OWNERS:
Dimitra, Joanna

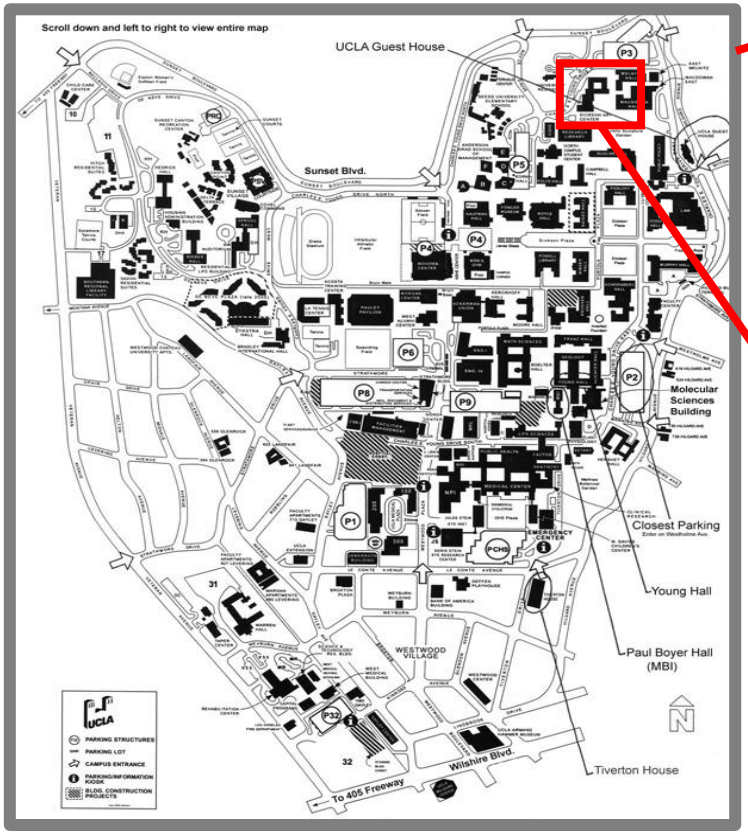
ADVISOR:
Renate

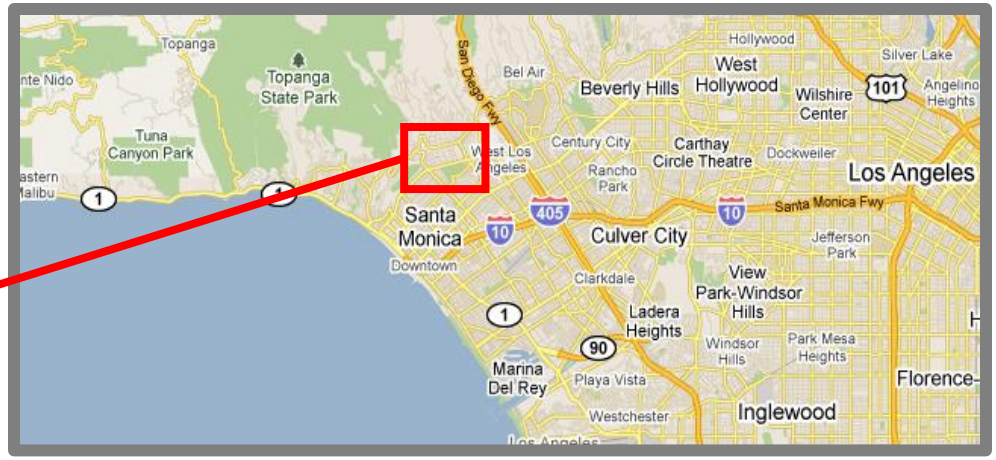
CENTRAL TEAM 2011

UNIVERSITY OF CALIFORNIA, LOS ANGELES

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

PROJECT SITE





University of California
Los Angeles

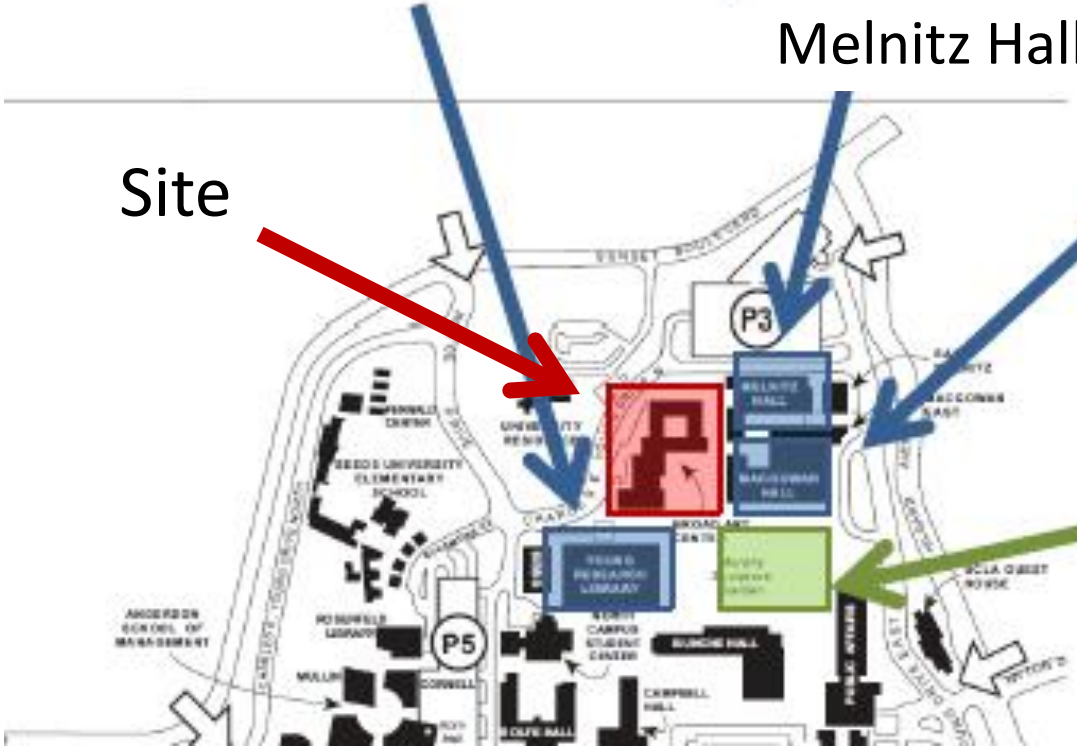
SITE ANALYSIS

Young Research Library

Melnitz Hall

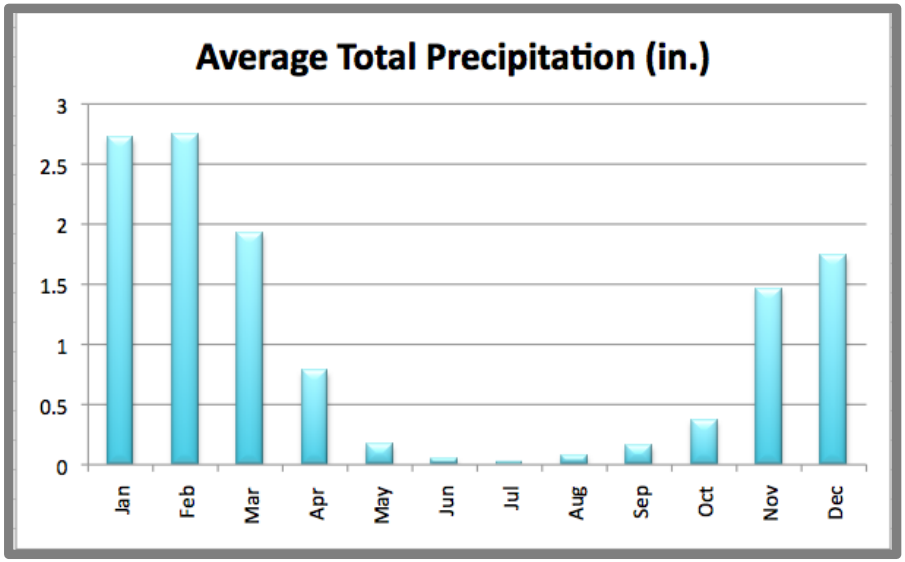
MacGowen Hall

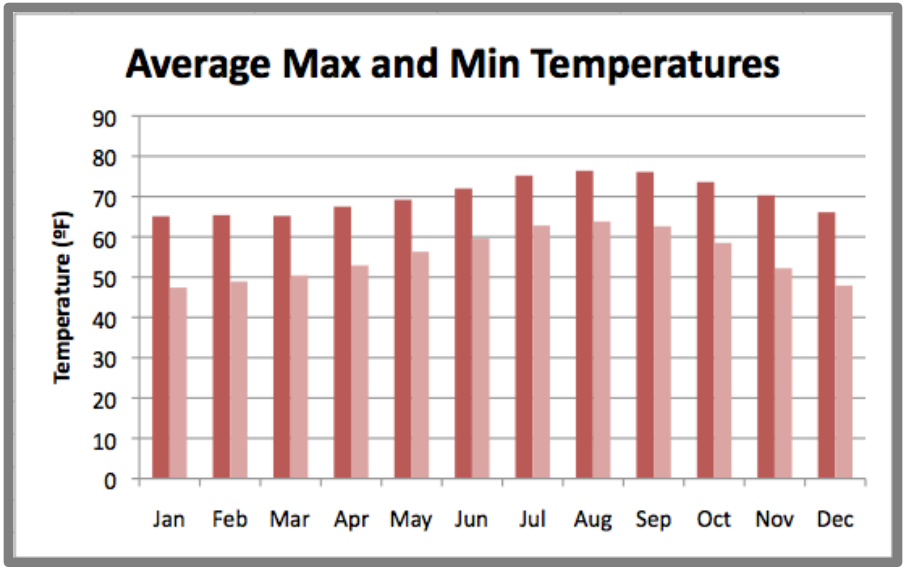
Site



Murphy Sculpture Garden

SITE CONDITIONS



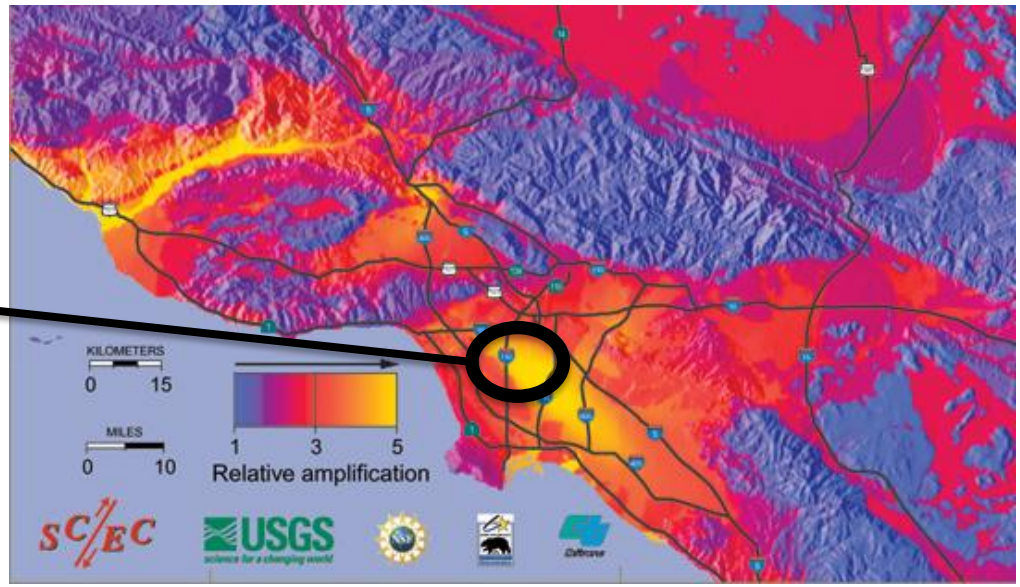


- Warm, moderate, dry climate
- Yearly precipitation – 13”
- Avg. max temperature < 80°F
- Avg. min temperature > 45°F

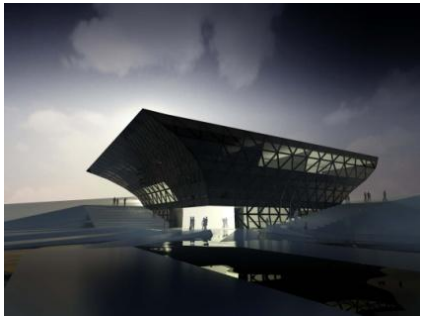
HAZARDS

- Earthquakes
  - Highly seismic area
- Air quality
  - Smog

- NO Flooding Concerns
- NO Snow
- NO Freezing



DECISION MATRIX



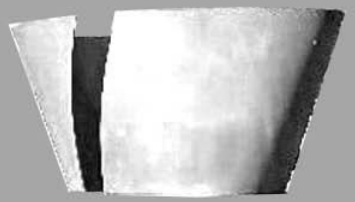
points	owner preference	sculpture				orthogonal			
		steel		concrete		steel		concrete	
		sum team	C*D	sum team	C*F	sum team	C*H	sum team	C*J
Design (interior)	12,5	4	55	4	44	3	36	3	33
Design (exterior)	14	5	67	3	40	3	35	2	30
Constructability	8	4	30	3	21	4	34	3	27
Initial cost	8	3	24	3	26	4	28	3	27
Life 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

{ARCHITECTURE}

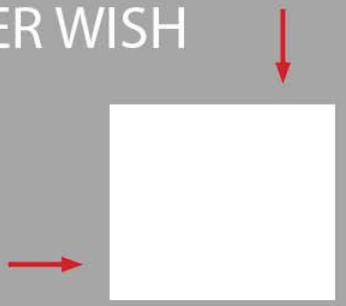
IDEA

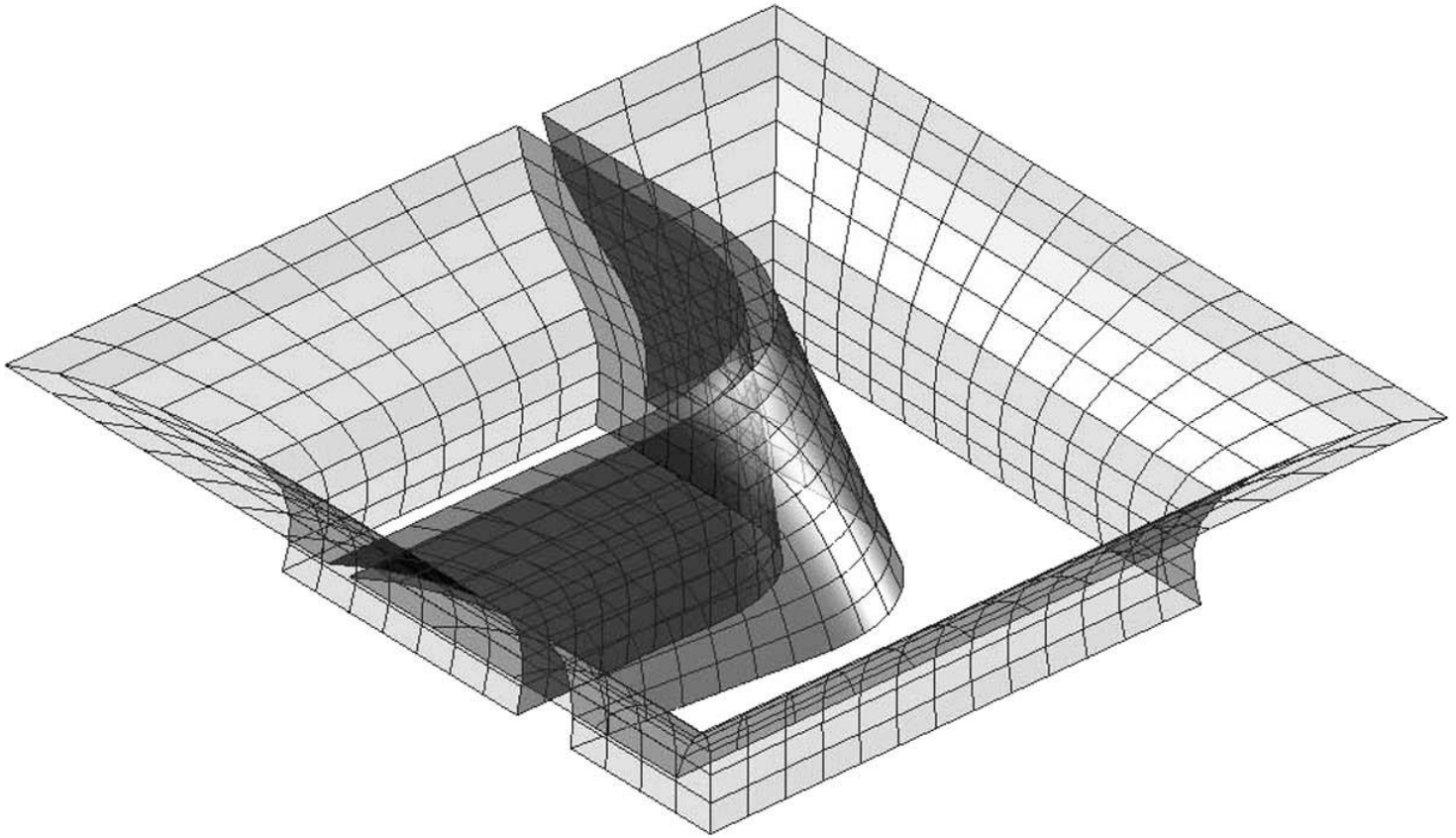
DIRECT SOUTH SUN

CULTURAL CONTEXT

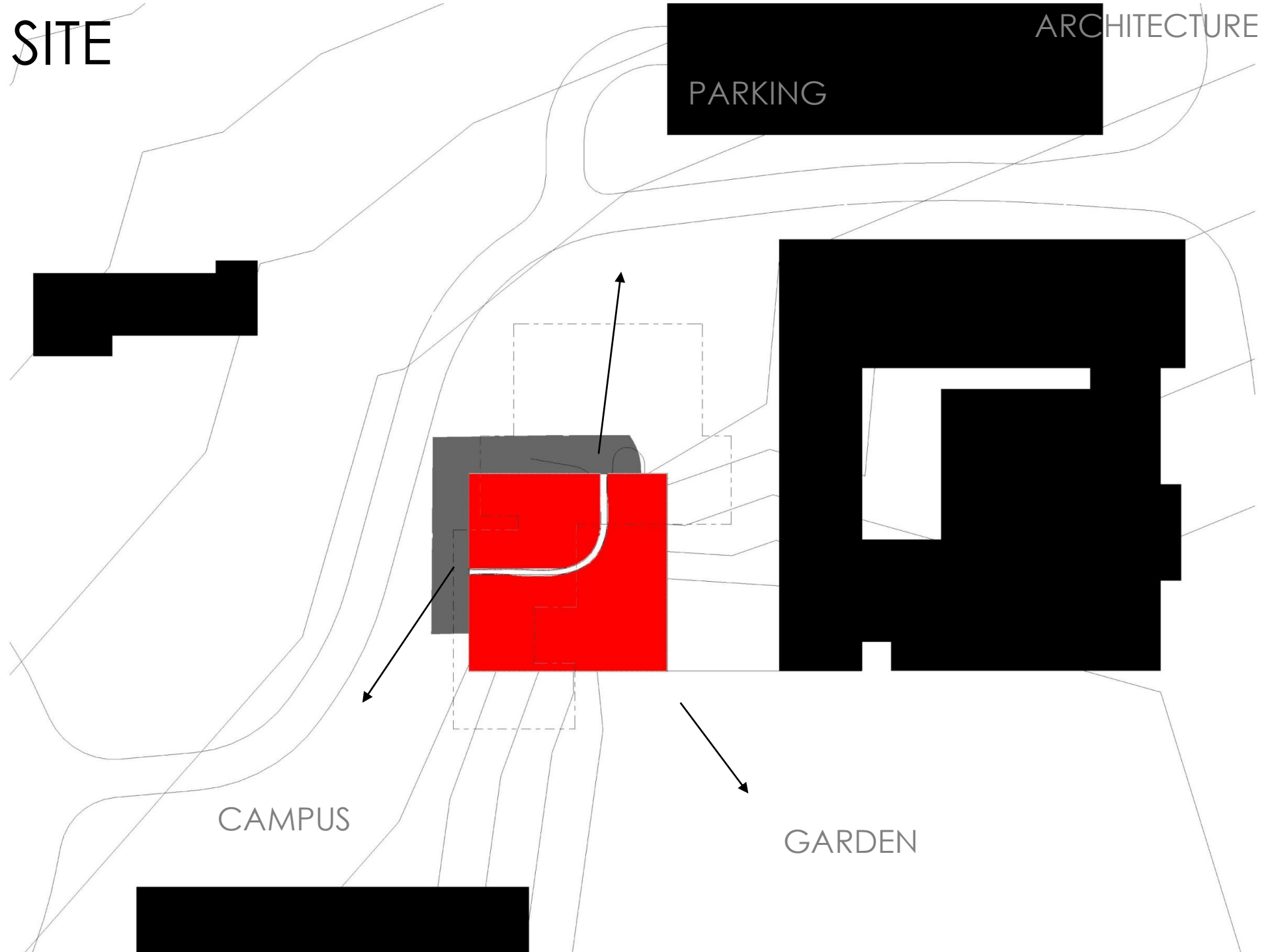


OWNER WISH

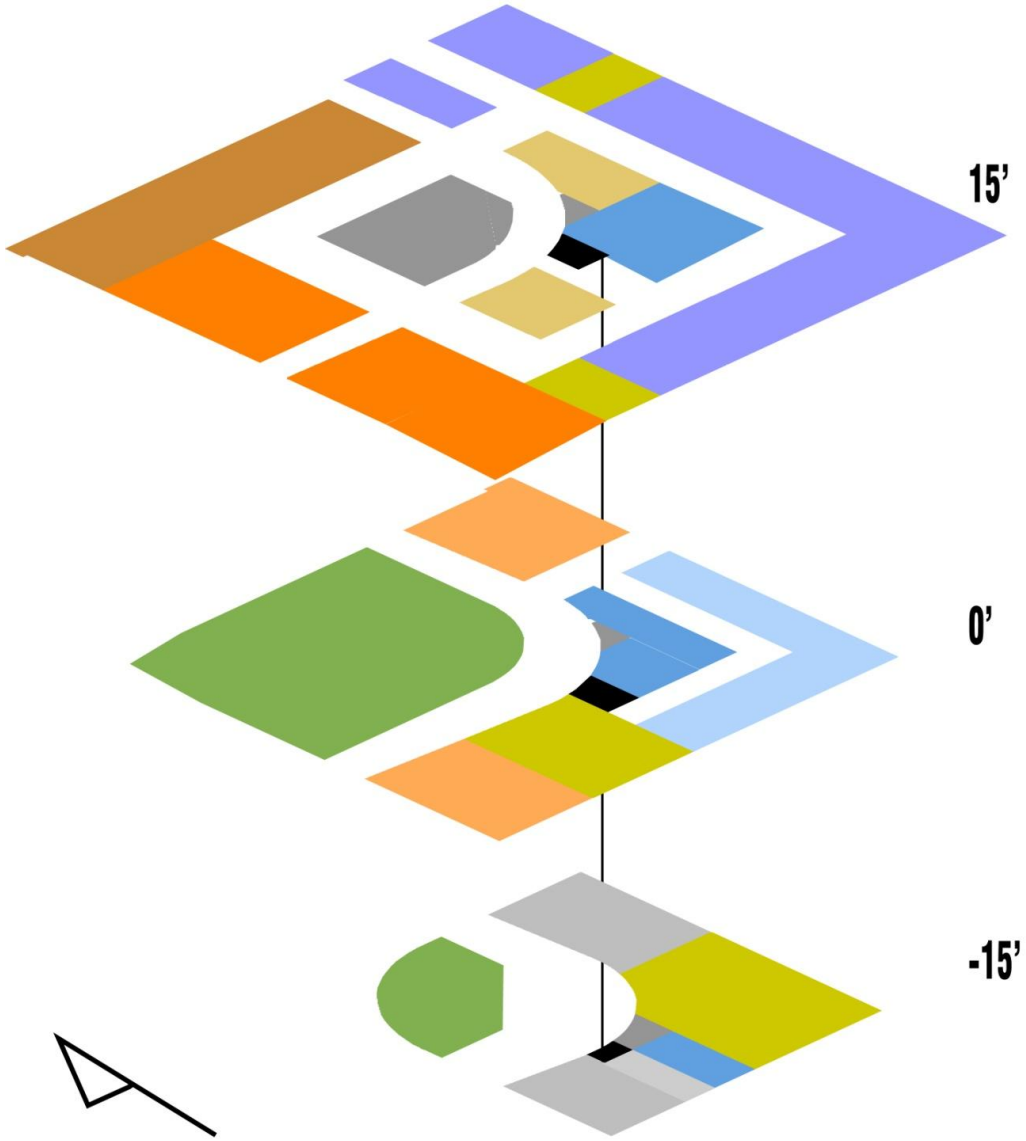




SITE

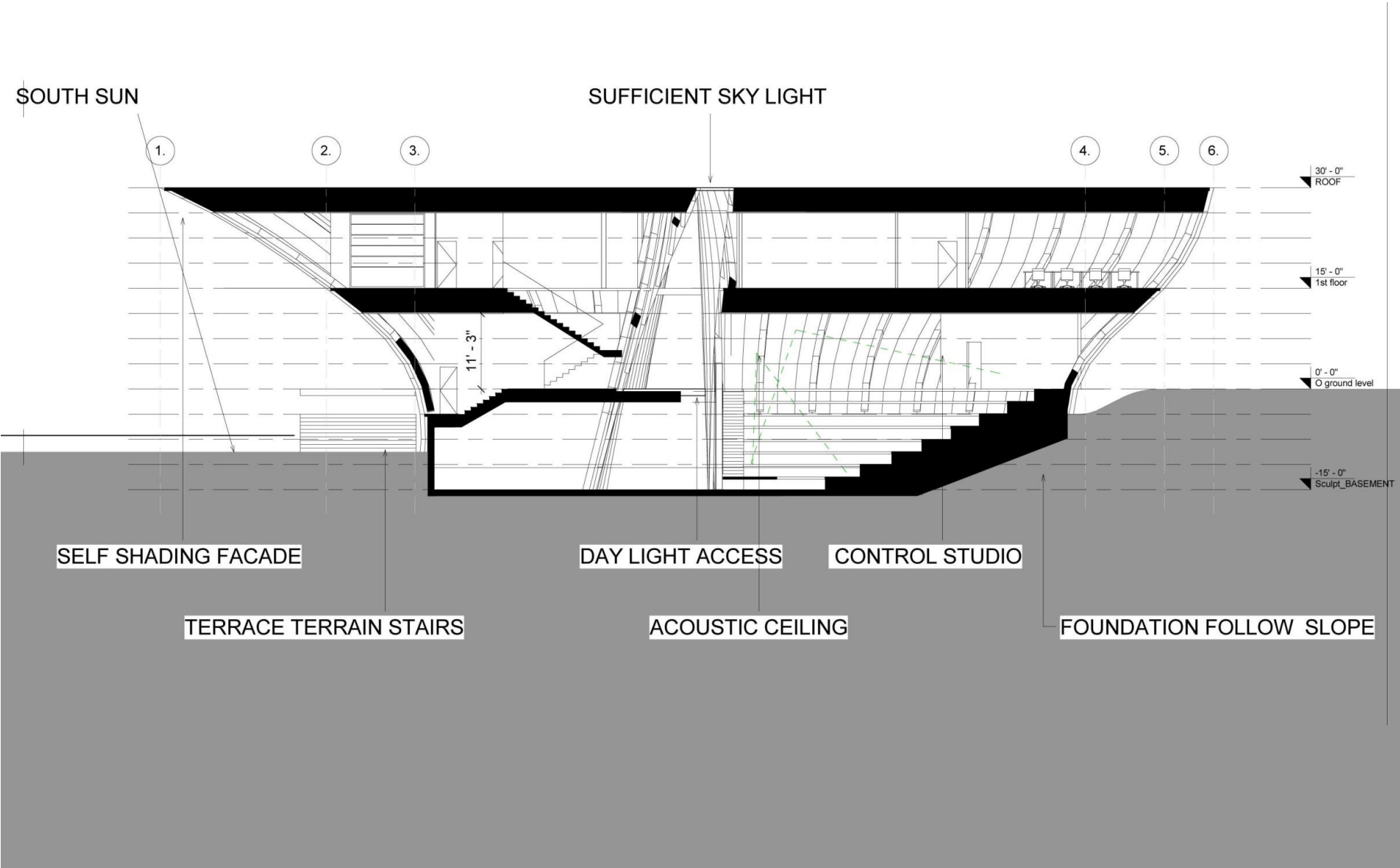


ORGANIGRAM

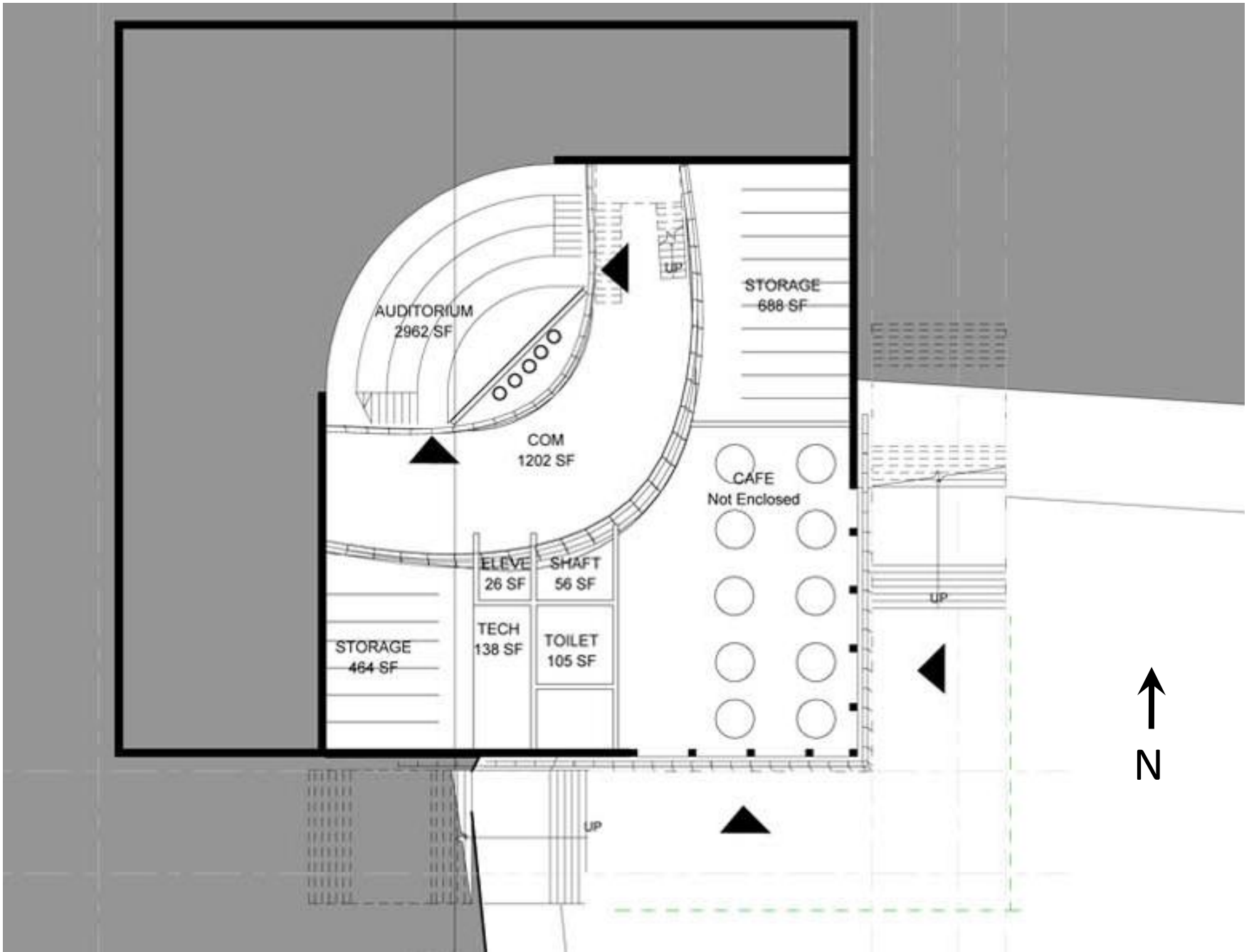


AUDITORIUM
CAFE/REST
LABS
SEMINARS
SMALL CLASS
LARGE CLASS
STUD OFFICES
OFFICES
TOILET
TECHNICAL

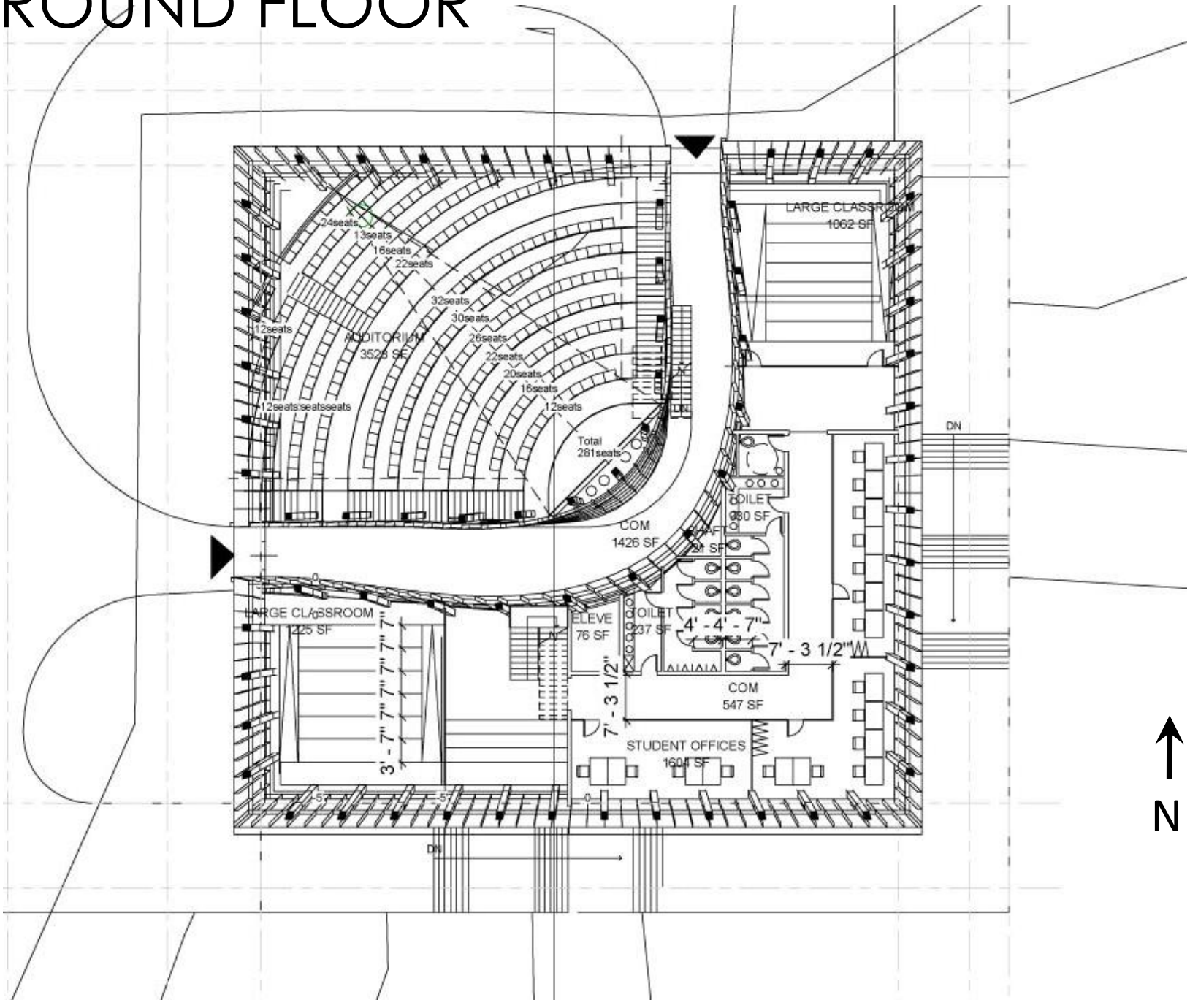
SECTION


SOUTH SUN
SUFFICIENT SKY LIGHT
1.
2.
3.
4.
5.
6.
30' - 0"
ROOF
15' - 0"
1st floor
0' - 0"
O ground level
-15' - 0"
Sculpt_BASEMENT
11' - 3"
SELF SHADING FACADE
TERRACE TERRAIN STAIRS
DAY LIGHT ACCESS
ACOUSTIC CEILING
CONTROL STUDIO
FOUNDATION FOLLOW SLOPE

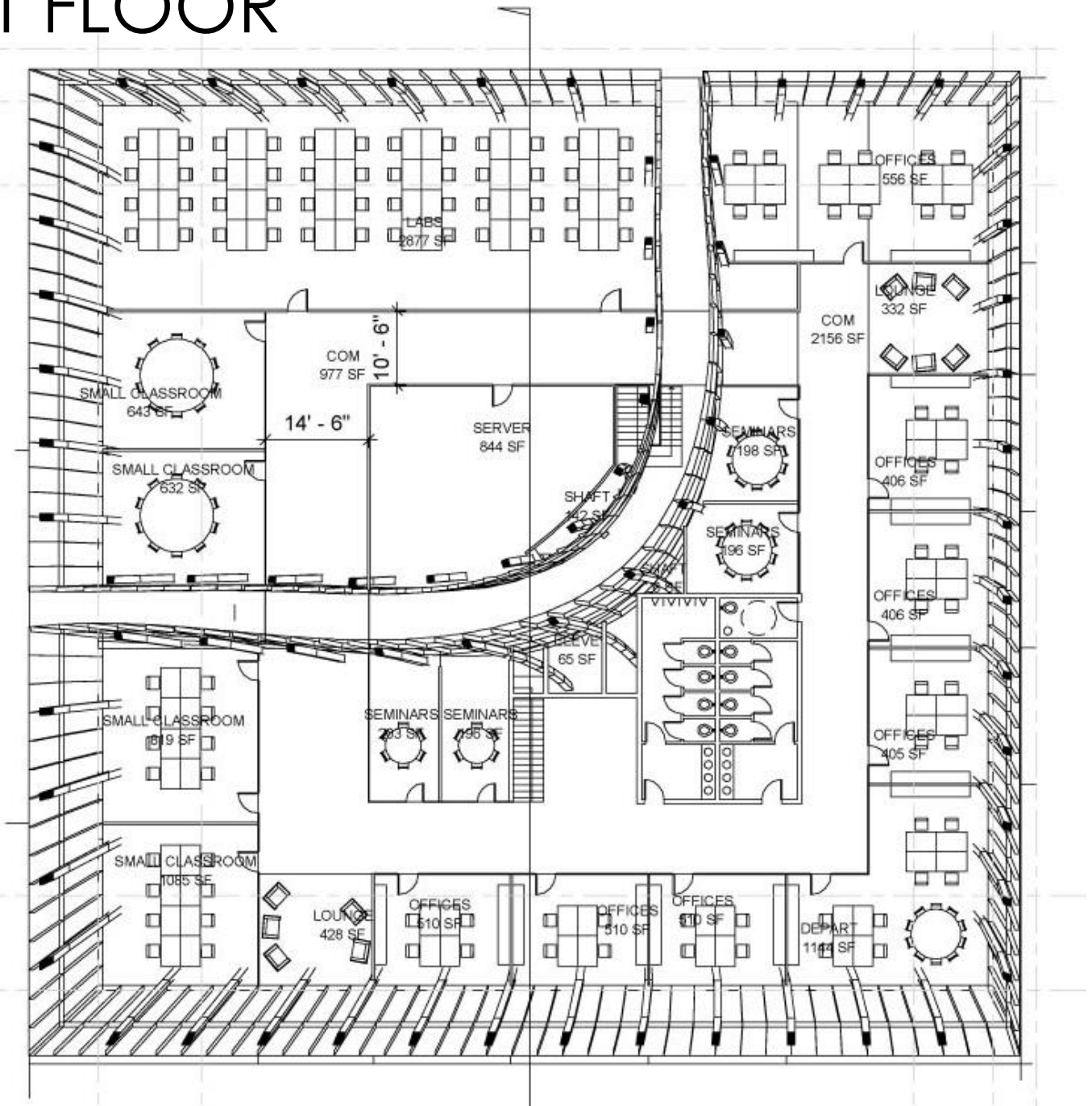
BASEMENT


AUDITORIUM
2962 SF
UP
STORAGE
688 SF
COM
1202 SF
CAFE
Not Enclosed
ELEVE
26 SF
SHAFT
56 SF
TECH
138 SF
TOILET
105 SF
STORAGE
464 SF
UP
UP
N

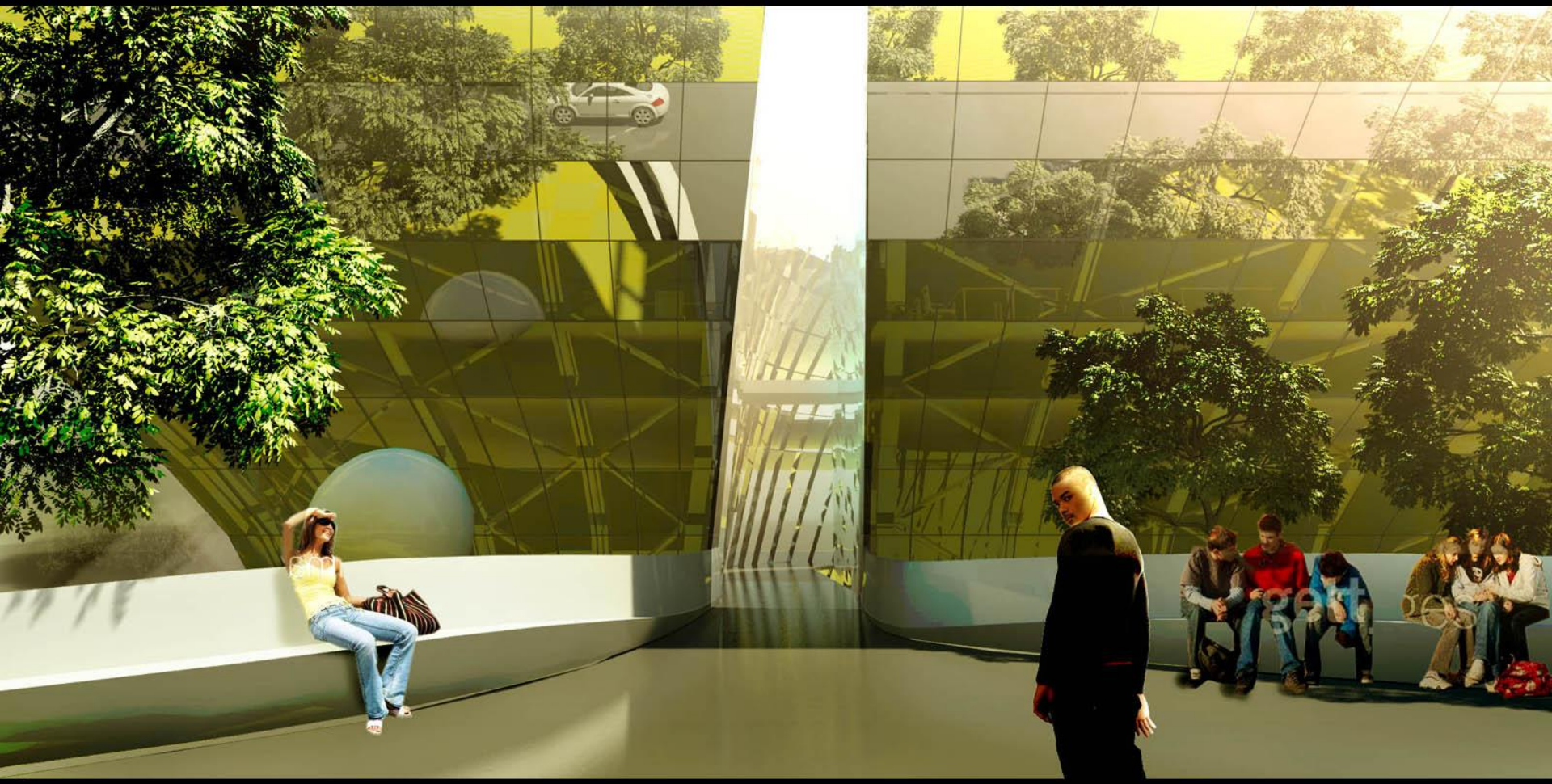
GROUND FLOOR



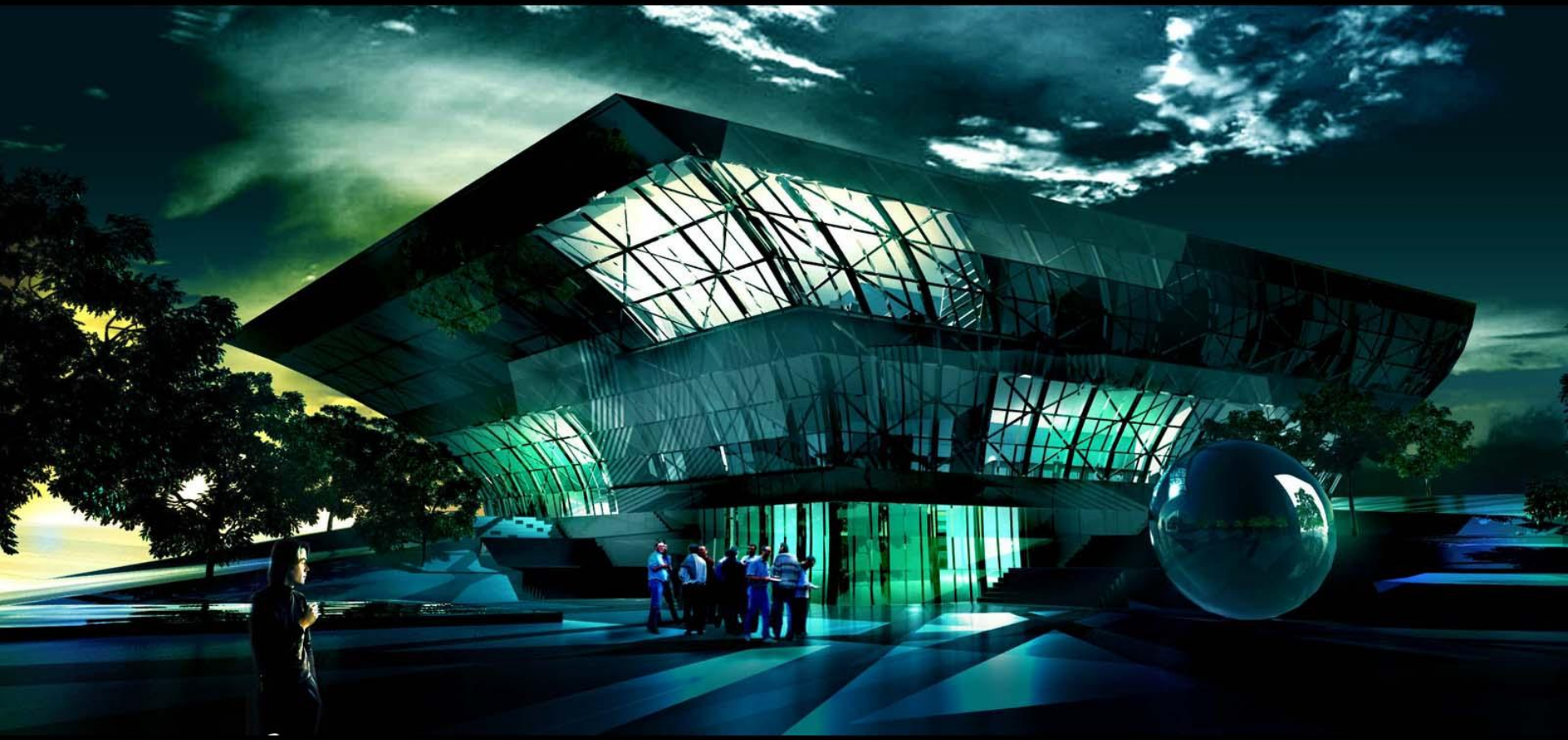
FIRST FLOOR

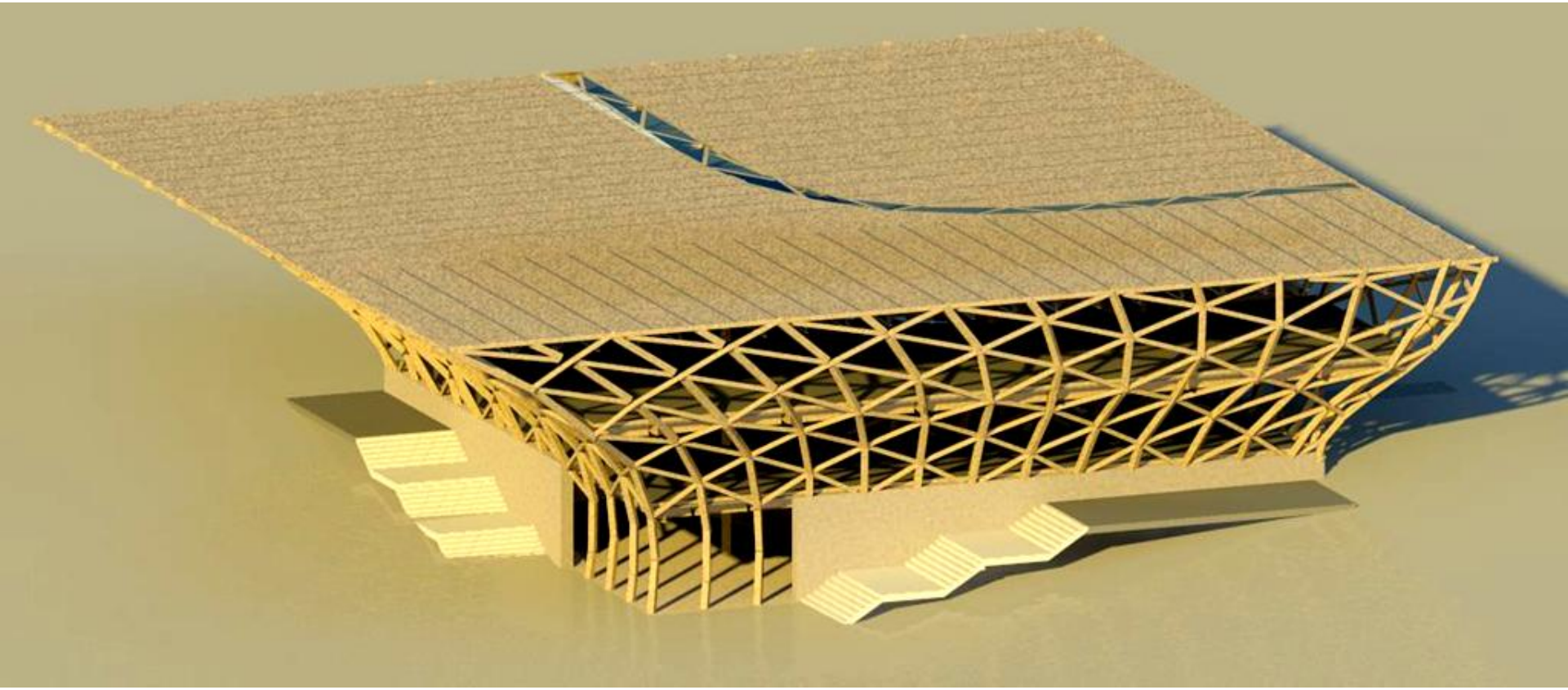

LABS
2877 SF
OFFICES
556 SF
LOUNGE
332 SF
COM
2156 SF
COM
977 SF
10' - 6"
14' - 6"
SMALL CLASSROOM
643 SF
SMALL CLASSROOM
632 SF
SERVER
844 SF
SEMINARS
198 SF
OFFICES
406 SF
SHAFT
SEMINARS
196 SF
OFFICES
406 SF
SMALL CLASSROOM
819 SF
SEMINARS
SEMINARS
OFFICES
405 SF
SMALL CLASSROOM
1085 SF
LOUNGE
428 SF
OFFICES
510 SF
OFFICES
510 SF
OFFICES
510 SF
DEPART
1149 SF
N

DECORATION



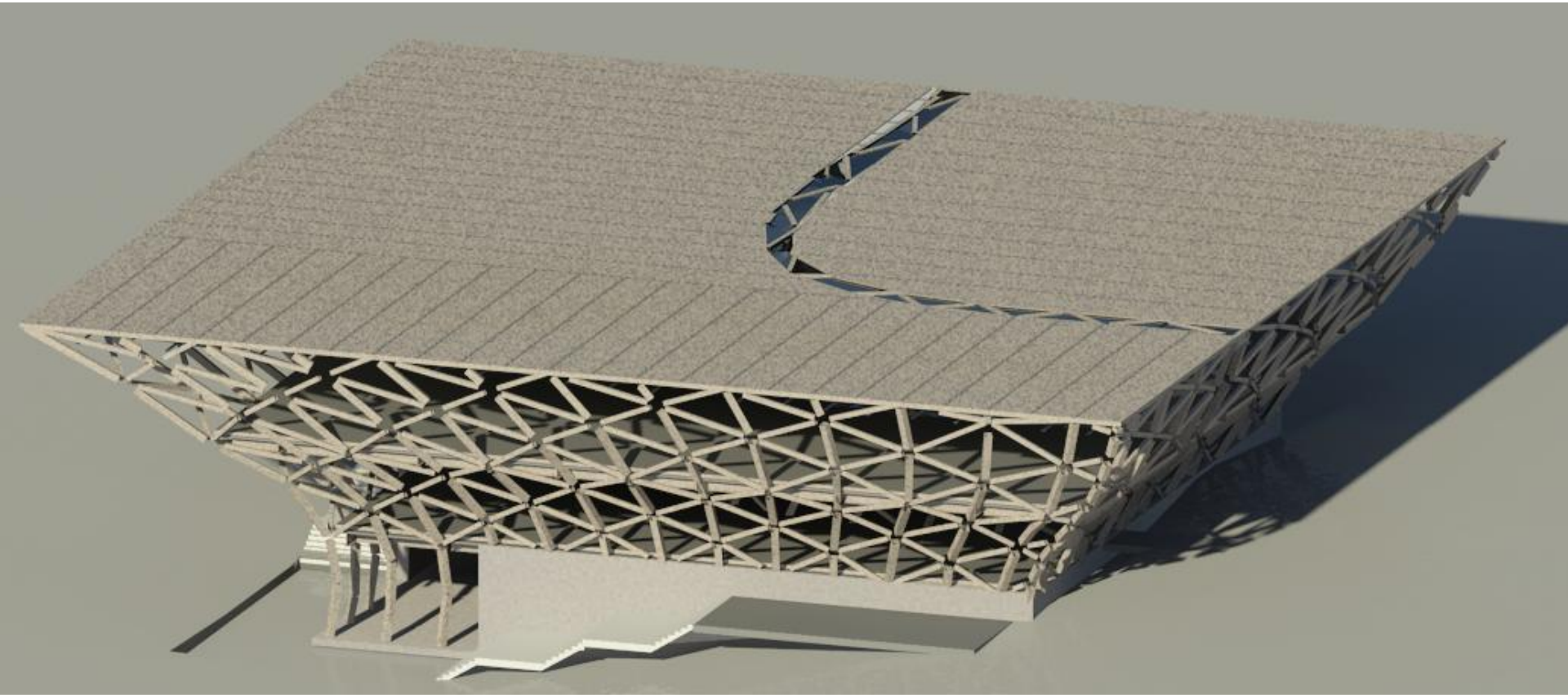
MAIN CORRIDOR





{STRUCTURAL DESIGN}

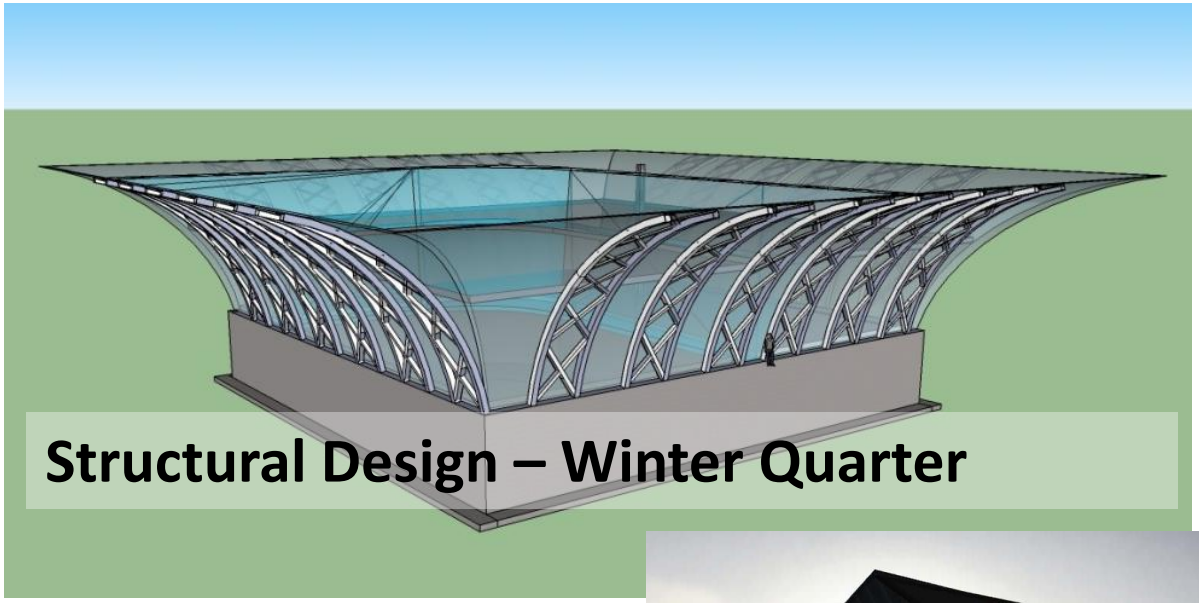
STRUCTURAL OVERVIEW



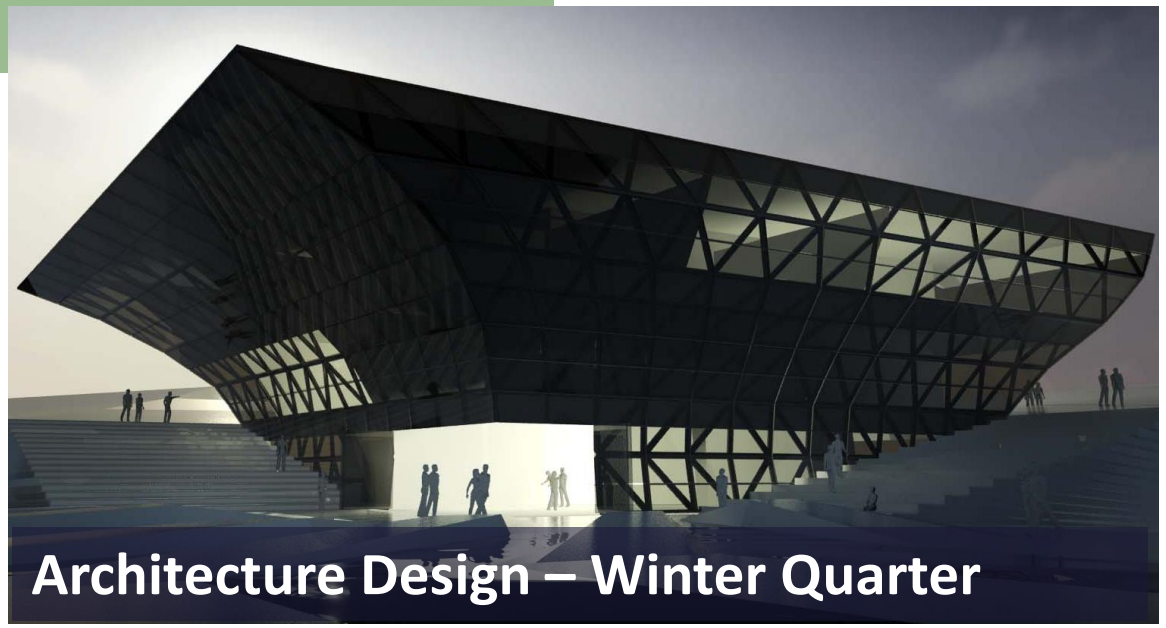
EXTERIOR STRUCTURAL SHELL

HSS TRUSS SYSTEM - GRAVITY AND LATERAL RESISITING SYSTEM

STRUCTURAL DESIGN SHIFT



DESIGN MERGE



SPRING QUARTER TASKS

- Modeling/Analysis
- Truss Design
- Connection Details

SCULPTURAL INSPIRATION

DESERT BLOOM, MORONGO CASINO - CA

OVERALL APPEARANCE OF TRUSS SHELL

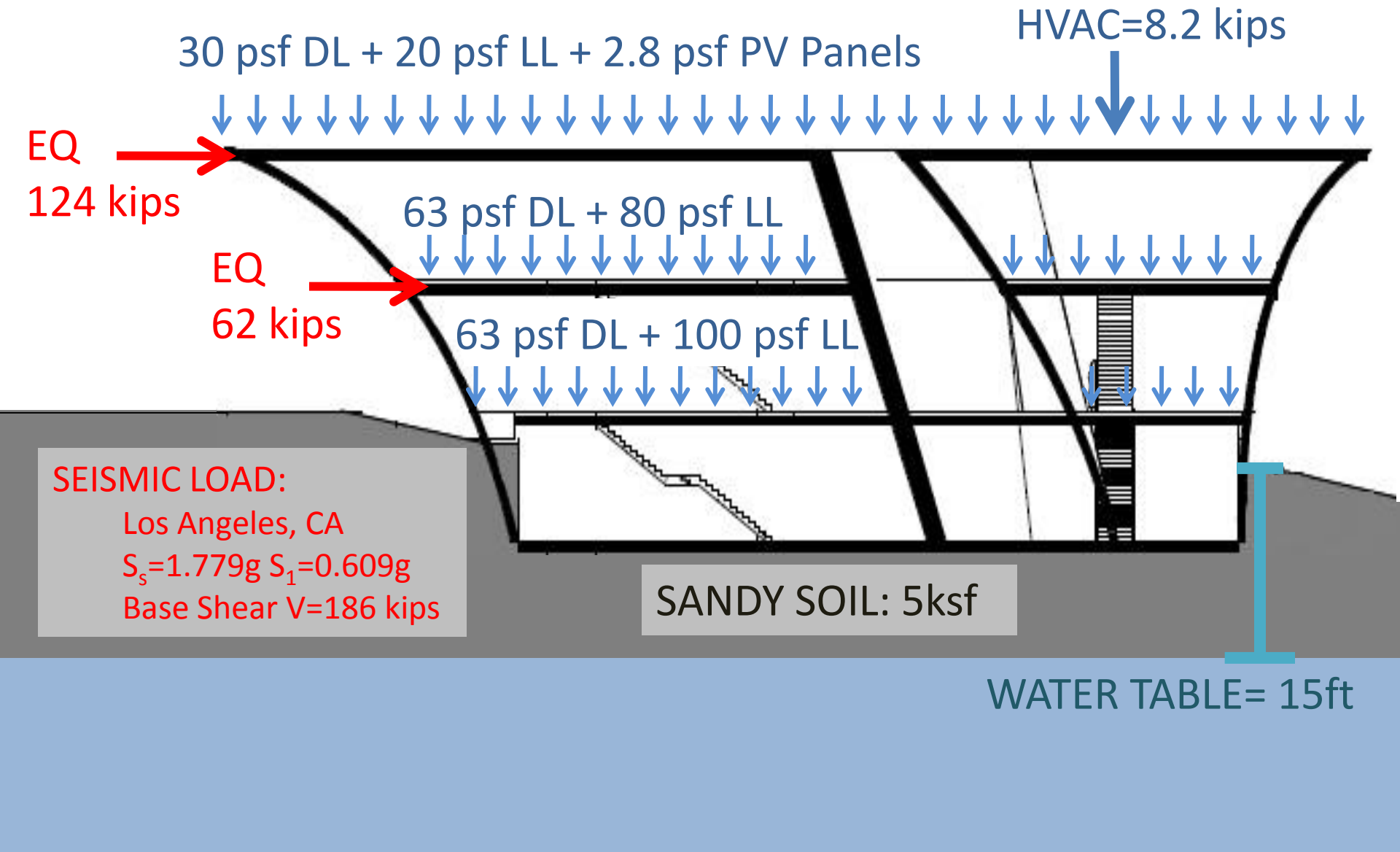
BIRDS NEST, BEIJING

STEEL MEMBER TYPE

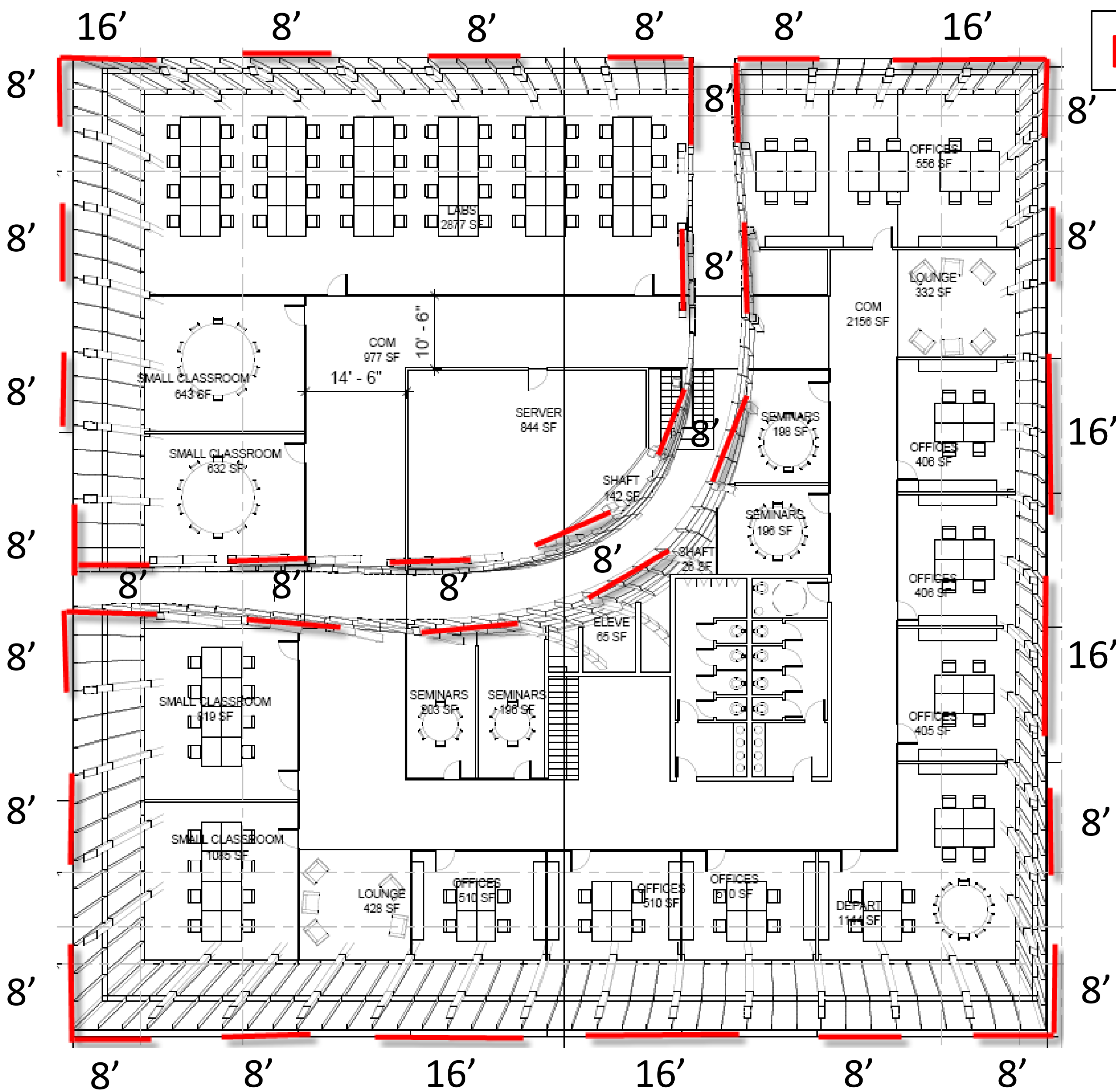
SOUMAYA ART MUSEUM, MEXICO CITY

CONNECTION DETAILS

BUILDING LOADS

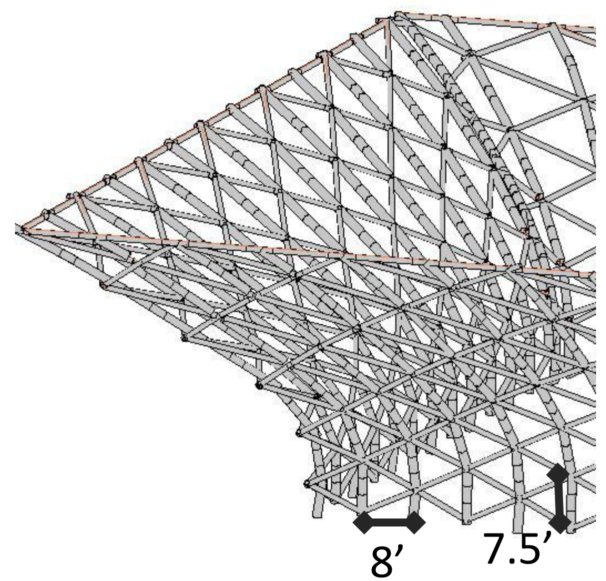


SHELL DESIGN OVERVIEW

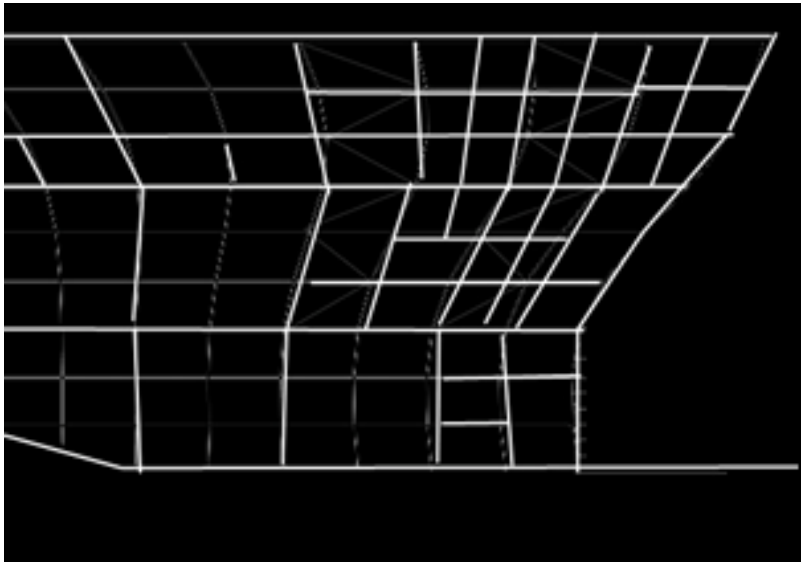


RED = PRE-FAB TRUSSES

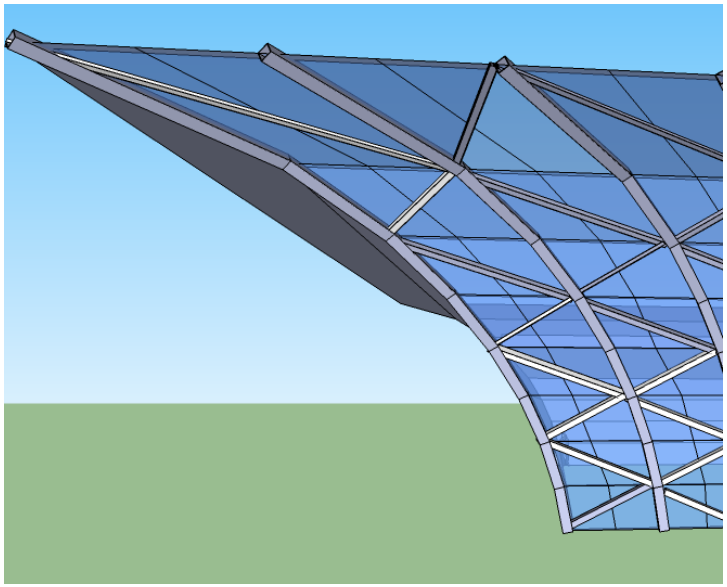
3D VIEW OF TRUSS SHELL



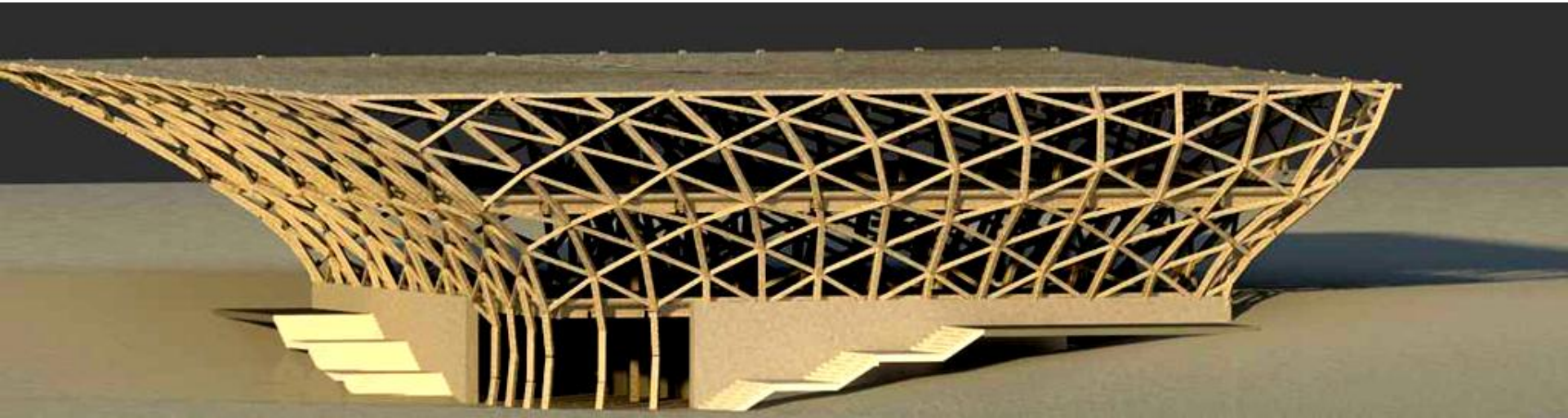
STRUCTURAL DESIGN ITERATIONS



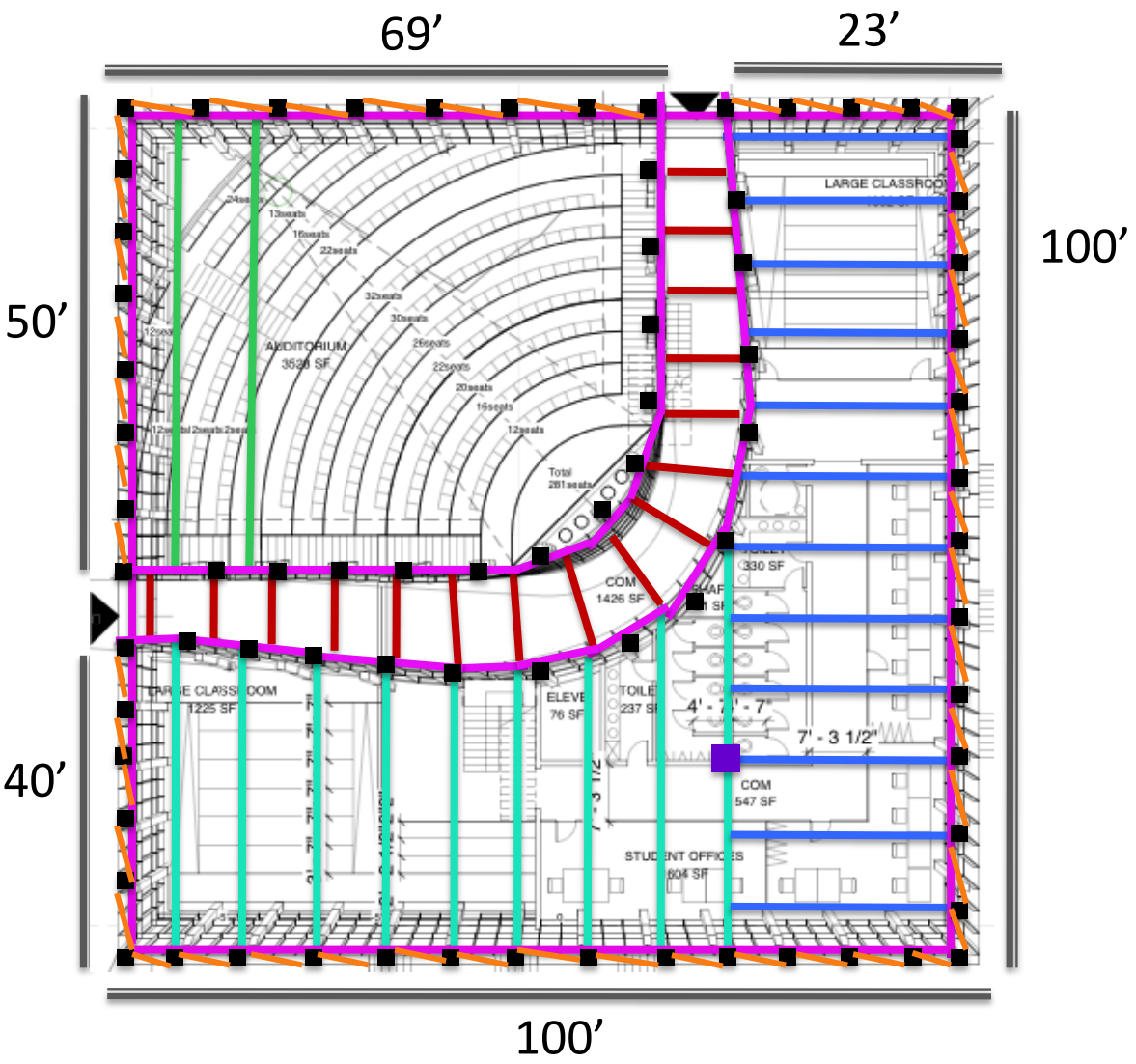
Architecture – April 11

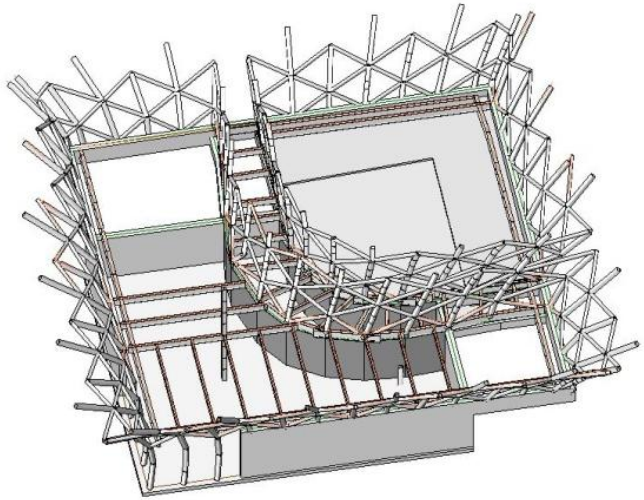


Structural – April 11



GROUND





TRUSS:

- Members - HSS 8x8x1/2
- Columns - HSS 12x12x5/8

COLUMNS:

- Single Column - W14x283

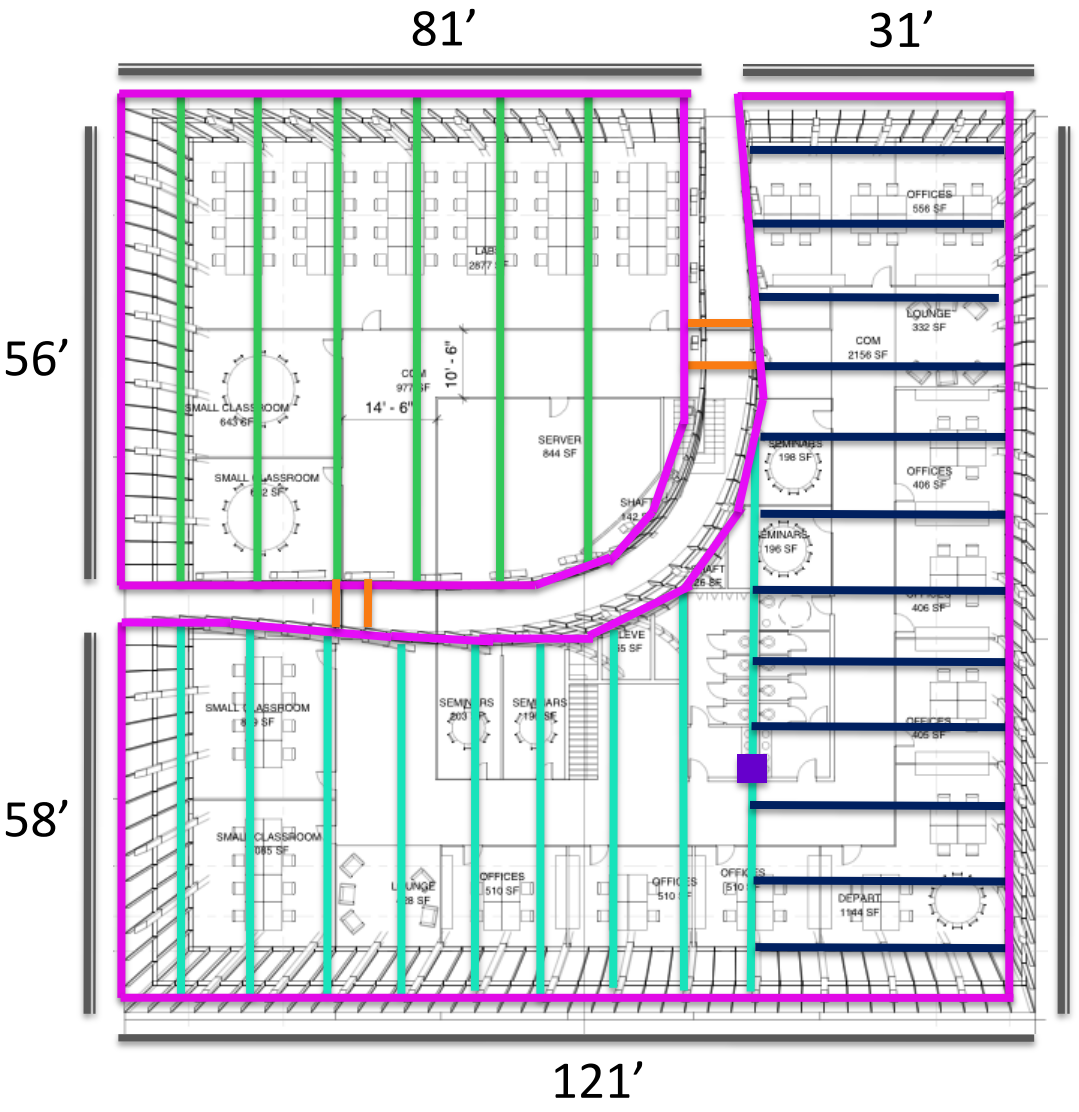
GIRDERS:

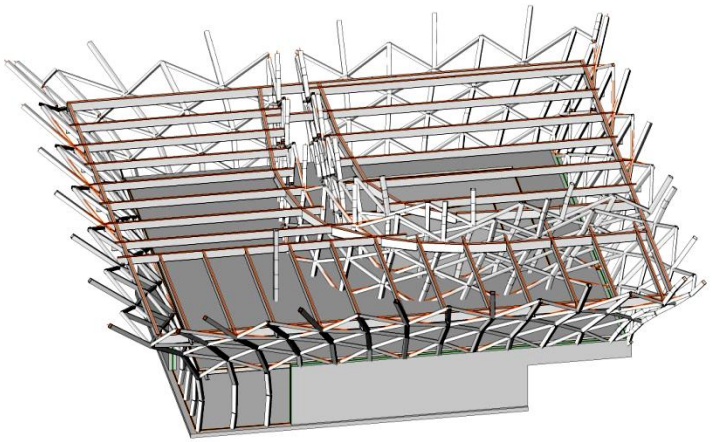
- Perimeter Girders - W27x84

FLOOR BEAMS:

- Auditorium - W24x68
- North/South - W21x55
- East/West - W16x26
- Corridor - W21x68

FIRST FLOOR





COLUMNS:

- Single Column - W14x283

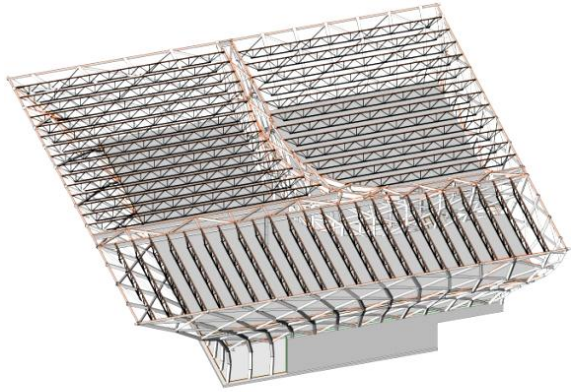
GIRDERS:

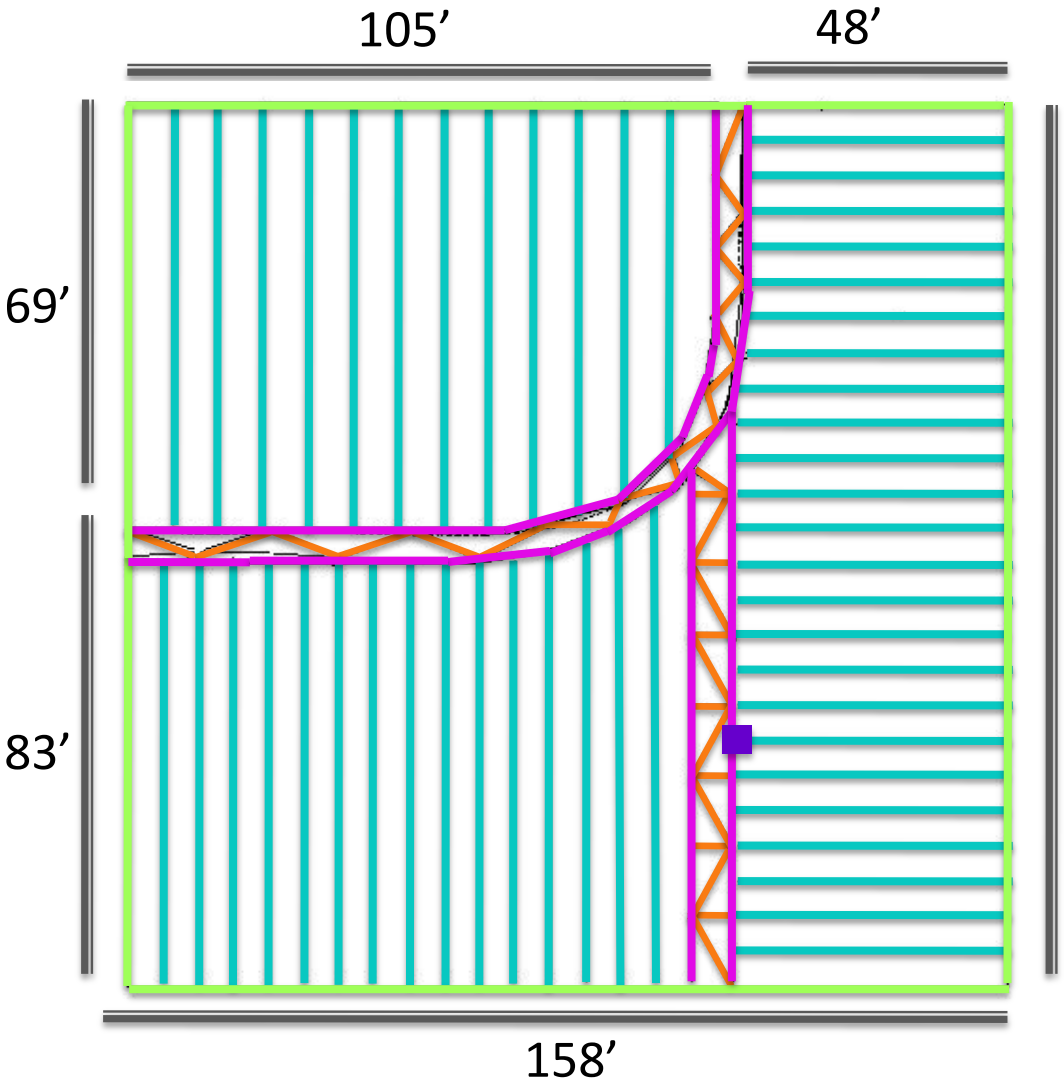
- Perimeter Girders - W27x84

FLOOR BEAMS:

- Auditorium - W27x84
- North/South - W27x84
- East/West - W21x68
- Catwalk - W27x129

ROOF





GIRDERS:

- Exterior Girders – HSS12x12x5/8
- Interior Girders - W27x84

ROOF JOISTS:

- Steel Joists – Vulcraft 48LH17

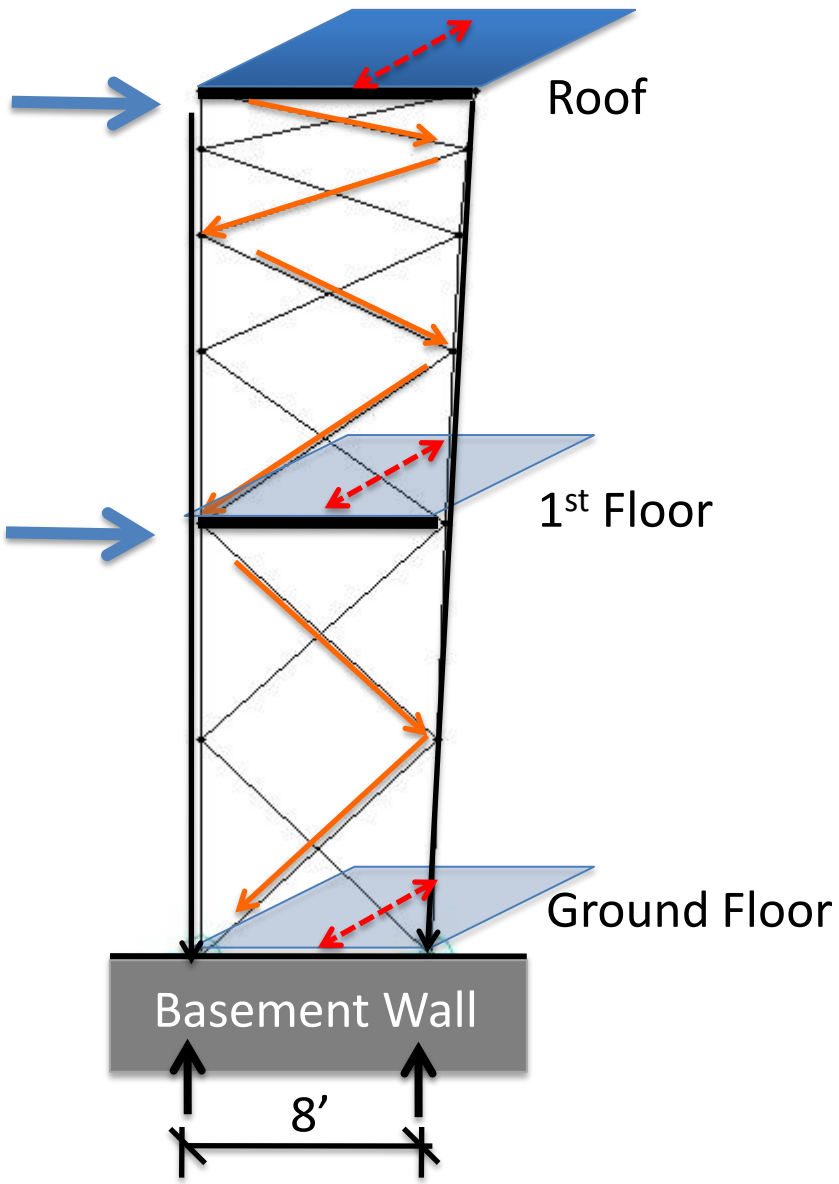
HORIZONTAL BRACING:

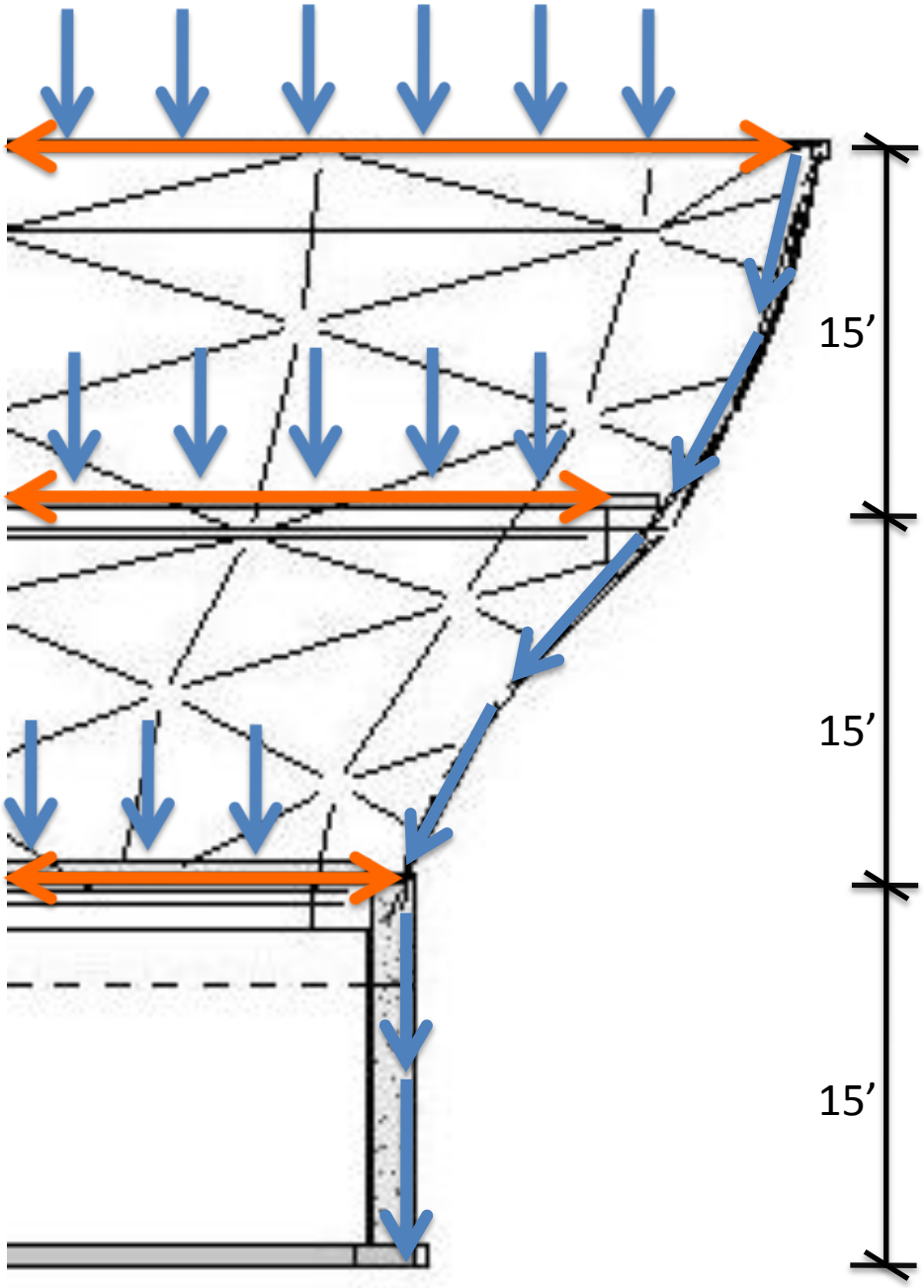
- Truss System - HSS8x8x1/2

COLUMNS:

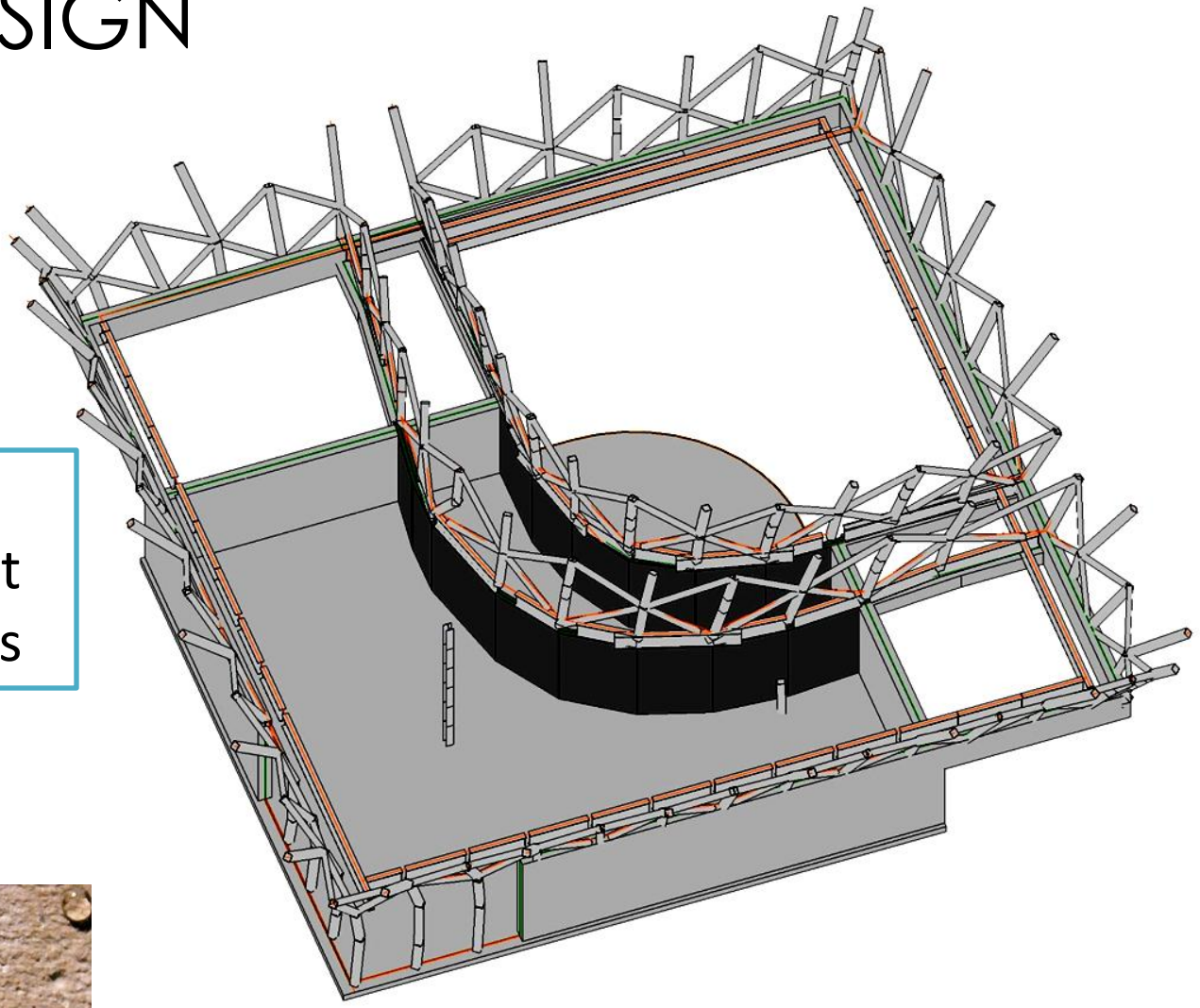
- Single Column - W14x283

LOAD PATH





BASEMENT DESIGN



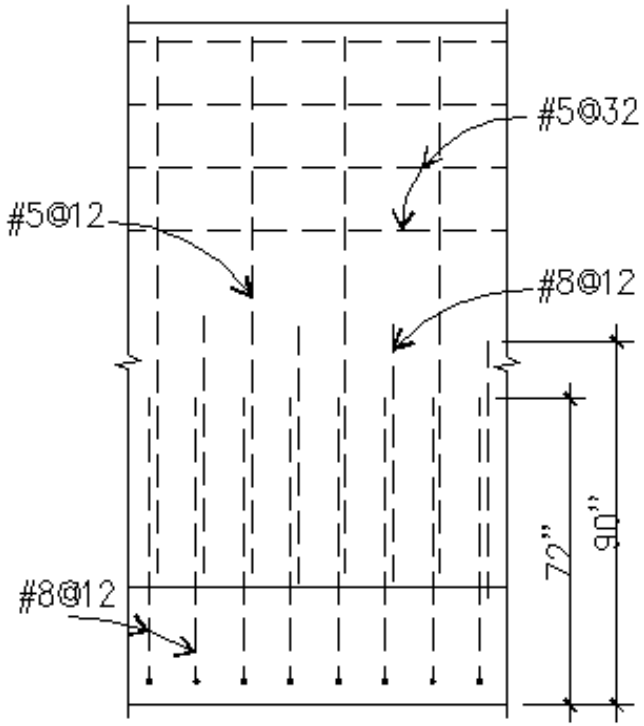
TRUSSES
Frame into Basement
Walls & Grade Beams

Hycrete

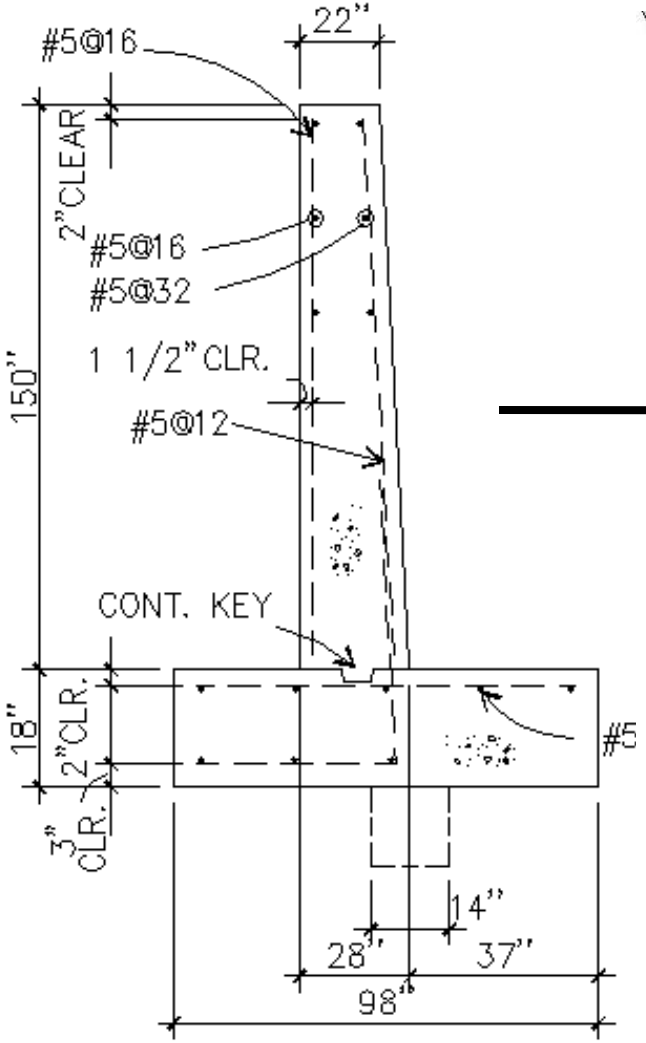
HYCRETE
Waterproofing
Concrete Admixture

RETAINING WALL

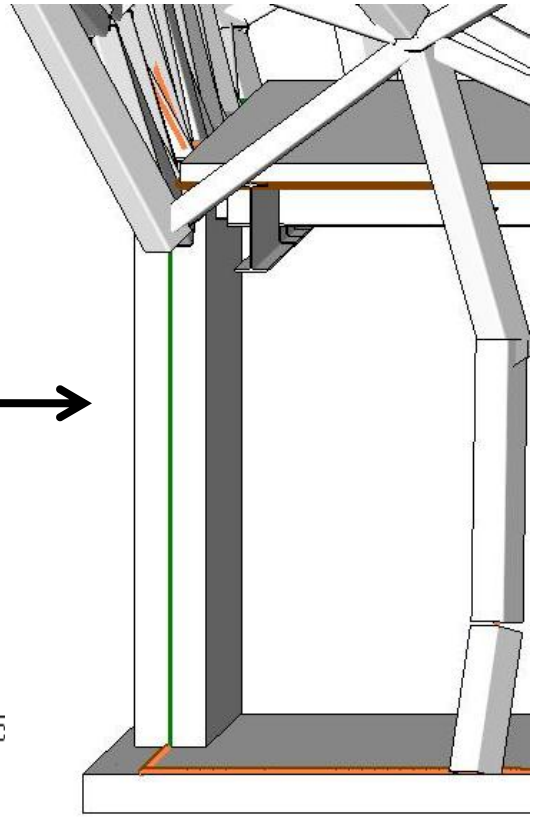
Elevation with reinforcement



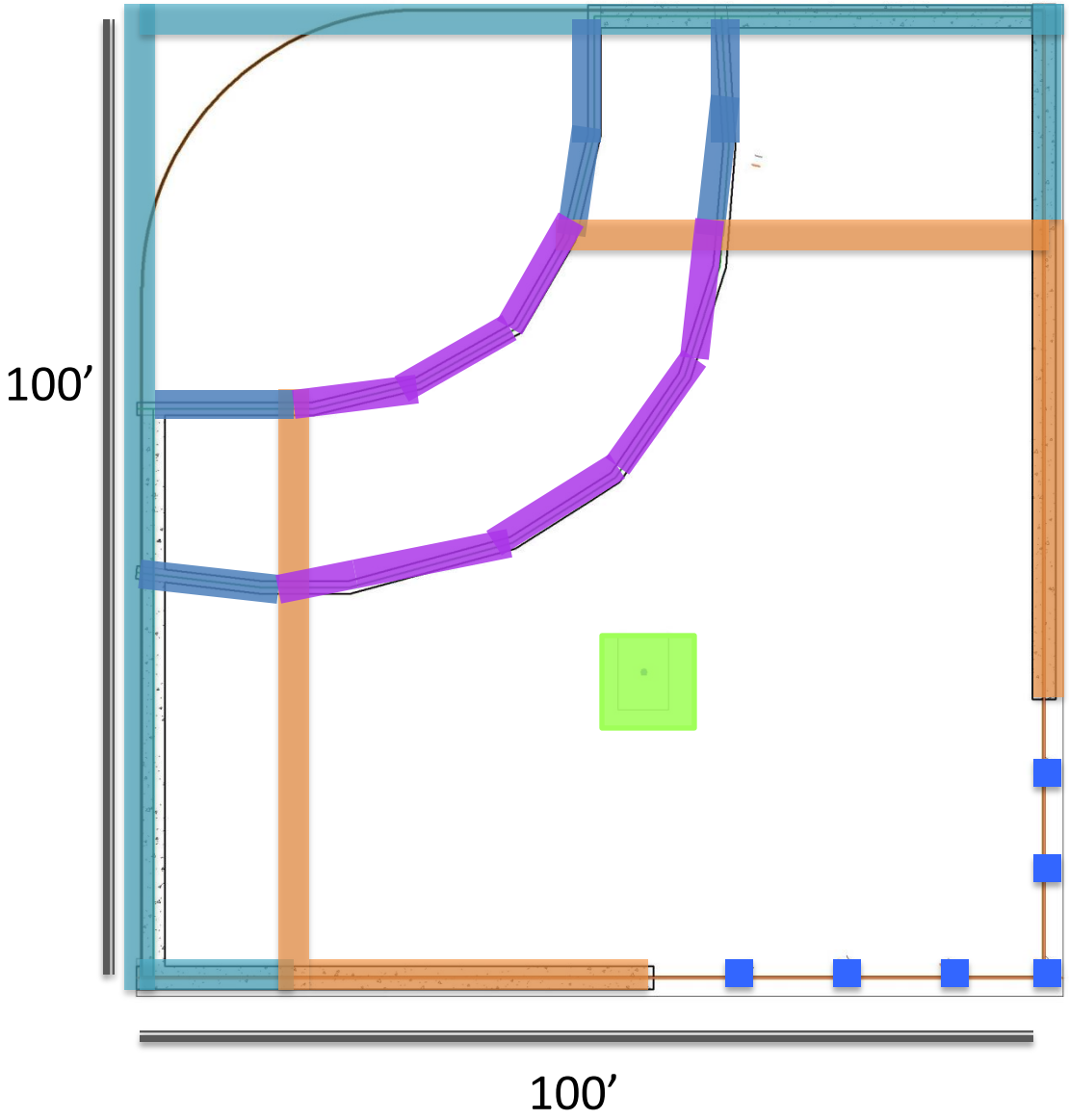
Section cut with reinforcement



3D view of retaining wall

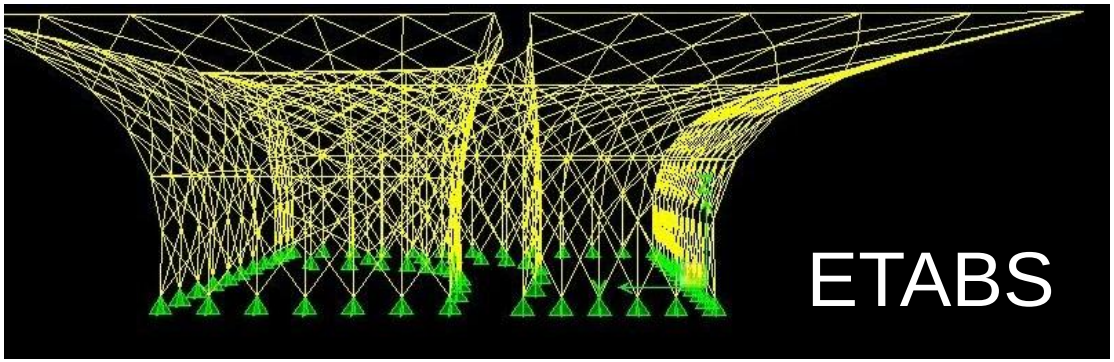


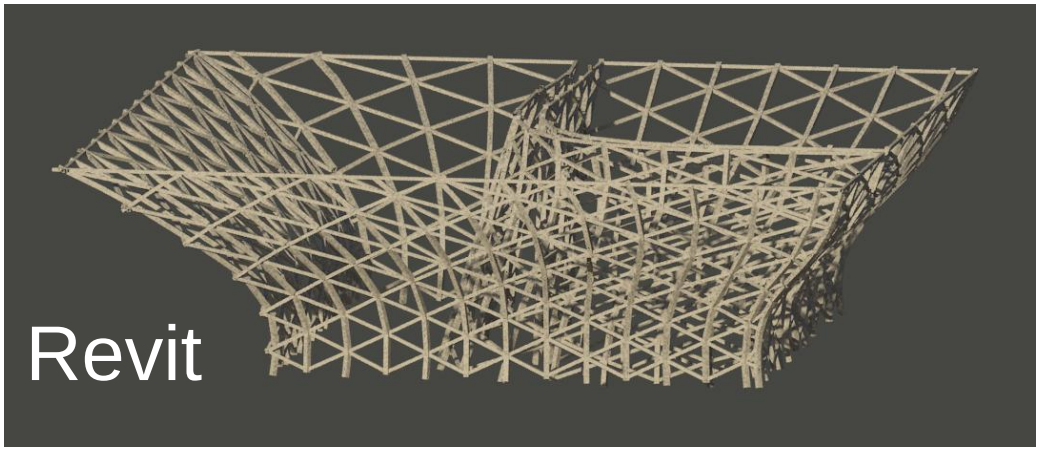
FOUNDATION DESIGN

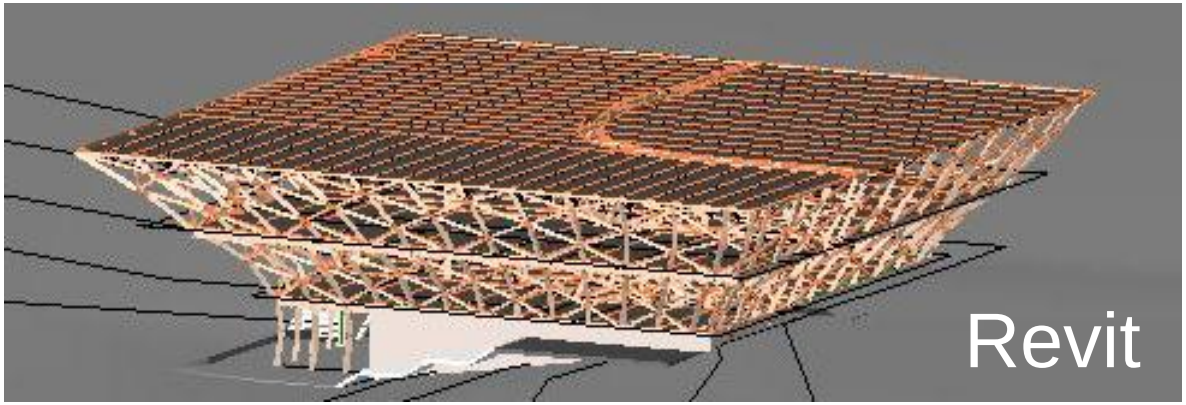


- Retaining wall - 22” wide
- Grade Beams - 22”wide & 30” deep
- Isolated Spread Footing - 9’x9’
- Base plate - 18”x18”
- Basement wall - 20” wide

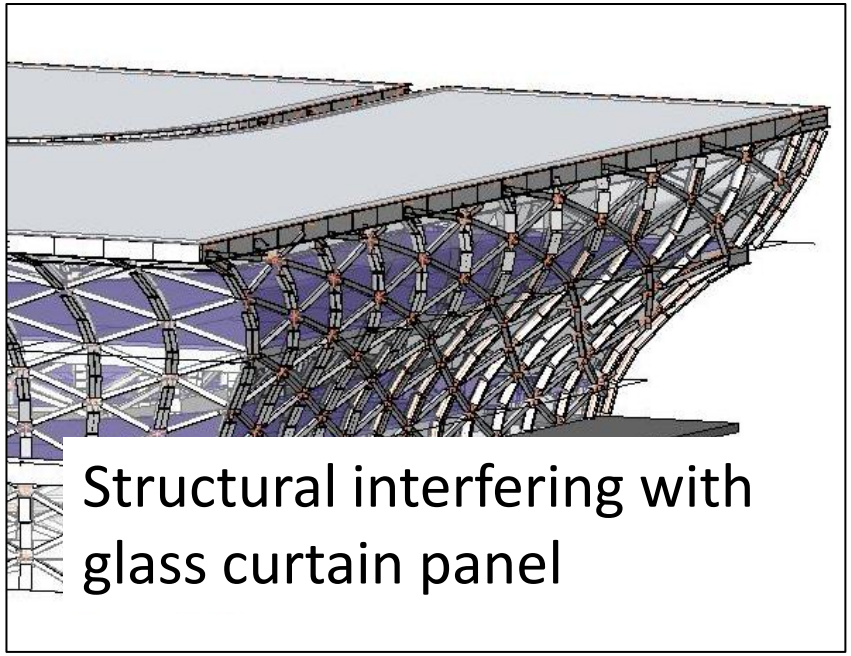
MODELING PROCESS



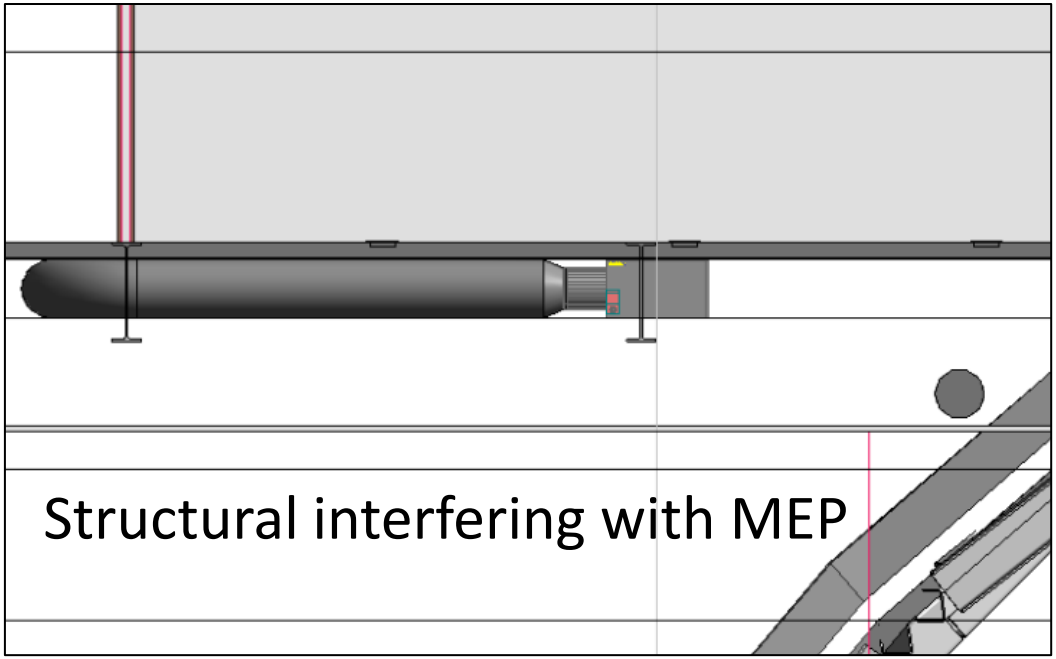




BIM COORDINATION CHALLENGES



Structural interfering with glass curtain panel



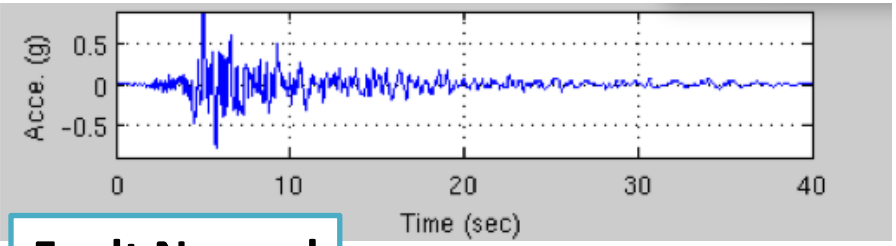
Structural interfering with MEP

Created a separate offset model so the team could view structure within panels

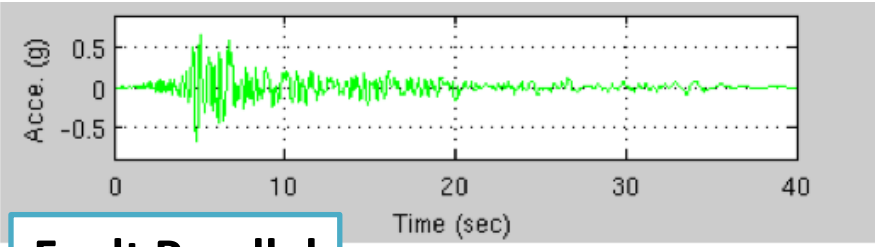
Moved structural beams and girders down 18”

ETABS NON-LINEAR ANALYSIS

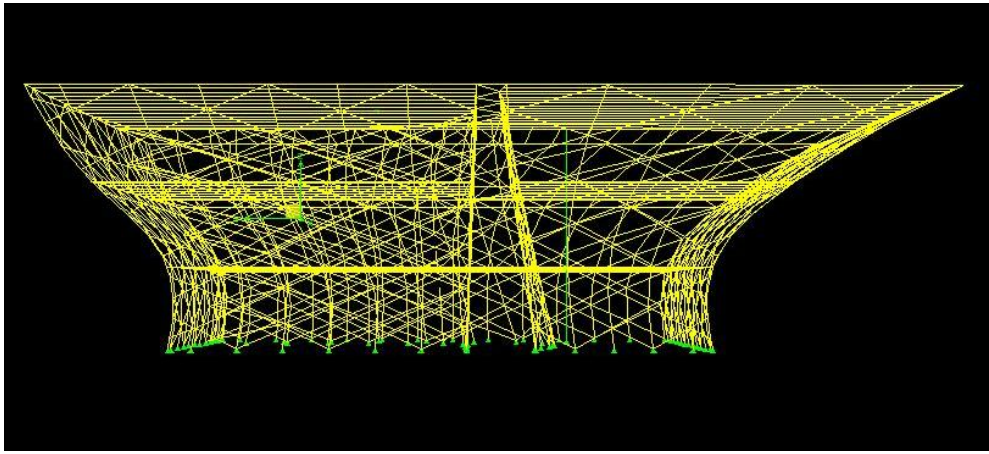
1989 Loma Prieta Earthquake

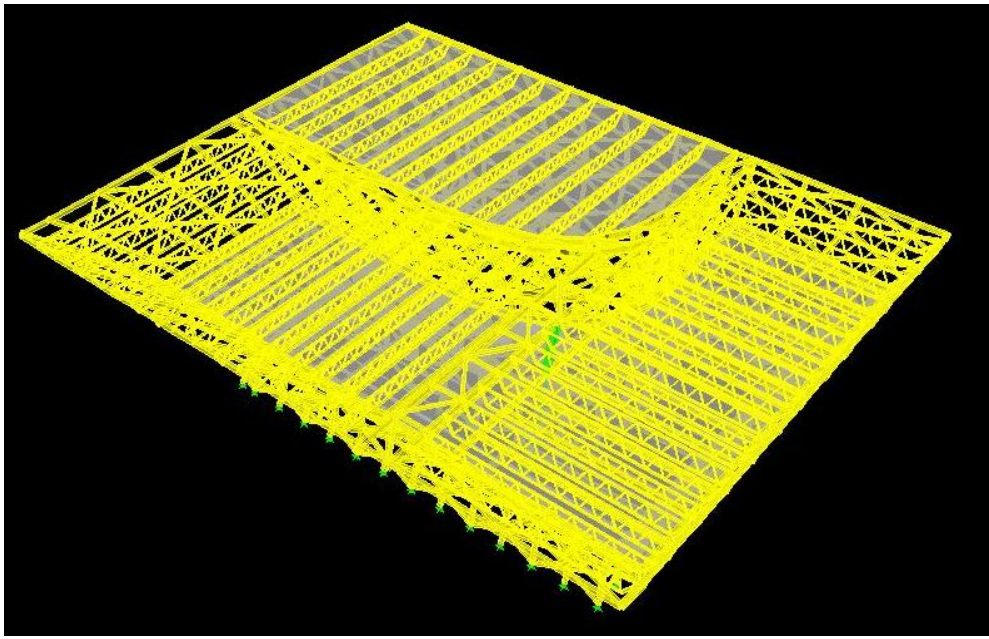


Fault Normal



Fault Parallel





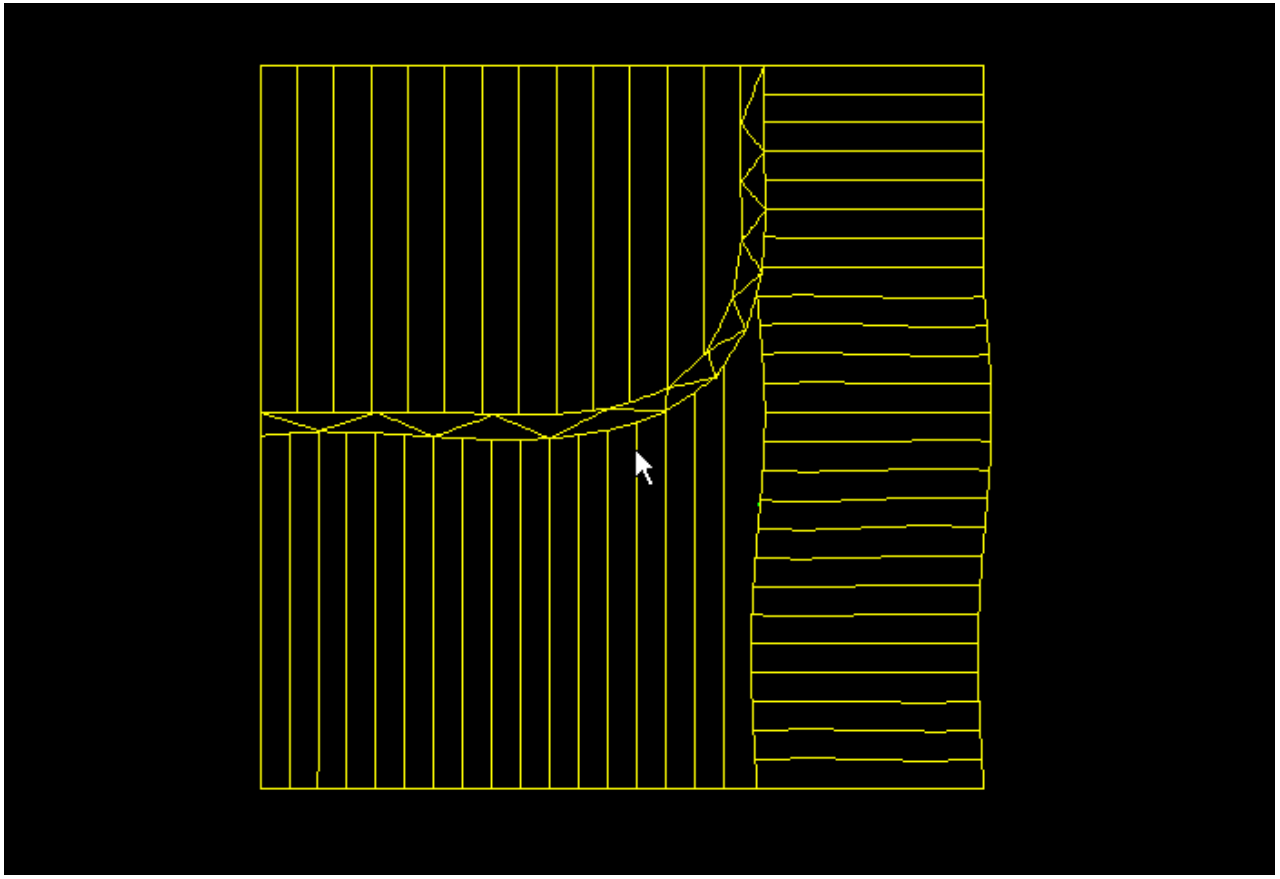
ETABS Analysis Input

-12 Load Cases

-100% and 30% Acceleration Contributions

-ξ=5%

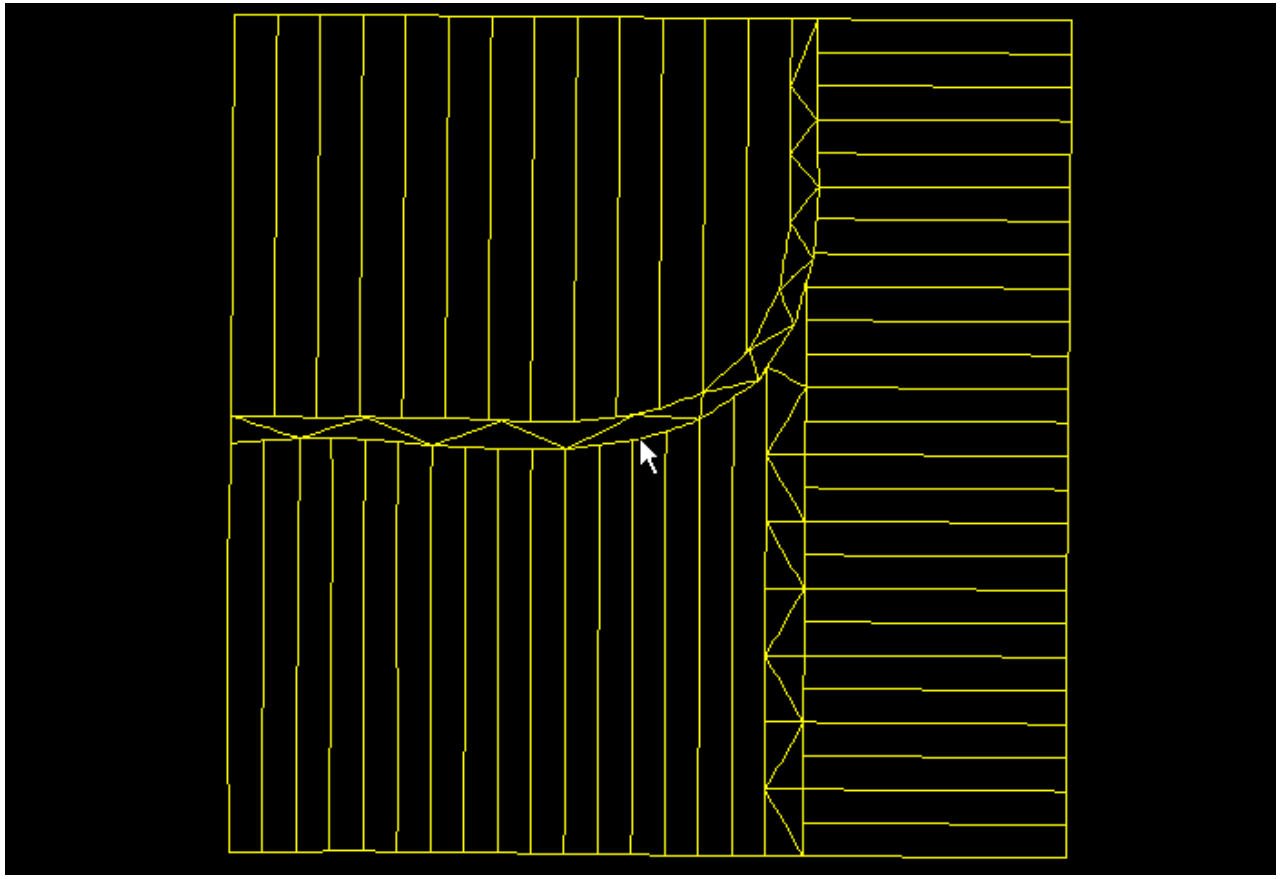
DESIGN DEVELOPMENT



Final Roof Plan

Initial ETABS Analysis – large roof deflections

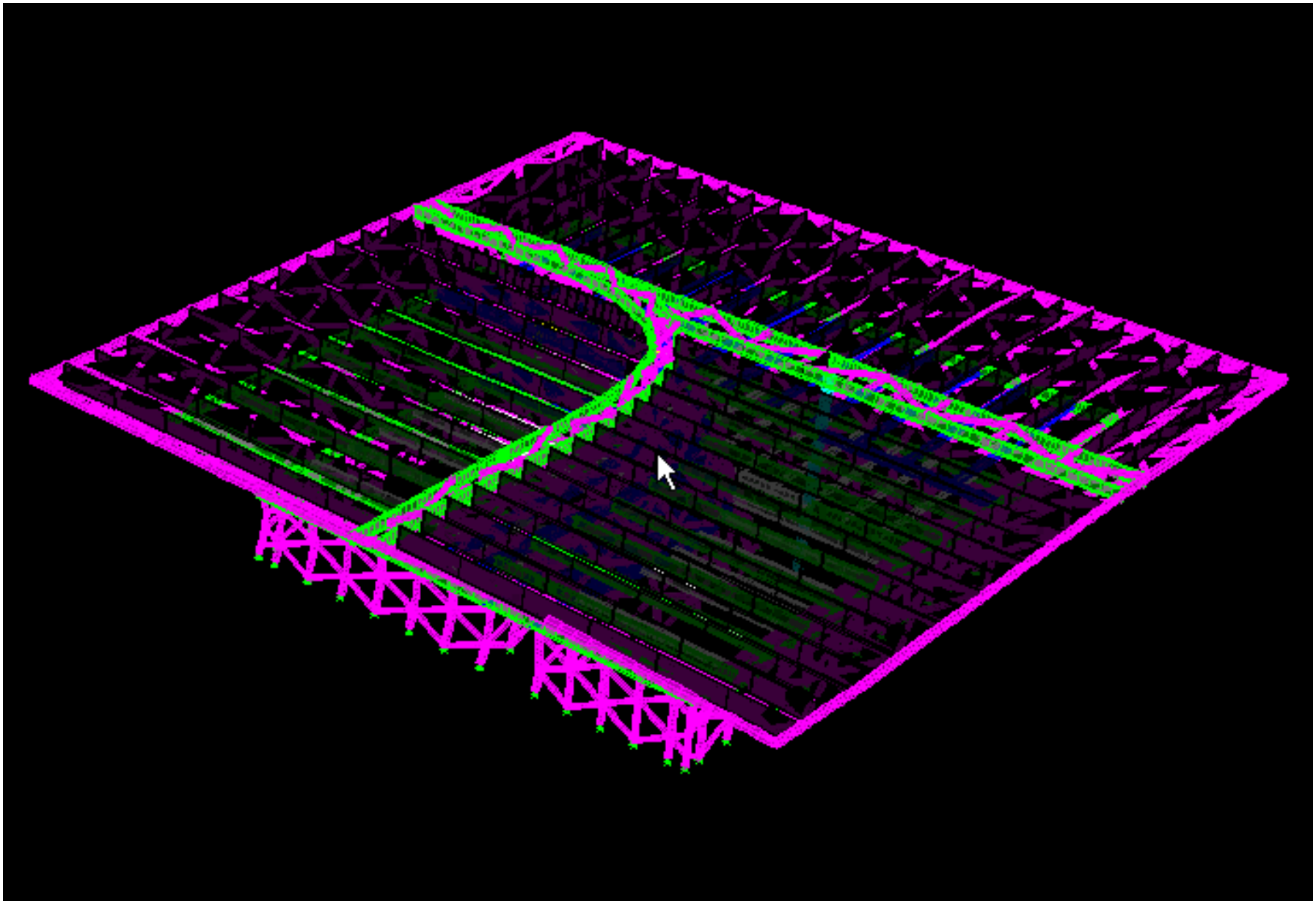
DESIGN DEVELOPMENT



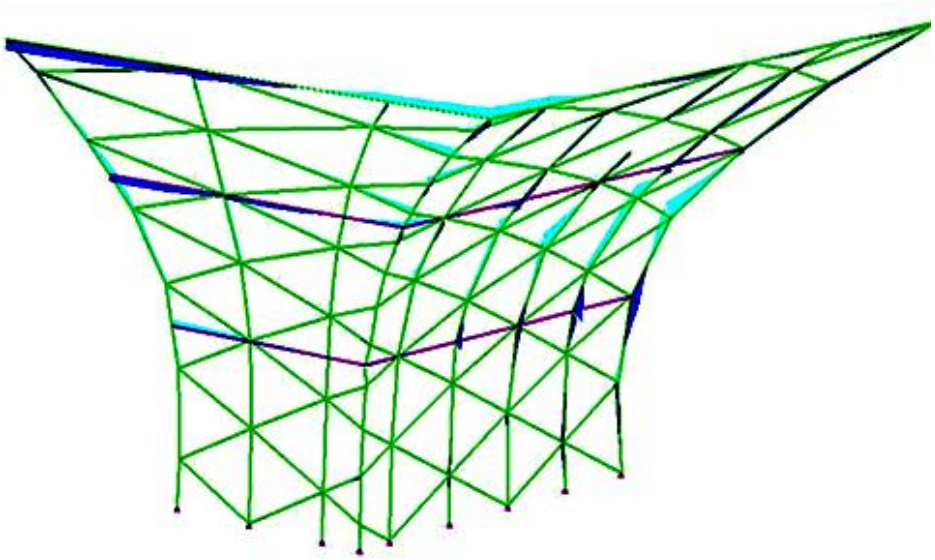
Final Roof Plan

Design Change with ETABS - Additional Truss Bracing

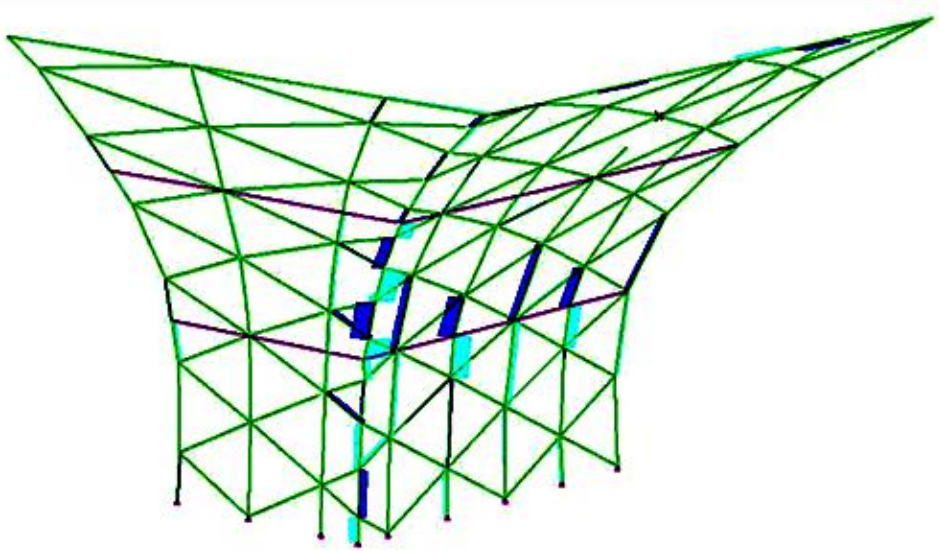
TIME HISTORY – MODE 1



MOMENT & SHEAR DIAGRAMS

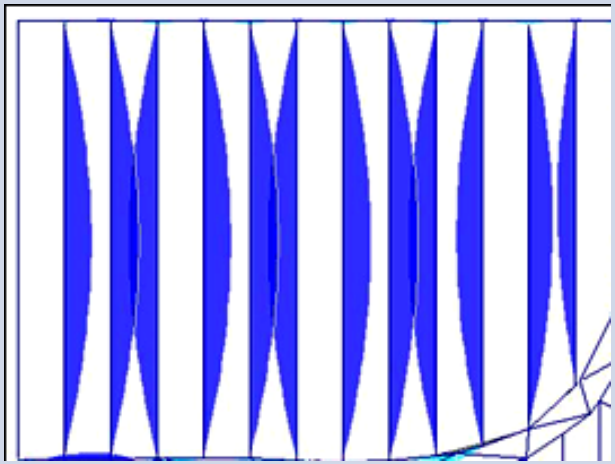
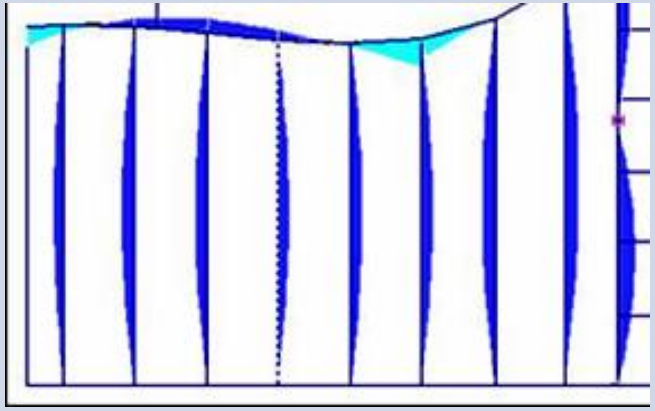


Moment Diagram



Shear Diagram

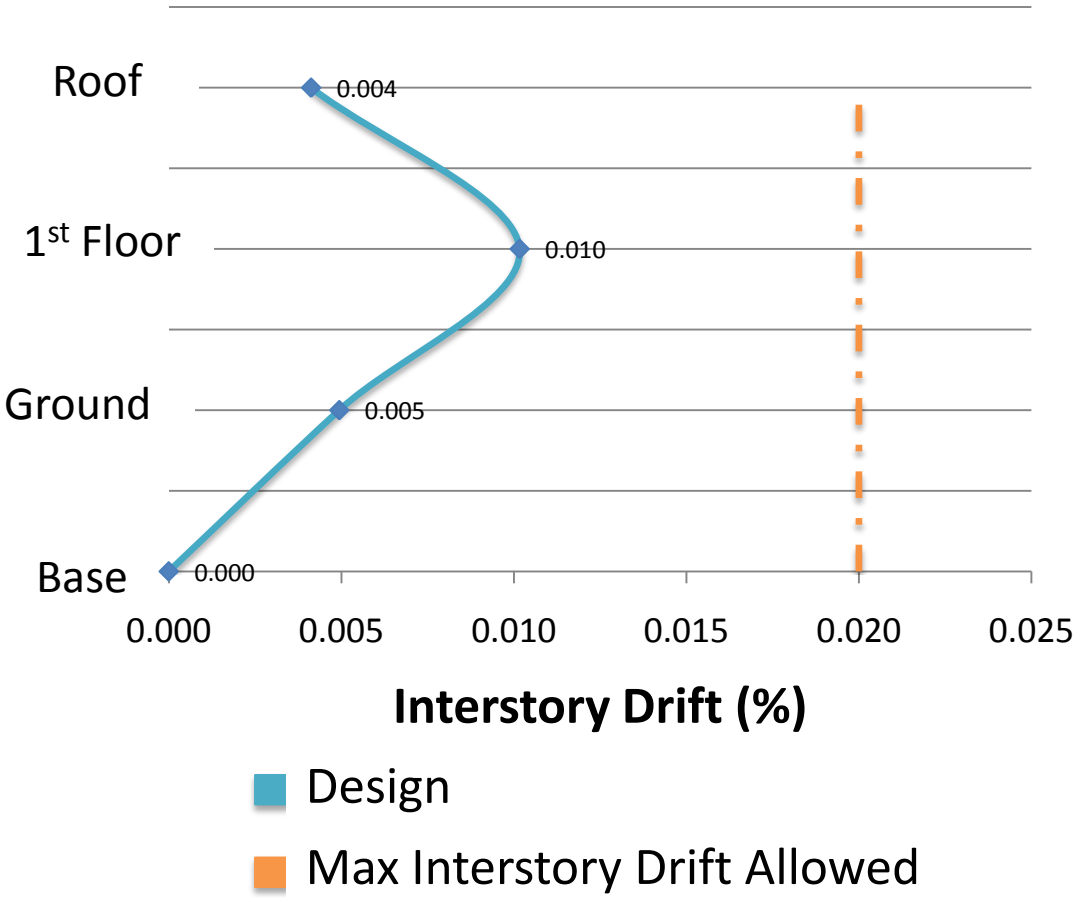
ETABS ANALYSIS RESULTS

	ROOF	FRIST FLOOR
Moment Diagram	Auditorium 48LH17 	South-west side W27x84 
Max. Moment (k.ft)	581.1	856.3
Demand/Capacity Ratio	0.92	0.94
Max. Shear (k)	194.4	384.3
Max. Deflection (in)	9.8	4.4

TIME HISTORY ANALYSIS RESULTS

Loma Prieta Scaled Earthquake Record

M_w=6.9 Δt=.005 sec

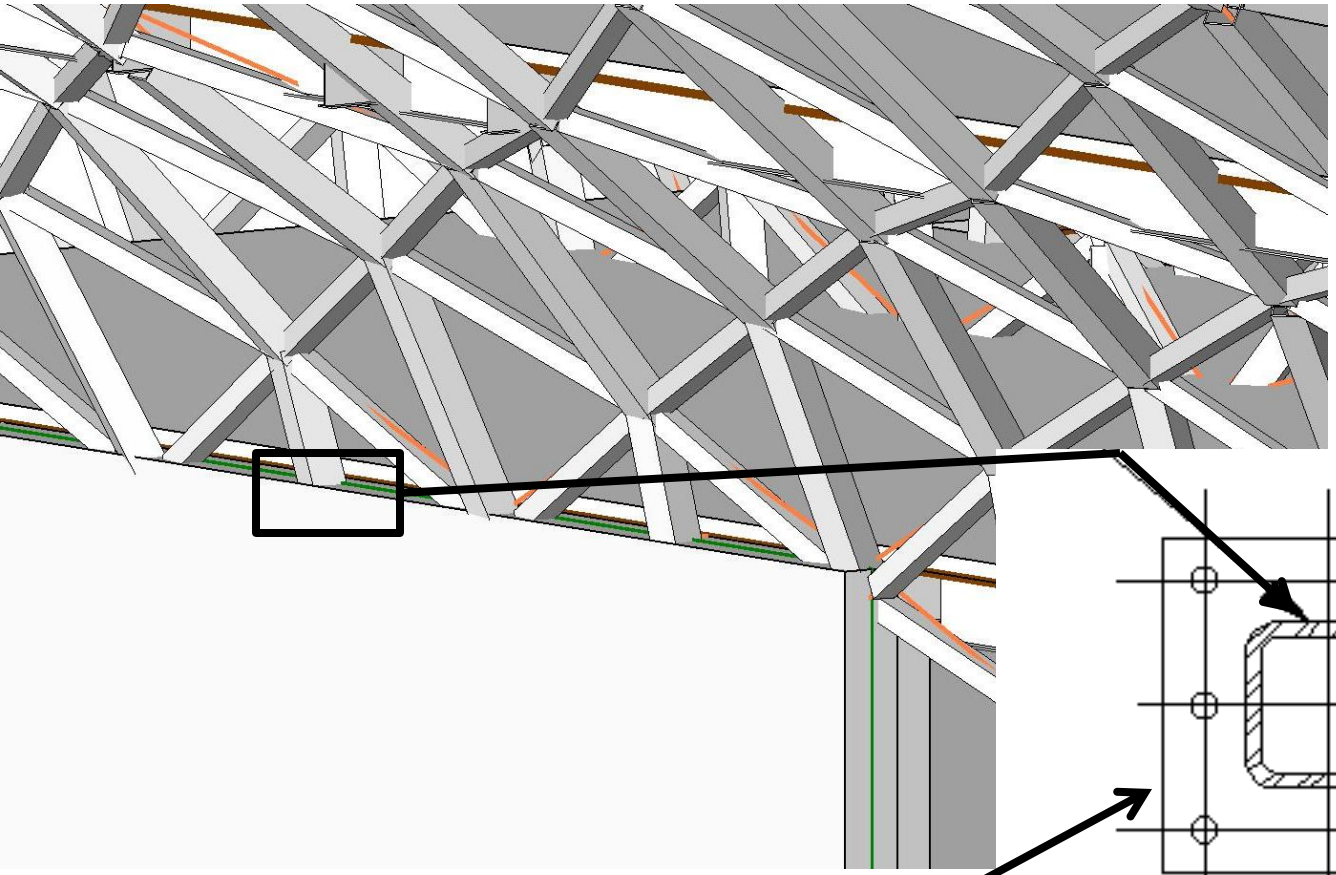


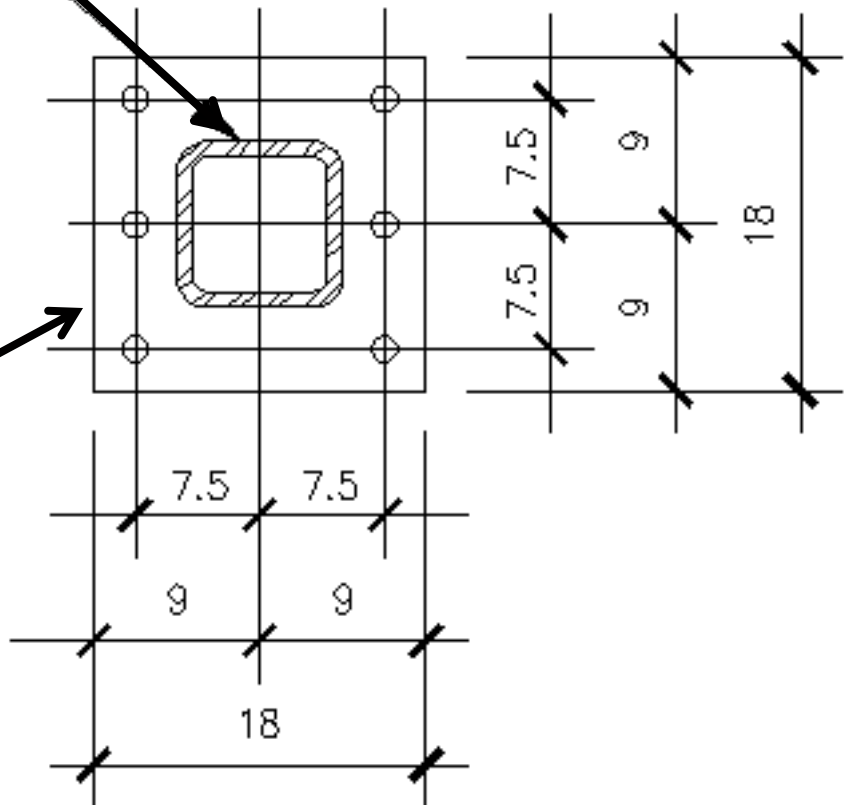
Mode	Period (sec)
1	**0.2458**
2	0.2083
3	0.1743
4	0.1560
5	0.1396

Max Floor Δ

ETABS – Non Linear Analysis	**.495”**
Max Allowable	3.6”
Max Reduced	.72”

COLUMN BASE CONNECTION



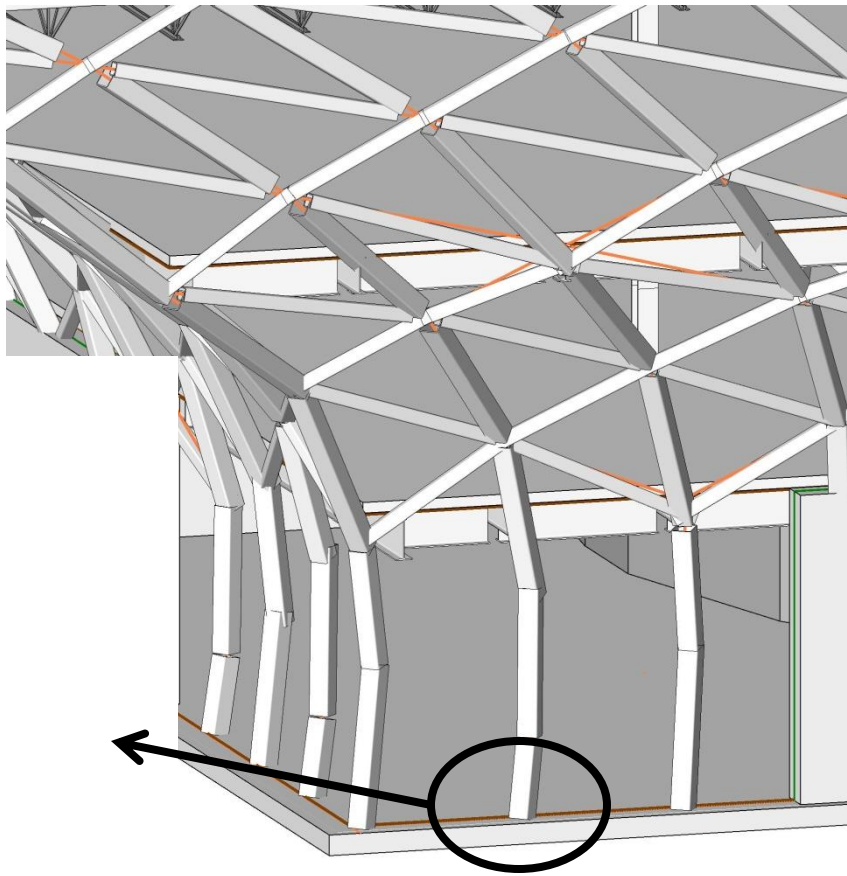


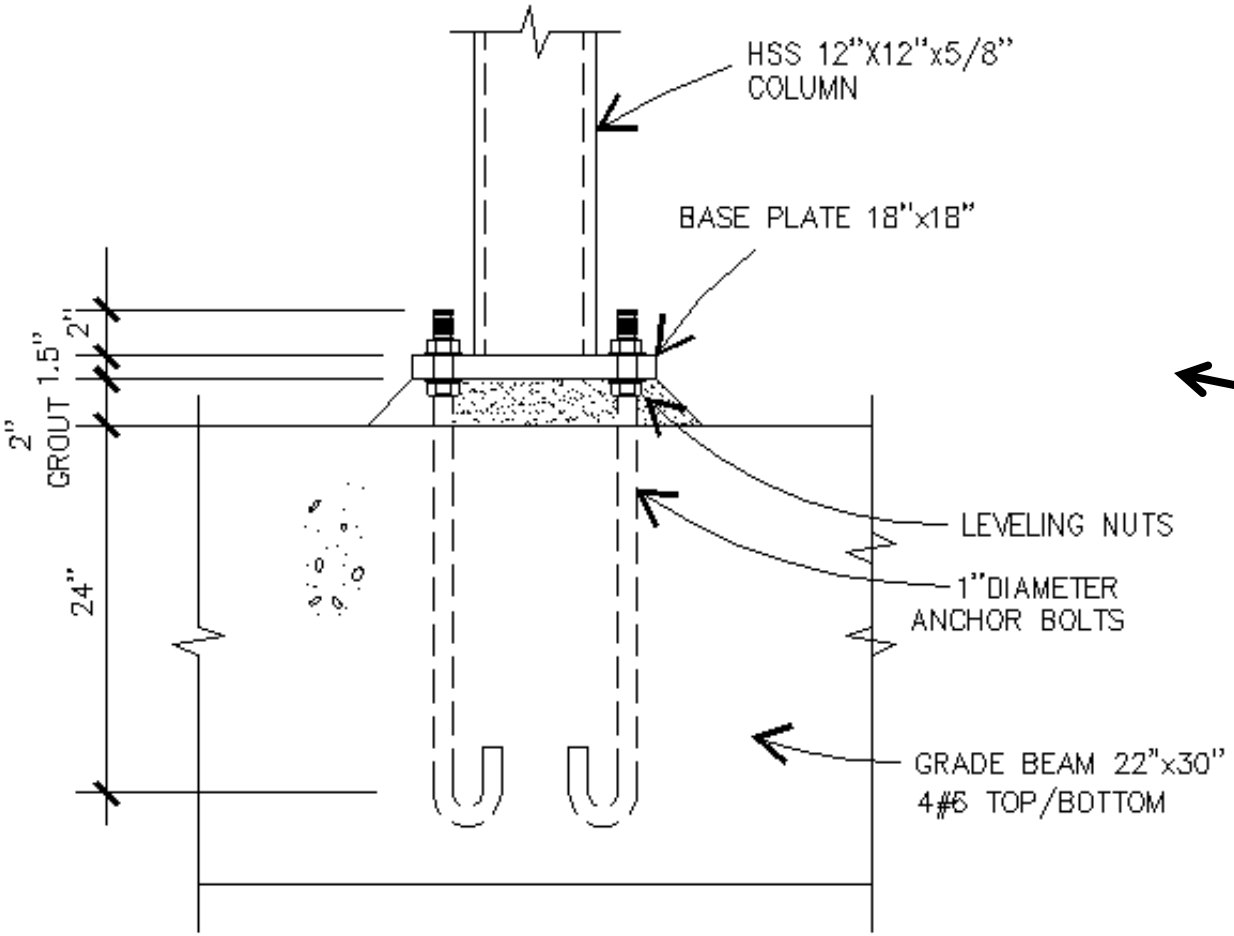
BASEPLATE DESIGN:

- Welds 1/16” smaller than tube thickness
- 6 bolts per baseplate

COLUMN BASE CONNECTION

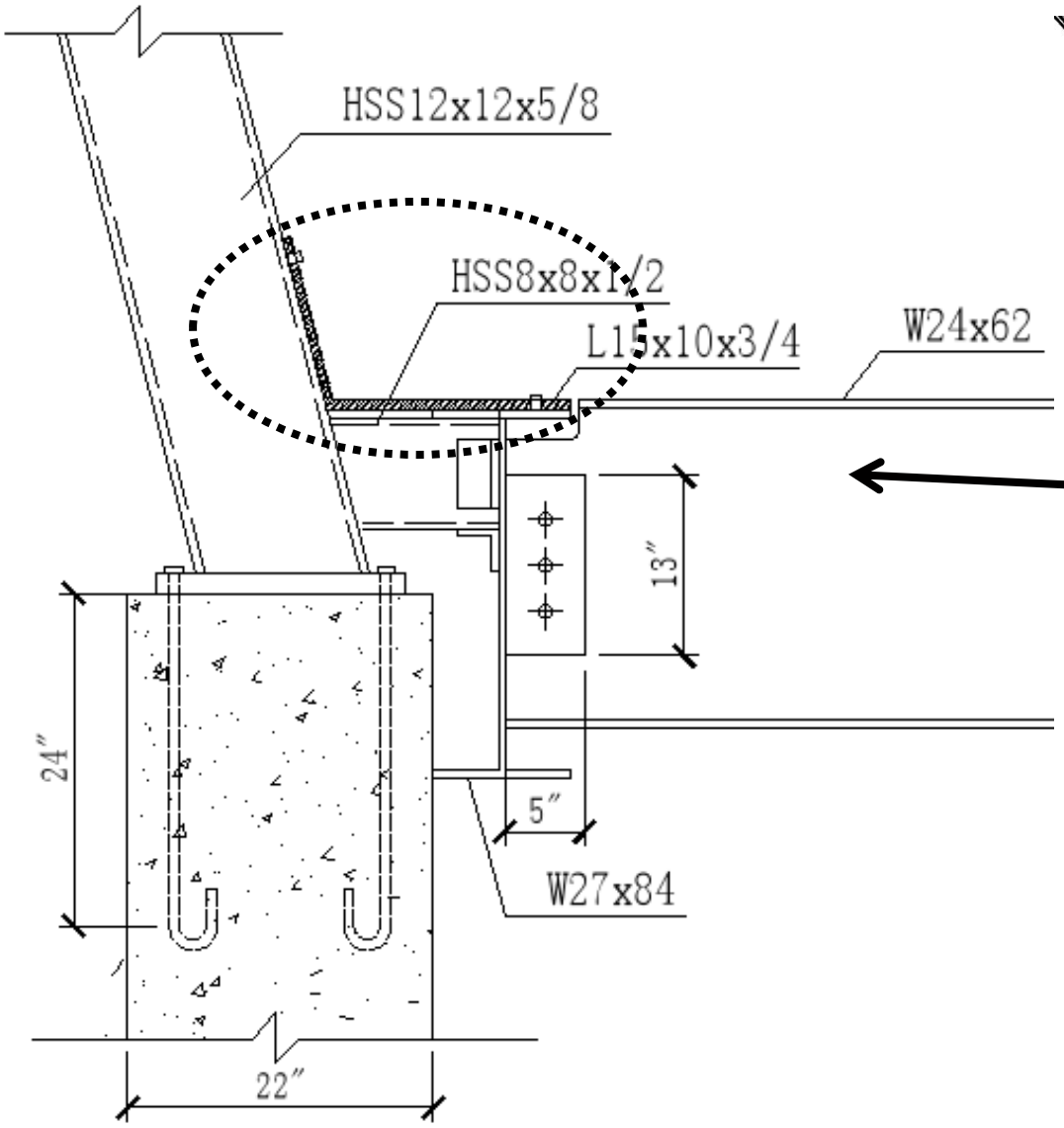
Columns @ Café Corner extended to Basement Slab

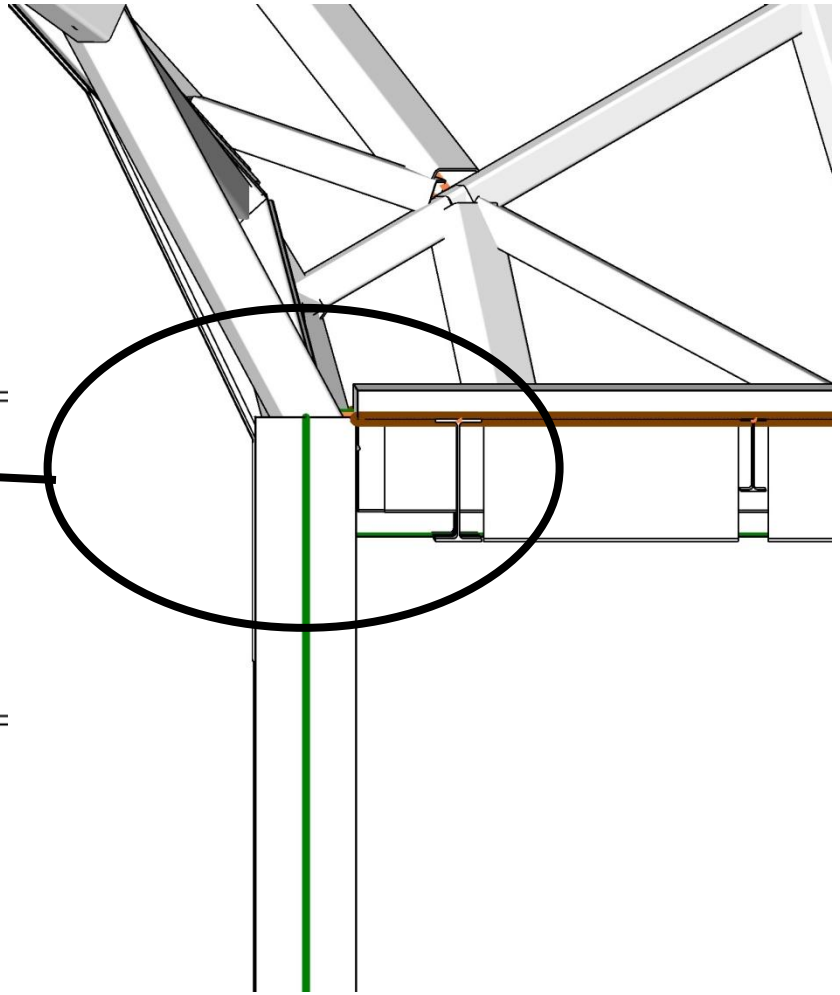




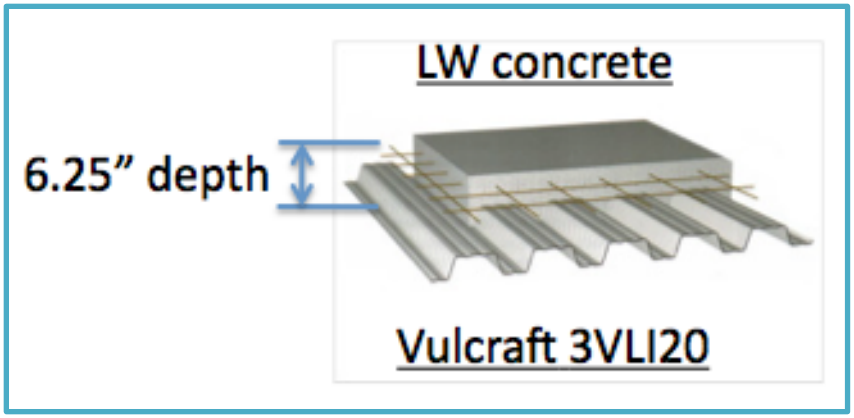
BASEPLATE
Restoring Moment Provided by Exterior Trusses

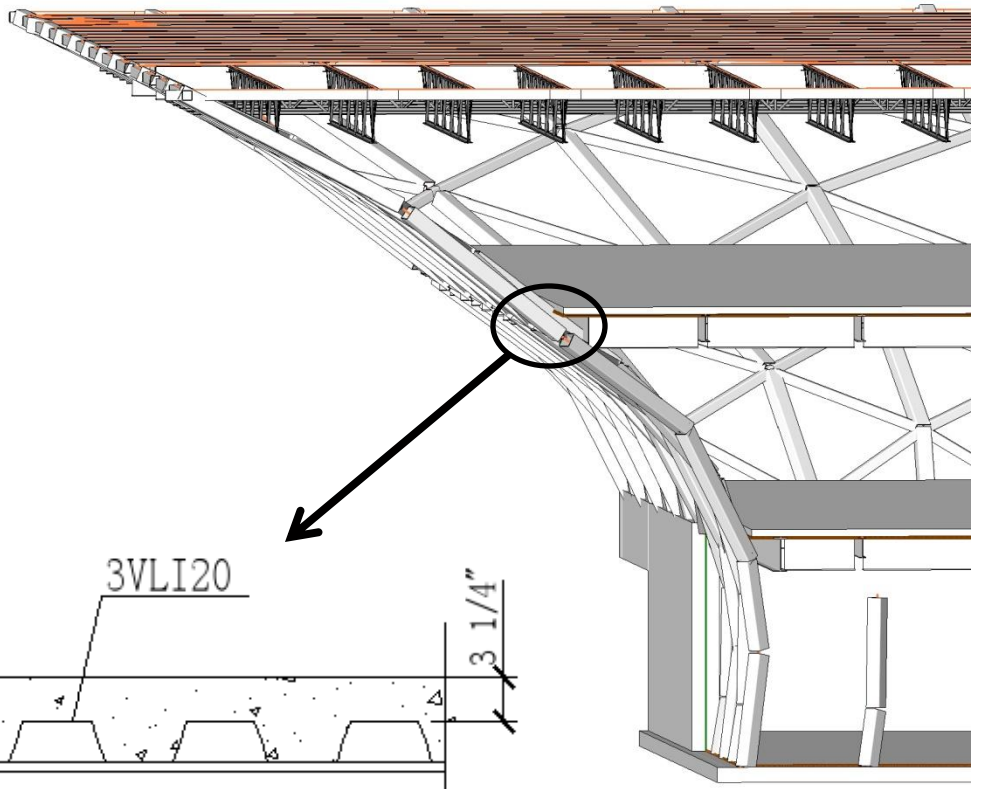
GROUND FLOOR CONNECTION

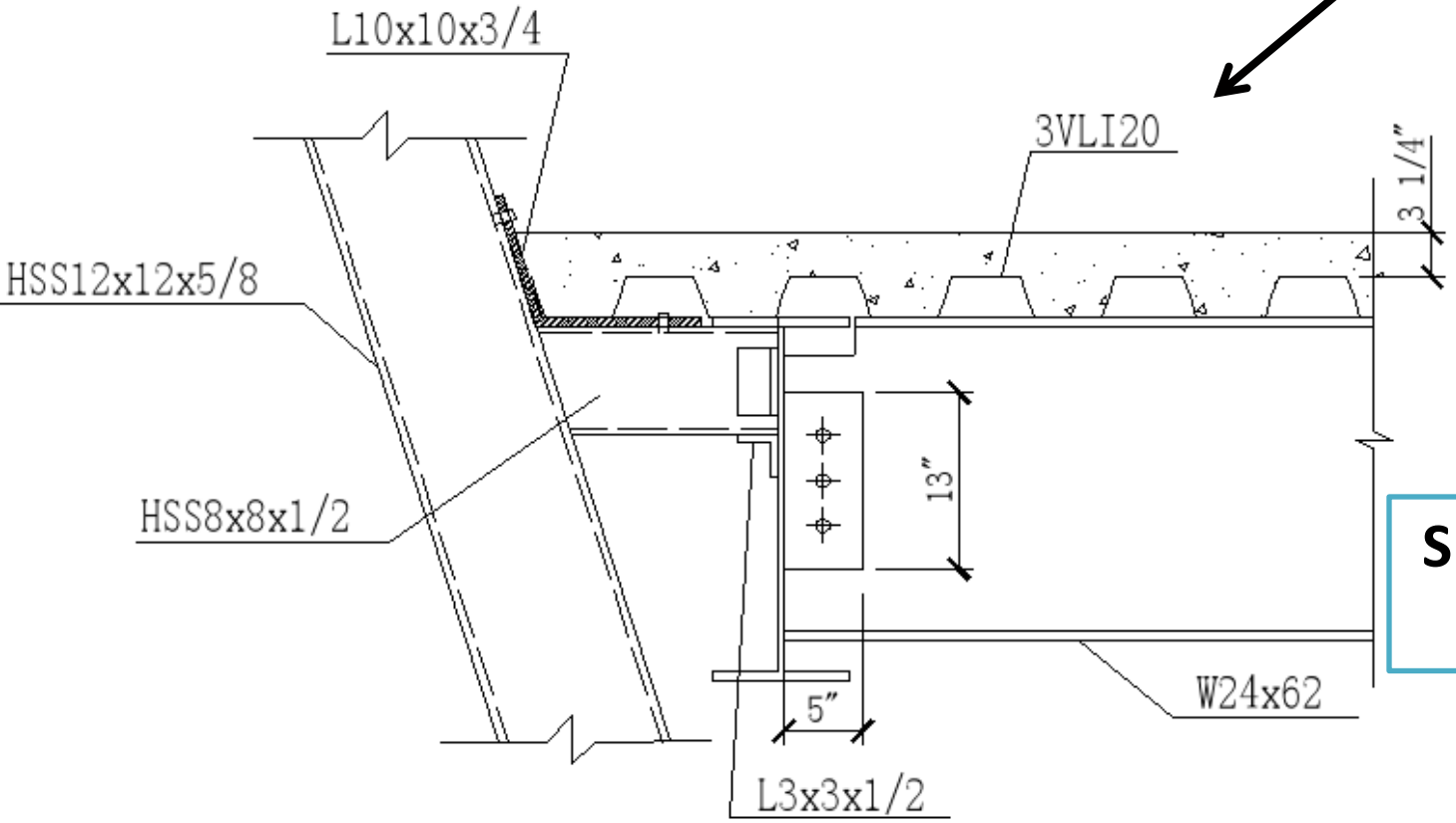




FIRST FLOOR CONNECTION



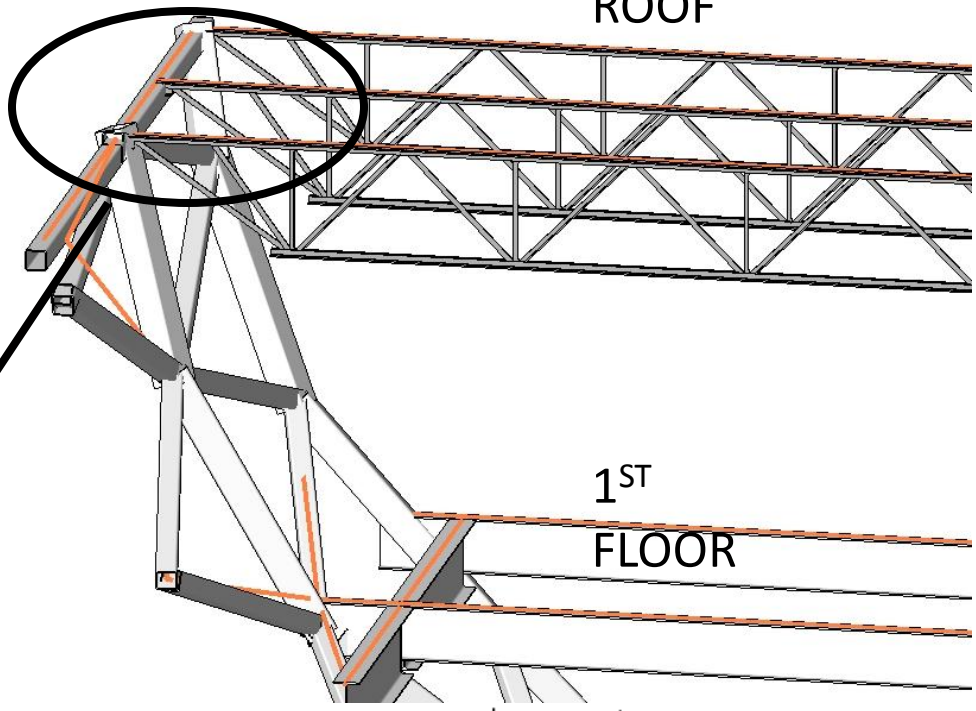


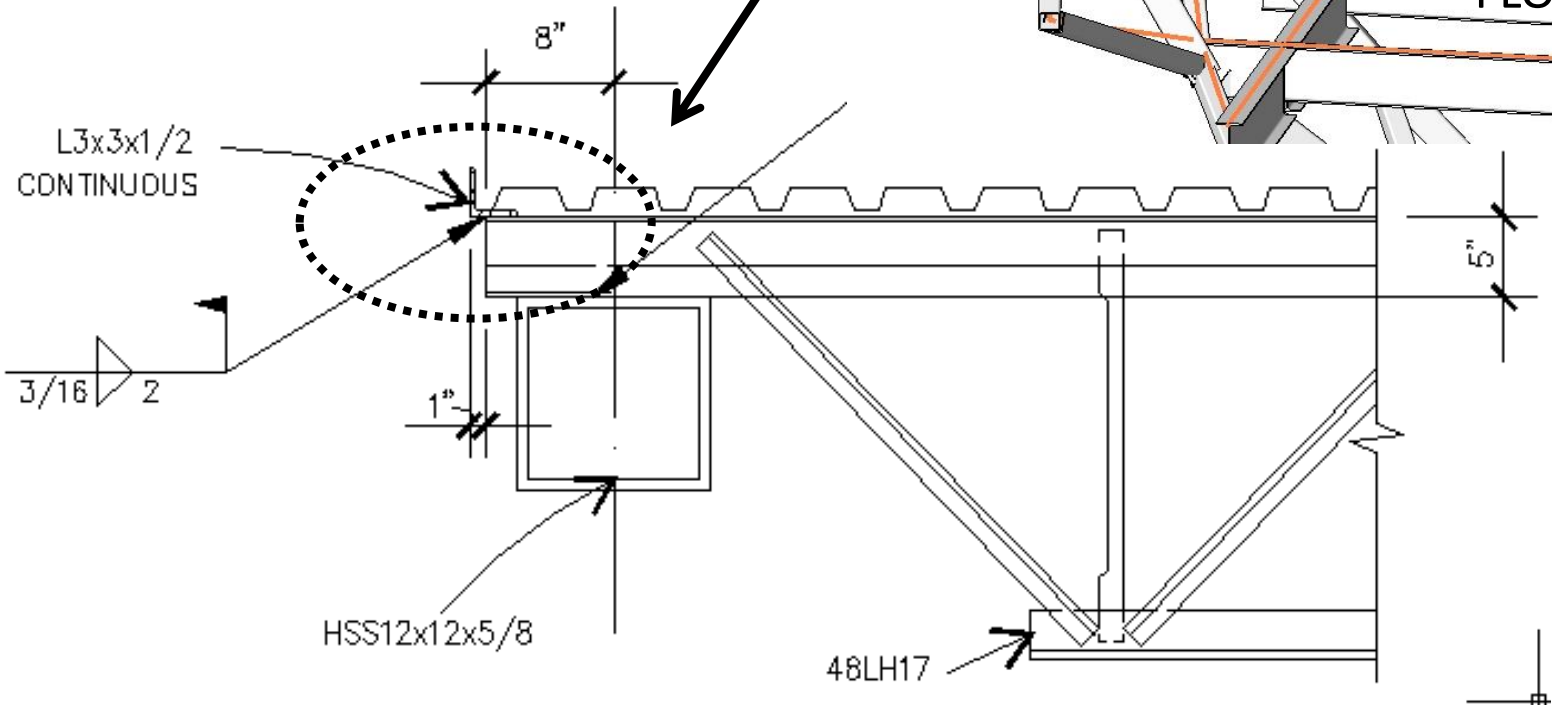


Slab Extended to HSS Columns

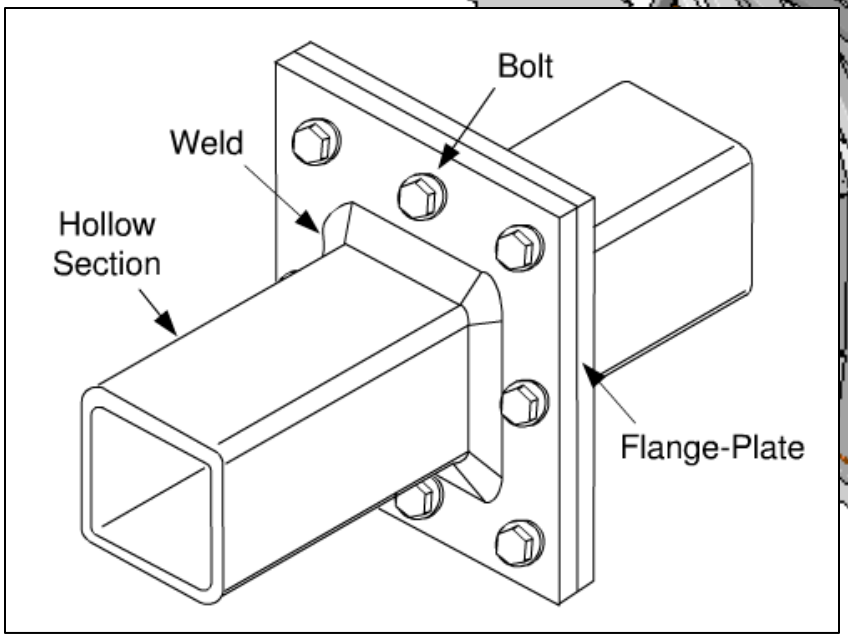
ROOF CONNECTION

Vulcraft 1.5BA22
(Acoustical decking for educational facilities)

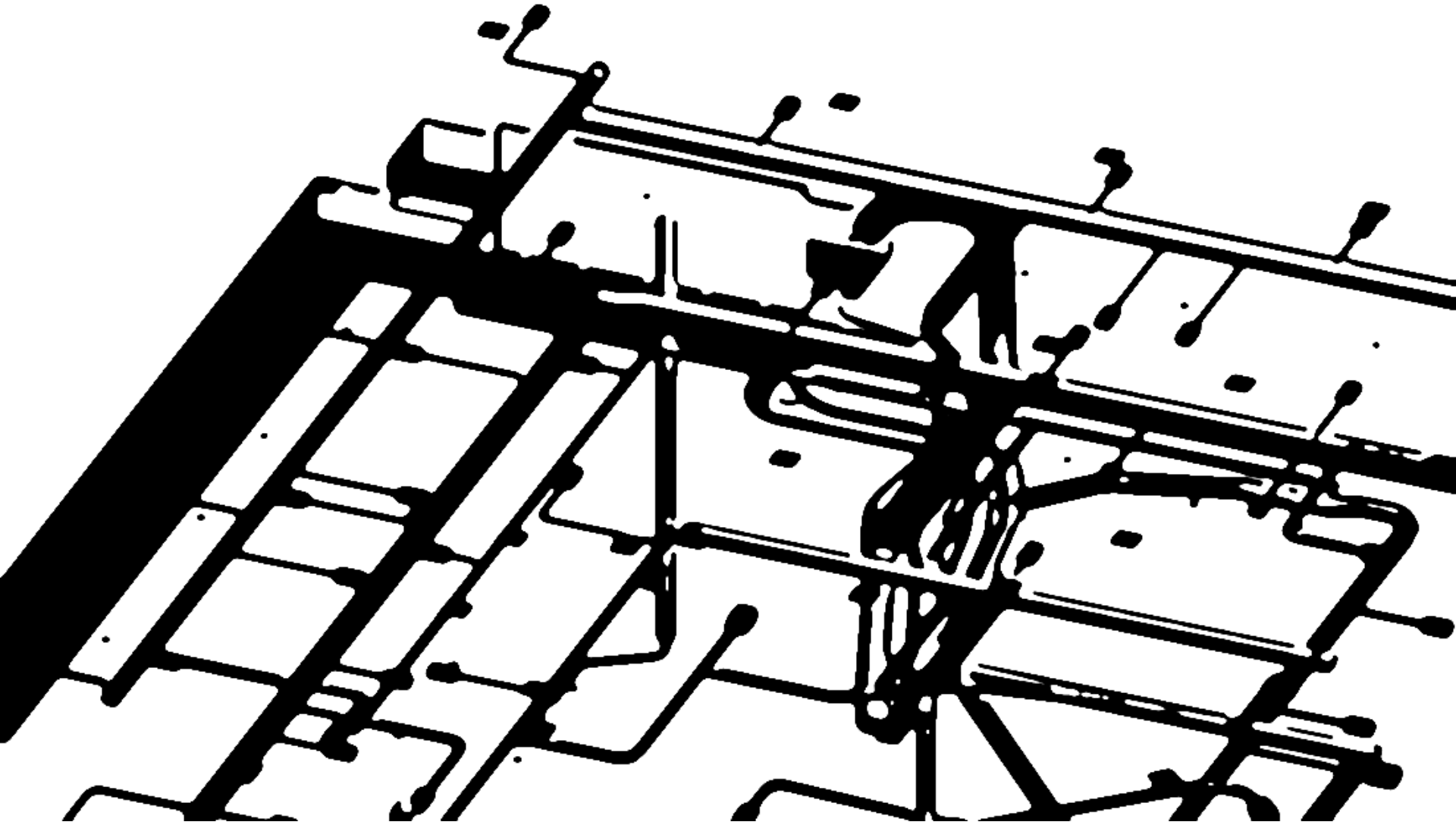




ON-SITE CONNECTION

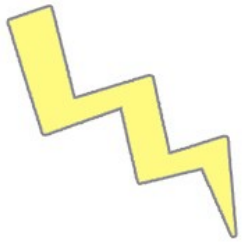


HSS Splice

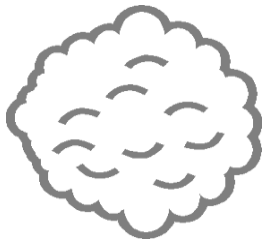


{MECHANICAL DESIGN}

ENERGY SOURCES

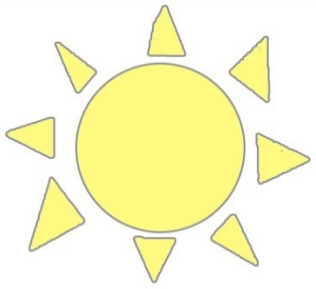


Electricity from on campus cogeneration plant



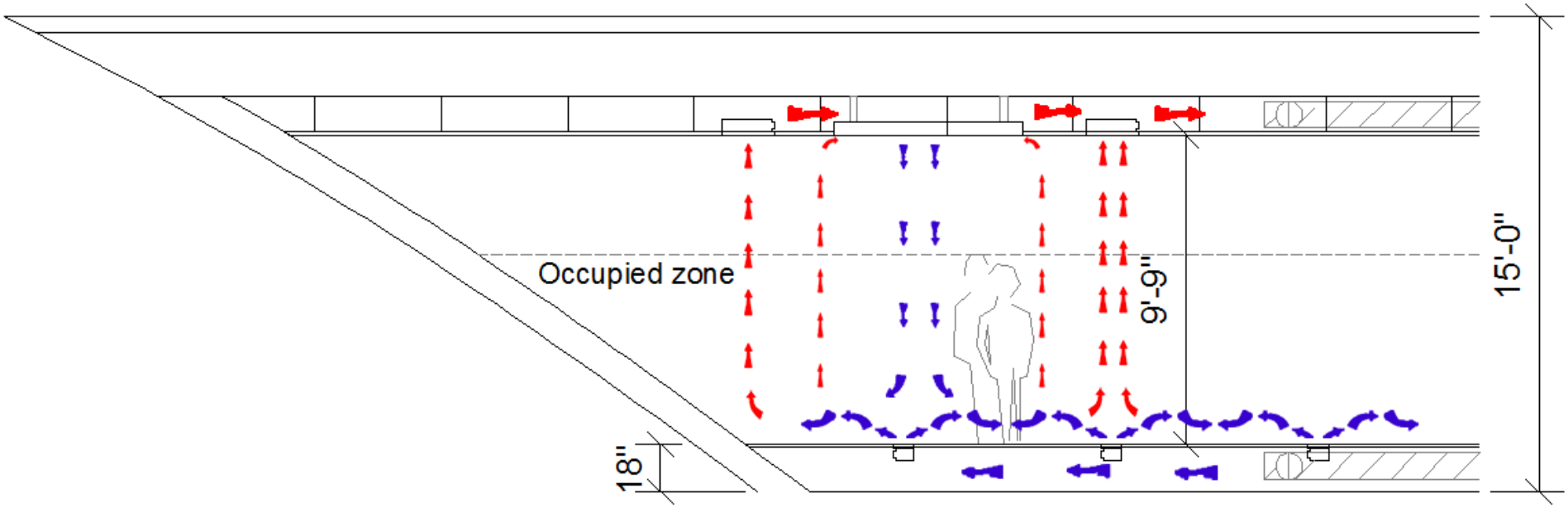
Steam from on campus cogeneration plant

Chilled water from on campus chillers



Annual solar resource 211 kWh/ft^2/yr

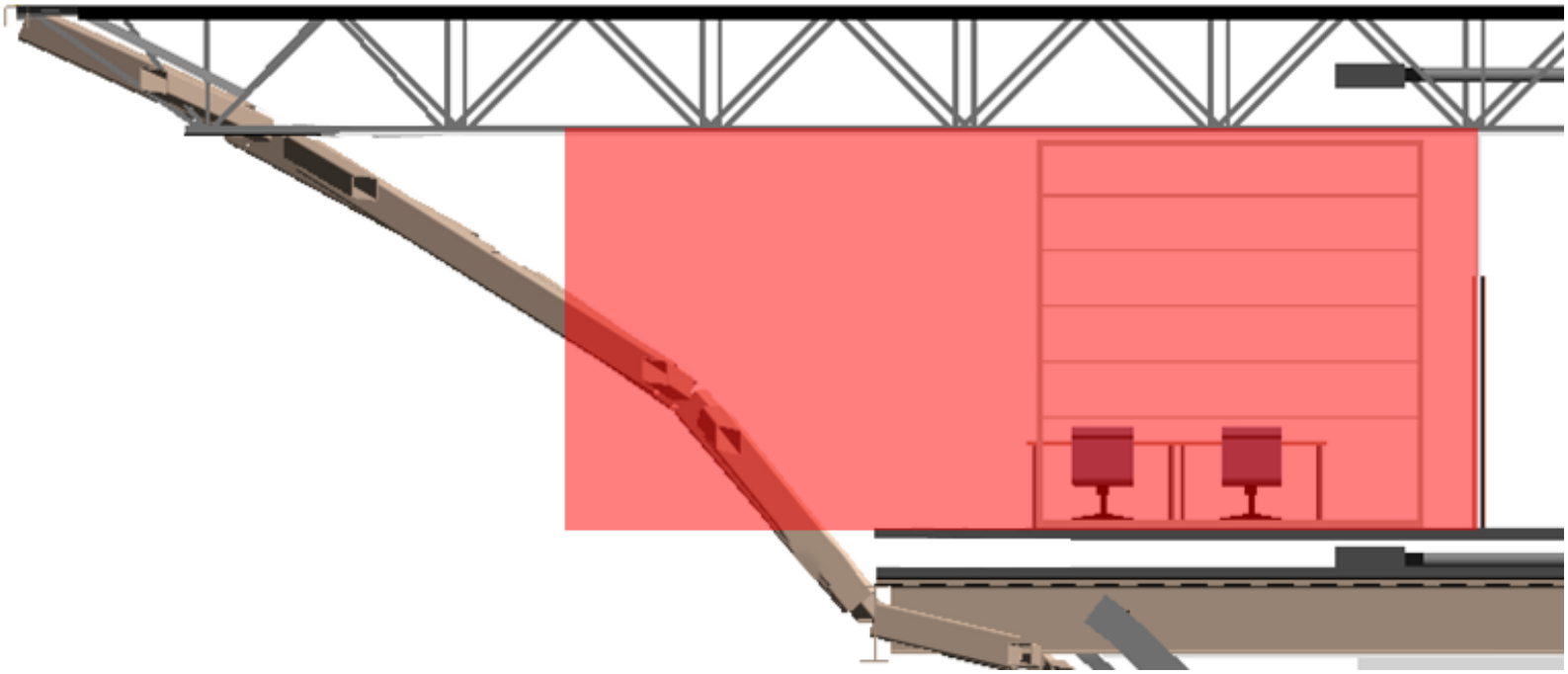
STRATEGY



SOFTWARE LIMITATIONS

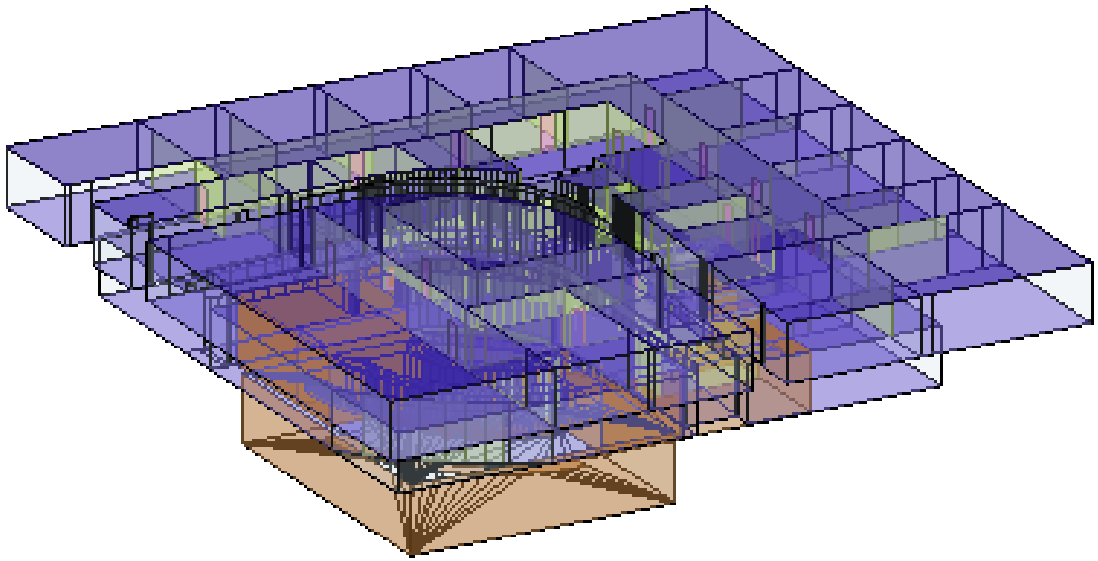
Sloped walls not room bounding

SOFTWARE LIMITATIONS



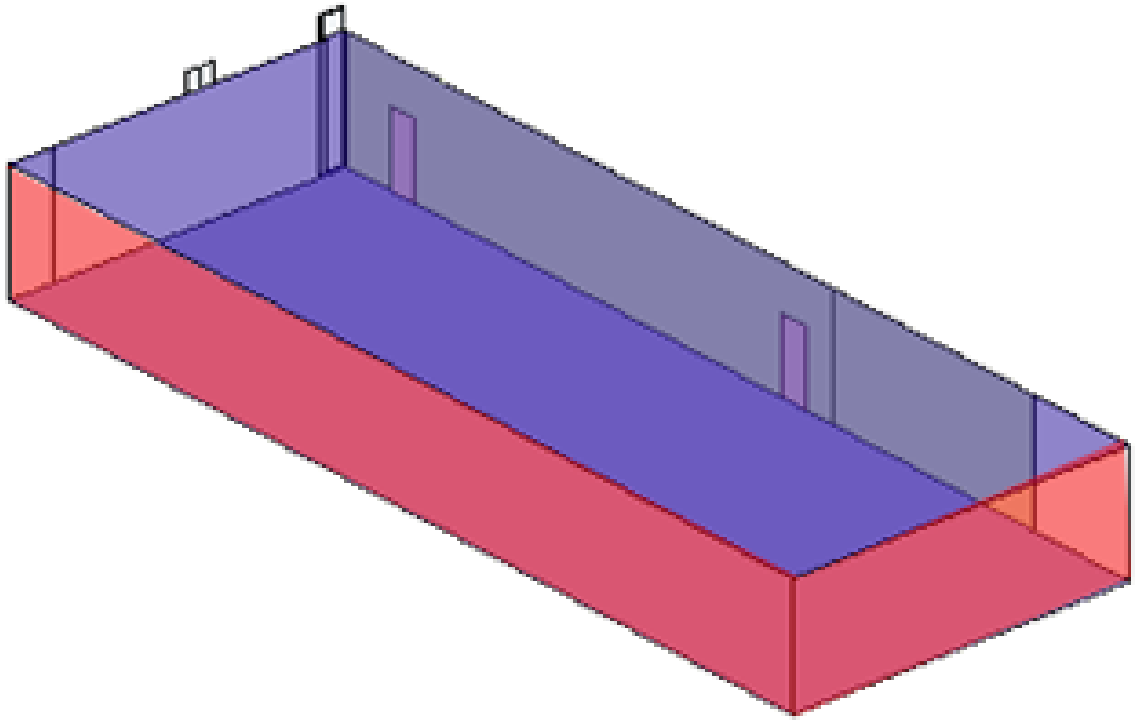
Simplification for approximate volumes

SOFTWARE LIMITATIONS



Simplified analytical model

SOFTWARE LIMITATIONS



Air gaps

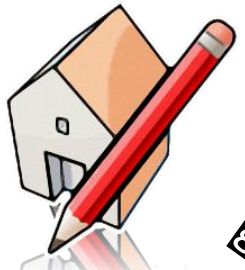
PROBLEM SOLVING

Revit
BIM

dxf

Rhino
Geometry

3DS

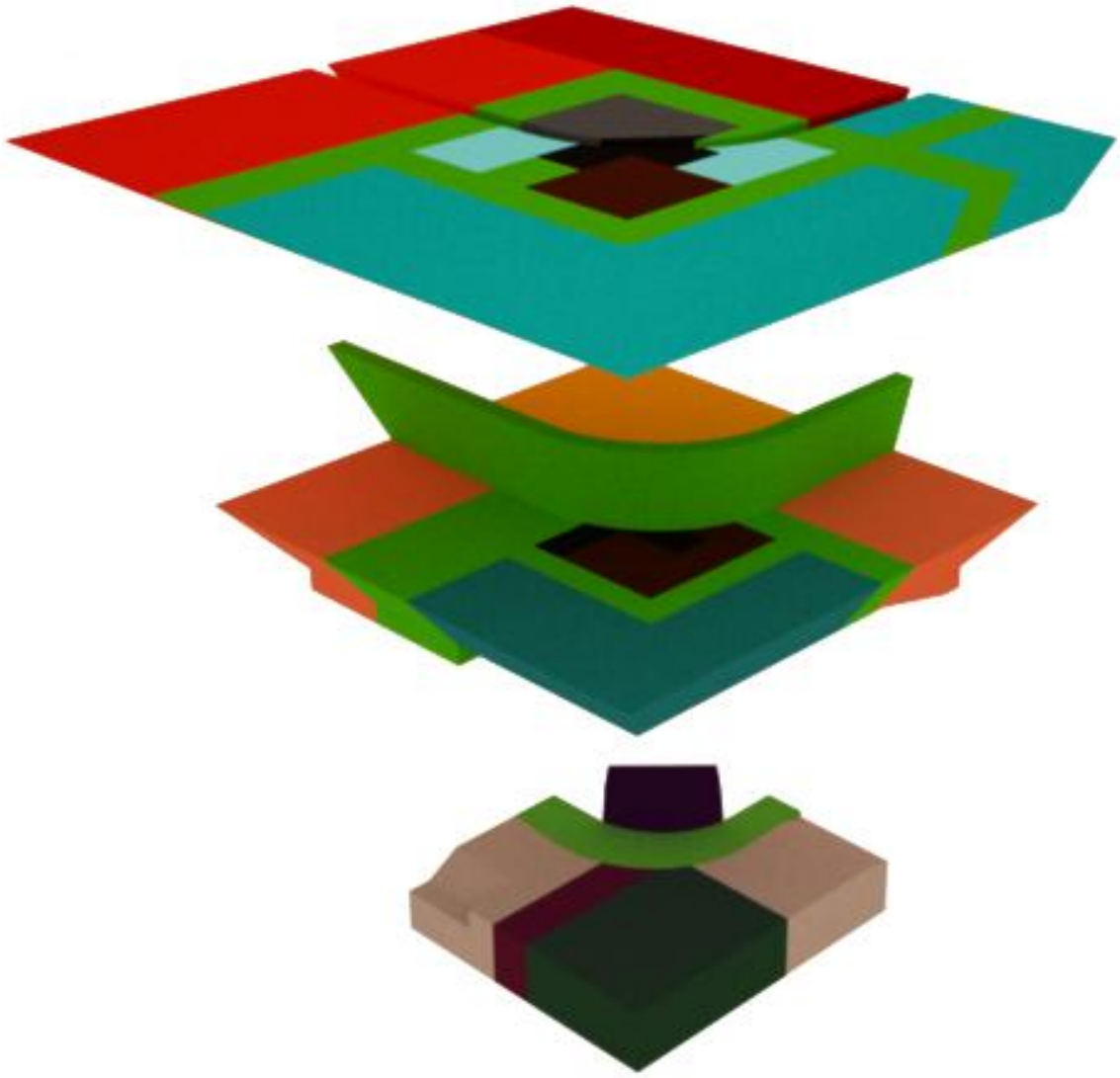


SketchUp
New geometry

gbXML

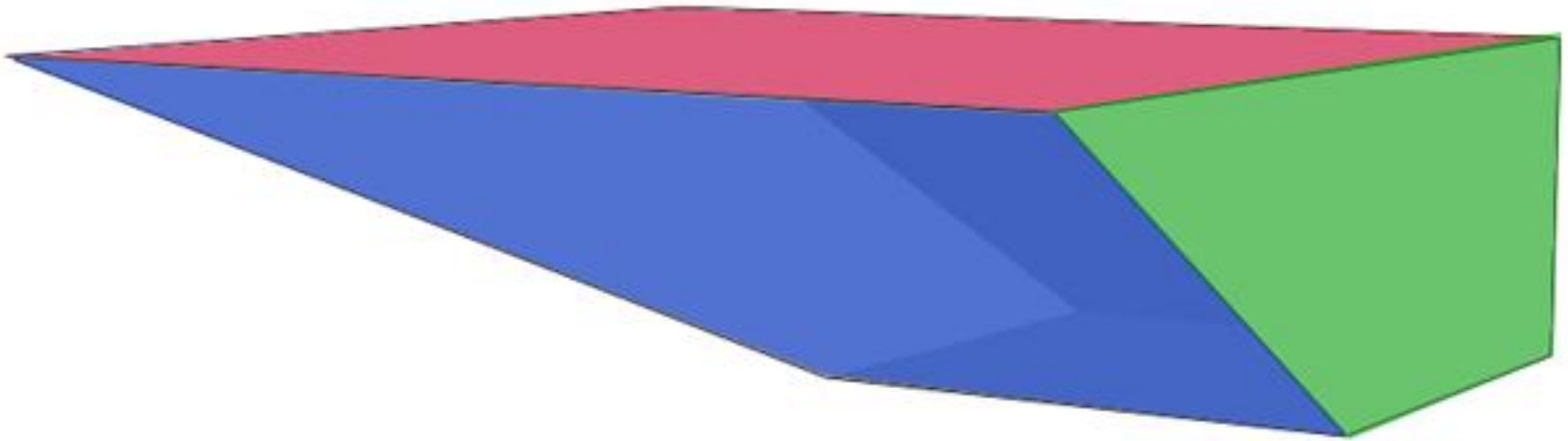
IES<VE>
Analytical model

ANALYTICAL MODEL



- Office
- Student office
- Corridor / Transition
- Small Classroom
- Computer Lab
- Large Classroom
- Server
- Auditorium
- Cafeteria
- Storage
- Restroom
- Plenum

MATERIALS

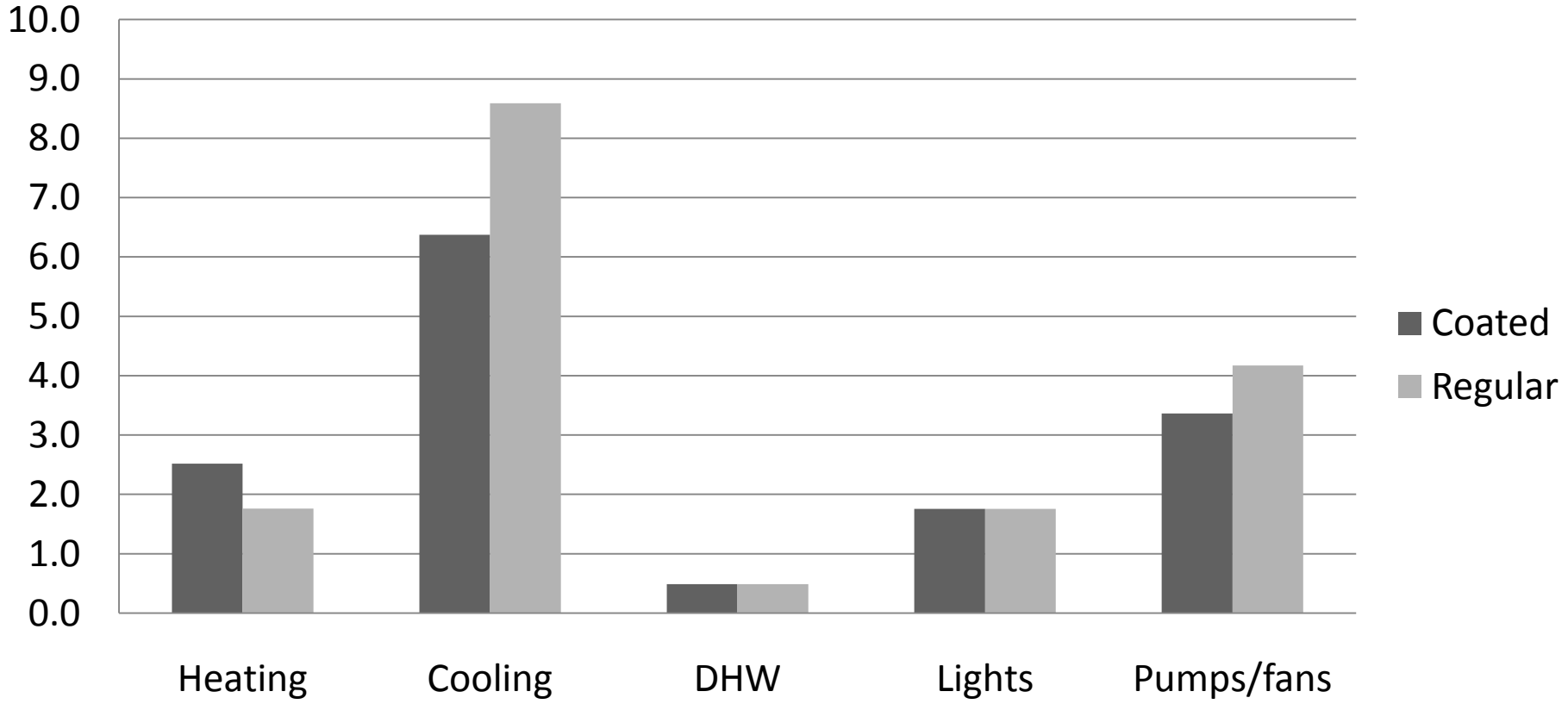


Glazing

Roof

Partition wall

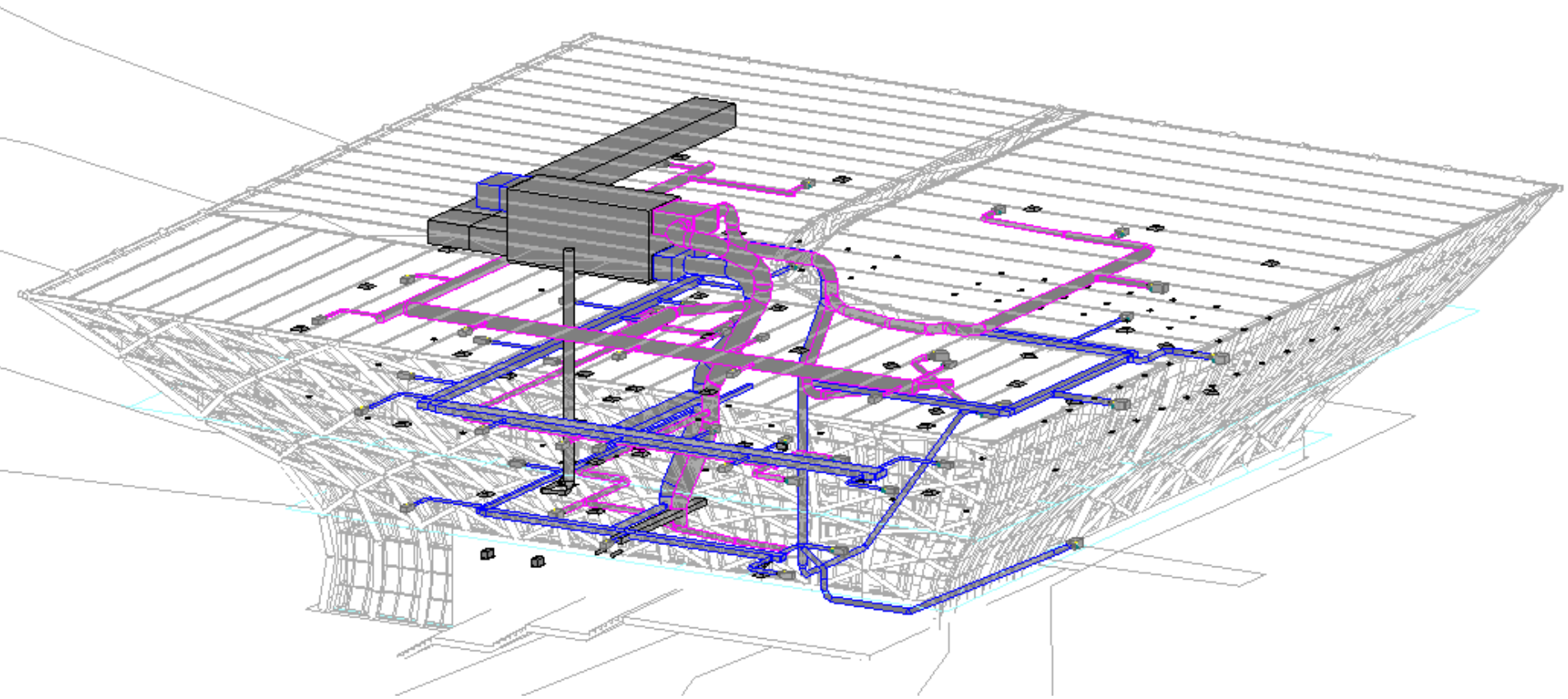
ANNUAL ENERGY CONSUMPTION



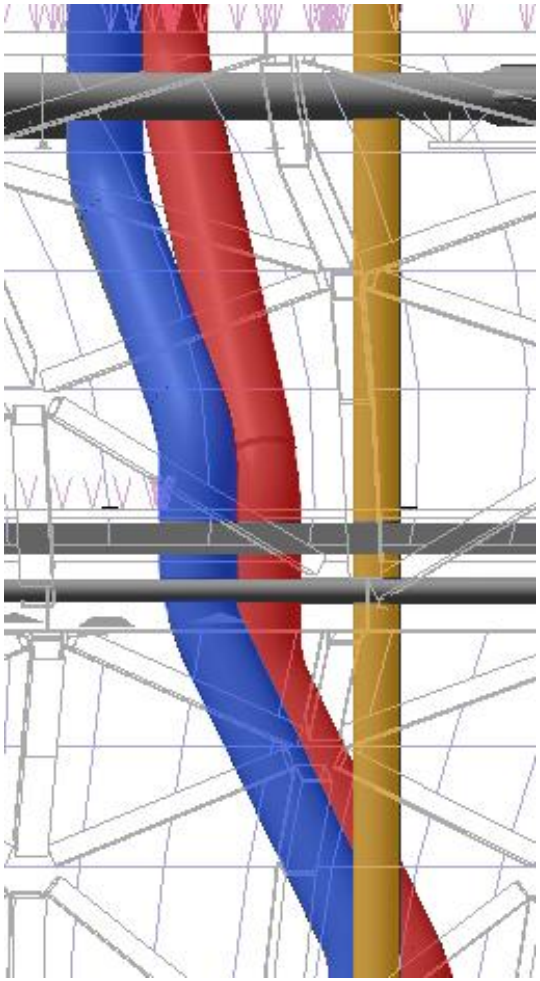
Suncool	14.5 kWh/SF
Standard	16.8 kWh/SF

MODELING

MEP



MODELING

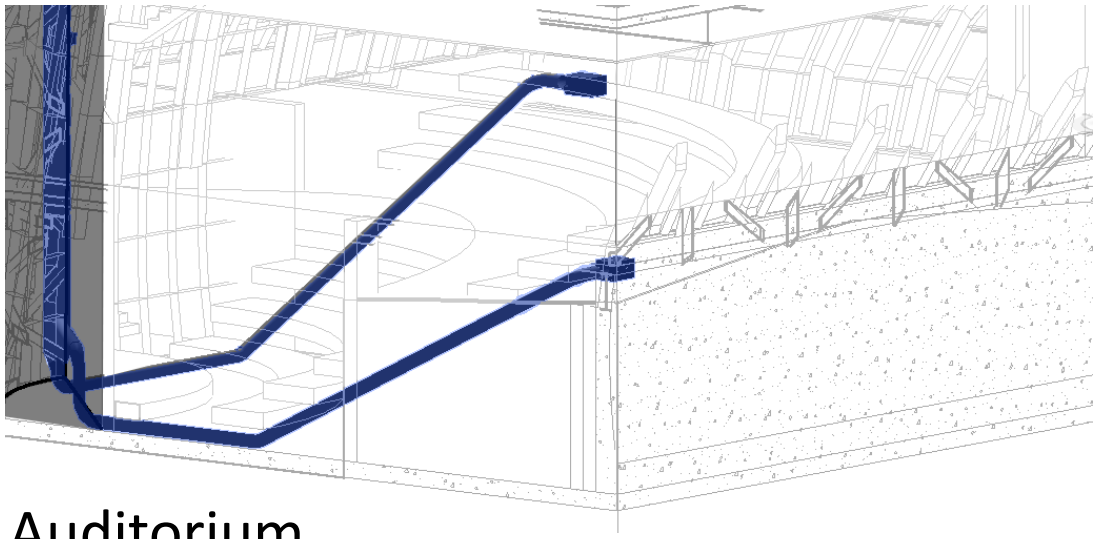


Main shaft

Supply air

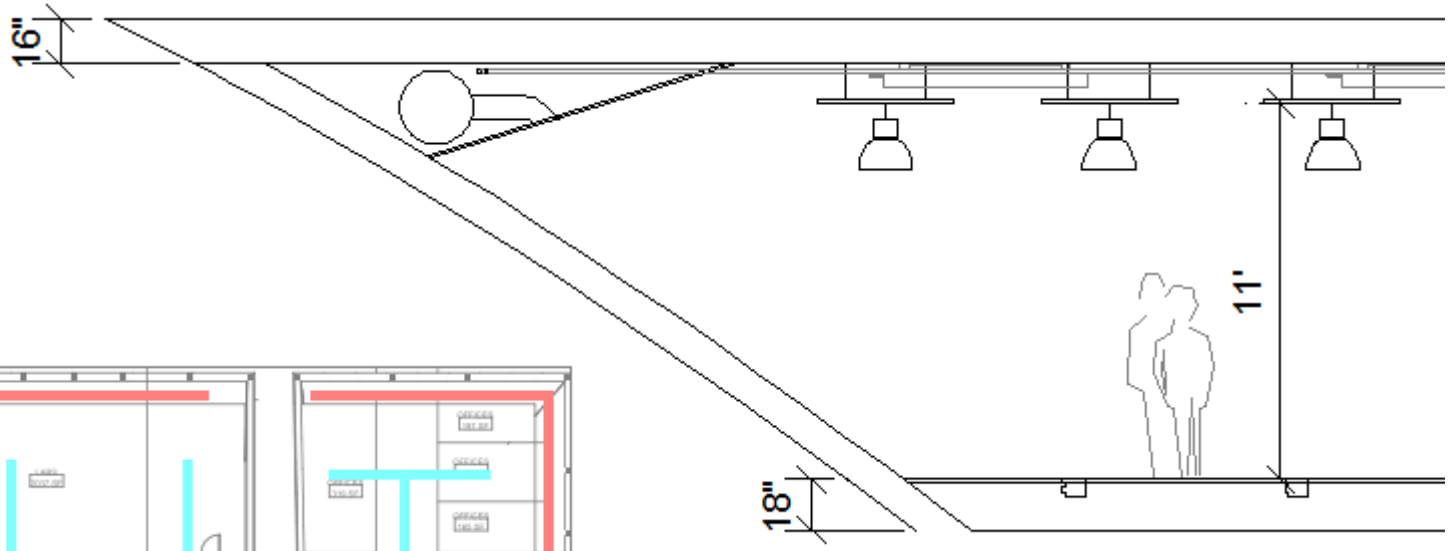
Return air

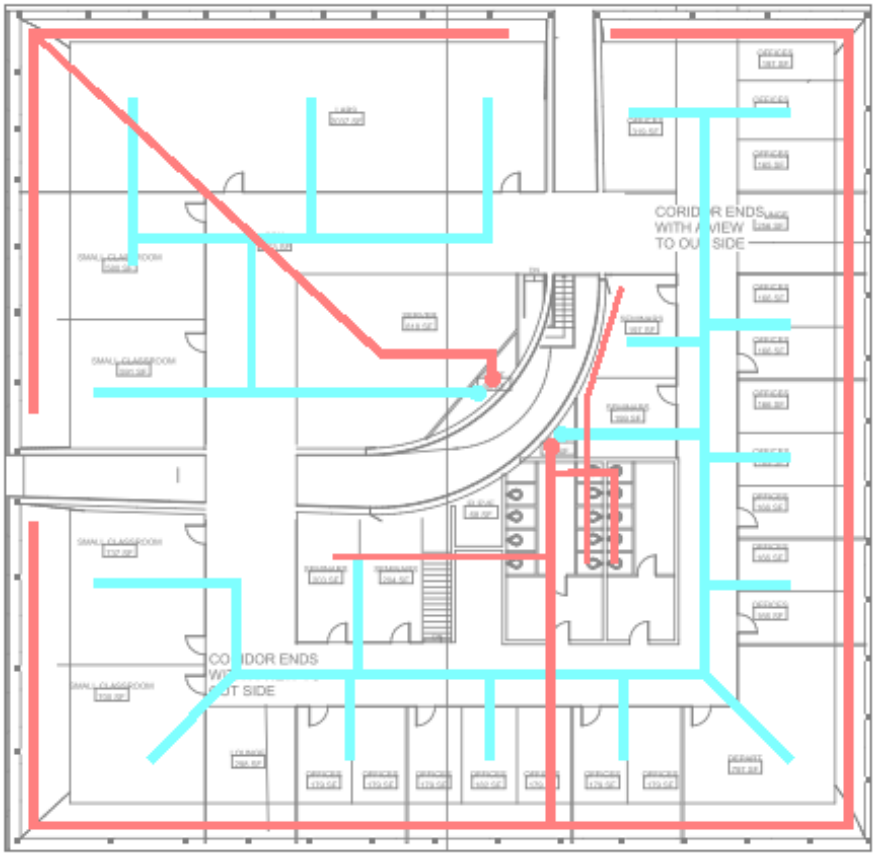
Exhaust air



Auditorium

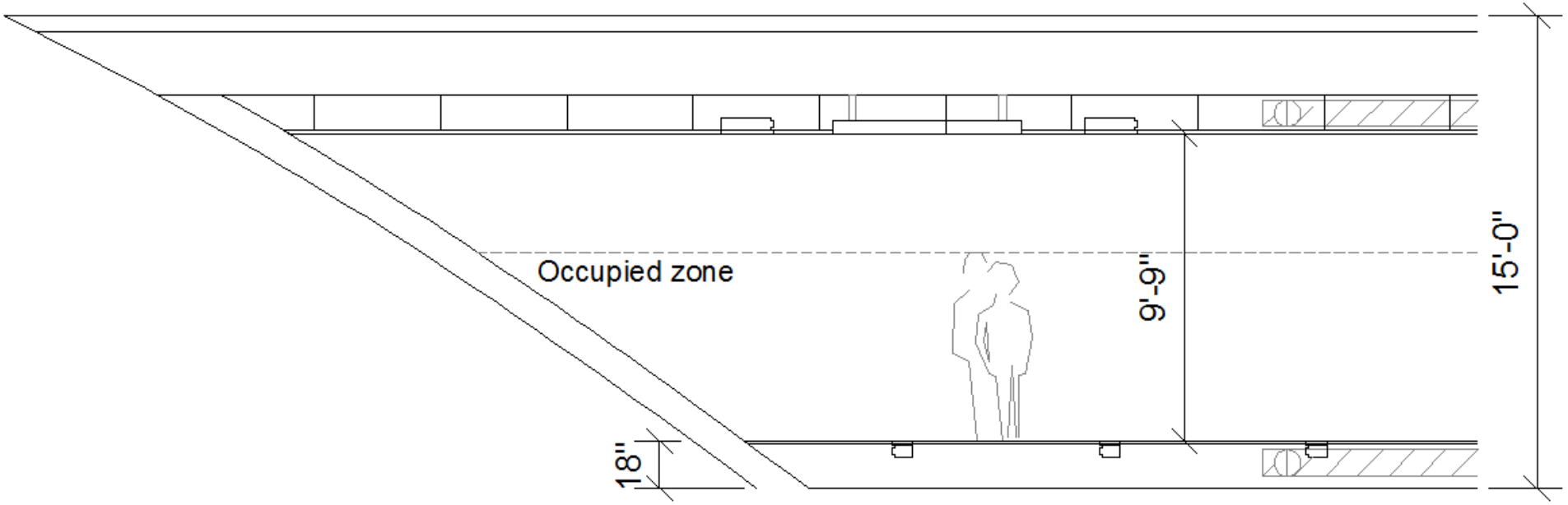
RETURN AIR



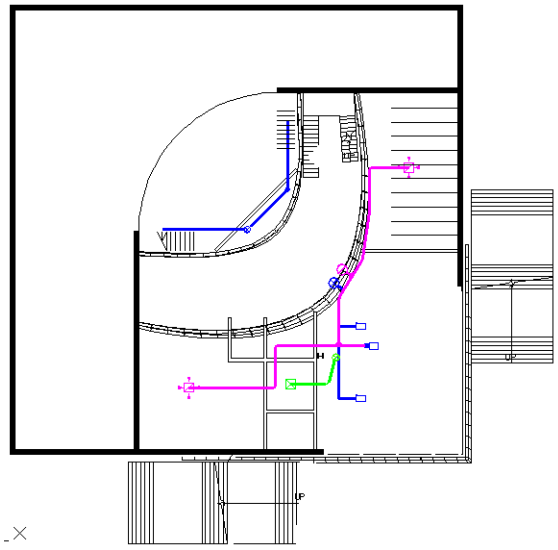


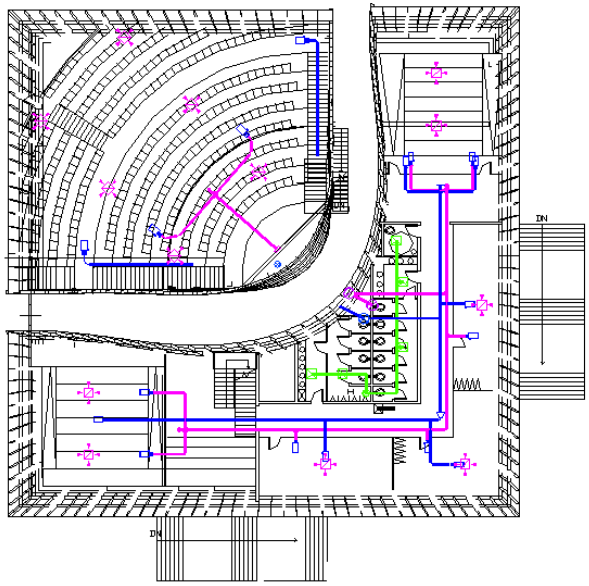
- Hard to mount from inside
- Hard to control room airflows individually

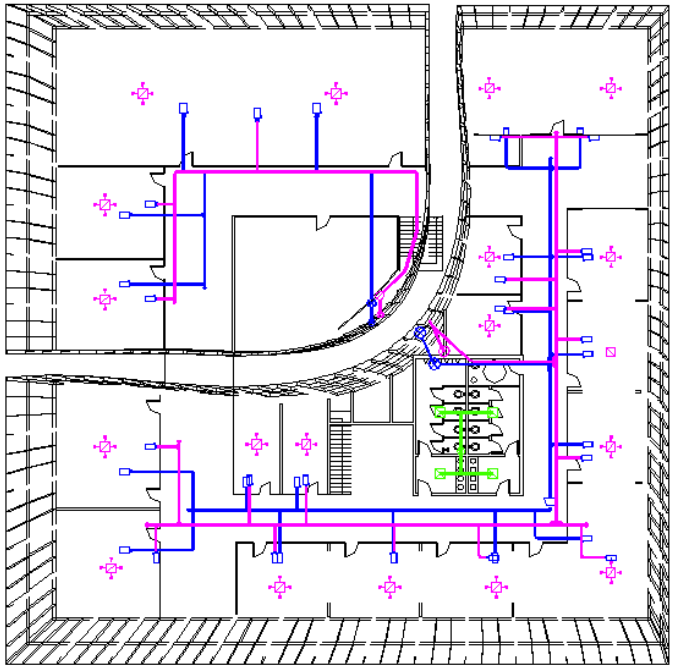
RETURN AIR



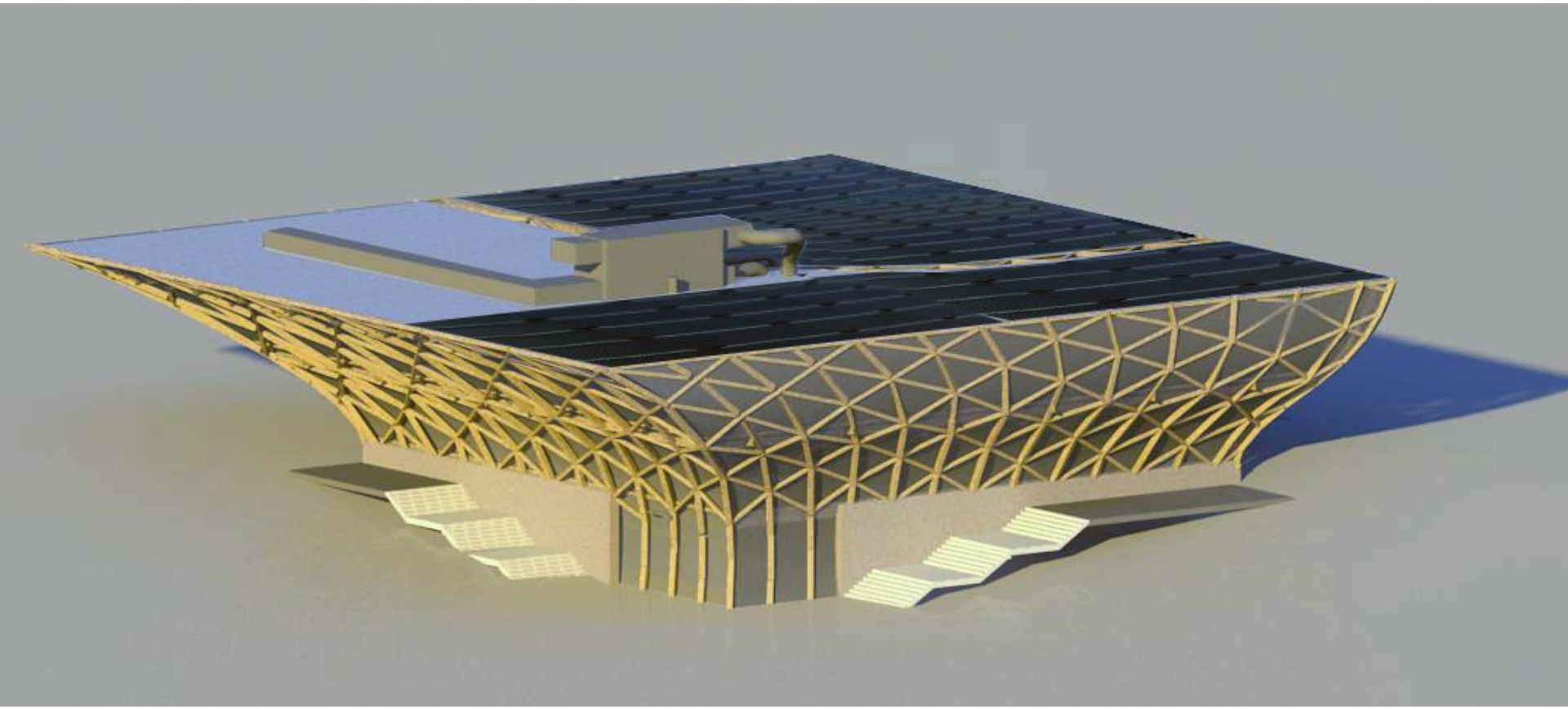
AIR DISTRIBUTION

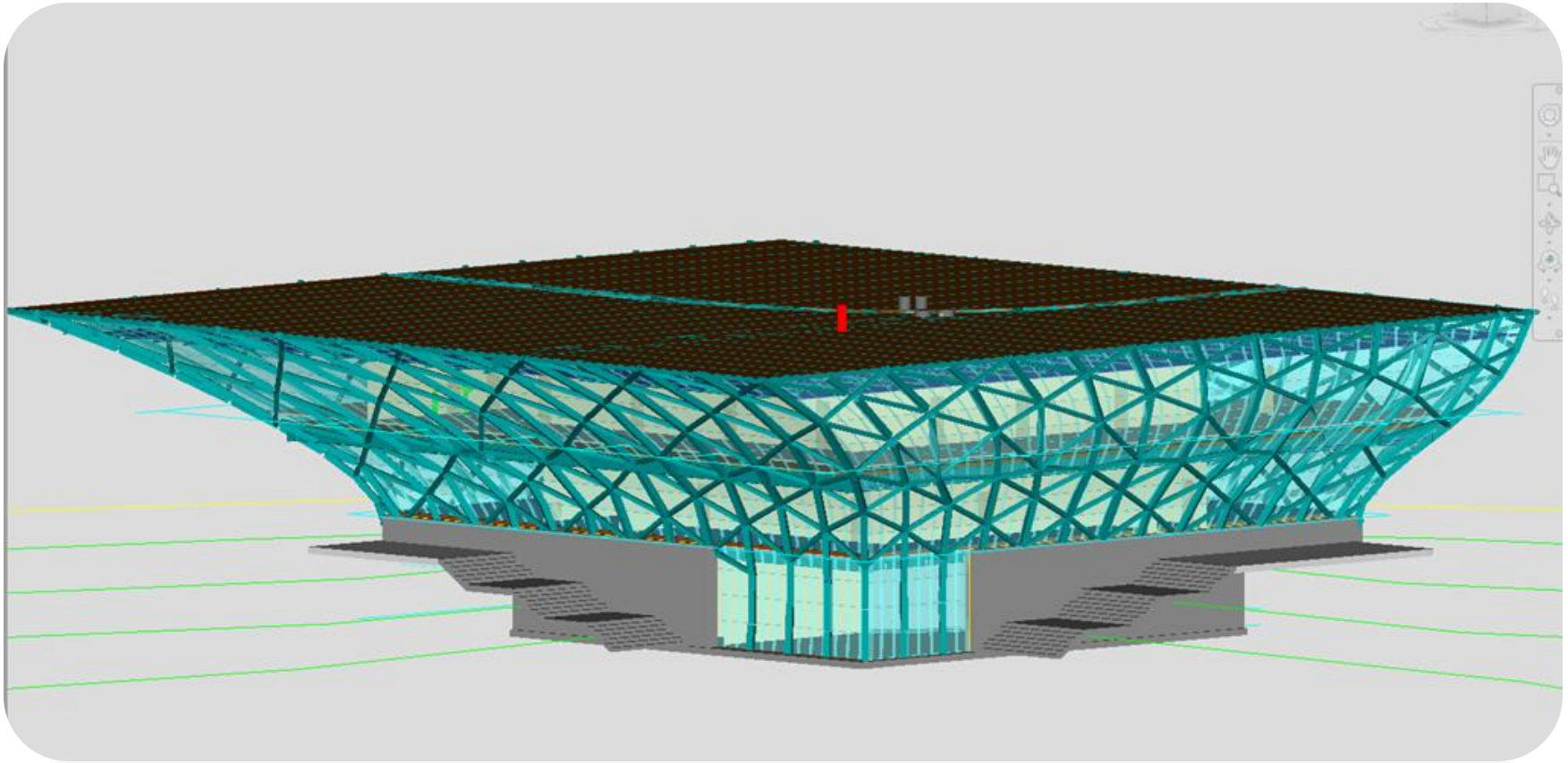






PV PANELS

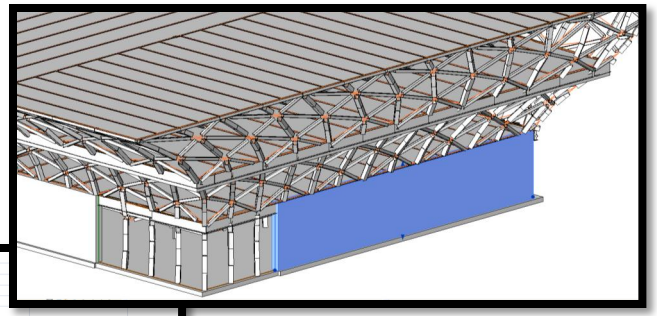




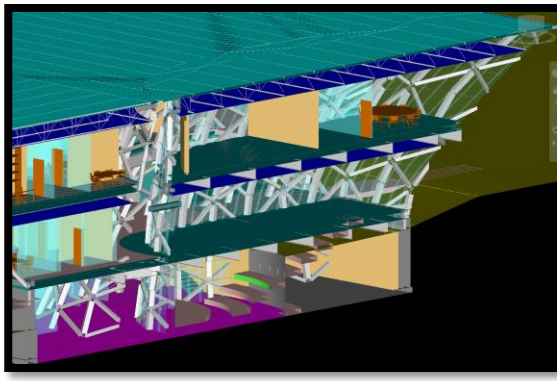
{CM}

BIM IMPLEMENTATION PLAN

Models



Model check

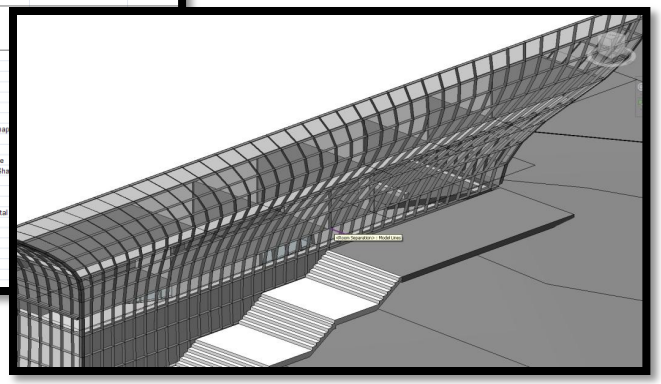


Content plan

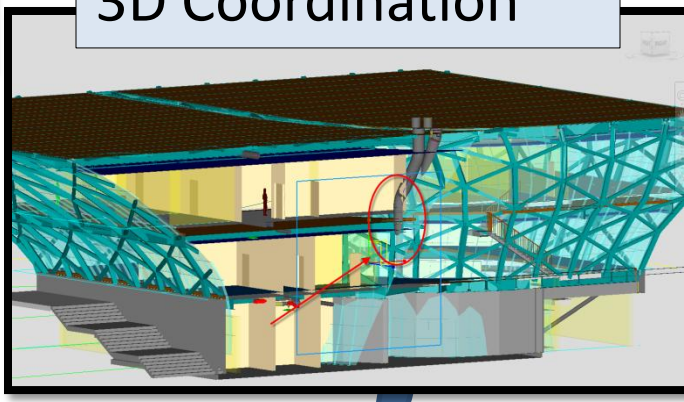
STRUCTURAL CONTENT PLAN

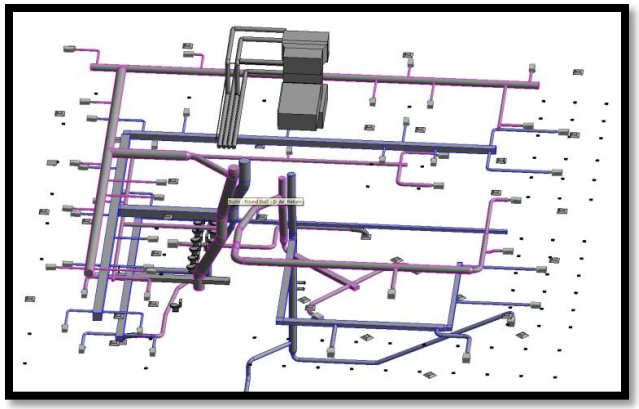
& Chelsea, I hid many rows with the MEP, you can unhide them if you need to see them
nt plan, delete rows you don't need and keep this up to date

ASTM UNIFORMAT 2 tion of Building Elements (E1557-97)			VICO SOFTWARE List of Bldg Elements/Recipes			
Level 2 Major Group Elements/Systems	Level 3 Group Elements	Level 4 Elements	MODELING DISCIPLINE ASSIGNMENT	Revit Family	Revit Type
		Shoring	CM		
	A2020 Basement Walls	Concrete Bmt Walls	E	System Family: Basic Wall	Retaining -22" Concrete
		Bmt Interior Skin	A		
B10 Superstructure	B1010 Floor Construction	Steel Columns	E	HSS-Hollow Structural Section	Column-HSS shape
		Steel Columns	E	HSS-Hollow Structural Section	Café Column- HSS shape
		Steel Columns	E	W-Wide Flange -Column	Column-W Shape
		Steel Beams	E	W-Wide Flange	Perimeter Girder-W Shape
		Steel Beams	E	W-Wide Flange	Auditorium Filler Beam-W Shap
		Steel Beams	E	W-Wide Flange	N/S Filler Beam-W Shape
		Steel Beams	E	W-Wide Flange	E/W Filler Beam-W Shape
		Steel Beams	E	W-Wide Flange	Corridor Filler Beam-W Shape
		Steel Beams	E	W-Wide Flange	Auditorium Filler Beam2-W Sh
		Steel Beams	E	W-Wide Flange	N/S Filler Beam2-W Shape
		Steel Beams	E	W-Wide Flange	E/W Filler Beam2-W Shape
		Bracing	E	HSS-Hollow Structural Section	Brace-HSS shape
		Slab on Deck	E	System Family - Floor	3.25" LW Concrete on 3" Metal
		Catwalks	E	W-Wide Flange	Catwalk Beam-W Shape
	B1020 Roof Construction	Steel Columns	E	HSS-Hollow Structural Section	Column-HSS shape
		Bracing	E	HSS-Hollow Structural Section	Brace-HSS shape
		Roof Joists	E	LH-Series Bar Joists	Joist- Roof
		Decking	E	System Family: Floor	1 1/2" Metal Roof Deck
B20 Exterior Enclosure	B2010 Exterior Walls	Masonry Wall	A		
		Veneer Wall	A		



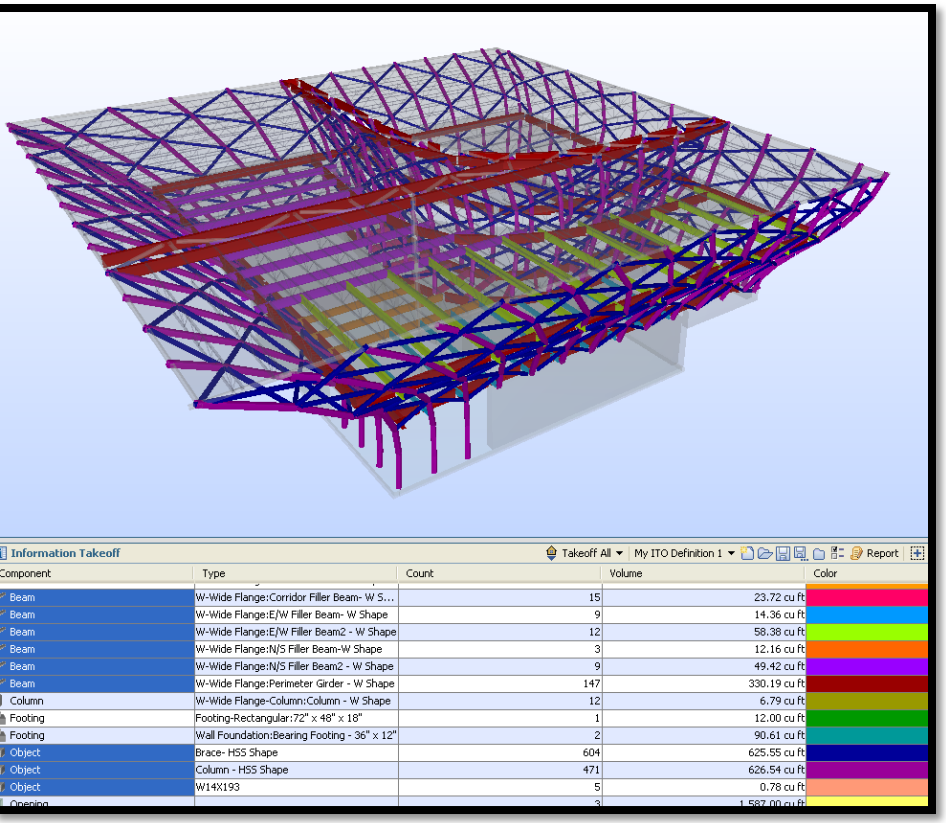
3D Coordination





BIM IMPLEMENTATION PLAN

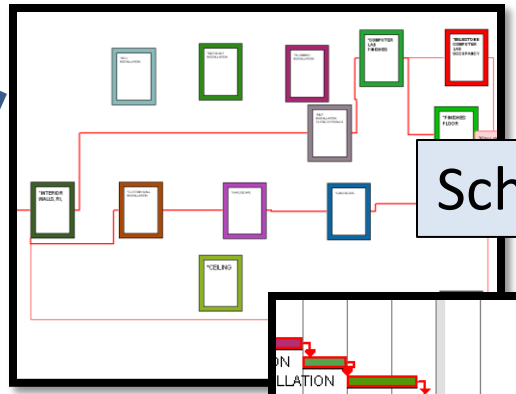
Quantities

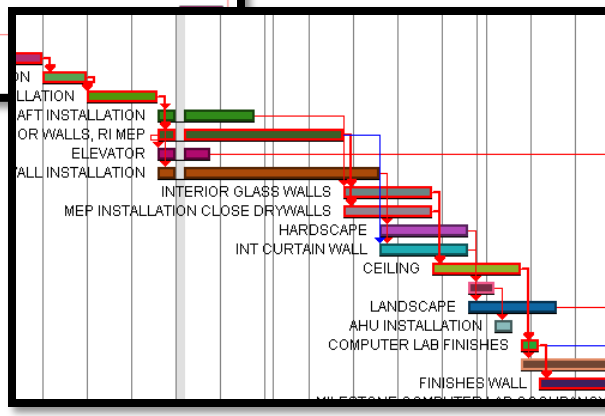


Information Takeoff — Takeoff All | My ITO Definition 1 | Report

Component	Type	Count	Volume	Color
Beam	W-Wide Flange:Corridor Filler Beam- W S...	15	23.72 cu ft	
Beam	W-Wide Flange:E/W Filler Beam- W Shape	9	14.36 cu ft	
Beam	W-Wide Flange:E/W Filler Beam2 - W Shape	12	58.38 cu ft	
Beam	W-Wide Flange:N/S Filler Beam-W Shape	3	12.16 cu ft	
Beam	W-Wide Flange:N/S Filler Beam2 - W Shape	9	49.42 cu ft	
Beam	W-Wide Flange:Perimeter Girder - W Shape	147	330.19 cu ft	
Column	W-Wide Flange-Column:Column - W Shape	12	6.79 cu ft	
Footing	Footing-Rectangular:72" x 48" x 18"	1	12.00 cu ft	
Footing	Wall Foundation:Bearing Footing - 36" x 12"	2	90.61 cu ft	
Object	Brace- HSS Shape	604	625.55 cu ft	
Object	Column - HSS Shape	471	626.54 cu ft	
Object	W14X193	5	0.78 cu ft	
Opening		3	1,587.00 cu ft	

Schedule



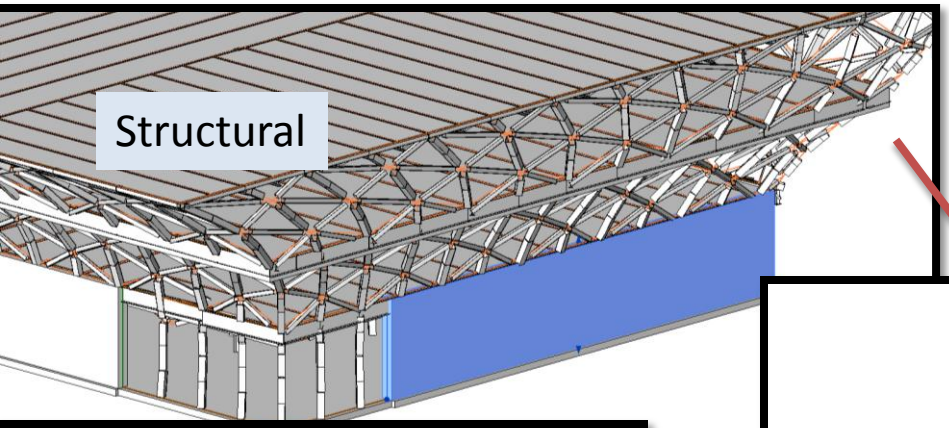


Estimate

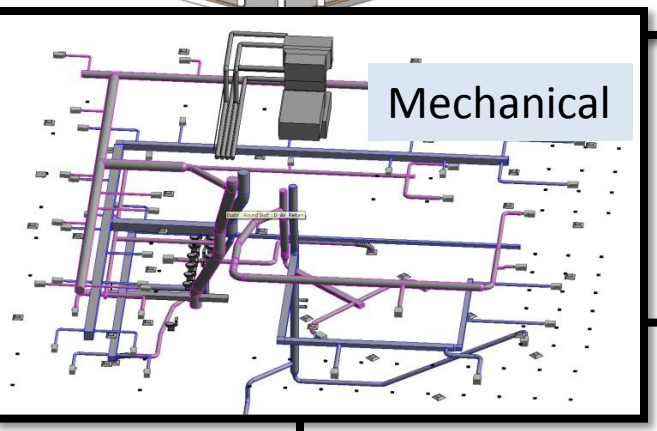
QTY	unit	method		M unit	R unit	rate $	consumption factc Cons M	ıumpt Re	Total cost
HSS-Hollow Structural Section: Column - HSS Shape93.34 lb/ft HSS 12x12x5/8									
HSS-Hollow Structural Section: Brace- HSS Shape48.85 lb/ft HSS 8x8x0.5									
half of HSS8x8 in prefabricated truss, half field assembled			HSS8x8 non truss: 340 CF						
890	Net_Volume	shop fabrication prefabricated truss system	Shop Labor Costs	LB	HR	19.5	0.0063	490	53,574.89
890	Net_Volume	shop fabrication prefabricated truss system	Shop Overhead Costs	LB	HR	16	0.0063	490	43,958.88
890	Net_Volume	shop fabrication prefabricated truss system	Freight - IN	LB	CWT	4.9	0.01	490	21,368.90
890	Net_Volume	shop fabrication prefabricated truss system	HSS - ASTM 500 Grade B, incl. 6% drop fee	LB	CWT	60	0.01	490	261,660.00
340	Net_Volume	Shop Fabrication - W-shape Column (A992)	Shop Labor Costs	LB	HR	19.5	0.0063	490	20,466.81
340	Net_Volume	Shop Fabrication - W-shape Column (A992)	Shop Overhead Costs	LB	HR	16	0.0063	490	16,793.28
340	Net_Volume	Shop Fabrication - W-shape Column (A992)	Freight - IN Rail: channels, W shapes, 709-pl	LB	CWT	4.9	0.01	490	8,163.40
340	Net_Volume	Shop Fabrication - W-shape Column (A992)	W-Shape - ASTM A 992, incl. 3% drop fee	LB	CWT	49.57	0.01	490	82,583.62
assuming half HSS8x8 field assembled									
387	Count	Erection - Speed 32pcs/6 man crew & Crane/day	Ironworker	EA	HR	75	1.5	1	43,537.50
387		Erection - Speed 32pcs/6 man crew & Crane/day	Crane Operator	EA	HR	110	0.25	1	10,642.50
387		Erection - Speed 32pcs/6 man crew & Crane/day	Mobile Crane 225 ton	EA	HR	525	0.25	1	50,793.75
387		Erection - Speed 32pcs/6 man crew & Crane/day	Crane phone rental	EA	HR	3.84	0.25	1	371.52
340	Net_Volume	Shipping - Regular HSS8x8 non truss system		LB	LD	1350	2.0833E-05	490	4,685.63
890	Net_Volume	Shipping - Oversize - Trusses	Freight - OUT WJ overwidth 11'	LB	LD	1,750.00	2.0833E-05	490	15,899.48
verify number of prefabricated pieces corridor and ext									
40	Count	Erection - Speed 16??pcs/6 man crew & Crane/da	Ironworker	EA	HR	75	12	1	36,000.00
40	Count	Cons M is for 16/day 1.5 and .5	Crane Operator	EA	HR	110	2	1	8,800.00
40	Count	4 pcs/day is 12, 2 consupmtion	Mobile Crane 225 ton	EA	HR	525	2	1	42,000.00

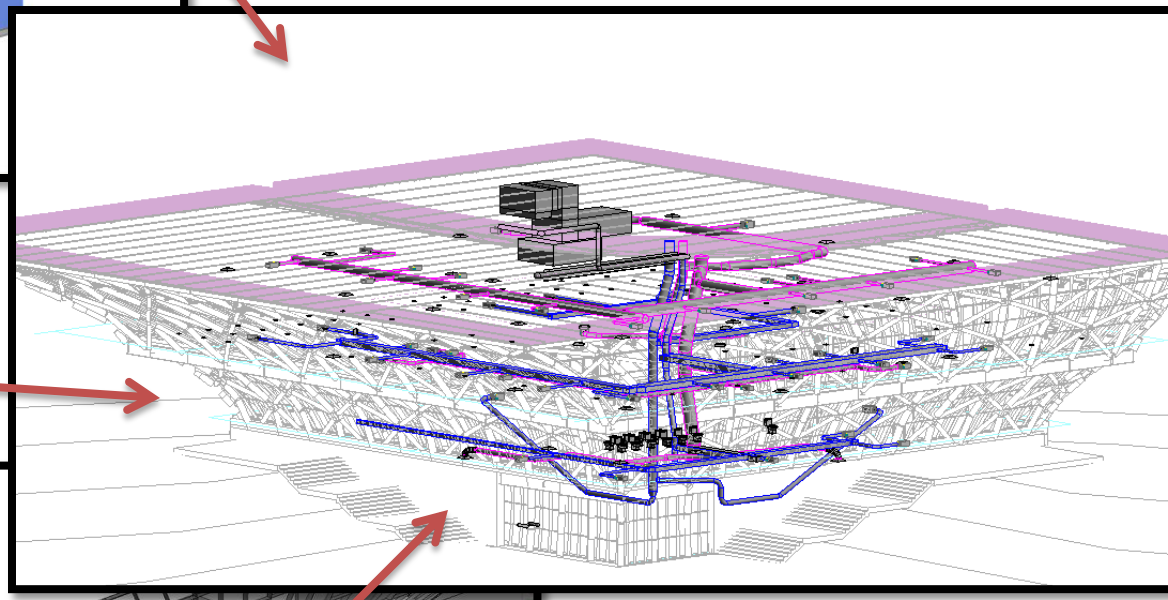
FACILITATING SPACIAL COORDINATION

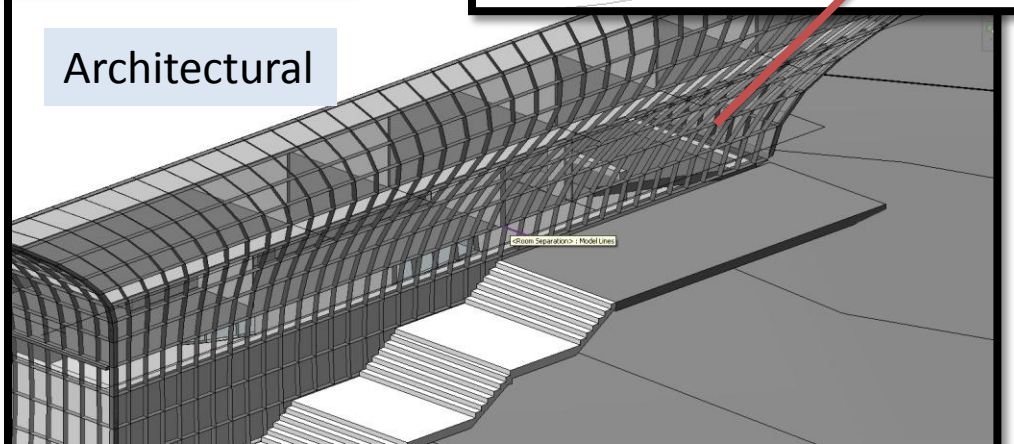
CM



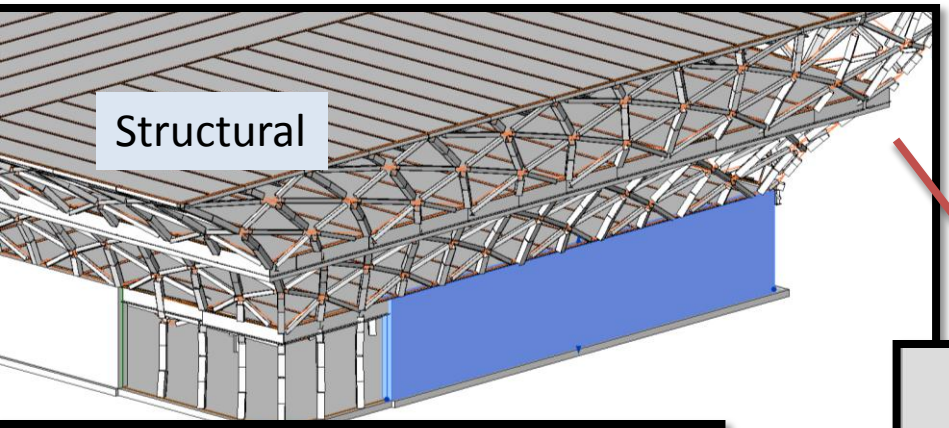
Revit linked integrated model

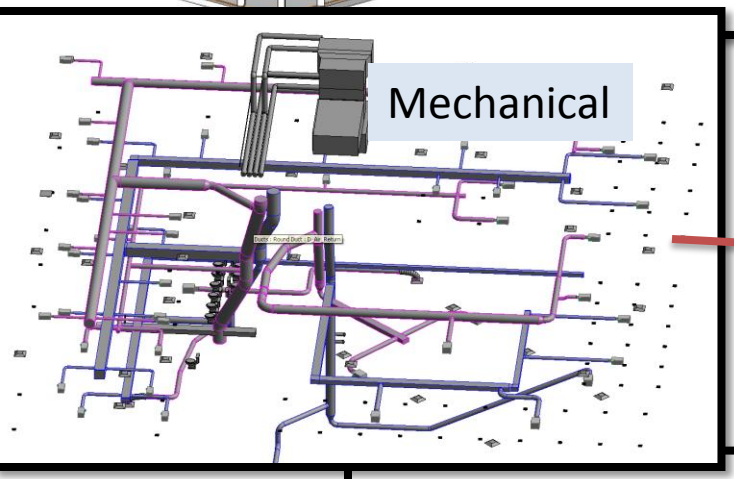


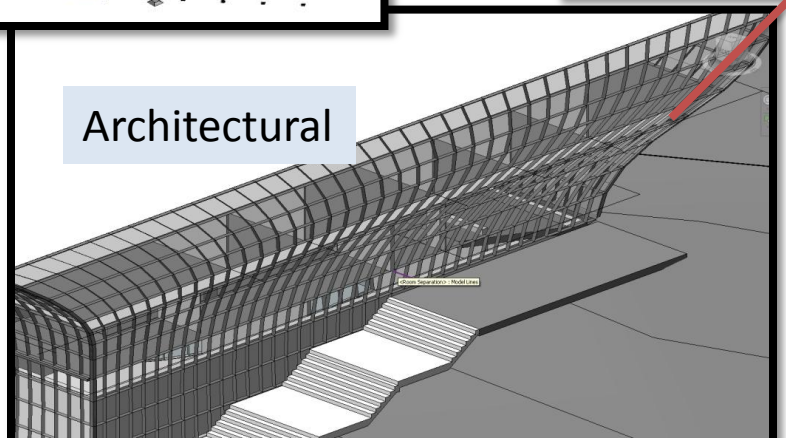




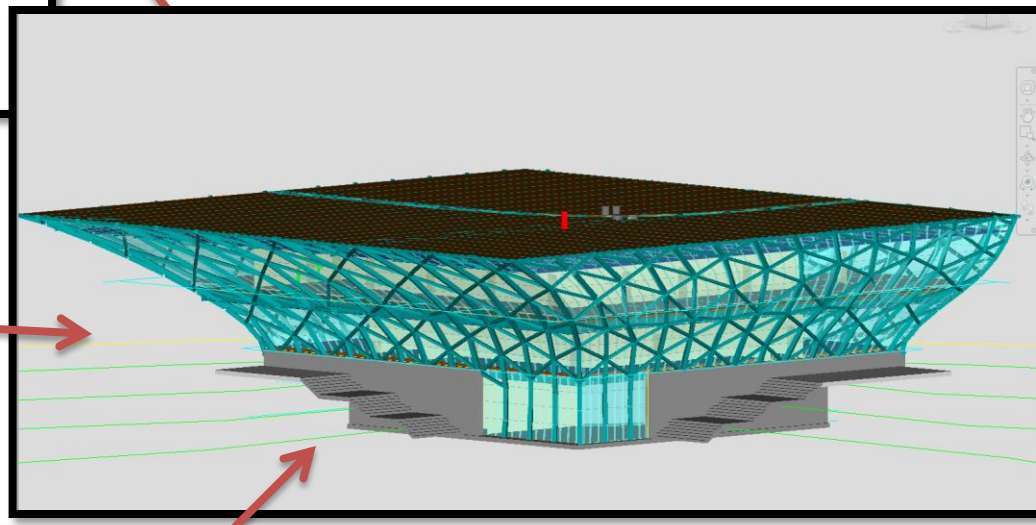
3D COORDINATION





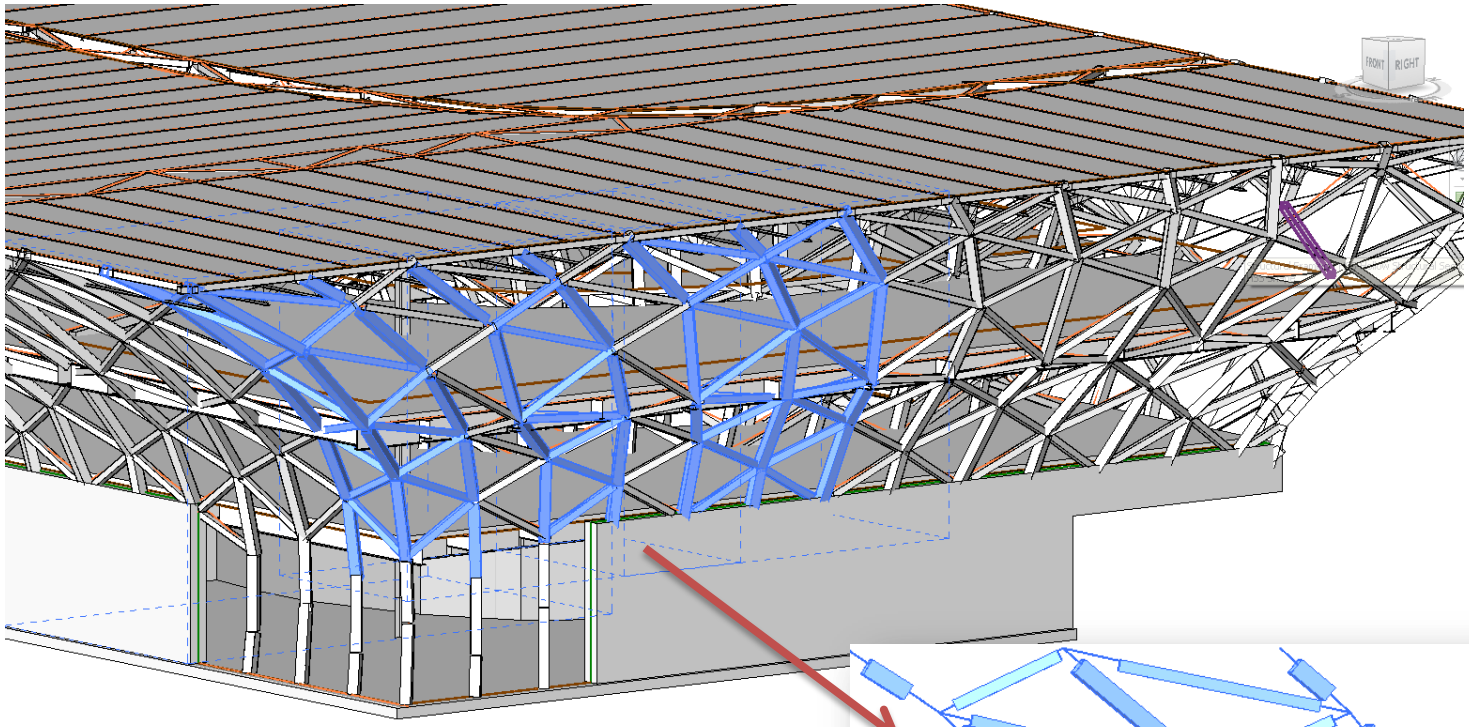


Navis: Coordinated model

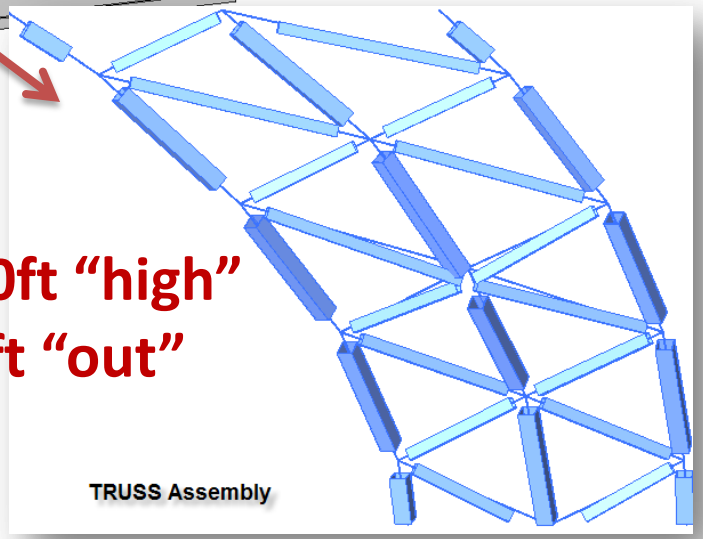


PREFABRICATION – STRUCTURAL STEEL

CM



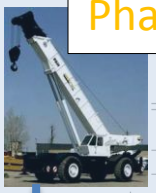
- HSS 12x12 & HSS 8x8 members in pre-fabricated assemblies
- Bolted connections for diagonal HSS 8x8 braces



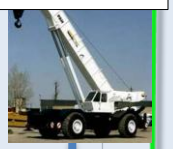
STEEL ERECTION SEQUENCE

CM

Phase I



Phase II



Prefabricated unit

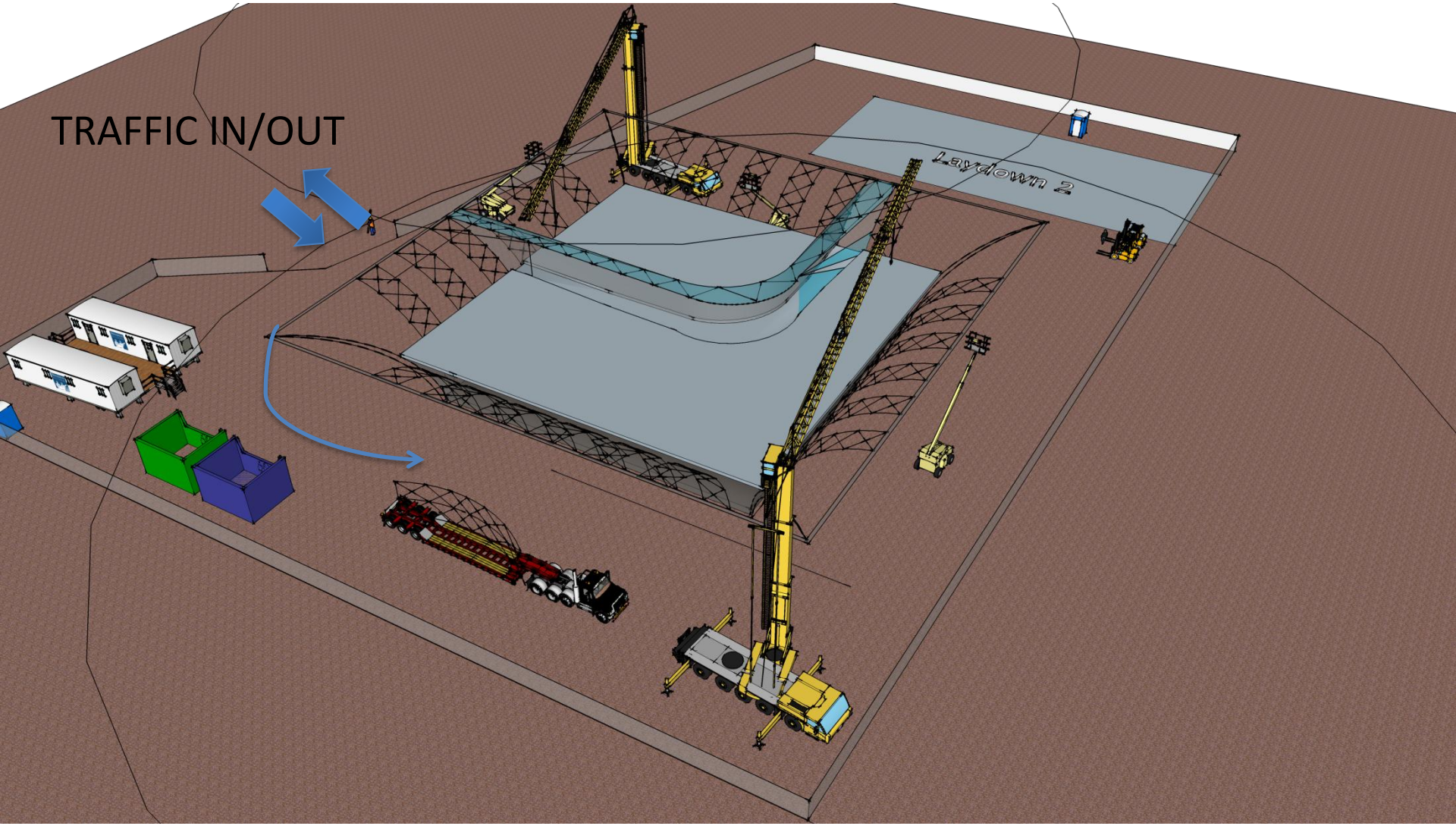
Phase I erection

Phase II erection

N

SITE LAYOUT

CM



MOBILE CRANE MOVES AROUND SITE DURING ERECTION

CRANE SIZING

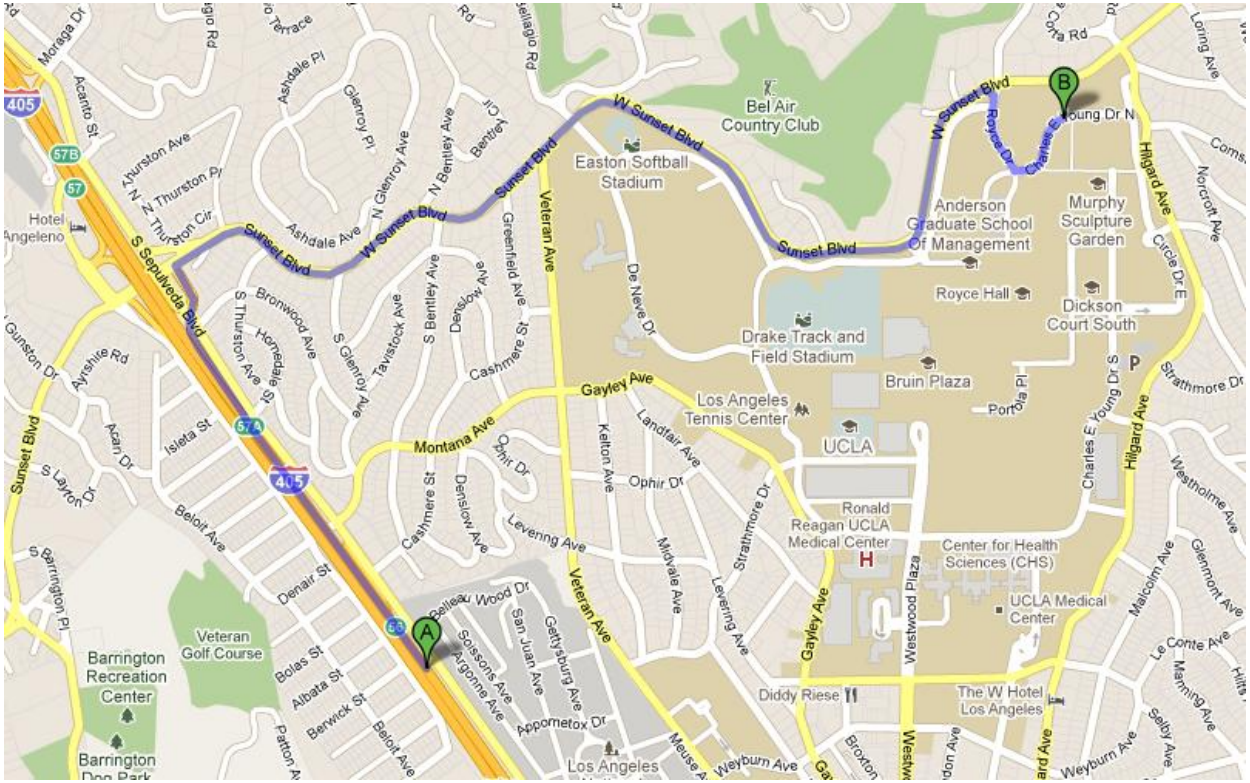
GROVE
GMK2035E

Manitowoc
www.manitowoccranes.com

Heaviest load/reach	Capacity
30 USt	35 USt
80 ft	95 ft

TRANSPORTING PREFAB ELEMENTS

CM

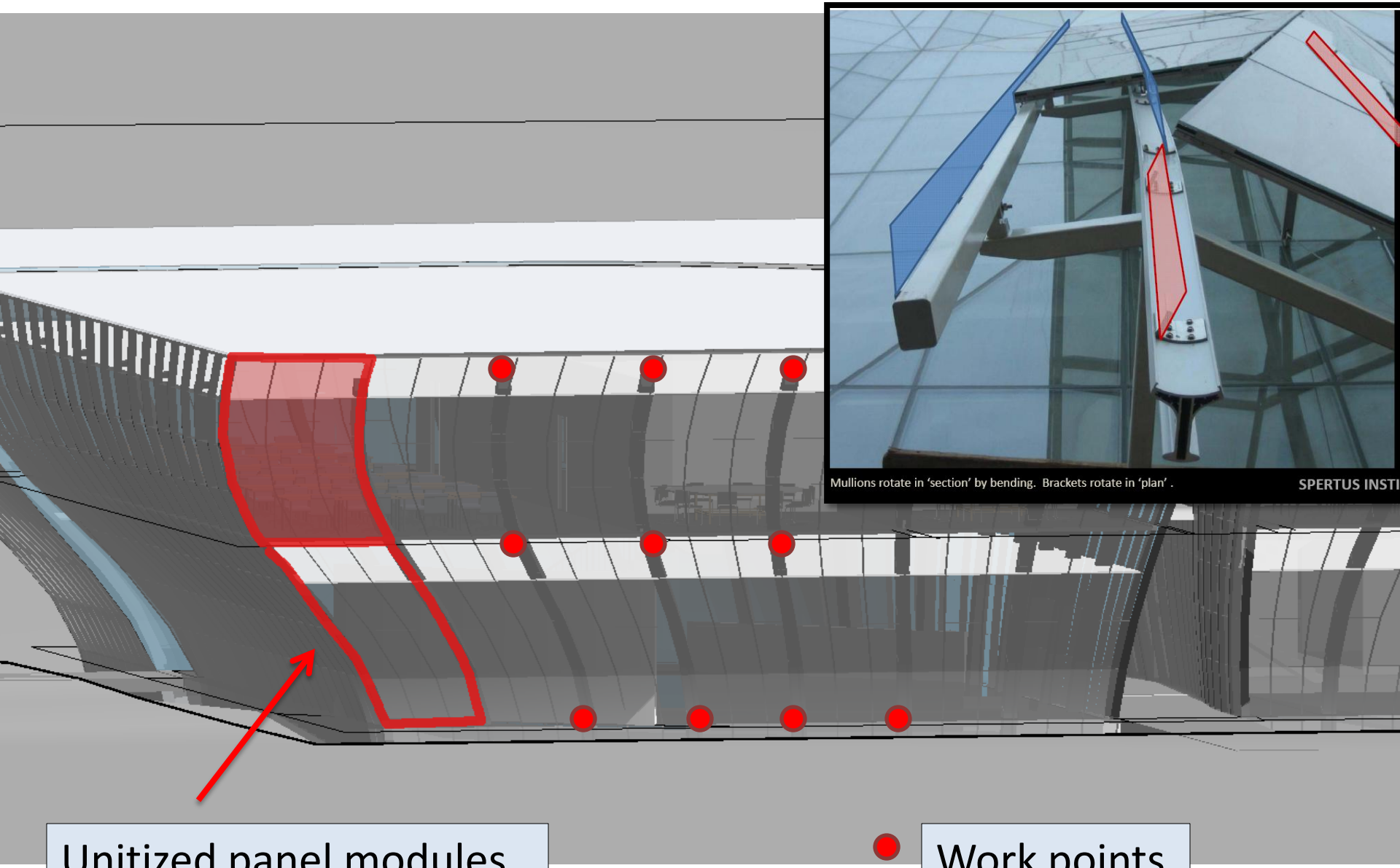


Caltrans

Height (16’), Width (10’), Length (53’), and Weight Limits (80K lbs) OK

PREFABRICATION – CURTAIN WALL

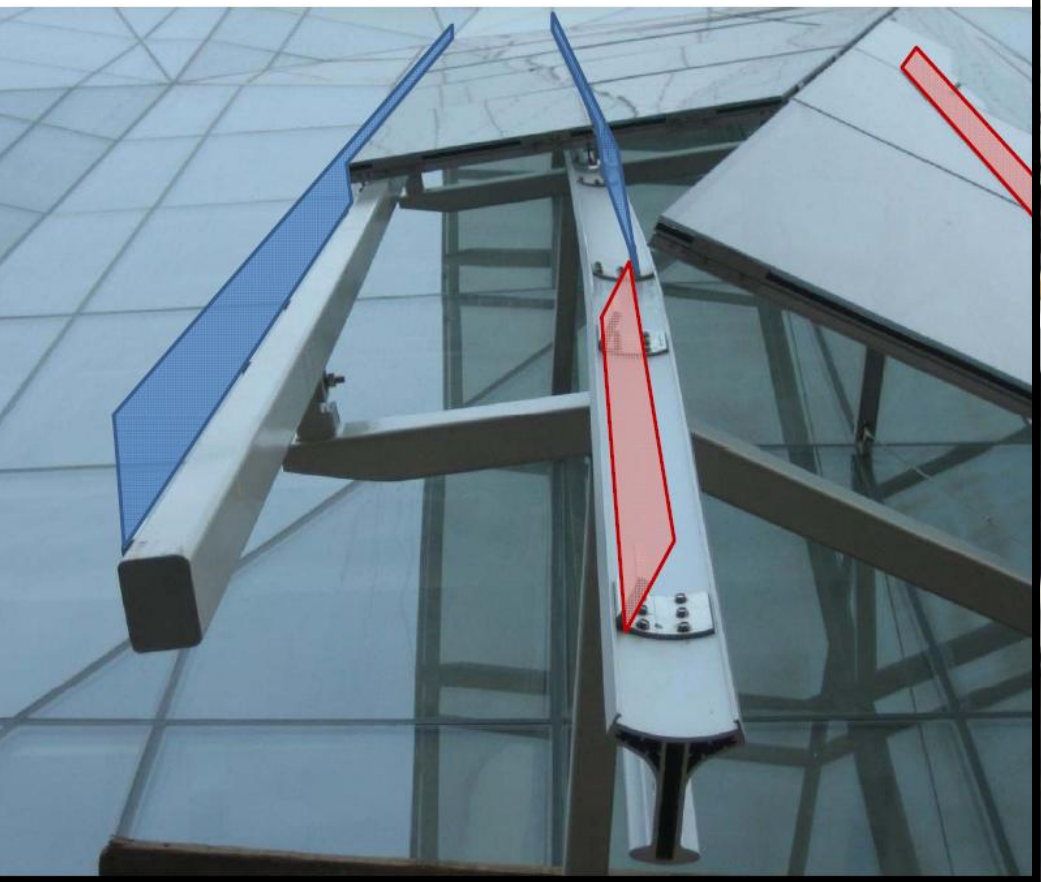
CM



Unitized panel modules

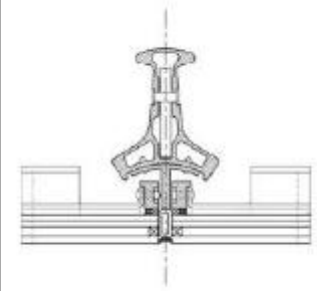
Work points

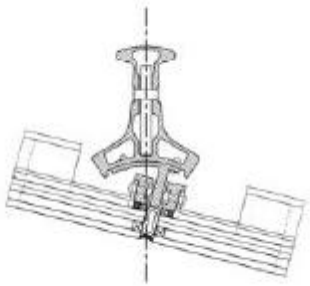
CONSTRUCTABLITY – CURTAIN WALL

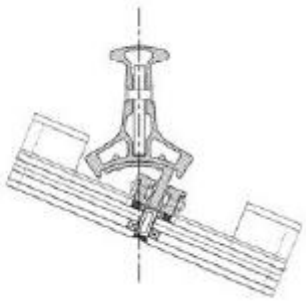


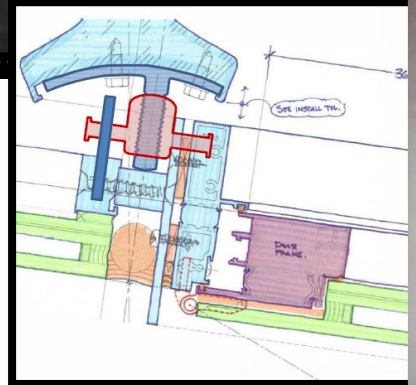
Mullions rotate in 'section' by bending. Brackets rotate in 'plan' .

SPERTUS IN



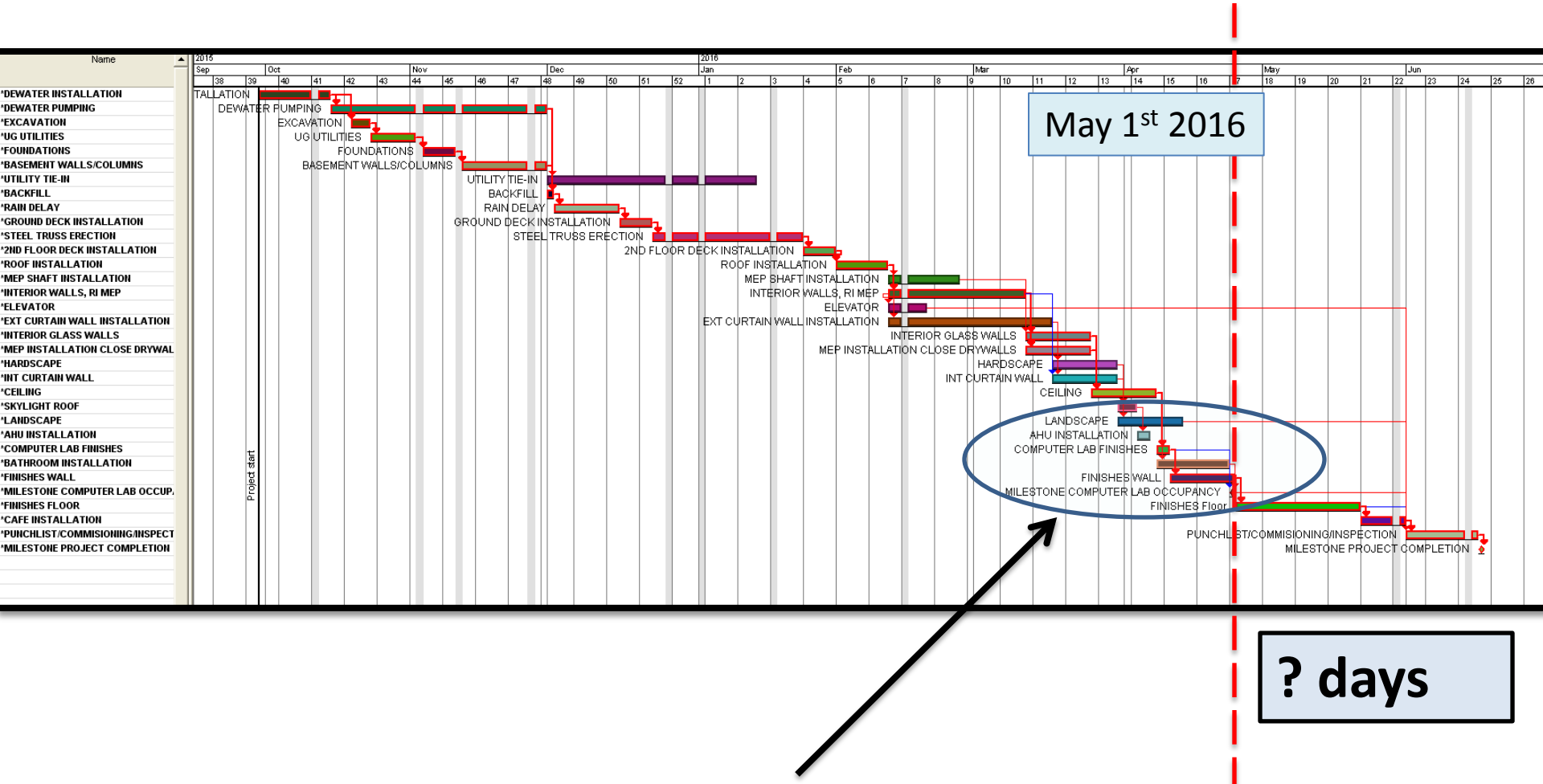






EARLY COMPUTER LABS

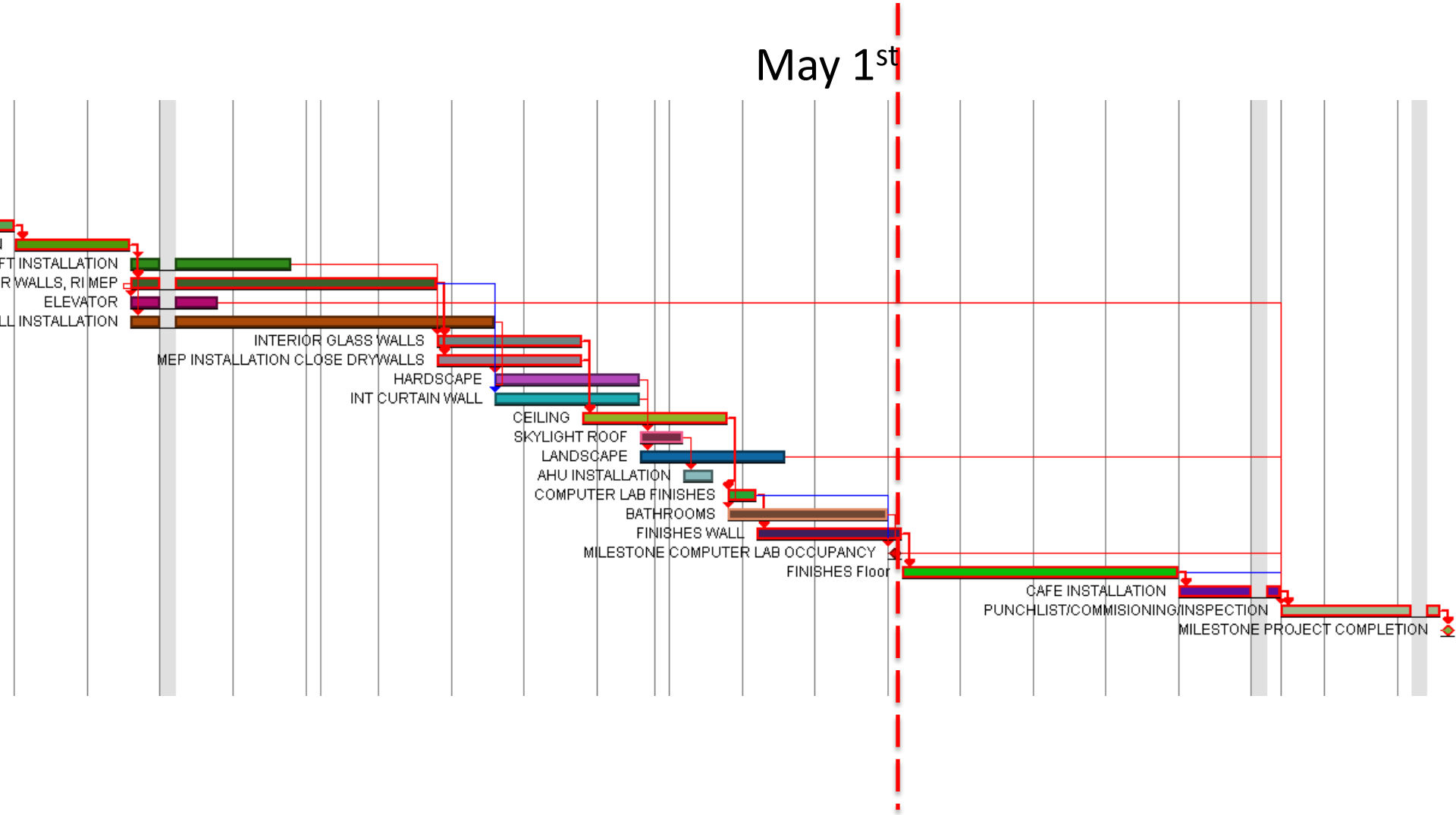
CM



- Early Occupancy of Computer Labs
- Worked intensely with Steel & Curtain wall subcontractors

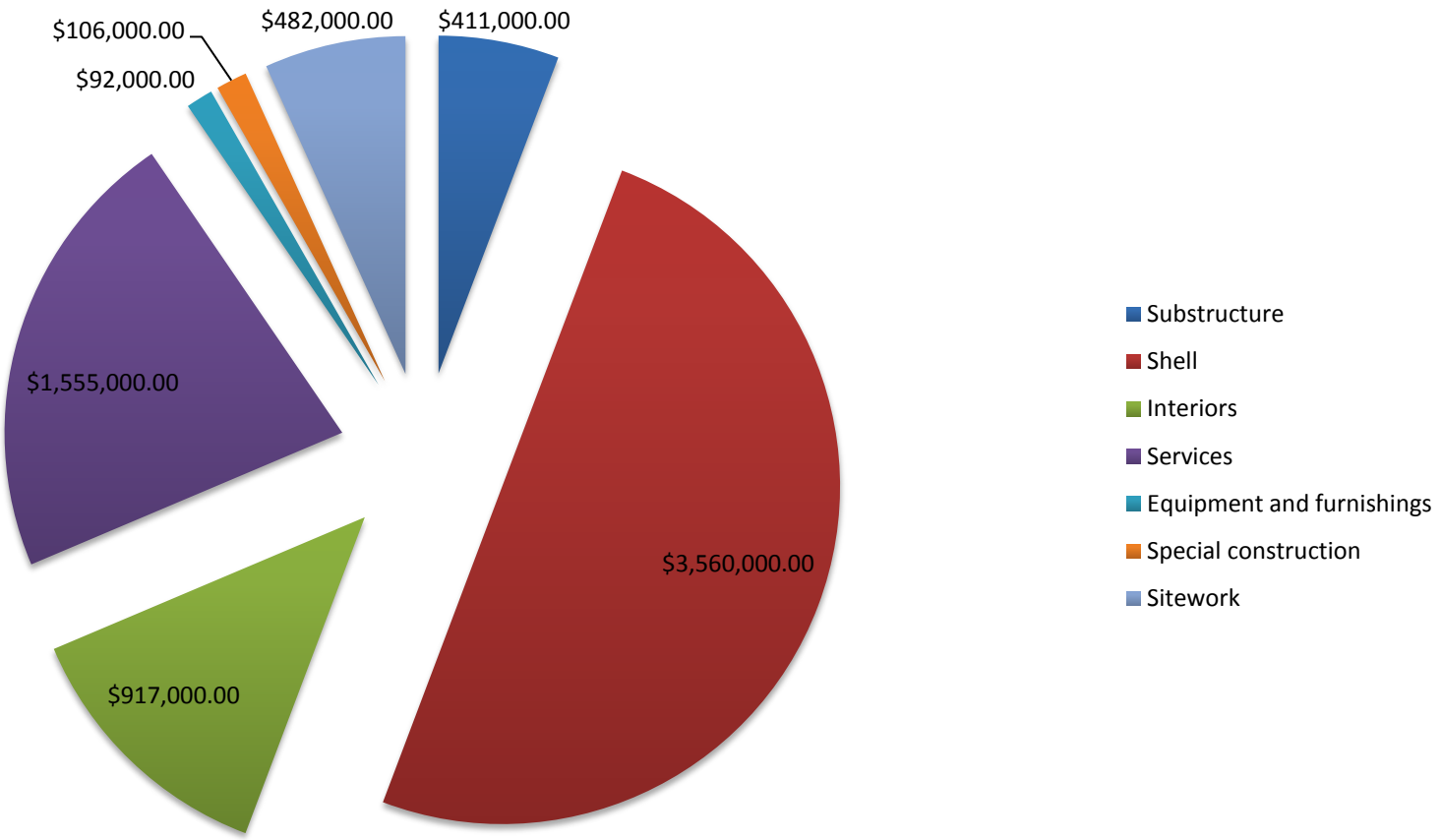
EARLY COMPUTER LABS

CM



COST ESTIMATE

CM



TOTAL COST (2011 DOLLARS)**: $7.12 MILLION**

TOTAL COST (2015 DOLLARS, ASSUMING 1.5% INFLATION)**: $7.56 MILLION**

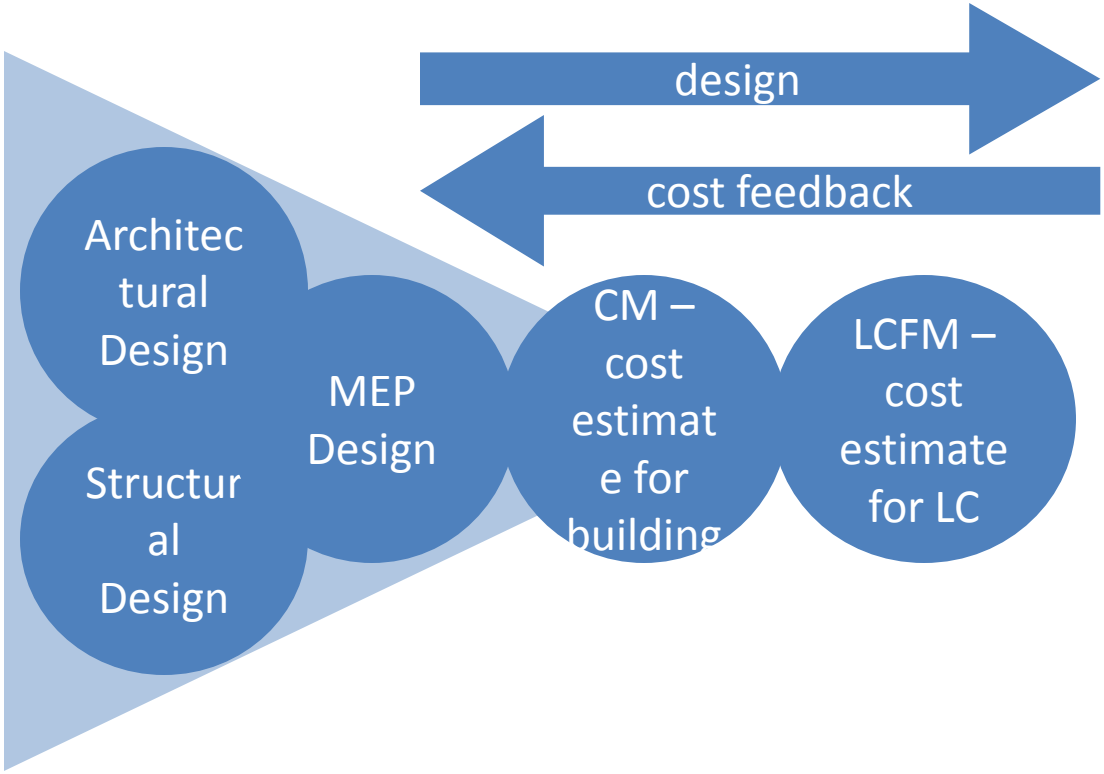
GOING NATIVE

- Local companies/construction materials

MIKE PEARSON CONSTRUCTION, INC.	Concrete/civil contractor – 9.2 miles
DSL STEEL, INC. DBA GBS COMPANY	Steel fabricator – 13.3 miles
AMERICAN RENTALS INC	Equipment rental – 26.7 miles
NORMAN S.WRIGHT/AIRELINK Mechanical Equipment, LLC	MEP Supplier – 20.7 miles
enclos	Curtain Wall Contractor – 14.5 miles

{LCFM}

RENT CALCULATION



=

rent p. year

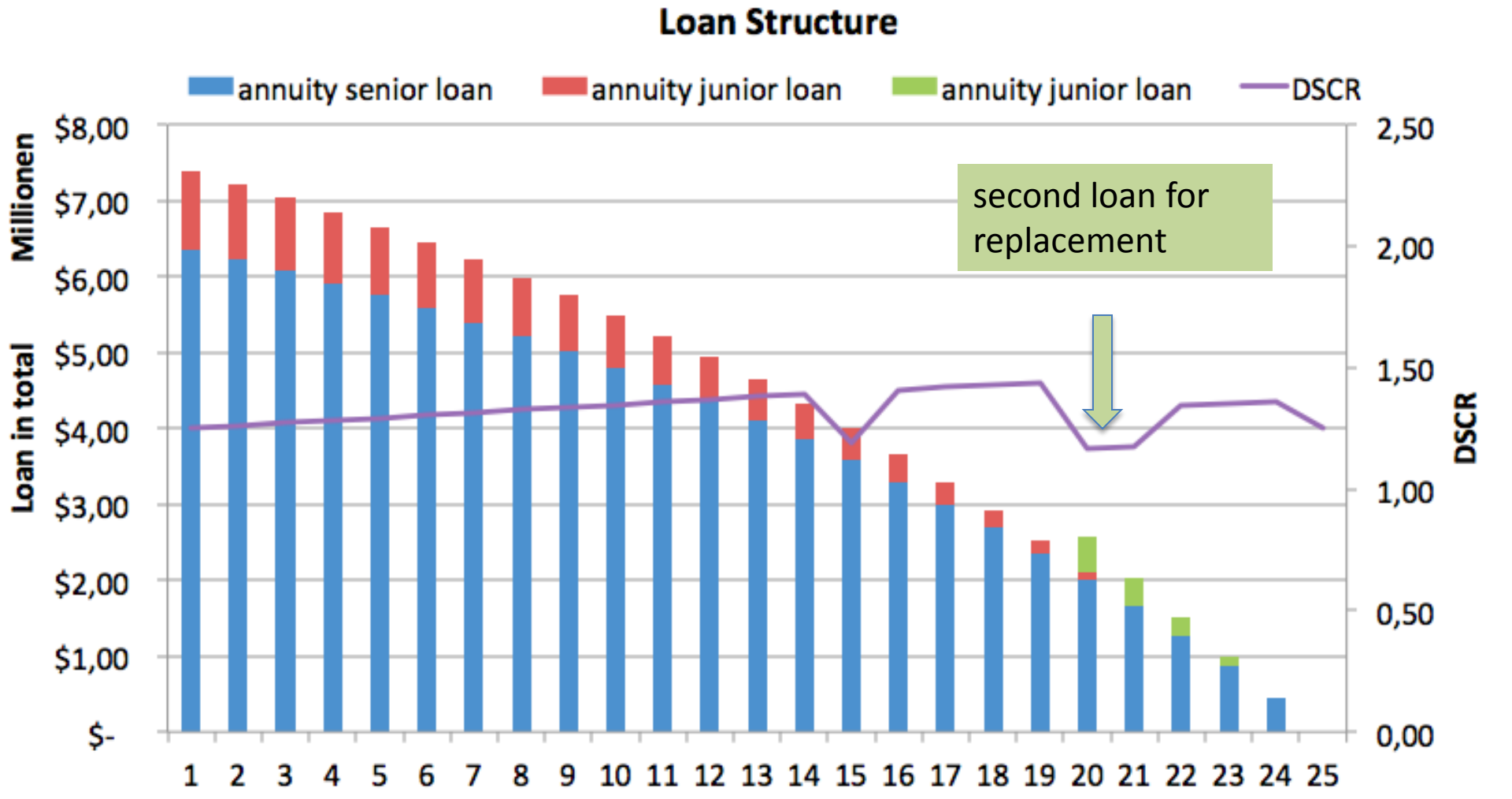
Goal: as low as possible

Team Central - SPV (special purpose vehicle)

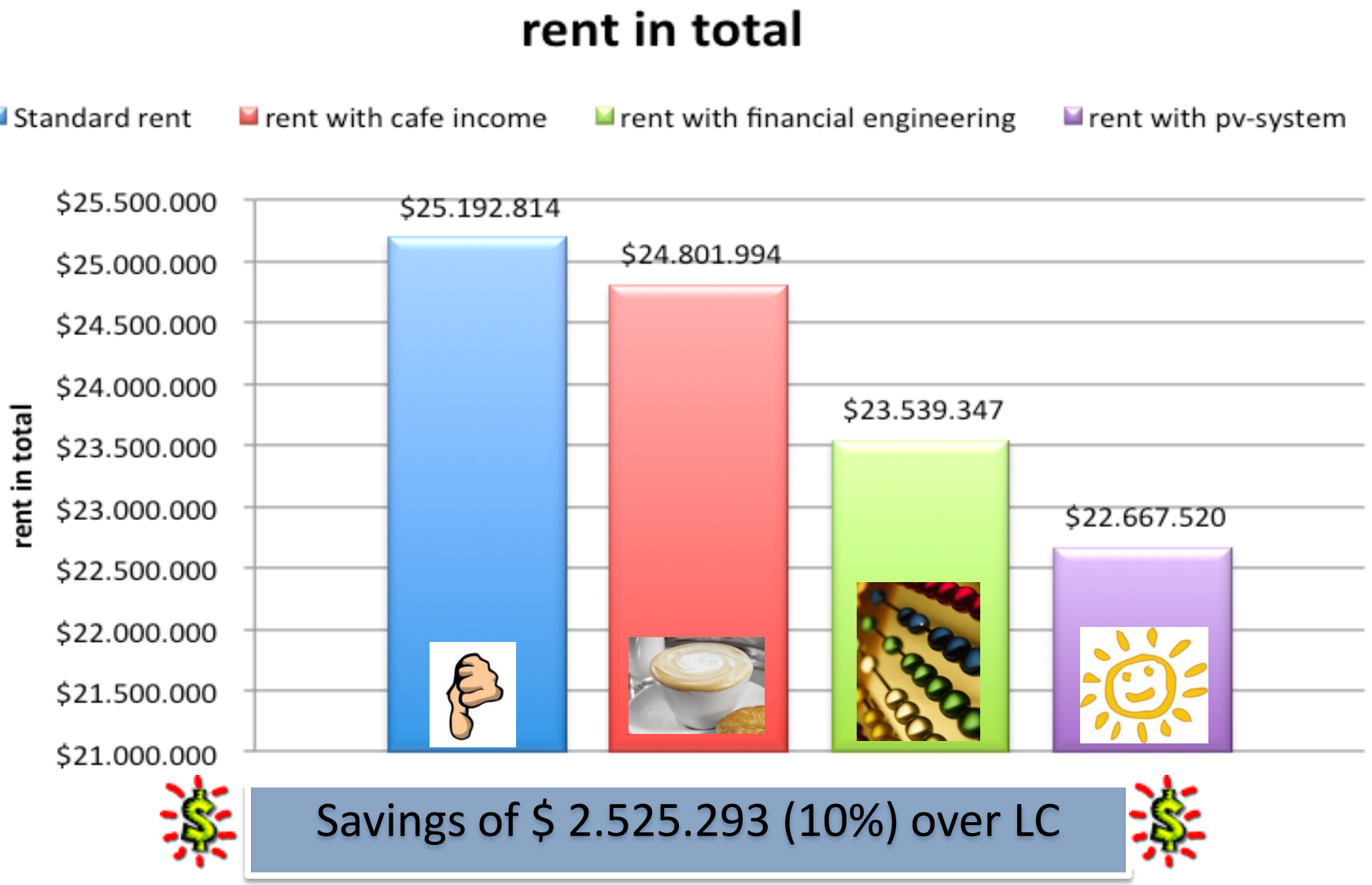
Client

LOAN STRUCTURE AND DSCR

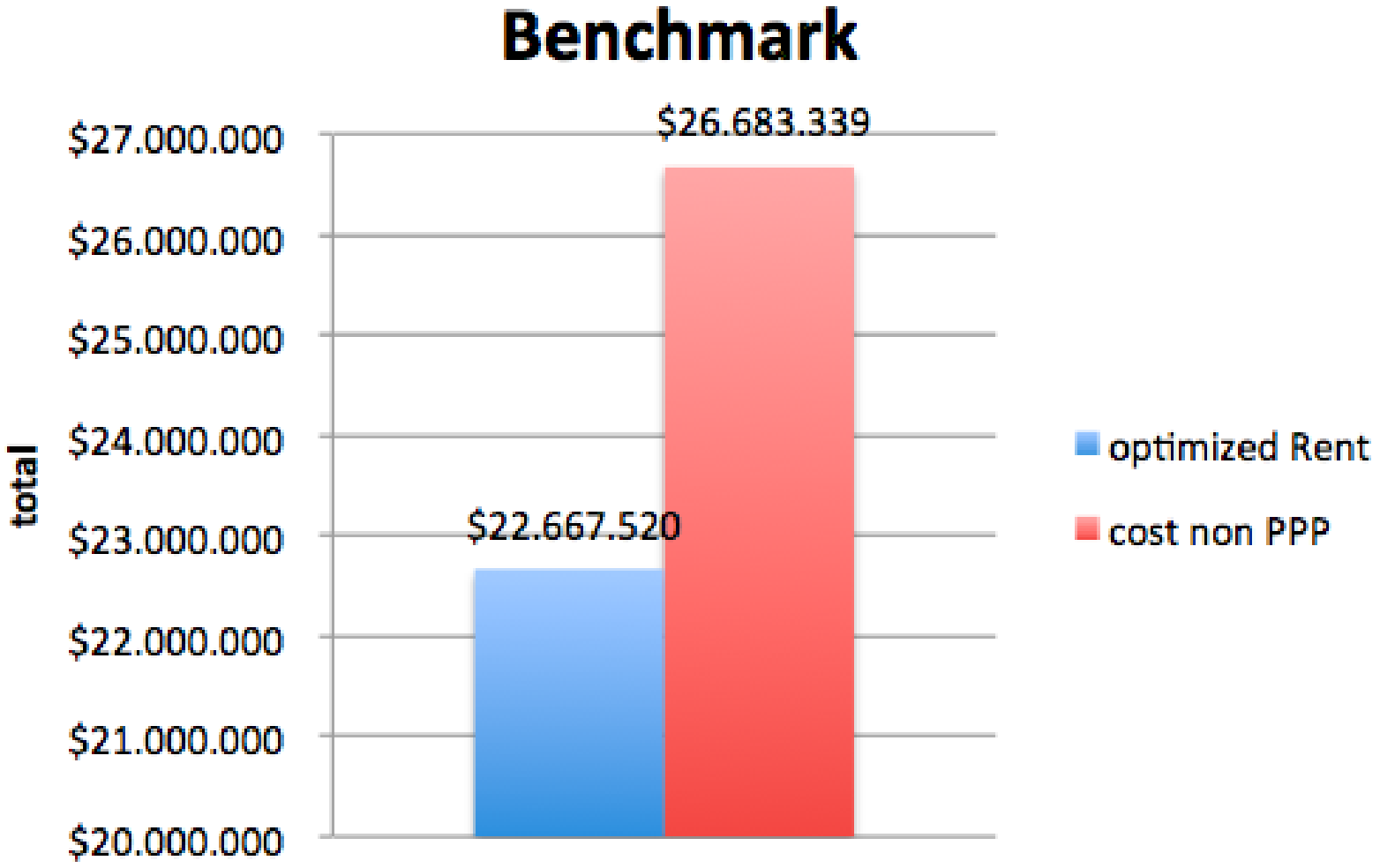
LCFM



RENT CALCULATION RESULT



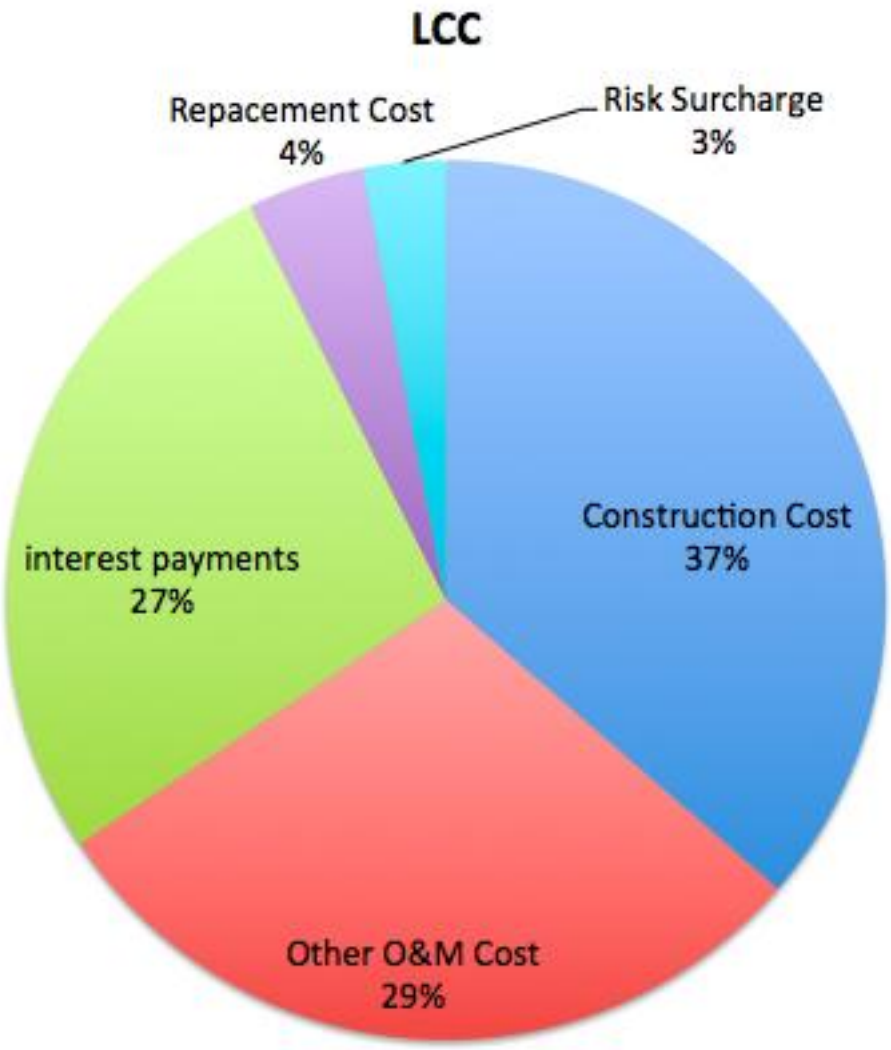
RENT COMPARISON

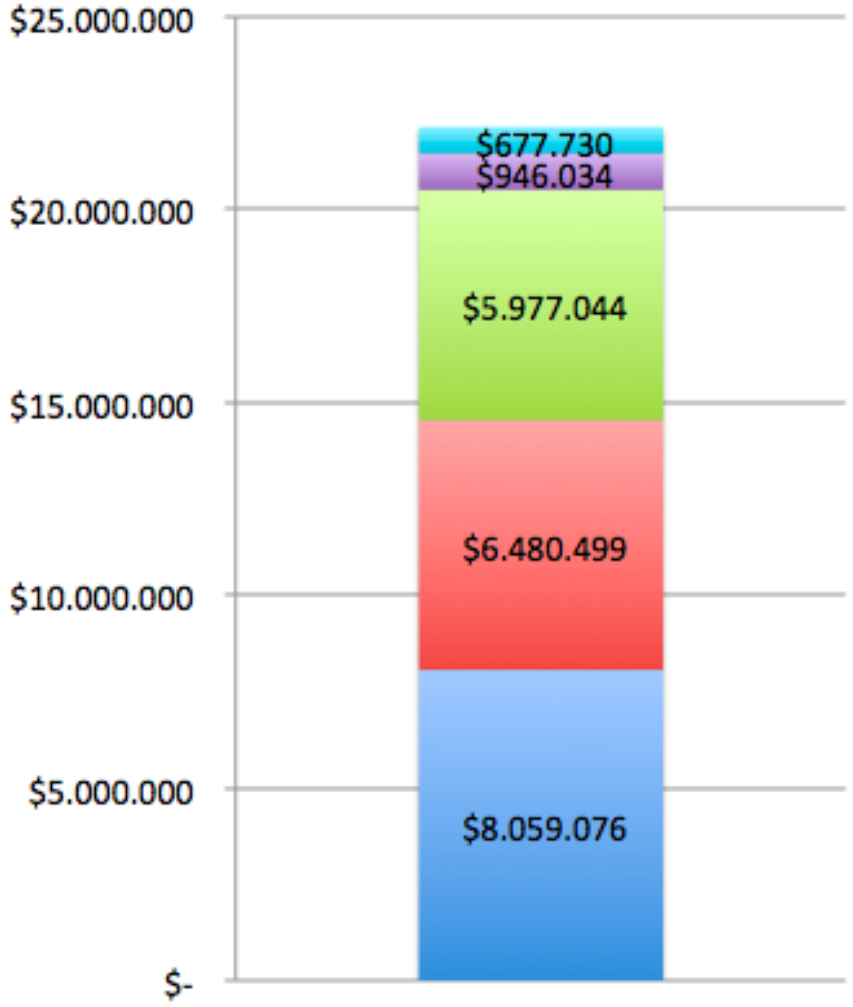


- 30% private equity
- same O+M cost

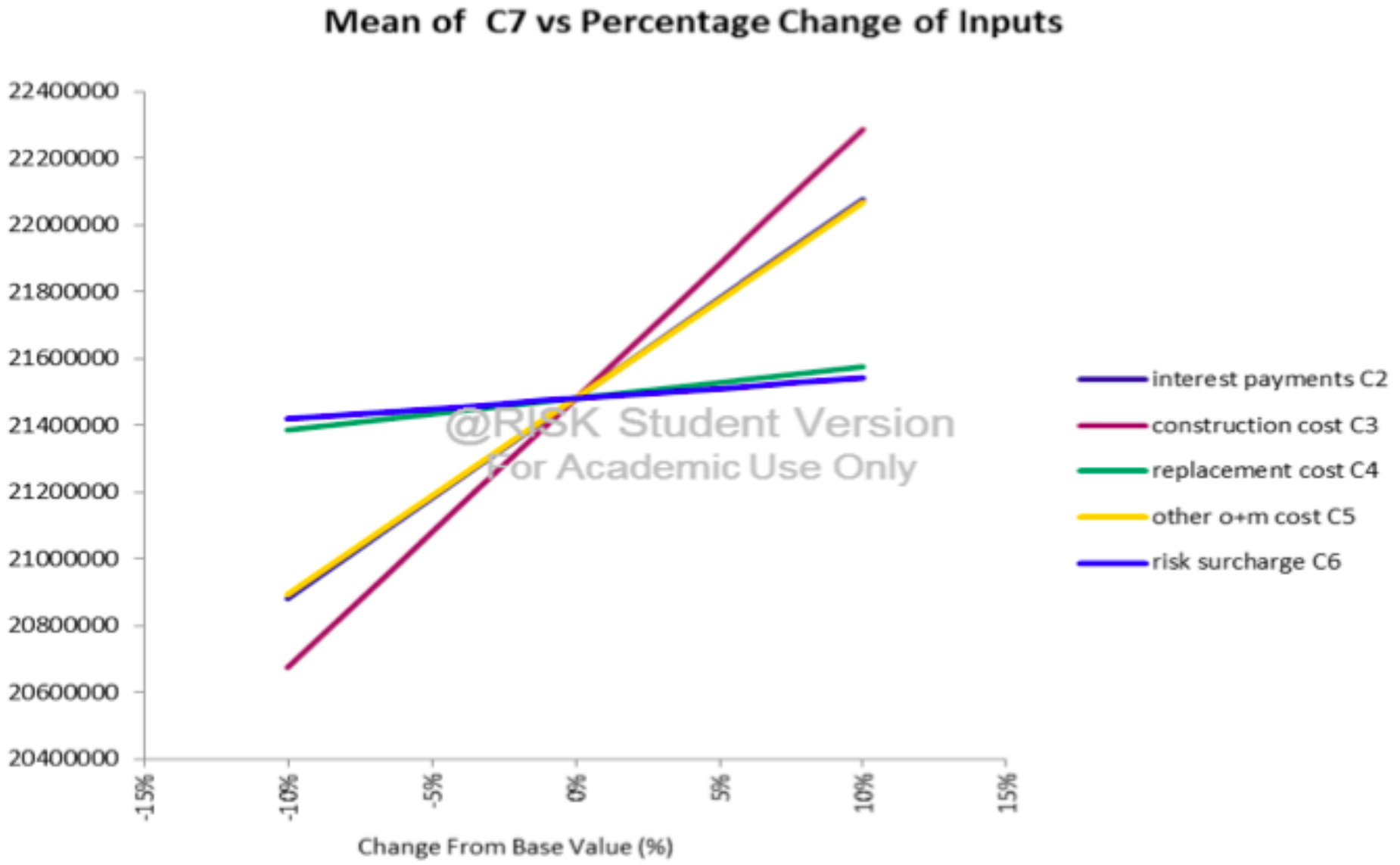
- same building cost
- without any management fees

LIFE CYCLE COST

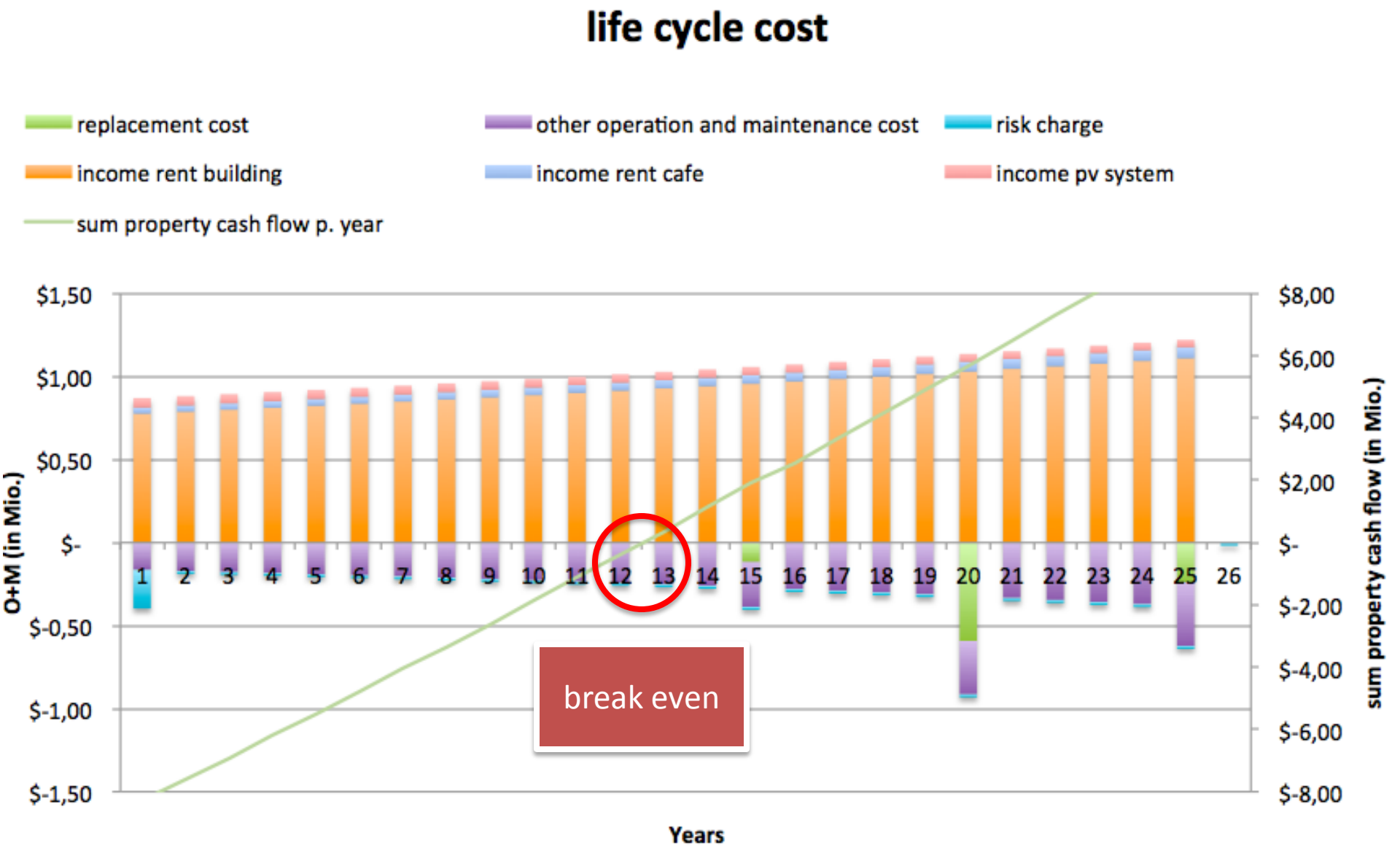




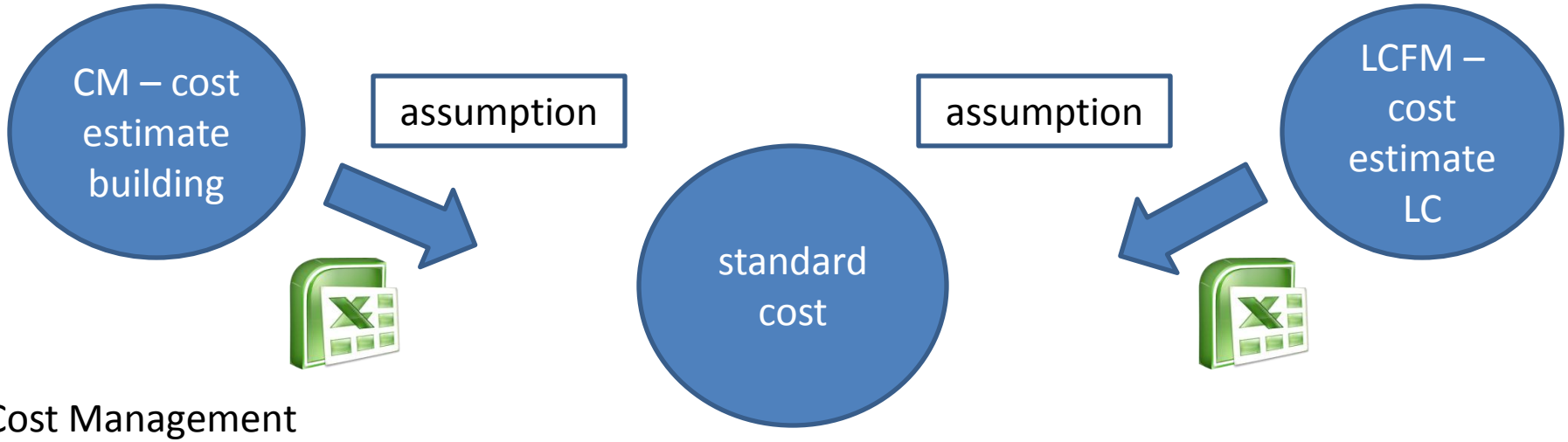
SENSITIVITY OF TOTAL LCC



CASH-FLOW LCC



RISK MANAGEMENT – MAIN PROCESS



Cost Management

Risk Management

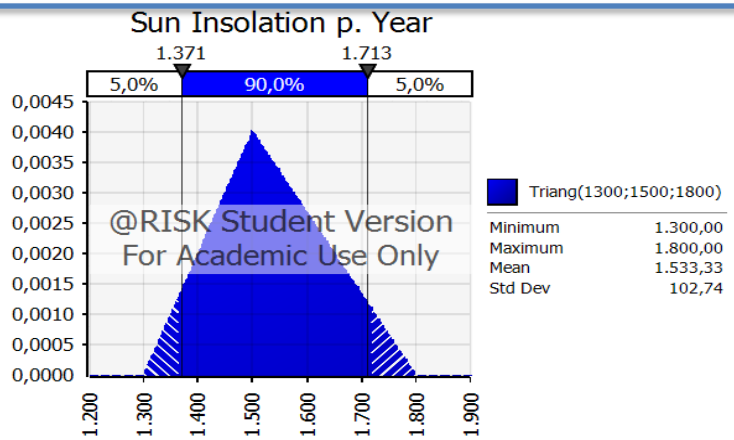
statistical distribution of assumption

most likely cost

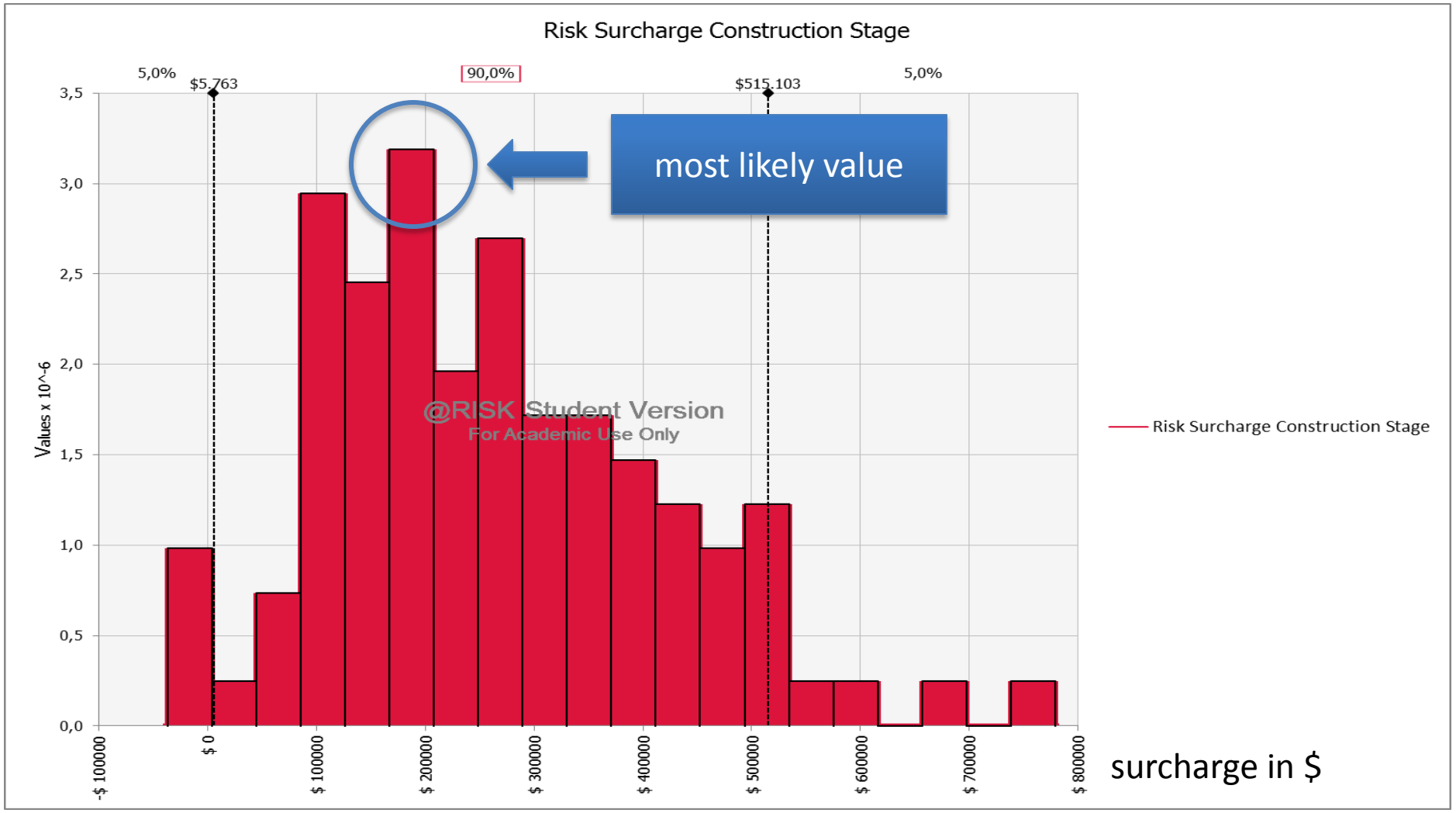
safety for client and SPV

Evolver

@RISK



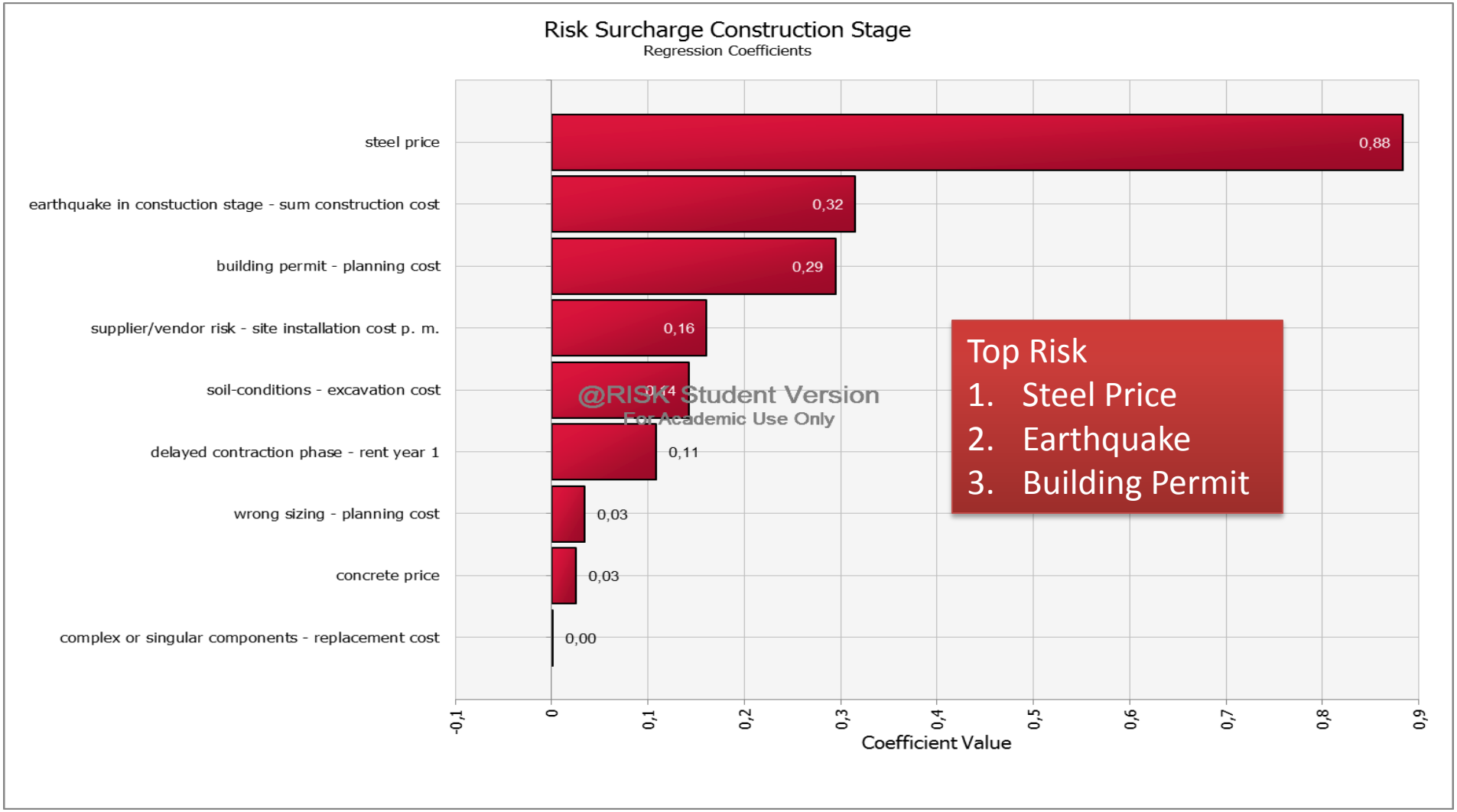
RISK MANAGEMENT – SURCHARGE



Risk Surcharge $ 231.585

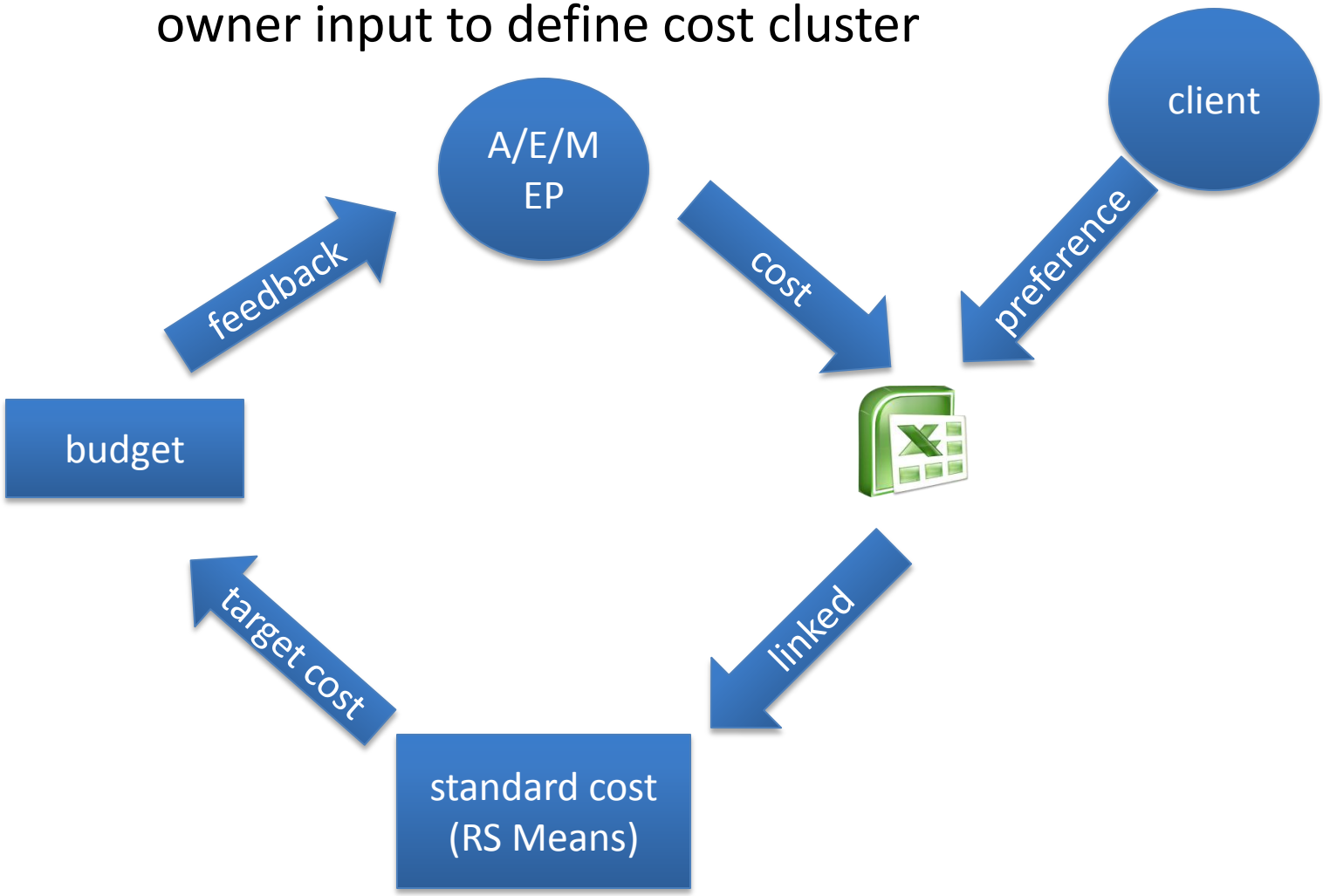
RISK MANAGEMENT – RESULTS IMPACT

LCFM



Risk Surcharge $ 231.585

VALUE FOR MONEY - TVD



VALUE FOR MONEY - TVD

challenge: distribute clients preference into cost cluster

		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

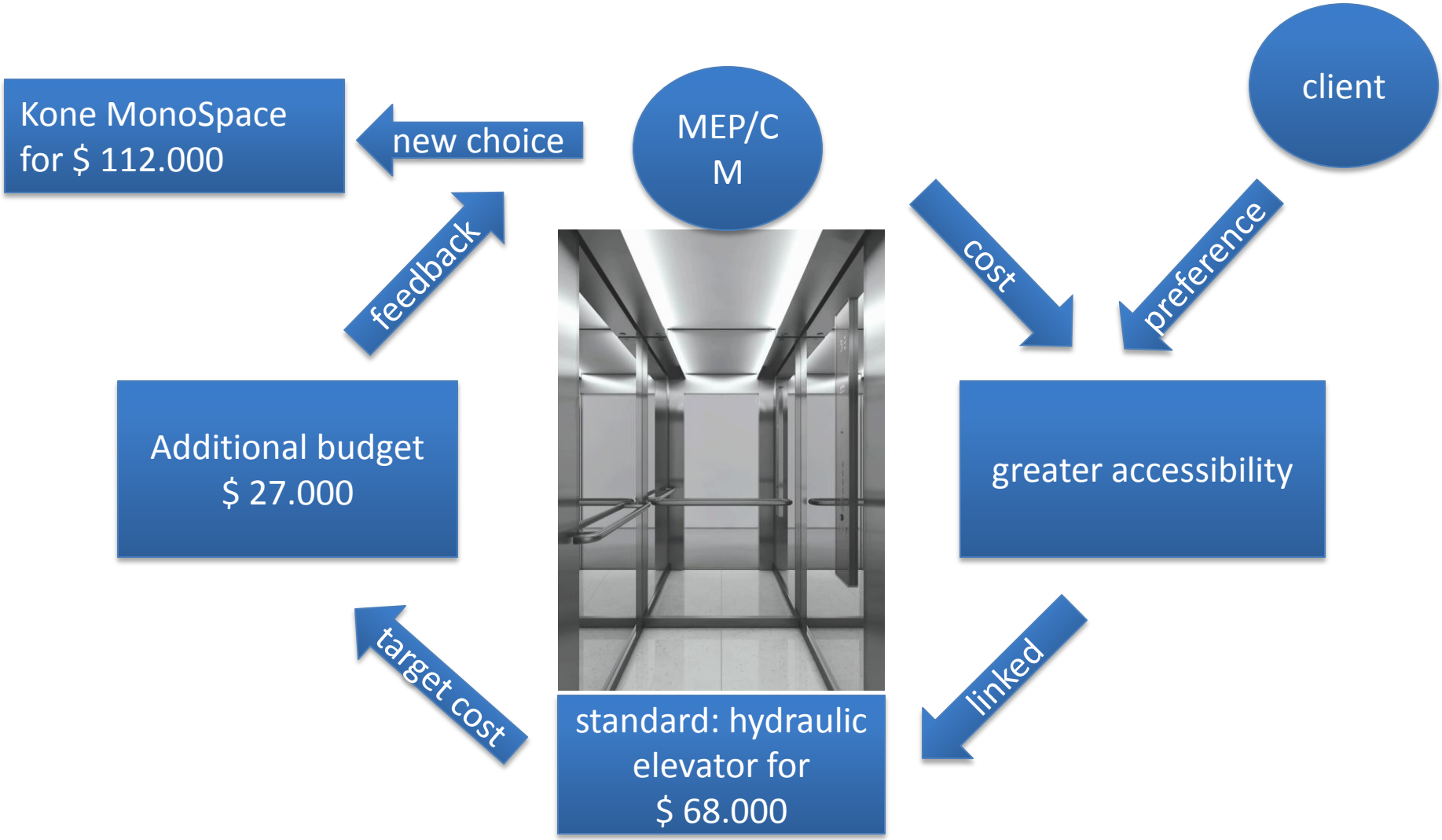
	averg
facade design	5
room design/quality	6
circulation area design	3
space efficiency	

CLIENT WEIGHTED CLUSTER - RESULT

	cluster	standard cost/target cost for cluster	in %	owners preference	in %	additional budget	difference
			D/D21	matrix			
B20	Exterior Enclosure	$ 1.102.946,00	19%	16,95	17,0%	$ 254.250,00	0,916
C10	Interior Construction	$ 469.395,00	8%	18,275	18,3%	$ 274.125,00	2,319
C30	Interior Finishes	$ 345.110,00	6%	9,275	9,3%	$ 139.125,00	1,601
D10	Conveying	$ 68.858,00	1%	1,775	1,8%	$ 26.625,00	1,536
D20	Plumbing	$ 78.560,00	1%	1,65	1,7%	$ 24.750,00	1,251
D30	HVAC	$ 331.414,00	6%	9,125	9,1%	$ 136.875,00	1,640
D40	Fire Protection	$ 122.500,00	2%	5,6	5,6%	$ 84.000,00	2,723
D50	Electrical	$ 851.500,00	14%	10,175	10,2%	$ 152.625,00	0,712
E10	Equipment	$ 22.707,00	0%	3,675	3,7%	$ 55.125,00	9,642
E20	Furnishings	$ 62.910,00	1%	2,4	2,4%	$ 36.000,00	2,273
G20	Landscaping Paving	$ 163.356,00	3%	2,175	2,2%	$ 32.625,00	0,793

sum all (RS Means)	$ 5.957.499,00	sum	$ 1.458.750,00

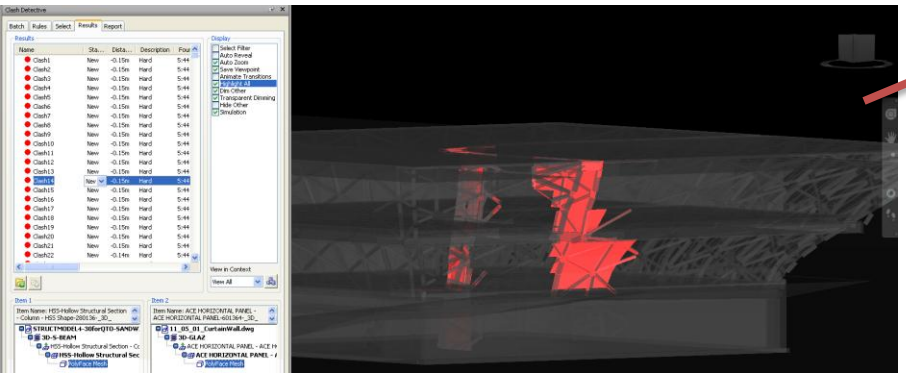
TVD – EXAMPLE


Kone MonoSpace
for $ 112.000
new choice
MEP/C
M
client
feedback
cost
preference
Additional budget
$ 27.000
greater accessibility
target cost
linked
standard: hydraulic
elevator for
$ 68.000

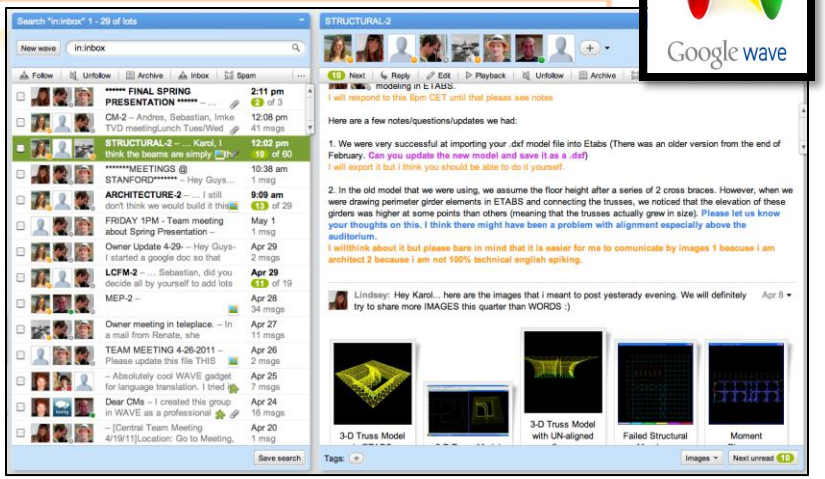
TEAM PROCESS COORDINATION

****Smaller increments of coordination are better for Feedback****

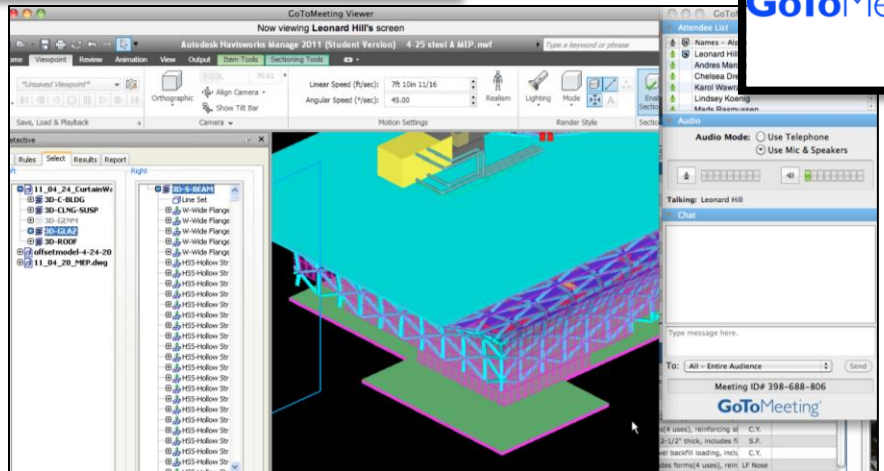
WHAT???? – I can't believe….



Could you look at this…



Let's resolve this…



LESSONS LEARNED

"If you think something is going to take one hour… plan on four"
-Chelsea

"The success of an avant-garde design lies in the trials of infinite iterations"
- Lindsey

"On design - steal from the best, and invent the rest"
- Marina

"You will get only as much as others want to give you"
-Karol

"If we have to learn from them, they have to learn from us…"
-Sebastian

"If experience is the sum of the mistakes made, this course has made us all very experienced."
-Mads

"Honest efforts to do your best have to be their own reward"
- Imke

"You must compromise"
- Andres

THANK YOU!

Renate Fruchter
Joanna Huey
Dimitra Loannidou
Glenn Katz

Björn Wündsch
Matthias Ehrlich

Willem Kymmell
Humberto Cavallin
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Jan Słyk

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