Ballenger East Building

Final Presentation

Design Development

Architectural Engineering Senior Thesis Presentation 2009
Lighting / Electrical Option

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Presentation Outline

Building Overview

Lighting Depth

- Ballenger Avenue Façade
- Main Lobby
- President Office
- Training Room

Electrical Depth

- Photovoltaic Arrays Analysis
- Central vs. Distributed Transformer

Breadth Topic

- Sustainable Materials
- Daylight Analysis

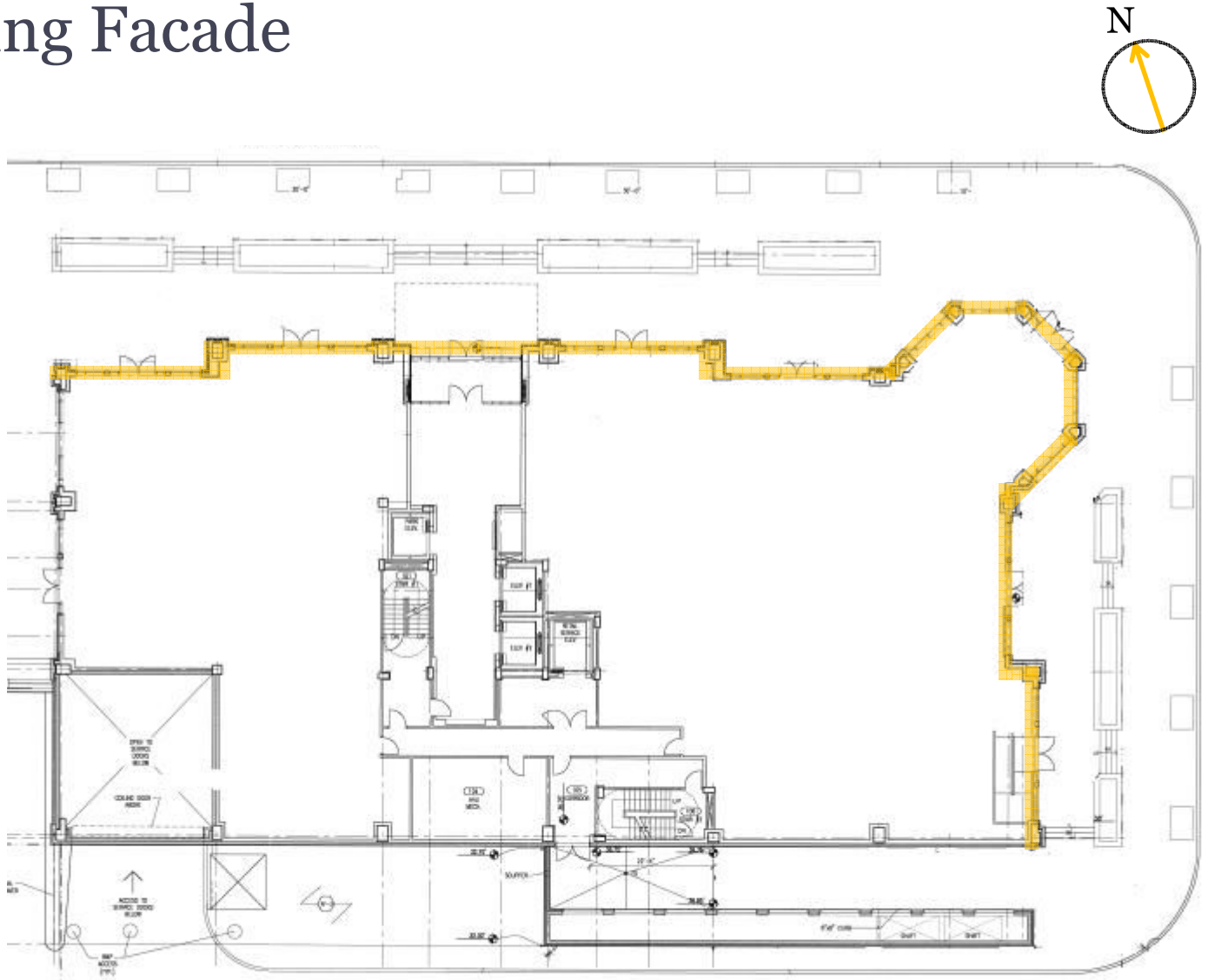
Building Overview

Building	Ballenger East Building
Location	Alexandria, Virginia
Floor Area	~ 60,000 SF (4 stories above grade)
Budget	34 million US dollars
Completion Date	November 2008
Occupancy	Office & Retail Mixed Use

Project Team

Architects	Still & Svitchan Associates, PC
MEP Engineers	Girard Engineers, PC
Structural Engineers	Tadjer-Cohen-Edelson
Lighting Engineers	MCLA
Construction	Turners Construction
Owner	LCOR Ballenger Avenue LLC

Building Facade



Building Facade

Design Objectives

Aid visual and physical orientation.

Provide visual appealing environment for neighborhood.

Design Criteria

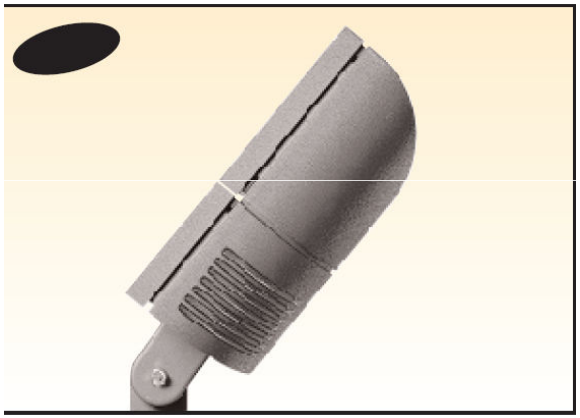
Avoid light trespass.

Security lighting : **5 - 20** fc on façade.

Path lighting : **20 to 30** fc.

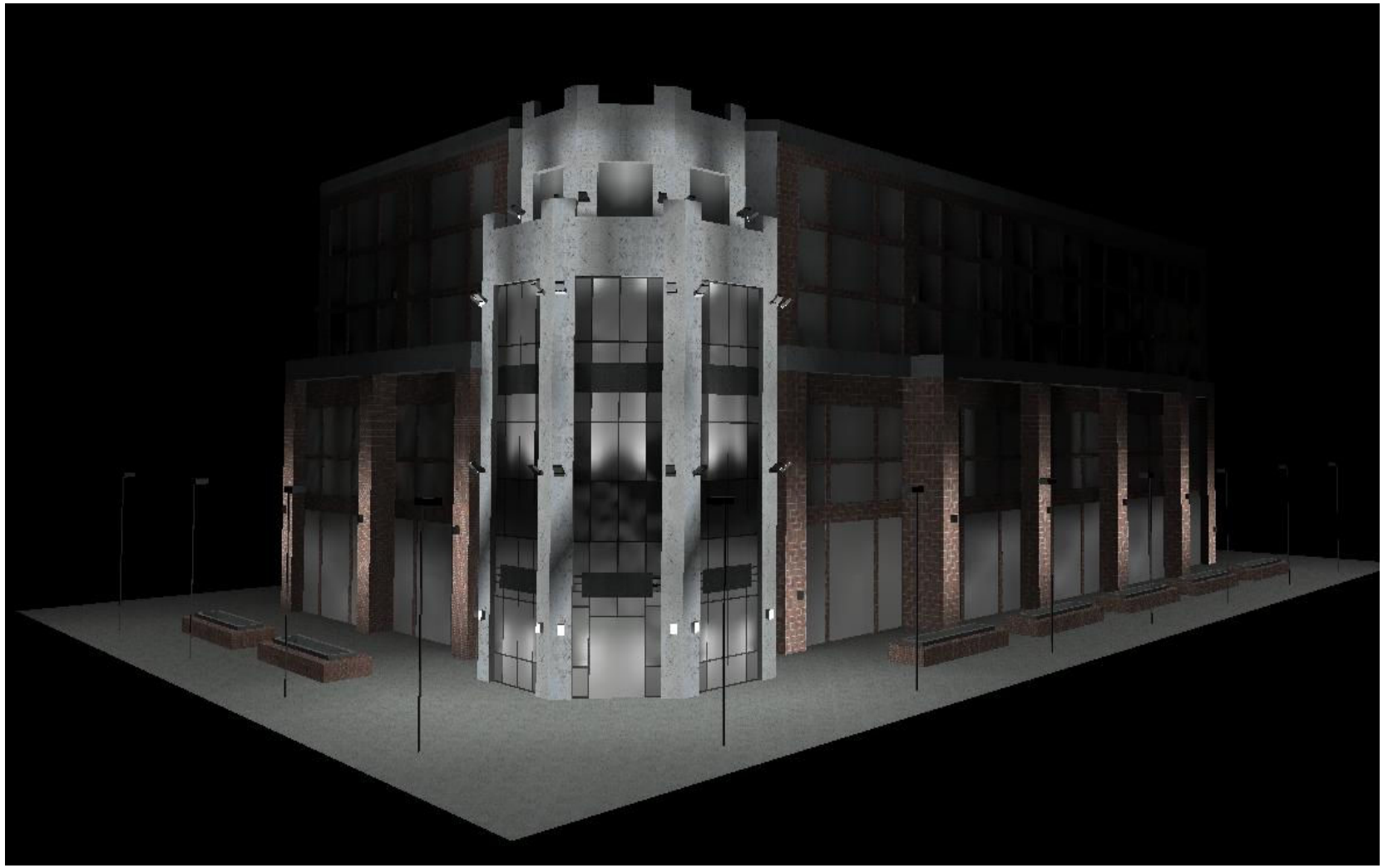
Luminaire Selection

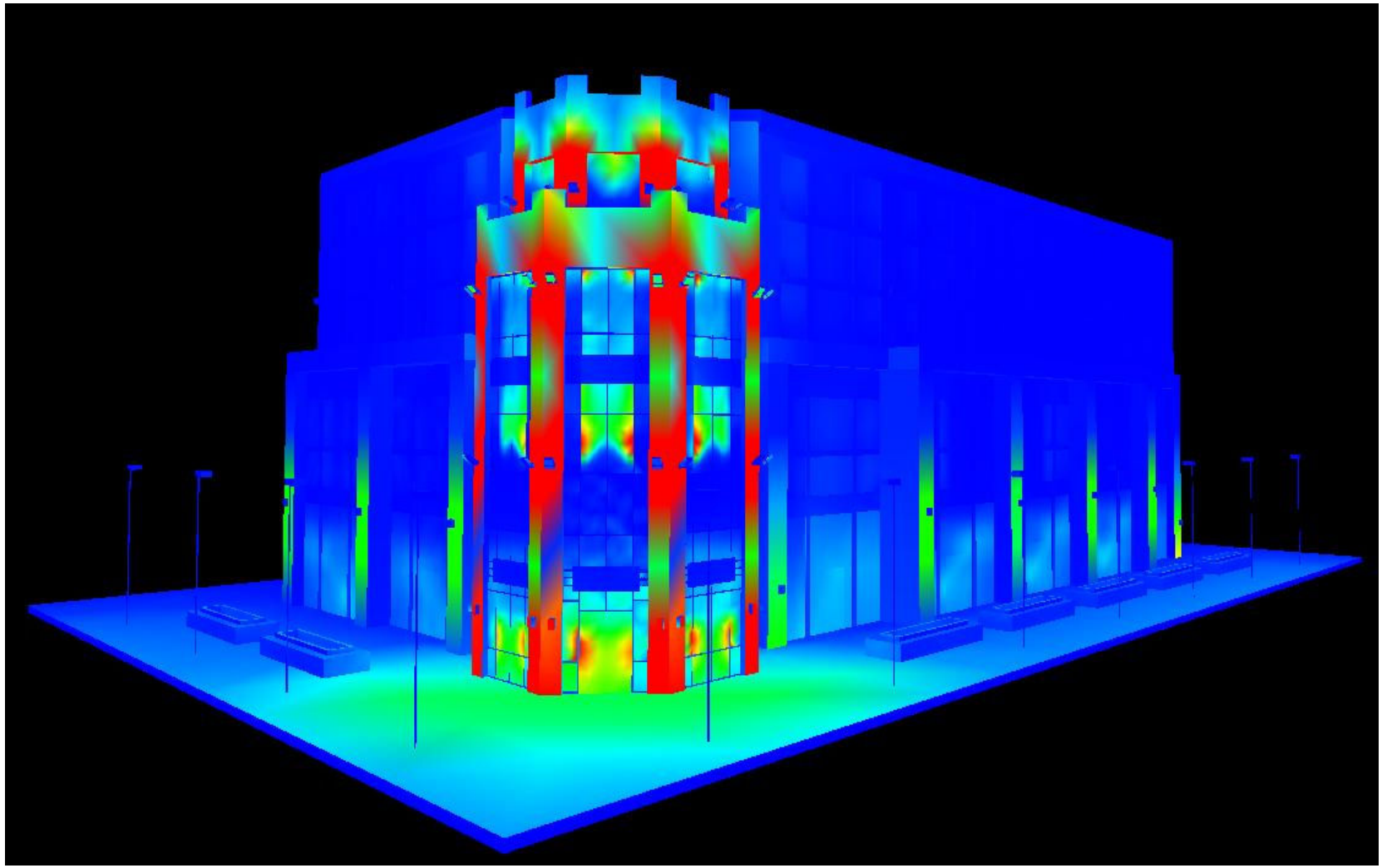
Pole-mounted metal halide

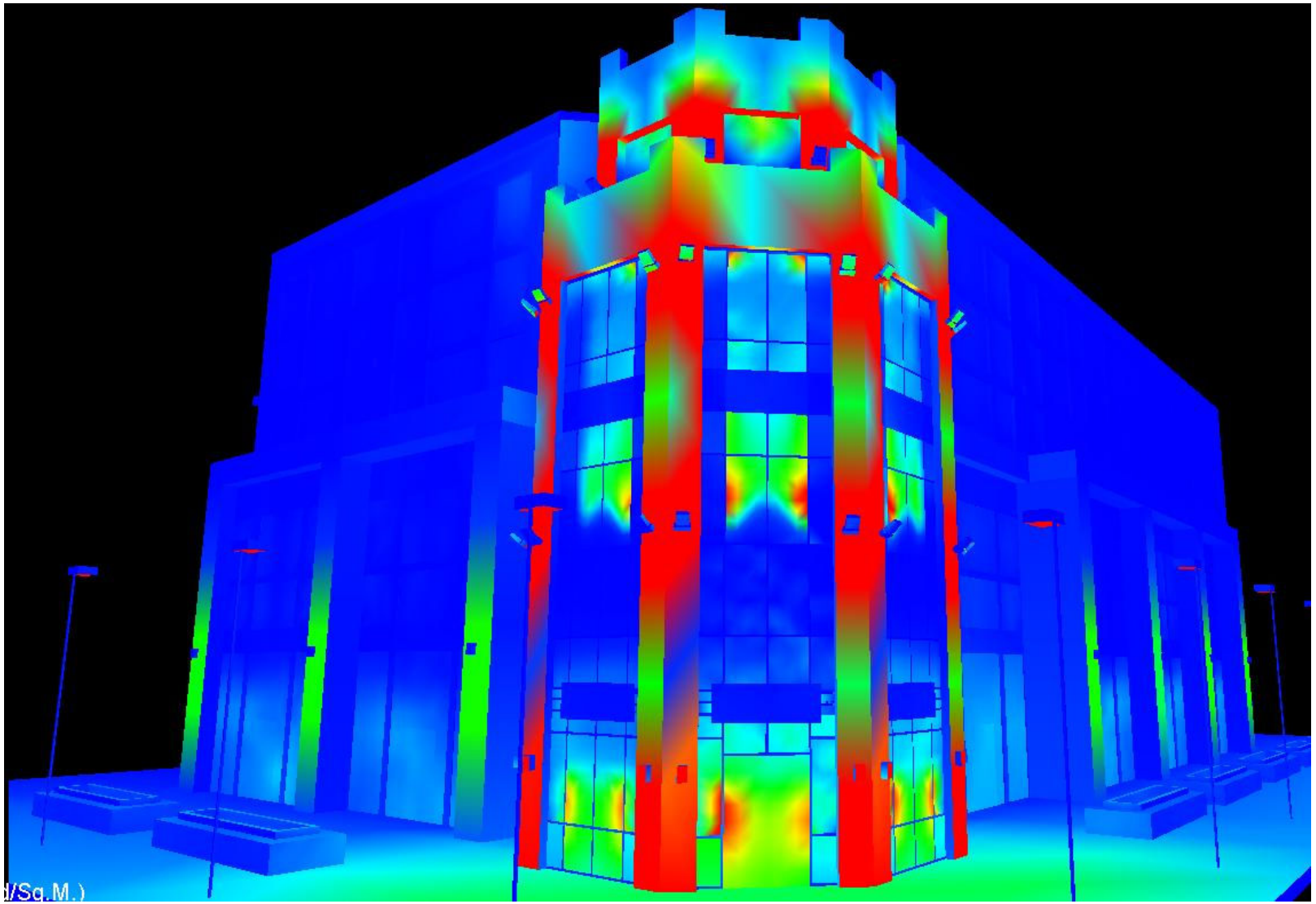


Metal halide flood light

Wall-mounted metal halide



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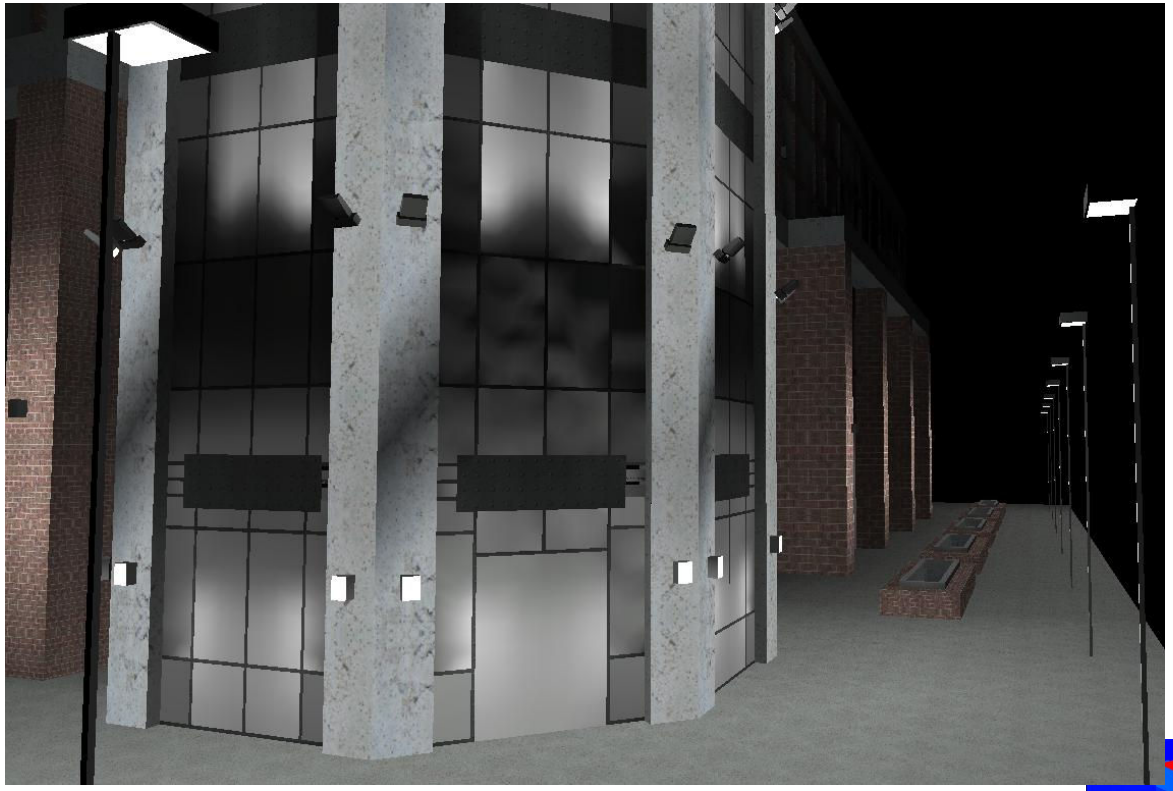
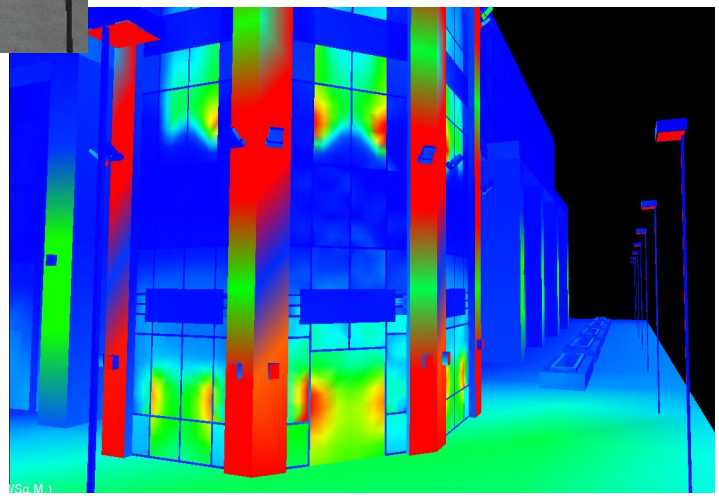
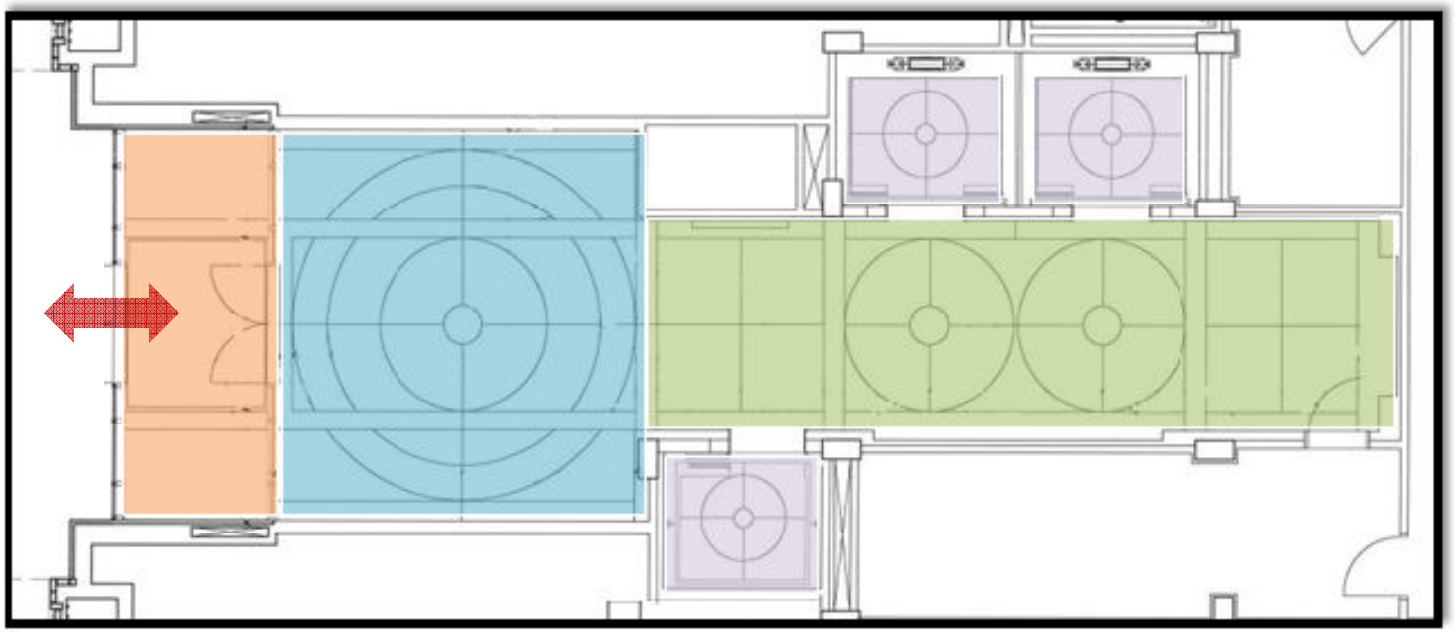




Main Lobby



Vestibule – 120 SF

Entrance Lobby – 320 SF

Elevator Lobby – 400 SF

Elevators – 40 SF each

Main Lobby

Design Objectives

Offer great first impression

Aid visual and physical orientation.

Offer appropriate atmosphere for social communications and interactions.

Design Criteria

Horizontal illuminance: **10 fc** in lobby

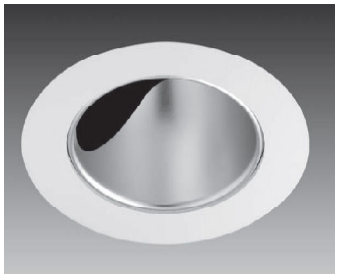
Vertical illuminance: **3 fc** in lobby
30 fc on directory display/art work

Luminance ratio of 1:3 between display and surrounding

Luminaire Selection

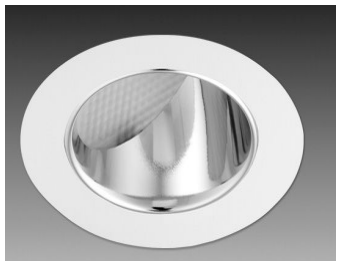
Cove Lights

Peripheral wall -washer

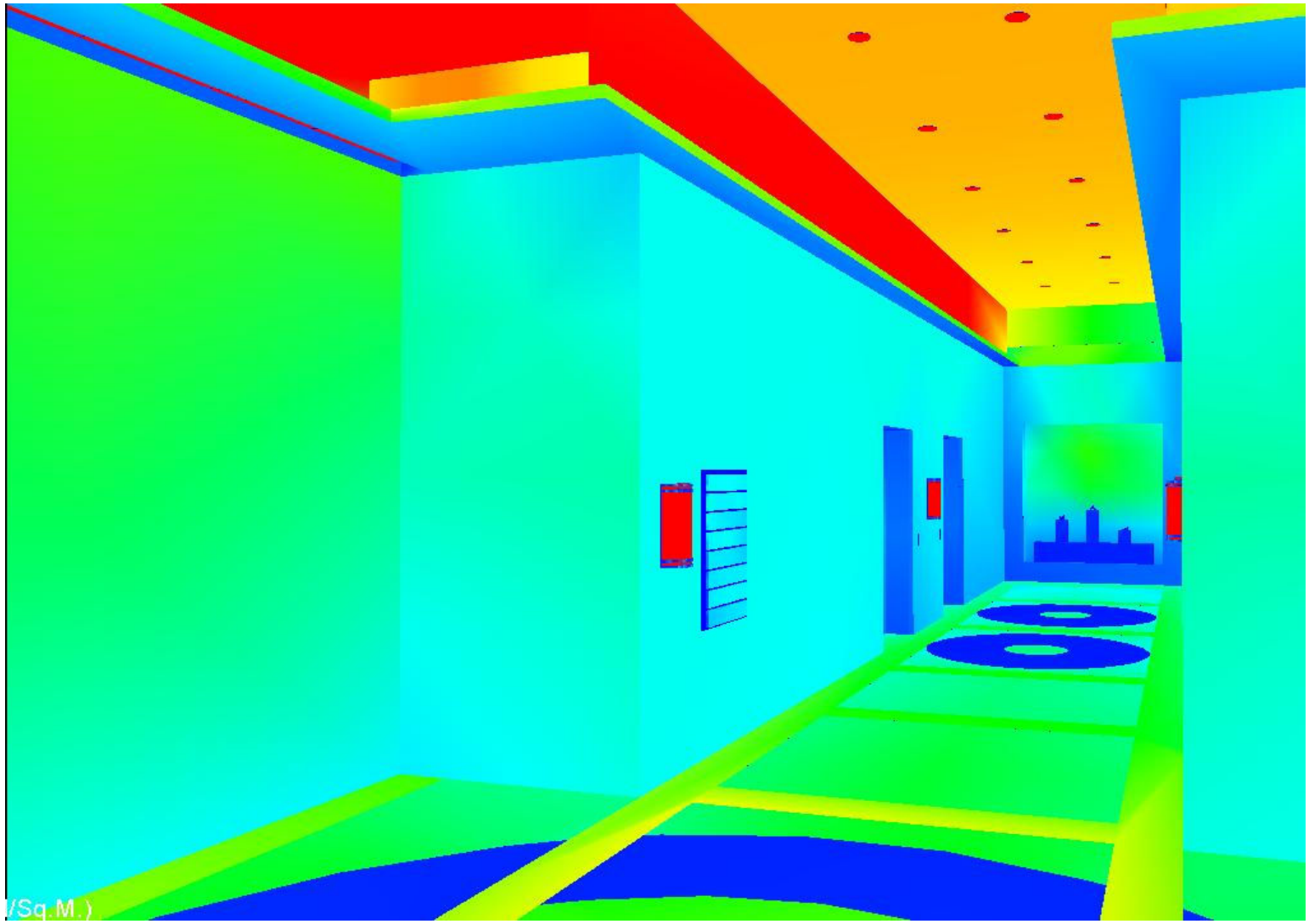


Recessed downlight

Wall Sconce



Recessed accent light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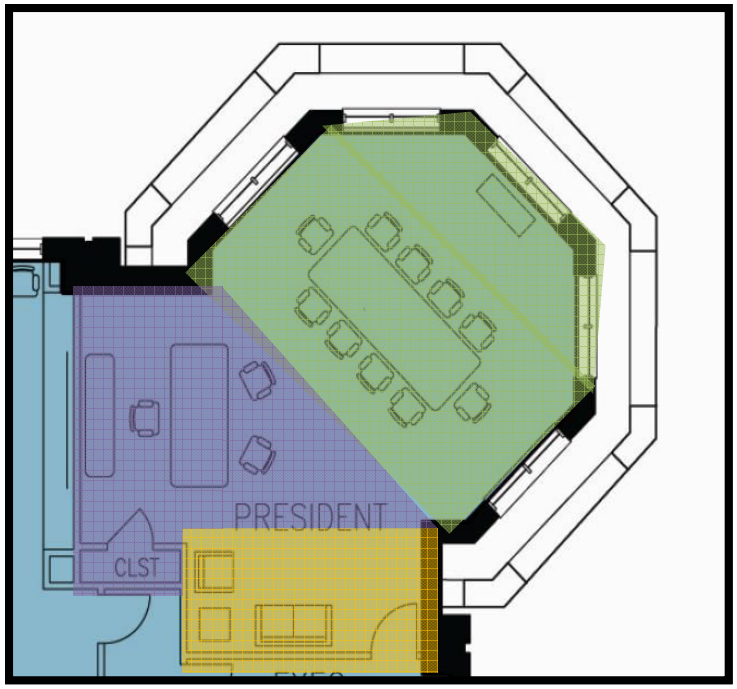
President Office



Lounge area – 100 SF

President working area – 350 SF

Conference area – 450 SF

President Office

Design Objectives

Reflect and reinforce the professional image of the organization.

Create and provide the best environment for both working and resting

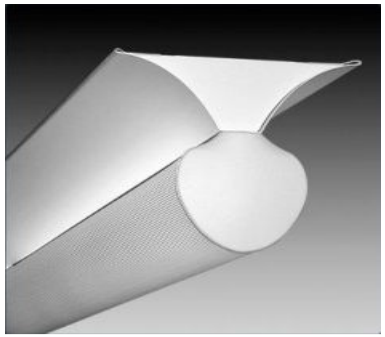
Design Criteria

Simple yet appealing lighting systems

Horizontal illuminance: **10 fc** in lounge
30 fc in conference area

Vertical illuminance: **3 fc** in lounge
5 fc in conference area

Luminaire Selection

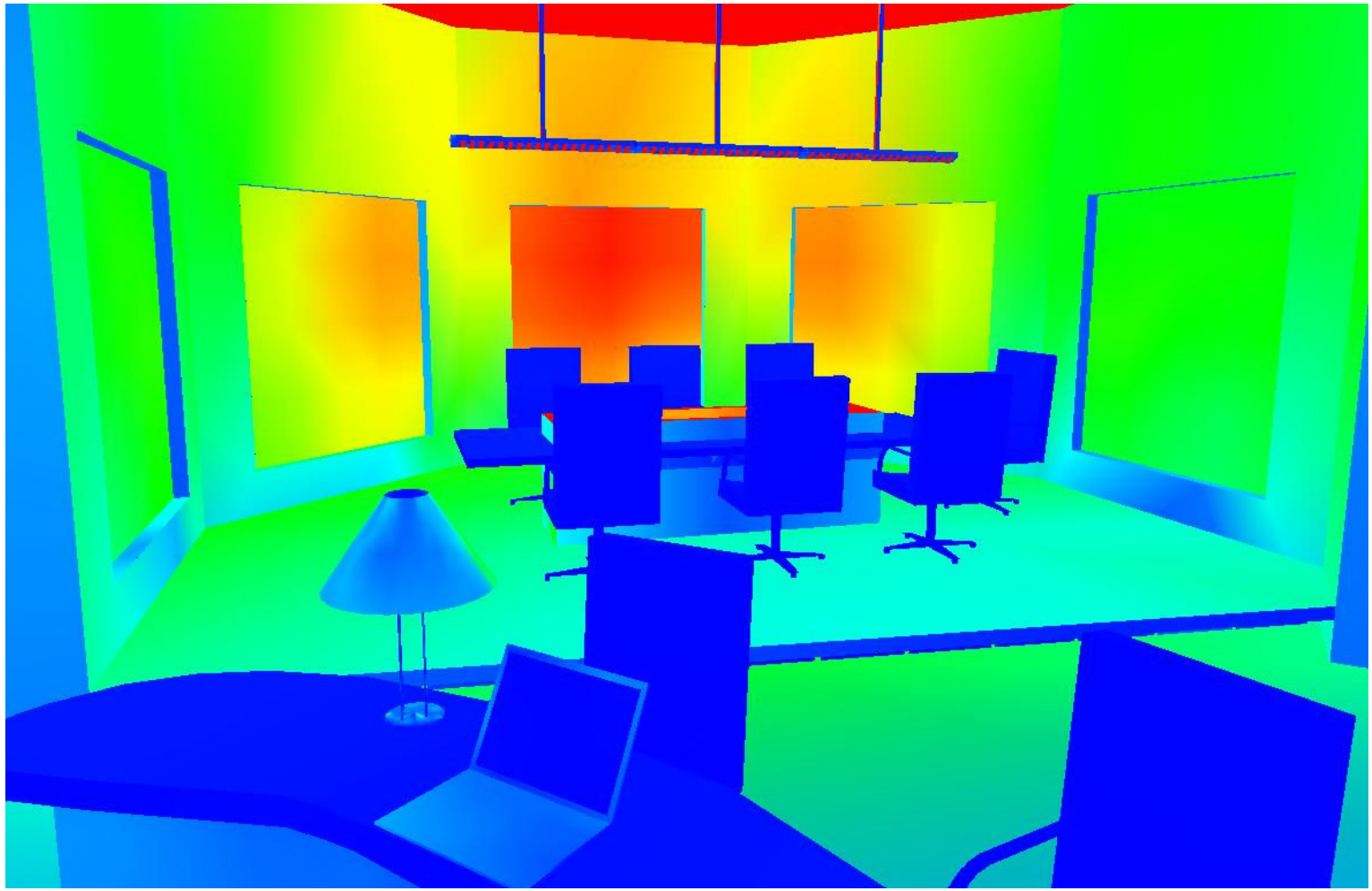


Suspended direct/indirect

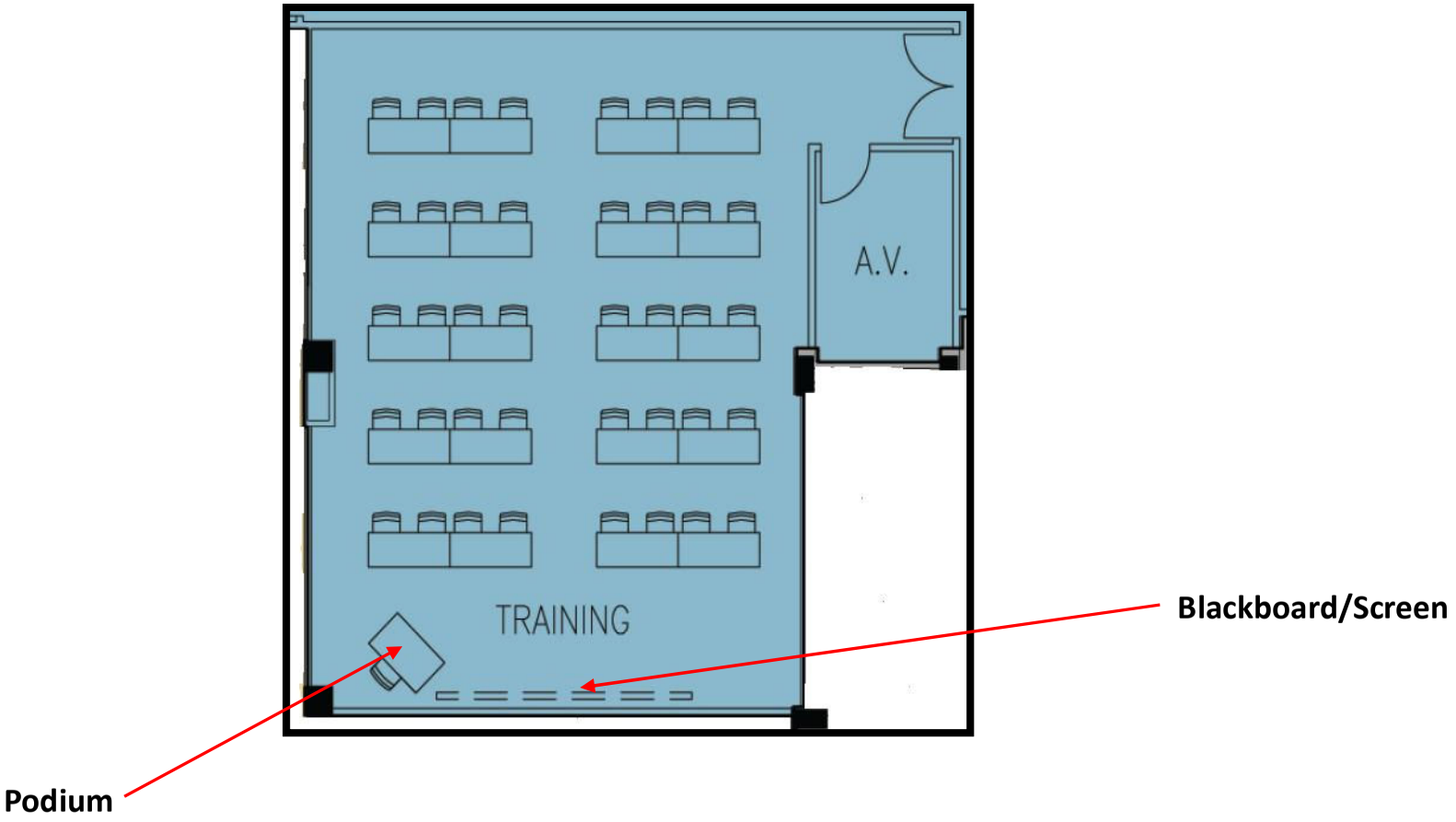
Suspended LED

Incandescent table lamp

Surface-mounted LED



Training Room



Training Room

Design Objectives

Provide adequate illumination for learning and social activities.

Create an appropriate learning environment.

Create different zones of lighting: typical learning
presentation

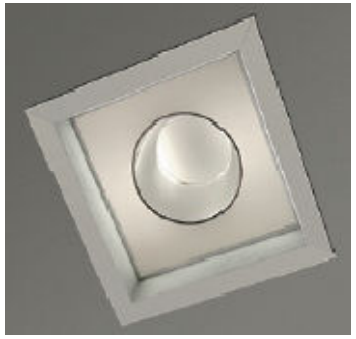
Design Criteria

Horizontal Illuminance: **30 fc** on work plane
Vertical Illuminance: **5 fc** on whiteboard
50 fc on chalkboard

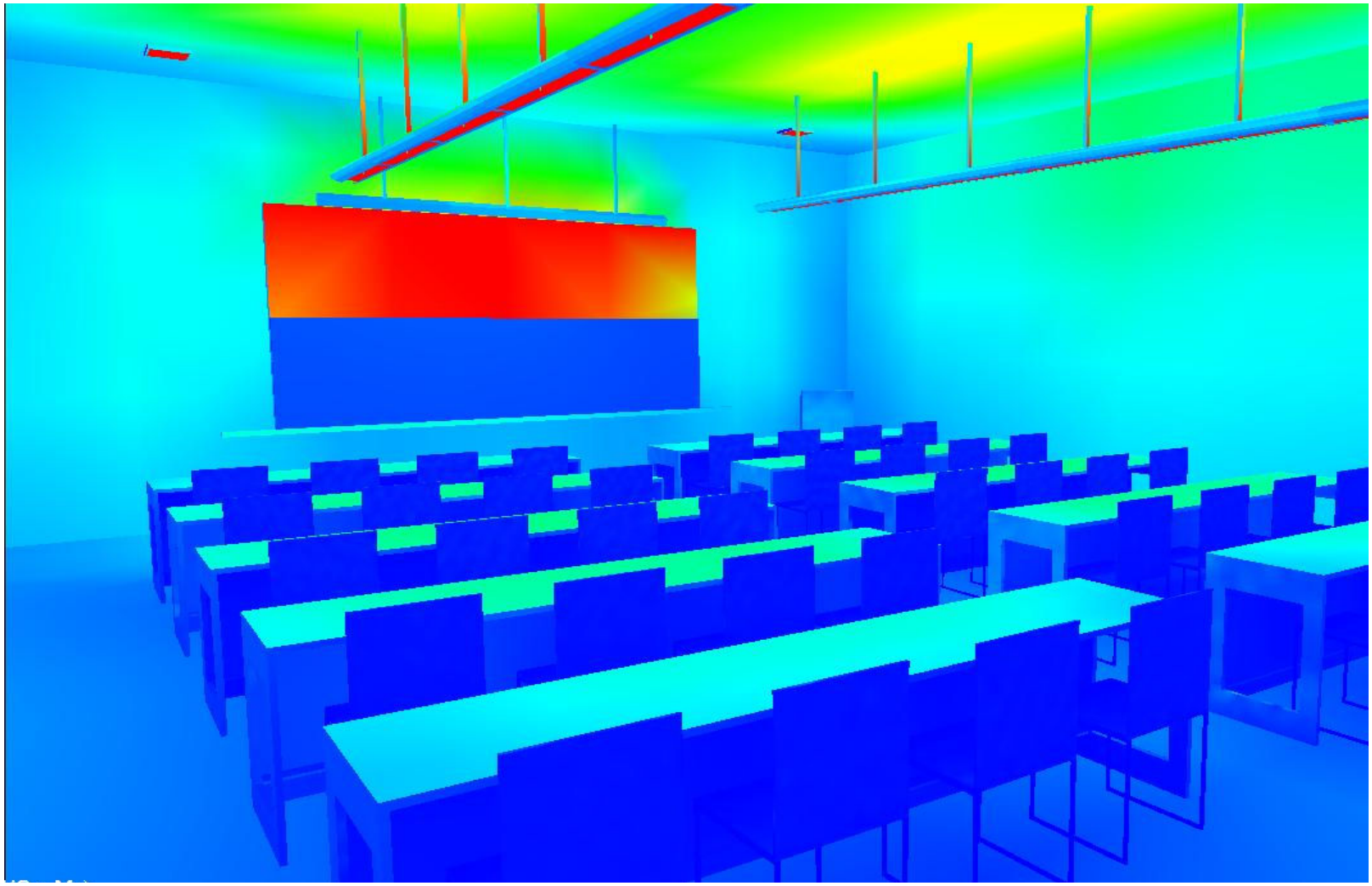
Luminaire Selection

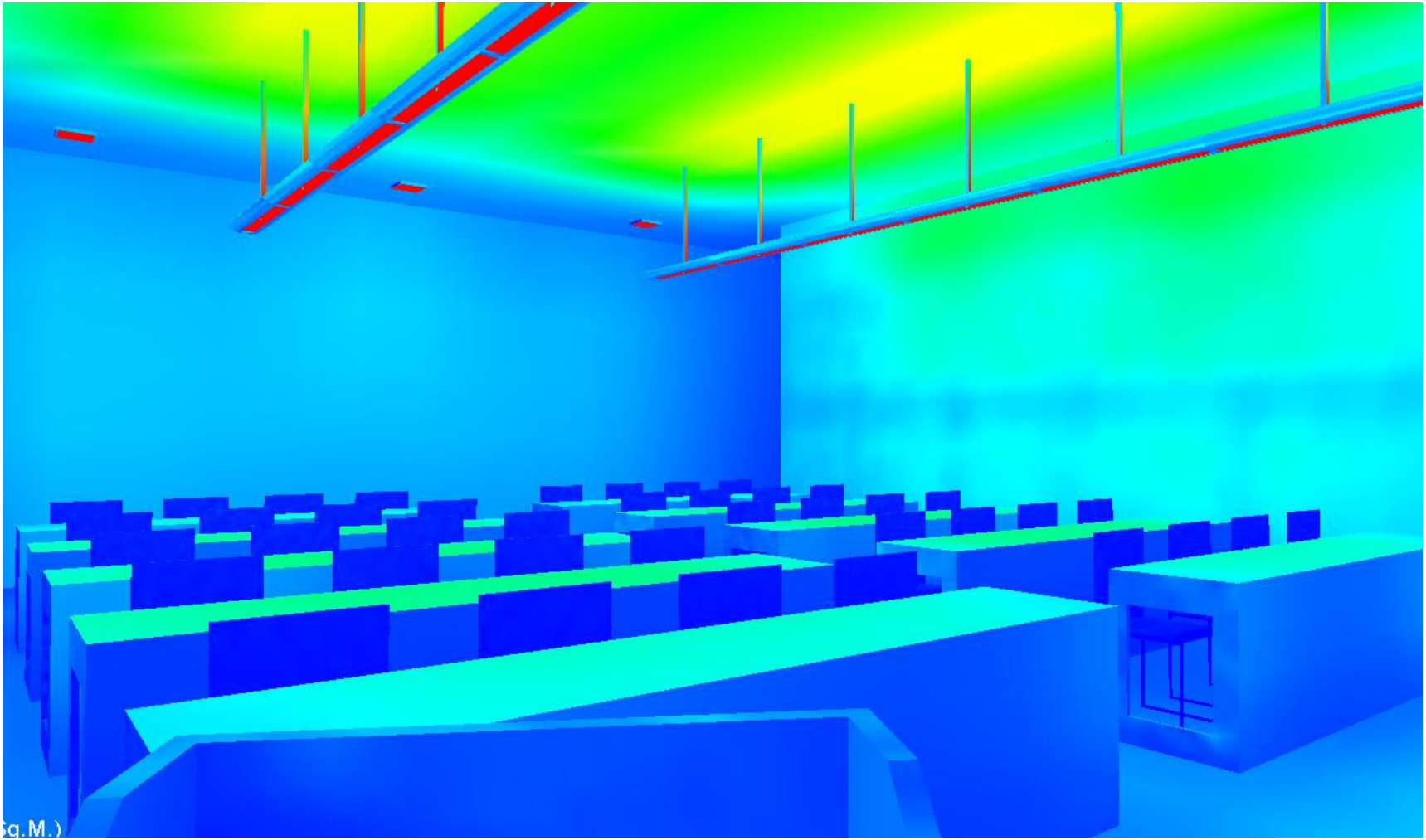
Suspended direct/indirect

Suspended direct fluorescent



Recessed CFL downlights

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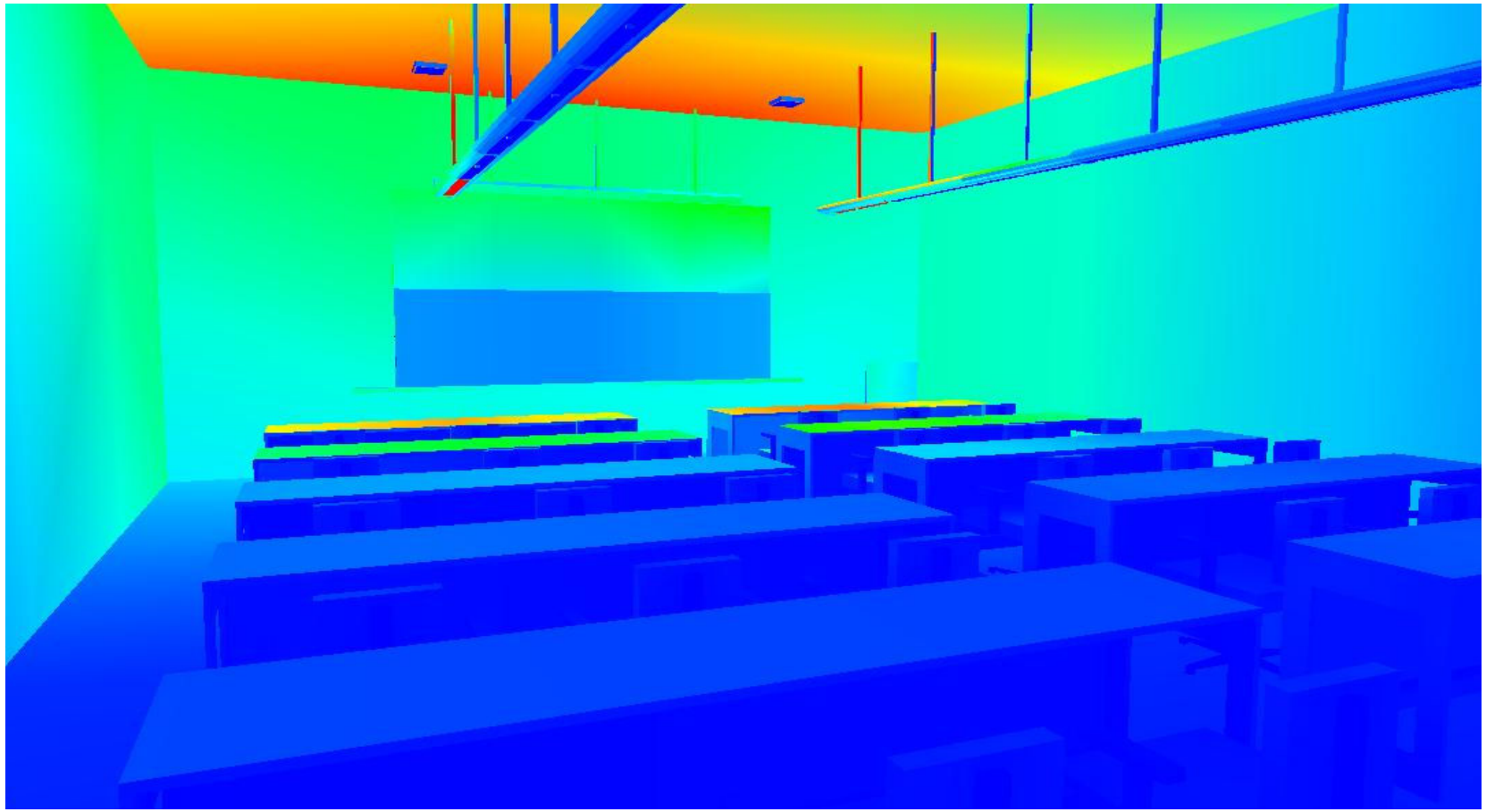


Photovoltaic Arrays Analysis

Software ‘RetScreen’ is used to perform the simulation.

Site Information:

Area available to collect solar power: 9,000 SF
Average period of time for solar power collection: 3 hours/day

Photovoltaic Arrays Information:

Power capacity: 1 kw (total 1,000 kw)
Model efficiency: 6%
Frame area: 9 SF per unit (total 1,000 units)
Capacity Factor: 15%

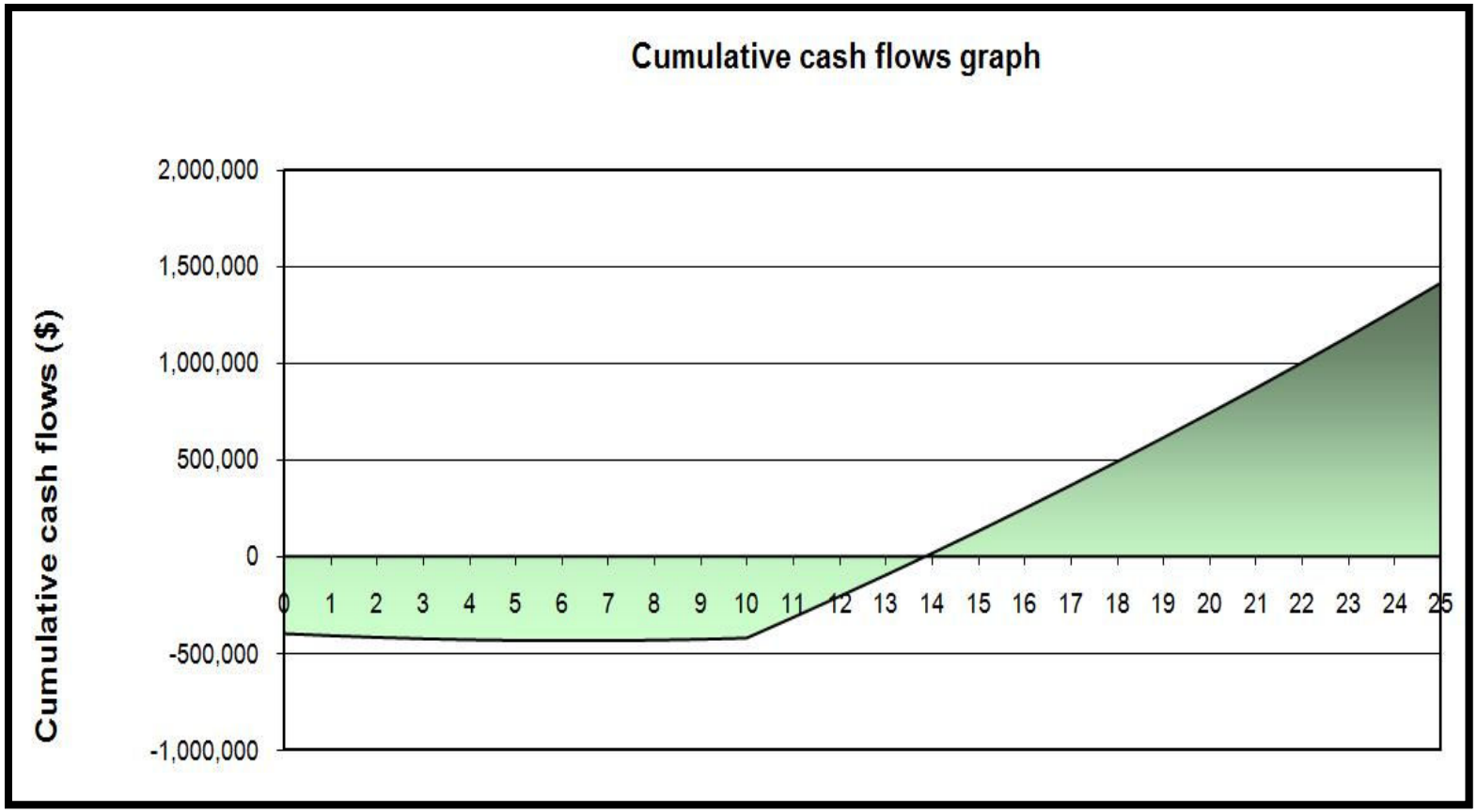
Financial Information:

Project life: 25 years
Initial cost: $1,000,000 ($1,000 per unit)
Total annual cost: $50,000
Total annual savings and income: $85,000

Photovoltaic Arrays Analysis

Simple Payback: 11.7 years (only counts cash-inflow)

Equity Payback: **13.9 years** (counts cash-outflows as well)



Sustainable Material on Building Envelope

Software 'BinMaker' is used to collect weather data and investigate how much natural ventilation could be generated

Space dimension:
Rectangular room of 15' x 15' x 10' with 4 windows of 5 SF are separated 6.5' by height on one wall.

Month: April

Material	Description	U value (W/ kM^2)
Wall	Wood Studs 2x5, 16" o.c. with exterior air film, stucco, exterior gypsum board, interior gypsum board with air film.	0.55
	Wood Studs 2x6, 24" o.c. with exterior air film, stucco, continuous insulation, interior/exterior gypsum, interior air film	0.37
Window	Double Glazed Clear , SC =1	3.63
	Double Glazed Reflective , SC = 0.6	3.50

Sustainable Material on Building Envelope

1st Attempt

Natural ventilation could be manipulated: **11 hours/day**
330 hours/month

2nd Attempt

By adding reflective properties to the window (decrease U-value),
Natural ventilation could be manipulated is now: **13 hours/day**
390 hours/month

Questions ?