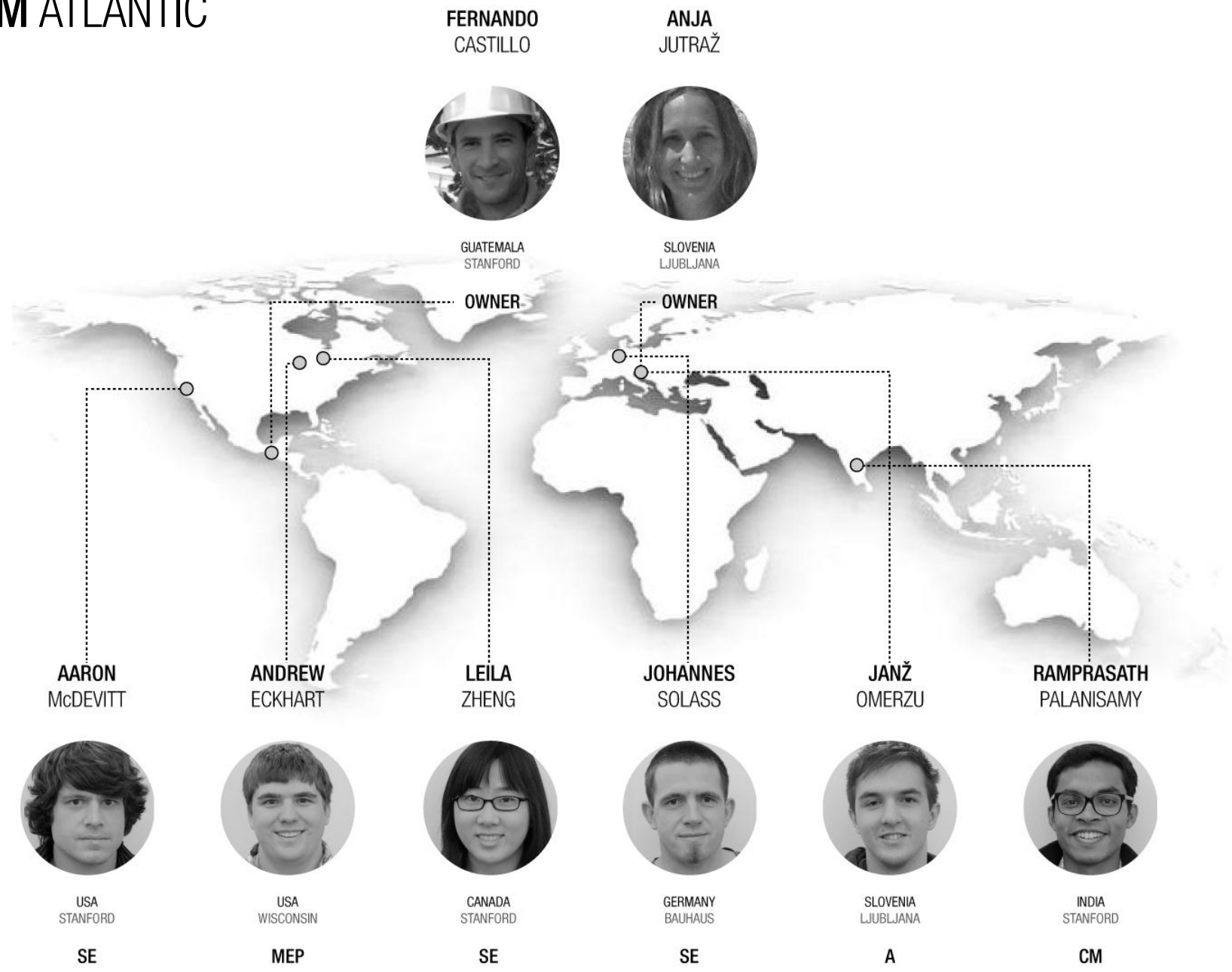
TEAM
ATLANTIC

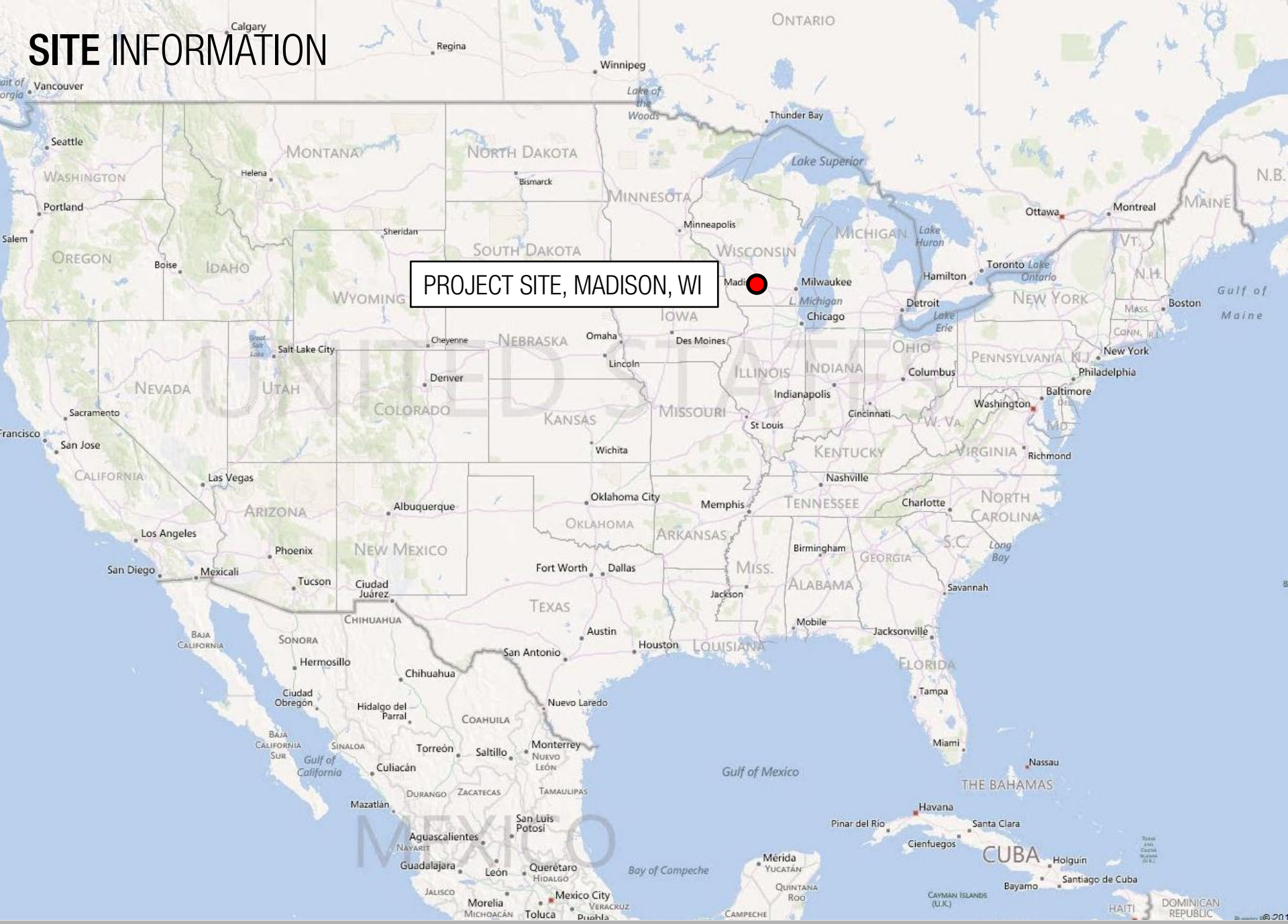
STANFORD PBL LAB
03/16/2012

WQ

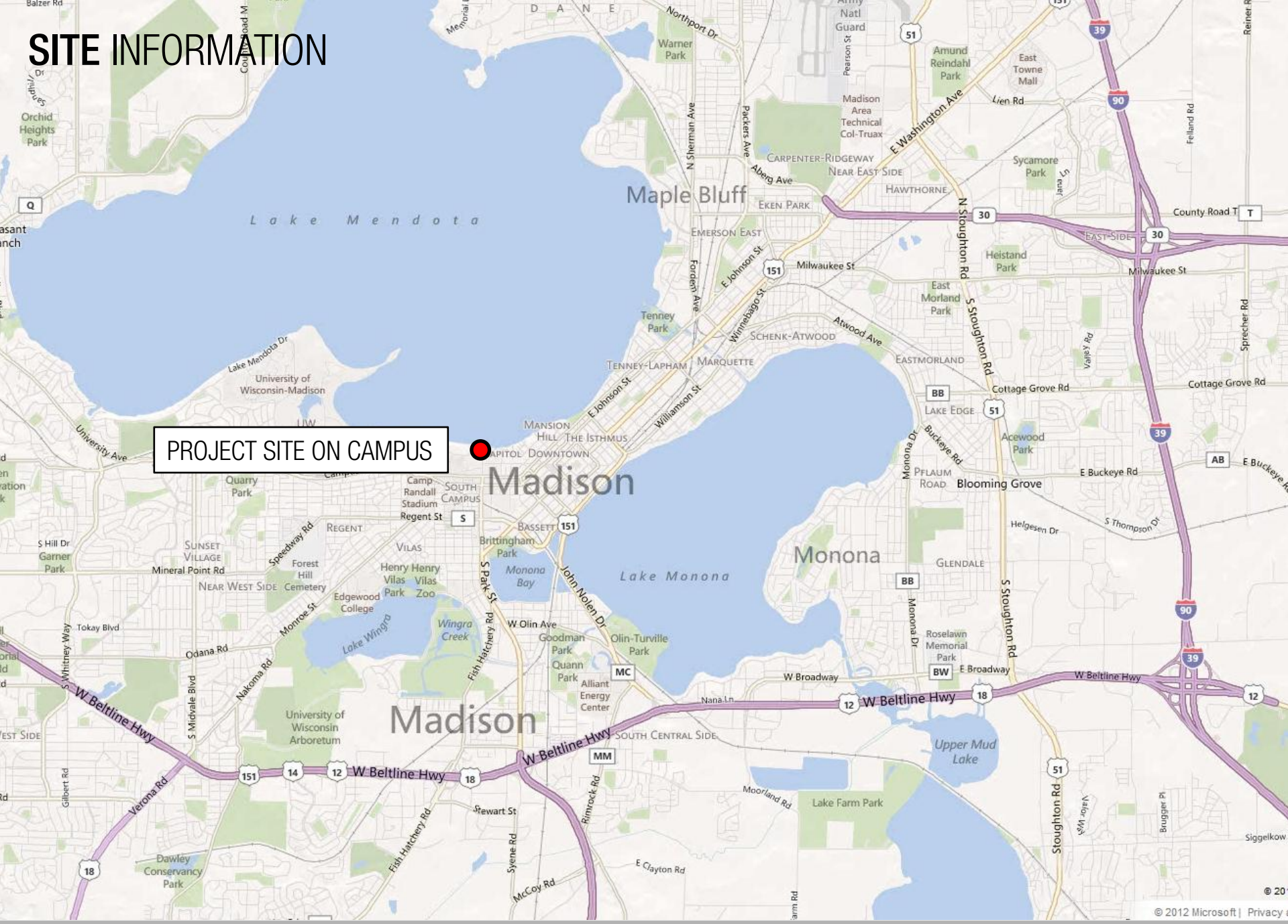
TEAM ATLANTIC



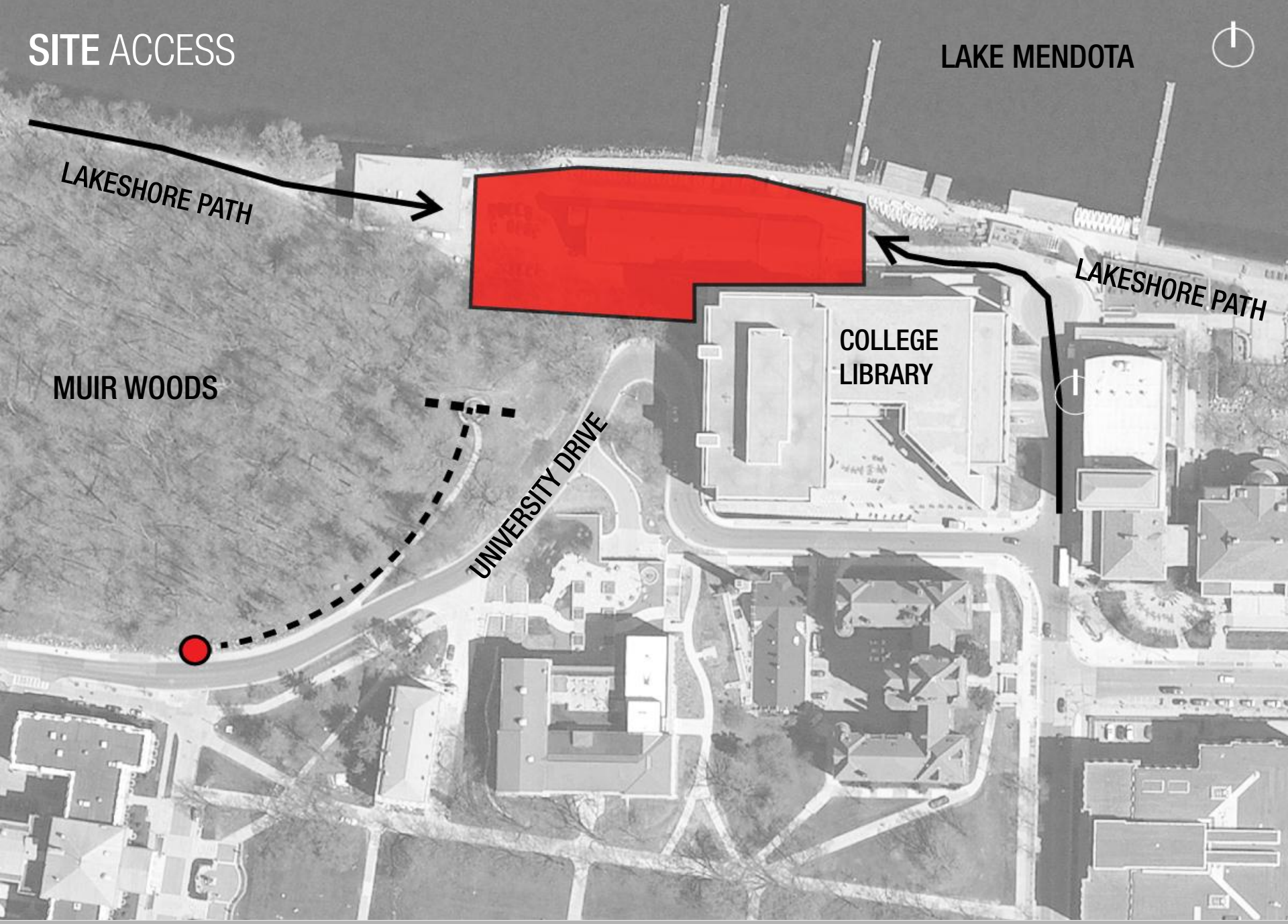
SITE INFORMATION



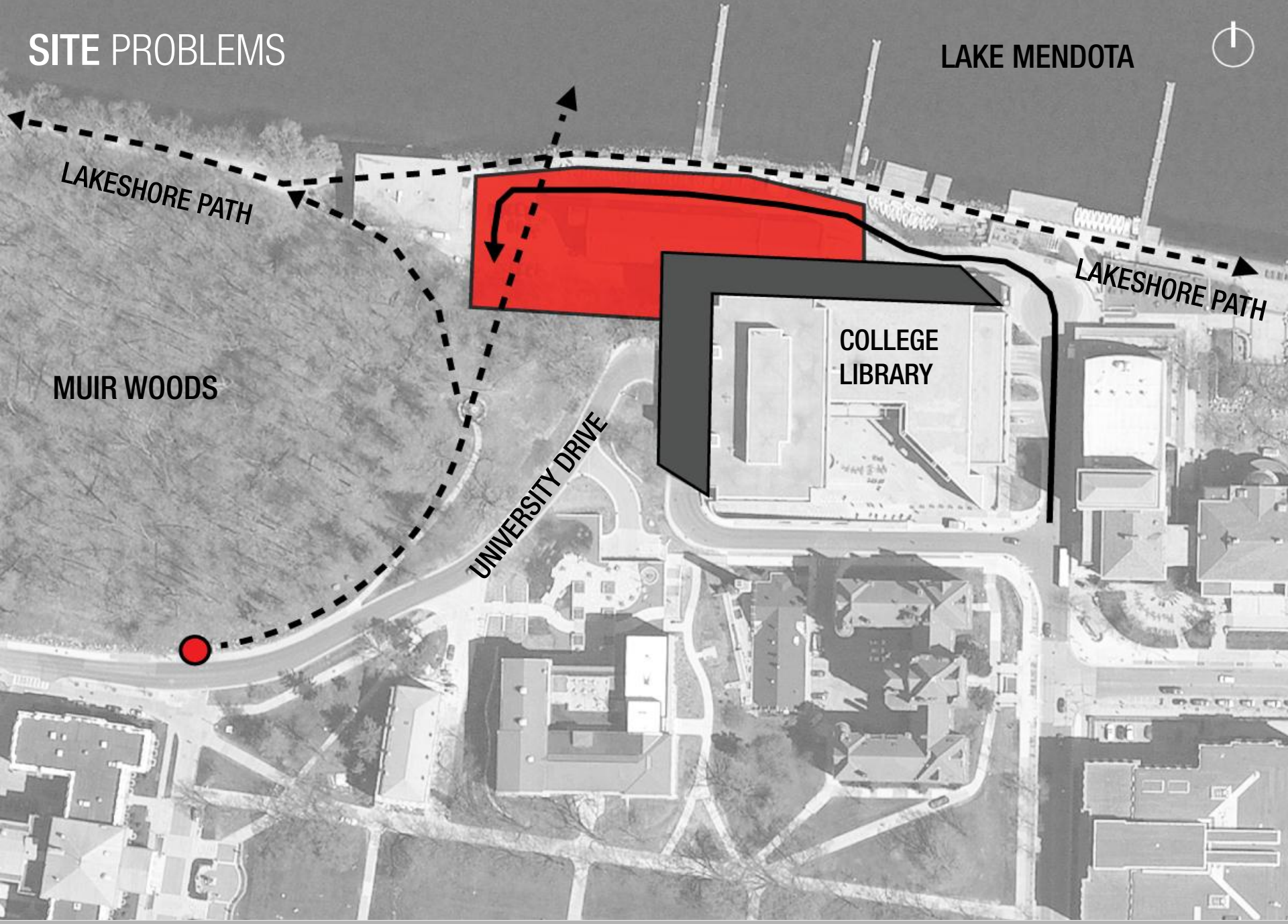
SITE INFORMATION



SITE ACCESS


LAKE MENDOTA
LAKESHORE PATH
LAKESHORE PATH
COLLEGE
LIBRARY
MUIR WOODS
UNIVERSITY DRIVE

SITE PROBLEMS



SITE PHOTOS

OLD BUILDING

LIMNOLOGY LAB

ACCESS ROAD

PANORAMIC VIEW OF THE SITE

JANŽ
OMERZU

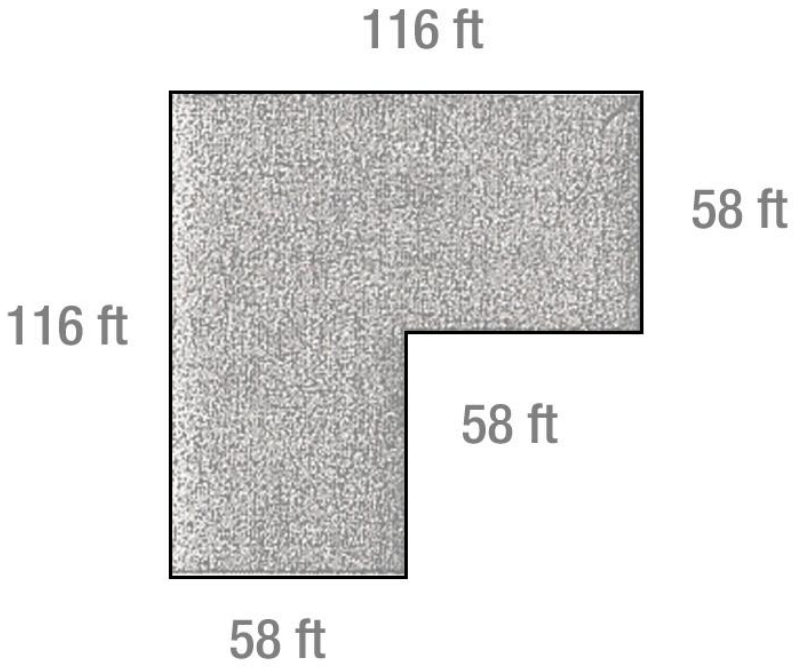
ARCHITECTURE
CONCEPT 1

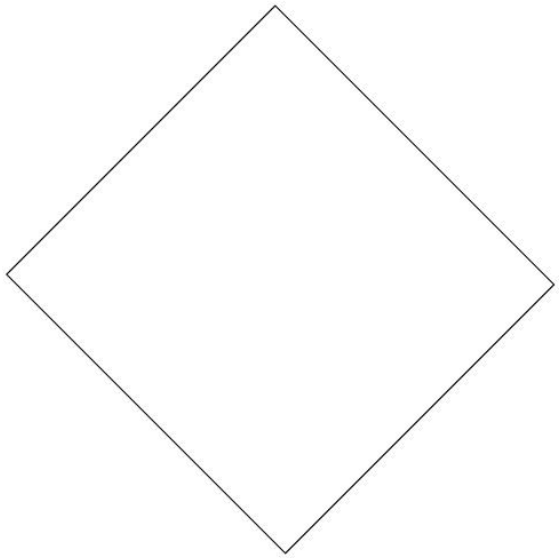
TEAM
ATLANTIC

A
CONCEPT 1

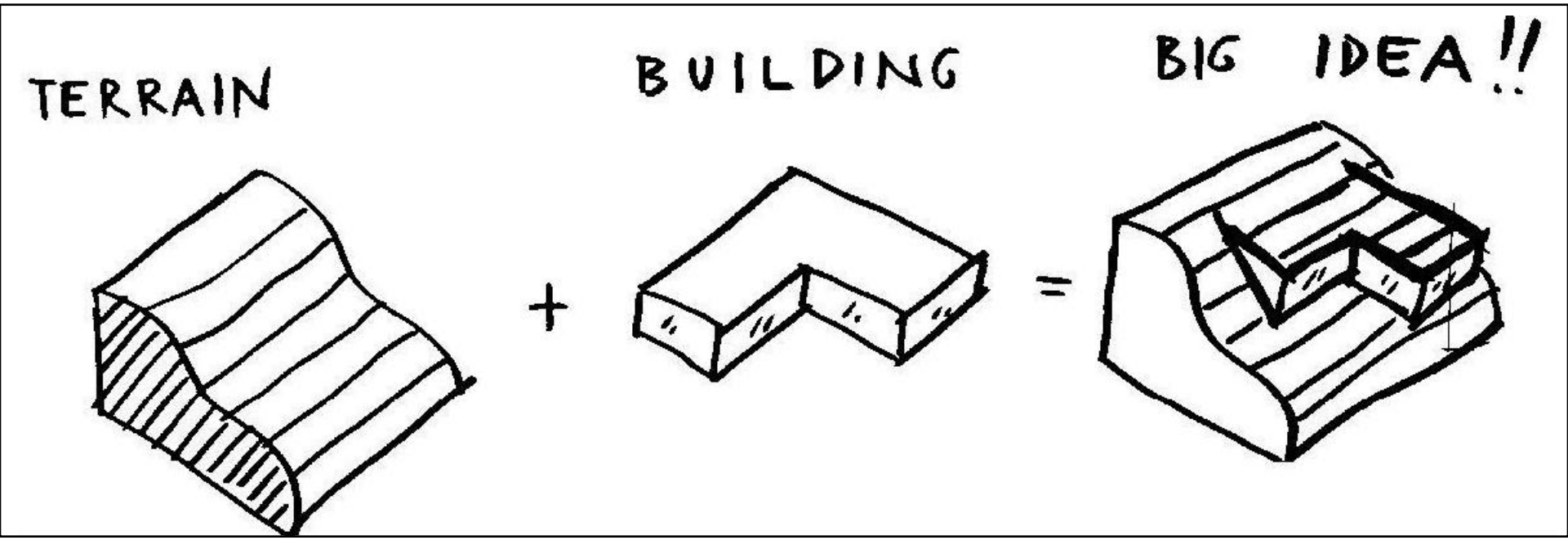
A SE MEP CM POP

CONCEPT 1_L SHAPE



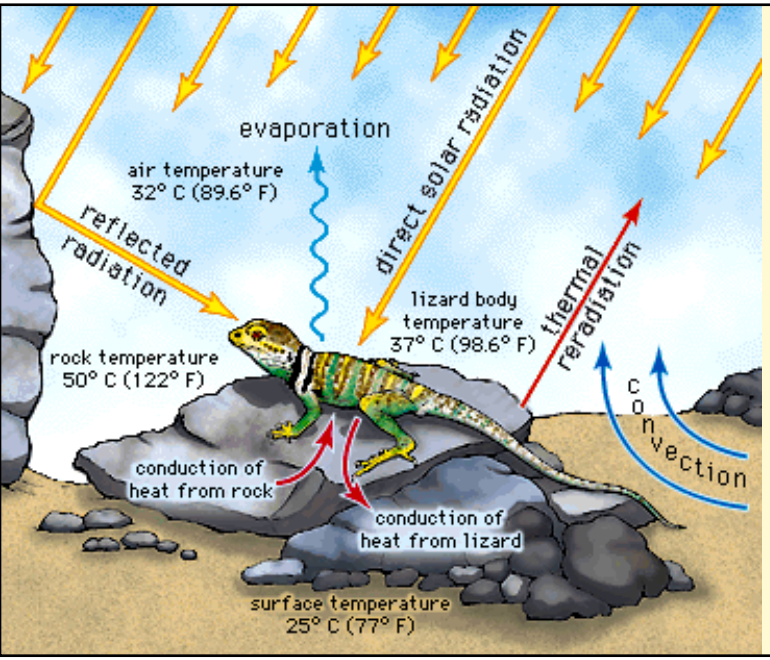


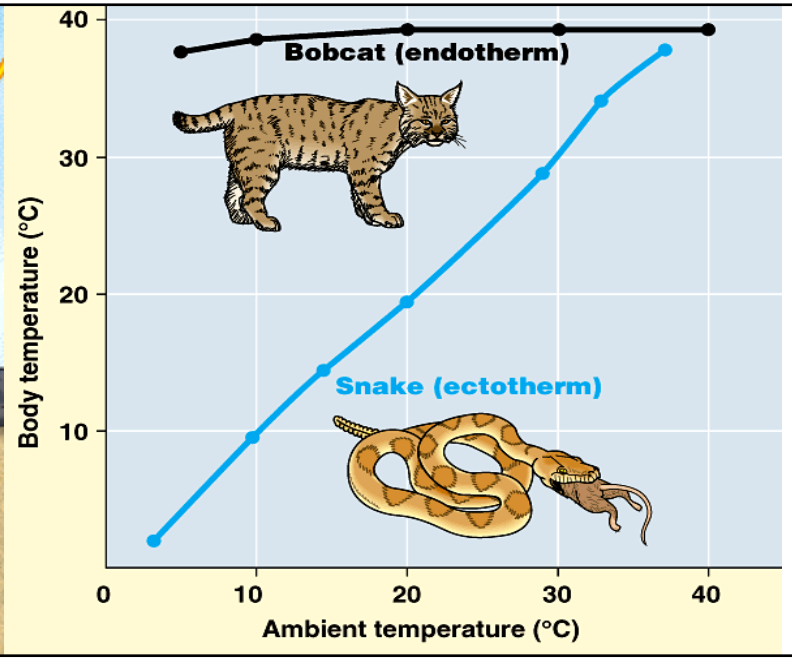
BIG IDEA = LANDSCAPING = BIOMIMICRY



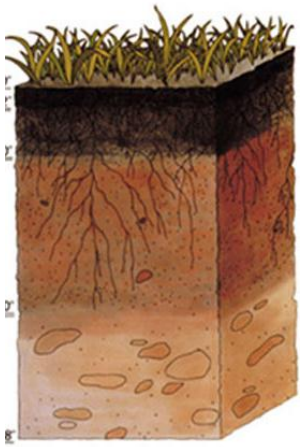
INTEGRATION = OPTIMIZATION

BIG IDEA = LANDSCAPING = BIOMIMICRY





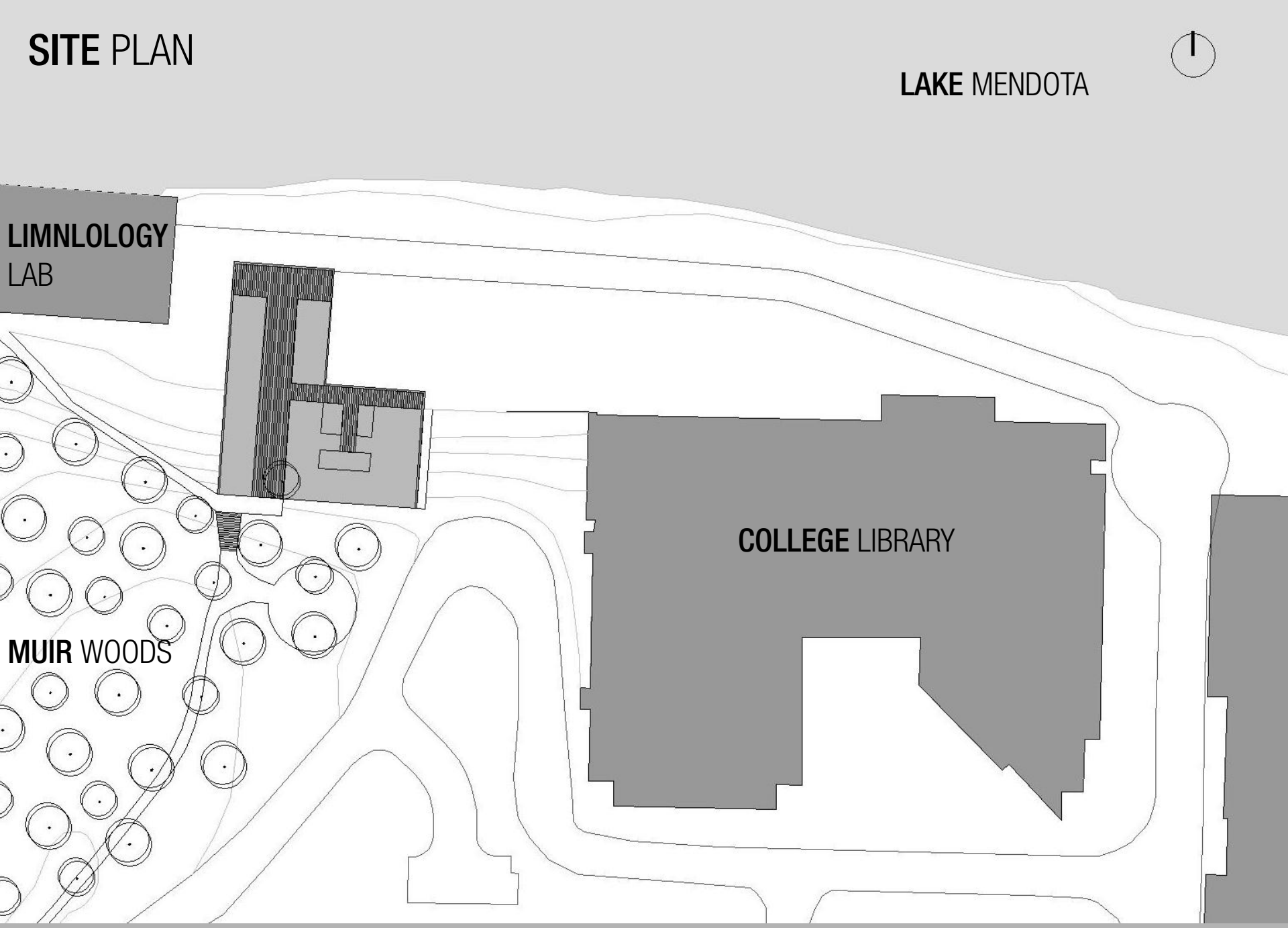
Large ΔT



Small ΔT

ECTOTHERMS = THERMOREGULATION

SITE PLAN



BASEMENT

AUDITORIUM

LARGE CLASSROOM

STUDY ROOM

LOBBY

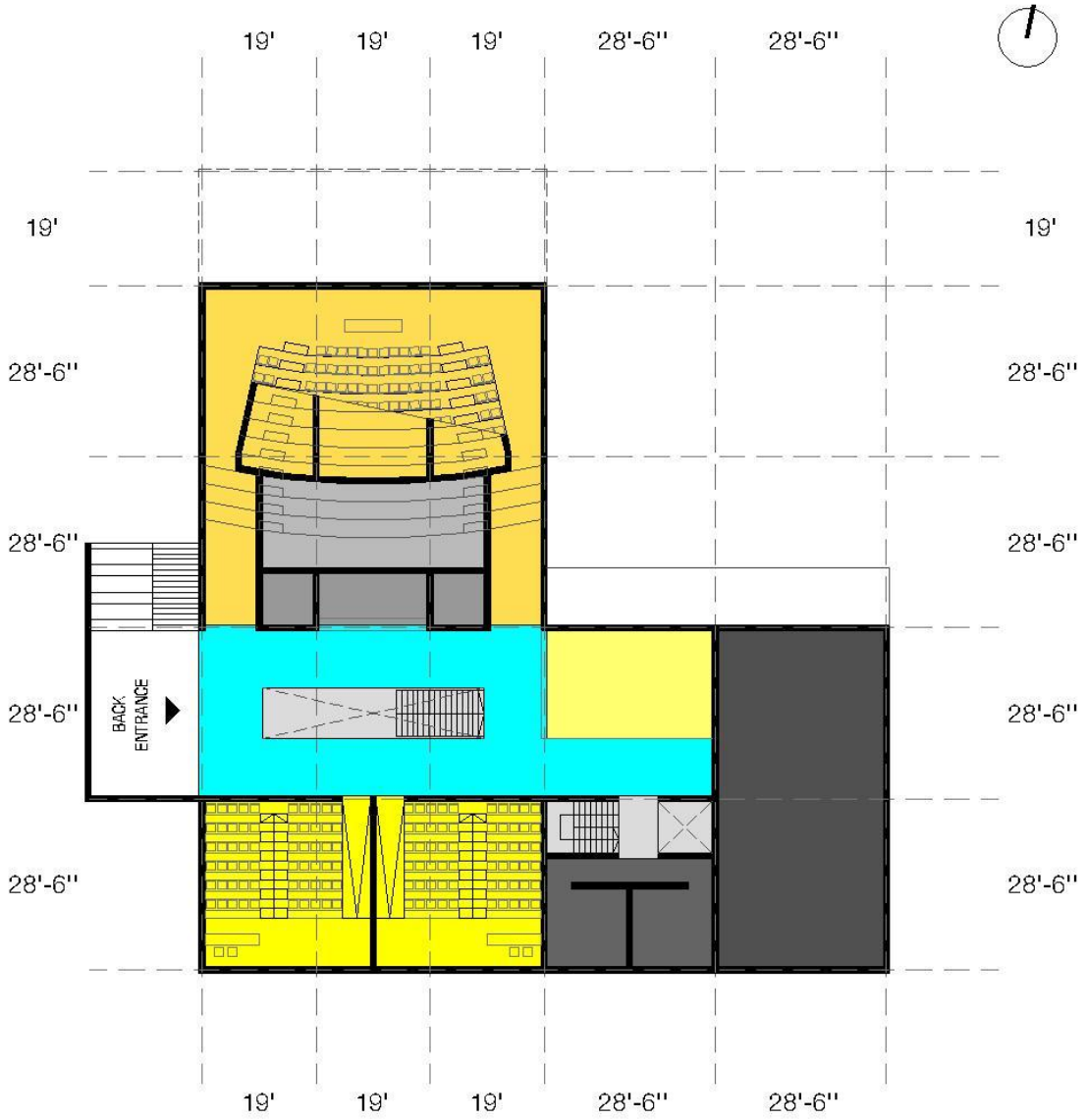
COMMUNICATION

STORAGE

WARDROBE/BAR

RESTROOM

MECHANICAL ROOM



1ST FLOOR

AUDITORIUM

LARGE CLASSROOM

INSTRUCTIONAL LAB

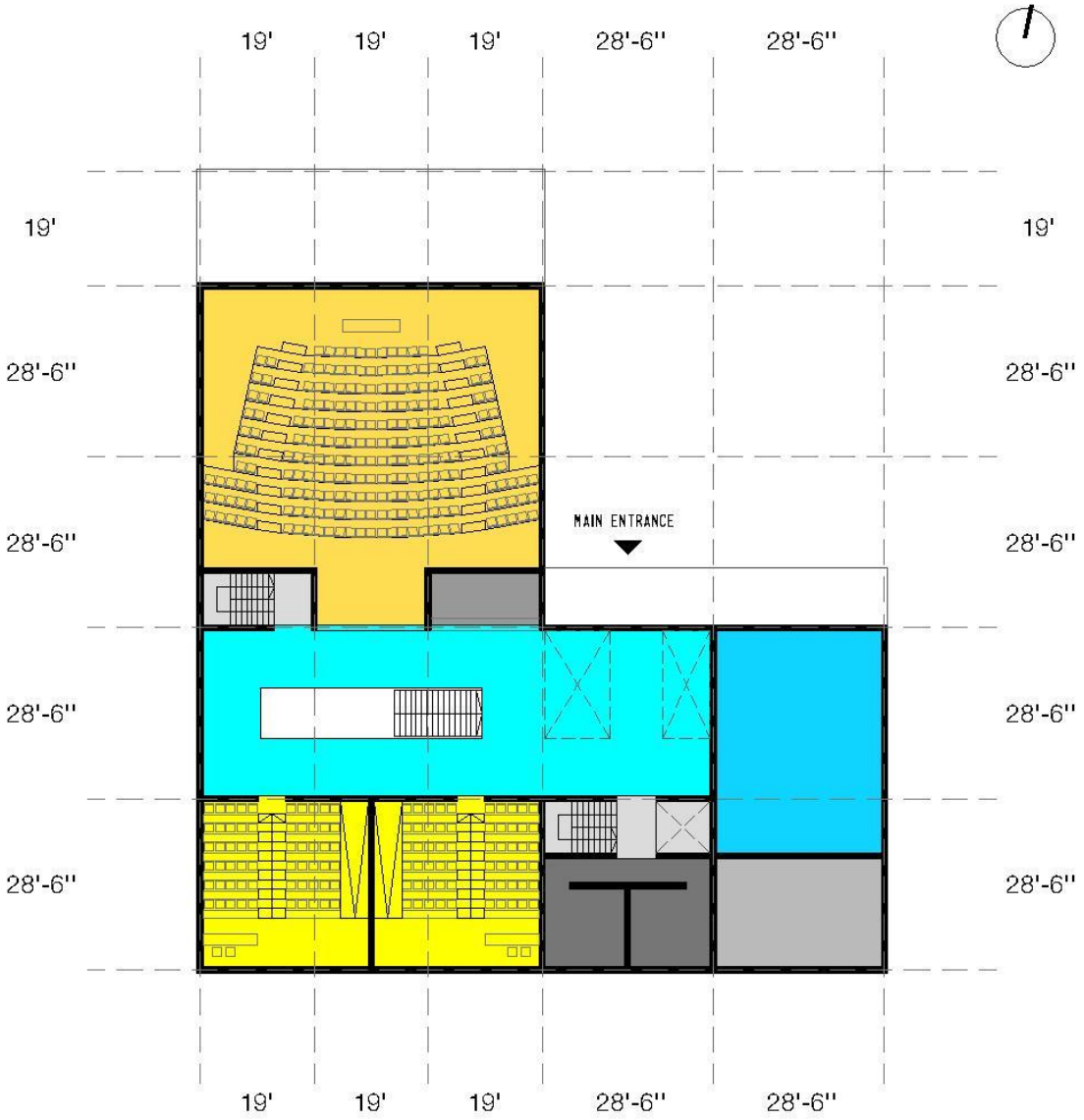
LOBBY/LOUNGE

COMMUNICATION

STORAGE/SERVER ROOM

TECHNICAL SUPPORT

RESTROOM



2ND FLOOR

STUDENT OFFICES

SMALL CLASSROOMS

SEMINAR ROOMS

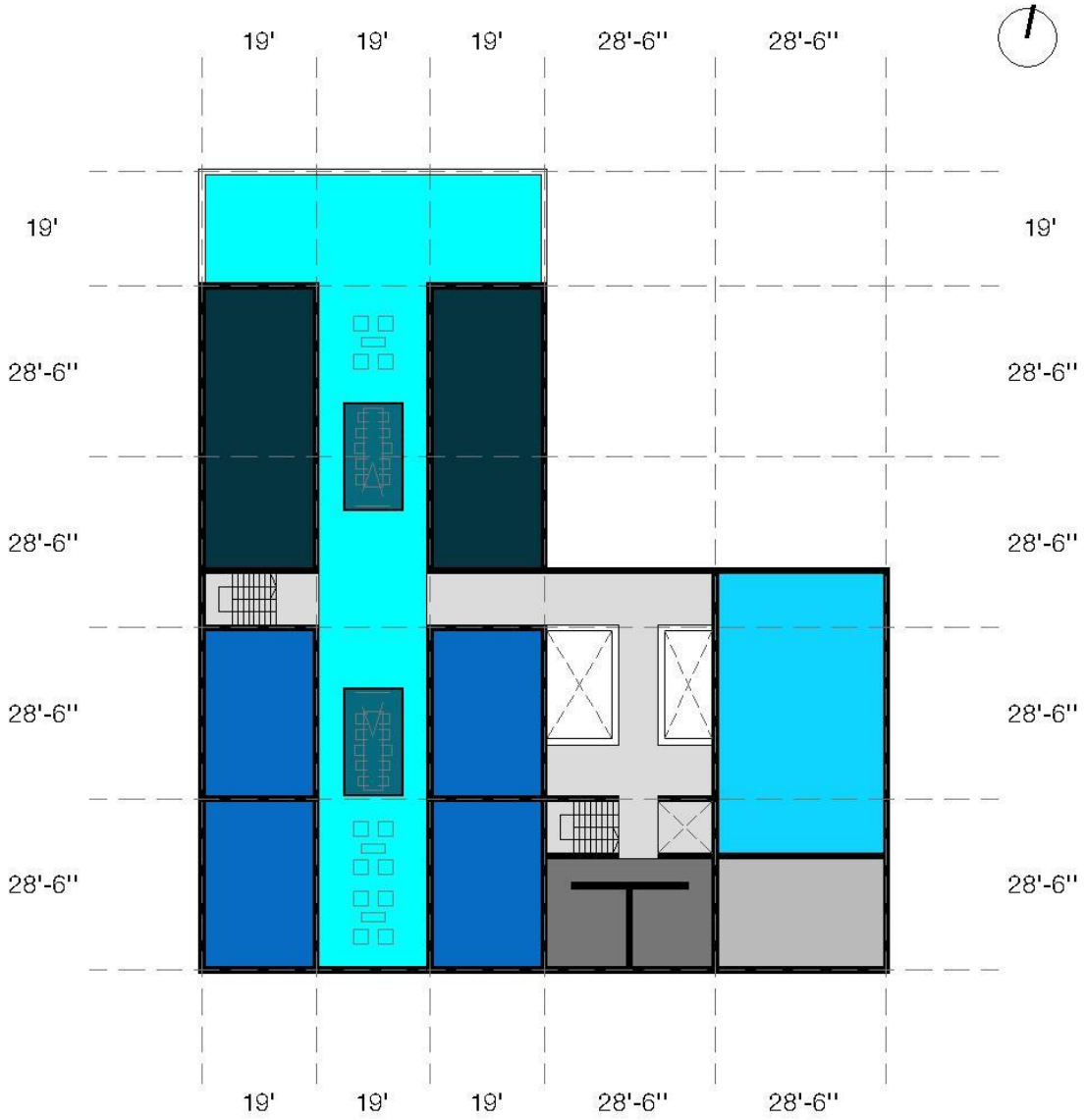
INSTRUCTIONAL LAB

LOUNGE

COMMUNICATION

STORAGE/SERVER ROOM

RESTROOM



3RD FLOOR

DEAN'S OFFICE

ADMINISTRATION

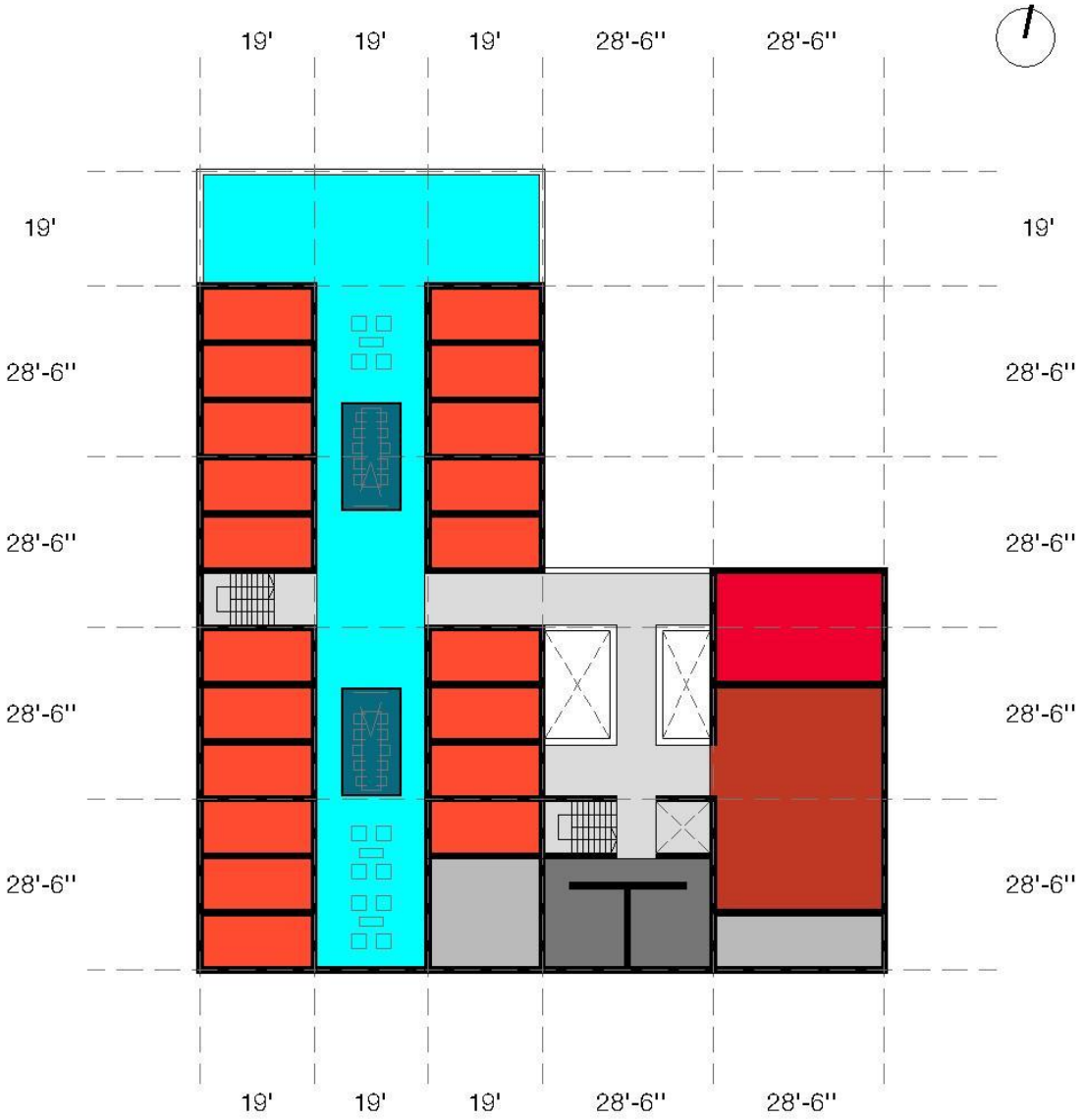
FACULTY OFFICES

LOUNGE

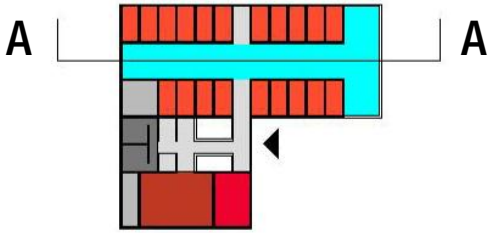
COMMUNICATION

STORAGE/SERVER ROOM

RESTROOM

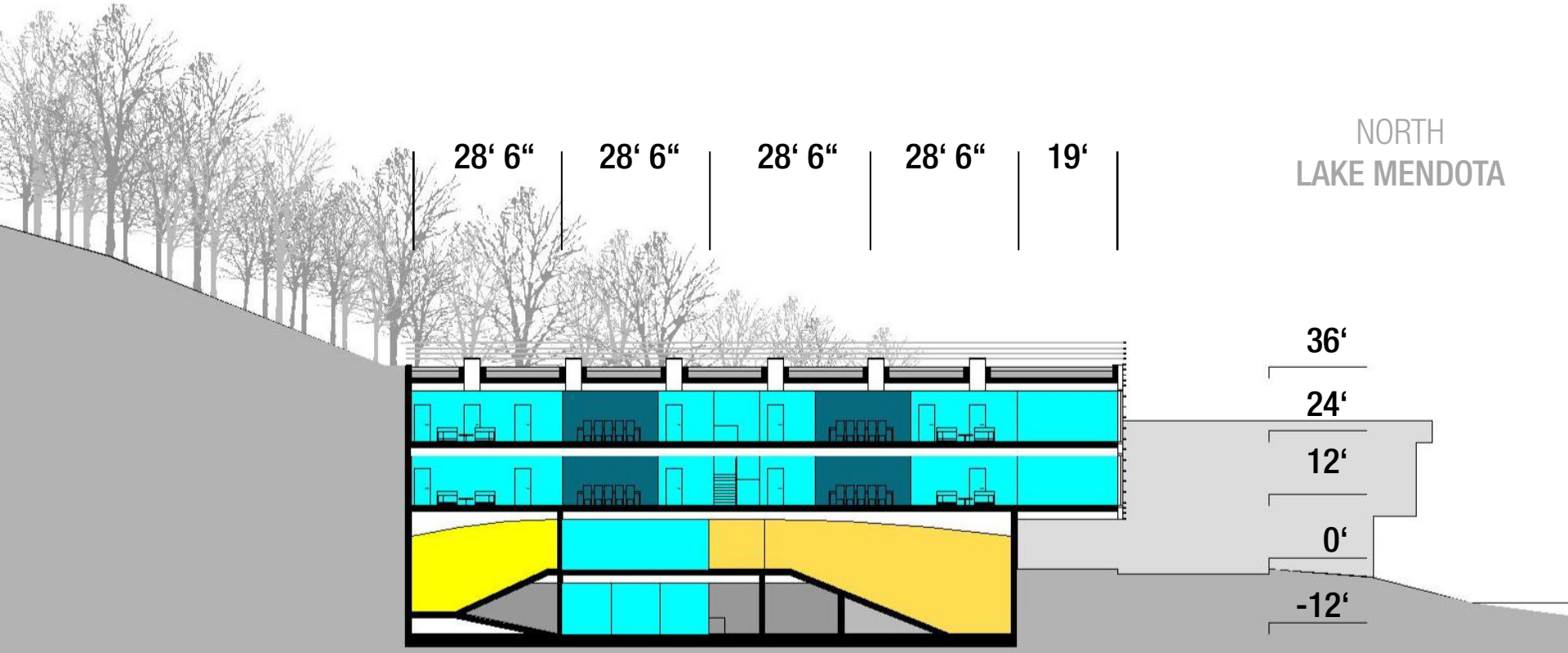


A-A SECTION

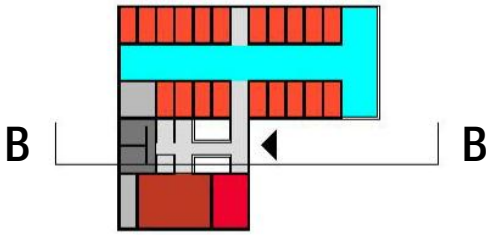


SOUTH
MUIR WOODS

NORTH
LAKE MENDOTA

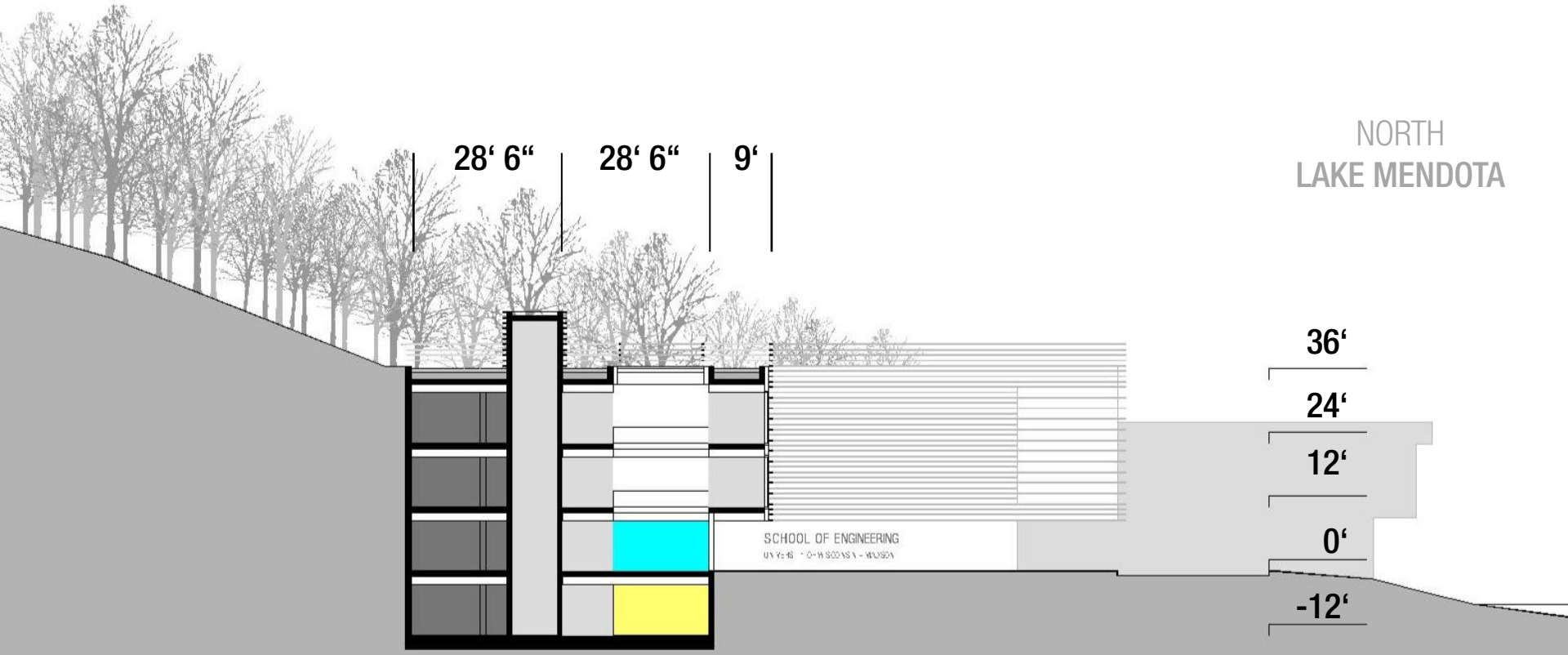


B-B SECTION

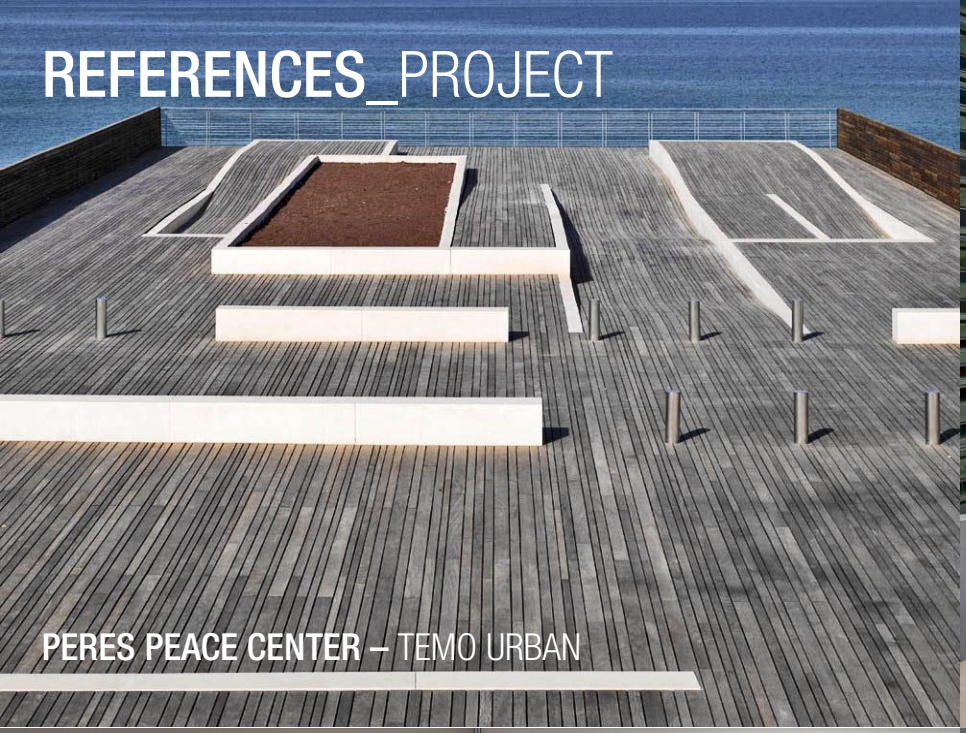


SOUTH
MUIR WOODS

NORTH
LAKE MENDOTA



REFERENCES_PROJECT



PERES PEACE CENTER – TEMO URBAN

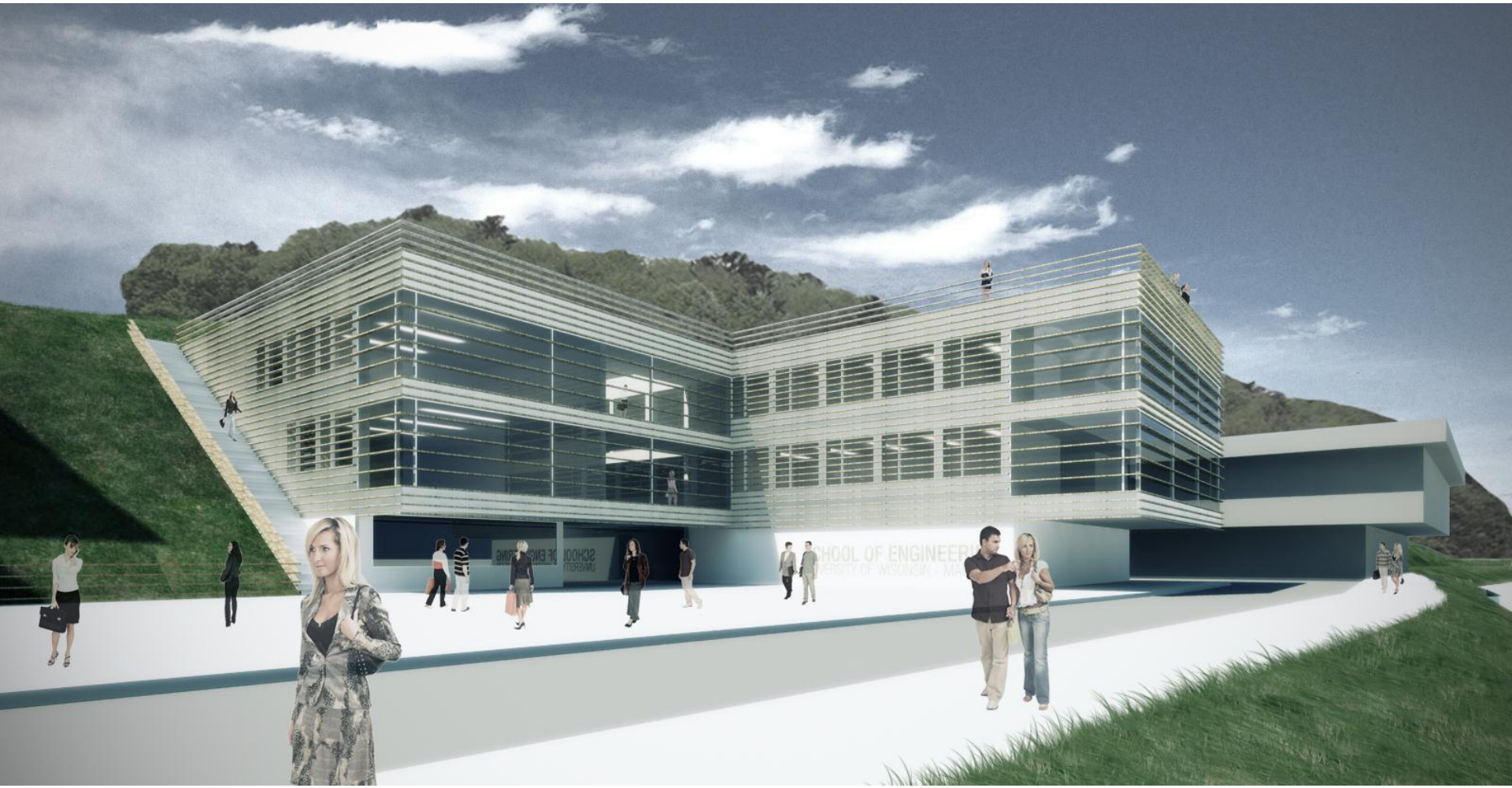
SMART GLASS – SEMINAR ROOMS

REFERENCES_FACADE

SALZBURG UNIVERSITY - DIETRICH UNTERTRIFALLER

BIOTECHNICAL FACULTY - ARHITEKTURA KRUŠEC

ENTRANCE PLAZA



ROOF VIEW

AARON
McDEVITT

LEILA
ZHENG

JOHANNES
SOLASS

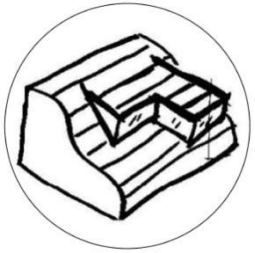
STRUCTURE
CONCEPT 1

TEAM
ATLANTIC

SE
CONCEPT 1

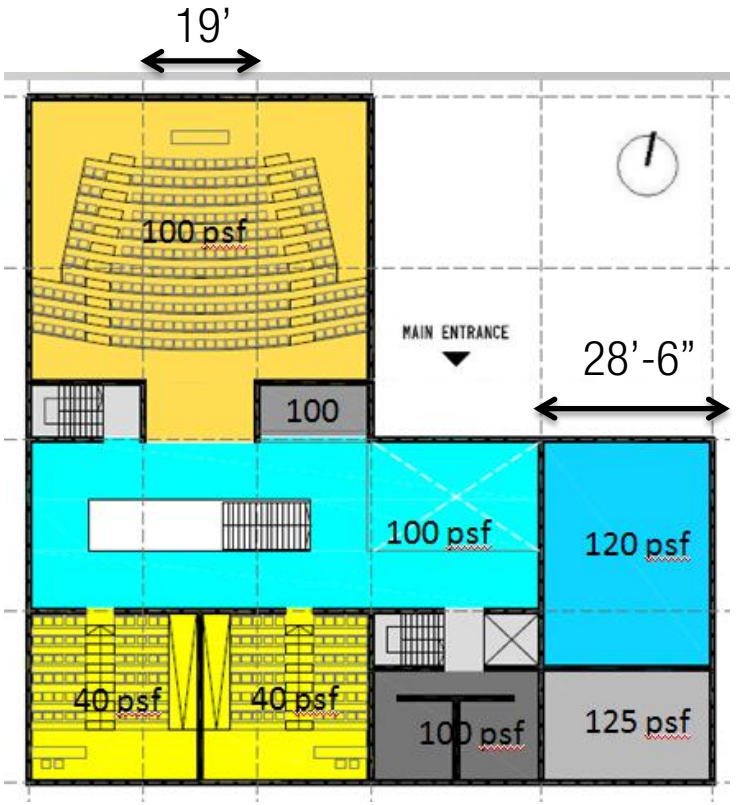
A **SE** MEP CM POP

SUMMARY AND LOADS



Dead load

Dead load	psf	Comments
Green roof (psf)	68.5	*just roof (duh)*
structure (concrete model)	75	*per floor, will be iterative process after we have designed correct members*
mep	5	
other	10.64936	*Ceilings, floors and finishes from ASCE7*
partitions	4.125714	*steel studs, 1/2 in gypsum boards*
Total (psf)	94.77507	*per floor*
Roof dead load (psf)	143.5	*roof structure+green roof*



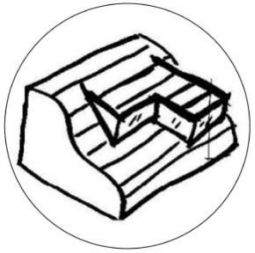
Wind load

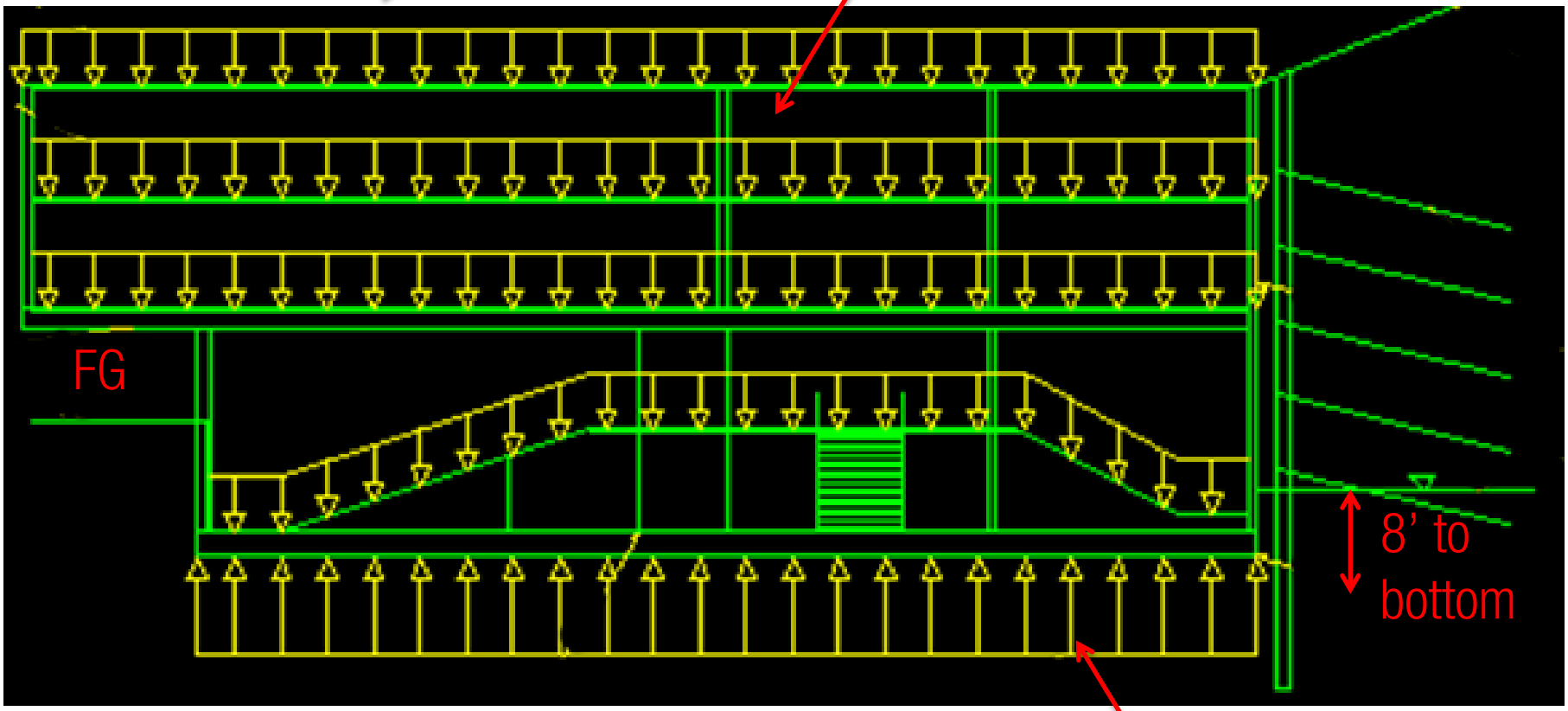
EW direction			NS direction		
Tributary area load (kips)			Tributary area load (kips)		
2nd floor	3rd floor	roof	2nd floor	3rd floor	roof
43.84077	46.7663	24.50273	25.37335	28.29888	15.26902

Snow load: 23.1 psf

Governing load eq (roof): 1.2D+1.6L+0.5S

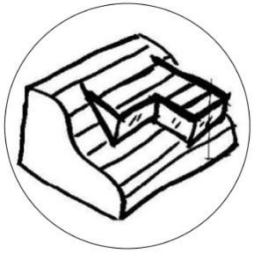
WATER TABLE CONCERNS





-uplift < gravity loads
-Mat foundation is estimated to be 30" (2.5')

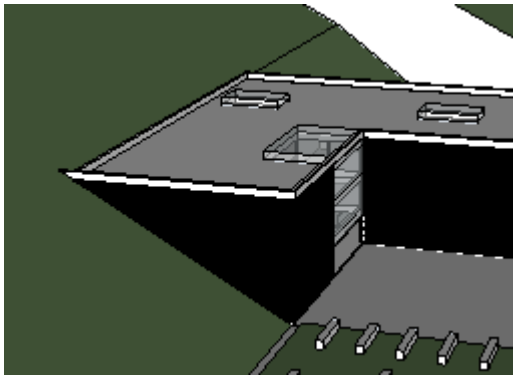
FOUNDATIONS



Excavated terrain 220,000 cubic feet

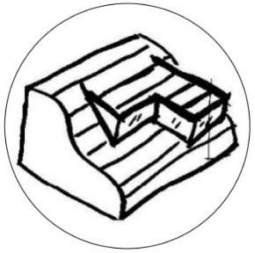
12’ tall retaining wall

Basement below water table

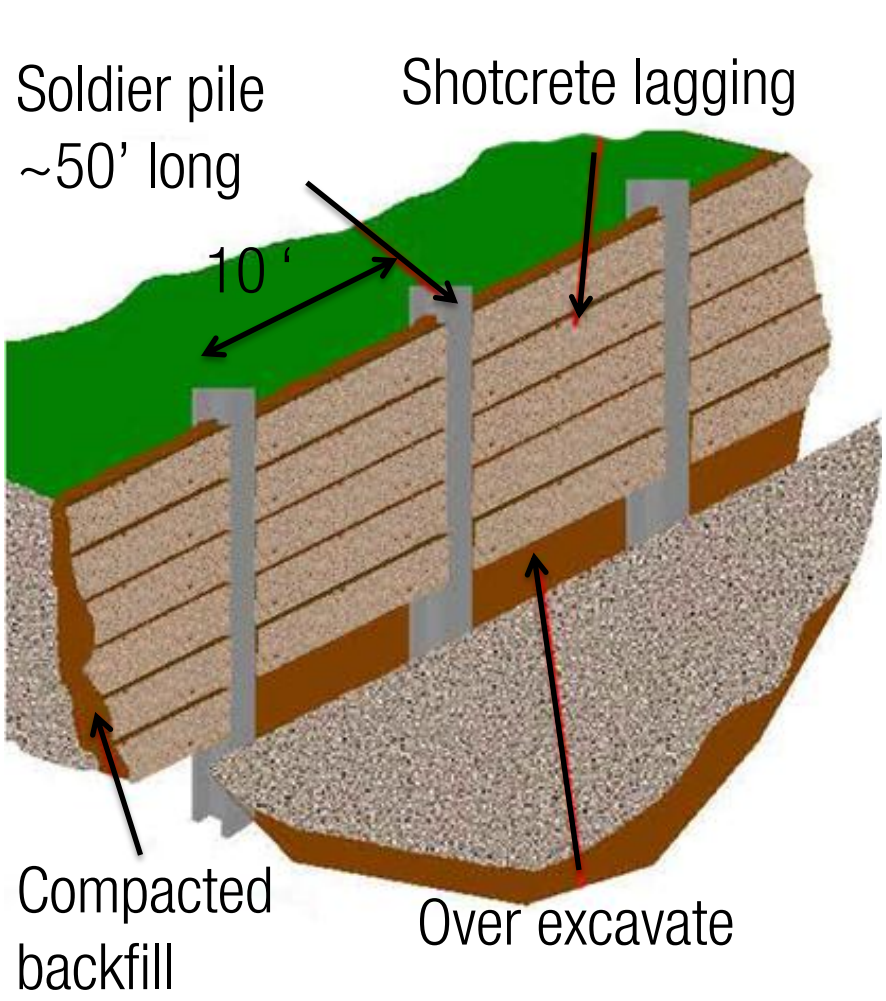


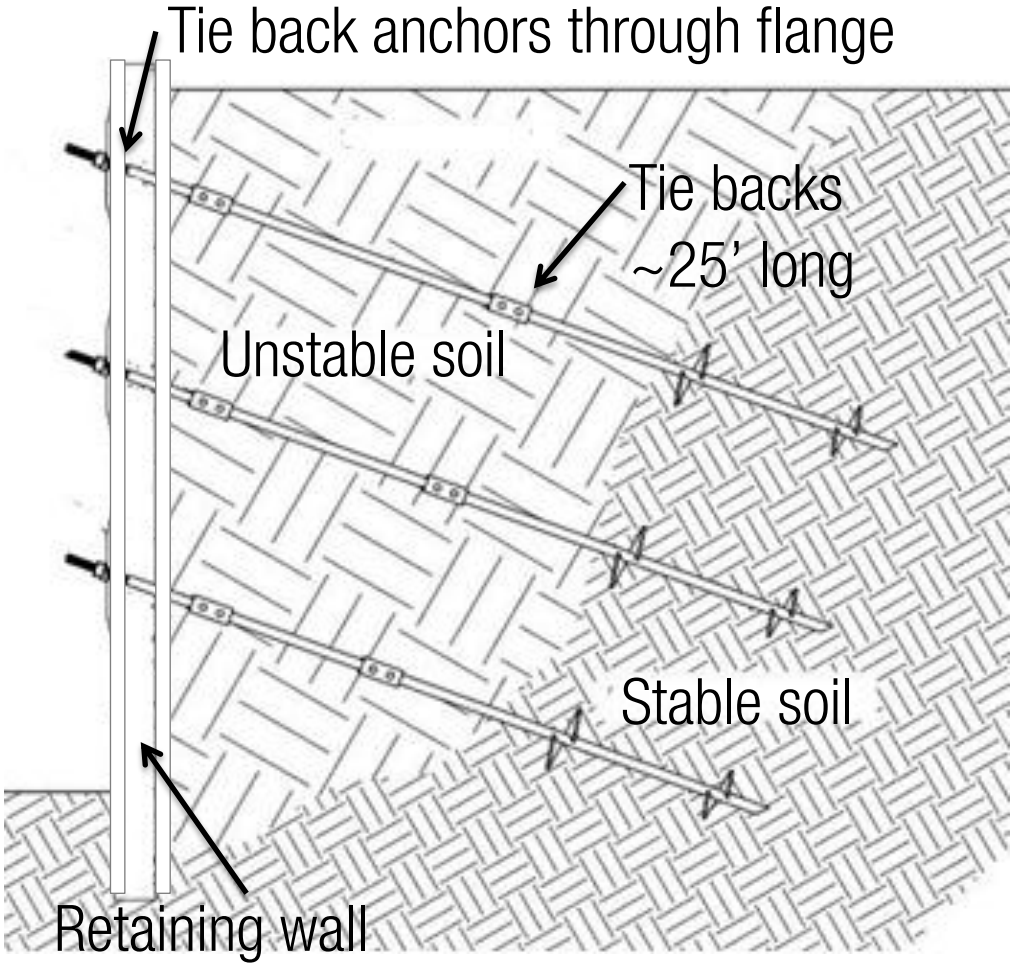
48’ tall retaining wall

RETAINING WALL SOLUTION

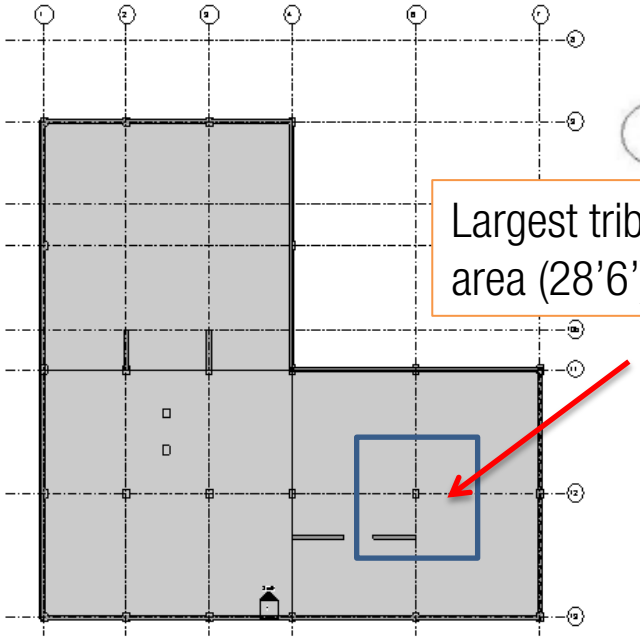


-Top down construction, permanent tie back wall
-Real wall built in front of wall, no lateral loads from hill





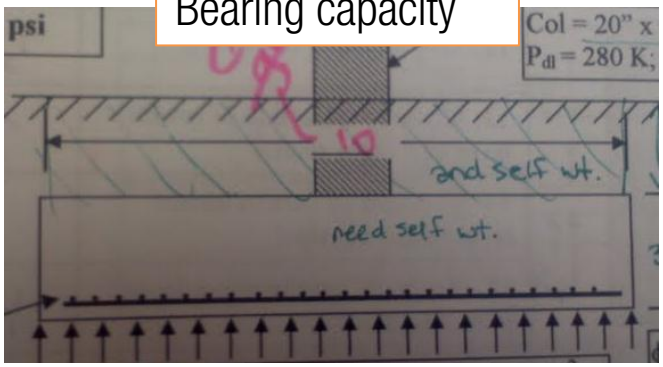
MAT FOUNDATION DESIGN, t=30“

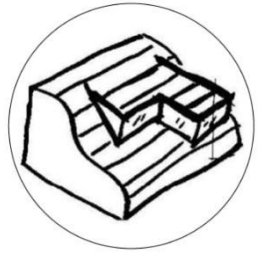


Largest tributary area (28’6’)^2

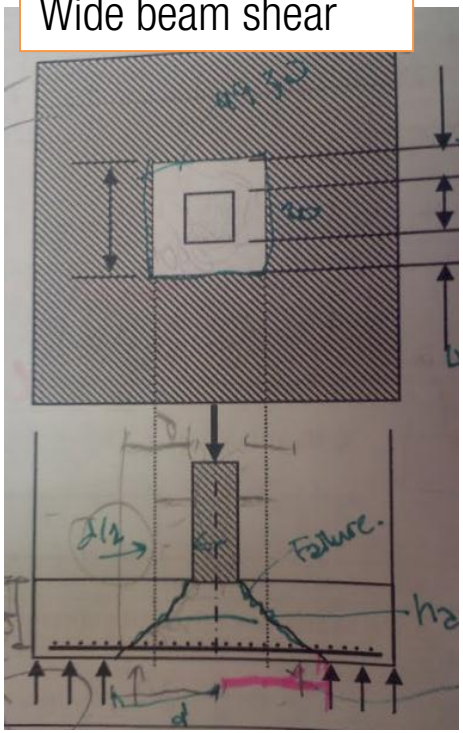
-design as spread footings
-bearing capacity 4ksf
-14.5’x14.5’, 30” thickness

Bearing capacity

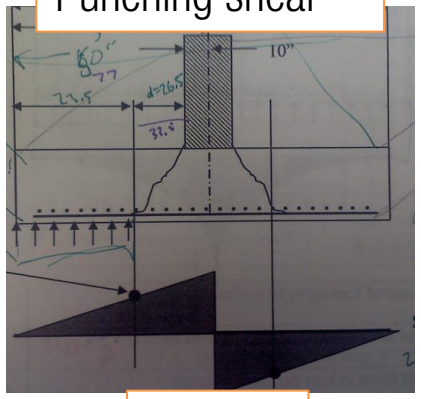




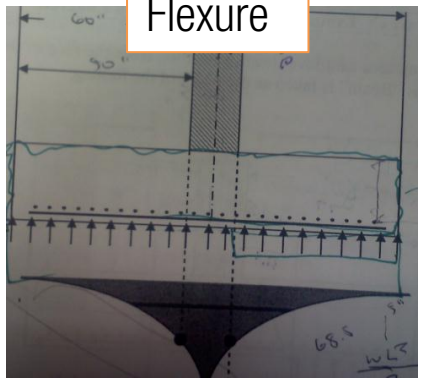
Wide beam shear



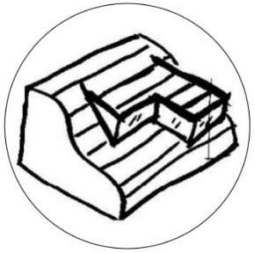
Punching shear



Flexure



CONCRETE ALTERNATIVE

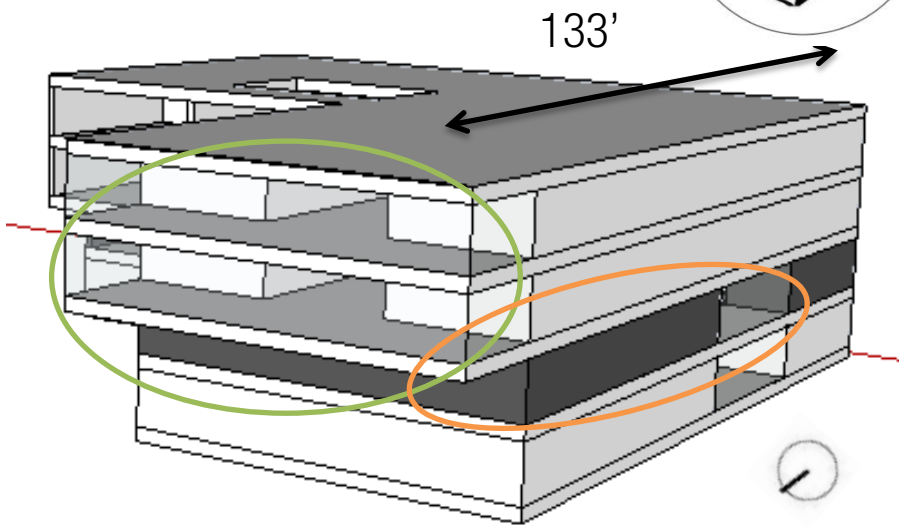


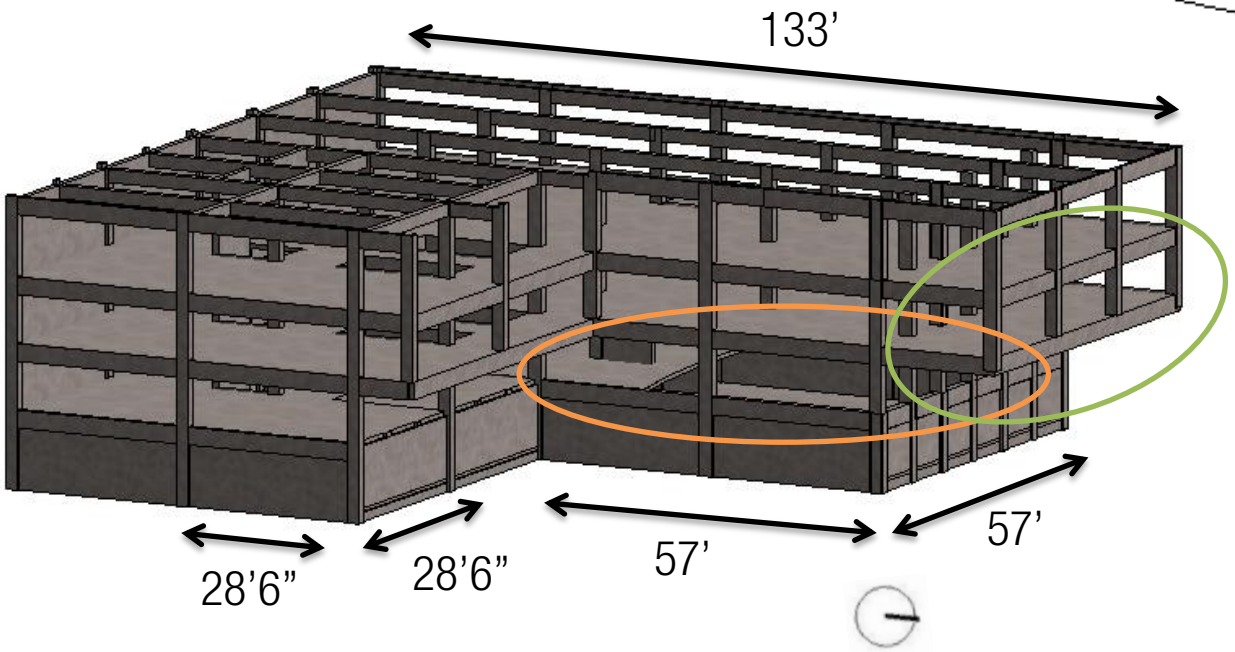
-CIP RC (beams, columns, slab)

Concerns:

1) Cantilevers

2) Auditorium span

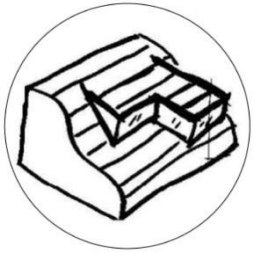


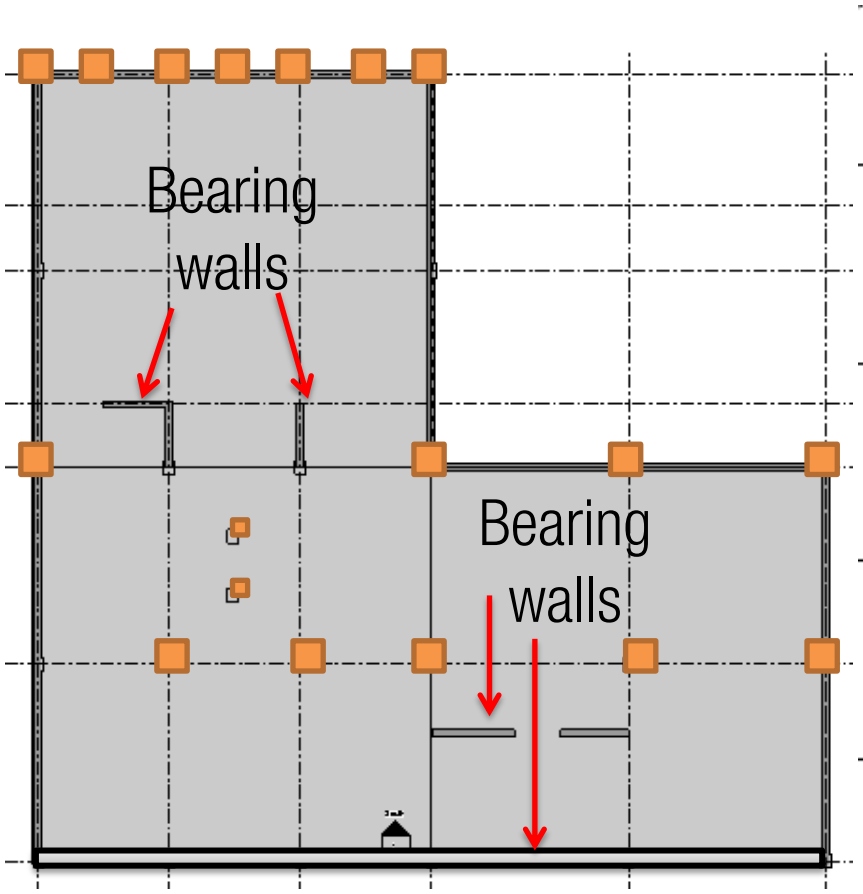


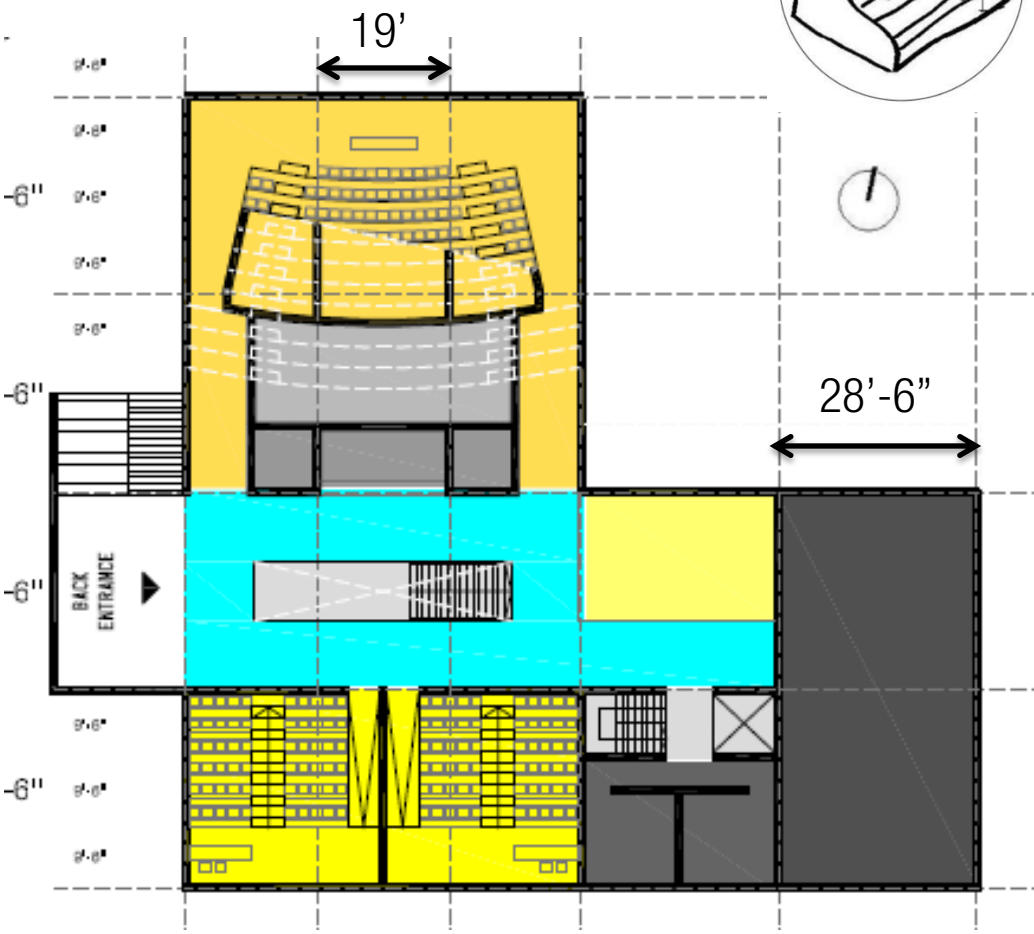
Larger spans 28'6"

Smaller spans 19'

CONCRETE ALTERNATIVE – BASEMENT



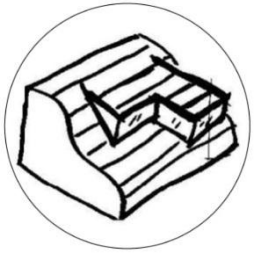


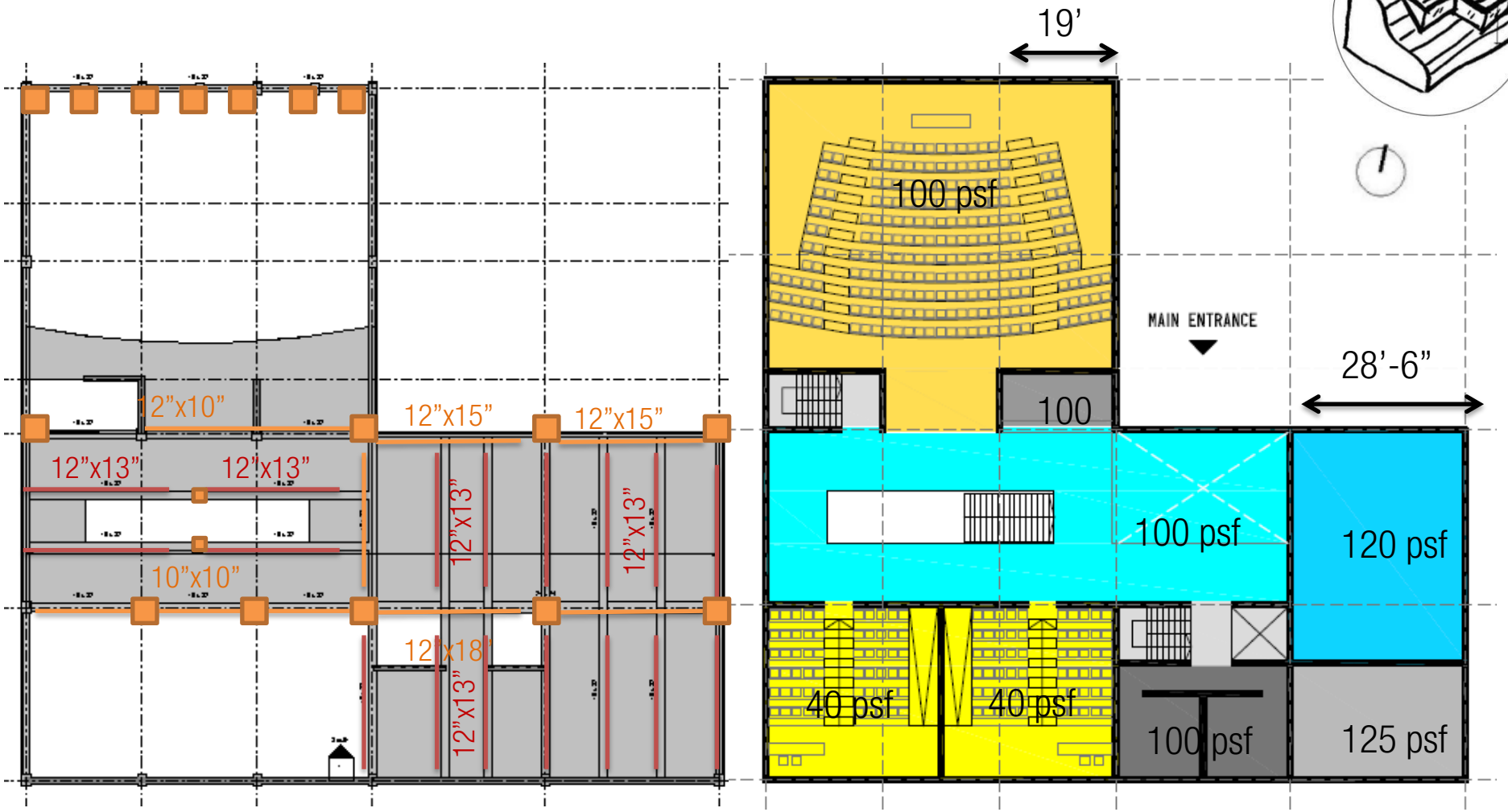


Columns :
Basement: 16"x16"
Other floors: 14"x14"

Basement

CONCRETE ALTERNATIVE – 1ST FLOOR

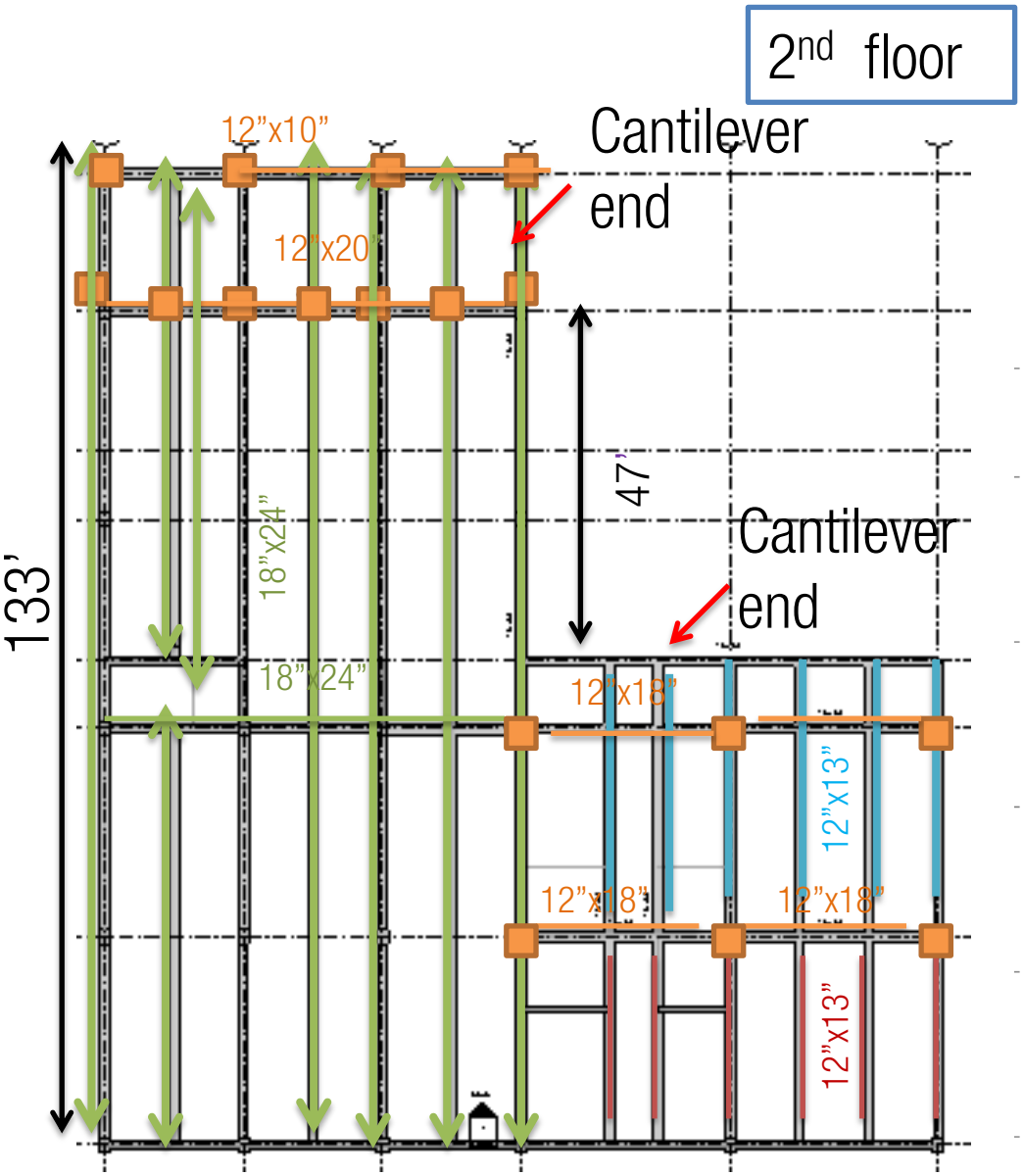


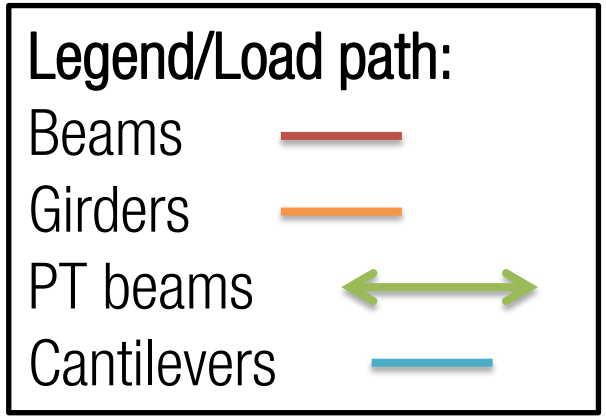


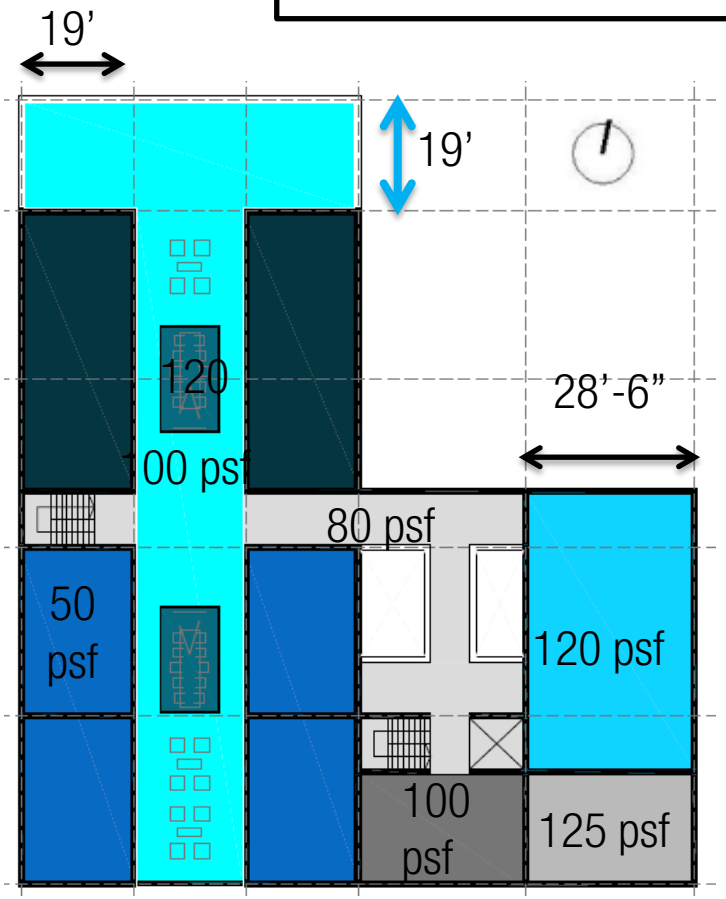
Legend/Load path:
Slab→beams→girders→columns

1st floor

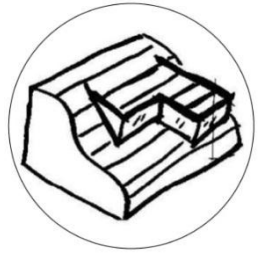
CONCRETE ALTERNATIVE – 2ND FLOOR

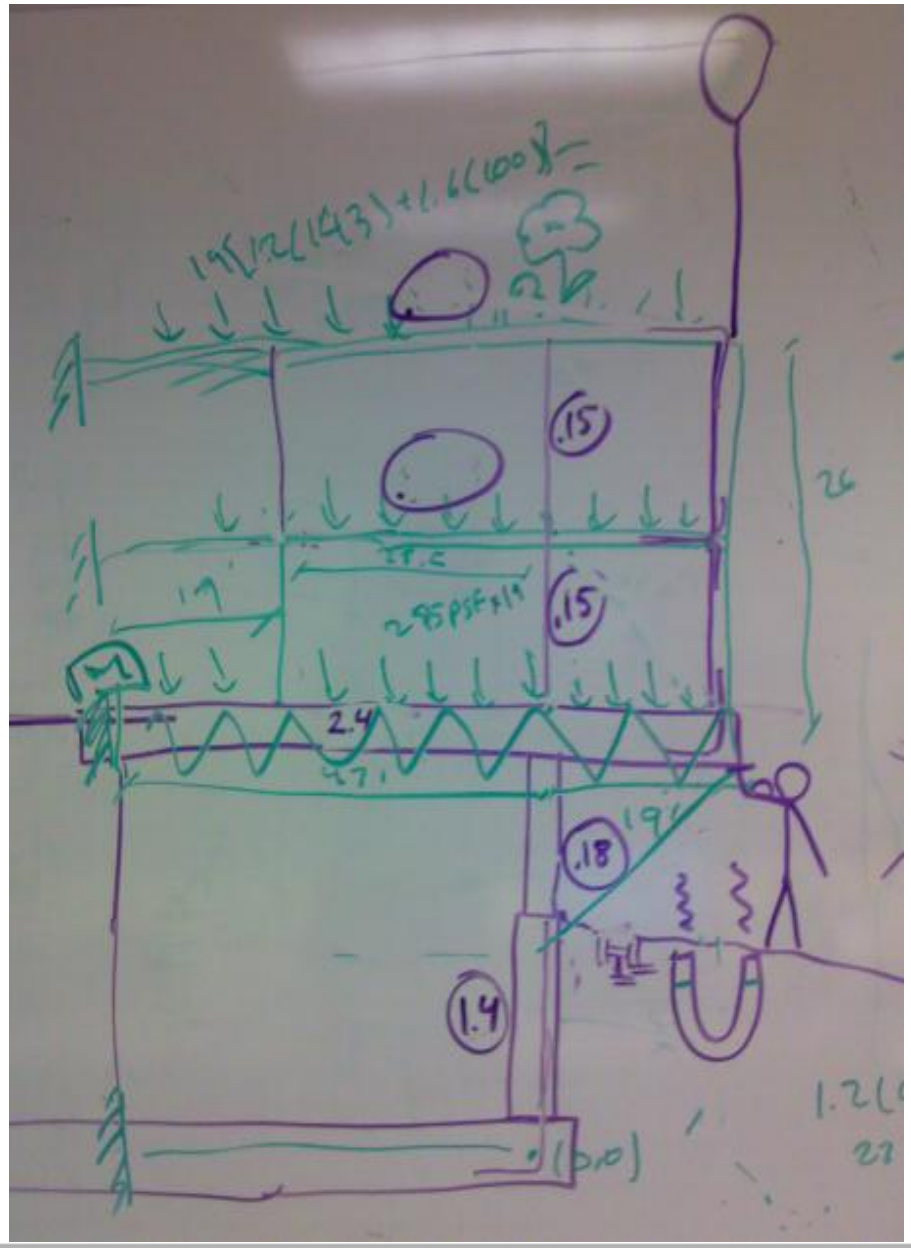




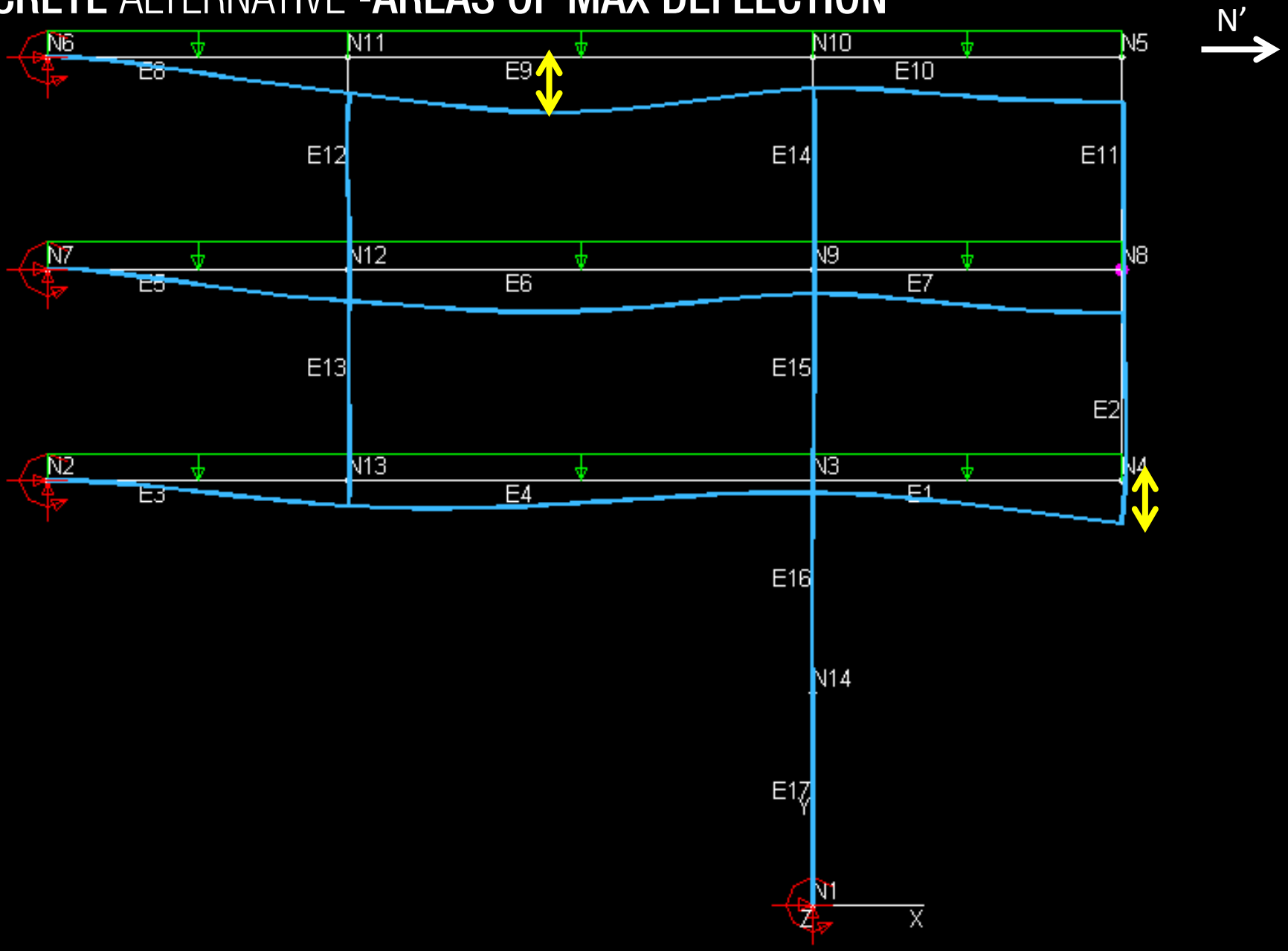


CONCRETE ALTERNATIVE - **AUDITORIUM-CANTILEVER INTERACTION**

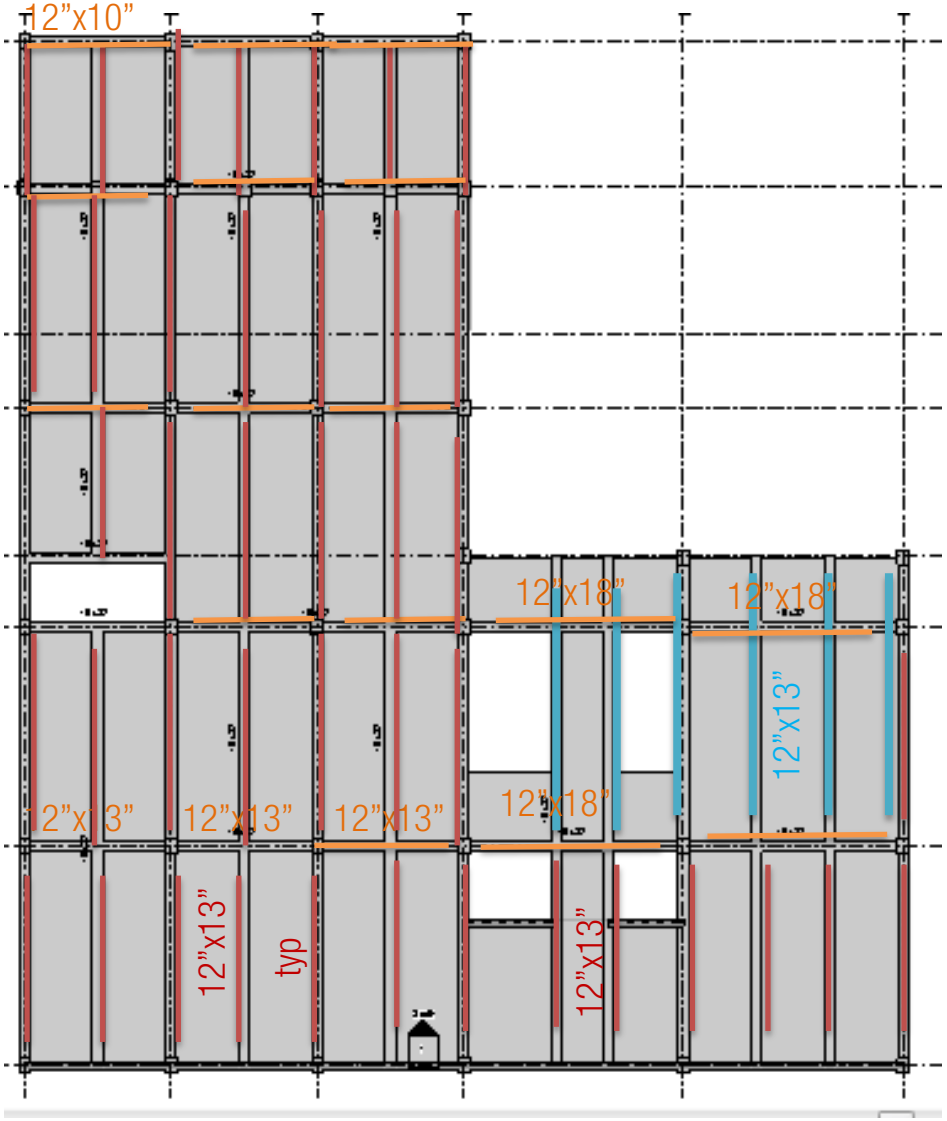




CONCRETE ALTERNATIVE -AREAS OF MAX DEFLECTION

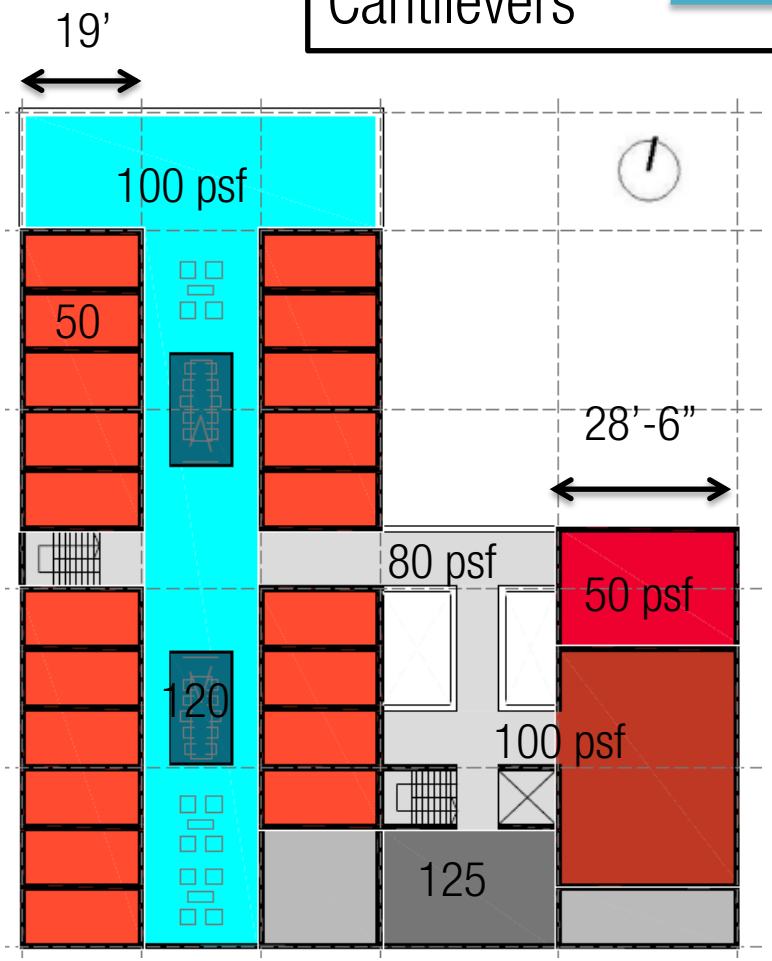


CONCRETE ALTERNATIVE – 3RD FLOOR

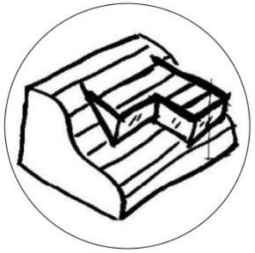


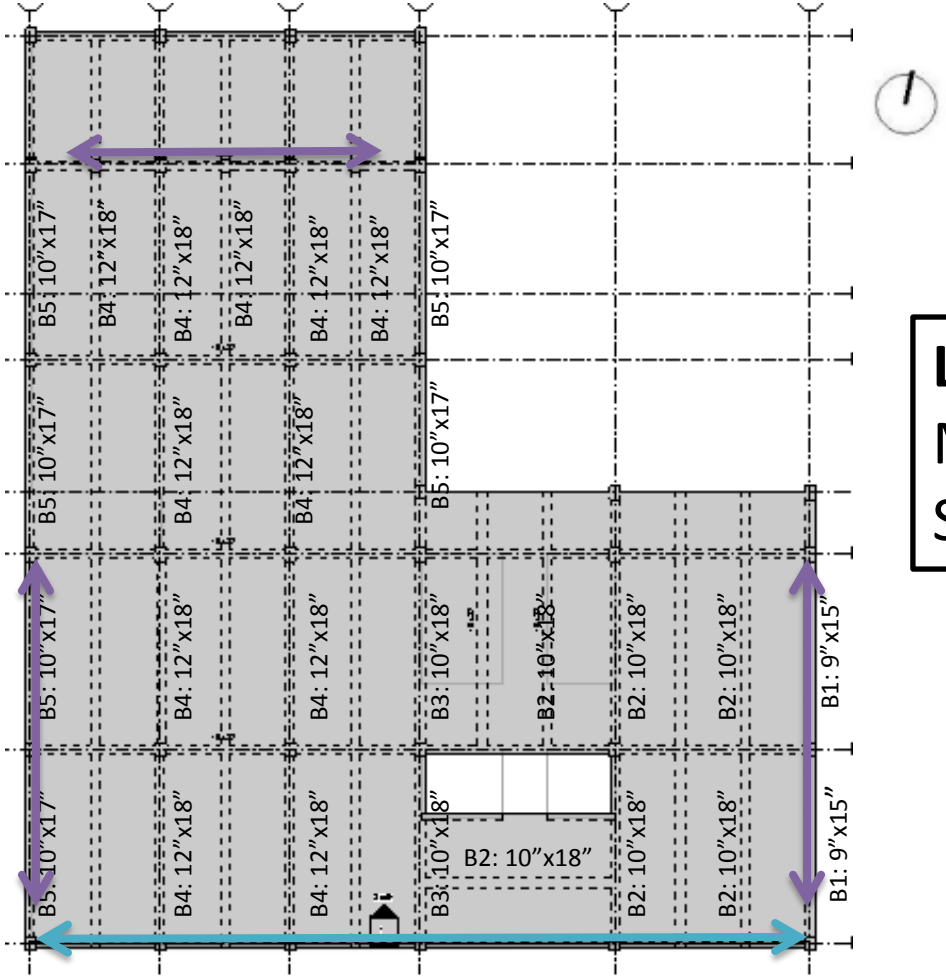
Legend/Load path:

- Beams
- Girders
- PT beams
- Cantilevers



CONCRETE ALTERNATIVE – ROOF AND LATERAL SYSTEM



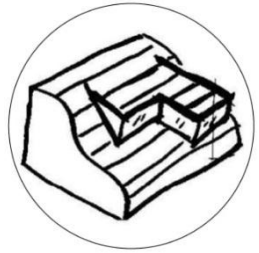


Legend:

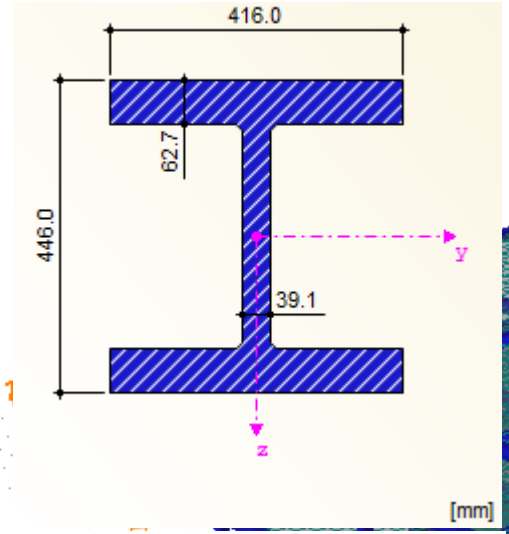
Moment frame ⟷

Shear wall ⟷

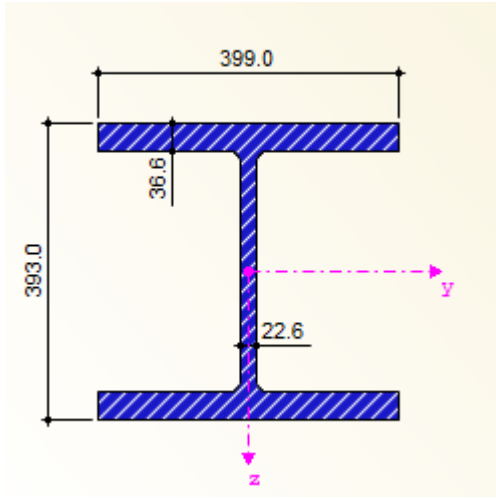
STEEL ALTERNATIVE

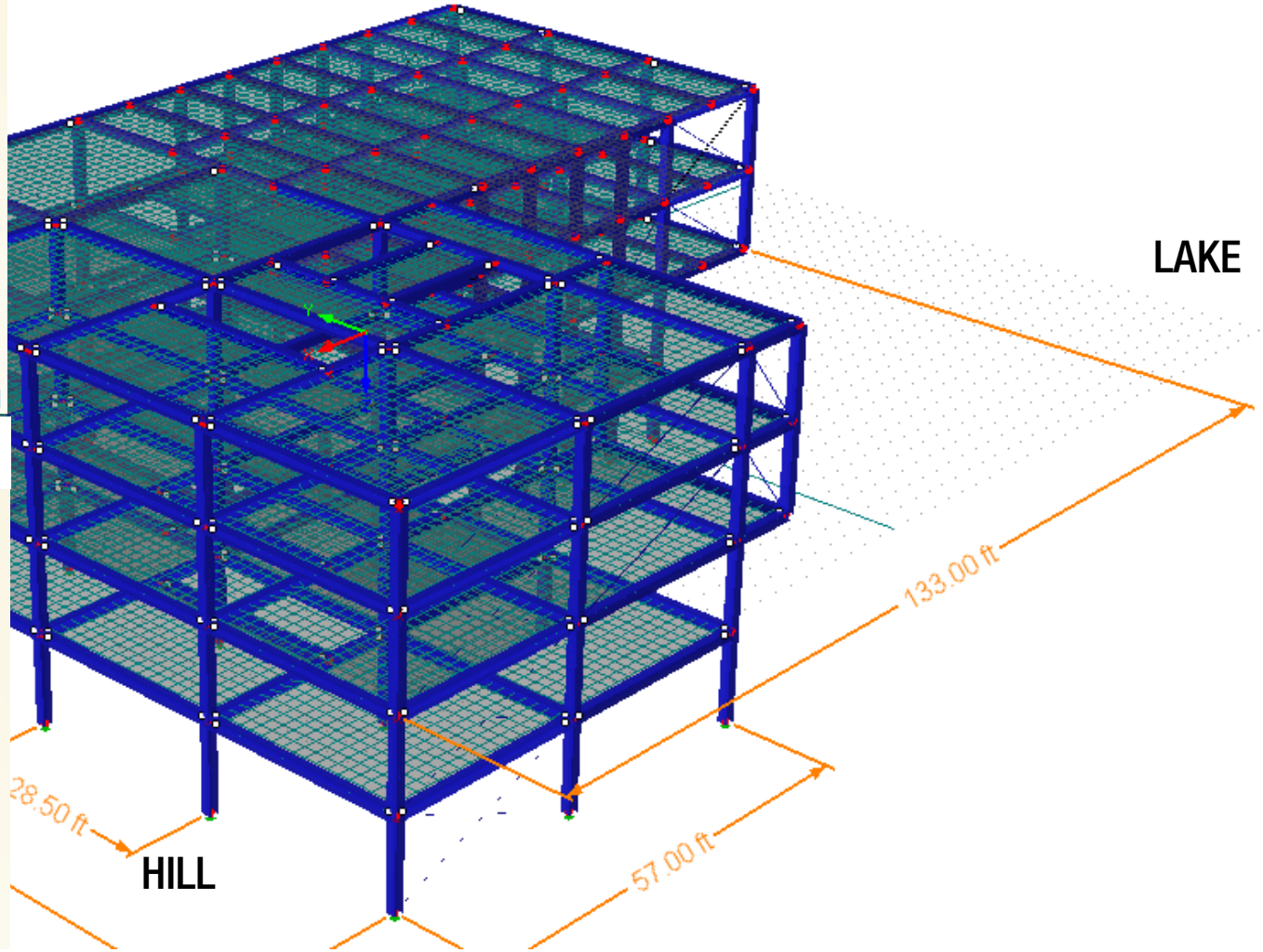


Columns: W 360x410x509

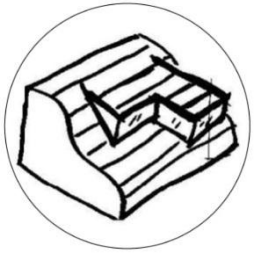


Beams: W 360x410x287



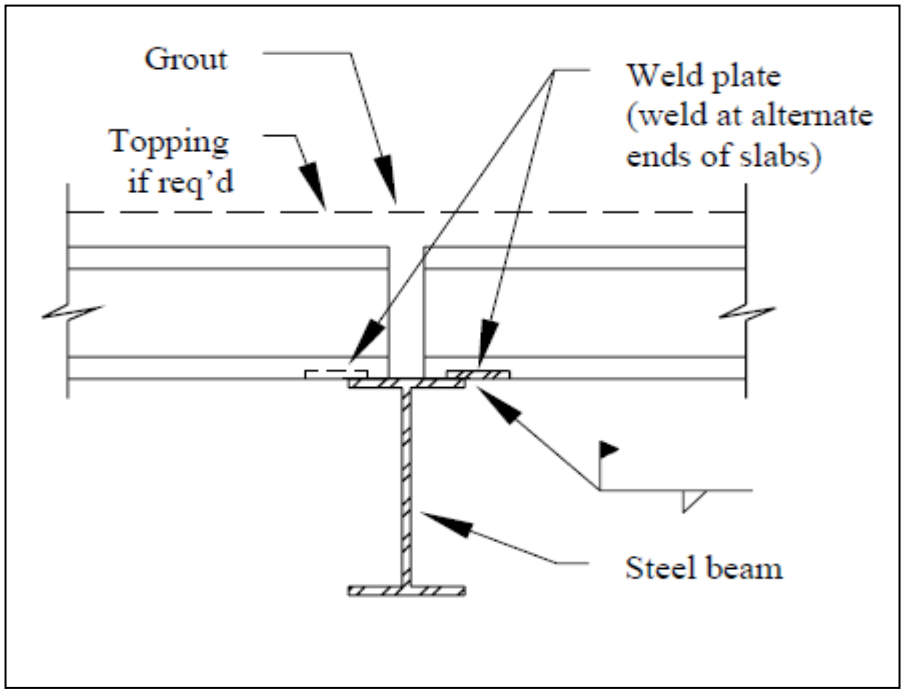


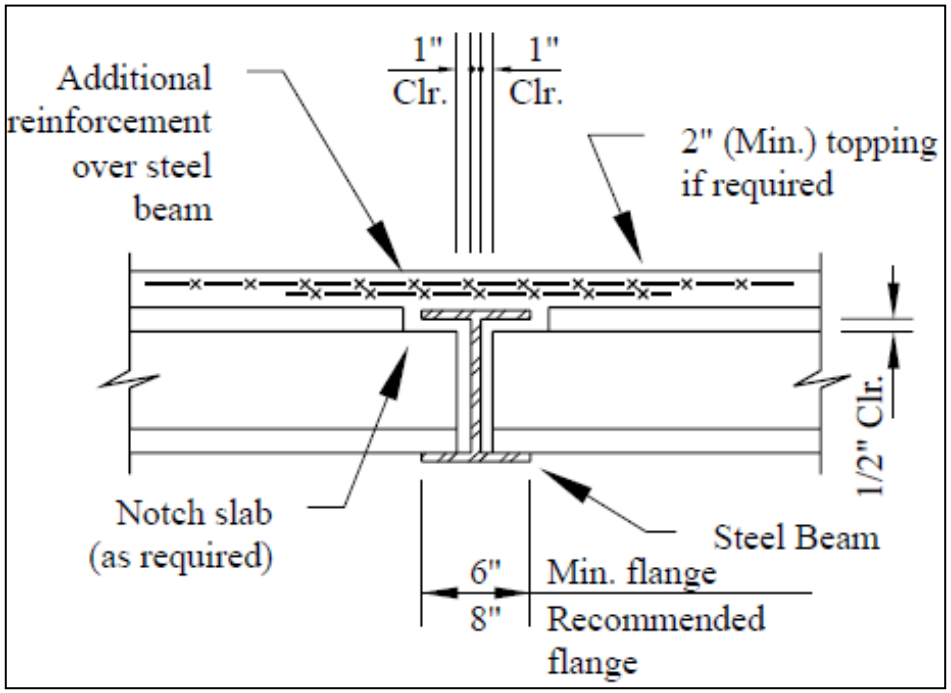
STEEL ALTERNATIVE – ROOF AND FLOOR



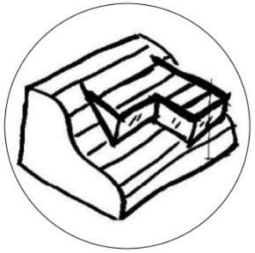
1st Option

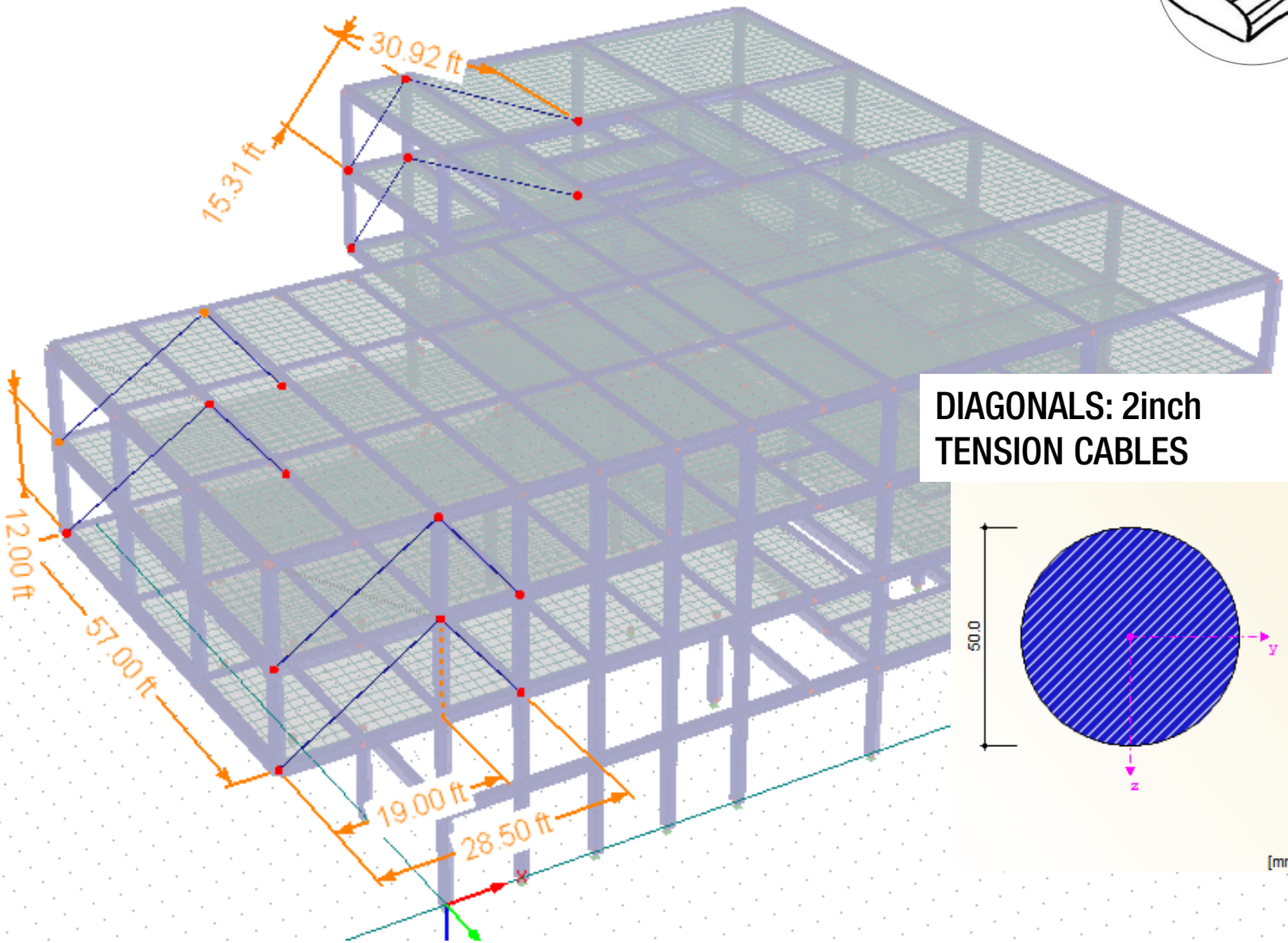
2nd Option





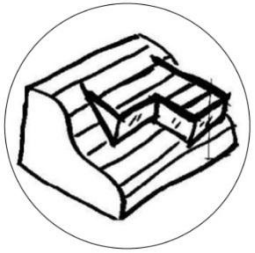
STEEL ALTERNATIVE – CANTILEVER REGION

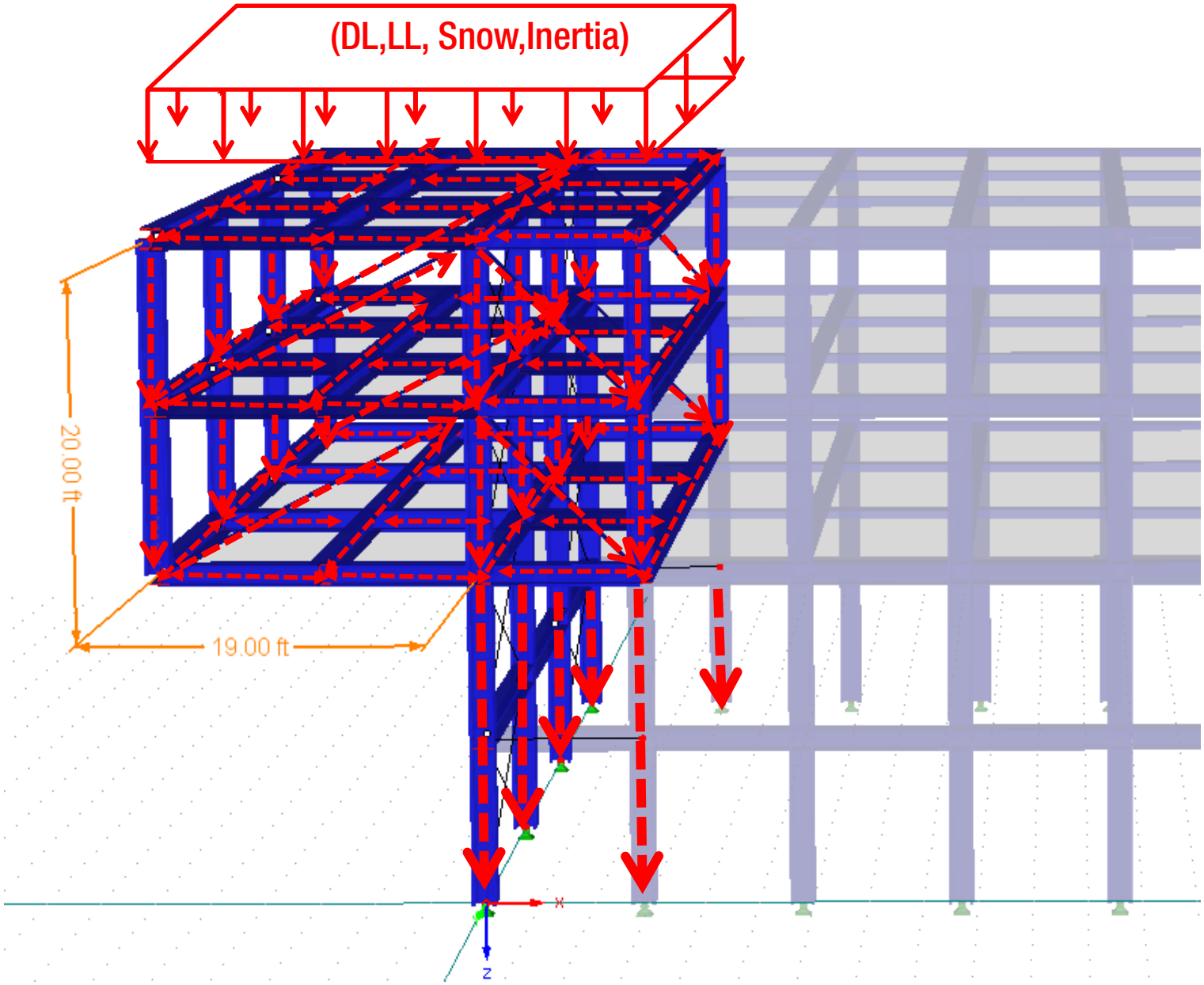




DIAGONALS: 2inch
TENSION CABLES

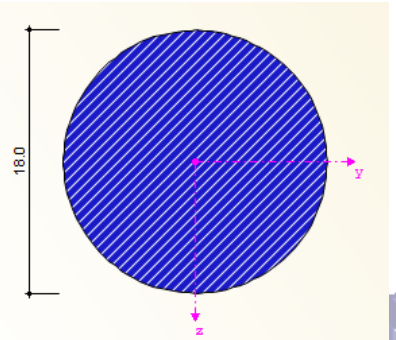
STEEL ALTERNATIVE – CANTILEVER LOAD PATH

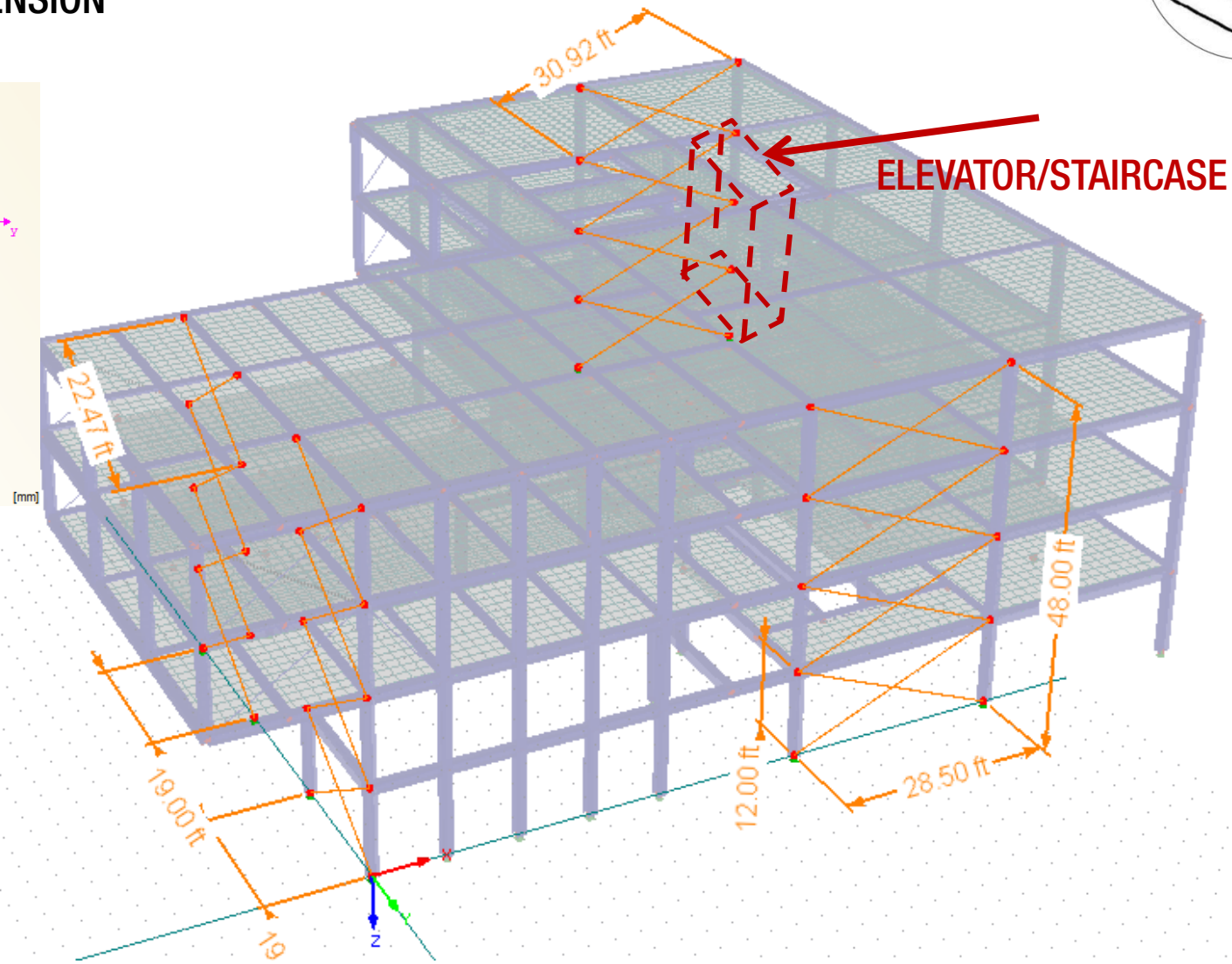




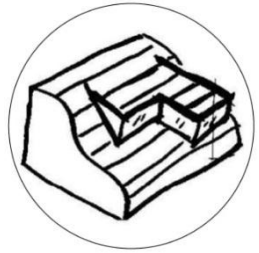
STEEL ALTERNATIVE – LATERAL SYSTEM

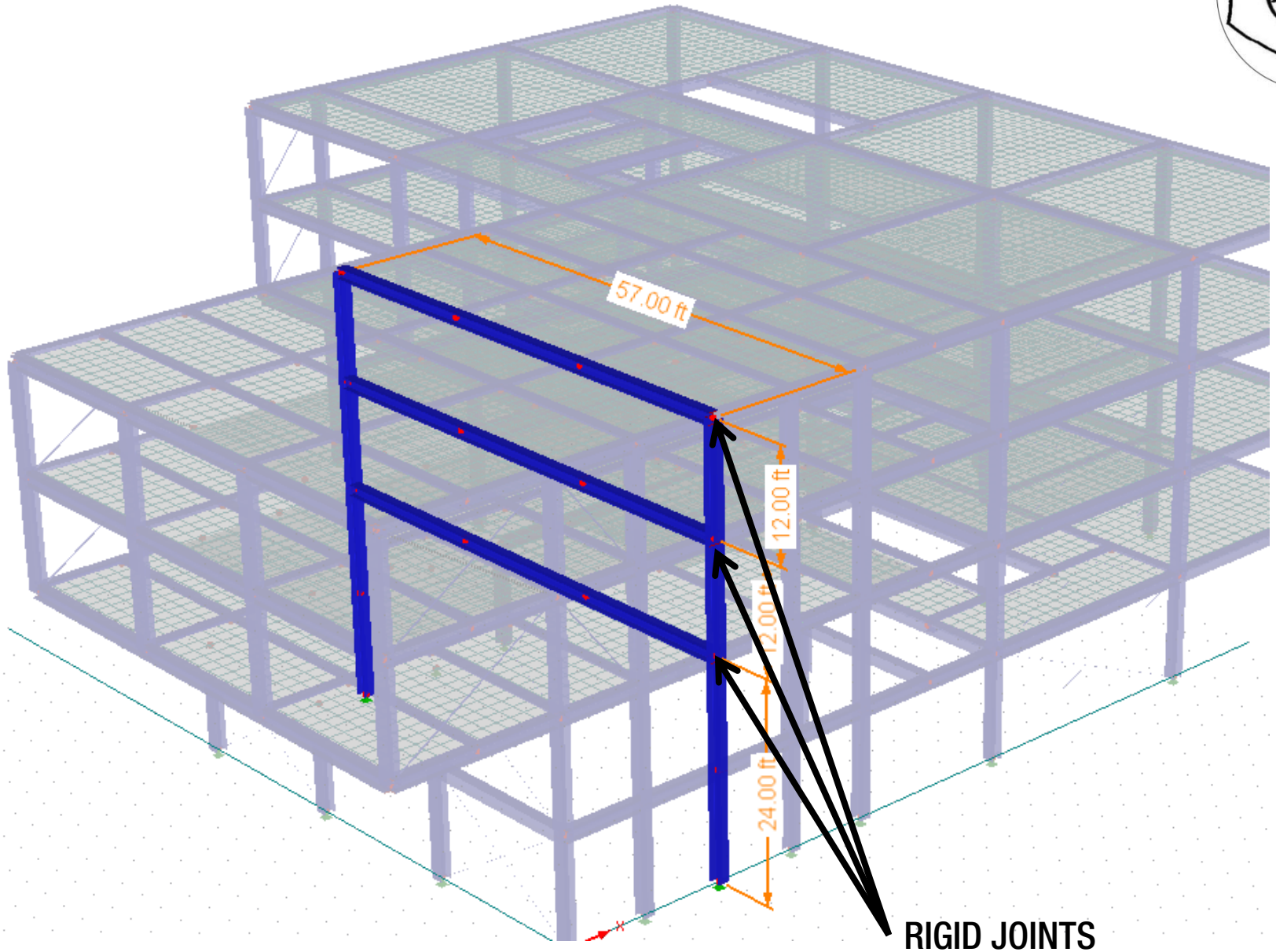
0,7 inch STEEL TENSION CABLES





STEEL ALTERNATIVE – DETAILS





JANŽ
OMERZU

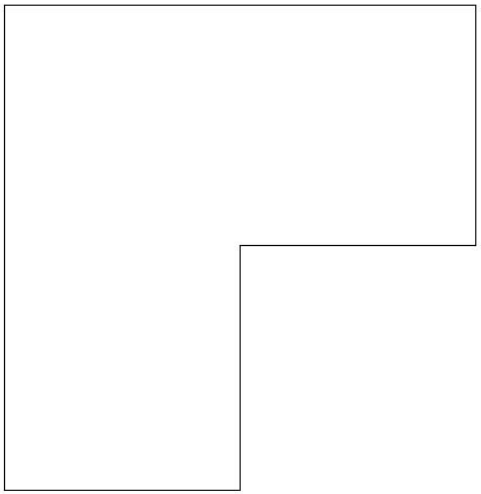
ARCHITECTURE
CONCEPT 2

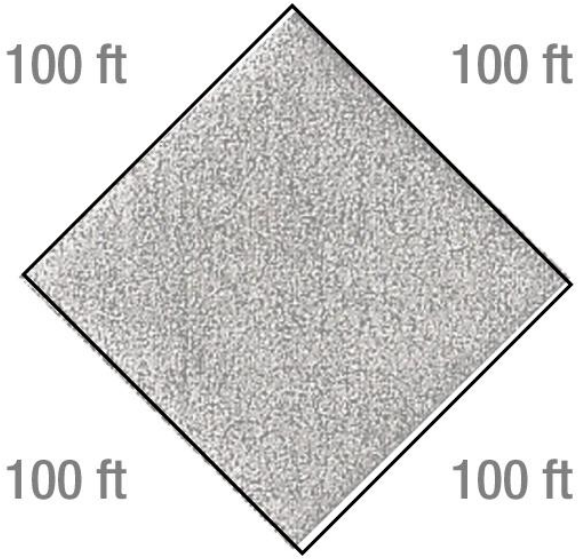
TEAM
ATLANTIC

A
CONCEPT 2

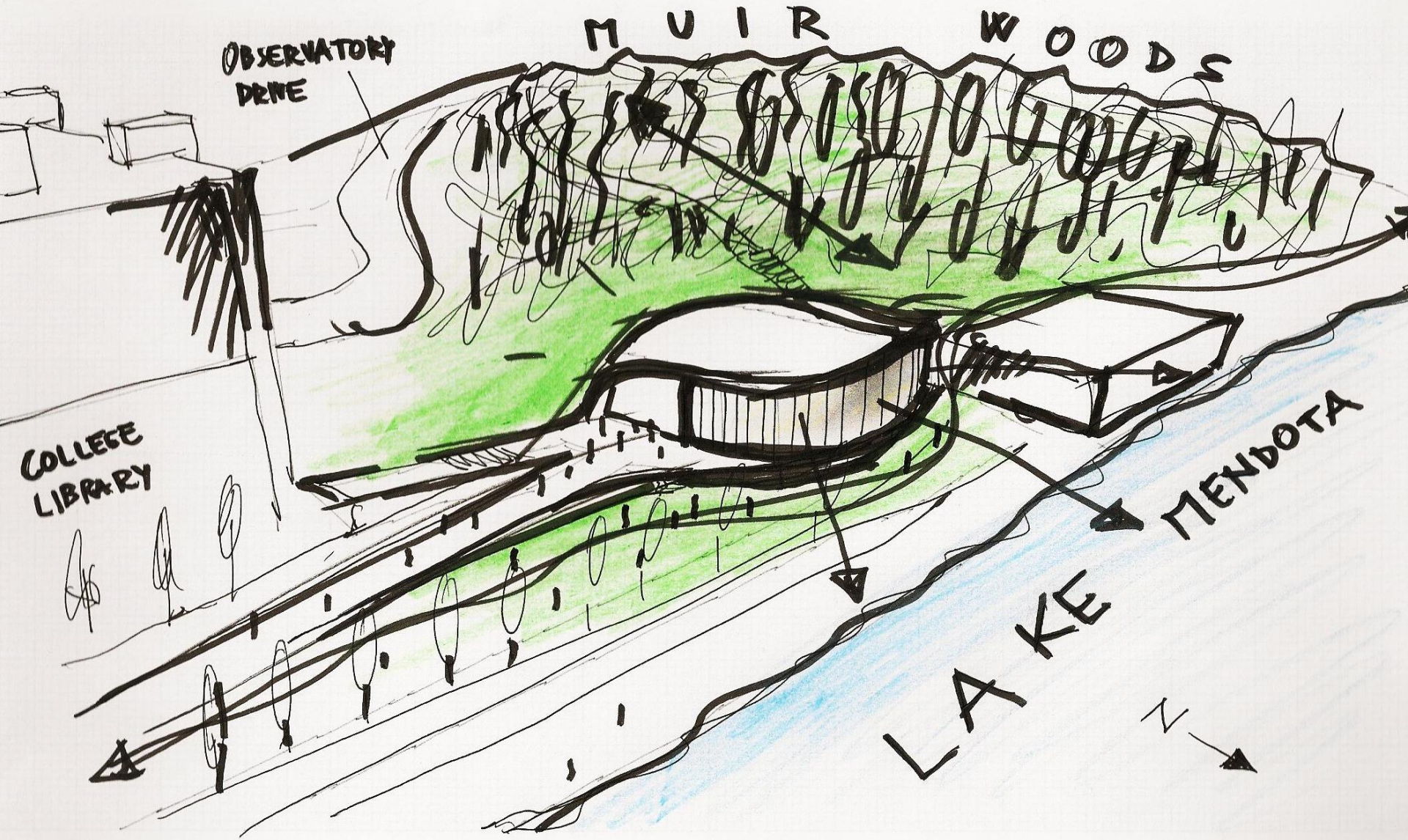
A SE MEP CM POP

CONCEPT 2_SQUARE SHAPE

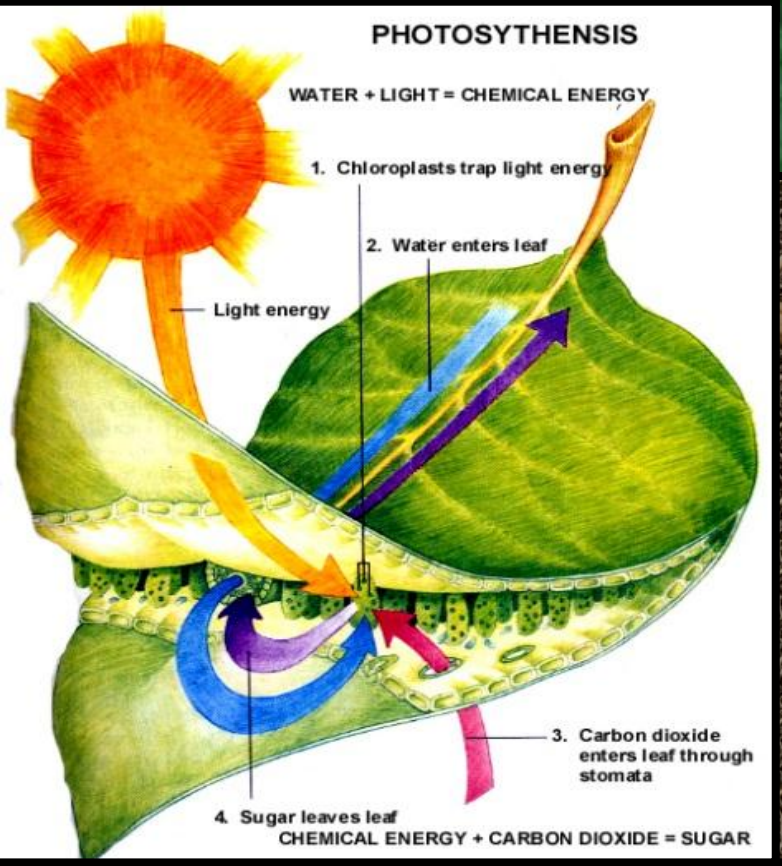




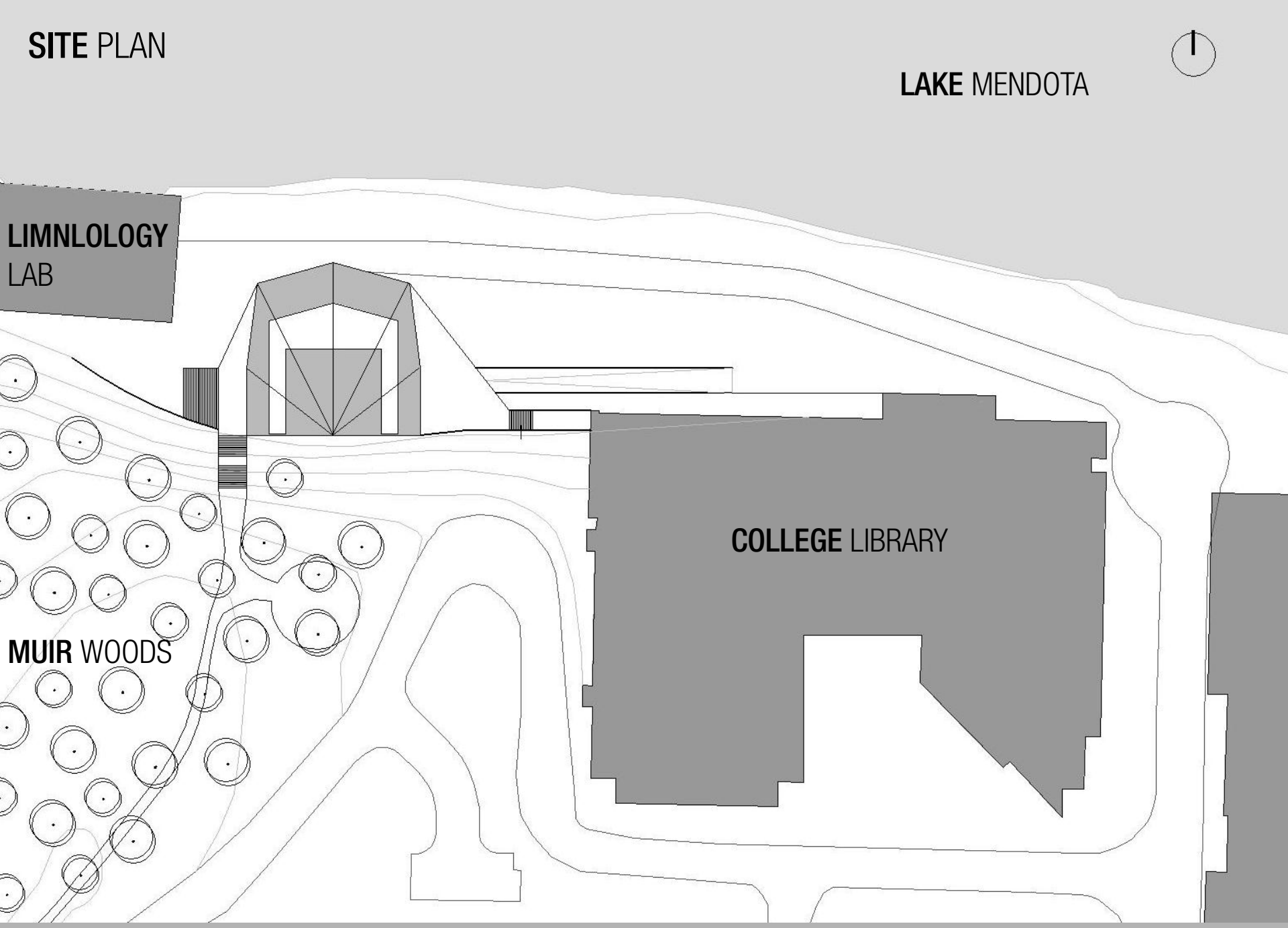
BIG IDEA_LEAF



BIOMIMICRY


PHOTOSYTHENSIS
WATER + LIGHT = CHEMICAL ENERGY
1. Chloroplasts trap light energy
2. Water enters leaf
Light energy
3. Carbon dioxide enters leaf through stomata
4. Sugar leaves leaf
CHEMICAL ENERGY + CARBON DIOXIDE = SUGAR

SITE PLAN



BASEMENT

AUDITORIUM

STORAGE

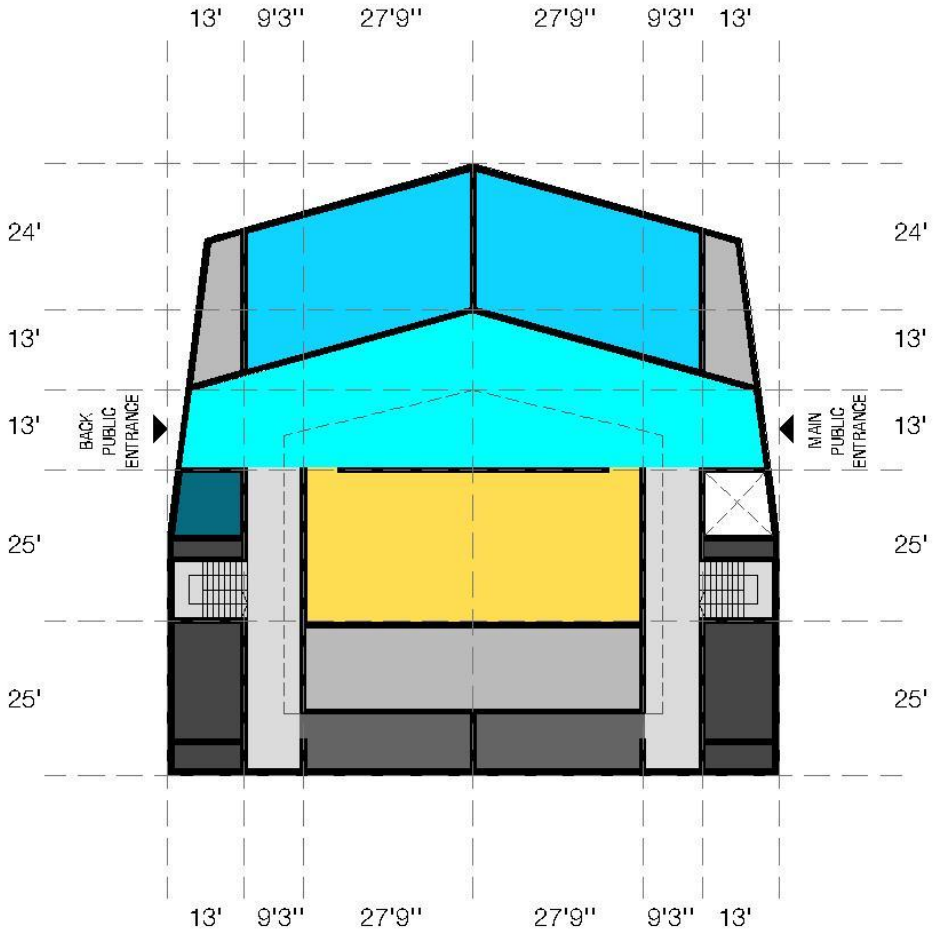
RESTROOMS

MECHANICAL ROOM

INSTRUCTIONAL LAB

SERVER ROOM

LOUNGE



1ST FLOOR

STUDENT OFFICES

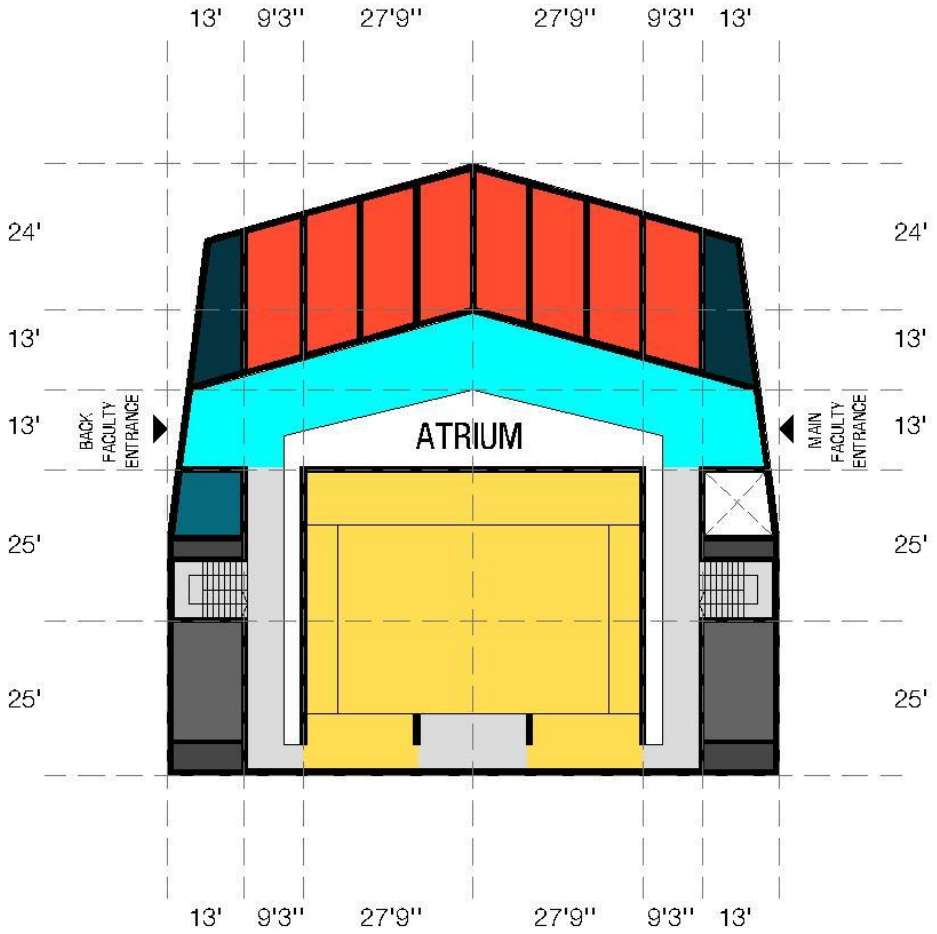
AUDITORIUM

RESTROOMS

FACULTY OFFICES

STORAGE

LOUNGE



2ND FLOOR

FACULTY OFFICES

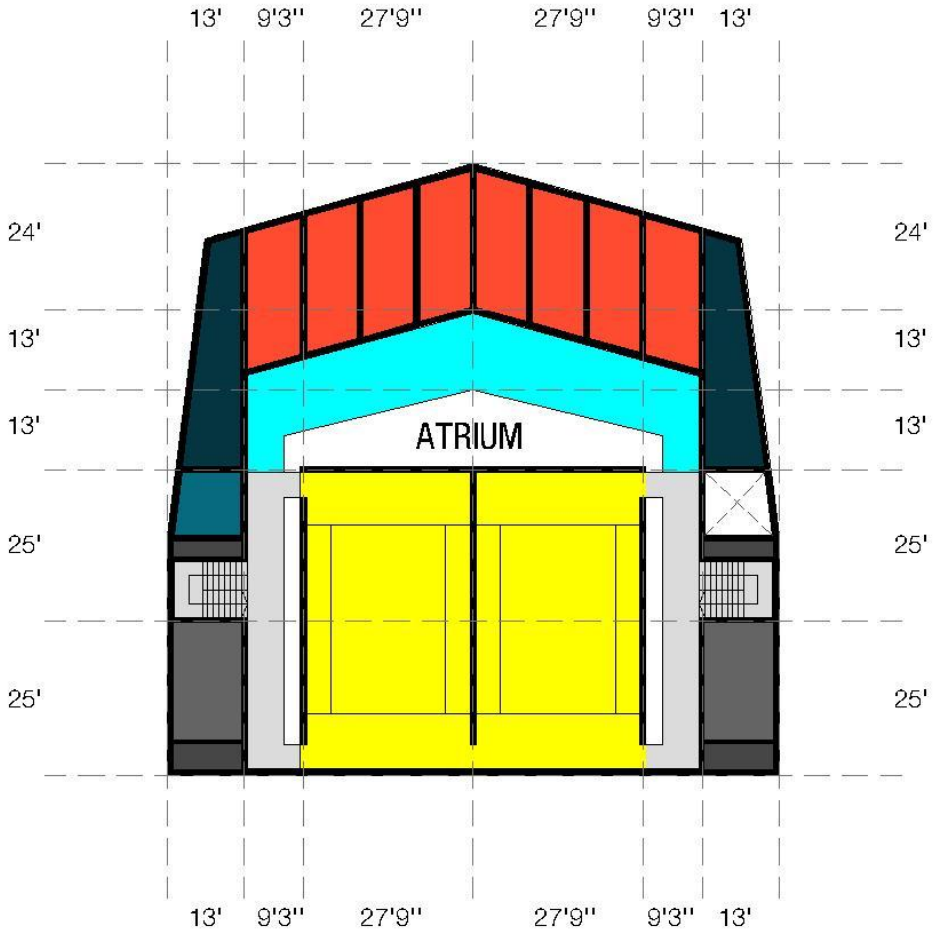
LARGE CLASSROOMS

RESTROOMS

STORAGE

SEMINAR ROOMS

LOUNGE



3RD FLOOR

FACULTY OFFICES

SMALL CLASSROOMS

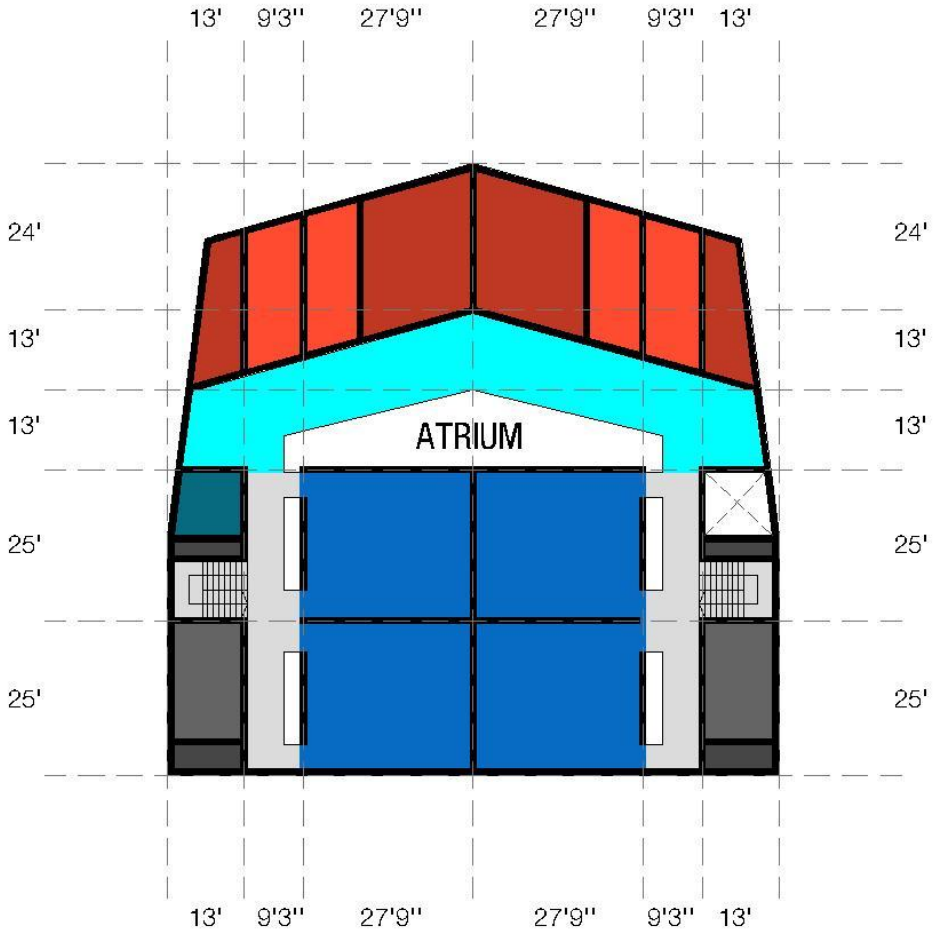
RESTROOMS

ADMINISTRATION

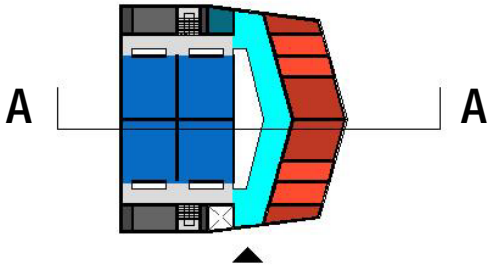
SEMINAR ROOMS

STORAGE

LOUNGE

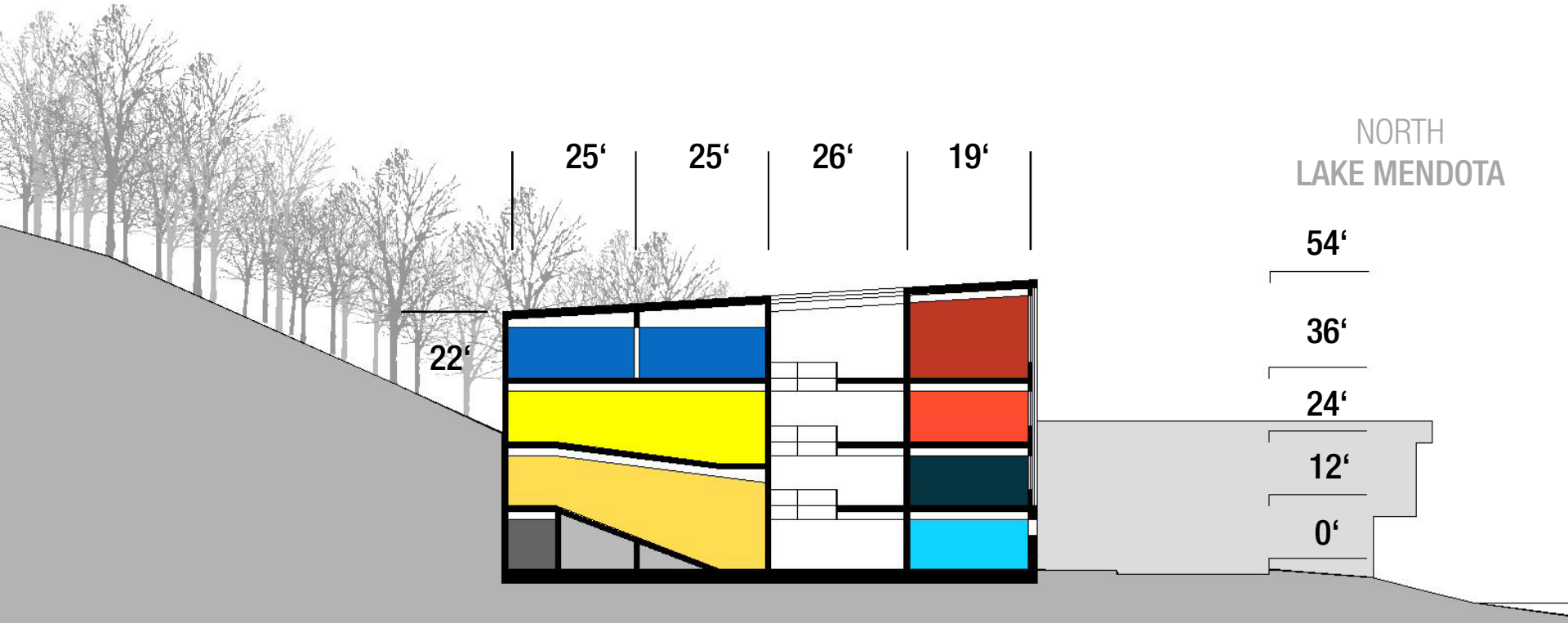


A-A SECTION



SOUTH
MUIR WOODS

NORTH
LAKE MENDOTA

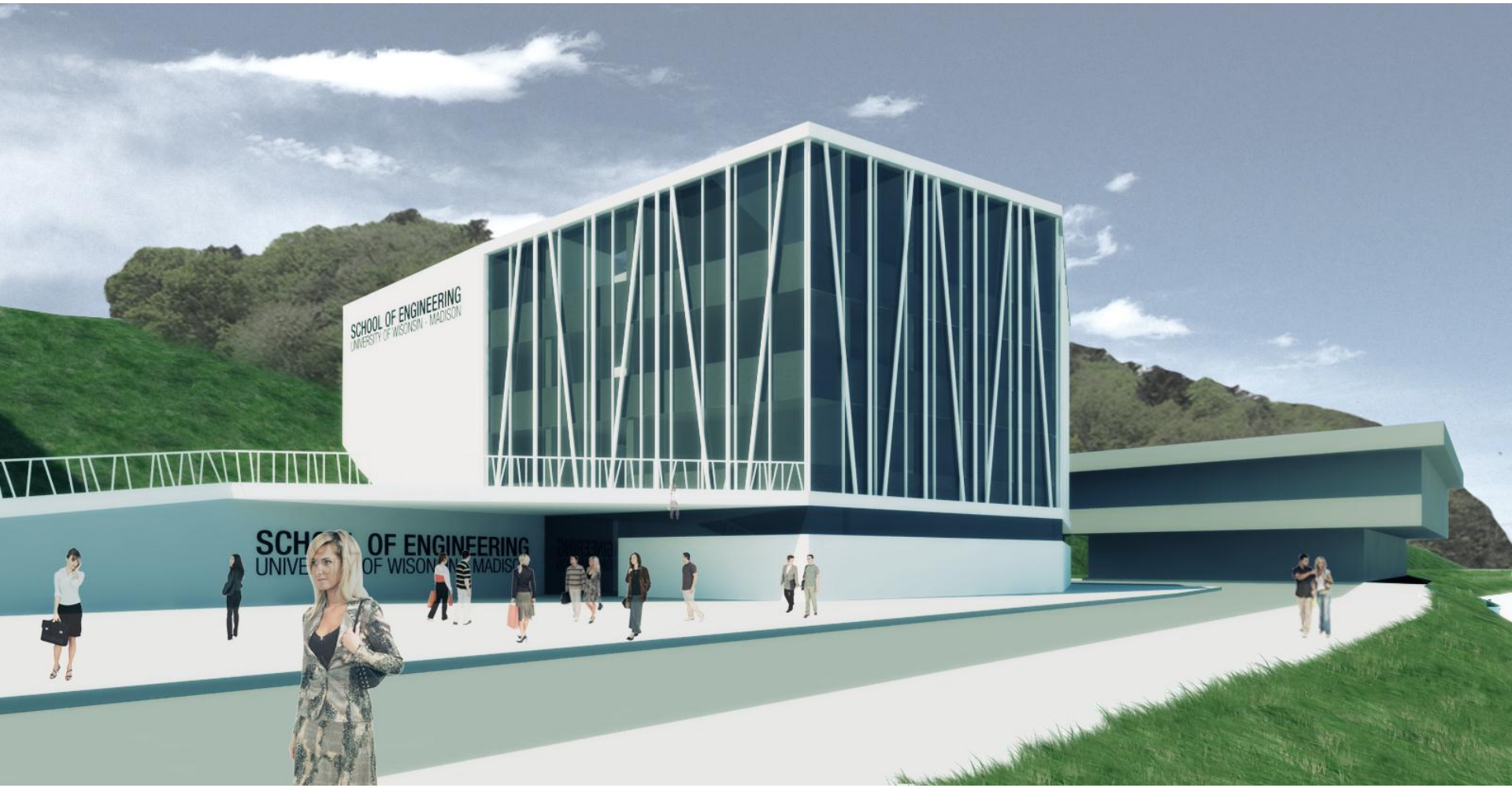


REFERENCES_FACADE

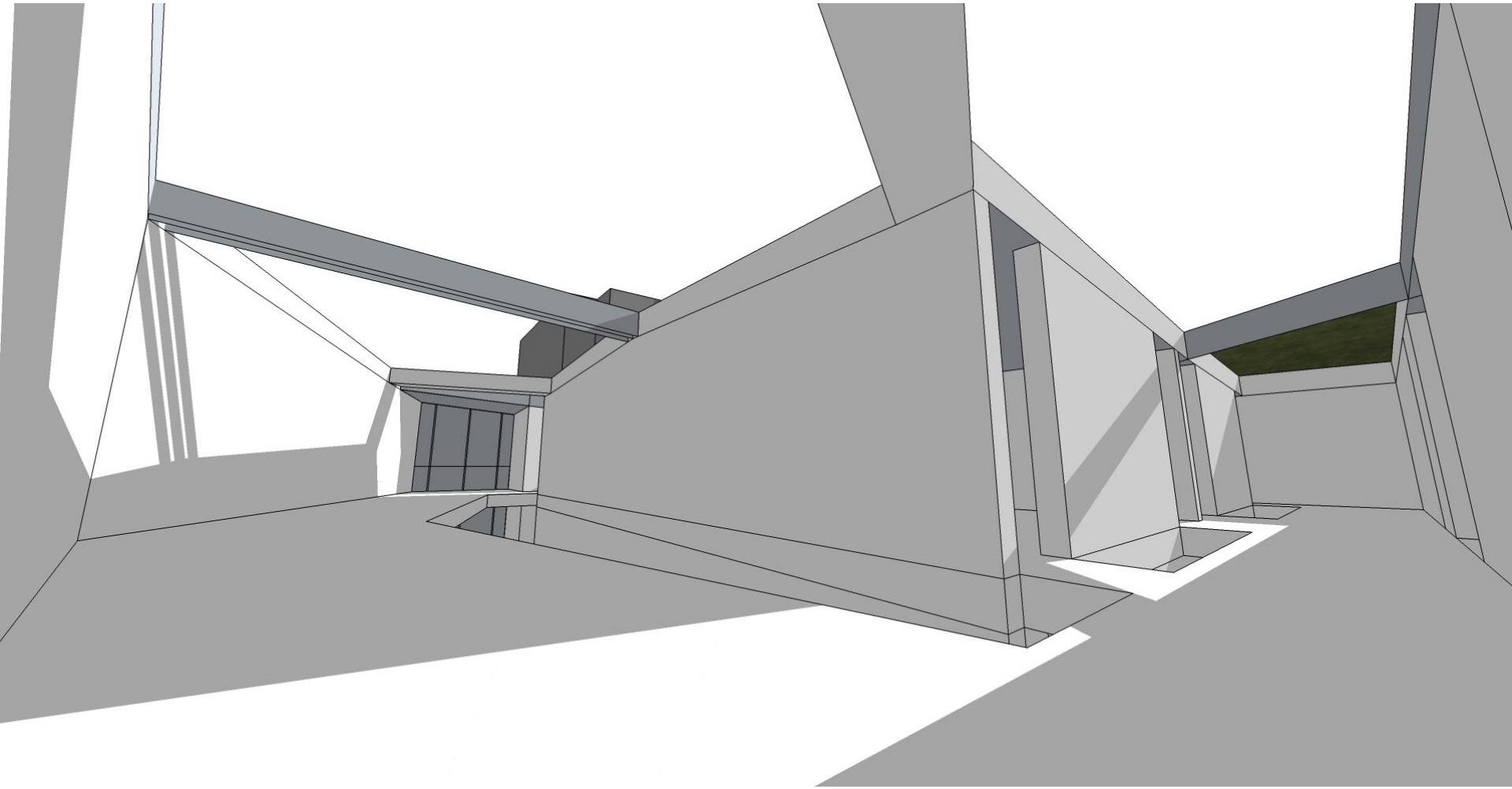
CASA DE MUSICA – REM KOOLHAAS

LUXEMBOURG PHILHARMONY – CHRISTIAN DE PORTZAMPARC

ENTRANCE PLAZA



FACULTY LOUNGE



AARON
McDEVITT

LEILA
ZHENG

JOHANNES
SOLASS

STRUCTURE
CONCEPT 2

TEAM
ATLANTIC

SE
CONCEPT 2

A **SE** MEP CM POP

SUMMARY AND LOADS

Dead load

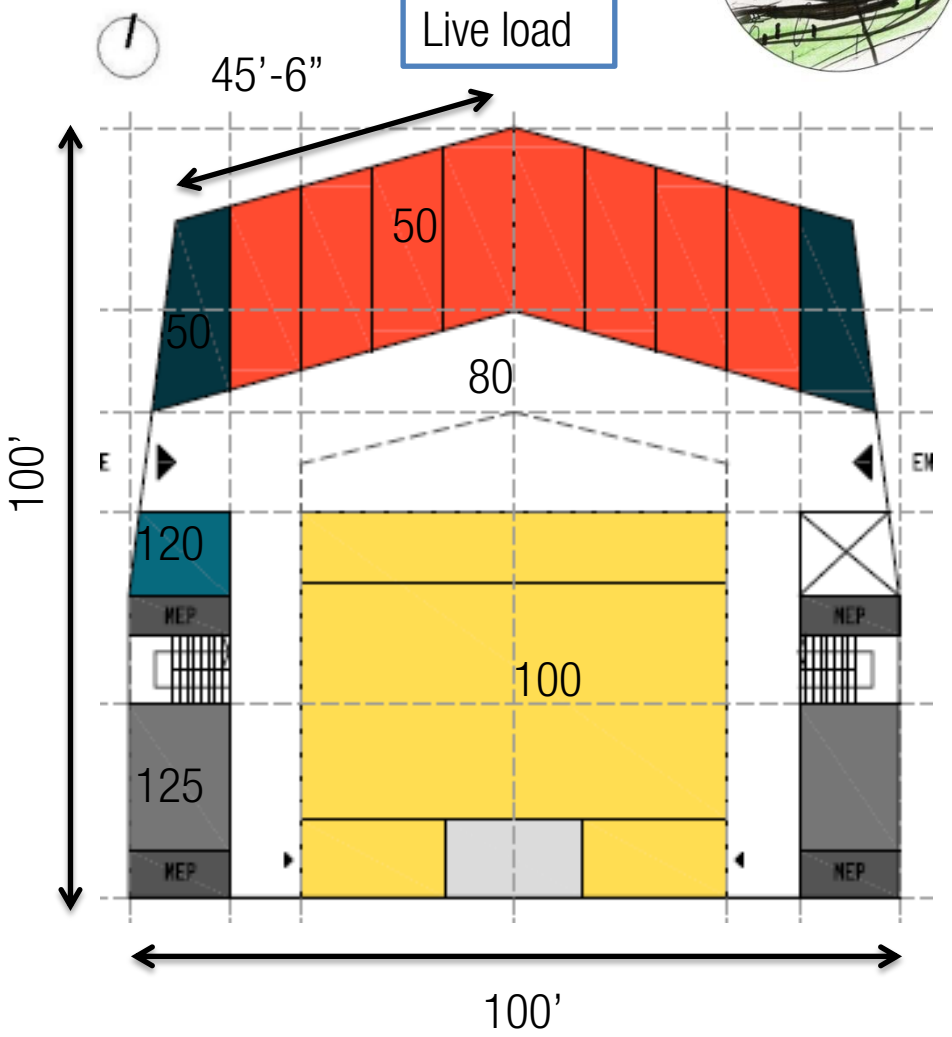
Per floor dead load (psf)	94.77507
Roof dead load (psf)	85

Wind load

Story Forces (total kips)

	E-W	N-S
2nd	26	24
3rd	38	44
4th	59	59
roof	37	37

Live load



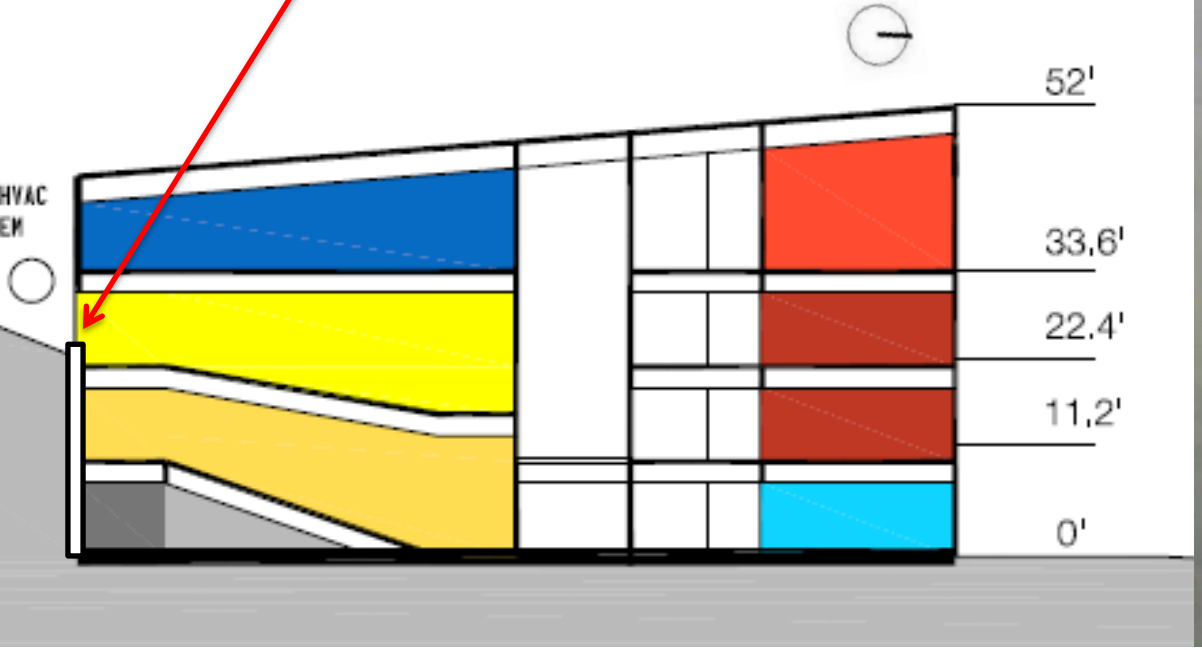
Snow load: 23.1 psf

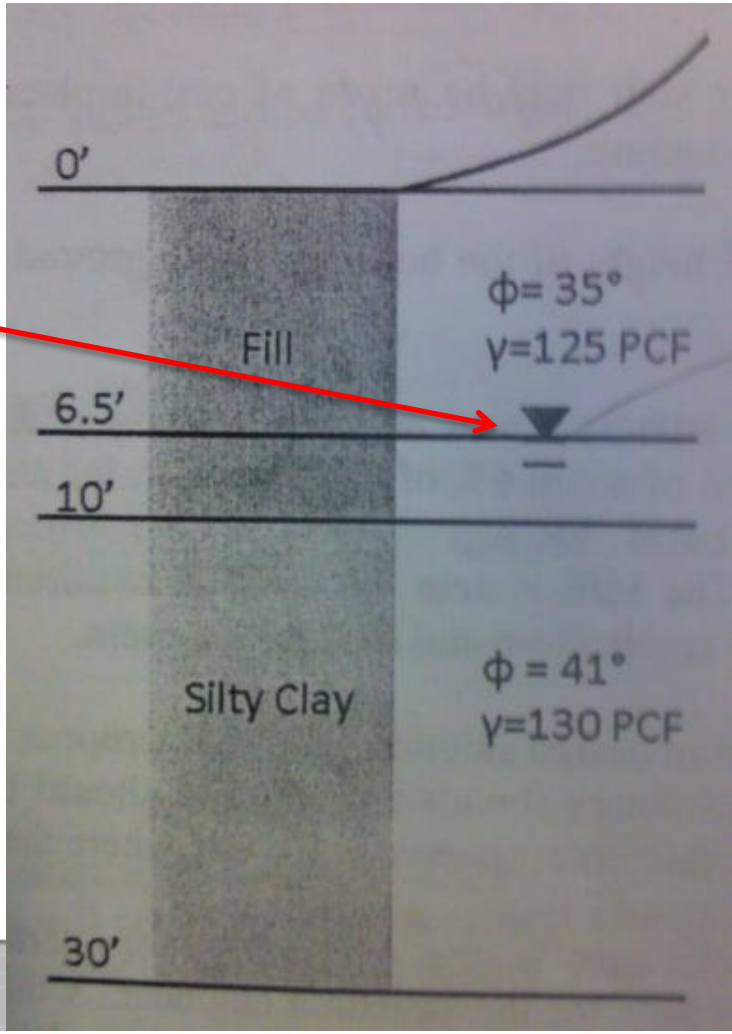
Governing load eq (roof): 1.2D+1.6L+0.5S

FOUNDATIONS

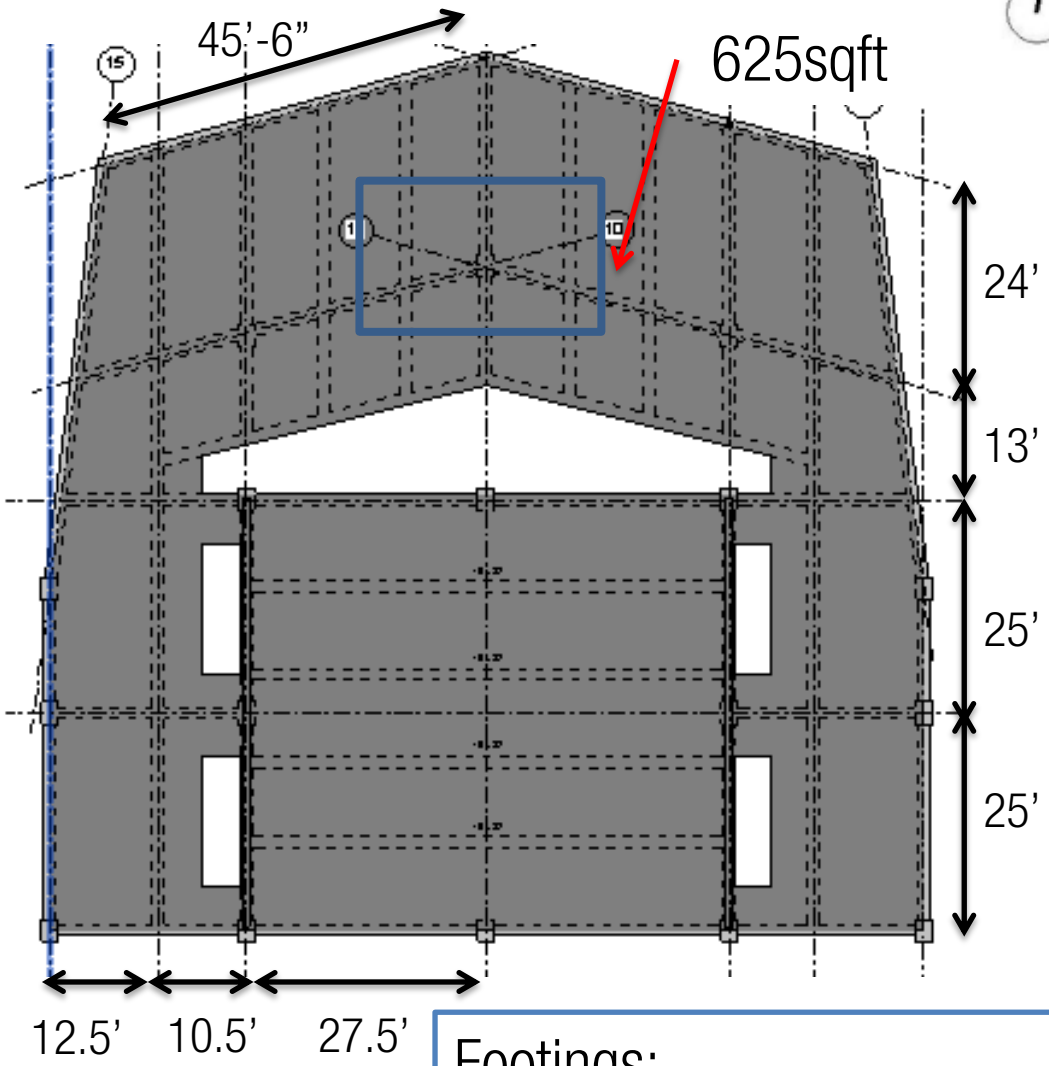
24’ Retaining wall

Design not affected by water table

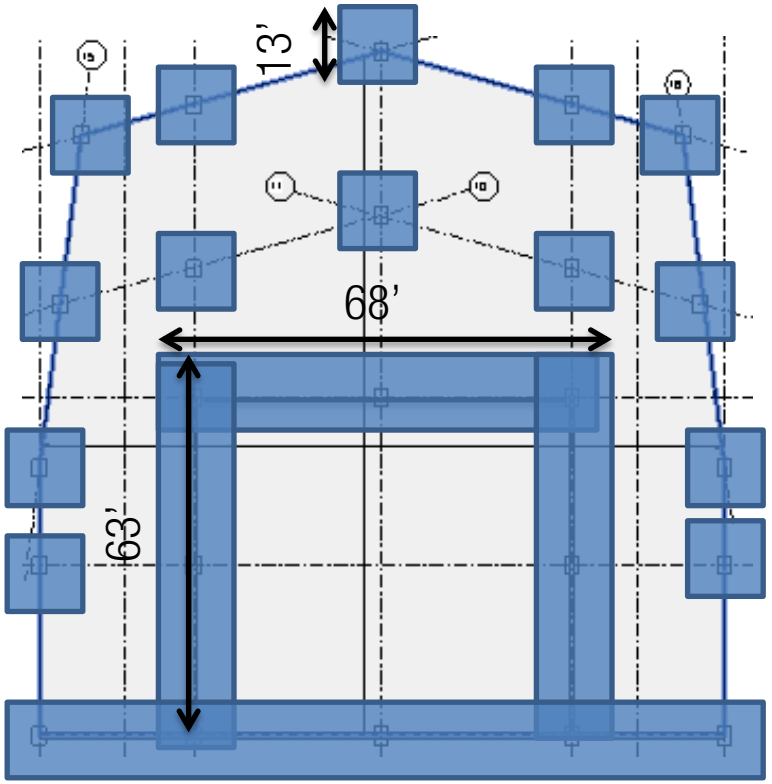




GRID AND SPREADFOOTINGs



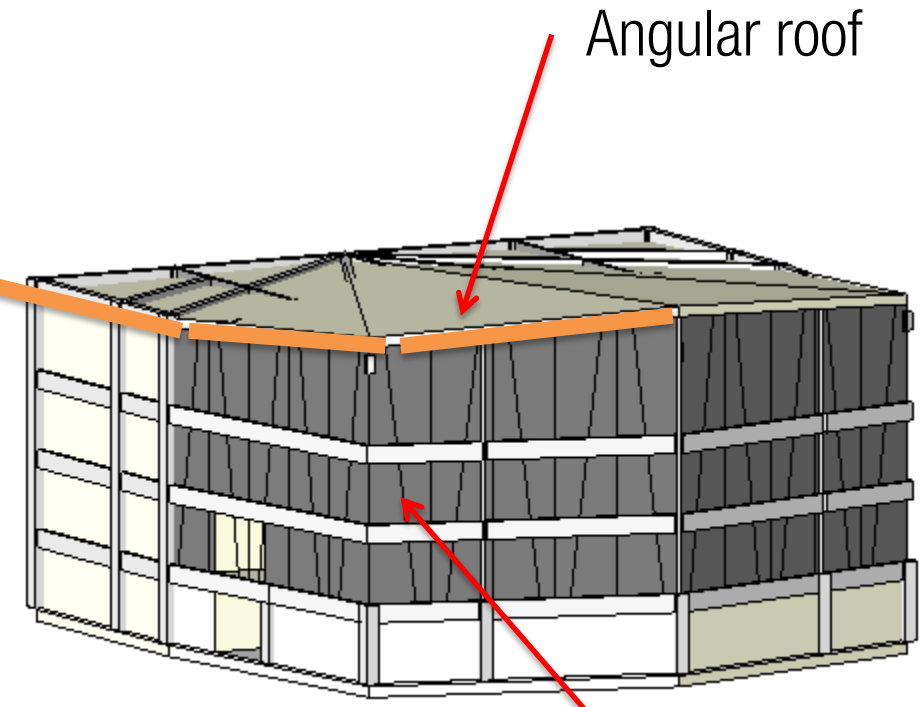
DL = 94psf
LL = 80 psf
→force into footing 602 kips

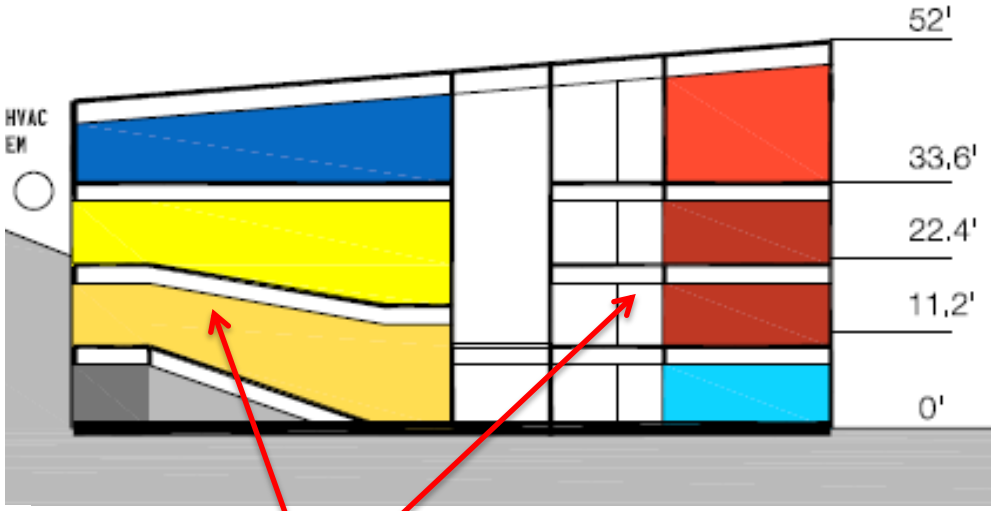


Footings:
13’x13’, 18” thickness

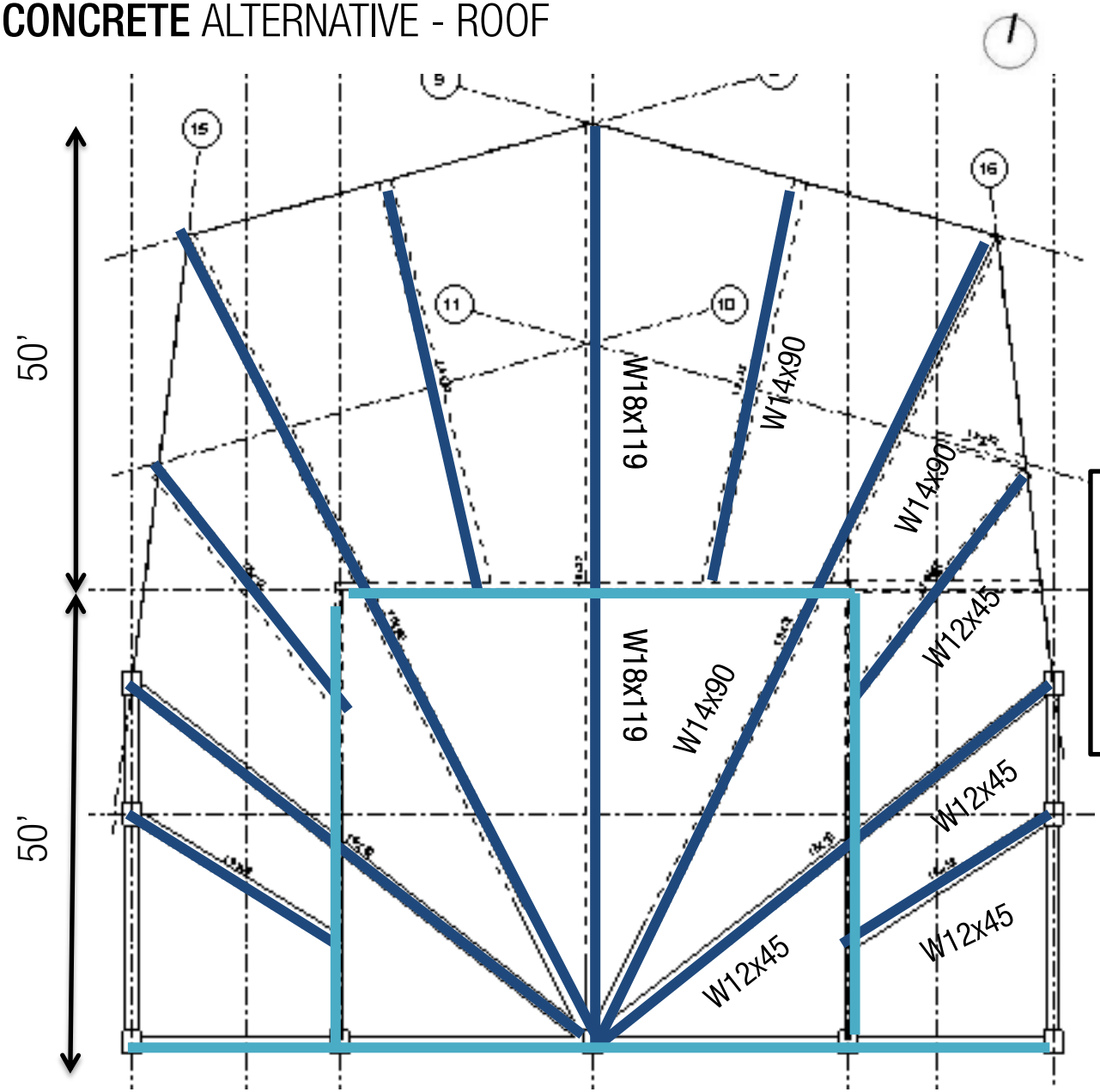
CONCEPT 2 CONCERNS

1) Roof for water retainment
2) Diagonal façade columns
3) Design for different floor heights





CONCRETE ALTERNATIVE - ROOF



Legend/Load path:

Steel Beams

Shear/bearing wall

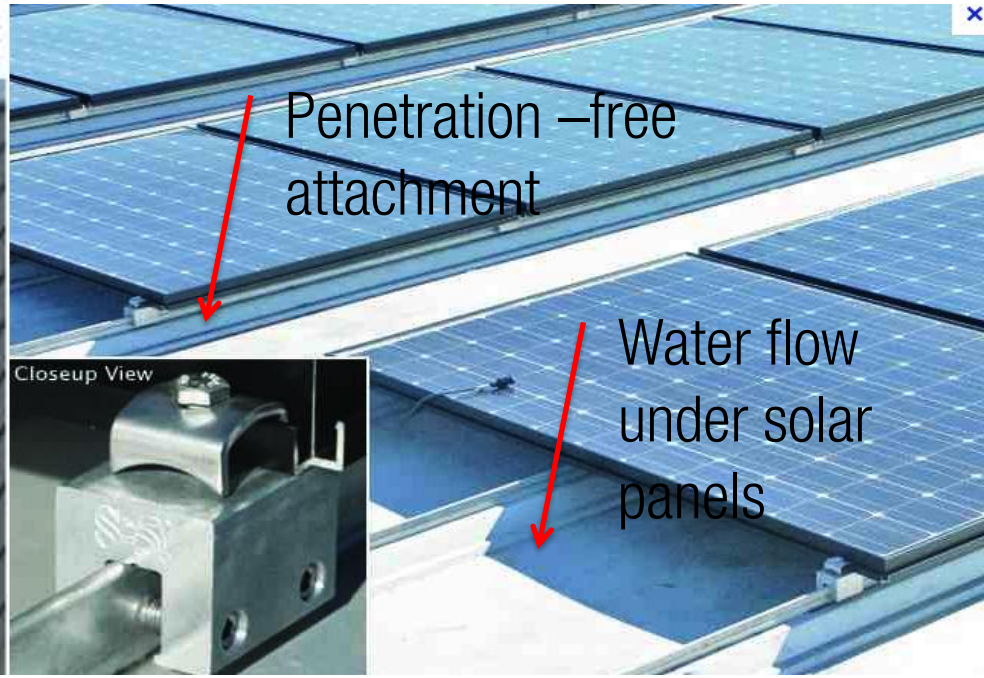
CONCRETE ALTERNATIVE - ROOF

Standing seam metal roof

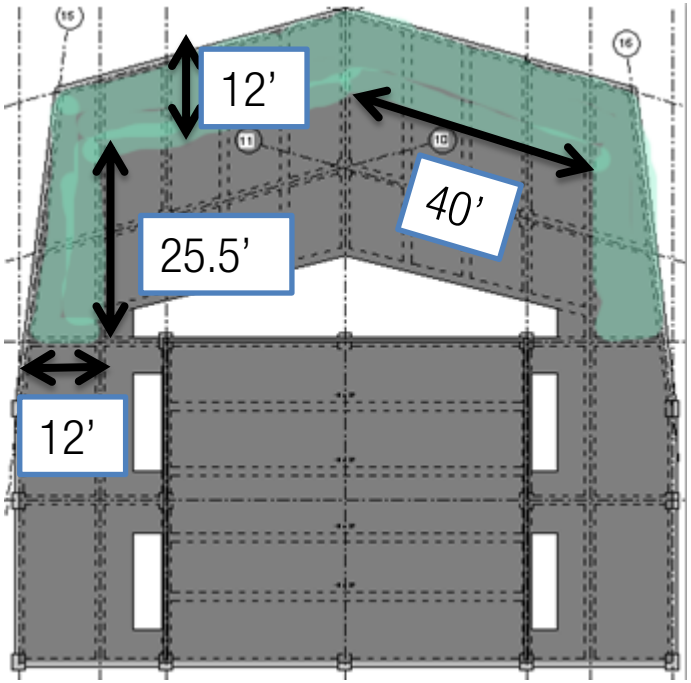
-outlive the PV

-good waterproofing

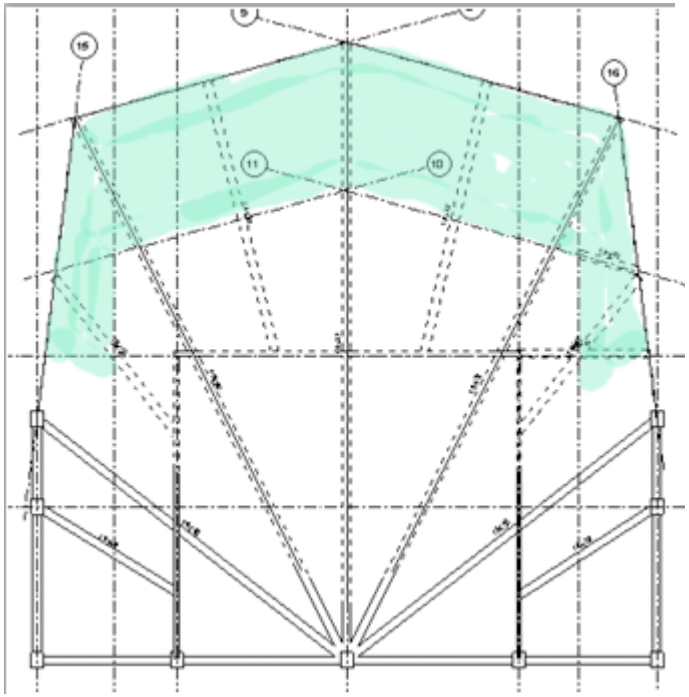
-PV easily attached



DIAGONAL PIPE COLUMNS LAYOUT



Typical floor (controlling)

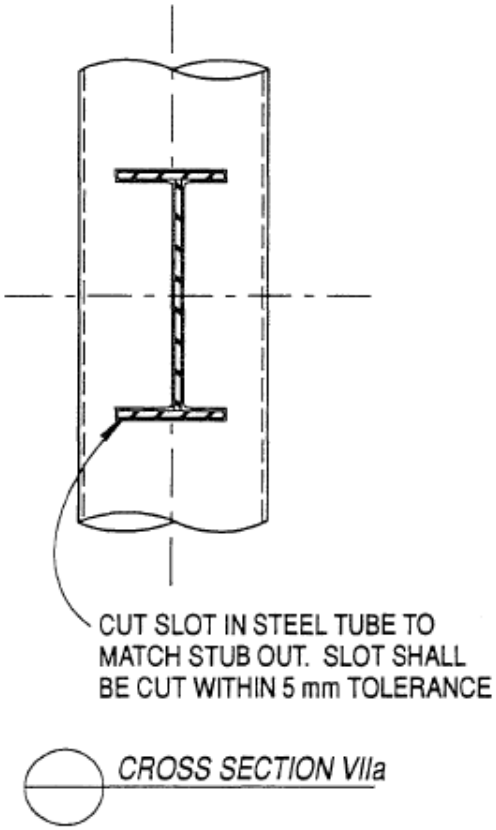


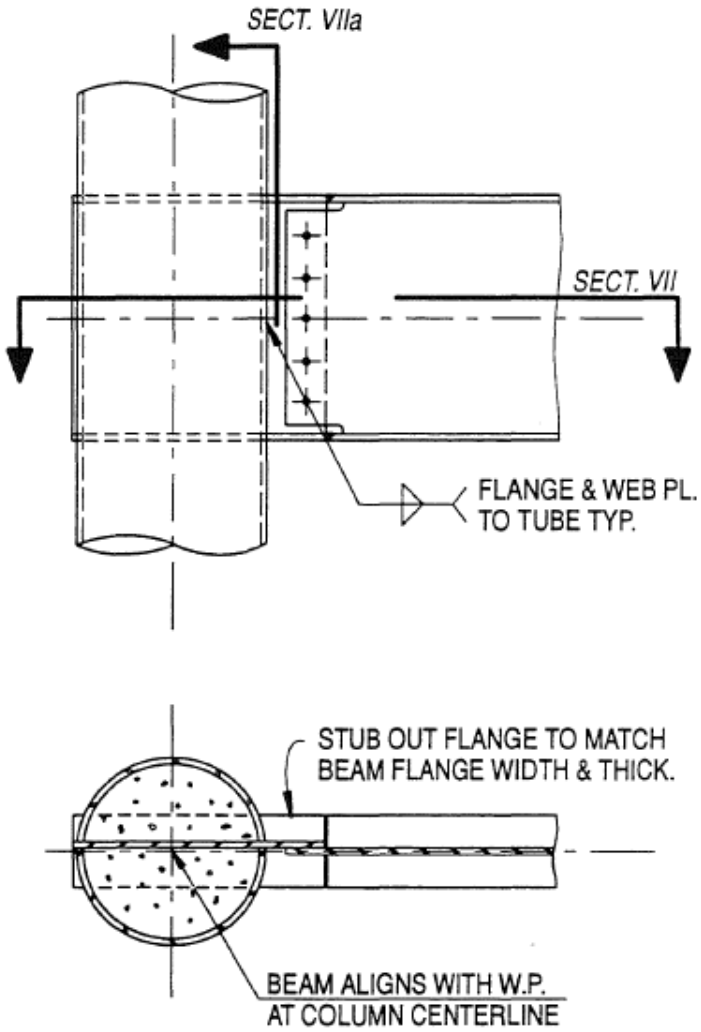
Roof

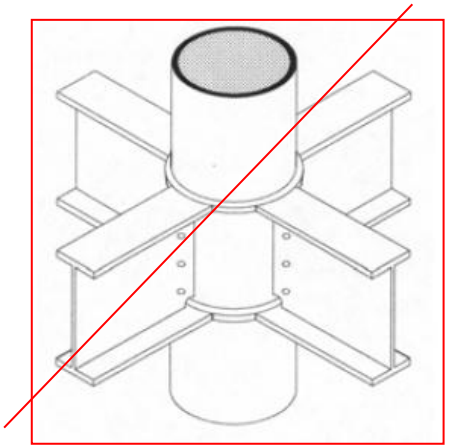
Total A~1440ft2
Total P~1571 kips
If 20 columns 78 kip/each
If 25 columns 62 kip/each
If 30 columns 53 kip/each

KL=6ft Fy=42ksi
Nominal outside diameter=7”
Wall thickness=0.5ft
Weight/ft = 34.71
Allowable P=219kips (over design)

Steel Tube Institute OF NORTH AMERICA





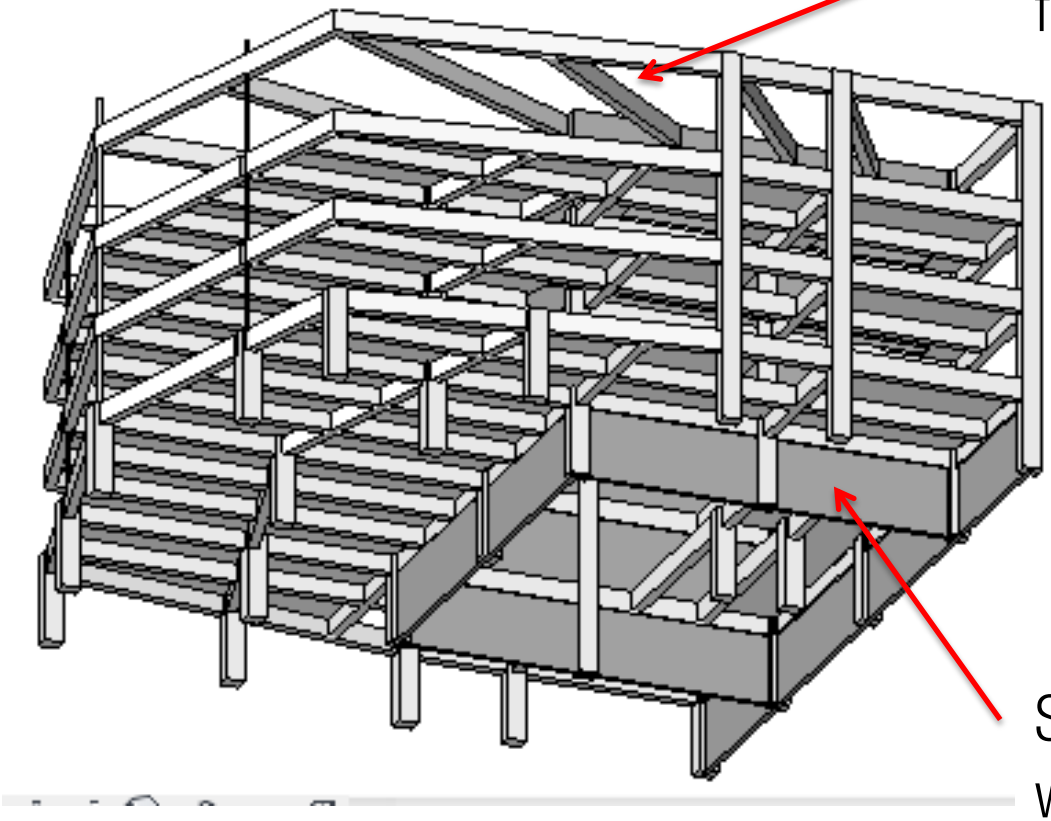


Typical connection will interfere with facade

CONCRETE ALTERNATIVE

-CIP RC (beams, columns, slab)

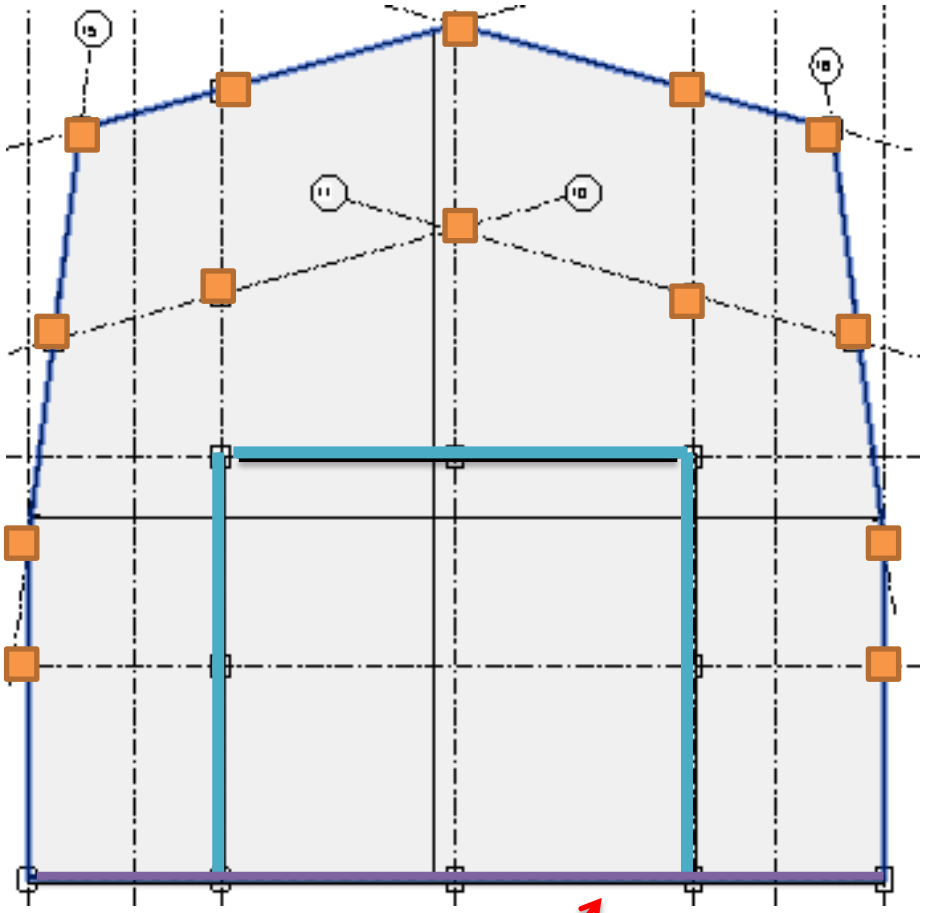
-Some PT Beams



Different layout for roof

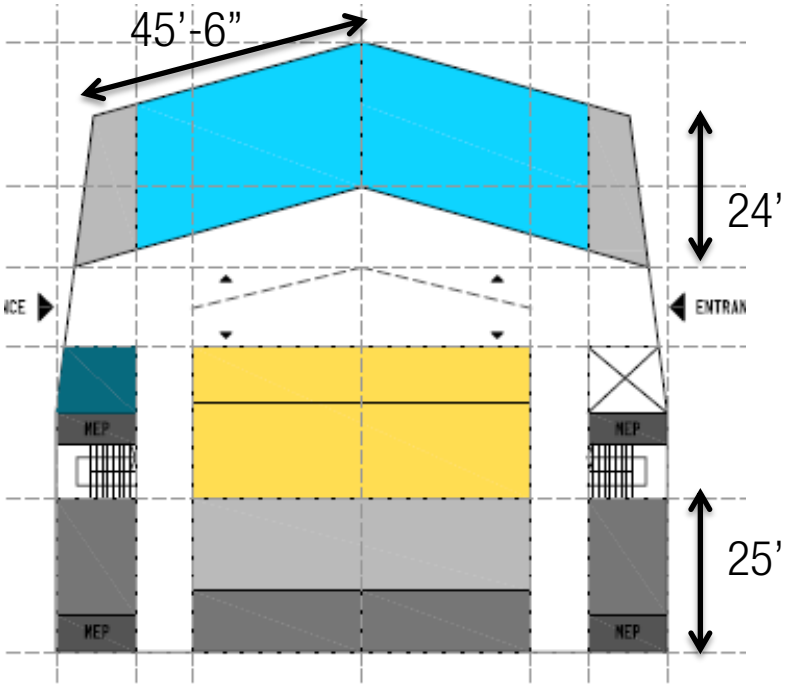
Shear/bearing walls through building

CONCRETE ALTERNATIVE – BASEMENT



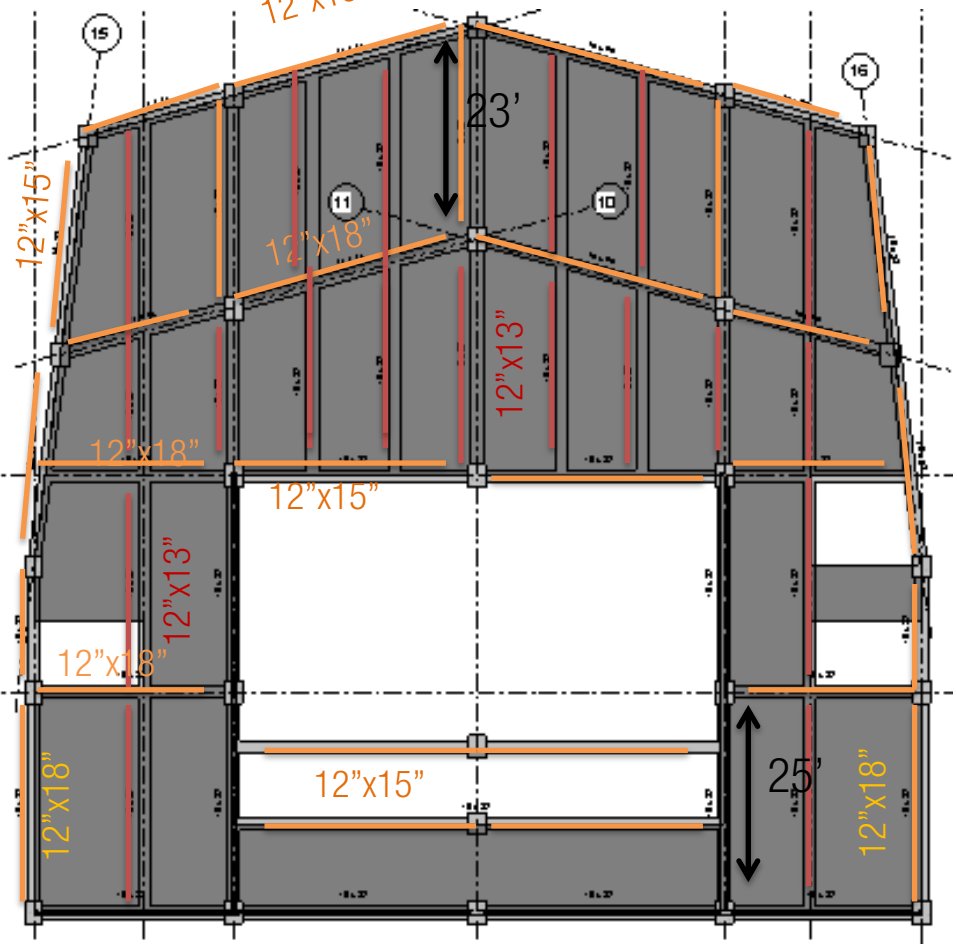
Retaining/shear wall
first two floors

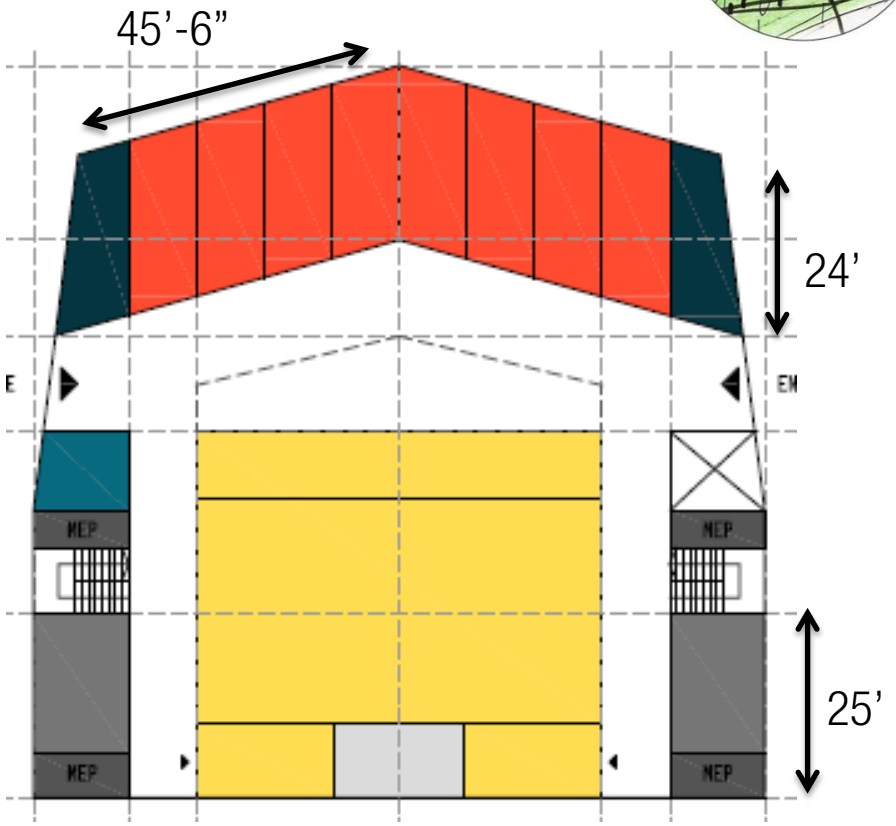
Legend:
Moment frame
Shear wall

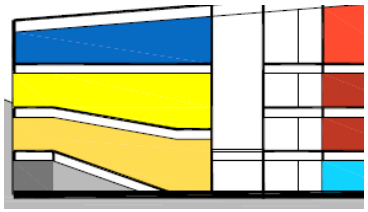


Columns :
Basement: 16”x16”
Other floors: 14”x14”

CONCRETE ALTERNATIVE – 1ST FLOOR

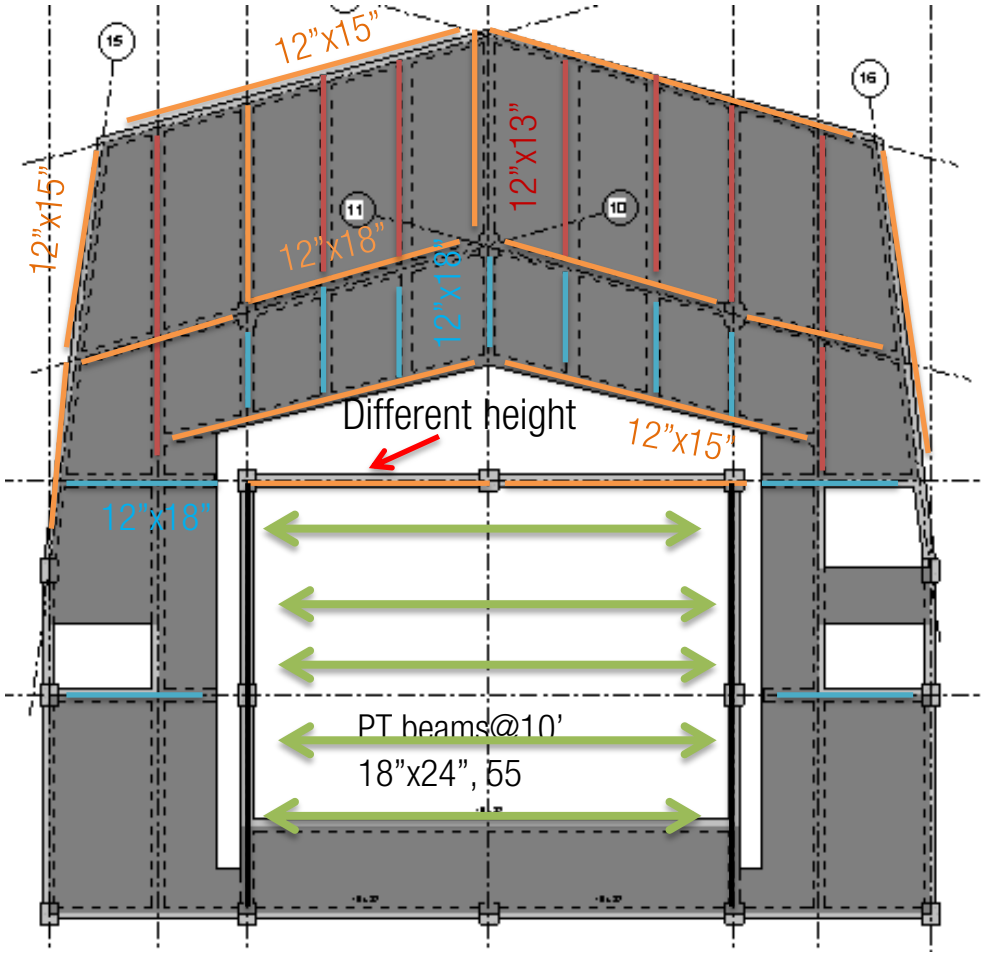


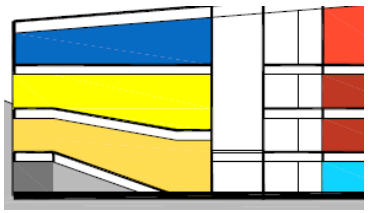




Legend/Load path:
Slab→beams→girders→columns

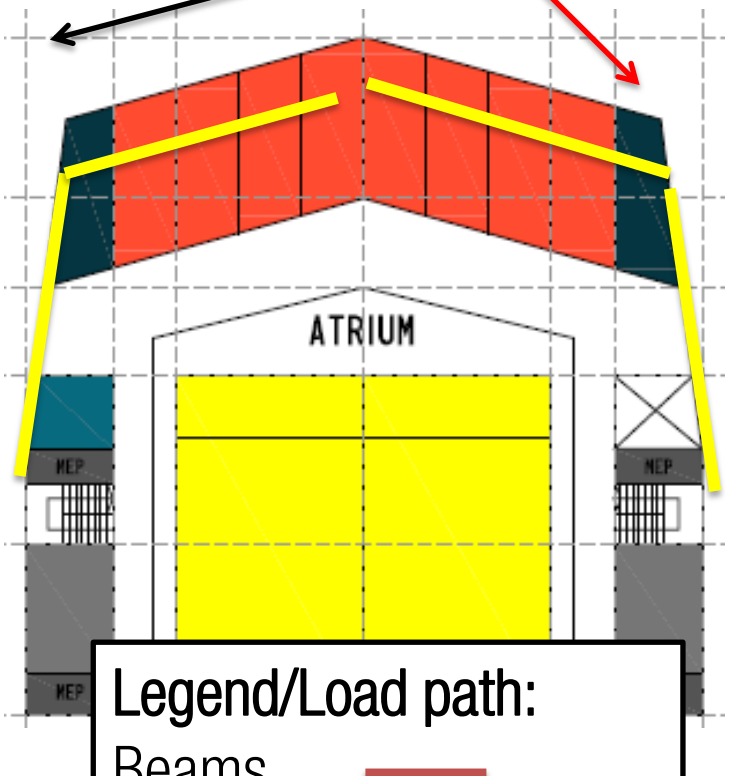
CONCRETE ALTERNATIVE 2ND FLOOR





Floors connected to pipe columns

45'-6"



24'

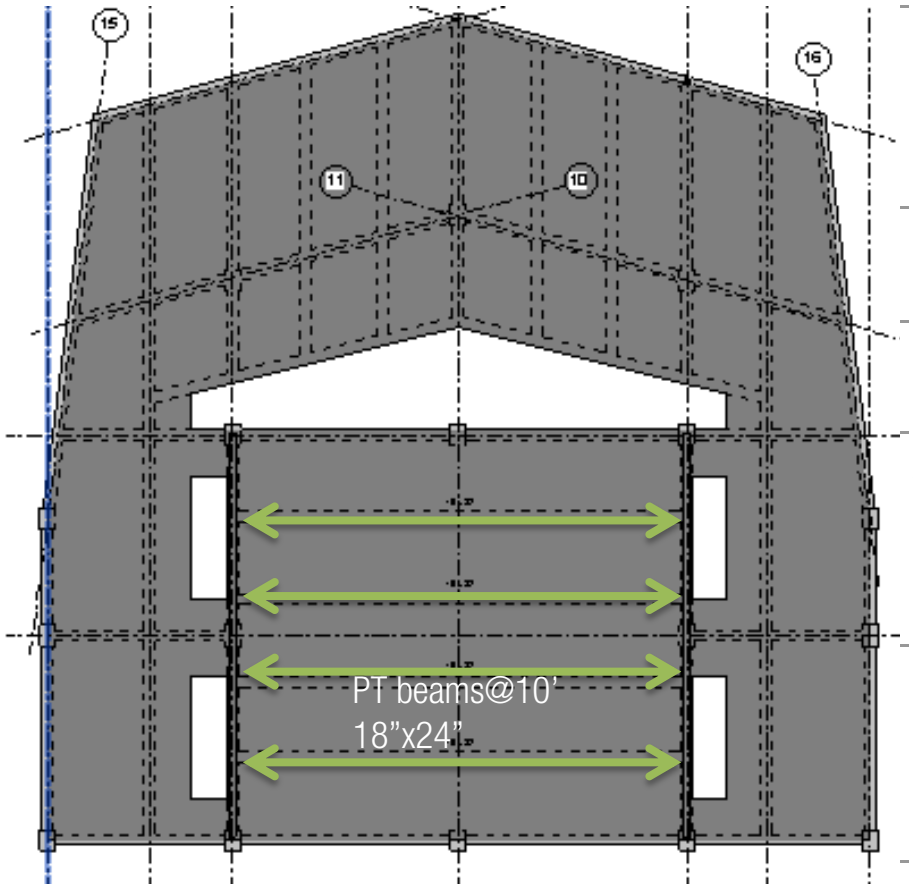
25'

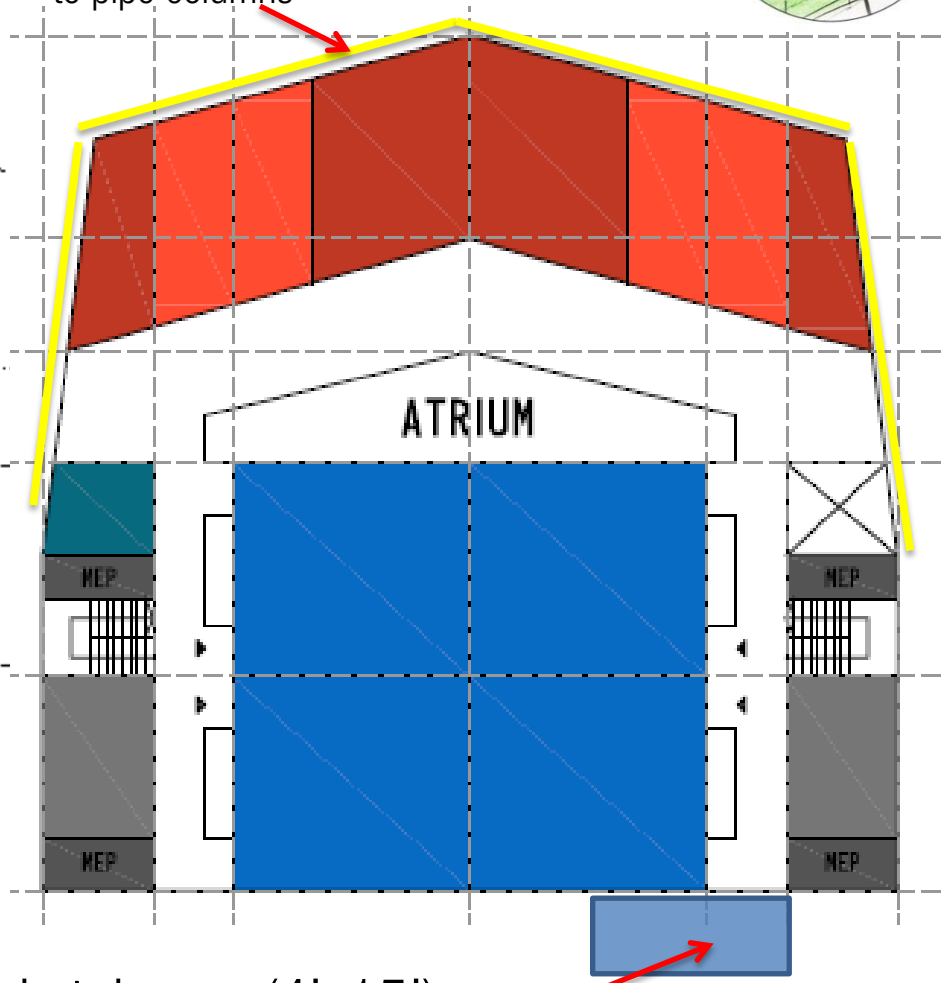
Legend/Load path:

- Beams
- Girders
- PT beams
- Cantilevers

CONCRETE ALTERNATIVE – 3RD FLOOR

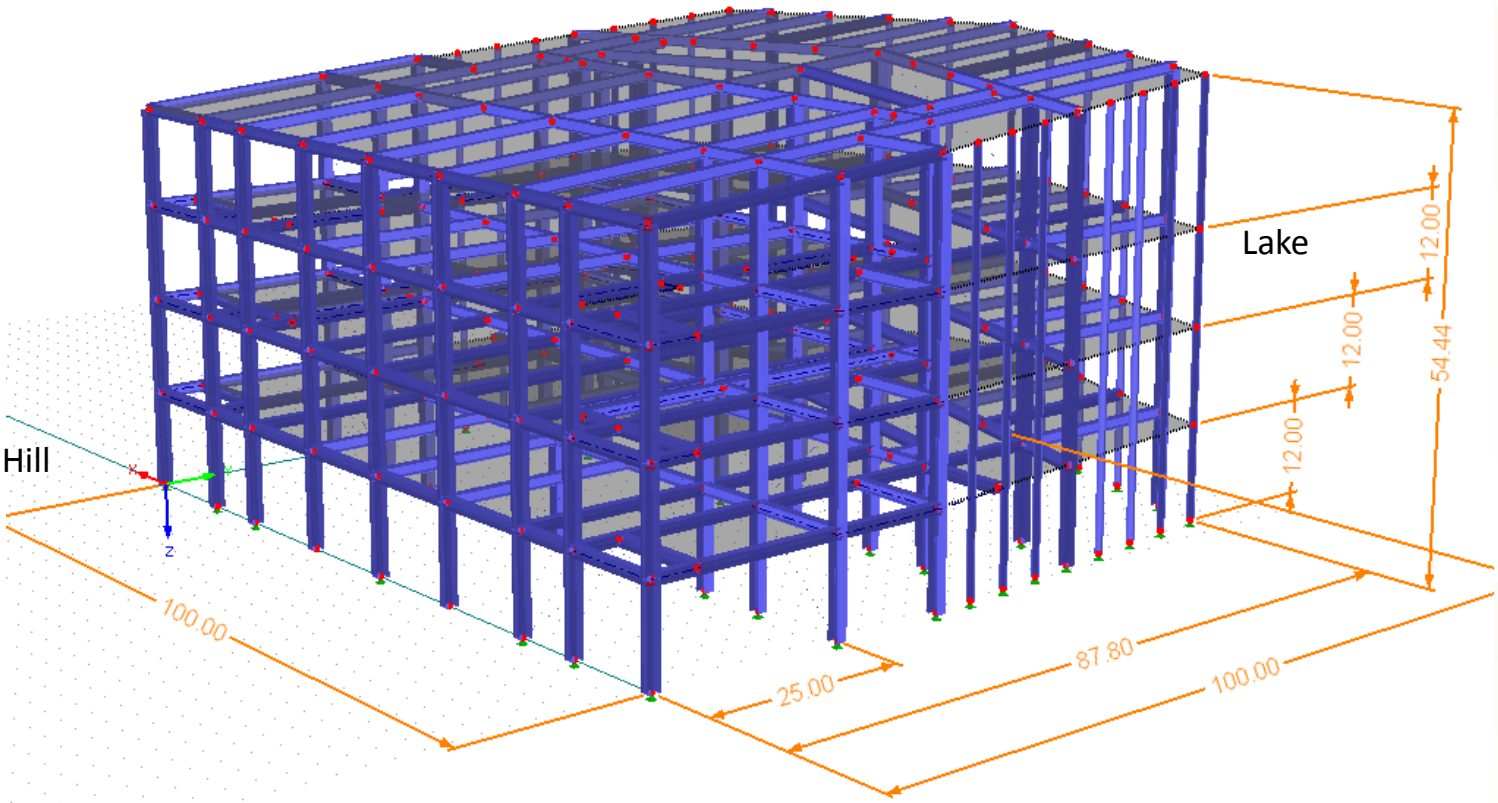
Floors connected
to pipe columns



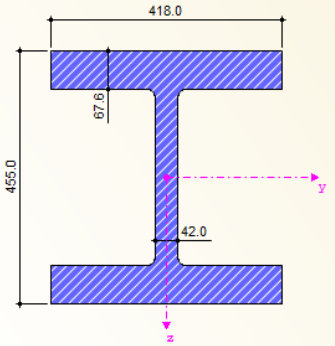


Cantilevered staircase (4'x15')
for PV maintenance

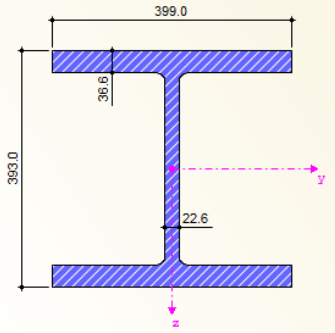
STEEL ALTERNATIVE



Columns:
W 360x410x551



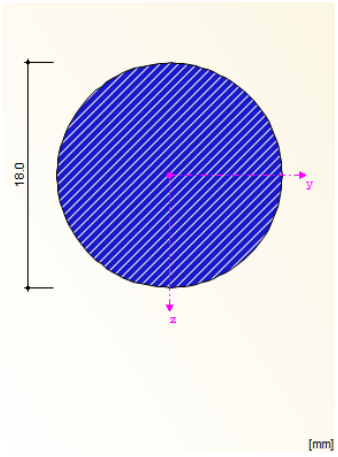
Beams:
W 360x410x287

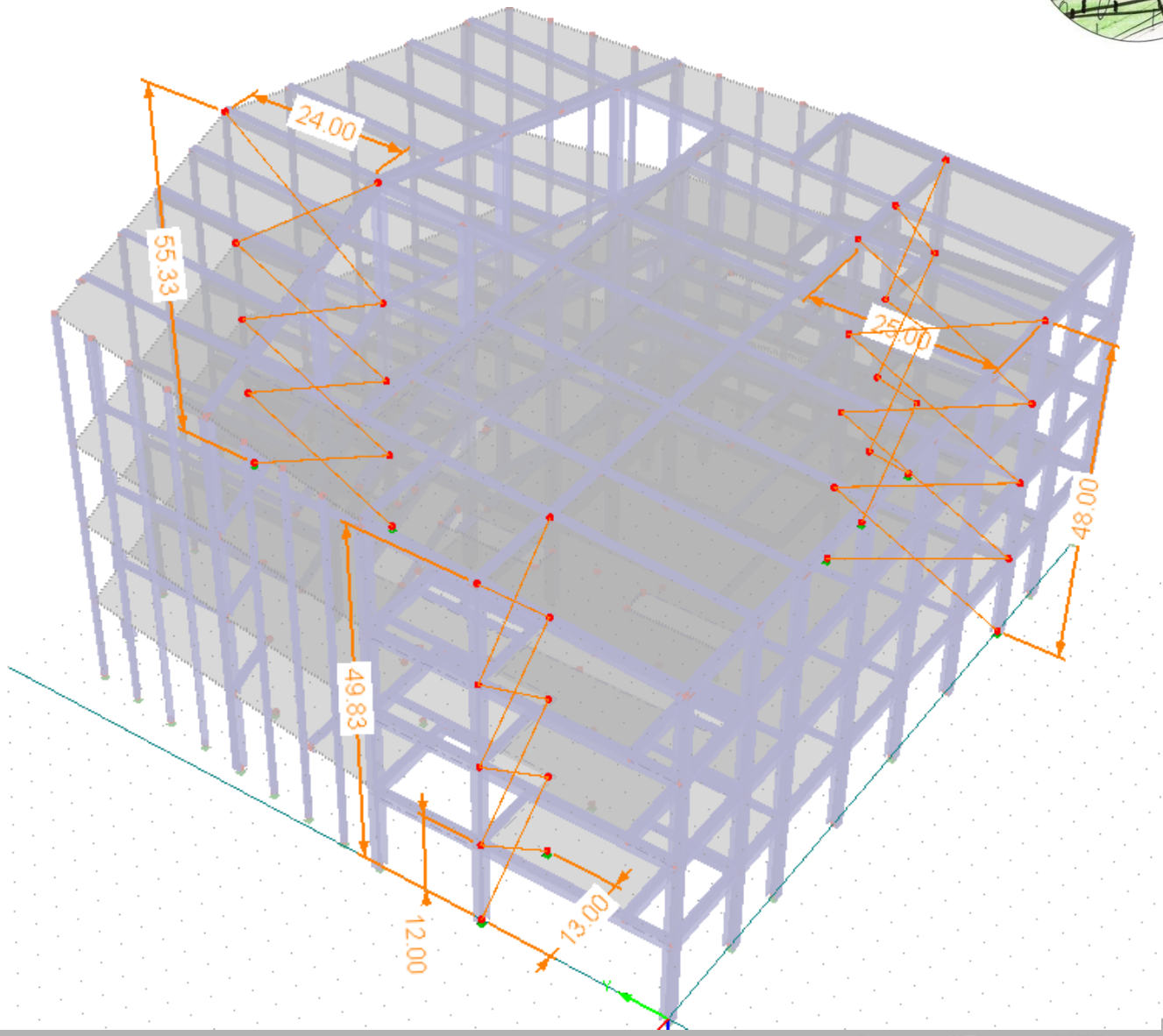


[mm]

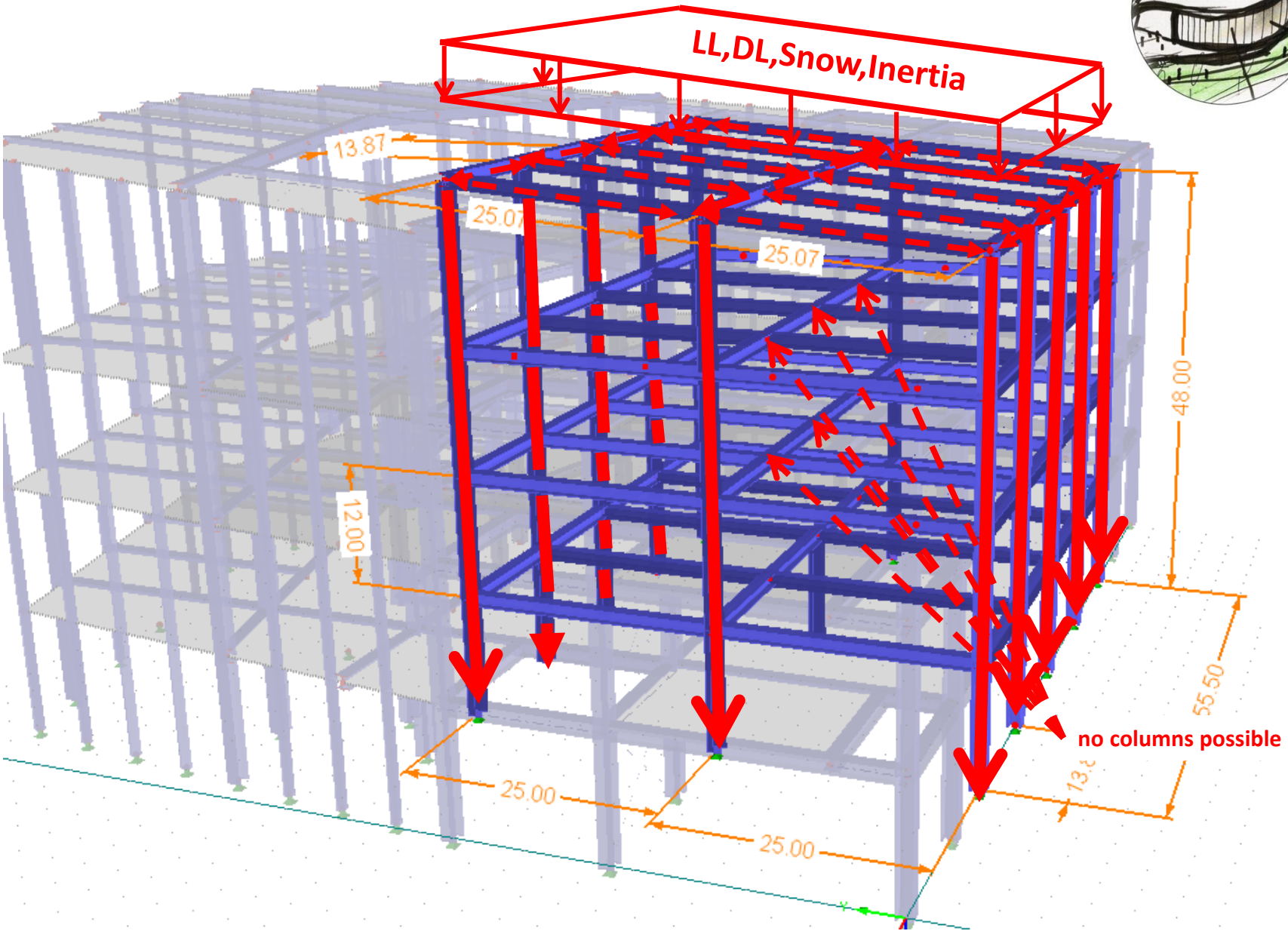
STEEL ALTERNATIVE

0,7 inch STEEL
Tension Cables





STEEL ALTERNATIVE



ANDREW
ECKHART

MEP

TEAM
ATLANTIC

MEP

A SE **MEP** CM POP

CLIMATE CONDITIONS

Wisconsin's weather varies a lot

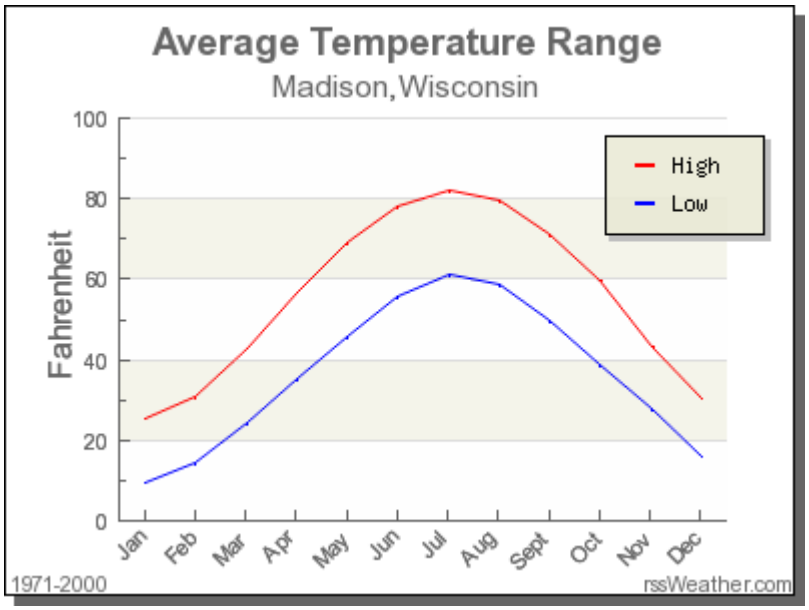
Need to Consider both Heating and Cooling Loads

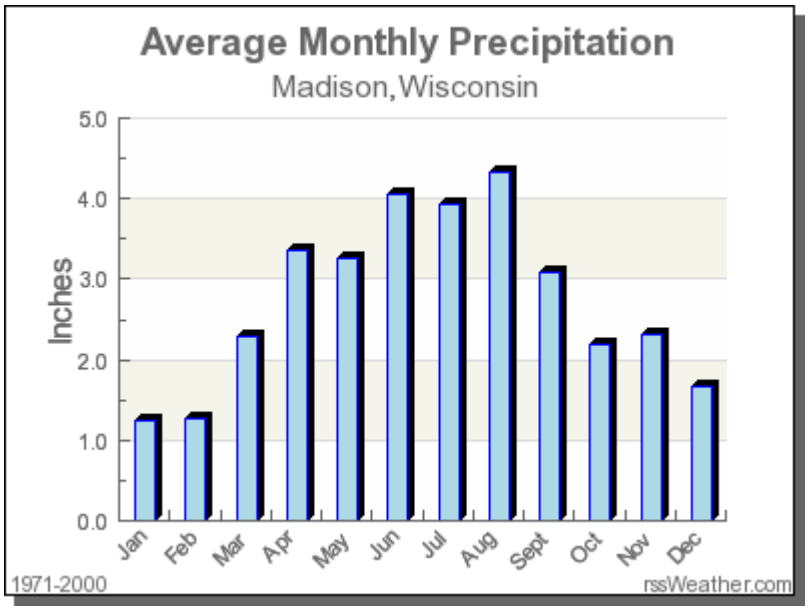
Design Temperatures

- Summer Outside Air Temp. 90F
- Winter Outside Air Temp. -11F
- Space Temp. 75F

Assumptions

- Lighting 1.2 Watts/ft^2
- Occupants 450 Btu/Person
- U-Values
  - Ceiling 0.05 Btu/($ft^{2*o}F$)
  - Glass 0.35 Btu/($ft^{2*o}F$)
  - Walls 0.035 Btu/($ft^{2*o}F$)
- Glass Shading Factor 0.4
- Infiltration 1.5 cfm/ft





CALCULATED VALUES

Concept 1-Landscape

- Cooling Load
  - 46 tons
- Heating Load
  - 105 MBH
- Ventilation
  - 26,000 CFM

- TermoBuild with Steel
- Conventional HVAC with Concrete

Concept 2-Leaf

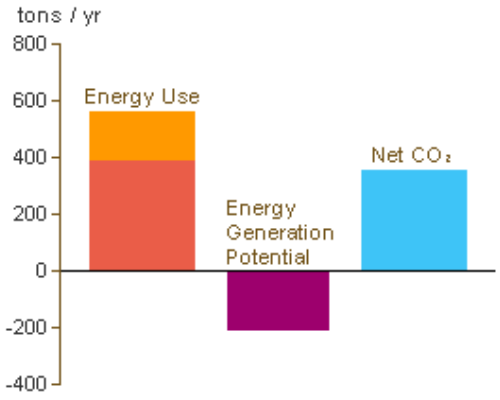
- Cooling Load
  - 53 tons
- Heating Load
  - 155 MBH
- Ventilation
  - 29,500 CFM

- Radiant Heat with Concrete
- Conventional HVAC with Steel

ENERGY ANALYSIS - VASARI

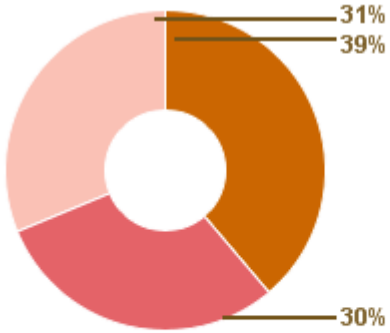
Concept 1- Landscape

Annual Carbon Emissions



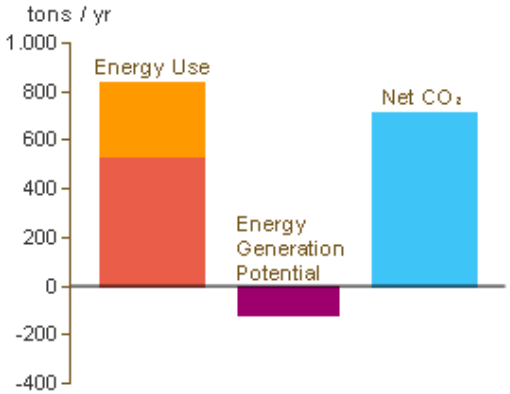
	(tons / yr)
Electricity Consumption	392
Fuel Consumption	168
Roof PV Potential (High Efficiency)	-205
Single 15' Wind Turbine Potential	-1
Net CO₂	354

Energy Use: Electricity

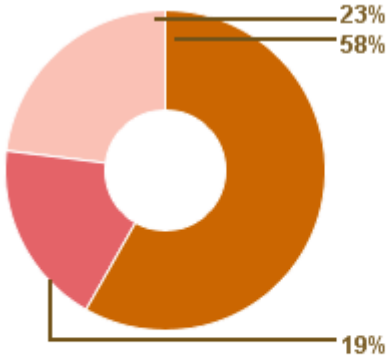


			(kWh)
HVAC	39%	$14,881	160,359
Lighting	30%	$11,497	123,893
Misc Equipment	31%	$11,985	129,155
		$38,363	413,407

Concept 2- Leaf



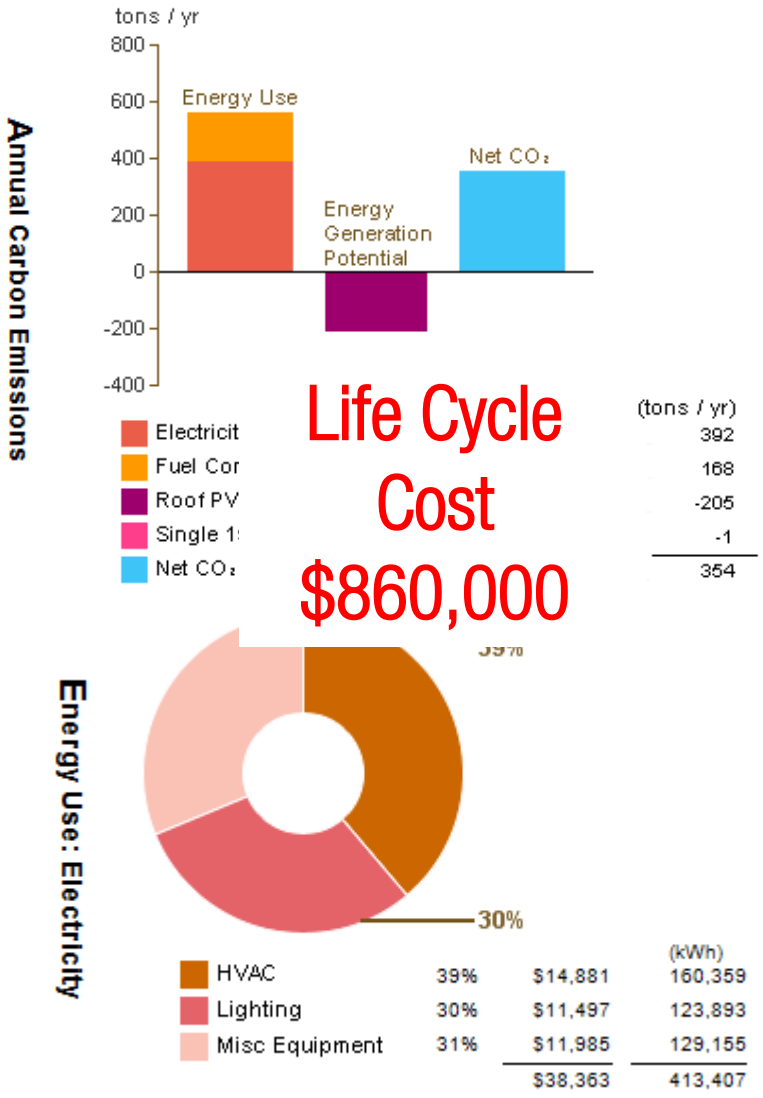
	(tons / yr)
Electricity Consumption	530
Fuel Consumption	306
Roof PV Potential (High Efficiency)	-120
Single 15' Wind Turbine Potential	-1
Net CO₂	715



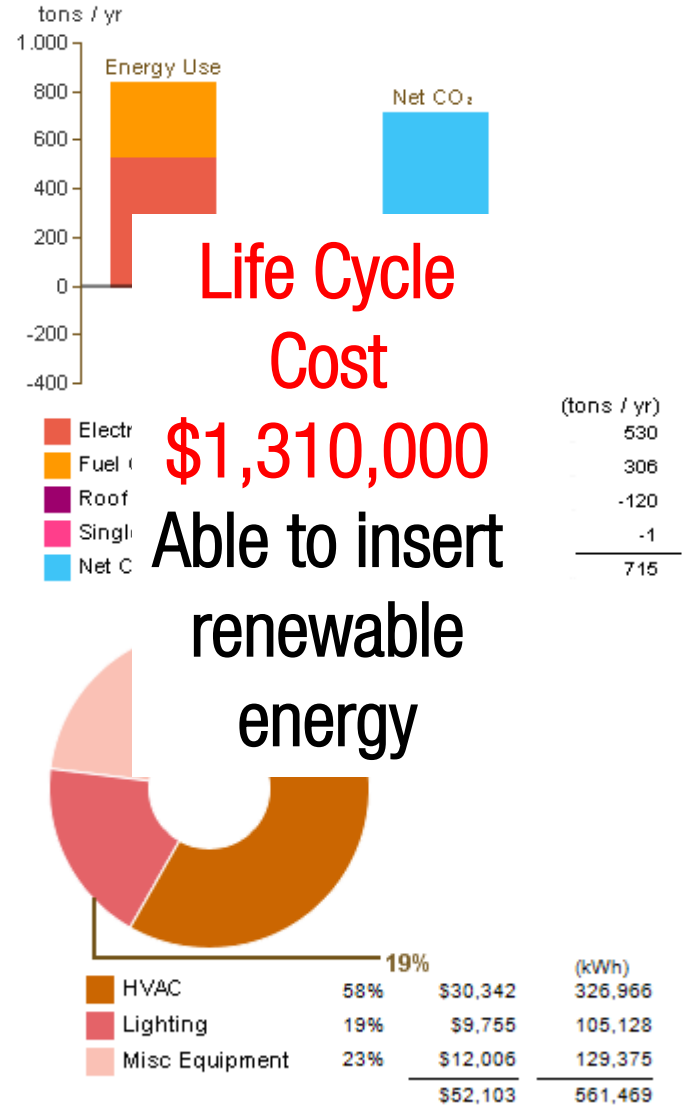
			(kWh)
HVAC	58%	$30,342	326,966
Lighting	19%	$9,755	105,128
Misc Equipment	23%	$12,006	129,375
		$52,103	561,469

ENERGY ANALYSIS - VASARI

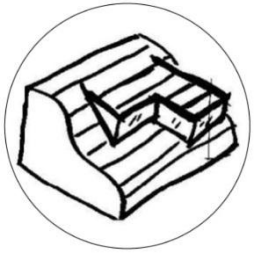
Concept 1- Landscape

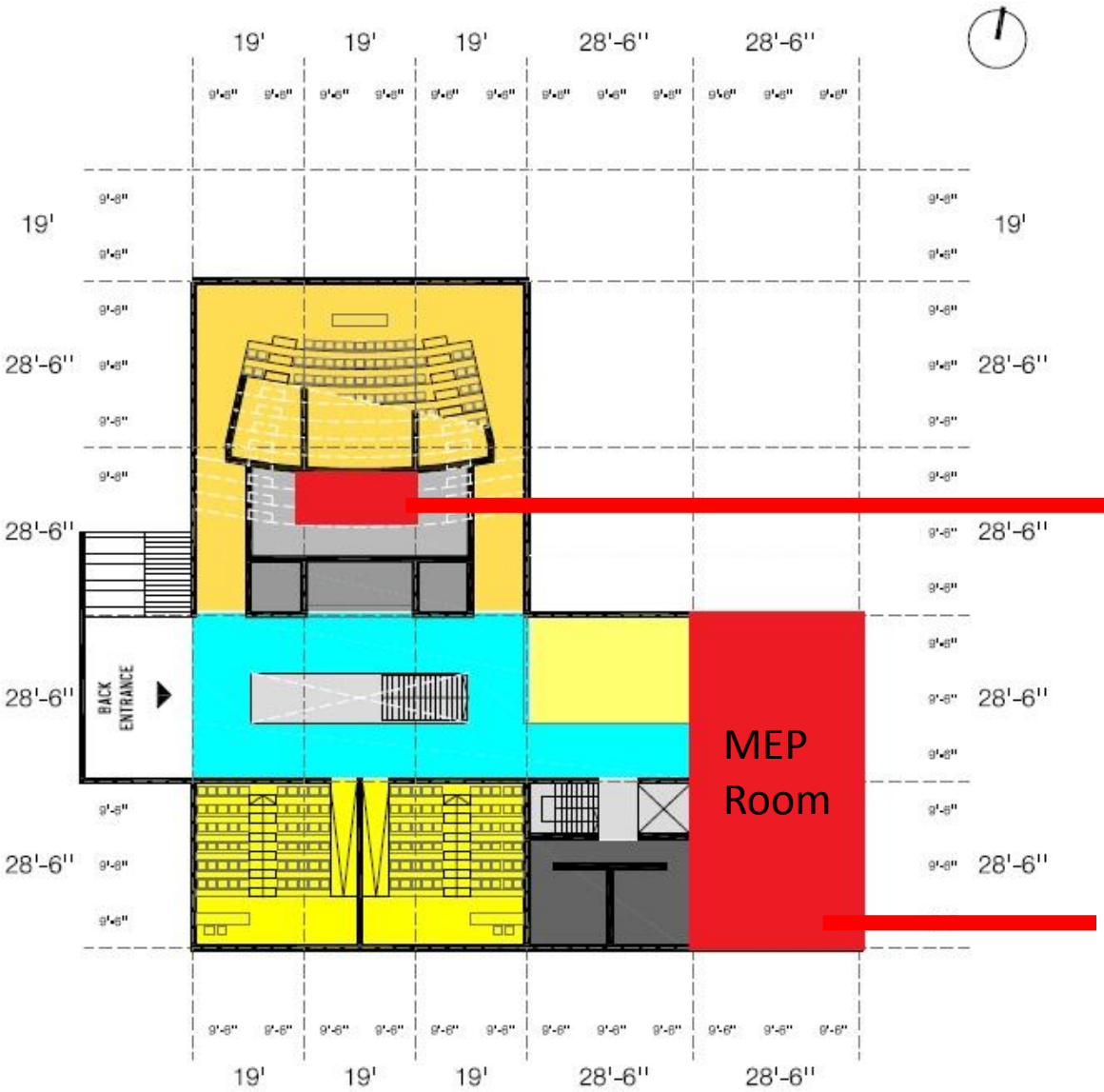


Concept 2- Leaf



MEP LAYOUT – BASEMENT

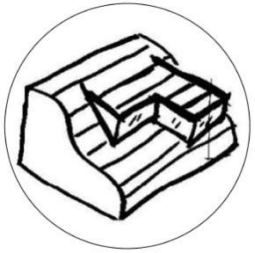




Air Intake is off Site

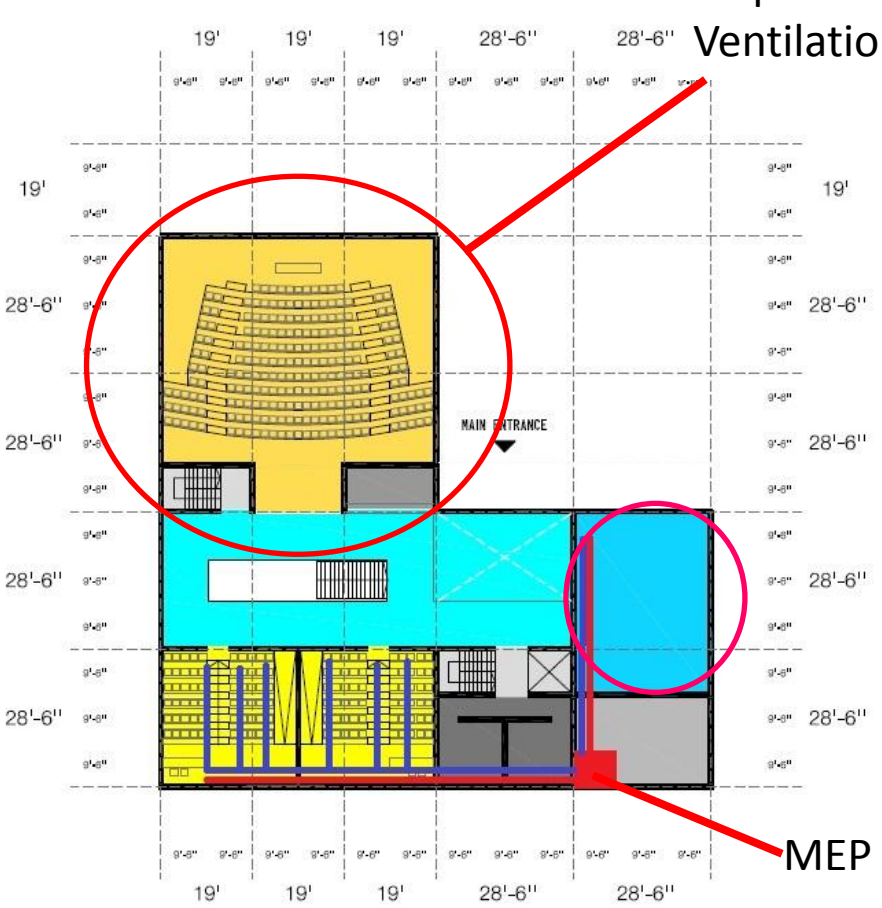
- Helps increase Air Temp

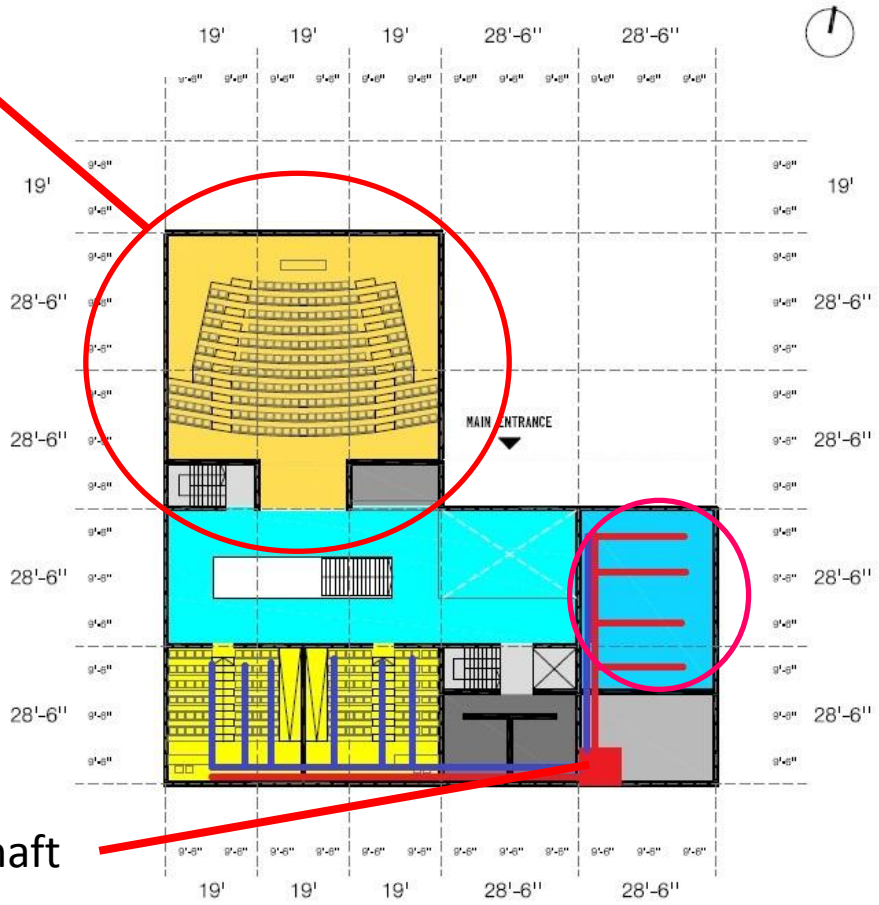
MEP LAYOUT – 1ST FLOOR



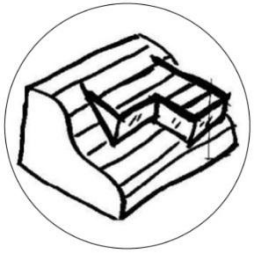
TERMOBUILD

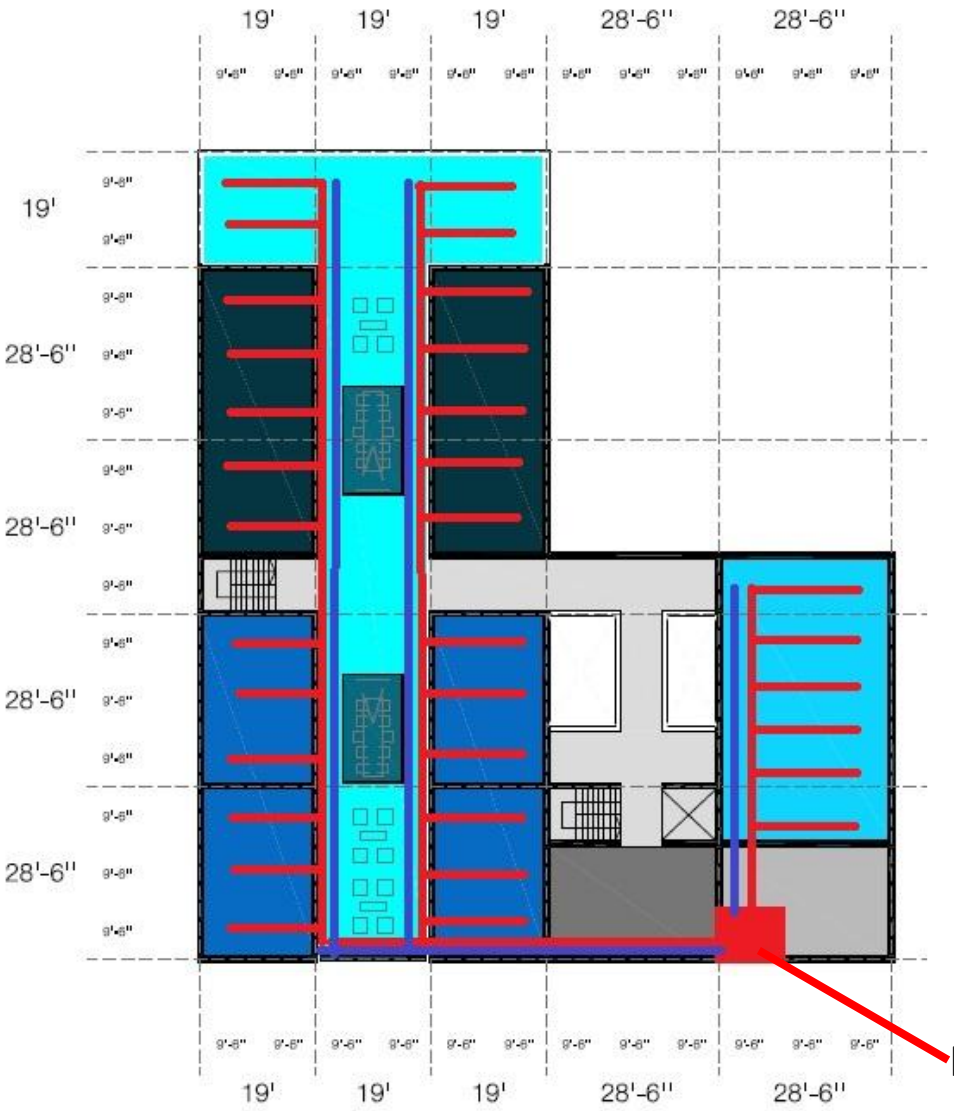
CONVENTIONAL HVAC

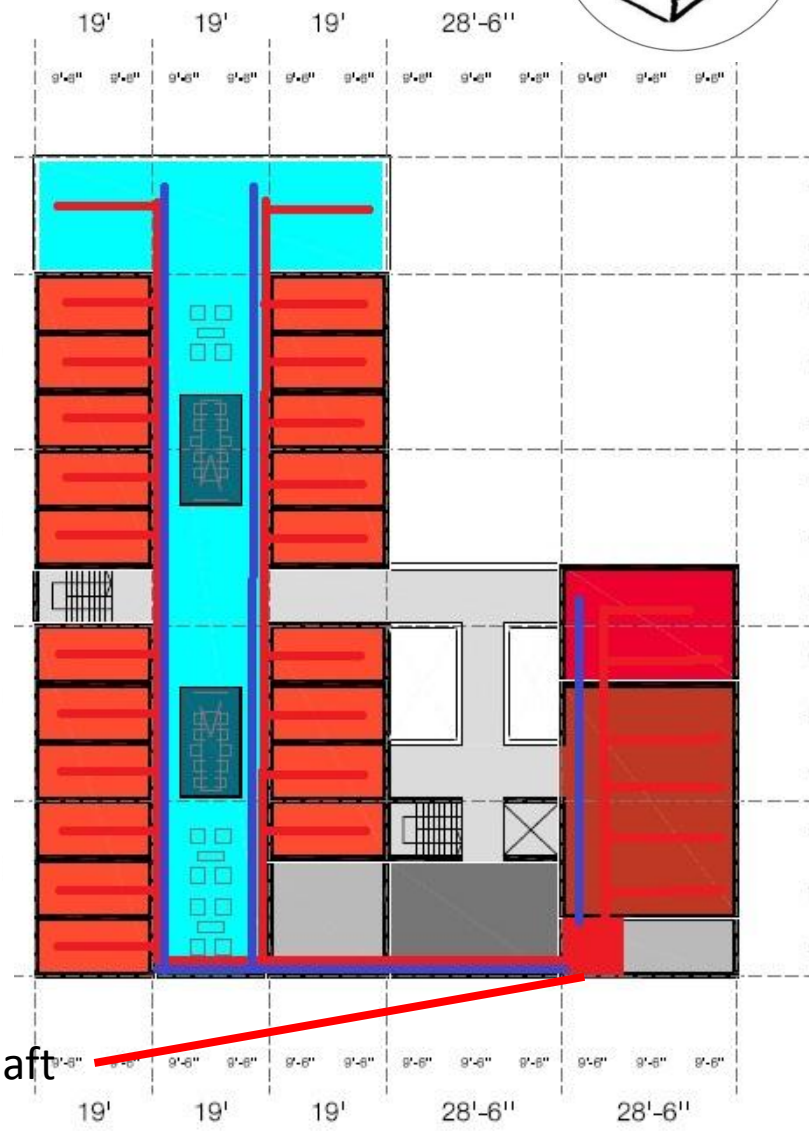




MEP LAYOUT – 2nd and 3rd FLOORS

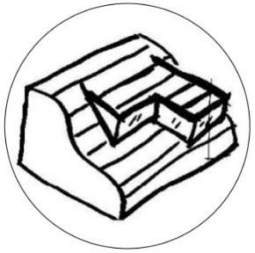


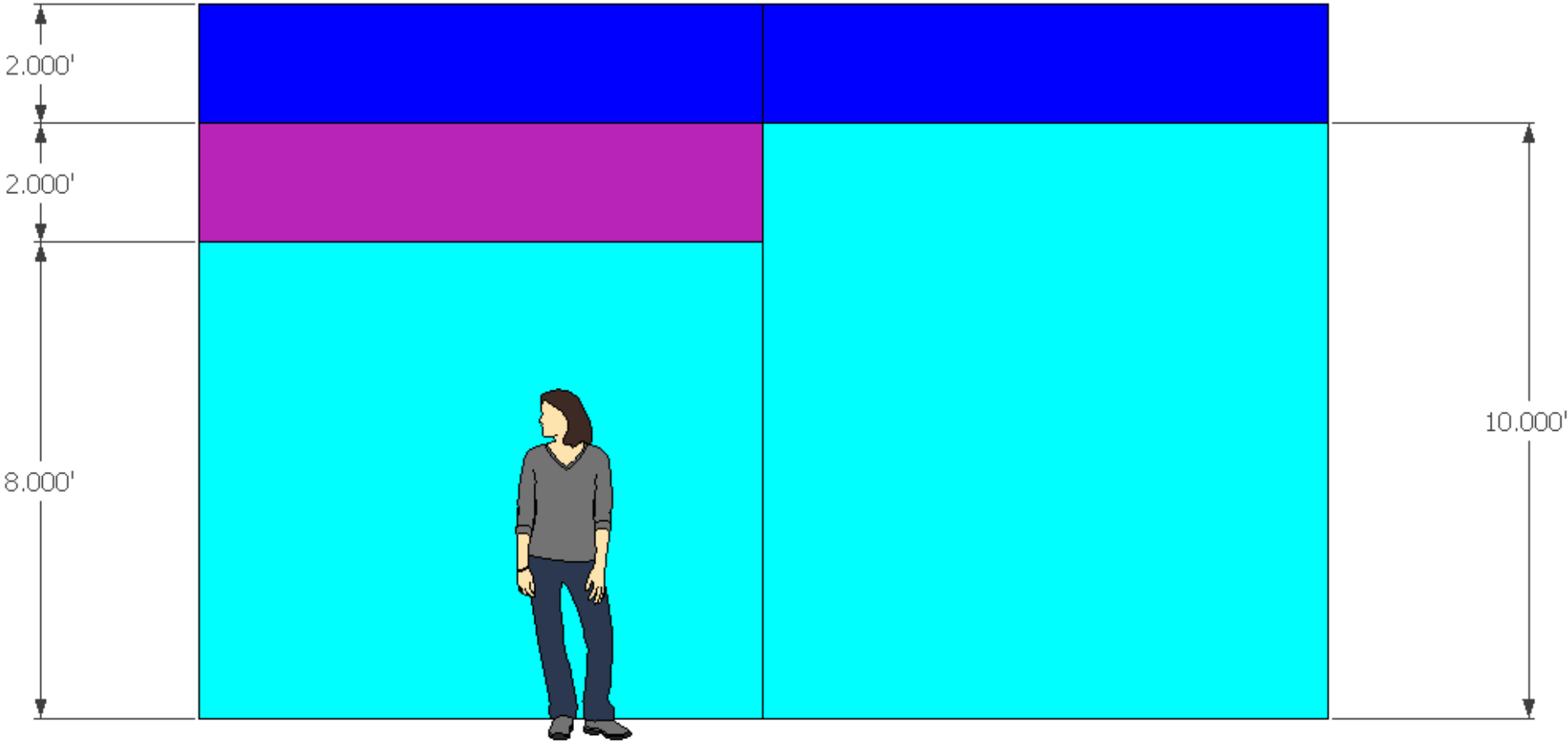




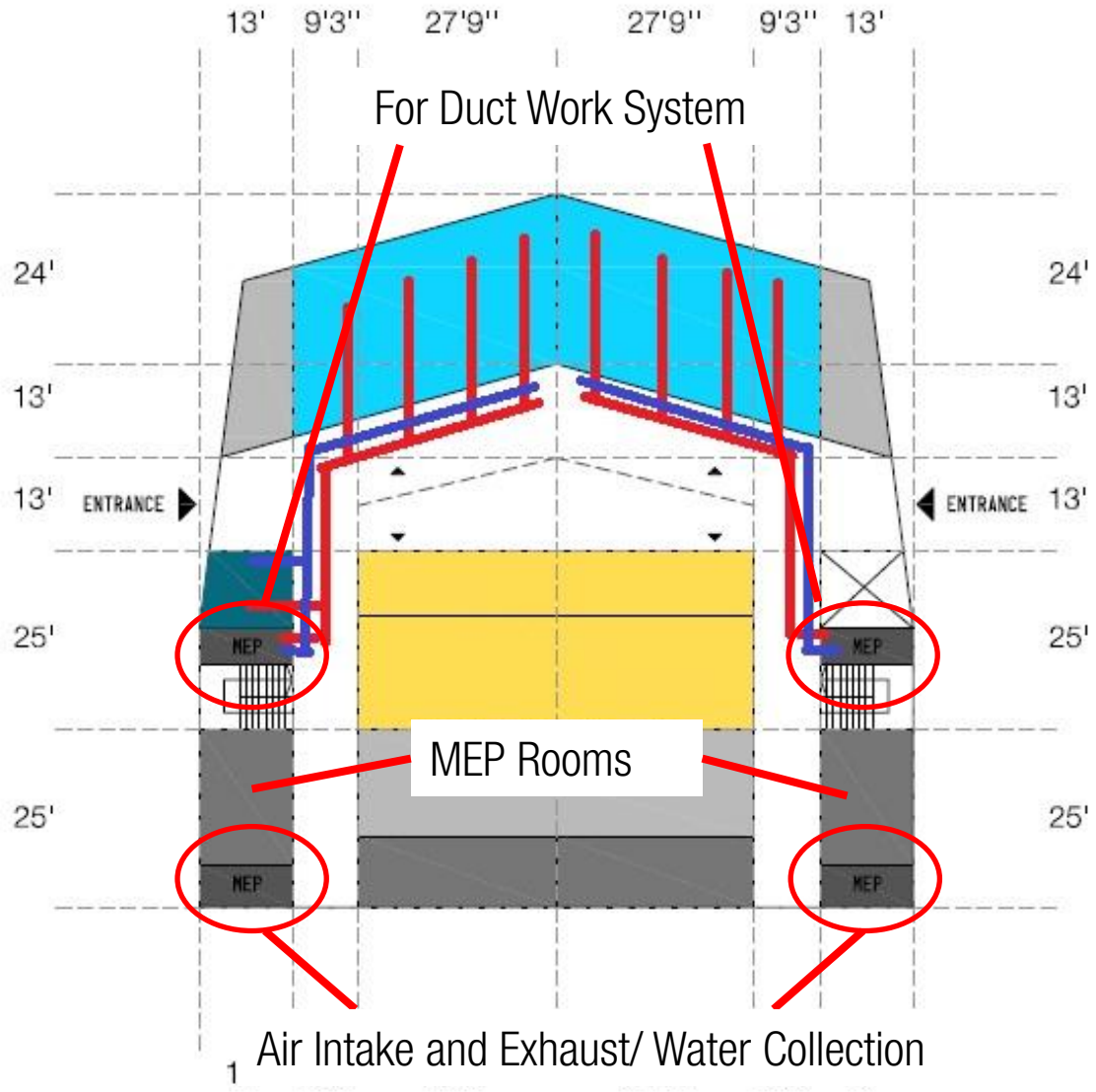
MEP Shaft

SANDWICH





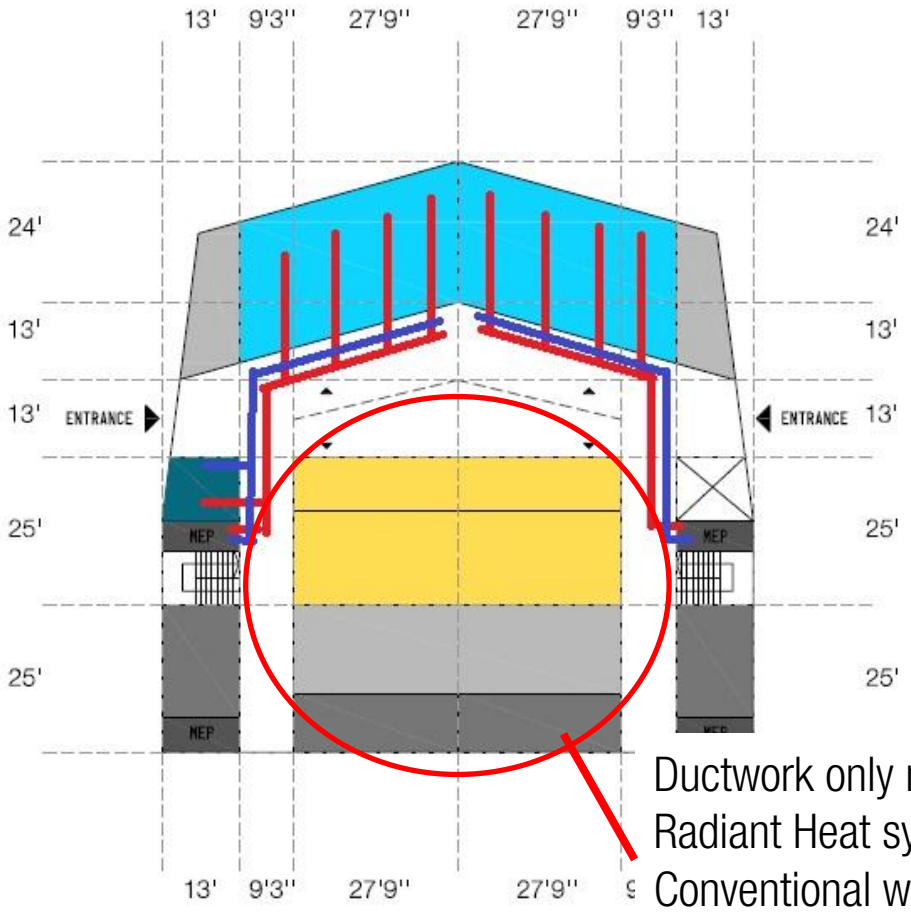
MEP ROOMS/SHAFT IN BASEMENT



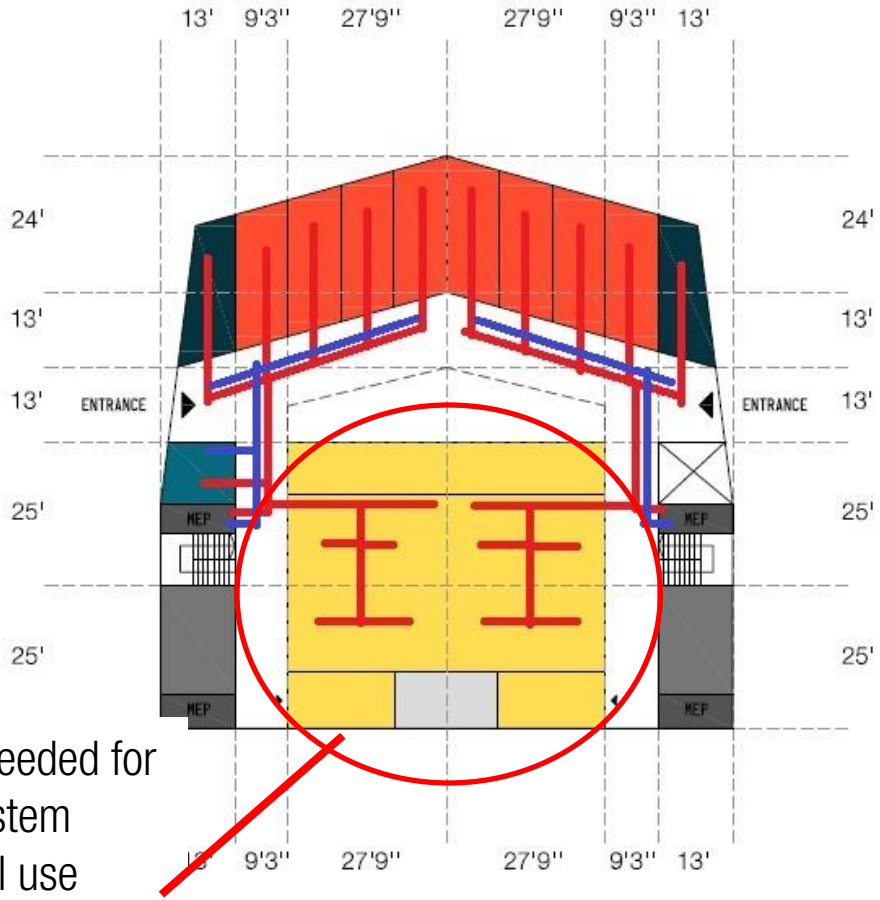
1 Air Intake and Exhaust/ Water Collection

MEP LAYOUT

Basement



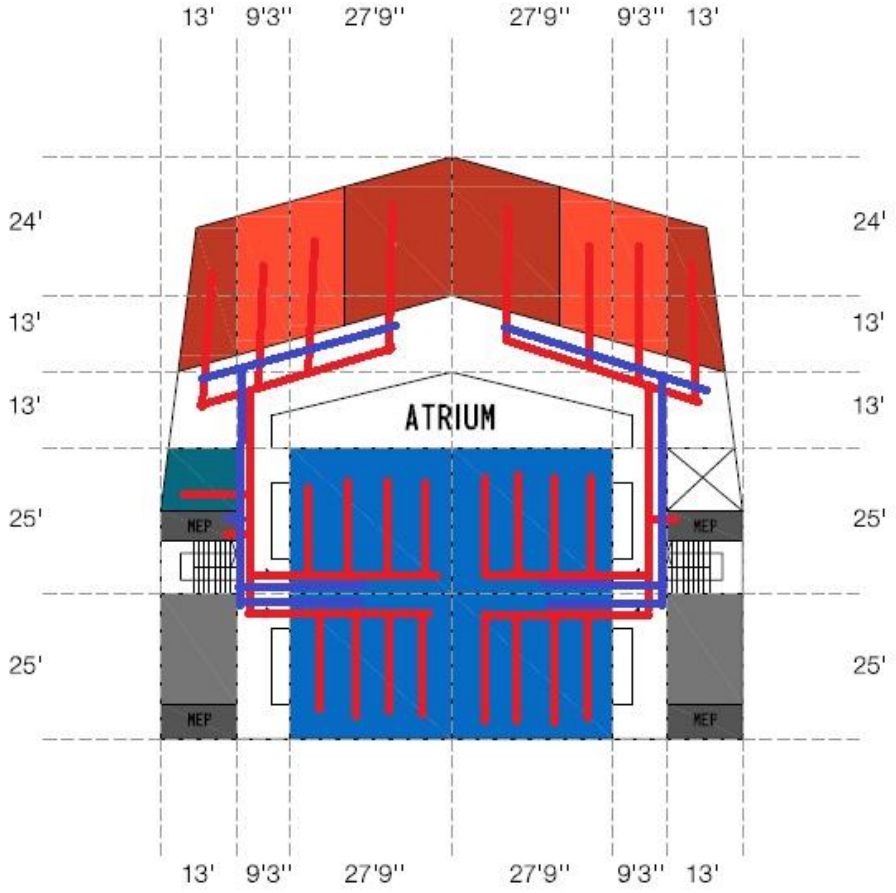
Floor 1



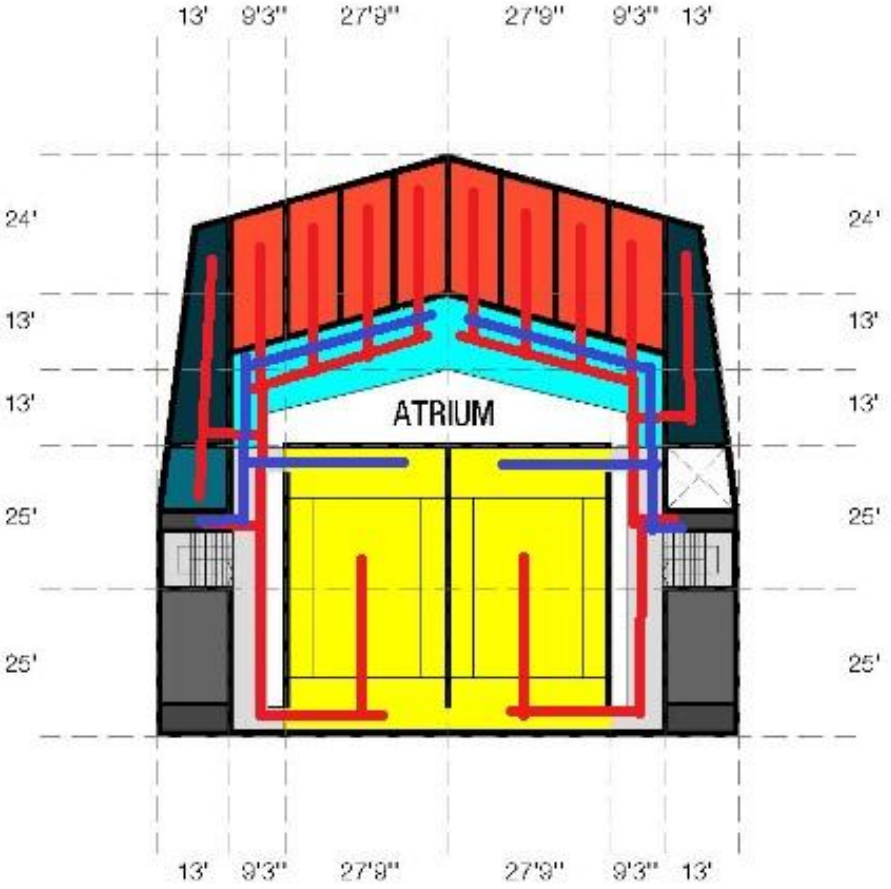
Ductwork only needed for Radiant Heat system
Conventional will use displacement system

MEP LAYOUT

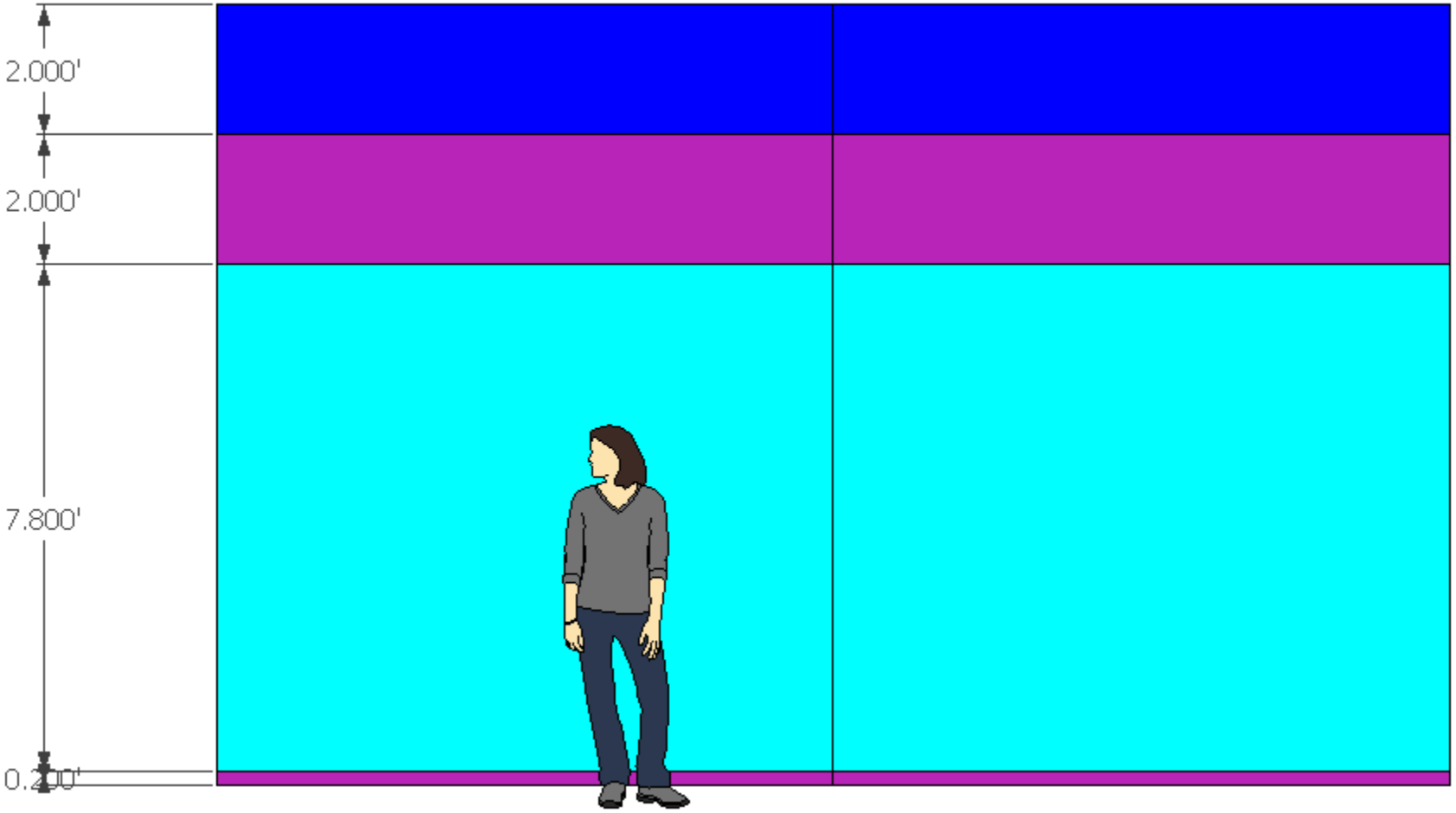
Floor 2



Floor 3



SANDWICH



LEED	Possible Points	Landscape-Concrete with Conventional HVAC	Landscape-Steel with TermoBuild	Leaf-Concrete with Radiant Heat	Leaf-Steel with Conventional HVAC
Sustainable Sites	26	19	19	17	17
Water Efficiency	10	6	6	8	8
Energy and Atmosphere	35	13	15	17	17
Material and Resources	14	3	3	3	3
Indoor Environment Quality	15	13	14	14	13
Innovation and Design Process	6	3	4	4	3
Regional Priority Credits		5	5	6	5
Total		**62**	**66**	**69**	**66**

RAMPRASATH
PALANISAMY

CONSTRUCTION
MANAGEMENT

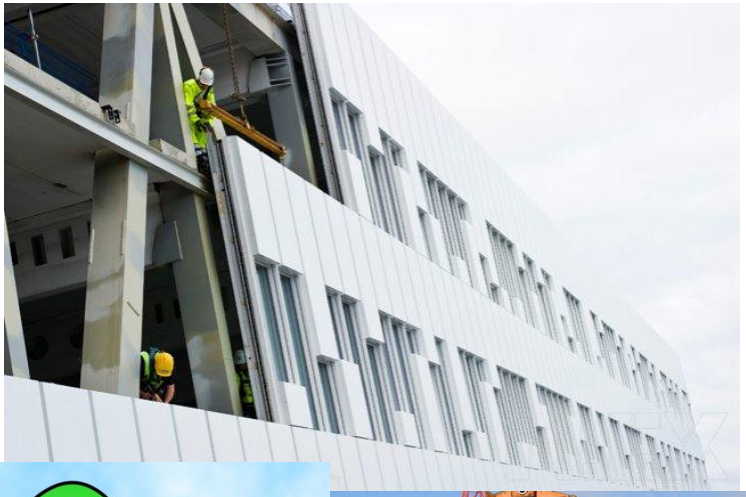
TEAM
ATLANTIC

CONSTRUCTION
MANAGEMENT

A SE MEP **CM** POP

LEAN_3Rs CONSTRUCTION PRINCIPLES

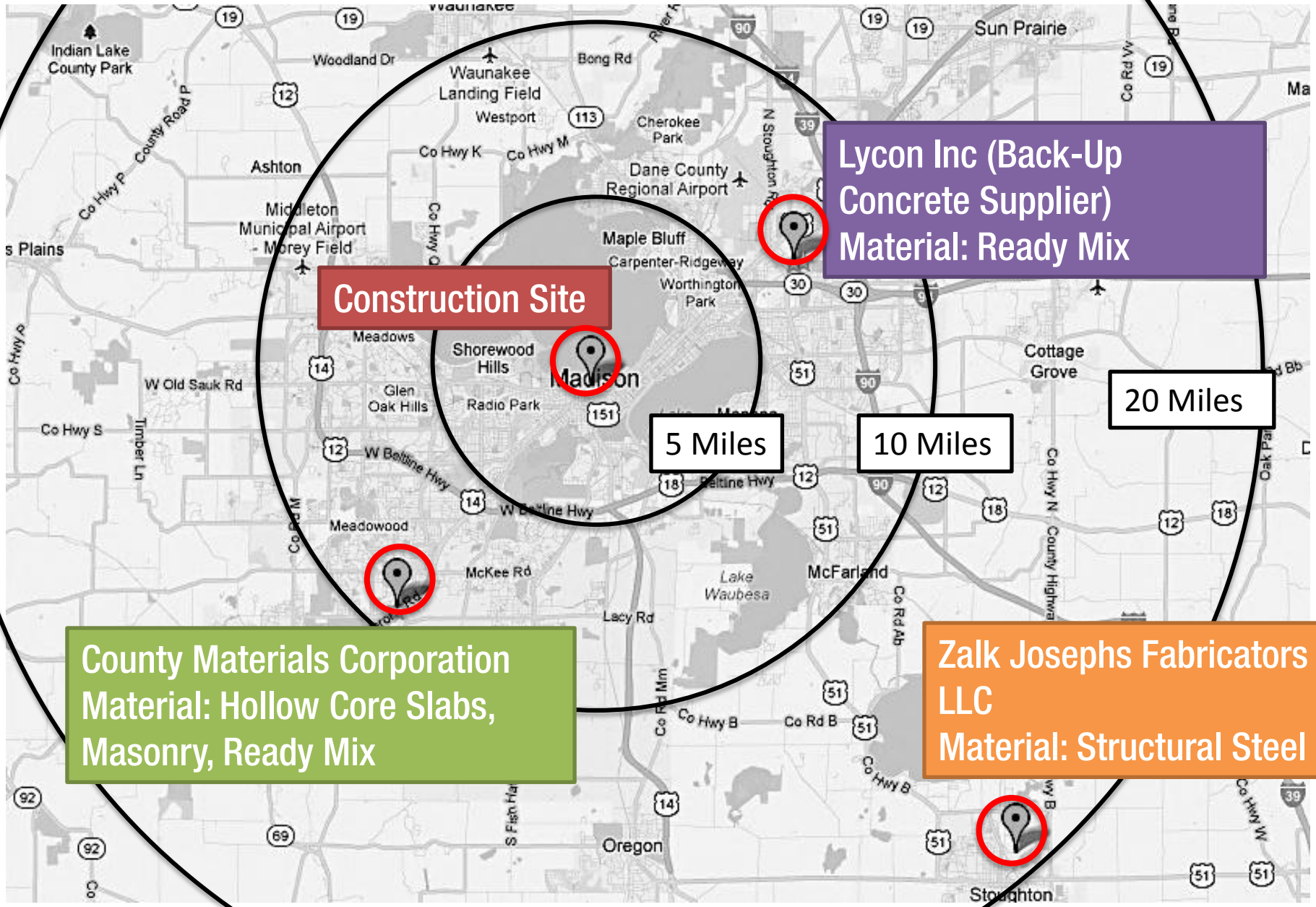
- Reuse
  - Soil for Ramp
  - Formwork
  - Machinery effective utilization



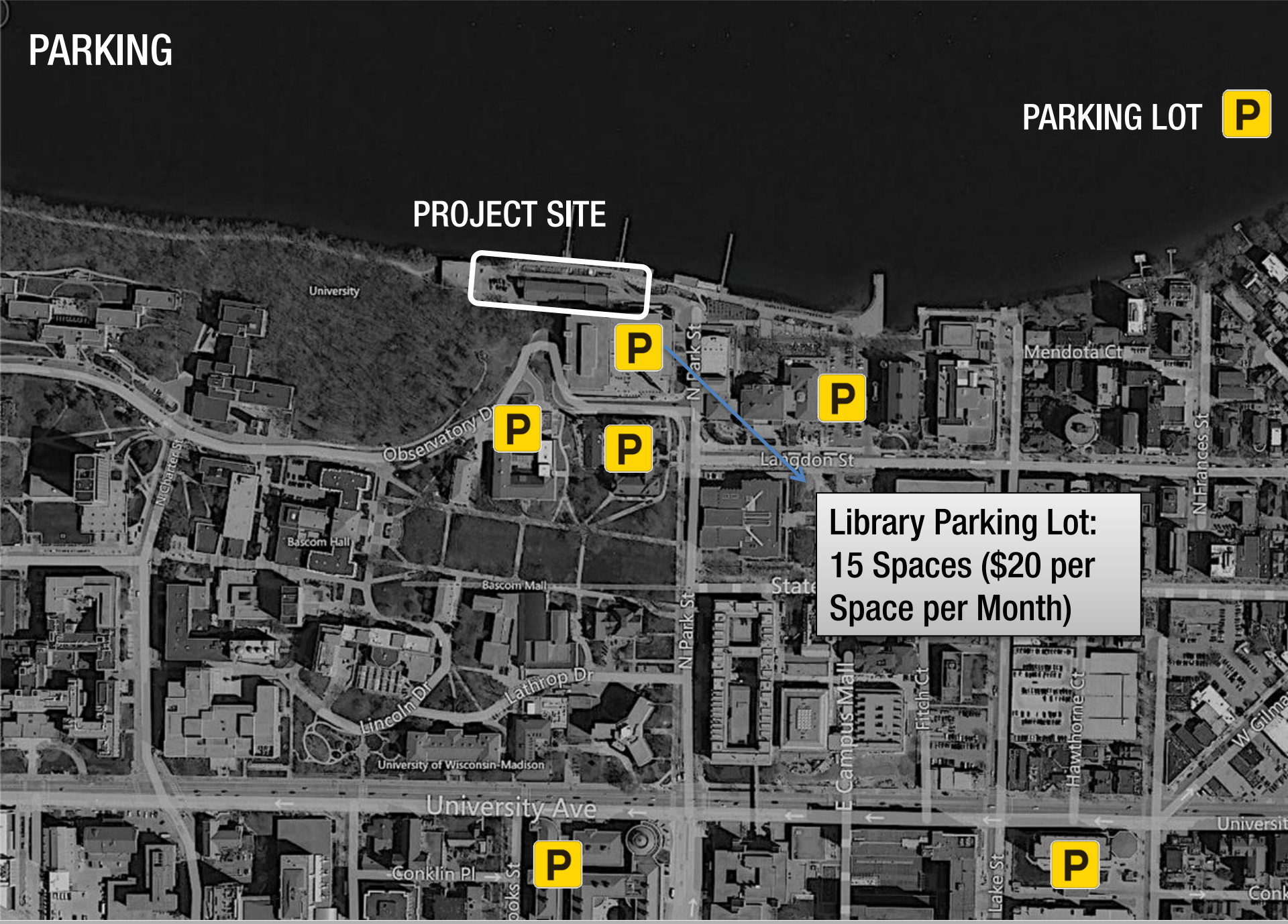
- Reduce
  - Just in time delivery
  - Pre-Fabrication
    - Hollow-Core Slabs
    - Façade
    - Steel

- Recycle
  - Wood
  - Concrete

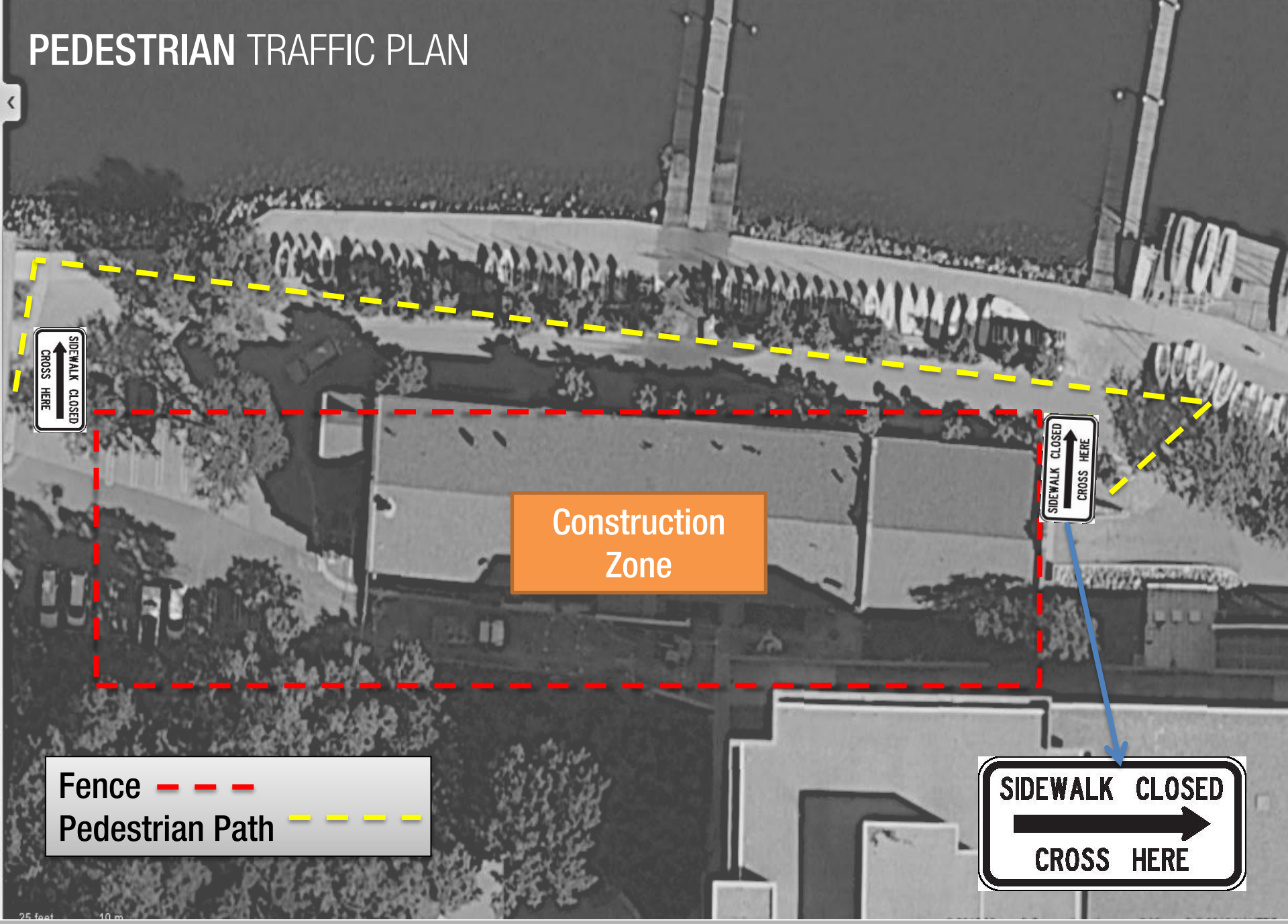
LOCAL MATERIALS



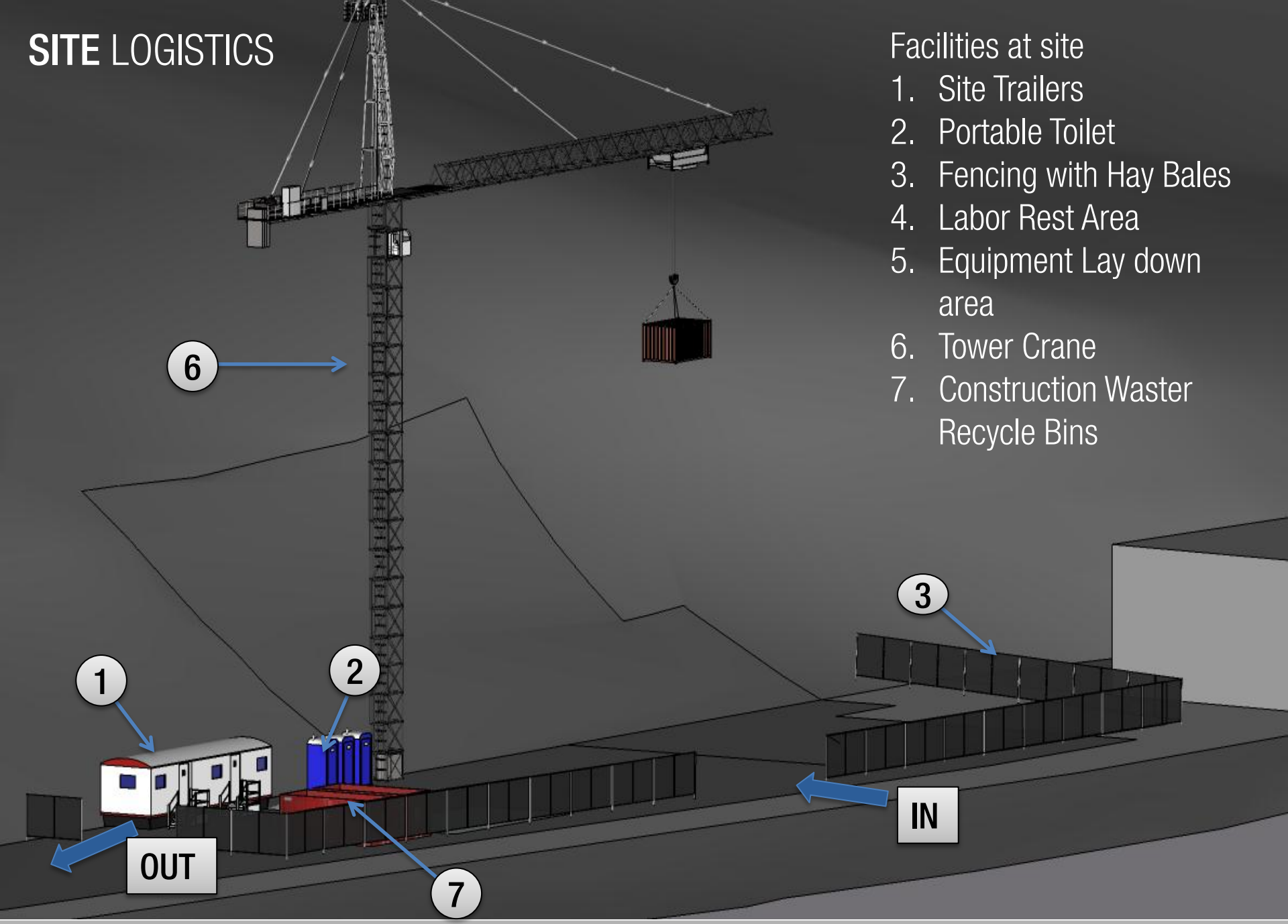
PARKING


PARKING LOT
P
PROJECT SITE
University
N Park St
Mendota Ct
Observatory Dr
N Charter St
Langdon St
N Frances St
Bascom Hall
Bascom Mall
State
N Park St
Lincoln Dr
Lathrop Dr
E Campus Mall
Fitch Ct
Hawthorne Ct
University of Wisconsin-Madison
University Ave
Conklin Pl
Lake St
Library Parking Lot:
15 Spaces ($20 per
Space per Month)

PEDESTRIAN TRAFFIC PLAN



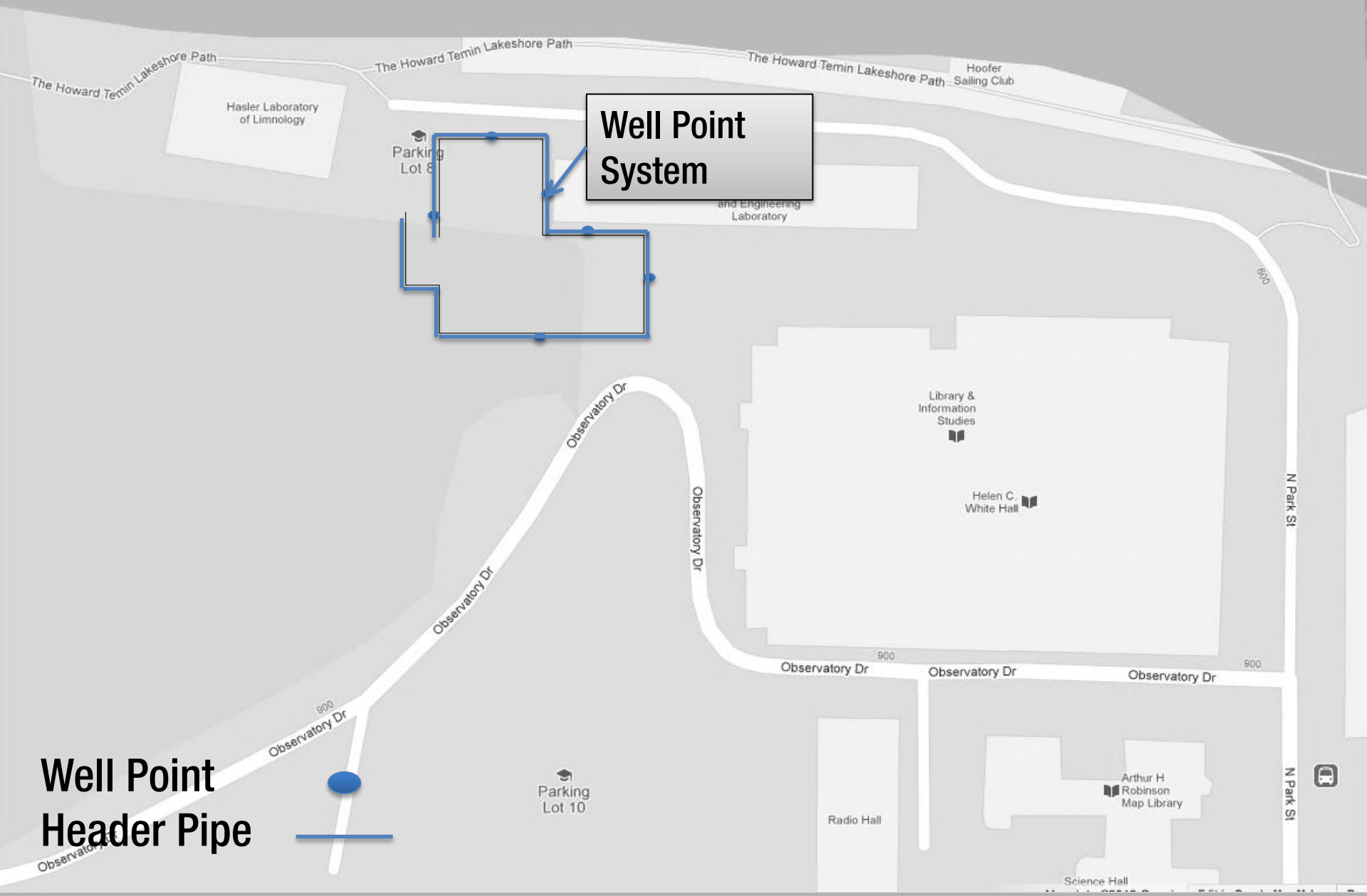
SITE LOGISTICS



Facilities at site

1. Site Trailers
2. Portable Toilet
3. Fencing with Hay Bales
4. Labor Rest Area
5. Equipment Lay down area
6. Tower Crane
7. Construction Waster Recycle Bins

CONSTRUCTABILITY – HIGH WATER TABLE - DEWATERING



MACHINERY

Excavator: Caterpillar 336DL
Operating Weight – 80464lb
Bucket – 1.56 CYD
Depth – 26’10”

Dump Truck: MACK Granite GU713
19’ American Steel Dump
395 HP

Skid Steer Loader: Bobcat S330
Operating Weight : 9185lb
Bucket : 0.61CYD

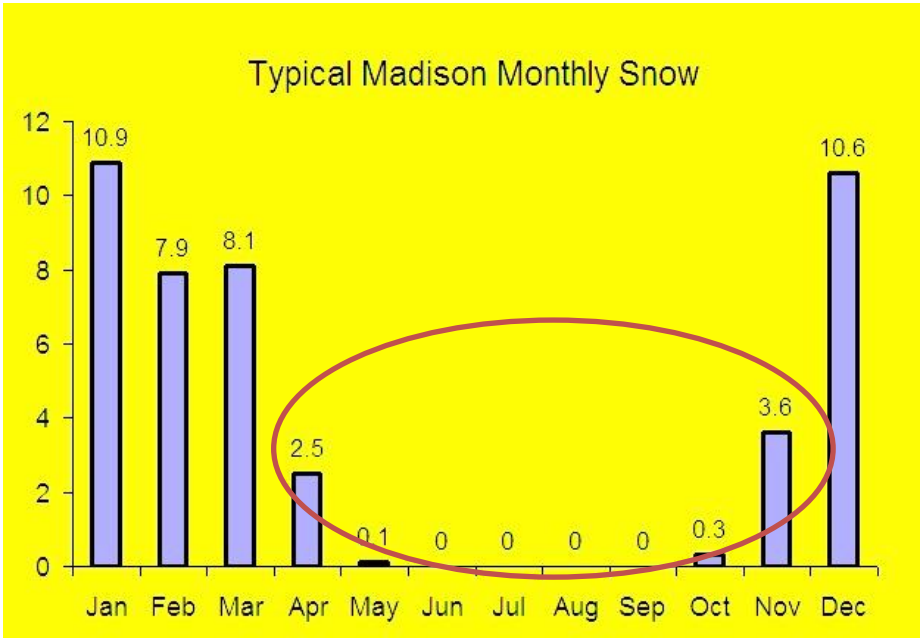
MACHINERY

Pile Driver

Tower Crane: TEREX SK 575-32
Max Jib Length: 262.5 ft
Capacity at Max. Length : 8598 lbs
Max Capacity : 70,548 lbs

SCHEDULE_MILESTONES

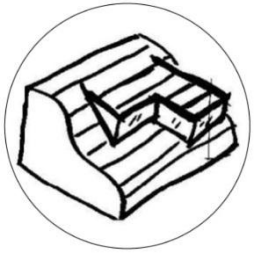
Negotiated Early Start Date: June 1st, 2015



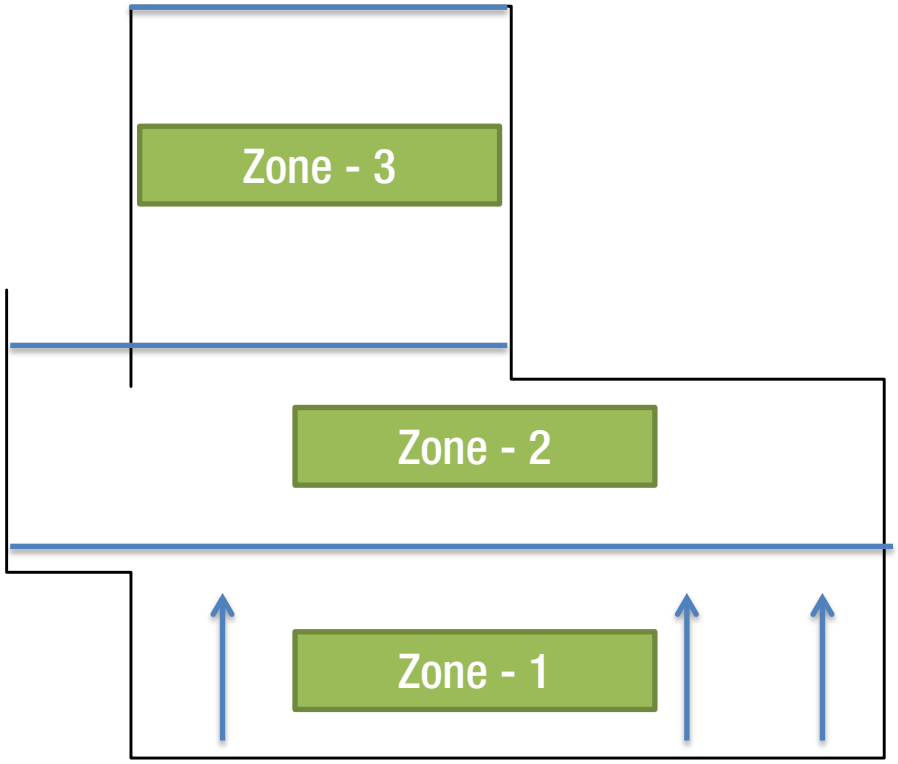
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Notice to Proceed												
Substructure												
Shell Enclosed												
Interiors												
Ready for Occupancy												

M1 M2 M3 M4 M5

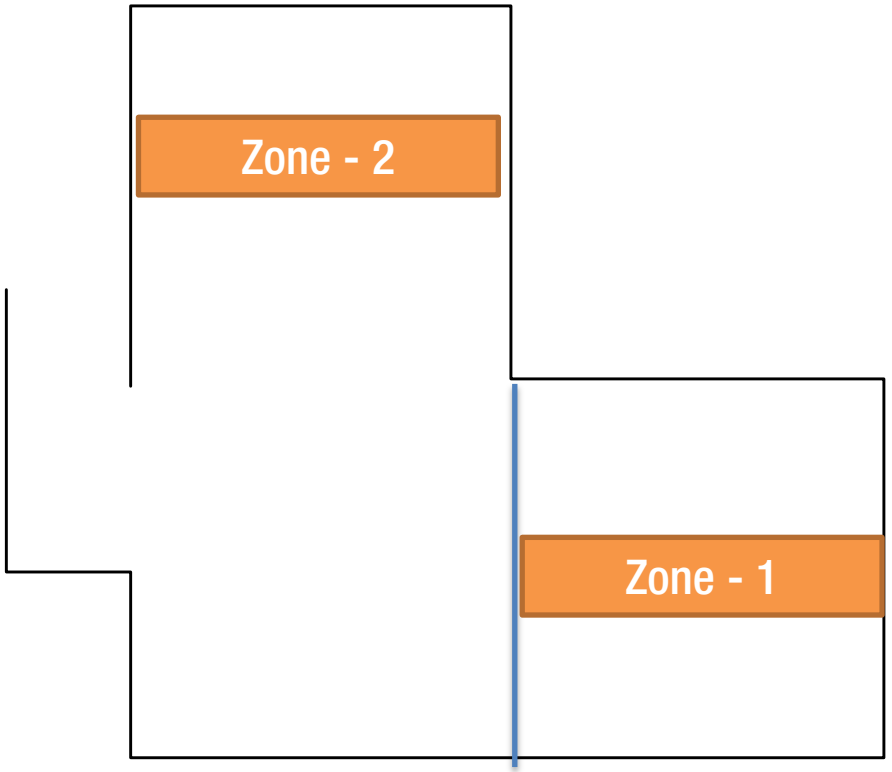
SCHEDULE_LANDSCAPE



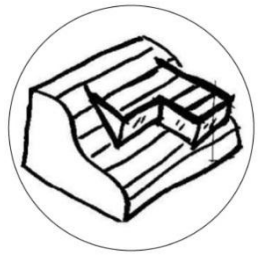
Steel



Concrete

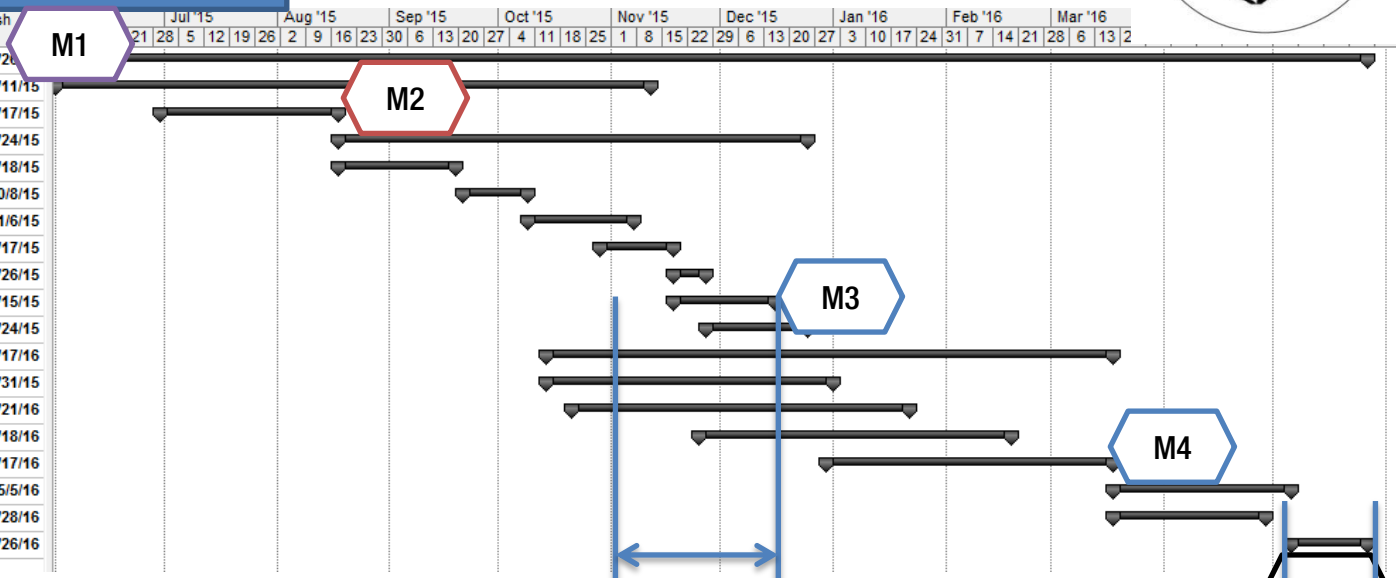


SCHEDULE_LANDSCAPE



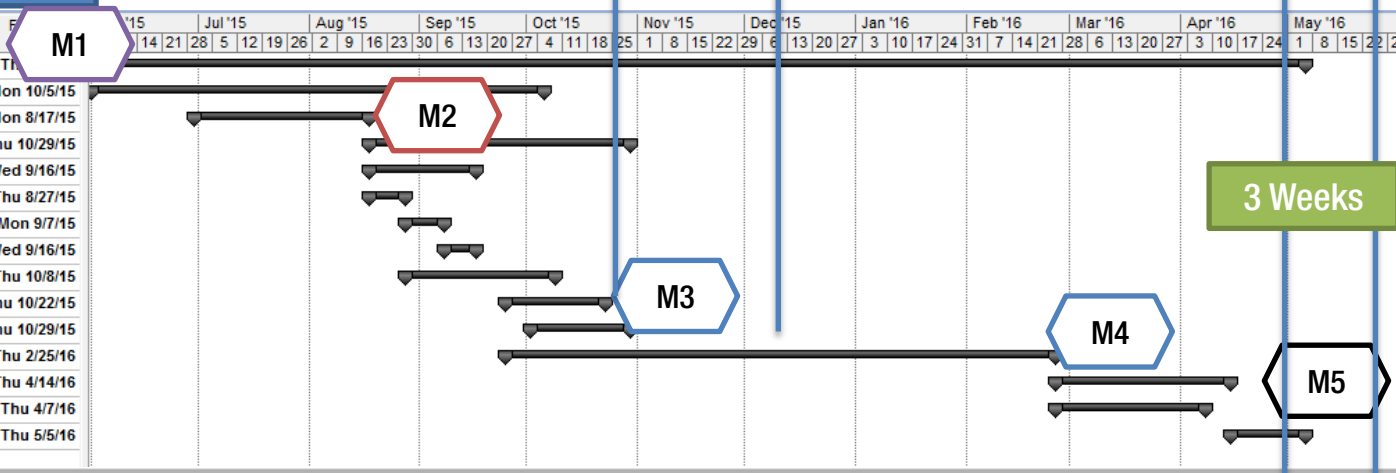
Concrete with Conventional HVAC

WBS	Task Name	Duration	Start	Finish
1	Project	259 days	Mon 6/1/15	Thu 5/2
1.1	General Conditions	118 days	Mon 6/1/15	Wed 11/11/15
1.2	Sub Structure	35 days	Tue 6/30/15	Mon 8/17/15
1.3	Shell	93 days	Tue 8/18/15	Thu 12/24/15
1.3.1	Basement	24 days	Tue 8/18/15	Fri 9/18/15
1.3.2	1st Floor	14 days	Mon 9/21/15	Thu 10/8/15
1.3.3	2nd Floor	21 days	Fri 10/9/15	Fri 11/6/15
1.3.4	3rd Floor	14 days	Thu 10/29/15	Tue 11/17/15
1.3.5	Roof Access	7 days	Wed 11/18/15	Thu 11/26/15
1.3.6	Façade	20 days	Wed 11/18/15	Tue 12/15/15
1.3.7	Staircase	20 days	Fri 11/27/15	Thu 12/24/15
1.4	Interiors	112 days	Wed 10/14/15	Thu 3/17/16
1.4.1	Basement	57 days	Wed 10/14/15	Thu 12/31/15
1.4.2	1st Floor	67 days	Wed 10/21/15	Thu 1/21/16
1.4.3	2nd Floor	62 days	Wed 11/25/15	Thu 2/18/16
1.4.4	3rd Floor	57 days	Wed 12/30/15	Thu 3/17/16
1.5	Services	35 days	Fri 3/18/16	Thu 5/5/16
1.6	Landscaping	30 days	Fri 3/18/16	Thu 4/28/16
1.7	Comissioning	15 days	Fri 5/6/16	Thu 5/26/16



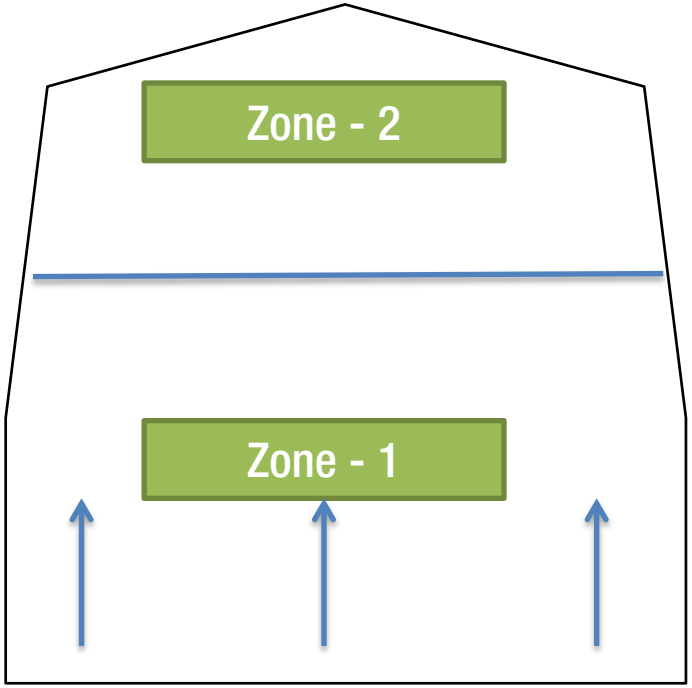
Steel with Thermodeck

WBS	Task Name	Duration	Start	F
1	Project	244 days	Mon 6/1/15	Th
1.1	General Conditions	91 days	Mon 6/1/15	Mon 10/5/15
1.2	Sub Structure	35 days	Tue 6/30/15	Mon 8/17/15
1.3	Shell	53 days	Tue 8/18/15	Thu 10/29/15
1.3.1	Steel Erection	22 days	Tue 8/18/15	Wed 9/16/15
1.3.1.1	Bay 1	8 days	Tue 8/18/15	Thu 8/27/15
1.3.1.2	Bay 2	7 days	Fri 8/28/15	Mon 9/7/15
1.3.1.3	Bay 3	7 days	Tue 9/8/15	Wed 9/16/15
1.3.2	Concrete Slab Erection	30 days	Fri 8/28/15	Thu 10/8/15
1.3.3	Façade	20 days	Fri 9/25/15	Thu 10/22/15
1.3.4	Staircase	20 days	Fri 10/2/15	Thu 10/29/15
1.4	Interiors	110 days	Fri 9/25/15	Thu 2/25/16
1.5	Services	35 days	Fri 2/26/16	Thu 4/14/16
1.6	Landscaping	30 days	Fri 2/26/16	Thu 4/7/16
1.7	Comissioning	15 days	Fri 4/15/16	Thu 5/5/16

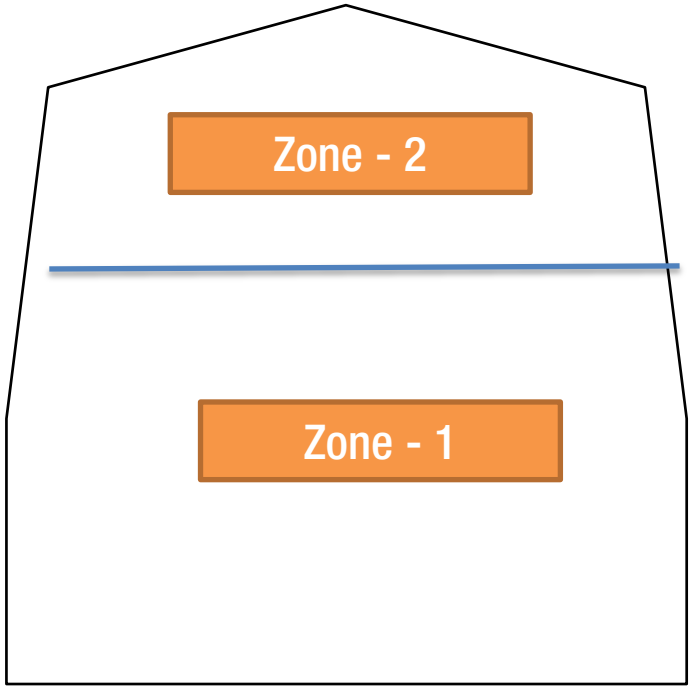


SCHEDULE_LEAF

Steel



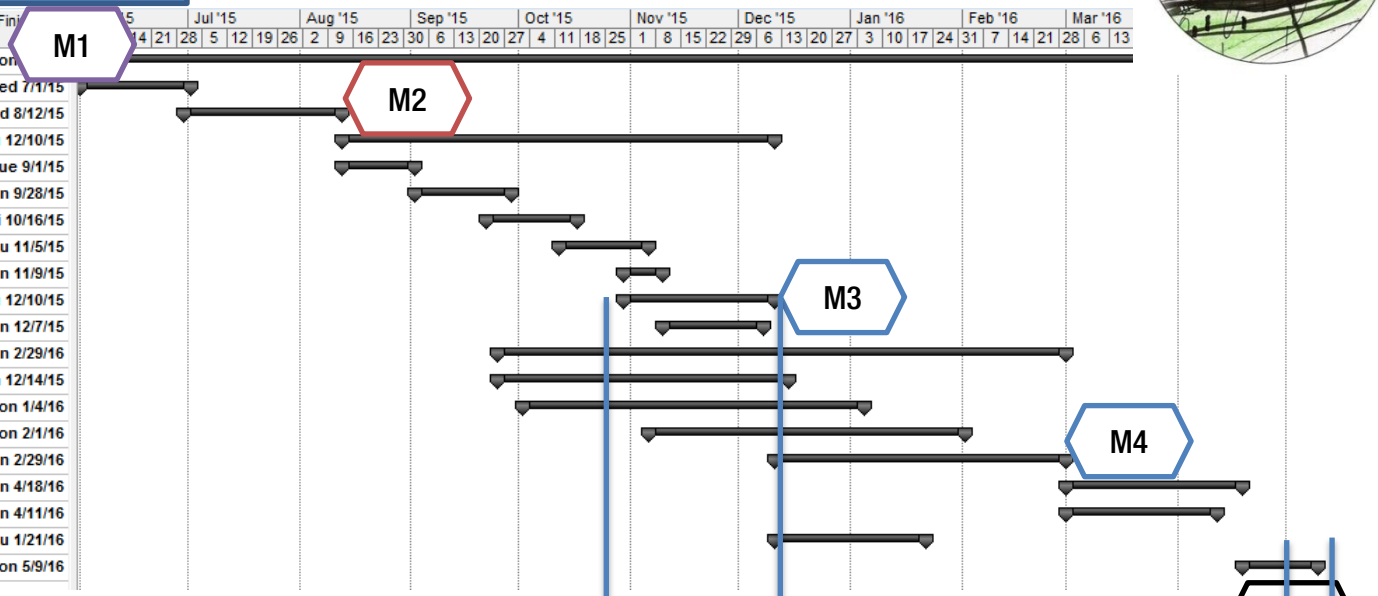
Concrete



SCHEDULE_LEAF

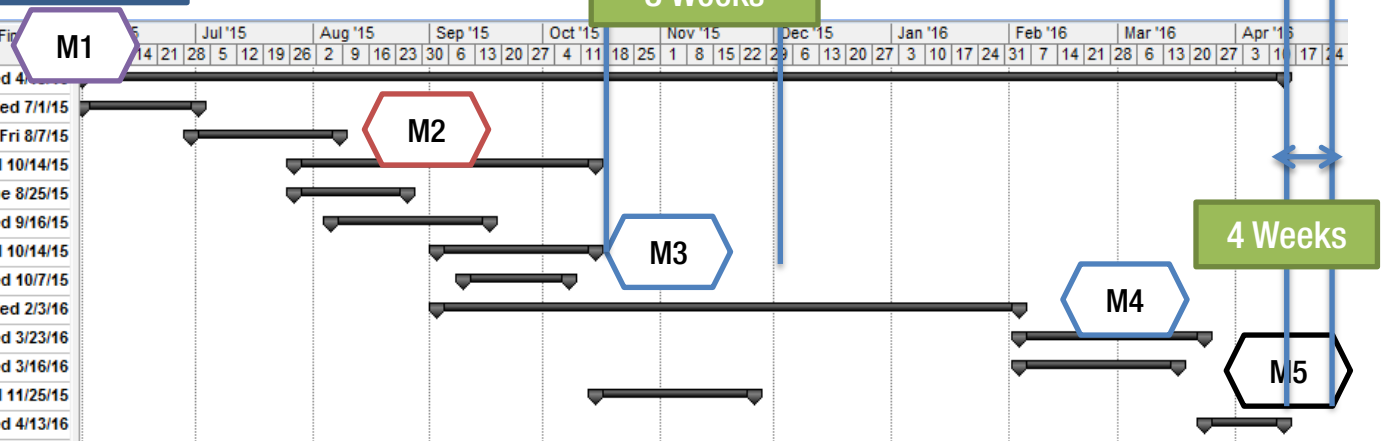
Concrete with Radiant Heat

WBS	Task Name	Duration	Start	Finish
1	Project	246 days	Mon 6/1/15	Mon
1.1	General Conditions	23 days	Mon 6/1/15	Wed 7/1/15
1.2	Sub Structure	32 days	Tue 6/30/15	Wed 8/12/15
1.3	Shell	86 days	Thu 8/13/15	Thu 12/10/15
1.3.1	1st Floor	14 days	Thu 8/13/15	Tue 9/1/15
1.3.2	2nd Floor	19 days	Wed 9/2/15	Mon 9/28/15
1.3.3	3rd Floor	19 days	Tue 9/22/15	Fri 10/16/15
1.3.4	4th Floor	19 days	Mon 10/12/15	Thu 11/5/15
1.3.5	Roof Access	7 days	Fri 10/30/15	Mon 11/9/15
1.3.6	Façade	30 days	Fri 10/30/15	Thu 12/10/15
1.3.7	Staircase	20 days	Tue 11/10/15	Mon 12/7/15
1.4	Interiors	112 days	Fri 9/25/15	Mon 2/29/16
1.4.1	1st Floor	57 days	Fri 9/25/15	Mon 12/14/15
1.4.2	2nd Floor	67 days	Fri 10/2/15	Mon 1/4/16
1.4.3	3rd Floor	62 days	Fri 11/6/15	Mon 2/1/16
1.4.4	4th Floor	57 days	Fri 12/11/15	Mon 2/29/16
1.5	Services	35 days	Tue 3/1/16	Mon 4/18/16
1.6	Landscaping	30 days	Tue 3/1/16	Mon 4/11/16
1.7	Ramp	30 days	Fri 12/11/15	Thu 1/21/16
1.8	Comissioning	15 days	Tue 4/19/16	Mon 5/9/16

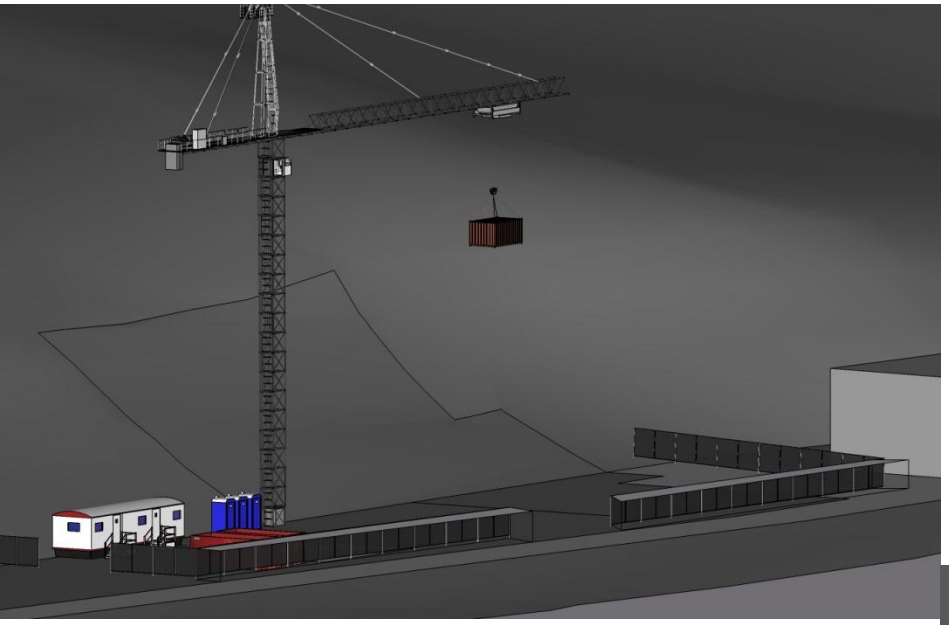


Steel with Conventional HVAC

WBS	Task Name	Duration	Start	Finish
1	Project	228 days	Mon 6/1/15	Wed 4/
1.1	General Conditions	23 days	Mon 6/1/15	Wed 7/1/15
1.2	Sub Structure	29 days	Tue 6/30/15	Fri 8/7/15
1.3	Shell	58 days	Mon 7/27/15	Wed 10/14/15
1.3.1	Steel Erection	22 days	Mon 7/27/15	Tue 8/25/15
1.3.2	Concrete Slab Erec	30 days	Thu 8/6/15	Wed 9/16/15
1.3.3	Façade	30 days	Thu 9/3/15	Wed 10/14/15
1.3.4	Staircase	20 days	Thu 9/10/15	Wed 10/7/15
1.4	Interiors	110 days	Thu 9/3/15	Wed 2/3/16
1.5	Services	35 days	Thu 2/4/16	Wed 3/23/16
1.6	Landscaping	30 days	Thu 2/4/16	Wed 3/16/16
1.7	Ramp	30 days	Thu 10/15/15	Wed 11/25/15
1.8	Comissioning	15 days	Thu 3/24/16	Wed 4/13/16

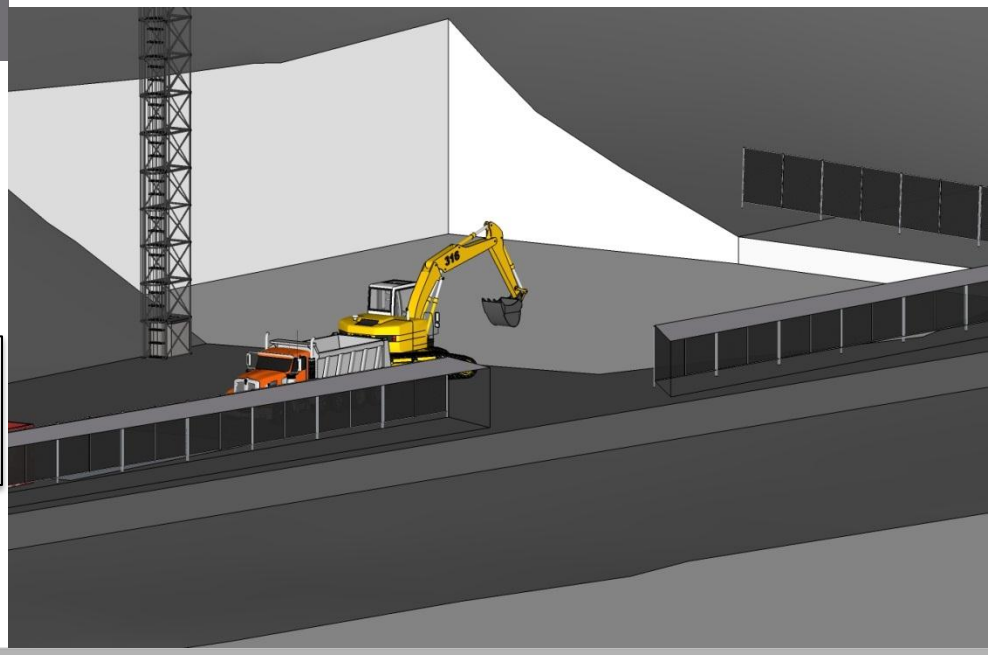


SCHEDULE_MILESTONES

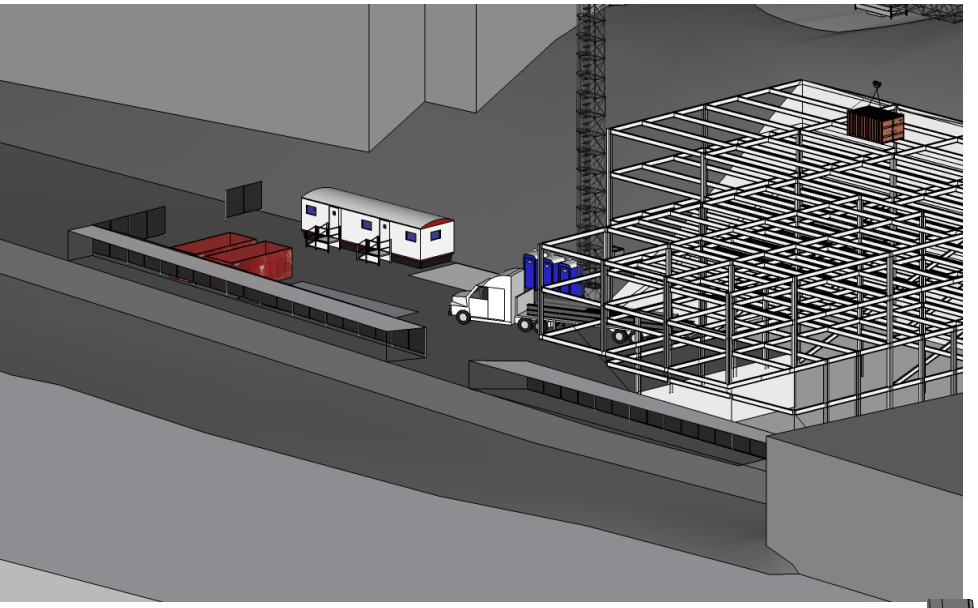


Site Mobilization Complete – 6/1/2015 (M1)

Substructure Complete – 8/7/2015 (M2)

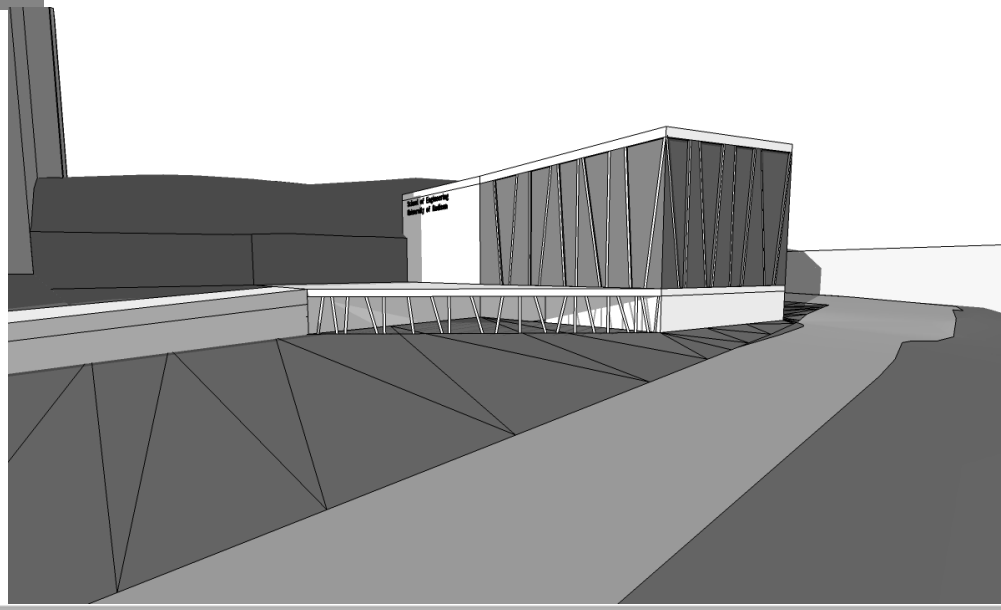


SCHEDULE_MILESTONES

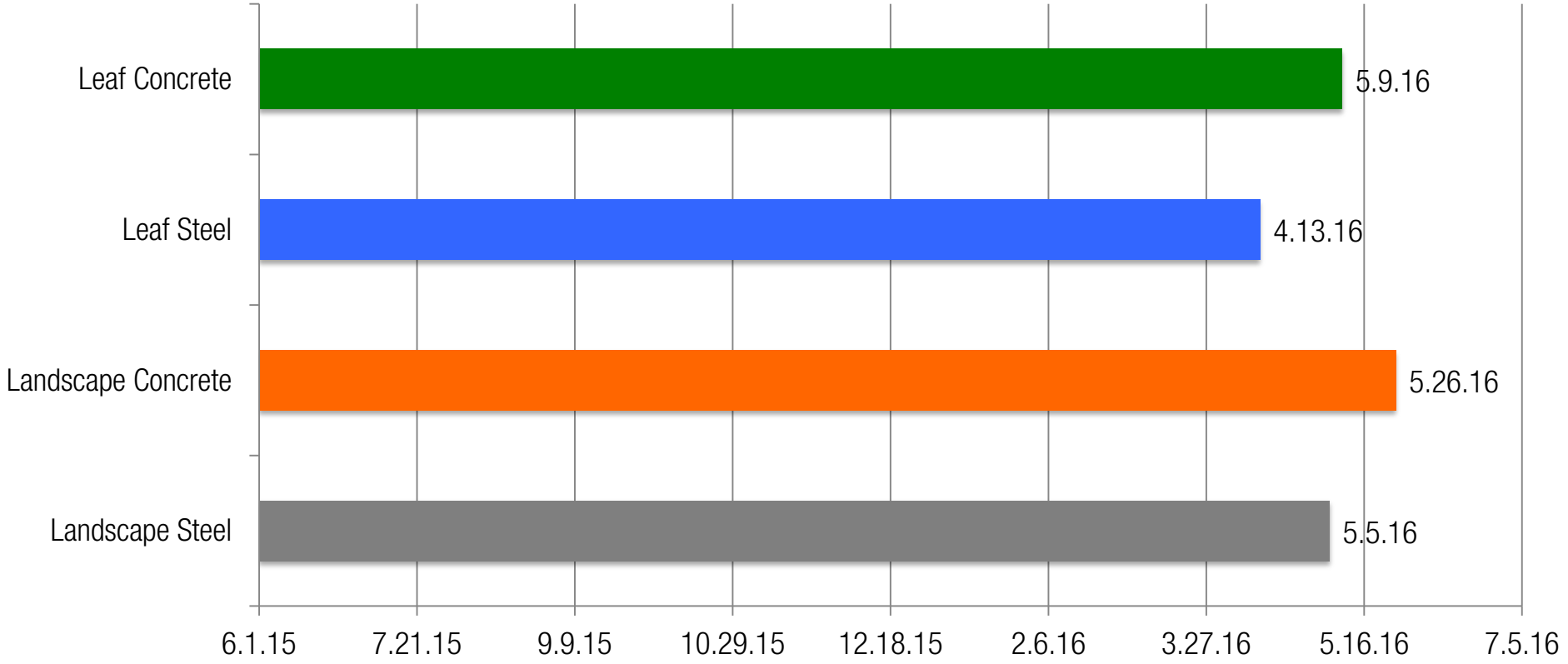


Shell Complete – 10/14/2015 (M3)

Project Complete – 4/13/2015 (M4)



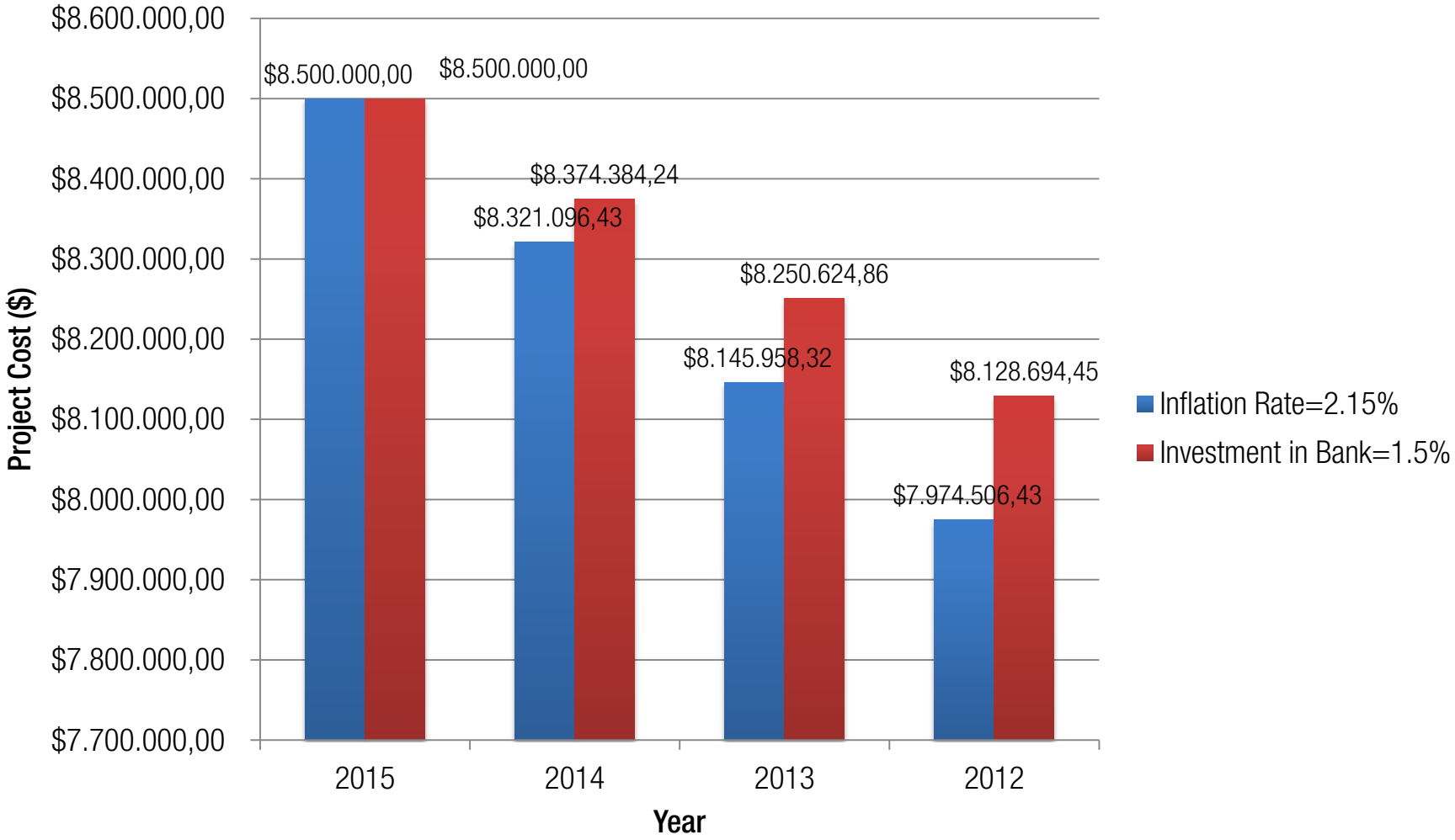
SCHEDULE_COMPARISON



Long Lead Items
- Steel
- Façade
- HVAC Units
- Furniture

Procurement to Begin:
04/01/2015

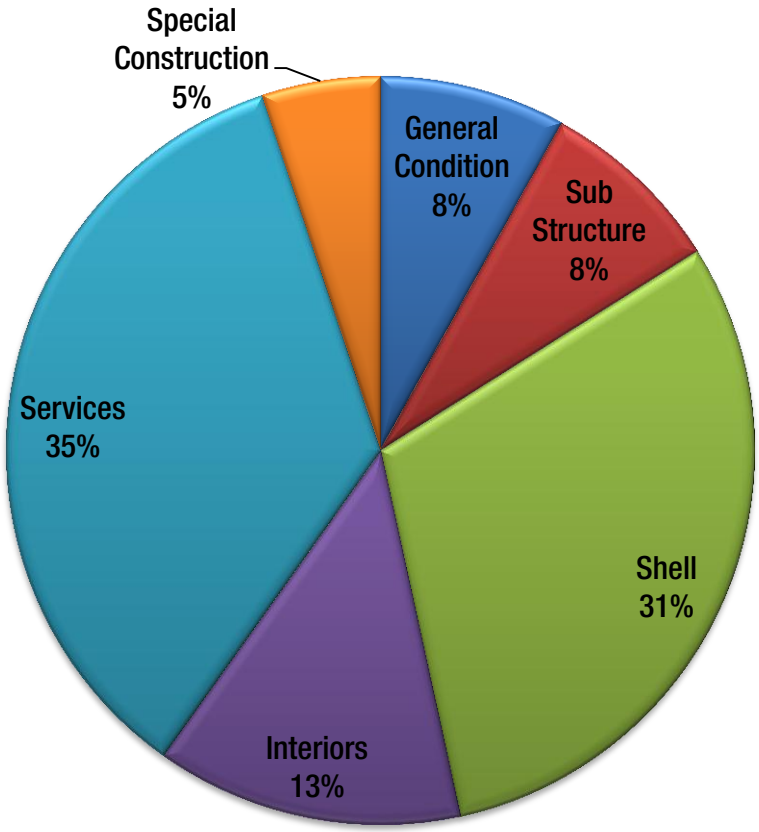
PROJECT BUDGET



PROJECT BUDGET = $7,97,4506

TARGET VALUE

		Target Value	
	Description	**Cost**	**%**
1.1	General Condition	$ 605000.00	8.03%
1.2	Sub Structure	$ 605000.00	8.03%
1.3	Shell	$ 2300000.00	30.52%
1.4	Interiors	$ 1000000.00	13.27%
1.5	Services	$ 2640000.00	35.04%
1.6	Special Construction	$ 385000.00	5.11%
	Total	**$ 7535000.00**	



Difference

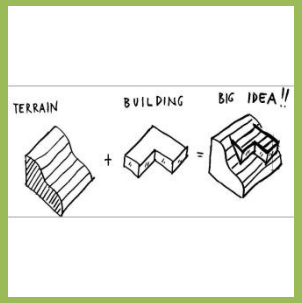
$7970000 – $7535000 =$ 435000

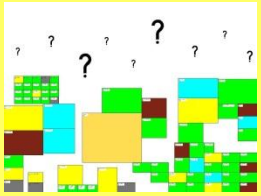
Owner Initiated Enhancements

SETTING TARGET VALUE

Conceptualization

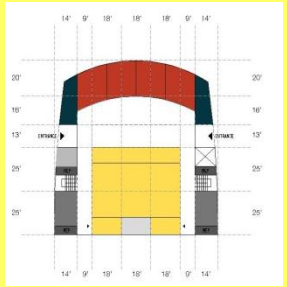
Estimate Type: SF Estimates- RS Means

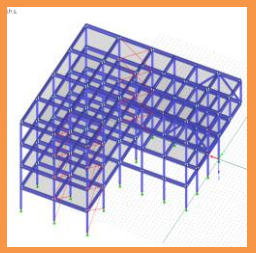




Program Development, Initial Design

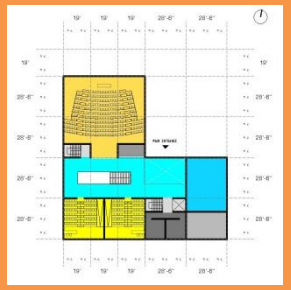
Estimate Type: Similar Projects + RS Means

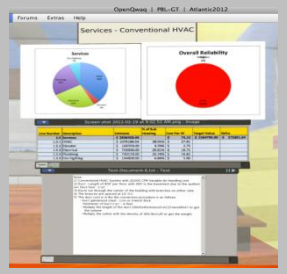




Schematic Design

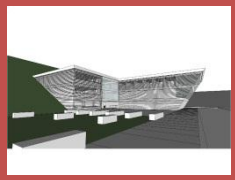
Estimate Type: Level -3 Estimate from RS Means





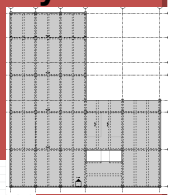
Set Target Value through Discussion

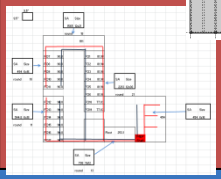
		Target Value	
	Description	Cost	%
1.1	General Condition	$ 605000.00	8.03%
1.2	Sub Structure	$ 605000.00	8.03%
1.3	Shell	$ 2300000.00	30.52%
1.4	Interiors	$ 1000000.00	13.27%
1.5	Services	$ 2640000.00	35.04%
1.6	Special Construction	$ 385000.00	5.11%
	Total	$ 7535000.00	



Detailed Design

- Eliminate Contingency
- Design to Target
- Interdisciplinary Negotiation
- Improve Reliability





TARGET VALUE TRACKING

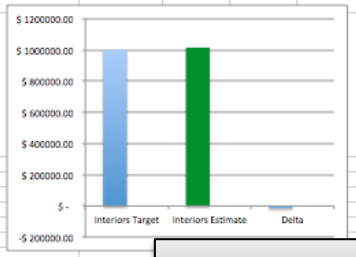
Quantity Reliability

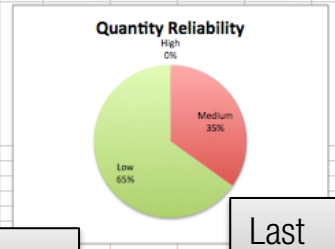
Cost Reliability

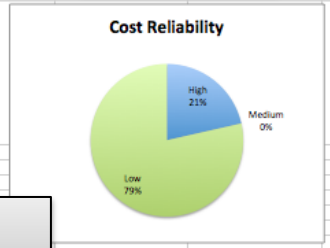
Overall Reliability

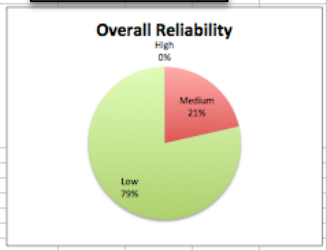
Interiors

Total Target	
Interiors Target	$ 1000000.00
Interiors Estimate	$ 1014222.99
Delta	-$ 14222.99









Description

Current Estimate

Last Estimate

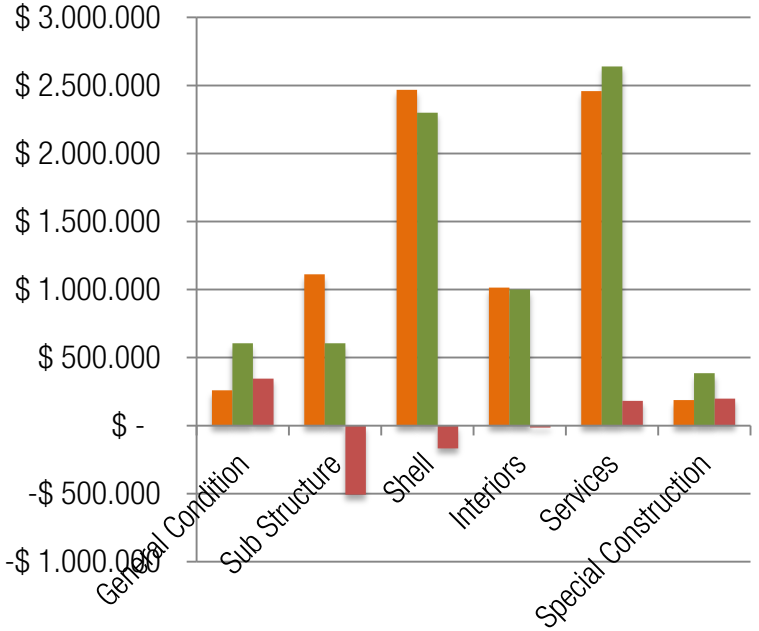
Reliability

Line Number	Description	Unit	Quantity	Material	Labor	Equipment	Total	Ext Total	Quantity	M+L+E	Ext Total	Quantity Reliability	Cost Reliability	Overall Reliability	Target Value	Delta= Target Value-Current Estimate
1.4	Interiors							$ 1014222.99								
1.4.1	Flooring							$ 89742.78								
1.4.1.1	Tile or terrazzo base, scratch coat only	S.F	28054	$ 0.42	$ 2.15	$ -	$ 2.57	$ 72098.78	35000	5.11	178850	1	1	1		
1.4.1.2	Carpet Tile, tufted nylon, 24 oz., 18" x 18" or 24" x 24"	S.Y	550	$ 28.00	$ 4.08	$ -	$ 32.08	$ 17644.00	700	32.08	22456	1	1	1		
1.4.2	Partitions							$ 216607.00								
1.4.2.1	Metals Studs & Gypsum Board	S.F	21660	$ 1.54	$ 3.44	$ -	$ 10.00	$ 216600.00				2	3	2		
1.4.3	Painting							$ 32601.80								
1.4.3.1	Paints & coatings, interior latex, zero voc, doors, flush, both sides, roll & brush, primer + 2 coats, incl. frame & trim	Ea	110	$ 16.35	$ 61.00	$ -	$ 77.35	$ 8508.50				1	1	1		
1.4.3.2	Paints & Coatings, walls & ceilings, interior, concrete, drywall or plaster, zero voc latex, primer or sealer coat, sand finish, roller	S.F	57365	$ 0.12	$ 0.30	$ -	$ 0.42	$ 24093.30				2	1	1		
1.4.4	Opening							$ 178244.36								
1.4.4.1	Door, single leaf, kd steel frame, hollow metal, commercial quality, flush, 3'-0" x 7'-0" x 1-3/8"	SF	42238	$ -	$ -	$ -	$ 4.22	$ 178244.36	39000	4.22	164580	1	1	1		
1.4.5	Ceiling							$ 111624.23								
1.4.5.1	Complete suspended ceilings, mineral fiber, lay-in board, 2' x 2' x 3/4", on 15/16" T bar susp., incl. standard susp. system, excl. 1-1/2" carrier channels	S.F	32927.5	$ 2.37	$ 1.02	$ -	$ 3.39	$ 111624.23	36280	9.8	355544	2	1	1		
1.4.6	Stair Construction							$ 122490.20								
1.4.6.1	Stairs, steel, cement filled metal pan & picket rail, 20 risers, with landing	S.F	42238				2.9	$ 122490.20	39000	2.9	113100	1	1	1		
1.4.7	Fittings							$ 178666.74								
1.4.7.1	wood frame & chalktrough, Cabinets, school, counter, wood, 32" high	S.F	42238				4.23	$ 178666.74	39000	4.23	164970	1	1	1		
1.4.8	Auditorium Seating							$ 79200.00								
1.4.8.1	Auditorium chair, veneer back, padded seat	Ea	300	$ -	$ -	$ -	$ 264.00	$ 79200.00				1	1	1		

ESTIMATE_LANDSCAPE

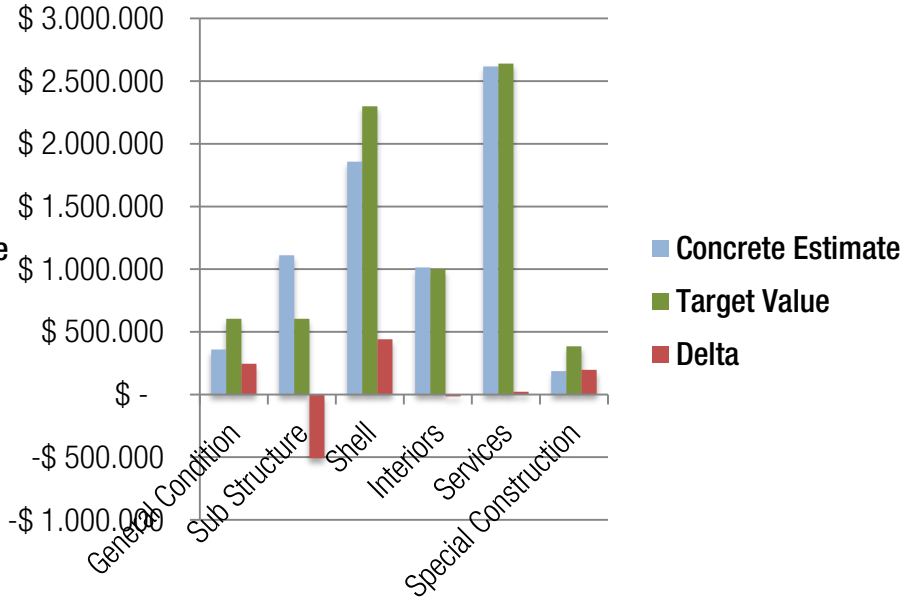
Steel with Thermodeck

	Descriptions	Estimate - Steel with Thermodeck
1.1	General Condition	$ 259556
1.2	Sub Structure	$ 1111977
1.3	Shell	$ 2467944
1.4	Interiors	$ 1014223
1.5	Services	$ 2458221
1.6	Special Construction	$ 187168
	Total	**$ 7499089**

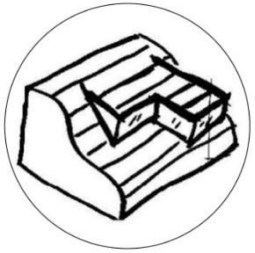


Concrete with Conventional HVAC

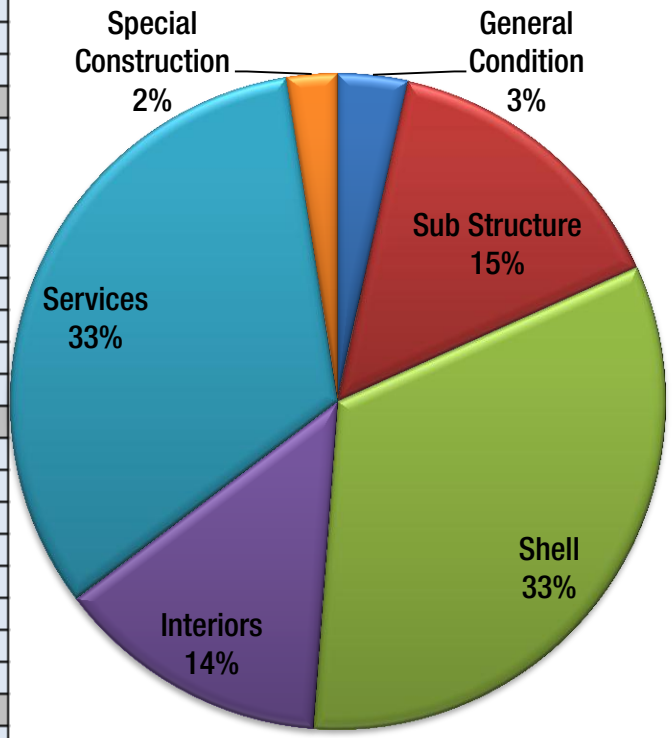
	Descriptions	Estimate - Concrete with Conventional HVAC
1.1	General Condition	$ 359556
1.2	Sub Structure	$ 1111977
1.3	Shell	$ 1858544
1.4	Interiors	$ 1014223
1.5	Services	$ 2617555
1.6	Special Construction	$ 187168
	Total	**$ 7149023**



ESTIMATE_LANDSCAPE – STEEL BREAKDOWN



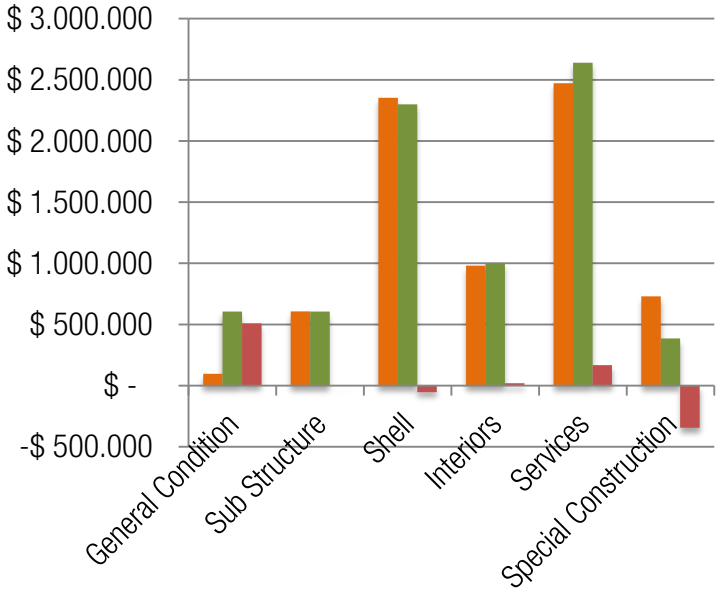
Line Number	Description	Estimate	% of Sub Heading	Cost Per SF	Target Value	Delta
	Total	**$ 7499089.42**				
1.1	**General Conditions**	**$ 259555.98**			**$ 605000.00**	**$ 345444.02**
1.1.1	Office Trailer	$ 12534.48	4.83%			
1.1.2	Temporary Utilities	$ 33762.00	13.01%			
1.1.3	Fencing	$ 19662.00	7.58%			
1.1.4	Site Survey	$ 5357.50	2.06%			
1.1.5	Cleaning & Grubbing	$ 22140.00	8.53%			
1.1.6	Dewatering	$ 162500.00	62.61%			
1.1.7	Parking	$ 3600.00	1.39%			
1.2	**Sub Structure**	**$ 1111977.24**		**$ 26.24**	**$ 605000.00**	**-$ 506977.24**
1.2.1	Excavation	$ 528972.07	47.57%	$ 12.48		
1.2.2	Mat Foundation	$ 329007.00	29.59%	$ 7.76		
1.2.3	Retaining Wall	$ 248465.94	22.34%	$ 5.86		
1.3	**Shell**	**$ 2467944.05**		**$ 58.24**	**$ 2300000.00**	**-$ 167944.05**
1.3.1	Columns	$ 267805.50	10.85%	$ 6.32		
1.3.2	Retaining Wall	$ 114276.00	4.63%	$ 2.70		
1.3.3	Beams	$ 1298005.00	52.59%	$ 30.63		
1.3.4	Slab	$ 1050697.56	42.57%	$ 24.80		
1.3.5	Façade	$ 407363.04	16.51%	$ 9.61		
1.4	**Interiors**	**$ 1014222.99**		**$ 23.94**	**$ 1000000.00**	**-$ 14222.99**
1.4.1	Flooring	$ 89742.78	8.85%	$ 2.12		
1.4.2	Partitions	$ 216607.00	21.36%	$ 5.11		
1.4.3	Painting	$ 32601.80	3.21%	$ 0.77		
1.4.4	Opening	$ 178244.36	17.57%	$ 4.21		
1.4.5	Ceiling	$ 111624.23	11.01%	$ 2.63		
1.4.6	Stair Construction	$ 122490.20	12.08%	$ 2.89		
1.4.7	Fittings	$ 178666.74	17.62%	$ 4.22		
1.4.8	Auditorium Seating	$ 79200.00	7.81%	$ 1.87		
1.5	**Services**	**$ 2458220.83**		**$ 58.02**	**$ 2640000.00**	**$ 181779.17**
1.5.1	HVAC	$ 581772.17	23.67%	$ 13.73		
1.5.2	Elevator	$ 106703.00	4.34%	$ 2.52		
1.5.3	Electrical	$ 986679.68	40.14%	$ 23.29		
1.5.4	Plumbing	$ 664811.08	27.04%	$ 15.69		
1.5.5	Fire Fighting	$ 106024.94	4.31%	$ 2.50		
1.6	**Special Construction**	**$ 187168.34**			**$ 385000.00**	`
1.6.1	Green Roof	$ 187168.34	100.00%	$ 18.72		



ESTIMATE_LEAF

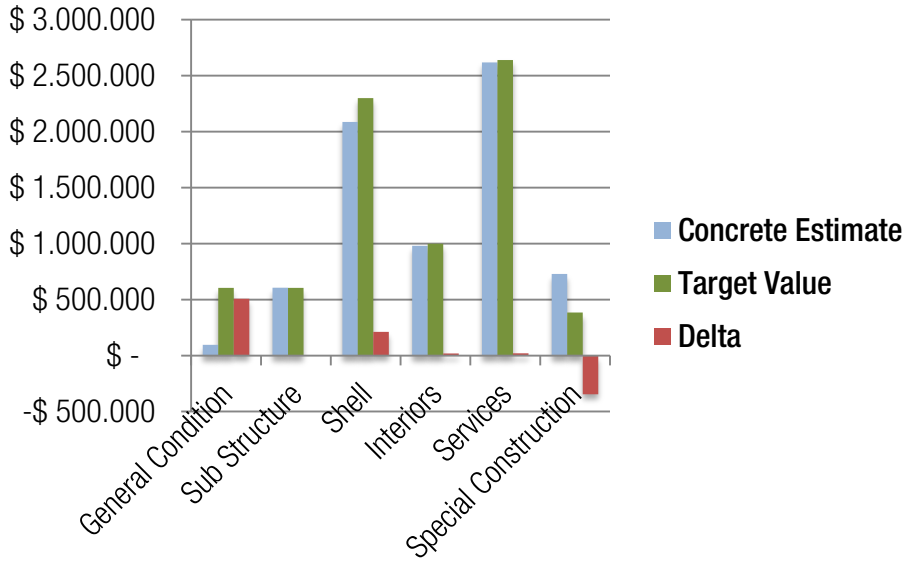
Steel with Conventional HVAC

	Description	Steel with Conventional HVAC
1.1	General Condition	$ 97056
1.2	Sub Structure	$ 606588
1.3	Shell	$ 2353402
1.4	Interiors	$ 980951
1.5	Services	$ 2472710
1.6	Special Construction	$ 729786
	Total	**$ 7240492**



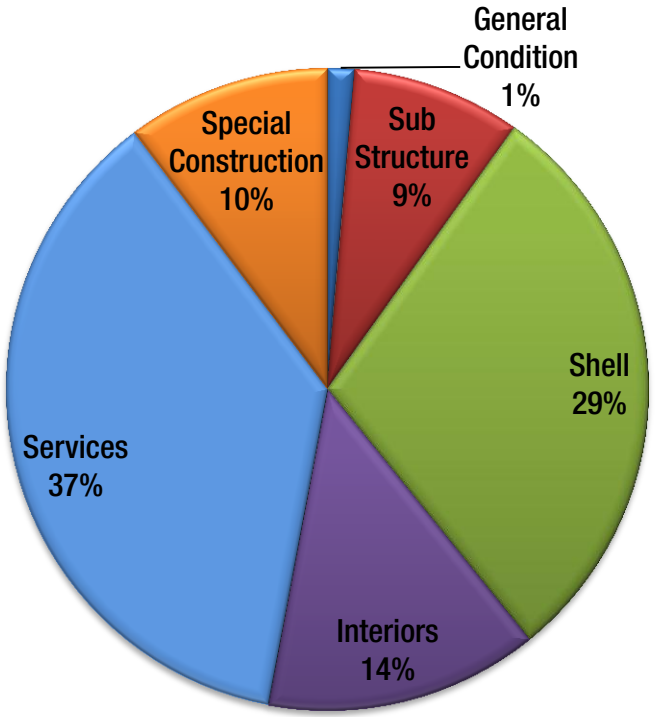
Concrete with Radiant Heat

	Description	Concrete with Radiant
1.1	General Condition	$ 97056
1.2	Sub Structure	$ 606588
1.3	Shell	$ 2086951
1.4	Interiors	$ 980951
1.5	Services	$ 2619645
1.6	Special Construction	$ 729786
	Total	**$ 7120975**

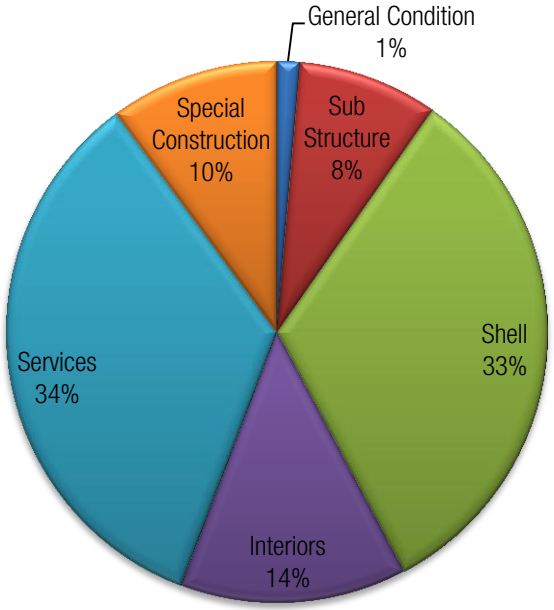


ESTIMATE_LEAF – CONCRETE BREAKDOWN

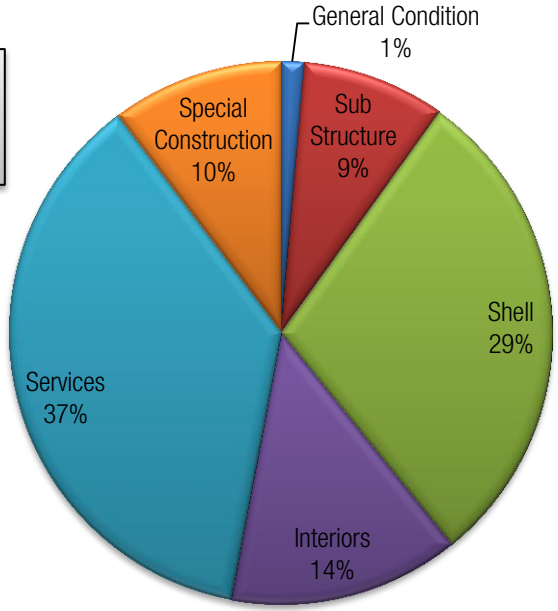
Line Number	Description	Estimate	% of Sub Heading	Cost Per SF	Target Value	Delta
	Total	**$ 7120975.44**				
1.1	**General Conditions**	**$ 97055.98**			**$ 605000.00**	**$ 507944.02**
1.1.1	Office Trailer	$ 12534.48	12.91%			
1.1.2	Temporary Utilities	$ 33762.00	34.79%			
1.1.3	Fencing	$ 19662.00	20.26%			
1.1.4	Site Survey	$ 5357.50	5.52%			
1.1.5	Cleaning & Grubbing	$ 22140.00	22.81%			
1.1.6	Dewatering	$ -	0.00%			
1.1.7						
1.2	**Sub Structure**	**$ 606587.90**		**$ 14.32**	**$ 605000.00**	**-$ 1587.90**
1.2.1	Earthwork	$ 358604.84	59.12%	$ 8.46		
1.2.2	Mat Foundation	$ 61595.31	10.15%	$ 1.45		
1.2.3	Retaining Wall	$ 119895.83	19.77%	$ 2.83		
1.2.4	Slab on Grade	$ 63474.07	10.46%	$ 1.50		
1.3	**Shell**	**$ 2086950.67**		**$ 49.25**	**$ 2300000.00**	**$ 213049.33**
1.3.1	Columns	$ 688348.70	32.98%	$ 16.25		
1.3.2	Slab	$ 745792.93	35.74%	$ 17.60		
1.3.3	Façade	$ 642426.20	30.78%	$ 15.16		
1.4	**Interiors**	**$ 980950.72**		**$ 23.15**	**$ 1000000.00**	**$ 19049.28**
1.4.1	Flooring	$ 86709.60	8.84%	$ 2.05		
1.4.2	Partitions	$ 249267.00	25.41%	$ 5.88		
1.4.3	Painting	$ 39761.54	4.05%	$ 0.94		
1.4.4	Opening	$ 152257.60	15.52%	$ 3.59		
1.4.5	Ceiling	$ 111624.23	11.38%	$ 2.63		
1.4.6	Stair Construction	$ 104632.00	10.67%	$ 2.47		
1.4.7	Fittings	$ 152618.40	15.56%	$ 3.60		
1.4.8	Auditorium Seating	$ 79200.00	8.07%	$ 1.87		
1.5	**Services**	**$ 2619644.63**		**$ 61.82**	**$ 2640000.00**	**$ 20355.37**
1.5.1	HVAC	$ 952484.38	36.36%	$ 22.48		
1.5.2	Elevator	$ 114428.00	4.37%	$ 2.70		
1.5.3	Electrical	$ 842828.80	32.17%	$ 19.89		
1.5.4	Plumbing	$ 580692.80	22.17%	$ 13.70		
1.5.5	Fire Fighting	$ 116177.60	4.43%	$ 2.74		
1.6	**Special Construction**	**$ 729785.54**			**$ 385000.00**	`
1.6.1	Ramp	$ 275154.77	37.70%	$ 27.52		
1.6.2	Solar PV System	$ 451000.00				



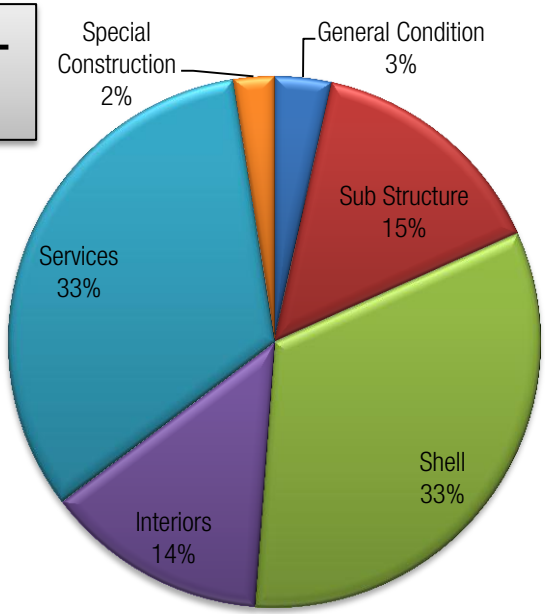
Leaf - Steel



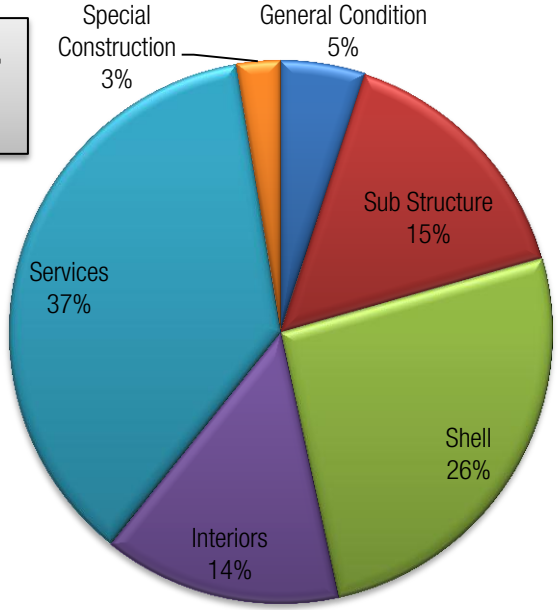
Leaf - Concrete



Landscape - Steel

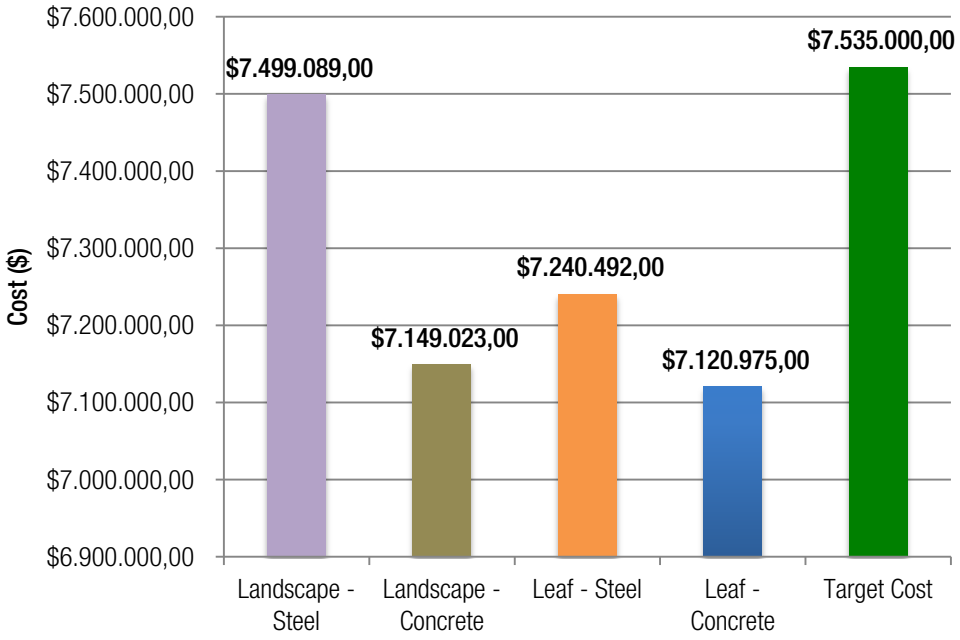


Landscape - Concrete



ESTIMATE COMPARISON

Description	Estimate
Landscape - Steel	$ 7499089.00
Landscape - Concrete	$ 7149023.00
Leaf - Steel	$ 7240492.00
Leaf - Concrete	$ 7120975.00
Target Cost	$ 7535000.00



Elements that make 5% or more of the estimate

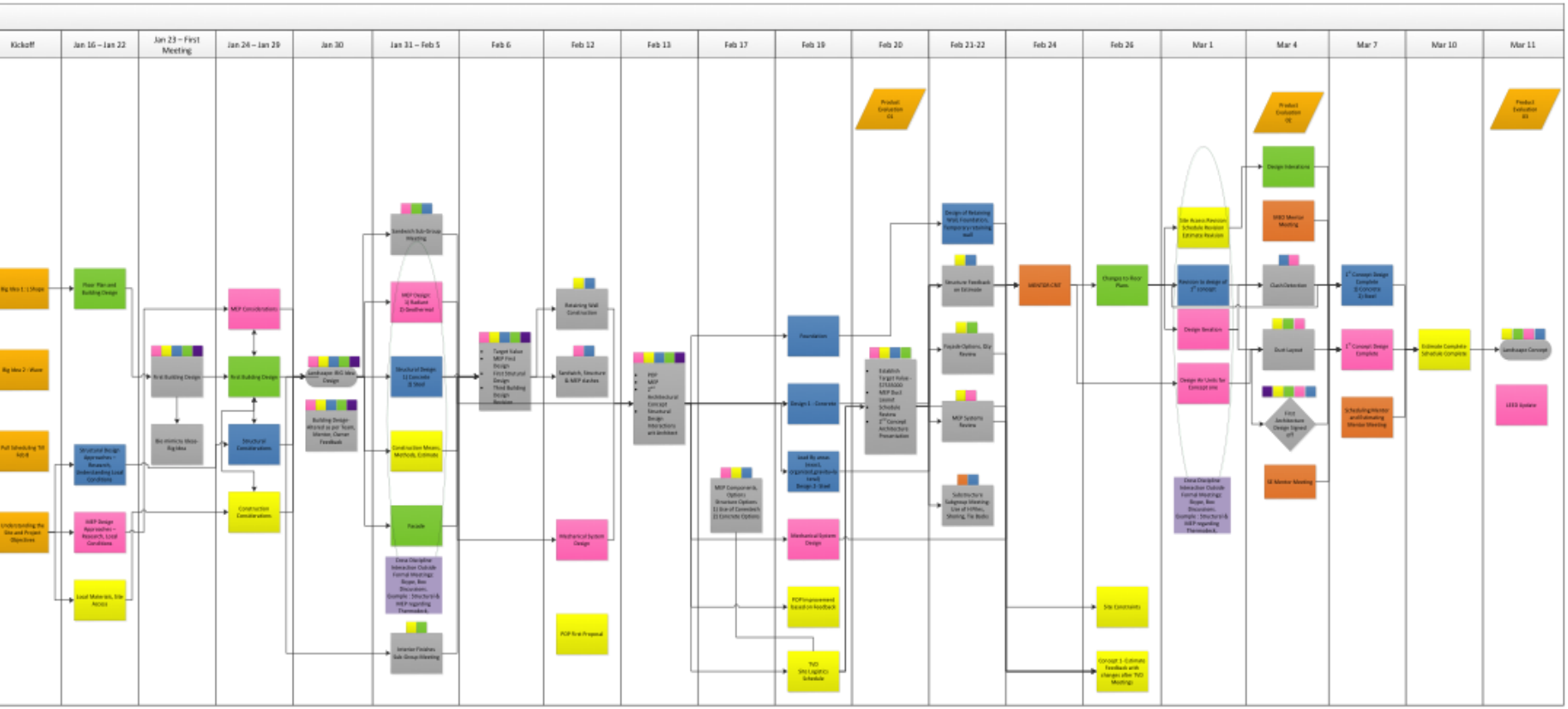
Leaf	Landscape
Shell	Dewatering
PV Panels	Excavation
HVAC Systems	Shell
Mechanical	Retaining Wall
Electrical	Mechanical
Plumbing	Electrical
	Plumbing

TEAM
ATLANTIC

POP
DECISION MATRIX

A SE MEP CM **POP**

POP ORGANISATION FLOW CHART



Meeting

Architect

Construction Manager

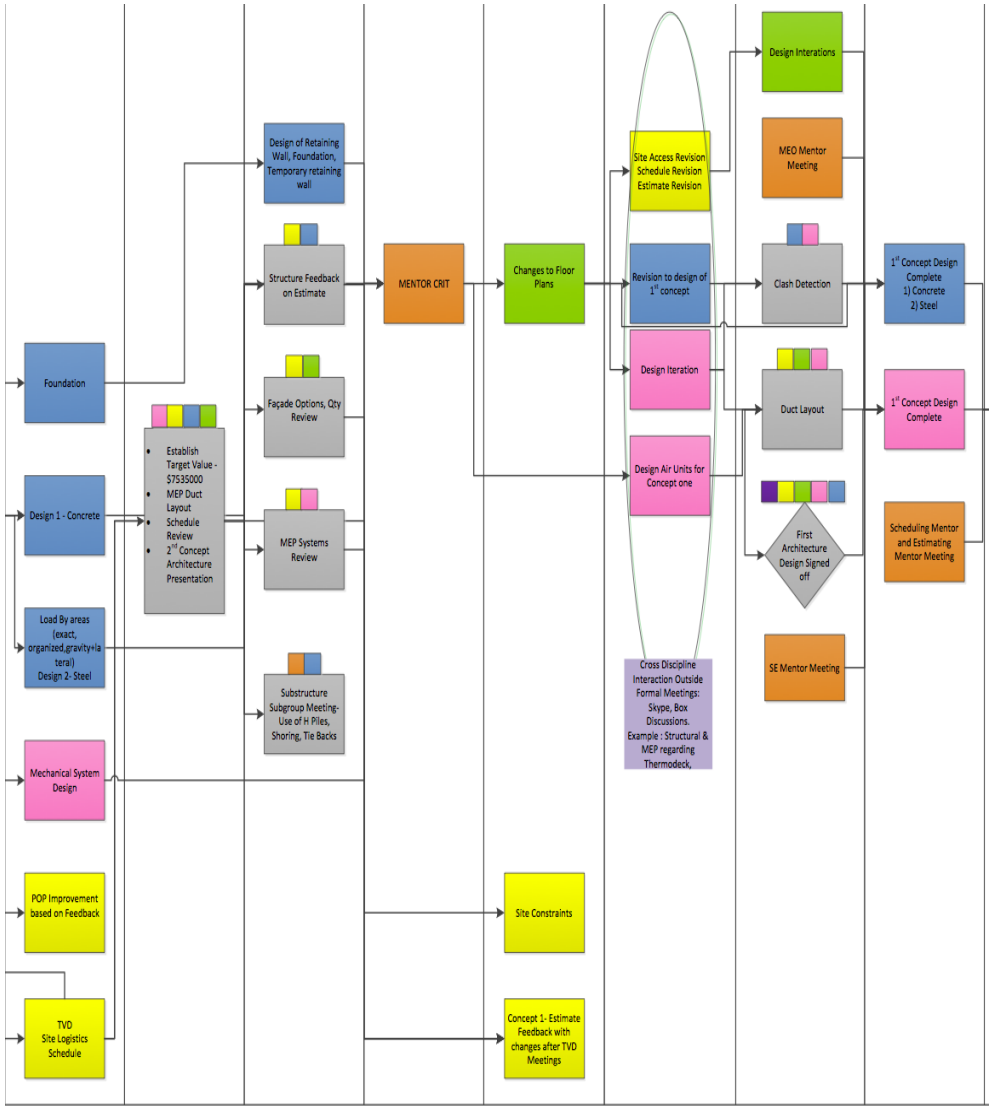
MEP Engineer

Structural Engineer

Owner

Mentors

POP ORGANISATION FLOW CHART



Purpose:

- Pull Scheduling
- Plan/ Re-Plan
- Monitor Progress
- Easy to communicate
- Track History of Project Development.

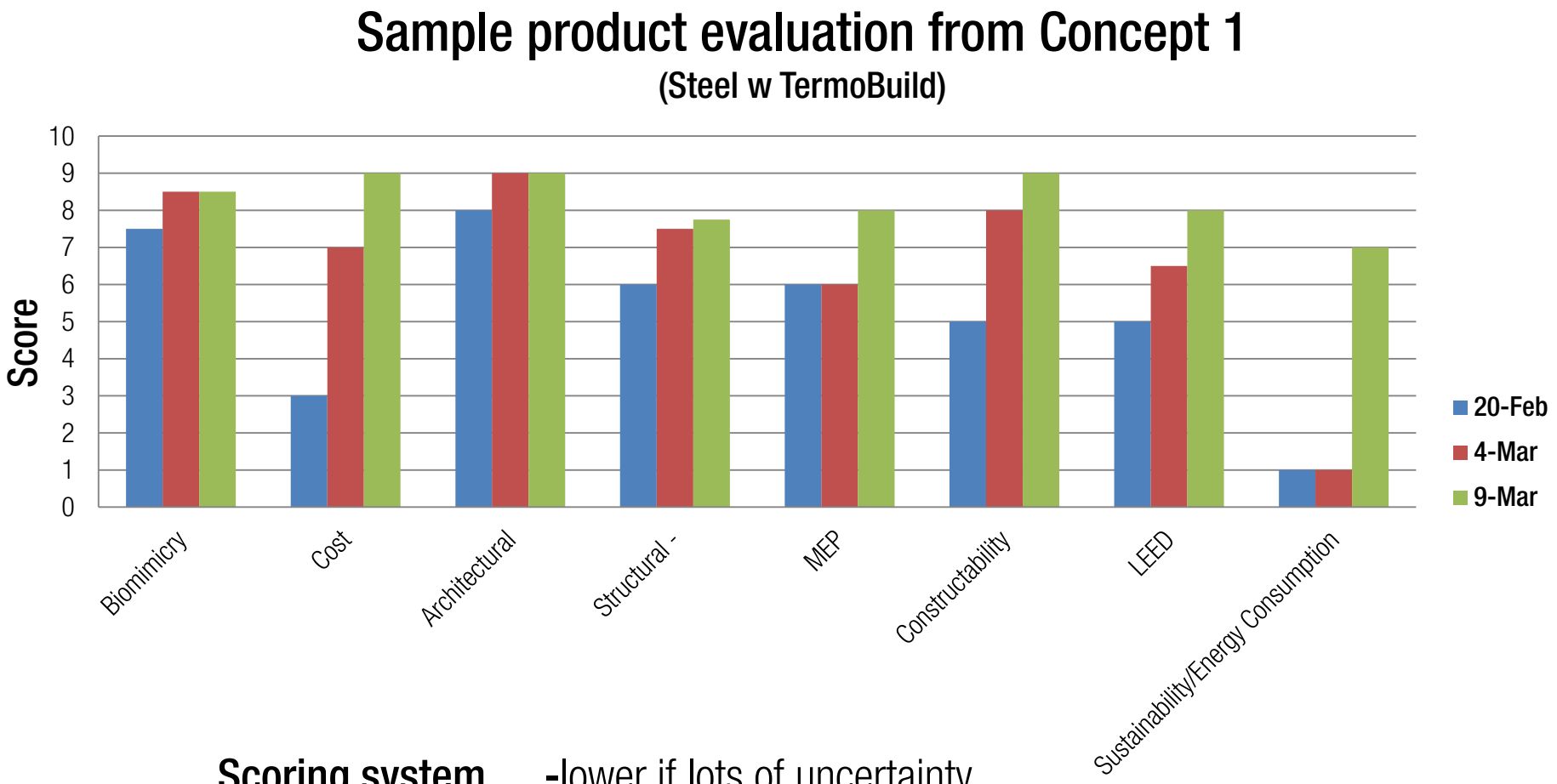
Things to consider:

- Need the buying in of the whole team
- Garbage in Garbage out
- Highlight Accomplished Tasks

SUBGROUP MEETINGS

Description	Architect	Structural Engineer	MEP Engineer	Construction Manager
Interior Finishes	☑			☑
Sandwich MEP & Structural Clashes		☑	☑	
Retaining Wall Construction		☑		☑
Structure, MEP Options		☑	☑	☑
Structure feedback on Estimate		☑		☑
MEP Feedback on Estimate			☑	☑
Façade Options	☑			☑
Clash Detection		☑	☑	
Duct Layout	☑		☑	
Cantilever Design	☑	☑		
Duct Layout			☑	☑
MEP Room Positioning	☑		☑	
Roof Design - Leaf	☑	☑		

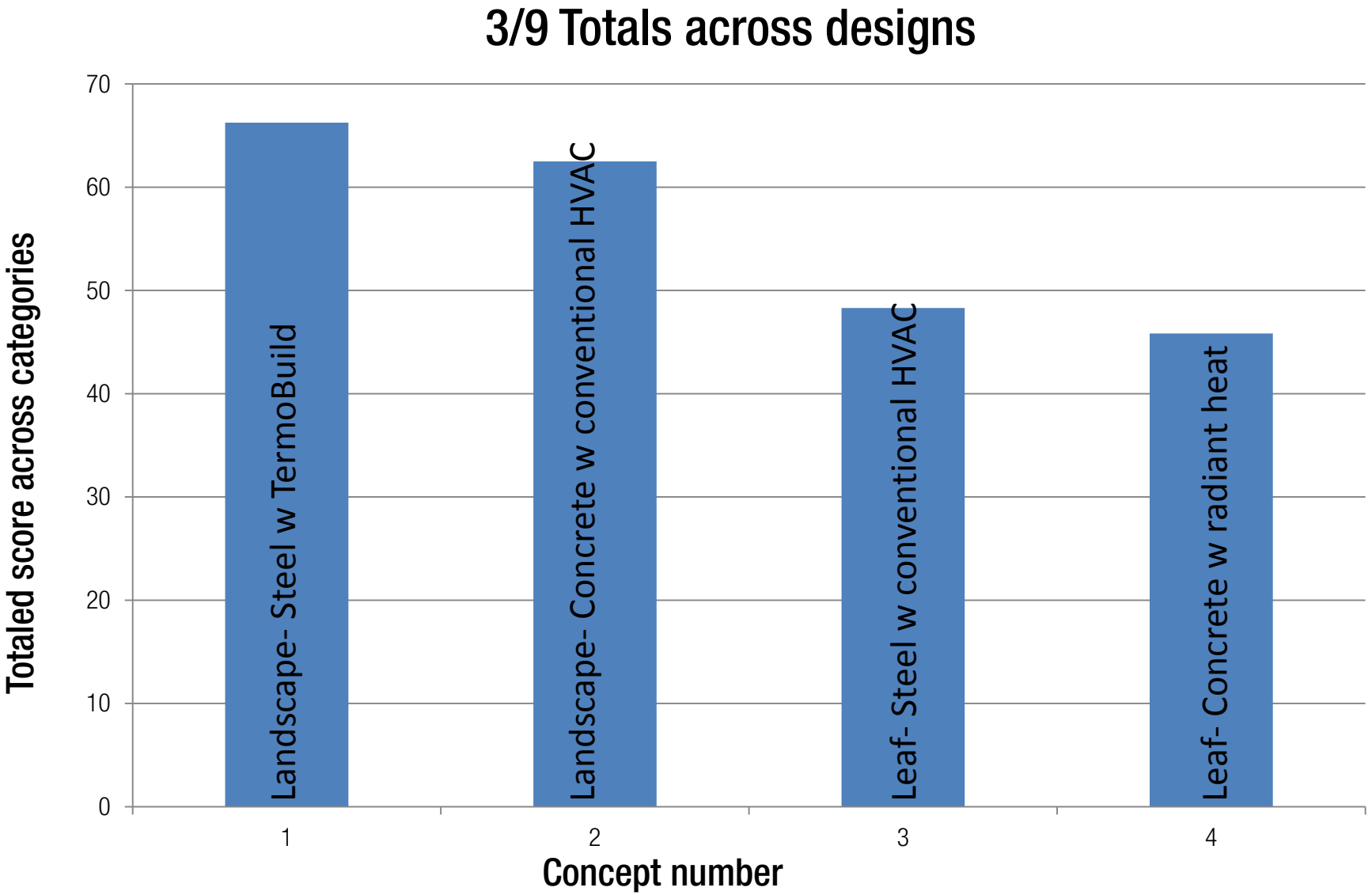
POP PRODUCT EVALUATION



Scoring system

-lower if lots of uncertainty
-lower if dislike design
-1 lower, 10 highest

POP PRODUCT EVALUATION



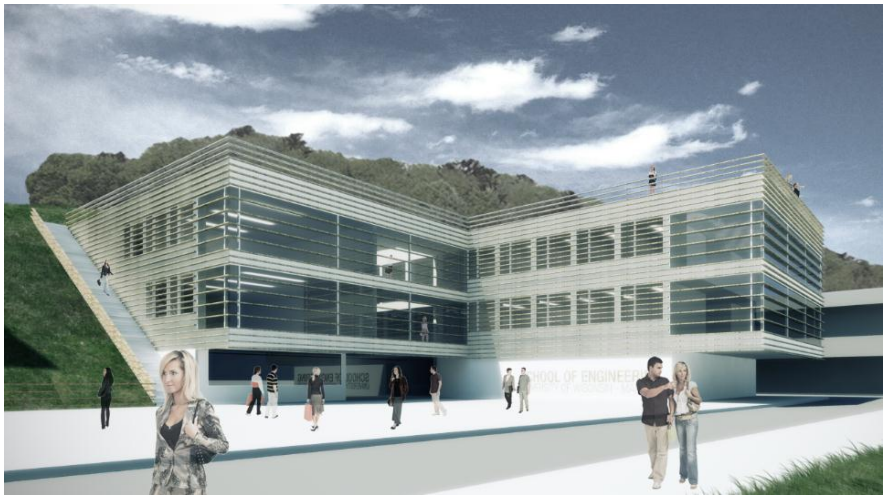
POP DECISION MATRIX CONCEPT

Brain Merge Results		
Category	Score based on point	Weighting
Students		
'I wanna be here!'' (are you excited about this concept?, stress free, relaxing space)	83	8.32
Functional-is the building easy to navigate? Do programs connect? Does the building promote learning?	87	8.72
Is the building comfortable? - temperature, air quality, light	46	4.61
University/Owners		
Cost, structural frame should cost less than $ 850,000 (materials and	91	12.30
Easy to operate and maintain, safety	45	6.08
Coolness		
Biomimicry/big idea -is it apparent? Does it make a statement?	60	6.02
Building complements its environment/campus, connection to the outside from the inside, use of exterior space, choice of façade	63	6.32
Overall aesthetics -structural coolness, architectural feel, MEP	60	6.02
Sustainability		
Sustainability/Energy savings/life cycle cost	46	6.22

	Building Concepts		
Decision Matrix	Arch concept 1: Landscape		
Category	Steel w TermoBuild	Concrete w normal HVAC	Steel w r HVAC
Students			
'I wanna be here!'' (are you excited about this concept?, stress free, relaxing space)			
Functional-is the building easy to navigate? Do programs connect? Does the building promote learning?			
Is the building comfortable? - temperature, air quality, light			
University/Owners			
Cost, structural frame should cost less than $ 850,000 (materials and			
Easy to operate and maintain, safety			

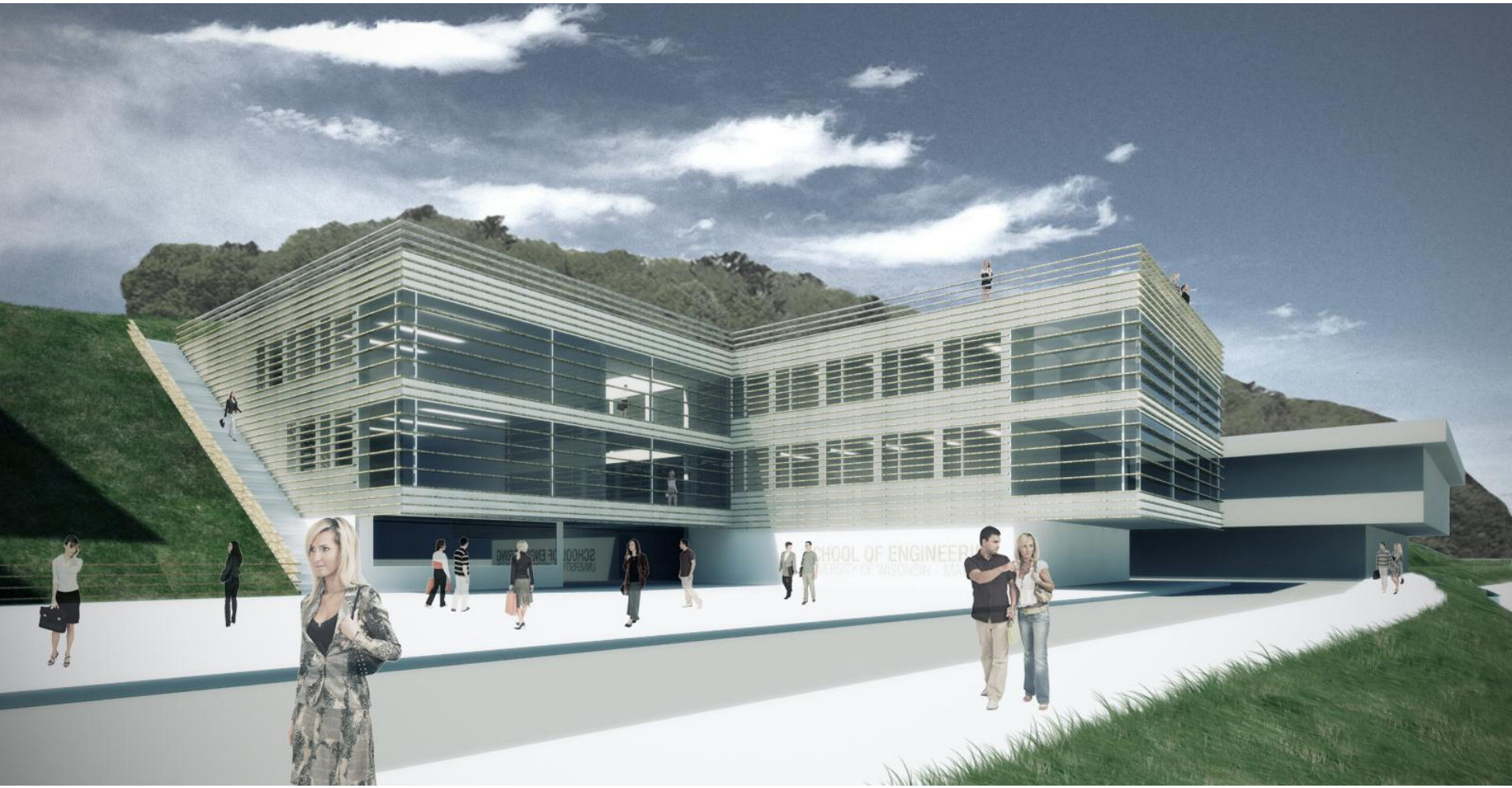
Students + coolness:	40%
University/Owners + Sustainability:	30%
Team Atlantic:	30%

POP DECISION MATRIX



STEEL W TERMOBUILD	Concrete w normal HVAC	Steel w normal HVAC	Concrete w radiant heat
4.070401	4.011952	3.973648	3.954205

WE CHOSE_LANDSCAPE



ROBERT ALVARADO

ERIC THATCHER

KYLE HALVERSON

DEREK OUYANG

JOHN NELSON

FOREST OLAF PETERSON

TEAM
ATLANTIC

THOMAS R. WOODEN

JUSTIN BOCIAN

WAFAA SABI

RENATE FRUCHTER

DAN GONZALES

RONNIE BORJA

RONNIE BORJA

ANDY MEADE

THANK YOU!

KYLE ADAMS

FERNANDO CASTILLO

HENRY TOORYANI

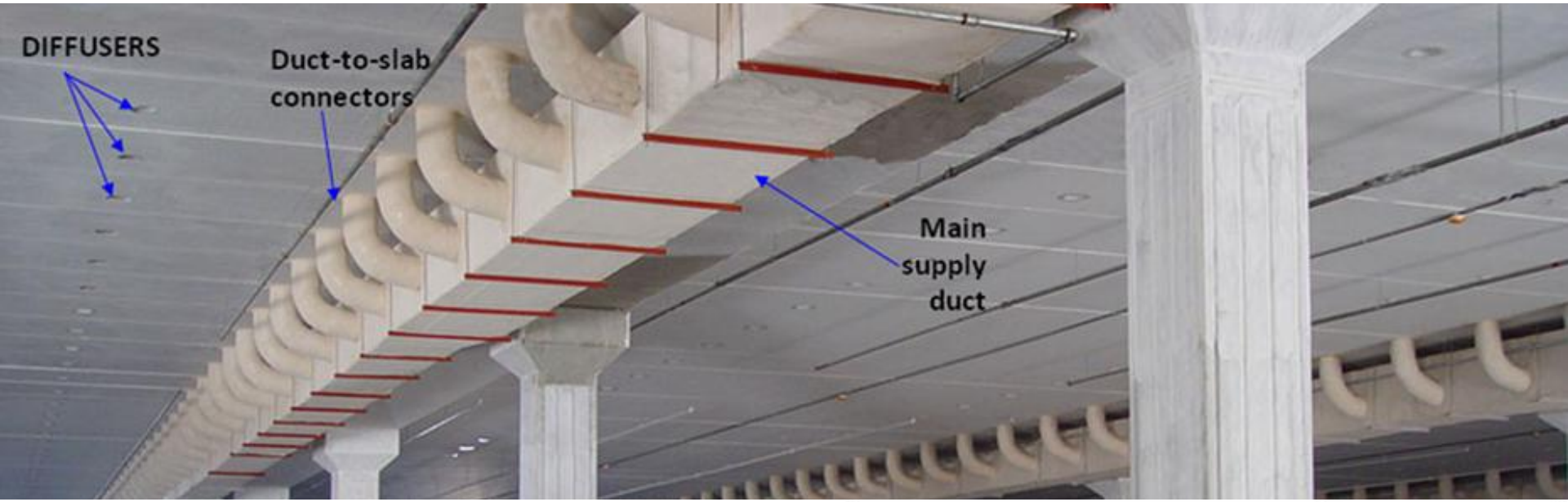
AFAAN NAQVI

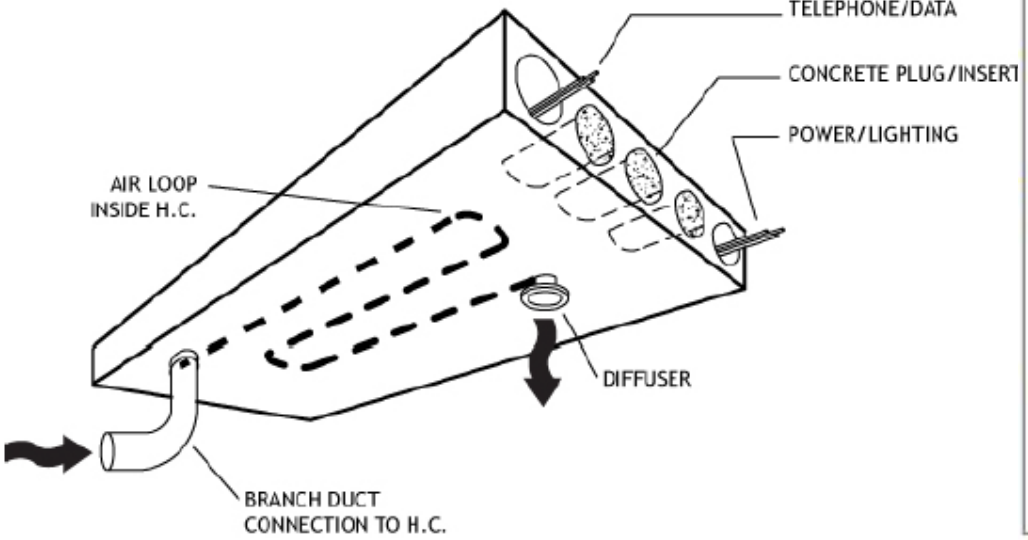
RIAM FIROUZ

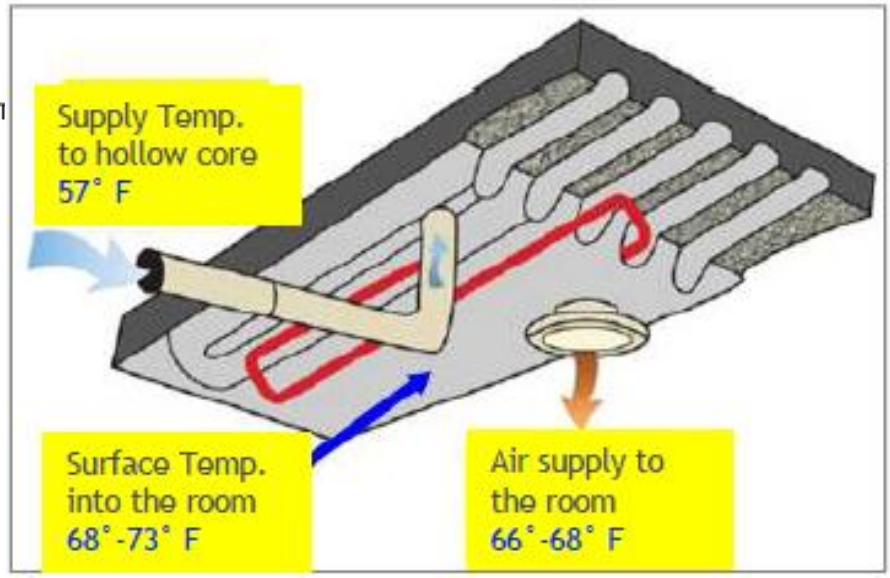
EDUARDO MIRANDA

ANJA JUTRAŽ

NICK ARENSON


DIFFUSERS
Duct-to-slab connectors
Main supply duct


TELEPHONE/DATA
CONCRETE PLUG/INSERT
POWER/LIGHTING
AIR LOOP INSIDE H.C.
DIFFUSER
BRANCH DUCT CONNECTION TO H.C.


Supply Temp. to hollow core 57° F
Surface Temp. into the room 68°-73° F
Air supply to the room 66°-68° F

CONSTRUCTION OWNER REQUIREMENTS

Requirement	Big Idea - Landscape		Big Idea - Leaf	
	Steel	Concrete	Steel	Concrete
Building Structural System to Cost max of $ 850,000	☒	☒	☑	☑
Access to Instructional Labs – May 1, 2016	☑	☑	☒	☒

Risk	Mitigation/Justification
Higher cost for Structural System	Need for specially fabricated members to satisfy height requirements

SCHEDULE AND COST RISKS

Risk: Transportation and Installation of Precast Slabs

Mitigation: Installation during weekends with multiple shifts, night time

Weight Allowed as per DOT (Semi-Trailer) (a)	65350	lbs
Dimensions of Hollow core slab	19'x4'x10"	
Weight Per Hollow Core Slab (b)	9183	lbs
Number of Slabs per truck (c = a/b)	7	
Area Per Slab (d)	76	
Number of slabs required (e= 10000/d)	132	
Number of truck loads (f=e/c)	18	
Installation Output per day as per RS Means	3200	SF
Number of Days Per floor	3	days

SITE LOGISTICS