

Designers Lighting Forum

Lighting Design Workflow:

An Exploration of a Designer's Software Toolkit

Tzu-Hao Kuo & Hsin-Ying Huang

Borealis Lighting Studio

09:00 - 10:00 | Wednesday March 8, 2023



Credit(s) earned on completion of this course will be reported to **AIA CES** for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

This course is registered with **AIA CES** for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any

material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

Learning Objectives

At the end of this session, participants will be able to:

1. Define the lighting goal/deliverable
2. Understand the capabilities of different software and their purpose
3. Evaluate the most appropriate tool for the application
4. Apply the right tools; A Decision Roadmap



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INTRODUCTION

How long does it take for a single calculation ?

How complicated is it to test types, locations, and aiming angles?

Can we rely on the lighting effect of the renderings?

How long does it take to build a mockup to see the lighting quality?

Is 0.0 footcandle in AGi32 dark ?

What is the right design for the volunteers to build the bollard on site ?

How long does it take to do a ComCheck?

Do we re-do the calculations If the result shows the designed wattage exceed the allowance?

Is the area measured from PDF drawings reliable ?

How **LONG** does it take for a single calculation ?

How **COMPLICATED** is it to test types, locations, and aiming angles?

Can we rely on the lighting **EFFECT** of the renderings?

How **LONG** does it take to build a mockup to see the lighting quality?

Is 0.0 footcandle in AGi32 **DARK** ?

What is the right **DESIGN** for the volunteers to build the bollard on site ?

How **LONG** does it take to do a ComCheck?

Do we **RE-DO** the calculations If the result shows the designed wattage exceed the allowance?

Is the area measured from PDF drawings **RELIABLE**?

How **LONG** does it take for a single calculation ?
How **LONG** does it take to build a mockup to see the lighting quality?
How **LONG** does it take to do a ComCheck?
Do we **RE-DO** the calculations If the result shows the designed wattage exceed the allowance?

How **COMPLICATED** is it to test types, locations, and aiming angles?
Is 0.0 footcandle in AGi32 **DARK** ?
Is the area measured from PDF drawings **RELIABLE**?

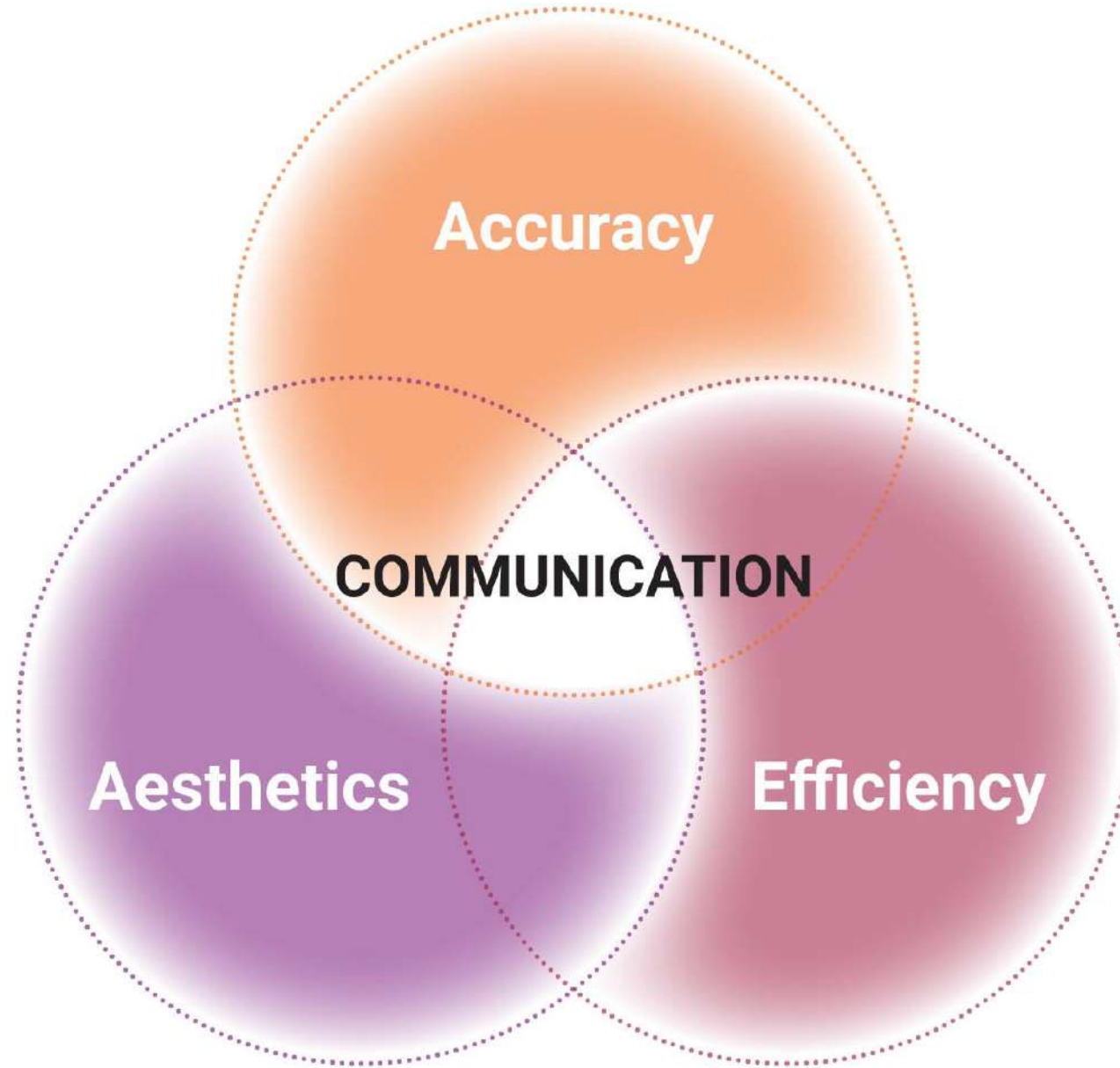
Can we rely on the lighting **EFFECT** of the renderings?
What is the right **DESIGN** for the volunteers to build the bollard on site ?

How **LONG** does it take for a single calculation ?
How **LONG** does it take to build a mockup to see the lighting quality?
How **LONG** does it take to do a ComCheck?
Do we **RE-DO** the calculations If the result shows the designed wattage exceed the allowance?

How **COMPLICATED** is it for test types, locations, and aiming angles?
Is 0.0 footcandle in AGi32 **DARK** ?
Is the area measured from PDF drawings **RELIABLE**?

Can we rely on the lighting **EFFECT** of the renderings?
What is the right **DESIGN** for the volunteers to build the bollard on site ?

#Efficiency #Accuracy #Aesthetics



Group 01

Revit-based/



ELUM TOOLS



LIGHTSTANZA



CLIMATE STUDIO



ENSCAPE

Group 02

Rhino-based/



HONEYBEE



LADYBUG



CLIMATE STUDIO



ENSCAPE

Group 03

Individual/



AGI 32



3DS MAX

Group 01

Revit-based/



ELUM TOOLS



LIGHTSTANZA



CLIMATE STUDIO



ENSCAPE

Group 02

Rhino-based/



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AGI 32



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LIGHTSTANZA



CLIMATE STUDIO



ENSCAPE

Group 02

Rhino-based/



HONEYBEE



LADYBUG



CLIMATE STUDIO



ENSCAPE

Group 03

Individual/



AGI 32



3DS MAX

01. Criteria



Calculation

02. Lighting Effect

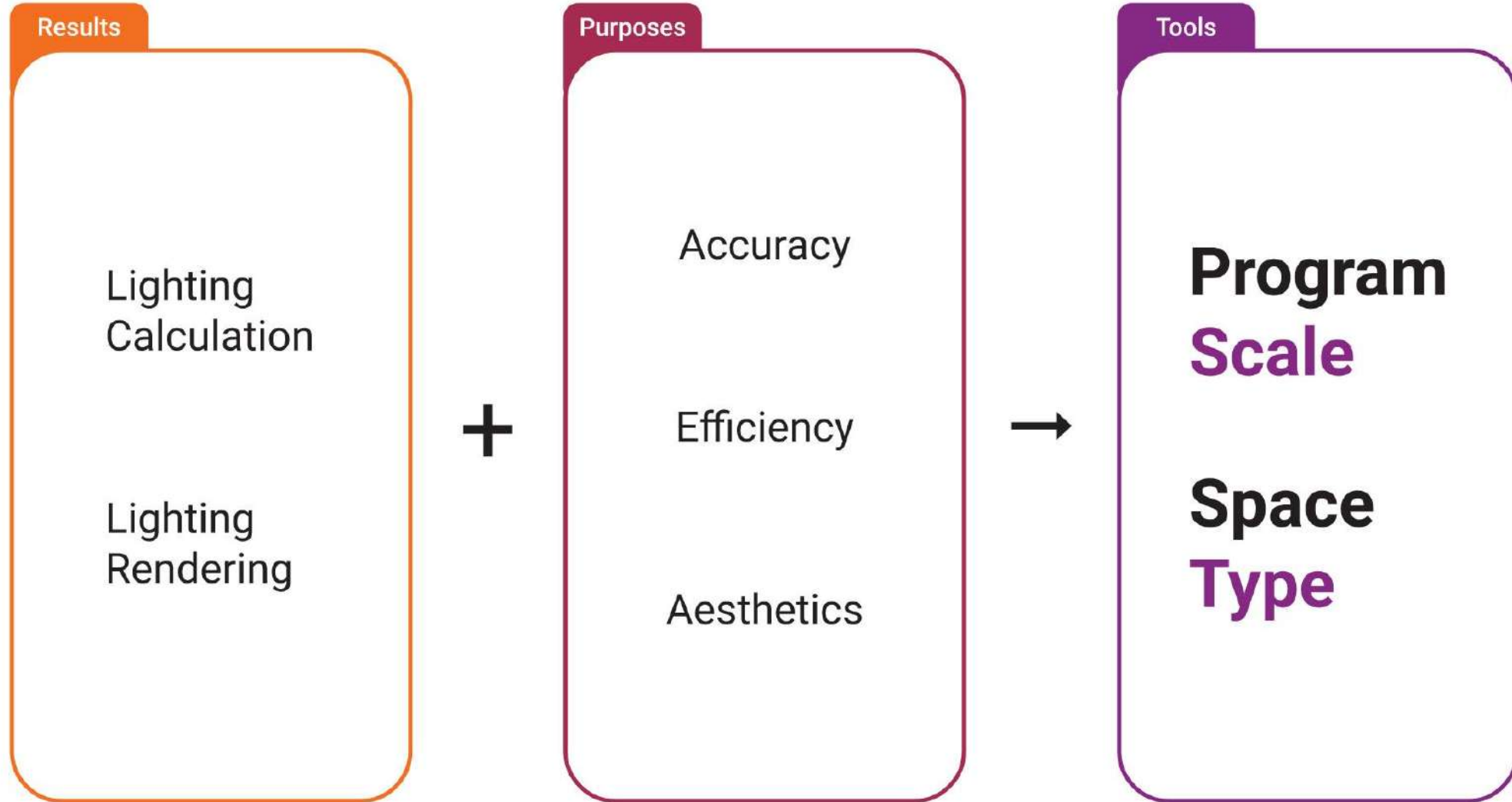


Rendering

03. Specific Issues



Mockup



HOW TO SELECT TOOLS

**PROGRAM
SCALE**

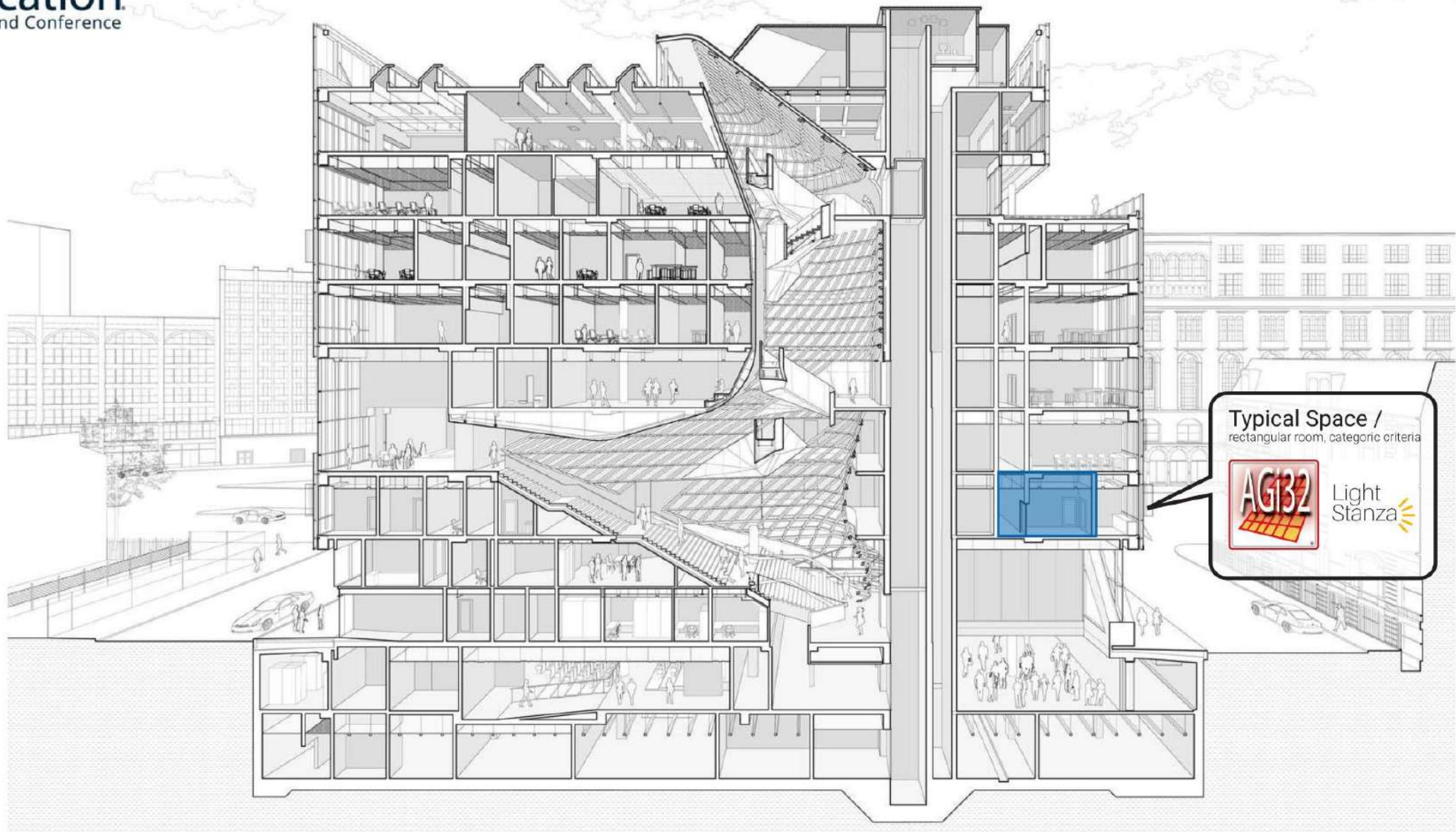
**SPACE
TYPE**

(using Cooper Square as a reference only)

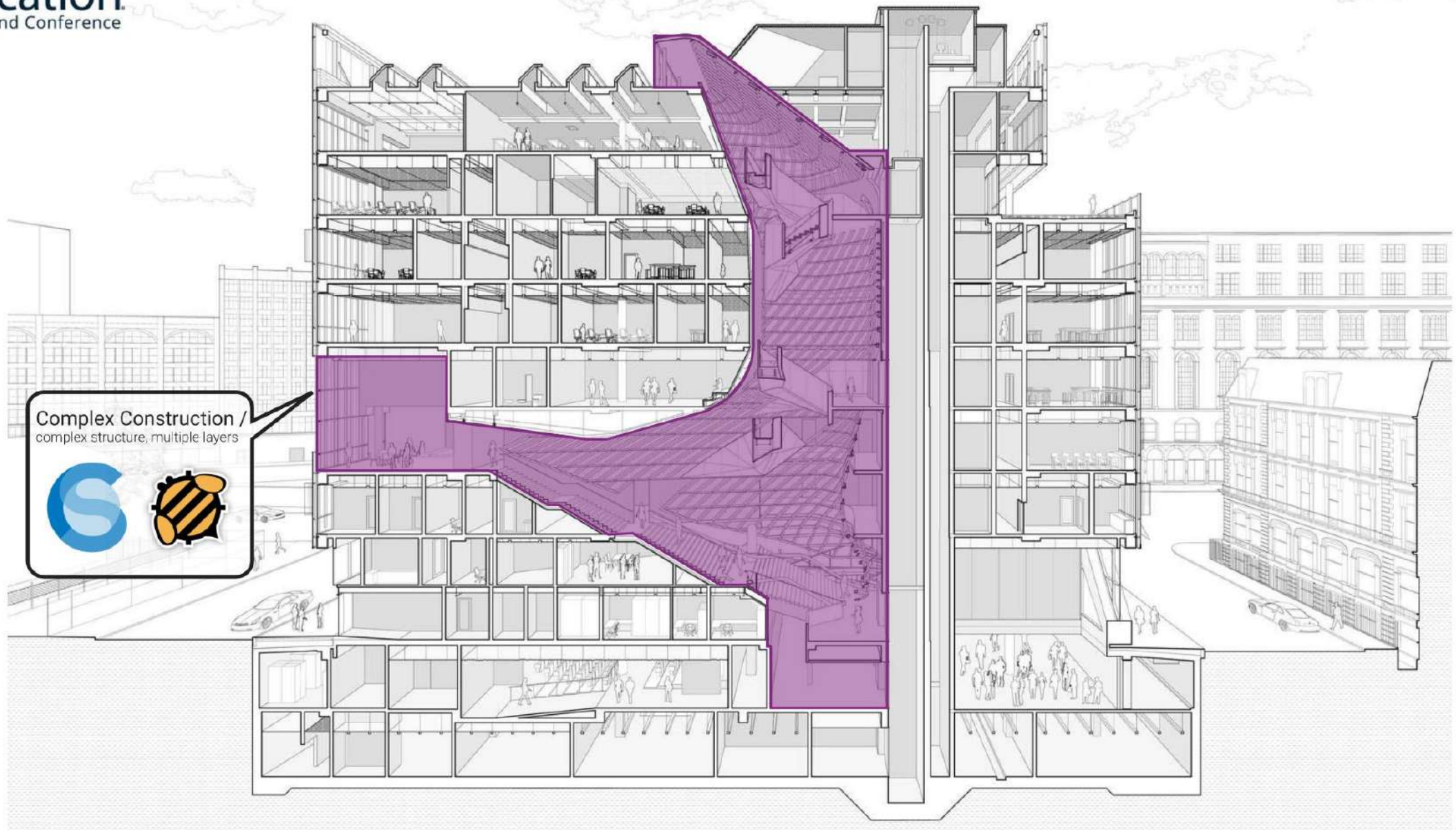
Reference: MANUAL OF SECTION / Cooper Square. Morphosis, New York, New York, USA (2009)




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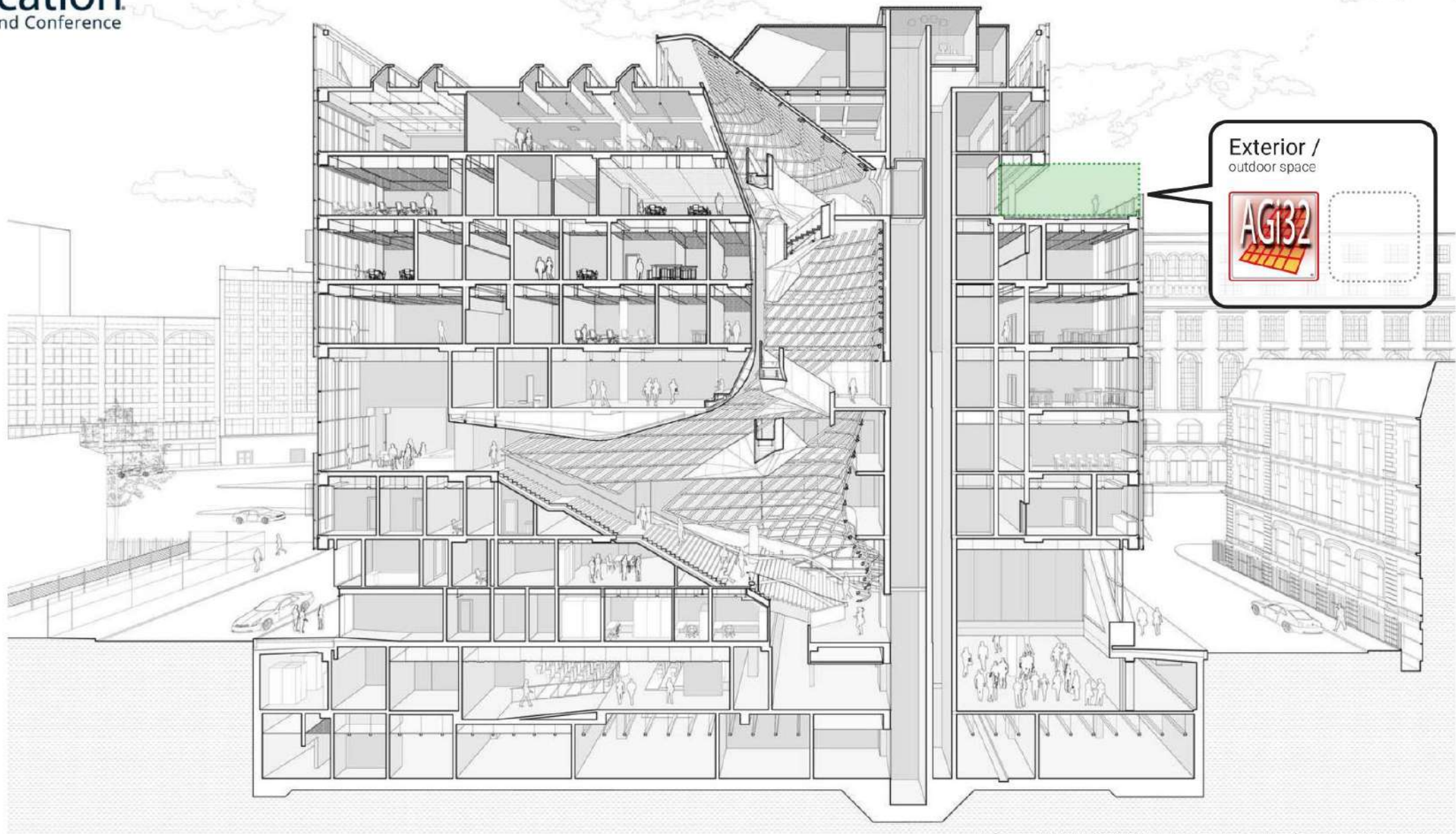
Reference: MANUAL OF SECTION / Cooper Square. Morphosis, New York, New York, USA (2009)



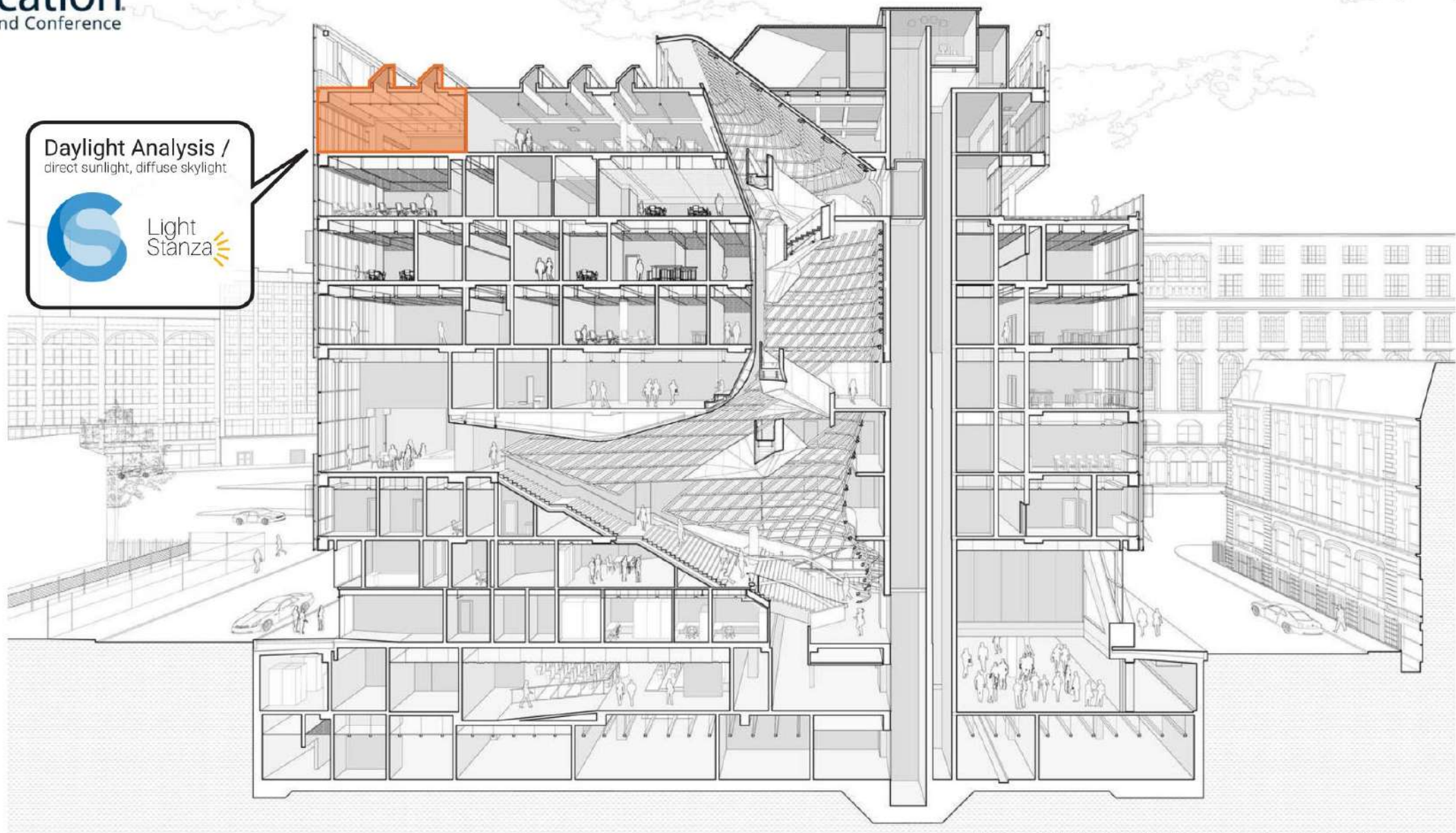
Complex Construction /
complex structure, multiple layers



Reference: MANUAL OF SECTION / Cooper Square. Morphosis, New York, New York, USA (2009)



Reference: MANUAL OF SECTION / Cooper Square. Morphosis, New York, New York, USA (2009)



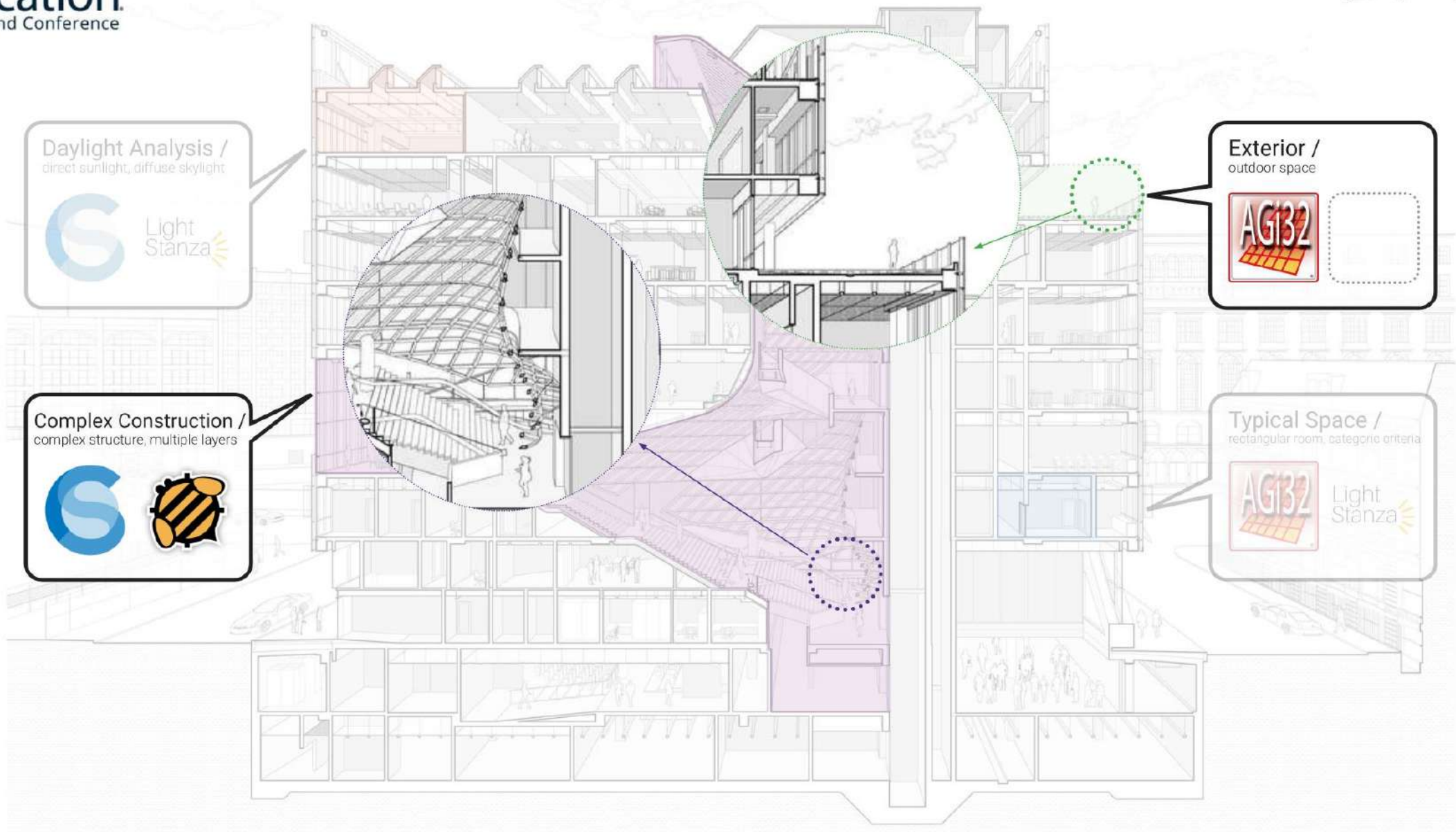
Daylight Analysis /
direct sunlight, diffuse skylight



Reference: MANUAL OF SECTION / Cooper Square. Morphosis, New York, New York, USA (2009)



Reference: MANUAL OF SECTION / Cooper Square. Morphosis, New York, New York, USA (2009)



Reference: MANUAL OF SECTION / Cooper Square. Morphosis, New York, New York, USA (2009)

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- 04 Pathway Bollard Lighting**
Headquarters Project Ramapo

Applications /

- 05 Artwork Reflection Prediction**
Faceted Column
- 06 LPD Space Method**
Revit



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2D Graphic /
Adobe Creative Suite

● ● ● ● ○

3D Modeling /
Revit
Rhino
Sketchup

● ● ● ● ●
● ● ● ● ●
● ● ● ● ●

Analysis /
AGI 32
Climate Studio
Elum Tools
Ladybug / Honeybee
Lightstanza

● ● ● ● ●
● ● ● ● ●
● ● ● ● ●
● ● ● ● ●
● ● ● ● ●

Rendering /
3ds Max
Enscape
V-Ray

● ○ ● ● ●
● ● ● ● ●
● ● ● ● ●



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2D Graphic /
Adobe Creative Suite

● ● ● ● ○

3D Modeling /
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● ● ● ● ●
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Rendering /
3ds Max
Enscape
V-Ray

● ○ ● ● ●
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● ● ● ● ●

LIGHTING CALCULATION

LADYBUG
HONEYBEE

2021 VIRTUAL ANNUAL CONFERENCE

AUGUST 9-13

Possibility of Parametric Design for Electrical Lighting Practice

Hsin-Ying Huang

Parsons School of Design, MFA Lighting Design Graduate 2021

Francesca Bastianini

Parsons School of Design, Part-Time Assistant Professor

Craig Bernecker

Parsons School of Design, Professor of Lighting Design

Rebecca Mintz

Parsons School of Design, Part-time Lecturer



www.ies.org/ac

Comparison between AGI32 and Honeybee

Radiosity

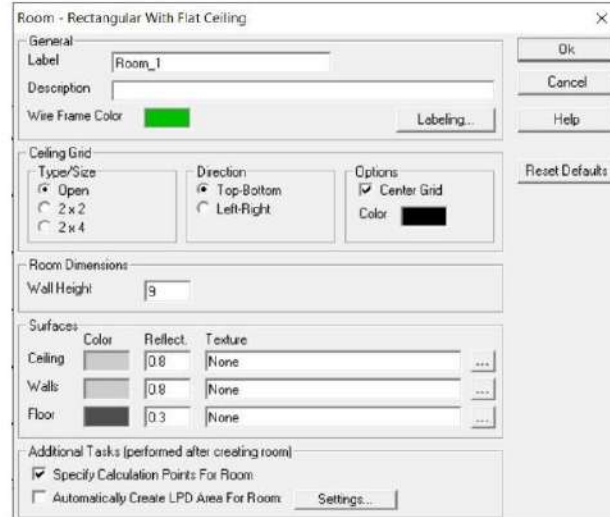


Lighting Analysts
illumination engineering software

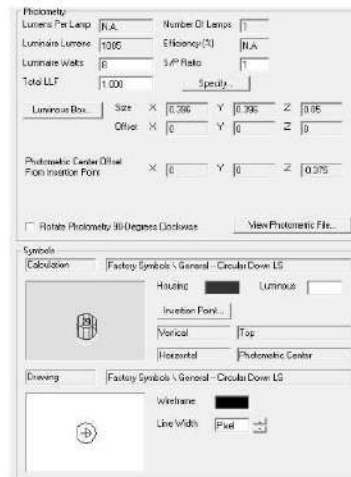


Raytracing

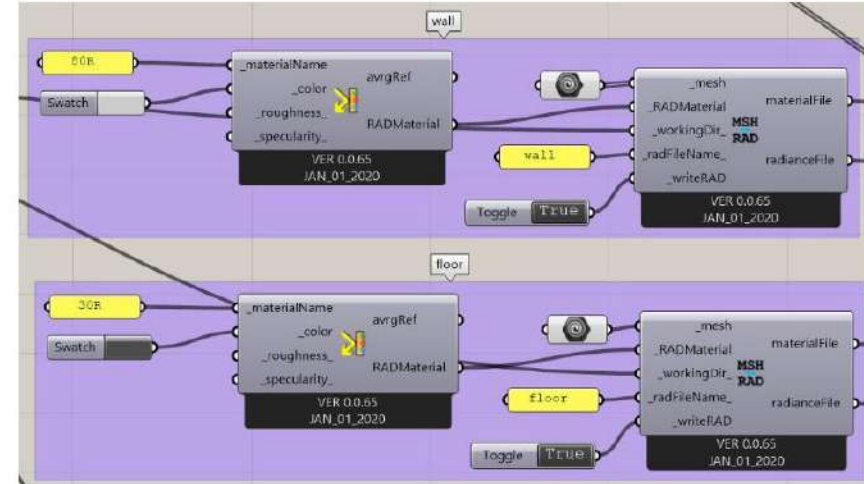




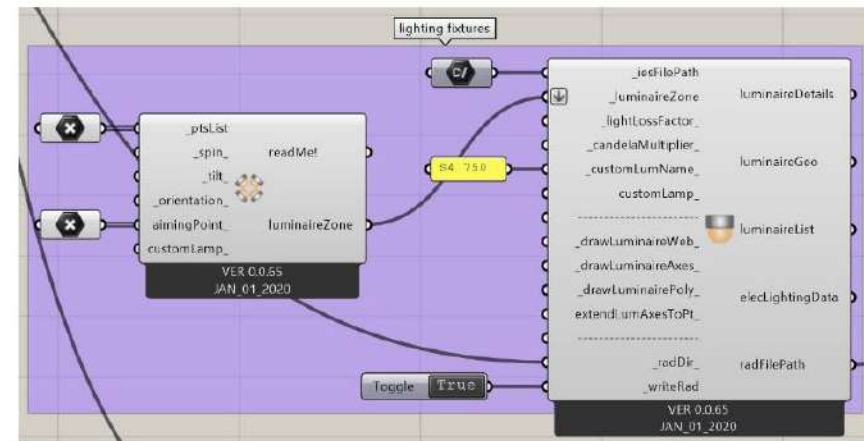
interface / room setting



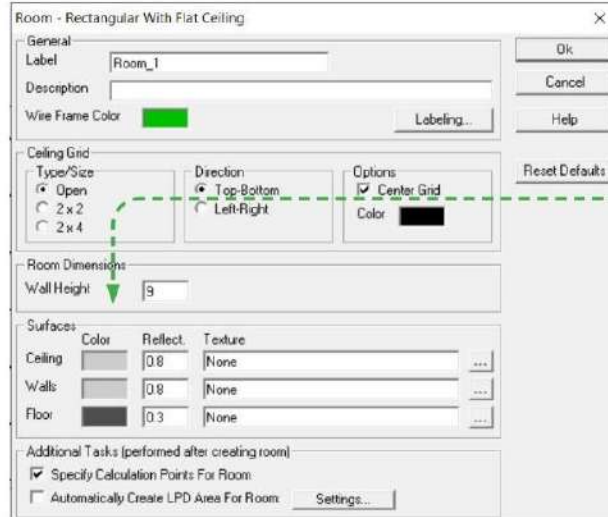
interface / luminaire setting



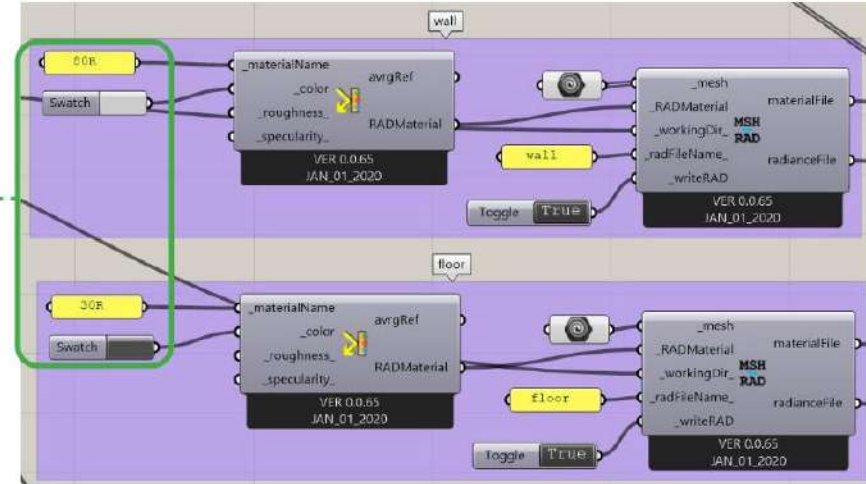
interface / room setting



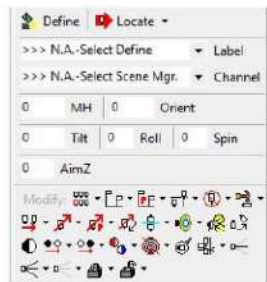
interface / luminaire setting



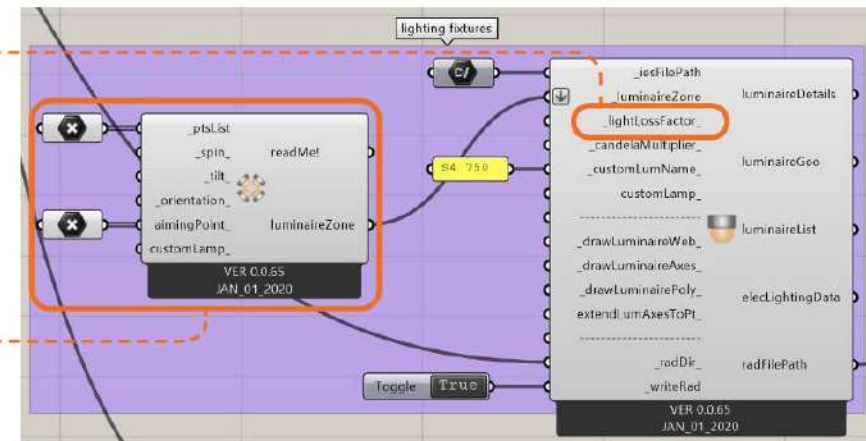
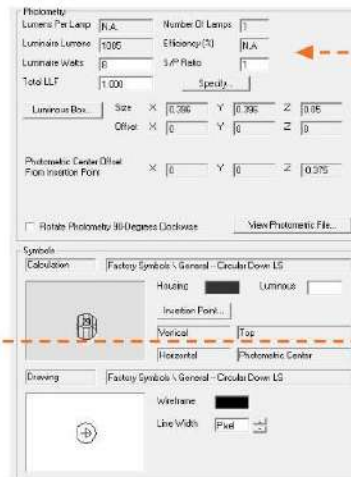
interface / room setting



interface / room setting

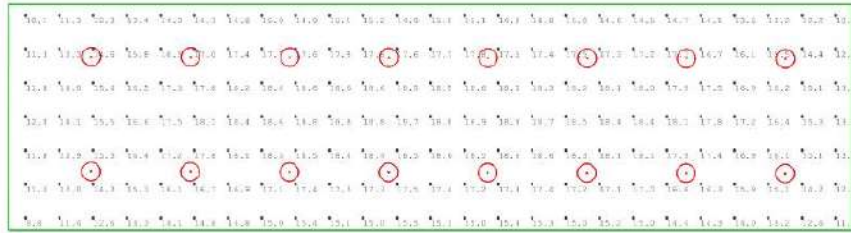


interface / luminaire setting

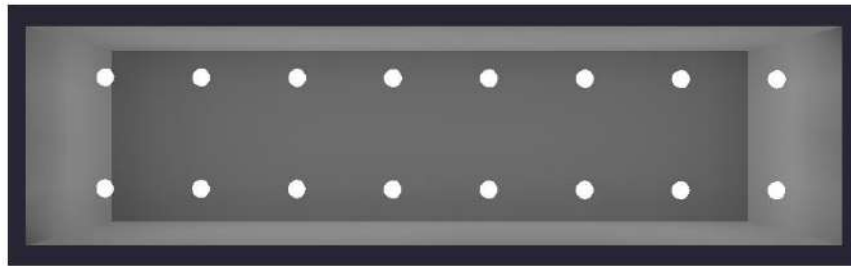


interface / luminaire setting

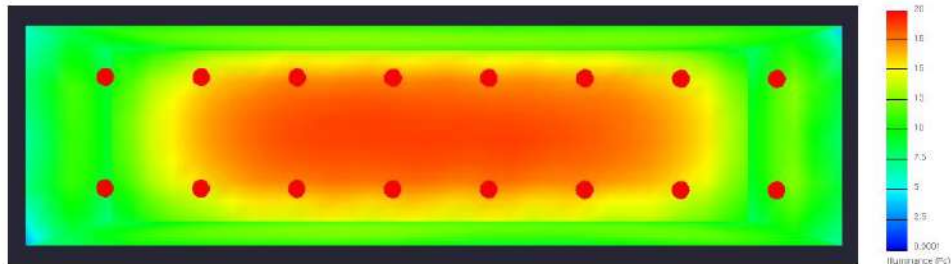
AGi32 version



plan view / point calculation

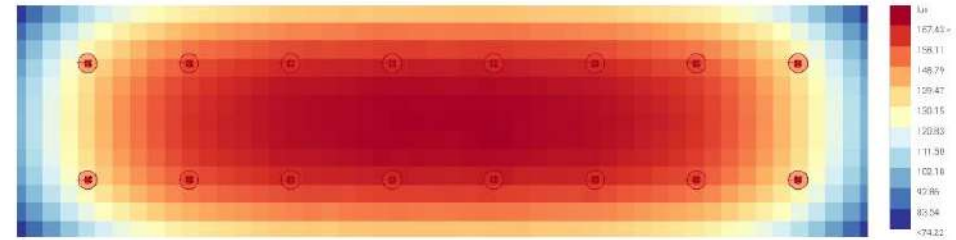


plan view / lighting rendering

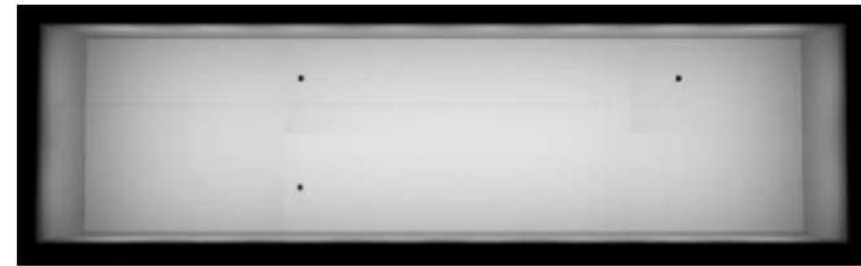


plan view / false color rendering

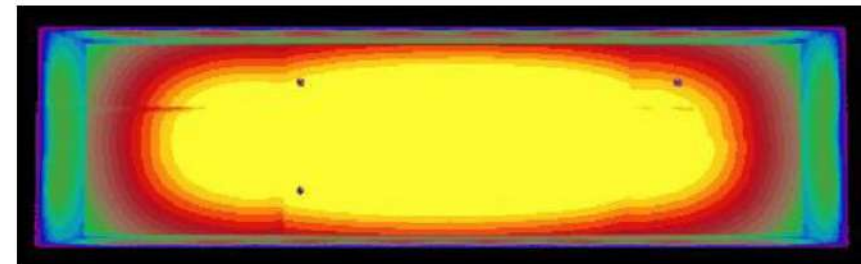
Honeybee version



plan view / point calculation

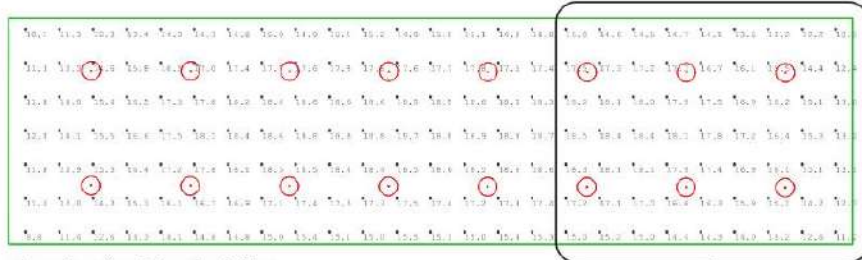


plan view / lighting rendering

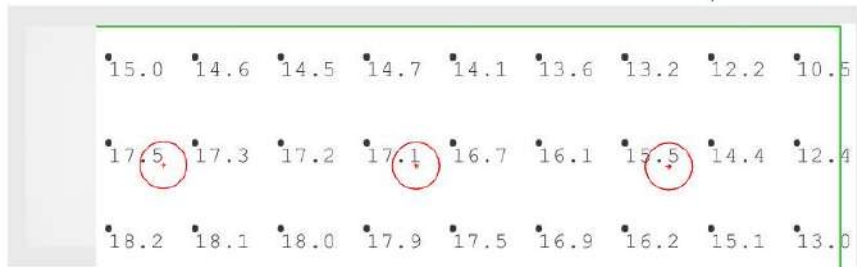


plan view / false color rendering

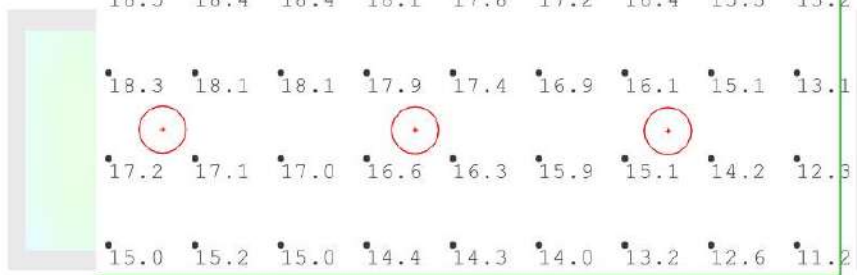
AGi32 version



plan view / point calculation

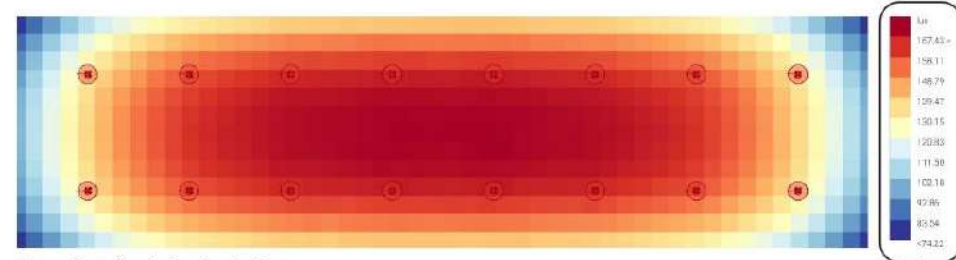


plan view

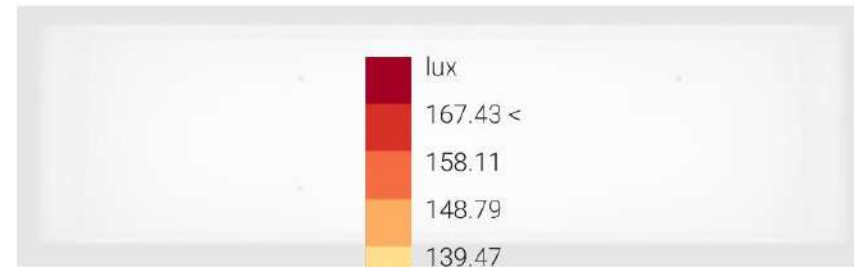


plan view / false color rendering

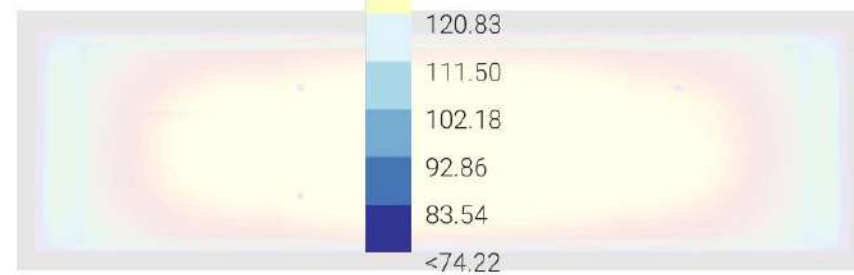
Honeybee version



plan view / point calculation



plan view / lighting rendering



plan view / false color rendering

Massbay Community College

Masary Studio Facade Artwork

Location **Framingham, MA**

Analysis:

Exterior facade lighting analysis

Criteria:

Lighter toned façade:

High Activity: 10vFC (LZ2)

Med Activity: 5vFC (LZ2)

Darker toned façade:

High Activity: 20vFC (LZ2)

Med Activity: 10vFC (LZ2)

Tools for Analysis:

AGI32

Grasshopper (ladybug/honeybee)

Goal of Analysis:

Best fixture locations and aiming angle



Massbay Community College

Masary Studio Facade Artwork

Location **Framingham, MA**
Architect **Sasaki**

Analysis:
Outdoor art installation lighting

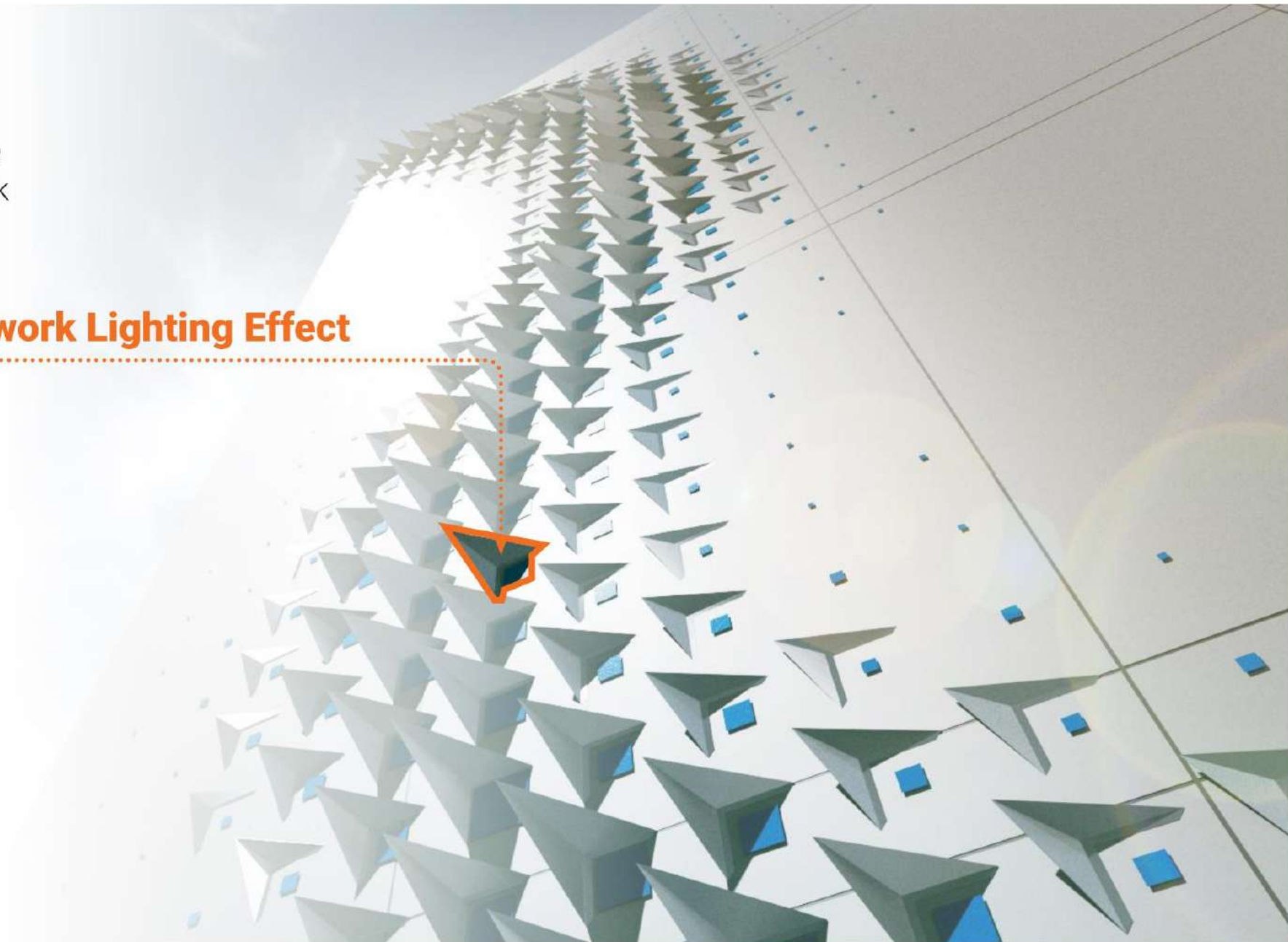
• Artwork Lighting Effect

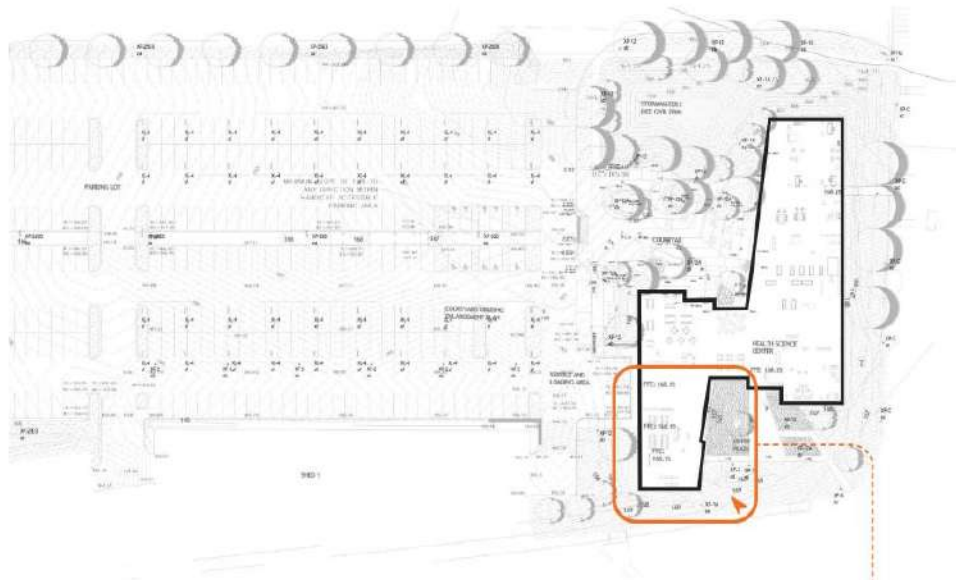
Criteria:
Lighter toned façade:
High Activity: 10vFC (LZ2)
Med Activity: 5vFC (LZ2)

Darker toned façade:
High Activity: 20vFC (LZ2)
Med Activity: 10vFC (LZ2)

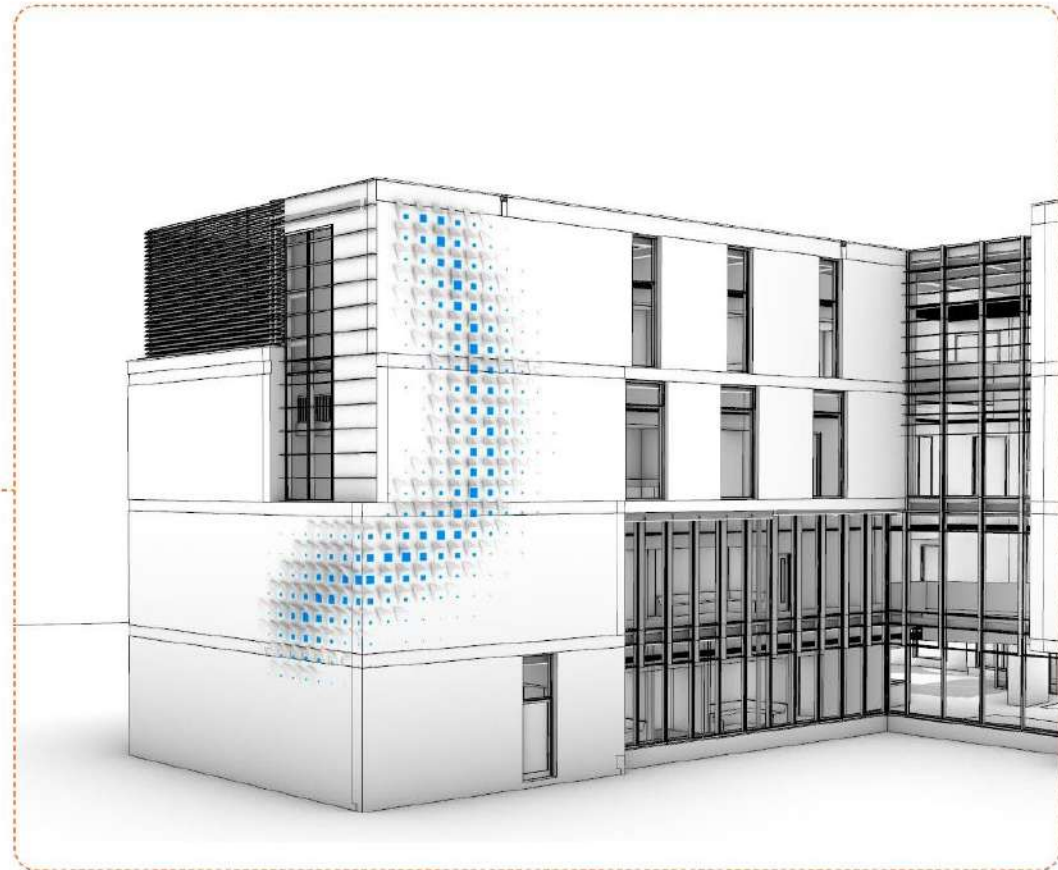
Tools for Analysis:
AGI32
Grasshopper (ladybug/honeybee)

Goal of Analysis:
Best fixture locations and aiming angle

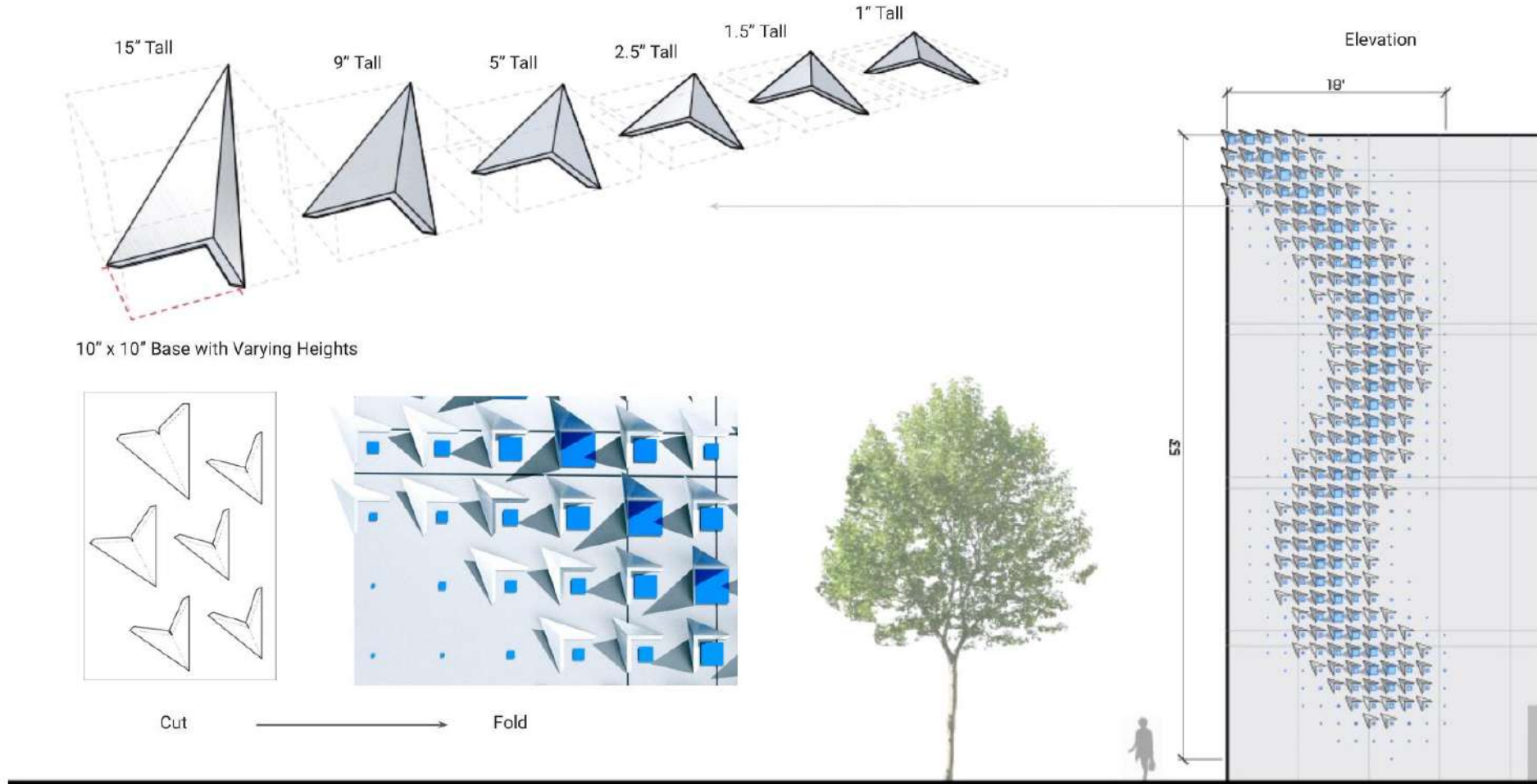




plan view / site plan



3D view / facade artwork installation



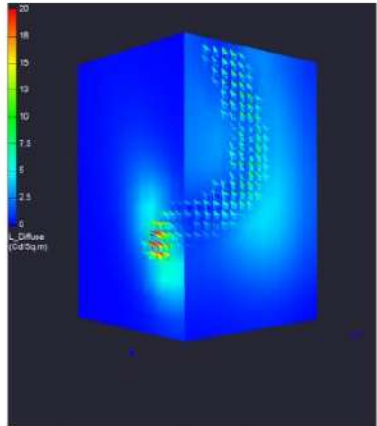
How **LONG** does it take for a single calculation ?

How **COMPLICATED** it is for testing types, locations, and aiming angles?

Can we rely on the lighting **EFFECT** of the renderings?

#Efficiency #Accuracy #Aesthetics

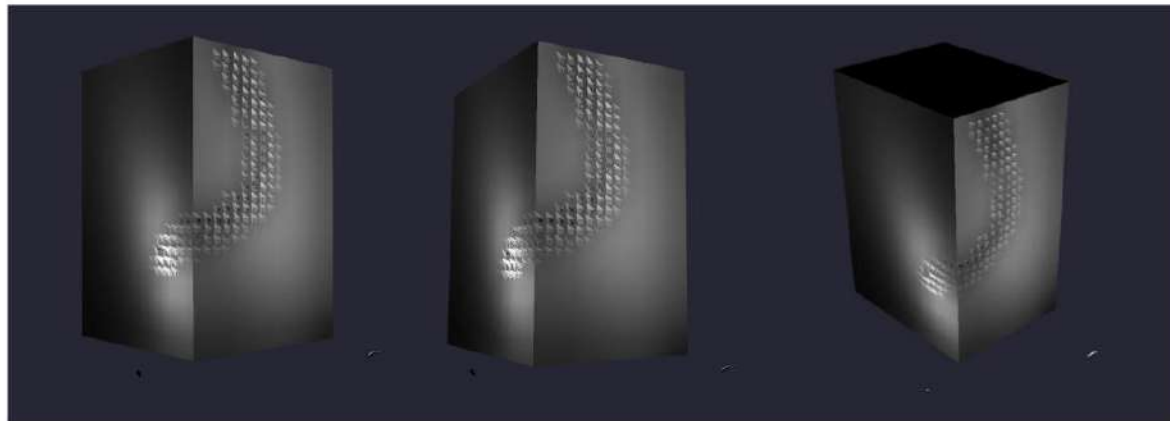
AGi32



Render - Display Properties

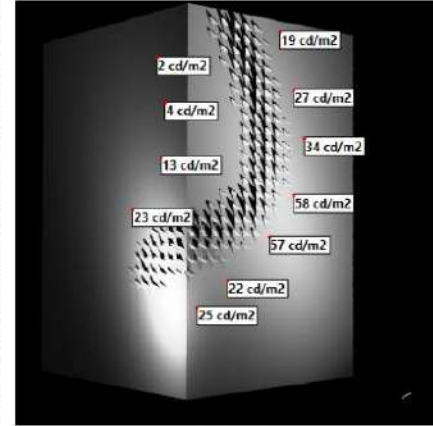
Analysis	Model Mode Overlay Settings	Color Temperature
Display <input type="checkbox"/> Wireframe <input type="checkbox"/> Hidden Wireframe <input type="checkbox"/> Shaded <input checked="" type="checkbox"/> Radiosity <input type="checkbox"/> Radiosity/Wireframe Color/Metric <input type="checkbox"/> RGB Color (Luminance Only) <input type="checkbox"/> Grayscale <input checked="" type="checkbox"/> Pseudo Color <input type="checkbox"/> Luminance <input type="checkbox"/> Illuminance	Light Component <input checked="" type="checkbox"/> Direct/Indirect <input type="checkbox"/> Direct Only <input type="checkbox"/> Indirect Only Options <input checked="" type="checkbox"/> Taskbars <input type="checkbox"/> Wireframe Overlay <input checked="" type="checkbox"/> Colorize Faces/Elements/Wireframe <input type="checkbox"/> Luminous Emitter Overlay <input type="checkbox"/> Transition Surface Vectors	
Scaling Luminance (Cd/m ²) Surface Type: <input type="checkbox"/> Non-Daylight <input type="checkbox"/> Daylight Max. Rastered: 43.04 0 Max. Emitted: 0 0 <input checked="" type="checkbox"/> Apply Minimum: 20 Pixel	Illuminance (fc) Surface Type: <input type="checkbox"/> Non-Daylight <input type="checkbox"/> Daylight Maximum: 3437 0 <input checked="" type="checkbox"/> Apply Minimum: 30 Raster	
Scale Type: <input checked="" type="checkbox"/> Linear <input type="checkbox"/> Power Law <input checked="" type="checkbox"/> Display Scale With Image (only when Apply Minimum is selected, Grayscale and Pseudo Color only) Scale Size: <input checked="" type="checkbox"/> Auto <input type="checkbox"/> Small <input type="checkbox"/> Medium <input type="checkbox"/> Large Exposure: Get Exposure For: <input checked="" type="checkbox"/> All Surface Types <input type="checkbox"/> Non-Daylight Surfaces <input type="checkbox"/> Daylight Surfaces Exposure Setting: 0.00		

Luminance Analysis / contrast study



3D rendering / shadow study

Honeybee

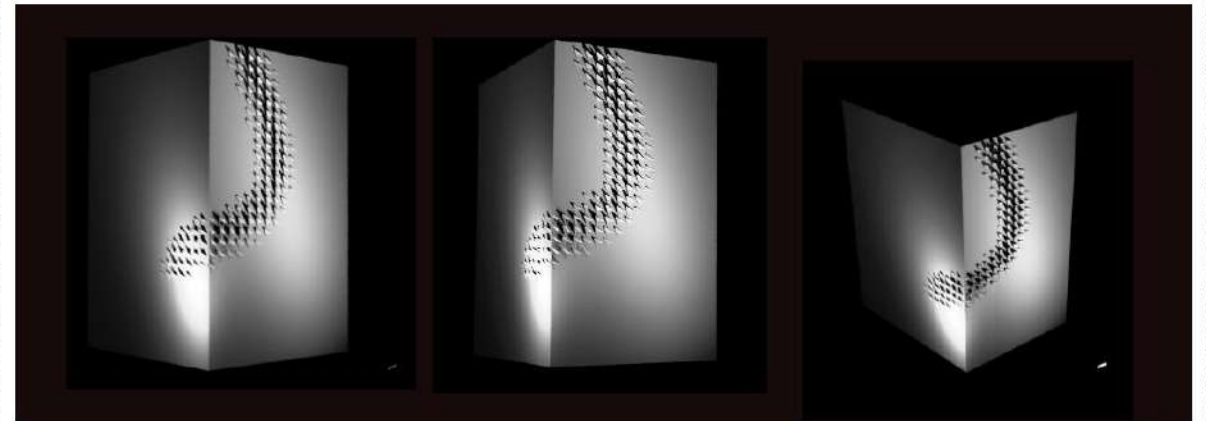


open HDR
save image

Labels
falsecolor
display

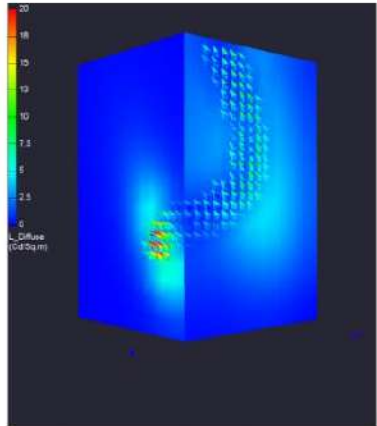
acuity loss
 veiling glare
 contrast
 color loss
 exp =0
 linear response
 centre-w. avg
 display range
 0.5 to 100
 apply pcond
 save bitmap

Luminance Analysis / contrast study



3D rendering / shadow study

AGi32



Render - Display Properties

Analysis | Initial View Order Settings | Color Temperature

Display

- Wireframe
- Hidden Wireframe
- Shaded
- Radiosity
- Radiosity/Wireframe

Color/Metric

- RGB Color/Luminance (Unit)
- Grayscale
- Pseudo Color
 - Luminance
 - Illuminance

Scaling

Luminance (cd/m²)

Surface Type: Non-Default Default

Max. Relaxed: 43.04 | 0

Max. Exposed: 0 | 0

Apply Minimum: 20 | Pixel

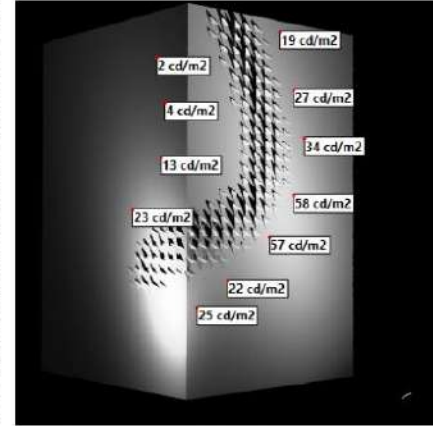
Display modification flexibility

Luminance Analysis / **contrast study**



3D rendering / **shadow study**

Honeybee



open HDR

save image

labels

falsecolor

display

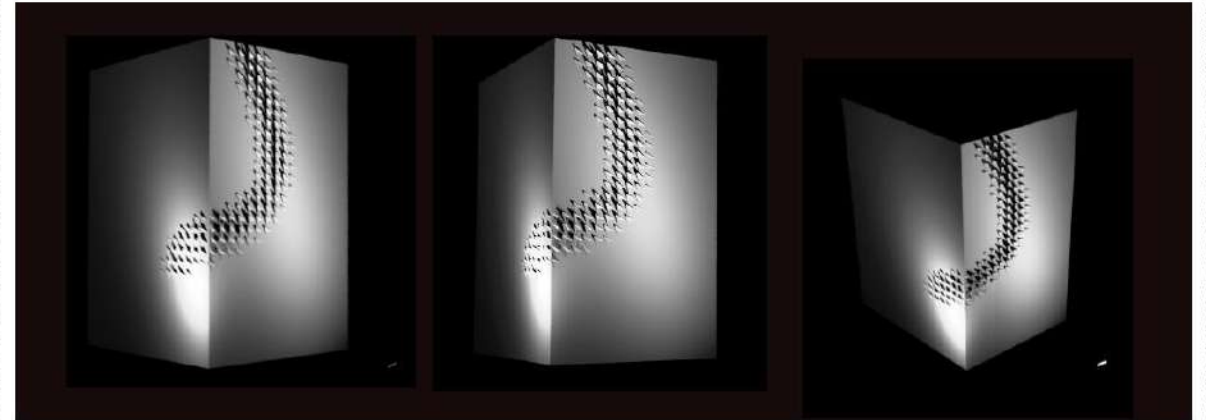
- acuity loss
- veiling glare
- contrast
- color loss
- exp: +0
- linear response
- centre-w. avg
- display range: 0.5 to 100

copy point

save bitmap

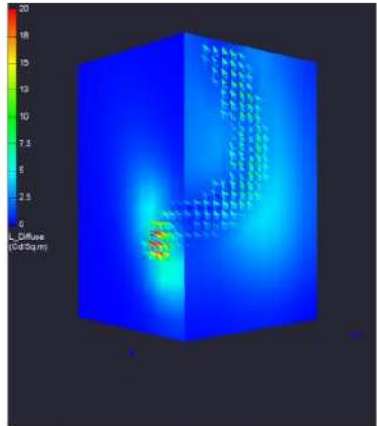
Display modification flexibility

Luminance Analysis / **contrast study**



3D rendering / **shadow study**

AGi32



Render - Display Properties

Analysis | Initial View Details | Color Temperature

Display

- Wireframe
- Hidden Wireframe
- Shaded
- Radiosity
- Radiosity/Wireframe

Color/Metric

- RGB Color/Luminescence Unit
- Grayscale
- Luminescence
- Pseudo Color
- Illuminance

Scaling

Luminescence (Cd/Scm)

Surface Type: Non-Default Default

Max. Relaxed:

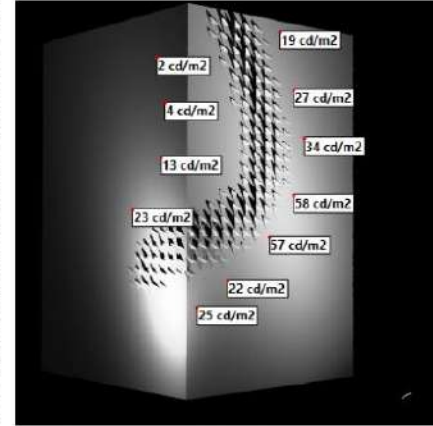
Max. Exposed:

Apply Minimum:

Display modification flexibility

Luminescence Analysis / **contrast study**

Honeybee



open HDR

save image

labels

falsecolor

display

- acuity loss
- veiling glare
- contrast
- color loss
- exp
- linear response
- centre-w. avg
- display range
- to

copy panel

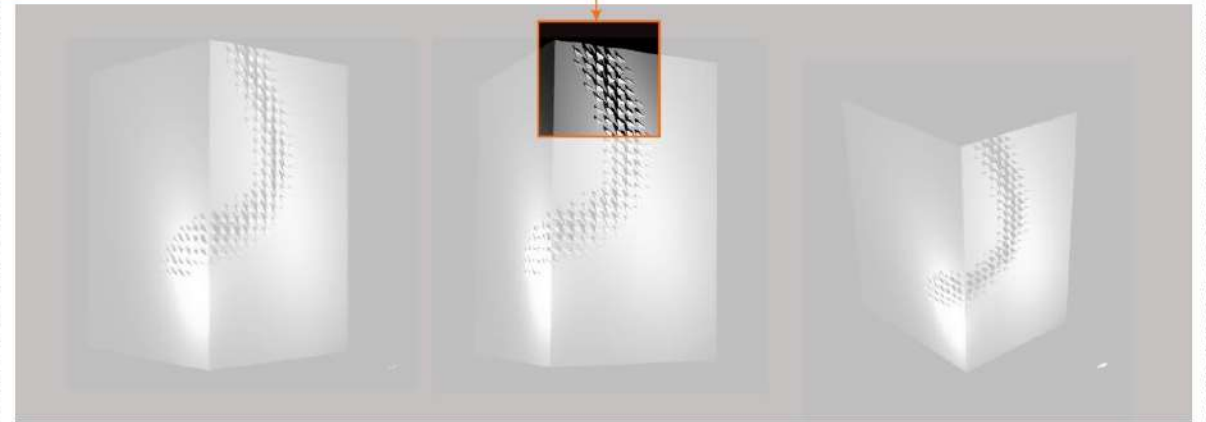
save bitmap

Display modification flexibility

Luminescence Analysis / **contrast study**

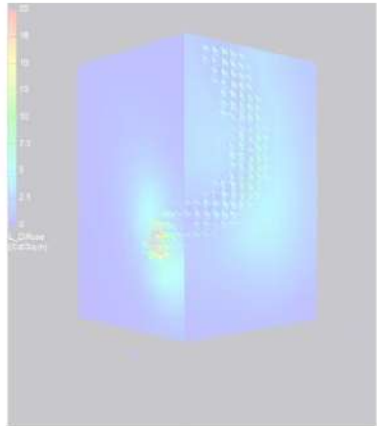


3D rendering / **shadow study**



3D rendering / **shadow study**

AGi32



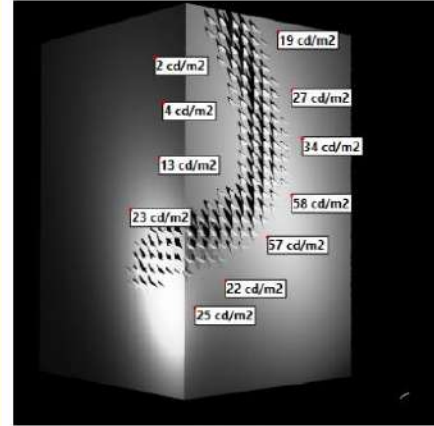
Display modification flexibility

Luminance Analysis / contrast study



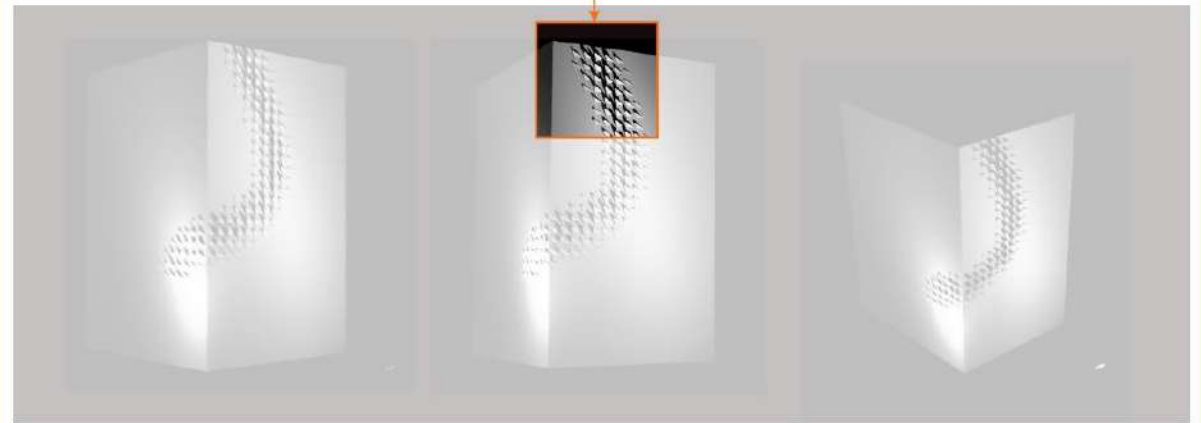
3D rendering / shadow study

Honeybee



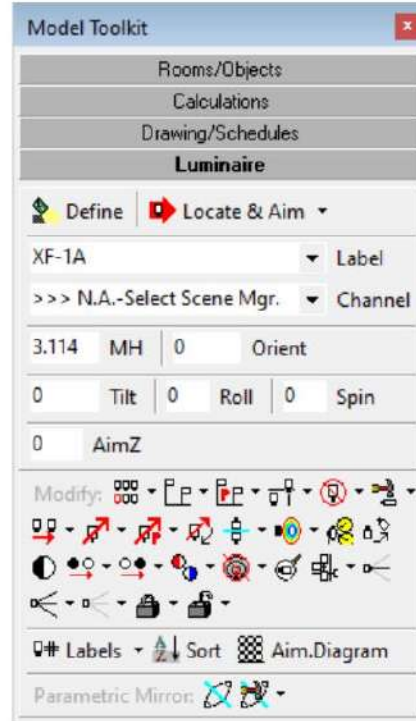
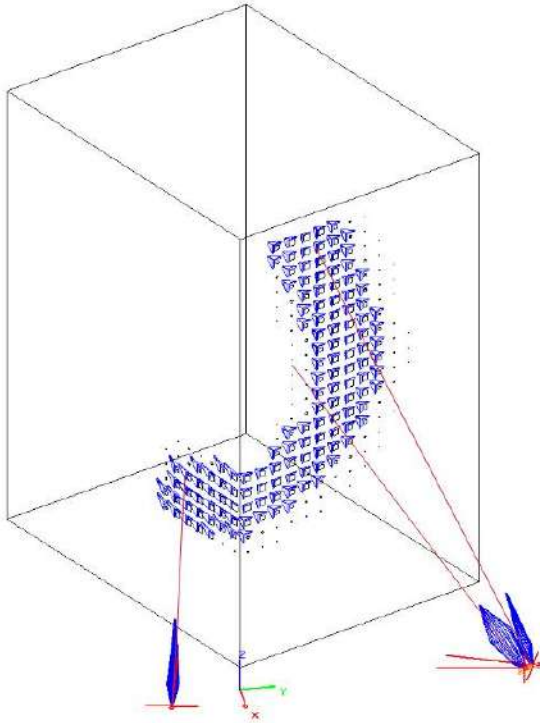
Display modification flexibility

Luminance Analysis / contrast study



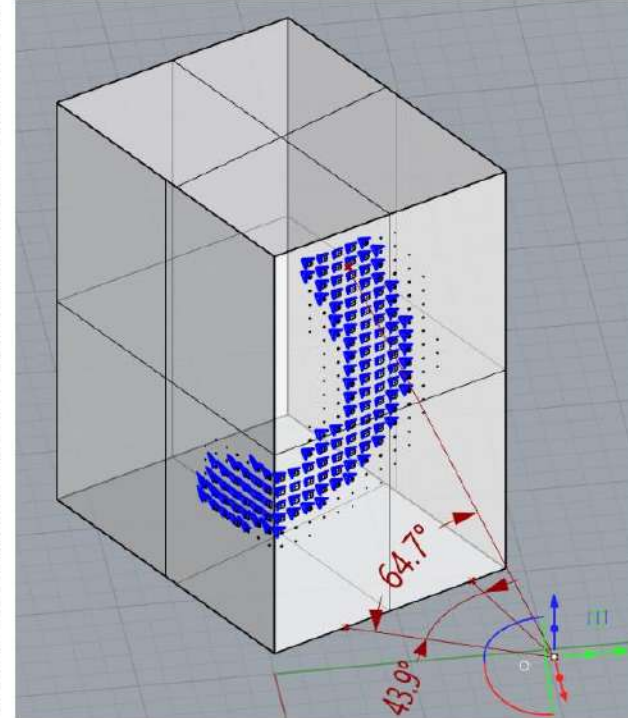
3D rendering / shadow study

AGi32

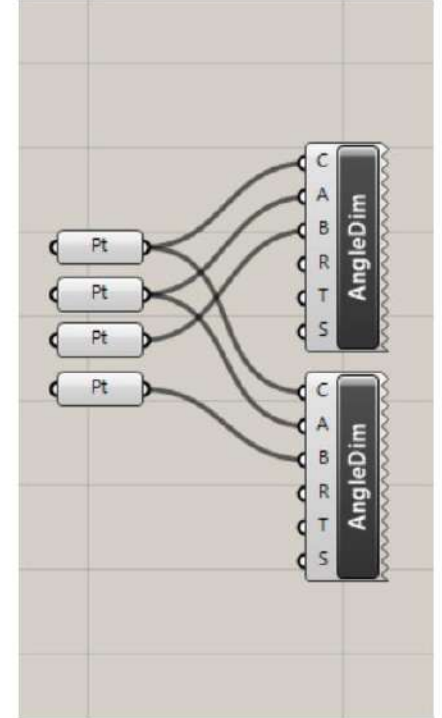


working view / user interface

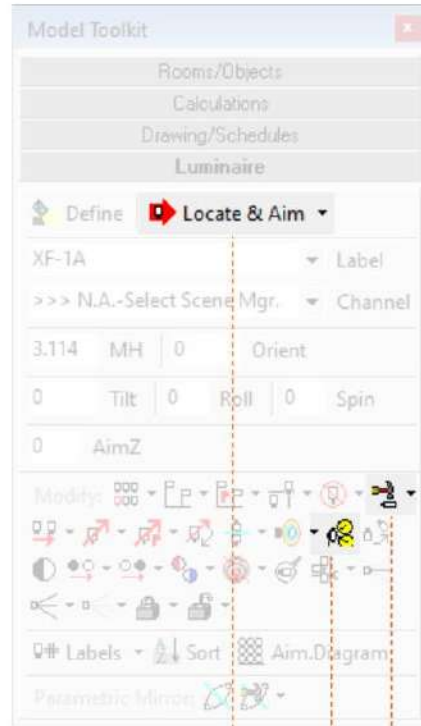
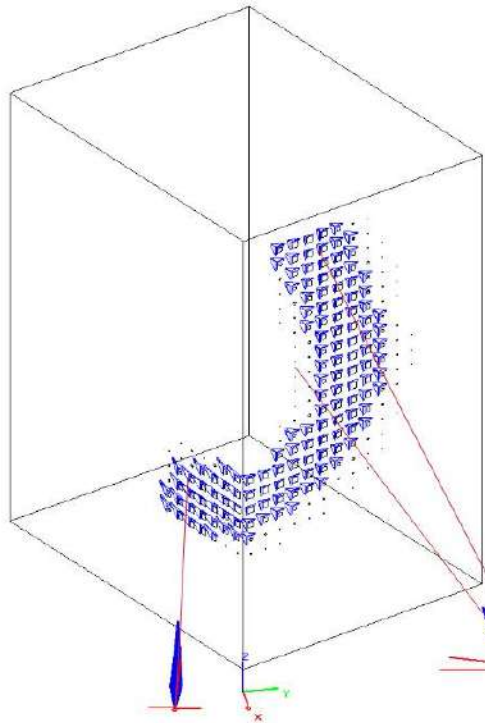
Honeybee



working view / user interface



AGi32



working view / user interface

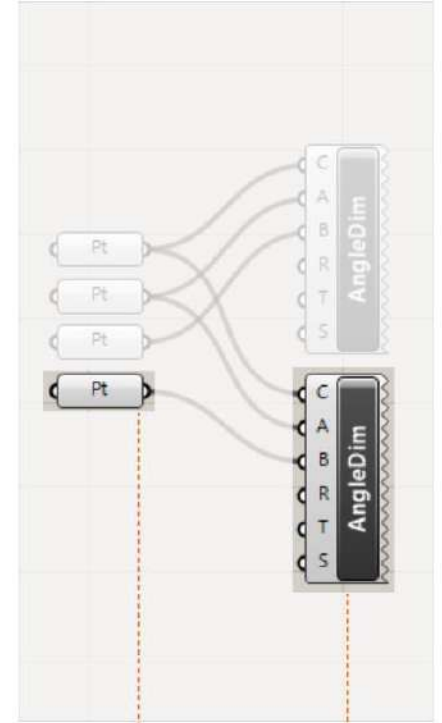
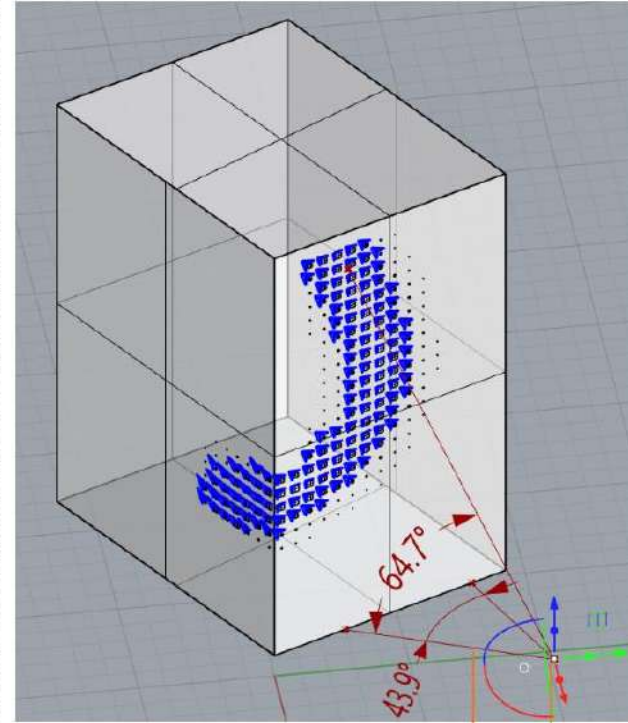
Fixture Location

Locate Luminaire

Re-Aim Luminaire

Edit Luminaire(s)

Honeybee

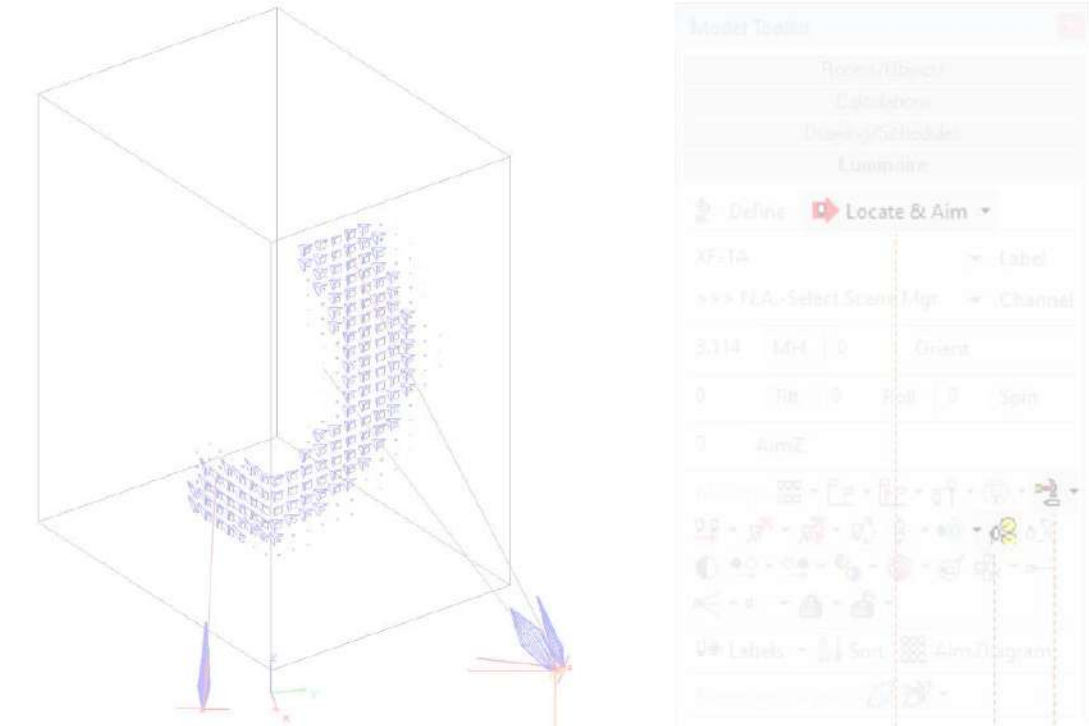


working view / user interface

Fixture Location /
Aiming Point

Aiming Angle Visualization

AGi32



working view / user interface

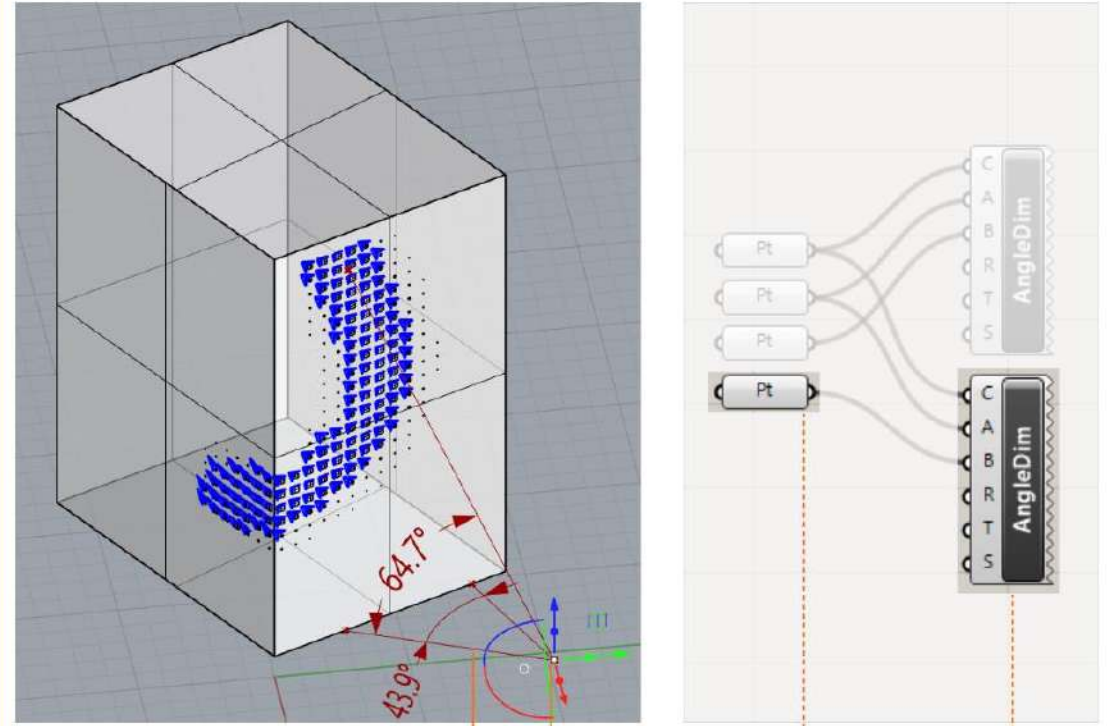
Fixture Location

Locate Luminaire

Re-Aim Luminaire

Edit Luminaire(s)



Honeybee

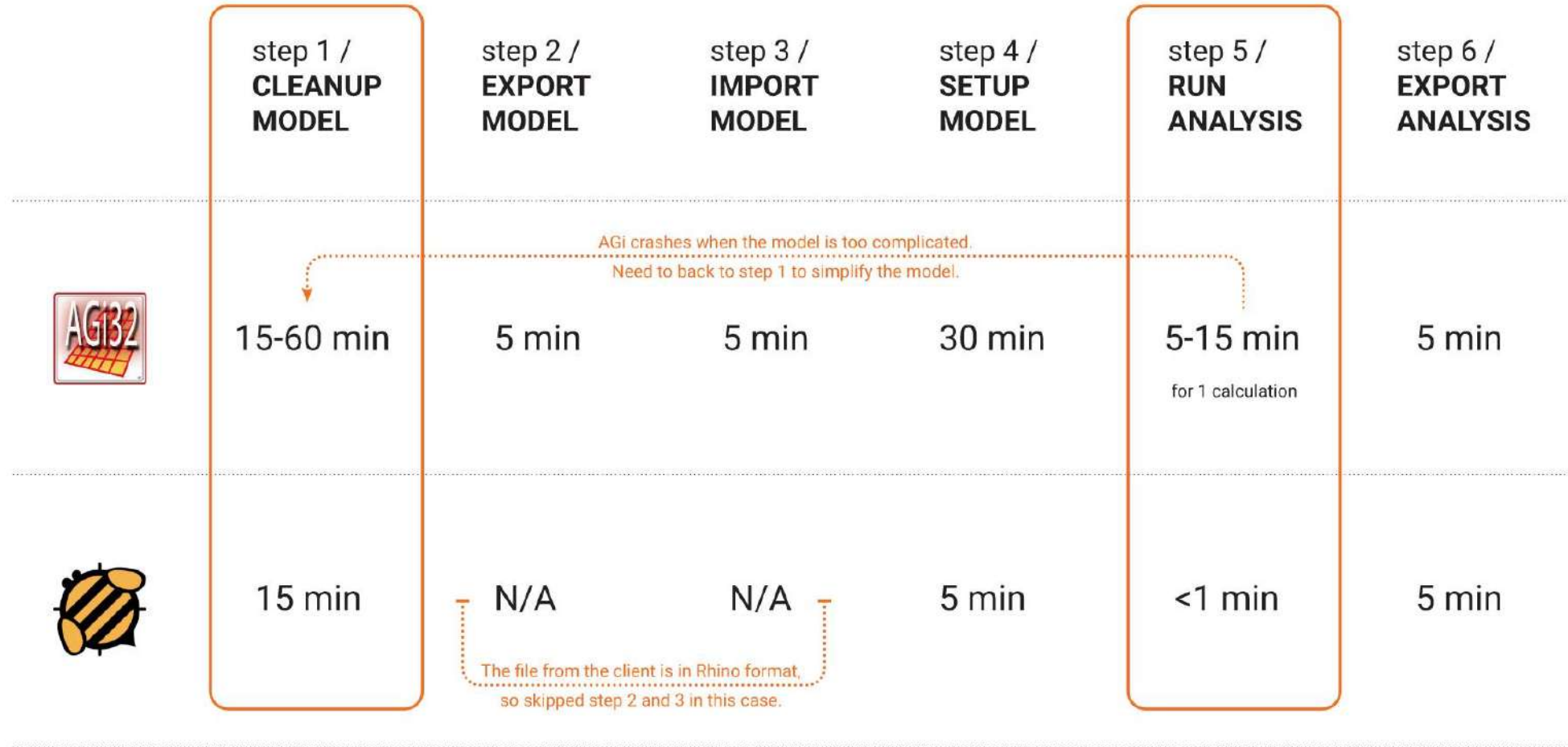




working view / user interface

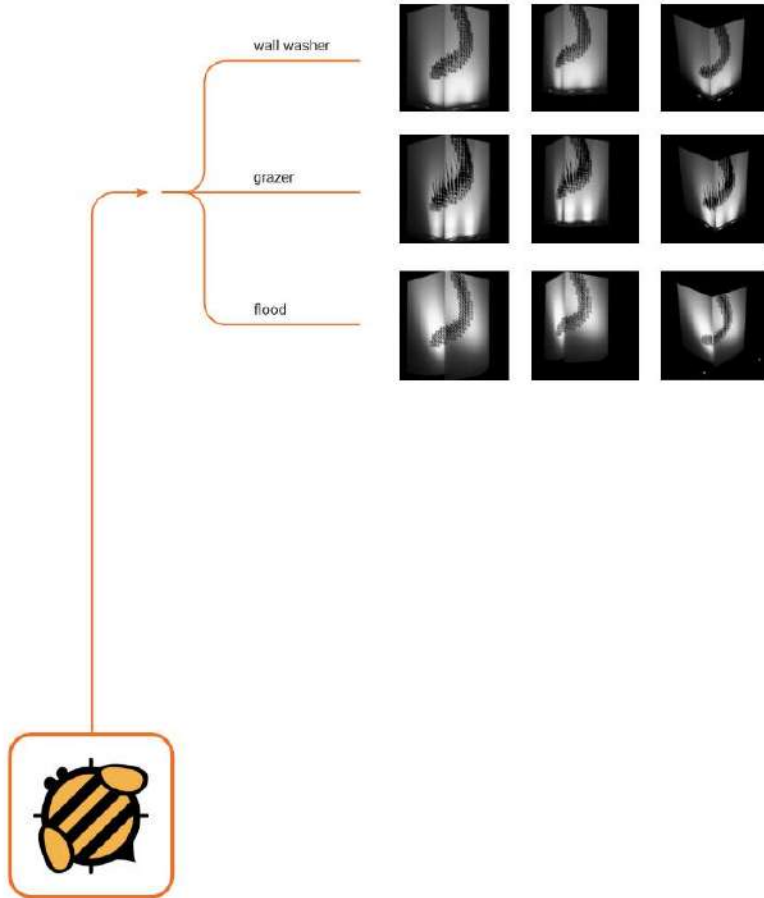
Fixture Location /
Aiming Point

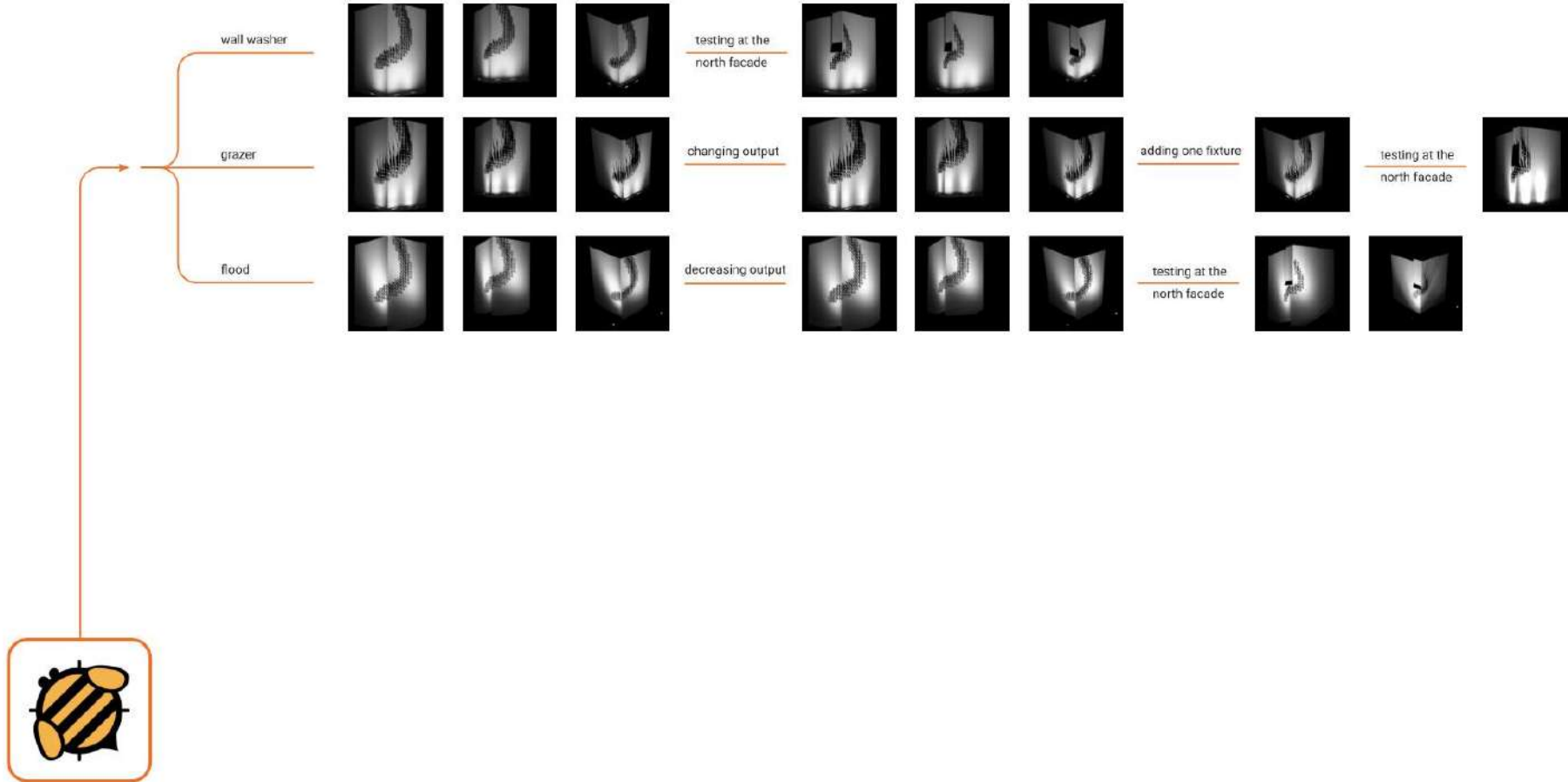
Aiming Angle Visualization

	step 1 / CLEANUP MODEL	step 2 / EXPORT MODEL	step 3 / IMPORT MODEL	step 4 / SETUP MODEL	step 5 / RUN ANALYSIS	step 6 / EXPORT ANALYSIS
	15-60 min	5 min	5 min	30 min	5-15 min <small>for 1 calculation</small>	5 min
	15 min	N/A	N/A	5 min	<1 min	5 min

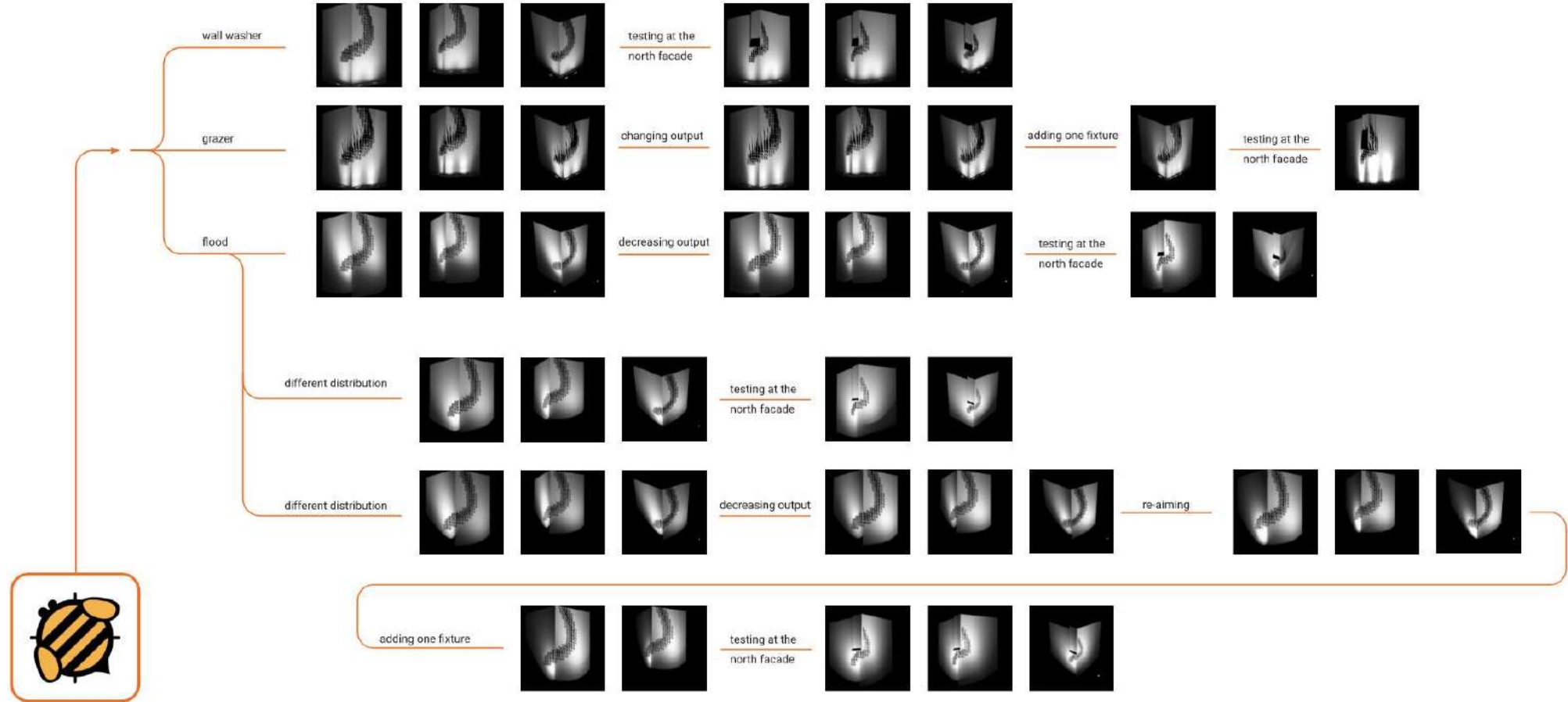


	step 1 / CLEANUP MODEL	step 2 / EXPORT MODEL	step 3 / IMPORT MODEL	step 4 / SETUP MODEL	step 5 / RUN ANALYSIS	step 6 / EXPORT ANALYSIS
	15-60 min	5 min	5 min	30 min	5-15 min <small>for 1 calculation</small>	5 min
	15 min	N/A	N/A	5 min	<1 min	5 min



















		
Set up	● ● ● ○ ○	● ● ● ○ ○
Export/Import Function	● ● ● ○ ○	○ ○ ○ ○ ○
Running Time	● ● ○ ○ ○	● ● ● ● ●
Aiming Function	● ● ○ ○ ○	● ● ● ● ○
Aiming Visualization	● ● ● ○ ○	● ● ● ● ○
Shadow Study	● ● ○ ○ ○	● ● ● ● ○
Luminance Contrast Study	● ● ● ● ○	● ● ● ● ○



	AGB2	Bee	#Efficiency
Set up	● ● ● ○ ○	● ● ● ○ ○	
Export/Import Function	● ● ● ○ ○	○ ○ ○ ○ ○	
Running Time	● ● ○ ○ ○	● ● ● ● ●	
Aiming Function	● ● ○ ○ ○	● ● ● ● ○	
Aiming Visualization	● ● ● ○ ○	● ● ● ● ○	
Shadow Study	● ● ○ ○ ○	● ● ● ● ○	
Luminance Contrast Study	● ● ● ● ○	● ● ● ● ○	

			
Set up	● ● ● ○ ○	● ● ● ○ ○	
Export/Import Function	● ● ● ○ ○	○ ○ ○ ○ ○	
Running Time	● ● ○ ○ ○	● ● ● ● ●	
Aiming Function	● ● ○ ○ ○	● ● ● ● ○	#Accuracy
Aiming Visualization	● ● ● ○ ○	● ● ● ● ○	
Shadow Study	● ● ○ ○ ○	● ● ● ● ○	
Luminance Contrast Study	● ● ● ● ○	● ● ● ● ○	

			
Set up	● ● ● ○ ○	● ● ● ○ ○	
Export/Import Function	● ● ● ○ ○	○ ○ ○ ○ ○	
Running Time	● ● ○ ○ ○	● ● ● ● ●	
Aiming Function	● ● ○ ○ ○	● ● ● ● ○	
Aiming Visualization	● ● ● ○ ○	● ● ● ● ○	
Shadow Study	● ● ○ ○ ○	● ● ● ● ○	#Aesthetics
Luminance Contrast Study	● ● ● ● ○	● ● ● ● ○	



Set up	● ● ● ○ ○	● ● ● ○ ○	#Efficiency
Export/Import Function	● ● ● ○ ○	○ ○ ○ ○ ○	
Running Time	● ● ○ ○ ○	● ● ● ● ●	
Aiming Function	● ● ○ ○ ○	● ● ● ● ○	#Accuracy
Aiming Visualization	● ● ● ○ ○	● ● ● ● ○	
Shadow Study	● ● ○ ○ ○	● ● ● ● ○	#Aesthetics
Luminance Contrast Study	● ● ● ● ○	● ● ● ● ○	

DAYLIGHT ANALYSIS

CLIMATE STUDIO
LIGHTSTANZA
AGI 32

When do we need to do a daylight study?

Schematic Design /

**Design
Consulting**

Design Development /

**Support
Design
Strategy**

Construction Documents /

**LEED
Report**

When do we need to do a daylight study?



Development Project Offices

Location **Sloatsburg, NY**

Analysis:
**Building facade analysis
(window/wall ratios)**

Criteria:
Design consulting only

Tools for Analysis:
AGI32

Goal of Analysis:
Design consulting

Development Project Offices

Location **Sloatsburg, NY**

Analysis:
**Building facade analysis
(window/wall ratios)**

Criteria:
Design consulting only

Tools for Analysis:
AGI32

Goal of Analysis:
Design consulting

- **Facade Fenestration**
- **Office Room**



FACADE Models

↓
10

OFFICE Models

↓
23

A3-2.1 | Facade Optimization Analysis - Daylight Analysis

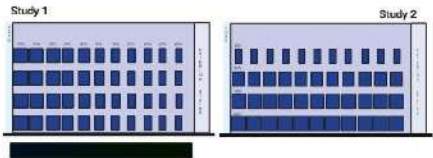
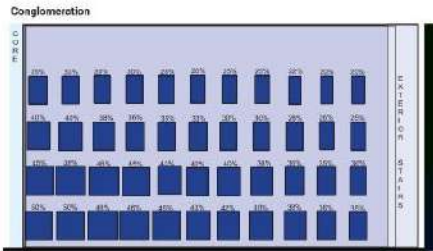
The daylight analysis focuses on three distinct criteria: daylight penetration through the various floor plates, window location to minimize glare and/or contrast, and strategies for individual offices to reduce and/or balance electric lighting requirements.

To analyze the first criterion, BSA used a photometric calculation program (Axi 32) that employs two different calculation methods: direct calculation for point-to-point analysis and full radiosity for renderings and the interaction of surfaces and inter-reflected light.

BSA developed models that take into account the amount, intensity, quantity and angle of the daylight that penetrates each of the floor plates. The analysis considered a year-round range of conditions, ultimately reporting the winter and summer solstices as extremes of the daylight penetration.

Using the same parameters of Window-to-Wall Ratio (WWR) as the thermal studies, the daylight penetration study calculated a variety of scenarios with the window apertures ranging from 20% to 50%. The WWR range was varied across all the facade both horizontally and vertically. The conclusion was that a gradient was optimal.

Facade areas that have the least amount of exposure to sunlight (due to building shading) should receive the largest WWR (50%), while the facade areas with the greatest amount of exposure to sunlight should have the smallest WWR (20%). Typically, the areas with the lowest exposure are located at the ground levels nearest the core of the building.



A3-2.2 | Window/Wall Ratios Variation 20% to 60%

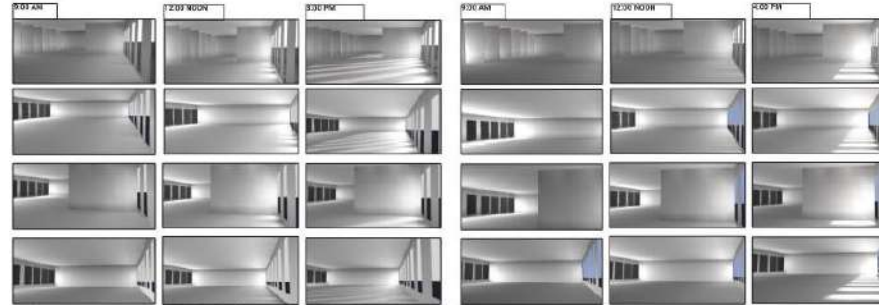
Using study models, BSA was able to evaluate the daylight response to various WWR (ranging from 20% to 60%, not only by the position on the facade but throughout the day and seasons. The insertion of potential office or conference room walls allows for evaluation of the inter-reflected light throughout the space as well as the effect of the light on the vertical surfaces. It is clear that the exact position of the walls with regard to the window location in the 10x15' module can exacerbate the high-contrast, or help push the light further into the space lessening the reliance on electric lighting.

Winter Solstice

In the winter months the sun is lower in the sky thereby creating deeper penetration of daylight throughout various times in the day.

Summer Solstice

During the summer months the penetration of daylight is more intense, with crisper lines and higher contrast. The daylight does not penetrate as deep during typical office hours despite the longer days of daylight.



Example morning hours when a minimal daylight penetration into the floor plate. However, as inter-reflected light off the vertical surfaces... Around 12:00 noon the daylight begins to move into the volume, leaving the lower of the building shaded (for approximately an hour 12:00-1:00pm)... During the afternoon hours the light penetrates the entire floor plate with a well defined light quality (especially in the region)... The light begins to enter the building around 4:00pm with some of light along the east facade. This is the best possible for office workers and guest at the end of the workday. By 5:00pm the light is subtle as the sun approaches the sky... Between 1:00pm and 3:00pm the light penetrates into both facades does not enter deeply into the building floor plate and is neutral even regardless of orientation. Many lights do to inter-reflected light from the vertical and horizontal surfaces... In the afternoon hours from 3:00pm onward the sun sets the most light is coming, creating most discomfort due to glare. Glare shadows and high contrast may need some mitigating techniques (blinds, shades, etc.)

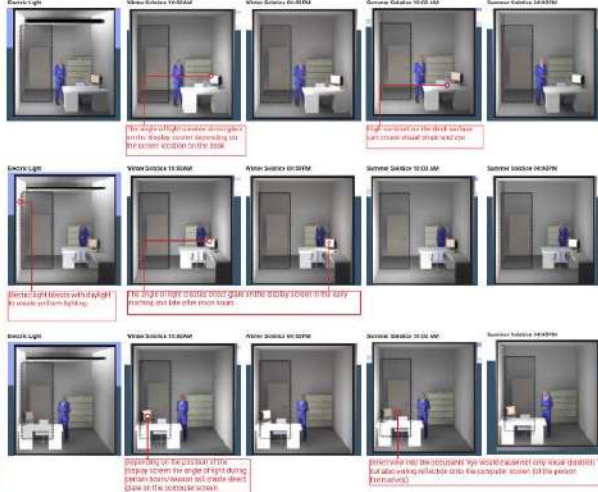
A3-2.3 | 20% Window/Wall Ratios

Detailed analysis of the greatest WWR 50% and smallest WWR 20% provides context for hypothetical furniture layouts. By modifying the layouts we can analyze the visual discomfort/glare of occupants during certain times of day and season.

With the smaller WWR the location of the window with regards to the interior walls is critical not only for the daylight on the wall but for the placement of the desk (and computer on the desk).

Ideally the computer would be located to avoid direct daylight while still providing direct view out the window and brightness on the wall surface across from occupant.

The addition of electric lighting helps to analyze how intensity, location and distribution may mitigate high contrast on vertical surfaces.

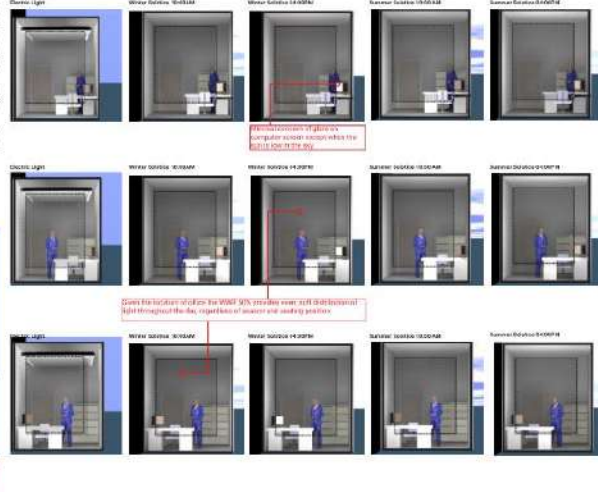


A3-2.4 | 50% Window/Wall Ratios

With the largest WWR there is no ability to determine the location of the window - it must be centered in the building module. This means that the position of the desk, and more importantly computer, is critical to avoid glare during the very early and very late hours of daylight when the sun is low in the sky. However those do tend to be fleeting hours with the sun dropping quickly.

Given the position of the 50% WWR on the facade (near the core and to the ground) the direct glare associated with the daylight is minimal.

Therefore greater latitude can be given to the desk location/position. It is still recommended to avoid location of the computer with a direct view of the window whenever feasible.



step 1 /
**EXPORT
MODEL**

step 2 /
**IMPORT
MODEL**

step 3 /
**CLEANUP
MODEL**

step 4 /
**SETUP
MODEL**

step 5 /
**RUN
ANALYSIS**

step 6 /
**EXPORT
ANALYSIS**



N/A

N/A

N/A

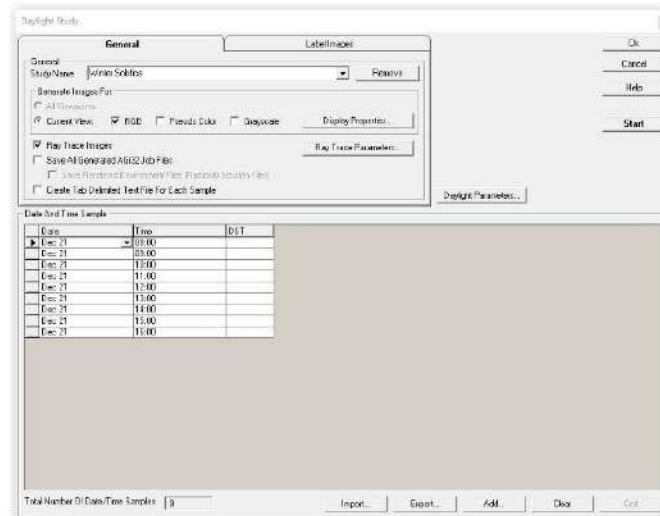
30-45 MINS
for one model

5 MINS
for one model

2-3 hours

01. Build the study model = 30 mins
AutoCAD / Rhino / Sketch

02. Interface Unfriendly
Viewpoint / Point Calculation



03. Total Simulation Time = 2 hours

04. Questions:

No sDA / ASE / DA / UDI etc.



Holyoke Soldiers Home Healthcare

Location **Holyoke, MA**
Architect **Payette**

Analysis:
spatial daylight autonomy (sDA)
annual sunlight exposure (ASE)

Criteria:
LEED credit (Healthcare only)
sDA 75% = 1 point
sDA 90% = 2 points

Tools for Analysis:
Climate Studio
Lightstanza

Goal of Analysis:
Support lighting design
LEED report

Holyoke Soldiers Home Healthcare

Location **Holyoke, MA**
Architect **Payette**

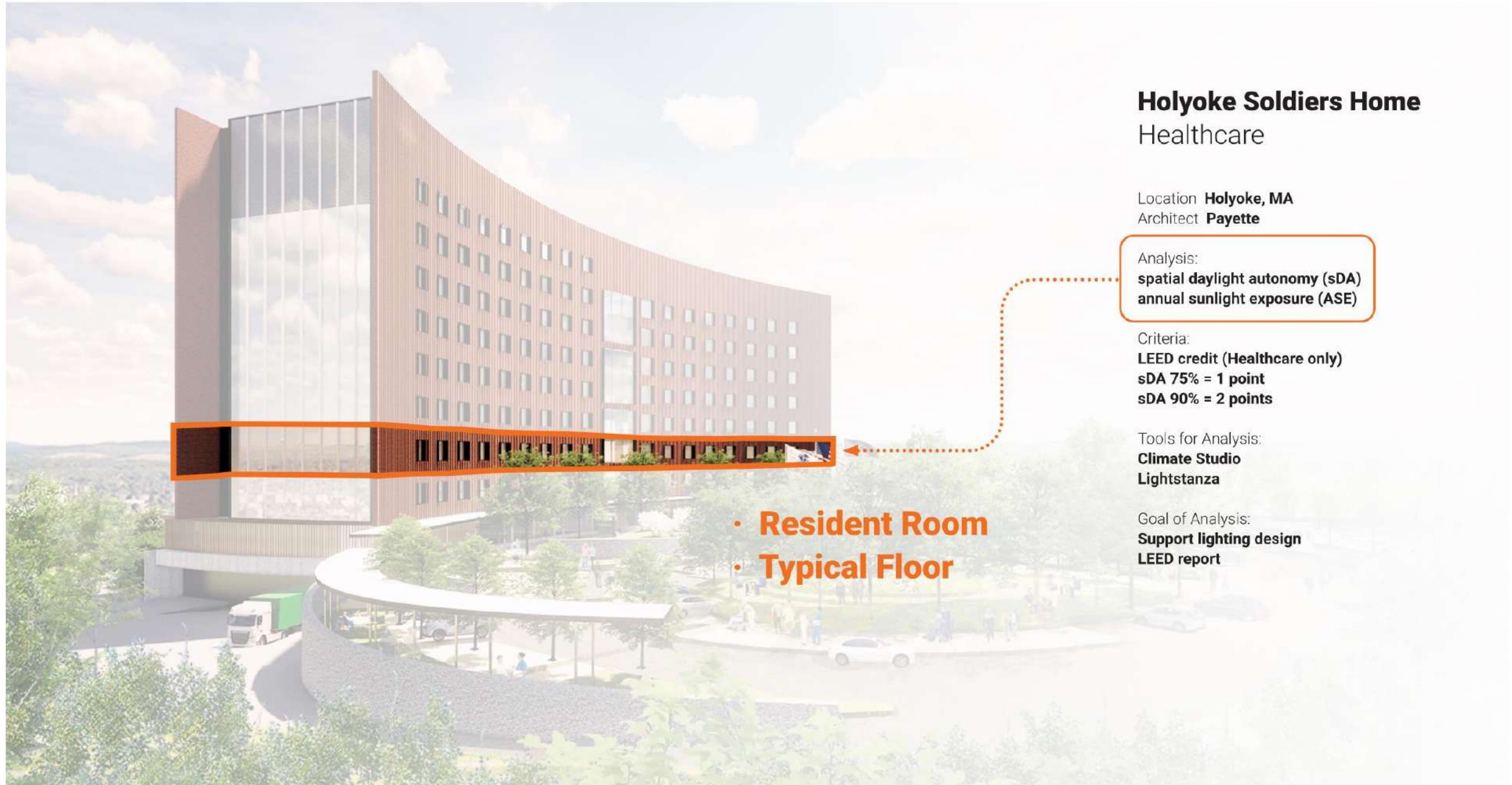
Analysis:
spatial daylight autonomy (sDA)
annual sunlight exposure (ASE)

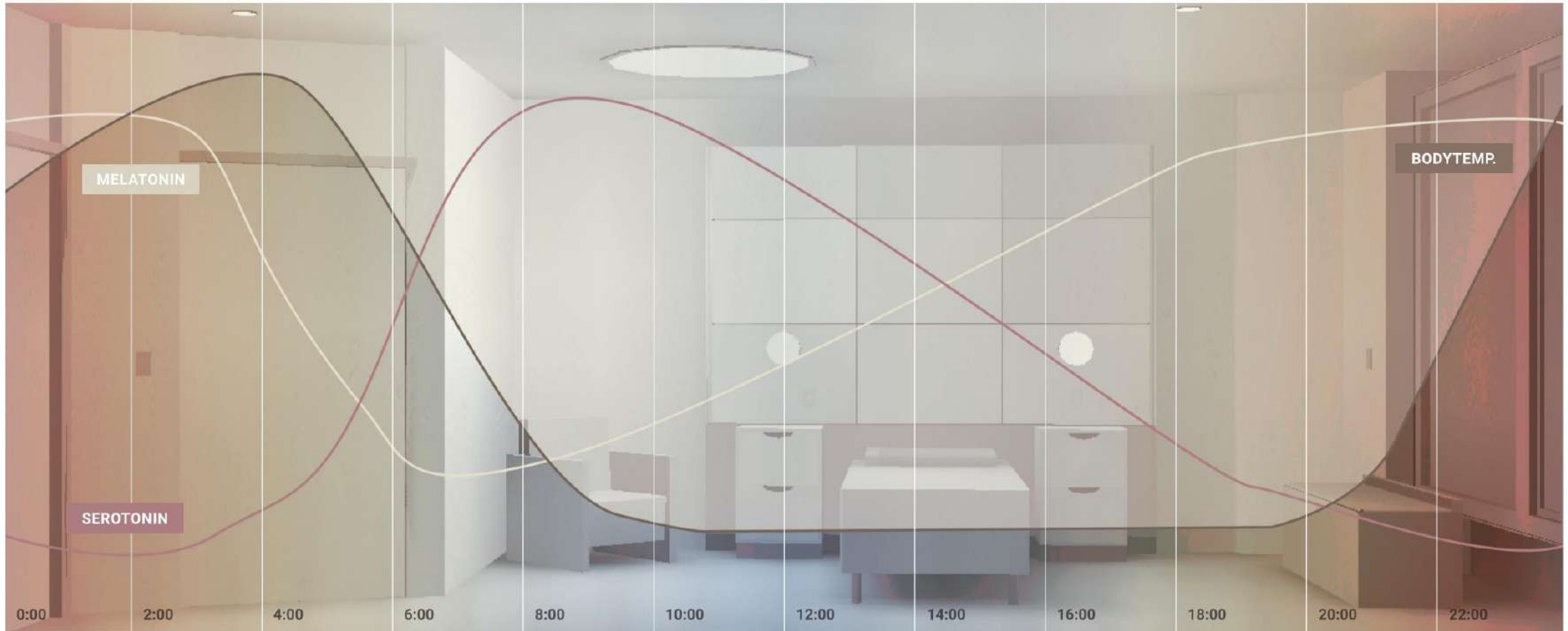
Criteria:
LEED credit (Healthcare only)
sDA 75% = 1 point
sDA 90% = 2 points

Tools for Analysis:
Climate Studio
Lightstanza

Goal of Analysis:
Support lighting design
LEED report

- **Resident Room**
- **Typical Floor**





Design Development /
01. Lighting Proposal

Construction Documents /
02. LEED Report

step 1 /
**EXPORT
MODEL**

step 2 /
**IMPORT
MODEL**

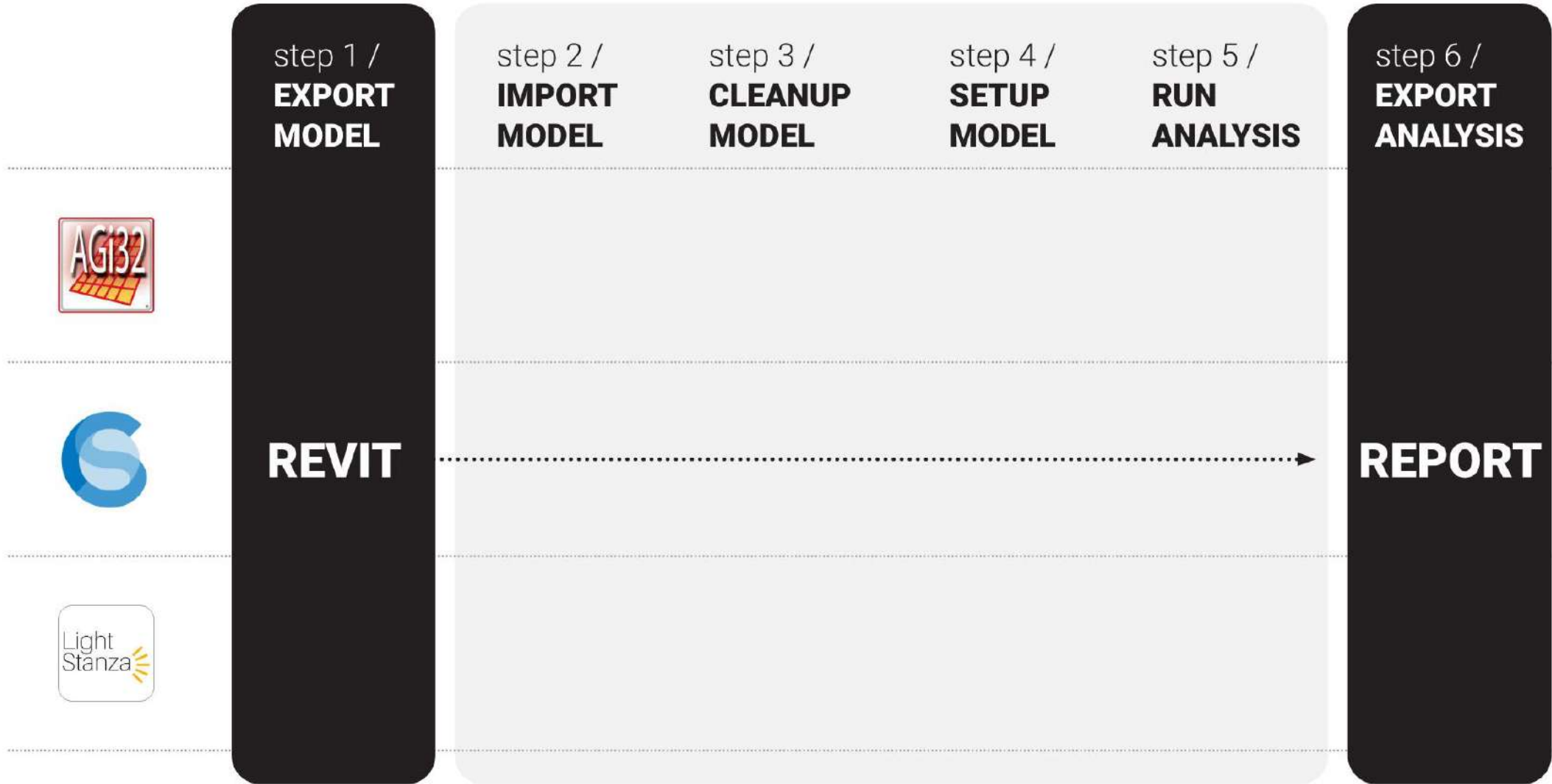
step 3 /
**CLEANUP
MODEL**

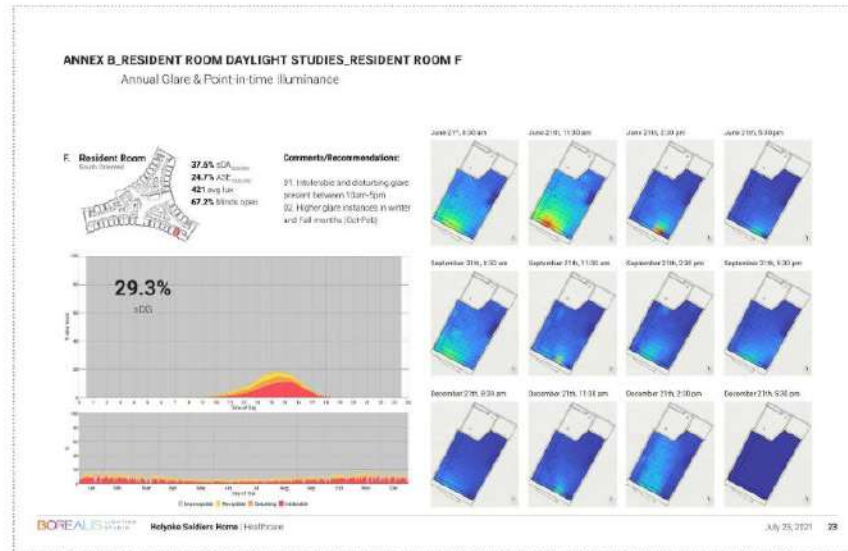
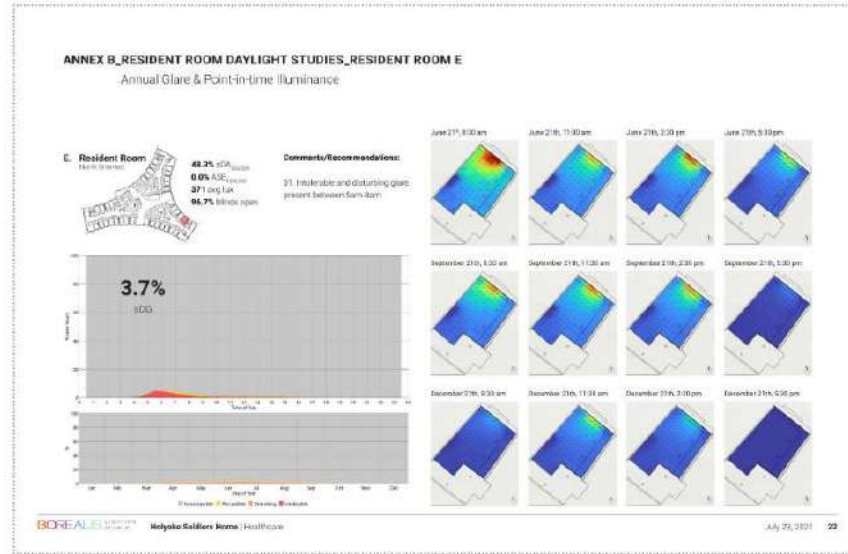
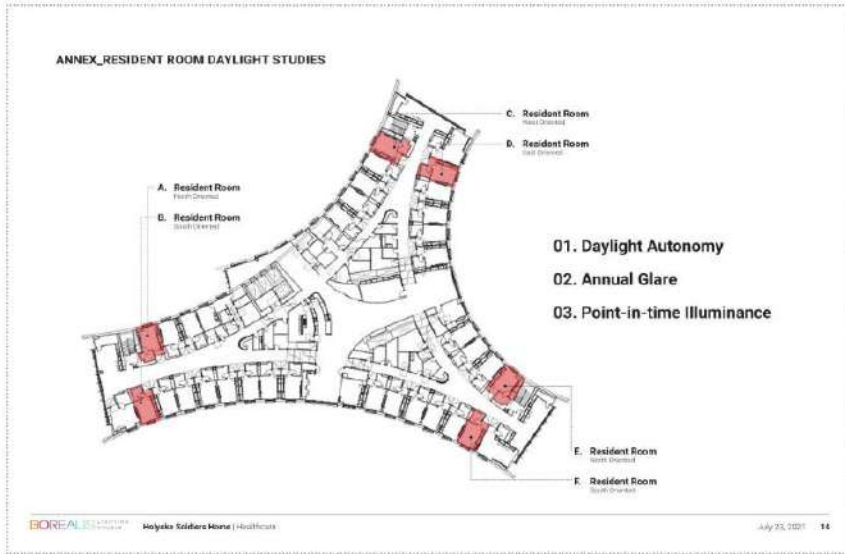
step 4 /
**SETUP
MODEL**

step 5 /
**RUN
ANALYSIS**

step 6 /
**EXPORT
ANALYSIS**







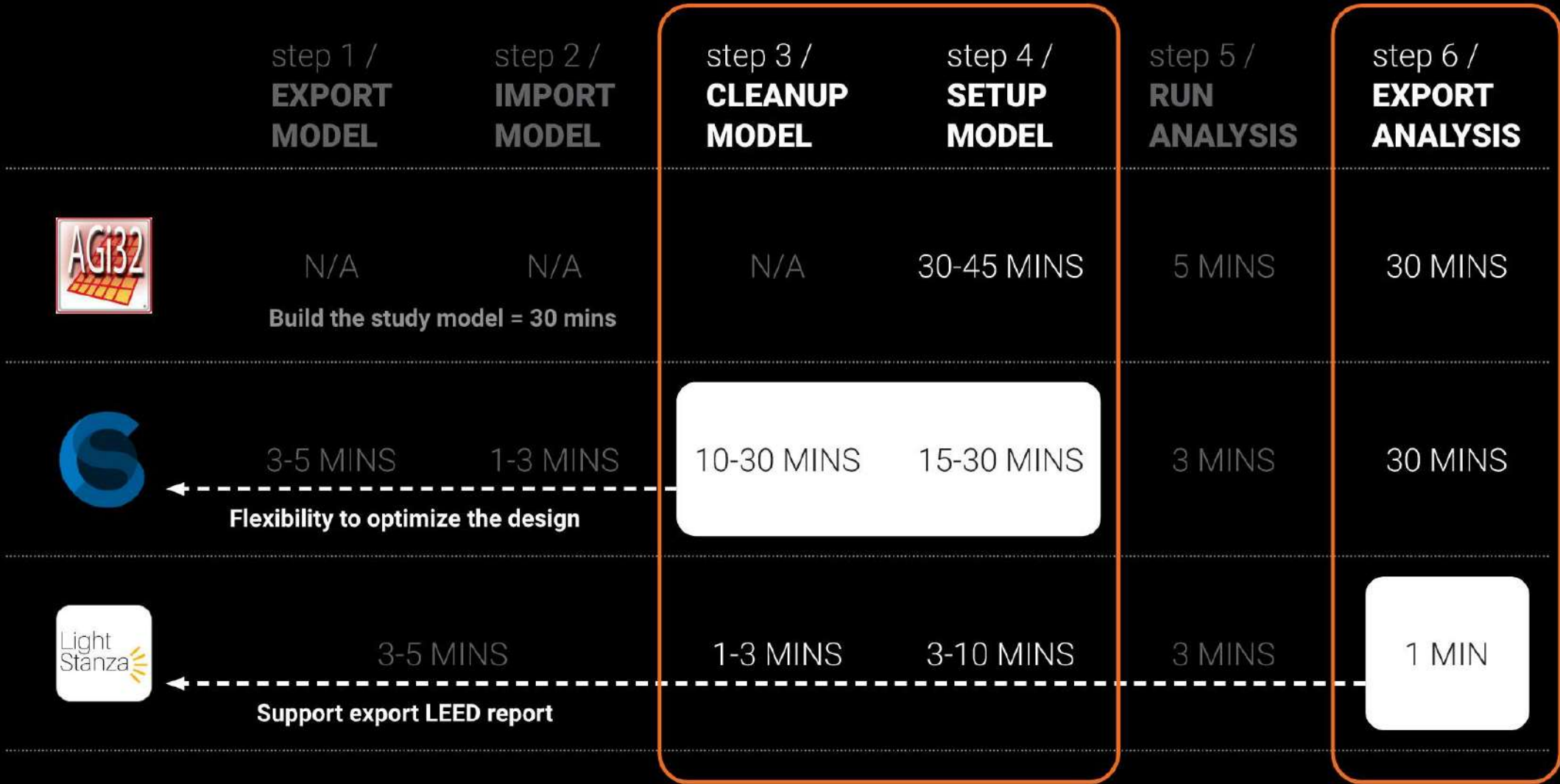









step 6 /
EXPORT ANALYSIS

a.
EXPORT RESULT

b.
EDIT REPORT

	step 1 / EXPORT MODEL	step 2 / IMPORT MODEL	step 3 / CLEANUP MODEL	step 4 / SETUP MODEL	step 5 / RUN ANALYSIS	step 6 / EXPORT ANALYSIS
	N/A Build the study model = 30 mins	N/A	N/A	30-45 MINS	5 MINS	30 MINS
	3-5 MINS	1-3 MINS	10-30 MINS	15-30 MINS	3 MINS	30 MINS
	3-5 MINS		1-3 MINS	3-10 MINS	3 MINS	1 MIN

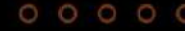


						 
Export/Import Function	● ● ● ● ●	● ● ● ○ ○	● ● ● ○ ○	○ ○ ○ ○ ○	● ● ● ○ ○	○ ○ ○ ○ ○
Interface Friendly	● ● ● ● ○	● ● ● ● ○	● ● ● ○ ○	○ ○ ○ ○ ○	● ● ● ○ ○	● ● ● ○ ○
Set up	● ● ● ● ○	● ● ● ○ ○	● ● ● ○ ○	○ ○ ○ ○ ○	● ● ● ○ ○	○ ○ ○ ○ ○
Calculating Time	● ● ● ● ○	● ● ● ● ○	● ● ● ● ○	○ ○ ○ ○ ○	● ● ● ● ○	○ ○ ○ ○ ○
Report Option	● ● ● ● ○	● ● ● ○ ○	● ● ● ○ ○	○ ○ ○ ○ ○	● ● ● ○ ○	○ ○ ○ ○ ○
Support System	● ● ● ● ●	○ ○ ○ ○ ○	● ● ● ● ●	● ● ● ● ●	● ● ● ○ ○	○ ○ ○ ○ ○
Learning Curve	● ● ● ● ○	● ● ● ○ ○	● ● ● ○ ○	● ● ● ○ ○	● ● ● ○ ○	● ● ● ○ ○
Cost					free	free

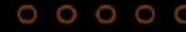
Best for Optimization



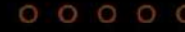
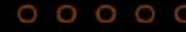
Export/Import Function



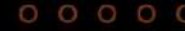
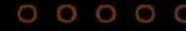
Interface Friendly



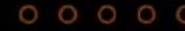
Set up



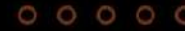
Calculating Time



Report Option



Support System



Learning Curve



Cost

free

free

Best for Large scale development

for AGI/Elum users

	Light Stanza	S	AGI32	ElumTools	Bee	Dx
Export/Import Function	●●●●●	●●●●○	●●●●○	○●●●○	●●●●○	○●●●○
Interface Friendly	●●●●○	●●●●○	●●●●○	○●●●○	●●●●○	●●●●○
Set up	●●●●○	●●●●○	●●●●○	○●●●○	●●●●○	○●●●○
Calculating Time	●●●●○	●●●●○	●●●●○	○●●●○	●●●●○	○●●●○
Report Option	●●●●○	●●●●○	●●●●○	○●●●○	●●●●○	○●●●○
Support System	●●●●●	○●●●○	●●●●●	●●●●●	●●●●○	○●●●○
Learning Curve	●●●●○	●●●●○	●●●●○	●●●●○	●●●●○	●●●●○
Cost					free	free

Good for Optimization

	Light Stanza	S	AGI32	ElumTools	Bees	Dx
Export/Import Function	●●●●●	●●●●○	●●●●○	○●●●○	●●●●○	○●●●○
Interface Friendly	●●●●○	●●●●○	●●●●○	○●●●○	●●●●○	●●●●○
Set up	●●●●○	●●●●○	●●●●○	○●●●○	●●●●○	○●●●○
Calculating Time	●●●●○	●●●●○	●●●●○	○●●●○	●●●●○	○●●●○
Report Option	●●●●○	●●●●○	●●●●○	○●●●○	●●●●○	○●●●○
Support System	●●●●●	○●●●○	●●●●●	●●●●●	●●●●○	○●●●○
Learning Curve	●●●●○	●●●●○	●●●●○	●●●●○	●●●●○	●●●●○
Cost					free	free

Easy to Use

LIGHTING RENDERING

AGI 32

ELUM TOOLS

ENSCAPE

CLIMATE STUDIO

3DMAX

When do we need to do a lighting rendering?

Purpose /

Lighting Effect:
Overall
Close-up

People /

Team
Architect
Client
Manufacturer

Issues /

Inaccuracy
Unclear
Design Concern

Suffolk Downs Redevelopment

Parcel R10

Location **Revere, MA**
Architect **Payette**

Analysis:
Canopy Entry Lighting Rendering

Criteria:
Main Entry = 1.5hFC
Balcony = 1hFC

Tools for Analysis:
AGI32, Elum, Enscape, Climate studio, 3Dmax

Goal of Analysis:
Night view rendering studies



Suffolk Downs Redevelopment

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Canopy Entry Lighting Rendering

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Main Entry = 1.5hFC
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Tools for Analysis:
AGI32, Elum, Enscape, Climate studio, 3Dmax

Goal of Analysis:
Night view rendering studies

• Glare Checking



Downlight /
Hand railing

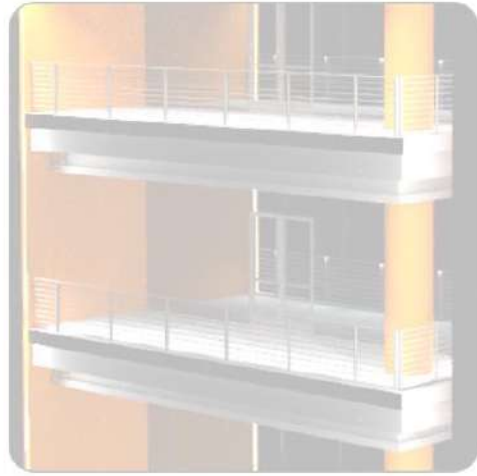


Linear /
Balcony doors



Cove /
Facade Eyebrow & Canopy





01/
AGI 32

the majority of users



02/
Elum Tools

the same system with AGI



03/
Enscape

one of the most common rendering plugins



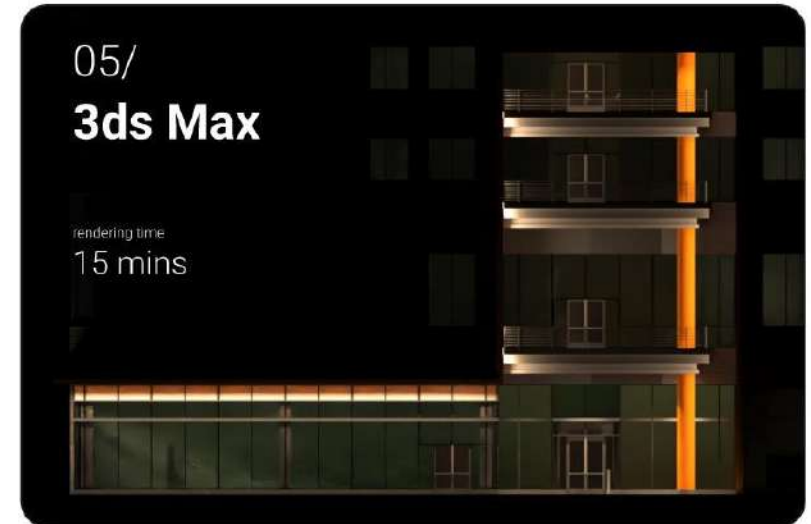
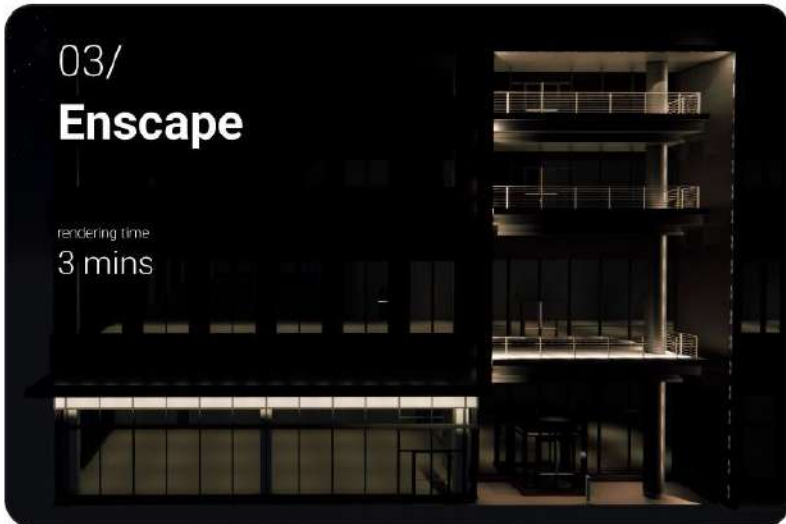
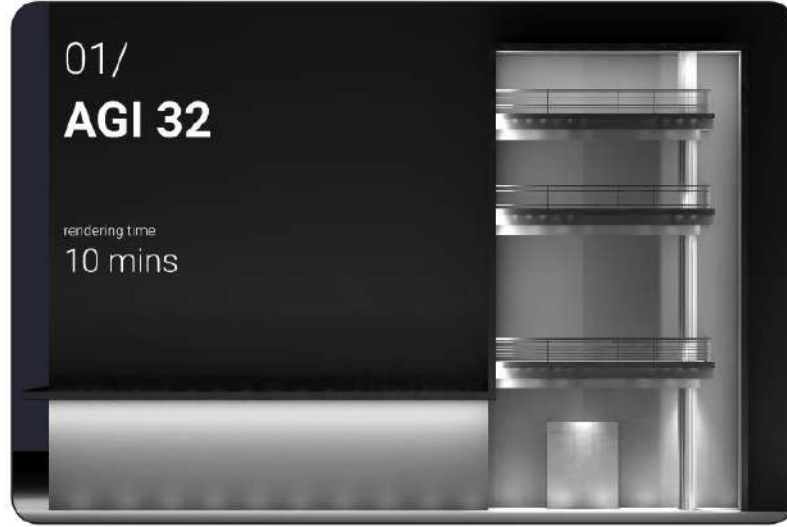
04/
Climate Studio

the latest update: luminaire



05/
3ds Max

the best rendering software

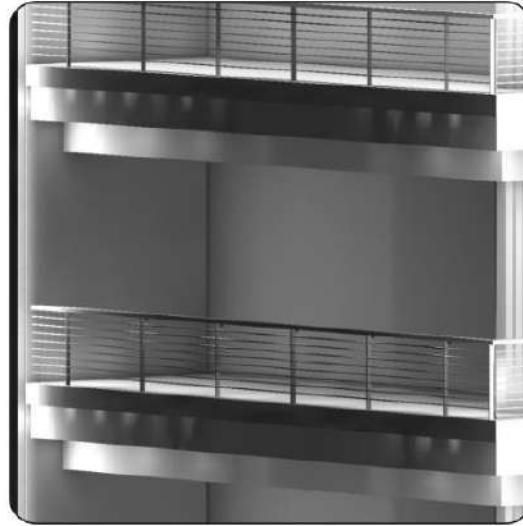


00/
**from
Archiect**



01/
AGI 32

rendering time
10 mins



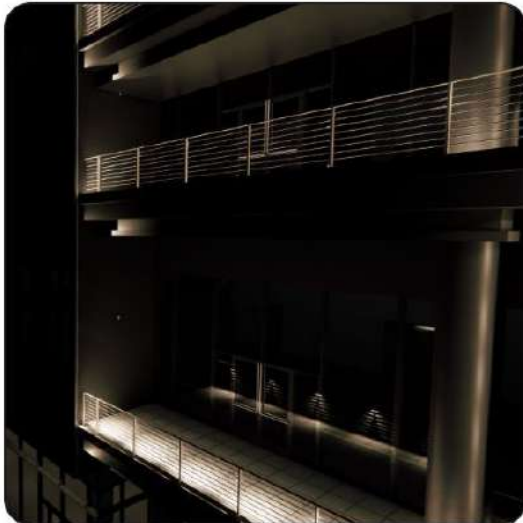
02/
**Elum
Tools**

rendering time
20 mins



03/
Enscape

rendering time
3 mins



04/
**Climate
Studio**

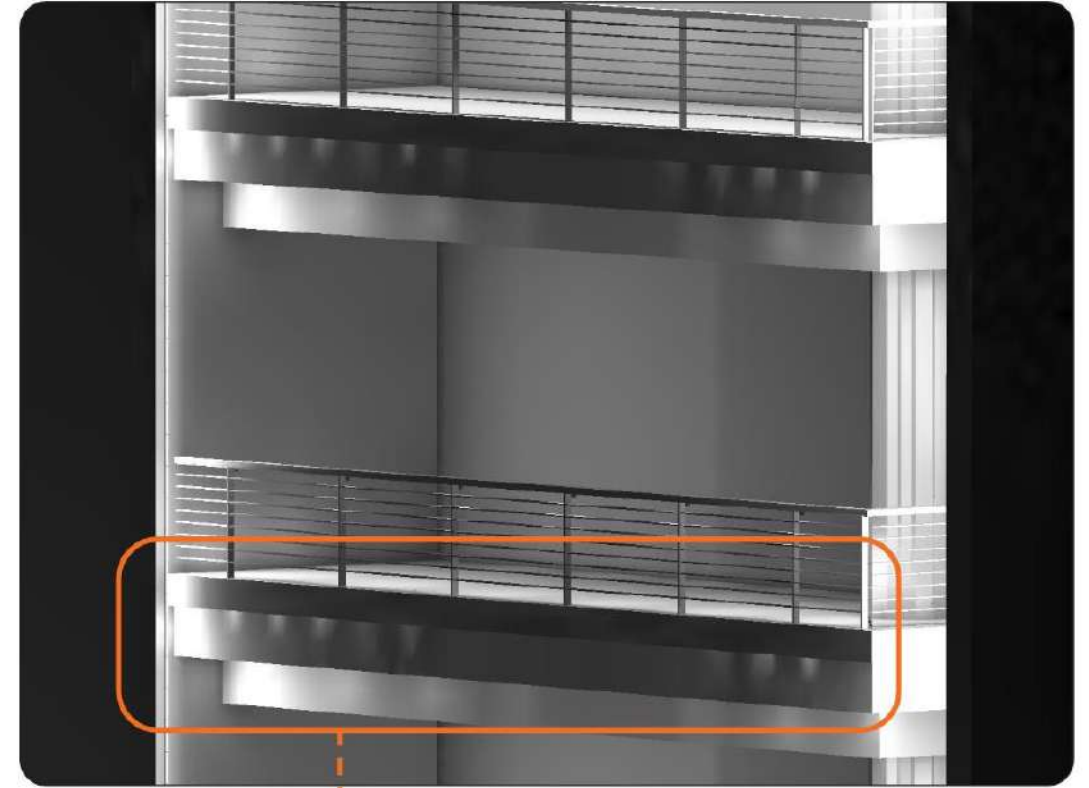
rendering time
2-3 hours



05/
3ds Max

rendering time
15 mins





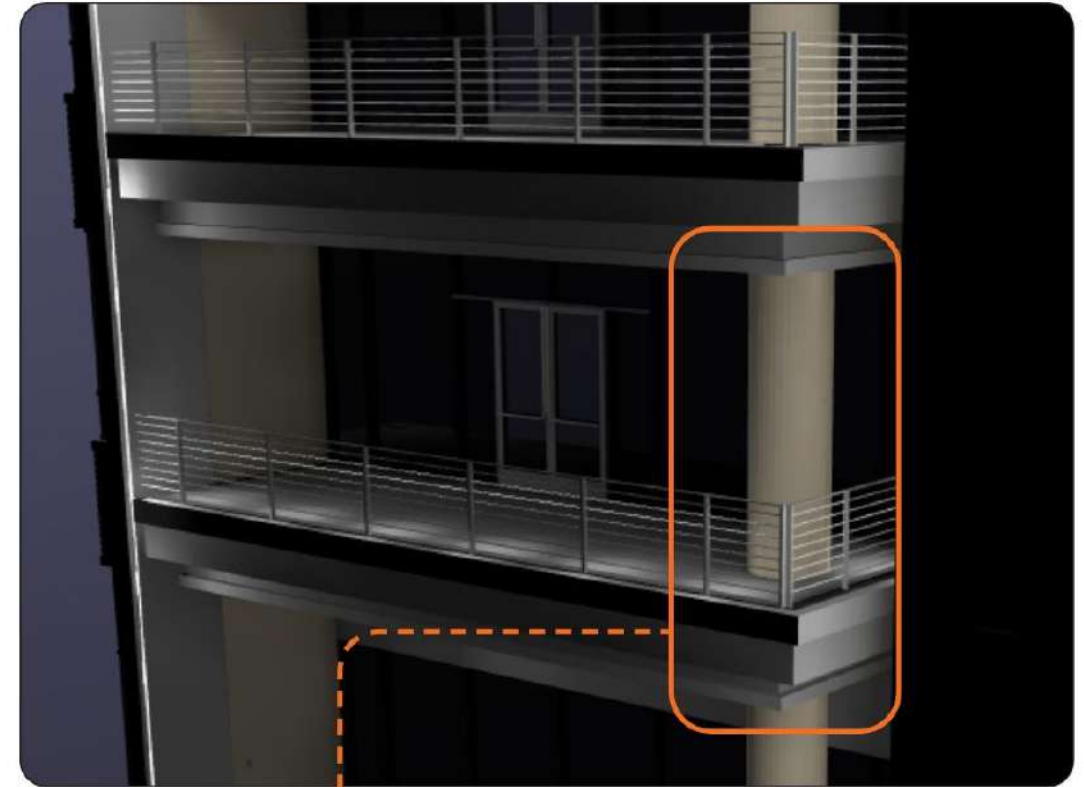
Pros

- **Easy to set up the model**
- **Get the calculation quickly**
- **Only need to render once**

Cons

- **Large scale exterior lighting rendering: easily to get fuzzy**
- **Inaccurate lighting effect**
- **Limited material options**

Quick Feedback:
can't fix the weird/confused lighting effect



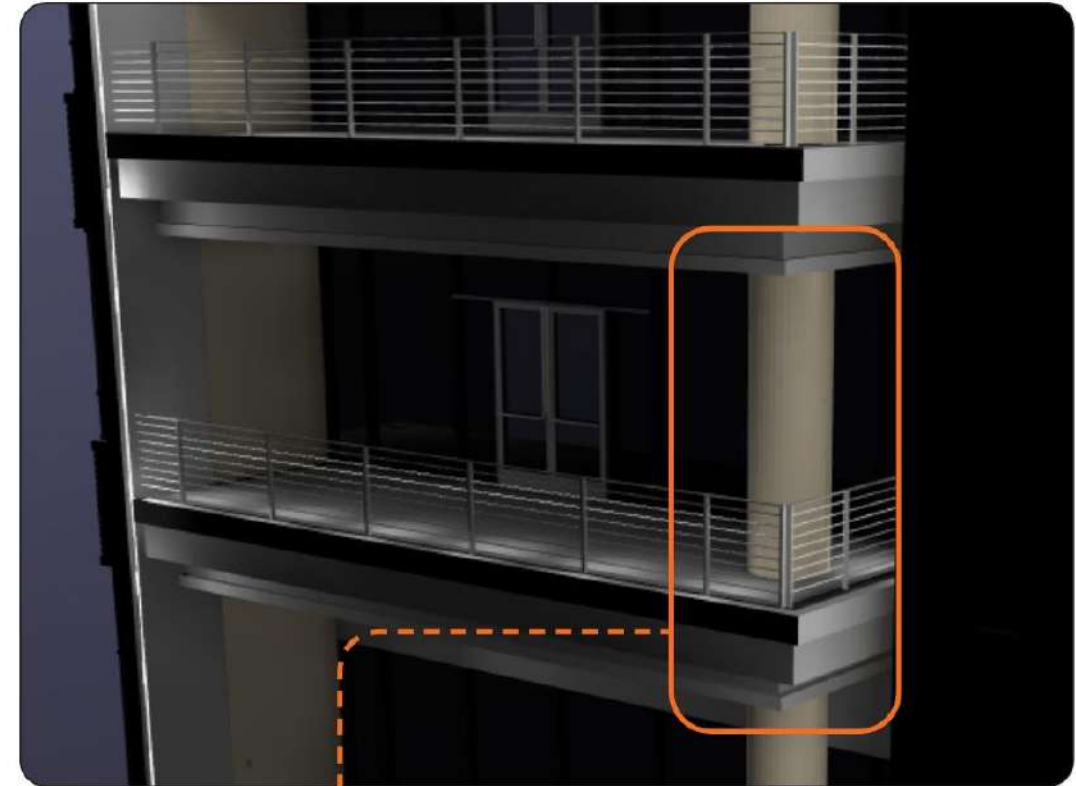
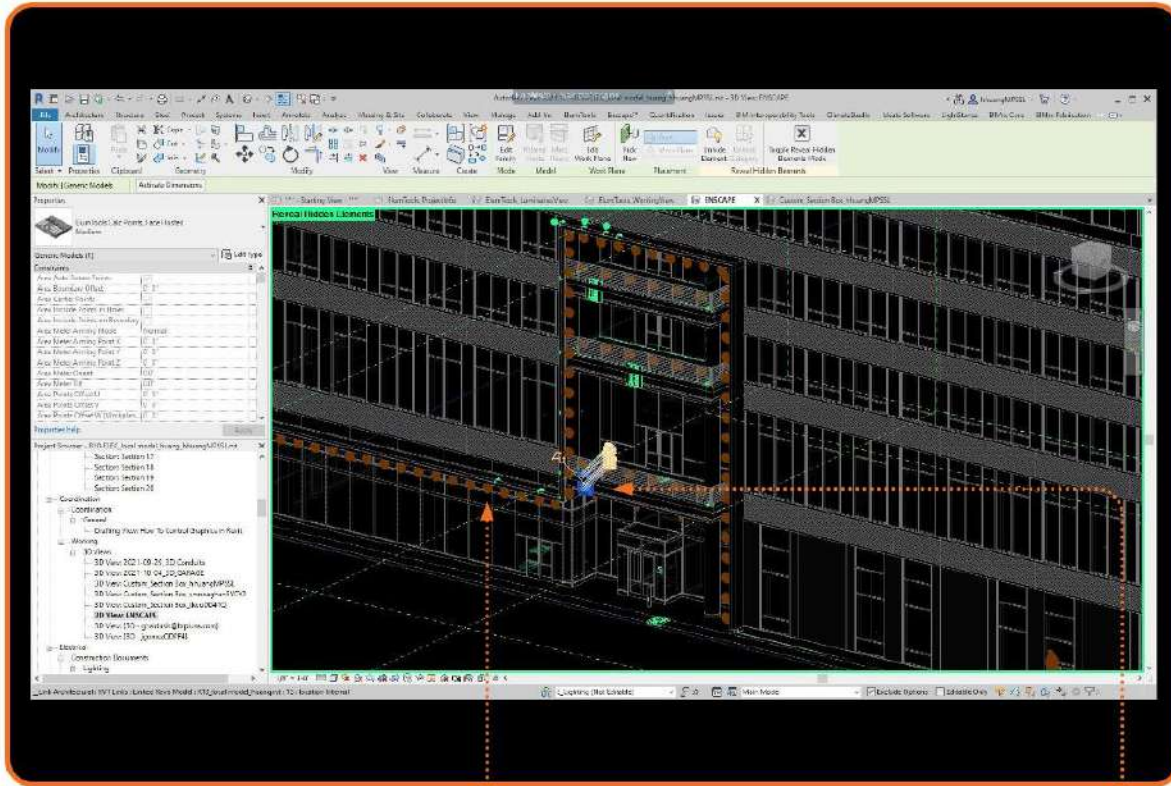
Pros

- **No need to set up the model**
- **Accurate lighting effect**
- **Only need to render once**

Cons

- **Make double rendering time of AGI**
- **Easily to mess up the Revit model**
- **Make the Revit model heavier**

Quick Feedback:
can't make more accurate rendering
because of the link model



Pros

- No need to set up the model
- Accurate lighting effect
- Only need to render once

Cons

- Make double rendering time of AGI
- Easily to mess up the Revit model
- Make the Revit model heavier

Quick Feedback:
can't make more accurate rendering
because of the link model



Pros

- **No need to set up the model**
- **Get the rendering quickly**

Cons

- **Inaccurate lighting effect**
- **Make the Revit model heavier**

Quick Feedback:

too much exposure / the wrong rendering ratio



Pros

- **No need to set up the model**
- **Get the rendering quickly**

Cons

- **Inaccurate lighting effect**
- **Make the Revit model heavier**

Quick Feedback:

too much exposure / the wrong rendering ratio



Pros

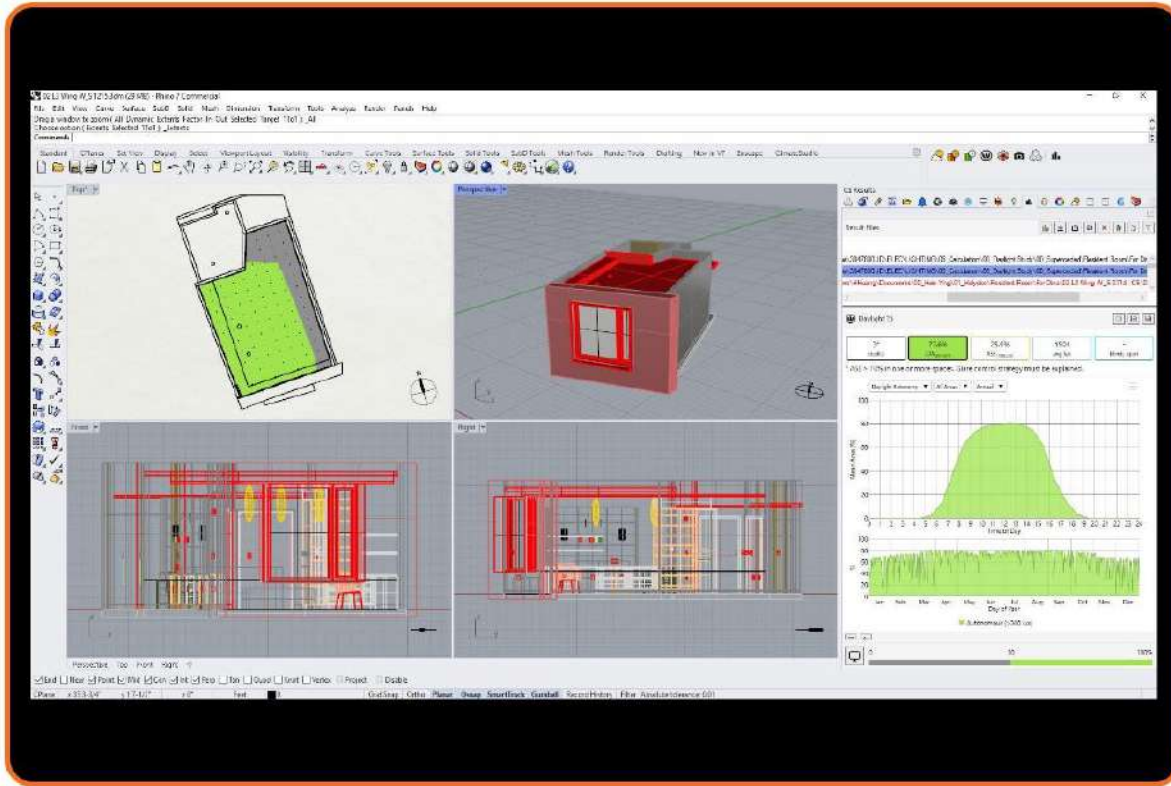
- **Flexibility**

Cons

- **Rendering time takes too long**
- **Rendering quality not good enough**
(not the latest version)

Why should test it

- **Short calculating time**
- **Daylight & Electrical lighting**
- **Interface friendly & Grasshopper plugin**
- **Material library**



All-In-One:
Design
Daylight
Luminaire

Pros

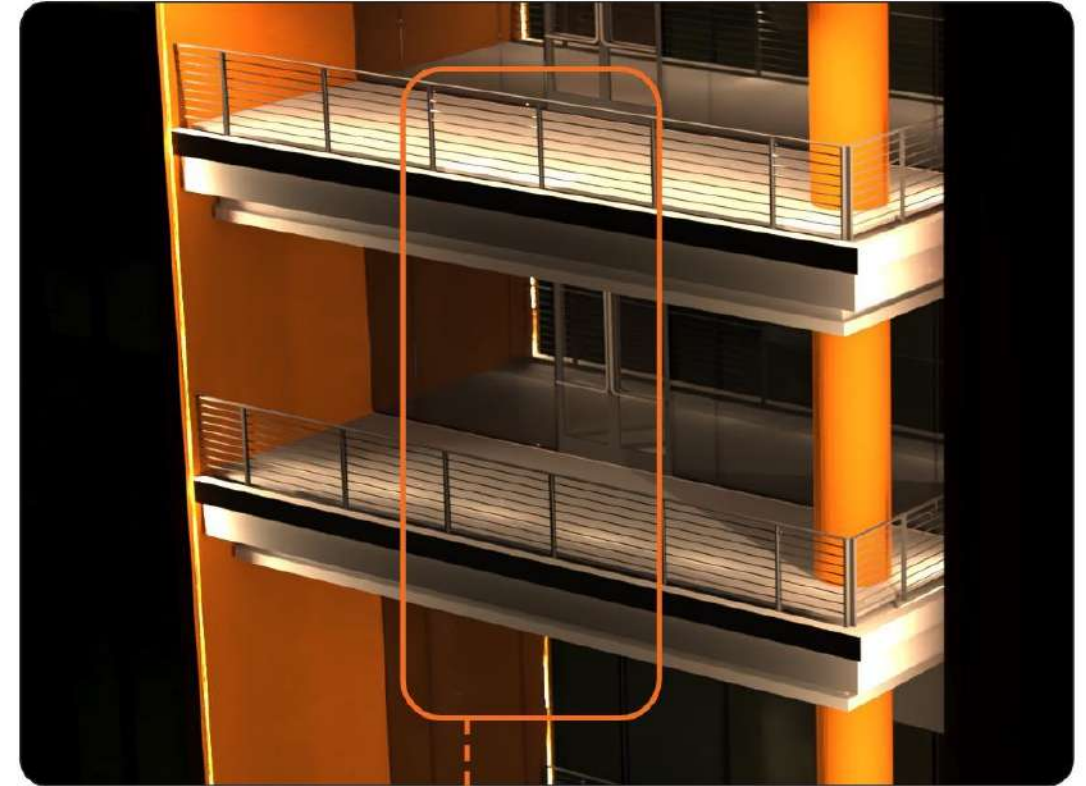
- Flexibility

Cons

- Rendering time takes too long
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(not the latest version)

Why should test it

- Short calculating time
- Daylight & Electrical lighting
- Interface friendly & Grasshopper plugin
- Material library



Pros






- **The best quality of rendering**

Cons

- **A steep learning curve (?)**
- **Extra software cost for the company**

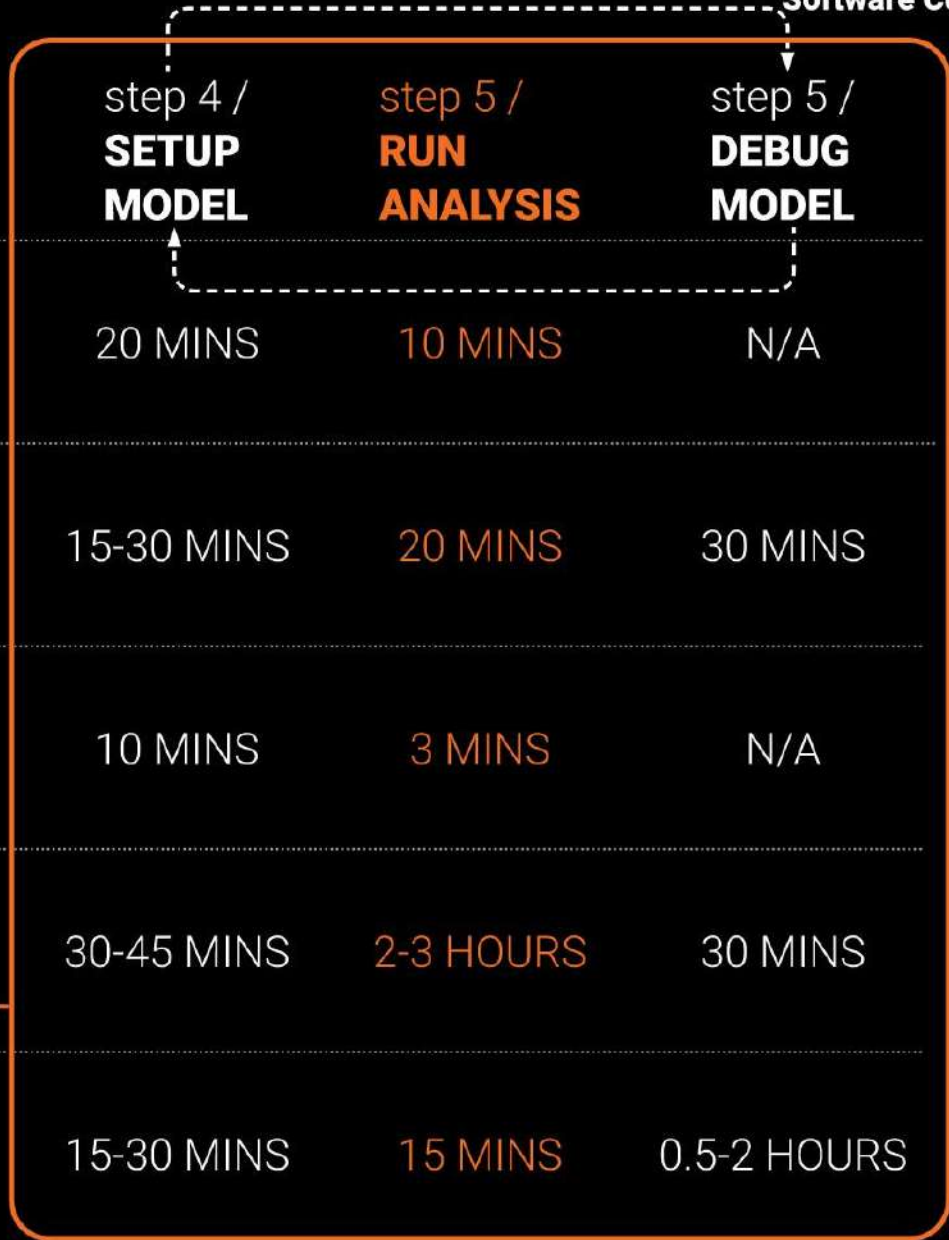
Quick Feedback:
should improve the glass material option

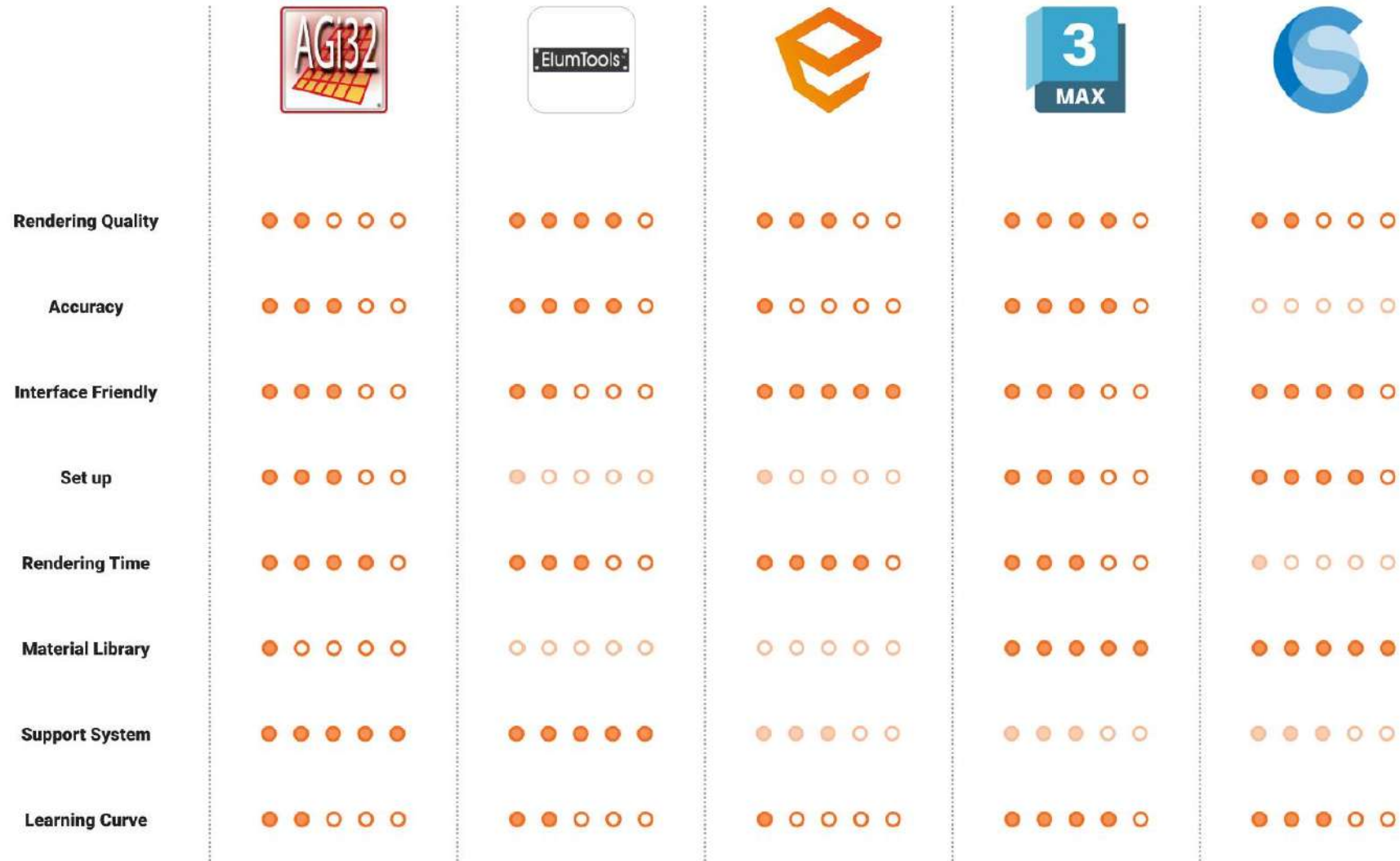
	step 1 / EXPORT MODEL	step 2 / CLEANUP MODEL	step 3 / IMPORT MODEL	step 4 / SETUP MODEL	step 5 / RUN ANALYSIS	step 5 / DEBUG MODEL
	3 MINS	10 MINS	3 MINS	20 MINS	10 MINS	N/A
	N/A	N/A	N/A	15-30 MINS	20 MINS	30 MINS
	N/A	N/A	N/A	10 MINS	3 MINS	N/A
	3-5 MINS		1-3 MINS	30-45 MINS	2-3 HOURS	30 MINS
	3 MINS	N/A	1-3 MINS	15-30 MINS	15 MINS	0.5-2 HOURS

	step 1 / EXPORT MODEL	step 2 / CLEANUP MODEL	step 3 / IMPORT MODEL	step 4 / SETUP MODEL	step 5 / RUN ANALYSIS	step 5 / DEBUG MODEL
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	N/A	N/A	N/A	15-30 MINS	20 MINS	30 MINS
	N/A	N/A	N/A	10 MINS	3 MINS	N/A
	3-5 MINS		1-3 MINS	30-45 MINS	2-3 HOURS	30 MINS
	3 MINS	N/A	1-3 MINS	15-30 MINS	15 MINS	0.5-2 HOURS

no need to export/import model = can't edit the model

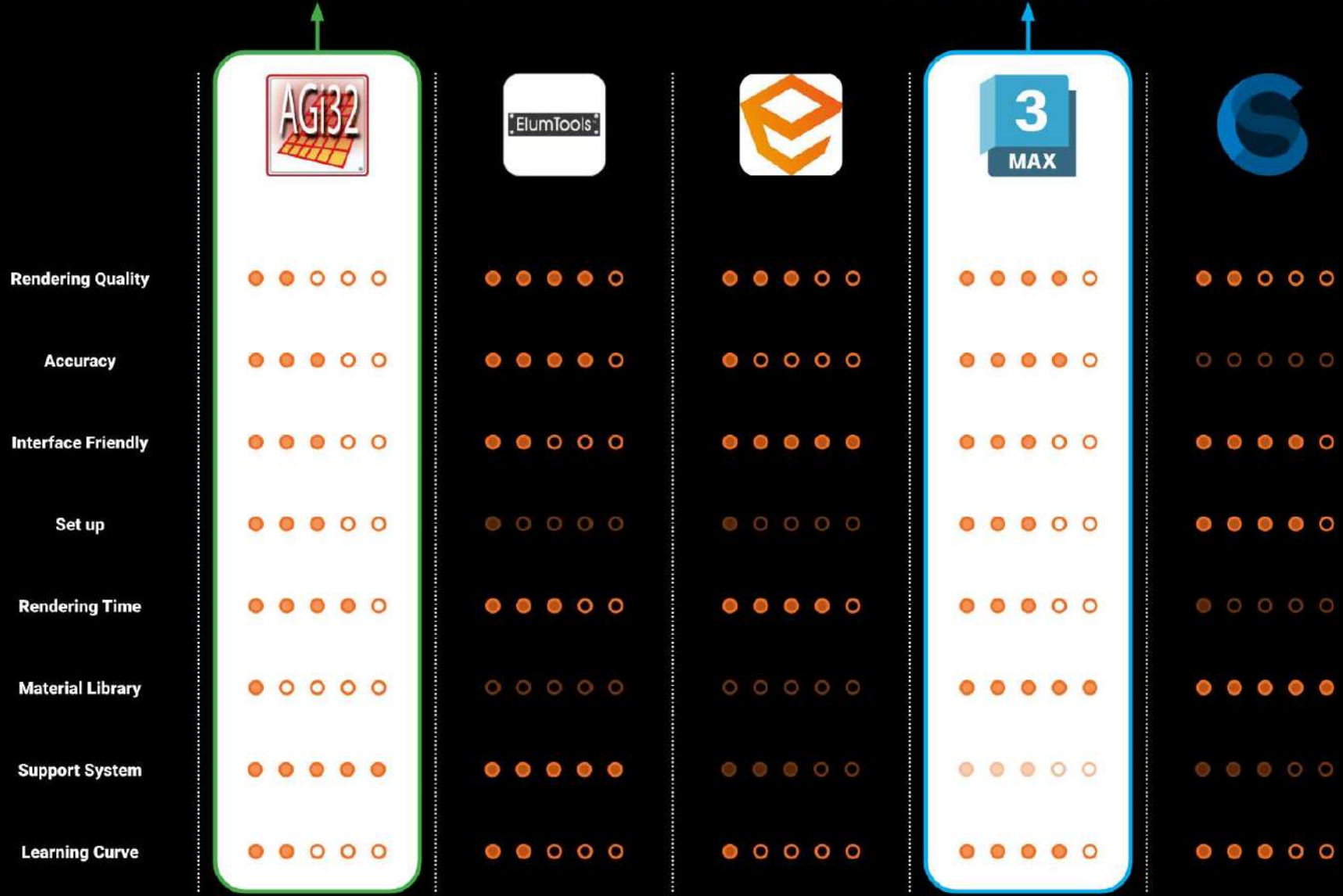
- a. needs to apply the ies file to the fixture family
- b. can't use stretchable family





Good for Quick Study

Best for Rendering



Good for small scale project



Rendering Quality



Accuracy



Interface Friendly



Set up



Rendering Time



Material Library



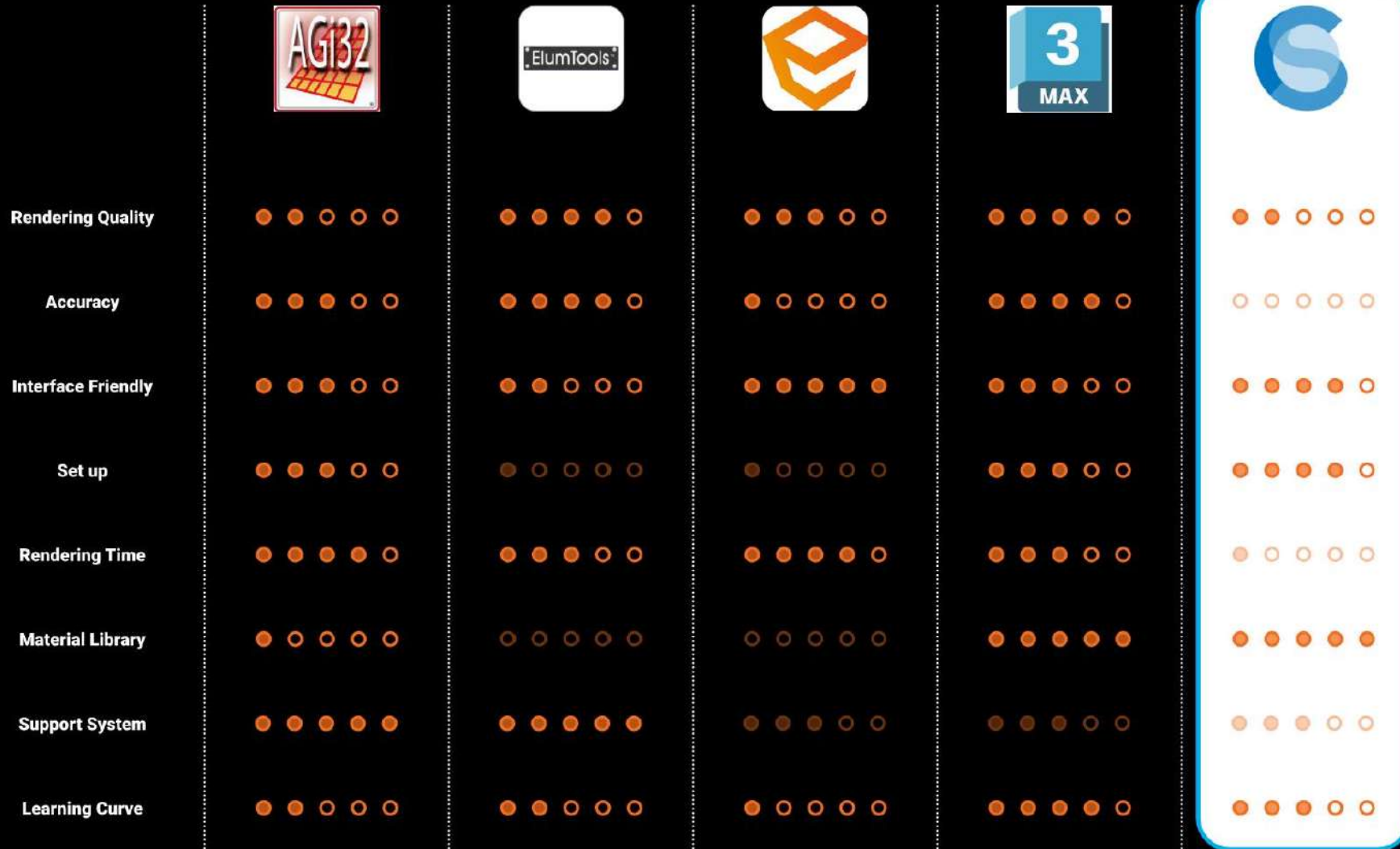
Support System



Learning Curve



Good for the early DD proposal



LANDSCAPE MOCKUP

CALCULATION
VS
MOCKUP

When do we need to do a lighting mockup?

Purpose /

Lighting Effect
Lighting Calc

People /

Team
Architect
Client
Manufacturer

Issues /

Inaccuracy
Unclear
Design Concern

Development Project Landscape

Location **Sloatsburg, NY**

Analysis:

Pathway bollard lighting analysis

Criteria:

Rural/Semi-Rural Areas: 0.2 hFC

**Low Density Residential: 0.3 hFC
(2 or fewer dwelling units per acre)**

**Medium Density Residential: 0.4 hFC
(2.1 to 6.0 dwelling units per acre):**

Tools for Analysis:

AGI32

Mockup

Goal of Analysis:

Design consulting



Development Project

Landscape

Location **Sloatsburg, NY**

Analysis:
Landscape lighting analysis

Criteria:
Rural/Semi-Rural Areas: 0.2 hFC

Low Density Residential: 0.3 hFC
(2 or fewer dwelling units per acre)

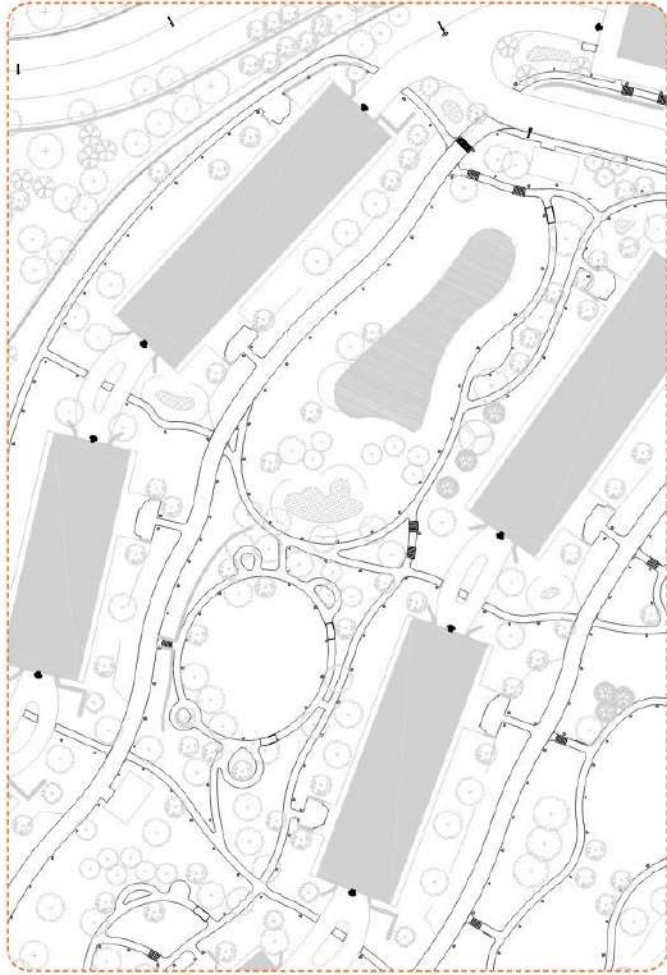
Medium Density Residential: 0.4 hFC
(2.1 to 6.0 dwelling units per acre)

Tools for Analysis:
AGI32
Mockup

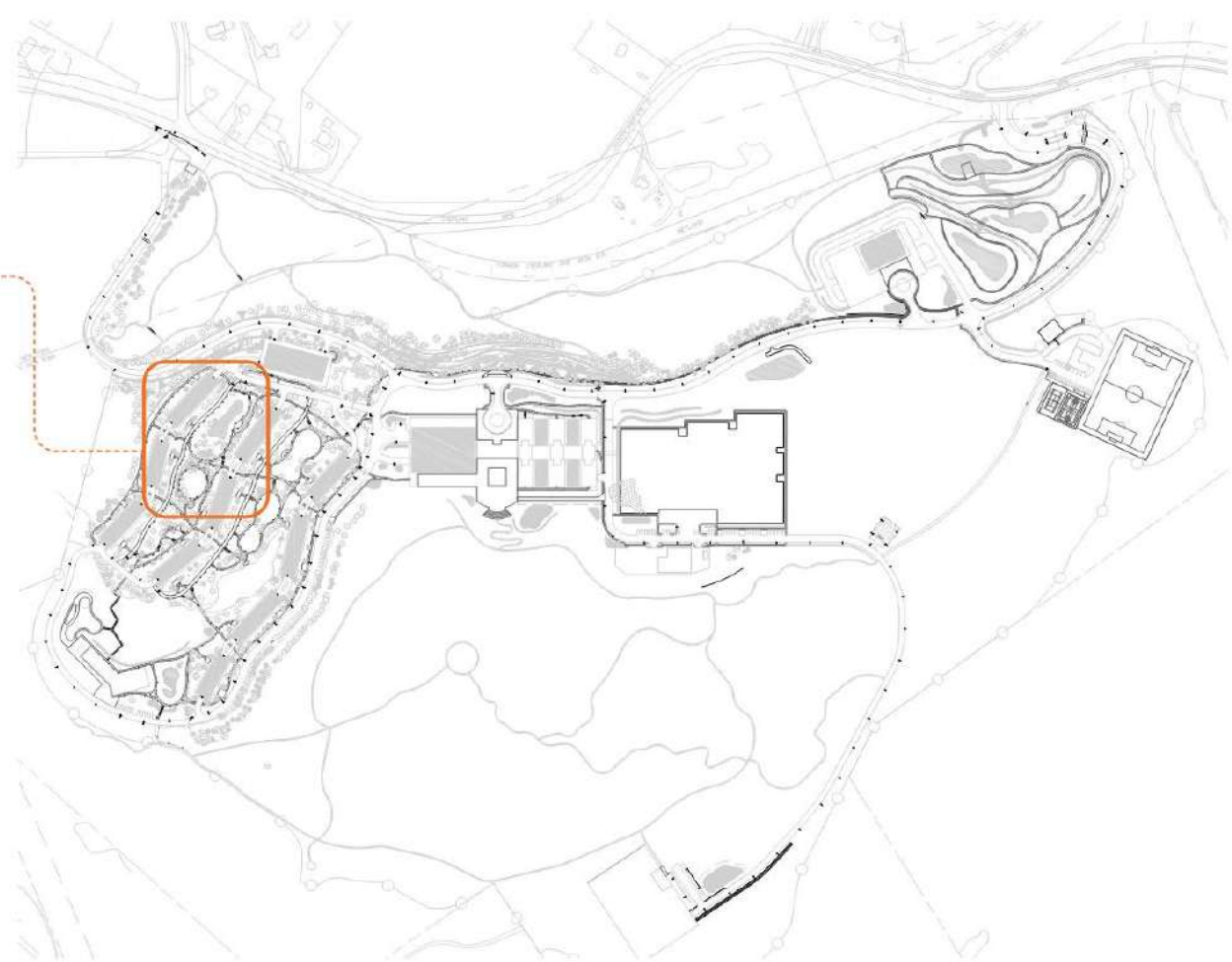
Goal of Analysis:
Design consulting

• Pathway Bollard

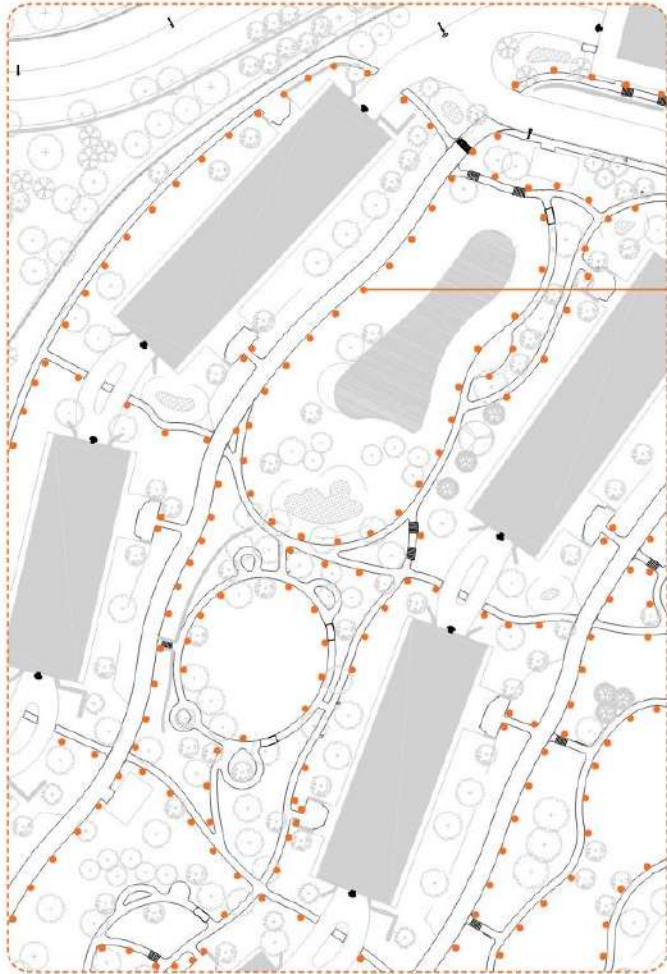




plan view / **residential area**



plan view / **master plan**



plan view / **residential area**



bollard design / **one head**



bollard design / **two heads**



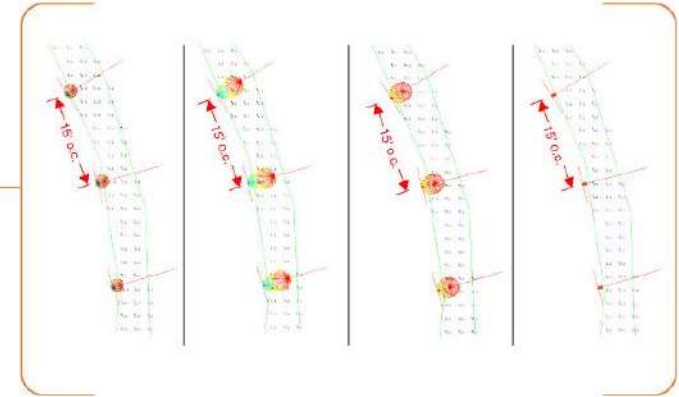
fixture / **outdoor recessed**



plan view / residential area



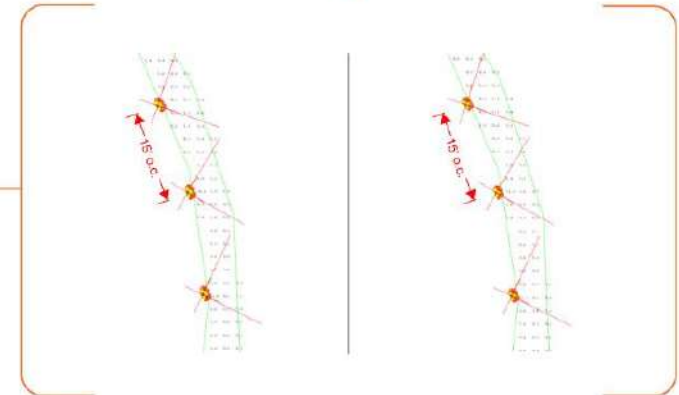
bollard design / one head



all the calculations show **0.0 fc** between two bollards



bollard design / two heads



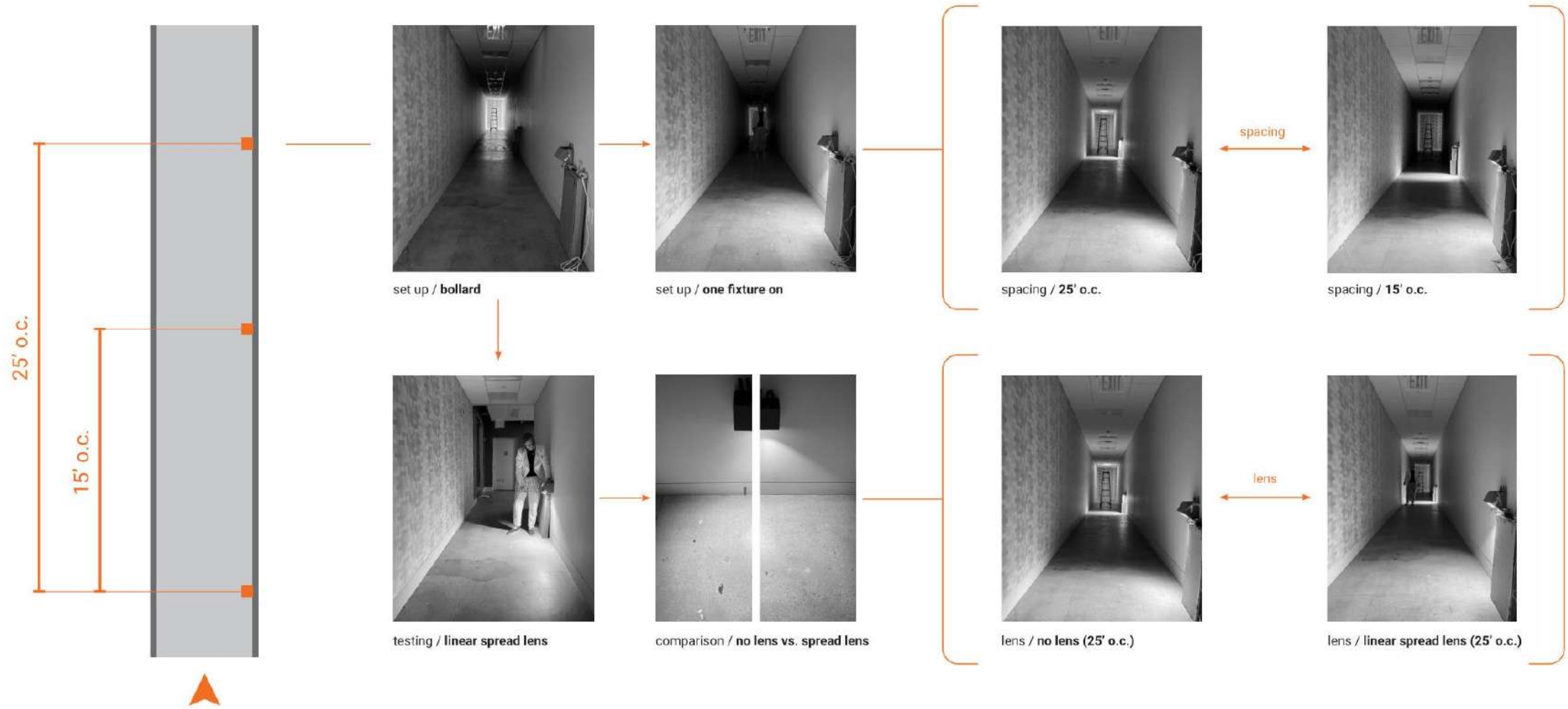
calculation / AGi32

How **LONG** does it take to build a mockup to see the lighting quality?



Is 0.0 footcandle in AGi32 **COMPLETELY DARK** ?

What is the right **DESIGN** for the volunteers to build the bollard on site ?

#Efficiency #Accuracy #Aesthetics

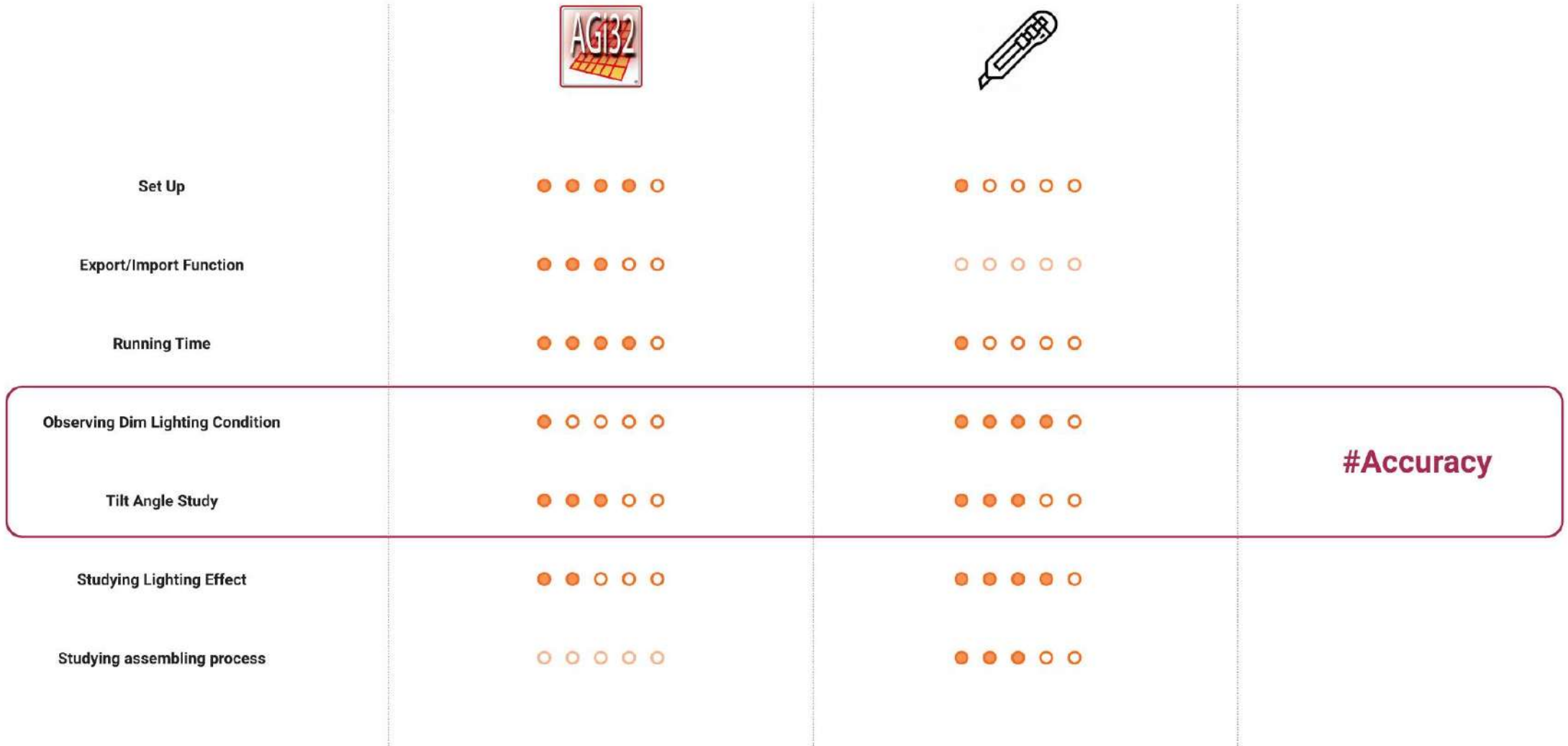




		
Set Up	● ● ● ● ○	● ○ ○ ○ ○
Export/Import Function	● ● ● ○ ○	○ ○ ○ ○ ○
Running Time	● ● ● ● ○	● ○ ○ ○ ○
Observing Dim Lighting Condition	● ○ ○ ○ ○	● ● ● ● ○
Tilt Angle Study	● ● ● ○ ○	● ● ● ○ ○
Studying Lighting Effect	● ● ○ ○ ○	● ● ● ● ○
Studying assembling process	○ ○ ○ ○ ○	● ● ● ○ ○



Set Up	● ● ● ● ○	● ○ ○ ○ ○	#Efficiency
Export/Import Function	● ● ● ○ ○	○ ○ ○ ○ ○	
Running Time	● ● ● ● ○	● ○ ○ ○ ○	
Observing Dim Lighting Condition	● ○ ○ ○ ○	● ● ● ● ○	
Tilt Angle Study	● ● ● ○ ○	● ● ● ○ ○	
Studying Lighting Effect	● ● ○ ○ ○	● ● ● ● ○	
Studying assembling process	○ ○ ○ ○ ○	● ● ● ○ ○	





Set Up



Export/Import Function



Running Time



Observing Dim Lighting Condition



Tilt Angle Study



Studying Lighting Effect



Studying assembling process



#Aesthetics



Set Up	● ● ● ● ○	● ○ ○ ○ ○	#Efficiency
Export/Import Function	● ● ● ○ ○	○ ○ ○ ○ ○	
Running Time	● ● ● ● ○	● ○ ○ ○ ○	
Observing Dim Lighting Condition	● ○ ○ ○ ○	● ● ● ● ○	#Accuracy
Tilt Angle Study	● ● ● ○ ○	● ● ● ○ ○	
Studying Lighting Effect	● ● ○ ○ ○	● ● ● ● ○	#Aesthetics
Studying assembling process	○ ○ ○ ○ ○	● ● ● ○ ○	

LIGHTING VISUALIZED DIAGRAM

RHINO/GRASSHOPPER-BASED

Faceted Column

At Wichita Riverfront Stadium

Location: **Wichita, Kansas**

Artist: **Derek Porter**

Art Advisor: **Elizabeth Stevenson, SJCF Architecture**

Owner: **City of Wichita**

Structural Engineer: **Genesis Structures, Inc.**

Fabrication and Installation: **Silvercrane LLC**

Analysis:

Artwork reflection prediction

Tools for Analysis:

Rhino

Grasshopper

Goal of Analysis:

Design consulting



Faceted Column

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Tools for Analysis:

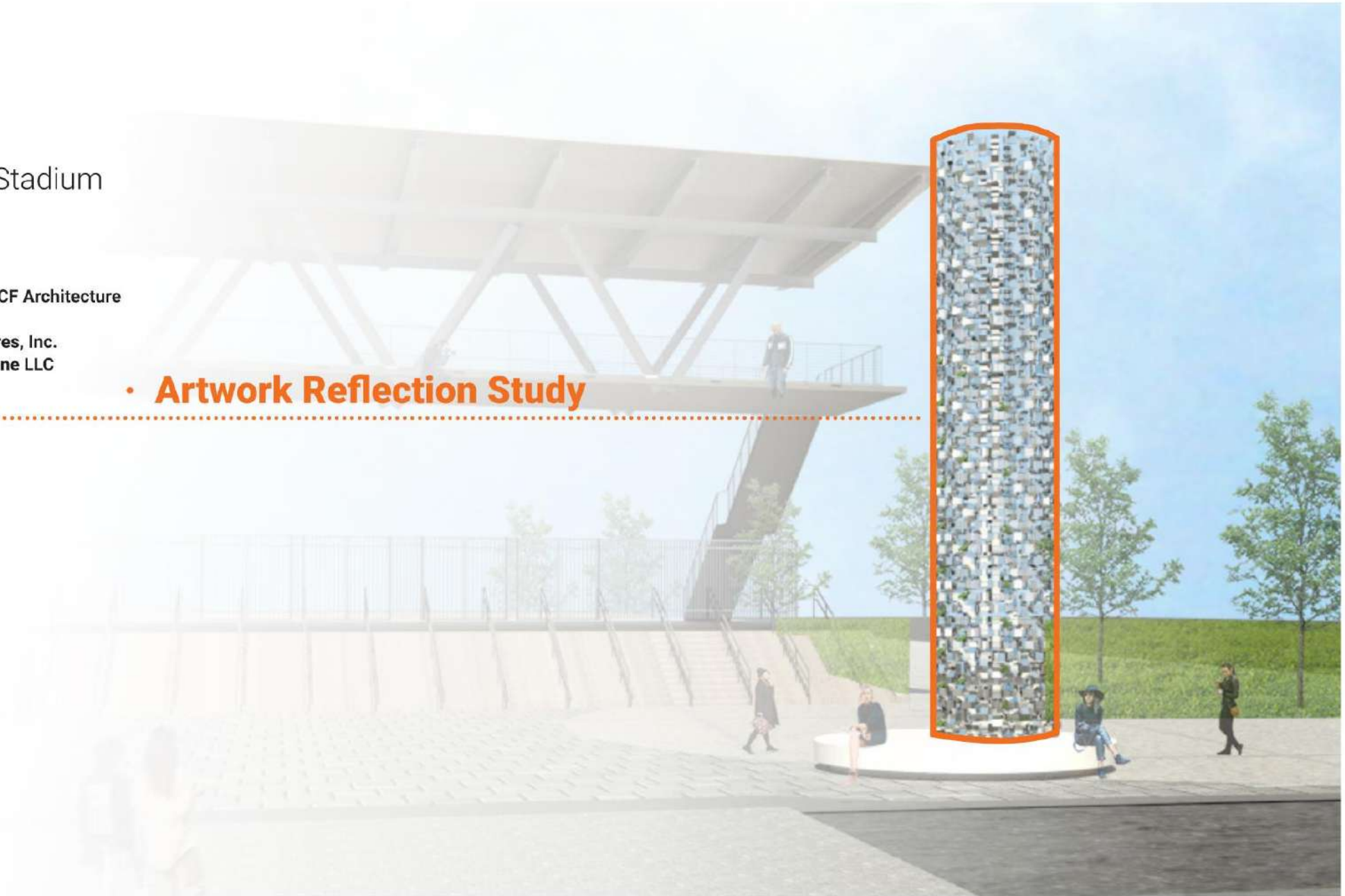
Rhino

Grasshopper

Goal of Analysis:

Design consulting

• Artwork Reflection Study

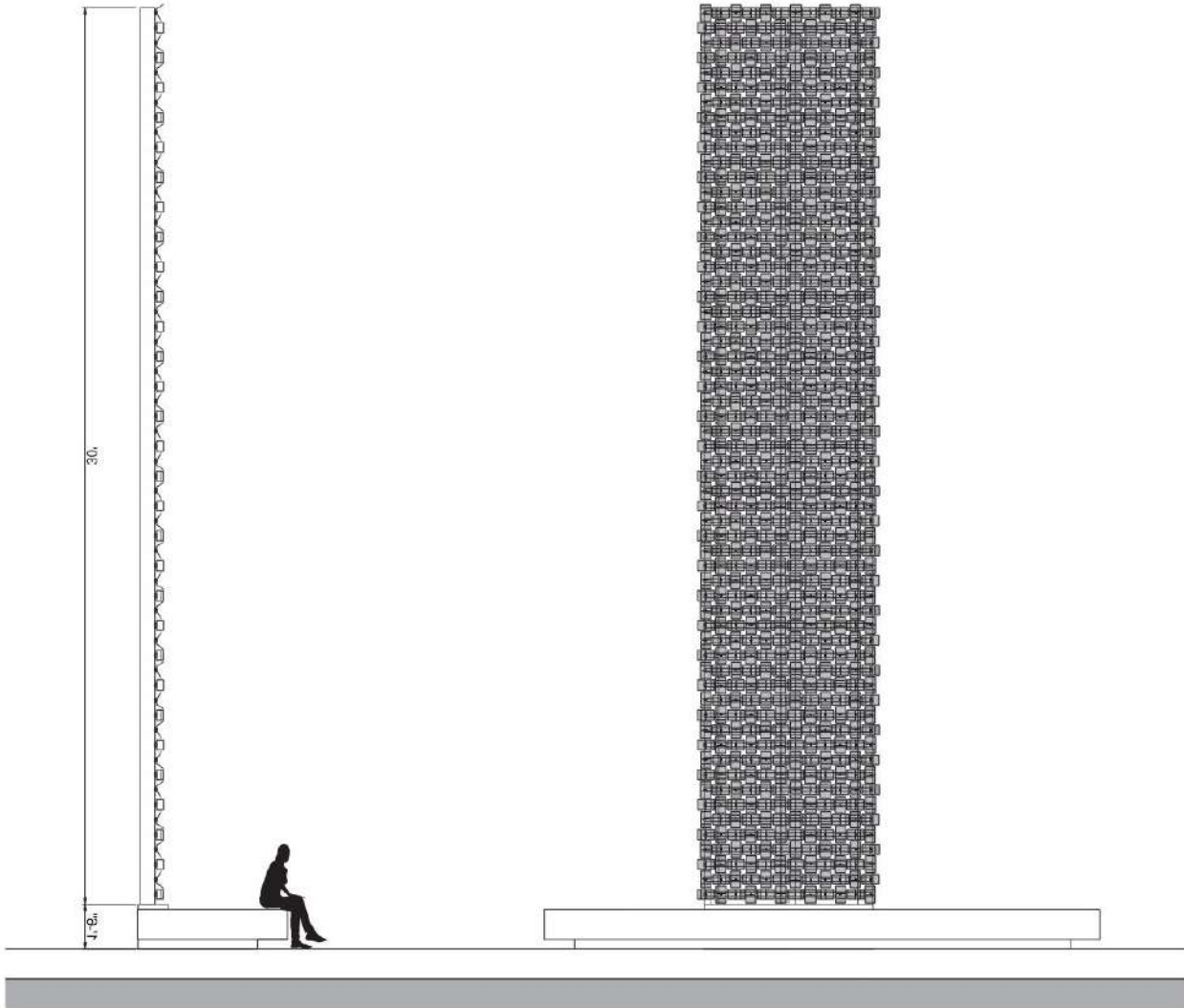


How **LONG** does it take to build a model ?

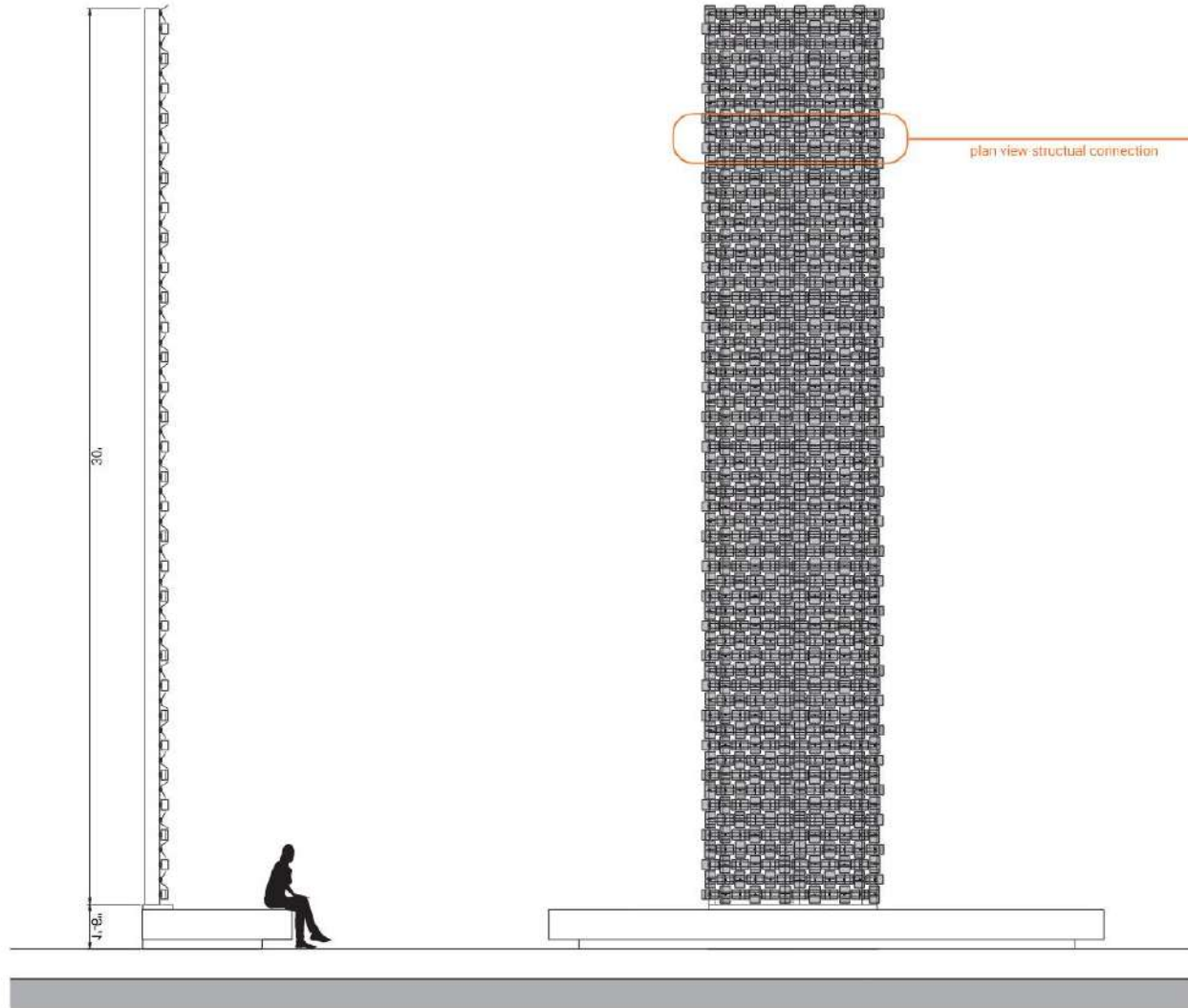
Can we **VISUALIZE** the view that reflected from the environment?

Can we rely on the lighting **EFFECT** of the renderings?

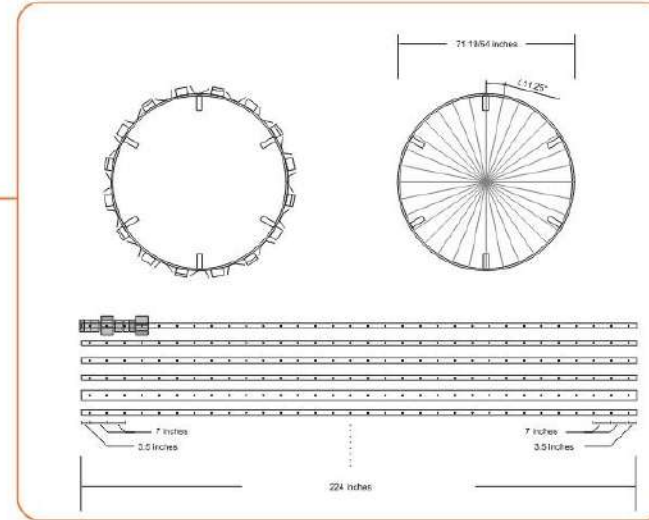
#Efficiency #Accuracy #Aesthetics

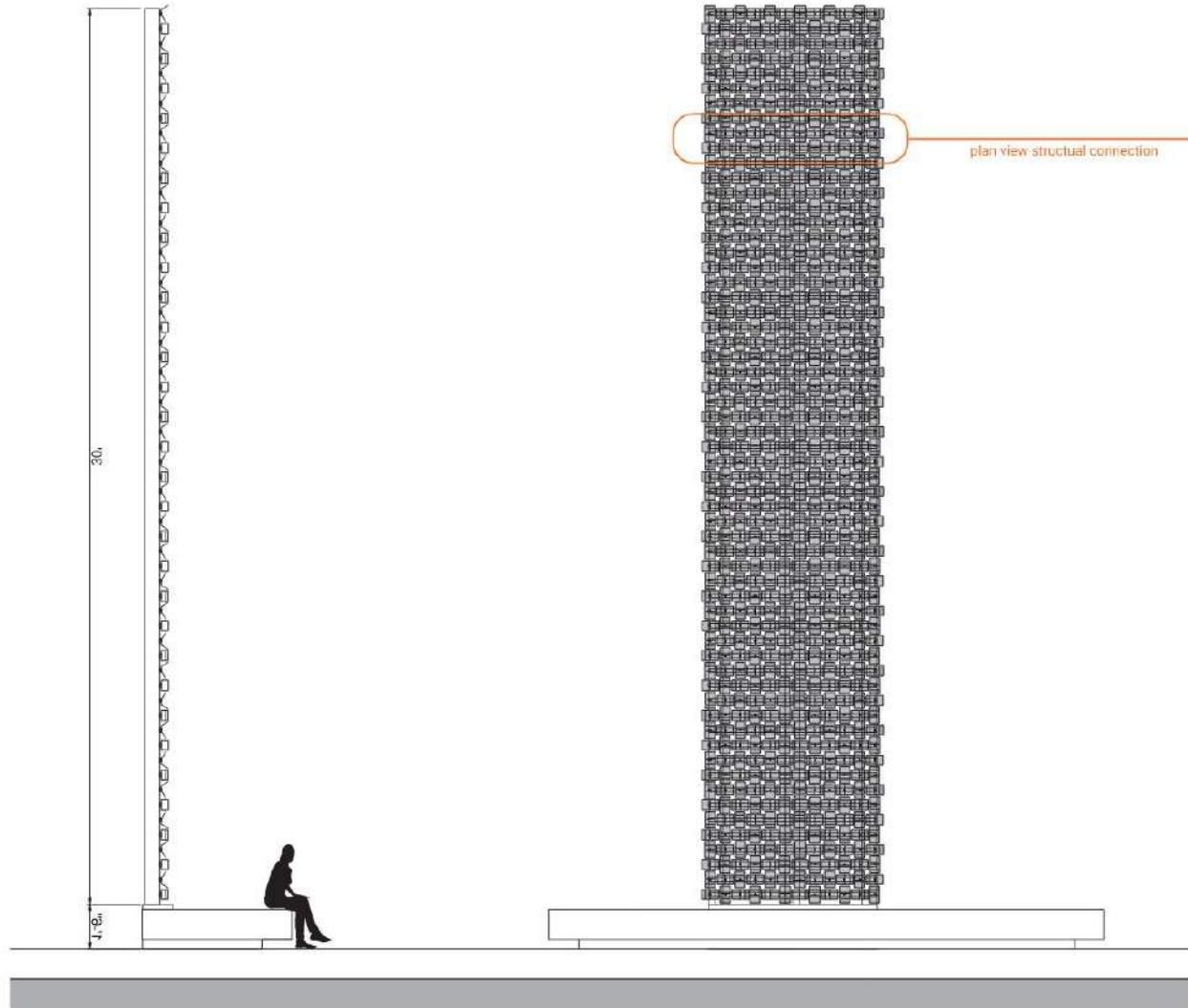


elevation / **structural connection**

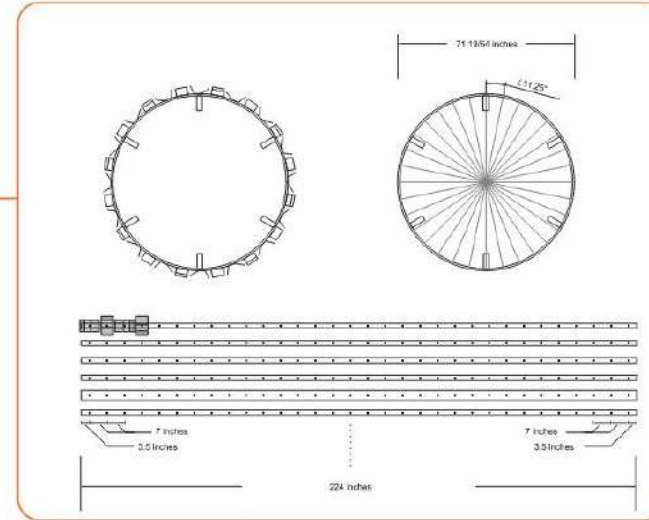


elevation / **structural connection**

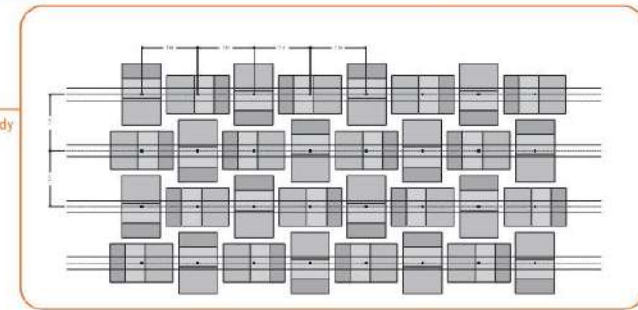




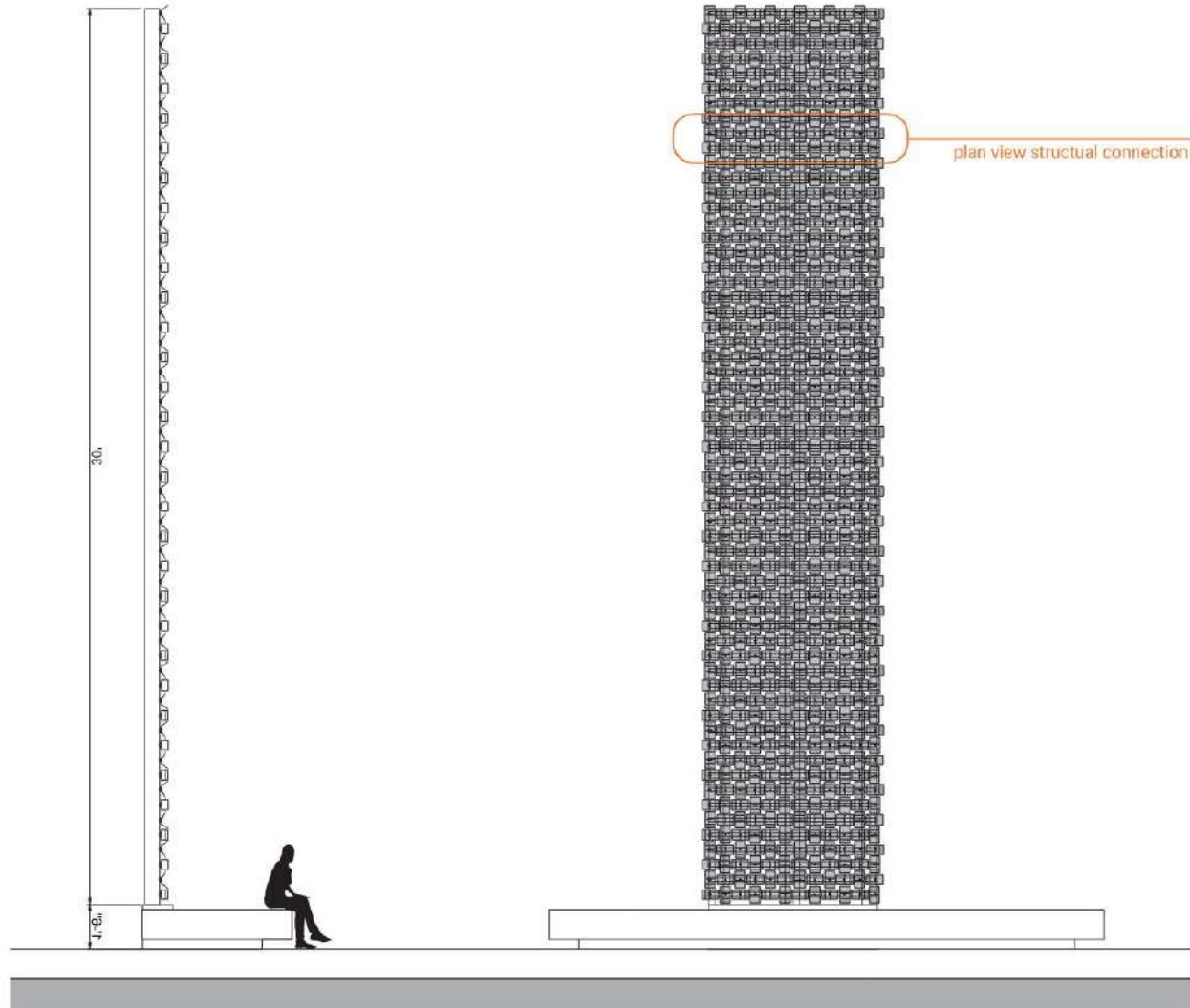
plan view structural connection



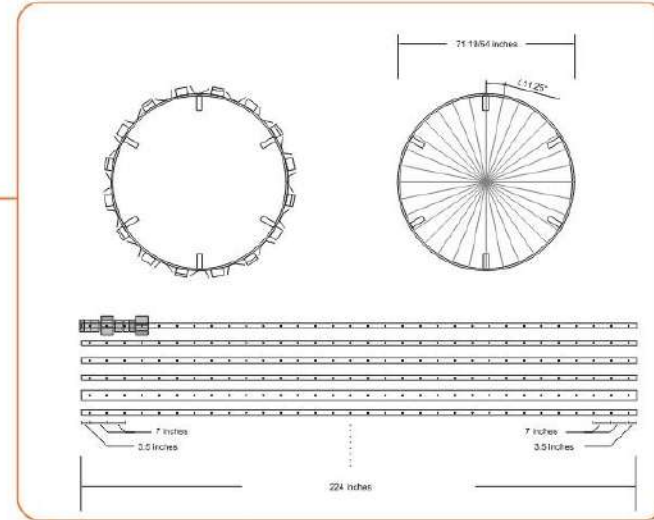
reflection proportion study



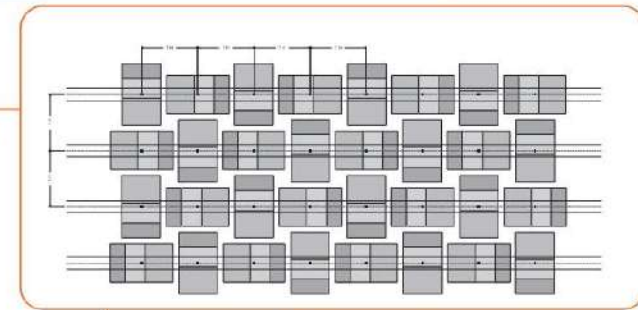
elevation / structural connection



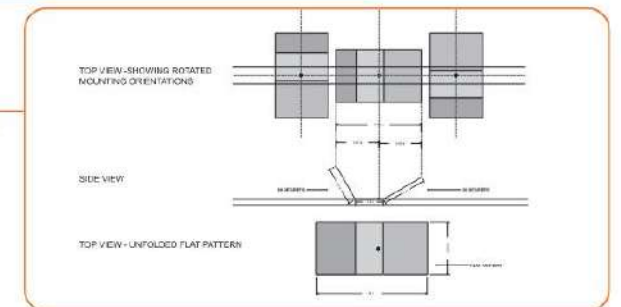
plan view structural connection



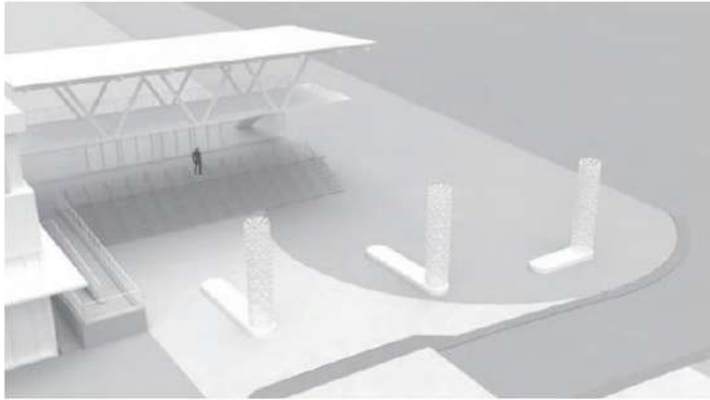
reflection proportion study



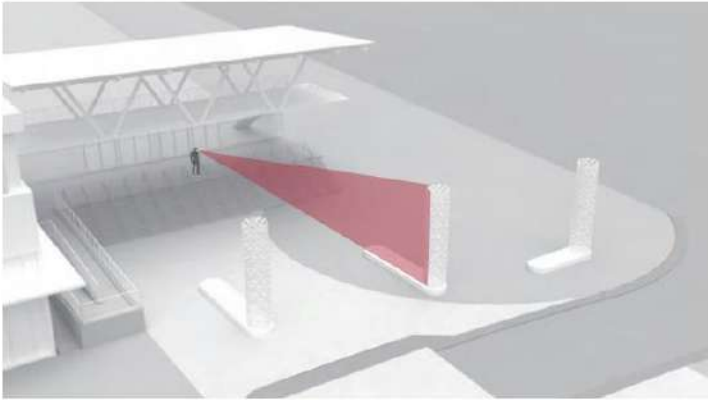
section and elevation details



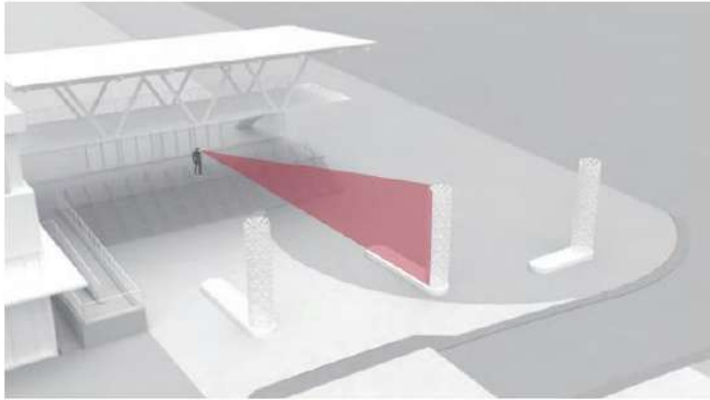
elevation / structural connection



perspective view / **eye sight**

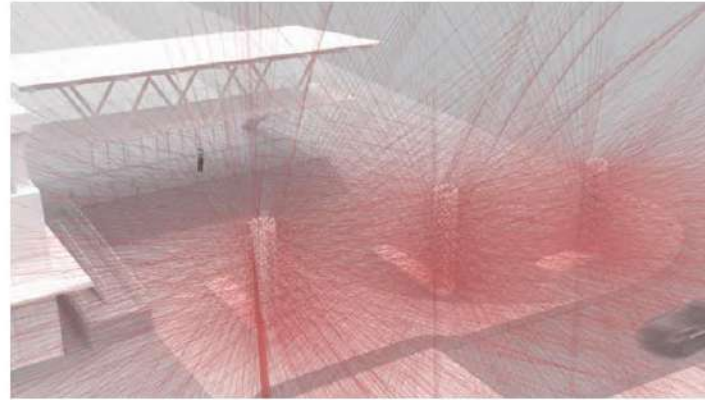


perspective view / **eye sight**

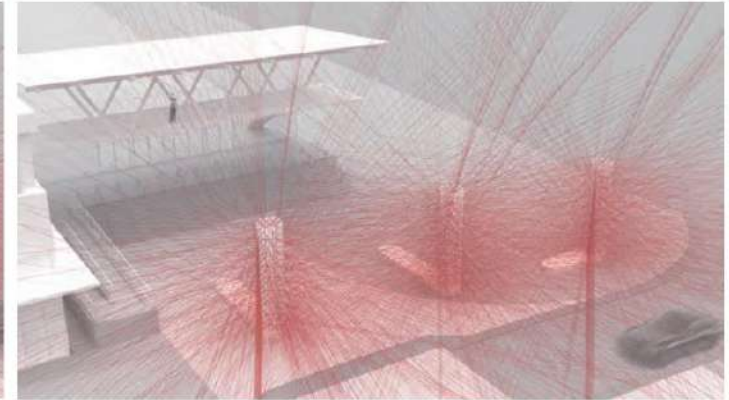


perspective view / **eye sight**

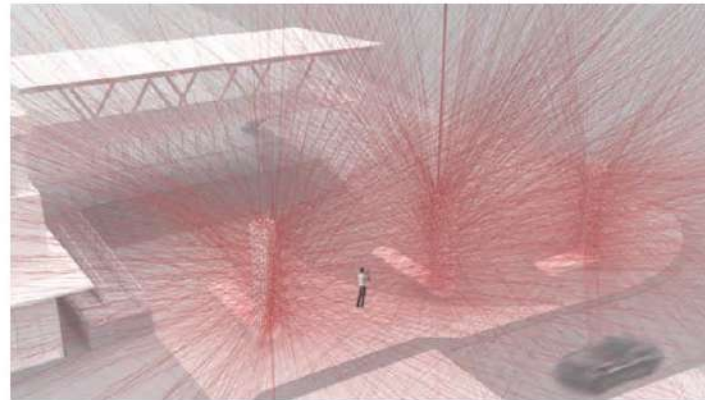
changing the observing location:



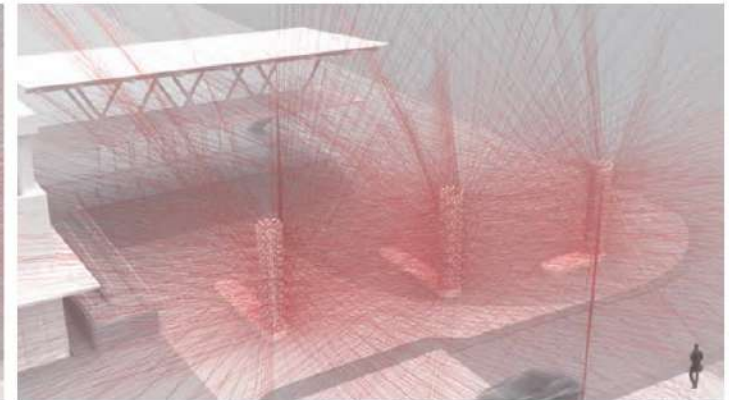
eyc sight / **under the bridge**



eyc sight / **on the bridge**

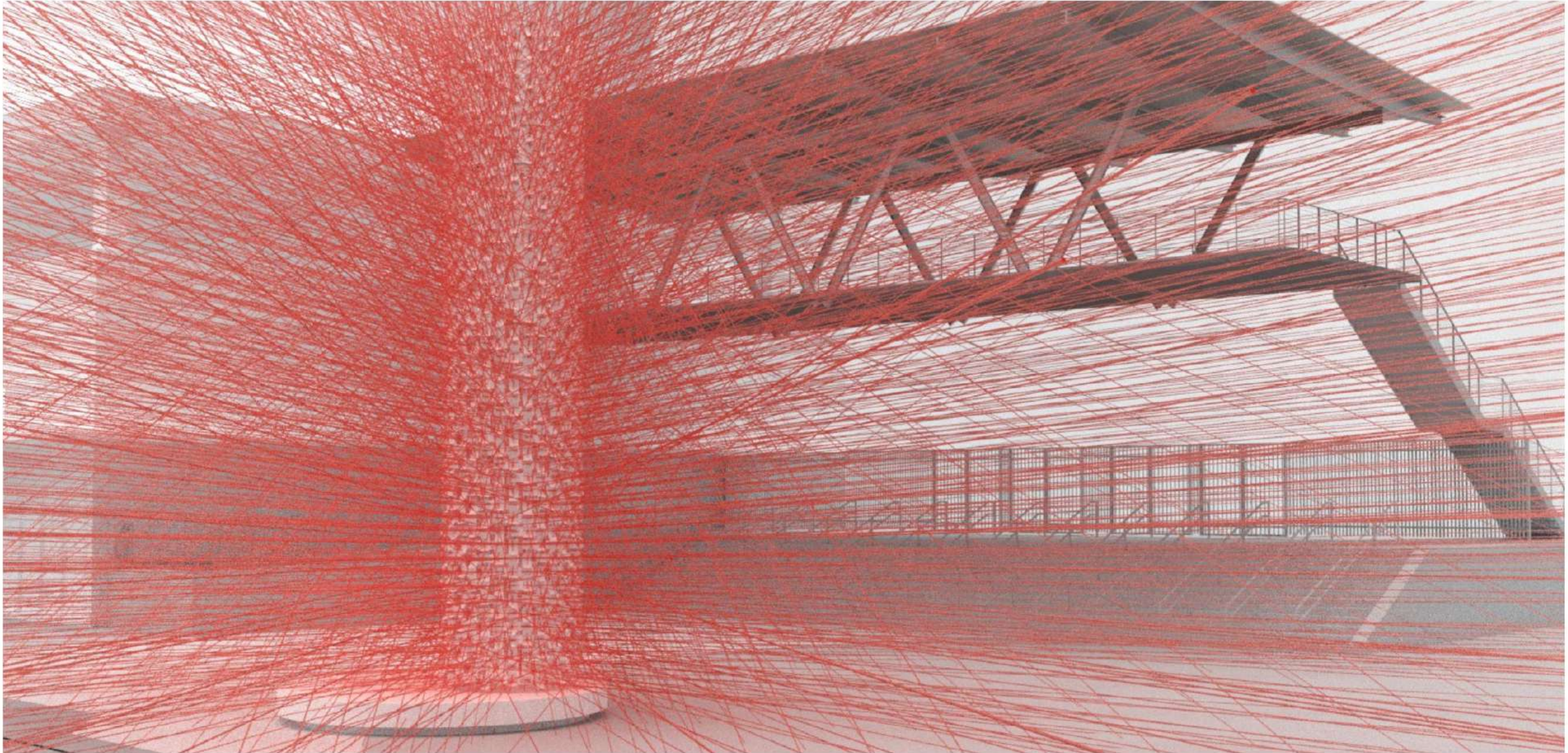


eyc sight / **at the plaza**



eyc sight / **across the street**





LPD SPACE METHOD IN REVIT

Revit

When do we need to do a LPD check?

Schematic Design /

Design Development /

**Design
Review**

Construction Documents /

**LEED
Report**

When do we need to do a LPD check?

Schematic Design /

Design Development /

**Design
Review**

Construction Documents /

**LEED
Report**

When do we need to do a LPD check?



How **LONG** does it take to do a ComCheck?

Do we change the fixture types If the result shows the designed wattage **EXCEED** the allowance?

Is the area measured from PDF drawings **RELIABLE**?

#Efficiency #Accuracy

How **LONG** does it take to do a ComCheck?

Do we change the fixture types If the result shows the designed wattage **EXCEED** the allowance?

Is the area measured from PDF drawings **RELIABLE**?

IF THERE IS A WAY TO CHECK THE LPD TIMELY...

#Efficiency #Accuracy

Properties

Spaces (1)

Phase: New Construction

Energy Analysis

Zone: Default

Plenum:

Occupiable:

Condition Type: Heated and cooled

Space Type: MBCC Office - Enclosed L...

Construction Type: <Building>

People: Edit...

Electrical Loads: Edit...

Outdoor Air Information: From Space Type

Outdoor Air per Person: 5.00 CFM

Outdoor Air per Area: 0.06 CFM/SF

Air Changes per Hour: 0.000000

Outdoor Air Method: by People and by Area

Calculated Heating Load: Not Computed

Design Heating Load: 0.00 Btu/h

Calculated Cooling Load: Not Computed

Design Cooling Load: 0.00 Btu/h

Properties help

Parameter	Value
Energy Analysis	
Area per Person	215.28 SF
Sensible Heat Gain per person	250.00 Btu/h
Latent Heat Gain per person	200.00 Btu/h
Lighting Load Density	0.74 W/ft ²
Power Load Density	1.50 W/ft ²
Infiltration Airflow per area	0.04 CFM/SF
Plenum Lighting Contribution	20.00000%
Occupancy Schedule	Common Office Occupancy -
Lighting Schedule	Office Lighting - 6 AM to 11 P
Power Schedule	Office Lighting - 6 AM to 11 P
Outdoor Air per Person	5.00 CFM
Outdoor Air per Area	0.06 CFM/SF
Air Changes per Hour	0.000000
Outdoor Air Method	by People and by Area

space analysis / revit working view

Family Types

Type name: RL-4

Search parameters

Parameter	Value	Formula	Lock
Electrical Engineering			
Voltage	277.00 V	= BRA_Rated Voltage	<input checked="" type="checkbox"/>
Electrical - Lighting			
Calculate Coefficient of Utilization (C _u)	=		<input checked="" type="checkbox"/>
Coefficient of Utilization (default)	=		<input checked="" type="checkbox"/>
Electrical - Loads			
BRA_Load Classification (default)	Lighting	=	<input checked="" type="checkbox"/>
BRA_Power Factor	1.000000	=	<input checked="" type="checkbox"/>
BRA_Rated Voltage	277.00 V	=	<input checked="" type="checkbox"/>
BRA_True Load (default)	33.80 VA	= (BRA_Length Modeled / 1	
BRA_Wattage Per Linear Foot	9.70 W	=	
Apparent Load	33.80 VA	=	
Dimensions			
Width	0' 4"	=	<input checked="" type="checkbox"/>
General			
BRA_Length Modeled (default)	4' 0"	=	<input checked="" type="checkbox"/>
BRA_True Cost (default)	0.00	=	<input checked="" type="checkbox"/>
Electrical - Circuiting			
True Voltage	277.00 V	=	<input checked="" type="checkbox"/>
Other			
BRA_Critical Power (default)		= IF(BRA_Critical Power_ON,	
BRA_Emergency (default)		= IF(BRA_Emergency_ON,	
BRA_Life Safety (default)		= IF(BRA_Life Safety_ON,	

Manage Lookup Tables

OK Cancel Apply

fixture family / parameters

space analysis / revit working view

+

fixture family / parameters

Room Name	Room ID	Area (SF)	Level	Room Description	VA	WPF	W	W/E*	Value
MLO ROOM	115A	174 SF	LEVEL 1	MBCC Conference Meeting/Multipurpose	65 VA	0.37 WPF	109 W	0.97 W/E*	0.306105
DEBREF ROOM	115C	167 SF	LEVEL 1	MBCC Conference Meeting/Multipurpose	116 VA	0.79 WPF	162 W	0.97 W/E*	0.718025
DEBREF ROOM	115B	157 SF	LEVEL 1	MBCC Conference Meeting/Multipurpose	116 VA	0.74 WPF	152 W	0.97 W/E*	0.76466
MBCC Conference Meeting/Multipurpose: 3									
ECE LAB	122	127 SF	LEVEL 1	MBCC Laboratory classroom	763 VA	0.59 WPF	443 W	1.11 W/E*	0.632717
EMT SKILLS LAB	112	470 SF	LEVEL 1	MBCC Laboratory classroom	275 VA	0.41 WPF	743 W	1.11 W/E*	0.368378
ECE LAB STG	122A	159 SF	LEVEL 1	MBCC Laboratory classroom	60 VA	0.37 WPF	176 W	1.11 W/E*	0.332742
DVS LAB	222	395 SF	LEVEL 2	MBCC Laboratory classroom	626 VA	0.70 WPF	693 W	1.11 W/E*	0.630503
MEDICAL ASSIST PRACTICE ROOM	214A	142 SF	LEVEL 2	MBCC Laboratory classroom	101 VA	0.71 WPF	158 W	1.11 W/E*	0.637637
CPO LAB	220	477 SF	LEVEL 2	MBCC Laboratory classroom	412 VA	0.36 WPF	529 W	1.11 W/E*	0.777553
Laboratory	S117	675 SF	LEVEL 2	MBCC Laboratory classroom	771 VA	1.14 WPF	749 W	1.11 W/E*	1.029621
DVS LAB STG	222A	98 SF	LEVEL 2	MBCC Laboratory classroom	29 VA	0.43 WPF	75 W	1.11 W/E*	0.306245
QUIET TESTING	320H	162 SF	LEVEL 3	MBCC Laboratory classroom	130 VA	0.34 WPF	100 W	1.11 W/E*	0.753723
DISABILITY TESTING	320G	214 SF	LEVEL 3	MBCC Laboratory classroom	233 VA	1.39 WPF	235 W	1.11 W/E*	0.879687
REFERENCE DESK	301D	103 SF	LEVEL 3	MBCC Laboratory classroom	120 VA	1.21 WPF	101 W	1.11 W/E*	1.612655
MBCC Laboratory classroom: 11									
ENROLLMENT COUNTER	116A	144 SF	LEVEL 1	MBCC Lobby	247 VA	0.72 WPF	200 W	0.84 W/E*	0.853187
ENROLLMENT WAITING AREA	110	149 SF	LEVEL 1	MBCC Lobby	223 VA	0.84 WPF	263 W	0.84 W/E*	0.781665
VESTIBULE B	100B	95 SF	LEVEL 1	MBCC Lobby	53 VA	0.55 WPF	80 W	0.84 W/E*	0.858852
VESTIBULE A	100A	90 SF	LEVEL 1	MBCC Lobby	52 VA	0.58 WPF	76 W	0.84 W/E*	0.868405
MBCC Lobby: 4									
FOOD SERVICE (CAFE)	S13	Not Placed	Not Placed	MBCC Food Service	175 VA	0.38 WPF	67 W	0.59 W/E*	0
FOOD SERVICE (CAFE)	120D	235 SF	LEVEL 1	MBCC Food Service	125 VA	0.33 WPF	139 W	0.59 W/E*	0.900255
MBCC Food Service: 2									
GROUP STUDY	120C	102 SF	LEVEL 1	MBCC Library - Studying Area	50 VA	0.39 WPF	90 W	0.96 W/E*	0
GROUP STUDY	120A	160 SF	LEVEL 1	MBCC Library - Studying Area	23 VA	0.14 WPF	154 W	0.96 W/E*	0.150634
GROUP STUDY	120B	171 SF	LEVEL 1	MBCC Library - Studying Area	63 VA	0.49 WPF	104 W	0.96 W/E*	0.508699
GROUP STUDY	302A	200 SF	LEVEL 3	MBCC Library - Studying Area	125 VA	0.39 WPF	200 W	0.96 W/E*	0.024415
QUIET STUDY	302B	147 SF	LEVEL 3	MBCC Library - Studying Area	63 VA	0.58 WPF	141 W	0.96 W/E*	0.608687
MBCC Library - Studying Area: 5									
SHARPS + LIENS	111J	55 SF	LEVEL 1	MBCC HAZ Waste	35 VA	0.93 WPF	28 W	0.61 W/E*	1.241262
MBCC HAZ Waste: 1									
		55 SF			35 VA		28 W		

LPD space schedule / categorize by space type

Room Name	Room ID	Area (SF)	Level	Room Description	VA	W	W/E*	Value
ENROLLMENT WAITING AREA	MBCC Lobby		LEVEL 1	DF-R4	12	21 VA	42 W	200.06
	MBCC Lobby		LEVEL 1	EV-2	1	0 W		0.00
	MBCC Lobby		LEVEL 1	LI-1	4		83 W	0.00
	MBCC Lobby		LEVEL 1	RL-4	5		427 W	0.00
	MBCC Lobby		LEVEL 1	RL-1	2		33 W	0.00
MBCC Food Service								
120D	FOOD SERVICE (CAFE)	MBCC Food Service	LEVEL 1	DF-R4	8	21 VA	125 W	200.06
MBCC Library - Studying Area								
120A	GROUP STUDY	MBCC Library - Studying Area	LEVEL 1	DF-R4	14	21 VA	261 W	200.06
120A	GROUP STUDY	MBCC Library - Studying Area	LEVEL 1	PL-2CB	1	23 VA	23 W	0.00
MBCC HAZ Waste								
111J	SHARPS + LIENS	MBCC HAZ Waste	LEVEL 1	BL-3	1	35 VA	35 W	0.00
MBCC JAN								
		MBCC JAN		BL-3A	4	34 VA	134 W	0.00
MBCC Operating Room								
115H	LABOR & DELIVERY	MBCC Operating Room	LEVEL 1	DA-R8	2	52 VA	104 W	0.00
115H	LABOR & DELIVERY	MBCC Operating Room	LEVEL 1	DF-R1A	4	21 VA	83 W	0.00
115H	LABOR & DELIVERY	MBCC Operating Room	LEVEL 1	RA-24A	1	97 VA	97 W	0.00
MBCC Storage								
		MBCC Storage		BL-3	9	35 VA	215 W	0.00
		MBCC Storage		BR-22	6	20 VA	121 W	0.00
		MBCC Storage		BR-21	15	29 VA	443 W	0.00
MBCC Electrical/Mechanical								
		MBCC Electrical/Mechanical		BL-3	45	35 VA	1575 W	0.00
		MBCC Electrical/Mechanical		BL-5	4	50 VA	200 W	0.00
114	BRAIN SUPPLY ROOM	MBCC Electrical/Mechanical	LEVEL 1	BR-22	5	29 VA	101 W	0.00
423	REP ROOM	MBCC Electrical/Mechanical	LEVEL 4	EV-2	1	0 W		0.00
		MBCC Electrical/Mechanical	LEVEL 3	RL-4	2	78 VA	165 W	0.00
MBCC Paramedic Lab classroom								
113C	PARAMEDIC STUDENT STG	MBCC Paramedic Lab classroom	LEVEL 1	BR-22	2	20 VA	40 W	0.00
113A	PARAMEDIC STG	MBCC Paramedic Lab classroom	LEVEL 1	BR-24	1	29 VA	29 W	0.00
		MBCC Paramedic Lab classroom	LEVEL 1	CR-16	3	27 VA	81 W	0.00
113D	PARAMEDIC BATHROOM	MBCC Paramedic Lab classroom	LEVEL 1	DF-R4W	1	11 VA	11 W	0.00
113	PARAMEDIC SKILLS LAB	MBCC Paramedic Lab classroom	LEVEL 1	EV-2	1	0 W		0.00
113	PARAMEDIC SKILLS LAB	MBCC Paramedic Lab classroom	LEVEL 1	RA-24	8	44 VA	263 W	0.00
113D	PARAMEDIC BATHROOM	MBCC Paramedic Lab classroom	LEVEL 1	AV-1	1	22 VA	22 W	0.00

fixture count schedule / quantity of each type in each space type

MILC ROOM	115A	174 SF	LEVEL 1	IBCC Conference Meeting/Multipurpose	65 VA	0.37 W/FP	109 W	0.97 W/ft²	0.306105
DEBREF ROOM	115C	167 SF	LEVEL 1	IBCC Conference Meeting/Multipurpose	116 VA	0.79 W/FP	162 W	0.97 W/ft²	0.718025
DEBREF ROOM	115B	157 SF	LEVEL 1	IBCC Conference Meeting/Multipurpose	116 VA	0.74 W/FP	152 W	0.97 W/ft²	0.76466
IBCC Conference Meeting/Multipurpose: 3					498 SF		208 VA	489 W	
ECE LAB	122	127 SF	LEVEL 1	IBCC Laboratory classroom	763 VA	0.59 W/FP	1413 W	1.11 W/ft²	0.632717
EMT SKILLS LAB	112	470 SF	LEVEL 1	IBCC Laboratory classroom	275 VA	0.41 W/FP	743 W	1.11 W/ft²	0.368378
ECE LAB STG	122A	156 SF	LEVEL 1	IBCC Laboratory classroom	69 VA	0.37 W/FP	176 W	1.11 W/ft²	0.332742
DVS LAB	222	395 SF	LEVEL 2	IBCC Laboratory classroom	626 VA	0.70 W/FP	693 W	1.11 W/ft²	0.630503
MEDICAL ASSIST PRACTICE ROOM	214A	142 SF	LEVEL 2	IBCC Laboratory classroom	101 VA	0.71 W/FP	158 W	1.11 W/ft²	0.632637
CPO LAB	220	477 SF	LEVEL 2	IBCC Laboratory classroom	412 VA	0.36 W/FP	529 W	1.11 W/ft²	0.777553
Laboratory	S117	670 SF	LEVEL 2	IBCC Laboratory classroom	771 VA	1.14 W/FP	749 W	1.11 W/ft²	1.029621
DVS LAB STG	222A	98 SF	LEVEL 2	IBCC Laboratory classroom	29 VA	0.43 W/FP	75 W	1.11 W/ft²	0.306245
QUIET TESTING	320H	162 SF	LEVEL 3	IBCC Laboratory classroom	130 VA	0.34 W/FP	100 W	1.11 W/ft²	0.755723
DISABILITY TESTING	320G	214 SF	LEVEL 3	IBCC Laboratory classroom	233 VA	1.39 W/FP	230 W	1.11 W/ft²	0.879687
REFERENCE DESK	304D	143 SF	LEVEL 3	IBCC Laboratory classroom	120 VA	1.21 W/FP	101 W	1.11 W/ft²	1.013655
IBCC Laboratory classroom: 11					4908 SF		3721 VA	6438 W	
ENROLLMENT COUNTER	116A	144 SF	LEVEL 1	IBCC Lobby	247 VA	0.72 W/FP	200 W	0.84 W/ft²	0.853187
ENROLLMENT WAITING AREA	110	149 SF	LEVEL 1	IBCC Lobby	223 VA	0.84 W/FP	263 W	0.84 W/ft²	0.781665
VESTIBULE B	100B	95 SF	LEVEL 1	IBCC Lobby	53 VA	0.55 W/FP	80 W	0.84 W/ft²	0.858852
VESTIBULE A	100A	80 SF	LEVEL 1	IBCC Lobby	52 VA	0.58 W/FP	76 W	0.84 W/ft²	0.868405
IBCC Lobby: 4					679 SF		675 VA	738 W	
FOOD SERVICE (CAFE)	S13	Not Placed	Not Placed	IBCC Food Service		0.38 W/FP	0 W	0.59 W/ft²	0
FOOD SERVICE (CAFE)	120D	235 SF	LEVEL 1	IBCC Food Service	125 VA	0.33 W/FP	139 W	0.59 W/ft²	0.900355
IBCC Food Service: 2					235 SF		125 VA	139 W	
GROUP STUDY	120C	102 SF	LEVEL 1	IBCC Library - Studying Area	50 VA	0.39 W/FP	90 W	0.96 W/ft²	0
GROUP STUDY	120A	160 SF	LEVEL 1	IBCC Library - Studying Area	23 VA	0.14 W/FP	154 W	0.96 W/ft²	0.150634
GROUP STUDY	120B	171 SF	LEVEL 1	IBCC Library - Studying Area	63 VA	0.49 W/FP	104 W	0.96 W/ft²	0.508699
GROUP STUDY	302A	200 SF	LEVEL 3	IBCC Library - Studying Area	125 VA	0.39 W/FP	200 W	0.96 W/ft²	0.024415
QUIET STUDY	302B	147 SF	LEVEL 3	IBCC Library - Studying Area	63 VA	0.58 W/FP	141 W	0.96 W/ft²	0.608687
IBCC Library - Studying Area: 5					789 SF		314 VA	753 W	
SHARPS + LIENS	111J	55 SF	LEVEL 1	IBCC HAZ Waste	36 VA	0.93 W/FP	28 W	0.61 W/ft²	1.244562
IBCC HAZ Waste: 1					55 SF		36 VA	28 W	

LPD space schedule / categorize by space type

110	ENROLLMENT WAITING AREA	IBCC Lobby	LEVEL 1	DF-R4	12	21 VA	42 W	209.06	1400.00
		IBCC Lobby	LEVEL 1	EV-2	1	0 W	0 W	0.00	0.00
		IBCC Lobby	LEVEL 1	LI-1	4		83 W	0.00	0.00
		IBCC Lobby	LEVEL 1	RL-4	5		427 W	0.00	0.00
		IBCC Lobby	LEVEL 1	RL-1	2		33 W	0.00	0.00
IBCC Food Service									
120D	FOOD SERVICE (CAFE)	IBCC Food Service	LEVEL 1	DF-R4	8	21 VA	125 W	209.06	1204.00
IBCC Library - Studying Area									
120A	GROUP STUDY	IBCC Library - Studying Area	LEVEL 1	DF-R4	14	21 VA	261 W	209.06	12804.00
120B	GROUP STUDY	IBCC Library - Studying Area	LEVEL 1	PL-2CB	1	23 VA	23 W	0.00	0.00
IBCC HAZ Waste									
111J	SHARPS + LIENS	IBCC HAZ Waste	LEVEL 1	RL-3	1	35 VA	35 W	0.00	0.00
IBCC JAN									
		IBCC JAN		RL-3A	4	34 VA	134 W	0.00	0.00
IBCC Operating Room									
115H	LABOR & DELIVERY	IBCC Operating Room	LEVEL 1	DA-R8	2	52 VA	104 W	0.00	0.00
115H	LABOR & DELIVERY	IBCC Operating Room	LEVEL 1	DF-R4A	4	21 VA	83 W	0.00	0.00
115H	LABOR & DELIVERY	IBCC Operating Room	LEVEL 1	RA-24A	1	97 VA	97 W	0.00	0.00
IBCC Storage									
		IBCC Storage		RL-3	9	35 VA	315 W	0.00	0.00
		IBCC Storage		BR-22	6	20 VA	121 W	0.00	0.00
		IBCC Storage		BR-21	15	29 VA	443 W	0.00	0.00
IBCC Electrical/Mechanical									
		IBCC Electrical/Mechanical		RL-3	45	35 VA	1575 W	0.00	0.00
		IBCC Electrical/Mechanical		RL-5	4	50 VA	200 W	0.00	0.00
114	BRAIN SUPPLY ROOM	IBCC Electrical/Mechanical	LEVEL 1	BR-22	5	29 VA	101 W	0.00	0.00
423	MEP ROOM	IBCC Electrical/Mechanical	LEVEL 1	EV-2	1	0 W	0 W	0.00	0.00
		IBCC Electrical/Mechanical	LEVEL 3	RL-4	2	78 VA	165 W	0.00	0.00
IBCC Paramedic Lab classroom									
113C	PARAMEDIC STUDENT STG	IBCC Paramedic Lab classroom	LEVEL 1	BR-22	2	20 VA	40 W	0.00	0.00
113A	PARAMEDIC STG	IBCC Paramedic Lab classroom	LEVEL 1	BR-24	1	29 VA	29 W	0.00	0.00
		IBCC Paramedic Lab classroom	LEVEL 1	CR-16	3	27 VA	81 W	0.00	0.00
113D	PARAMEDIC BATHROOM	IBCC Paramedic Lab classroom	LEVEL 1	DF-R4V1	1	11 VA	11 W	0.00	0.00
113	PARAMEDIC SKILLS LAB	IBCC Paramedic Lab classroom	LEVEL 1	EV-2	1	0 W	0 W	0.00	0.00
113	PARAMEDIC SKILLS LAB	IBCC Paramedic Lab classroom	LEVEL 1	RA-24	3	44 VA	263 W	0.00	0.00
113D	PARAMEDIC BATHROOM	IBCC Paramedic Lab classroom	LEVEL 1	AV-1	1	22 VA	22 W	0.00	0.00

fixture count schedule / quantity of each type in each space type



- adding pricing
calculate the budget for the project

- adding Global Warming Potential Data

Panel Discussion:

Life Cycle Assessment (LCA) of Luminaires and Lighting Design Strategies - Tales from the Front

March 8, 2023

11:00am – 12:30pm EST

Room Location: Murray Hill

Leela Shanker, Flint Collective NYC

Russell Greenberg, Rux Studio

Kate Hickcox, Pacific Northwest National Laboratory

expandable schedules / adding parameters as needed

CONCLUSION

- Ask the right **QUESTIONS**
- **Prioritize** your goals
- If there is **ONE** can... Use it!

- No “**THE ONE**” Software
- **Debugging** / Self-Learning
- “**WHO**” are you going to talk

01. Exploring Revit-based Plugins

<LPD Space Schedule>

A	B	C	D	E	F	G	H	I	J
Name	Number	Area	Level	Space Type	Designed Lighting Load	Designed LFD	Allowable Lighting Load	Code Load	Target %
SWING OFFICE	110B	126 SF	LEVEL 1	MBCC Office - Enclosed less 256sf	76 VA	0.82 W/ft²	83 W	0.74 W/ft²	0.83282
ADMISSIONS OFFICE	110E	120 SF	LEVEL 1	MBCC Office - Enclosed less 256sf	76 VA	0.85 W/ft²	89 W	0.74 W/ft²	0.871823
FINANCIAL AD OFFICE	110P	171 SF	LEVEL 1	MBCC Office - Enclosed less 256sf	97 VA	0.57 W/ft²	127 W	0.74 W/ft²	0.764222
SWING OFFICE	110C	135 SF	LEVEL 1	MBCC Office - Enclosed less 256sf	76 VA	0.56 W/ft²	109 W	0.74 W/ft²	0.778324
SECURITY OFFICE	104	126 SF	LEVEL 1	MBCC Office - Enclosed less 256sf	48 VA	0.38 W/ft²	109 W	0.74 W/ft²	0.461422
OFFICE	118D	152 SF	LEVEL 1	MBCC Office - Enclosed less 256sf	78 VA	0.59 W/ft²	98 W	0.74 W/ft²	0.794232
QMS OFFICE	222C	117 SF	LEVEL 2	MBCC Office - Enclosed less 256sf	78 VA	0.53 W/ft²	105 W	0.74 W/ft²	0.711115
LIBRARY OFFICE	310A	118 SF	LEVEL 3	MBCC Office - Enclosed less 256sf	78 VA	0.66 W/ft²	88 W	0.74 W/ft²	0.885411
DISABILITY OFFICE	325F	144 SF	LEVEL 3	MBCC Office - Enclosed less 256sf	77 VA	0.54 W/ft²	107 W	0.74 W/ft²	0.724357
DISABILITY OFFICE	320E	148 SF	LEVEL 3	MBCC Office - Enclosed less 256sf	78 VA	0.52 W/ft²	119 W	0.74 W/ft²	0.707788
ACADEMIC ADVISING OFFICE	320A	126 SF	LEVEL 3	MBCC Office - Enclosed less 256sf	77 VA	0.61 W/ft²	93 W	0.74 W/ft²	0.82913
COUNSELING SERVICES OFFICE	320C	128 SF	LEVEL 3	MBCC Office - Enclosed less 256sf	77 VA	0.61 W/ft²	94 W	0.74 W/ft²	0.820106
SWING OFFICE	320P	123 SF	LEVEL 3	MBCC Office - Enclosed less 256sf	77 VA	0.63 W/ft²	91 W	0.74 W/ft²	0.803586
ASSOCIATE DEANS OFFICE	320B	250 SF	LEVEL 3	MBCC Office - Enclosed less 256sf	233 VA	0.93 W/ft²	185 W	0.74 W/ft²	1.258111
ADJUNCT GROUP OFFICE	417	466 SF	LEVEL 4	MBCC Office - Enclosed less 256sf	368 VA	0.85 W/ft²	338 W	0.74 W/ft²	1.14928

<LPD Fixture Count Schedule>

A	B	C	D	E	F	G	H
Space Number	Space Name	Space Space Type	Level	Type Mark	Count	BRA True Load	True Load Totals
S295	BRIDGE LV4A	MBCC Corridor/Transition	LEVEL 1	PL-2XH	2	54 VA	107 W
S295	BRIDGE LV4A	MBCC Corridor/Transition		PL-2XJ	2		134 W
S296	BRIDGE LV4B	MBCC Corridor/Transition	LEVEL 1	PL-2XJ	2		80 W
S296	BRIDGE LV4B	MBCC Corridor/Transition		PL-2XK	2	54 VA	107 W
S296	BRIDGE LV4B	MBCC Corridor/Transition		PL-2XL	1	54 VA	54 W
		MBCC Corridor/Transition		RA-22	74	18 VA	1191 W
		MBCC Corridor/Transition	LEVEL 4	RL-4	4	58 VA	233 W
MBCC Conference Meeting/Multipurpose							
416	CONFERENCE ROOM	MBCC Conference Meeting/Multipurpose	LEVEL 4	RL-4	10		737 W
		MBCC Conference Meeting/Multipurpose		RP-3	3		378 W
MBCC Laboratory							
122	ECE LAB	MBCC Laboratory	LEVEL 1		5	96 VA	480 W
		MBCC Laboratory		BR-24	3	29 VA	88 W
214A	MEDICAL_ASSIST_PRACTICE R	MBCC Laboratory	LEVEL 2	DF_R4S	2	28 VA	56 W
		MBCC Laboratory		EX-2	3		0 W
122	ECE LAB	MBCC Laboratory	LEVEL 1	PL-0B	3	30 VA	115 W
301D	REFERENCE DESK	MBCC Laboratory	LEVEL 3	PL-0C	4	77 VA	307 W
122	ECE LAB	MBCC Laboratory	LEVEL 1	PL-8D	5	96 VA	480 W
222	DMS LAB	MBCC Laboratory	LEVEL 2	RA-22	8	16 VA	129 W
228	CPD LAB	MBCC Laboratory	LEVEL 2	RA-24	8	38 VA	300 W
222	DMS LAB	MBCC Laboratory	LEVEL 2	RA-24A	5	81 VA	405 W



CLIMATE STUDIO



ELUM TOOLS



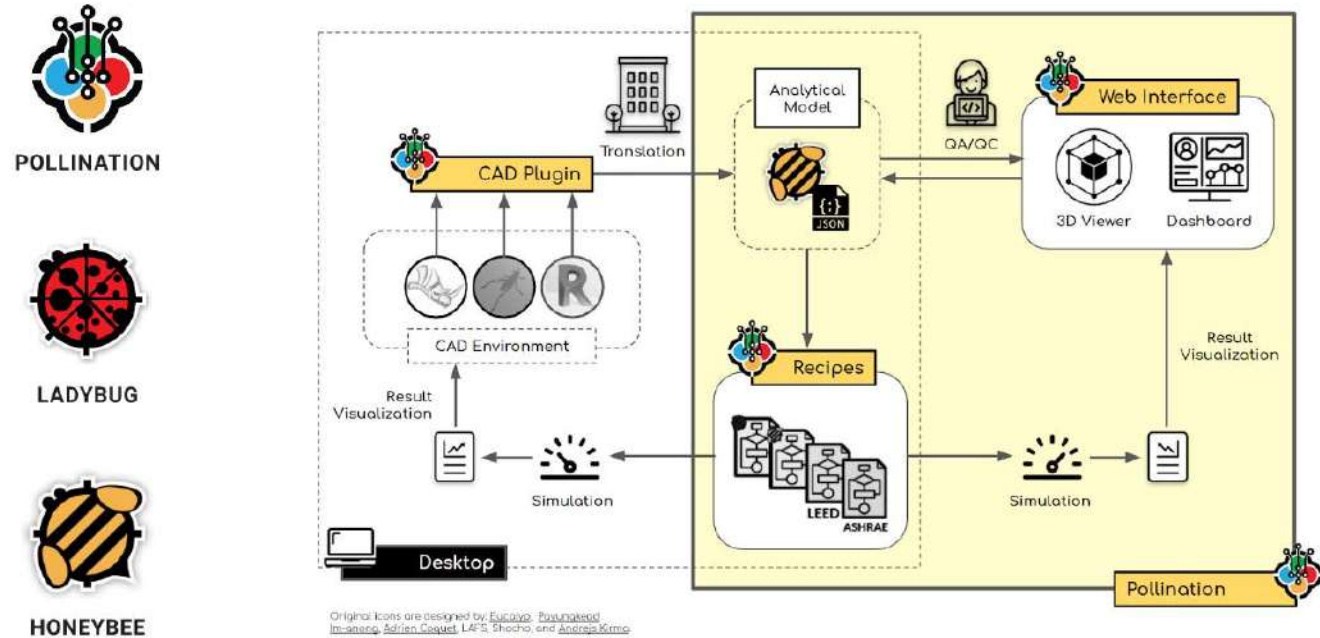
ENSCAPE



LIGHTSTANZA

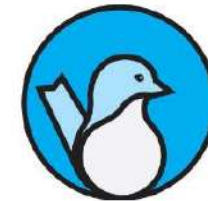
Combining with Revit Parameter (Fixture Families)

02. Parametric Tools in Lighting Practice



Collaborating with the Sustainable Design Team

02. Parametric Tools in Lighting Practice



LARK
SPECTRAL LIGHTING

Reference: Lark Spectral Lighting Website
<https://www.food4rhino.com/en/app/lark-spectral-lighting>



ALFA

Reference: Alfa Website
<https://www.solemma.com/alfa>

Possibility for Circadian Lighting Design

Acknowledgements

Our dear lighting mentors

Brooke Silber, Associate Principal, Borealis Lighting Studio Director, BR+A Consulting

Nancy Lok, Senior Associate, Borealis Lighting Team Captain, BR+A Consulting

Projects

Sasaki, Massbay Community College, Framingham, MA

Elkus Manfredi, Suffolk Downs Redevelopment, Revere, MA

Payette, Holyoke Soldiers Home, Holyoke, MA

JW .ORG/HPR, Headquarters Project Ramapo, Sloatsburg, NY

Derek Porter Studio, Faceted Column, Wichita, KS

Tools

3DMax, AGI 32, Climate Studio, Elum Tools, Enscape, Honeybee, Ladybug, Lightstanza, Revit, Rhino





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Q & A



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This concludes The American Institute of Architects Continuing
Education Systems Course

