ISLAND TEAM

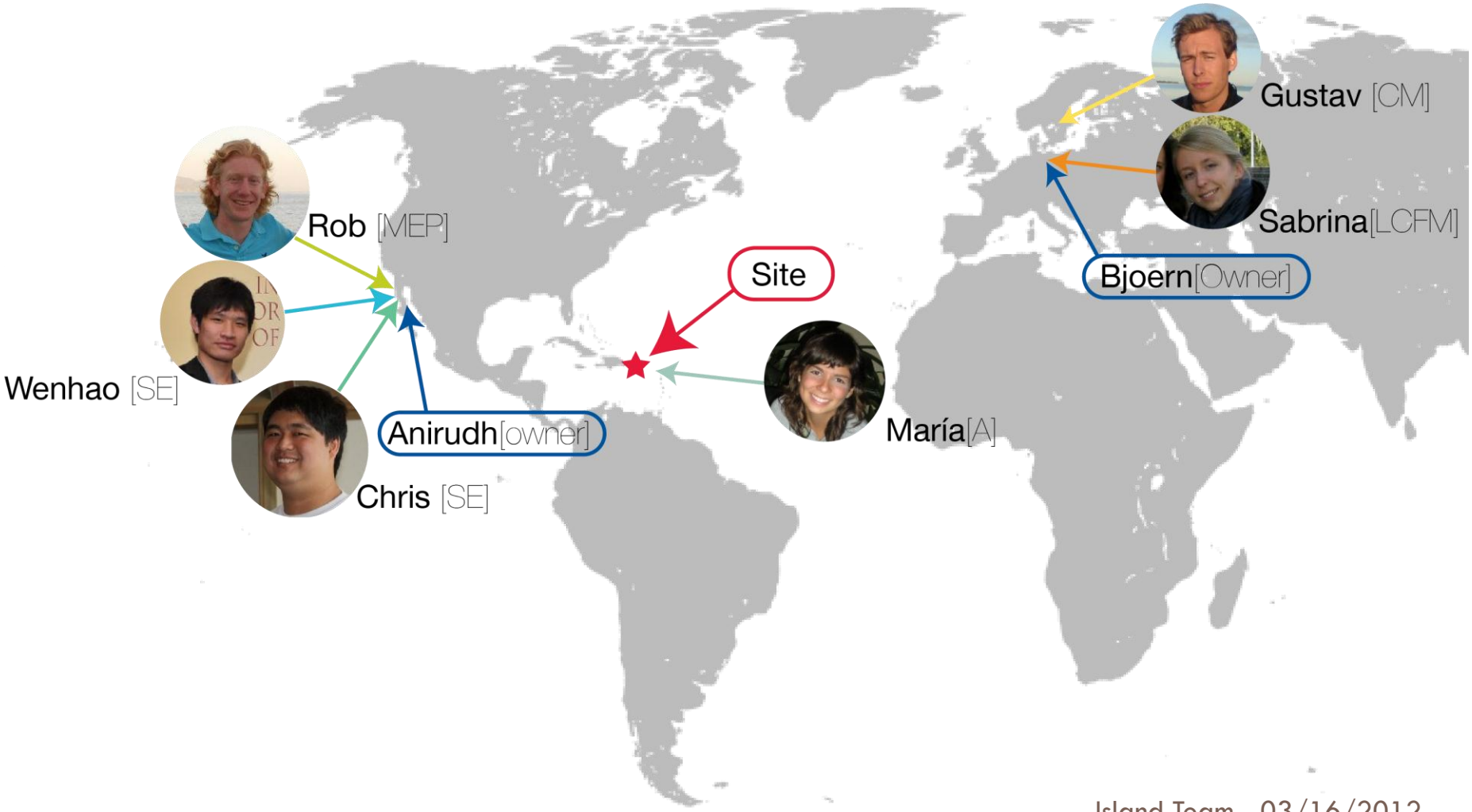
"No man is an island, entire of itself; every man is a…part of the main…"

-John Donne

Winter Quarter Presentation

Rob Best, Maria Carrion, Wenhao Chen, Chris Lee, Sabrina Lingemann, Gustav Westphal

Island Team


Gustav [CM]
Sabrina[LCFM]
Bjoern[Owner]
Rob [MEP]
Site
Wenhao [SE]
Anirudh[owner]
María[A]
Chris [SE]

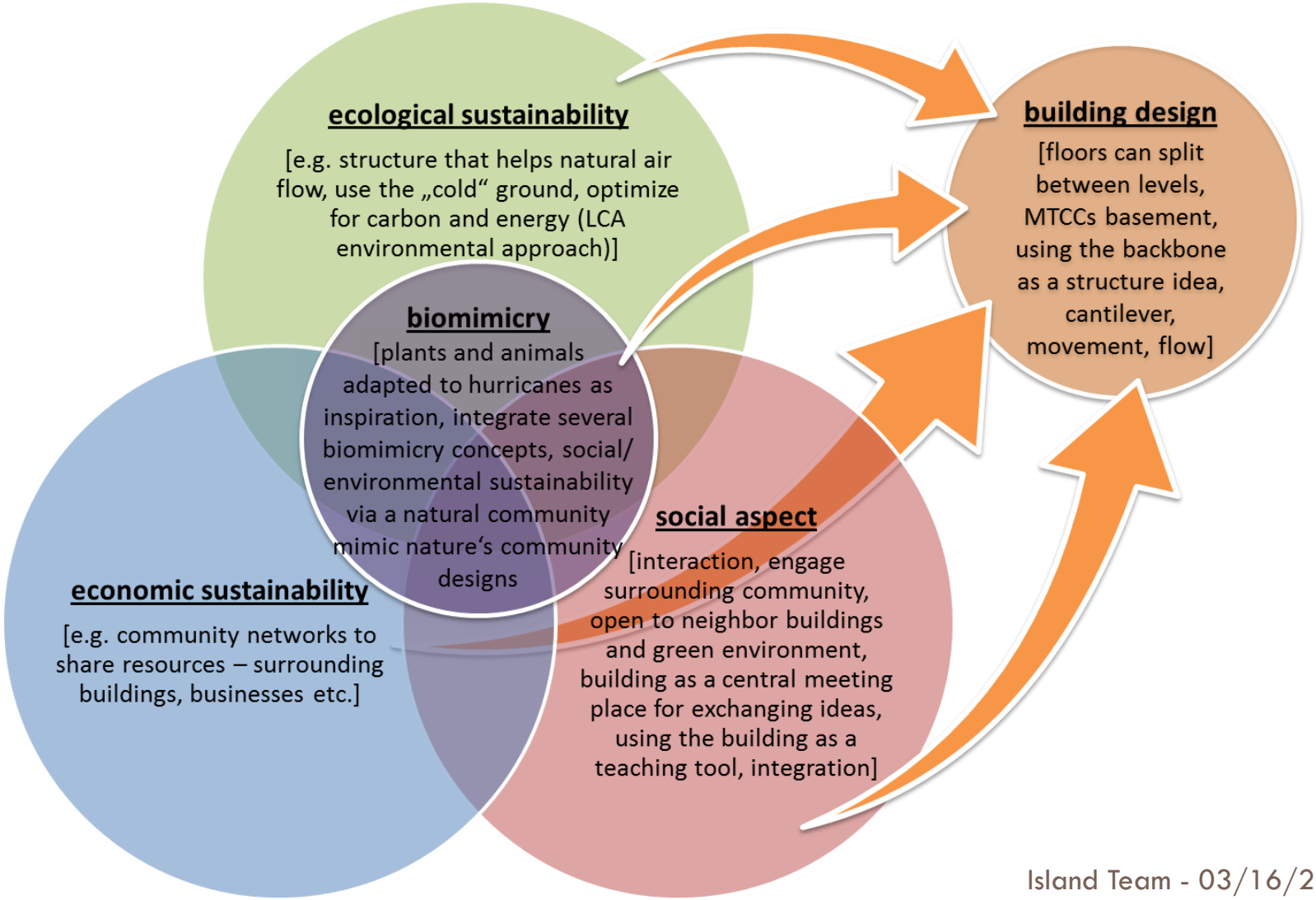
Big Ideas - Be social!

„No man is an island."

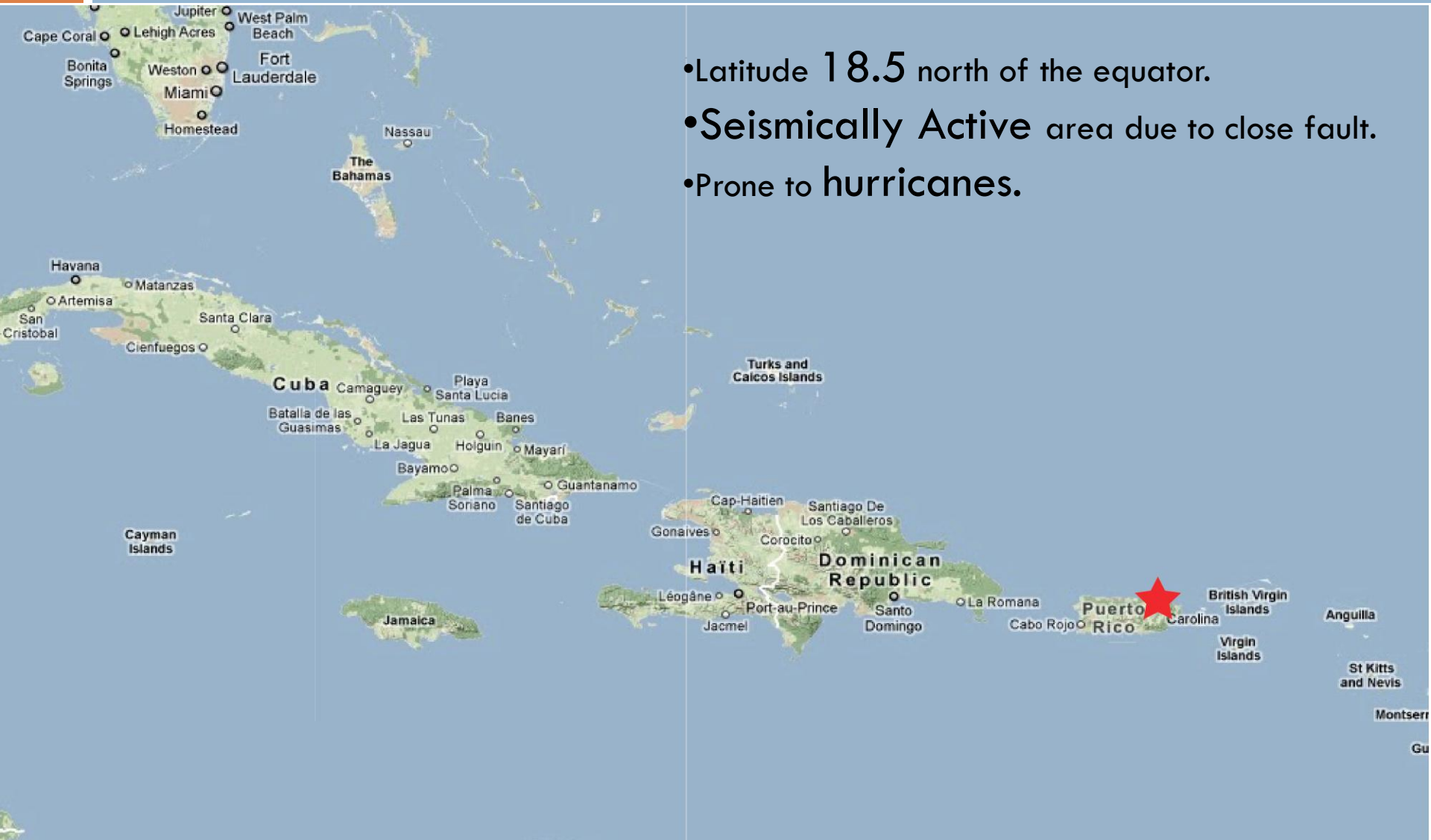
- Be social in all areas / professions!

- social architecture
- social engineering
- social HVAC systems
- social costs

Big Ideas - Be sustainable!

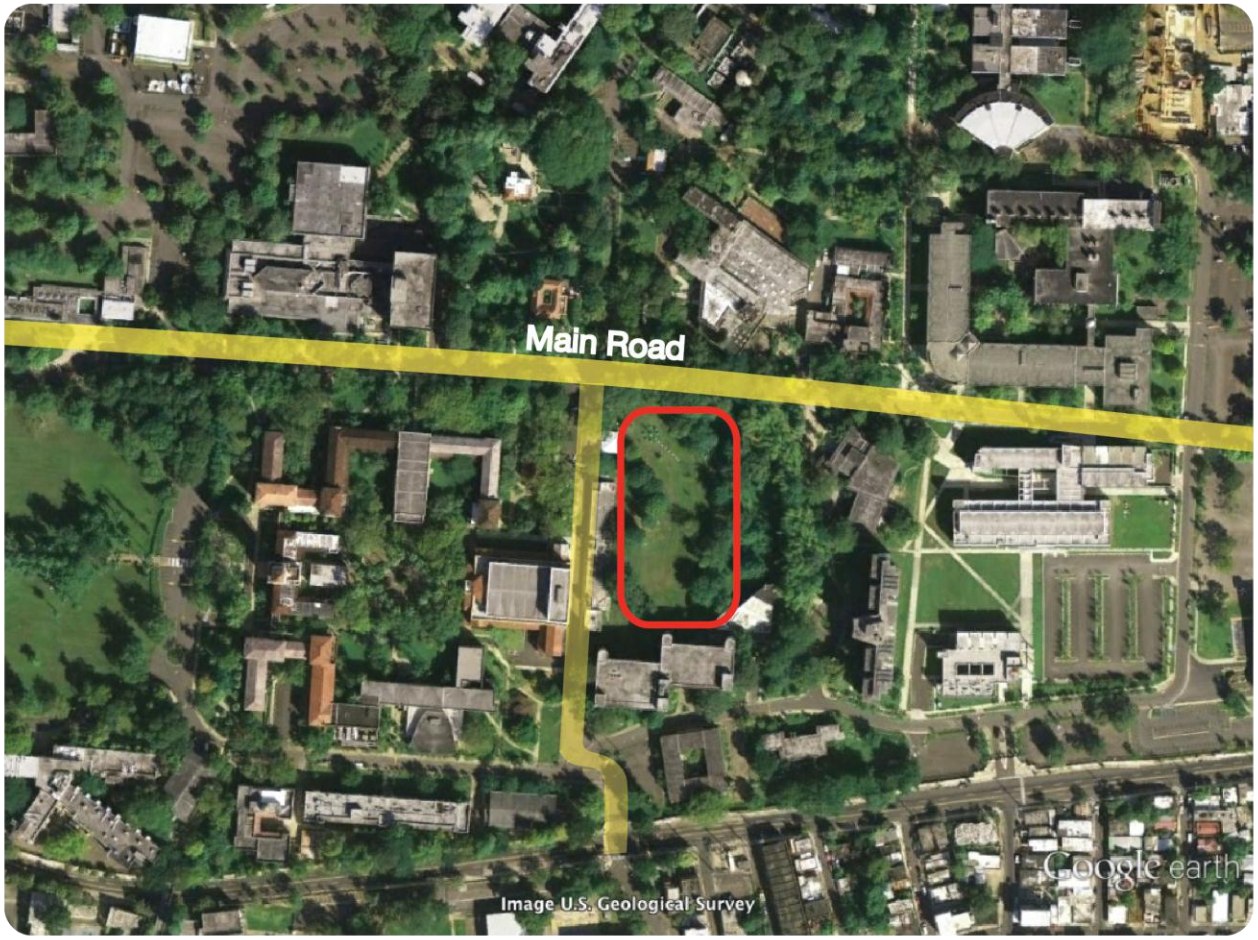


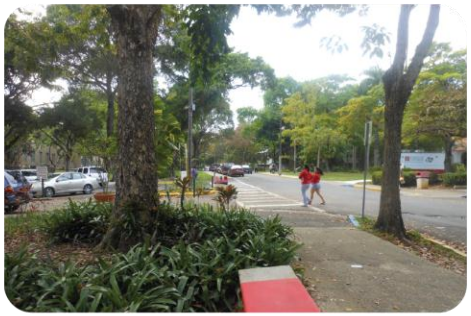
Puerto Rico



- Latitude 18.5 north of the equator.
- Seismically Active area due to close fault.
- Prone to hurricanes.

University of Puerto Rico





Biomimicry

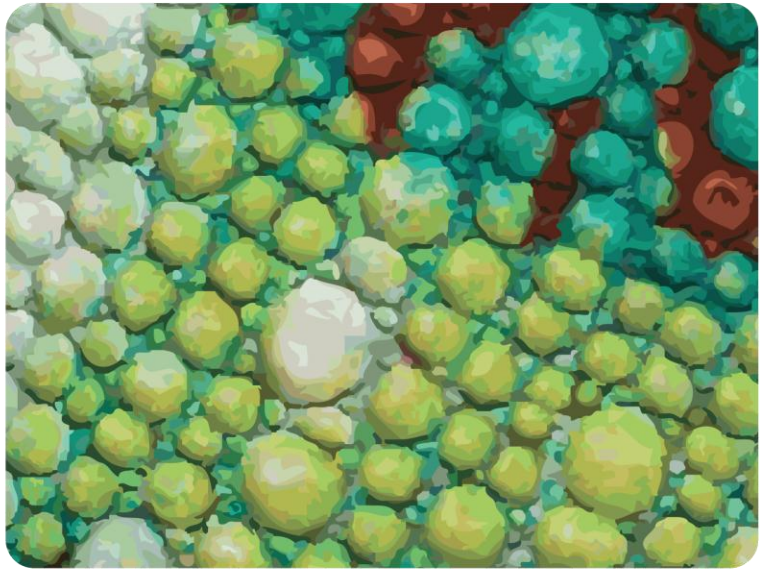
Puerto Rico's Issues
1.Heat
2.High Humidity levels
3.Heavy Rainfall

Pueto Rico's Natural Resources
1.Sunlight
2.Rainwater

How to use our problems as a source of resources?
1.Use sunlight as means of energy production
2.Water Recollection : from Rain, as well as from the air.
3.Cross ventilation to increase thermal comfort.

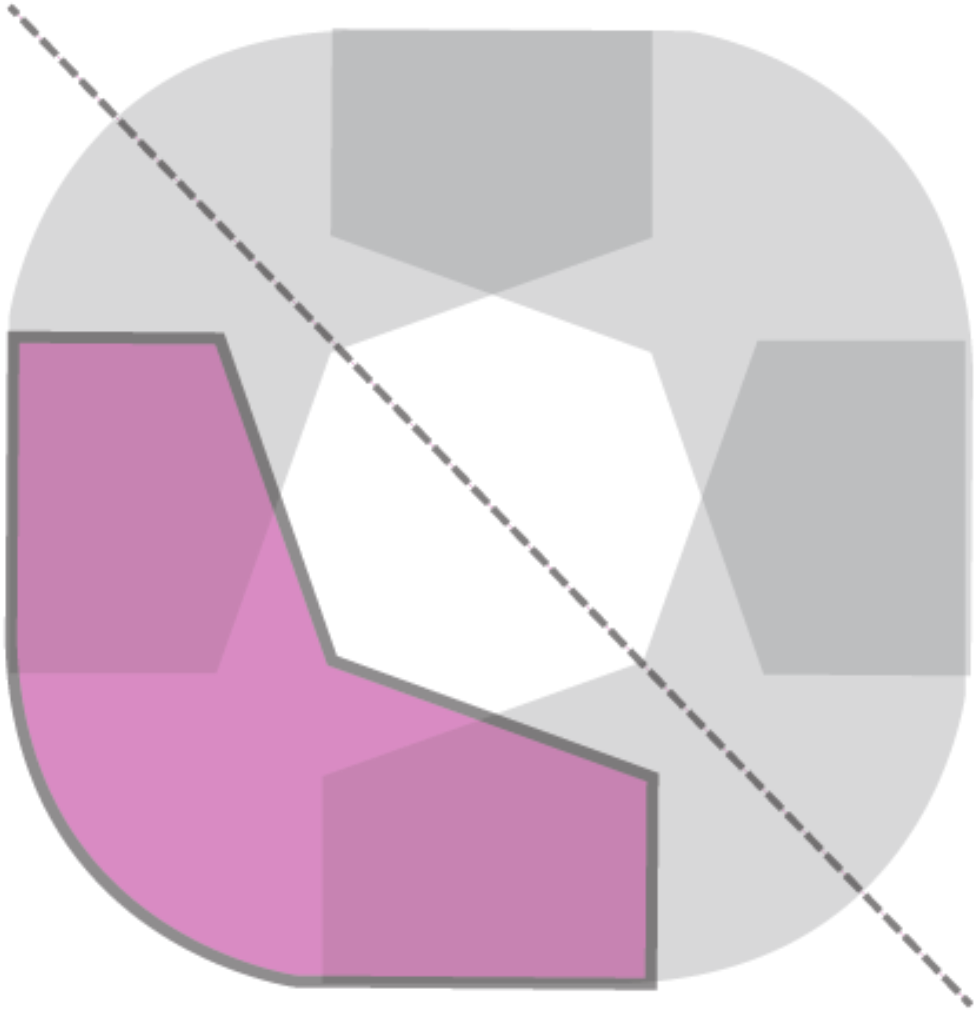
Serveral Biomimicry concepts that apply
1.Skin of the building as the human skin: thermal comfort.
2.Skin of the building as leaves that move seeking sunlight.
3.Corrugated surfaces to produce capilary action to gather water from rainfall.

Strategies
1.Approach the external surfaces of the building with a skin that is adaptable and operational to maximize cross ventilation, captation of solar energy and water recollection. 2.Implement climate data to manipulate smart materials, or systems that will improve the buildings conditions and keep a visual data registry in the facade.



Boomerang

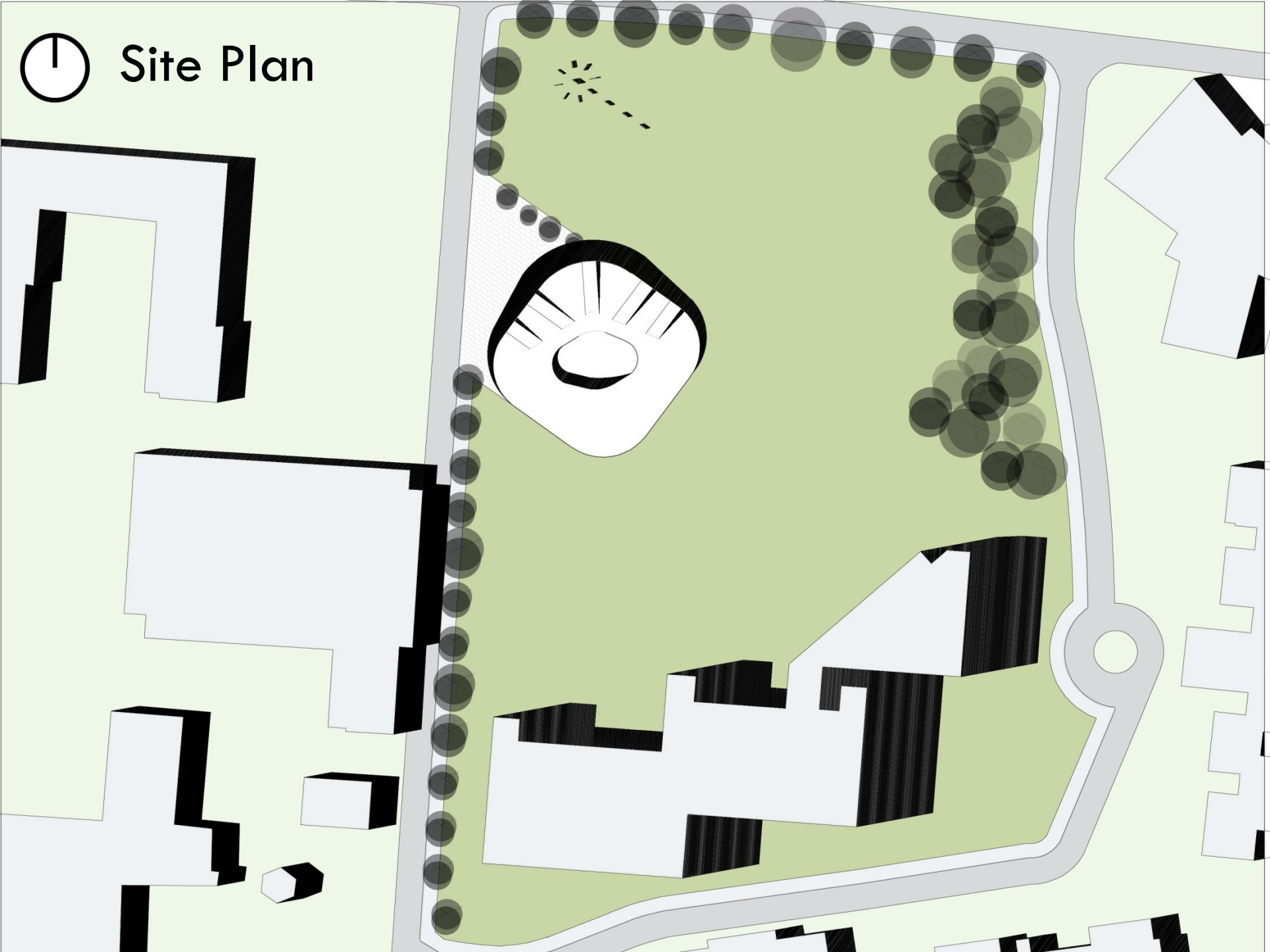
- **Rotation** of original piece: Boomerang
- One boomerang piece as **anchor** to the terrain.
- The **Courtyard** for ventilation and water collection
- **Pilotis.**



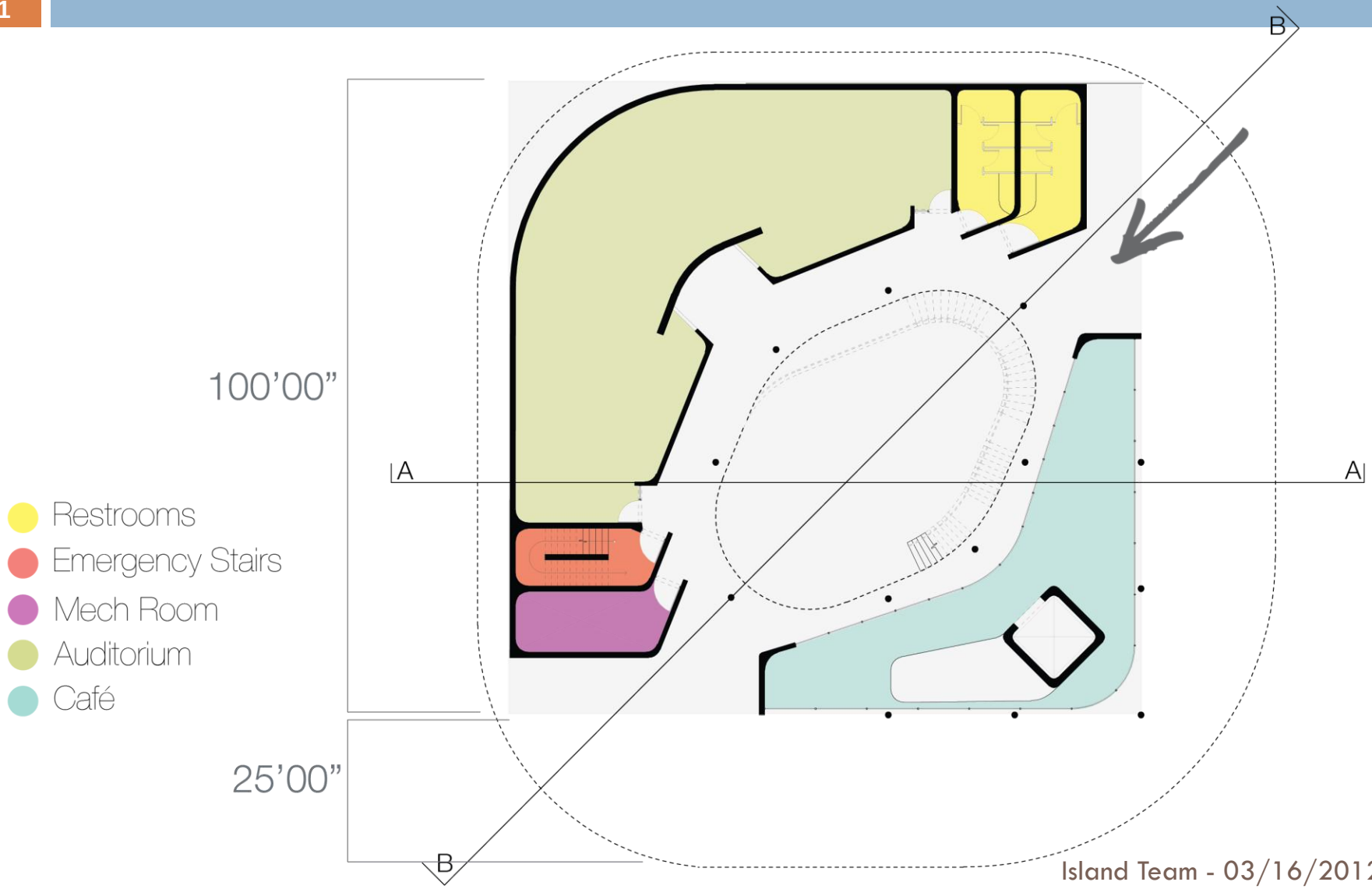
The Courtyard: A Historical Reference

- Comfortable space in **tropical** climate.
- Provides Natural **illumination**
- Maximizes Natural **Ventilation**
- Provides a sense of **security** and visual comfort.

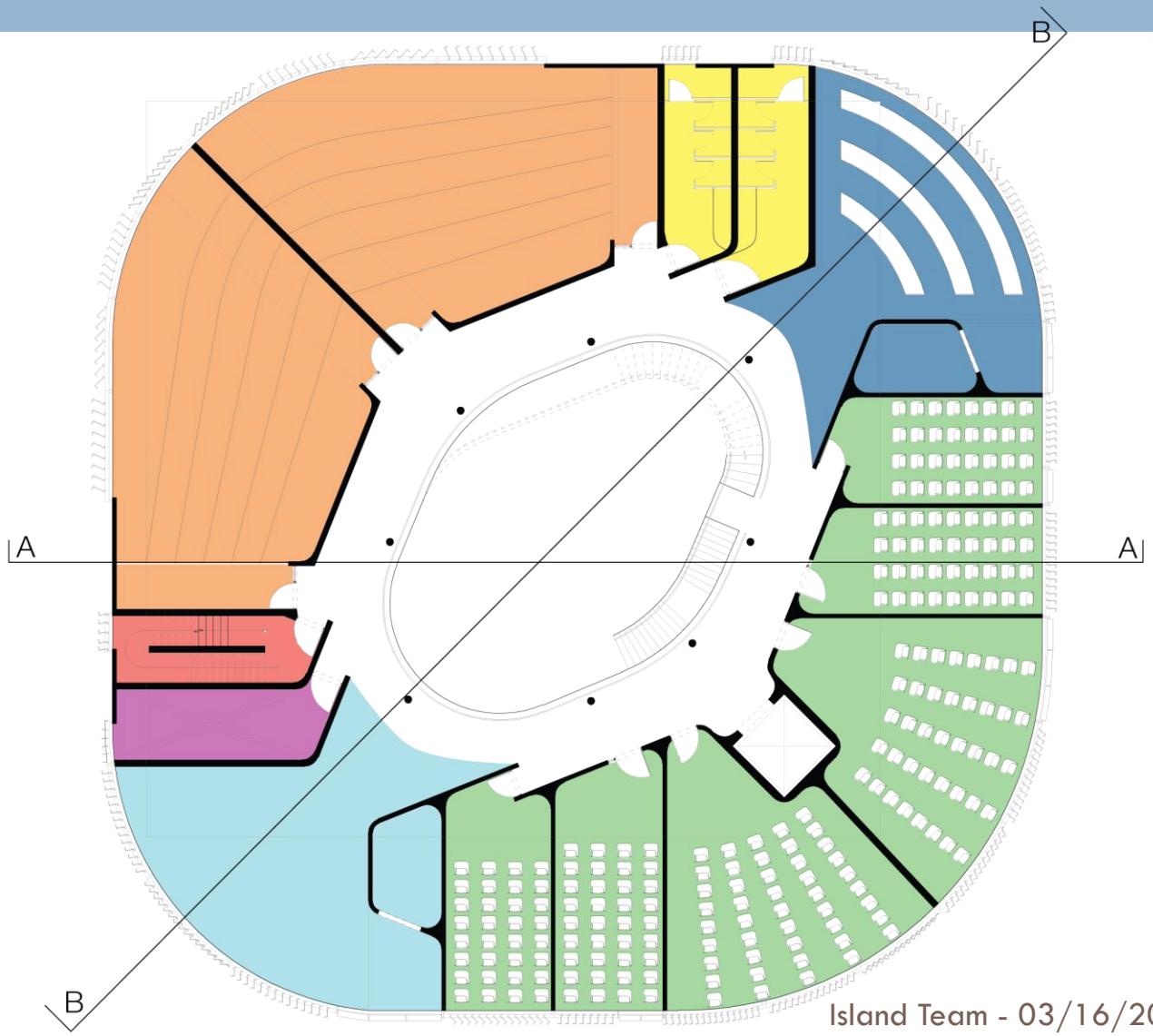
Site Plan



First Floorplan

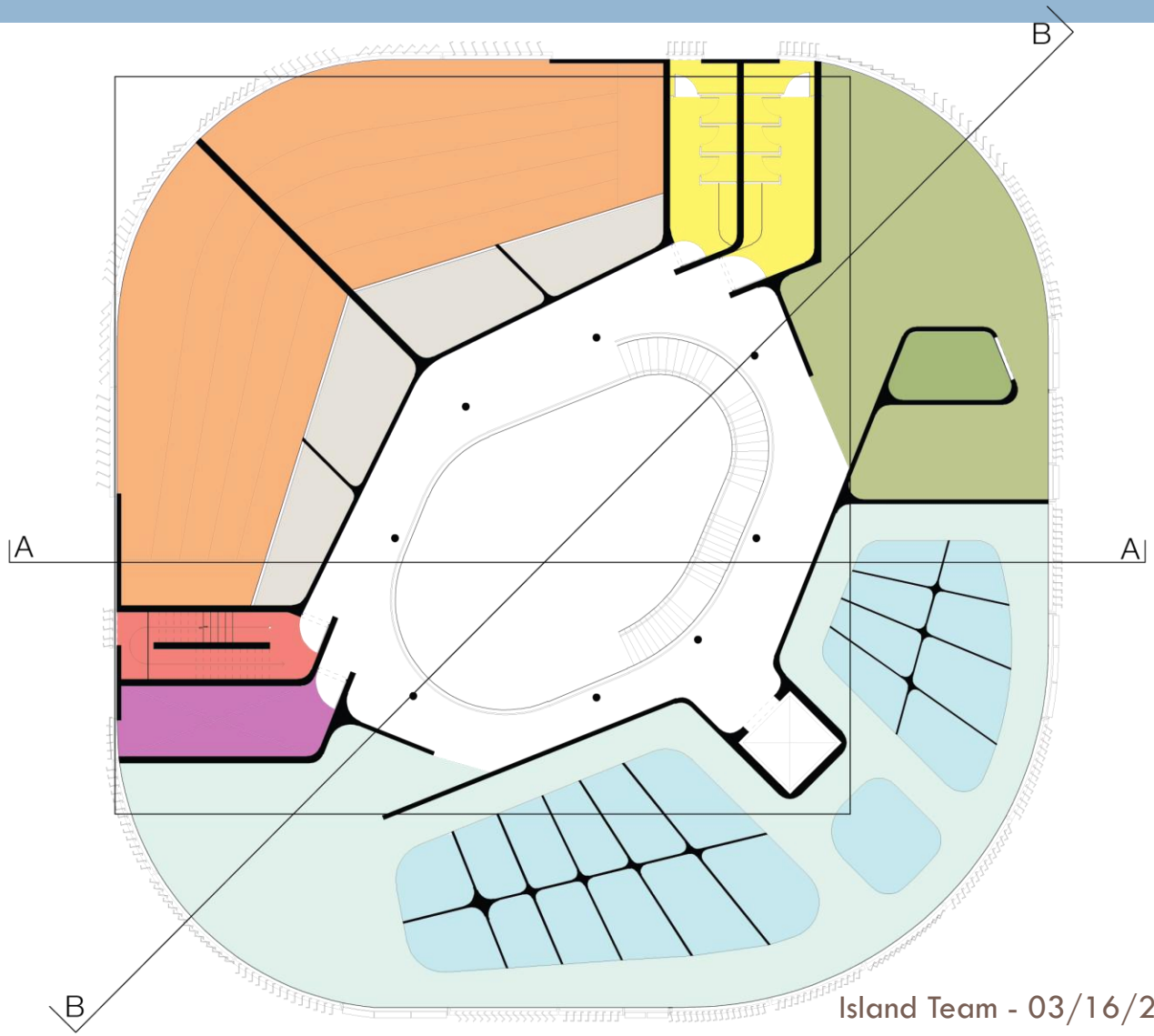


Second Floorplan



- Restrooms
- Emergency Stairs
- Mech Room
- Instructional Labs
- Server Room
- Classrooms
- Student Lounge

Third Floorplan



- Restrooms
- Emergency Stairs
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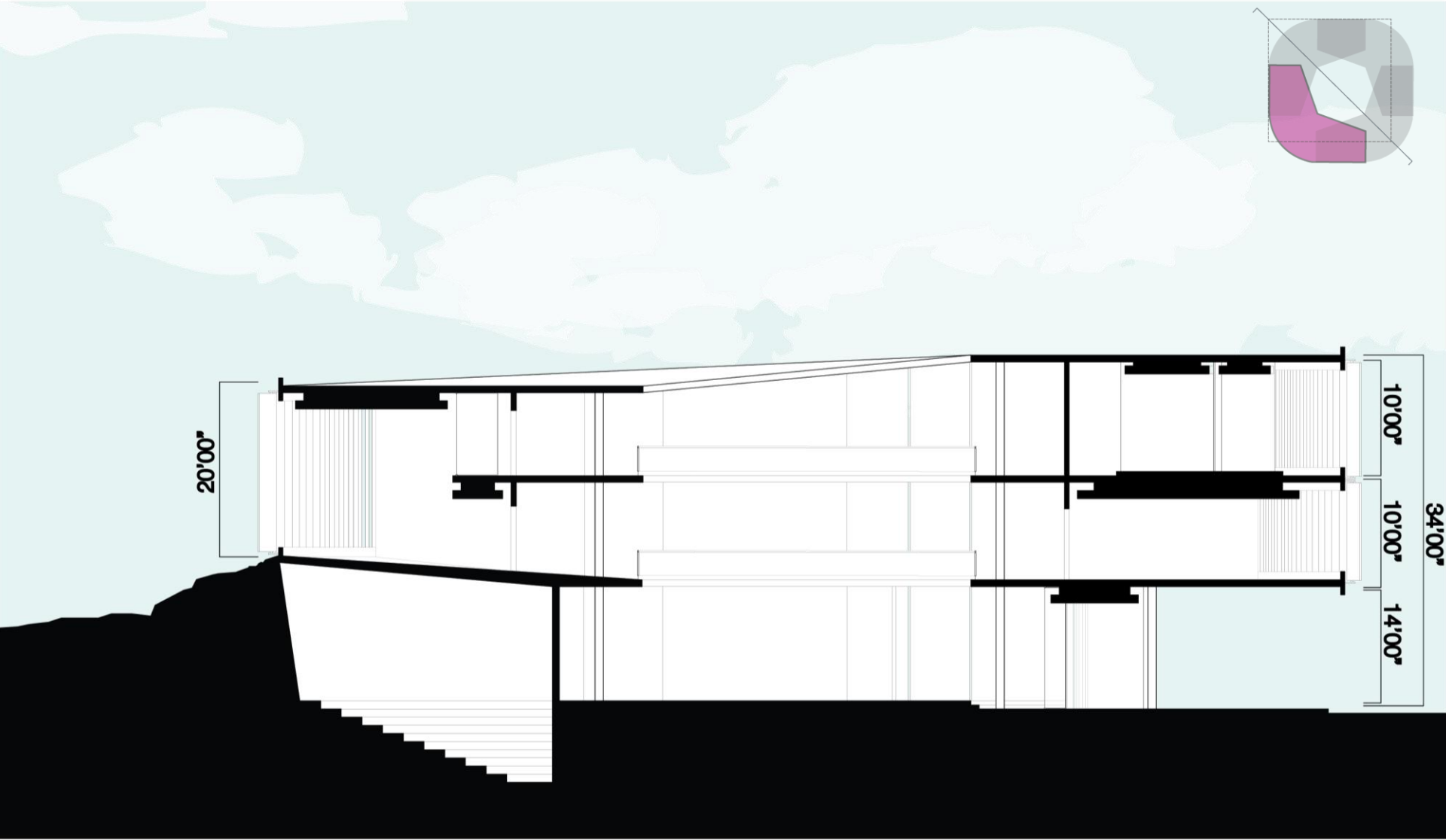
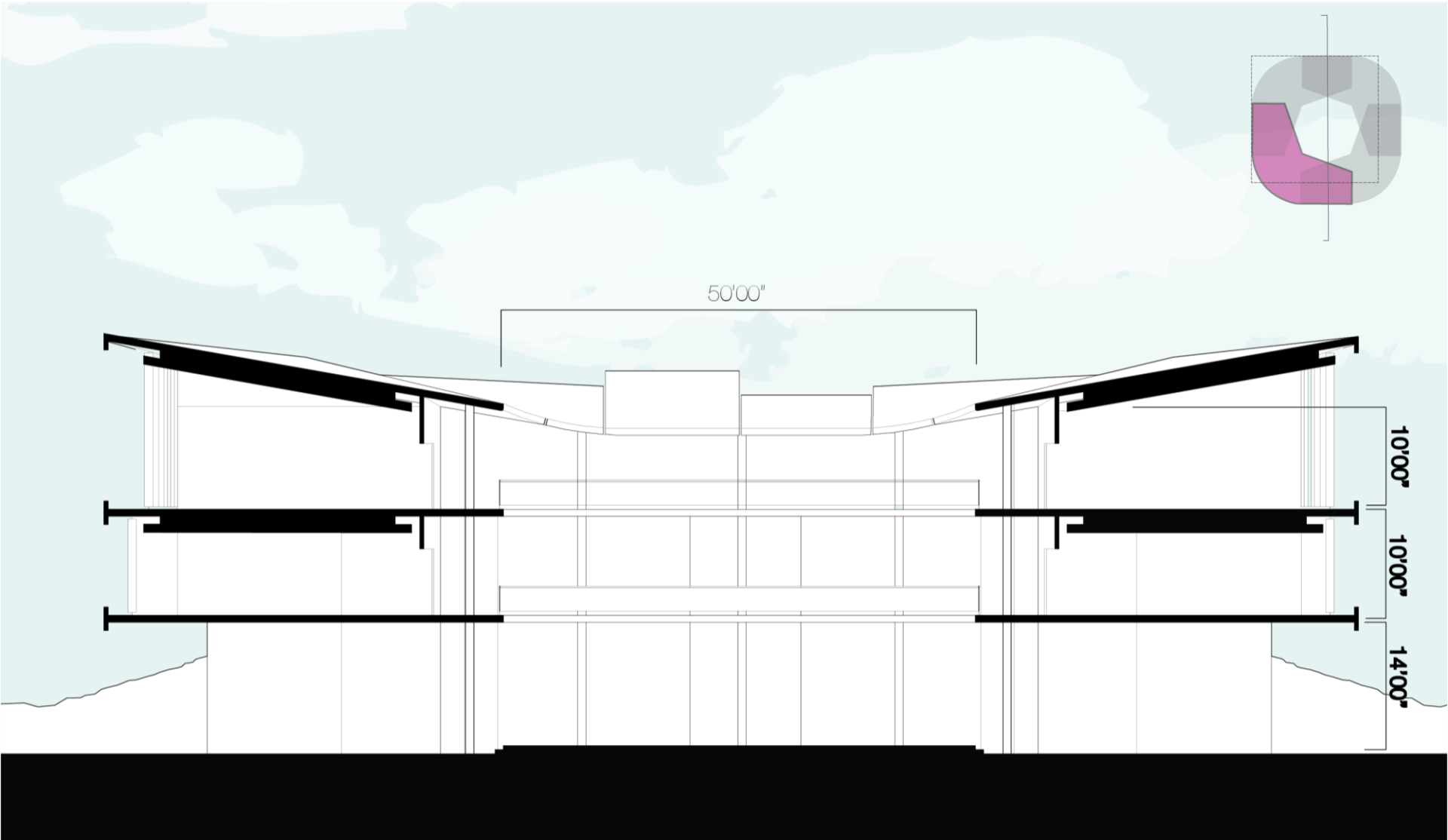
- Instructional Labs
- Seminar Rooms
- Faculty Lounge
- Faculty Offices
- Administration

Section A-A

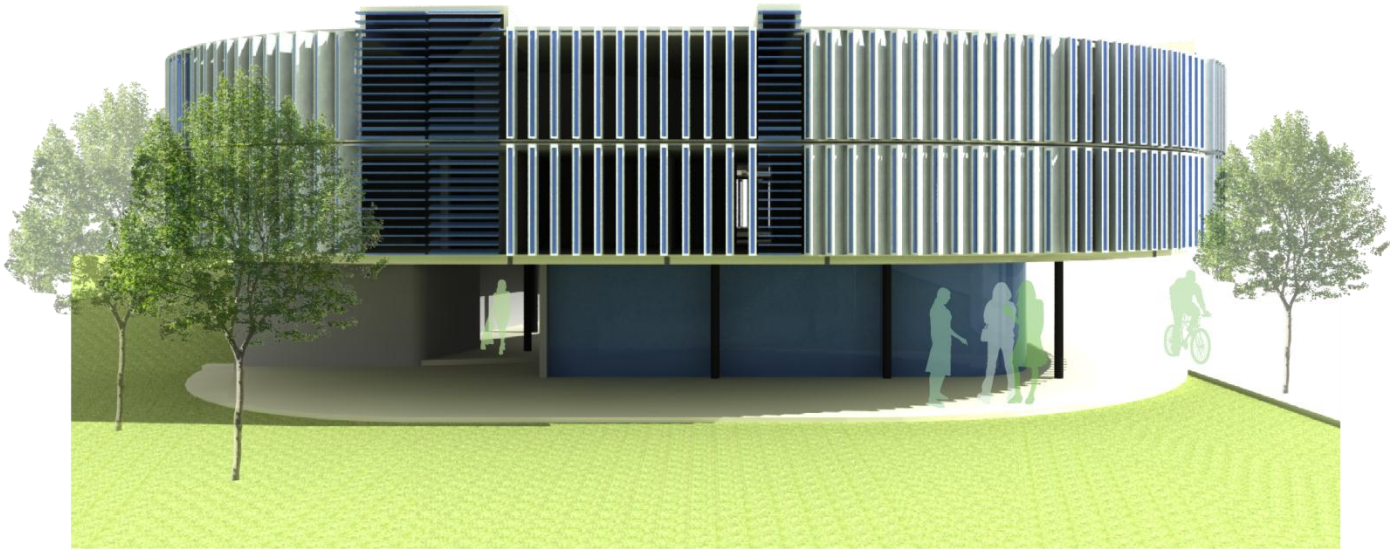


Section B-B



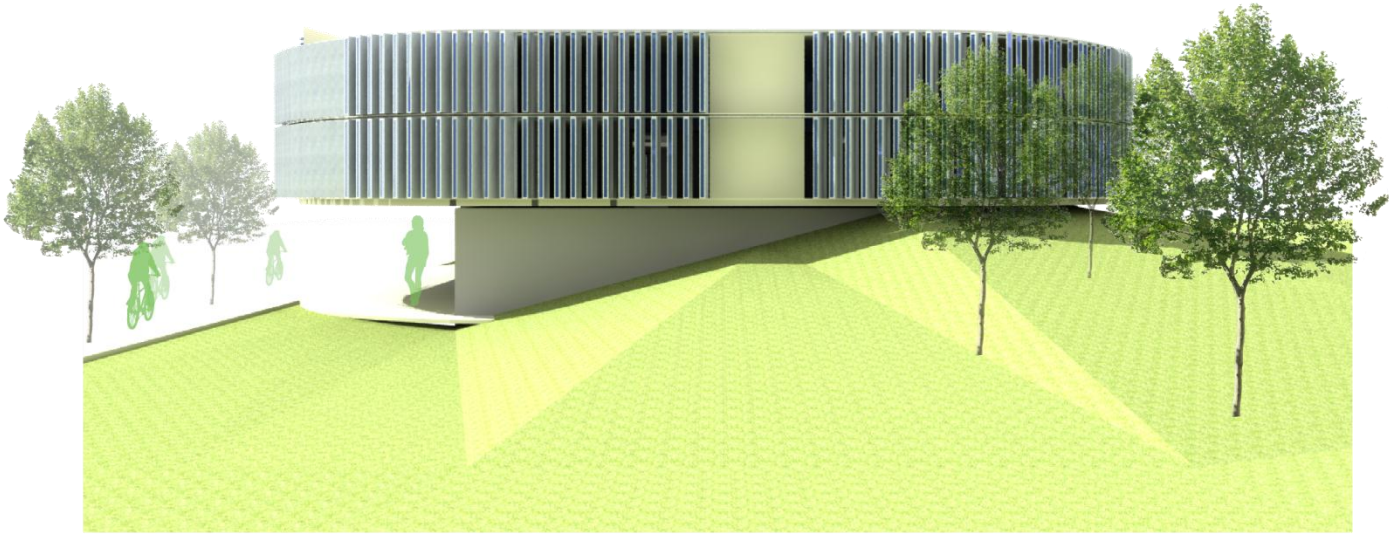
View From Street-East

North Elevation

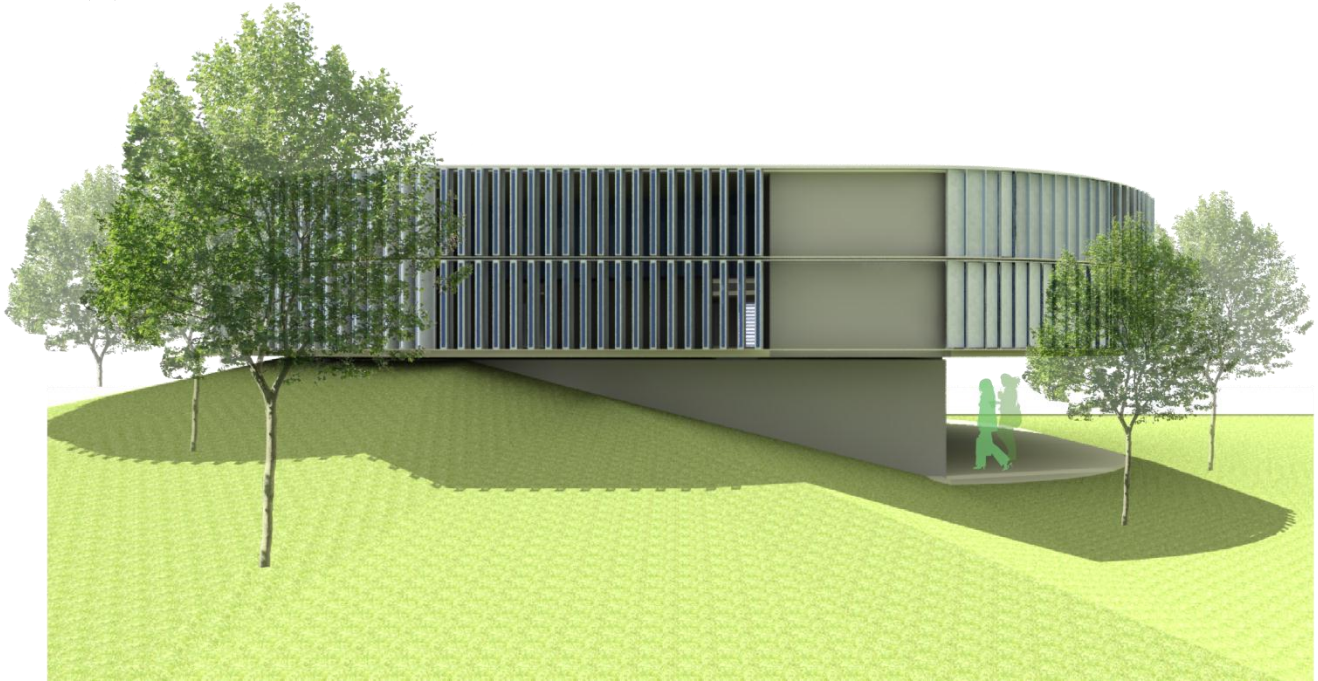


East Elevation

South Elevation



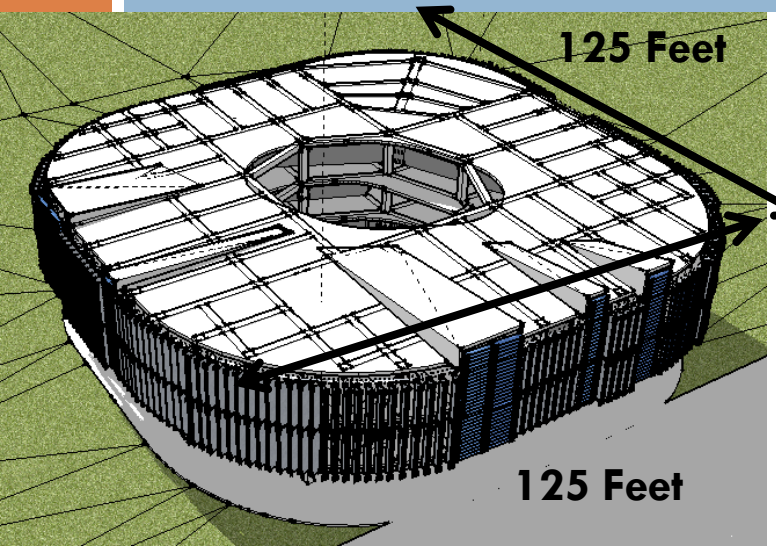
West Elevation



Structural Engineering

- Design Criteria: Social and Sustainable
- Social: Not to interrupt architectural plan
- Sustainability
  - Initial Earthquake Performance Level: Life Safe under Rare Seismic Condition
  - Sustainable: Concentrate damage in easily replaceable sections (fuses) to achieve Operational Level under Rare Seismic Condition

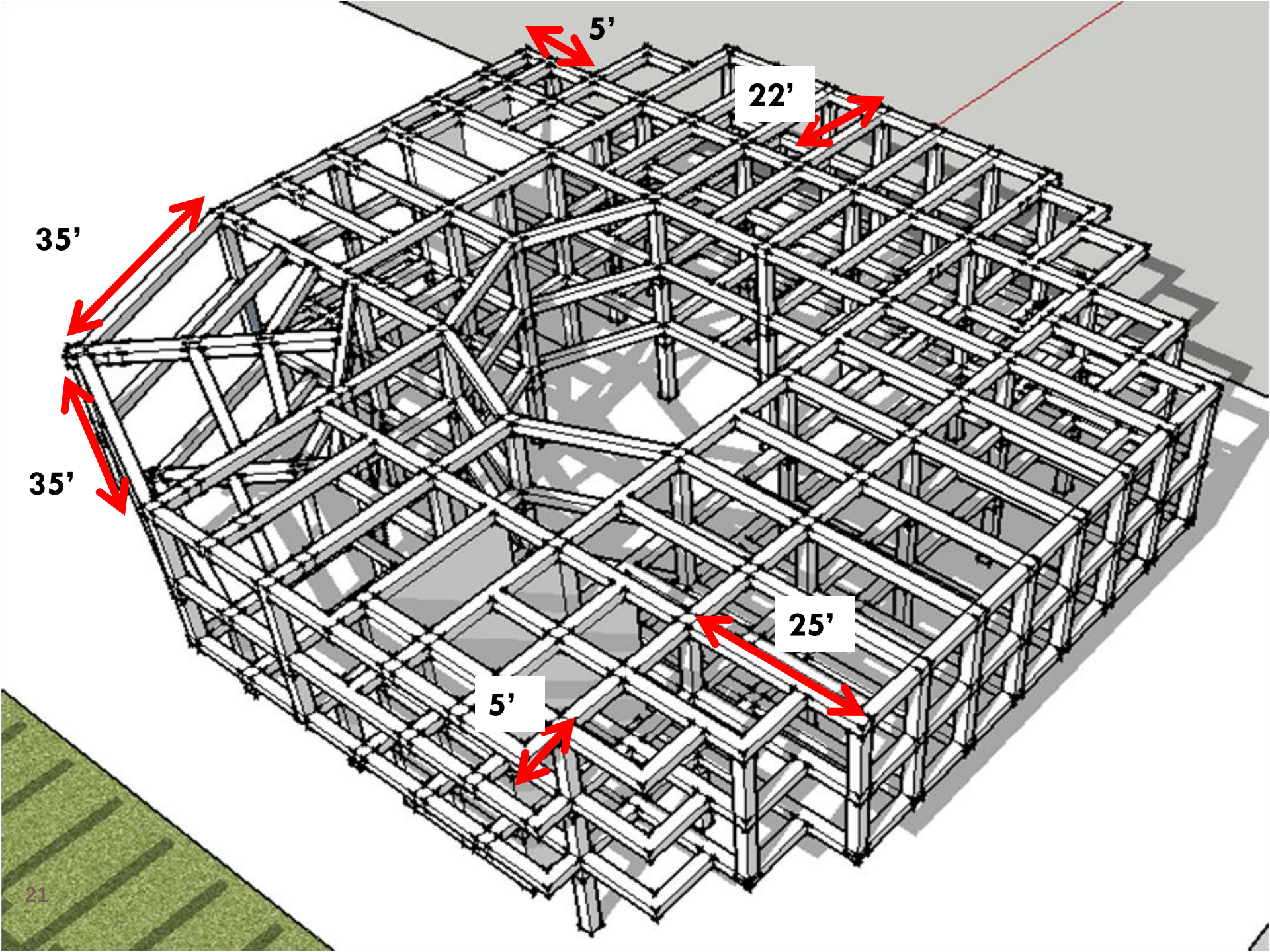
Boomerang



Architecture and Structural Model Combined

Load Type	Floor	Values
Dead Load	Typical Floor	2000 kips
	Roof	900 kips
Live Load	Typical Floor	1000 kips
	Roof	0.3 kips
Wind Load	Typical Floor	43 kips
	Roof	25 kips
Seismic	Base Shear	765 kips

Chris standing in the Auditorium to see how the Structure integrated with Architecture.


5’
22’
35’
35’
25’
5’

Boomerang– Steel

Columns	Member Size	
Exterior	W 10 x 33	
Interior	W 10 x 39	

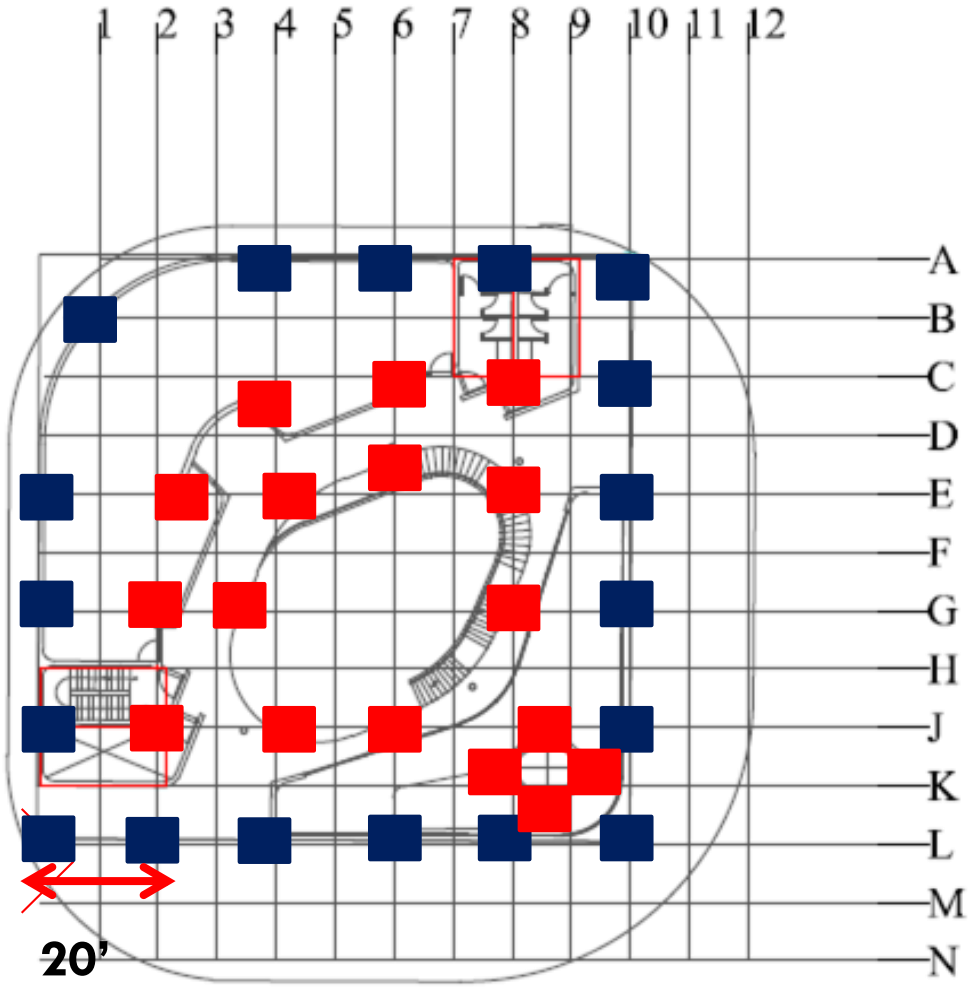
Beams	Member Size
Exterior	W 24 x 55
Interior	W 21 x 44

Spread Footing: 8'x8'x2'

Grade Beams Between Footings : 2' x 2'

Basement Wall : 12"

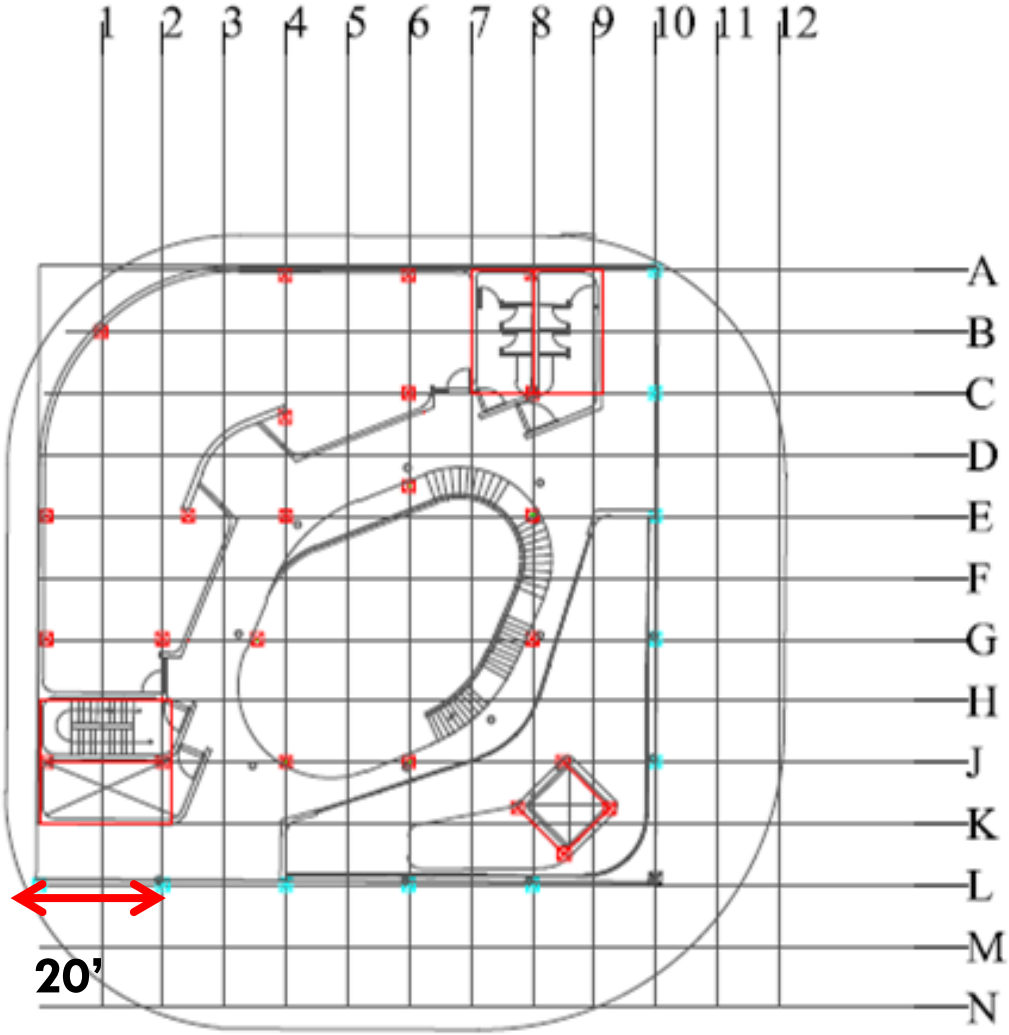
Slab on Grade : 6"



Boomerang– Concrete– Columns

Typical Member Sizes

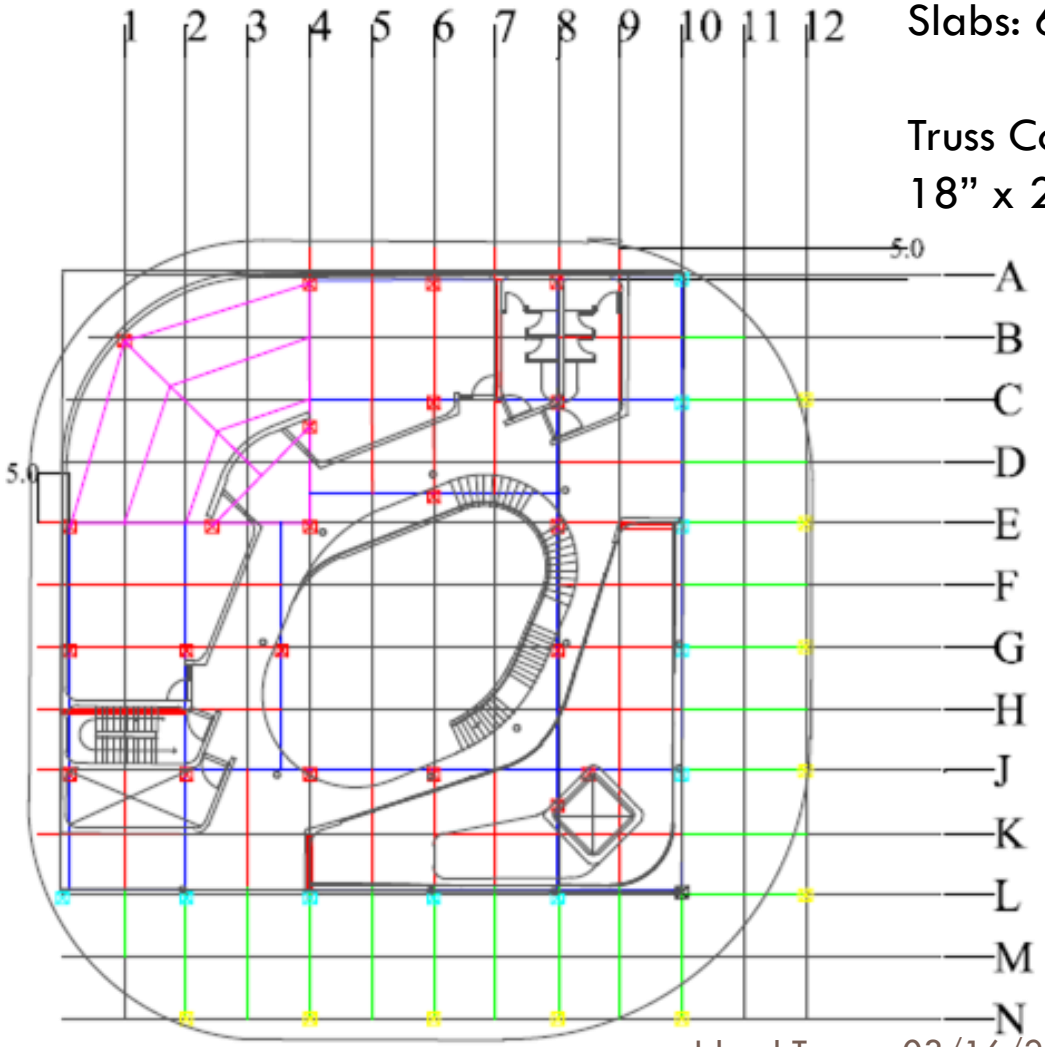
Columns	Member Size
Exterior	12” x 12”
Interior	14” x 14”
Cantilever	20” x 20”
Corner	24” x 24”



Boomerang– Concrete– Beam

Typical Floor	Member Size
	14” x 16” (PT)
	18” x 18”
	18” x 22” (PT)
	18” x 18” (PT)

Roof	Member Size
	10” x 12” (PT)
	14” x 14”
	14” x 16” (PT)
	14” x 14” (PT)



Slabs: 6”

Truss Columns: 18” x 22”

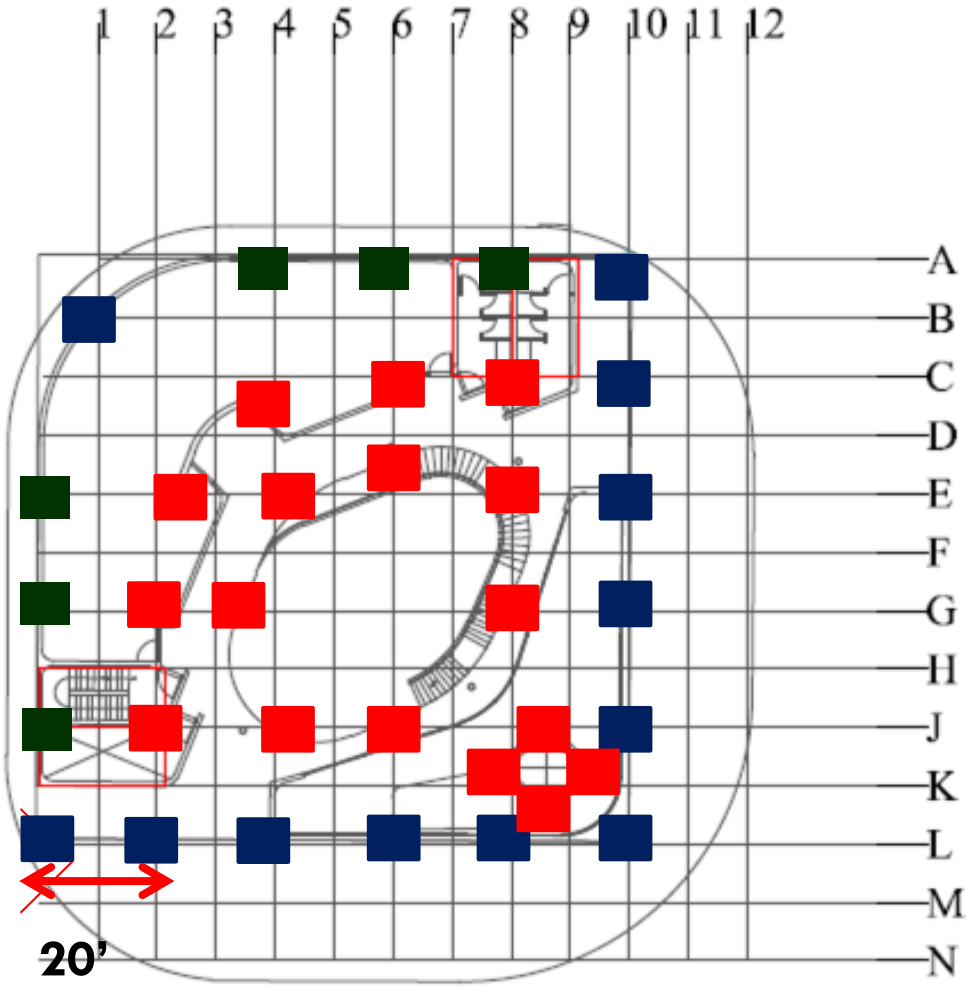
Boomerang– Concrete– Foundation

Interior : 9’ x 9’ x 2’
Exterior : 7’ x 7’ x 2’
Cantilever : 11’ x 11’ x 2’

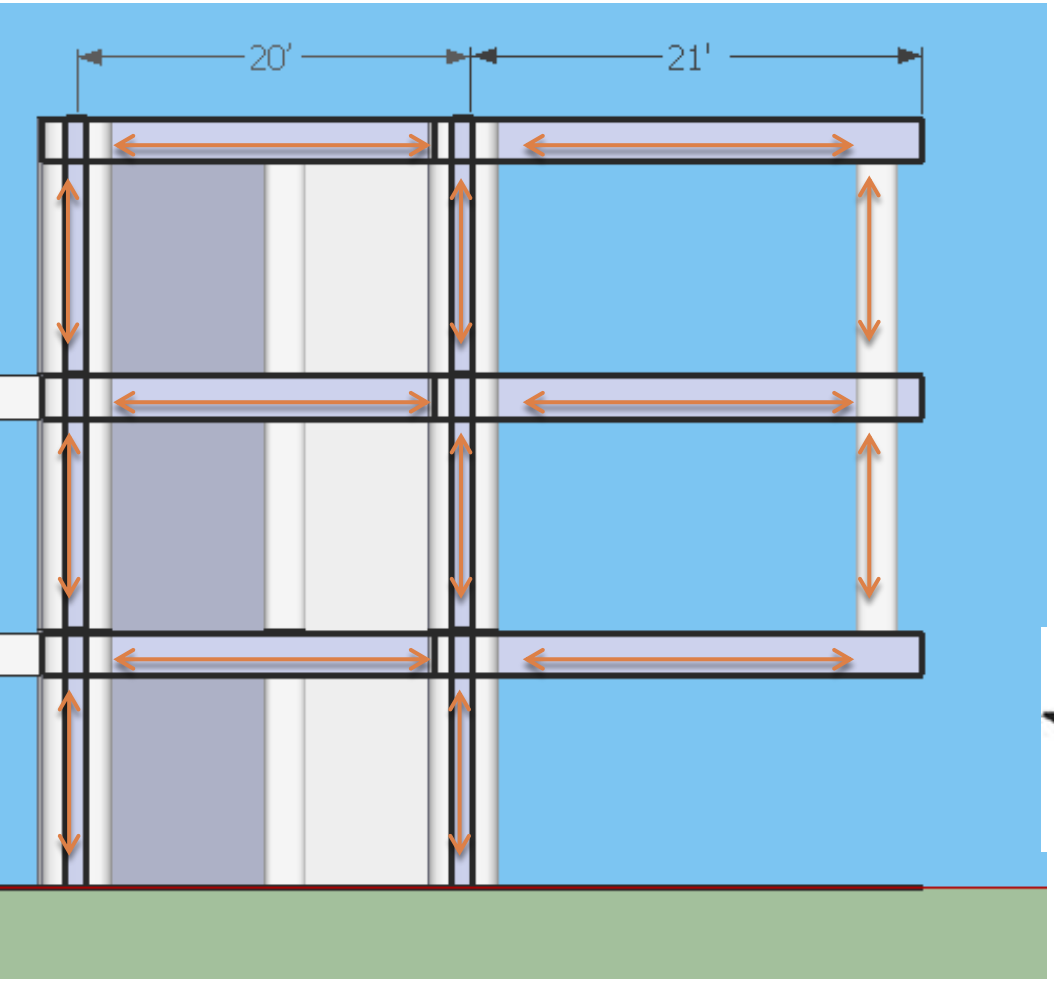
Grade Beams Between Footings : 2’ x 2’

Basement Wall : 12”

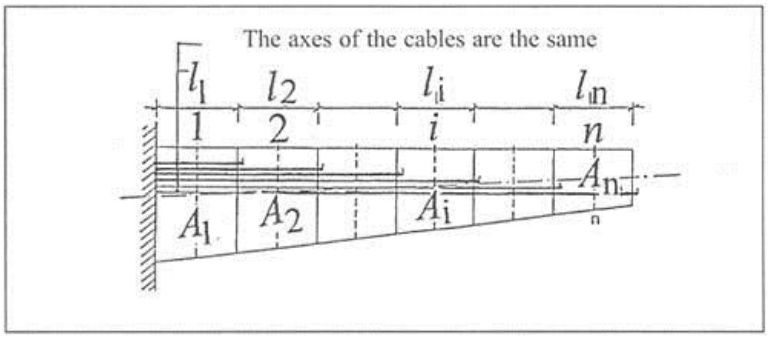
Slab on Grade : 6”



Boomerang– Gravity Load Path and Cantilever



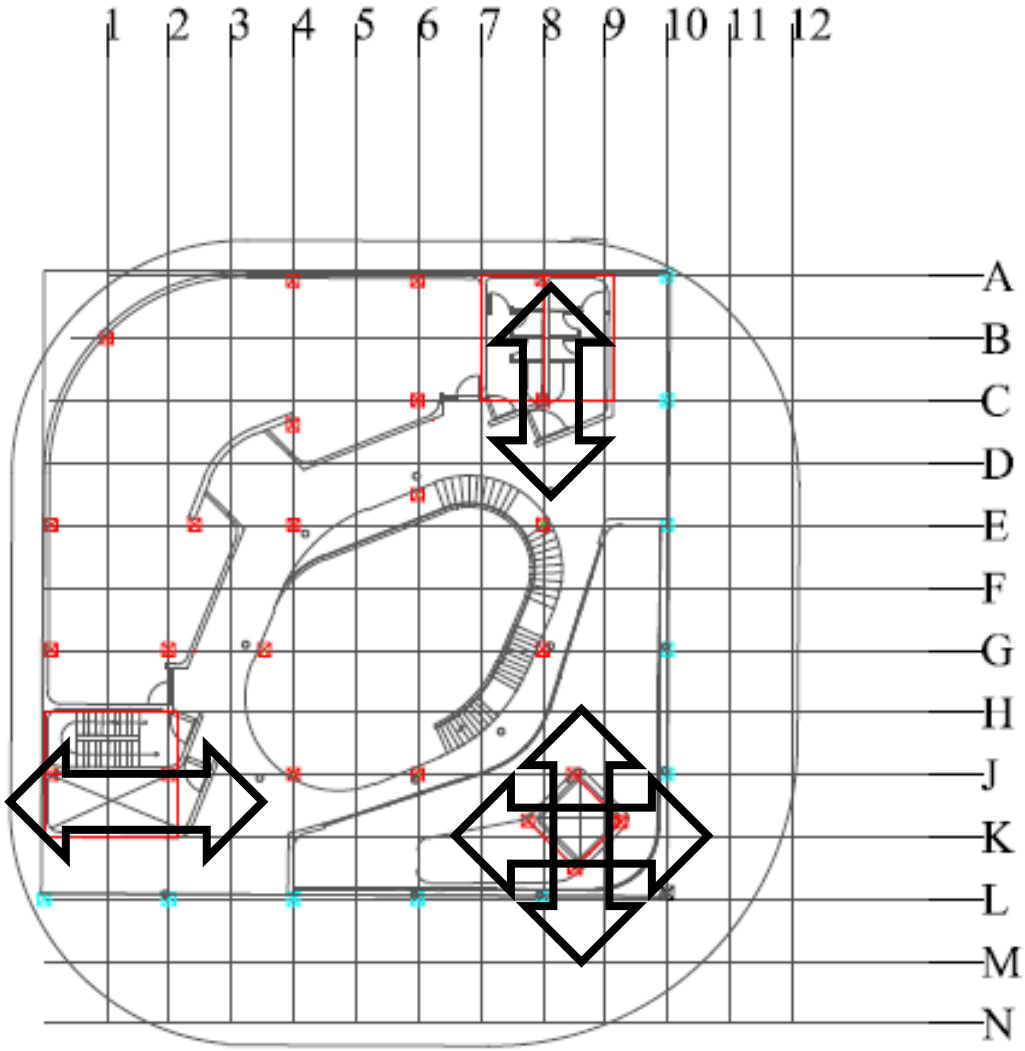
Tapered Post Tension Cantilevers



Typical Post Tension Backspan

Typical Post Tension Auditorium Span

Boomerang–Lateral



Concrete Shear Wall
Thickness=18”

Steel Shear Wall
Thickness = 18”

Site Overview: Climate

- Climatic Design Conditions
  - 2% Cooling Design Temperature: 89.2 F
  - 99% Heating Design Temperature: 70.8 F
    - No Heating Required
- Average Humidity: 76.5% (0.019 humidity fraction)
- Yearly Rainfall: 56.43 inches
  - Monthly Range: 1.95 inches to 6.35 inches

Outdoor Air Requirements

Room	Quantity	Square Footage (Each)	Occupancy (people)	IMC Ventilation Requirement (cfm/person)	IMC Ventilation Requirement (cfm/ft2)	IMC Total Ventilation Requirement Each (cfm)	IMC Total Ventilation Requirement (cfm)
Faculty Offices	20	180	1	20		400	0
Department Chair's Office	1	300	1	20		20	0
Senior Administration Office	2	150	1	20		40	0
Administrative Assistants	4	75	1	20		80	0
Faculty Lounge	1	1000	20	20		400	0
Student Offices	20	60	1	20		400	0
Auditorium	1	3000	100	15		1500	0
Large Classrooms	2	800	50	15		1500	0
Small Classrooms	4	500	25	15		1500	0
Seminar Rooms	4	200	20	15		1200	0
Instructional Labs	2	1000	30	20		1200	0
Server Room	1	800	1		0.15	0	120
Technical Support	1	100	1	20		20	0
Storage Rooms	1	1000	1		0.15	0	150
Bathrooms	6	300	1	35		210	0
Mechanical Rooms	3	600	1		0.15	0	270
Circulation Space	1	0	30		0.1	0	0
Commercial Space	1						
Lobby	1						

Total Ventilation Requirement	9310
ACH	2.132061069

Total Supply Air: 30,000 cfm

Baseline Cooling Load

Cooling Load Baseline: Wrench											
Note that the parameters of this scenario are very poor intentionally. This is meant to be an absolute worst case scenario.											
Tavg (F)	89.2										
Tdesign (F)	78										
Wavg	0.0190										
Wdesign	0.0100										
Outdoor Air (CFM)	9353.5										
Number of Occupants	326										
Fan Duty Cycle	0.3										
Supply Air Requirement (CFM)	29372.28132										
Type of Heat Gain	**U-Value (Btu/hr-ft2-F)**	**Area**	**CLTD**	**SHGF**	**Shading Coefficient**	**CLF**	**Btuh/person**	**W/sf**	**Heat Transfer**	**Notes**	
North Walls	0.124	0	16	--	--	--	--	--	-	Minimum	
Northeast Walls	0.124	1428	26	--	--	--	--	--	4,603.87	Minimum	
East Walls	0.124	0	32	--	--	--	--	--	-	Minimum	
Southeast Walls	0.124	1428	26	--	--	--	--	--	4,603.87	Minimum	
South Walls	0.124	0	13	--	--	--	--	--	-	Minimum	
Southwest Walls	0.124	2271	11	--	--	--	--	--	3,097.64	Minimum	
West Walls	0.124	0	13	--	--	--	--	--	-	Minimum	
Northwest Walls	0.124	1511	15	--	--	--	--	--	2,810.46	Minimum	
Roof	0.124	8049.16	28	--	--	--	--	--	27,946.68	Minimum	
Doors	0.7	96	20	--	--	--	--	--	1,344.00	Minimum	
Floor	0.73	2136	28	--	--	--	--	--	40,541.28	Minimum	
North Windows	1.2	0	26	55	0.95	0.76	--	--	-	No shadin	
Northeast Windows	1.2	2160	37	187	0.95	0.28	--	--	203,346.72		
East Windows	1.2	0	47	210	0.95	0.29	--	--	-		
Southeast Windows	1.2	2220	45	111	0.95	0.36	--	--	204,155.64		
South Windows	1.2	0	34	42	0.95	0.53	--	--	-		
Southwest Windows	1.2	760	30	111	0.95	0.53	--	--	69,835.26		
West Windows	1.2	0	28	210	0.95	0.4	--	--	-		
Northwest Windows	1.2	1240	34	187	0.95	0.3	--	--	116,677.80		
Sensible Ventilation	--	--	--	--	--	--	--	--	33,645.16		
Latent Ventilation	--	--	--	--	--	--	--	--	119,091.57		
Occupants, Latent	--	--	--	--	--	--	150	--	48,900.00		
Occupants, Sensible	--	--	--	--	--	--	170.85	--	55,697.10		
Appliances	--	30000	--	--	--	--	--	1.2	122,760.00		
Lighting	--	30000	--	--	--	--	--	1	102,300.00		
					Total				***1,161,357.06***	***Btuh***	
									96.78	***tons***	

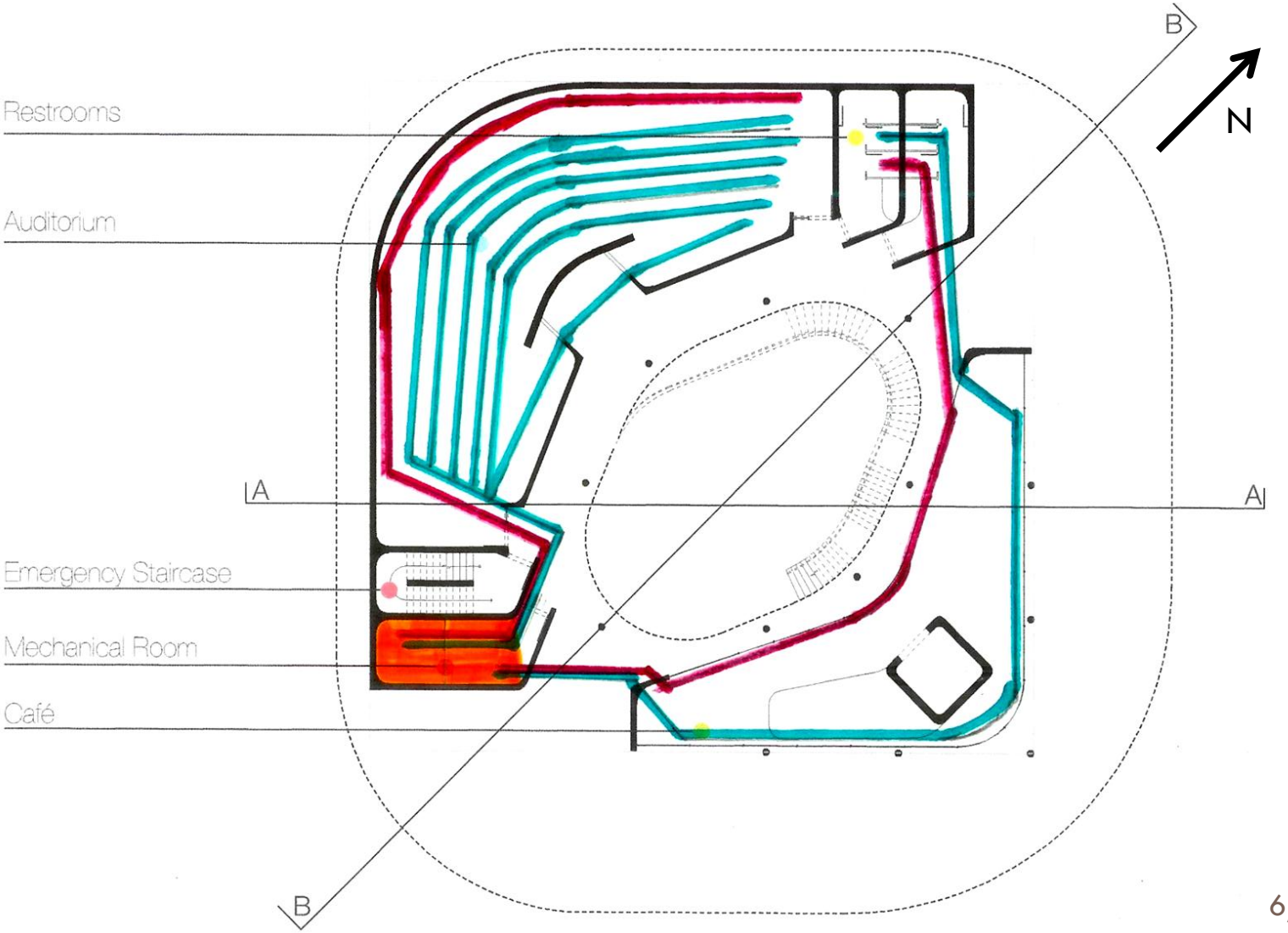
Cooling Load Summary

Scenario	Description	Cooling Load (tons)	Reduction from Baseline (%)
Baseline	--	97	--
ASHRAE 189.1	Complies with ASHRAE 189.1	94	3%
IECC/Overhang	Includes overhangs and meets IECC	75	23%
Reduction 1	R-20 walls, R-30 roof, double-glazed, low-e windows	59	39%
Reduction 2	Reduction 1+65% design humidity	56	42%
Reduction 3	Reduction 1+shift to N/S-E/W axis	63	35%
Reduction 4	IECC/Overhang with 50% Reduced Fenestration	64	34%

Cooling System

- Central chiller plant on-site ~1200 ft from location
- 6 small AHUs by use zone (2 per floor)
  - Auditorium
  - Café/restrooms
  - Classrooms
  - Server room/restrooms
  - Classrooms
  - Offices

Duct Routing



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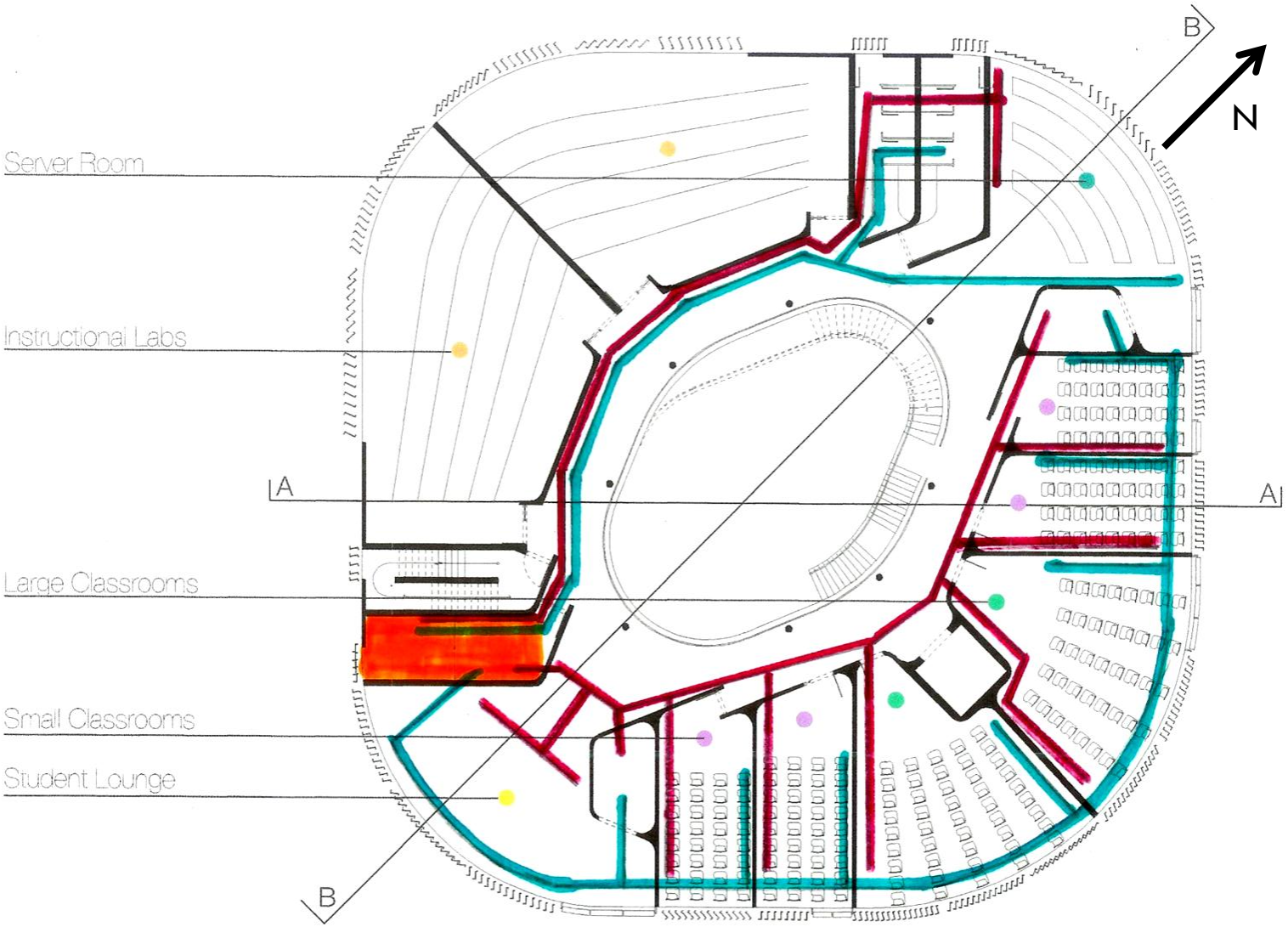

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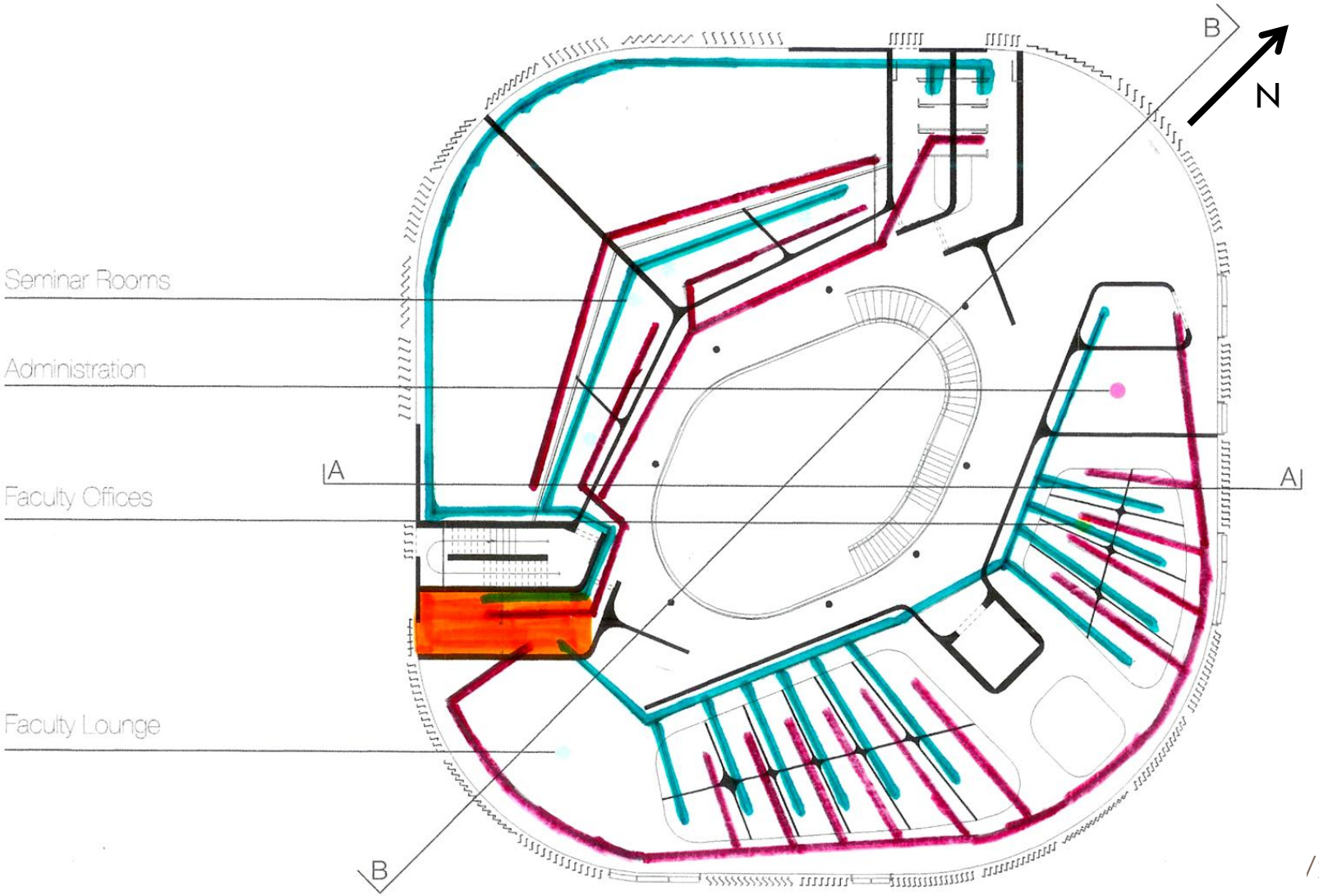
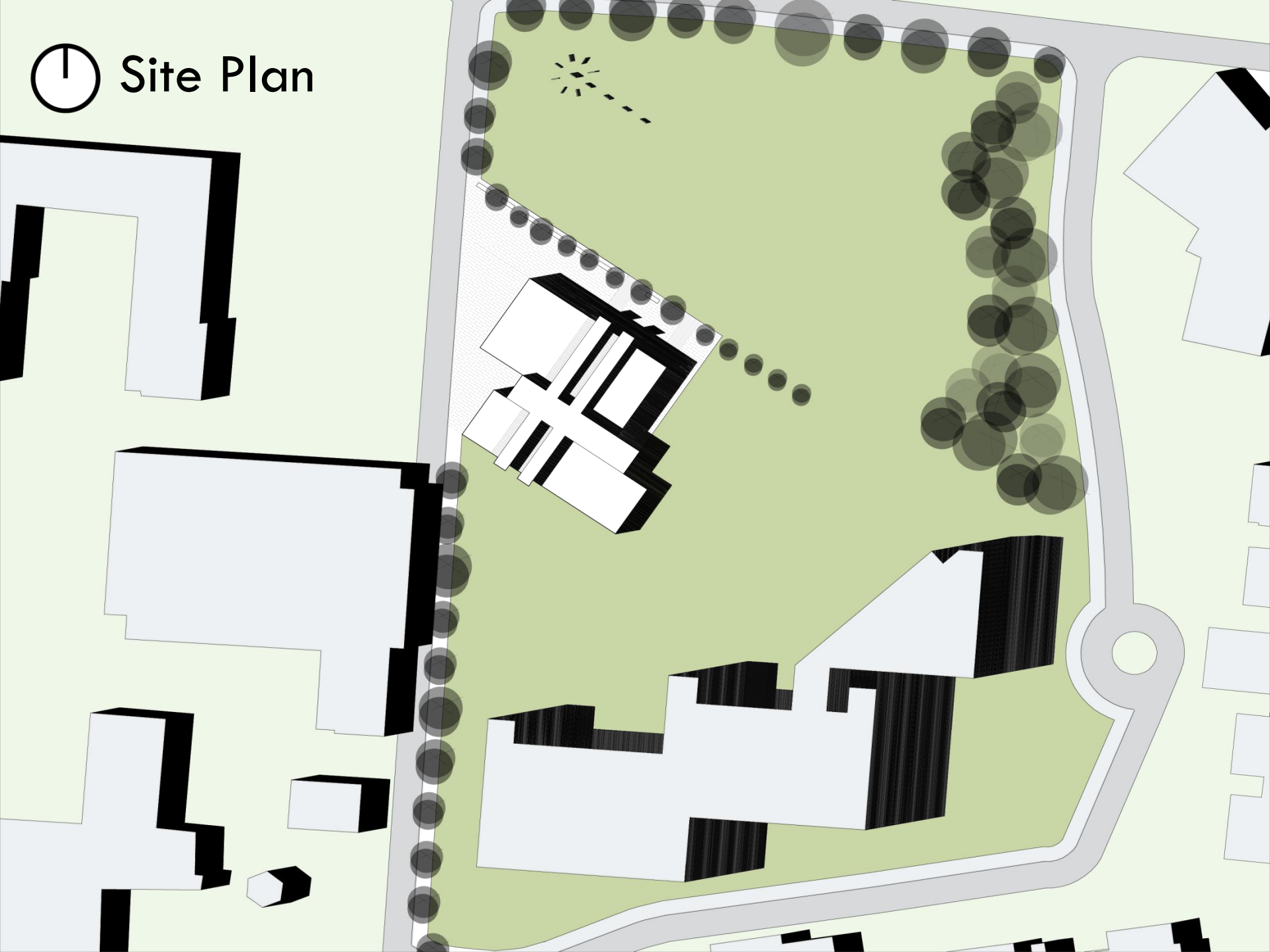


Floating Box

- Core as **Backbone.**
- **Ribs** as unifying elements.
- Ribs allow indirect **sunlight** and **ventilation.**
- **Covered Plaza:** Space for social and academic activity.

Site Plan



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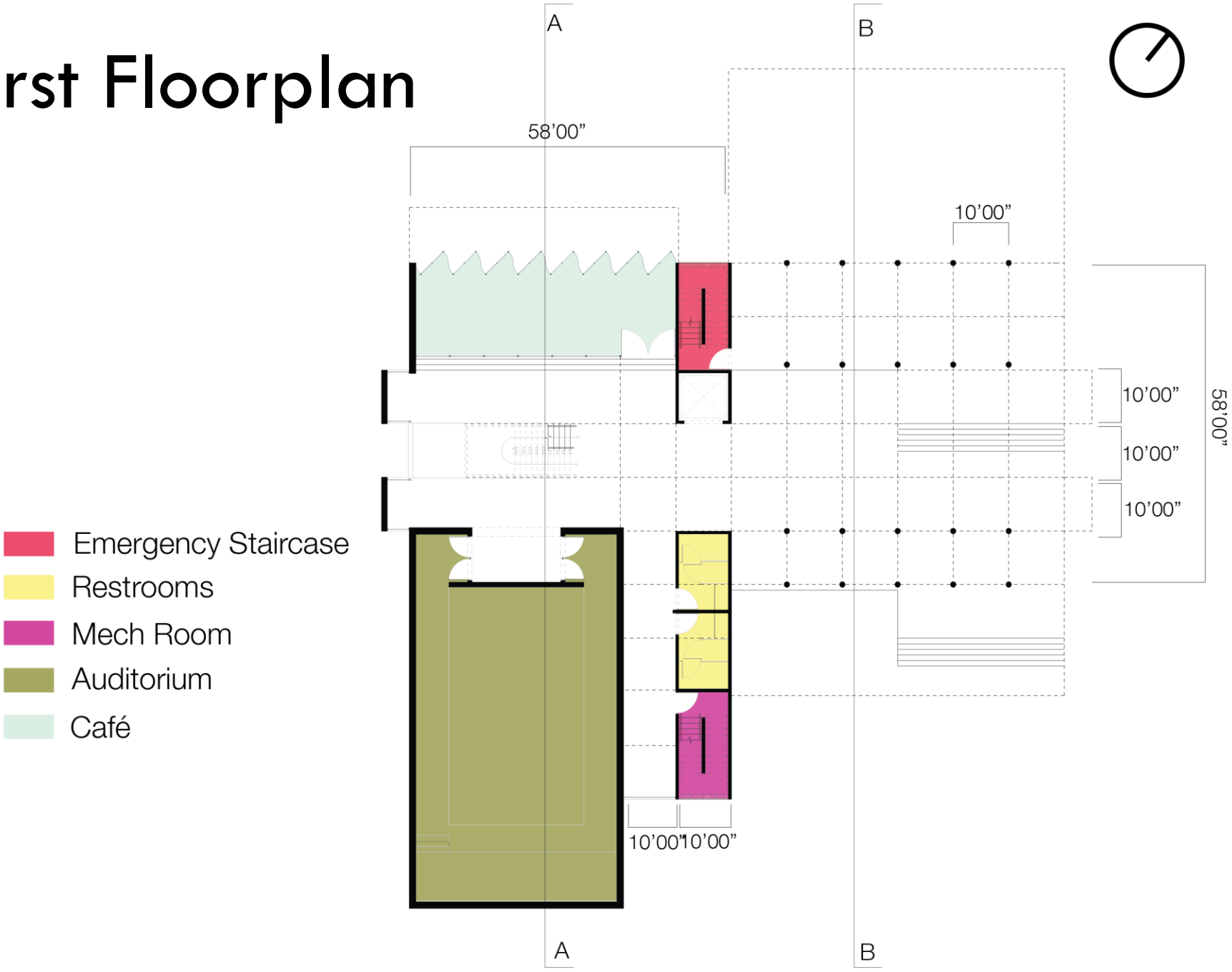
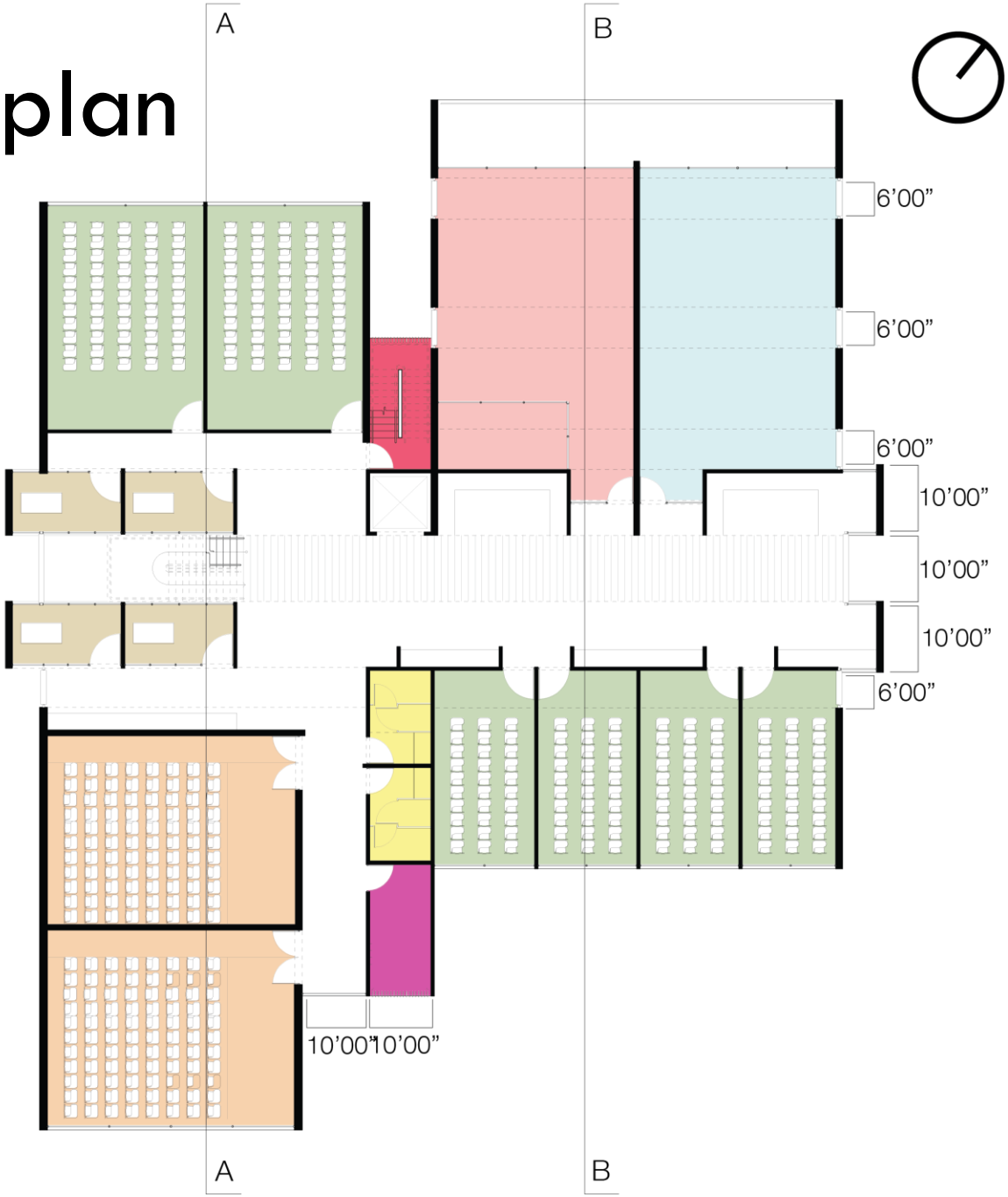


Second Floorplan



- Emergency Staircase
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- Auditorium
- Café
- Classrooms
- Server Room
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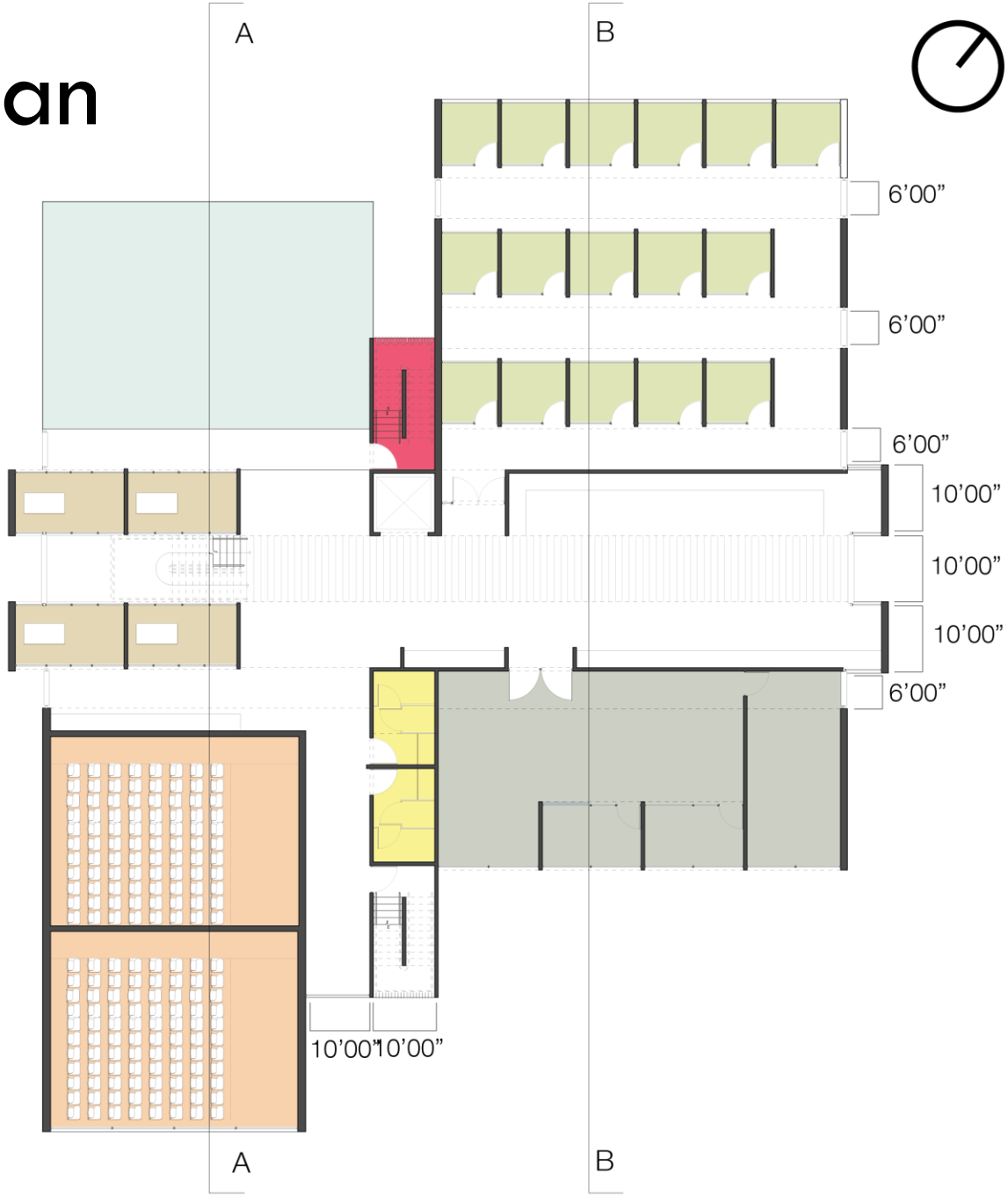
Third Floorplan



- Emergency Staircase
- Restrooms
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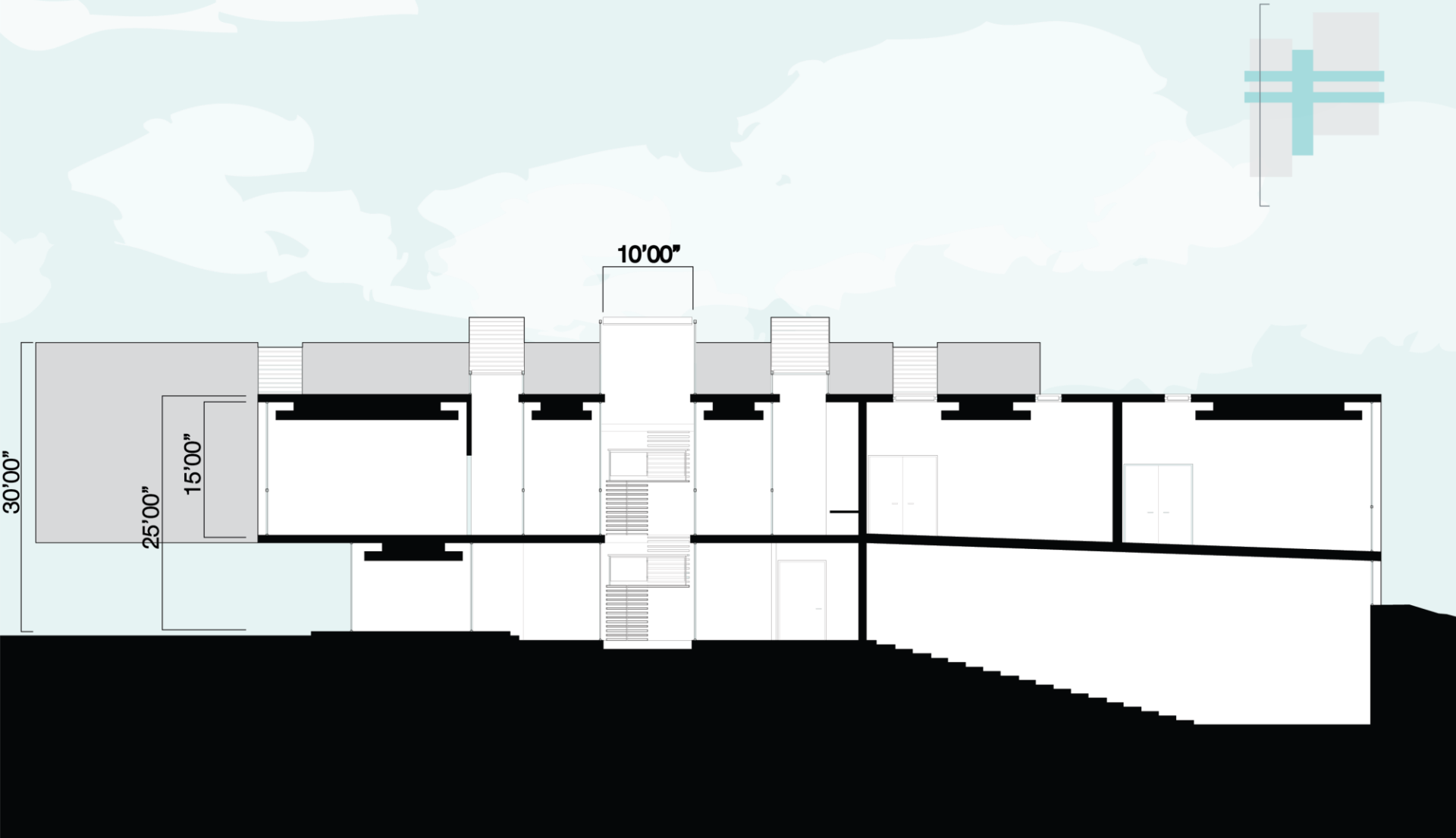
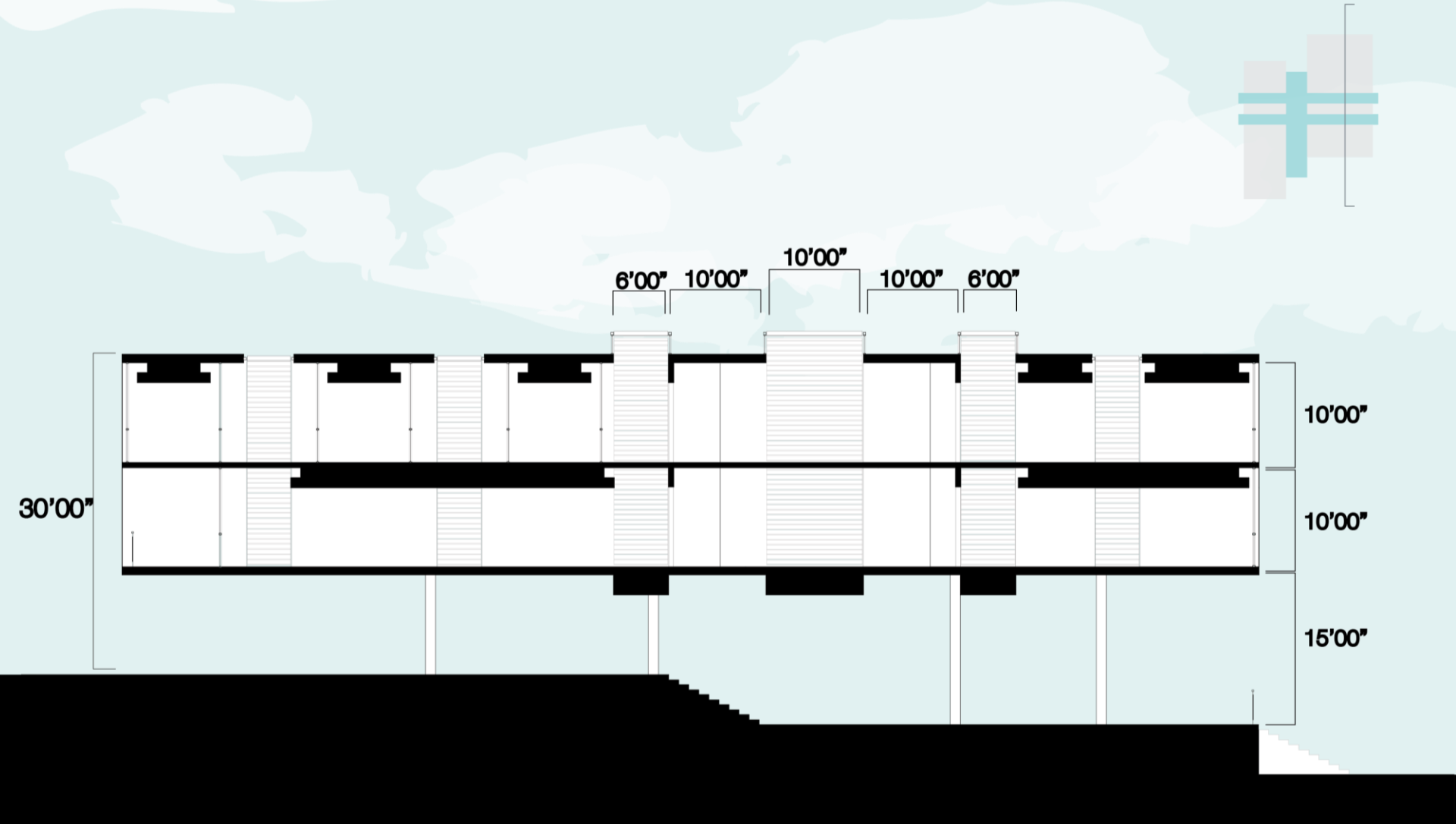
- Instructional Labs
- Seminar Rooms
- Faculty Offices
- Administration
- Terrace

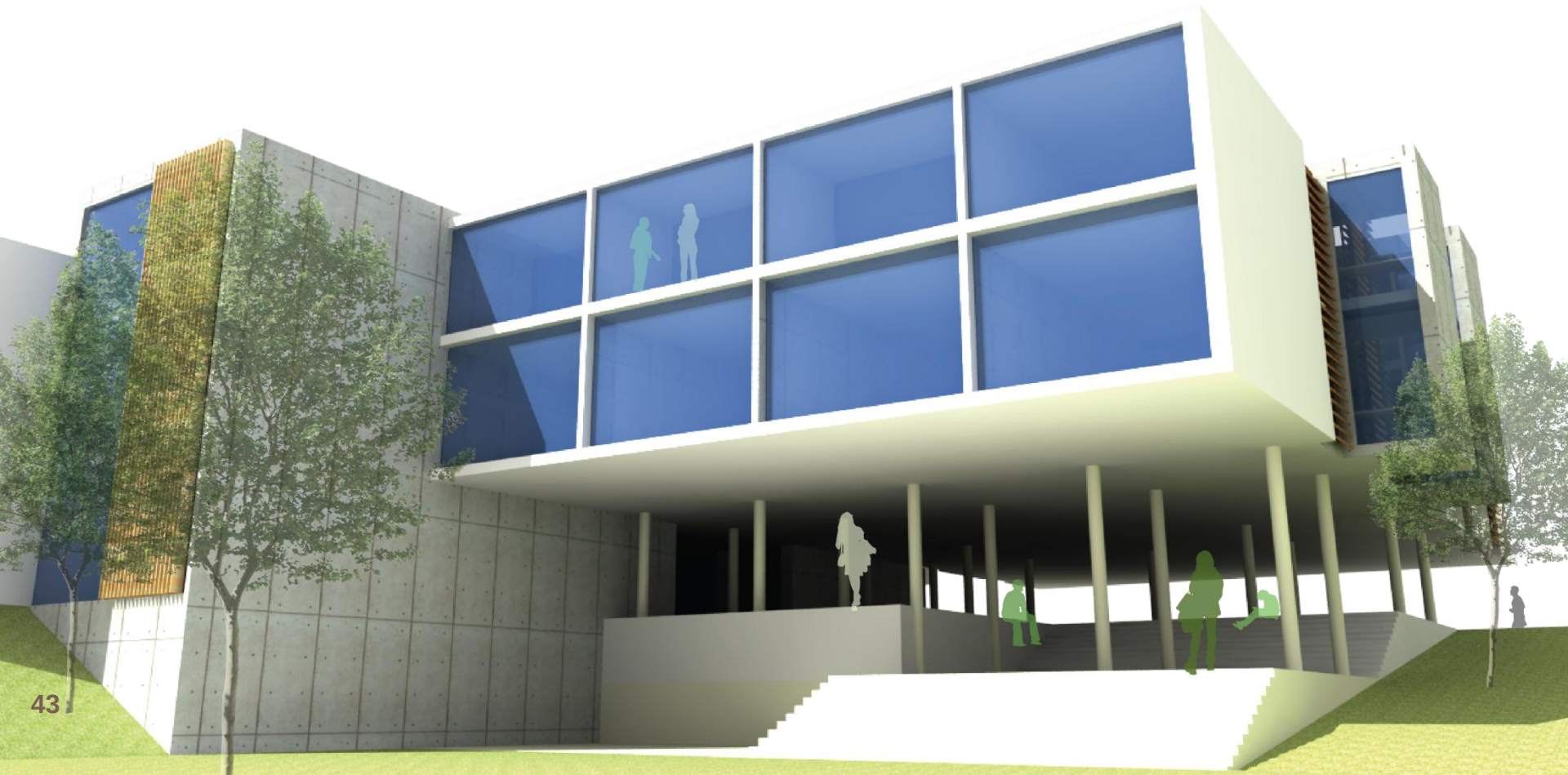
Section A-A



Section B-B

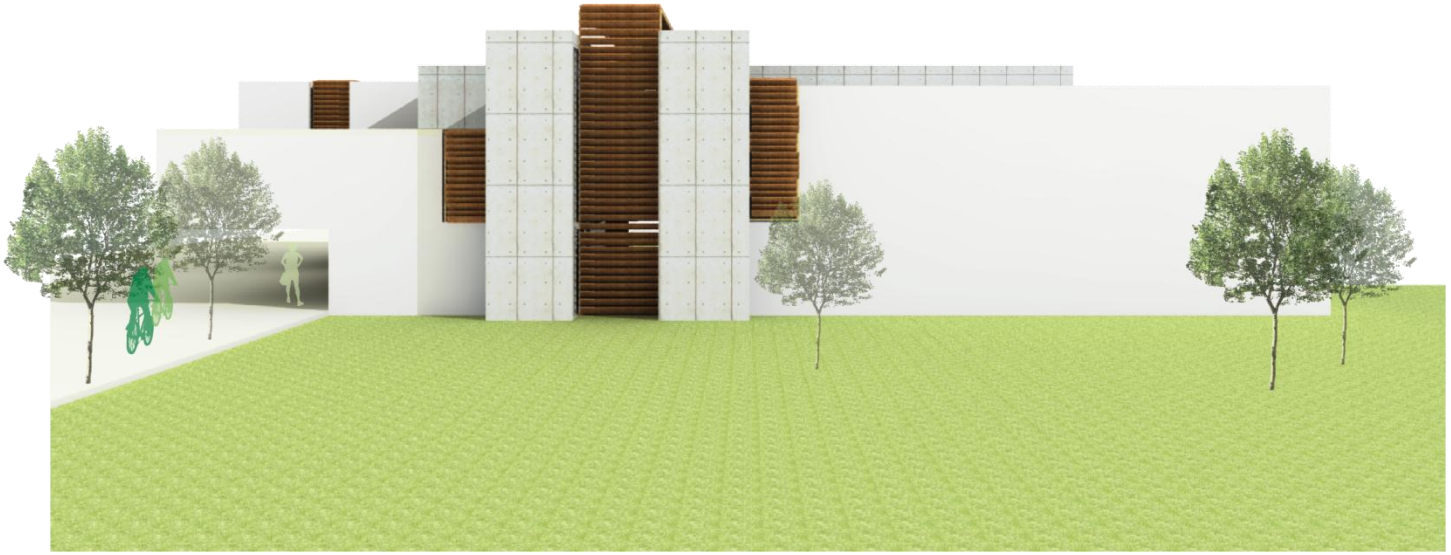


View from Green Area



East Elevation

South Elevation

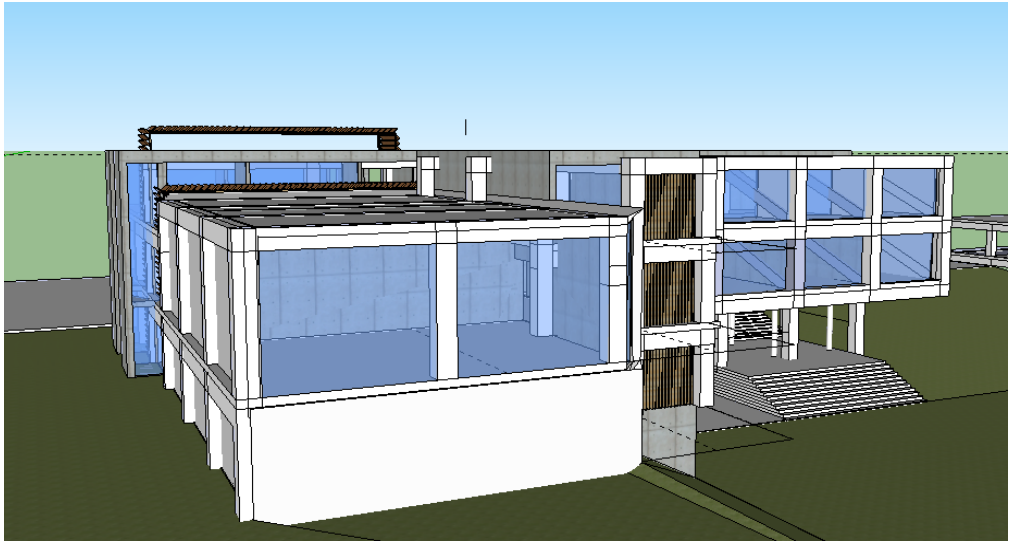


West Elevation

North Elevation

Floating Box

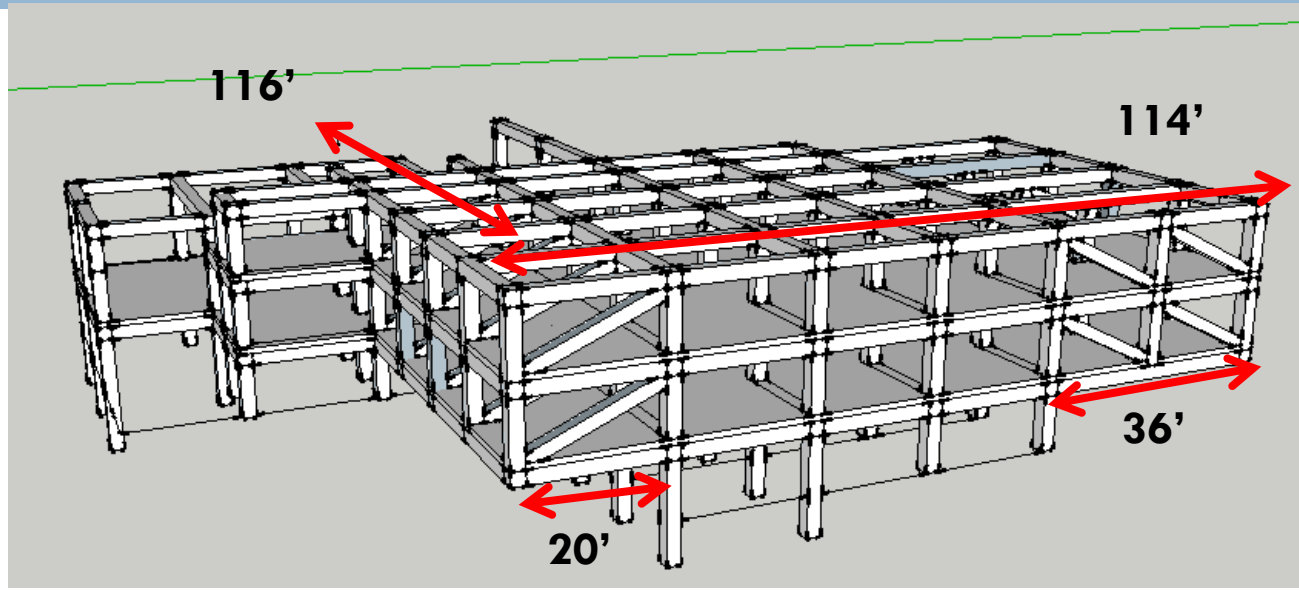
Load Type	Floor	Values
Dead Load	Typical Floor	2100 kips
	Roof	900 kips
Live Load	Typical Floor	800 kips
	Roof	0.3 kips
Wind Load	Typical Floor	43 kips
	Roof	25 kips
Seismic	Base Shear	765 kips

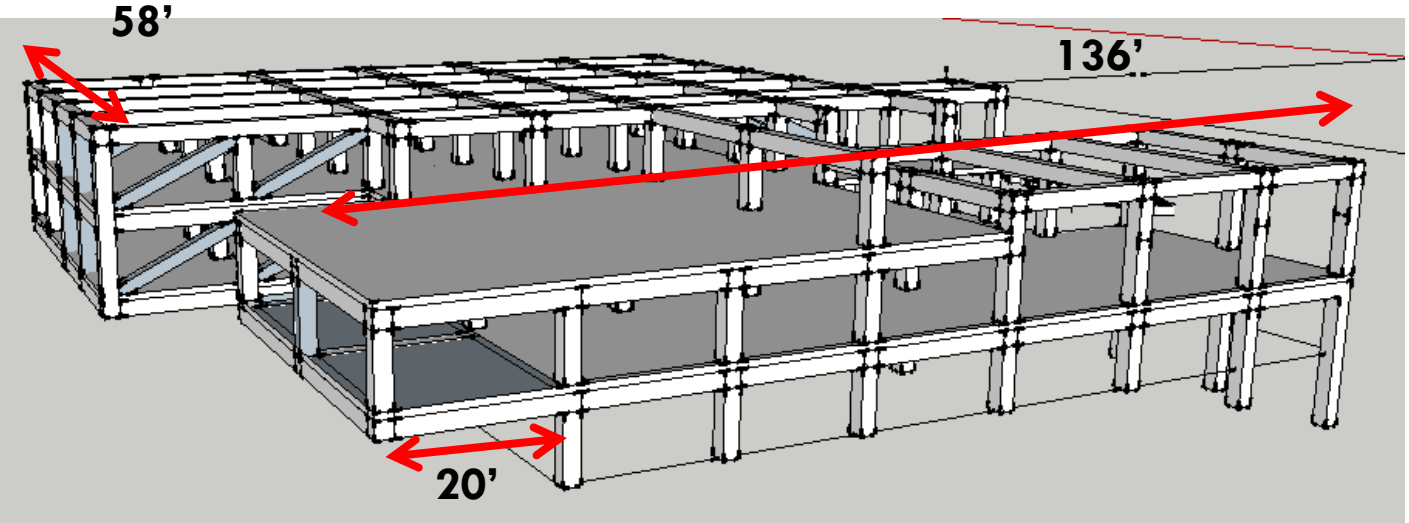


Architecture and Structural Model Combined

Chris and Wenhao standing next to each other in the hallway.

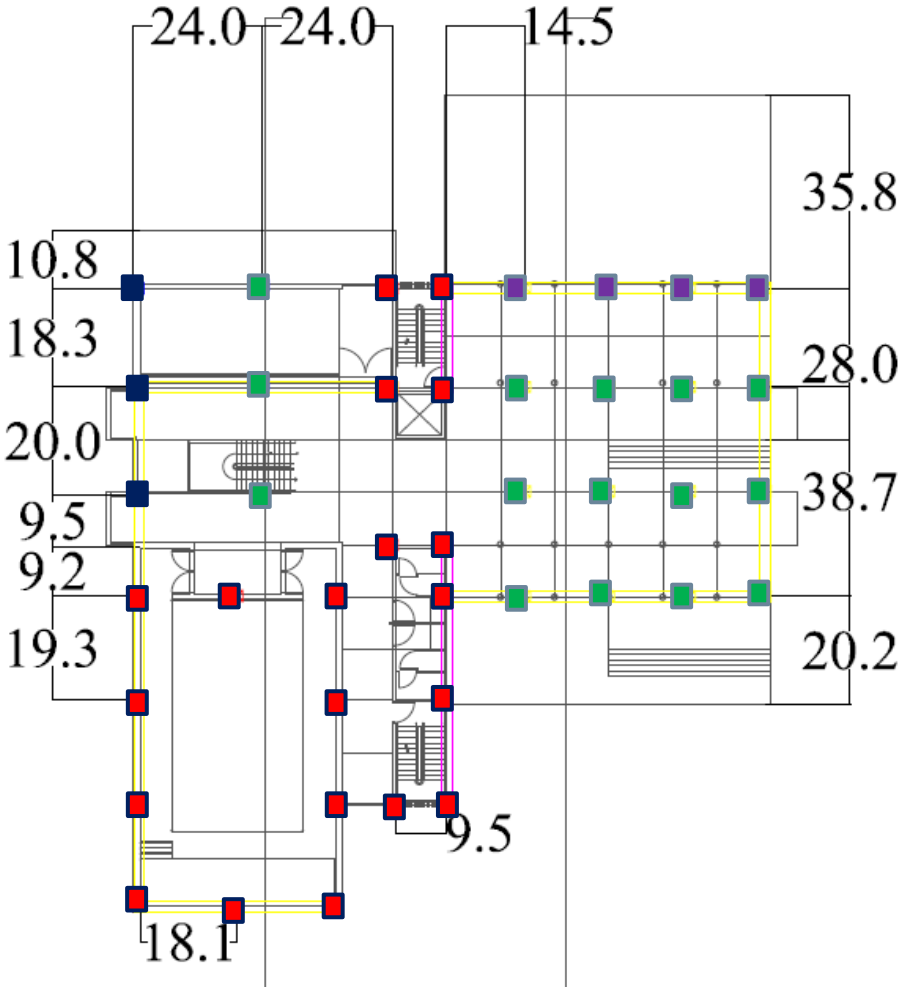
Floating Box





Floating Box– Steel - Column

Typical Floor	Member Size	Spacing	
Holding Cantilever	W14x74	20’	
Interior	W14x30		
Exterior	W12x26		
Auditorium Stair Core	W12x16	18.3’	



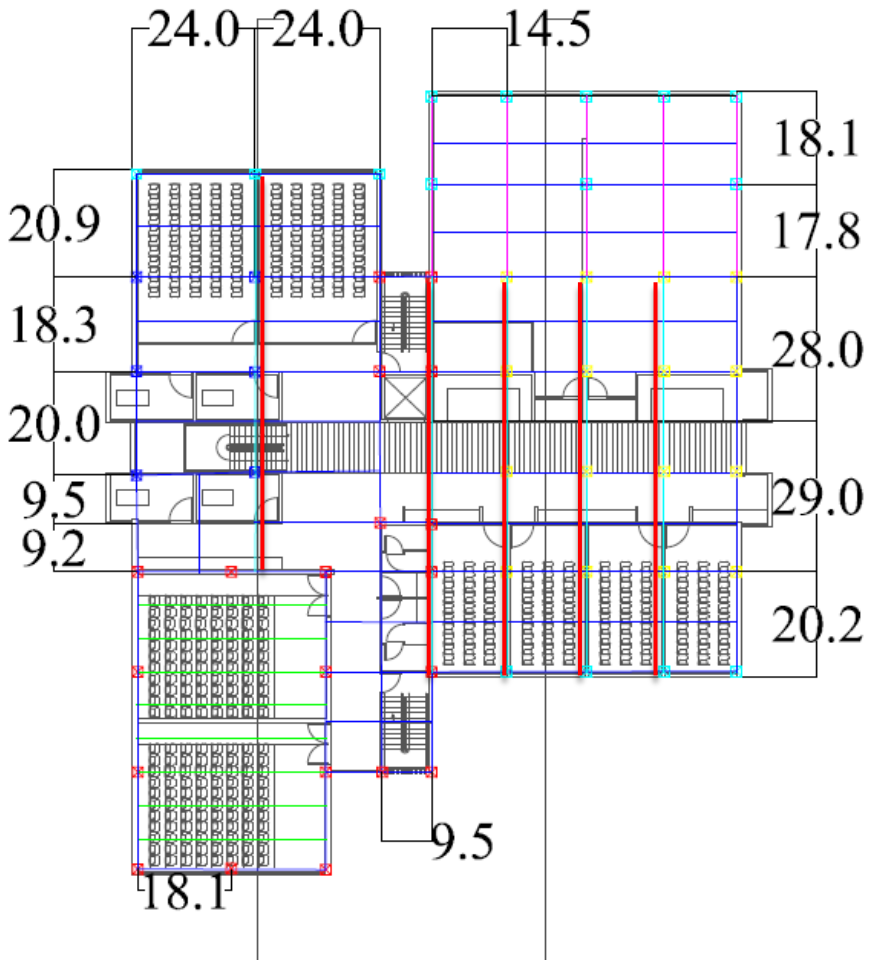
Floating Box– Steel - Floor

	Typical Floor	Roof	Span
Cantilever Beam			
	W21x122	W21x93	36’
Interior Girders			
	W14x26	W12x26	28.5’
Exterior Girders and Beams			
	W12x26	W12x19	20’

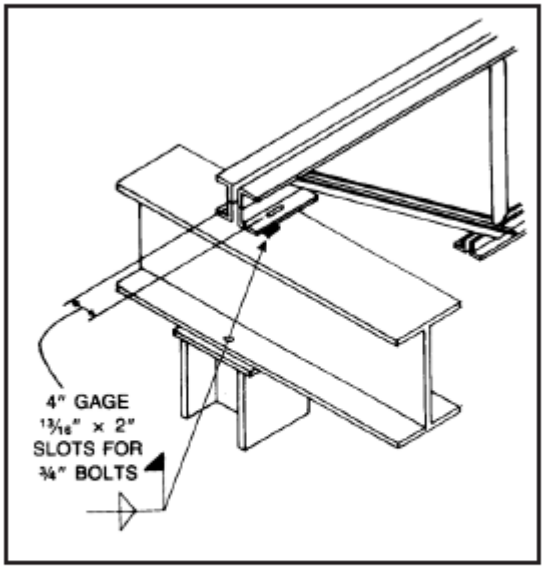
Slab: 2” Deck + 3” Concrete

Truss Columns: W14x43

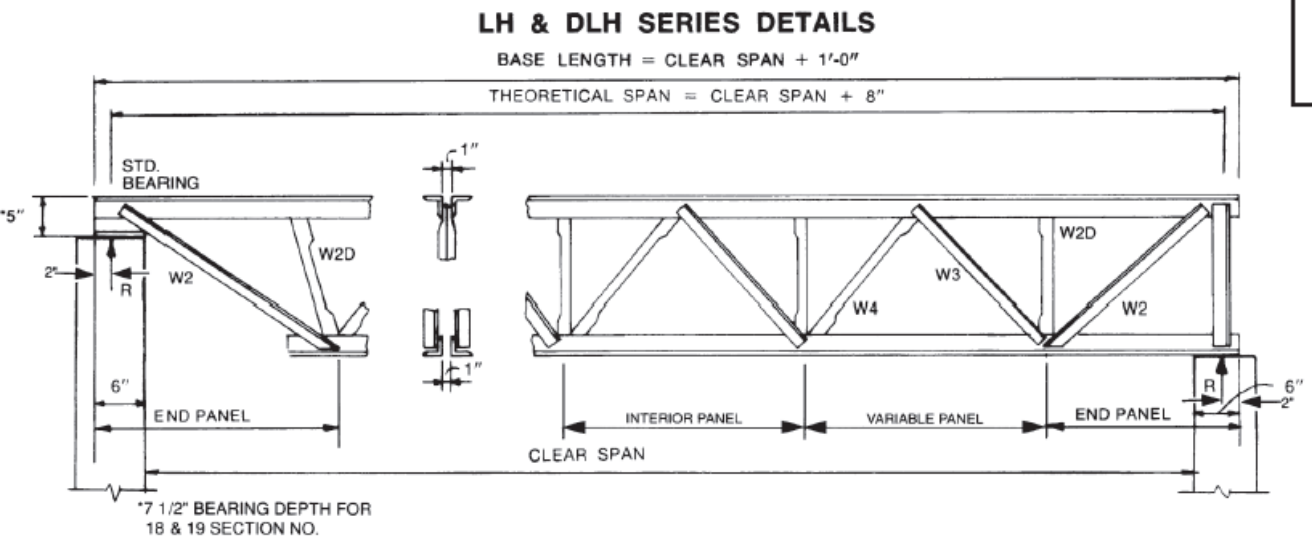
Auditorium 20LH08



Floating Box– Steel - Auditorium



BOLTED CONNECTION
See Note (c)
Typically required at columns



Joists: 20LH08 (AUCOR)
Spacing: 3.3'
Span: 36'

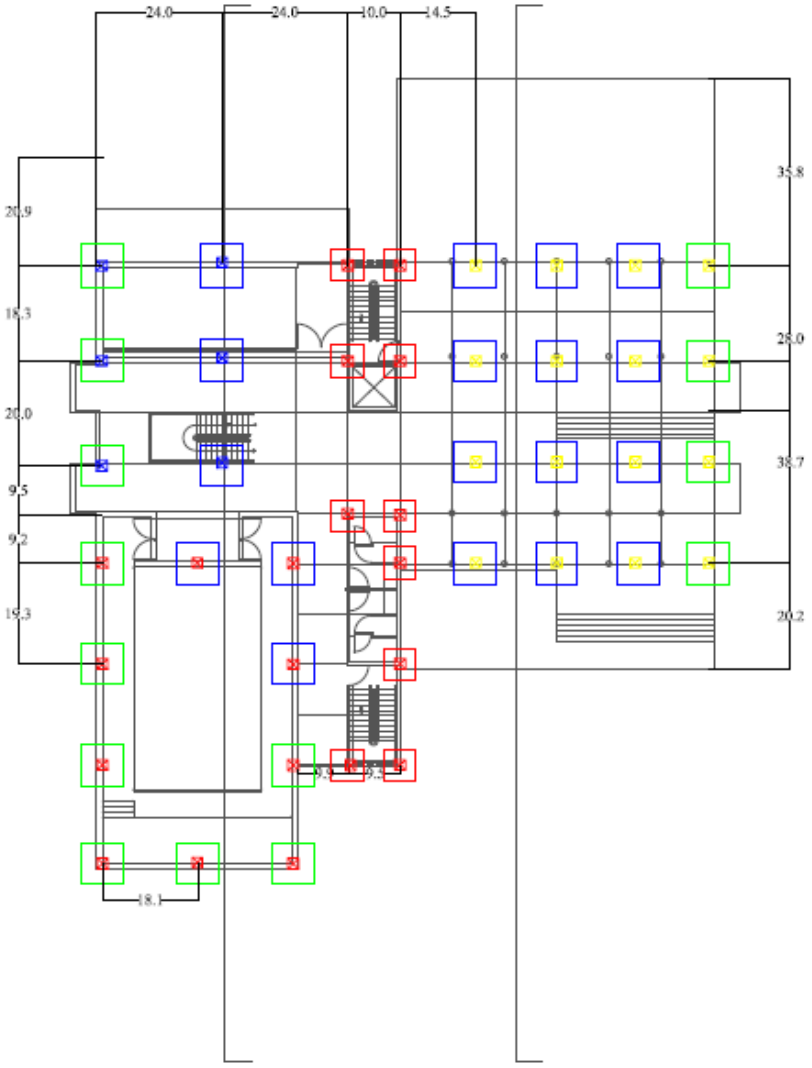
Floating Box– Steel– Foundation

Spread Footing
Interior : 8’ x 8’ x 2’
Exterior : 6’ x 6’ x 2’
Stair Core : 6’ x 6’ x 2’

Grade Beams Between Footings : 2’ x 2’

Basement Wall : 12”

Slab on Grade : 6”



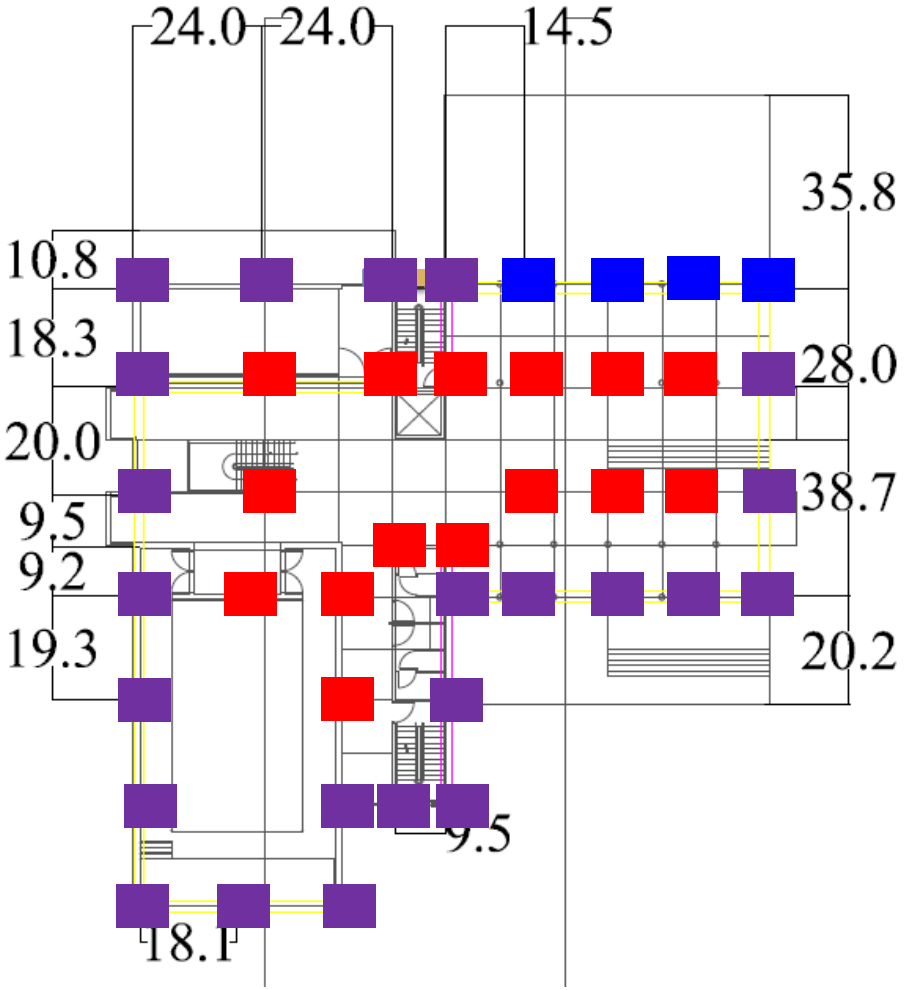
Floating Box– Concrete

Post-Tensioned Concrete

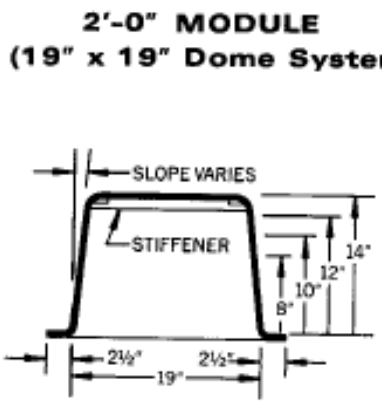
Columns	Member Size	Spacing	
Exterior	12” x 12”	14’-20’	
Interior	14” x 16”	20’	
Cantilever	18” x 18”	14.5’	

Beams	Member Size	Span
Exterior	12” x 12”	20’
Interior	16” x 16”	20’

Spread Footing: 8’x8’ x2’ Depth
Grade Beams Between Footings : 2’x2’
Basement Wall : 12”
Slab on Grade : 6”

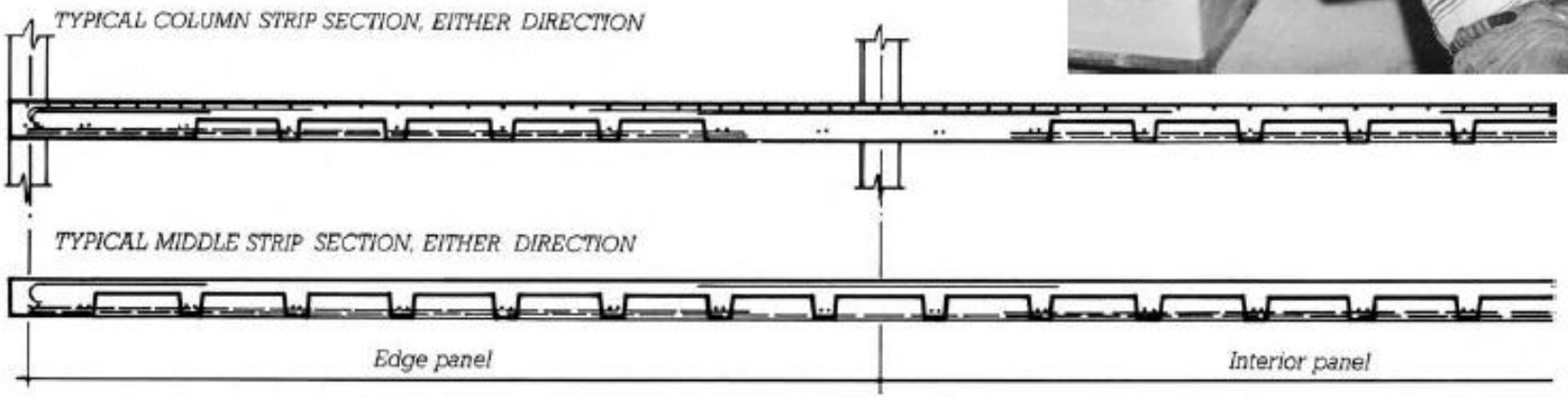


Floating Box– Concrete - Auditorium



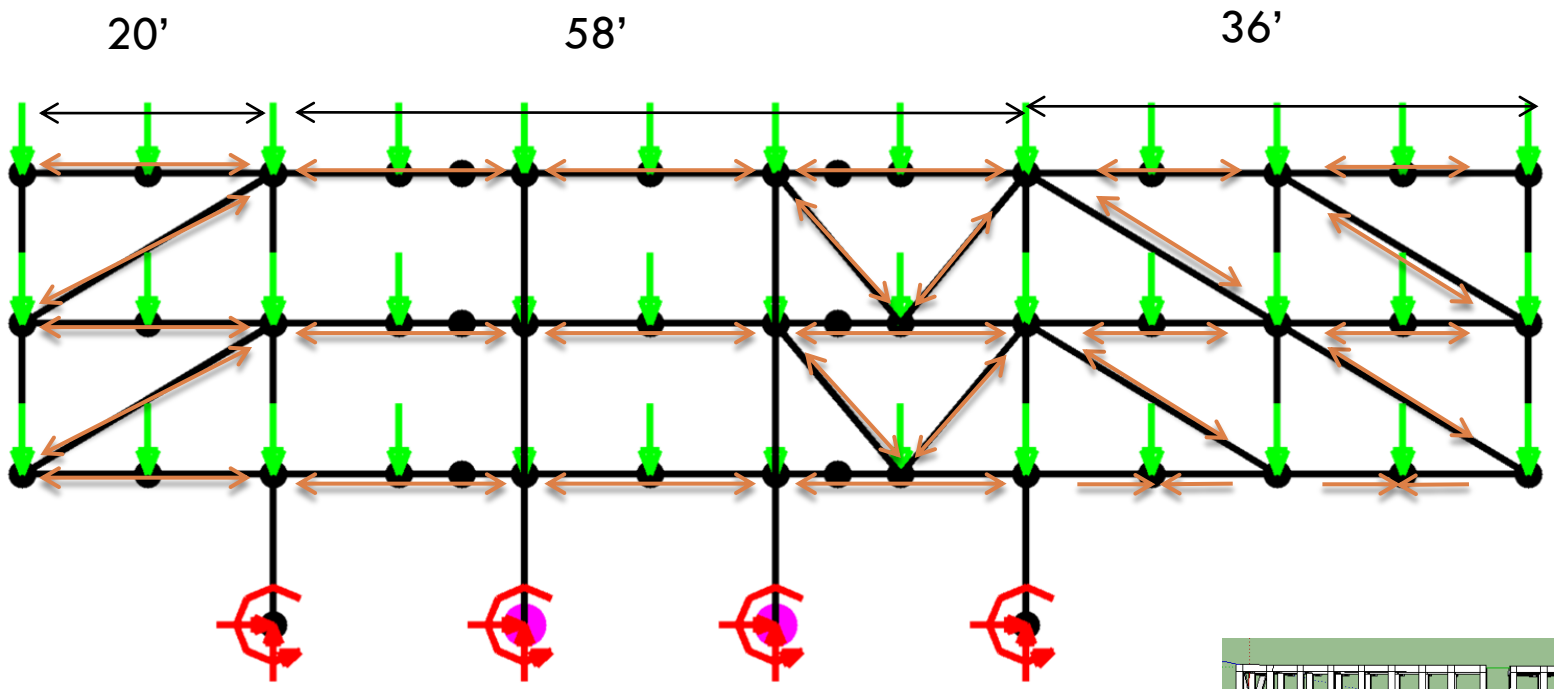
Post-tensioned Waffle Slab
2'-0" Module

Depth: 16.5 inches



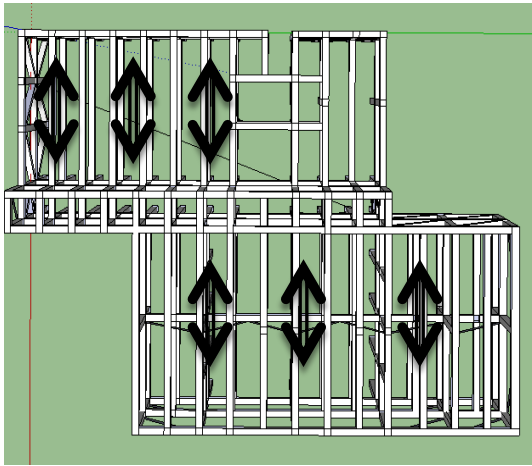
Images Courtesy of Fundamentals of Building Construction

Floating Box – Gravity and Cantilever Load Path

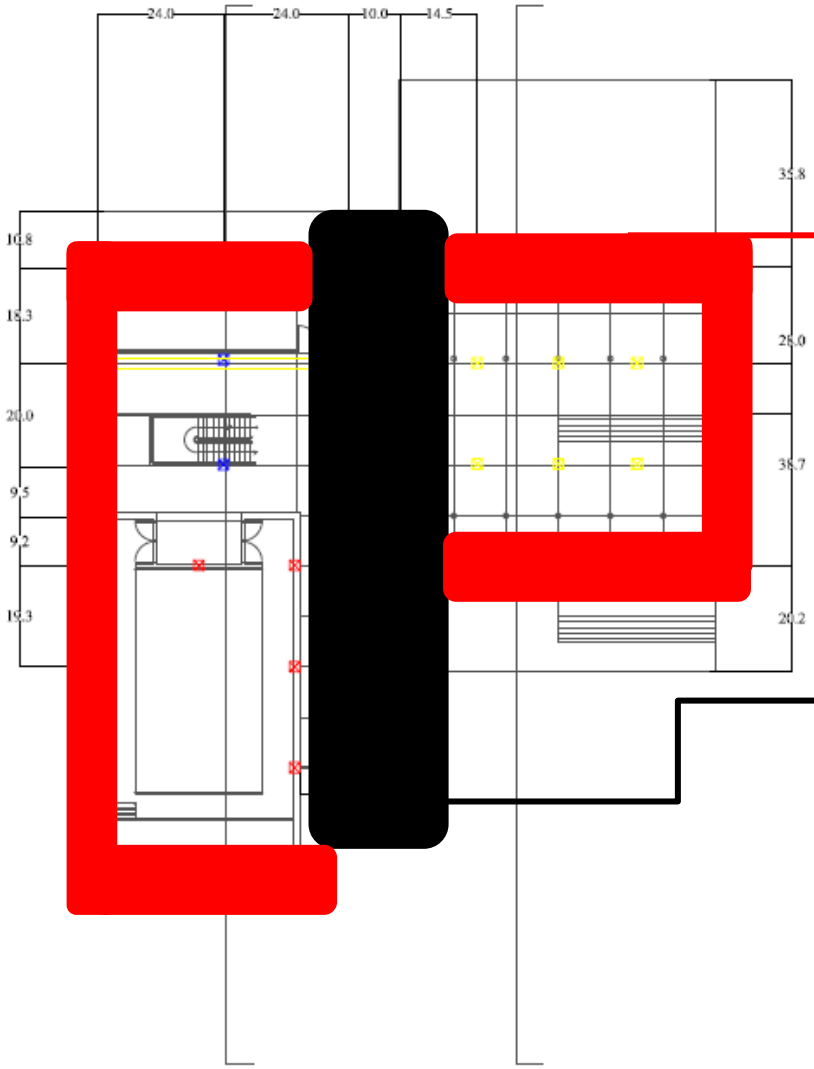


Steel: Diagonal Truss
Truss Beam: W21x122
Truss Column: W14x43
Truss Diagonal: HSS 6” x 6” x 3/8”

Concrete: Vierendeel Truss
Truss Beam: 24x24
Truss Column: 24x24



Floating Box – Lateral



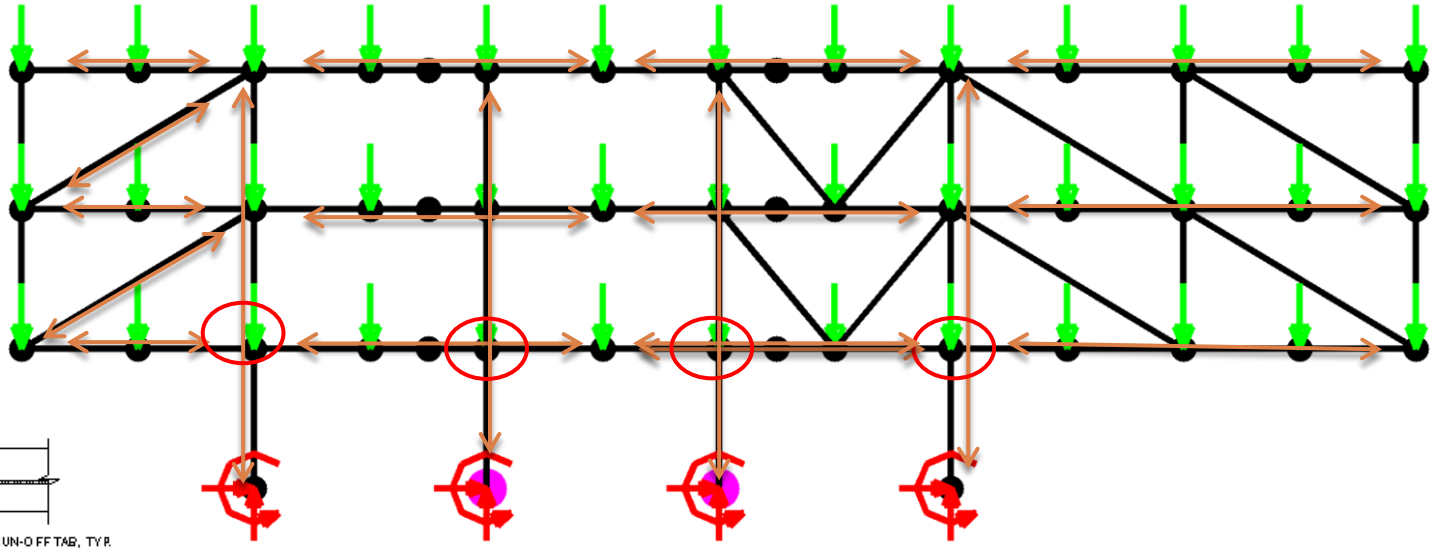
Moment Frames

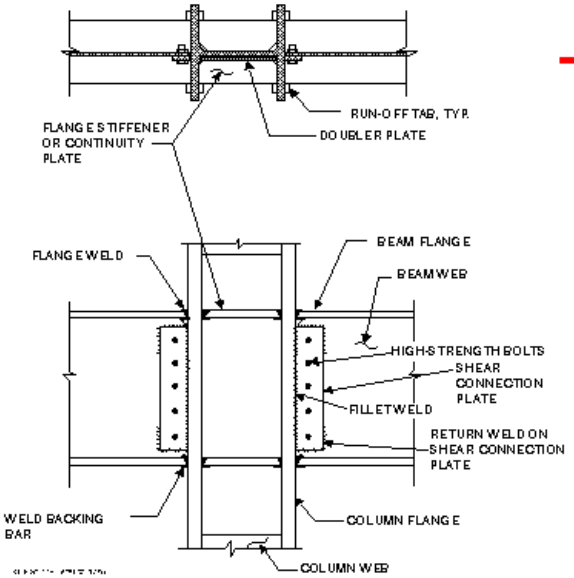
- Steel Moment Frame
  - Column W14*30
  - Beam W12*26
- Concrete Moment Frame
  - Column 18*18
  - Beam 12*12

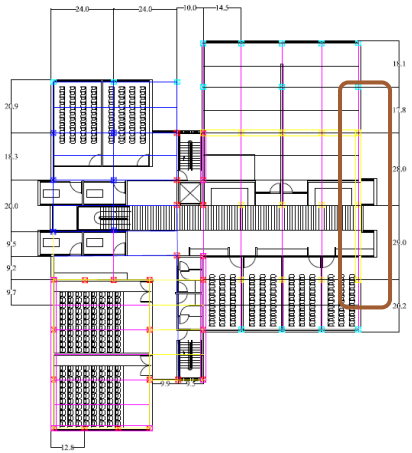
Rocking Frames

Floating Box– Lateral – Moment Frame

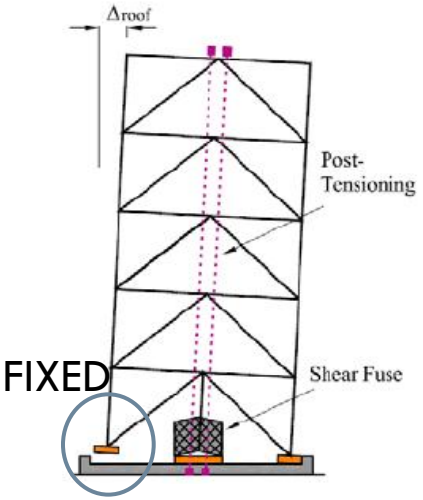
Slit Shear Plate Fuses

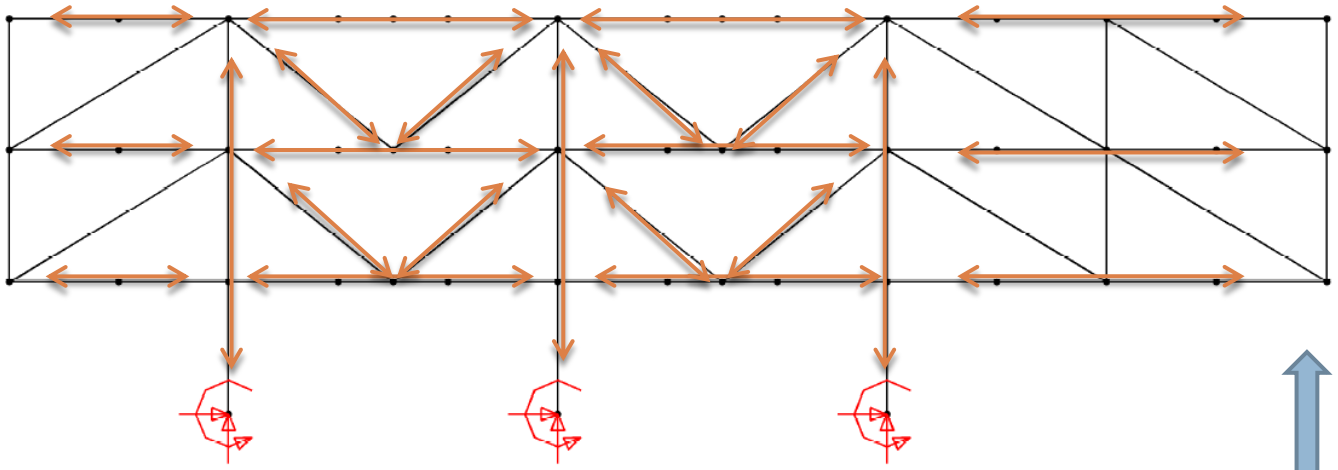


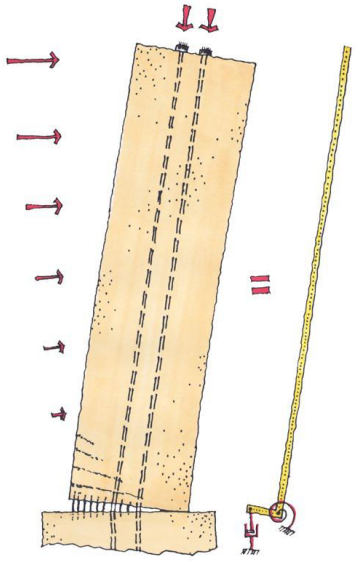


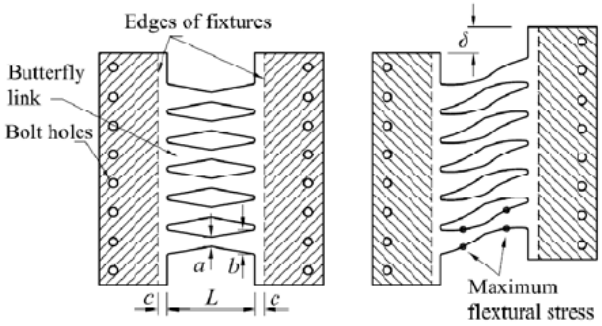


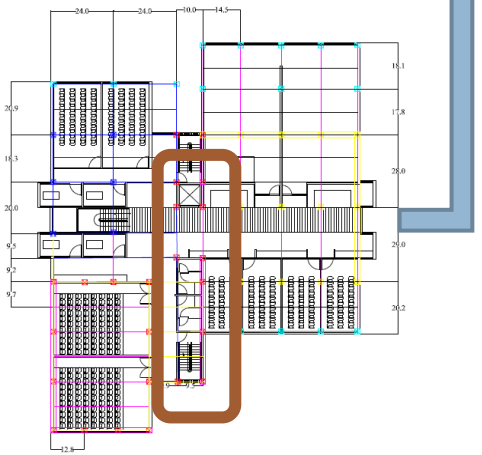
Floating Box– Lateral – Rocking Frame











Images courtesy of SEAONC 2008 Publication:
Post-Tensioned Concrete Walls and Frames for Seismic-Resistance

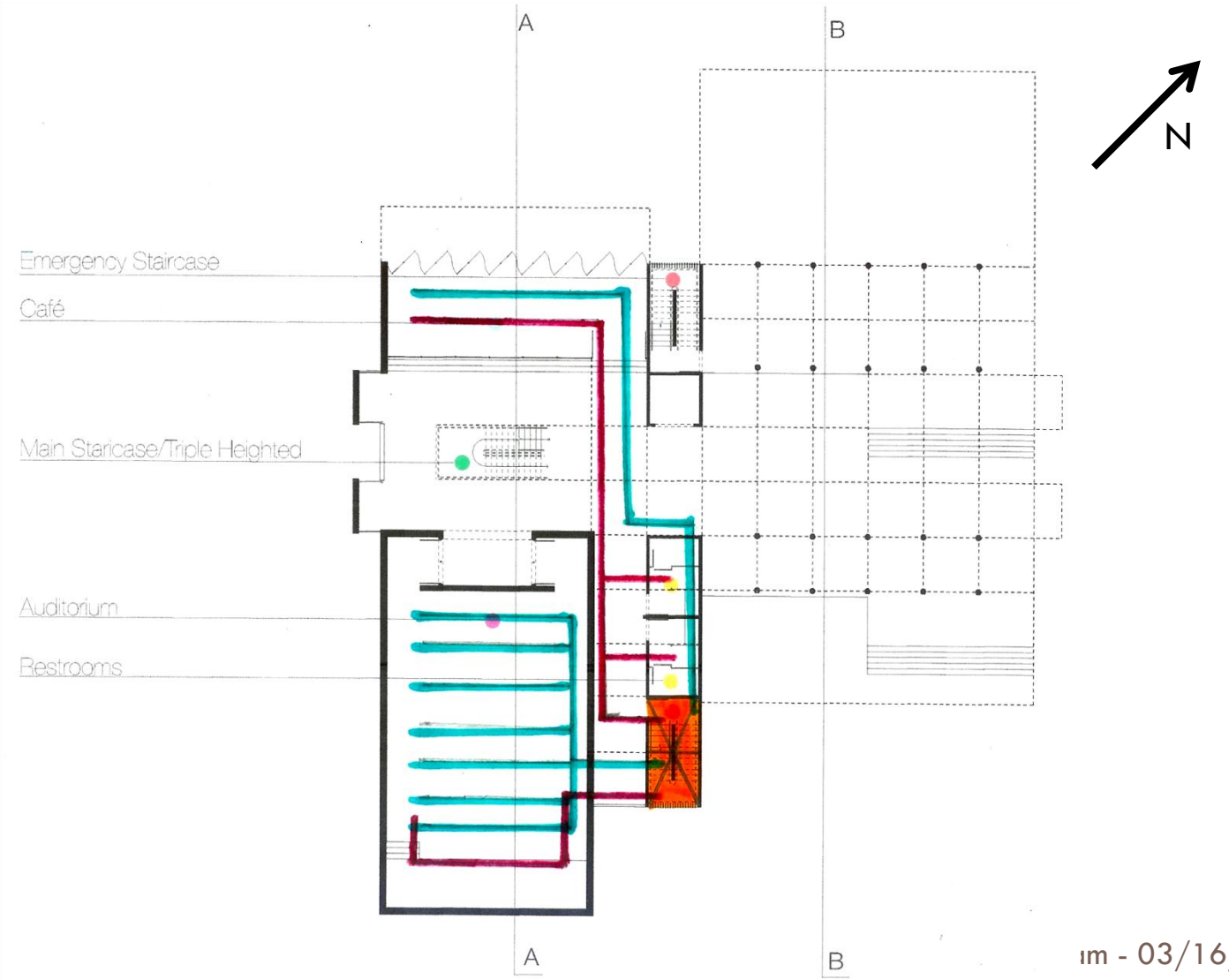
Cooling Factors

- 9,500 cfm outdoor air
- 30,000 cfm supply air
- 6 Smaller AHUs to zone by use/occupancy load
  - Auditorium
  - Commercial Space
  - Classrooms
  - Offices
  - Server/Bathroom
  - Classrooms

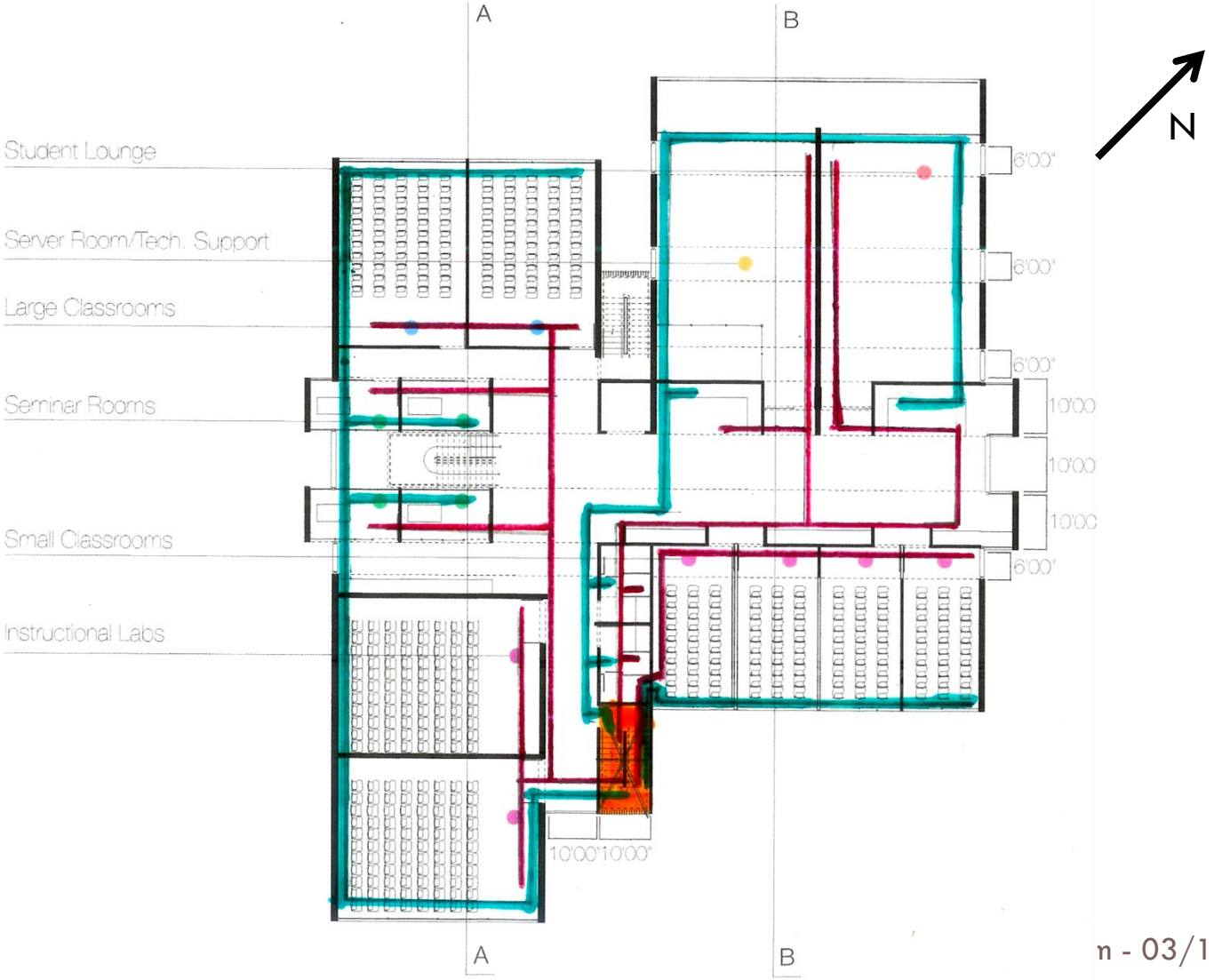
Cooling Summary and Reductions

Scenario	Description	Cooling Load (tons)	Reduction from Baseline
Baseline	--	111	--
ASHRAE 189.1	Complies with ASHRAE 189.1	99	4.5%
IECC/Overhang	Includes overhangs and meets IECC	81	18%
Reduction 1	R-20 walls, R-30 roof, double-glazed, low-e windows	64	42%
Reduction 2	Reduction 1+65% design humidity	61	45%
Reduction 3	IECC/Overhang with 50% Reduced Fenestration	70	37%

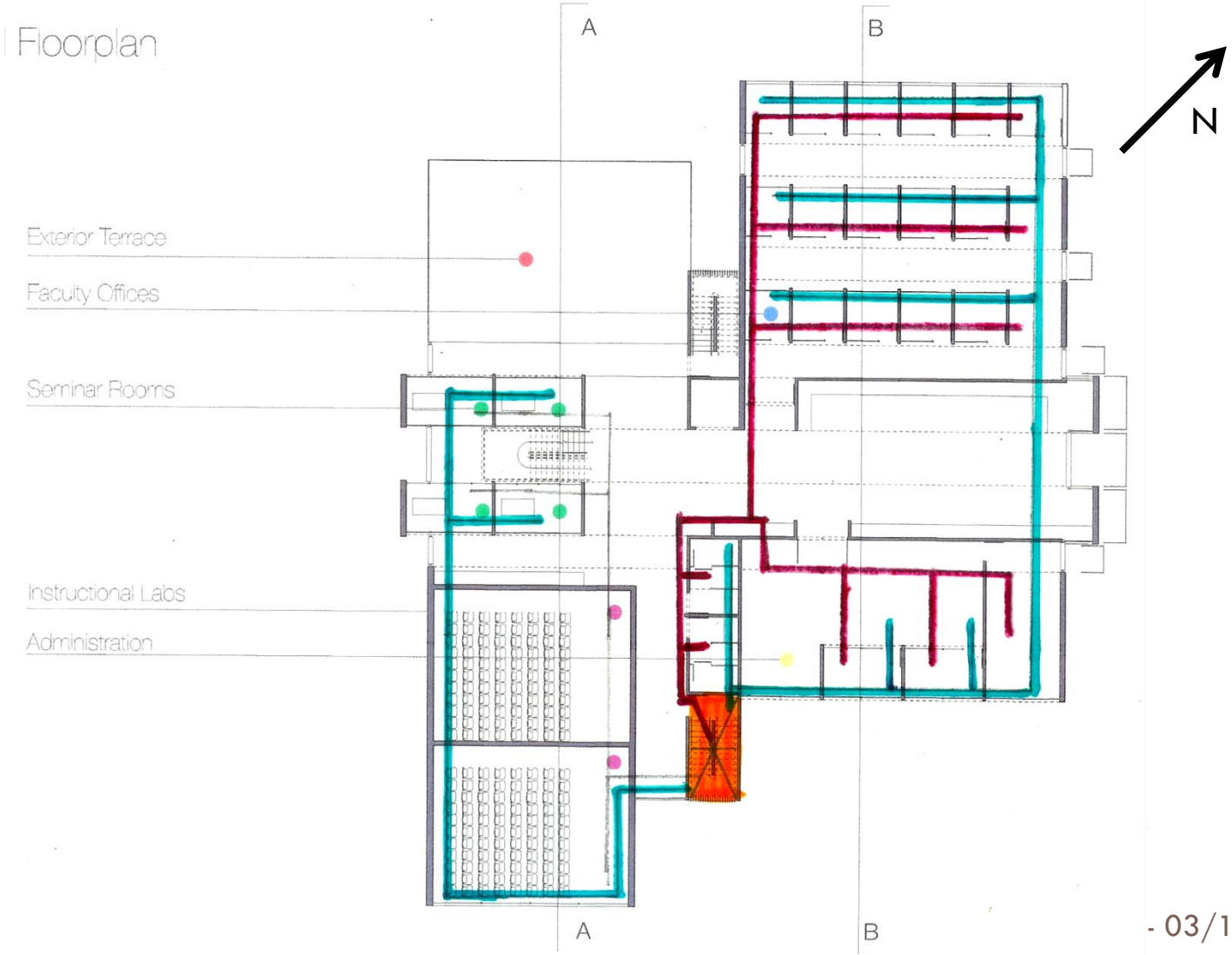
Duct Routing



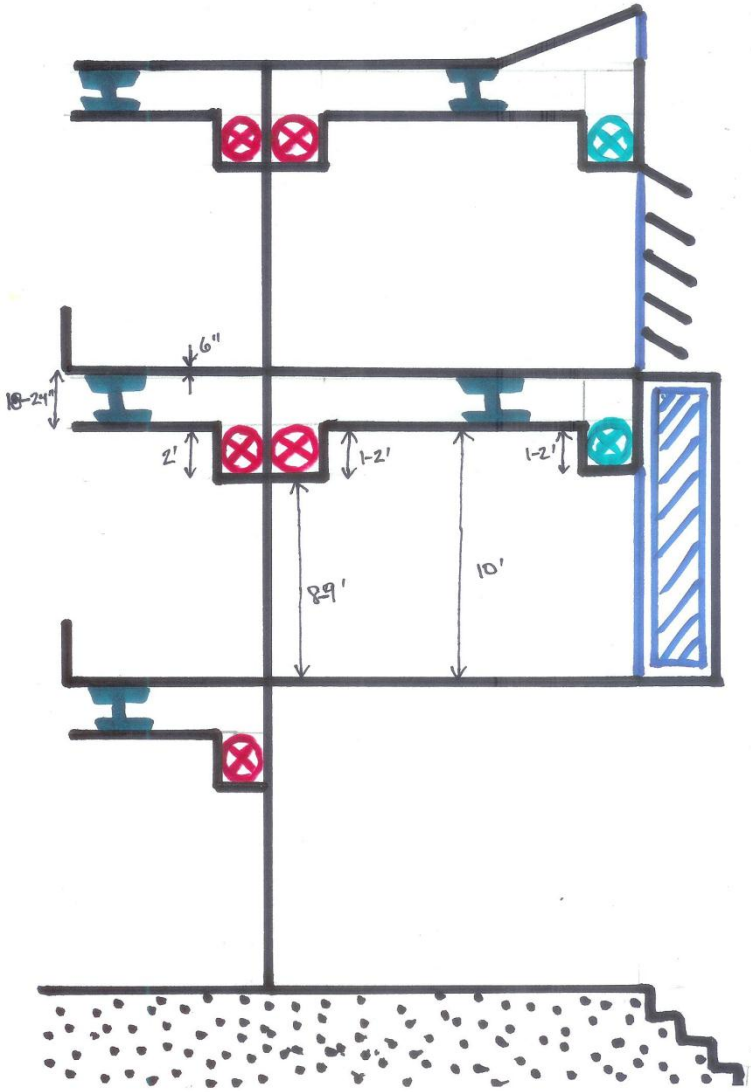
Duct Routing



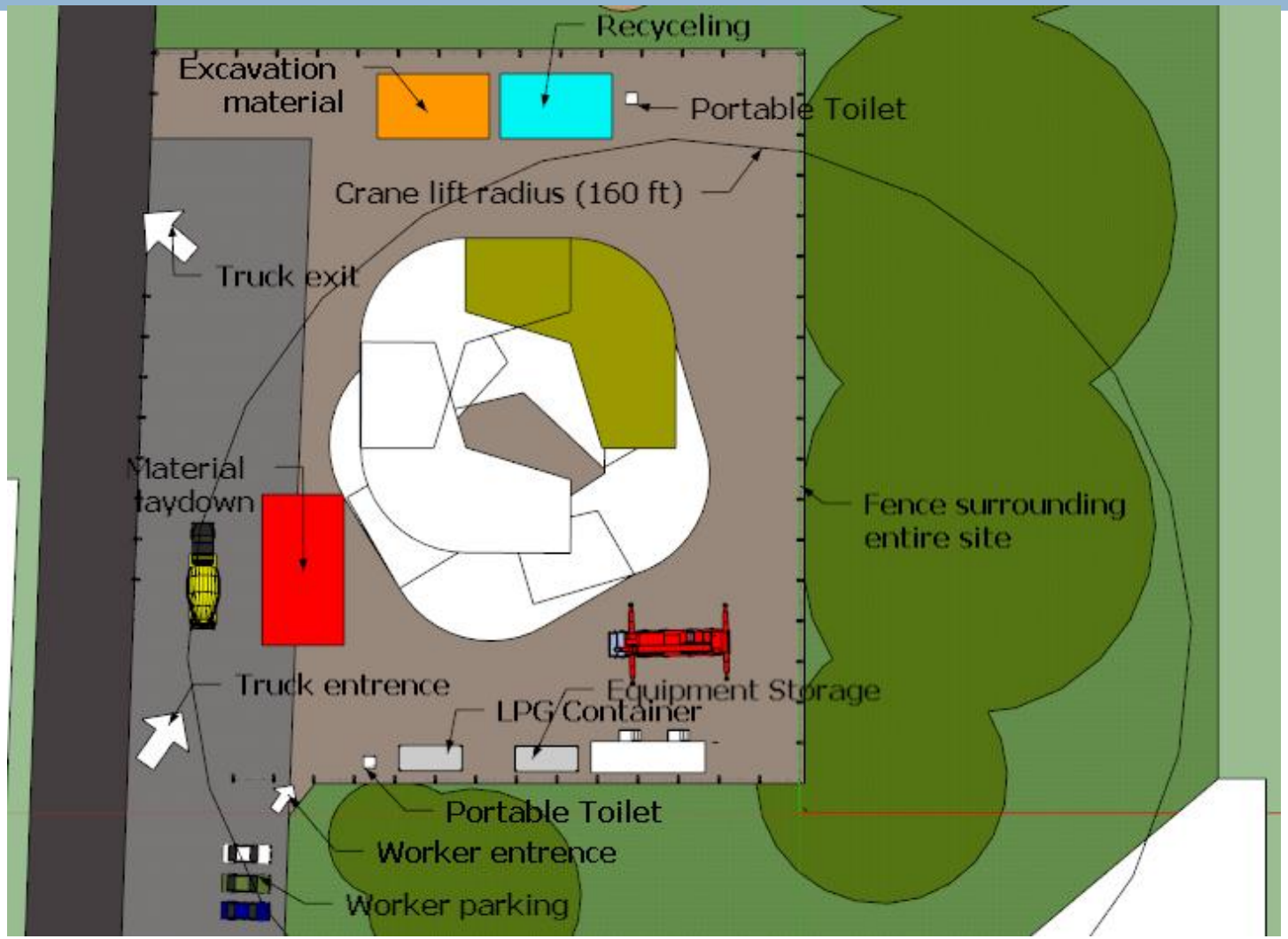
Duct Routing



Floor Sandwich



Site Logistics



Equipment

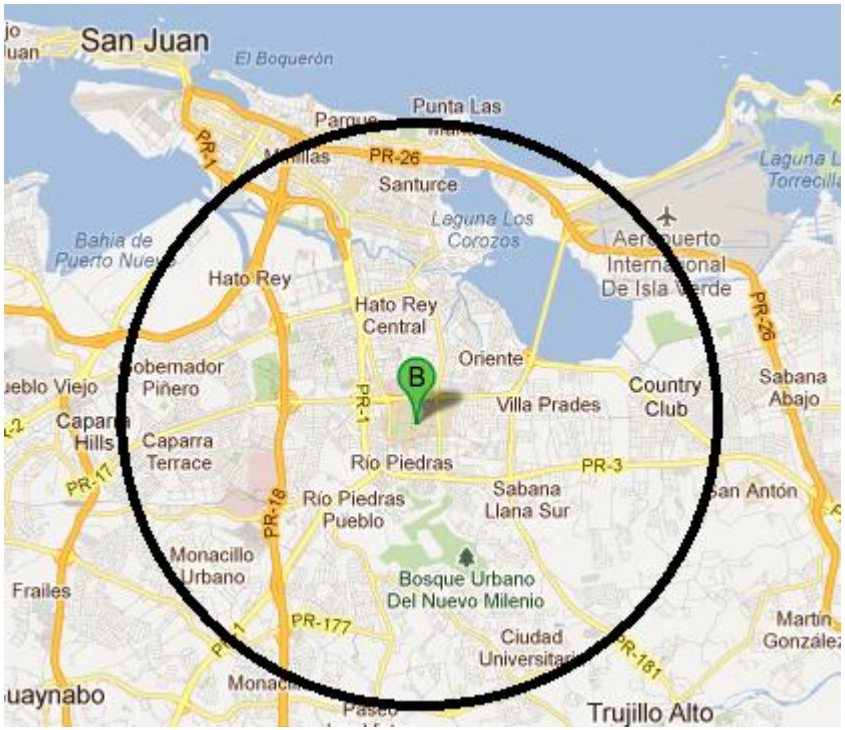
- Excavator with high capacity

- Mobile crane suitable for slopes

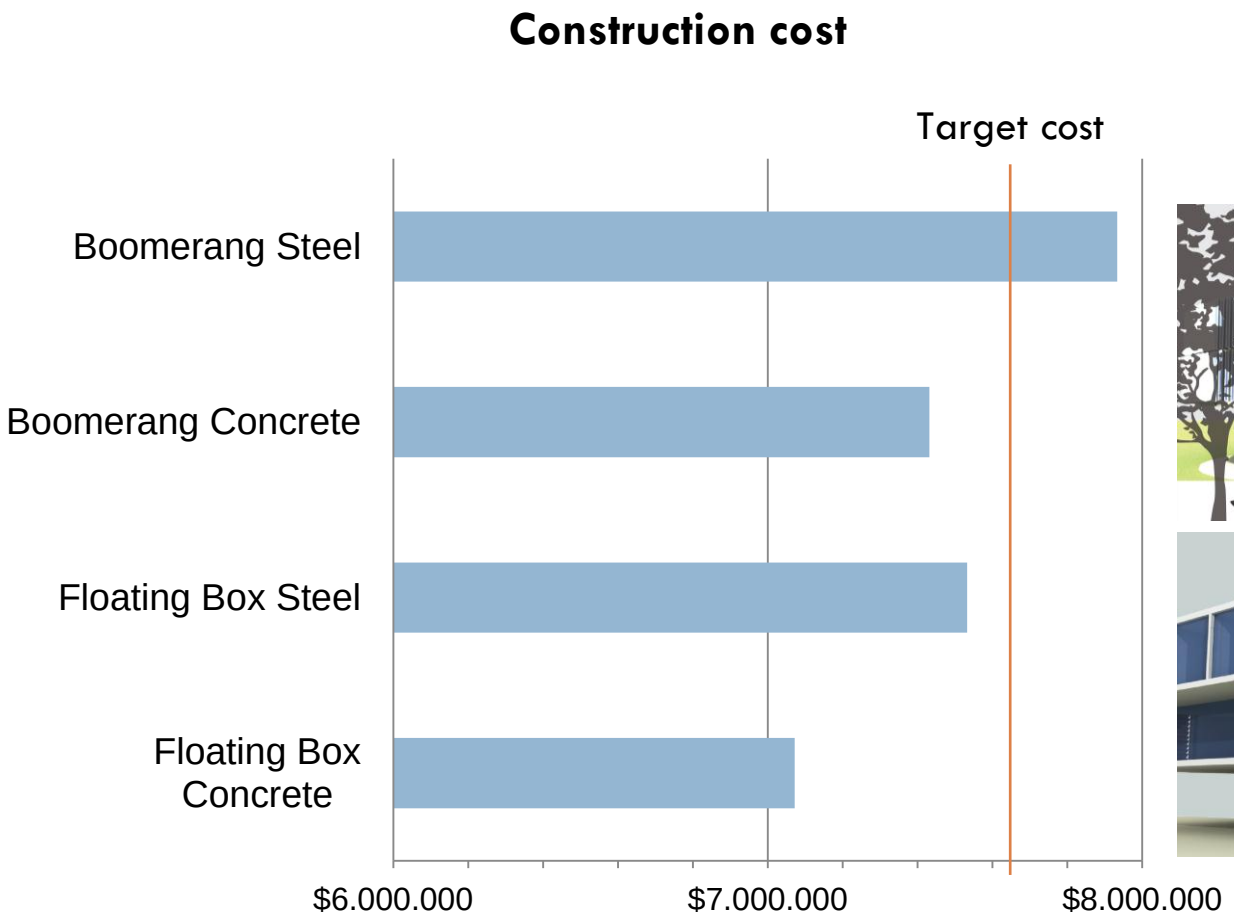
- Sky lift for fitting

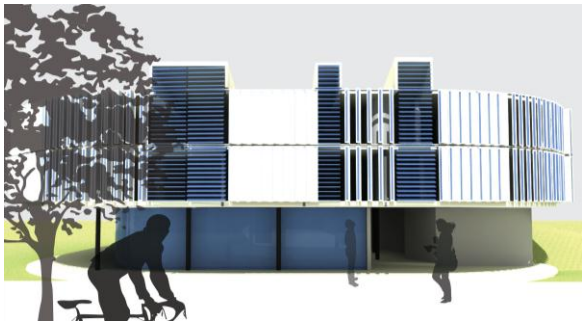
Off Site Logistics

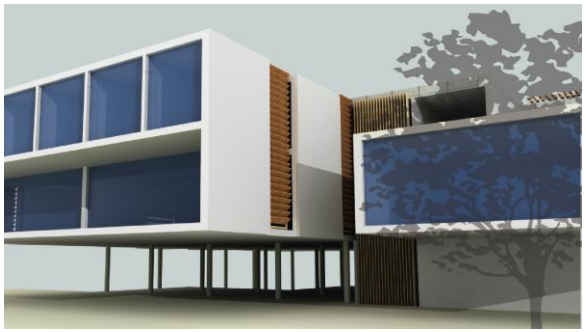
- Concrete: 4.6 mi
- Glazing: 7.0 mi
- Steel (harbour): 6.1 mi
- Hospital: 0.7 mi
- Equipment rental: 6.3 mi



Cost Estimate





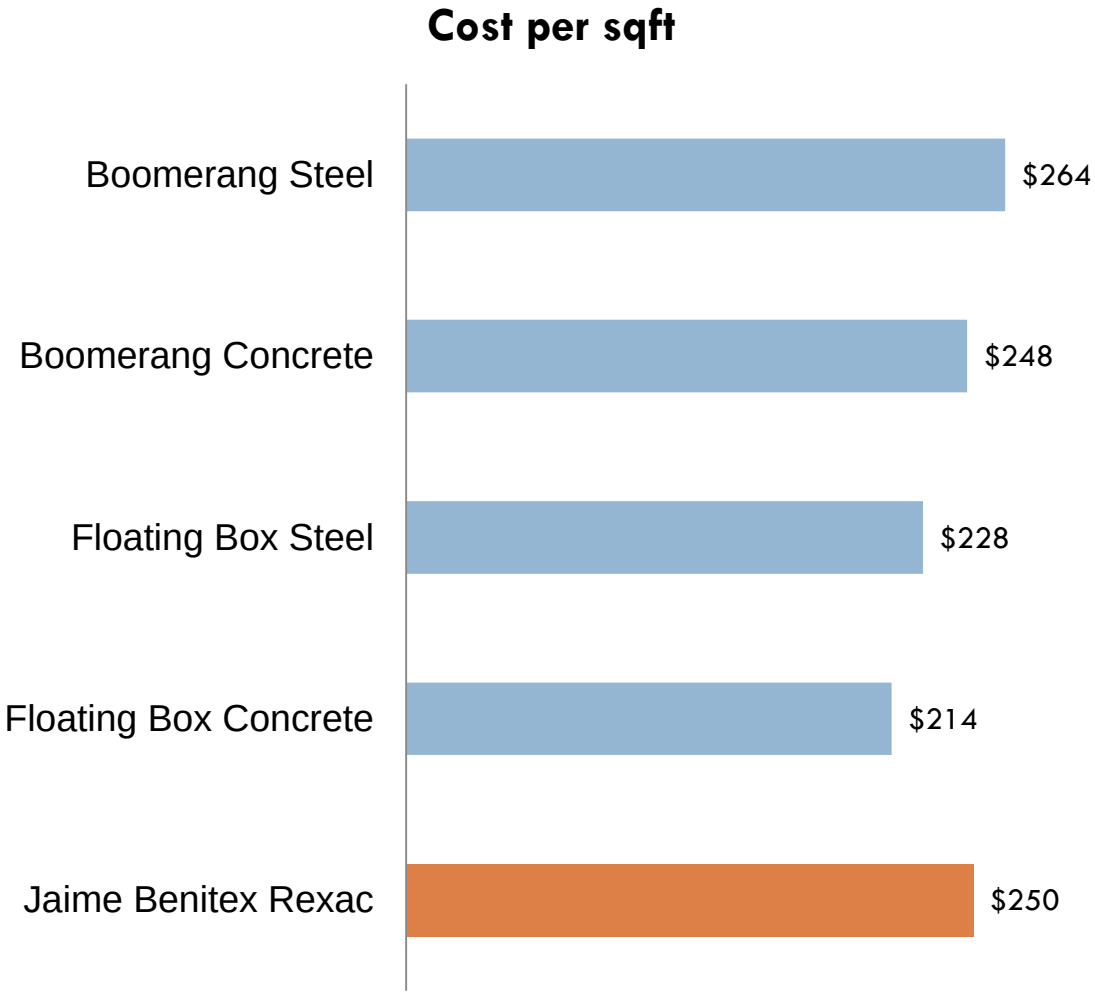


Cost Estimate

- Reference building:
  - Jaime Benitex Rexac
  - Built in 2009
  - 55 000 sqft
  - Cost per sqft in today's value:

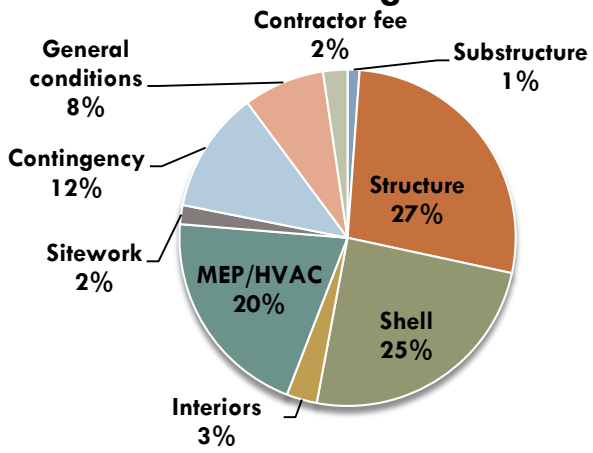
    250 $/sqft

Cost Estimate

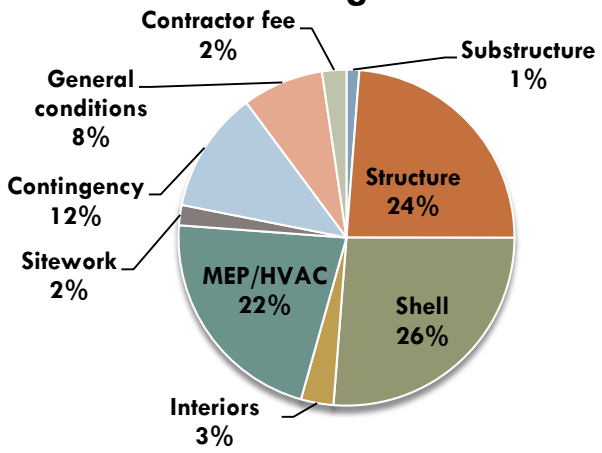


Cost Estimate

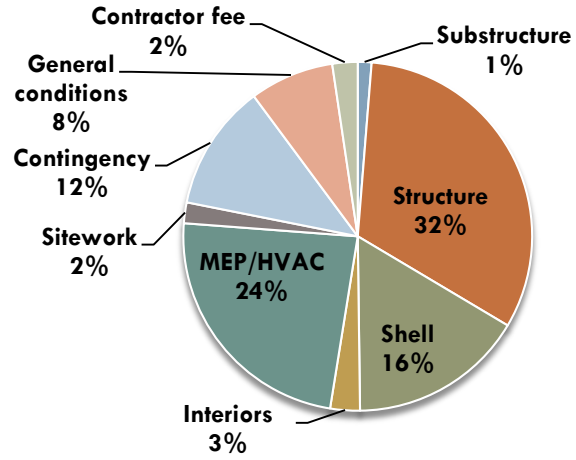
Boomerang steel



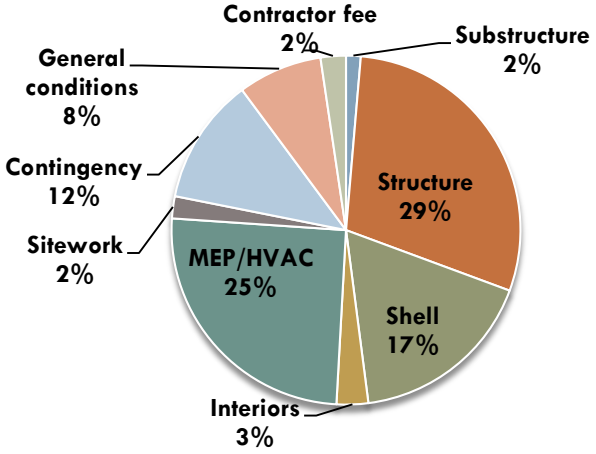
Boomerang concrete



Floating Box Steel



Floating Box Concrete

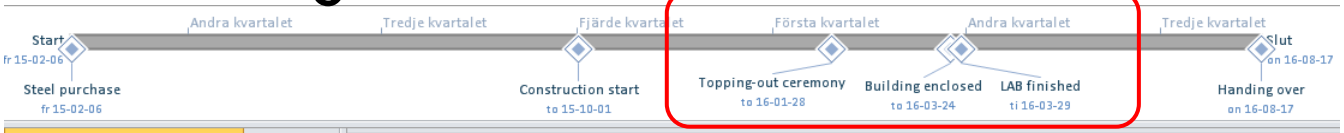


Schedule

Boomerang

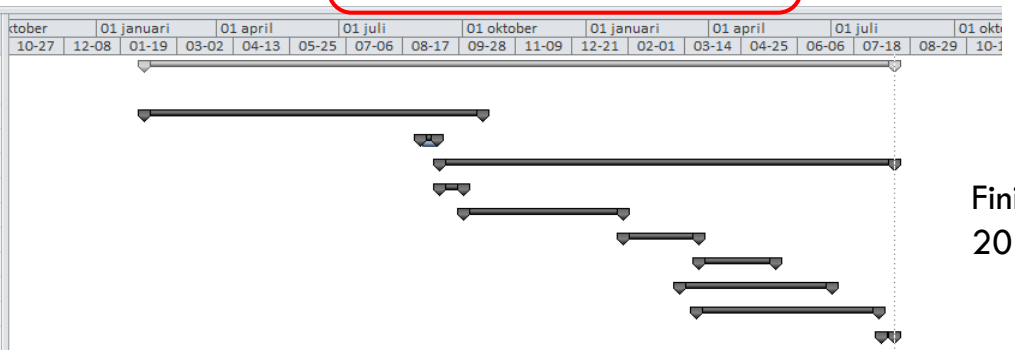
Steel

Milestones



Topping-out:
2016-01-28
Building enclosed:
2016-03-24
LAB access:
2016-03-29

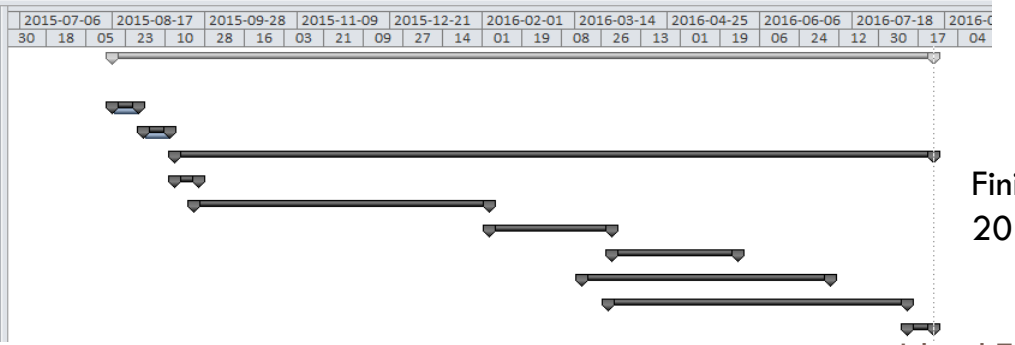
Aktivitet	Varaktighe
Construction schedule Boomerang steel	**399 dagar**
Preconstruction	180 dagar
Demolition	10 dagar
Construction phase	243 dagar
Site preparation	14 dagar
Structure	85 dagar
Shell	40 dagar
Interiors part 1	41 dagar
MEP/HVAC	81 dagar
Interiors part 2	98 dagar
Testing and handing ove	8 dagar



Finished
2016-08-17

Concrete

Aktivitet	Varaktighe
Construction schedule Boomerang concrete	**267 dagar**
Preconstruction	10 dagar
Demolition	10 dagar
Construction phase	247 dagar
Site preparation	9 dagar
Structure	96 dagar
Shell	40 dagar
Interiors part 1	41 dagar
MEP/HVAC	81 dagar
Interiors part 2	98 dagar
Testing and handing ove	8 dagar

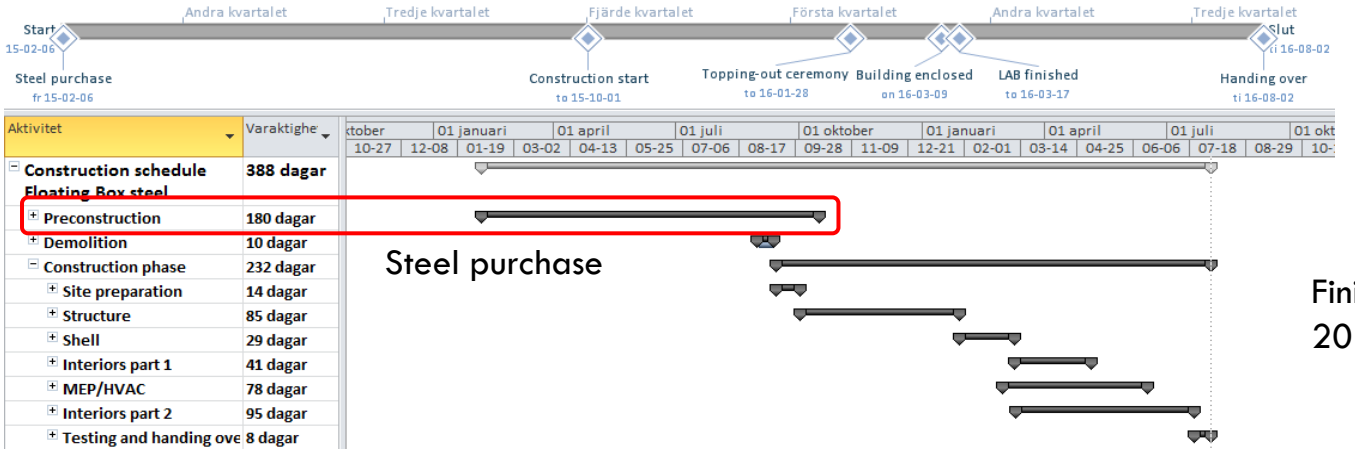


Finished
2016-08-23

Schedule

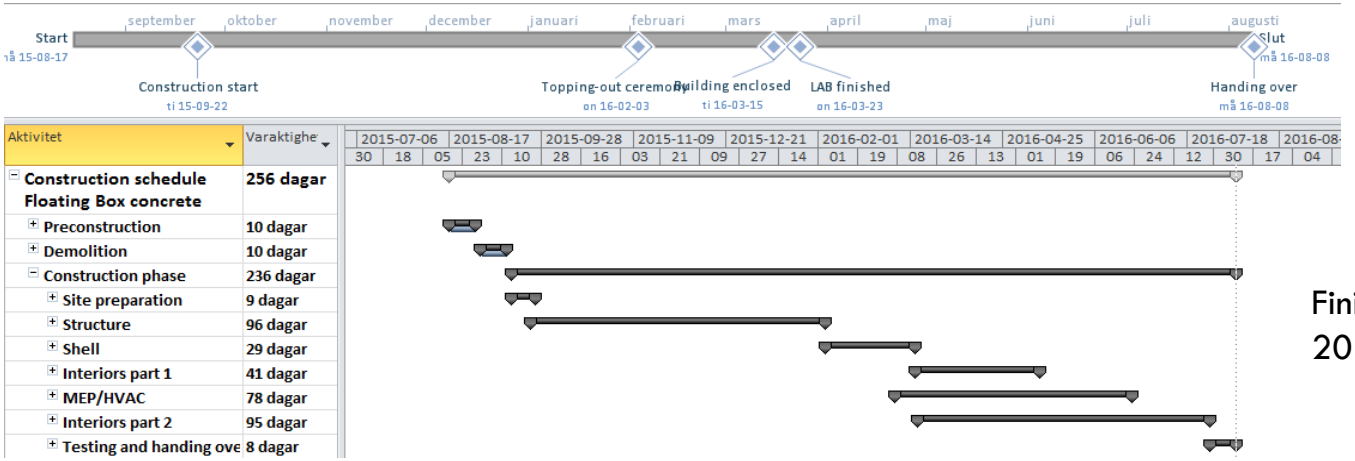
- Floating Box

Steel



Finished
2016-08-02

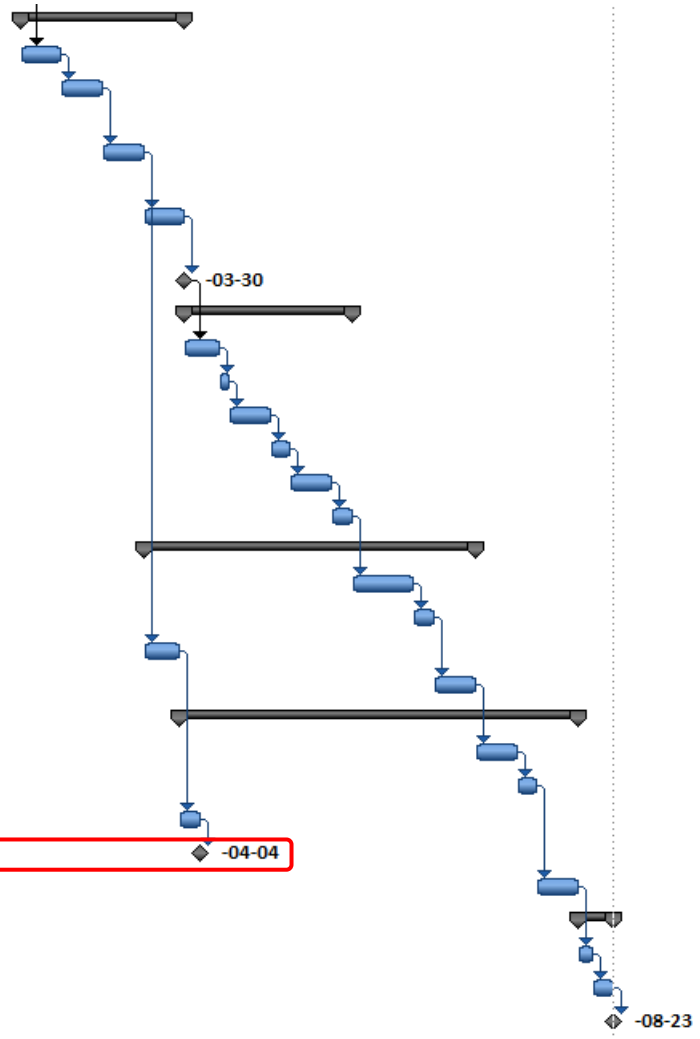
Concrete



Finished
2016-08-08

Schedule – Detailed and LAB access

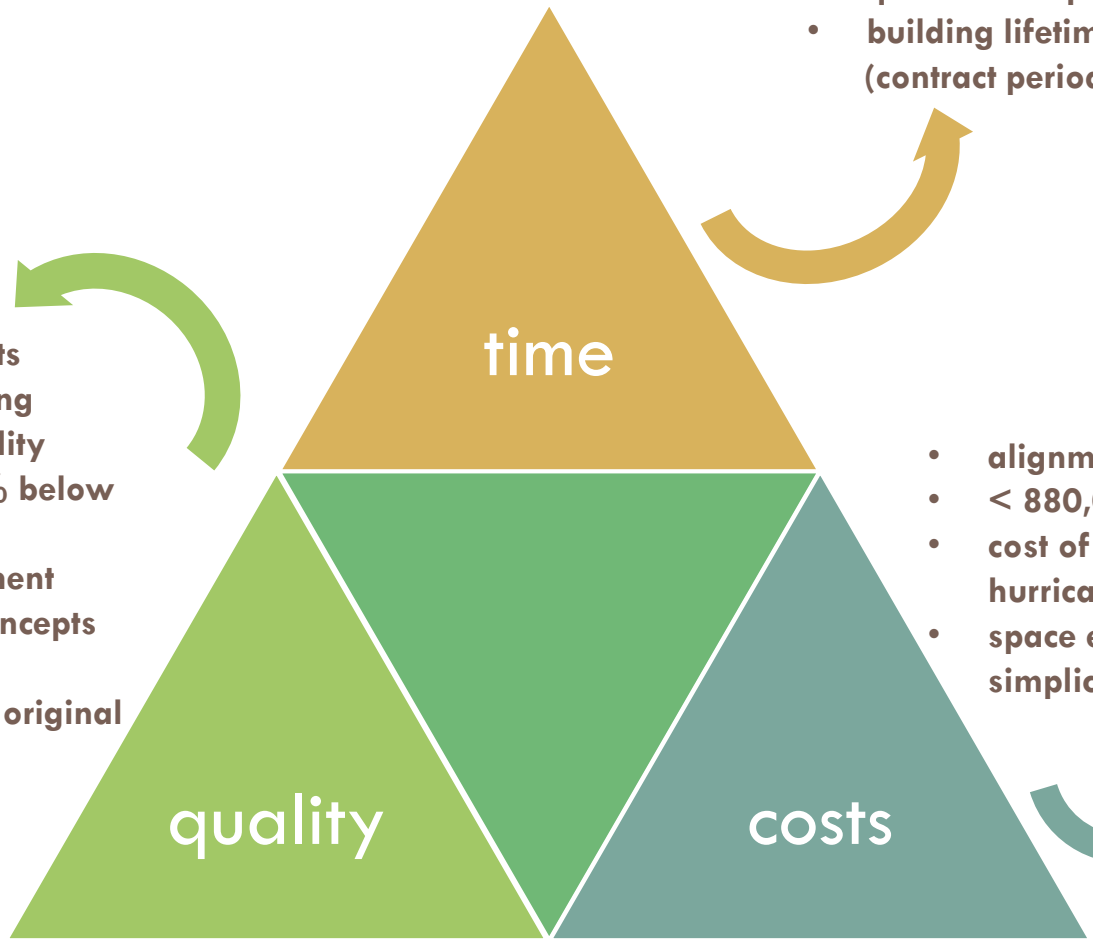
Shell	**40 dagar**
Roof envelope	10 dagar
Building envelope level 1	10 dagar
Building envelope level 2	10 dagar
Building envelope level 3	10 dagar
Building enclosed	0 dagar
Interiors part 1	**41 dagar**
Interior walls level 1	8 dagar
Doors level 1	3 dagar
Interior walls level 2	10 dagar
Doors level 2	5 dagar
Interior walls level 3	10 dagar
Doors level 3	5 dagar
MEP/HVAC	**81 dagar**
Installation level 1	15 dagar
Installation level 2	5 dagar
Installation level 2 - L	8 dagar
Installation level 3	10 dagar
Interiors part 2	**98 dagar**
Surface level 1	10 dagar
Surface level 2	5 dagar
Surface level 2 - LAB	5 dagar
LAB finished	0 dagar
Surface level 3	10 dagar
Testing and handing ove	**8 dagar**
MEP/HVAC	3 dagar
Owner approvement	5 dagar
Handing over	0 dagar



LAB finished early

Targets in the Triangle

- completion earlier than on time
- quick build up after hurricane
- building lifetime > 75 years (contract period 25 years)

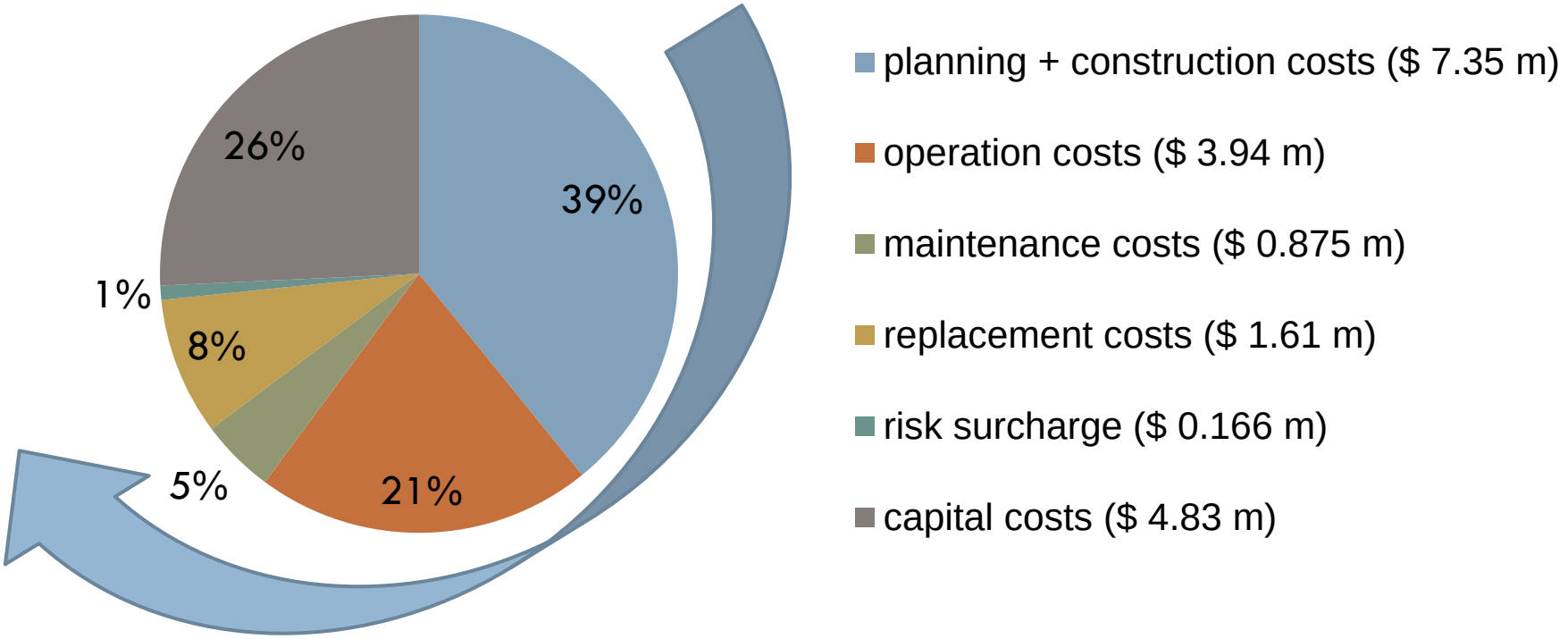


- fulfill spatial requirements
- social & educating building
- LEED + DGNB sustainability
- energy performance 25% below baseline
- integration into environment
- integrated biomimicry concepts
- structural performance in hurricanes and back into original state afterwards
- flexibility of the building

- alignment to benchmarks
- < 880,000 $ annual rent
- cost of repair in case of hurricane included
- space efficiency and simplicity for o+m

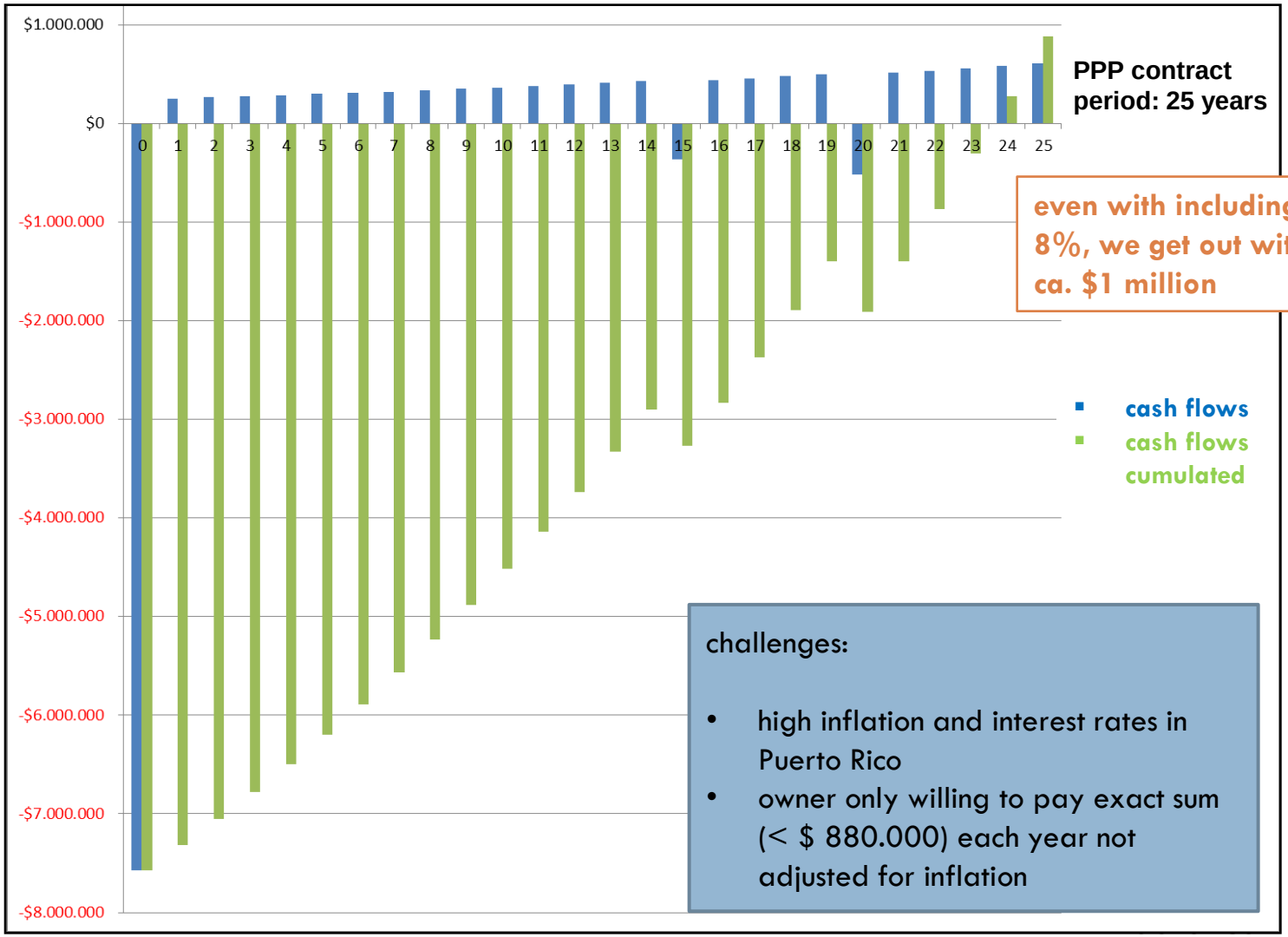
Building lifecycle approach

LCC in average (as NPV) for e.g. Boomerang Concrete



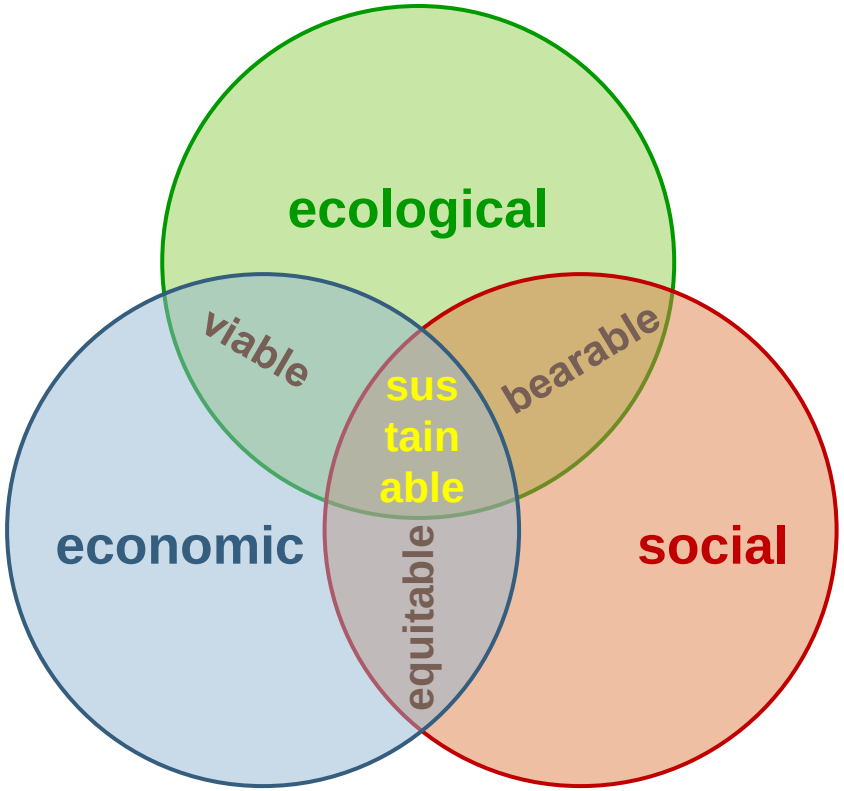
	Boomerang steel (c↑, o&m ↑, income↑)	Boomerang concrete (c↓, o&m ↑, income↑)	Floating box steel (c↑, o&m ↓, income↓)	Floating box concrete (c↓, o&m ↓, income↓)
NPV	$ 3.81 m	$ 4.30 m	$ 3.65 m	$ 3.99 m

Lifecycle cost calculation



Sustainability approach

- LEED Silver certificate
- in addition fulfillment of the DGNB social criteria



LEED

- Owners target: LEED Silver

Category	Max. points	Pints given
Sustainable site	26	20
Water Efficiency	10	6
Energy and Atmosphere	35	20
Materials and Resources	14	4
Indoor Environmental Quality	15	9
	100	59
Certified 40 to 49 points	**Silver 50 to 59 points**	Gold 60 to 79 points Platinum 80 to 110

both concepts are performing nearly the same

DGNB

- DGNB - social sustainability checklist
  - **Sociocultural and functional quality**

Health, comfort and user friendliness	Functionality	Aesthetic quality
Thermal comfort in winter	Accessibility	Design and urban planning quality through competition
Thermal comfort in summer	Efficient use of floor area	Integration of public art
Indoor air quality	Suitability for conversion	
Acoustic comfort	Public access	
Visual comfort	Cycling convenience	
User influence on building operation		
Quality of outdoor spaces		
Safety and security		

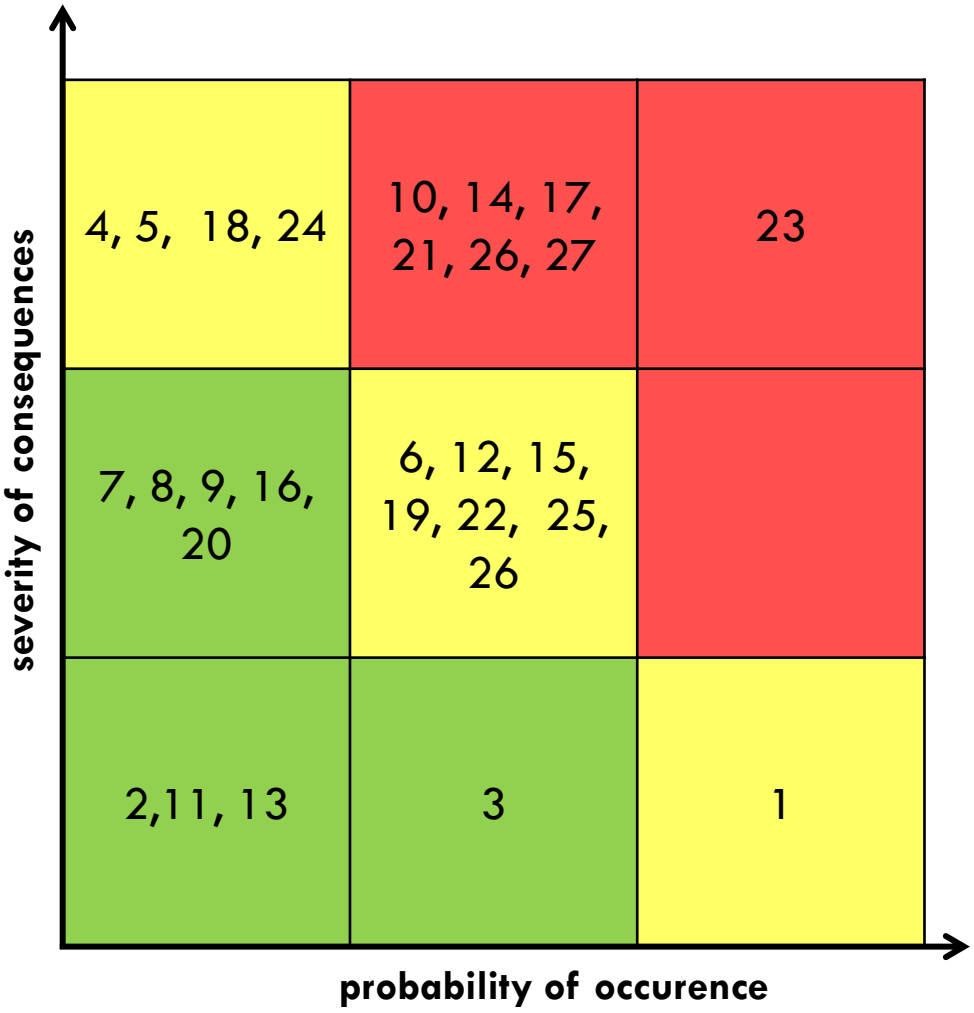
both concepts are performing nearly the same

Risk Identification

Design / Planning period	Construction period	Operation period	Maintenance period	Whole Lifecycle
site / location	complaint and protest	need / demand	technology	interface / (communication)
building ground / soil	input	operation	maintenance	management
tendering and awarding	material prices	resource prices		natural catastrophes
complaint and protest	technical construction	change in performance		riots / war
finance		vandalism		change of laws, guidelines and standards
design and planning		income		interest rate
contract		bankruptcy of owner		inflation

27 risk categories identified

Risk Evaluation



No.	Risk name	
1	site / location	B3
2	building ground / soil	C3
3	tendering and awarding	C2
4	complaint and protest	B1
5	finance	B1
6	design and planning	B2
7	contract	C1
8	complaint and protest	C1
9	input	C1
10	material prices	A2
11	technical construction	C3
12	need / demand	B2
13	operation	C3
14	resource prices	A2
15	change in performance	B2
16	vandalism	C1
17	income	A2
18	non-solvency / bankruptcy of owner	B1
19	technology	B2
20	maintenance	C1
21	interface / (communication)	A2
22	management	B2
23	**natural catastrophes**	A1
24	riots / war	B1
25	change of laws, guidelines and standards	B2
26	interest rate	B2
27	inflation	A1

Risk Treatment

- 4 steps of risk treatment:
  - avoid - reduce - accept - allocate

material prices	avoid	avoid material with volatile prices (steel)
resource prices for o&m	avoid, accept	use renewable resources, calculate in budget
income	allocate, reduce	insurance, plan alternatives
interface / (communication)	avoid	regular communication
natural catastrophes	reduce, accept	address in structural concept, include risk in calculations
inflation and interest rate	accept, allocate	insurance, financial derivatives

Decision Matrix

		Power in decision-making, Personal Weighting and Assessment of Fulfillment														
		Island team average					Owners' average					Overall average				
		50%					50%					100%				
		Weighting	Assessment				Weighting	Assessment				Weighting	Assessment			
			Boomerang - Steel	Boomerang - Concrete	Floating Box - Steel	Floating Box - Concrete		Boomerang - Steel	Boomerang - Concrete	Floating Box - Steel	Floating Box - Concrete		Boomerang - Steel	Boomerang - Concrete	Floating Box - Steel	Floating Box - Concrete
Targets	**Subtargets**															
Time												15%				
	easy construction and completion											5%	1,3125	2,0875	1,4375	2,2125
	quick build up after hurricane											5%	1,23	1,78	1,6775	1,965
	sustainable and long-living buildin											5%	1,4325	2,1975	1,4325	2,1975
Costs												27%				
	Construction costs <7.5 million $											7%	1,0925	2,29125	1,40375	2,13
	< 880,000 $ annual rent possible											7%	1,62	2,24	1,225	1,535
	low cost of repair in case of hurrica											6%	1,57625	1,5725	2,04375	2,04
	space efficiency											5%	1,47625	1,47625	2,10375	2,10375
	amount of risk surcharge											3%	0,97	1,685	1,38	2,145
Quality												57%				
	fulfill spatial requirements											3%	2,3	2,3	1,6875	1,6875
	architectural beauty											8%	2,55	2,55	1,7125	1,7125
	social building											6%	2,3025	2,3025	1,8675	1,8675
	educating building											4%	1,9	1,9	1,55	1,55
	LEED sustainability											5%	1,1075	2,0525	1,63	2,5625
	DGNB sustainability											4%	1,4825	1,4825	1,8425	1,8425
	energy perfomance 25% below bas											4%	1,5025	1,5025	2,17	2,17
	integrated biomimicry concepts											7%	2,5375	2,5375	1,5375	1,5375
	flexibility of the building											4%	1,4675	1,4675	1,995	1,995
	integration into environment											6%	2,0625	2,0625	1,7875	1,7875
	performance in hurricanes											6%	1,3875	1,9125	1,4625	1,7625
Sum												100%	3,307	3,879	3,288	3,732

Targets	Subtargets
Time	
	easy construction and completion on time / earlier
	quick build up after hurricane
	sustainable and long-living building
Costs	
	construction costs <7.5 million $
	< 880,000 $ annual rent possible
	low cost of repair in case of hurricane
	space efficiency
	amount of risk surcharge
Quality	
	fulfill spatial requirements
	architectural beauty
	social building
	educating building
	LEED sustainability
	DGNB sustainability
	energy perfomance 25% below baseline
	integrated biomimicry concepts
	flexibility of the building
	integration into environment
	performance in hurricanes

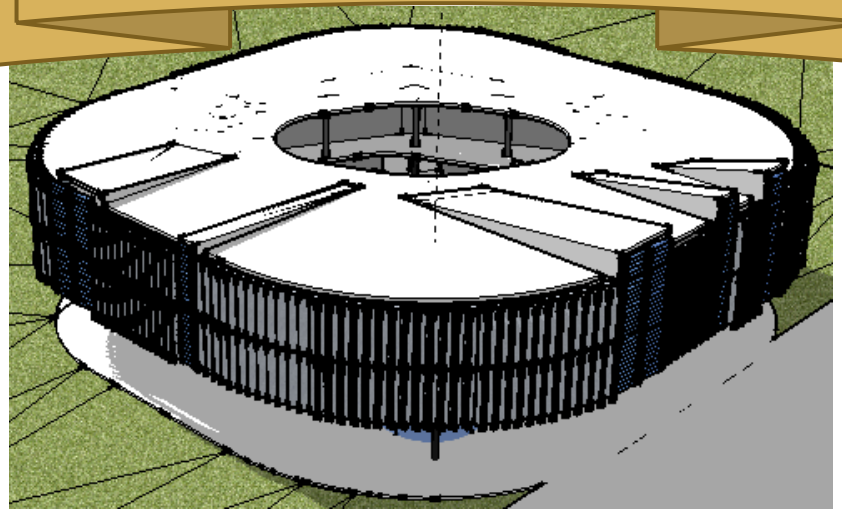
aligned to cost, quality and time targets

Concept Decision

	Boomerang - Steel	Boomerang - Concrete	Floating Box - Steel	Floating Box - Concrete
Island team's decision (50%)	3,093	**3,857**	3,184	3,756
Owners' decision (50%)	3,520	**3,900**	3,393	3,708
Final decision	3,307	**3,879**	3,288	3,732

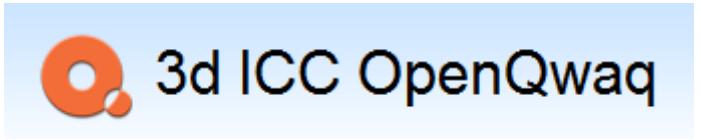
maximum score: 5

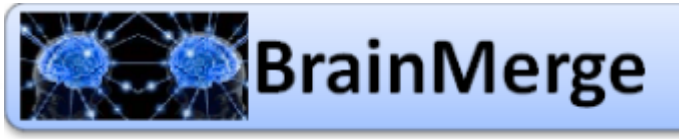
The winner is Boomerang – Concrete!



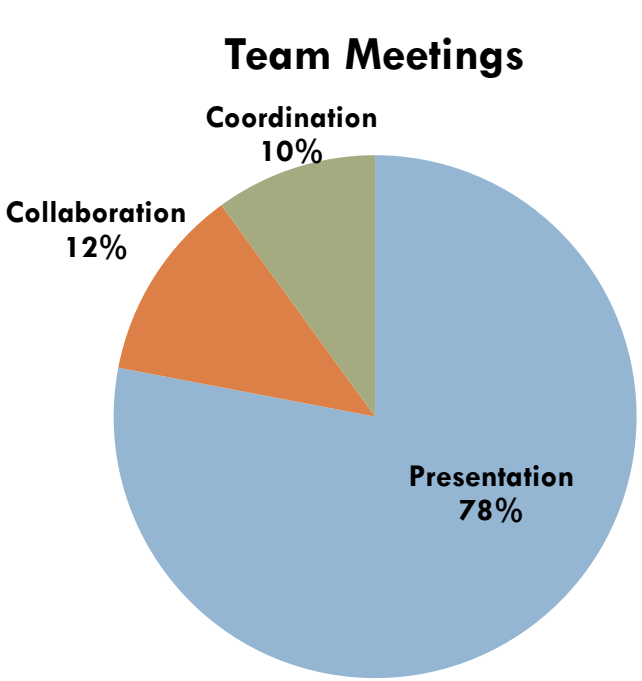
Team communication

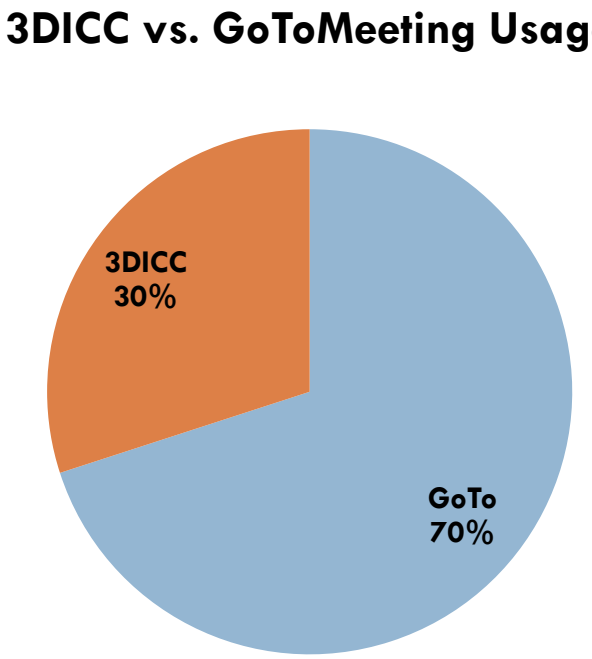
… for different modes and purposes of communication

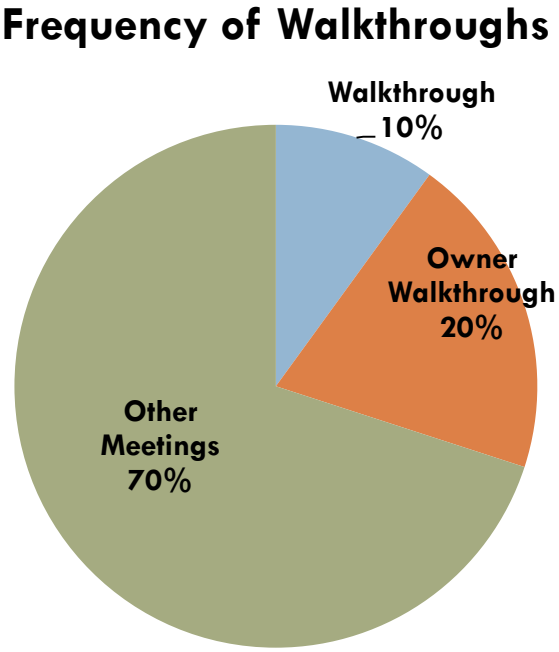




Team Meetings







3DICC Used For: Walkthrough, TVD

How 3d ICC Helped Us

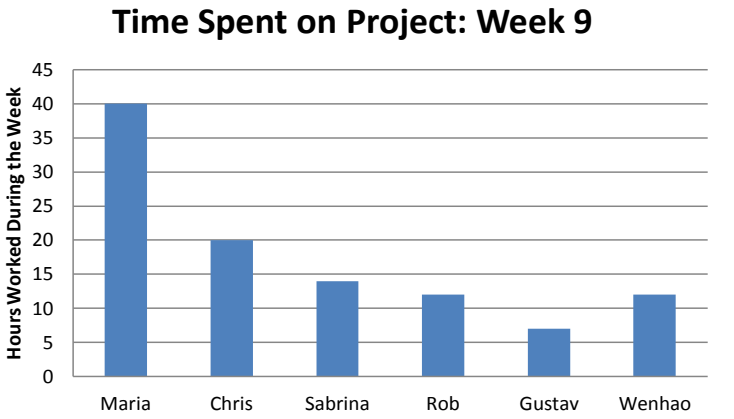
Chris and Rob – 2/17/2012

3d ICC OpenQwaq

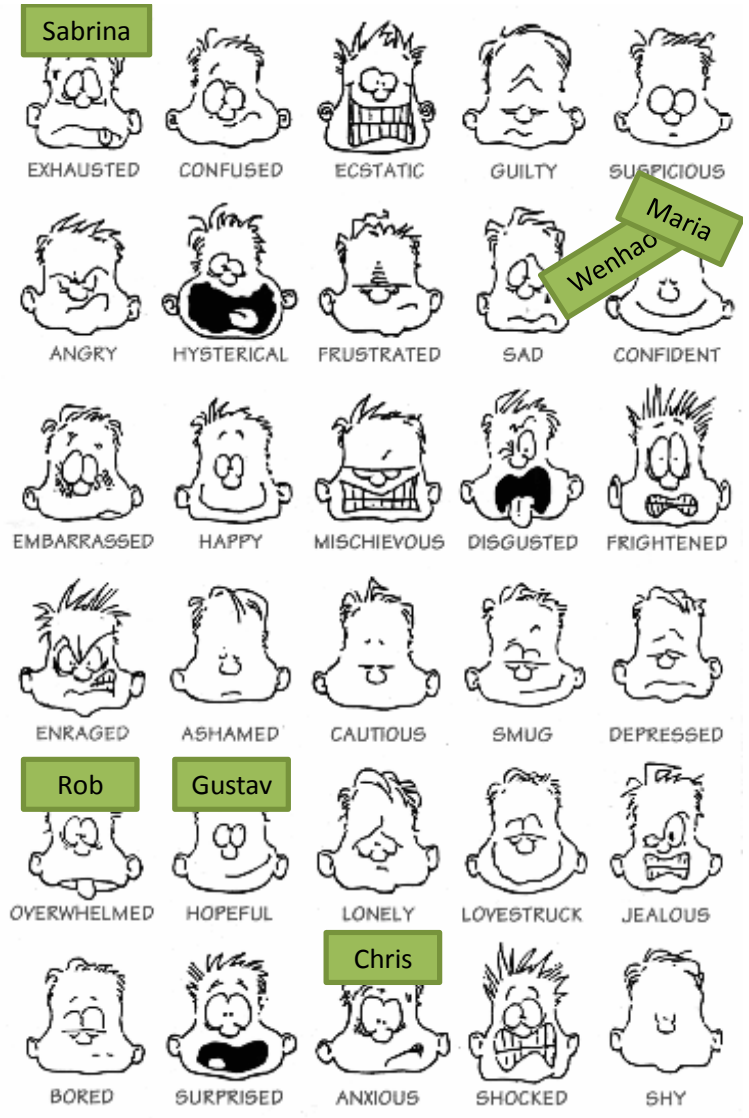
Wenhao and Chris – 3/11/2012

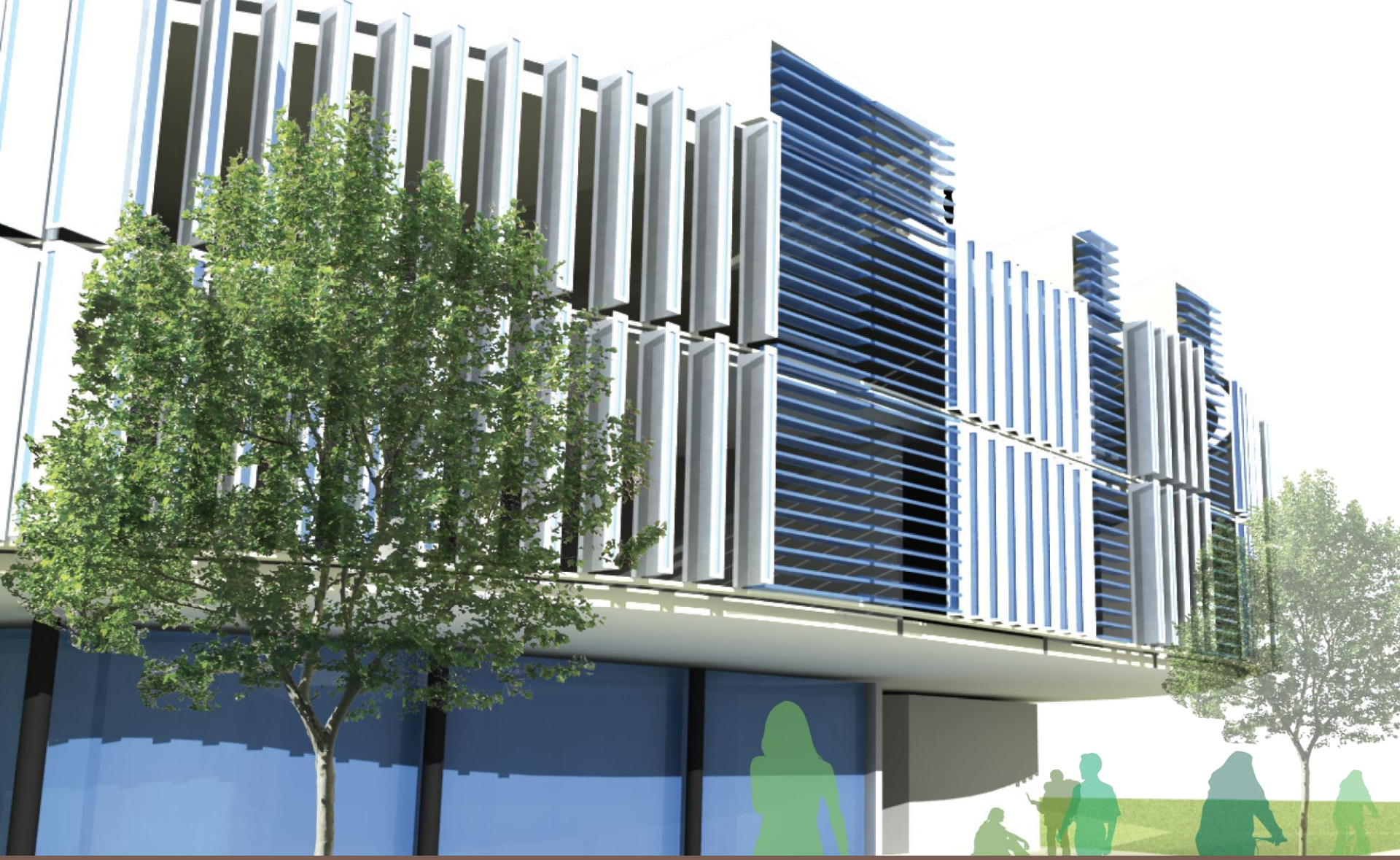
We discovered there was a hallway next to the auditorium that was **too narrow** for people to walk past each other. After a few **iteration** of the design, we have created a hallway **wide enough where multiple people can walk past each other.**

Team Process Assessment Survey



Team Communication						
	Chris	Gustav	Maria	Rob	Sabrina	Wenhao
Chris						
Gustav						
Maria						
Rob						
Sabrina						
Wenhao						





ISLAND TEAM – UNIVERSITY OF PUERTO RICO
SAN JUAN, PUERTO RICO