



# METr Webinar

January 14, 2025



# Outline

- What is METr?
- Accessing METr
- Using METr
- Timeline
- Future Features in METr
- Questions



Event Approved for  
Phius CEUs

## Jan. Webinar: METr

*Earn 1.0 CEU*



Self Report Code  
Coming Later

*Self Report @*

[www.phius.org/certifications/  
professionals/maintain-credentials](http://www.phius.org/certifications/professionals/maintain-credentials)





# What is METr?

*(M)odeled (E)nergy (Tr)ansfer*



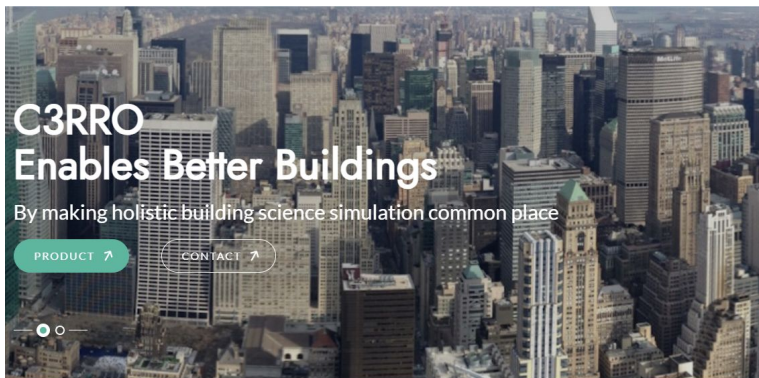
## METr: The Future of Energy Modeling

METr is a new, cloud-based modeling tool developed by C3RRO and Phius optimized for passive building energy modeling. With the familiar mechanics and interface of WUFI Passive, METr features a streamlined user experience and easy-to-use tools.

<https://www.phius.org/metr>



# Accessing METr



## The 3 C's - Work With Us



### Compute

Empowering sustainable building design and operation through cutting-edge computing solutions that prioritize health, comfort, and low energy consumption.



### Consult

Providing expert consulting to integrate building science knowledge, increase productivity, and solve research questions.



### Code

Developing software solutions to aid clients in designing and operating energy-efficient, healthy, and comfortable buildings.

## Website

<https://c3rro.com/>

## Signing Up

<https://c3rro.com/product/metr/>



# Accessing METr

## Cost

€588.00 / year (~\$610 USD)

[Shop / C3RRO® Software / C3RRO® Passive / METr](#)

### METr

€588.00 / year

- 🔗 The phius tool for Passive House Verification
- 🔗 available at: [metr.c3rro.com](http://metr.c3rro.com)
- 🔗 Monthly Building heat balance calculation
- 🔗 Metrix:
  - 🔗 53 cpu computation hours (dynamic shading)
  - 🔗 53 projects
  - 🔗 single user
- 🔗 web-browser based: tested with Edge, Chrome, Firefox, Safari (all up-to-date)
- 🔗 Availability: 95% per month
- 🔗 *The Service-specific fault rectification times (2.5)*

Buy now



# Current WUFI License Holders

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**License Holders w/ 60+ months left in term**



50% discount coupon\*

**License Holders w/ 18-60 months left in term**



35% discount coupon\*

**License Holders w/ 6-18 months left in term**



20% discount coupon\*

*To redeem this offer, users must provide C3RRO with their current WUFI License Key, Username, Company, and 'Valid through' date ([support@c3rro.com](mailto:support@c3rro.com))*

\*Discount applies to first year of subscription only



## Early sign-up

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**January and February 2025:**



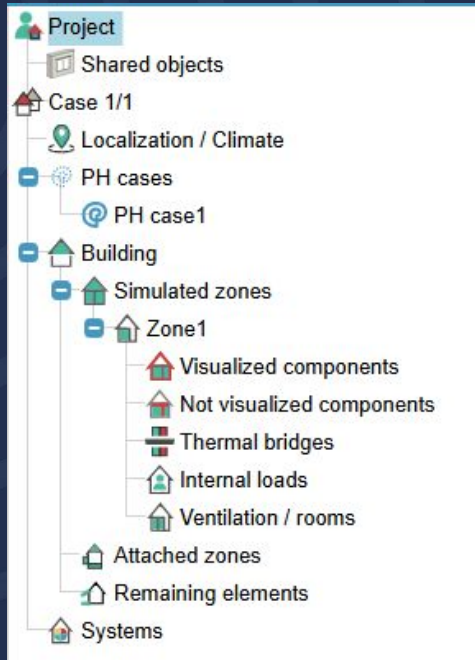
- 50% off the first year, with a coupon
  - Coupon: **betasale**

**March - December 2025:**



- 10% off the first year, with a coupon
  - Coupon code(s): **coming March**





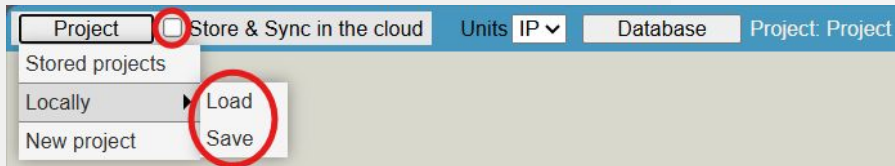
# Using METr (project walk-through)



# Project

## Import

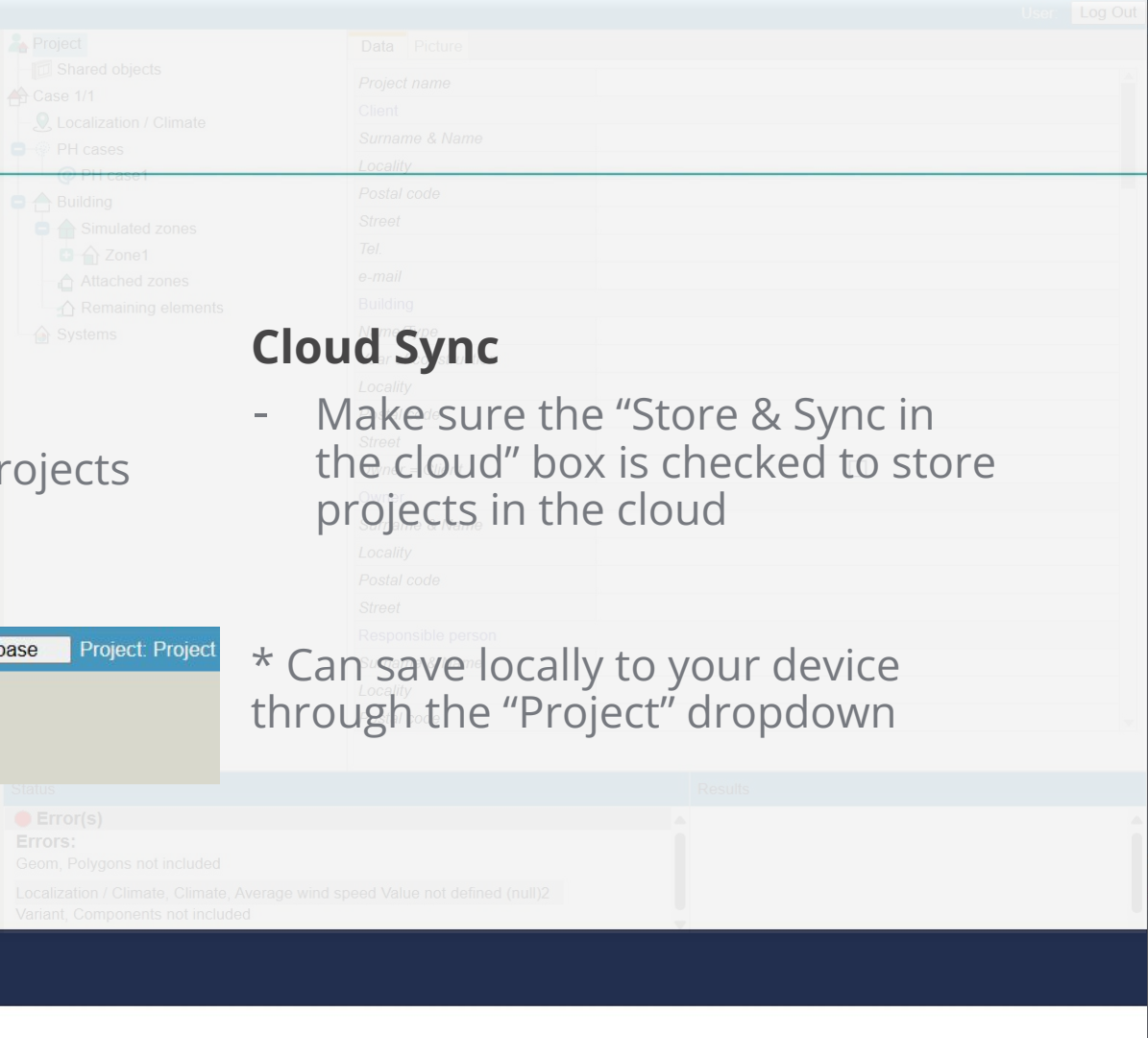
- Can import a .JSON file
- Load previously saved projects from the cloud



## Cloud Sync

- Make sure the “Store & Sync in the cloud” box is checked to store projects in the cloud

\* Can save locally to your device through the “Project” dropdown

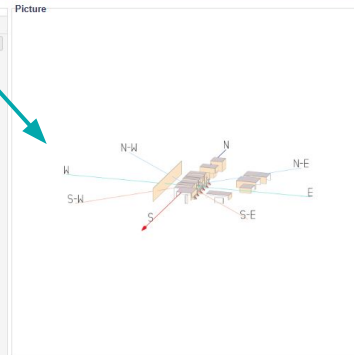




# Stored Projects

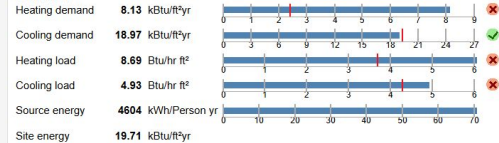
Tool: Stored projects | Import project | Import project as new | Close

Stored projects			
Nr	Project name	Scope	Last saved
1	FS-177_Boudet Place_2025 01 07	Passive	Tuesday, January 14, 2025 6:42 PM
2	FS-164_Elmwood_2025 01 07	Passive	Thursday, January 9, 2025 4:20 PM
3	FS-164_Elmwood_2025 01 07	Passive	Thursday, January 9, 2025 4:20 PM
4	FS-164_Elmwood_2025 01 07	Passive	Thursday, January 9, 2025 4:20 PM
5	FS-146 Wesley Townhomes_2025 01 07	Passive	Thursday, January 9, 2025 4:20 PM
6	FS-170 McLean Senior Living Villas_2025 01 08	Passive	Wednesday, January 8, 2025 6:25 PM
7	FS-120 Renu House_2025 01 08	Passive	Wednesday, January 8, 2025 6:25 PM
8	FS-156 La Olazul_2025 01 08	Passive	Wednesday, January 8, 2025 6:18 PM
9	FS-170 Test Import	Passive	Wednesday, January 8, 2025 6:06 PM
10	FS-156 Import Test	Passive	Tuesday, January 7, 2025 6:32 PM
11	FS-160 Test Import	Passive	Tuesday, January 7, 2025 6:13 PM
12	FS-160 Test	Passive	Wednesday, December 11, 2024 8:13 PM
13	Project	Passive	Wednesday, December 11, 2024 8:13 PM



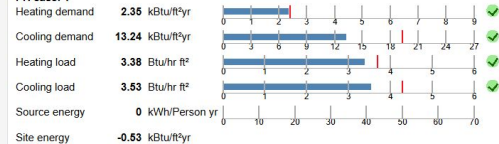
Calculation: Passive, 1/14/2025 6:42:16 PM

PH case: 1



Calculation: Passive, 1/14/2025 6:37:29 PM

PH case: 1



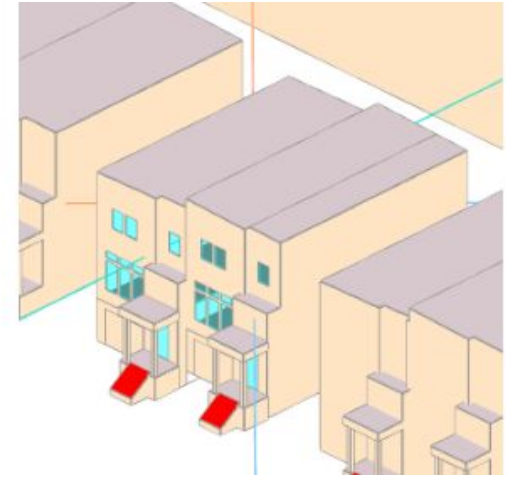


# Project

## Data/Picture

- Similar to Wufi, image can be assigned from model or loaded from a local file to show on reports.

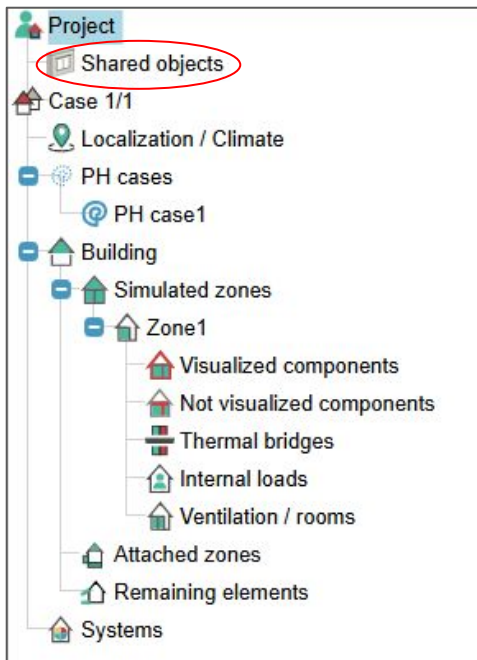
Data	Picture
Project name	Project
Client	
Surname & Name	
Locality	
Postal code	
Street	
Tel.	
e-mail	
Building	
Name/Type	
Year of construction	
Locality	
Postal code	
Street	
Owner = Client	<input type="checkbox"/>
Owner	
Surname & Name	
Locality	
Postal code	
Street	
Responsible person	
Surname & Name	
Locality	
Postal code	
Street	
Tel.	
License Nr.	
e-mail	
Date	8/9/2024



Data	Picture
Background white	<input type="checkbox"/>
Assign actual image	<input type="checkbox"/>
	<input type="checkbox"/>
Picture	



# Shared Objects



## New to the 'Tree'

- Contains Building elements and Utilization Patterns that can be shared between cases
- Building elements
  - Materials & Assemblies
- Utilization Patterns
  - For ventilation
  - For non-res internal loads



# Project - Shared Objects

## Building Elements - Materials

- Add project-specific materials from the database to be used in assemblies
- User can create a personal material database to be shared between all projects
- Or create a custom, project-specific material in this section

The screenshot shows a software interface with a tabbed menu at the top: 'Building elements' (selected), 'Utilization patterns', 'Materials', 'Assemblies', 'Windows', 'Shading device', and 'Window overhang'. Below the tabs is a table with columns 'Nr' and 'Name'. The table contains 16 rows of material entries. To the right of the table is a 'Basic parameters' section with fields for 'Thermal conductivity, dry, 10 C/50 F [Btu/hr ft °F]' (value: 0.016667) and 'Color' (value: yellow). To the right of the table are three icons: a green plus sign, a blue circle with a white arrow, and a blue square with a white arrow. Two red arrows point from the text 'Get from database' and 'Save to database' to these icons respectively.

Nr	Name
1	_Phius: Extruded Polystyrene (XPS): R-5/in
2	_Phius: Plywood
3	_Phius: Concrete
4	Veneer
5	Densglass
6	IKOS-15
7	_Phius: Gypsum Board (5/8 in)
8	ROCKWOOL COMFORTBATT
9	_Phius: Concrete
10	_Phius: Mineral Wool (Board): R-4/in
11	_Phius: Mineral Wool (Board): R-4/in
12	_Phius: Expanded Polystyrene (EPS): R-4/in
13	_Phius: Mineral Wool (Batt Insulation): R-3.6/in
14	IKOS-20
15	_Phius: Concrete
16	_Phius: Extruded Polystyrene (XPS): R-5/in

Basic parameters

Thermal conductivity, dry, 10 C/50 F [Btu/hr ft °F] 0.016667

Color

Get from database

Save to database




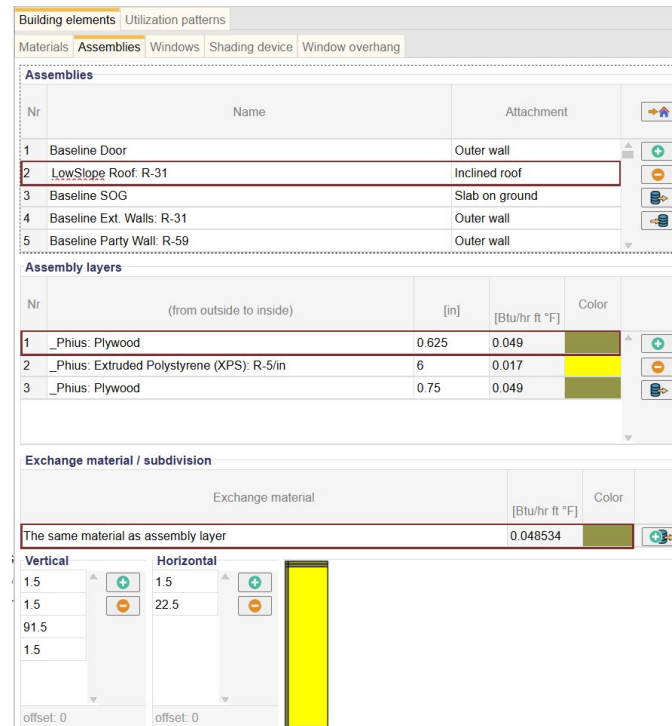
# Project - Shared Objects

## Building Elements - Assemblies

- Assemblies can be created and added to the database for use in other projects
- Once materials are added, they will appear as options in the dropdown under “Assembly layers”

\* Materials cannot currently be reorganized, so they must be added from outside to inside.

 Shared objects



The screenshot displays a software interface for managing building elements. It is divided into several sections:

- Building elements / Utilization patterns:** A top navigation bar with tabs for 'Materials', 'Assemblies', 'Windows', 'Shading device', and 'Window overhang'. The 'Assemblies' tab is active.
- Assemblies:** A table listing five assemblies with columns for 'Nr', 'Name', and 'Attachment'.

Nr	Name	Attachment
1	Baseline Door	Outer wall
2	LowSlope Roof: R-31	Inclined roof
3	Baseline SOG	Slab on ground
4	Baseline Ext. Walls: R-31	Outer wall
5	Baseline Party Wall: R-59	Outer wall
- Assembly layers:** A table showing the layers for the selected assembly (LowSlope Roof: R-31).

Nr	(from outside to inside)	[in]	[Btu/hr ft °F]	Color
1	_Phius: Plywood	0.625	0.049	Green
2	_Phius: Extruded Polystyrene (XPS): R-5/in	6	0.017	Yellow
3	_Phius: Plywood	0.75	0.049	Green
- Exchange material / subdivision:** A section for defining exchange material properties.

Exchange material	[Btu/hr ft °F]	Color
The same material as assembly layer	0.048534	Green
- Vertical / Horizontal:** Two vertical sliders for defining dimensions. The 'Vertical' slider is set to 1.5, and the 'Horizontal' slider is set to 22.5. Both have an 'offset: 0' label below them.



# Project - Shared Objects

## Building Elements - Windows

- Windows can be created and stored in the database for use in other projects
- Functions similar to typical assemblies
- Same inputs and set-up as WUFI

Building elements Utilization patterns

Materials Assemblies **Windows** Shading device Window overhang

**Window types**

Nr	Name
1	Baseline Windows
2	Phius Windows
3	Phius Skylight

**Window parameters**

Uw - mounted	[Btu/hr ft <sup>2</sup> °F]	0.263619
Frame factor	[-]	0.9992
U-value frame	[Btu/hr ft <sup>2</sup> °F]	0.263619
Glass U-value	[Btu/hr ft <sup>2</sup> °F]	0.25
SHGC/Solar energy transmittance (perpendicular)	[-]	0.3

Setting	Left	Right	Top	Bottom
Frame width [in]	0.01	0.01	0.01	0.01
Frame U-value [Btu/hr ft <sup>2</sup> °F]	0.25	0.25	0.25	0.25
Glazing-to-frame psi-value [Btu/hr ft <sup>2</sup> °F]	0	0	0	0
Frame-to-wall psi-value [Btu/hr ft <sup>2</sup> °F]	0.015	0.015	0.015	0.015





# Phius Databases: Coming Soon

Phius is currently working on developing databases for METr, including:

- Default materials
- Climate-specific assemblies (Appendix B)
- Phius Certified Windows & Doors

## Materials

Name	Thermal conductivity [Btu/hr ft <sup>2</sup> °F]	Density [lb/ft <sup>3</sup> ]	Heat capacity [Btu/lb °F]
.Phius: Brick	0.231	104.255	0.201
.Phius: Cellulose (Dense-Pack): R-3.6/in	0.023	3.434	0.608
.Phius: Cellulose (Loose-Fill): R-3.3/in	0.025	3.434	0.608
.Phius: Closed-Cell Spray Polyurethane Foam (CCS...)	0.014	2.435	0.351
.Phius: Concrete	0.793	131.348	0.185
.Phius: Concrete Masonry Unit (CMU)	0.424	144.521	0.191
.Phius: Expanded Polystyrene (EPS): R-4/in	0.021	0.936	0.358
.Phius: Extruded Polystyrene (XPS): R-5/in	0.017	2.497	0.358
.Phius: Fiberboard (FB): R-3/in	0.028	18.791	0.334
.Phius: Fiberglass Batt Insulation (High-Density): R-...	0.023	1.873	0.201
.Phius: Fiberglass Batt Insulation (Low-Density): R-...	0.025	1.873	0.201
.Phius: Graphite Polystyrene (GPS): R-5/in	0.017	2.497	0.358
.Phius: Gypsum Board (1/2 in)	0.094	53.064	0.208
.Phius: Gypsum Board (5/8 in)	0.094	53.064	0.208
.Phius: Mineral Wool (Batt Insulation): R-3.6/in	0.023	3.746	0.203
.Phius: Mineral Wool (Board): R-4/in	0.021	3.746	0.203
.Phius: Open-Cell Spray Polyurethane Foam (OPCS...)	0.023	0.468	0.351
.Phius: Oriented Strand Board (OSB)	0.061	37.145	0.334
.Phius: Plywood	0.049	29.341	0.449
.Phius: Polyisocyanurate (Polyiso): R-6/in	0.014	1.654	0.351
.Phius: Still Air Gap: 0.5 in	0.341	0.081	0.239
.Phius: Still Air Gap: 1 in	0.341	0.081	0.239
.Phius: Wood Fiber Insulation: R-3.6/in	0.023	18.728	0.358
.Phius: Wood Framing	0.052	24.971	0.334

## Assemblies

Assigned assembly

Name	R [hr ft <sup>2</sup> °F/Btu]	Select from database	Edit
R1B_CZ6_24"oc	62.863		

Available assemblies

F1	0.339	New
F2	5.329	Delete
F3	10.319	Copy
R1A_CZ0-8_24"oc	29.037	Insert
R1B_CZ0-3B_24"oc	37.223	New/Insert after
W1A_CZ4C-8_16"oc	11.843	
W1B_CZ4C-16"oc	15.982	
W1B_CZ7-8_16"oc	43.858	

Inhomogenous layers

Thermal resistance: 62.863 / 64.439 hr ft<sup>2</sup> °F/Btu (EN ISO 6946 / homogenous layers)

Heat transfer coefficient (U-value): 0.016 Btu/hr ft<sup>2</sup> °F

Thickness: 15.75 in



# Project - Shared Objects

## Building Elements - Shading Device

- First, create all shading devices in 'Shared objects'
- Then, assign them to the applicable glazing components later

Building elements Utilization patterns

Materials Assemblies Windows **Shading device** Window overhang

**Shading devices**

Nr	Name
1	Placeholder

+

-

**Shading device**

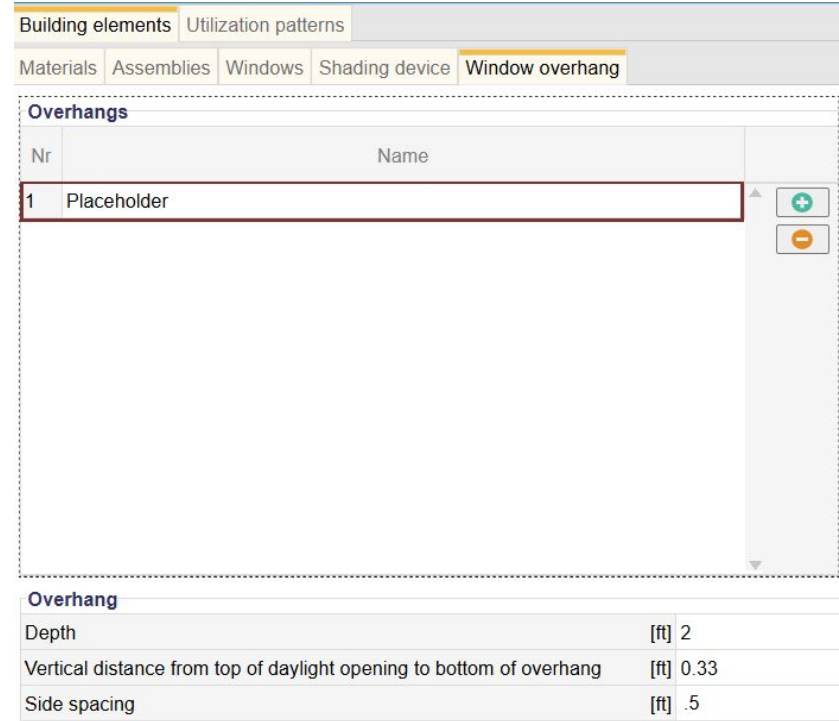
Solar exposure for shading device [-] 0.85



# Project - Shared Objects

## Building Elements - Window Overhang

- Create all window overhangs in this section
- Then, assign them to the applicable glazing components later



Overhangs	
Nr	Name
1	Placeholder

Overhang	
Depth	[ft] 2
Vertical distance from top of daylight opening to bottom of overhang	[ft] 0.33
Side spacing	[ft] .5



# Project - Shared Objects



## Utilization Patterns - Room Ventilation

- The Utilization Pattern for ventilation has moved to 'Shared objects' in METr
- Define the ventilation schedule here, then assign the pattern later under 'Ventilation/rooms' as usual



Building elements Utilization patterns

Room ventilation Internal loads

### Utilization patterns - room ventilation

Nr	Name	Operating days per week [d/week]	Operating weeks per year [week/y]	
1	Typical Day	7	52	 

### Additional data



Setting	Daily operation schedule [hrs]	Fraction of design air flow [-]	
Maximum	24	1	
Standard	0	0.77	
Basic	0	0.54	
Minimum	0	0.4	



# Project - Shared Objects

## Utilization Patterns - Internal Loads

- The Utilization Pattern for **non-residential** internal loads/occupancy has also moved to 'Shared objects' in METr
- Define the utilization pattern of occupants here, then assign the pattern later under 'Internal loads/occupancy' as usual


Building elements		Utilization patterns							
Room ventilation		Internal loads							
Utilization patterns - loads									
Nr	Name	Begin utilization [hrs]	End utilization [hrs]	Annual utilization days [days/yr]	Illumination level [lux]	Height of utilization level	Relative absence [-]	Part use factor of oper. period for lighting [-]	
1	Classroom (School)	7	15.5	200	300	Level 2: 0.8 m	0.25	0.9	
2	Workgroup Office	7	15.5	200	500	Level 2: 0.8 m	0.3	0.7	
3	Janitorial	5	22	365	100	Level 2: 0.8 m	0.9	0.5	
4	Food Prep	7	15.5	200	300	Level 2: 0.8 m	0.25	0.9	
5	Gym - School Year	15.5	22	280	300	Level 2: 0.8 m	0.25	0.9	
Optional data									
Average occupancy				[ft <sup>2</sup> /Person]					
Room setpoint temperature				[°F]					
Heating reduction temperature				[°F]					
Daily utilization hours				[hrs/d]					
Annual utilization hours				[hrs/yr]					
Annual utilization hours during daytime				[hrs/yr]					
Annual utilization hours during nighttime				[hrs/yr]					
Daily heating operation hours				[hrs/d]					
Daily ventilation operation hours				[hrs/d]					
Number of max water tabs per day				[-]					



# Case

## Case 1/2: Baseline Case

- Similar to WUFI, METr allows you to create and optimize multiple cases
- Found under the 'Case' section in the tree, user can add or remove cases

 Case 1/2:

## Case 1/2: Baseline Case

Cases/Variants	
Nr	Name
1	Baseline Case
2	Phius Case

## Case 2/2: Phius Case

Cases/Variants	
Nr	Name
1	Baseline Case
2	Phius Case



# Localization / Climate

## Location

- Users now have the ability to select their climate location directly from the integrated Map/Database.
- This feature includes all of Phius' available climate data sets\*

\*Not including custom CD sets

Location		Weather data	
Selection		From map (database)	
<b>Building</b>			
Latitude	[°]	42.267	
Longitude	[°]	-71.883	
Height NN	[ft]	489	
Find and select climate data near building			

**BUILDING**

Latitude:

Longitude:

**CLIMATE**

Find nearest climates

Selection: WORCESTER REGION

Latitude selected:

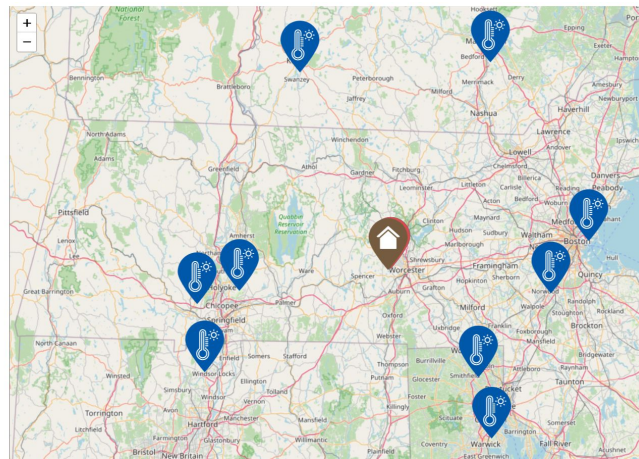
Longitude selected:

Height NN:

Center locations

Accept

Cancel





# Localization / Climate

## Weather Data

Location		Weather data	
Selection	User defined		
<b>Building</b>			
Latitude	[°]	29.333	
Longitude	[°]	-98.467	
Height NN	[ft]	700	
<b>Climate station</b>			
Name	SAN ANTONIO/STINSON		
Latitude	[°]	29.333	
Longitude	[°]	-98.467	
Height NN	[ft]	577.427822	
Time zone			
<b>Additional data</b>			
Climate zone	US 2		
Daily temperature swing summer	[°F]	19.8	
Average wind speed	[ft/s]	13.12336	
Ground thermal conductivity	[Btu/hr ft °F]	1.155582	
Ground heat capacity	[Btu/lb°F]	0.238846	
Ground density	[lb/ft³]	124.855947	
Depth below grade of groundwater	[ft]	9.84252	
Flow rate of groundwater	[ft/d]	0.164042	
<b>Space conditioning</b>			
Space conditioning target data	User defined		
Annual heating demand	[kBtu/ft²·yr]	2.4	
Annual cooling demand	[kBtu/ft²·yr]	19.3	
Peak heating load	[Btu/hr ft²]	3.7	
Peak cooling load	[Btu/hr ft²]	4.3	

Location		Weather data															
Setting		Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	W_1	W_2	W_1	W_2
<b>Temperature [°F]</b>																	
Ambient	[°F]	55.4	51.98	61.16	73.4	76.82	81.14	85.28	81.86	76.1	68.36	57.38	55.04	41.72	52.52	84.92	
Dew point	[°F]	41.54	33.26	45.68	62.96	64.76	69.98	66.56	69.44	67.28	56.84	50	36.68				
Sky	[°F]	31.28	23.36	35.78	55.4	57.92	62.42	60.08	62.78	60.98	46.58	41.72	28.76				
Ground	[°F]																
<b>Solar radiation [kBtu/ft²·Month]</b>																	
North	[kBtu/ft²·Month]	8.2419	8.5589	11.094	14.264	15.532	18.068	19.019	14.581	11.411	10.460	7.2909	7.2909	11.0949	6.97396	26.6278	
East	[kBtu/ft²·Month]	17.751	20.287	24.408	23.457	22.189	25.993	36.137	31.699	23.774	25.993	14.581	18.702	25.0428	7.60795	53.8897	
South	[kBtu/ft²·Month]	44.062	35.186	30.431	24.408	16.800	17.117	19.019	23.457	26.944	41.843	27.578	40.892	58.6446	9.19295	24.4088	
West	[kBtu/ft²·Month]	24.725	21.555	26.627	31.699	25.993	30.431	37.722	31.699	26.944	28.846	15.215	18.702	29.7978	8.24195	54.5237	
Global	[kBtu/ft²·Month]	32.967	34.235	43.111	51.036	45.647	55.791	70.690	60.229	44.062	44.696	24.408	28.846	41.8437	14.5819	102.073	





# PH Cases

## PH Cases

- In the PH Cases section, you can specify the certification criteria for your project.
  - Phius CORE 2021
  - Phius ZERO 2021
  - **Phius CORE/ZERO 2024 coming soon!**

Use detailed month mean shading factors

**Passive house case(s) / building parts with similar usage**

Nr	Name	Certificate criteria
1		PHIUS ZERO 2021

- Default Standard
- PHIUS+ 2015
- PHIUS+ 2018
- Italian
- PHIUS+ 2018 Core
- PHIUS+ 2018 Source Zero
- PHIUS CORE 2021
- PHIUS ZERO 2021**



# PH Case

## Mixed-Use Projects

- Multiple 'PH Cases' can be added to model a mixed-use project within the same file
- Each PH Case will be assigned to its corresponding 'Simulated Zone' later

The screenshot displays a software interface with a left-hand navigation pane and a main content area. The navigation pane shows a tree structure: 'Project' (with a person icon), 'Shared objects' (with a folder icon), 'Case 2/2: Phius Case' (with a house icon), 'Localization / Climate: SAN ANTONIO/STINSON TX' (with a location pin icon), and 'PH cases' (with a gear icon). Under 'PH cases', there are two entries: 'PH case1: Residential Portion' and 'PH case2: Non-Residential Portion', both with the '@' logo icon.

The main content area features a checkbox labeled 'Use detailed month mean shading factors' which is checked. Below this is a section titled 'Passive house case(s) / building parts with similar usage' containing a table with the following data:

Nr	Name	Certificate criteria	
1	Residential Portion	PHIUS ZERO 2021	
2	Non-Residential Portion	PHIUS ZERO 2021	



# PH Case 1

## General

- Parameters in METr are set up identical to WUFI

General	Additional data	Source energy/CO2-factor
<b>Parameters</b>		
Building category		Residential
Occupancy type		Residential
Building status		In planning
Type		New construction
Indoor temperature	[°F]	68
Internal gains setting		Calculated
Internal heat gains	[Btu/hr ft²]	
Occupancy setting method		Design
Number of occupants		
Number of units	[-]	2
Number of floors		3
<b>Zones included</b>		
	Name	Floor area [ft²]
<b>Simulated zones</b>		
	Zone1: Unit B	329.1871
<b>Attached zones</b>		
	Zone1: Unheated Garage	



# PH Case 1

## Additional Data

- Parameters in METr are set up identical to WUFI

General	Additional data	Source energy/CO2-factor
<b>Additional parameters</b>		
Preferred minimum indoor temperature for night ventilation	[°F]	68
Overheating temperature threshold	[°F]	77
Fresh air per person	[cfm]	18
Hot water tapp-opening per person per day	[-]	3
Hot water tapp-opening utilization days per year	[days/yr]	365
Air-tightness metric	Envelope airtightness at 50 Pa	
Envelope airtightness at 50 Pa	[cfm/ft²]	0.28
Non combustible materials		<input checked="" type="checkbox"/>
Type of ventilation system	Balanced PH ventilation	
Max. humidity ratio (if dehumidification)	[lbw/lba]	0.012
Building wind exposure	Several sides exposed - moderate screening	
Wind screening coefficient (e)	[-]	0.07
Wind exposure factor (f)	[-]	15
Wind shield factor	[-]	0.05
DHW consumption (60°) per person per day	[gal/Person/day]	6.6
Average cold water temperature of the supply	[°F]	
Mechanical room temperature	[°F]	68



# PH Case 1

## Source Energy/CO2-factor

- The location for 'Source Energy/CO2-factor' is found under 'PH Case' in METr (rather than 'Localization/Climate' like in WUFI)
- The setup and selection options are identical (2024 coming soon)

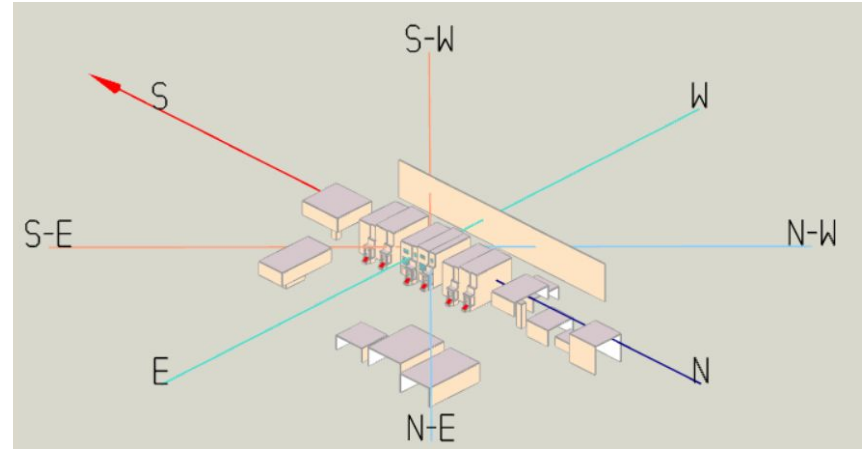
General   Additional data   Source energy/CO2-factor			
Selection		Standard USA	
Name	Source energy factor [Btu/Btu]	CO2 emission factor [g/kBtu]	
Oil	1.1	0.090861	
Natural gas	1.1	0.073275	
LPG	1.1	0.079137	
Hard coal	1.1	0.128964	
Wood	0.2	0.014655	
Electricity Mix	1.8	0.199308	
Electricity from photovoltaics	0.7	0.073275	
Hard Coal CGS 70% CHP	0.8	0.070344	
Hard Coal CGS 35% CHP	1.1	0.093792	
Hard Coal HS 0% CHP	1.5	0.120171	
Gas CGS 70% CHP	0.7	-0.020517	
Gas CGS 35% CHP	1.1	0.038103	
Gas HS 0% CHP	1.5	0.093792	
Oil CGS 70% CHP	0.8	0.02931	
Oil CGS 35% CHP	1.1	0.073275	
Oil HS 0% CHP	1.5	0.120171	



# Building

## Orientation

- Defining the orientation in METr remains similar to WUFI
- This includes the definition of orientation by:
  - Main Orientations
  - Azimuth



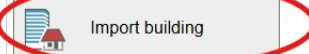
Orientation	Geometry
<b>Orientation main facade</b>	
Orientation definition	Main orientations <input type="button" value="v"/>
Orientation	South
Azimuth (clockwise from north)	[°] 180



# Building

## Geometry

- Before importing, define the 'Dimensions, visualized geometry' for proper import
  - Inner, outer partitions not included x
  - Outer, extern partition included ✓
- Import from 'Sketchup' or 'Building wizard'
- When merging import with existing data, all applicable model data will be applied to the new geometry
  - 'Set zone volume/floor area calculated from geometry' should be **checked**

Orientation		Geometry	
Dimensions, visualized geometry		Outer, extern partitions included	
<b>Import options</b>			
Import from		SketchUp ▾	
Merge imported with existing data		<input checked="" type="checkbox"/>	
Set zone volume/floor area calculated from geometry		<input checked="" type="checkbox"/>	
 Import building			



# SketchUp Plugin

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## Plugin

- SketchUp plugin helps define the building geometry for export in C3RRO applications
- Current SketchUp to WUFI Passive plugin also works for importing

## Website:

<https://c3rro.com/product/sketchup-plugin/>





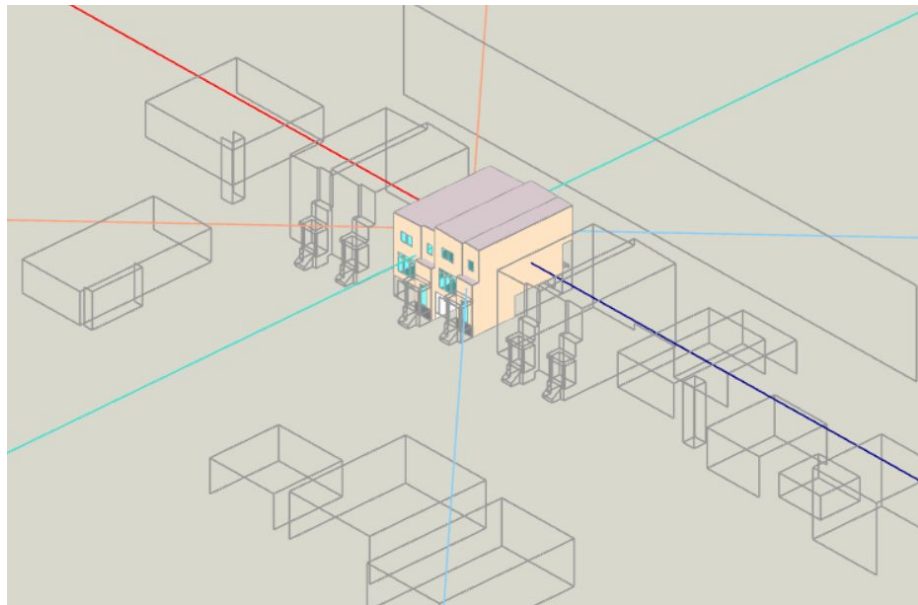
# Maneuvering

## Hot Keys

Left Click: Pan

Scroll Wheel: Zoom In & Out

Click (and hold) Scroll Wheel: Orbit





# Building

## Simulated Zones

- Add or delete simulated zones (not typical)

Simulated zones		
Nr	Name	Floor area [ft <sup>2</sup> ]
1	Unit B	

Project

- Shared objects
- Case 1/2: Baseline Case
  - Localization / Climate: SAN ANTONIO/STINSON TX
  - PH cases
    - PH case1
  - Building
    - Simulated zones
      - Zone1: Unit B
      - Visualized components
      - Not visualized components
      - Thermal bridges
      - Internal loads
      - Ventilation / rooms



# Zone 1

## General

- Parameters in METr are set up identical to WUFI
- Define the iCFA and Specific heat capacity in this section
- For mixed-use projects, assign the simulated zone to the corresponding PH case

General			Foundation interface
<b>Name/type</b>			
Name			Unit B
Type			Simulated zone
Included in PH case			PH case 1
<b>Geometry</b>			
Setting		Setting way	Value
Visualized volume	[ft <sup>3</sup> ]	From visualized geometry	52708.930521
Gross volume	[ft <sup>3</sup> ]	From visualized volume and components	52708.941115
Net volume	[ft <sup>3</sup> ]	Estimated from gross volume	40058.803723
Interior conditioned floor area	[ft <sup>2</sup> ]	User defined	3543.340455
Specific heat capacity	[Btu/ft <sup>2</sup> F]	Lightweight	11.000006
<b>Additional data</b>			
Humidity capacity	[lb/(lbw/lbda) ft <sup>2</sup> ]		143.371301



# Zone 1

## Foundation Interface

- Parameters in METr are set up identical to WUFI
- Note that the foundation interface has moved to **'Zone 1'** in METr
  - *Under 'PH Case' in WUFI*

General		Foundation interface	
Setting		User defined	
<b>Foundation interfaces</b>			
Nr	Name	Type	
1	Slab on Grade	Slab on grade	
<b>Parameters</b>			
Related to zone		Not related to zone	
Setting	Setting way	Value	
Floor slab area	[ft <sup>2</sup> ] User defined	332.869624	
U-Value of slab on grade	[Btu/hr ft <sup>2</sup> °F] User defined	0.72177	
Floor slab perimeter (P)	[ft] User defined	114.439961	
<b>Additional data</b>			
Position of the perimeter insulation	Not defined		
Perimeter insulation width/depth	[ft]	3.28084	
Thickness of perimeter insulation	[in]	1.968504	
Conductivity perimeter insulation	[Btu/hr ft °F]	0.057779	
Phase shift months			
Harmonic fraction	[Btu/hr F]		



# Zone 1 - Visualized Components

## Components

- Layout of components and associated inputs are identical to WUFI
  - General
  - Assembly\*
  - Surface

\*Remember that assemblies are built under 'Shared Objects'. Here, you will select one the corresponding assembly for each component

The screenshot displays a software interface for managing components. On the left, a tree view titled 'Visualized components' lists 12 items: C.1: Operable Windows, C.2: Slab on Grade, C.3: Walls to Garage, C.4: Opaque Doors, C.5: Floor over Garage, C.6: Entry Foundation Wall, C.7: Typ Ext Walls, C.8: Fixed Windows, C.9: Main Roof, C.10: Entry Roof, C.11: Terrace Ceiling, and C.12: Glazed Doors. On the right, a properties panel is open for 'C.1: Operable Windows', showing tabs for 'General', 'Assembly', and 'Surface'. The 'General' tab is active, displaying fields for Name/type/attachment, Name (Typ Ext Walls), Type (Opaque), Inner side (Zone 1: Unit B), Outer side (Outer air), Geometry (Area: 42.797308 / 4629.870024 [ft²], Perimeter: 46.791667 [ft]), Orientation (S 30%, E 20%, W 19%, N 31%), Azimuth (180), and Inclination (90). Below the properties panel is a table titled 'Visualized components' with columns for Nr, Name, Type, and Attachment outside.

Nr	Name	Type	Attachment outside
1	Operable Windows	Transparent	Outer air
2	Slab on Grade	Opaque	Ground
3	Walls to Garage	Opaque	Attached zone 1: Unheated Garage
4	Opaque Doors	Opaque	Attached zone 1: Unheated Garage
5	Floor over Garage	Opaque	Attached zone 1: Unheated Garage
6	Entry Foundation Wall	Opaque	Ground
7	Typ Ext Walls	Opaque	Outer air
8	Fixed Windows	Transparent	Outer air
9	Main Roof	Opaque	Outer air
10	Entry Roof	Opaque	Outer air
11	Terrace Ceiling	Opaque	Outer air
12	Glazed Doors	Transparent	Outer air



# Zone 1 - Thermal Bridges

## Linear thermal bridges

- Inputs are identical to WUFI
  - Linear thermal transmittance
  - Length
  - Attachment

Linear thermal bridges (no heat capacity)

Nr	Name	Linear thermal transmittance [Btu/hr ft °F]	Length [ft]	Attachment outside
1	Placeholder	0.021	80	Ambient

Attachment outside dropdown menu options:

- Zone 1: Unit B
- Attached zone 1: Unheated Garage
- Ambient
- Perimeter
- Basement floor



# Zone 1 - Internal Loads

## Internal Loads/Occupancy

- Inputs are identical to WUFI

Occupant quantity	[ - ] 8
Number of bedrooms	[ - ] 6
Humidity sources	[lb/(ft <sup>2</sup> hr)] 0.00041

Set standard dataset

Nr	Device / end use	Reference quantity	Quantity	In conditioned space	
1	Kitchen dishwasher	PH case occupants		<input checked="" type="checkbox"/>	
2	Laundry - washer	PH case occupants		<input checked="" type="checkbox"/>	
3	Laundry - dryer	PH case occupants		<input checked="" type="checkbox"/>	
4	Kitchen fridge/freeze combo	PH case Units	2	<input checked="" type="checkbox"/>	
5	Kitchen cooking	PH case occupants		<input checked="" type="checkbox"/>	
6	User defined - Misc electric loads	User defined	1	<input checked="" type="checkbox"/>	
7	User defined - lighting	User defined	1	<input checked="" type="checkbox"/>	

### Additional data, device: 1

Energy demand (norm) reference	Year
Water connection	DHW connection
Dishwasher capacity, preselection	Standard
Dishwasher capacity, in place settings	[ - ] 12
Annual energy use rating	[kWh/yr] 269
Comment	



# Zone 1 - Ventilation/Rooms

## Rooms ventilation

- Inputs identical to WUFI
  - Remember that 'Utilization patterns' were defined earlier under 'Shared objects'

Rooms ventilation						
Summer ventilation						
Exhaust ventilation						
Nr	Name	Room type	Quantity	Utilization pattern	Design supply air [cfm]	Design exhaust air [cfm]
1	Full Bath	Bathroom	4	Pattern 1: Typical Day	0	100
2	1/2 Bath	WC	2	Pattern 1: Typical Day	0	50
3	Bedrooms	User defined	6	Pattern 1: Typical Day	58	0
4	Living Room	User defined	2	Pattern 1: Typical Day	76	0

**Additional data, room: 1**

Design volume flow rate interzonal	[cfm]
Area	[ft <sup>2</sup> ]
Clear room height	[ft]





# Zone 1 - Ventilation/Rooms

## Summer ventilation

- Inputs identical to WUFI

Rooms ventilation	Summer ventilation	Exhaust ventilation
<i>Average mechanical ventilation air change rate</i>	[1/hr]	
Summer HRV/humidity recovery		Always
<i>ACH via natural ventilation (day)</i>	[1/hr]	
<i>ACH via natural ventilation (night)</i>	[1/hr]	
<i>Additional automatic controll ventilation</i>	[1/hr]	
<i>Specific power consumption cooling</i>	[W/cfm]	
Automatic control system via		Temperature difference
<i>Additional mechanical ventilation exhaust air</i>	[1/hr]	
<i>Specific power consumption</i>	[W/cfm]	



# Zone 1 - Ventilation/Rooms

## Exhaust ventilation

- Inputs identical to WUFI

Rooms ventilation	Summer ventilation	Exhaust ventilation		
Nr	Name	Type	Exhaust volume flow rate [cfm]	Run time per use [min/use]
1	Dryer	Exhaust dryer	125	
2	Kitchen Exhaust hood	Exhaust range hood	300	

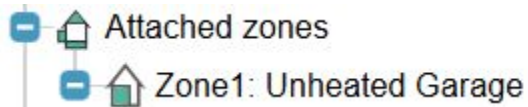


# Attached Zones

## Zone 1

- Inputs identical to WUFI

General	
<b>Name/type</b>	
Name	Unheated Garage
Type	Attached zone
Type of attached zone	Unheated space
<b>Additional data</b>	
Temperature difference reduction factor	[-] 1





# Systems

## HVAC systems/ Coverage

- Inputs identical to WUFI
- Coverage inputs are more prominent
- Only one cooling system is needed
  - Increased limit on cooling capacity in METr to avoid the need to model multiple systems, unlike WUFI

HVAC systems

Nr	System type	Name
1	User defined	

Coverage

Zone	Space heating		DHW		Space cooling		Space ventilation	
	Chosen system	Other systems	Chosen system	Other systems	Chosen system	Other systems	Chosen system	Other systems
Zone 1	1		1		1		1	



# System - General

## Device / Usage / Coverage

- Device inputs are numerical rather than check-boxes as were in WUFI

General		Distribution			
Device/Usage/Coverage					
Nr	Type	Space heating	DHW	Space cooling	Space ventilation
1	Heat pump	1	0	1	
2	Heat pump	0	1	0	
3	Mechanical ventilation				1



# System - Distribution

## Hydronic Heating

- Inputs identical to WUFI

General		Distribution			
Hydronic heating		DHW	Cooling	Ventilation	Supportive device / auxiliary energy
<b>Heating distribution</b>					
Setting		In conditioned space	Outside conditioned space 1	Outside conditioned space 2	
Design flow temperature	[°F]				
Length of distribution pipes	[ft]				
Heat loss coefficient per meter pipe	[Btu/hr ft °F]				
Temperature of the room the pipes pass through	[°F] 68				
Design system heating load	[kBtu/hr]				
Flow temperature controlled		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	



# System - Distribution

## DHW - General

- Inputs identical to WUFI

General		Distribution				
Hydronic heating		DHW	Cooling	Ventilation	Supportive device / auxiliary energy	
General		Hot water piping				
Calculation method individual pipes			Hot water piping calculator (unit method)			
<b>DHW distribution</b>						
Setting		In conditioned space	Outside conditioned space 1	Outside conditioned space 2		
Design flow temperature		[°F]	120			
<b>Circulation pipes</b>						
Length of distribution pipes		[ft]				
Heat loss coefficient per meter pipe		[Btu/hr ft °F]				
Temperature of the room the pipes pass through		[°F]	68			
Daily running hours of the circulation		[hrs]				



# System - Distribution

## DHW - Hot Water Piping

- Inputs identical to WUFI

General **Distribution**

Hydronic heating **DHW** Cooling Ventilation Supportive device / auxiliary energy

General **Hot water piping**

Preselection effectiveness	Low flow
Hot water fixture effectiveness	[-] 0.95
All pipes are insulated	<input checked="" type="checkbox"/>
Count of units or floors	PH case setting

**Trunc(s)**

Nr	Name	Demand recirculation	Pipe material	Piping diameter [in]	Piping length [ft]	Heat capacity [Btu/lb]	Count units or floors	Volume [gal]	Cumulative volume [gal]
1	Generic Trunk	<input type="checkbox"/>	Copper L	1/2	0		2/3		
2	Recirc Pump	<input checked="" type="checkbox"/>	Copper L	3/4	100		2/3		

**Branch(es), Trunc: 1**

Nr	Name	Pipe material	Piping diameter [in]	Piping length [ft]	Heat capacity [Btu/lb]	Volume [gal]	Upstream volume [gal]	Branch cumulative volume [gal]	Cumulative volume [gal]
1	Generic Branch	Copper L	1/2	0					

**Twig(s), Branch: 1**

Nr	Name	Pipe material	Piping diameter [in]	Piping length [ft]	Heat capacity [Btu/lb]	Volume [gal]	Upstream volume [gal]	Cumulative volume [gal]	Watersense met?	Time to "hot" @ 1gpm [s]
1	Kitchen S Copper L		1/2	15						
2	1/2 Bath S Copper L		1/2	15						
3	Bath 1 Sir Copper L		1/2	30						





# System - Distribution

## Cooling

- Inputs identical to WUFI
  - *No more limit on cooling capacity*

General		Distribution		
Hydronic heating	DHW	Cooling	Ventilation	Supportive device / auxiliary energy
Cooling via ventilation air		<input type="checkbox"/>		
Cooling via air recirculation		<input checked="" type="checkbox"/>		
Dehumidification		<input checked="" type="checkbox"/>		
Panel cooling		<input type="checkbox"/>		
<b>Additional data</b>				
Recirculating air cooling is single speed				<input type="checkbox"/>
Minimum temperature of cooling coil (for recirculation air)	[°F]	46.999999		
Recirculation air flow rate	[cfm]	1200		
Recirculation air flow is variable				<input type="checkbox"/>
Recirculation air cooling capacity	[kBtu/hr]	48		
Recirculation cooling COP	[-]	3.84		
Useful dehumidification heat loss				<input type="checkbox"/>
Dehumidification COP	[-]	1.5		



# System - Distribution

## Ventilation

- Inputs identical to WUFI

General <b>Distribution</b>					
Hydronic heating   DHW   Cooling   <b>Ventilation</b>   Supportive device / auxiliary energy					
Nr	Name	Duct type	Duct shape	Quantity	Duct length [ft]
1	Supply	Supply / outdoor air duct	Round	1	5
2	Exhaust	Extract / Exhaust air duct	Round	1	12

Additional data, Duct: 1		Assigned ventilation units, Duct: 1	
Duct diameter, nominal width	[in] 8	Device: Renovaire EV Premium L ERV	<input checked="" type="checkbox"/>
Insulation thickness	[in] 2		
Thermal conductivity	[Btu/hr ft °F] 0.01389		
Is reflective	<input type="checkbox"/>		



# System - Distribution

## Supportive device / auxiliary energy

- Inputs identical to WUFI

General **Distribution**

Hydronic heating | DHW | Cooling | Ventilation | **Supportive device / auxiliary energy**

Use default values

Device in conditioned space

Nr	Name	Device type	Quantity	In conditioned space	Energy demand (rated) [W]
1	Recirc Pump	DHW circulating pump	1	<input checked="" type="checkbox"/>	28.9

Dropdown menu options:

- Heating circulating pump
- DHW circulating pump**
- DHW storage load pump
- Other



# Error Messages, Warnings, & Reports

## Errors & Warnings

- Appear at the bottom of the window to the left of the results
  - Red circle = error that will prevent results from populating
  - Yellow circle = warnings based on current model inputs & results
  - Double click on an error/warning to jump to the section of METr that needs attention

## Reports

- Download reports using the button at the top of the 'Results' window

The screenshot shows two panels of the software interface. The top panel, titled 'Status', has a red circle icon and the text 'PH case: 1, Error(s)'. Below it, under 'Errors:', there are two messages: 'Internal loads, Energy demand (norm) reference: Key/Object not found' and 'Internal loads, Energy demand (rated): No data or invalid format'. The bottom panel, also titled 'Status', has a yellow circle icon and the text 'PH case: 1, OK/Warning(s)'. Below it, under 'Warnings:', there are five messages: 'Verification: heating demand 8.1 kBtu/ft²yr is above the target value 2.4 kBtu/ft²yr', 'Verification: heating load 8.7 Btu/hr ft² is above the target value 3.7 Btu/hr ft²', 'Verification: cooling load 4.93 Btu/hr ft² is above the target value 4.3 Btu/hr ft²', 'Verification: primary energy 35.46 kBtu/ft²yr is above the target value 0 kBtu/ft²yr', and 'Verification: Infiltration pressure test (ACH50) 4.16 1/hr is above the target value 0.9 1/hr'. At the bottom of this panel, it says 'Ventilation: fresh air supply 513.4 cfm is significant above the fresh air requirement 216 cfm'.

The screenshot shows a 'Results' window with a 'Download' button at the top. A dropdown menu is open, listing several report options: 'Data & Results (json)', 'Verification report', 'REM-Rate report', 'Site Energy Report', 'Source Energy Report', 'Site Energy Monthly Report', and 'JSON testing (json)'. Each item has a right-pointing arrow next to it, indicating it is a submenu item.



# METr Certification Timeline

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## Timeline

- WUFI Passive & METr
  - Both Accepted Now (January 2025)
  
- METr only
  - New projects under the Phius 2027 standard and forward



# Future Features in METr

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## Upcoming Features

- Updated reports
- Calculators
  - ERV/HRV Outside
  - Performance Criteria
  - Average COP
  - UEF to EF
  - IMEF to MEF
  - Booster Pump
- Phius Material and Assembly Database

## Ongoing Bug Fixes & Reporting

- To report an issue, contact C3RRO
  - [support@c3rro.com](mailto:support@c3rro.com)



# Thank you!

---

Questions?



Event Approved for  
Phius CEUs

## Webinar: METr

*Earn 1.0 CEU*

**25102**

5-Digit Self Report Code

*Self Report @*

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