CENTRAL TEAM

University of California, Los Angeles

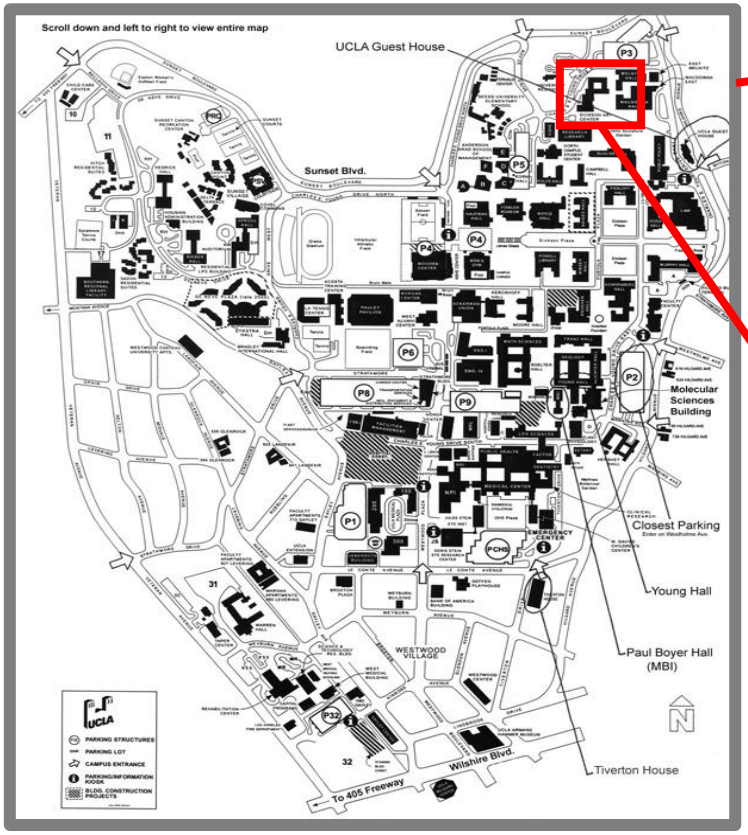
Chelsea	Lindsey	Imke	Marina	Andres	Sebastian	Mads	Karol
E	E	CM	E	CM	LCFM	MEP	A

OWNERS:
Dimitra
Joanna

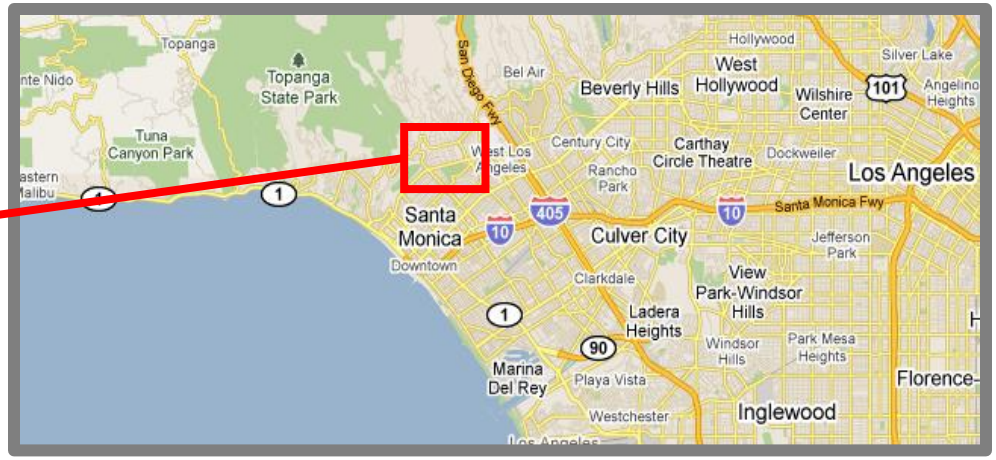
Winter Quarter 2011

ADVISOR:
Renate

PROJECT SITE



University of California, Los Angeles



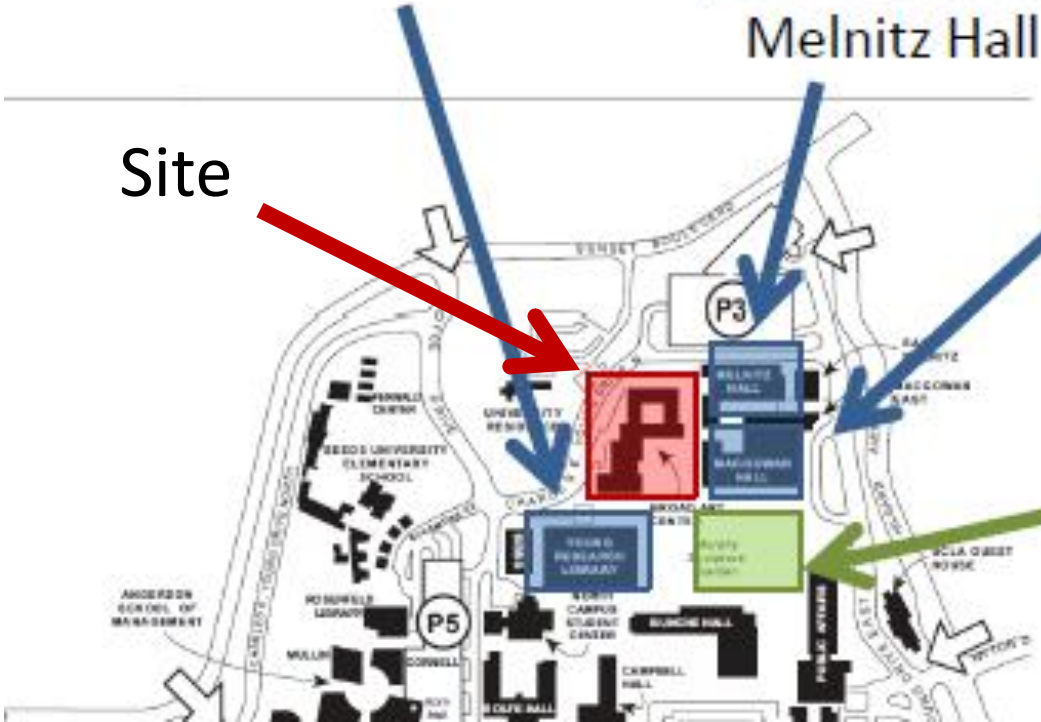
SITE ANALYSIS

Young Research Library

Melnitz Hall

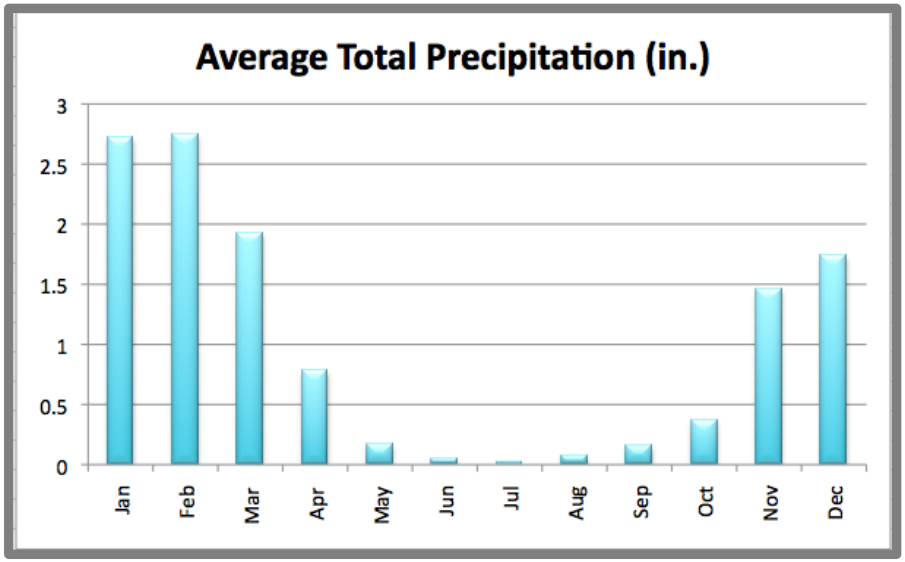
Macgowen Hall

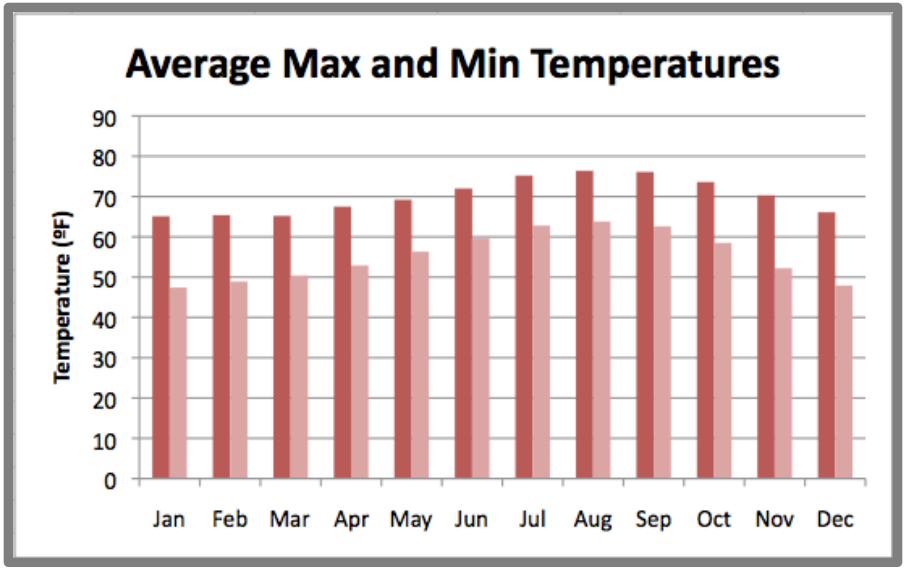
Site



Murphy Sculture Garden

SITE CONDITIONS

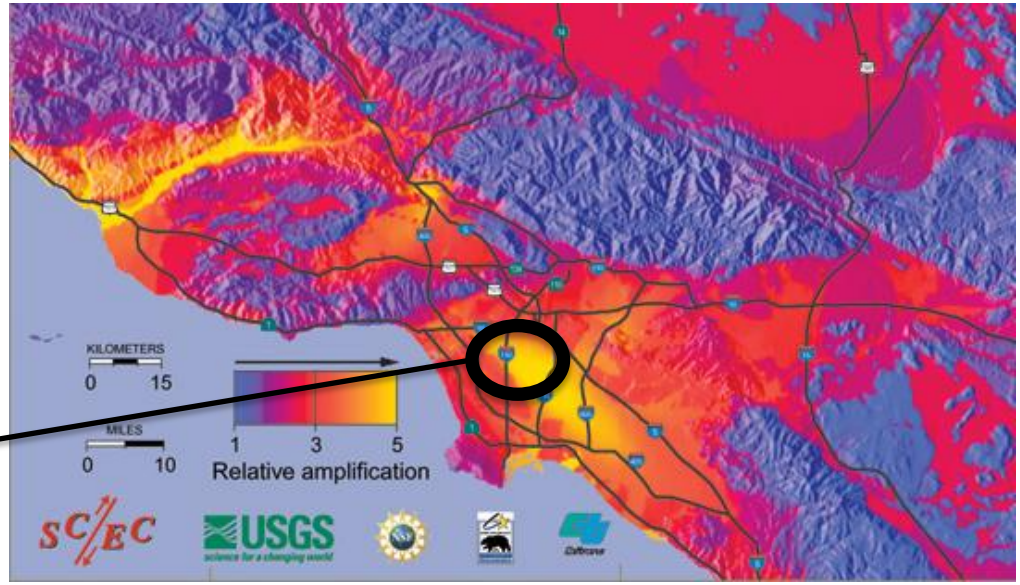




- Warm, moderate, dry climate
- Yearly precipitation – 13”
- Avg. max temperature < 80°F
- Avg. min temperature > 45°F

HAZARDS

- **Earthquakes**
  - **Highly seismic area**



- **Air quality**
  - **Smog**

- NO Flooding Concerns
- NO Snow
- NO Freezing

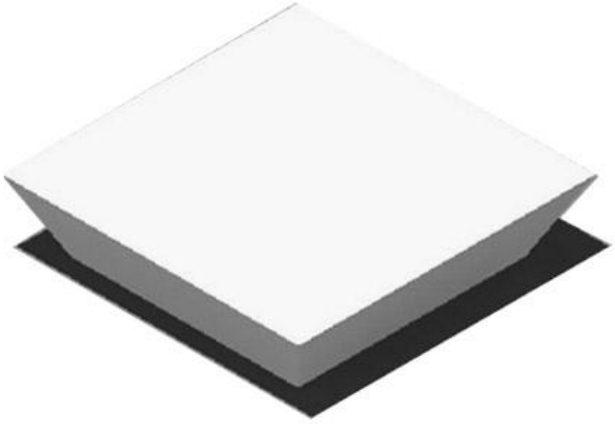
{ARCHITECTURAL DESIGN}

GUIDELINES

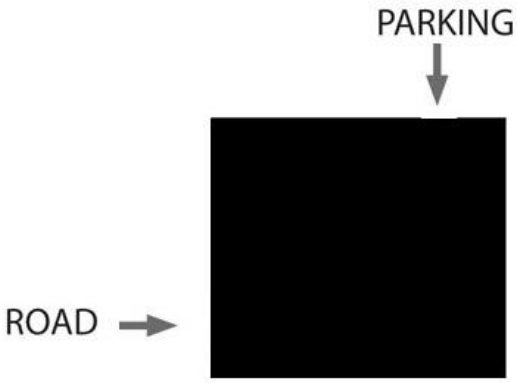
ARCHITECT

FOOTPRINT IN 3D

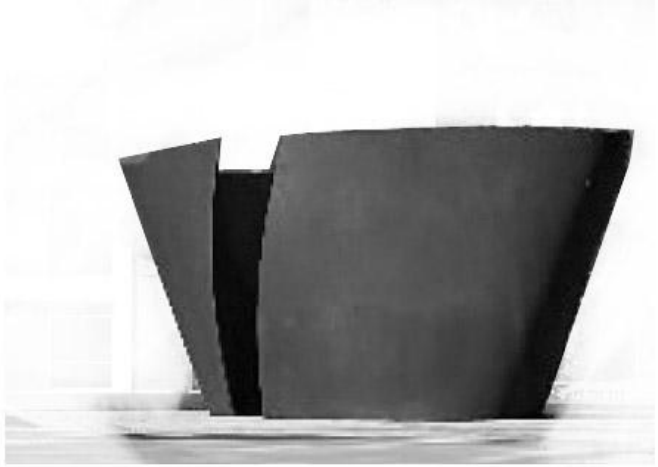
SELFSHADING

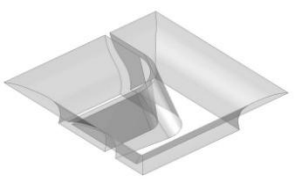


ACCESS



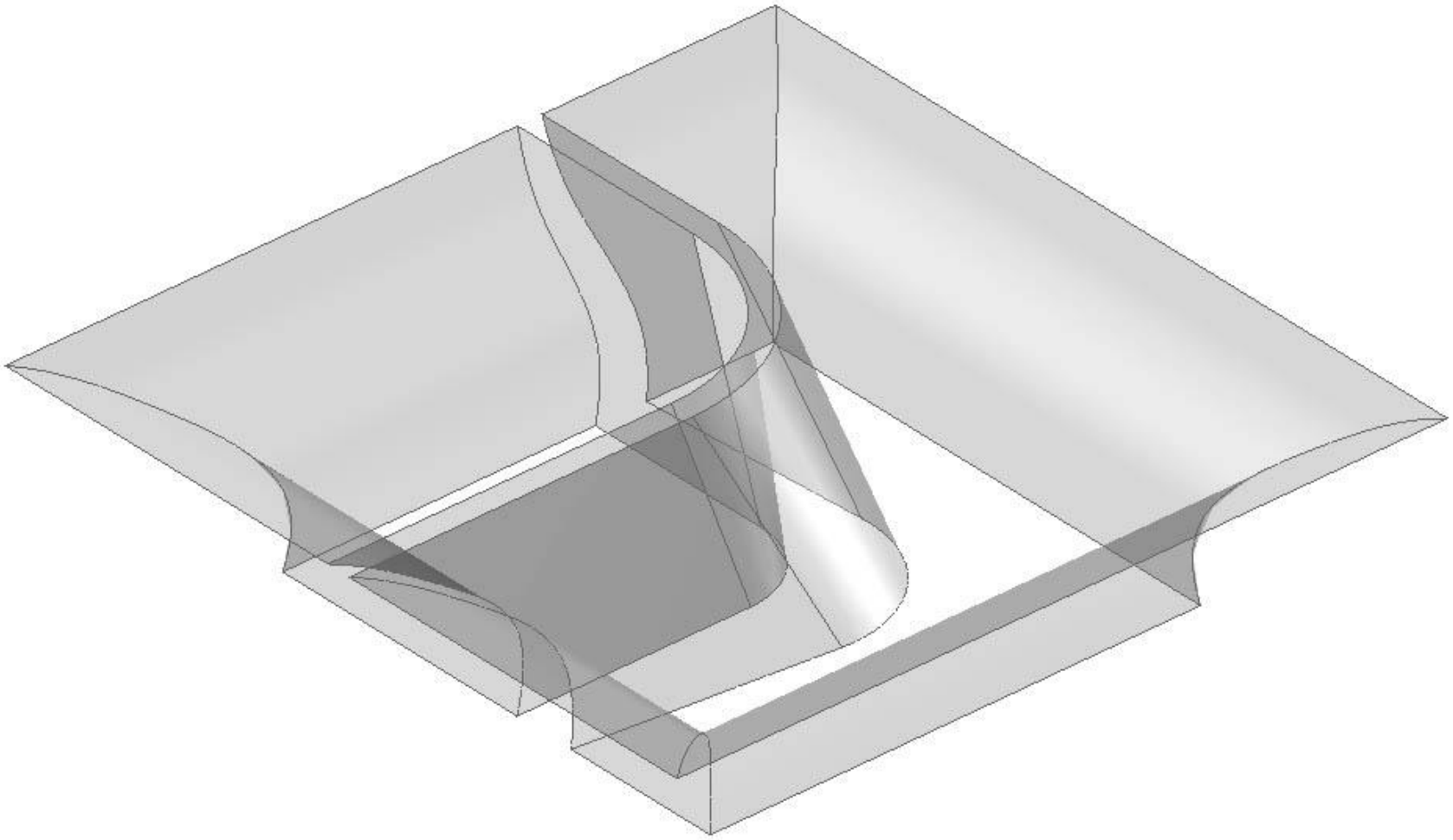
SITE ARTWORK

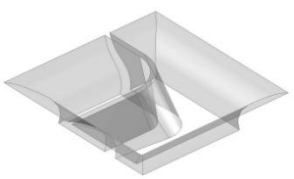




SHAPE MERGE

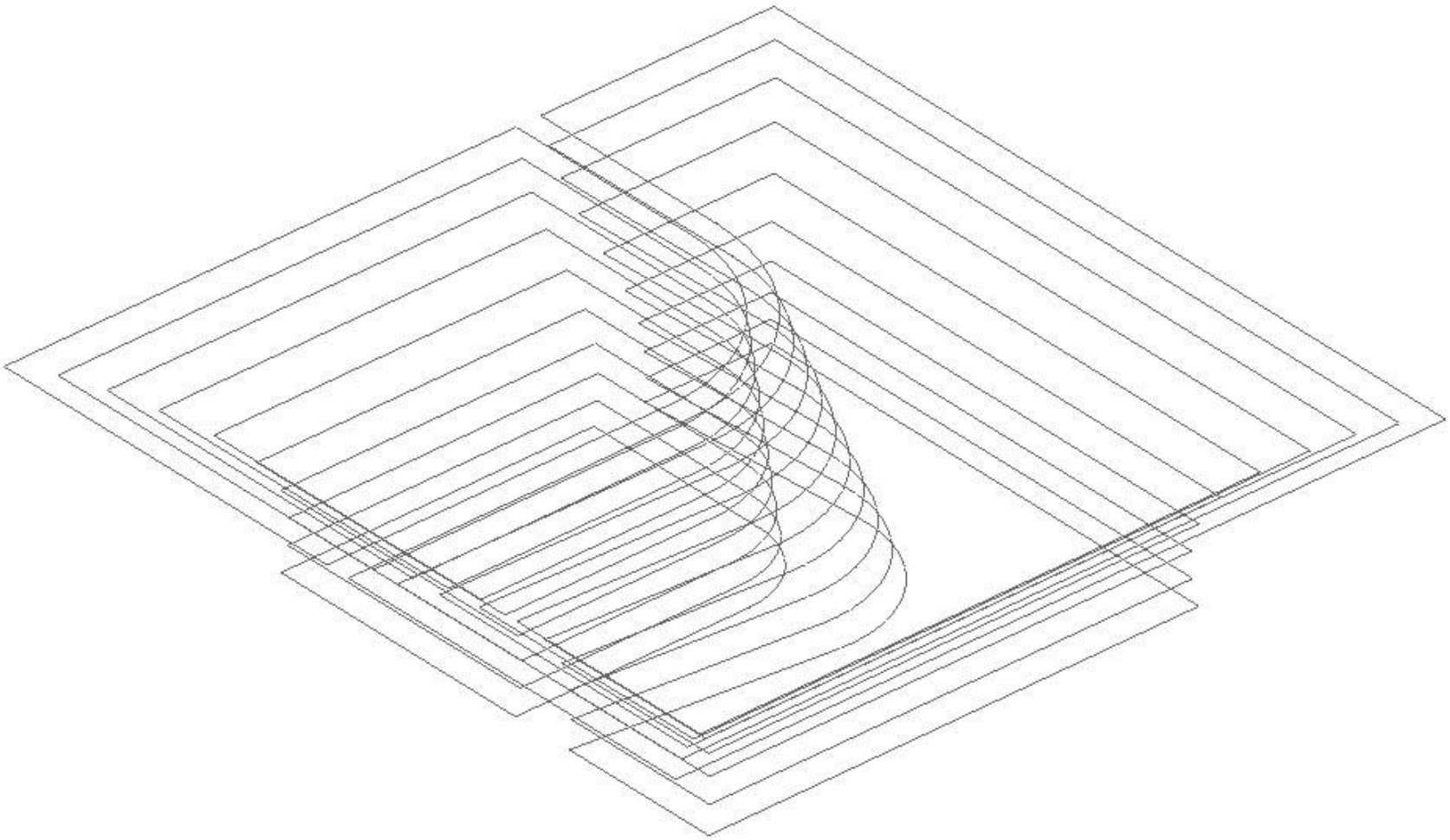
ARCHITECT

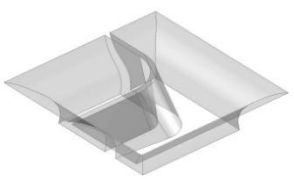




SURFACES VERTICAL DIVISION

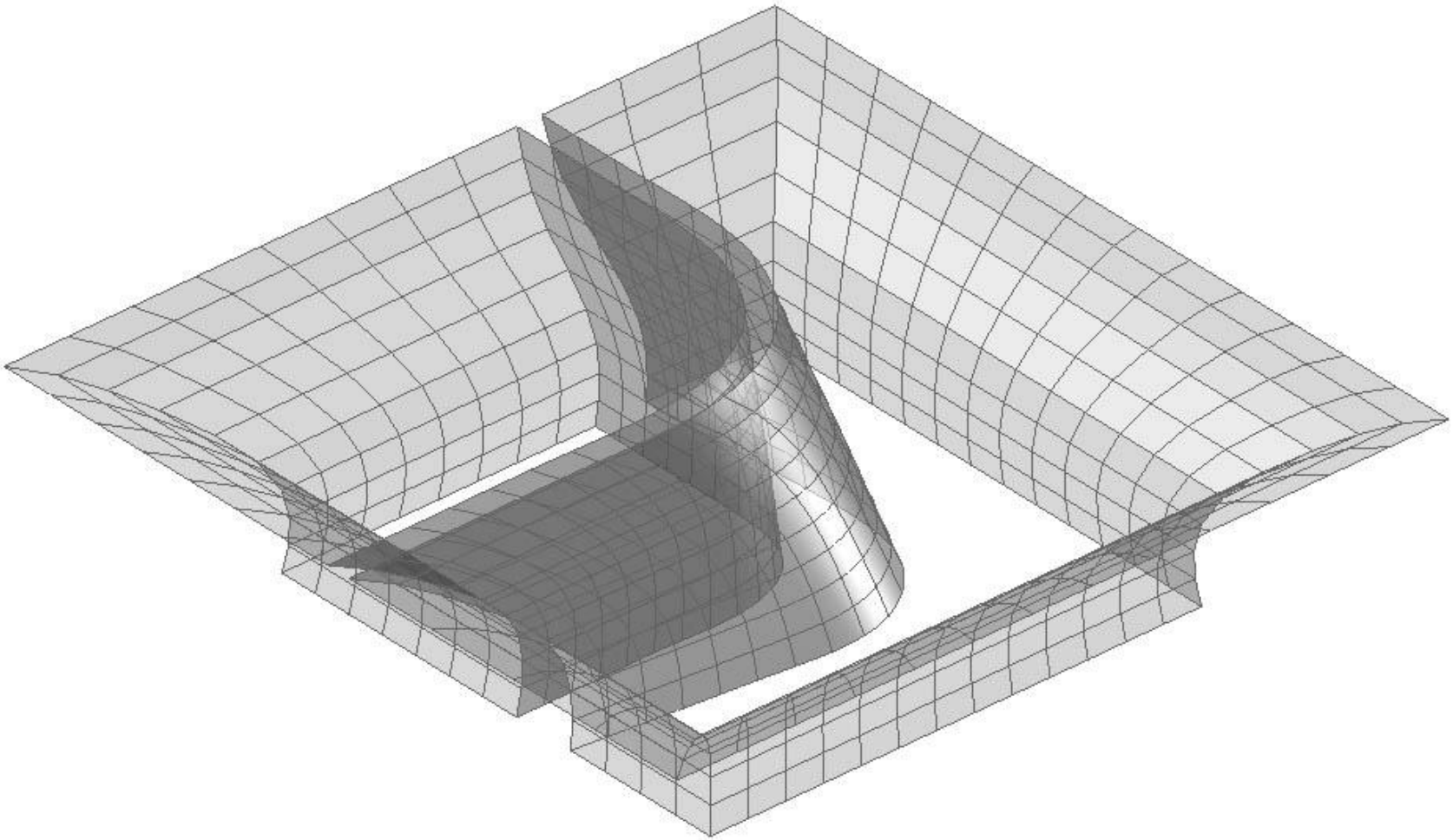
ARCHITECT

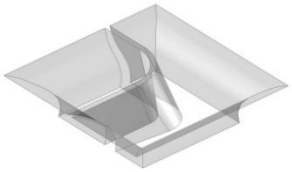




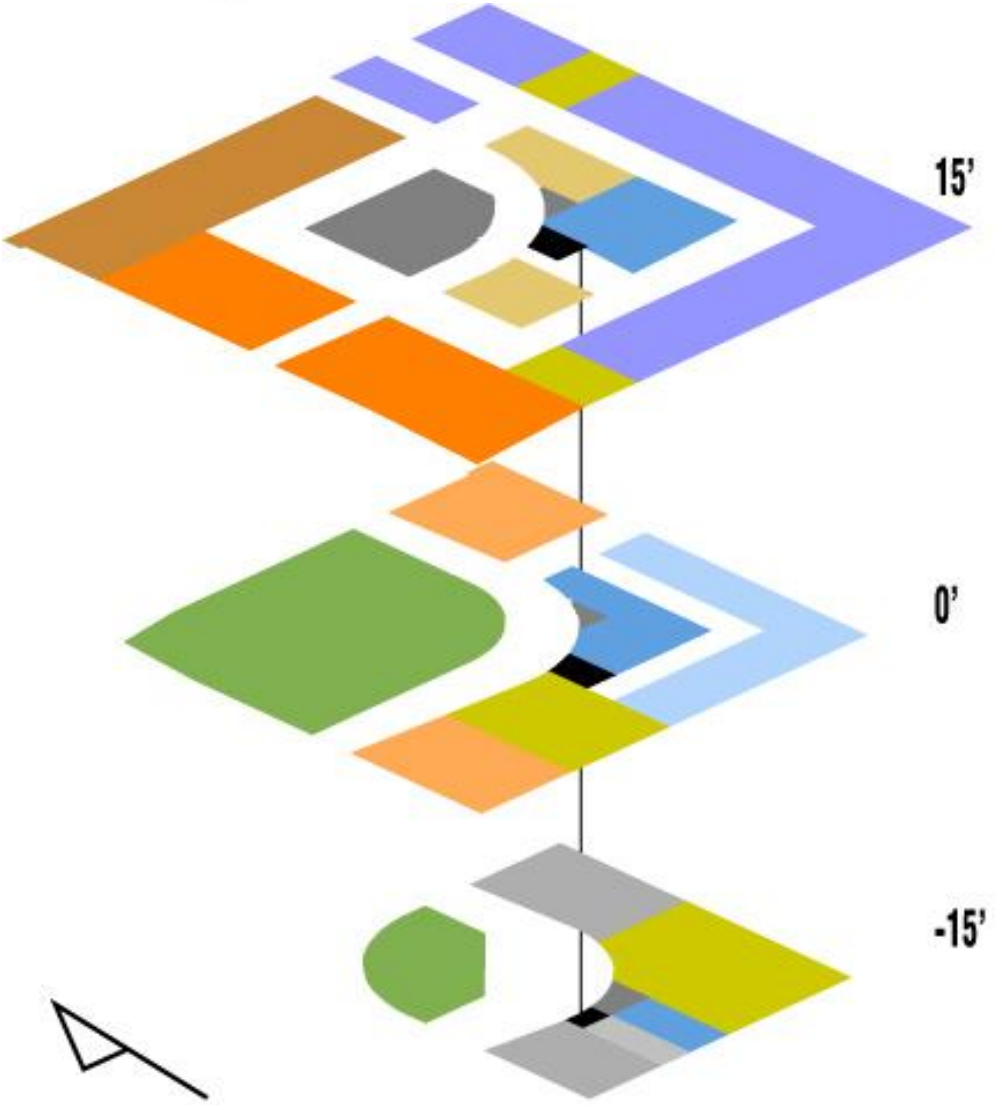
PANELS & FRAMES GUIDELINES

ARCHITECT

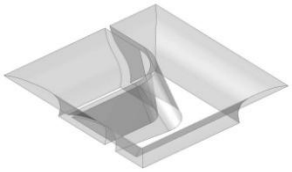




ORGANIGRAM

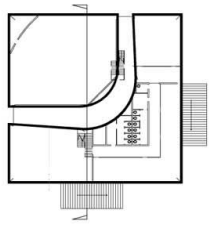


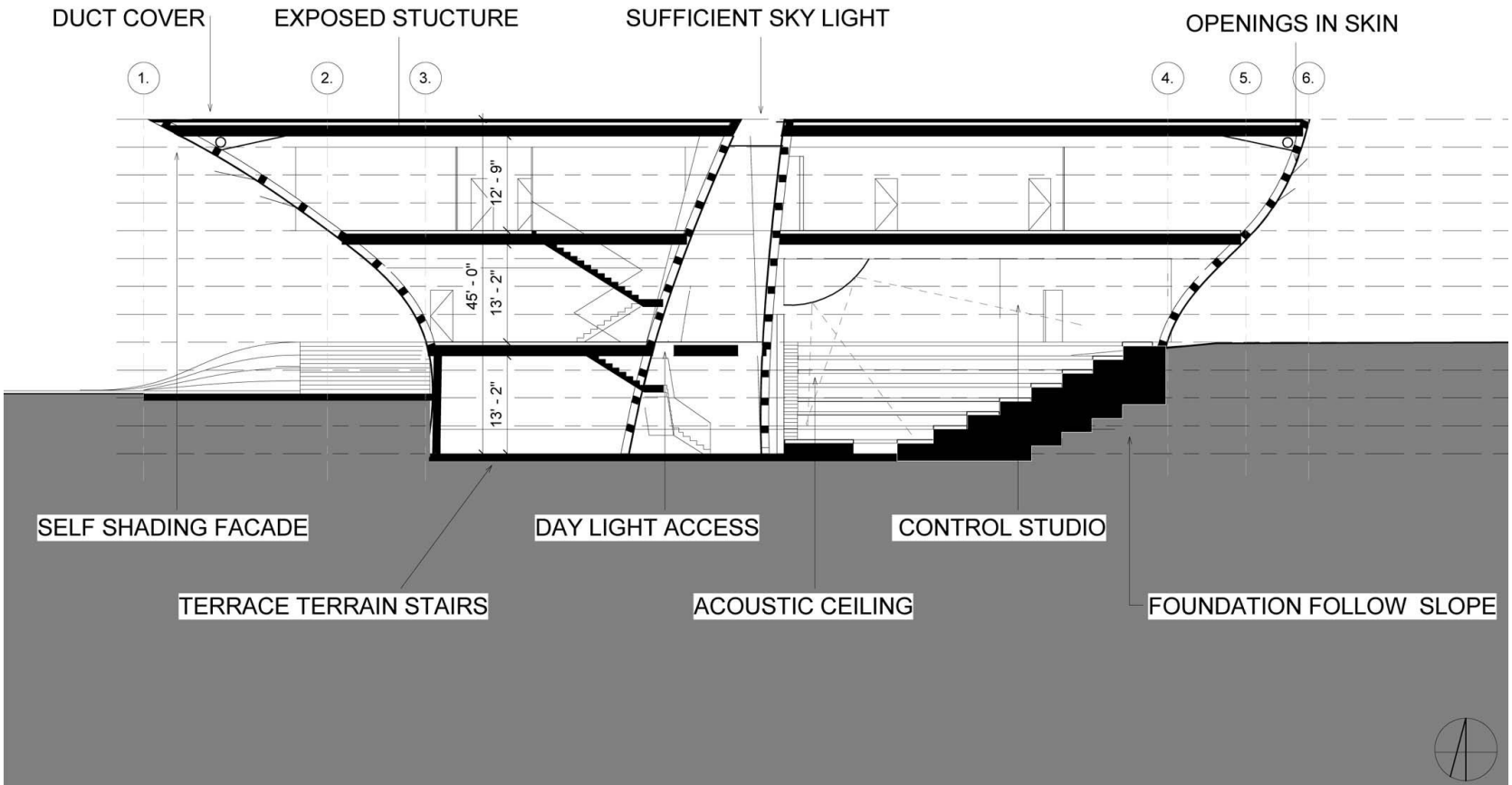
AUDITORIUM
CAFE/REST
LABS
SEMINARS
SMALL CLASS
LARGE CLASS
STUD OFFICES
OFFICES
TOILET
TECHNICAL



N-S SECTION

ARCHITECT

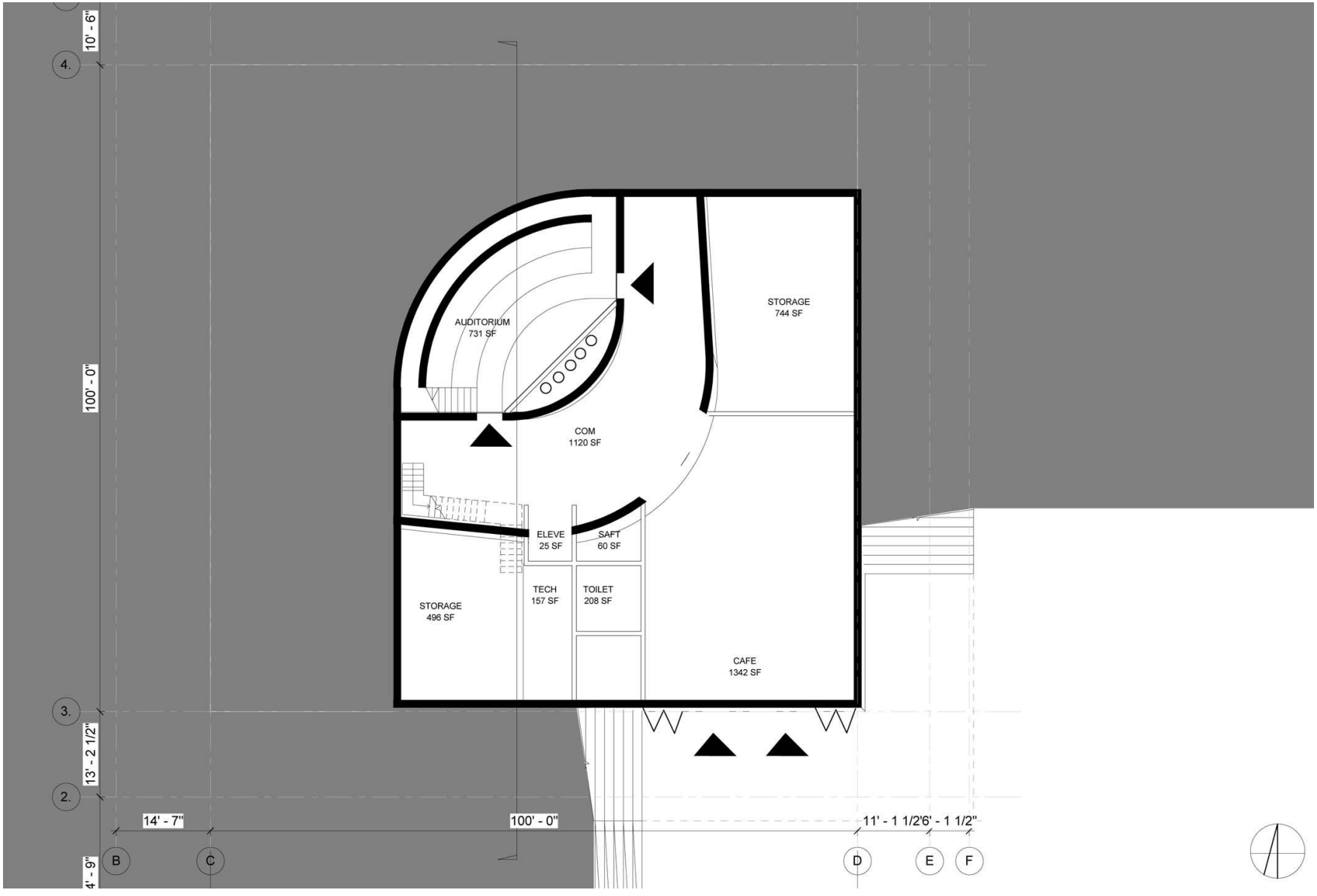


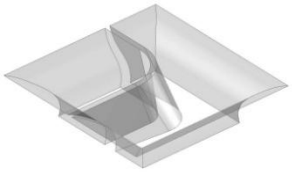


S-W CORNER

SCULPTURE BASEMENT

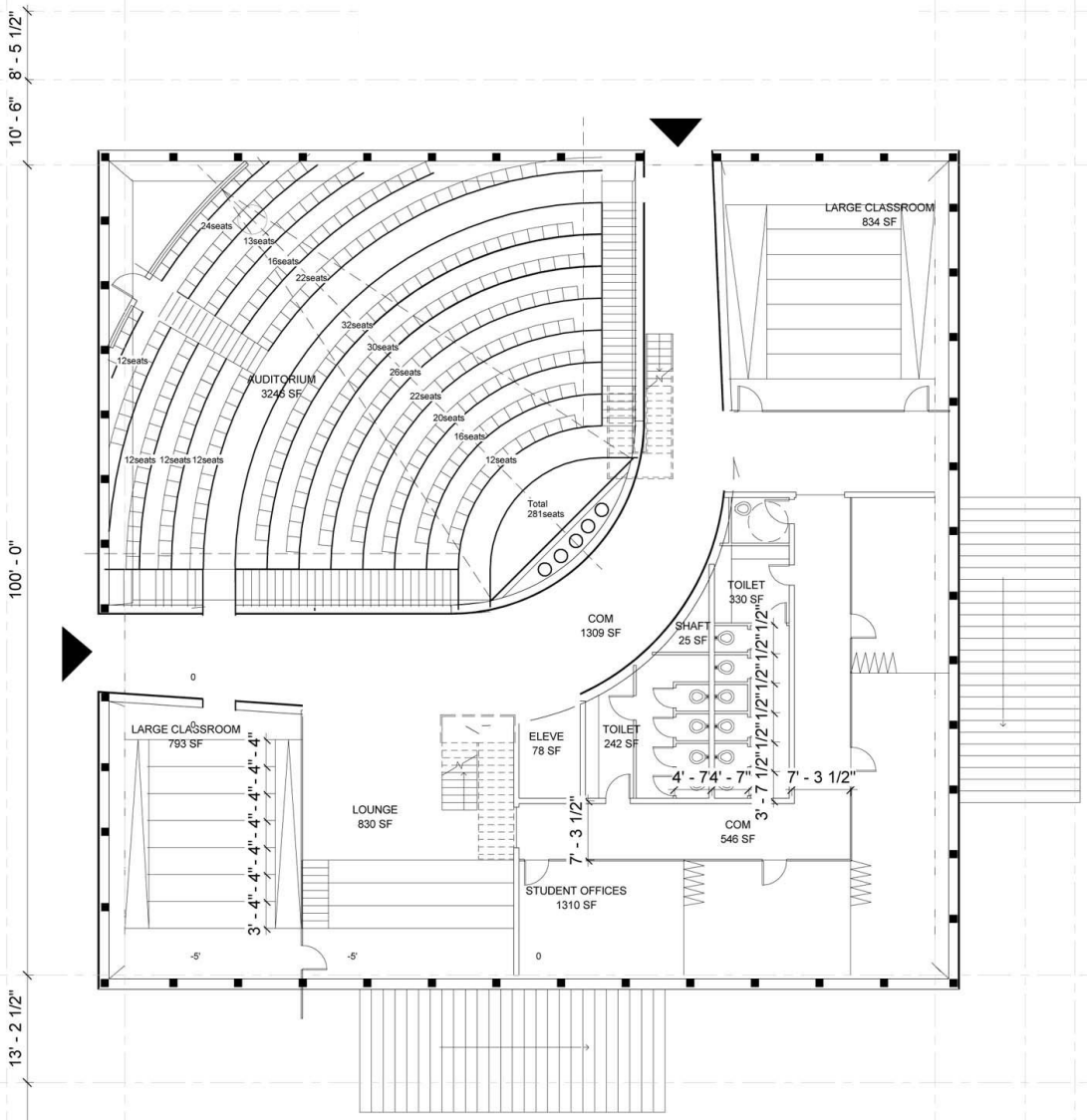
ARCHITECT

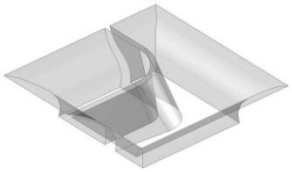




GROUND FLOOR

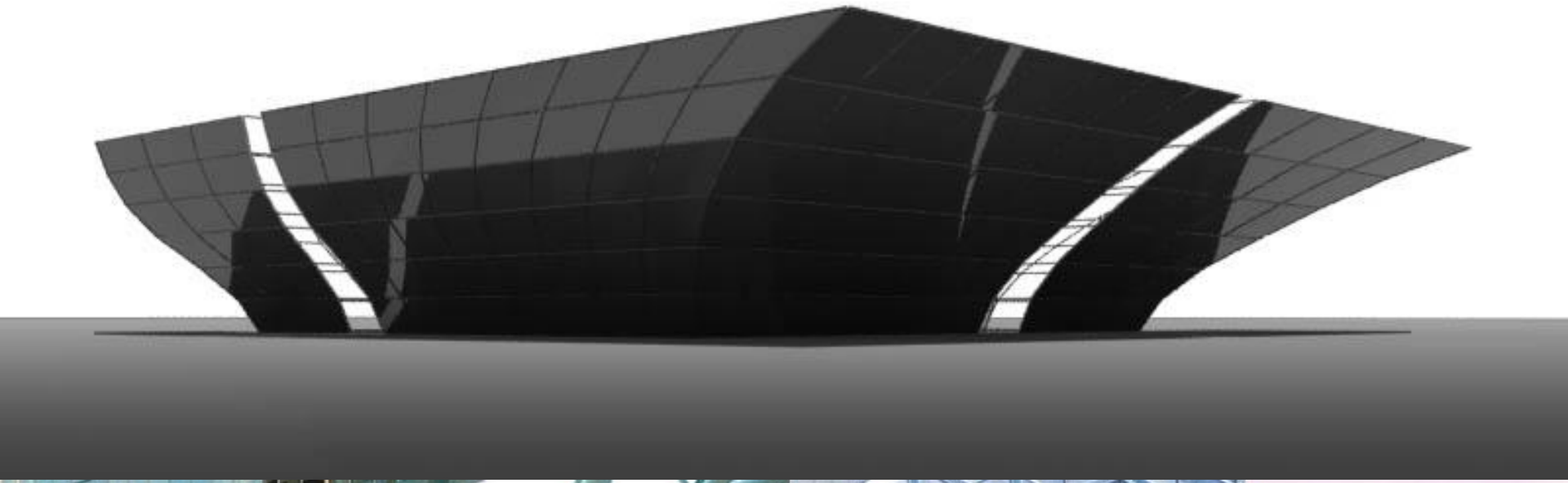
ARCHITECT





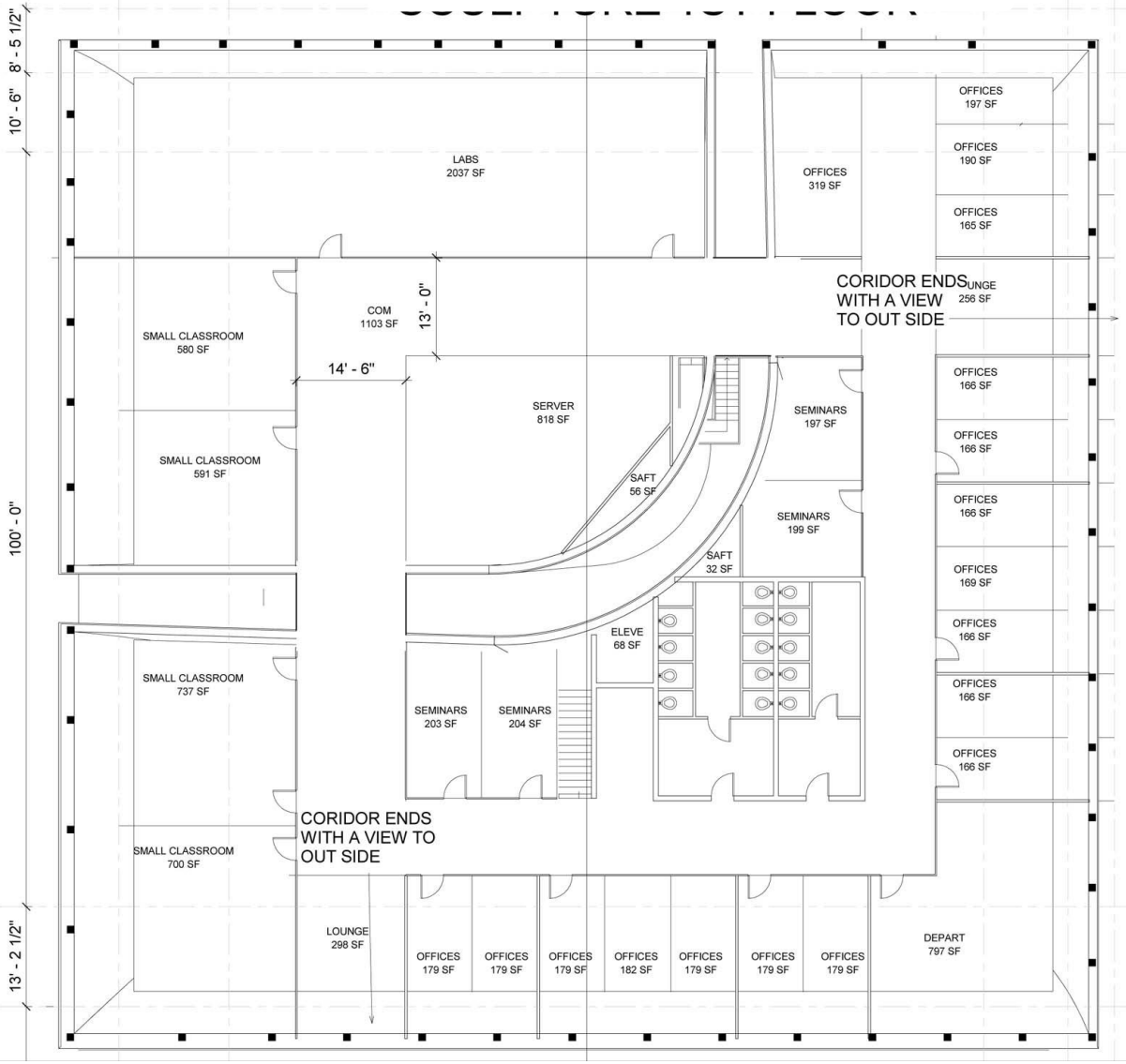
N-E CORNER WITH ENTRANCES

ARCHITECT



FIRST FLOOR

ARCHITECT



ORTHOGONAL CONCEPT

ARCHITECT

+

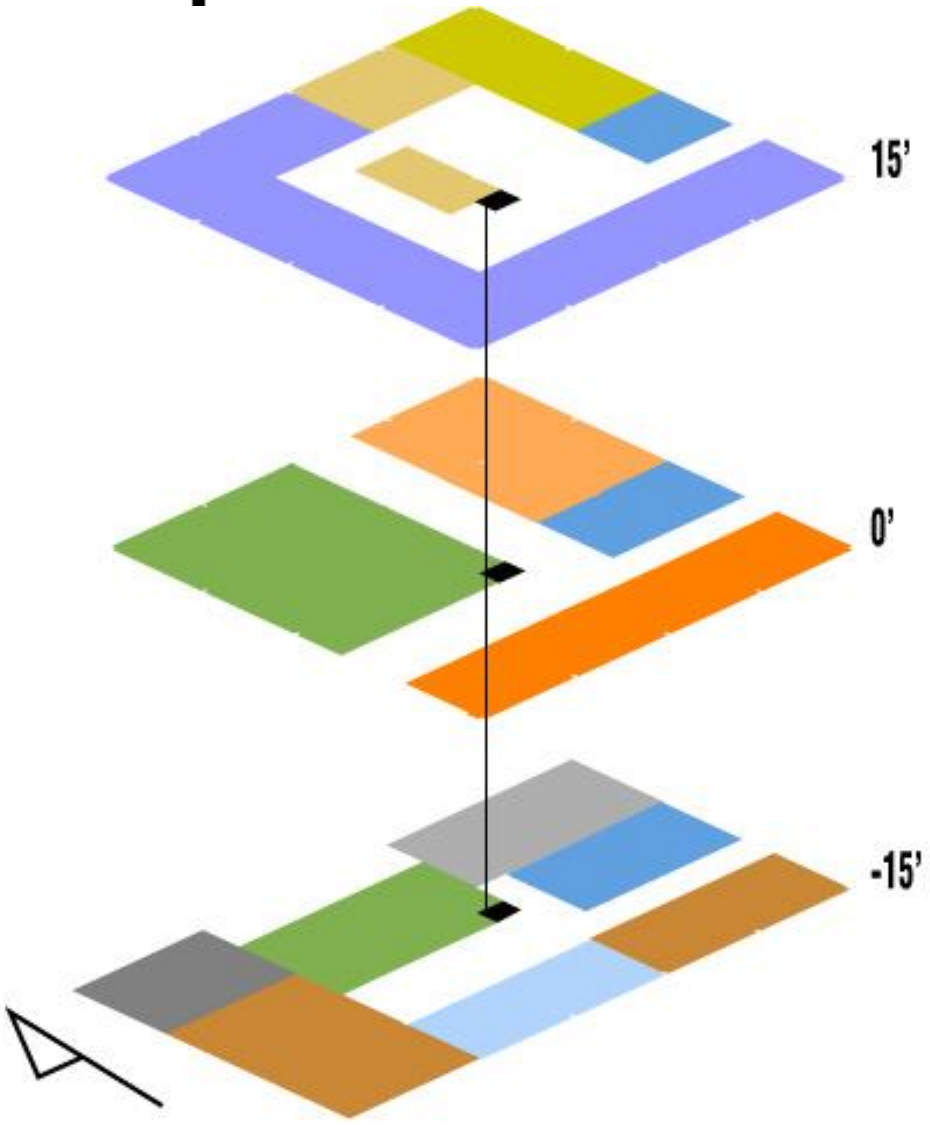
=

COZY OLD

TECH NEW

REACTIVE SKIN

ORGANIGRAM



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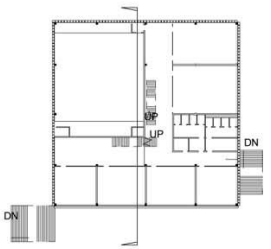
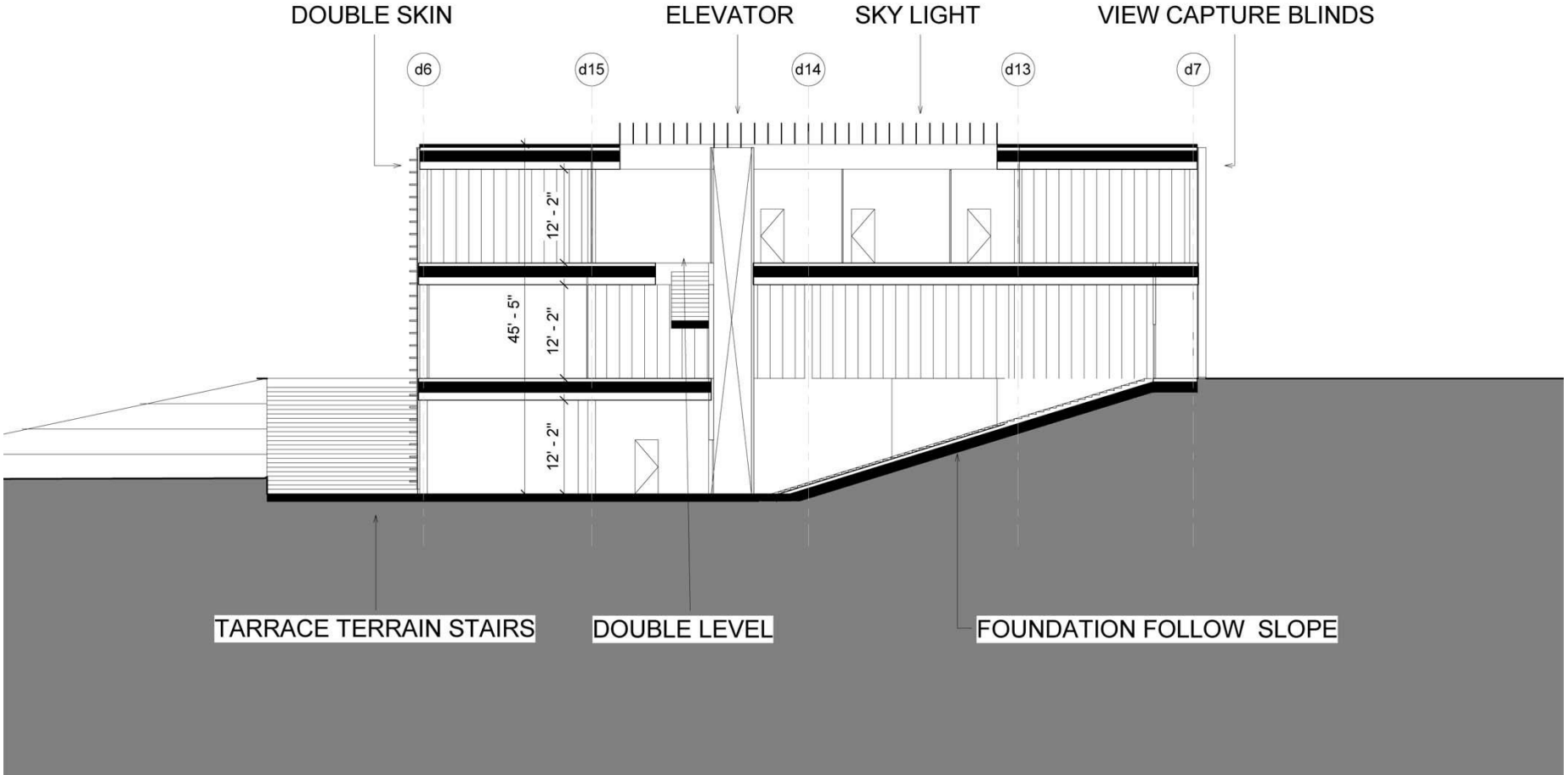
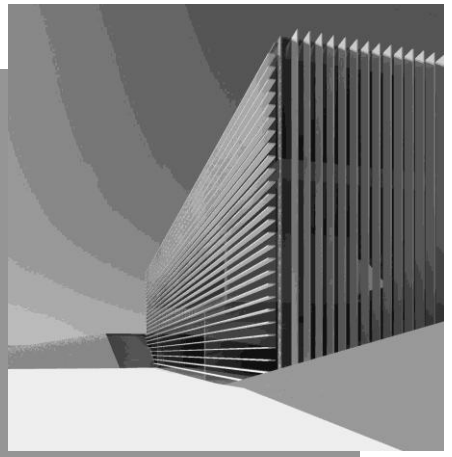
ARCHITECT





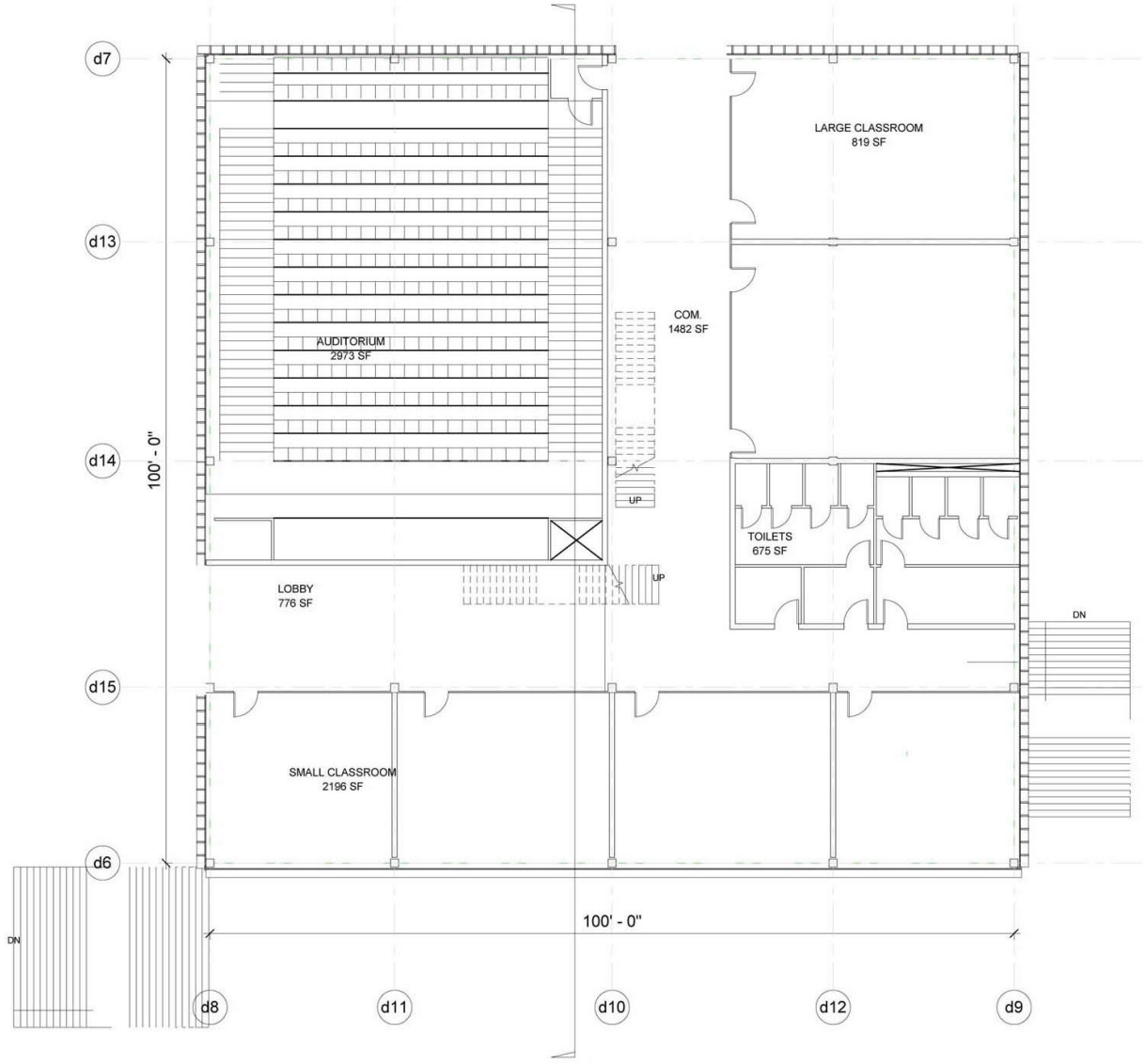
BASEMENT

ARCHITECT



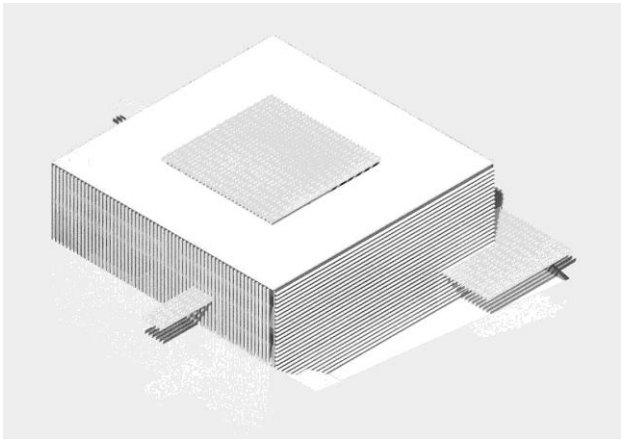
GROUND FLOOR

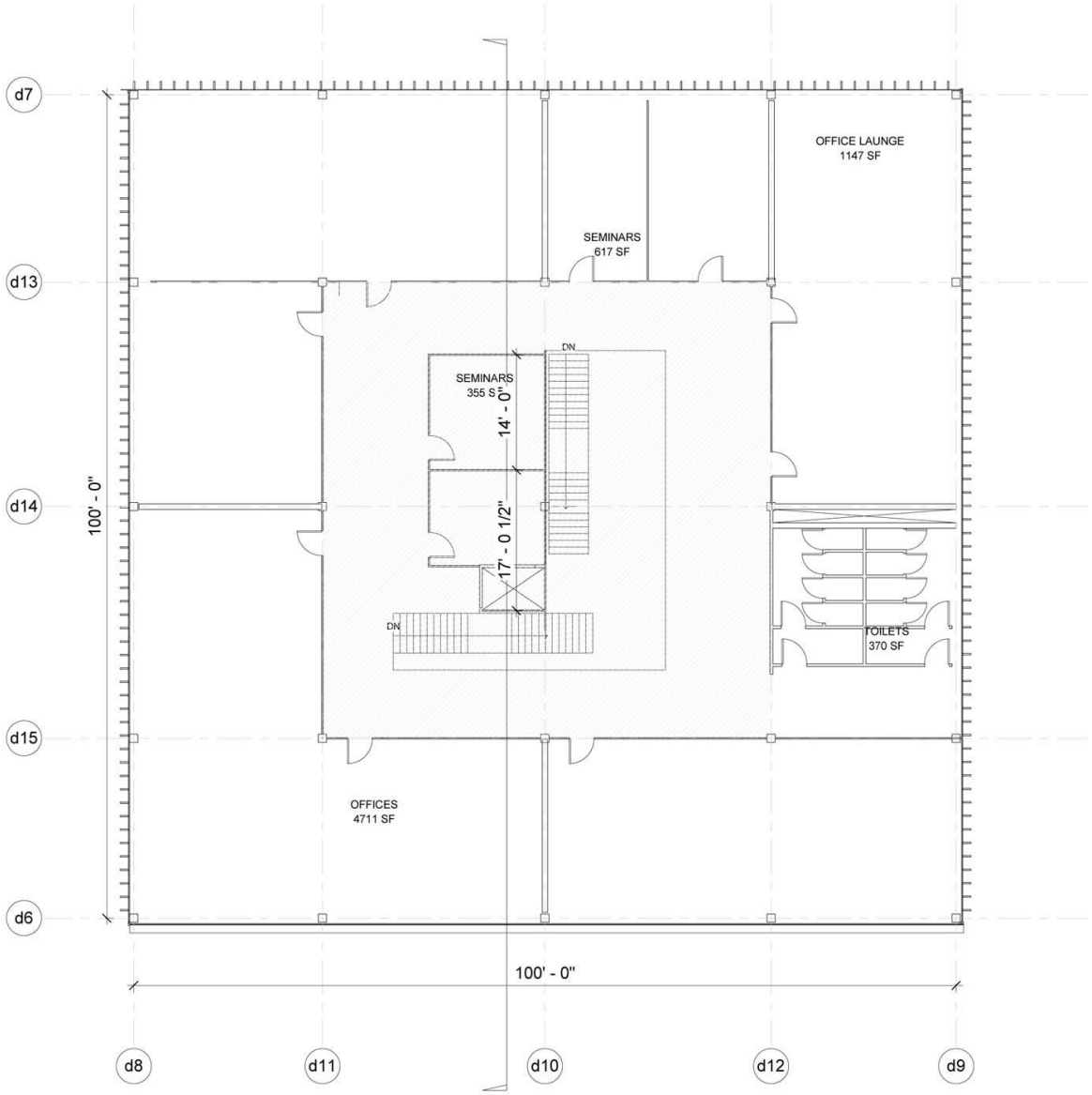
ARCHITECT



FIRST FLOOR

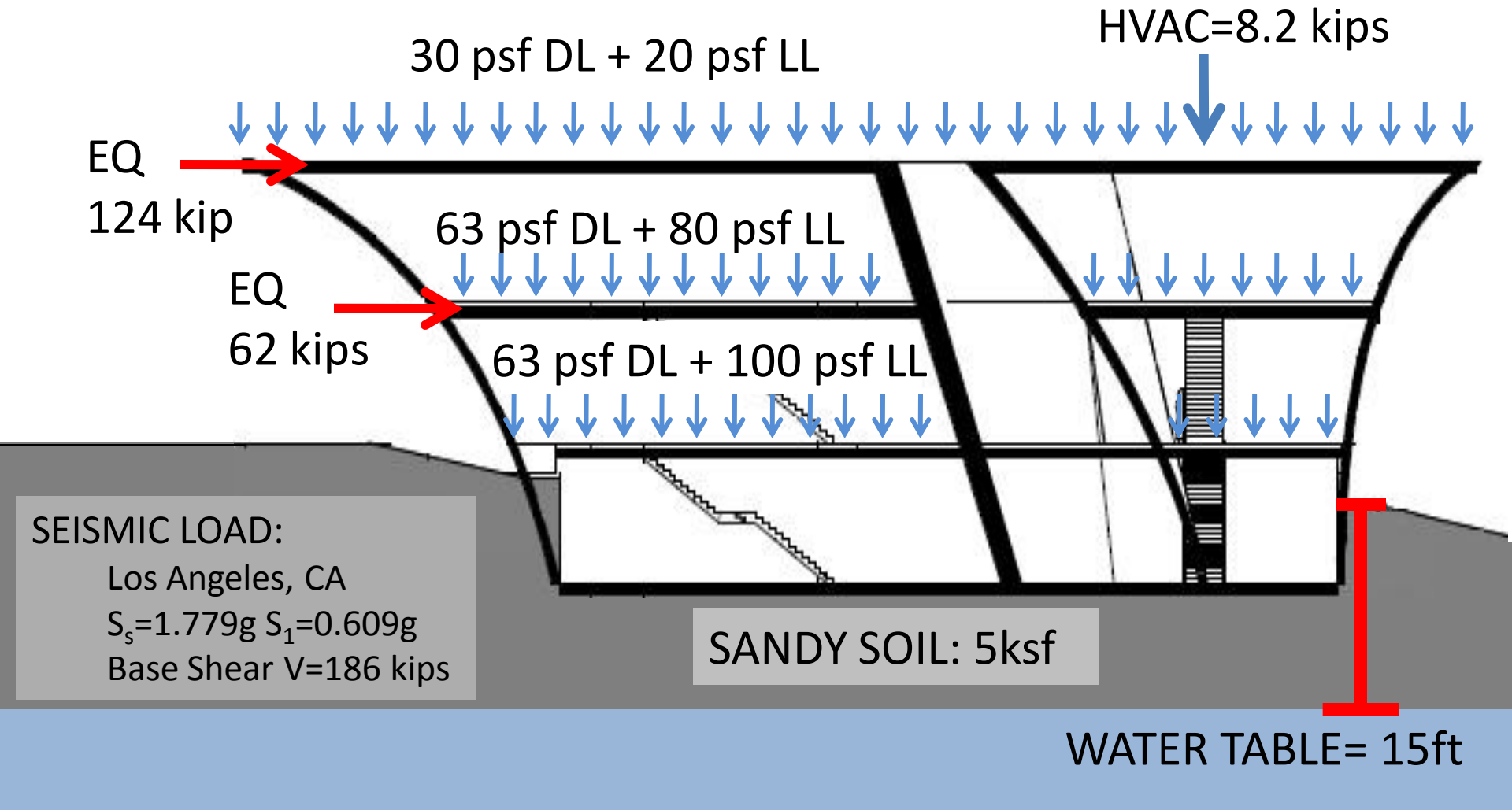
ARCHITECT

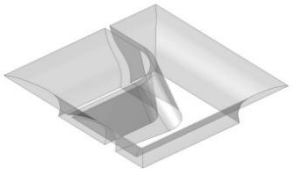




{STRUCTURAL DESIGN}

BUILDING LOADS

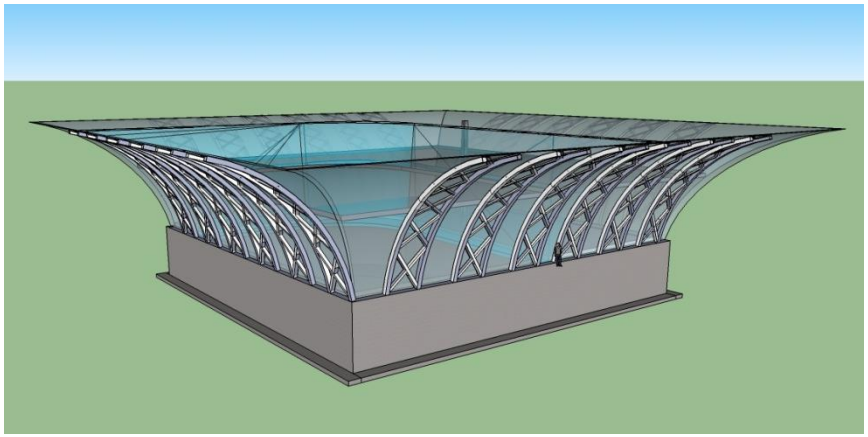


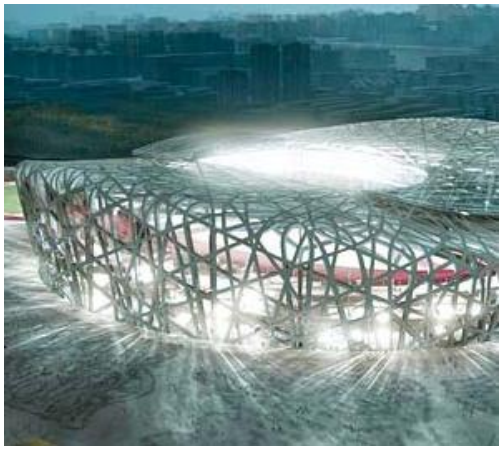


SCULPTURE CONCEPT

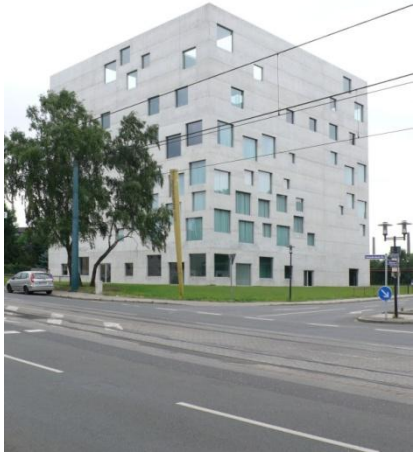
STRUCTURAL

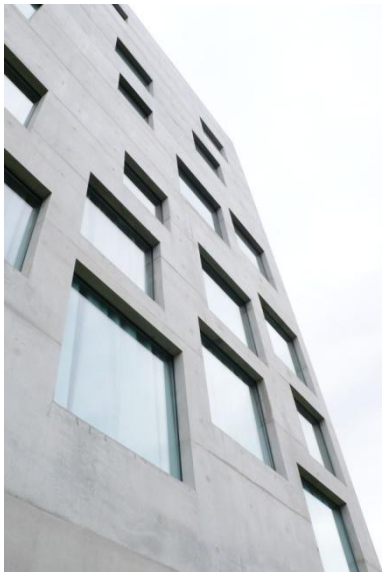
STEEL DESIGN

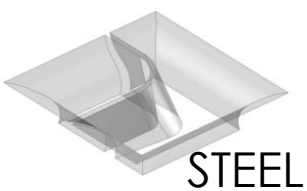




CONCRETE DESIGN







STEEL

GROUND FLOOR

STRUCTURAL

69’

23’

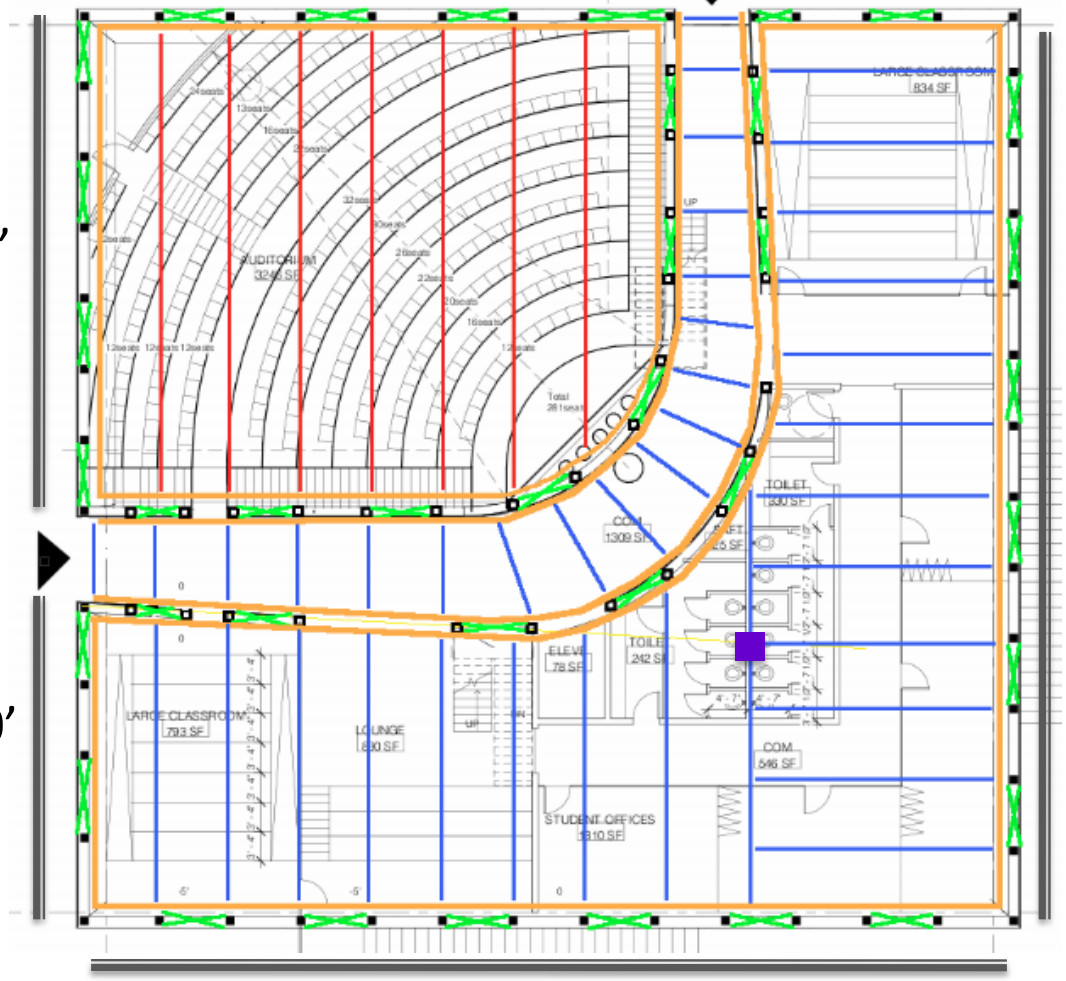
50’

40’

100’

8’

100’



TRUSS:

- Members – HSS 10x10x1/2
- Columns – HSS 12x12x1/2

COLUMNS:

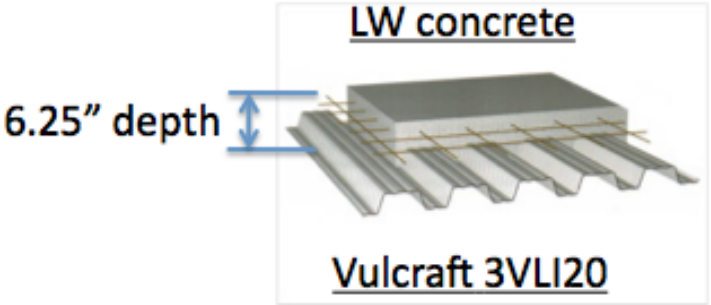
- Single Column: W12x72

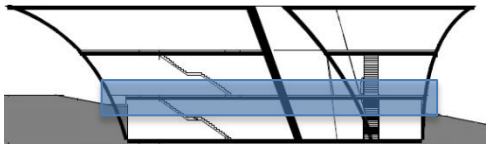
GIRDERS:

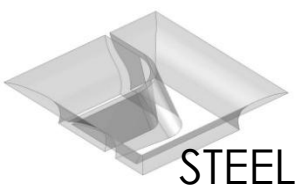
- Perimeter Girders: W27x84

FLOOR BEAMS:

- Auditorium : W24x68
- North/South: W21x55
- East/West: W14x22



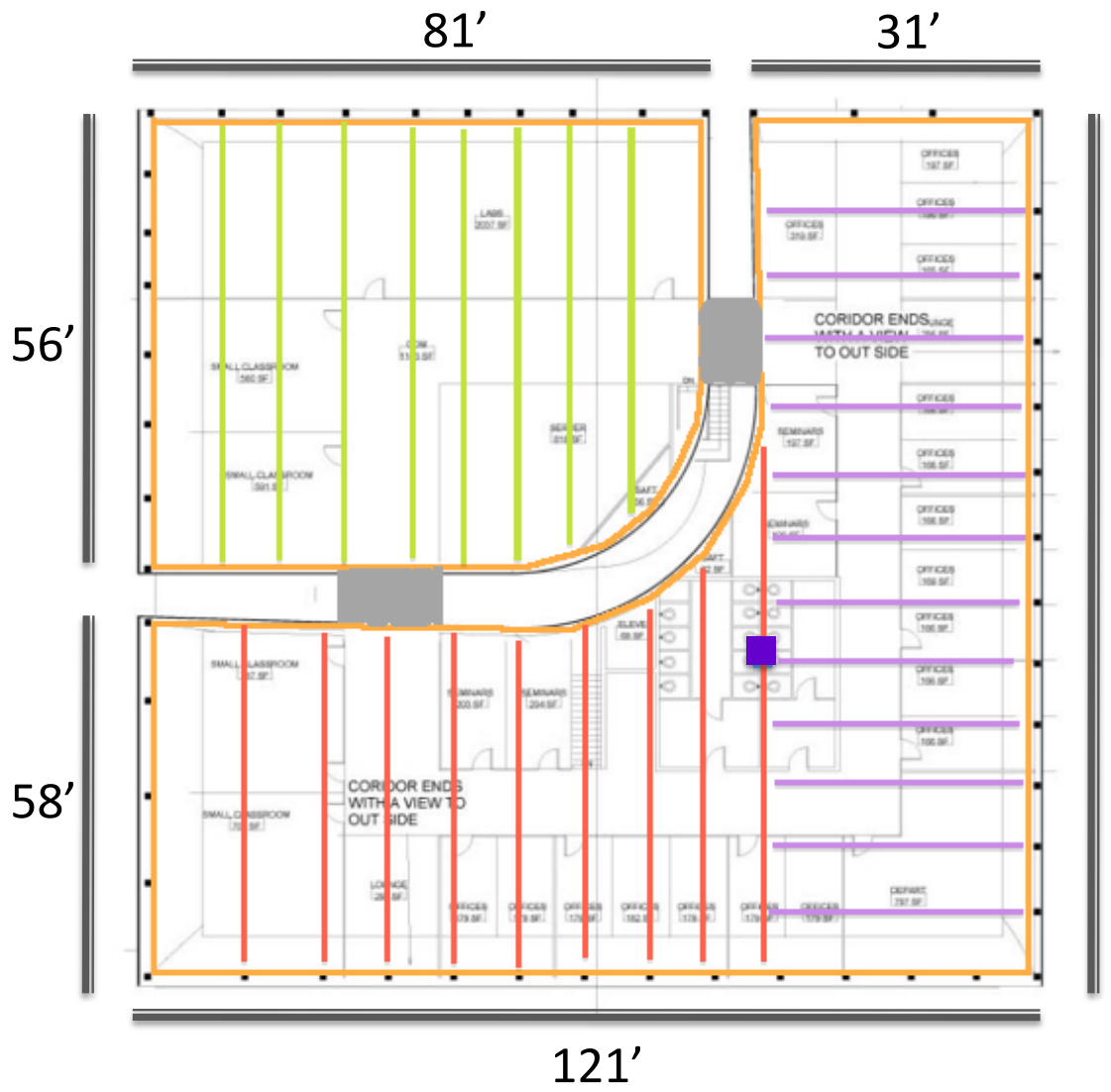




STEEL

FIRST FLOOR

STRUCTURAL



COLUMNS:

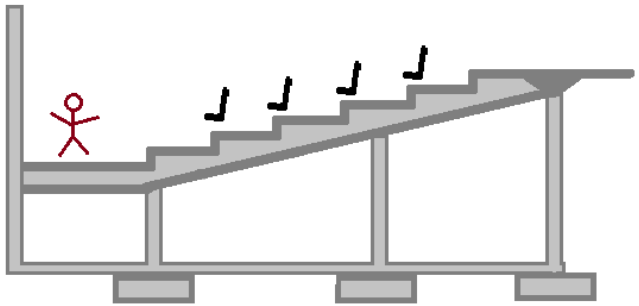
- Single Column: W12x72

GIRDERS:

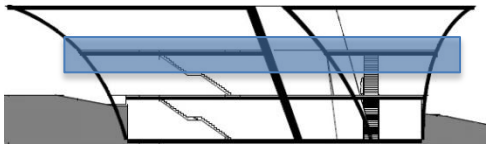
- Perimeter Girders: W27x84

FLOOR BEAMS:

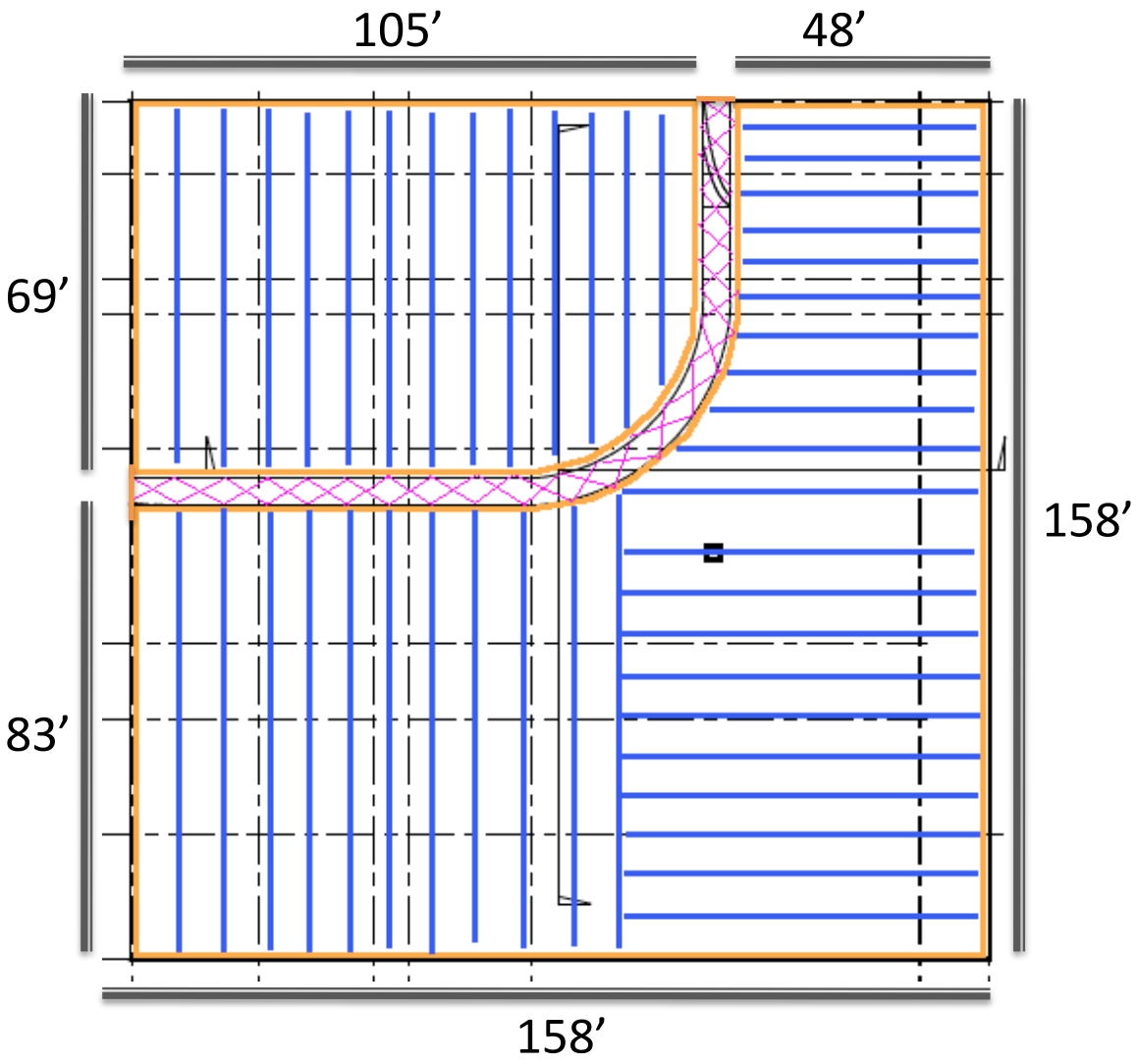
- Auditorium: W27x84
- North/South: W27x84
- East/West: W21x55



Auditorium Detail



ROOF



GIRDERS:

- Perimeter Girders: W27x84

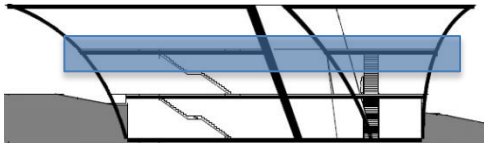
ROOF JOISTS:

- Steel Joists: 44LH11

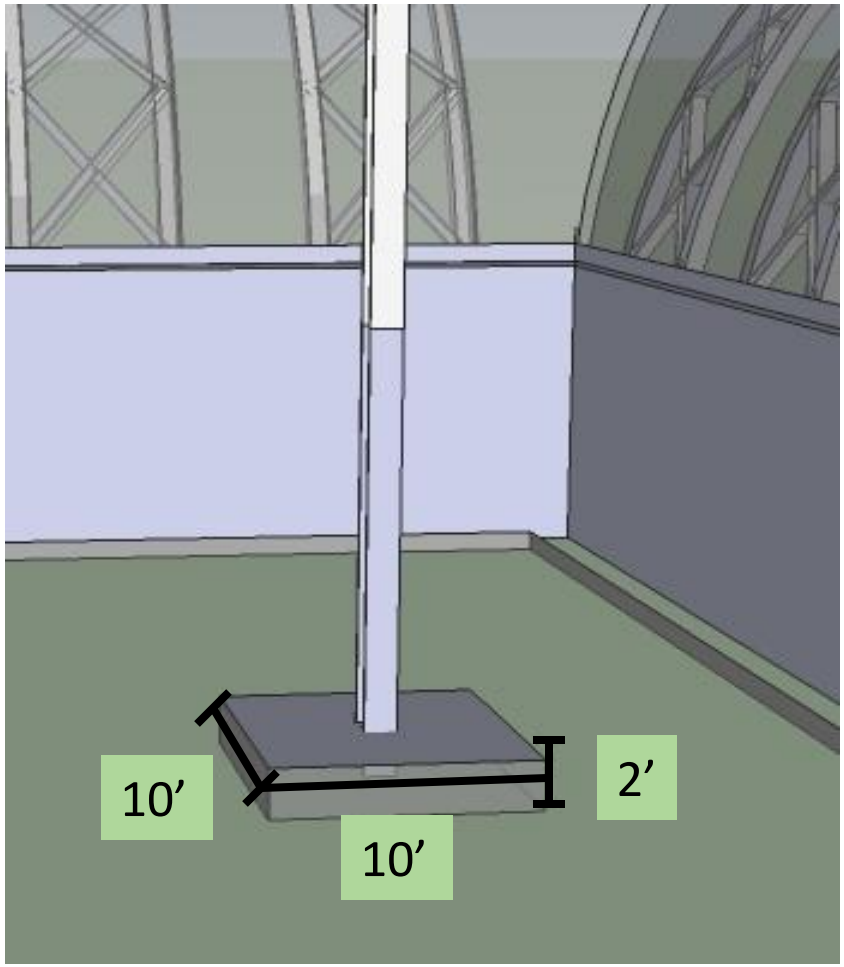
HORIZONTAL BRACING:

- Truss System: HSS8x8x1/2

Vulcraft 1.5BA22
(Acoustical decking for educational facilities)

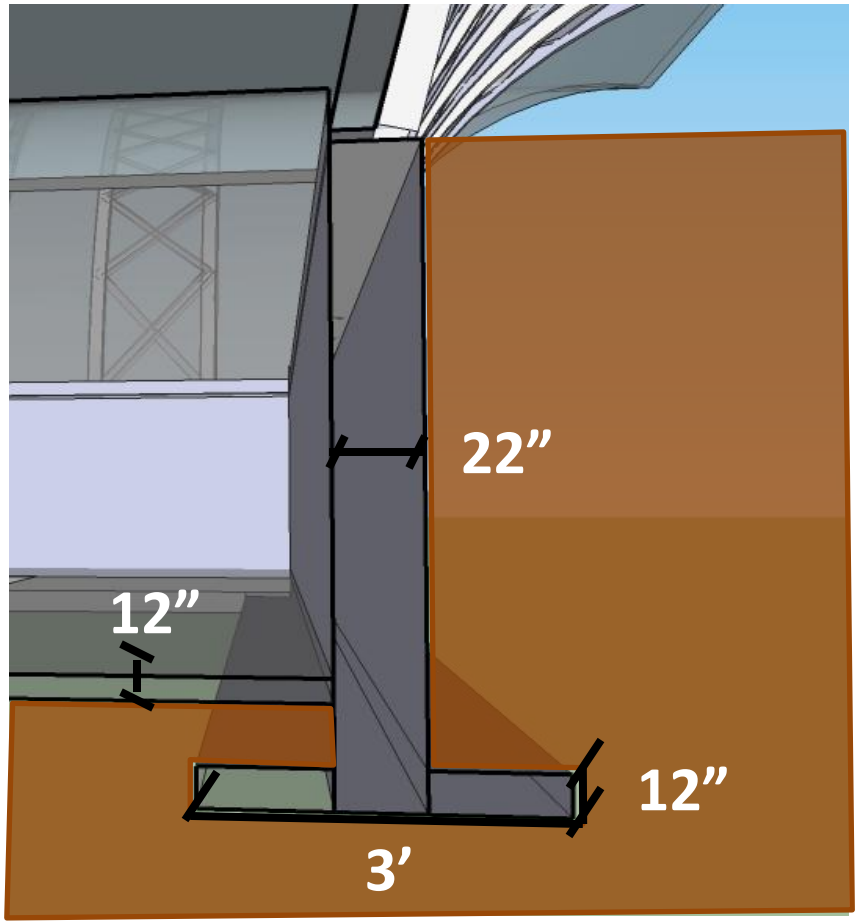


FOUNDATION DESIGN

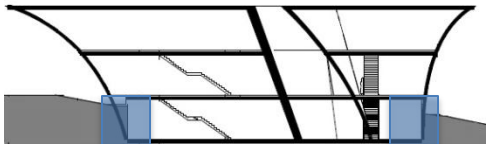


Spread Footing- Normal Weight Concrete

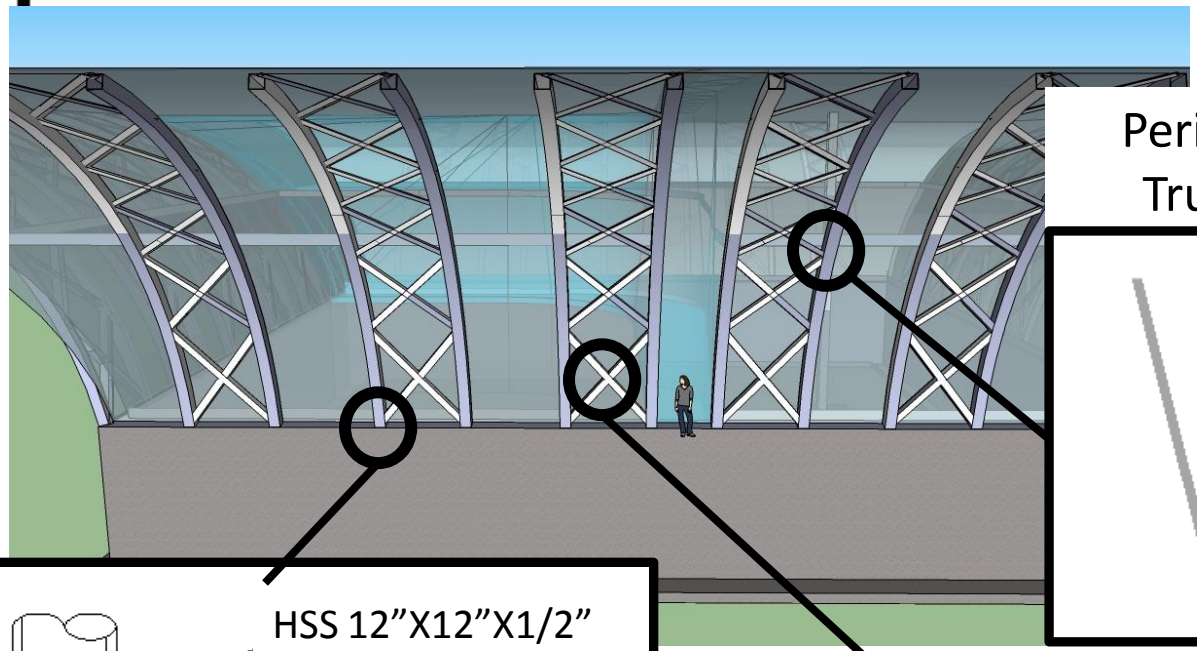
10 #9s in each direction (Mentor Reference: Greg Luth)



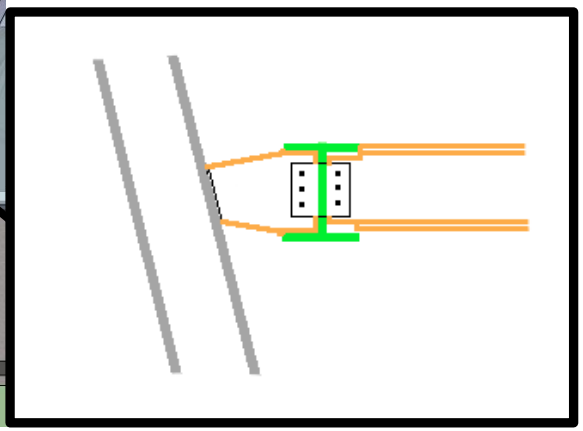
Strip Footing

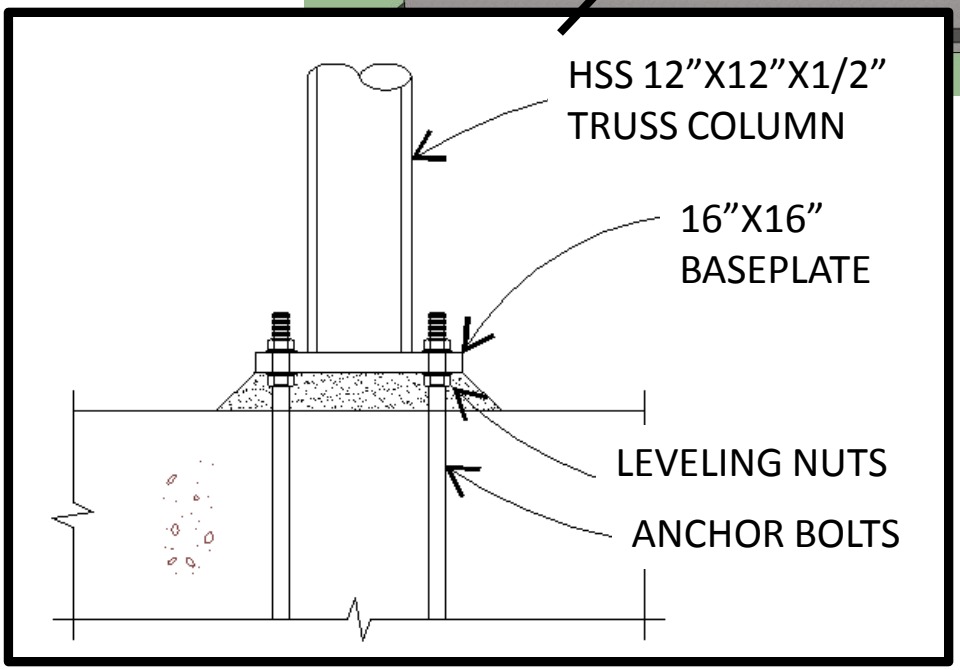


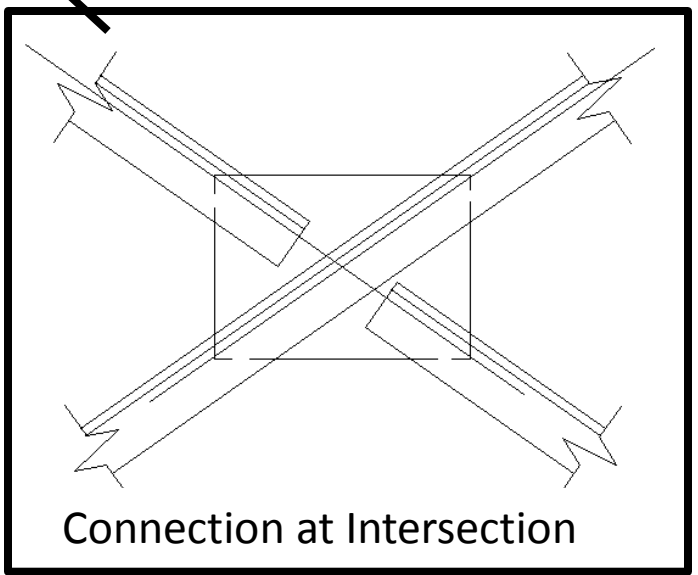
TRUSS DETAILS



Perimeter Girder & Truss Connection

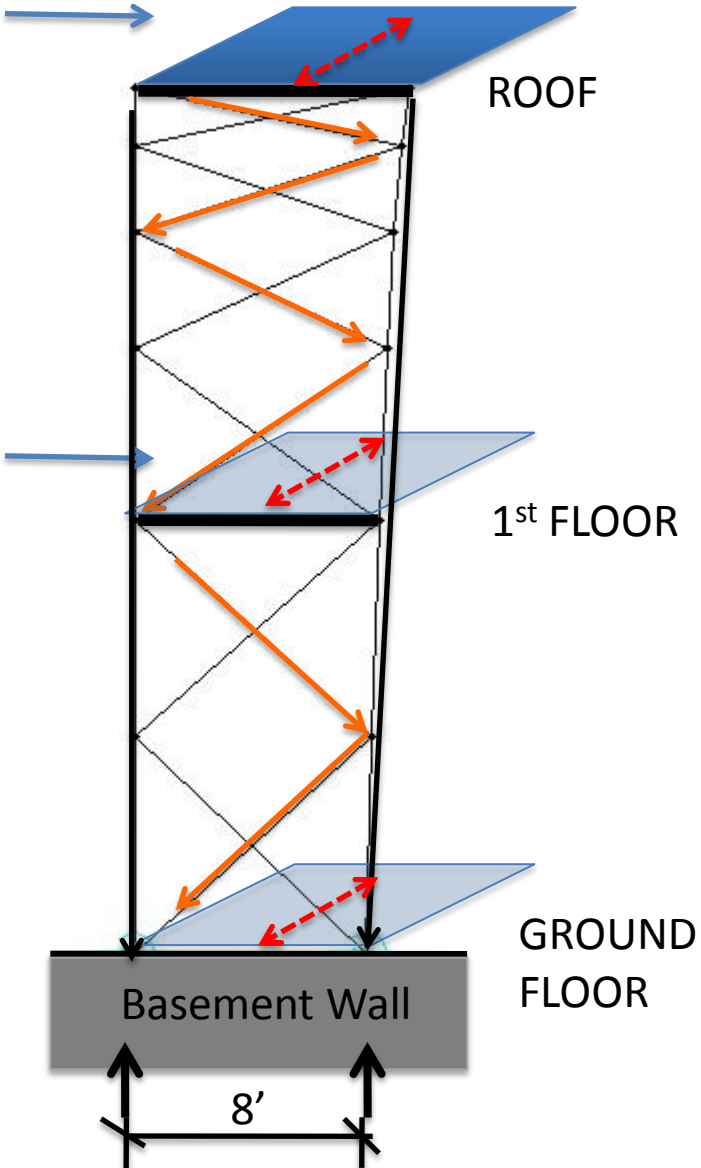


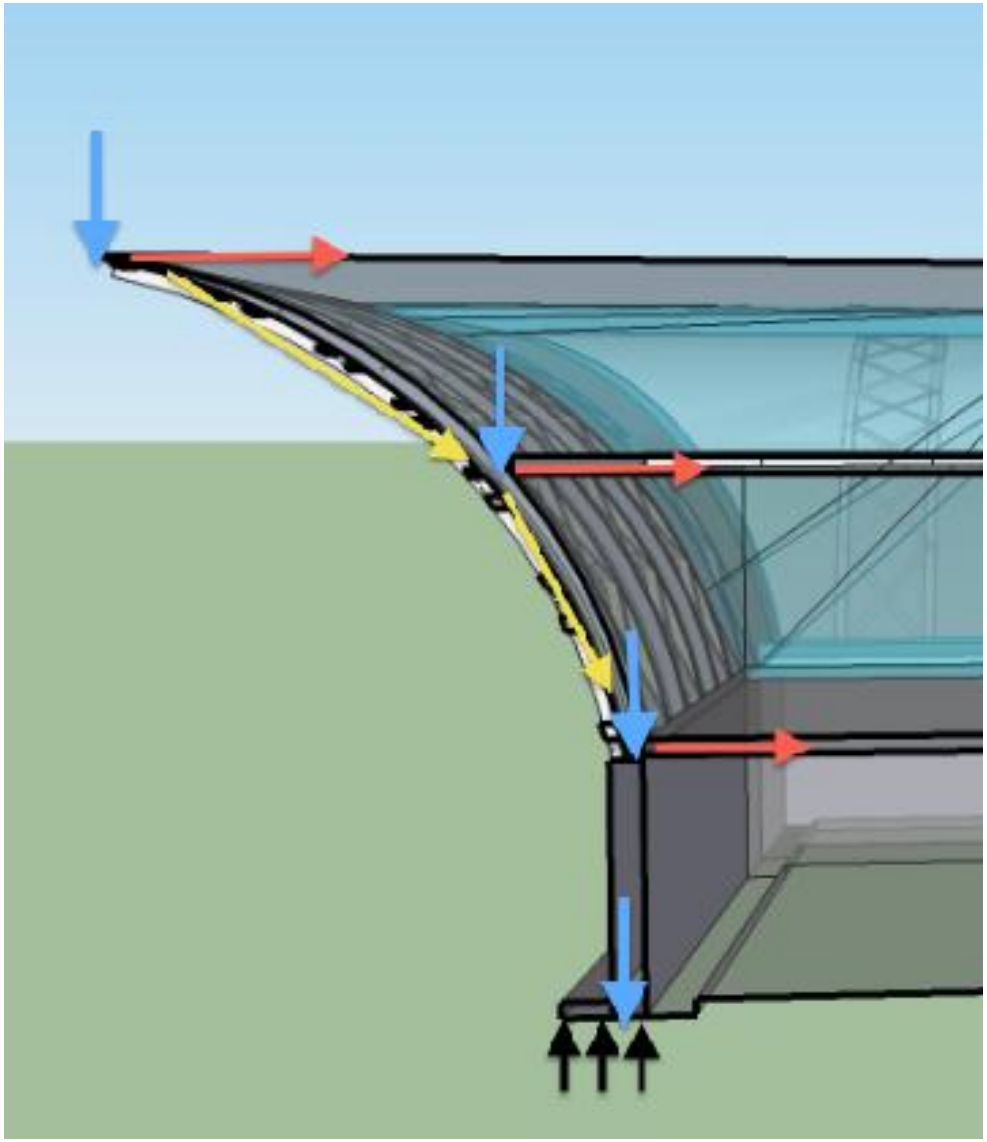




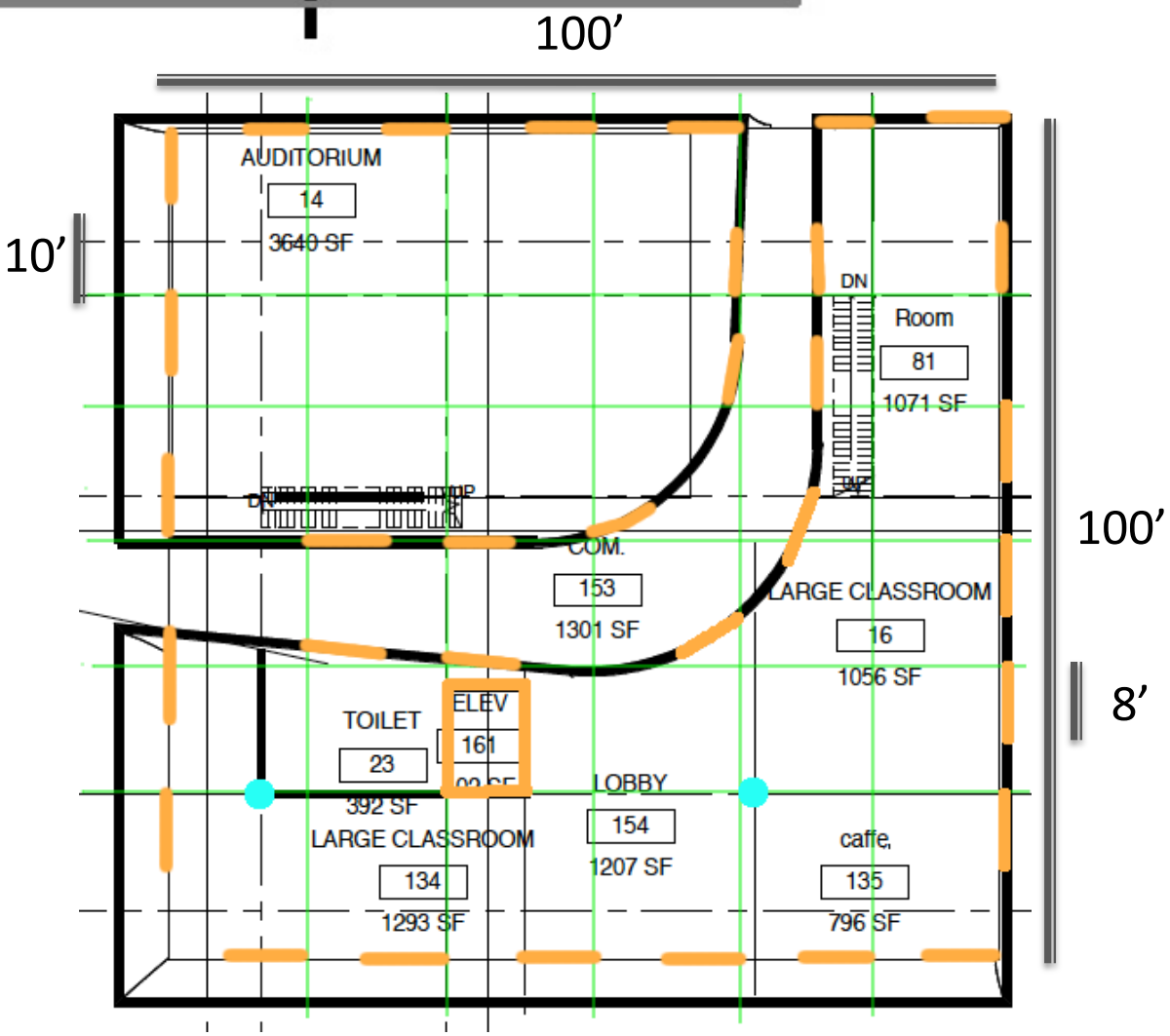
Connection at Intersection

LOAD PATH





LAYOUT



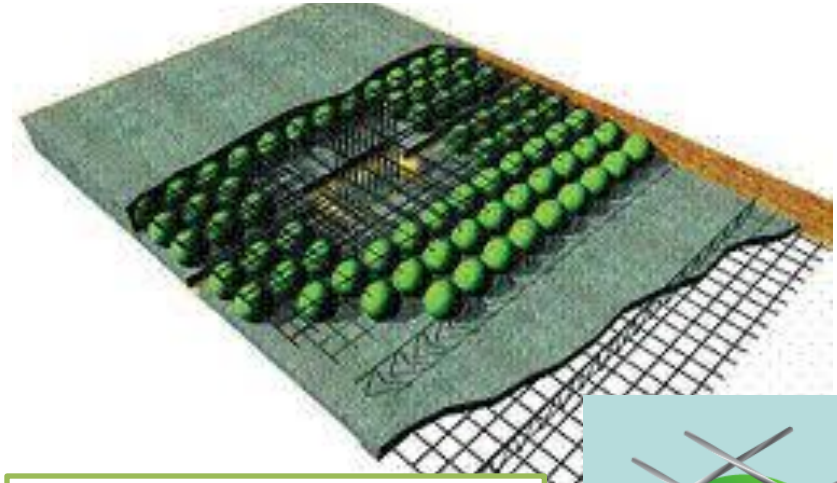
Coupled Shear Wall Elevation

Architectural Inspiration

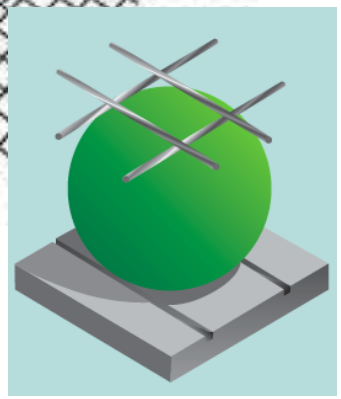
- Round 16” Columns
- Coupled Shear Walls, 14” Thick

ENABLING DETAILS

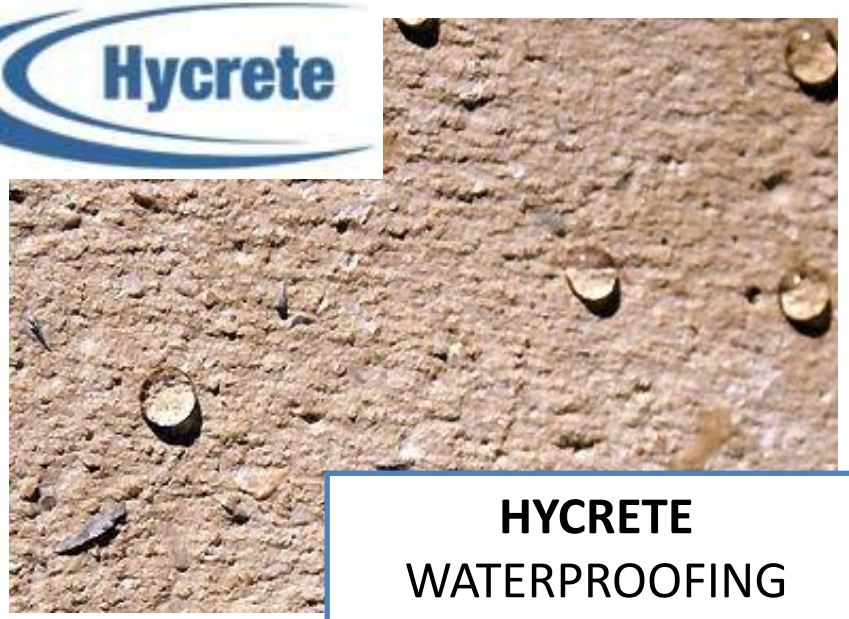
BubbleDeck®
Build more with less.



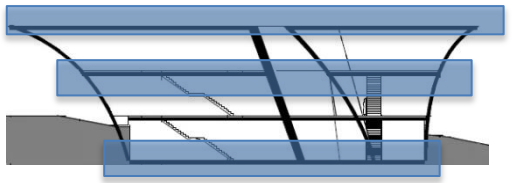
VOIDED BIAXIAL FLAT PLATE SLAB



Hycrete



HYCRETE
WATERPROOFING CONCRETE MIXTURE



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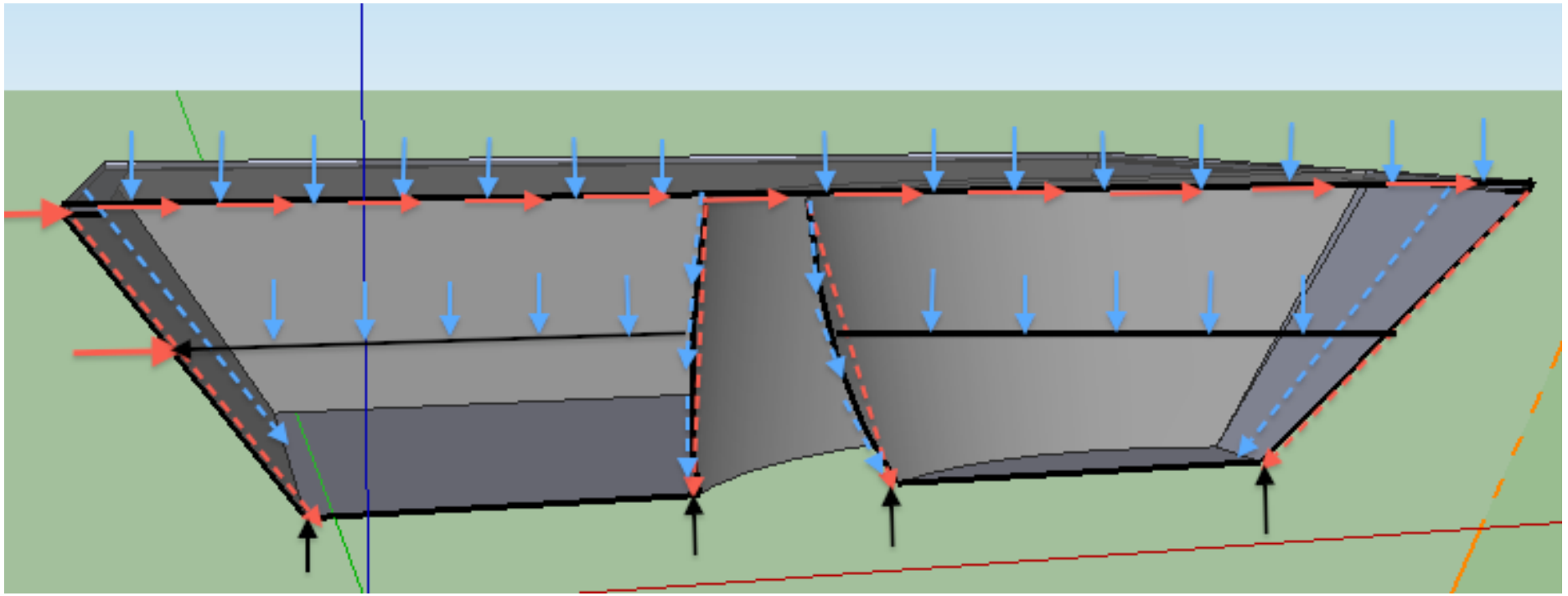
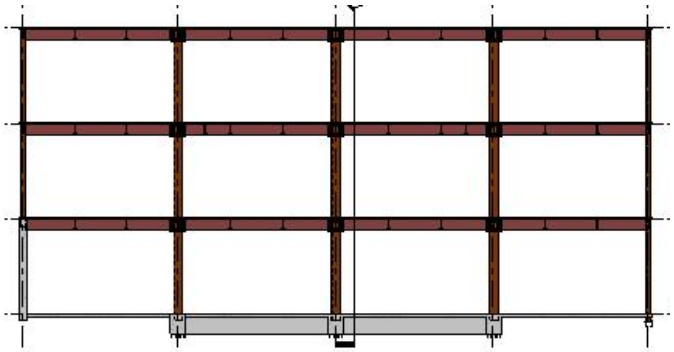
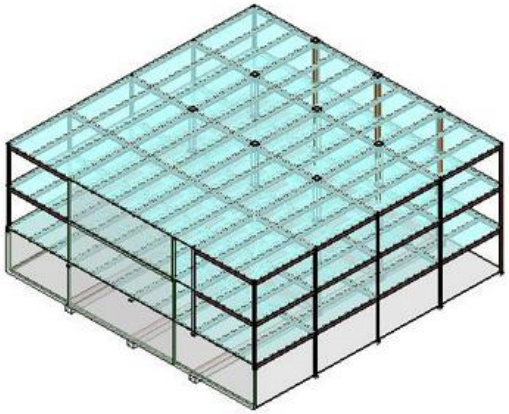


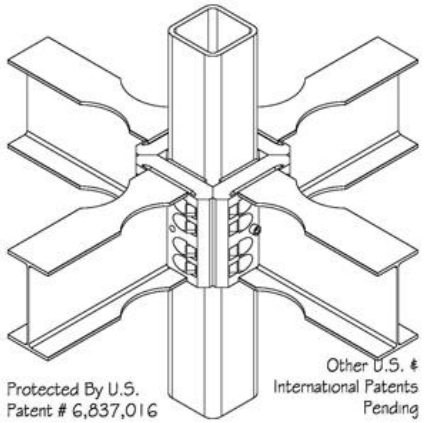
ORTHOGONAL CONCEPT

CONXTECH
SPACE FRAME SYSTEMS



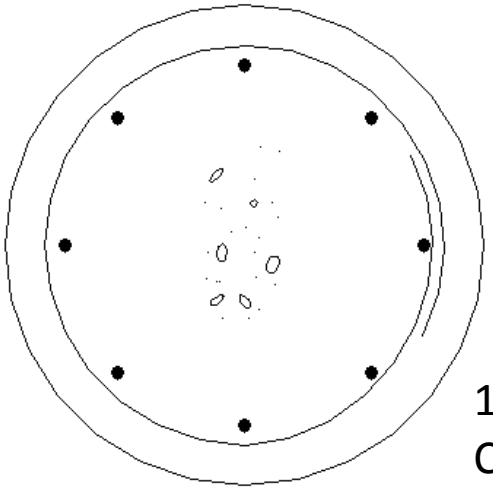
STEEL DESIGN





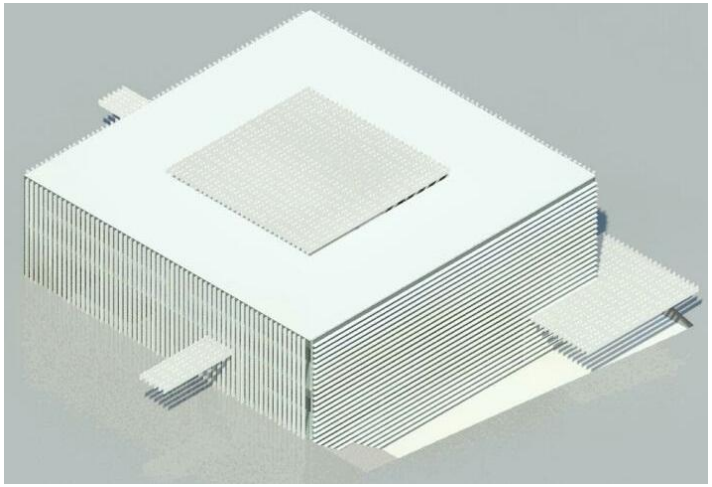
Standard bay width: 25’x25’ (allowed for use of ConXtech)

CONCRETE DESIGN

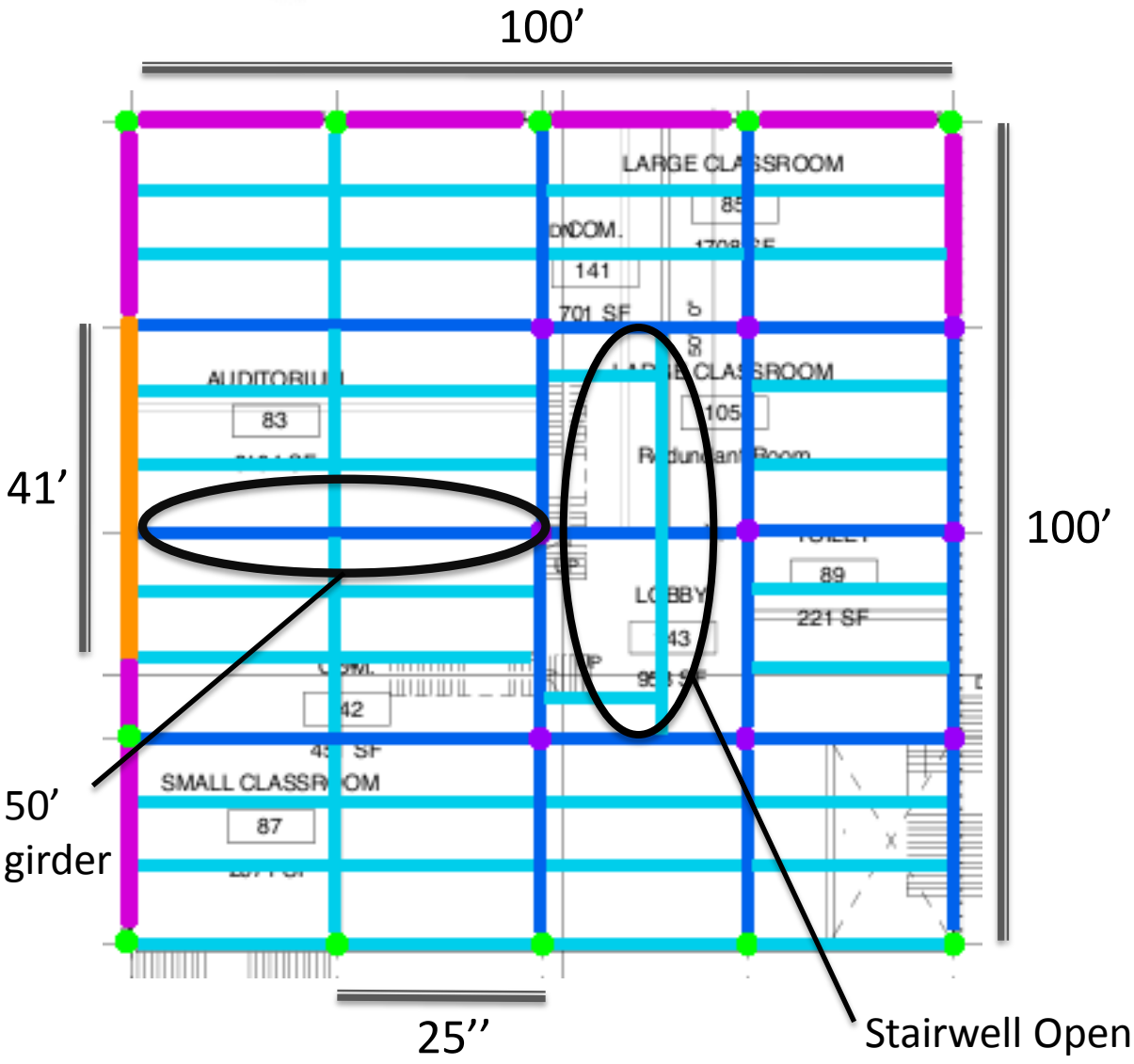


14”x14”
Column

ROUND COLUMN DESIGN



GROUND FLOOR



TOP OF BASEMENT WALL:

- Wall Thickness: 16”

SHEAR WALL:

- Wall Thickness: 12”

COLUMNS:

- Interior: HSS 16x16x5/8
- Exterior: HSS 8x8x1/2

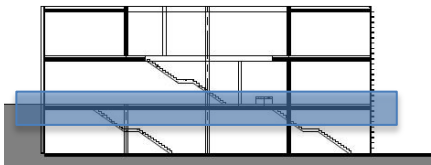
CONXTECH MOMENT FRAME:

- Girders: W 21x62

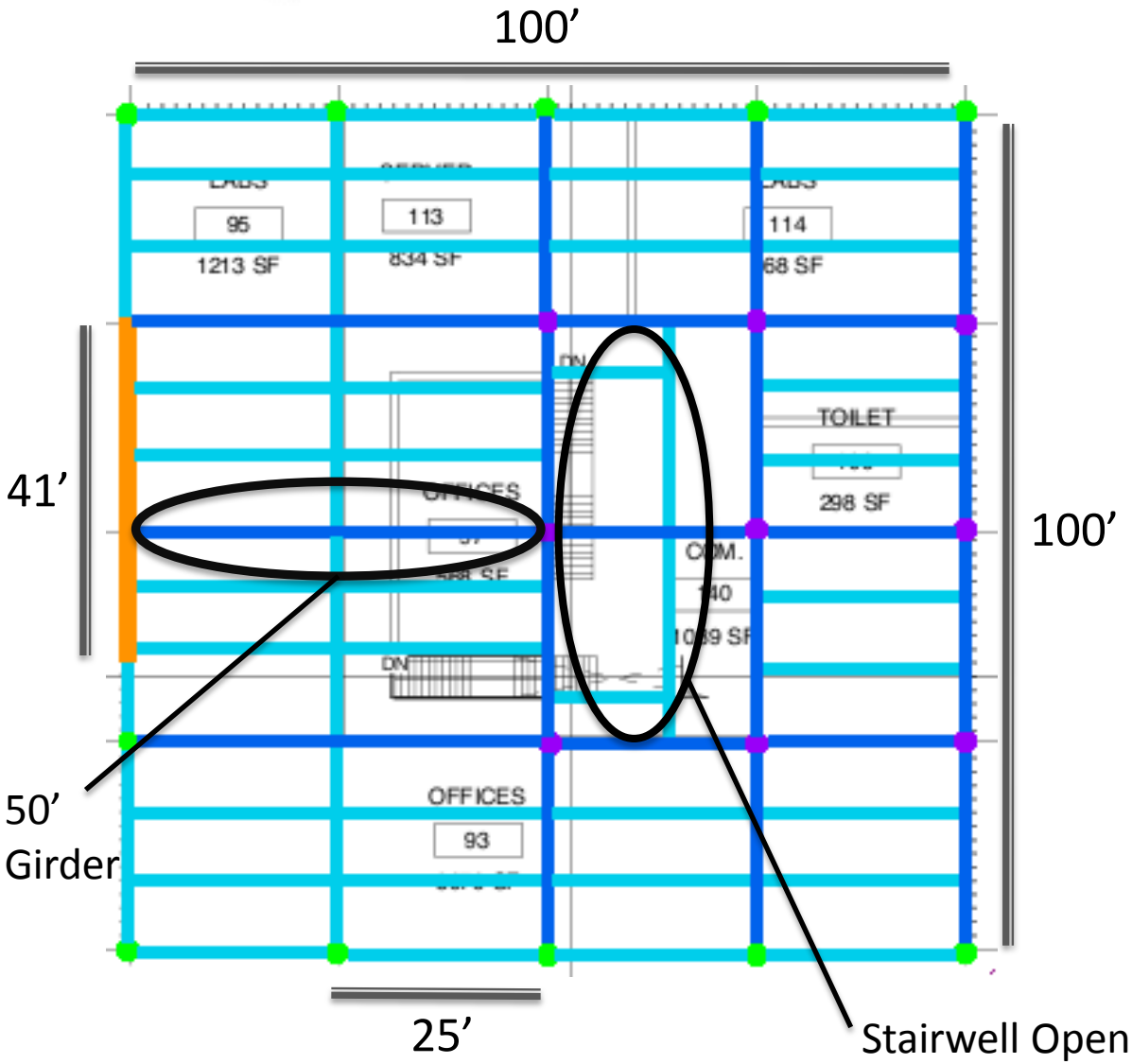
FLOOR BEAMS:

- East/West: W 18x35

North Elēvation



FIRST FLOOR & ROOF



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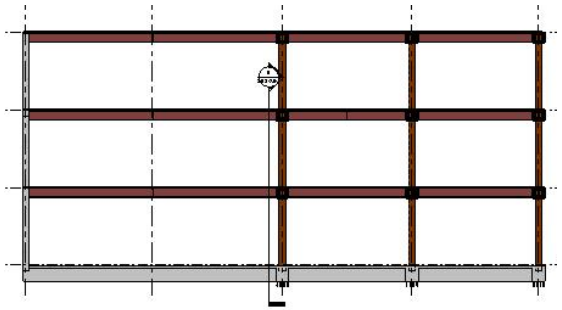
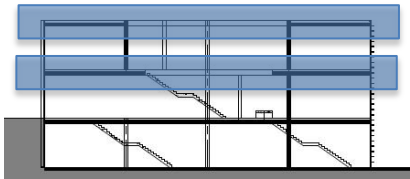
- E/W: W18x35

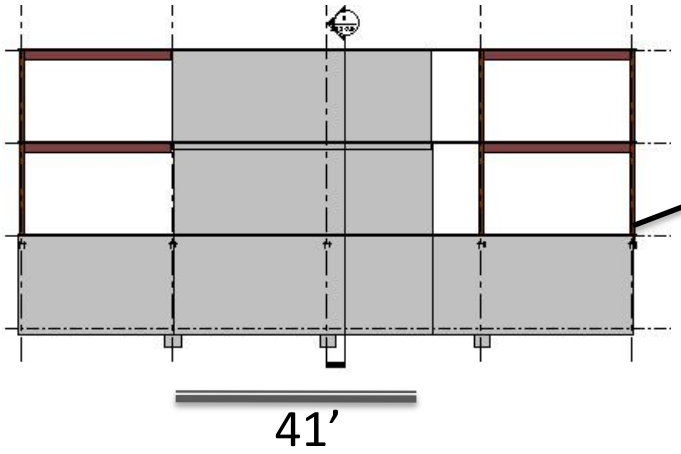


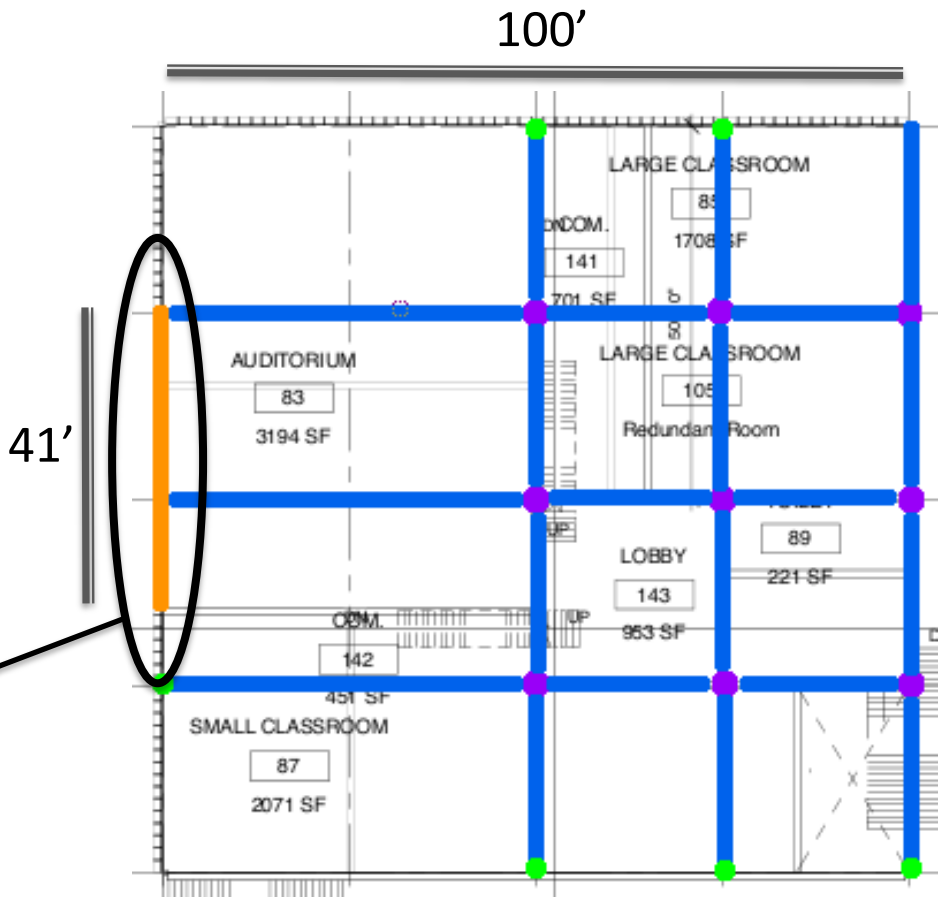
East Elevation



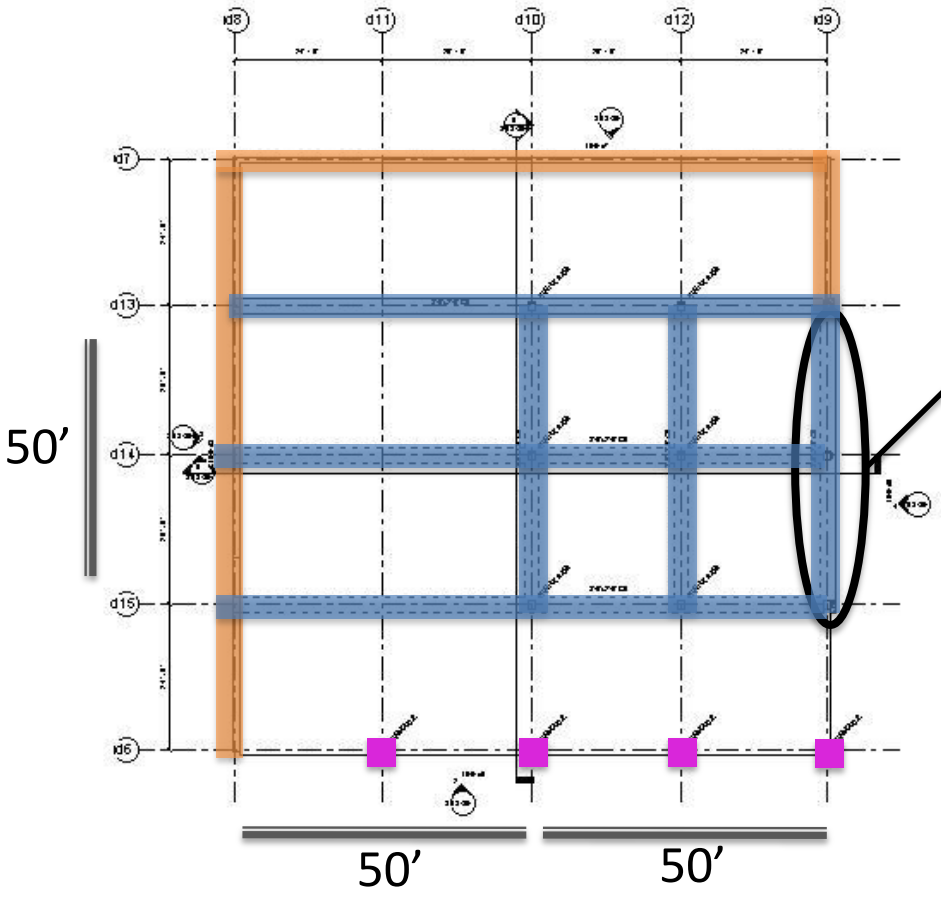
DUAL LATERAL RESISTING SYSTEM

CONXTECH 2-WAY
MOMENT FRAME
+
SHEAR WALL

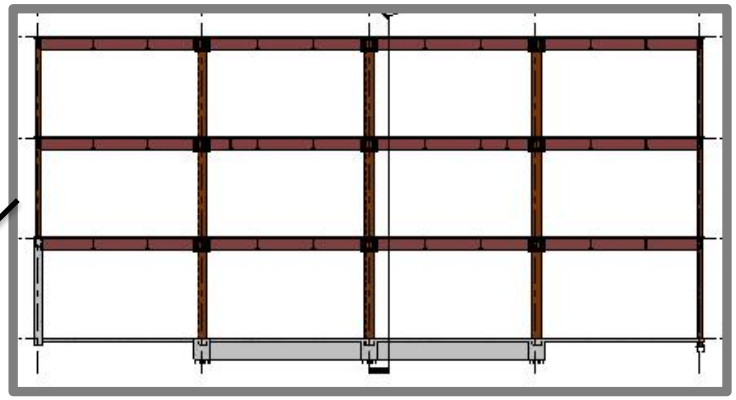




FOUNDATION DESIGN

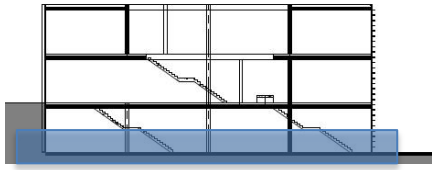


Elevation View

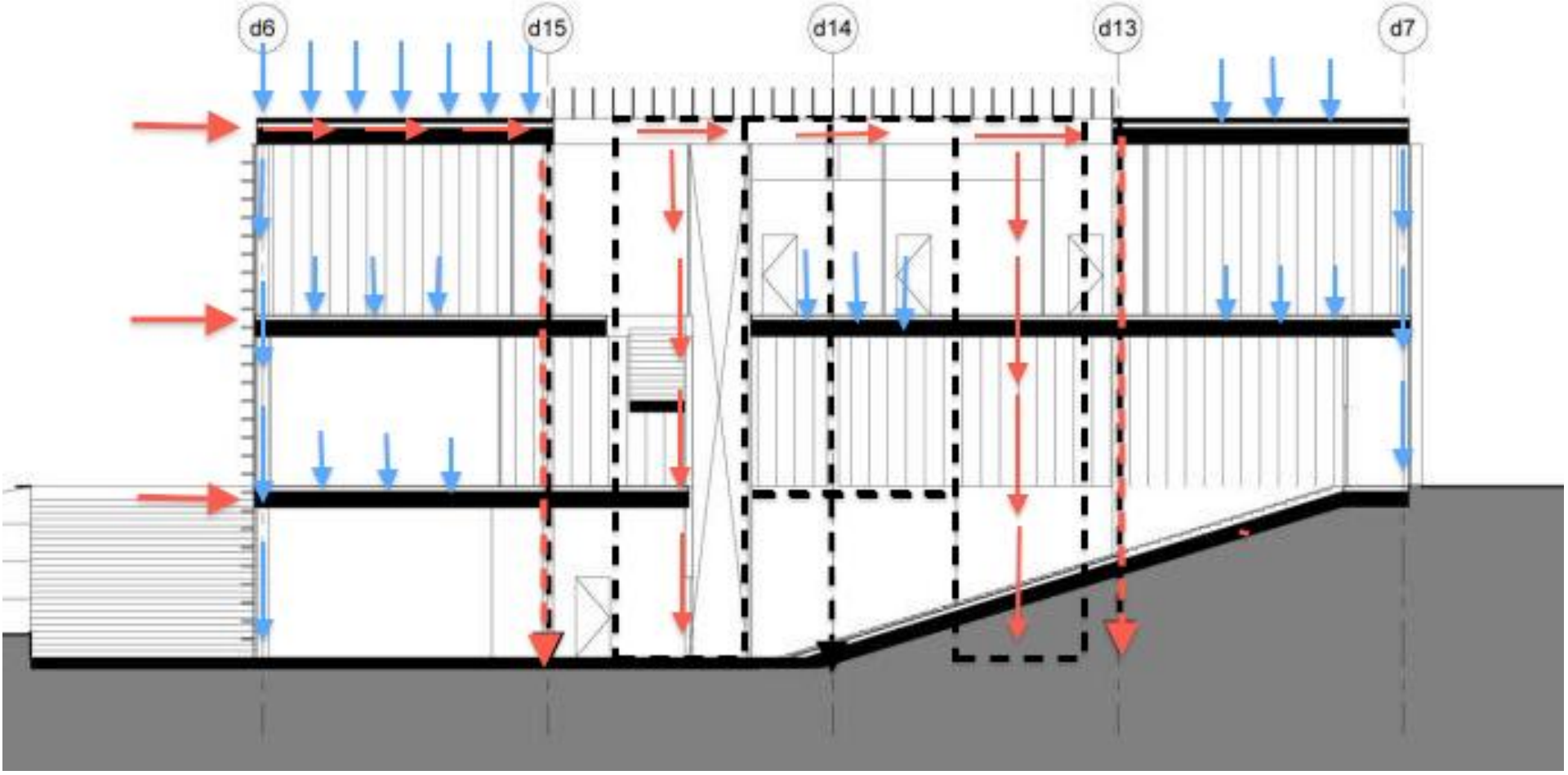


50’

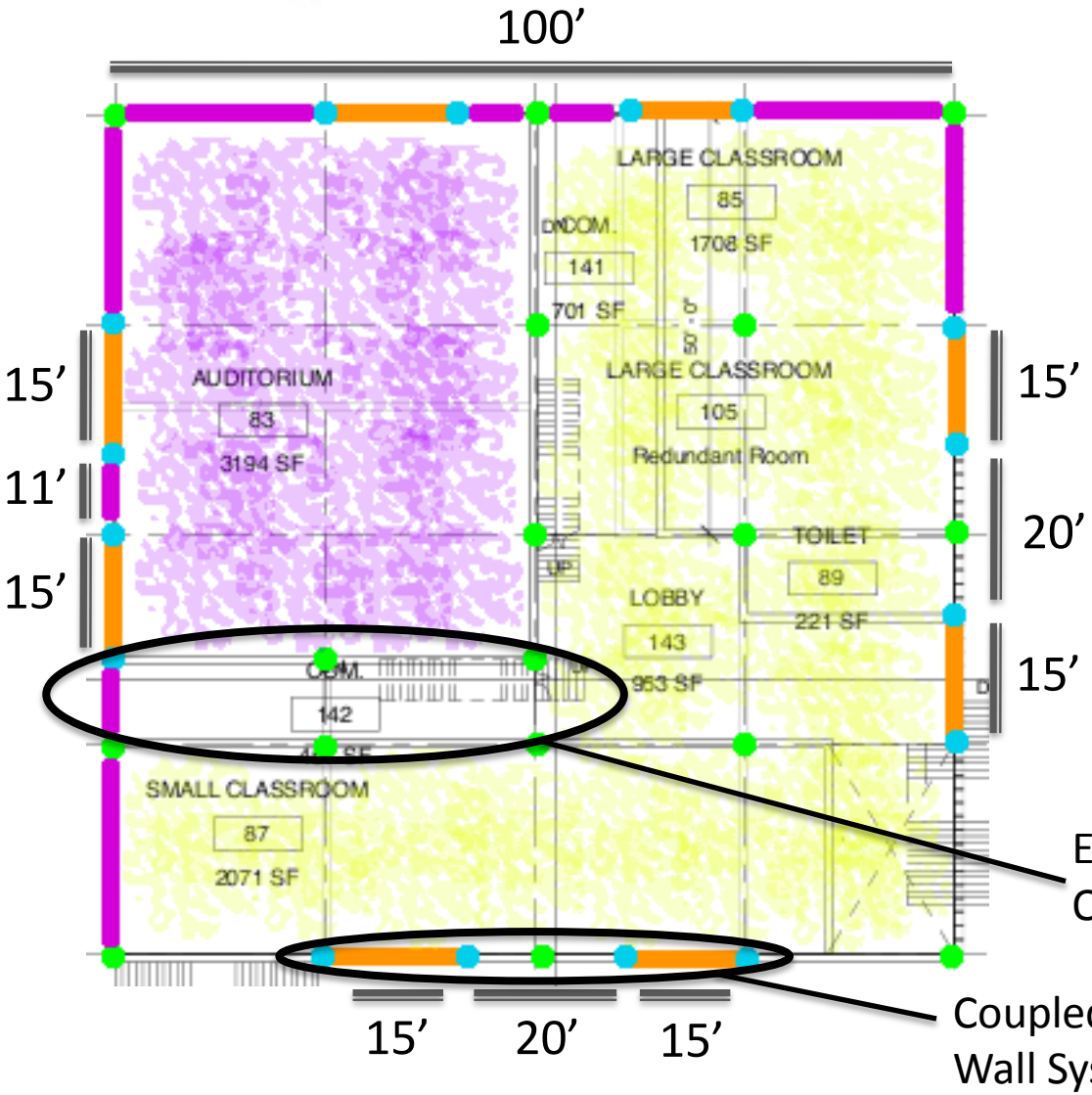
- Strip Footing 25’ x24”x12”
- Grade Beams 50’x3”x2.5”
- Isolated Spread Footings 16”x16”x12”



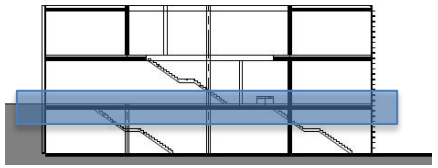
LOAD PATH



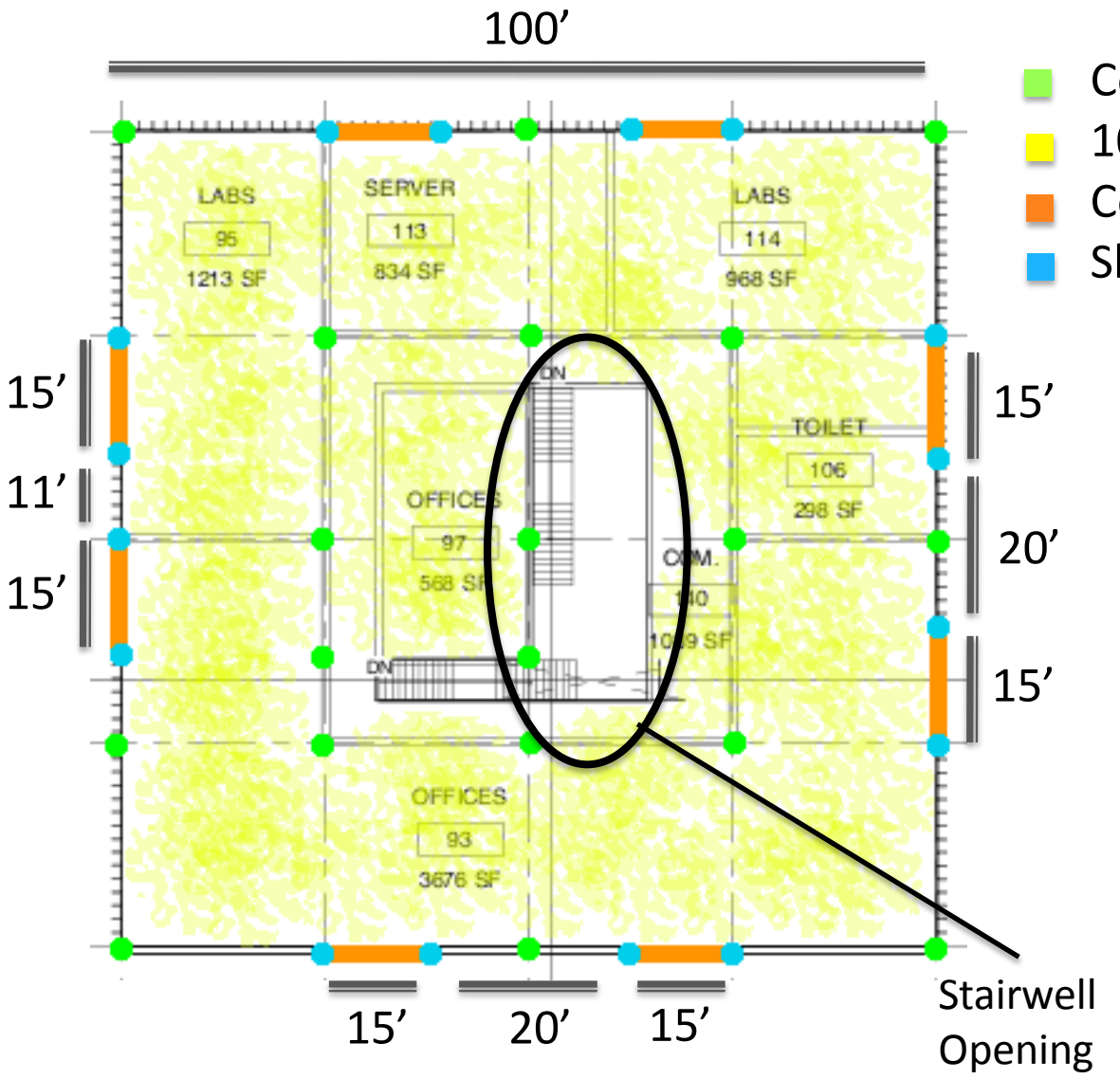
GROUND FLOOR



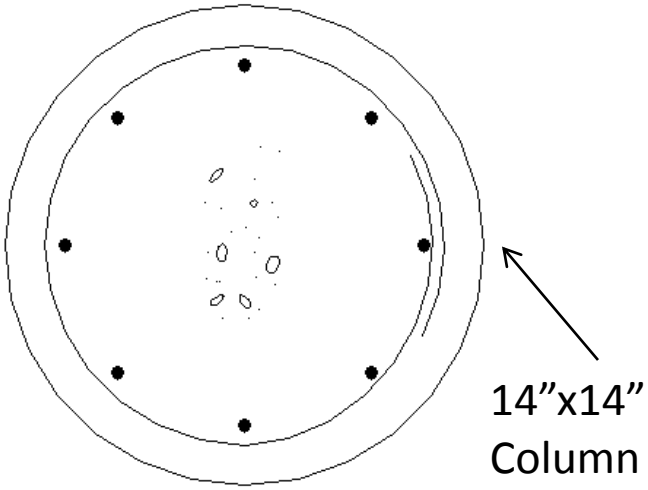
- Columns, Round 14”x14”
- 16” PT BubbleDeck slab with 14” bubbles
- 10” BubbleDeck slab with 7” bubbles
- Coupled Shear Walls
- Shear Wall Boundary Elements
- Top of Basement Walls



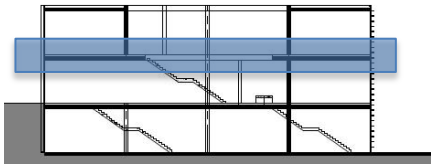
FIRST FLOOR



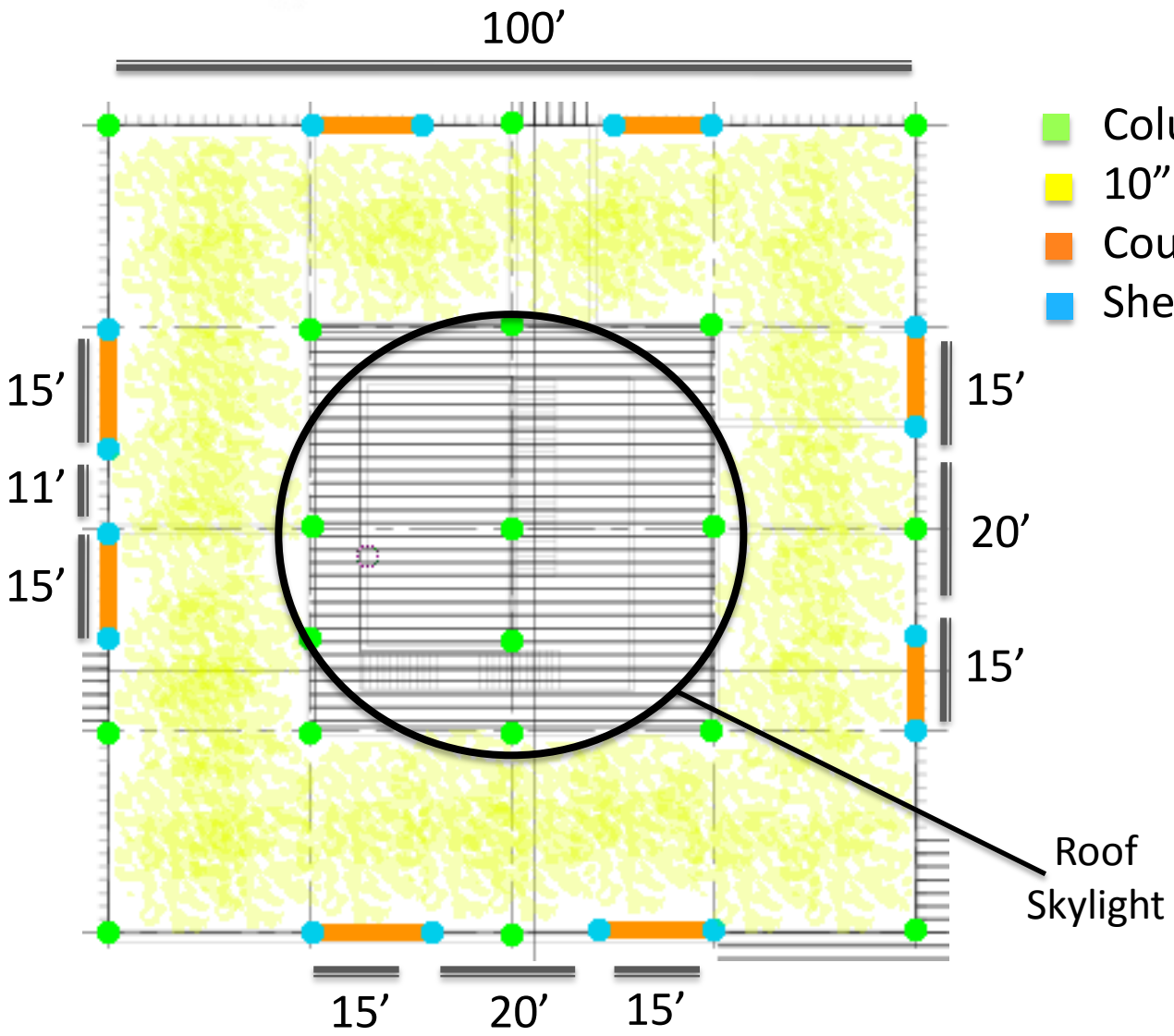
- Columns, Round 14”x14”
- 10” BubbleDeck slab, 7” bubbles
- Coupled Shear Walls
- Shear Wall Boundary Elements



ROUND COLUMN DESIGN



ROOF



- Columns, Round 14”x14”
- 10” BubbleDeck slab, 7” bubbles
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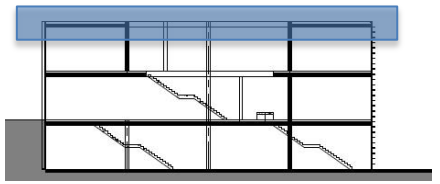
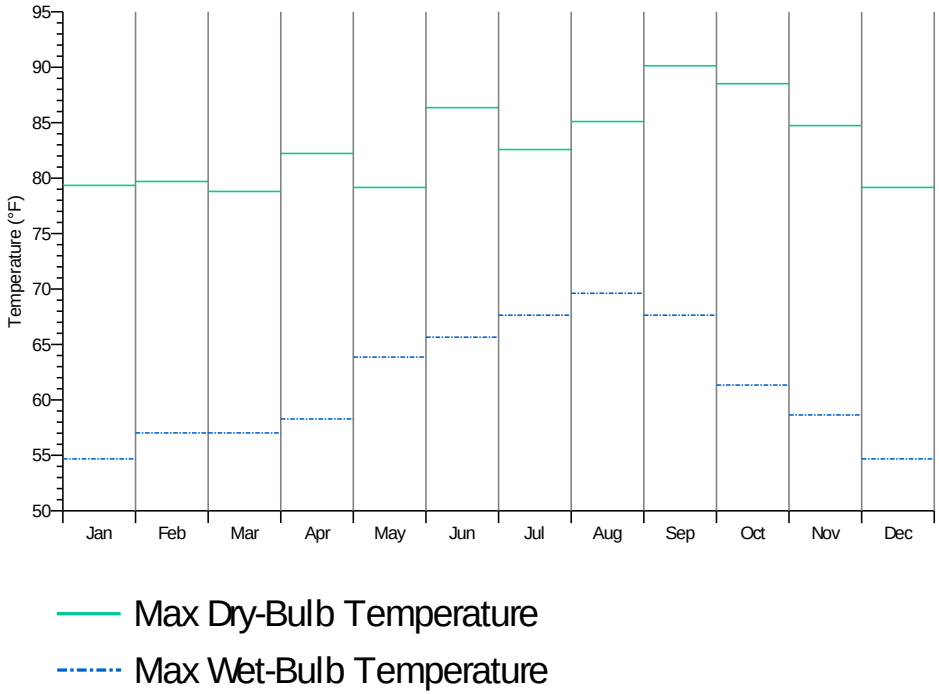
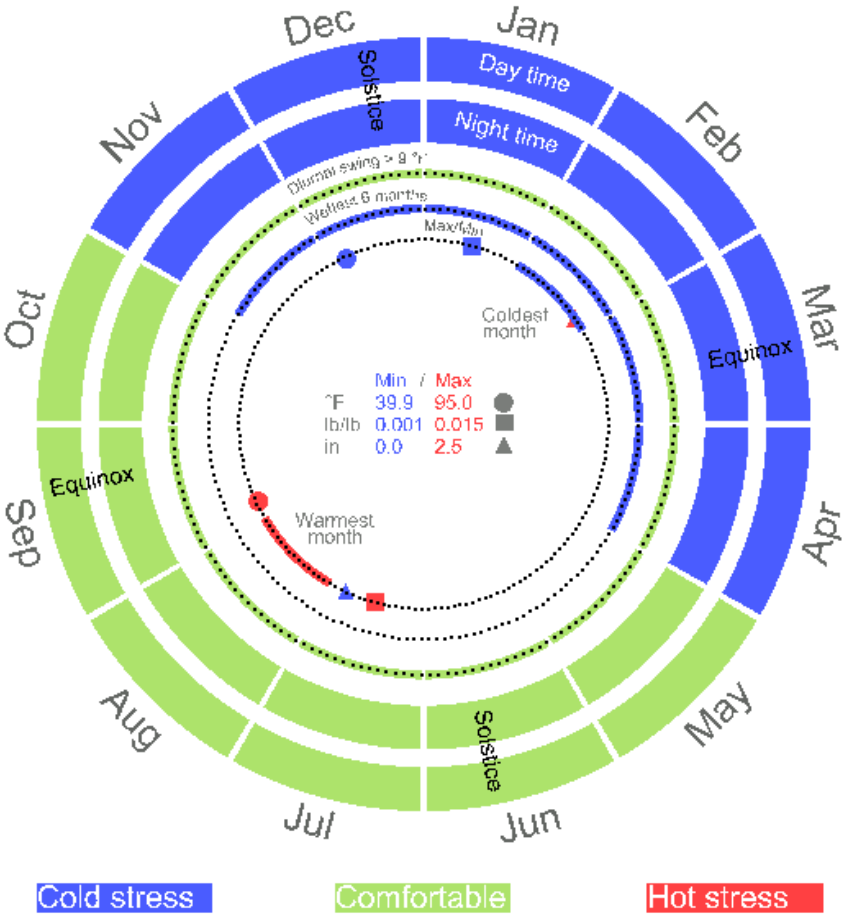
- Shear Wall Boundary Elements



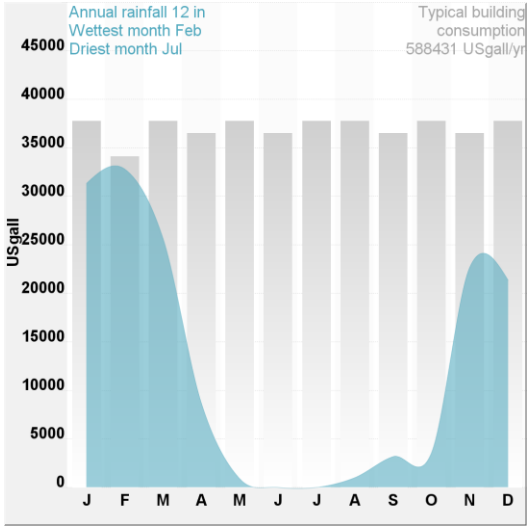
{MEP}

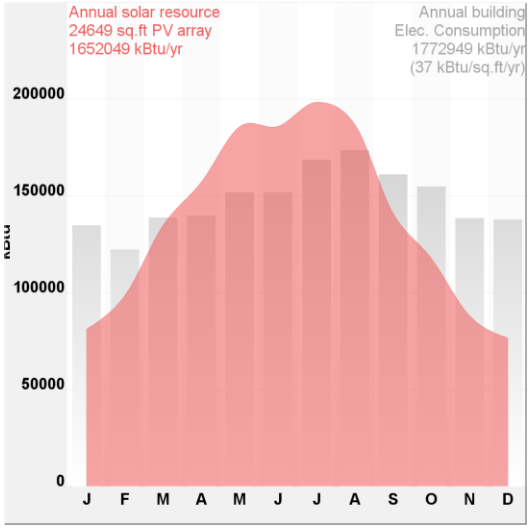
LOCAL WEATHER CONDITIONS





LOCAL RESOURCES





Natural resources

Annual solar resource 211 kWh/ft^2/yr *(93 %)*

Annual rainfall 12“ *(26 %)*

On campus cogeneration plant

Electricity

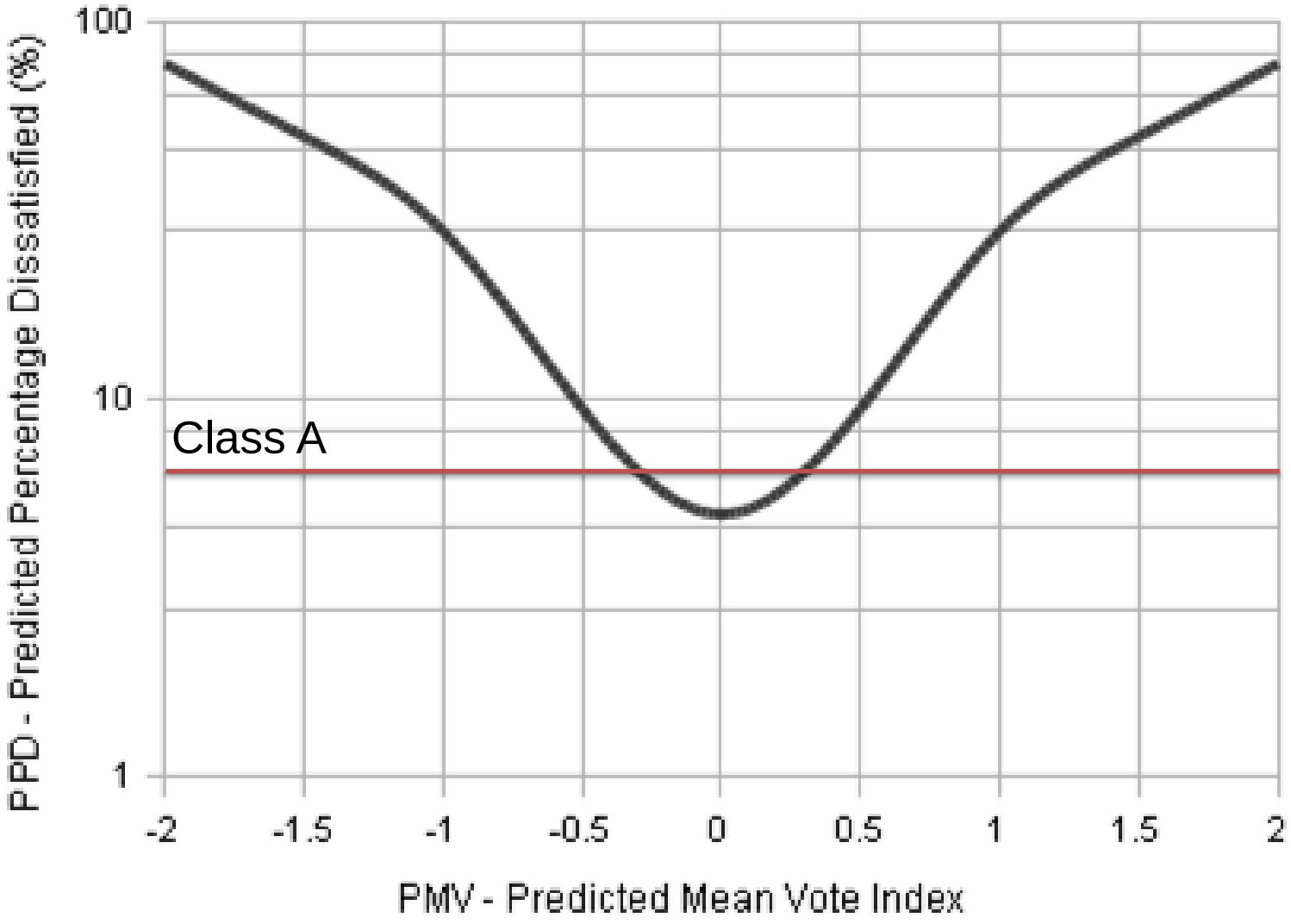
Steam

Chilled water

LADWP

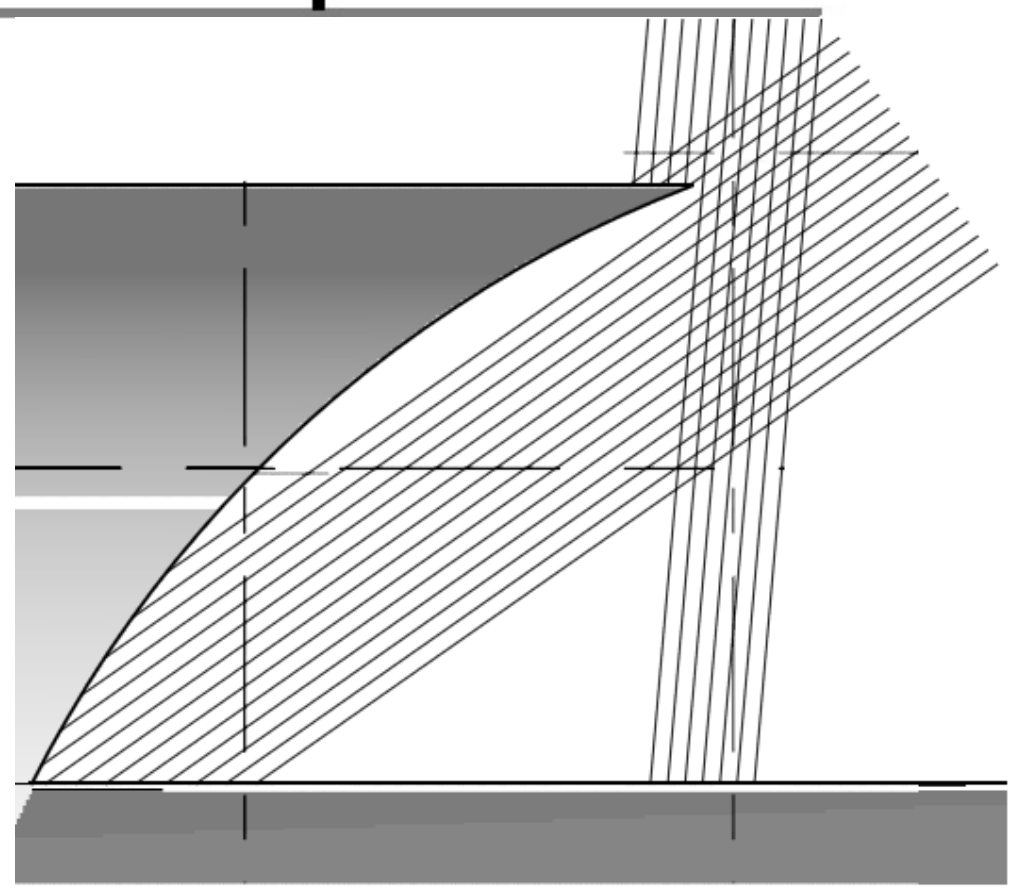
Water

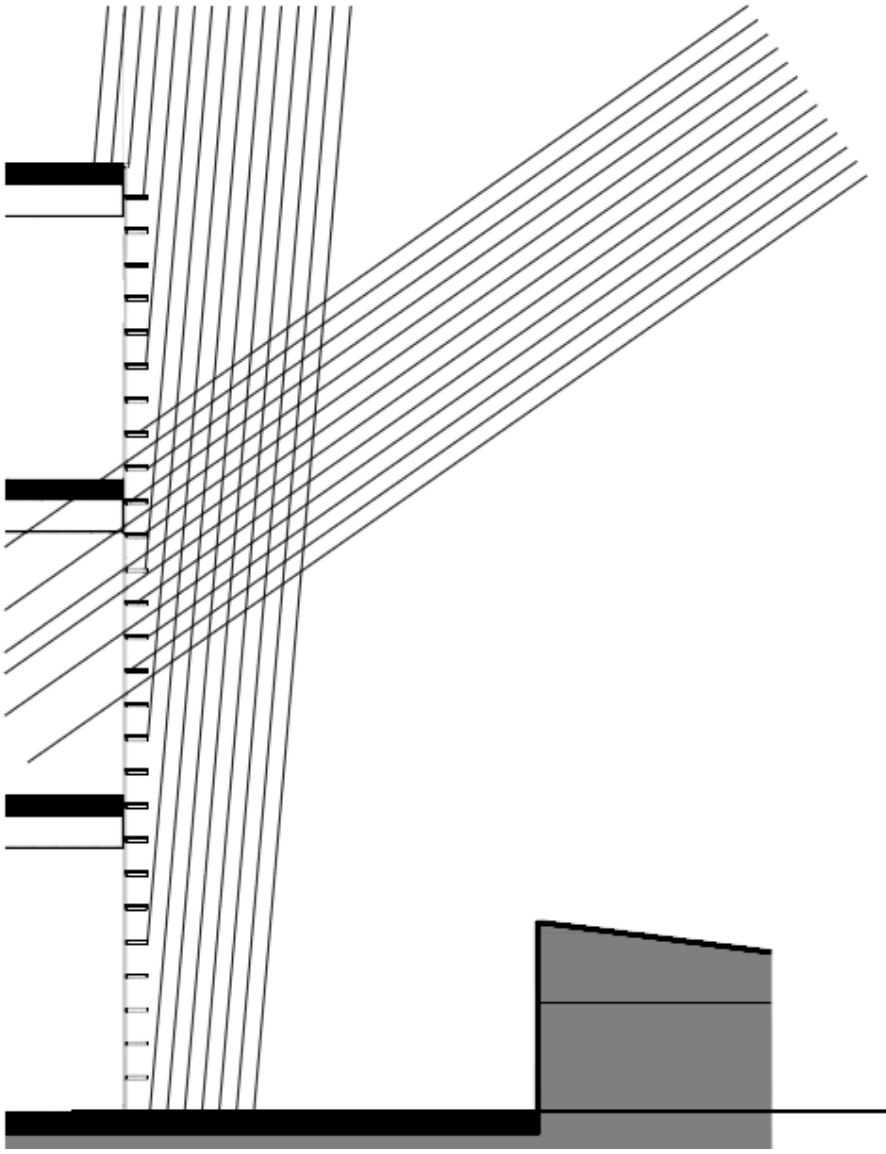
INDOOR ENVIRONMENT



INTEGRATED DESIGN

MEP





Better to reduce loads than to raise ventilation/cooling!

STRATEGY | REDUCE

Reduce ventilation demand
- Avoid emitting materials
- Sensors

Reduce cooling demand
- Insulation
- Cool roof
- Recirculate return air
- Sensors

Reduce fresh water use
- Energy efficient products
- Sensors

Reduce fresh water use
- Waterless urinals
- Water saving sanitary wares
- Rainwater harvesting
- Grey water recycling

STRATEGY | SYSTEM

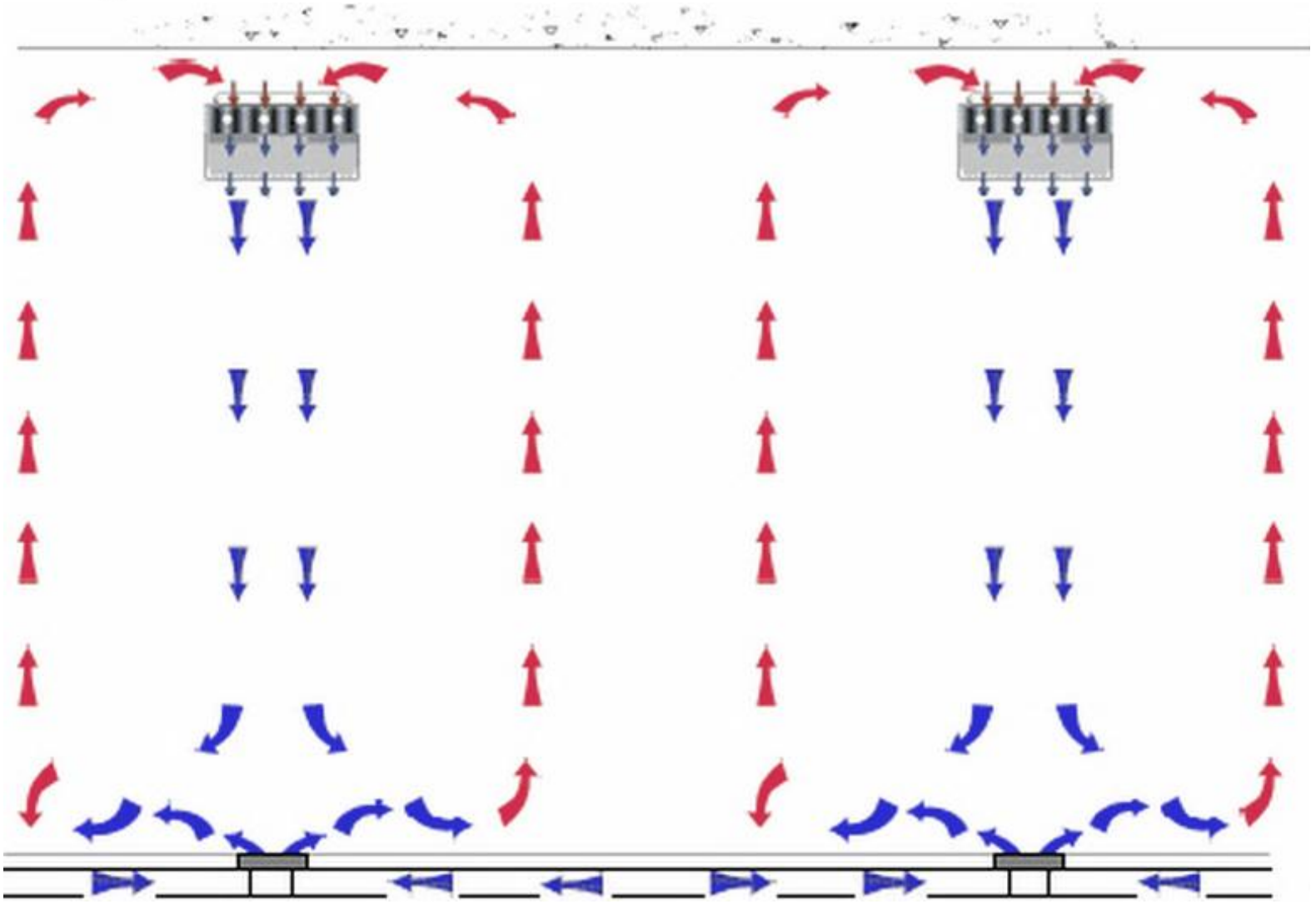
	Air for ventilation Water for cooling	Air for ventilation Air for cooling
Air flow needed	11,500 cfm	45,000 cfm
Main duct diameter (max)	37”	72”

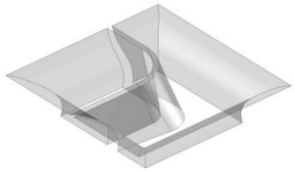
Chilled beams will be used for cooling

Reason 1: Water better than air to remove sensible heat
Reason 2: Cooling by air requires larger air flow = larger ducts

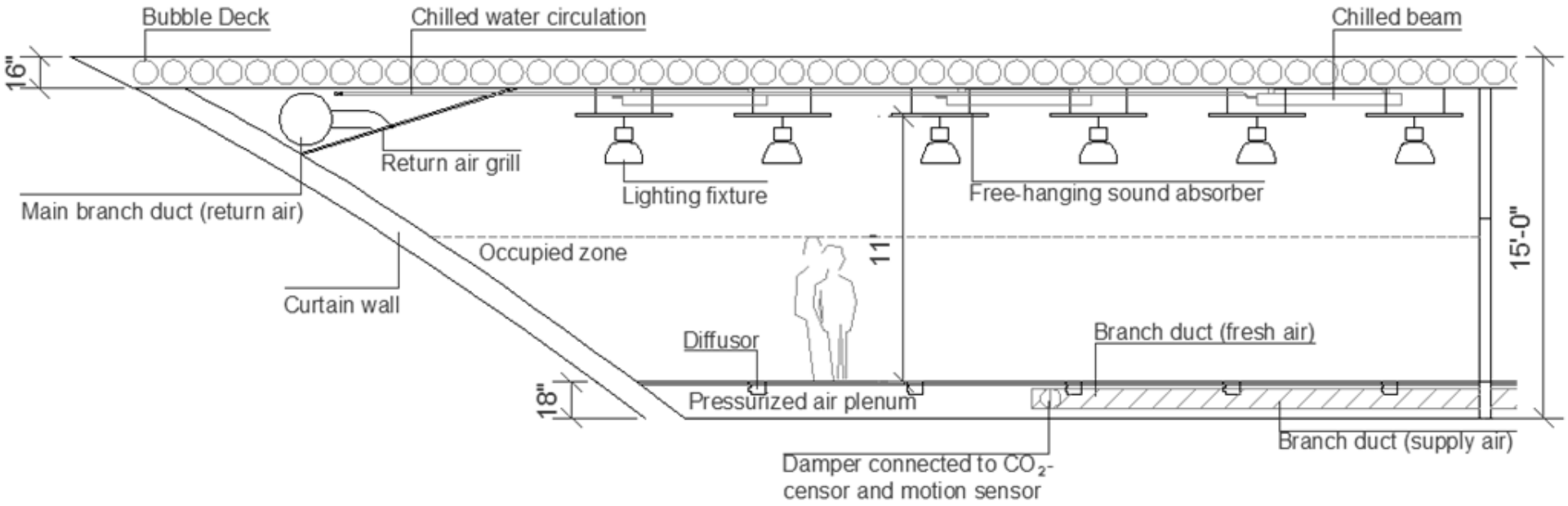
VENTILATION / COOLING

MEP

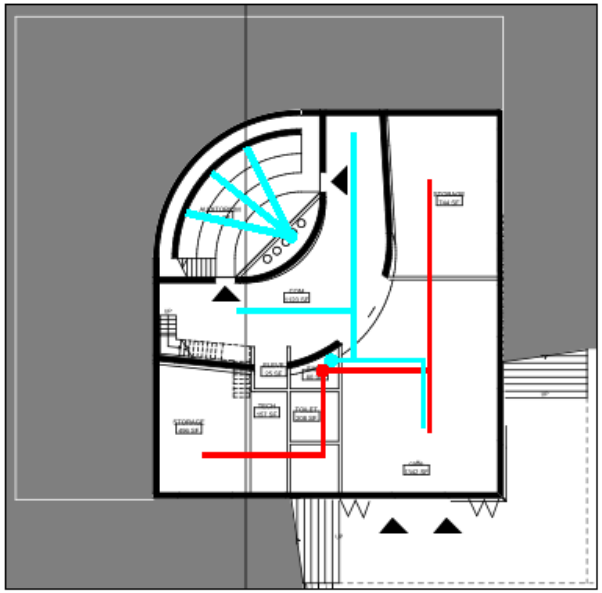


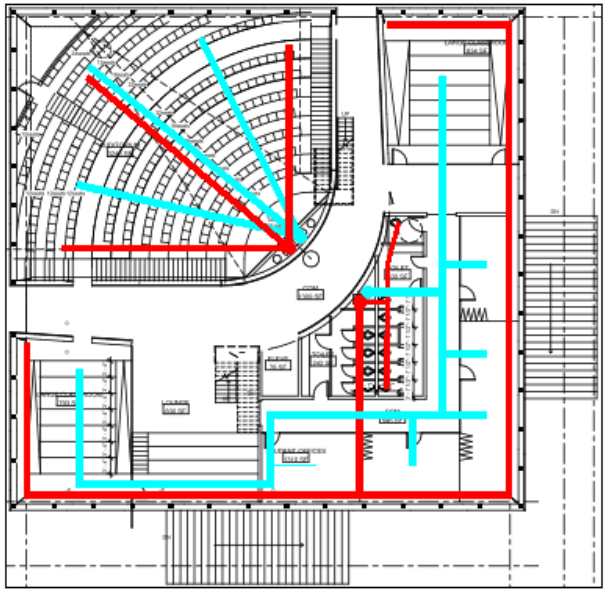


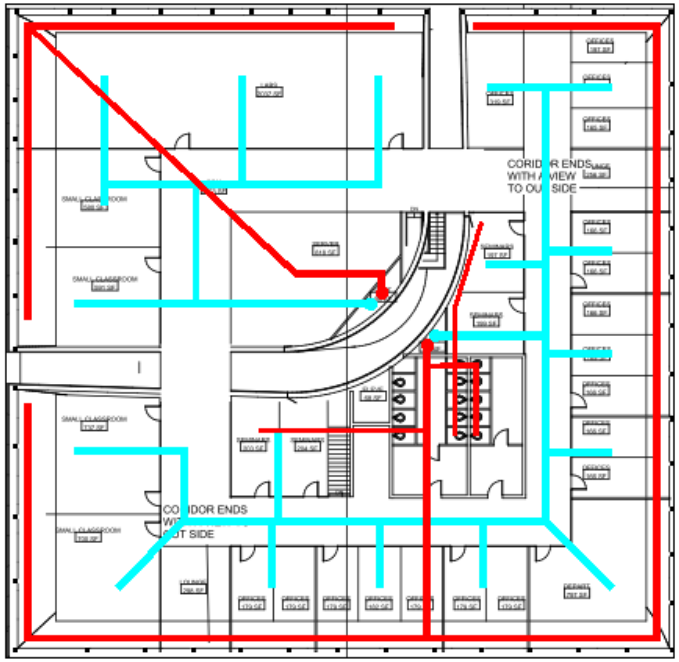
AIR DISTRIBUTION | ROOM



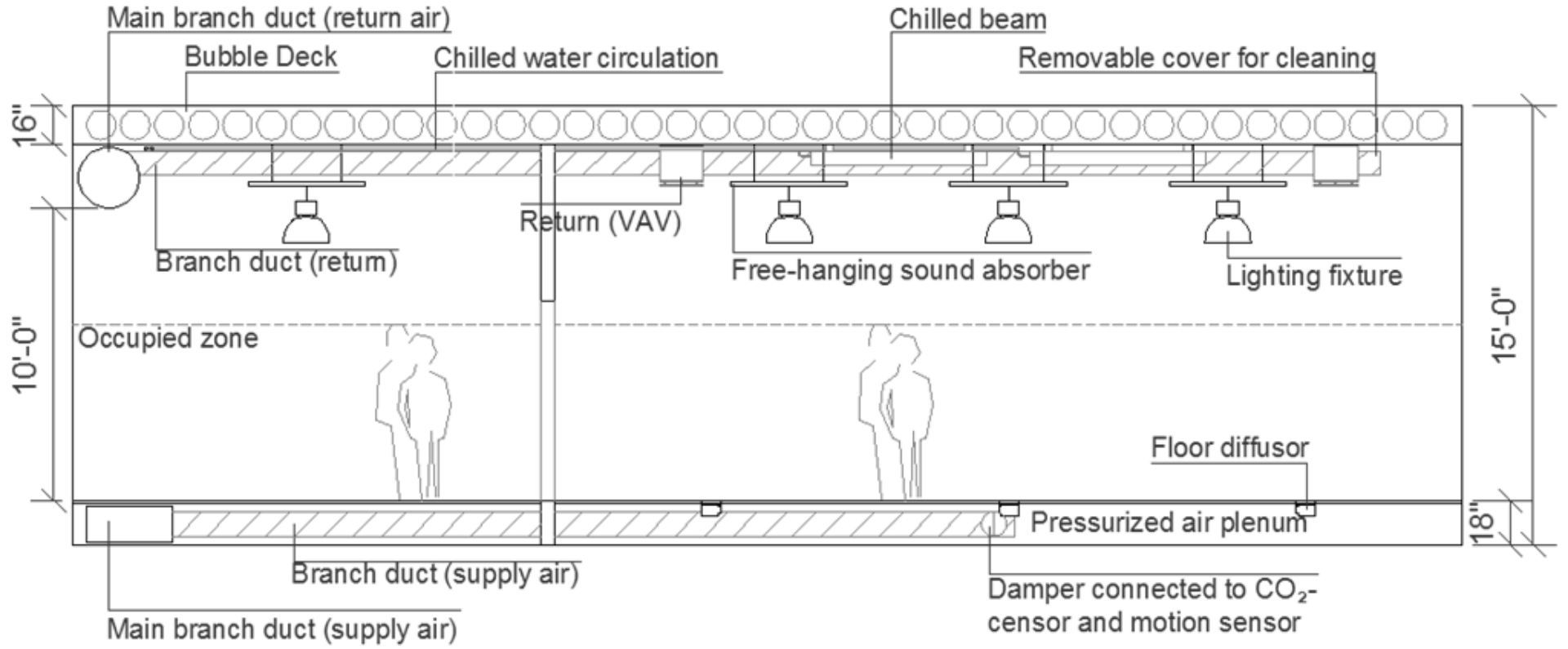
AIR DISTRIBUTION | BUILDING | MEP



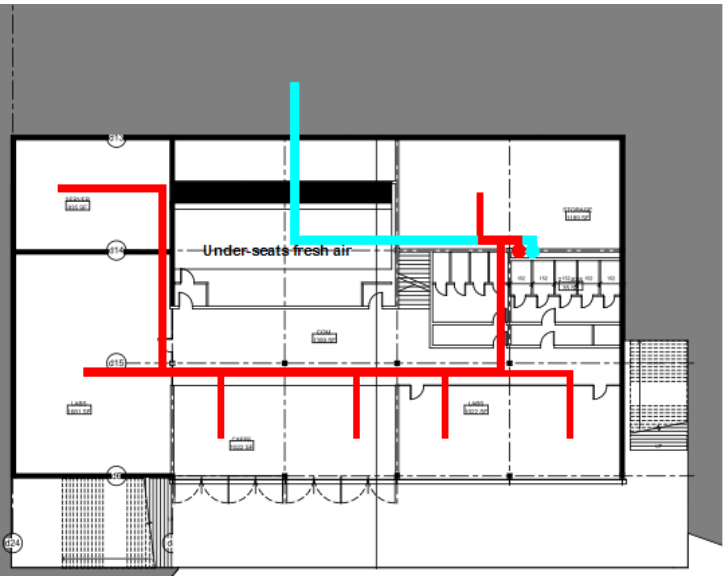


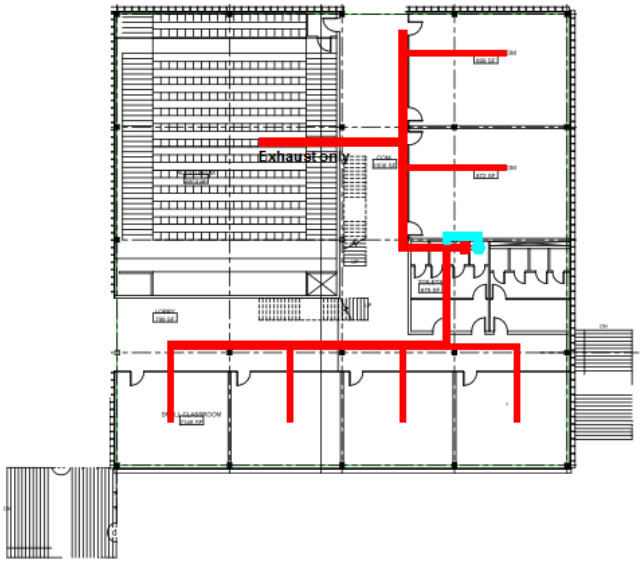


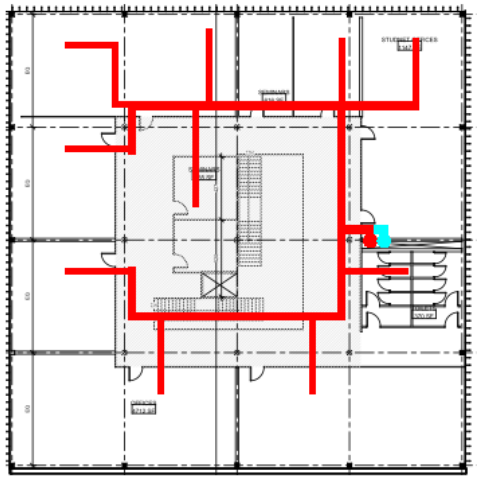
AIR DISTRIBUTION | ROOM



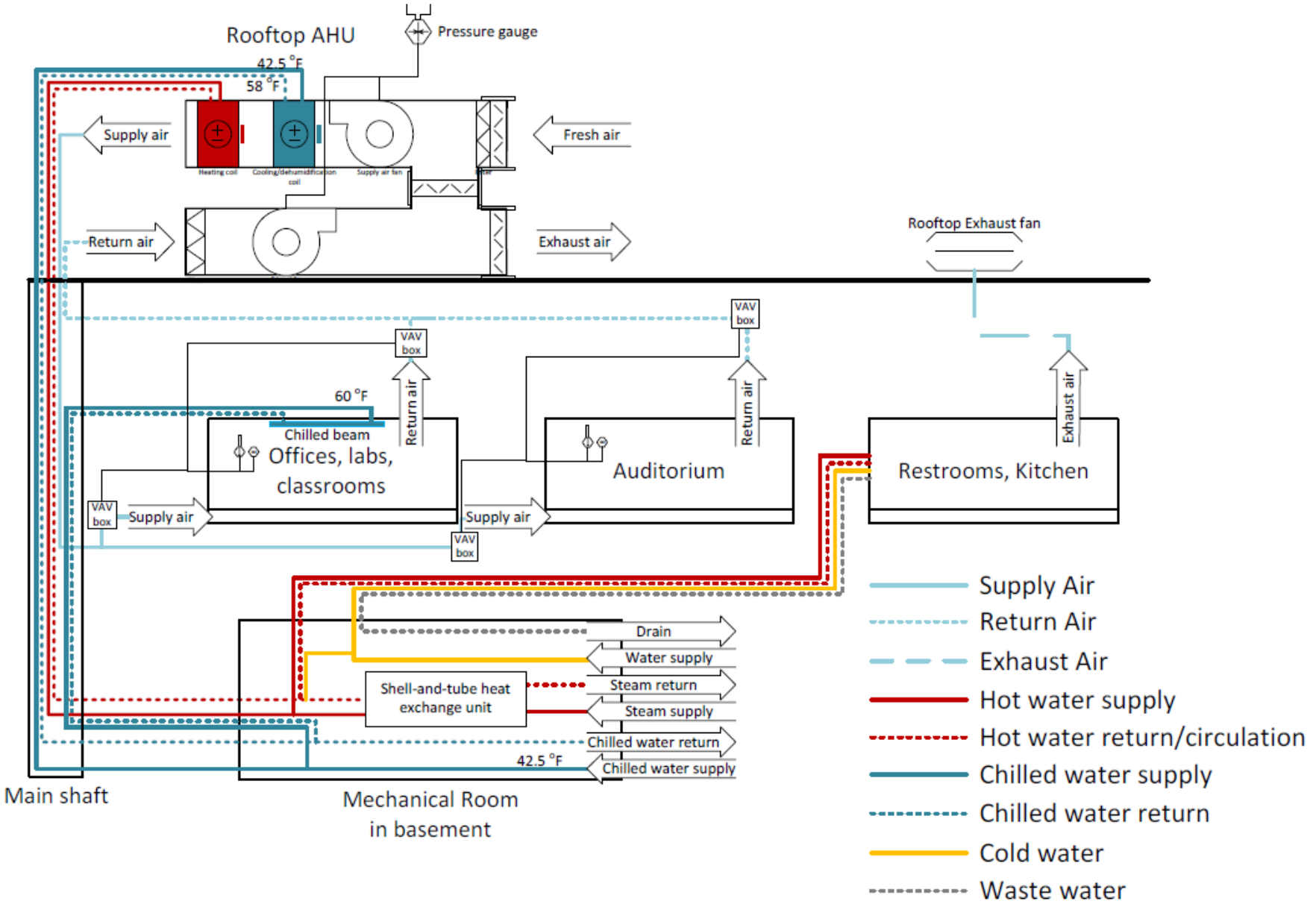
AIR DISTRIBUTION | BUILDING | MEP





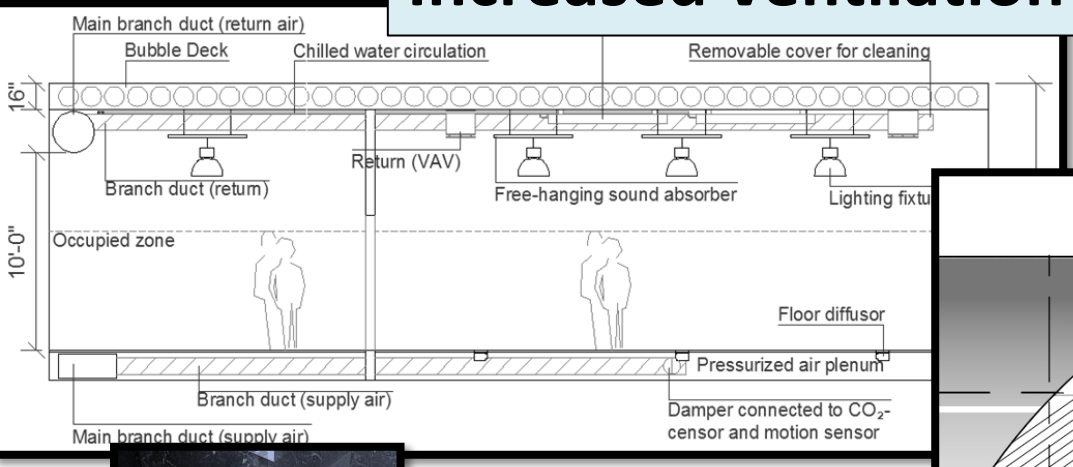


OVERVIEW

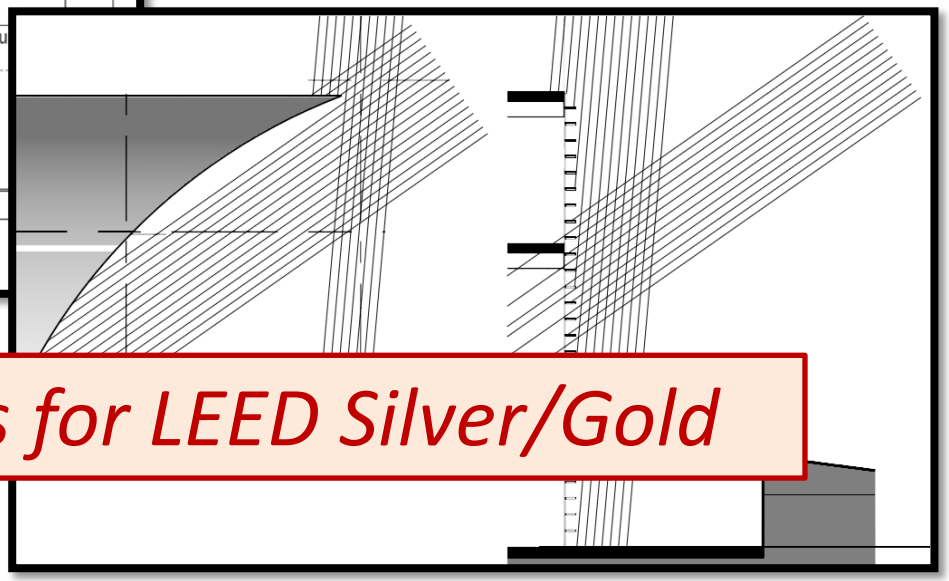

Rooftop AHU
Pressure gauge
42.5 °F
58 °F
Supply air
Fresh air
Return air
Exhaust air
Rooftop Exhaust fan
VAV box
60 °F
Chilled beam
Return air
Offices, labs, classrooms
Auditorium
Restrooms, Kitchen
Exhaust air
Supply air
Drain
Water supply
Steam return
Steam supply
Shell-and-tube heat exchange unit
Chilled water return
42.5 °F
Chilled water supply
Main shaft
Mechanical Room in basement
Supply Air
Return Air
Exhaust Air
Hot water supply
Hot water return/circulation
Chilled water supply
Chilled water return
Cold water
Waste water

SUSTAINABILITY

Increased Ventilation

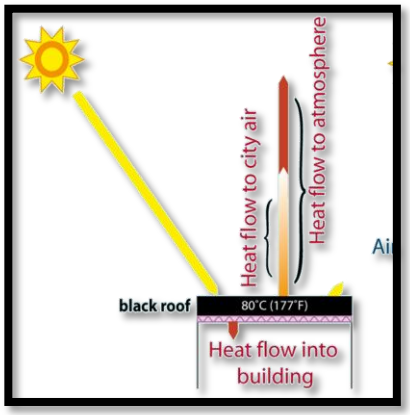


Energy Savings



Enough points for LEED Silver/Gold

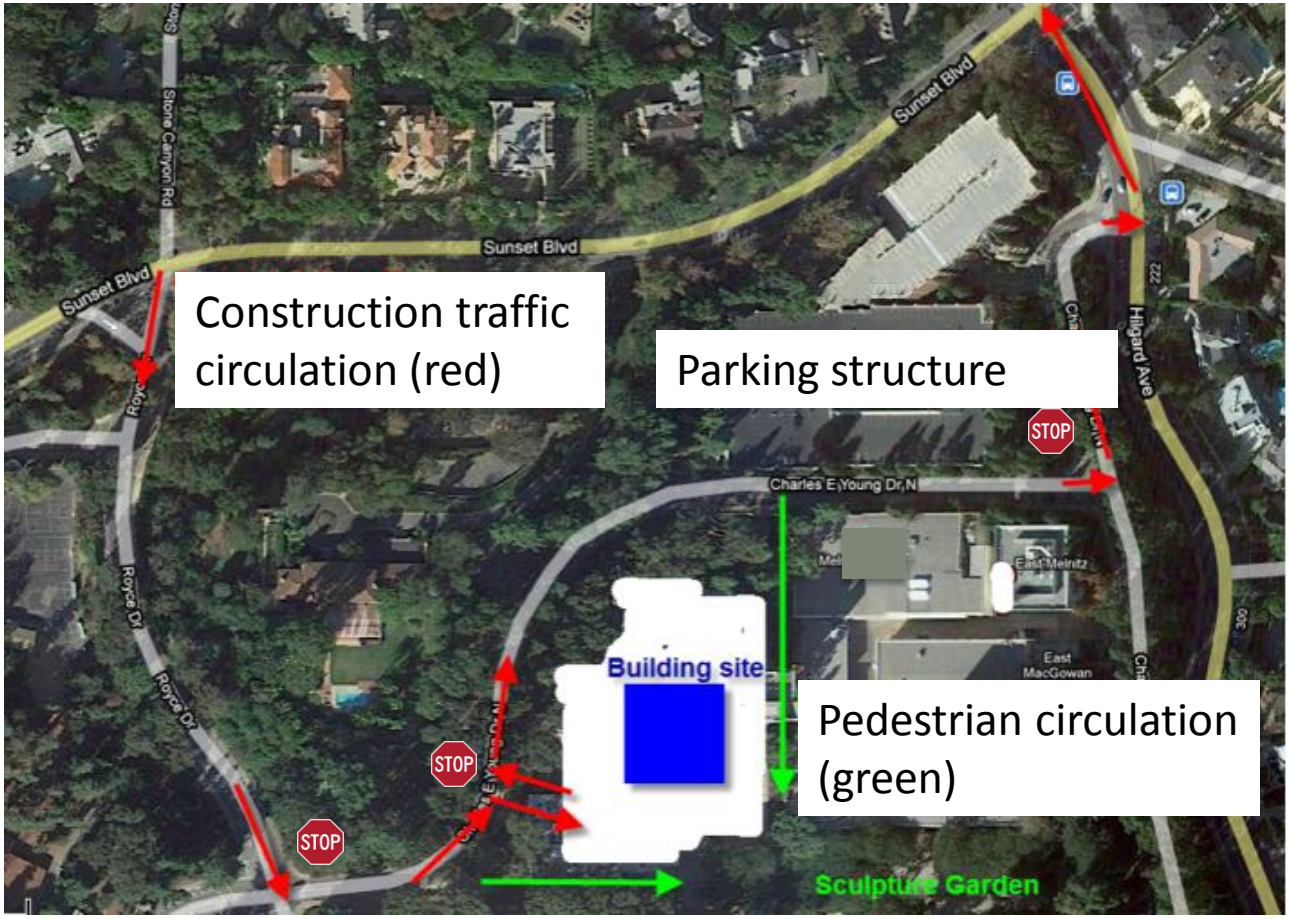
Water Savings



Reflective Roof

{CM}

TRAFFIC

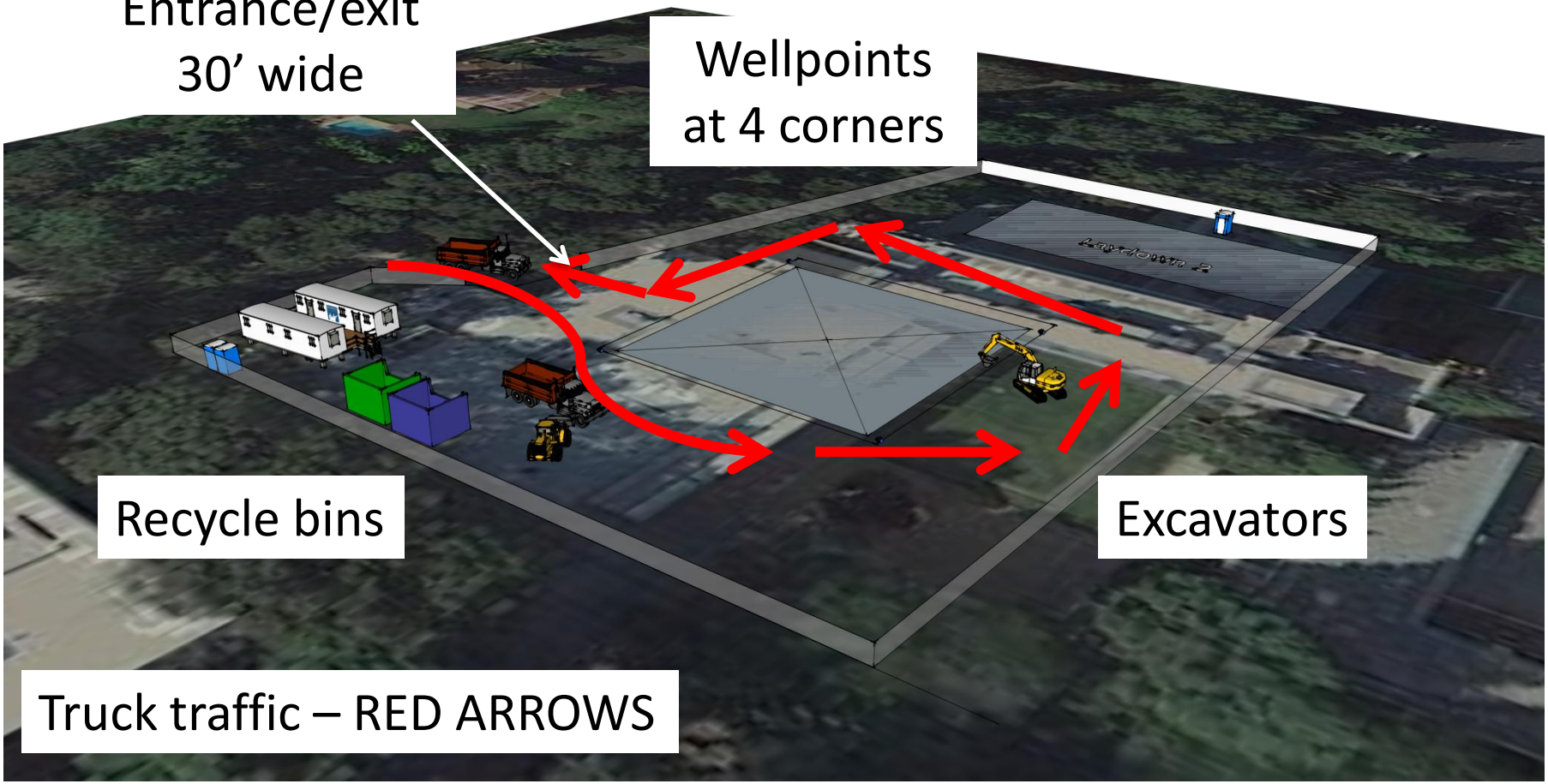


STOP Potential traffic-control sites

Site logistics

EXCAVATION

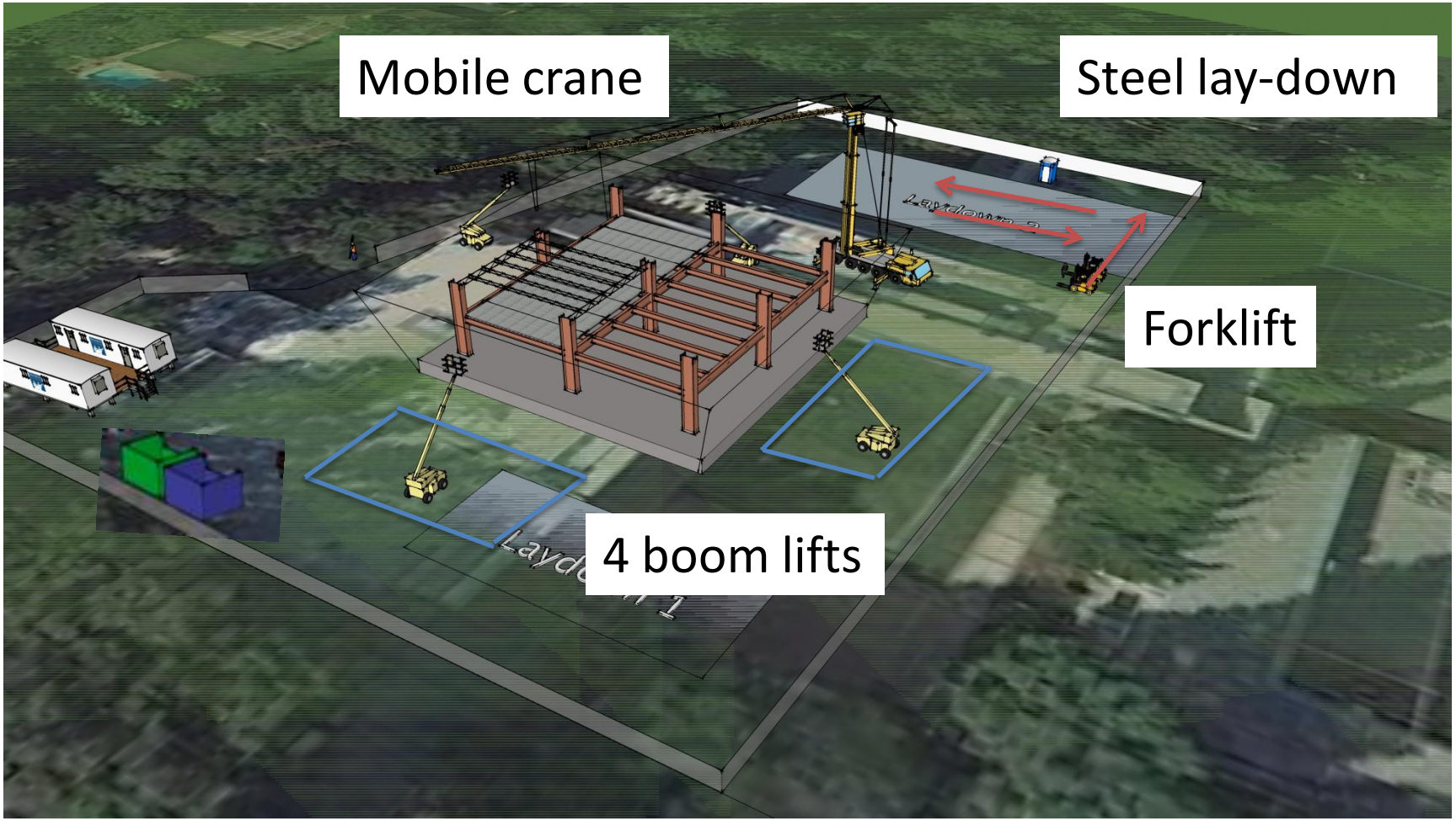
CM



Site logistics

STEEL/CONXTECH

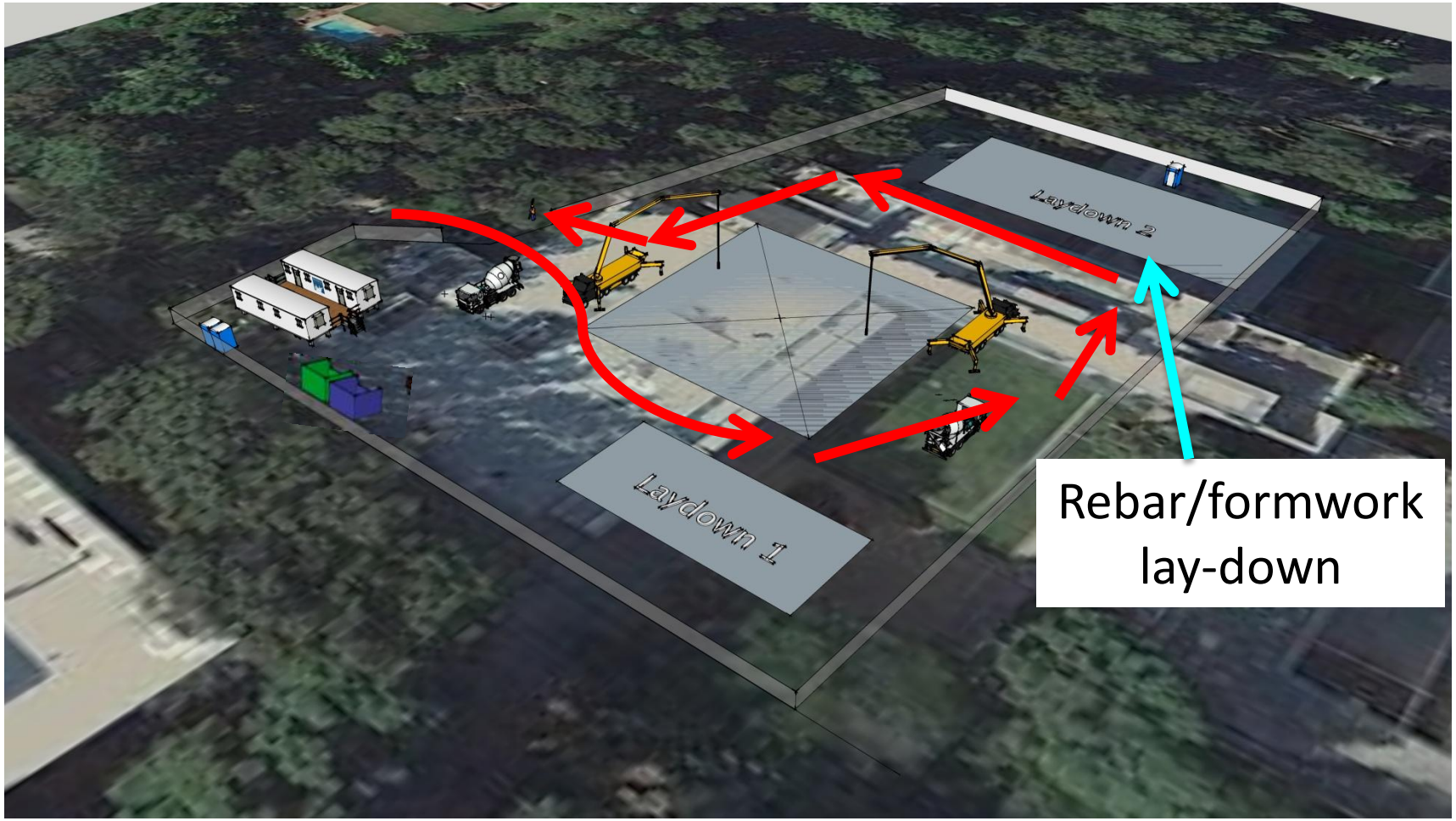
CM



Site logistics

CONCRETE

CM

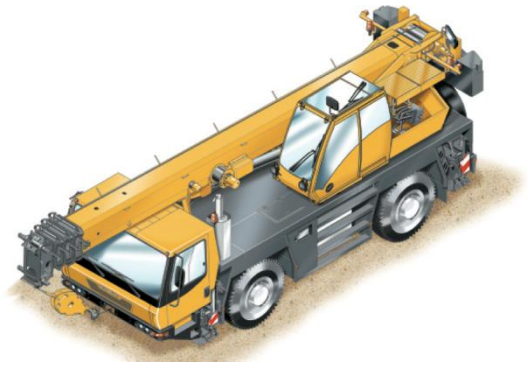


EQUIPMENT

CM

Crane

Manitowoc GROVE GMK2035E



- Capacity – 35 USt
- Boom – 30’ to 95’
- Outrigger pads store within crane width

Concrete Pump

SCHWING AMERICA INC.

Schwing 42

- Boom pump
- Hydraulic outrigger
- MACK engine
- PTO Pump power

Excavator

WACKER NEUSON

Compact Excavator 14504

- 101.9 Hp
- 18’ Digging Depth
- 30’ Digging Radius

ORTHOGONAL STEEL

- ‘Life-size erector set’
- FAST - 10,000 GSF/day

CONXTECH®
SPACE FRAME SYSTEMS

GOING NATIVE

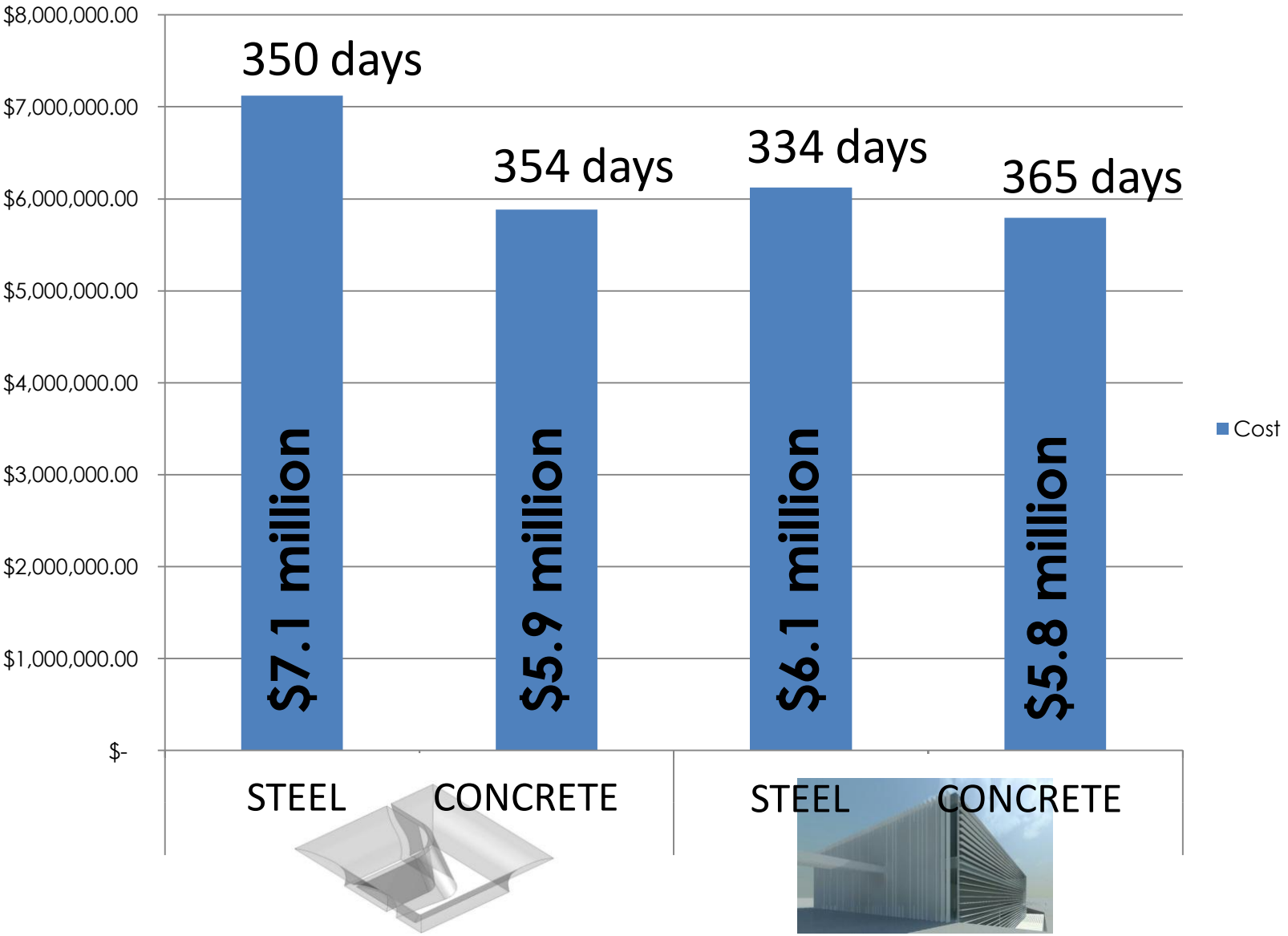
- Hire local companies
- Buy local construction materials
- Reuse/recycle construction waste AMAP

MIKE PEARSON CONSTRUCTION, INC.	Concrete/civil contractor – 9.2 miles from site
DSL STEEL, INC. DBA GBS COMPANY	Steel fabricator – 13.3 miles from site
AMERICAN RENTALS INC	Equipment rental – 26.7 miles from site
NORMAN S.WRIGHT/AIRELINK Mechanical Equipment, LLC	MEP Supplier – 20.7 miles from site

Cost

COST/SCHEDULE

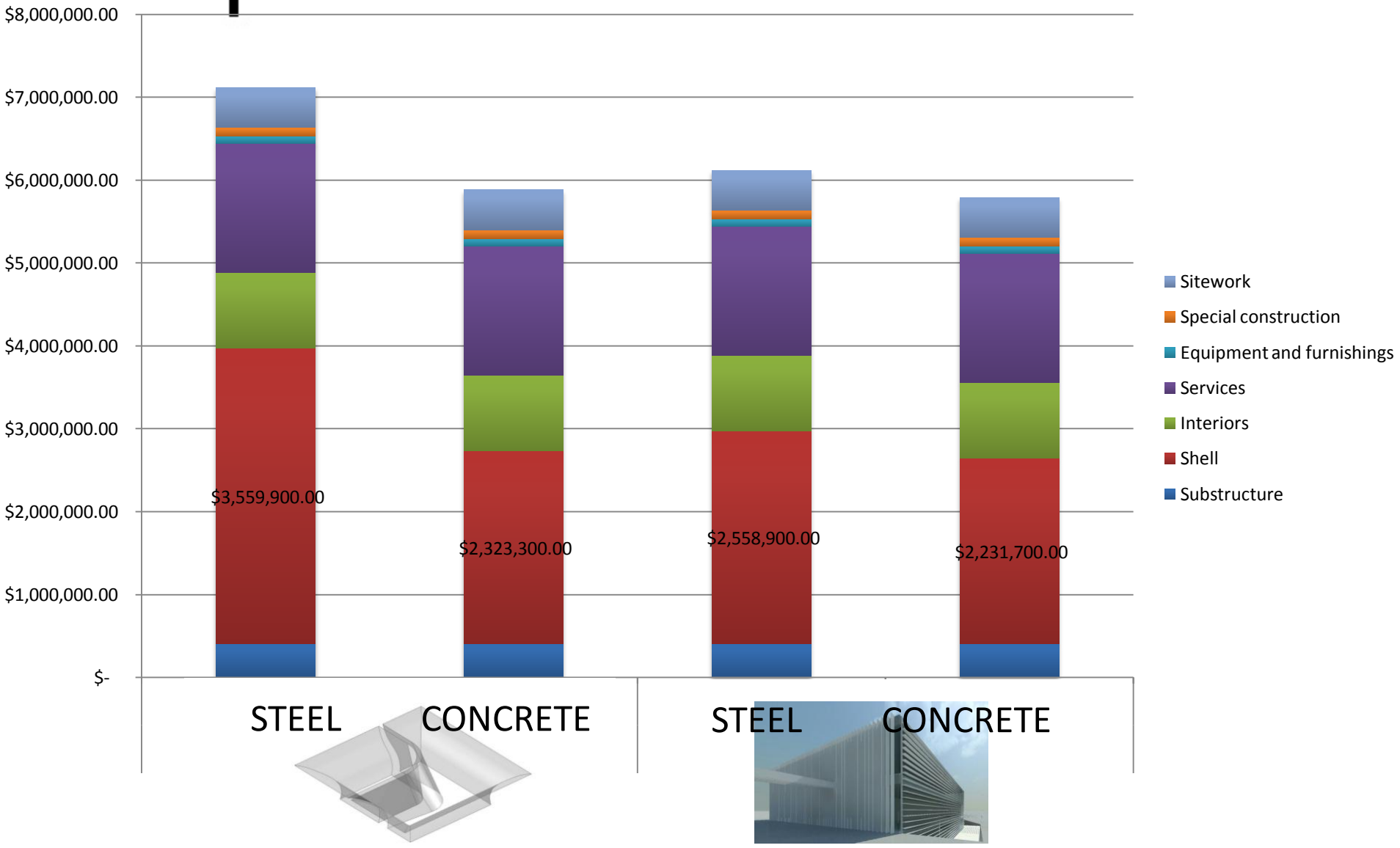
CM



Cost

COST DISTRIBUTION

CM



MAIN COST ITEMS

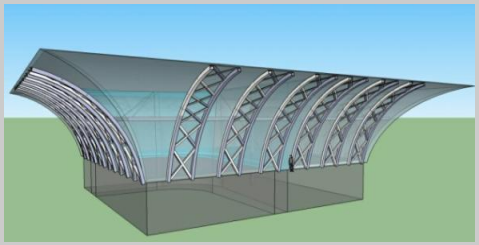
	Sculpture	Orthogonal
Steel	Prefab curved steel trusses	ConXtech ® system
Concrete	Curved concrete walls	Bubbledeck ® System

Curved façade materials/ construction

ALL – Dewatering during construction

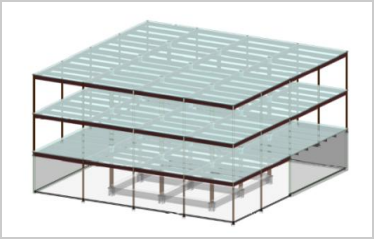
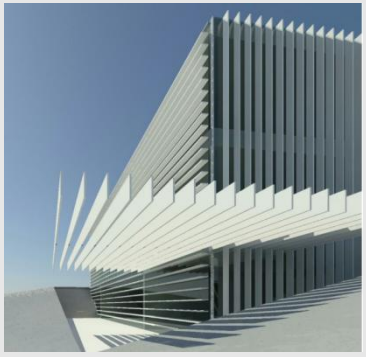
CONSTRUCTABILITY

CM

		+	-
STEEL		•No shoring •Little CIP •Prefabrication	•Transportation
CONCRETE		•Prefabrication •Modular slip forms & void forms for windows	•Interior CIP columns/shear

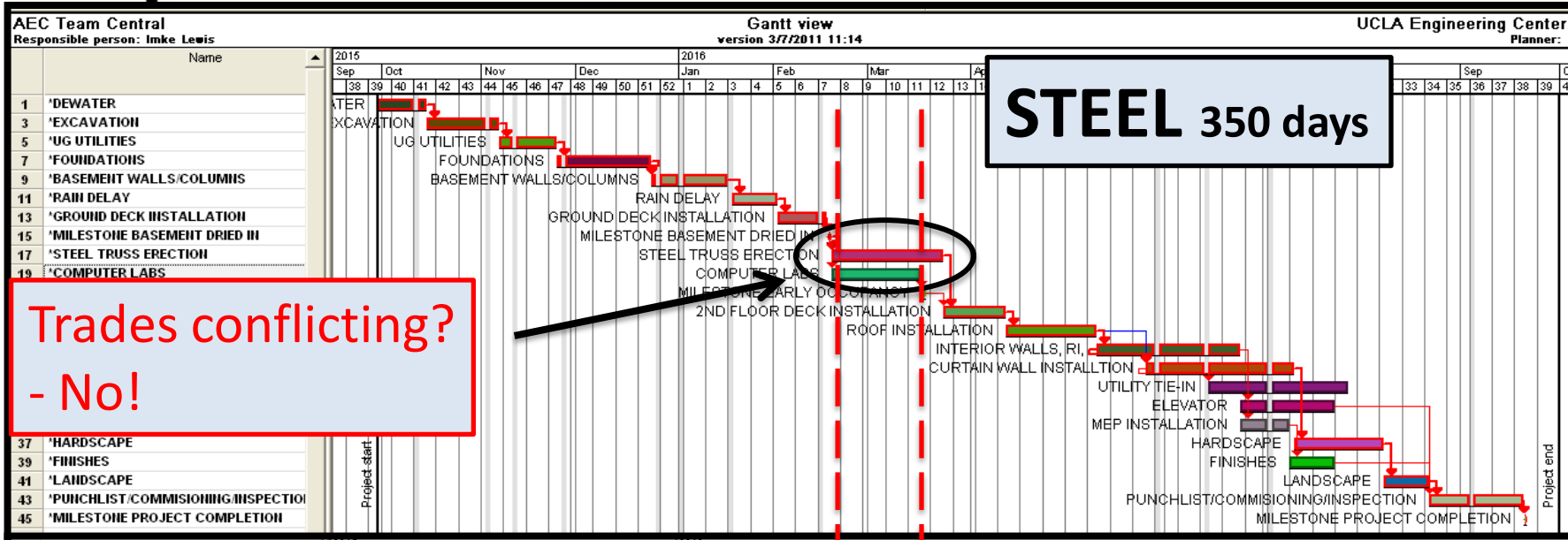
CONSTRUCTABILITY

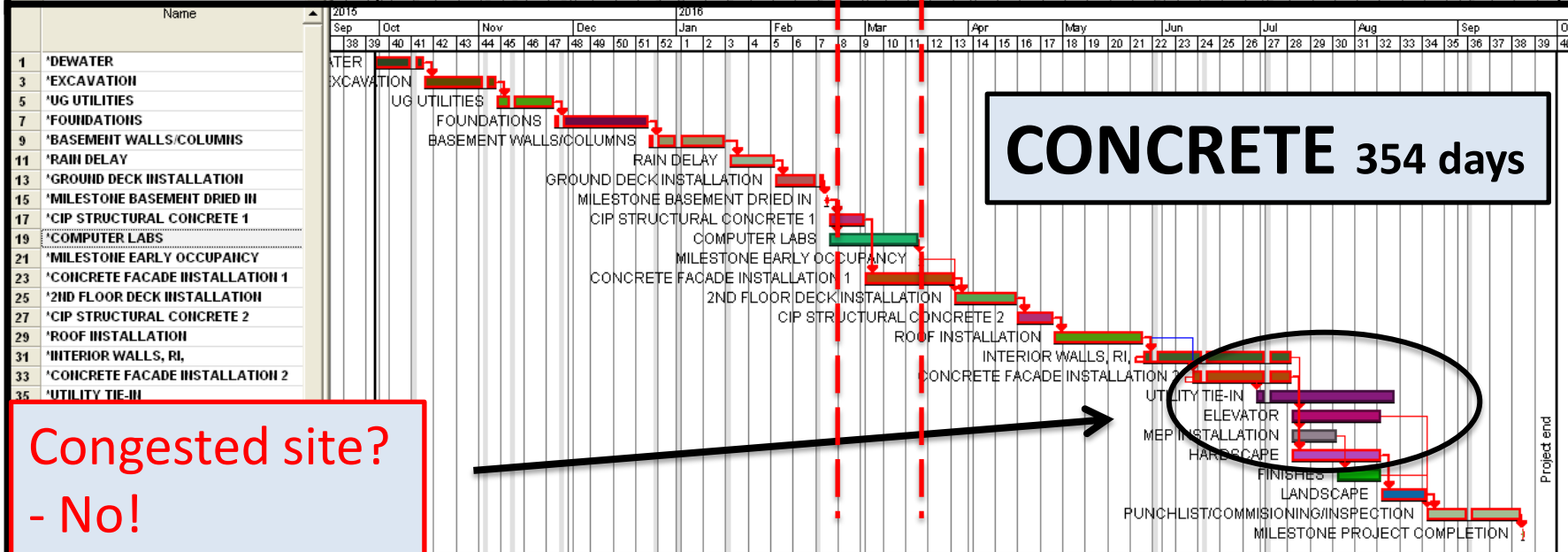
CM

		+	-
STEEL		•Modular grid system •ConXtech = SPEED	•Blinds installation
CONCRETE		•Very regular/repetitive •Prefabrication •Concrete bubble decks	•CIP columns/shear walls •Blinds installation

SCHEDULE

CM


AEC Team Central
Responsible person: Imke Lewis
Gantt view
version 3/7/2011 11:14
UCLA Engineering Center
Planner:
Name
'DEWATER
'EXCAVATION
'UG UTILITIES
'FOUNDATIONS
'BASEMENT WALLS/COLUMNS
'RAIN DELAY
'GROUND DECK INSTALLATION
'MILESTONE BASEMENT DRIED IN
'STEEL TRUSS ERECTION
'COMPUTER LABS
'HARDSCAPE
'FINISHES
'LANDSCAPE
'PUNCHLIST/COMMISIONING/INSPECTIO
'MILESTONE PROJECT COMPLETION
2015
2016
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Sep
UG UTILITIES
FOUNDATIONS
BASEMENT WALLS/COLUMNS
RAIN DELAY
GROUND DECK INSTALLATION
MILESTONE BASEMENT DRIED IN
STEEL TRUSS ERECTION
2ND FLOOR DECK INSTALLATION
ROOF INSTALLATION
INTERIOR WALLS, RI,
CURTAIN WALL INSTALLTION
UTILITY TIE-IN
ELEVATOR
MEP INSTALLATION
HARDSCAPE
FINISHES
LANDSCAPE
PUNCHLIST/COMMISIONING/INSPECTION
MILESTONE PROJECT COMPLETION
Project start
Project end
STEEL 350 days
Trades conflicting?
- No!

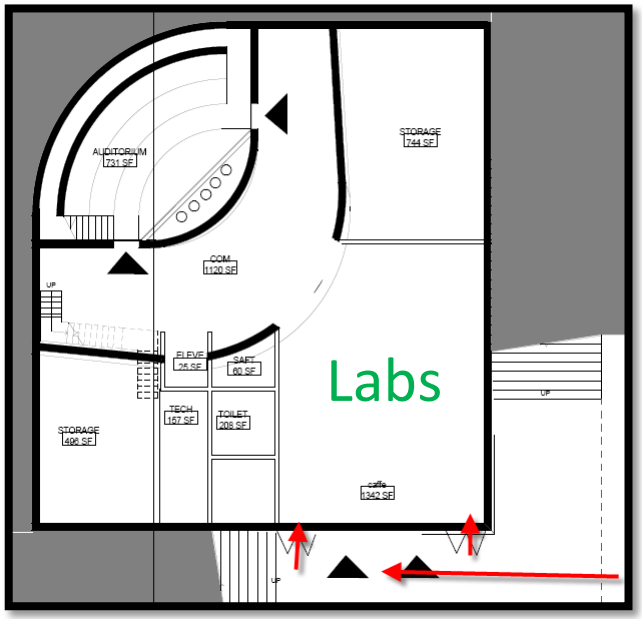

Name
'DEWATER
'EXCAVATION
'UG UTILITIES
'FOUNDATIONS
'BASEMENT WALLS/COLUMNS
'RAIN DELAY
'GROUND DECK INSTALLATION
'MILESTONE BASEMENT DRIED IN
'CIP STRUCTURAL CONCRETE 1
'COMPUTER LABS
'MILESTONE EARLY OCCUPANCY
'CONCRETE FACADE INSTALLATION 1
'2ND FLOOR DECK INSTALLATION
'CIP STRUCTURAL CONCRETE 2
'ROOF INSTALLATION
'INTERIOR WALLS, RI,
'CONCRETE FACADE INSTALLATION 2
'UTILITY TIE-IN
2015
2016
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
UG UTILITIES
FOUNDATIONS
BASEMENT WALLS/COLUMNS
RAIN DELAY
GROUND DECK INSTALLATION
MILESTONE BASEMENT DRIED IN
CIP STRUCTURAL CONCRETE 1
COMPUTER LABS
MILESTONE EARLY OCCUPANCY
CONCRETE FACADE INSTALLATION 1
2ND FLOOR DECK INSTALLATION
CIP STRUCTURAL CONCRETE 2
ROOF INSTALLATION
INTERIOR WALLS, RI,
UTILITY TIE-IN
ELEVATOR
HARDSCAPE
LANDSCAPE
PUNCHLIST/COMMISIONING/INSPECTION
MILESTONE PROJECT COMPLETION
Project end
CONCRETE 354 days
Congested site?
- No!

Labs

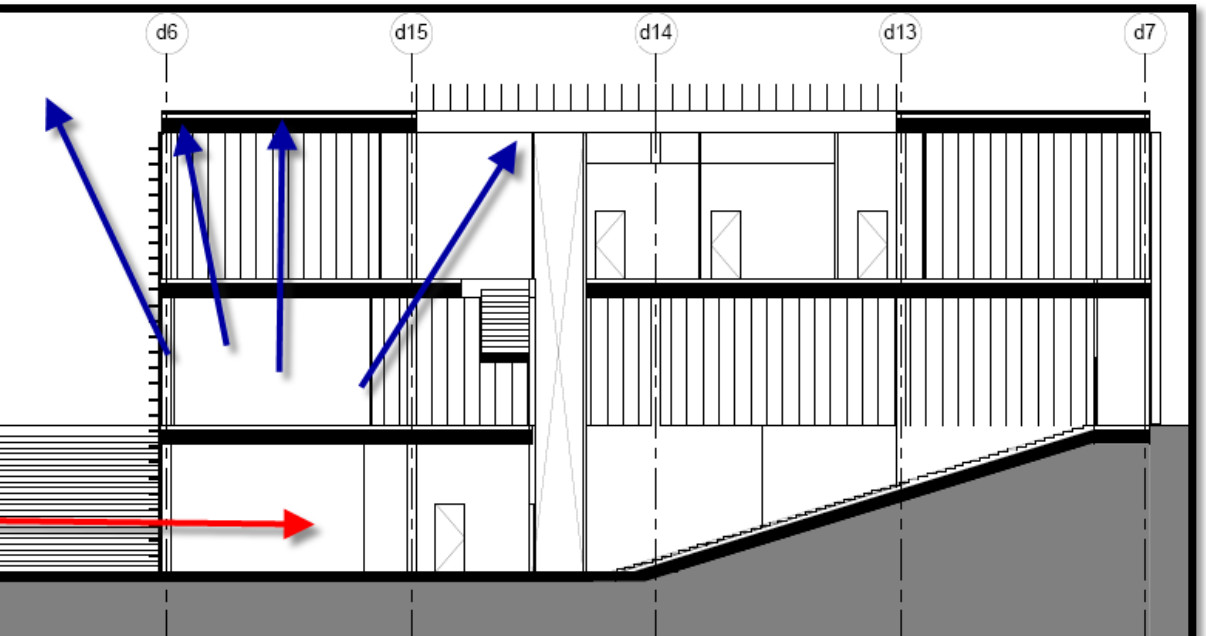
EARLY OCCUPANCY

CM

Basement



Separation/Stories



Pedestrian Flow

SCHEDULE

CM

STEEL 334 days

2 1/2 weeks savings
1 month float

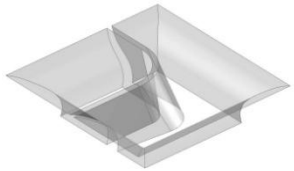
CONCRETE 365 days

Project duration right to due date!

{LCFM}

BUILDING PROGRAM

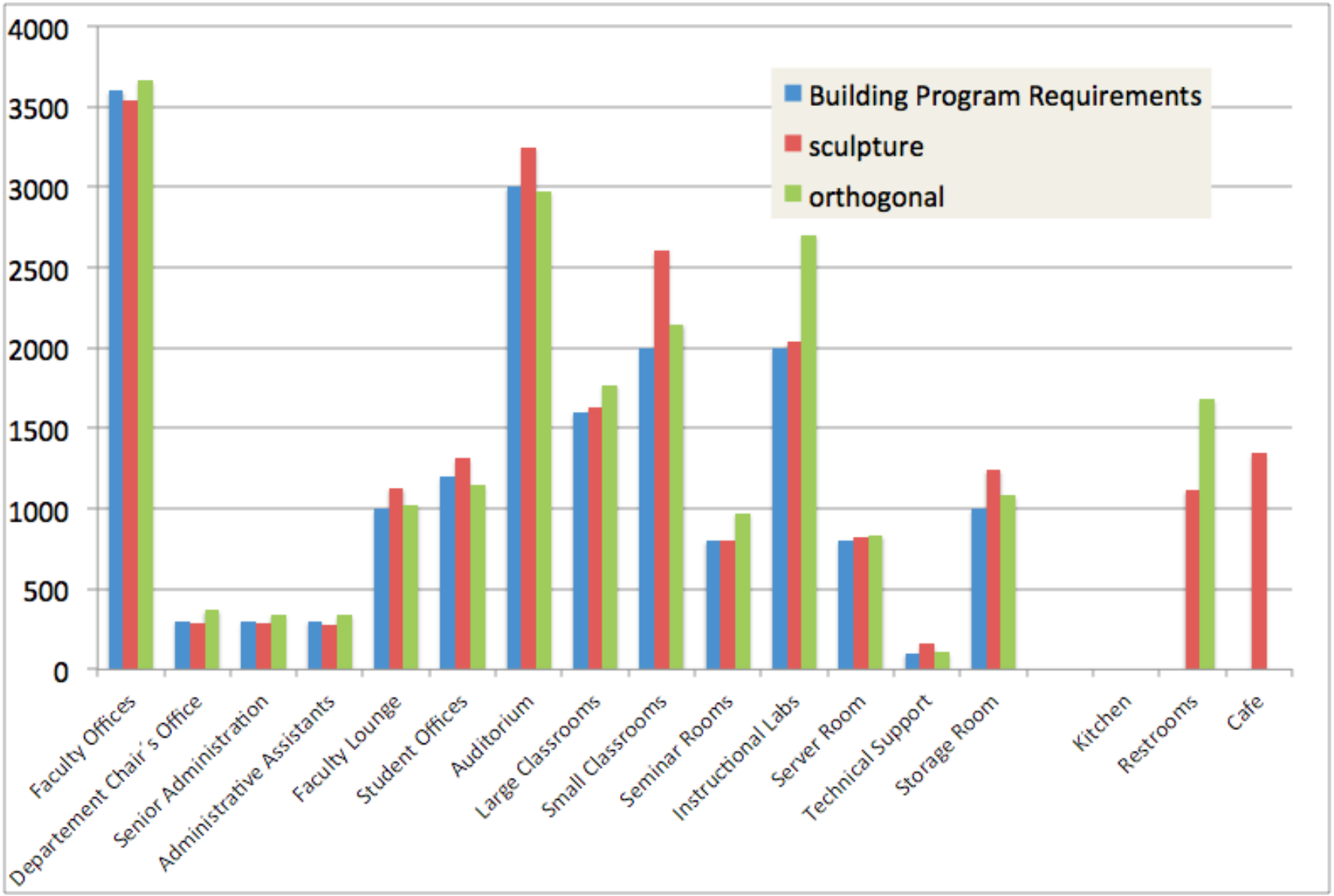
LCFM



Date: 10.3.2010	Building Program Requirements			sculpture		orthogonal	
Room	**Quantity**	**SqFt each**	**TOTAL SqFt**	TOTAL SqFt	Percent	TOTAL SqFt	Percent
Faculty Offices	20	180	3600	3542	98%	3660	102%
Departement Chair´s Office	1	300	300	285	95%	370	123%
Senior Administration	2	150	300	290	97%	340	113%
Administrative Assistants	4	75	300	280	93%	340	113%
Faculty Lounge	1	1000	1000	1128	113%	1022	102%
Student Offices	20	60	1200	1310	109%	1147	96%
Auditorium	1	3000	3000	3246	108%	2973	99%
Large Classrooms	2	800	1600	1627	102%	1771	111%
Small Classrooms	4	500	2000	2608	130%	2148	107%
Seminar Rooms	4	200	800	803	100%	971	121%
Instructional Labs	2	1000	2000	2037	102%	2703	135%
Server Room	1	800	800	818	102%	835	104%
Technical Support	1	100	100	157	157%	105	105%
Storage Room	1	1000	1000	1240	124%	1084	108%
Kitchen				0		0	
Restrooms				1115		1680	
Cafe				1342		0	
Total assignable SqFt (without restrooms)			18000	20655		19471	
Ratio (assignable Area/Gross total)			60%	68%		67%	

BUILDING PROGRAM

LCFM



RISK LIST - EXCEPT

LCFM

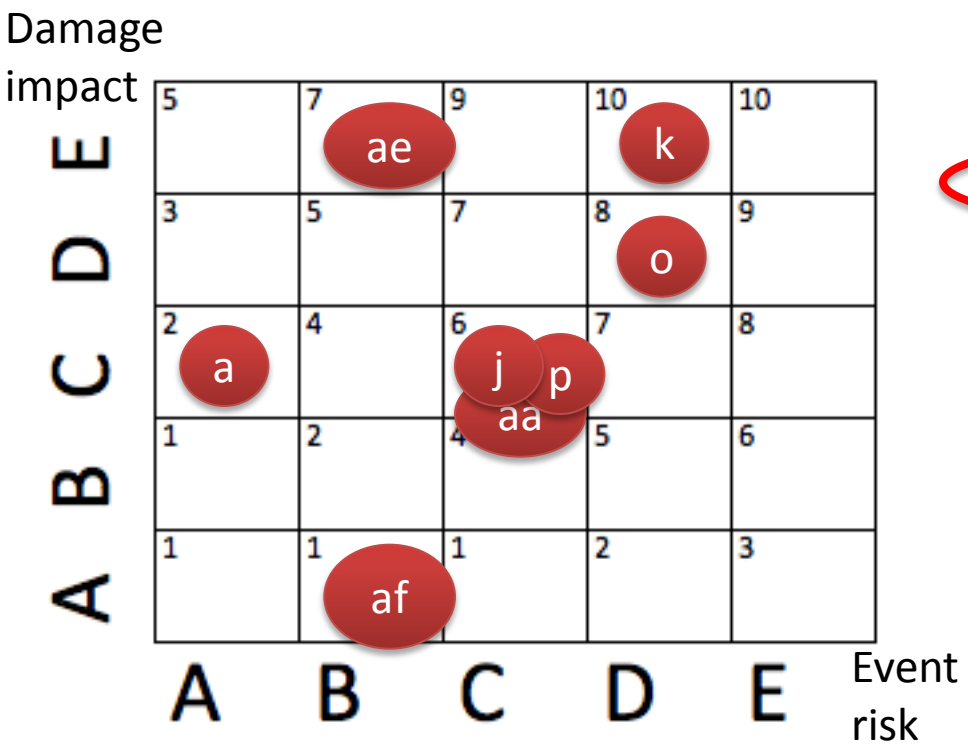
STAGE	NR.	Risk name	Description	damage impact	event risk	Consequences	Risk Allocation		Responsibility	Risk Management
							Contractor	Owner		
Planning	a	wrong sizing	wrong sizing (windows, doors, colloums...)	C	A	problems to fulfill the time schedule -> increasing costs	X		A, E	good comunication with engineers, very careful planning

STAGE	NR.	Risk name	Description	damage impact	event risk
Construction	o	increased costs of material	material price is higher than expacted becaus of inflation and wrong input	D	D

Planning	f	are the affinities fulfilled and the units	the owner has requierements about the floorplan	A	A					
Planning	g	functional flexible spaces	possibility to change of use	B	B	loose value in long term use		x		check the requirements of the building programm
Construction	h	complex or singular componets	modular construction reduce costs in case of replacing and for maintenance	B	B	unique components more expensive	x			
Construction	i	unexpacted demands of the owner	owner needs additional rooms, needs bathroom with shower, auditorium needs to be bigger	B	C	additional costs because of new floorplans, new HVAC and MEP plan		X	A+C+E+MEP	show the owner frequently the latest concept
Construction	j	supplier/vendor risk	missing material/labor at a certain time, delivered bad quality	C	C	additional costs because you need to find a new contractor, might cross the timeframe and need to pay both contractors	X		C	check capability, performance and reliability of suppliers
Construction	k	earthquake	earthquake destroy the construction	E	D	additional costs that rise with the time of construction period for replacements	X	X	C+E	create a damage proof constriction
		delayed construction	late handing over			additional costs for crossing the timeframe				

RISK MATRIX

LCFM



This is an example, the scoring matrix was done for all 36 risk

Nr.	name	score
k	earthquake	10
o	cost of material	8
ae	fire/vandalism	7
i	unexpected demands of the owner	6
p	higher operating cost	6
aa	material risk	6
a	wrong sizing	2
af	cost of repair	1

CASHFLOW – O+M

LCFM

O+M

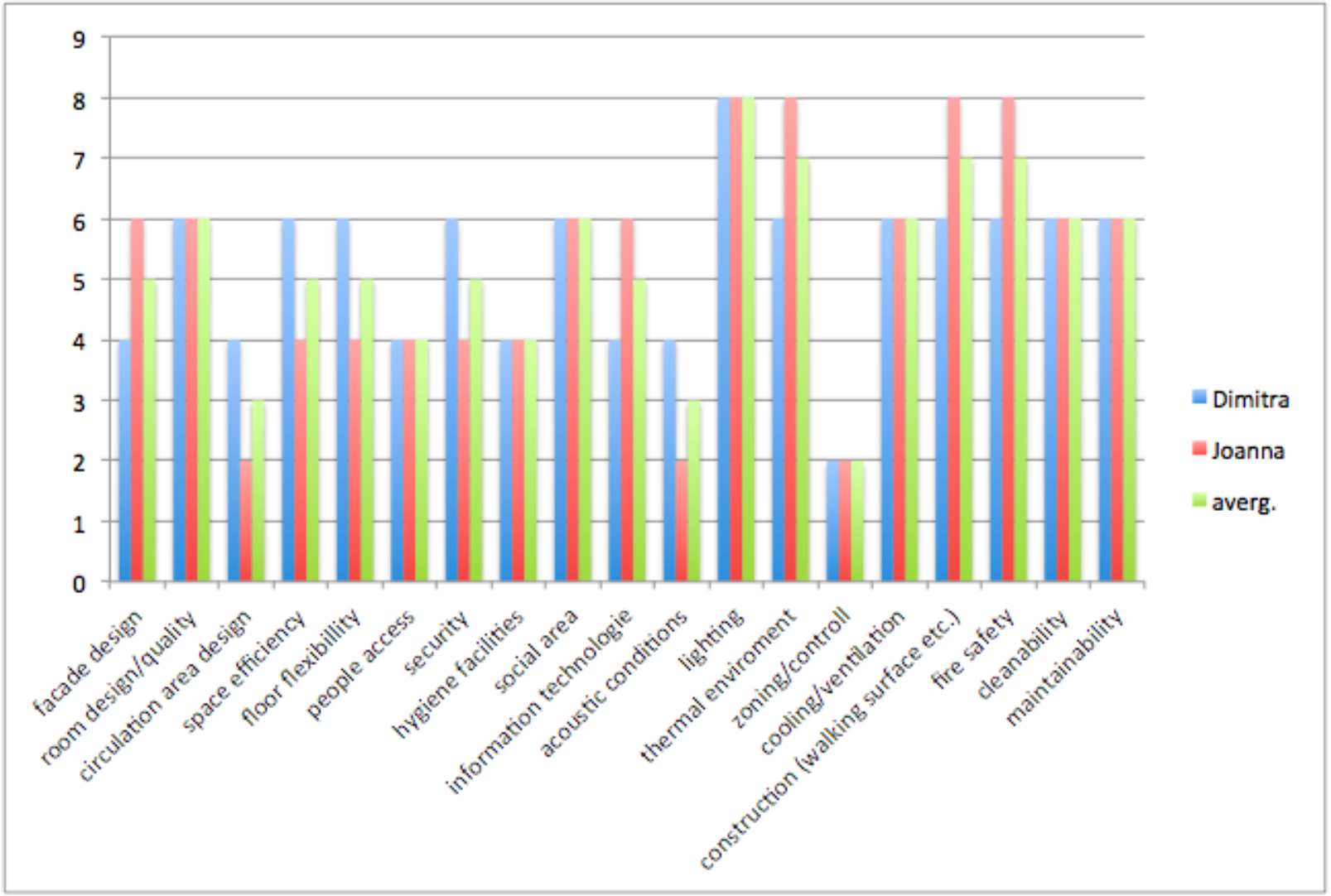
					2015	2016	2017	2018	2019
					0	1	2	3	4
cost component	base	$ per year	area	index					
local auth. Charges	sqft	0,51	30.202	5%		$ 15.465	$ 16.238	$ 17.050	$ 17.902
Insurance	sqft	0,18	30.202	5%		$ 5.365	$ 5.634	$ 5.915	$ 6.211
maintenace	sqft	0,46	30.202	2%		$ 13.887	$ 14.137	$ 14.391	$ 14.650
elektricity	sqft	0,31	30.202	7%		$ 9.468	$ 10.102	$ 10.779	$ 11.502
cooling	sqft	0,49	30.202	7%		$ 14.833	$ 15.872	$ 16.983	$ 18.172
water	sqft	0,14	30.202	4%		$ 4.103	$ 4.267	$ 4.438	$ 4.615
cleaning	sqft	0,29	30.202	5%		$ 8.837	$ 9.279	$ 9.743	$ 10.230
security	sqft	0,29	30.202	5%		$ 8.837	$ 9.279	$ 9.743	$ 10.230
Management	sqft	0,32	30.202	5%		$ 9.784	$ 10.273	$ 10.787	$ 11.326
Caretaker	sqft	0,29	30.202	3%		$ 8.837	$ 9.102	$ 9.375	$ 9.656
sum		$ 4.743.147				$ 99.415	$ 104.181	$ 109.203	$ 114.493

Based on JL Office Buildings – the usage in University Buildings is much higher

Exact calculations next quarter

VALUE FOR MONEY - OWNERS

How to transform the owners preference into cluster cost



VALUE FOR MONEY - CLUSTERING

How to transform the owners preference into cluster cost

		Presentation			
	cost	Facade design	Room design/quality	circulation area design	summ
A2020	Basement Walls	1,2		0,35	3,35
B1010	Floor Construction		3,15	1,75	23,8
B1020	Roof Construction	0,6			1,65
B20	Exterior Enclosure	3,6	0,7	0,35	7,475
B30	Roofing	0,6			1,55
C10	Interior Construction		1,75	0,35	10,325
C20	Stairs		0,35		1,4
C30	Interior Finishes		0,7		7,925
D10	Conveying		0,35		4,325
D20	Plumbing				0,45
D30	HVAC				7,6
D40	Fire Protection				9,1
D50	Electrical				12,8
E10	Equipment				3,325
E20	Furnishings				3,45
G20	Landscaping Paving			0,7	1,475
	user function	**6**	**7**	**3,5**	100
	controll	6	7	3,5	

Owner input

	averg
facade design	5
room design/quality	6
circulation area design	3
space efficiency	

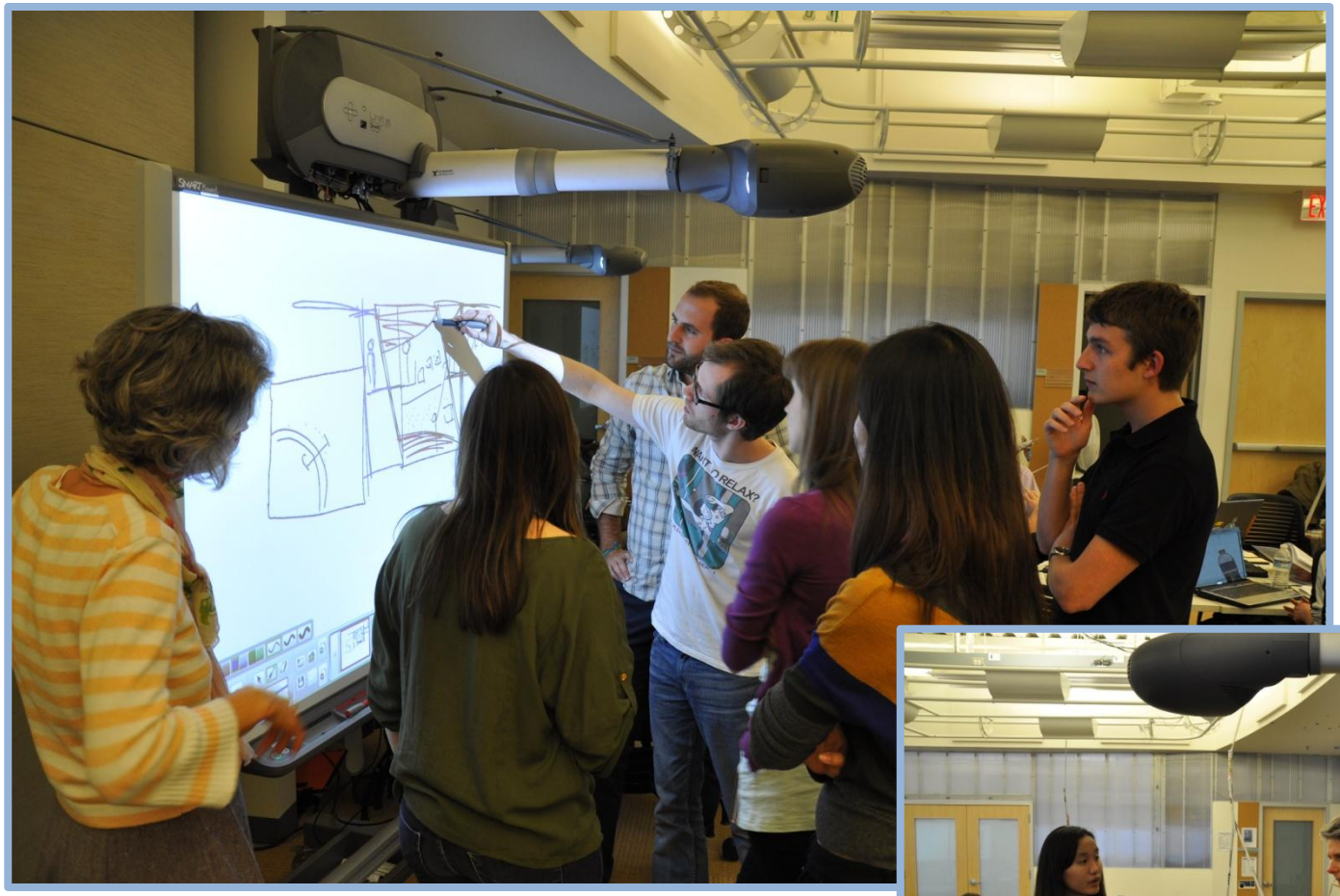
TVD – OWNER WEIGHTED CLUSTERS

LCFM

	cost	standard cost	in %	user function	in %	target cost	difference
A2020	Basement Walls	$ 141.776,00	2%	3,35	3,4%	$ 199.576,22	1,408
B1010	Floor Construction	$ 1.884.984,00	32%	23,8	23,8%	$ 1.417.884,76	0,752
B1020	Roof Construction	$ 239.904,00	4%	1,65	1,7%	$ 98.298,73	0,410
B20	Exterior Enclosure	$ 1.102.946,00	19%	7,475	7,5%	$ 445.323,05	0,404
C10	Interior Construction	$ 469.395,00	8%	10,325	10,3%	$ 615.111,77	1,310
C30	Interior Finishes	$ 345.110,00	6%	7,925	7,9%	$ 472.131,80	1,368
D30	HVAC	$ 331.414,00	6%	7,6	7,6%	$ 452.769,92	1,366
D50	Electrical	$ 851.500,00	14%	12,8	12,8%	$ 762.559,87	0,896
E20	Furnishings	$ 62.910,00	1%	3,45	3,5%	$ 205.533,72	3,267
G20	Landscaping Paving	$ 163.356,00	3%	1,475	1,5%	$ 87.873,11	0,538
	sum all	$ 5.957.499,00				$ 5.869.625,89	
	sum reg	**$ 6.653.781,37**					

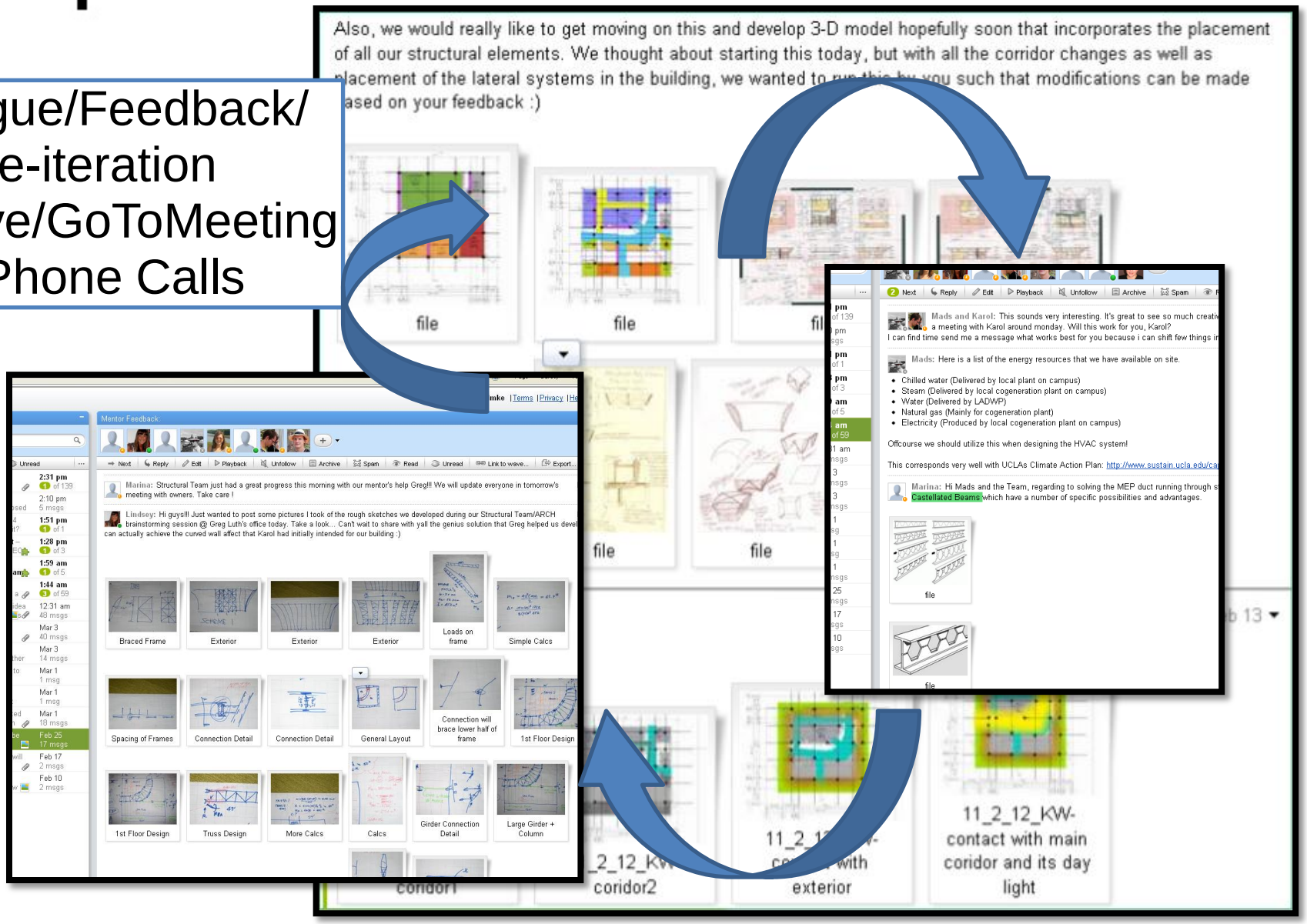
No consideration of fixed cost e.g. excavation

TEAM PROCESS



IPD

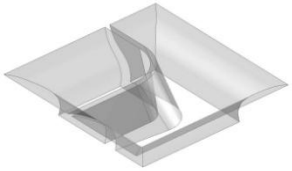
Dialogue/Feedback/
Re-iteration
by Wave/GoToMeeting
& Phone Calls



MOVING FORWARD

+	Δ	How?
•Information •Research	•Applying •Developing	•Sub-group meetings
•Sharing •Communicating	•Inter-disciplinary coordination •Technology coordination	•Teleplace •Process planning meetings
•Enthusiasm	•Project Management	•Pull Schedule •Leadership •Organization

DECISION MATRIX



points	owner preference	sculpture				orthogonal			
		steel		concrete		steel		concrete	
		sum team	C*D	sum team	C*F	sum team	C*H	sum team	C*J
Design (interior)	12,5	4	55	4	44	3	36	3	33
Design (exterior)	14	5	67	3	40	3	35	2	30
Constructability	8	4	30	3	21	4	34	3	27
Initial cost	8	3	24	3	26	4	28	3	27
Life cycle cost	11,5	3	39	3	36	3	36	3	37
Sustainability	14	4	51	3	46	3	40	3	39
Quality of Space	14	5	65	3	44	2	33	3	35
usability after earthquake	18	4	72	3	50	3	61	2	43
RESULT	100		402		306		303		270


The winner is…
Sculptural Steel Design

Thank you!