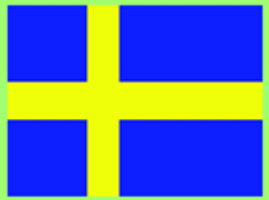
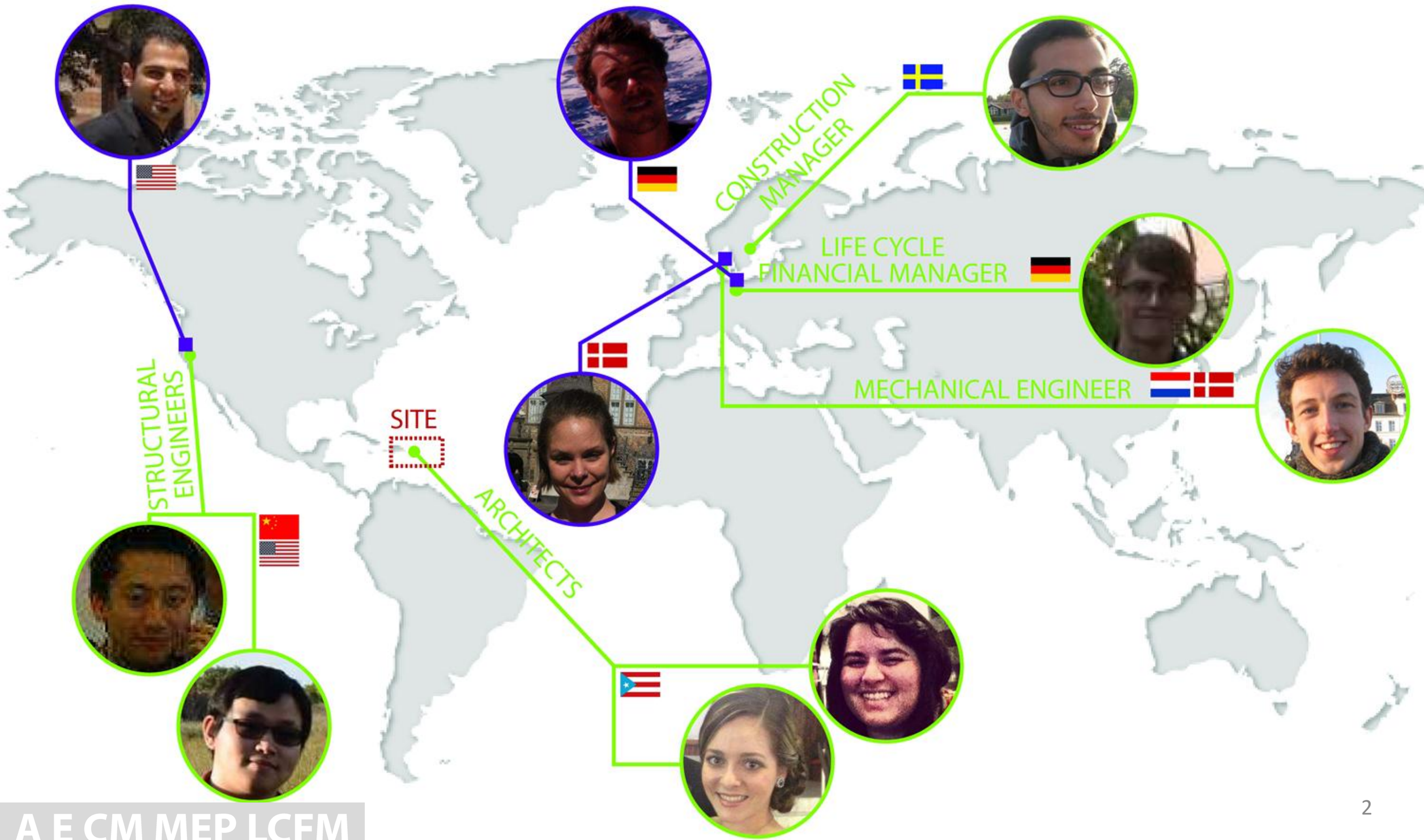



ISLAND TEAM 2013

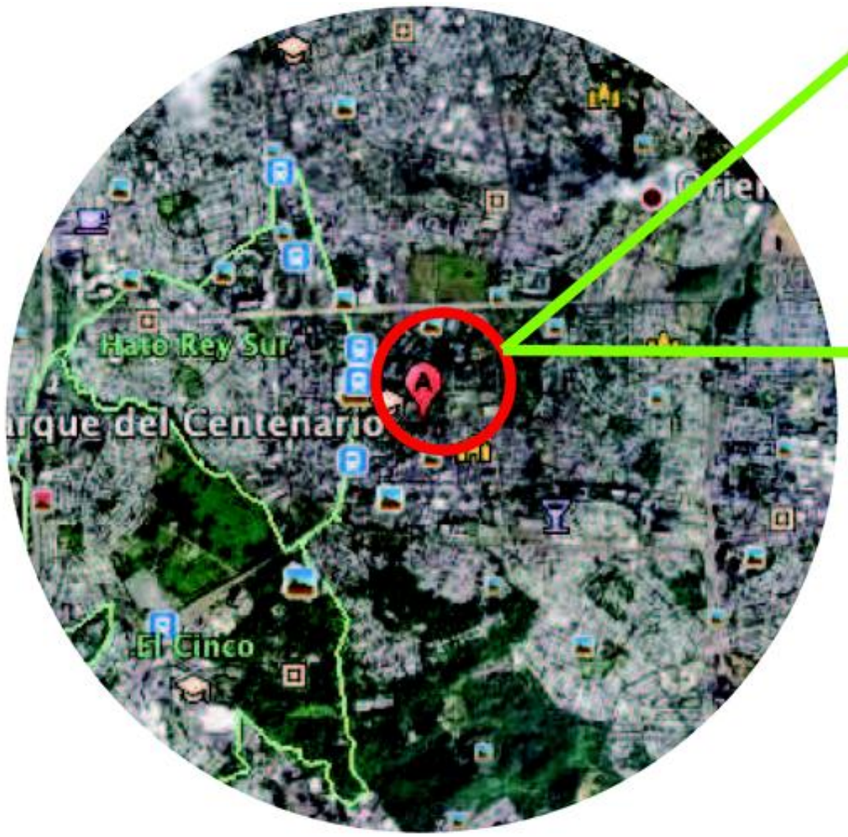




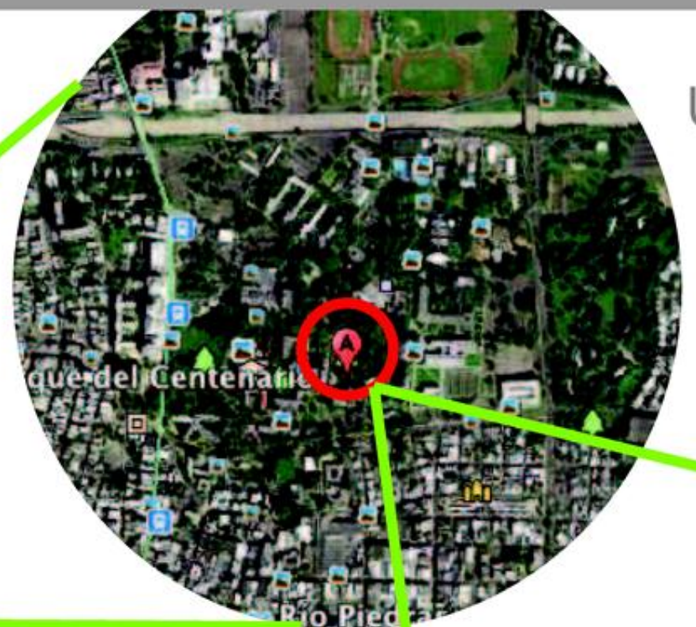
ARCHITECTS	ANA SOFÍA CARDONA JOANNE MUNIZ
STRUCTURAL ENGINEERS	NANYU ZHAO STEVEN SHUHUI QU
MECHANICAL ENGINEER	REINIER KOK
CONSTRUCTION MANAGER	KOUROSH SALEHZADEH
LIFE CYCLE FINANCIAL MANAGER	FELIX BOLUWHAN



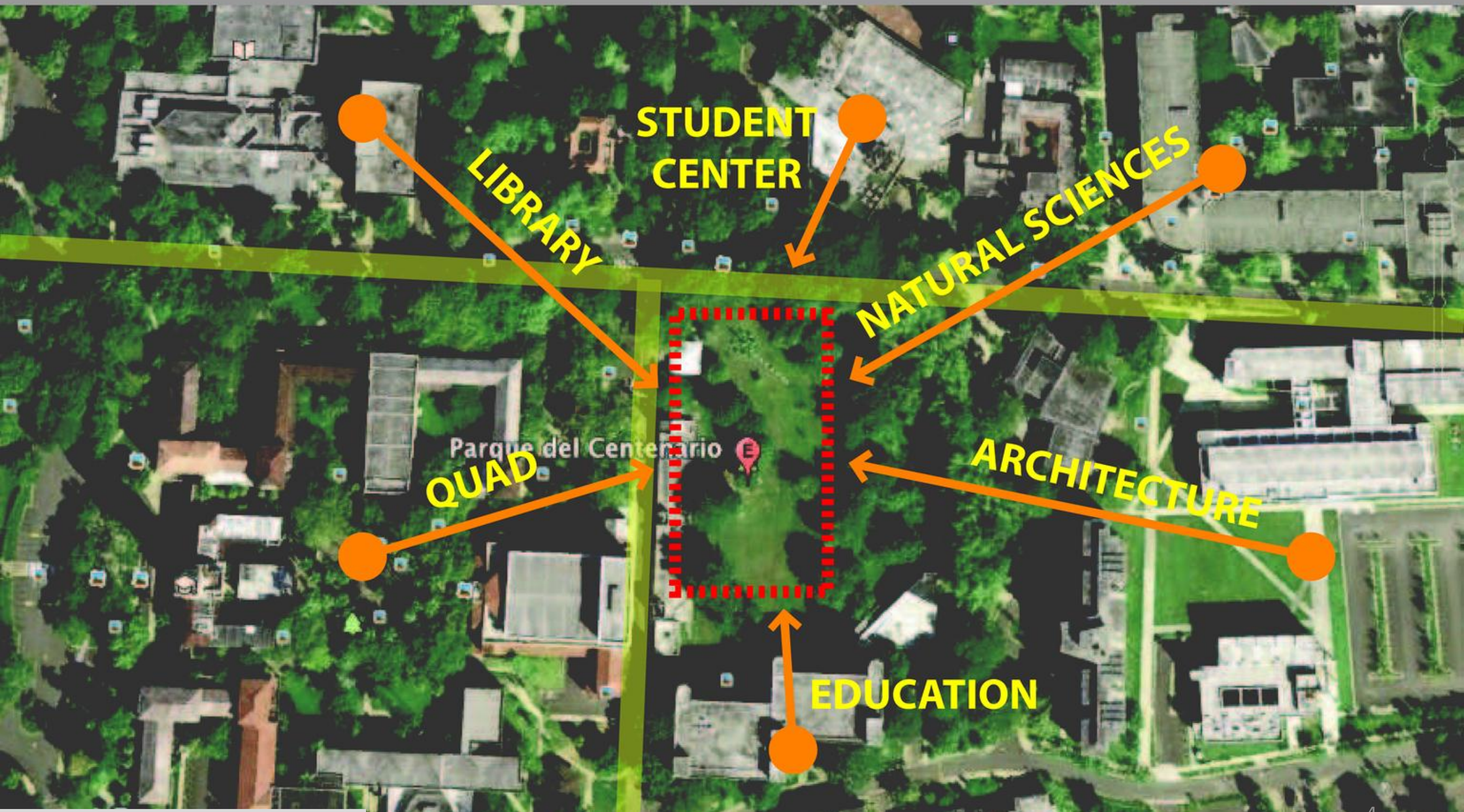
A E CM MEP LCFM



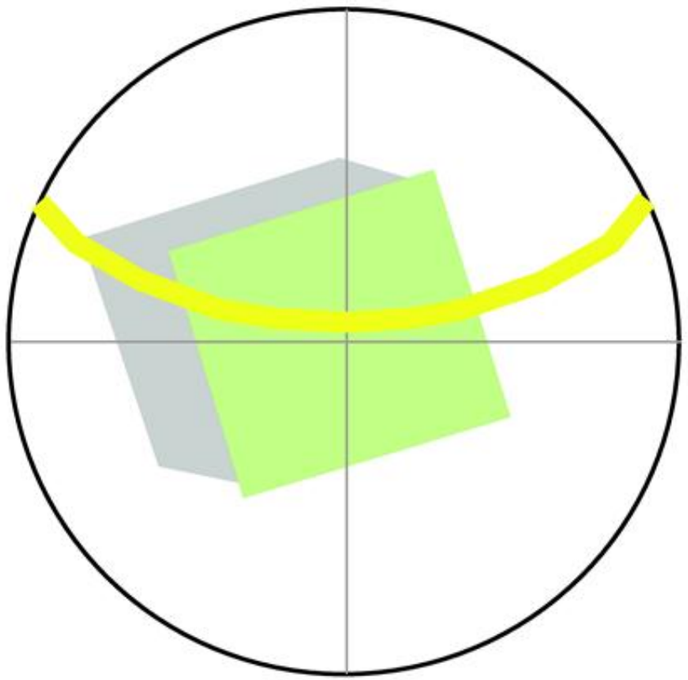
METROPOLITAN AREA



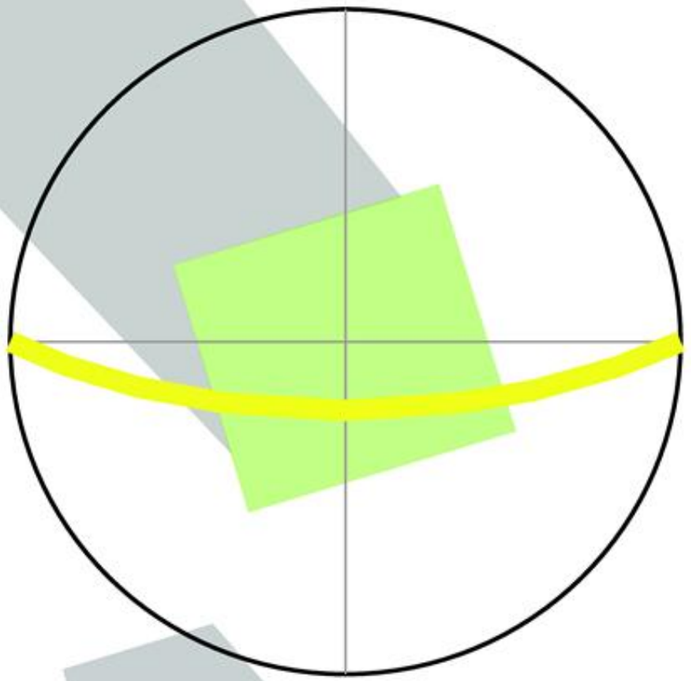
UNIVERSITY OF PUERTO RICO
RIO PIEDRAS CAMPUS


LIBRARY
STUDENT CENTER
NATURAL SCIENCES
Parque del Centenario
QUAD
ARCHITECTURE
EDUCATION

JUNE 21



EQUINOX [MARCH / SEPTEMBER]



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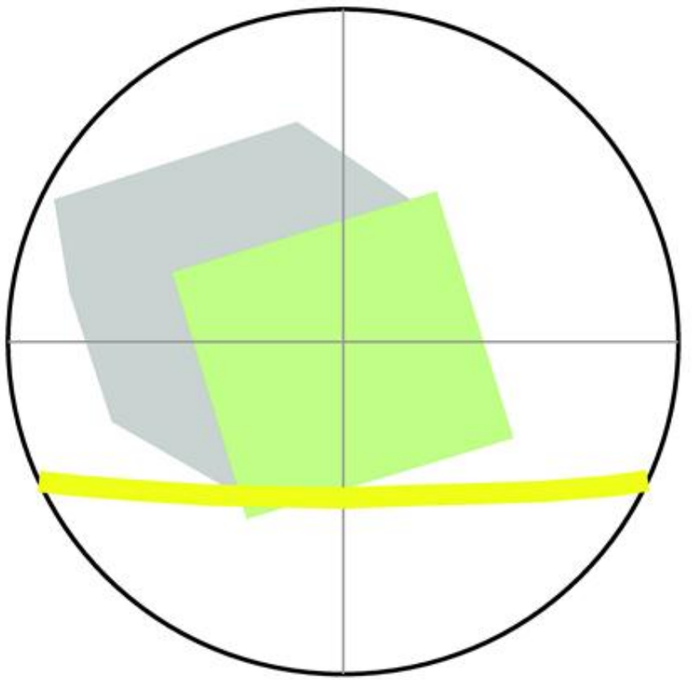
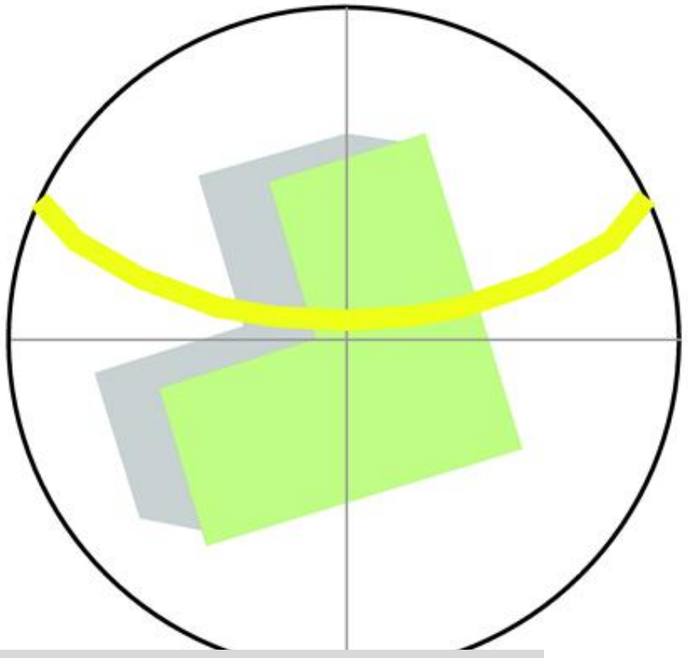
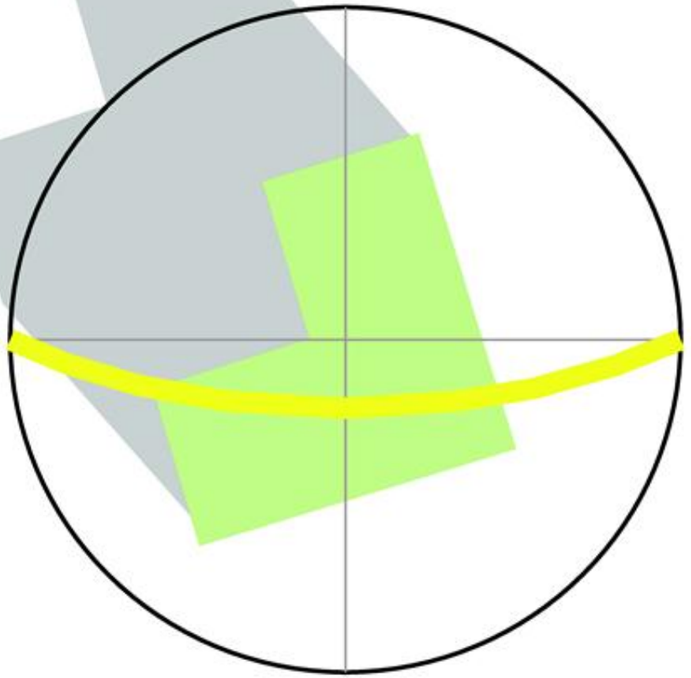
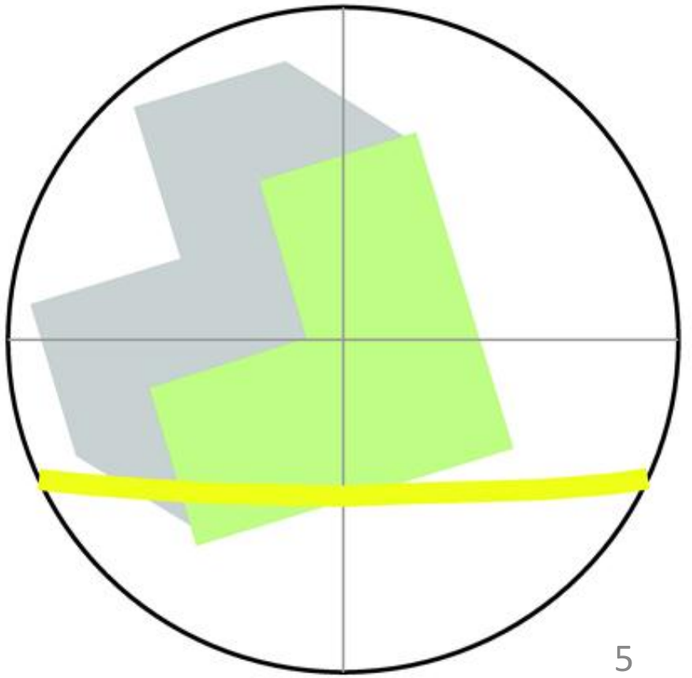
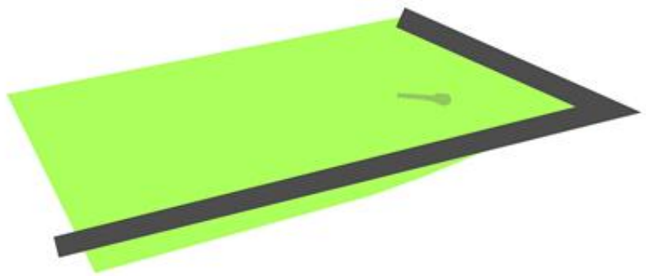


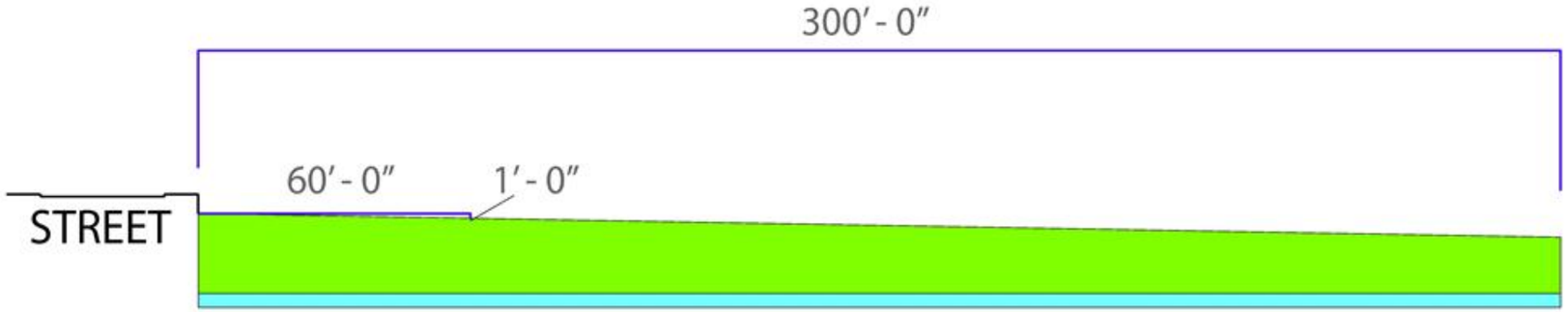




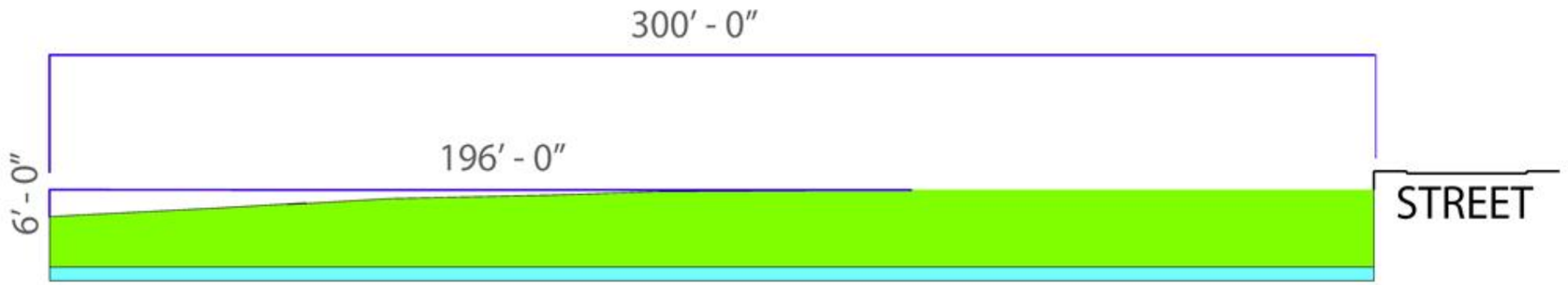


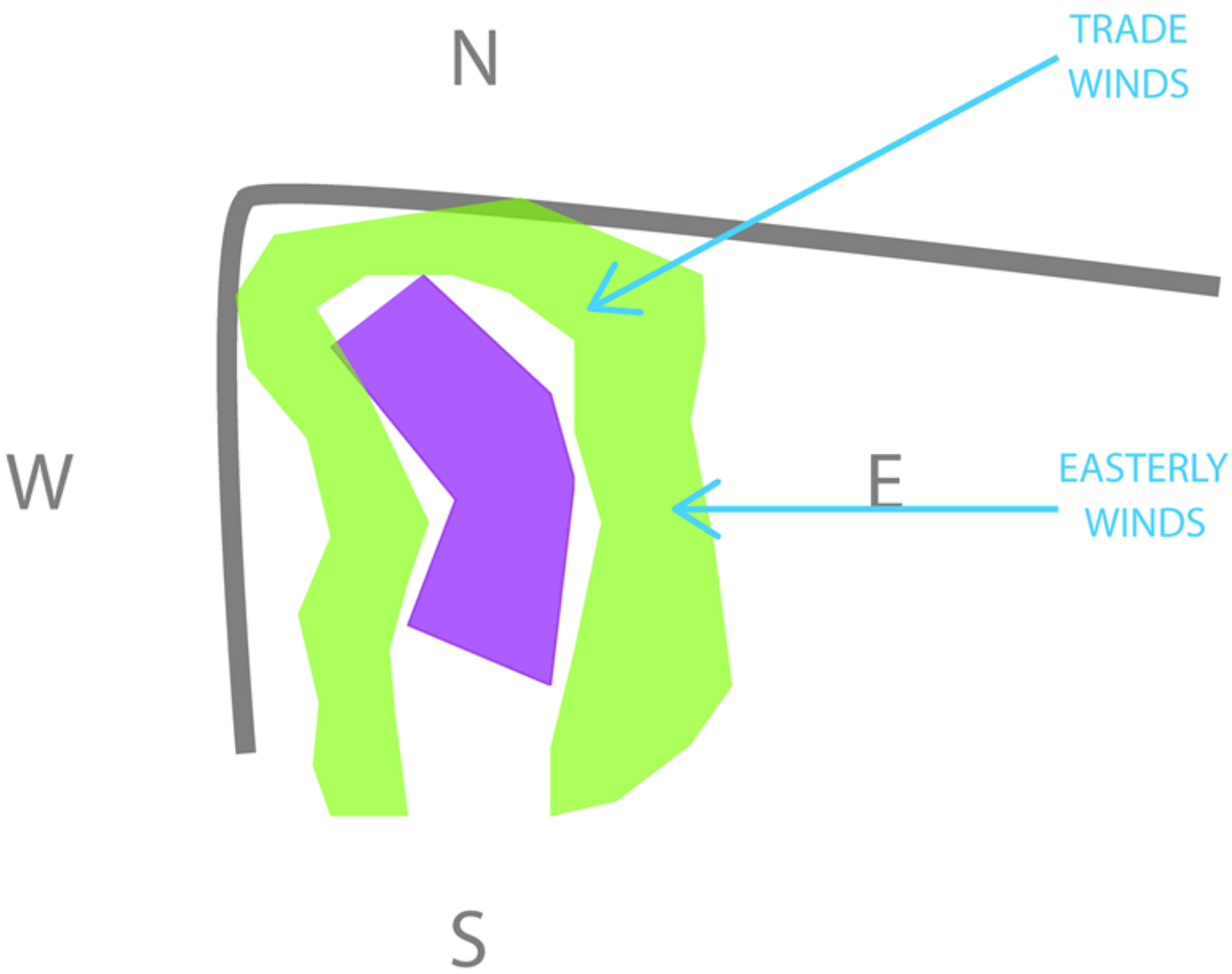


LONGITUDINAL SECTION THROUGH SITE



TRANSVERSAL SECTION THROUGH SITE





LOCAL HAZARDS:

HURRICANES
BETWEEN MONTHS OF AUGUST, SEPTEMBER, AND OCTOBER

EARTHQUAKES
THERE HAVE BEEN FOUR MAJOR EARTHQUAKES IN PUERTO RICO. THE LATEST OCURRED IN 1918 AND HAD A MAGNITUDE OF 7.5 IN THE RICHTER SCALE. AS AN AFTERSHOCK, THERE WAS A 19.5 FEET [6 METER] HIGH TSUNAMI RECORDED.

TSUNAMIS

GENERAL DESCRIPTION:

DAYLIGHT
12 HOURS [6AM - 6PM]

RAIN SEASON
APRIL - NOVEMBER

CLIMATE:

TYPE OF CLIMATE
HUMID - TROPICAL

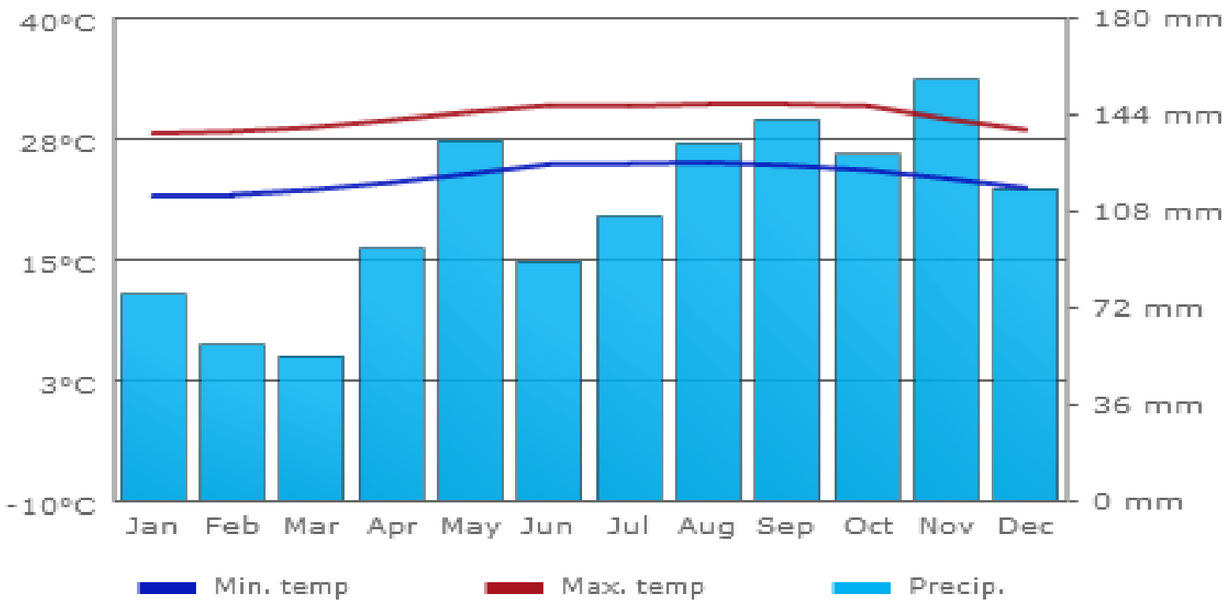
TEMPERATURE
RANGES FROM 70 - 90 F [~ 20 - 30 C]

PRECIPITATION
RANGES FROM 2 -6 INCHES [~ 50 - 160 mm]

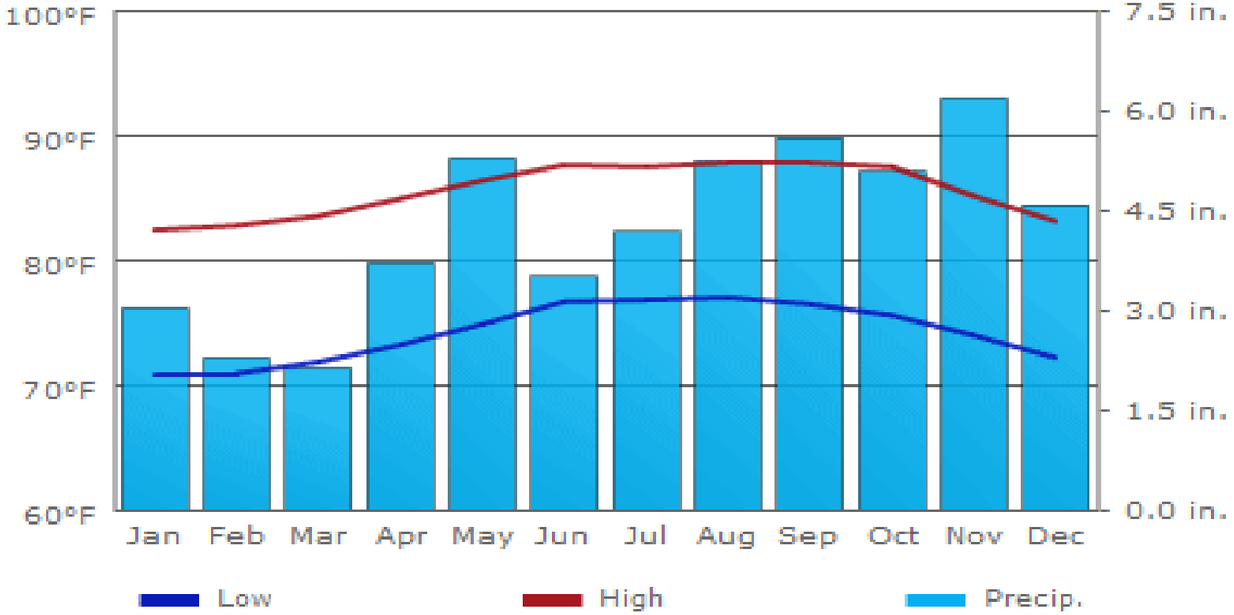
RELATIVE HUMIDITY
RANGES FROM 73% [MARCH] TO 78% [JUNE]

WIND SPEED
RANGES FROM 2 - 3 BEAUFORT [~ 2 - 5 m/s]

METRIC



IMPERIAL



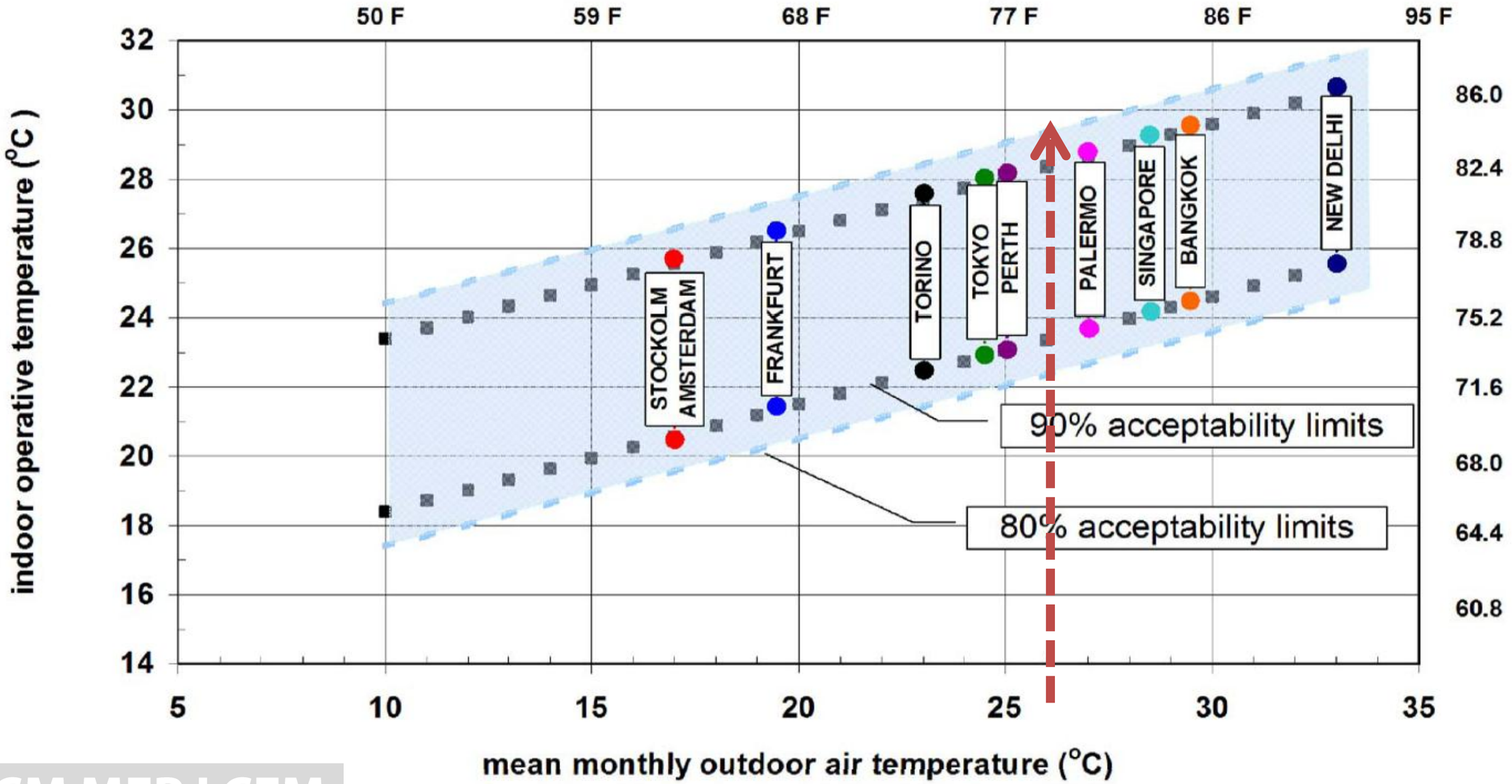
AIR TEMPERATURE RANGE: 70 - 90°F (~ 20 – 30 °C)

MEAN OUTDOOR AIR TEMPERATURE: 80 °F

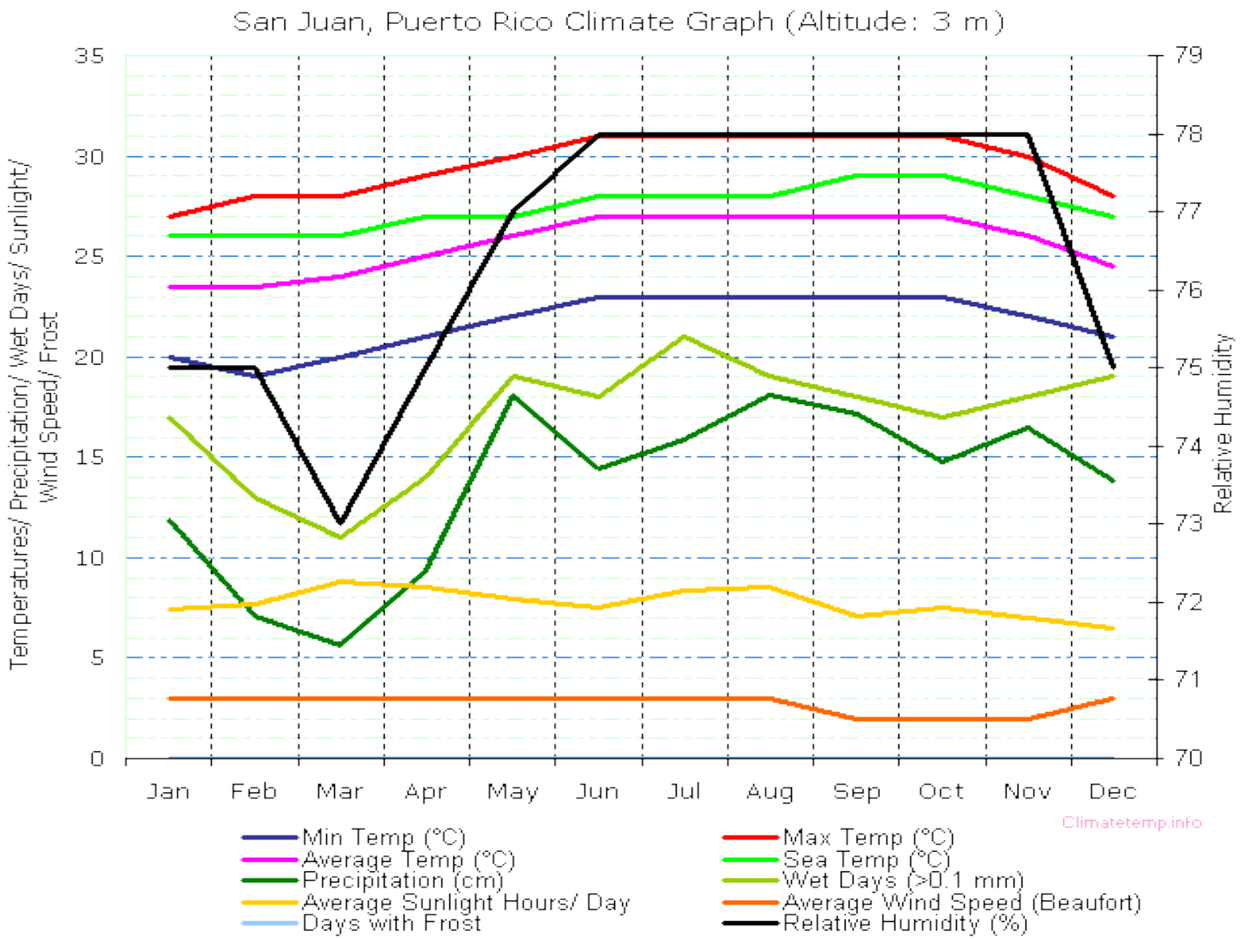
PRECIPITATION RANGE: 2 – 6 inches (~ 50 – 160 mm)

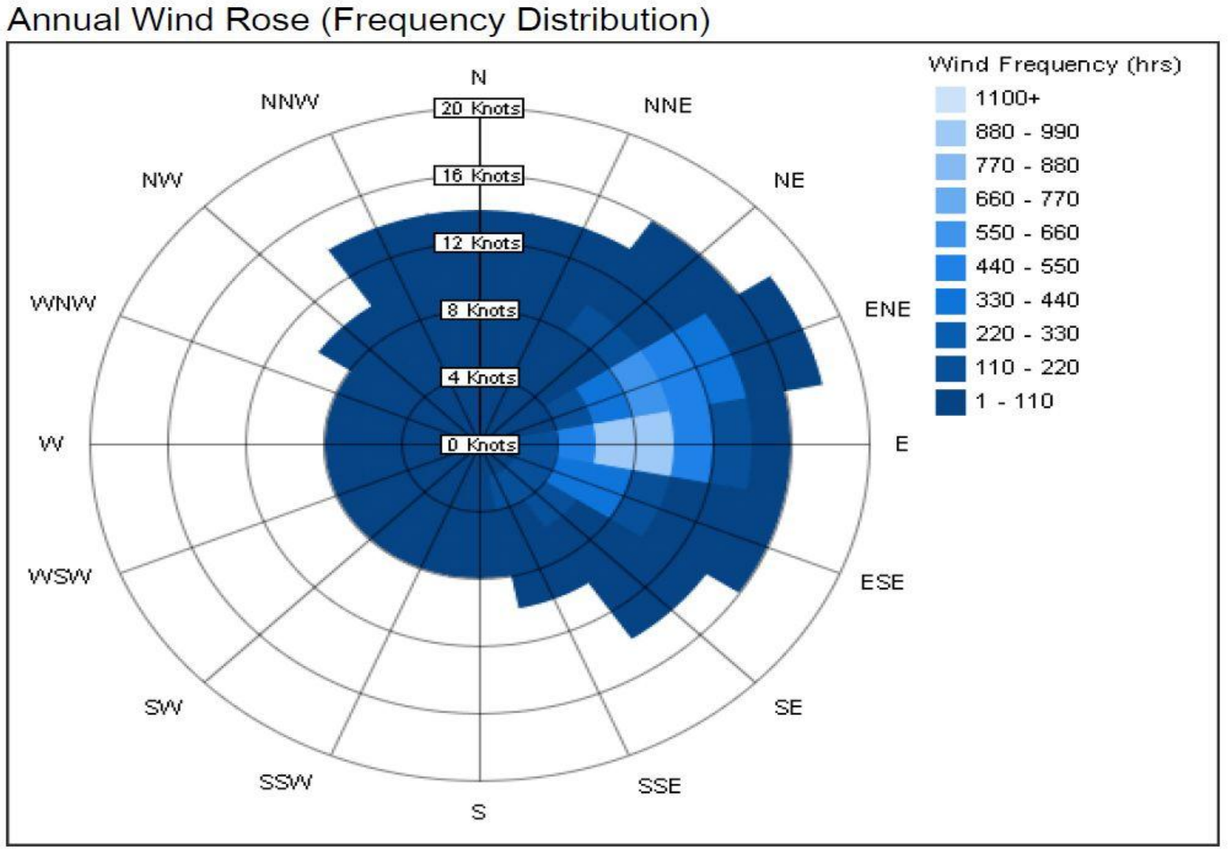
FOR A MEAN OUTDOOR AIR TEMPERATURE OF 80°, THE 90% ACCEPTABILITY CRITERIA IS:

OPERATIVE TEMPERATURE 23,5 °C < TO < 28,5 °C



MEAN RELATIVE HUMIDITY



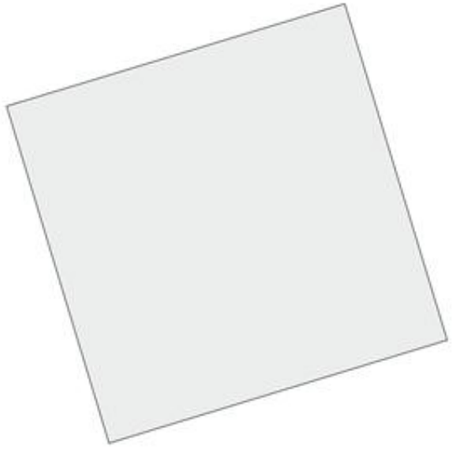


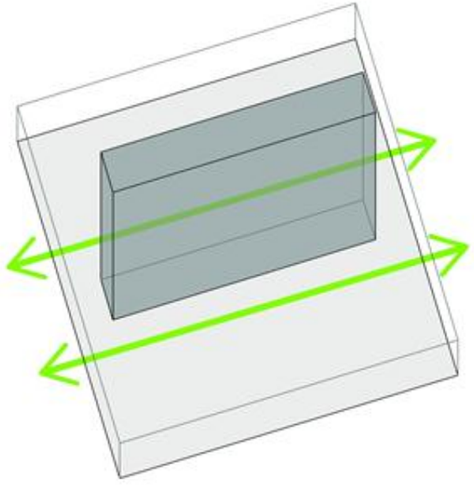
RELATIVE HUMIDITY RANGES FROM 73% IN MARCH TO 78% IN JUNE

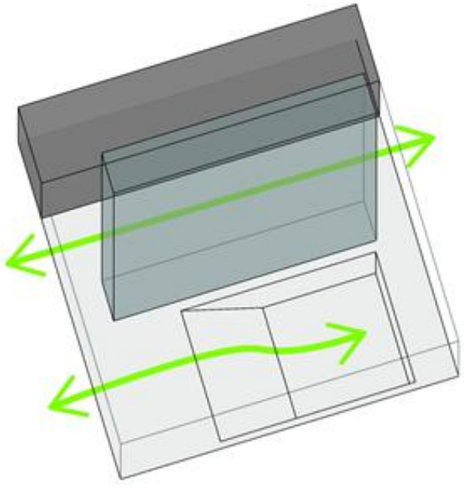
WHEN AIR WITH HIGH ‘RH’ ENTERS THE BUILDING AND IS COOLED, THE ‘RH’ INCREASES EVEN FURTHER

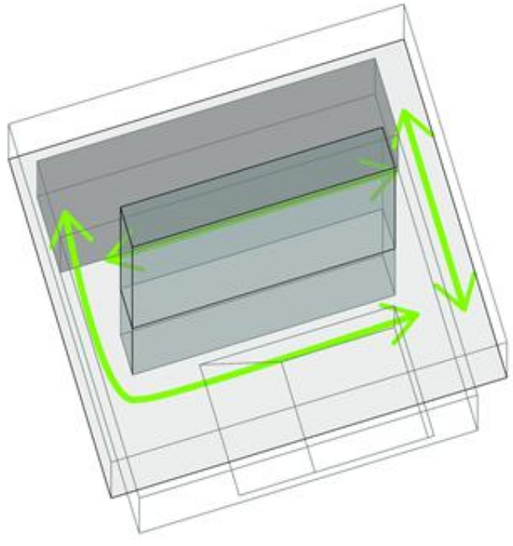
WIND SPEED RANGES FROM 2 -3 BEAUFORT (~2 – 5 m/s)

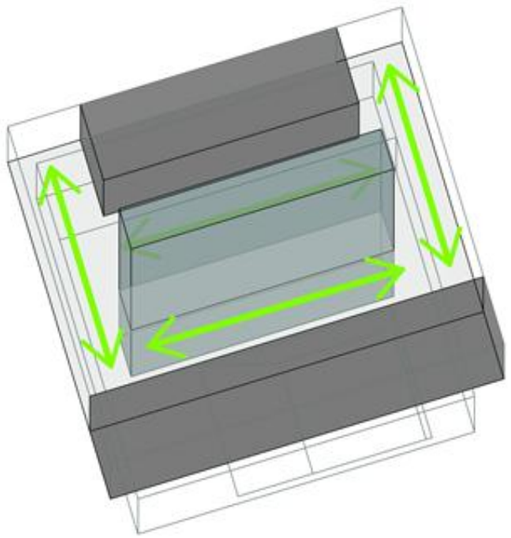
PREVAILING WIND DIRECTION: EAST

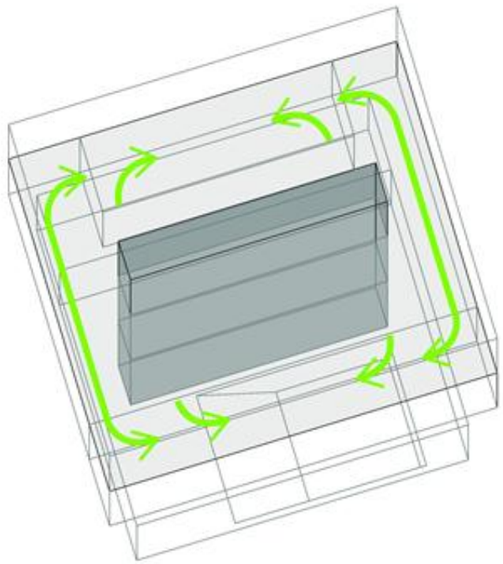


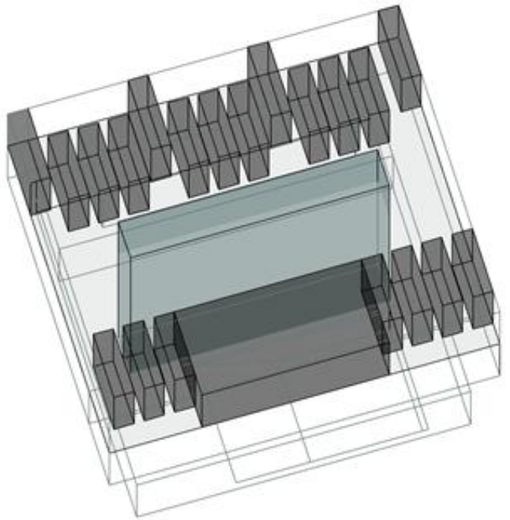


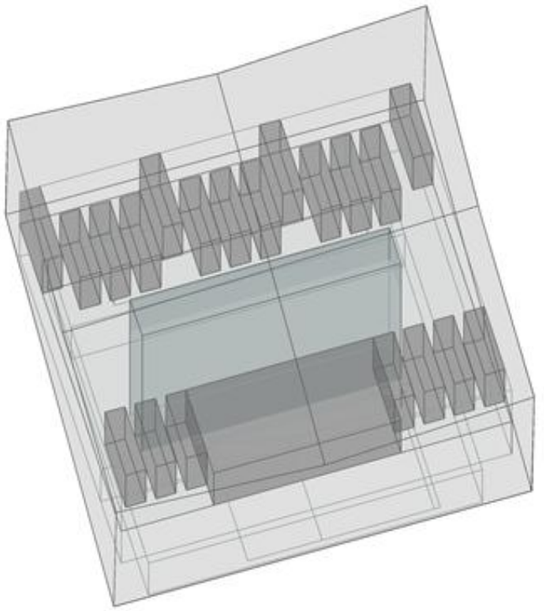


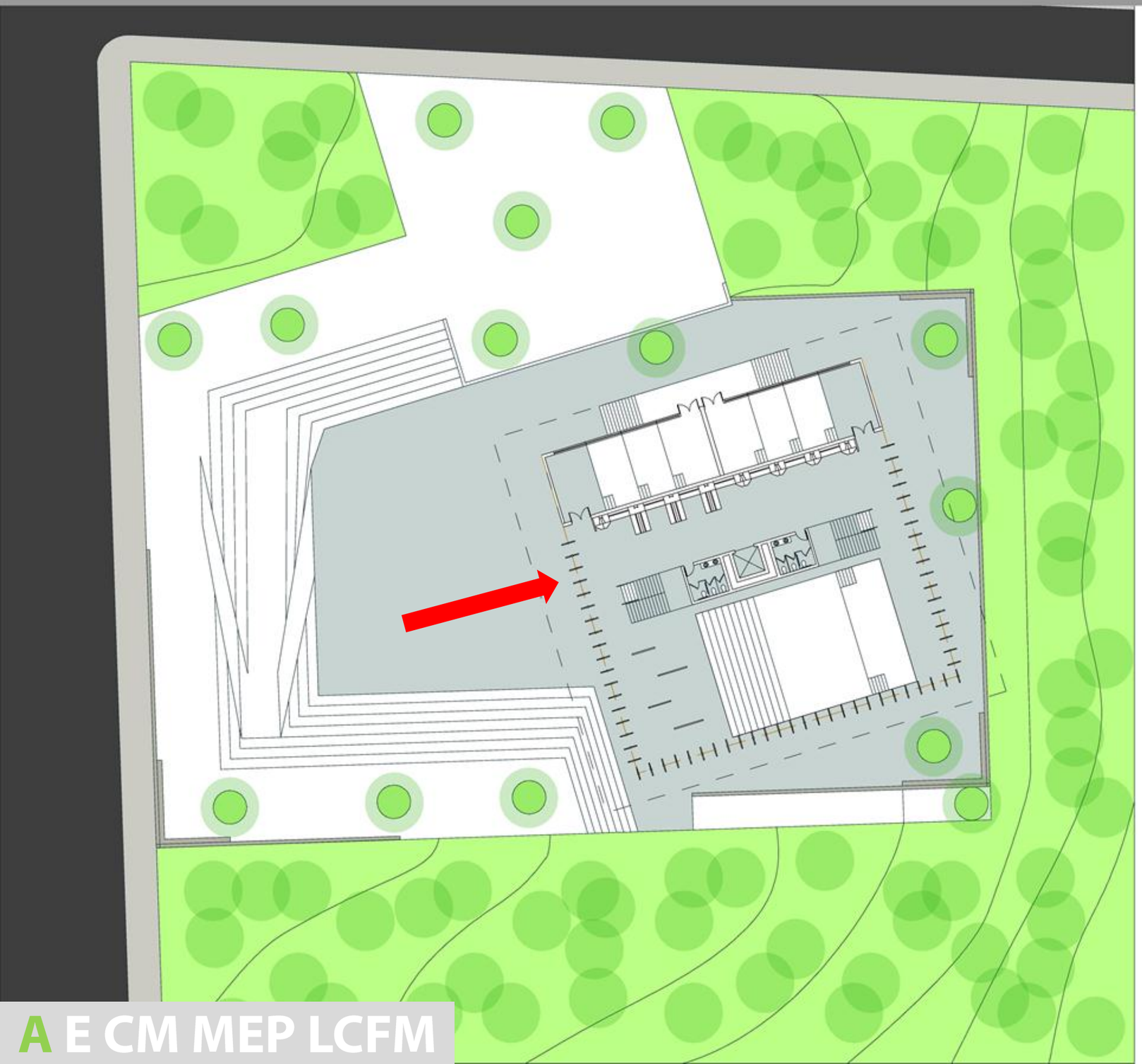




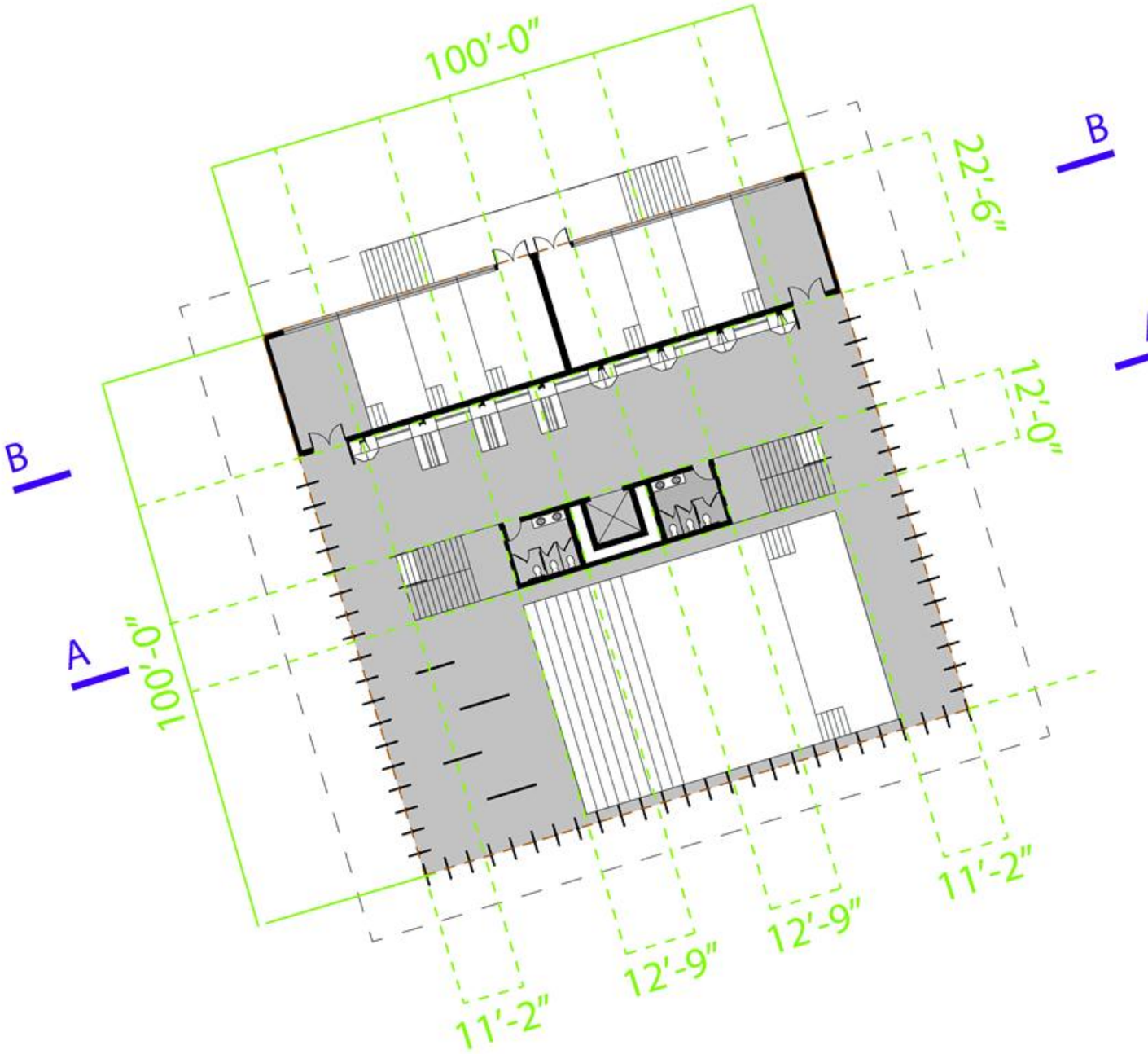






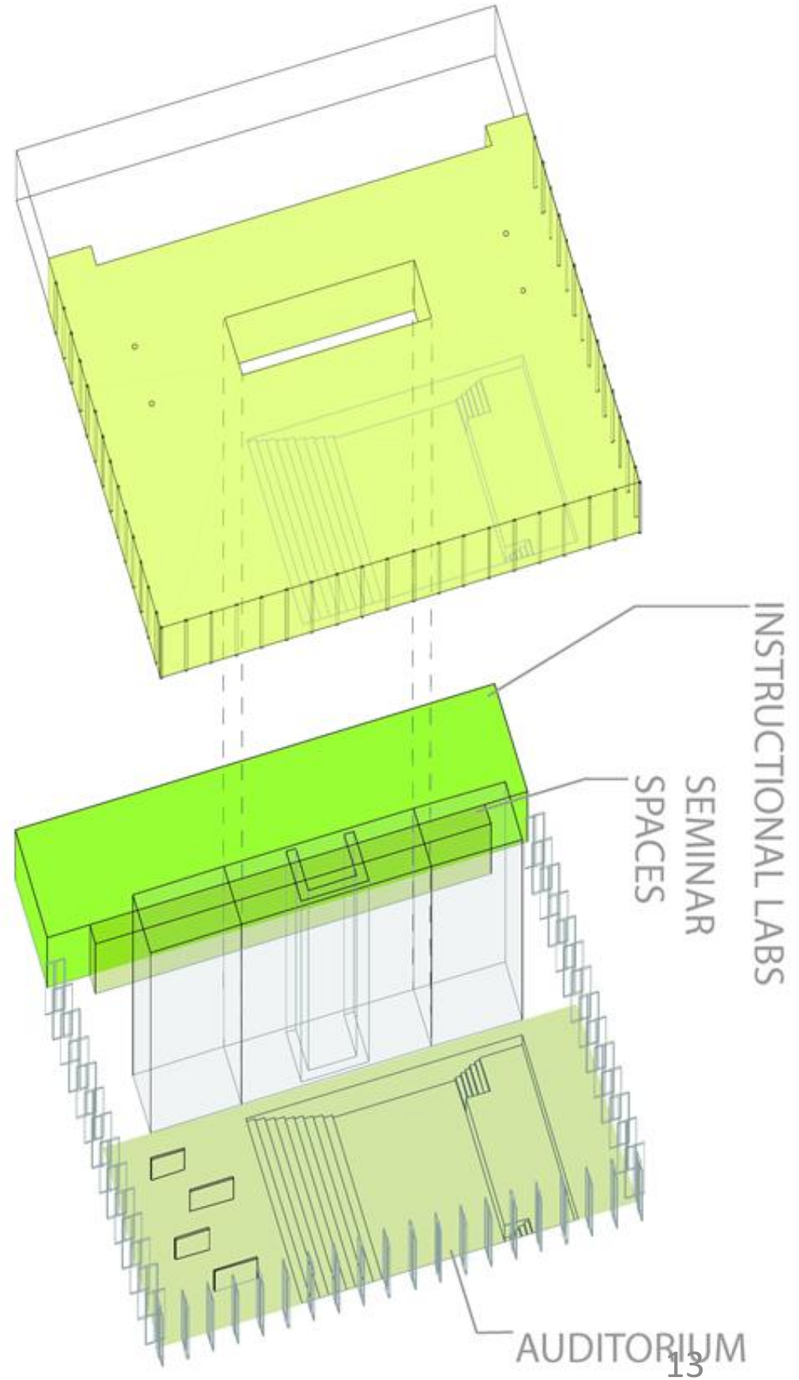


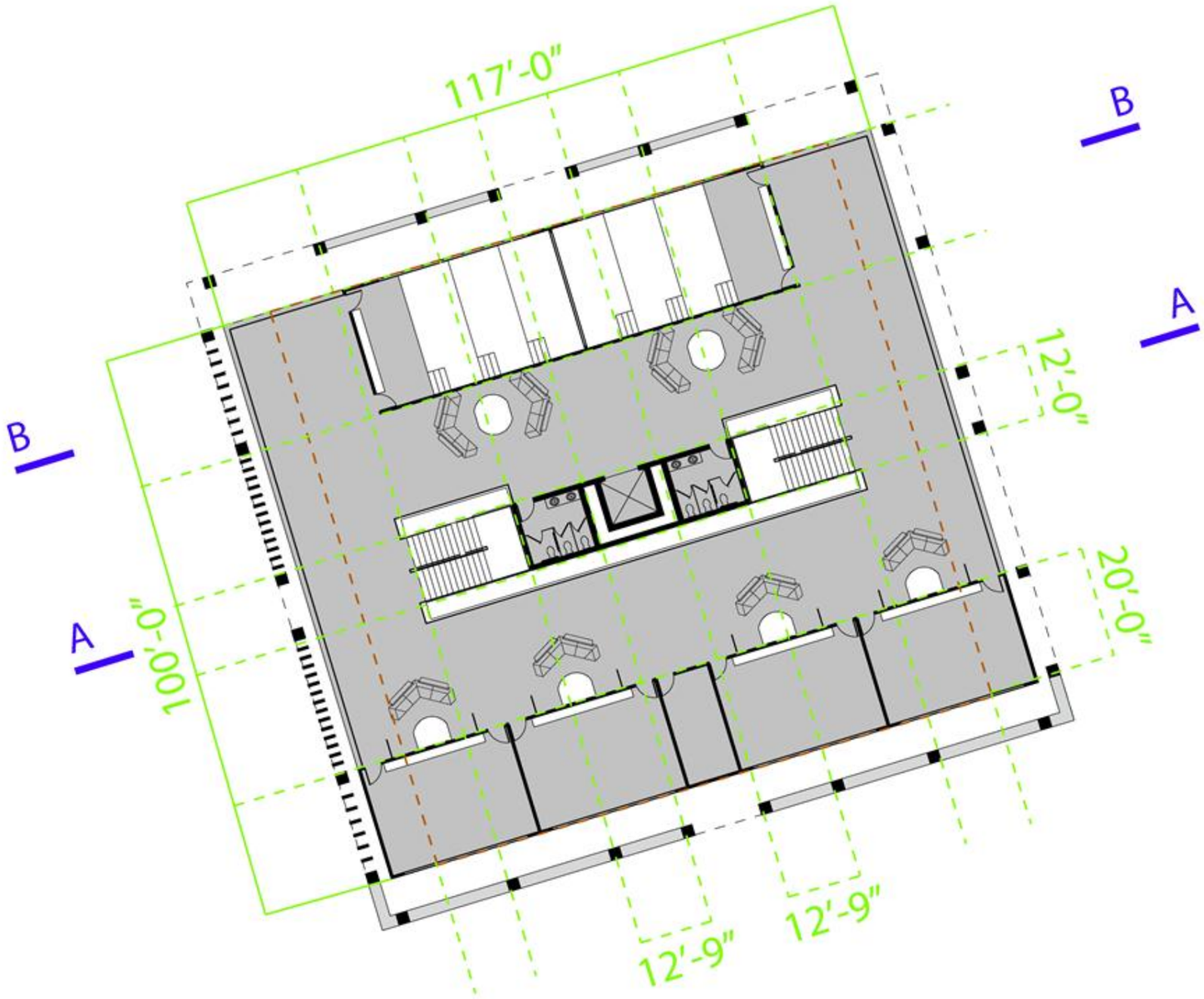

SHADE
COLLABORATION SPACE



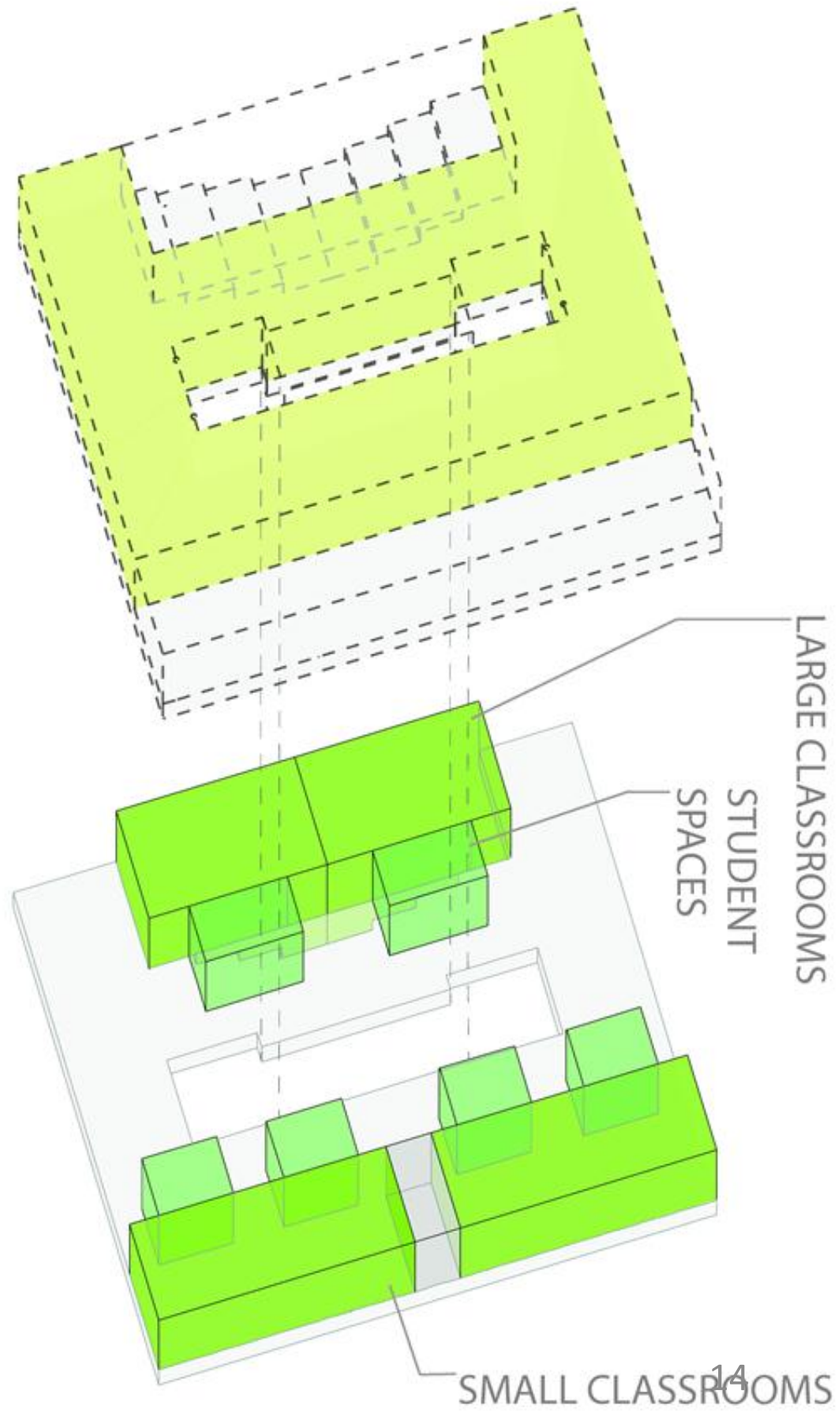
NEGATIVE SPACE

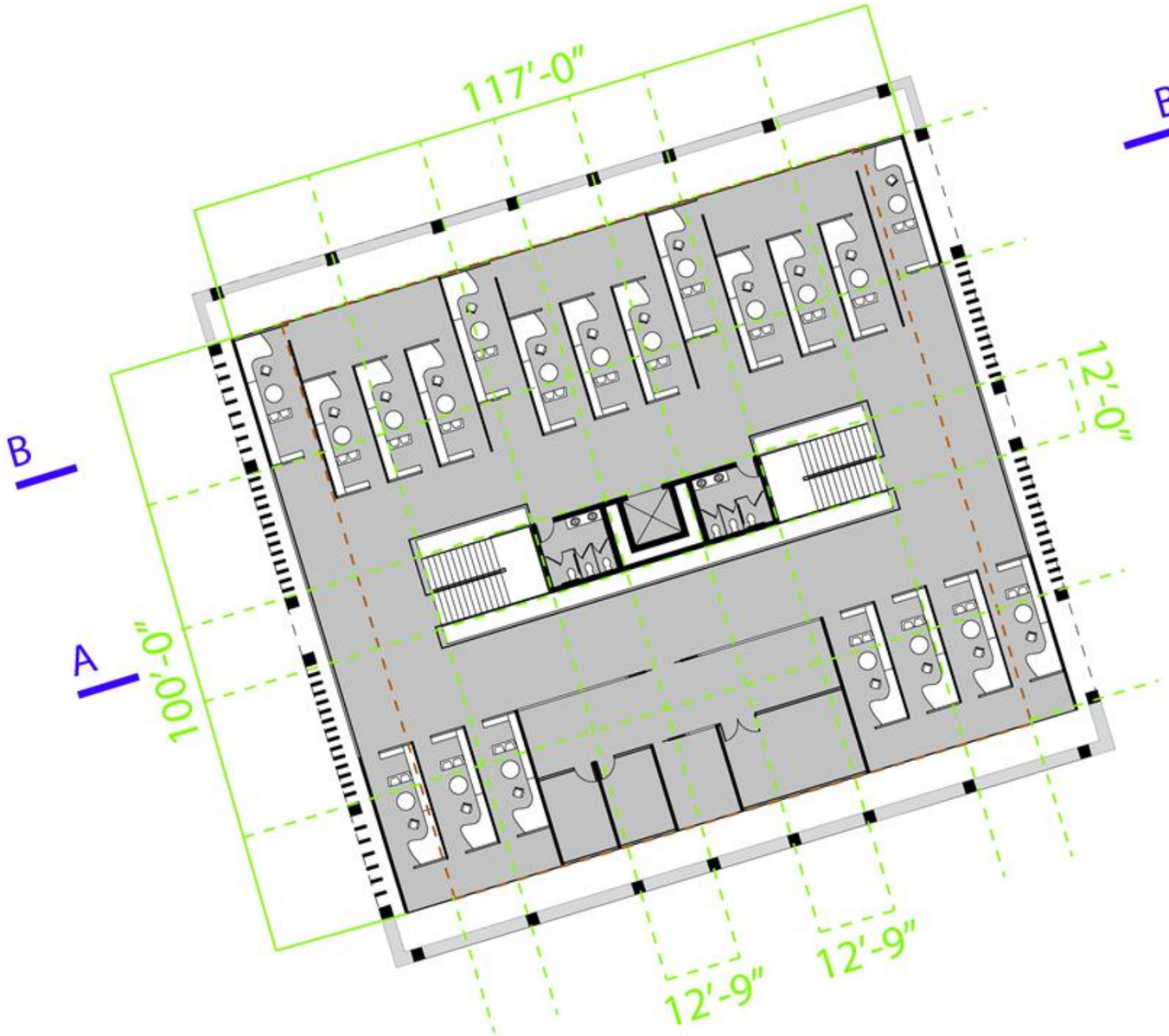
PROGRAMMATIC DISTRIBUTION





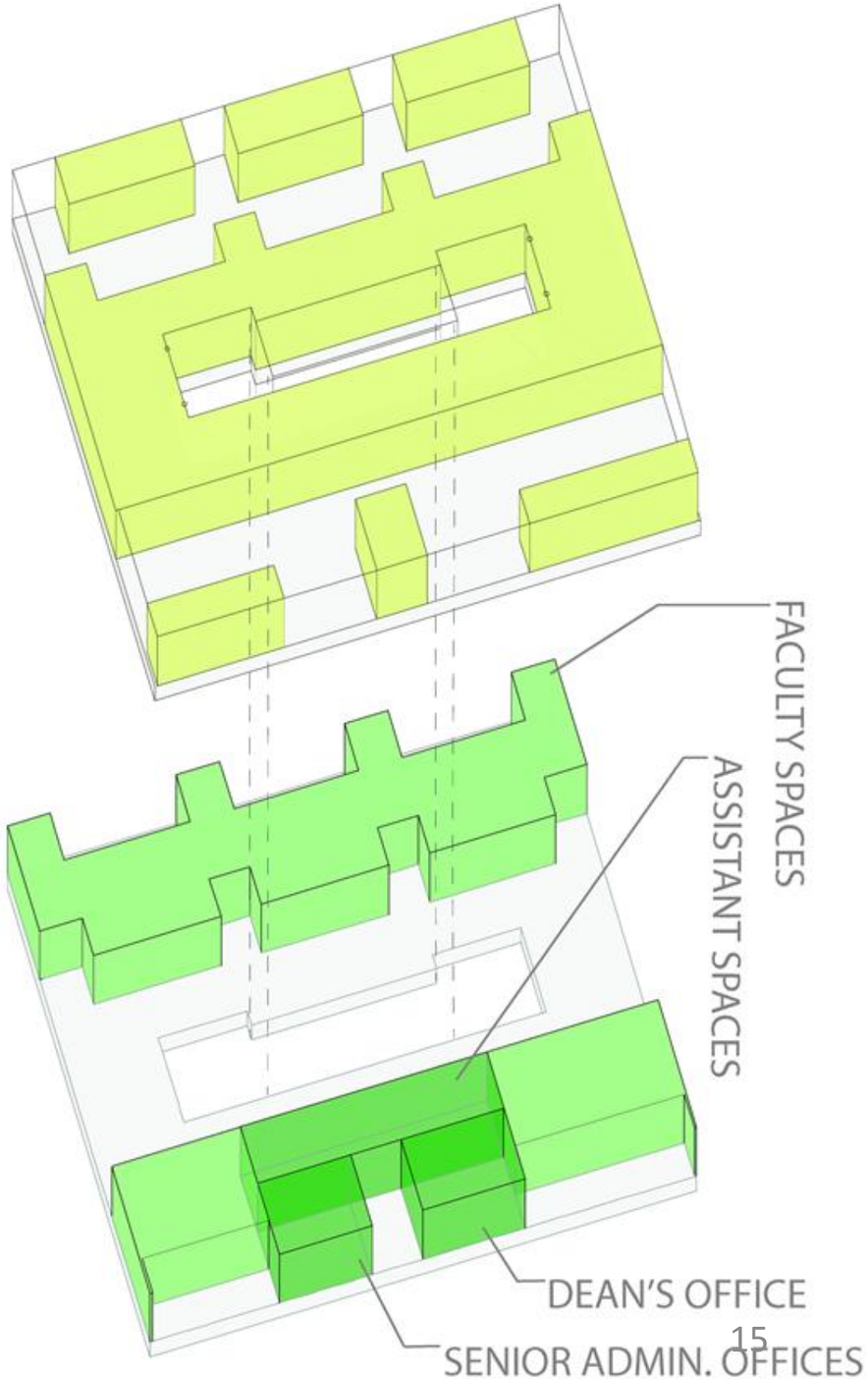
NEGATIVE SPACE

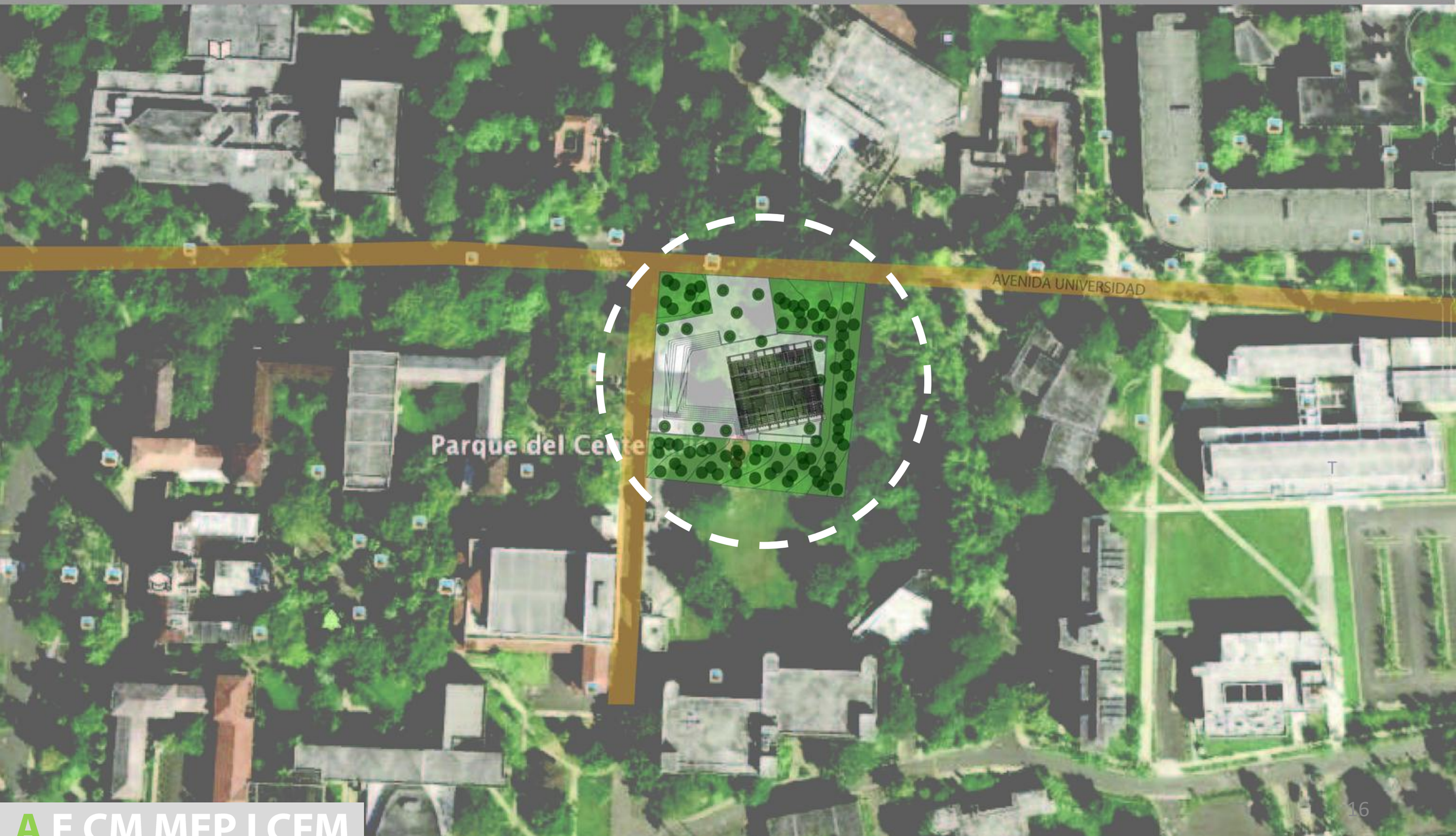


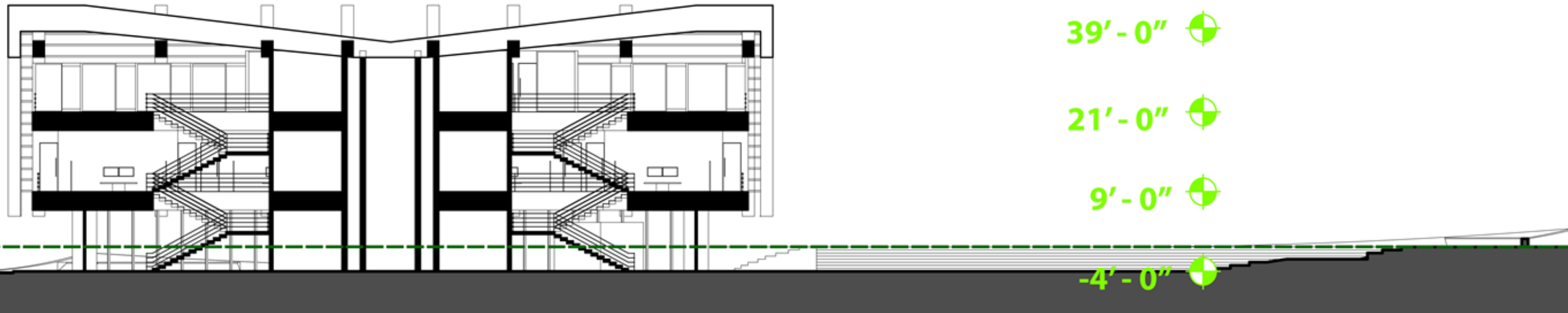


NEGATIVE SPACE

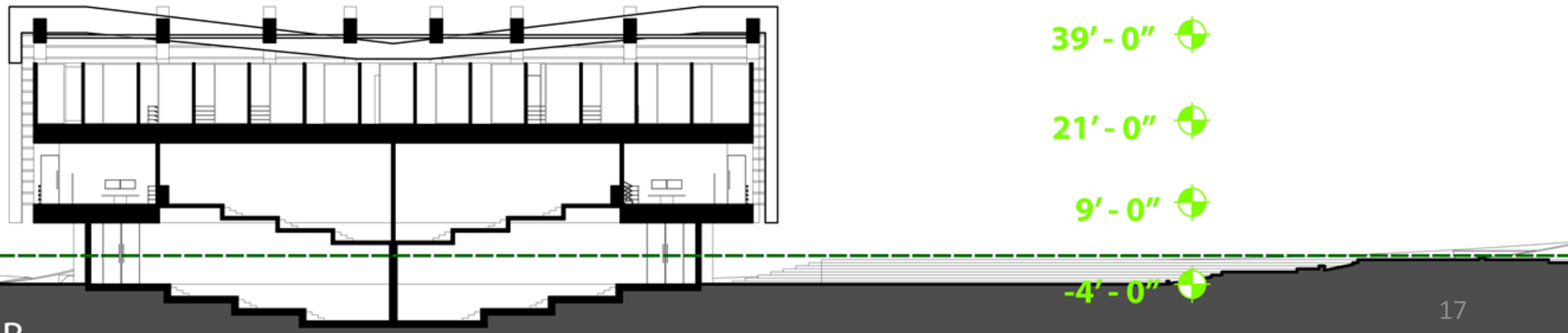
PROGRAMMATIC DISTRIBUTION




AVENIDA UNIVERSIDAD
Parque del Centenario



SECTION AA



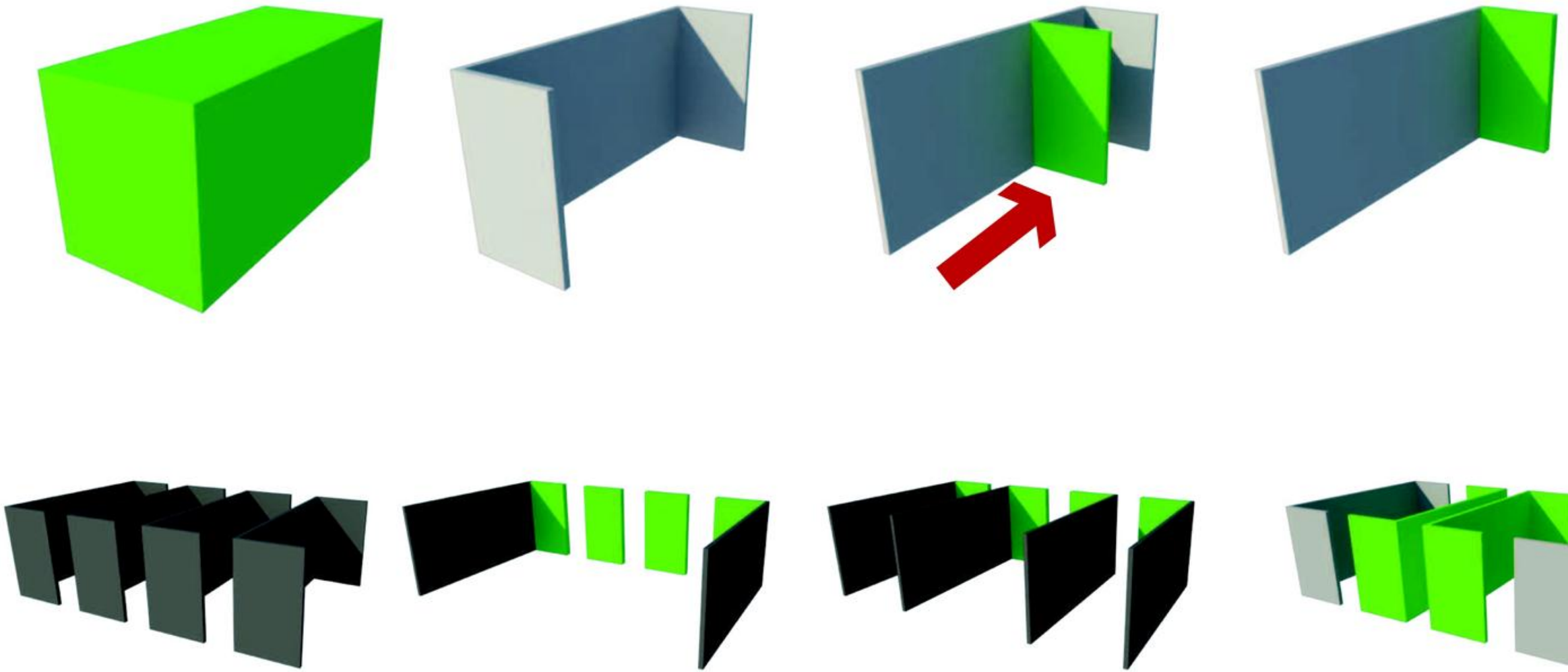
SECTION BB

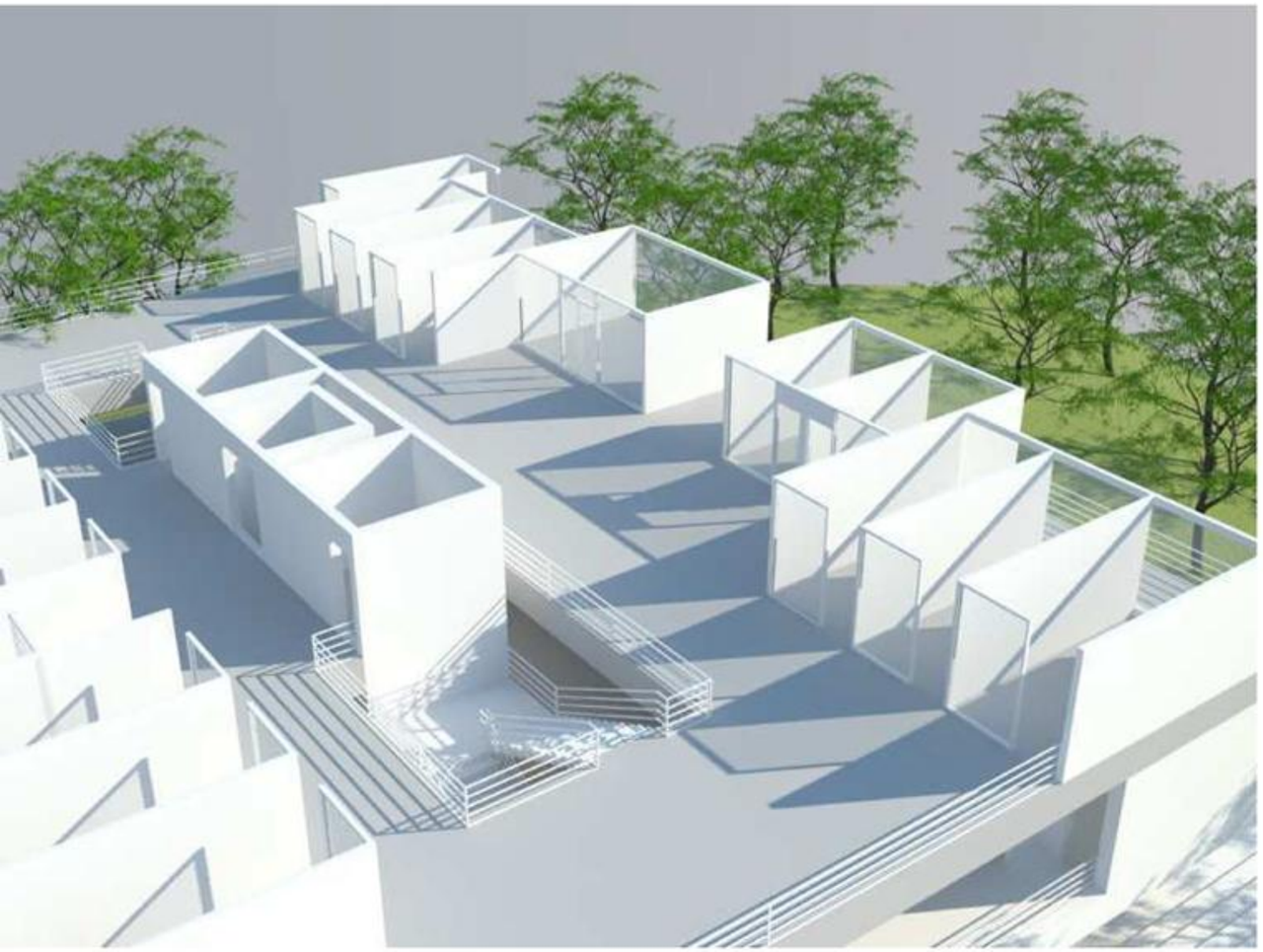
NORTH PLAZA

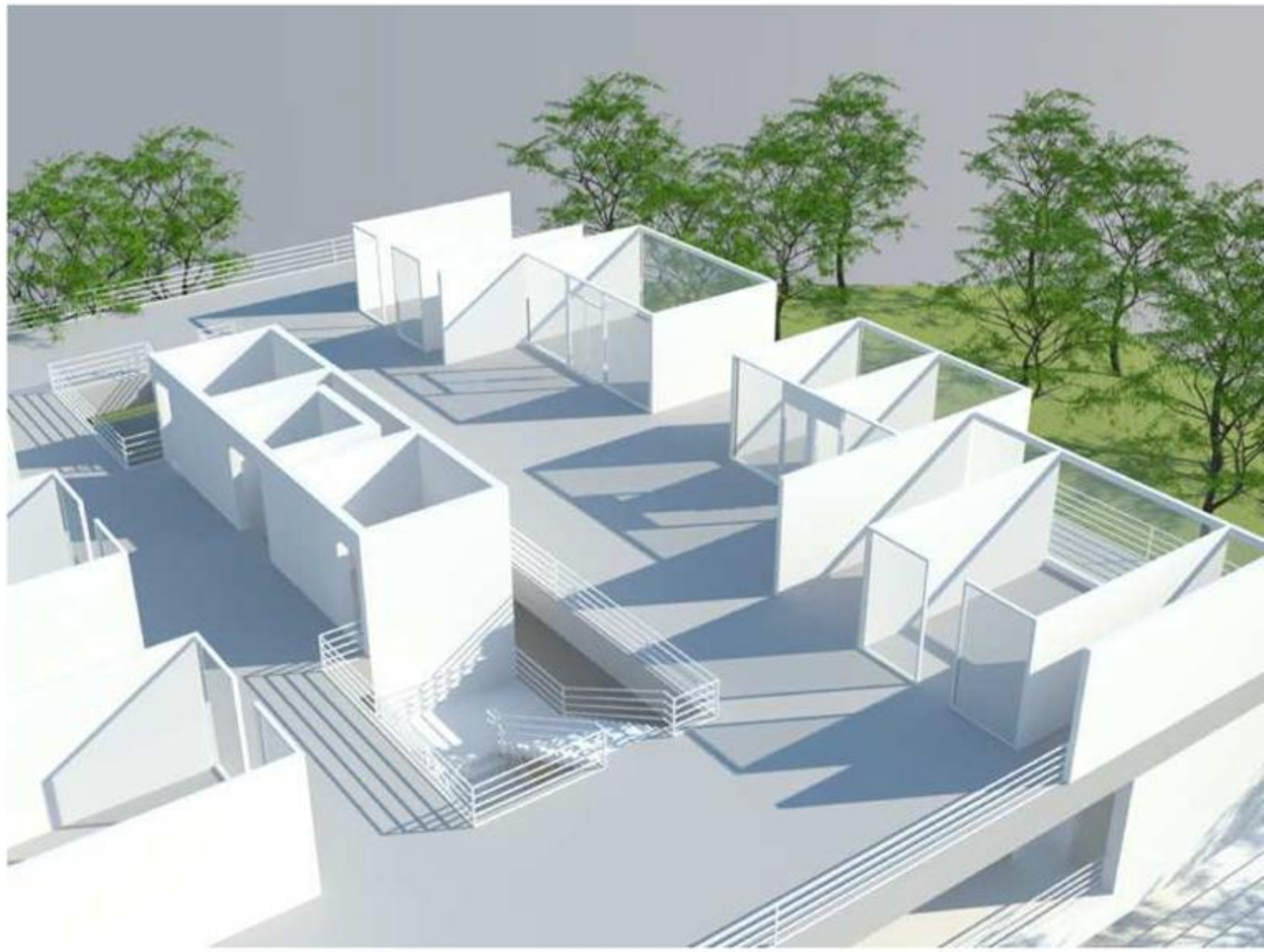
VIEW FROM MAIN STREET

WEST FAÇADE

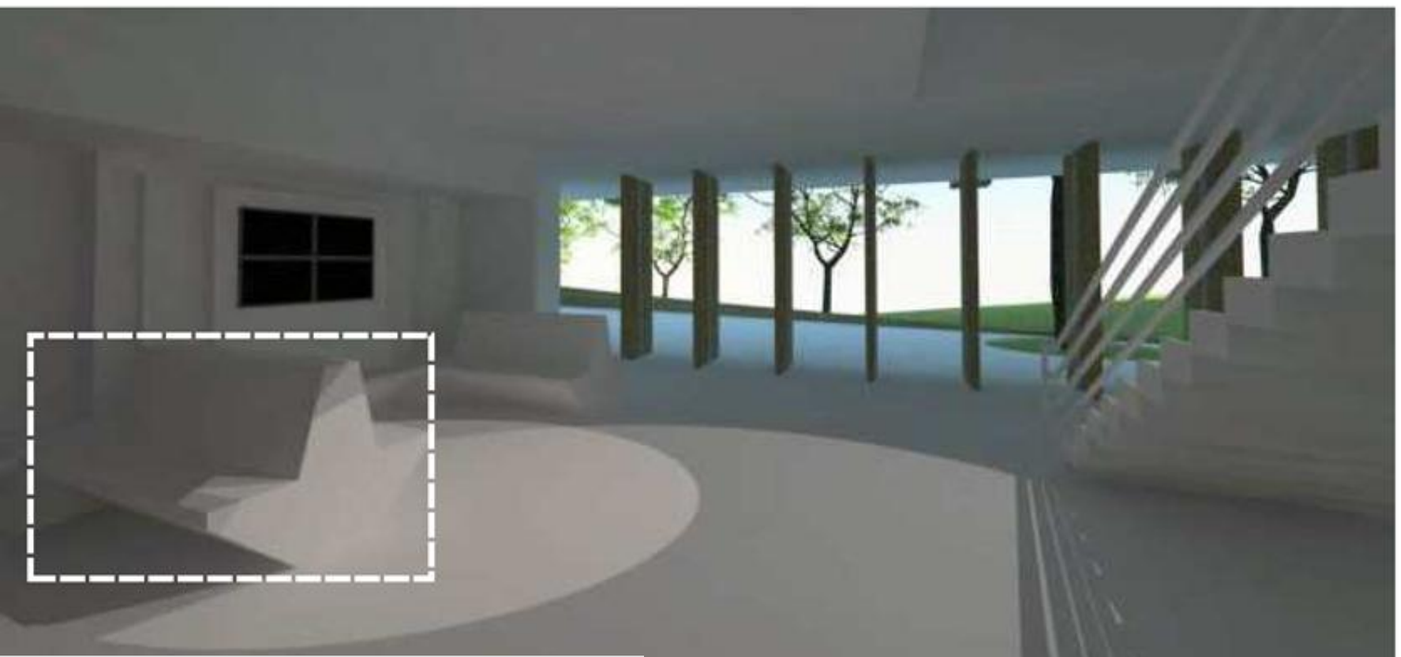
MOVABLE OFFICE SPACE

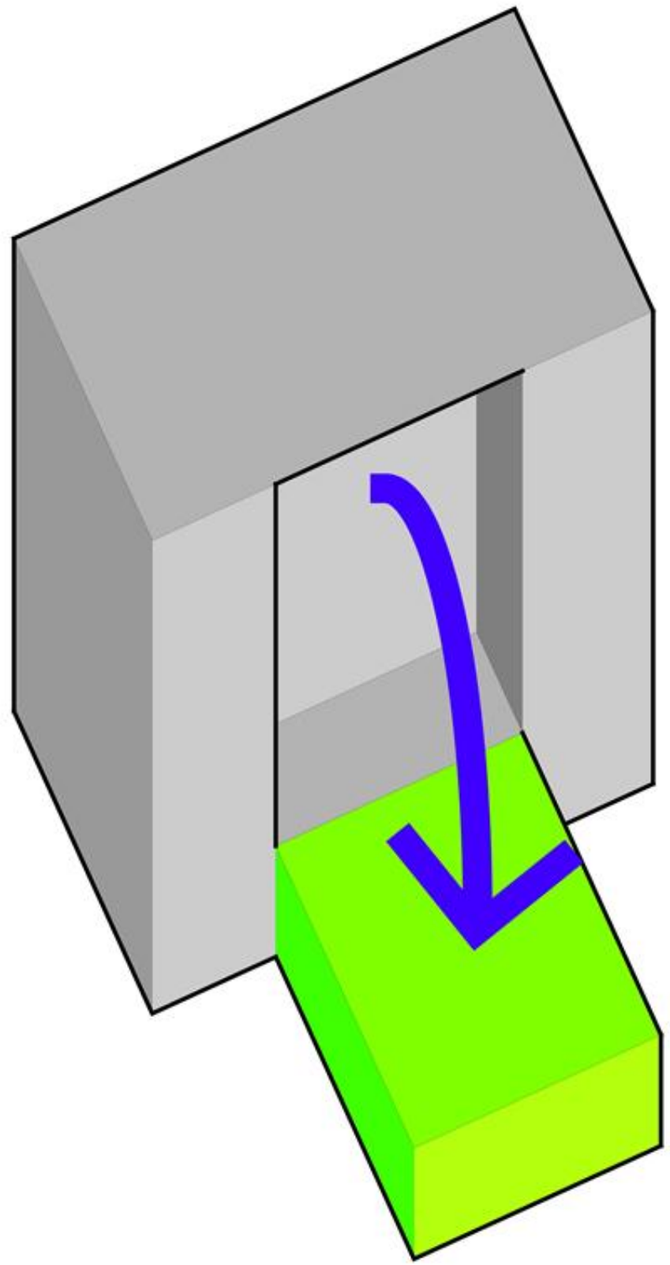






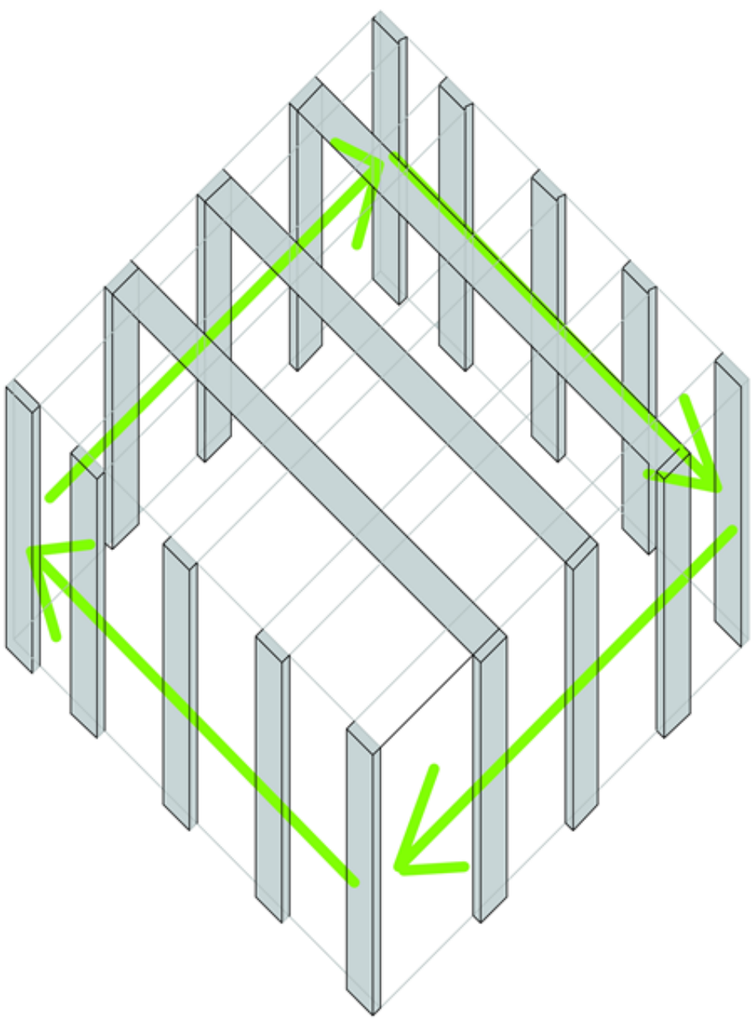
"CREATING A BUILDING THAT CAN EVOLVE INTO ANOTHER, WHICH IS NOT MEANT FOR ONE PURPOSE AND ONE ALONE. AN OFFICE DOES NOT HAVE TO FUNCTION AS A TYPICAL 2013 OFFICE MODEL."

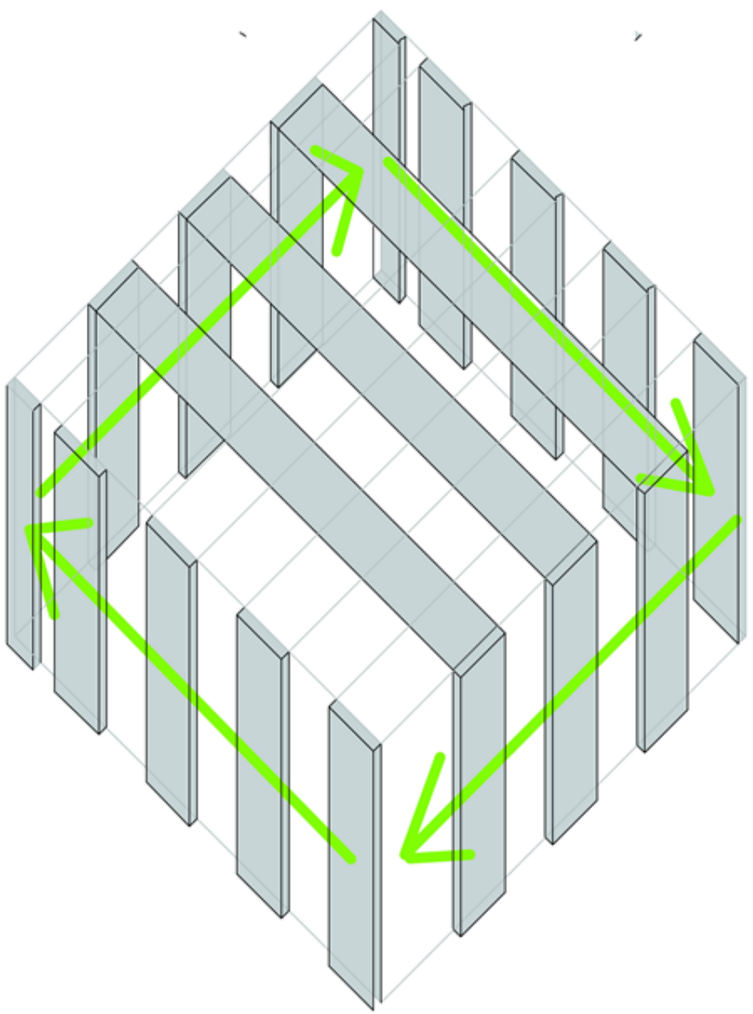


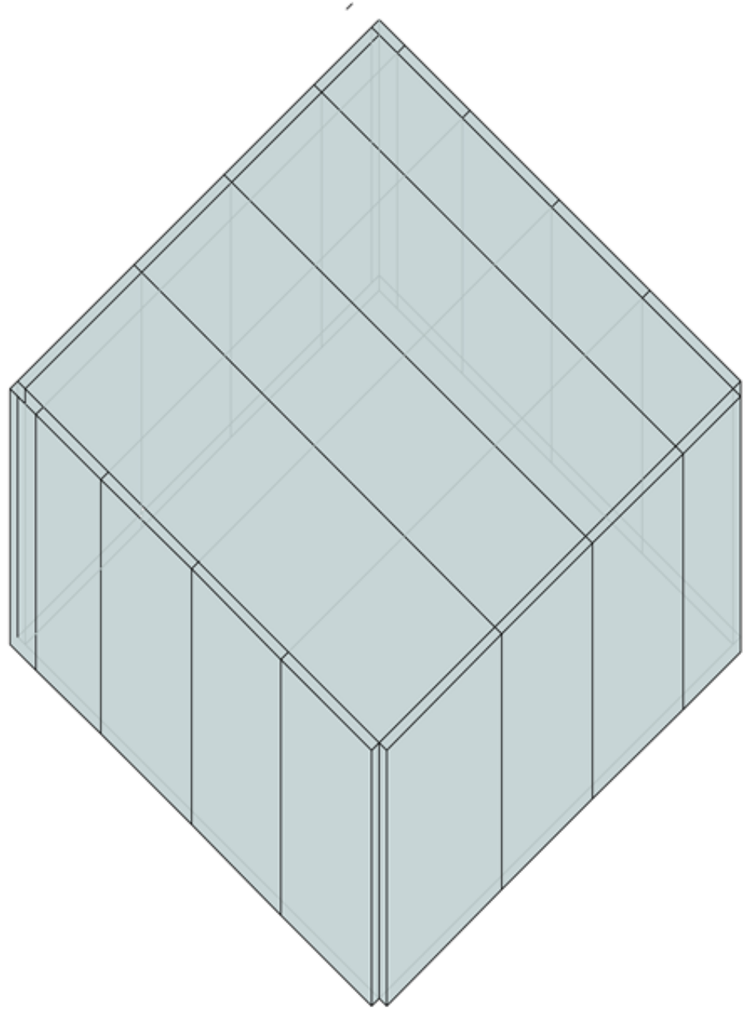


"WHAT ARE SEMINAR SPACES, TYPICAL ENCLOSED SPACES? OPEN SPACE?"

ARMADILLO FAÇADE







OPEN ARMADILLO FAÇADE

A E CM MEP LCFM

STRUCTURAL ENGINEERING

- DESIGN CRITERIA:
- INTEGRATION: INTEGRATE ARCHITECTURAL PLAN, MEP SYSTEM AND EASY TO CONSTRUCT.
- COOPERATION: CREATE LARGE OPEN SPACE
- SUSTAINABILITY: EARTHQUAKE PERFORMANCE LEVEL AND REPAIRABLE(FUSE)

PALM TREE DESIGN LOADS

Design Loads

Floor	Dead Load (PSF)	Live Load (PSF)
Roof	60	40
3	70	75
2	70	75
1	70	110

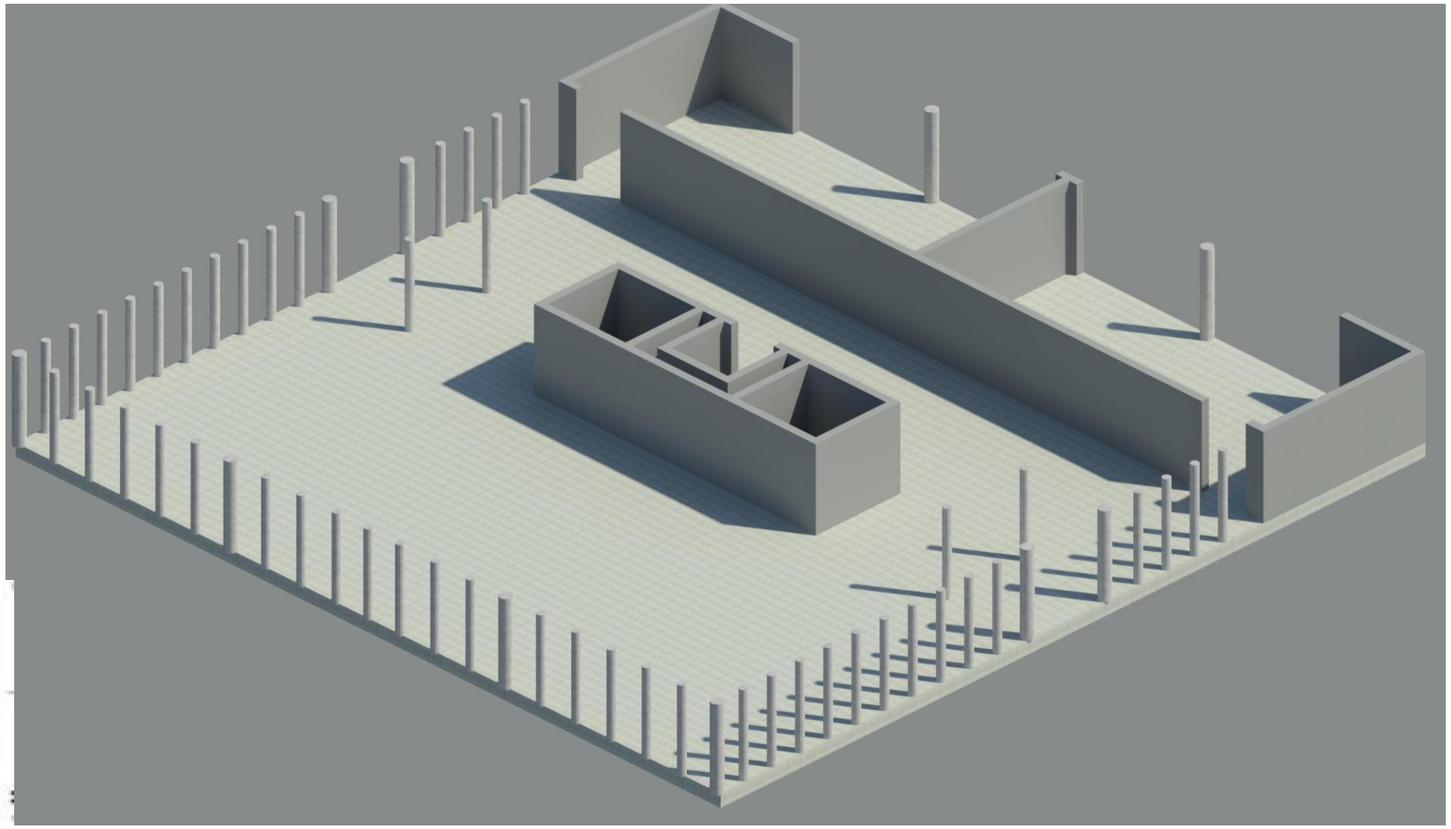
Wind	Seismic
Wind Speed 170 mph	Soil D
Base Shear 160kips	Base Shear 500kips

Function Spaces	Live Load (PSF)
Office	50
Faculty Lounge	80
Auditorium (average)	100
Classroom & Seminar	40
Labs	100
Server Room	125
Technical Support	100
Storage	250
Mechanical Room	100
Stair	100
Corridor	80 or 100
Roof	40

FOUNDATIONS

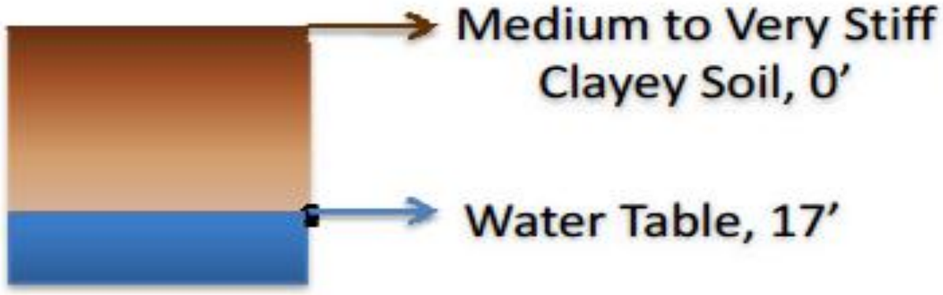
Mat Foundation

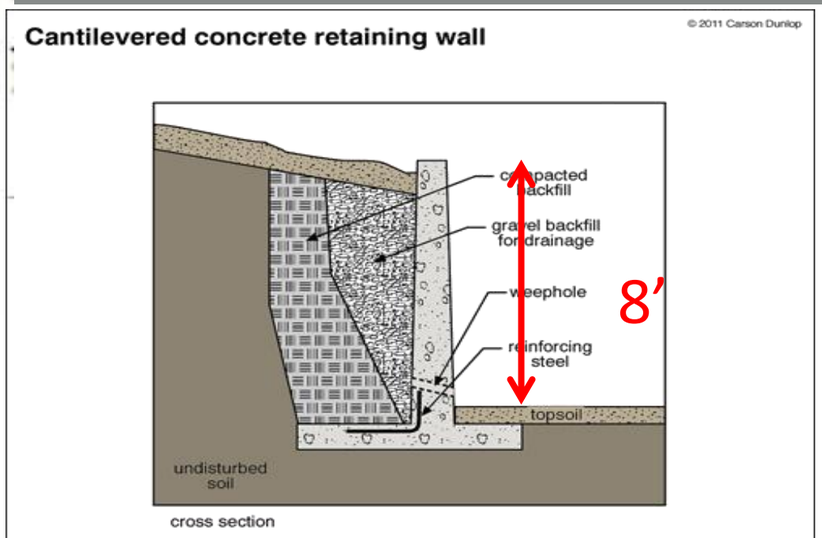
Shallow Foundation
Place from -8’ below grade
Thickness: 2’ thick for both concept



Soil Profile:

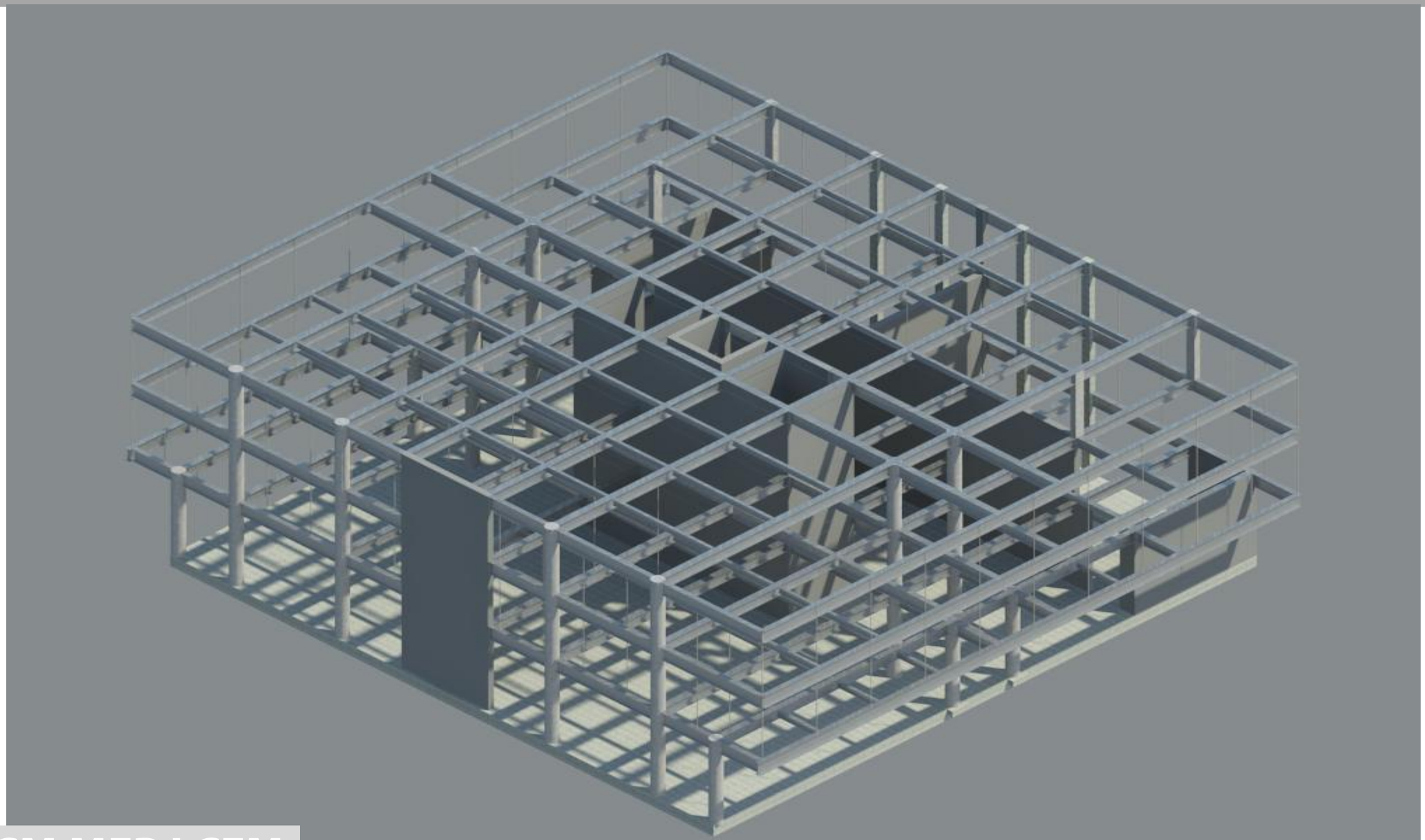
Bearing Capacity: 5000 PSF





PALM TREE — STEEL AND CONCRETE

OVERVIEW

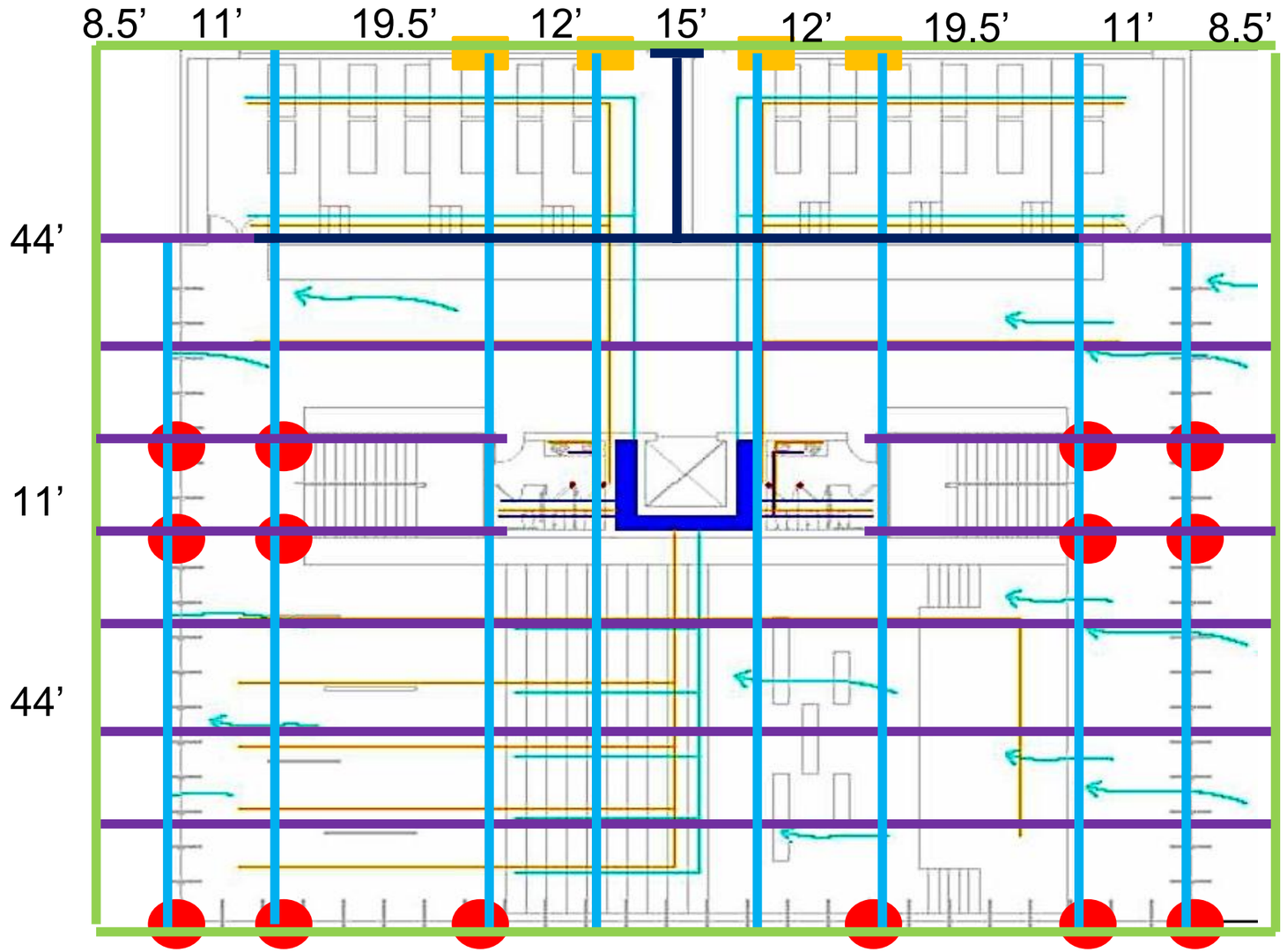


A E CM MEP LCFM

PALM TREE — STEEL AND CONCRETE

LEVEL 1

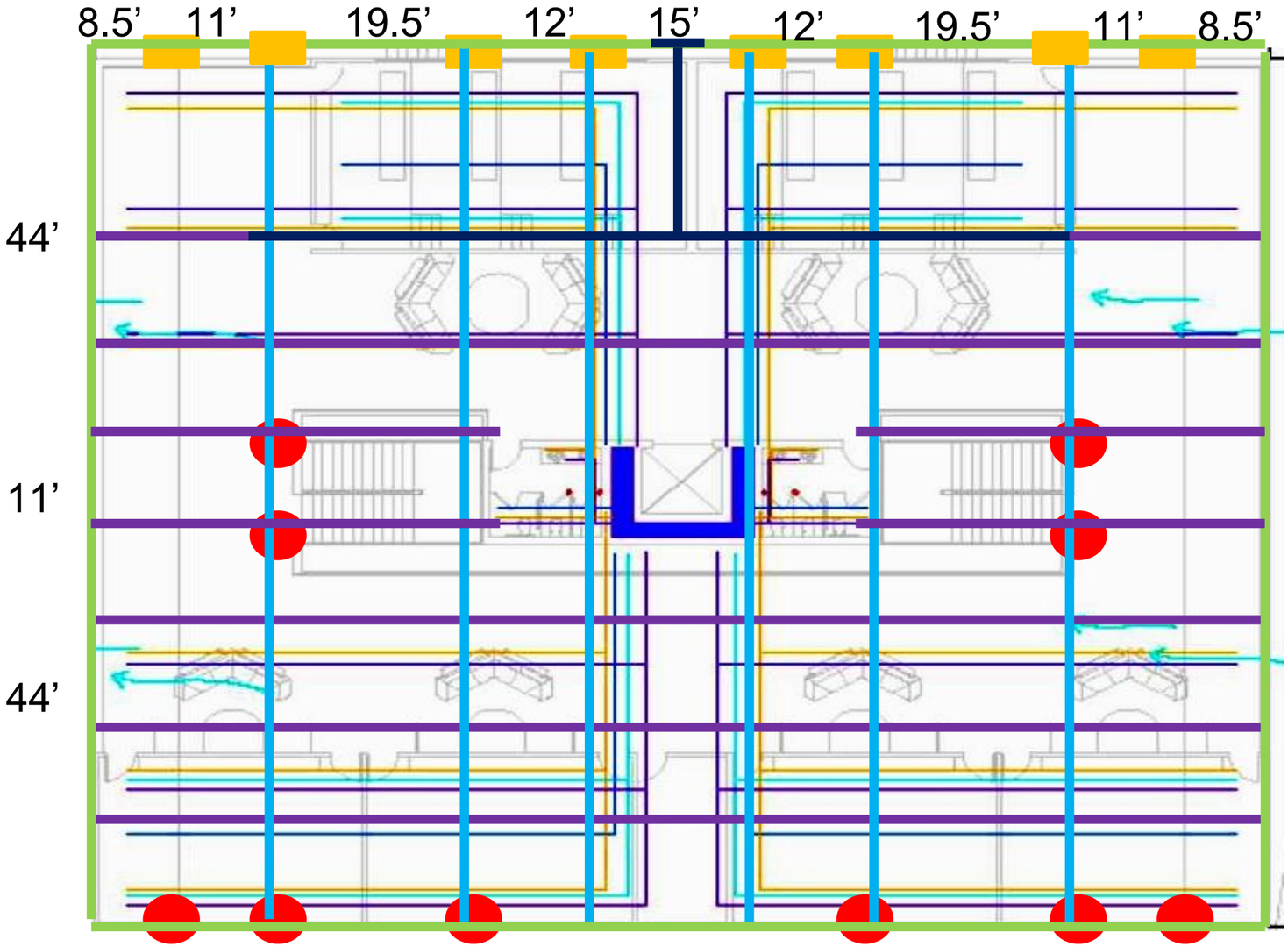
Column		
Round	R=24”	
Rectangle	12’x18’	
Beam		
Filler Beam	W12X26	
Int Girder	W21X111	
Ext Girder	W27X84	
Gravity Wall		
Gravity Wall	12”	
Composite Floor System		
LW Slab	4.5”	



PALM TREE — STEEL and CONCRETE

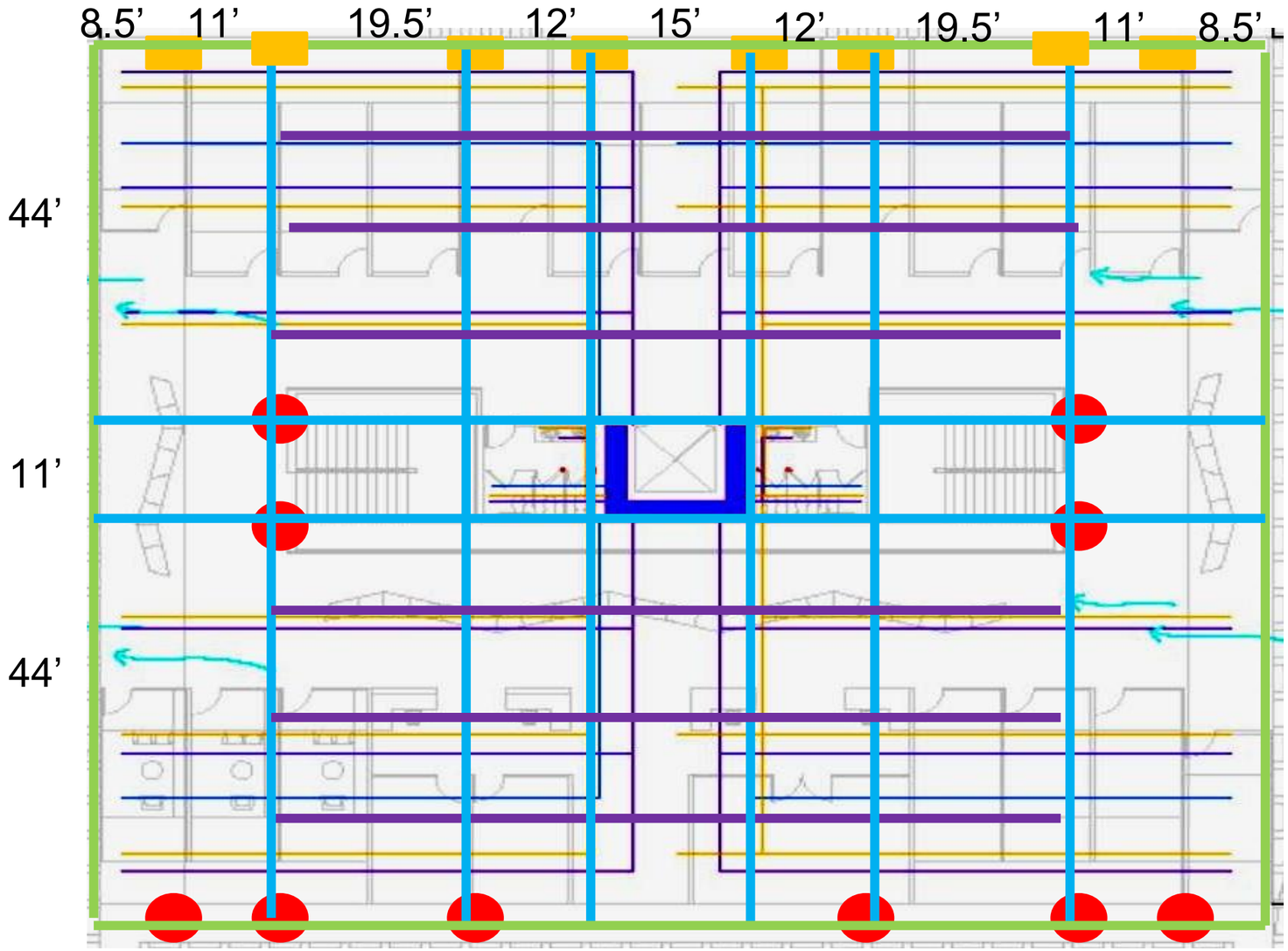
LEVEL 2

Column		
Round	R=24”	
Rectangle	12’x18’	
Tension	Pipe 1 STD	
Beam		
Filler Beam	W12X26	
Int Girder	W21X111	
Ext Girder	W27X84	
Gravity Wall		
Gravity Wall	12”	
Composite Floor System		
LW Slab	4.5”	



PALM TREE — STEEL AND CONCRETE LEVEL 3

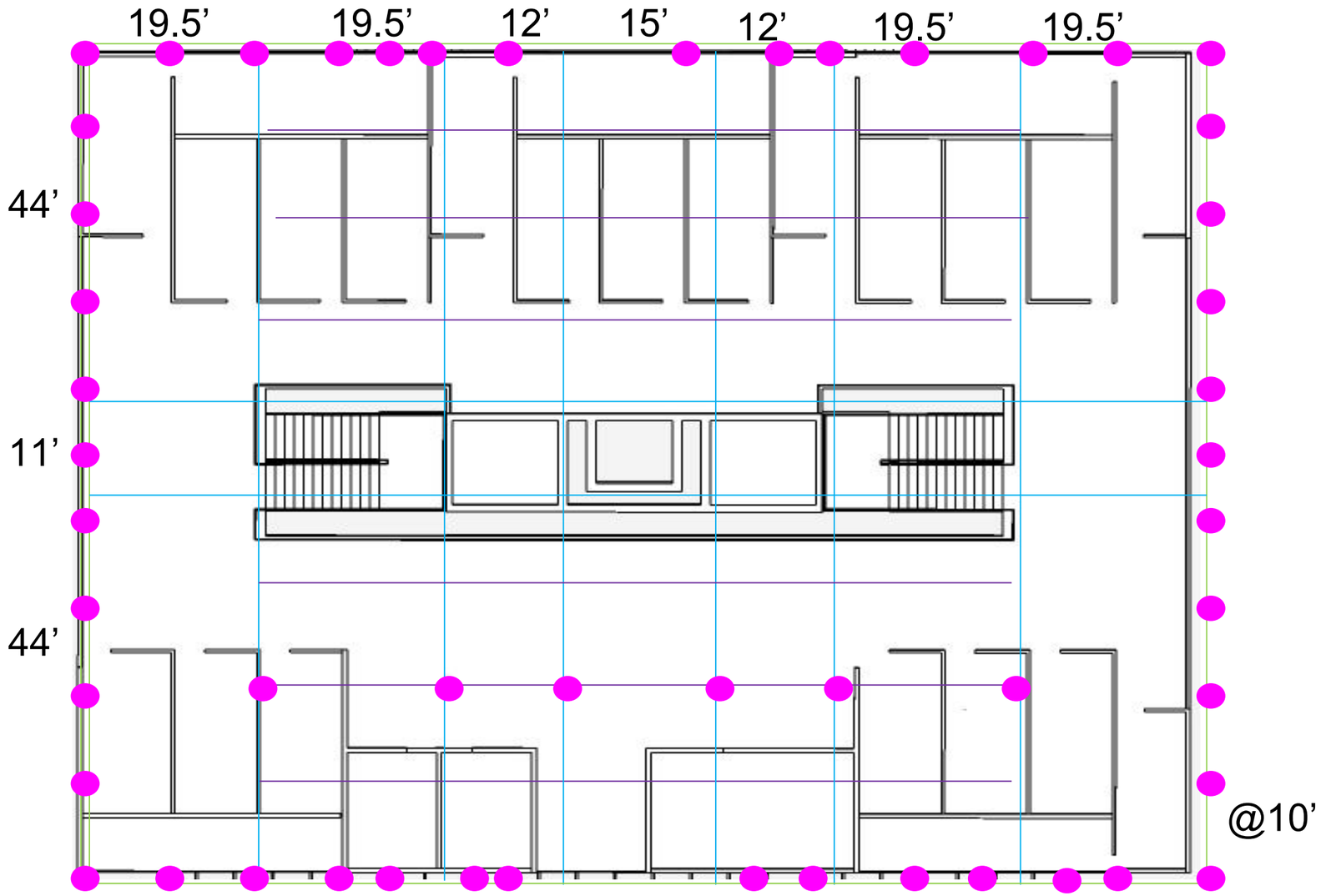
Column		
Round	R=24”	
Rectangle	12’x18’	
Tension	Pipe 1 STD	
Beam		
Filler Beam	W12X26	
Int Girder	W24X131	
Ext Girder	W27X84	
Composite Floor System		
LW Slab	4.5”	



PALM TREE — STEEL AND CONCRETE IDEA

REDISTRIBUTION

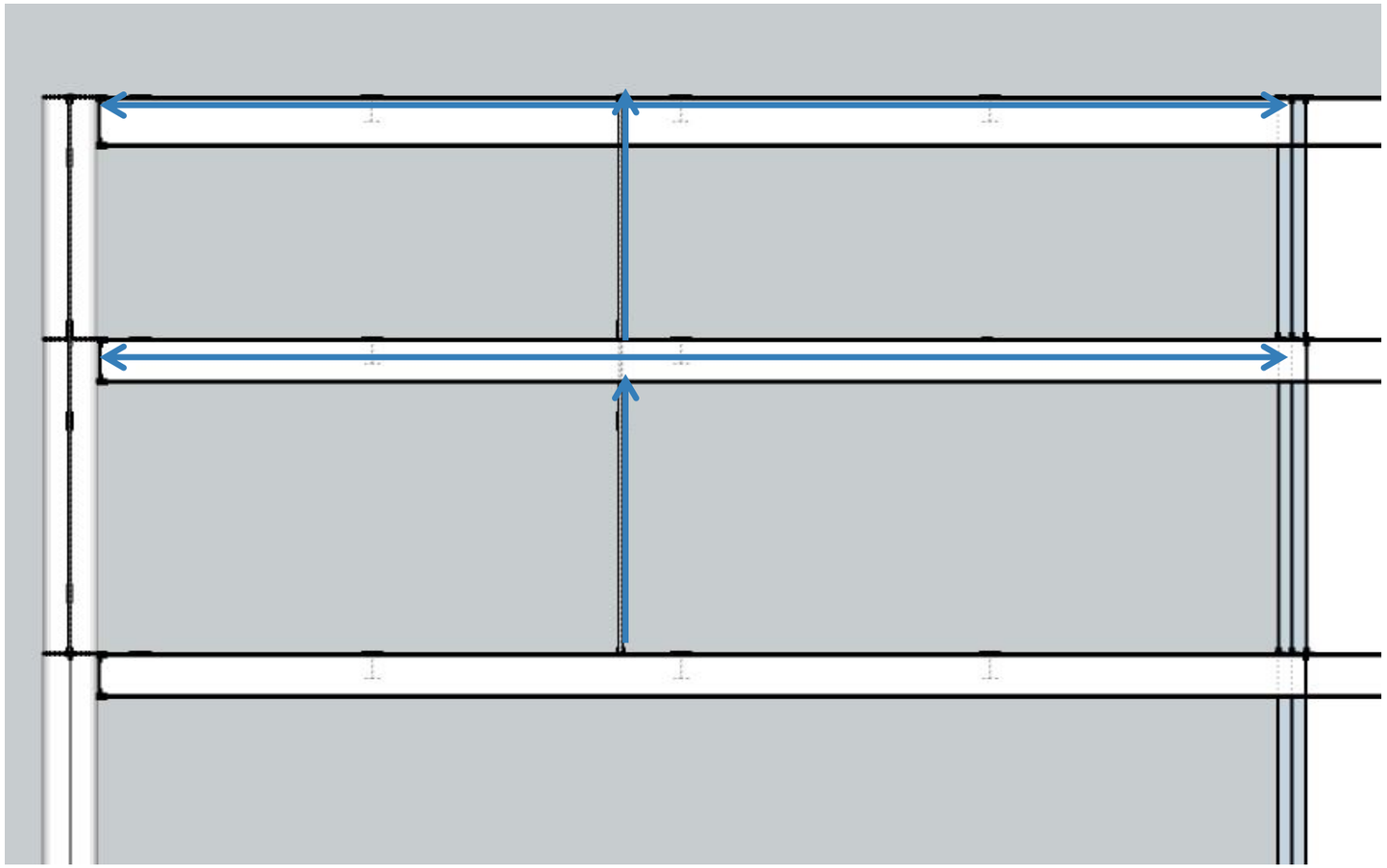
Column		
Round	R=24”	
Rectangle	12’x18’	
Tension	Pipe 1 STD	
Beam		
Filler Beam	W12X26	
Int Girder	W24X131	
Ext Girder	W27X84	
Composite Floor System		
LW Slab	4.5”	

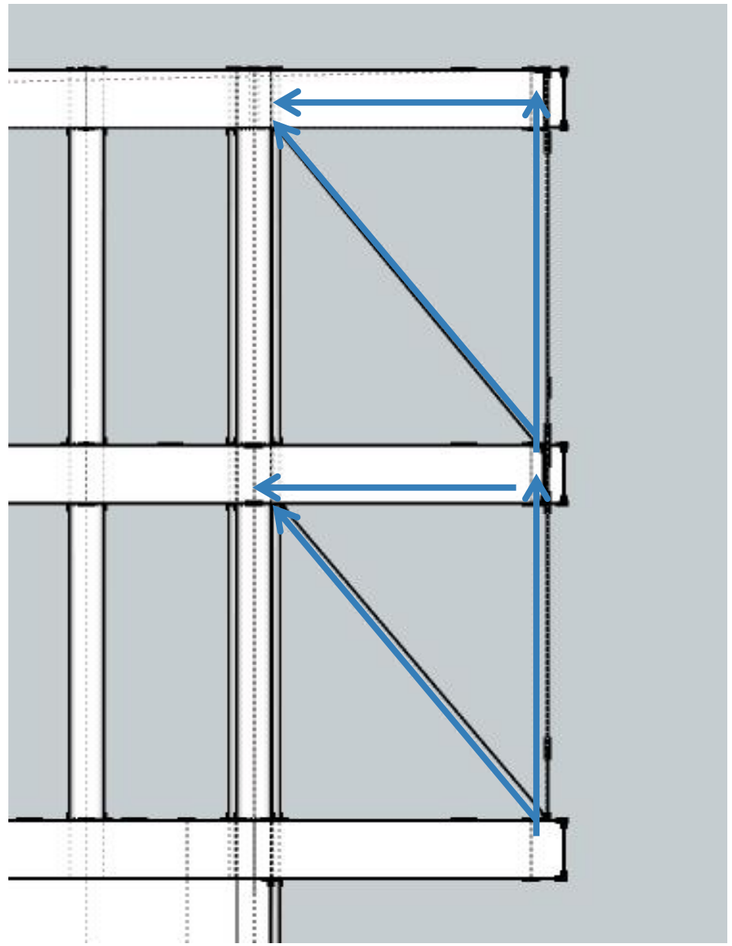


@6’ skip compression column

PALM TREE — CONCRETE IDEA

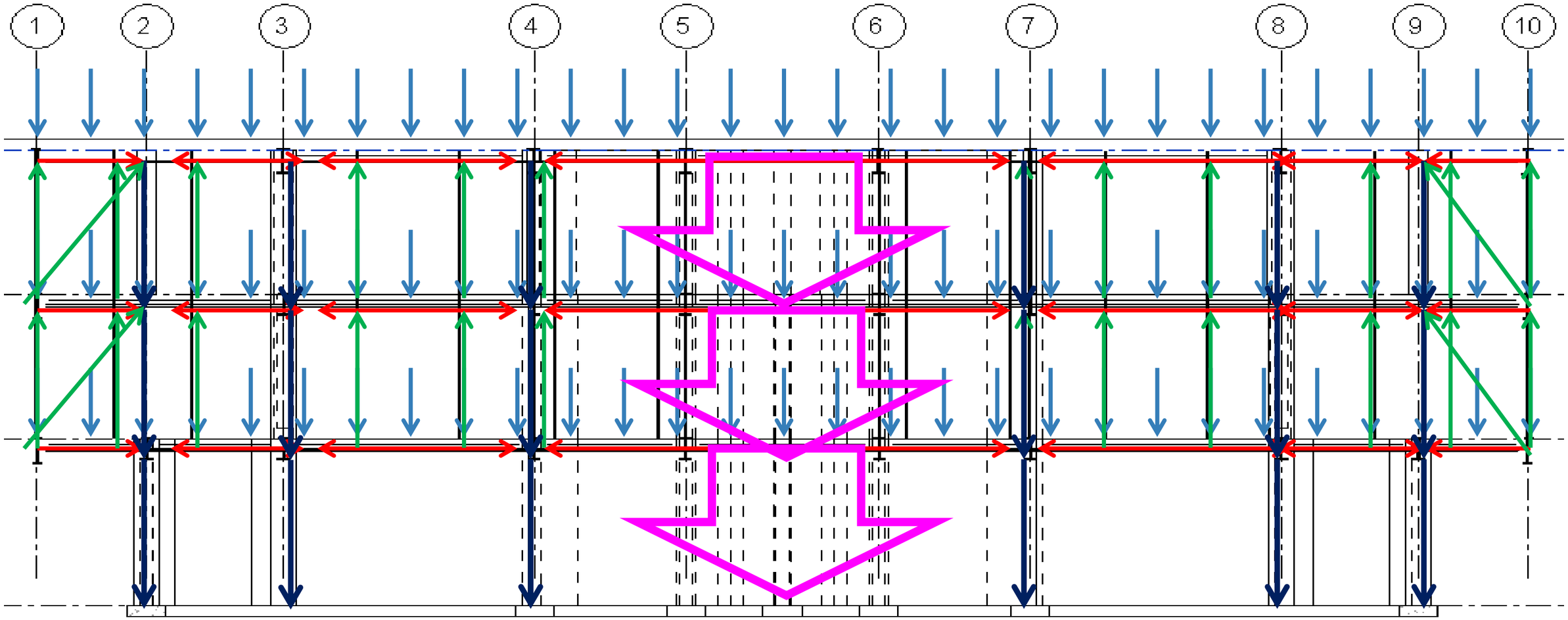
REDISTRIBUTION





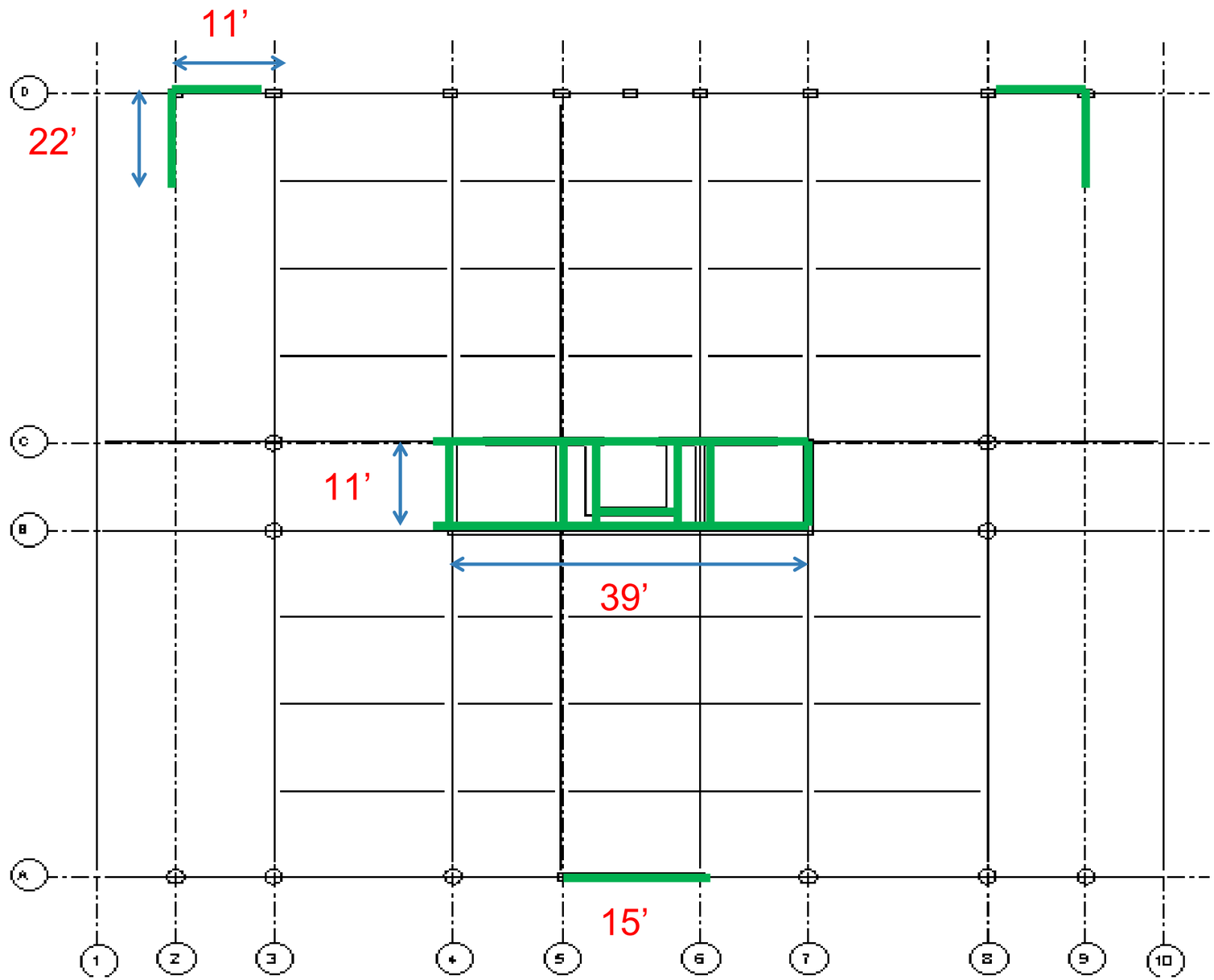
PALM TREE — STEEL AND CONCRETE LOAD PATH

GRAVITY LOAD PATH



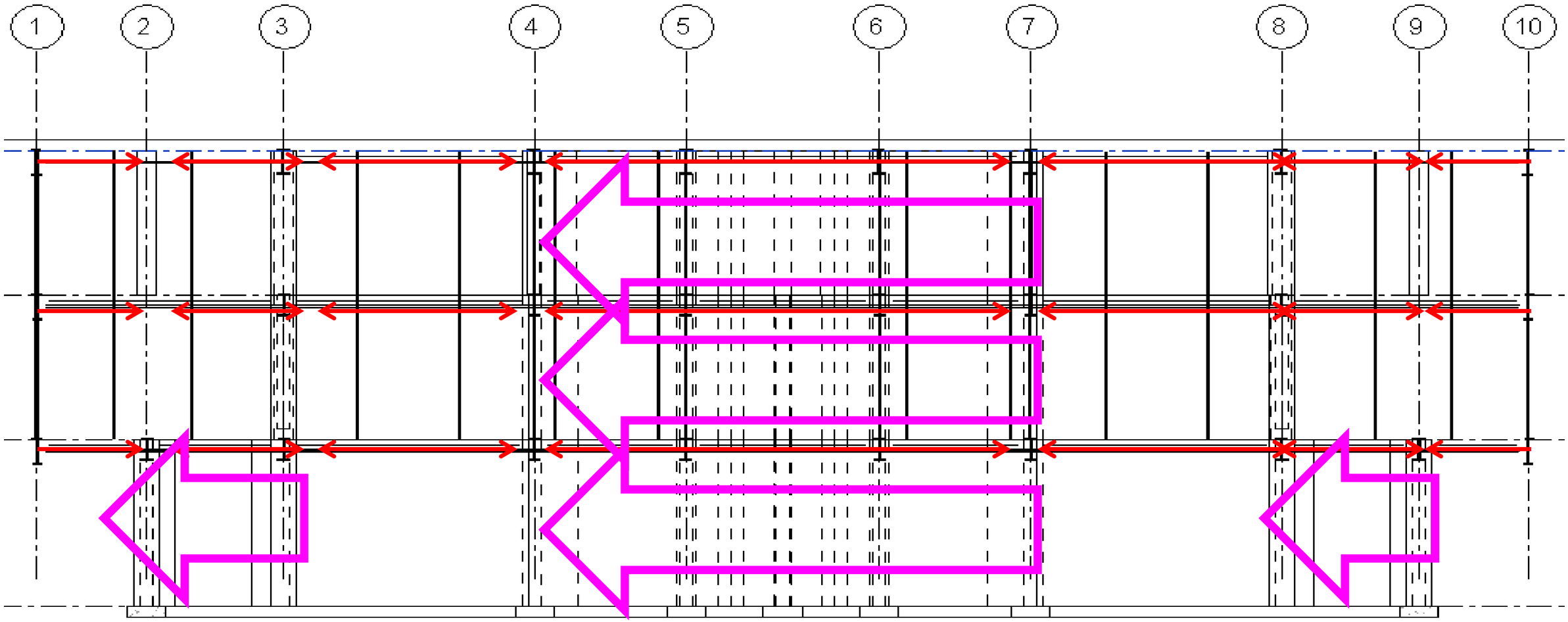
PALM TREE — STEEL AND CONCRETE LATERAL SYS

Shear Wall		
Shear Wall	12”	



PALM TREE — STEEL AND CONCRETE LATERAL SYS

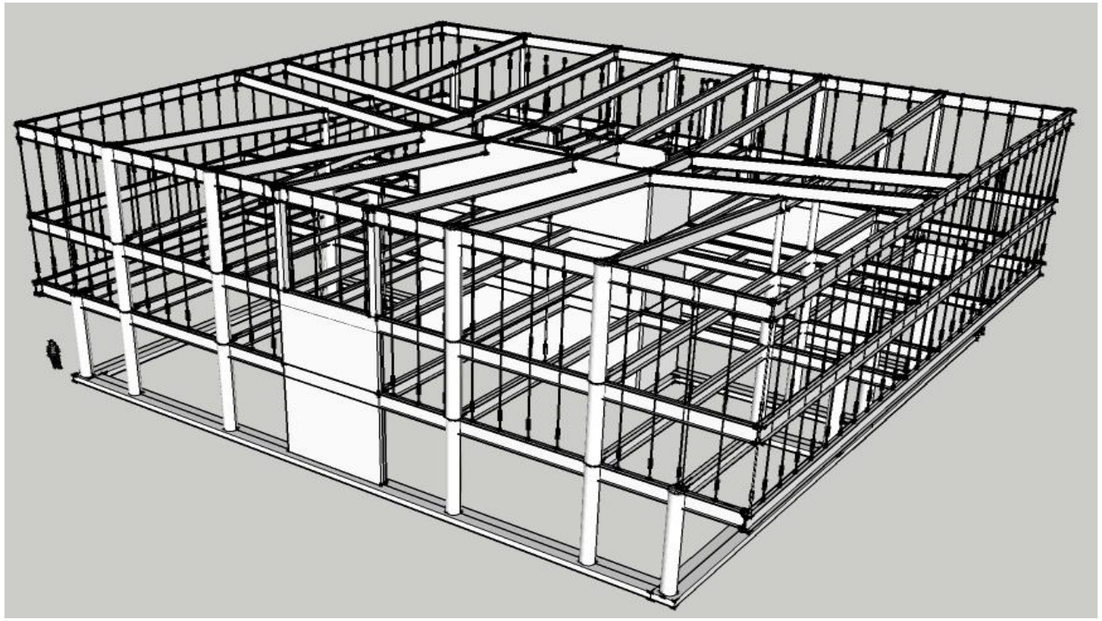
LOAD PATH



PALM TREE — STEEL AND CONCRETE CHALLENGE

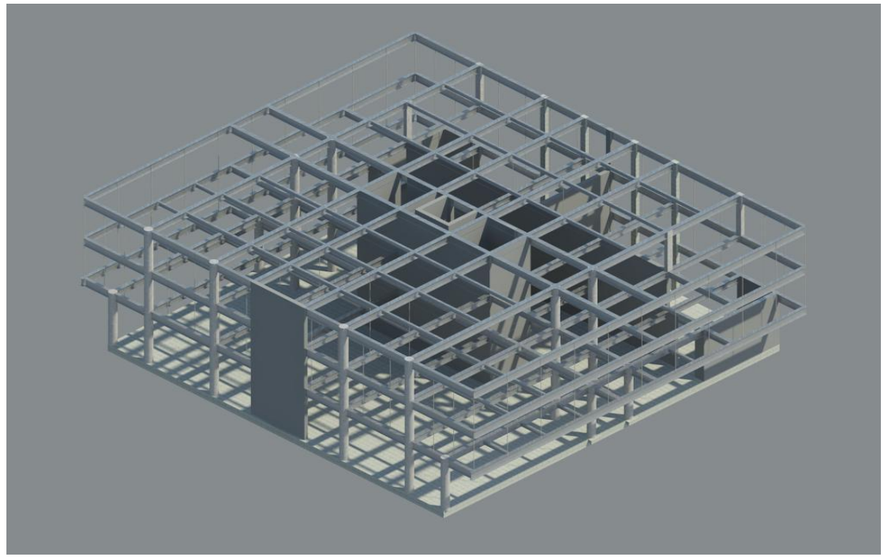
- ROOF BEAMS ARE SLOPED

- COLUMNS WILL HAVE HORIZONTAL LOAD

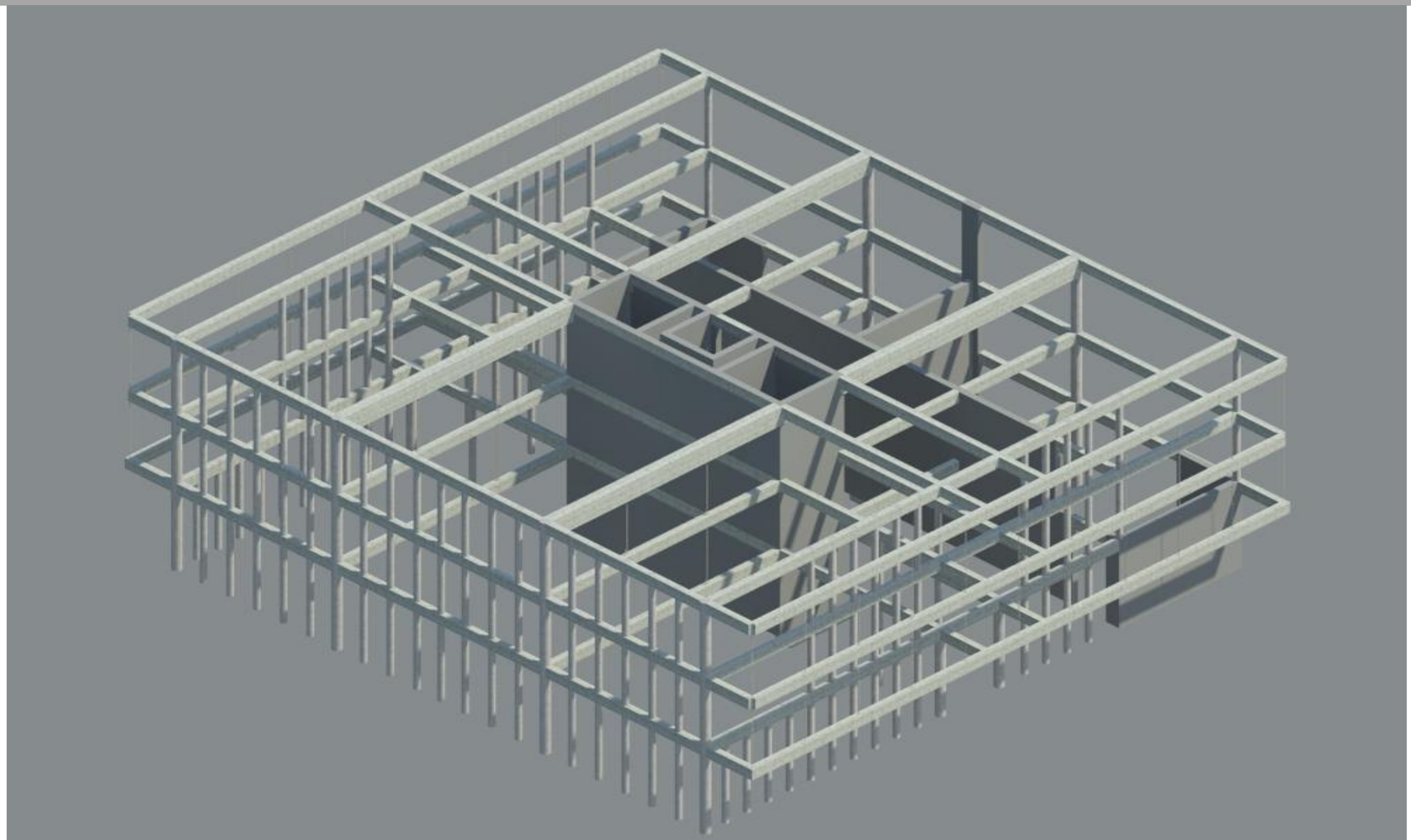


PALM TREE — STEEL AND CONCRETE PRO AND CON

- EASY TO CONSTRUCT
- BIG SPACE
- SUSTAINABLE
- INTEGRATE ARCHITECTURAL FACADE
- WEAK LATERAL RESISTANCE



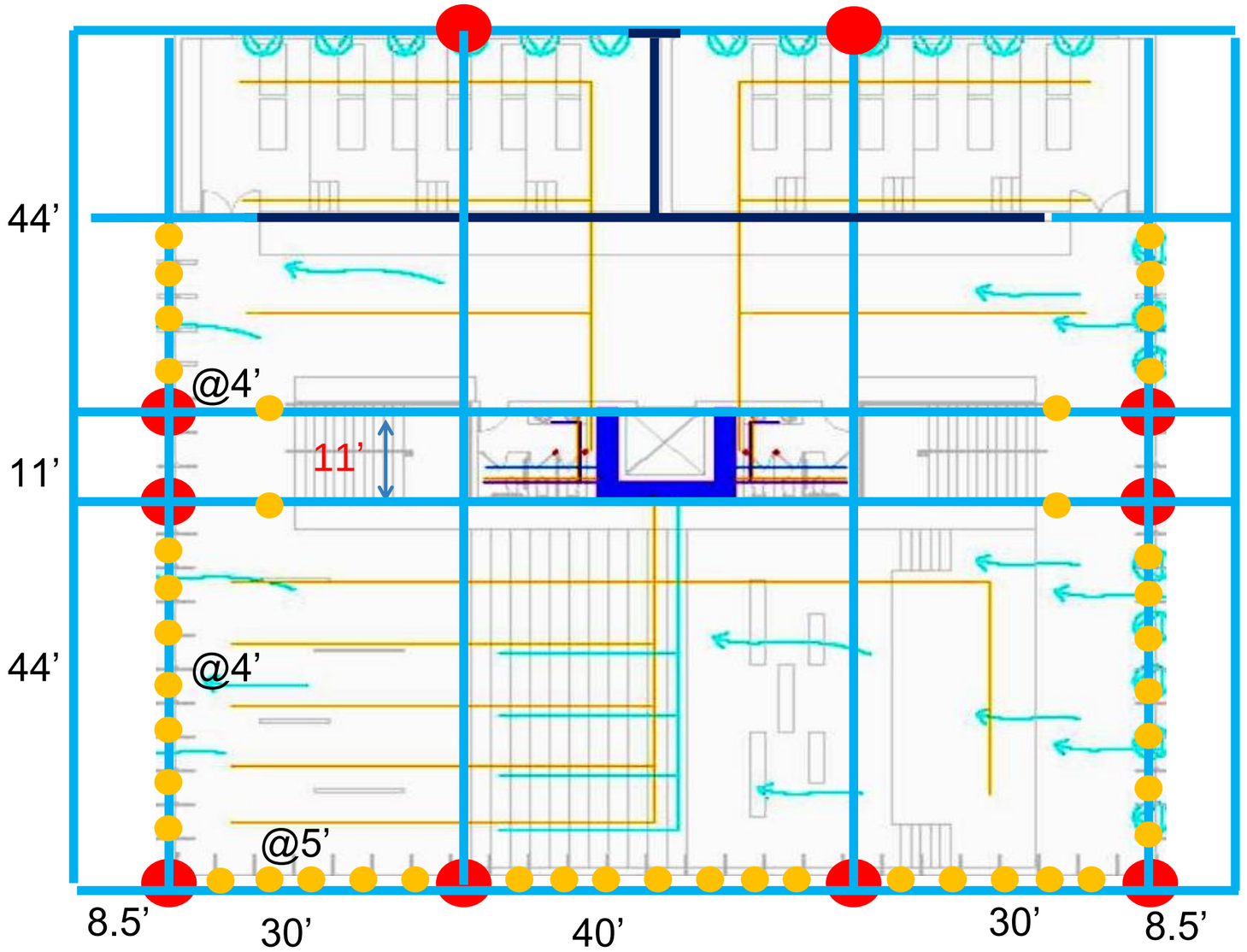
PALM TREE —CONCRETE OVERVIEW



A E CM MEP LCFM

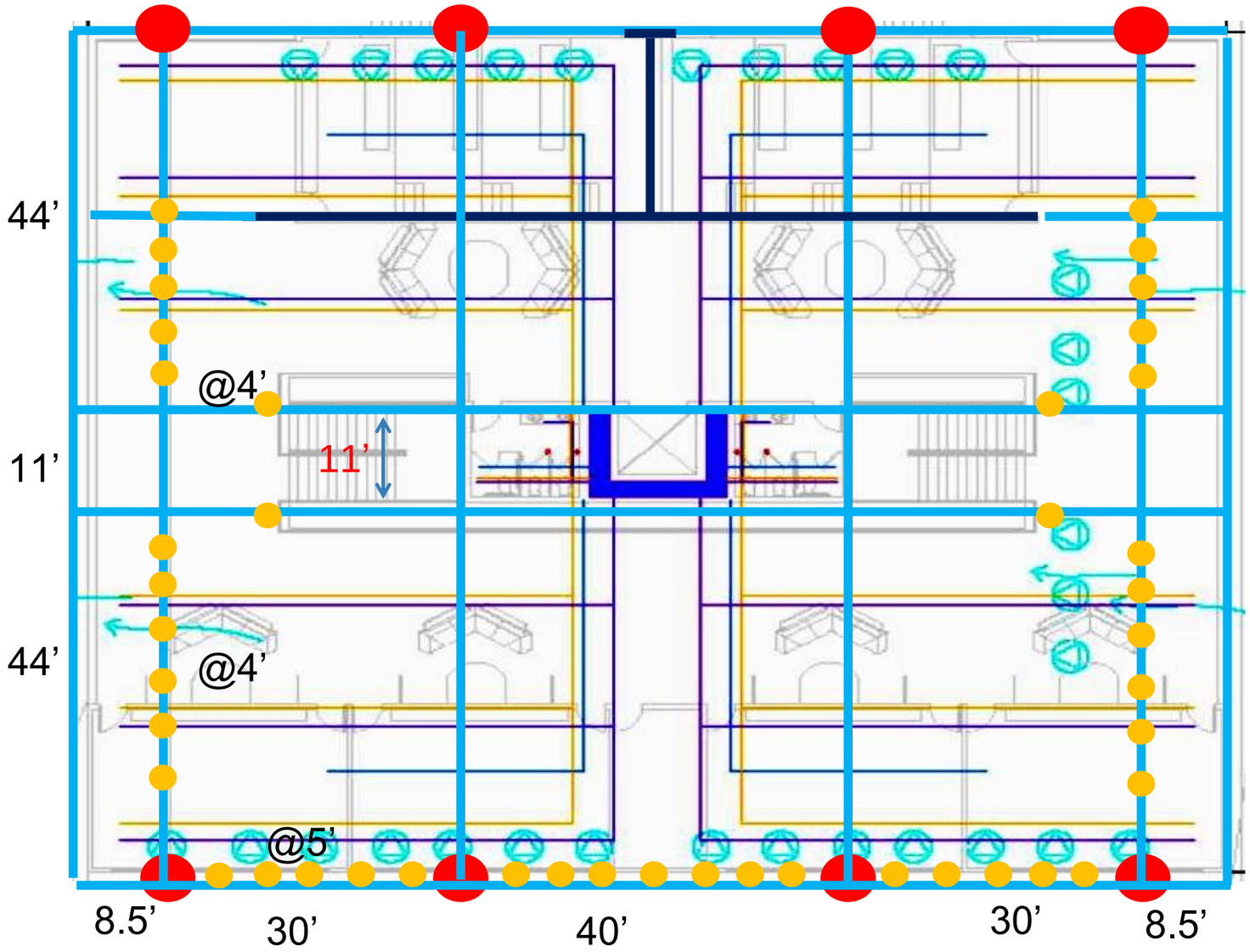
PALM TREE —CONCRETE LEVEL 1

Column		
Round	R=12”	●
Round	R=18”	●
PT Beam		
Int Beam	24”X12”	—
Gravity Wall		
Gravity Wall	12”	—
Floor System		
PT Slab	10.5”	



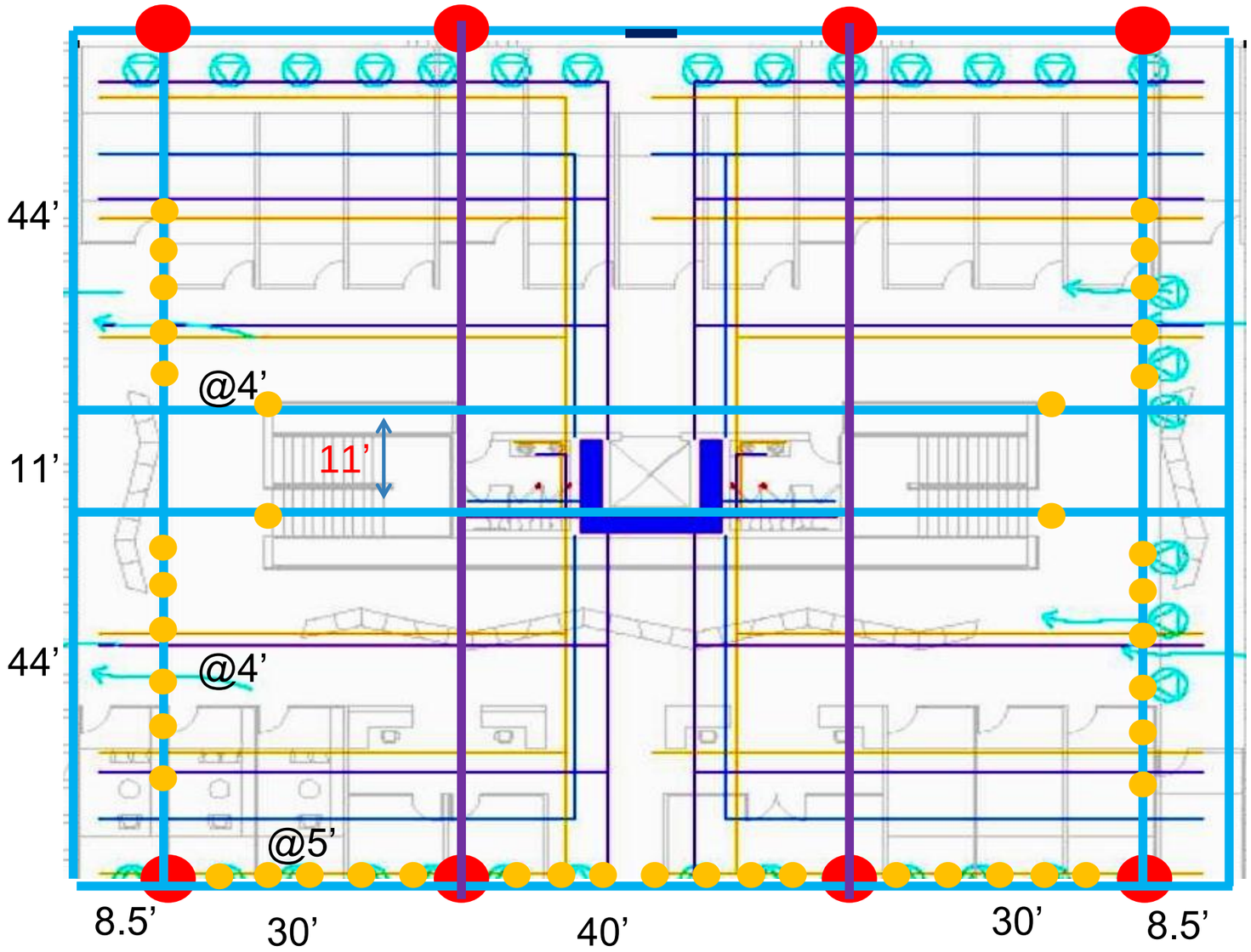
PALM TREE —CONCRETE LEVEL 2

COLUMN		
ROUND	r=12”	●
ROUND	r=18”	●
TENSION	PIPE1STD	●
PT BEAM		
INT BEAM	24”x12”	—
GRAVITY WALL		
GRAVITY WALL	12”	—
FLOOR SYSTEM		
PT SLAB	10.5”	



PALM TREE —CONCRETE LEVEL 3

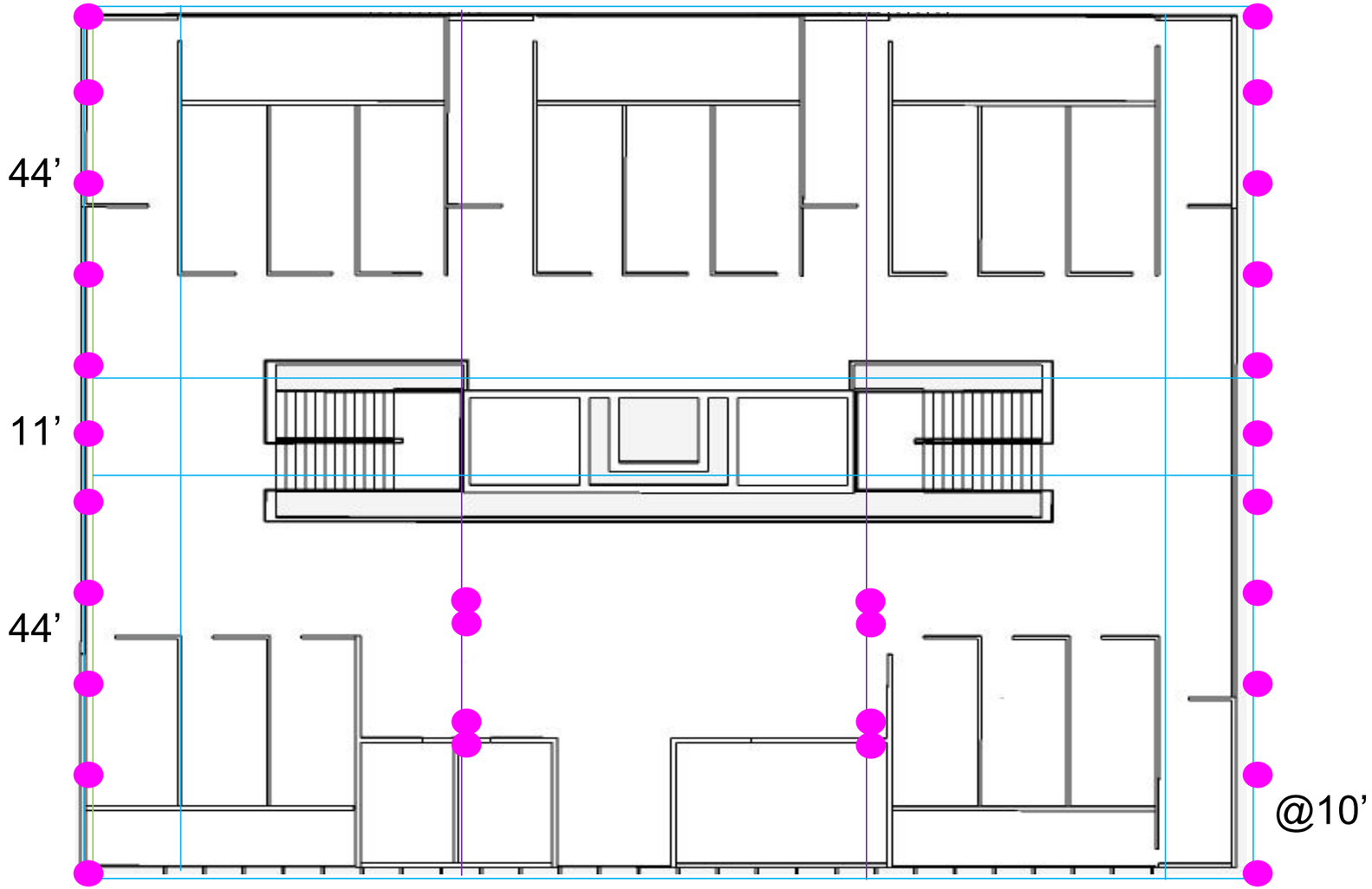
Column		
Round	R=12”	●
Round	R=18”	●
Tension	Pipe1STD	●
PT Beam		
Int Beam	44”X21”	—
Ext Beam	24”X12”	—
Gravity Wall		
Gravity Wall	12”	—
Floor System		
PT Slab	10.5”	



PALM TREE — CONCRETE IDEA

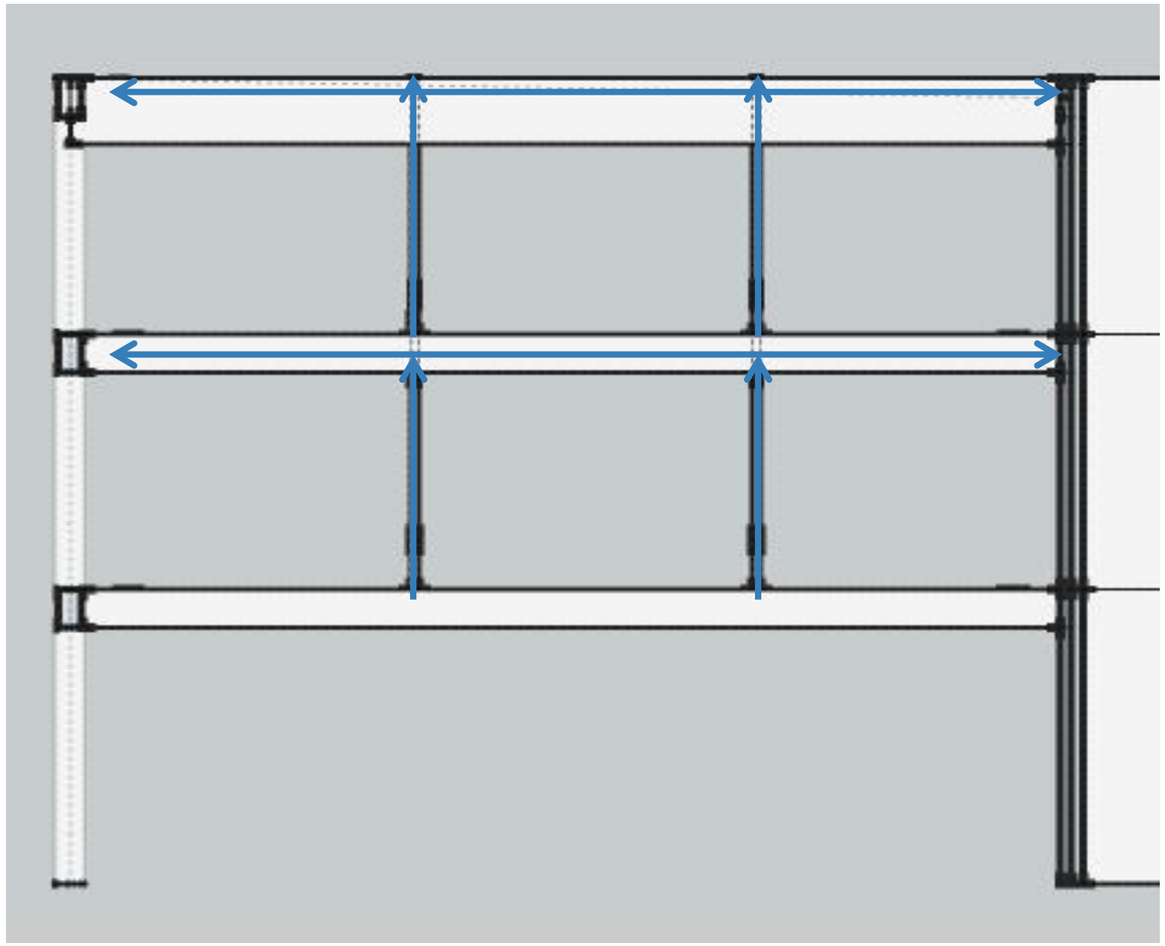
REDISTRIBUTION

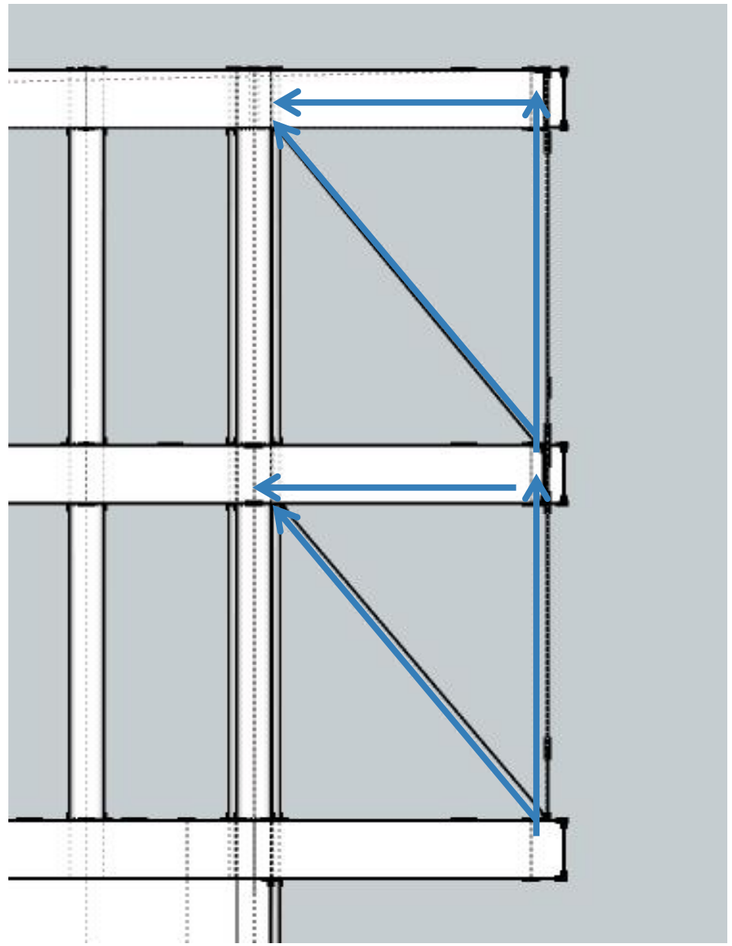
Column		
Tension	Pipe 1 STD	●
Beam		
Int Beam	44”X21”	▬
Ext Beam	24”X12”	▬



PALM TREE — CONCRETE IDEA

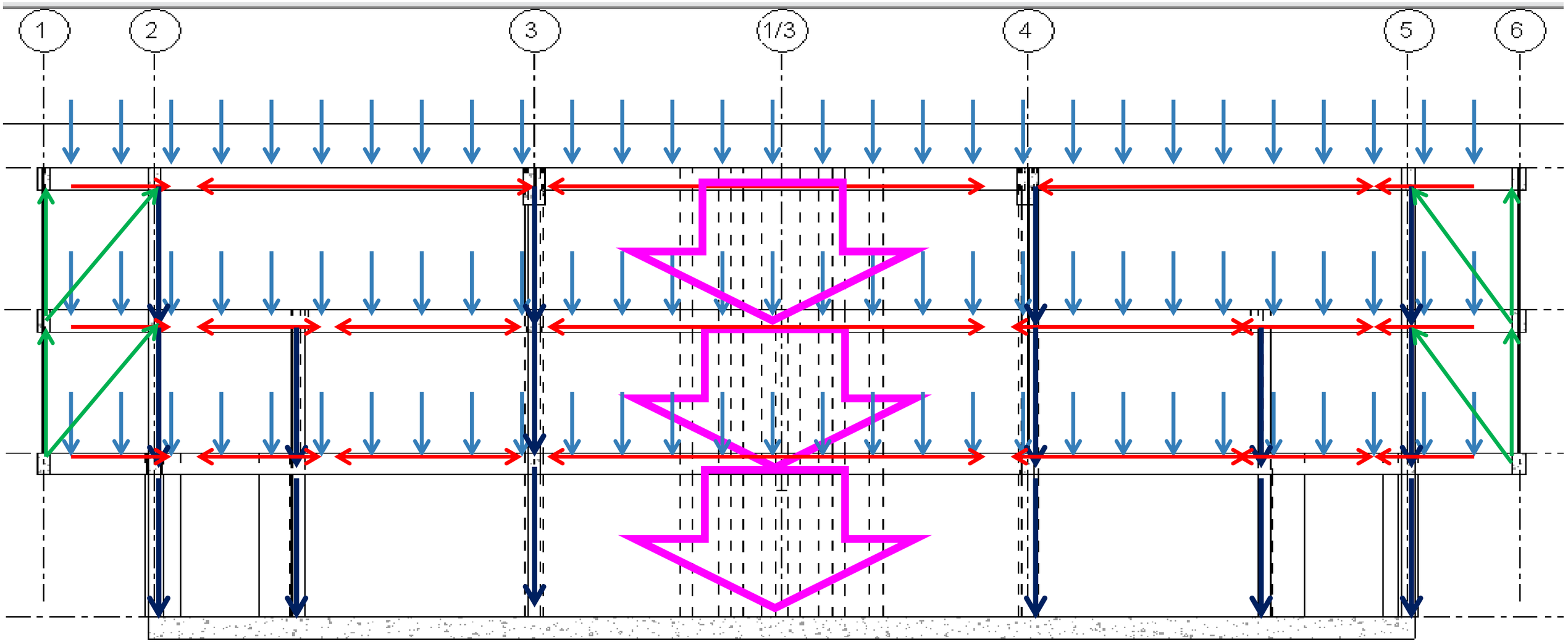
REDISTRIBUTION





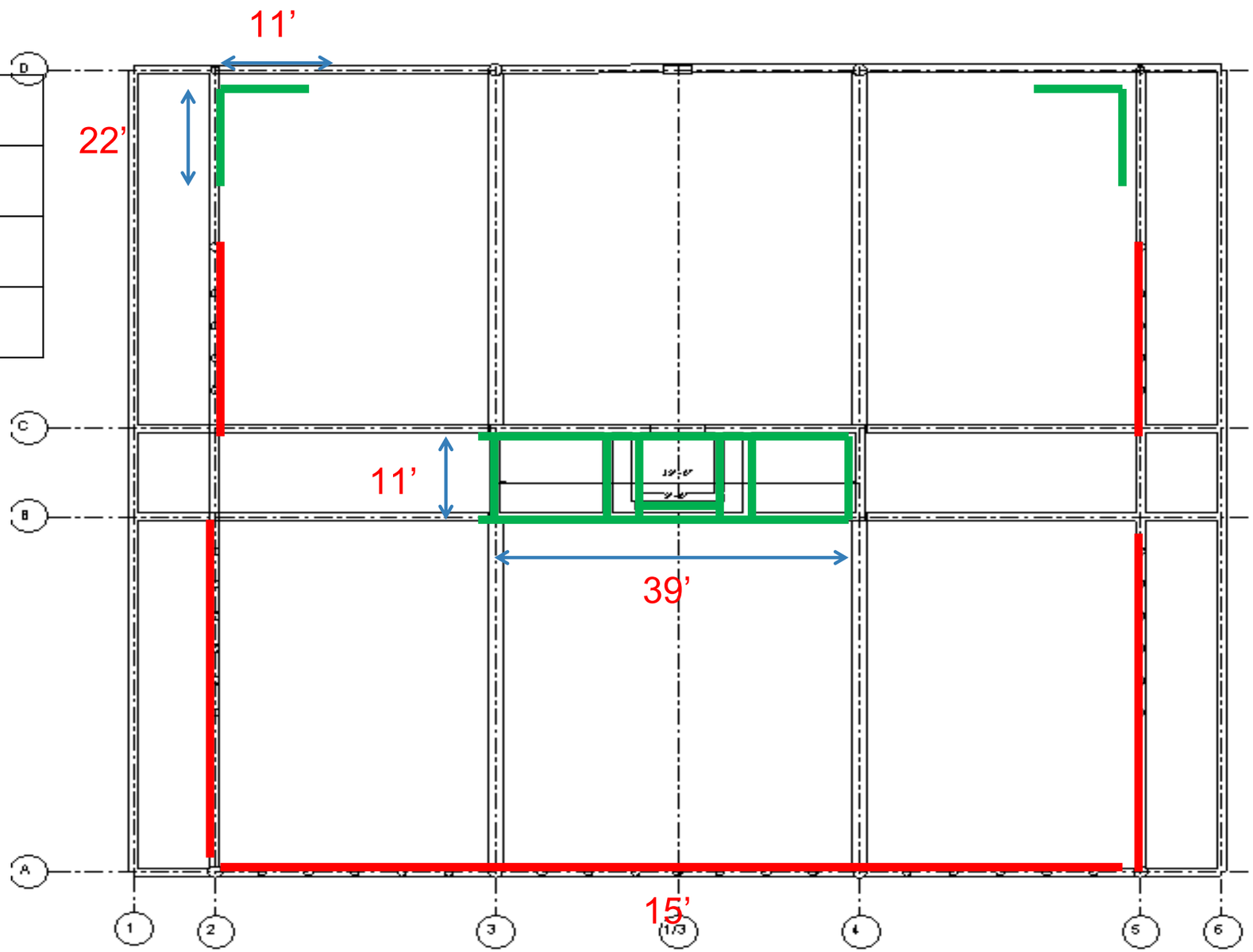
PALM TREE — CONCRETE LOAD PATH

Gravity Load Path



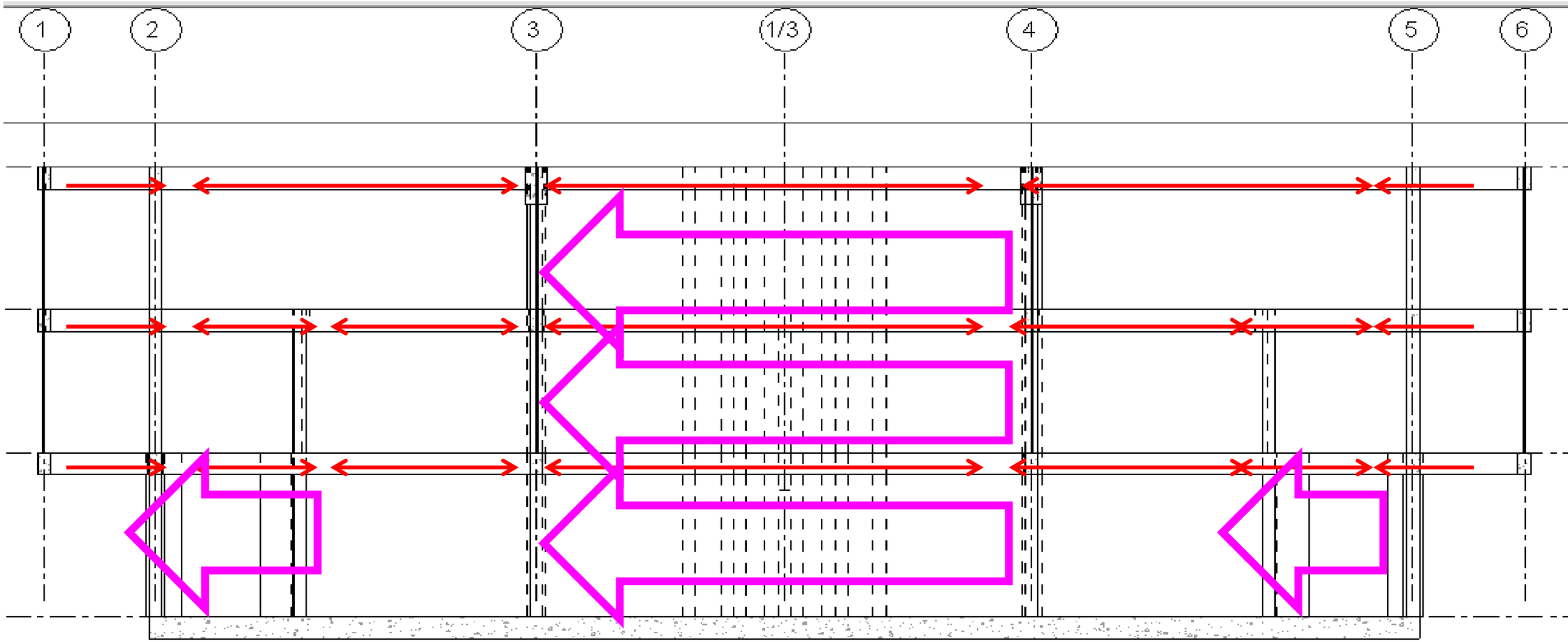
PALM TREE — CONCRETE LATERAL SYS

Shear Wall		
Shear Wall	12”	—
Columns		
Columns	R=12”	—



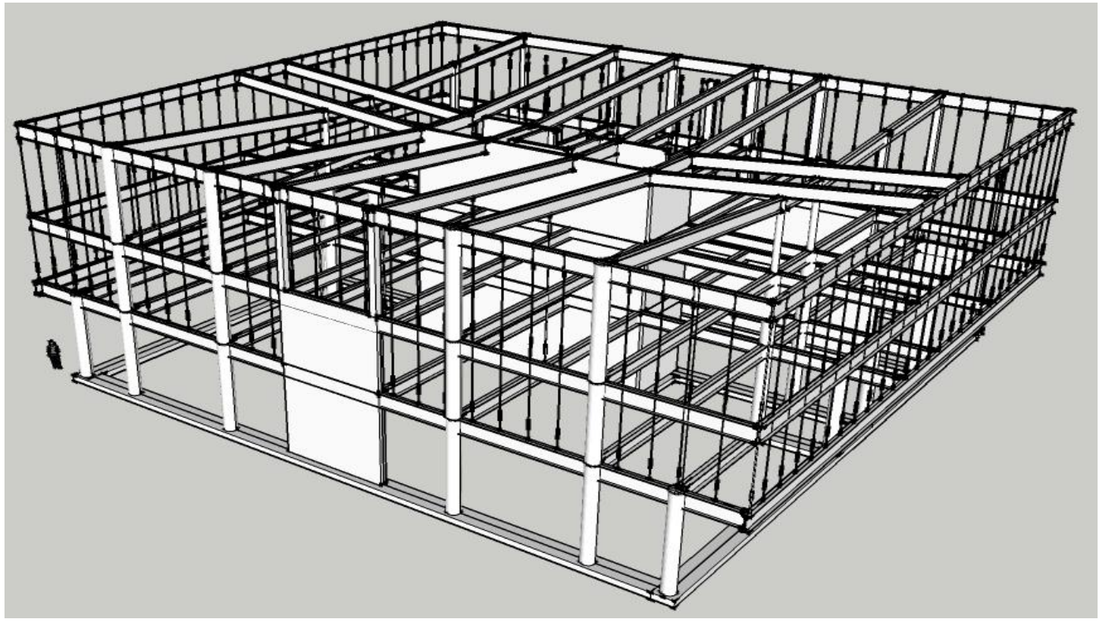
PALM TREE — CONCRETE LATERAL SYS

Load Path



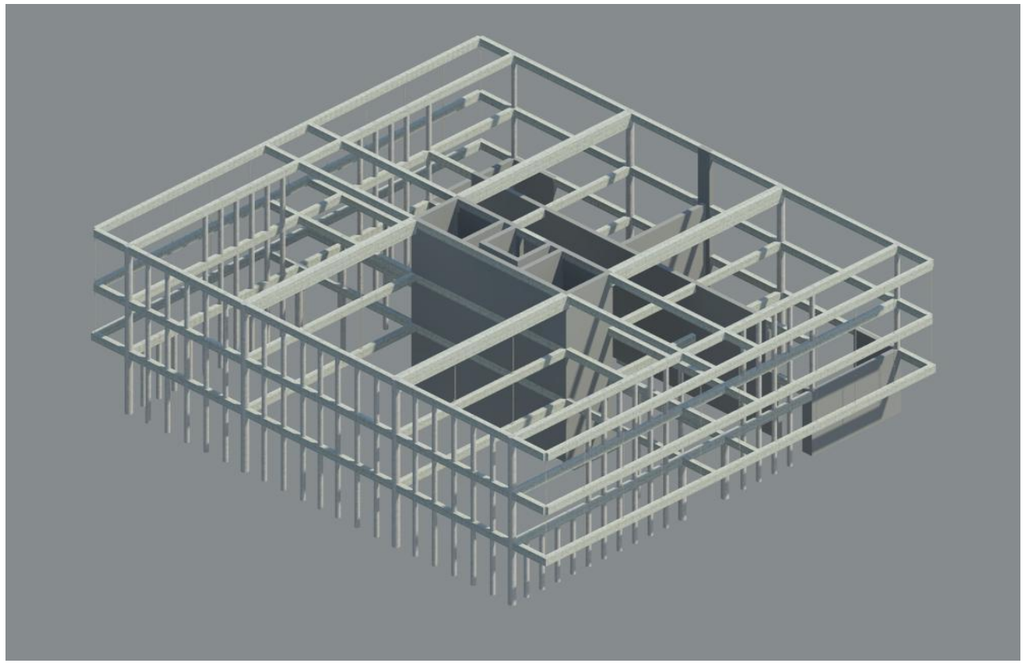
PALM TREE — CONCRETE CHALLENGE

- ROOF BEAMS ARE SLOPED
- COLUMNS WILL HAVE HORIZONTAL LOAD
- BIG SPAN



PALM TREE — CONCRETE PRO AND CON

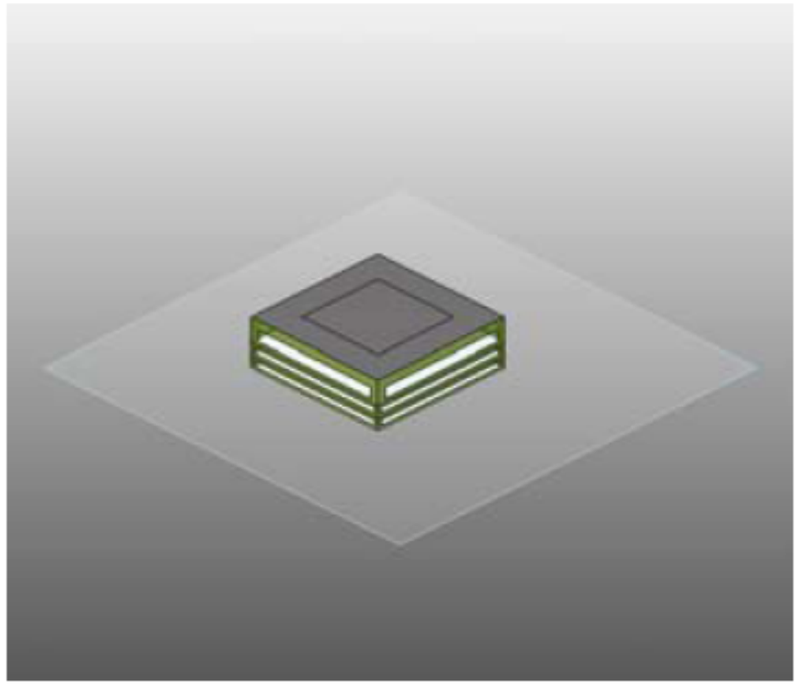
- GOOD LATERAL RESISTANCE
- INTEGRATE ARCHITECTURAL COMPONENT
- BIG SPACE
- HEAVY MASS
- HUGE COMPONENT



	CLASS	SPECIFICATIONS	
THERMAL ENVIRONMENT	CLASS B	COOLING SEASON: 24.5 – 27.5 C HEATING SEASON: 21.5 – 25.5 C	76 – 81.5 F 71 – 78 F
ENERGY	NET-ZERO	ANNUAL PRIMARY ENERGY CONSUMPTION ≤ RENEWABLE ENERGY PRODUCTION ON SITE	
INDOOR AIR QUALITY (IAQ)	GOOD	25 < RELATIVE HUMIDITY < 60%; CO2 concentration ≤ 1000 ppm	
LIGHTING QUALITY	GOOD	DAYLIGHT FACTOR ≥ 2.5%	

CONSTANT PARAMETERS

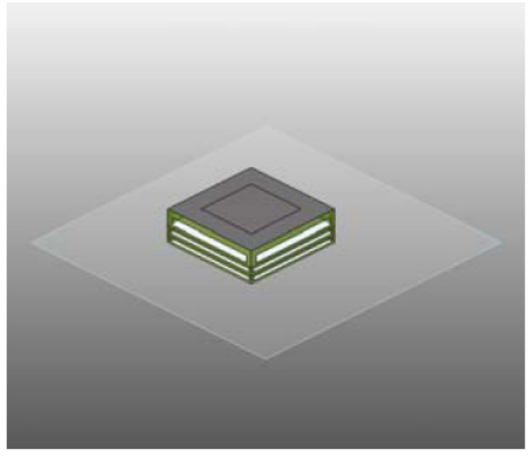
Revit Energy Analysis Result



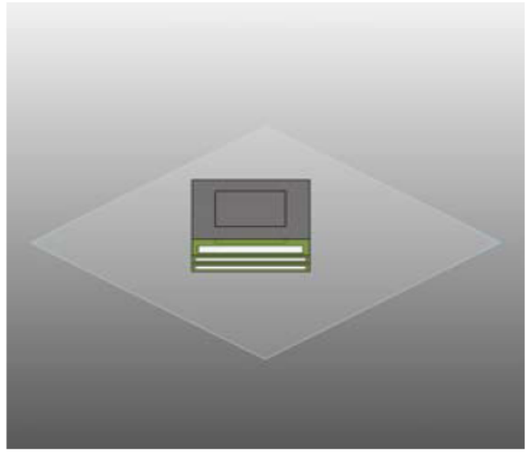
Building Performance Factors

Location:	San Juan, Puerto Rico
Weather Station:	1080107
Outdoor Temperature:	Max: 92°F/Min: 67°F
Floor Area:	30,000 sf
Exterior Wall Area:	16,000 sf
Average Lighting Power:	1.01 W / ft²
People:	124 people
Exterior Window Ratio:	0.40
Electrical Cost:	$0.09 / kWh
Fuel Cost:	$0.78 / Therm

N-E-S-W

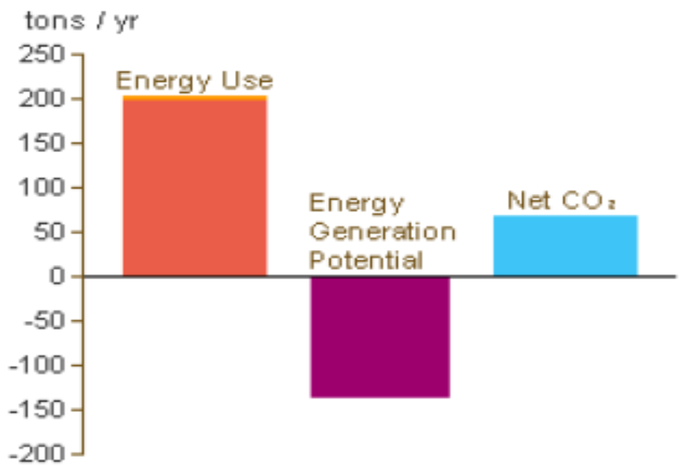


NE – SE – SW – NW

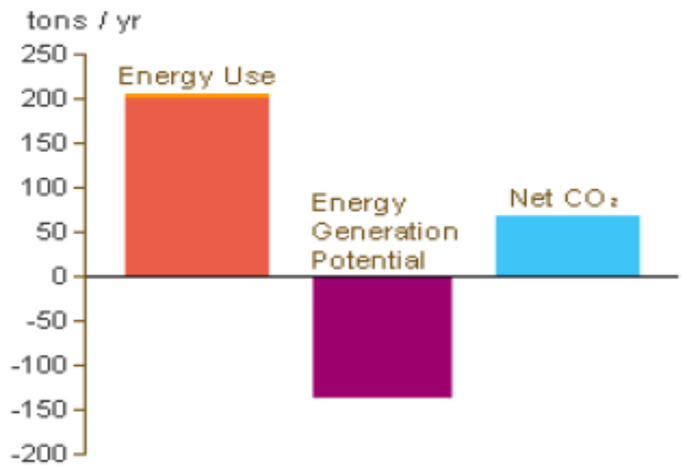


Revit Energy Analysis Result

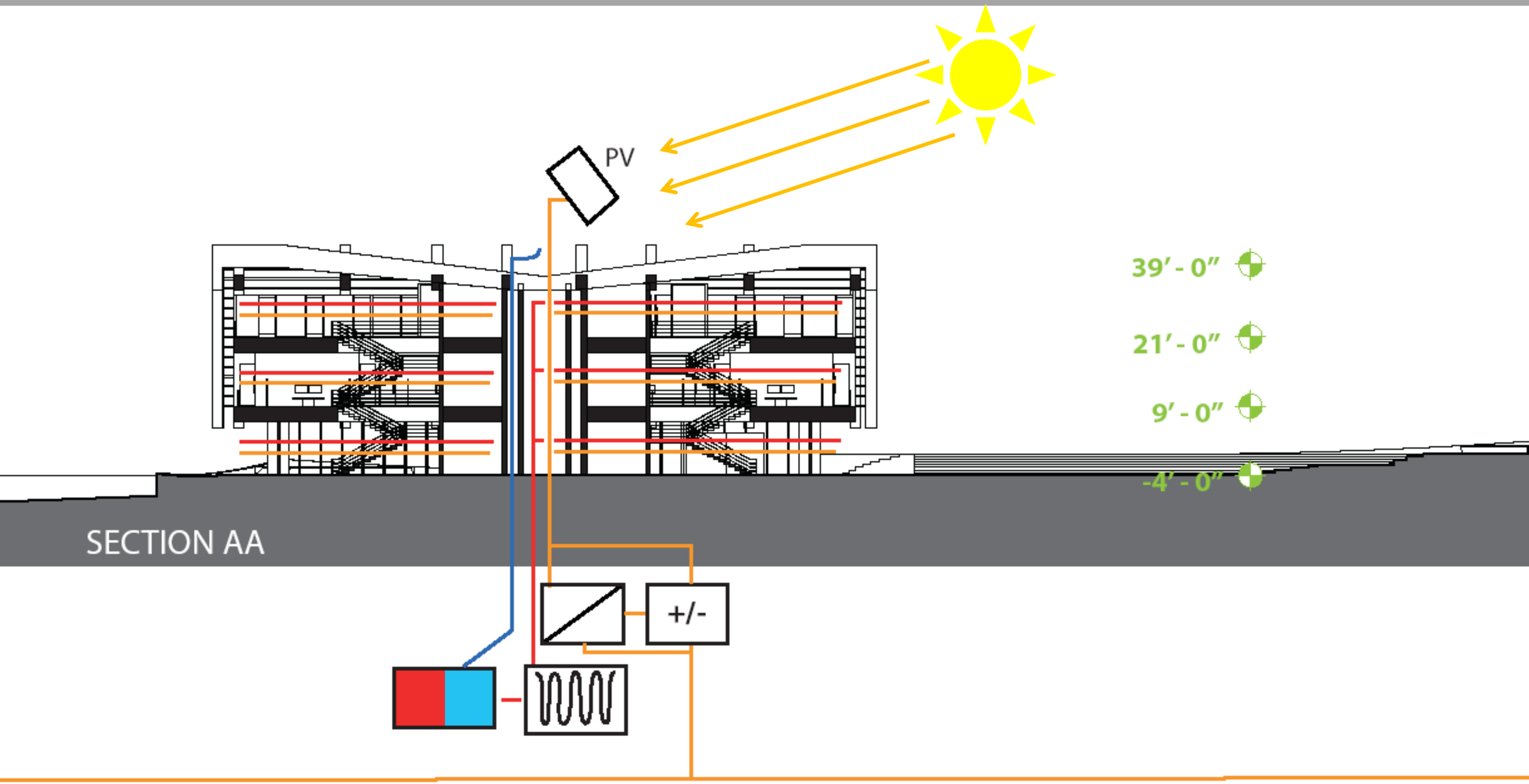
Emissions



	(tons / yr)
Electricity Consumption	198
Fuel Consumption	2
Roof PV Potential (High Efficiency)	-134
Single 15' Wind Turbine Potential	0
Net CO₂	66

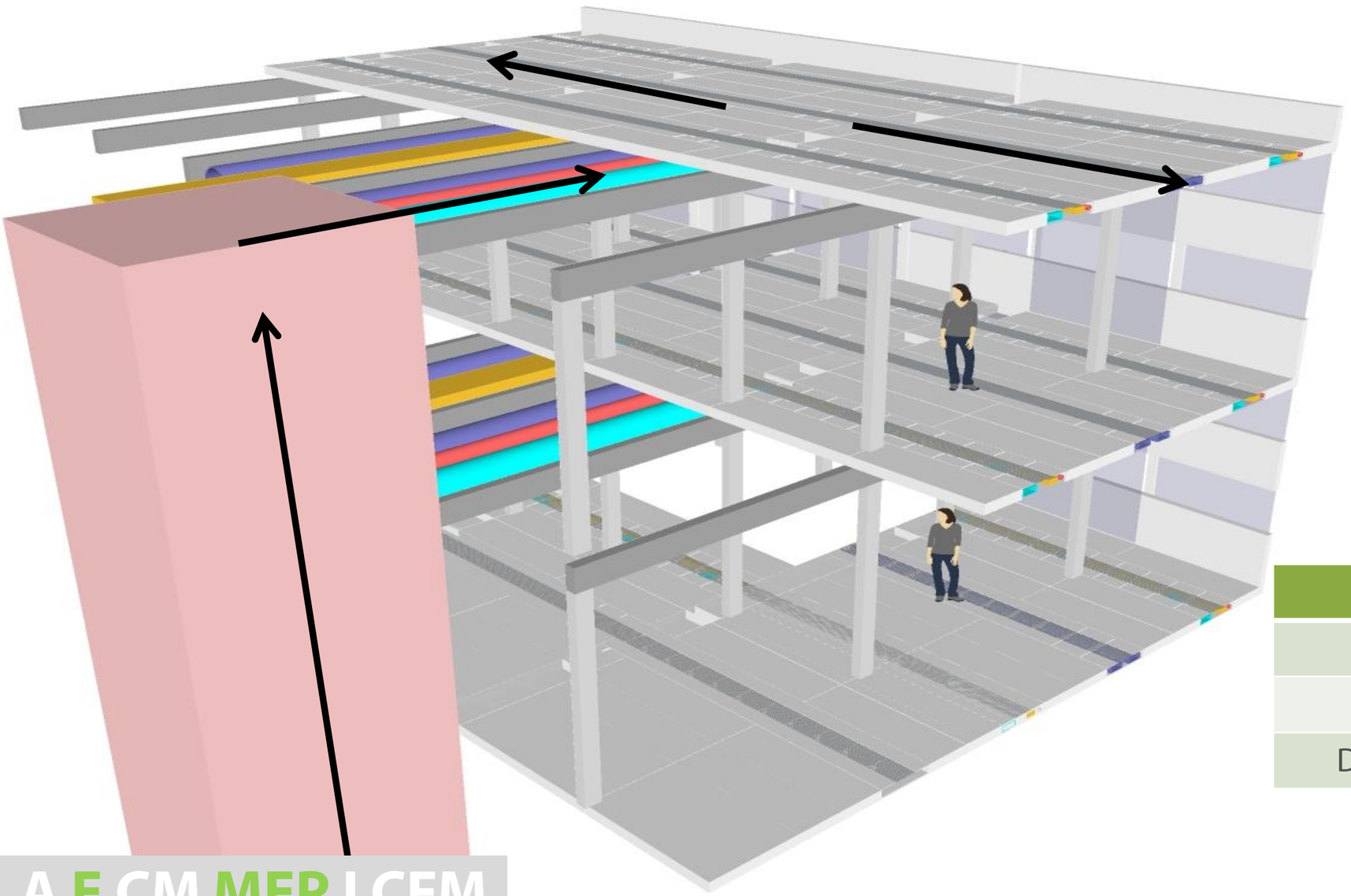


	(tons / yr)
Electricity Consumption	201
Fuel Consumption	2
Roof PV Potential (High Efficiency)	-135
Single 15' Wind Turbine Potential	0
Net CO₂	68



SECTION AA

SANDWICH HEIGHT: 2’ INCLUDING BEAM HEIGHT



- AIR SUPPLY
- AIR RETURN
- ELECTRICITY
- SPRINKLER SYSTEM
- CORE
- DISTRIBUTION CONCEPT

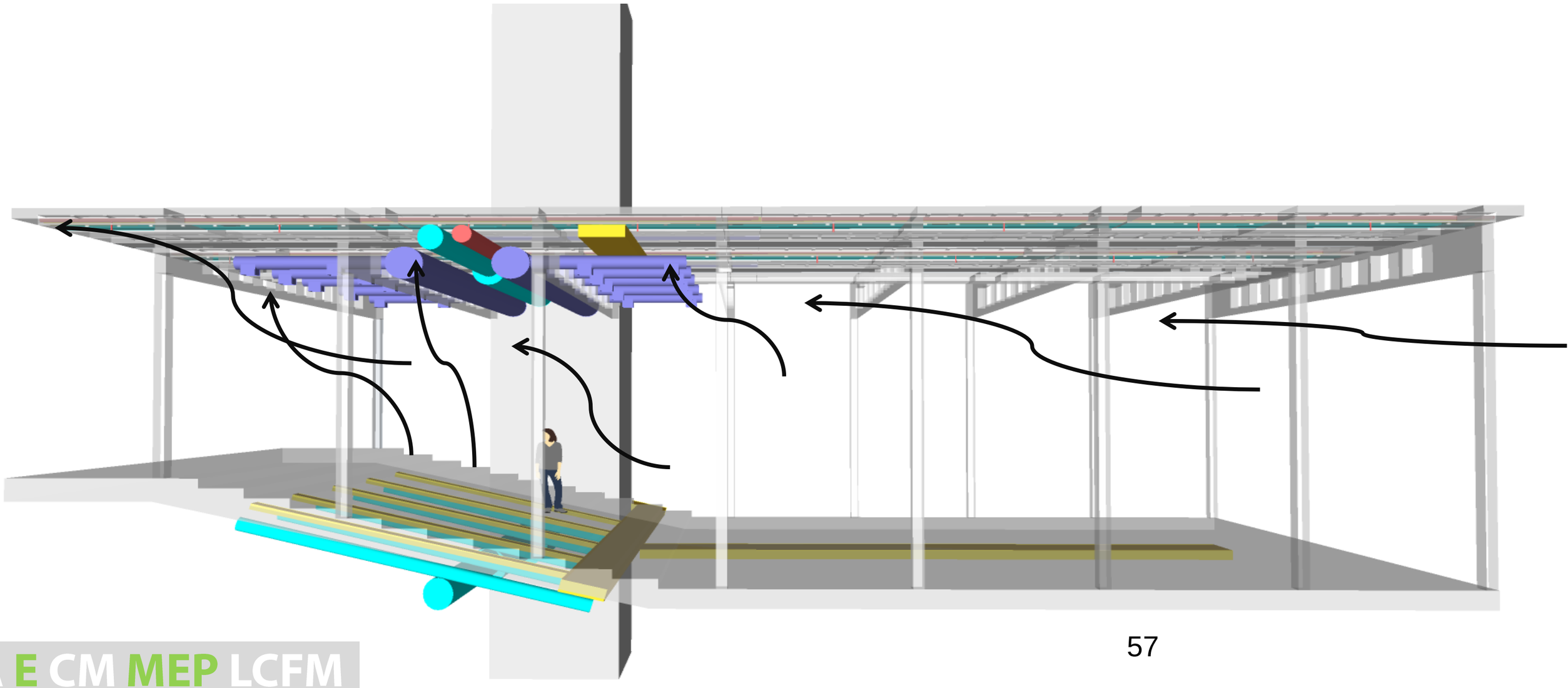
DUCT TYPE	DUCT DIAMETER
SHAFTS	24”
MAIN DUCTS	20”
DISTRIBUTION DUCTS	12”

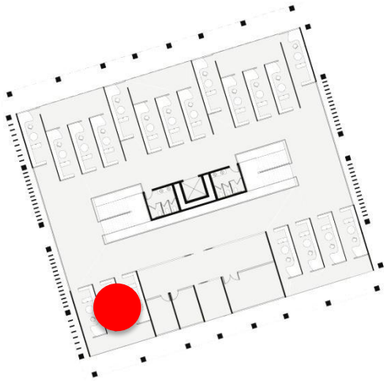
SANDWICH HEIGHT: 2’

WIND DRIVEN NATURAL VENTILATION

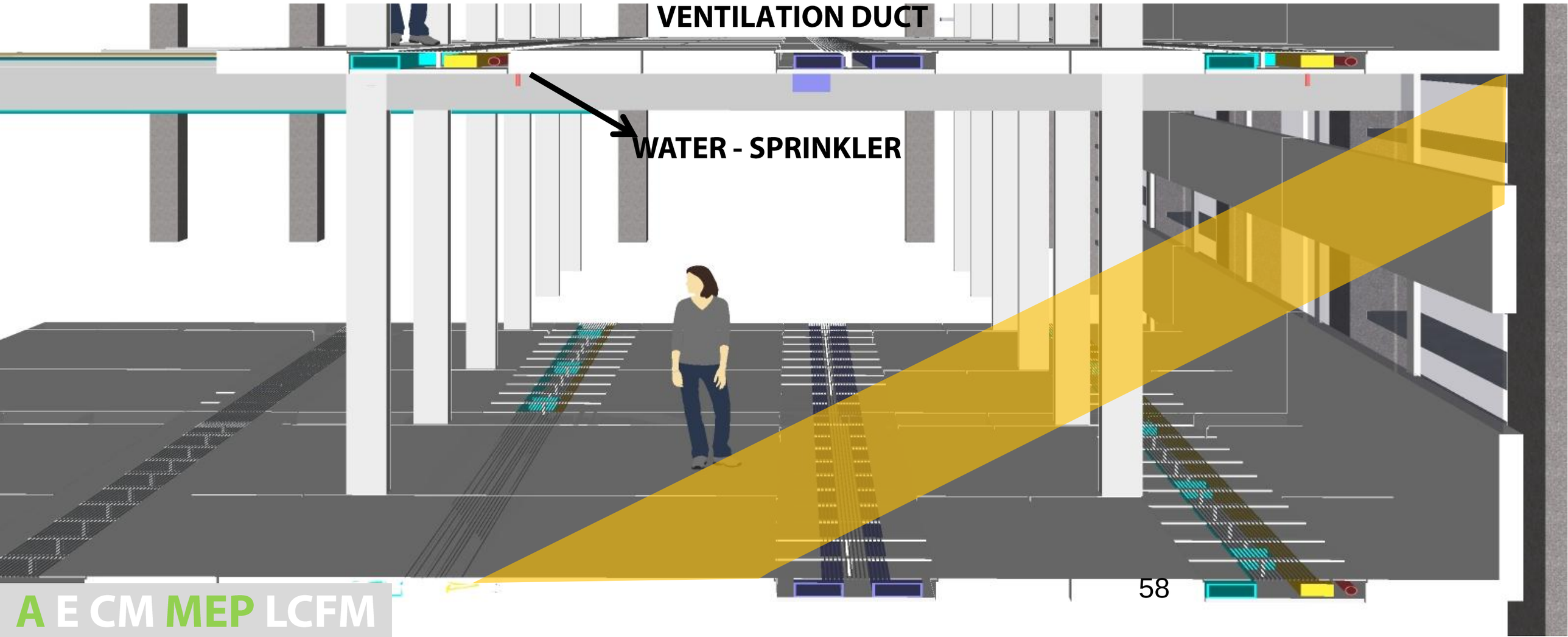
ASSISTING MECHANICAL VENTILATION

Air supply
Electricity
Sprinkler system
Air flow

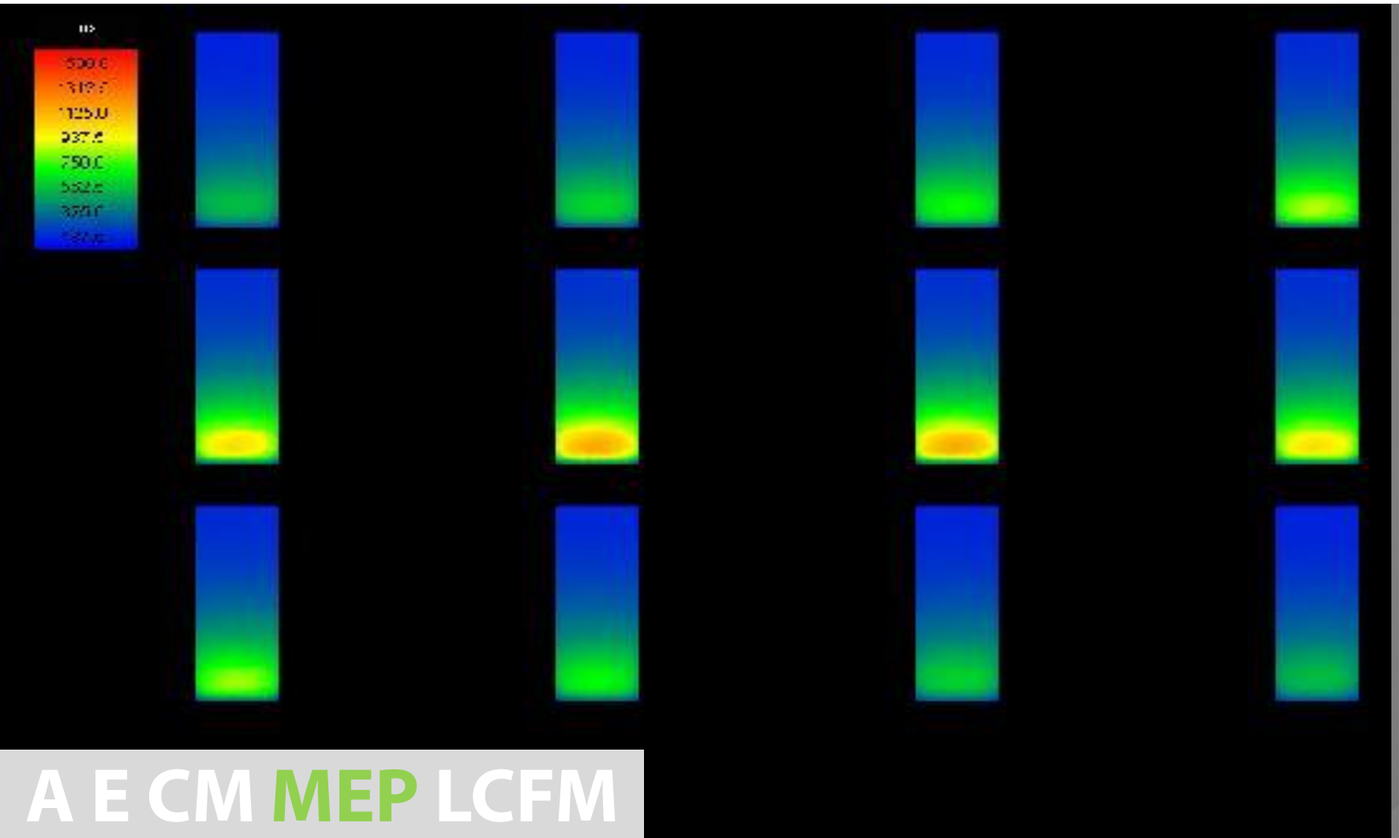


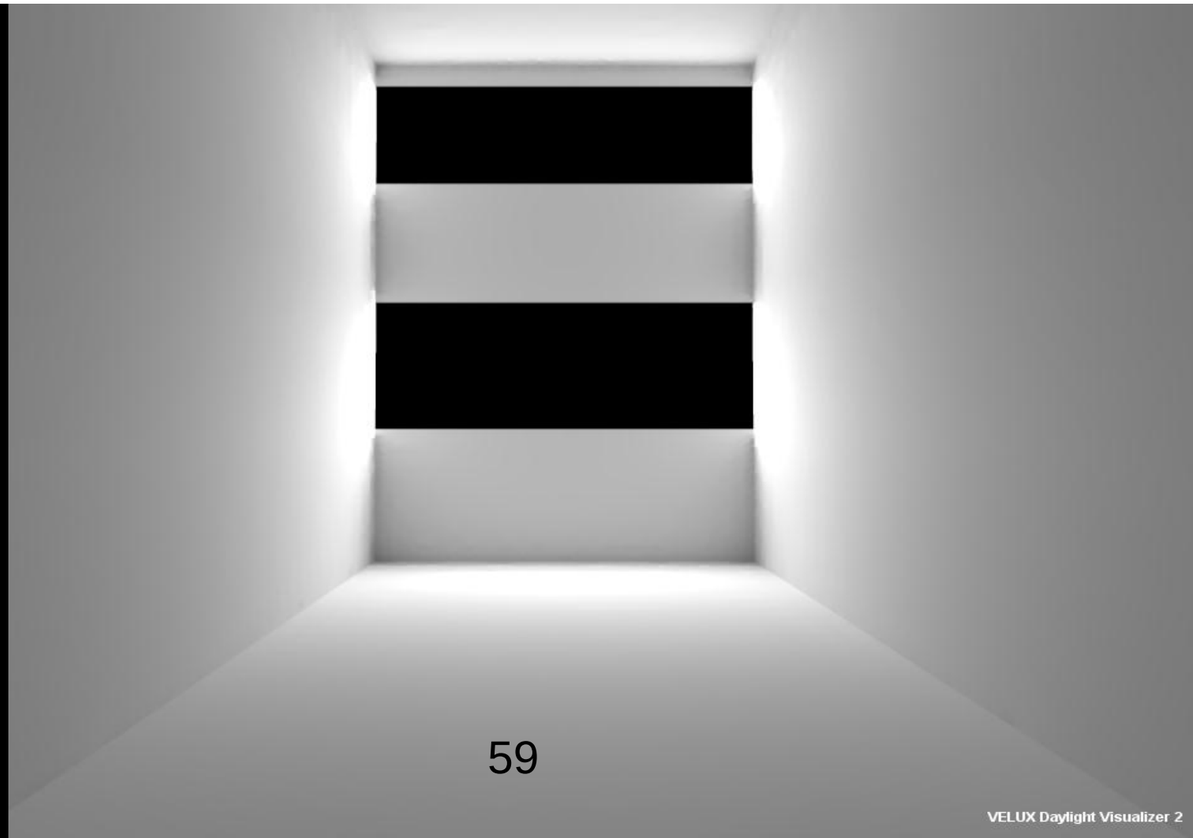


DAYLIGHT

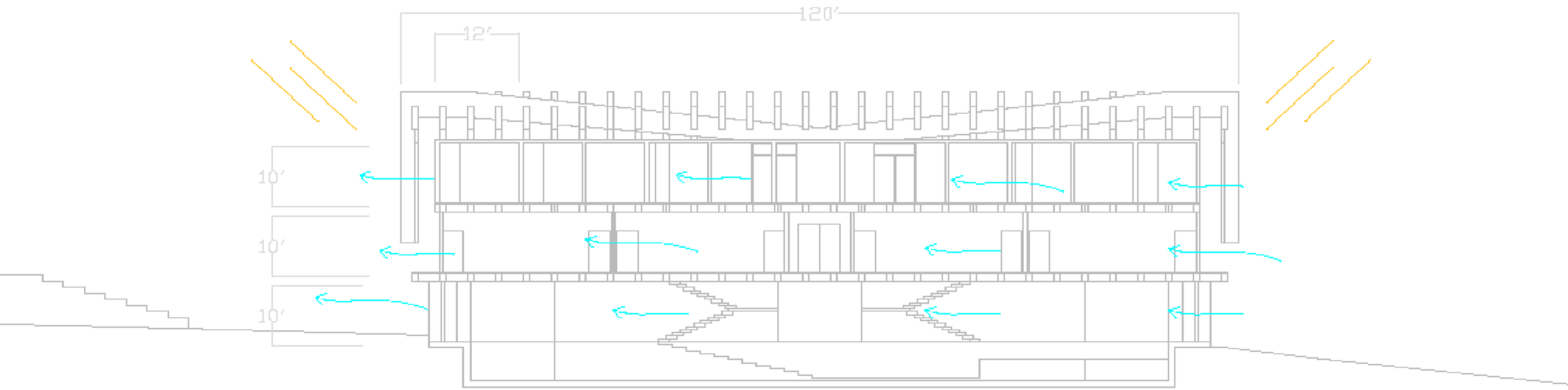


AVERAGE ILLUMINANCE: 200 LUX



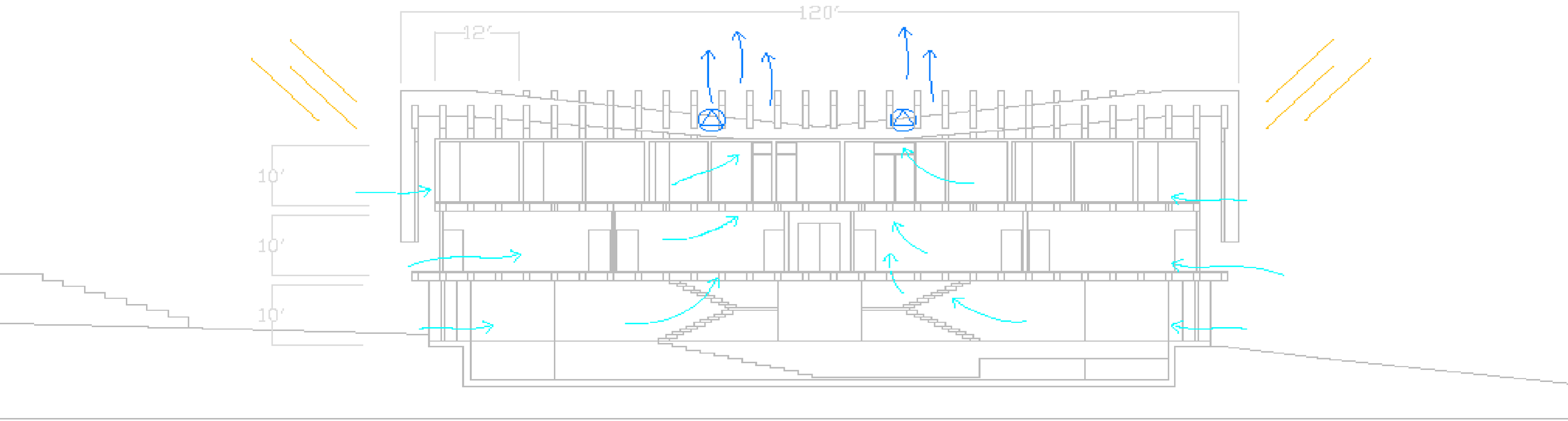


AIR SUPPLY
SUNLIGHT

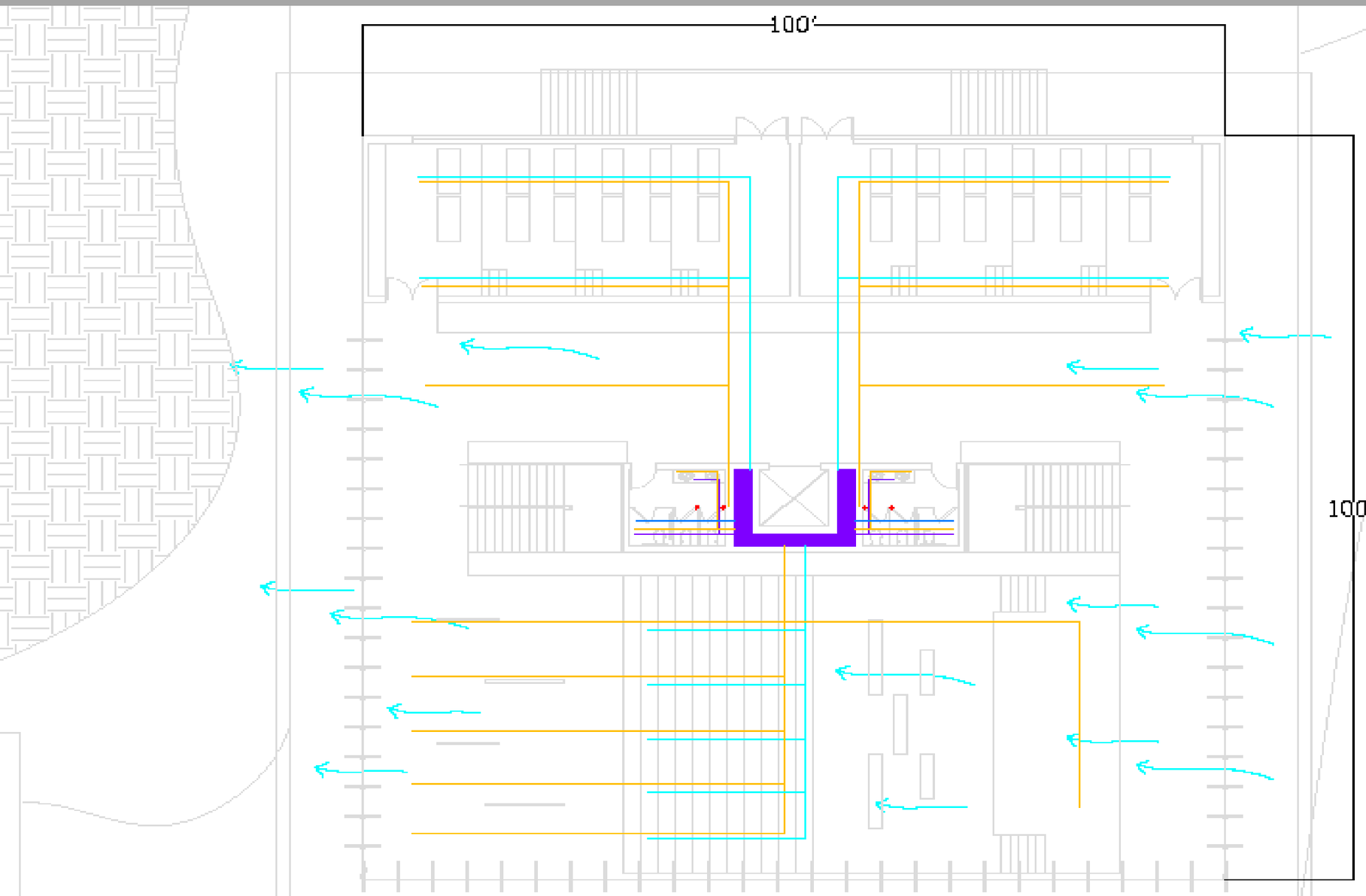


WIND – DRIVEN CROSS VENTILATION IN OPEN ZONES
AIR – BASED COOLING
NIGHT VENTILATION TO ACTIVATE THE THERMAL MASS
LAMELLAE PROVIDE SHADING

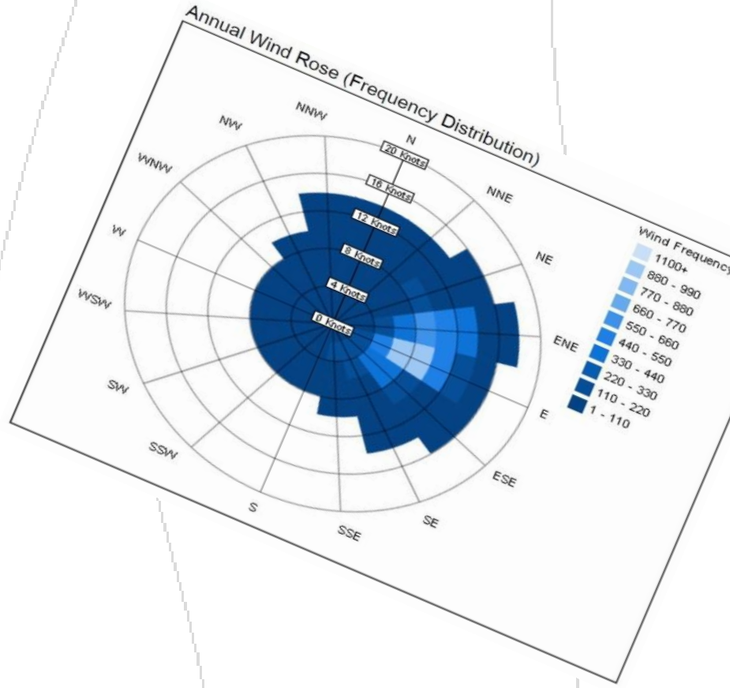
AIR SUPPLY
SUNLIGHT

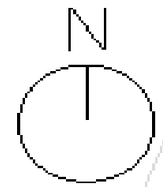


BUOYANCY BASED VENTILATION IN OPEN ZONES, DRIVEN BY STACK EFFECT
OR DISPLACEMENT VENTILATION WITH OUTLET FANS
NIGHT VENTILATION TO ACTIVATE THE THERMAL MASS



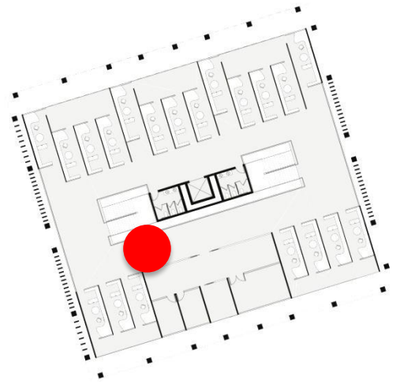
AIR SUPPLY
WATER
ELECTRICITY



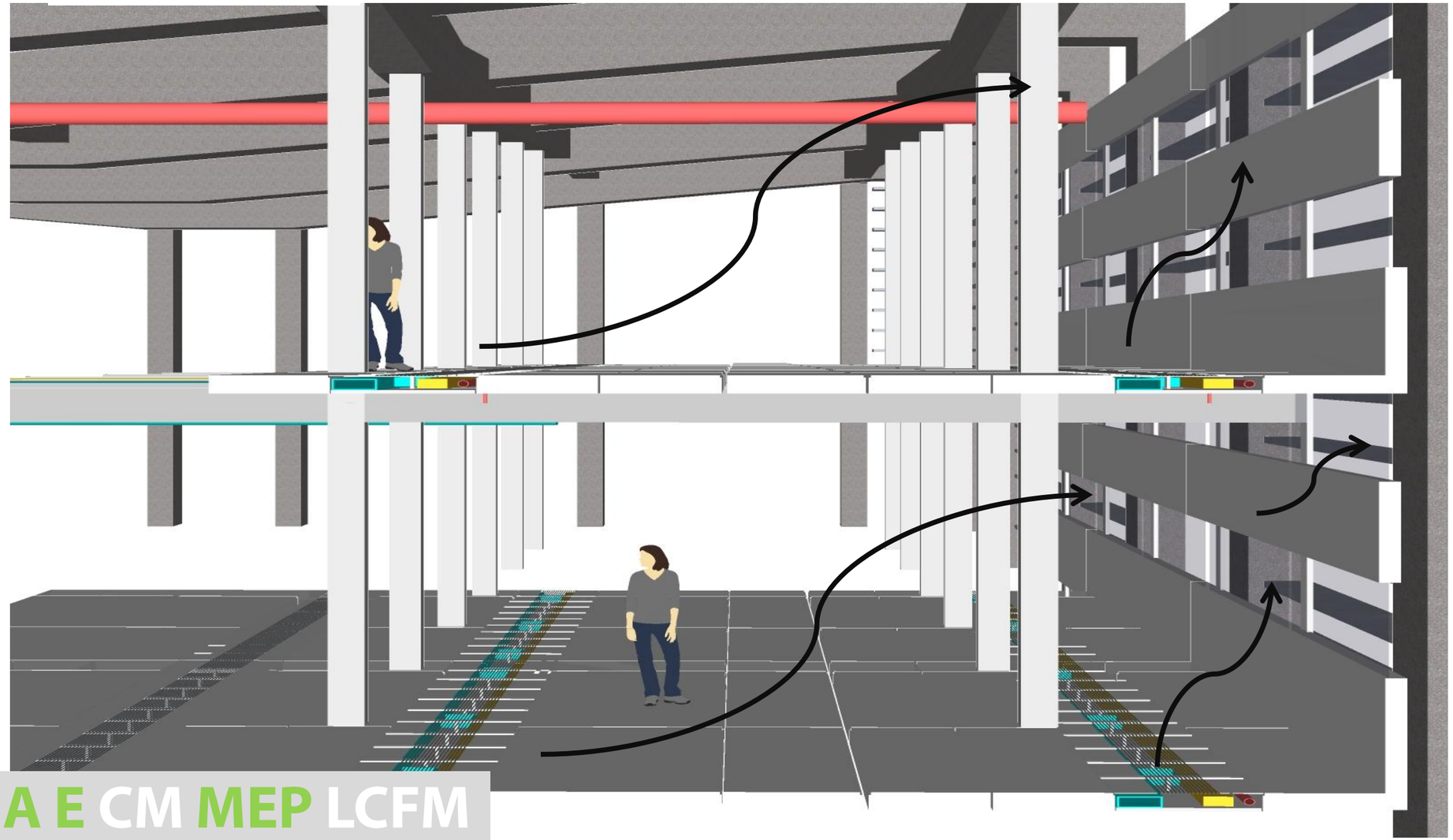


OPEN ZONES: CROSS VENTILATION
CLOSED ZONES: MECHANICAL IN, NATURAL OUT

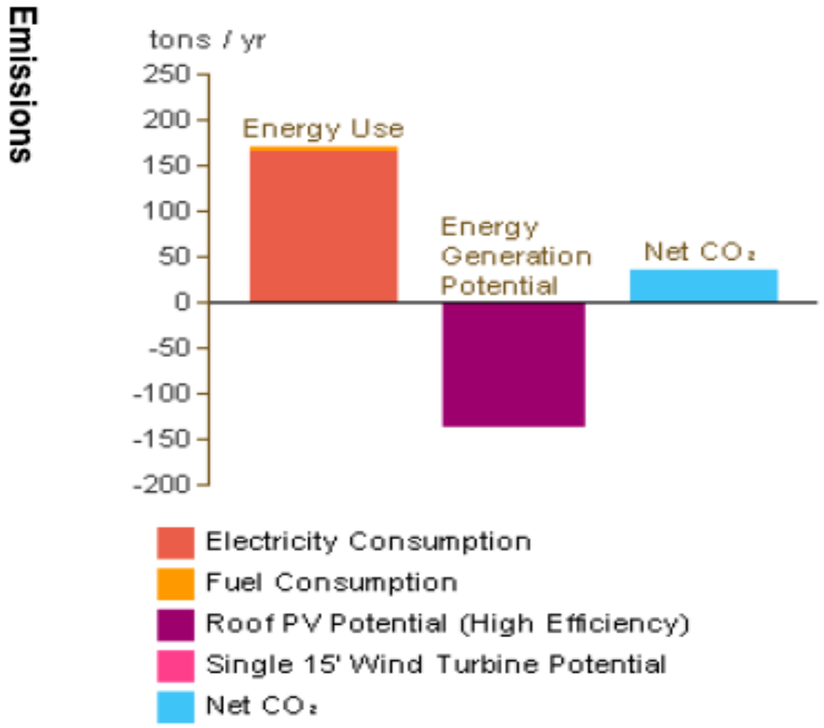
FLOOR SANDWHICH - OFFICE DESIGN #1



AIR SUPPLY
ELECTRICITY
SPRINKLER SYSTEM
AIR FLOW

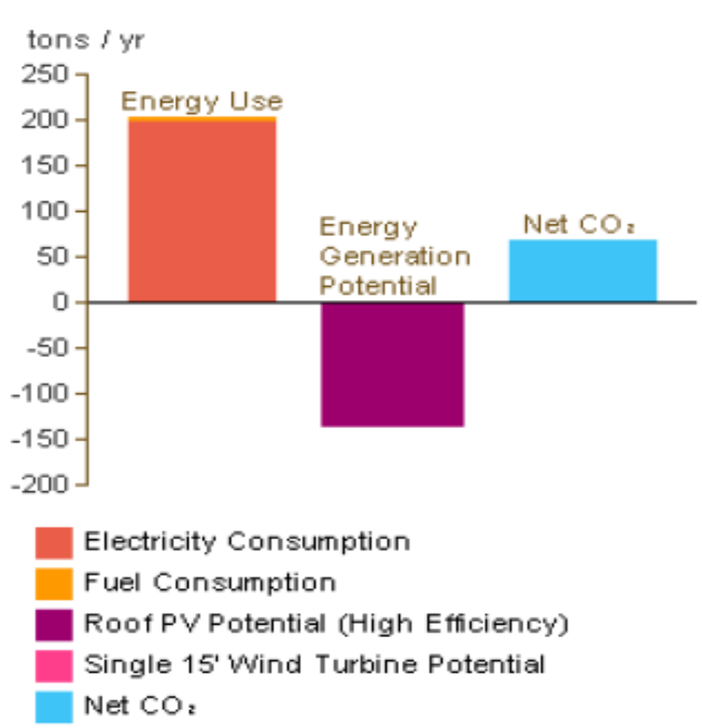


UFAD
UNDER FLOOR AIR DISTRIBUTION



	(tons / yr)
Electricity Consumption	167
Fuel Consumption	2
Roof PV Potential (High Efficiency)	-134
Single 15' Wind Turbine Potential	0
Net CO₂	35

VAV
VARIABLE AIR VOLUME

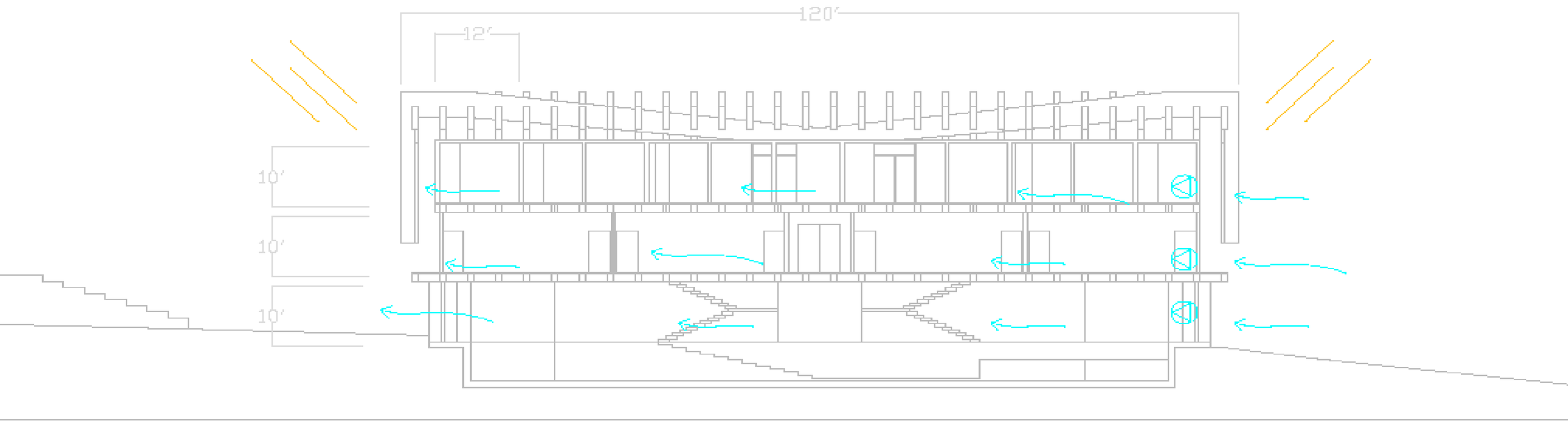


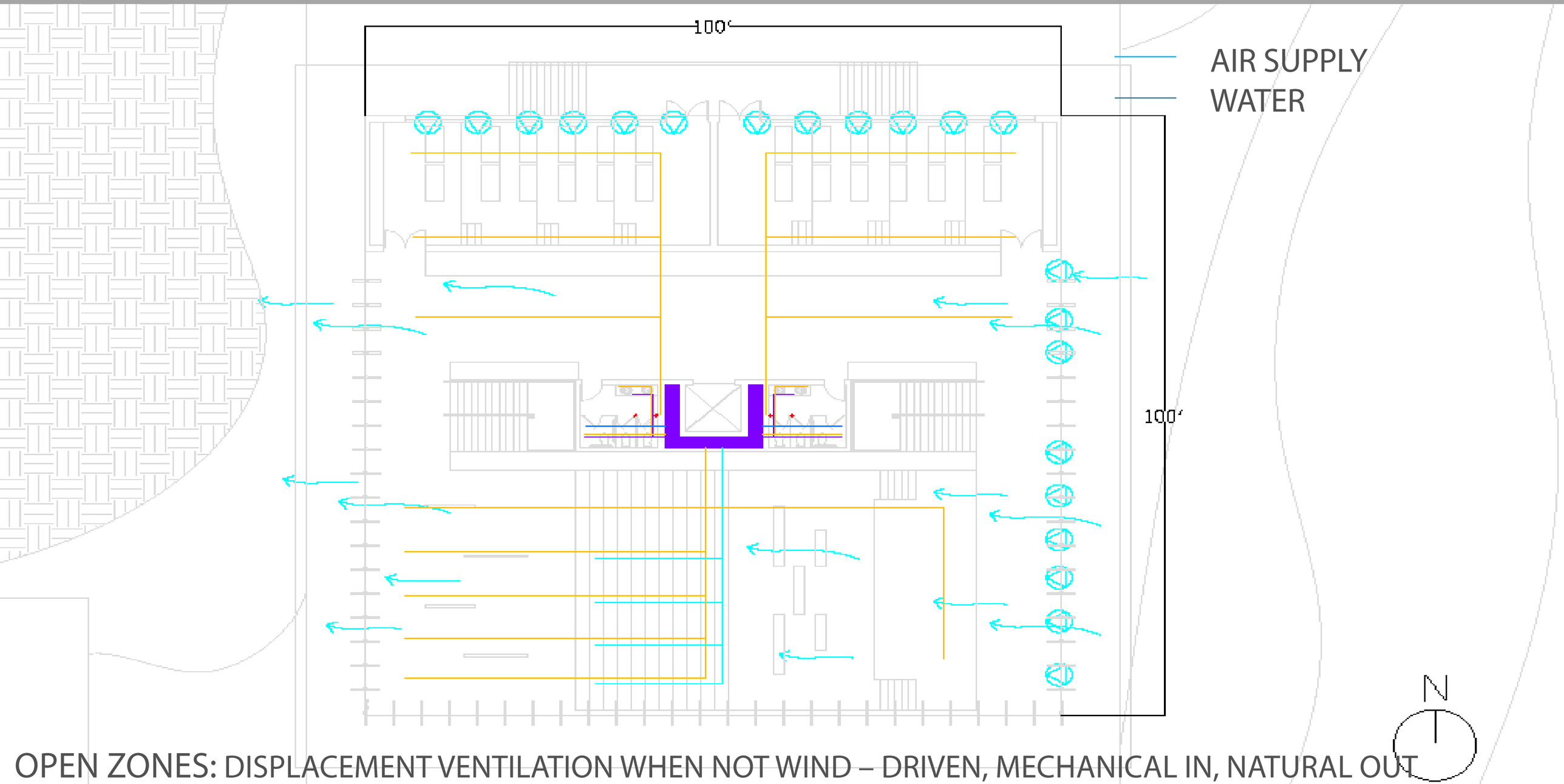
	(tons / yr)
Electricity Consumption	198
Fuel Consumption	2
Roof PV Potential (High Efficiency)	-134
Single 15' Wind Turbine Potential	0
Net CO₂	66

DISPLACEMENT VENTILATION WHEN NOT WIND – DRIVEN

MECHANICAL IN, NATURAL OUT

Air supply
Sunlight

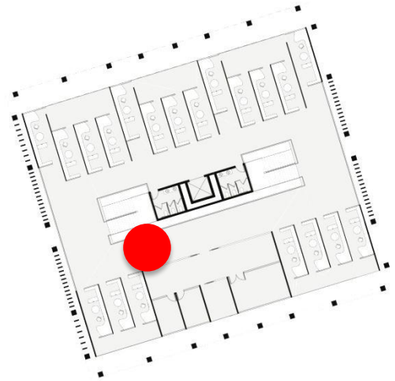




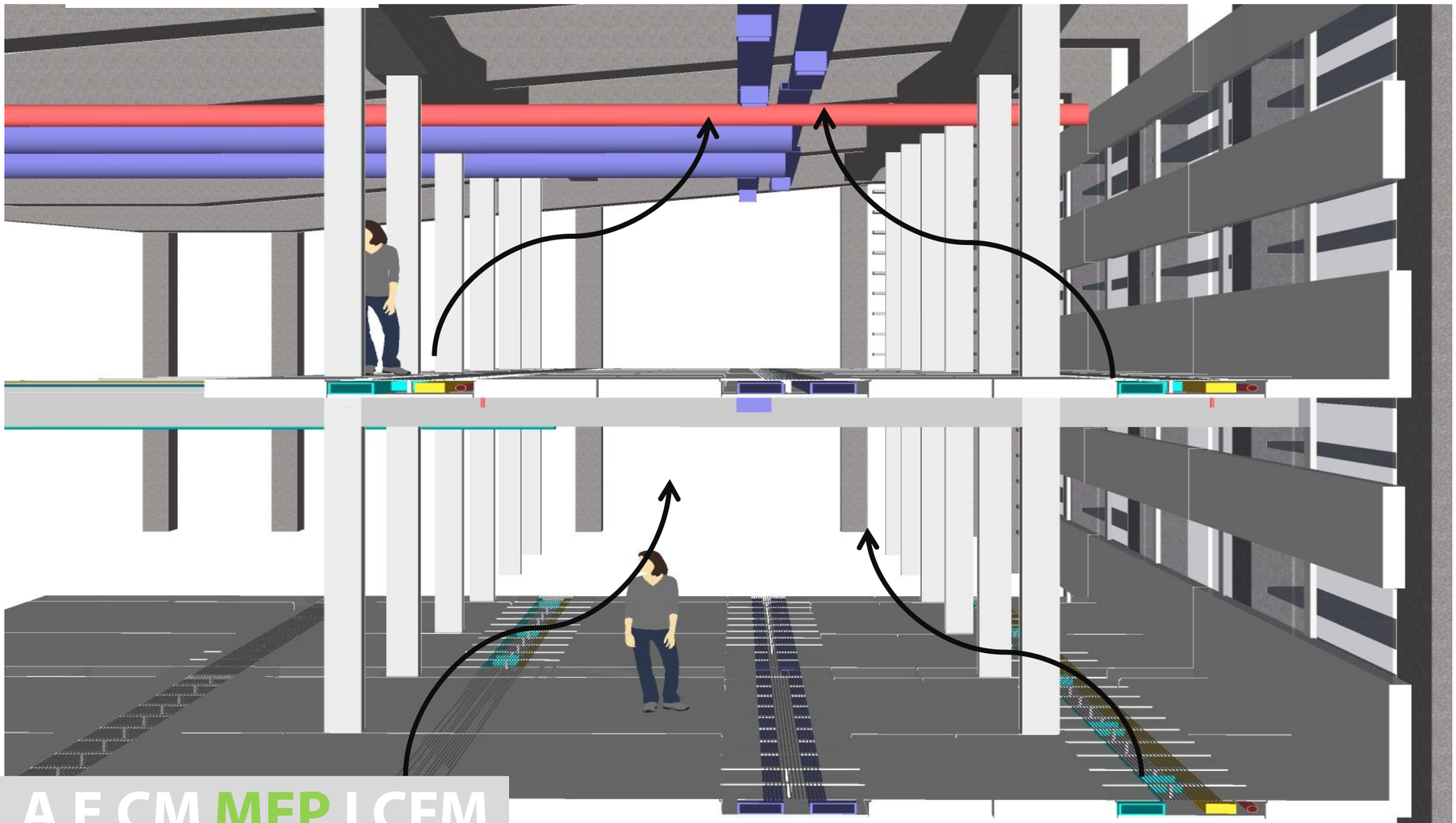
OPEN ZONES: DISPLACEMENT VENTILATION WHEN NOT WIND – DRIVEN, MECHANICAL IN, NATURAL OUT

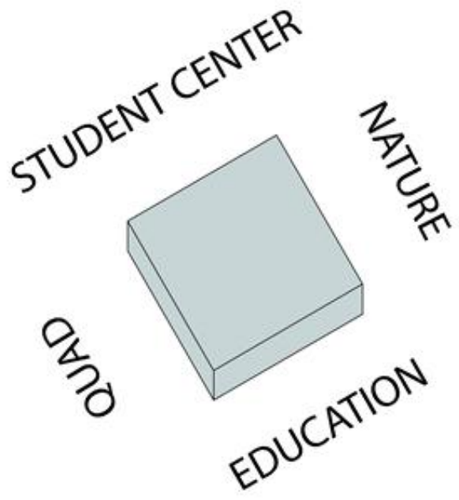
CLOSED ZONES: MIXING VENTILATION

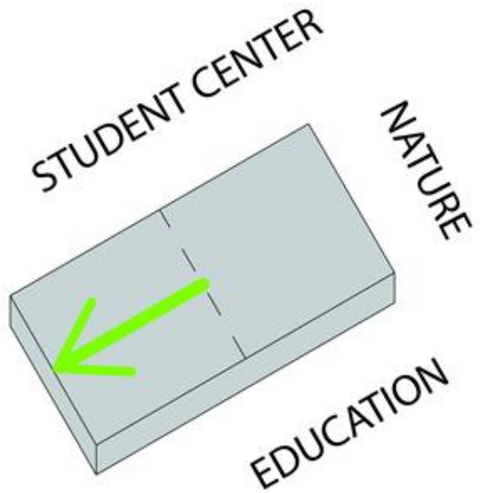
FLOOR SANDWICH OFFICE DESIGN #2

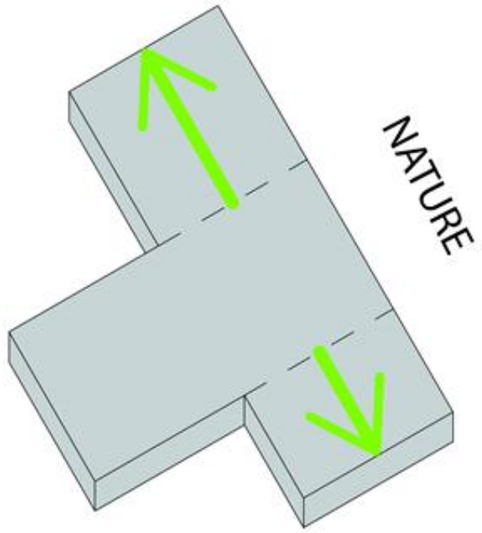


AIR SUPPLY
AIR RETURN
ELECTRICITY
SPRINKLER SYSTEM
AIR FLOW




STUDENT CENTER
NATURE
QUAD
EDUCATION


STUDENT CENTER
NATURE
EDUCATION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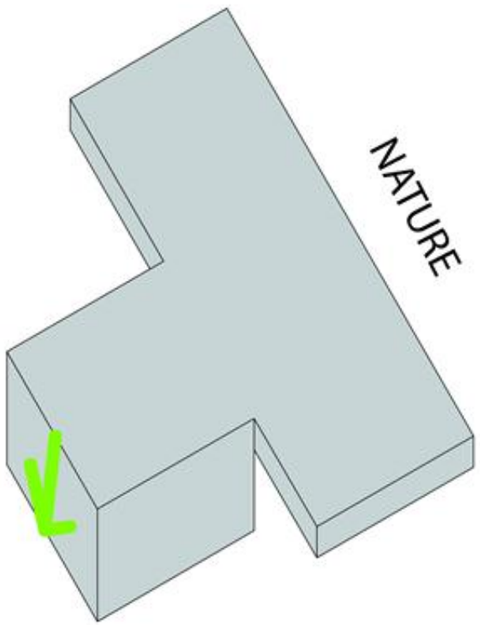
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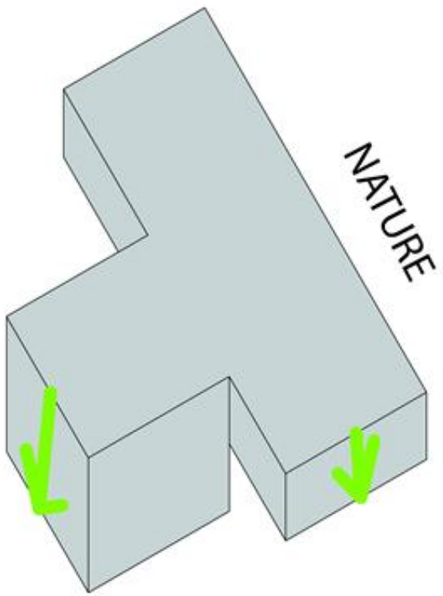
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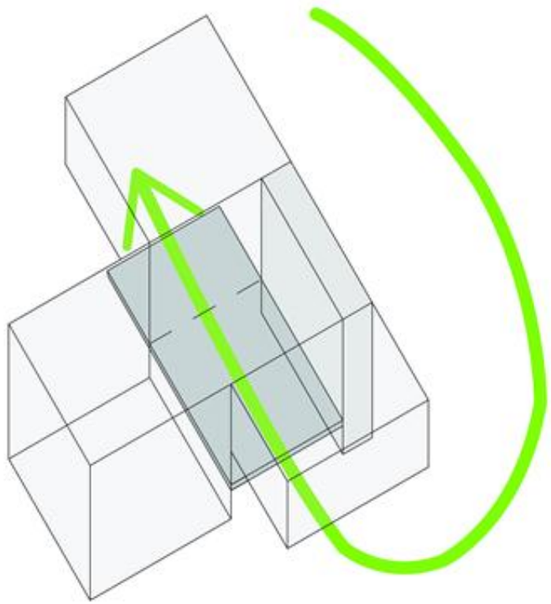
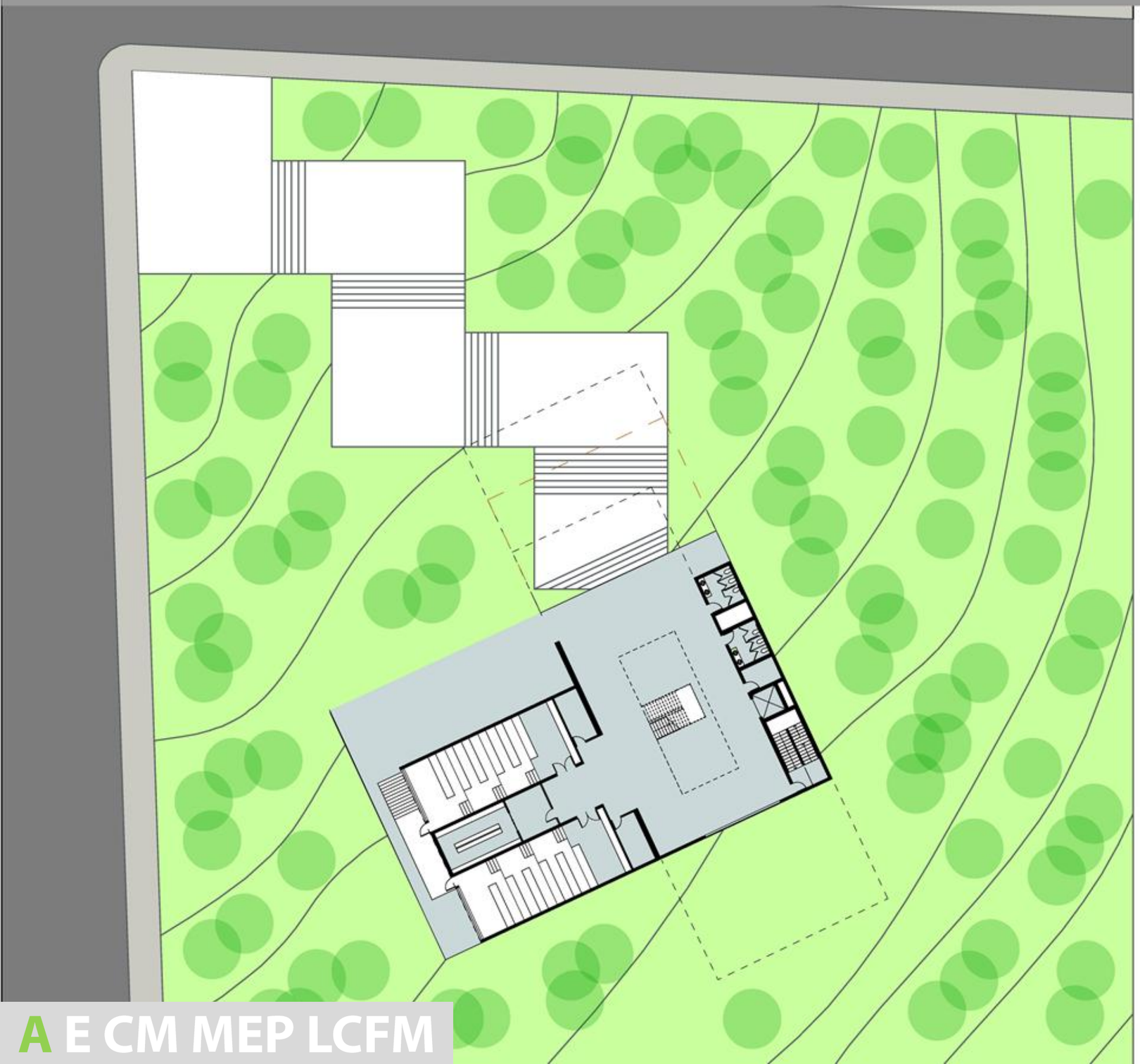
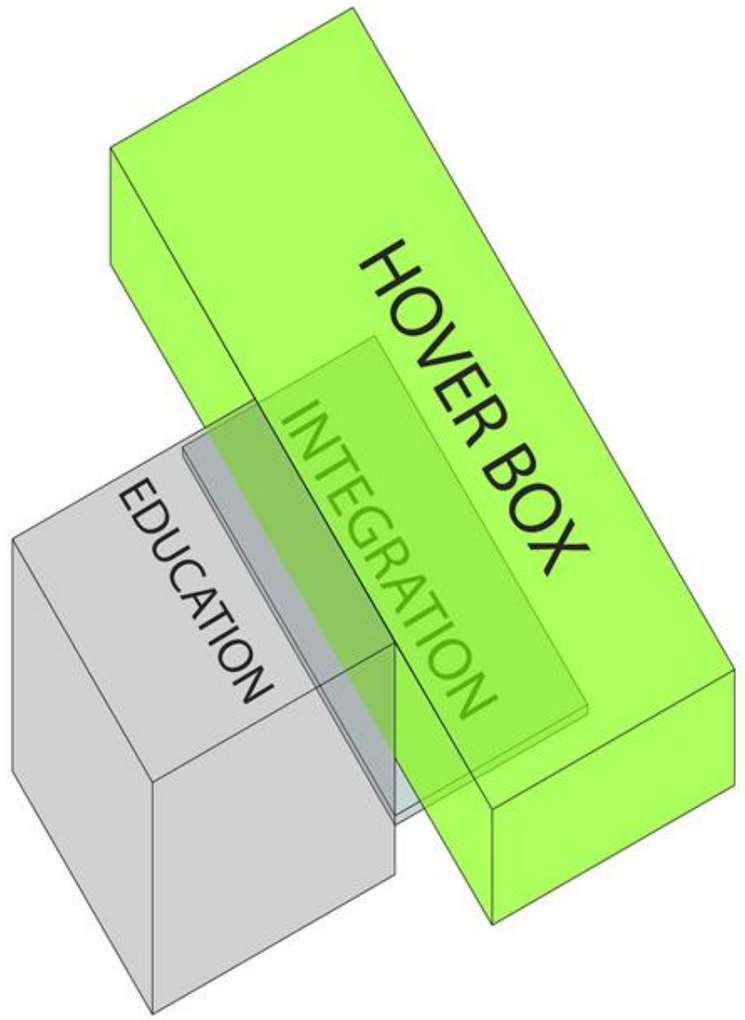
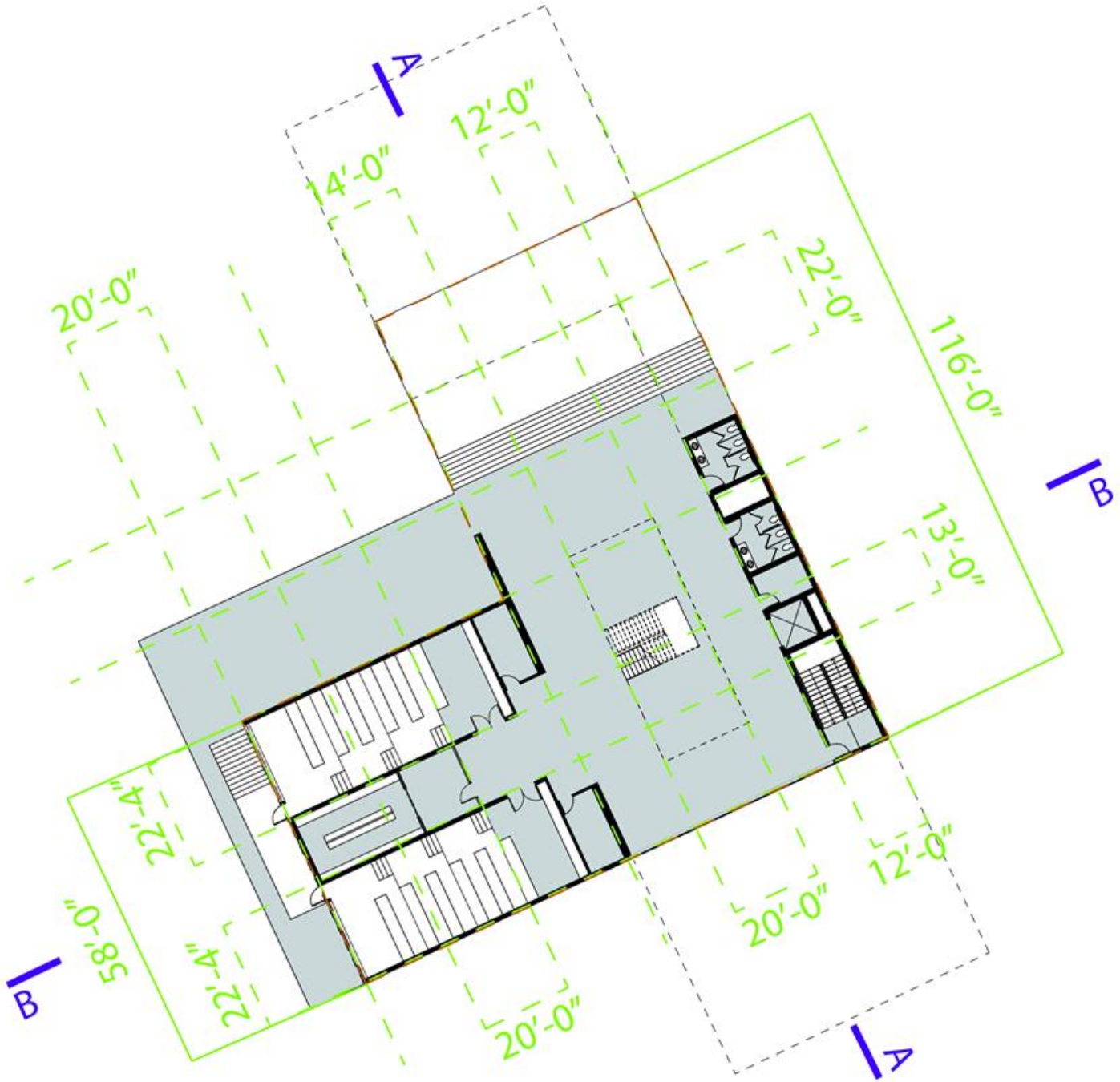
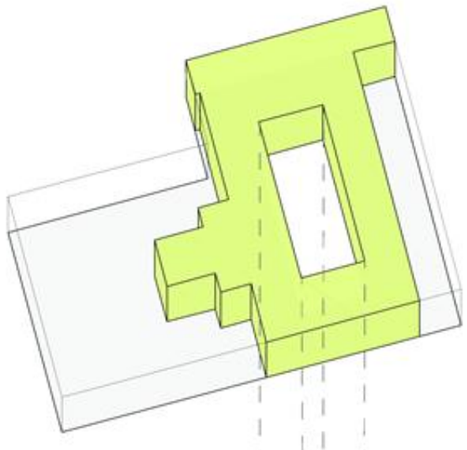




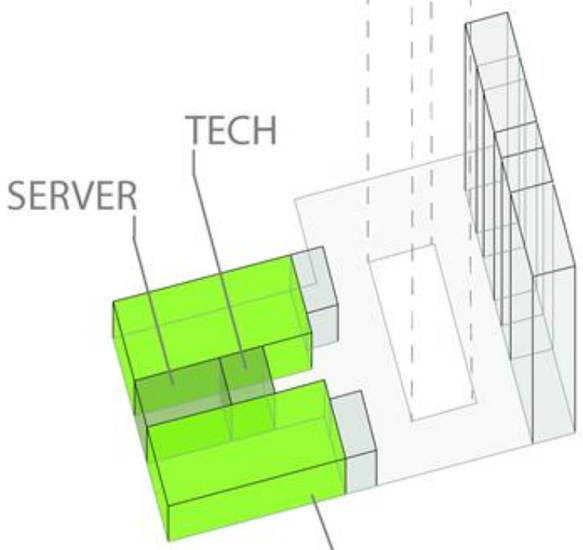

HOVER BOX
INTEGRATION
EDUCATION

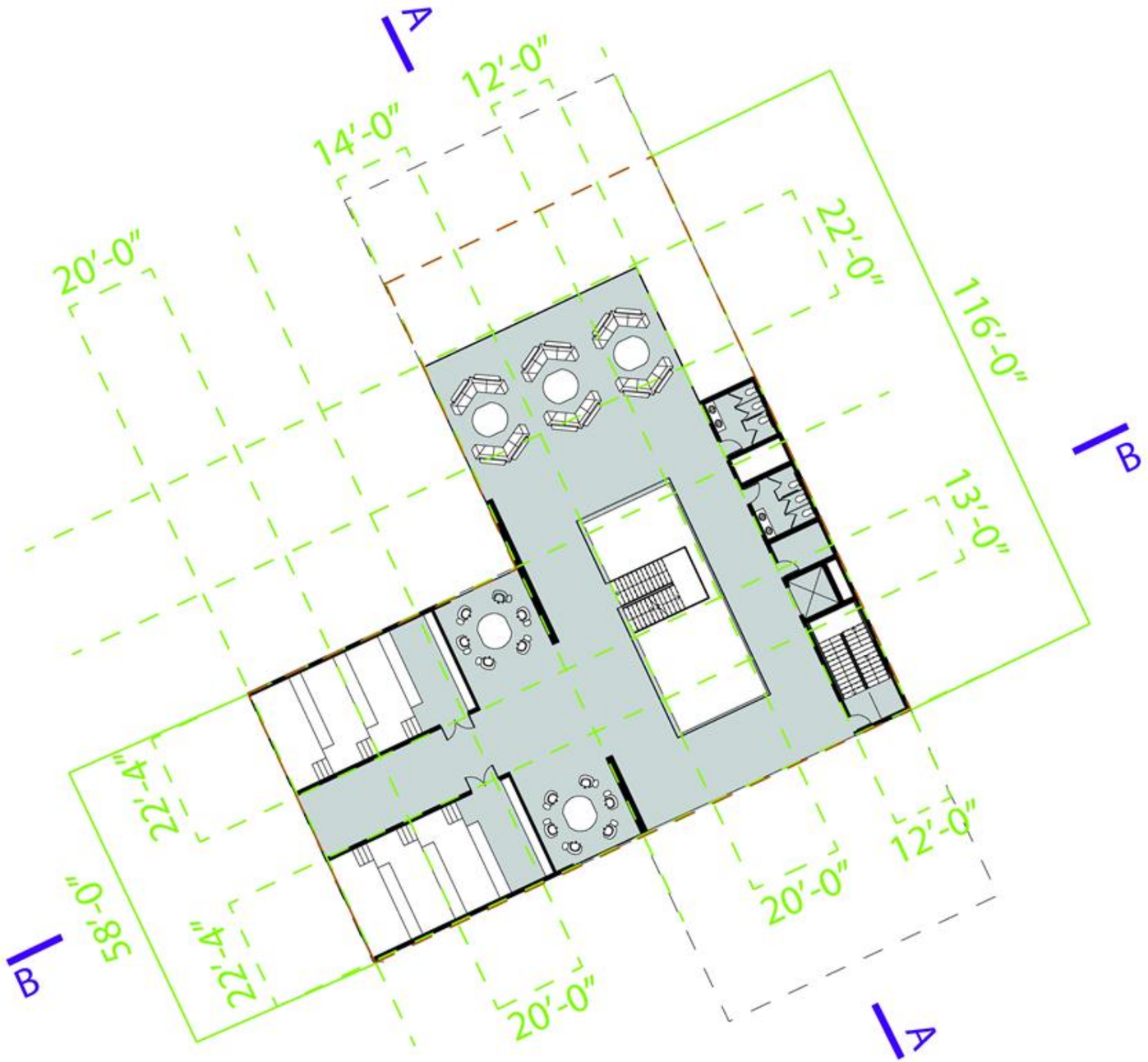


NEGATIVE SPACE



PROGRAMMATIC DISTRIBUTION





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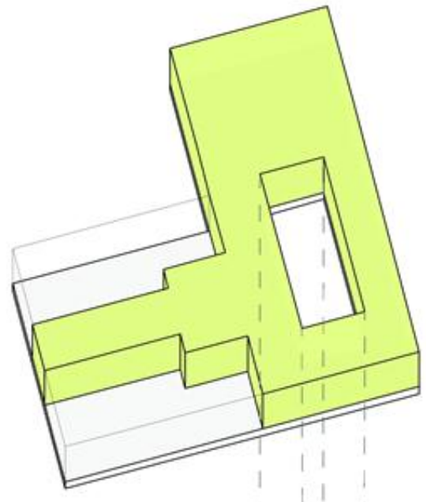
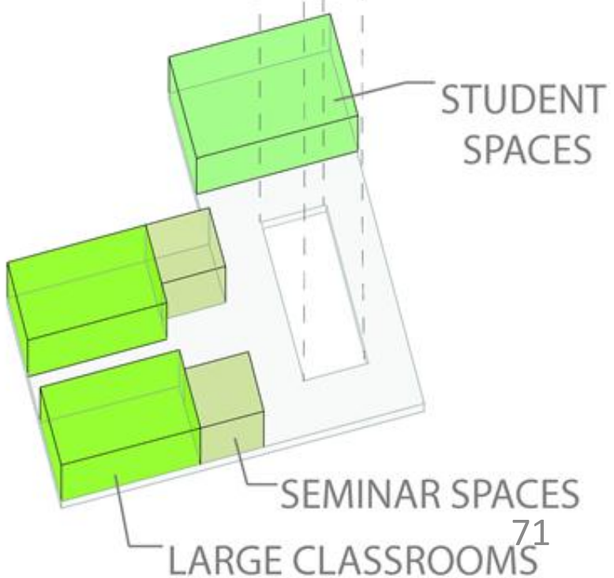
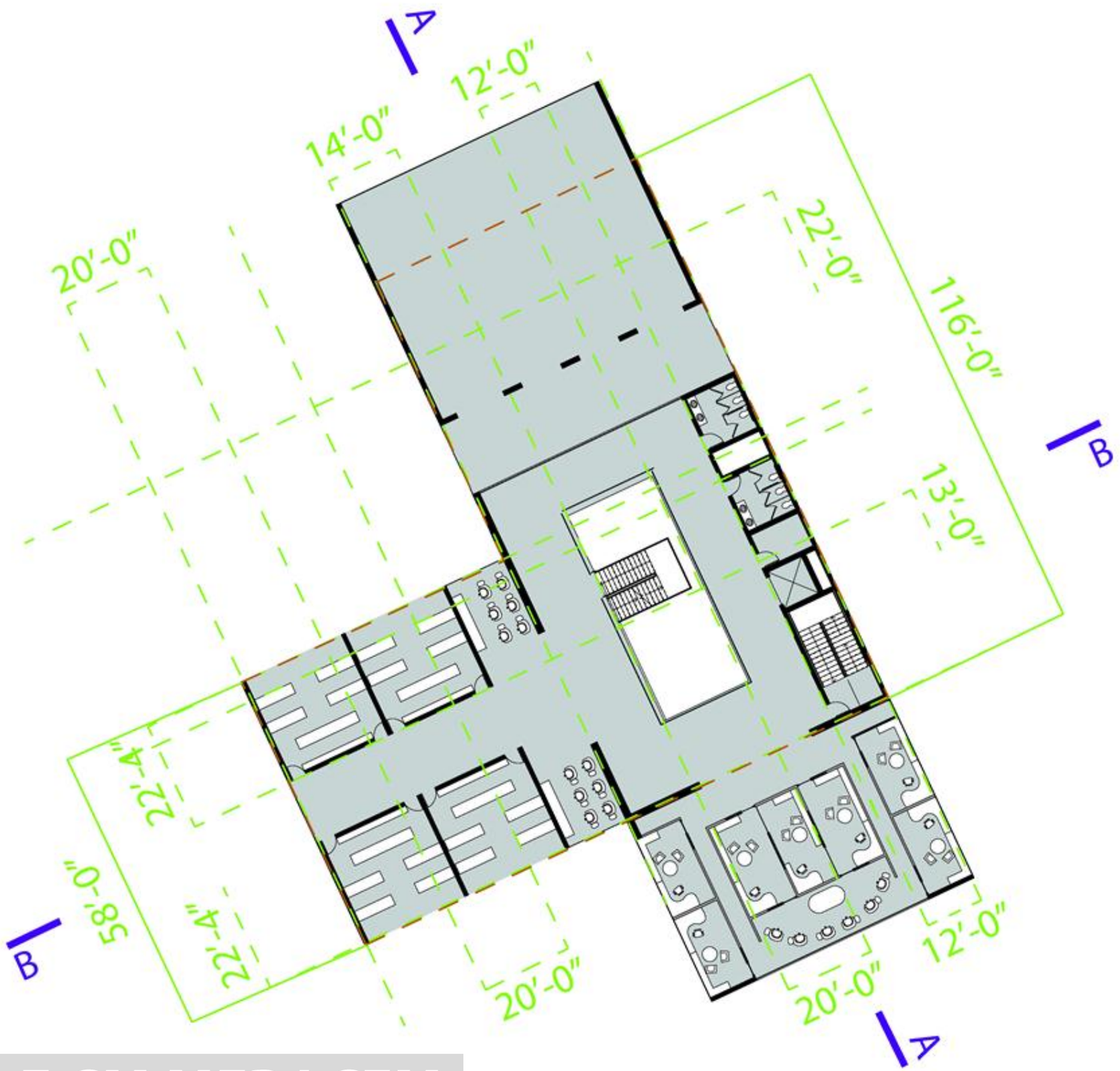
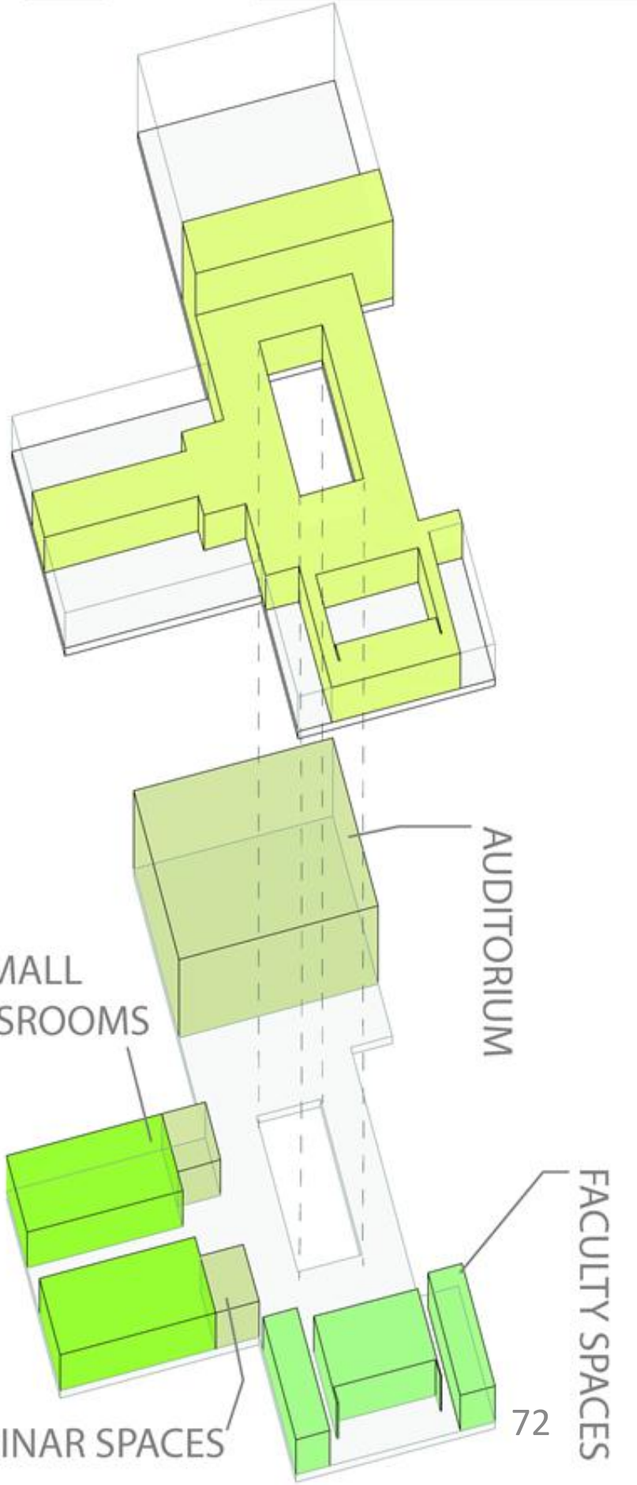


PROGRAMMATIC DISTRIBUTION

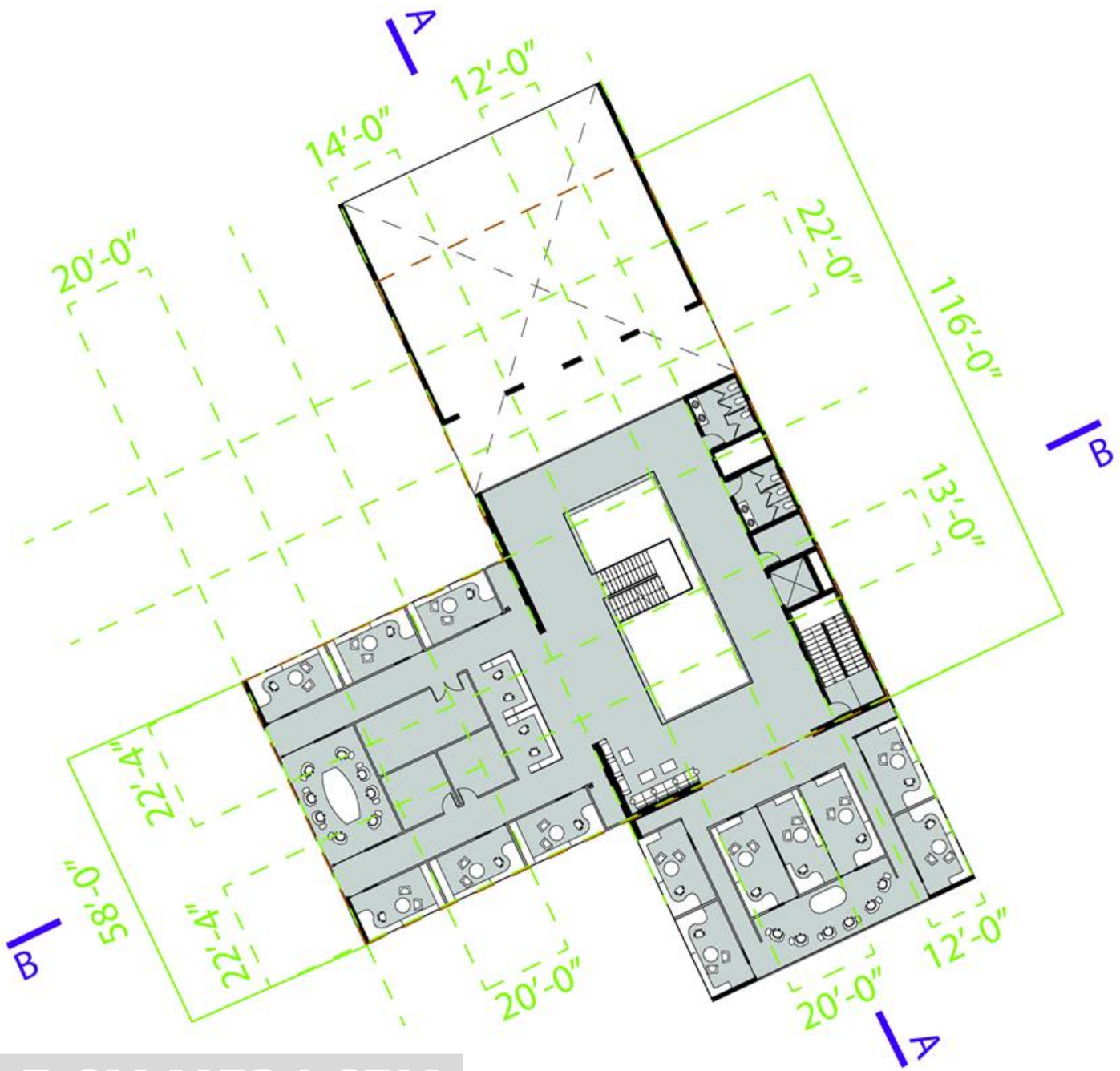




NEGATIVE SPACE



PROGRAMMATIC DISTRIBUTION



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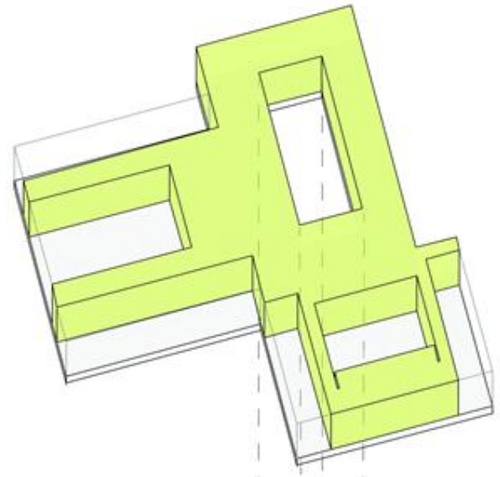
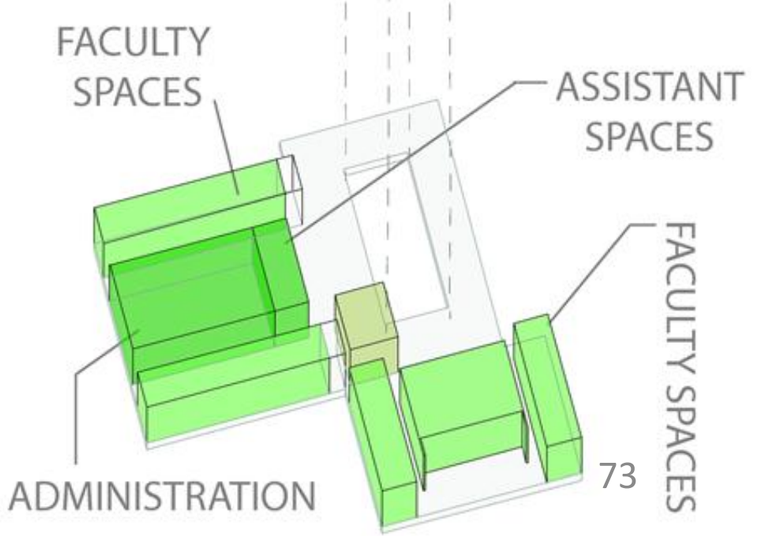
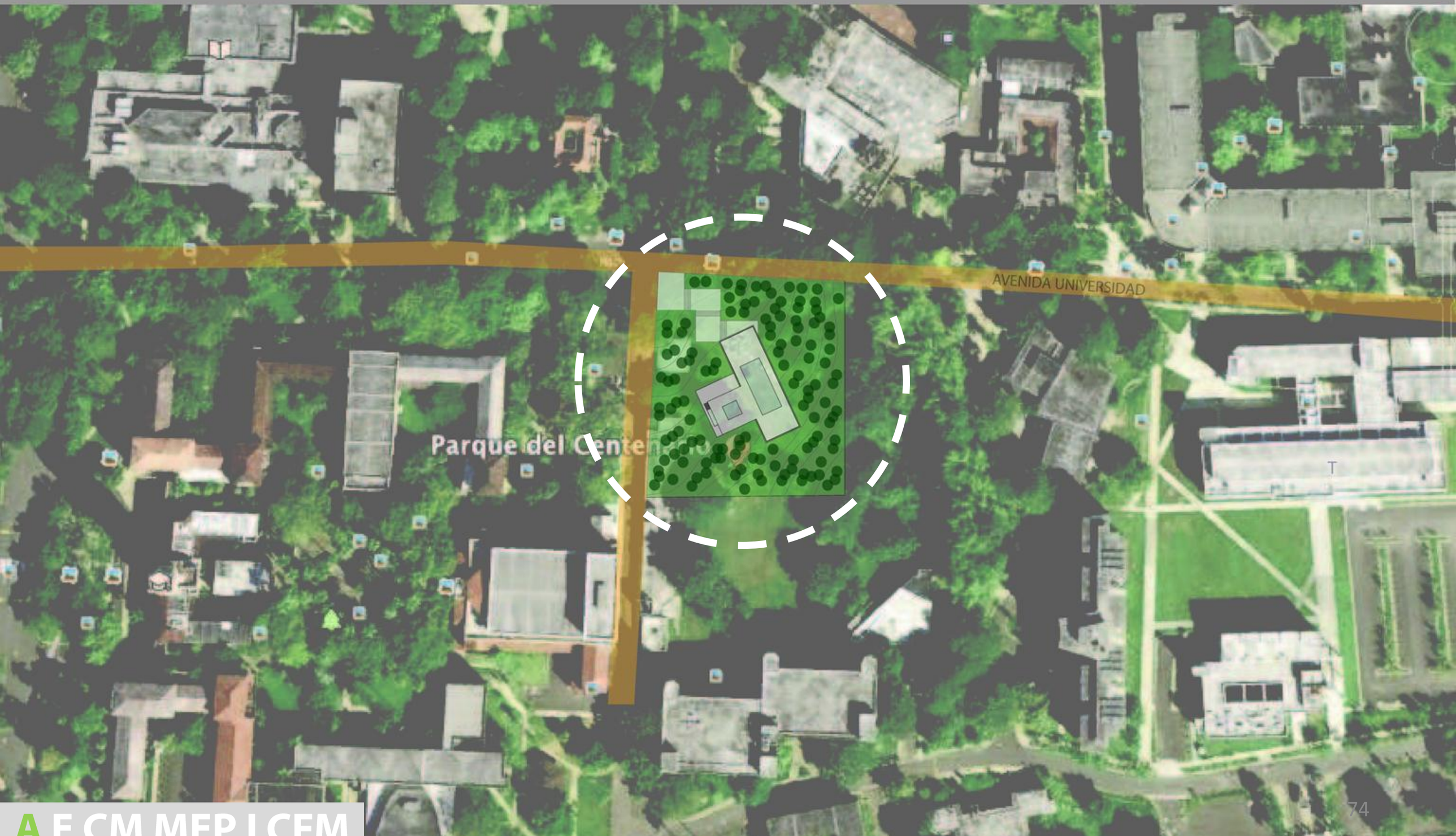
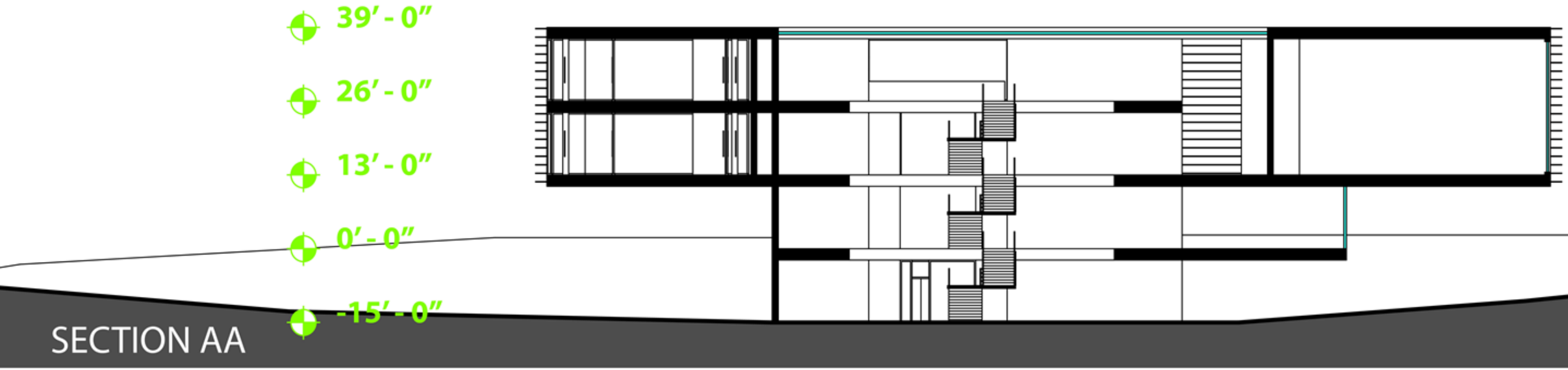


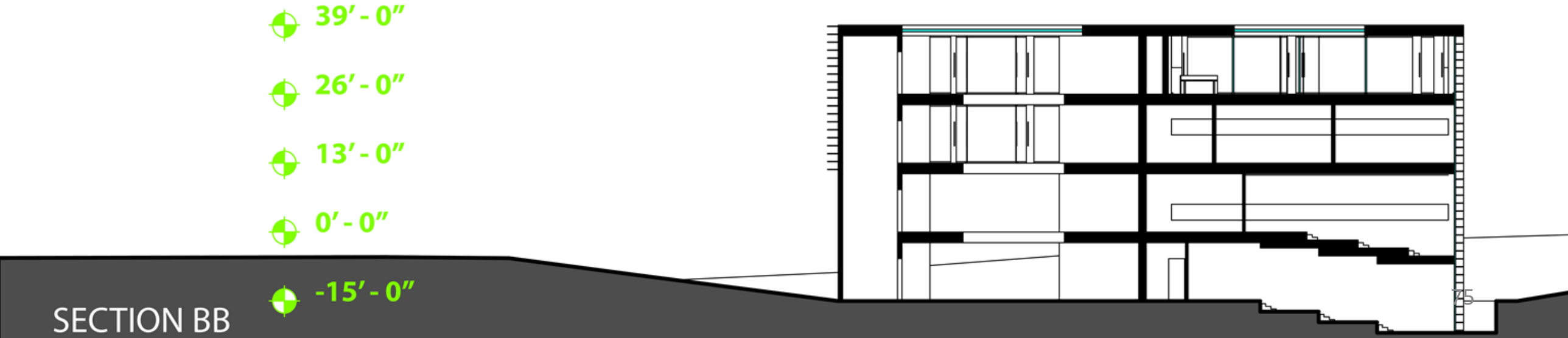
PROGRAMMATIC DISTRIBUTION




AVENIDA UNIVERSIDAD
Parque del Centenario



SECTION AA



SECTION BB

CORNER VIEW

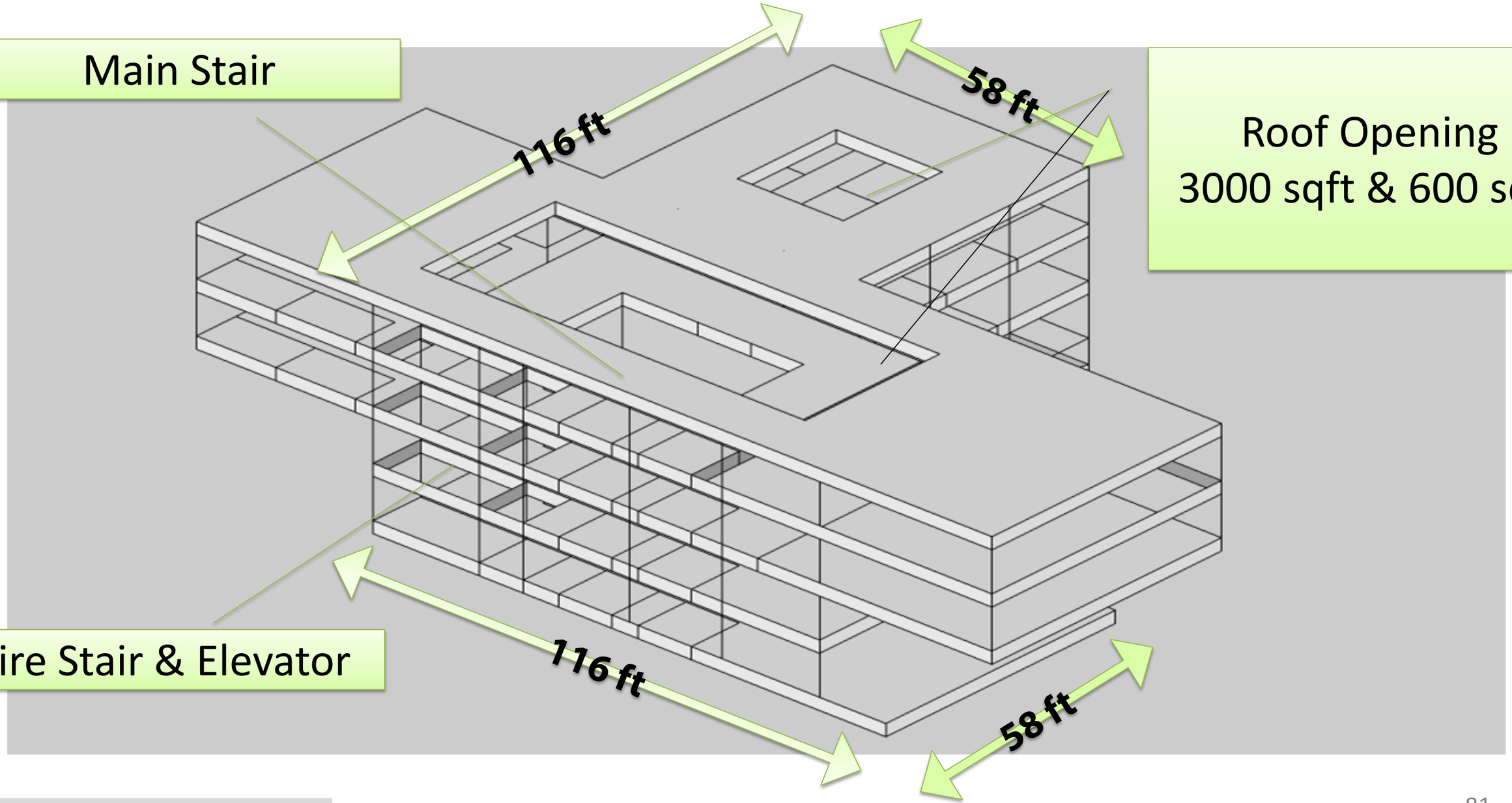
MAIN STREET VIEW

NORTH FAÇADE

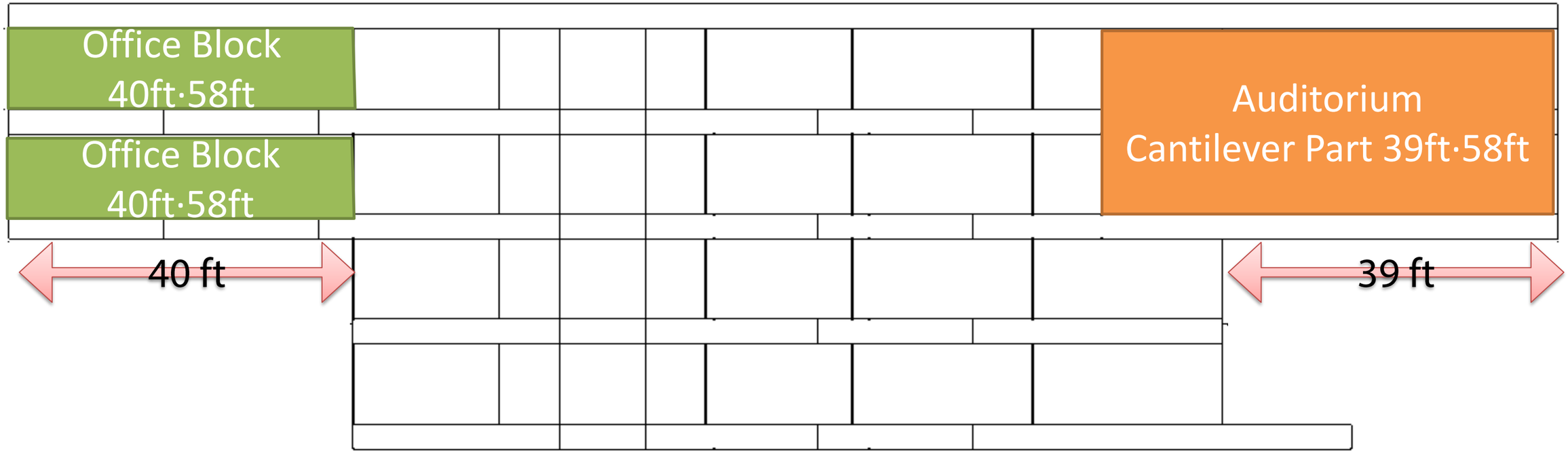
WEST FAÇADE

"CREATING A BUILDING THAT CAN EVOLVE INTO ANOTHER, WHICH IS NOT MEANT FOR ONE PURPOSE AND ONE ALONE. AN OFFICE DOES NOT HAVE TO FUNCTION AS A TYPICAL 2013 OFFICE MODEL."

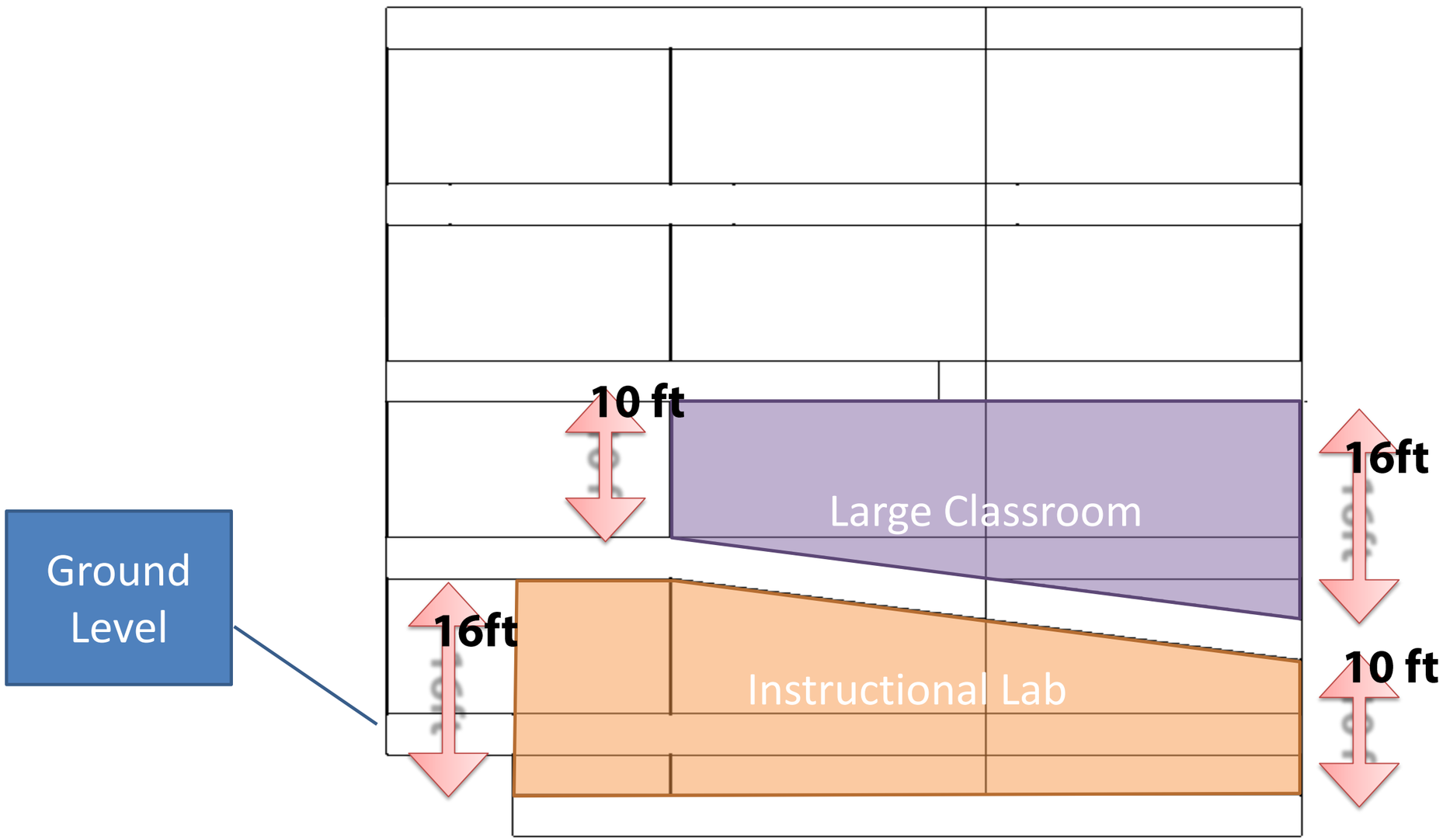
Intro


Main Stair
116 ft
58 ft
Roof Opening
3000 sqft & 600 sqft
Fire Stair & Elevator
116 ft
58 ft

Key Element


Office Block
40ft·58ft
Office Block
40ft·58ft
Auditorium
Cantilever Part 39ft·58ft
40 ft
39 ft

Key Element

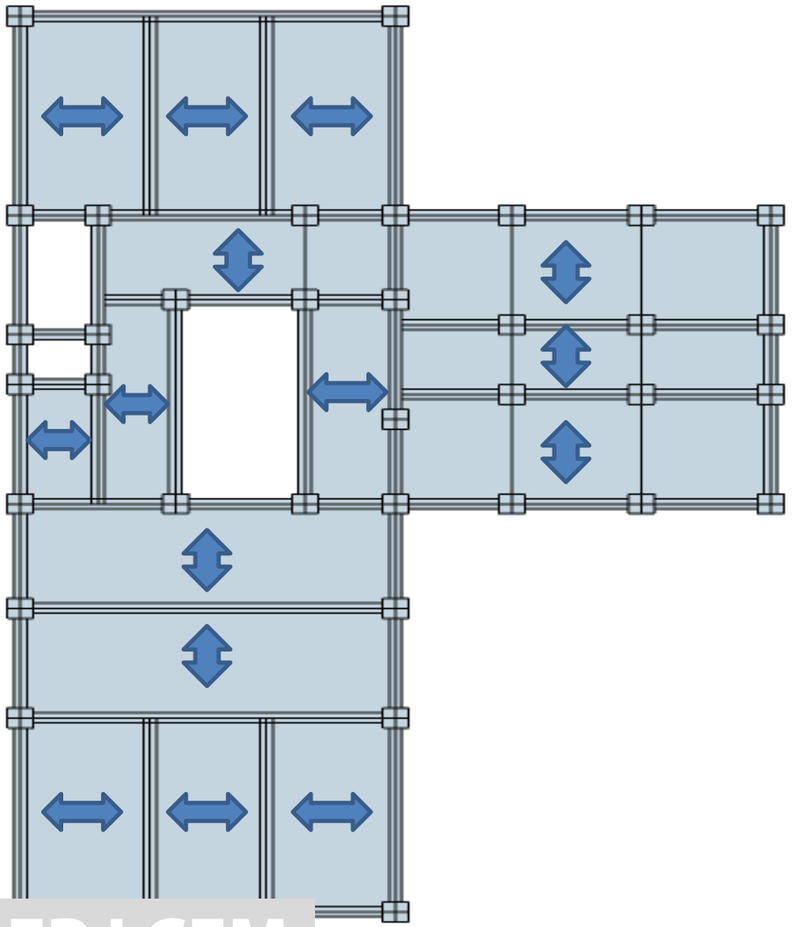

Ground Level
10 ft
16ft
Large Classroom
16ft
Instructional Lab
10 ft

Floor Load Path

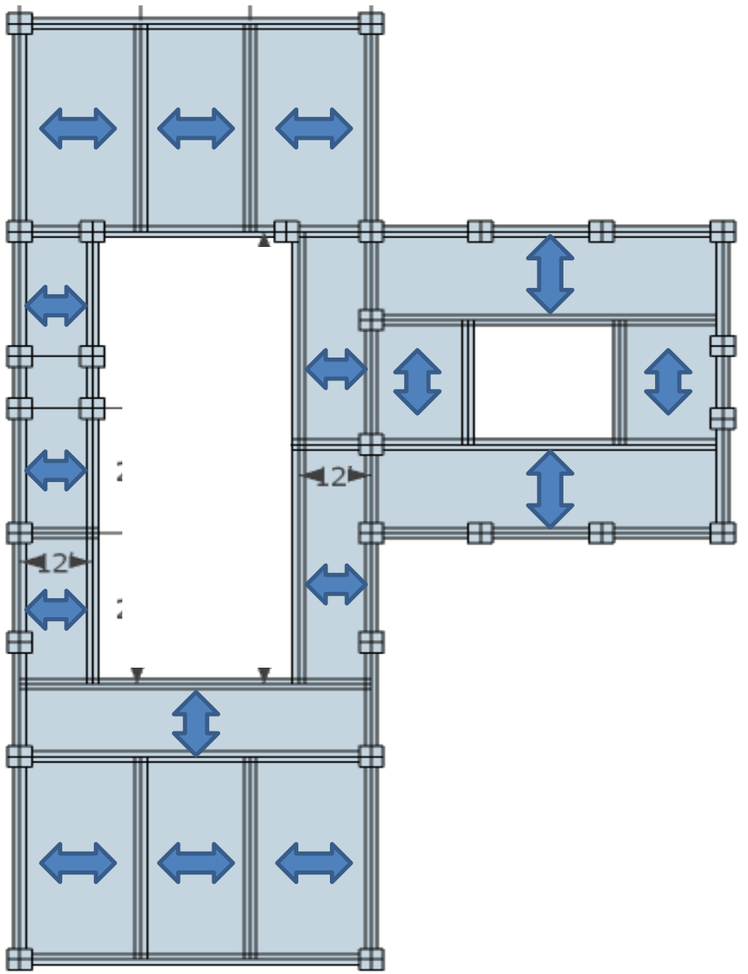
Load	Dead (PSF)	Live (PSF)
Roof	40	40
Floor	72	88

Wind	Seismic
170 mph	Risk III

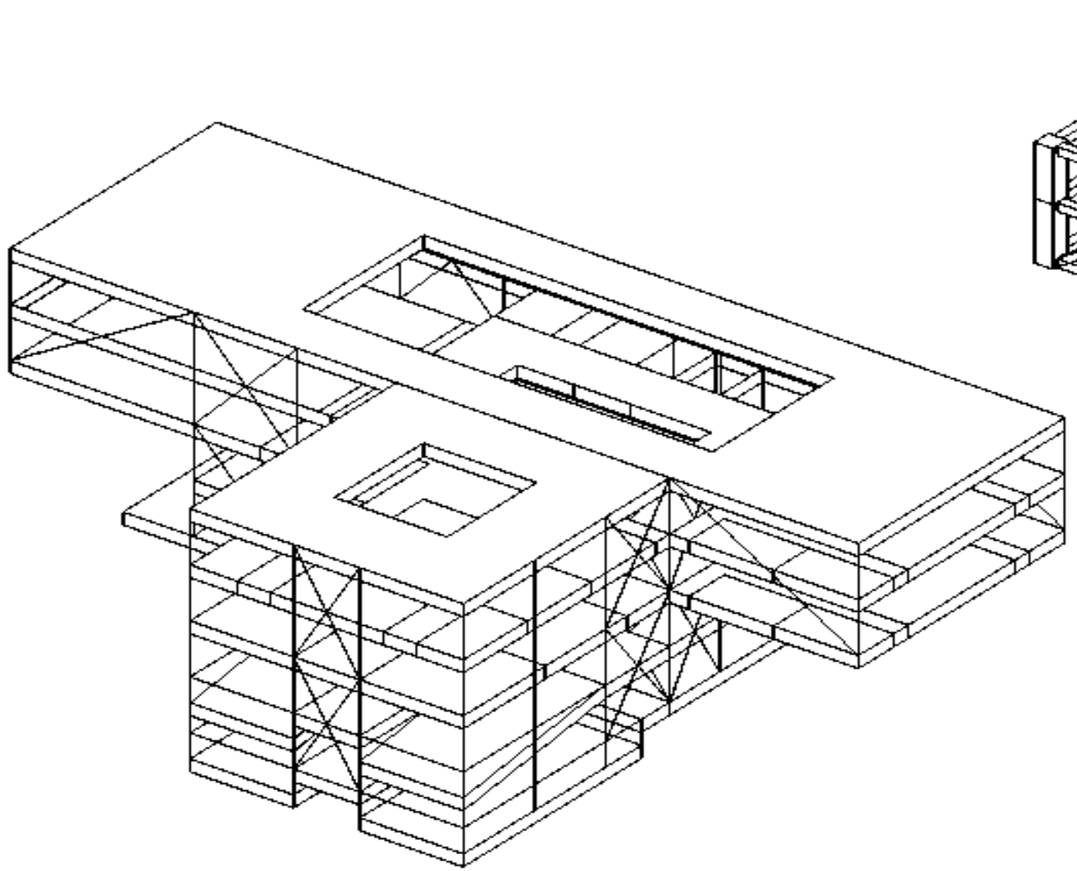
Floor Level

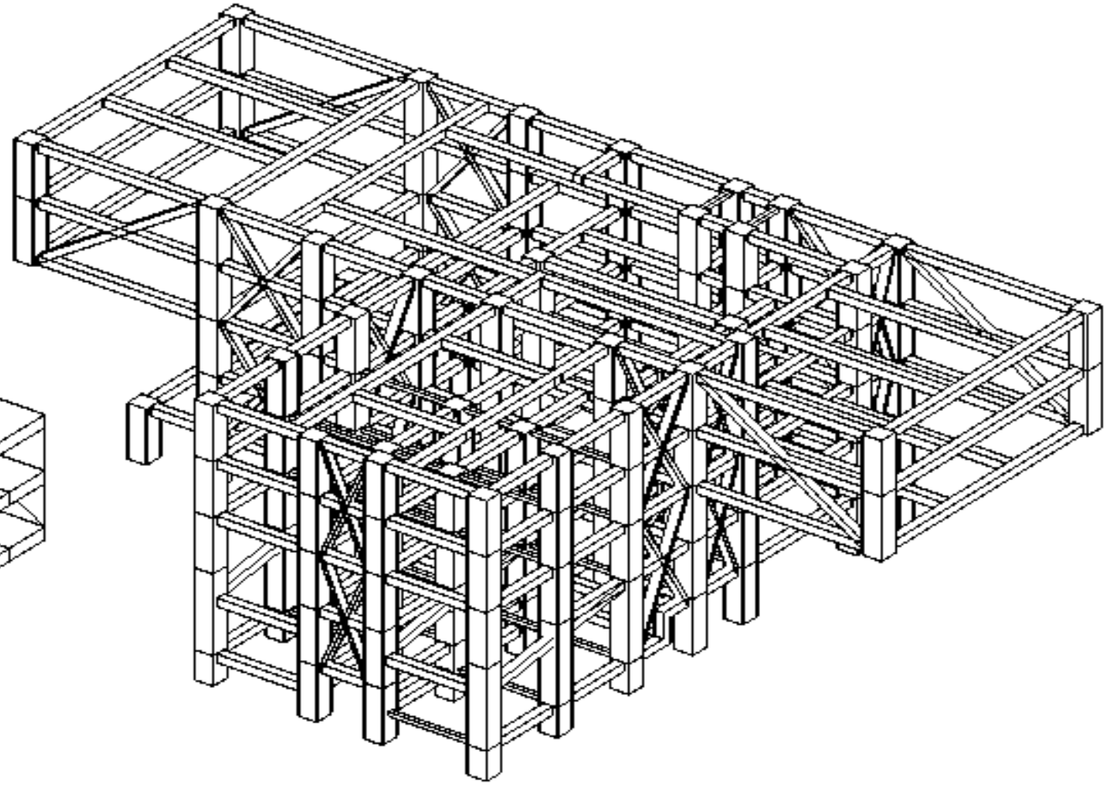


Roof Level



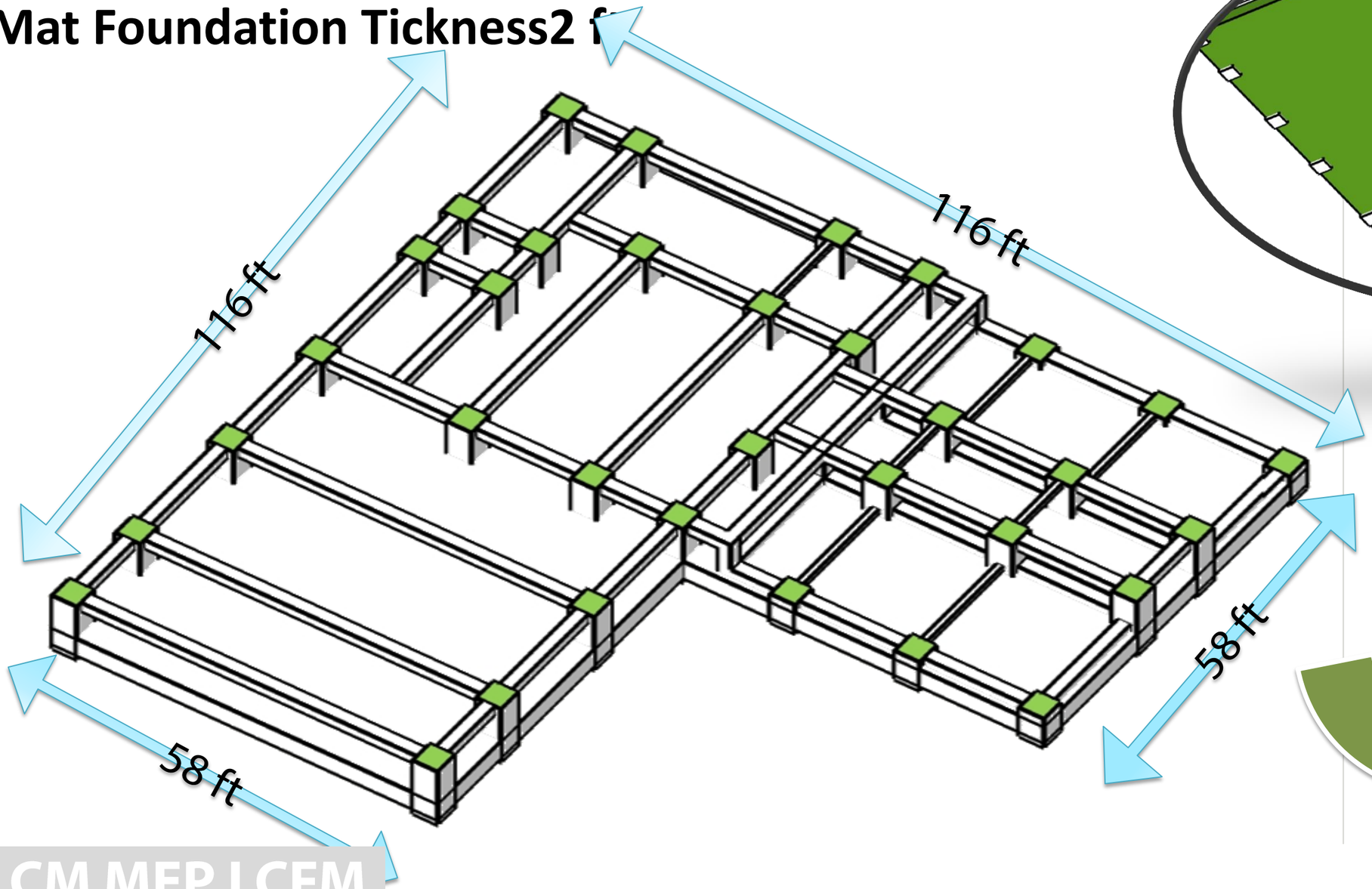
HOVER BOX
Steel scheme

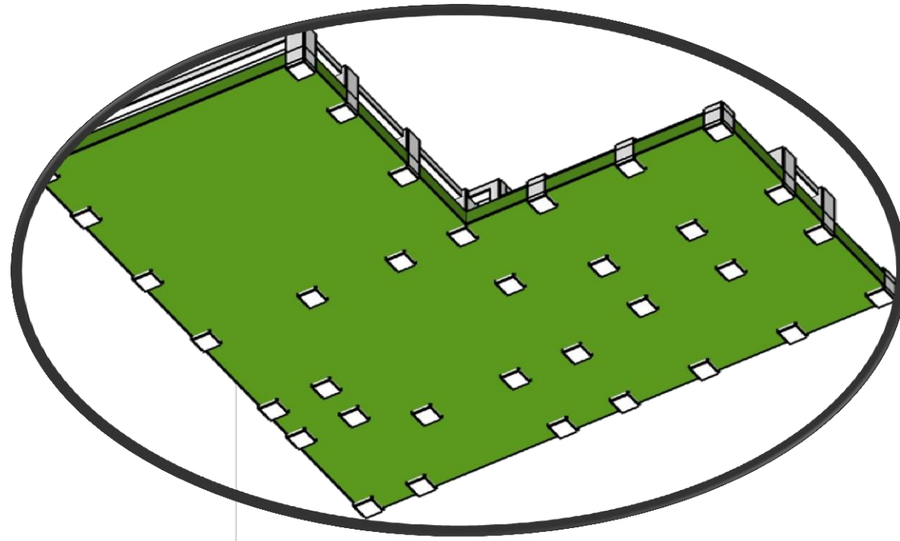




Ground Level

Column Size W14 X 38
Slab Thickness 6”
Mat Foundation Tickness2 f





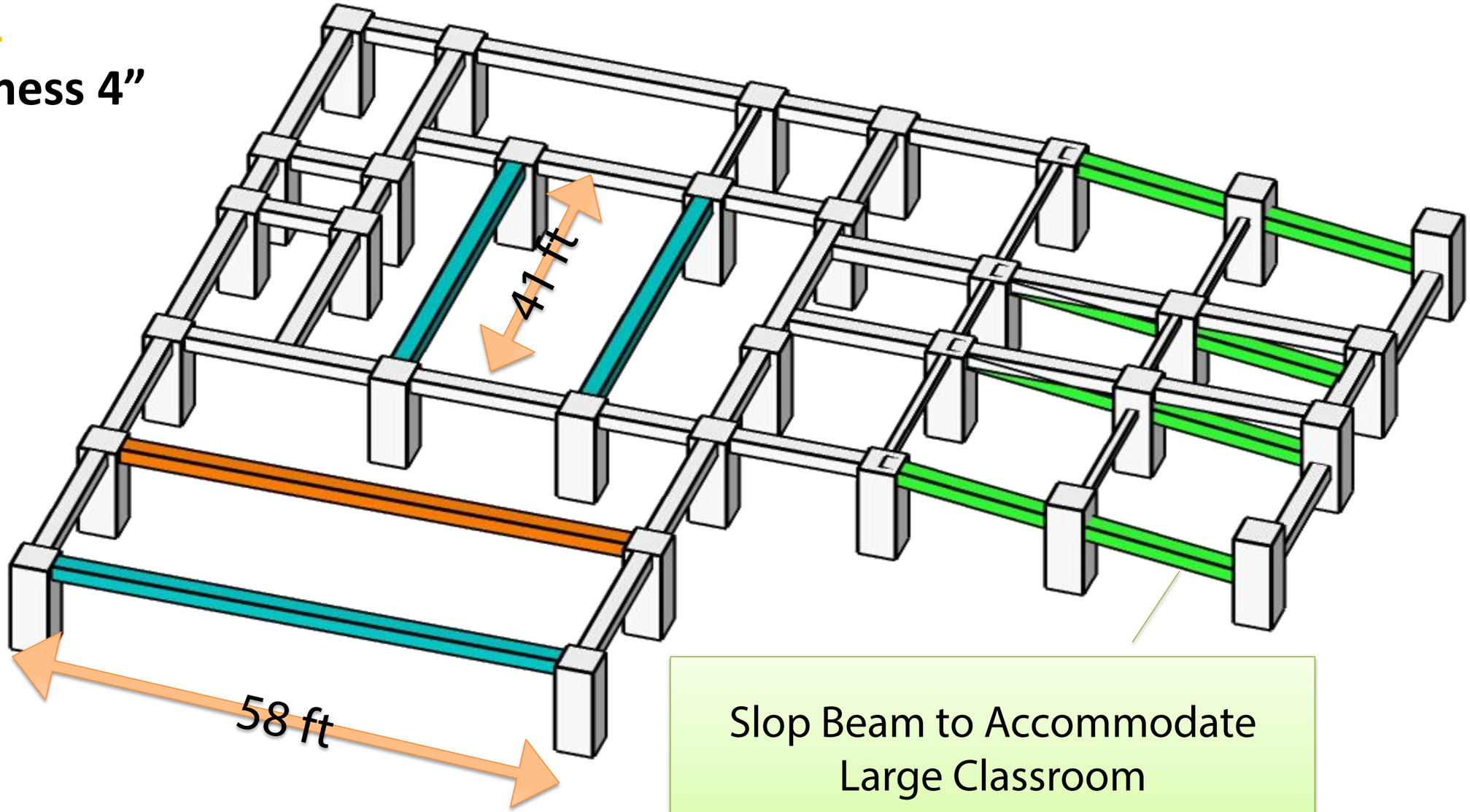
First Level

Majority Member W14 X 38

W24 X 94

W33 X 221

Slab Thickness 4”



Slop Beam to Accommodate Large Classroom

HOVER BOX
Steel Scheme
Second Level

Majority Member W14 X 38

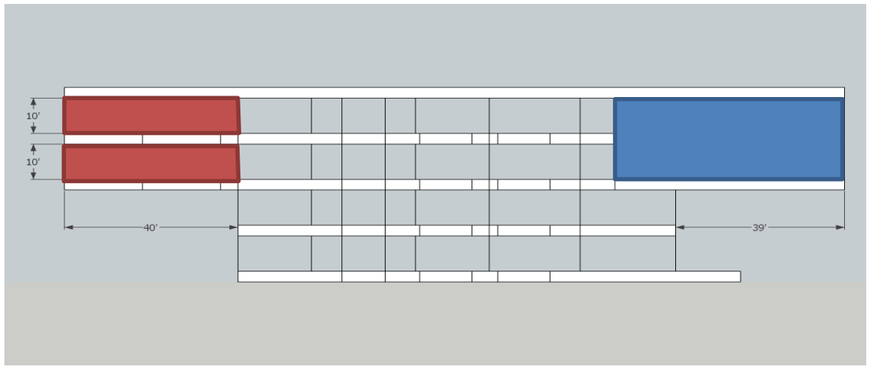
W24 X 94

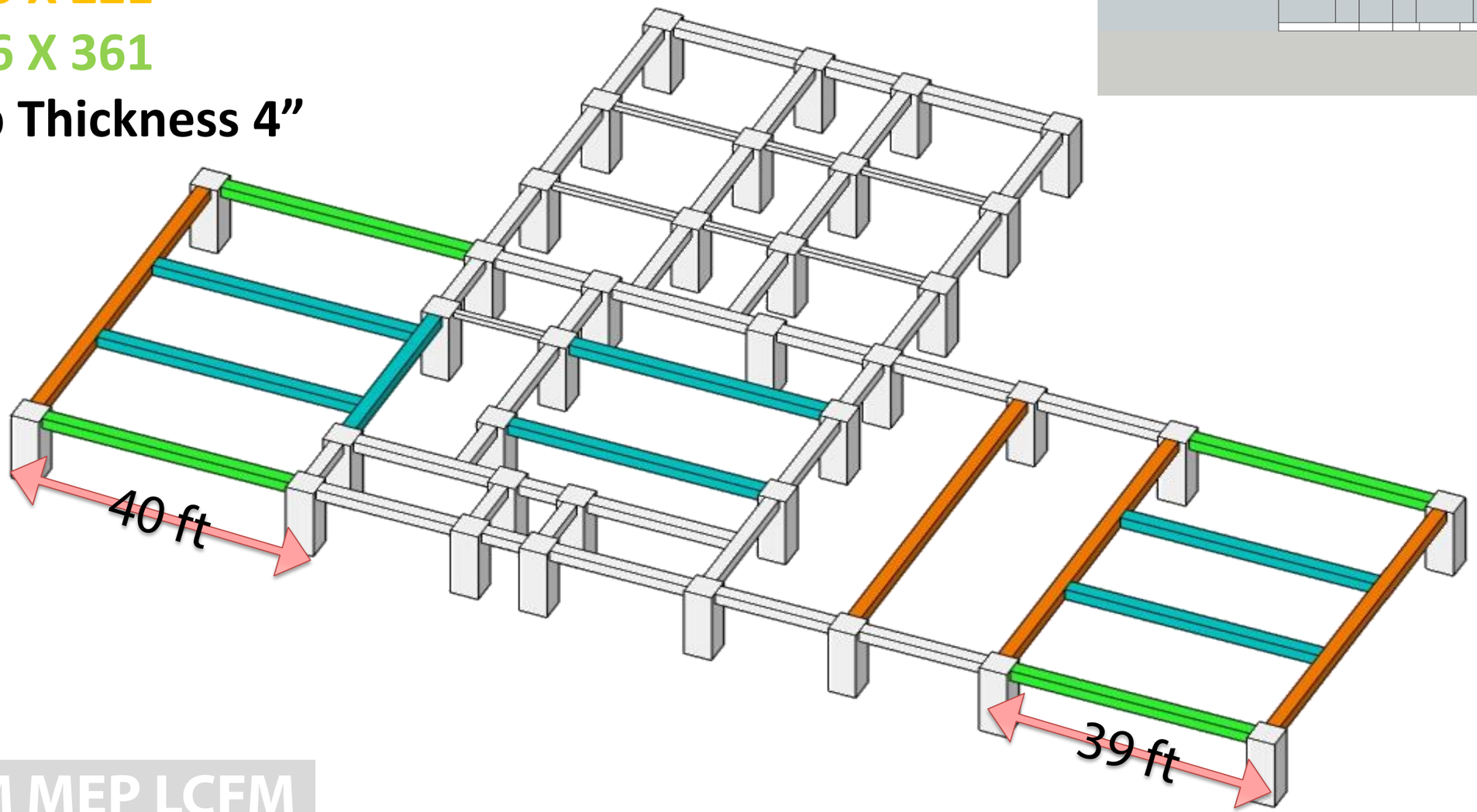
Cantilever Office & Auditorium

W33 X 221

W36 X 361

Slab Thickness 4”





HOVER BOX
Steel Scheme
Third Level

Majority Member W14 X 38

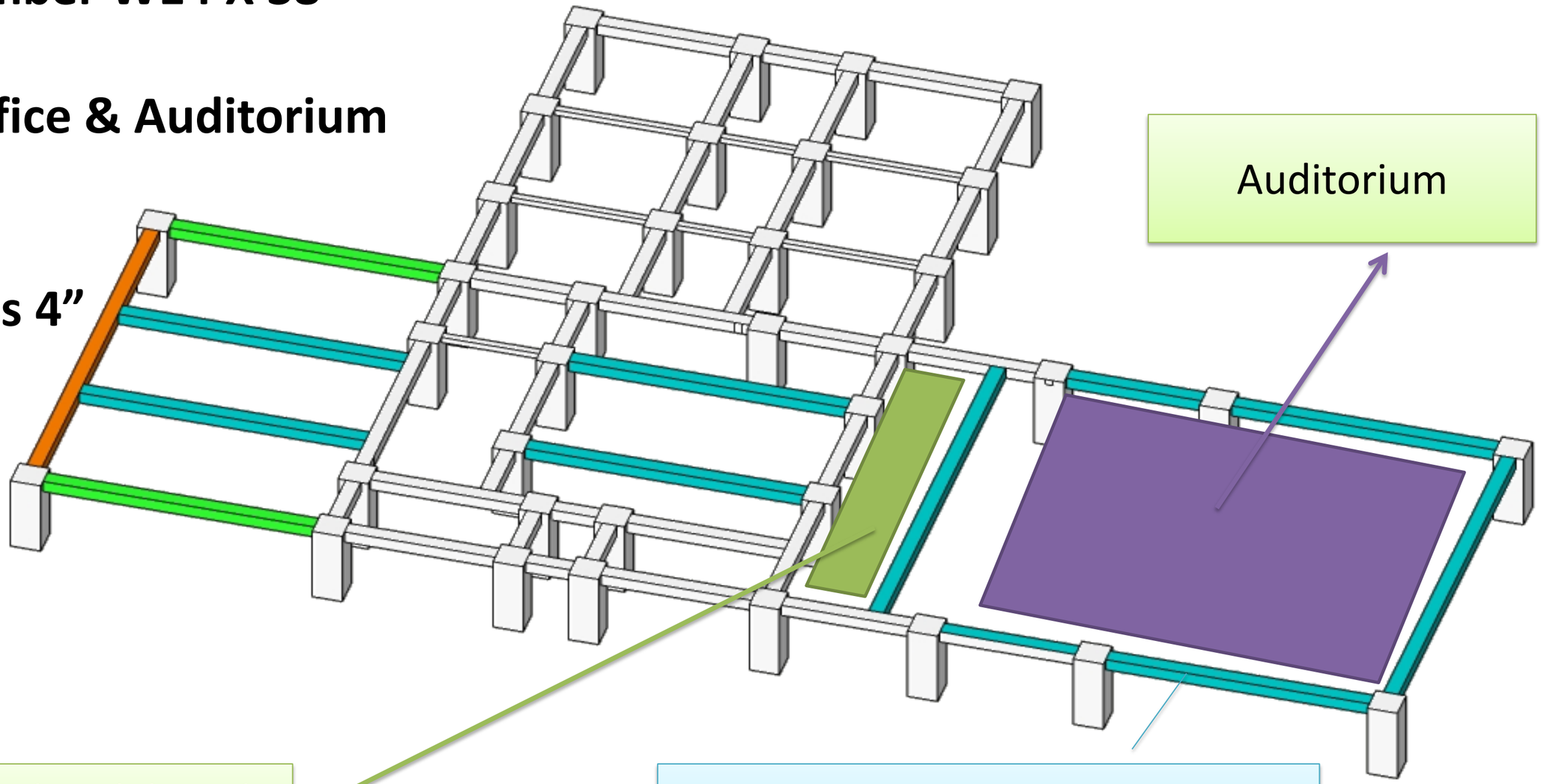
W24 X 94

Cantilever Office & Auditorium

W33 X 221

W36 X 361

Slab Thickness 4”



Roof Level

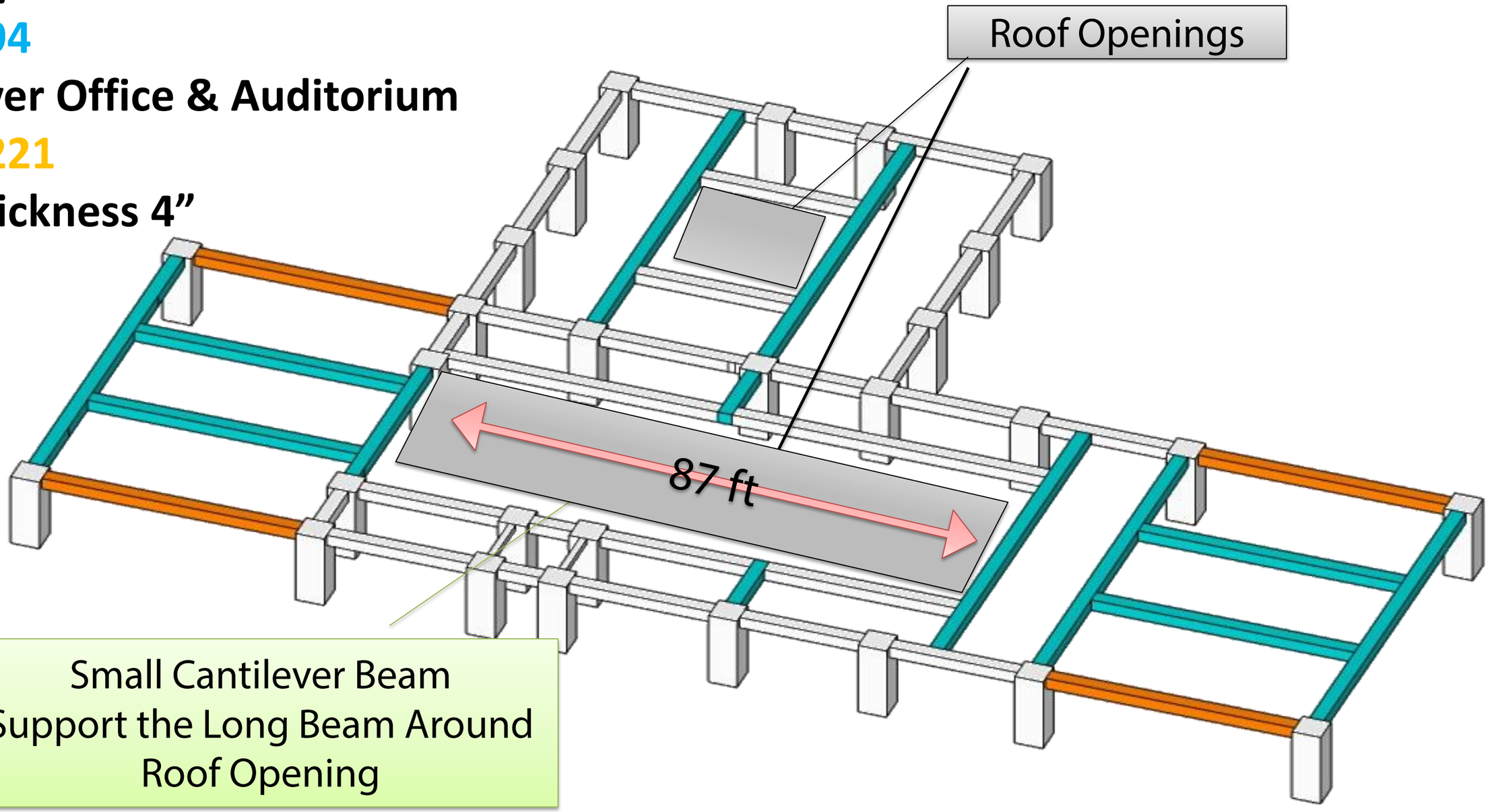
Majority Member W14 X 38

W24 X 94

Cantilever Office & Auditorium

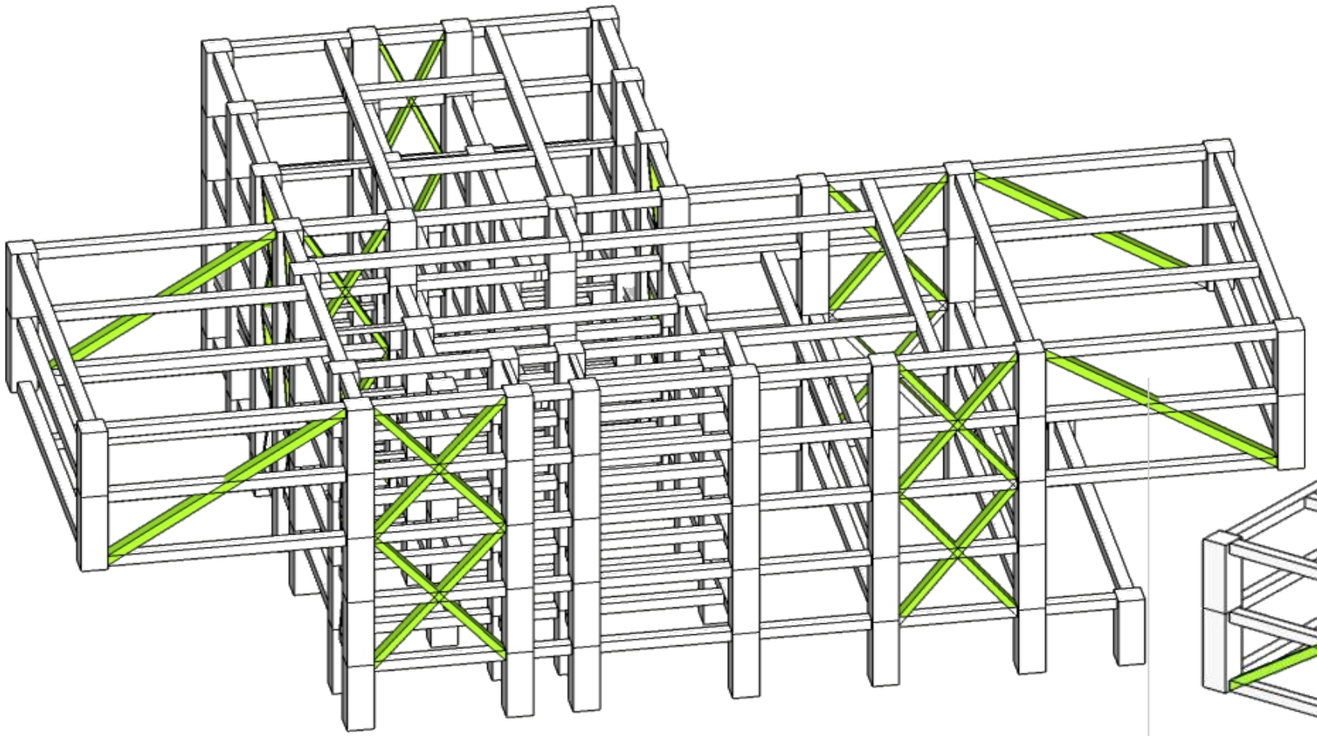
W33 X 221

Roof Thickness 4”

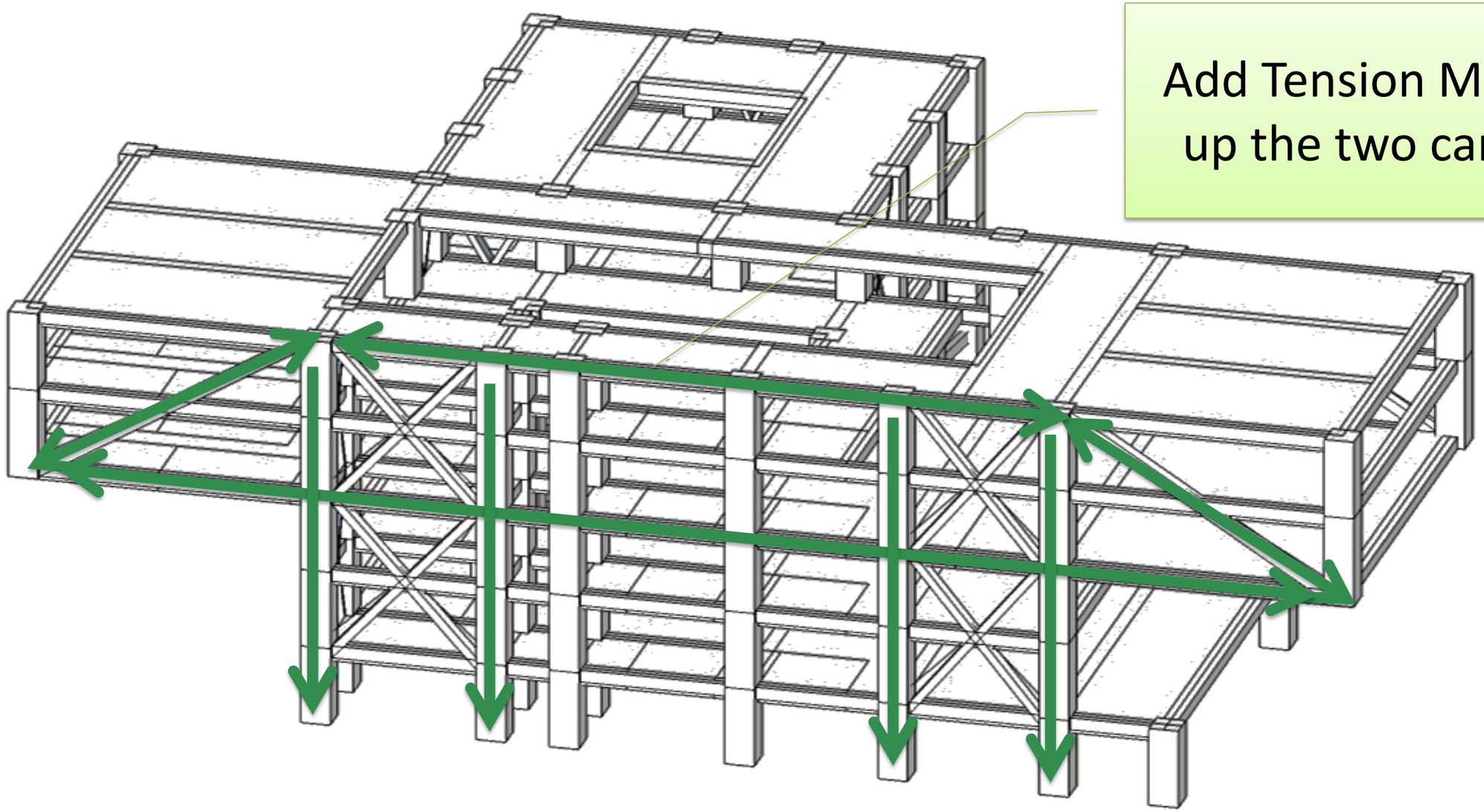


Lateral System

Column & Brace W14 X 38

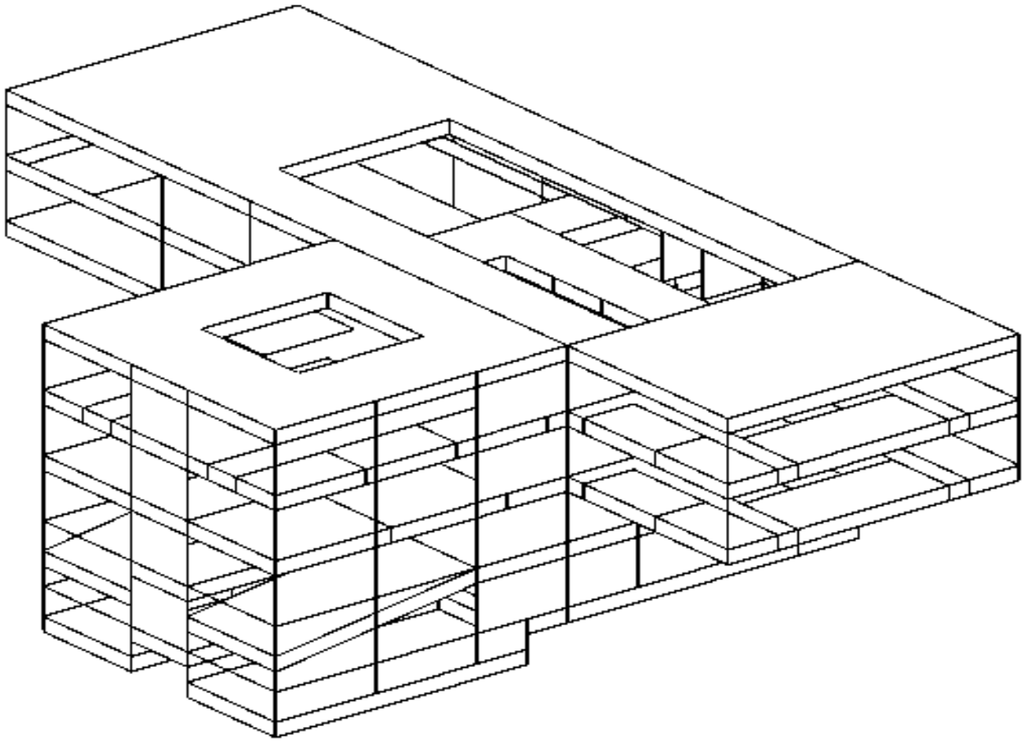


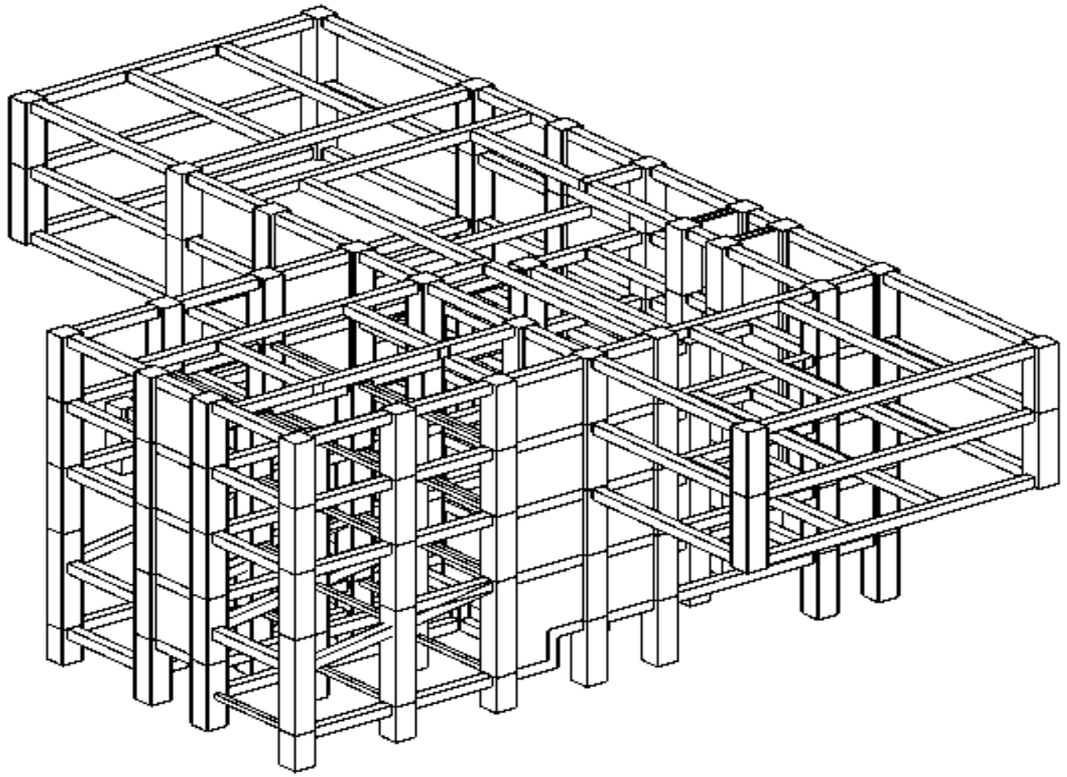
HOVER BOX
Steel Scheme
Lateral System



Add Tension Member to tie up the two cantilever part

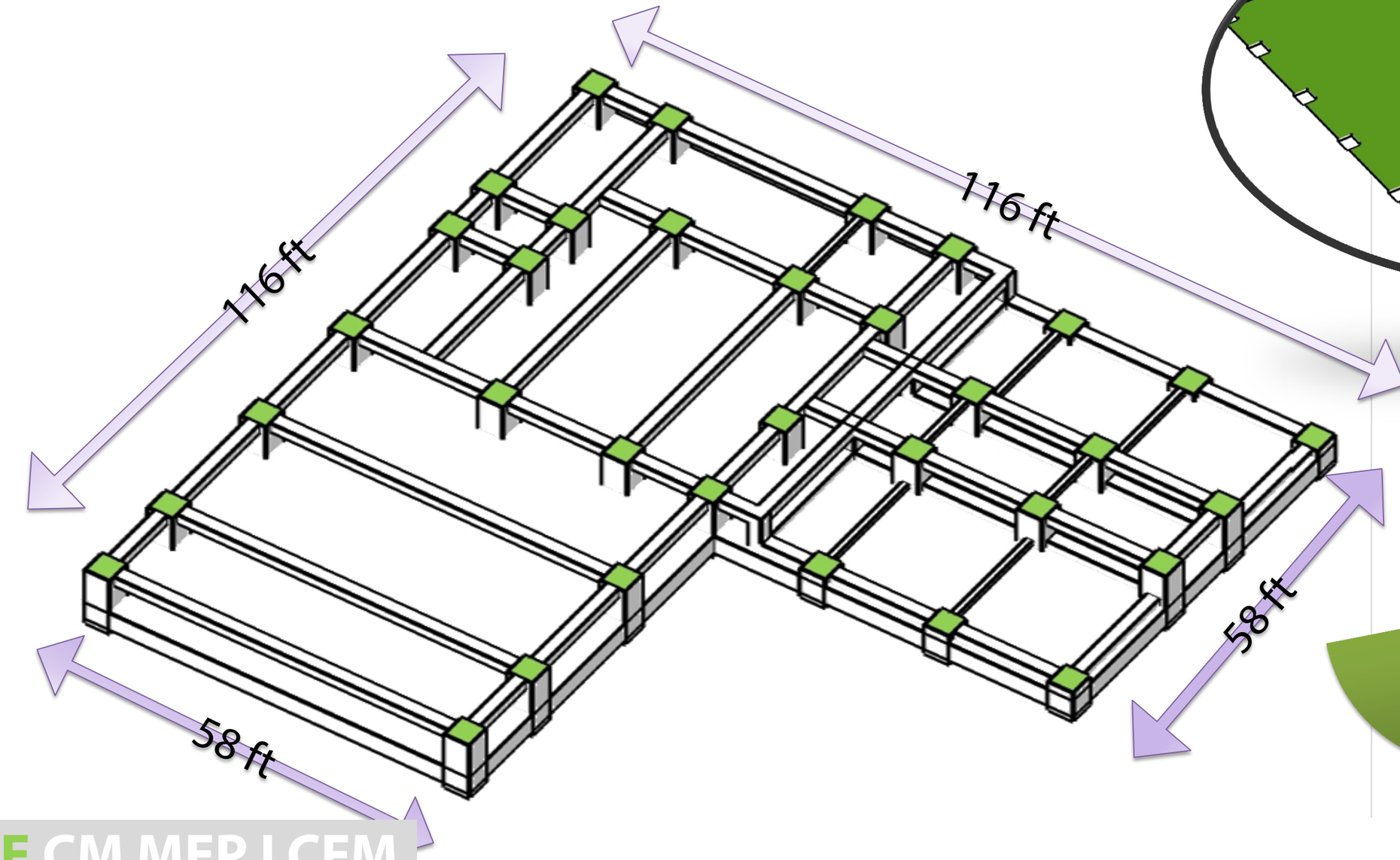
HOVER BOX
Steel & Concrete Scheme



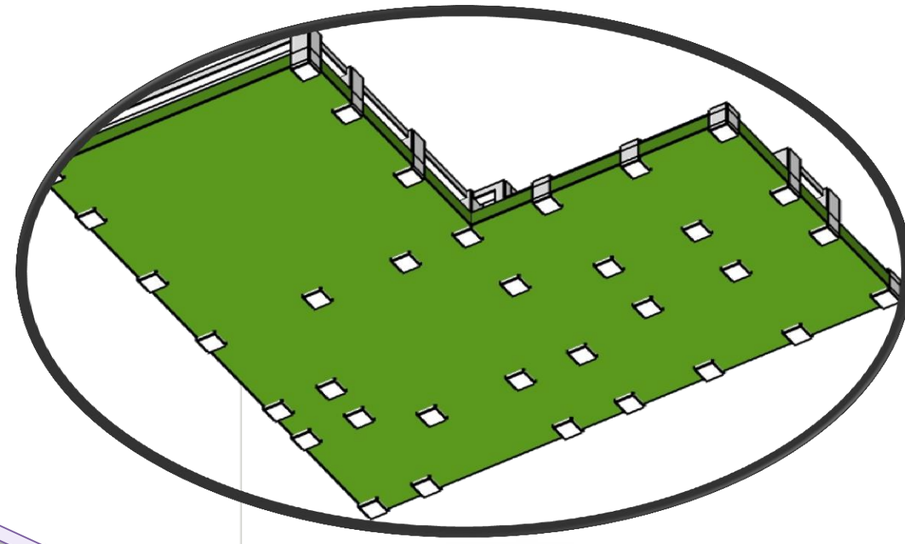


HOVER BOX
Steel & Concrete Scheme

Column Size 20” X 20”
Slab Thickness 6”
Mat Foundation Thickness 2 ft



Ground Level



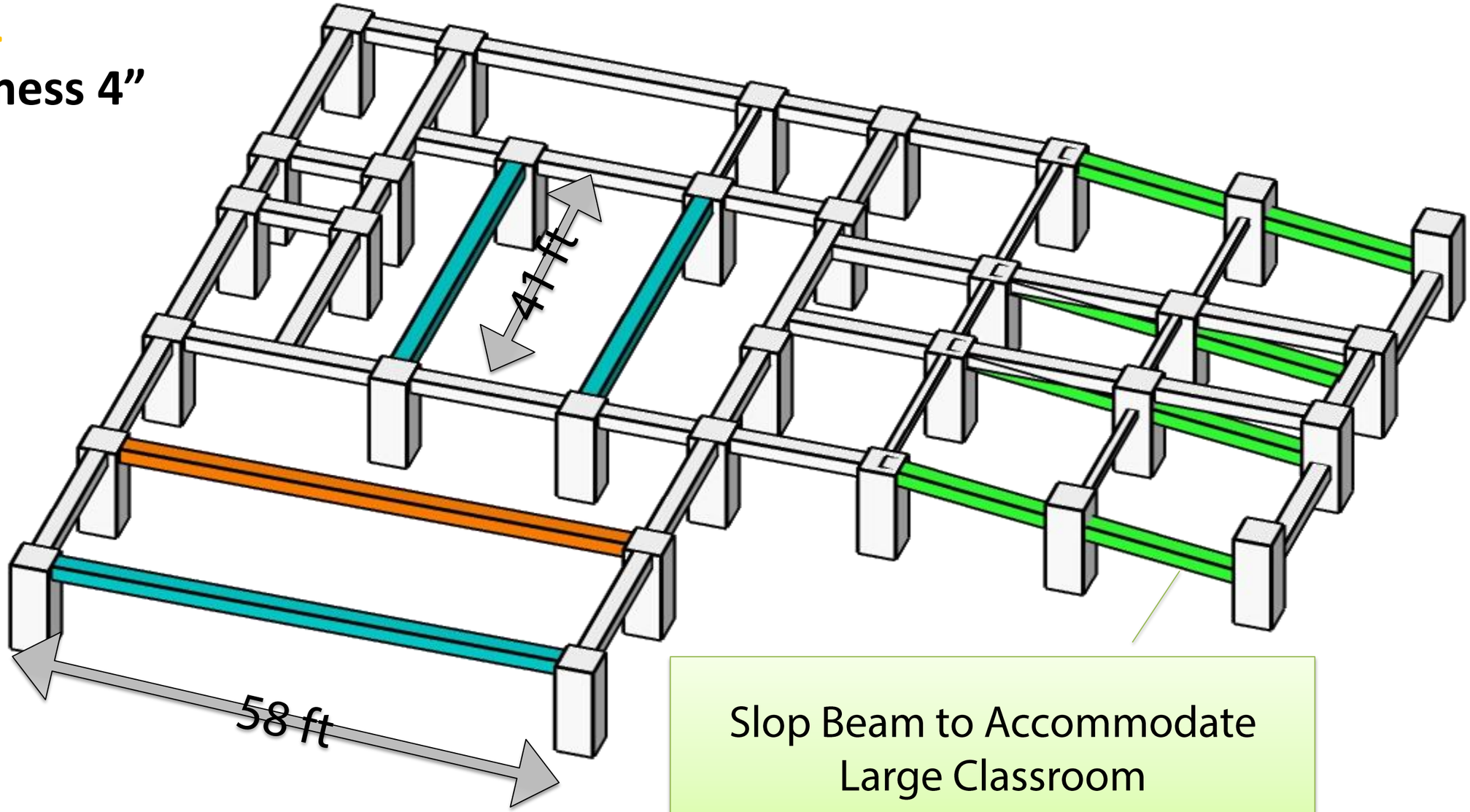
First Level

Concrete Beam Section 18” X 12”

W24 X 94

W33 X 221

Slab Thickness 4”



Slop Beam to Accommodate Large Classroom

HOVER BOX

Steel & Concrete Scheme

Concrete Beam Section 18” X 12”

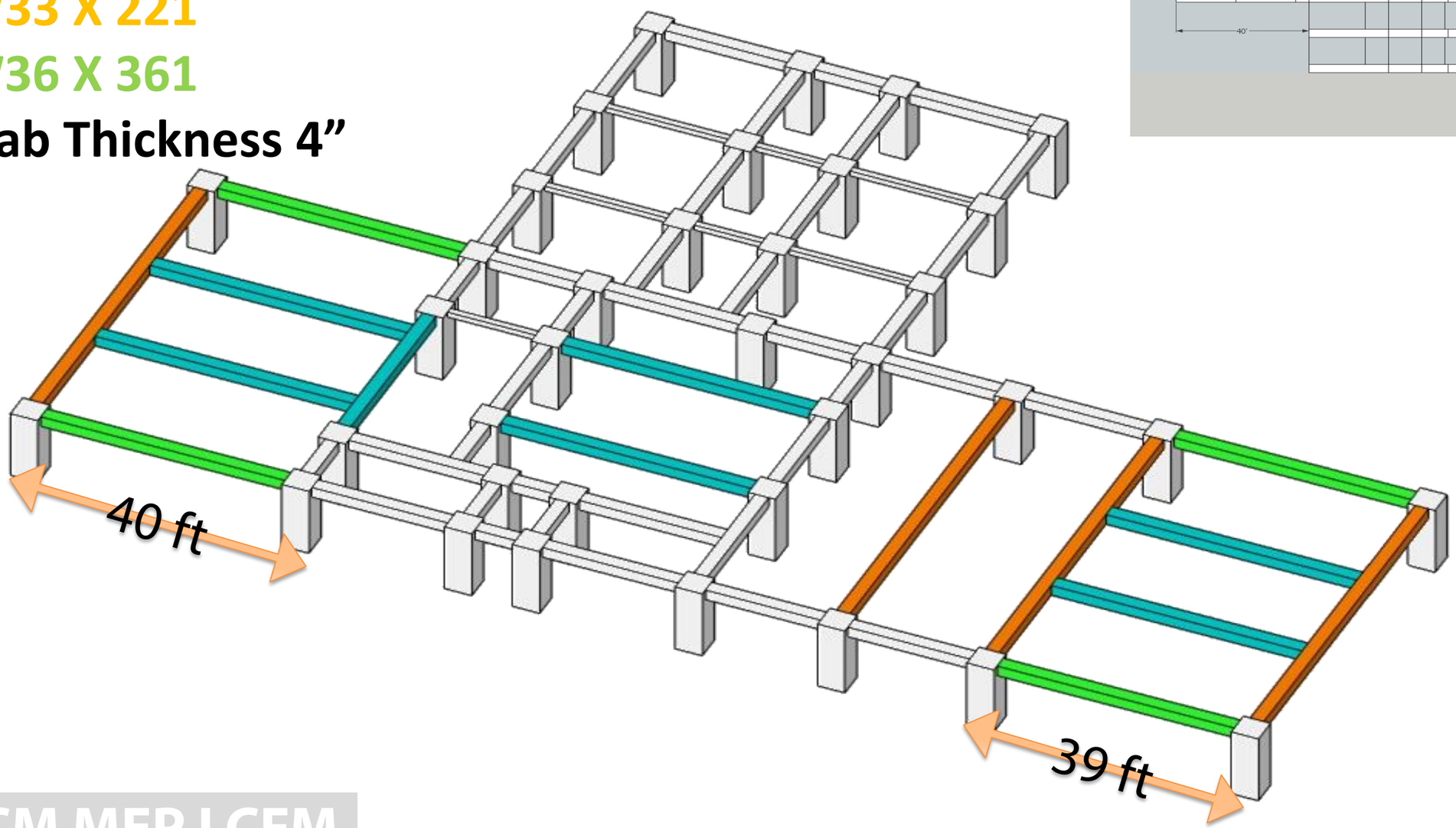
W24 X 94

Cantilever Office & Auditorium

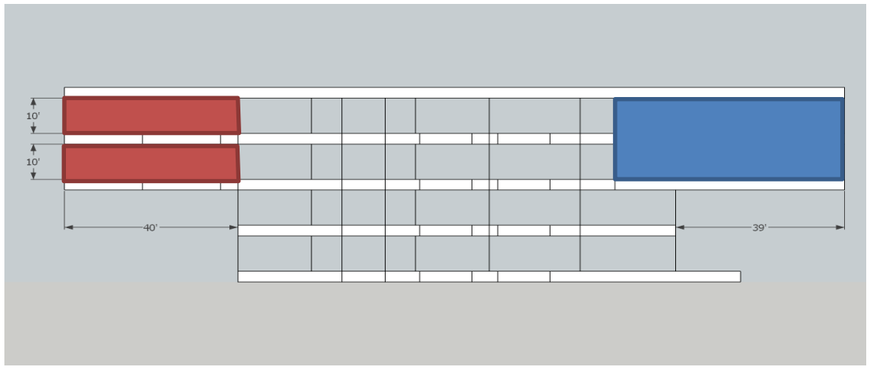
W33 X 221

W36 X 361

Slab Thickness 4”



Second Level



Third Level

Concrete Beam Section 18” X 12”

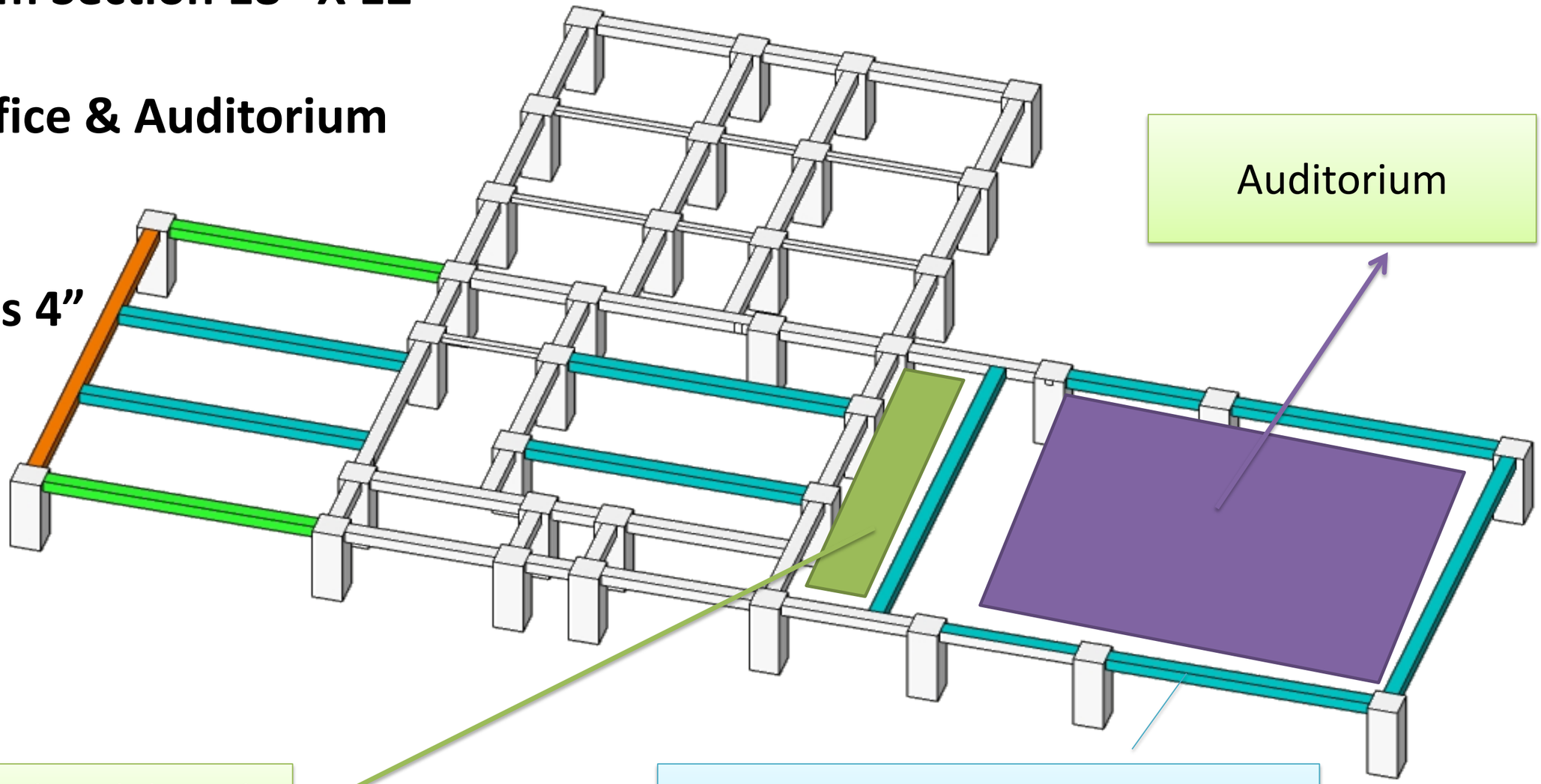
W24 X 94

Cantilever Office & Auditorium

W33 X 221

W36 X 361

Slab Thickness 4”



Roof Level

Concrete Beam Section 16” X 12”

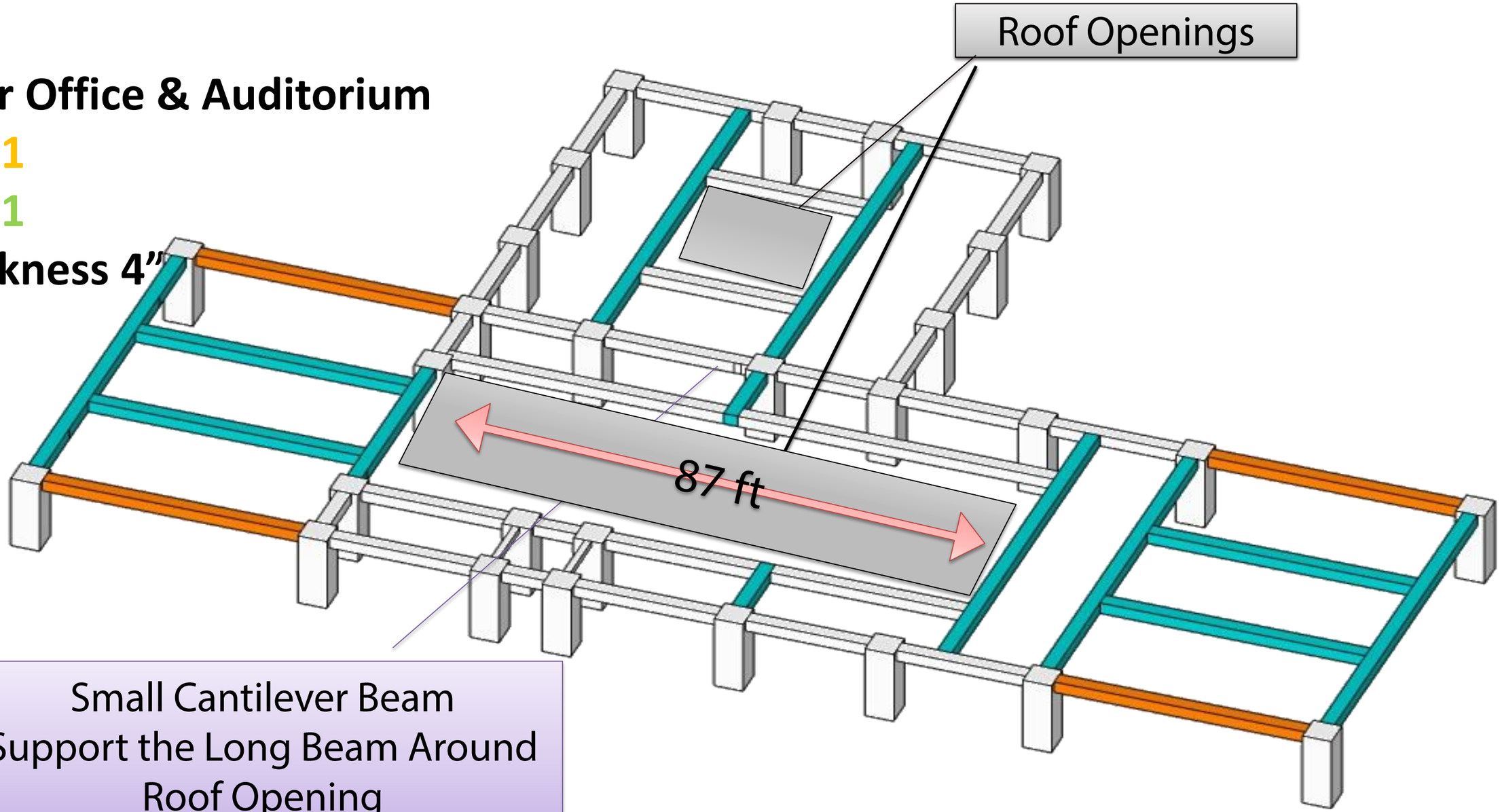
18” X 12”

Cantilever Office & Auditorium

W33 X 221

W36 X 361

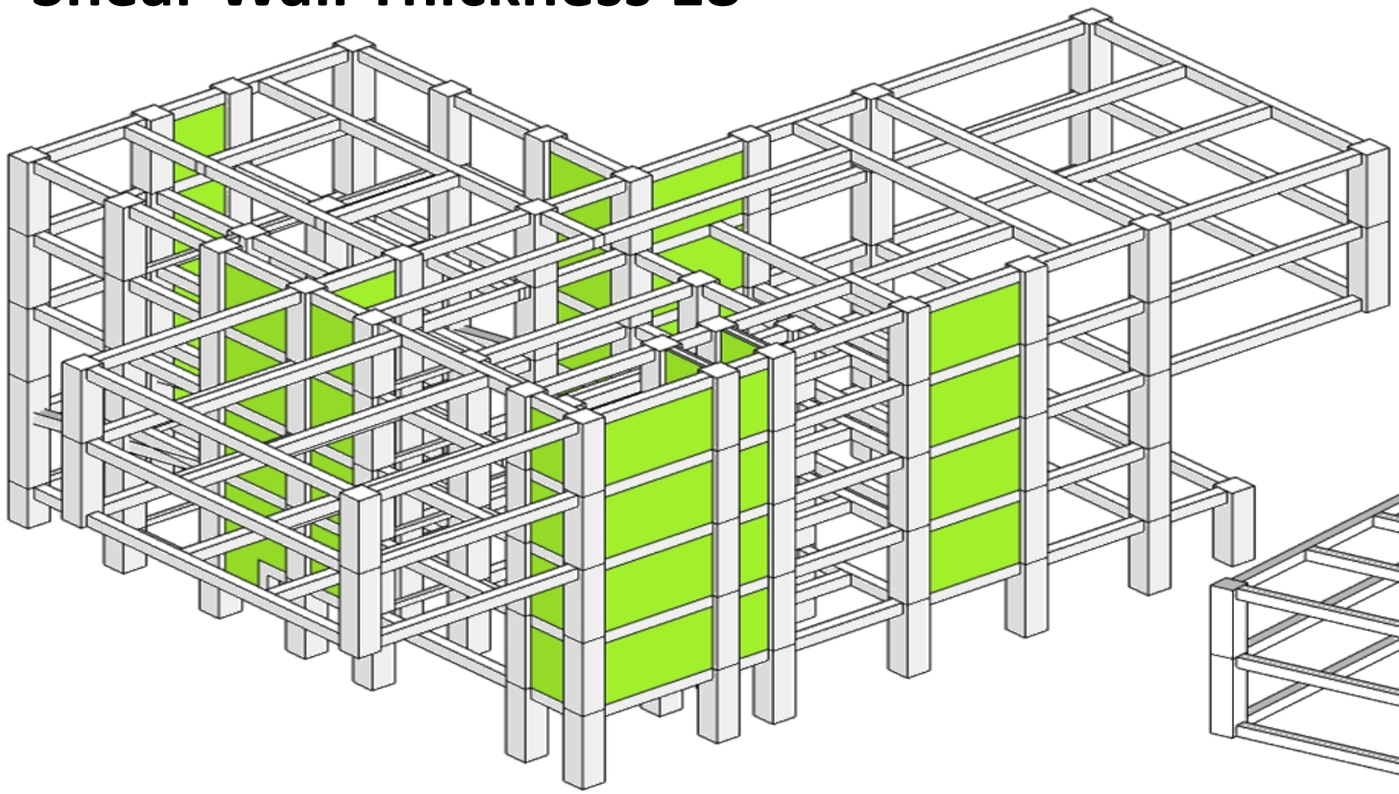
Roof Thickness 4”

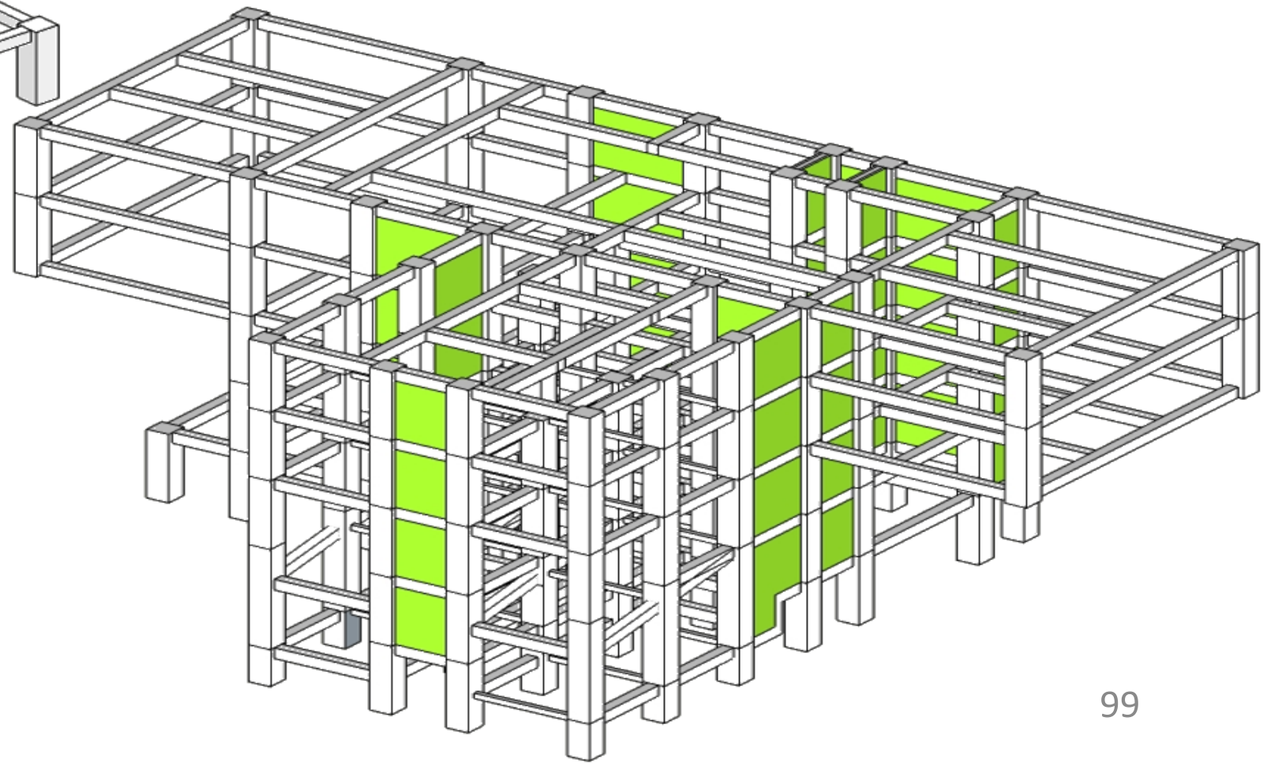


Small Cantilever Beam Support the Long Beam Around Roof Opening

Lateral System

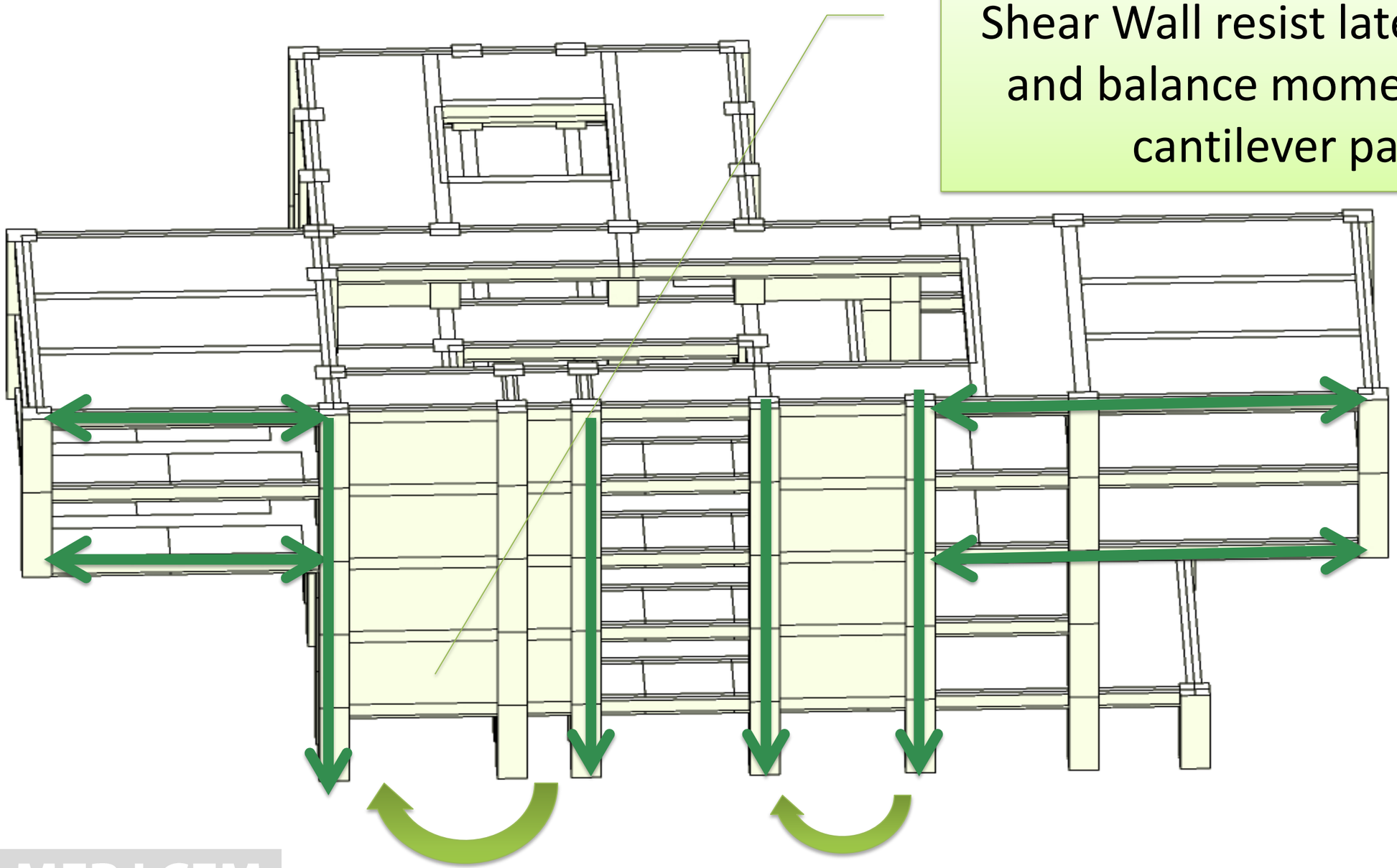
Column 20”X 20”
Shear Wall Thickness 18”





Lateral System

Shear Wall resist lateral force and balance moment from cantilever part



Quantity Takeoff

Steel Scheme

Item	Bulk Volume cft
Concrete Slab & Roof	17000
Steel Beam Column Brace	1200

Steel & Concrete Scheme

Item	Bulk Volume cft
Concrete Slab & Roof	17000
Steel Member	700
Concrete Beam & Column	8000
Shear Wall	15000

Compare

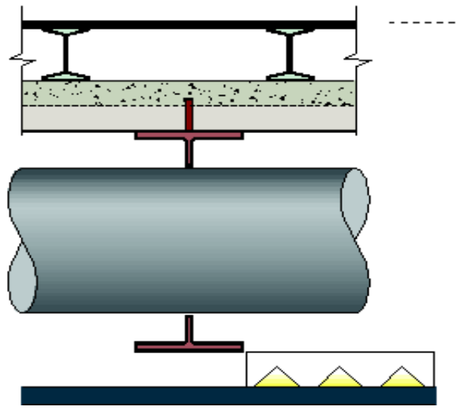
Steel Scheme

- Light Weight
- Fast Construction
- High Recycle Rate
- Good Seismic Stability

Steel & Concrete Scheme

- Cheaper
- Material Availability
- Good Wind Stability
- High Rotation Stiffness

Integration



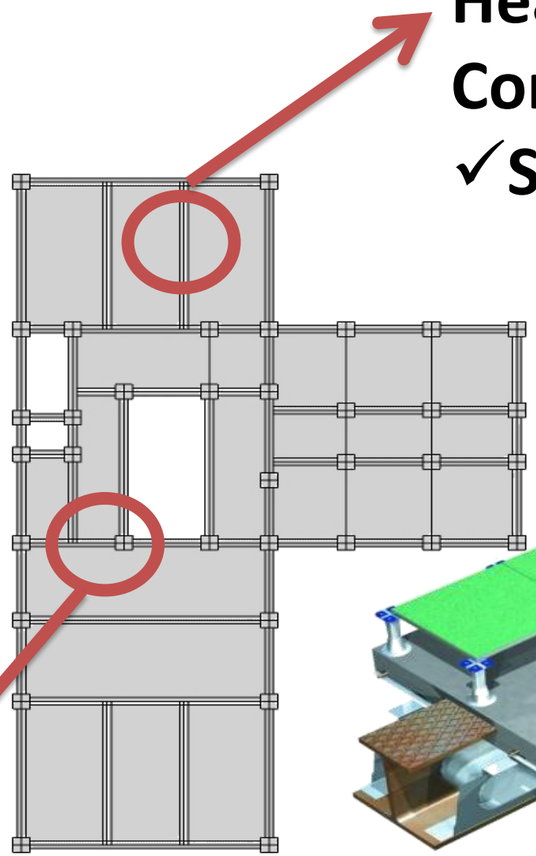
MEP Coming Through

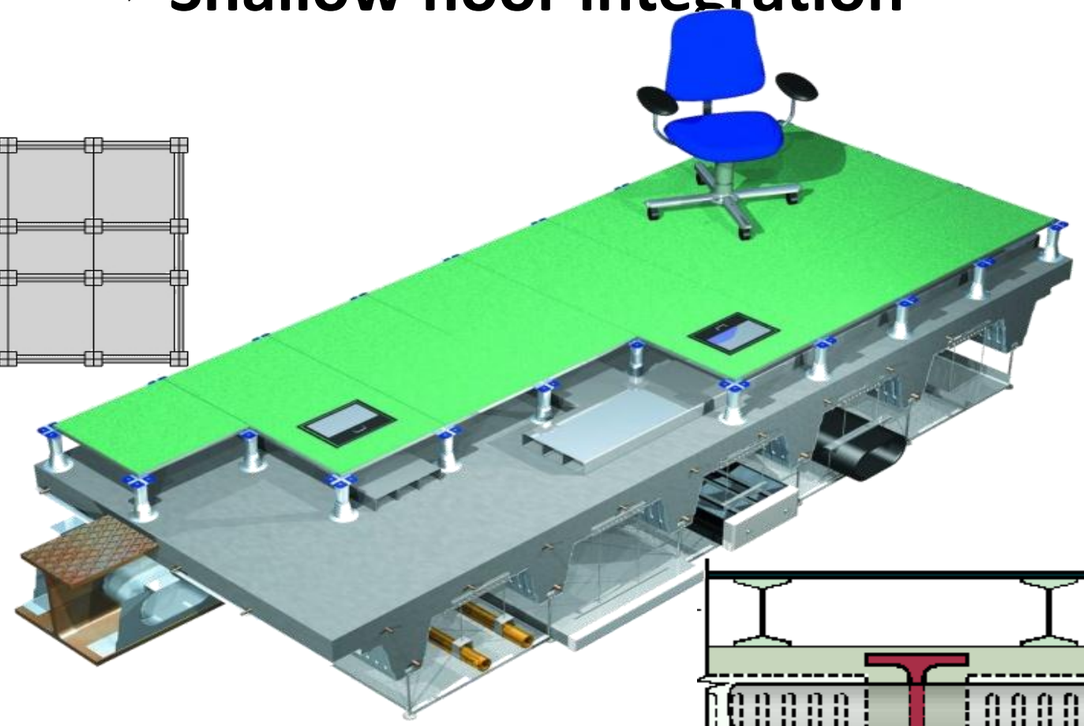
✓Cellular beams with multiple openings for services

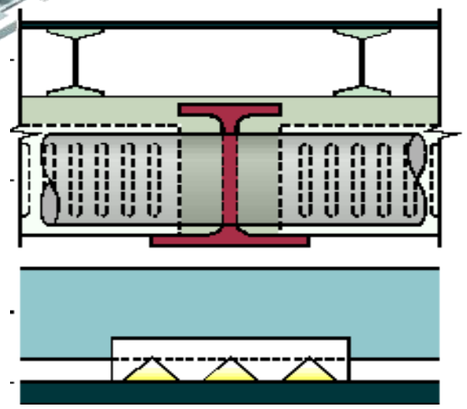
Heavy Structure Member

Compacted Floor Section

✓Shallow floor integration





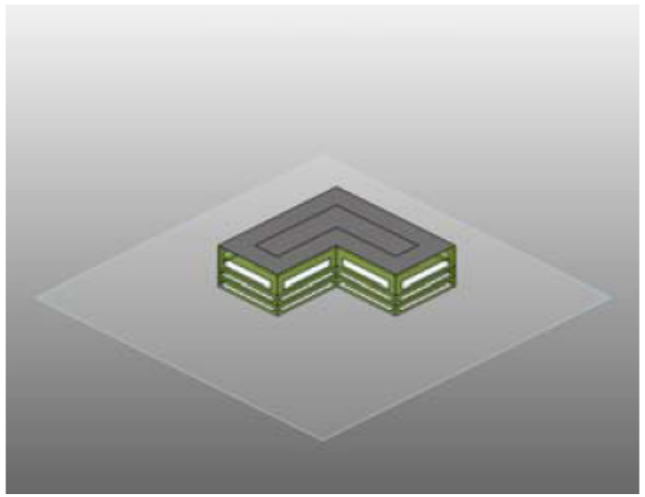


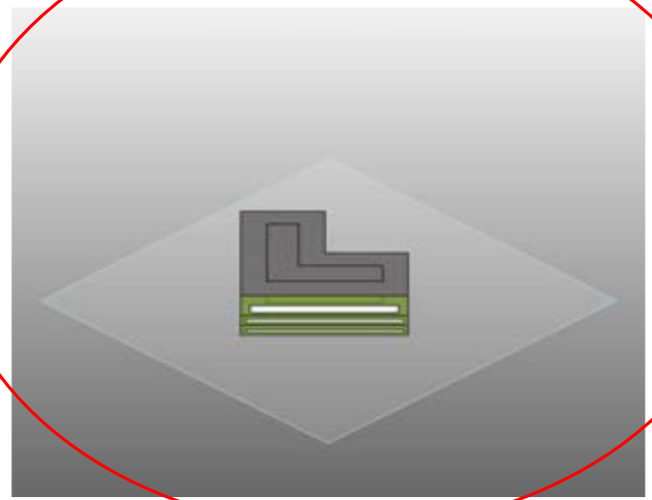
ORIENTATION HOVERING BOX

N – E – S – W

NW

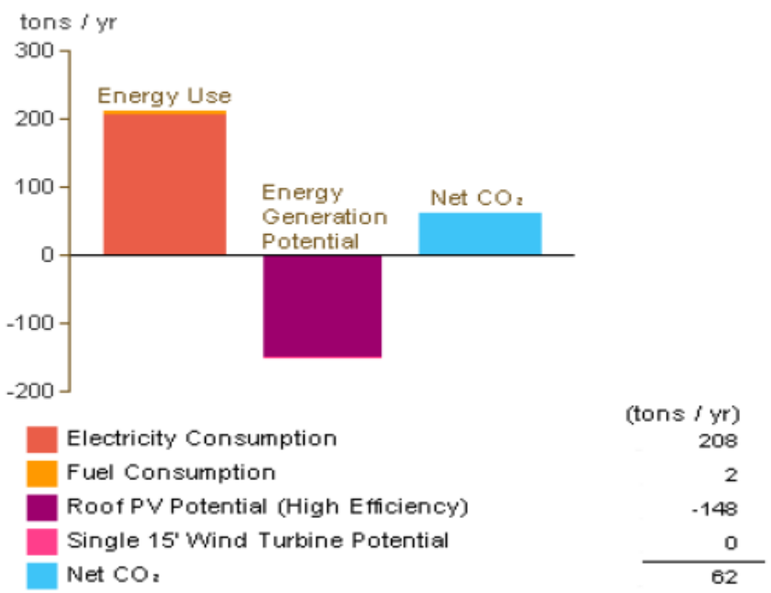
NE – SE – SW



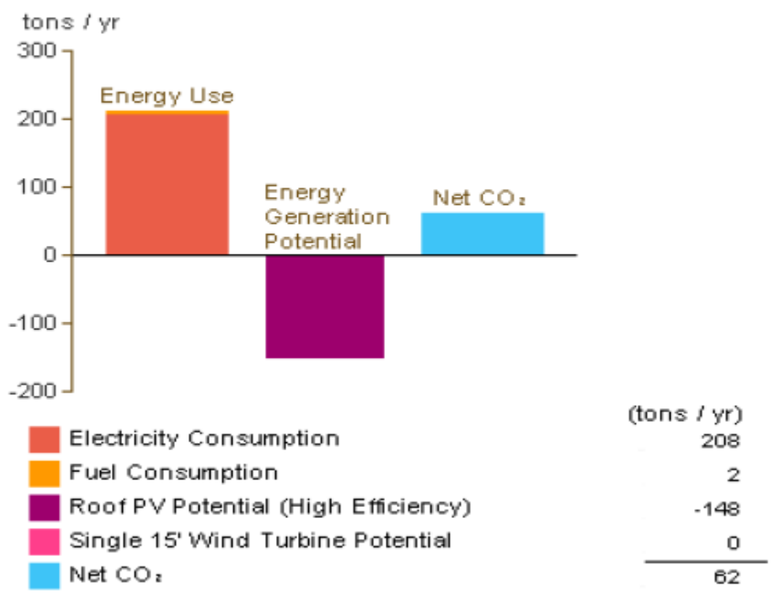


Revit Energy Analysis Result

Emissions



	(tons / yr)
Electricity Consumption	208
Fuel Consumption	2
Roof PV Potential (High Efficiency)	-148
Single 15' Wind Turbine Potential	0
Net CO₂	62



	(tons / yr)
Electricity Consumption	208
Fuel Consumption	2
Roof PV Potential (High Efficiency)	-148
Single 15' Wind Turbine Potential	0
Net CO₂	62

HOVERING BOX SYSTEM CONCEPT

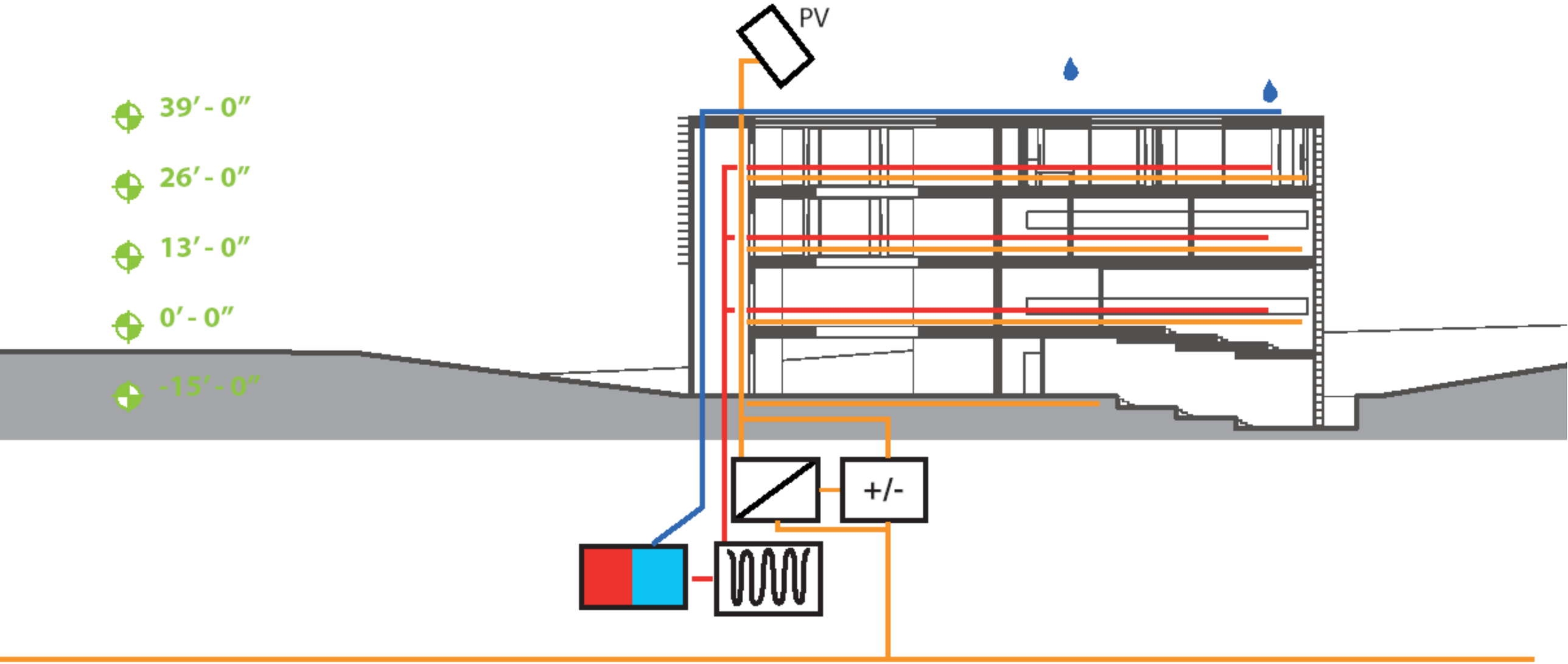
39′ - 0″

26′ - 0″

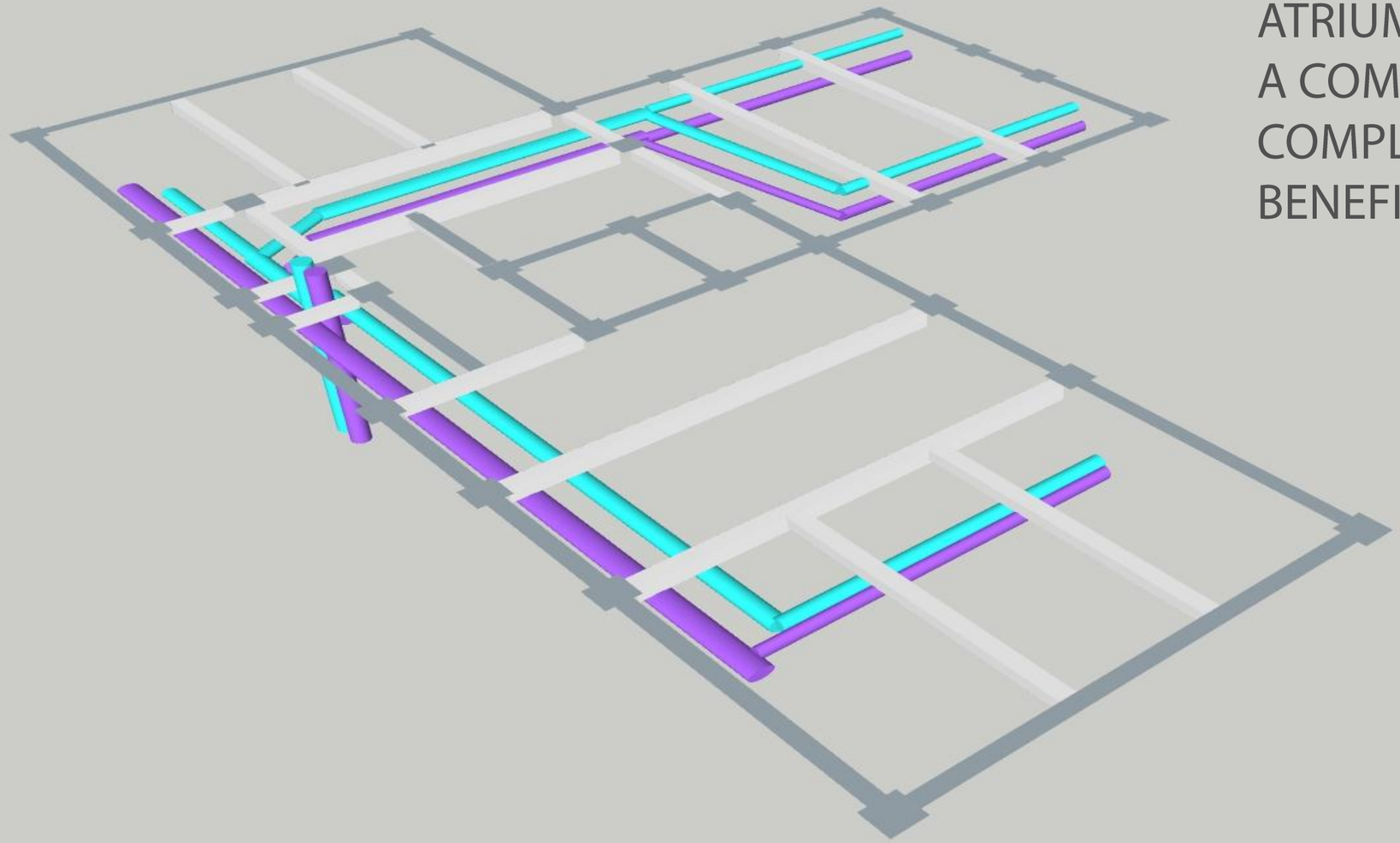
13′ - 0″

0′ - 0″

-15′ - 0″



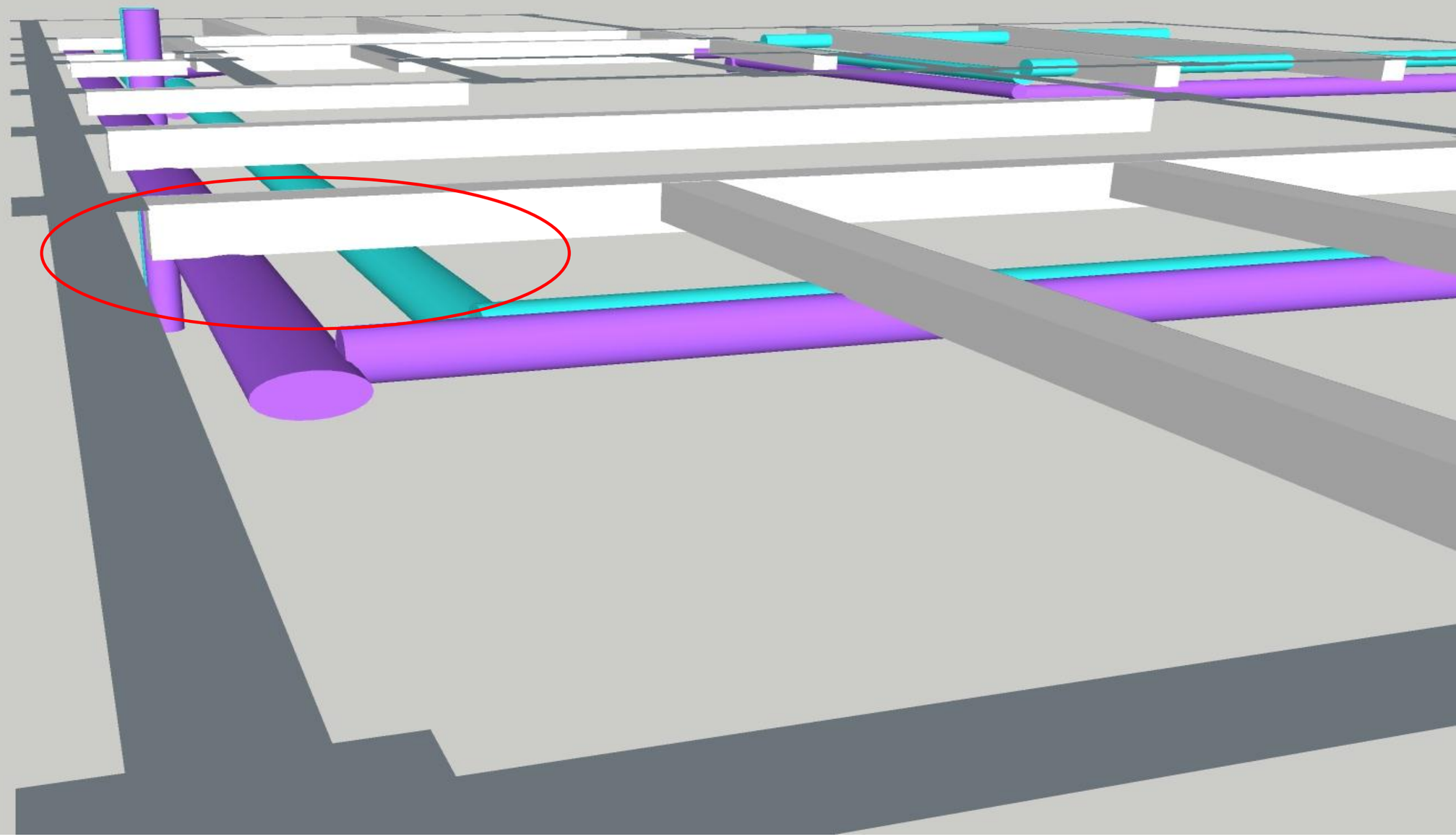
HOVERING BOX SANDWICH

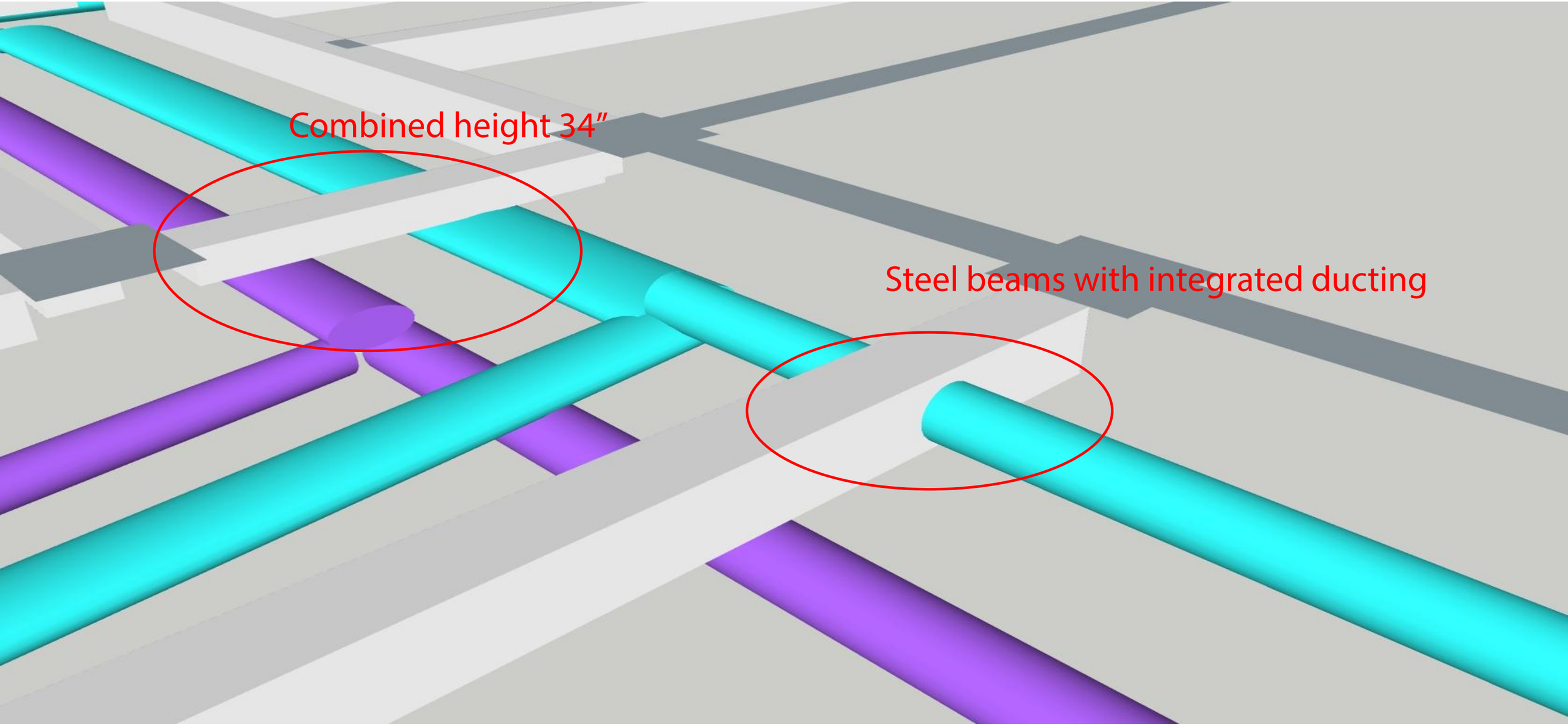


ATRIUM AND OPEN SPACES REQUIRED A COMPLEX STRUCTURAL DESIGN
COMPLEX STRUCTURAL DESIGN NOT BENEFICIAL FOR DUCTING

HOVERING BOX SANDWICH

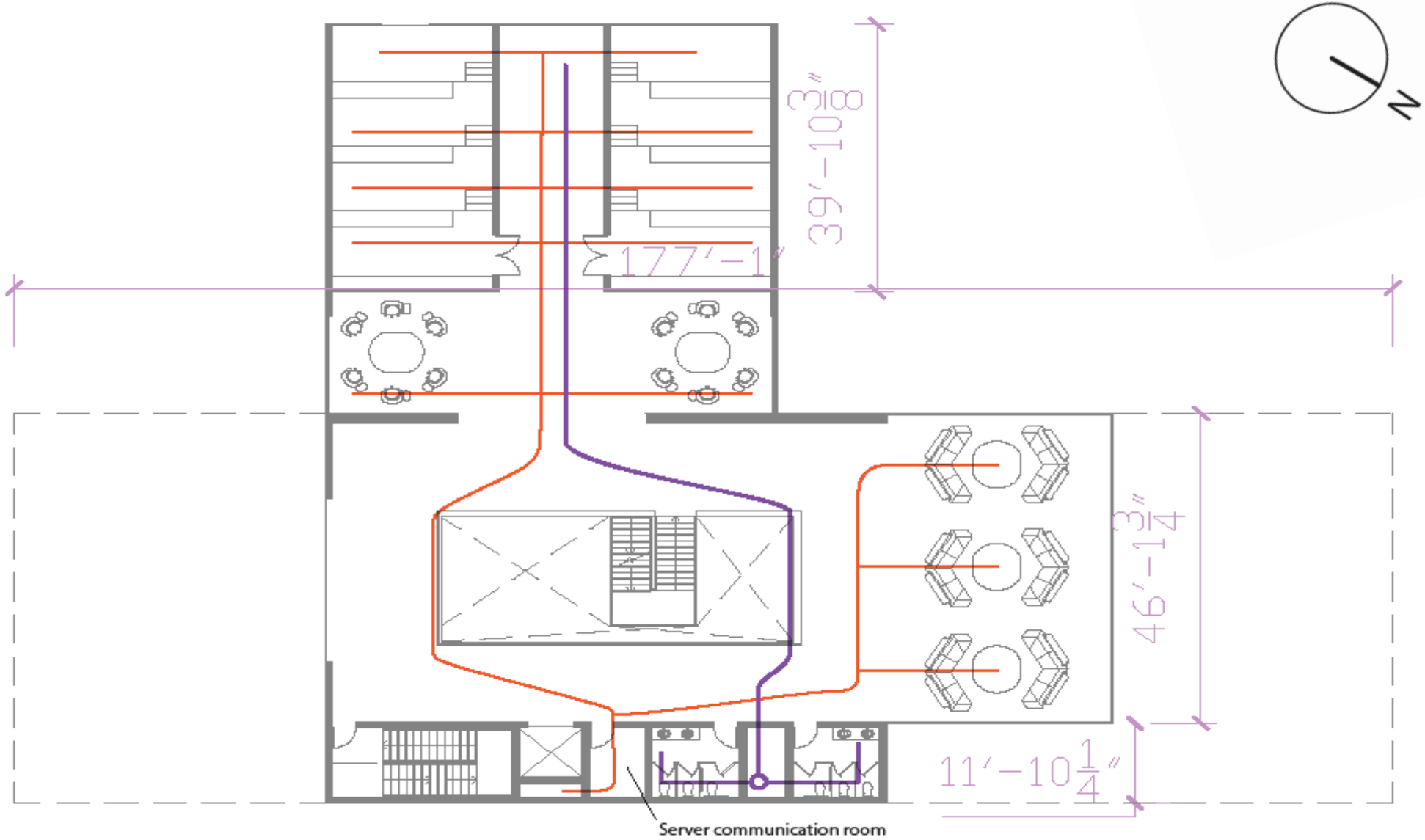
HEIGHT 40”




Combined height 34”
Steel beams with integrated ducting

HOVERING BOX #1 – MECHANICAL BALANCED

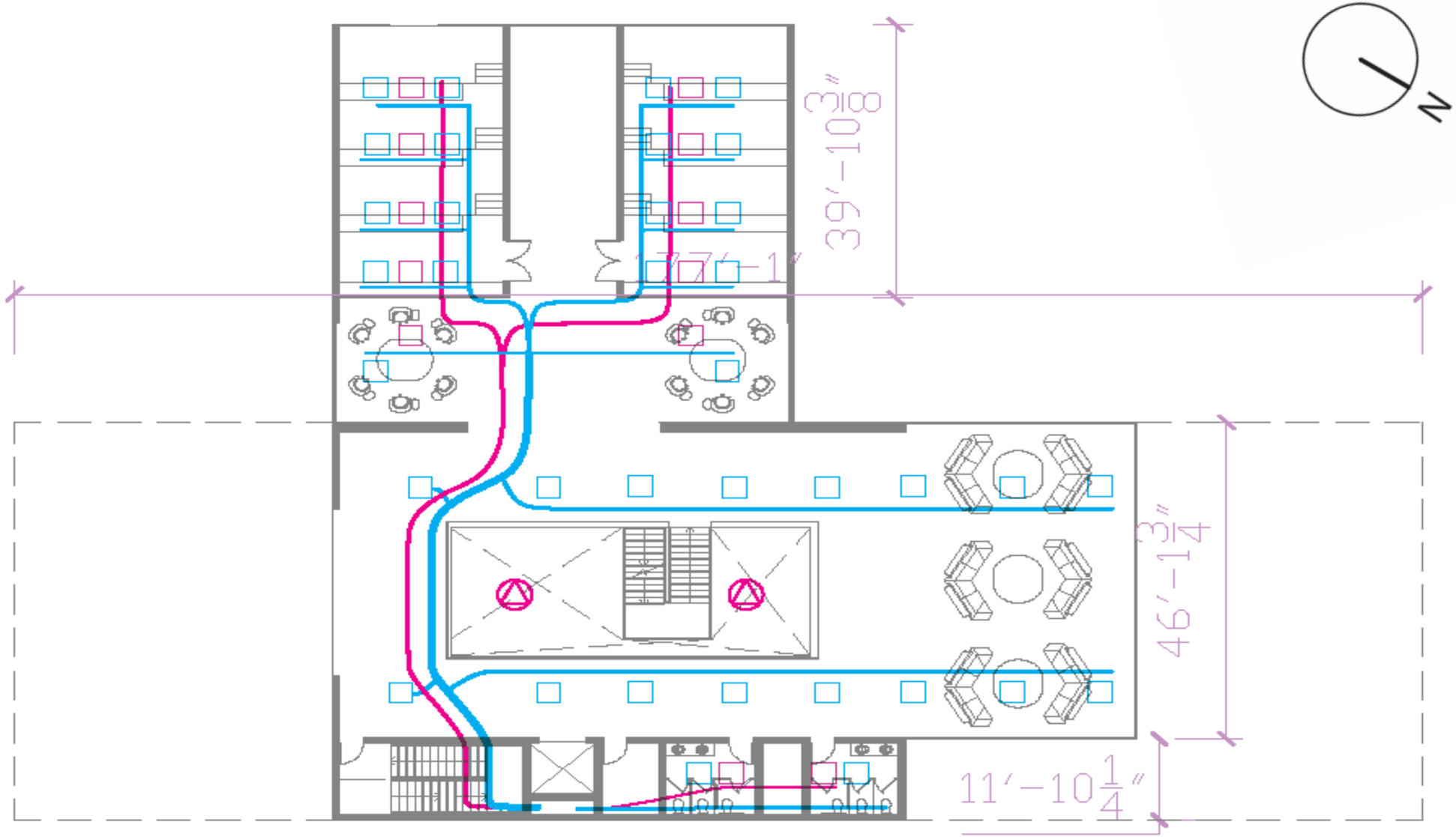
ELECTRICITY DISTRIBUTION
WATER DISTRIBUTION



HOVERING BOX #1 – MECHANICAL BALANCED

AIR SUPPLY

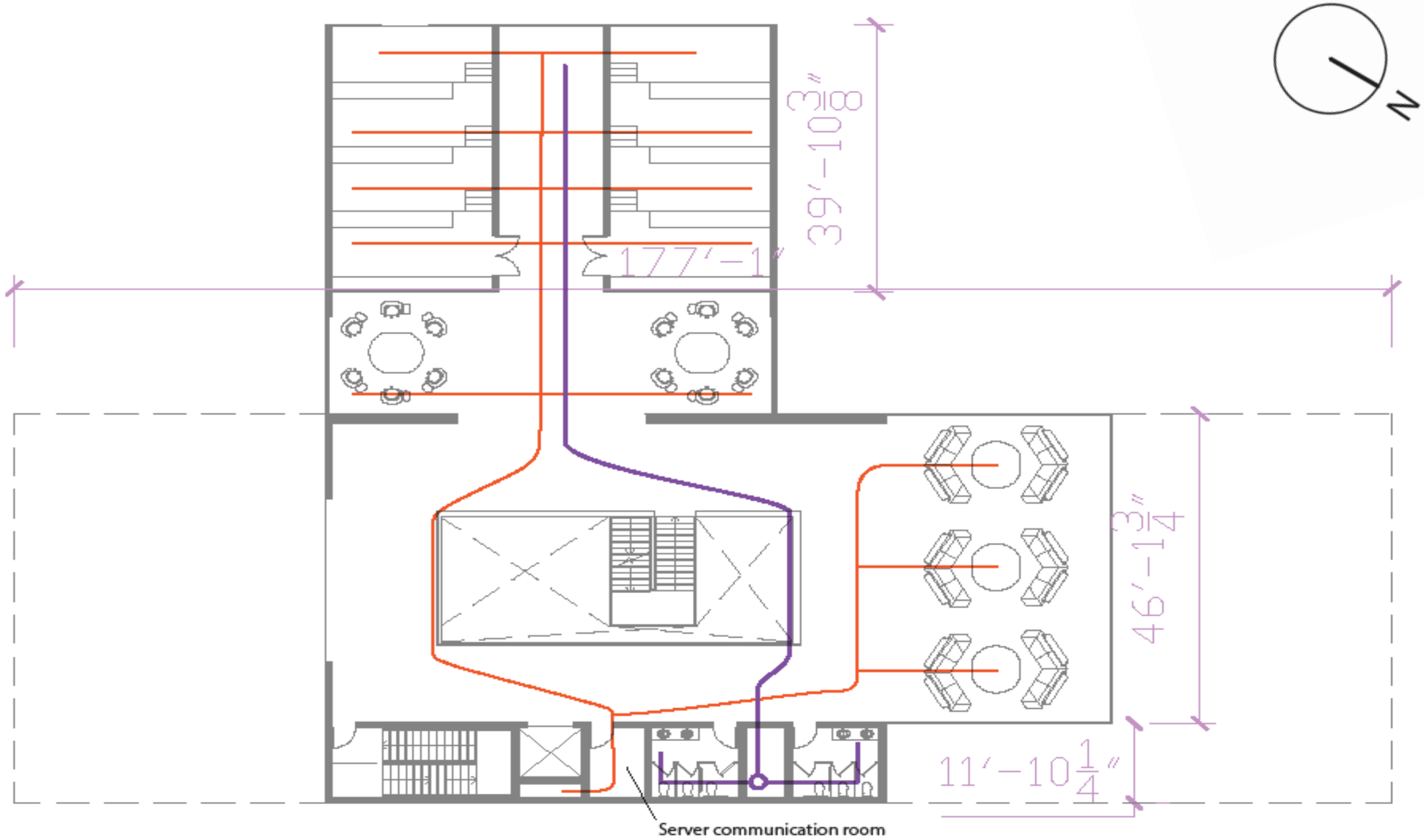
AIR EXTRACT



HOVERING BOX #2 – MECHANICAL BALANCED

ELECTRICITY DISTRIBUTION

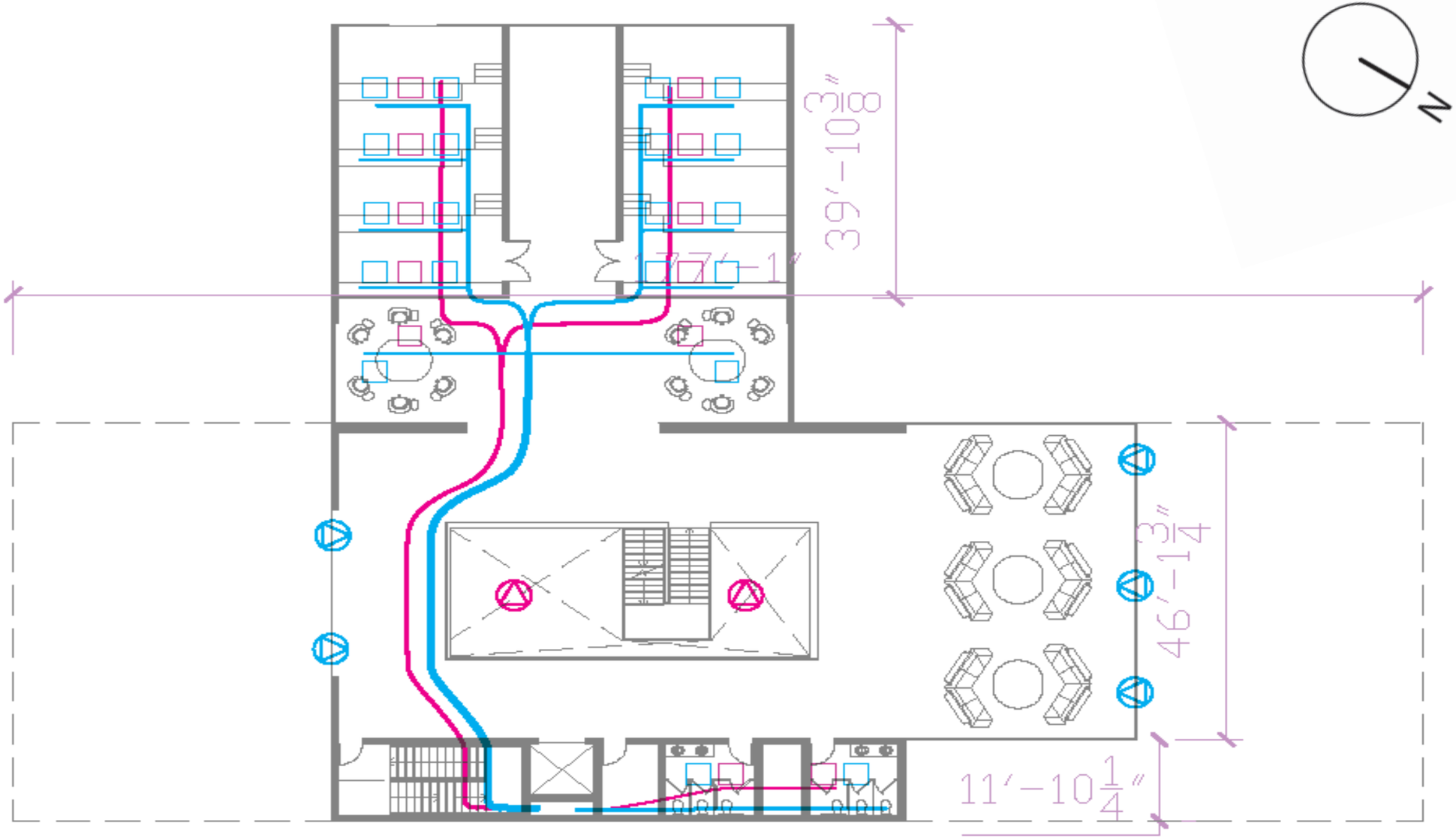
WATER DISTRIBUTION



HOVERING BOX #2 - HYBRID

AIR SUPPLY

AIR EXTRACT



HIGHLY TRAFFICKED

NORMAL TRAFFICKED

Source : Google traffic

P – PARKING
H – HOSPITAL
R – RESIDENCE
U – UNIVERSITY

- MAIN ROADS IS AVAILABLE
- PARKING LOT TRAFFICKED PART TIME OF THE DAY

PUBLIC TRANSPORT
H - HOSPITAL
P - PARKING

LOGISTIC DIRECTION

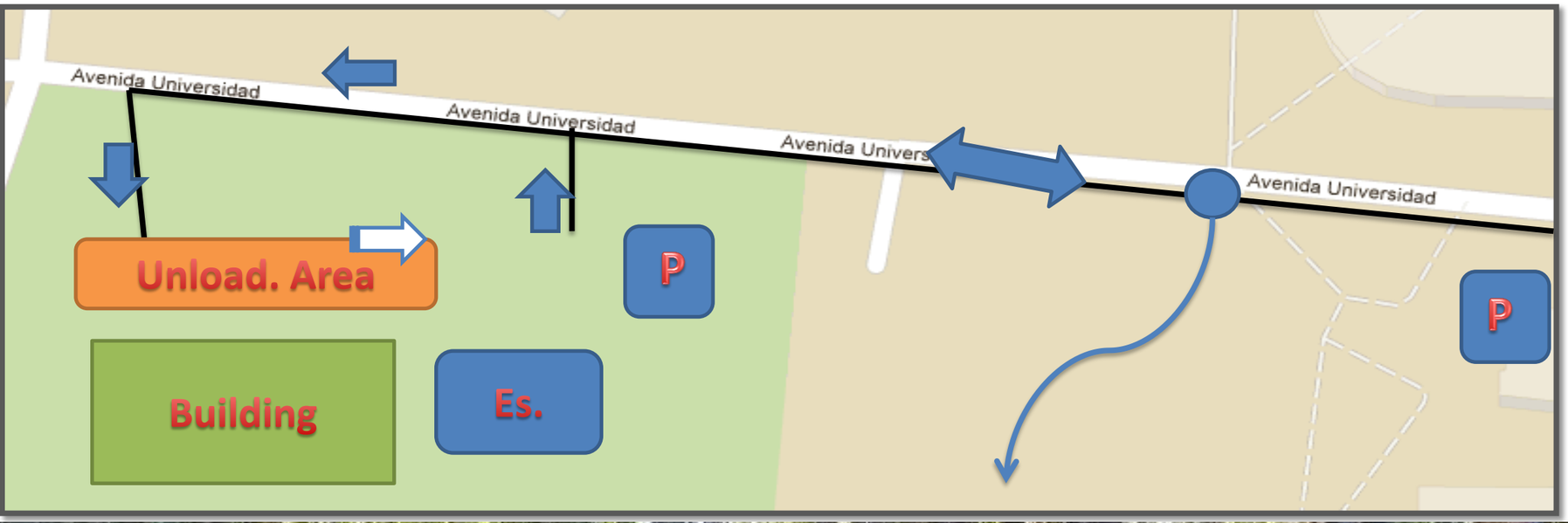
BOTH DIRECTINON
ONE DIRECTION

HIGHLY TRAFFICKED

LOGISTIC DIRECTION

BOTH DIRECTINON
ONE DIRECTION

LOGISTIC & SITE

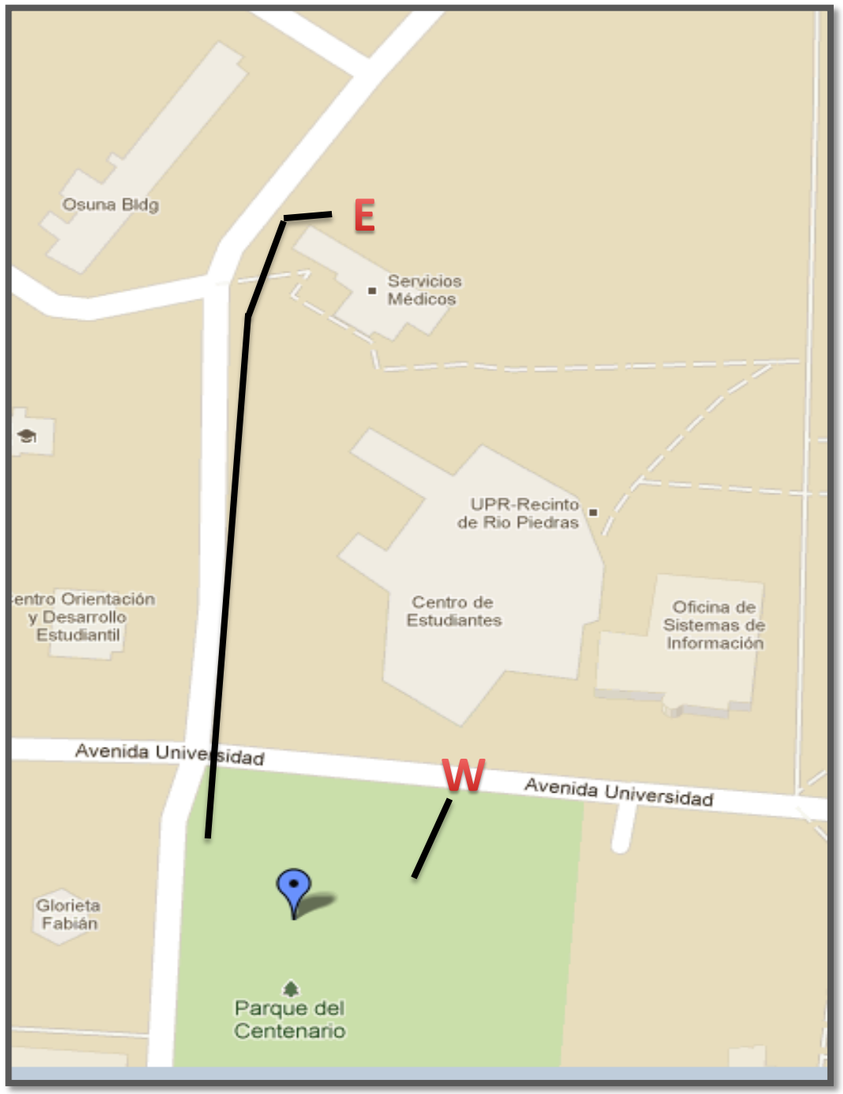


P - PARKING FOR WORKER
ES - ESTABLISHMENT

- SEPARATE IN- & OUTGOING TRAFFIC

LOGISTIC DIRECTION

BOTH DIRECTINON
ONE DIRECTION
PARTIALLY TRAFFIC

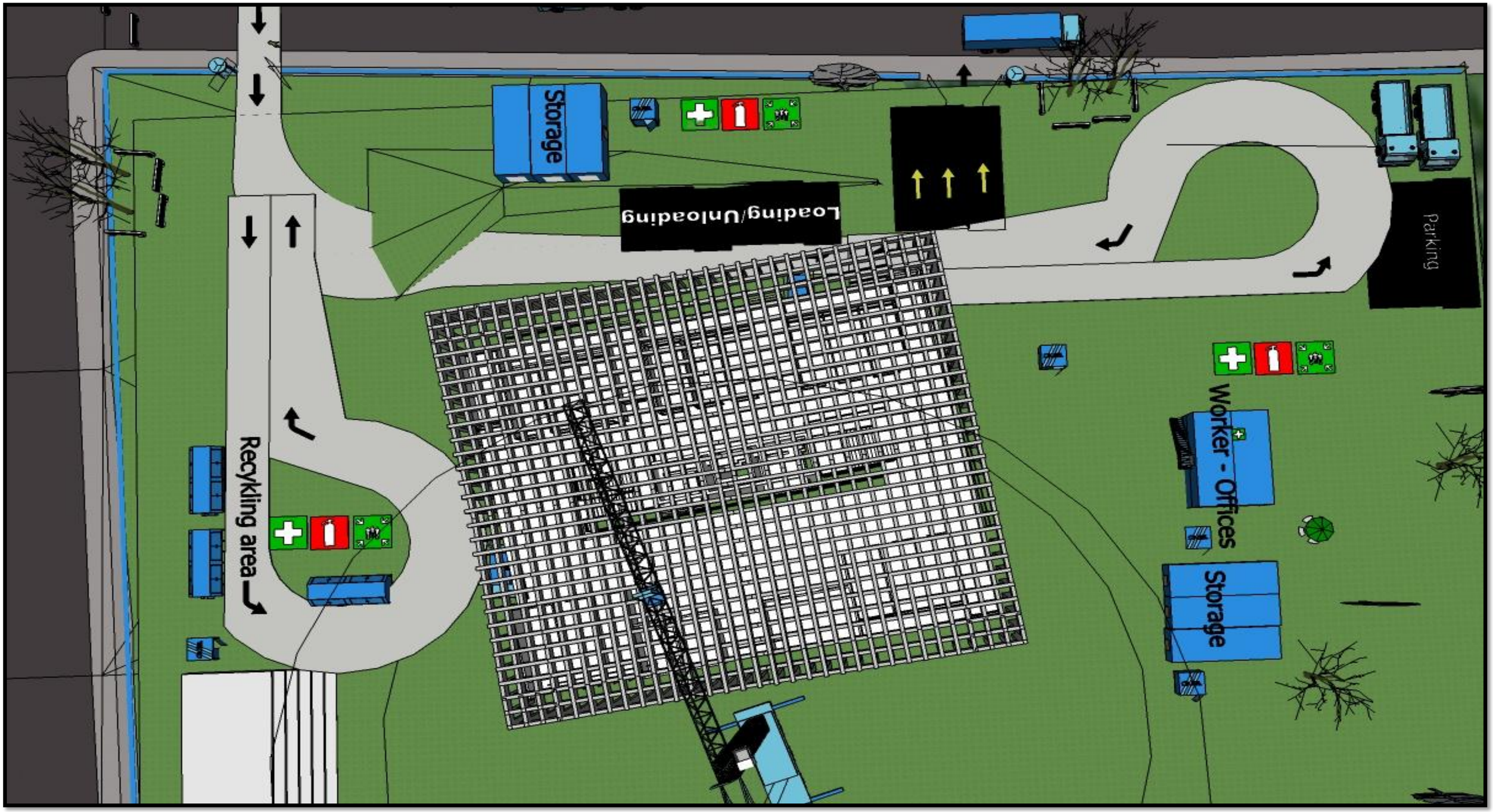


- E – ELECTRICITY GENERATOR IN NEAR AREA
- W – WATER CAN BE PROVIDED BY "AAA [ACUEDUCTOS Y ALCANTARILLADOS]"

LOCAL COMPANIES

1. STEEL ➢ 5mi
2. CONCRETE ➢ 6mi
3. CONSTRUCTION EQUIPMENT ➢ 3mi
4. PRECASTING CONCRETE ➢ 5mi
5. GLAZING COMPANY ➢ 1mi
6. OFF-STORAGE COMPANY ➢ 9mi
7. MEP COMPANY ➢ 2mi

PALM TREE - CONCEPT

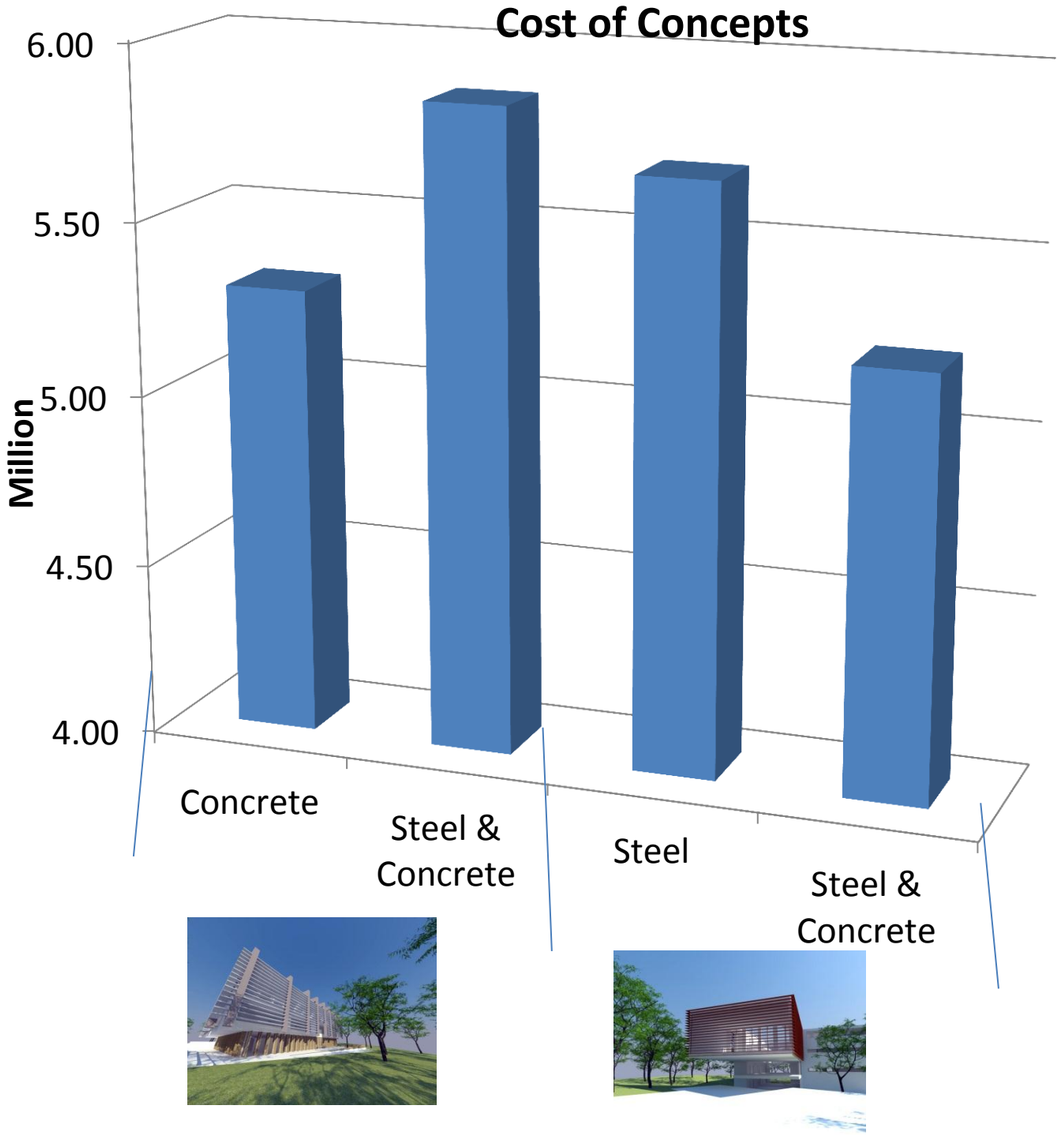


NORTH

Storage
Recycling station

Parking
Worker - Offices
Storage

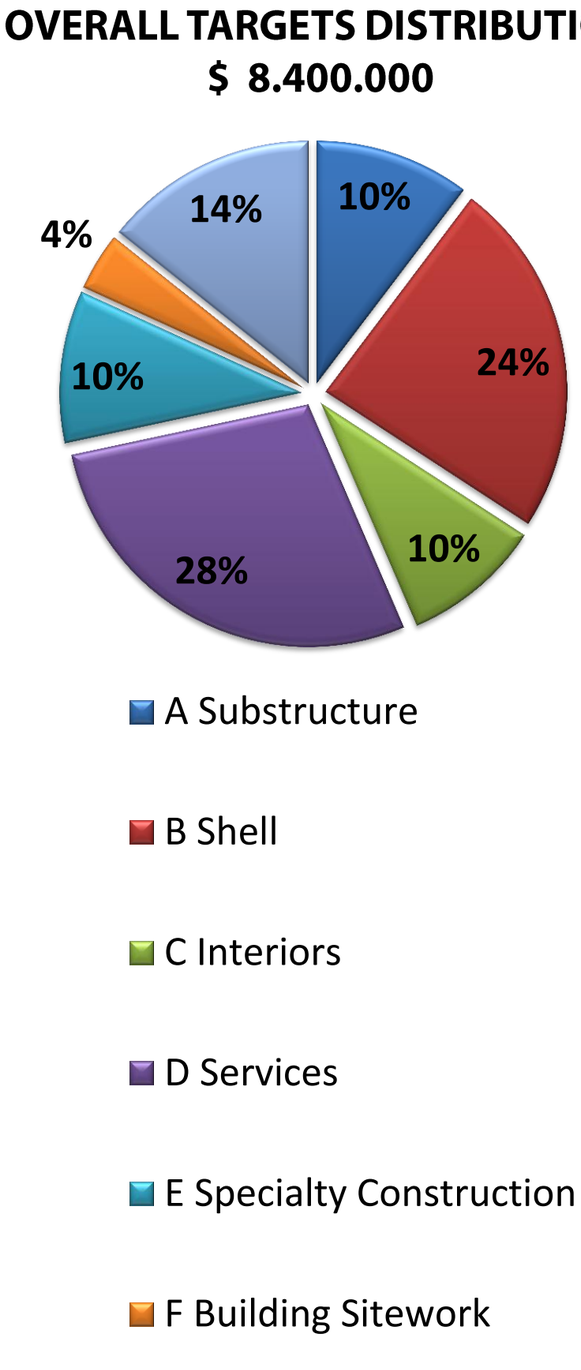
COST ESTIMATION - CONCEPTS



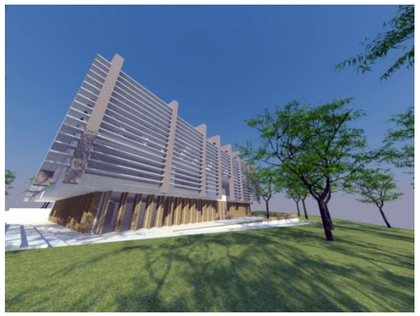
- THE VALUE OF TVDIS BASED ON :

  - RS MEANS – SQUARE FOOT ESTIMATOR
  - PREVIOUS YEARS ISLAND TEAM ESTIMATIONS

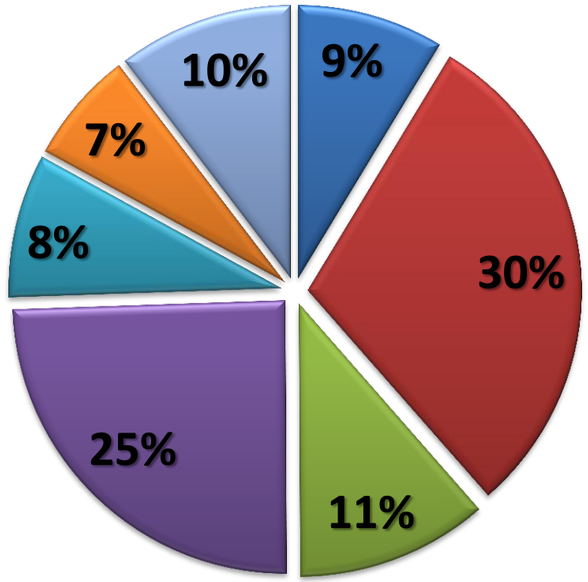
- EXPECTED INFLATION RATIO IS AN AVERAGE OF ACTUAL INFLATION RATIO OF PUERTO RICO DURING LAST 10 YEARS BASED ON WORLDBANK



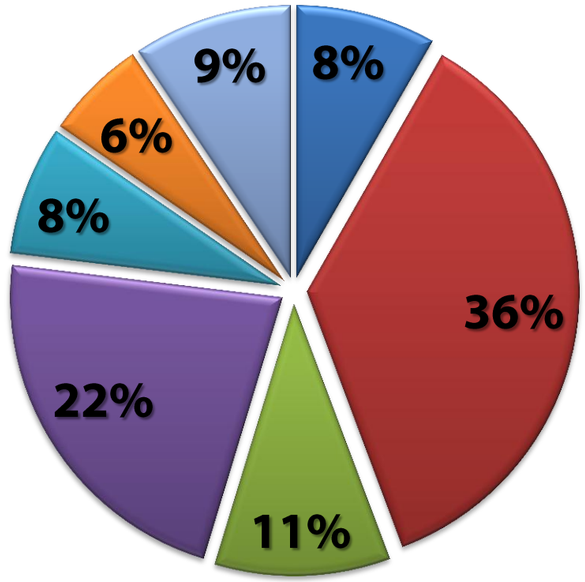
COST ESTIMATION - CONCEPTS



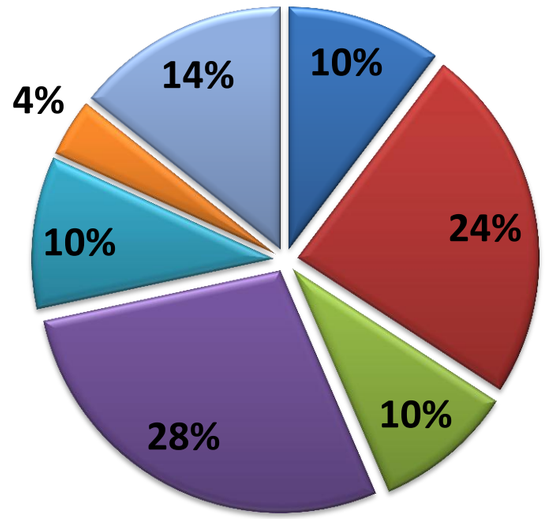
1.Concrete **$ 5.500.000**



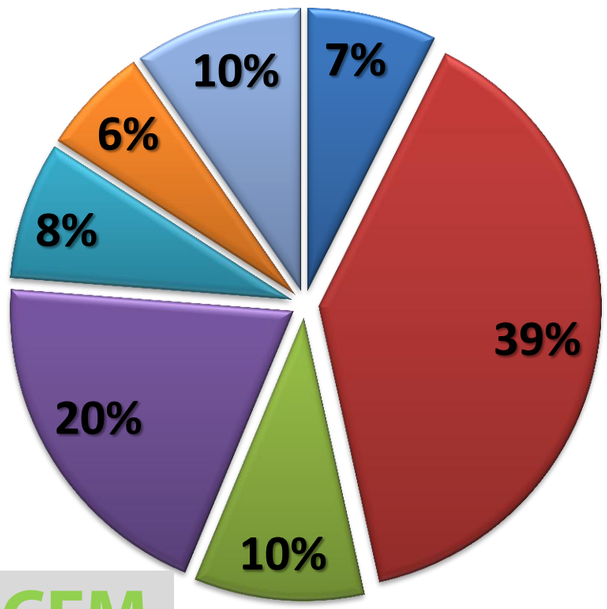
2.Steel & Concrete **$ 5.900.000**



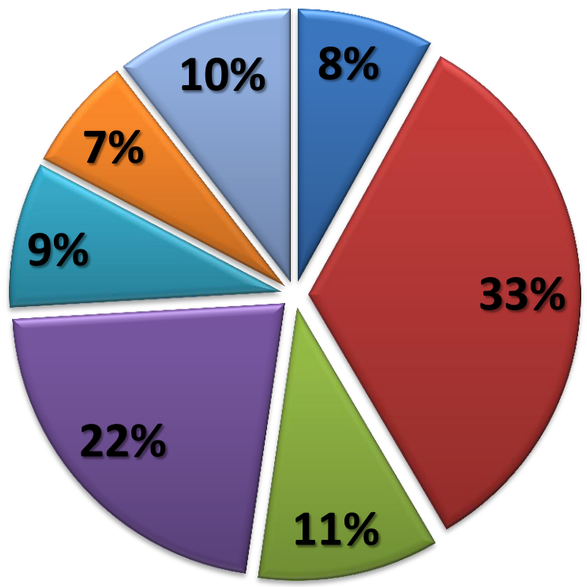
OVERALL TARGETS DISTRIBUTION
$ 8.400.000



1.Steel **$ 5.700.000**



2.Steel & Concrete **$ 5.250.000**



- A Substructure
- B Shell
- C Interiors
- D Services
- E Specialty Construction
- F Building Sitework
- G General Conditions

Island Team -activities

Contracts -Preconstruction

- Supplier purchase

Site Preparation

-Soil level work

-Establishing on site

Construction Preparation

-Contractor mobilize

- Water, Recycling, power conn. to site

-Excavation

- Water tank

-Ground cover

Structure Work

-Construction start

-Mat foundation

-Floor slab level 1

-Concrete structure level 1

-Floor slab level 2

-Concrete structure level 2

-Floor slab level 3

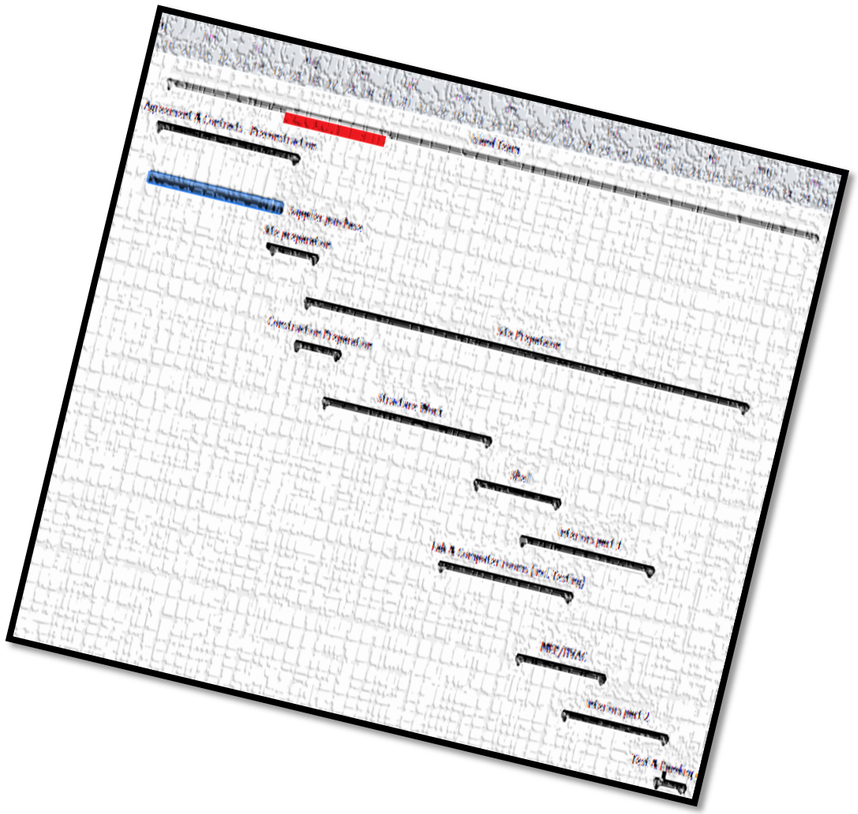
-Concrete structure level 3

-Roof

-Topping-out ceremony

ISLAND TEAM – CA 280 DAYS OF CONSTRUCTION

SCHEDULE PROCESS



TAKING INTO CONSIDERATION TWO PREVIOUS REFERENCE ISLAND PROJECTS

Roof envelope
Building envelope level 1
Building envelope level 2
Building envelope level 3
Building enclosed

Interiors part 1

Interior walls level 1
Doors level 1
Interior walls level 2
Doors level 2
Interior walls level 3
Doors level 3

Lab & Computer rooms (incl. Testing)

Slab LAB
Structure LAB
Roof LAB
Shell LAB
Temporary LAB entrence
Installation level 2 - LAB
Surface level 2 - LAB
LAB Cleaning & inspection

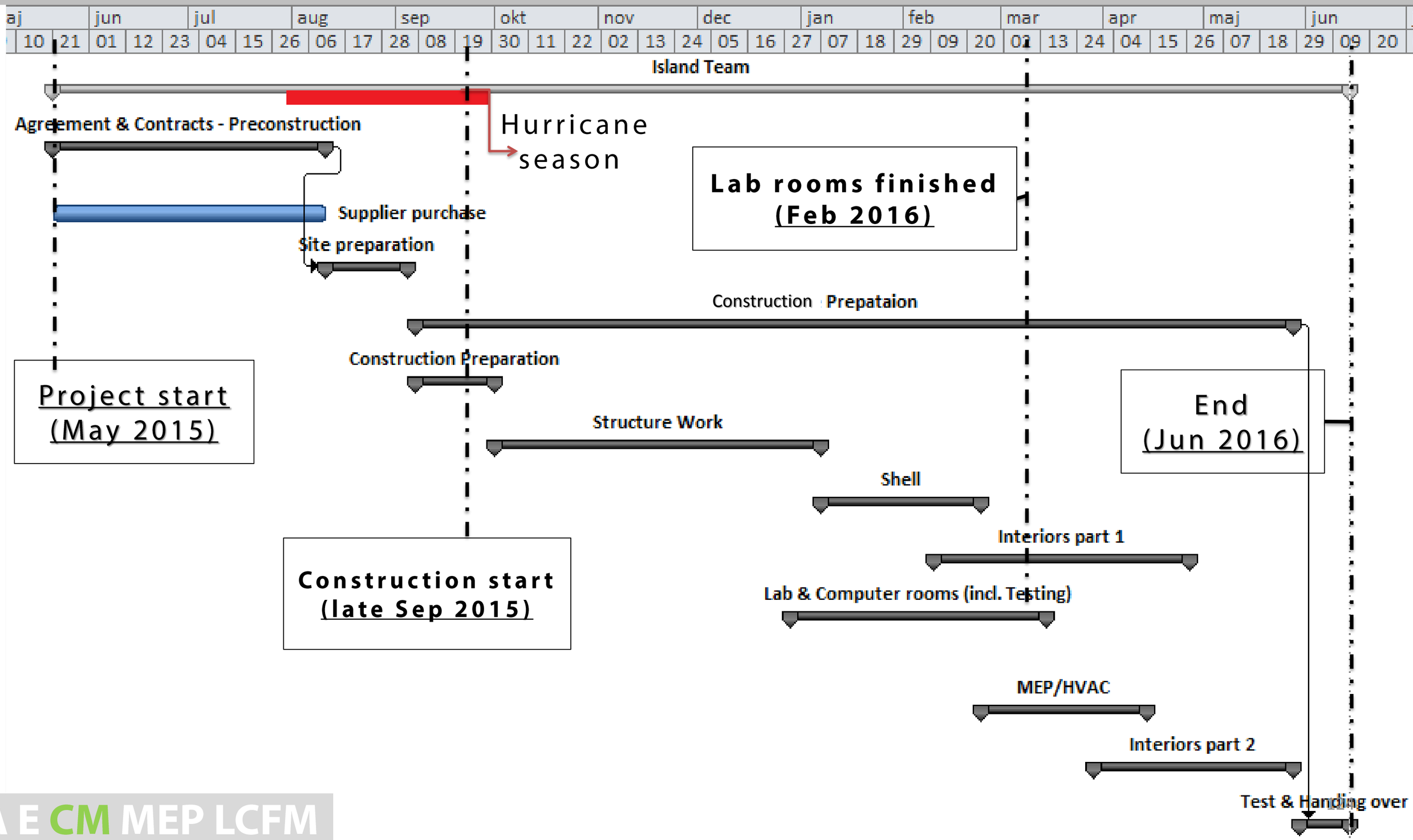
MEP/HVAC

Installation level 1
Installation level 2
Installation level 3

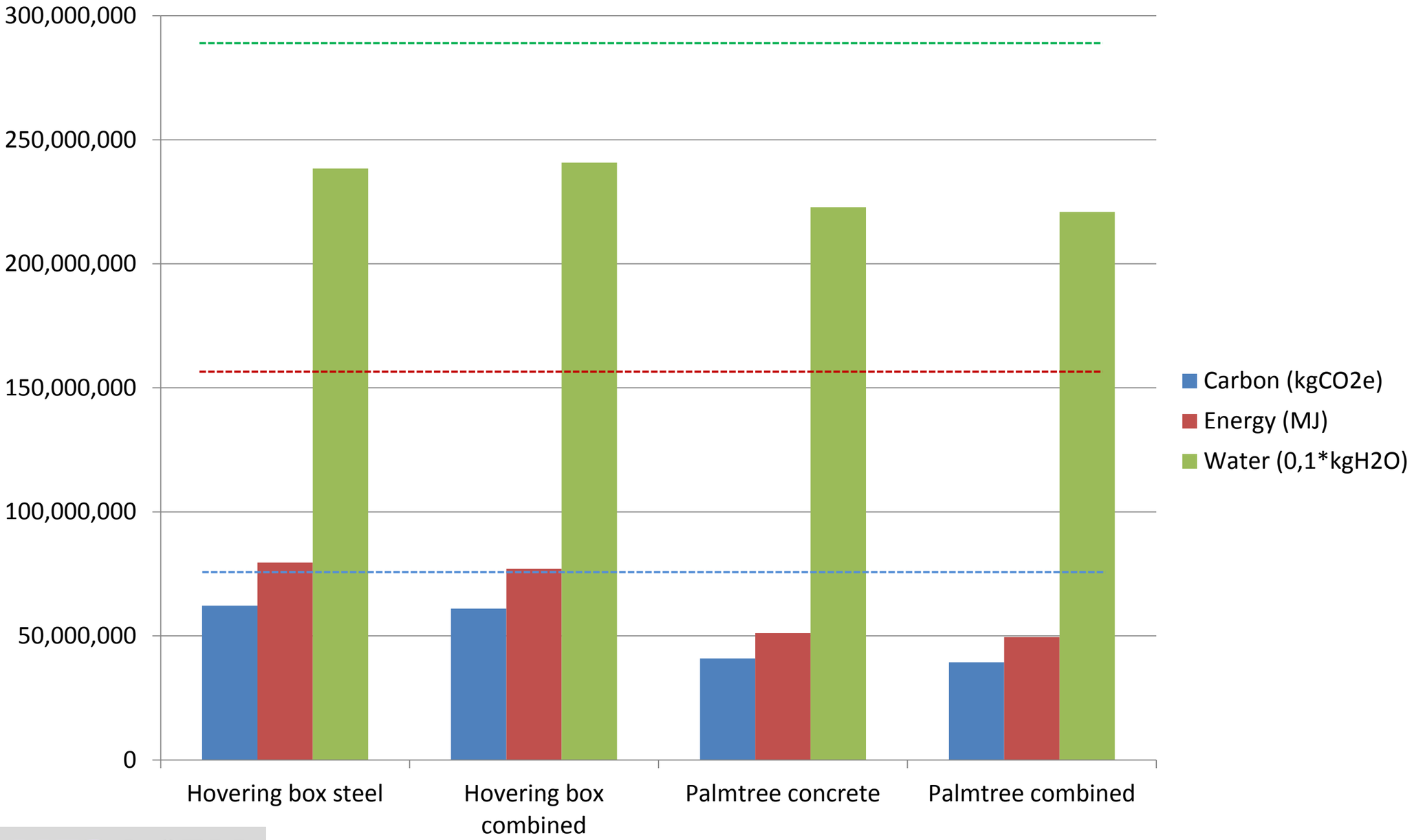
Interiors part 2

Surface level 1
Surface level 2

PROJECT PLAN



CONCLUSION: PALMTREE CONCRETE AND STEEL COMBINED SHOWS THE BEST RESULTS



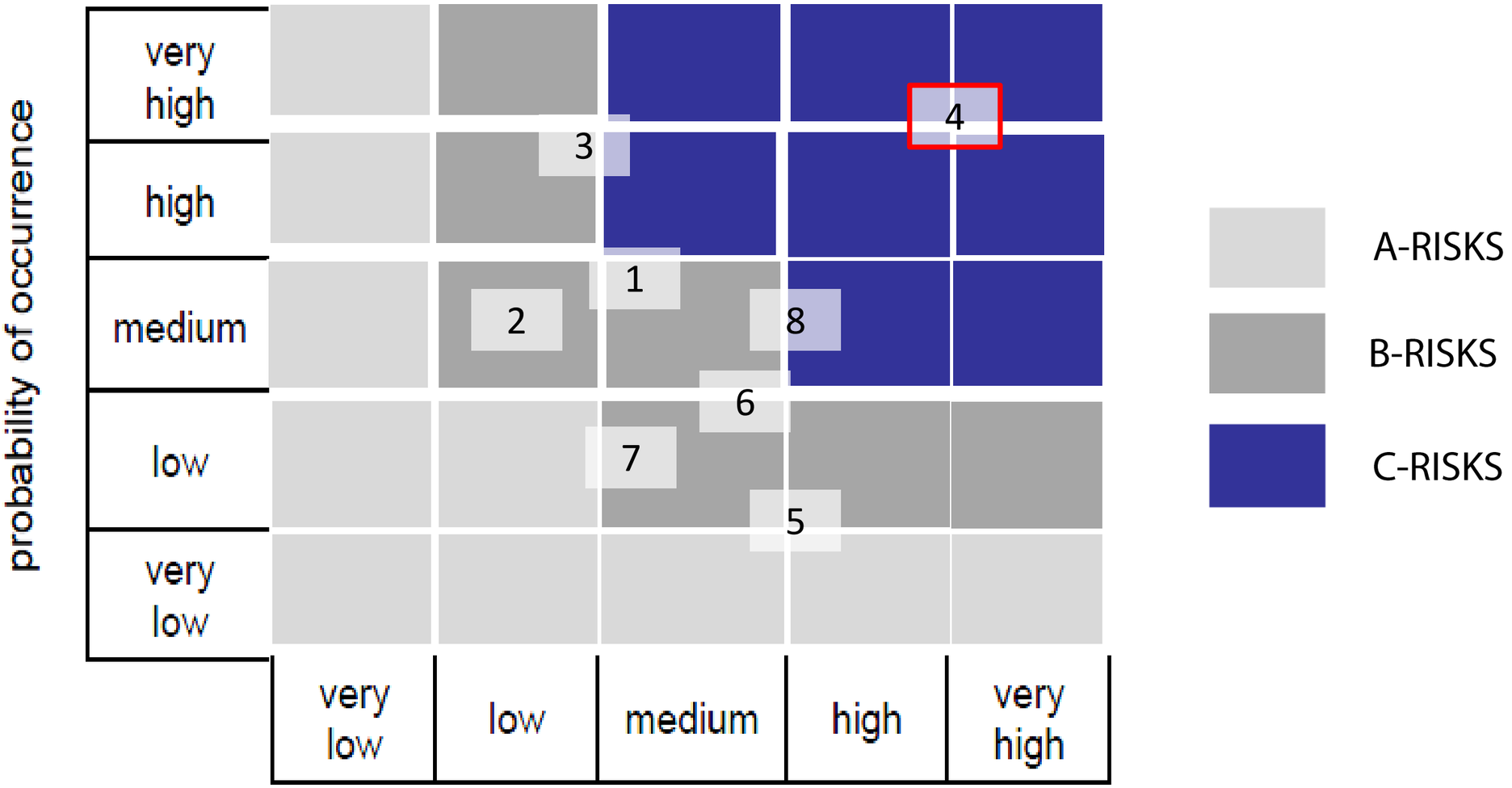

Subway

Project Phase	Category	Risk name	Description	Consequences
planning & construction	price changes	steel price	change in steel price	higher/lower purchasing cost
		concrete price		
		inflation in construction cost		
		manpower cost		
	natural hazards	soil-conditions		
		hurricane		
		earthquake		
	other	exceeding construction schedule		

Project Phase	Category	Risk name	Description	Consequences
operation & maintenance	price changes	oil price	price changes	higher/lower purchasing cost
		electricity price	price changes	higher/lower purchasing cost
		water price	price changes	higher/lower purchasing cost
		inflation in O&M costs	inflation is higher/lower than expected	higher or lower O&M cost
	other	hurricane	category 5 hurricane during O & M phase	repair/ rebuilt/ cleaning costs
		earthquake	maximum probable earthquake during O & M phase	repair/ rebuilt/ cleaning costs
		HVAC system performance	HVAC system works better/worse then expected	higher/lower cooling cost
		life expectations	life expectations not as expected	higher/lower replacement costs
		vandalism	vandalism in or outside the building	repair/ cleaning costs

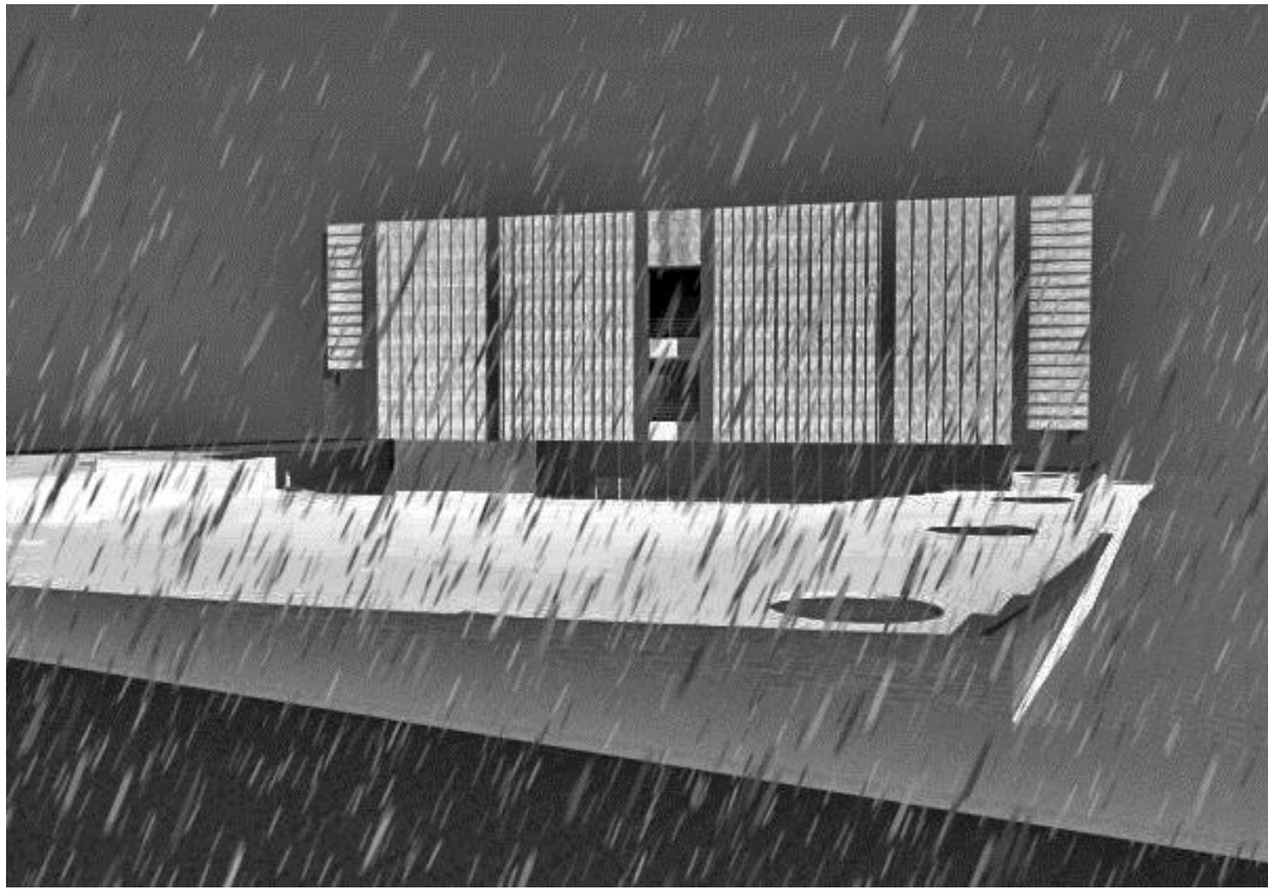
RISK TREATMENT

RISK NAME	DESCRIPTION	CONSEQUENCES	RISK MANAGEMENT
HURRICANE	HURRICANE DURING CONSTRUCTION PHASE	ADDITIONAL COSTS FOR RE-BUILDING, RE-PURCHASING	
VANDALISM	VANDALISM IN OR OUTSIDE THE BUILDING	REPAIR/ CLEANING COSTS	
SOIL-CONDITIONS	PROBLEMS WITH THE EXCAVATION AND THE FOUNDATION	ADDITIONAL COSTS FOR DIFFERENT FOUNDATION	
EXCEEDING CONSTRUCTION SCHEDULE	AVAILABILITY OF BUILDING CAN NOT BE GUARANTEED	ADDITIONAL COSTS (E.G. CONTRACT PENALTY)	CREATE A REALISTIC TIMEFRAME AND INCLUDE BUFFERS



1. INFLATION IN CONSTRUCTION COSTS
2. WATER PRICE CHANGE
3. VANDALISM IN OR OUTSIDE THE BUILDING
4. HURRICANE DURING O&M PHASE
5. REFUSED PERMISSION
6. ELECTRICITY PRICE CHANGE
7. UNEXPECTED SOIL CONDITIONS
8. HVAC SYSTEM PERFORMANCE

ADDRESSING THE RISK OF HURRICANES DURING O&M PHASE:
→ OVERHANGING "LEAVES" OF THE FAÇADE CLOSE TO PROVIDE SHELTER



SAVES ABOUT: $ 650.000 OF REPLACEMENT COSTS AND
$ 220.000 OF CLEANING COSTS DURING THE 25 YEARS OF PROJECT LIFETIME

SUM ~ $ 870.000

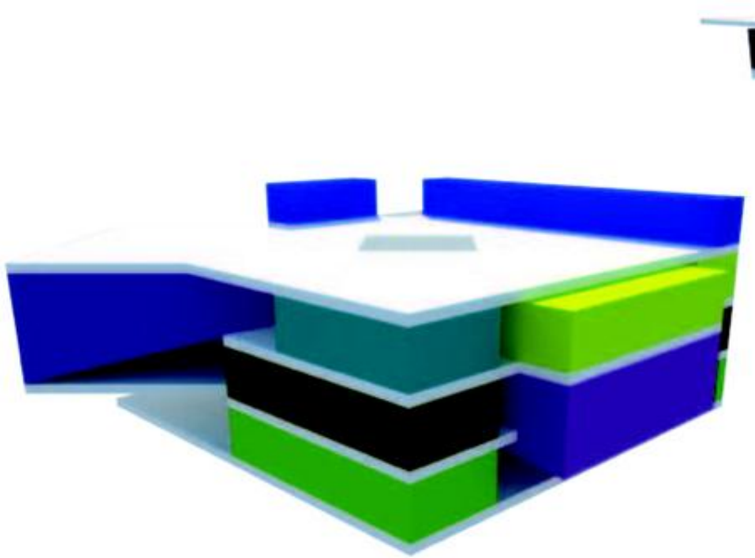
DECISION MATRIX

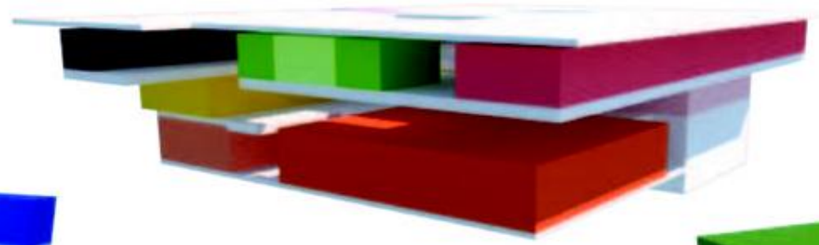
Criteria	Emphasis	Palm Tree Concept Concrete		Palm Tree Concept Steel and Concrete		Hover Box Concept Steel and Concrete		Hover Box Concept Steel	
		Team	Owner	Team	Owner	Team	Owner	Team	Owner
Construction costs	5,00%	8,57	6,5	6,00	8,5	9,14	6,5	7,14	8
Value for money	12,33%	8,14	8	7,00	9	7,43	5,5	7,14	7,5
Architectural aestethics	11,67%	9	7,5	9,00	8	6,43	8	6,57	8
Addressing the required room program	4,67%	8	9	8,00	9	8,14	9	8,14	9
Innovation in design - Leapfrogging	14,00%	6,57	6,5	7,14	7	5,71	5	5,71	5,5
Integration of nature	7,67%	8	8,5	8,00	8,5	6,00	7,5	6,00	7,5
Creation of an open and collaborative space	16,67%	8,29	8,75	8,43	8,75	7,00	9	7,00	9
Usage of natural ventilation	10,00%	8,71	7,5	8,72	7,5	5,29	9	5,29	9
Provided safety for the occupants	5,67%	7,86	7	8,00	7,5	6,86	8	7,00	9
Resistance to natural hazards, especially earthquakes & hurricanes	12,33%	8,29	6,75	8,57	8,75	5,57	6,5	5,86	8
Sum weighted:		8,11	7,61	7,99	8,23	6,53	7,29	6,46	7,92
Result:		**7,86**		**8,11**		**6,91**		**7,19**	

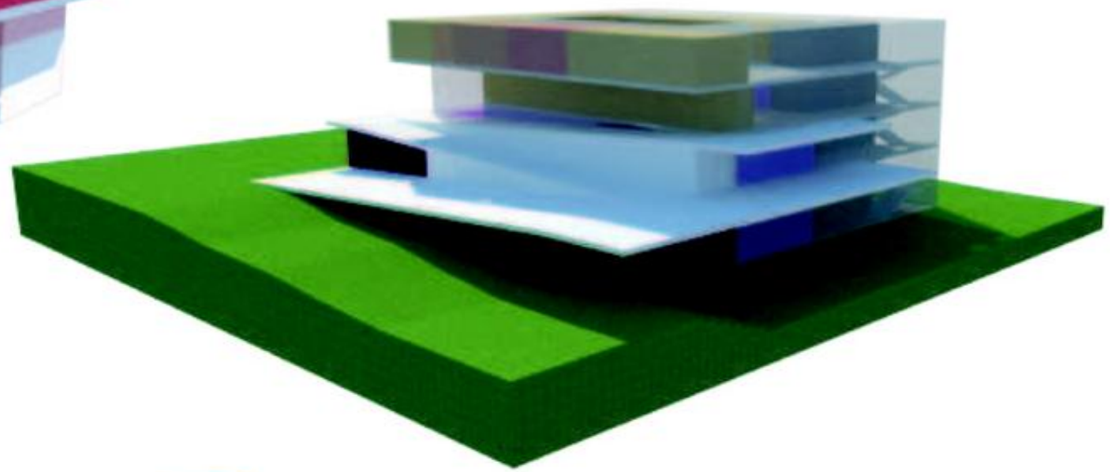
CHOSEN OPTION

SOUTHWEST CORNER

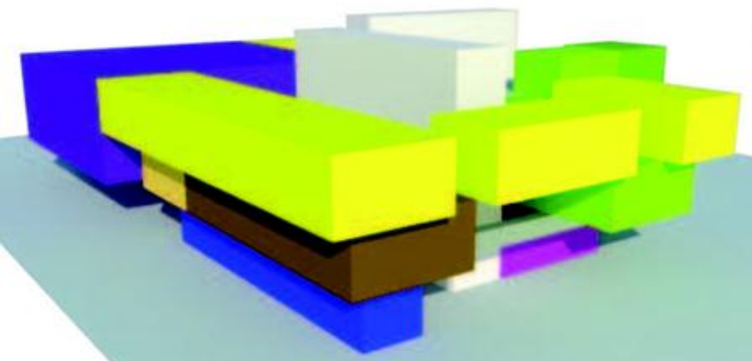
PROJECT EVOLUTION SQUARE

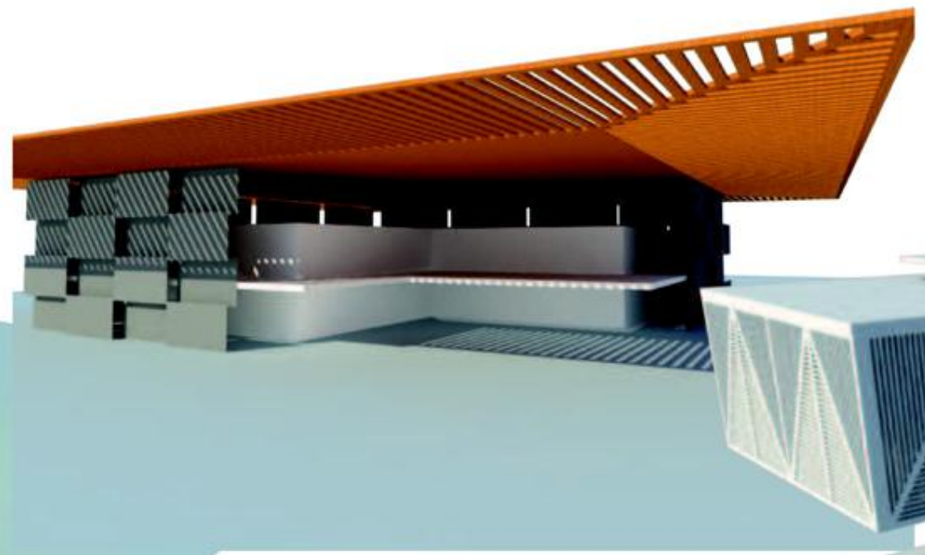


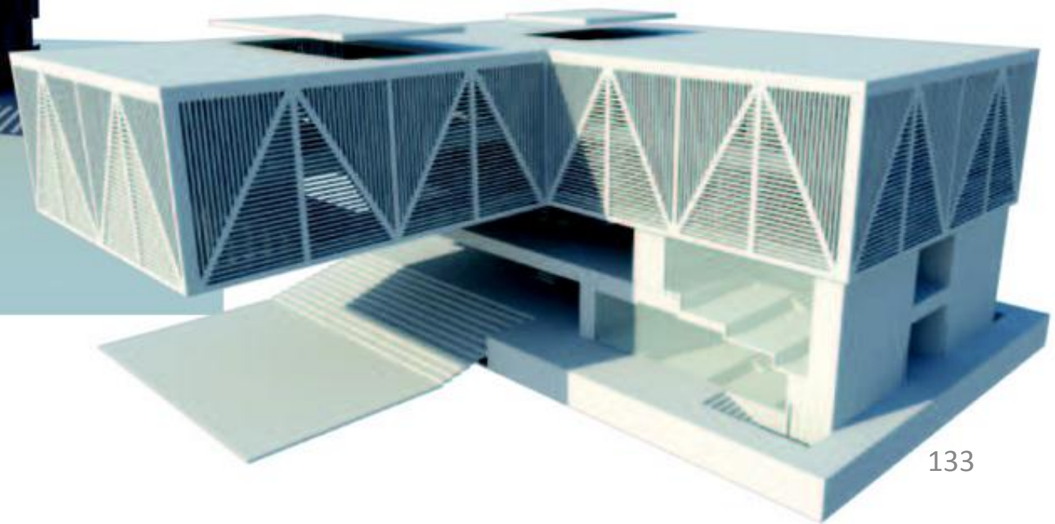




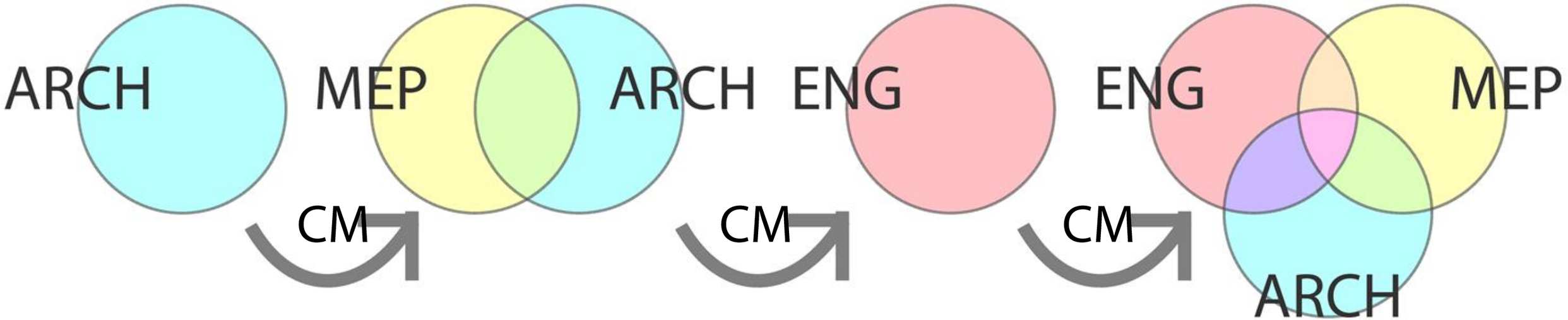
PROJECT EVOLUTION L-SHAPE



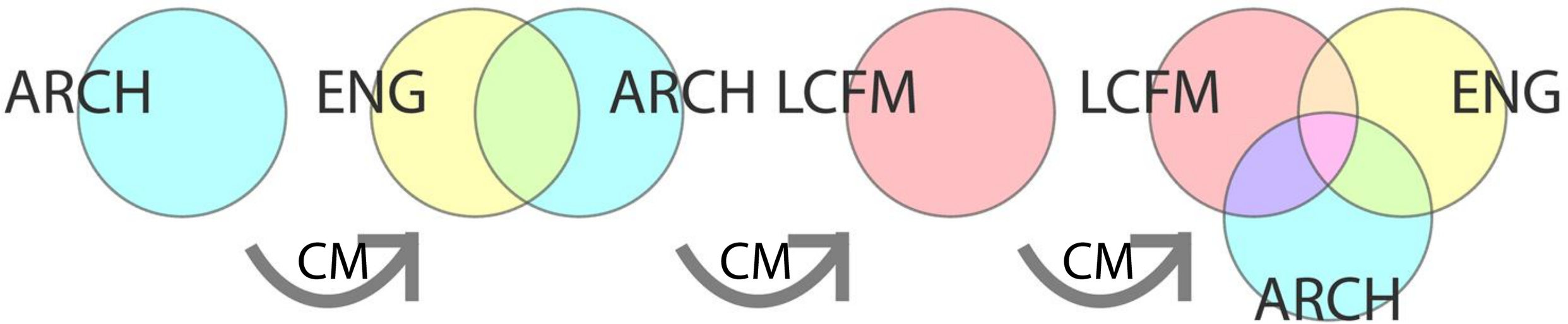




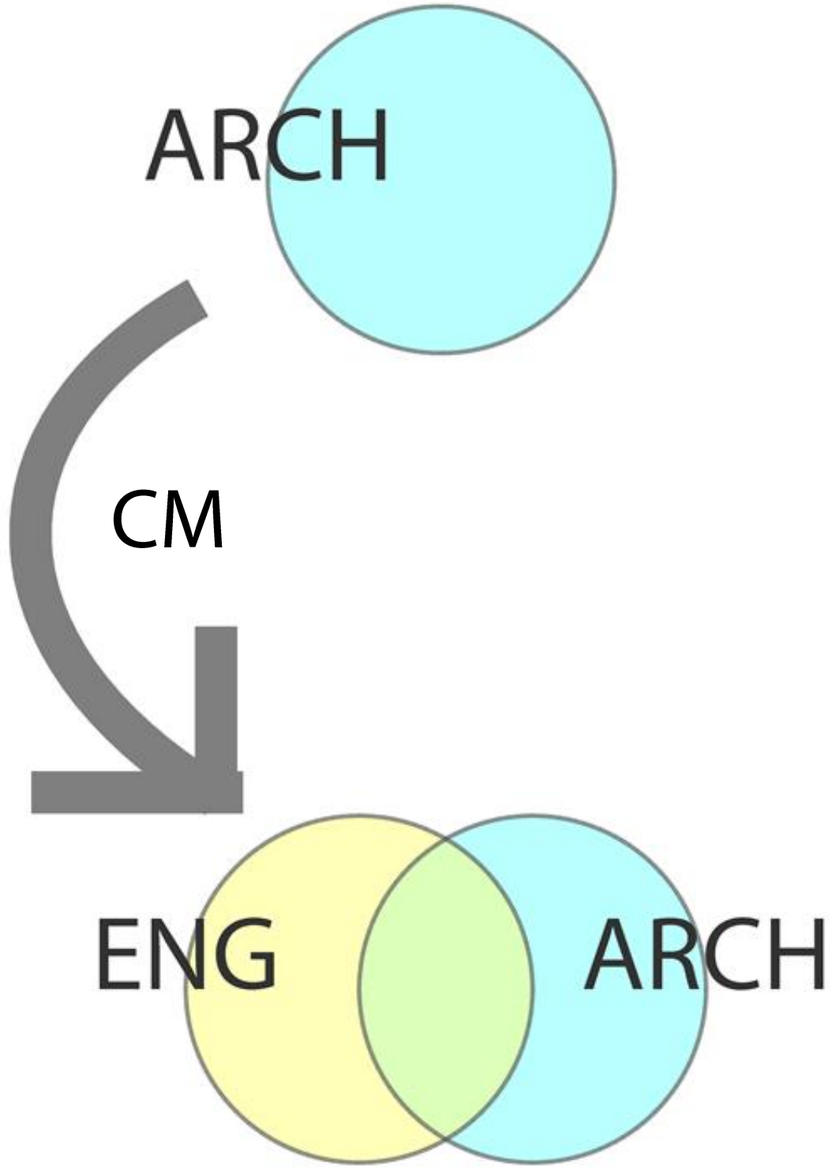
CENTRAL CORE LOCATION AND SPACING



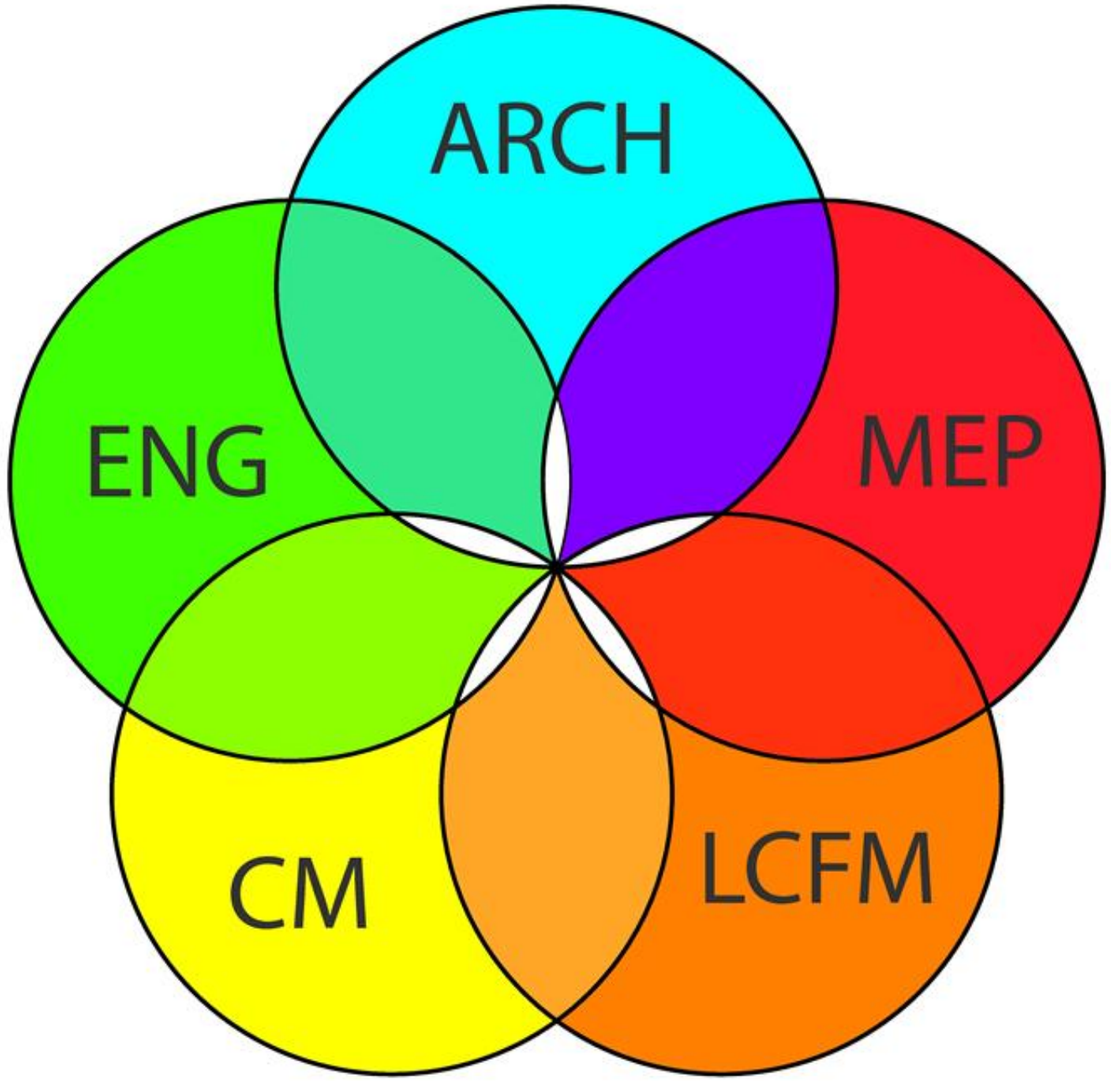
PALM TREE ROOF STRUCTURE AND FUNCTIONALITY



HOVER BOX CANTILEVER



ORIENTATION
LOCATION IN SITE
ENTRANCES



WITHIN THE TEAM

WITH THE OWNERS

WITH OUR MENTORS

THANKS TO:

HUMBERTO CAVALLIN
GITTE SORENSEN
DAVID BENDET
WAFAA SABIL
GREG LUTH
EDUARDO MIRANDA
RENATA ABMA
KYLE ADAMS
JOHN NELSON
LUIS RIVERA
ALIAA EDDNAN HUSEIN
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ISLAND TEAM 2013