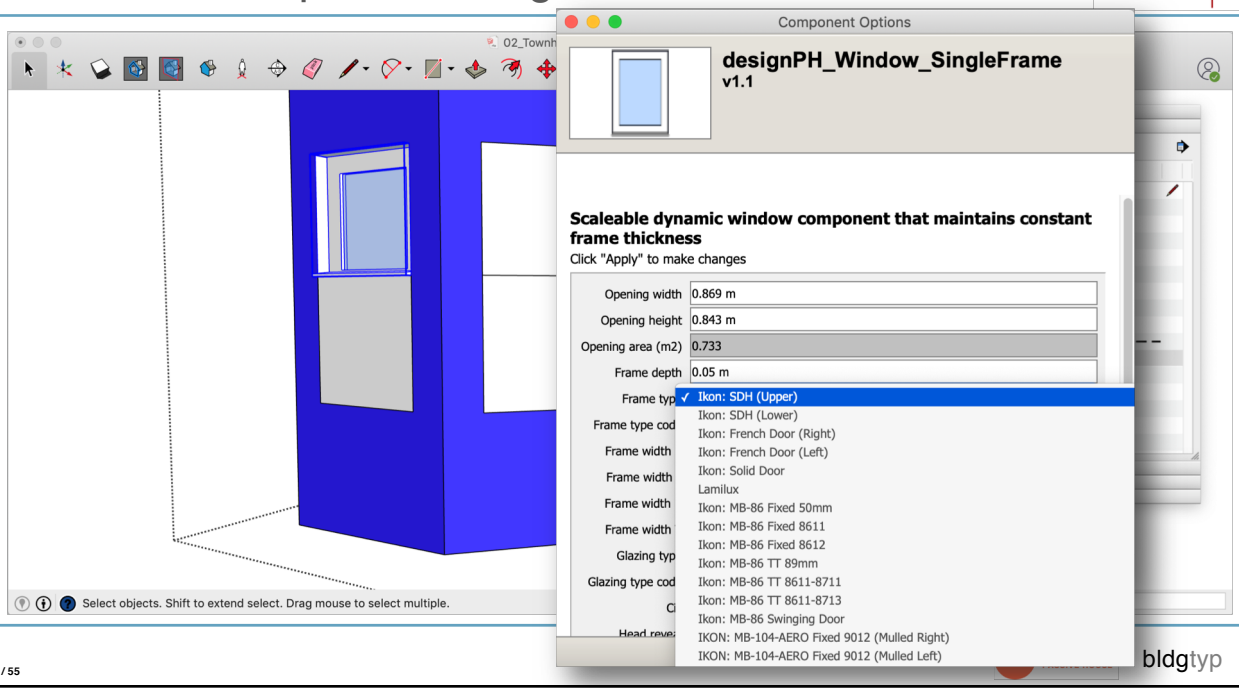
Window Component Assignment



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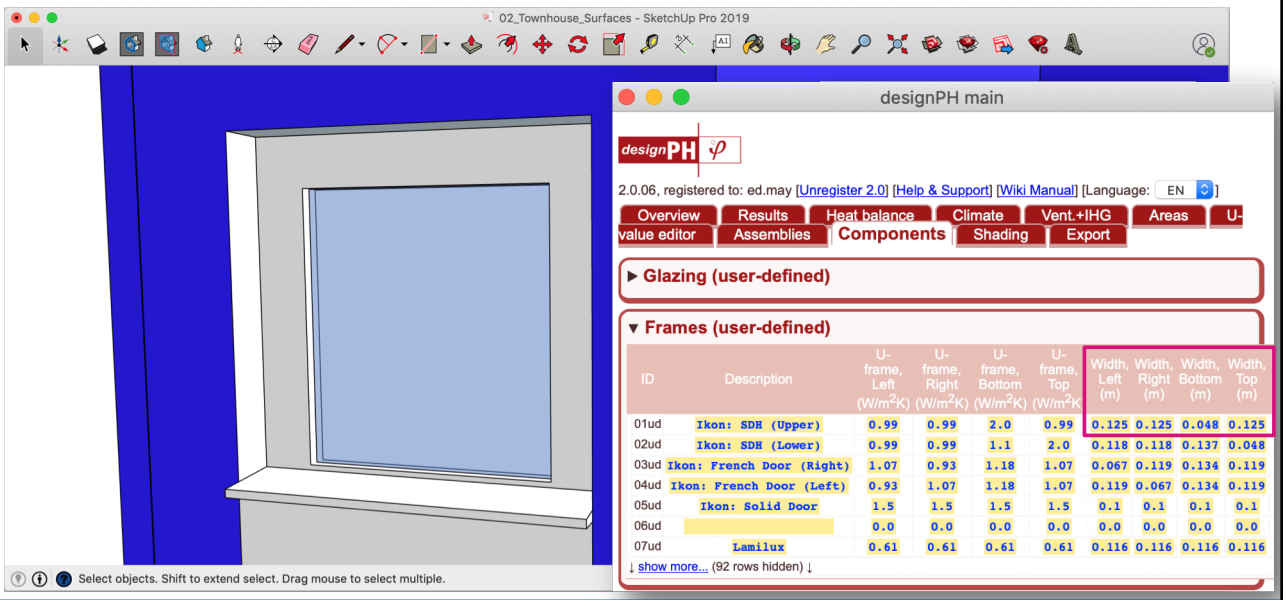
Window Component Assignment



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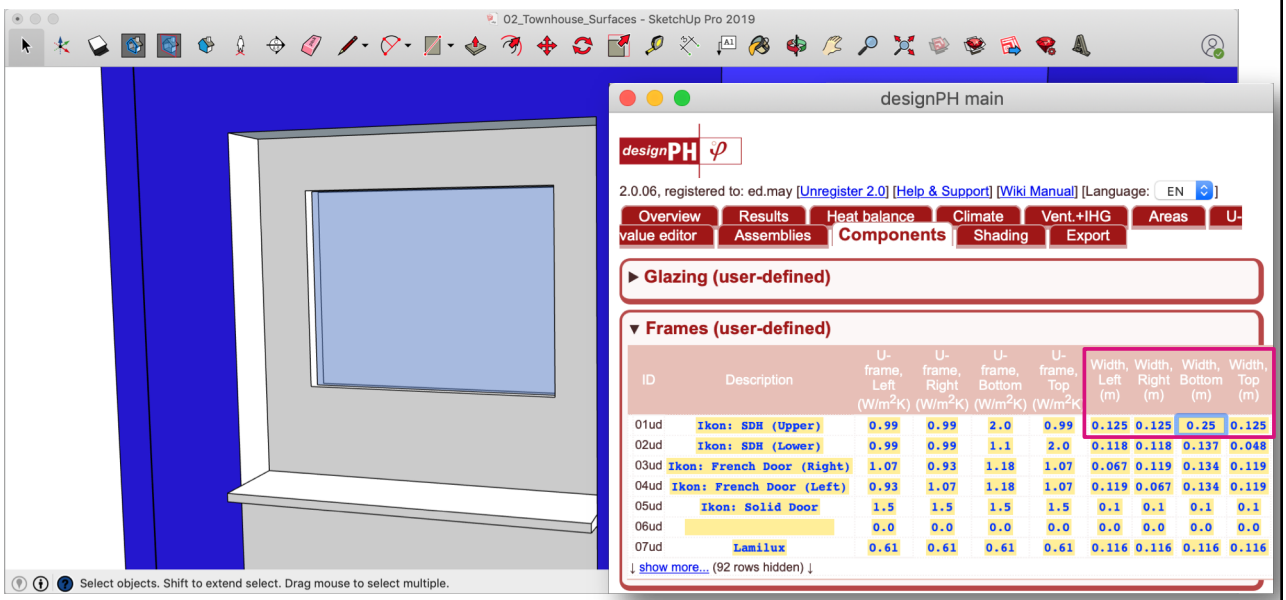
Window Component Assignment



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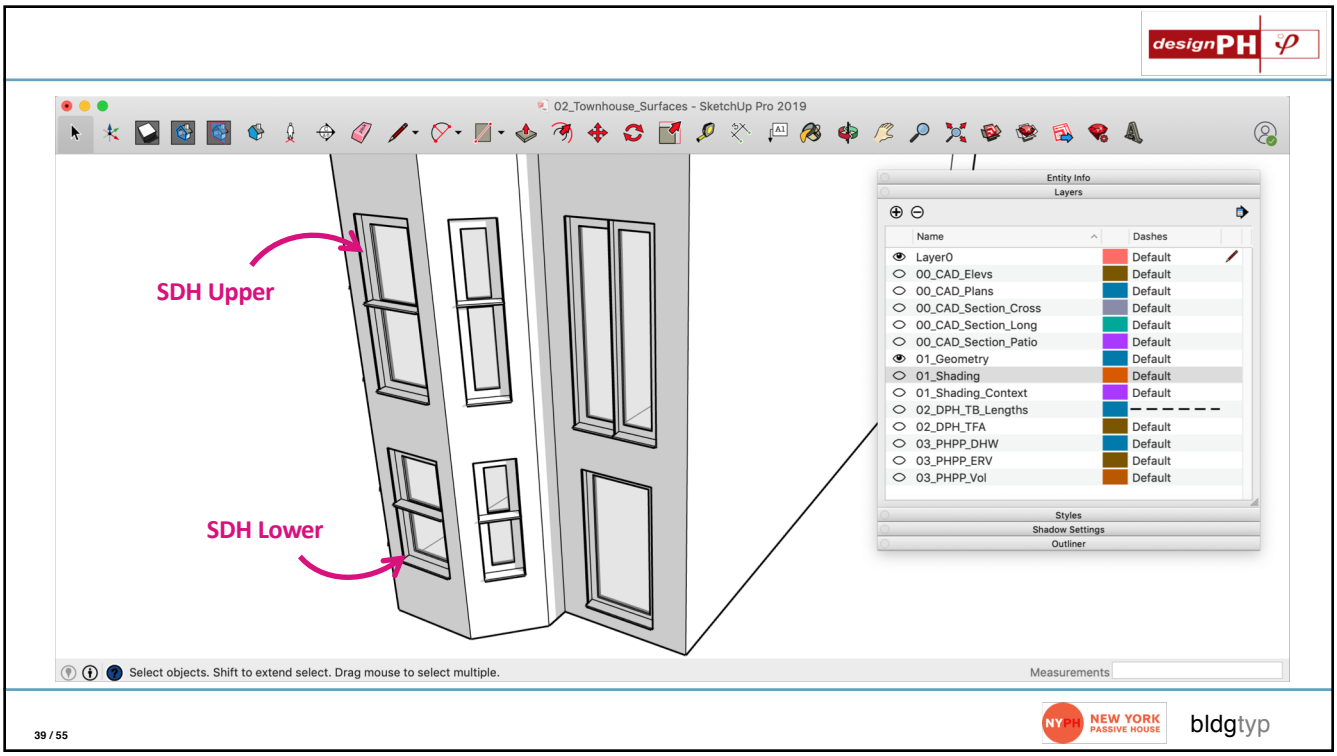
designPH
02_Townhouse_Surfaces - SketchUp Pro 2019
SDH Upper
SDH Lower
Entity Info
Layers
Name
Dashes
Layer0
00_CAD_Elevs
00_CAD_Plans
00_CAD_Section_Cross
00_CAD_Section_Long
00_CAD_Section_Patio
01_Geometry
01_Shading
01_Shading_Context
02_DPH_TB_Lengths
02_DPH_TFA
03_PHPP_DHW
03_PHPP_ERV
03_PHPP_Vol
Default
Styles
Shadow Settings
Outliner
Select objects. Shift to extend select. Drag mouse to select multiple.
Measurements
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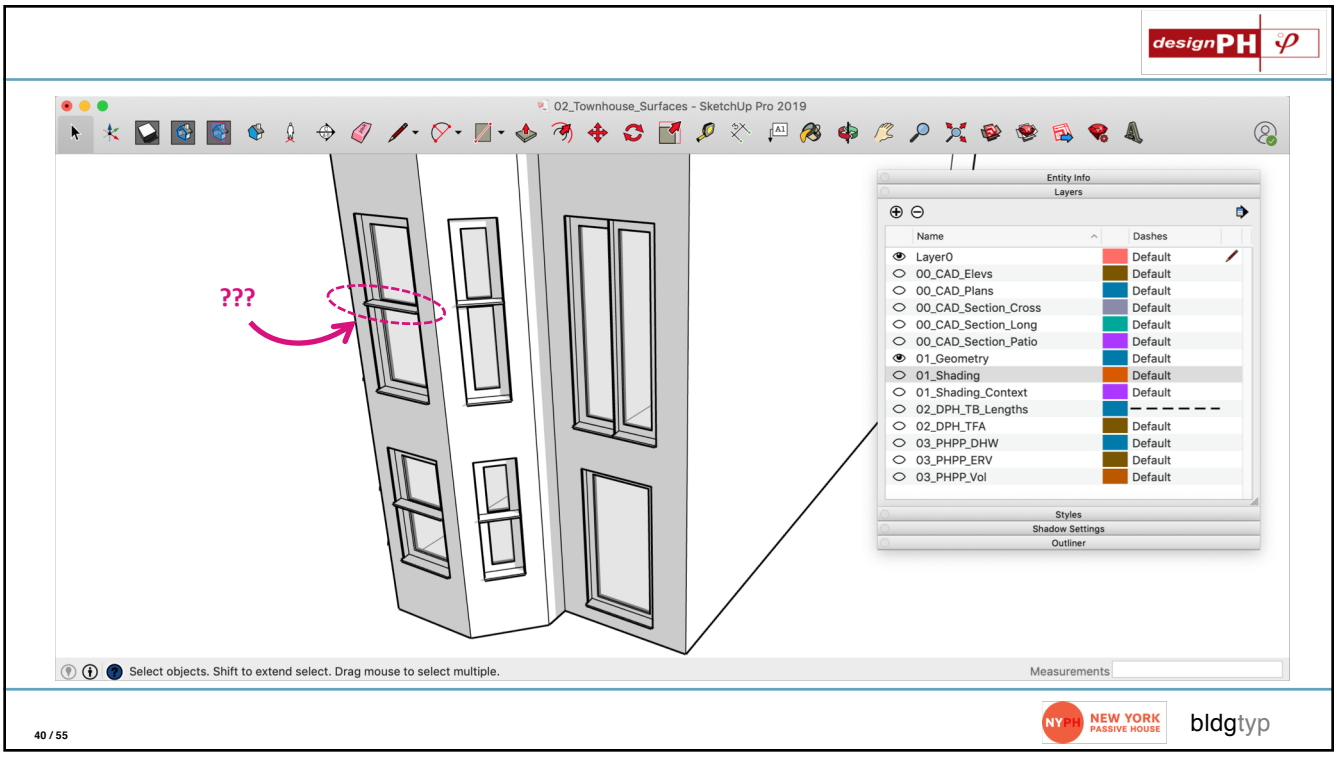
designPH
02_Townhouse_Surfaces - SketchUp Pro 2019
???
Entity Info
Layers
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Layer0
00_CAD_Elevs
00_CAD_Plans
00_CAD_Section_Cross
00_CAD_Section_Long
00_CAD_Section_Patio
01_Geometry
01_Shading
01_Shading_Context
02_DPH_TB_Lengths
02_DPH_TFA
03_PHPP_DHW
03_PHPP_ERV
03_PHPP_Vol
Default
Styles
Shadow Settings
Outliner
Select objects. Shift to extend select. Drag mouse to select multiple.
Measurements
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Window Installations

How PHPP Handles Window 'Installs'

Heating degree hours [kKh/a]: 64.4

Quan-tity	Description	Deviation from north	Angle of inclination from the horizontal	Orien- tation	Window rough openings Width	Height	Se	Ψ zing dge (avg.)	Installation situation left	right	bottom	top	Ψ_{Instal} (Avg
		°	°		m	m		W/(mK)	W/(mK) or 1/0				W/(m
1	Win_N0.4_#_001	20	90	North	1.066	2.133	8-Wa	040	1	1	1	1	0.04
1	Win_S0.2_#_002	200	90	South	0.953	2.336	4-Wa	026	0	1	1	1	0.04
1	Win_S0.1_#_D.1	200	90	South	1.485	2.336	4-Wa	027	1	0	1	1	0.04
1	Win_N0.3L_#_B.1	335	90	North	0.539	0.889	12-W	029	1	1	1	0	0.04
1	Win_N0.2L_#_A.1	20	90	North	0.869	0.889	13-W	029	1	1	1	0	0.04
1	Win_N0.1L_#_B.1	65	90	East	0.539	0.889	14-W	029	1	1	1	0	0.04
1	Win_N0.3U_#_B.1	335	90	North	0.539	0.844	12-W	029	1	1	0	1	0.04
1	Win_N0.2U_#_A.1	20	90	North	0.869	0.844	13-W	029	1	1	0	1	0.04
1	Win_N0.1U_#_B.1	65	90	East	0.539	0.844	14-W	029	1	1	0	1	0.04
1	Win_S1.2_#_D.2	200	90	South	2.438	3.149	4-Wa	028	1	1	1	1	0.04
1	Win_S1.1_#_102	200	90	South	0.990	2.438	4-Wa	026	1	1	1	1	0.04
1	Win_N1.4Right_#_101	20	90	North	0.610	2.692	8-Wa	040	0	1	1	1	0.04

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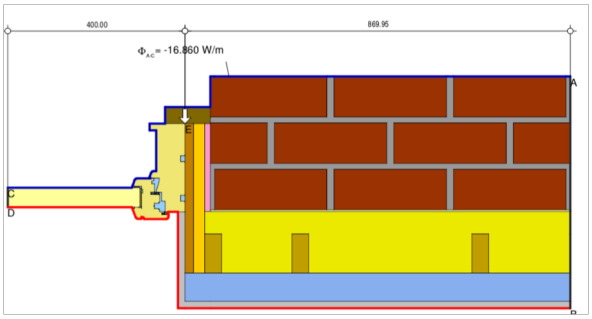
How PHPP Handles Window 'Installs'

- **'1' means do apply the Psi-Install along this edge**
- **'0' means do not apply the Psi-Install along this edge (apply at 0%)**
- **Any other number input gets applied as the Psi-Install (can override the Components worksheet this way)**

Ψ zing dge	Installation situation user determined value for $\Psi_{installation}$ or '1': $\Psi_{installation}$ from 'Components' worksheet '0': in the case of abutting windows				
zing edge vg.)	left	right	bottom	top	Ψ_{Instal} (Avg
/(mK)	W/(mK) or 1/0				W/(m
040	1	1	1	1	0.04
026	0	1	1	1	0.04
027	1	0	1	1	0.04
029	1	1	1	0	0.04
029	1	1	1	0	0.04
029	1	1	1	0	0.04
029	1	1	0	1	0.04
029	1	1	0	1	0.04
029	1	1	0	1	0.04
028	1	1	1	1	0.04
026	1	1	1	1	0.04
040	0	1	1	1	0.04

Psi-Install?

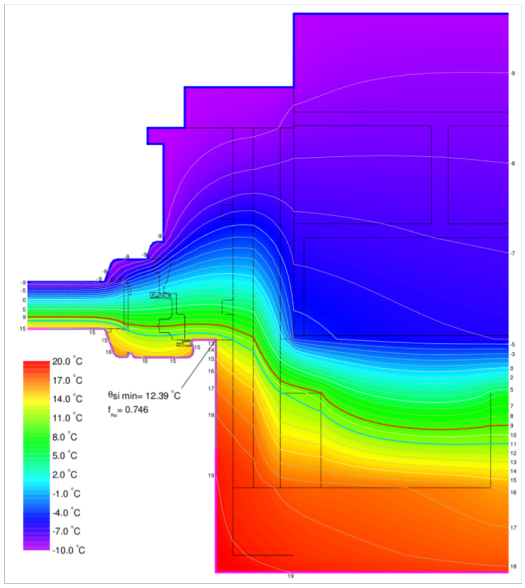


$$\Psi_{A\text{-}E\text{-}C,\,*} = \frac{16.860}{30.000} - 0.249 \cdot 0.870 - \frac{9.537}{30.000} = 0.028\ \text{W/(m·K)}$$

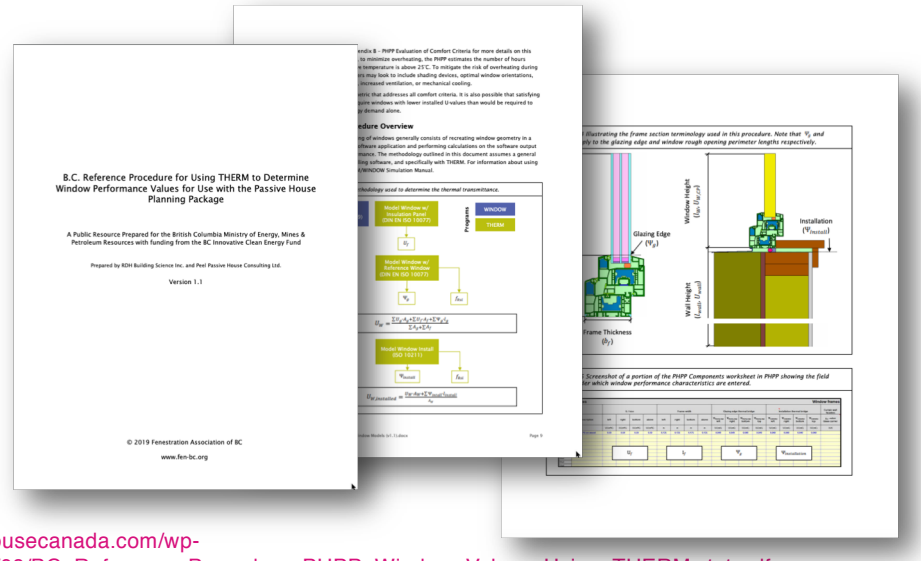
Psi-Install

Material	λ[W/(m·K)]	ε
Air layer, unventilated, horizontal, thickness: 65 mm	0.361	
Brick (Common) [R-0.2/in]	0.720	0.900
Cellulose (Densepack) [R-3.7/in]	0.040	0.900
EPDM (ethylene propylene diene monomer)	0.250	
GWB (Typ) [R-0.85/in]	0.170	0.900
Mortar - Portland Cement-Lime (PHI)	0.900	0.900
PVC, flexible (PVC-P) 40% softener	0.140	
Panel	0.035	
Plywood (Typ) [R-1.2/in]	0.119	0.900
Polyisocyanurate Board [R-6/in]	0.024	0.900
Silicone, pure	0.350	
Softwood 500, typical construction timber	0.130	
Stucco [R-0.2/in]	0.722	0.900
Wood, Coniferous (Softwood) [R-1.03/in]	0.140	0.900
Wood, Deciduous (Hardwood) [R-0.91/in]	0.159	0.900
XPS, [R-5.0/in]	0.029	0.900
Unventilated air cavity (1) *		

* Simplified approach



Calculating Psi-Install Values



https://www.passivehousecanada.com/wp-content/uploads/2019/09/BC_Reference_Procedure_PHPP_Window_Values_Using_THERM_1.1.pdf

NEW YORK PASSIVE HOUSE bldgtyp

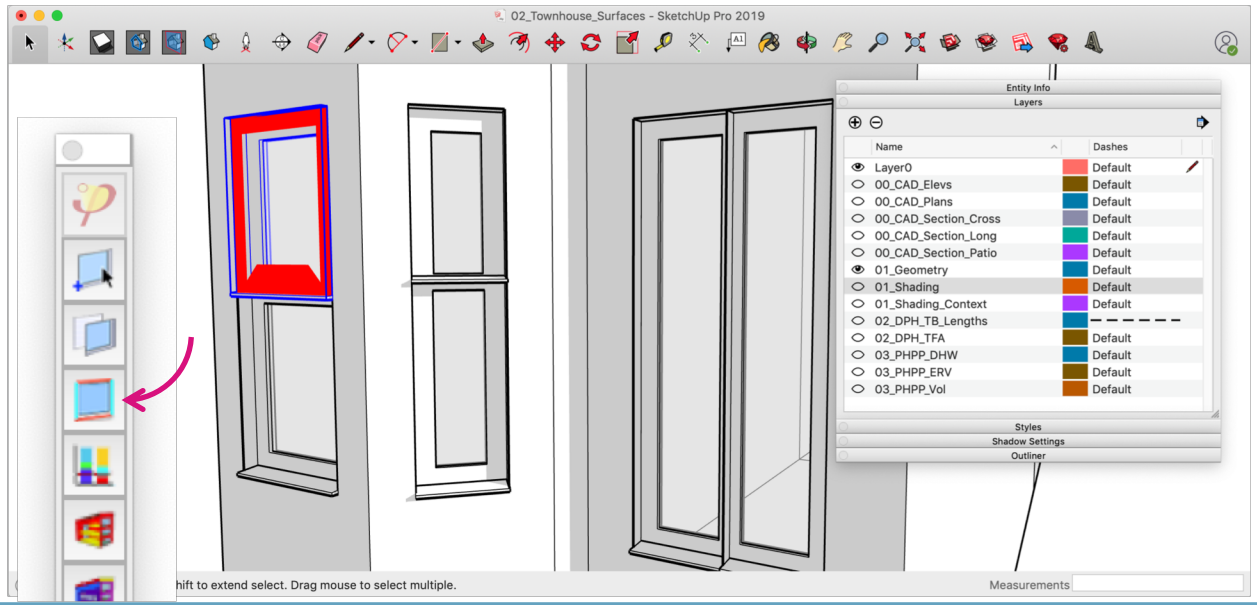
Window Components: Just like PHPP

▼ Frames (user-defined)

ID	Description	U-frame, Left (W/m²K)	U-fram Rig (W/m	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	0.7	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
03ud		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
05ud		0.0	0.0	0.0	0.0	0.0	0.0	0.0

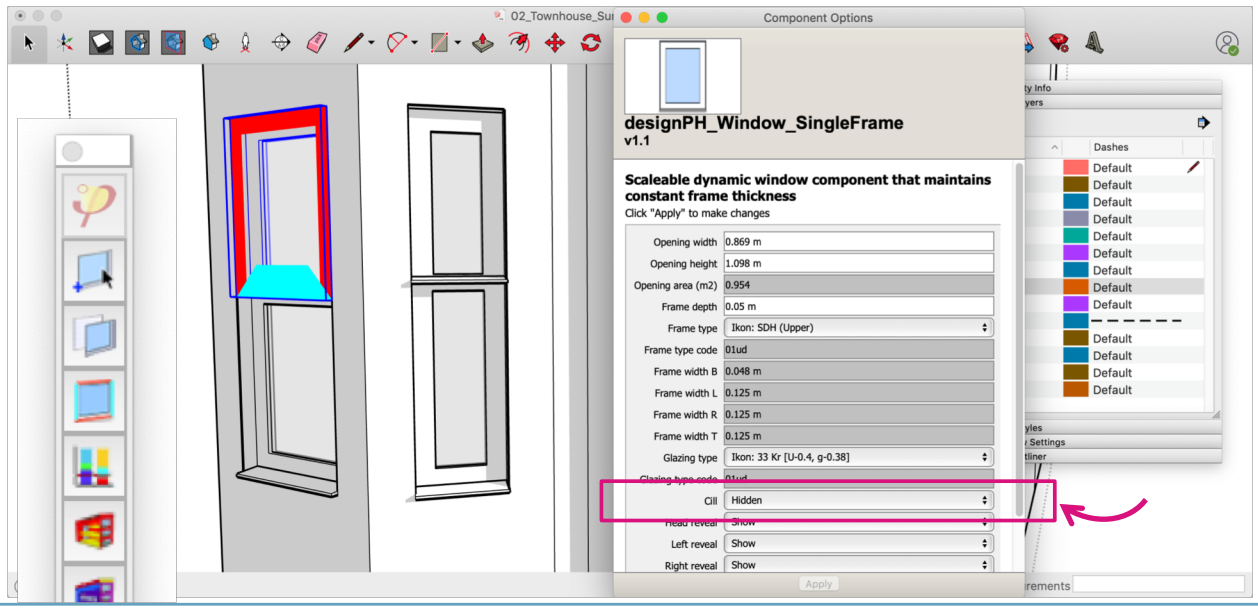
NEW YORK PASSIVE HOUSE bldgtyp

Set ‘Installs’ for Each Window



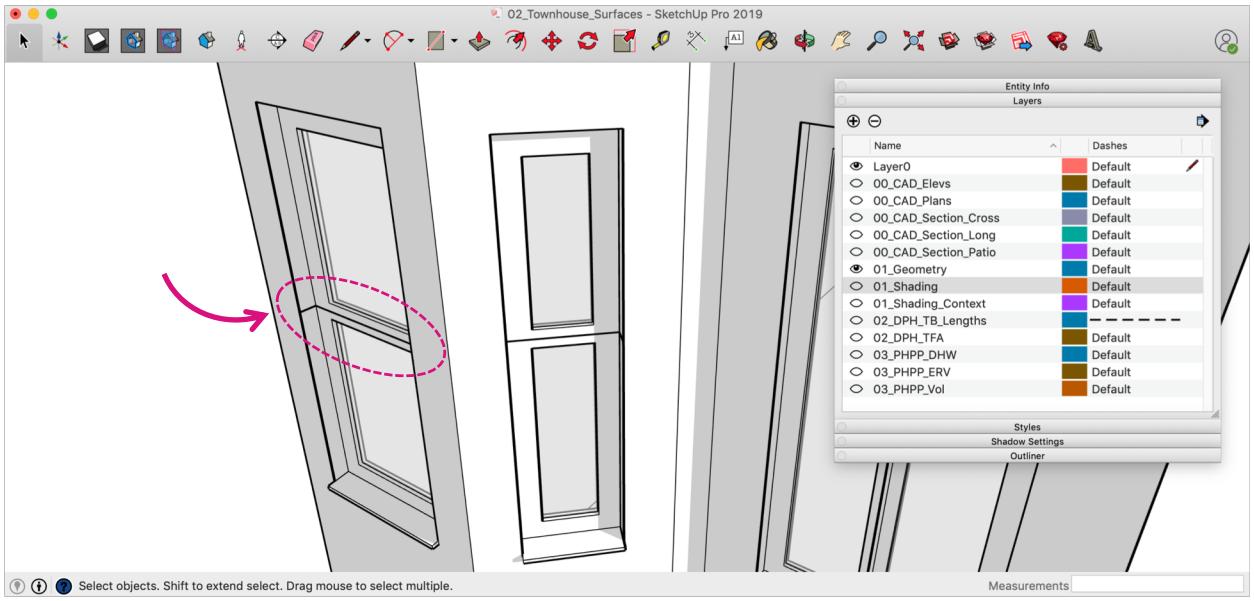
NEW YORK PASSIVE HOUSE bldgtyp

Set ‘Installs’ for Each Window



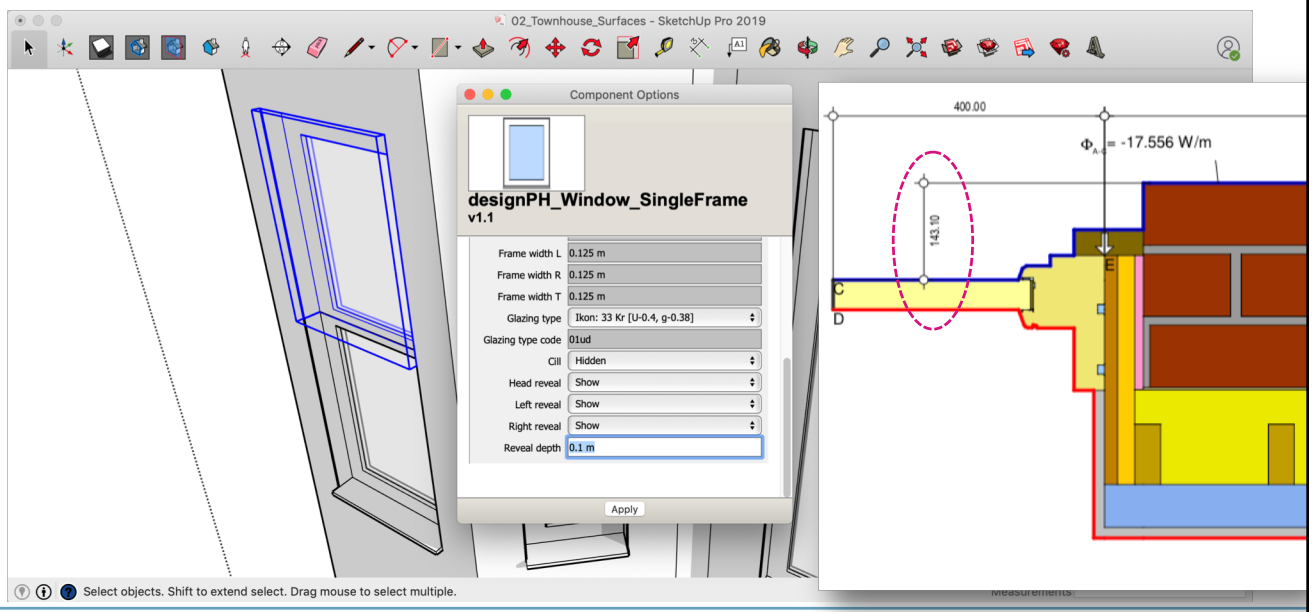
NEW YORK PASSIVE HOUSE bldgtyp

Set ‘Installs’ for Each Window



NEW YORK PASSIVE HOUSE bldgtyp

Window Reveal Depth – Upper Sash



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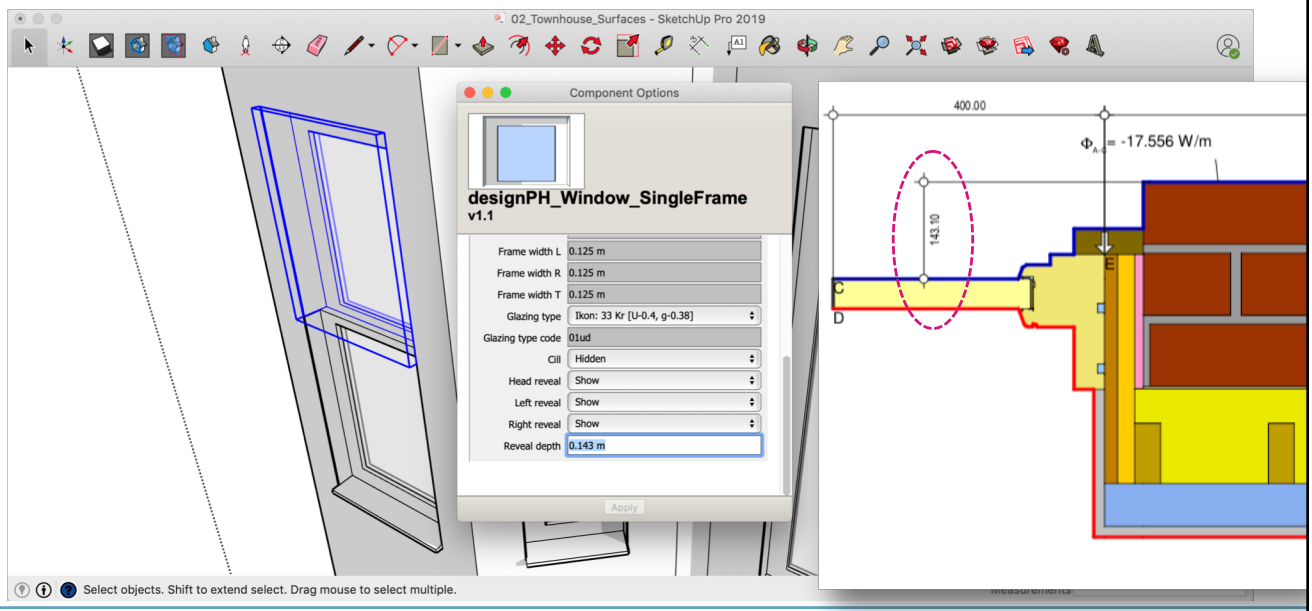
Window Reveal Depth – Upper Sash



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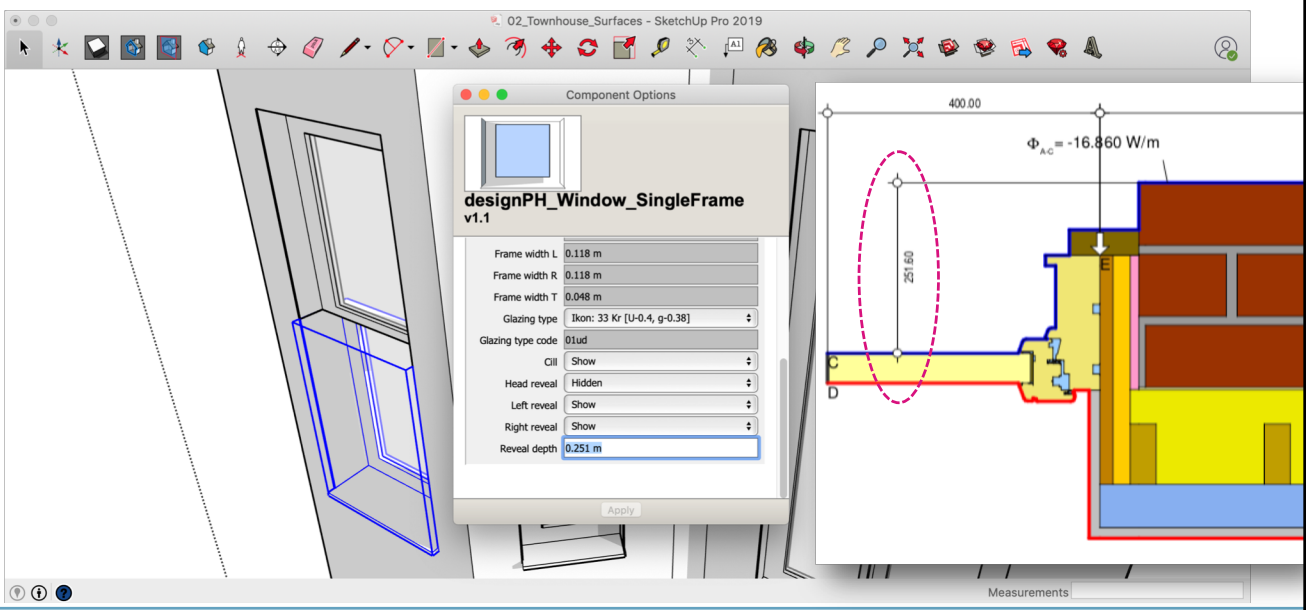
Window Reveal Depth – Lower Sash



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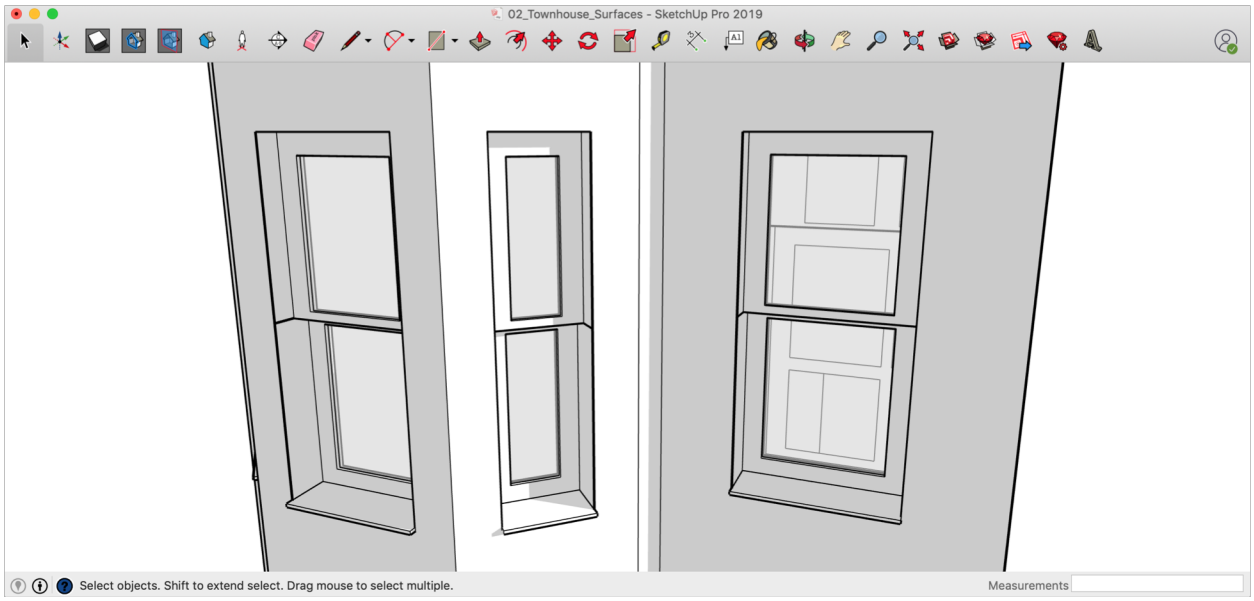
Set All Window Parameters



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