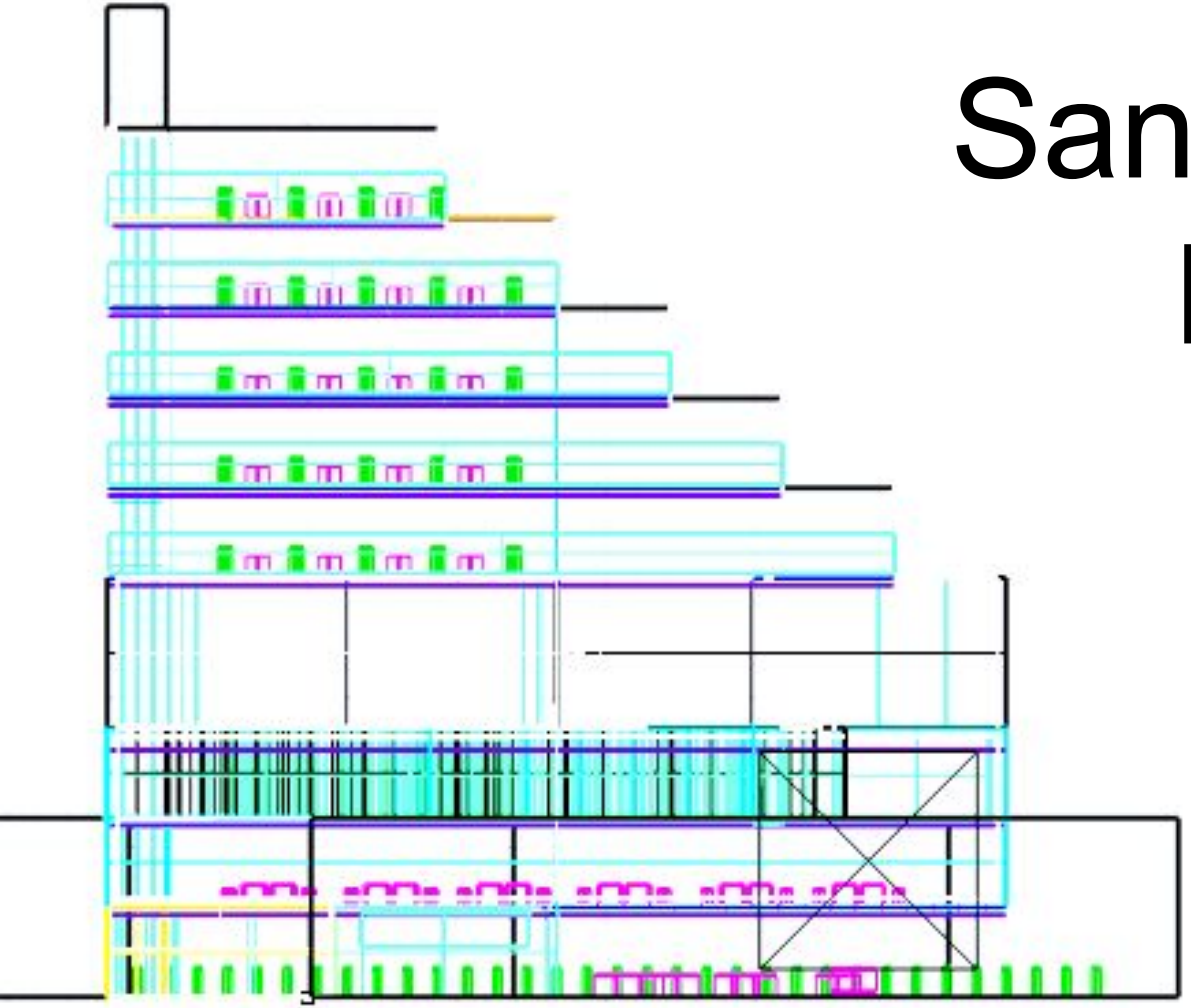


San Francisco Mixed-Use Building

By Stephanie Chin and Florence Lo

4.401 Final Project

Introduction

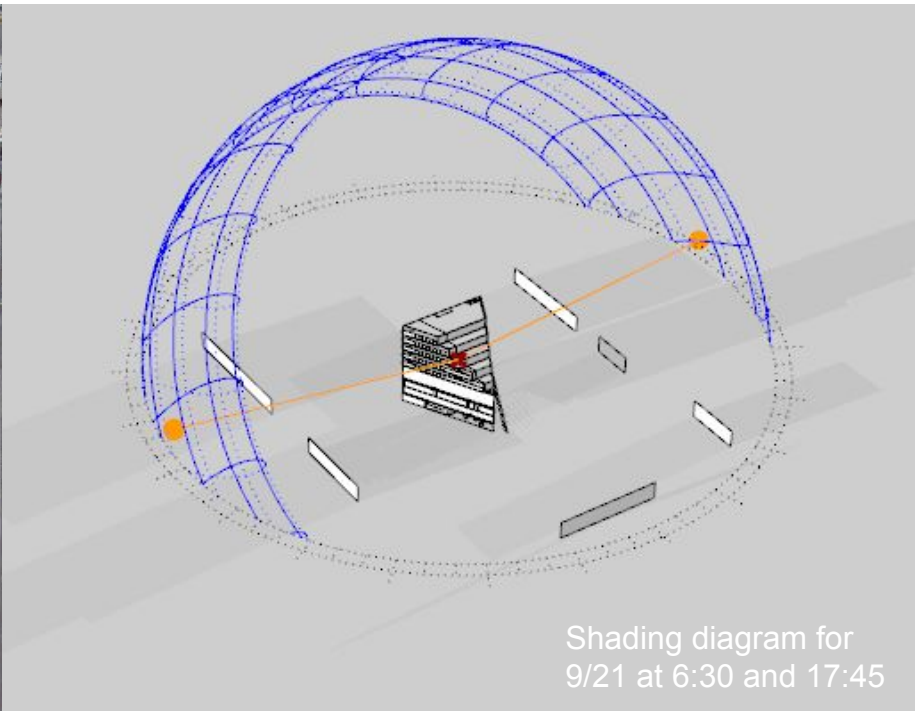
Design Philosophy

- Temperate climate
- Flexible and mixed-use
- Useful balconies

EUI Target: 100 EUI

Location

Vacant plot, 70 m wide with low-roofed buildings nearby



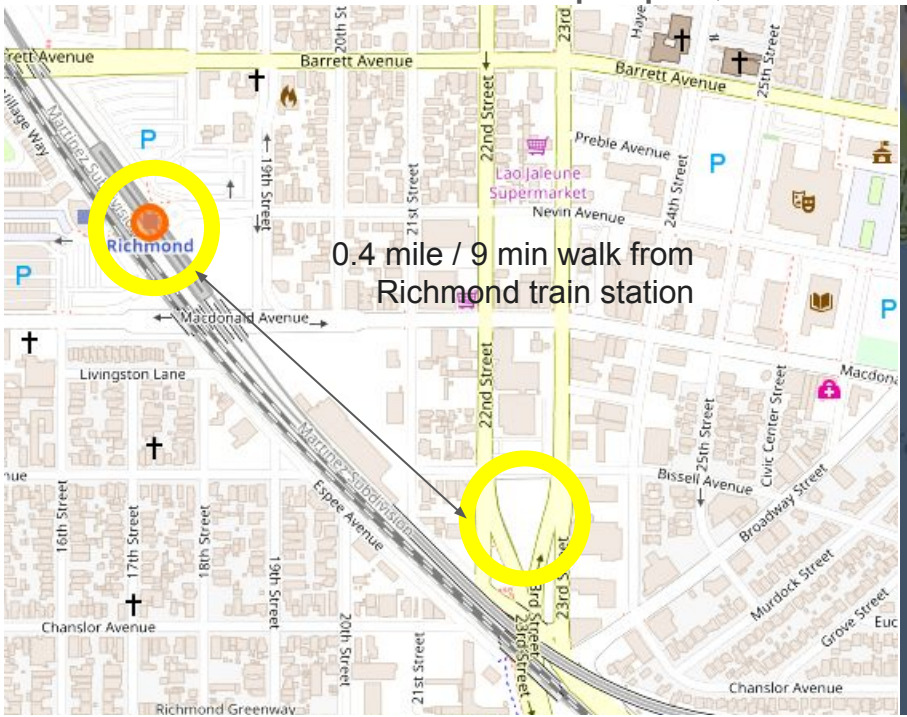
Shading diagram for
9/21 at 6:30 and 17:45

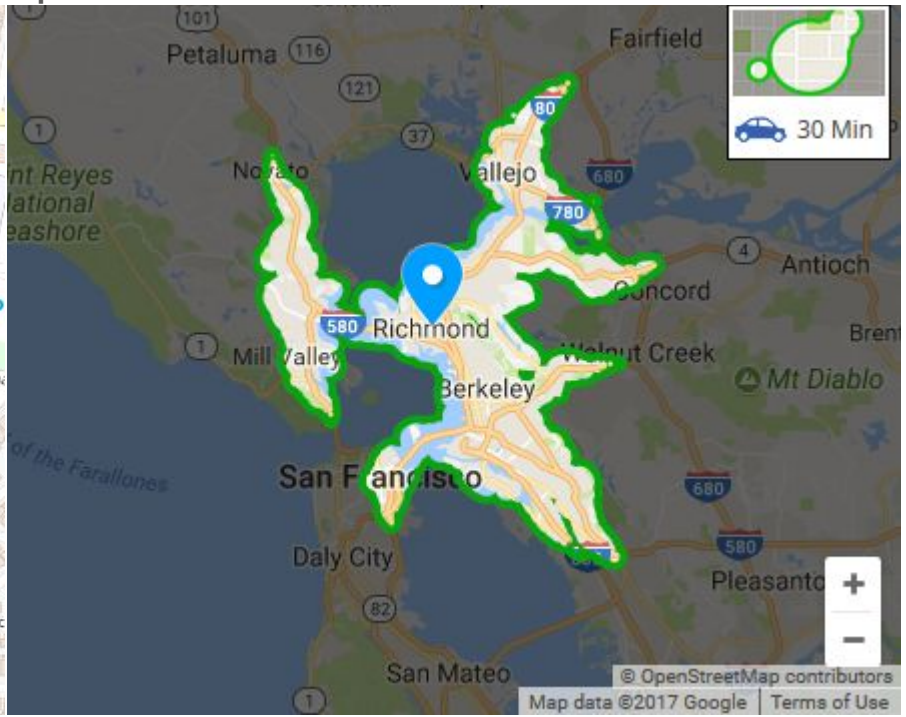
Location

Very Walkable
Most errands can be accomplished on foot.

Good Transit
Many nearby public transportation options.

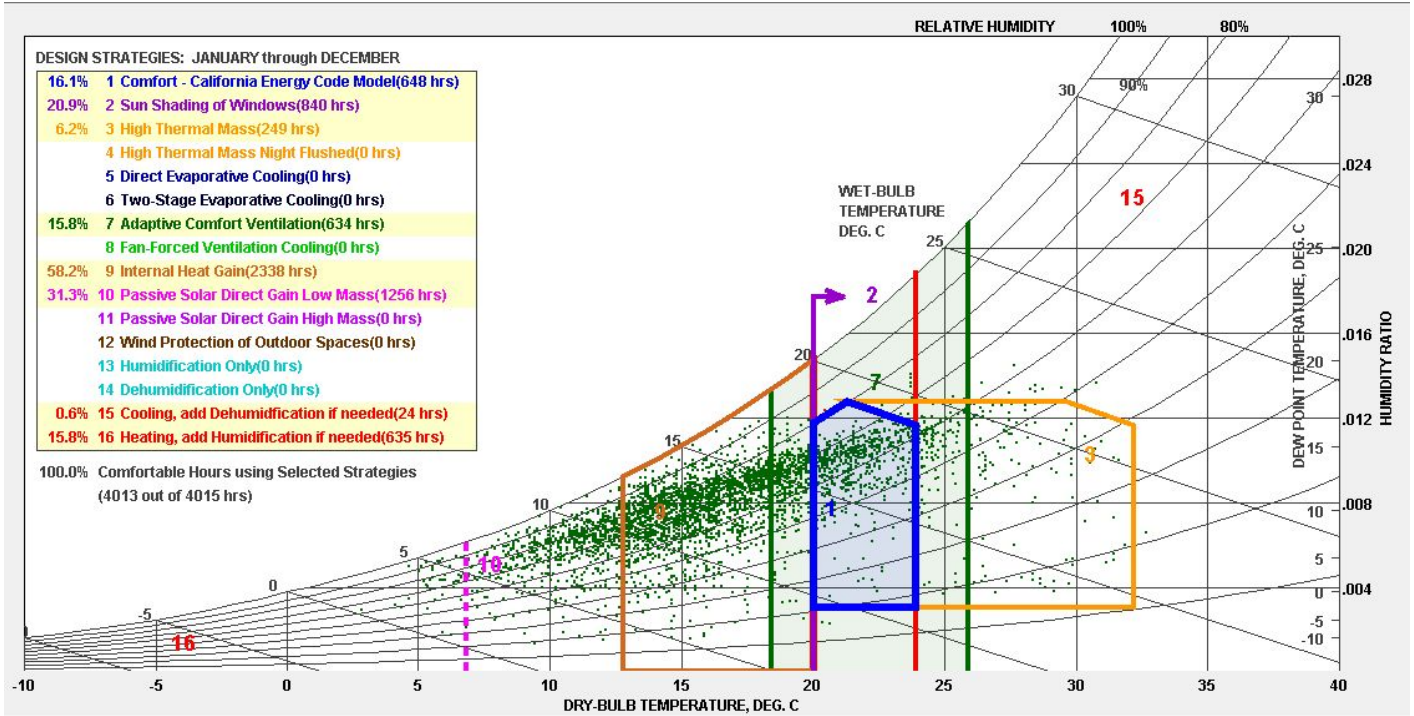
Outside of San Francisco proper, but near public transit





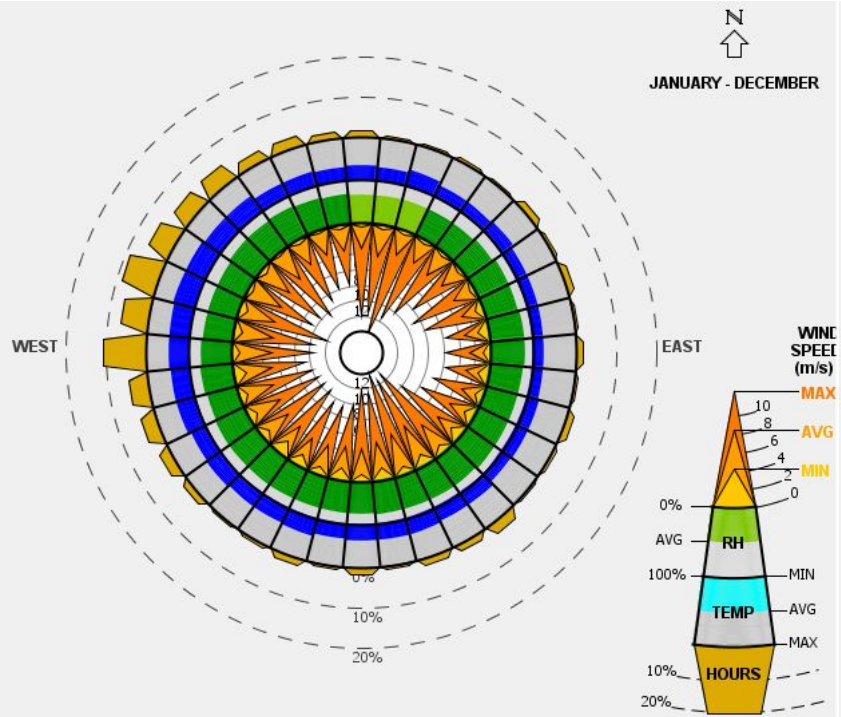
Climate

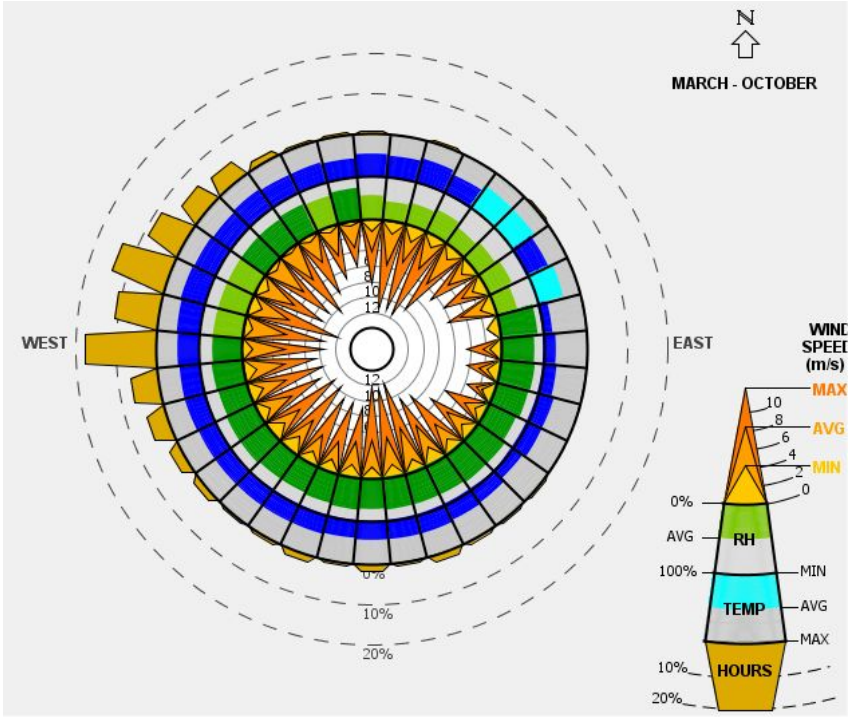
San Francisco: moderate climate



Climate

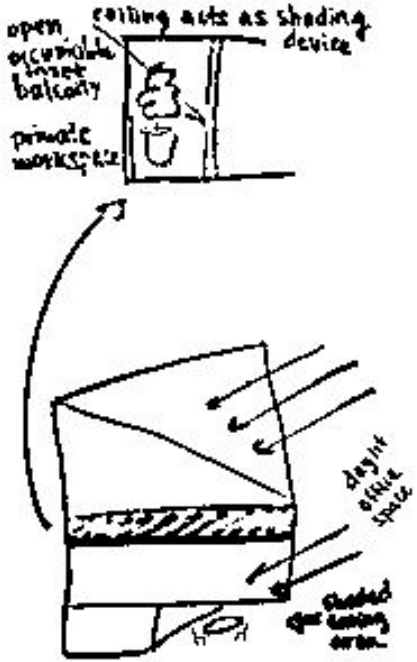
Higher humidity and winds from the south and west

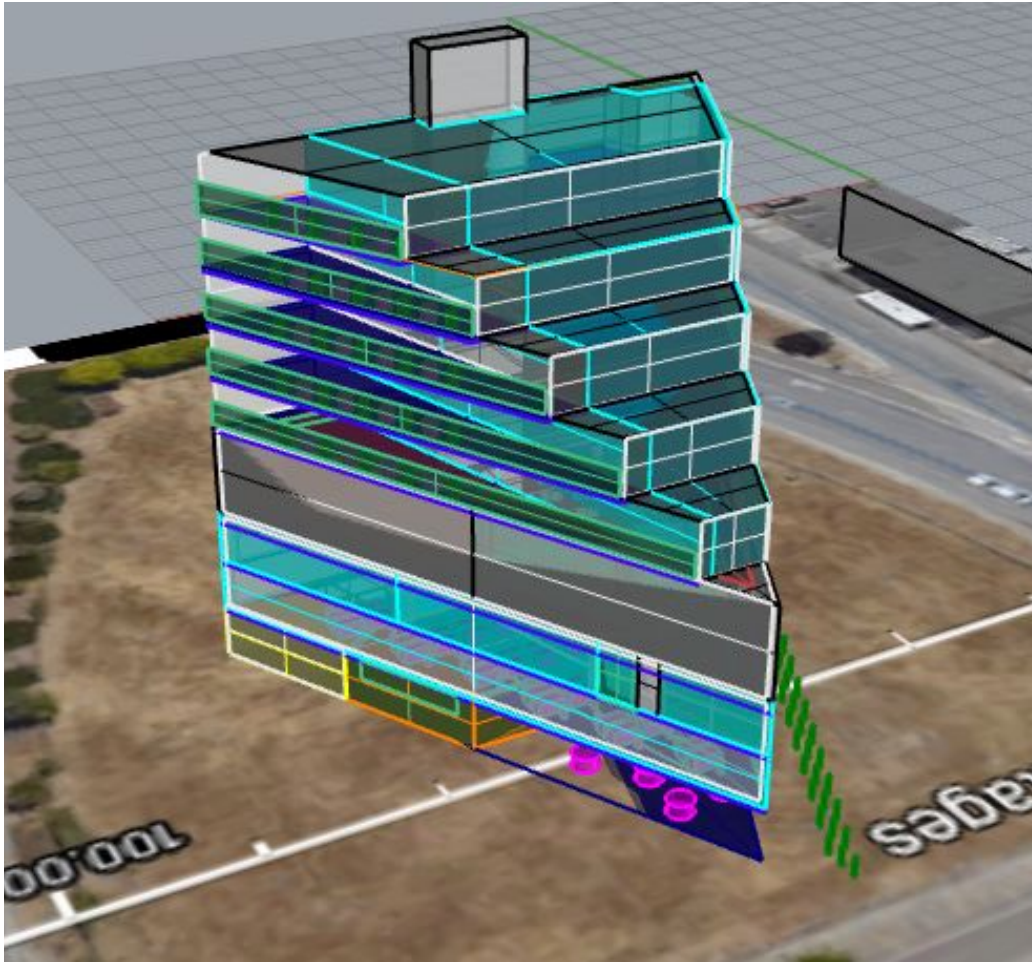




Design

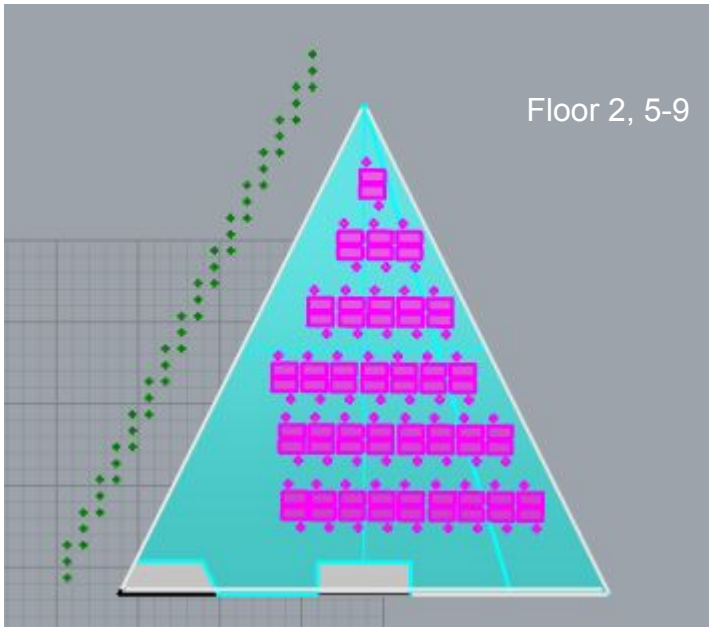
Glass facade, usable balconies



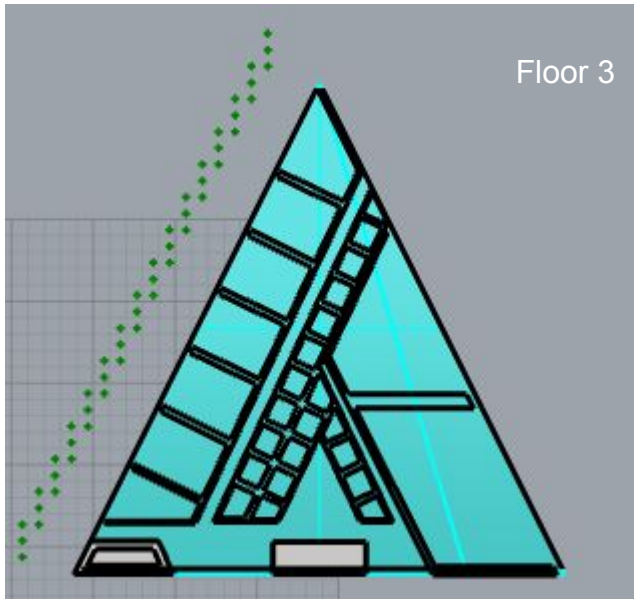


Floorplans: Office spaces

Flexible office layout on upper floors

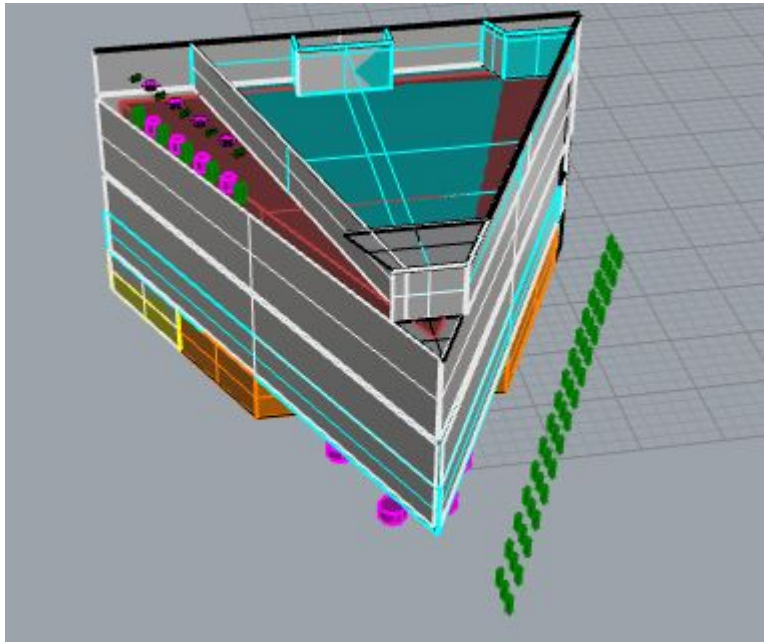


private work rooms, conference rooms

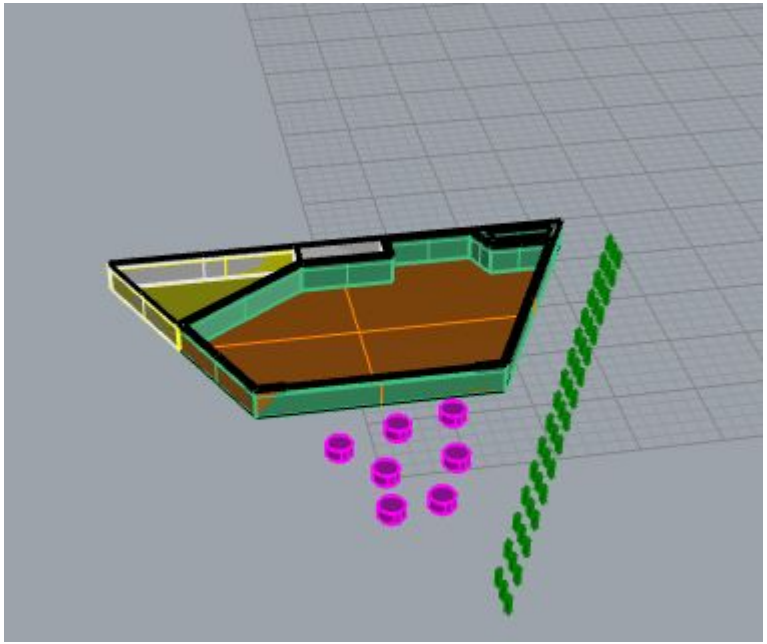


Floorplans: Auxiliary spaces

Split auditorium for 1 large or 2 medium lecture halls with work-friendly open balcony space



Small ground-level cafe, outdoor eating area, and reception area



Environmental Concept

Naturally ventilated open office floors

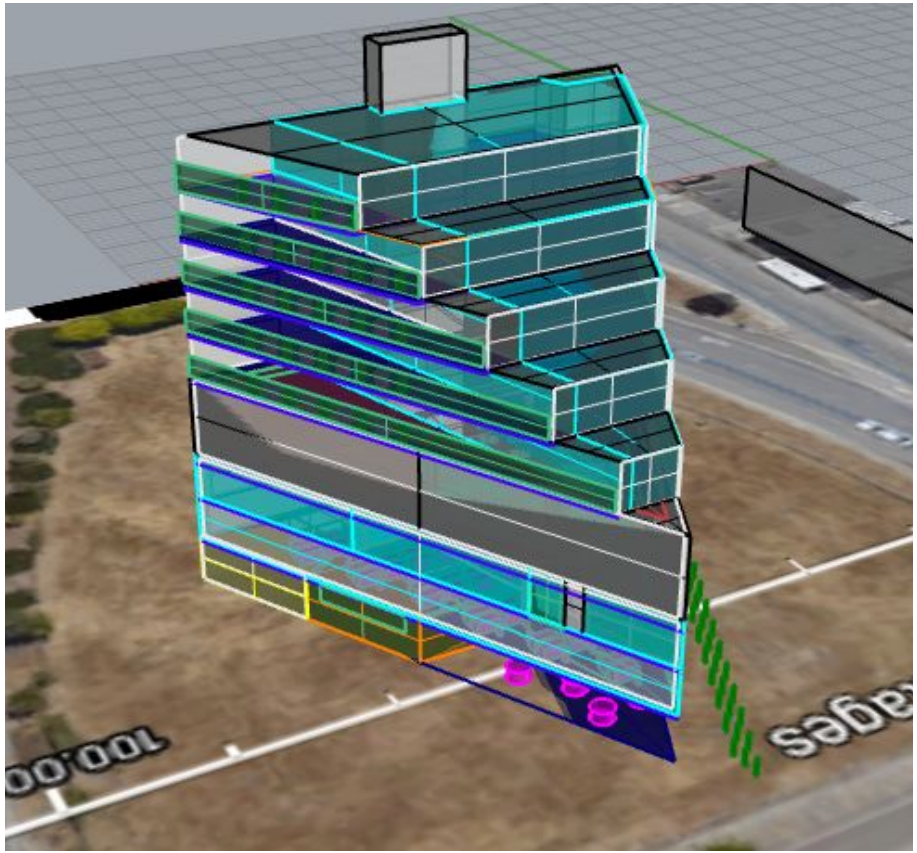
Shorter floor:height distance for non-open private/conference rooms on 3rd floor for reduced heating/cooling loads

Low LPD

Enthalpy heat recovery in cafe

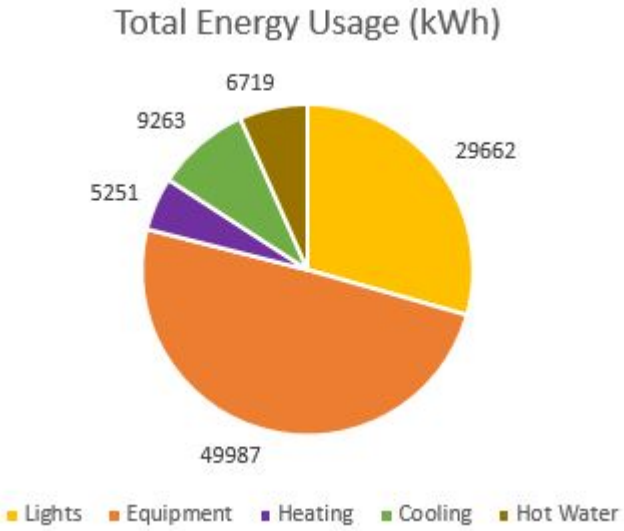
Ground pump heating/cooling

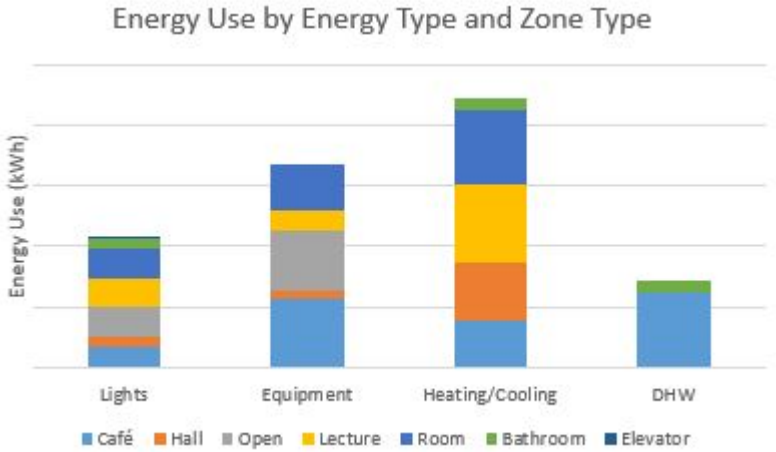
Greenery on balconies and ground-level eating area to provide background noise (sound privacy) and shade from sun/wind



Energy Performance

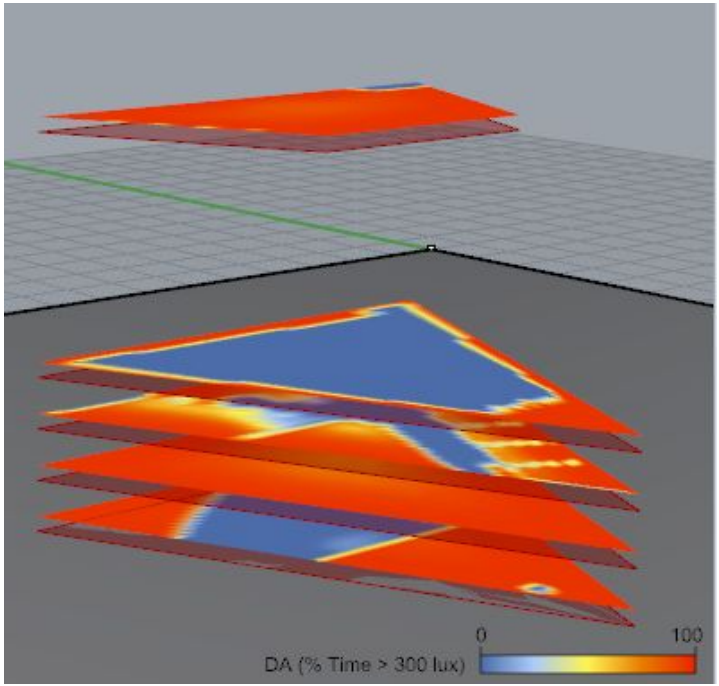
108 Total EUI, significant savings by lowering LPD



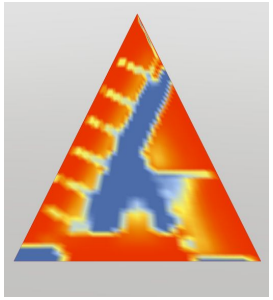


Daylighting

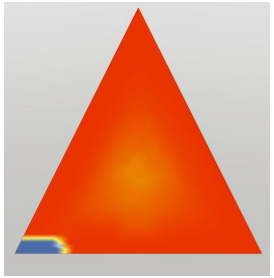
either 100% or 0% daylight autonomy



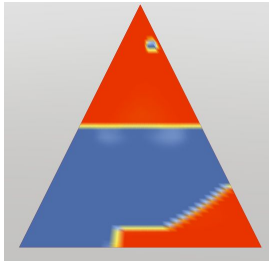
Floor 3 (individual/conference rooms)
$sDA_{300,50\%}$ = 66.9%



Floor 2 (open office)
$sDA_{300,50\%}$ = 97.8%

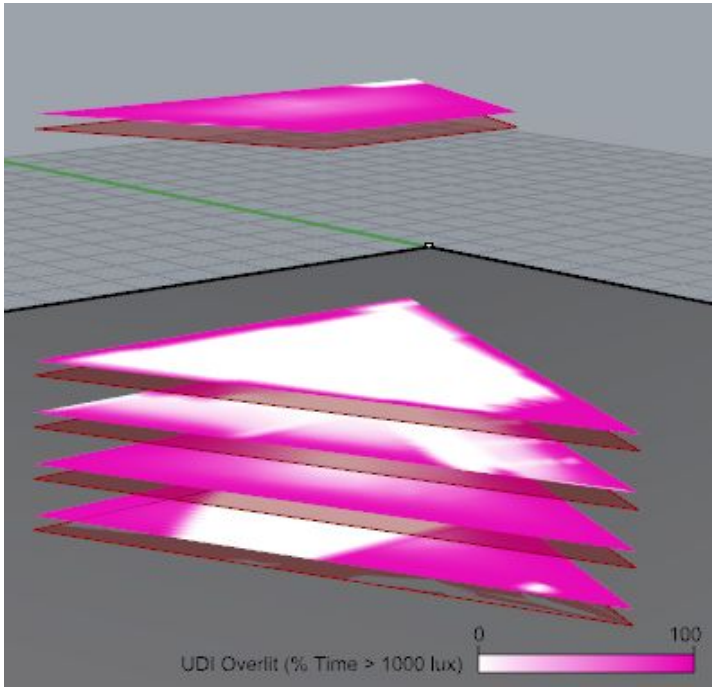


Floor 1 (cafe/reception)
$sDA_{300,50\%}$ = 39.6%

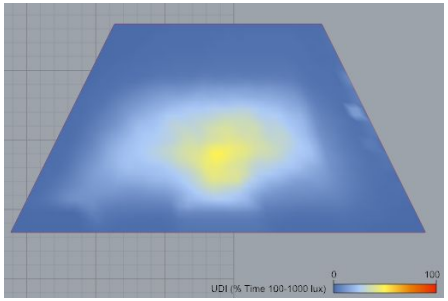


Daylighting

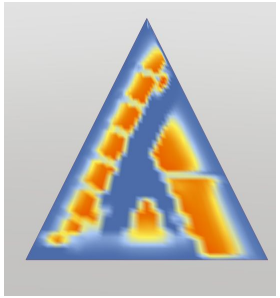
too much glare



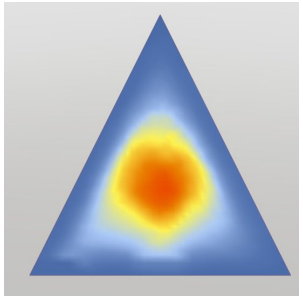
Floor 8 (open office)
Avg $UDI_{100\text{-}2000}$ = 32.3%



Floor 3 (individual/conference rooms)
Avg $UDI_{100\text{-}2000}$ = 42.6%



Floor 2 (open office)
Avg $UDI_{100\text{-}2000}$ = 45.3%



Future improvements

Reduce glare (opaque roof, increase depth on side balcony, reduce interior reflectance, distribute the private work rooms across all floors)

Add rooftop PV or rooftop garden for energy or water generation

Allow natural rise/circulation of hot air from cafe through upper levels
Add cross ventilation of naturally ventilated spaces

Reduce plug loads through energy efficient appliances

Conclusion

Designed a mixed-use office/commercial building near San Francisco

Designed for the sunny, temperate climate

> glass facade for lighting and solar heating

> natural ventilation for cooling and air quality

> useful balcony space as non-controlled work area

Met goal of 108 EUI, but had too much glare

> Additional improvements might reduce glare and reduce EUI further

References

https://www.dezeen.com/2016/12/03/salmela-architect-office-building-minneapolis-advertising-agency-fire-escape-balcony/