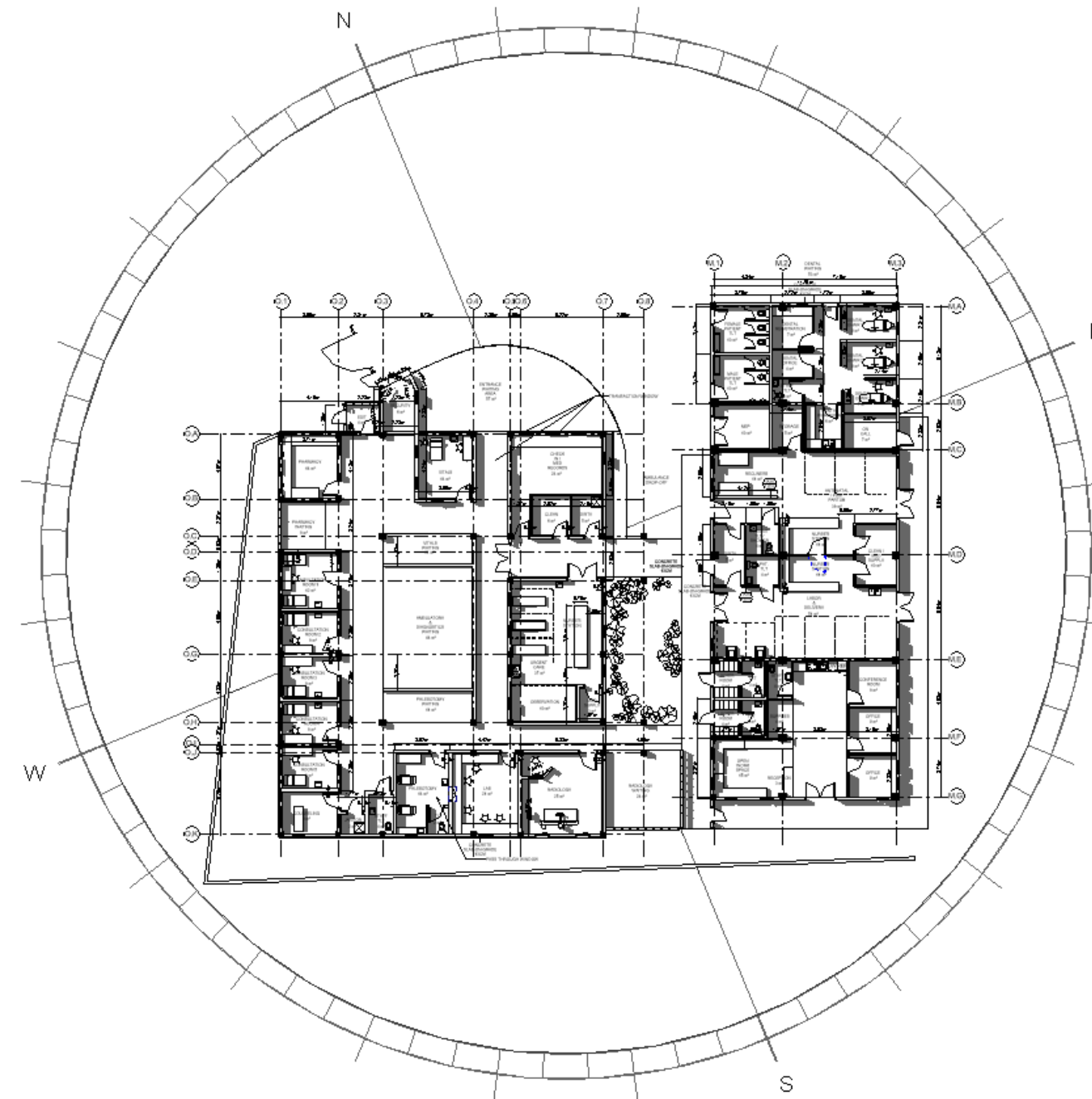
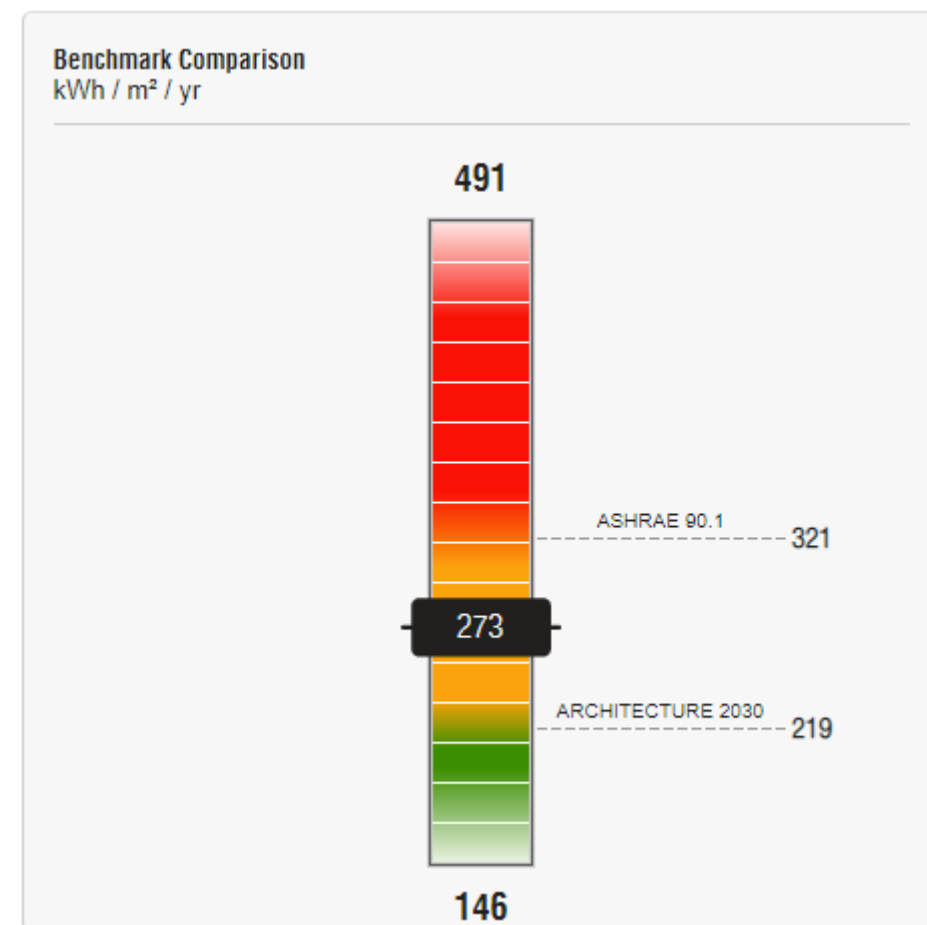


# Practical Energy Analysis with Revit:

## Case Studies from a Nonprofit Design Firm



# Learning Objectives

---

**LEARN** HOW TO GENERATE A CONCEPTUAL-LEVEL REVIT MODEL SUITABLE FOR RUNNING THROUGH INSIGHT ENERGY ANALYSIS

**LEARN** ABOUT THE DIFFERENCE BETWEEN INPUT-BASED AND OUTPUT-DRIVEN DESIGN FACTORS THAT IMPACT ENERGY ANALYSIS

**LEARN** ABOUT HOW ENERGY AND DAYLIGHTING ANALYSIS IMPACTED RECENT PROJECTS, BASED ON CASE STUDIES

**DISCOVER** THE VALUE OF USING ANALYSIS TOOLS EARLY IN THE DESIGN PHASE OF A PROJECT

# About the speakers

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CLARKE MORRISON

Strategic BIM Consultant, Microdesk



LUC WING



Solutions Specialist - MEP, Microdesk



OMAR HERNANDEZ

Director of Engineering, Build Health International (BHI)





Reset

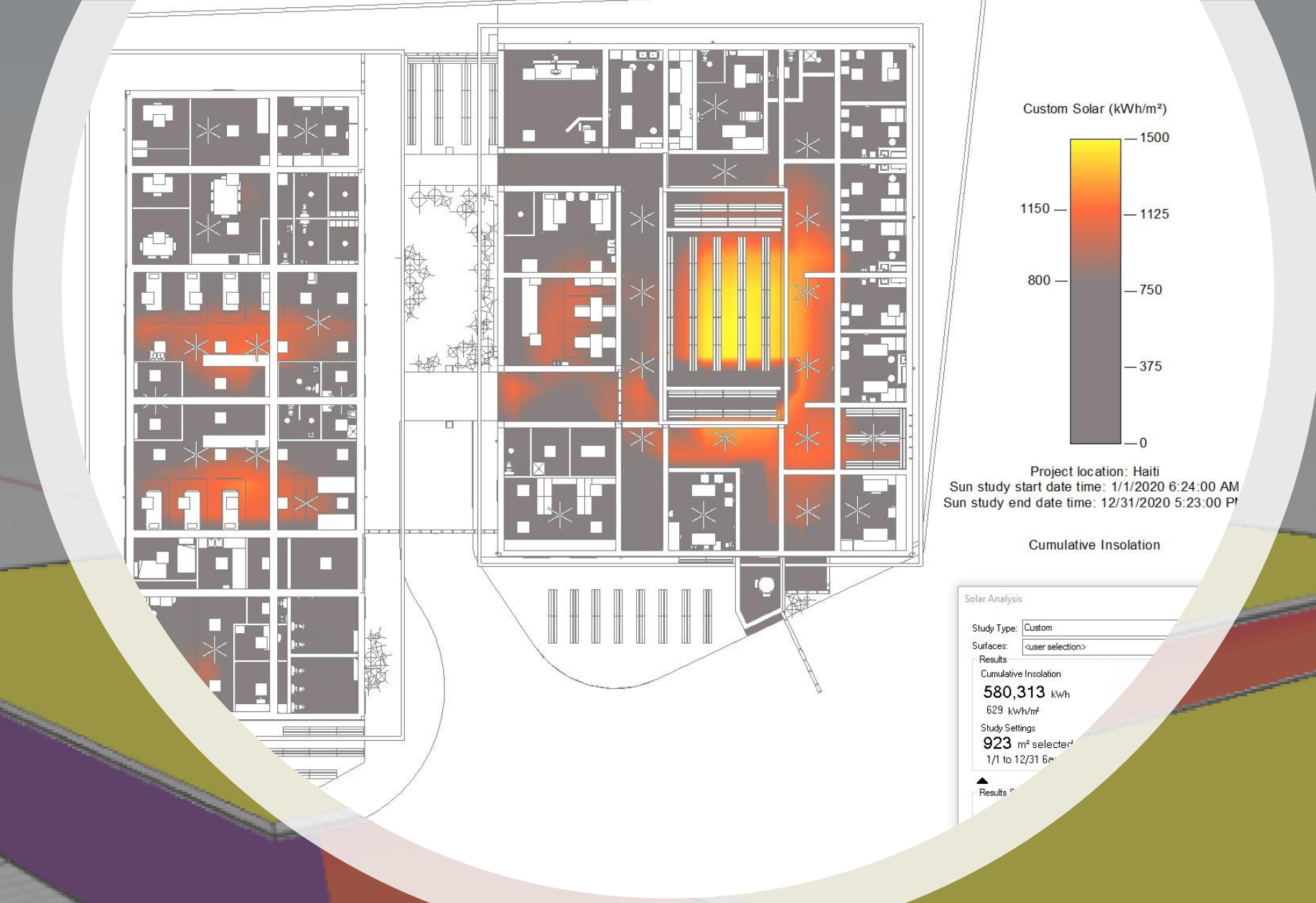
Analyze

Range/Method:

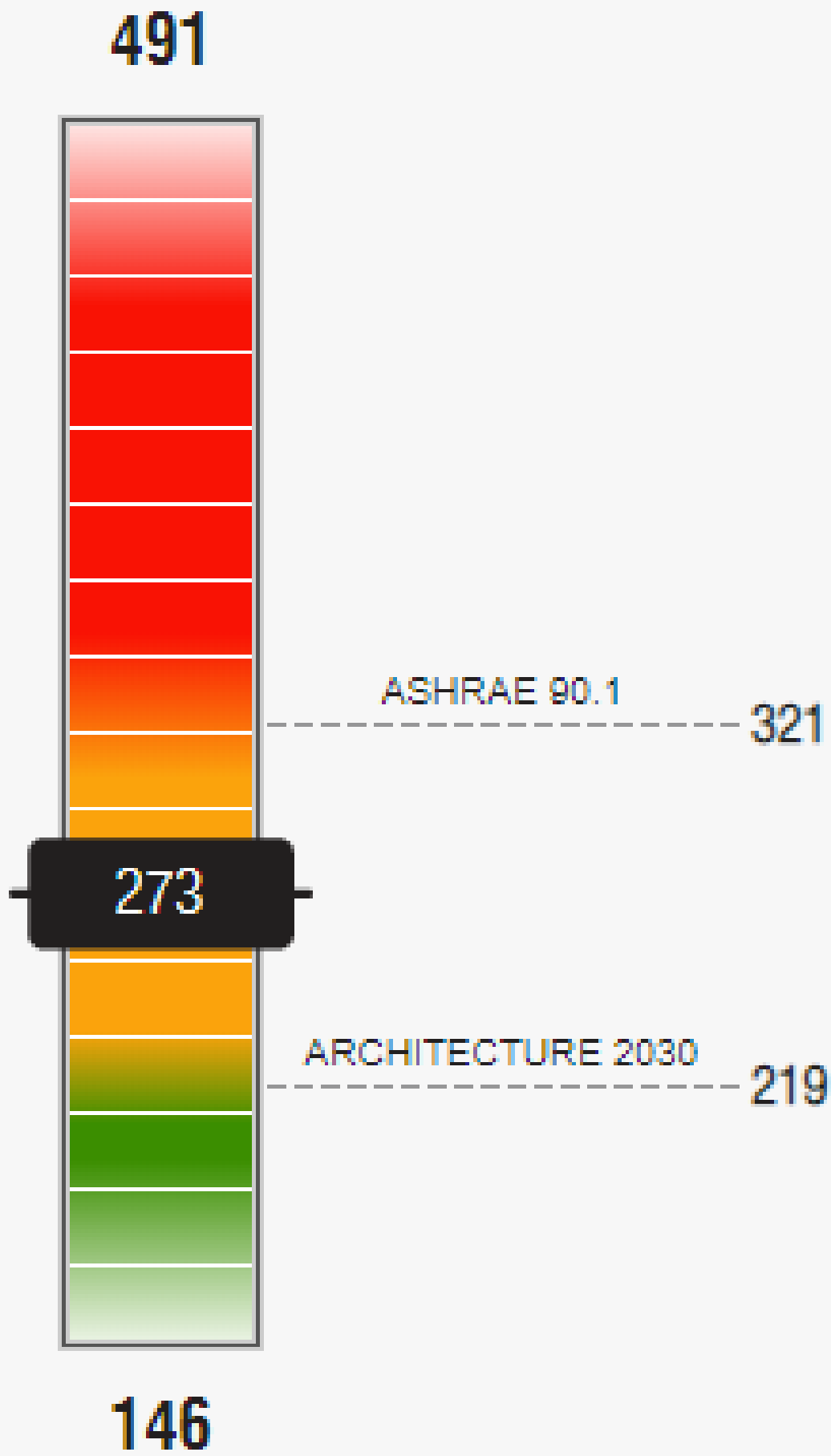
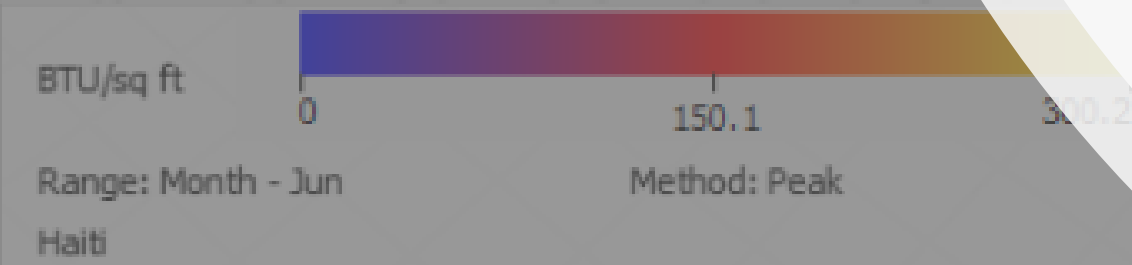
Month Peak

Jun

Hover over faces to see radiation values.



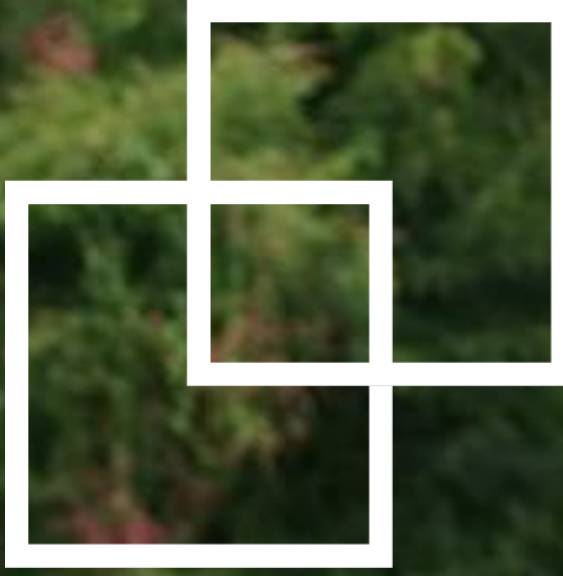
# Class Agenda







# About Build Health International





# INNOVATING PROJECT DELIVERY

Your global resource for BIM Services and Autodesk Software, impacting design & construction, solving real-world problems through innovation, technology and deep industry knowledge.

[LEARN MORE](#)



## About Microdesk

- AECO Industry Consulting Firm
- Founded in 1994
- 12 locations nationwide + 1 in the UK
- 213+ AECO Consultants and Software Developers

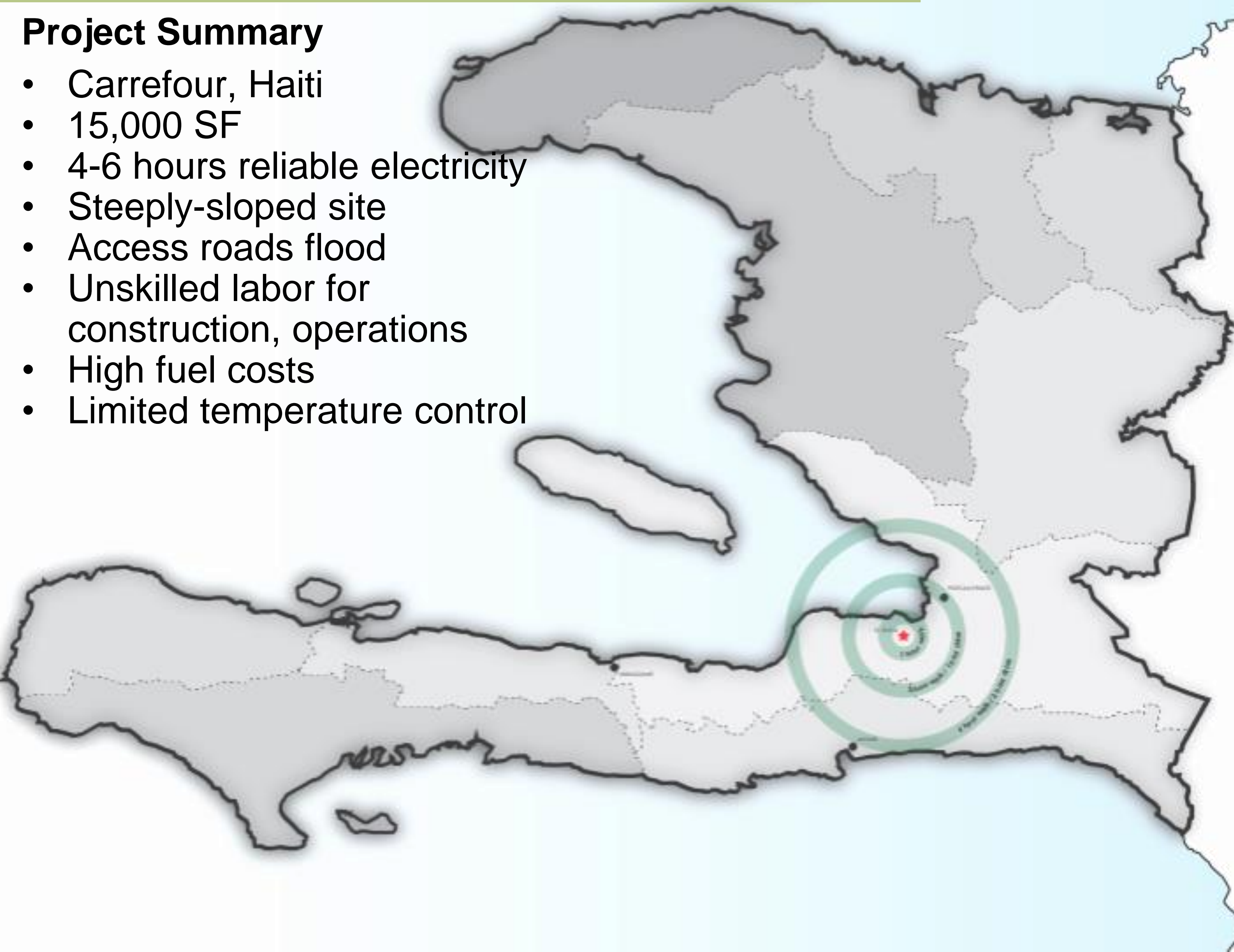




# St. Rock, Haiti

## Project Summary

- Carrefour, Haiti
- 15,000 SF
- 4-6 hours reliable electricity
- Steeply-sloped site
- Access roads flood
- Unskilled labor for construction, operations
- High fuel costs
- Limited temperature control







Dignified  
care for  
those who  
need it  
most.





Insights that save lives

---



# St. Rock Healthcare Facility

- INPATIENT

TESTING

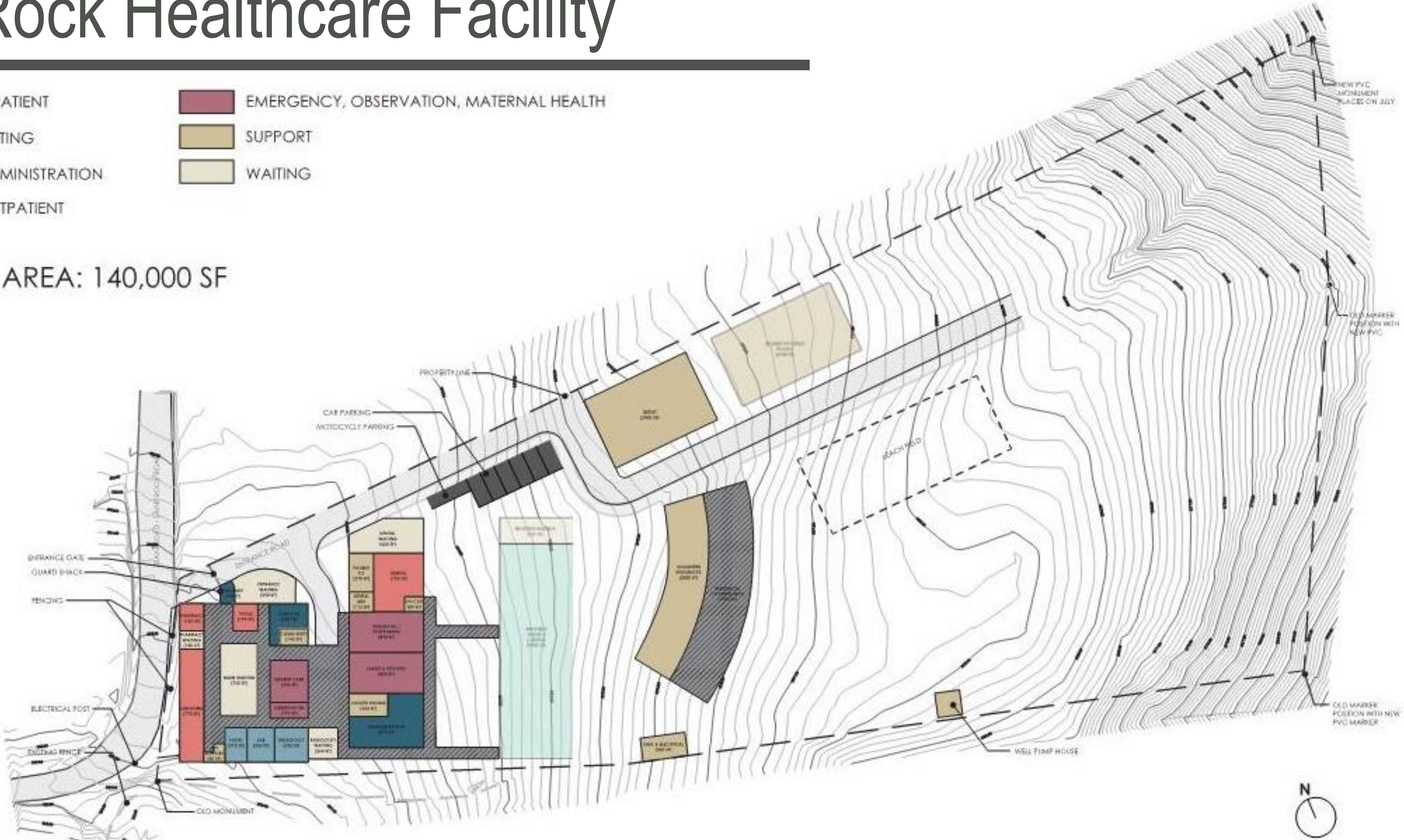
ADMINISTRATION

OUTPATIENT
- EMERGENCY, OBSERVATION, MATERNAL HEALTH

SUPPORT

WAITING

TOTAL AREA: 140,000 SF





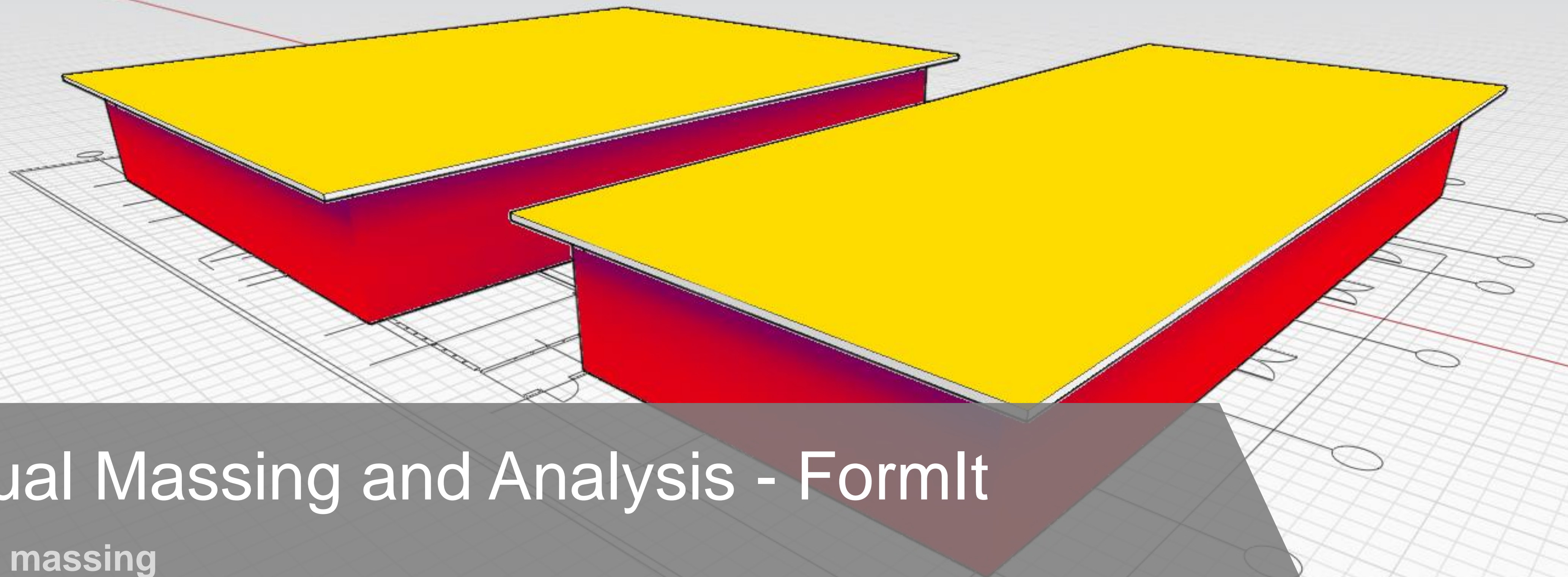




☰ ☑ Reset Analyze

Range/Method: Year Cumulative ▼

Hover over faces to see radiation values.

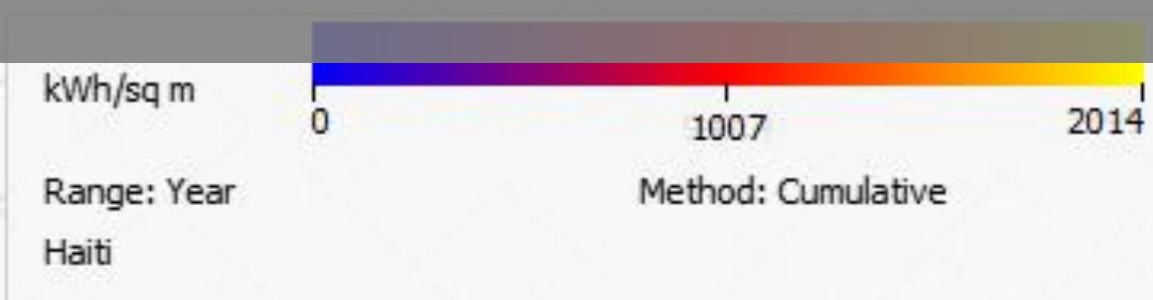


# Conceptual Massing and Analysis - FormIt

Simple FormIt massing

Solar Analysis

Energy Analysis





## ABOUT YOUR BUILDING

Building Name

Country

City | State/Prov.

Postal Code

Degree Days

☐ New construction ☐ Existing Building

## BUILDING USE DETAILS

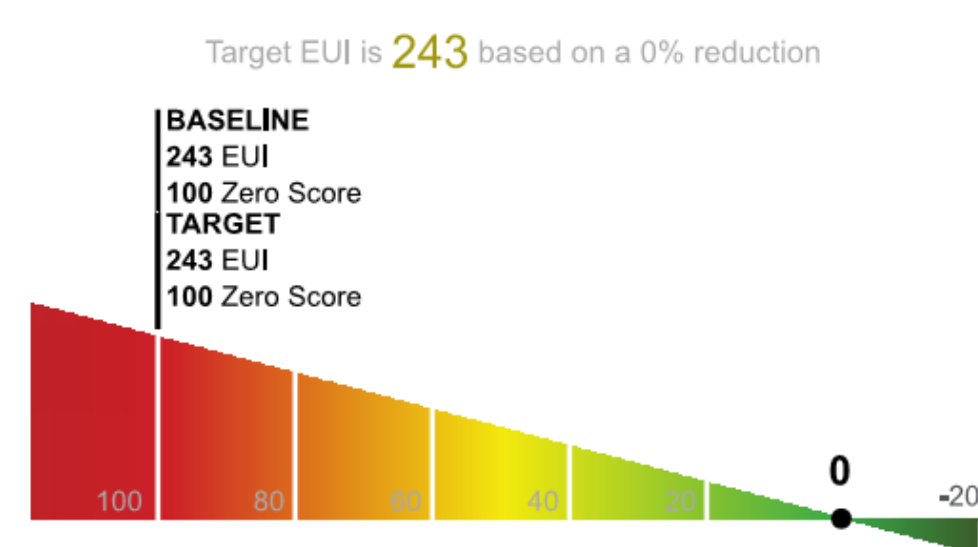
In order to provide you with an appropriate comparison for your building, we need to know how spaces in this building will be used. If your building has multiple uses, add them below.

☐ Commercial ☐ Residential

Add Another Use

Selected Use Type(s):

## RESULTS



## BUILDING SUMMARY

LOCATION	Florida keys, FL	33040
USES	Hospital	9,688 sq.ft (100.0%)

RESULTS	BASELINE	TARGET	YOUR BUILDING
EUI % Reduction from Baseline	0%	0%	N/A
Zero Score	100	100	N/A
Site EUI (kBtu/ft²/yr)	243	243	N/A
Source EUI (kBtu/ft²/yr)	492	492	N/A
Total GHG Emissions (metric tons CO₂e/yr)	243	243	N/A

Building type	Definition	Includes these sub-categories from the CBECS questionnaire
Education	Buildings used for academic or technical classroom instruction, such as elementary, middle, or high schools, and classroom buildings on college or university campuses. Buildings on education campuses for which the main use is not classroom are included in the category relating to their use. For example, administration buildings are part of "Office," dormitories are "Lodging," and libraries are "Public Assembly."	<ul style="list-style-type: none"> <li>elementary or middle school</li> <li>high school</li> <li>college or university</li> <li>preschool or daycare</li> <li>adult education</li> <li>career or vocational training</li> <li>religious education</li> </ul>
Food Sales	Buildings used for retail or wholesale of food.	<ul style="list-style-type: none"> <li>grocery store or food market</li> <li>gas station with a convenience store</li> <li>convenience store</li> </ul>
Food Service	Buildings used for preparation and sale of food and beverages for consumption.	<ul style="list-style-type: none"> <li>fast food</li> <li>restaurant or cafeteria</li> <li>bar</li> <li>catering service or reception hall</li> <li>coffee, bagel, or doughnut shop</li> <li>ice cream or frozen yogurt shop</li> </ul>
Health Care (Inpatient)	Buildings used as diagnostic and treatment facilities for inpatient care.	<ul style="list-style-type: none"> <li>hospital</li> <li>inpatient rehabilitation</li> </ul>
Health Care (Outpatient)	Buildings used as diagnostic and treatment facilities for outpatient care. Medical offices are included here if they use any type of diagnostic medical equipment (if they do not, they are categorized as an office building).	<ul style="list-style-type: none"> <li>medical office (see previous column)</li> <li>clinic or other outpatient health care</li> <li>outpatient rehabilitation</li> <li>veterinarian</li> </ul>

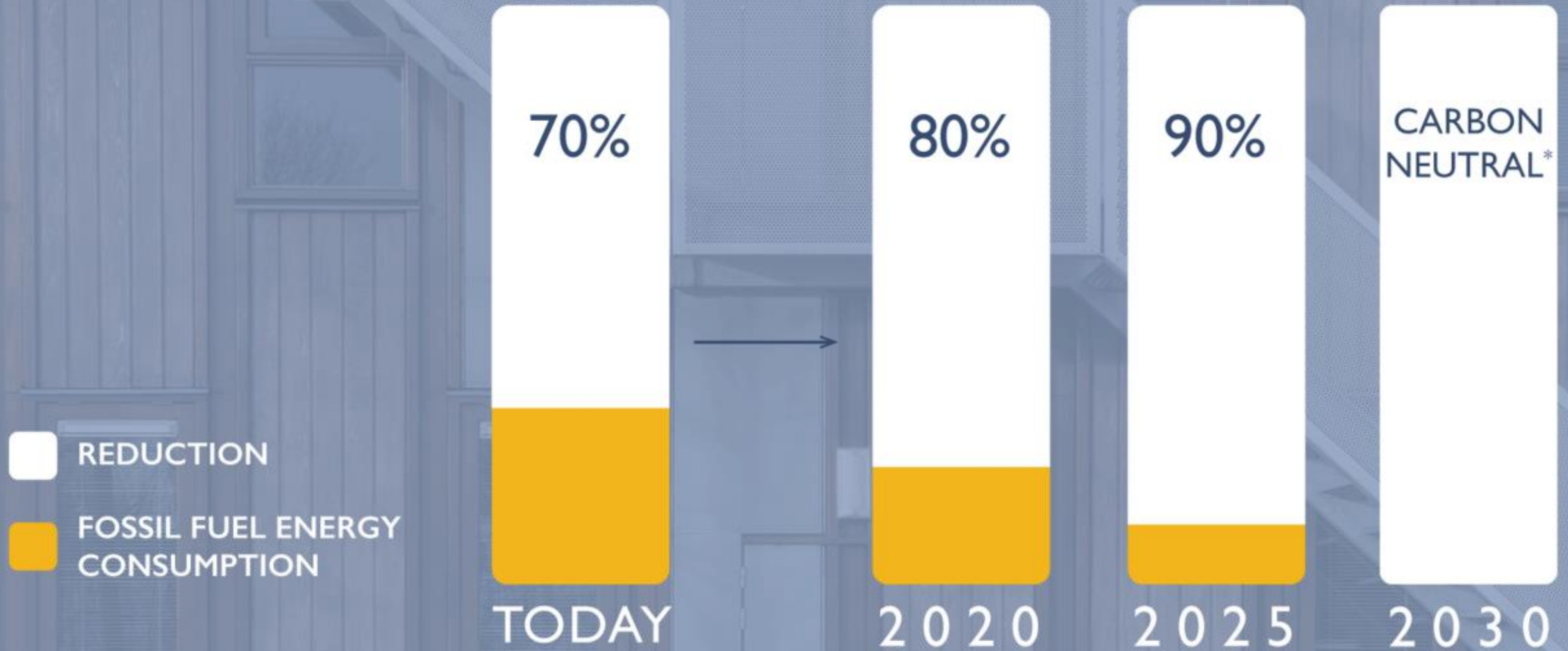
<https://www.eia.gov/consumption/commercial/building-type-definitions.php>

# Defining a baseline using Zero Tool and CBECS

COMMERCIAL BUILDINGS ENERGY CONSUMPTION SURVEY (CBECS)



# THE 2030 CHALLENGE



# WHAT'S YOUR EUI?

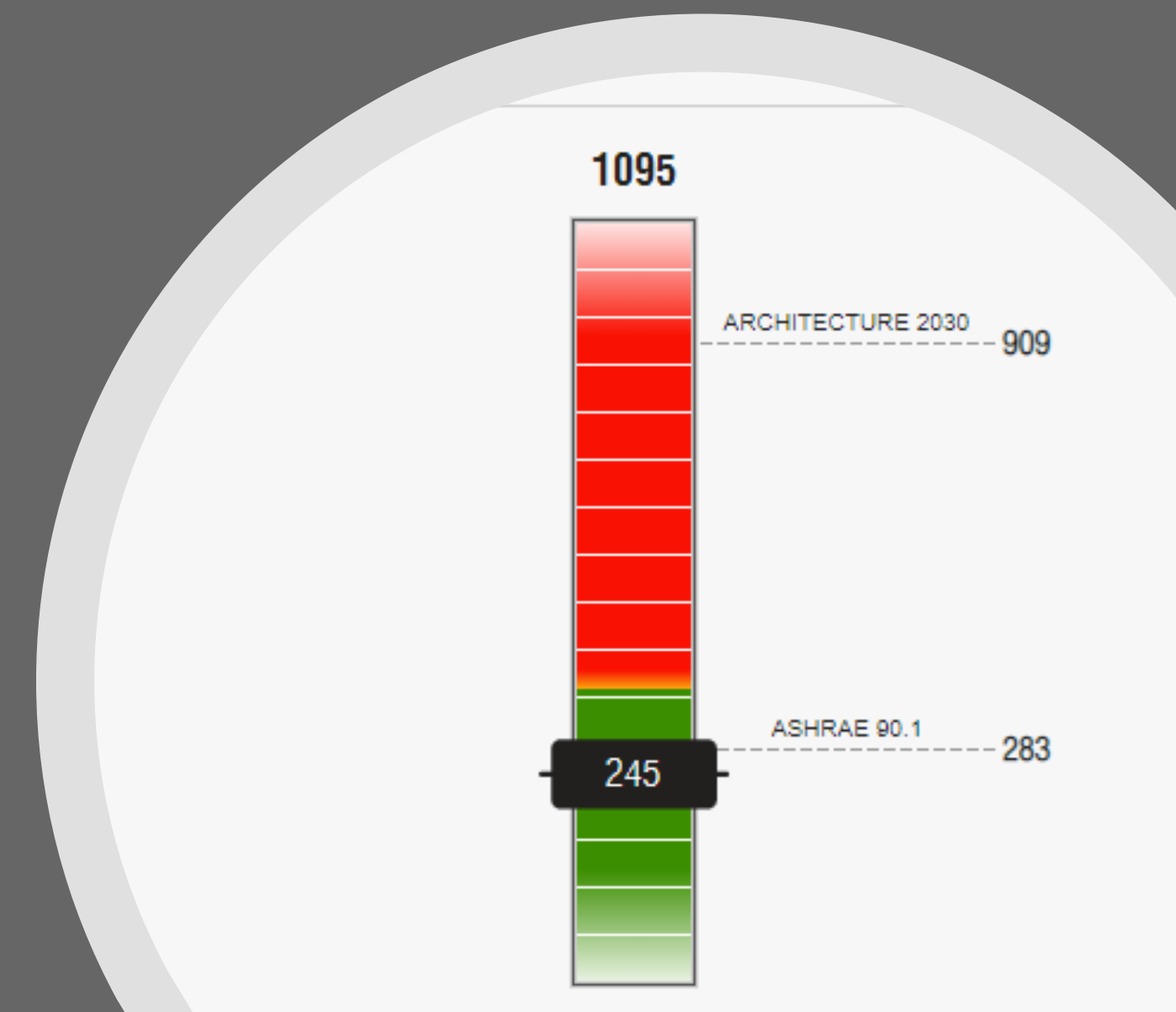
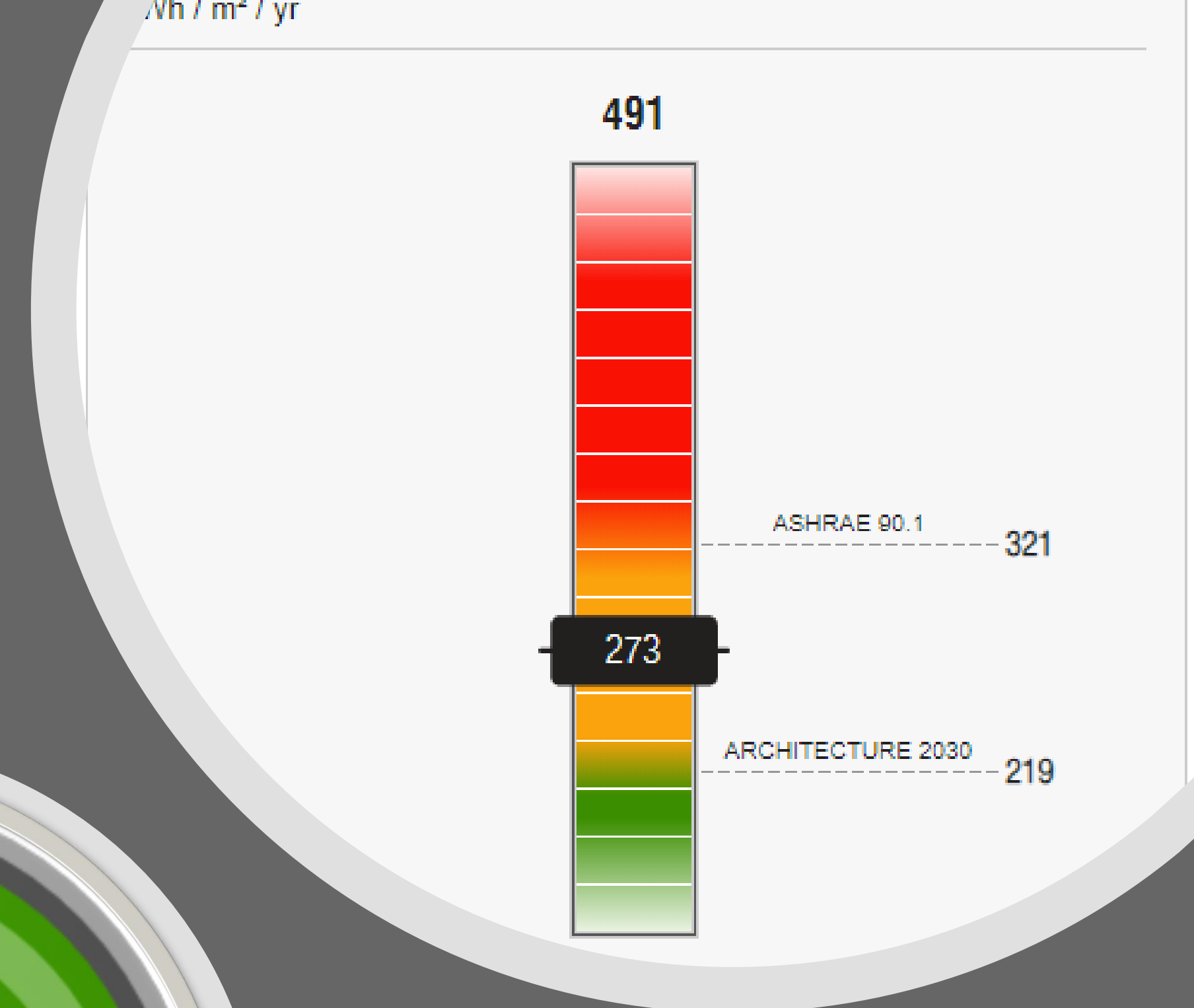
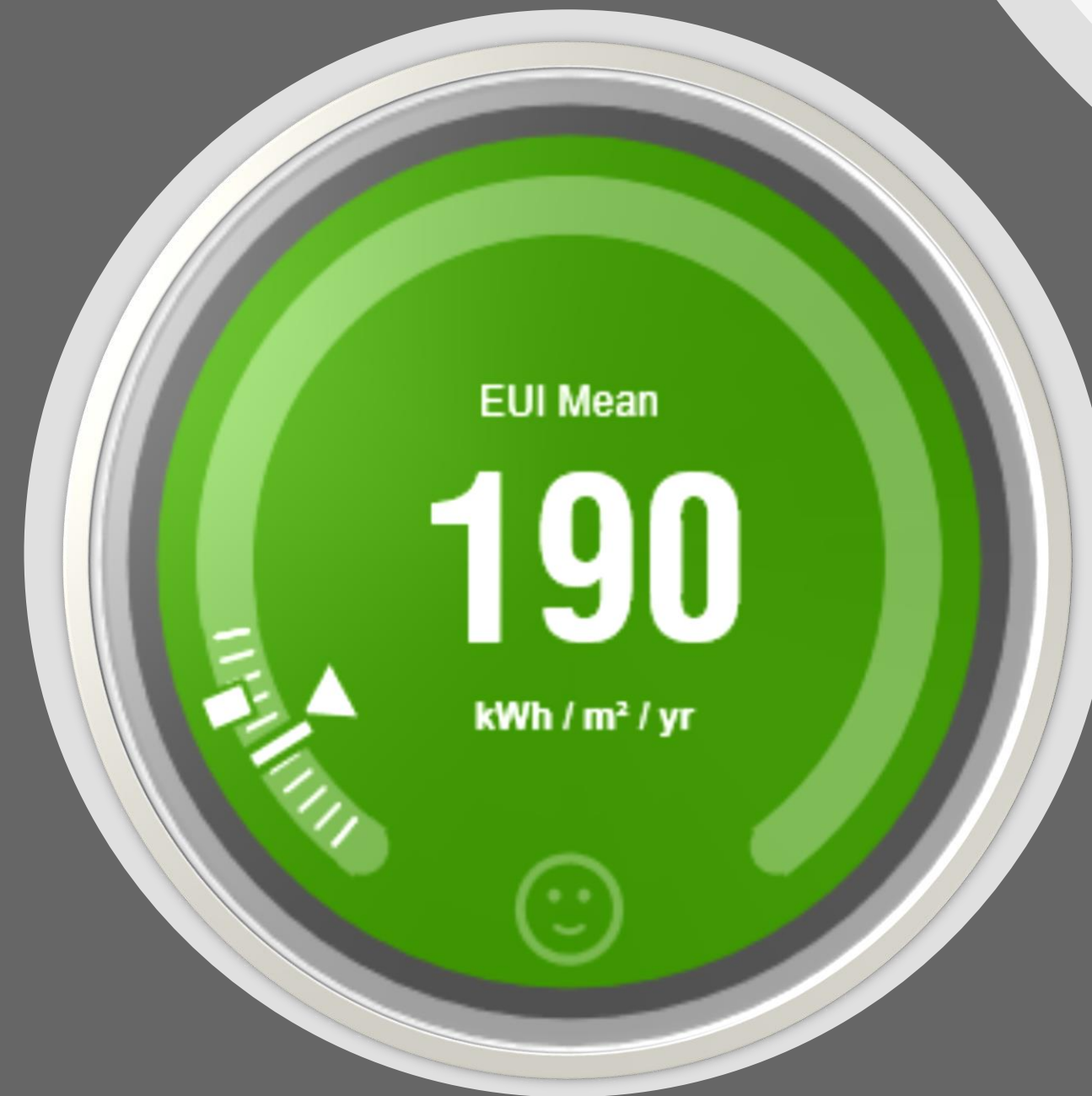
**EUI** = Energy Use Intensity

And is measured by:

- **kWh/m<sup>2</sup>/yr** = 3.6 megajoules
- **Kilowatt Hours / Meters Squared / year**
- **1000watts = kilowatt**

A **kWh** equals the amount of energy you would use by keeping a **1,000watt** appliance running for one hour.

According to the U.S. Energy Information Administration, in 2008, the average annual electricity consumption for a U.S. residential utility customer was **11,040 kWh/ year**.









# Building Element Analysis - Revit

Most impactful factors:

Lighting Efficiency

Roof Construction

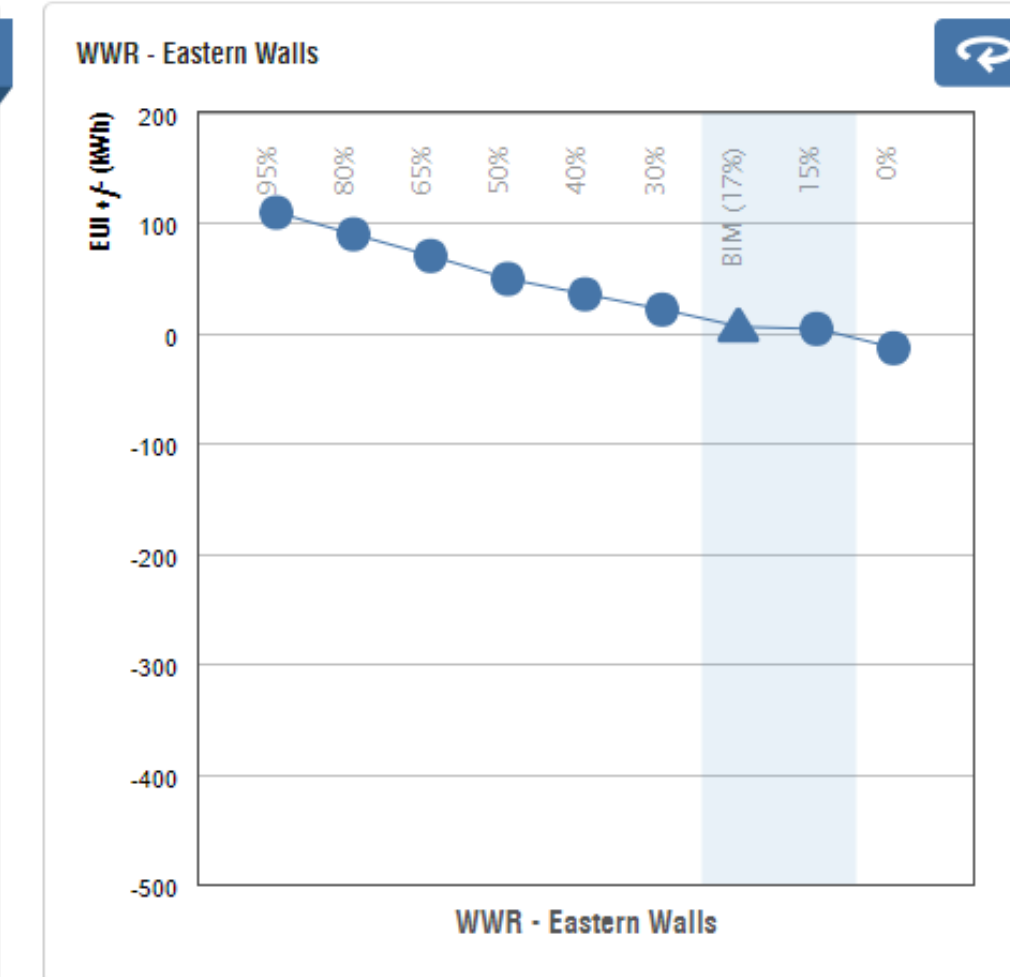
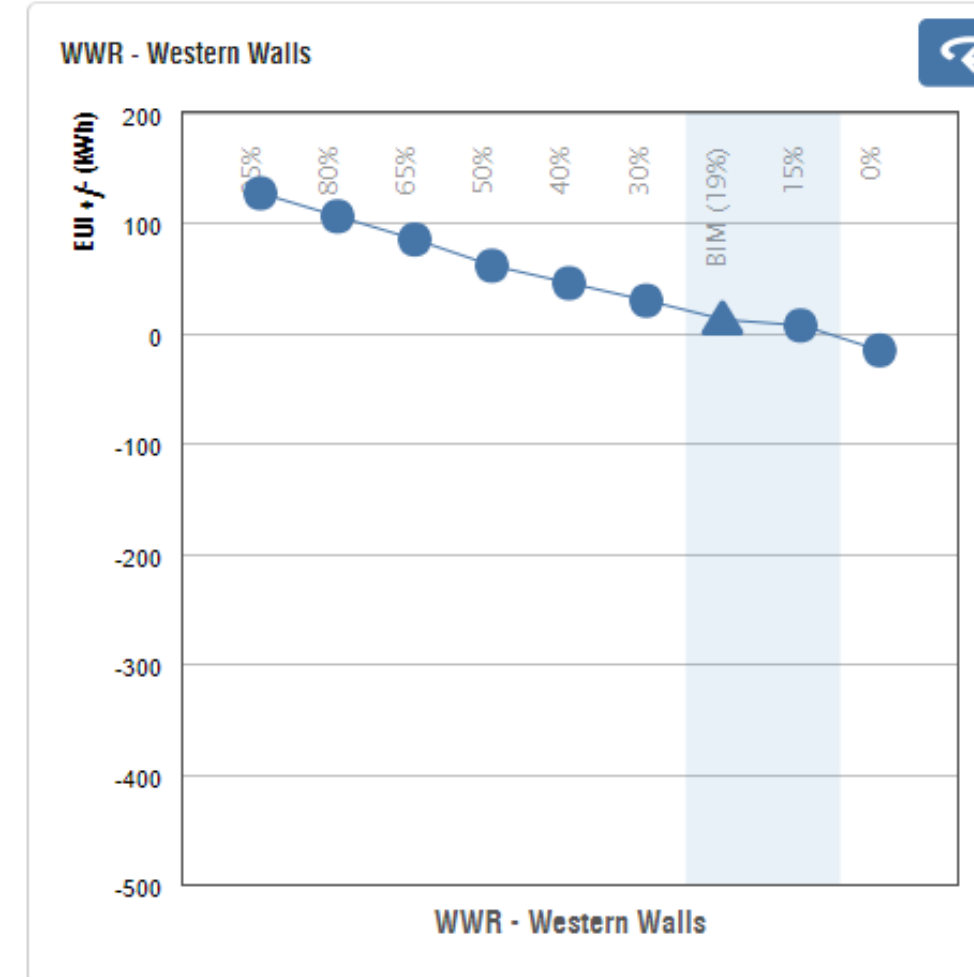
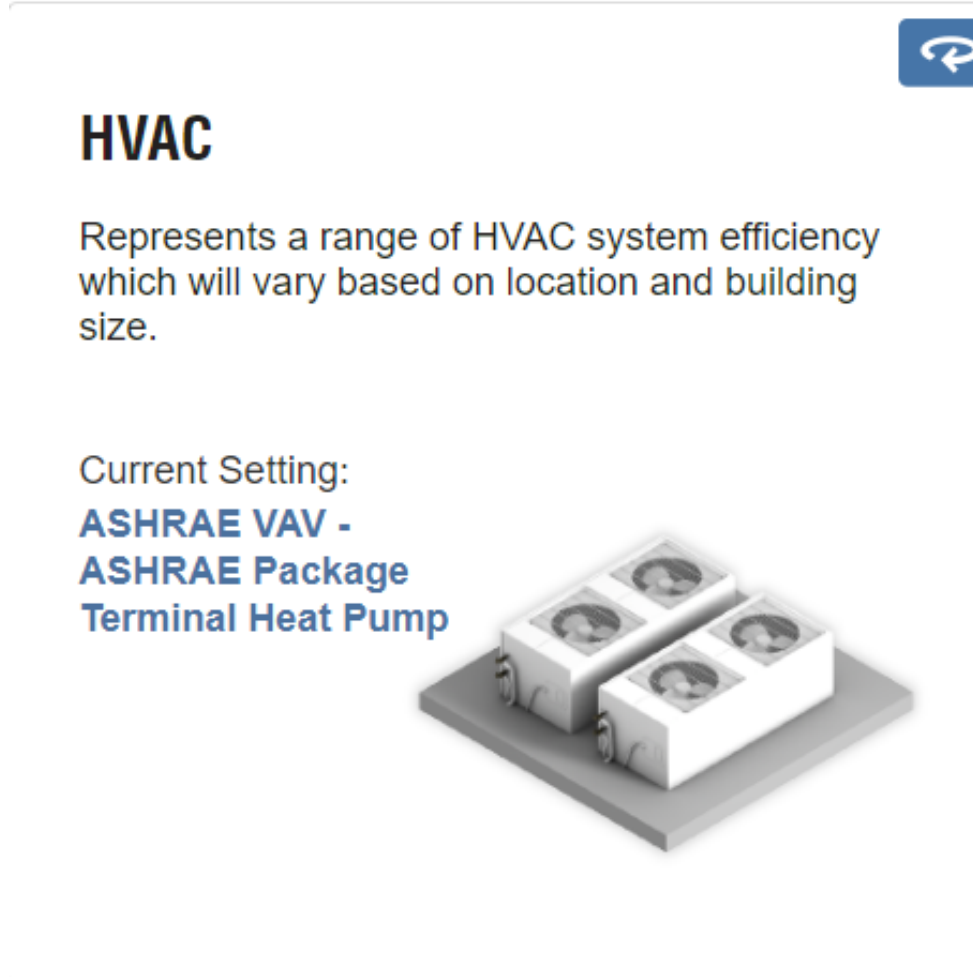
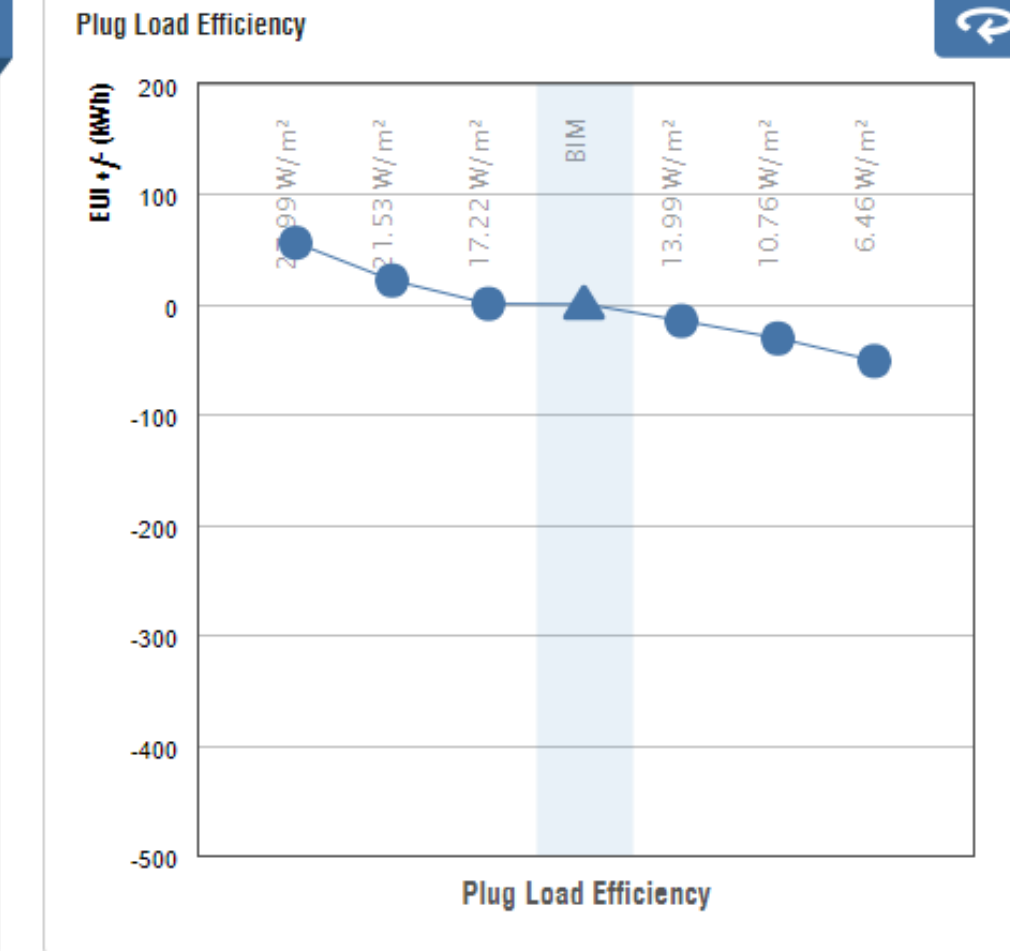
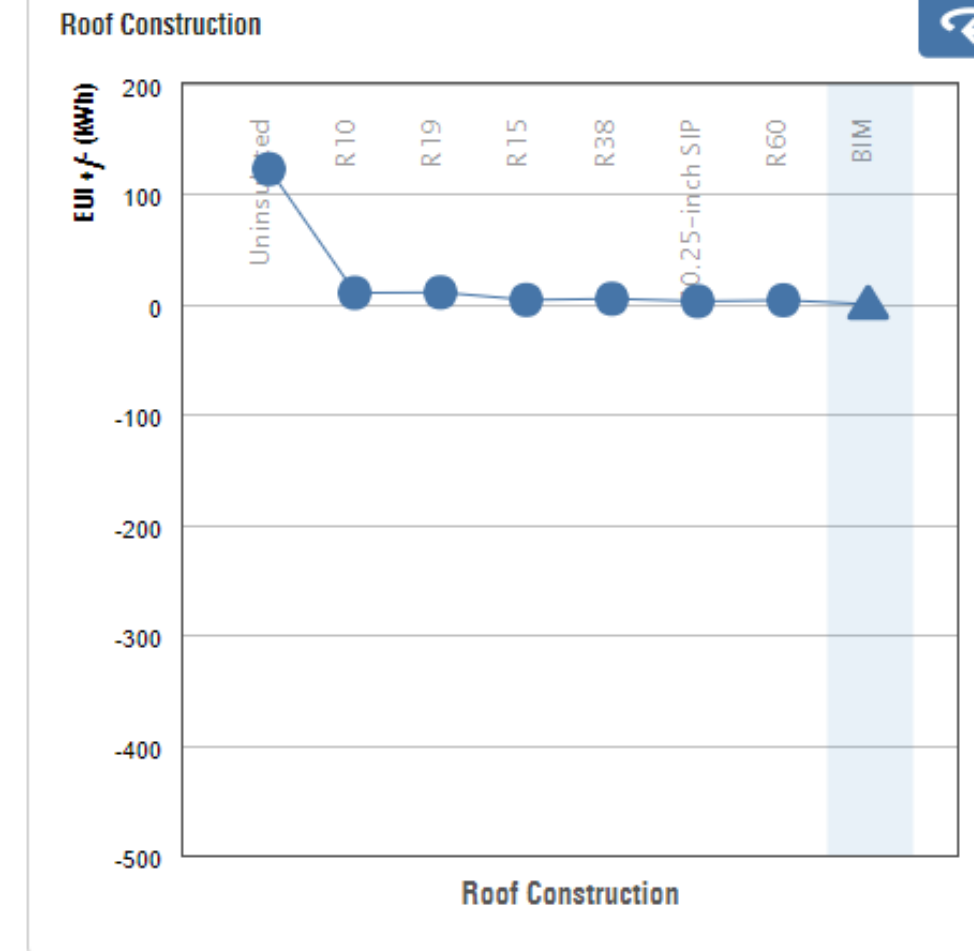
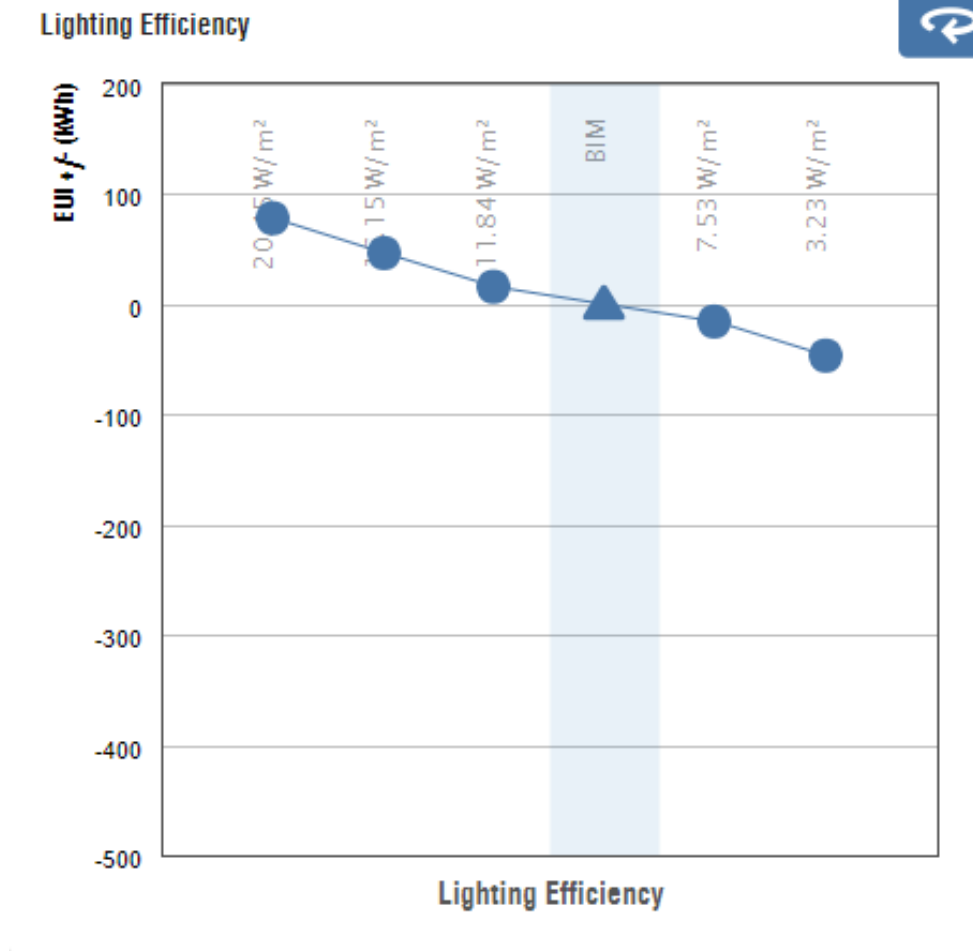
Plug Load Efficiency

Window-wall ratio: S

Window-wall ratio: W

HVAC System

Wall Construction



# Show Insight!



## Network problem

Sorry. We seem to have some technical difficulties and couldn't complete your request.

Try loading the item again.

Please verify your Internet connection, and refresh the browser to see if that fixes the problem.

OK



# Building Element Analysis - Revit

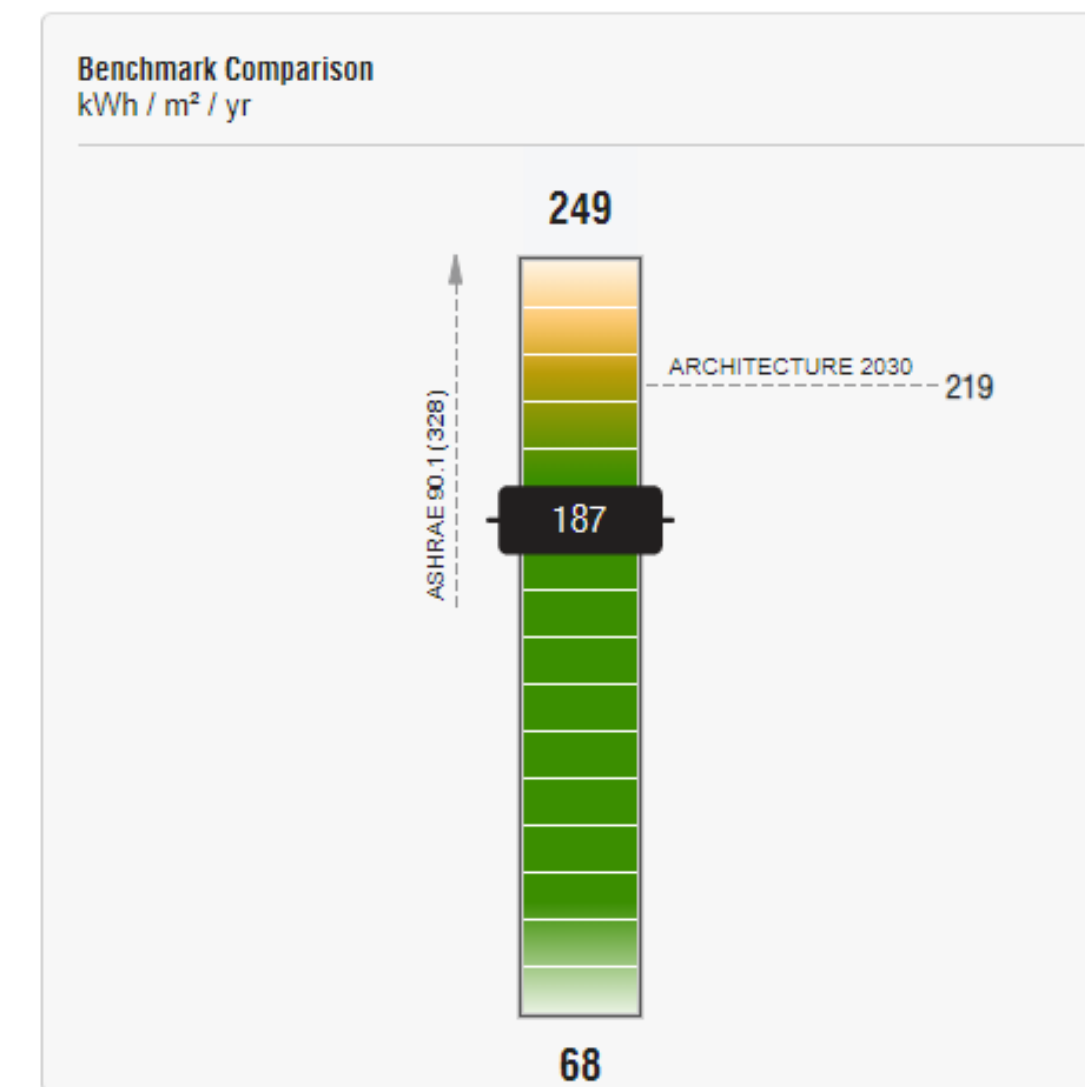
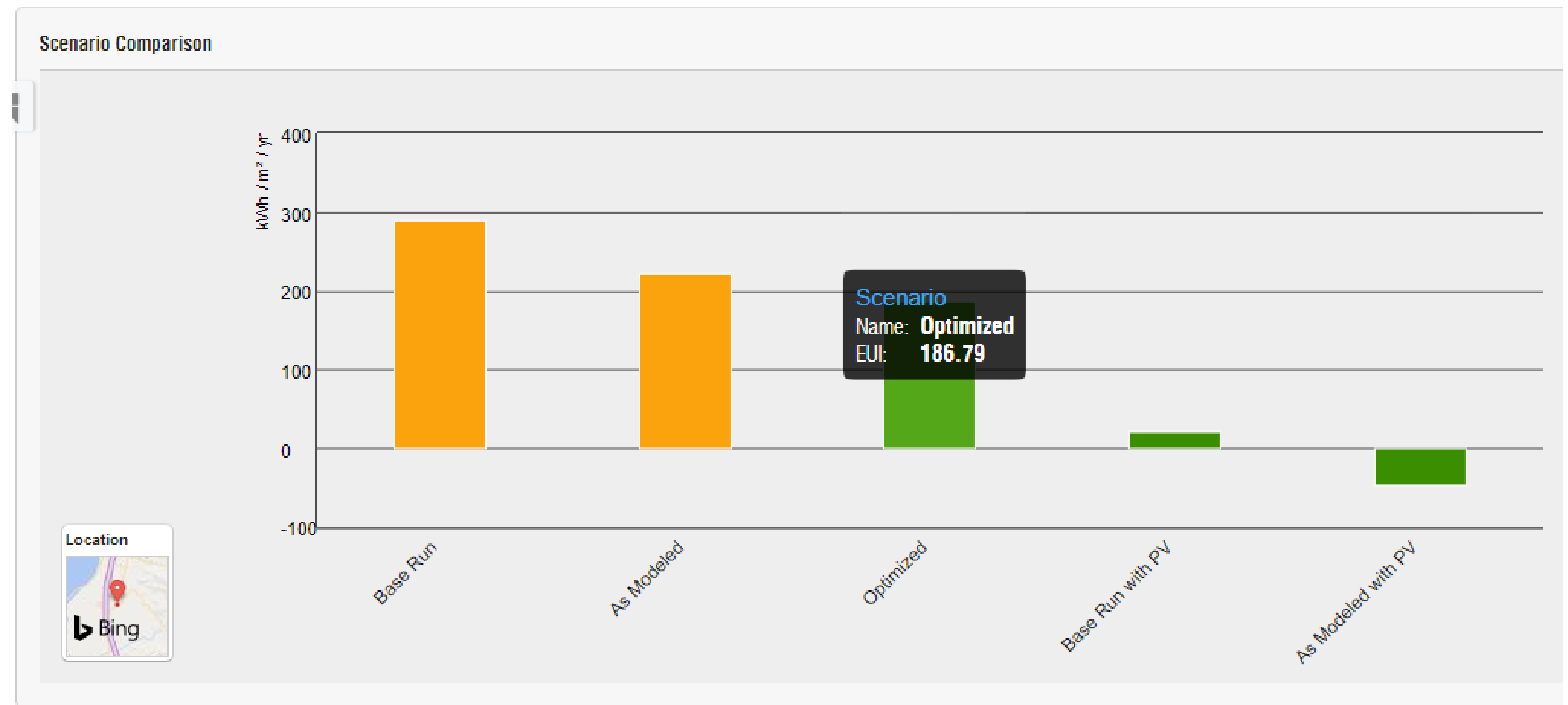
## Insight Scenarios:

Base Run

As modeled

Net Zero

PV Panels





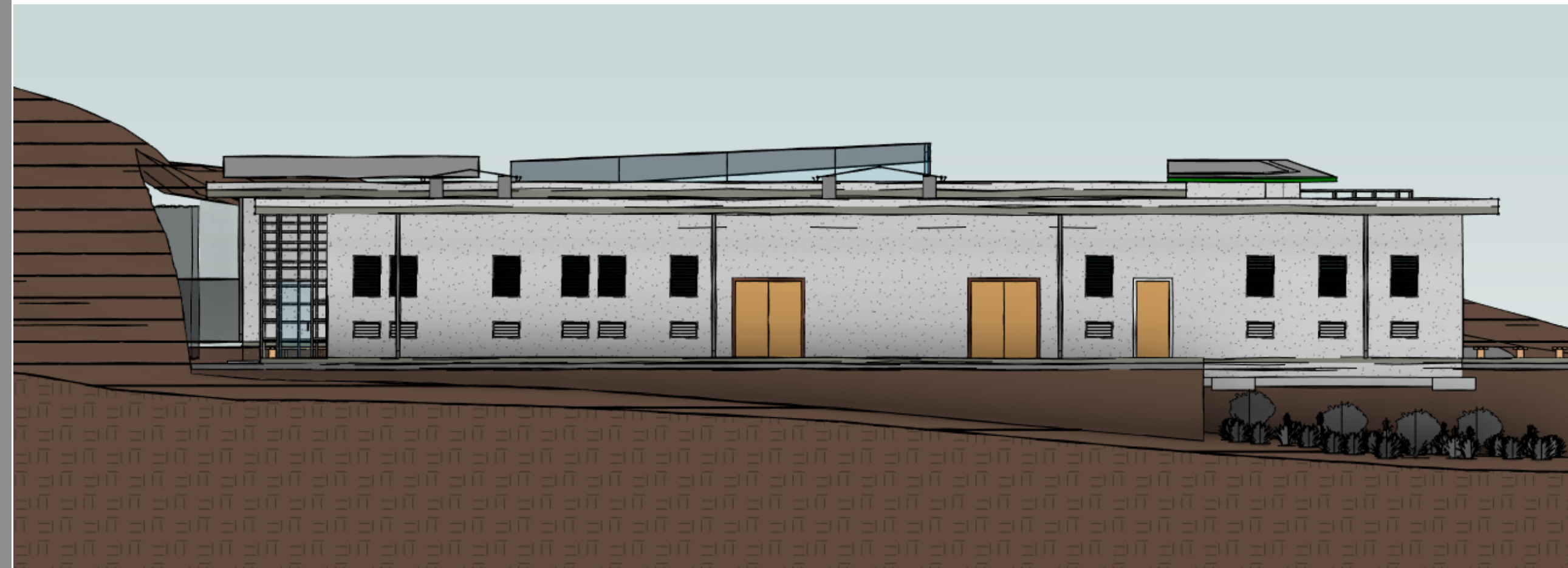
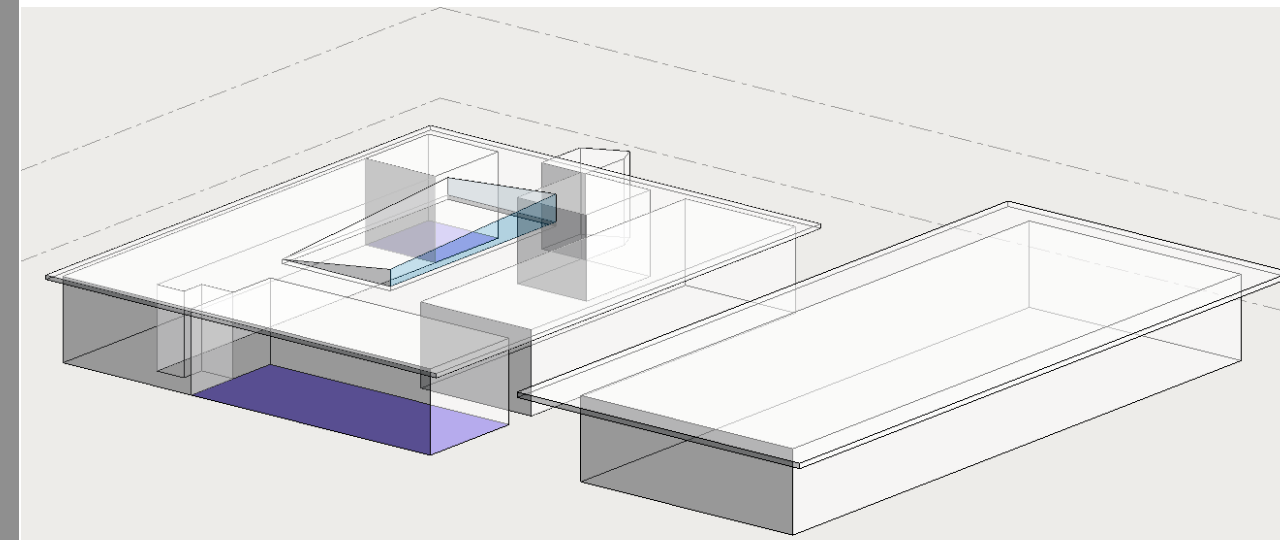
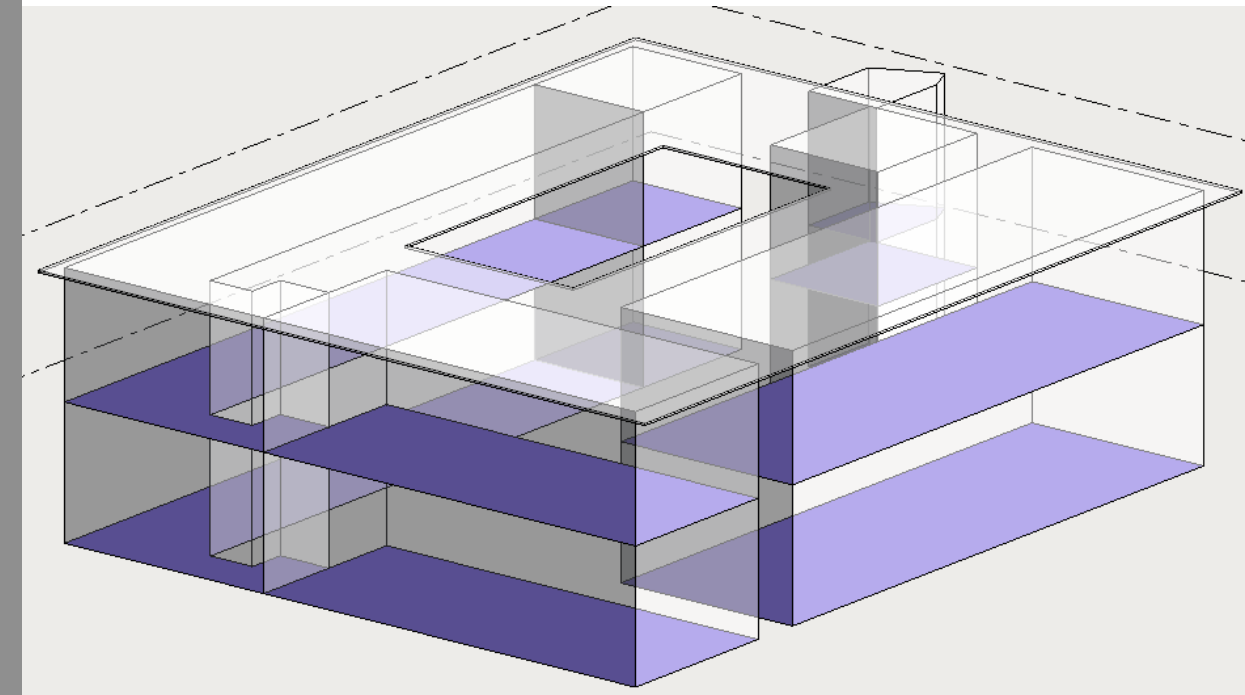
# Building Performance Analysis - Revit

Integrating analysis into your workflow

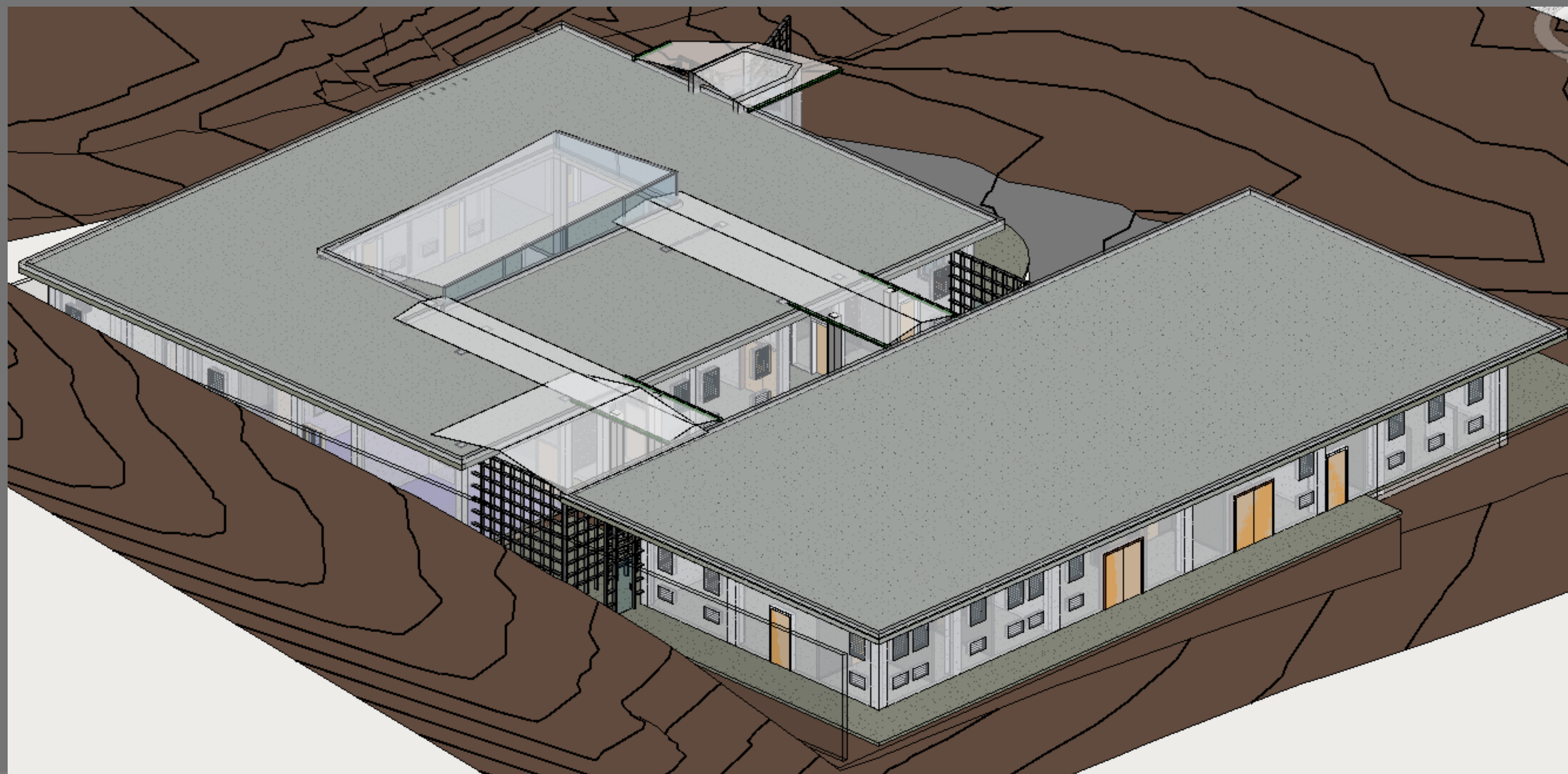


# Conceptual Massing and Analysis - Revit

- 1-story, multiple buildings
- 2-story, single building
- Partially below-grade







# Creating the Energy Analytical Model

Isolate Categories  
Model Cleanup

Visibility/Graphic Overrides for 3D View: 3D for EAM

Model Categories Annotation Categories Analytical Mod

☒ Show model categories in this view

Filter list: <multiple> v

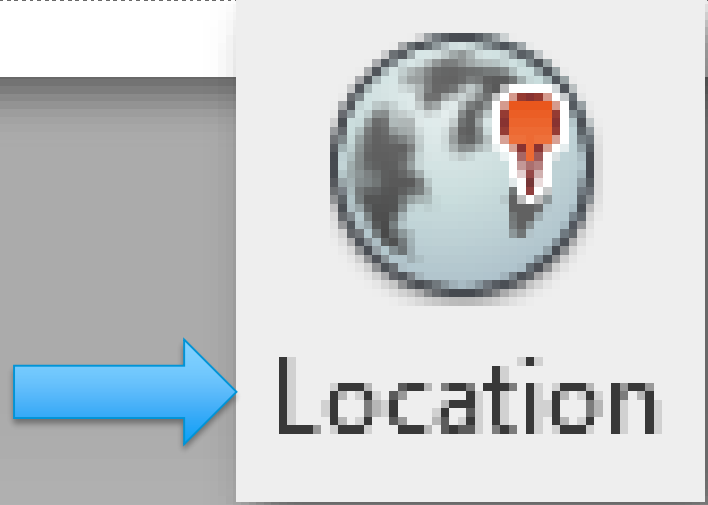
Visibility	
<input checked="" type="checkbox"/>	Ceilings
<input checked="" type="checkbox"/>	Columns
<input checked="" type="checkbox"/>	Curtain Panels
<input checked="" type="checkbox"/>	Curtain Systems
<input checked="" type="checkbox"/>	Curtain Wall Mullions
<input type="checkbox"/>	Detail Items
<input checked="" type="checkbox"/>	Doors
<input type="checkbox"/>	Electrical Equipment
<input type="checkbox"/>	Electrical Fixtures
<input type="checkbox"/>	Entourage
<input checked="" type="checkbox"/>	Floors
<input type="checkbox"/>	Furniture
<input type="checkbox"/>	Furniture Systems
<input type="checkbox"/>	Generic Models
<input type="checkbox"/>	Lighting Fixtures
<input type="checkbox"/>	Lines
<input type="checkbox"/>	Mass
<input type="checkbox"/>	Mechanical Equipment
<input type="checkbox"/>	Parking
<input type="checkbox"/>	Parts
<input type="checkbox"/>	Planting
<input type="checkbox"/>	Plumbing Fixtures
<input type="checkbox"/>	Railings
<input type="checkbox"/>	Ramps
<input type="checkbox"/>	Raster Images
<input type="checkbox"/>	Roads
<input checked="" type="checkbox"/>	Roofs
<input checked="" type="checkbox"/>	Shaft Openings
<input type="checkbox"/>	Site
<input type="checkbox"/>	Specialty Equipment
<input type="checkbox"/>	Stairs
<input type="checkbox"/>	Structural Area Reinforcement
<input type="checkbox"/>	Structural Beam Systems
<input checked="" type="checkbox"/>	Structural Columns
<input type="checkbox"/>	Structural Connections



# Building Element Analysis - Revit

Output-driven analysis

Energy Settings	
Parameter	Value
<b>Energy Analytical Model</b>	
Mode	Use Conceptual Masses and Building Elements
Ground Plane	MATERNAL HEALTH G.L.
Project Phase	PHASE 1
Analytical Space Resolution	0.4572 m
Analytical Surface Resolution	0.3048 m
Perimeter Zone Depth	4.5720 m
Perimeter Zone Division	<input checked="" type="checkbox"/>
Average Vertical Void Height Threshold	1.8288 m
Horizontal Void/Chase Area Threshold	0.093 m <sup>2</sup>
<b>Advanced</b>	
Other Options	Edit...
<b>Identity Data</b>	
Workset	Project Info
Edited by	Cmorrison2



Factors that are analyzed by Insight, no input needed:

Advanced Energy Settings	
Parameter	Value
<b>Detailed Model</b>	
Target Percentage Glazing	0%
Target Sill Height	0.7500 m
Glazing is Shaded	<input type="checkbox"/>
Shade Depth	0.4572 m
Target Percentage Skylights	0%
Skylight Width & Depth	0.9144 m
<b>Building Data</b>	
Building Type	Hospital or Healthcare
Building Operating Schedule	Default
HVAC System	Central VAV, HW Heat, Chiller 5.96 COP, Boilers 84.5 eff
Outdoor Air Information	Edit...
<b>Room/Space Data</b>	
Export Category	Rooms
<b>Material Thermal Properties</b>	
Conceptual Types	Edit...
Schematic Types	<Building>
Detailed Elements	<input type="checkbox"/>
<b>Identity Data</b>	
Workset	Project Info
Edited by	Cmorrison2



# Building Element Analysis - Revit

Advanced Energy Settings

Parameter	Value
<b>Detailed Model</b>	
Target Percentage Glazing	0%
Target Sill Height	0.7500 m
Glazing is Shaded	<input type="checkbox"/>
Shade Depth	0.4572 m
Target Percentage Skylights	0%
Skylight Width & Depth	0.9144 m
<b>Building Data</b>	
Building Type	Hospital or Healthcare
Building Operating Schedule	Default
HVAC System	Central VAV, HW Heat, Chiller 5.96 COP, Boilers 84.5 eff
Outdoor Air Information	Edit...
<b>Room/Space Data</b>	
Export Category	Rooms
<b>Material Thermal Properties</b>	
Conceptual Types	Edit...
Schematic Types	<Building>
Detailed Elements	<input type="checkbox"/>
<b>Identity Data</b>	
Workset	Project Info
Edited by	Cmorrison2

Analysis Properties

By default, analysis properties are generated from information in Conceptual Types. Properties of Schematic Types are used when override is selected.

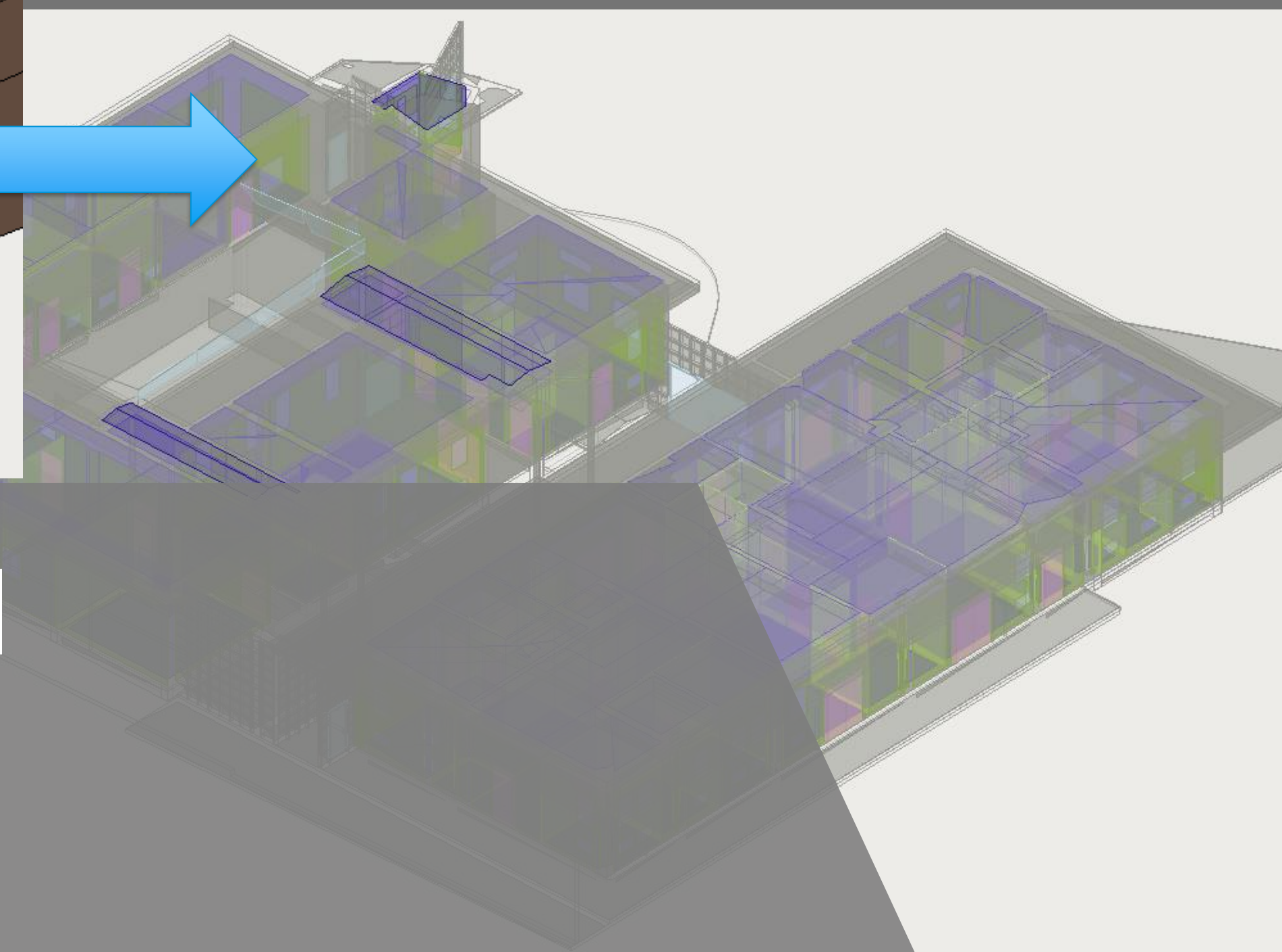
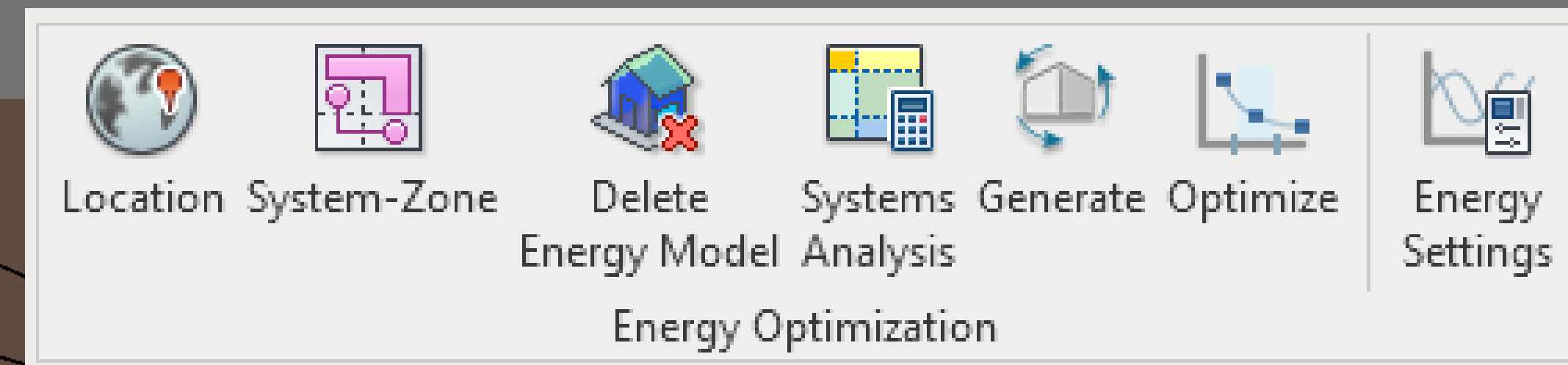
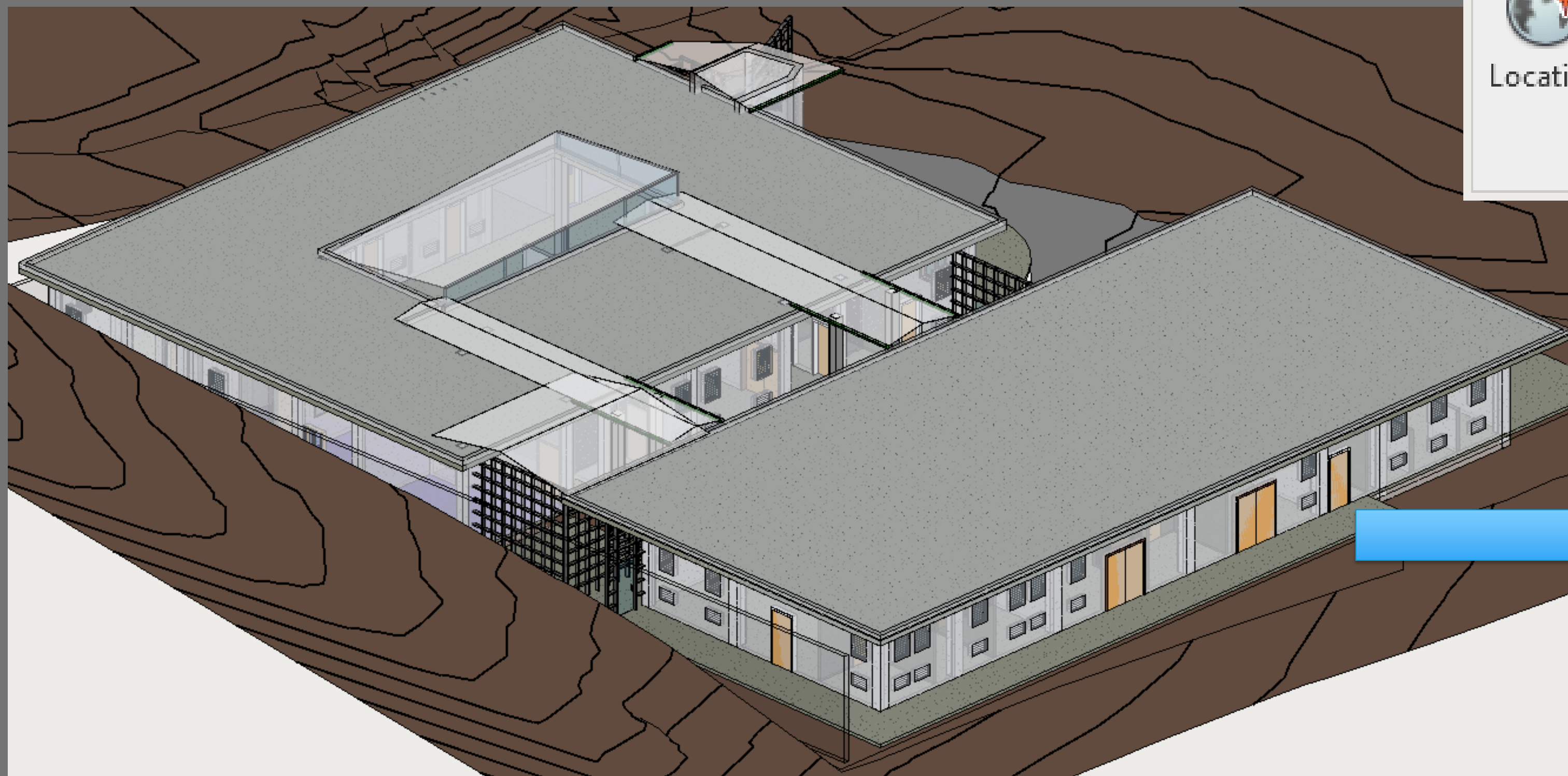
Category	Override	Analytic Construction
Roofs	<input type="checkbox"/>	4 in lightweight concrete (U=1.2750 W/(m <sup>2</sup> ·K))
Exterior Walls	<input checked="" type="checkbox"/>	8 in heavyweight concrete block (U=2.0846 W/(m <sup>2</sup> ·K))
Interior Walls	<input type="checkbox"/>	Frame partition with 3/4 in gypsum board (U=1.4733 W/(m <sup>2</sup> ·K))
Ceilings	<input type="checkbox"/>	8 in lightweight concrete ceiling (U=1.3610 W/(m <sup>2</sup> ·K))
Floors	<input type="checkbox"/>	Passive floor, no insulation, tile or vinyl (U=2.9582 W/(m <sup>2</sup> ·K))
Slabs	<input type="checkbox"/>	Un-insulated solid (U=0.7059 W/(m <sup>2</sup> ·K))
Doors	<input type="checkbox"/>	Metal (U=3.7021 W/(m <sup>2</sup> ·K))
Exterior Windows	<input type="checkbox"/>	Large double-glazed windows (reflective coating) - industry (U=2.9214 W/(m <sup>2</sup> ·K),
Interior Windows	<input type="checkbox"/>	Large single-glazed windows (U=3.6898 W/(m <sup>2</sup> ·K), SHGC=0.86)
Skylights	<input type="checkbox"/>	Large double-glazed windows (reflective coating) - industry (U=3.1956 W/(m <sup>2</sup> ·K),

AllNone

Shading factor for exterior windows: 0

OKCancel



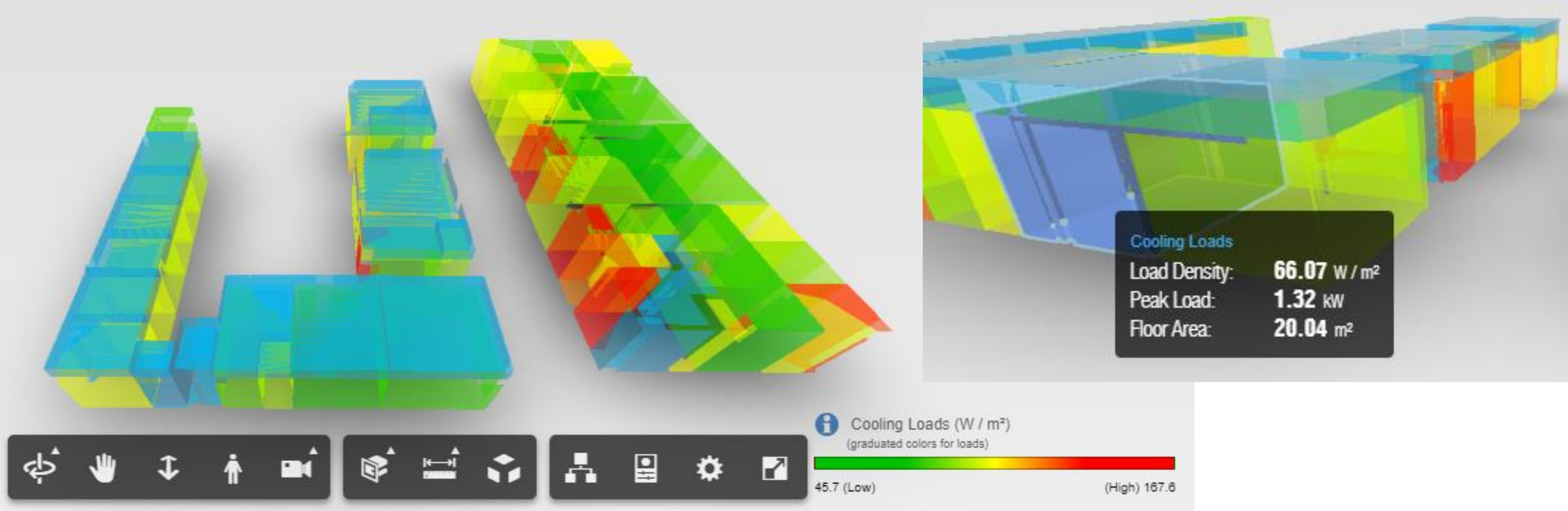


# Creating the Energy Analytical Model

Create Energy Model (EAM)

Review EAM for gaps and surface types





# Building Element Analysis - Revit

Insight – Cooling Loads



# Building Element Analysis - Revit

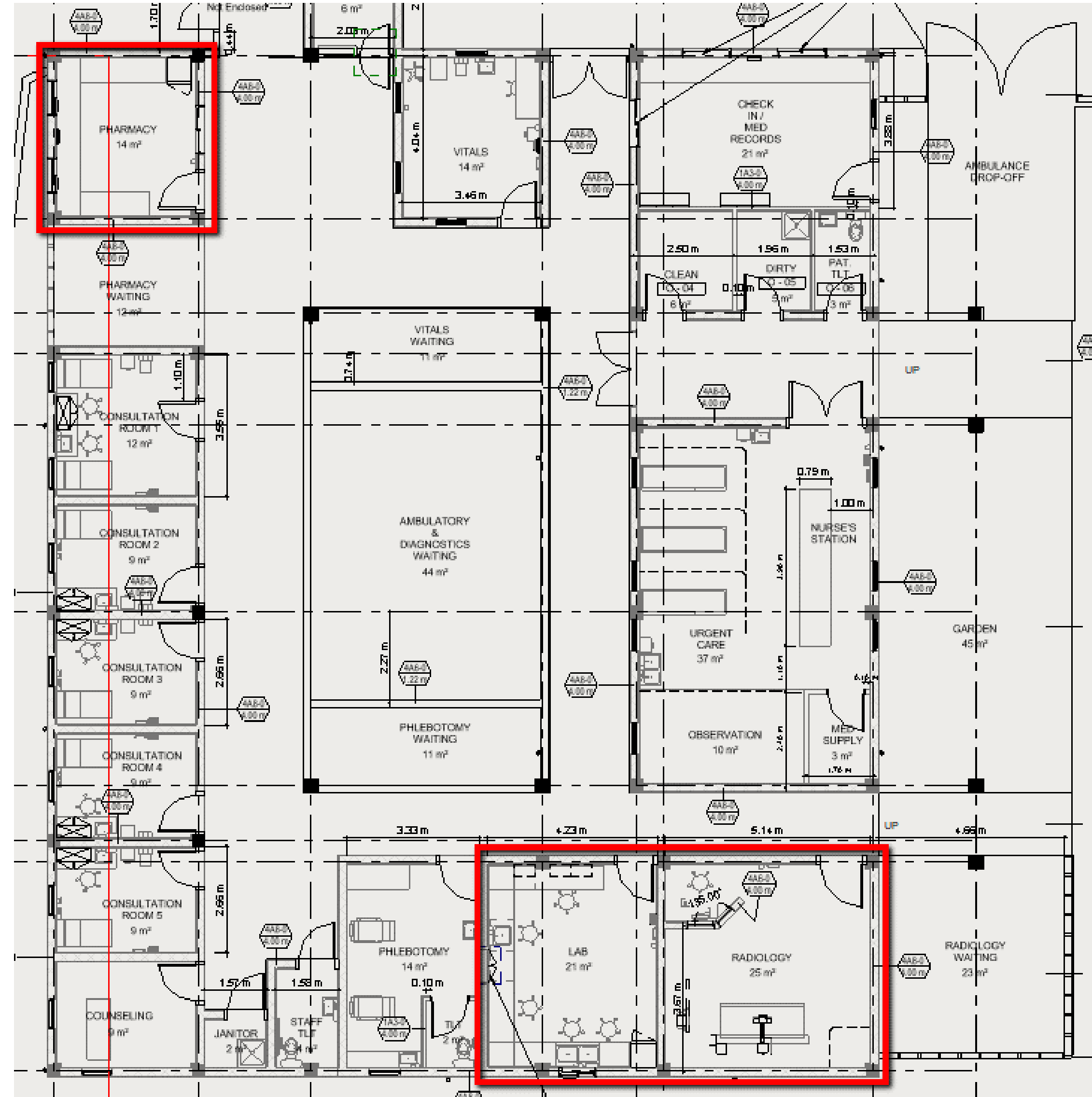
## Defining the spaces:

Cooling Loads

Naturally Ventilated only

Massing – mass floors

Space Types





# Building Element Analysis - Revit

## Optimizing the Design:

Cooling Loads

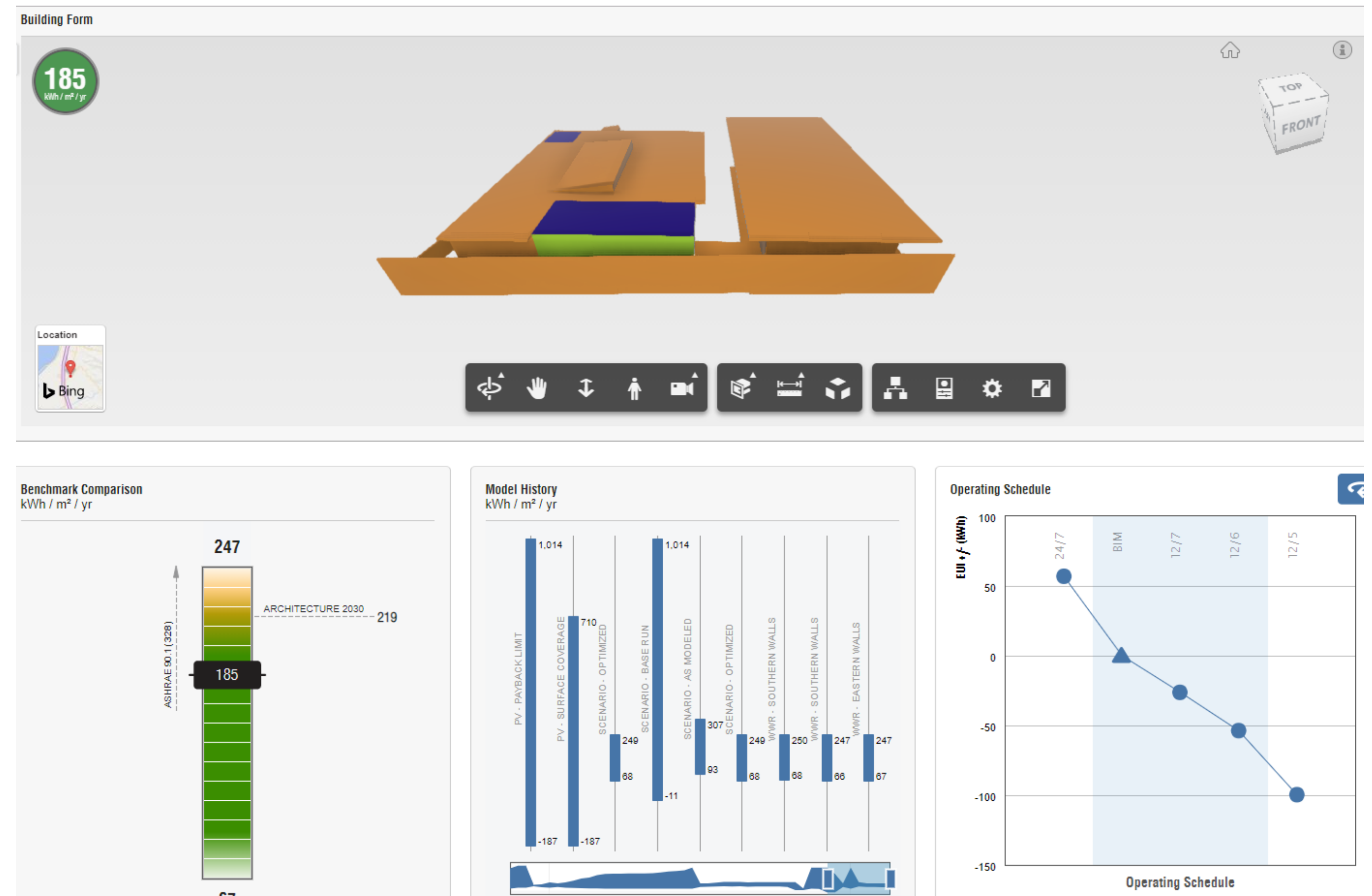
Natural Ventilation

Window-Wall Ratio

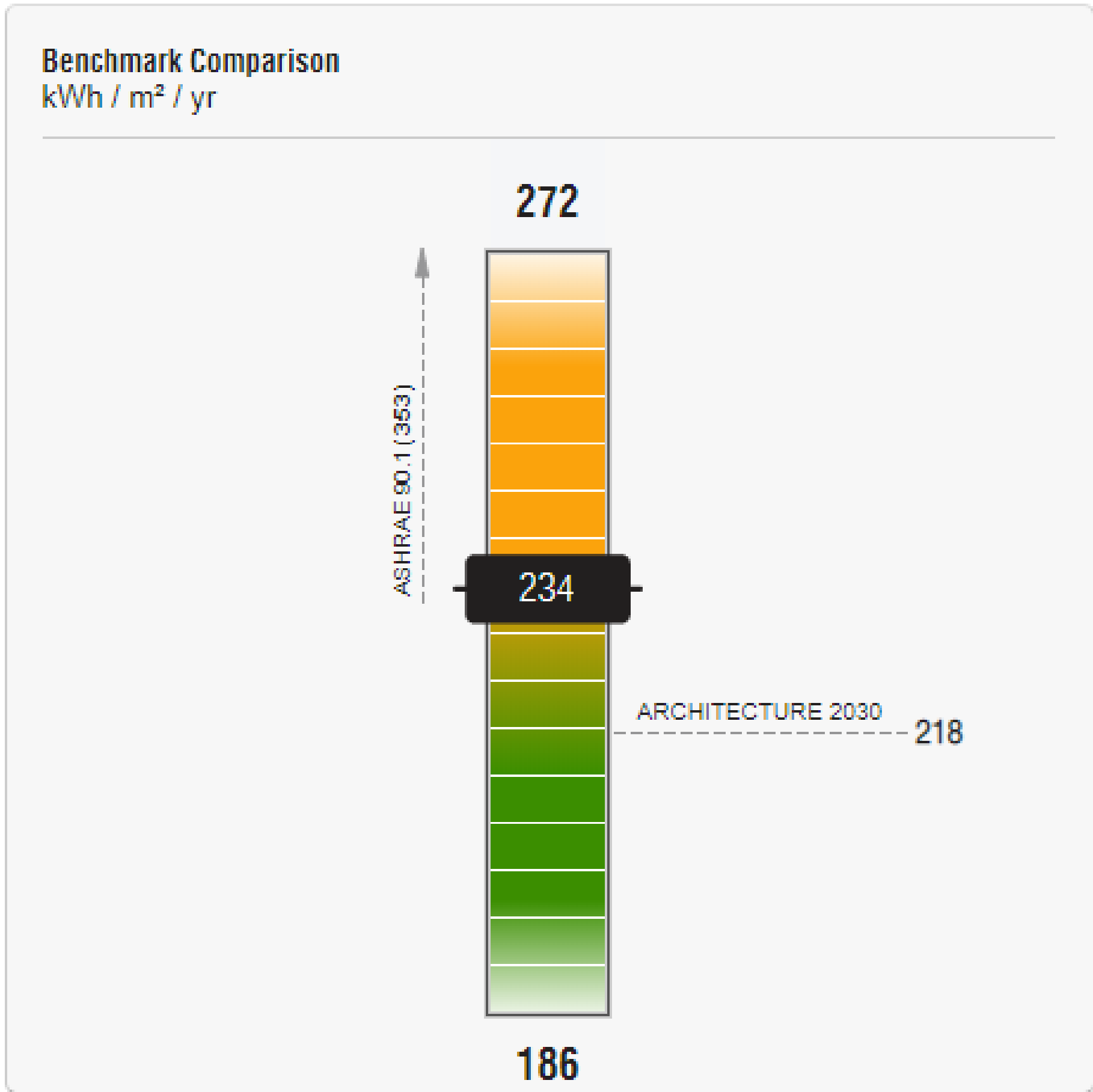
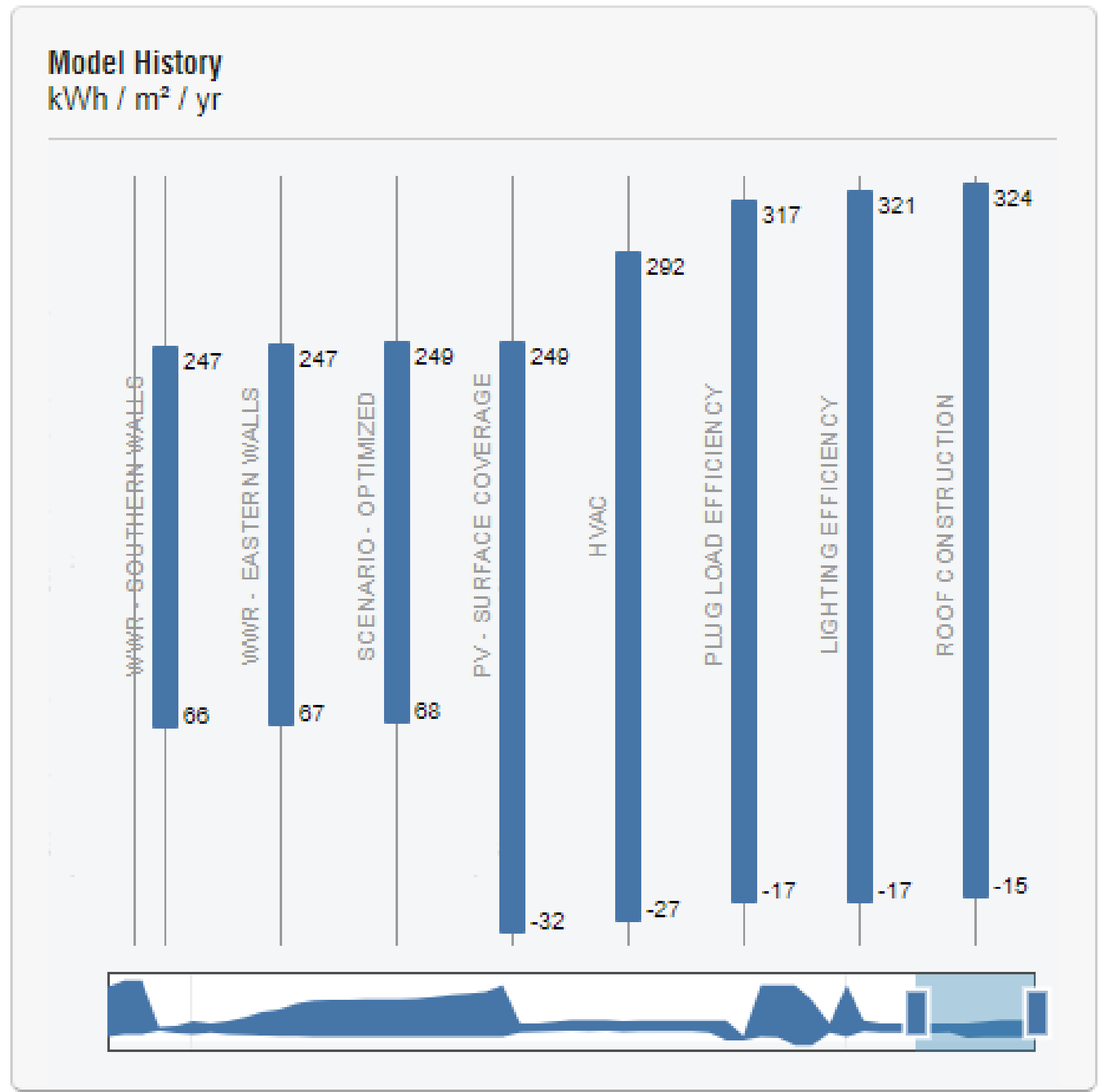
Wall Construction

Roof Construction

<https://insight.autodesk.com/oneenergy/Model/179200#>







# Insight – Final EUI – Design Phase



Members

Add member

ohernandez@buildhealthinterna...Clarke Morrison

Luc Wing

Export

Select All

ENERGY PLUS

GBXML

DOE-2


ENERGY COST


BENCHMARK COMPARISON

FACTOR WIDGETS

Export

## Insight – Collaboration and Interoperability

 Build Health  
International

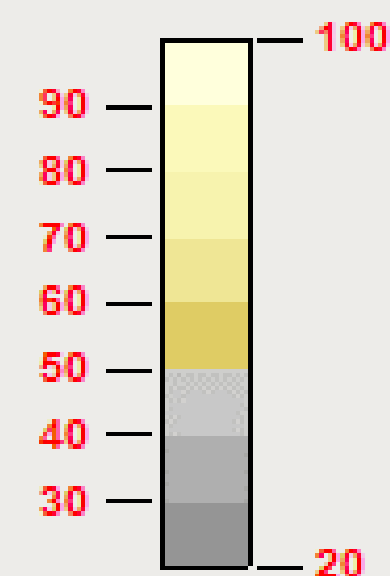
 MICRODESK



# Daylighting Analysis – Revit & Insight

Overview of Daylighting Analysis Plugin from Insight

(Percent)



Lighting sDA Annual Hours



# Daylighting Analysis – Insight

Insight – factors that impact daylighting:

Window to Wall Ratio

Glazing Types

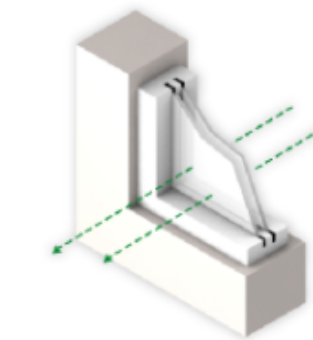
Daylight Controls

Shading Devices

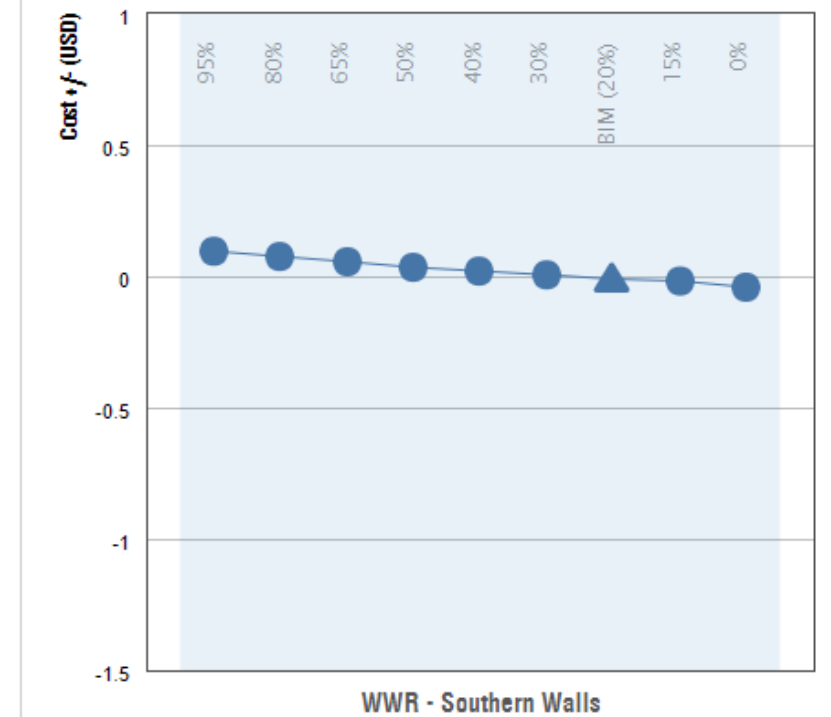
## Window Glass - East

Glass properties control the amount of daylight, heat transfer & solar heat gain into the building, along with other factors.

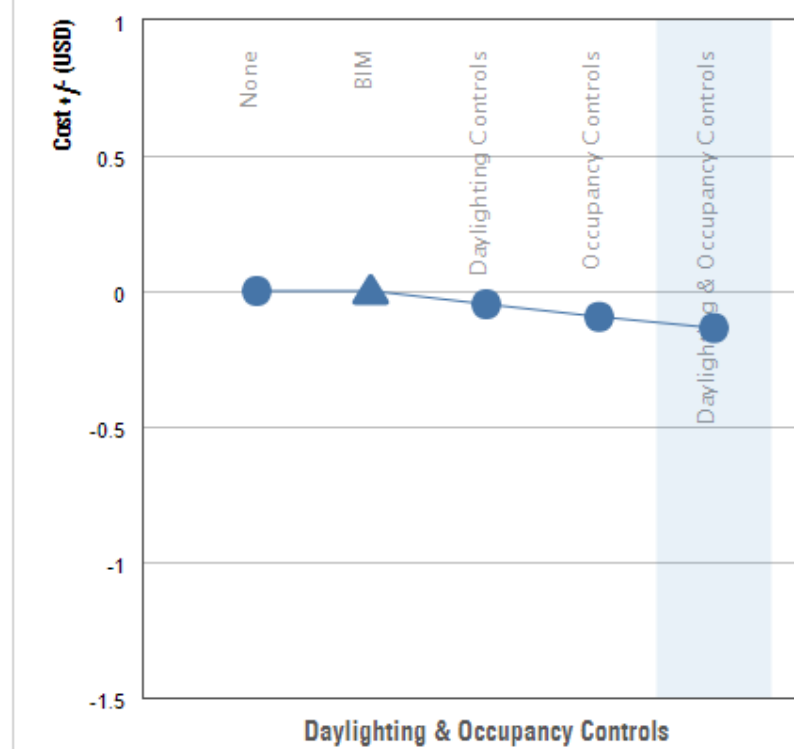
Current Setting:  
**Sgl Clr - Trp LoE**



WWR - Southern Walls



Daylighting & Occupancy Controls



## Window Shades - East

Shades can reduce HVAC energy use. The impact depends on other factors, such as window size and solar heat gain properties.

Current Setting:  
**1/6 Win Height - 2/3 Win Height**





# Daylighting Analysis - Revit

MULTIPLE TYPES OF ANALYSIS

MINIMAL USER INPUT

VISUALIZE THE RESULTS

Select Analysis Type

For best results, follow the best practices checklist in Help

Analysis: **Illuminance Analysis**

Levels: **Illuminance Analysis**

Environment

Location: Boston, MA, USA

Date/Time: ... Define

The following environments are defined

9/21 9am - GHI: 623, DNI: 856, DHI: 79

9/21 3pm - GHI: 270, DNI: 293, DHI: 149

Illuminance Settings

Threshold: Lower: 0 Upper: 500 Footcandles

Analysis Plane Height: 32 inches above floor

Thresholds are used for results in Room and Floor Schedules

Cloud Credits

Resolution: 12 inch grid

Required: 39 Credits

## Analytical Properties

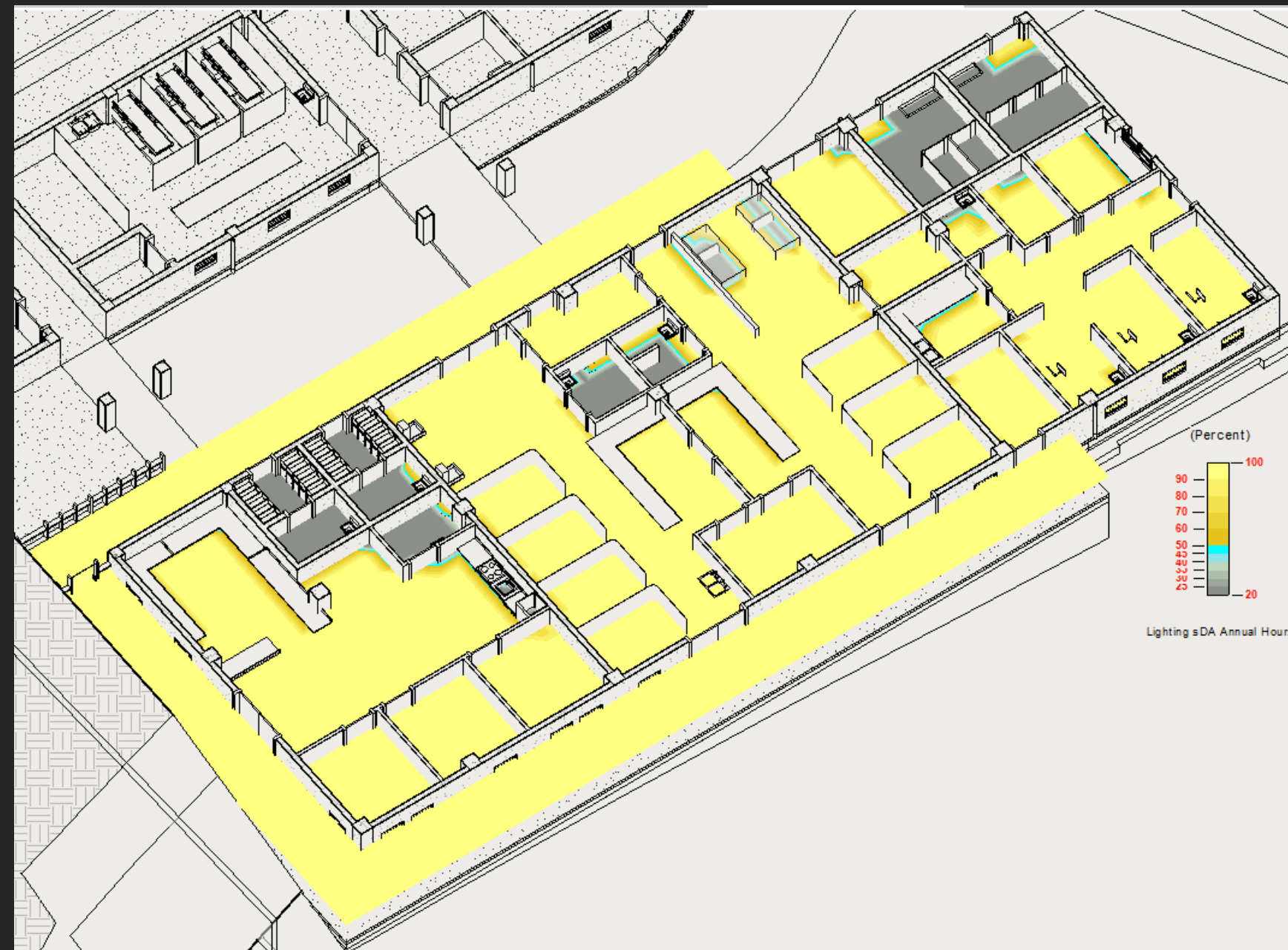
Analytic Construction	Double glazing - 1/4 in thick -
Define Thermal Properties by	Schematic Type
Visual Light Transmittance	0.600000
Solar Heat Gain Coefficient	0.310000
Thermal Resistance (R)	2.8573 (h·ft <sup>2</sup> ·°F)/BTU
Heat Transfer Coefficient (U)	0.3500





# Daylighting Analysis - Revit

## Insight: Daylight Autonomy and Annual Sunlight Exposure



Lighting Analysis - Results Summary ? X

LEED v4 EQc7 opt1 sDA/ASE  
For all Rooms Included in Daylighting

Jan 1 to Dec 31, 8:00 am to 6:00 pm  
(Both sDA and ASE must be met for Room area to qualify)

**sDA<sub>300/50</sub> + ASE<sub>1000/250</sub> 3 Points**

78% of Building area meets sDA % hours  
in Rooms with <20% area above ASE

Detailed Summary:

- 78% of Building area meets sDA % hours
- 0% of sDA Building area fails for Rooms >ASE
- 1% of Building area >ASE hours threshold
- 85% of Rooms meet sDA >55% Room area
- 70% of Rooms meet sDA 75% Room area
- 0% of Rooms >ASE hours >20% Room area

Design Tips

### Daylight Autonomy Tips

Included rooms are illuminated by natural daylight most hours of the year, and direct sun levels are within recommended limits. Take care to maintain solar shading and limit glazing transparency.

#### **Building geometry**

Design changes should maintain or increase ceiling and window head heights, and rooms currently have a good depth from glazed walls or skylights.

#### **Glazing specification**

Glazing transparency is good for overall daylight levels, and may be decreased to reduce the potential impact of direct sun on occupant comfort and thermal energy management.

#### **Shading**

Direct sun is sufficiently shaded from affecting occupant comfort levels in included rooms. Avoid changes that would increase direct sun by reviewing sun and shading patterns using the Solar tool.

[Daylighting Pattern Guide](#)



<_InsightLighting Room Schedule>										
LEED Daylight Autonomy Results Summary: 26.09, -81.75 - 45178										
Building scores 3 LEED points with 78% Building area passing thresholds										
At least 55% must exceed sDA300/50 in Rooms with ASE1000/250 < 20% of Room area										
A	B	C	D	E	F	G	H	I	J	K
Level	Name	Number	Area	Include In Daylighting	sDA 300/50		ASE 1000/250		sDA/ASE	
					%	Points	%	Pass	%	Points
MATERNAL HEALT	FEMALE PATIENT T	MAT - 30	10 m²	<input checked="" type="checkbox"/>	7	none	7	Yes	7	none
MATERNAL HEALT	MALE PATIENT TLT	MAT - 31	10 m²	<input checked="" type="checkbox"/>	7	none	3	Yes	7	none
MATERNAL HEALT	DENTAL REGISTR	MAT - 33	7 m²	<input checked="" type="checkbox"/>	75	3 pt	0	Yes	75	3 pt
MATERNAL HEALT	DENTAL OFFICE	MAT - 34	4 m²	<input checked="" type="checkbox"/>	87	3 pt	0	Yes	87	3 pt
MATERNAL HEALT	STAFF TLT	MAT - 35	3 m²	<input checked="" type="checkbox"/>	78	3 pt	0	Yes	78	3 pt
MATERNAL HEALT	MEP	MAT - 32	10 m²	<input checked="" type="checkbox"/>	93	3 pt	7	Yes	93	3 pt
MATERNAL HEALT	STORAGE	MAT - 36	5 m²	<input checked="" type="checkbox"/>	89	3 pt	0	Yes	89	3 pt
MATERNAL HEALT	DENTAL WORKRO	MAT - 37	6 m²	<input checked="" type="checkbox"/>	55	2 pt	0	Yes	55	2 pt
MATERNAL HEALT	ON CALL	MAT - 41	7 m²	<input checked="" type="checkbox"/>	100	3 pt	0	Yes	100	3 pt
MATERNAL HEALT	ANTENATAL / POS	MAT - 43	39 m²	<input checked="" type="checkbox"/>	100	3 pt	0	Yes	100	3 pt
MATERNAL HEALT	RECLINERS	MAT - 42	11 m²	<input checked="" type="checkbox"/>	69	2 pt	0	Yes	69	2 pt
MATERNAL HEALT	NURSE'S STATION	MAT - 47	11 m²	<input checked="" type="checkbox"/>	74	2 pt	0	Yes	74	2 pt
MATERNAL HEALT	CLEAN / MED SUPP	MAT - 49	10 m²	<input checked="" type="checkbox"/>	100	3 pt	0	Yes	100	3 pt
MATERNAL HEALT	NURSE'S STATION	MAT - 48	11 m²	<input checked="" type="checkbox"/>	91	3 pt	0	Yes	91	3 pt
MATERNAL HEALT	PAT. TLT	MAT - 46	4 m²	<input checked="" type="checkbox"/>	0	none	0	Yes	0	none
MATERNAL HEALT	DIRTY	MAT - 44	7 m²	<input checked="" type="checkbox"/>	96	3 pt	0	Yes	96	3 pt
MATERNAL HEALT	LABOR & DELIVER	MAT - 50	51 m²	<input checked="" type="checkbox"/>	95	3 pt	1	Yes	95	3 pt
MATERNAL HEALT	LOCKER ROOM	MAT - 51	4 m²	<input checked="" type="checkbox"/>	0	none	0	Yes	0	none
MATERNAL HEALT	LOCKER ROOM	MAT - 53	4 m²	<input checked="" type="checkbox"/>	0	none	0	Yes	0	none
MATERNAL HEALT	STAFF TLT	MAT - 55	4 m²	<input checked="" type="checkbox"/>	0	none	0	Yes	0	none
MATERNAL HEALT	SUPPLIES	MAT - 56	4 m²	<input checked="" type="checkbox"/>	100	3 pt	0	Yes	100	3 pt
MATERNAL HEALT	CONFERENCE ROO	MAT - 59	9 m²	<input checked="" type="checkbox"/>	100	3 pt	0	Yes	100	3 pt
MATERNAL HEALT	OFFICE	MAT - 60	8 m²	<input checked="" type="checkbox"/>	100	3 pt	0	Yes	100	3 pt
MATERNAL HEALT	OFFICE	MAT - 61	8 m²	<input checked="" type="checkbox"/>	100	3 pt	0	Yes	100	3 pt
MATERNAL HEALT	OPEN WORK SPAC	MAT - 57	15 m²	<input checked="" type="checkbox"/>	60	2 pt	0	Yes	60	2 pt
MATERNAL HEALT	RECEPTION	MAT - 58	3 m²	<input checked="" type="checkbox"/>	100	3 pt	0	Yes	100	3 pt
MATERNAL HEALT	TLT	MAT - 52	3 m²	<input checked="" type="checkbox"/>	0	none	0	Yes	0	none
MATERNAL HEALT	TLT	MAT - 54	3 m²	<input checked="" type="checkbox"/>	0	none	0	Yes	0	none
MATERNAL HEALT	PATIENT TLT / SHO	MAT - 45	4 m²	<input checked="" type="checkbox"/>	0	none	0	Yes	0	none
MATERNAL HEALT	DENTAL WAITING	MAT - 29	53 m²	<input checked="" type="checkbox"/>						

## Lighting Analysis Schedules

- Room Schedule
- Floor Area Schedule



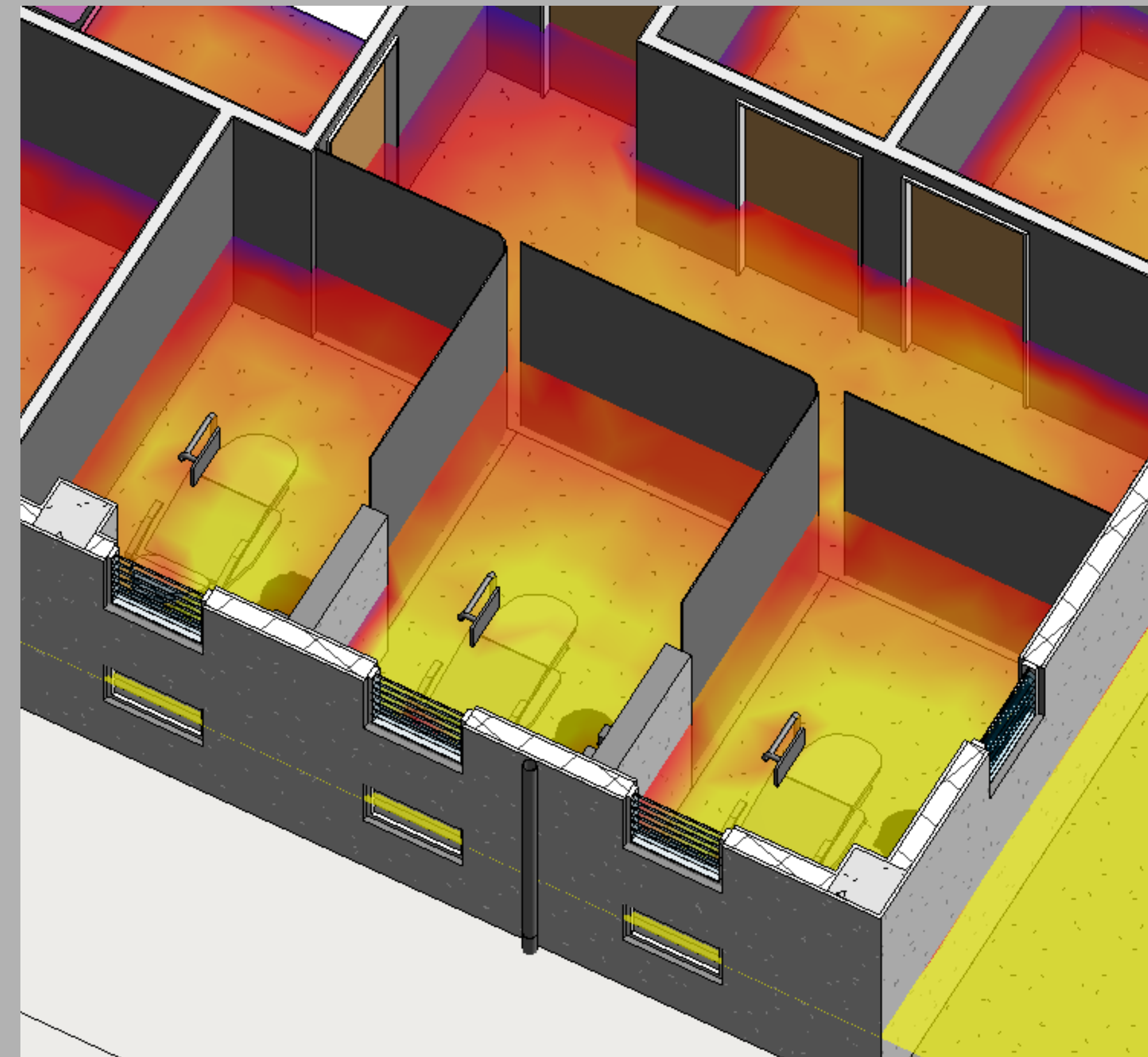
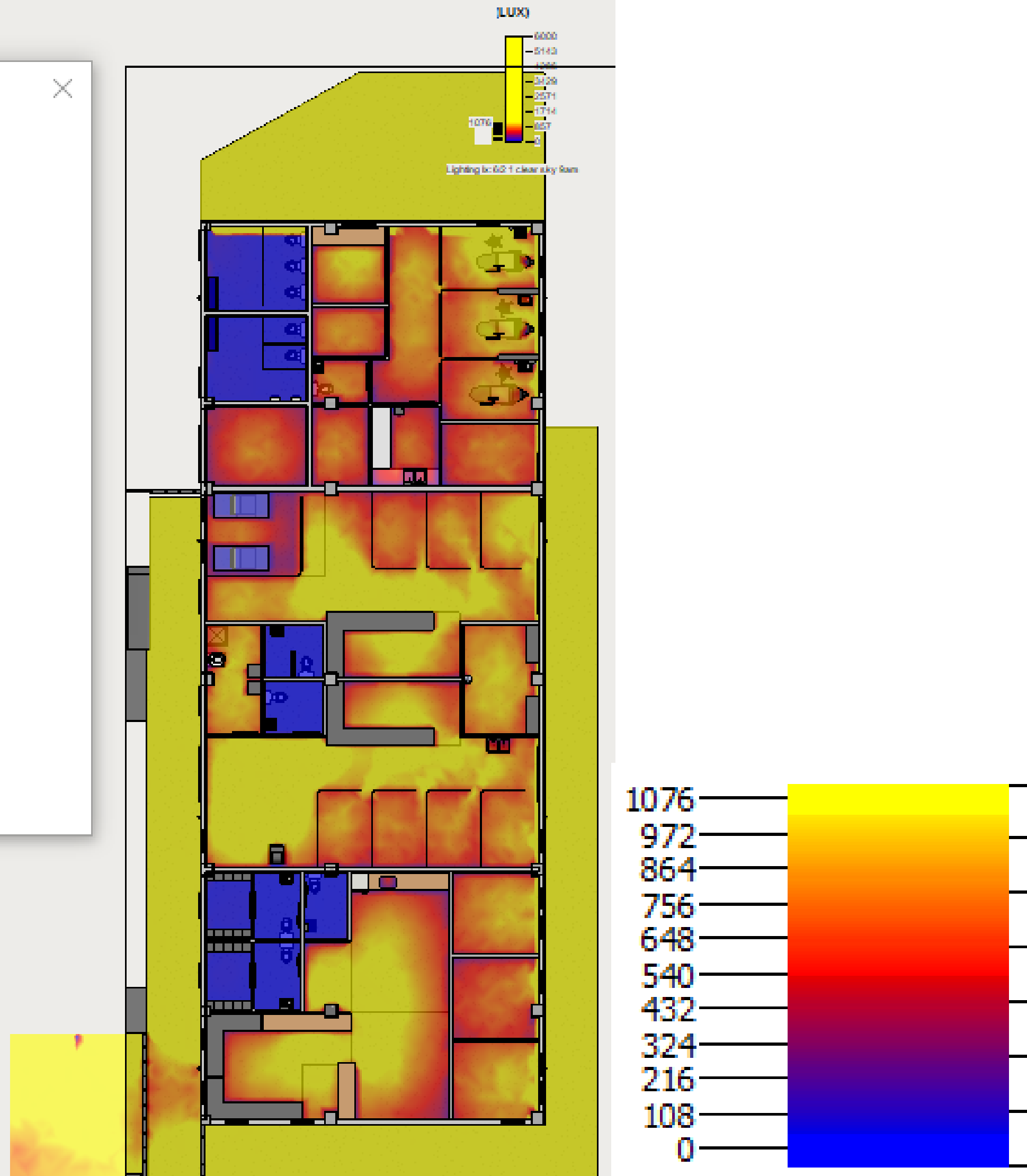
Lighting Analysis - Results Summary

Custom Analysis  
For all Rooms Included in Daylighting

Total Both - 85% Passing  
0% either time below threshold  
15% either time above threshold

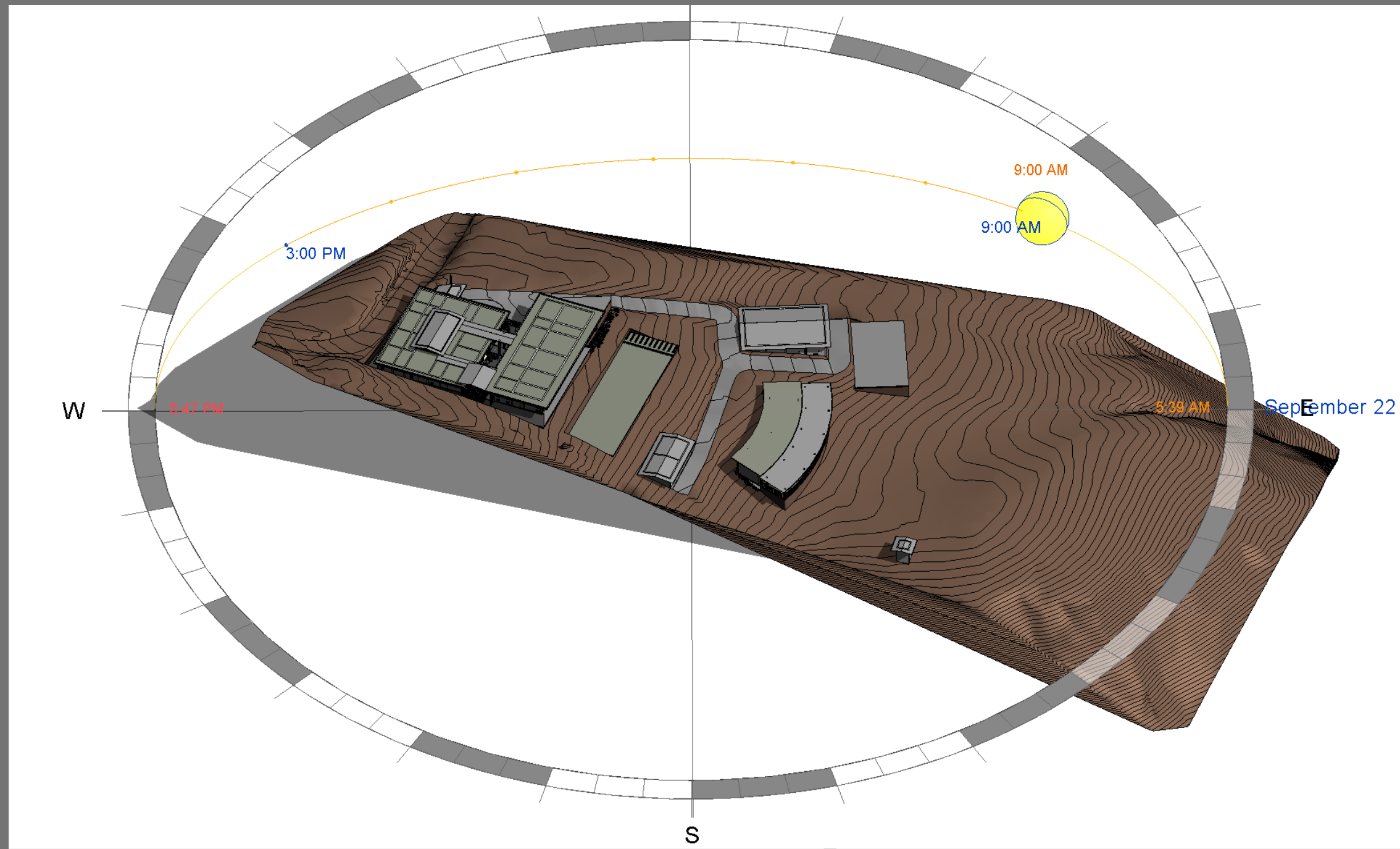
9:00 am - 85% Passing  
June 21  
GHI: 614, DNI: 694, DHI: 84  
0% below threshold  
15% above threshold w/o shades

9:00 am - 85% Passing  
June 21  
GHI: 614, DNI: 694, DHI: 84  
0% below threshold  
15% above threshold w/o shades



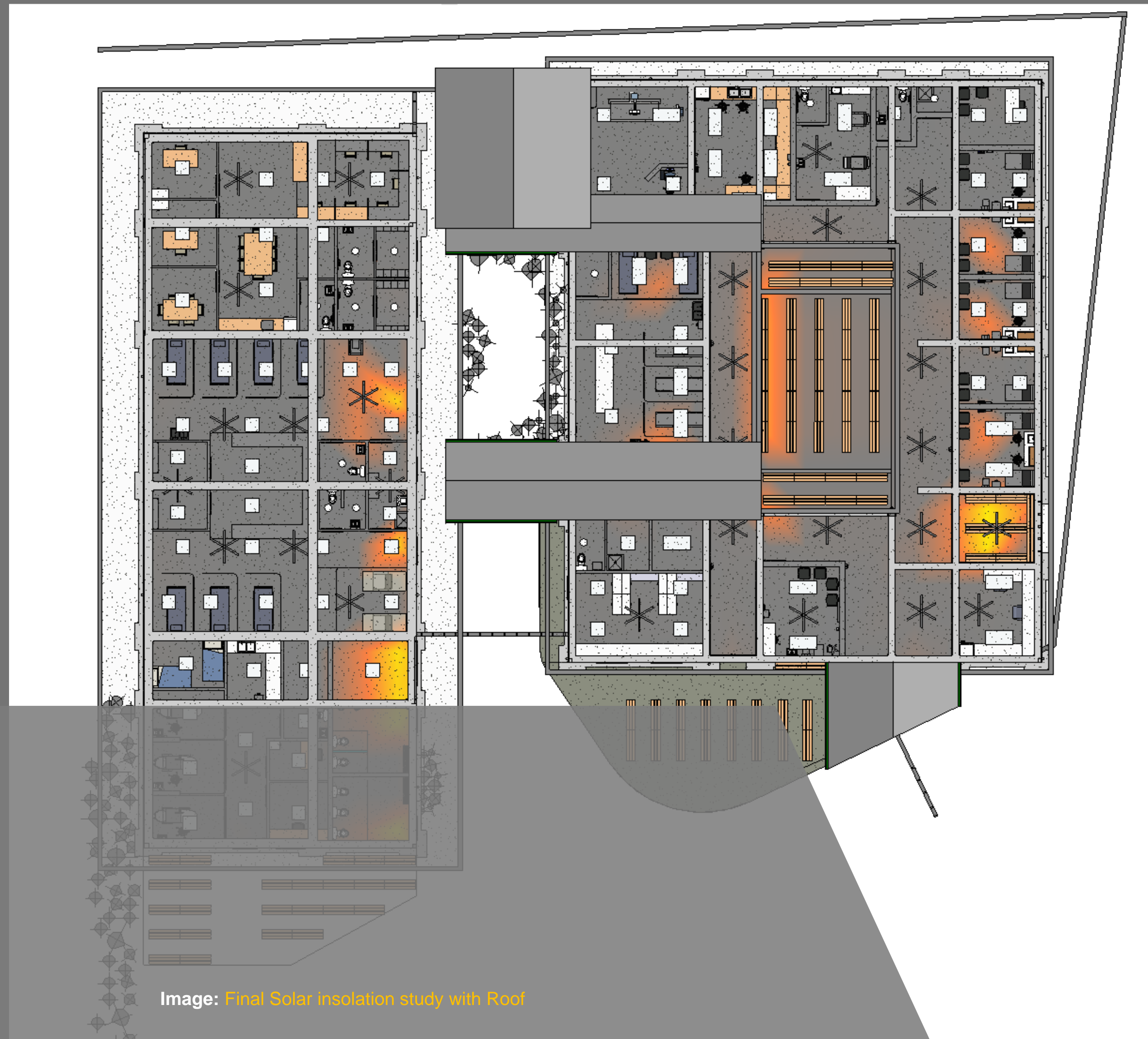
# Daylighting Analysis - Revit



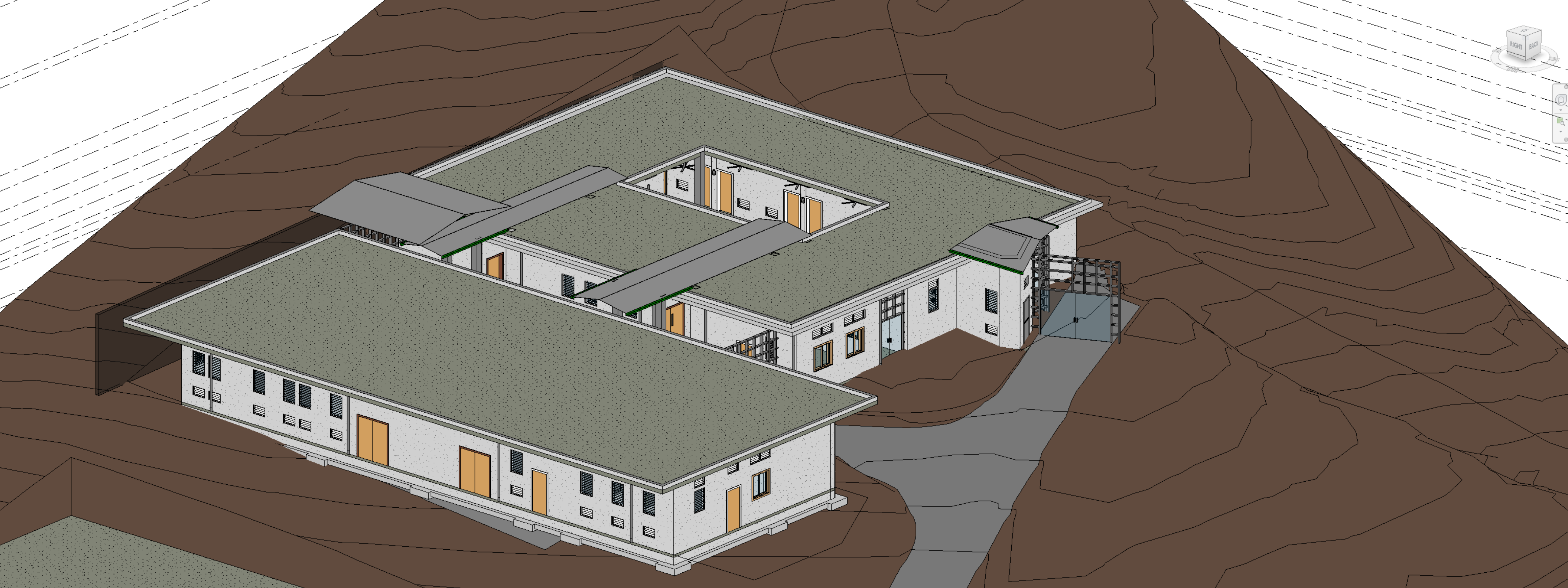


# Solar Studies in Revit

Illuminance study  
Solar Insolation







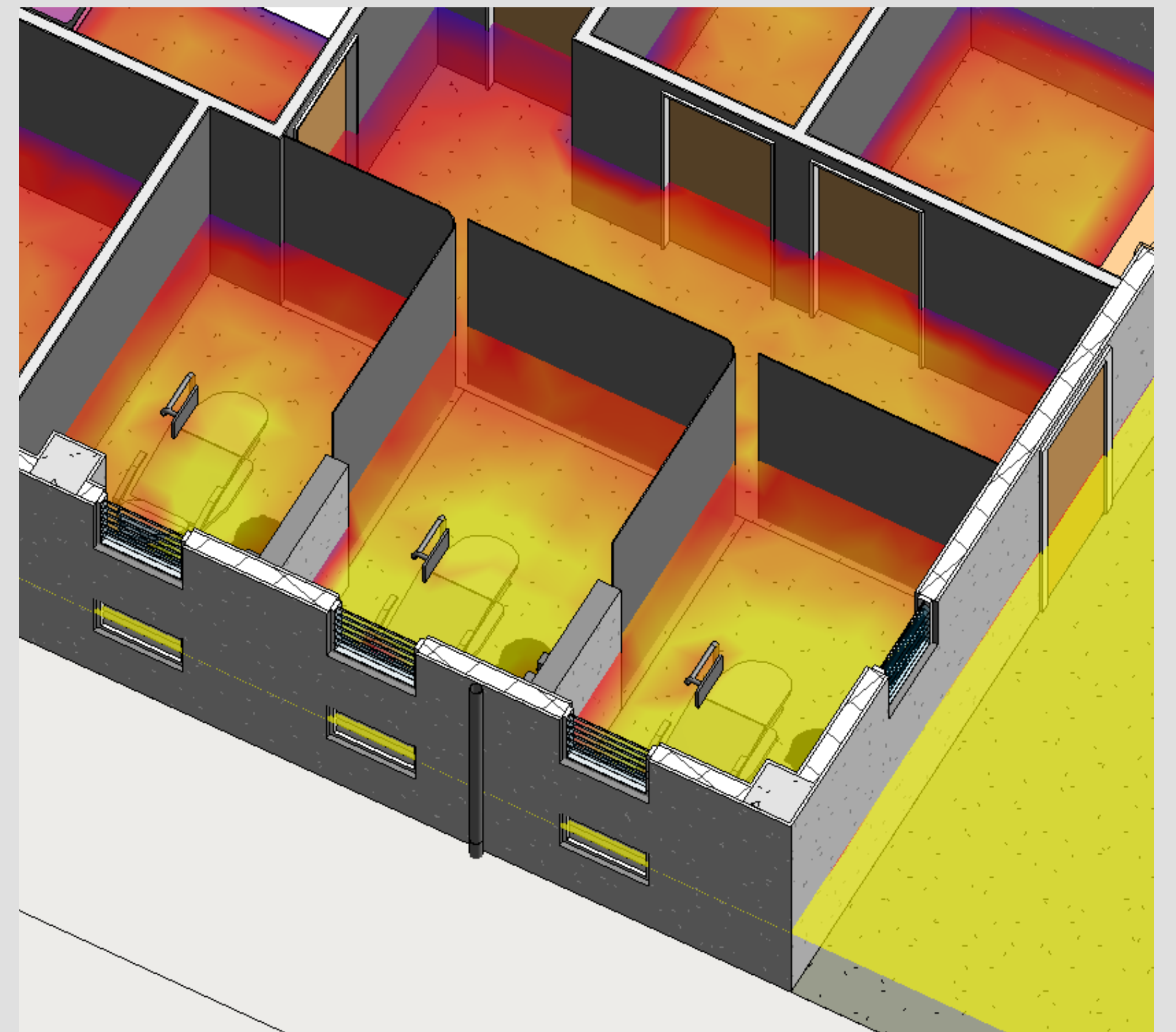
# Courtyard | Shading Study



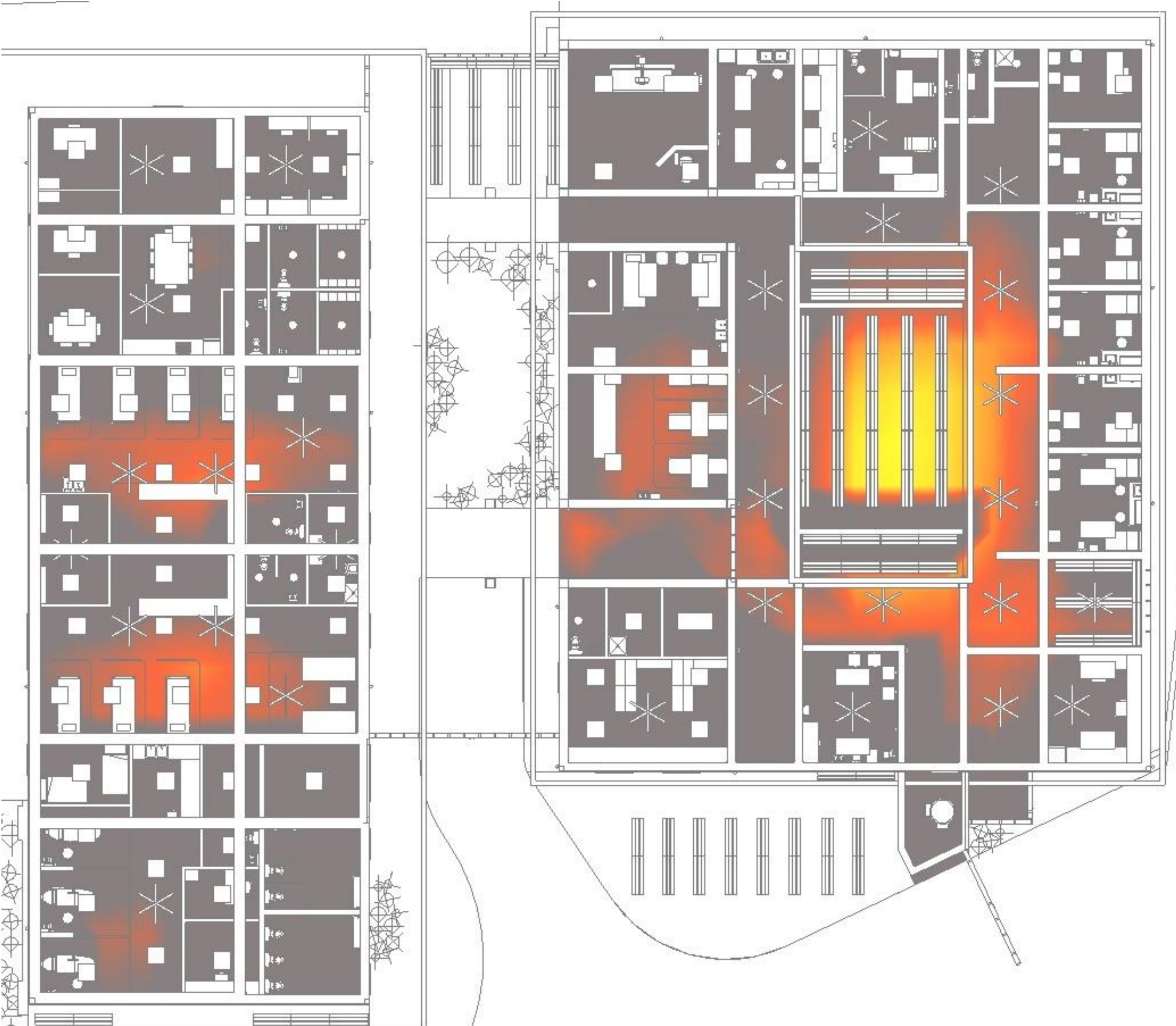
# Solar Insolation

## Custom Illuminance

*Solar insolation* is the amount of electromagnetic energy (**solar radiation**) incident on the surface of the earth. This refers to the amount of sunlight shining down on the area under consideration.

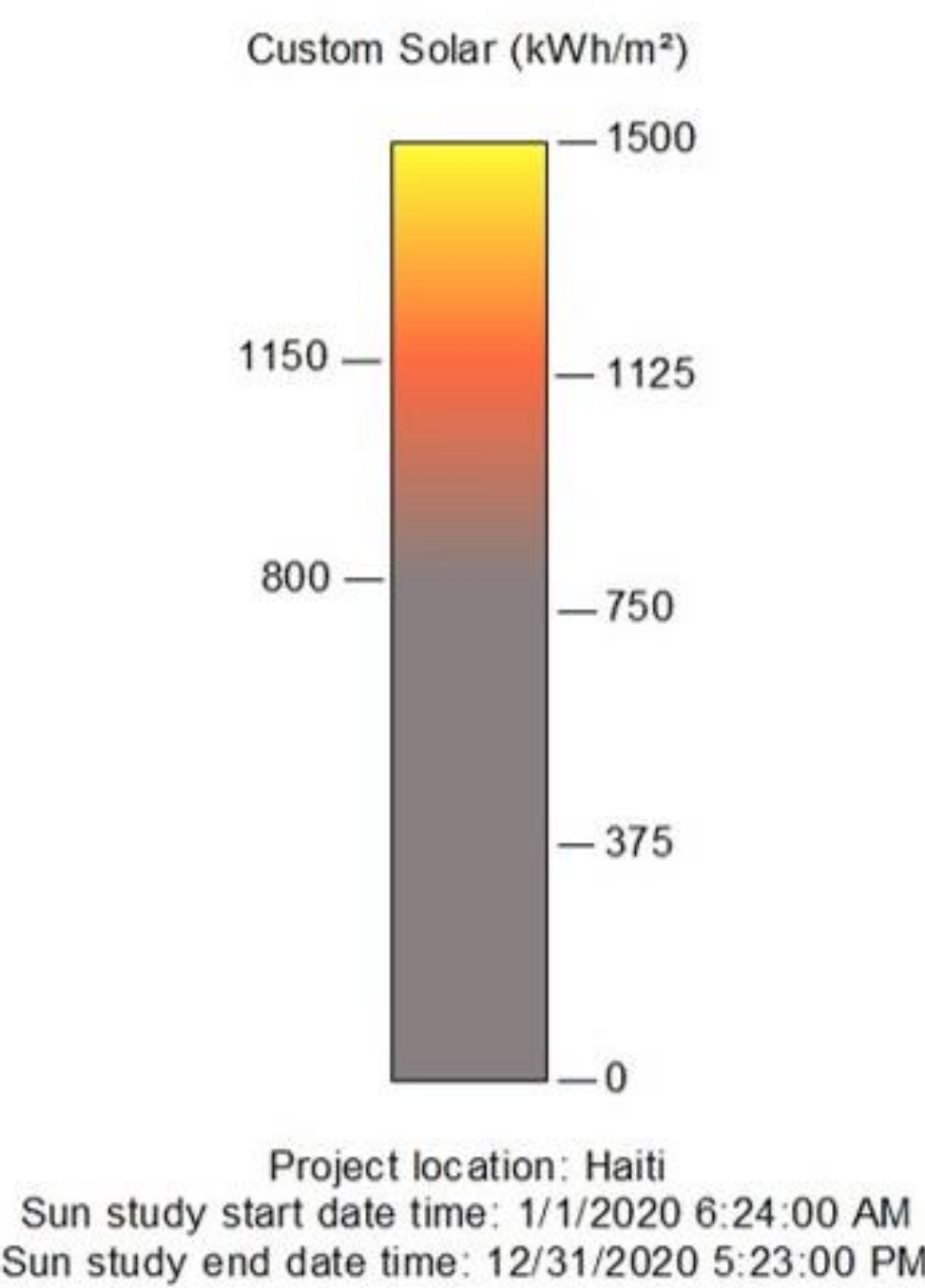






# Solar Insolation – Annual Insolation

No Canopy



Cumulative Insolation

Solar Analysis

Study Type: Custom

Surfaces: <user selection>

Results

Cumulative Insolation

580,313 kWh

629 kWh/m²

Study Settings

923 m² selected

1/1 to 12/31 6am-5pm

Update

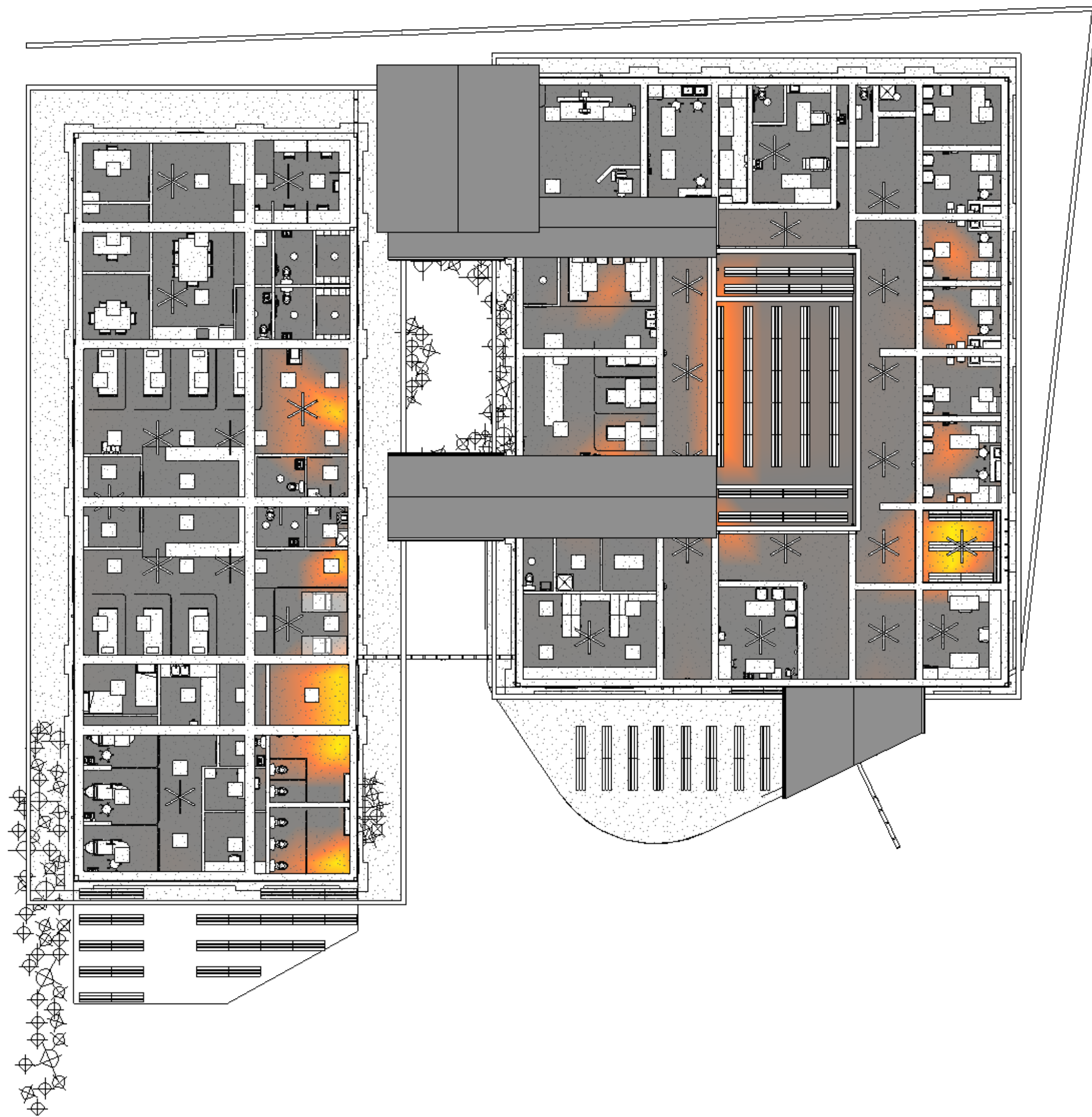
Results Settings

Type: Cumulative Insolation kWh/m²

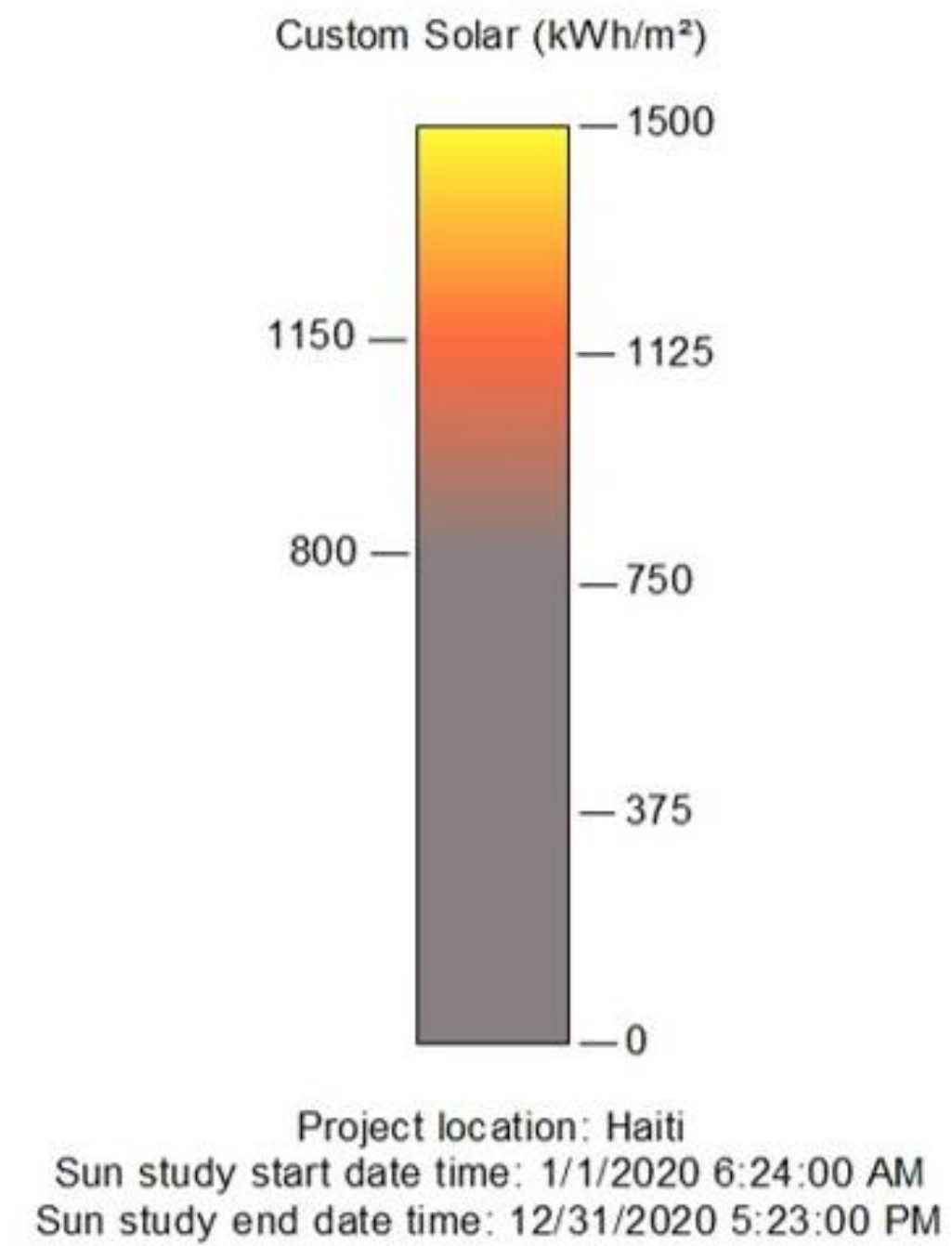
Style: Solar Analysis Annual Insolation

Export: Insolation csv





## Solar Insolation – Annual Insolation With Canopy



Cumulative Insolation

Solar Analysis

Study Type: Custom

Surfaces: <user selection>

Results

Cumulative Insolation  
**580,313** kWh  
629 kWh/m<sup>2</sup>

Study Settings  
**923** m<sup>2</sup> selected  
1/1 to 12/31 6am-5pm

Update

Results Settings

Type: Cumulative Insolation kWh/m<sup>2</sup>

Style: Solar Analysis Annual Insolation

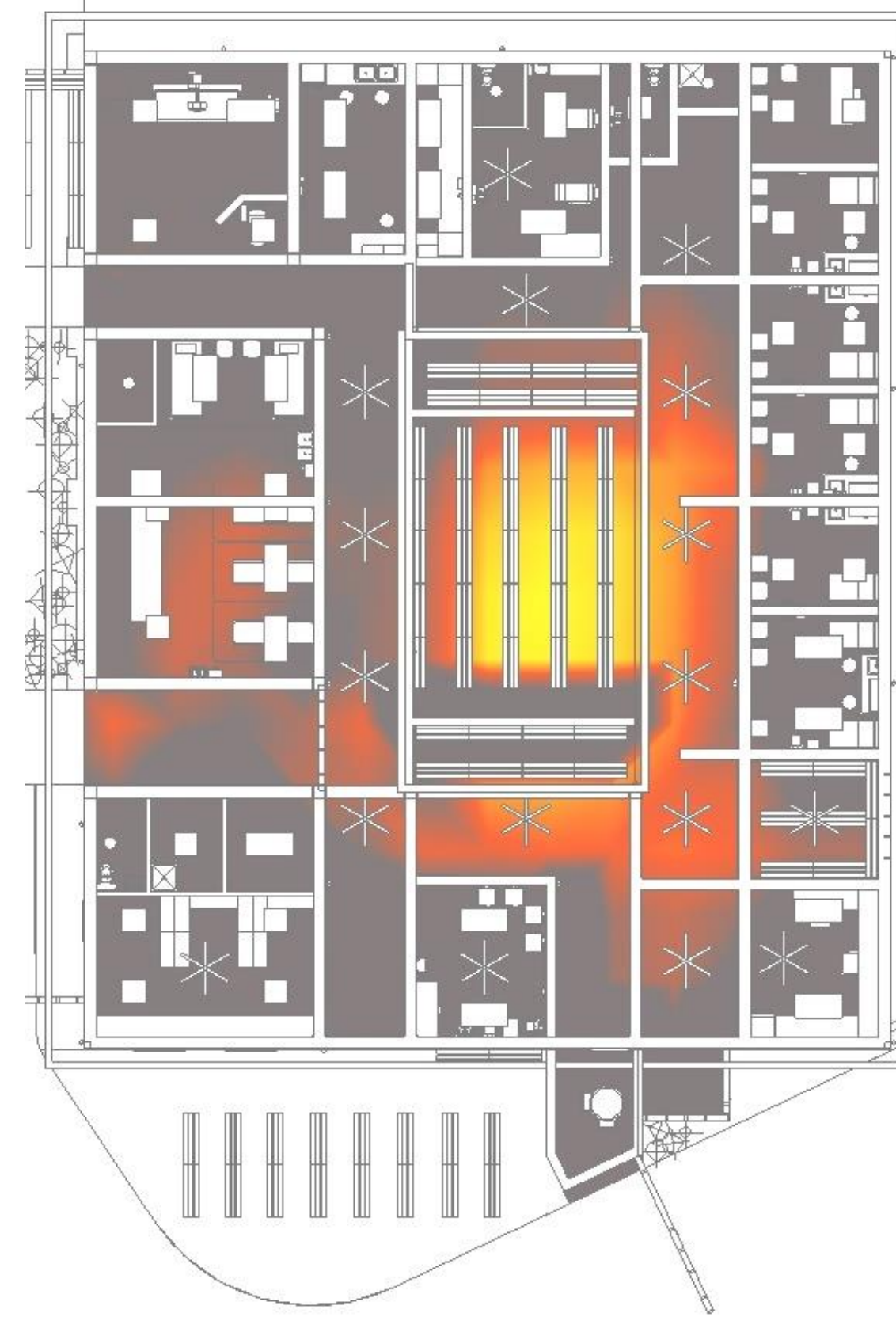
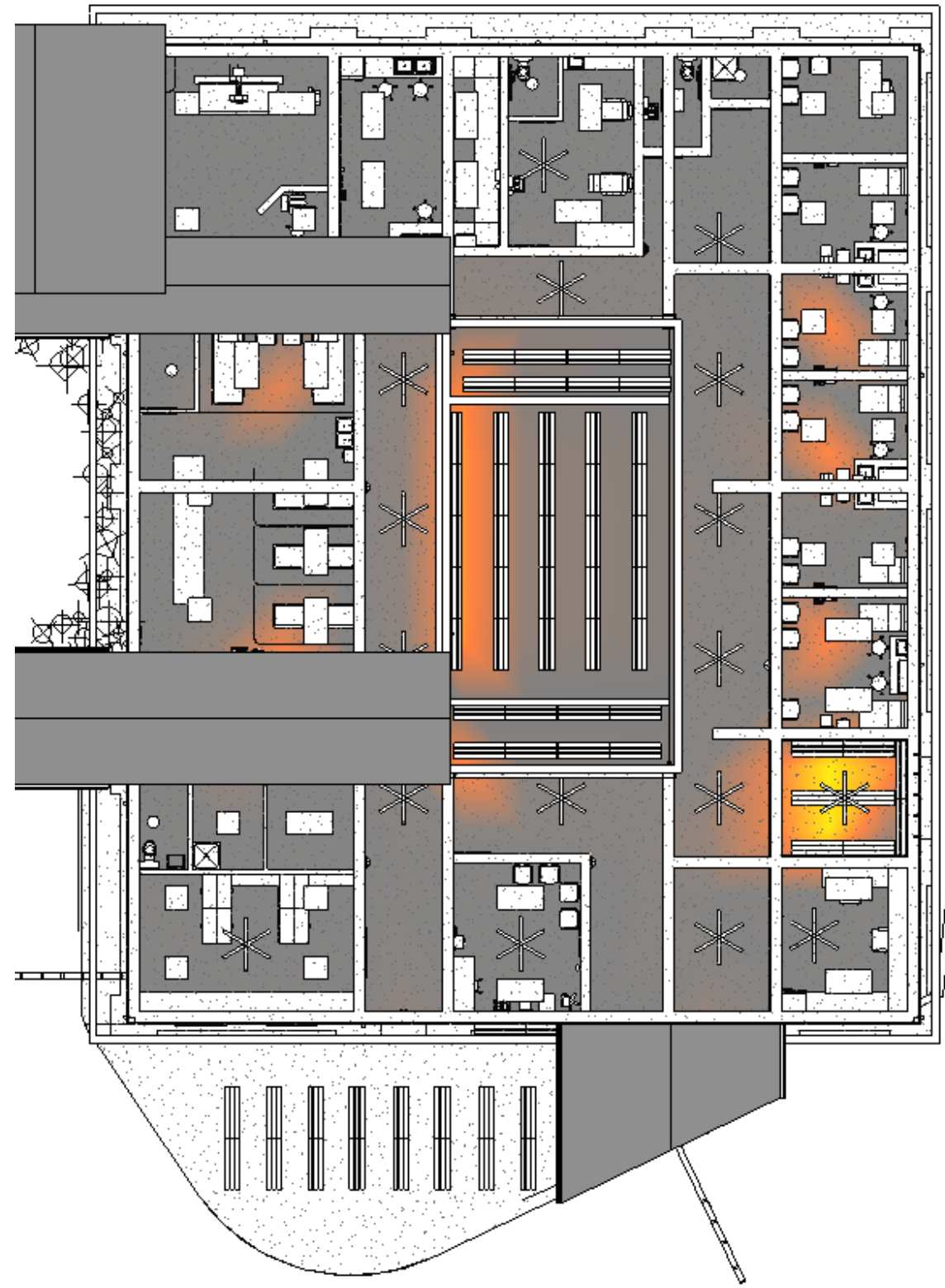
Export: Insolation csv

v1.0.2.23

# Solar Studies - Revit







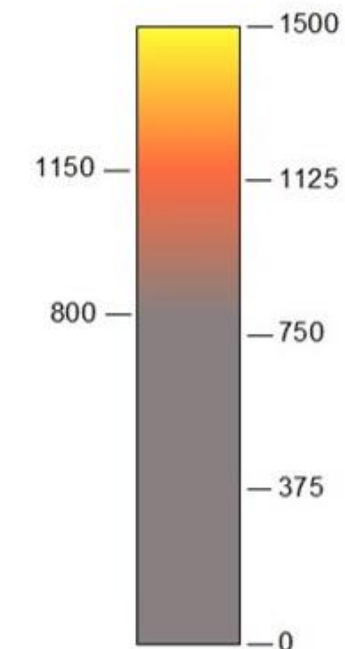
# Solar Insolation – Annual Insolation

With Canopy & without – Comparison

More Solar exposure means, more **Energy** transferred into your space

Energy = Heat  
Measured in: (kWh/M<sub>2</sub>)

Custom Solar (kWh/m<sup>2</sup>)



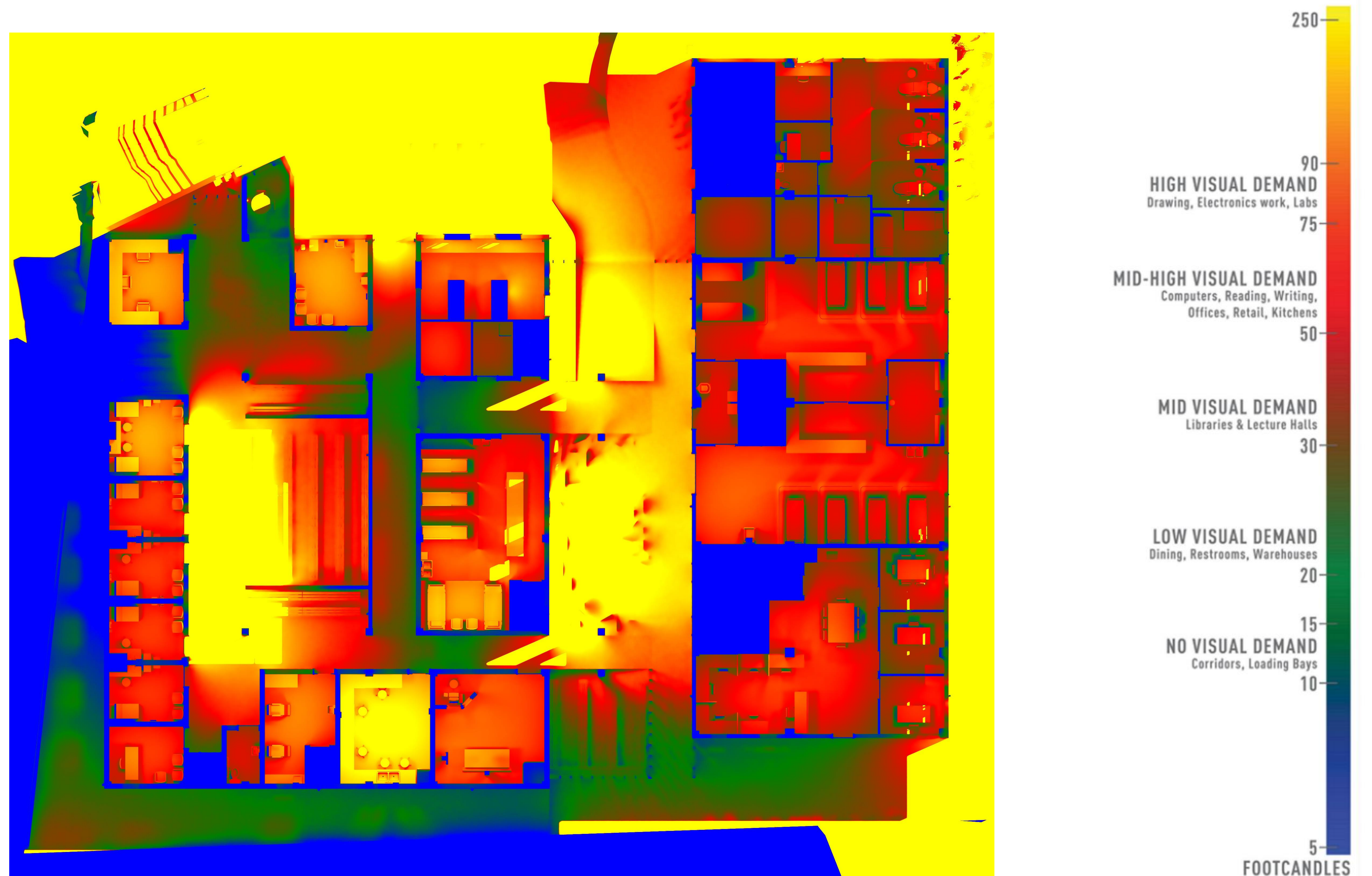
Project location: Haiti  
Sun study start date time: 1/1/2020 6:24:00 AM  
Sun study end date time: 12/31/2020 5:23:00 PM

Cumulative Insolation

## Solar Studies - Revit





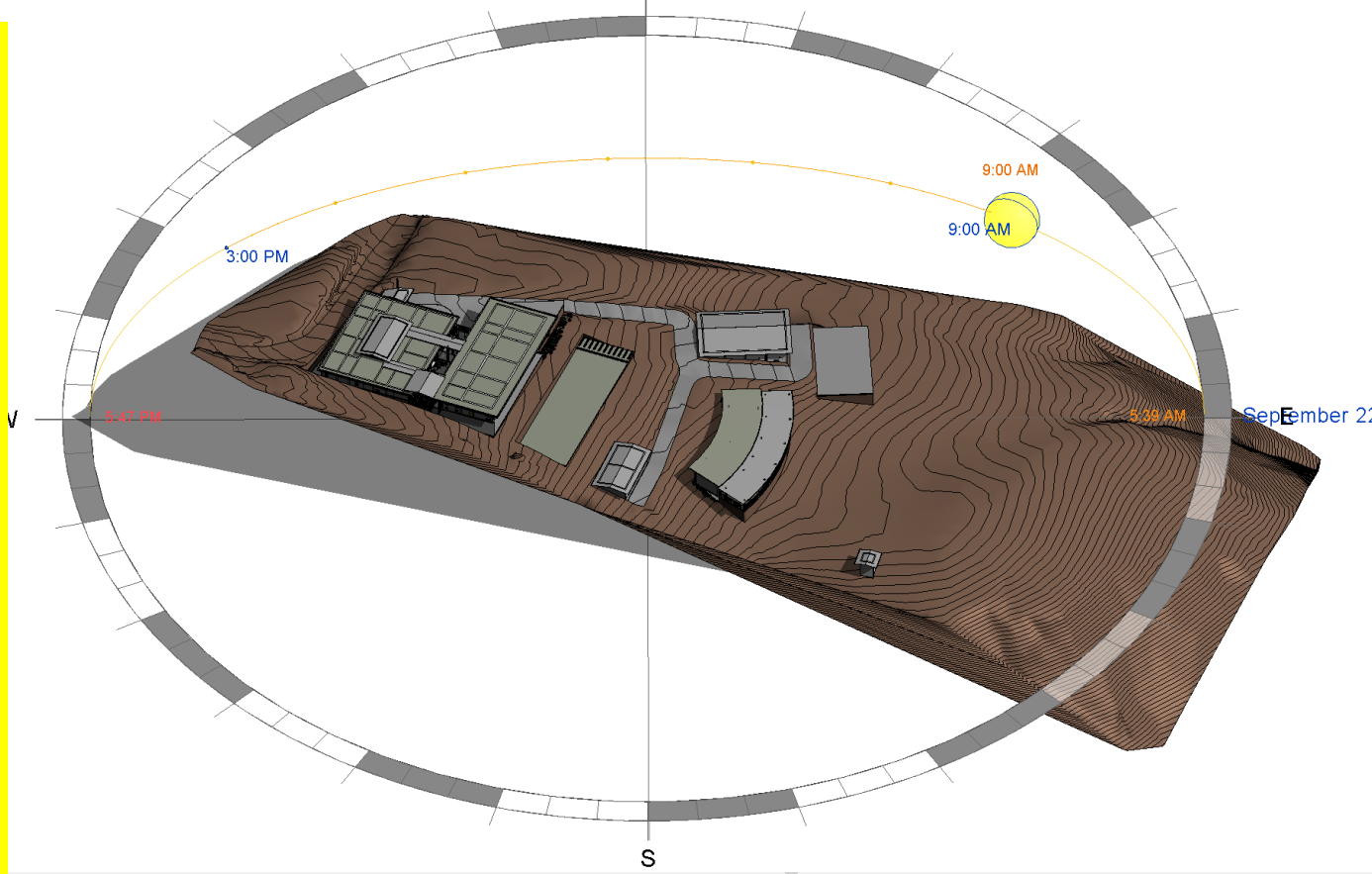


**FALL EQUINOX – NO ROOF  
OVER COURTYARD**

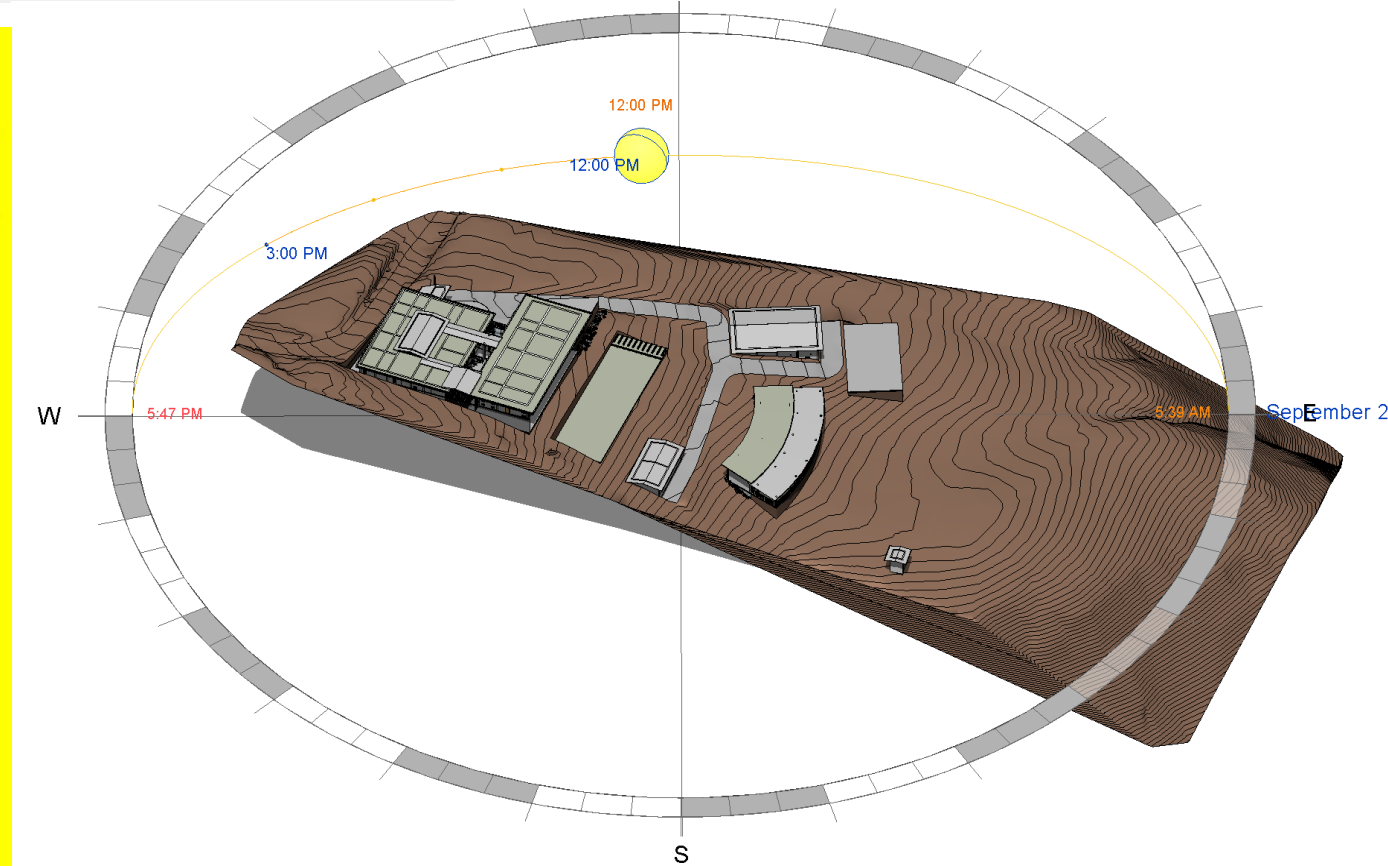
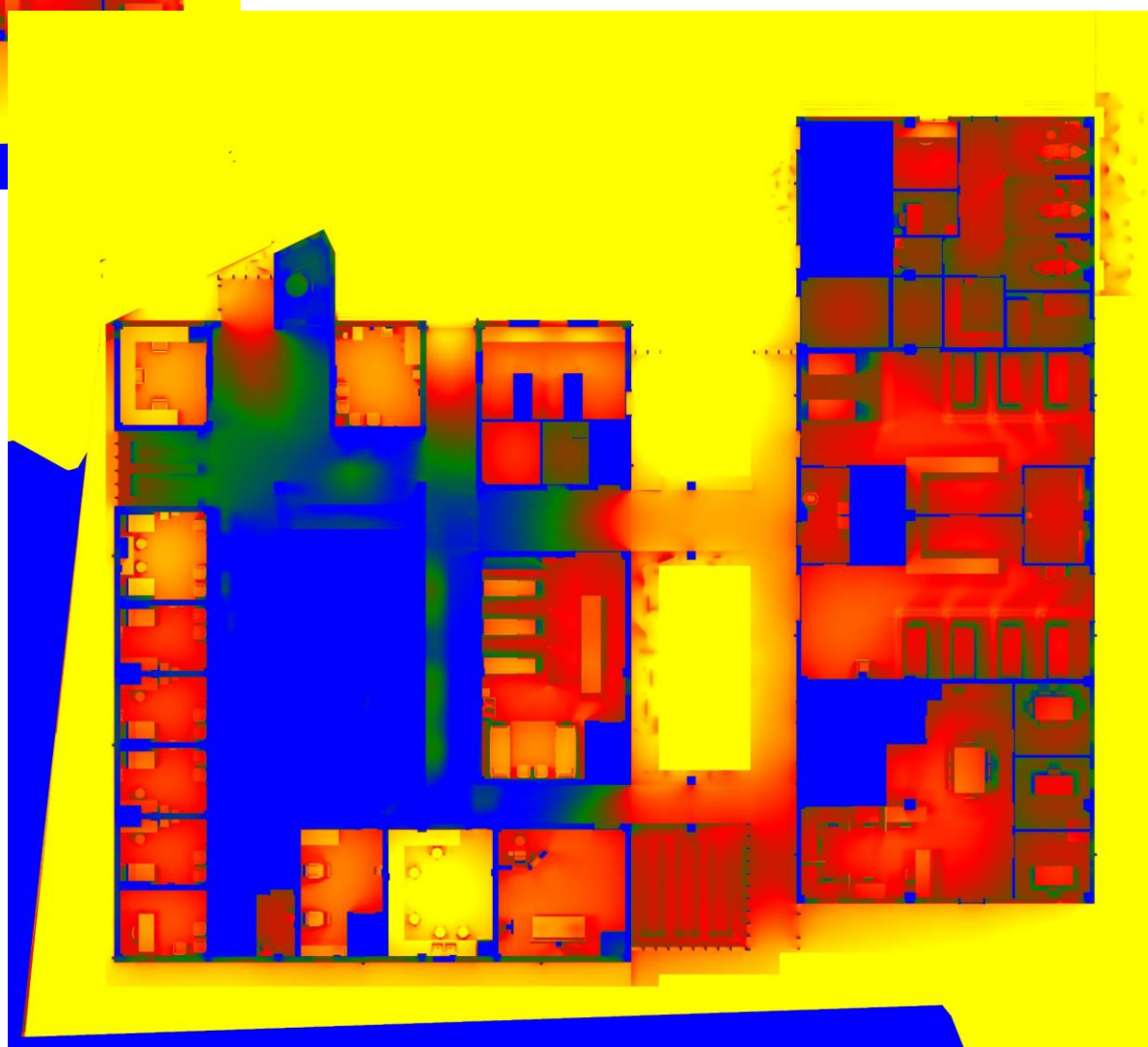




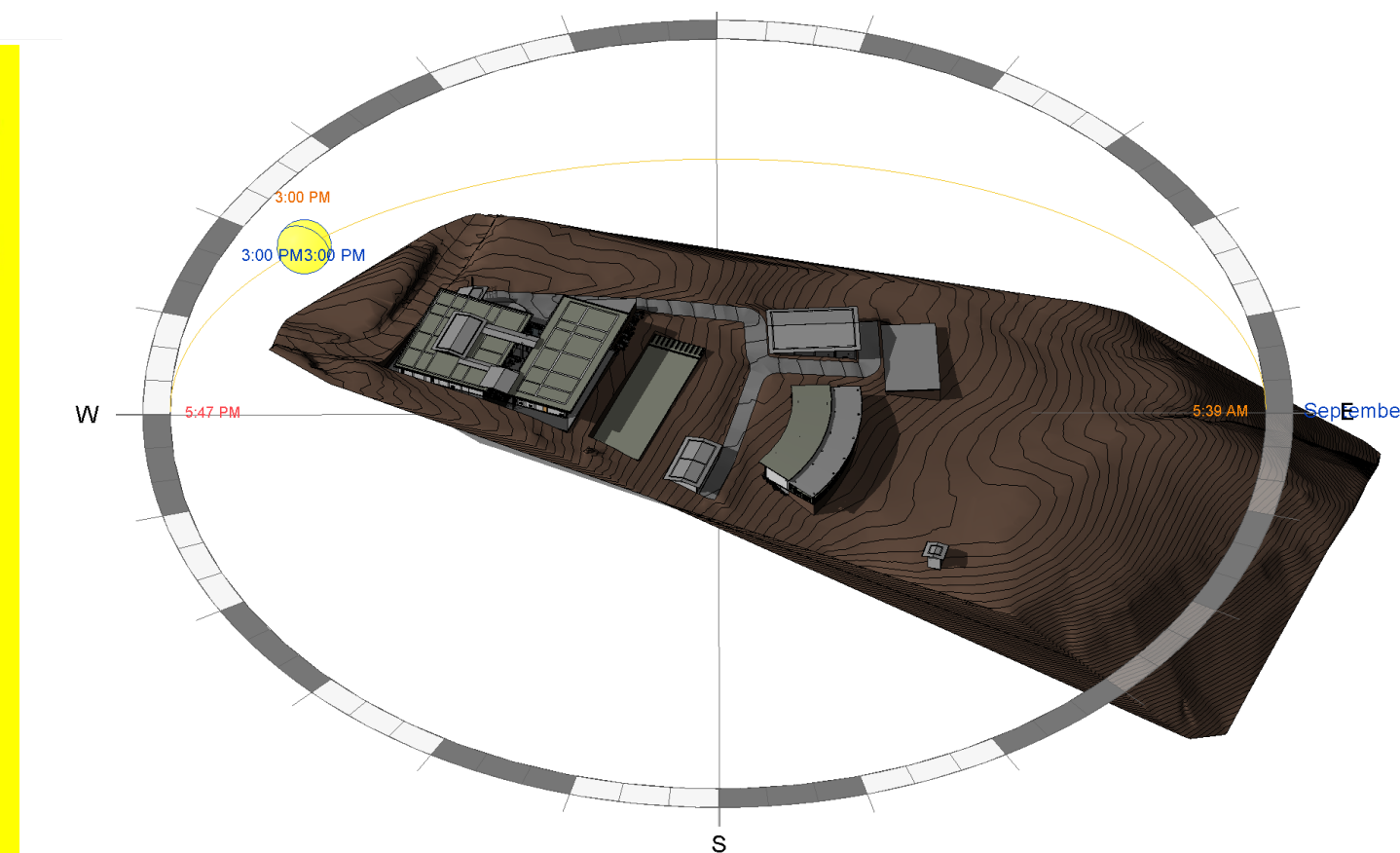
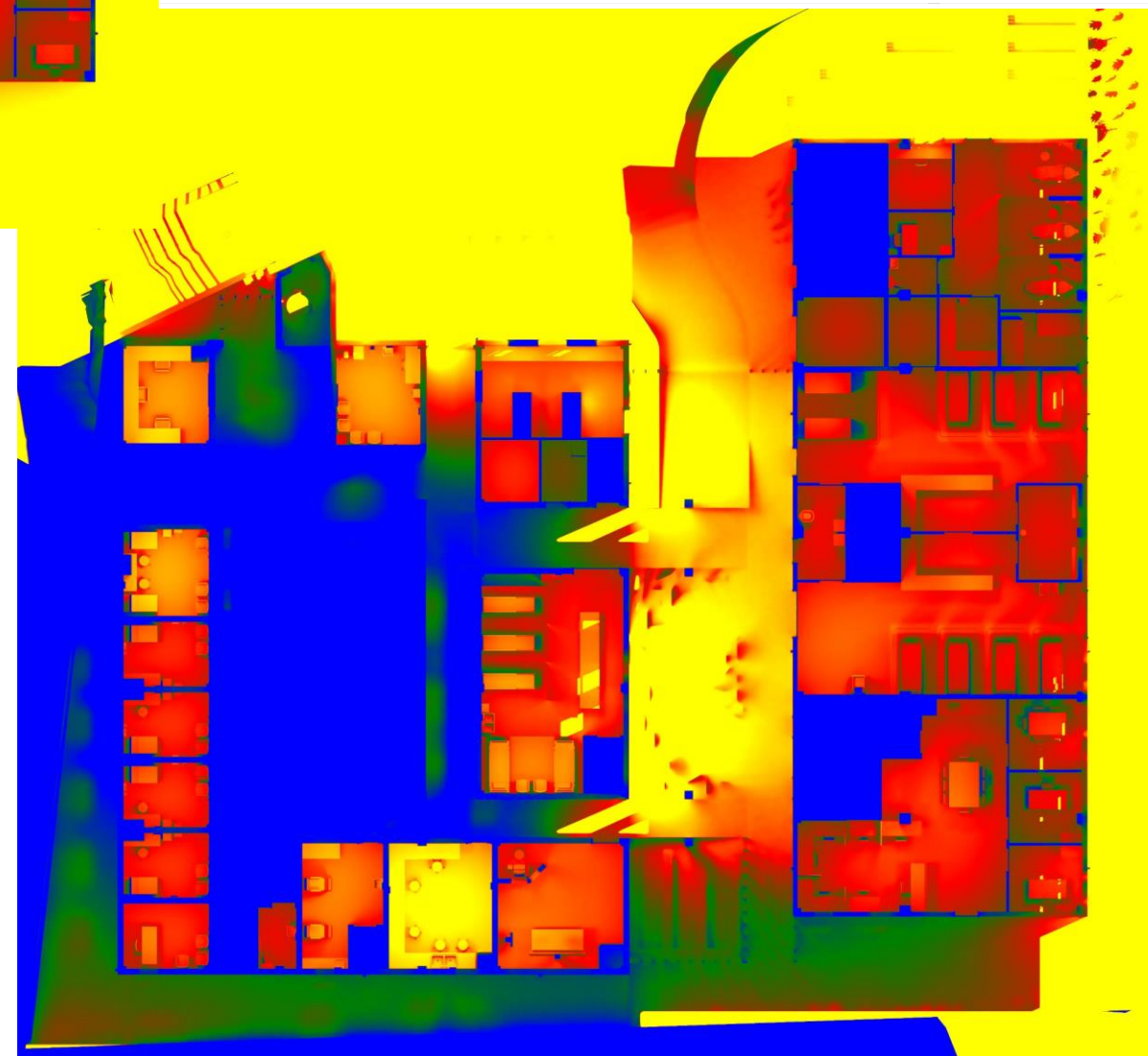




9:00 A.M.



12:00 P.M.



3:00 P.M.

**HIGH VISUAL DEMAND**  
Drawing, Electronics work, Labs

**MID-HIGH VISUAL DEMAND**  
Computers, Reading, Writing,  
Offices, Retail, Kitchens

**MID VISUAL DEMAND**  
Libraries & Lecture Halls

**LOW VISUAL DEMAND**  
Dining, Restrooms, Warehouses

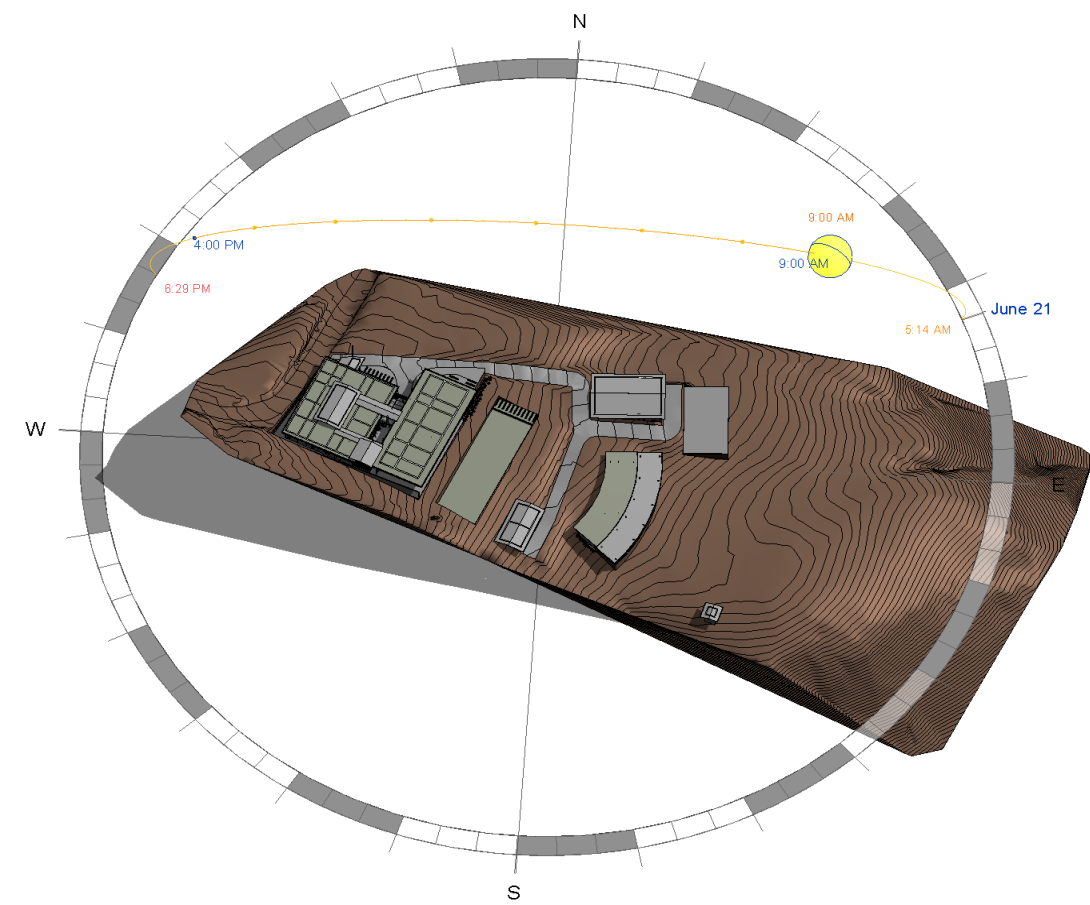
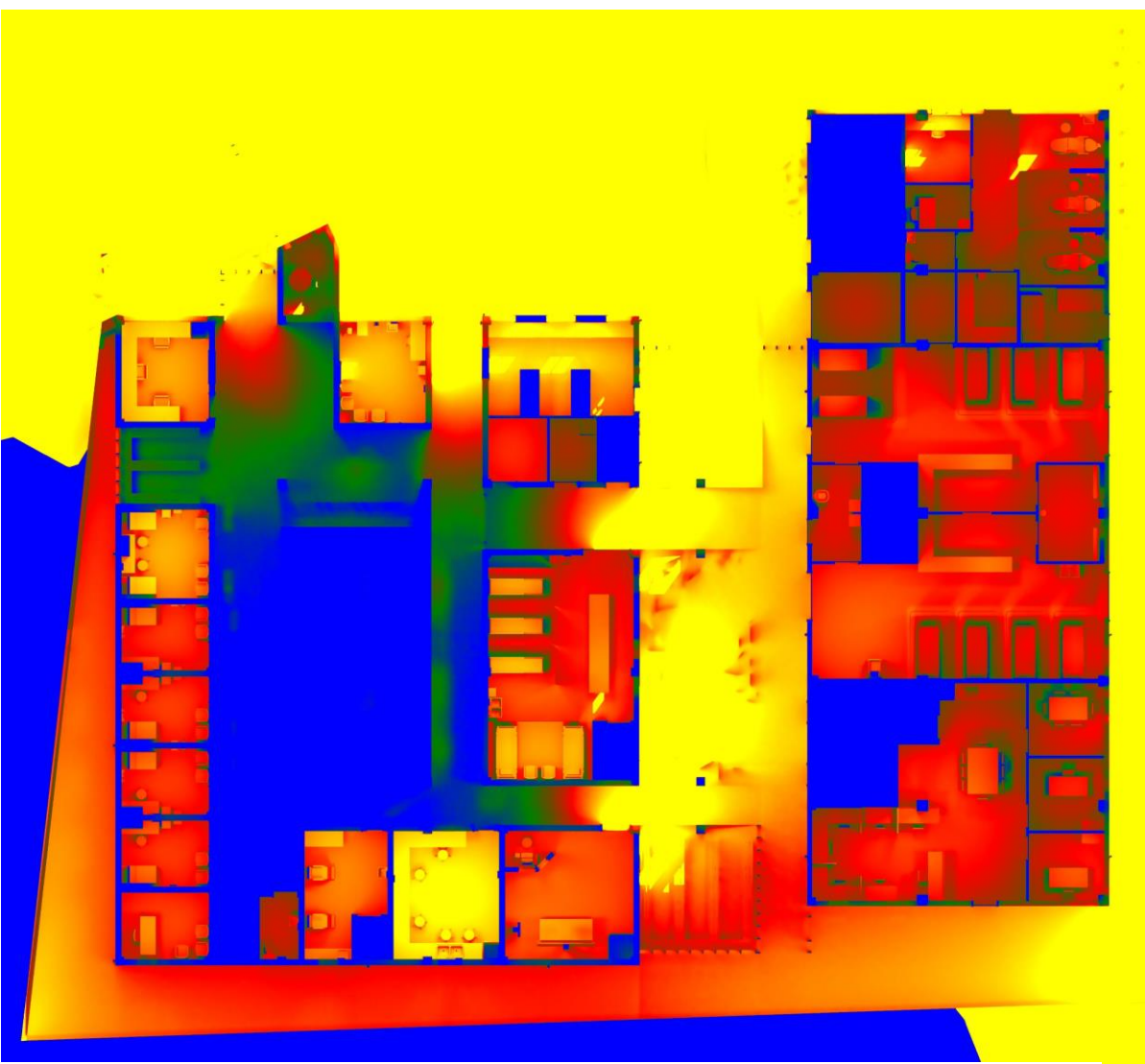
**NO VISUAL DEMAND**  
Corridors, Loading Bays



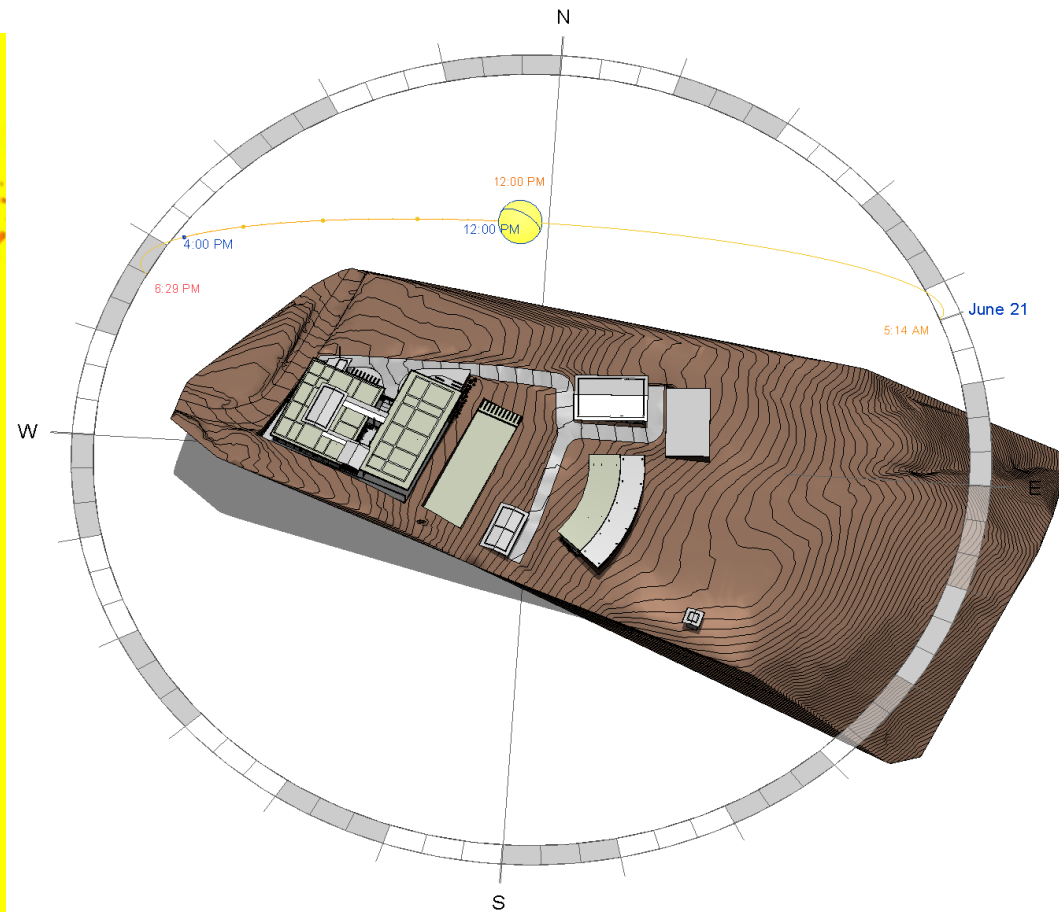
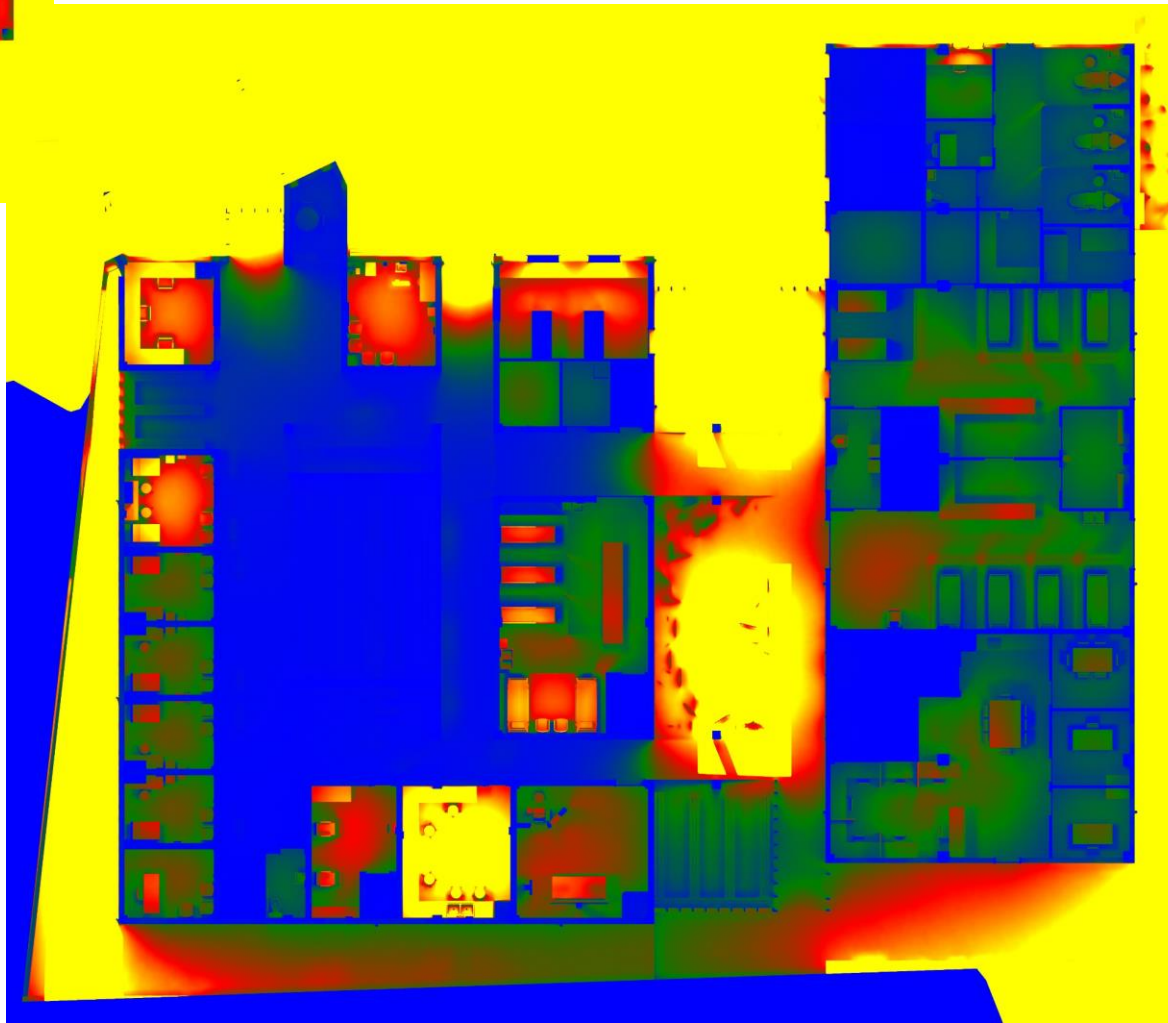
# FALL EQUINOX

## PITCHED ROOF OVER COURTYARD

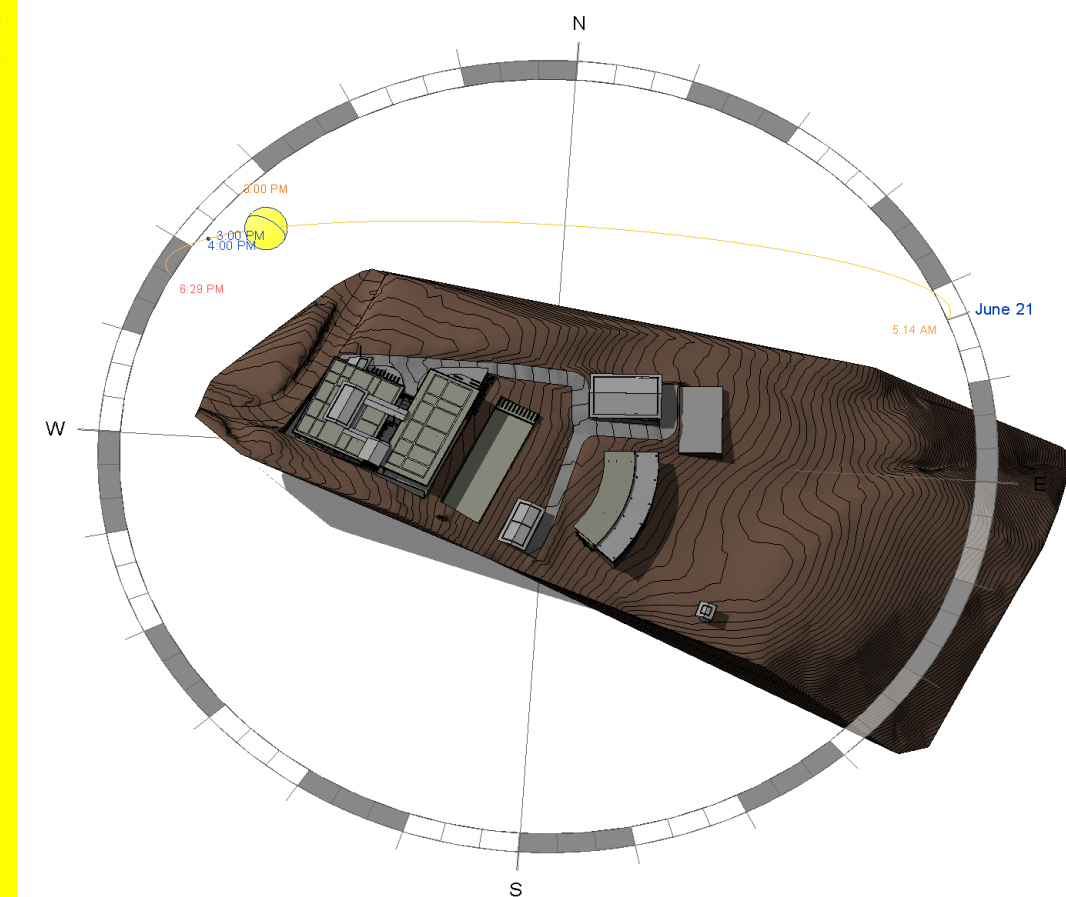
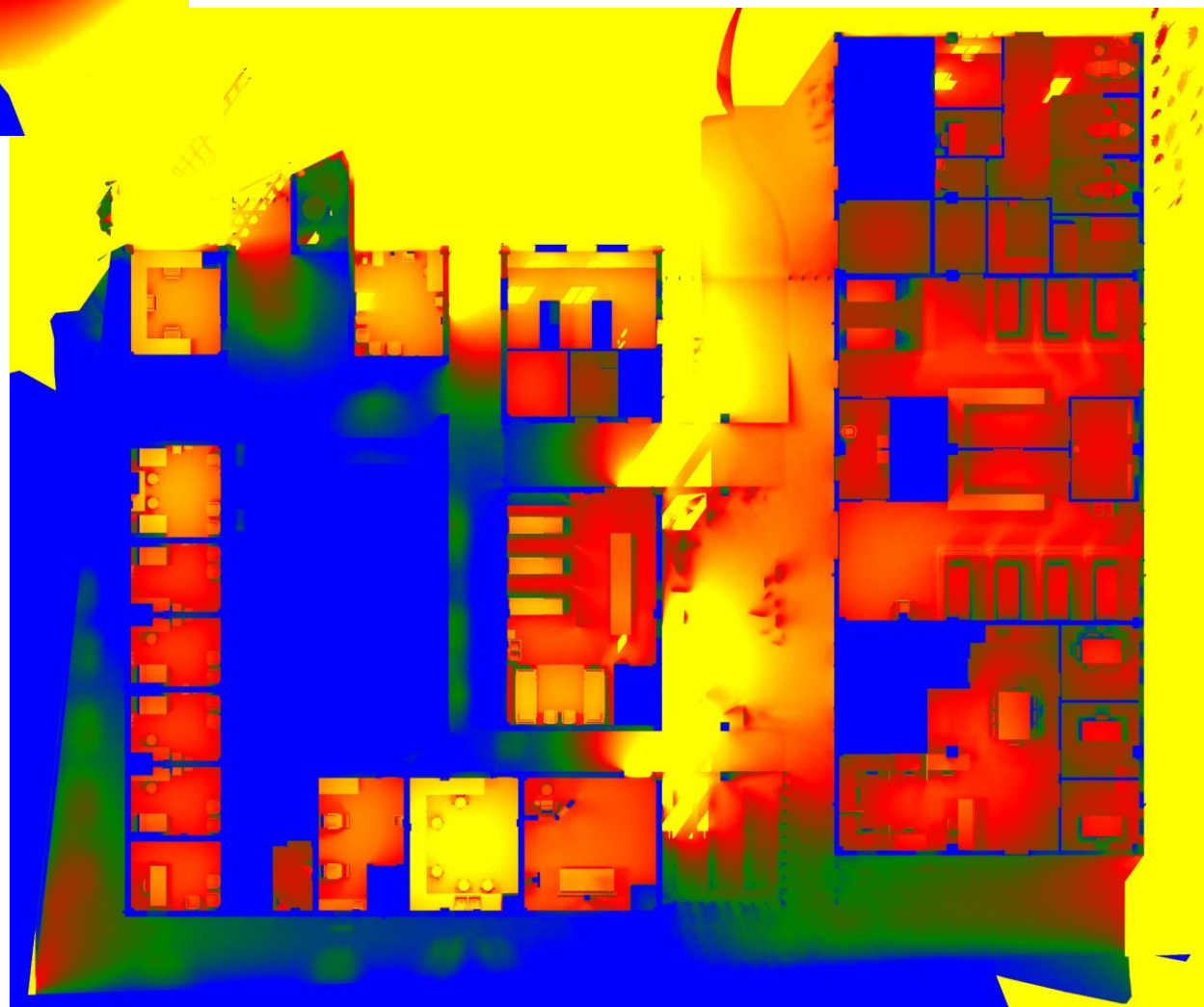




9:00 A.M.



12:00 P.M.



3:00 P.M.

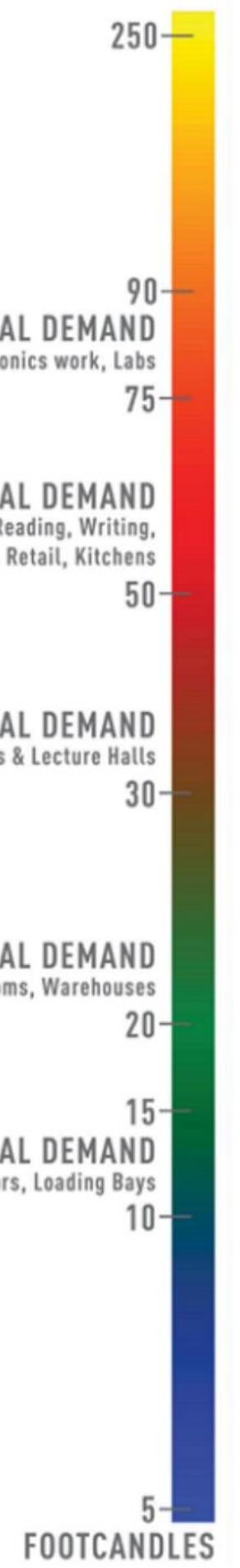
**HIGH VISUAL DEMAND**  
Drawing, Electronics work, Labs

**MID-HIGH VISUAL DEMAND**  
Computers, Reading, Writing,  
Offices, Retail, Kitchens

**MID VISUAL DEMAND**  
Libraries & Lecture Halls

**LOW VISUAL DEMAND**  
Dining, Restrooms, Warehouses

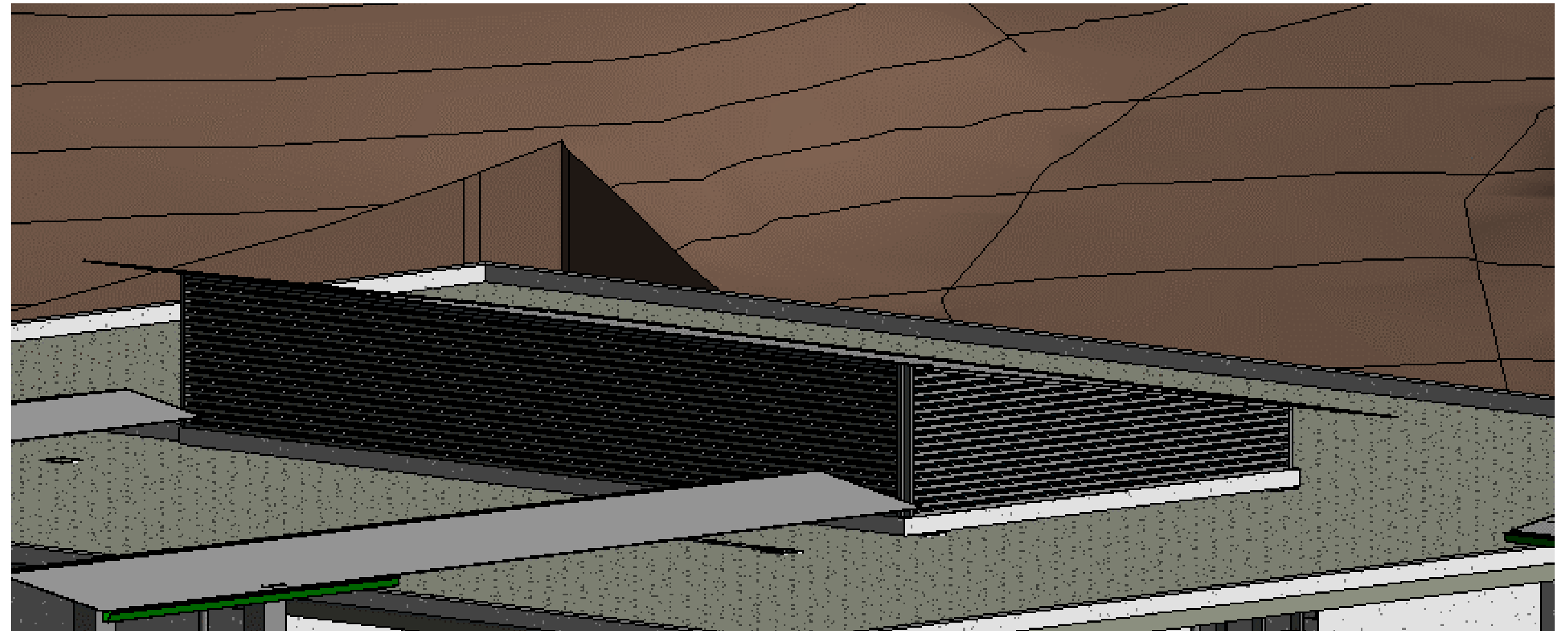
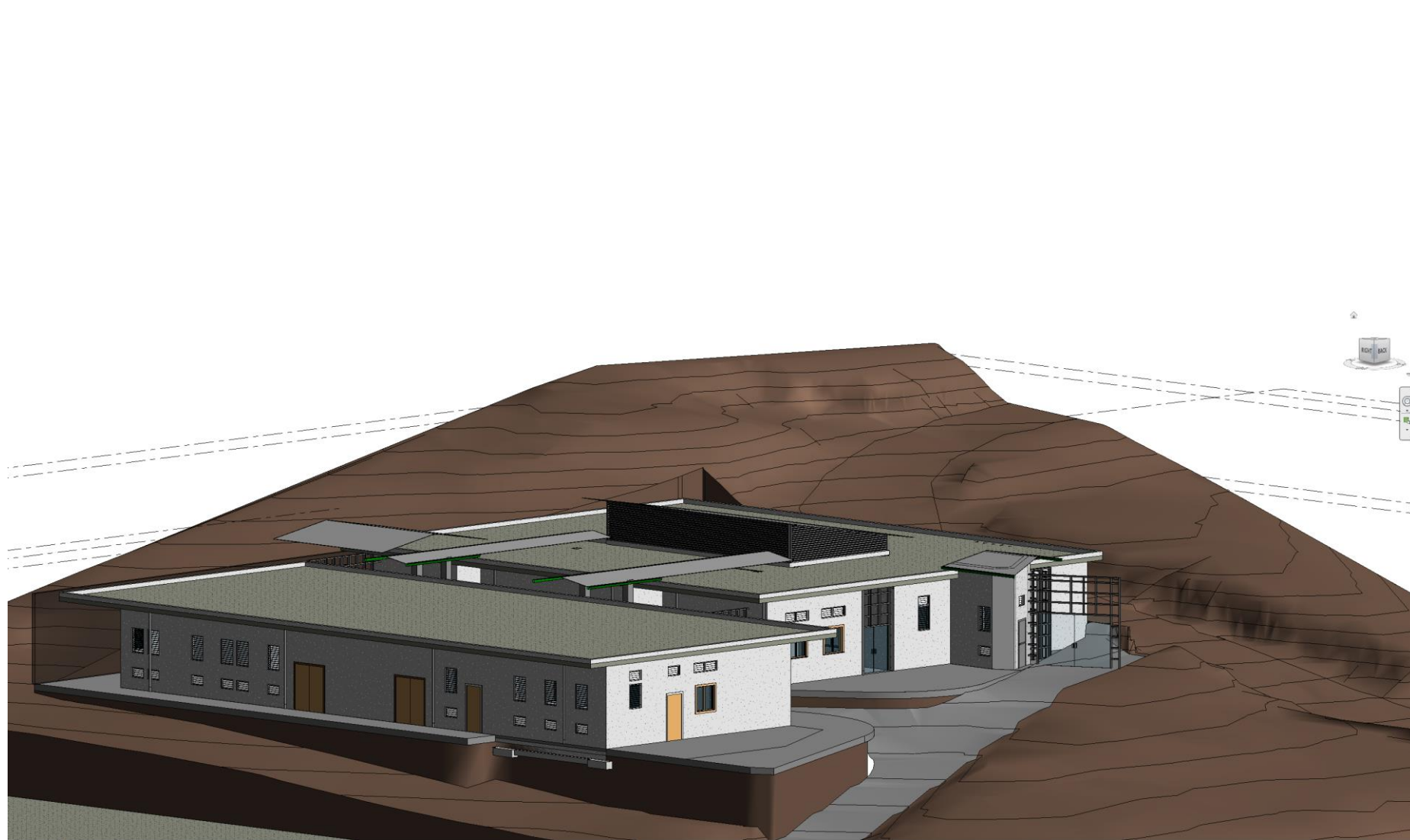
**NO VISUAL DEMAND**  
Corridors, Loading Bays



# SUMMER SOLSTICE

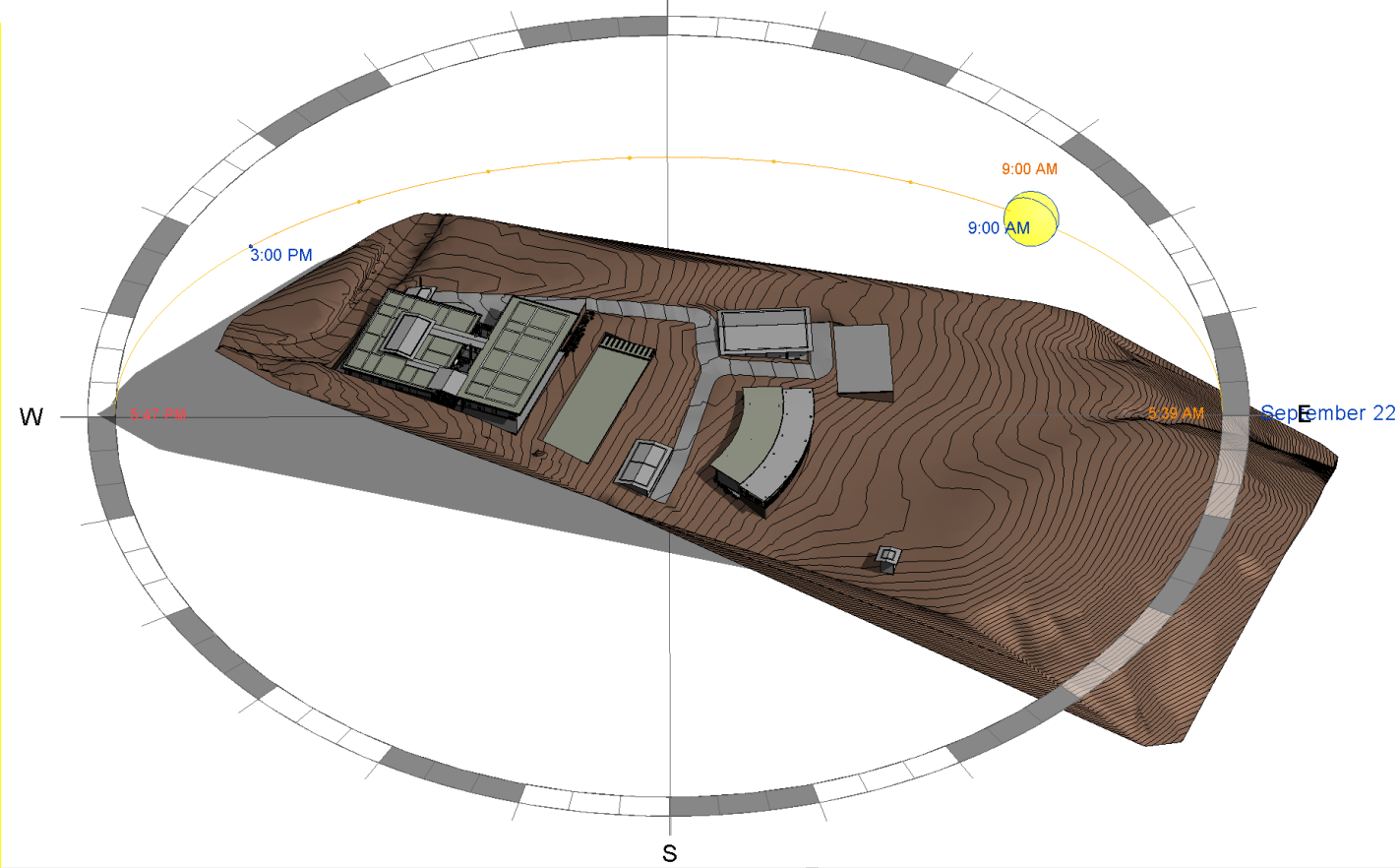
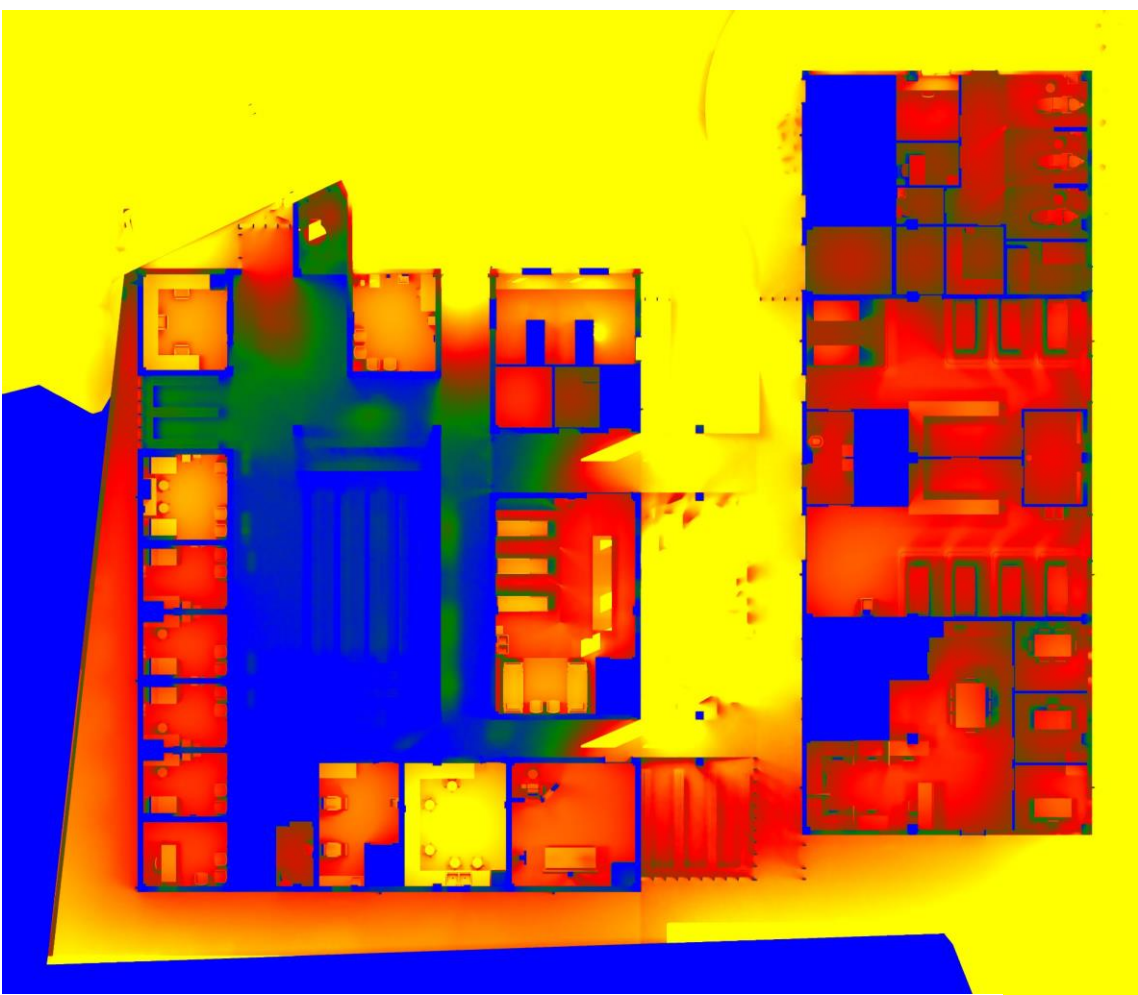
## PITCHED ROOF OVER COURTYARD





## Roof Studies - Daylighting





9:00 A.M.

**HIGH VISUAL DEMAND**  
Drawing, Electronics work, Labs

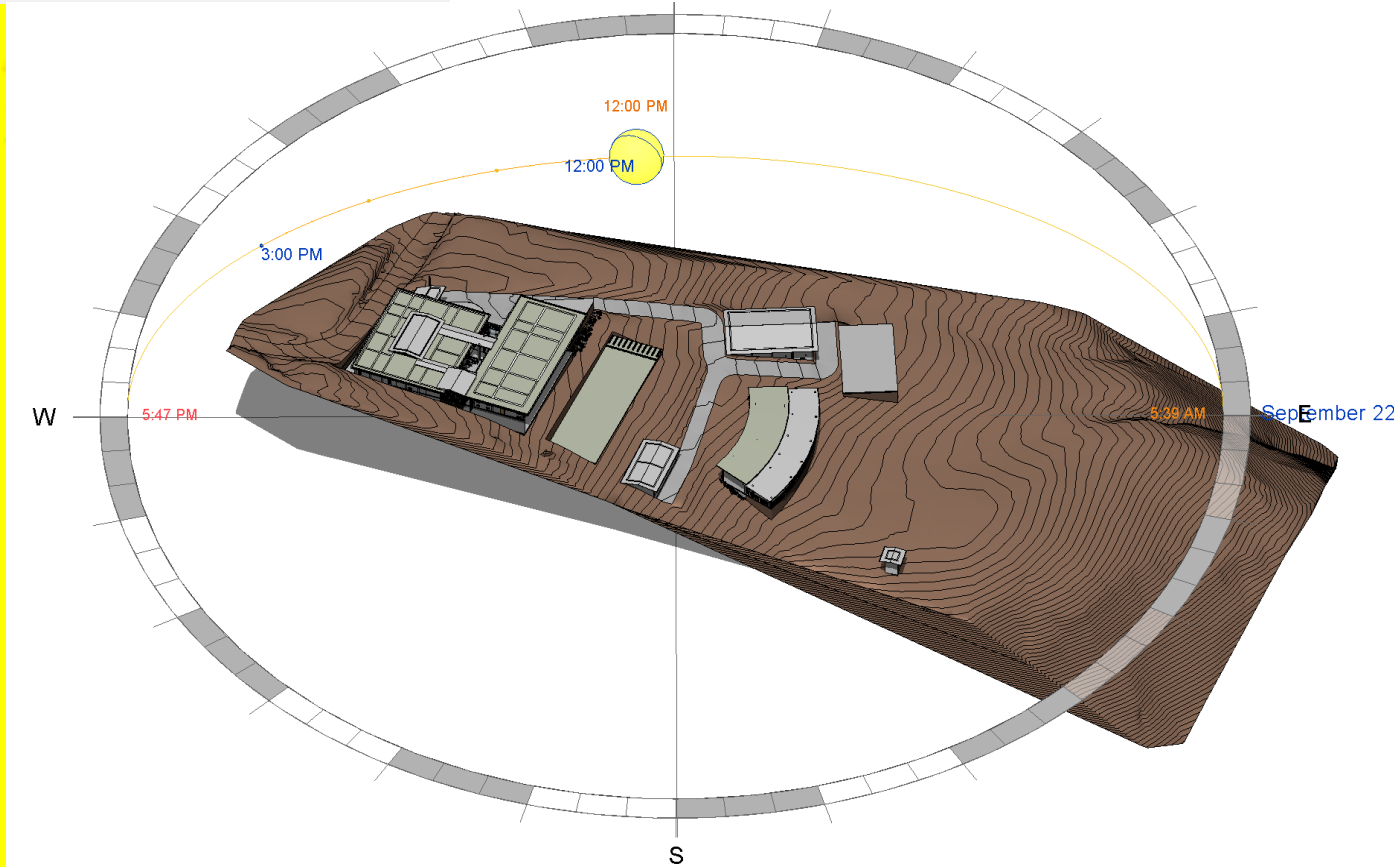
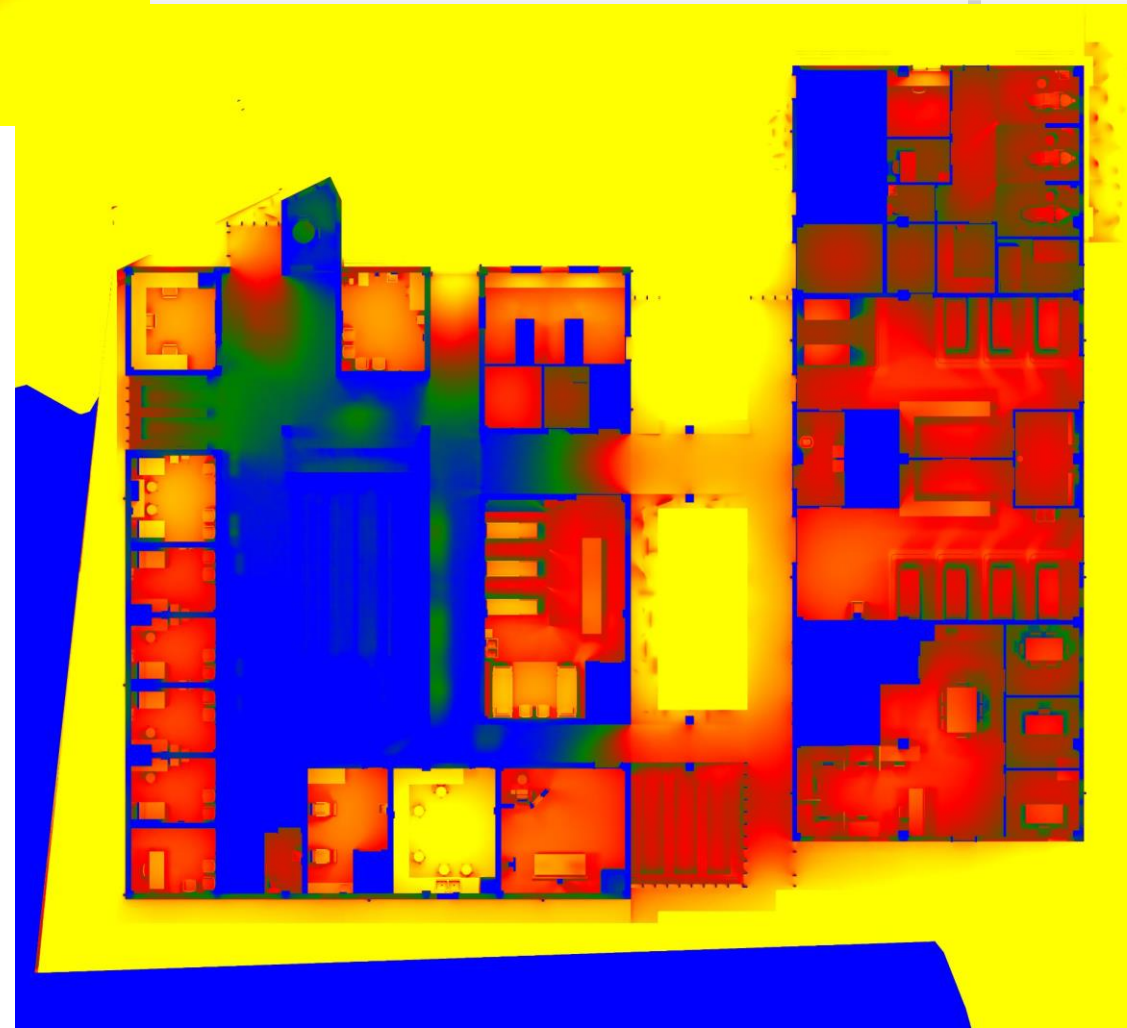
**MID-HIGH VISUAL DEMAND**  
Computers, Reading, Writing,  
Offices, Retail, Kitchens

**MID VISUAL DEMAND**  
Libraries & Lecture Halls

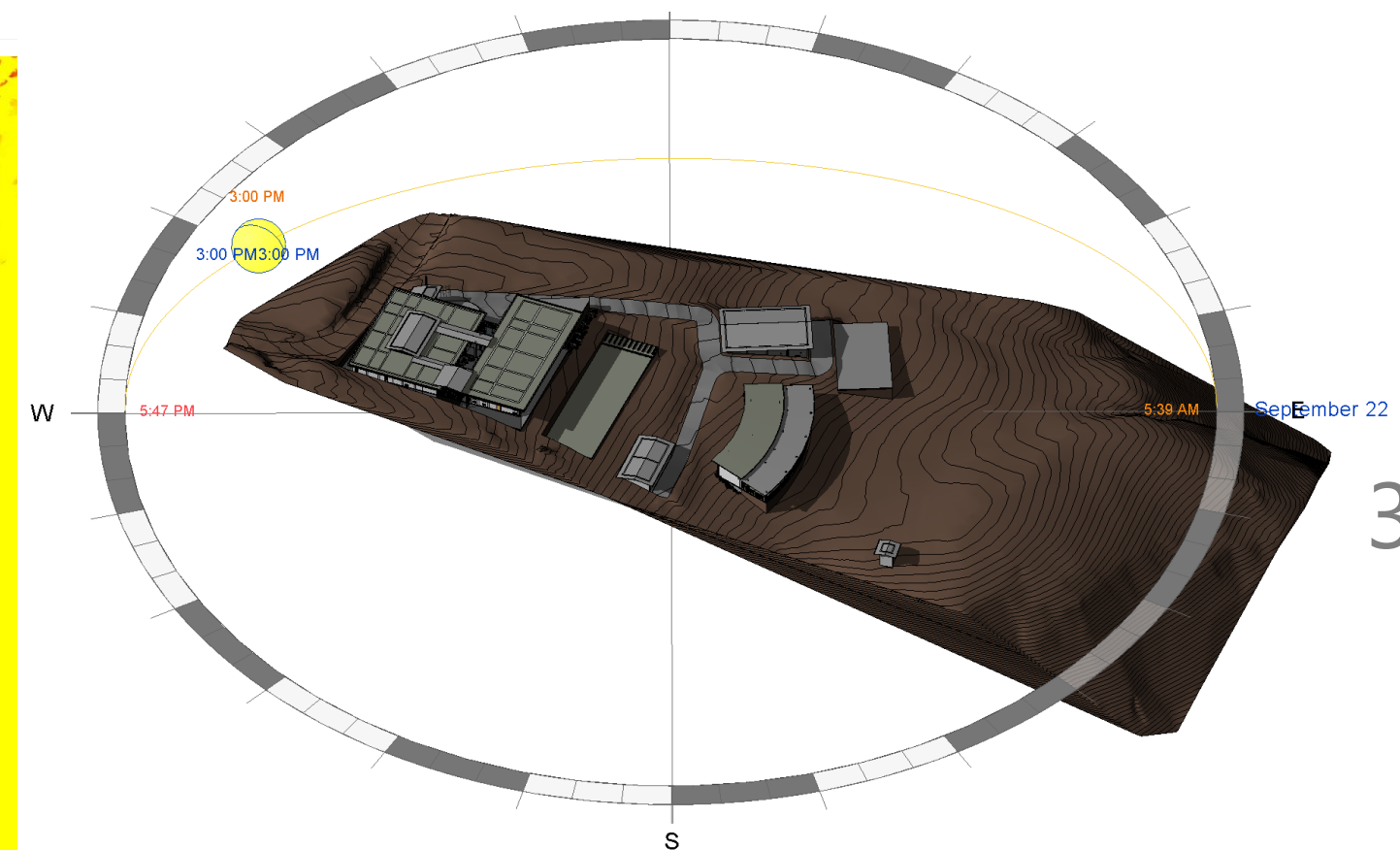
**LOW VISUAL DEMAND**  
Dining, Restrooms, Warehouses

**NO VISUAL DEMAND**  
Corridors, Loading Bays

FOOTCANDLES



12:00 P.M.



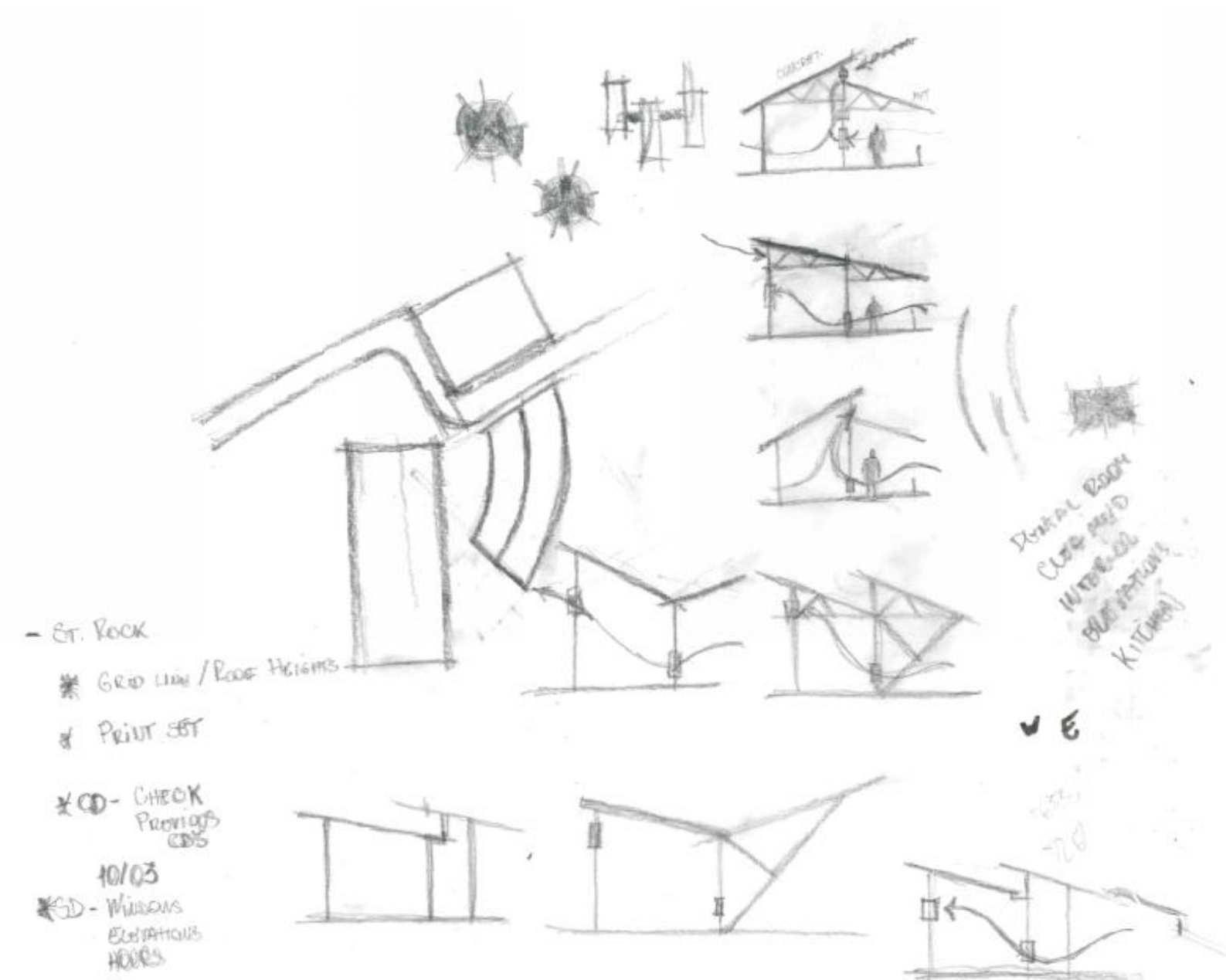
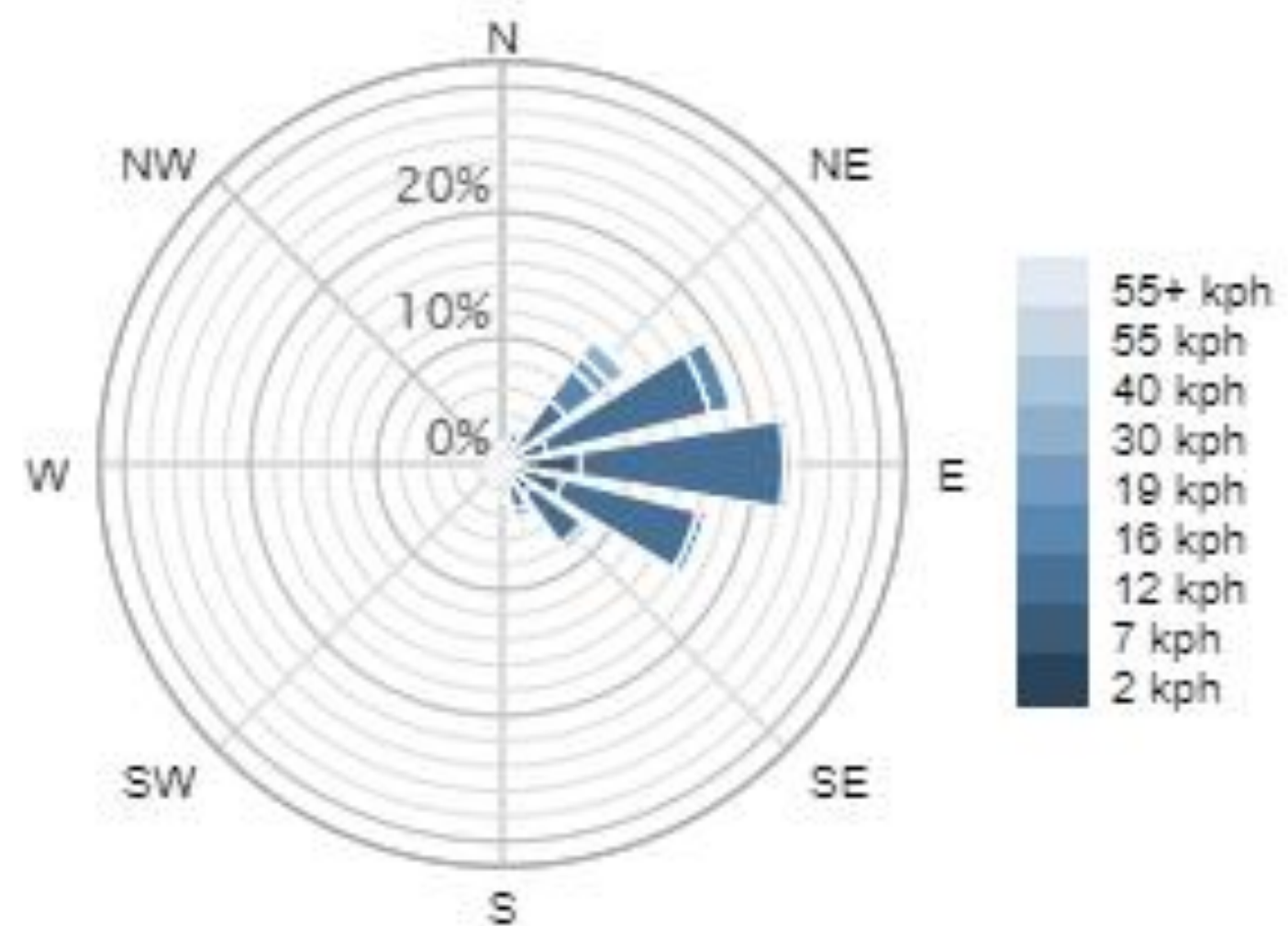
3:00 P.M.

# FALL EQUINOX

## SINGLE SLOPED ROOF OVER COURTYARD

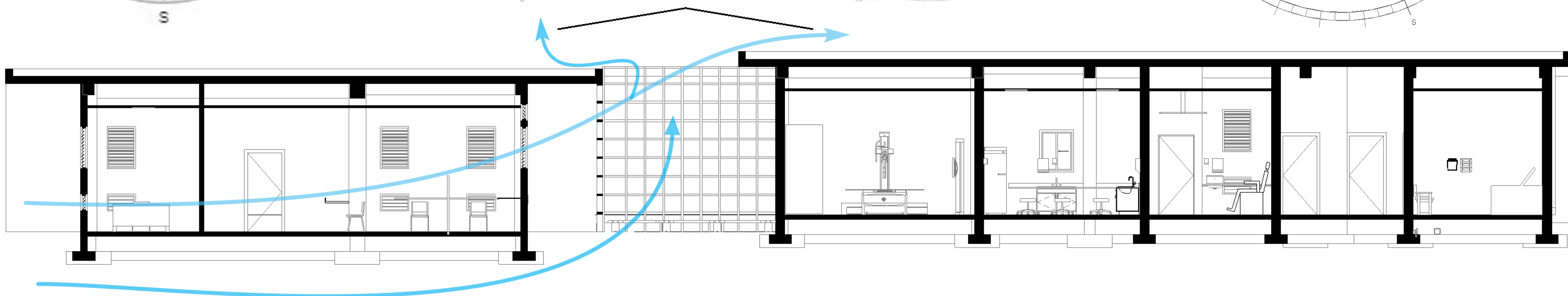
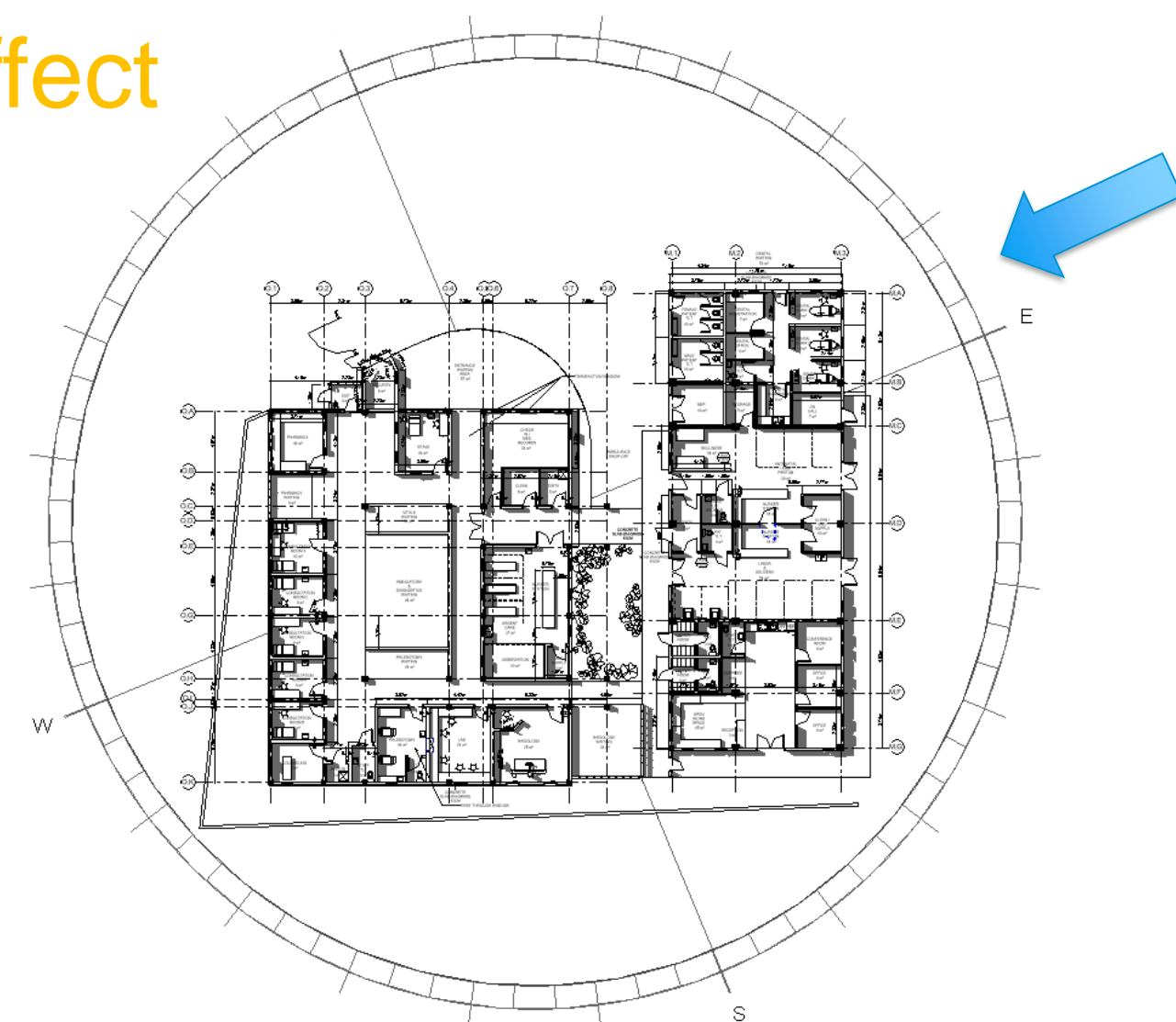


Windrose Speed Annual  
Weather Station ID: 1077899  
3.1 km away



# Natural Ventilation

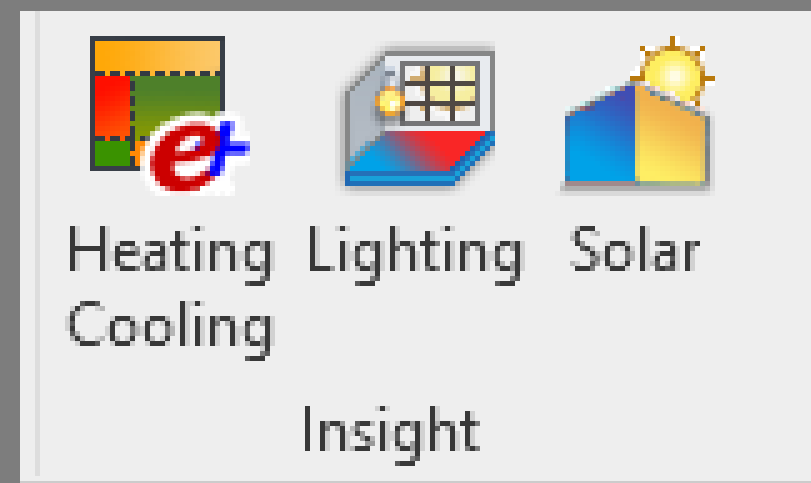
Stack Effect



Wind Flow

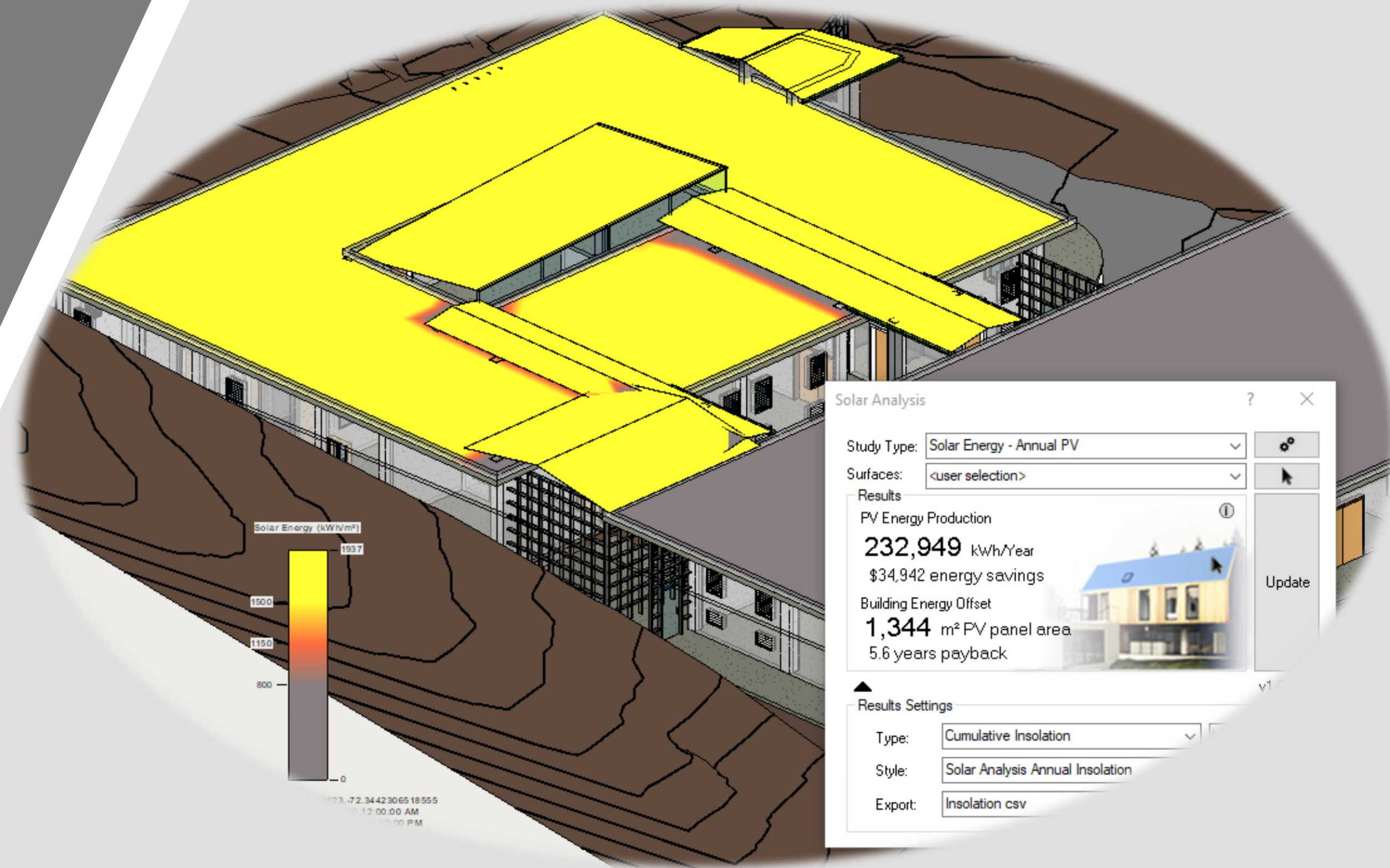


# PV Analysis – Revit

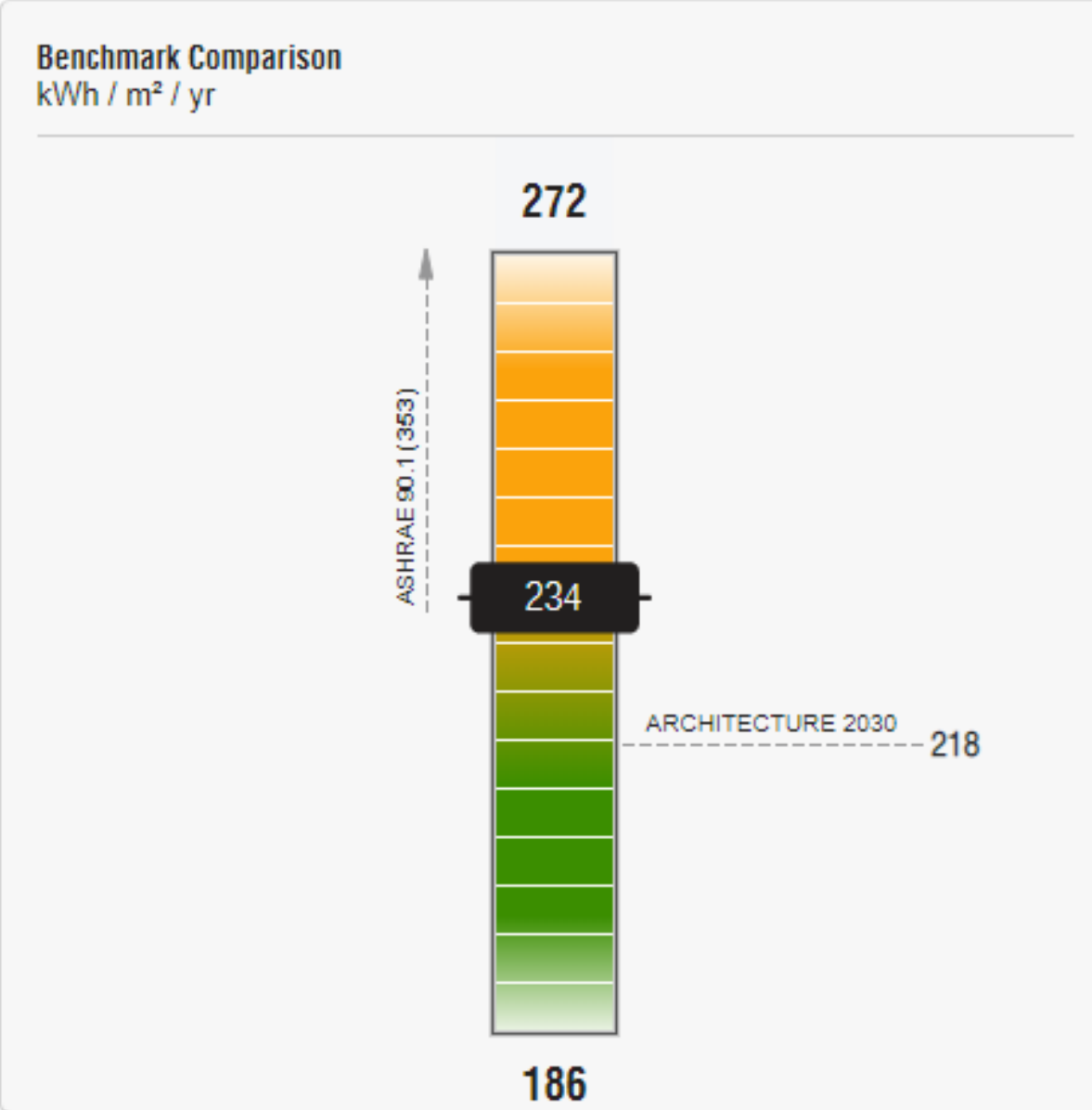
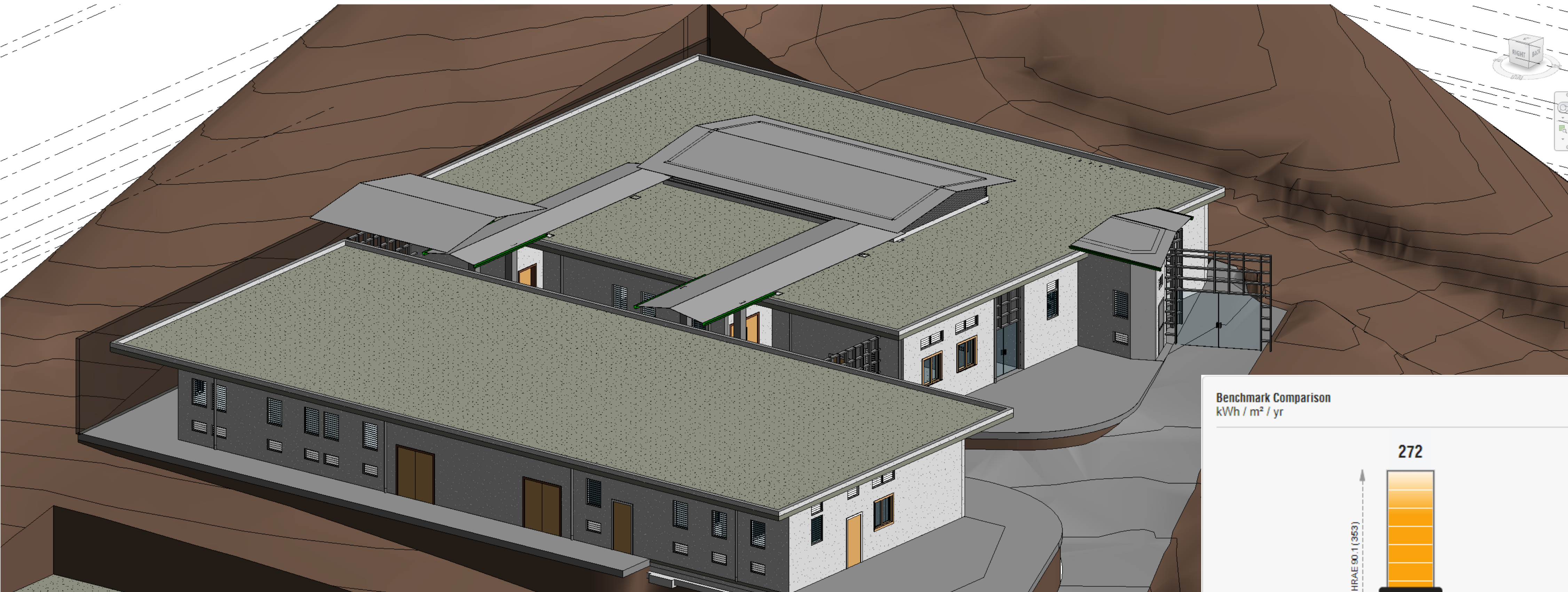


## Photovoltaic (PV) Analysis

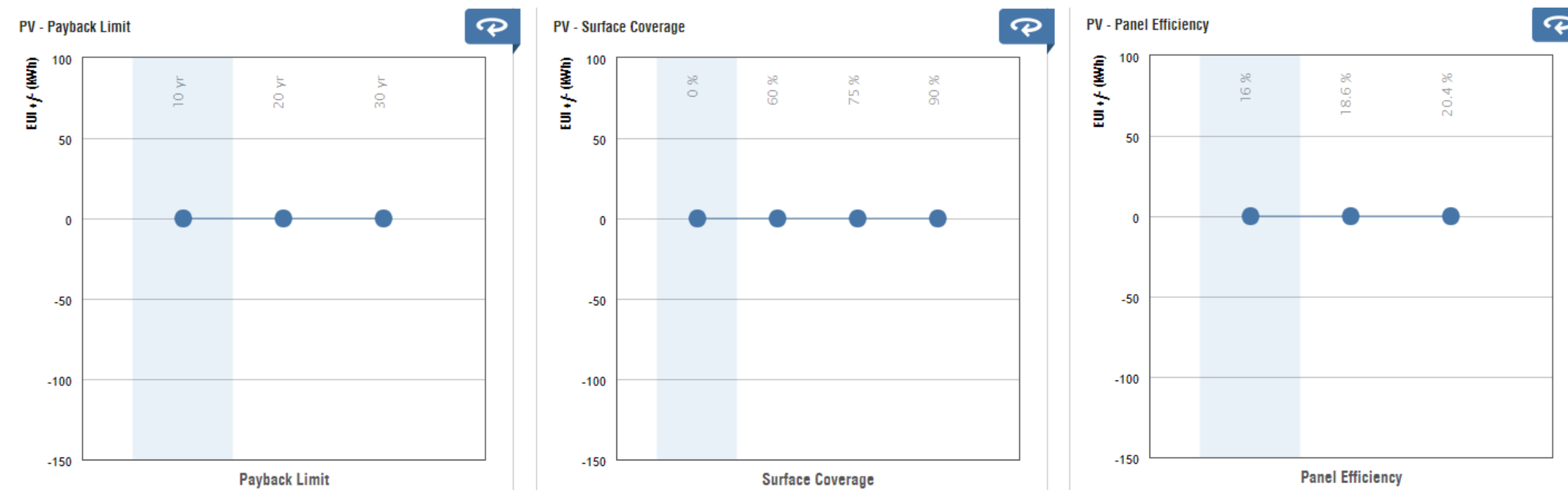
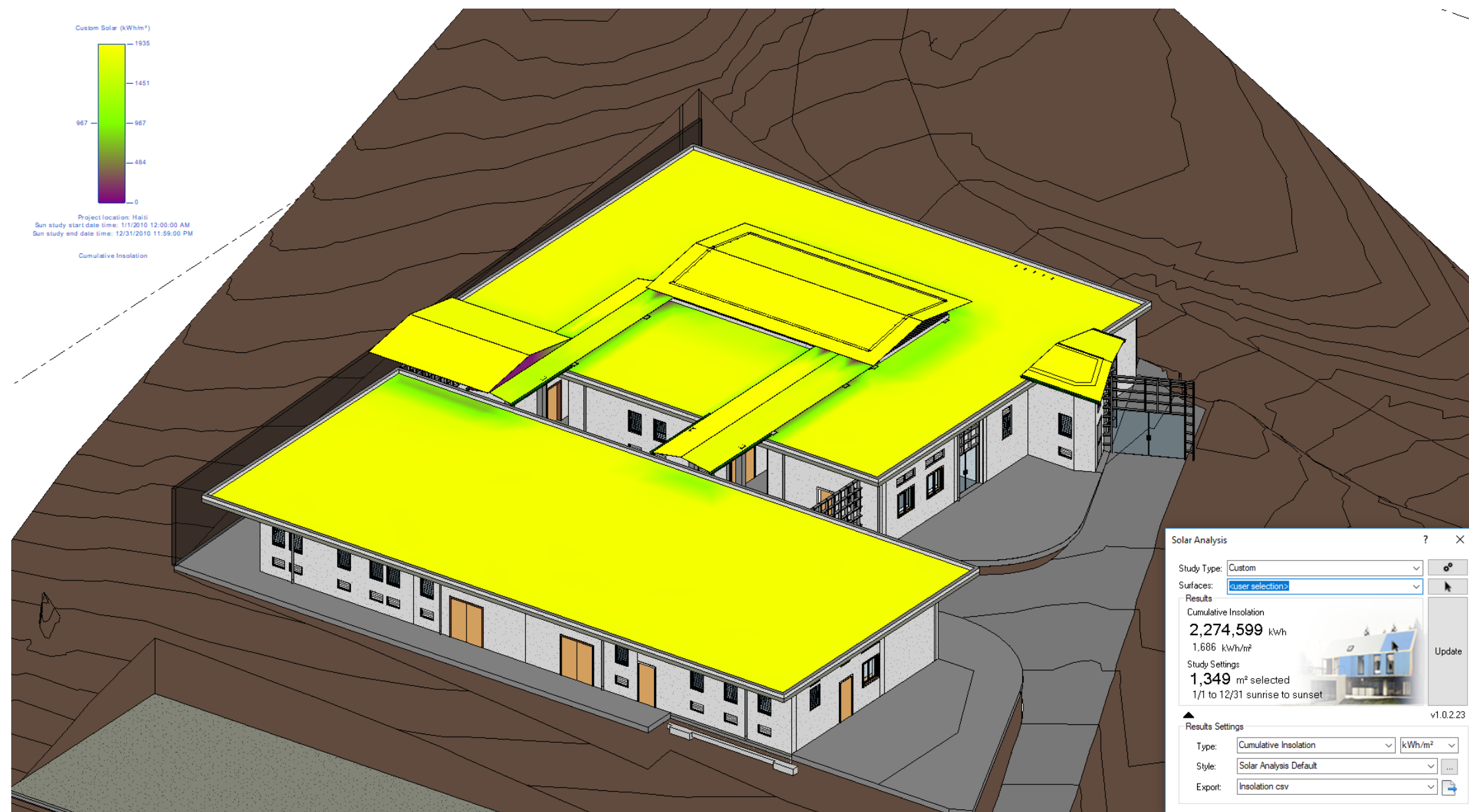
Determine prime locations  
Estimate PV production  
Estimate building energy offset  
Roughly predict payback period.





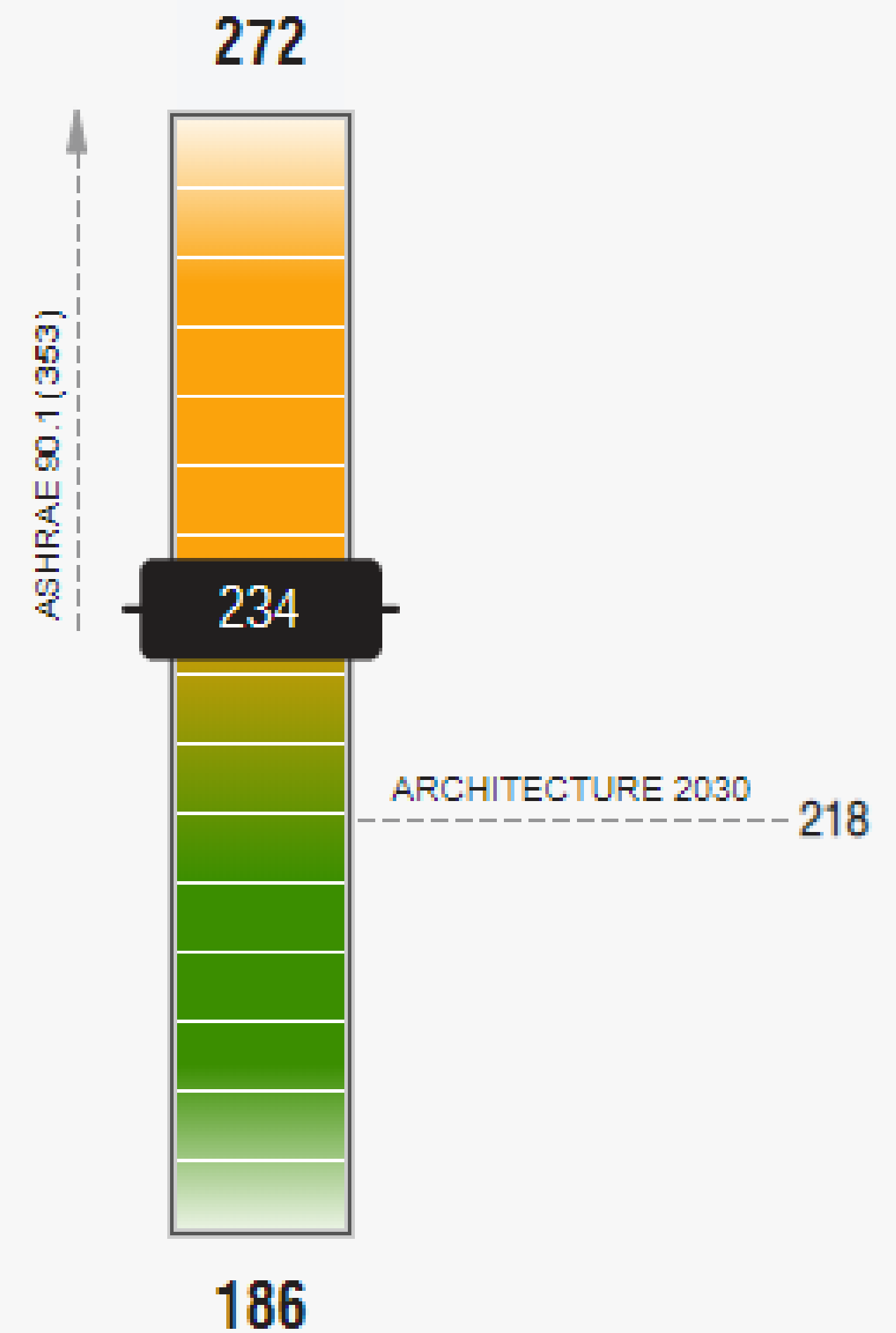




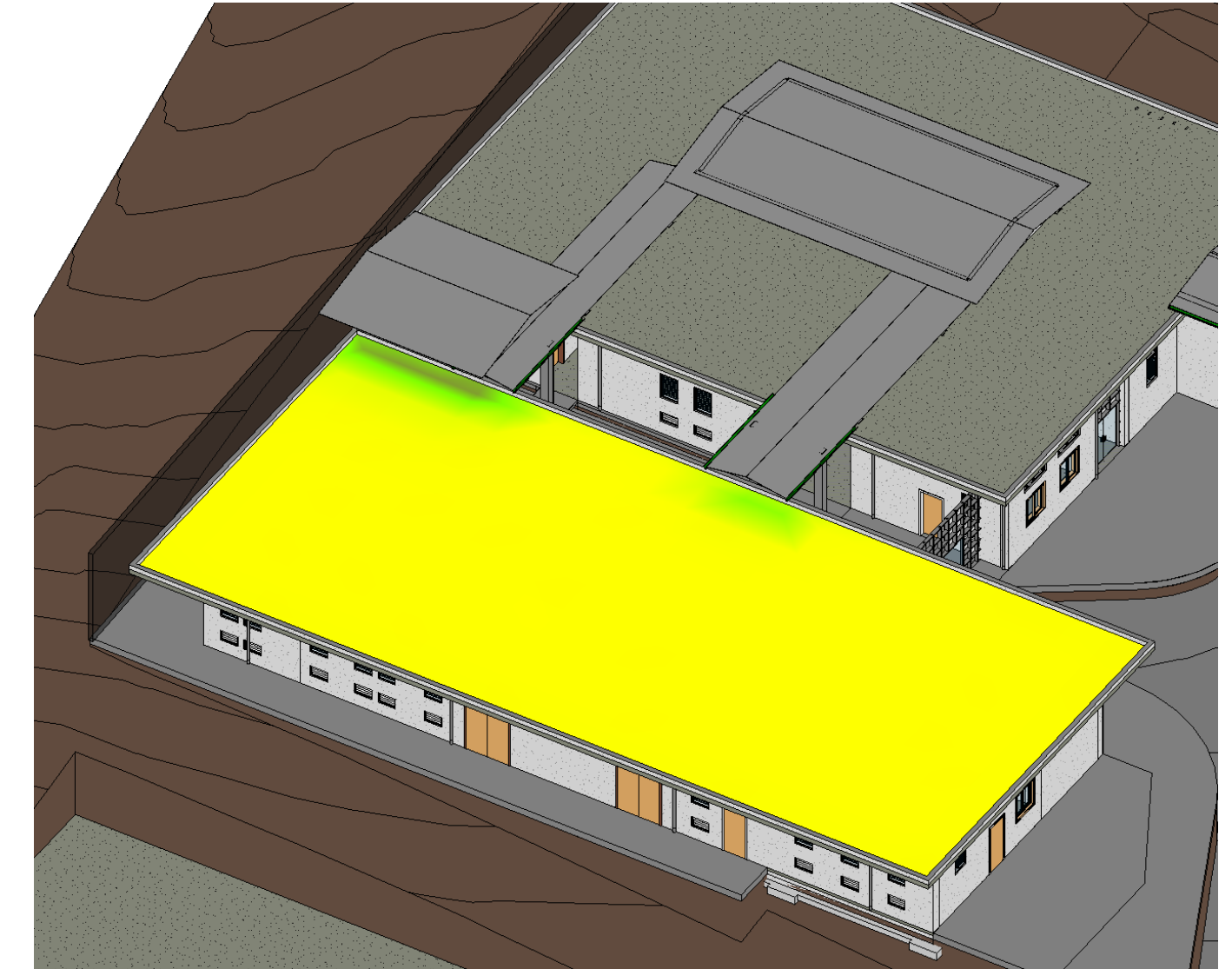
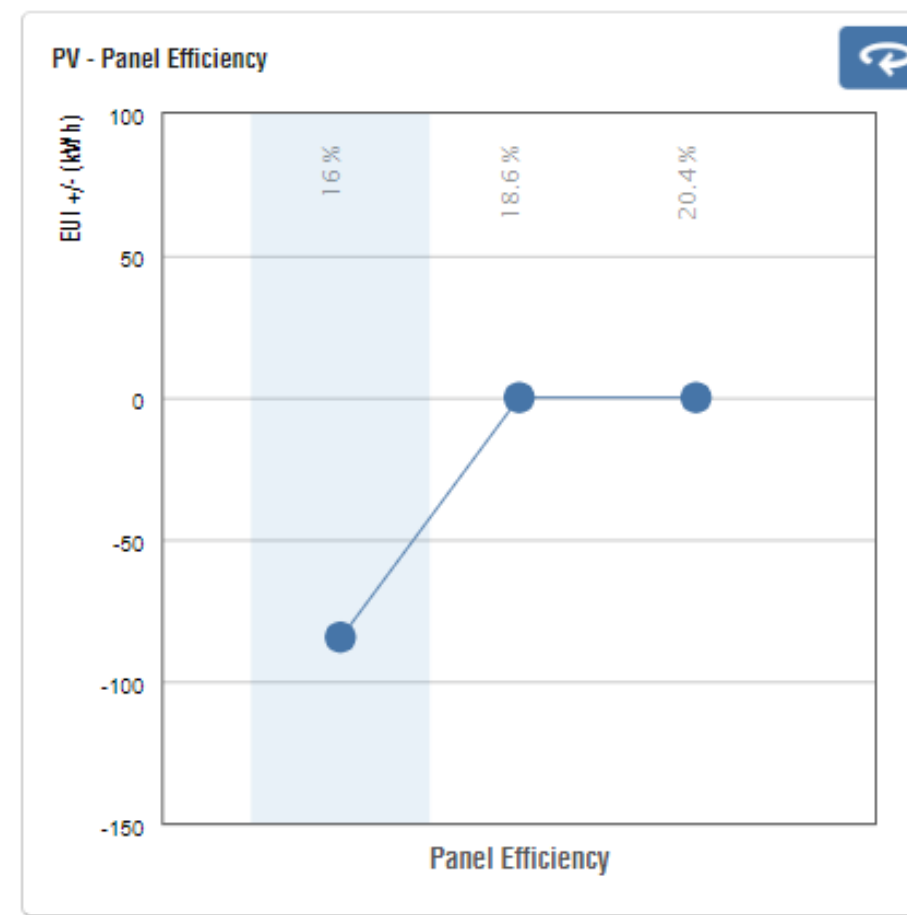
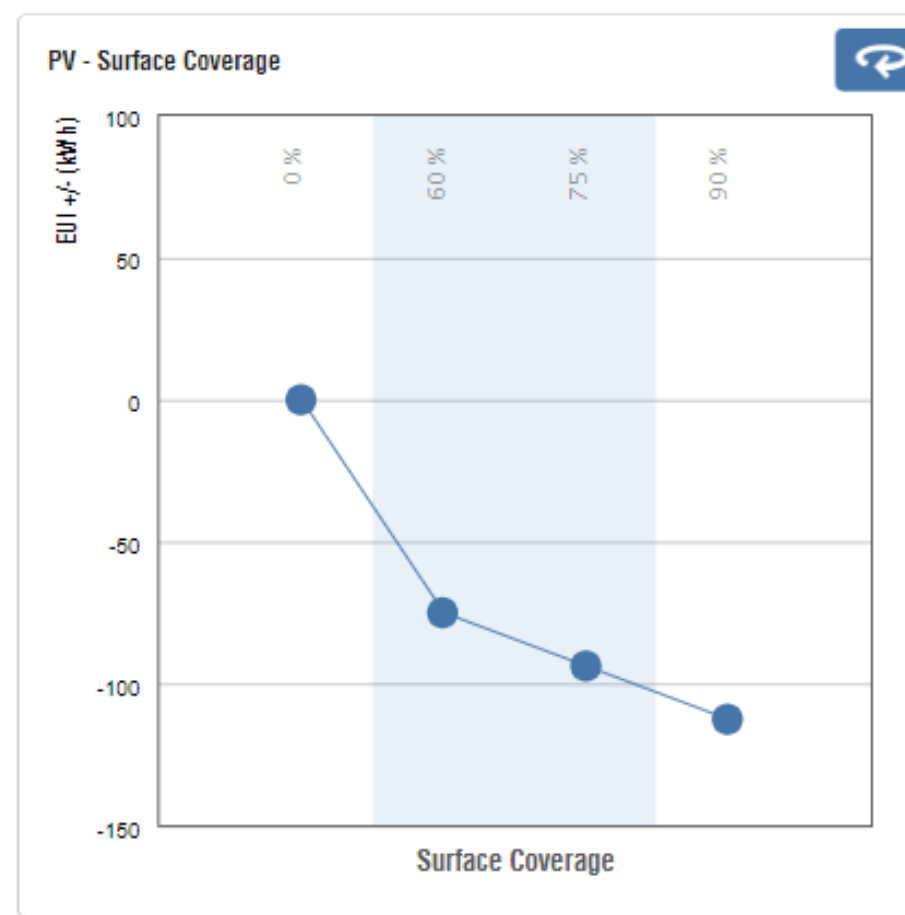
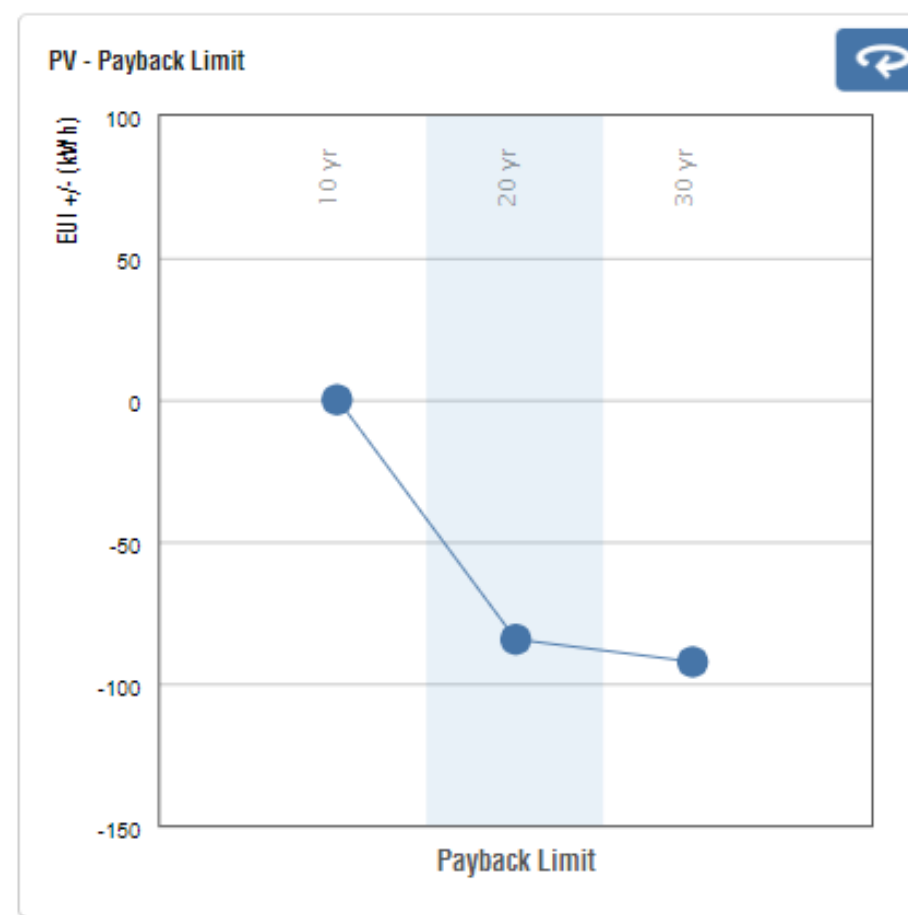


## Benchmark Comparison

kWh / m² / yr







### Solar Analysis

Study Type: Custom

Surfaces: <user selection>

Results

Cumulative Insolation

**963,449** kWh

1,746 kWh/m²

Study Settings

**552** m² selected

1/1 to 12/31 sunrise to sunset

Update

v1.0.2.23

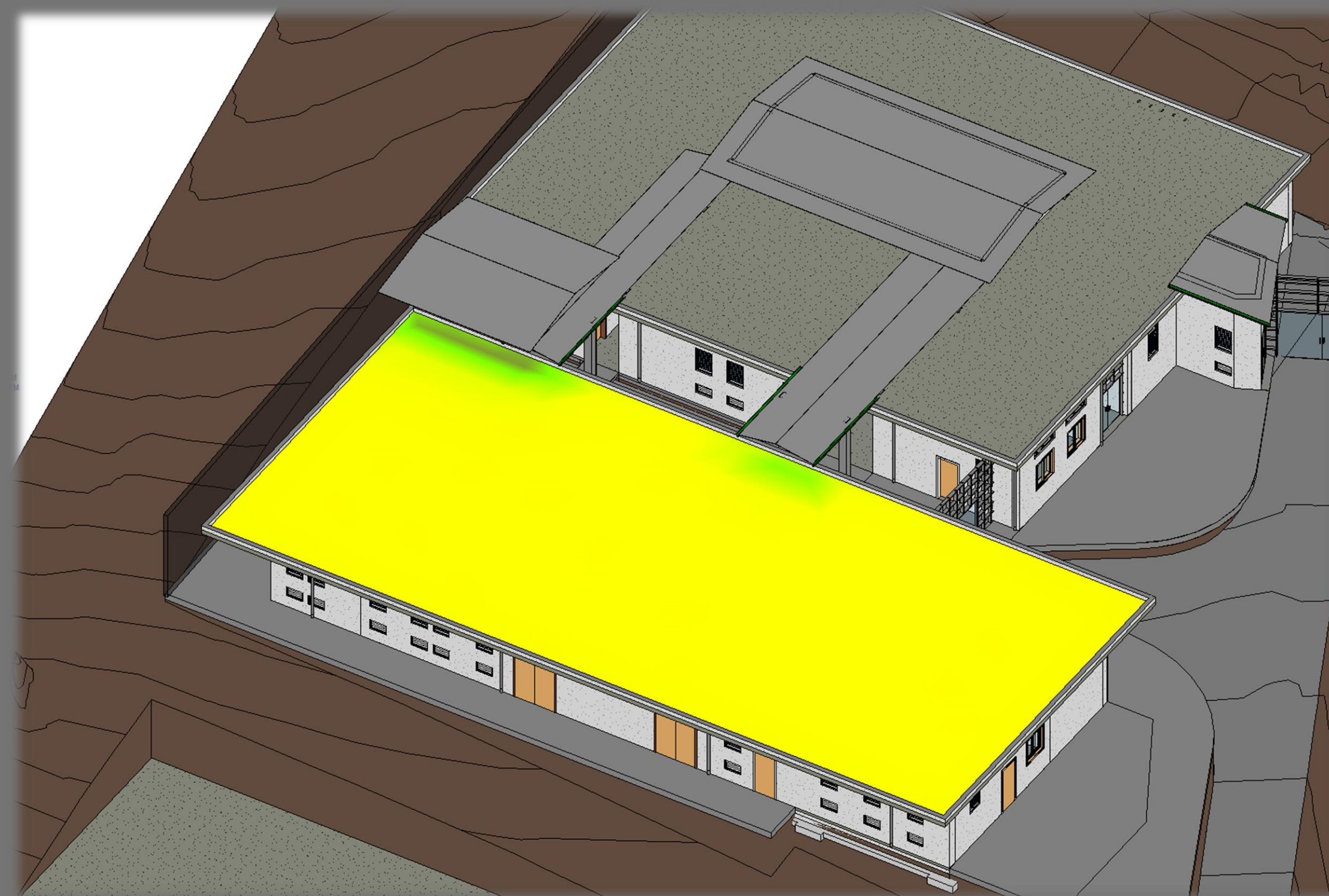
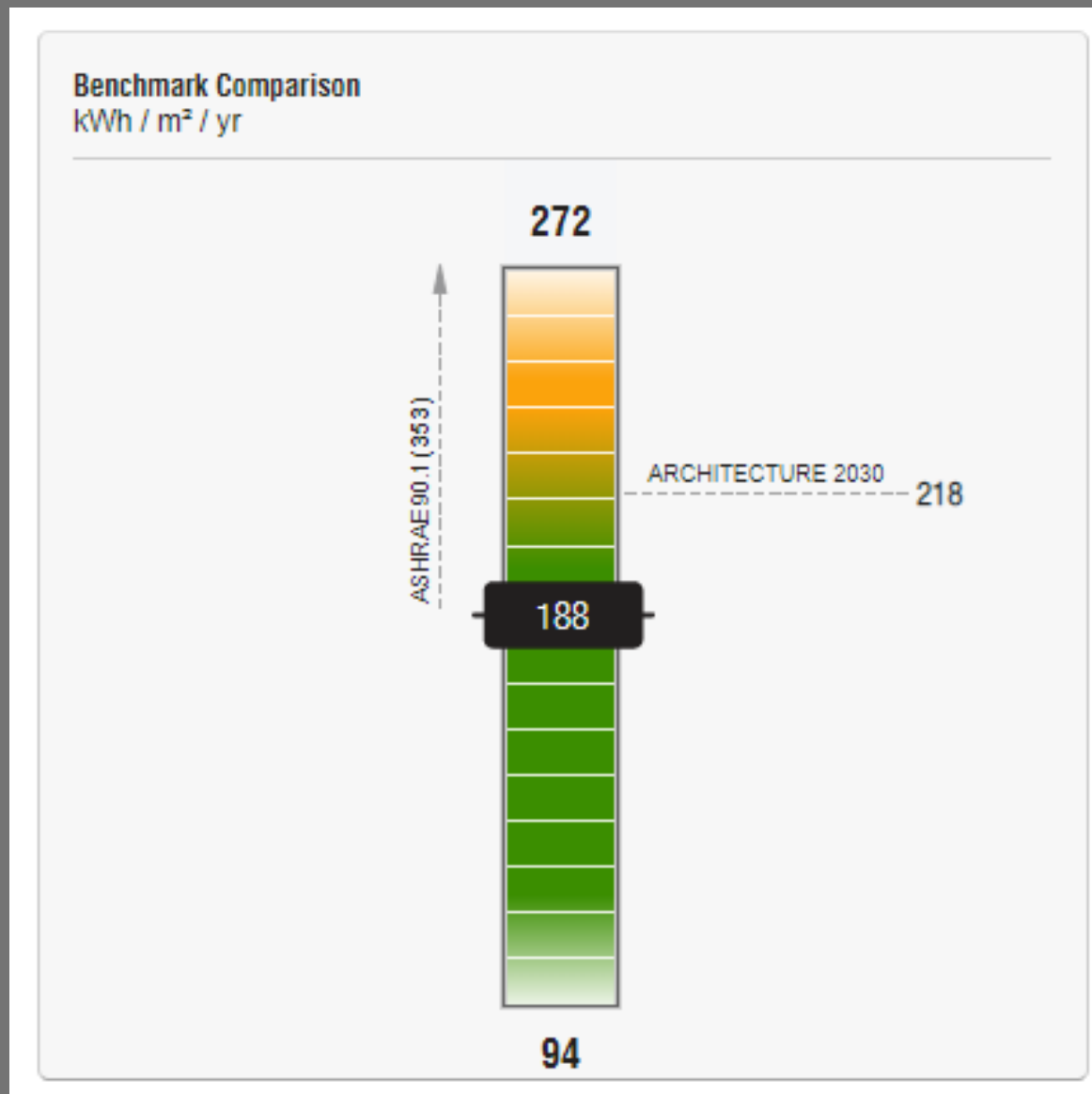
Results Settings

Type: Cumulative Insolation kWh/m²

Style: Solar Analysis Default

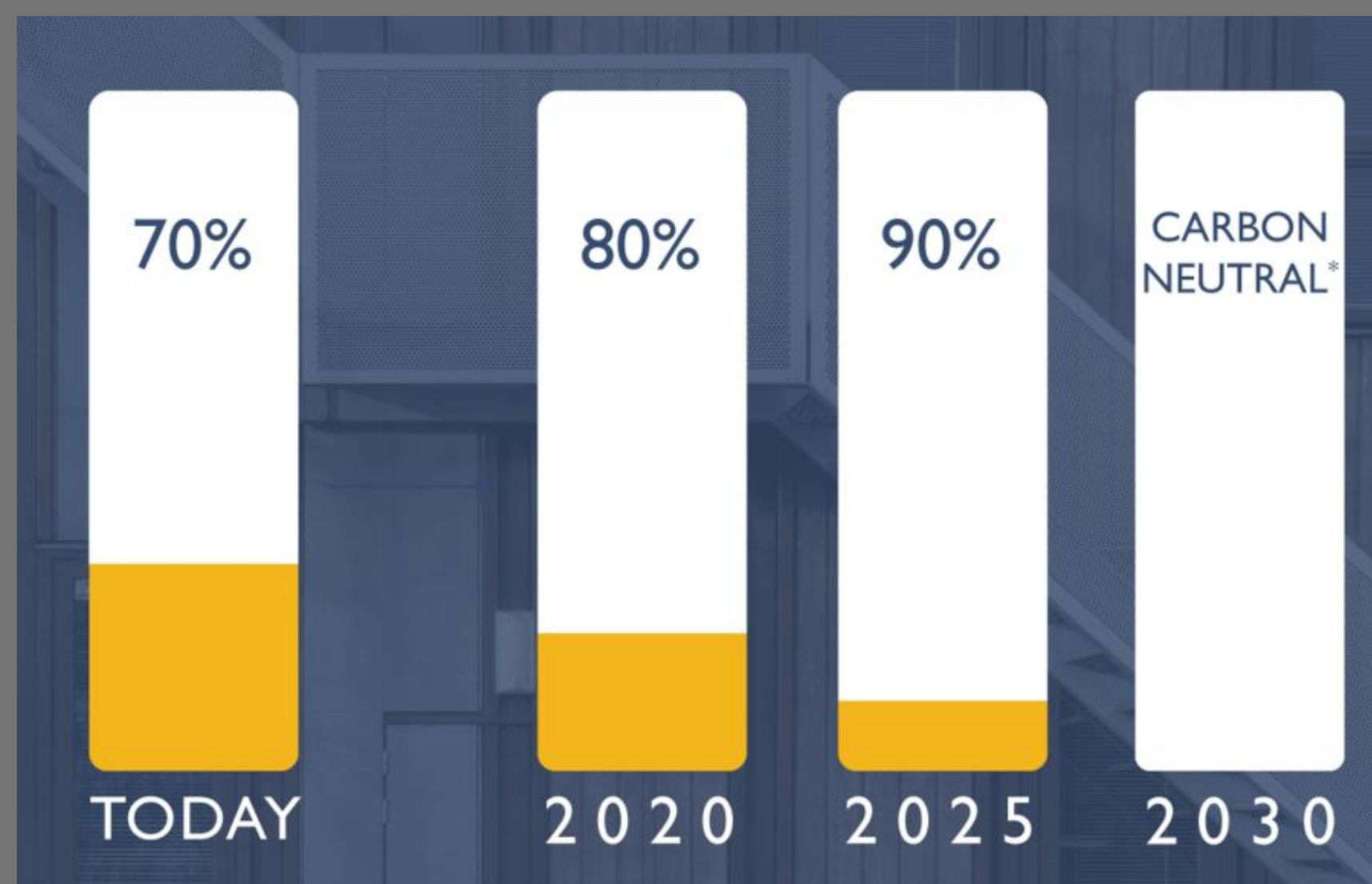
Export: Insolation csv





**Time invested for analysis: ~30 hours**

Revit Massing  
Revit Modeling  
Multiple Insight Iterations  
Daylighting  
Solar Insolation  
Illuminance  
Wind Studies















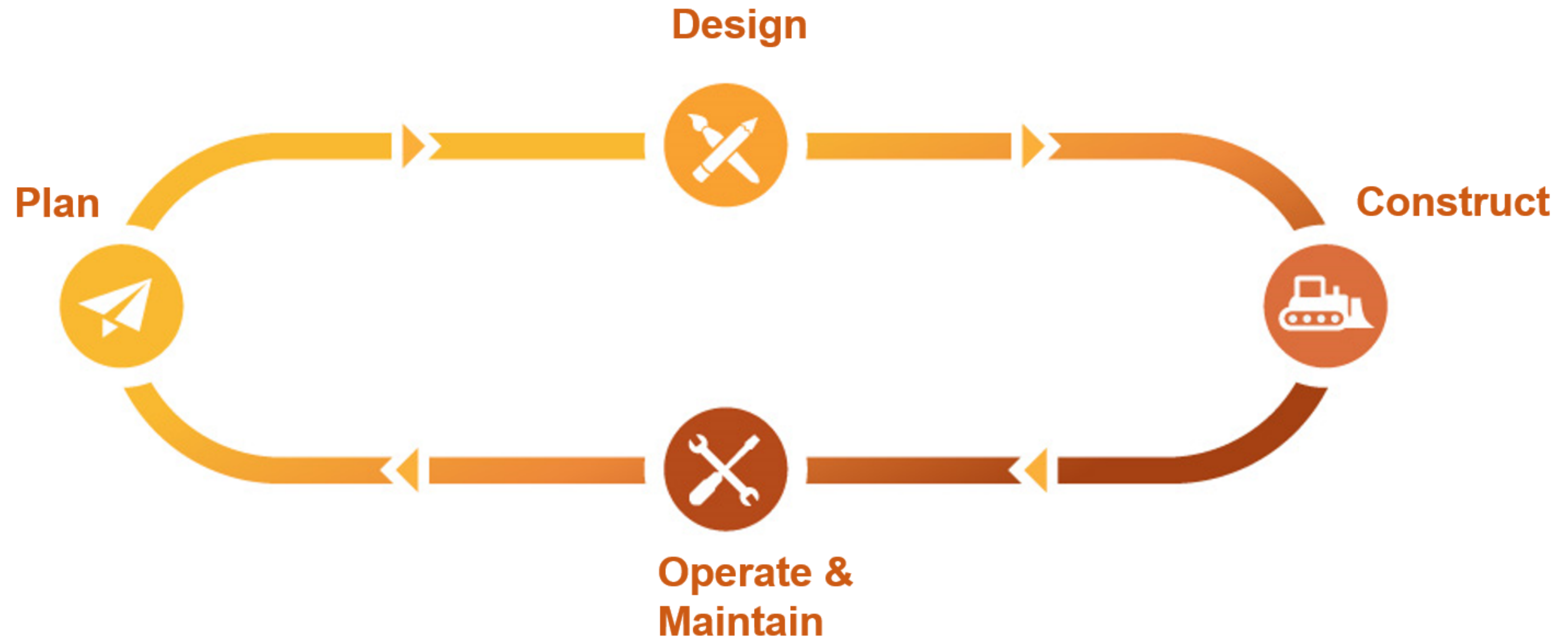
## Reminders

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- Take the class survey in the app
- Check out socials and meetups in the Expo and Community Quads
- Schedule time to meet after class if you'll be in the Quads yourself







# Microdesk Consulting Services

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## Microdesk Clients

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## Microdesk Partners

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