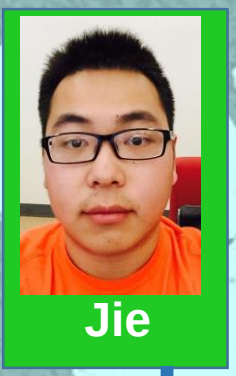
WINTER PRESENTATION

Pacific 2015

A-E-C-MEP

March 13th, 2015


Jie


Jiacheng


Adrienne


Carlo


Ola

OWNERS


Karolina


Mike


Kourosh


Michael


Adam

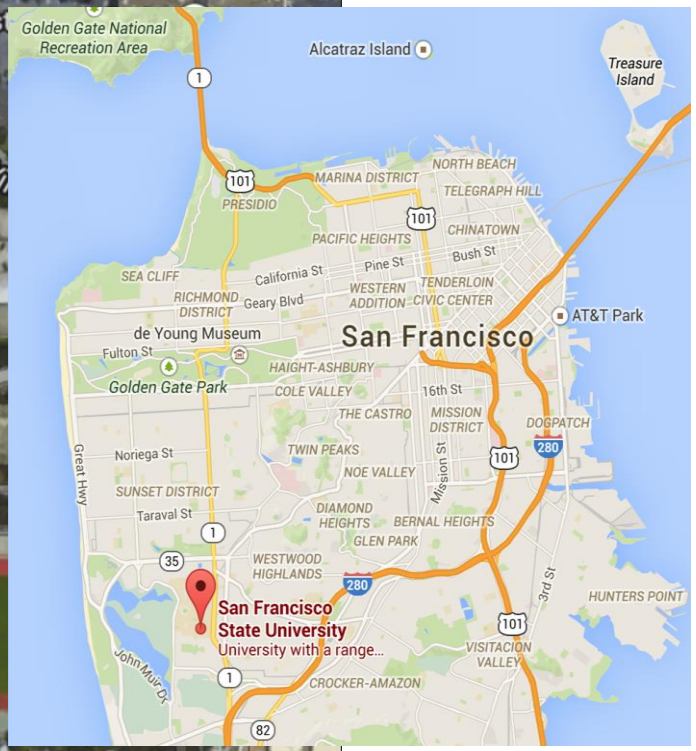

Daniel

Pacific 2015

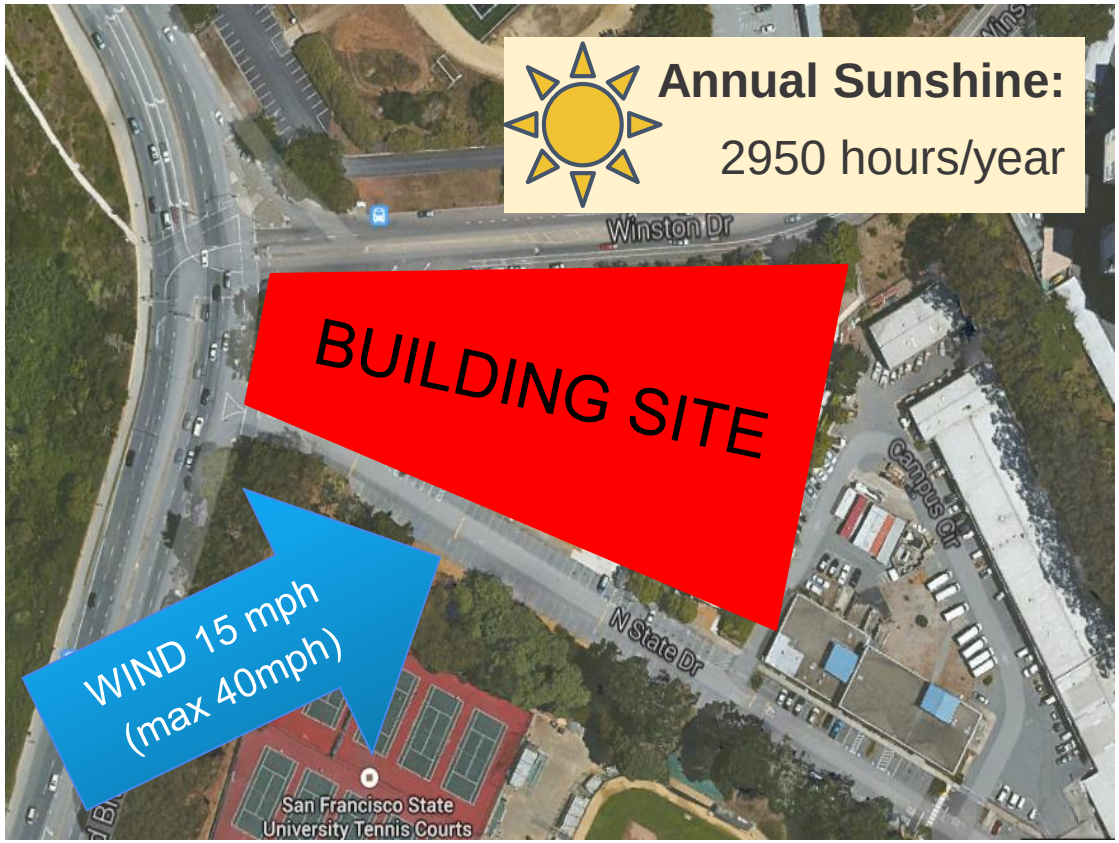
A-E-C-MEP

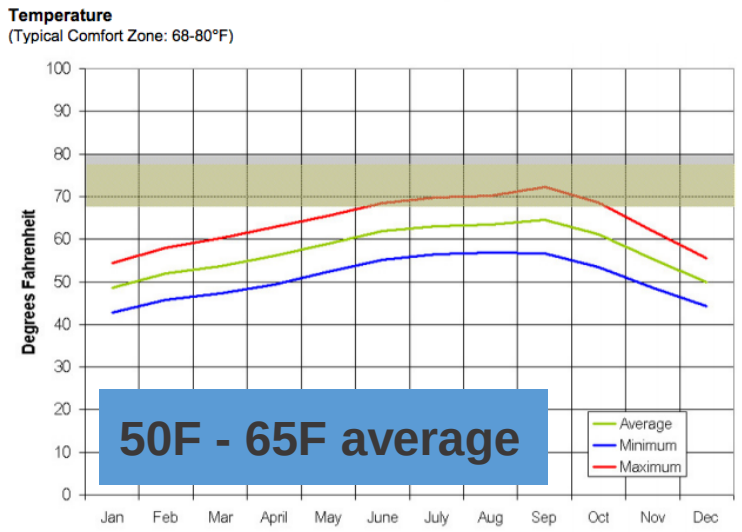
SITE CONTEXT

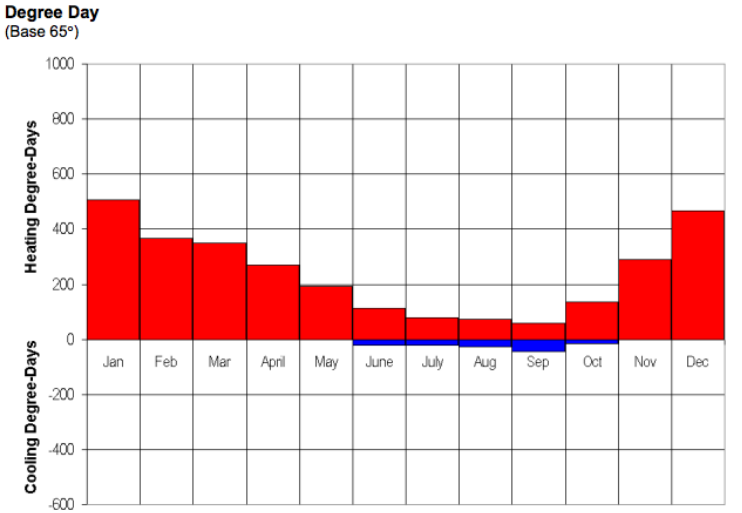
SITE CONTEXT



CLIMATE







Annual Rainfall:

68 days/year

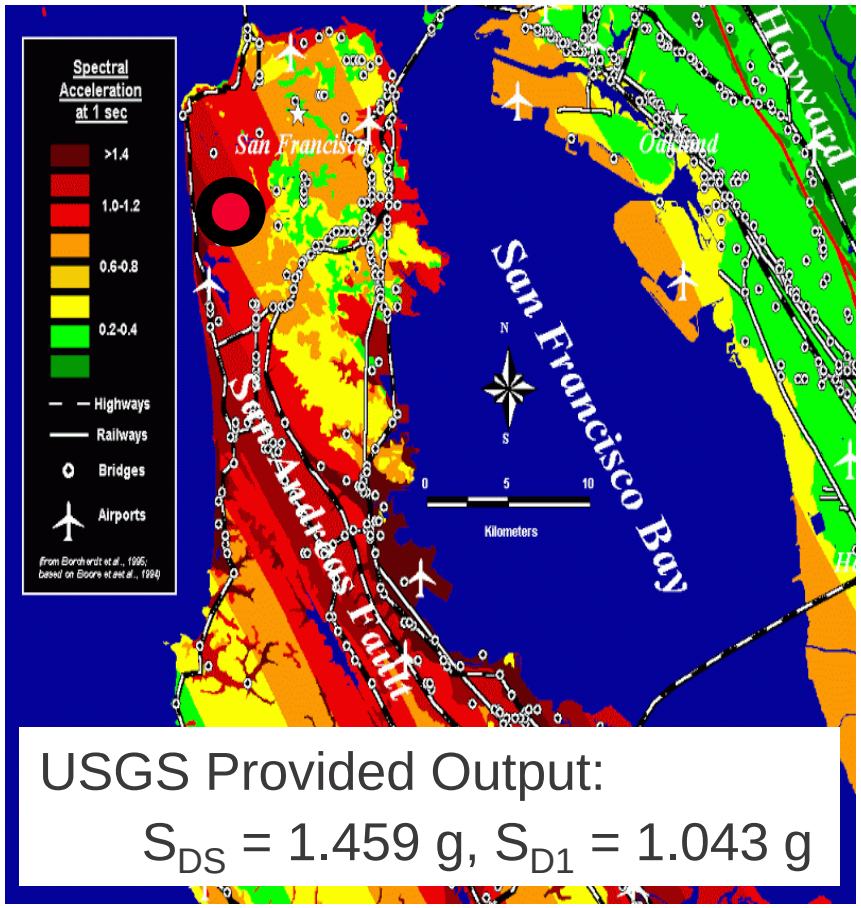
Total 23.64 in

Humidity (due to fog):

Daily average high = 84%

Daily average low = 60%

LOCAL CONSIDERATIONS



USGS Provided Output:

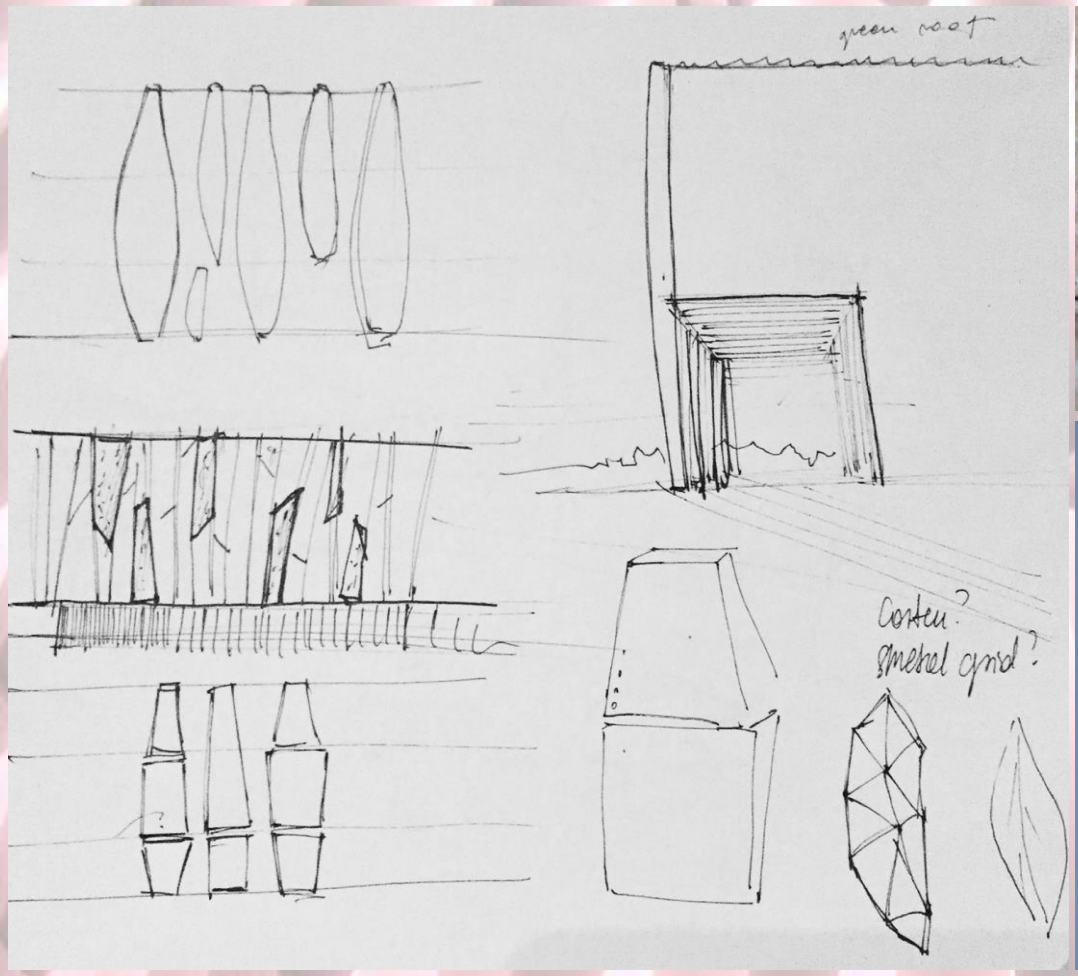
S_{DS} = 1.459 g, S_{D1} = 1.043 g

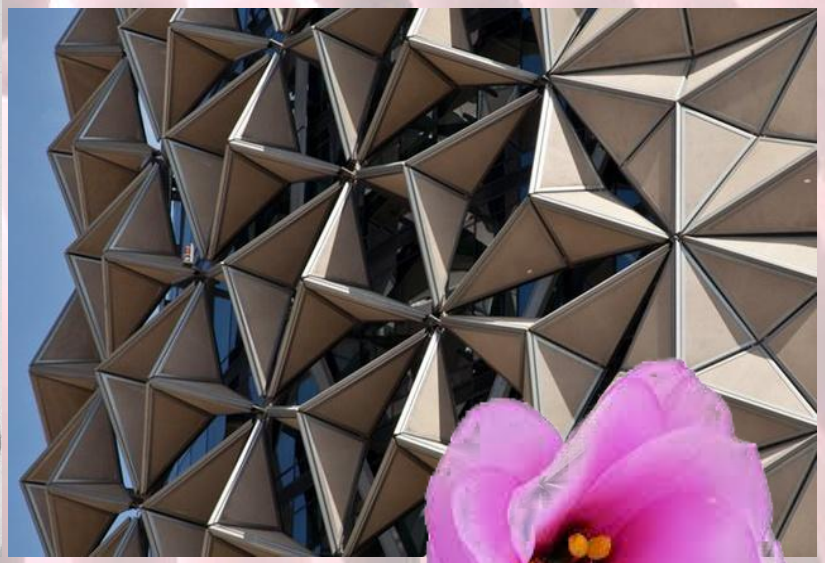
Seismic Zone

Slope

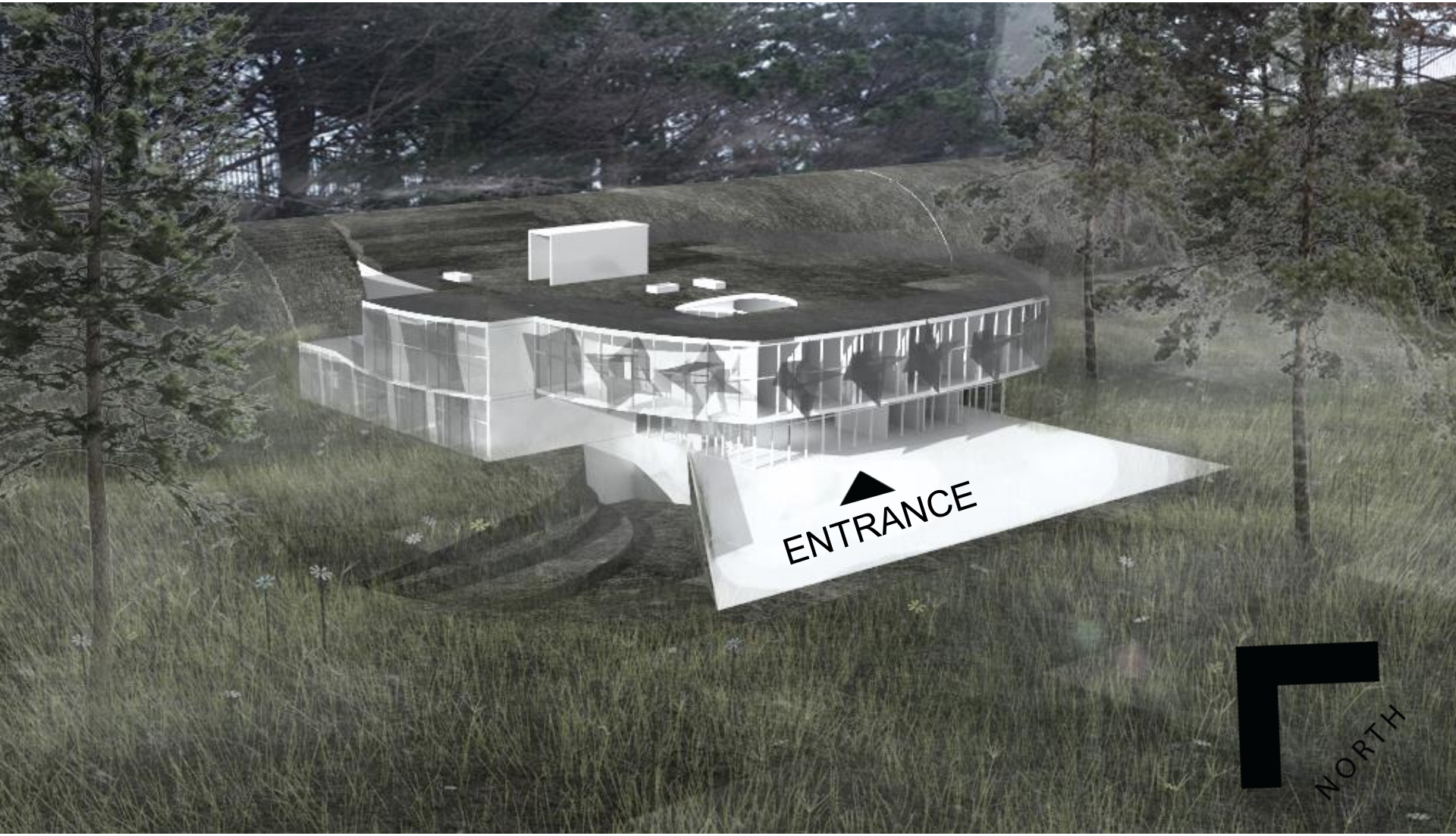
BIG IDEA – ICE PLANT

SKETCHES, INSPIRATIONS

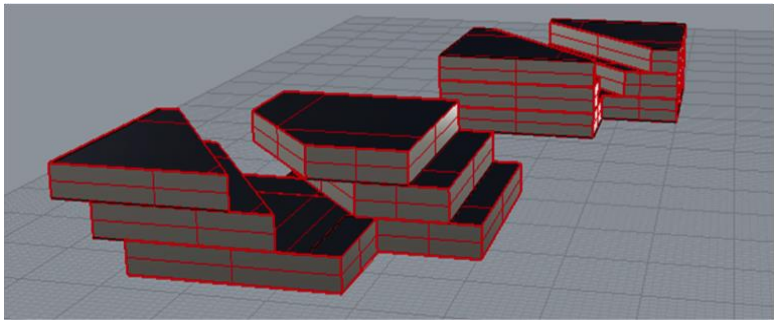


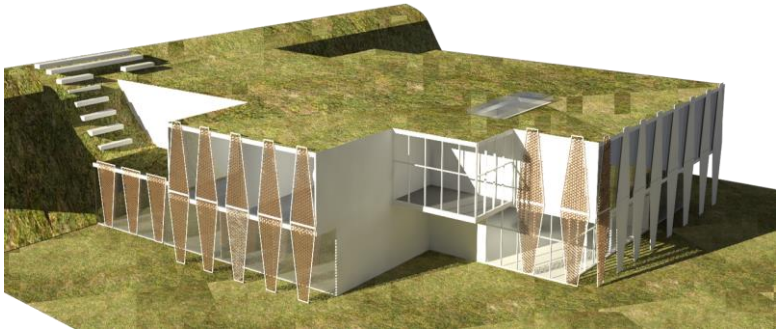


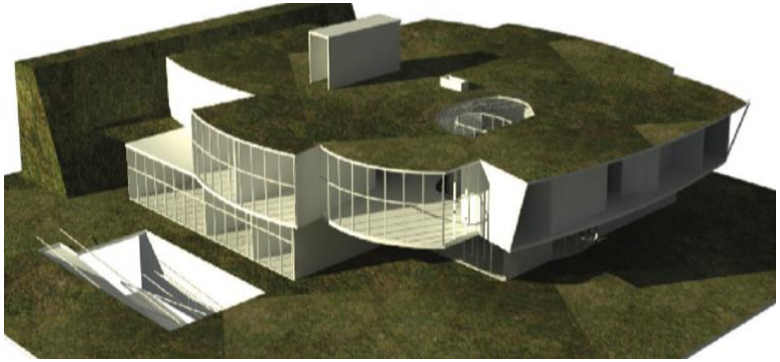
BIRD VIEW



EVOLUTION OF BIG IDEA







1/18 Kick off

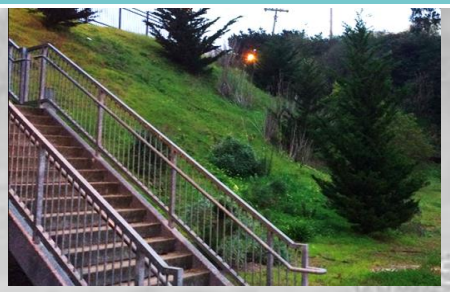
1/30 1st Delivery

2/13 Peer Review

2/20 Crit Session

FOOTPRINT ORIENTATION

ADDITIONAL ENTRANCE - ROOF

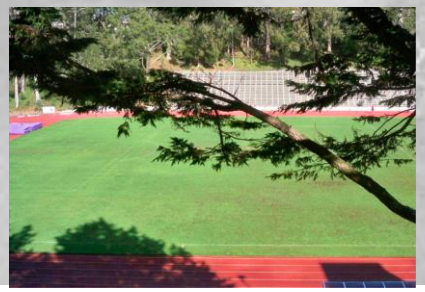


NORTH

LAKE/FOREST

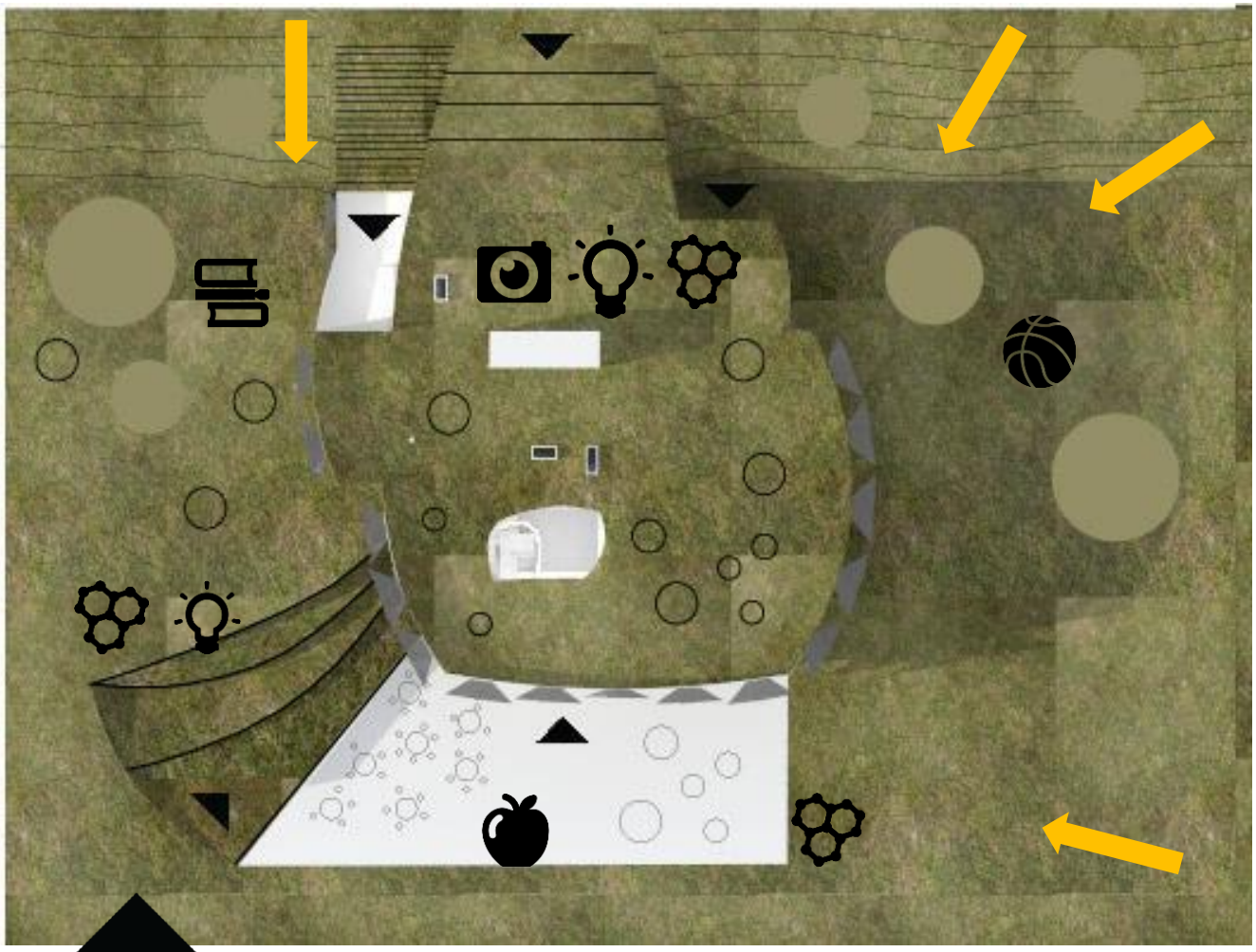
SCHOOL DORMS AROUND TREES

TREES/SPORT FACILITIES



VIEWS

SURROUNDINGS



SNACK SPACE

COLLABORATIO
N
SPACE

FOCUS SPACE

INSPIRATION
SPACE

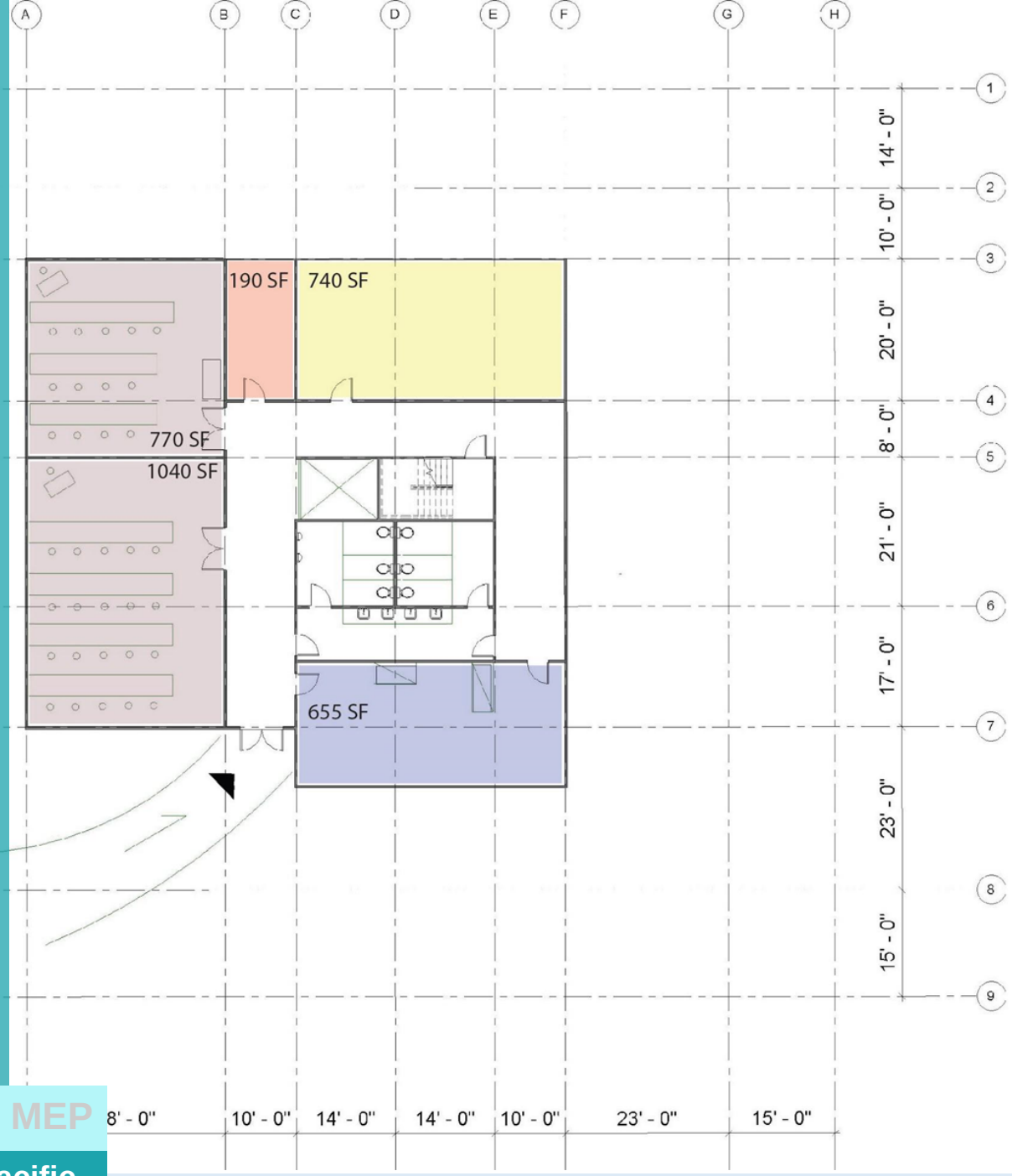
BEAUTIFUL
VIEWS

RECREATION
SPACE

NORTH

PEOPLE

BASEMENT



- LAB
- MEP ROOM
- TECH SUPPORT
- SERVER ROOM
- CAFFE
- LARGE CLASSROOM
- SMALL CLASSROOM
- STUDENT OFFICES
- SEMINAR ROOM
- ART HUB!
- AUDITORIUM
- DEPARTMENT CHAIR'S+ASSIST
- SENIOR ADM OFFICE+ASSIST
- FACULTY OFFICES
- FACULTY LOUNGE

A E C MEP

Team Pacific

LEVEL 1

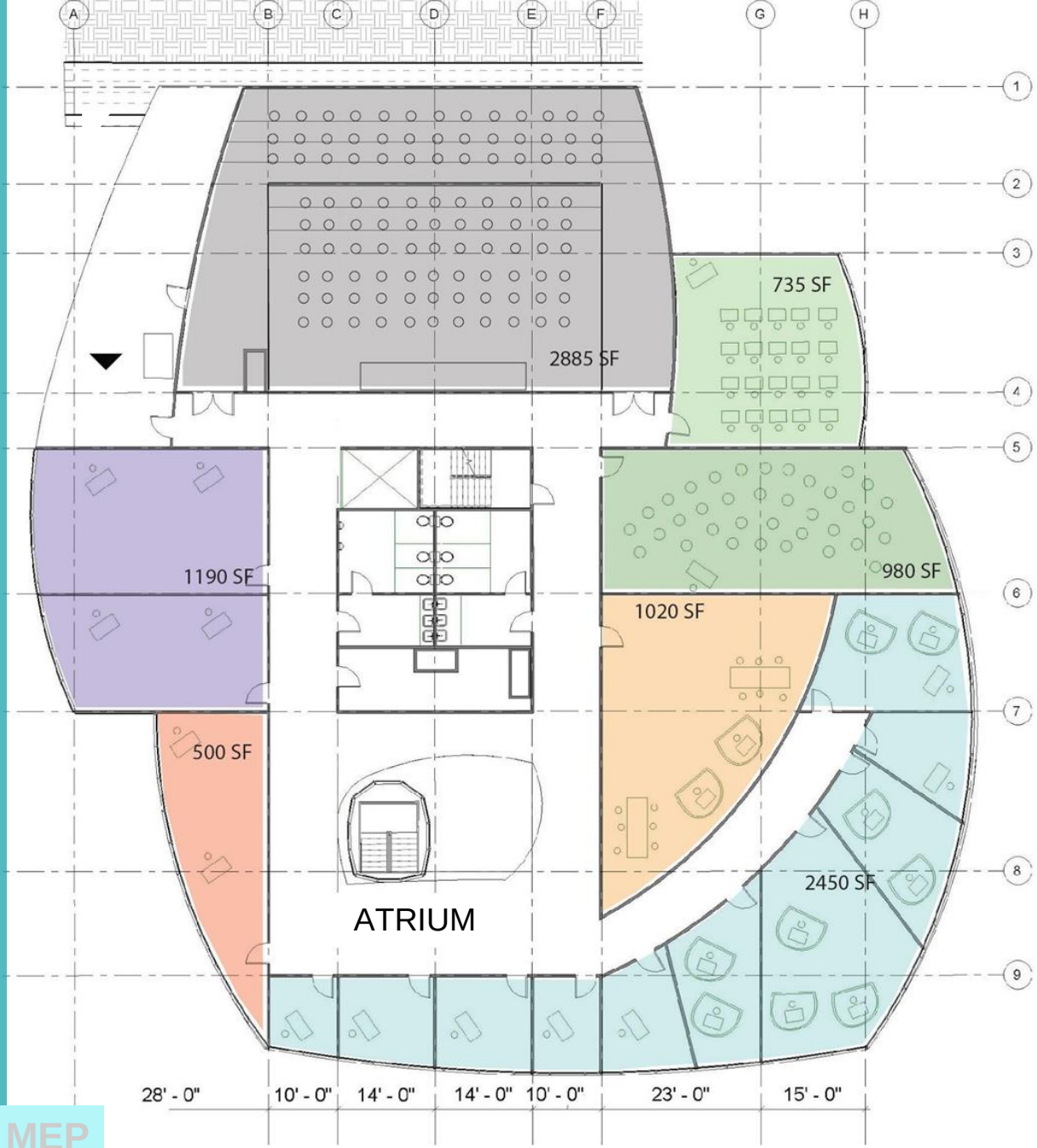
NORTH

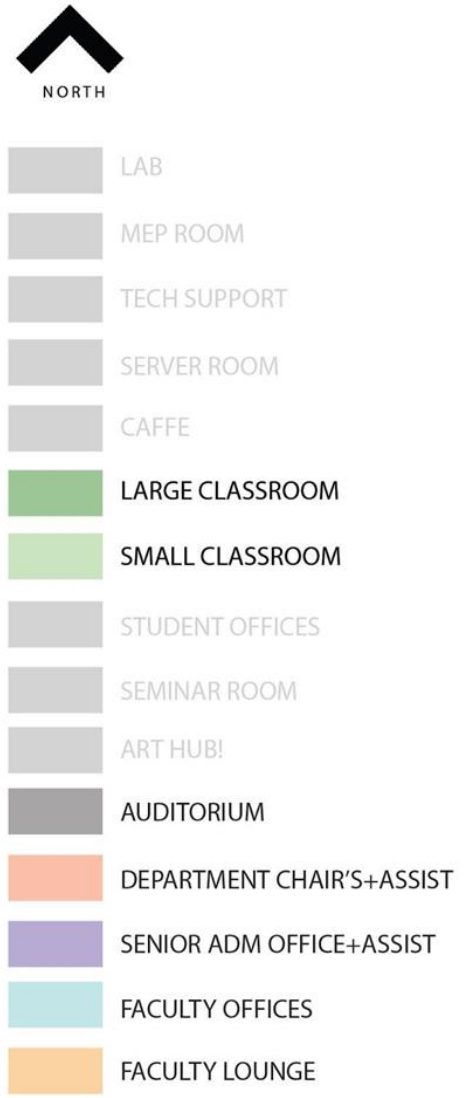
- LAB
- MEP ROOM
- TECH SUPPORT
- SERVER ROOM
- CAFFE
- LARGE CLASSROOM
- SMALL CLASSROOM
- STUDENT OFFICES
- SEMINAR ROOM
- ART HUB!
- AUDITORIUM
- DEPARTMENT CHAIR'S+ASSIST
- SENIOR ADM OFFICE+ASSIST
- FACULTY OFFICES
- FACULTY LOUNGE

A E C MEP

Team Pacific

LEVEL 2



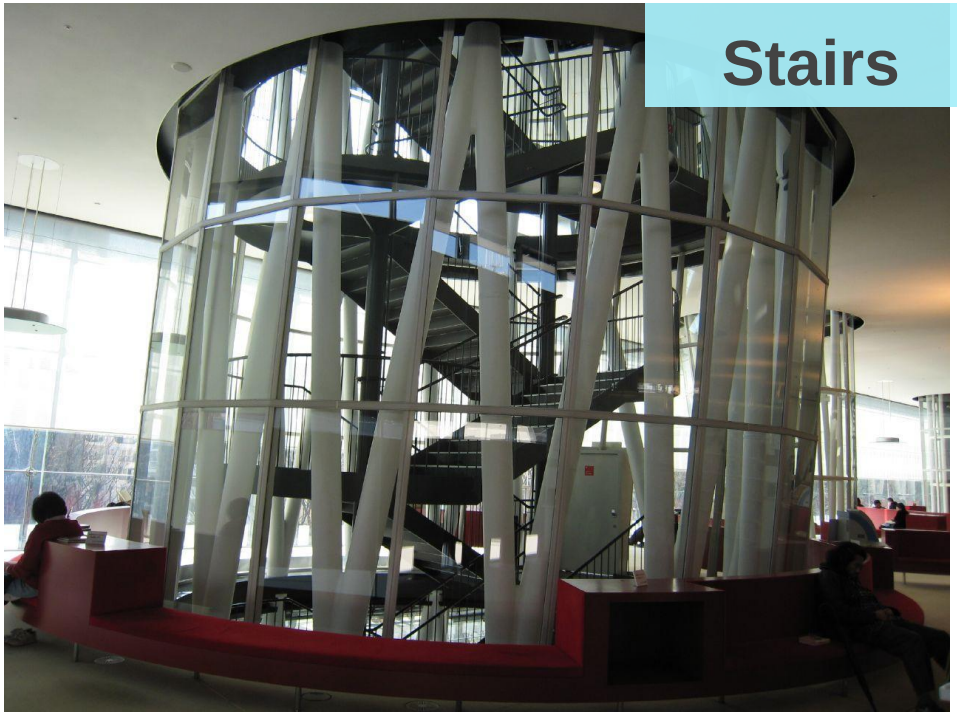


A E C MEP

Team Pacific

REFERENCE PHOTOS

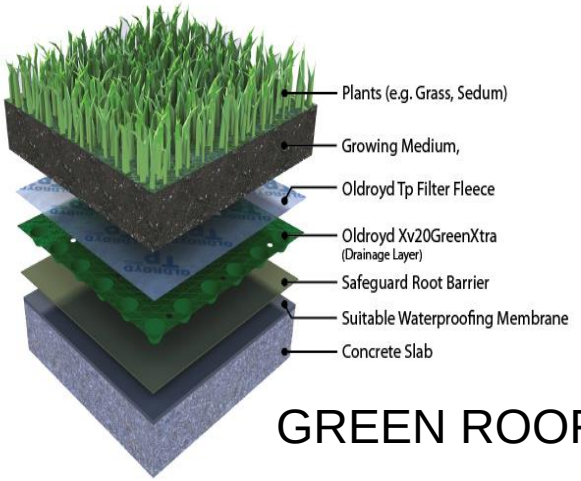
Open Space



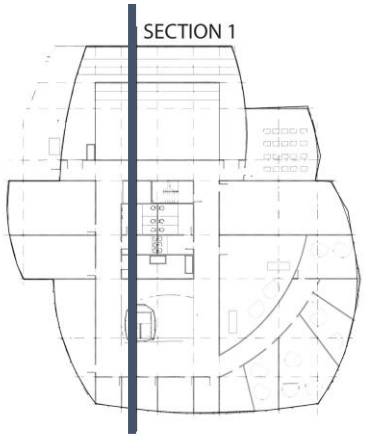
Stairs

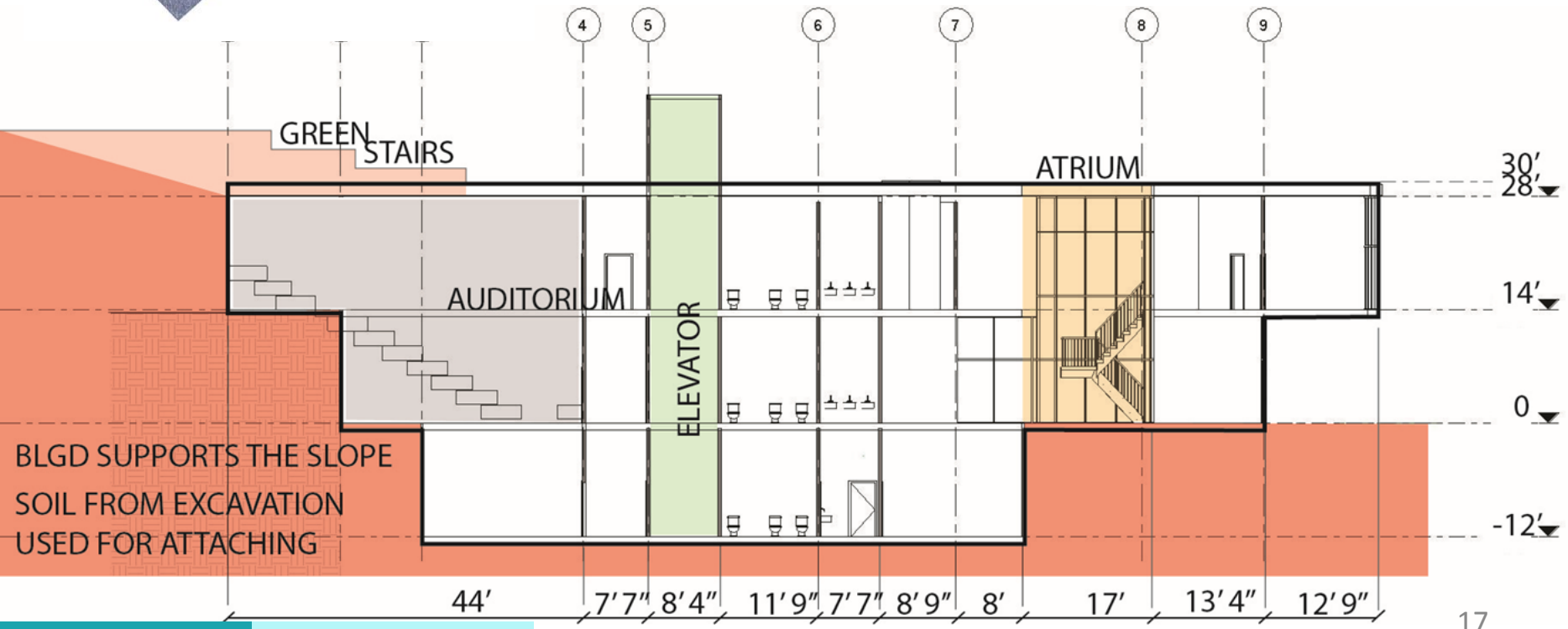
Atrium

SECTION 1

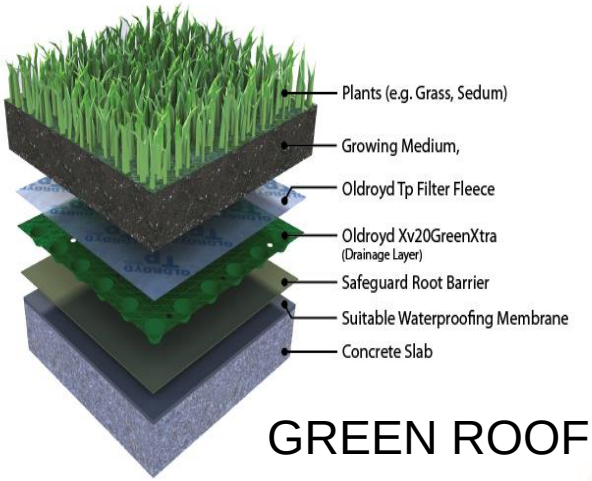


GREEN ROOF

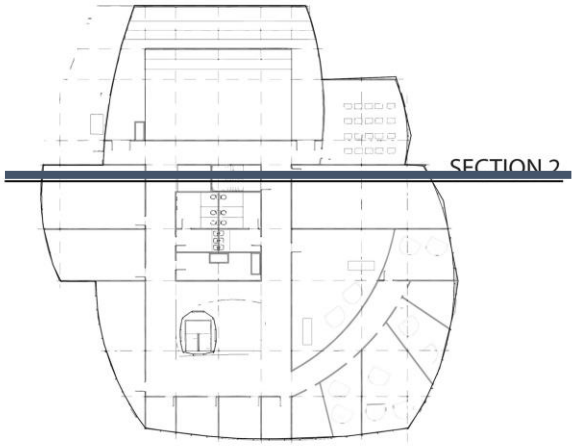


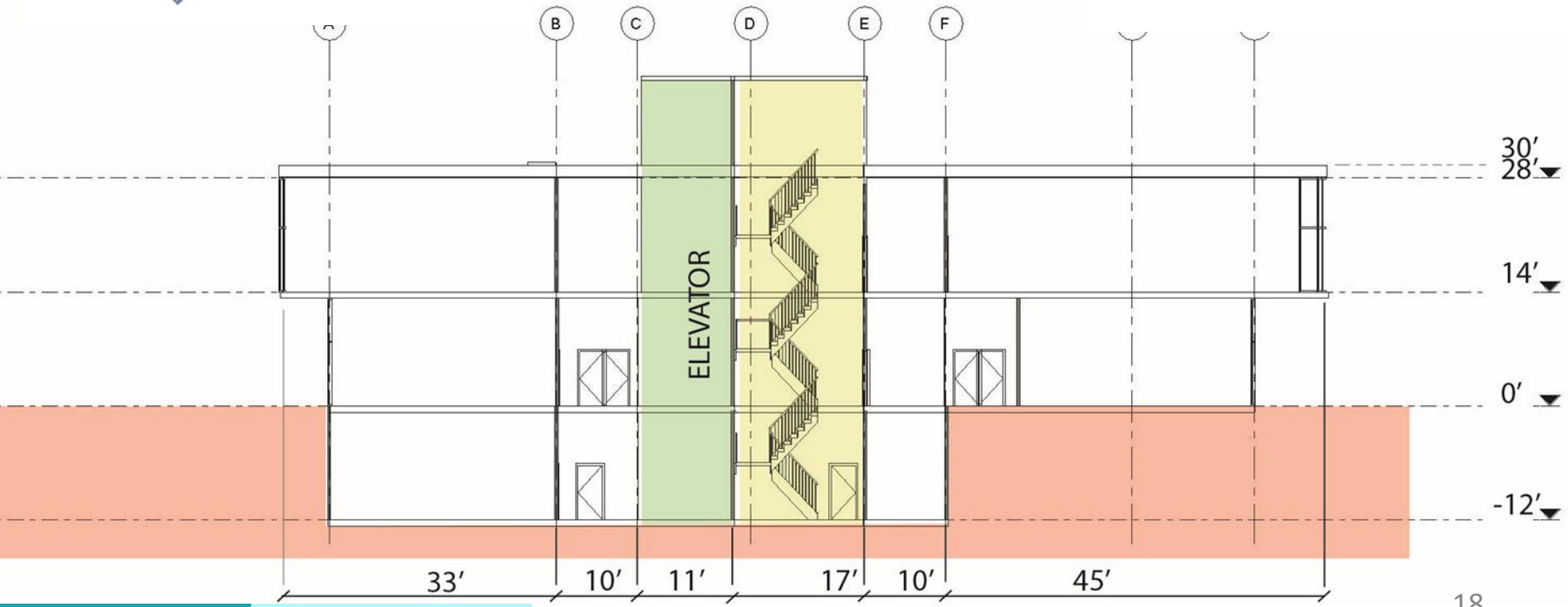


SECTION 2

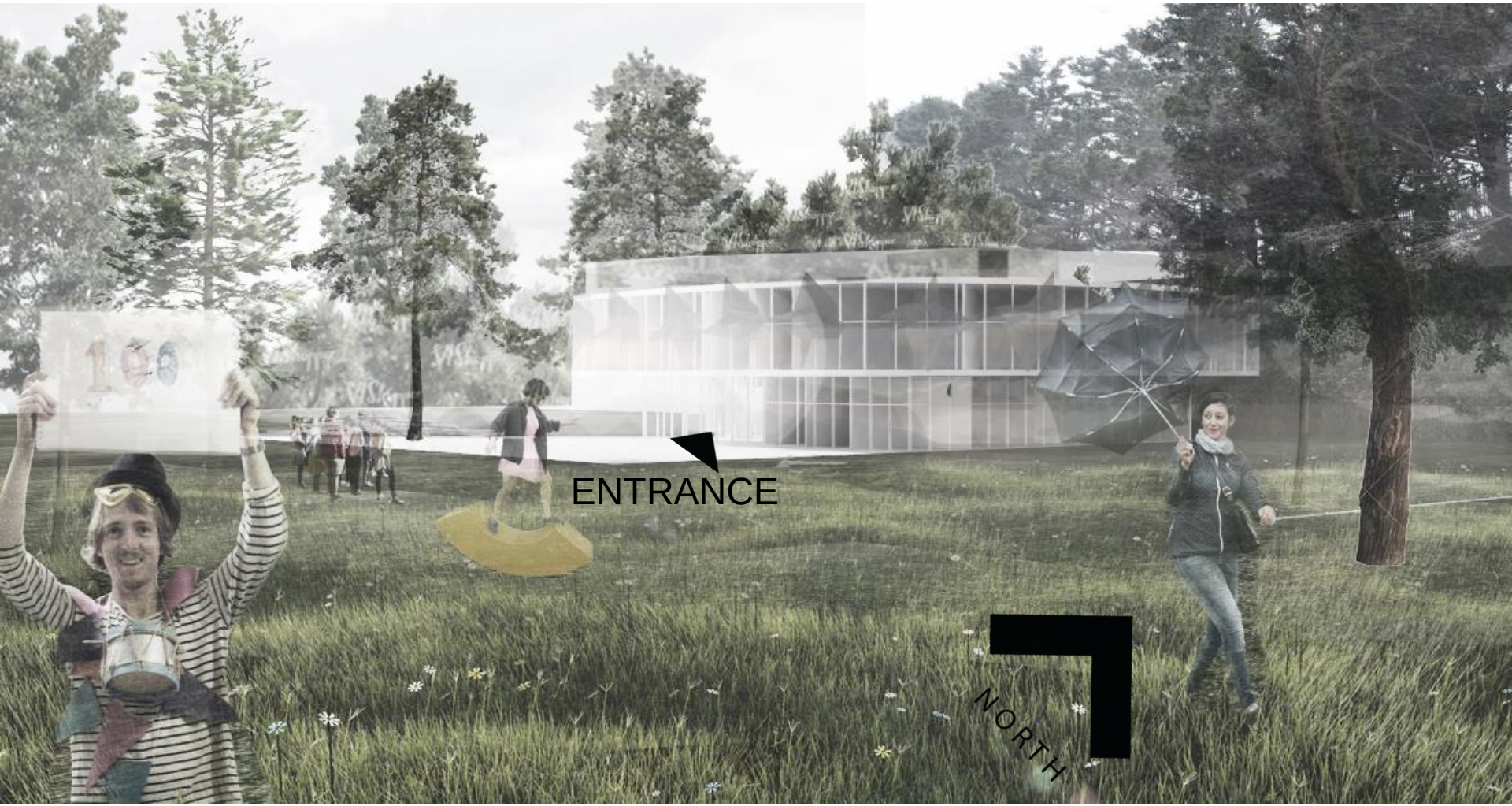


GREEN ROOF



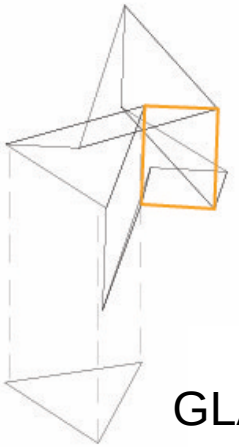


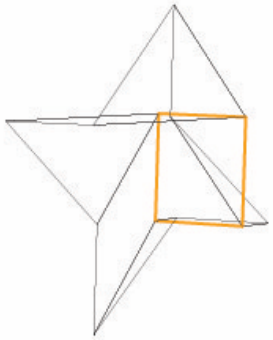
VIEW FROM SOUTH-EAST

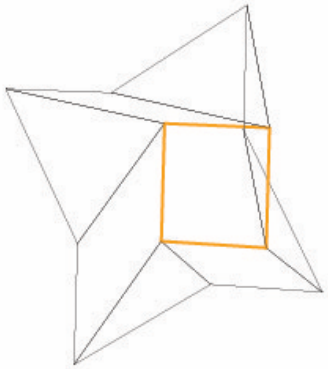


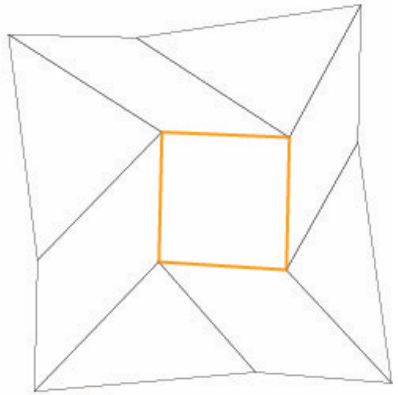
ORIGAMI HYGRO FAÇADE PANELS

BUD → FLOURISHING → OPENING → OPENED







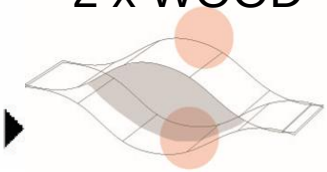


GLASS

MESH

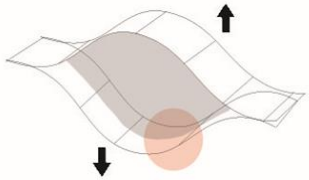
HYGRO

2 x WOOD VENEER



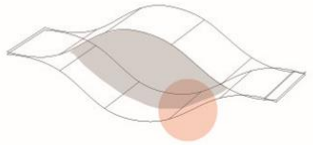
FOG HARVESTING MESH

WOOD STRETCHES

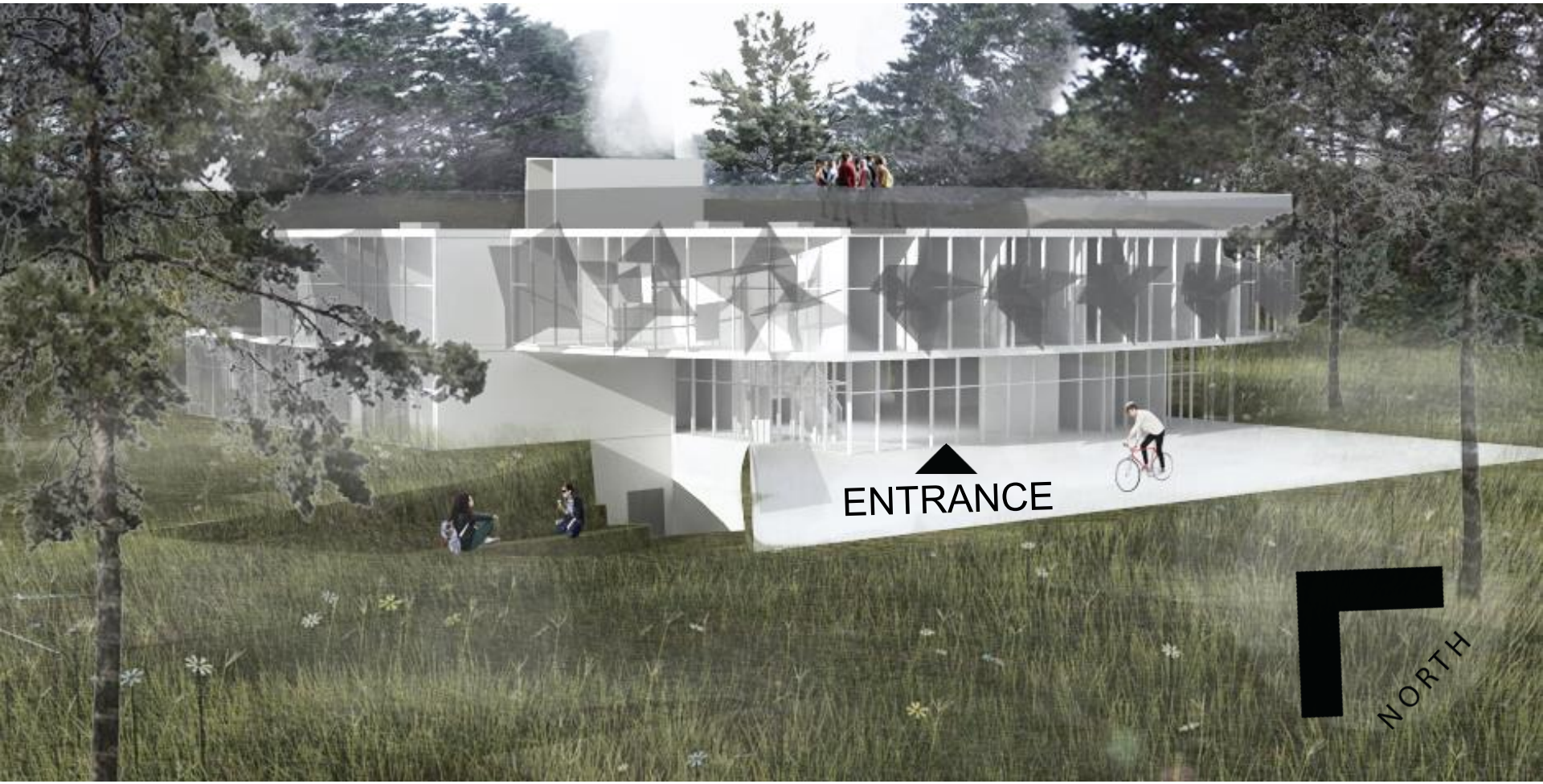


MESH STRETCHES

WOOD SHRINKS



VIEW FROM SOUTH-WEST



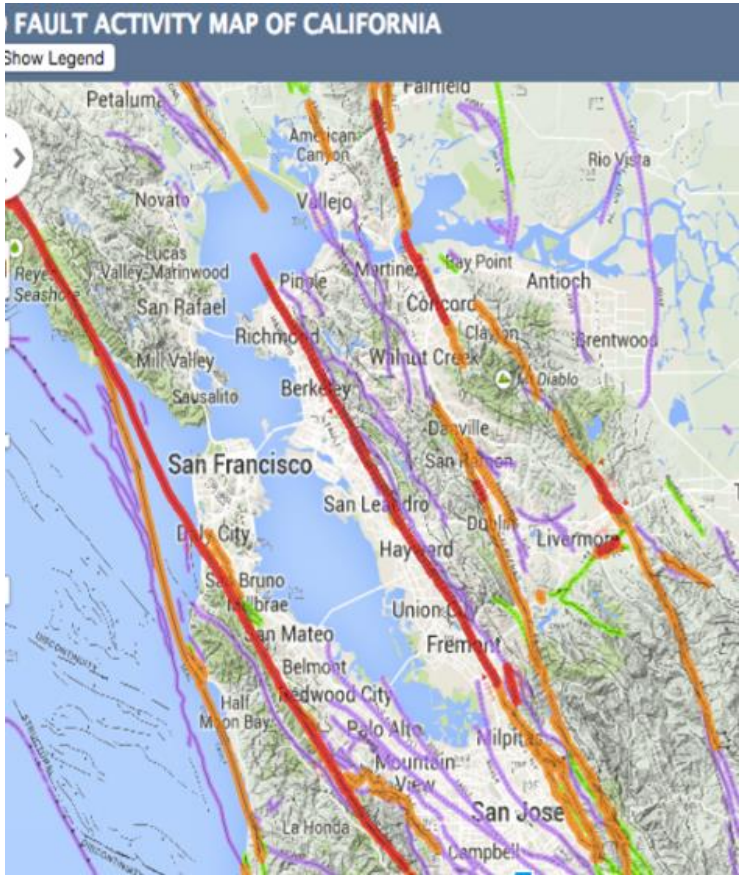
LIVE LOAD REQUIREMENT

Room Function Type	Total Area [sf]	Minimum LL [psf]
Faculty Lounge	1000	100
Faculty Offices	3600	50
Student Offices	1200	50
Classrooms	3600	40
Storage Rooms	1000	150

Reference: California Building Code
http://www.ecodes.biz/ecodes_support/free_resources/2013California/13Building/PDFs/Chapter%2016%20-%20Structural%20Design.pdf

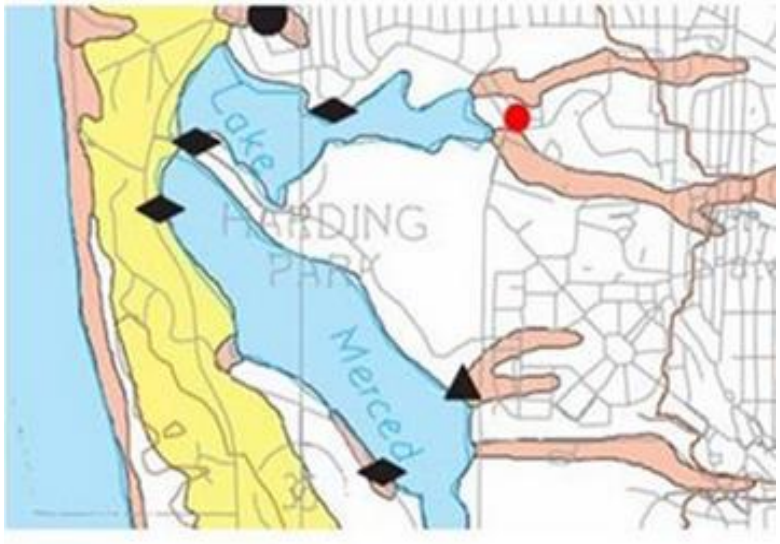
LATERAL LOADS

Design Concept	Lateral System	Force [kips]
Iceplant I	BRBF	2142
Iceplant II	Shear Wall	3637
Water I	Diagrid	1071
Water II	EBF	1008



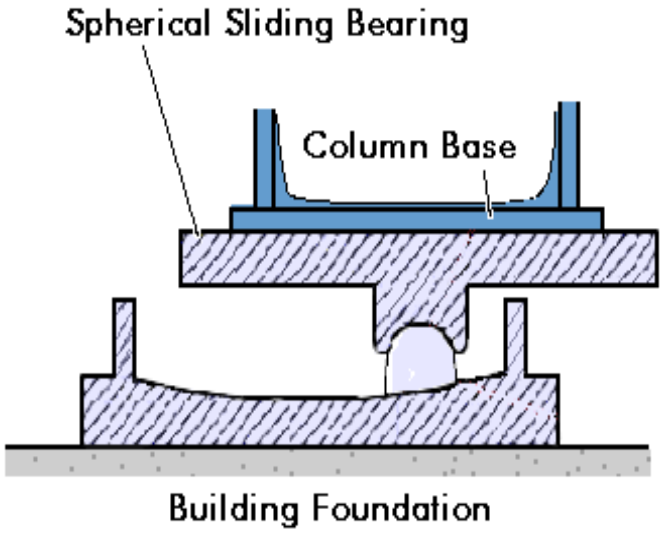
SOIL PROFILE

- Soil Condition
  - Well sorted fine to medium sand
  - Bearing capacity: 3500 psf
  - Not in liquefaction zone
  - Water table: 14 ft below grade



FOUNDATION SOLUTION

Evolution of chosen concept:



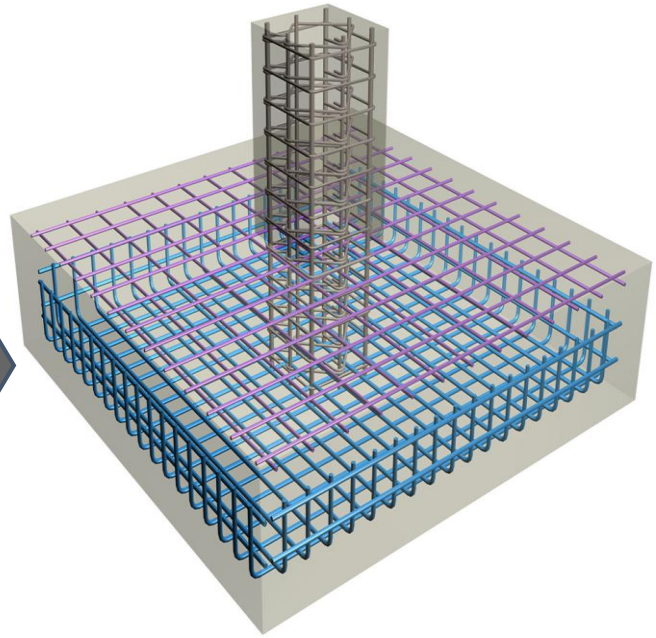
Kick off Meetings /First Phase
1/19 - 2/15

Crit Session Mentorship

Cost

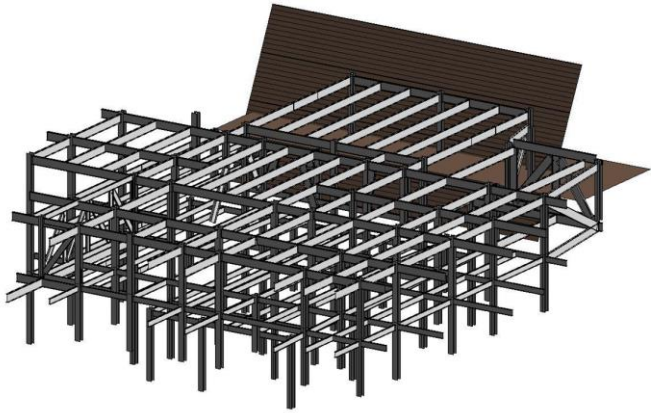
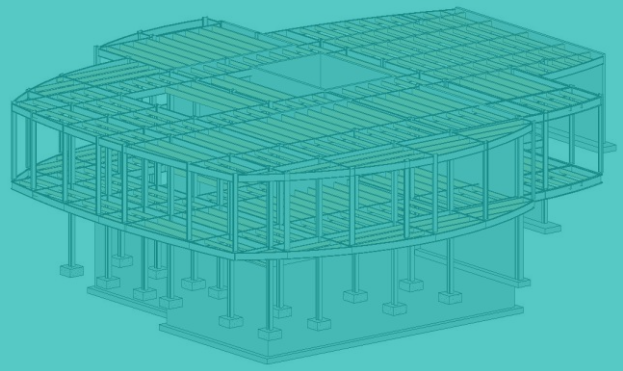
Additional need to detach building from slope/ground

Maintenance

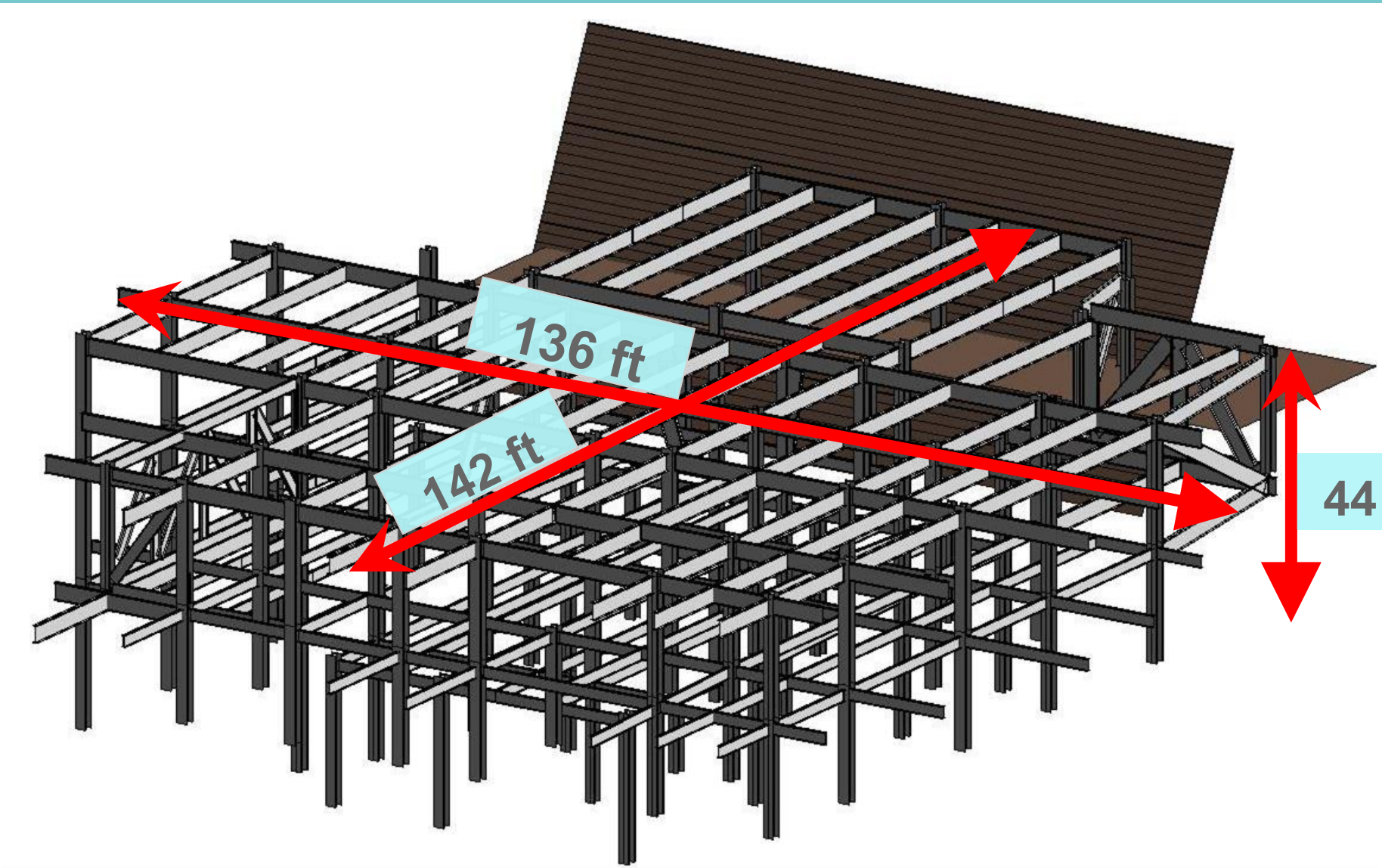


Second Phase /Current Design
2/15 - 3/13

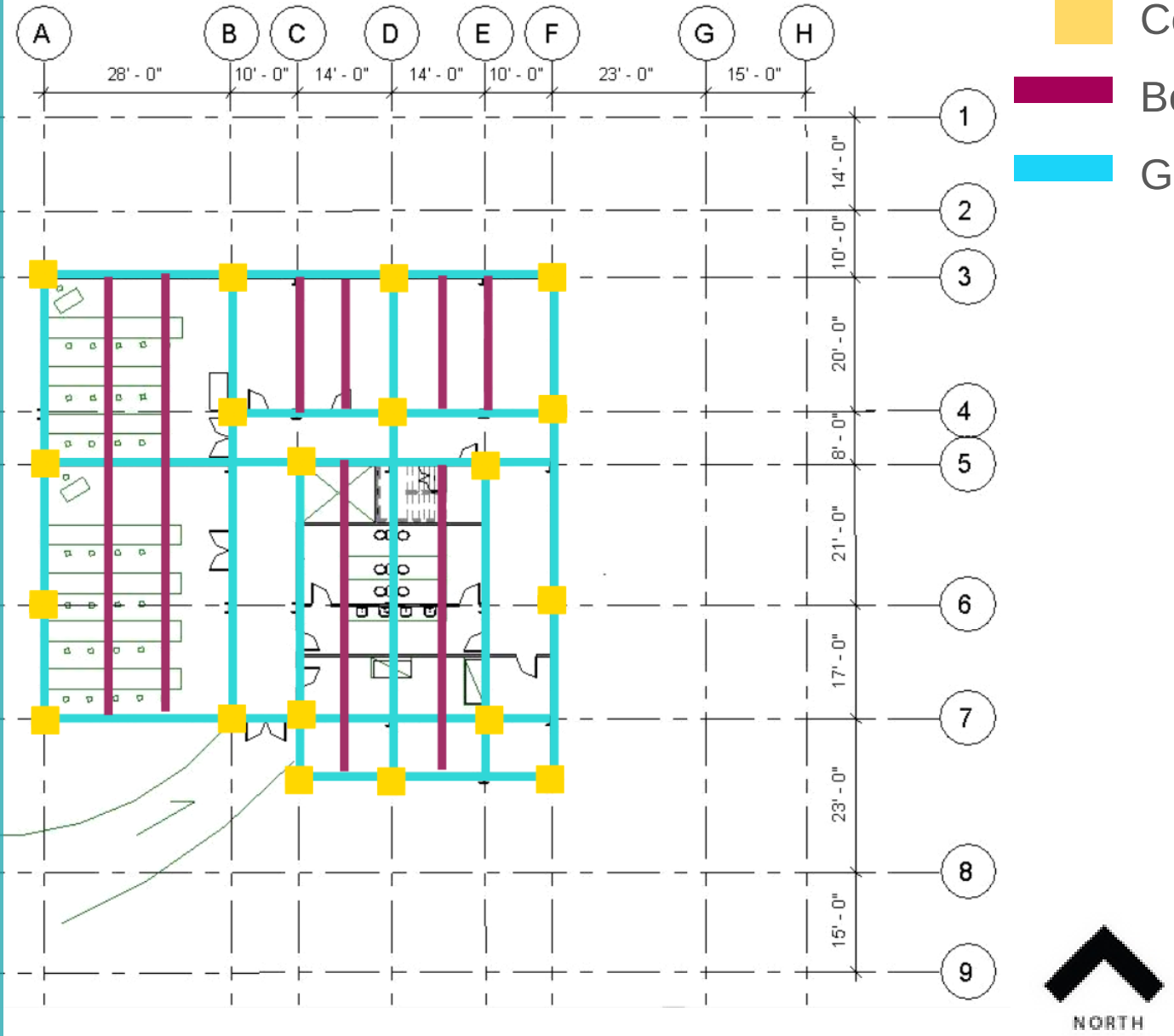
STRUCTURAL SYSTEMS

	Steel	Timber Composite
Structural System		
Gravity System	Beam: W Section Girder: W Section Column: W Section	Beam: Timber Rectangular Girder: W Section Column: W Section
Lateral System	Buckling Restrained Braced Frame (BRBF)	Concrete core and shear wall system

3D STEEL STRUCTURE



BASEMENT

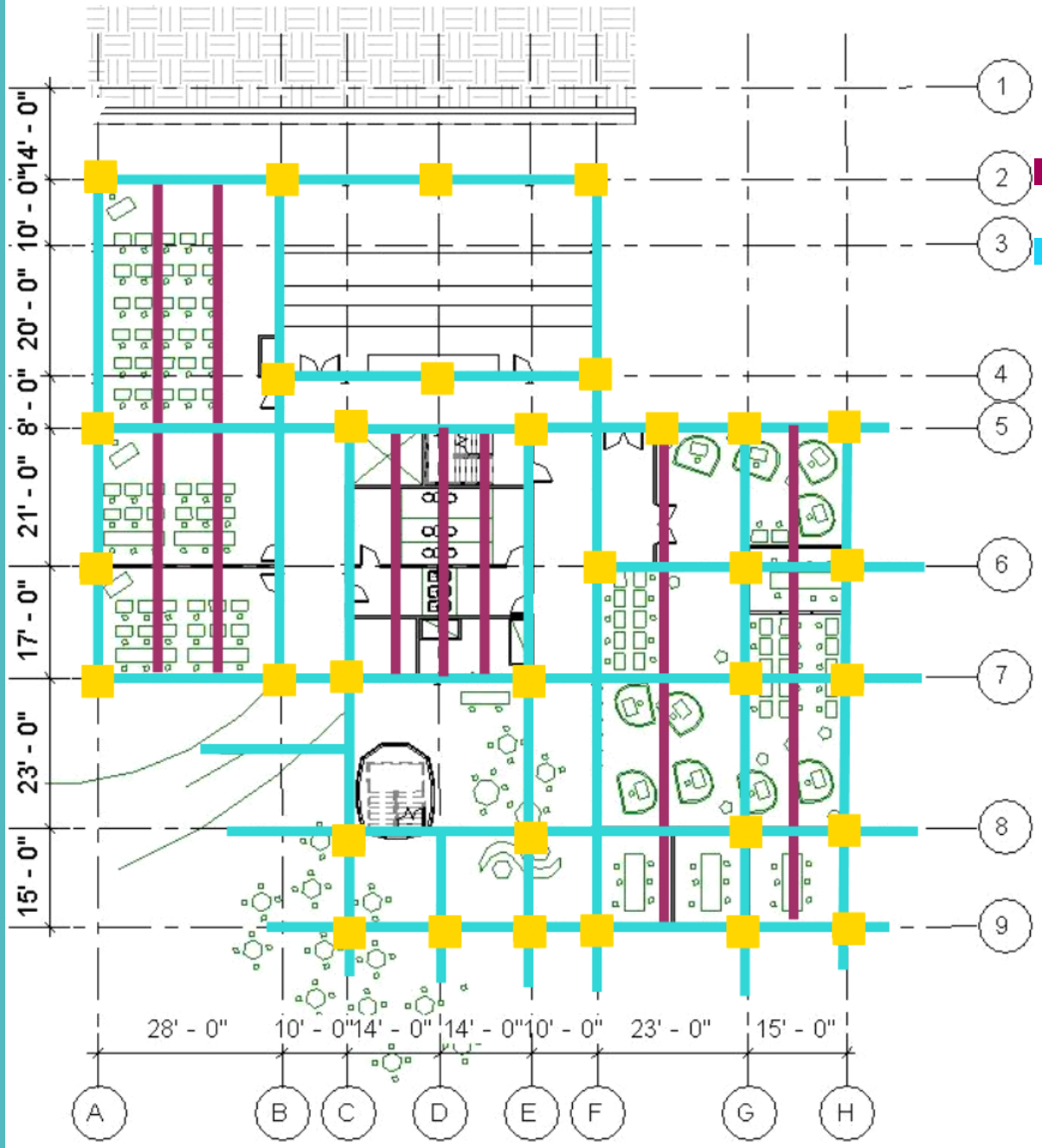


Column: W14×90

Beam: W16×31

Girder: W16×31

LEVEL 1



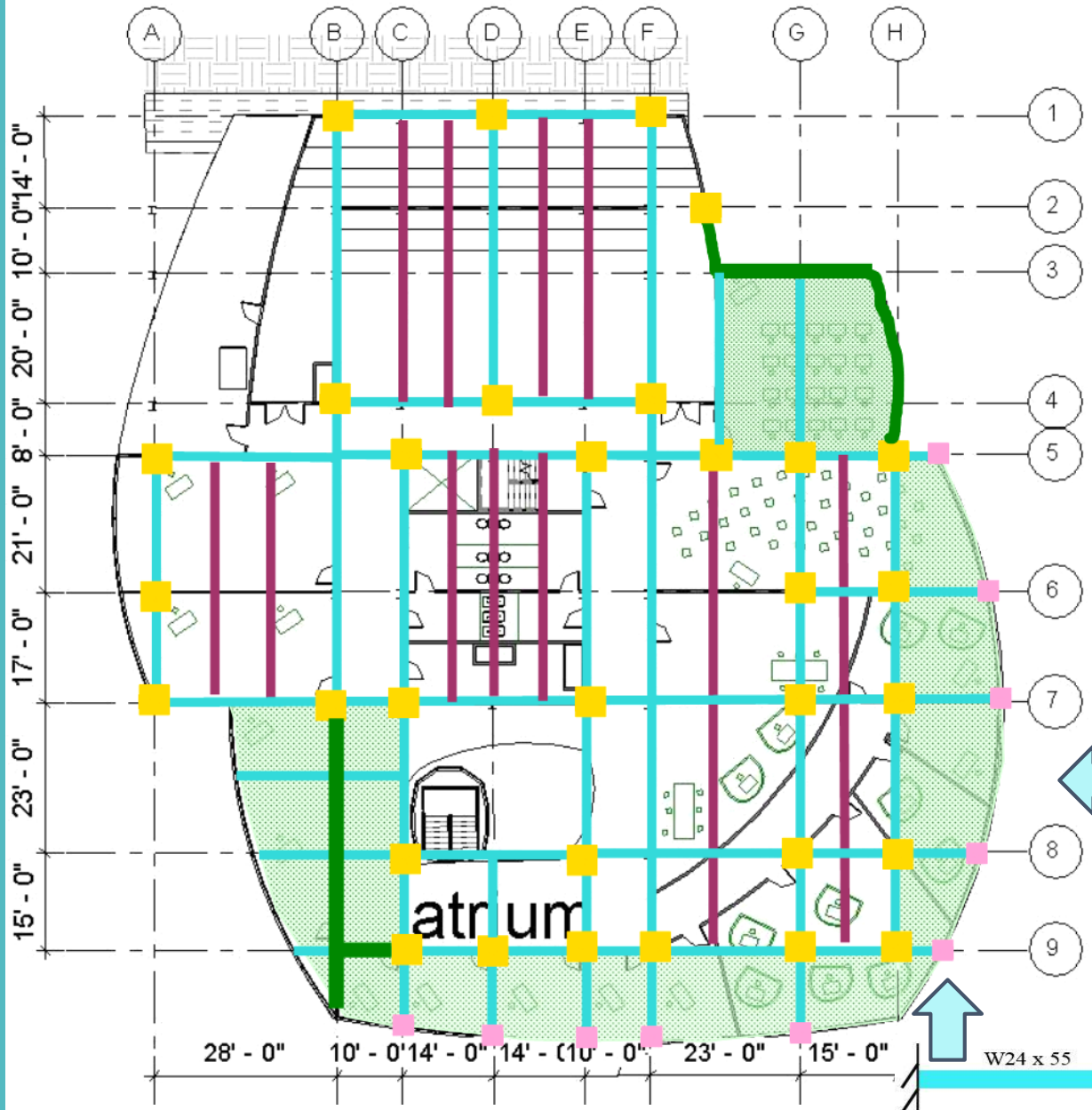
Column: W14×90

Beam: W16×31

Girder: W16×31

NORTH

LEVEL 2



Column: W14×90

Beam: W24×55

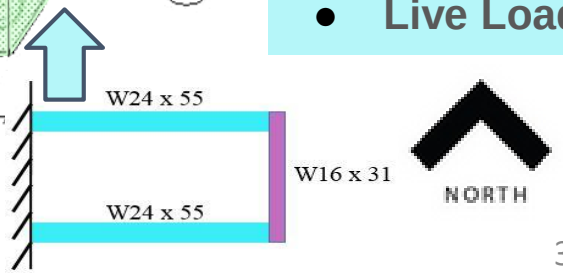
Girder: W24×55

Truss: W24×55

Truss: W16×31

Cantilever

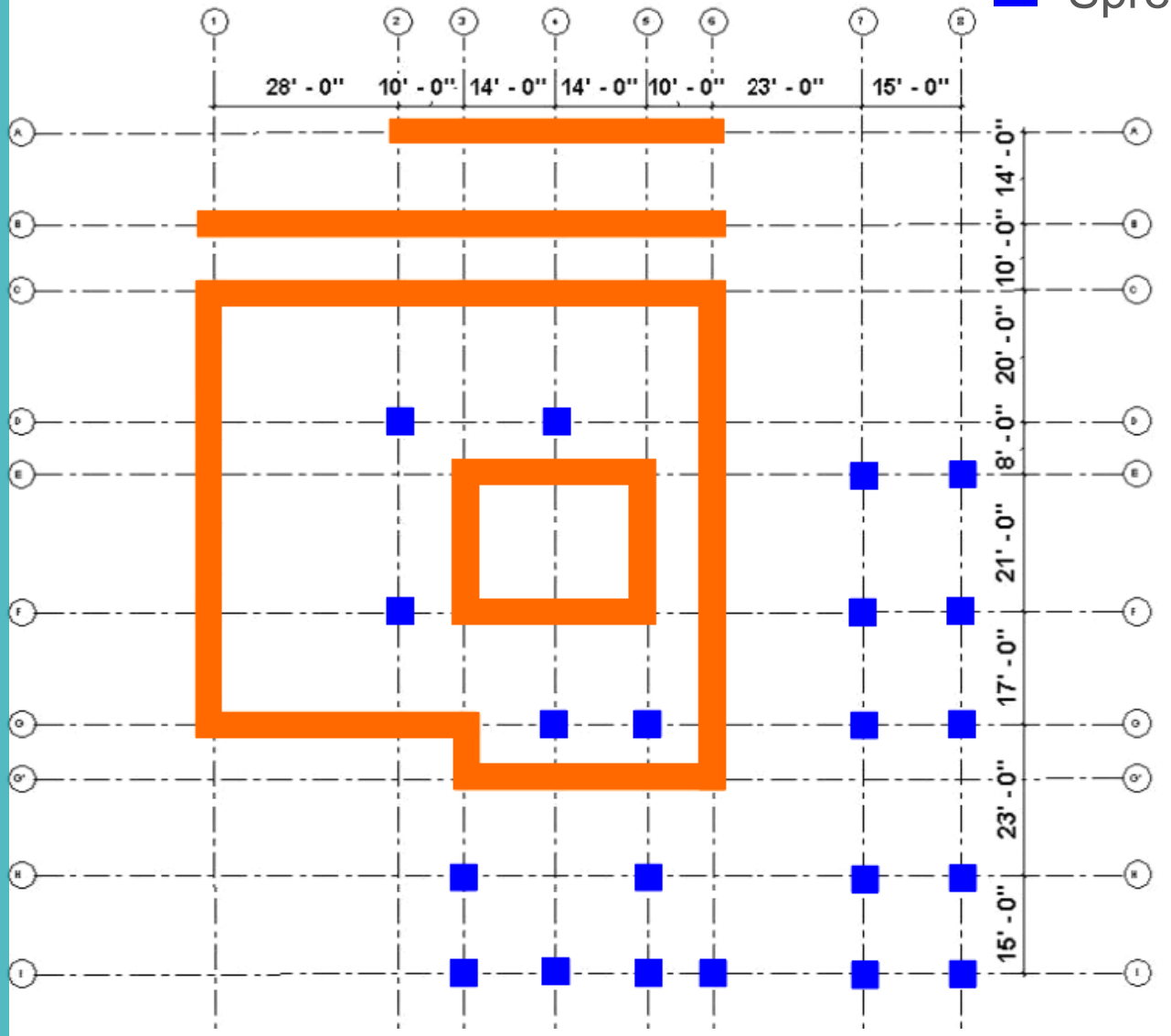
- **Green Roof Load**
- **Live Load**



FOUNDATION LAYOUT

Line footing 1’x3’x1’

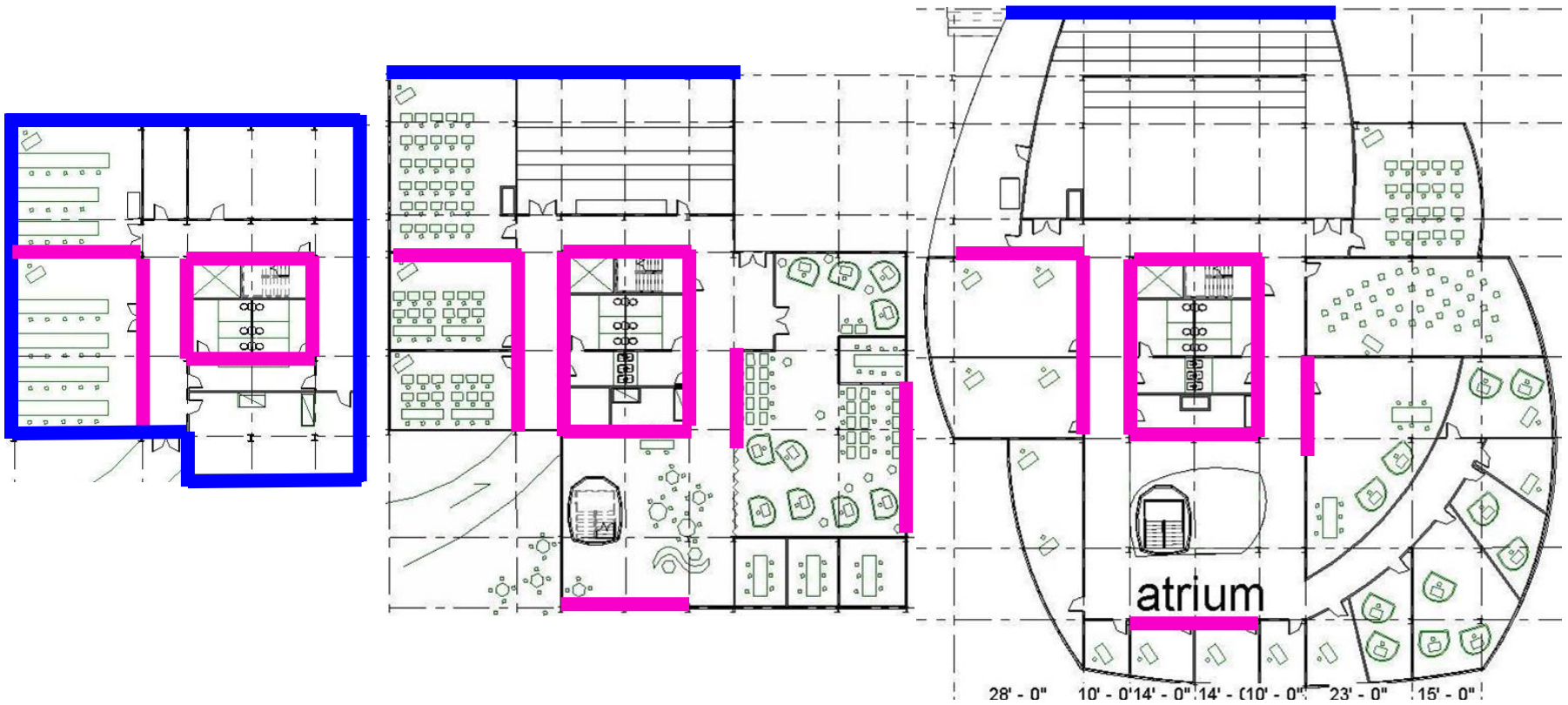
Spread footing 2’x2’x1’



LATERAL SYSTEM

BRBF $(8'')^2$

Retaining Wall 10''

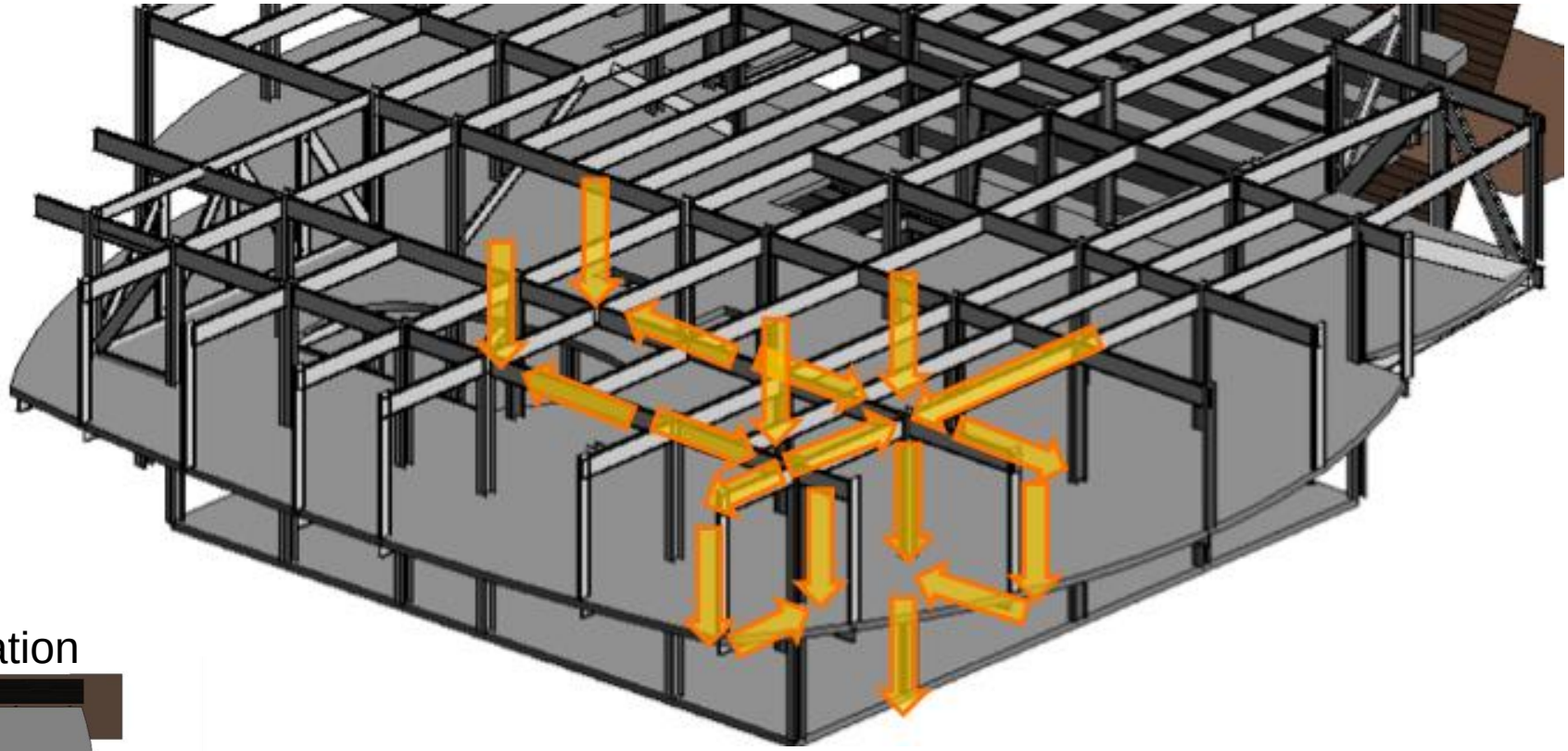


Basement

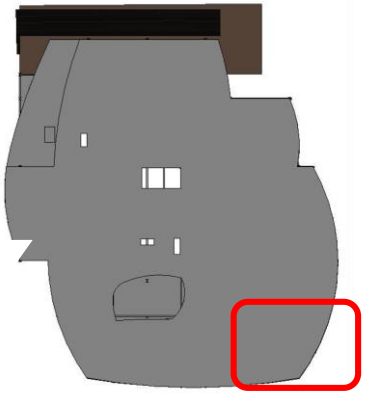
Level 1

Level 2

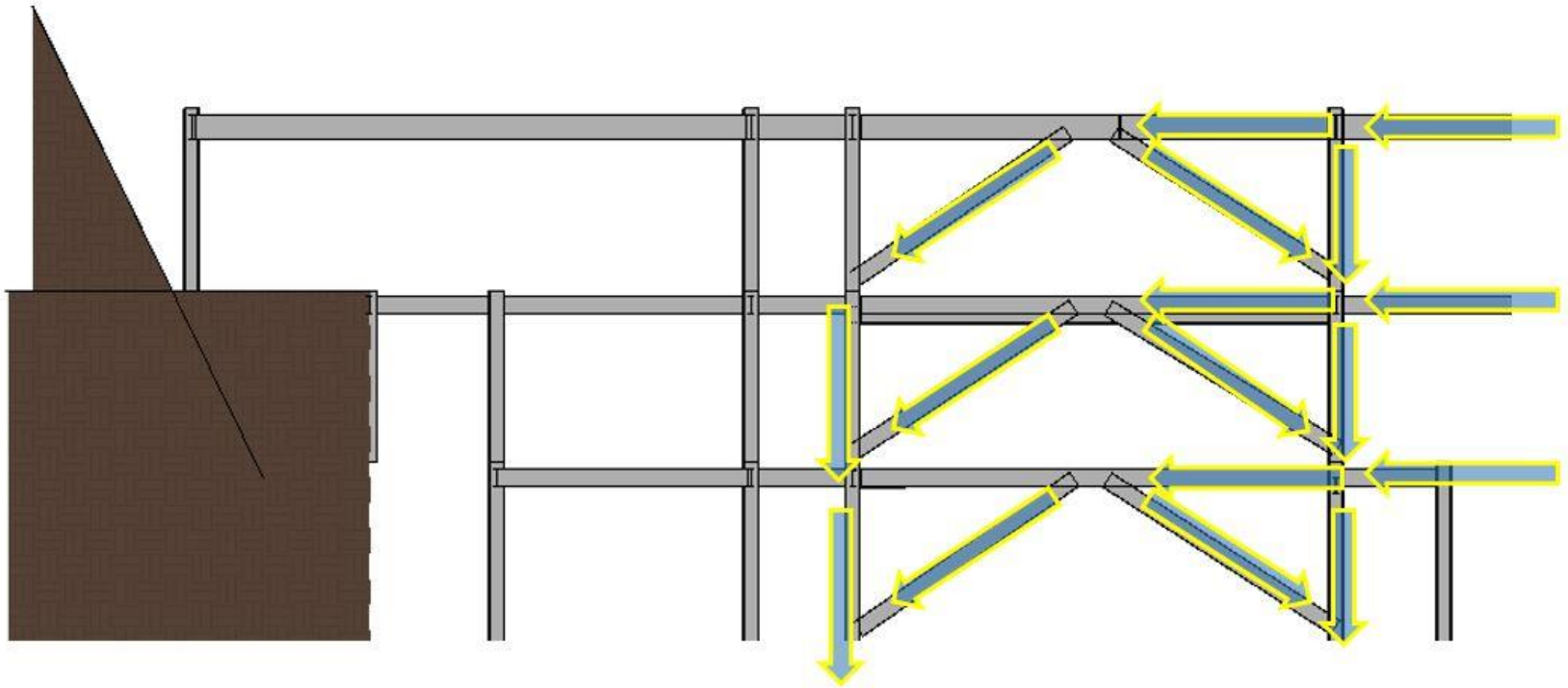
LOAD PATH - GRAVITY



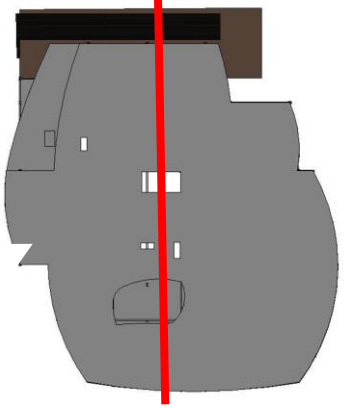
Location



LOAD PATH - LATERAL



Location



VAV W/ REHEAT

MEP Solution for ICE PLANT/STEEL :

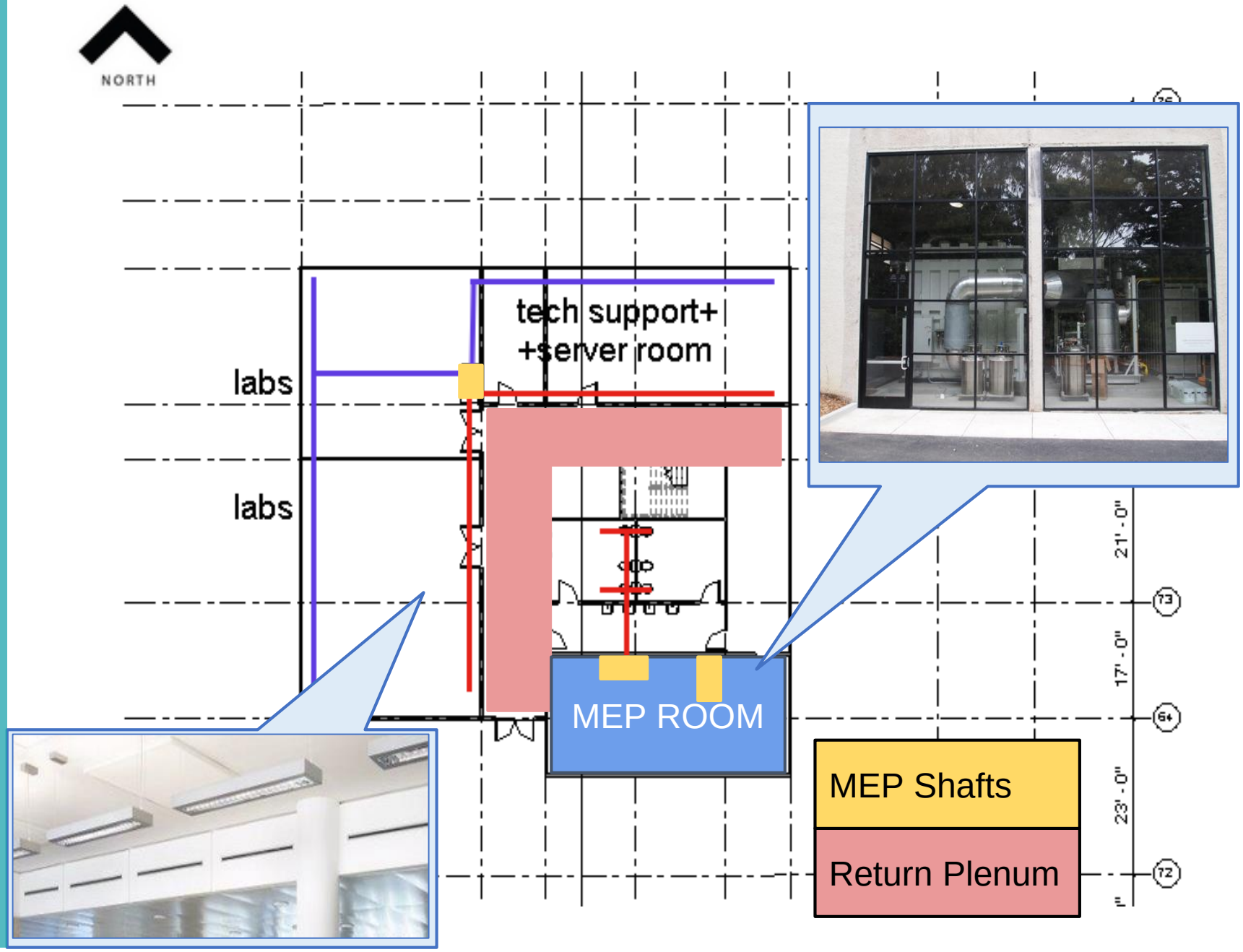
General:
- VAV w/ Reheat

Auditorium:
- Underfloor Air Distribution (UFAD)

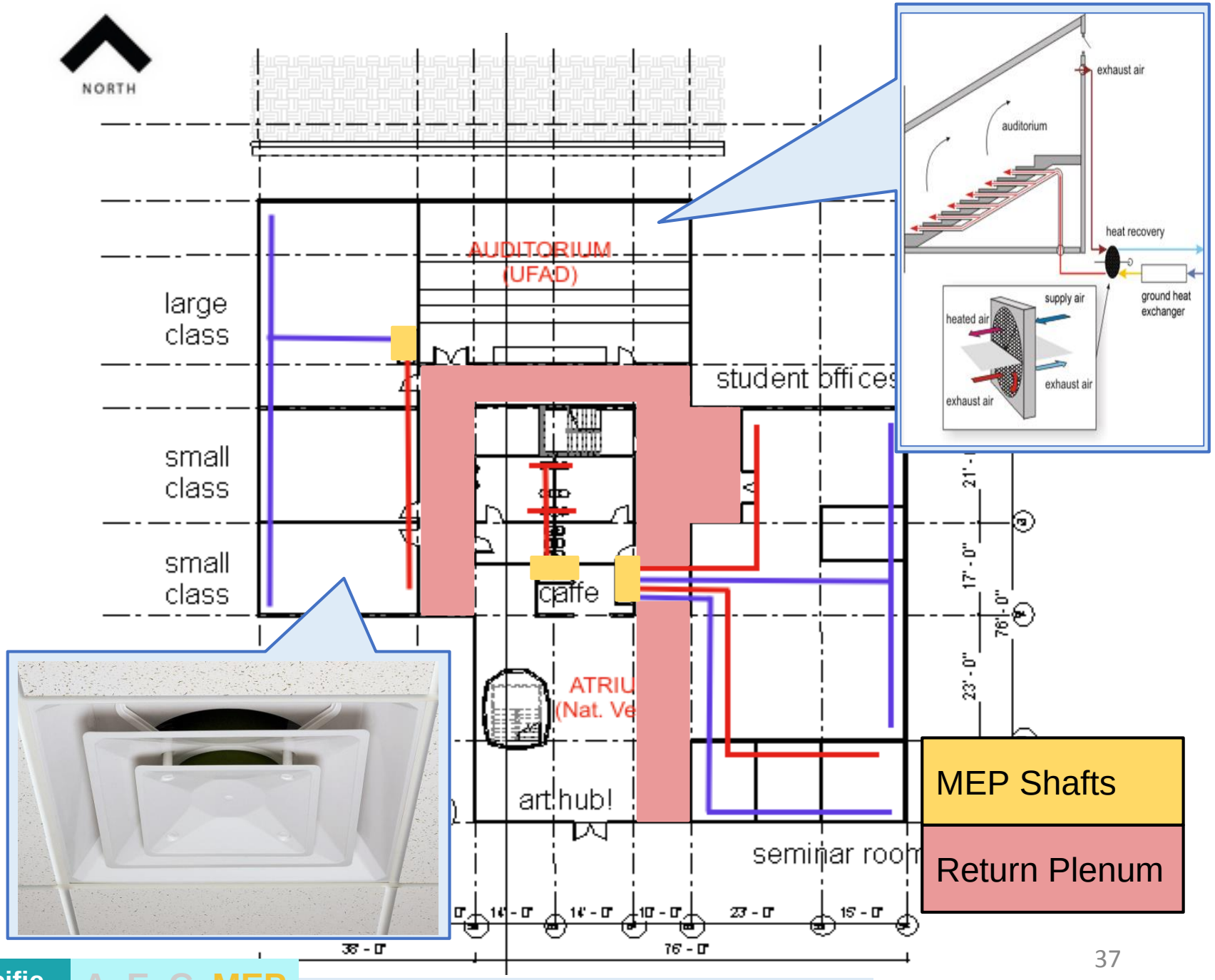
\+ Economizer option
\+ SImple zoning
\+ Common, inexpensive

\- Wasted reheat energy
\- More ductwork
\- Open plenum reduces privacy

BASEMENT

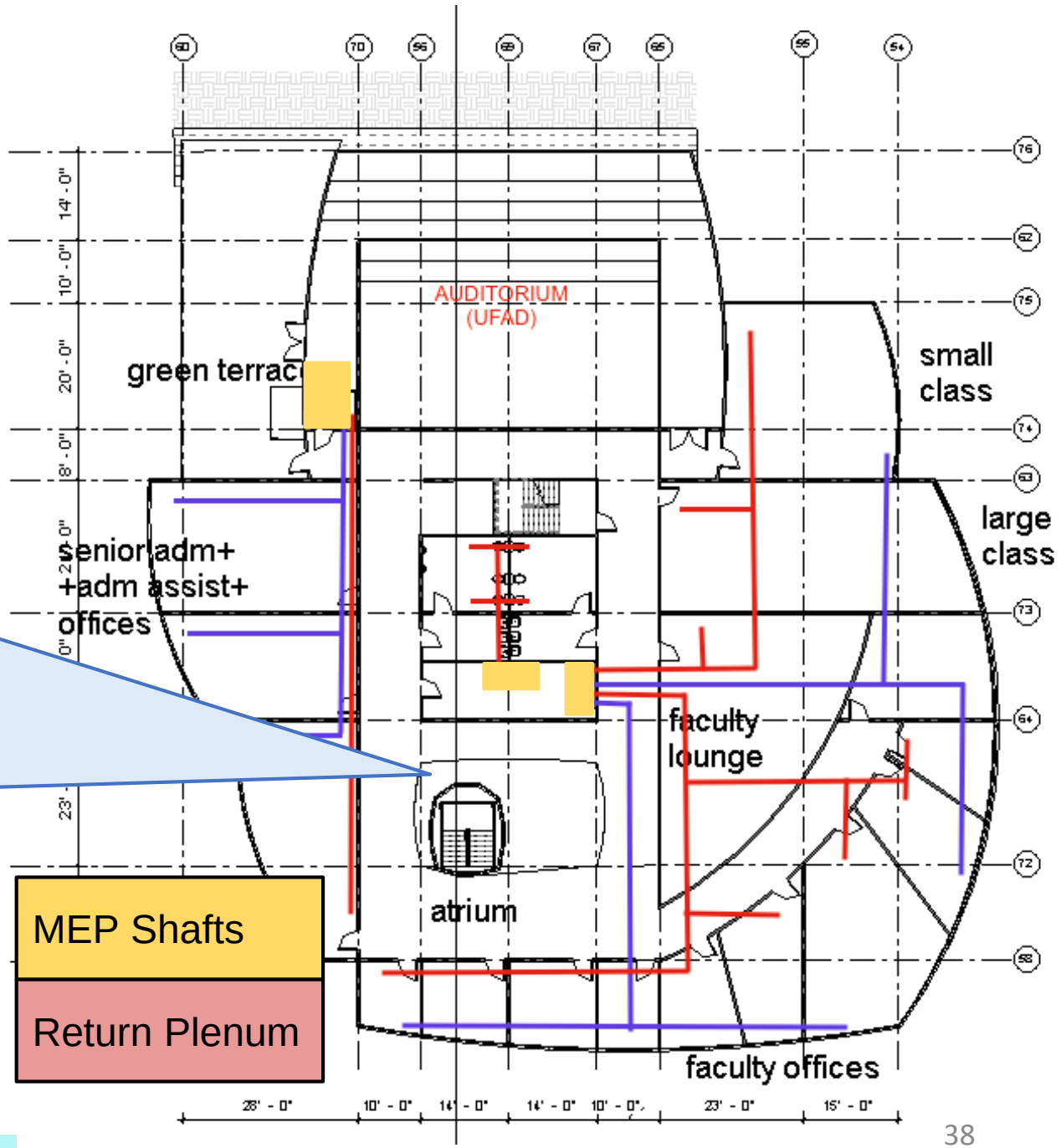

NORTH
tech support+
+server room
labs
labs
MEP ROOM
MEP Shafts
Return Plenum
21' - 0"
17' - 0"
23' - 0"
73
64
72

LEVEL 1

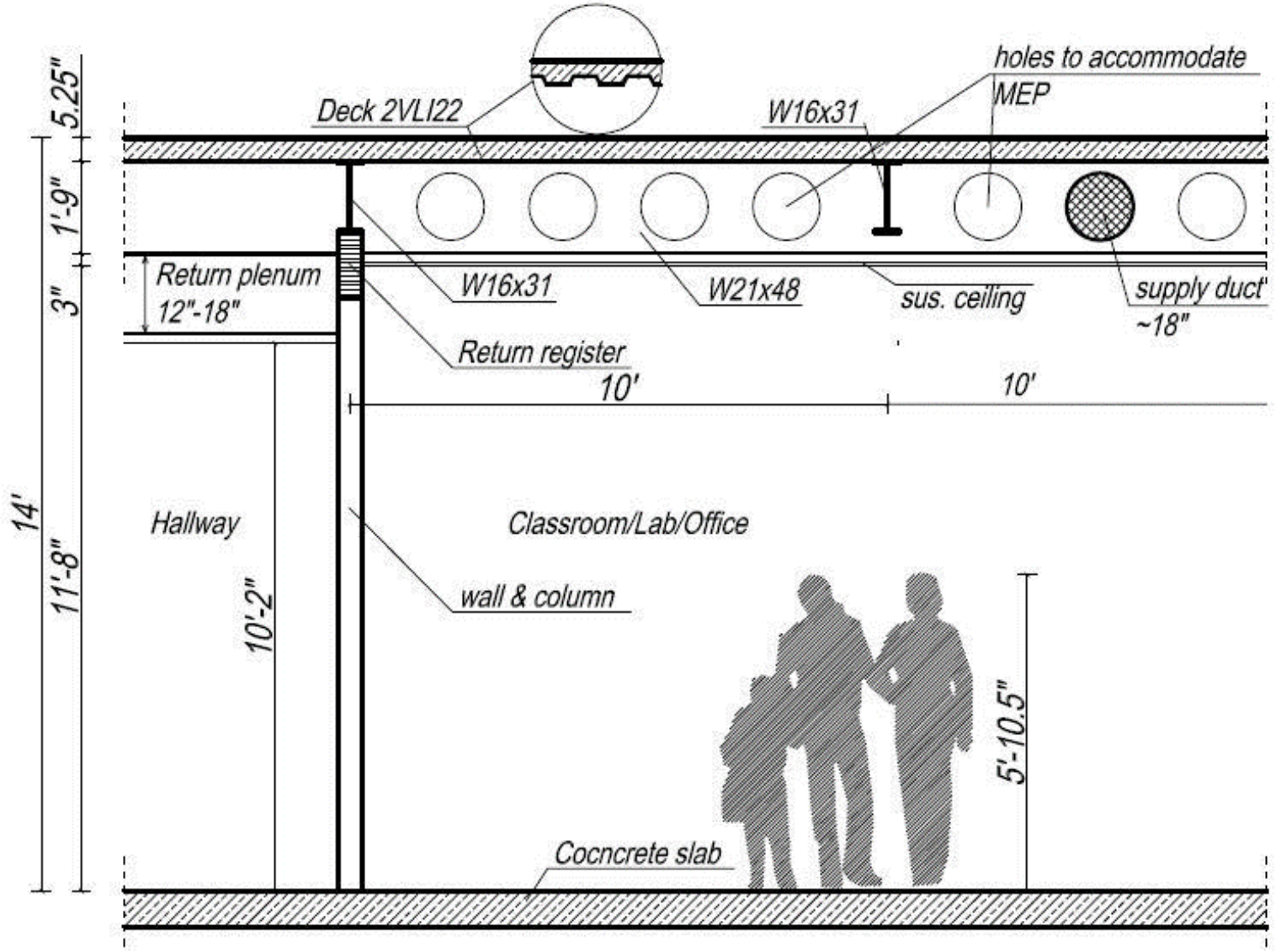

NORTH
AUDITORIUM
(UFAD)
large
class
small
class
small
class
student offices
caffe
ATRIU
(Nat. Ve
art hub!
seminar room
exhaust air
auditorium
heat recovery
ground heat
exchanger
supply air
heated air
exhaust air
exhaust air
MEP Shafts
Return Plenum

LEVEL 2

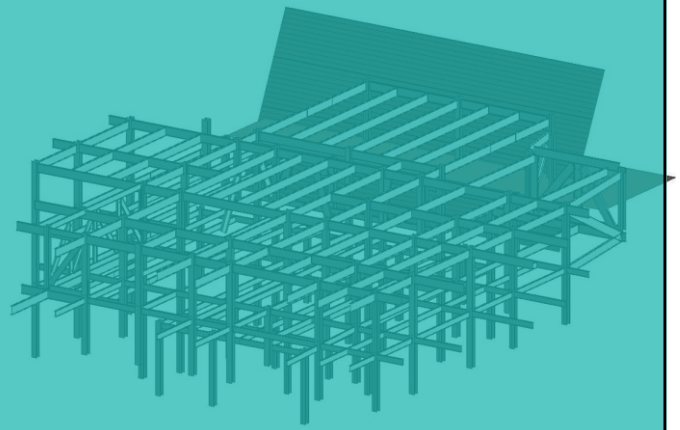
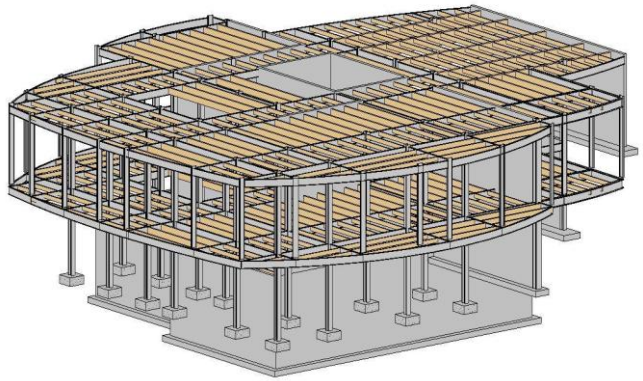

heated air exhausted to outside through skylight louver
air flow from outside


NORTH
AUDITORIUM (UFAD)
green terrac
small class
large class
senior adm+ +adm assist+ offices
faculty lounge
atrium
faculty offices
MEP Shafts
Return Plenum

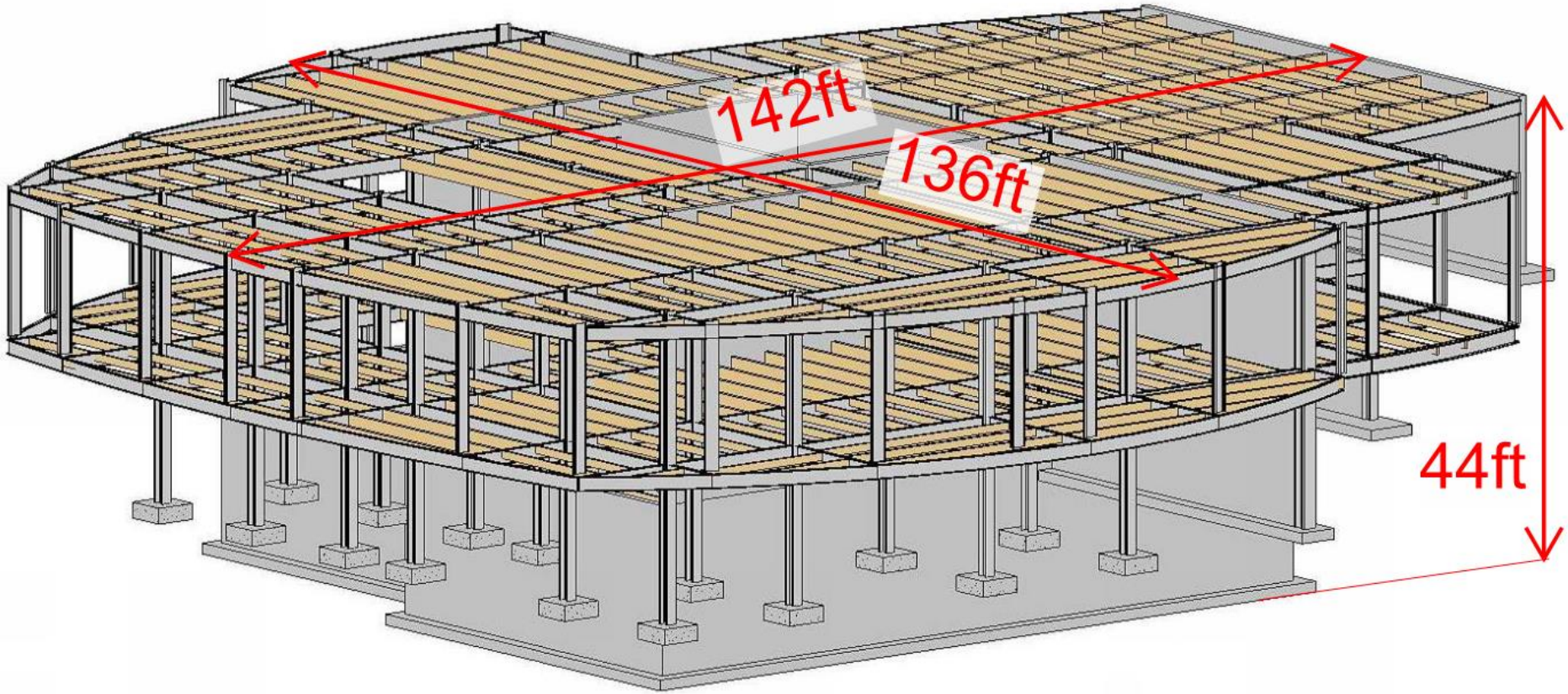
FLOOR SANDWICH



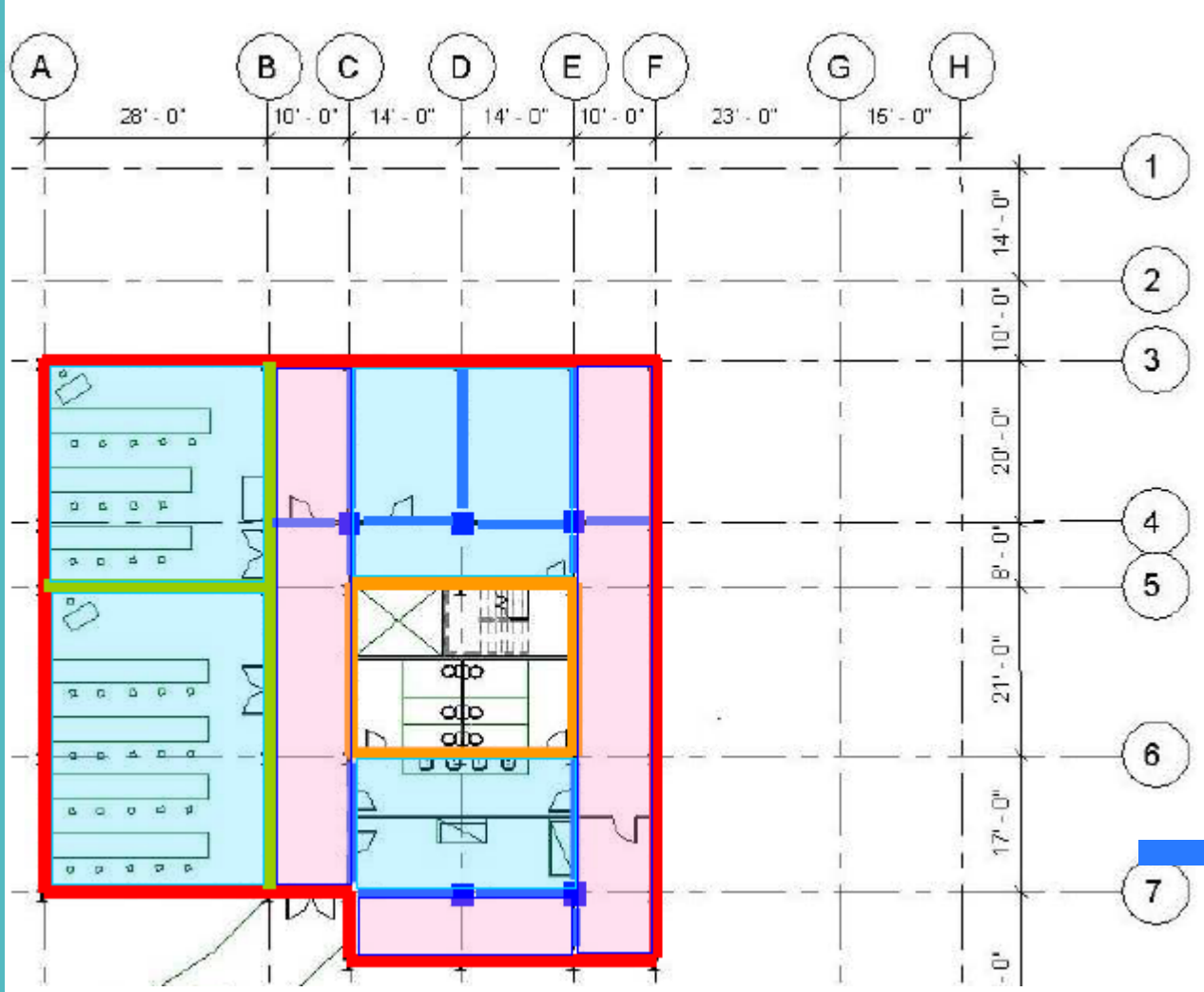
STRUCTURAL SYSTEMS

	Steel	Timber Composite
Structural System		
Gravity System	Beam: W Section Girder: W Section Column: W Section	Beam: Timber Rectangular Girder: W Section Column: W Section
Lateral System	Buckling Restrained Braced Frame (BRBF)	Concrete core and shear wall system

3D – TIMBER COMPOSITE

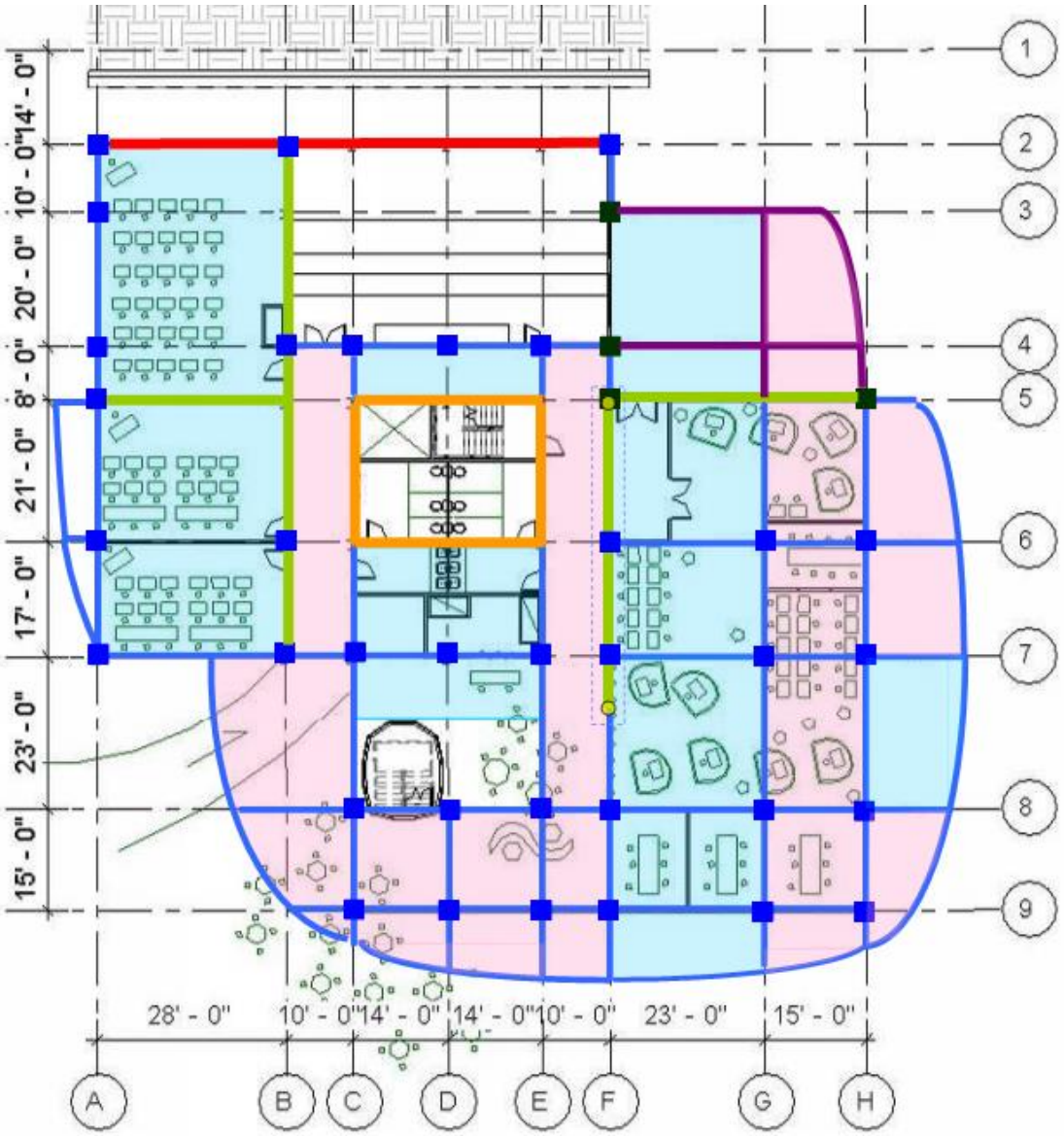


BASEMENT



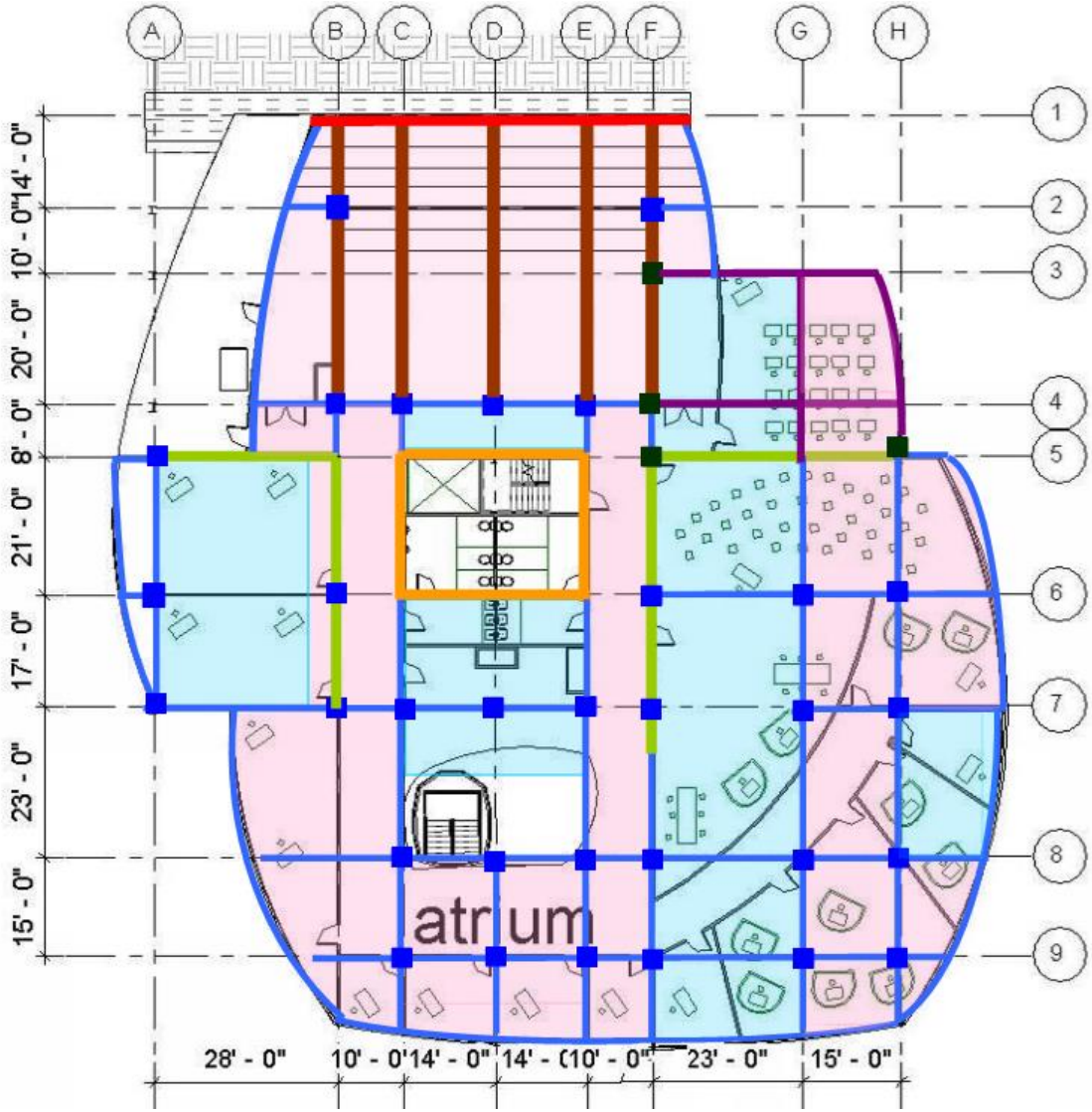
- Column: W12×170
- Beam: W18x76
- SP 5.25”x14”/4’
- SP 3.25”x9”/4’
- Retaining wall 10”
- Core wall 10”
- Shear wall 10”

LEVEL 1



- Column: W12×170
- Column: W14x311
- Beam: W16x31
- Beam: W18x76
- PT Timber: 8.5”x26”
- Framing: SP 5.25”x14”/4’
- Framing: SP 3.25”x9”/4’
- Retaining wall 10”
- Core wall 10”
- Shear wall 10”
- 3” Concrete slab

LEVEL 2

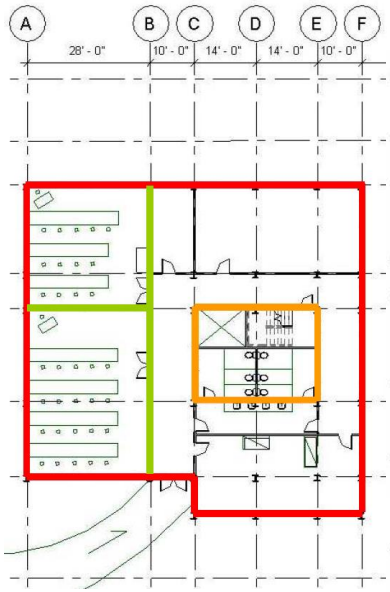


NORTH

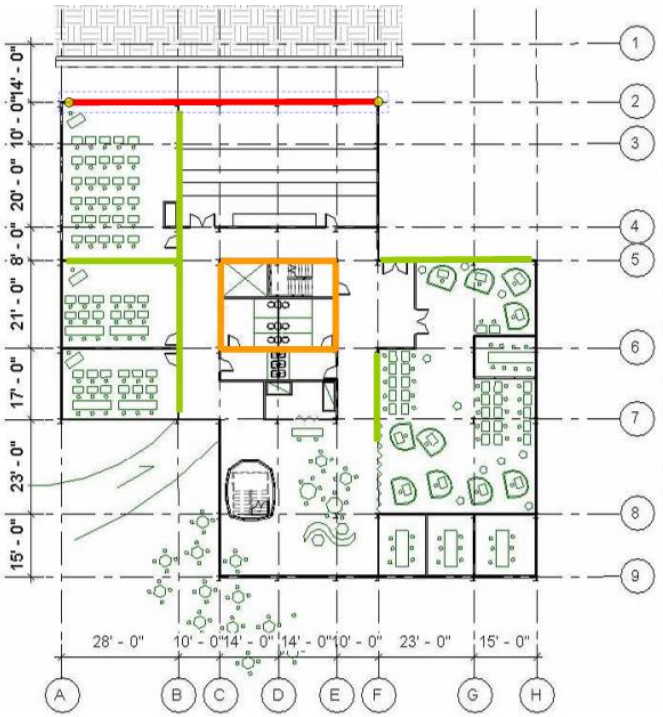
- Column: W12×170
- Column: W14x311
- Beam: W16x31
- Beam: W18x76
- PT Timber: 8.5”x26”
- Framing: SP 5.25”x14”/4’
- Framing: SP 3.25”x9”/4’
- Retaining wall 10”
- Core wall 10”
- Shear wall 10”
- 3” Concrete slab

LATERAL SYSTEM

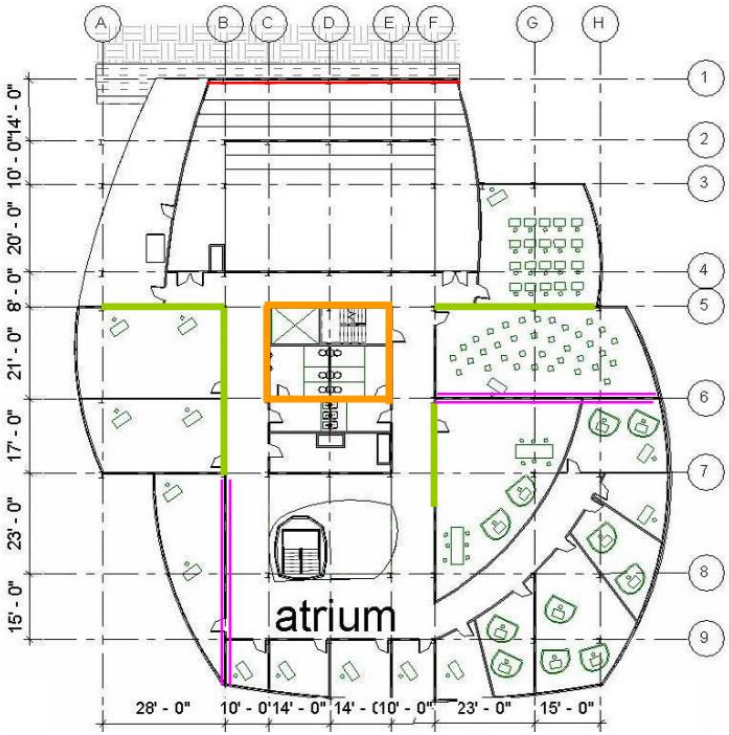
Basement



Level 1

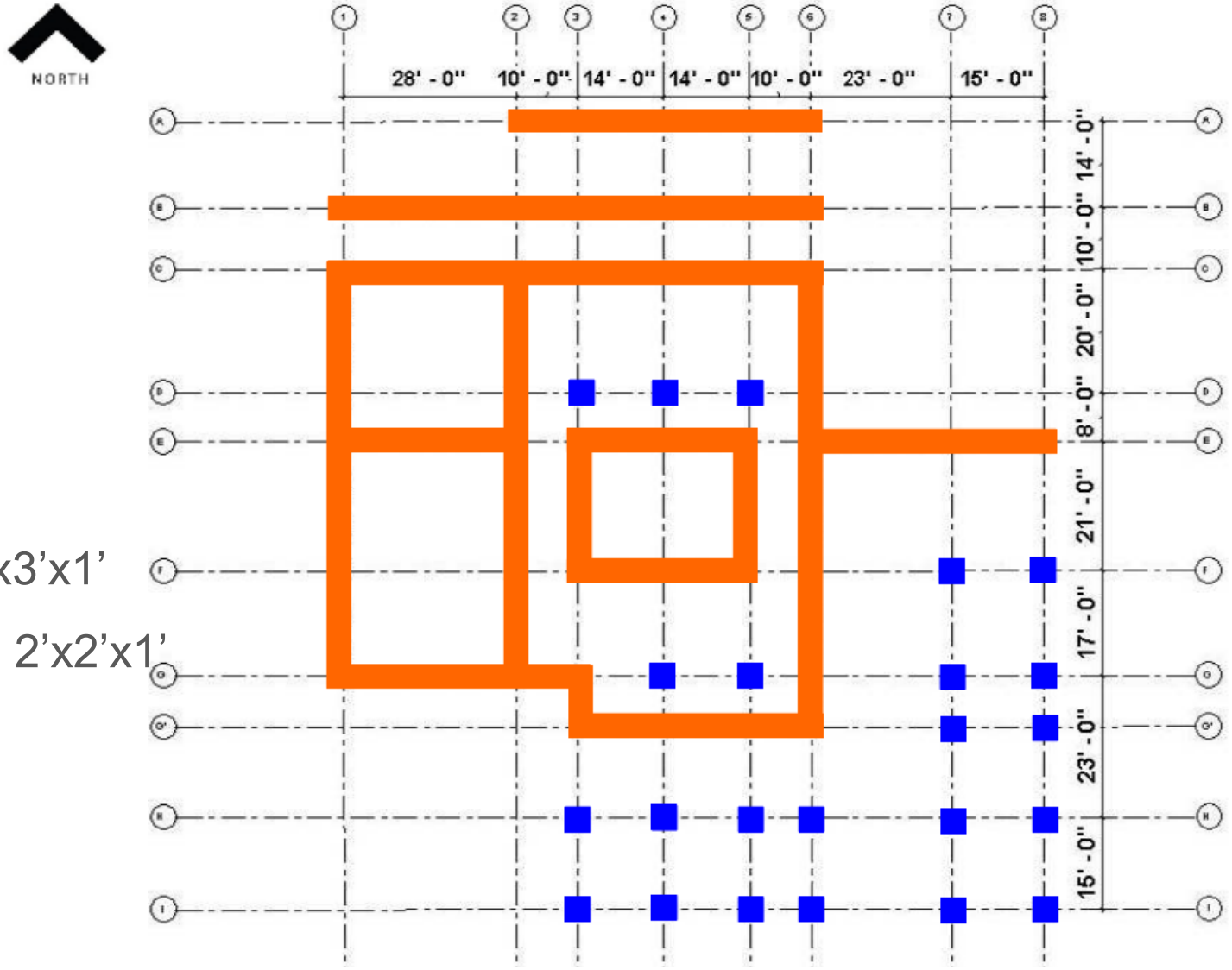


Level 2



- Retaining wall 10”
- Core wall 10”
- Shear wall 10”
- Lateral bracing
- Moment resisting

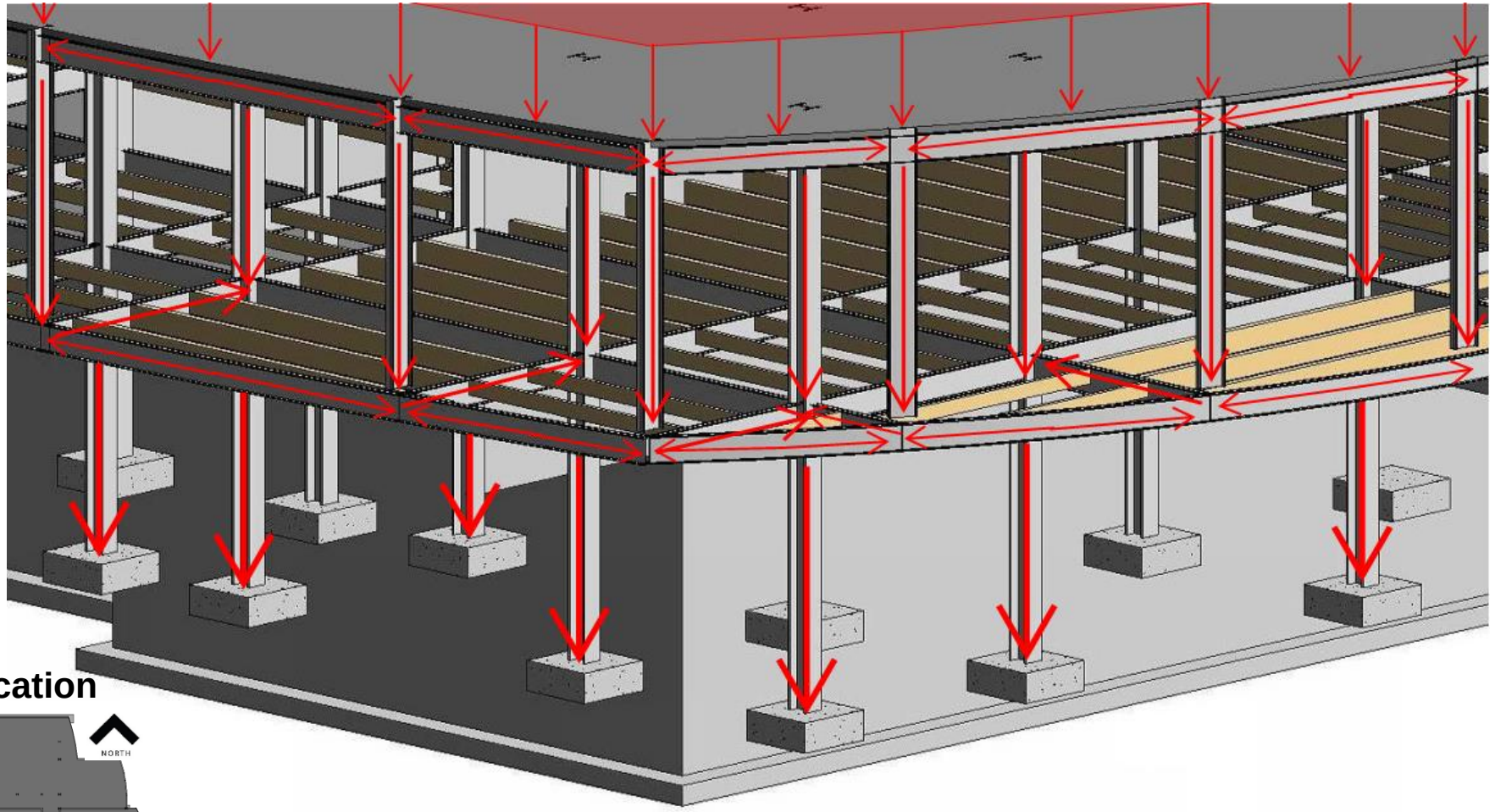
FOUNDATION LAYOUT



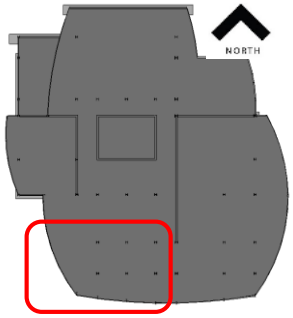
Line footing 1'x3'x1'

Spread footing 2'x2'x1'

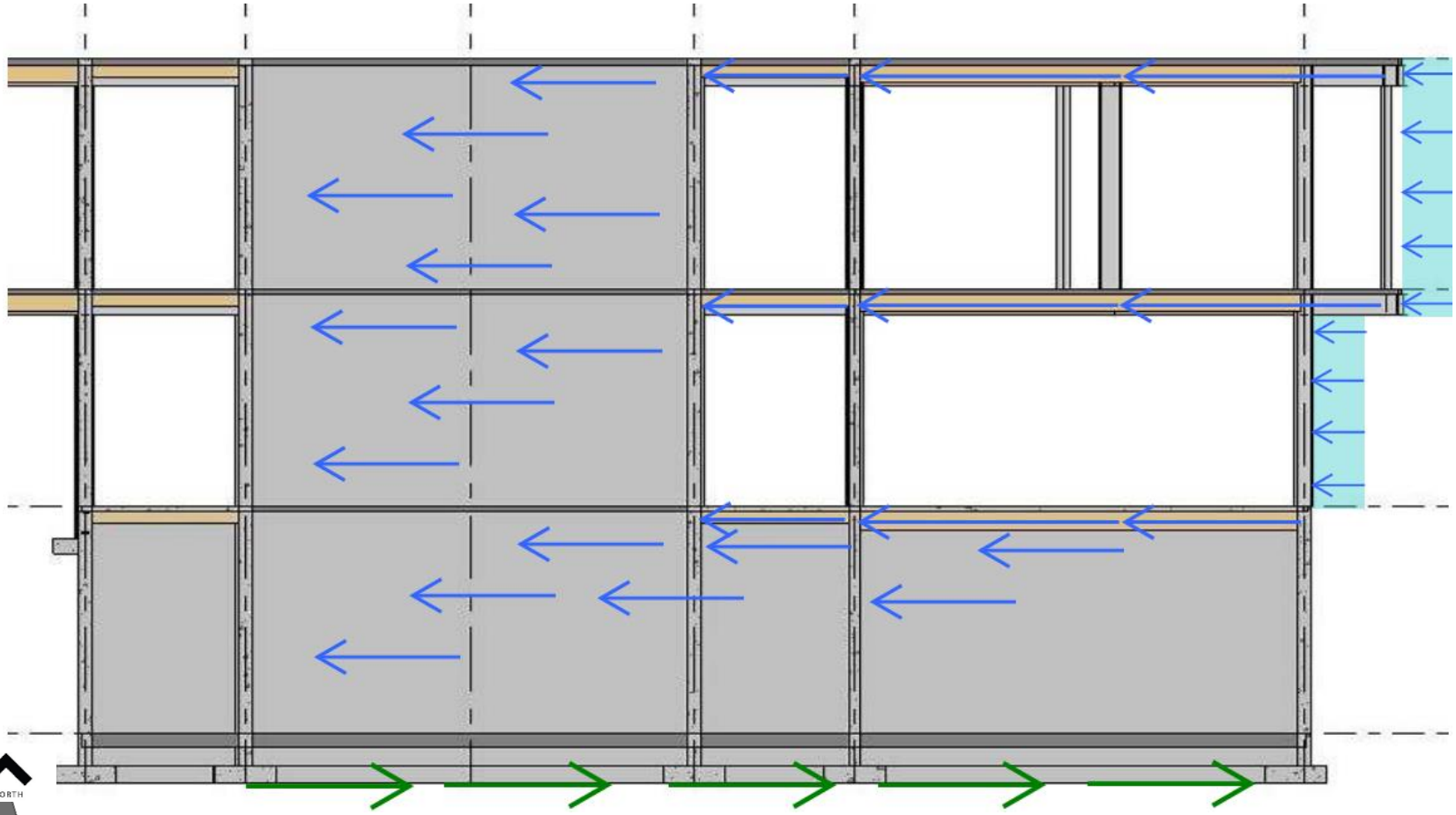
LOAD PATH - GRAVITY



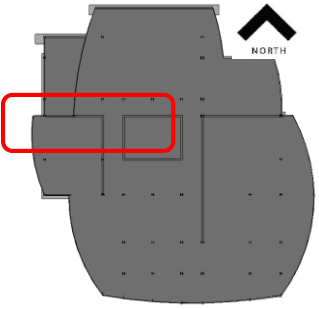
Location



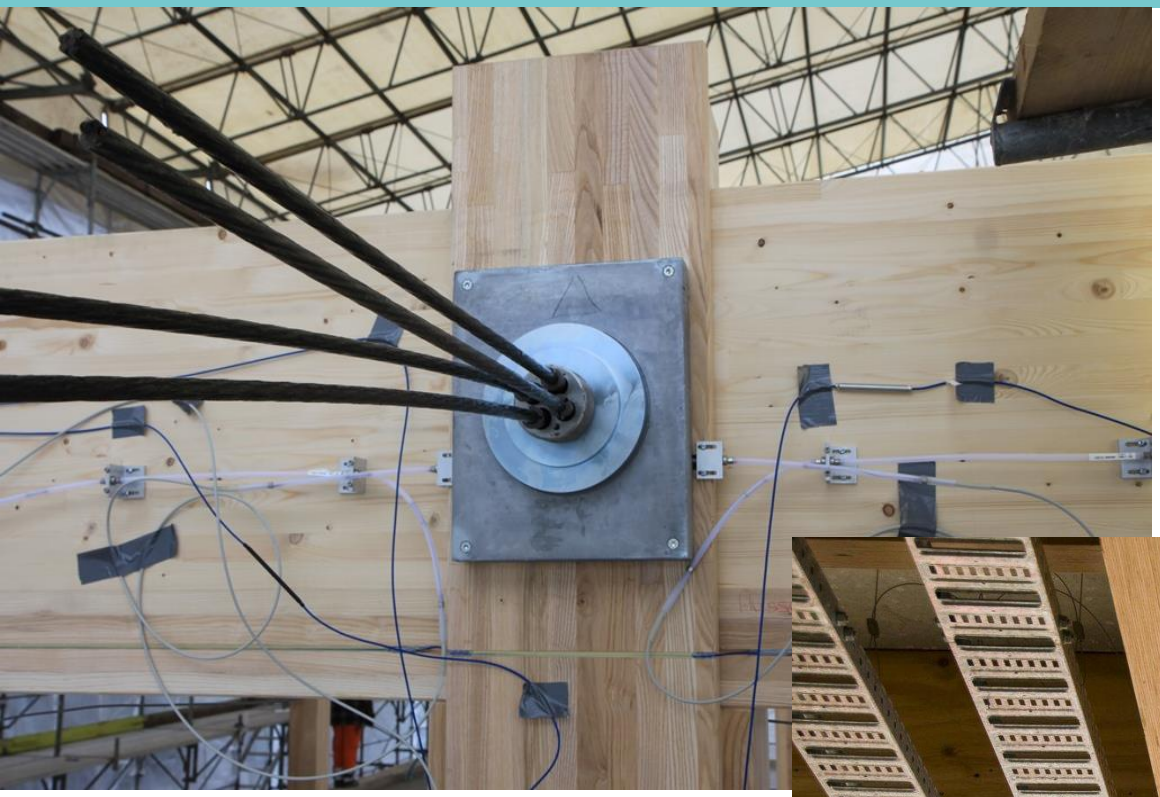
LOAD PATH - LATERAL



Location

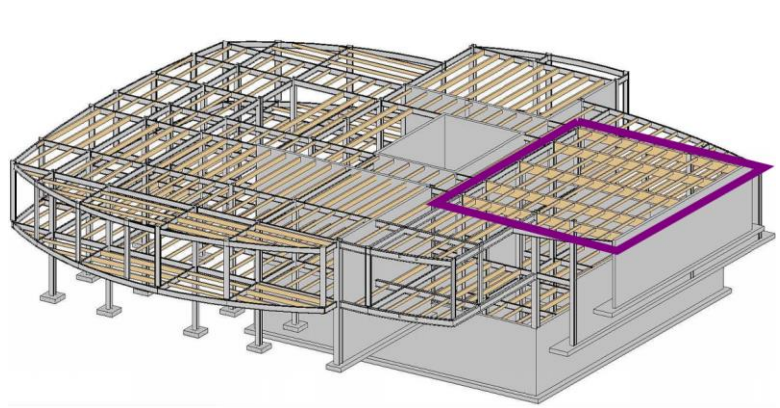


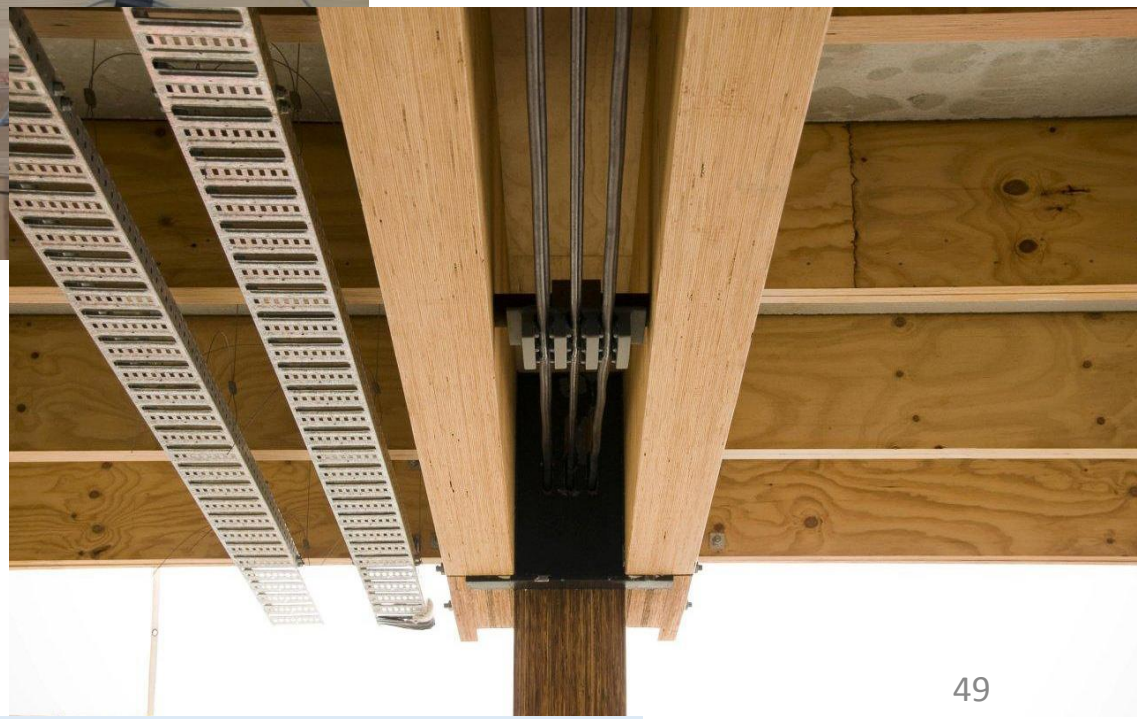
AUDITORIUM SPAN



Post-Tensioned Timber beam:

- Larger span
- More shallow beam
- Damage control design





RADIANT HEATING & COOLING

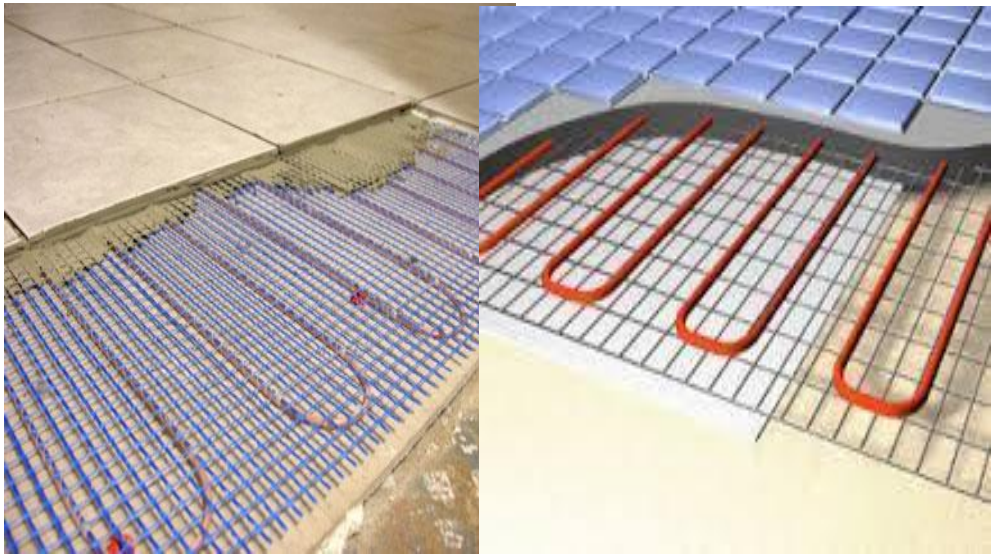
MEP - ICE PLANT - COMPOSITE:

General:

- Radiant Heating & Cooling
- DOAS
- Forced Air System for peaks

Auditorium:

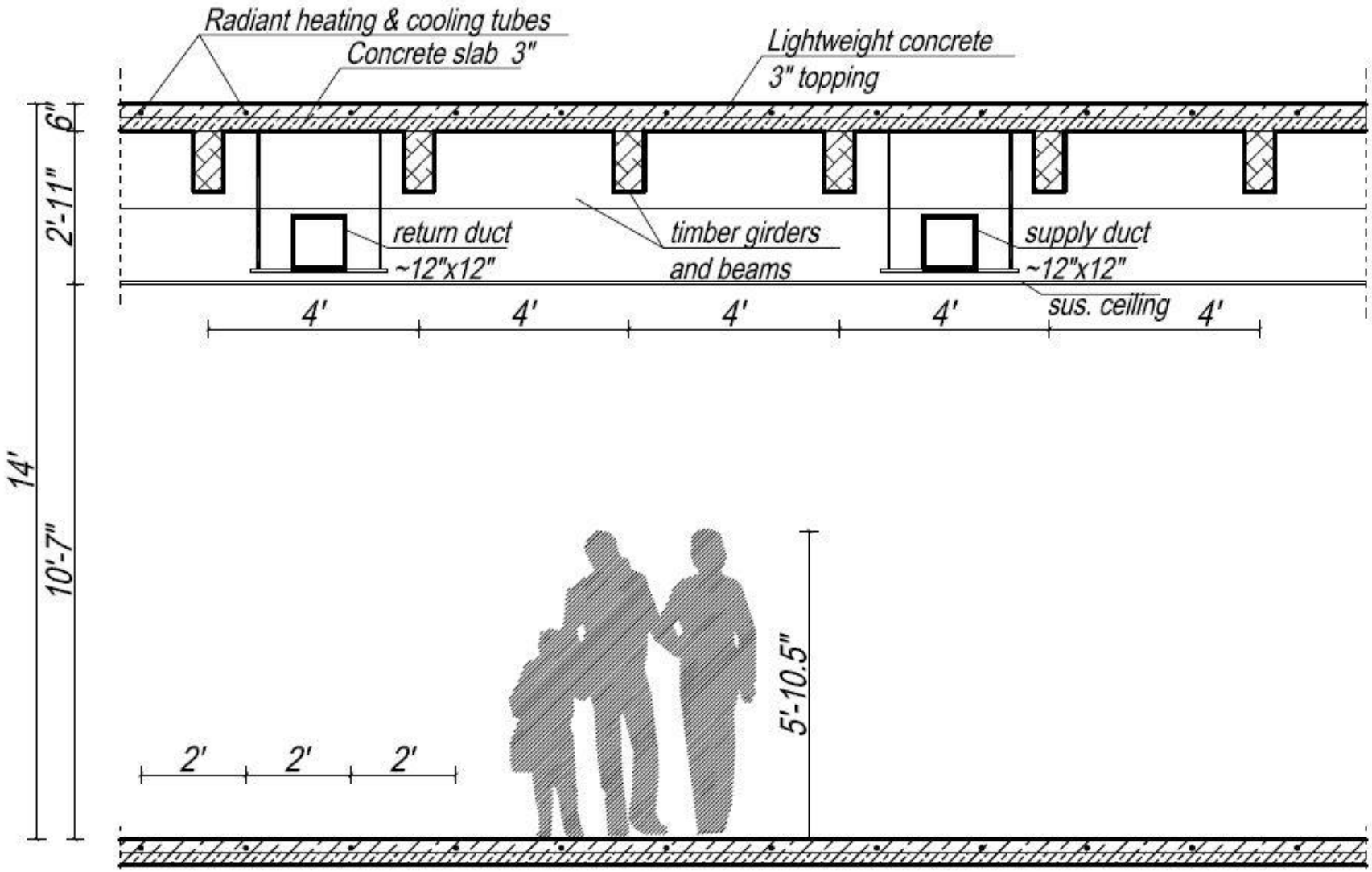
- Displacement Ventilation



\+ Use of reclaimed water
\+ Efficient hydronics
\+ Heats occupants directly

\- Low capacity
\- High cost
\- Difficult maintenance

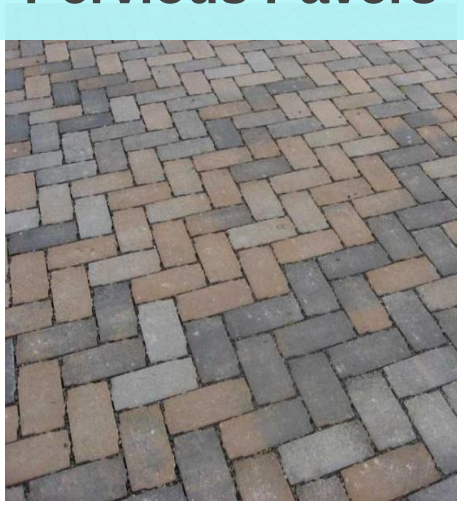
FLOOR SANDWICH



WATER CHALLENGE - ICE PLANT

HYGRO

Pervious Pavers



Recycled Water

Water Feature

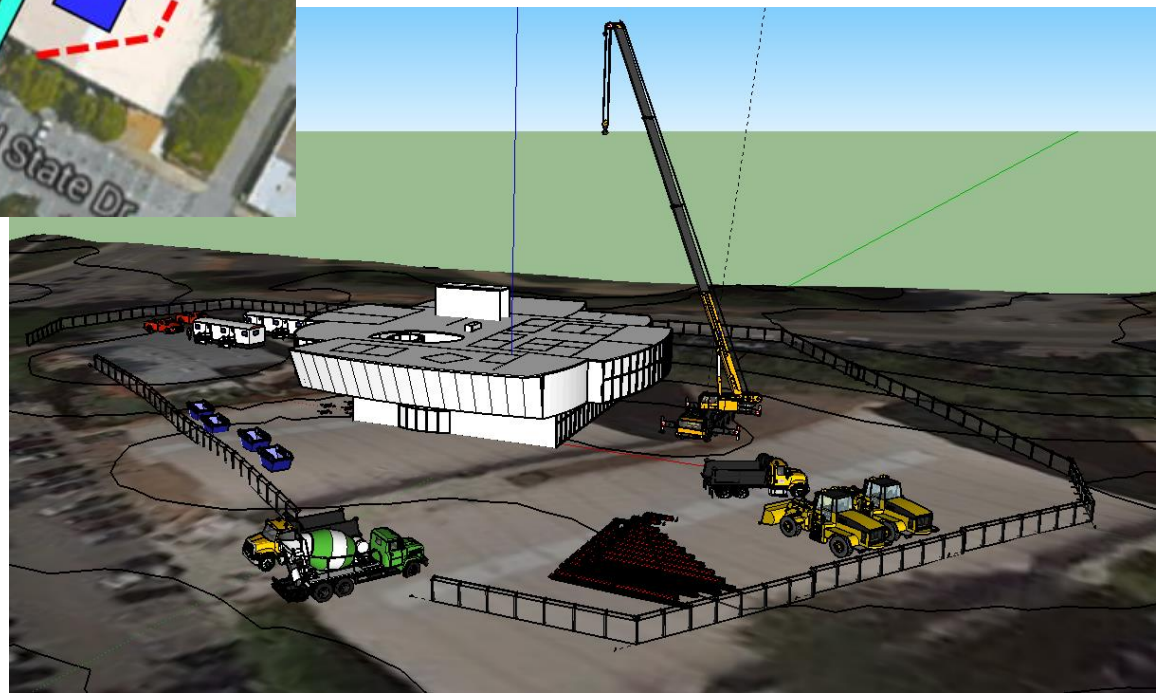
SITE LOGISTICS - ICE PLANT

Legend

- Employee Entrance
- Parking
- Field Trailers
- Building Footprint
- Waste & Recycling
- Crane
- Equipment/Supplies Entrance
- Material Storage
- Equipment Parking

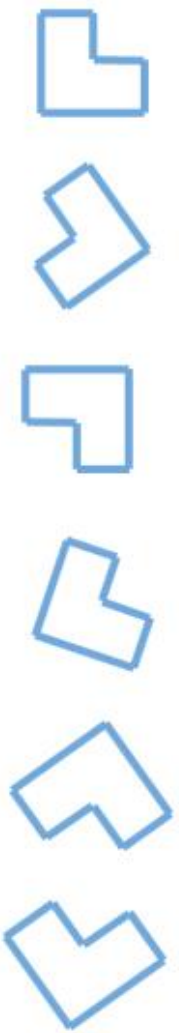
Key Goals

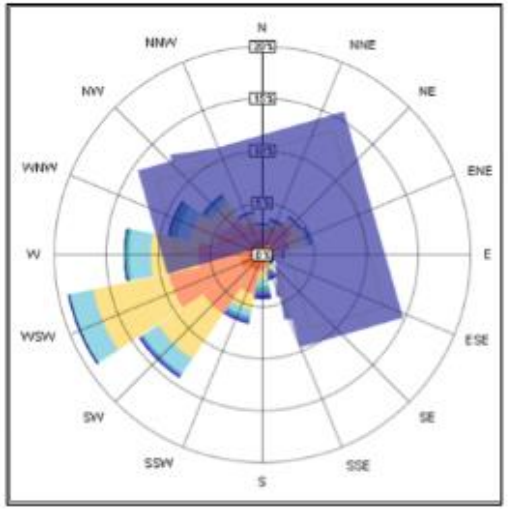
1. Safety
2. Latency
3. Reduce construction site footprint



BIG IDEA – WATER FLOW

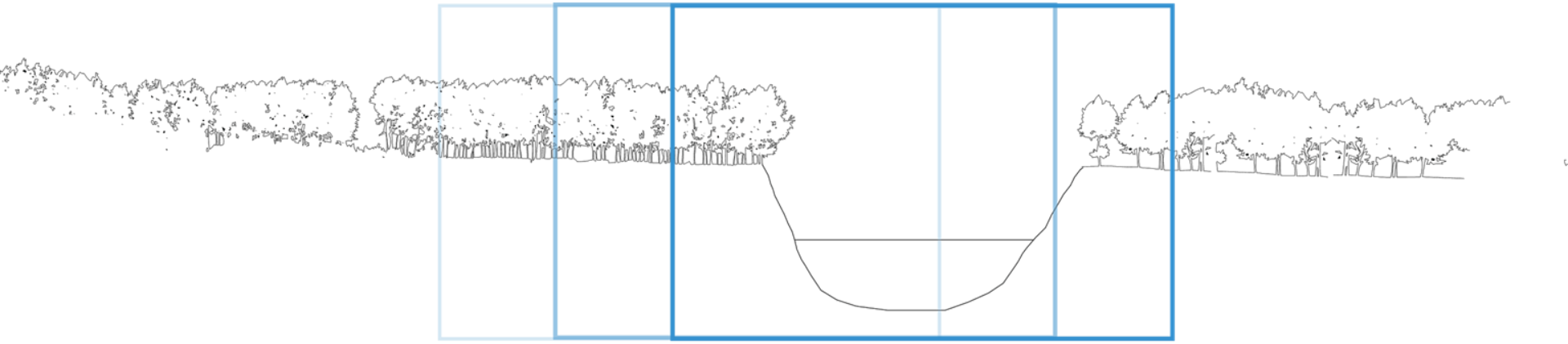
FOOTPRINT ORIENTATION





Evolution of chosen footprint

VIEWS IDEA



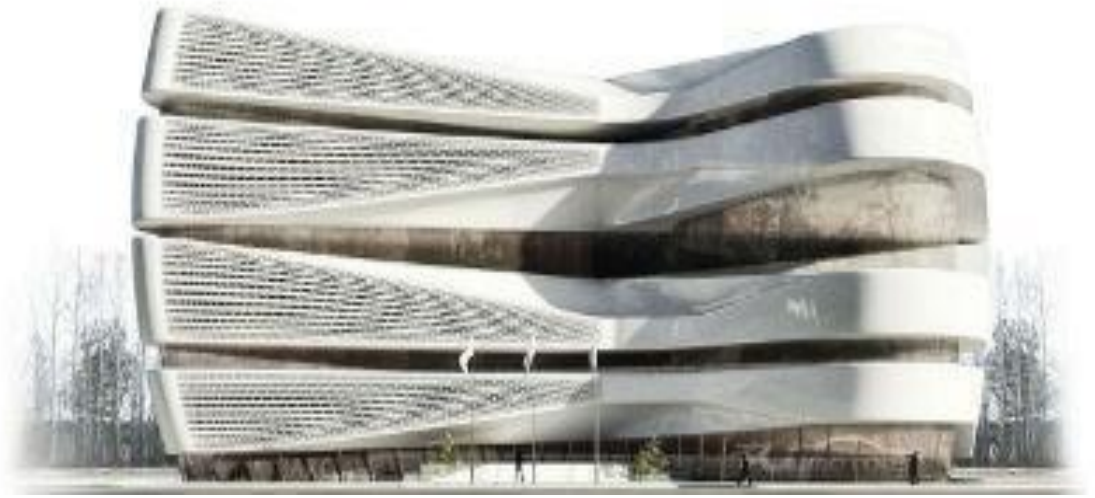
LAKE MERCED & FOREST

VIEWS

NORTH

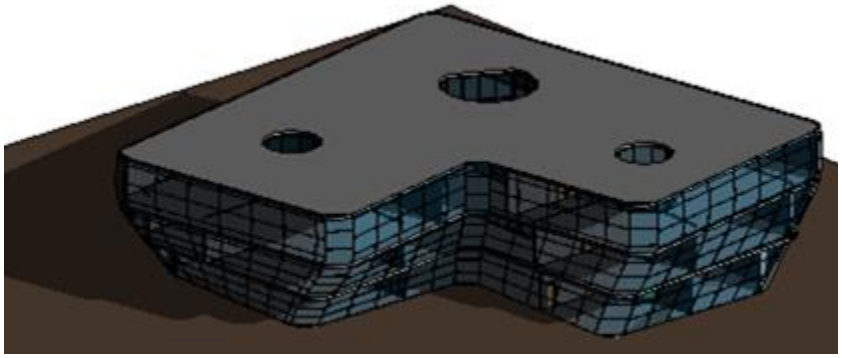
OUR BUILDING

INSPIRATIONS

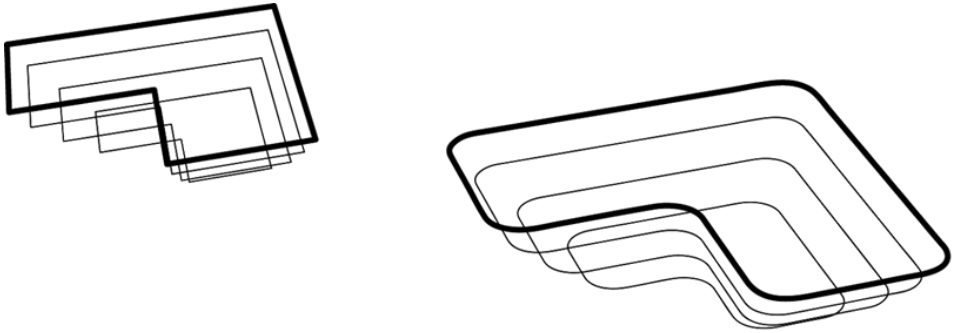


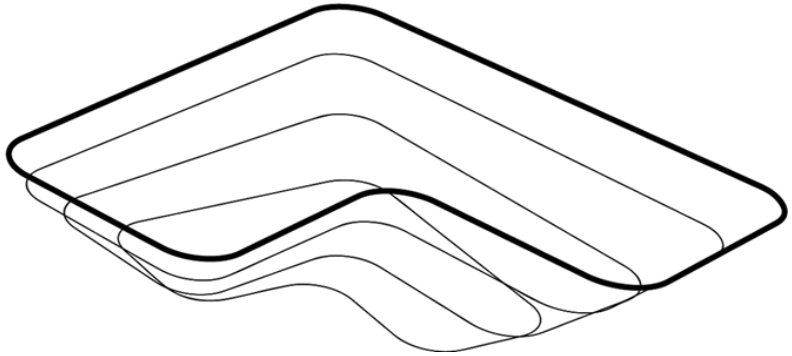
EVOLUTION

WINTER SOLSTICE

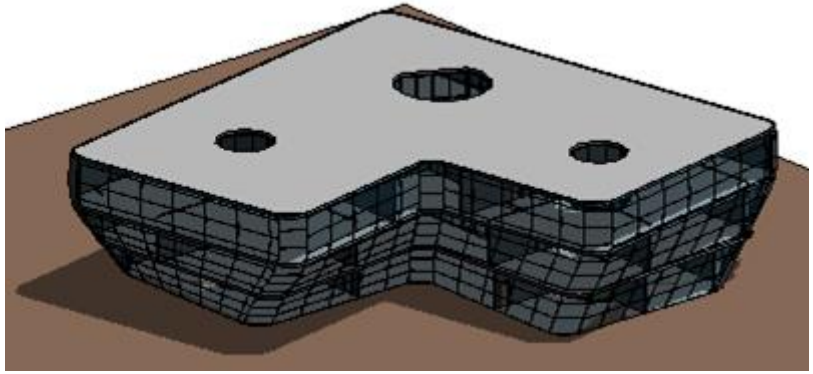


Increased Solar Gains



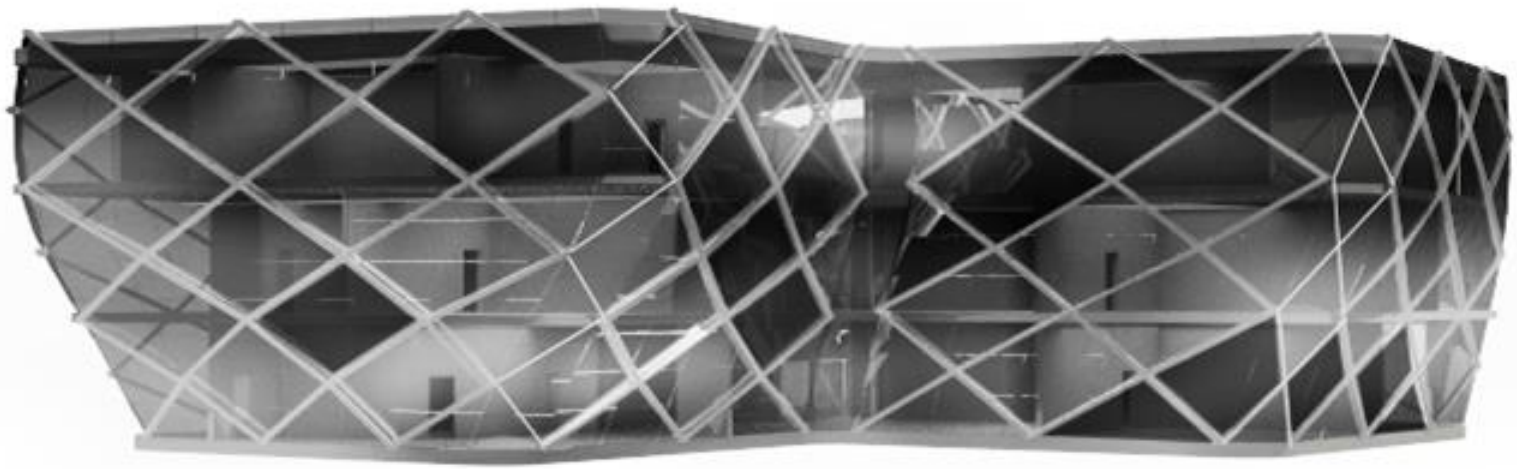


SUMMER SOLSTICE



Self-Shading

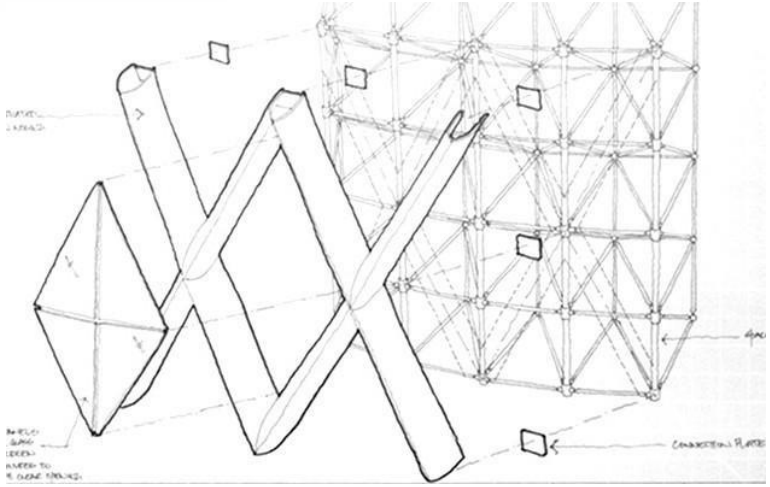
EXAMPLE 3D VIEW (ELEVATION)



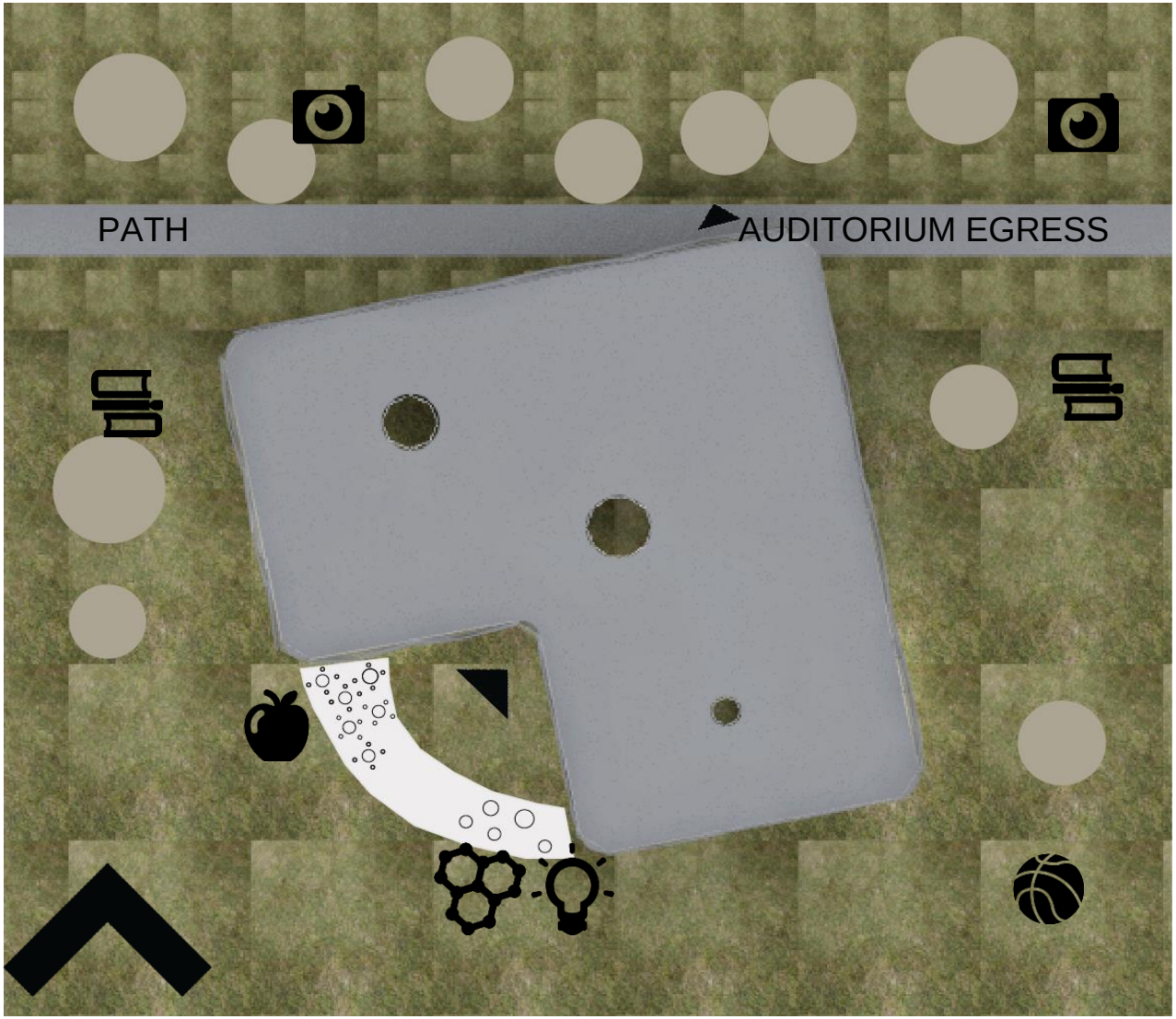
NORTH

ENTRANCE

PANEL IDEA



SURROUNDINGS



SNACK SPACE

COLLABORATION SPACE

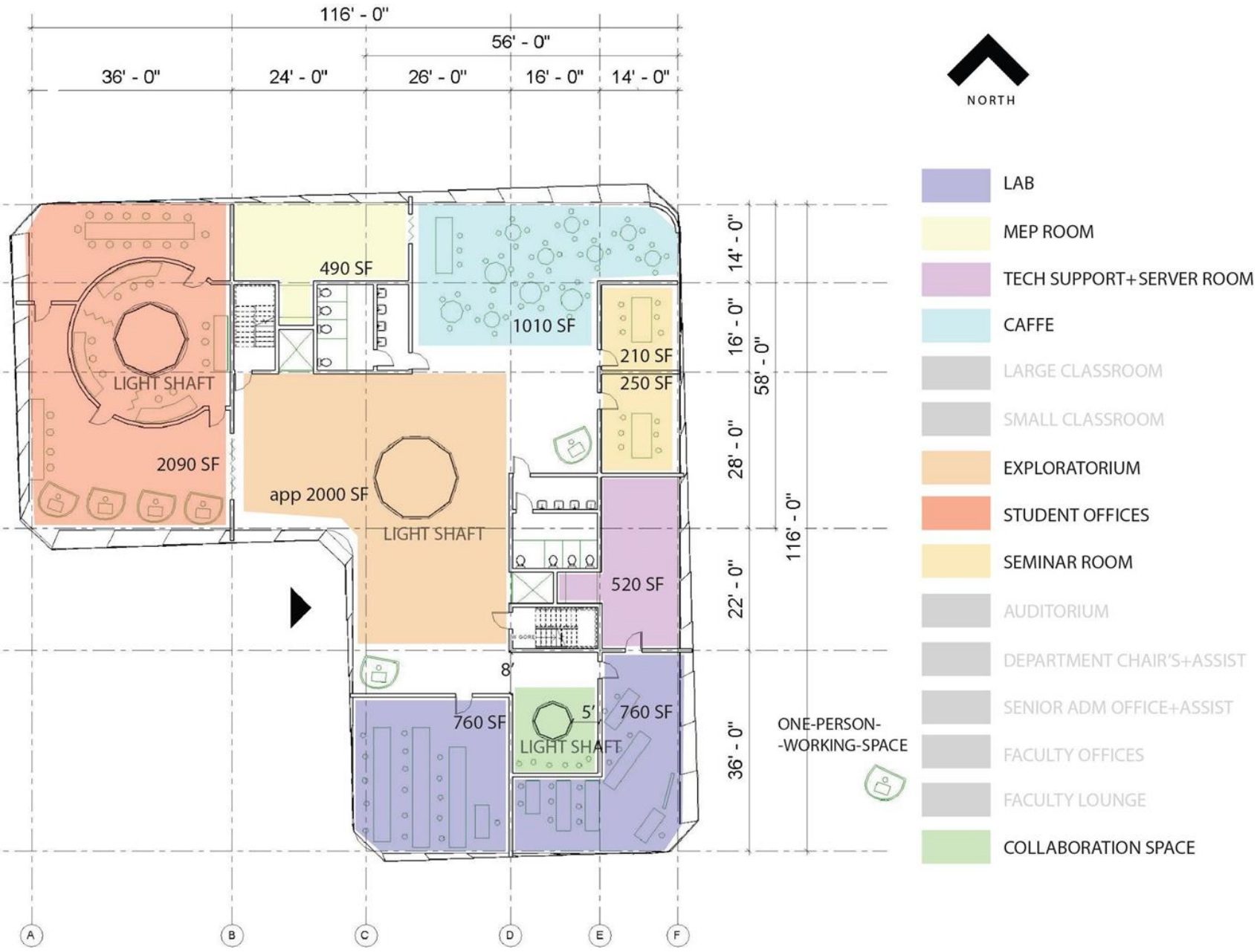
FOCUS SPACE

INSPIRATION SPACE

BEAUTIFUL VIEWS

RECREATION SPACE

BASEMENT


116' - 0"
56' - 0"
36' - 0"
24' - 0"
26' - 0"
16' - 0"
14' - 0"
NORTH
490 SF
1010 SF
210 SF
250 SF
LIGHT SHAFT
2090 SF
app 2000 SF
LIGHT SHAFT
520 SF
8'
760 SF
5'
760 SF
LIGHT SHAFT
14' - 0"
16' - 0"
58' - 0"
28' - 0"
116' - 0"
22' - 0"
36' - 0"
ONE-PERSON-
-WORKING-SPACE
A
B
C
D
E
F
LAB
MEP ROOM
TECH SUPPORT+SERVER ROOM
CAFFE
LARGE CLASSROOM
SMALL CLASSROOM
EXPLORATORIUM
STUDENT OFFICES
SEMINAR ROOM
AUDITORIUM
DEPARTMENT CHAIR'S+ASSIST
SENIOR ADM OFFICE+ASSIST
FACULTY OFFICES
FACULTY LOUNGE
COLLABORATION SPACE

LEVEL 1

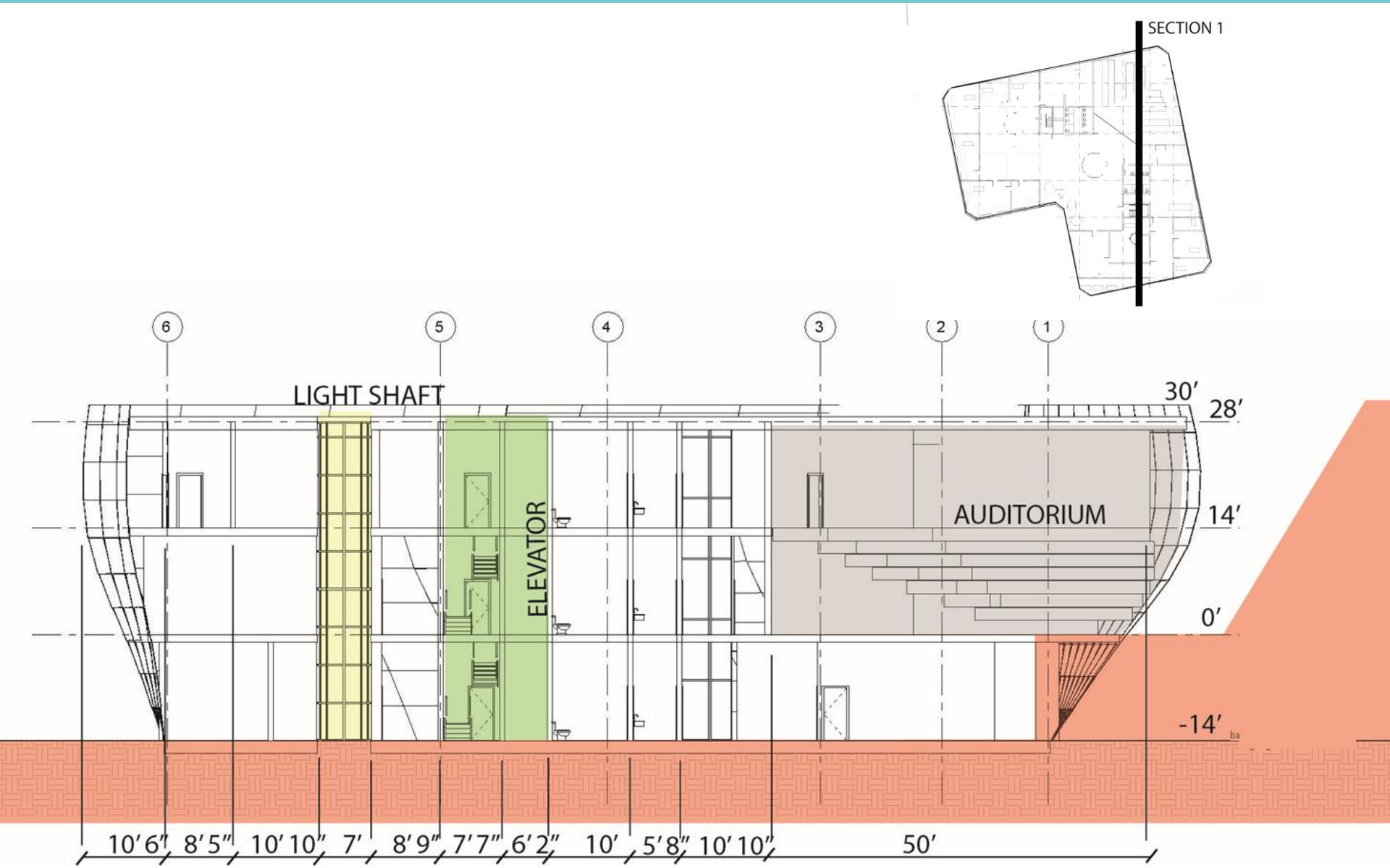
- LAB
- MEP ROOM
- TECH SUPPORT+SERVER ROOM
- CAFFE
- LARGE CLASSROOM
- SMALL CLASSROOM
- EXPLORATORIUM
- STUDENT OFFICES
- SEMINAR ROOM
- AUDITORIUM
- DEPARTMENT CHAIR'S+ASSIST
- SENIOR ADM OFFICE+ASSIST
- FACULTY OFFICES
- FACULTY LOUNGE
- COLLABORATION SPACE

LEVEL 2

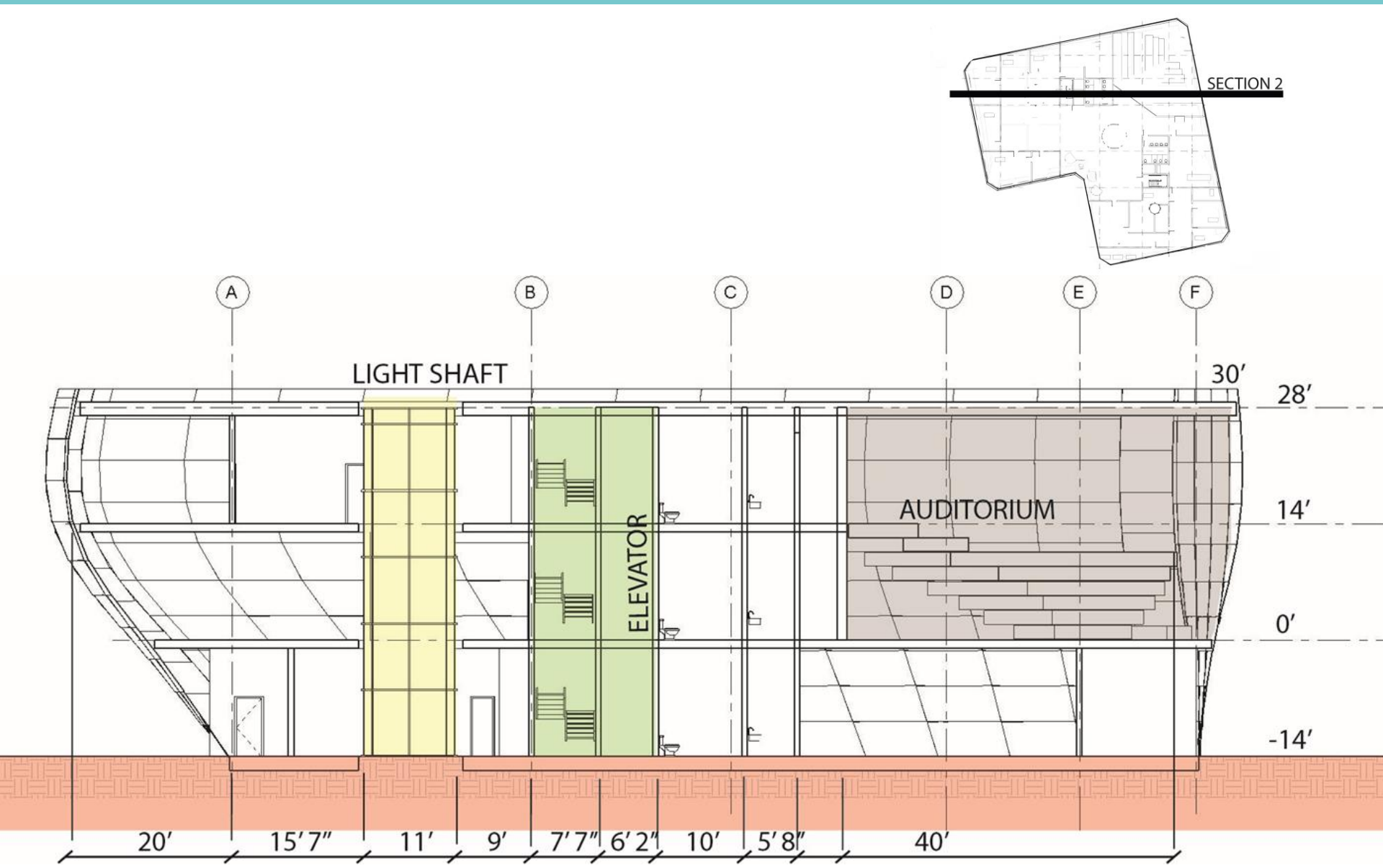
NORTH

- LAB
- MEP ROOM
- TECH SUPPORT+SERVER ROOM
- CAFFE
- LARGE CLASSROOM
- SMALL CLASSROOM
- EXPLORATORIUM
- STUDENT OFFICES
- SEMINAR ROOM
- AUDITORIUM
- DEPARTMENT CHAIR'S+ASSIST
- SENIOR ADM OFFICE+ASSIST
- FACULTY OFFICES
- FACULTY LOUNGE
- COLLABORATION SPACE

SECTION 1

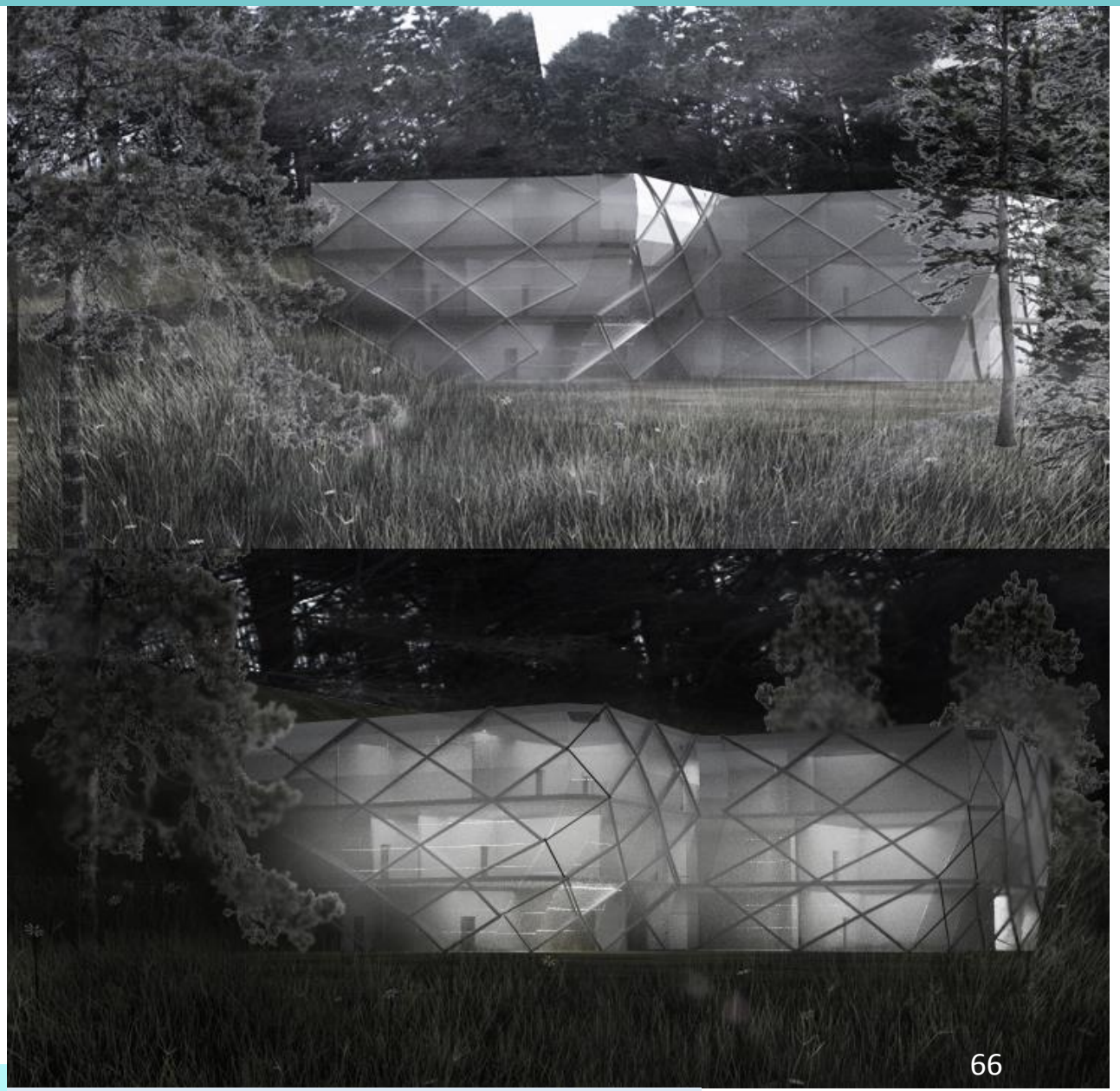

SECTION 1
6
5
4
3
2
1
LIGHT SHAFT
ELEVATOR
AUDITORIUM
30′
28′
14′
0′
-14′
10′ 6″
8′ 5″
10′ 10″
7′
8′ 9″
7′ 7″
6′ 2″
10′
5′ 8″
10′ 10″
50′

SECTION 2


SECTION 2
A
B
C
D
E
F
LIGHT SHAFT
ELEVATOR
AUDITORIUM
30′
28′
14′
0′
-14′
20′
15′ 7″
11′
9′
7′ 7″
6′ 2″
10′
5′ 8″
40′

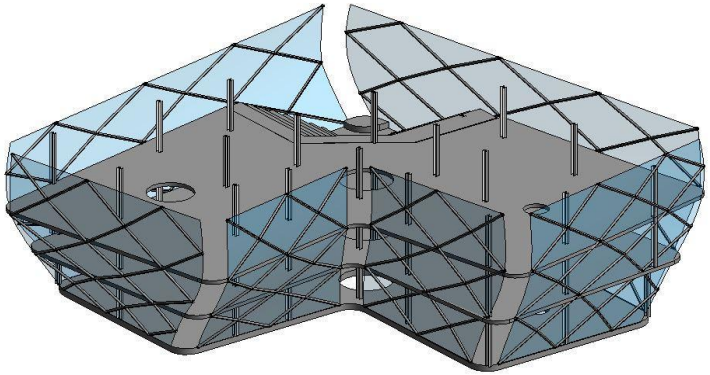
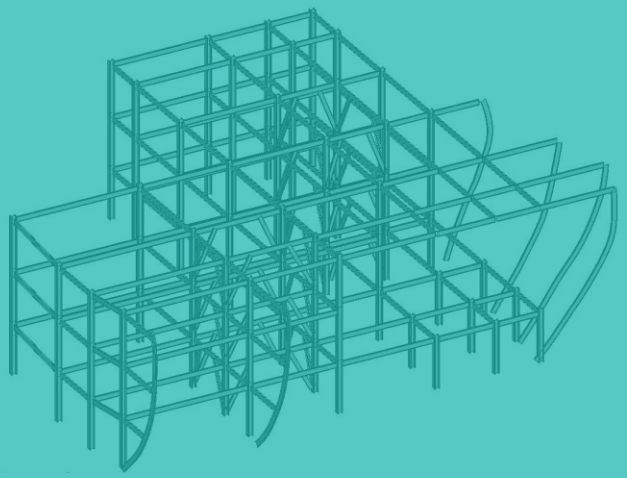
VIEW FROM SOUTH-WEST

NORTH



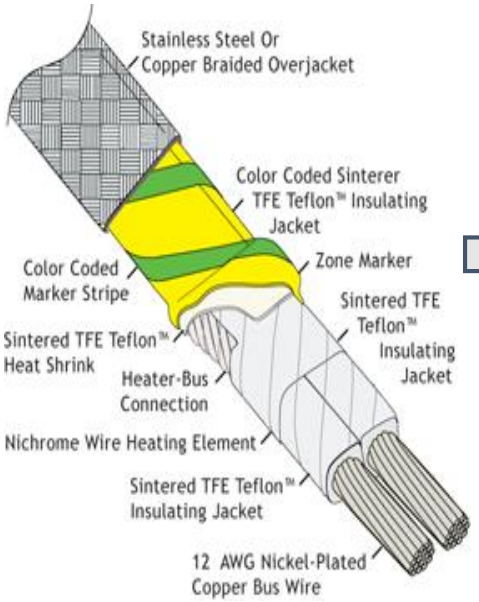
EFTE panels

STRUCTURAL SYSTEMS

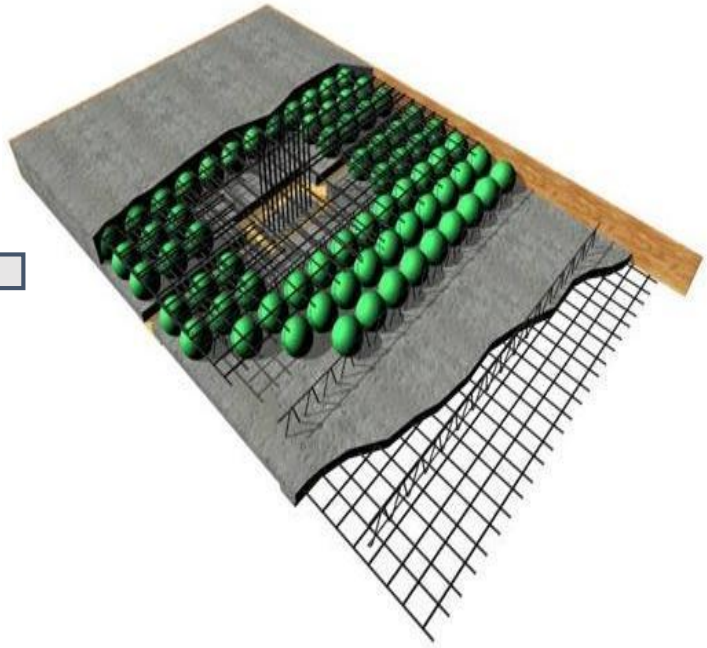
	Diagrid	Steel
3D View		
Gravity System	Column: W Section Floor: Bubble Deck + PT Slab	Girder: W Section Column: W Section Floor: Bubble Deck
Lateral System	Exterior Diagrid Systems	Eccentrically Braced Frame (EBF)

LARGE SPAN SOLUTION

Post Tensioning



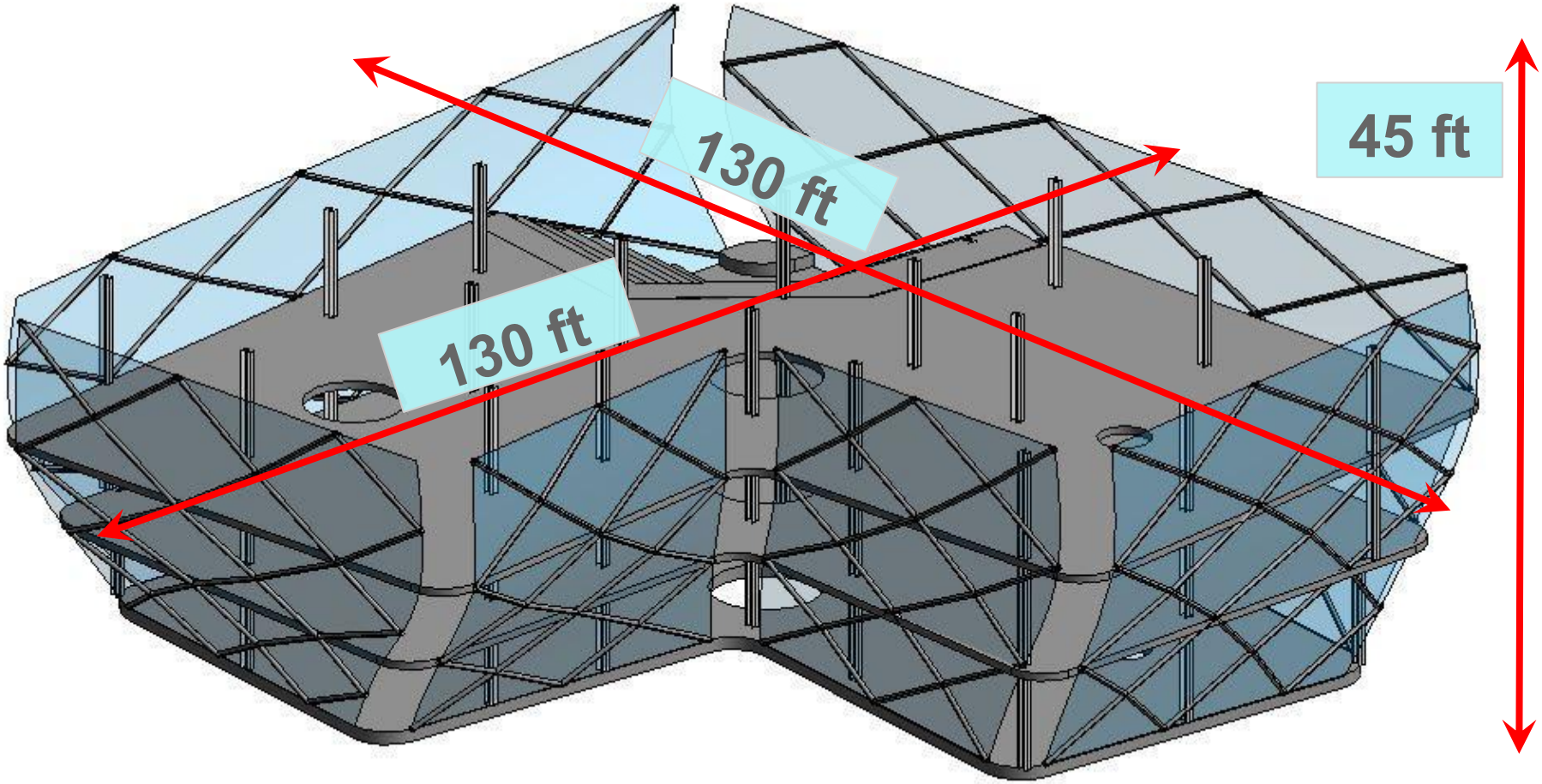
Bubbledeck



Spans up to 50 times slab height!

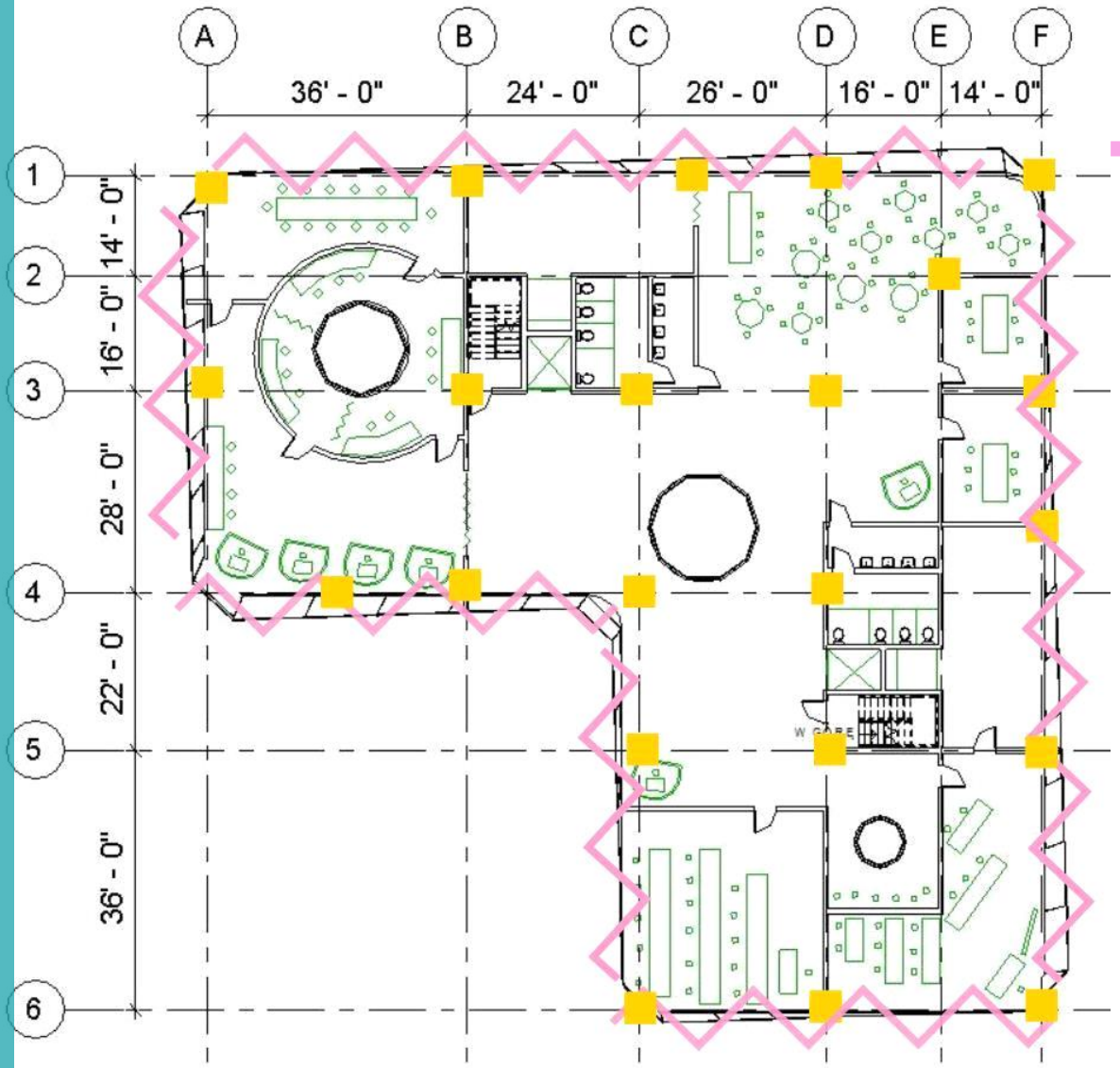
1ft deck = 50 ft span

3D - DIAGRID



Diagrid serves as lateral resistance systems

BASEMENT



Column: W14×90

Diagrid System

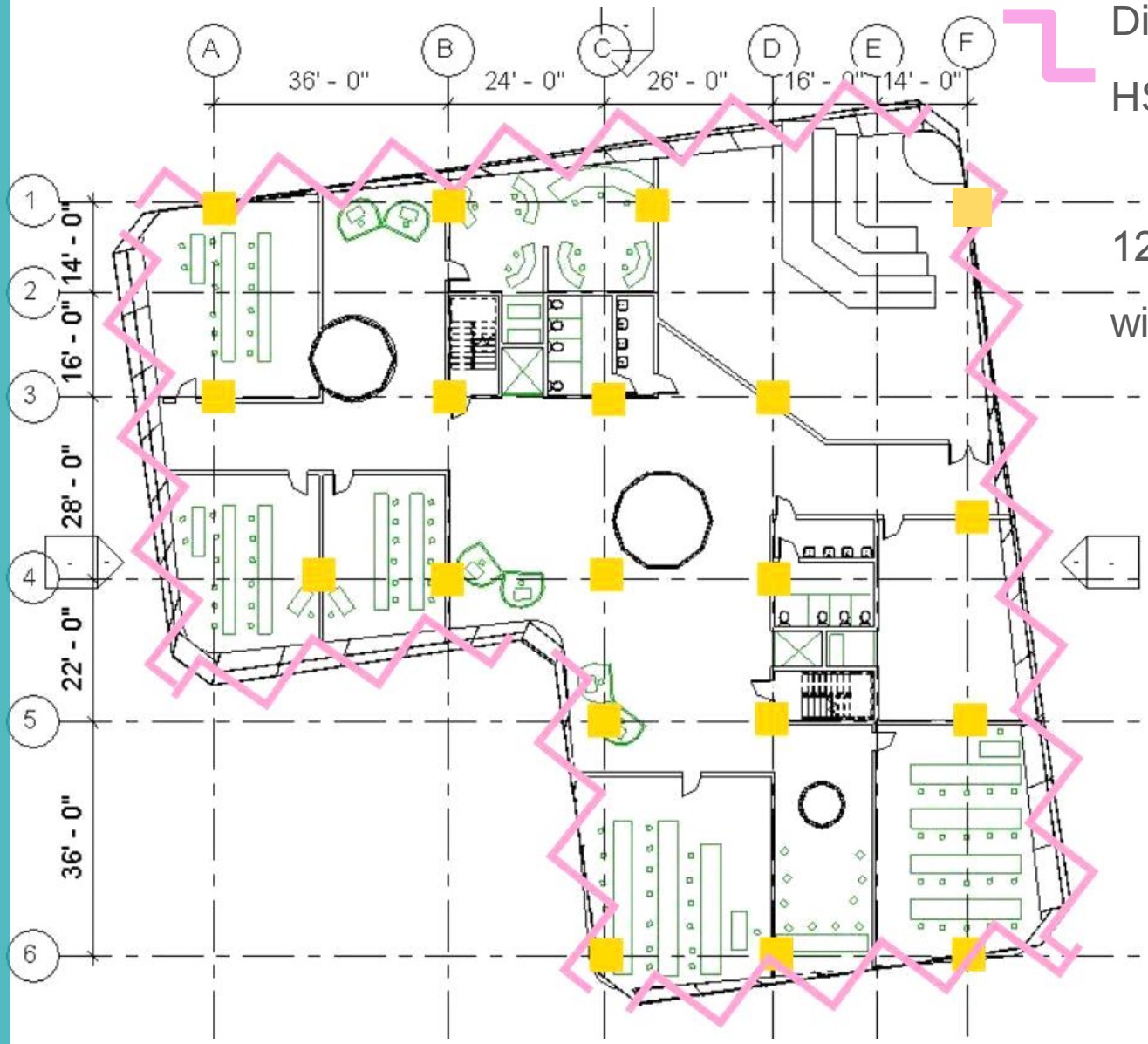
HSS 10x0.312

12’’ Bubble Deck slab

with Post Tensioning

NORTH

LEVEL 1



Column: W14×90

Diagrid System

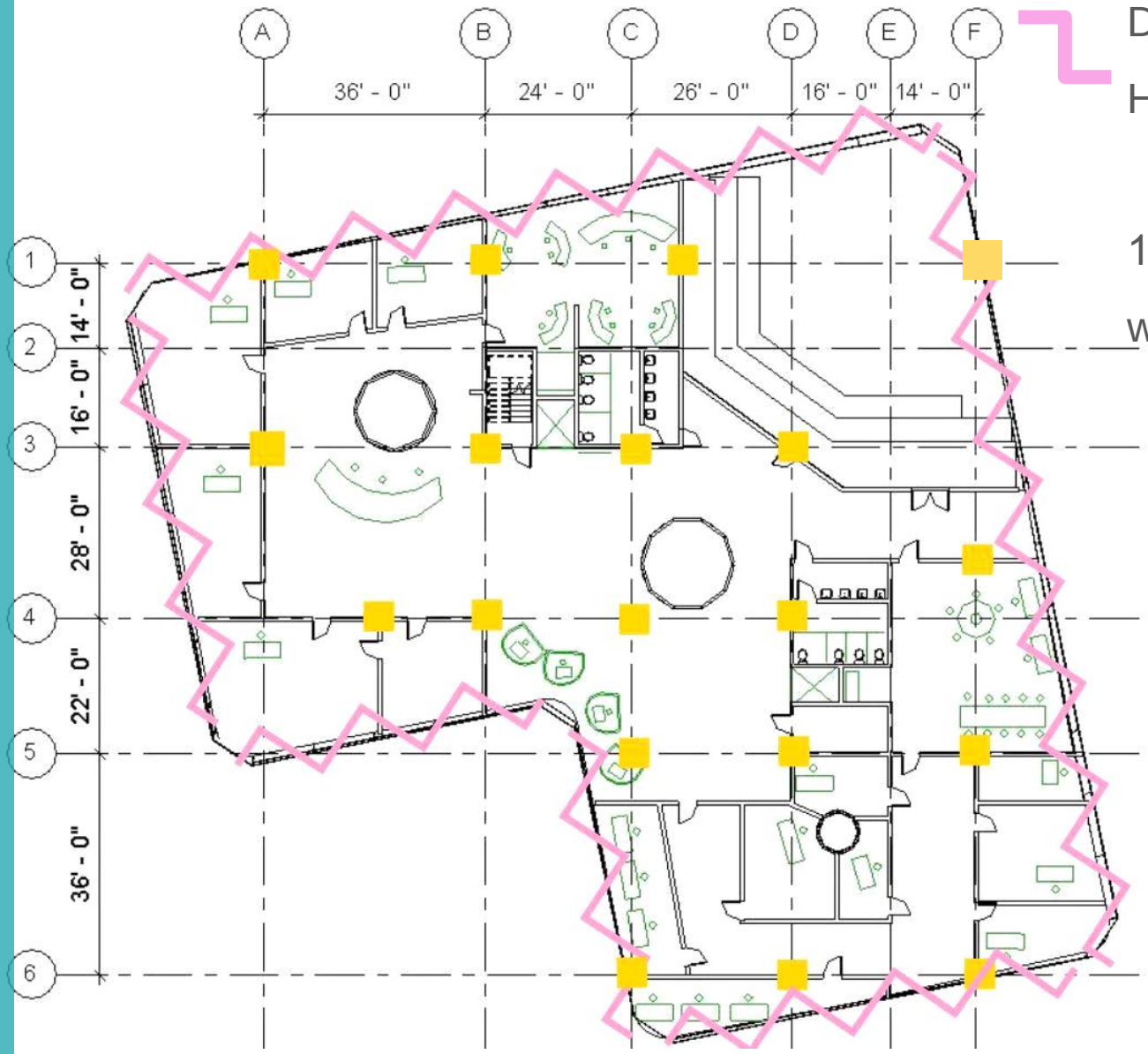
HSS 10x0.312

12'' Bubble Deck slab

with Post Tensioning

NORTH

LEVEL 2



Column: W14×90

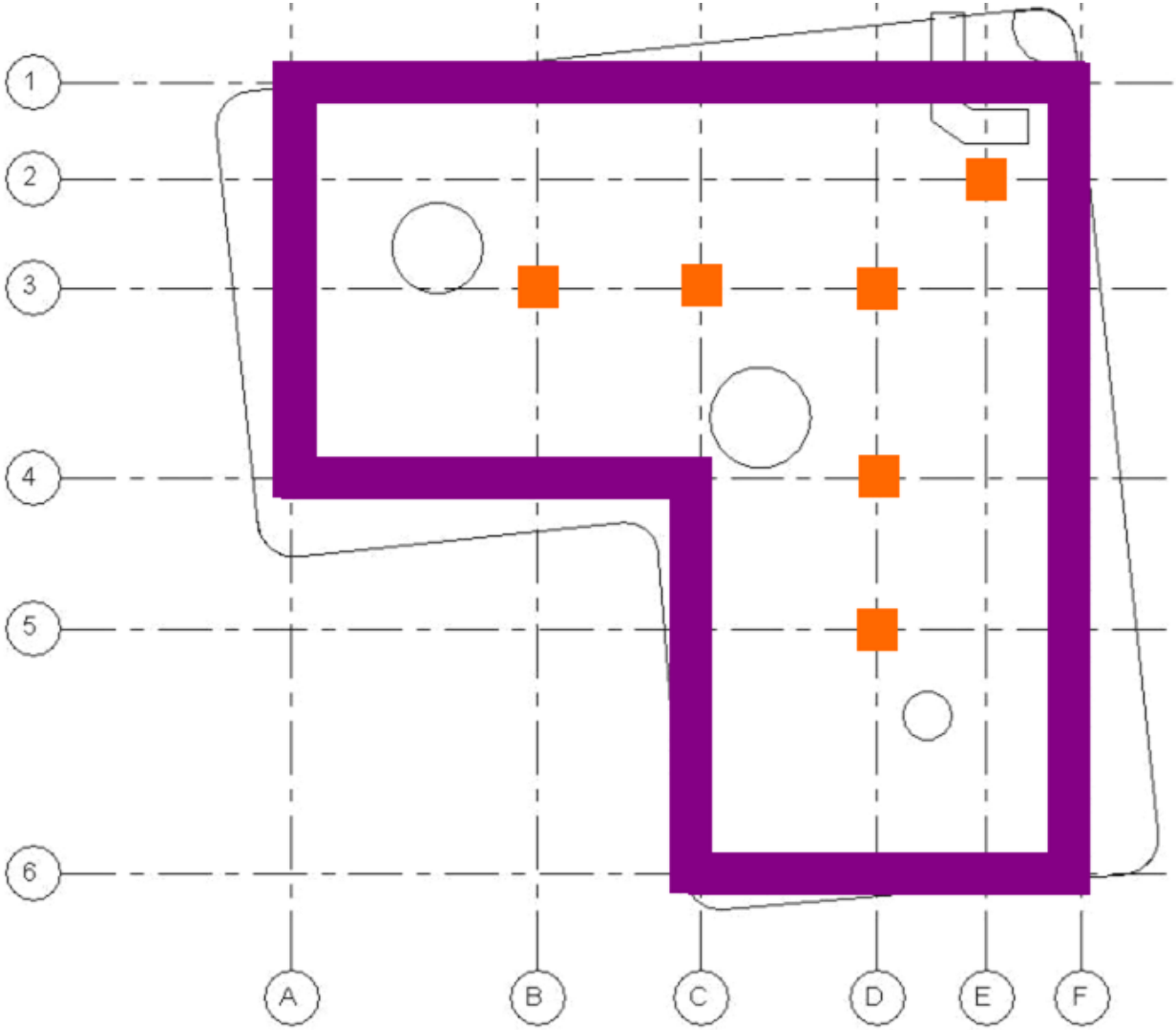
Diagrid System

HSS 10x0.312

12'' Bubble Deck slab with Post Tensioning

NORTH

FOUNDATION LAYOUT

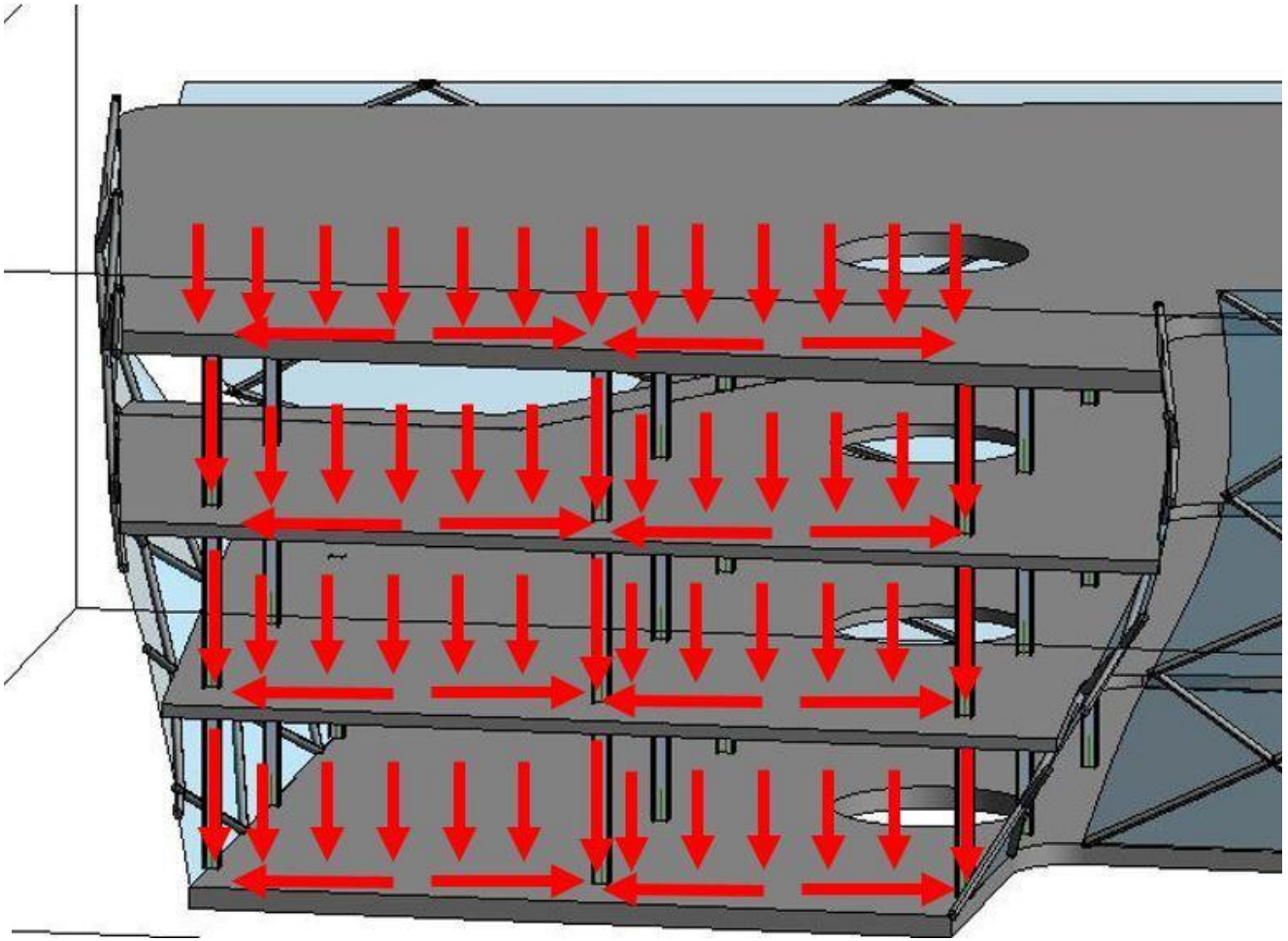


NORTH

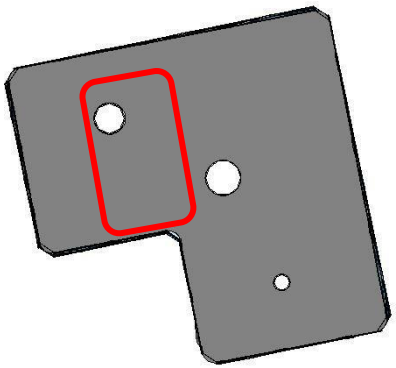
Spread footing: 3'x4'x1'

Line footing: 3'x1'x1'

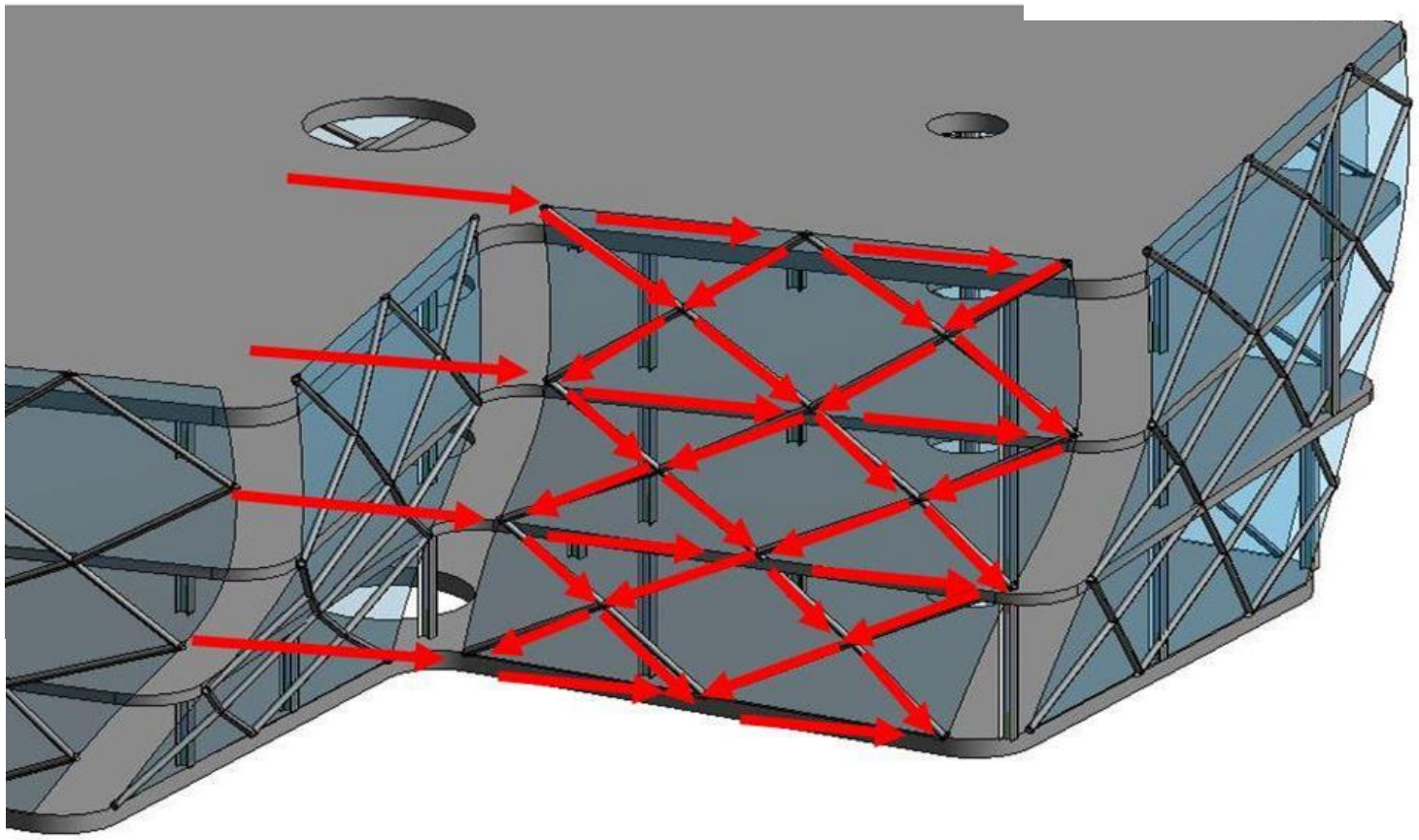
LOAD PATH - GRAVITY



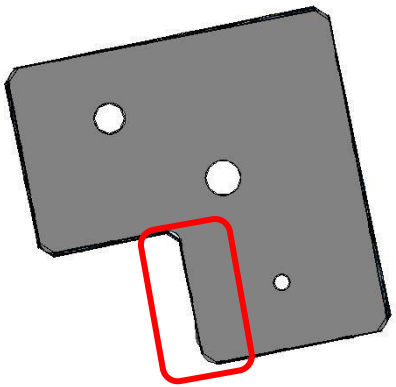
Location



LOAD PATH—LATERAL



Location



UNDERFLOOR AIR DISTRIBUTION

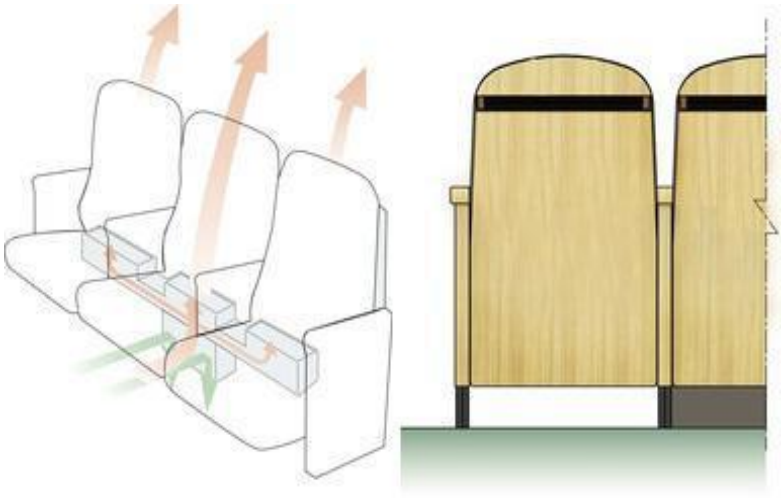
MEP SOLUTION FOR DIAGRID :

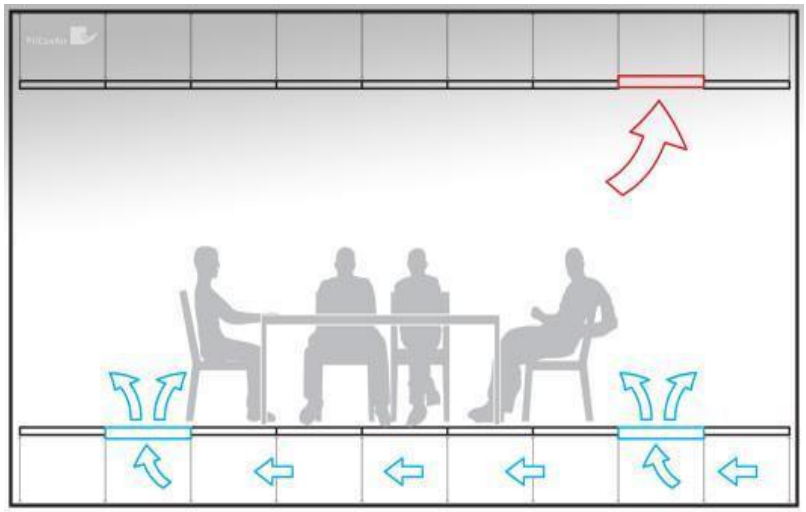
General:

- Underfloor Air Distribution

Auditorium:

- Ventilation Seats

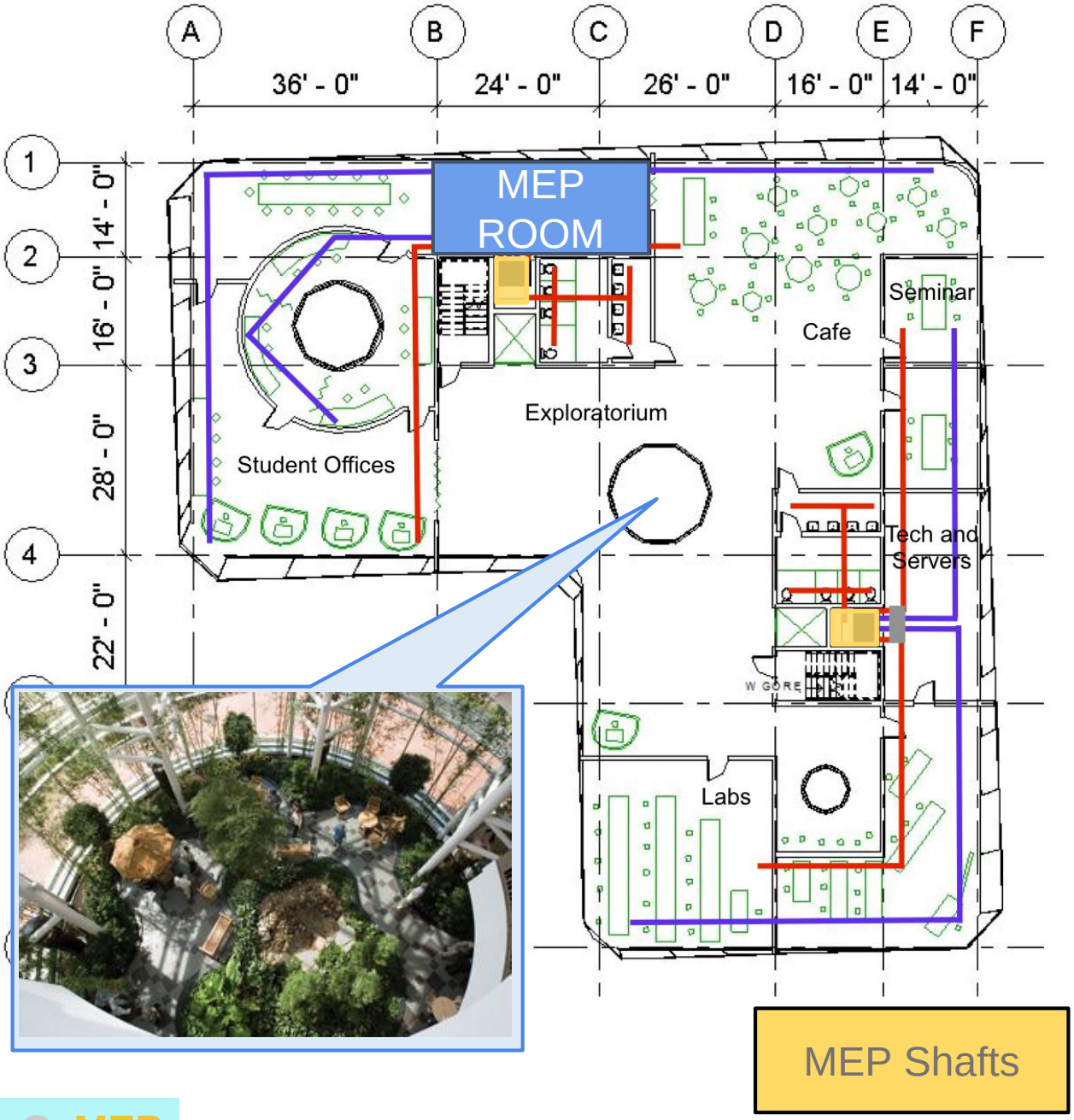




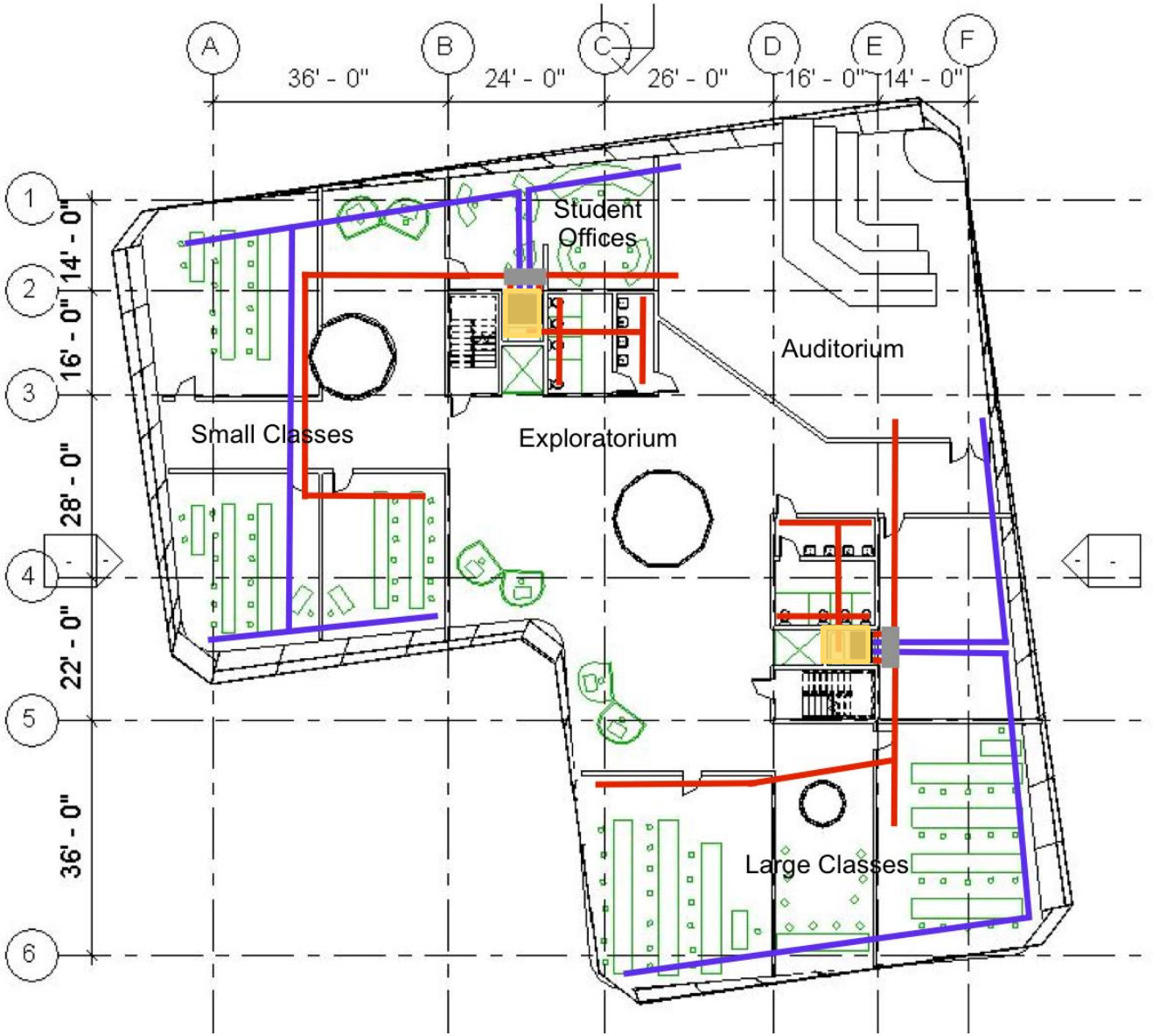
\+ User flexibility and control
\+ Minimal ductwork
\+ Easier discipline coordination

\- Dirt/dust in floor plenum
\- High cost
\- Potential air leakage

BASEMENT

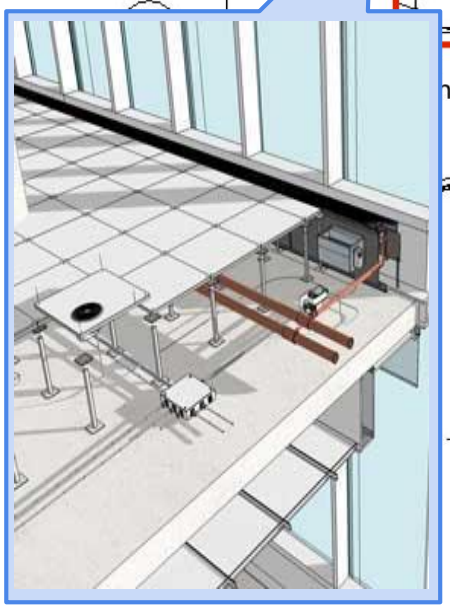

A
B
C
D
E
F
36' - 0"
24' - 0"
26' - 0"
16' - 0"
14' - 0"
1
2
3
4
16' - 0"
14' - 0"
28' - 0"
22' - 0"
MEP ROOM
Student Offices
Exploratorium
Cafe
Seminar
Tech and Servers
Labs
MEP Shafts

LEVEL 1



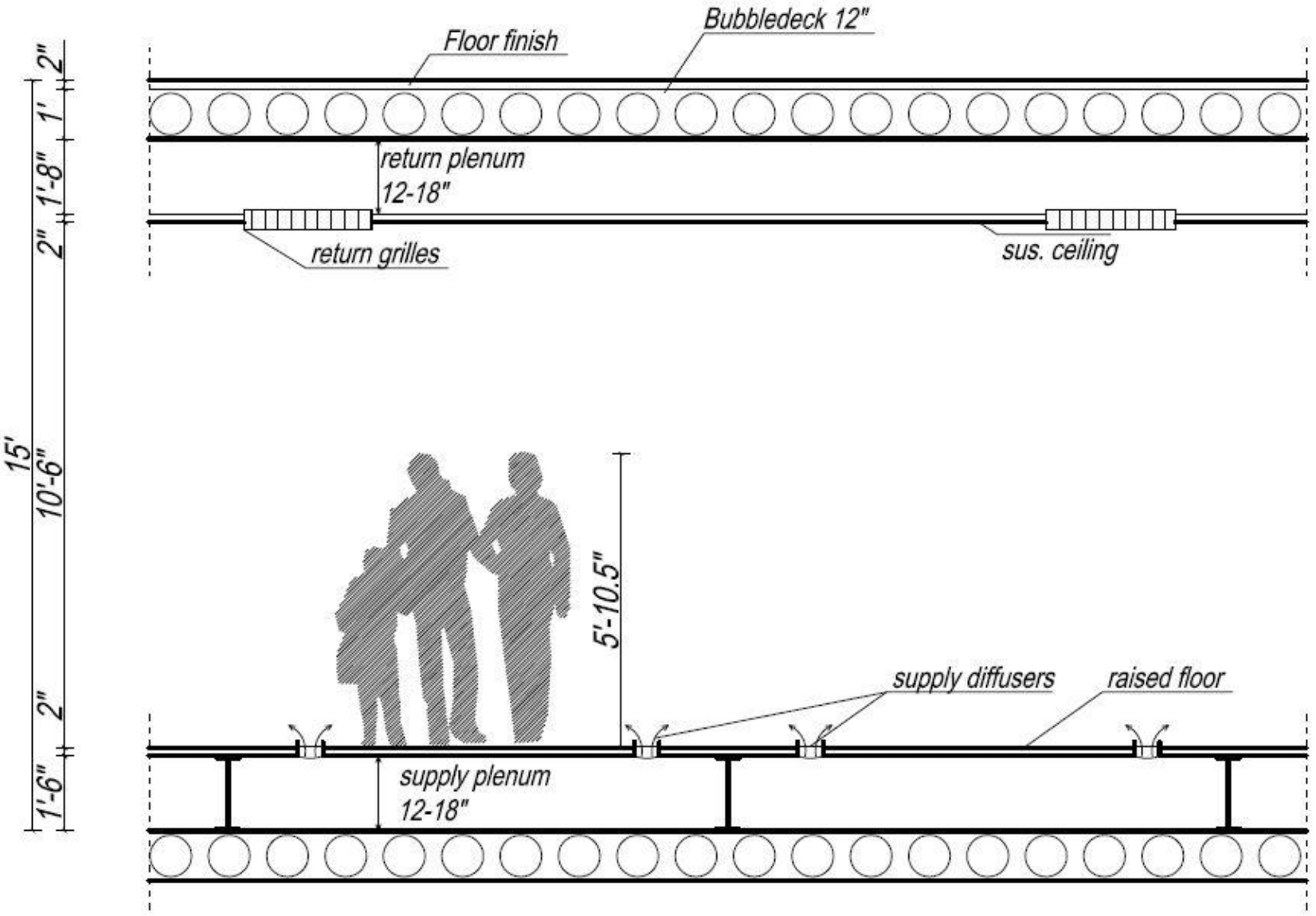
MEP Shafts

LEVEL 2

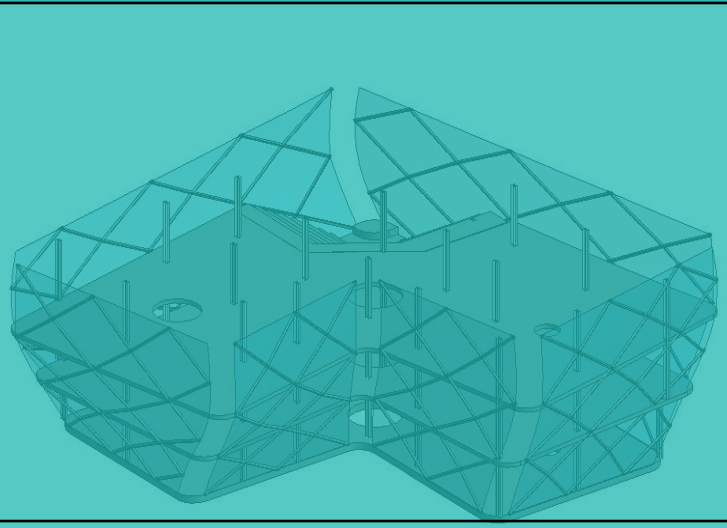
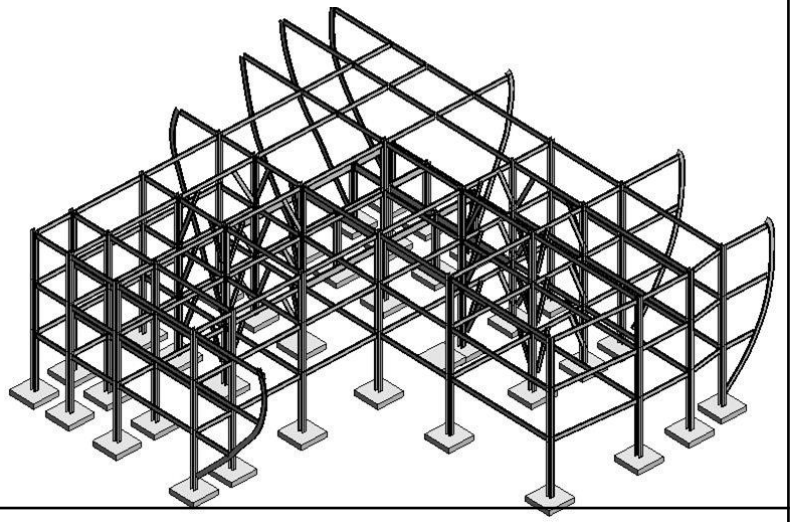


MEP Shafts

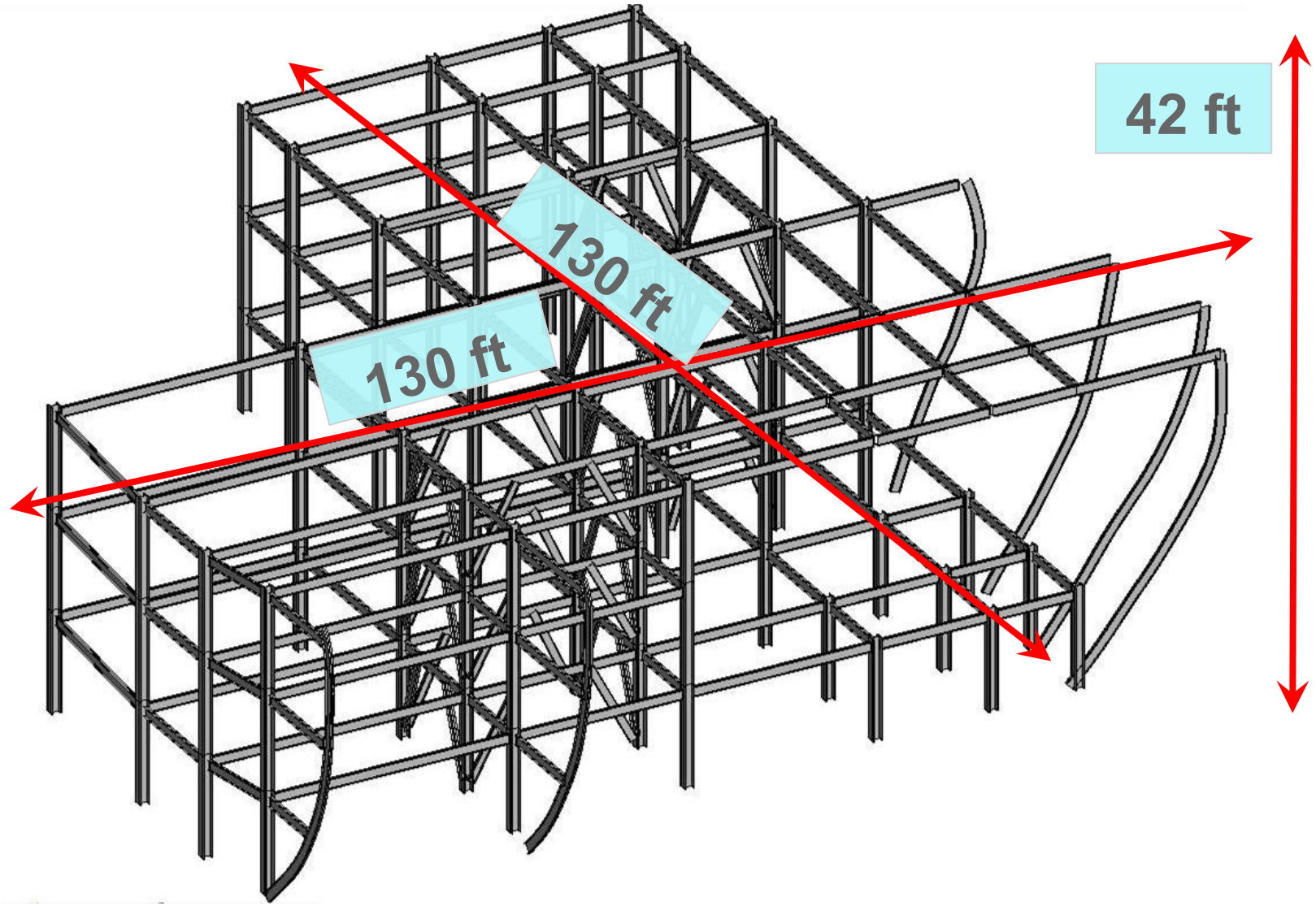
FLOOR SANDWICH



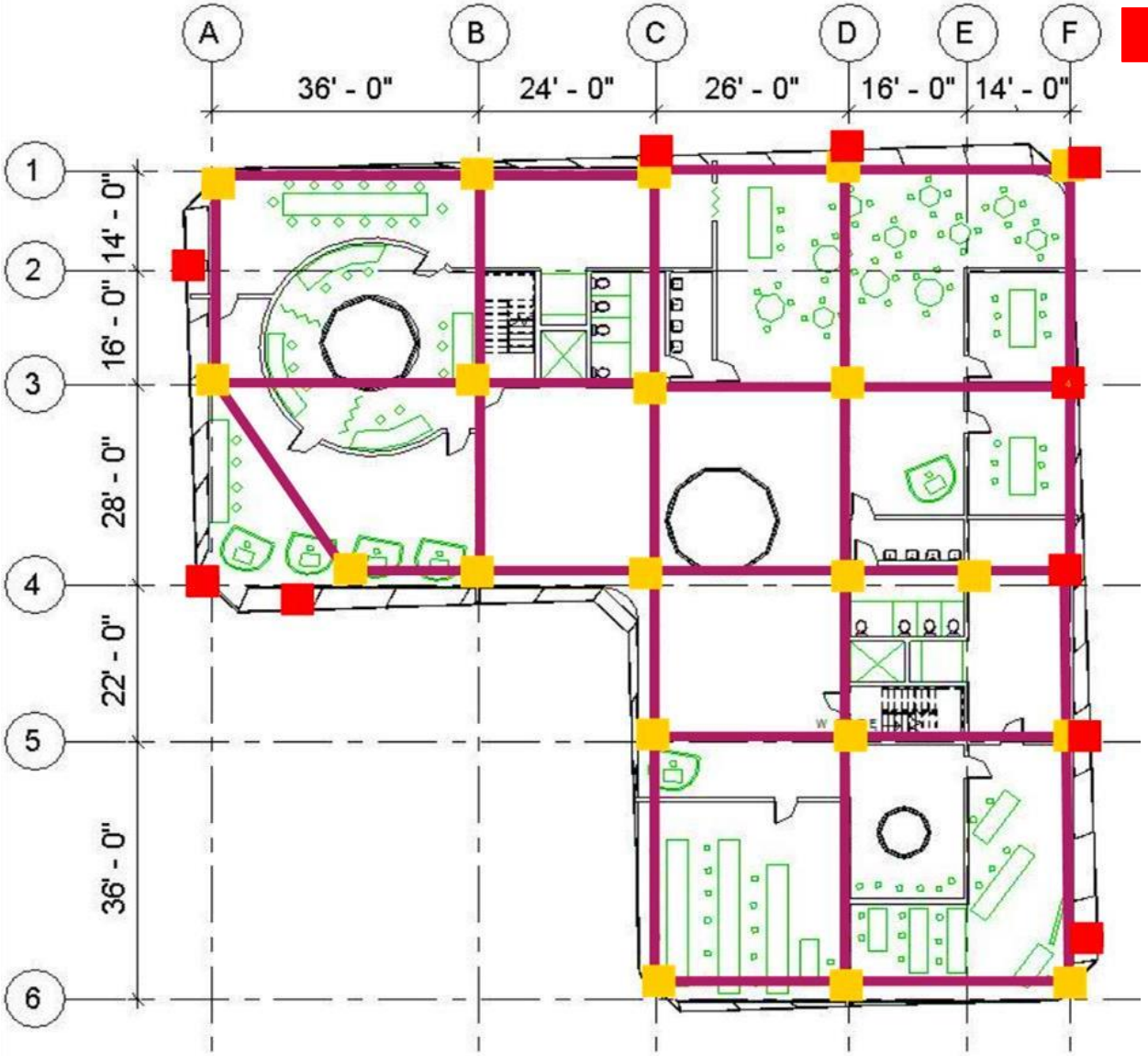
STRUCTURAL SYSTEMS

	Diagrid	Steel
3D View		
Gravity System	Girder: W Section Column: W Section Floor: Bubble Deck + PT Slab	Girder: W Section Column: W Section Floor: Bubble Deck
Lateral System	Exterior Diagrid Systems	Eccentrically Braced Frame (EBF)

3D - STEEL



BASEMENT



Column: W14×90

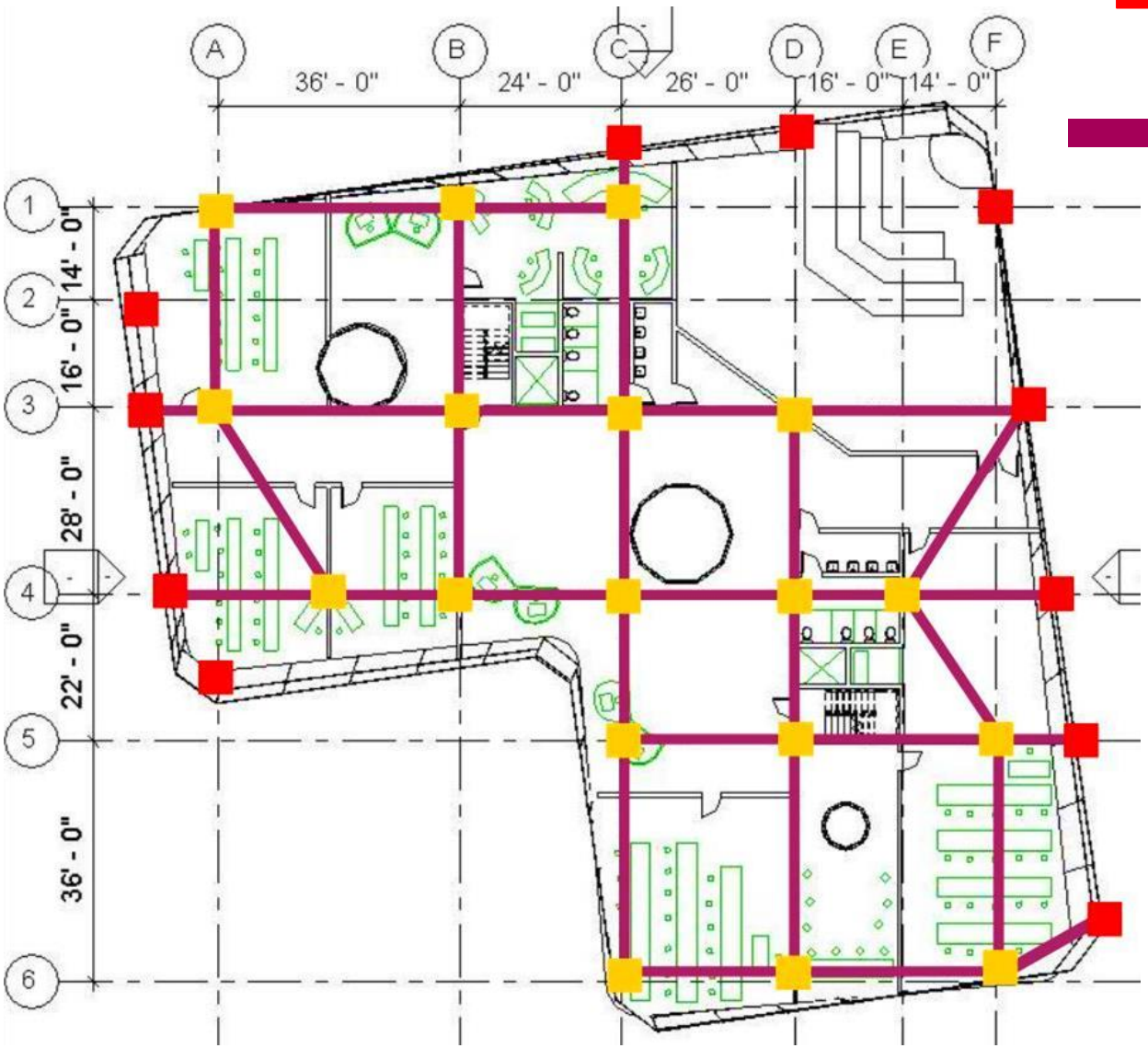
Girder: W16×31

Curved Column: W14×90

12 in. bubble deck

NORTH

LEVEL 1



Column: W14×90

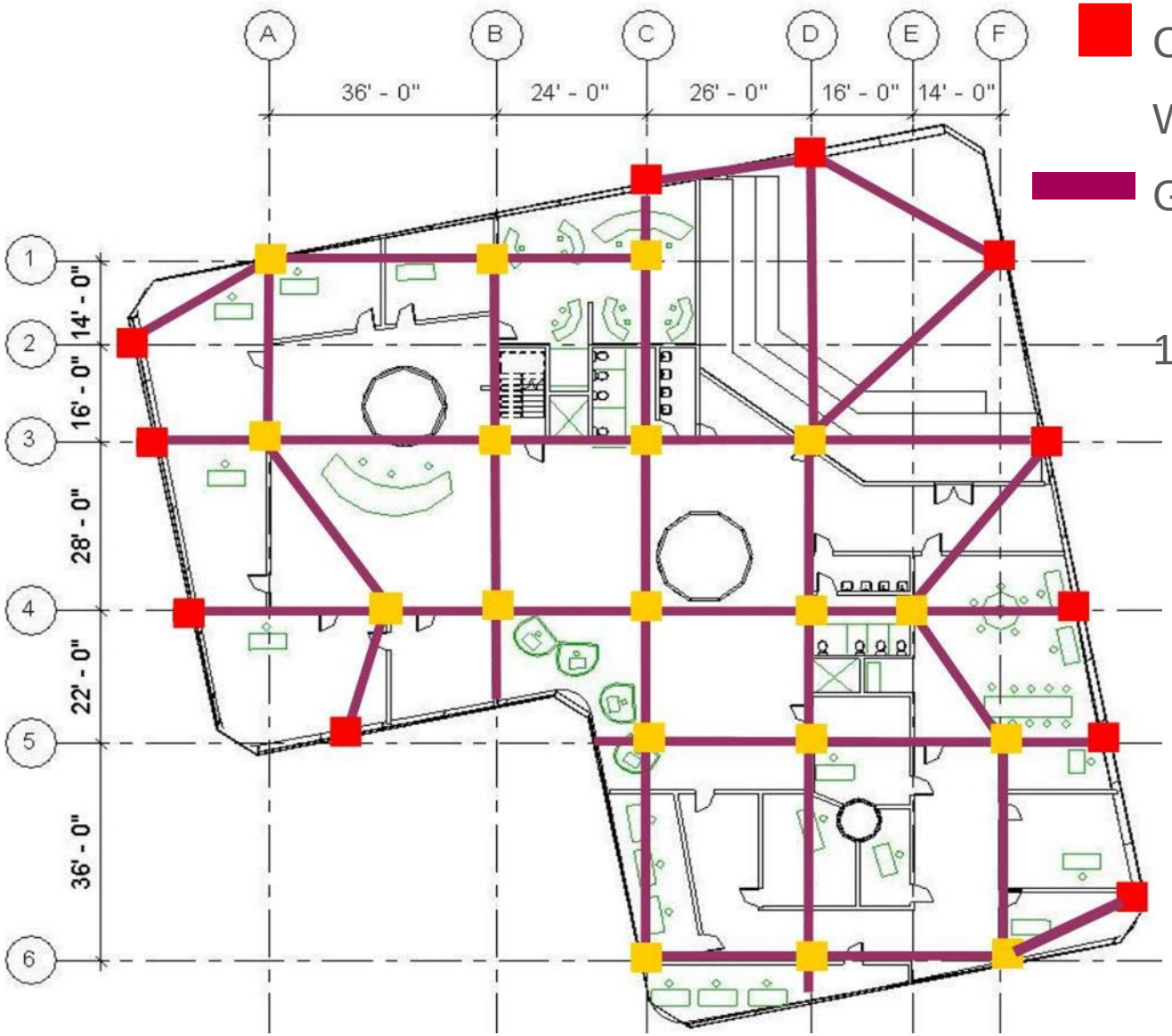
Curved Column: W14×90

Girder: W16×31

12 in bubble deck

NORTH

LEVEL 2



Column: W14×90

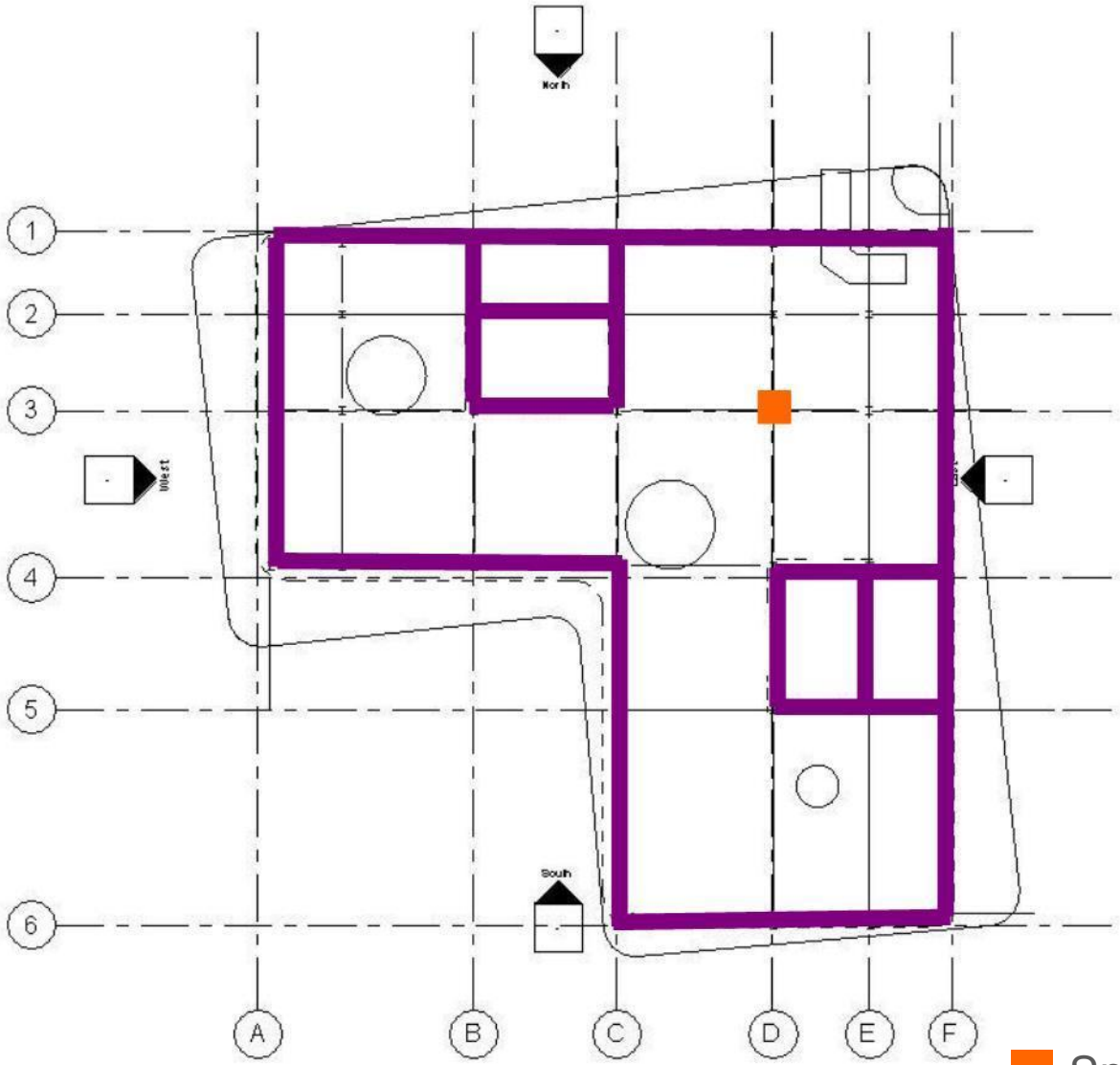
Curved Column: W14×90

Girder: W16×31

12 in bubble deck

NORTH

FOUNDATION LAYOUT



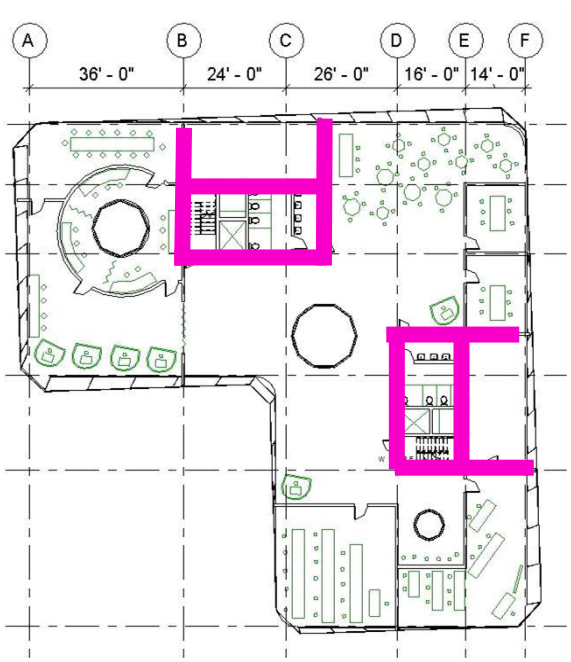
NORTH

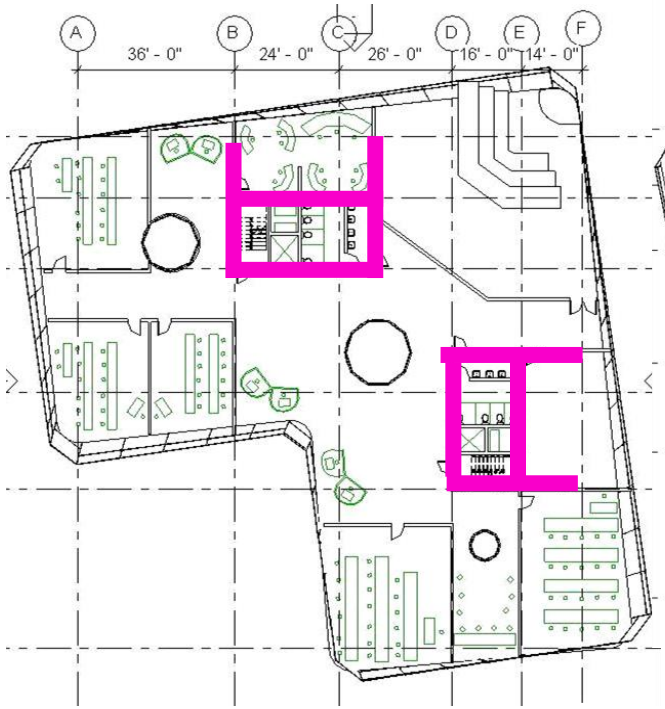
Spread footing: 3'x1'x1'

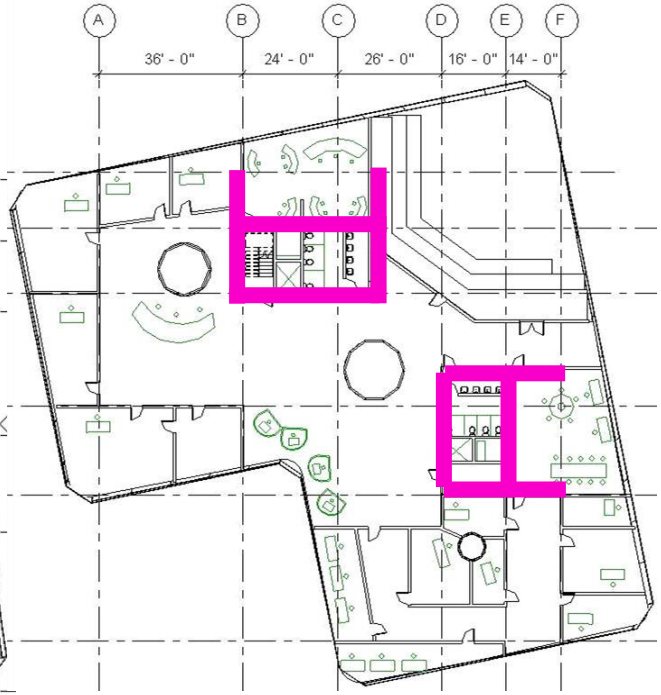
Line footing: 3'x3'x1'

LATERAL SYSTEM

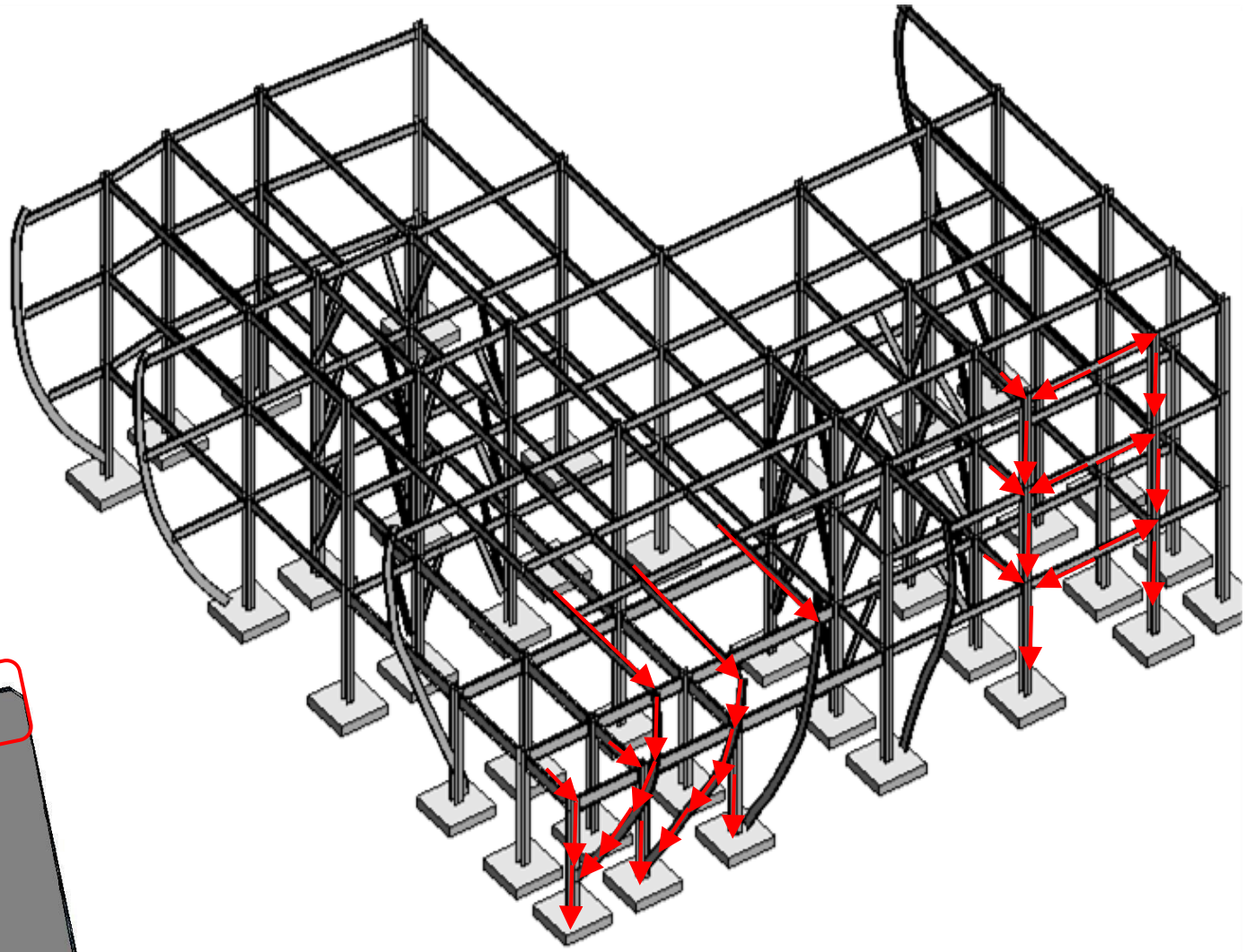
EBF (7.5’’)^2



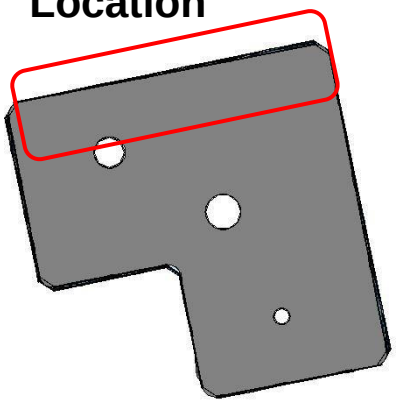




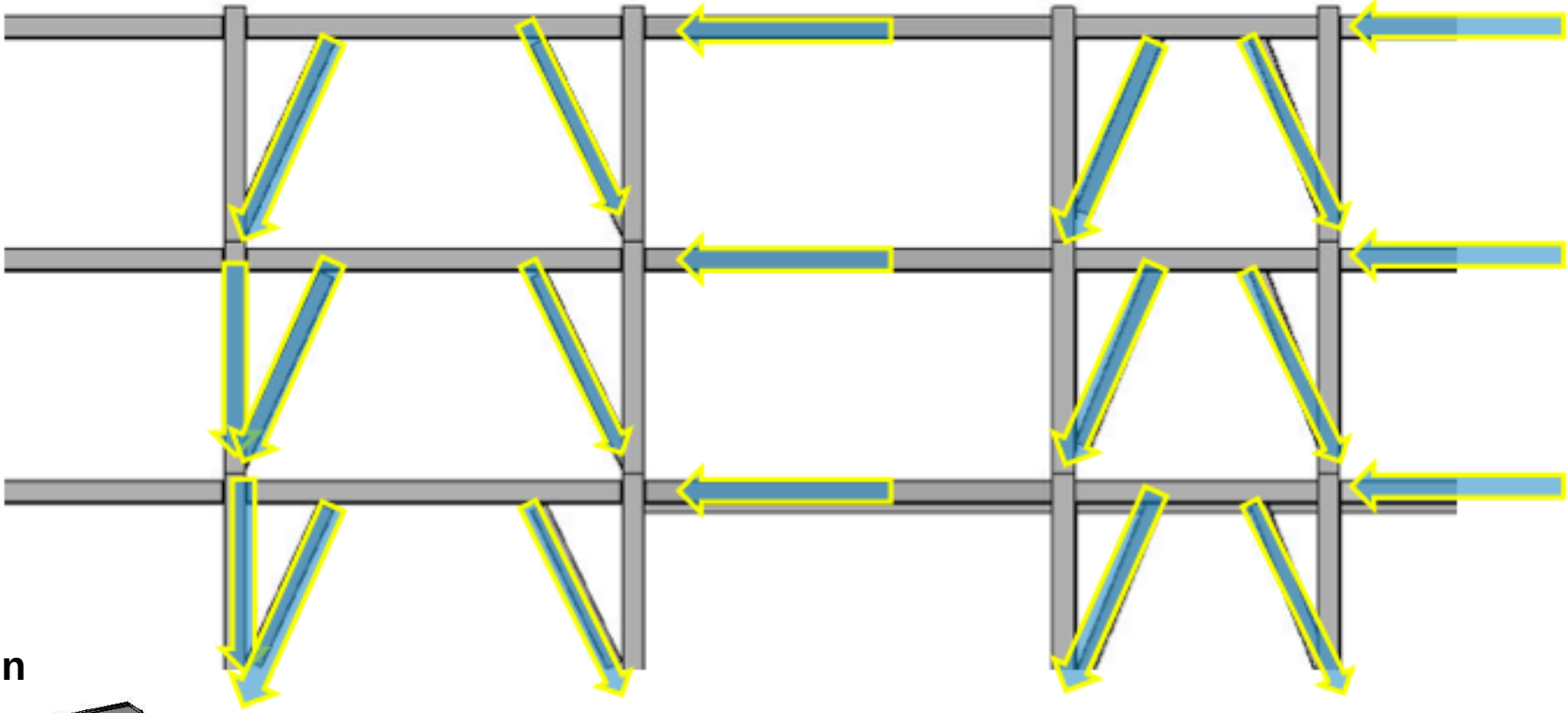
LOAD PATH - GRAVITY



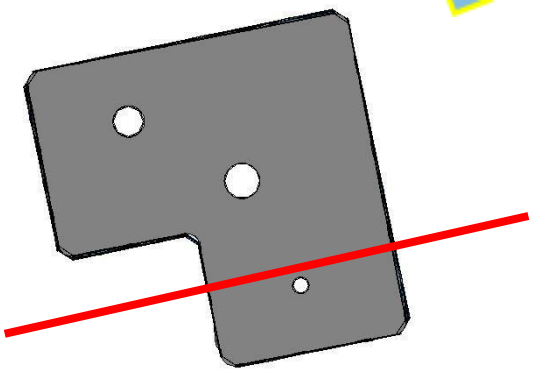
Location



LOAD PATH LATERAL



Location



ACTIVE CHILLED BEAMS & DOAS

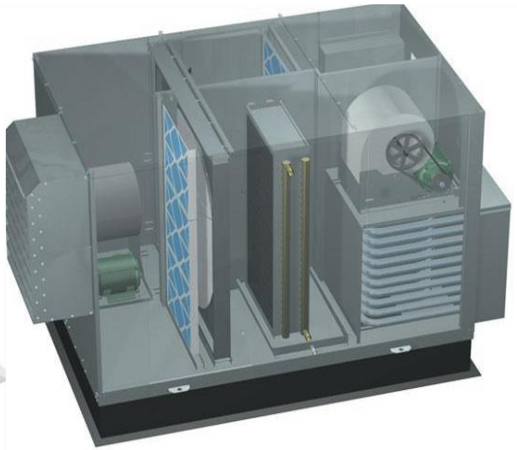
MEP SOLUTION FOR STEEL :

General:

- Active Chilled Beams + DOAS

Auditorium:

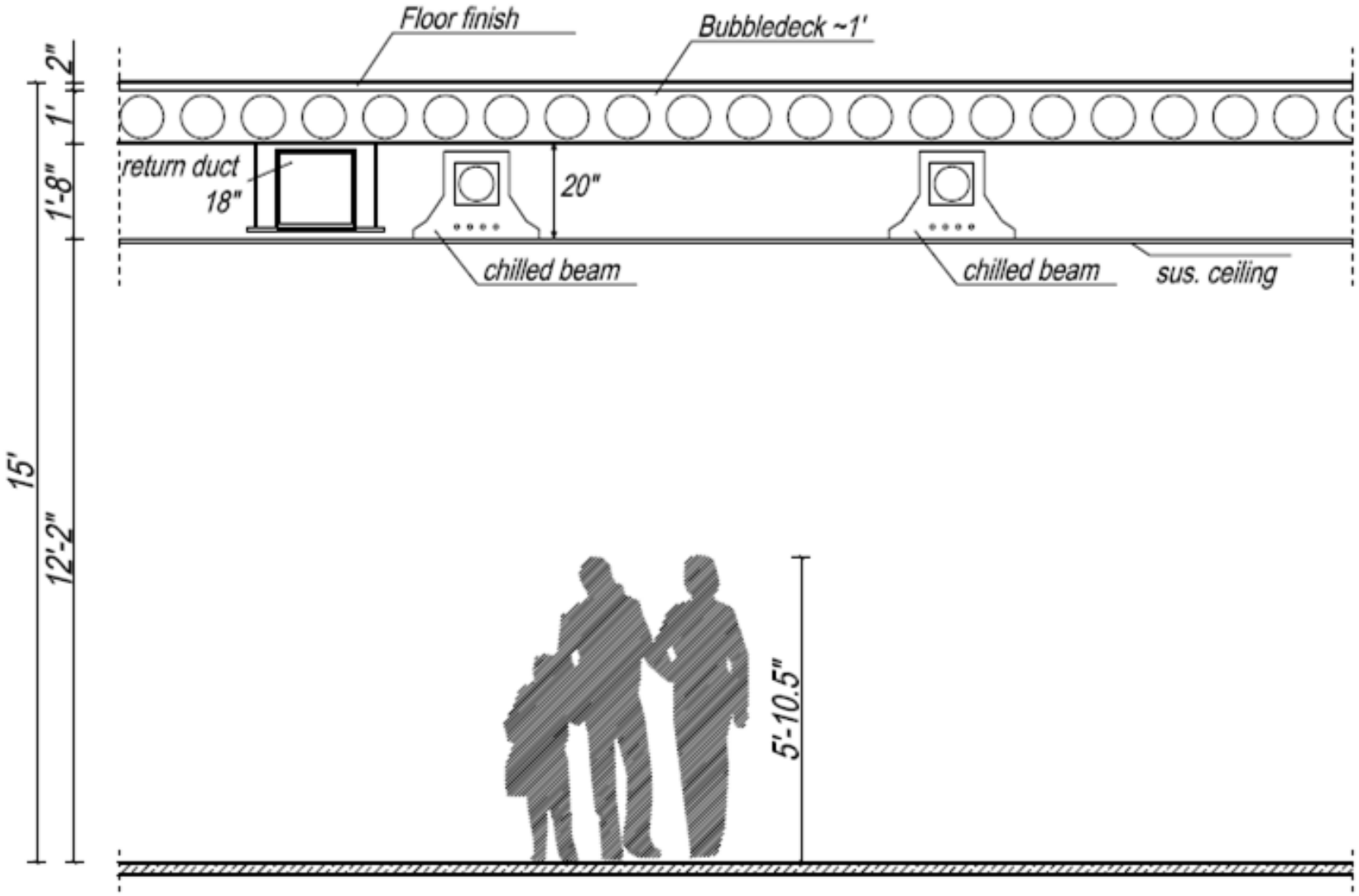
- Underfloor Air Distribution



\+ Efficient hydronic system
\+ Minimal ductwork
\+ Less fan and reheat energy

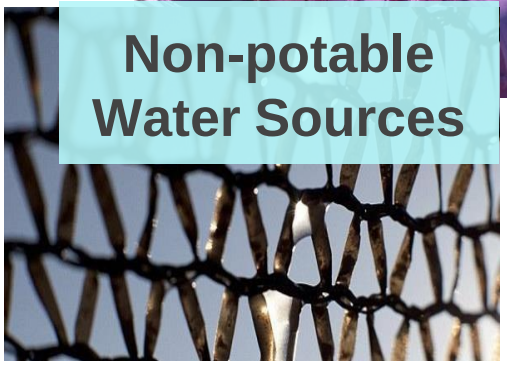
\- Constant airflow required
\- Less economizer benefit
\- More piping than VAV

FLOOR SANDWICH



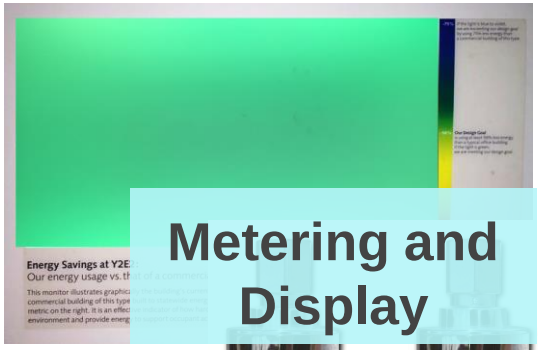
WATER CHALLENGE - WATER FLOW

Non-potable Water Sources



Water-Energy Nexus

Resource Efficiency



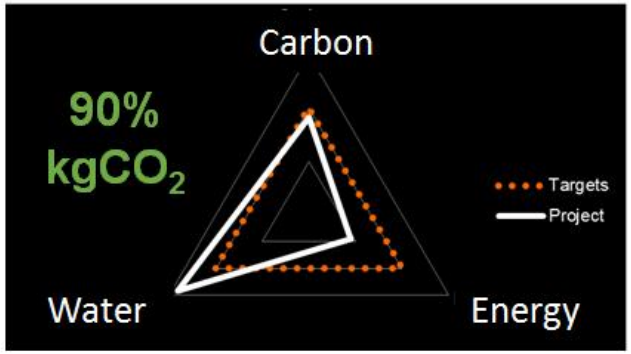
Metering and Display

Stormwater Filtration

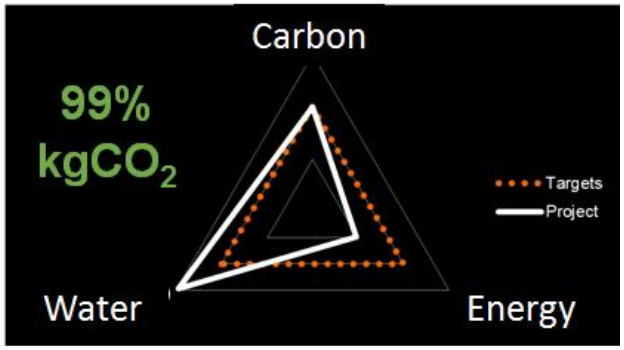
SUSTAINABLE TARGET VALUE

Iceplant

STEEL

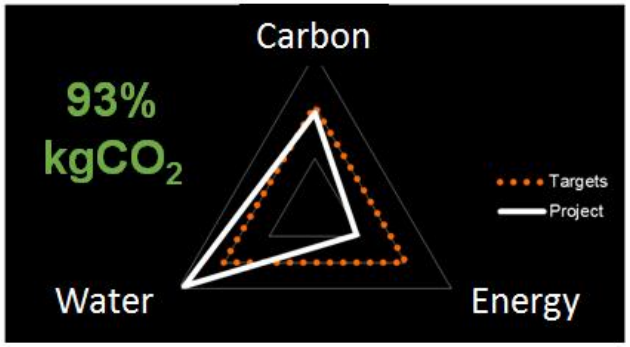


TIMBER COMPOSITE

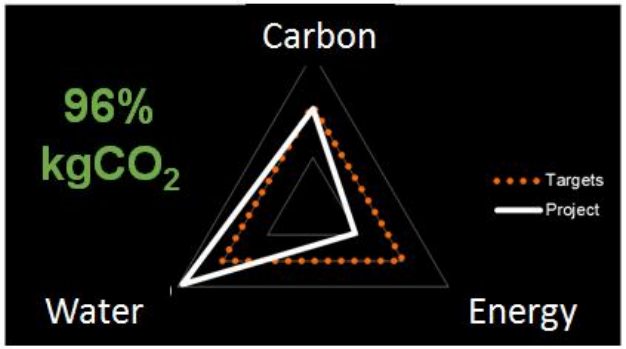


Water Flow

DIAGRID



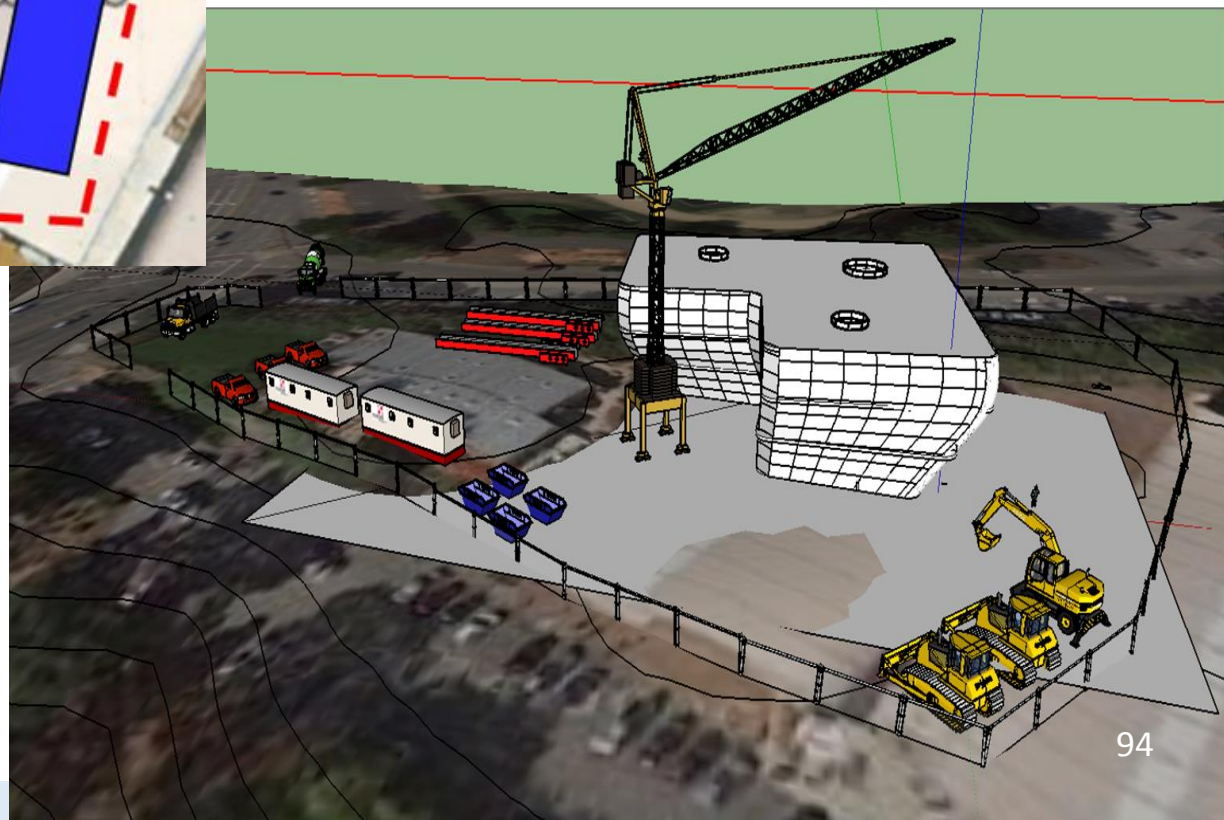
STEEL



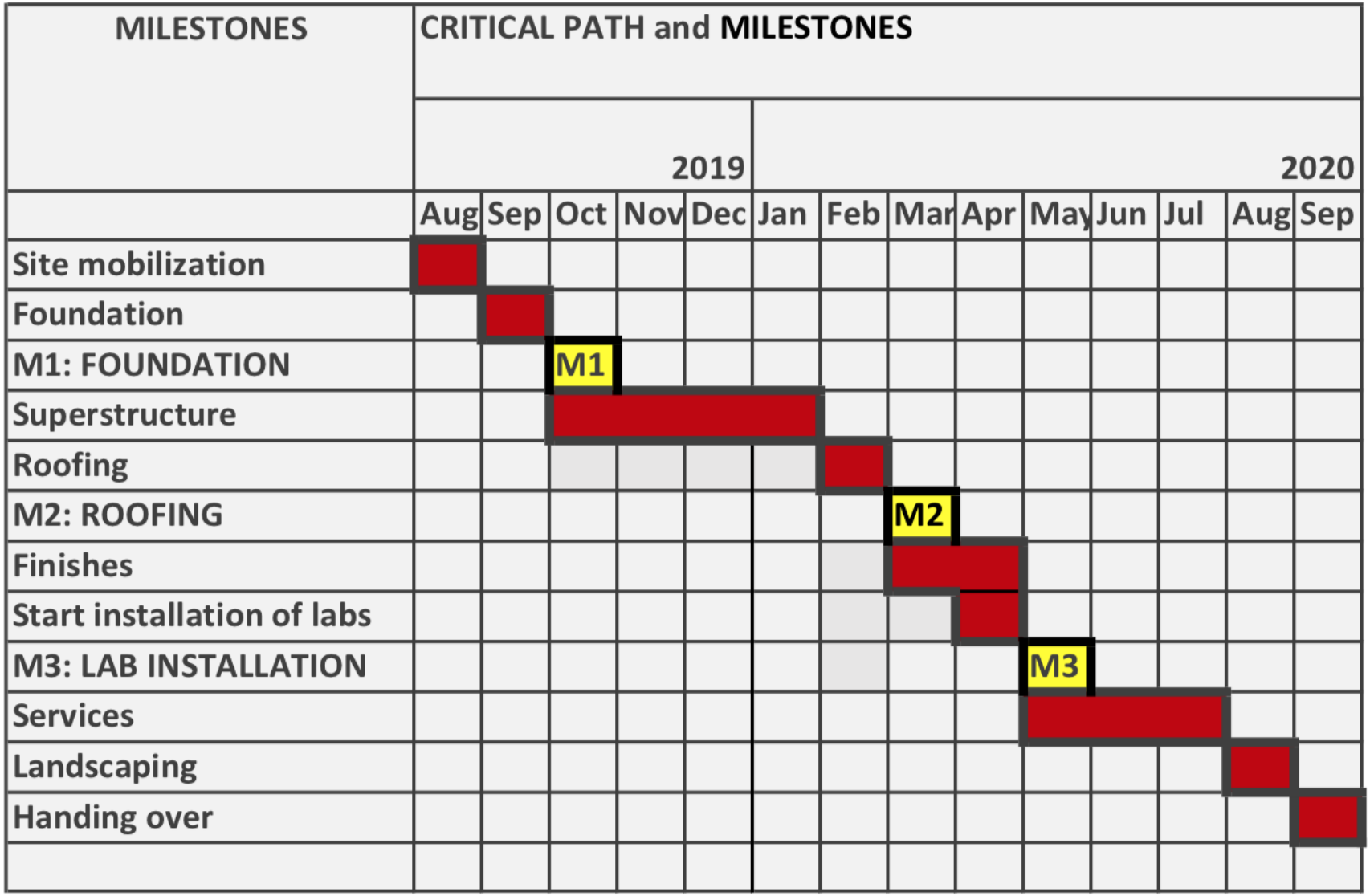
SITE LOGISTICS - Water Flow

Key Goals

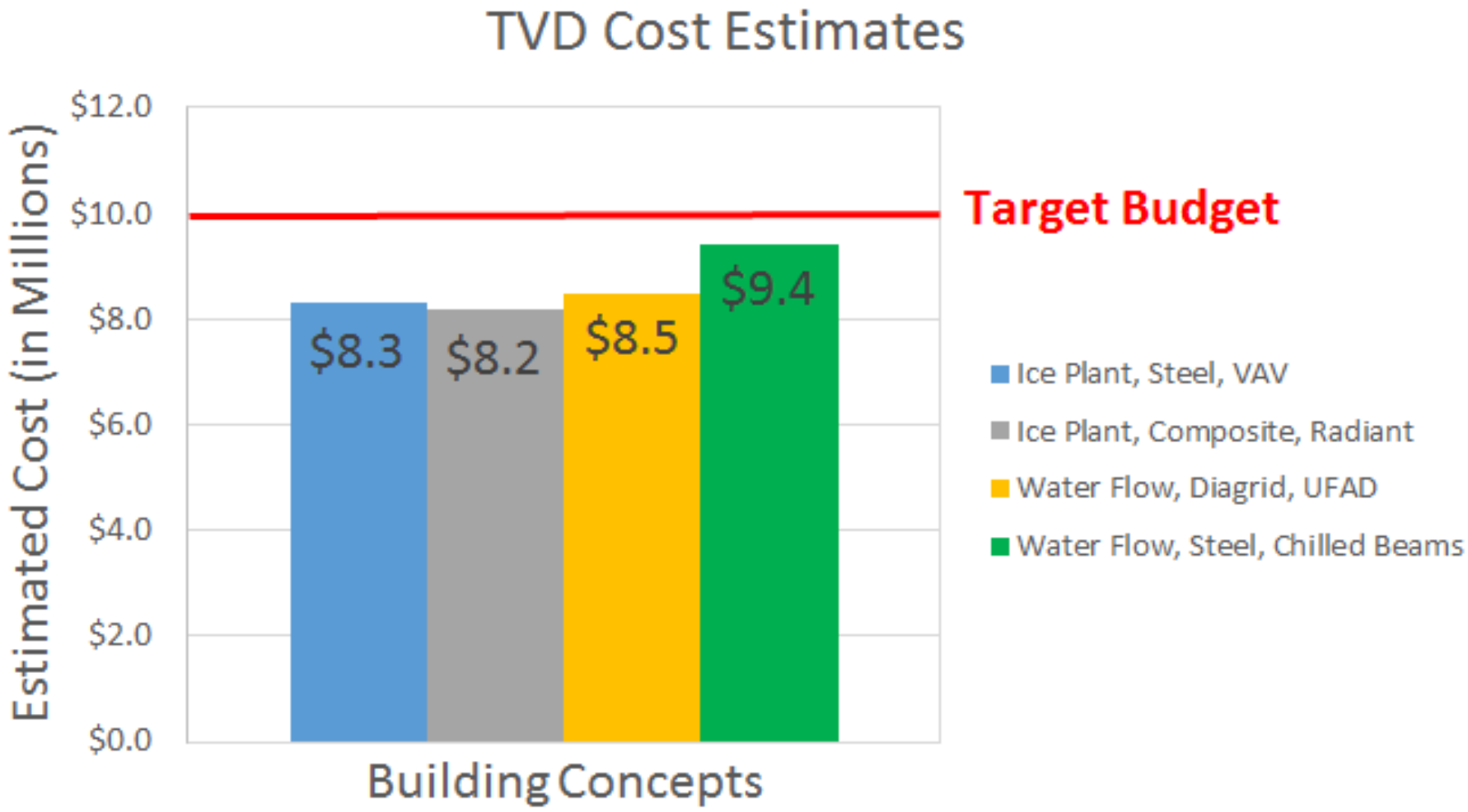
1. Safety
2. Latency
3. Reduce constr. site footprint



CRITICAL PATH & MILESTONES

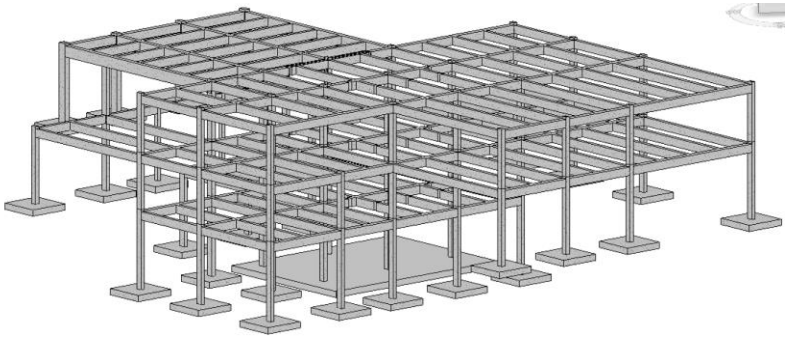


TARGET VALUE DESIGN

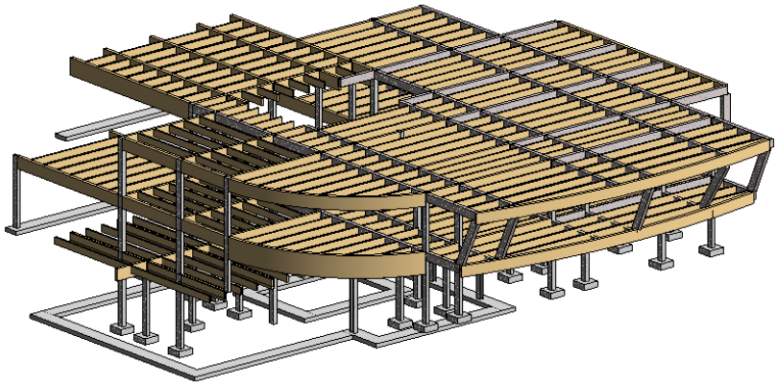


TARGET VALUE DESIGN

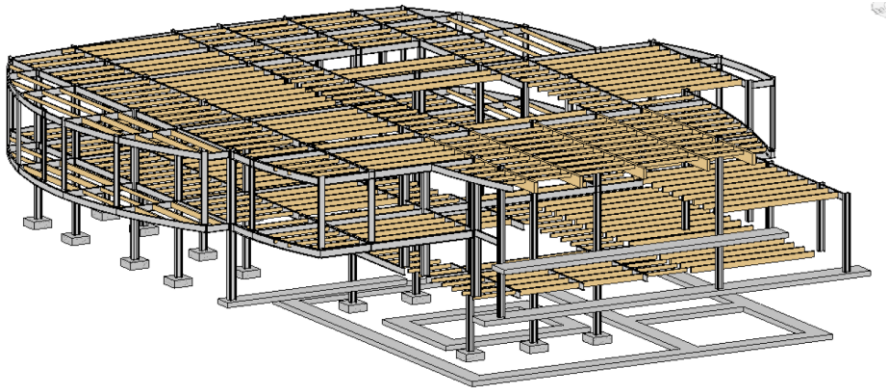
Concrete Structure
(02-12-15): $900,000



Glulam Beams and Concrete Columns
(02-25-15): $700,000



Glulam and Steel Columns
(03-09-15): $1,000,000



CONSTRUCTABILITY CHALLENGE

Building Concept		Excavation	Crane	Seismic Bracing	Exterior	Structural Systems	MEP Concept Implementation
Iceplant	Steel /VAV	×		×			
	Composite /Radiant	×		×			×
Water Flow	Diagrid /UFAD		×	×	×	×	×
	Steel /Chilled Beam		×	×	×		

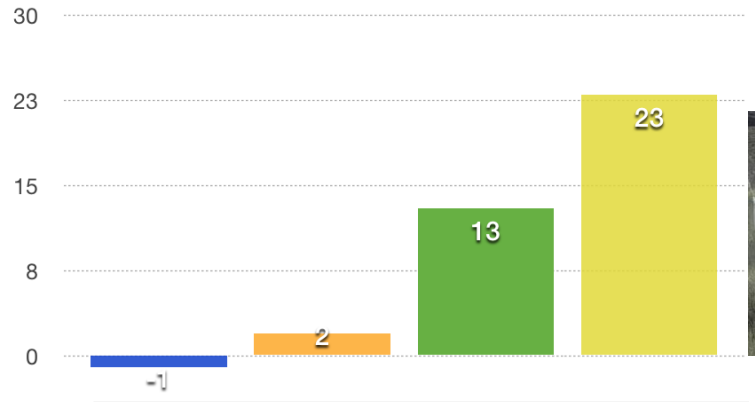
×: **Constructability Challenge**

DECISION MATRIX

Water Flow + Steel/Eccentricity Bracing + Chilled Beams

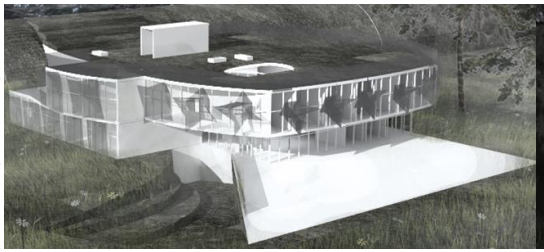
- Water Challenge Concept
- Big Idea Incorporation throughout building
- Aesthetics
- Structural Efficiency
- Costs
- Constructability
- STV Results

DECISION MATRIX OVERALL

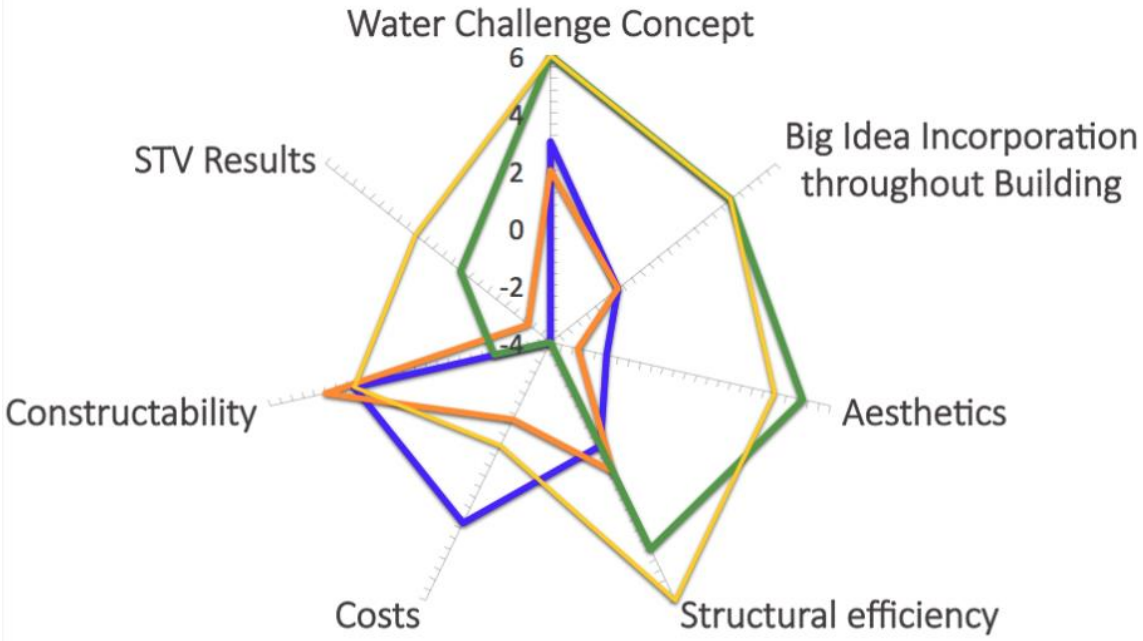


BUILDING CONCEPT
Ice Plant + Composite + Radiant
Ice Plant + STEEL + VAV w/Reheat
Water Flow + Diagrid + Bubbledeck/PT + UFAD
Water Flow + Steel/Eccentricity Bracing + Bubbledeck/PT

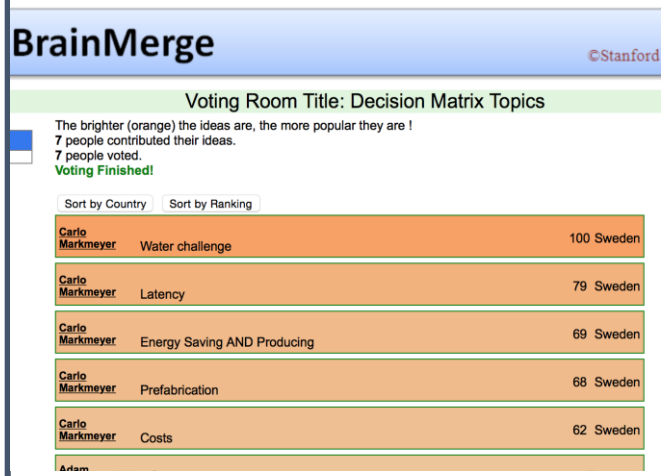
ICEPLANT



WATER FLOW



MEETING PROTOCOLS



Brainstorming

Standup Meeting

Weekly Meeting

SOFTWARE AND TOOLS

Communication

WhatsApp

facebook

Collaboration

Google Drive

Dropbox

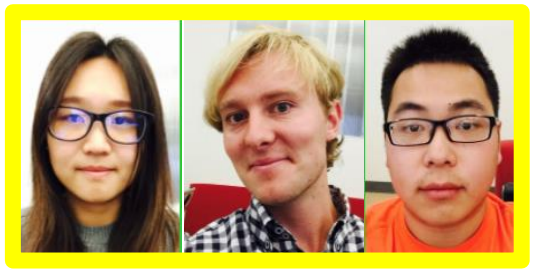
TERF The Future of Enterprise Engagement from 3D ICC

Coordination

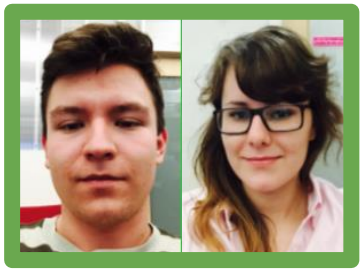
asana:

box

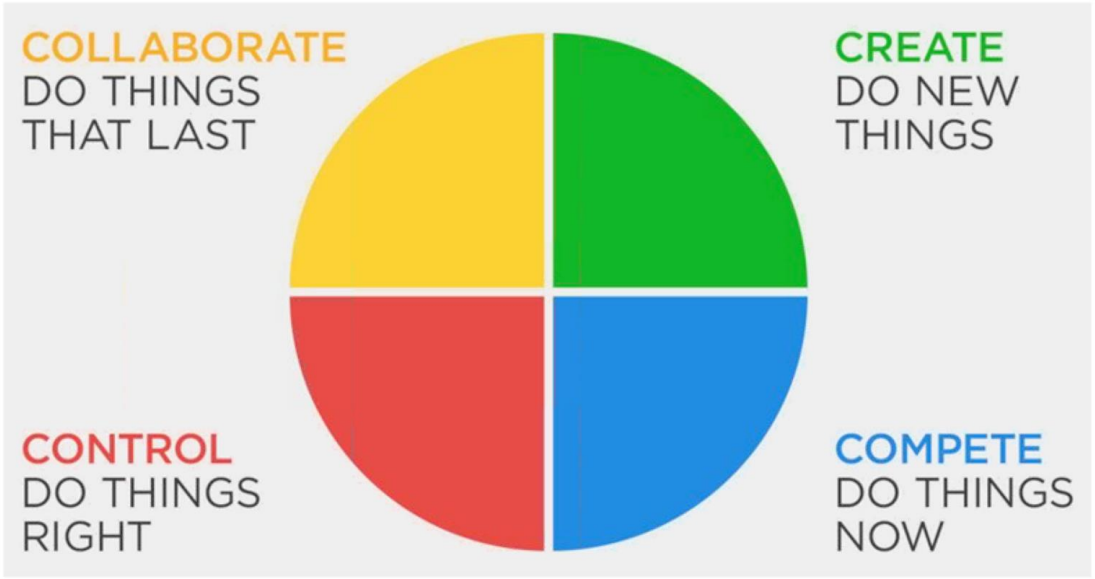
TEAM PROCESS



Transparency



Cross-disciplinary



I & My
→ WE
& OUR

<u>HEALTHY TEAM BALANCE</u>
Leave comfort zone & learn!

Thank You for Your Attention!