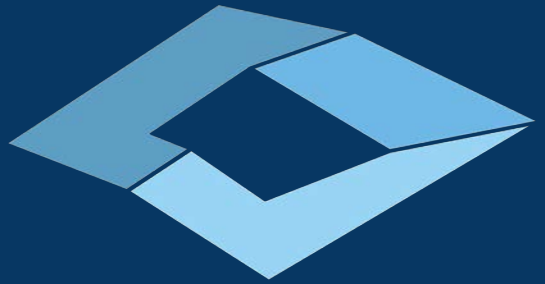


COast WORKING

Red Hook, Brooklyn
40.6789899,-74.0162075

Zoe Le Hong + Sam Ratanarat + Hana Meihan Davis

Site Analysis.

Red Hook, Brooklyn

30m

80m

100m

200m

500m

1000m

2000m

5000m

Why Red Hook?

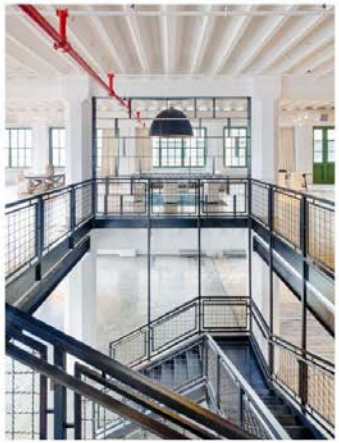
- City-wide initiative to renovate piers and shipping yards;
- Site orientation towards skyline;
- Neighboring buildings have little to no impact on sunlight;
- Site is an empty lot

Brooklyn Precedents

25 Kent Ave, Williamsburg

Dock 72, Brooklyn Navy Yard

Empire Stores & Offices, DUMBO



Industry City, Sunset Park


LEHIGH VALLEY

Shading Analysis

January 1, 9am

January 1, 12pm

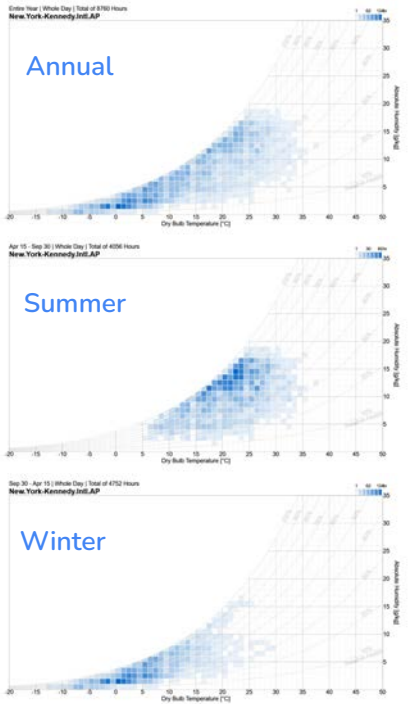
January 1, 3pm

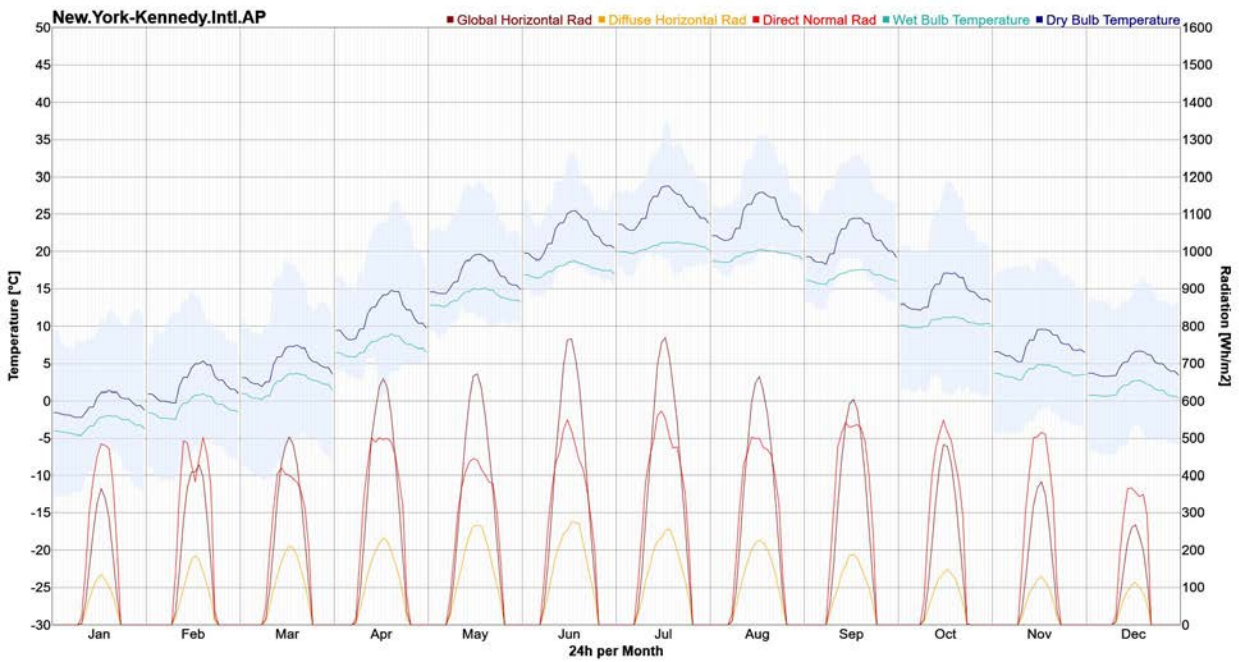
July 1, 9am

July 1, 12pm

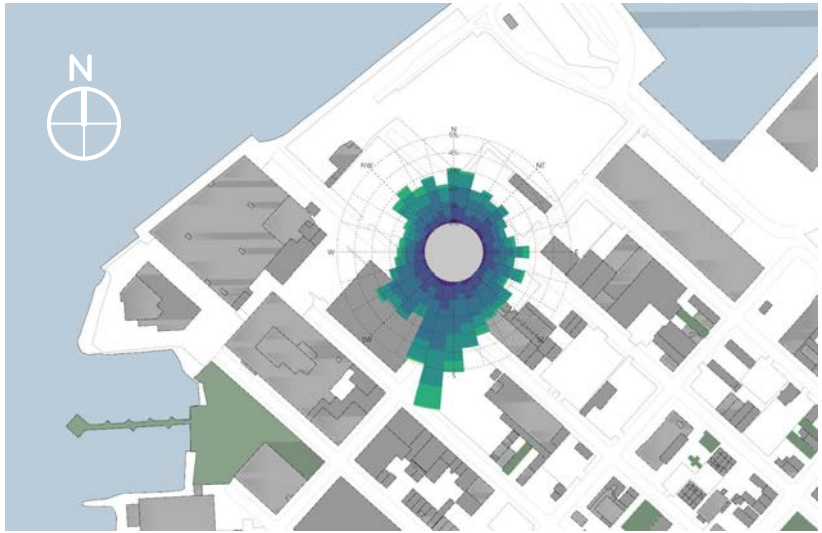
July 1, 3pm

Psychrometric & Diurnal

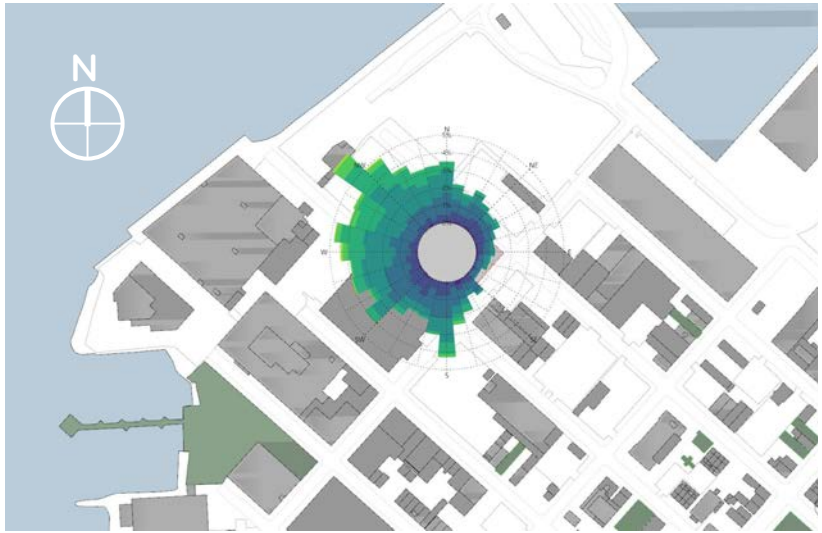




Windrose

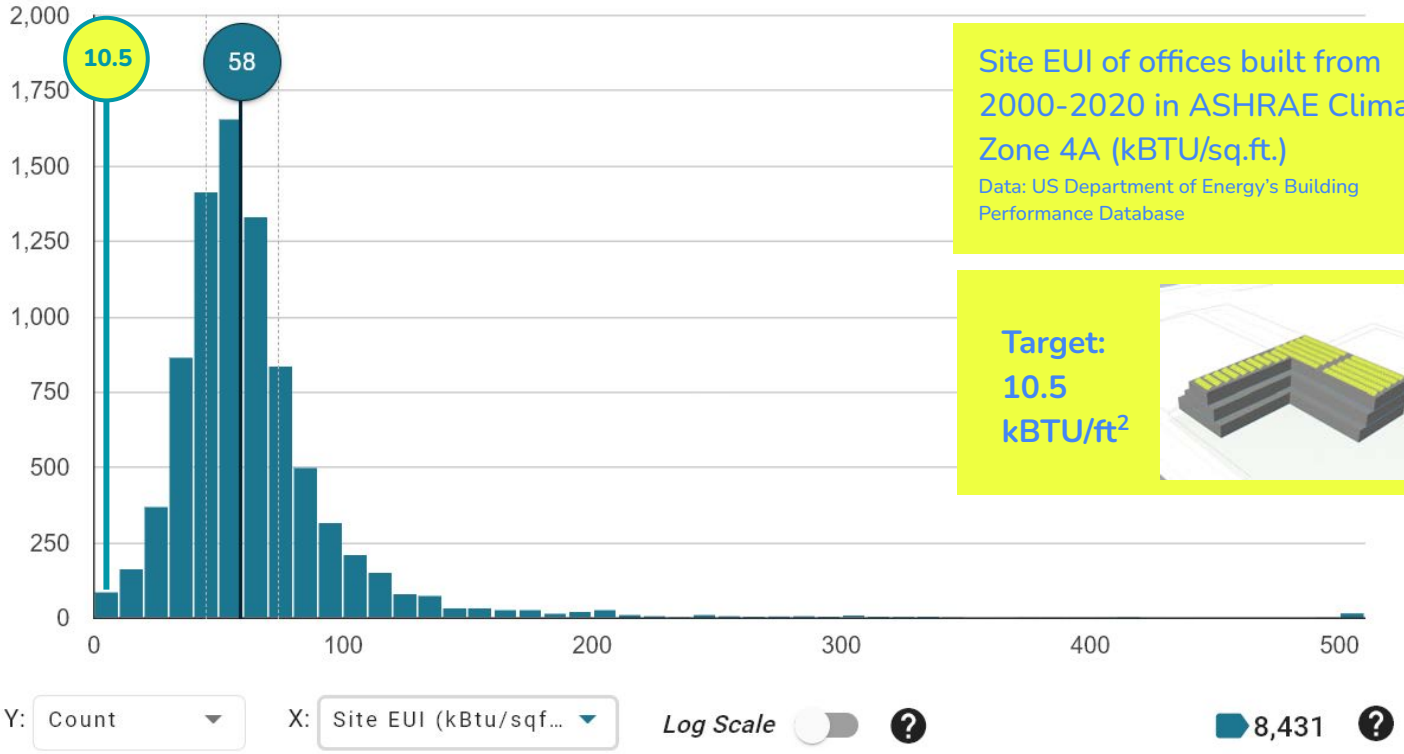


Summer



Winter

Energy Benchmarking (kBTU/ft²)



Site EUI of offices built from 2000-2020 in ASHRAE Climate Zone 4A (kBTU/sq.ft.)

Data: US Department of Energy's Building Performance Database

Target: 10.5 kBTU/ft²

Sunlight.

The surrounding buildings are 33ft at the tallest, and cast few shadows over our site, increasing our unobstructed sunlight. This encourages the use of daylighting through windows, skylights and terracing as well as energy generation via solar panels.

Wind.

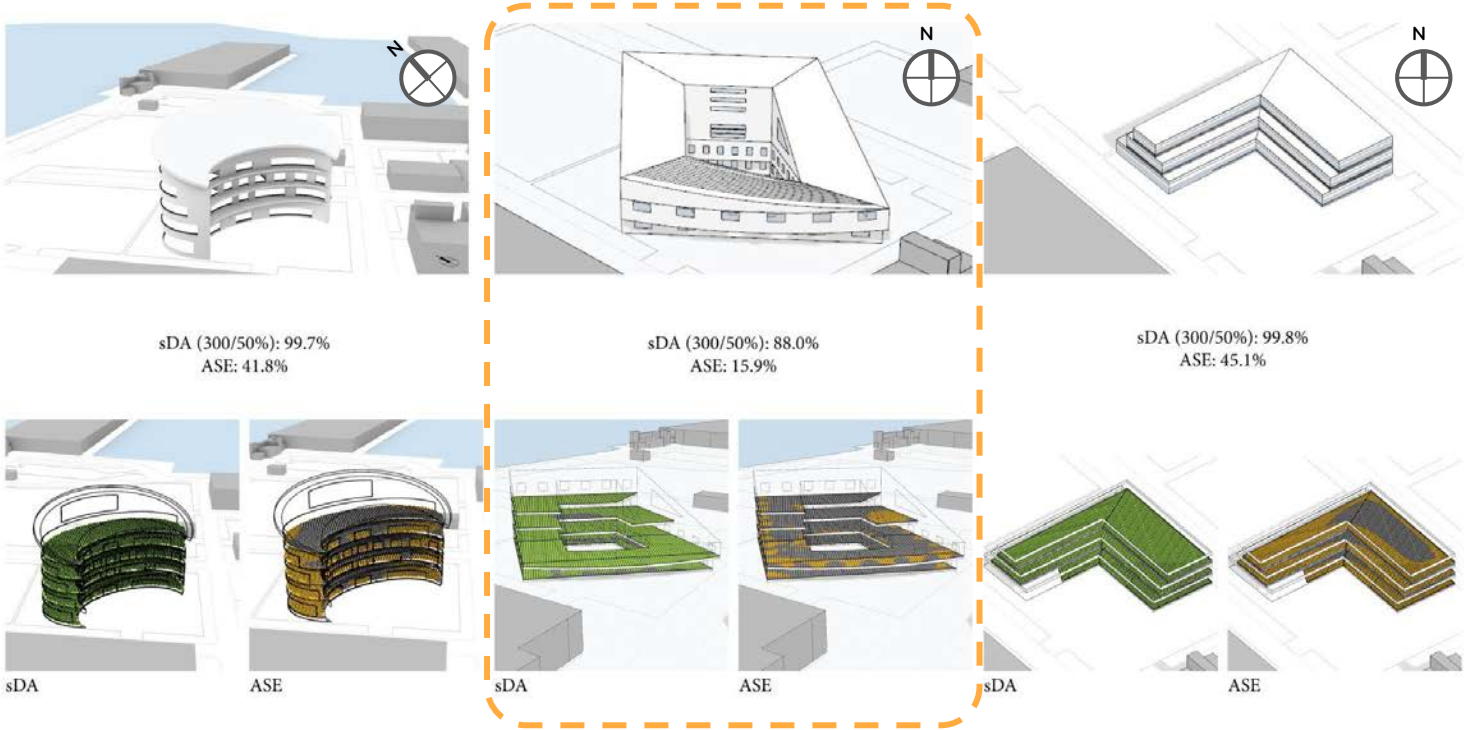
Sited on a windy waterfront in the Upper Bay, we will explore how the massing direction can block out harsh winter winds, while also be used to naturally cool the space in warmer months.

Thermal Massing.

New York City experiences high temperatures during the summer and cold temperatures during the winter. Therefore using material with high thermal mass will help absorb, store and emit heat, allowing for a passive solar design.

Massing.

Initial Massing Models

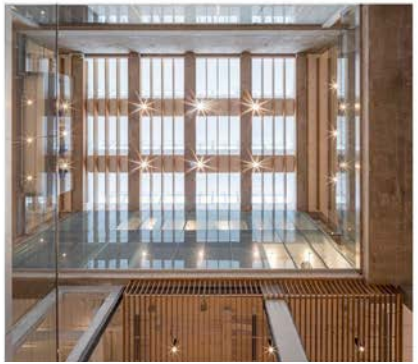


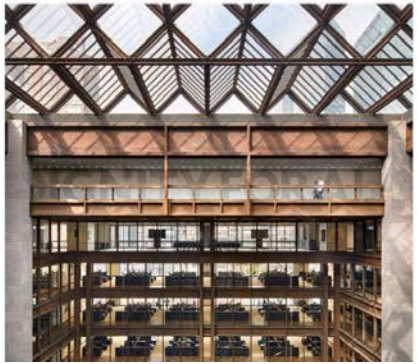
Daylight Precedents

Keller Center. Chicago, IL

Ford Foundation. New York, NY

Kroon Hall. New Haven, CT





Daylight Technologies

Clerestories + Skylights

Orientation

Lightwell / Atrium / Courtyard

Occupant Control

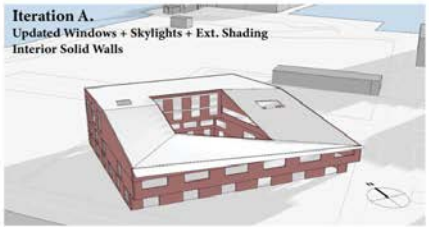
Reflection Off Interior Surfaces

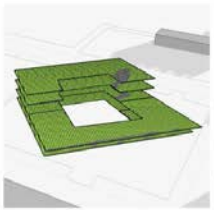
Task-based Programming
(glare acceptance)

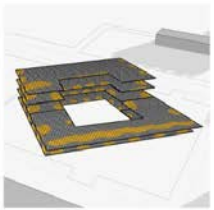
Window Size + Height

Seasonal Shading + Terracing

Facade Study

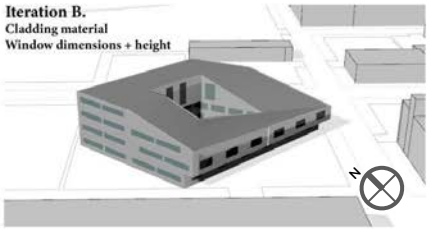


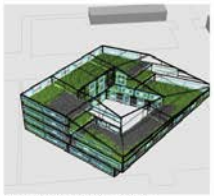


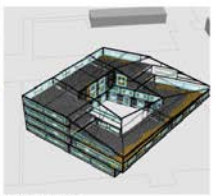


sDA (300/50%): 93.8%

ASE: 18.3%

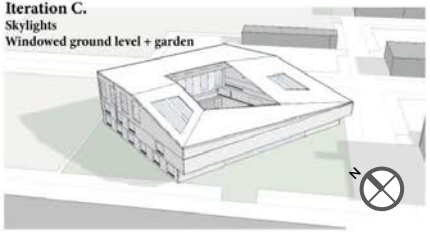


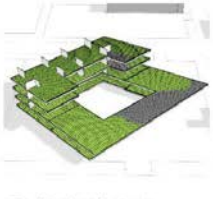


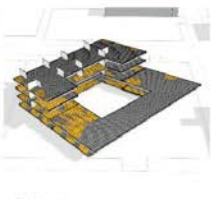


sDA (300/50%): 68.9%

ASE: 17.5%







sDA (300/50%): 88.7%

ASE: 21%

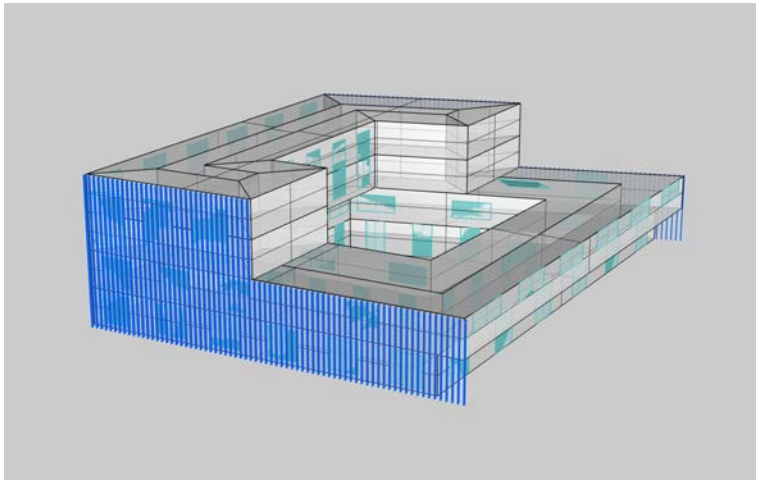
Smaller skylights + Moveable blinds/exterior shades → mitigate the temperature and daylighting differences between summer and winter.

Minimise glare while maximising daylight by combining skylights with wall window placement and height.

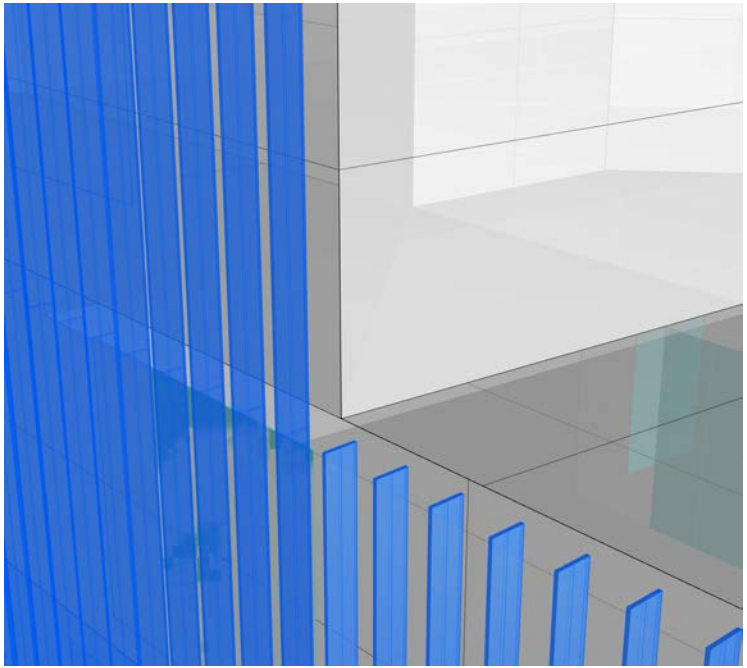
Creating an indoor/outdoor landscaping in the courtyard to produce a healthier environment.

Visual Comfort.

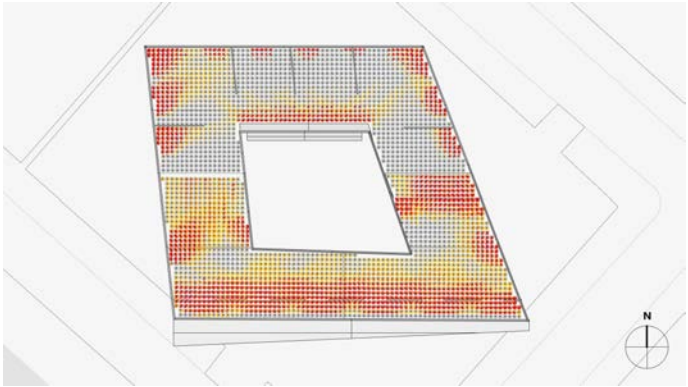
External Shading Design

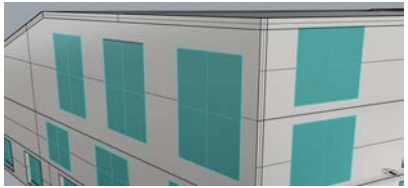


- Vertical louvers installed on East and West exterior facades.
- Assume dynamic for adjustment depending on glare and solar intensity.
- Overhang on the south facade.



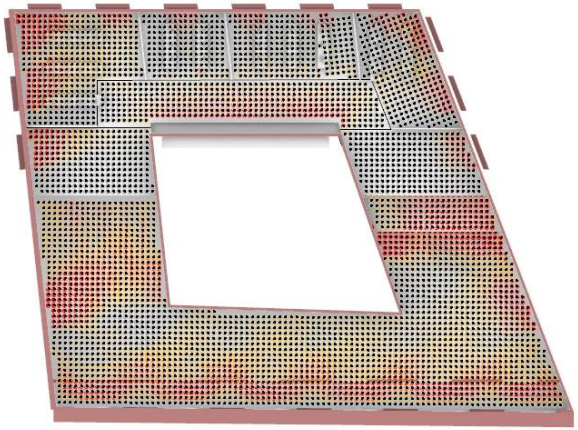
Glare Probability Distribution

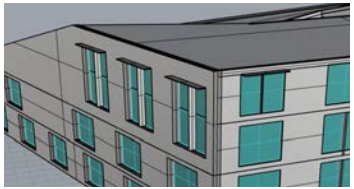




sDA = 94.34%
ASE = 18.7%
DGP = 14.1%

Initial Facade

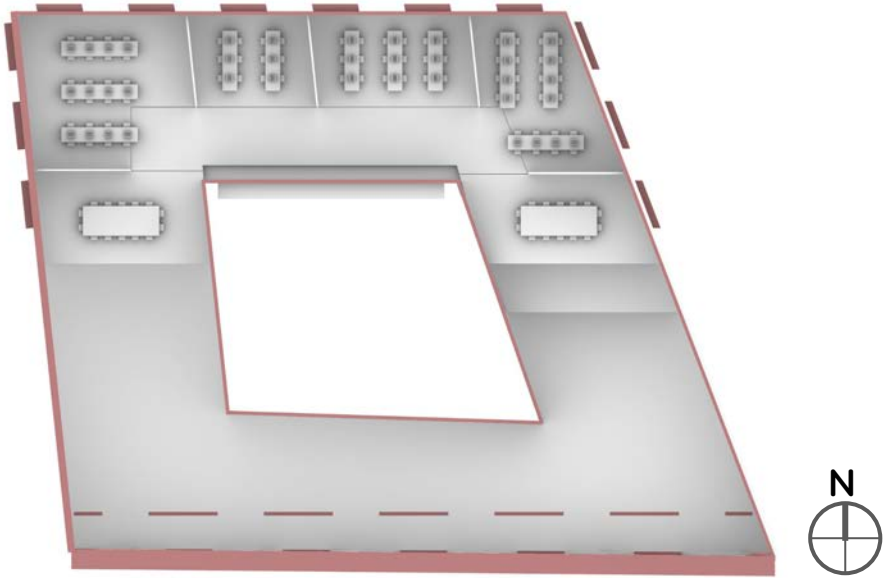




sDA = 93.6%
ASE = 3.5%
DGP = 12.5%

Updated Facade

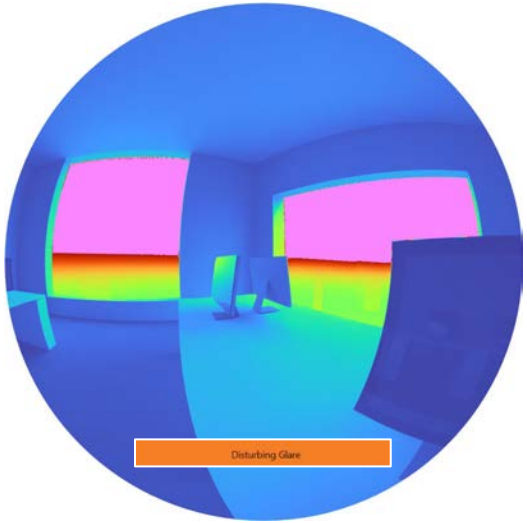
Sample Floor Plan

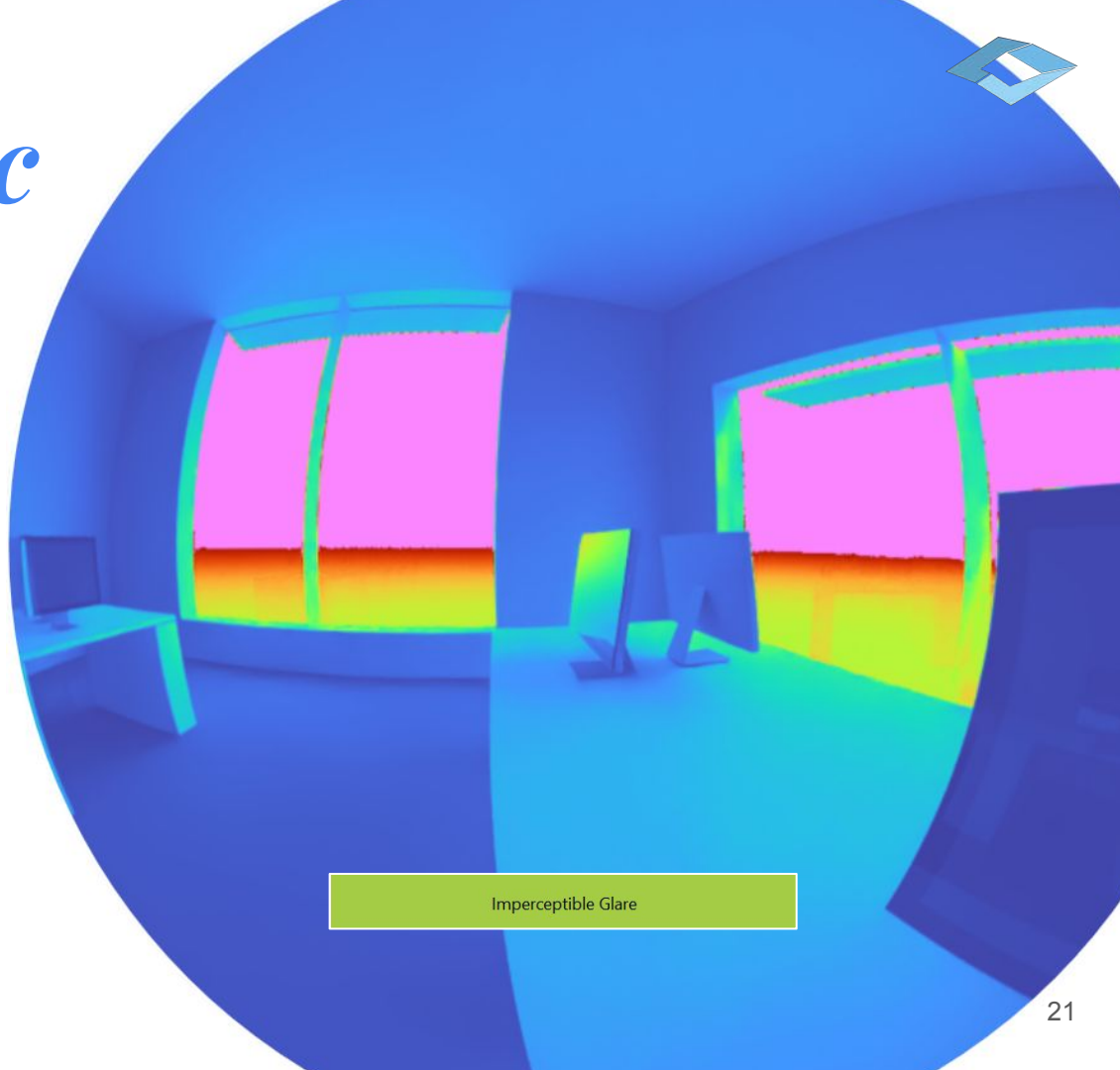


Open concept, adaptive floor plan concept for co-working and flexible meeting rooms

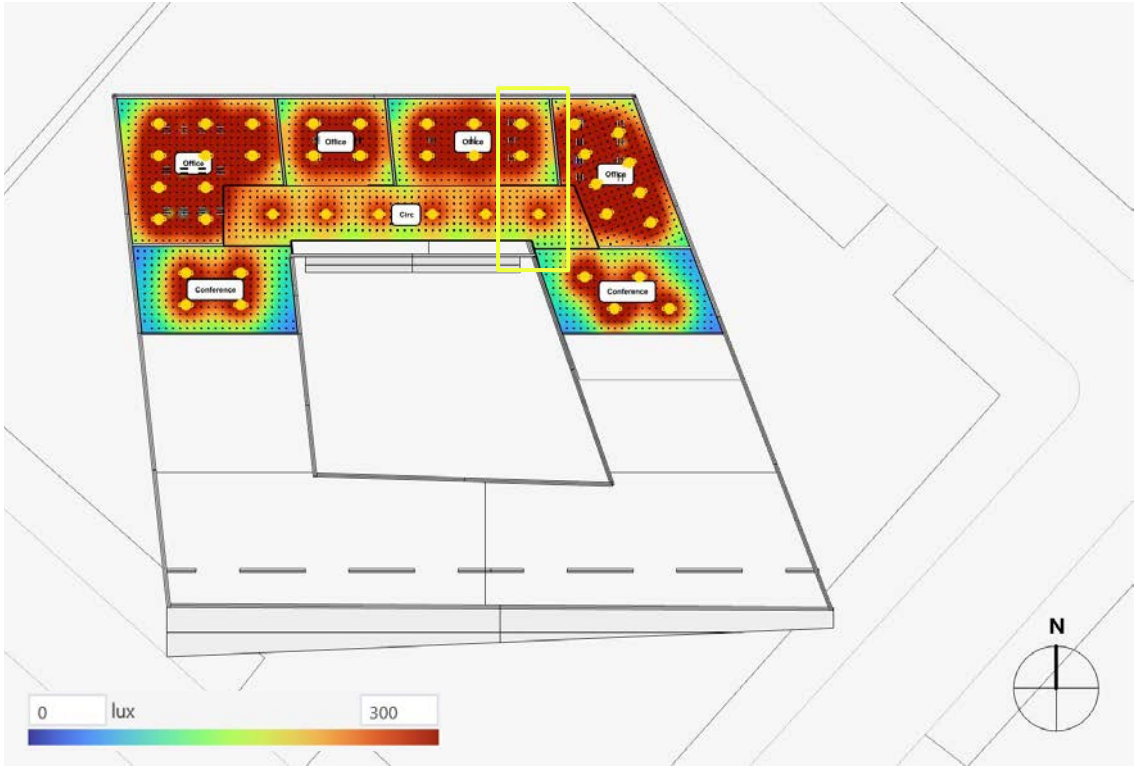
Hemispheric Glare Map

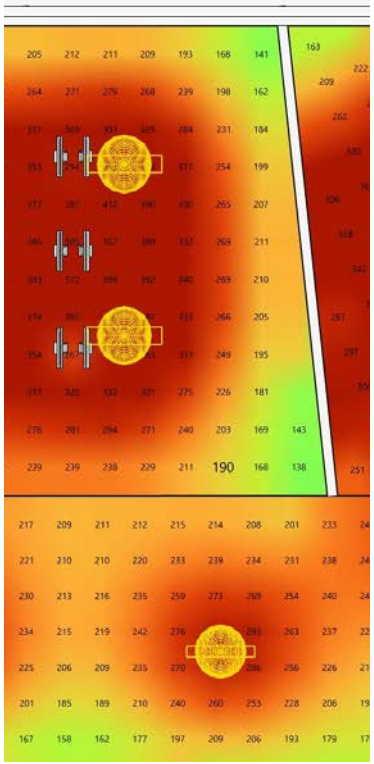
May 20, 9:30am, Northeast Corner



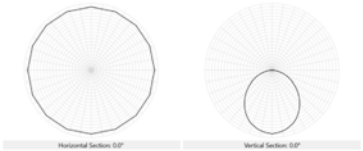
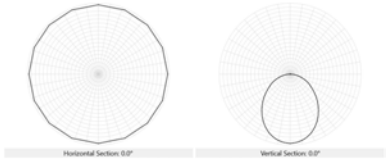


Electric Lighting





Luminaires & LPD

TYPE	PERSPECTIVE	LUMINANCE INTENSITY DISTRIBUTION	WATTs	LOCATION
FluxGrid Gen2 Recessed Led: 1x4, 5400 Nominal Delivered Lumens, 80 CRI, 4000K, Round Diffuse			21.2	Offices / Conference
MicroSquare gen2 suspended: Solid Housing/Asym. Performance Lens, 4700lm/4ft, 80 CRI, 3000K			26.5	Circulation

LPD
= energy use of lighting / floor area
= (36 x 21.2W + 6 x 36.5W) / 778.4m^2
= 1.26 W/m^2

PROJECTED LIGHTNING ENERGY USE
= LPD x floor area
= 1.26W/m^2 x 4900m^2
= 6.174 kW

Visual Inspection in 3D

CCT = 3500K

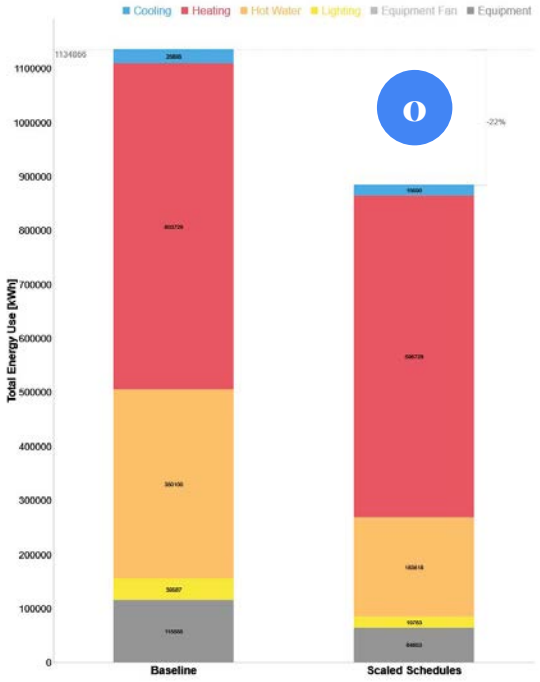
CCT = 5000K

CCT = 8000K

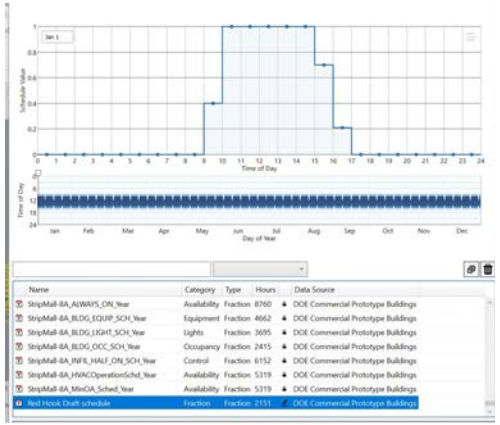
CCT = 8000/3000K (office/circulation)

Baseline Thermal Massing.

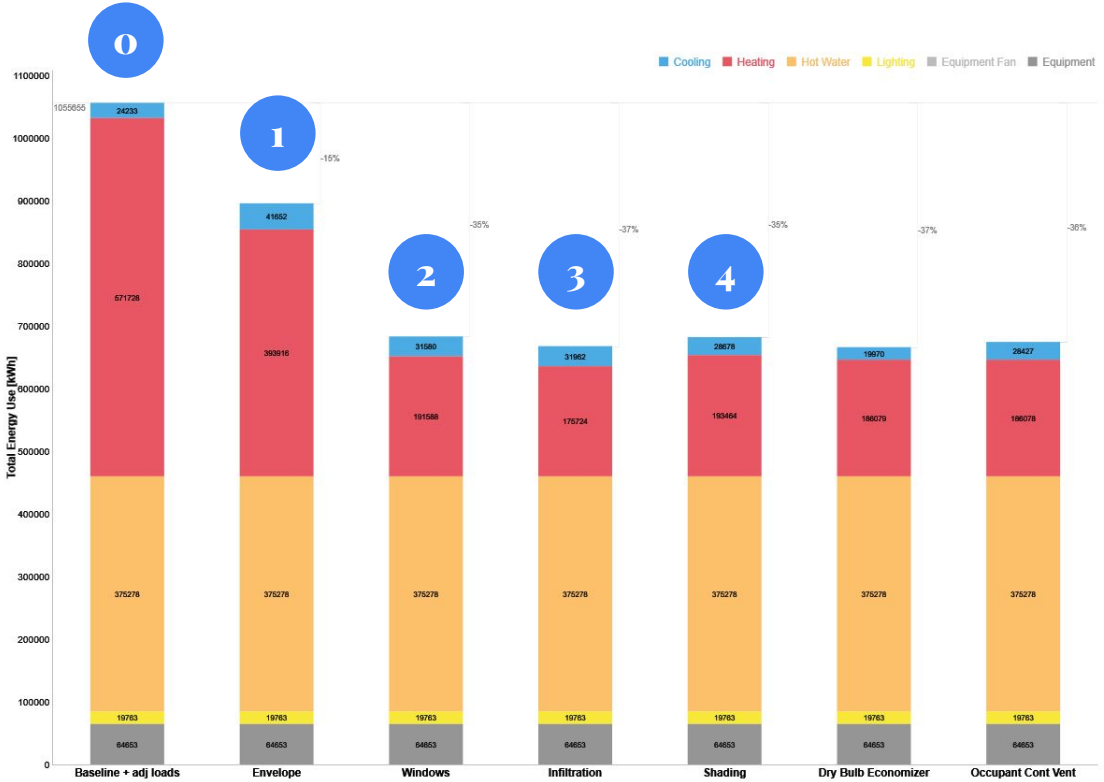
Schedule Refinement



- **Co-working space - flexible office**
  - Weekday and reduced weekend use
  - 0.11 ppl/sq.m.
  - 450 people at peak occupancy
  - Lighting & equipment: occupancy-based
  - 22% reduction from baseline



Envelope Upgrades



1 **Upgrade Variant: NYC 2020 Energy Conservation Codes**

Roof = R-53
Walls = R-19
Slab = R-20

43% reduction from baseline

2 **Upgrade Variant: Windows**

U-val = 0.785 W/m2K
SHGC = 0.764
Tvis = 0.661

68% reduction from baseline

3 **Upgrade Variant: Infiltration**

30% reduction = no change

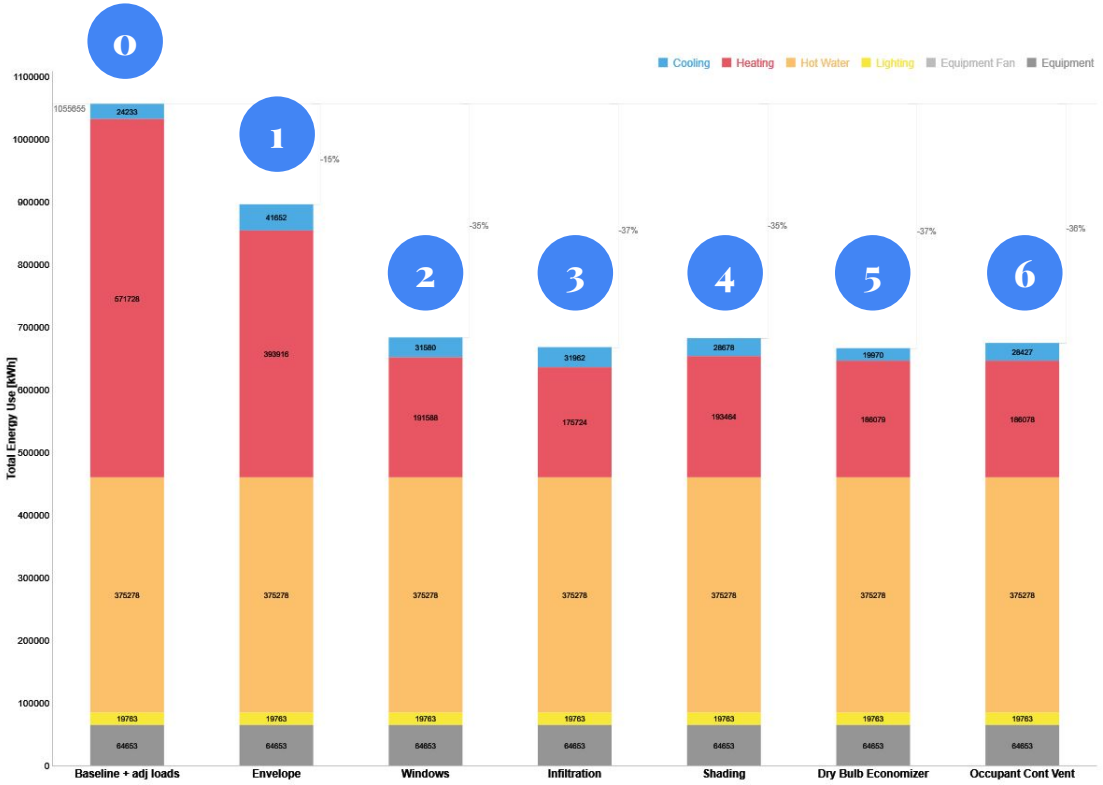
4 **Upgrade Variant: External Shading**

Shading = increase

Ventilation Upgrades

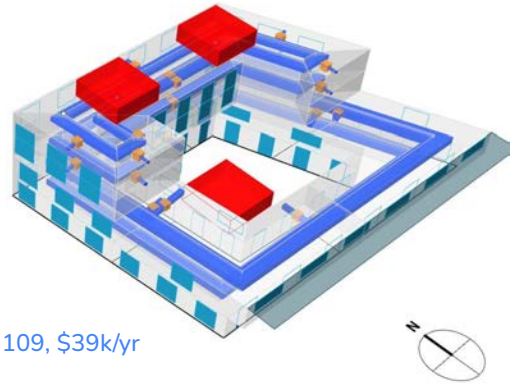
5 **Ventilation**: occupancy sensors for CO2

6 **Dry Bulb Economizer:** Installed to reduce cooling



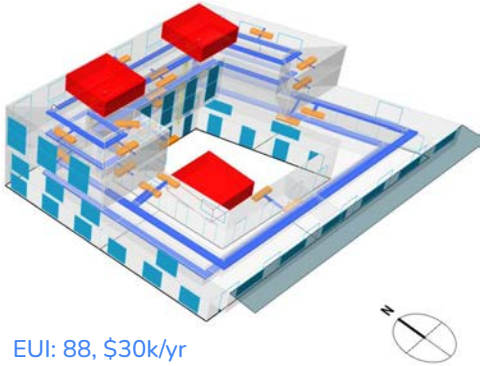

HVAC.

VAV - too energy intensive, too big



EUI: 109, $39k/yr

FCU + DOAS - Good balance

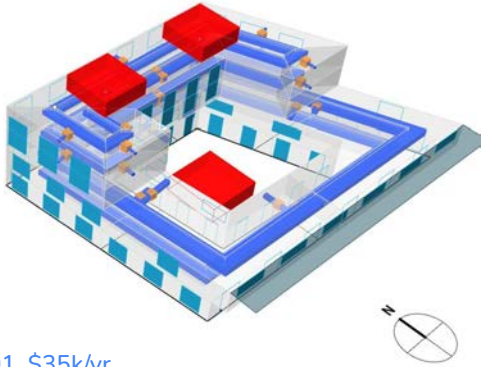


EUI: 88, $30k/yr

FCU and DOAS:

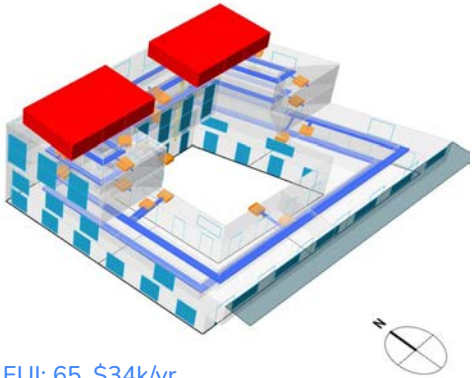
- Cheapest
- Smallest
- EUI reduction of 21%
- More roof space for PV

VAV + Econ - too energy intensive, too big

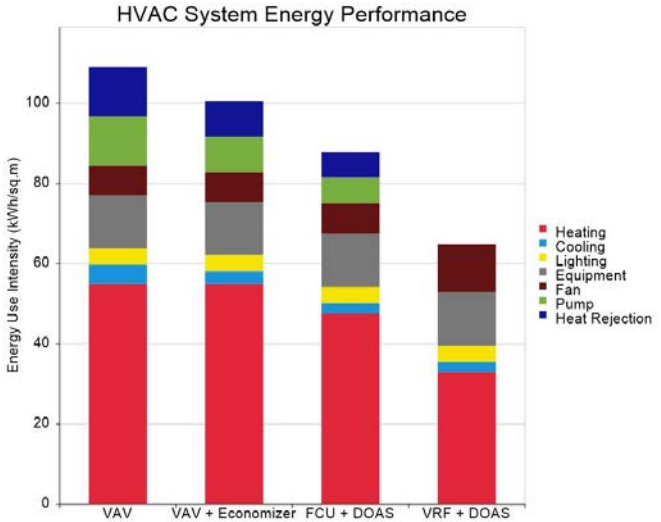


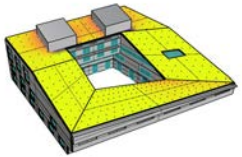
EUI: 101, $35k/yr

VRF + DOAS - Mech rooms inhibit PV

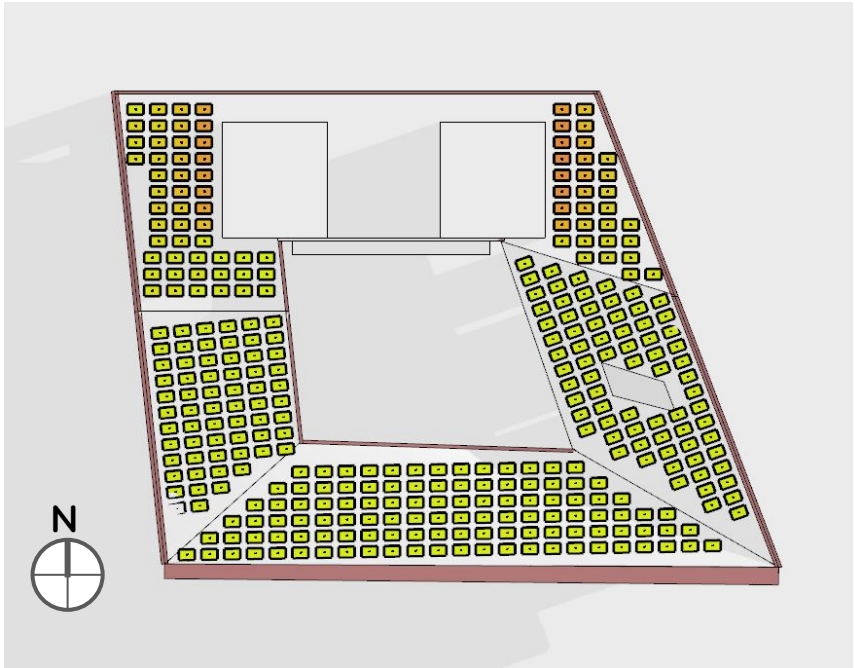


EUI: 65, $34k/yr





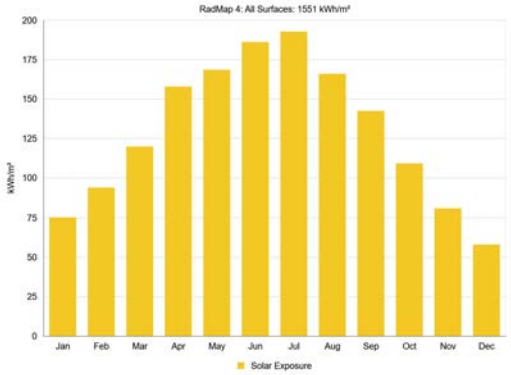
Updated PV Potential



Annual electricity yield of a sample 384 panel PV system -

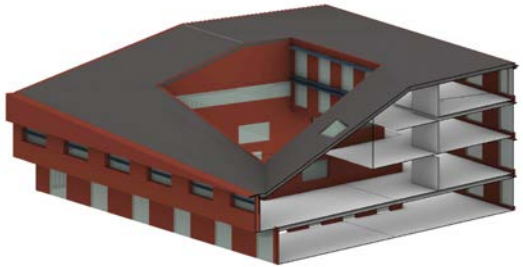
328 x 1.5m^2 x 1,551 kWh/m^2 x 0.18 x 0.96

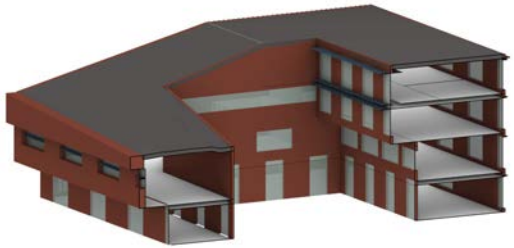
= 131, 862 kWh



Final Design.

Thermal Envelope





Based on NYC 2020 Energy Conservation Codes

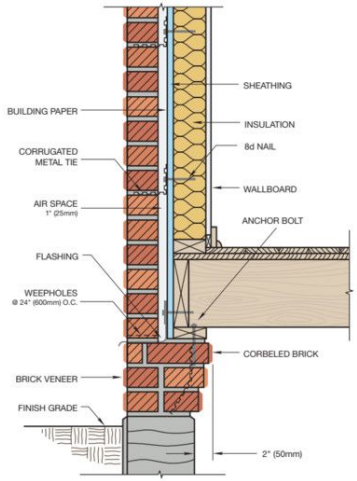
Roof = R-53

Walls = R-19

Slab = R-20

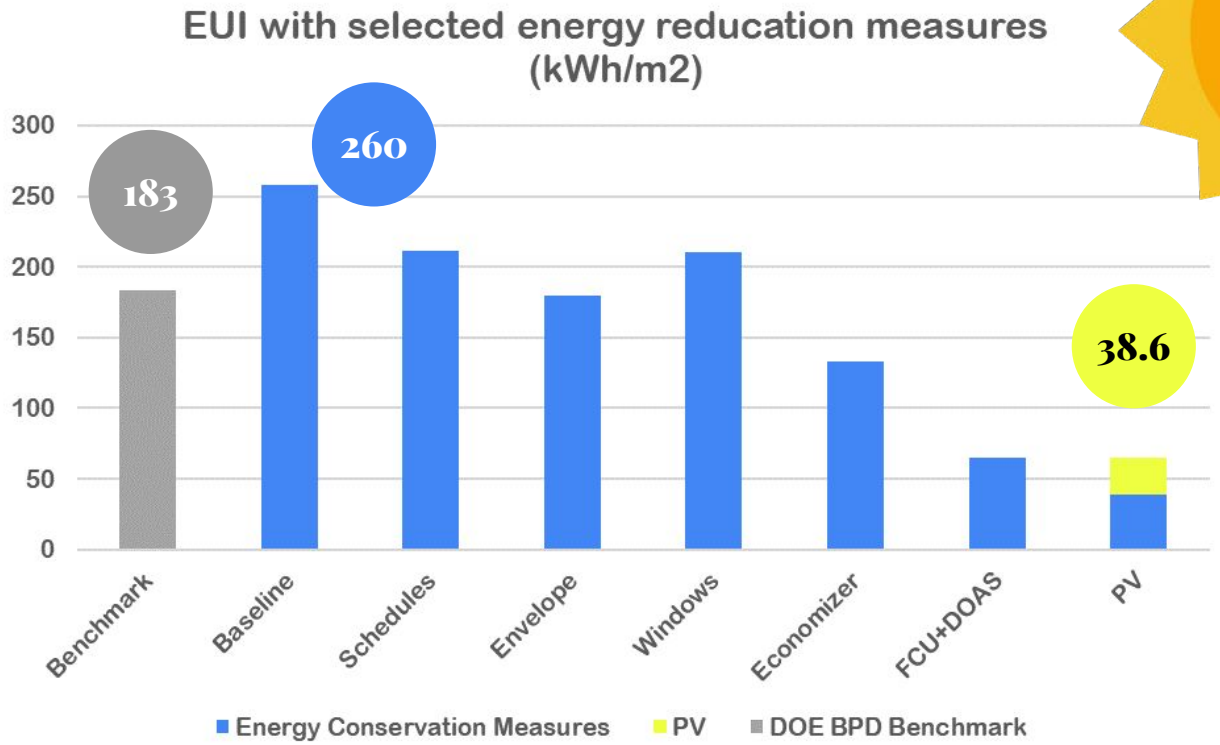
Double pane glazing (argon)

Thermal mass: brick construction



Source: AIA

Performance



93.6% sDA
3.5% ASE

79% reduction DOE benchmark

80% reduction from model benchmark

16% increase from target (10.5 kBTU/ft^2, 33 kWh/m^2)

Final Design