LEDucation
Trade Show and Conference

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

LEDucation
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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.

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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

LEDucation
Trade Show and Conference

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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**?

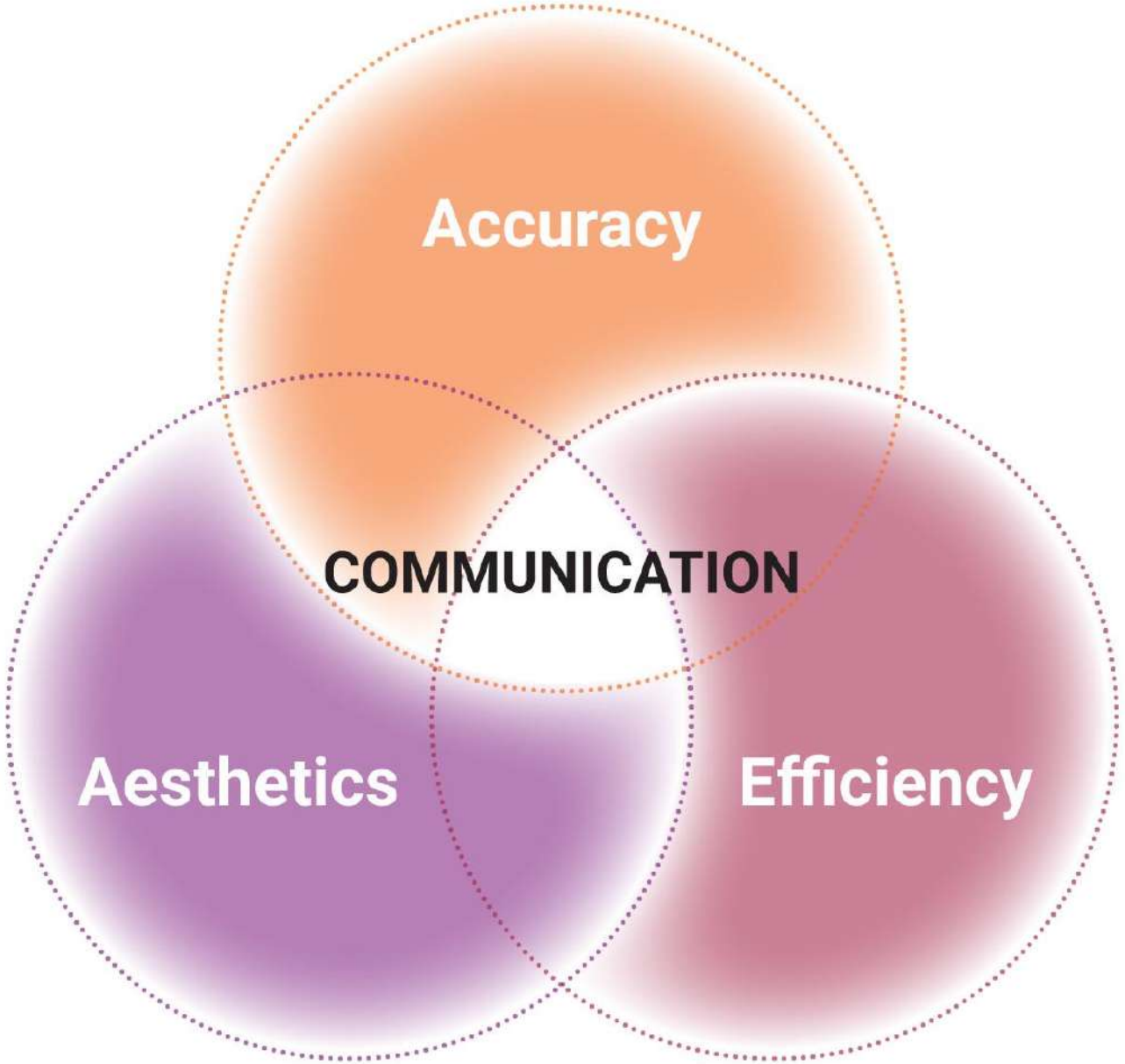
Can we rely on the lighting **EFFECT** of the renderings?
What is the right **DESIGN** for the volunteers to build the bollard on site ?

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


Accuracy
COMMUNICATION
Aesthetics
Efficiency

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
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- LADYBUG
- CLIMATE STUDIO
- ENSCAPE

Group 03

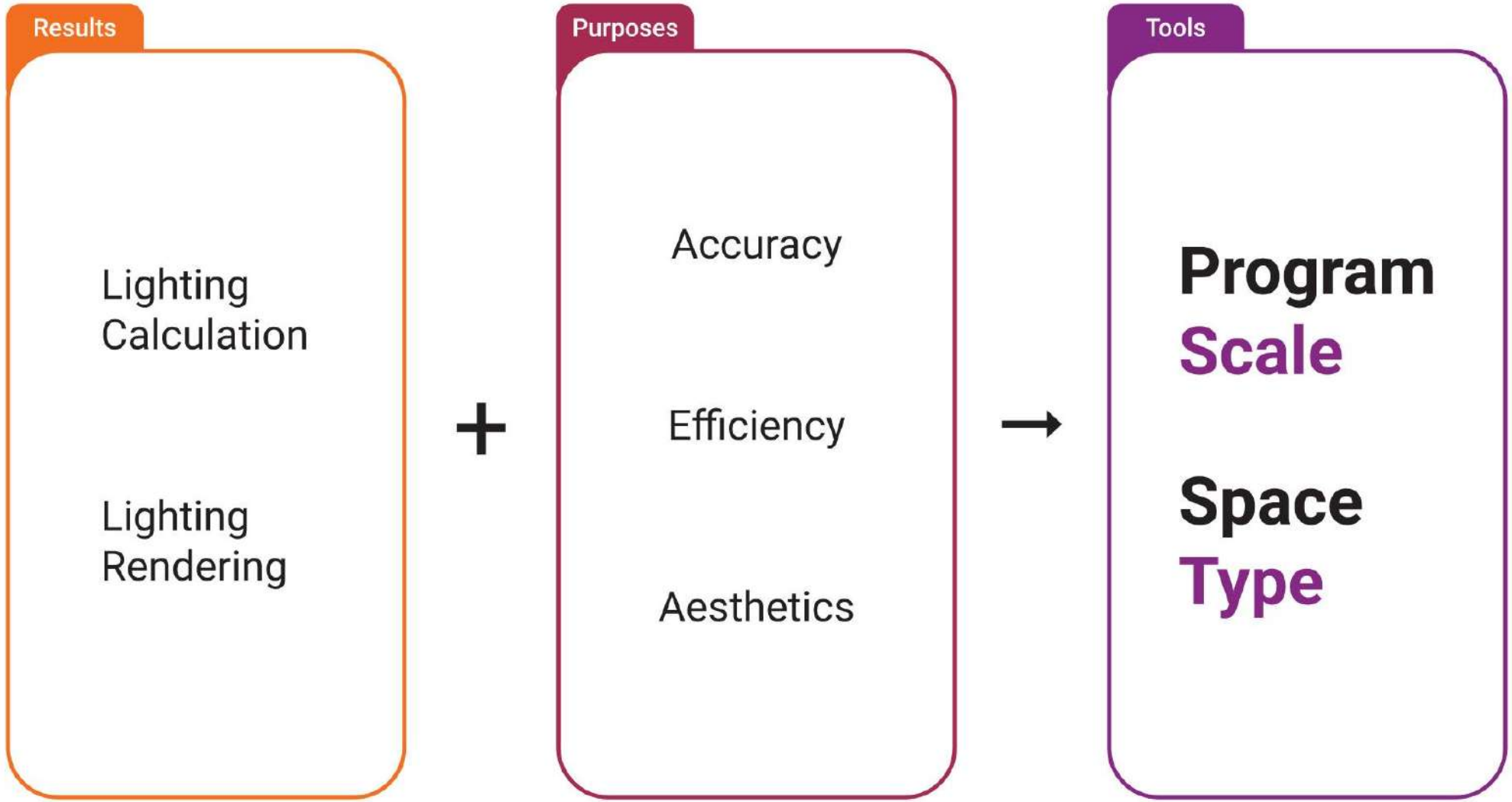
Individual/

- AGI 32
- 3DS MAX

01. Criteria ·····► **Calculation**

02. Lighting Effect ·····► **Rendering**

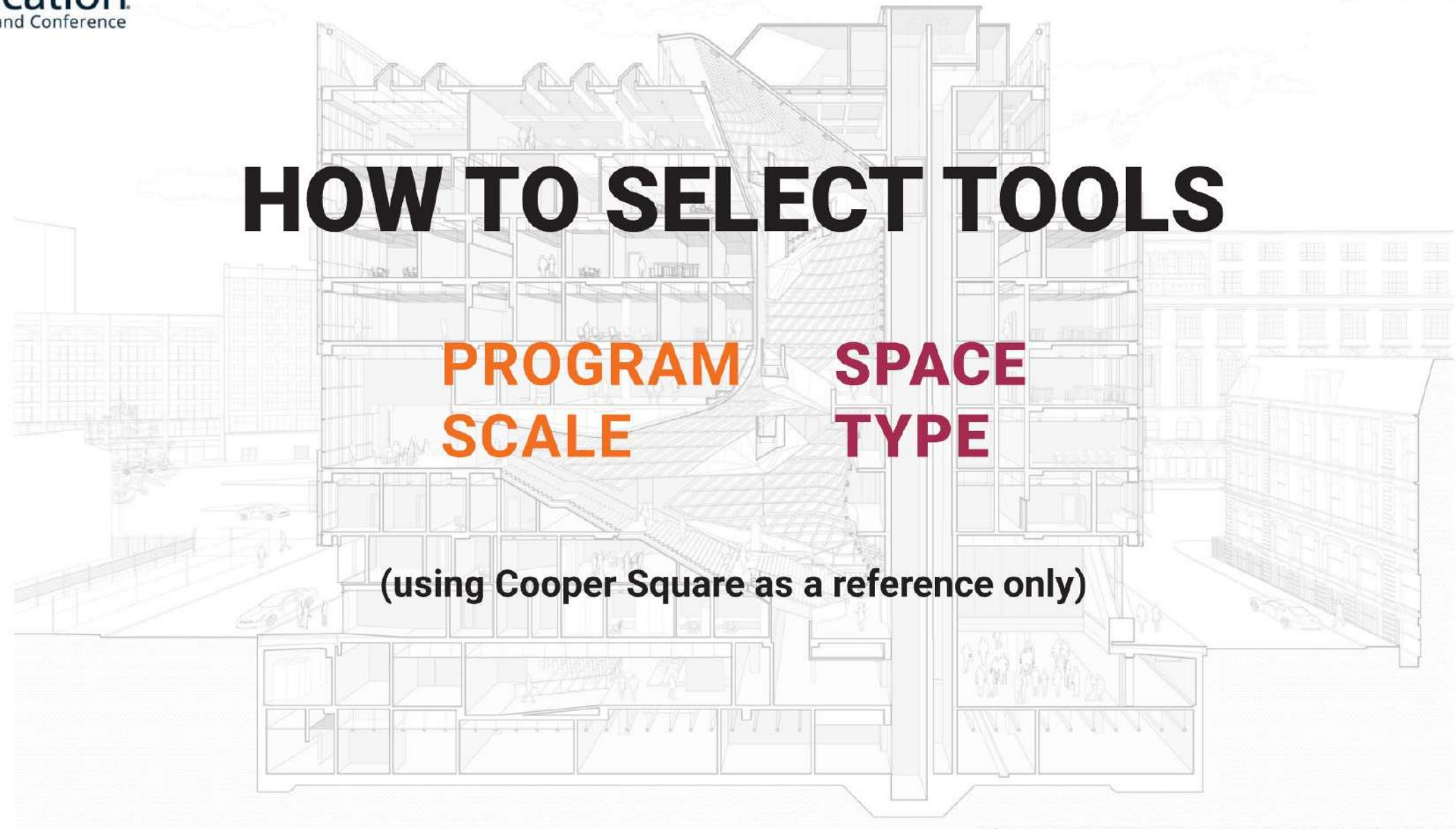
03. Specific Issues ·····► **Mockup**


Results
Lighting Calculation
Lighting Rendering
+
Purposes
Accuracy
Efficiency
Aesthetics
→
Tools
Program
Scale
Space
Type

HOW TO SELECT TOOLS

PROGRAM **SPACE**
SCALE **TYPE**

(using Cooper Square as a reference only)



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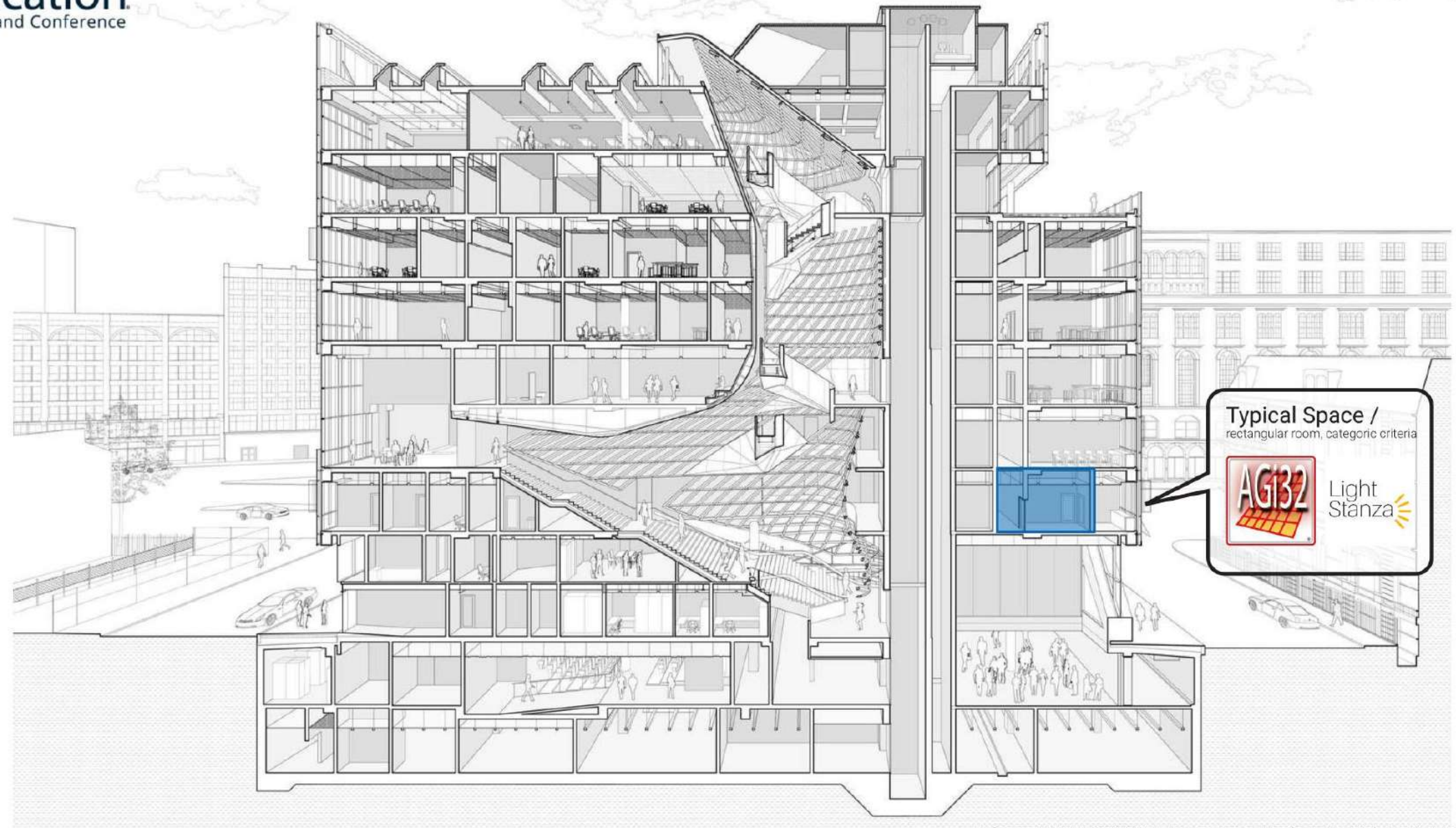

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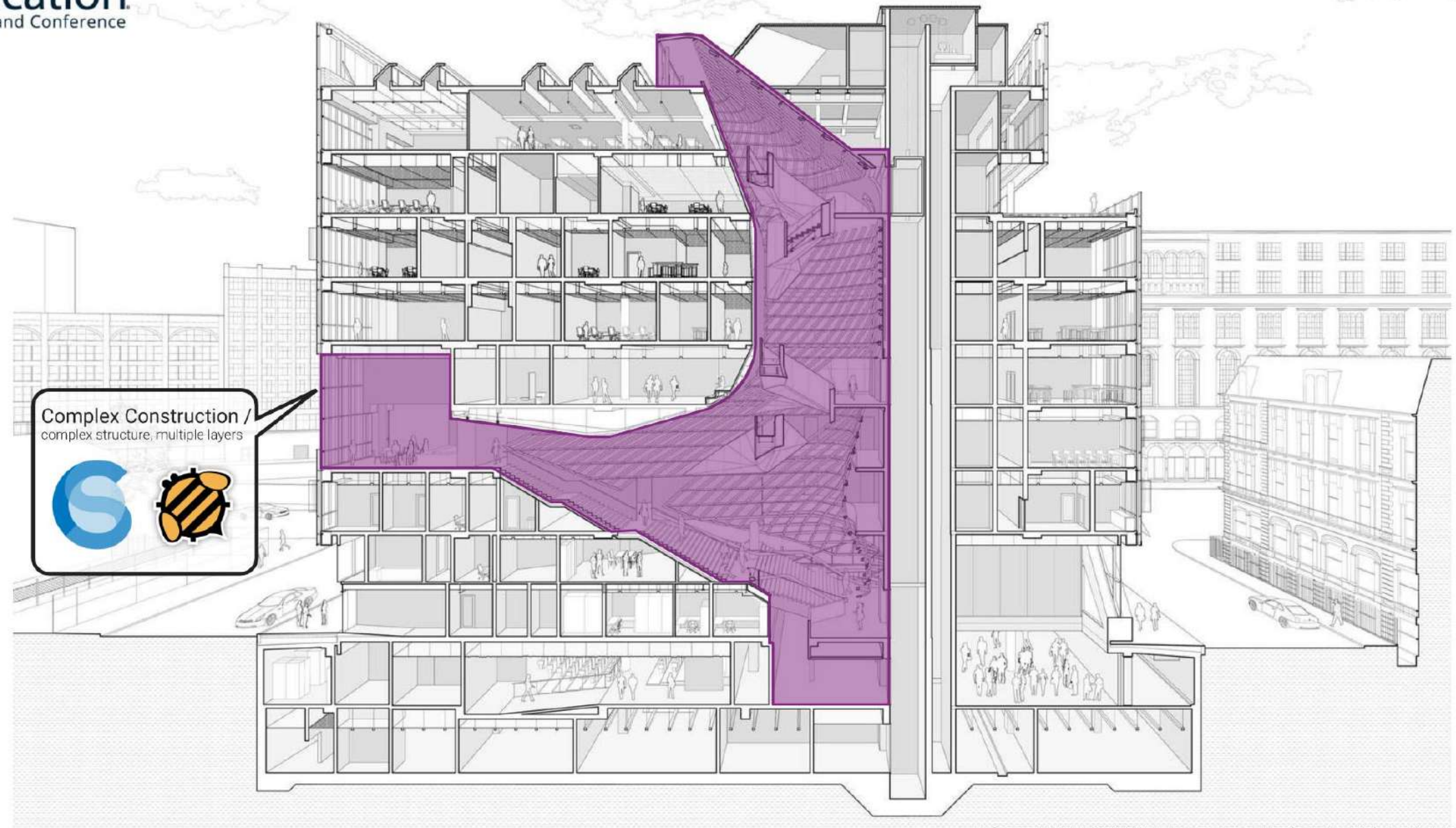

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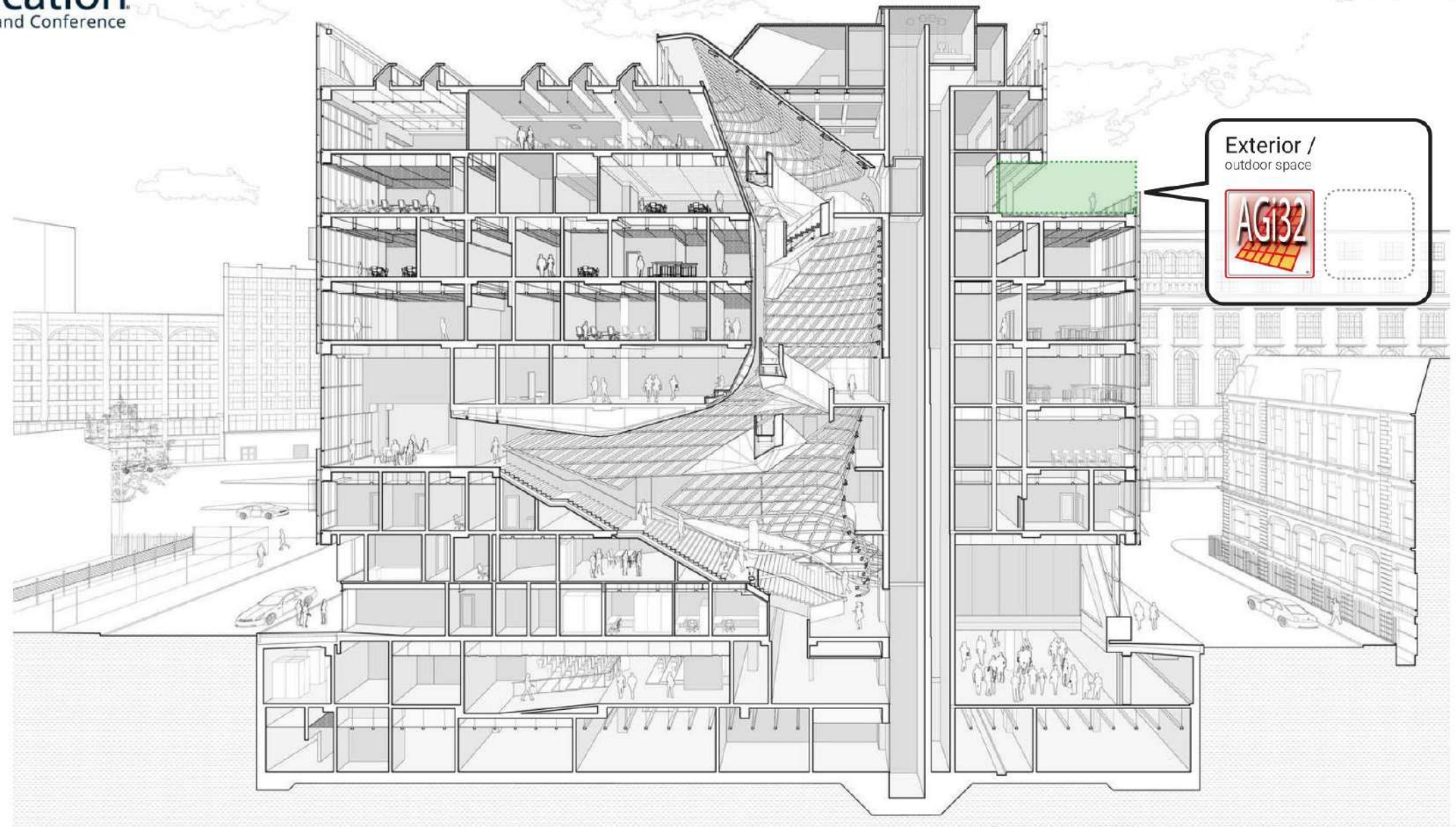

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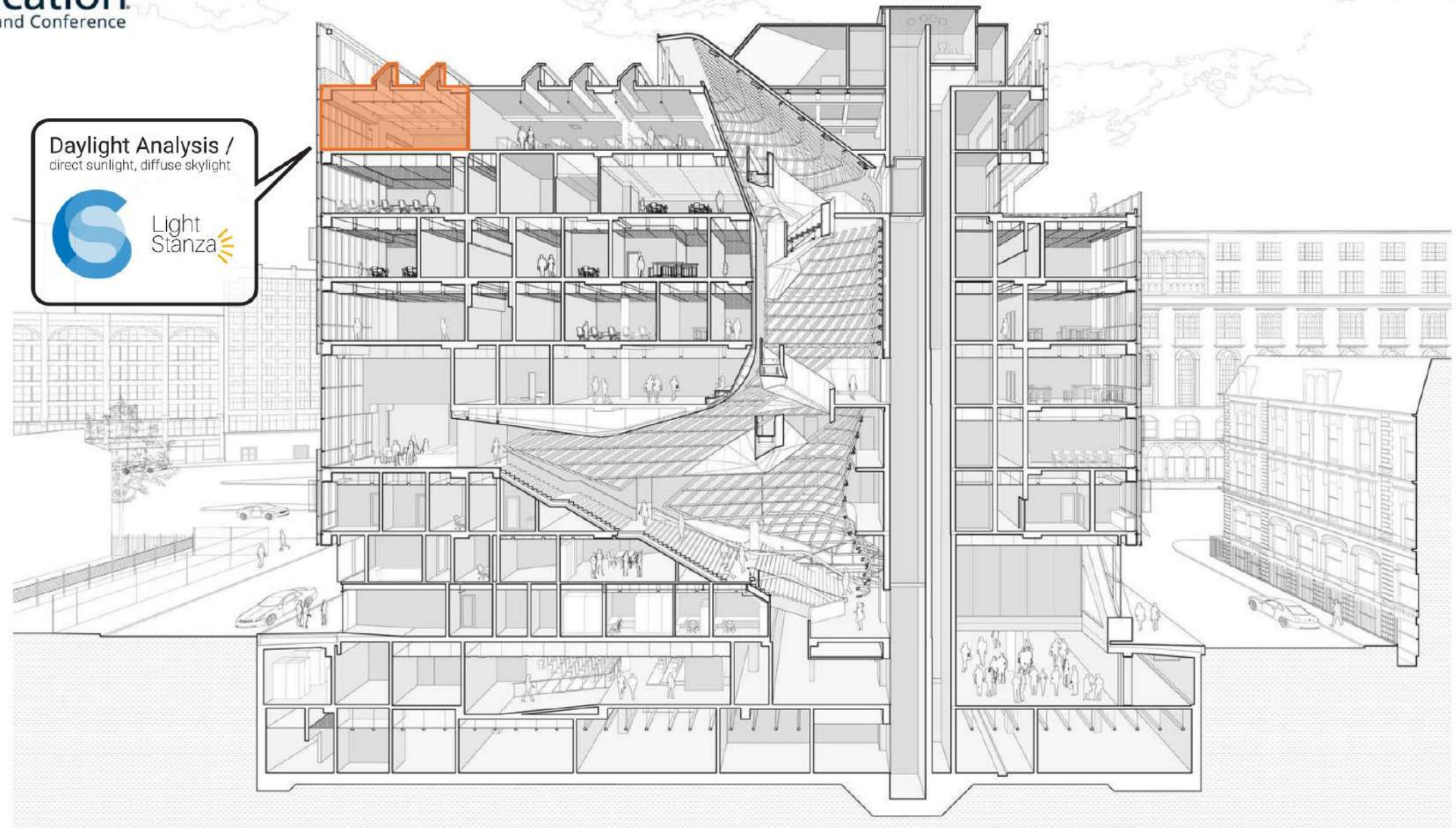

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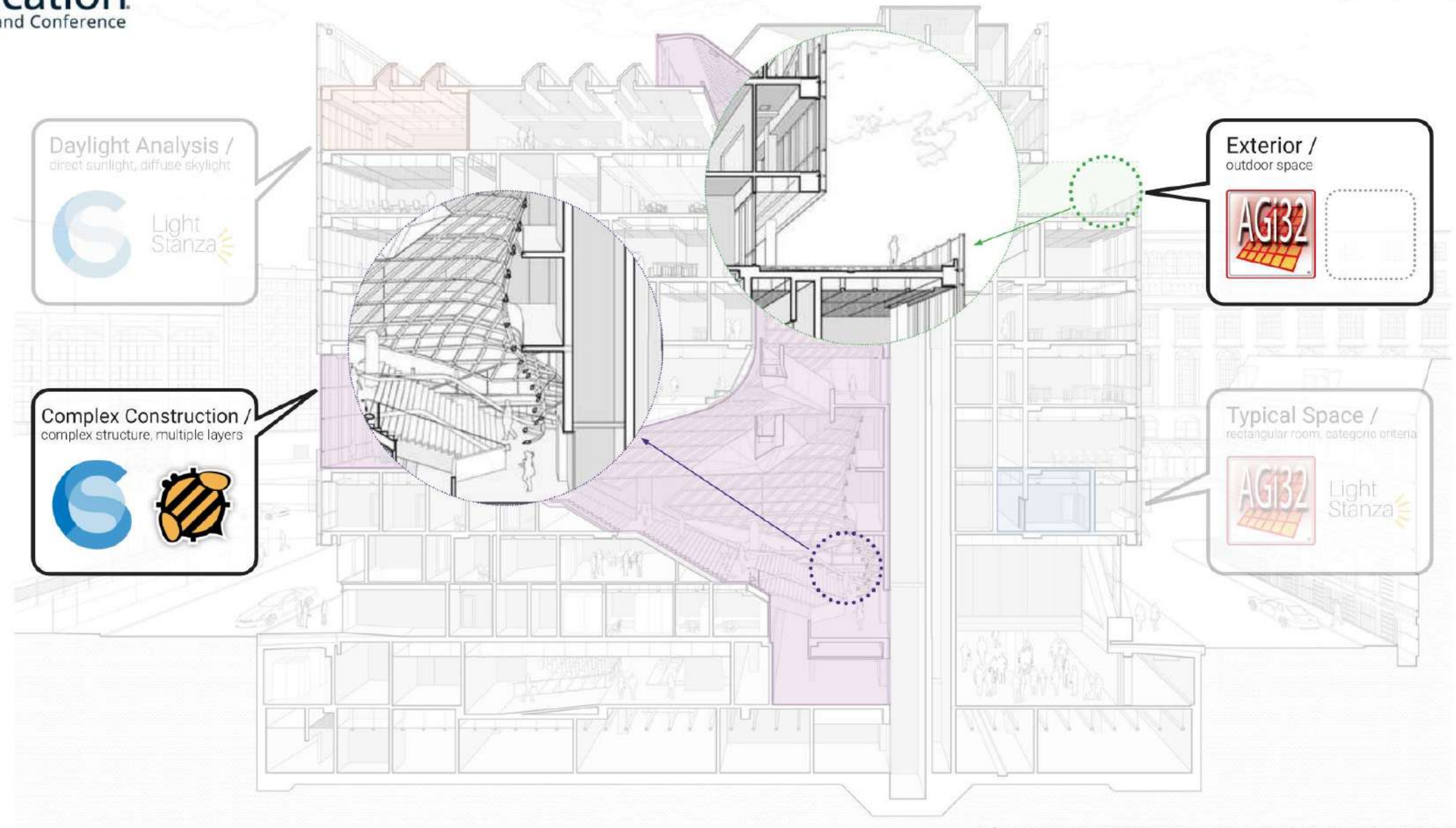

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Table of contents

Tzu-Hao Kuo
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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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Lightstanza ●●●○○

Rendering /
3ds Max ●○○○○
Enscape ●●●○○
V-Ray ●●●○○

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

2021 IES ANNUAL CONFERENCE

www.ies.org/ac

Comparison between AGI32 and Honeybee

Radiosity

AGi32

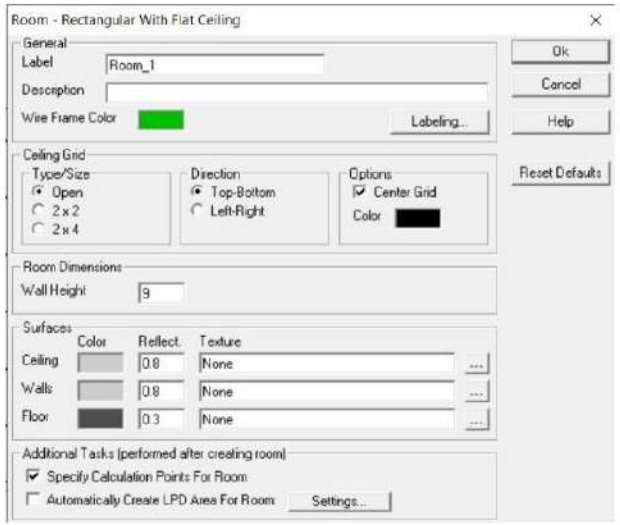
Lighting Analysts
illumination engineering software

Raytracing

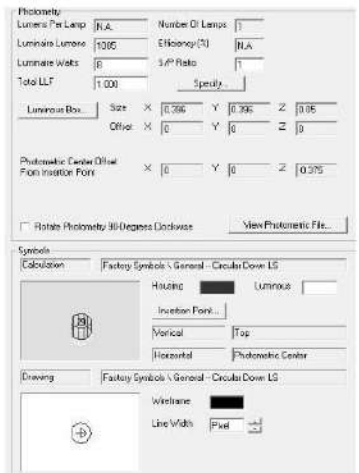
BERKELEY LAB

RADSITE | radiance-online.org

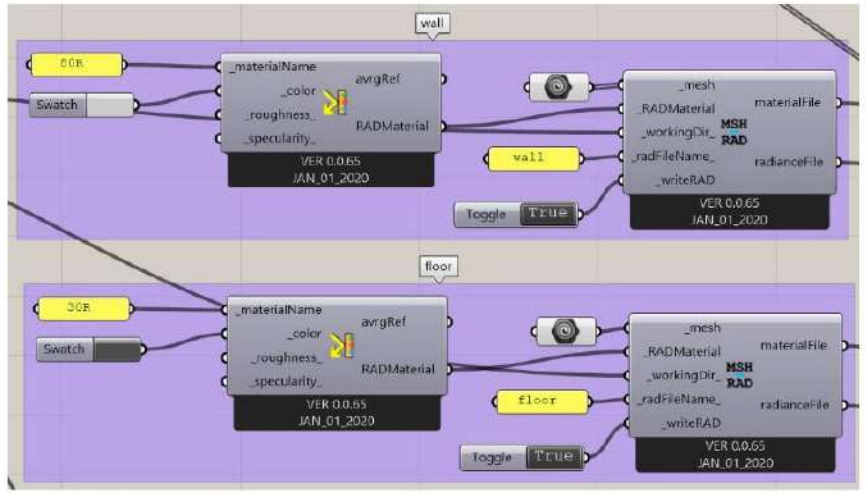
interface / **room setting**



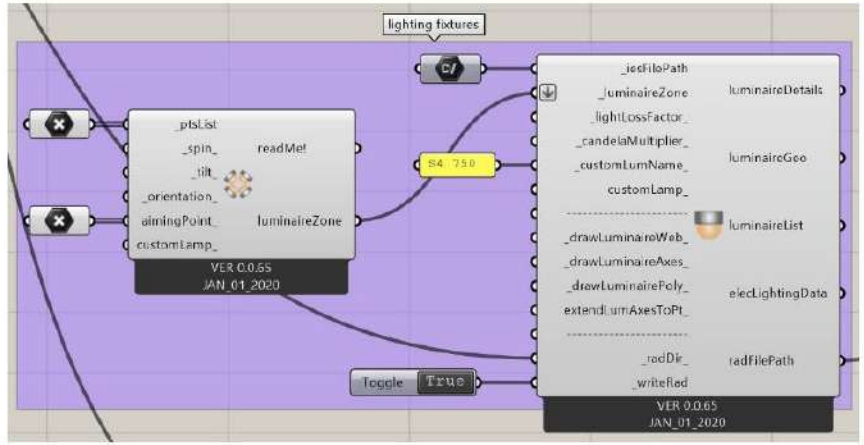
interface / **luminaire setting**

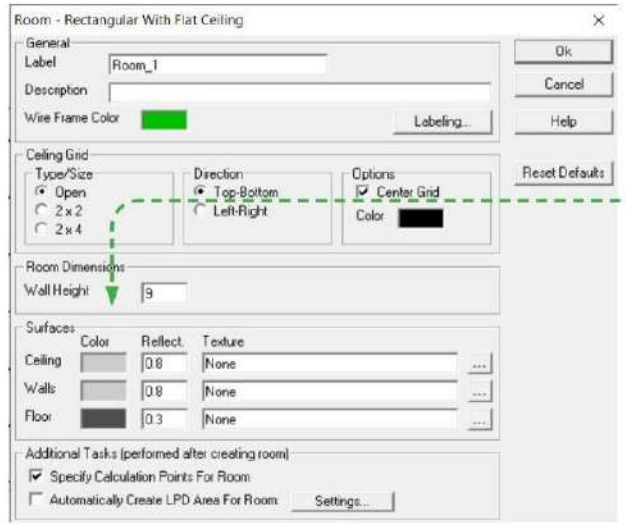


interface / **room setting**



interface / **luminaire setting**





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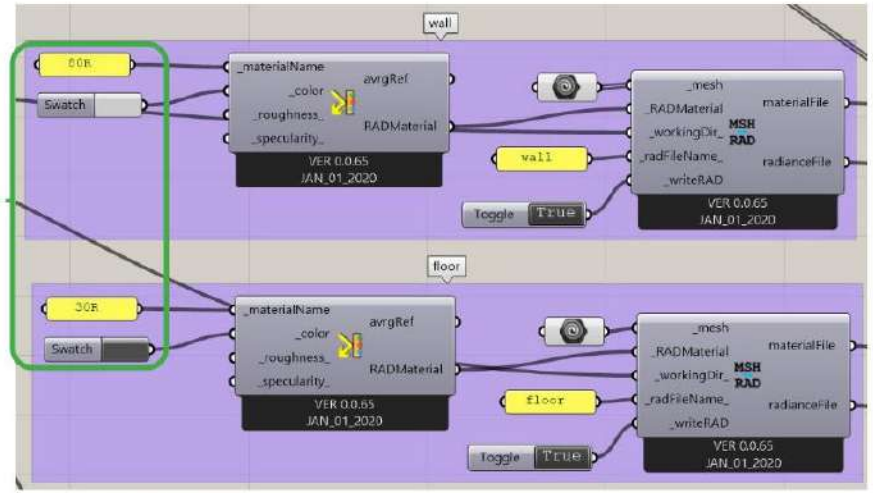

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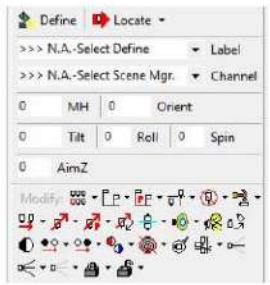

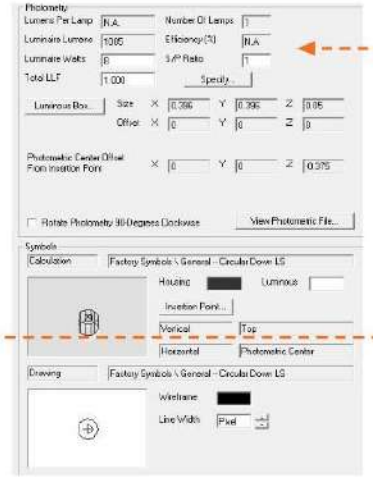

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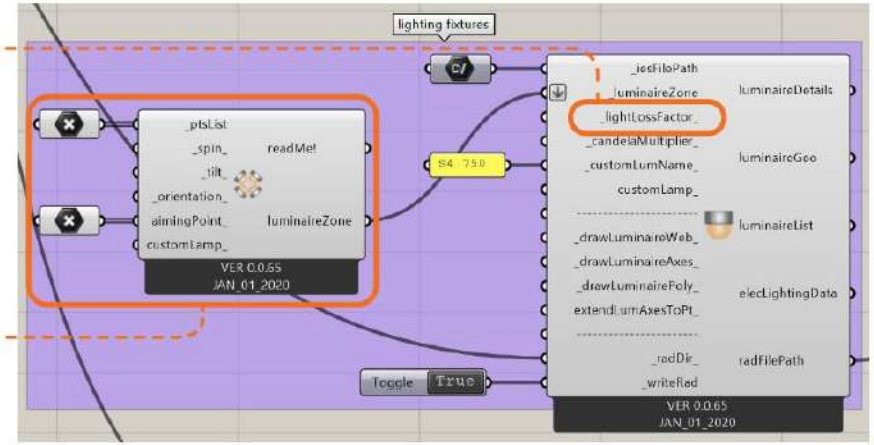
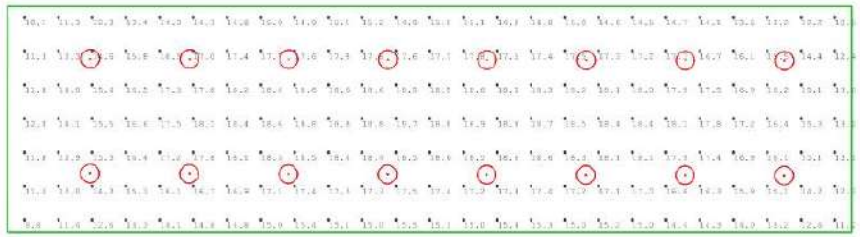
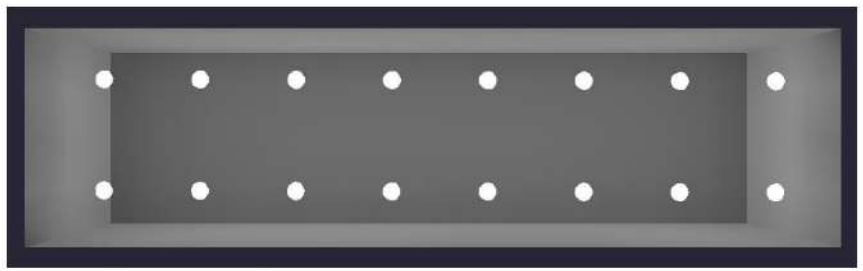


interface / **luminaire setting**

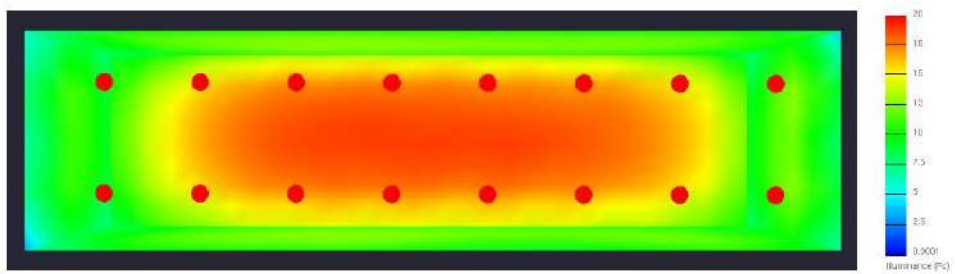
AGi32 version



plan view / **point calculation**

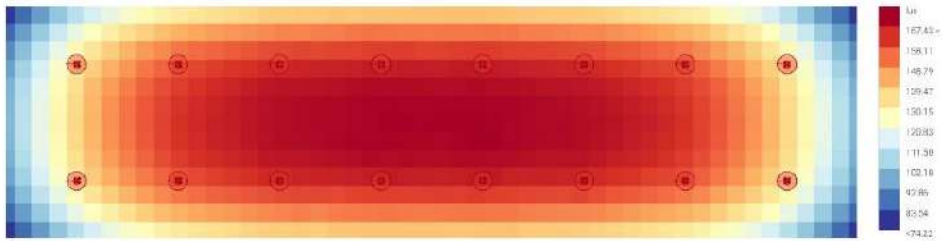


plan view / **lighting rendering**

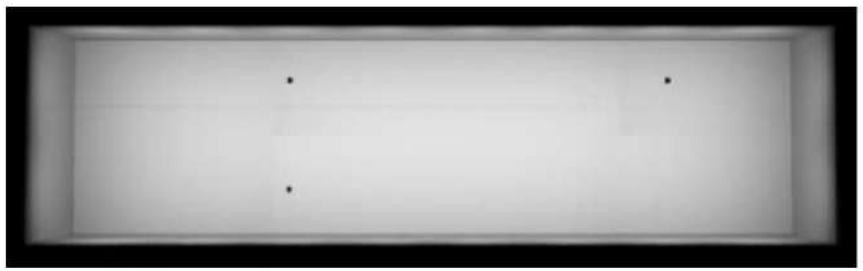


plan view / **false color rendering**

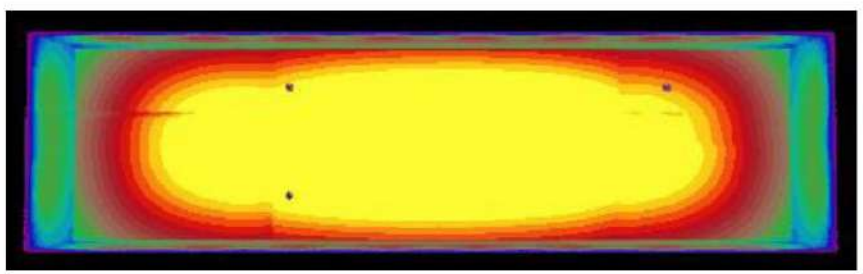
Honeybee version



plan view / **point calculation**

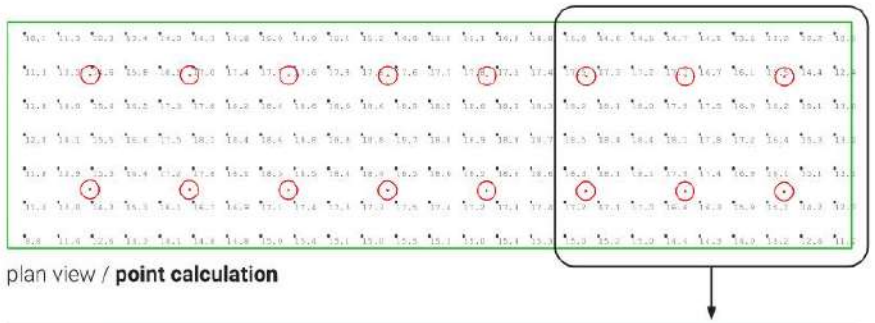


plan view / **lighting rendering**

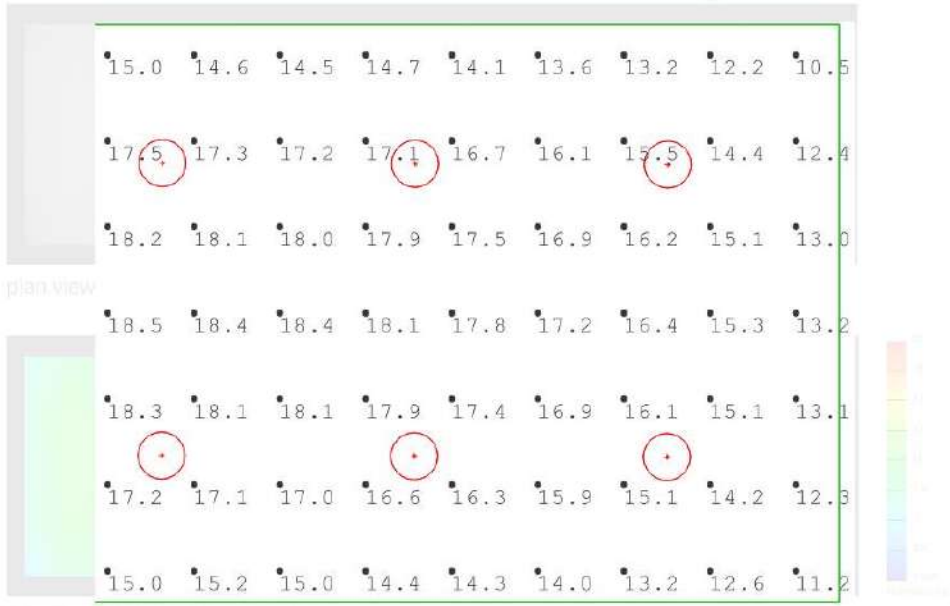


plan view / **false color rendering**

AGi32 version



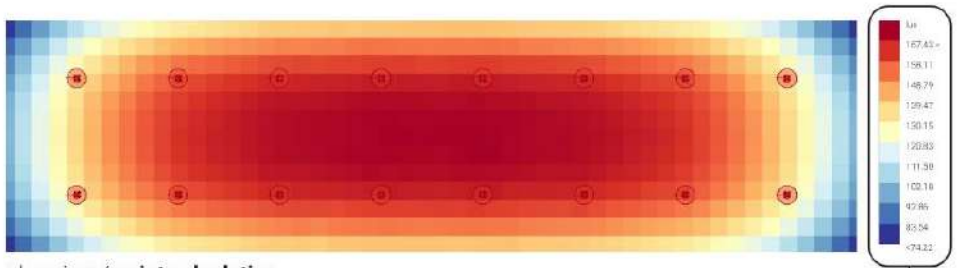
plan view / **point calculation**



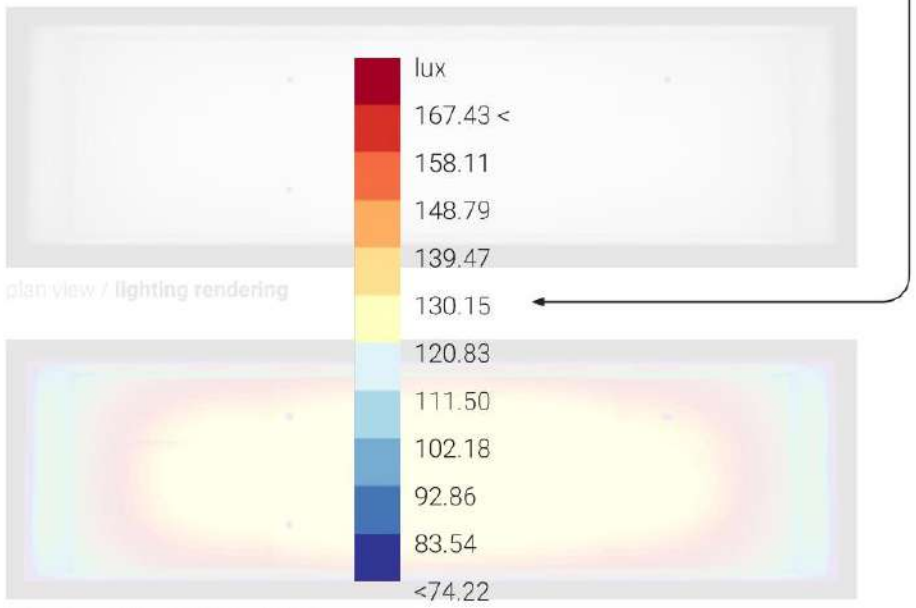
plan view

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

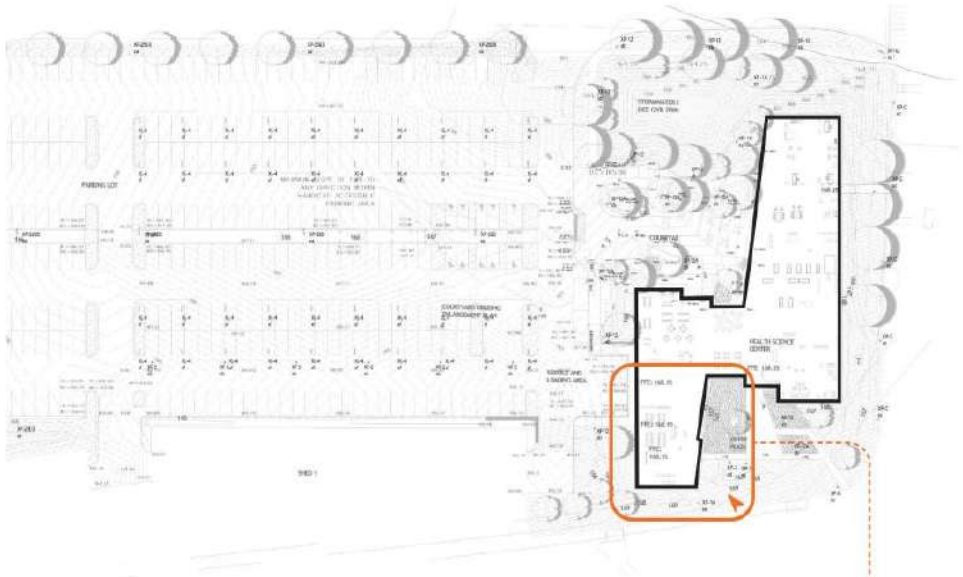
Criteria:
Lighter toned façade:
High Activity: 10vFC (LZ2)
Med Activity: 5vFC (LZ2)

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

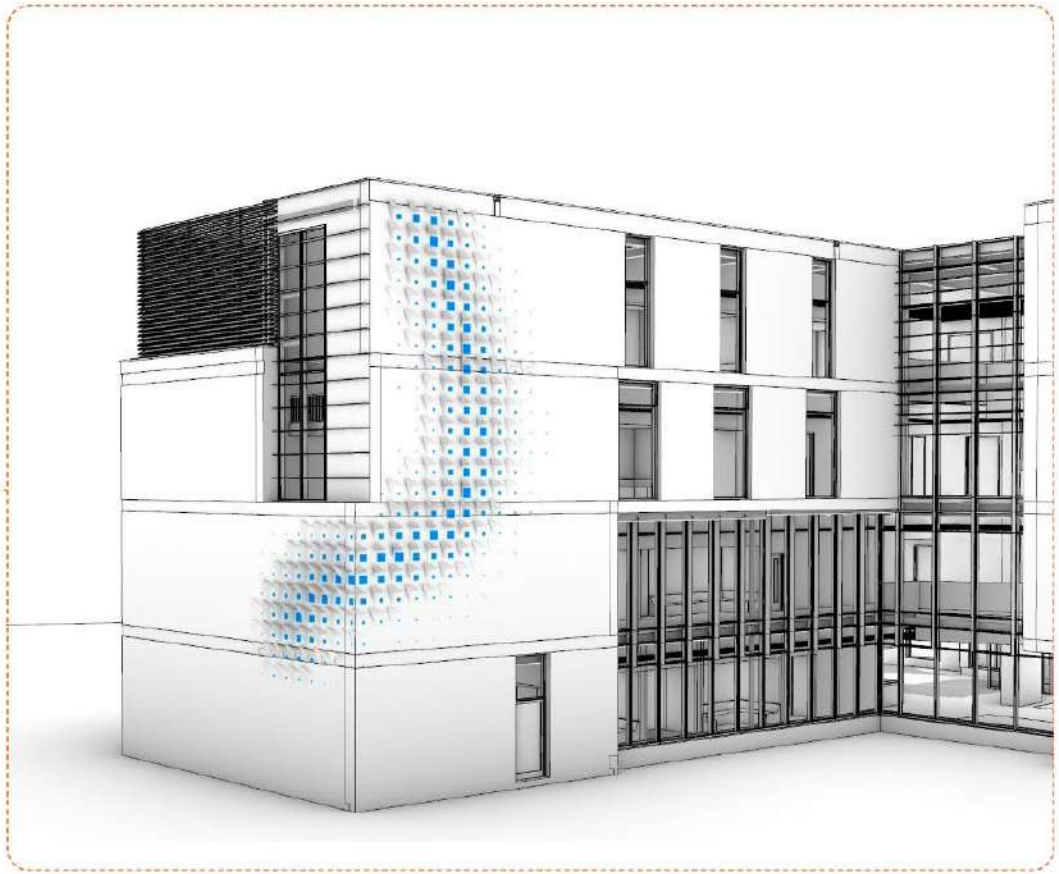
Tools for Analysis:
AGI32
Grasshopper (ladybug/honeybee)

Goal of Analysis:
Best fixture locations and aiming angle

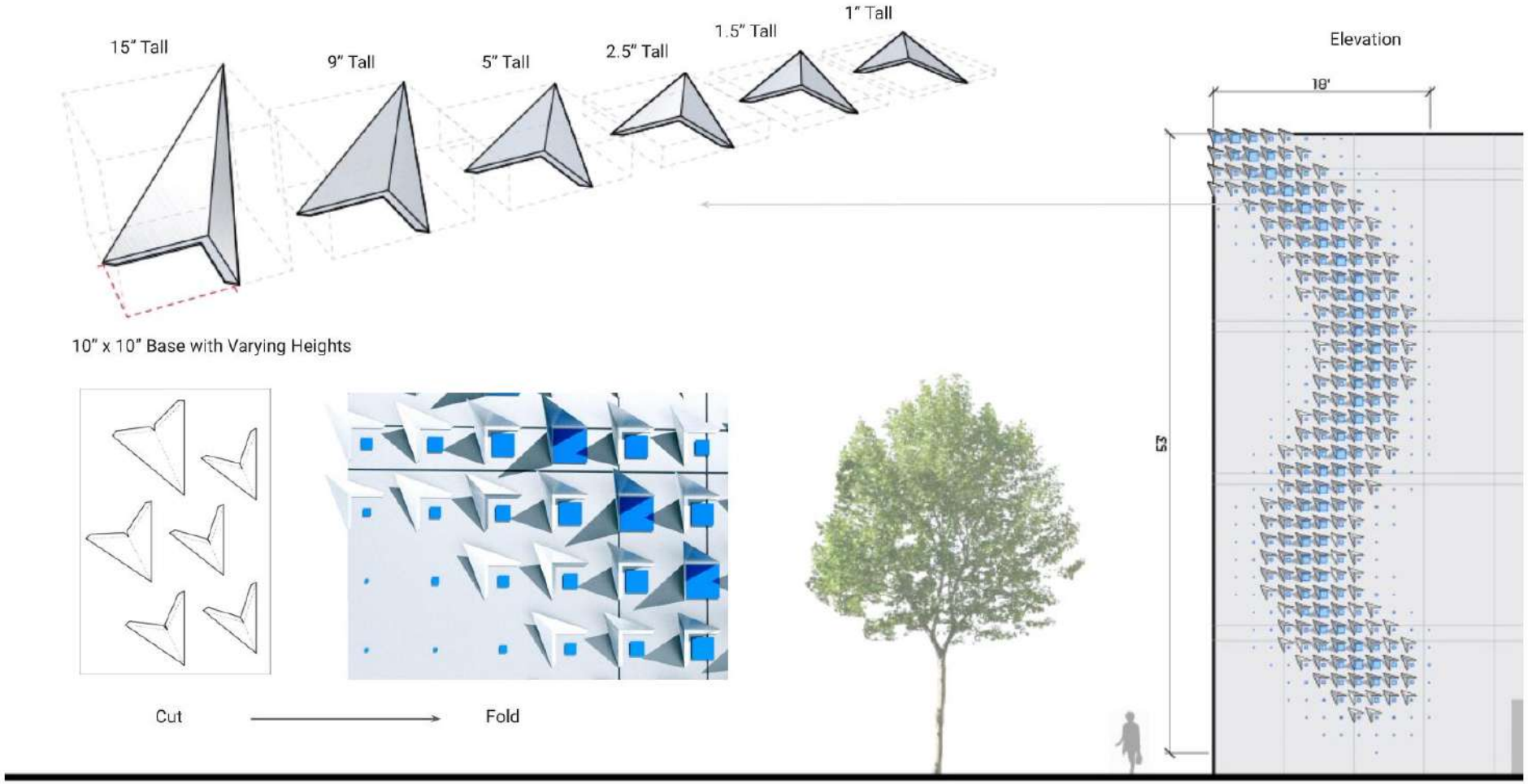
· Artwork Lighting Effect



plan view / **site plan**



3D view / **facade artwork installation**


15" Tall
9" Tall
5" Tall
2.5" Tall
1.5" Tall
1" Tall
10" x 10" Base with Varying Heights
Cut
Fold
Elevation
18'
53'

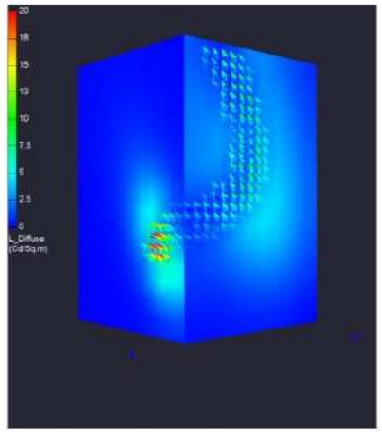
How **LONG** does it take for a single calculation ?

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

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

#Efficiency #Accuracy #Aesthetics

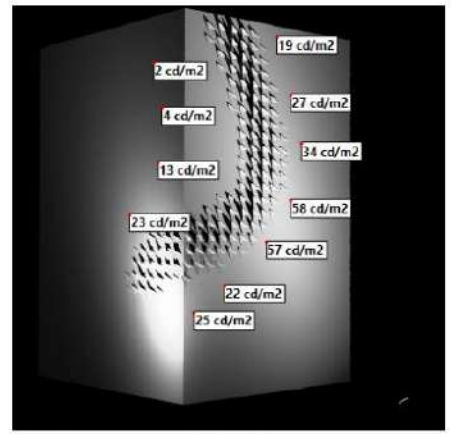
AGi32

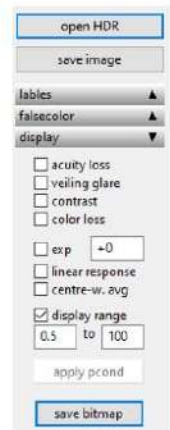


Luminance Analysis / **contrast study**

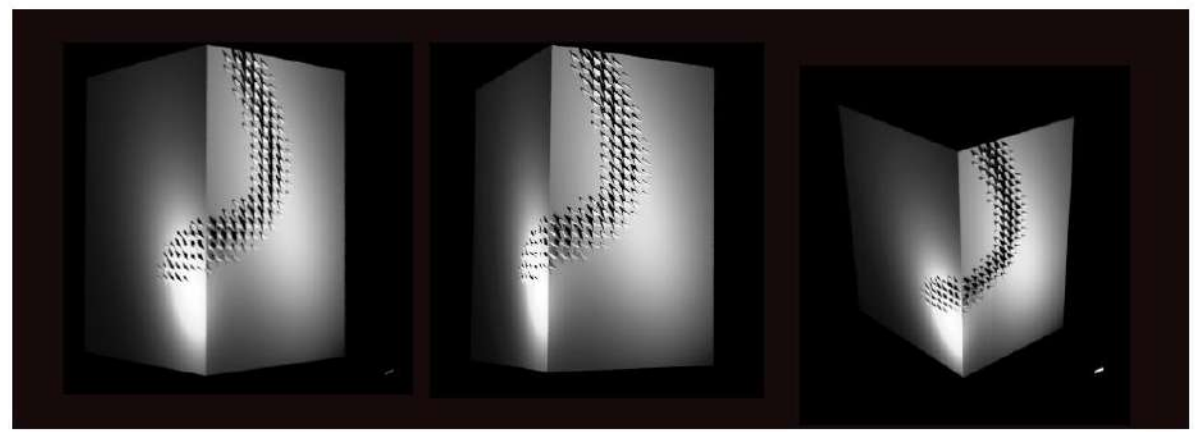
3D rendering / **shadow study**

Honeybee



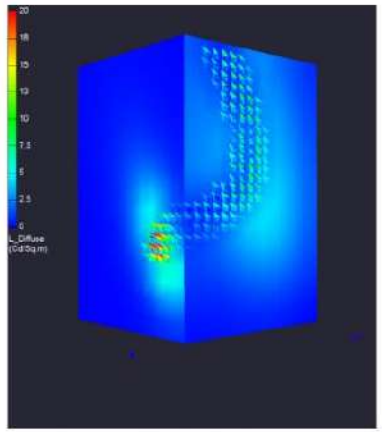


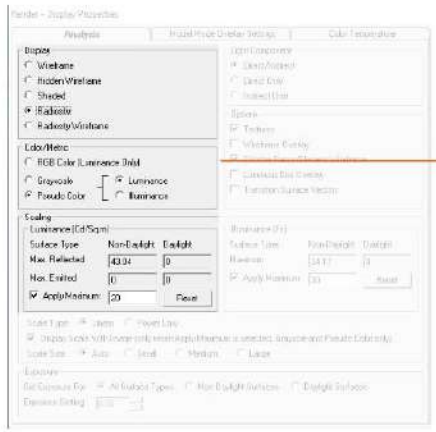
Luminance Analysis / **contrast study**



3D rendering / **shadow study**

AGi32



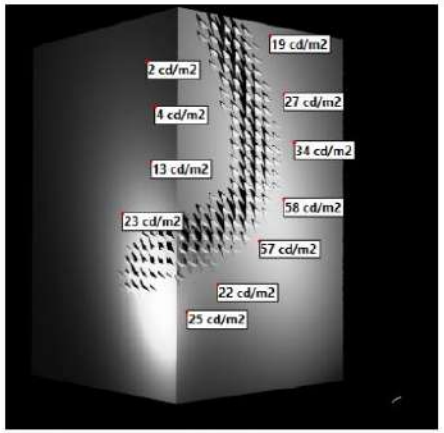


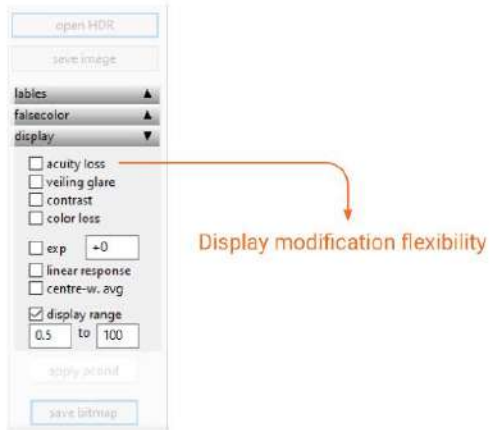
Display modification flexibility

Luminance Analysis / **contrast study**

3D rendering / **shadow study**

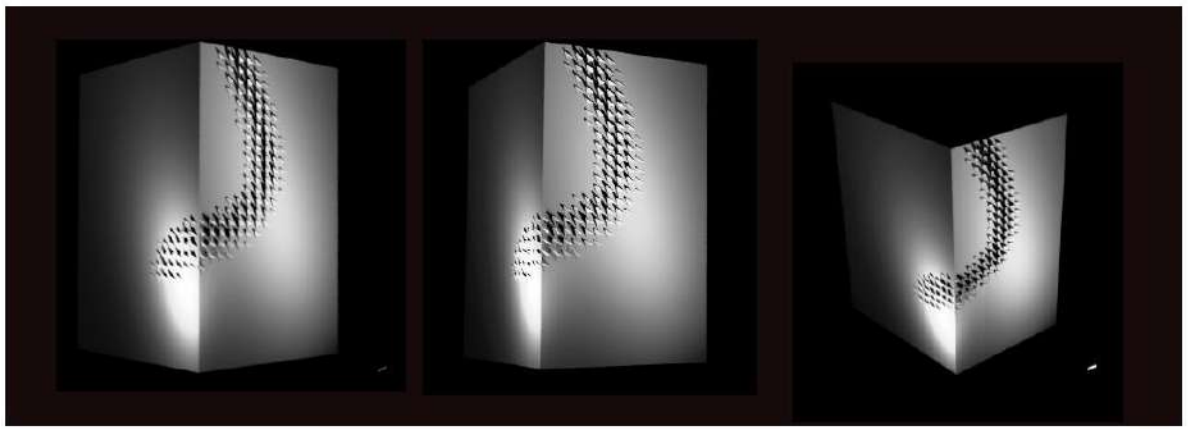
Honeybee





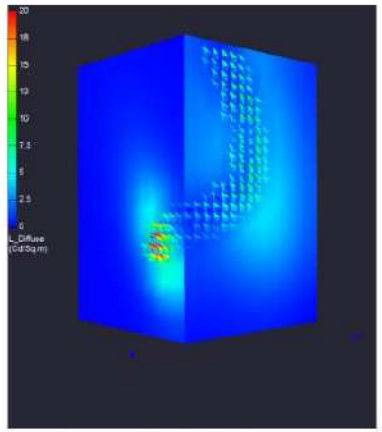
Display modification flexibility

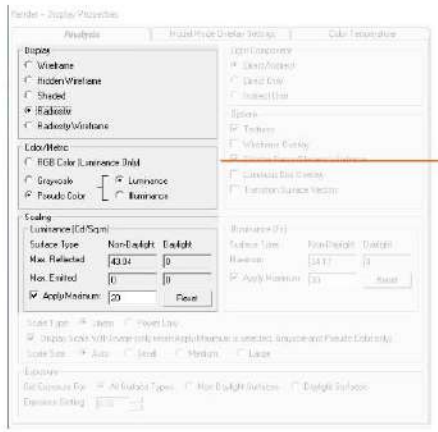
Luminance Analysis / **contrast study**



3D rendering / **shadow study**

AGi32



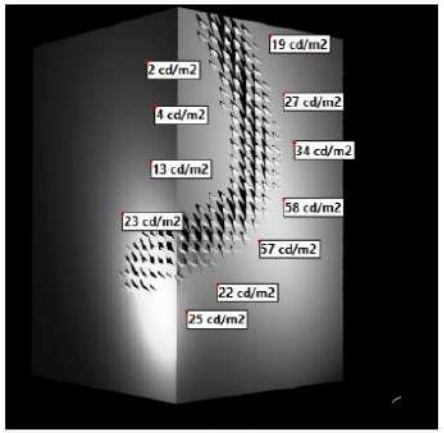


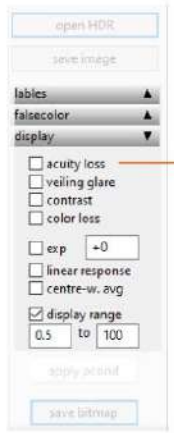
Display modification flexibility

Luminance Analysis / **contrast study**

3D rendering / **shadow study**

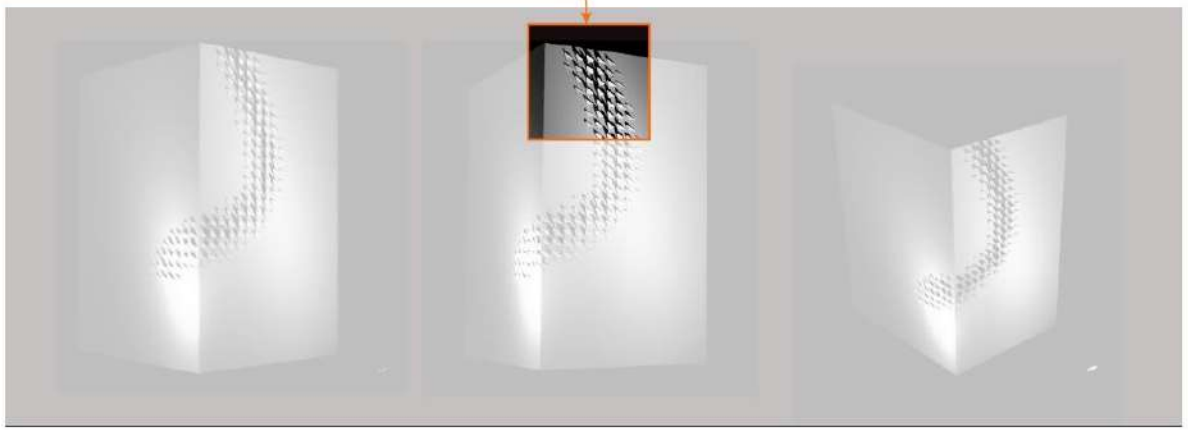
Honeybee





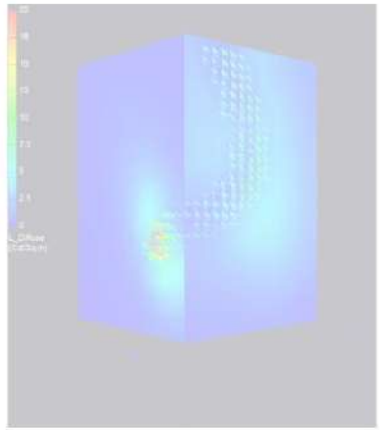
Display modification flexibility

Luminance Analysis / **contrast study**



3D rendering / **shadow study**

AGi32

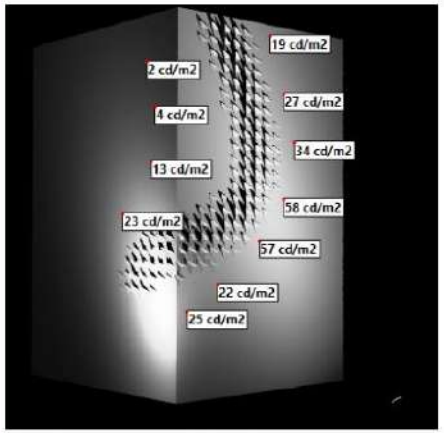


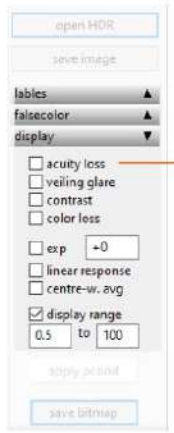
Display modification flexibility

Luminance Analysis / **contrast study**

3D rendering / **shadow study**

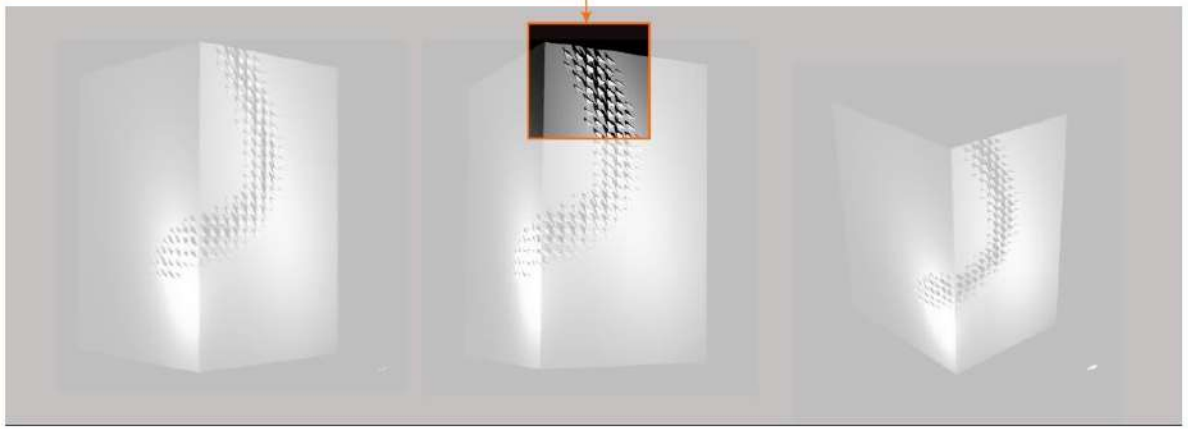
Honeybee





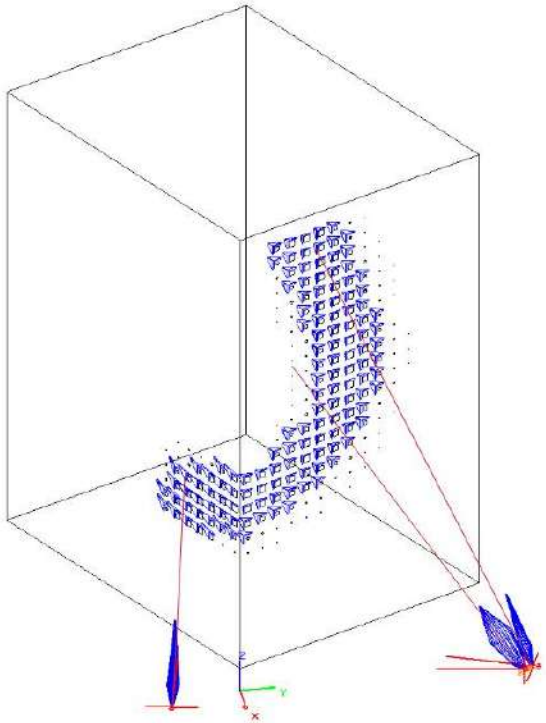
Display modification flexibility

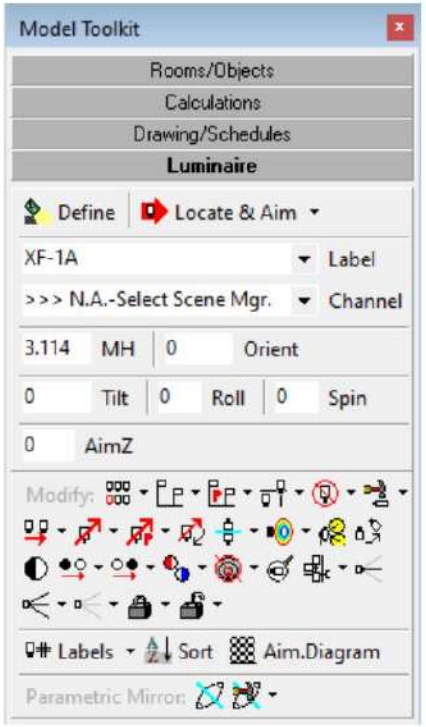
Luminance Analysis / **contrast study**



3D rendering / **shadow study**

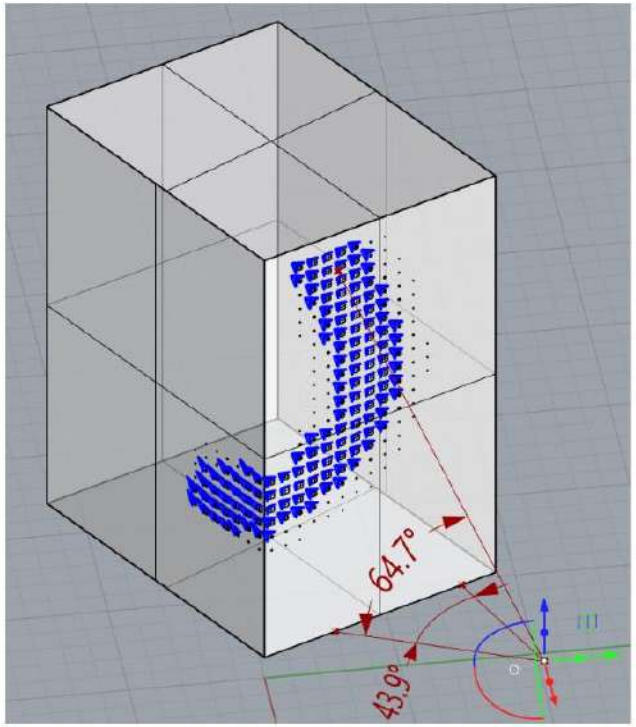
AGi32

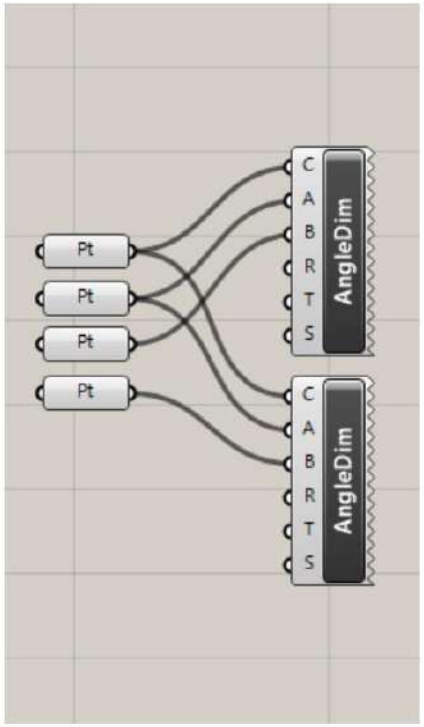




working view / **user interface**

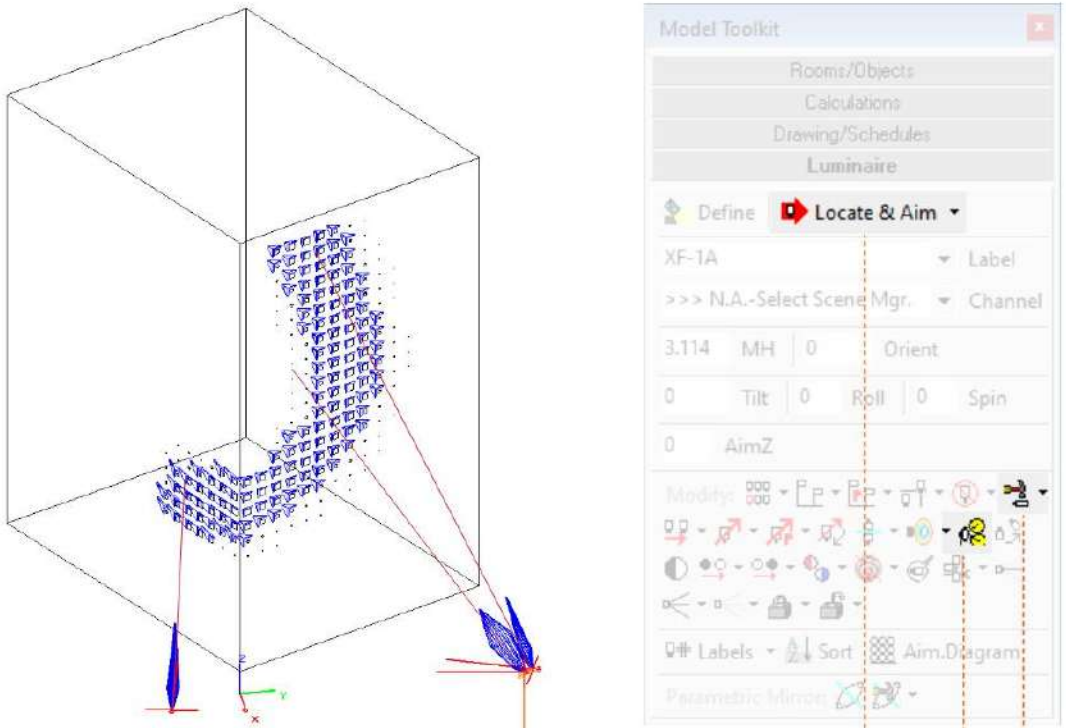
Honeybee





working view / **user interface**

AGi32



working view / **user interface**

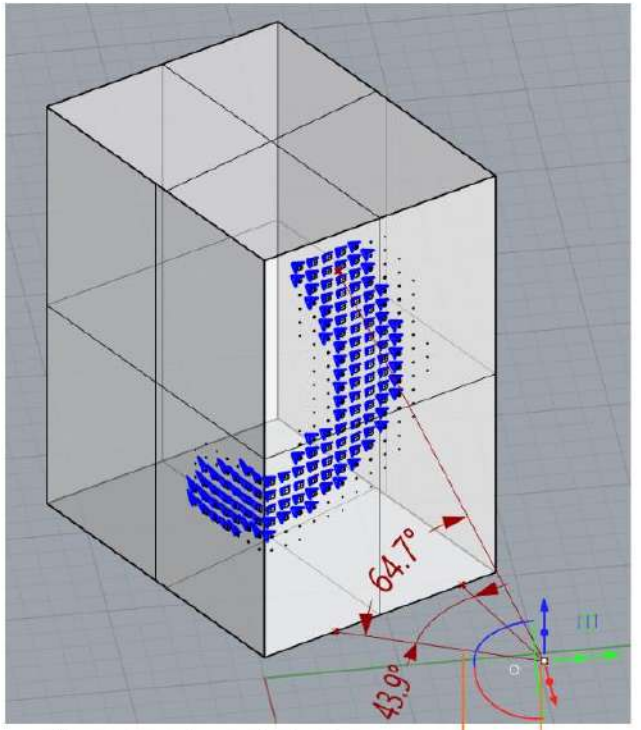
Fixture Location

Locate Luminaire

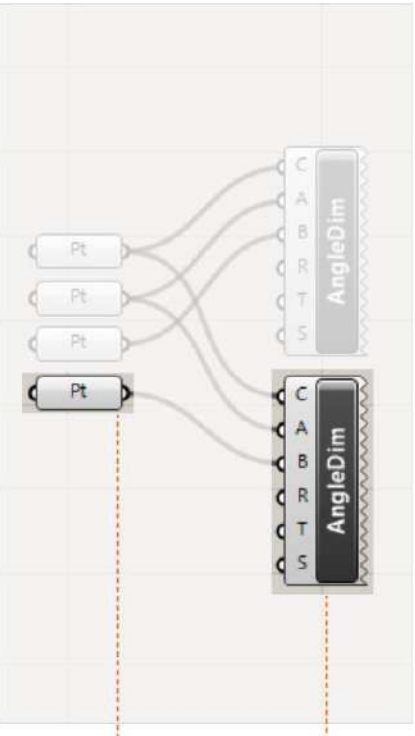
Re-Aim Luminaire

Edit Luminaire(s)

Honeybee



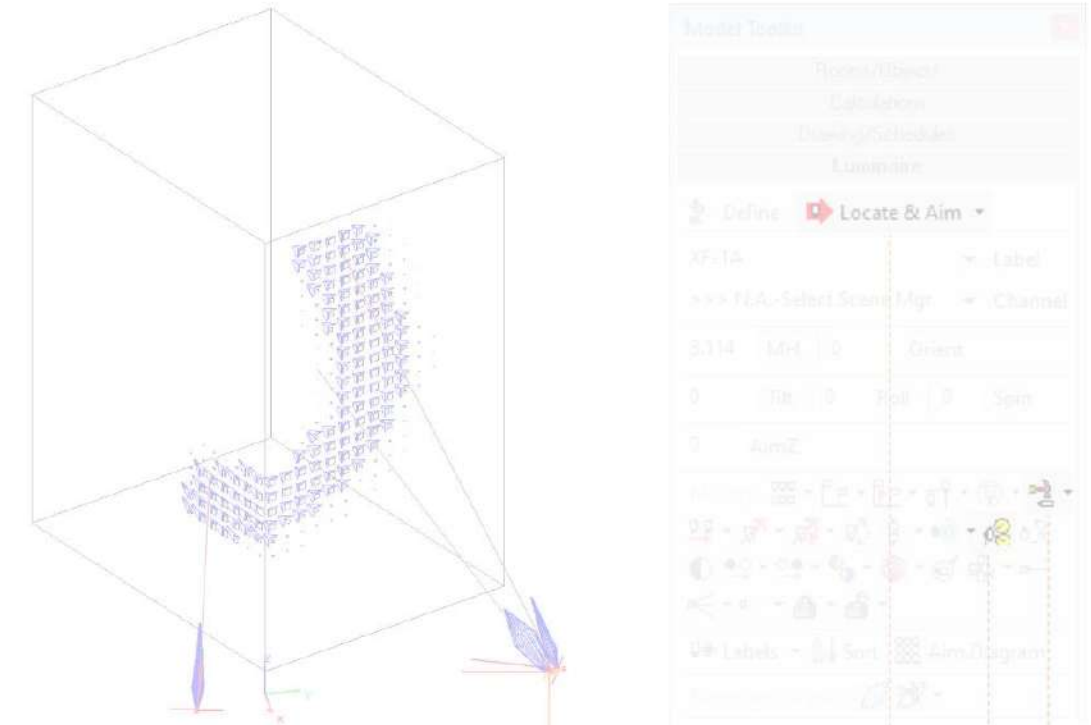
working view / **user interface**



Fixture Location /
Aiming Point

Aiming Angle Visualization

AGi32



working view / **user interface**

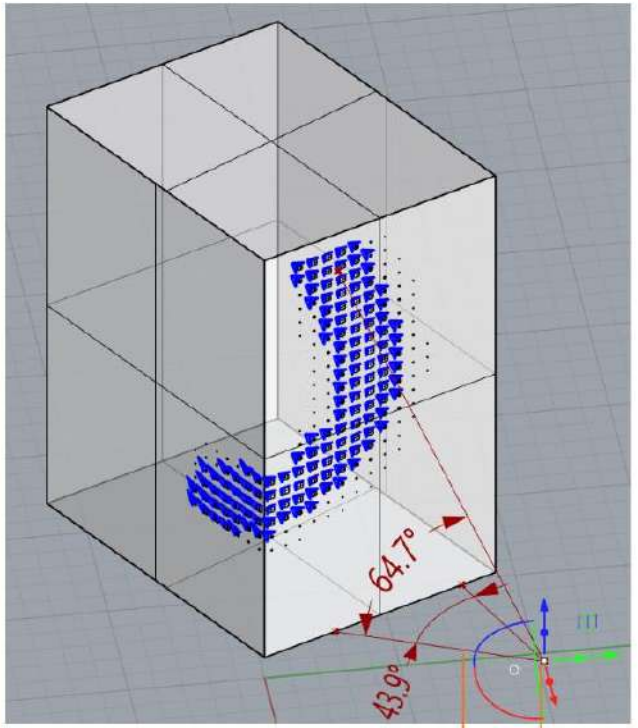
Fixture Location

Locate Luminaire

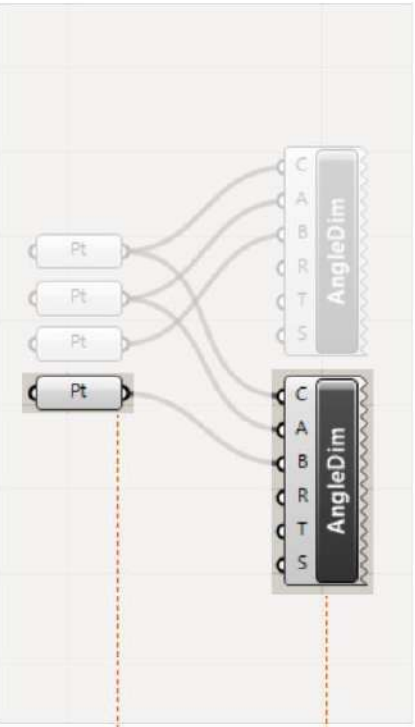
Re-Aim Luminaire

Edit Luminaire(s)

Honeybee



working view / **user interface**



Fixture Location /
Aiming Point

Aiming Angle Visualization

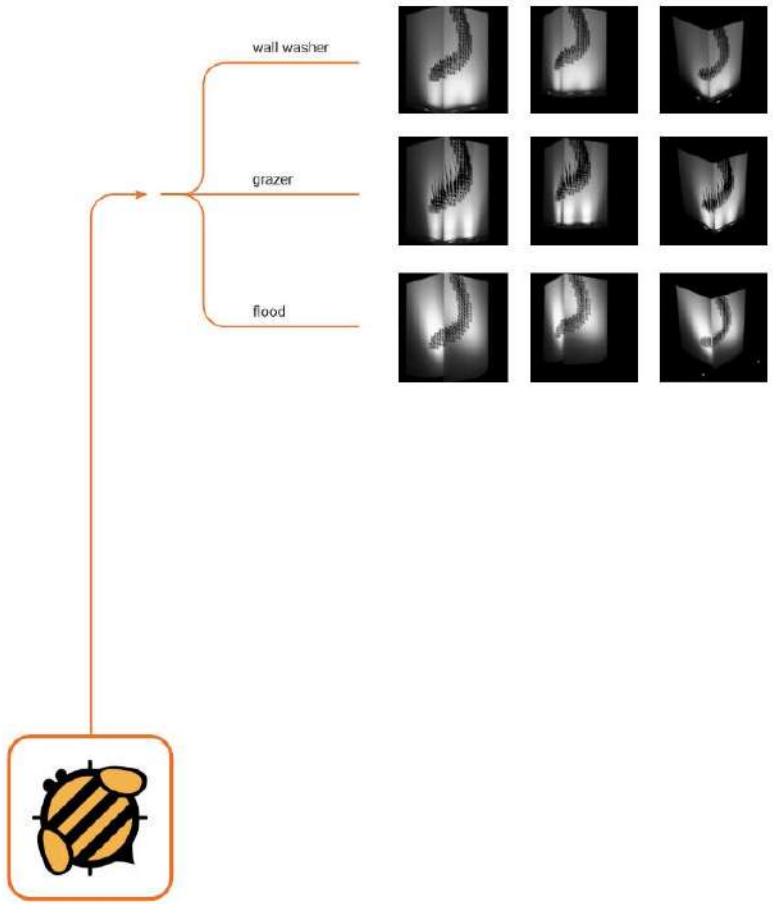
	step 1 / **CLEANUP MODEL**	step 2 / **EXPORT MODEL**	step 3 / **IMPORT MODEL**	step 4 / **SETUP MODEL**	step 5 / **RUN ANALYSIS**	step 6 / **EXPORT ANALYSIS**
AG132	15-60 min	5 min	5 min	30 min	5-15 min for 1 calculation	5 min
	15 min	N/A	N/A	5 min	<1 min	5 min

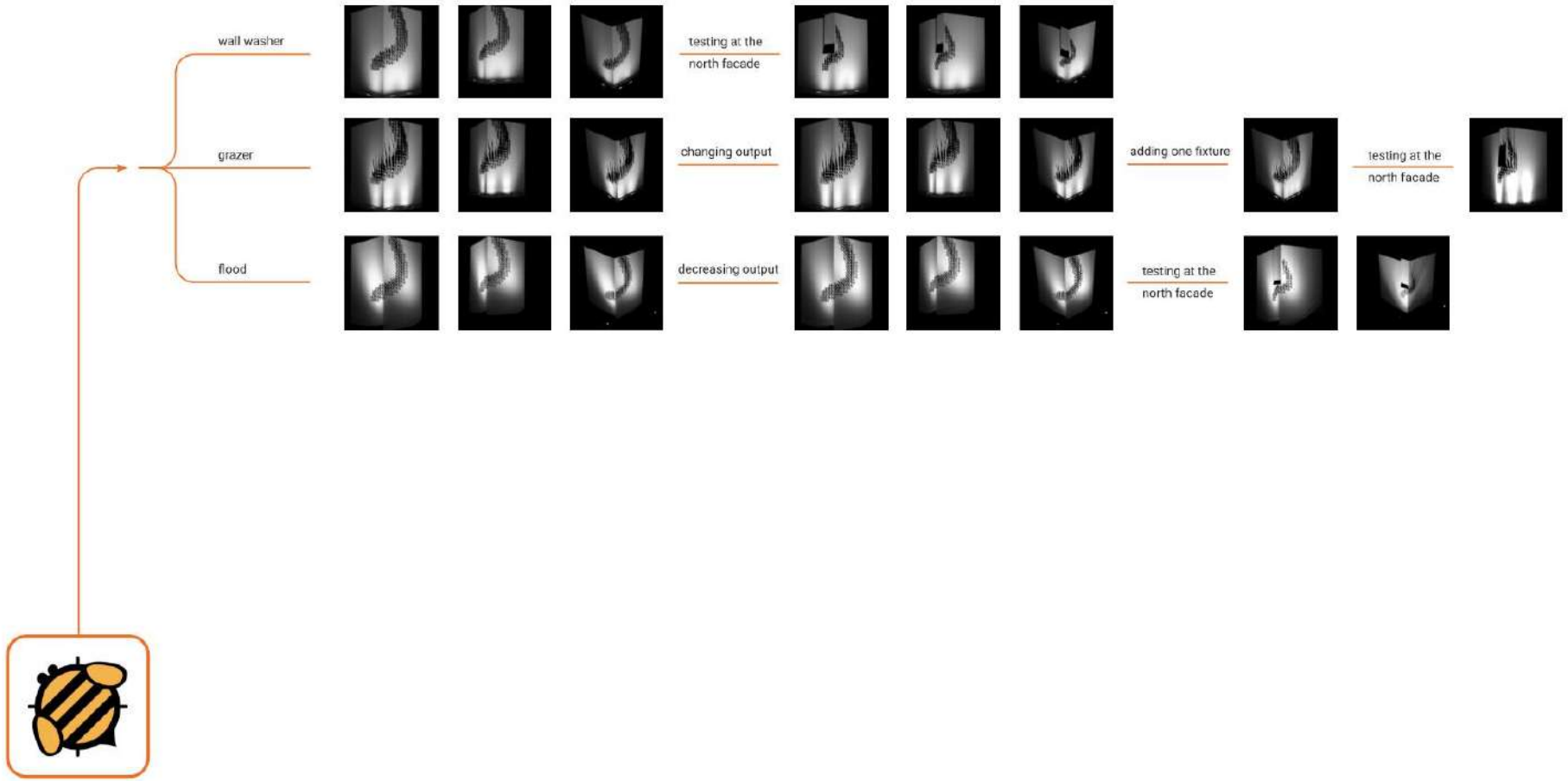
	step 1 / **CLEANUP MODEL**	step 2 / **EXPORT MODEL**	step 3 / **IMPORT MODEL**	step 4 / **SETUP MODEL**	step 5 / **RUN ANALYSIS**	step 6 / **EXPORT ANALYSIS**
AG132	15-60 min	5 min	5 min	30 min	5-15 min for 1 calculation	5 min
	15 min	N/A	N/A	5 min	<1 min	5 min

AGi crashes when the model is too complicated.
Need to back to step 1 to simplify the model.

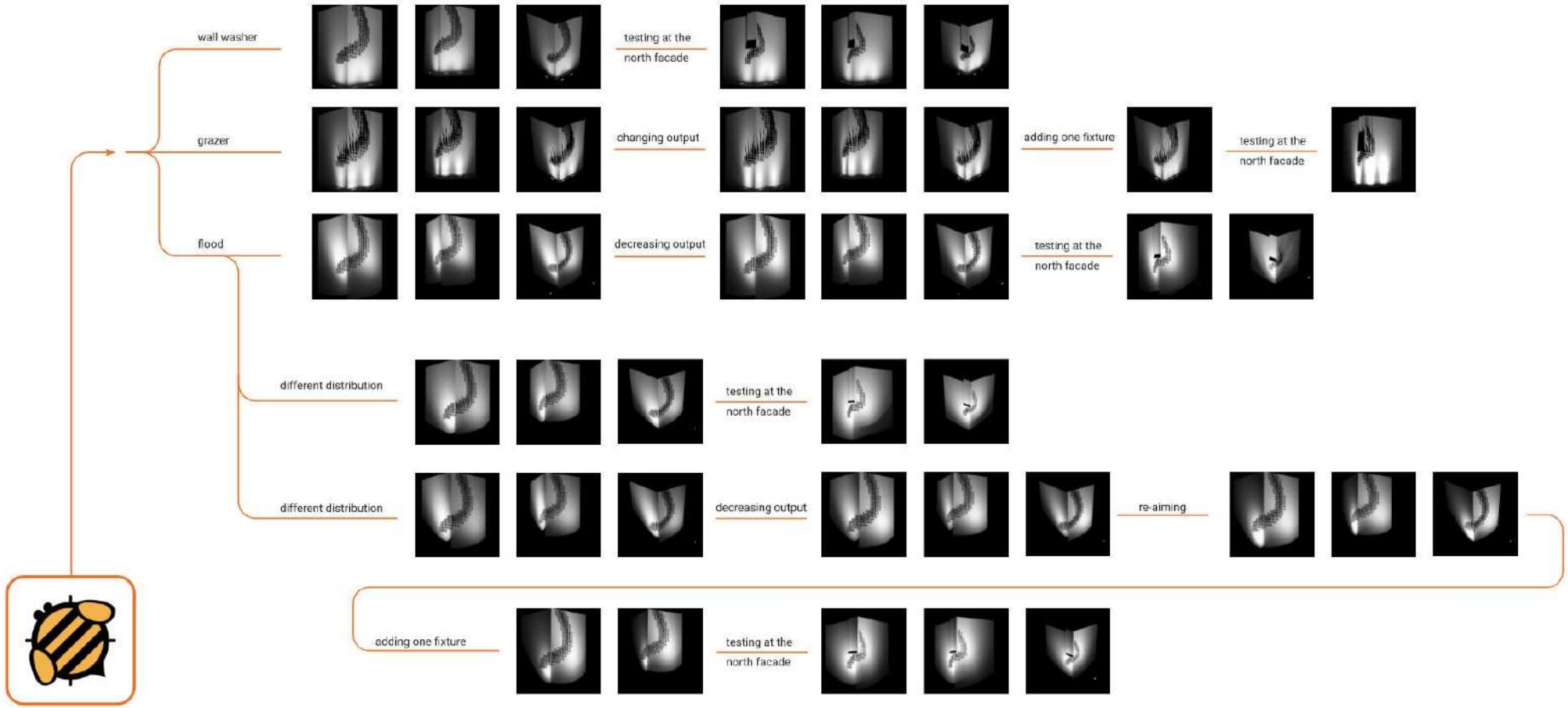
The file from the client is in Rhino format,
so skipped step 2 and 3 in this case.

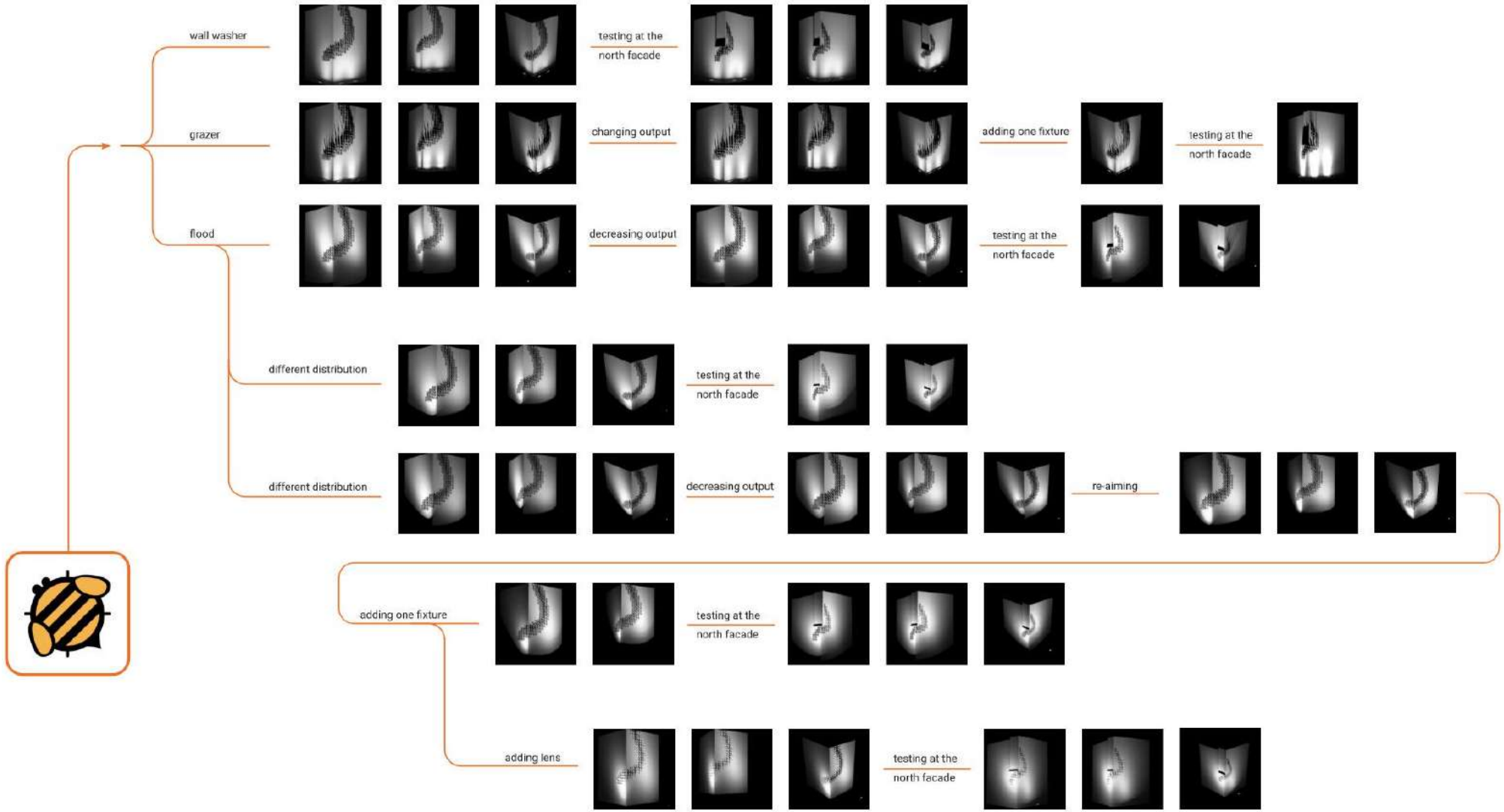
	step 1 / **CLEANUP MODEL**	step 2 / **EXPORT MODEL**	step 3 / **IMPORT MODEL**	step 4 / **SETUP MODEL**	step 5 / **RUN ANALYSIS**	step 6 / **EXPORT ANALYSIS**
	15-60 min	5 min	5 min	30 min	5-15 min for 1 calculation	5 min
	15 min	N/A	N/A	5 min	<1 min	5 min

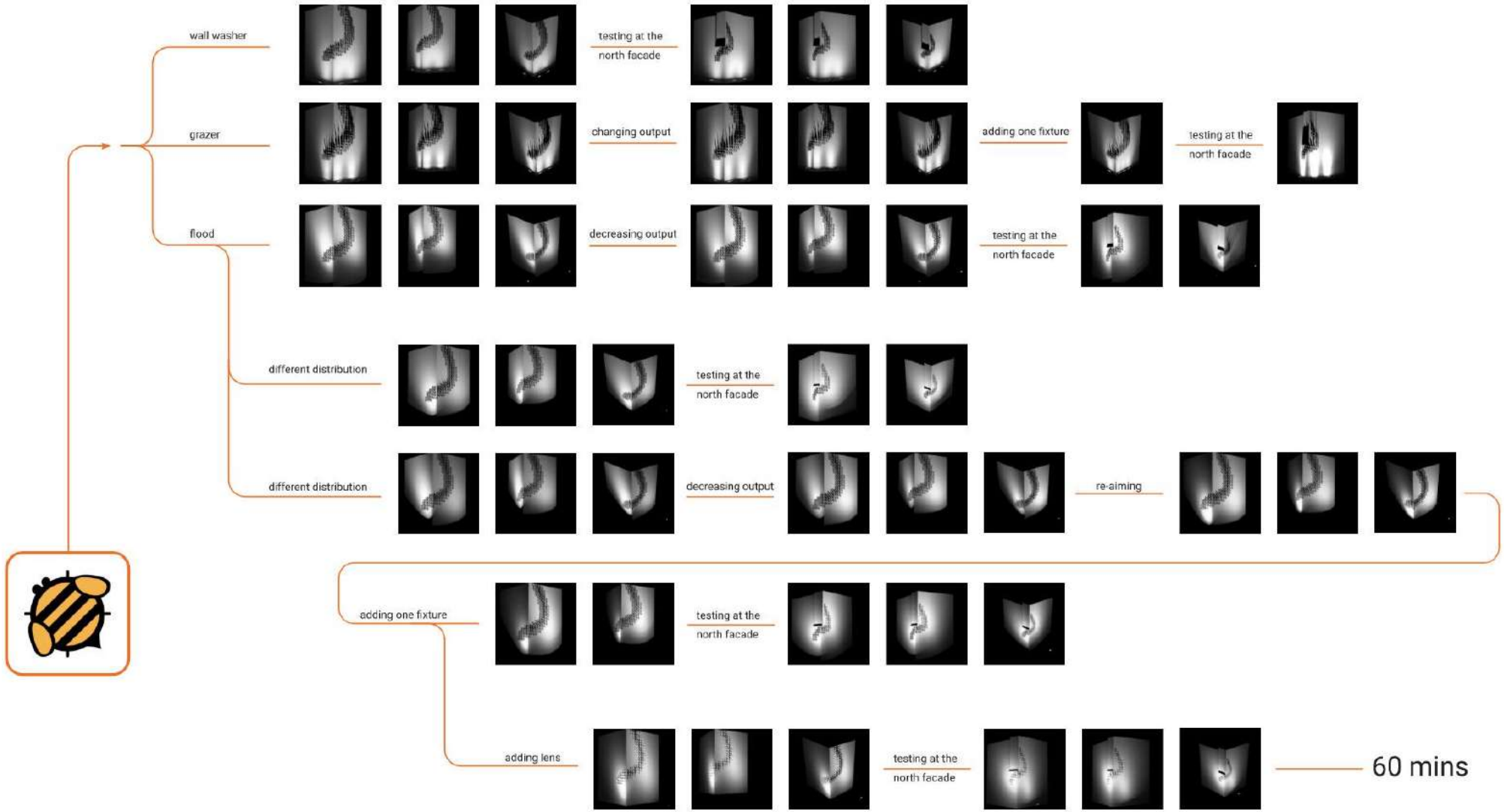

wall washer
grazer
flood


wall washer
grazer
flood
testing at the north facade
changing output
decreasing output
adding one fixture
testing at the north facade
testing at the north facade


wall washer
grazer
flood
different distribution
different distribution
testing at the north facade
changing output
decreasing output
adding one fixture
testing at the north facade
testing at the north facade
testing at the north facade
decreasing output
re-aiming


wall washer
grazer
flood
testing at the north facade
changing output
decreasing output
adding one fixture
testing at the north facade
testing at the north facade
different distribution
testing at the north facade
different distribution
decreasing output
re-aiming
adding one fixture
testing at the north facade


wall washer
grazer
flood
testing at the north facade
changing output
decreasing output
adding one fixture
testing at the north facade
testing at the north facade
different distribution
testing at the north facade
different distribution
decreasing output
re-aiming
adding one fixture
testing at the north facade
adding lens
testing at the north facade


wall washer
grazer
flood
testing at the north facade
changing output
decreasing output
adding one fixture
testing at the north facade
testing at the north facade
different distribution
testing at the north facade
different distribution
decreasing output
re-aiming
adding one fixture
testing at the north facade
adding lens
testing at the north facade
60 mins

	AGI32	
Set up	● ● ● ○ ○	● ● ● ○ ○
Export/Import Function	● ● ● ○ ○	○ ○ ○ ○ ○
Running Time	● ● ○ ○ ○	● ● ● ● ●
Aiming Function	● ● ○ ○ ○	● ● ● ● ○
Aiming Visualization	● ● ● ○ ○	● ● ● ● ○
Shadow Study	● ● ○ ○ ○	● ● ● ● ○
Luminance Contrast Study	● ● ● ● ○	● ● ● ● ○

	AGI32	
Set up	●●●○○	●●●○○
Export/Import Function	●●●○○	○○○○○
Running Time	●●○○○	●●●●●
Aiming Function	●●○○○	●●●●○
Aiming Visualization	●●●○○	●●●●○
Shadow Study	●●○○○	●●●●○
Luminance Contrast Study	●●●●○	●●●●○

#Efficiency

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

#Accuracy

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

#Aesthetics

	AGI32		
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 reatios)

Criteria:
Design consulting only

Tools for Analysis:
AGI32

Goal of Analysis:
Design consulting

Development Project
Offices

Location **Sloatsburg, NY**

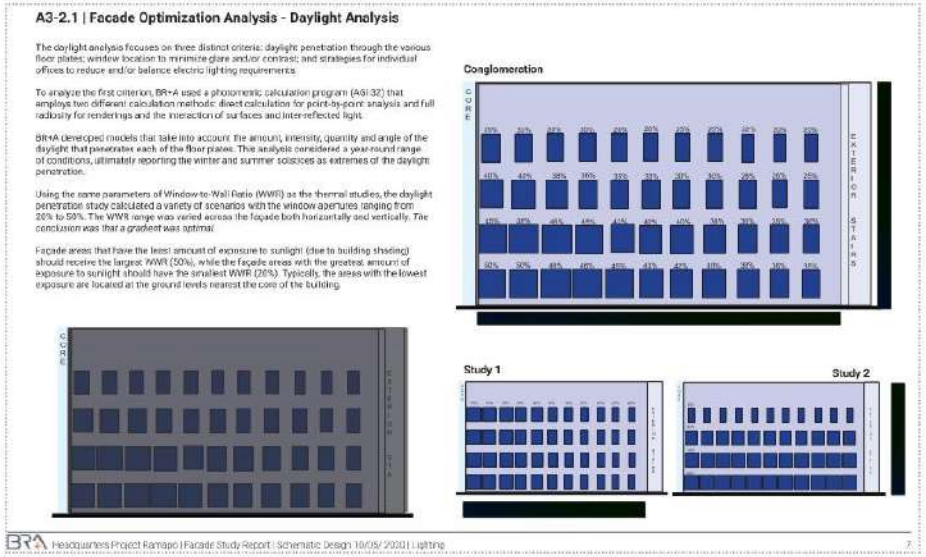
Analysis:
Building facade analysis (window/wall reatios)

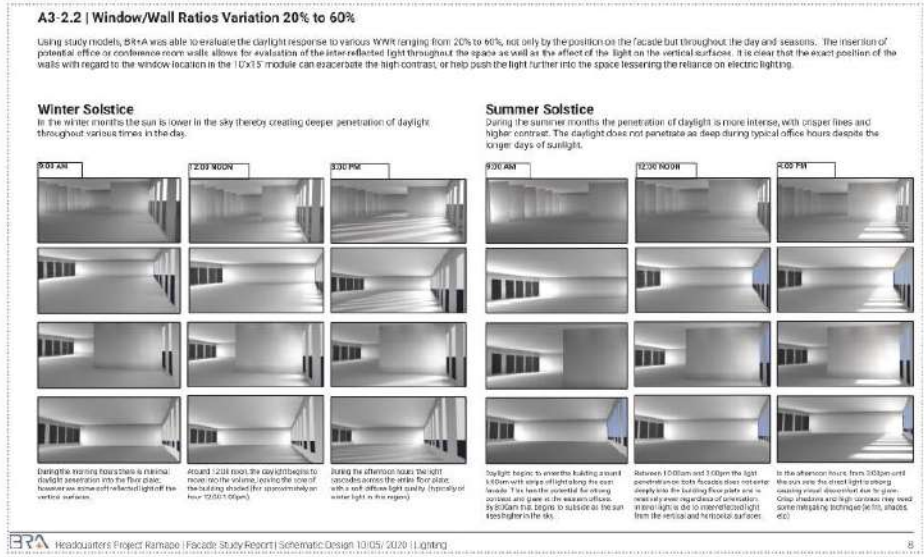
Criteria:
Design consulting only

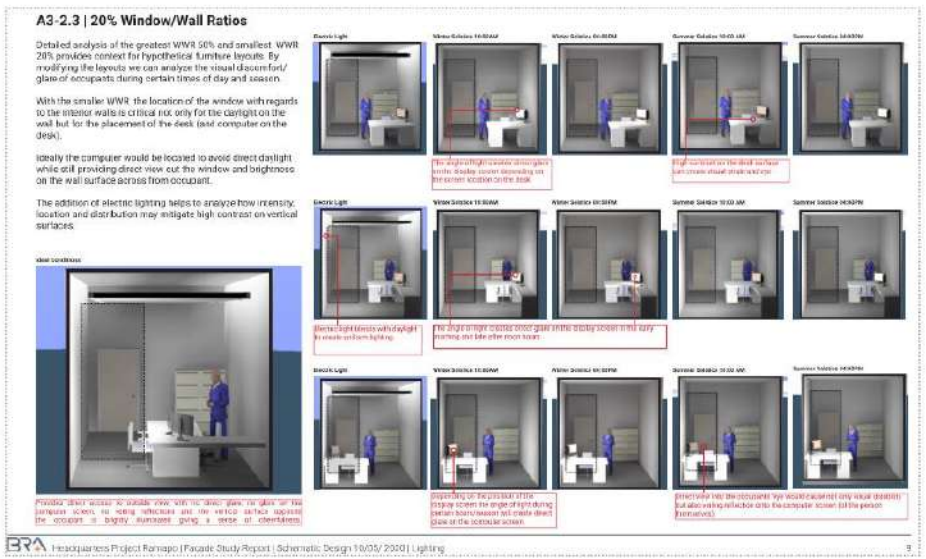
Tools for Analysis:
AGI32

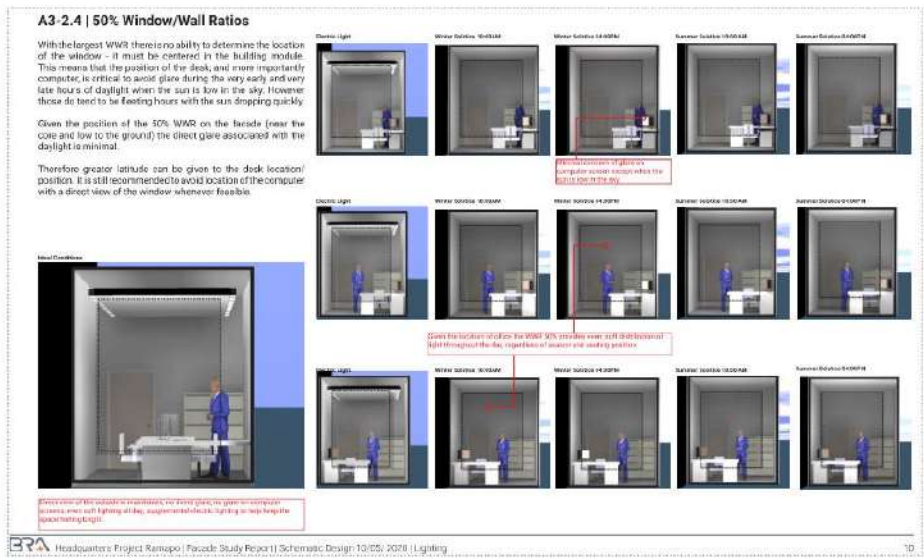
Goal of Analysis:
Design consulting

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









FACADE

Models

⋮

10

OFFICE

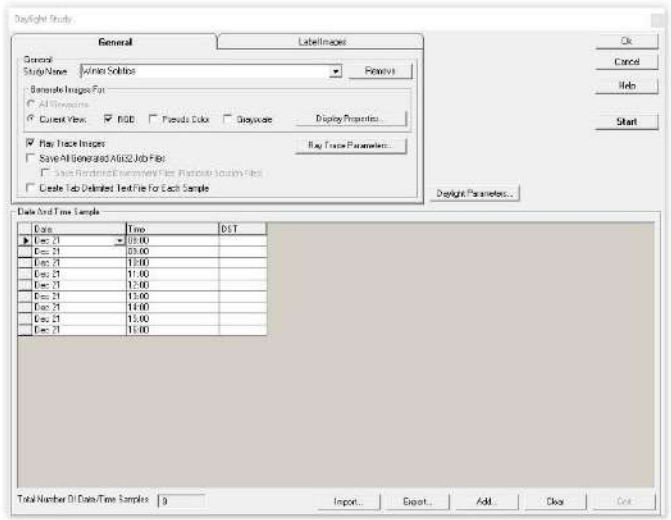
Models

⋮

23

	step 1 / **EXPORT MODEL**	step 2 / **IMPORT MODEL**	step 3 / **CLEANUP MODEL**	step 4 / **SETUP MODEL**	step 5 / **RUN ANALYSIS**	step 6 / **EXPORT ANALYSIS**
AG132	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

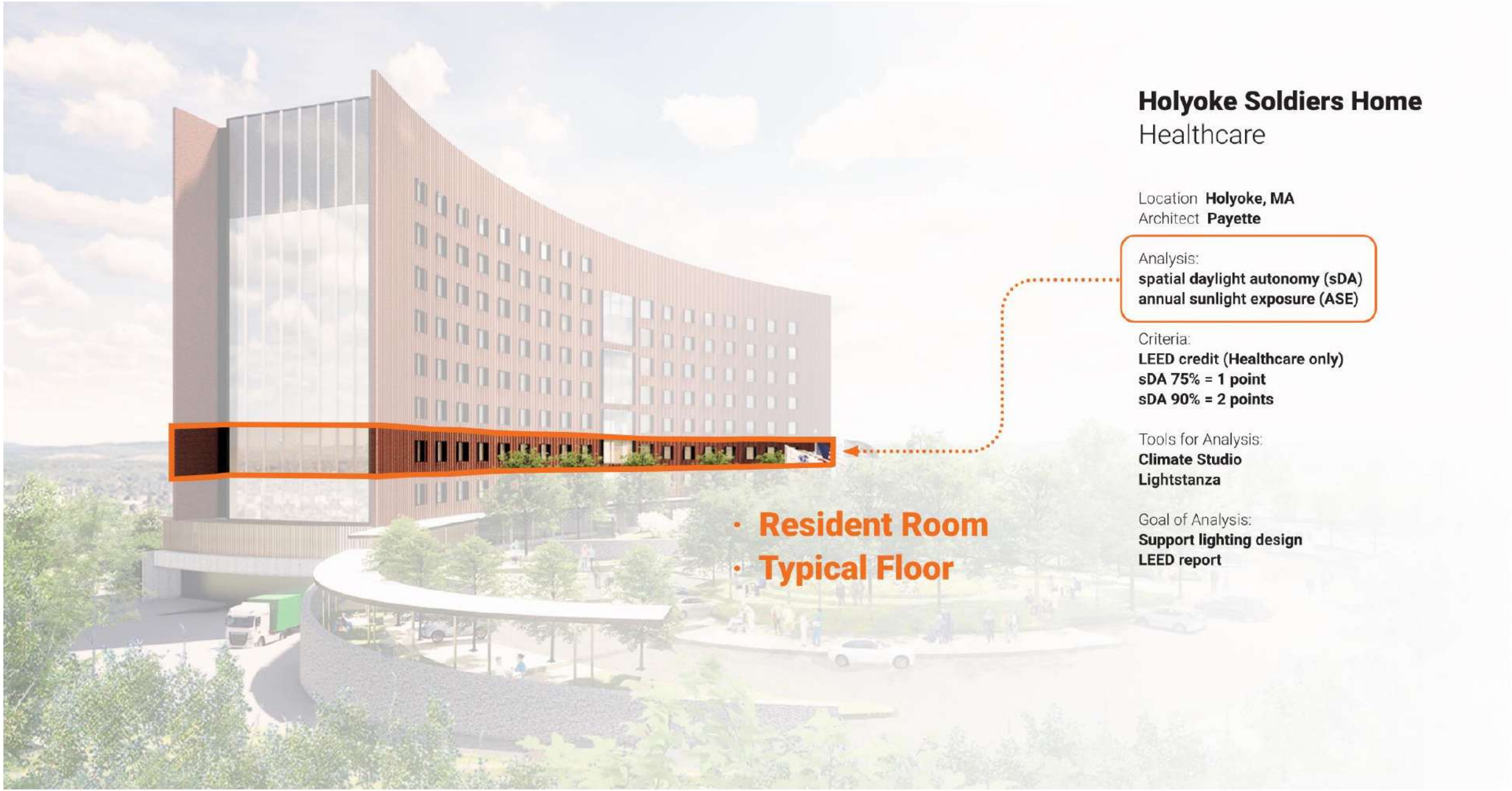
Location **Holyoke, MA**
Architect **Payette**

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**

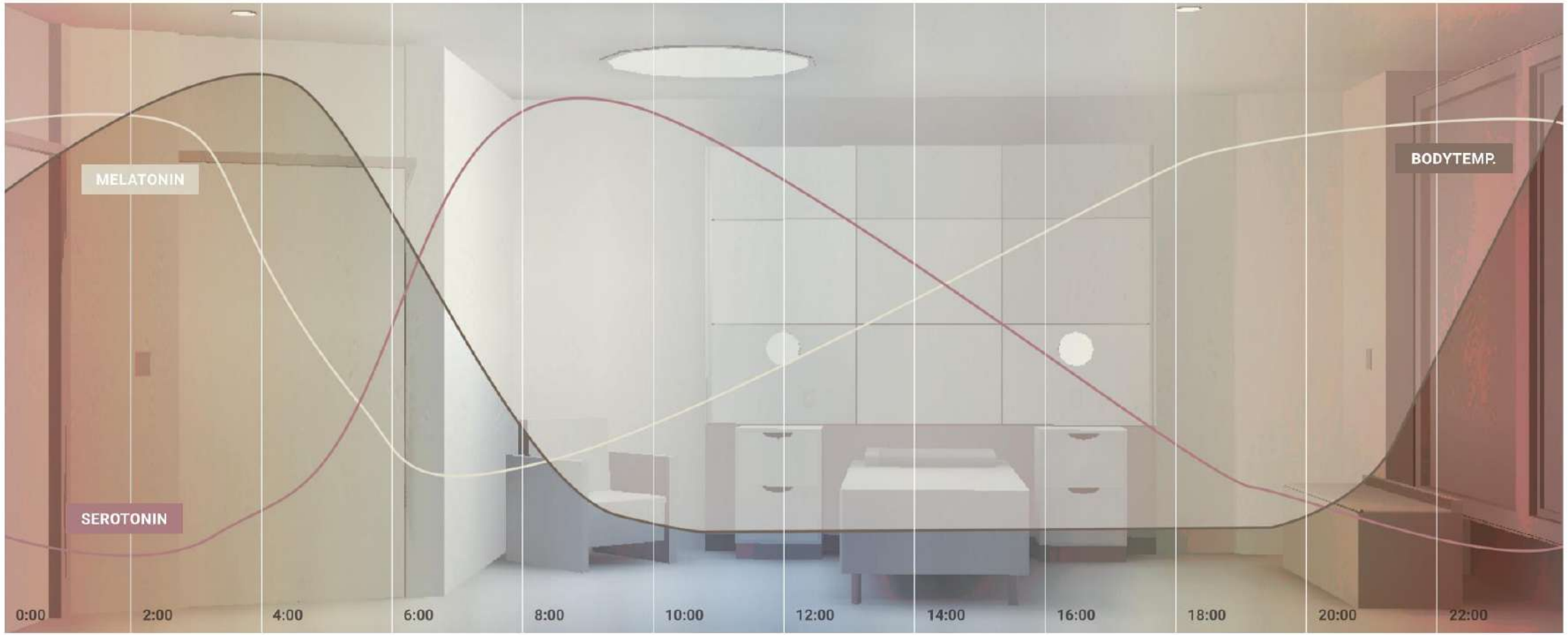
Analysis:
spatial daylight autonomy (sDA)
annual sunlight exposure (ASE)

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

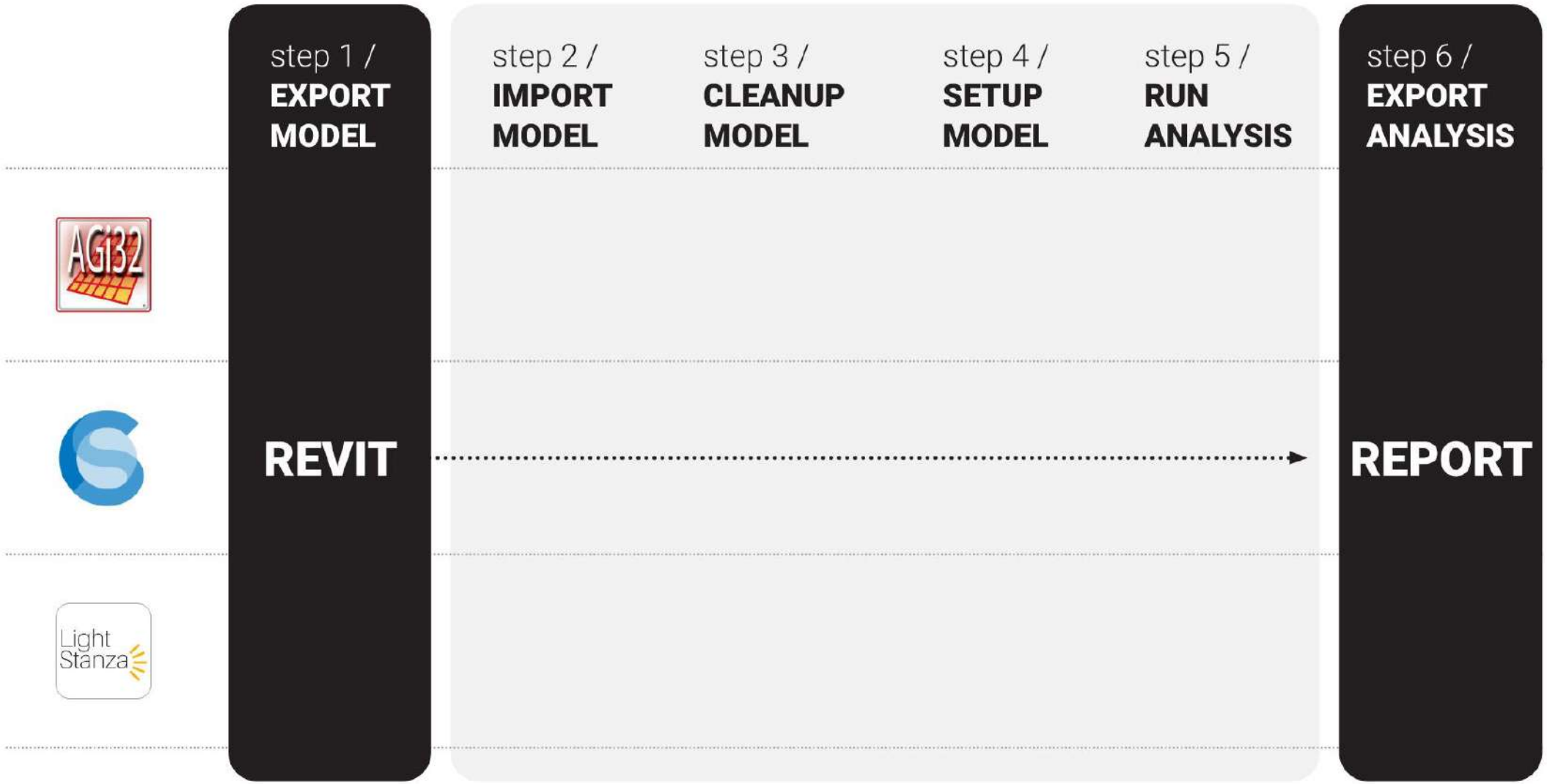
- **Resident Room**
- **Typical Floor**

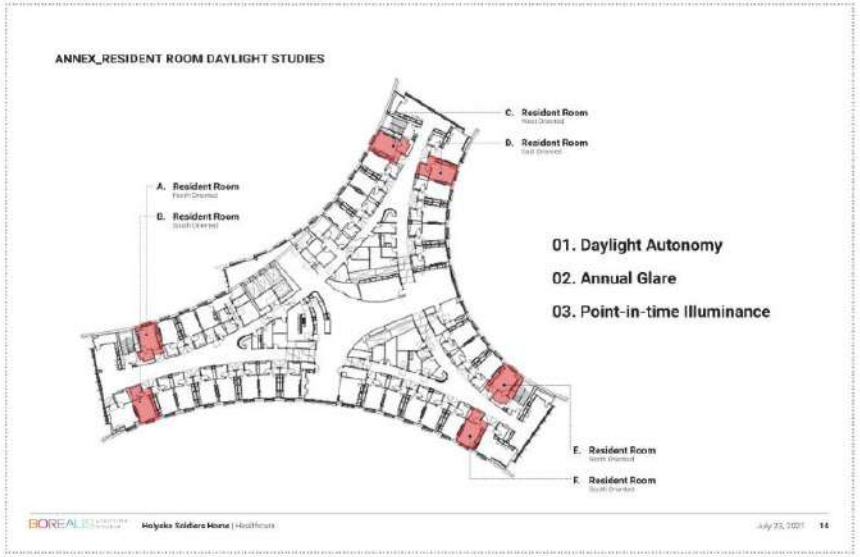


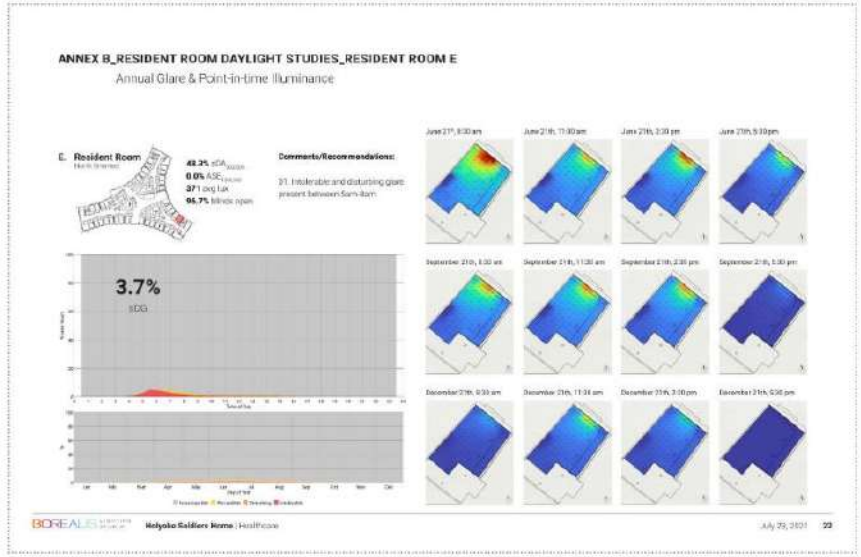
01. Design Development /
Lighting Proposal

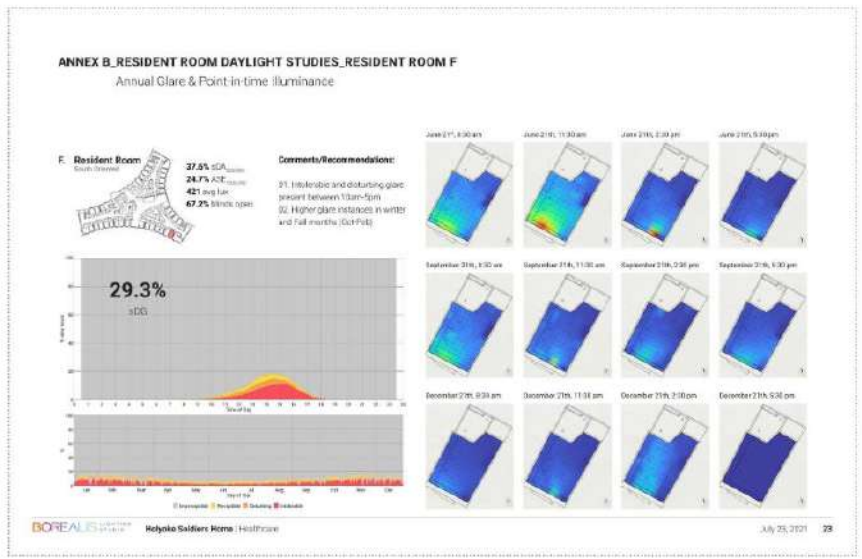
02. Construction Documents /
LEED Report

	step 1 / **EXPORT MODEL**	step 2 / **IMPORT MODEL**	step 3 / **CLEANUP MODEL**	step 4 / **SETUP MODEL**	step 5 / **RUN ANALYSIS**	step 6 / **EXPORT ANALYSIS**
AGi32						
Light Stanza						


step 1 /
EXPORT
MODEL
step 2 /
IMPORT
MODEL
step 3 /
CLEANUP
MODEL
step 4 /
SETUP
MODEL
step 5 /
RUN
ANALYSIS
step 6 /
EXPORT
ANALYSIS
AG132
REVIT
REPORT
Light
Stanza



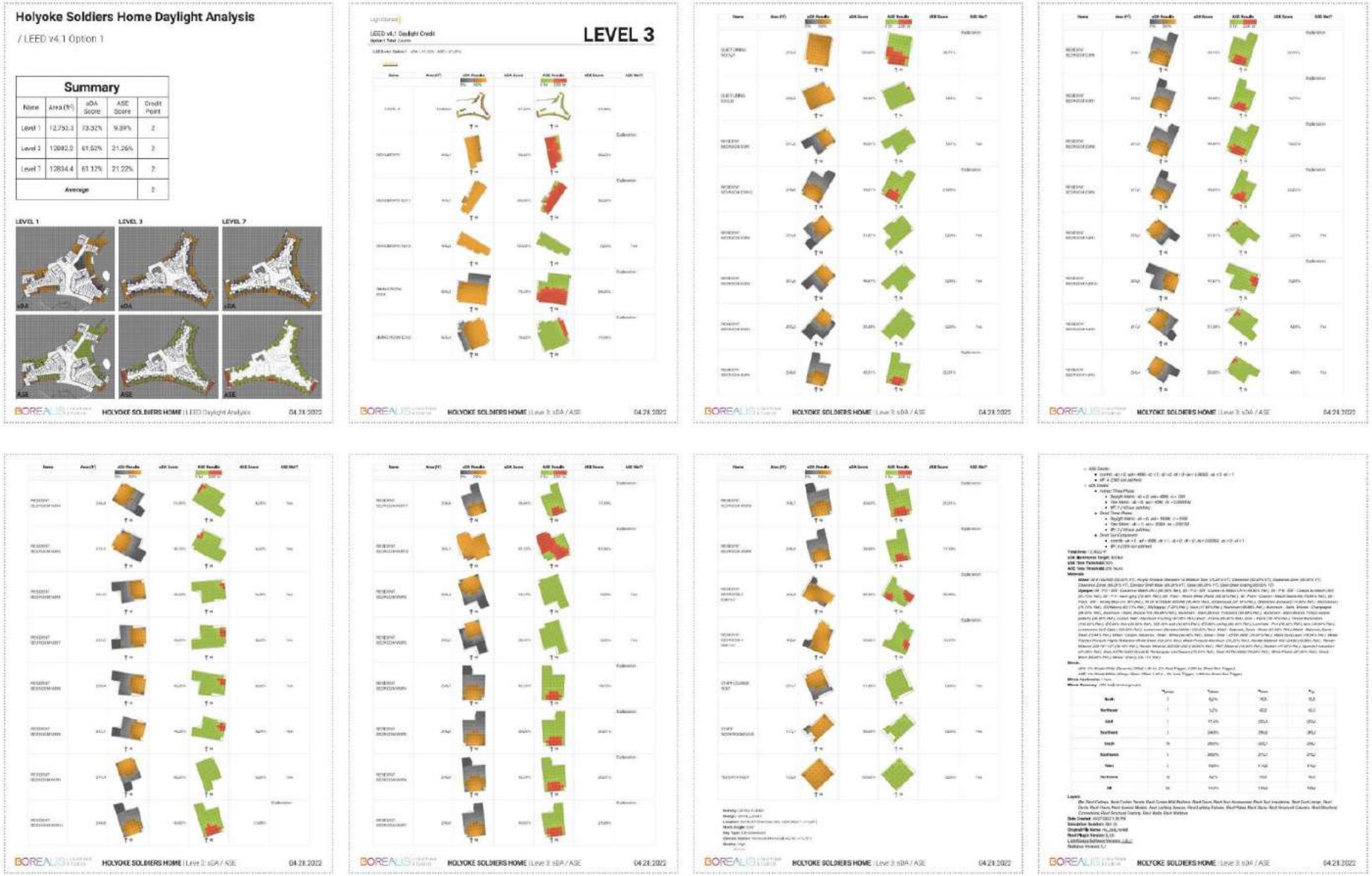




step 6 /
EXPORT ANALYSIS

a. EXPORT RESULT

b. EDIT REPORT



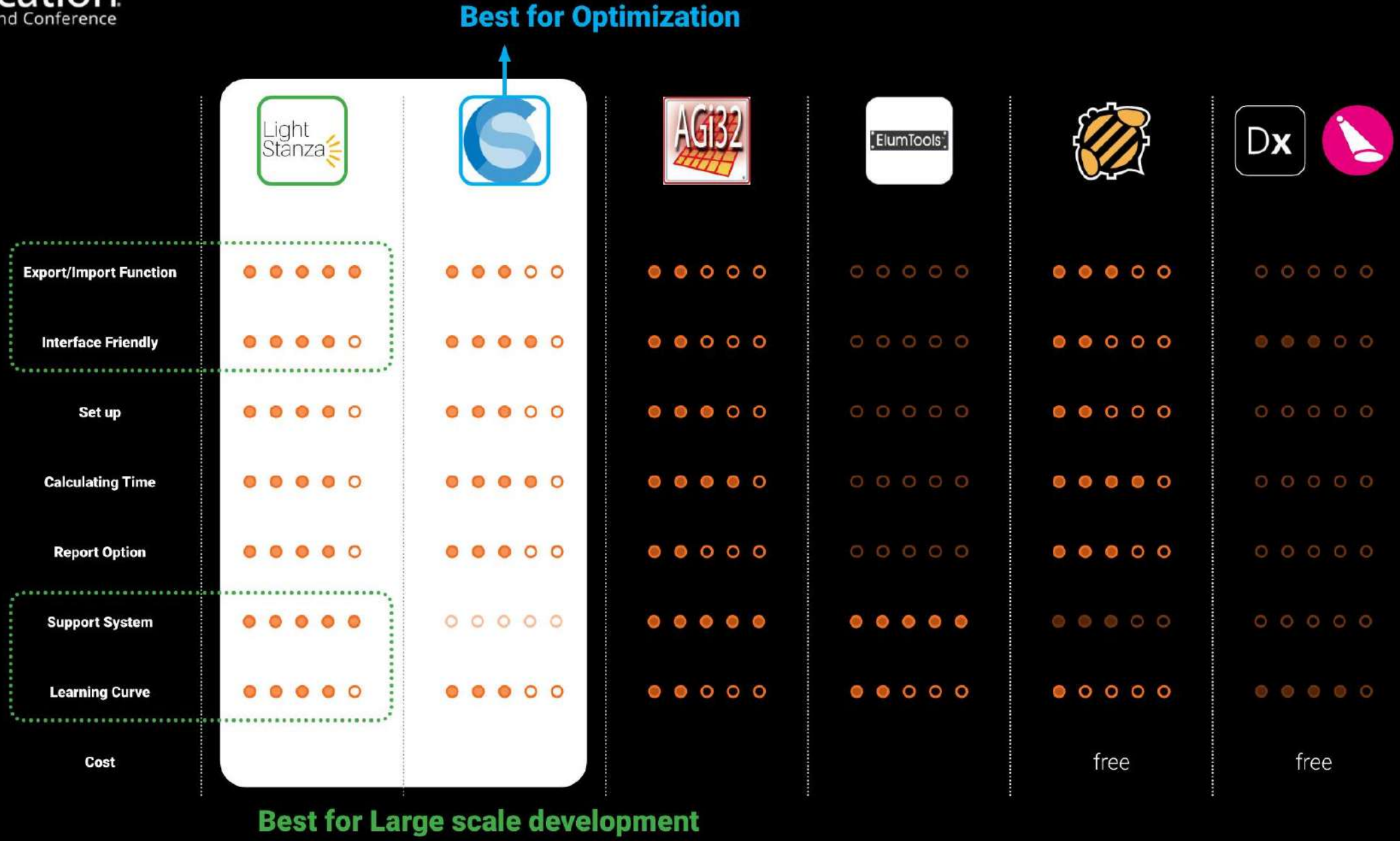
step 6 /
EXPORT ANALYSIS

EXPORT 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**
AG132	N/A	N/A	N/A	30-45 MINS	5 MINS	30 MINS
	Build the study model = 30 mins					
	3-5 MINS	1-3 MINS	10-30 MINS	15-30 MINS	3 MINS	30 MINS
Light Stanza	3-5 MINS		1-3 MINS	3-10 MINS	3 MINS	1 MIN

	step 1 / **EXPORT MODEL**	step 2 / **IMPORT MODEL**	step 3 / **CLEANUP MODEL**	step 4 / **SETUP MODEL**	step 5 / **RUN ANALYSIS**	step 6 / **EXPORT ANALYSIS**
AGi32	N/A	N/A	N/A	30-45 MINS	5 MINS	30 MINS
	Build the study model = 30 mins					
	3-5 MINS	1-3 MINS	10-30 MINS	15-30 MINS	3 MINS	30 MINS
	Flexibility to optimize the design					
Light Stanza	3-5 MINS		1-3 MINS	3-10 MINS	3 MINS	1 MIN
	Support export LEED report					

	Light Stanza		AGi32	ElumTools		Dx	
Export/Import Function	●●●●●	●●●○○	●●○○○	○○○○○	●●●○○	○○○○○	
Interface Friendly	●●●●○	●●●●○	●●○○○	○○○○○	●●○○○	●●●○○	
Set up	●●●●○	●●●○○	●●●○○	○○○○○	●●○○○	○○○○○	
Calculating Time	●●●●○	●●●●○	●●●●○	○○○○○	●●●●○	○○○○○	
Report Option	●●●●○	●●●○○	●●○○○	○○○○○	●●●○○	○○○○○	
Support System	●●●●●	○○○○○	●●●●●	●●●●●	●●○○○	○○○○○	
Learning Curve	●●●●○	●●●○○	●●○○○	●●○○○	●○○○○	●●●○○	
Cost					free	free	


Best for Optimization
Light Stanza
AGi32
ElumTools
Dx
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
AGI32
ElumTools
Dx
Export/Import Function
Interface Friendly
Set up
Calculating Time
Report Option
Support System
Learning Curve
Cost
free
free

Good for Optimization

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

Parcel R10

Location **Revere, MA**
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Canopy Entry Lighting Rendering

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Main Entry = 1.5hFC
Balcony = 1hFC

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

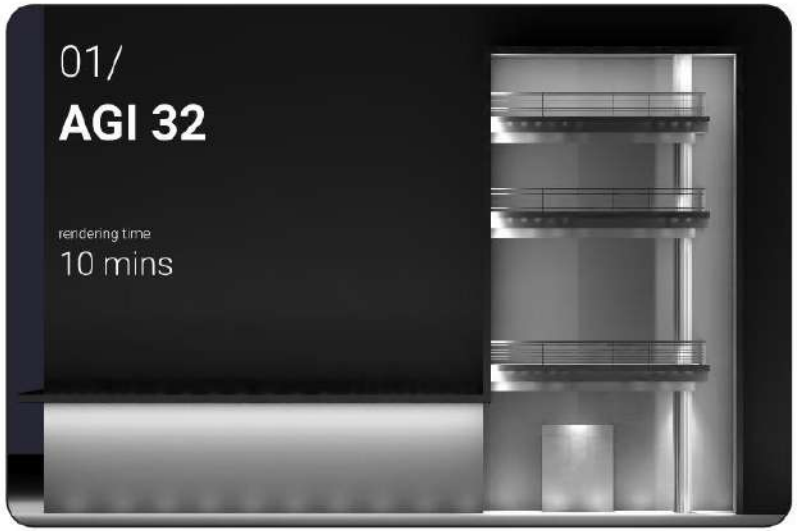
02/
Elum Tools
the same system with AGI

03/
Enscape
one of the most common rendering plugins

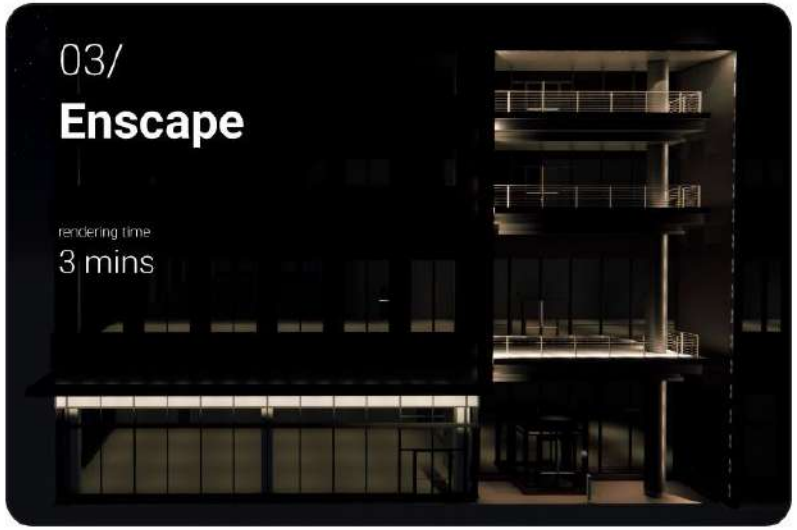
04/
Climate Studio
the latest update: luminaire

05/
3ds Max
the best rendering software

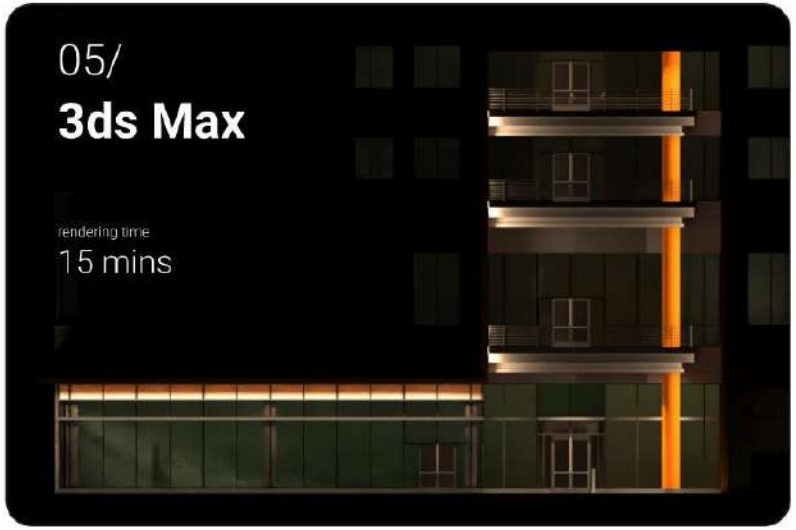

00/
from
Archiect


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

00/
from Archiect

01/
AGI 32

rendering time
10 mins

02/
Elum Tools

rendering time
20 mins

03/
Enscape

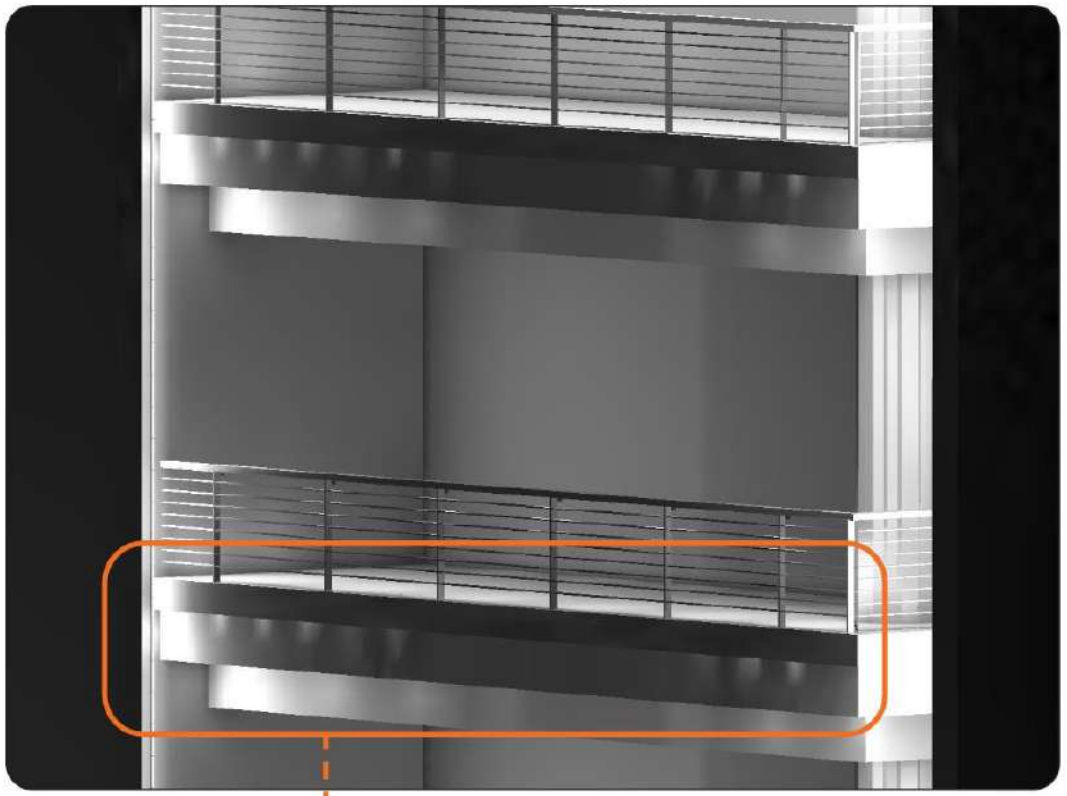
rendering time
3 mins

04/
Climate Studio

rendering time
2-3 hours

05/
3ds Max

rendering time
15 mins



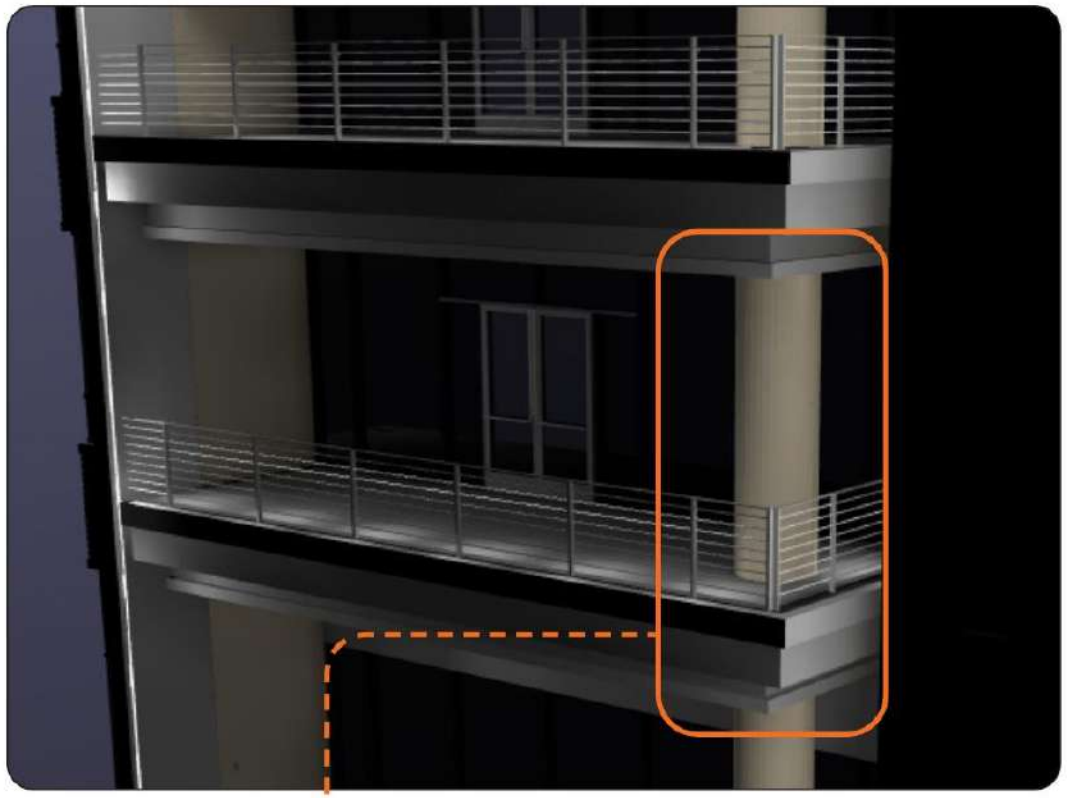
Pros

- **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



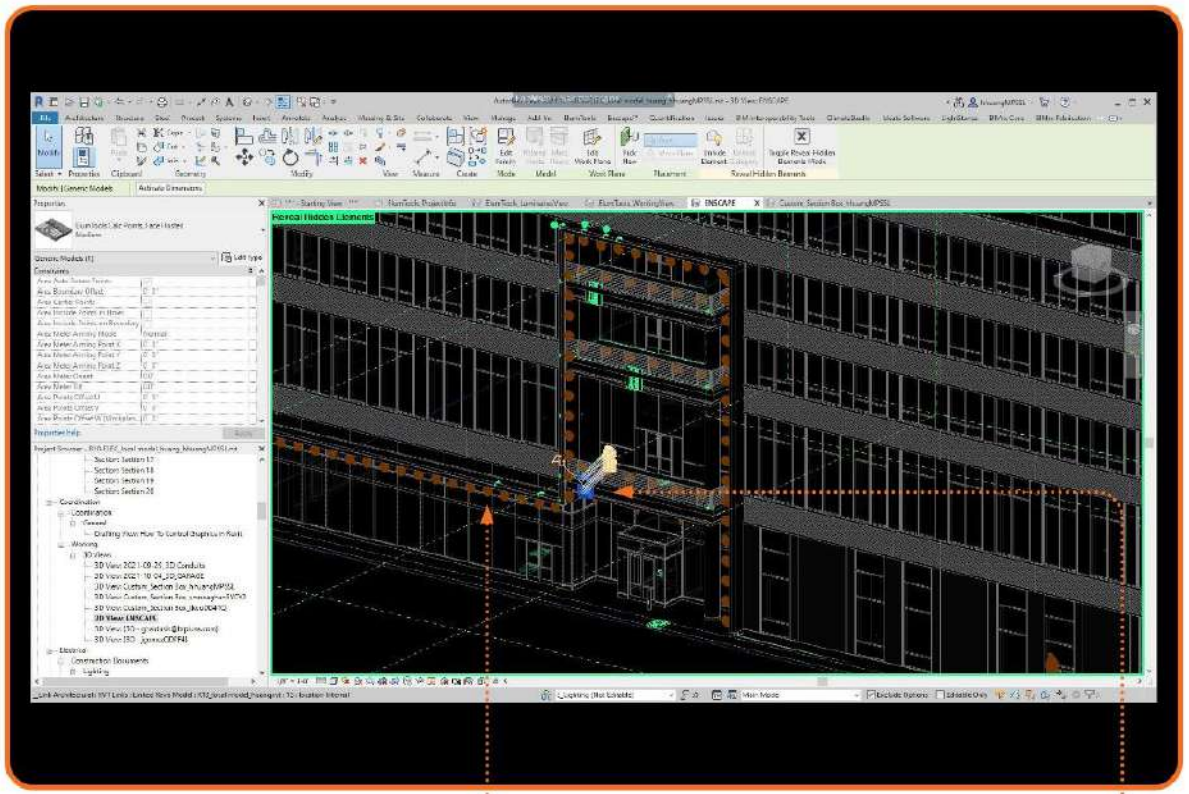
Pros

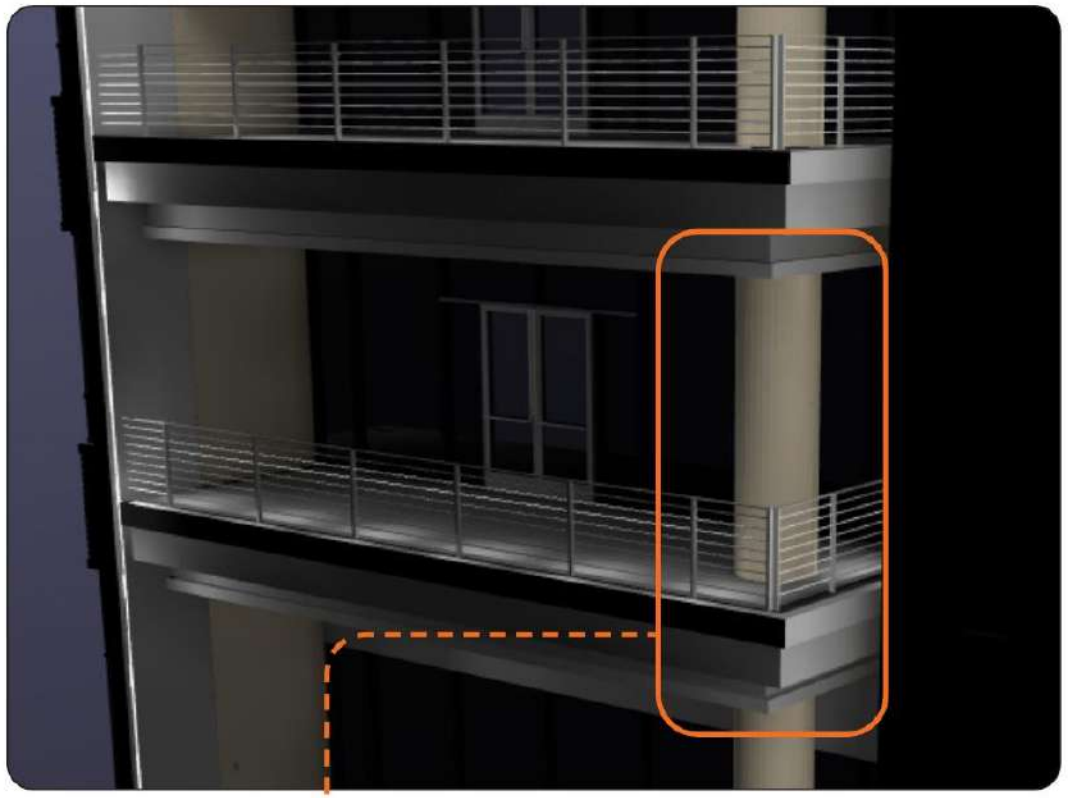
- **No need to set up the model**
- **Accurate lighting effect**
- **Only need to render once**

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

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Cons

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Quick Feedback:
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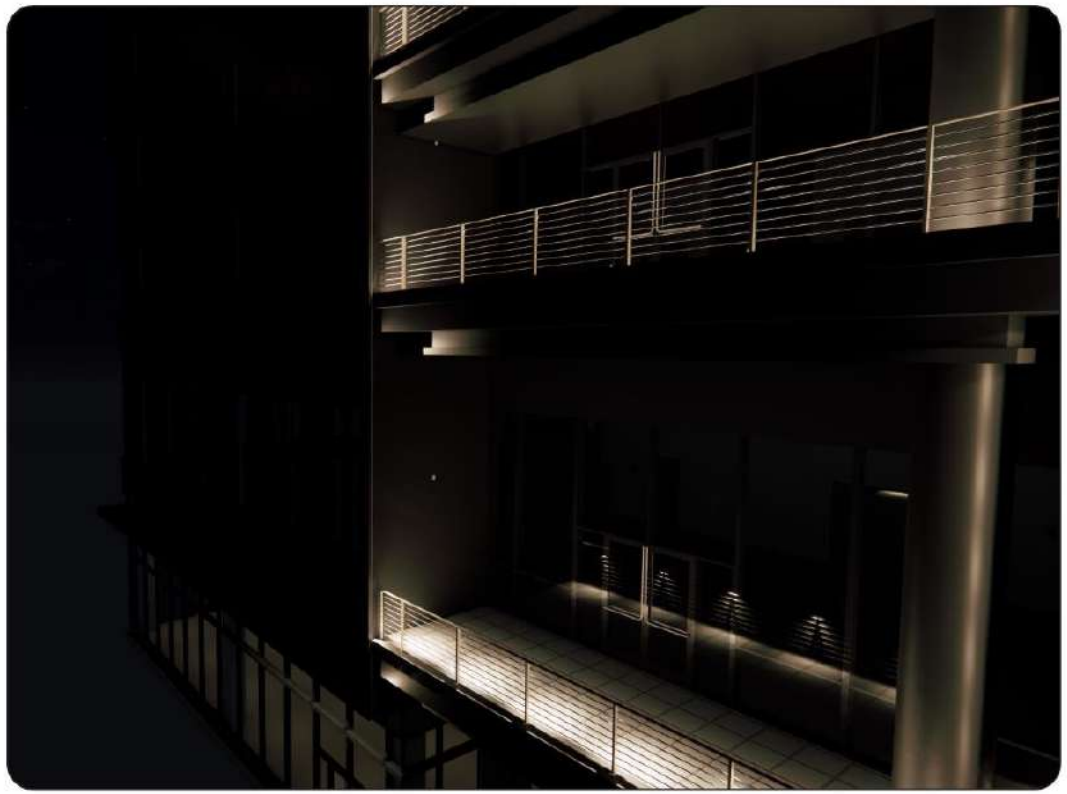


Pros

- **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

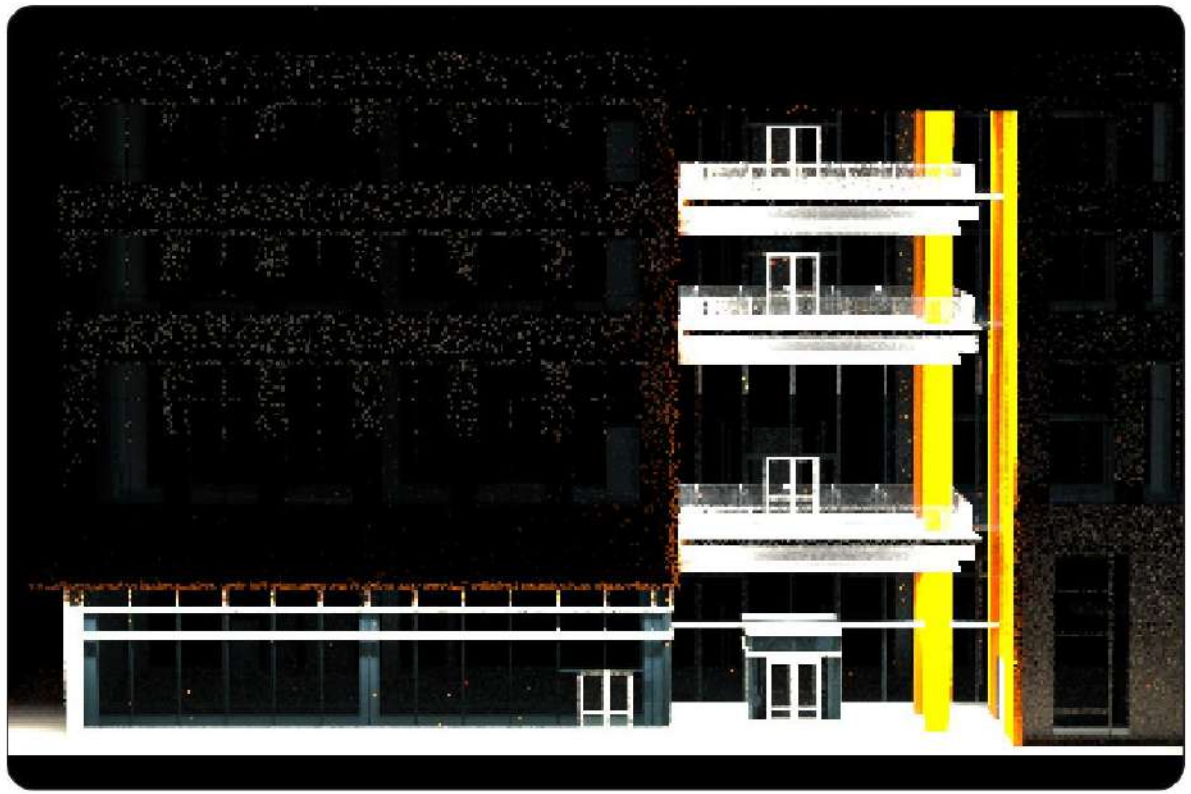
- **No need to set up the model**
- **Get the rendering quickly**

Cons

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

Quick Feedback:

too much exposure / the wrong rendering ratio



Pros

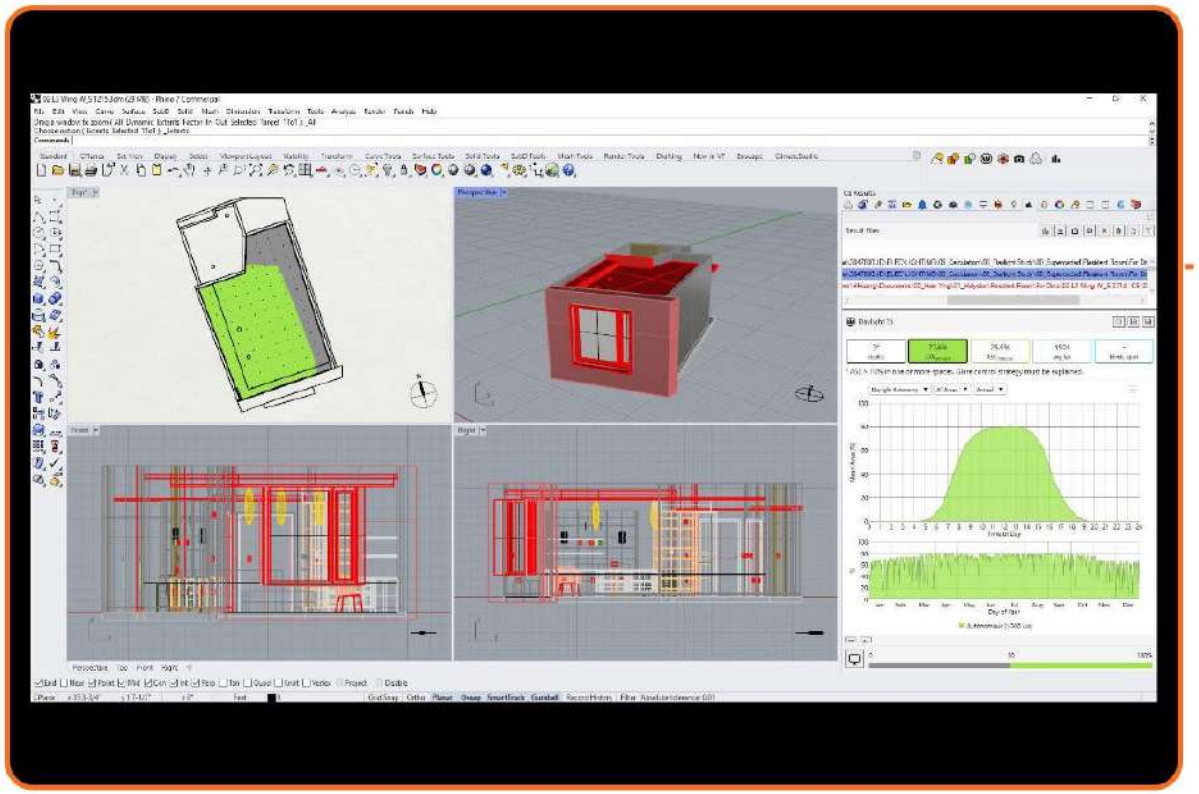
- **Flexibility**

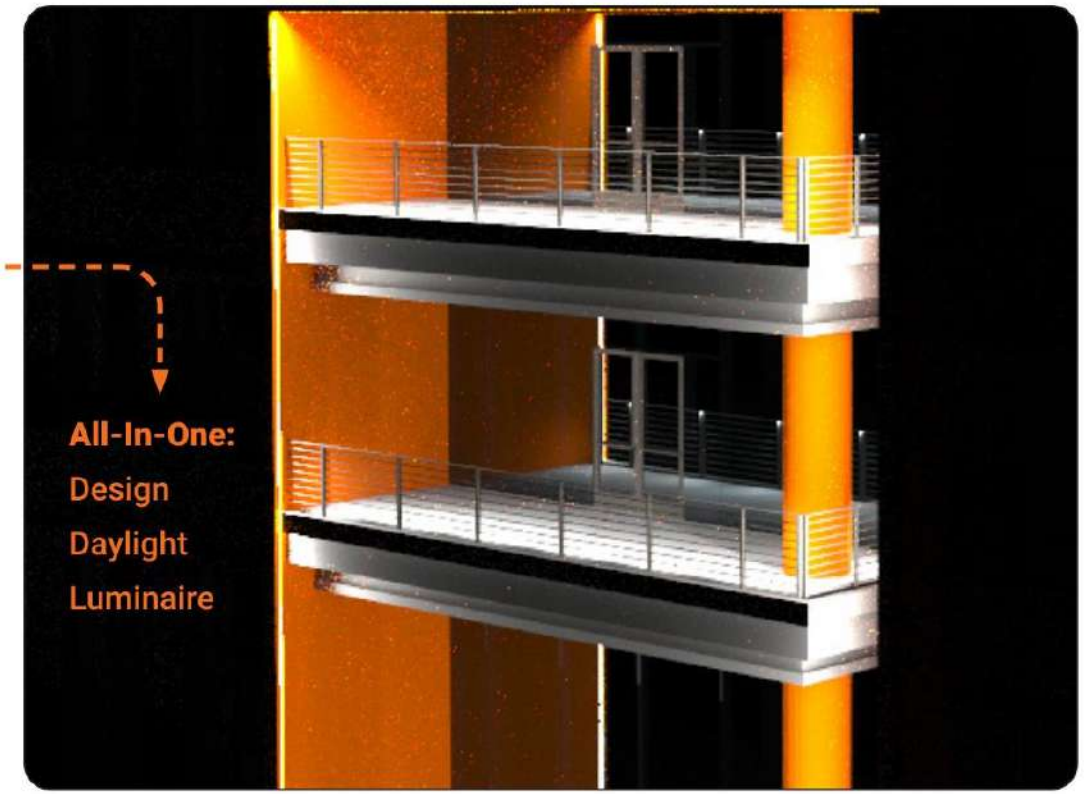
Cons

- **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**





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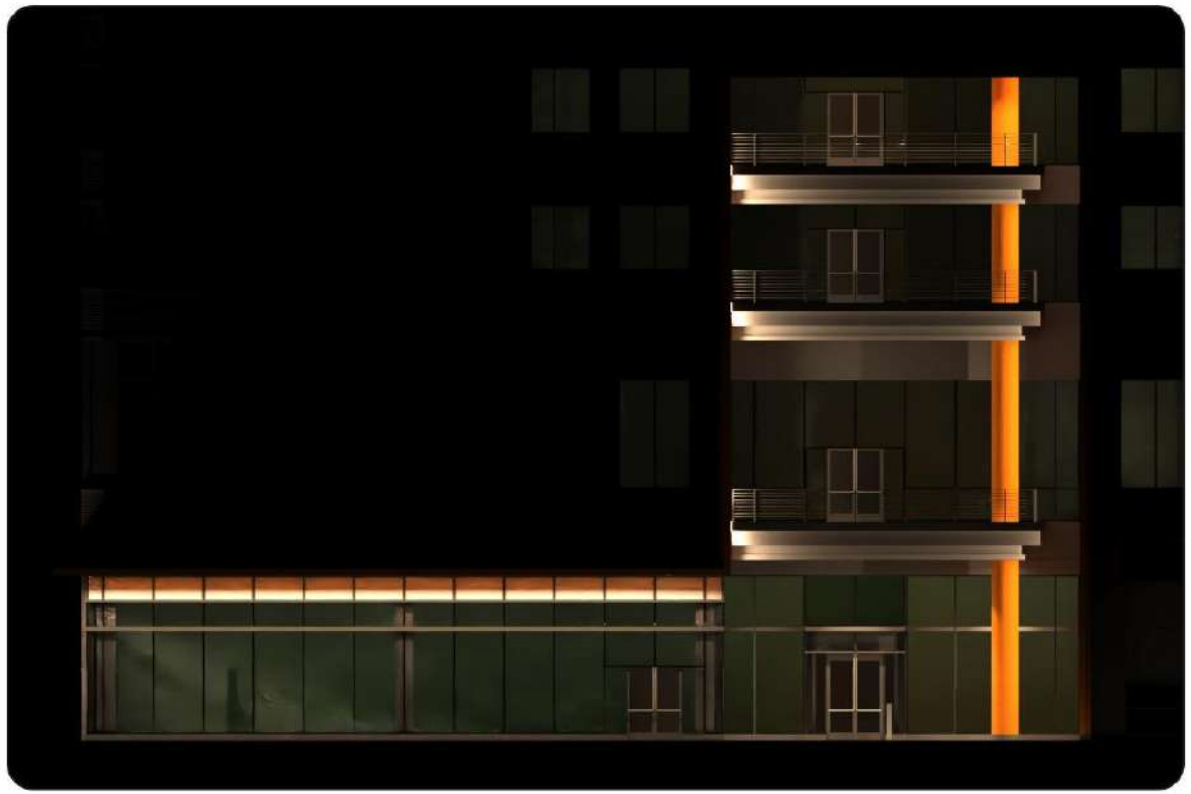
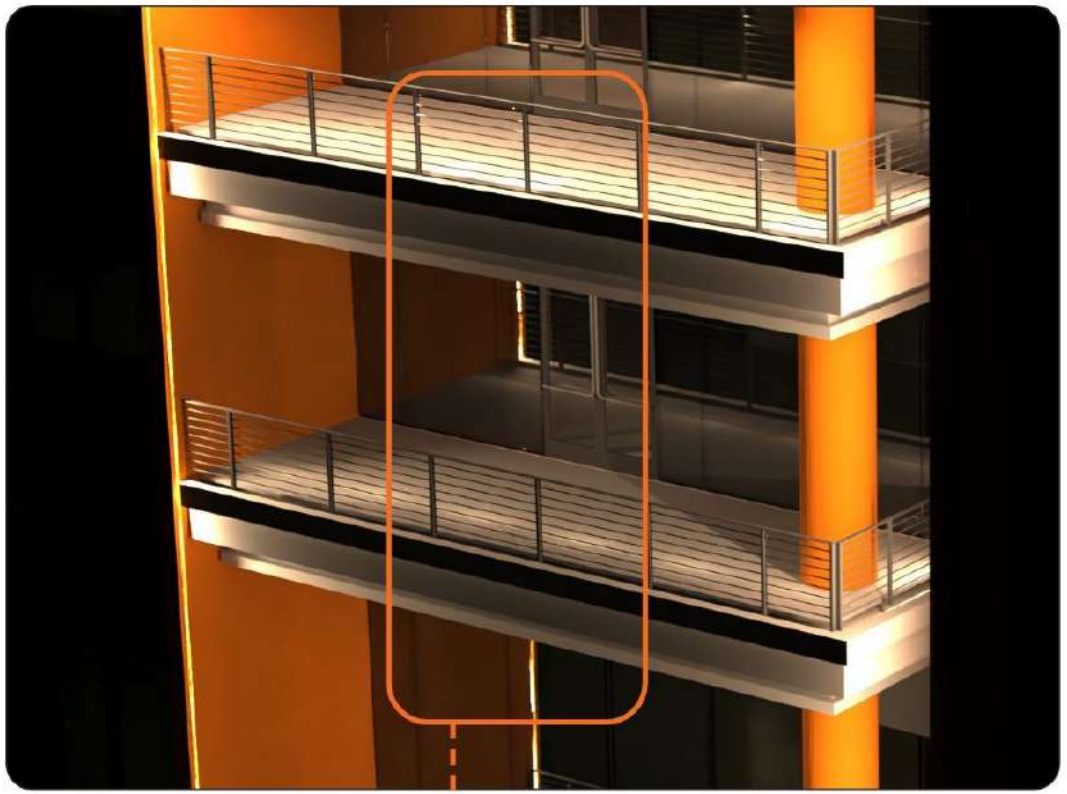




Pros

- **The best quality of rendering**

Cons

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

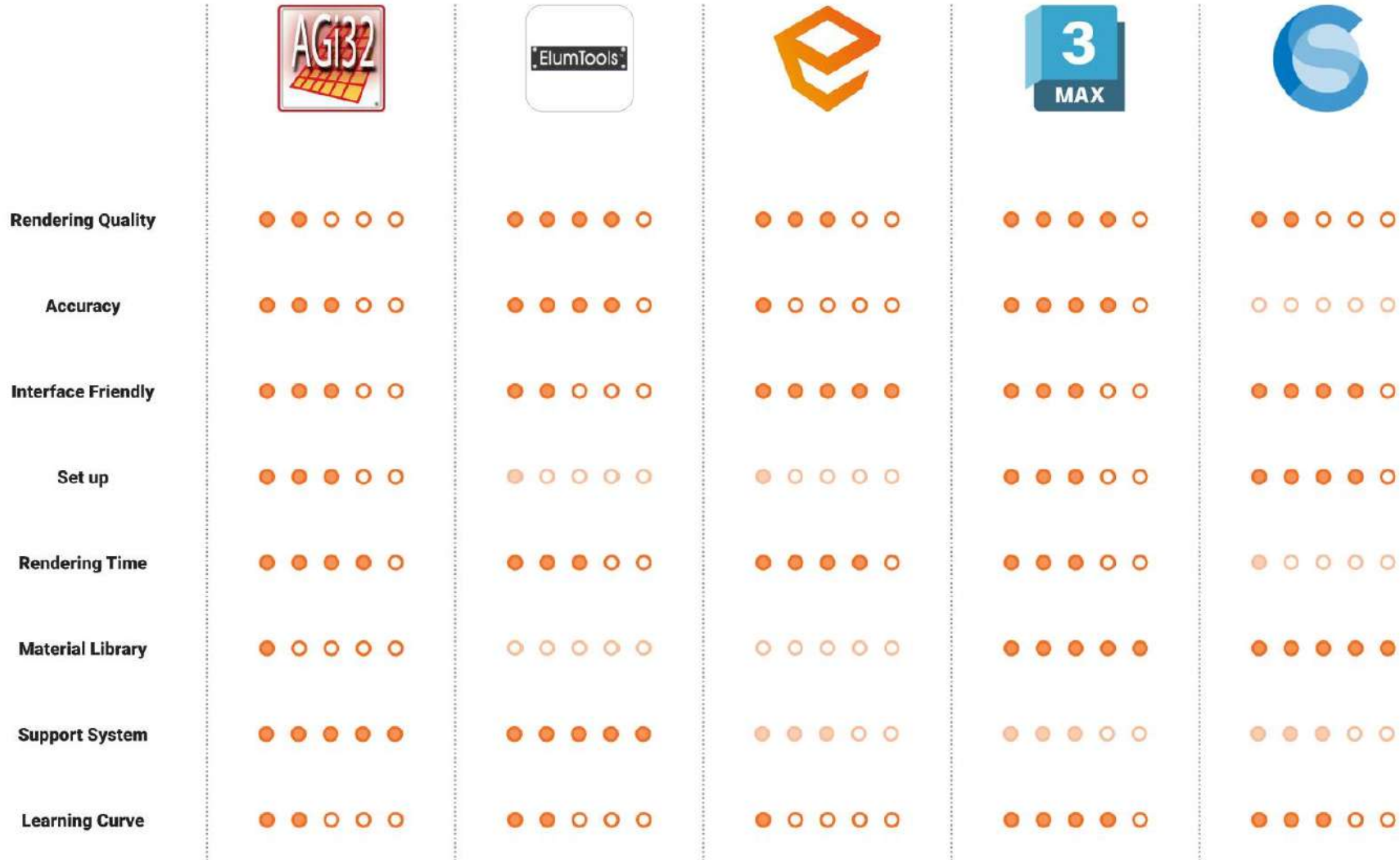
Quick Feedback:
should improve the glass material option

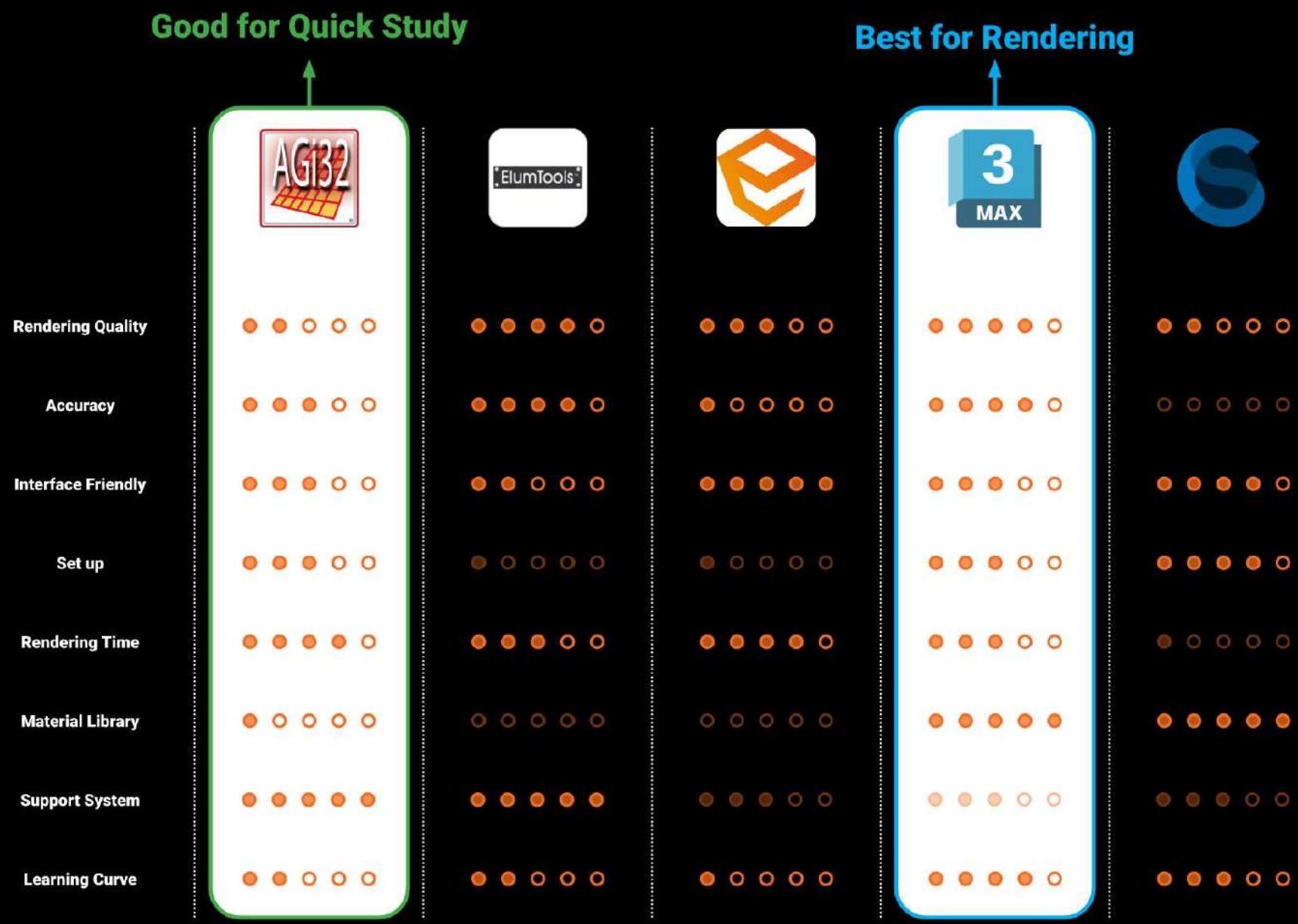
	step 1 / **EXPORT MODEL**	step 2 / **CLEANUP MODEL**	step 3 / **IMPORT MODEL**	step 4 / **SETUP MODEL**	step 5 / **RUN ANALYSIS**	step 5 / **DEBUG MODEL**
AGI32	3 MINS	10 MINS	3 MINS	20 MINS	10 MINS	N/A
ElumTools	N/A	N/A	N/A	15-30 MINS	20 MINS	30 MINS
	N/A	N/A	N/A	10 MINS	3 MINS	N/A
	3-5 MINS		1-3 MINS	30-45 MINS	2-3 HOURS	30 MINS
3 MAX	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**
AGI32	3 MINS	10 MINS	3 MINS	20 MINS	10 MINS	N/A
ElumTools	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 MAX	3 MINS	N/A	1-3 MINS	15-30 MINS	15 MINS	0.5-2 HOURS

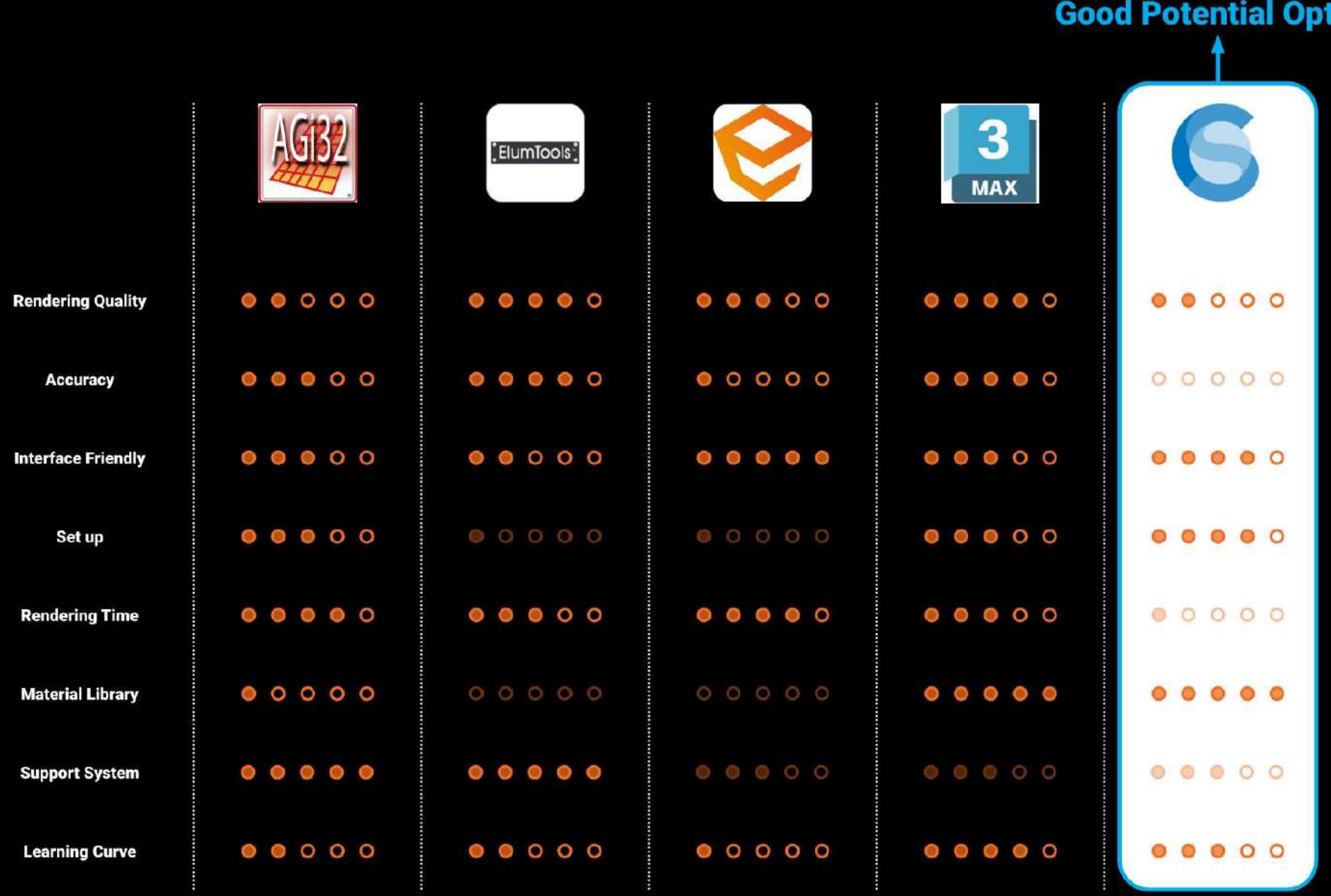
no need to export/import model = can't edit the model

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


AGI32
ElumTools
3
MAX
Rendering Quality
Accuracy
Interface Friendly
Set up
Rendering Time
Material Library
Support System
Learning Curve


Good for Quick Study
Best for Rendering
AG132
ElumTools
3
MAX
Rendering Quality
Accuracy
Interface Friendly
Set up
Rendering Time
Material Library
Support System
Learning Curve


Good for small scale project
AG132
ElumTools
3
MAX
Rendering Quality
Accuracy
Interface Friendly
Set up
Rendering Time
Material Library
Support System
Learning Curve
Good for the early DD proposal


Good Potential Option
AG132
ElumTools
3
MAX
Rendering Quality
Accuracy
Interface Friendly
Set up
Rendering Time
Material Library
Support System
Learning Curve

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

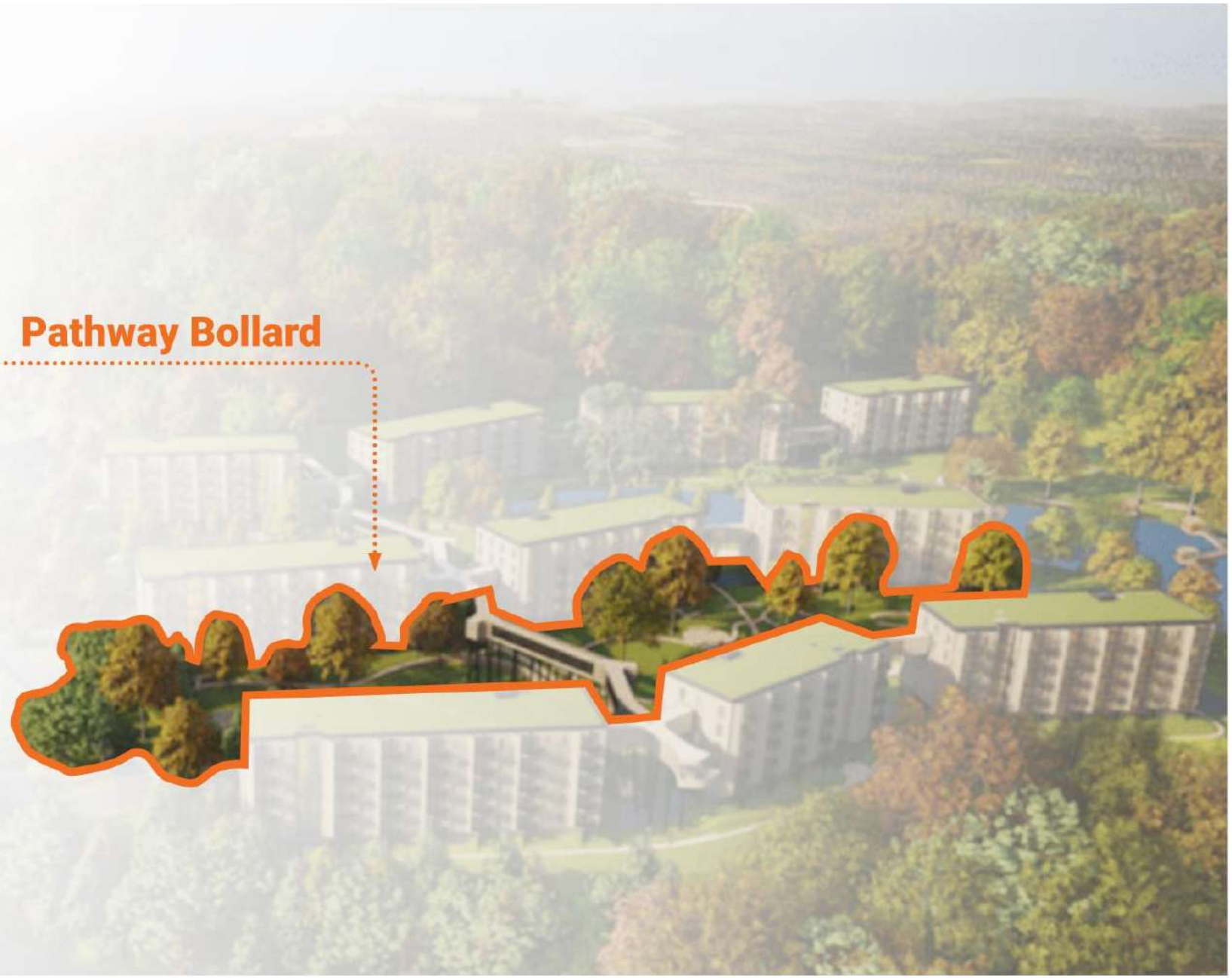
Criteria:
Rural/Semi-Rural Areas: 0.2 hFC

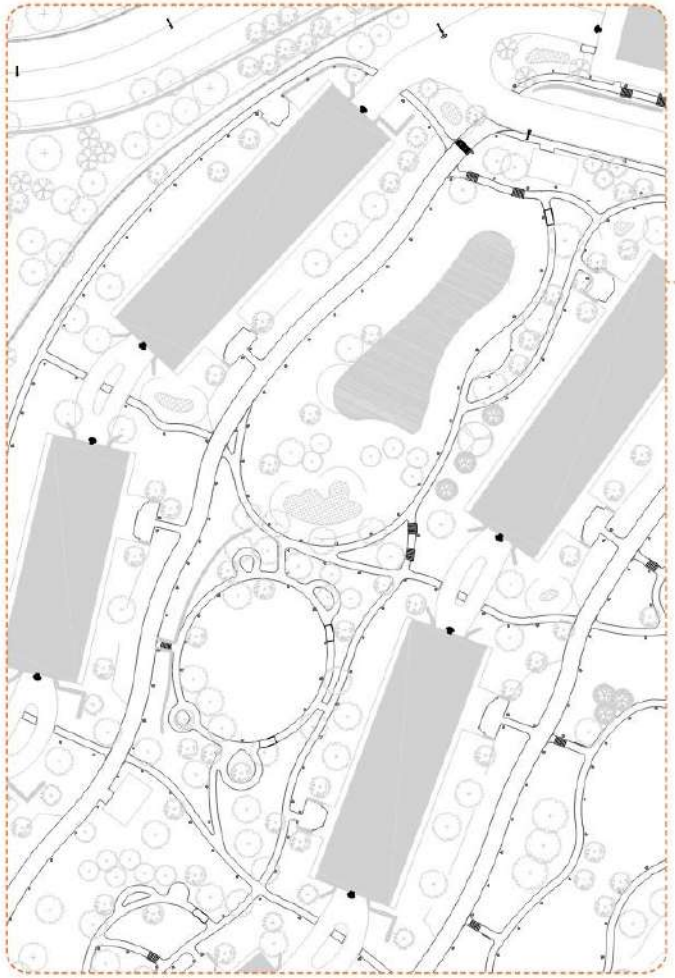
Low Density Residential: 0.3 hFC
(2 or fewer dwelling units per acre)

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

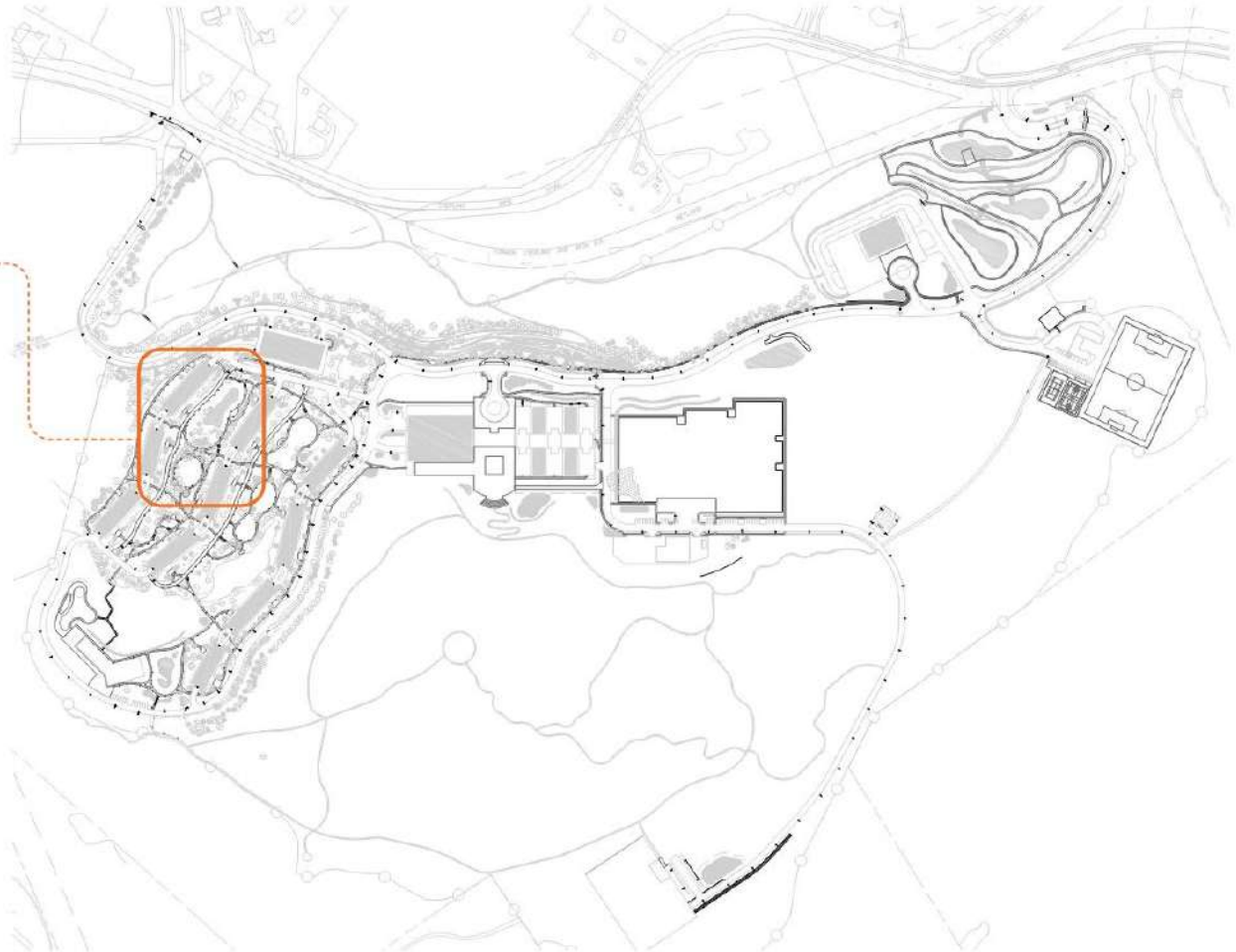
Tools for Analysis:
AGI32
Mockup

Goal of Analysis:
Design consulting

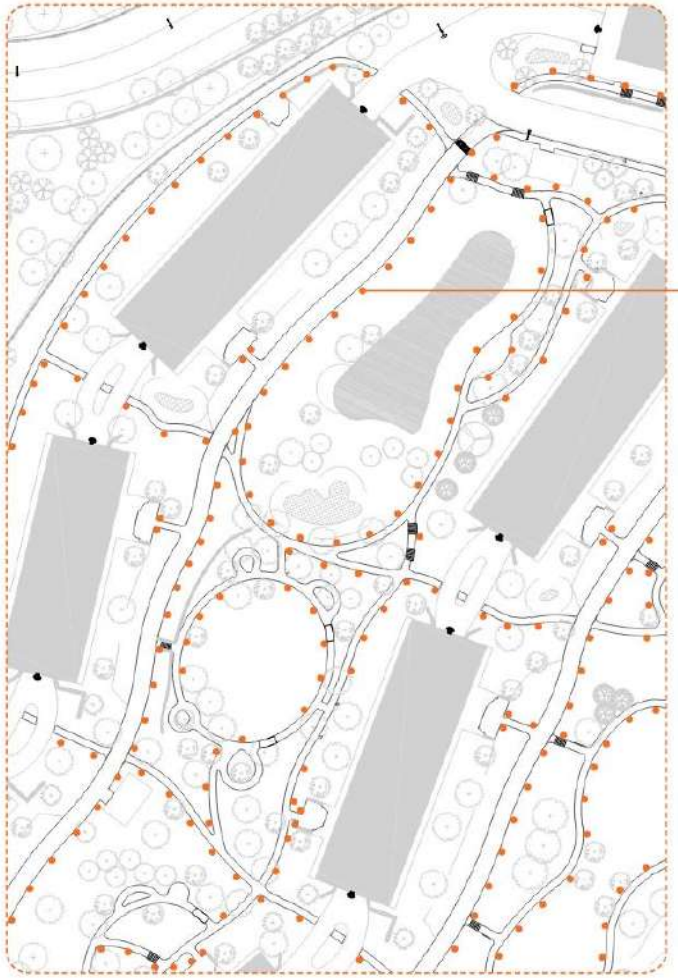




plan view / **residential area**



plan view / **master plan**

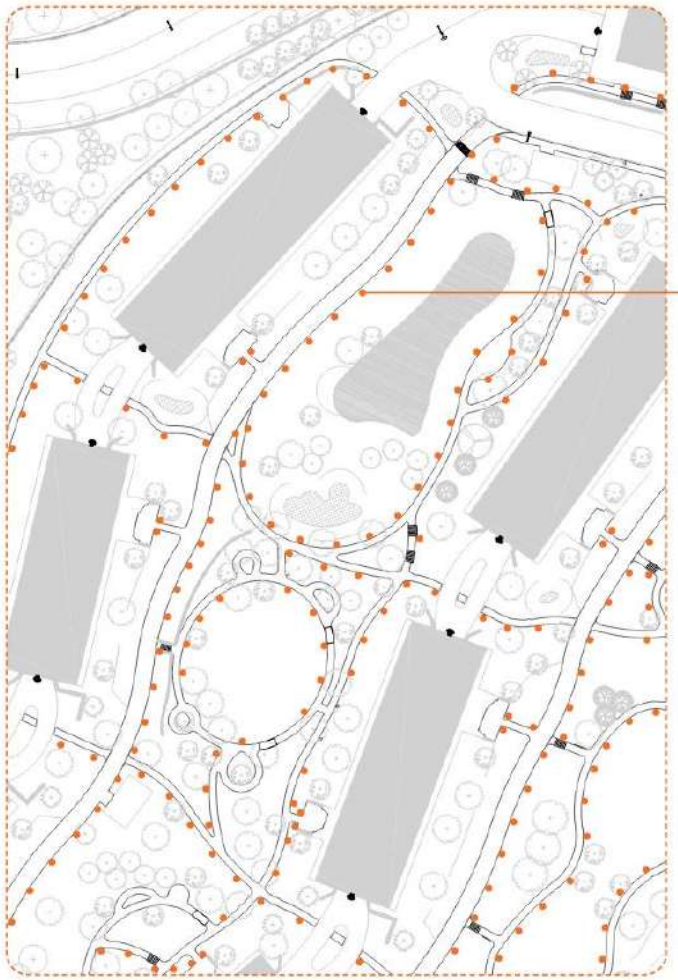


plan view / **residential area**

bollard design / **one head**

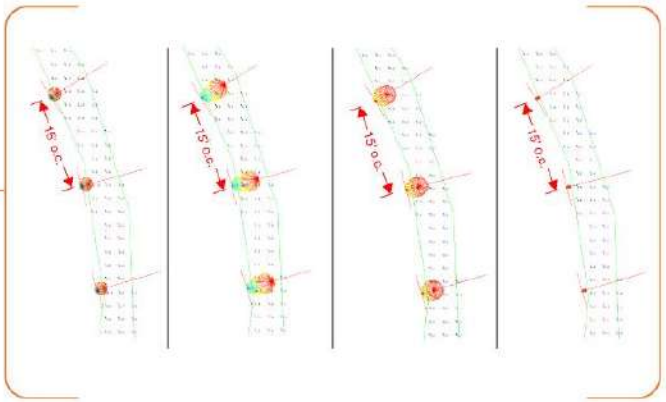
bollard design / **two heads**

fixuture / **ooutdoor recessed**



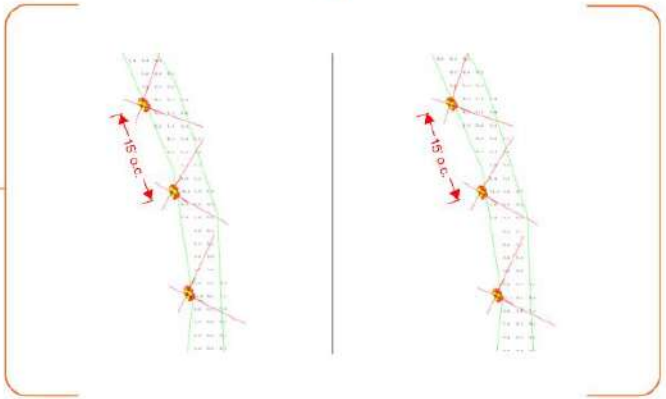
plan view / **residential area**

bollard design / **one head**



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

bollard design / **two heads**



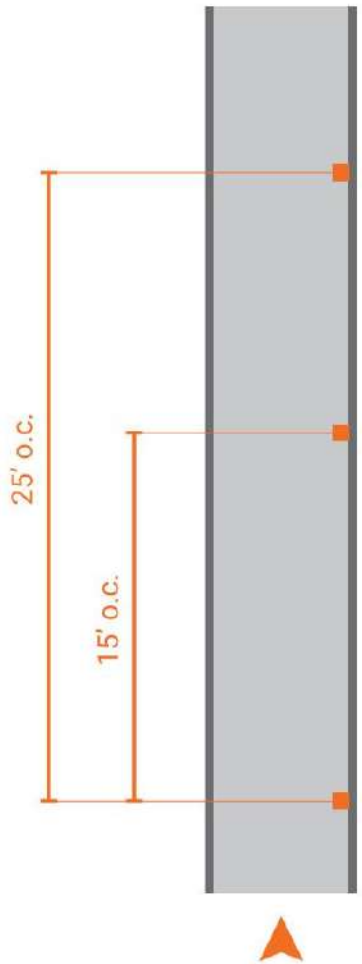
calculation / **AGi32**

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 / **bollard**

set up / **one fixture on**

spacing / **25' o.c.**

spacing

spacing / **15' o.c.**

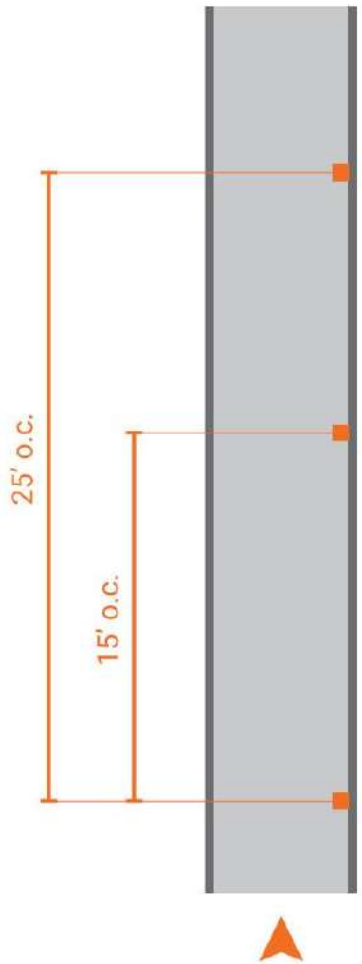
testing / **linear spread lens**

comparison / **no lens vs. spread lens**

lens / **no lens (25' o.c.)**

lens

lens / **linear spread lens (25' o.c.)**

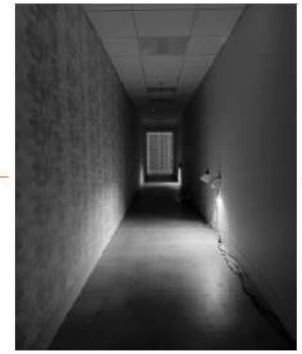


set up / **one head**

set up / **15' o.c.**

testing / **motion record**

testing / **two head**



set up / **15' o.c.**

testing / **motion record**

	AGI32	
Set Up	●●●●○	●○○○○
Export/Import Function	●●●○○	○○○○○
Running Time	●●●●○	●○○○○
Observing Dim Lighting Condition	●○○○○	●●●●○
Tilt Angle Study	●●●○○	●●●○○
Studying Lighting Effect	●●○○○	●●●●○
Studying assembling process	○○○○○	●●●○○

	AGI32	
Set Up	●●●●○	●○○○○
Export/Import Function	●●●○○	○○○○○
Running Time	●●●●○	●○○○○
Observing Dim Lighting Condition	●○○○○	●●●●○
Tilt Angle Study	●●●○○	●●●○○
Studying Lighting Effect	●●○○○	●●●●○
Studying assembling process	○○○○○	●●●○○

#Efficiency

	AGI32	
Set Up	●●●●○	●○○○○
Export/Import Function	●●●○○	○○○○○
Running Time	●●●●○	●○○○○
Observing Dim Lighting Condition	●○○○○	●●●●○
Tilt Angle Study	●●●○○	●●●○○
Studying Lighting Effect	●●○○○	●●●●○
Studying assembling process	○○○○○	●●●○○

#Accuracy

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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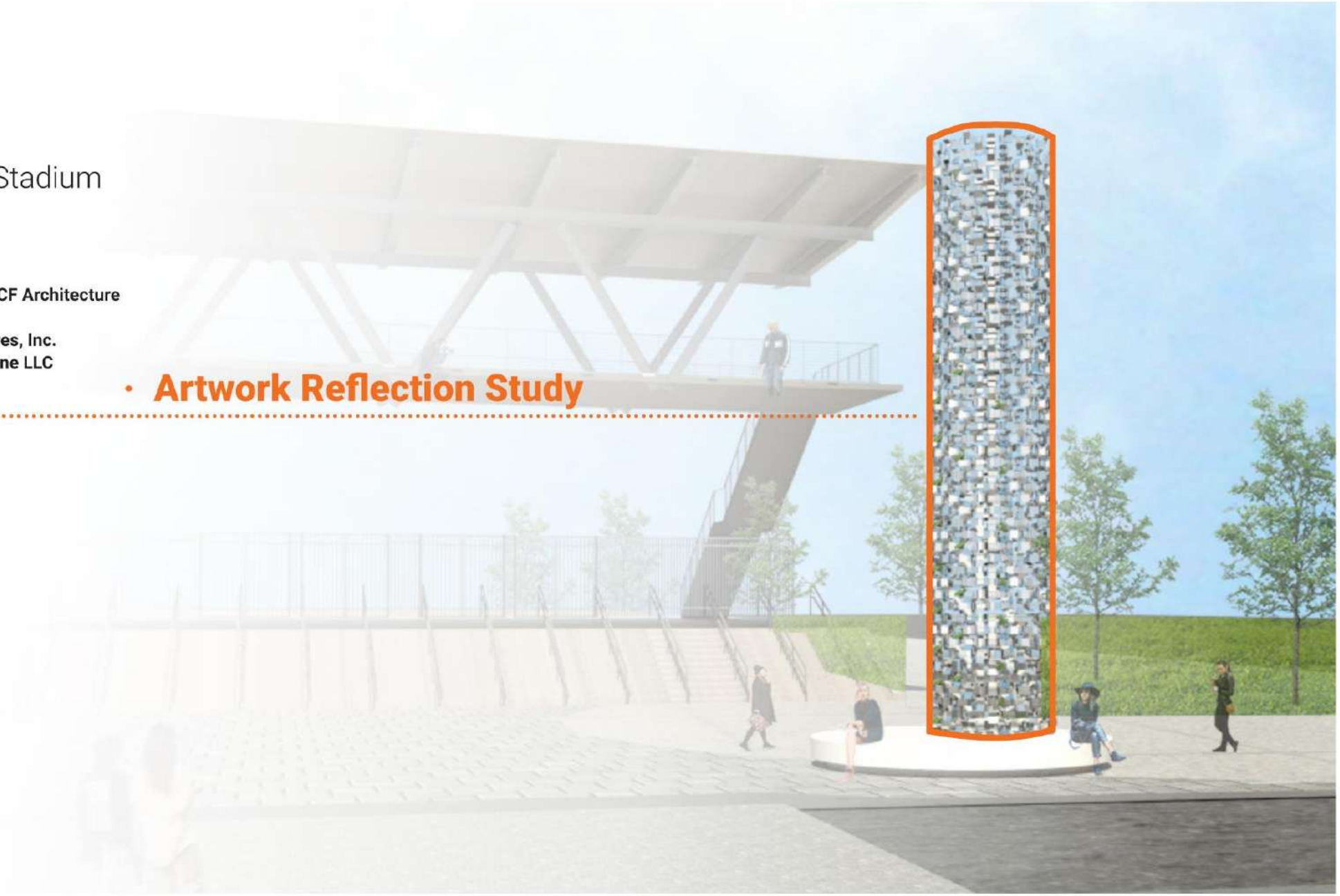
Artwork Reflection Study

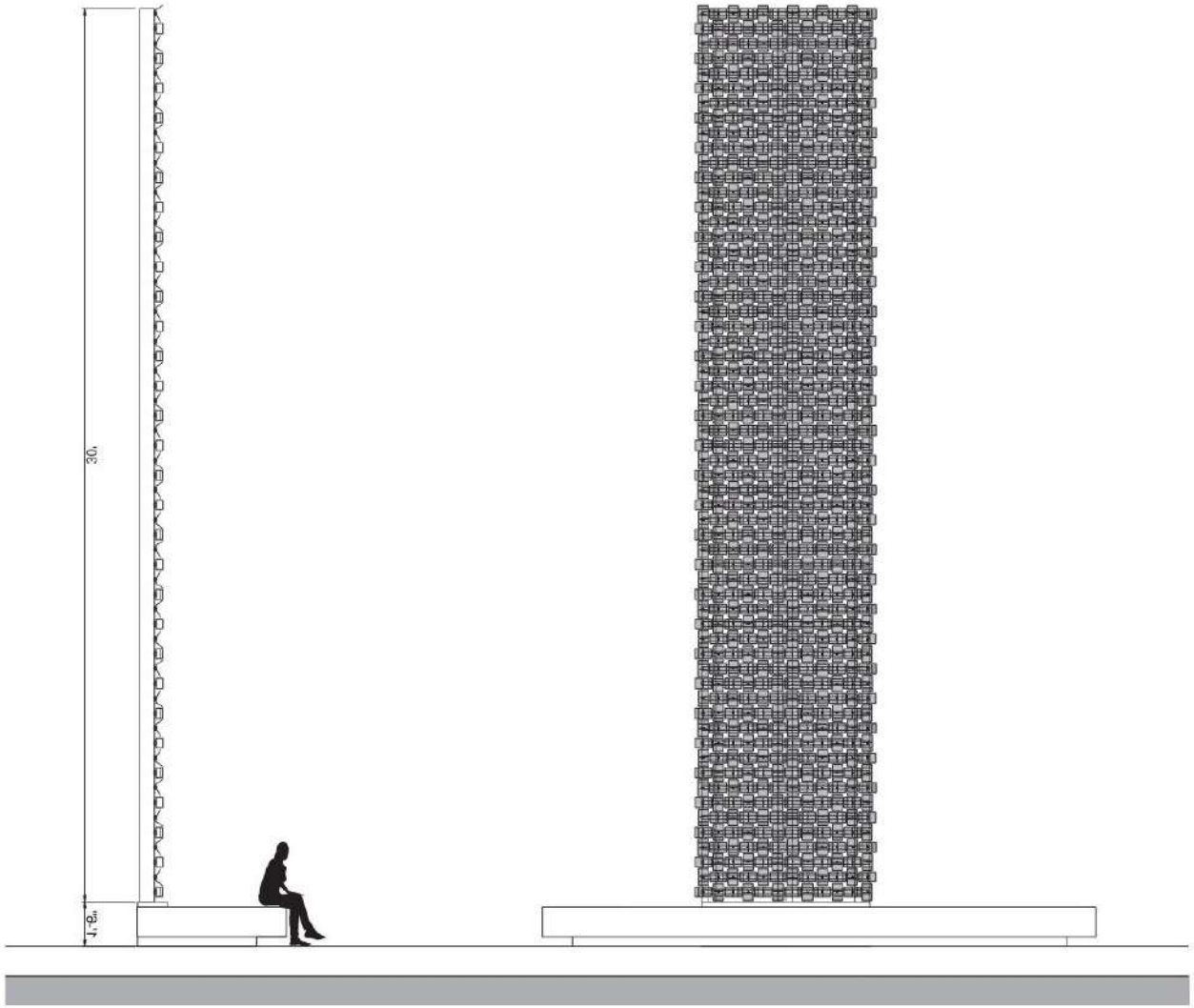


How **LONG** does it take to build a model ?

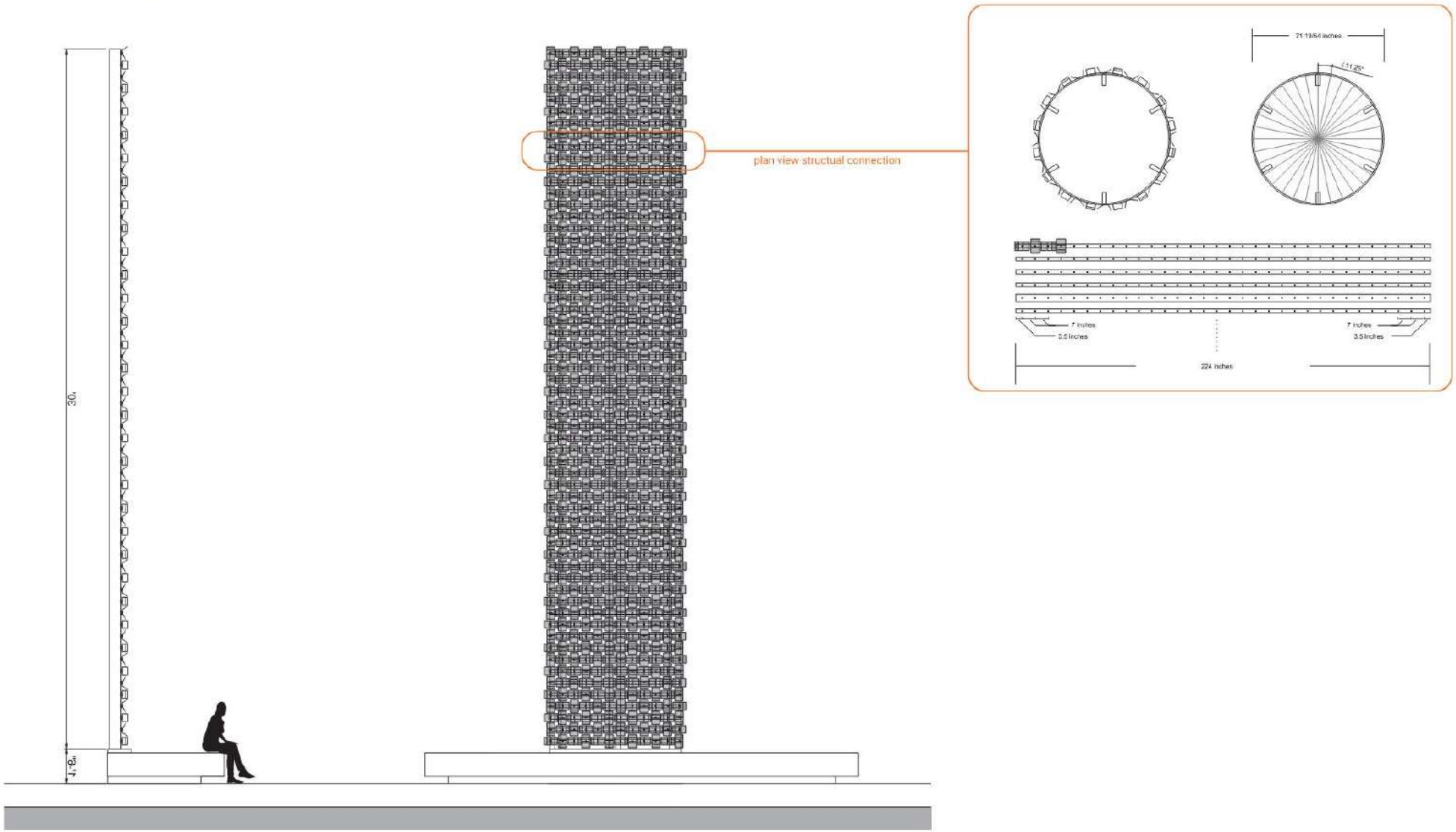
Can we **VISUALIZE** the view that reflected from the environment?

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

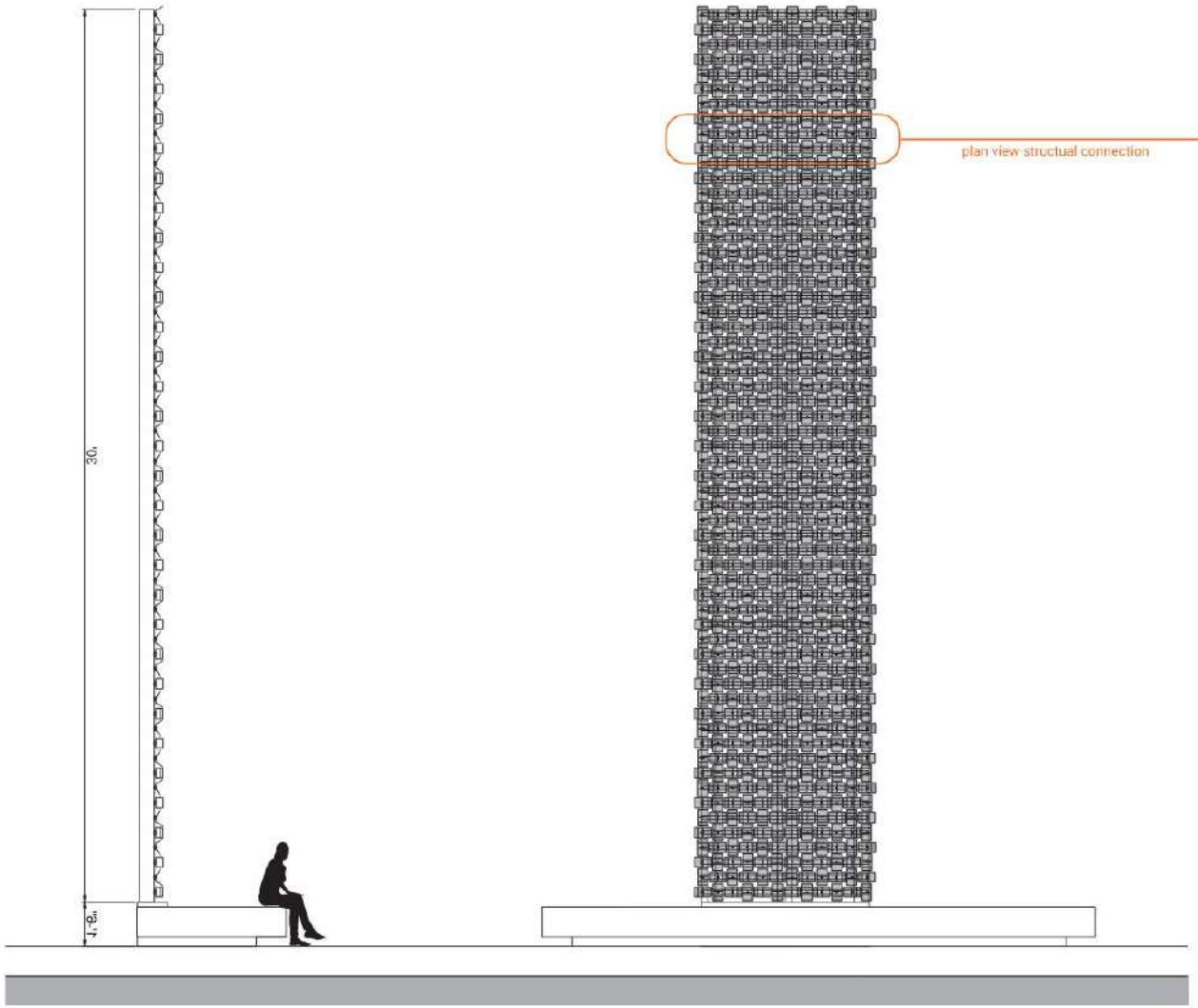
#Efficiency #Accuracy #Aesthetics



elevation / **structual connection**

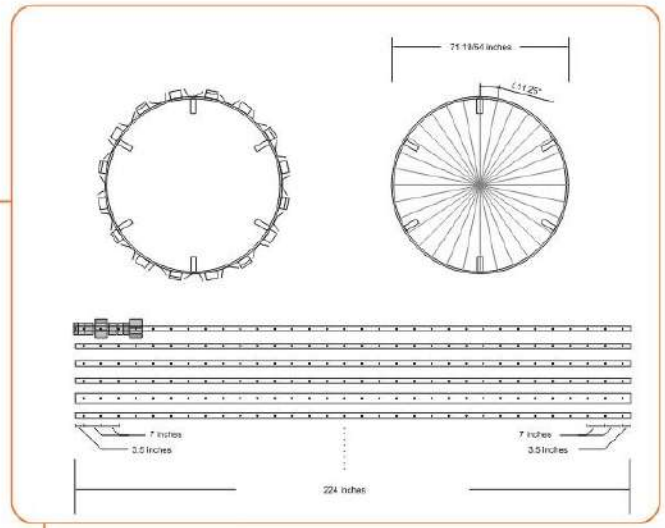


elevation / **structual connection**

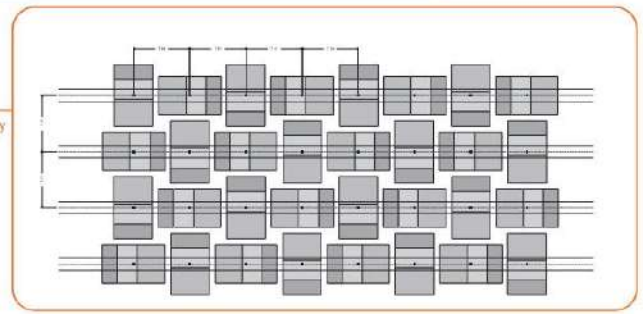


elevation / **structual connection**

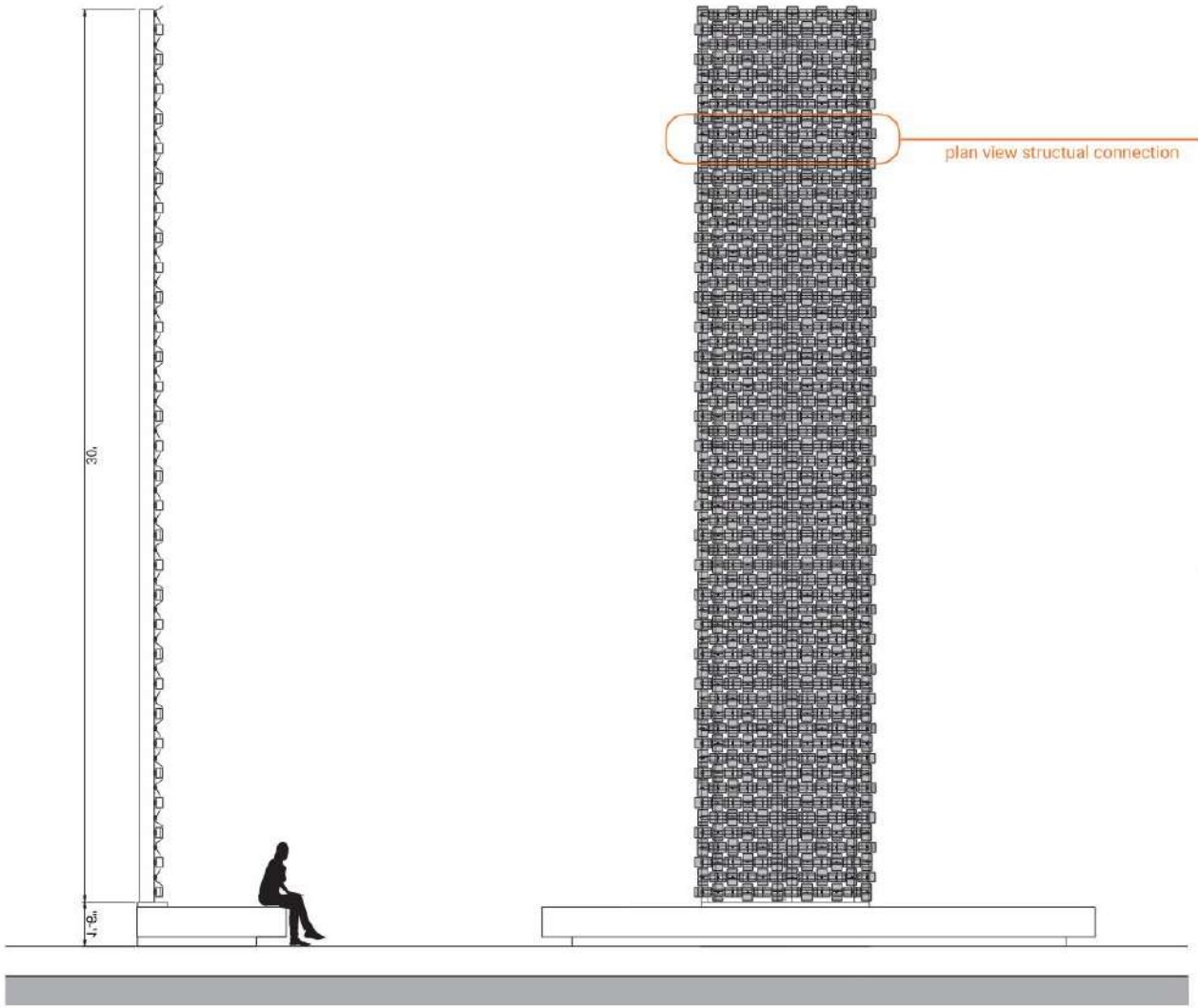
plan view structual connection



reflection proportion study

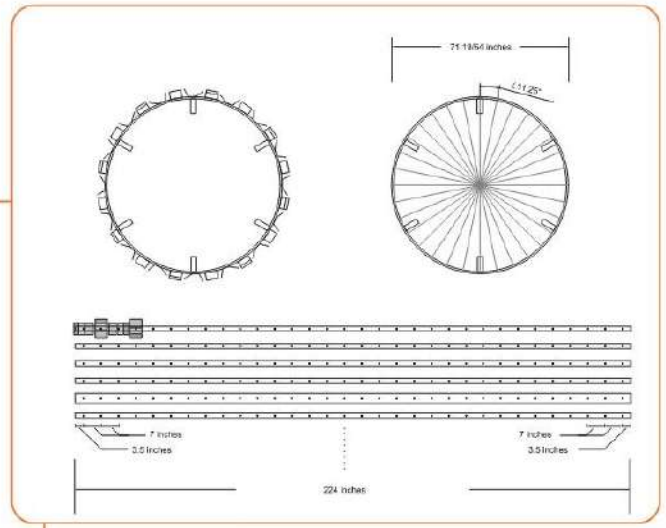


Lighting Visualized Diagram / **Art Installation Break Down**

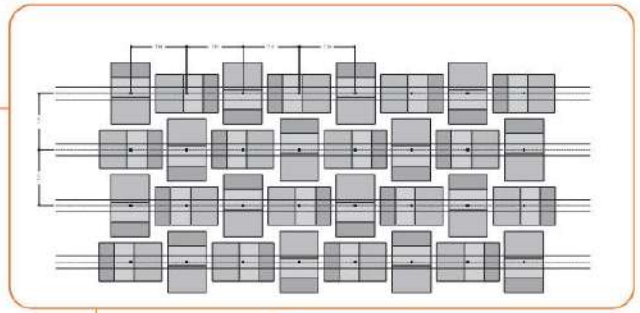


elevation / **structual connection**

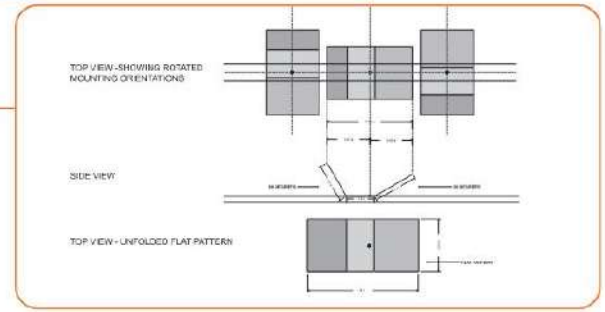
plan view structual connection

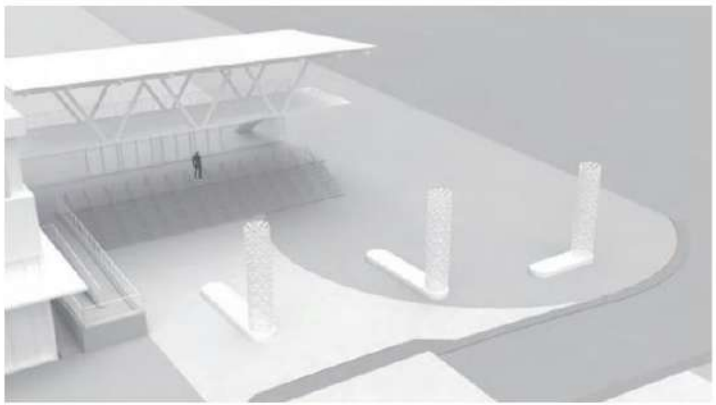


reflection proportion study

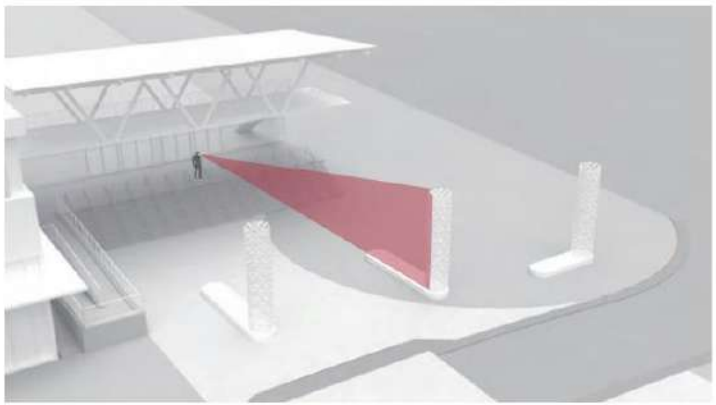


section and elevation details

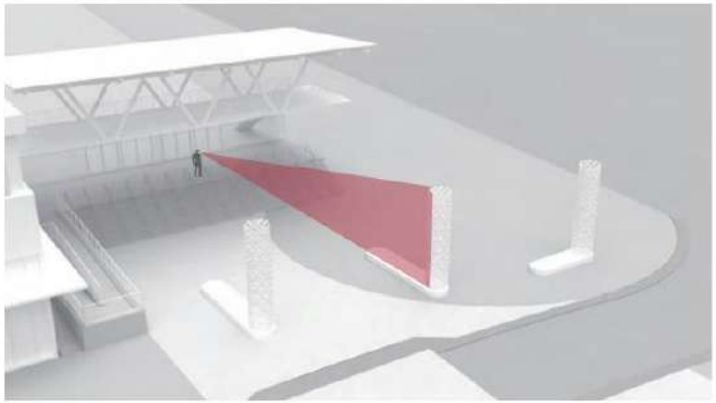




perspective view / **eye sight**

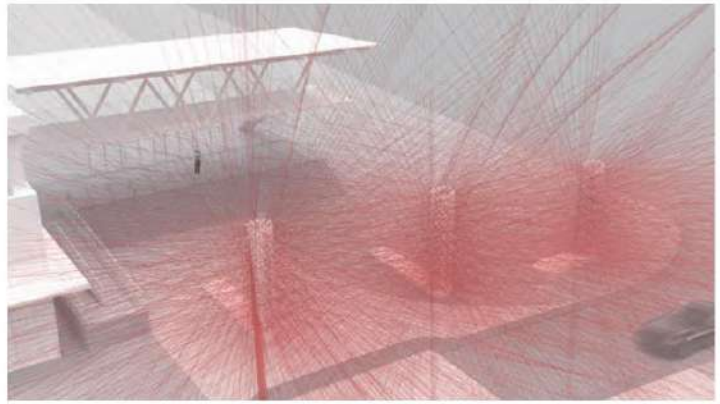


perspective view / **eye sight**

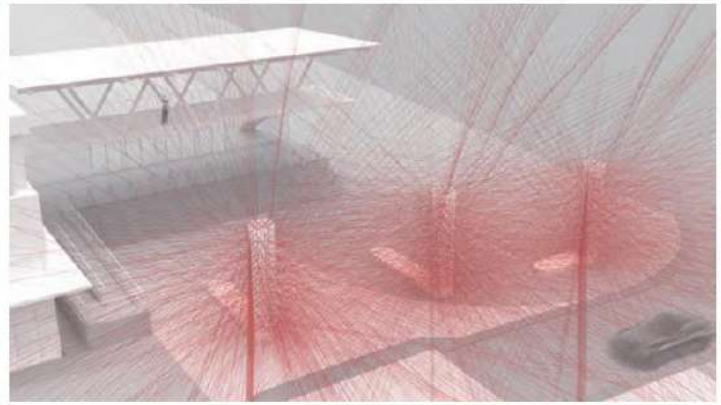


perspective view / **eye sight**

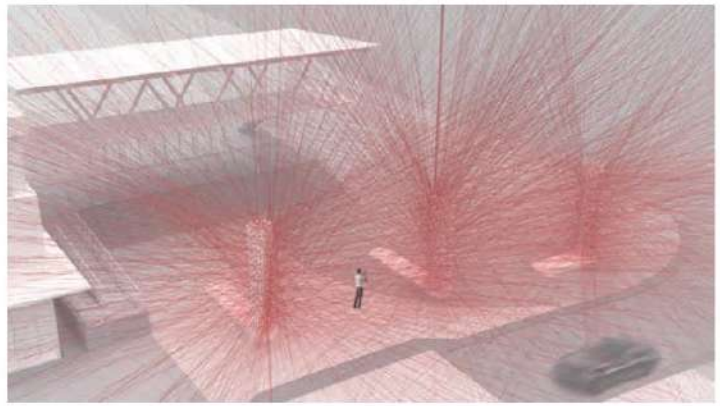
changing the observing location



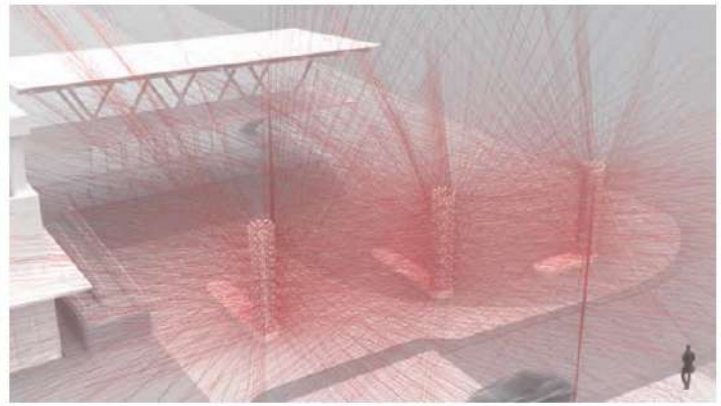
eyc sight / **under the bridge**



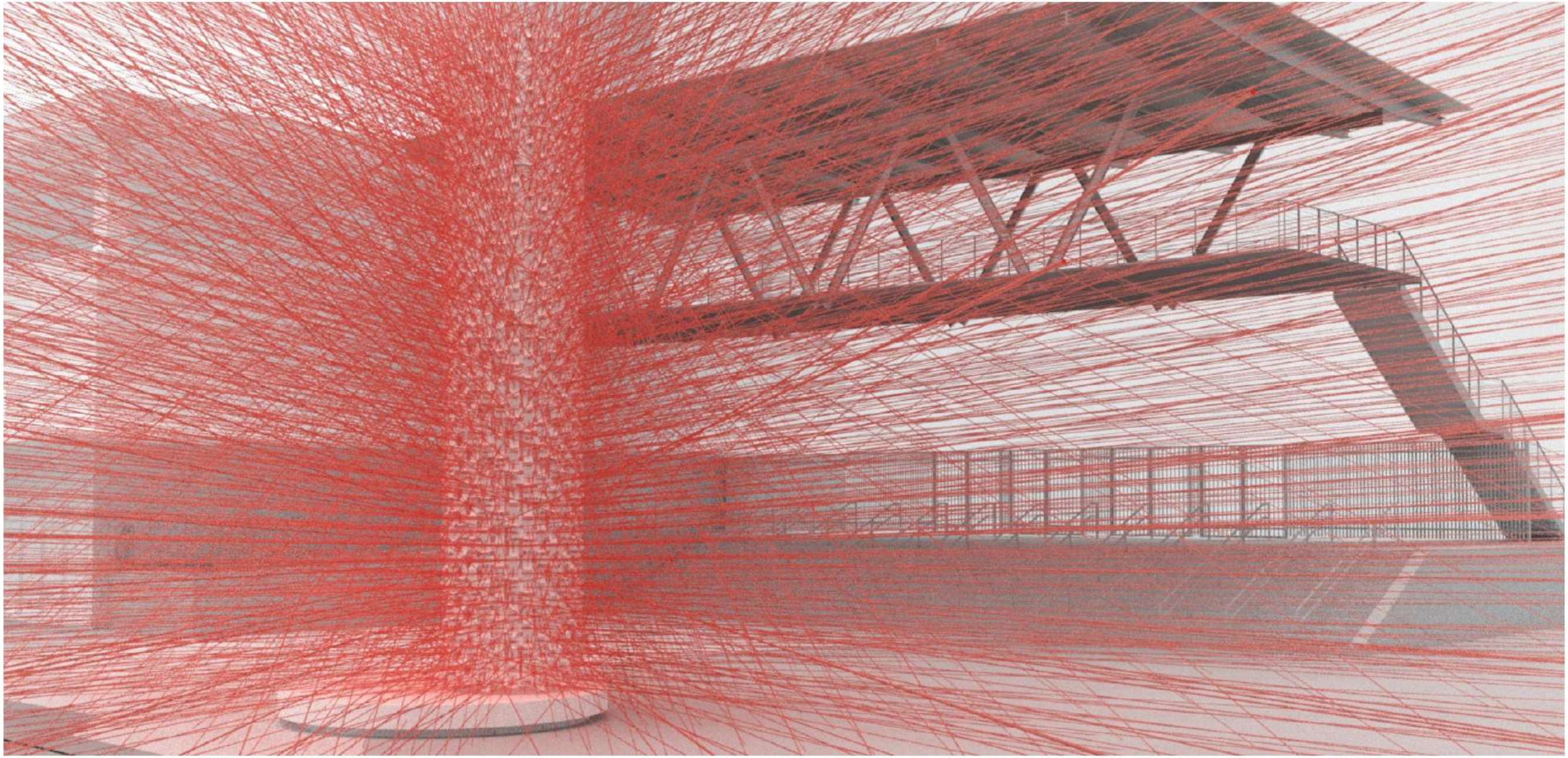
eyc sight / **on the bridge**



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?

Schematic Design /

Design Development /

Design Review

Construction Documents /

LEED Report

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

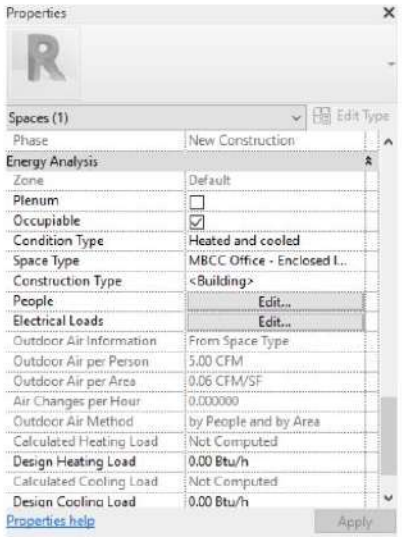
How **LONG** does it take to do a ComCheck?

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

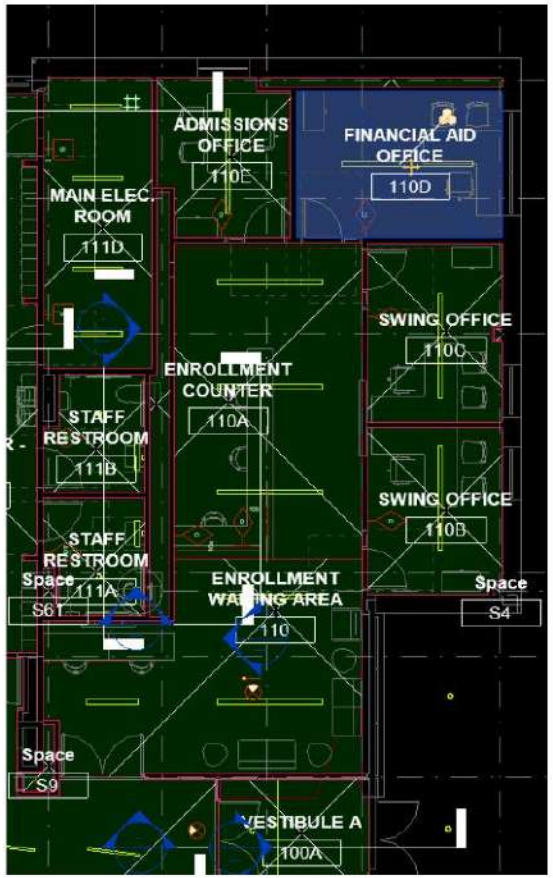
Is the area measured from PDF drawings **RELIABLE**?

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

#Efficiency #Accuracy

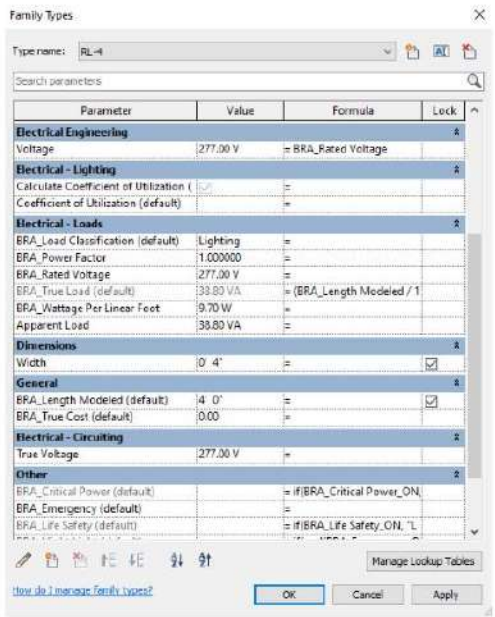


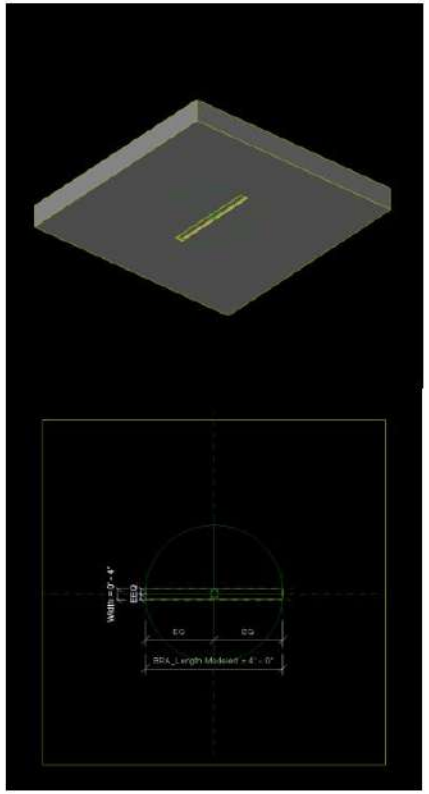
Parameter	Value
Energy Analysis	
Area per Person	215.28 SF
Sensible Heat Gain per person	250.00 Btu/h
Latent Heat Gain per person	200.00 Btu/h
Lighting Load Density	0.74 W/ft²
Power Load Density	1.50 W/ft²
Infiltration Airflow per area	0.04 CFM/SF
Plenum Lighting Contribution	20.0000%
Occupancy Schedule	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



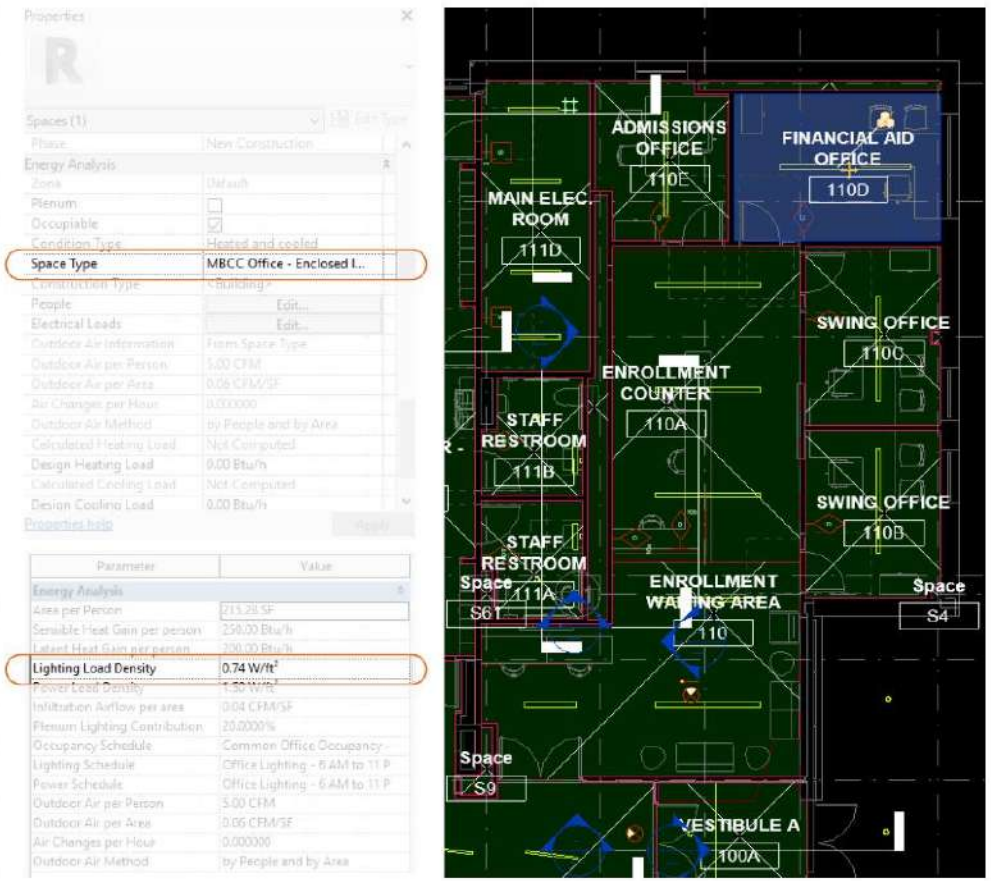
space analysis / **revit working view**

+

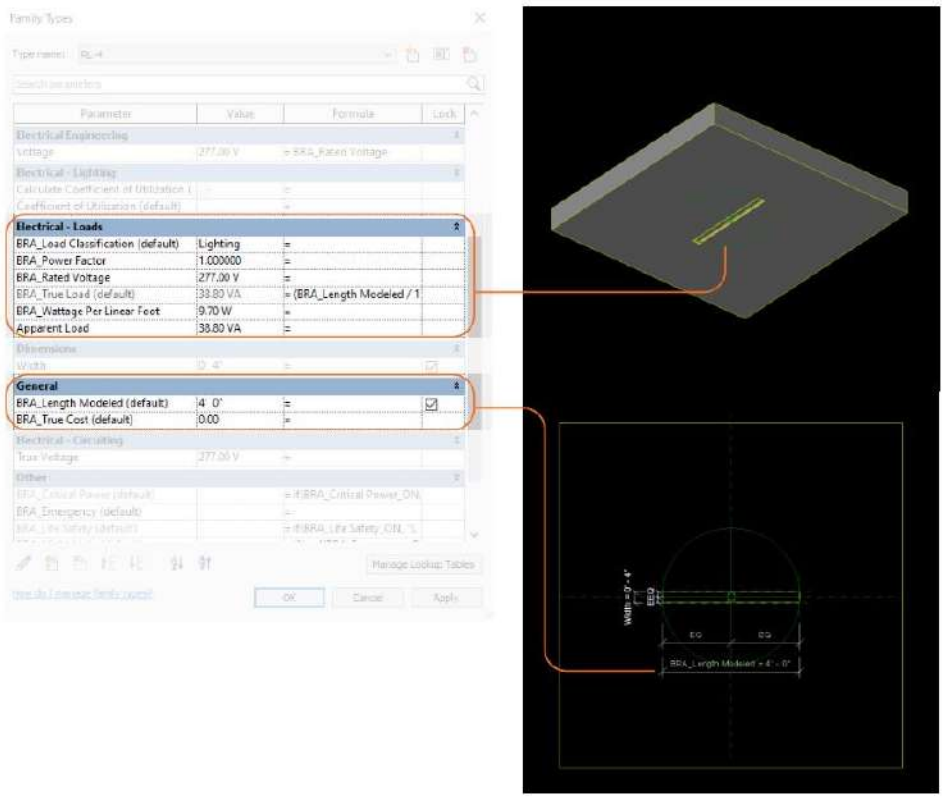




fixture family / **parameters**



space analysis / **revit working view**



fixture family / **parameters**

NILO ROOM	115A	174 SF	LEVEL 1	MBCC Conference Meeting/Multipurpose	65 VA	0.37 W/ft²	169 W	0.97 W/ft²	0.366105
DEBREF ROOM	115C	167 SF	LEVEL 1	MBCC Conference Meeting/Multipurpose	116 VA	0.79 W/ft²	162 W	0.97 W/ft²	0.718625
DEBREF ROOM	115B	157 SF	LEVEL 1	MBCC Conference Meeting/Multipurpose	116 VA	0.74 W/ft²	152 W	0.97 W/ft²	0.76466
MBCC Conference Meeting/Multipurpose: 3		498 SF			298 VA		483 W		
ECE LAB	122	1273 SF	LEVEL 1	MBCC Laboratory classroom	753 VA	0.59 W/ft²	1413 W	1.11 W/ft²	0.532717
EMT SKILLS LAB	112	670 SF	LEVEL 1	MBCC Laboratory classroom	275 VA	0.41 W/ft²	743 W	1.11 W/ft²	0.369378
ECE LAB STG	122A	159 SF	LEVEL 1	MBCC Laboratory classroom	59 VA	0.37 W/ft²	176 W	1.11 W/ft²	0.332742
DMS LAB	222	895 SF	LEVEL 2	MBCC Laboratory classroom	626 VA	0.70 W/ft²	993 W	1.11 W/ft²	0.630503
MEDICAL-ASSIST. PRACTICE ROOM	214A	142 SF	LEVEL 2	MBCC Laboratory classroom	101 VA	0.71 W/ft²	158 W	1.11 W/ft²	0.637037
CPO LAB	220	477 SF	LEVEL 2	MBCC Laboratory classroom	412 VA	0.86 W/ft²	529 W	1.11 W/ft²	0.777553
Laboratory	S117	675 SF	LEVEL 2	MBCC Laboratory classroom	771 VA	1.14 W/ft²	749 W	1.11 W/ft²	1.029621
DMS LAB STG	222A	68 SF	LEVEL 2	MBCC Laboratory classroom	29 VA	0.43 W/ft²	75 W	1.11 W/ft²	0.386245
QUIET TESTING	320H	162 SF	LEVEL 3	MBCC Laboratory classroom	136 VA	0.84 W/ft²	180 W	1.11 W/ft²	0.753723
DISABILITY TESTING	320G	214 SF	LEVEL 3	MBCC Laboratory classroom	233 VA	1.09 W/ft²	238 W	1.11 W/ft²	0.979897
REFERENCE DESK	301D	163 SF	LEVEL 3	MBCC Laboratory classroom	328 VA	2.01 W/ft²	181 W	1.11 W/ft²	1.813655
MBCC Laboratory classroom: 11		4898 SF			3721 VA		5436 W		
ENROLLMENT COUNTER	116A	344 SF	LEVEL 1	MBCC Lobby	247 VA	0.72 W/ft²	289 W	0.84 W/ft²	0.853387
ENROLLMENT WAITING AREA	116	349 SF	LEVEL 1	MBCC Lobby	223 VA	0.64 W/ft²	293 W	0.84 W/ft²	0.76865
VESTIBULE B	106B	95 SF	LEVEL 1	MBCC Lobby	53 VA	0.55 W/ft²	80 W	0.84 W/ft²	0.658852
VESTIBULE A	106A	90 SF	LEVEL 1	MBCC Lobby	52 VA	0.58 W/ft²	76 W	0.84 W/ft²	0.688405
MBCC Lobby: 4		879 SF			575 VA		738 W		
FOOD SERVICE (CAFE)	S13	Not Placed	Not Placed	MBCC Food Service		0.00 W/ft²	0 W	0.59 W/ft²	0
FOOD SERVICE (CAFE)	120D	235 SF	LEVEL 1	MBCC Food Service	125 VA	0.53 W/ft²	139 W	0.59 W/ft²	0.908355
MBCC Food Service: 2		235 SF			125 VA		139 W		
GROUP STUDY	120C	102 SF	LEVEL 1	MBCC Library - Studying Area		0.00 W/ft²	90 W	0.96 W/ft²	0
GROUP STUDY	120A	160 SF	LEVEL 1	MBCC Library - Studying Area	23 VA	0.14 W/ft²	154 W	0.96 W/ft²	0.150634
GROUP STUDY	120B	171 SF	LEVEL 1	MBCC Library - Studying Area	63 VA	0.49 W/ft²	164 W	0.96 W/ft²	0.598699
GROUP STUDY	302A	208 SF	LEVEL 3	MBCC Library - Studying Area	125 VA	0.89 W/ft²	200 W	0.96 W/ft²	0.624415
QUIET STUDY	302B	147 SF	LEVEL 3	MBCC Library - Studying Area	63 VA	0.56 W/ft²	141 W	0.96 W/ft²	0.588687
MBCC Library - Studying Area: 5		789 SF			314 VA		750 W		
SHARPS + LINENS	111J	55 SF	LEVEL 1	MBCC HAZ Waste	35 VA	0.83 W/ft²	28 W	0.51 W/ft²	1.244362
MBCC HAZ Waste: 1		55 SF			35 VA		28 W		

LPD space schedule / **categorize by space type**

		MBCC Lobby	LEVEL 1	DF-R4	2	21 VA	42 W	200.00	400.00
116	ENROLLMENT WAITING AREA	MBCC Lobby	LEVEL 1	EX-2	1		0 W		0.00
		MBCC Lobby	LEVEL 1	LB-1	4		65 W	0.00	0.00
		MBCC Lobby	LEVEL 1	RL-4	5		427 W	0.00	0.00
		MBCC Lobby	LEVEL 1	RL-1	2		33 W	0.00	0.00
MBCC Food Service									
120D	FOOD SERVICE (CAFE)	MBCC Food Service	LEVEL 1	DF-R4	6	21 VA	125 W	200.00	1200.00
MBCC Library - Studying Area									
		MBCC Library - Studying Area		DF-R4	14	21 VA	291 W	200.00	2800.00
120A	GROUP STUDY	MBCC Library - Studying Area	LEVEL 1	PL-2C8	1	23 VA	23 W	0.00	0.00
MBCC HAZ Waste									
111J	SHARPS + LINENS	MBCC HAZ Waste	LEVEL 1	RL-3	1	35 VA	35 W	0.00	0.00
MBCC JAIL									
		MBCC JAIL		RL-3A	4	34 VA	136 W	0.00	0.00
MBCC Operating Room									
115M	LABOR & DELIVERY	MBCC Operating Room	LEVEL 1	DA-R8	2	52 VA	104 W	0.00	0.00
115M	LABOR & DELIVERY	MBCC Operating Room	LEVEL 1	DF-R4A	4	21 VA	83 W	0.00	0.00
115M	LABOR & DELIVERY	MBCC Operating Room	LEVEL 1	RA-24A	1	97 VA	97 W		0.00
MBCC Storage									
		MBCC Storage		RL-3	9	35 VA	315 W	0.00	0.00
		MBCC Storage		BR-22	6	20 VA	121 W		0.00
		MBCC Storage		BR-24	15	29 VA	440 W		0.00
MBCC Electrical/Mechanical									
		MBCC Electrical/Mechanical		RL-3	45	35 VA	1575 W	0.00	0.00
		MBCC Electrical/Mechanical		RL-5	4	59 VA	209 W	0.00	0.00
114	MAIN SUPPLY ROOM	MBCC Electrical/Mechanical	LEVEL 1	BR-22	5	20 VA	101 W		0.00
429	MEP ROOM	MBCC Electrical/Mechanical	LEVEL 4	EX-2	1		0 W		0.00
		MBCC Electrical/Mechanical	LEVEL 3	RL-4	2	78 VA	155 W	0.00	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/EMT STG	MBCC Paramedic Lab classroom	LEVEL 1	BR-24	1	29 VA	29 W		0.00
		MBCC Paramedic Lab classroom	LEVEL 1	GR-16	3	27 VA	81 W	0.00	0.00
113D	PARAMEDIC BATHROOM	MBCC Paramedic Lab classroom	LEVEL 1	DF-R4W	1	11 VA	11 W	0.00	0.00
113	PARAMEDIC SKILLS LAB	MBCC Paramedic Lab classroom	LEVEL 1	EX-2	1		0 W		0.00
113	PARAMEDIC SKILLS LAB	MBCC Paramedic Lab classroom	LEVEL 1	RA-24	8	44 VA	353 W		0.00
113D	PARAMEDIC BATHROOM	MBCC Paramedic Lab classroom	LEVEL 1	WV-1	1	22 VA	22 W		0.00

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

NILO ROOM	115A	174 SF	LEVEL 1	MBCC Conference Meeting/Multipurpose	65 VA	0.37 W/ft²	169 W	0.97 W/ft²	0.366105
DEBREF ROOM	115C	167 SF	LEVEL 1	MBCC Conference Meeting/Multipurpose	116 VA	0.79 W/ft²	162 W	0.97 W/ft²	0.718625
DEBREF ROOM	115B	157 SF	LEVEL 1	MBCC Conference Meeting/Multipurpose	116 VA	0.74 W/ft²	152 W	0.97 W/ft²	0.76466
MBCC Conference Meeting/Multipurpose: 3		498 SF			298 VA		483 W		
ECE LAB	122	1273 SF	LEVEL 1	MBCC Laboratory classroom	753 VA	0.59 W/ft²	1413 W	1.11 W/ft²	0.532717
EMT SKILLS LAB	112	670 SF	LEVEL 1	MBCC Laboratory classroom	275 VA	0.41 W/ft²	743 W	1.11 W/ft²	0.369378
ECE LAB STG	122A	159 SF	LEVEL 1	MBCC Laboratory classroom	59 VA	0.37 W/ft²	176 W	1.11 W/ft²	0.332742
DMS LAB	222	895 SF	LEVEL 2	MBCC Laboratory classroom	626 VA	0.70 W/ft²	993 W	1.11 W/ft²	0.630503
MEDICAL-ASSIST. PRACTICE ROOM	214A	142 SF	LEVEL 2	MBCC Laboratory classroom	101 VA	0.71 W/ft²	158 W	1.11 W/ft²	0.637037
CPO LAB	220	477 SF	LEVEL 2	MBCC Laboratory classroom	412 VA	0.86 W/ft²	529 W	1.11 W/ft²	0.777553
Laboratory	S117	675 SF	LEVEL 2	MBCC Laboratory classroom	771 VA	1.14 W/ft²	749 W	1.11 W/ft²	1.029621
DMS LAB STG	222A	68 SF	LEVEL 2	MBCC Laboratory classroom	29 VA	0.43 W/ft²	75 W	1.11 W/ft²	0.386245
QUIET TESTING	320H	162 SF	LEVEL 3	MBCC Laboratory classroom	136 VA	0.84 W/ft²	180 W	1.11 W/ft²	0.753723
DISABILITY TESTING	320G	214 SF	LEVEL 3	MBCC Laboratory classroom	233 VA	1.09 W/ft²	238 W	1.11 W/ft²	0.979897
REFERENCE DESK	301D	163 SF	LEVEL 3	MBCC Laboratory classroom	328 VA	2.01 W/ft²	181 W	1.11 W/ft²	1.813855
MBCC Laboratory classroom: 11		4898 SF			3721 VA		5436 W		
ENROLLMENT COUNTER	116A	344 SF	LEVEL 1	MBCC Lobby	247 VA	0.72 W/ft²	289 W	0.84 W/ft²	0.853387
ENROLLMENT WAITING AREA	116	349 SF	LEVEL 1	MBCC Lobby	223 VA	0.64 W/ft²	293 W	0.84 W/ft²	0.76865
VESTIBULE B	106B	95 SF	LEVEL 1	MBCC Lobby	53 VA	0.55 W/ft²	80 W	0.84 W/ft²	0.658852
VESTIBULE A	106A	90 SF	LEVEL 1	MBCC Lobby	52 VA	0.58 W/ft²	76 W	0.84 W/ft²	0.688405
MBCC Lobby: 4		879 SF			575 VA		738 W		
FOOD SERVICE (CAFE)	S13	Not Placed	Not Placed	MBCC Food Service		0.00 W/ft²	0 W	0.59 W/ft²	0
FOOD SERVICE (CAFE)	120D	235 SF	LEVEL 1	MBCC Food Service	125 VA	0.53 W/ft²	139 W	0.59 W/ft²	0.908355
MBCC Food Service: 2		235 SF			125 VA		139 W		
GROUP STUDY	120C	102 SF	LEVEL 1	MBCC Library - Studying Area		0.09 W/ft²	96 W	0.96 W/ft²	0
GROUP STUDY	120A	160 SF	LEVEL 1	MBCC Library - Studying Area	23 VA	0.14 W/ft²	154 W	0.96 W/ft²	0.150634
GROUP STUDY	120B	171 SF	LEVEL 1	MBCC Library - Studying Area	63 VA	0.49 W/ft²	164 W	0.96 W/ft²	0.598699
GROUP STUDY	302A	208 SF	LEVEL 3	MBCC Library - Studying Area	125 VA	0.89 W/ft²	200 W	0.96 W/ft²	0.624415
QUIET STUDY	302B	147 SF	LEVEL 3	MBCC Library - Studying Area	63 VA	0.56 W/ft²	141 W	0.96 W/ft²	0.598687
MBCC Library - Studying Area: 5		789 SF			314 VA		756 W		
SHARPS + LINENS	111J	55 SF	LEVEL 1	MBCC HAZ Waste	35 VA	0.83 W/ft²	28 W	0.51 W/ft²	1.244262
MBCC HAZ Waste: 1		55 SF			35 VA		28 W		

LPD space schedule / **categorize by space type**

		MBCC Lobby	LEVEL 1	DF-R4	2	21 VA	42 W	200.00	400.00
116	ENROLLMENT WAITING AREA	MBCC Lobby	LEVEL 1	EX-2	1		0 W		0.00
		MBCC Lobby	LEVEL 1	LIL-1	4		65 W	0.00	0.00
		MBCC Lobby	LEVEL 1	RL-4	5		427 W	0.00	0.00
		MBCC Lobby	LEVEL 1	RL-1	2		33 W	0.00	0.00
MBCC Food Service									
120D	FOOD SERVICE (CAFE)	MBCC Food Service	LEVEL 1	DF-R4	9	21 VA	125 W	200.00	1200.00
MBCC Library - Studying Area									
		MBCC Library - Studying Area		DF-R4	14	21 VA	291 W	200.00	2800.00
120A	GROUP STUDY	MBCC Library - Studying Area	LEVEL 1	PL-2C8	1	23 VA	23 W	0.00	0.00
MBCC HAZ Waste									
111J	SHARPS + LINENS	MBCC HAZ Waste	LEVEL 1	RL-3	1	35 VA	35 W	0.00	0.00
MBCC JAN									
		MBCC JAN		RL-3A	4	34 VA	136 W	0.00	0.00
MBCC Operating Room									
115H	LABOR & DELIVERY	MBCC Operating Room	LEVEL 1	RA-R8	2	52 VA	104 W	0.00	0.00
115H	LABOR & DELIVERY	MBCC Operating Room	LEVEL 1	DF-R4A	4	21 VA	83 W	0.00	0.00
115H	LABOR & DELIVERY	MBCC Operating Room	LEVEL 1	RA-24A	1	97 VA	97 W		0.00
MBCC Storage									
		MBCC Storage		RL-3	9	35 VA	315 W	0.00	0.00
		MBCC Storage		BR-22	6	20 VA	121 W		0.00
		MBCC Storage		BR-24	15	29 VA	449 W		0.00
MBCC Electrical/Mechanical									
		MBCC Electrical/Mechanical		RL-3	45	35 VA	1575 W	0.00	0.00
		MBCC Electrical/Mechanical		RL-5	4	59 VA	209 W	0.00	0.00
114	MAIN SUPPLY ROOM	MBCC Electrical/Mechanical	LEVEL 1	BR-22	5	20 VA	101 W		0.00
429	MEP ROOM	MBCC Electrical/Mechanical	LEVEL 4	EX-2	1		0 W		0.00
		MBCC Electrical/Mechanical	LEVEL 3	RL-4	2	78 VA	155 W	0.00	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/EMT 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	0.00
113D	PARAMEDIC BATHROOM	MBCC Paramedic Lab classroom	LEVEL 1	DF-R4W	1	11 VA	11 W	0.00	0.00
113	PARAMEDIC SKILLS LAB	MBCC Paramedic Lab classroom	LEVEL 1	EX-2	1		0 W		0.00
113	PARAMEDIC SKILLS LAB	MBCC Paramedic Lab classroom	LEVEL 1	RA-24	8	44 VA	353 W		0.00
113D	PARAMEDIC BATHROOM	MBCC Paramedic Lab classroom	LEVEL 1	WV-1	1	22 VA	22 W		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

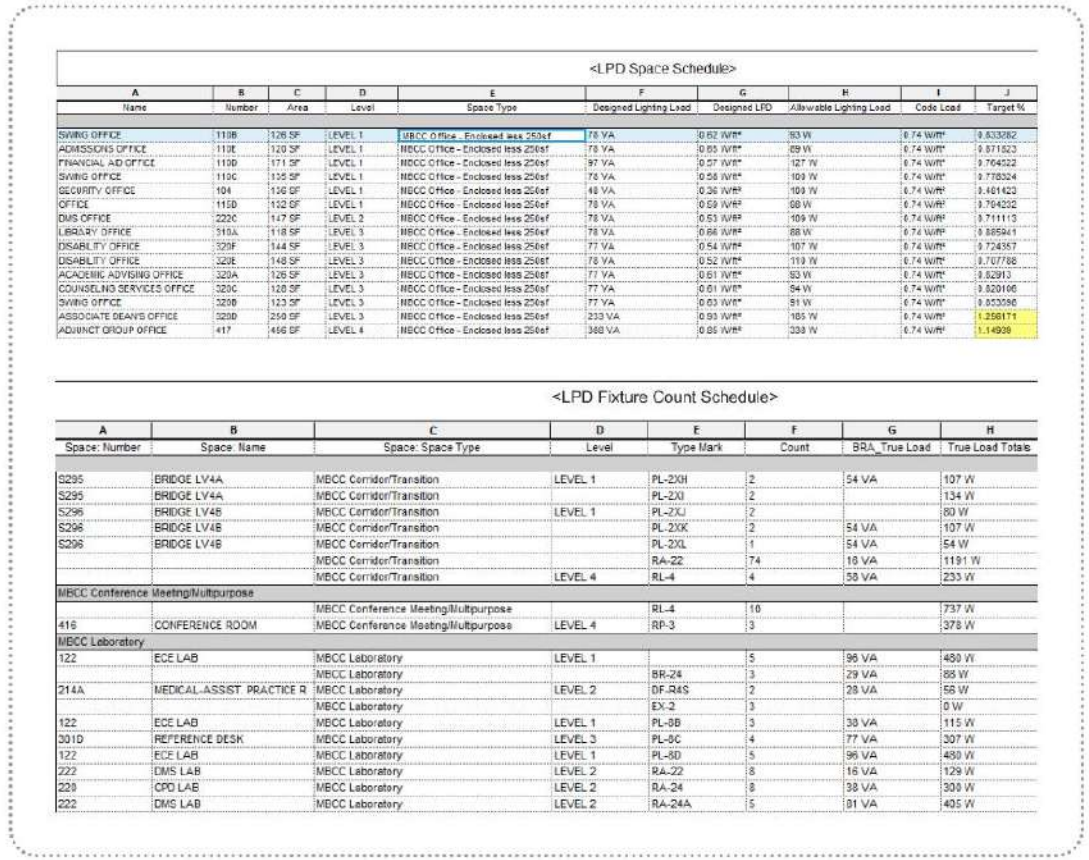
expandable schedules / **adding parameters as needed**

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 LPD	Allowable Lighting Load	Code Load	Target %
SWING OFFICE	110B	126 SF	LEVEL 1	MBCC Office - Enclosed less 250sf	76 VA	0.62 W/ft²	93 W	0.74 W/ft²	0.833282
ADMISSIONS OFFICE	110E	120 SF	LEVEL 1	MBCC Office - Enclosed less 250sf	76 VA	0.65 W/ft²	89 W	0.74 W/ft²	0.871823
FINANCIAL AID OFFICE	110D	171 SF	LEVEL 1	MBCC Office - Enclosed less 250sf	97 VA	0.57 W/ft²	127 W	0.74 W/ft²	0.764522
SWING OFFICE	110C	135 SF	LEVEL 1	MBCC Office - Enclosed less 250sf	76 VA	0.56 W/ft²	100 W	0.74 W/ft²	0.758324
SECURITY OFFICE	104	136 SF	LEVEL 1	MBCC Office - Enclosed less 250sf	48 VA	0.35 W/ft²	100 W	0.74 W/ft²	0.481423
OFFICE	115D	122 SF	LEVEL 1	MBCC Office - Enclosed less 250sf	76 VA	0.62 W/ft²	90 W	0.74 W/ft²	0.764222
DMS OFFICE	222C	147 SF	LEVEL 2	MBCC Office - Enclosed less 250sf	76 VA	0.51 W/ft²	109 W	0.74 W/ft²	0.711113
LIBRARY OFFICE	310A	118 SF	LEVEL 3	MBCC Office - Enclosed less 250sf	76 VA	0.64 W/ft²	88 W	0.74 W/ft²	0.885941
DISABILITY OFFICE	320F	144 SF	LEVEL 3	MBCC Office - Enclosed less 250sf	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 250sf	76 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 250sf	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 250sf	77 VA	0.61 W/ft²	84 W	0.74 W/ft²	0.820106
SWING OFFICE	320B	123 SF	LEVEL 3	MBCC Office - Enclosed less 250sf	77 VA	0.63 W/ft²	81 W	0.74 W/ft²	0.853096
ASSOCIATE DEANS OFFICE	320D	250 SF	LEVEL 3	MBCC Office - Enclosed less 250sf	233 VA	0.93 W/ft²	185 W	0.74 W/ft²	1.256171
ADJUNCT GROUP OFFICE	417	456 SF	LEVEL 4	MBCC Office - Enclosed less 250sf	368 VA	0.85 W/ft²	339 W	0.74 W/ft²	1.14939

<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-2XI	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	16 VA	1191 W
		MBCC Corridor/Transition	LEVEL 4	RL-4	4	58 VA	233 W
MBCC Conference Meeting/Multipurpose							
		MBCC Conference Meeting/Multipurpose		RL-4	16		737 W
416	CONFERENCE ROOM	MBCC Conference Meeting/Multipurpose	LEVEL 4	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-8B	3	38 VA	115 W
301D	REFERENCE DESK	MBCC Laboratory	LEVEL 3	PL-8C	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
229	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

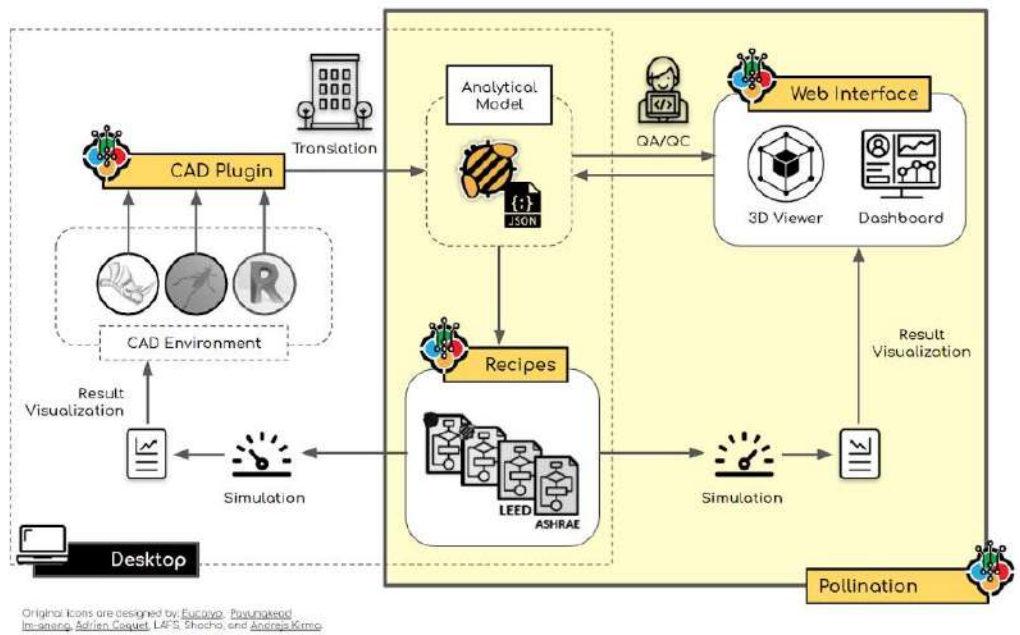
Combining with Revit Parameter (Fixture Families)

02. Parametric Tools in Lighting Practice

POLLINATION

LADYBUG

HONEYBEE



Reference: Pollination Website
https://www.pollination.cloud/blog/principles-of-pollination

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

LEDucation
Trade Show and Conference

Q & A

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This concludes The American Institute of Architects Continuing Education Systems Course