West Pierpont Ave. near 300 West and 200 south just north of Pioneer Park in Salt Lake City Utah was an excellent site choice for a multi resident housing complex with ground floor retail space. This area not only has nearby amenities but receives large amounts of direct winter daylight.

A main concept was to have high density and large amounts of daylight penetration into each unit. As found in previous design exercises by running windows across the unit's lengthwise daylight penetration could be increased. However this came at a cost of having low density as more footprint was needed to have good amounts of direct daylight. By opening one wall completely with floor to ceiling glass large amounts of daylight penetrates into the space even in walls that have a shorter length. The units are then oriented with the units facing East South and West with the majority of units on the south façade.

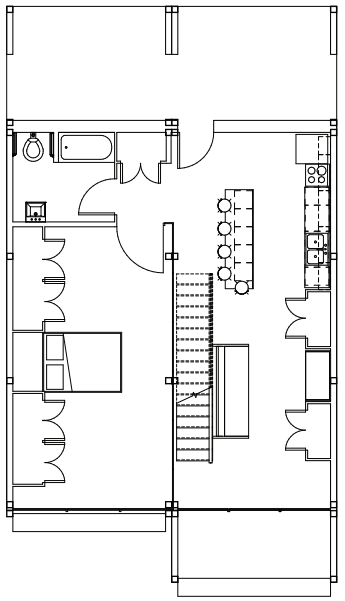
This creates an ideal opportunity to use concrete floors as a thermal mass for passive heat gain. Covered privacy balconies provide protection from the summer sun. But operational louvers help to protect from sun throughout other summer months, control glare, and at night can be closed to provide an extra thermal and wind barrier. It is critical that Schöck Isokorb® type S. for steel structures are used. Having a continuous tube steel structure penetrate the wall assembly would cause MASSIVE heat loss due to thermal bridging. While private balconies and interior floors are tile on concrete for passive thermal properties, walkways are tile on XPS to create a structural acoustical barrier.

The green roof acts as a regulating thermal mass keeping the roof cool during hot summer days and acting as insulation during winter months and provides opportunity for a storm water collection system.

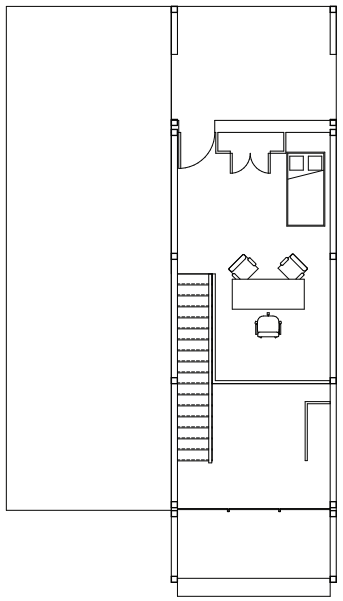
Using Equest it became apparent that due to the high amount of glass, energy efficient glass was critical. Because covered balconies are an integral part of the initial design they are included in the Baseline run. After playing with several energy efficiency measurements it was found that by combining triple pain low e glass, as well as thicker roof and exterior wall insulation the heating costs dropped by nearly half. The most substantial change from the three energy saving measures was from the change in glass type.

Pre-Fabricated units are shipped to site Then stacked each unit acts as a space frame truss each shared wall only has contact structurally with other units at the corners. Each floor is separate from adjacent ceiling this system helps create acoustical barriers and helps prevent thermal bridging through structure. Sound is also impeded by use of resilient bars, and other barriers like closets plumbing walls and batt insulation. Large holes cannot be made in tube steel frame: stacks, plumbing, electrical and gas are brought up through a C-channel Gyp. wall. Tank-less water heaters are placed under sinks. Small individual air heating and cooling units are used in each room.

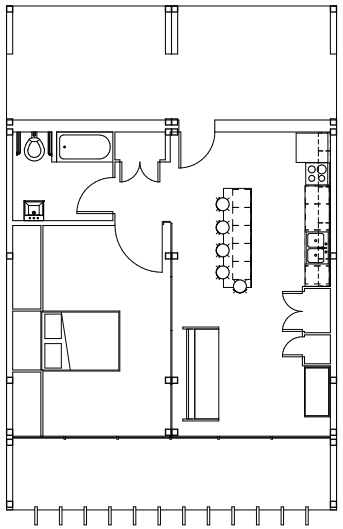
Due to the split nature of the building, for vertical transport it I suggest 2 cars @ 2000 lb. Capacity 200 fpm the primary reason to use two low end lift systems instead of one high end cart is because the building is disconnected and needs vertical transport in two opposite corners.



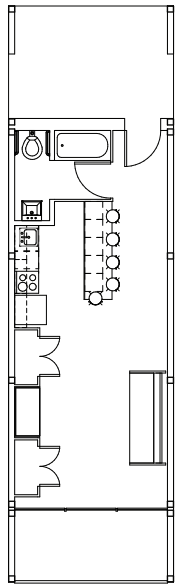
1- Two Bedroom



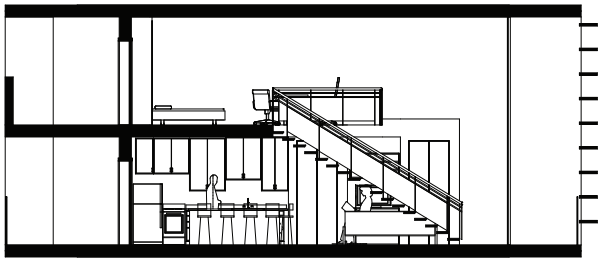
2- Two Bedroom Level 2



3- One Bedroom



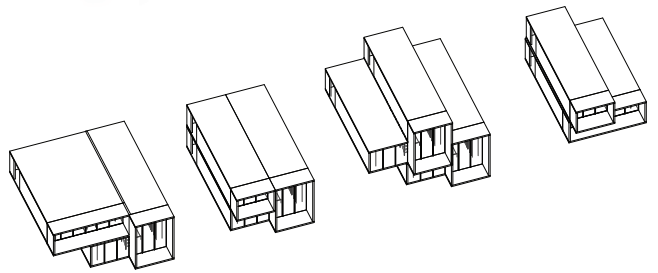
4- Micro Unit



5- Three Bedroom Section

6- Two, One, Micro.

Pre-Fabricated units are shipped to site Then stacked each unit acts as a space frame truss each shared wall only has contact structurally with other units at the corners. Each floor is separate from adjacent ceiling this system helps create acoustical barriers and helps prevent thermal bridging through structure



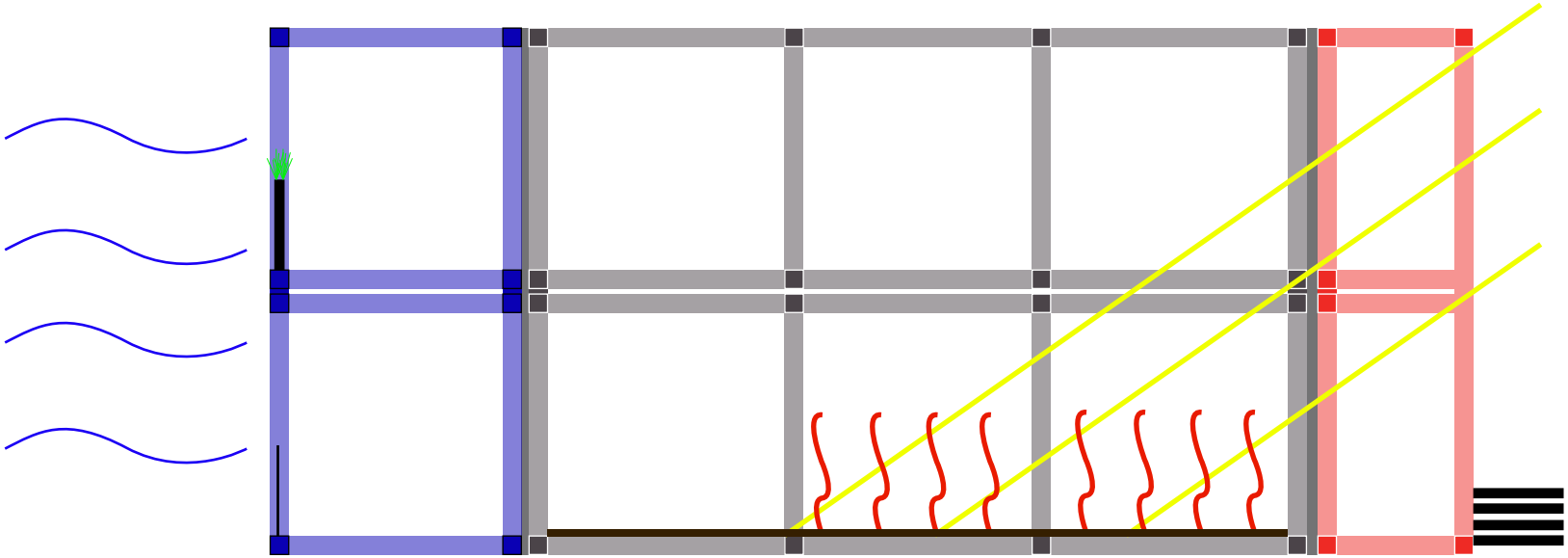
7- Adjcent On Top One,Two Micro,Two

# Winter

# Summer

Winter Solstace

Daylight Only Light Source



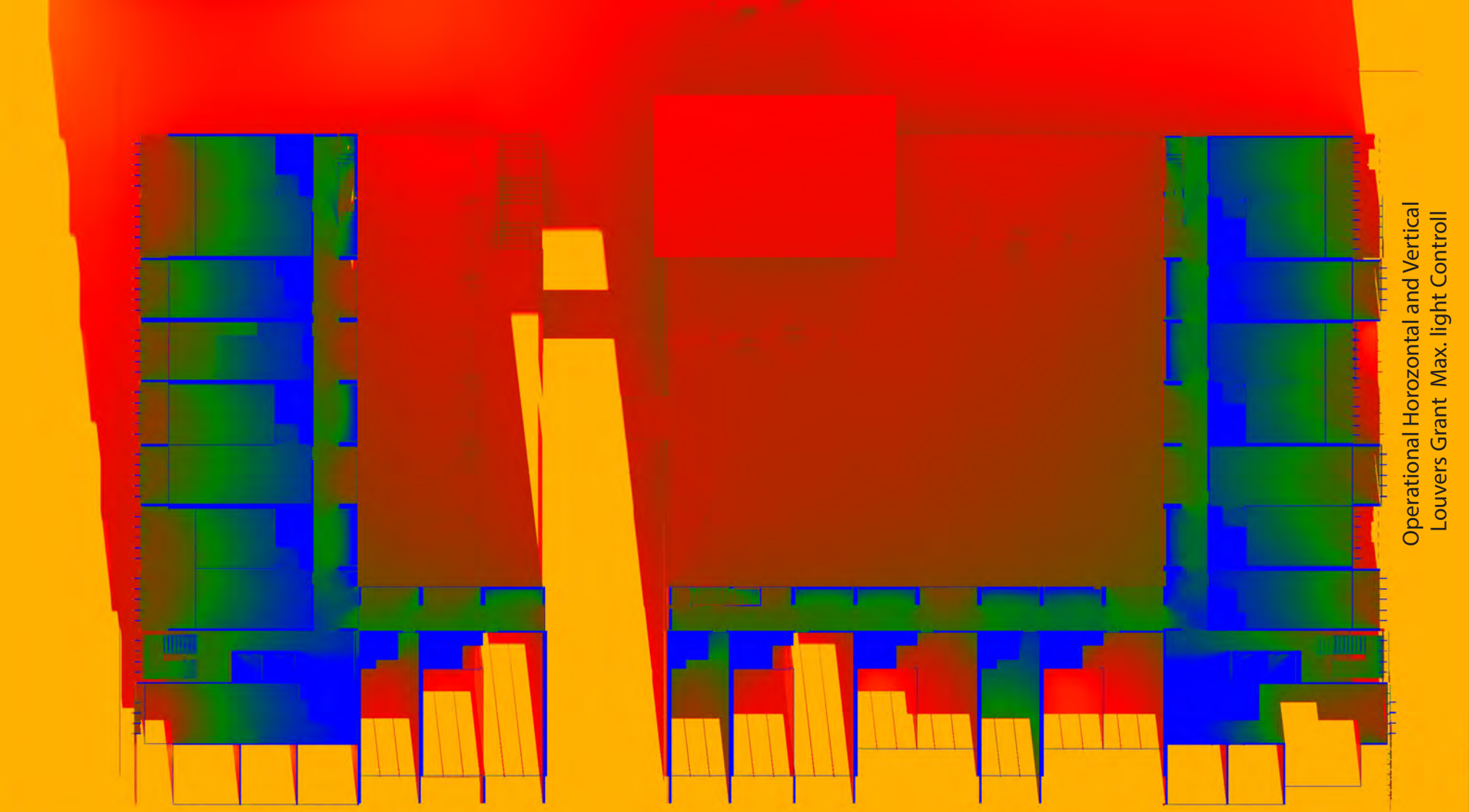
Guard Rails Protect From Wind

No Thermal Bridge

3.5″Thick floor Ideal Solar Heat Gain

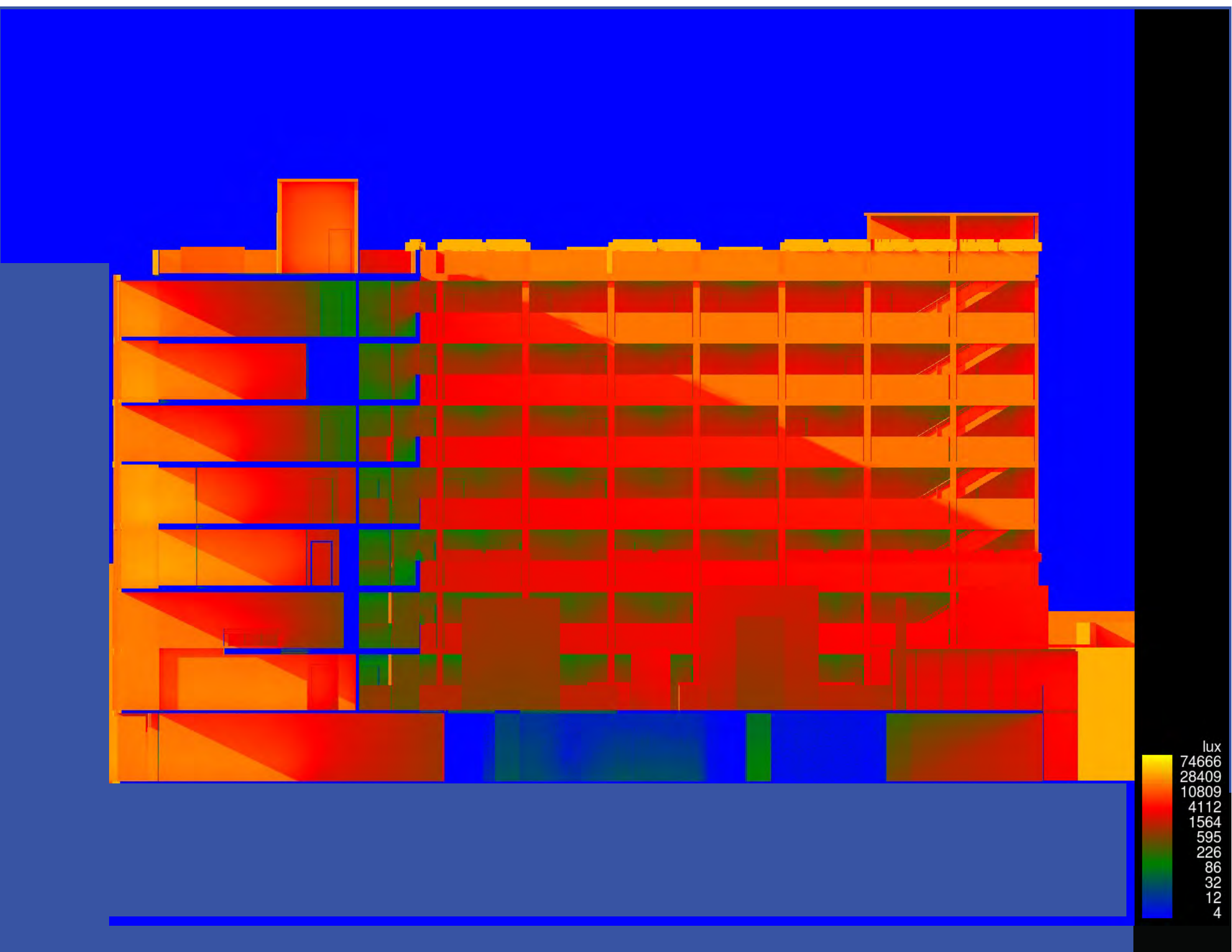
No Thermal Bridge

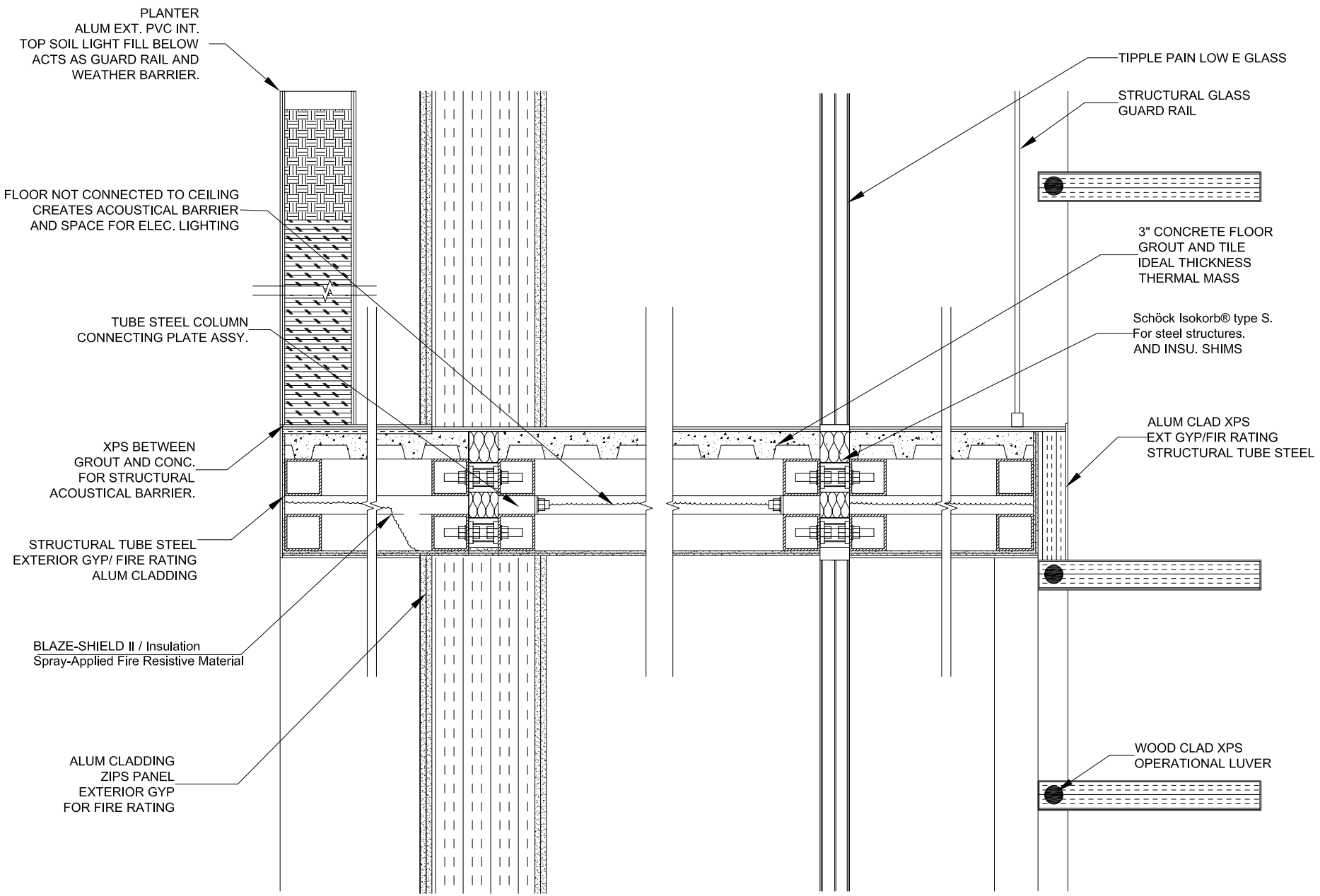
Balcony Gives Solar Protection
From Summer Sun



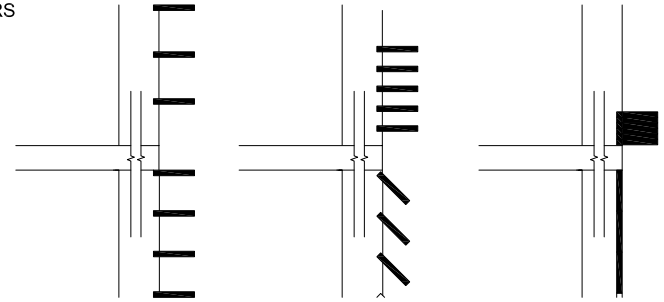

## Floor to Ceiling Glass Allows For Lots of Direct Daylight

A main concept was to have high density and large amounts of daylight penetration into each unit. As found in previous design exercises by running windows across the unit's lengthwise daylight penetration could be increased. However this came at a cost of having low density as more footprint was needed to have good amounts of direct daylight. By opening one wall completely with floor to ceiling glass large amounts of daylight penetrates into the space even in walls that have a shorter length. The units are then oriented with the units facing East South and West with the majority of units on the south façade.

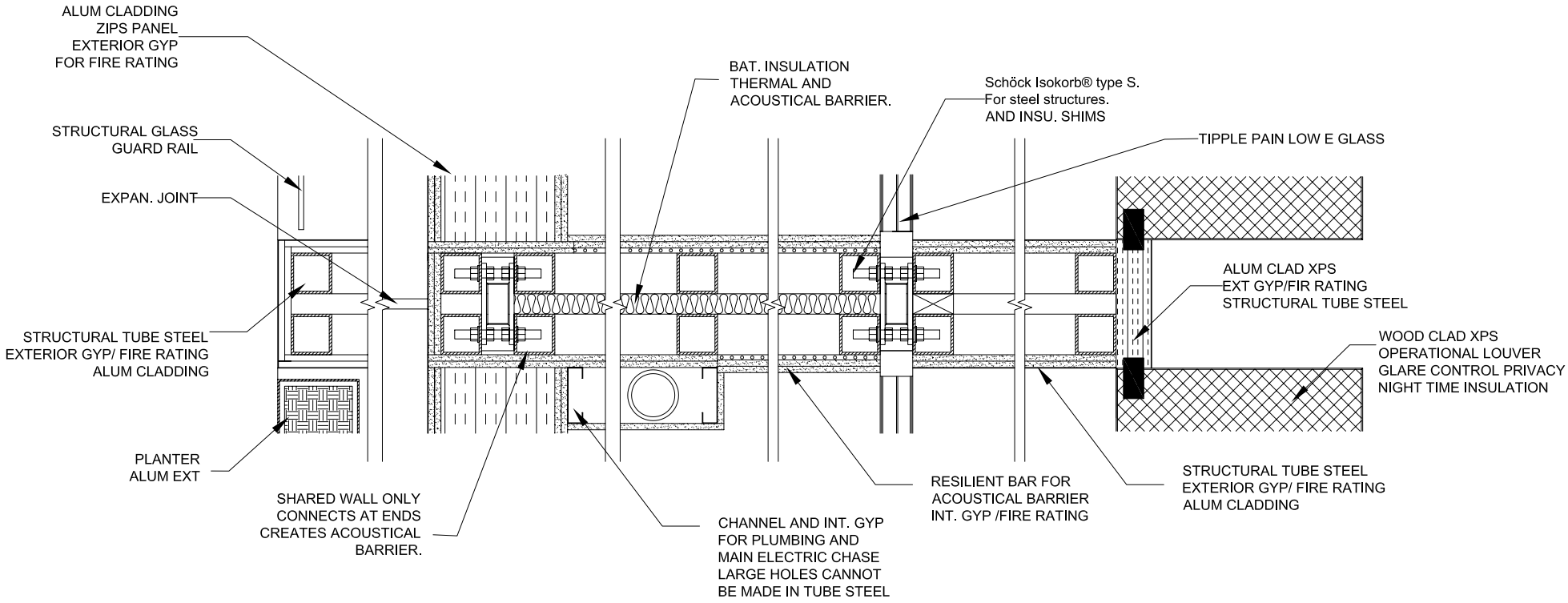

lux
74666
28409
10809
4112
1564
595
226
86
32
12
4

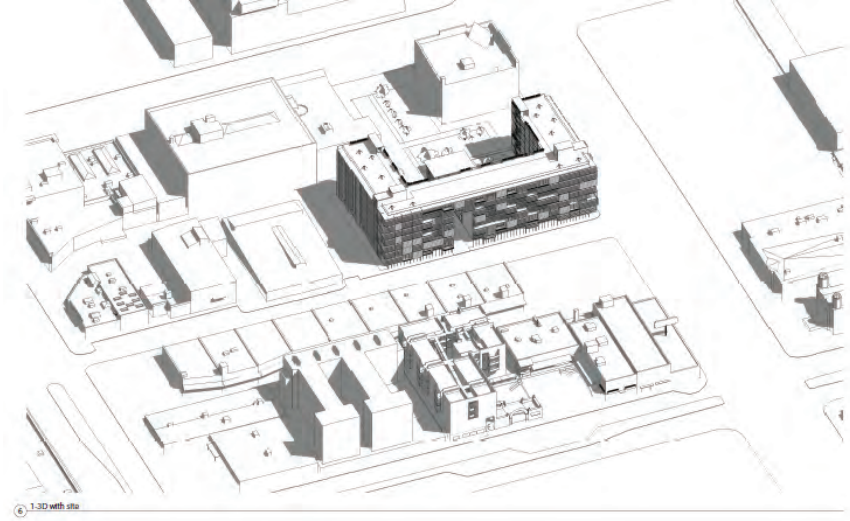

PLANTER
ALUM EXT. PVC INT.
TOP SOIL LIGHT FILL BELOW
ACTS AS GUARD RAIL AND
WEATHER BARRIER.
FLOOR NOT CONNECTED TO CEILING
CREATES ACOUSTICAL BARRIER
AND SPACE FOR ELEC. LIGHTING
TUBE STEEL COLUMN
CONNECTING PLATE ASSY.
XPS BETWEEN
GROUT AND CONC.
FOR STRUCTURAL
ACOUSTICAL BARRIER.
STRUCTURAL TUBE STEEL
EXTERIOR GYP/ FIRE RATING
ALUM CLADDING
BLAZE-SHIELD II / Insulation
Spray-Applied Fire Resistive Material
ALUM CLADDING
ZIPS PANEL
EXTERIOR GYP
FOR FIRE RATING
TIPPLE PAIN LOW E GLASS
STRUCTURAL GLASS
GUARD RAIL
3" CONCRETE FLOOR
GROUT AND TILE
IDEAL THICKNESS
THERMAL MASS
Schöck Isokorb® type S.
For steel structures.
AND INSU. SHIMS
ALUM CLAD XPS
EXT GYP/FIR RATING
STRUCTURAL TUBE STEEL
WOOD CLAD XPS
OPERATIONAL LUVER

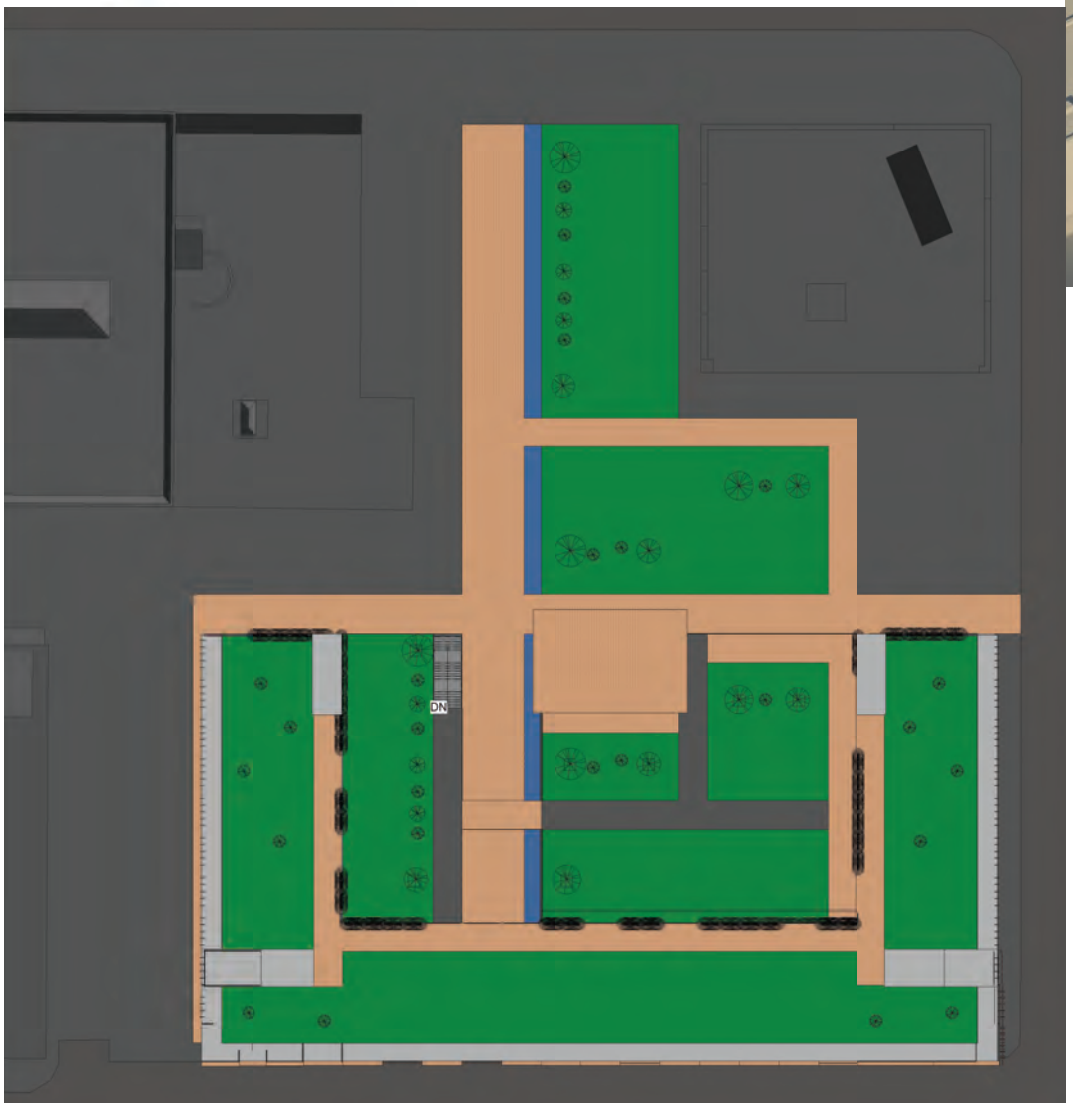
OPERATIONAL EXT. LOUVERS



. Large holes cannot be made in tube steel frame: stacks, plumbing, electrical and gas are brought up through a C-channel Gyp. wall. Tank-less water heaters are placed under sinks. Small individual Air heating and cooling units are used in each room.

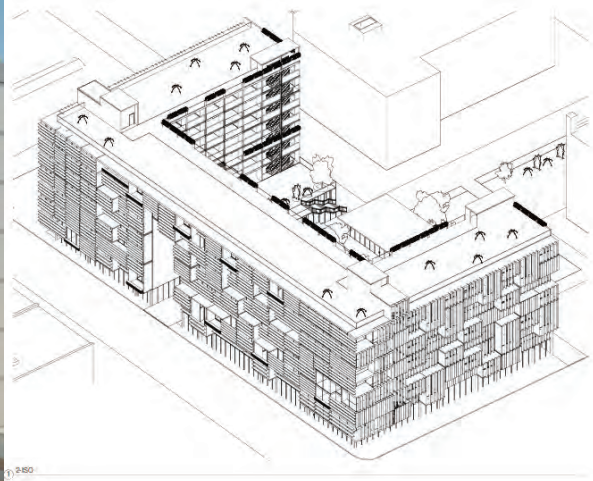





N

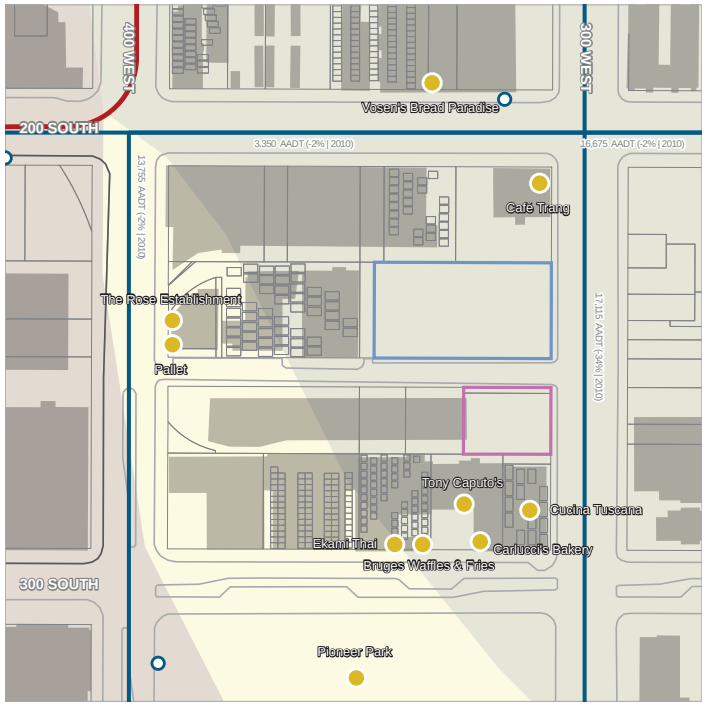
The green roof acts as a regulating thermal mass keeping the roof cool during hot summer days and acting as insulation during winter months and provides opportunity for a storm water collection system.



# Site Analysis

Group Work Main Contributor : Joseph Briggs

## SITE ANALYSIS




### SITE ONE

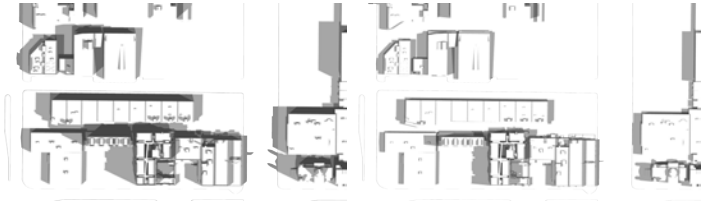
| | |
|---|---|
| Owner: | Greek Orthodox Church of Salt Lake |
| Value: | $895,200 |
| Acres: | 1.16 |
| $/SF: | $18 |
| Soil: | Alluvial Fan and Debris Fan Deposits |
| Zoning: | D-3 |

### SITE TWO

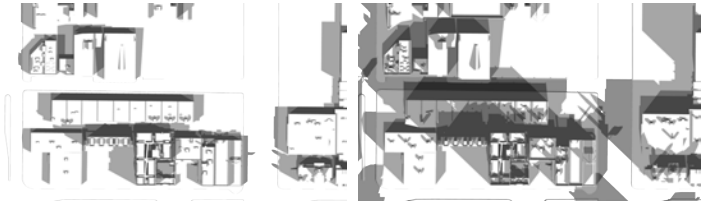
| | |
|---|---|
| Owner: | Tire Town Phase I, LLC |
| Value: | $357,500 |
| Acres: | 0.39 |
| $/SF: | $21 |
| Soil: | Alluvial Fan and Debris Fan Deposits |
| Zoning: | D-3 |

Closest Grocery Store: Harmons | 135 E 100 S | 0.85 miles away
Washington Elementary School | 420 N 200 W | 1.25 miles away
Bryant Middle School | 40 S 800 E | 2.15 miles away
West High School | 241 N 300 W | 0.75 miles away

### SHADOW STUDIES

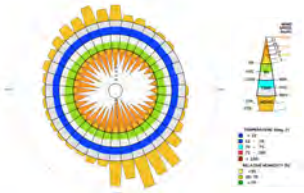


Vernal Equinox | Summer Solstice

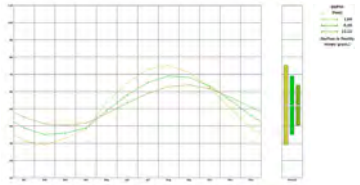


Autumnal Equinox | Winter Solstice

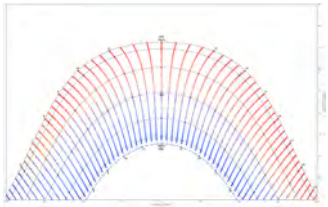
### ENVIRONMENTAL



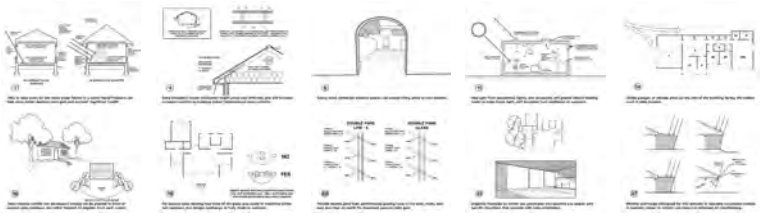
Annual Wind Rose



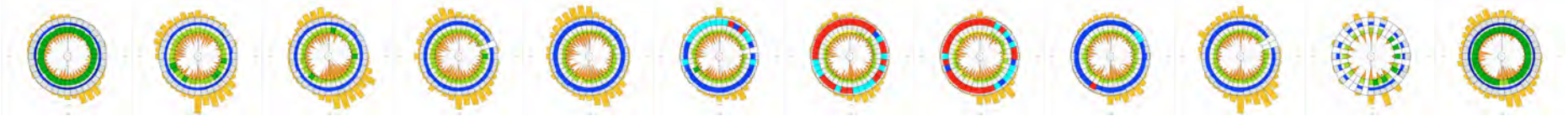
Ground Temperature



Sun Shading Chart

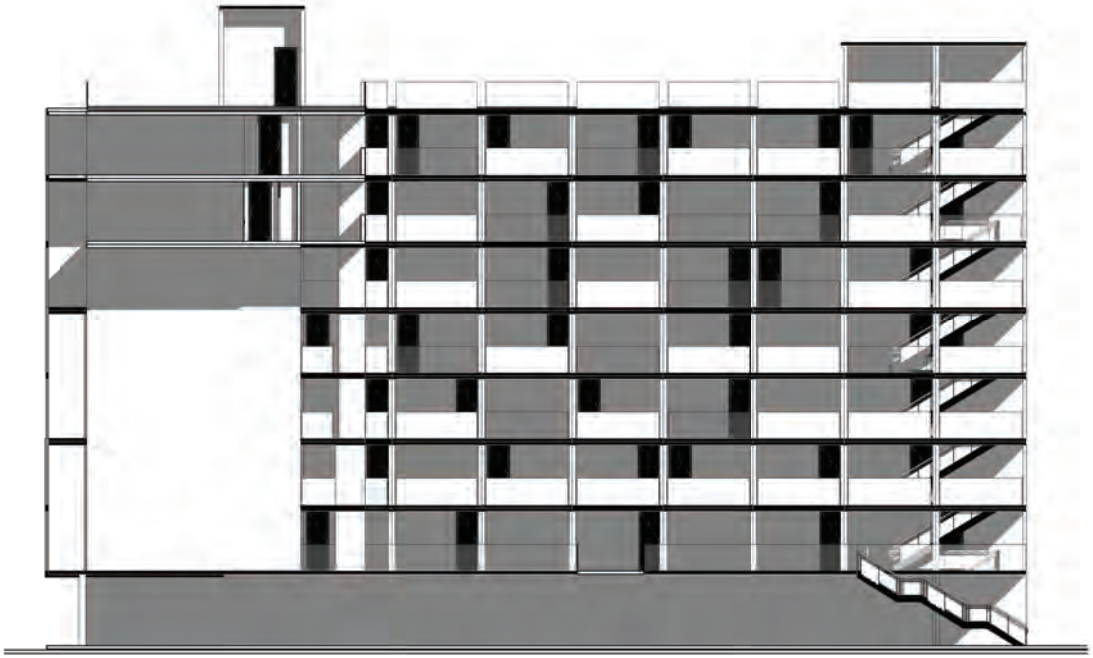


Design Guidelines

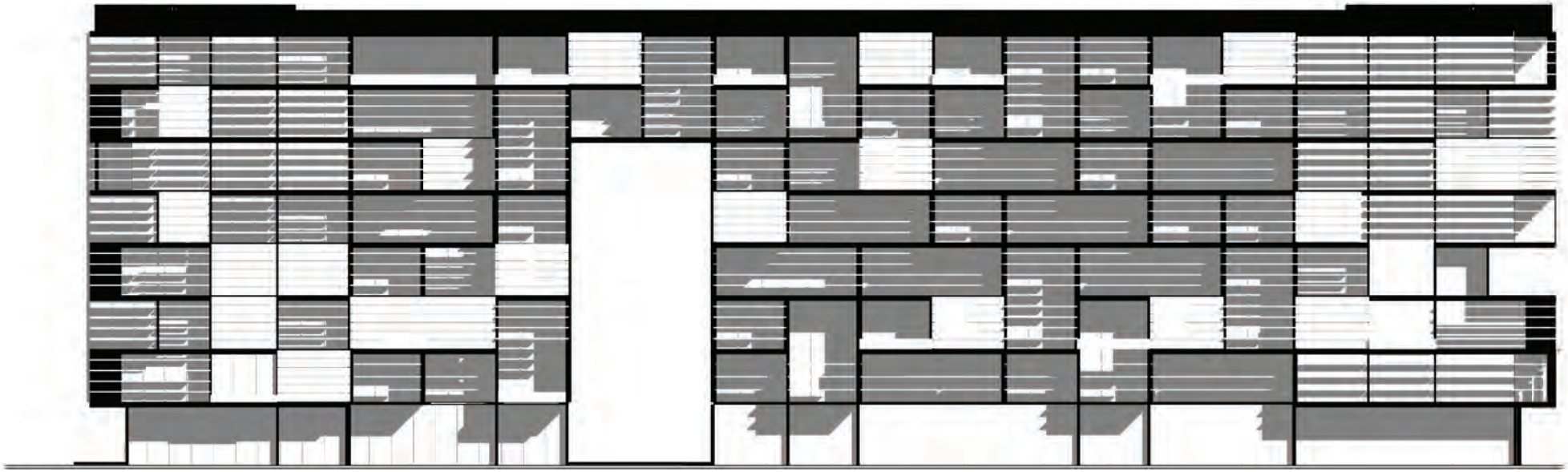


January | February | March | April | May | June | July | August | September | October | November | December

# Facade Studies Focusing on Shadow

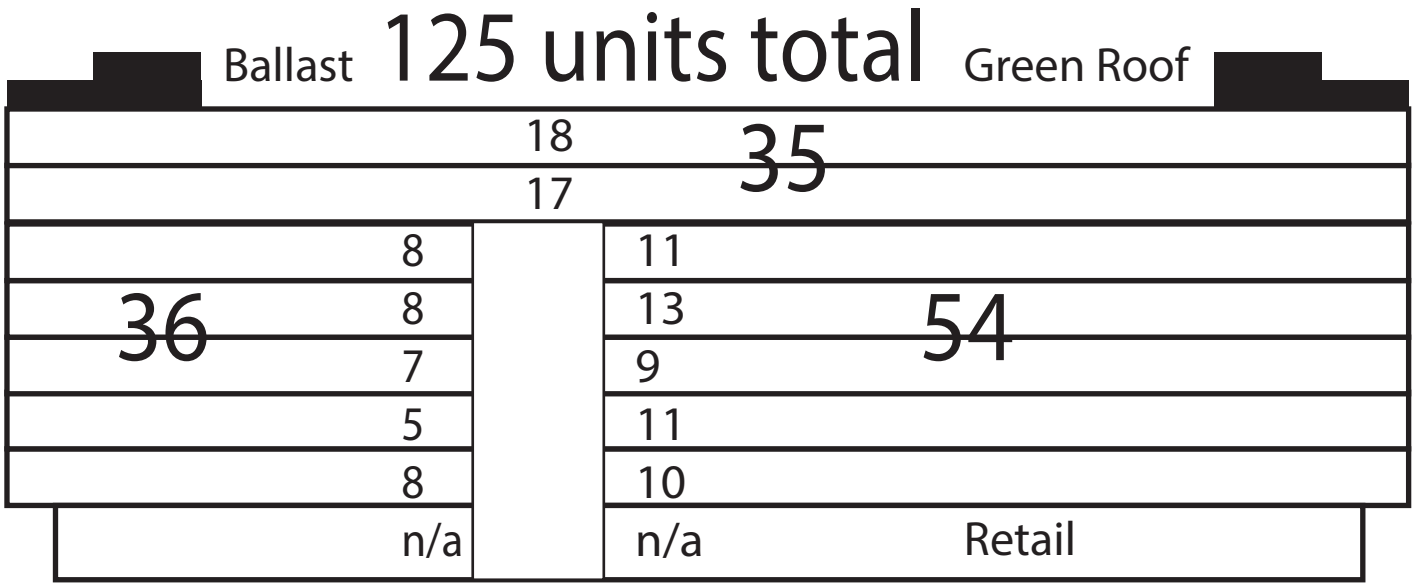


8 2-West Middle Study



7 1-South study

Suggested Car
2 Cars@ 2000 lb Capacity 200 fpm
Recommended for 75-125' Buildings




Micro Unit 1 person avg
1 Bed 2 person avg
2 Bed 3 person avg

Moderate-rental housing
2.0 avg per bedroom

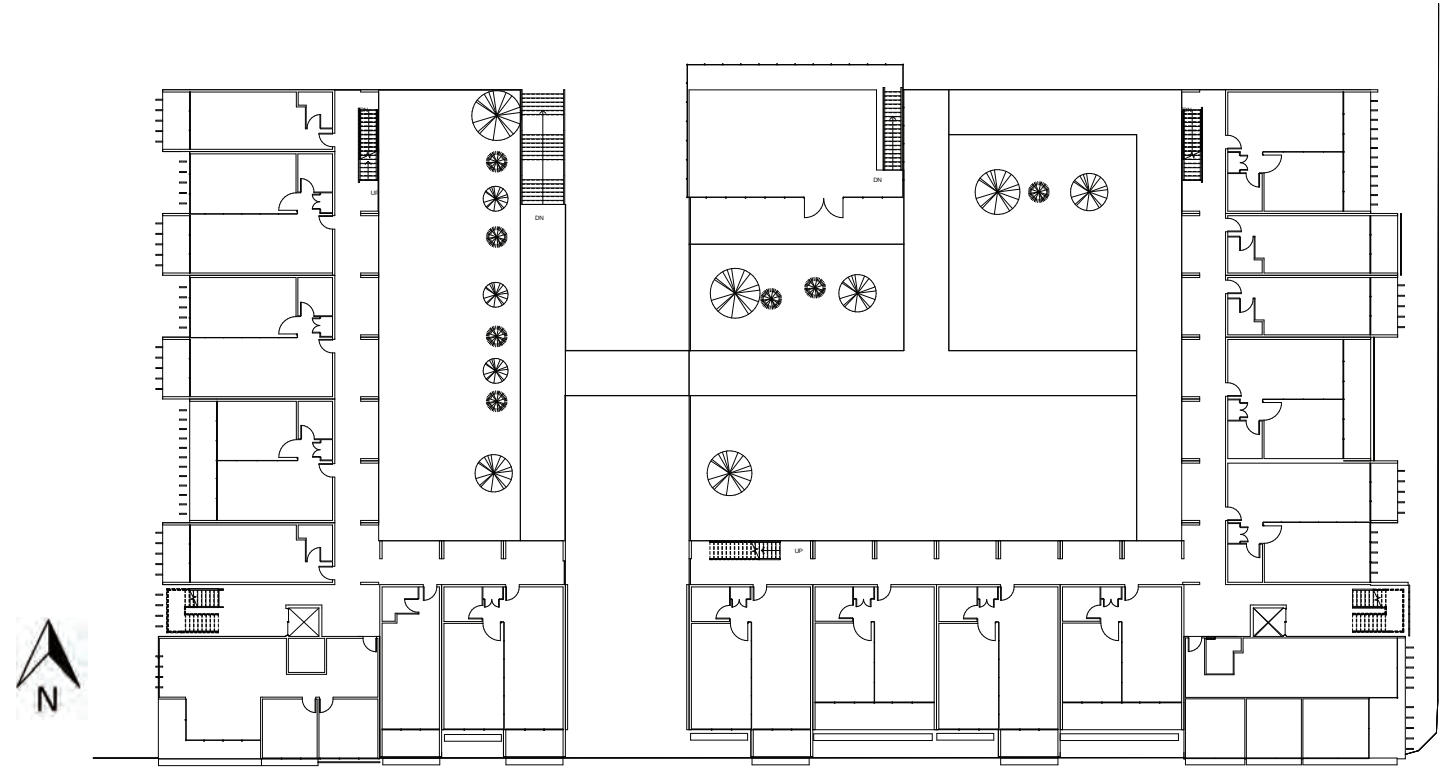
125 units @ 2ppl/unit
250 Residents
Percent Handling Capacity
Moderate-rental housing 8%/5min
Due to Work/School Rush

Recommended Wait Time 36–48 sec
Handling Capacity 20ppl/5min

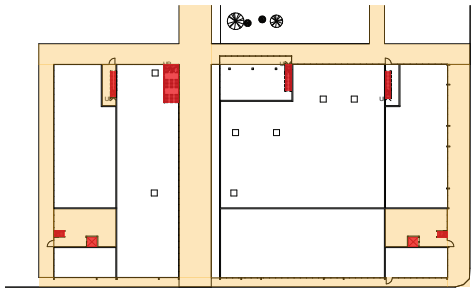
Lobby+7floors+Roof=9 Floors = 95'
Normal load 10persons @ 2000 fpm
10 ft floor to floor avg = approx 70 sec/trip
140 sec round trip = approx 21ppl/5min
Wait time 60% of Interval

1 Elev. has PHC needed but
unacceptable wait time of 84 sec.
Due to Split/Gate in Building 2 Elev Required
2 Elev. has two times PHC needed
and sufficiant wait time of 42 sec.

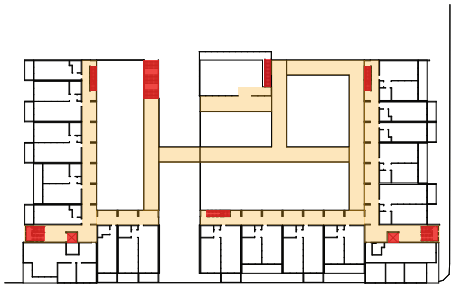
# Circulation & Vertical Transportation



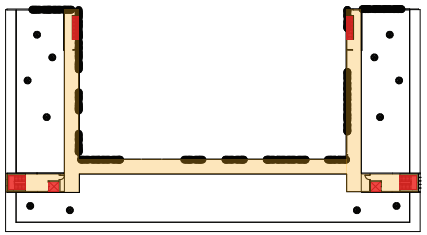

1-Level 1



3-Retail



2-Circulation



4-Roof

# Appendix a.

studio drawings  with very little climate and tech. control systems intigration

Drawing 1 of 1
Figure Ground
Modular to Site Concept

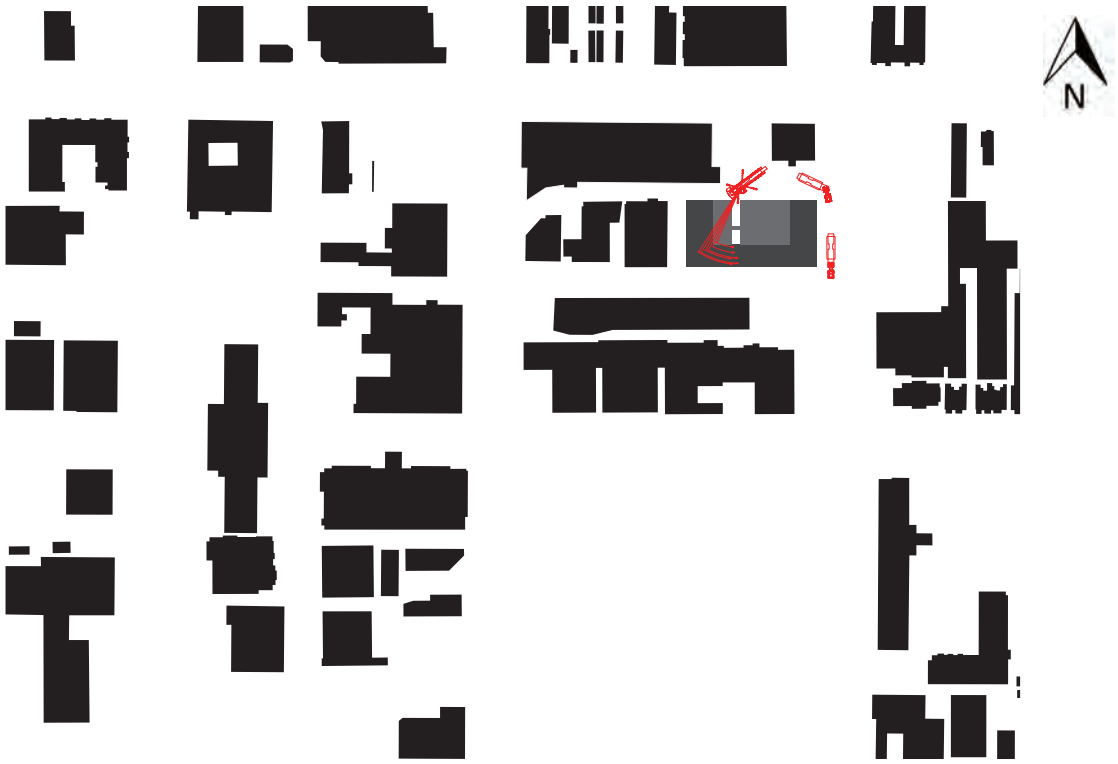



FIGURE GROUND

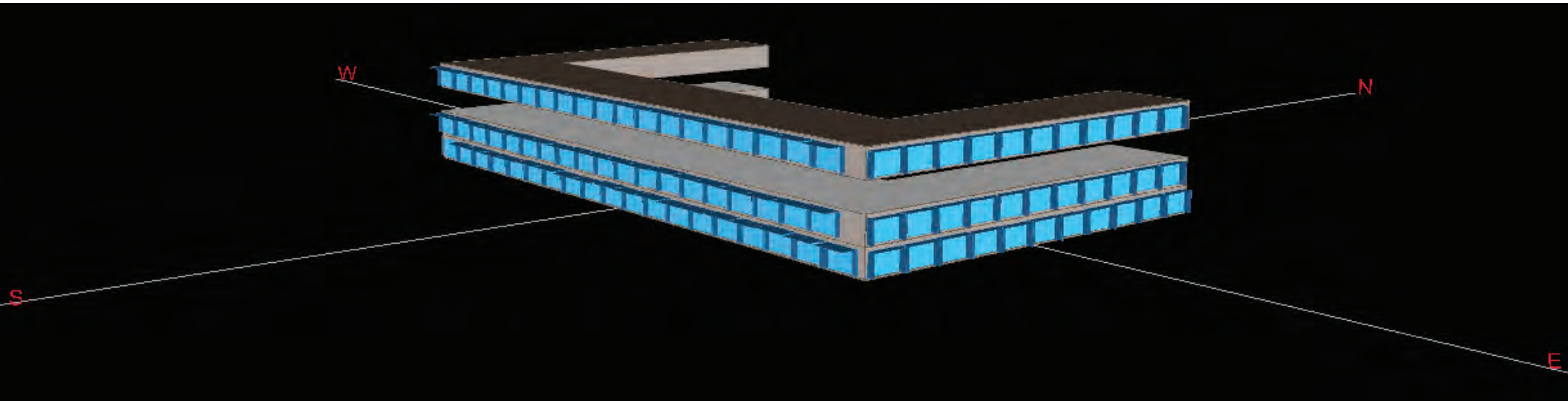
# Appendix b.1

A brief Equest printout that shows
some analysis using Equest.



3D Geometry

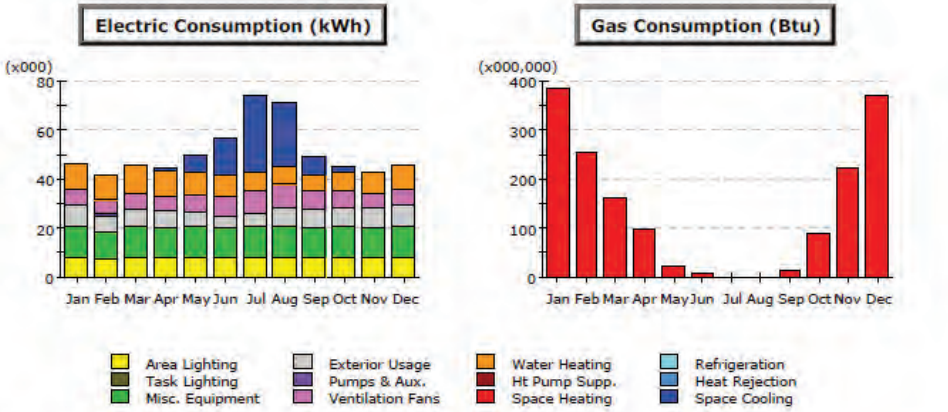
Using Equest it became apparent that due to the high amount of glass, energy efficient glass was critical. Because covered balconies are an integral part of the initial design they are included in the Baseline run. After playing with several energy efficiency measurements it was found that by combining triple pain low e glass, as well as thicker roof and exterior wall insulation the heating costs dropped by nearly half. The most substantial change from the three energy saving measures was from the change in glass type.



# Appendix b.2

Page 2 of 2
EEM Summary Reports









**Electric Consumption (kWh x000)**

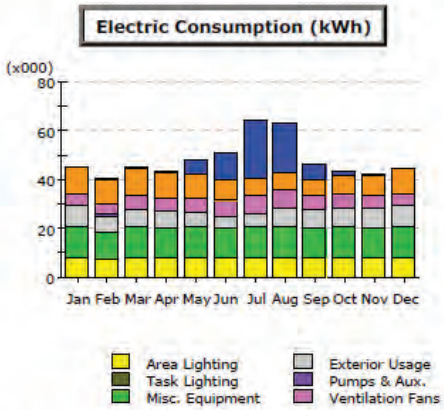
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Space Cool | 0.00 | 0.09 | 0.18 | 0.54 | 6.88 | 14.79 | 31.32 | 26.52 | 7.85 | 1.98 | 0.07 | - | 90.21 |
| Heat Reject. | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Refrigeration | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Space Heat | - | - | - | - | - | - | - | - | - | - | - | - | - |
| HP Supp. | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Hot Water | 10.61 | 10.06 | 11.24 | 10.69 | 9.81 | 8.38 | 7.69 | 7.08 | 6.79 | 7.54 | 8.05 | 9.71 | 107.64 |
| Vent. Fans | 6.78 | 5.89 | 6.32 | 6.05 | 7.21 | 7.74 | 9.26 | 8.92 | 6.96 | 6.41 | 6.30 | 6.58 | 84.41 |
| Pumps & Aux. | 0.11 | 0.09 | 0.08 | 0.06 | 0.02 | 0.01 | - | - | 0.02 | 0.05 | 0.09 | 0.11 | 0.65 |
| Ext. Usage | 8.35 | 6.60 | 7.31 | 7.07 | 5.41 | 5.24 | 5.41 | 8.00 | 7.74 | 8.00 | 8.08 | 8.35 | 85.55 |
| Misc. Equip. | 12.71 | 11.48 | 12.71 | 12.29 | 12.71 | 12.30 | 12.71 | 12.71 | 12.30 | 12.71 | 12.31 | 12.70 | 149.63 |
| Task Lights | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Area Lights | 7.95 | 7.23 | 8.00 | 7.66 | 8.01 | 7.71 | 7.95 | 8.01 | 7.71 | 7.96 | 7.86 | 7.90 | 93.95 |
| **Total** | 46.50 | 41.43 | 45.84 | 44.36 | 50.06 | 56.15 | 74.33 | 71.24 | 49.36 | 44.66 | 42.76 | 45.38 | 612.04 |

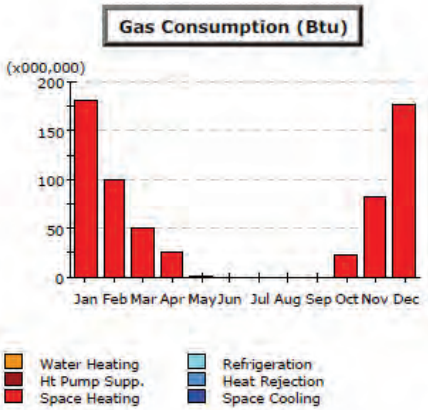
**Gas Consumption (Btu x000,000)**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Space Cool | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Heat Reject. | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Refrigeration | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Space Heat | 385.3 | 251.9 | 160.2 | 96.8 | 21.1 | 5.5 | - | - | 14.5 | 89.1 | 222.7 | 372.6 | 1,619.6 |
| HP Supp. | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Hot Water | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Vent. Fans | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Pumps & Aux. | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ext. Usage | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Misc. Equip. | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Task Lights | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Area Lights | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Total** | 385.3 | 251.9 | 160.2 | 96.8 | 21.1 | 5.5 | - | - | 14.5 | 89.1 | 222.7 | 372.6 | 1,619.6 |








**Electric Consumption (kWh x000)**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Space Cool | 0.07 | 0.33 | 0.37 | 0.75 | 5.66 | 11.14 | 23.04 | 19.90 | 5.52 | 2.08 | 0.31 | 0.01 | 70.18 |
| Heat Reject. | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Refrigeration | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Space Heat | - | - | - | - | - | - | - | - | - | - | - | - | - |
| HP Supp. | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Hot Water | 10.60 | 10.05 | 11.23 | 10.68 | 9.80 | 8.37 | 7.69 | 7.08 | 6.79 | 7.54 | 8.04 | 9.70 | 107.57 |
| Vent. Fans | 5.23 | 4.76 | 5.27 | 5.05 | 5.90 | 6.16 | 7.15 | 6.90 | 5.69 | 5.39 | 5.20 | 5.15 | 67.90 |
| Pumps & Aux. | 0.11 | 0.09 | 0.08 | 0.06 | 0.02 | 0.01 | - | - | 0.02 | 0.05 | 0.09 | 0.11 | 0.64 |
| Ext. Usage | 8.35 | 6.60 | 7.31 | 7.07 | 5.41 | 5.24 | 5.41 | 8.00 | 7.74 | 8.00 | 8.08 | 8.35 | 85.55 |
| Misc. Equip. | 12.71 | 11.48 | 12.71 | 12.29 | 12.71 | 12.30 | 12.71 | 12.71 | 12.30 | 12.71 | 12.31 | 12.70 | 149.63 |
| Task Lights | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Area Lights | 7.95 | 7.23 | 8.00 | 7.66 | 8.01 | 7.71 | 7.95 | 8.01 | 7.71 | 7.96 | 7.86 | 7.90 | 93.95 |
| **Total** | 45.01 | 40.53 | 44.96 | 43.56 | 47.52 | 50.92 | 63.95 | 62.60 | 46.75 | 43.73 | 41.89 | 43.92 | 575.40 |

**Gas Consumption (Btu x000,000)**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Space Cool | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Heat Reject. | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Refrigeration | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Space Heat | 180.85 | 99.93 | 50.18 | 24.34 | 0.94 | 0.05 | - | - | 0.66 | 22.46 | 82.59 | 176.67 | 638.66 |
| HP Supp. | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Hot Water | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Vent. Fans | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Pumps & Aux. | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ext. Usage | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Misc. Equip. | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Task Lights | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Area Lights | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Total** | 180.85 | 99.93 | 50.18 | 24.34 | 0.94 | 0.05 | - | - | 0.66 | 22.46 | 82.59 | 176.67 | 638.66 |

# MICHAEL BLACK

## Pierpont Plaza Place