Shaping the Next-Generation of Passive House Tools

Honeybee-PH

A free, open-source toolkit for building and documenting our Passive House models.

"...Given the slow capital investment cycle in buildings...we need to retrofit nearly half of our buildings to zero emissions by 2030... Essentially, every building we touch over the next ten years, **and we likely need to touch about 5 million buildings per year in the US**, needs to be brought to zero emissions in a way that is both cost-effective and supports decarbonization of the grid."

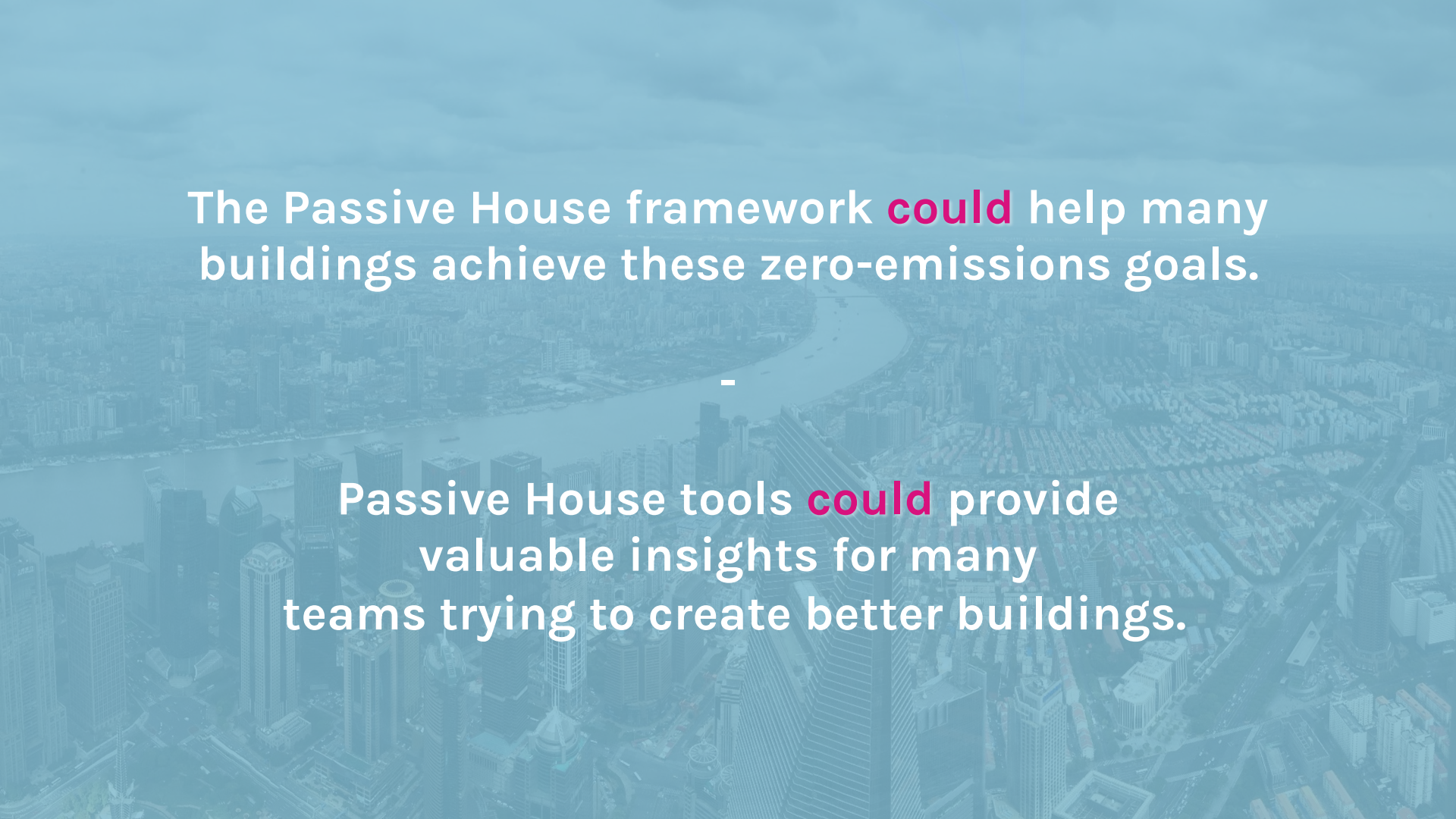
James Mandel, Laurie Stone, Dec 2019


Imagine ½ of all these buildings being
retrofit to a zero-emissions level

113 million bldgs. In the @ US. 50% retrofit over 10 years = ~ 5 million bldgs / yr

5 million bldgs / yr ÷ 12 months = +400,000 / month ÷ 30 days = 13,000 / day

Or... given there are ~70,000 architecture companies in the US (2023): That would be about 70 zero-emissions building retrofits completed every single year by every single architecture firm in the country



The Passive House framework could help many buildings achieve these zero-emissions goals.

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Passive House tools could provide valuable insights for many teams trying to create better buildings.

Setting aside the policy, finance and construction challenges for just a second.....

Question:

Could you scale **your own** PH design and engineering process to handle even a fraction of those projects **right now**?

Could you do them well? Accurately? Efficiently? Quickly?

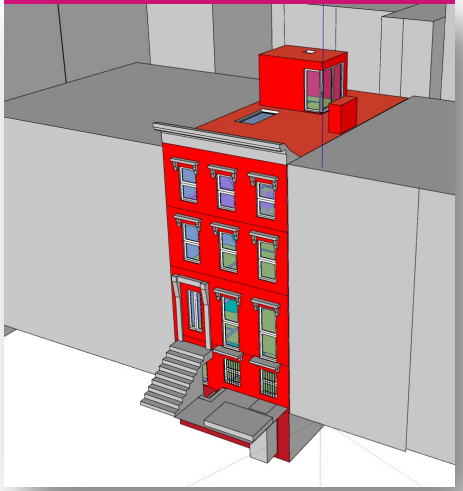
Opinion:

The current Passive House tools are too laborious, too slow, and too disconnected for that potential to be realized at any meaningful scale.

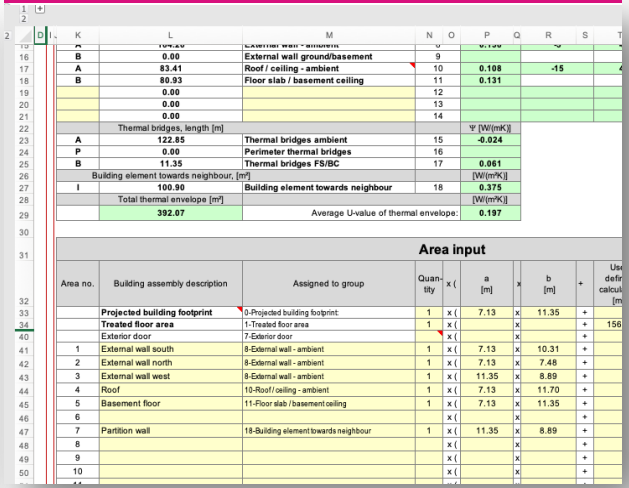
Area input															Building assembly selection			
Building assembly description	Assigned to group	Quan-tity	x (	a [m]	x	b [m]	+	User-defined calculation [m²]	-	User-defined subtraction [m²]	-	Subtraction window areas [m²]	) =	Area [m²]	Selection building assembly / Building system	U-value [W/(m²K)]	Deviation from North	A inc fr ho
ected building footprint	0-Projected building footprint:	1	x (		x		+		-		)		=	0.0	2-Sort by ID			
ted floor area	1-Treated floor area	1	x (		x		+	292.75	-		)		=	292.8				
rior door	7-Exterior door		x (		x		+		-		) -		=		Exterior door			
_01eda891	10-Roof / ceiling - ambient	1	x (		x		+	75.39	-		) -	2.7	=	72.6	15ud-RT-9	**0.107**	14	
_3474bbdc	9-External wall ground/basement	1	x (		x		+	17.03	-		) -	0.0	=	17.0	03ud-WT-3	**0.226**	14	
_4fe9bd2d	7-Exterior door	1	x (		x		+	1.86	-		) -	0.0	=	1.9	06ud-DR-01	**2.043**	194	
_54b3d657	12-Floor Over Mech. Room	1	x (		x		+	12.39	-		) -	0.0	=	12.4	13ud-FT-XX	**0.130**	0	
_a81c1de0	11-Floor slab / basement ceiling	1	x (		x		+	62.75	-		) -	0.0	=	62.7	04ud-FT-8A	**0.258**	0	
_be8b9a92	11-Floor slab / basement ceiling	1	x (		x		+	18.58	-		) -	0.0	=	18.6	12ud-FT-8B	**0.200**	0	
_dd7afcb6	8-External wall - ambient	1	x (		x		+	15.17	-		) -	0.0	=	15.2	01ud-WT-2	**0.317**	194	
_8d4268d9	10-Roof / ceiling - ambient	1	x (		x		+	12.31	-		) -	0.0	=	12.3	08ud-RT-13	**0.095**	0	
_c1b06986	10-Roof / ceiling - ambient	1	x (		x		+	6.27	-		) -	0.0	=	6.3	08ud-RT-13	**0.095**	0	
_4b4ffab7	18-Building element towards neighbour	1	x (		x		+	28.76	-		) -	0.0	=	28.8	02ud-WT-4	**1.090**	284	
_c3cd2be8	18-Building element towards neighbour	1	x (		x		+	28.76	-		) -	0.0	=	28.8	02ud-WT-4	**1.090**	104	
_32377580	18-Building element towards neighbour	1	x (		x		+	36.47	-		) -	0.0	=	36.5	11ud-WT-5A	**1.016**	284	
_7405d691	18-Building element towards neighbour	1	x (		x		+	34.99	-		) -	0.0	=	35.0	11ud-WT-5A	**1.016**	104	
_81c3a76d	18-Building element towards neighbour	1	x (		x		+	42.11	-		) -	0.0	=	42.1	11ud-WT-5A	**1.016**	104	
_8494baaa	18-Building element towards neighbour	1	x (		x		+	36.47	-		) -	0.0	=	36.5	11ud-WT-5A	**1.016**	104	
_88f3dc62	18-Building element towards neighbour	1	x (		x		+	42.11	-		) -	0.0	=	42.1	11ud-WT-5A	**1.016**	284	
_a5aa8e4f	18-Building element towards neighbour	1	x (		x		+	34.99	-		) -	0.0	=	35.0	11ud-WT-5A	**1.016**	284	
_ce9700a7	18-Building element towards neighbour	1	x (		x		+	46.10	-		) -	0.0	=	46.1	11ud-WT-5A	**1.016**	104	
_ed94e6e8	18-Building element towards neighbour	1	x (		x		+	46.10	-		) -	0.0	=	46.1	11ud-WT-5A	**1.016**	284	
_774db421	8-External wall - ambient	1	x (		x		+	17.30	-		) -	5.7	=	11.6	09ud-WT-6	**0.211**	194	
_895ae748	8-External wall - ambient	1	x (		x		+	23.95	-		) -	5.0	=	19.0	09ud-WT-6	**0.211**	194	
_9c5281dc	8-External wall - ambient	1	x (		x		+	18.04	-		) -	4.7	=	13.3	09ud-WT-6	**0.211**	194	
_ee6fda87	8-External wall - ambient	1	x (		x		+	22.80	-		) -	9.7	=	13.1	09ud-WT-6	**0.211**	194	
_0a0a3a07	8-External wall - ambient	1	x (		x		+	17.30	-		) -	8.6	=	8.7	10ud-WT-7A	**0.219**	14	
_63cea7b1	8-External wall - ambient	1	x (		x		+	25.73	-		) -	10.7	=	15.1	10ud-WT-7A	**0.219**	14	
_694efc32	8-External wall - ambient	1	x (		x		+	17.70	-		) -	4.8	=	12.9	10ud-WT-7A	**0.219**	14	
_8e45da21	8-External wall - ambient	1	x (		x		+	15.10	-		) -	7.7	=	7.4	10ud-WT-7A	**0.219**	14	

right now there is no separation between the data, the model and the application.

MODEL 1 (3D)



MODEL 2 (Energy)

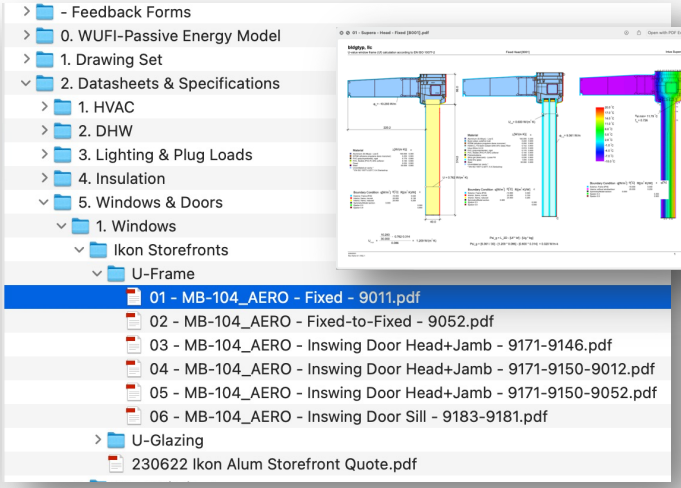


B	0.00	External wall ground/basement	9					
A	83.41	Roof / ceiling - ambient	10	0.108	-15			
B	80.93	Floor slab / basement ceiling	11	0.131				
	0.00		12					
	0.00		13					
	0.00		14					
Thermal bridges, length [m]				Ψ [W/(mK)]				
A	122.85	Thermal bridges ambient	15	-0.024				
P	0.00	Perimeter thermal bridges	16					
B	11.35	Thermal bridges FS/BC	17	0.061				
Building element towards neighbour, [m²]				[W/(m²K)]				
I	100.90	Building element towards neighbour	18	0.375				
Total thermal envelope [m²]				[W/(m²K)]				
392.07		Average U-value of thermal envelope:		0.197				

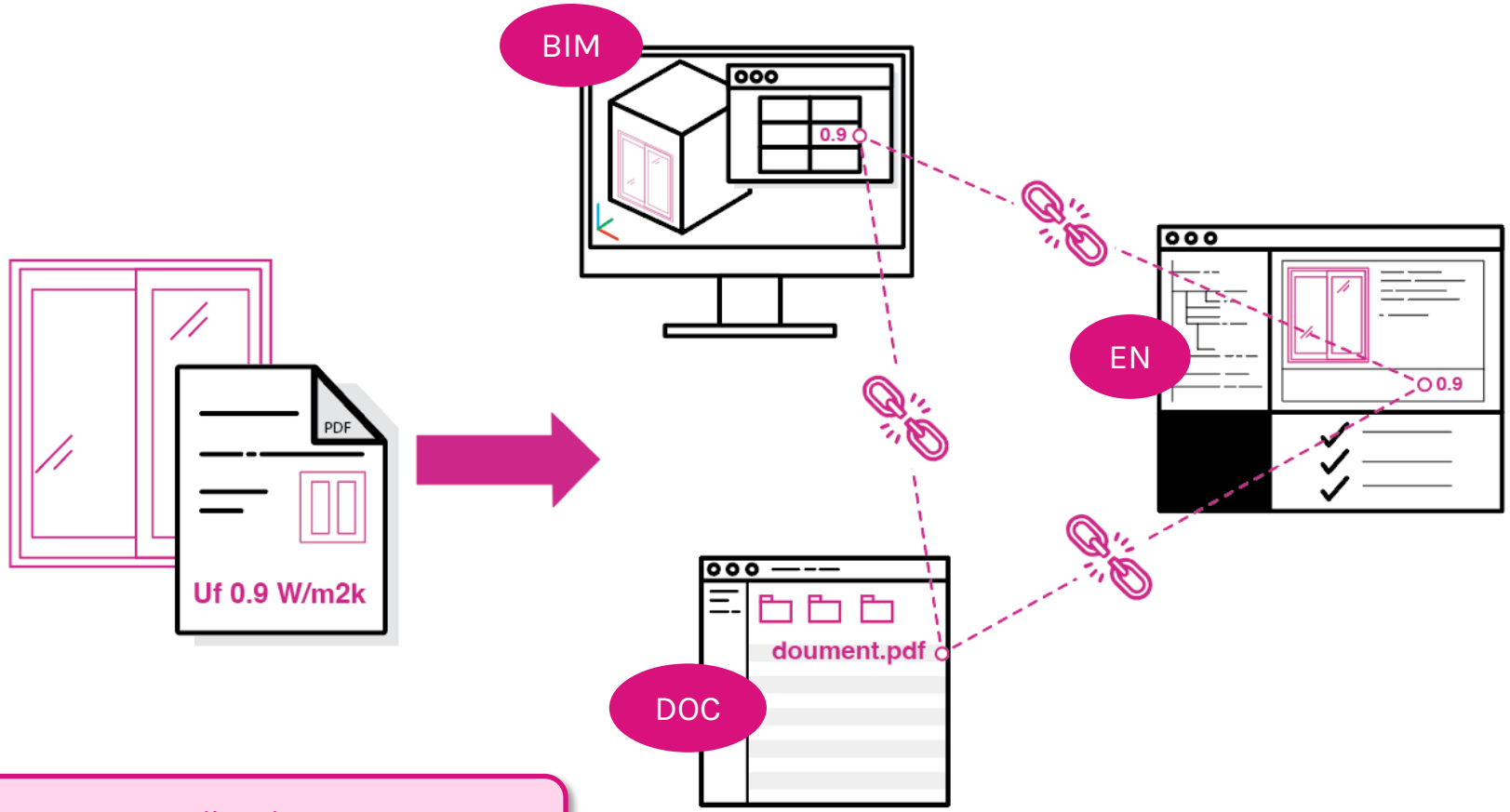
Area input

Area no.	Building assembly description	Assigned to group	Quantity	x (	a [m]	x	b [m]	+	Use defin calcul [m
	Projected building footprint	0-Projected building footprint	1	x (	7.13	x	11.35	+	
	Treated floor area	1-Treated floor area	1	x (		x		+	156
	Exterior door	7-Exterior door		x (		x		+	
1	External wall south	8-External wall - ambient	1	x (	7.13	x	10.31	+	
2	External wall north	8-External wall - ambient	1	x (	7.13	x	7.48	+	
3	External wall west	8-External wall - ambient	1	x (	11.35	x	8.89	+	
4	Roof	10-Roof / ceiling - ambient	1	x (	7.13	x	11.70	+	
5	Basement floor	11-Floor slab / basement ceiling	1	x (	7.13	x	11.35	+	
6				x (		x		+	
7	Partition wall	18-Building element towards neighbour	1	x (	11.35	x	8.89	+	
8				x (		x		+	
9				x (		x		+	
10				x (		x		+	

MODEL 3 (Document)

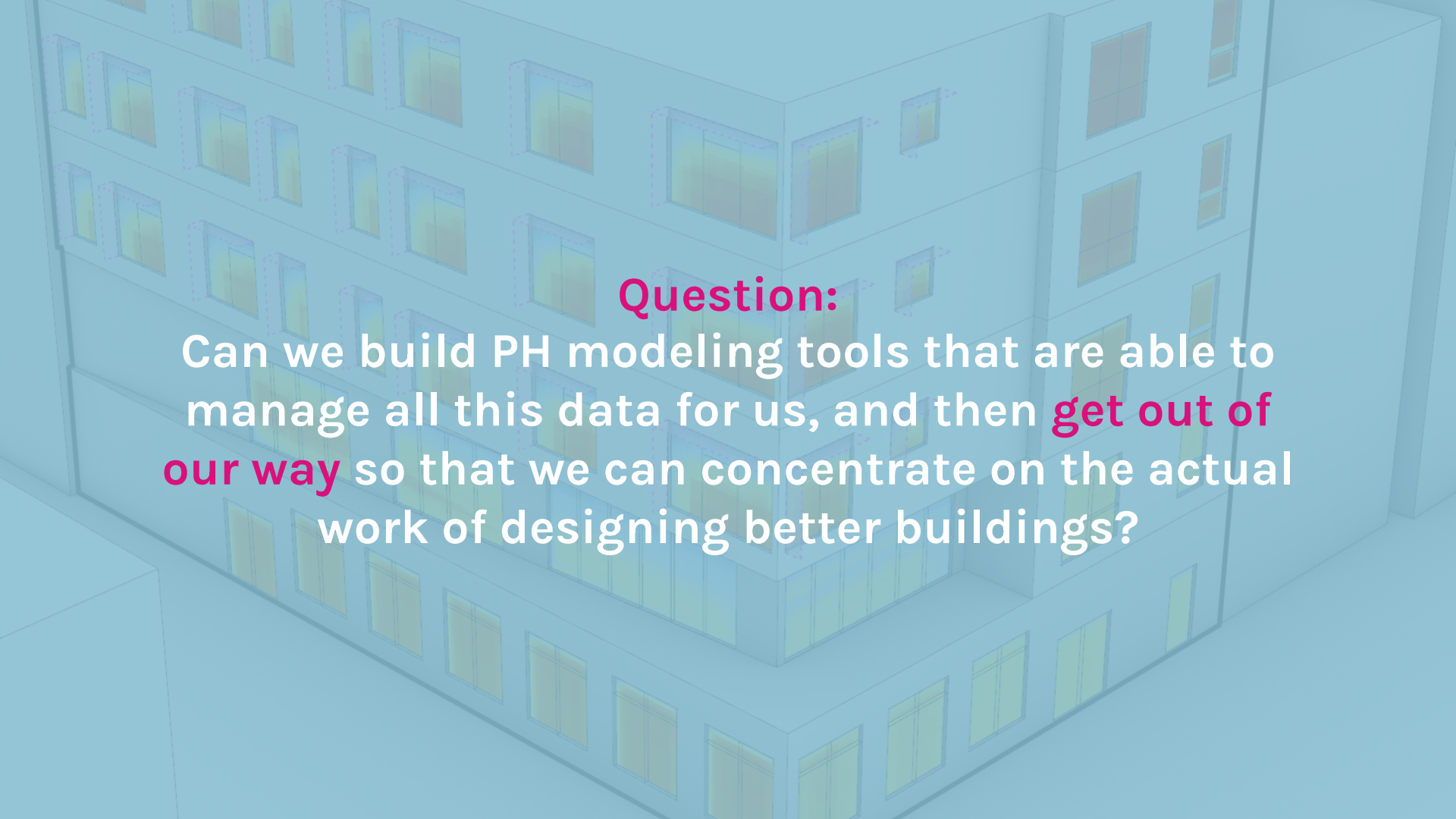


For **PH-Certification,** teams are required to produce **3** models:
(1) A **3D geometry** model (WUFI-Sketchup / DesignPH)
(2) The **PH energy** model itself (WUFI-Passive / PHPP)
(3) A '**document**' model which **justifies** and **explains** every input value.



Our current tooling does **not** support this requirement well.

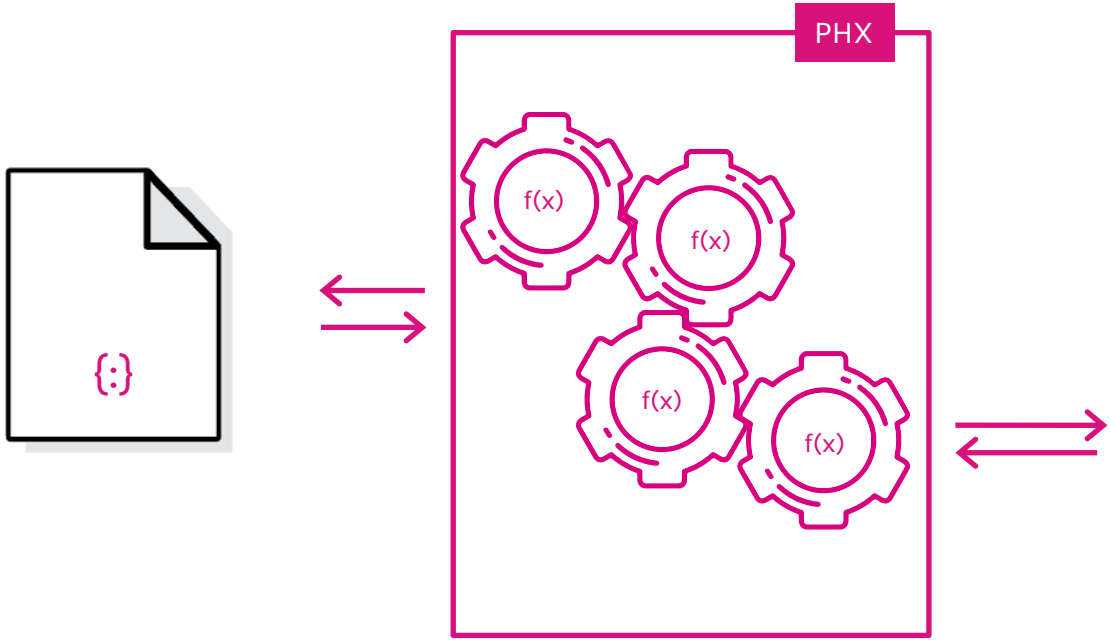
	Ikon Storefront:	Basic Parameters	General:	Datasheets noted
			U-glass:	0.123 entered, Saint Gobain calls for 0.088, please confirm
			SHGC:	Does not match datasheet
		Frame Parameters	Frame Width:	Cannot confirm from documentation provided
			U-frame:	Does not match values on datasheet, lookd like Uf is on shop drawings
			Glazing-to-frame psi-value (psi-spacer)	Please confirm why this is not included
			Frame-to-wall psi-value (psi-install)	0.023, OK
			Comfort Criteria:	Please confirm assembly passes

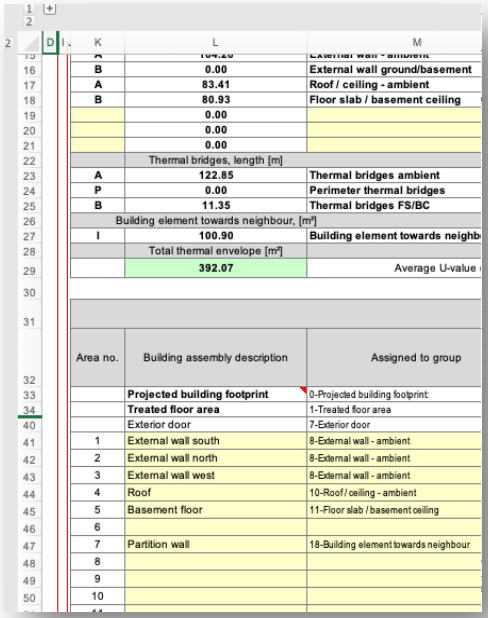


Question:

Can we build PH modeling tools that are able to manage all this data for us, and then get out of our way so that we can concentrate on the actual work of designing better buildings?

Step 1: The PH-Model **Interface**

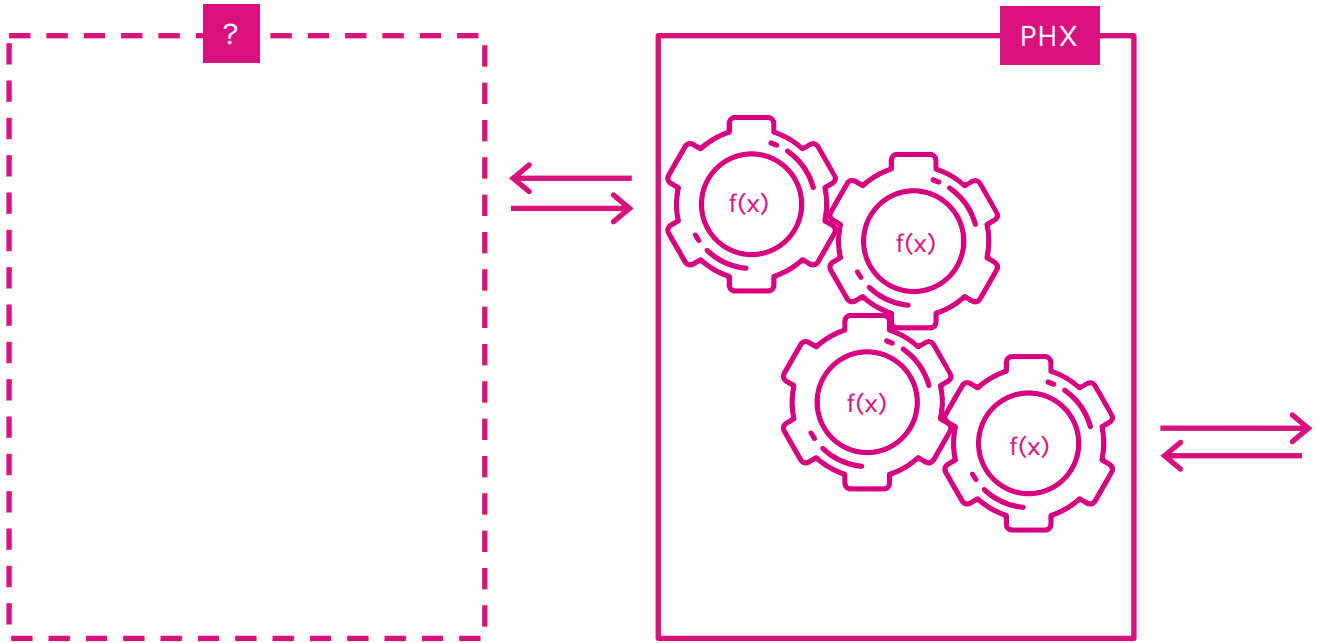


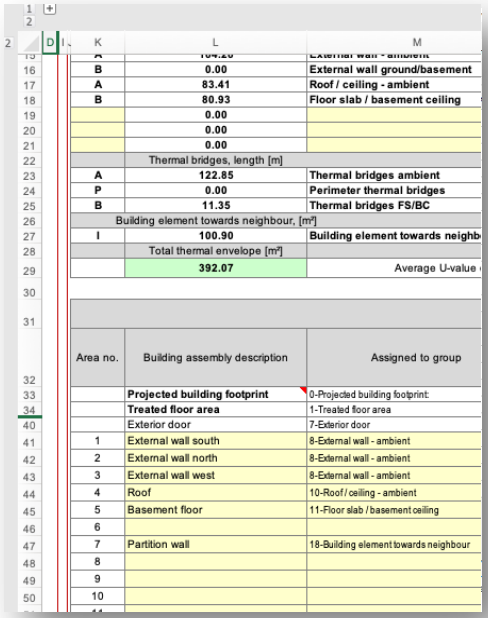


	K	L	M
16	B	0.00	External wall ground/basement
17	A	83.41	Roof / ceiling - ambient
18	B	80.93	Floor slab / basement ceiling
19		0.00	
20		0.00	
21		0.00	
22		Thermal bridges, length [m]	
23	A	122.85	Thermal bridges ambient
24	P	0.00	Perimeter thermal bridges
25	B	11.35	Thermal bridges FS/BC
26		Building element towards neighbour, [m²]	
27	I	100.90	Building element towards neighb
28		Total thermal envelope [m²]	
29		392.07	Average U-value
30			
31	Area no.	Building assembly description	Assigned to group
32			
33		**Projected building footprint**	0-Projected building footprint
34		**Treated floor area**	1-Treated floor area
40		Exterior door	7-Exterior door
41	1	External wall south	8-External wall - ambient
42	2	External wall north	8-External wall - ambient
43	3	External wall west	8-External wall - ambient
44	4	Roof	10-Roof / ceiling - ambient
45	5	Basement floor	11-Floor slab / basement ceiling
46	6		
47	7	Partition wall	18-Building element towards neighbour
48	8		
49	9		
50	10		

https://github.com/PH-Tools/PHX

Step 2: The PH-Model **Interface's Interface?**





	K	L	M
16	B	0.00	External wall ground/basement
17	A	83.41	Roof / ceiling - ambient
18	B	80.93	Floor slab / basement ceiling
19		0.00	
20		0.00	
21		0.00	
22		Thermal bridges, length [m]	
23	A	122.85	Thermal bridges ambient
24	P	0.00	Perimeter thermal bridges
25	B	11.35	Thermal bridges FS/BC
26		Building element towards neighbour, [m²]	
27	I	100.90	Building element towards neighb
28		Total thermal envelope [m²]	
29		392.07	Average U-value
30			
31			
32	Area no.	Building assembly description	Assigned to group
33		Projected building footprint	0-Projected building footprint
34		Treated floor area	1-Treated floor area
40		Exterior door	7-Exterior door
41	1	External wall south	8-External wall - ambient
42	2	External wall north	8-External wall - ambient
43	3	External wall west	8-External wall - ambient
44	4	Roof	10-Roof / ceiling - ambient
45	5	Basement floor	11-Floor slab / basement ceiling
46	6		
47	7	Partition wall	18-Building element towards neighbour
48	8		
49	9		
50	10		

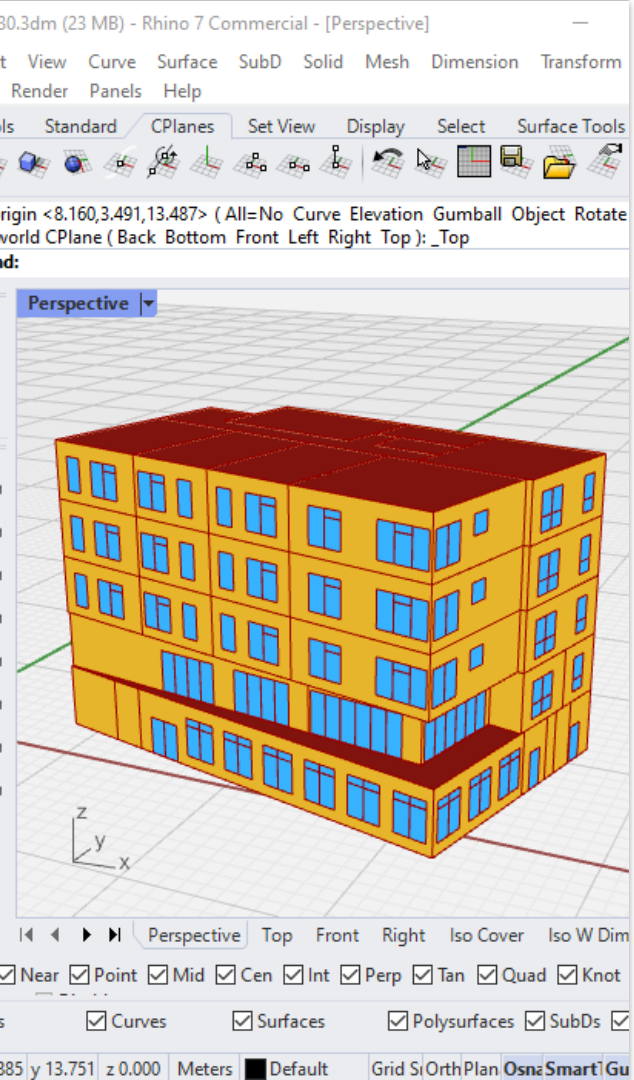
Ladybug

Honeybee

Dragonfly

Butterfly

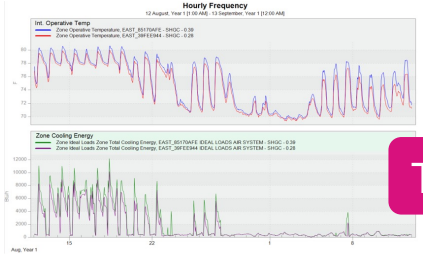
“Ladybug and Honeybee … have become a common language amongst architecture students, consultants and academics around the world, uniting communities that until recently operated in silos.”
-Alejandra Menchaca, Senior Associate, Thornton Tomasetti



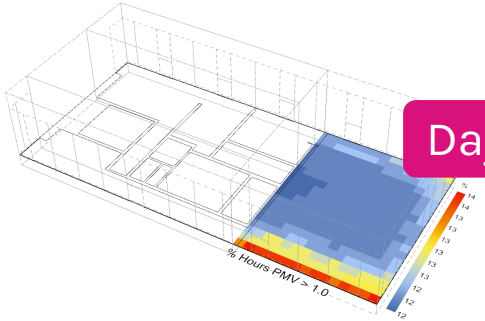
HONEYBEE-PH

EnergyPlus

Hourly Energy



Thermal Comfort



Daylighting

PH-Models

WUFI-PASSIVE

PHPP

Honeybee-Core
Geometry
Visualizations

Honeybee-Energy
Envelope
HVAC
Thermal Comfort
EnergyPlus Simulations

Honeybee-Radiance
Daylighting

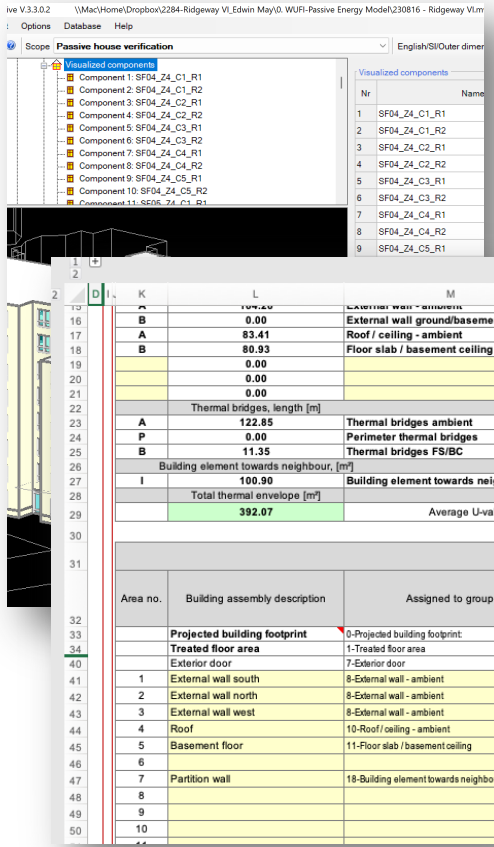
Honeybee-PH
Passive House
PHPP / WUFI-Passive

Step 2: The PH-Model **Interface**

Honeybee + HB-PH

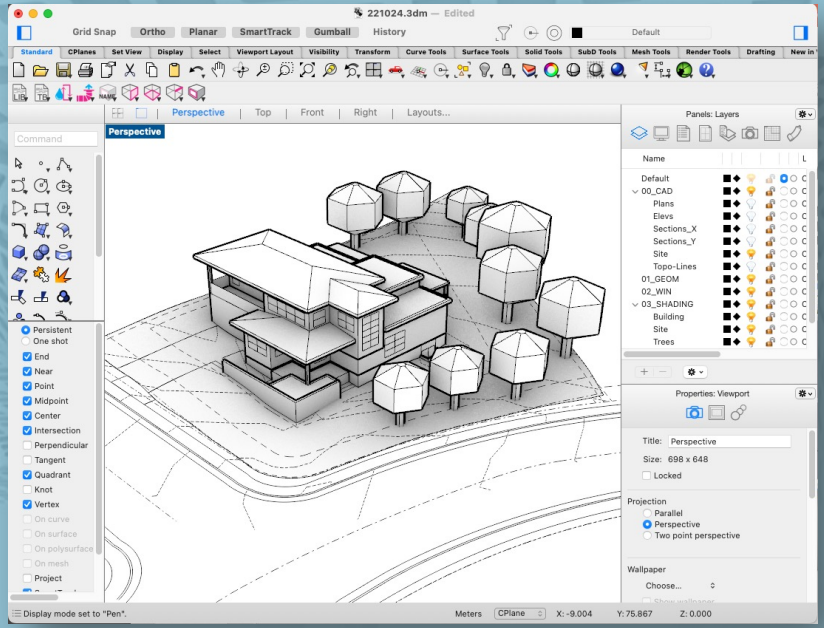
HONEYBEE-PH

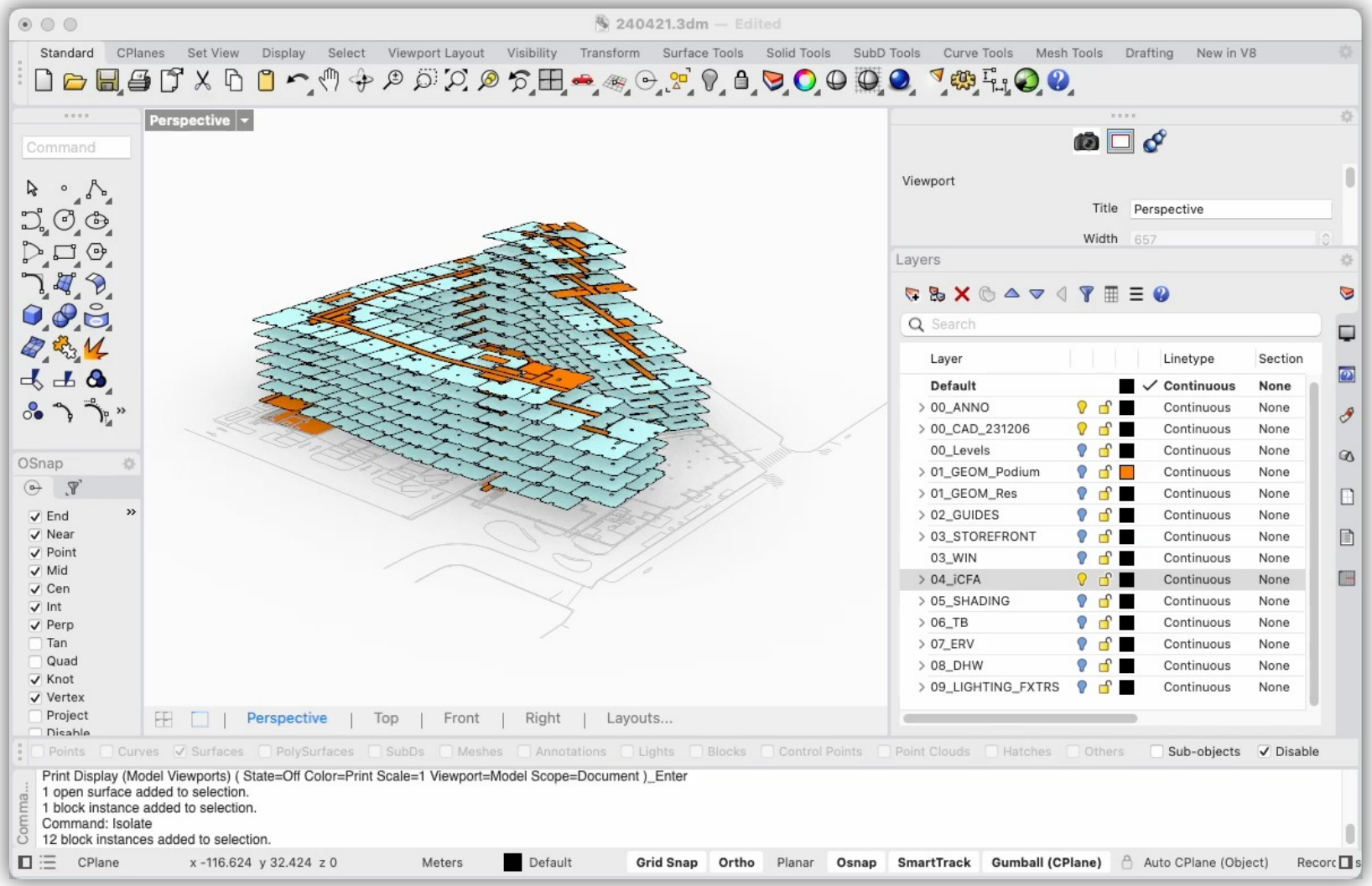
PHX

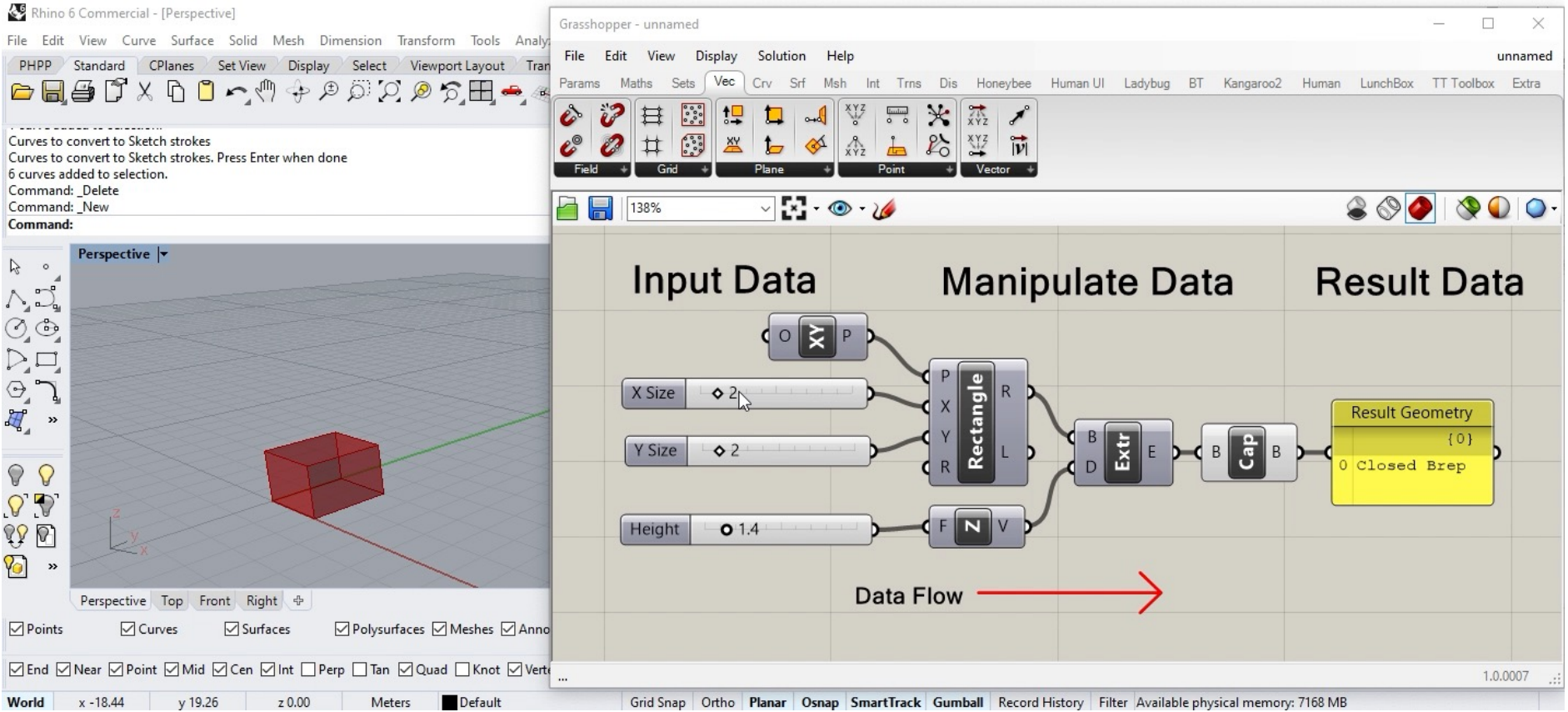


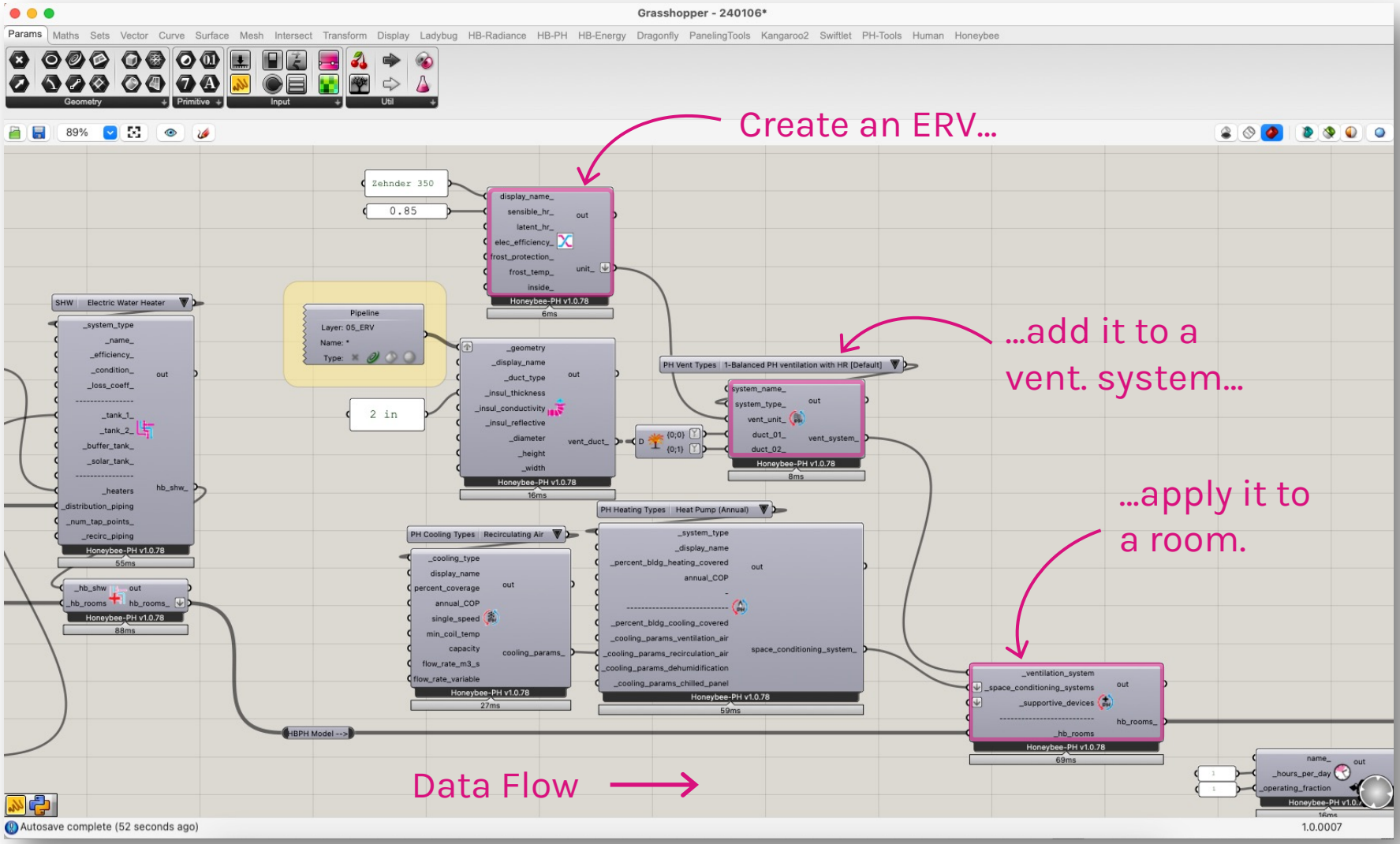
Rhinoceros

www.rhino3d.com




240421.3dm — Edited
Standard
CPlanes
Set View
Display
Select
Viewport Layout
Visibility
Transform
Surface Tools
Solid Tools
SubD Tools
Curve Tools
Mesh Tools
Drafting
New in V8
Perspective
Command
OSnap
End
Near
Point
Mid
Cen
Int
Perp
Tan
Quad
Knot
Vertex
Project
Disable
Perspective
Top
Front
Right
Layouts...
Viewport
Title
Perspective
Width
657
Layers
Search
Layer
Linetype
Section
Default
Continuous
None
00_ANNO
00_CAD_231206
00_Levels
01_GEOM_Podium
01_GEOM_Res
02_GUIDES
03_STOREFRONT
03_WIN
04_iCFA
05_SHADING
06_TB
07_ERV
08_DHW
09_LIGHTING_FXTRS
Points
Curves
Surfaces
PolySurfaces
SubDs
Meshes
Annotations
Lights
Blocks
Control Points
Point Clouds
Hatches
Others
Sub-objects
Disable
Print Display (Model Viewports) (State=Off Color=Print Scale=1 Viewport=Model Scope=Document)_Enter
1 open surface added to selection.
1 block instance added to selection.
Command: Isolate
12 block instances added to selection.
CPlane
x -116.624 y 32.424 z 0
Meters
Default
Grid Snap
Ortho
Planar
Osnap
SmartTrack
Gumball (CPlane)
Auto CPlane (Object)


Rhino 6 Commercial - [Perspective]
File Edit View Curve Surface Solid Mesh Dimension Transform Tools
PHPP Standard CPlanes Set View Display Select Viewport Layout
Curves to convert to Sketch strokes
Curves to convert to Sketch strokes. Press Enter when done
6 curves added to selection.
Command: _Delete
Command: _New
Command:
Perspective
Perspective Top Front Right
Points Curves Surfaces Polysurfaces Meshes
End Near Point Mid Cen Int Perp Tan Quad Knot
World x -18.44 y 19.26 z 0.00 Meters Default
Grasshopper - unnamed
File Edit View Display Solution Help
unnamed
Params Maths Sets Vec Crv Srf Msh Int Trns Dis Honeybee Human UI Ladybug BT Kangaroo2 Human LunchBox TT Toolbox Extra
Field Grid Plane Point Vector
138%
Input Data
Manipulate Data
Result Data
O XY P
X Size 2
Y Size 2
Height 1.4
P X Y R Rectangle R L
F Z V
B D Extr E
B Cap B
Result Geometry
{0}
0 Closed Brep
Data Flow
1.0.0007
Grid Snap Ortho Planar Osnap SmartTrack Gumball Record History Filter Available physical memory: 7168 MB


Grasshopper - 240106*
Create an ERV...
...add it to a vent. system...
...apply it to a room.
Data Flow
Zehnder 350
0.85
display_name_
sensible_hr_
latent_hr_
elec_efficiency_
frost_protection_
frost_temp_
inside_
out
unit_
Honeybee-PH v1.0.78
6ms
Pipeline
Layer: 05_ERV
Name: *
Type:
2 in
_geometry
_display_name
_duct_type
_insul_thickness
_insul_conductivity
_insul_reflective
_diameter
_height
_width
vent_duct_
16ms
PH Vent Types | 1-Balanced PH ventilation with HR [Default]
system_name_
system_type_
vent_unit_
duct_01_
duct_02_
vent_system_
8ms
SHW | Electric Water Heater
_system_type
name
efficiency
condition
_loss_coeff_
_tank_1_
_tank_2_
_buffer_tank_
_solar_tank_
_heaters
_distribution_piping
_num_tap_points_
_recirc_piping
hb_shw_
55ms
_hb_shw
_hb_rooms
hb_rooms_
88ms
PH Cooling Types | Recirculating Air
_cooling_type
display_name
percent_coverage
annual_COP
single_speed
min_coil_temp
capacity
flow_rate_m3_s
flow_rate_variable
cooling_params_
27ms
PH Heating Types | Heat Pump (Annual)
_system_type
_display_name
_percent_bldg_heating_covered
annual_COP
_percent_bldg_cooling_covered
_cooling_params_ventilation_air
_cooling_params_recirculation_air
_cooling_params_dehumidification
_cooling_params_chilled_panel
space_conditioning_system_
59ms
_ventilation_system
_space_conditioning_systems
_supportive_devices
_hb_rooms
hb_rooms_
69ms
name_
_hours_per_day
_operating_fraction
Honeybee-PH v1.0.78
16ms
HBPH Model -->
Autosave complete (52 seconds ago)
1.0.0007

Grasshopper - unnamed

Params Maths Sets Vector Curve Surface Mesh Int Trns Dis HB-PH DF HB HB-R PH-Tools PanelingTools Kangaroo2 HB-E Swiftlet LB Human Extra PCamp

00 |... | 01 | Model | 02 | Shading | 03 |... | 04 | PDF

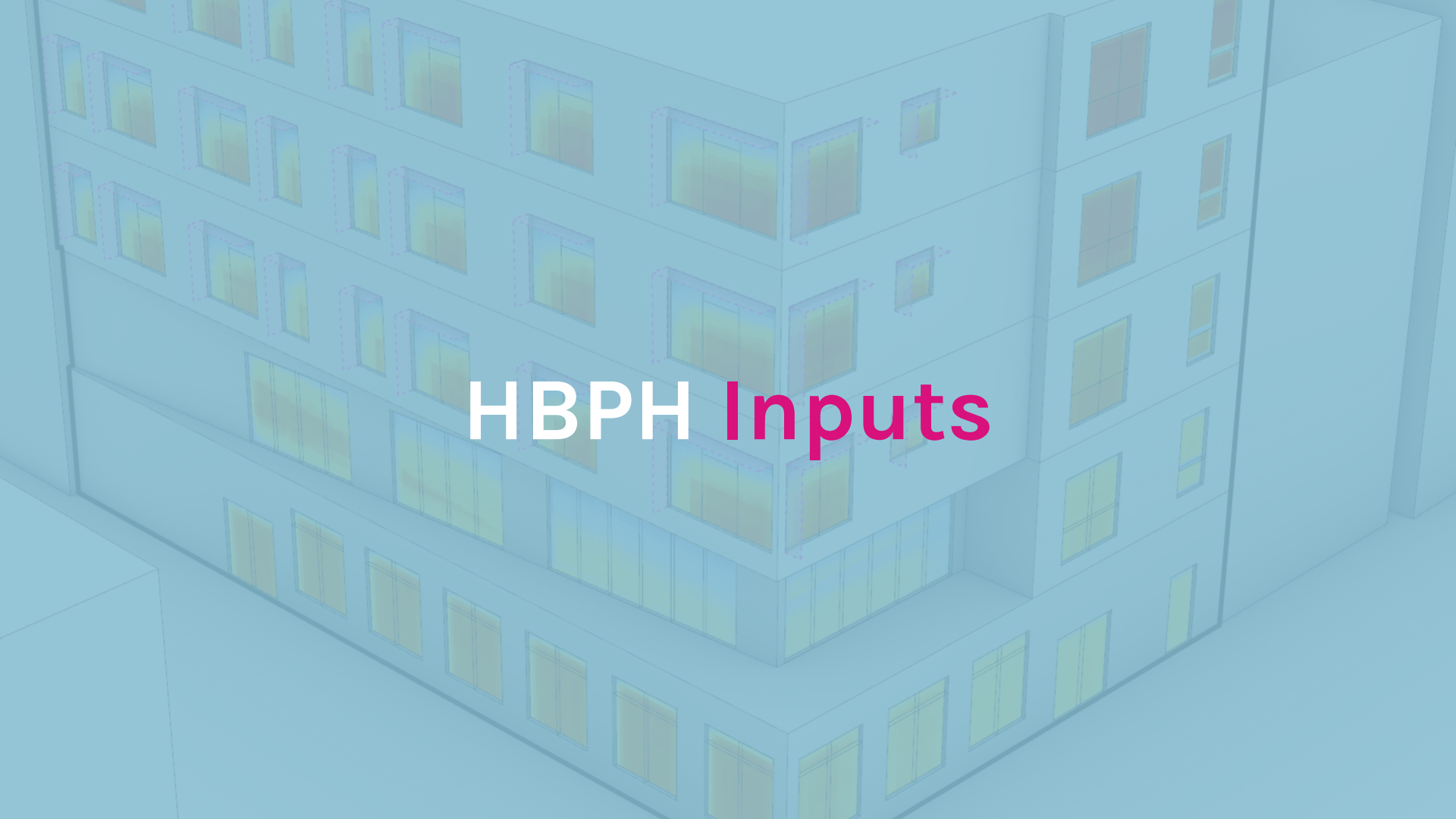
100%

Assemblies
Components
Thermal Bridges
Shading
Space TFA/iCFA

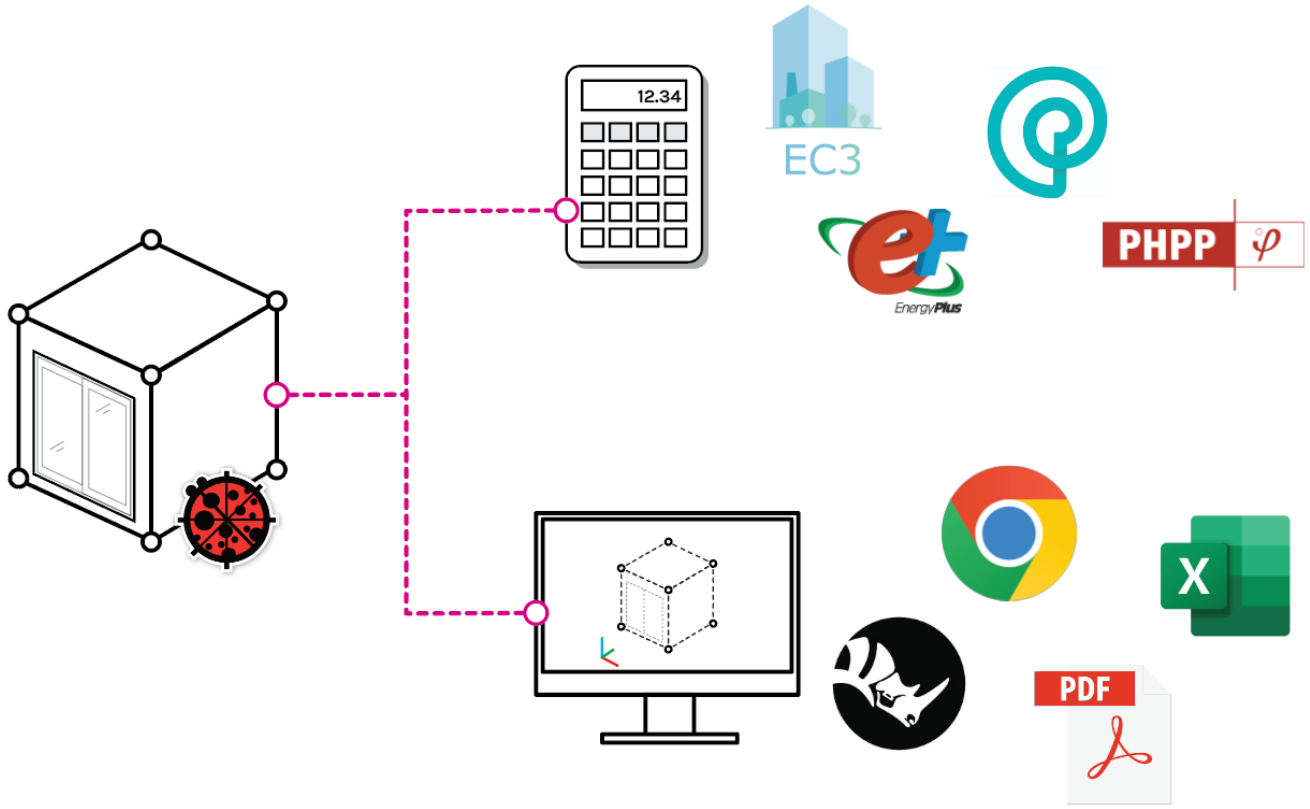
Hot-Water
Mechanicals
Appliances
Programs
Climate
Certification
Variants
PDF Reports

...

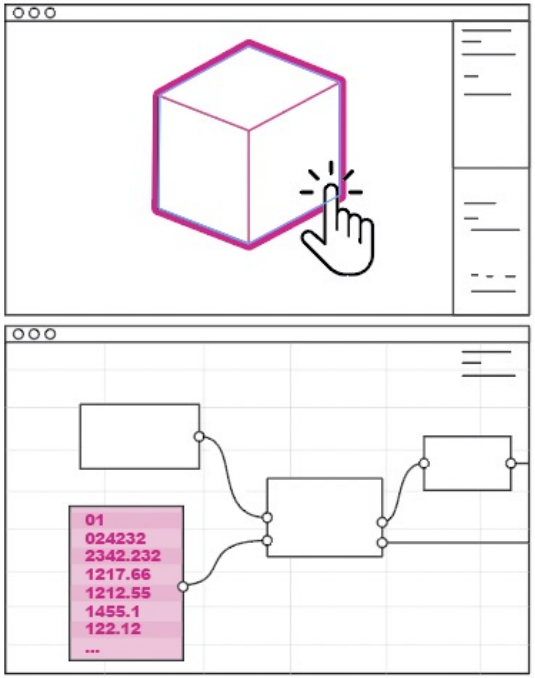
1.0.0007

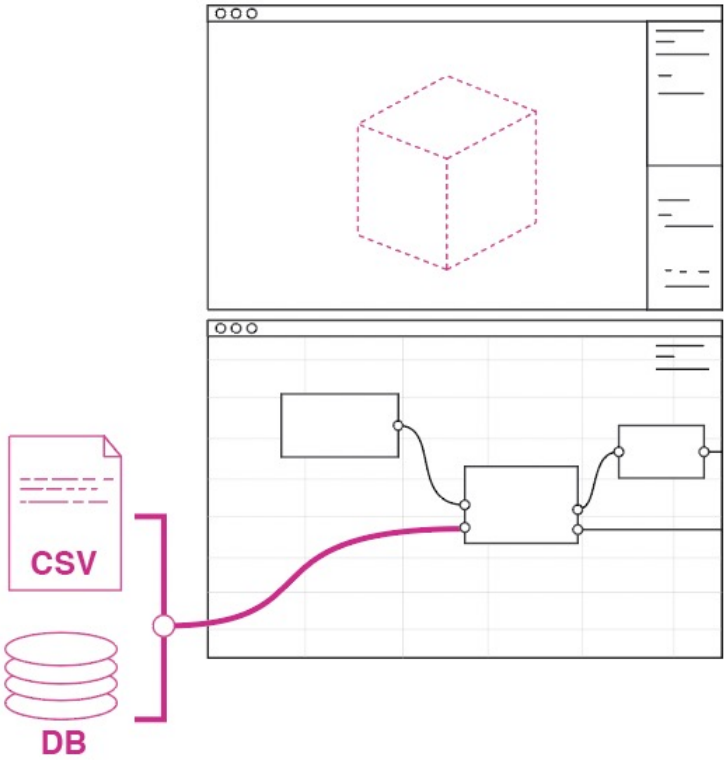


HBPH Inputs

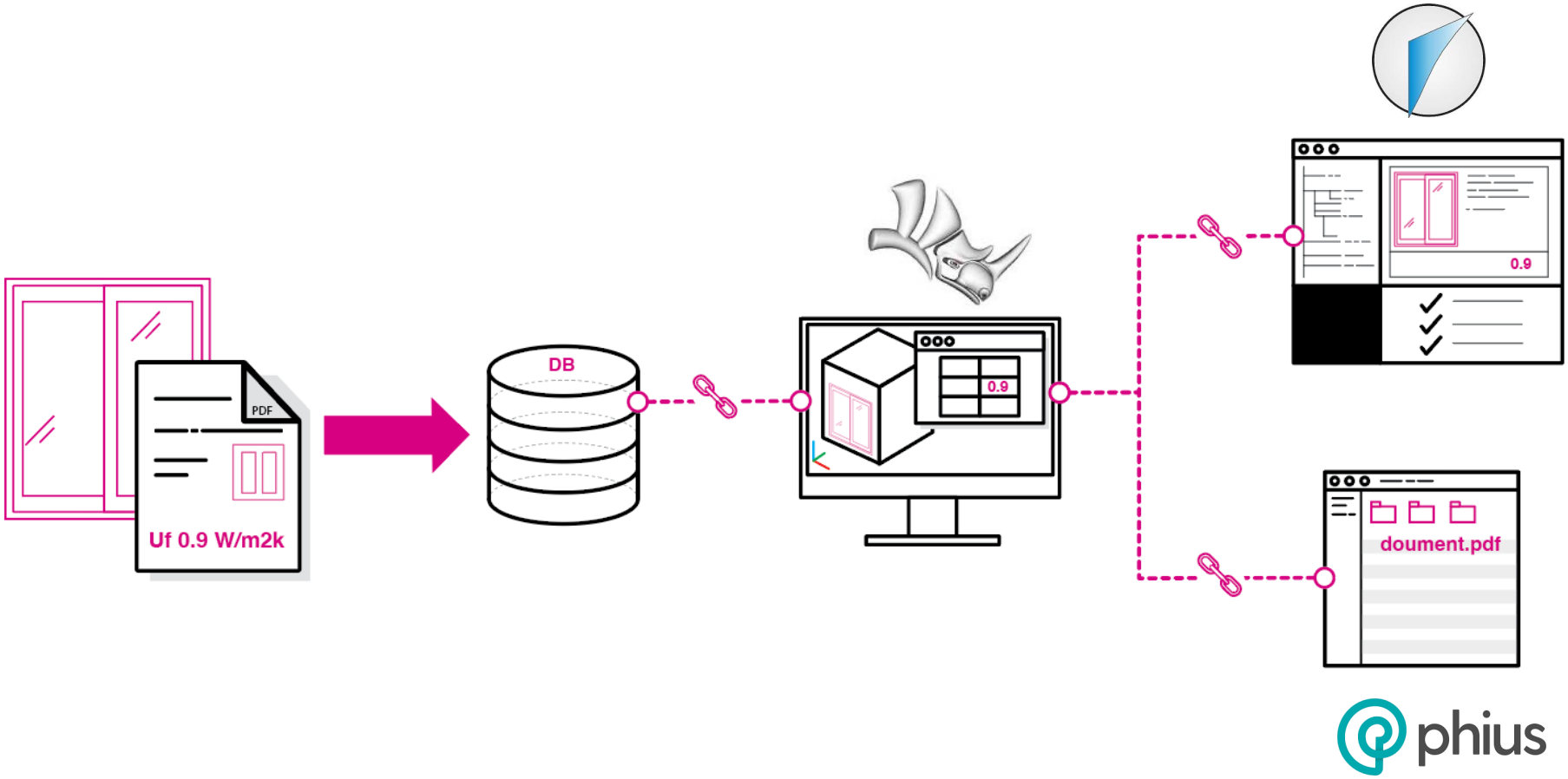


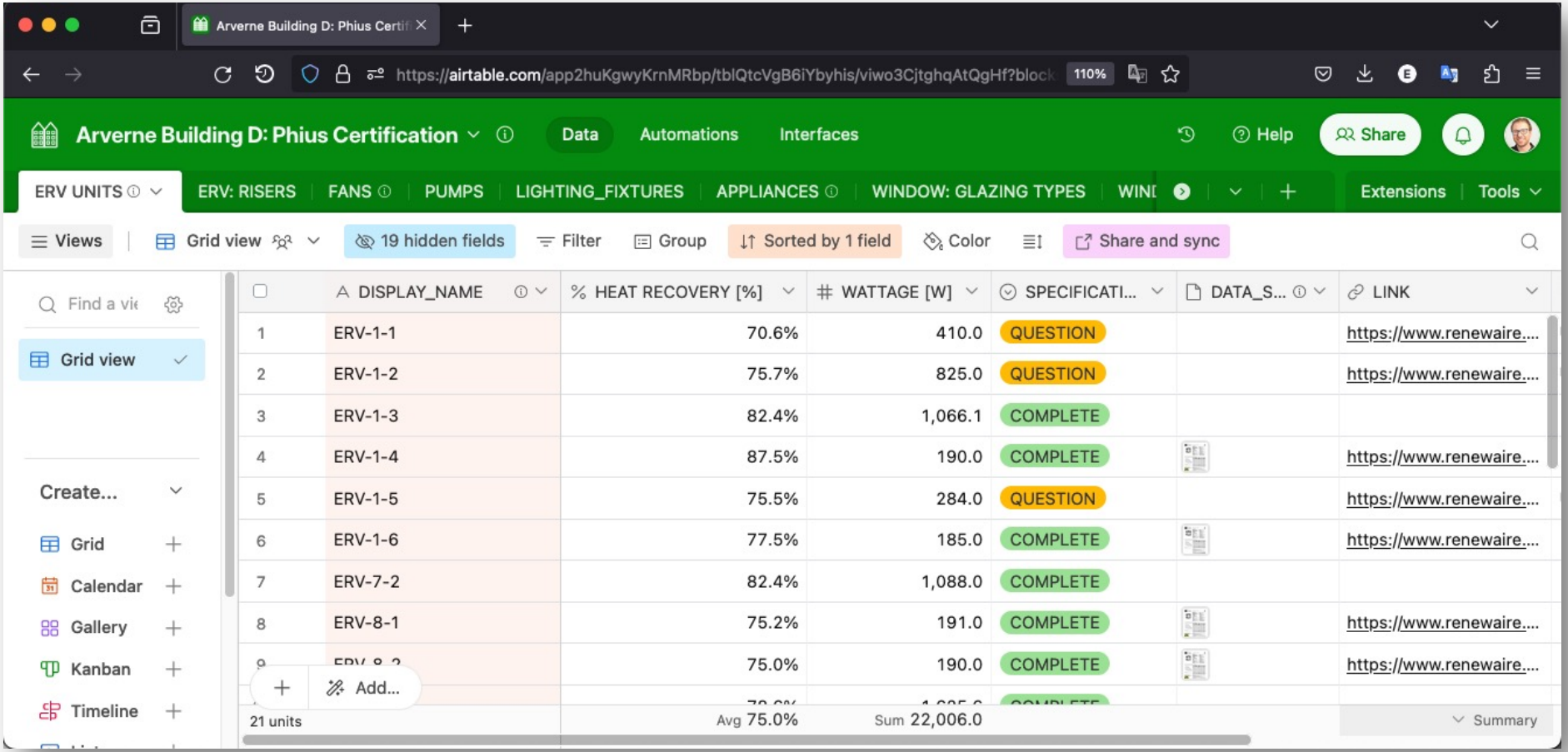
The model should be free from the application...



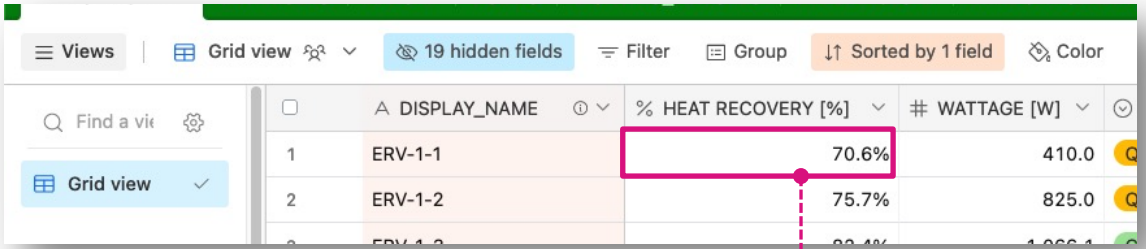


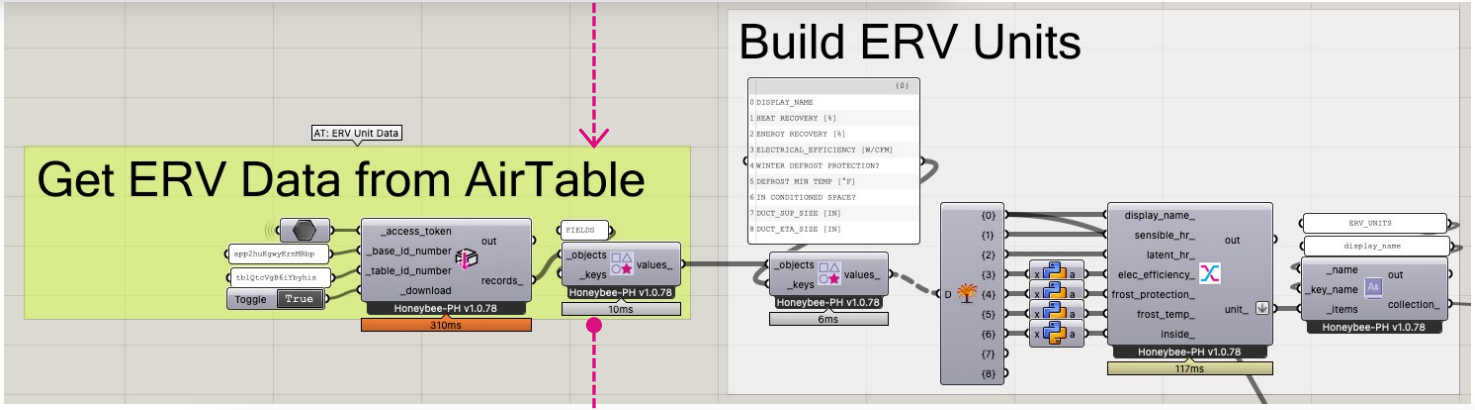
...and the data should be free from the model.

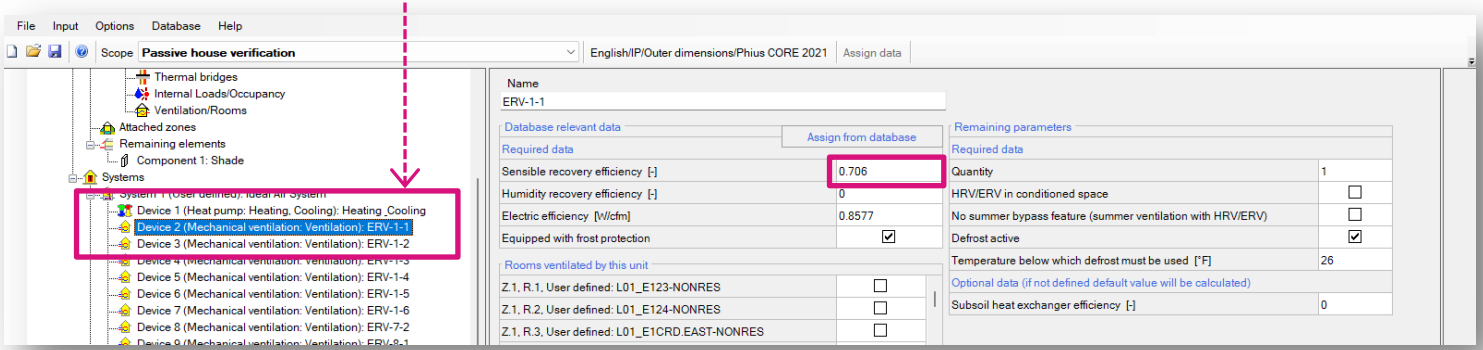

PDF
Uf 0.9 W/m2k
DB
0.9
0.9
dument.pdf
phius

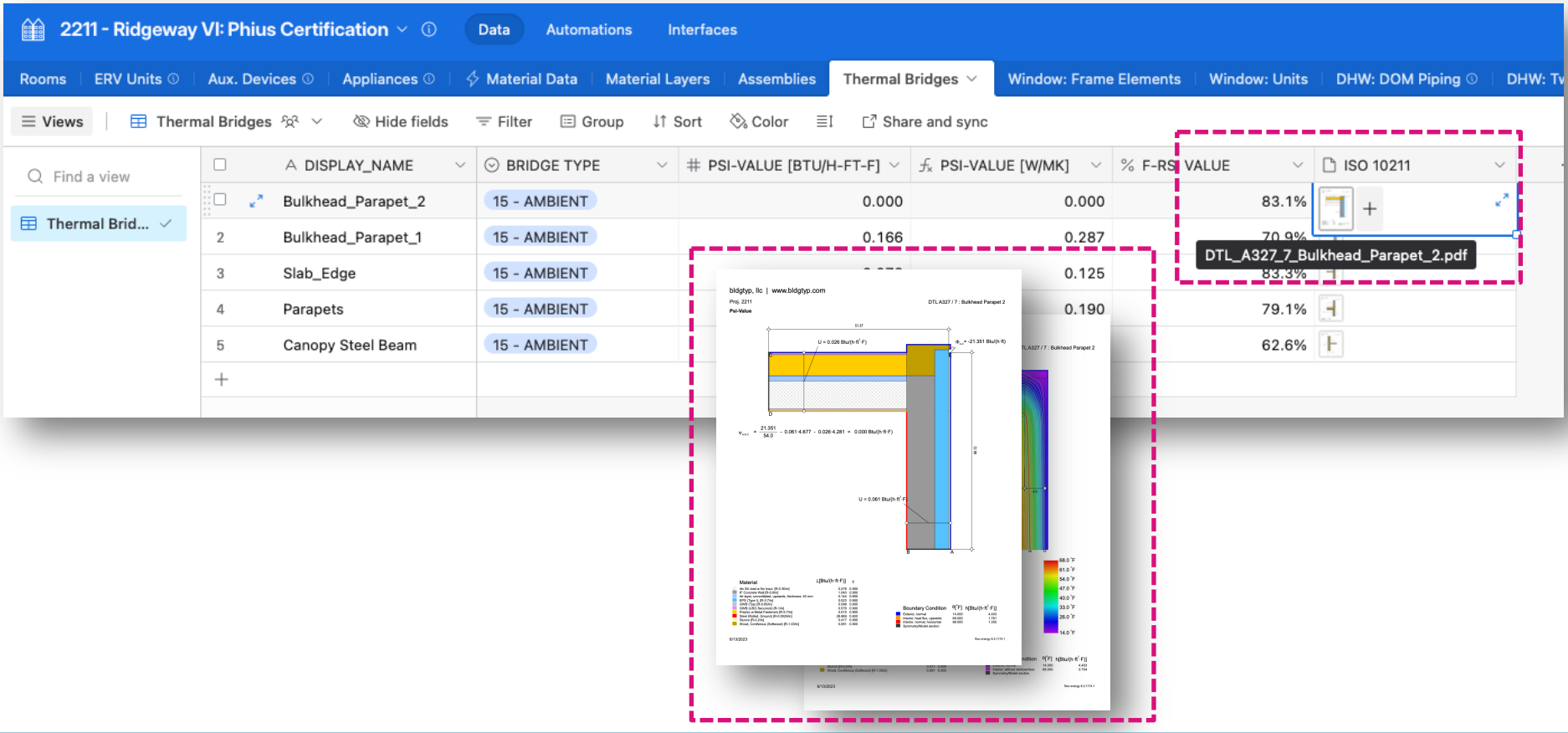

Arverne Building D: Phius Certif
https://airtable.com/app2huKgwyKrnMRbp/tblQtcVgB6iYbyhis/viwo3CjtghqAtQgHf?block
110%
Arverne Building D: Phius Certification
Data
Automations
Interfaces
Help
Share
ERV UNITS
ERV: RISERS
FANS
PUMPS
LIGHTING_FIXTURES
APPLIANCES
WINDOW: GLAZING TYPES
Extensions
Tools
Views
Grid view
19 hidden fields
Filter
Group
Sorted by 1 field
Color
Share and sync
Find a vie
Grid view
Create...
Grid
Calendar
Gallery
Kanban
Timeline
DISPLAY_NAME
HEAT RECOVERY [%]
WATTAGE [W]
SPECIFICATI...
DATA_S...
LINK
1 ERV-1-1 70.6% 410.0 QUESTION https://www.renewaire....
2 ERV-1-2 75.7% 825.0 QUESTION https://www.renewaire....
3 ERV-1-3 82.4% 1,066.1 COMPLETE
4 ERV-1-4 87.5% 190.0 COMPLETE https://www.renewaire....
5 ERV-1-5 75.5% 284.0 QUESTION https://www.renewaire....
6 ERV-1-6 77.5% 185.0 COMPLETE https://www.renewaire....
7 ERV-7-2 82.4% 1,088.0 COMPLETE
8 ERV-8-1 75.2% 191.0 COMPLETE https://www.renewaire....
75.0% 190.0 COMPLETE https://www.renewaire....
Add...
21 units
Avg 75.0%
Sum 22,006.0
Summary

Airtable

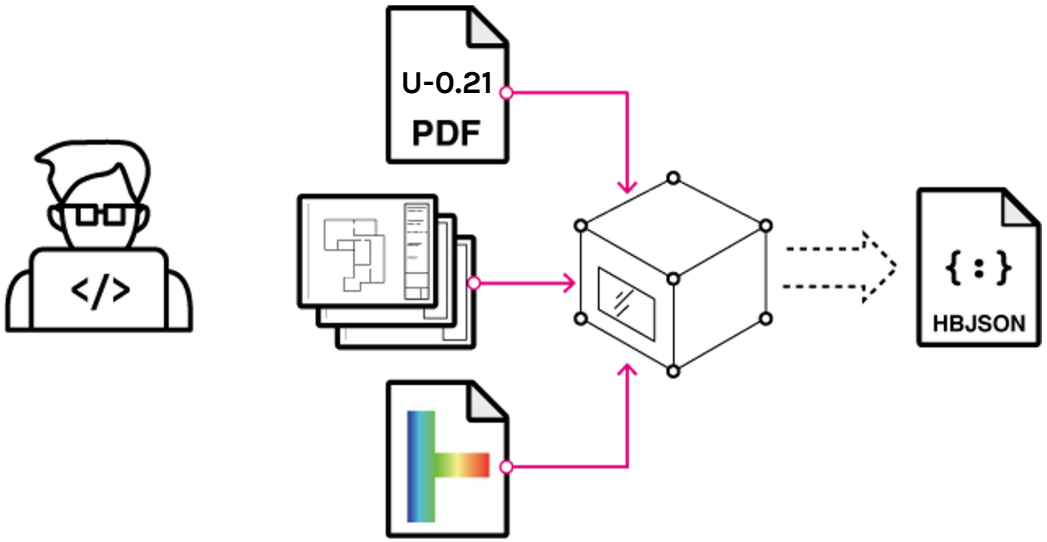

Views
Grid view
19 hidden fields
Filter
Group
Sorted by 1 field
Color
Find a vie
Grid view
DISPLAY_NAME
HEAT RECOVERY [%]
WATTAGE [W]
1
ERV-1-1
70.6%
410.0
2
ERV-1-2
75.7%
825.0

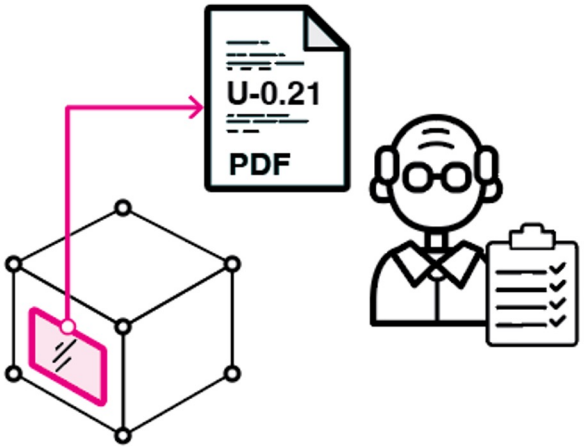

Build ERV Units
Get ERV Data from AirTable
AT: ERV Unit Data
_access_token
_base_id_number
_table_id_number
_download
out
records_
Toggle
True
Honeybee-PH v1.0.78
310ms
FIELDS
_objects
_keys
values_
Honeybee-PH v1.0.78
10ms
DISPLAY_NAME
HEAT RECOVERY [%]
ENERGY RECOVERY [%]
ELECTRICAL_EFFICIENCY [W/CFM]
WINTER DEFROST PROTECTION?
DEFROST MIN TEMP [°F]
IN CONDITIONED SPACE?
DUCT_SUP_SIZE [IN]
DUCT_ETA_SIZE [IN]
Honeybee-PH v1.0.78
6ms
display_name_
sensible_hr_
latent_hr_
elec_efficiency_
frost_protection_
frost_temp_
inside_
unit_
Honeybee-PH v1.0.78
117ms
ERV_UNITS
display_name
_name
_key_name
_items
collection_
Honeybee-PH v1.0.78


File
Input
Options
Database
Help
Scope
Passive house verification
English/IP/Outer dimensions/Phius CORE 2021
Assign data
Thermal bridges
Internal Loads/Occupancy
Ventilation/Rooms
Attached zones
Remaining elements
Component 1: Shade
Systems
Device 1 (Heat pump: Heating, Cooling): Heating_Cooling
Device 2 (Mechanical ventilation: Ventilation): ERV-1-1
Device 3 (Mechanical ventilation: Ventilation): ERV-1-2
Device 5 (Mechanical ventilation: Ventilation): ERV-1-4
Device 6 (Mechanical ventilation: Ventilation): ERV-1-5
Device 7 (Mechanical ventilation: Ventilation): ERV-1-6
Device 8 (Mechanical ventilation: Ventilation): ERV-7-2
Name
ERV-1-1
Database relevant data
Assign from database
Required data
Sensible recovery efficiency [-]
0.706
Humidity recovery efficiency [-]
0
Electric efficiency [W/cfm]
0.8577
Equipped with frost protection
Rooms ventilated by this unit
Z.1, R.1, User defined: L01_E123-NONRES
Z.1, R.2, User defined: L01_E124-NONRES
Z.1, R.3, User defined: L01_E1CRD.EAST-NONRES
Remaining parameters
Required data
Quantity
1
HRV/ERV in conditioned space
No summer bypass feature (summer ventilation with HRV/ERV)
Defrost active
Temperature below which defrost must be used [°F]
26
Optional data (if not defined default value will be calculated)
Subsoil heat exchanger efficiency [-]
0

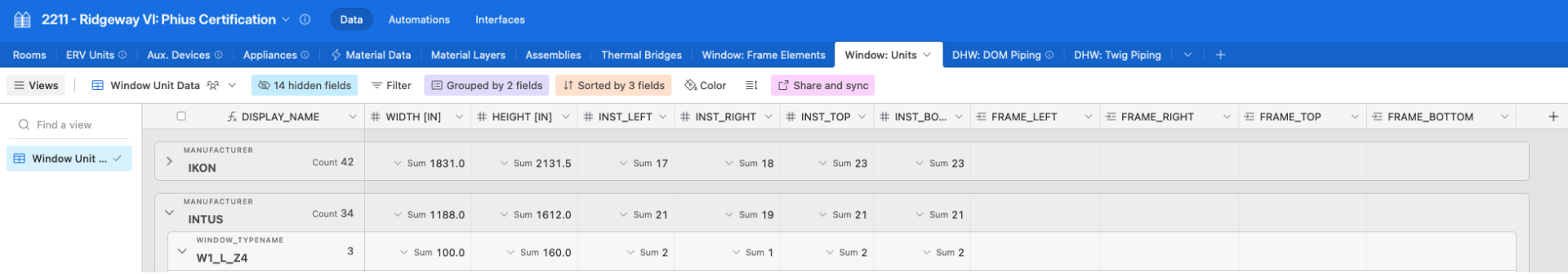


It is **not** enough to just build a good model. We have to be able to **justify and document** each of the model input values.

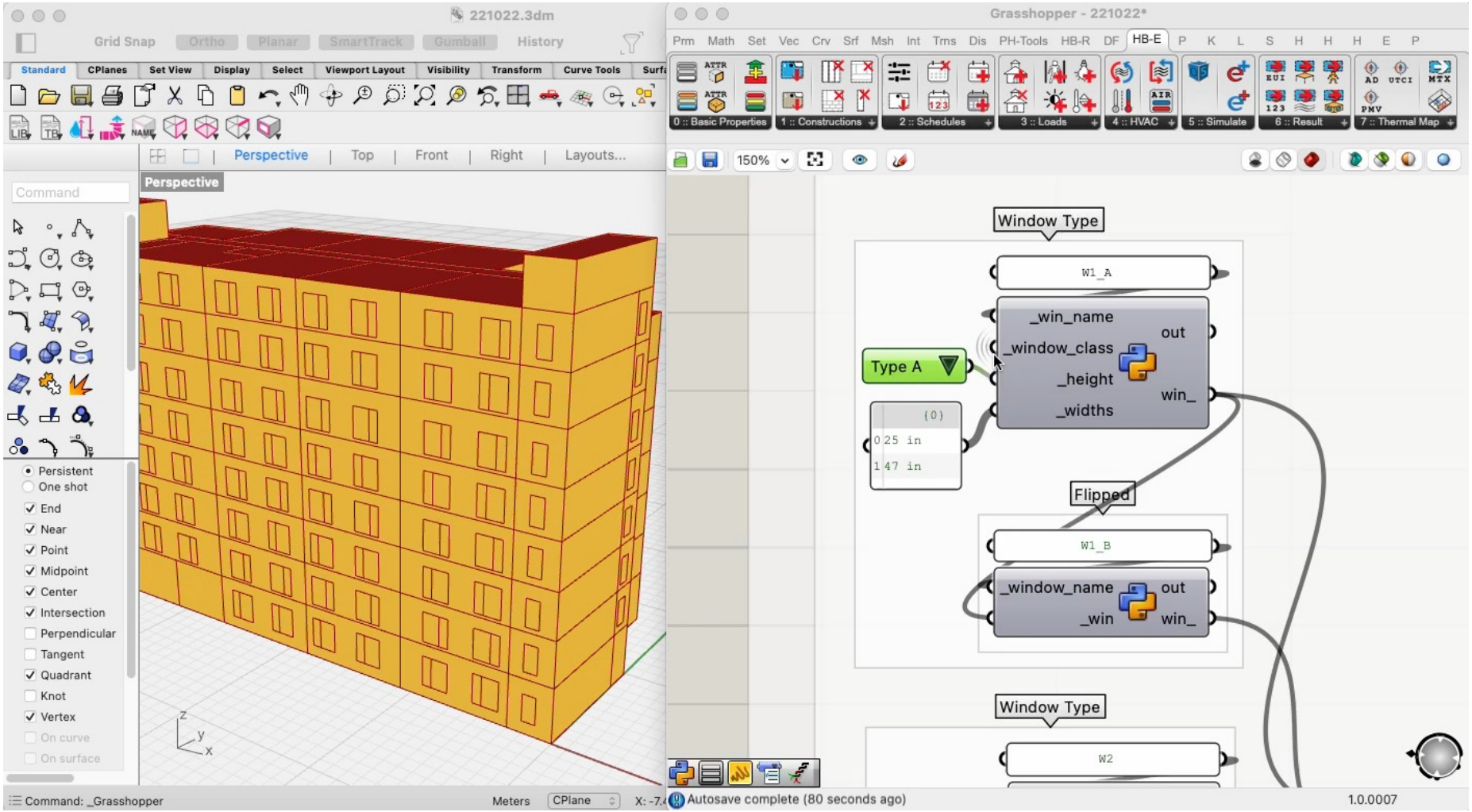




It is **not** enough to just build a good model. We have to be able to **justify and document** each of the model input values.



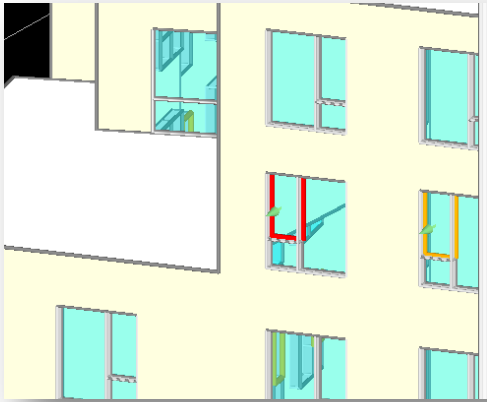
Room Data
Ventilation Equipment, Pumps, Fans, Appliances
Heating, Cooling Equipment
Material Data
Assembly Layers, Constructions
Thermal Bridges
Window Frames, Glass, Sizes
DHW Piping, Heaters, Tanks
...


221022.3dm
Grid Snap
Ortho
Planar
SmartTrack
Gumball
History
Standard
CPlanes
Set View
Display
Select
Viewport Layout
Visibility
Transform
Curve Tools
Perspective
Top
Front
Right
Layouts...
Command
Persistent
One shot
End
Near
Point
Midpoint
Center
Intersection
Perpendicular
Tangent
Quadrant
Knot
Vertex
On curve
On surface
Command: _Grasshopper
Meters
CPlane
Grasshopper - 221022*
Prm
Math
Set
Vec
Crv
Srf
Msh
Int
Trns
Dis
PH-Tools
HB-R
DF
HB-E
0 :: Basic Properties
1 :: Constructions
2 :: Schedules
3 :: Loads
4 :: HVAC
5 :: Simulate
6 :: Result
7 :: Thermal Map
150%
Window Type
W1_A
_win_name
_window_class
_height
_widths
out
win_
Type A
{0}
0 25 in
1 47 in
Flipped
W1_B
_window_name
_win
out
win_
Window Type
W2
Autosave complete (80 seconds ago)
1.0.0007

	DISPLAY_NAME	ID NUMBER	MANUFACTURER	BRAND	POSITION	OPERATION	PART NUMBER	WIDTH [IN]	U-VALUE [BTU/HR-FT2-F]	PSI-GLAZING [BTU/HR-FT-F]	ISO-10077-2
	MANUFACTURER IKON	Count 6	Sum 21					Sum 32.06	Sum 1.100	Sum 0.100	
	MANUFACTURER INTUS		Sum 105					Sum 46.99	Sum 3.445	Sum 0.255	
7	INTUS_01 [3.39"]	1	INTUS	SUPERA	HEAD	Fixed	[8001]	3.39	0.213	0.012	
8	INTUS_02 [5.35"]	2	INTUS	SUPERA	HEAD	Operable	[8001 8095]	5.35	0.229	0.012	
9	INTUS_03 [3.39"]	3	INTUS	SUPERA	JAMB	Fixed	[8001]	3.39	0.213	0.012	
10	INTUS_04 [5.35"]	4	INTUS	SUPERA	JAMB	Operable	[8001 8095]	5.35	0.229	0.011	
11	INTUS_05 [4.88"]	5	INTUS	SUPERA	SILL	Fixed	[8001]	4.88			

3.39

5.35



SF08_Z4_C1_R2 0.1458

Frame factor		0.7176
Glass U-value	[Btu/hr ft² °F]	0.091
SHGC/Solar energy transmittance (perpendicular)		0.392

Frame data

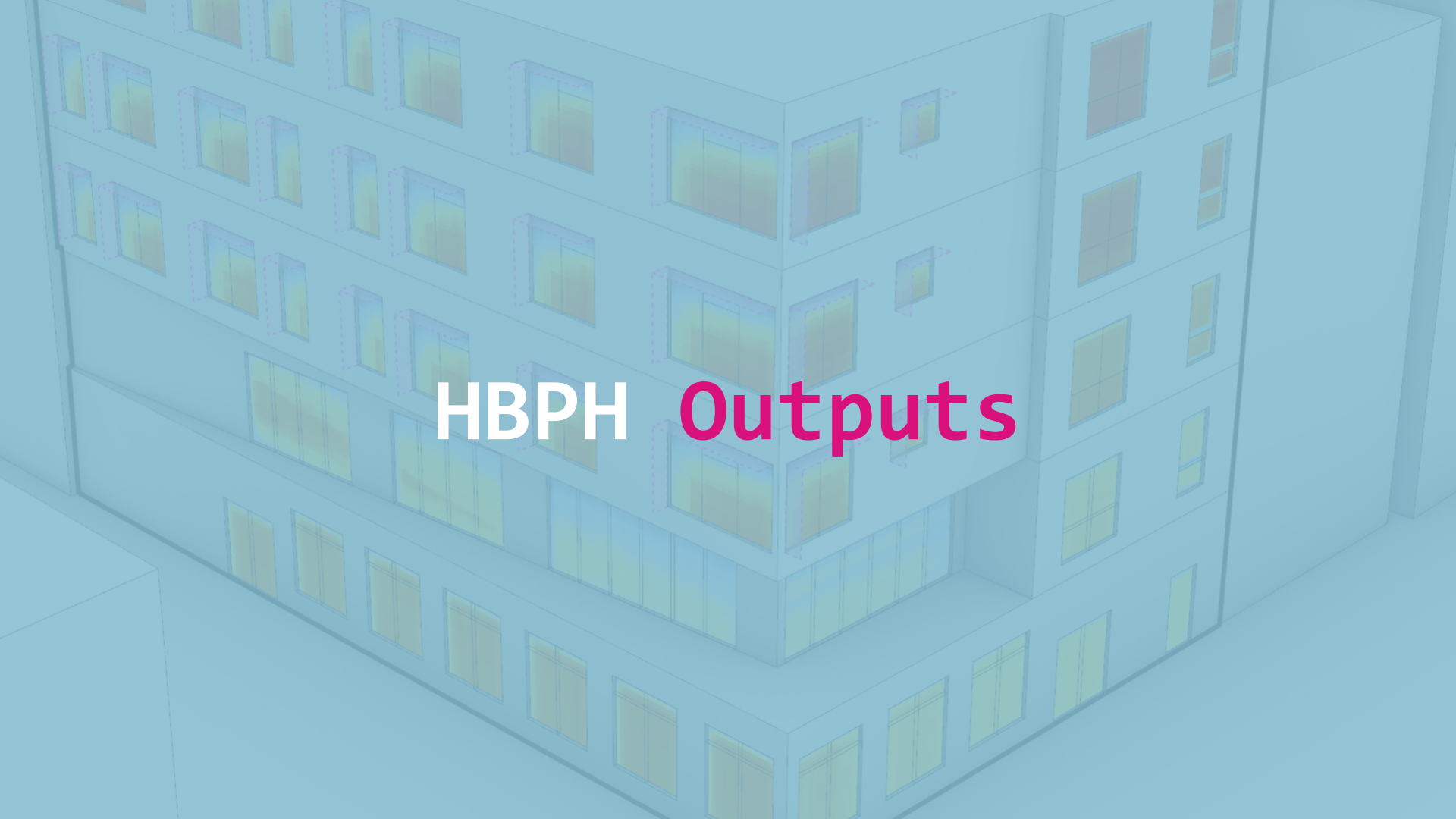
Setting		Left	Right	Top	Bottom
Frame width	[in]	5.3543	2.8307	5.3543	2.5984
Frame U-value	[Btu/hr ft² °F]	0.2291	0.2702	0.2295	0.2506
Glazing-to-frame psi-value	[Btu/hr ft °F]	0.011	0.0231	0.0116	0.0231
Frame-to-Wall psi-value	[Btu/hr ft °F]	0.054	0	0.054	0

Solar radiation angle dependent data

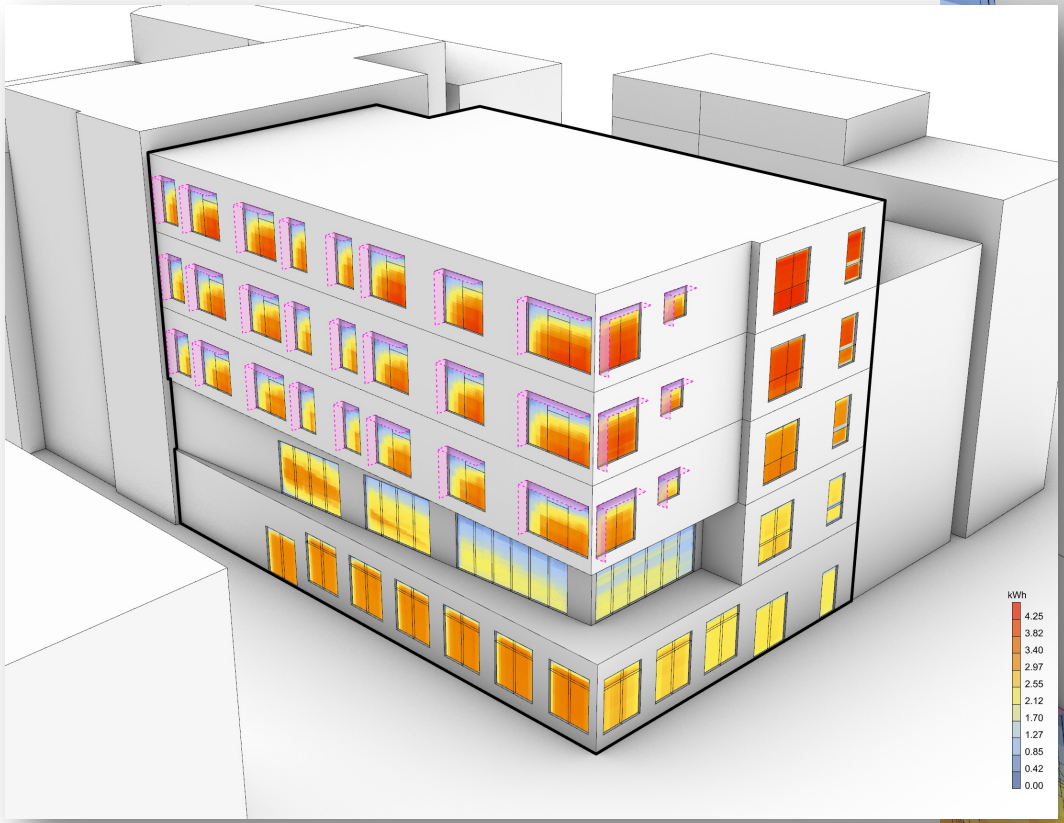
Angle [°]	Total solar trans.
0	

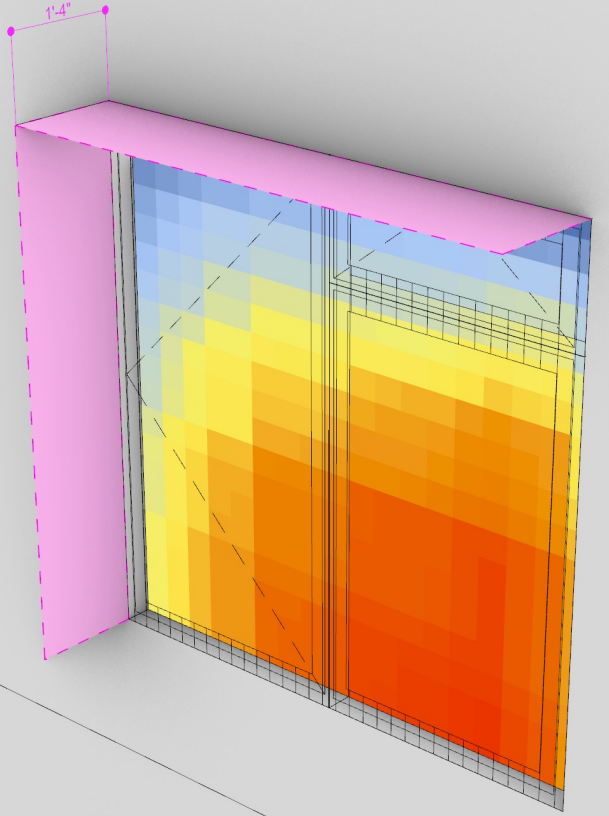
Setting	Left
[in]	5.3543
[Btu/hr ft² °F]	0.2291
psi-value [Btu/hr ft °F]	0.011

			Risk of Condensation?	OK	-
	W1.2_X:	Basic Parameters	General:	OK per datasheets / Flixo /Airtable	-
			U-glass:	0.691, OK	-
			SHGC:	0.392, OK	-
		Frame Parameters	Frame Width:	OK	-
			U-frame:	OK	-
			Glazing-to-frame psi-value (psi-spacer)	OK	-
			Frame-to-wall psi-value (psi-install)	OK	-
			Comfort Criteria:	OK	-
			Risk of Condensation?	OK	-
			General:	OK per datasheets / Flixo /Airtable	-



HBPH Outputs

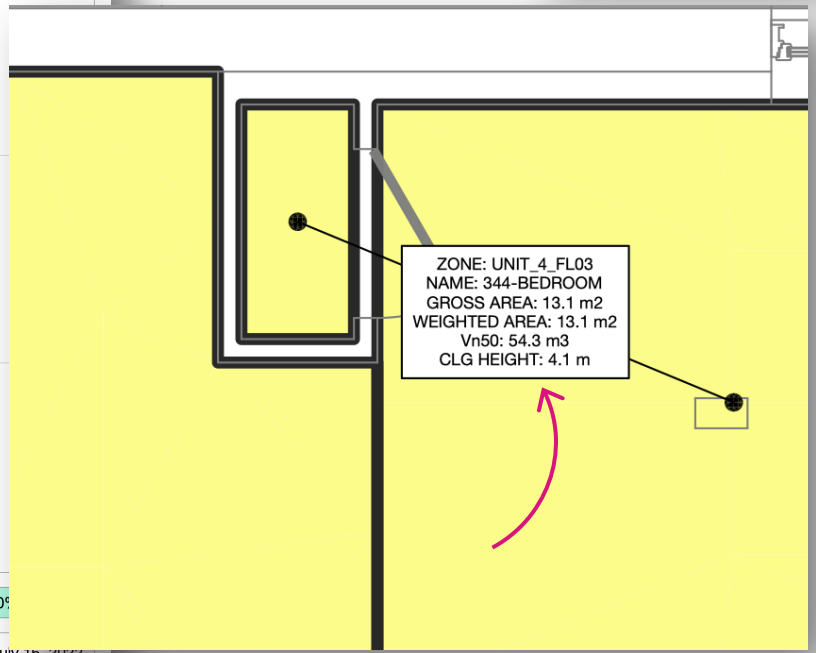

kWh
4.25
3.82
3.40
2.97
2.55
2.12
1.70
1.27
0.85
0.42
0.00


1'-4"


03 Second
223 E 25th St.

05 Third Floor TFA
TFA Weighting:
100%
60%
50%
223 E 25th St.


TXT
PDF
04 | PDF


ZONE: UNIT_4_FL03
NAME: 344-BEDROOM
GROSS AREA: 13.1 m2
WEIGHTED AREA: 13.1 m2
Vn50: 54.3 m3
CLG HEIGHT: 4.1 m

	K	L	M
16	B	0.00	External wall ground/basement
17	A	83.41	Roof / ceiling - ambient
18	B	80.93	Floor slab / basement ceiling
19		0.00	
20		0.00	
21		0.00	
22	Thermal bridges, length [m]		
23	A	122.85	Thermal bridges ambient
24	P	0.00	Perimeter thermal bridges
25	B	11.35	Thermal bridges FS/BC
26	Building element towards neighbour, [m²]		
27	I	100.90	Building element towards neighb
28	Total thermal envelope [m²]		
29		392.07	Average U-value

Area no.	Building assembly description	Assigned to group
	Projected building footprint	0-Projected building footprint:
	Treated floor area	1-Treated floor area
	Exterior door	7-Exterior door
1	External wall south	8-External wall - ambient
2	External wall north	8-External wall - ambient
3	External wall west	8-External wall - ambient
4	Roof	10-Roof / ceiling - ambient
5	Basement floor	11-Floor slab / basement ceiling
6		
7	Partition wall	18-Building element towards neighbour
8		
9		
10		

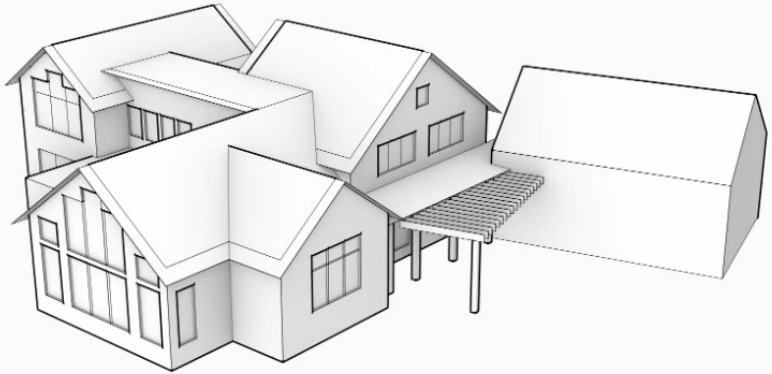
{PHX}

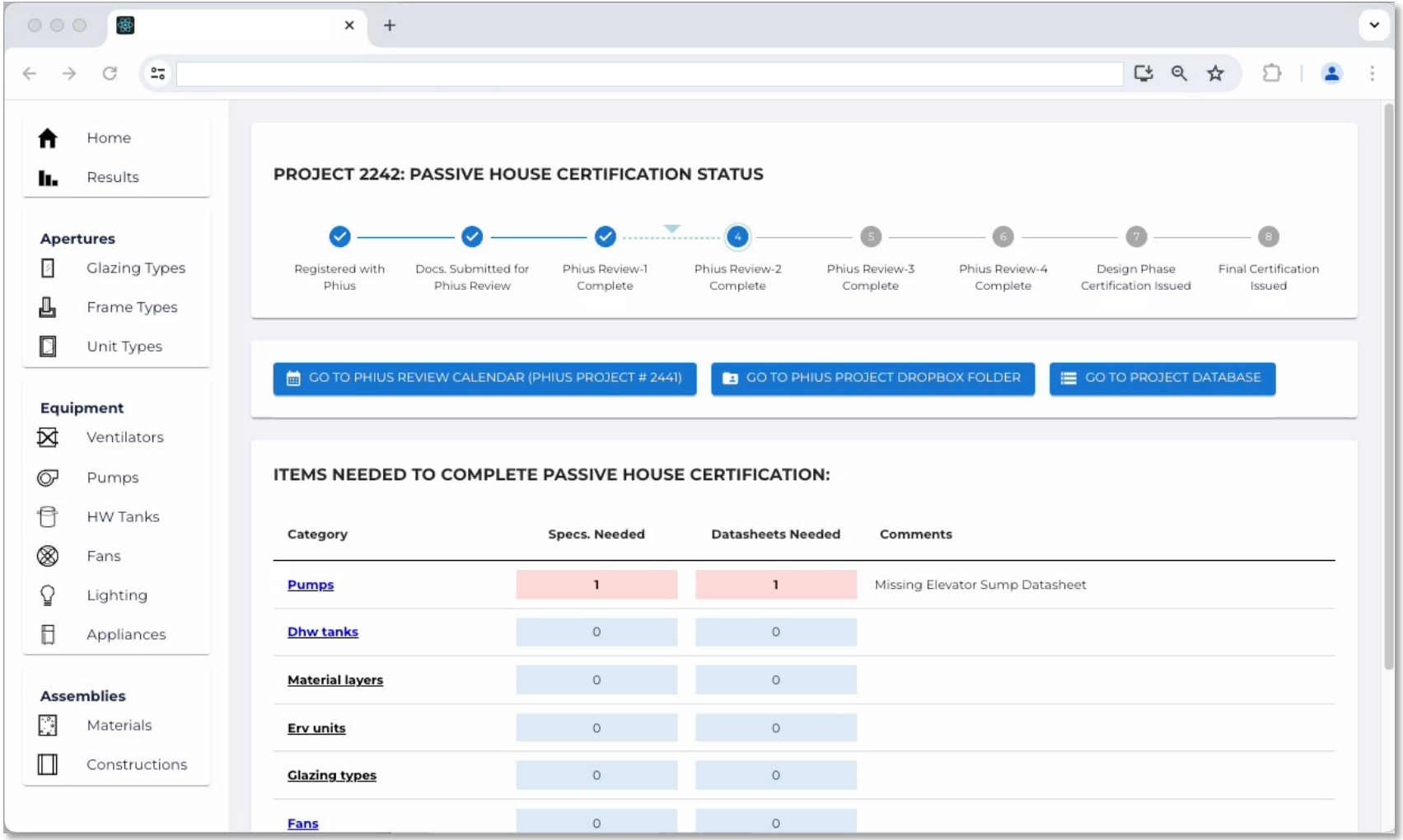
Pam Sandler Architect, LLC |

Pam Sandler Architect, LLC | Williamstown Home

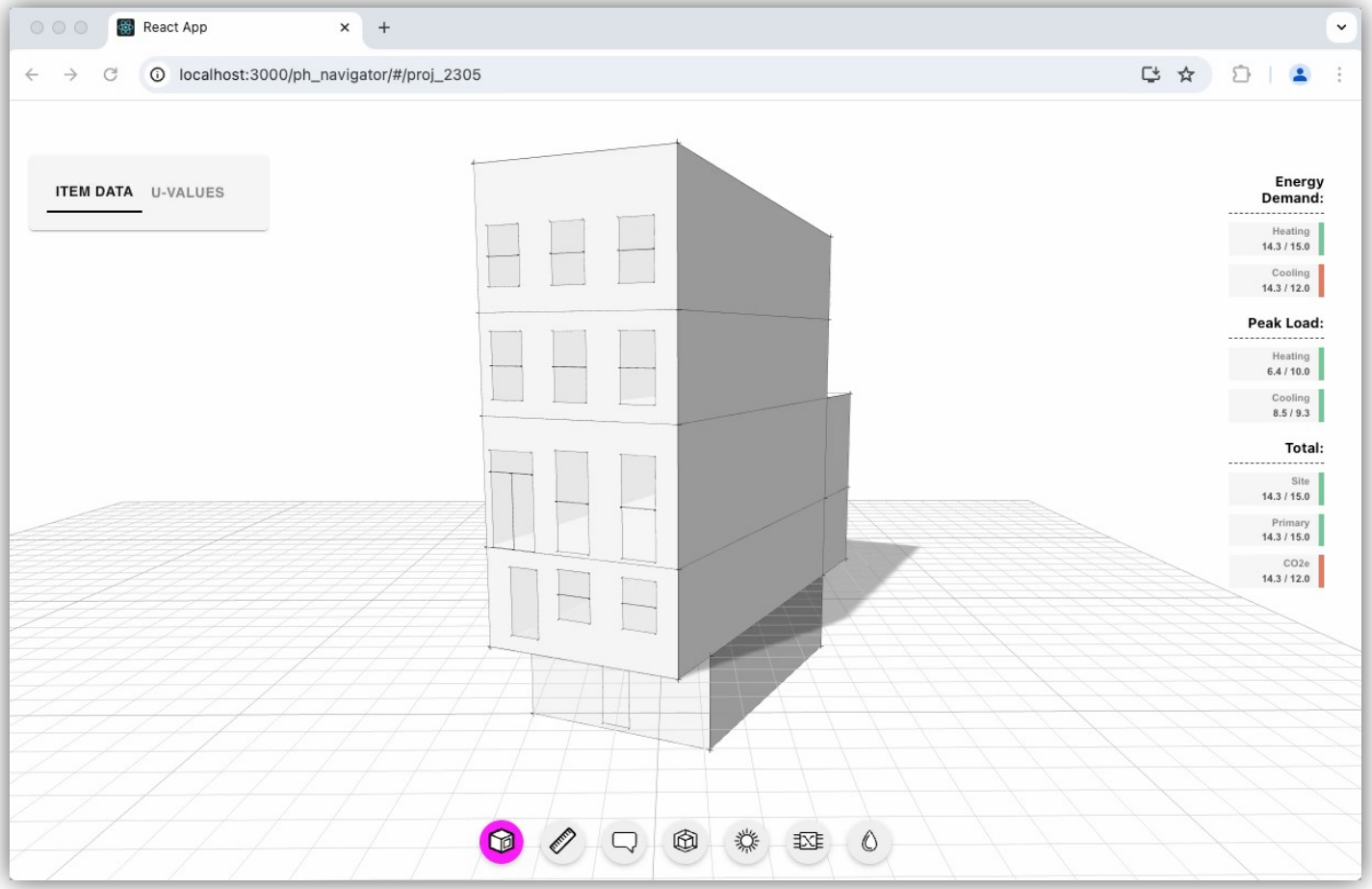
January 12, 2024

Energy Model Building Envelope Windows Mechanical

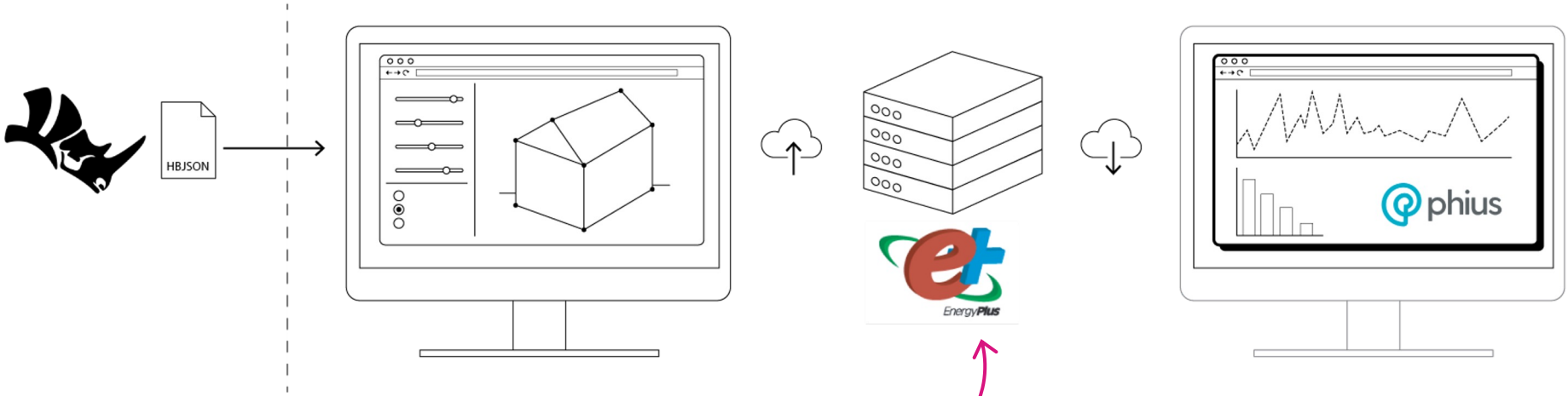



Home
Results
Apertures
Glazing Types
Frame Types
Unit Types
Equipment
Ventilators
Pumps
HW Tanks
Fans
Lighting
Appliances
Assemblies
Materials
Constructions
PROJECT 2242: PASSIVE HOUSE CERTIFICATION STATUS
Registered with Phius
Docs. Submitted for Phius Review
Phius Review-1 Complete
Phius Review-2 Complete
Phius Review-3 Complete
Phius Review-4 Complete
Design Phase Certification Issued
Final Certification Issued
GO TO PHIUS REVIEW CALENDAR (PHIUS PROJECT # 2441)
GO TO PHIUS PROJECT DROPBOX FOLDER
GO TO PROJECT DATABASE
ITEMS NEEDED TO COMPLETE PASSIVE HOUSE CERTIFICATION:
Category
Specs. Needed
Datasheets Needed
Comments
Pumps
1
1
Missing Elevator Sump Datasheet
Dhw tanks
0
0
Material layers
0
0
Erv units
0
0
Glazing types
0
0
Fans
0
0


{:}
HBJSON


React App
localhost:3000/ph_navigator/#/proj_2305
ITEM DATA
U-VALUES
Energy Demand:
Heating
14.3 / 15.0
Cooling
14.3 / 12.0
Peak Load:
Heating
6.4 / 10.0
Cooling
8.5 / 9.3
Total:
Site
14.3 / 15.0
Primary
14.3 / 15.0
CO2e
14.3 / 12.0

phius REVIVE 2024



Finally, we can use an
open source calculator!

React App

localhost:3000/ph_navigator/#/proj_2305

ITEM DATA U-VALUES

Energy Demand:

Heating 14.3 / 15.0

Cooling 14.3 / 12.0

Peak Load:

Heating 6.4 / 10.0

Cooling 8.5 / 9.3

Total:

Site 14.3 / 15.0

Primary 14.3 / 15.0

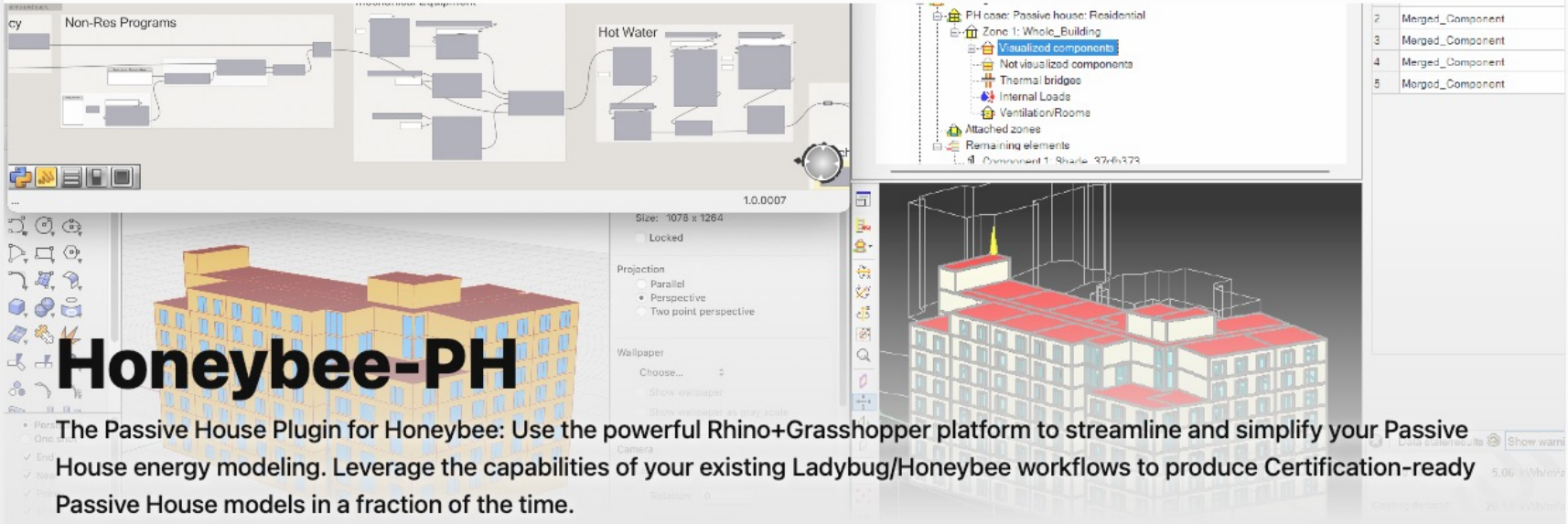
CO2e 14.3 / 12.0

PH-Tools.honeybee-grasshop

www.passivehousetools.com

PH-Tools.honeybee_grasshopper_ph

Install Quick Start Learn More Contact



Honeybee-PH

The Passive House Plugin for Honeybee: Use the powerful Rhino+Grasshopper platform to streamline and simplify your Passive House energy modeling. Leverage the capabilities of your existing Ladybug/Honeybee workflows to produce Certification-ready Passive House models in a fraction of the time.

Download Honeybee-PH Installer File


free the model from the application,
free the data from the model.