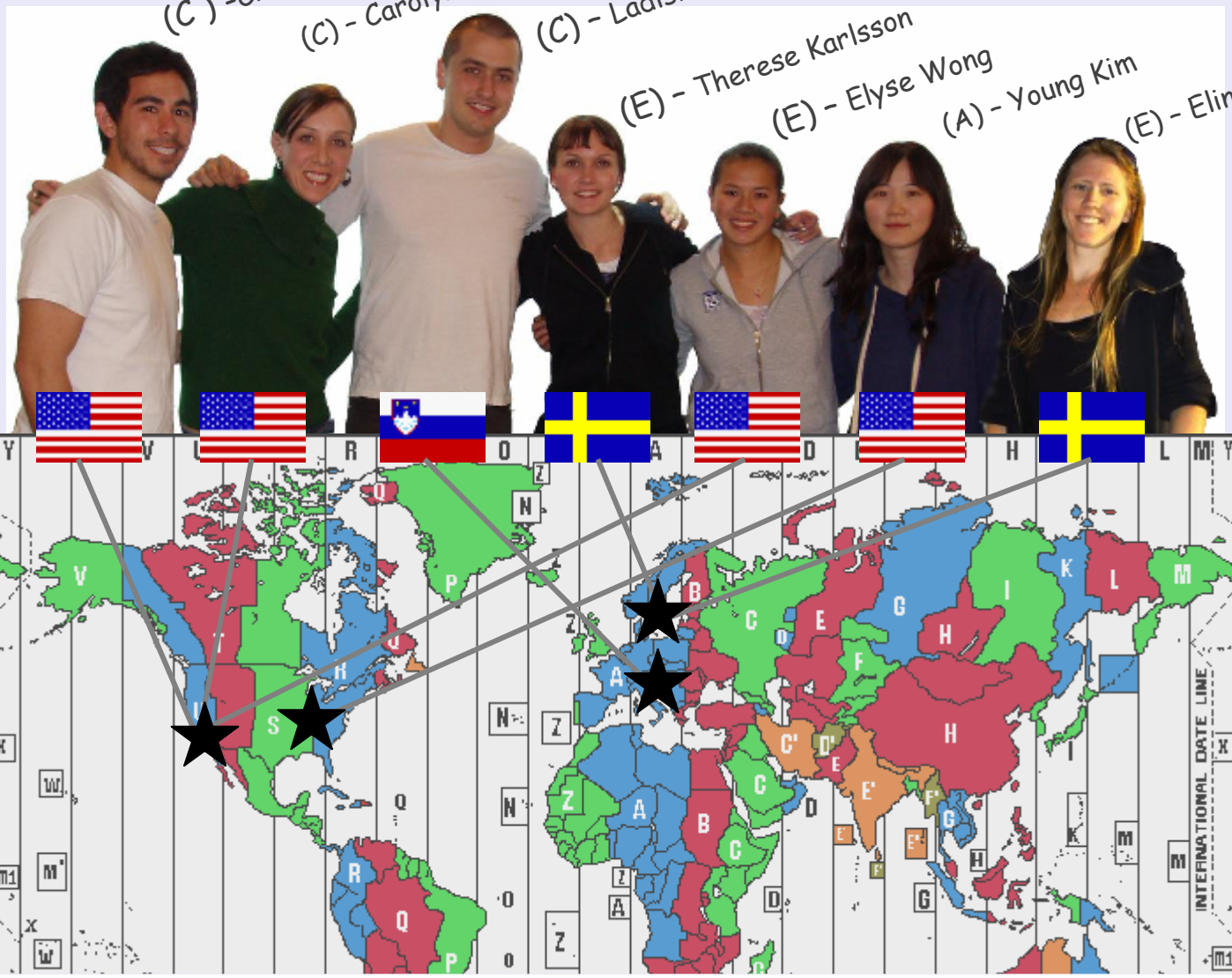
PACIFIC TEAM

A – Young Kim
E - Elina Wetterblad
Elyse Wong
Therese Karlsson
C - Carolyn Galayda
Chris Hall
Ladislav Klinc

The Team



Owners:
Hans Verhay
& Eric Borchers

Time difference:

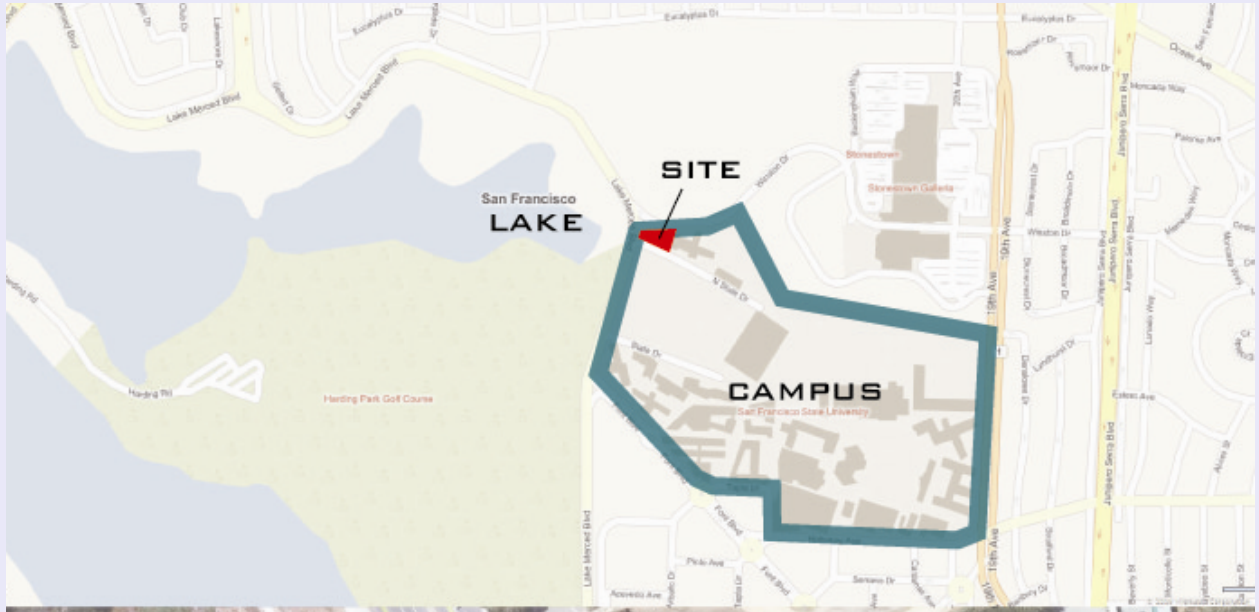
Palo Alto 11 am

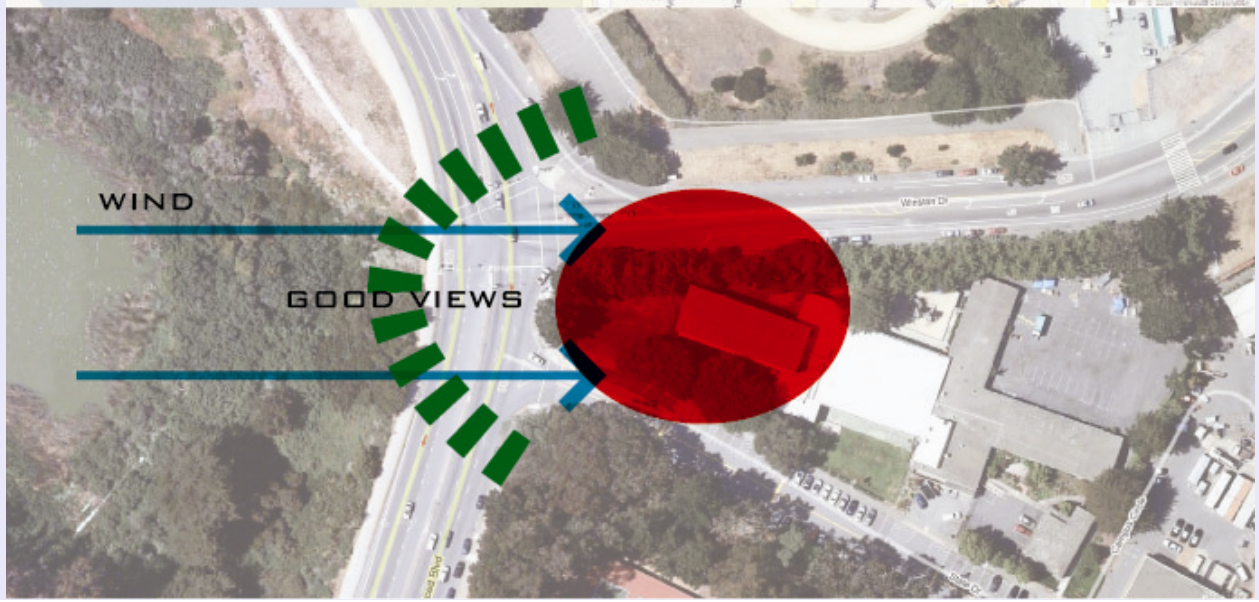
Georgia 2 pm

Ljubljana 7 pm

Stockholm 7 pm

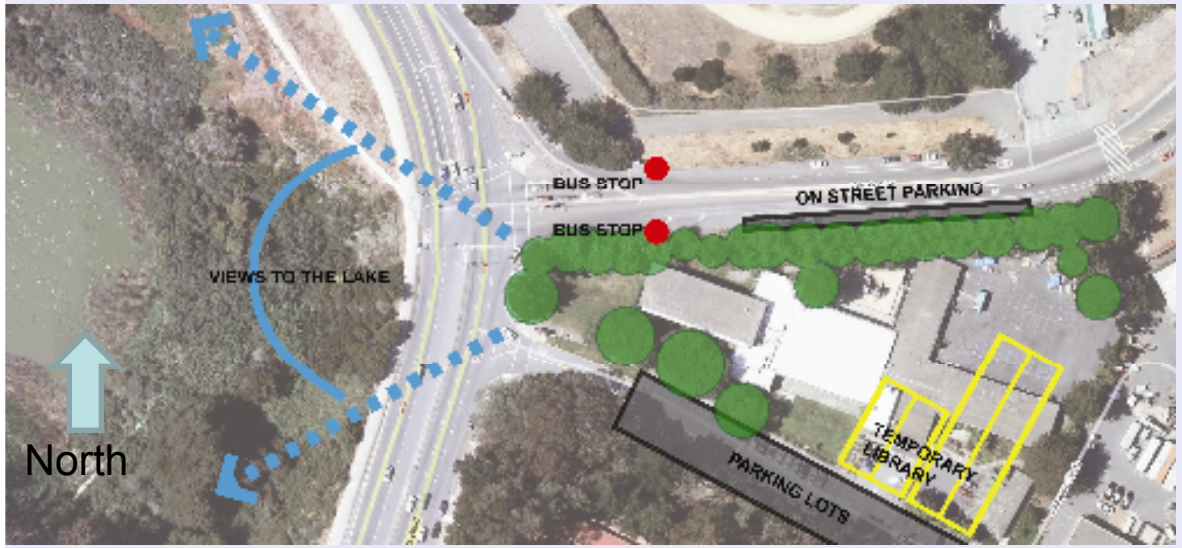
Project Site-SFSU



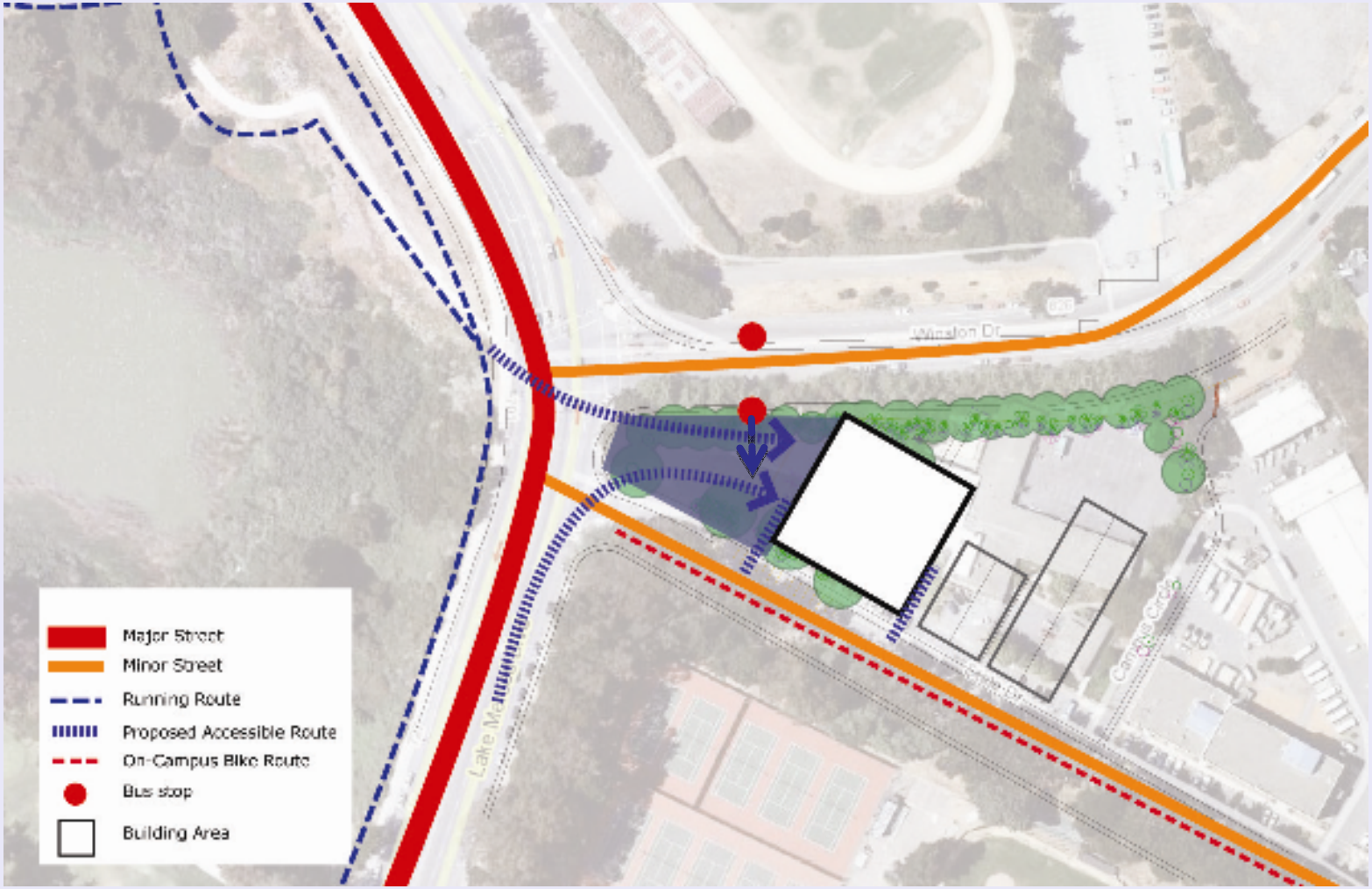


North

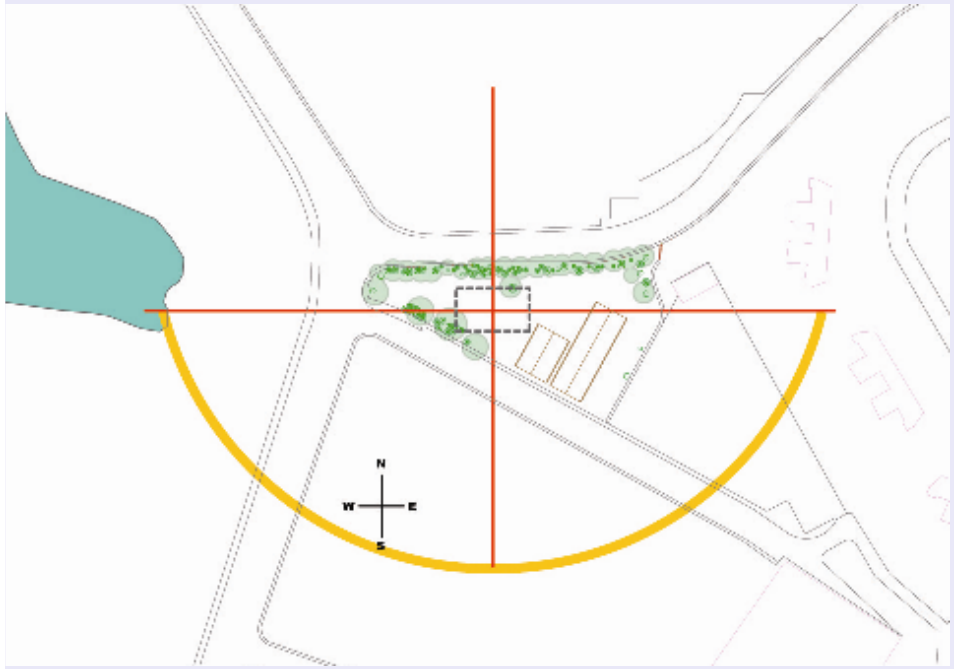
Existing Conditions



Proposed Access

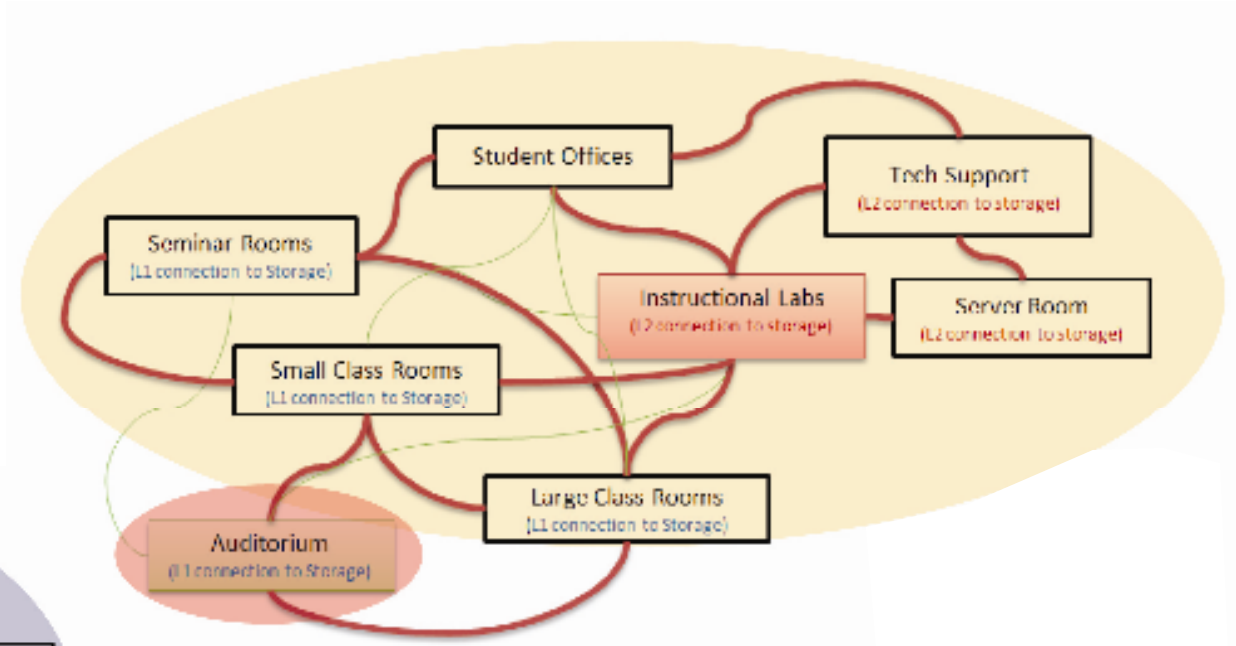


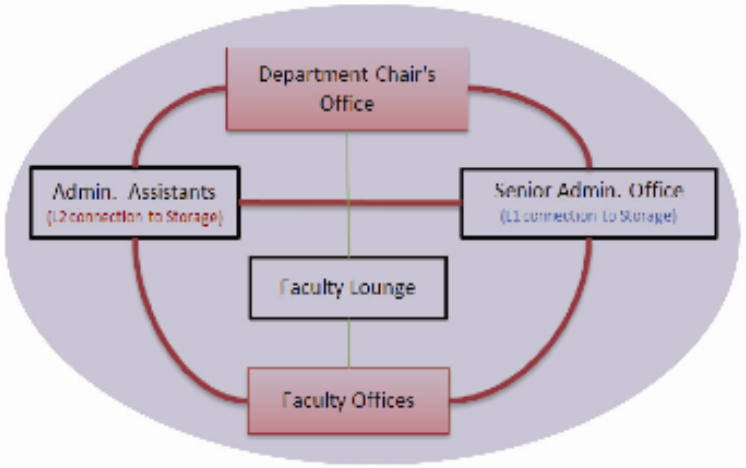
Proposed Orientation



North

Spatial Affinities





Student Space

Faculty Space

Visitor Space

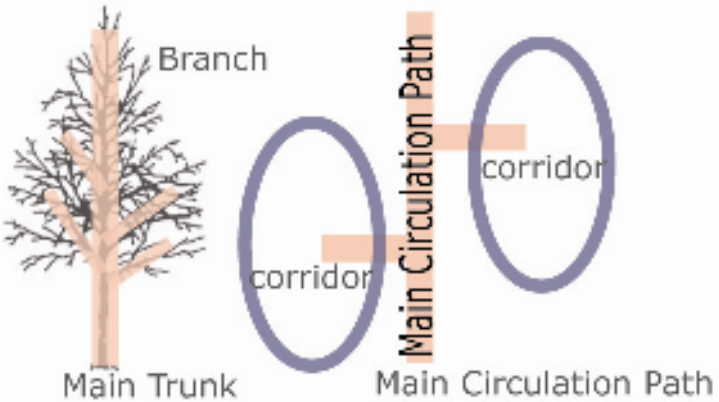
- High Security
- Medium Security
- Low Security
- L2 Affinity
- L1 Affinity

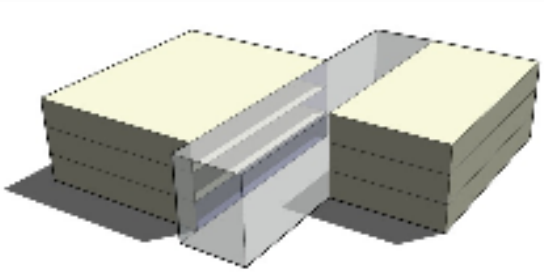
ARCHITECTURE

- 1st Concept

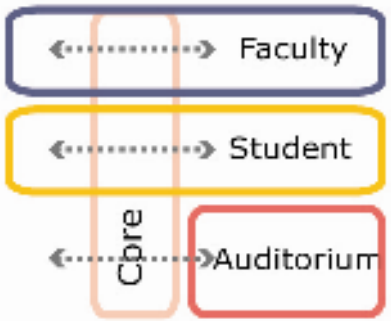
First Architectural Concept

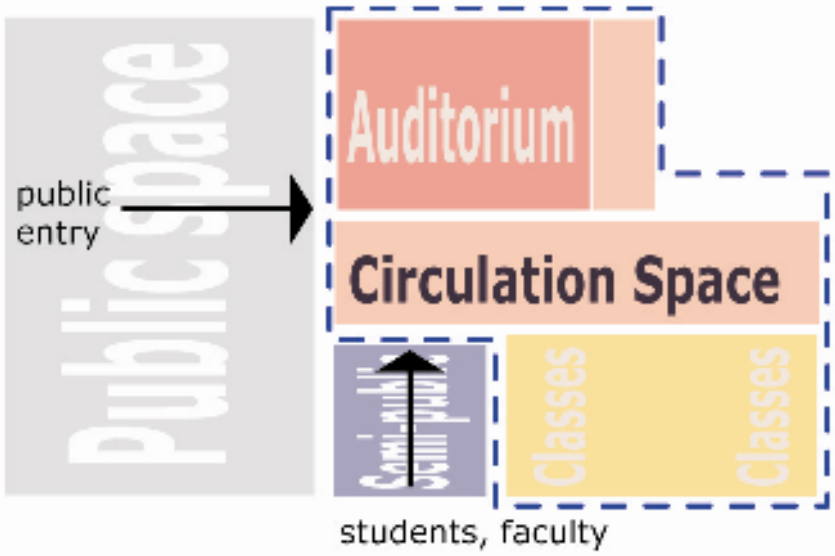
Mass Concept



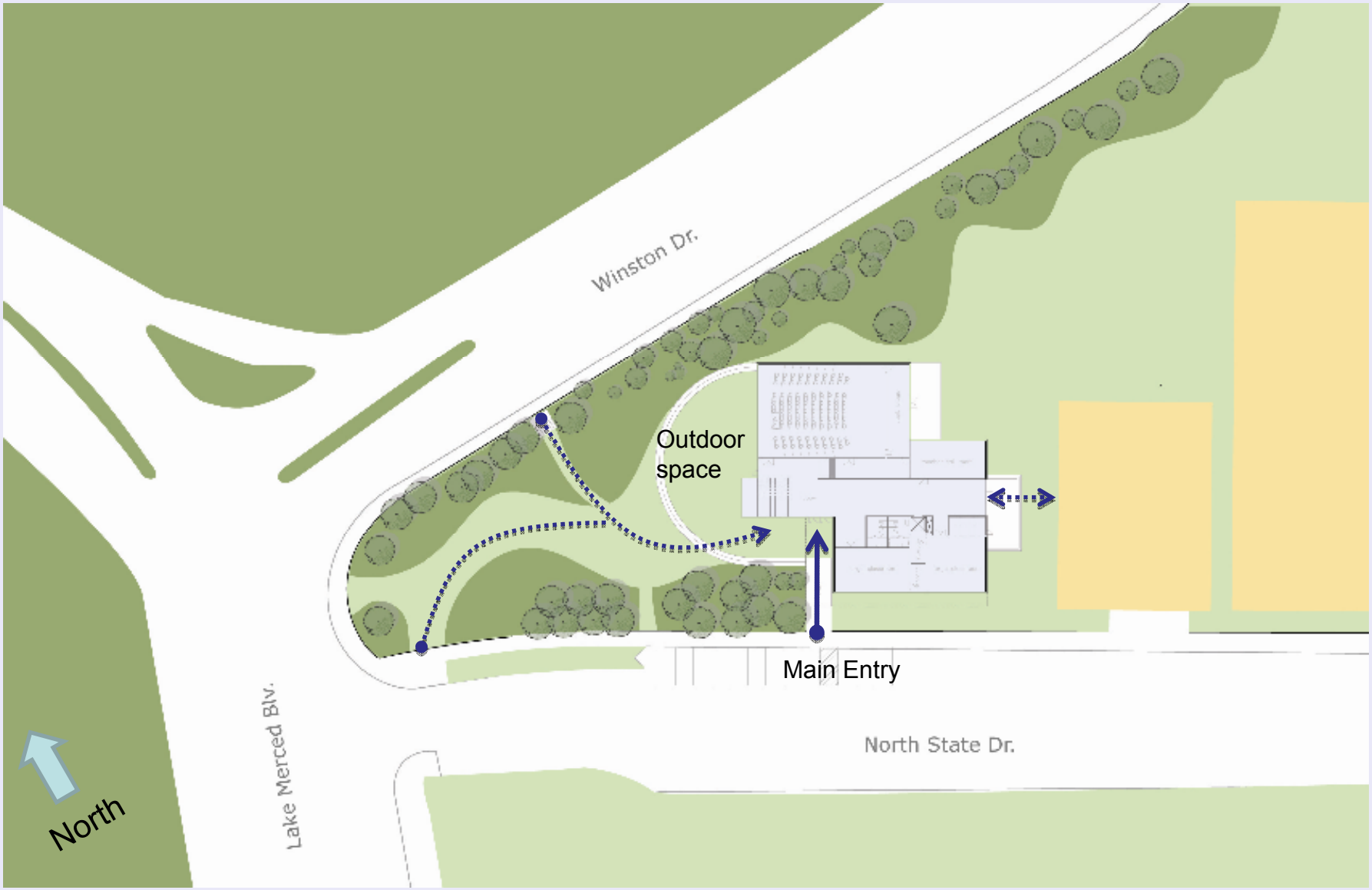


Program Layout

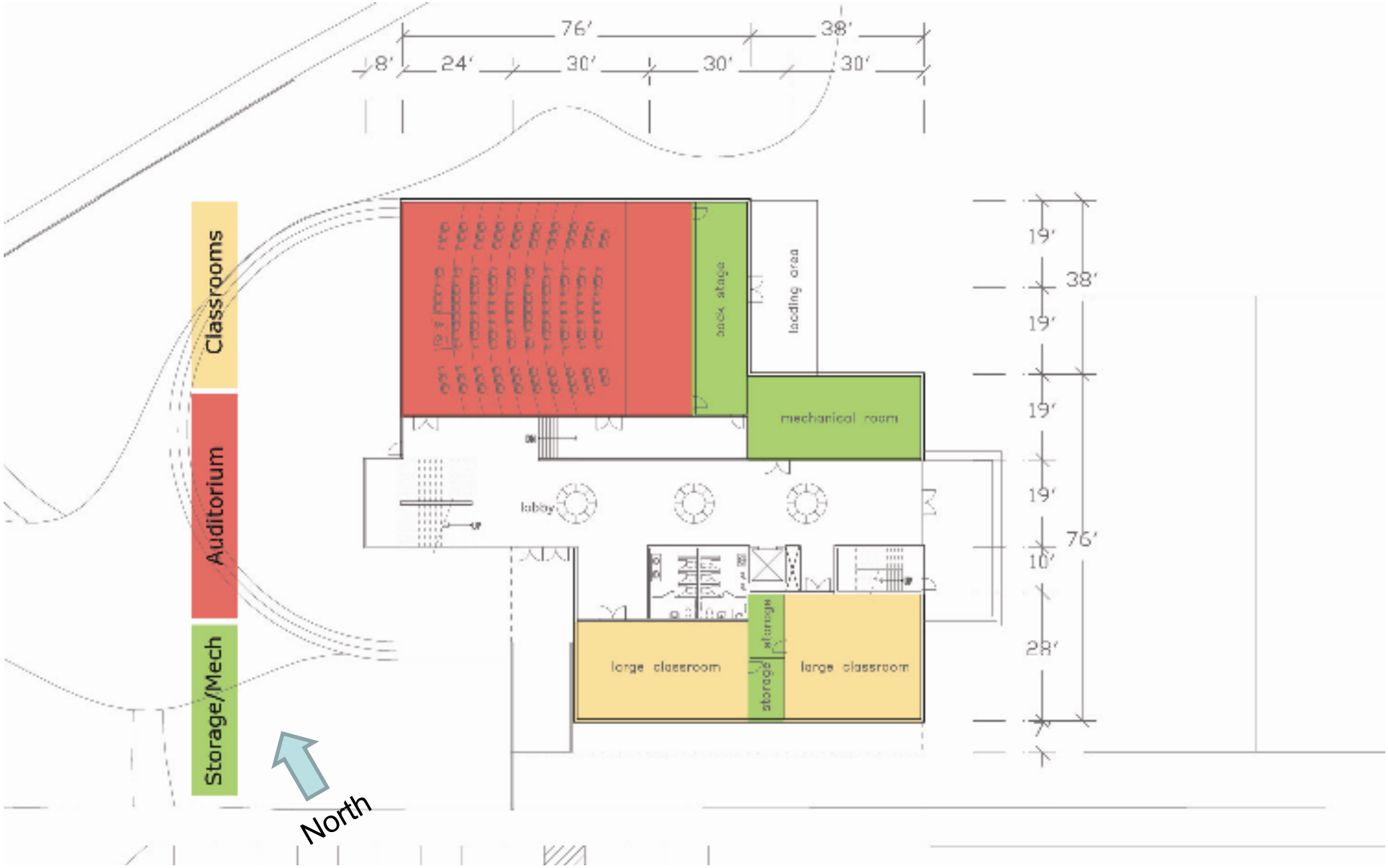




Site plan


Winston Dr.
Outdoor space
Main Entry
North State Dr.
Lake Merced Blv.
North

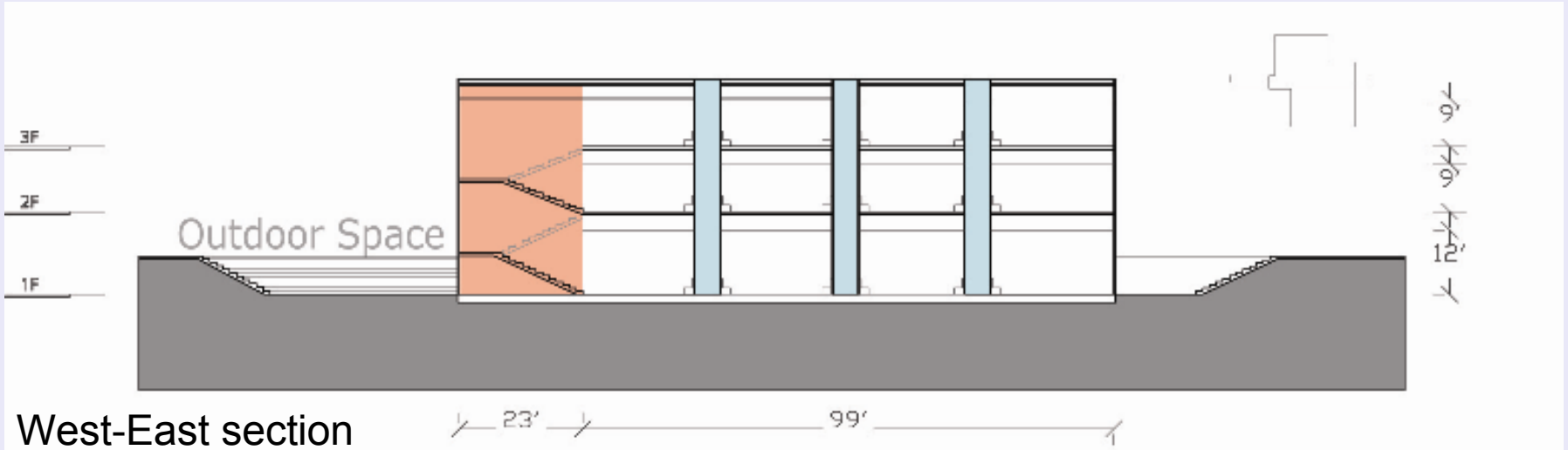
First Floor Plan



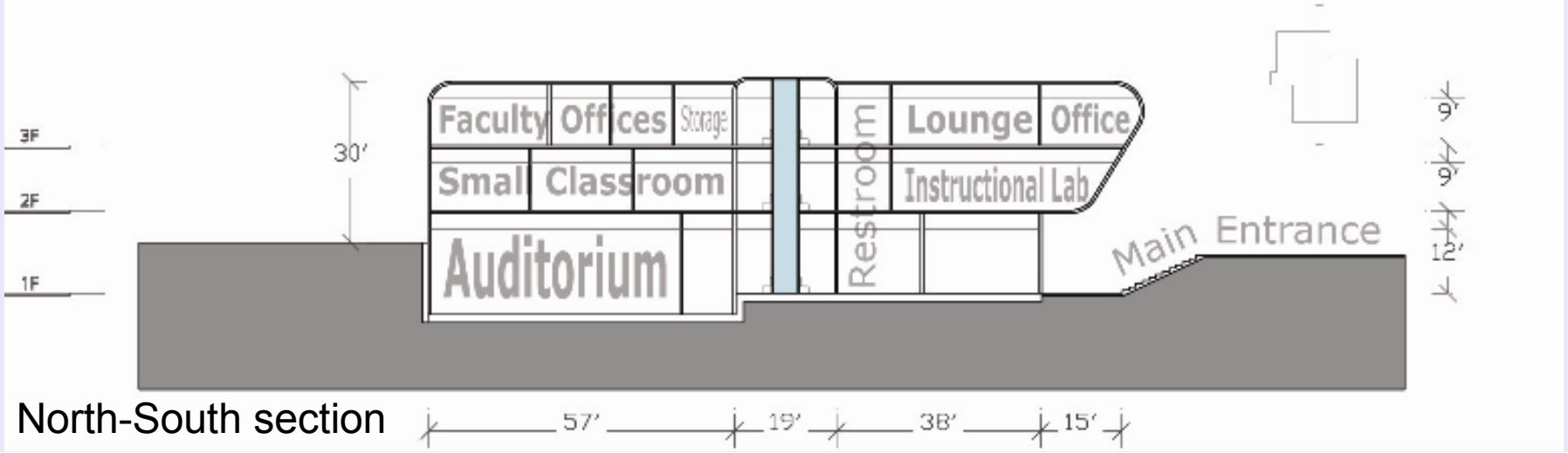
Second Floor plan

Third Floor plan

Section



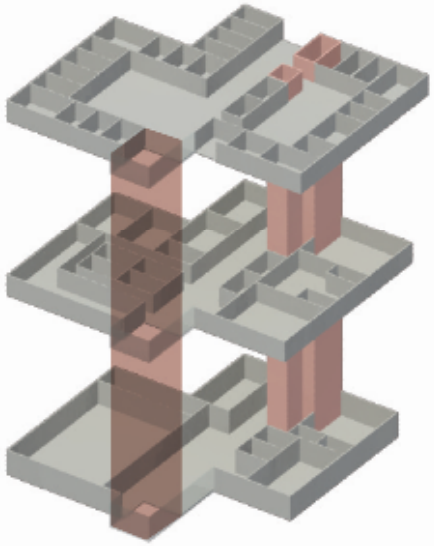
West-East section



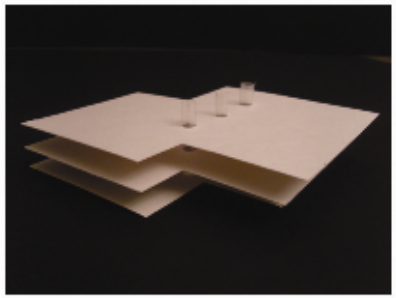
North-South section

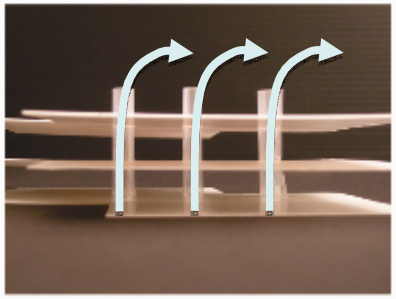
Vision

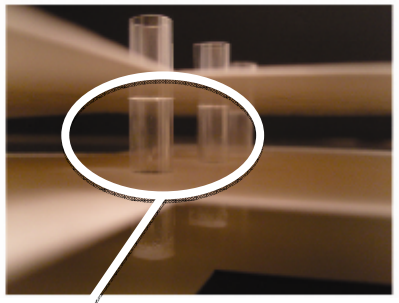
Vertical Circulation

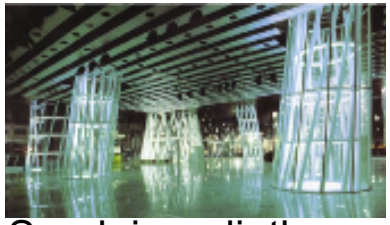


Concept Model

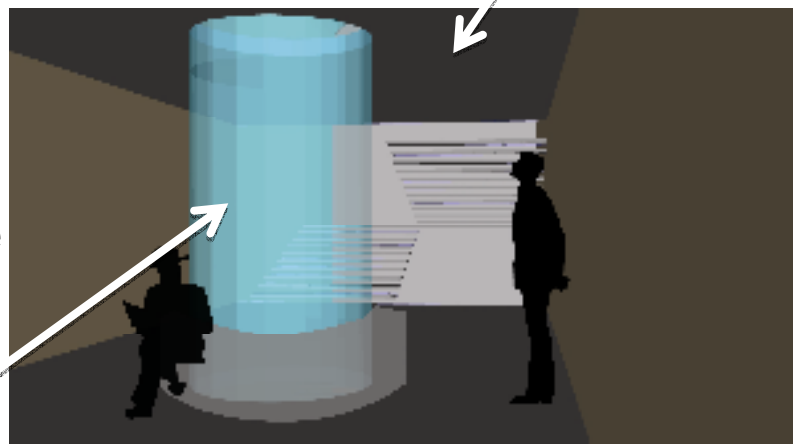








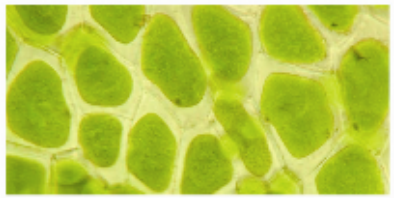
Sendai mediatheque

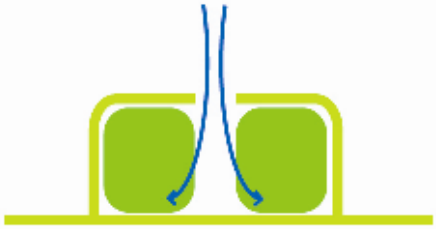


Interactive screen

Hallway view

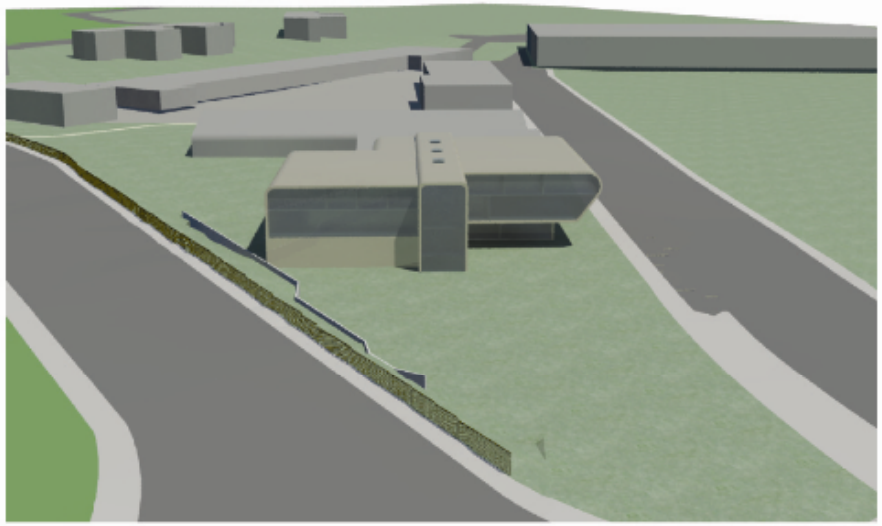
Facade Design Concept



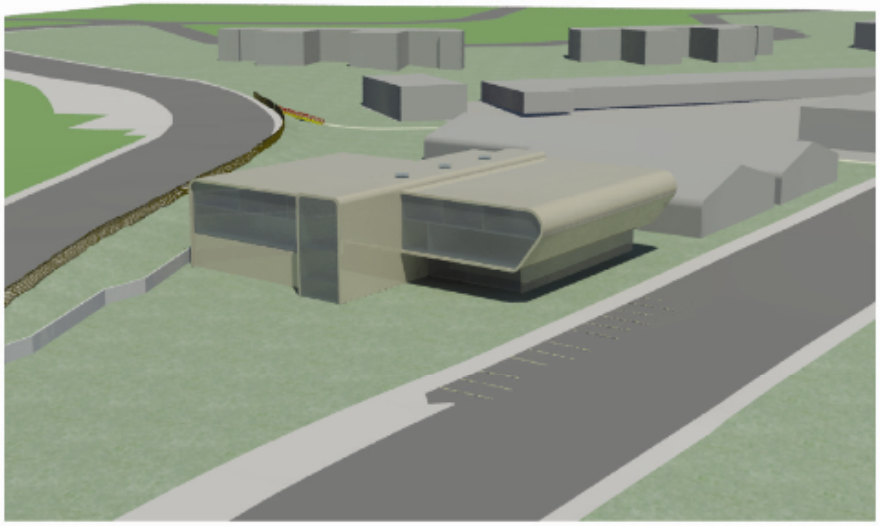


3D views

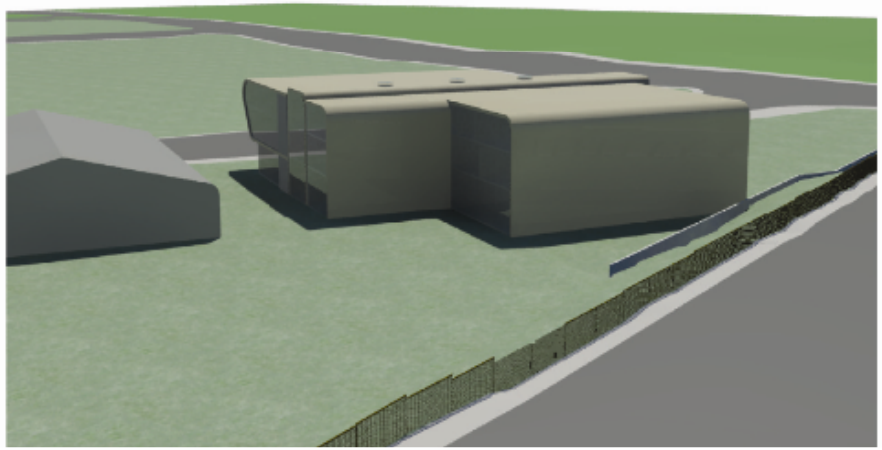
West side view



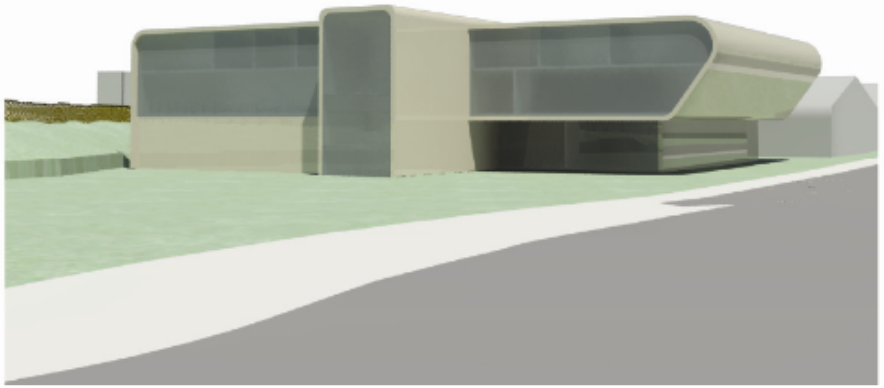
South- west side view



North side view



South-west side view



ENGINEERING

- First Concept
  - Loading
  - Floor Layouts
  - Lateral Systems
  - Foundation

Gravity Loading

per ASCE 7-05

Dead Load

MEP	4 psf
Ceiling	6 psf
Partitions	20 psf
Steel Framing	15 psf
Concrete Elements	20 psf
Roof	20 psf
Cladding	25 psf
Composite Floor Deck	46 psf
Concrete P-T slab	150 psf

Live Load (per room type)

Offices	50 psf
Assembly area- fixed seats	60 psf
Classrooms	40 psf
Access floor systems	100 psf
Stairs and exit ways	100 psf
Corridors	100 psf
Roof	20 psf
Restrooms	50 psf

Lateral Loading

Importance Factor = 1.0

Occupancy Category III

Wind

Exposure C

Wind Velocity = 85 mph

Velocity pressure, $q_z = (0.00256V^2)K_zK_{zt}K_dI$

Design Wind pressure, $p = q_z(GC_p)$

Lateral Loading

Earthquake ⇨ Controls!!

Site Class D

Seismic Design Category D

$S_s = 2.02$, $S_1 = 1.083$

R = 8 (Special Steel Moment Resisting Frame, Buckling Restraining Brace Frame)

R = 6 (Special Reinforced Concrete Shear Wall)

Seismic Base Shear:

$$C_s = S_{DS} / (R/I)$$

$$V = C_s W$$

Lateral Load Distribution:

$$C_{vx} = (w_x h_x^k) / \sum (w_i h_i^k)$$

$$F_x = C_{vx} V$$

Load Combinations

1.2D + 1.6L

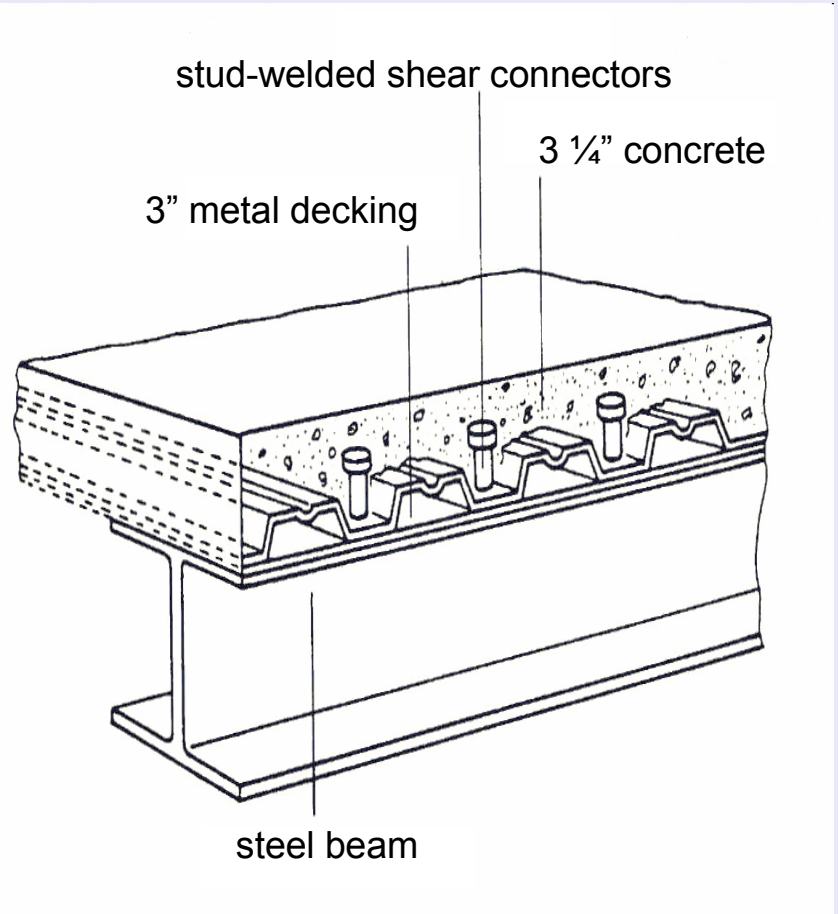
1.2D + 0.5L + 1.6W

$(1.2 + 0.2\ S_{DS})D + 0.5L + 1.0E$

→ 1.47D + 0.5L + 1.0E

0.9D + 1.0E

Composite Floor Deck



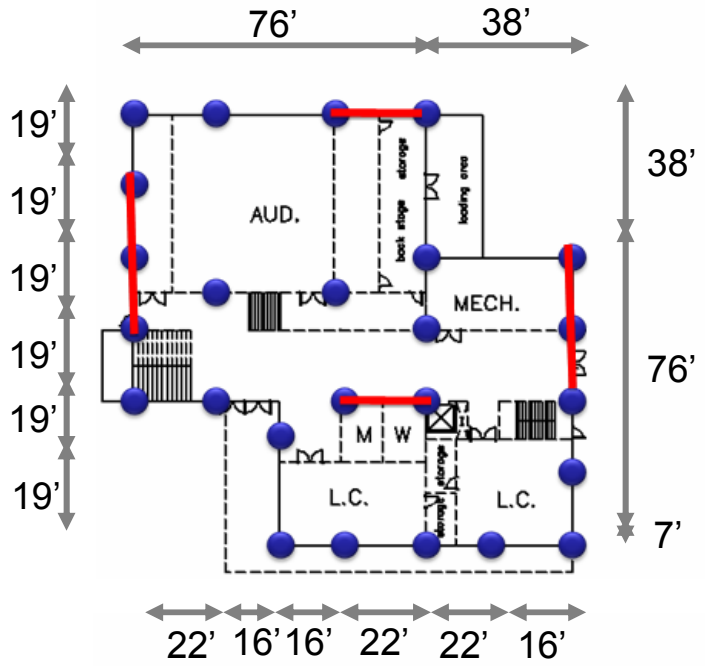
- Vulcraft 3VLI20
  - 3 ¼" concrete +3" metal deck = 6 ¼"total depth
  - Lightweight Concrete (110pcf)
  - 46 psf
  - 3-span
  - Max sheet length 42'

http://www.epitech.com.au/Composite_beam_construction_drawing.gif

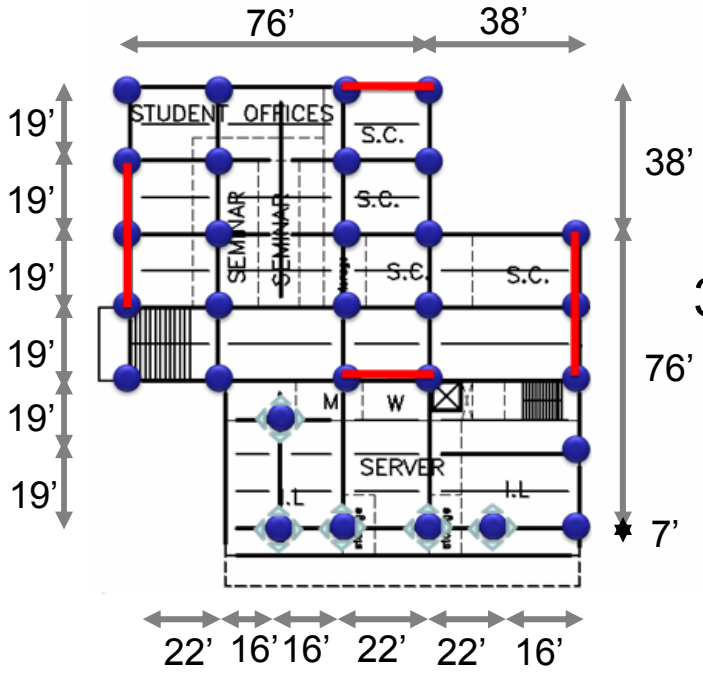
1st Arch - Buckling Restrained Braced Frame

BRBF
Cantilever
Steel Column
Moment Connection

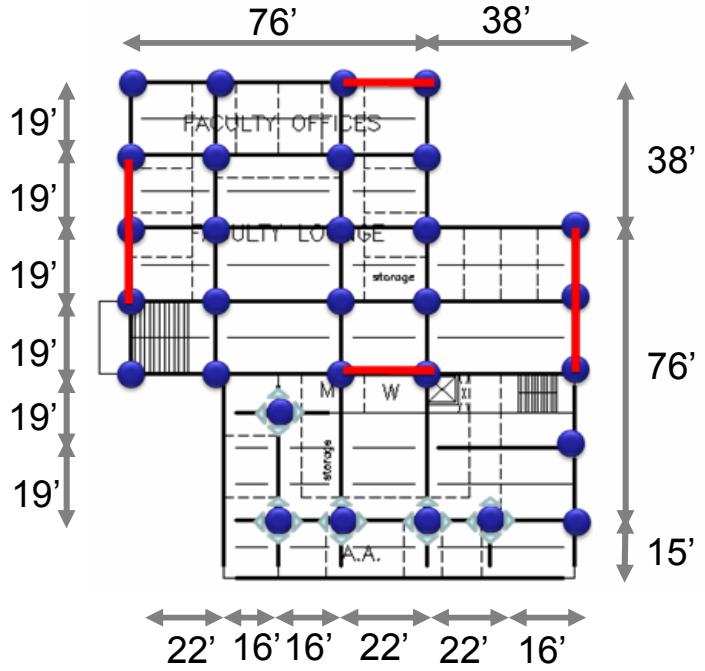
1st Floor



2nd Floor

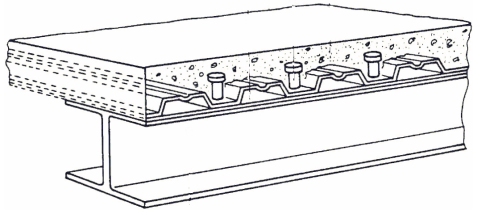


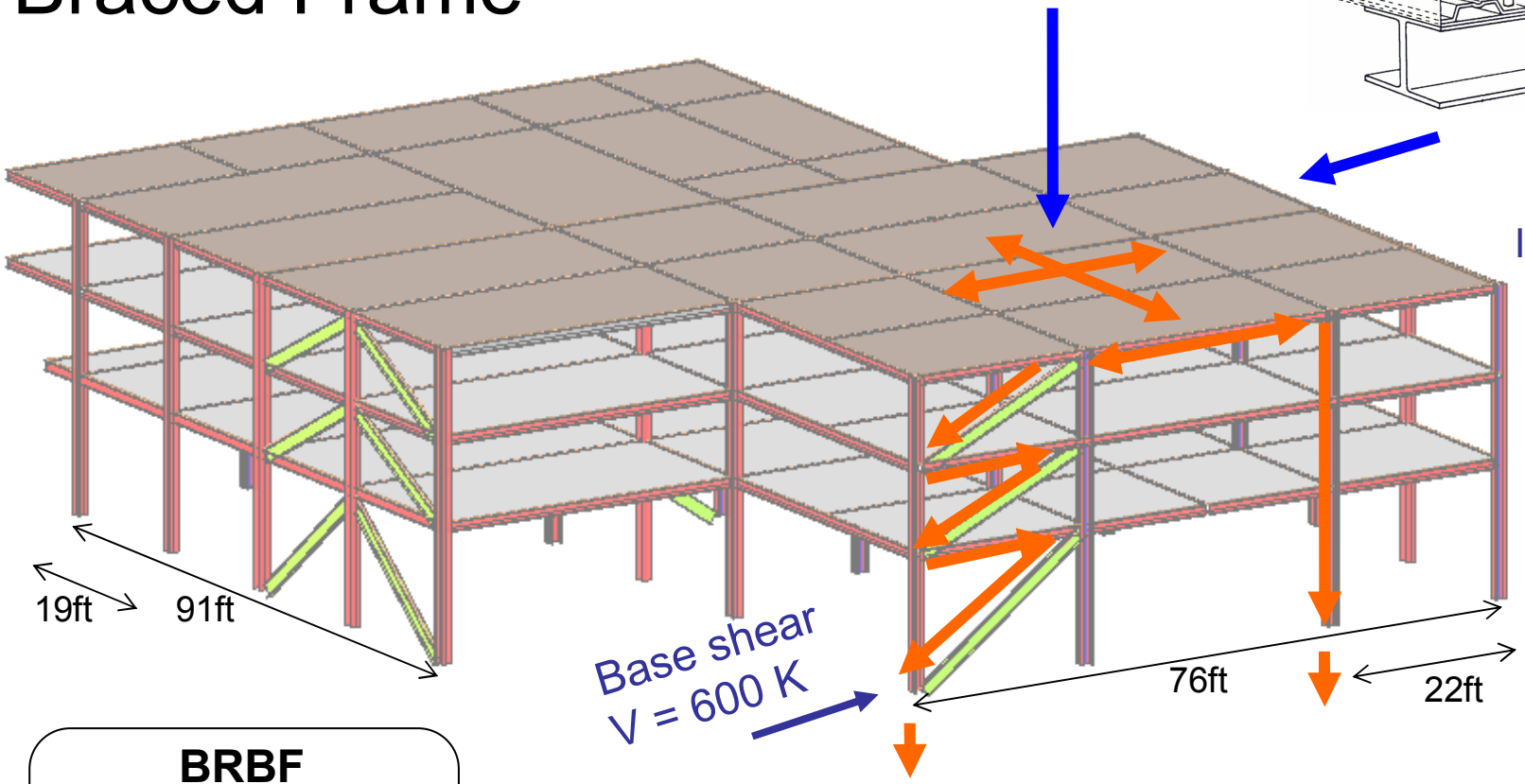
3rd Floor



1st Arch - Buckling Restrained Braced Frame

3VLI20 Vulcraft
Composite Floor Deck





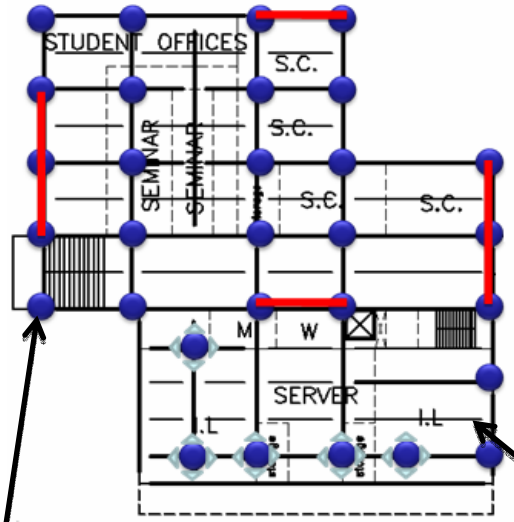
IDR_{max}= 0.005
Δ_{roof} = 1.75”

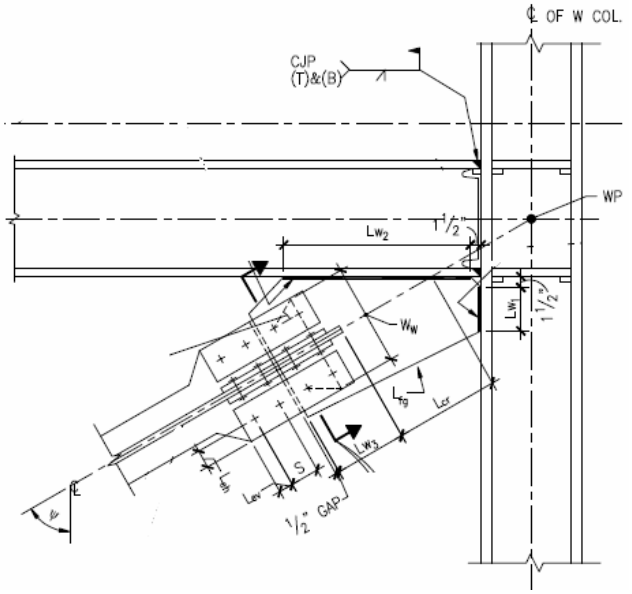
BRBF
Asc = 9 in²
Beams W18x60
Columns W14x109

Beams W21x182
Columns W18x119

Typical Connections

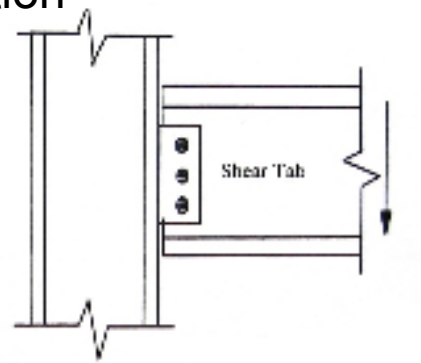
BRBF connection



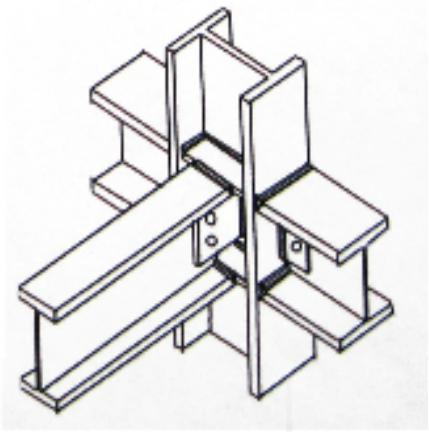


Steel Tips, 2004.

Beam-to-Column:
Shear connection



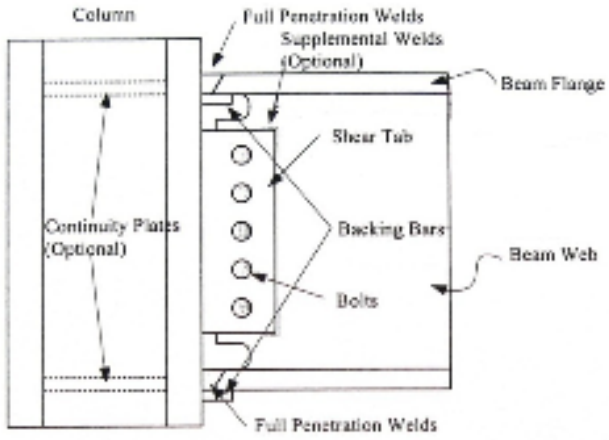
3-Way Joint Connection



Krawinkler, 2009.

1st Arch – Moment Resisting Frame

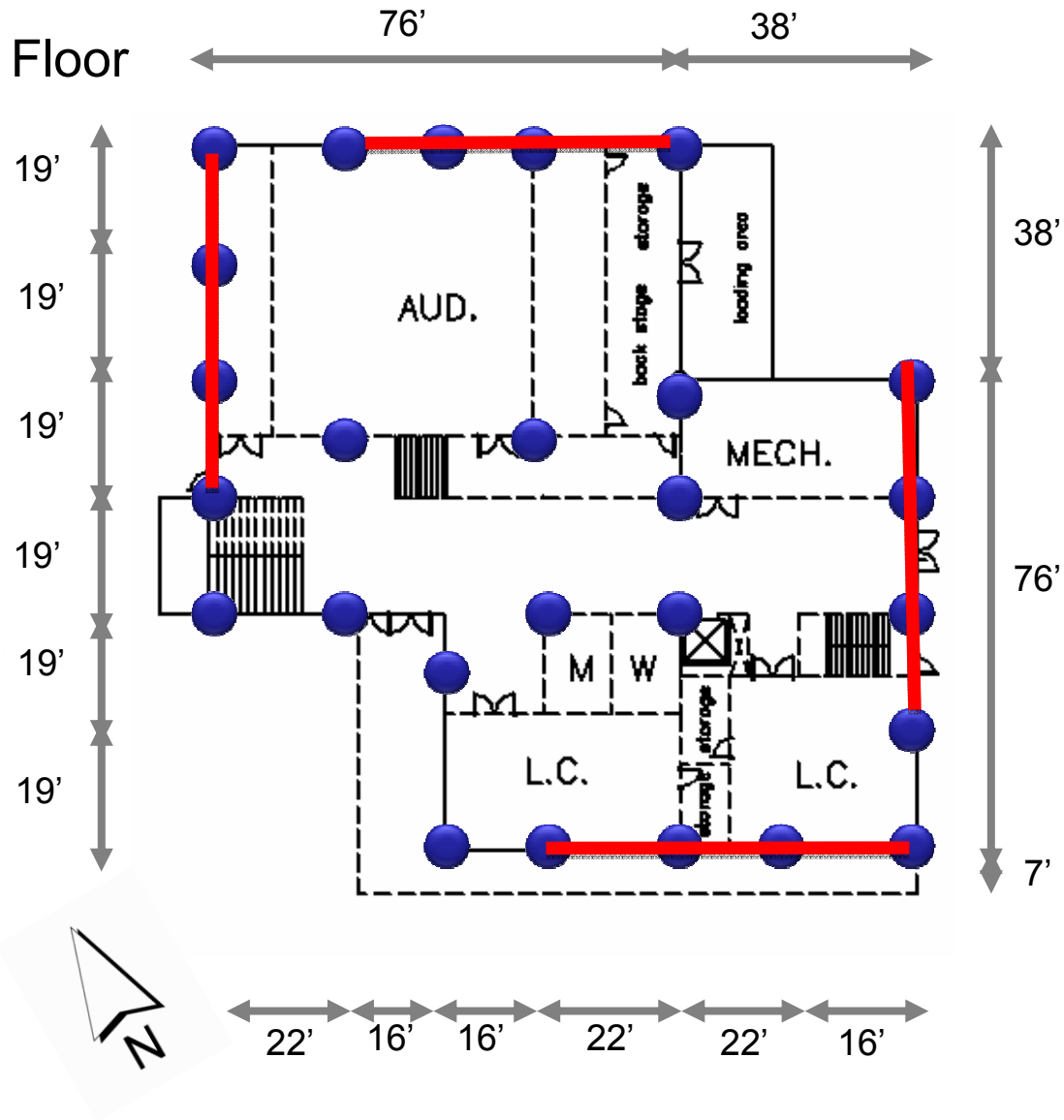
MRF connection



MRF

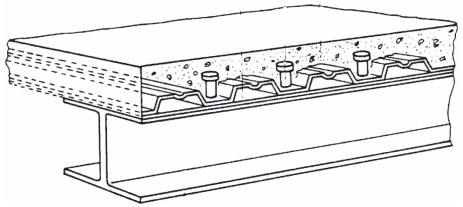
Steel columns

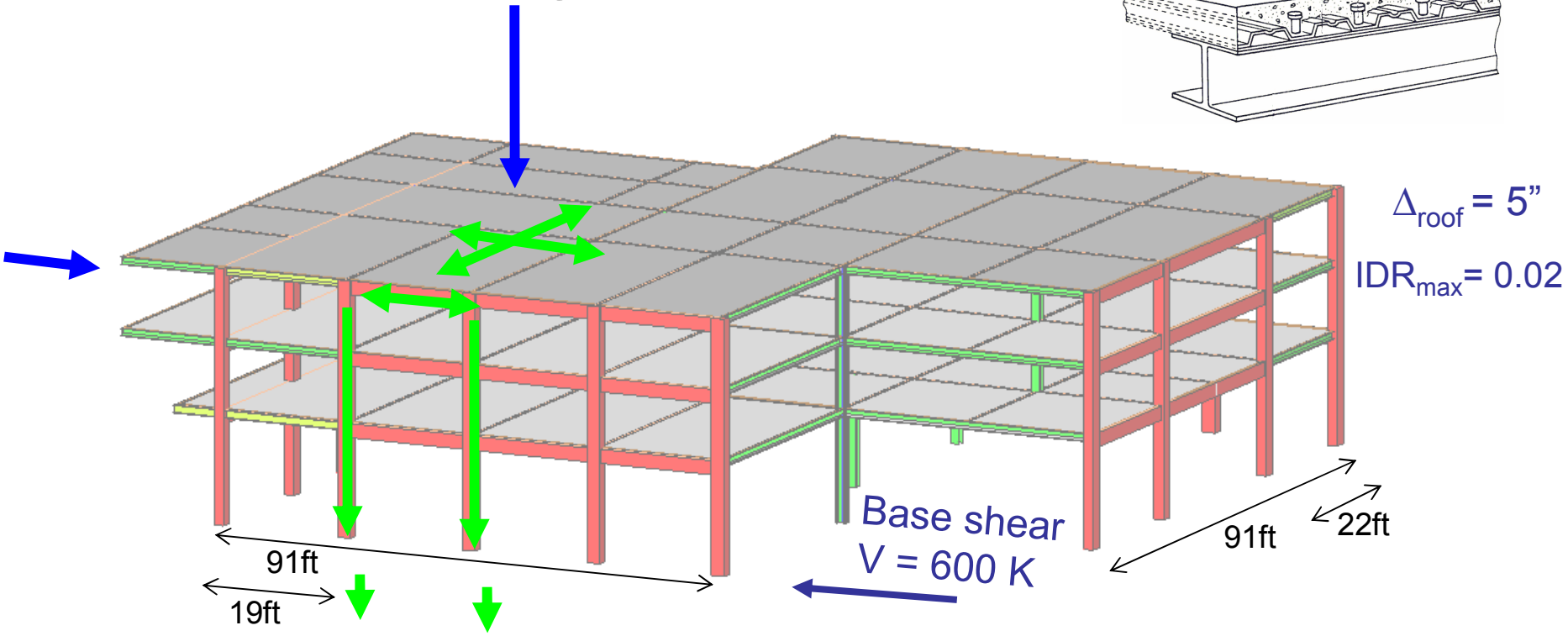
Cantilever



1st Arch -
Moment Resisting Frame

3VLI20 Vulcraft
Composite Floor Deck



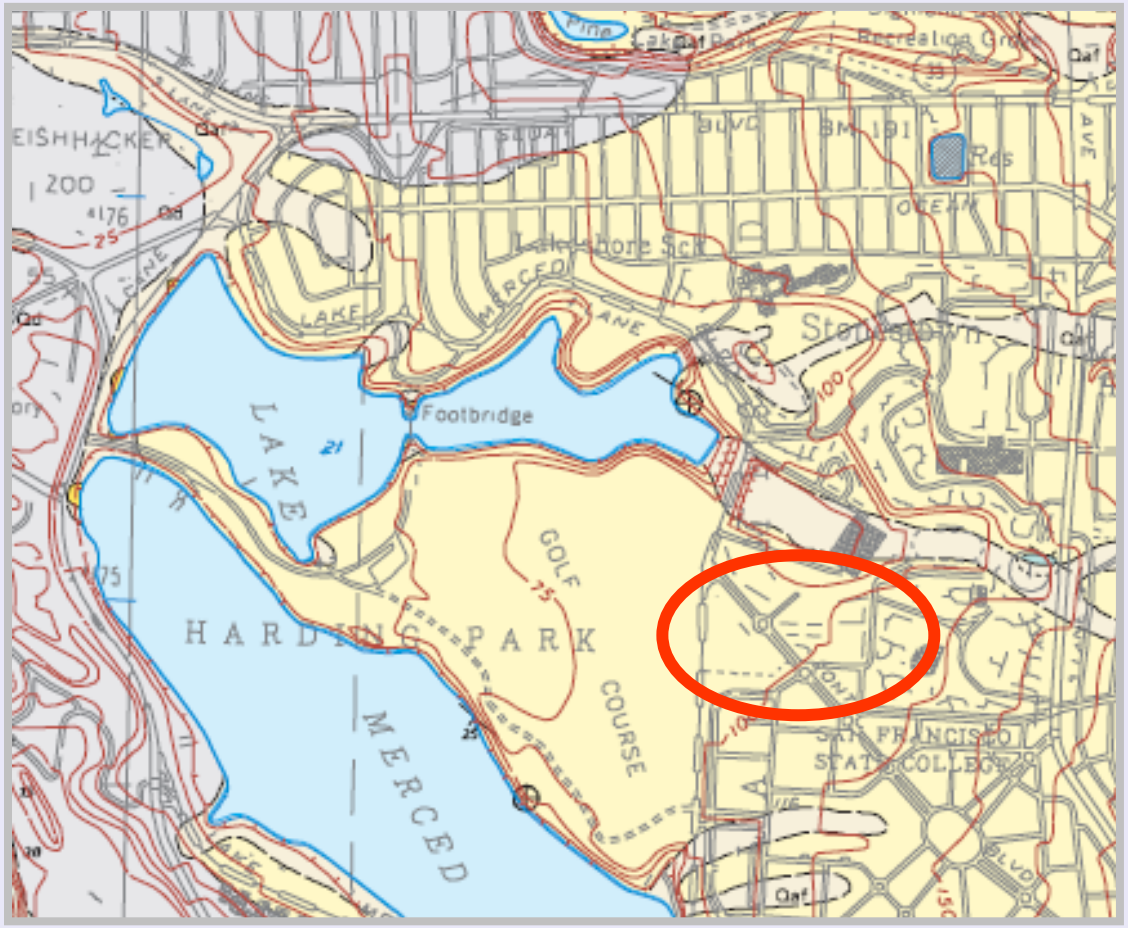


MRF
Beams W30x132
Exterior columns W24x146
Interior columns W24x207

Beams W21x182
Columns
W18x119

N

Soil information



Colma Formation

SP-SM

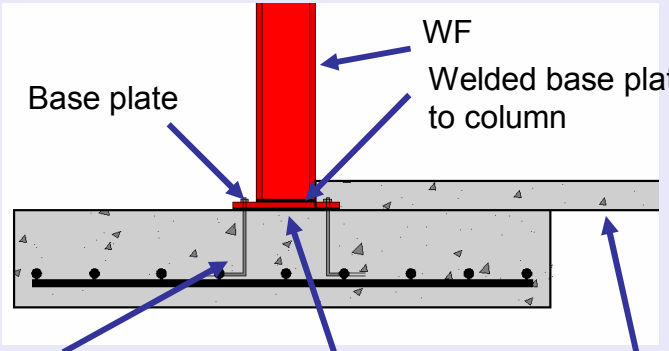
Bearing Capacity: 3500 psf

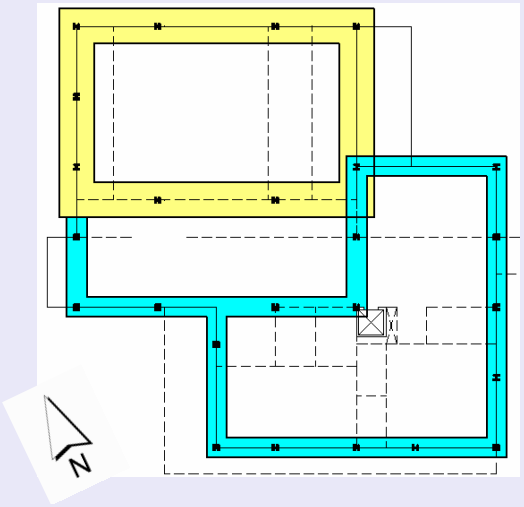
Next to Liquefaction Zone

Water Table: 14’

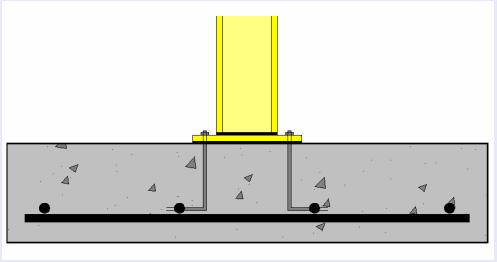
1st Arch – Strip Footing

f'_c: 6 ksi
f_s: 20 ksi





Total load: 33 kip/ft (480 kN/m)

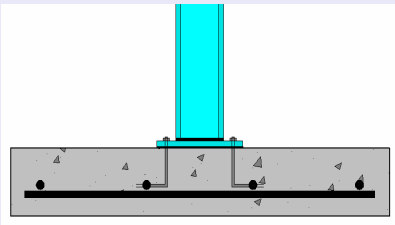


18 inch

9.4 Feet

Transverse: # 9 bar spacing 7.2 inch
Longitudinal: 4 bars # 9

Total load: 19 kip/ft (273 kN/m)



10 inch

5.3 Feet

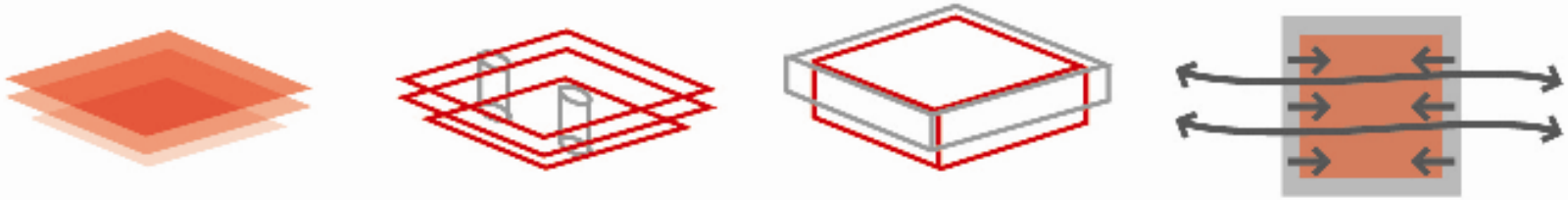
Transverse: # 6 bar spacing 7.7 inch
Longitudinal: 4 bars # 5

ARCHITECTURE

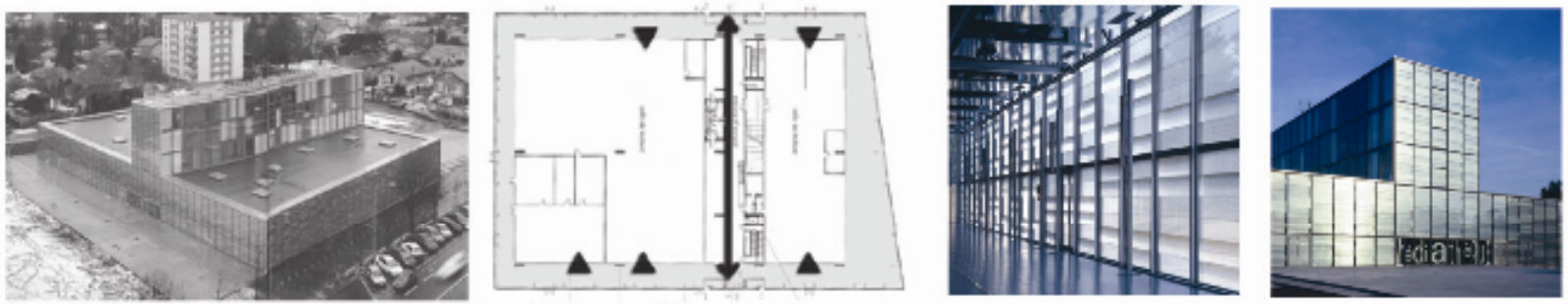
- 2nd Concept

Second Architectural Concept

Mass Concept

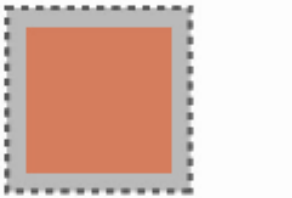


Precedent



Venissieux Mediatheque by Dominique Perrault

Learning process <-> Design



Ambiguous Boundary

Horizontally

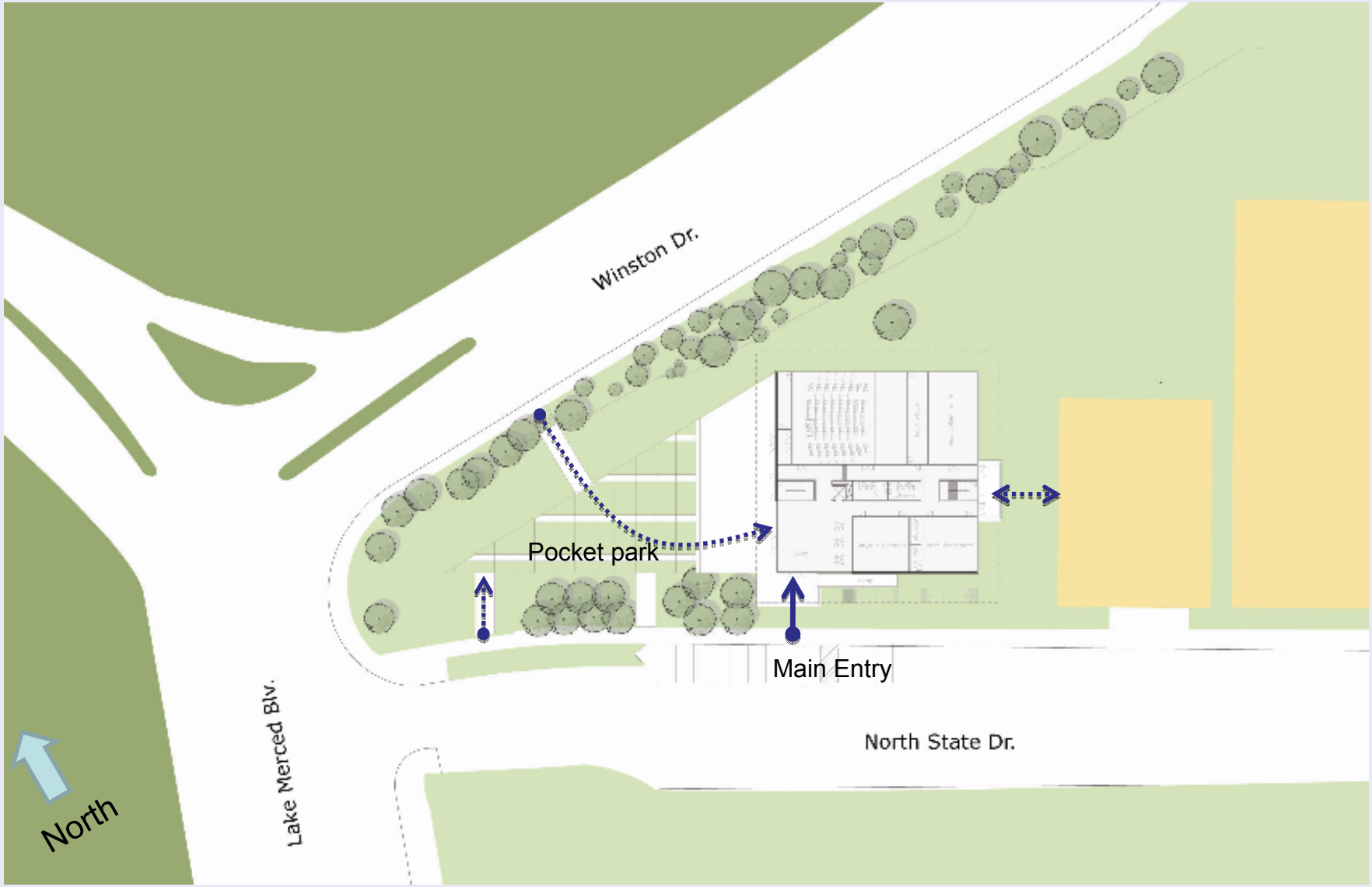
Vertically

Faculty — Design to be porous

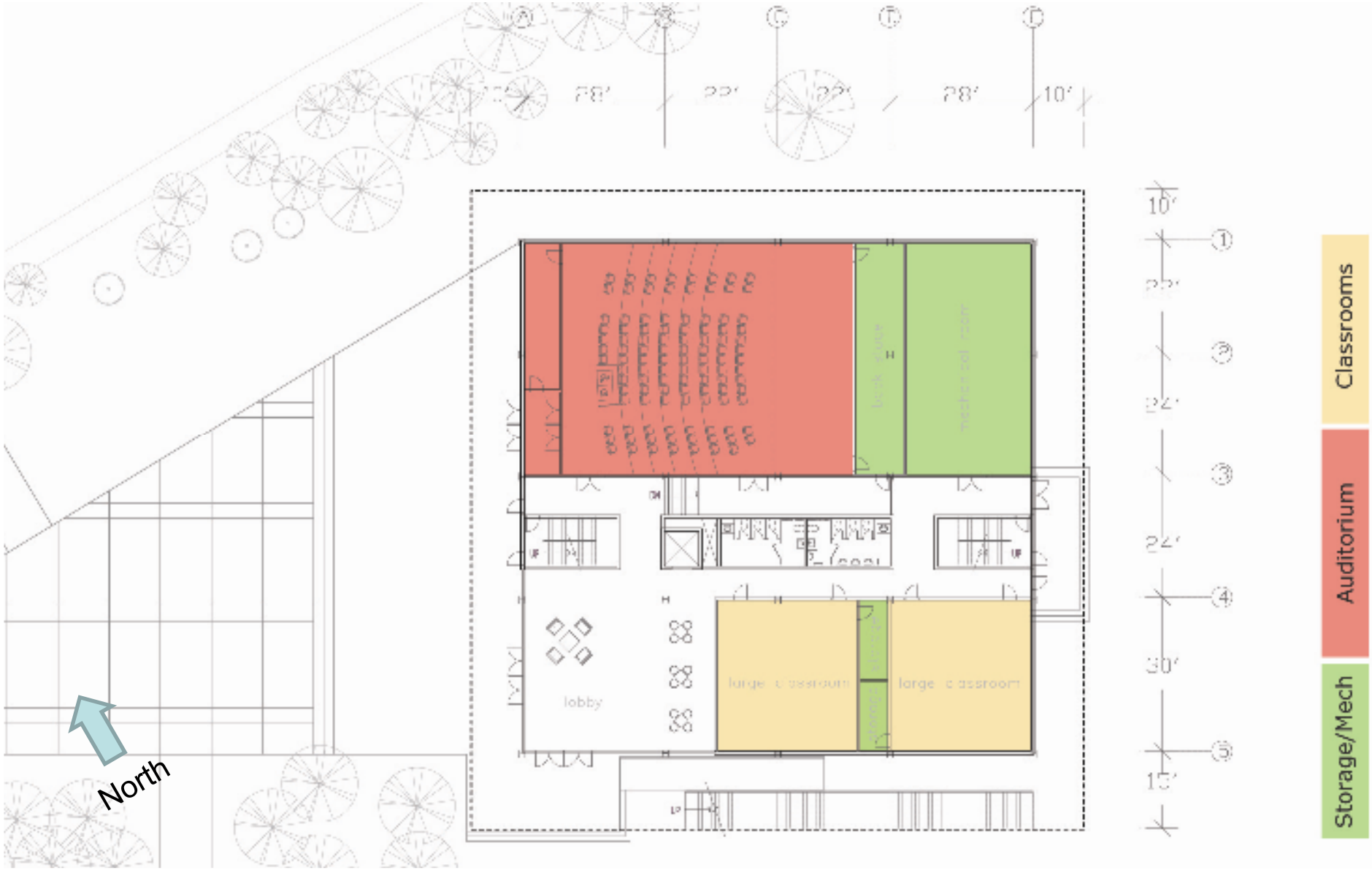
Student — Transfer Knowledge

Community — Become a local community anchor

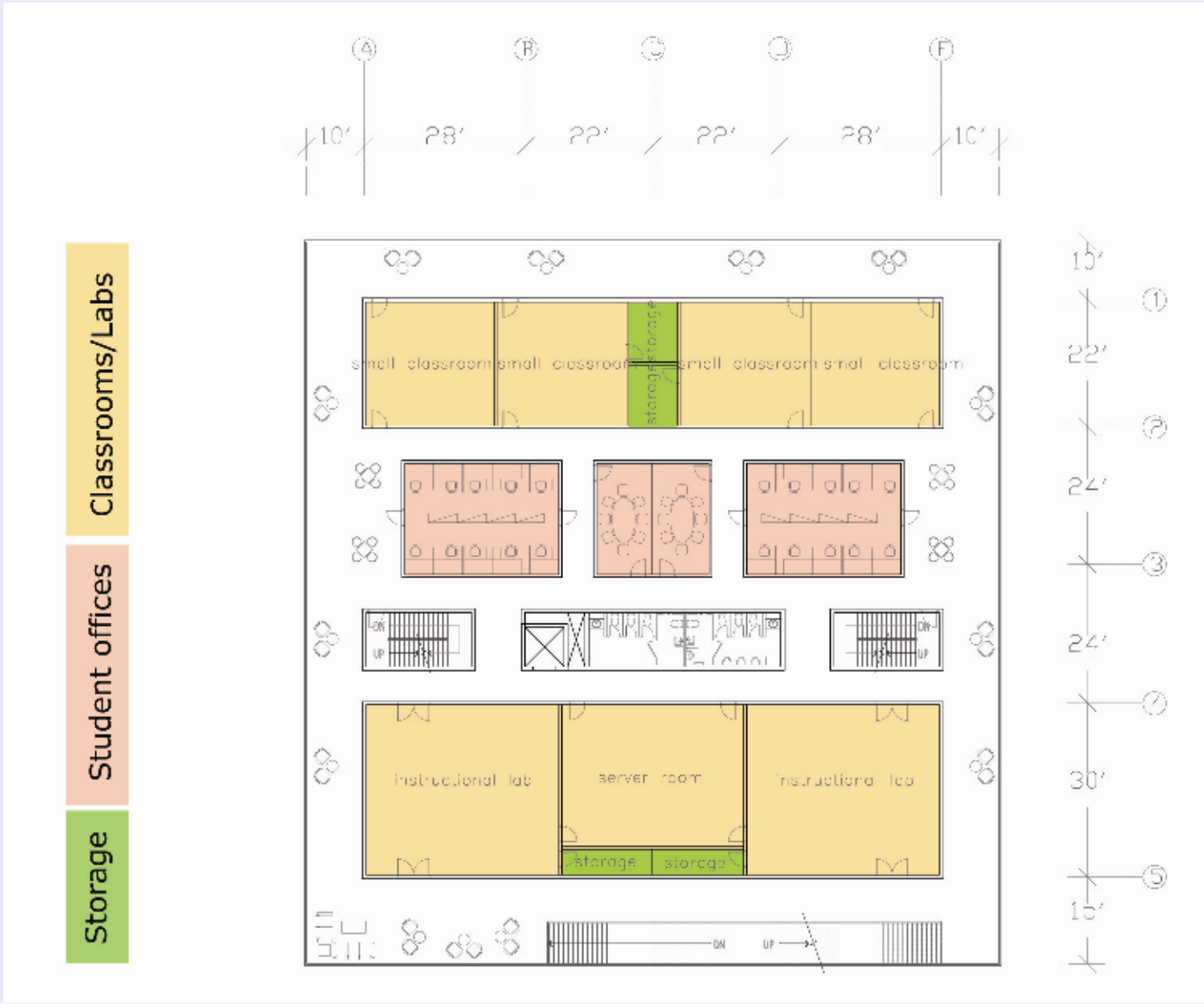
Site plan


Winston Dr.
Pocket park
Main Entry
Lake Merced Blv.
North State Dr.
North

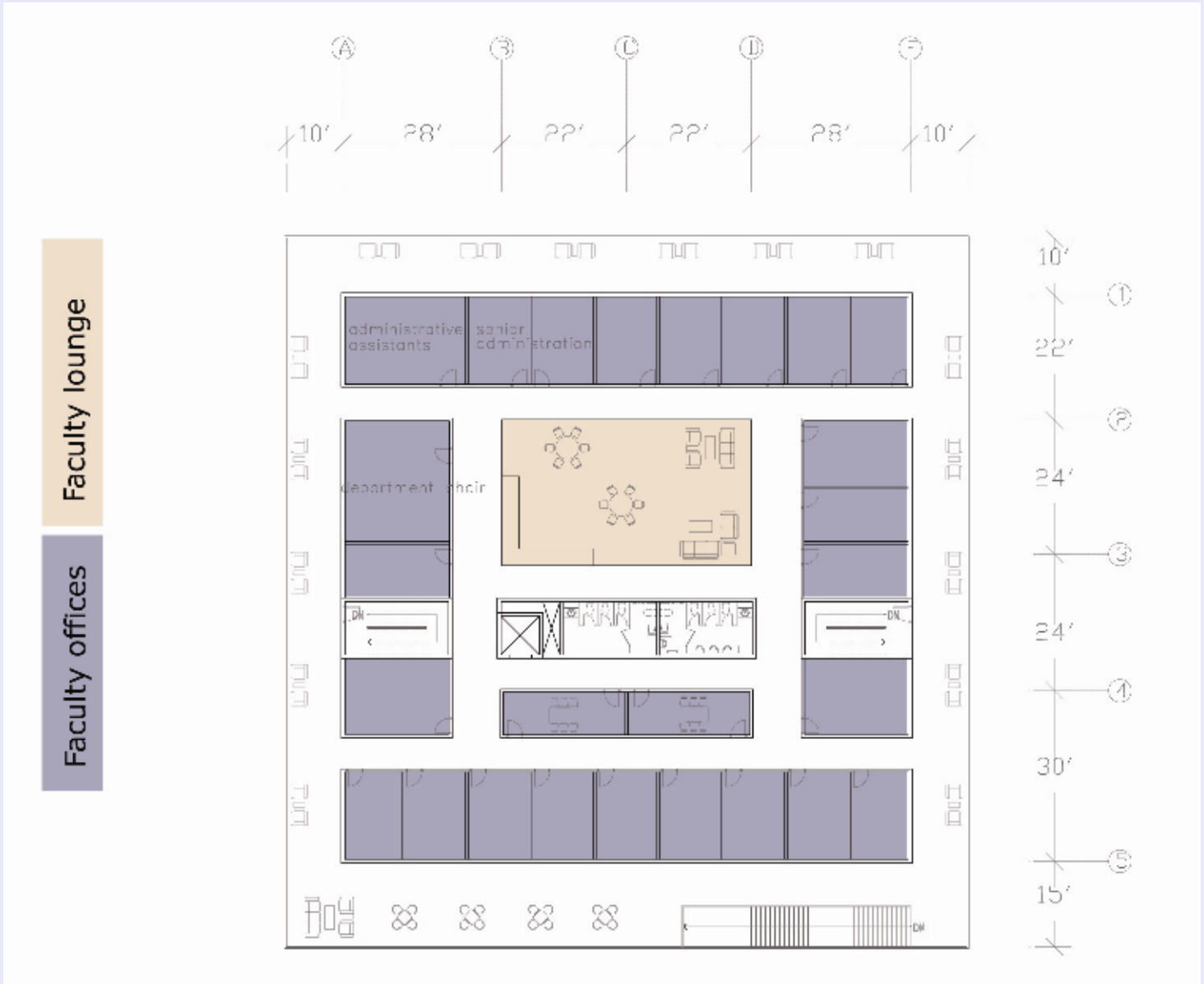
First Floor plan



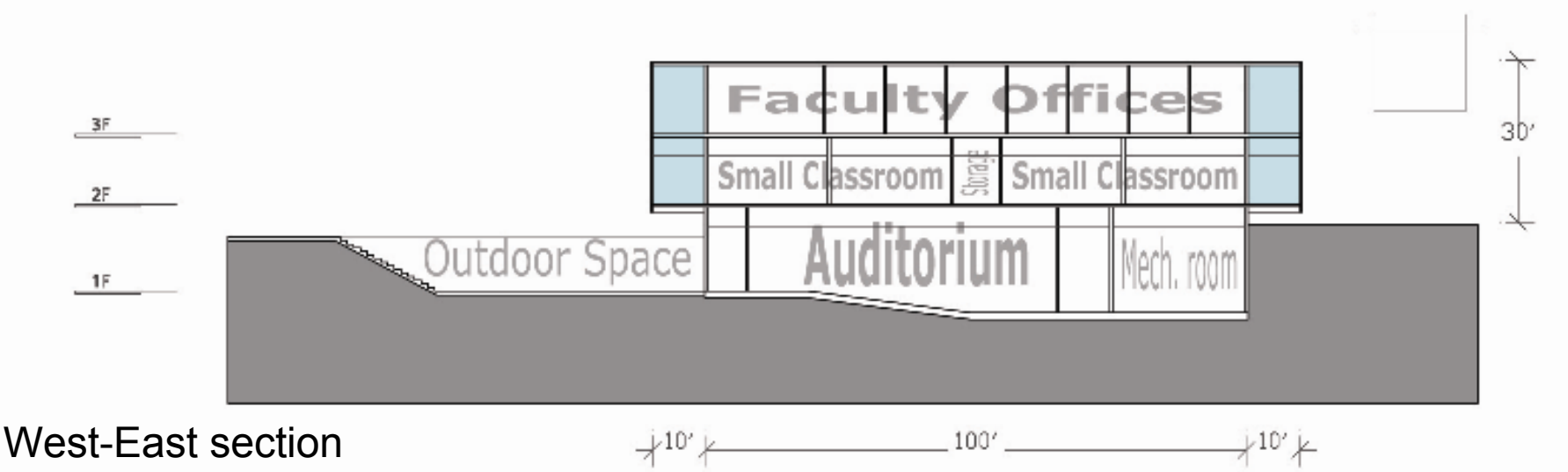
Second Floor Plan



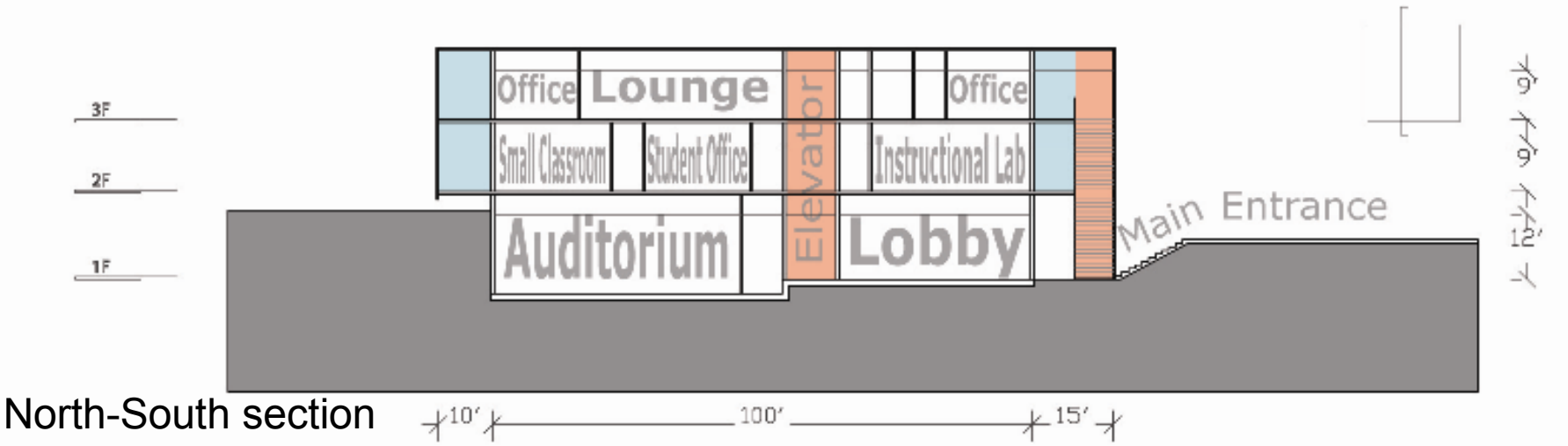
Third Floor Plan



Section



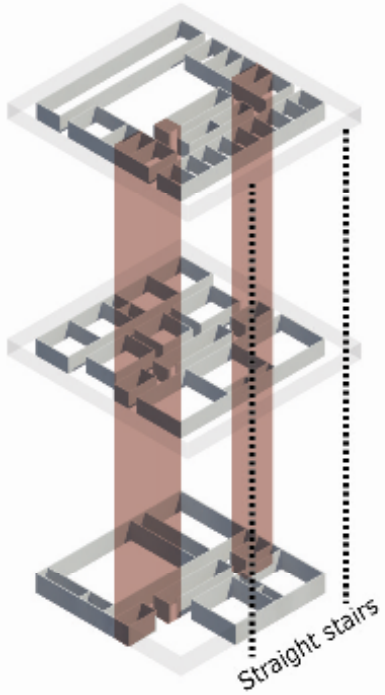
West-East section



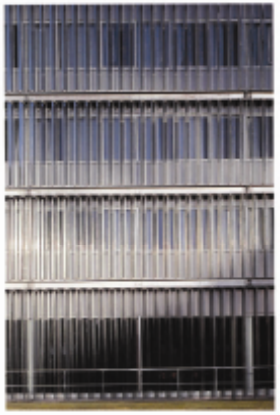
North-South section

Vision

Vertical Circulation



Enclosure

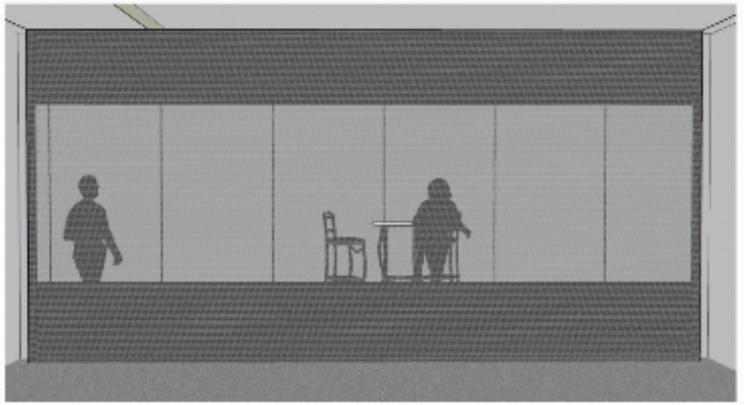


University institute in Paris

Kunsthaus Bregenz

Interior views

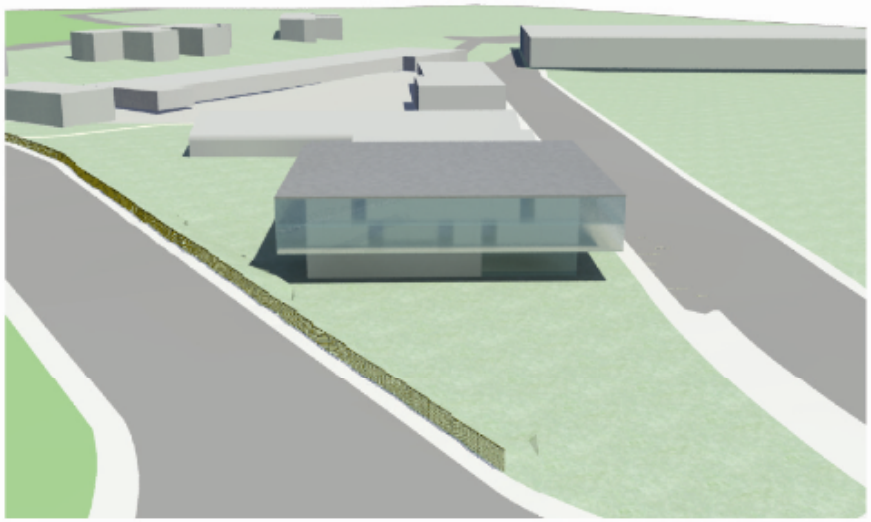
View of Corridor on the West side



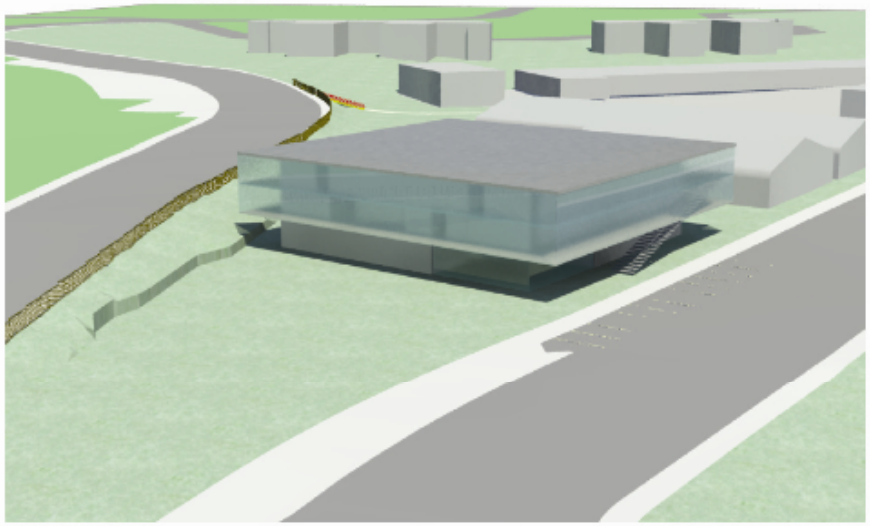
View from Student office

3D views

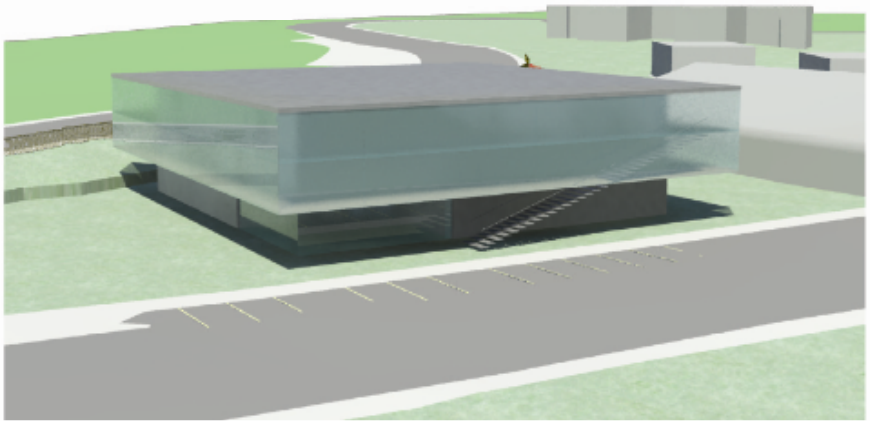
West side view



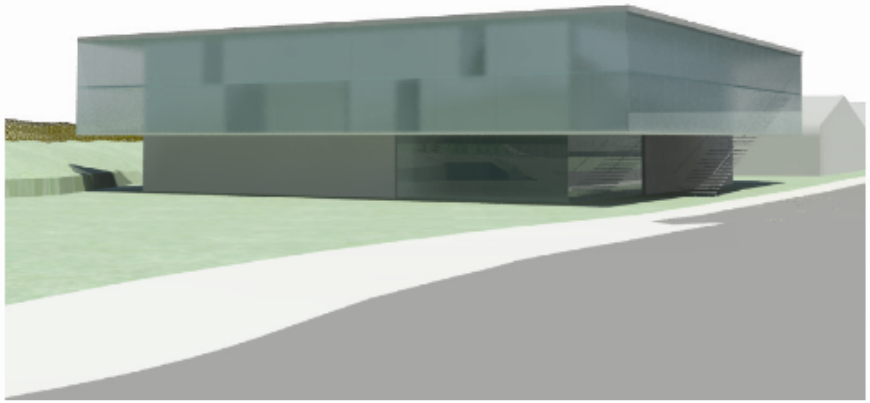
South-west side view



South side view



South-west side view



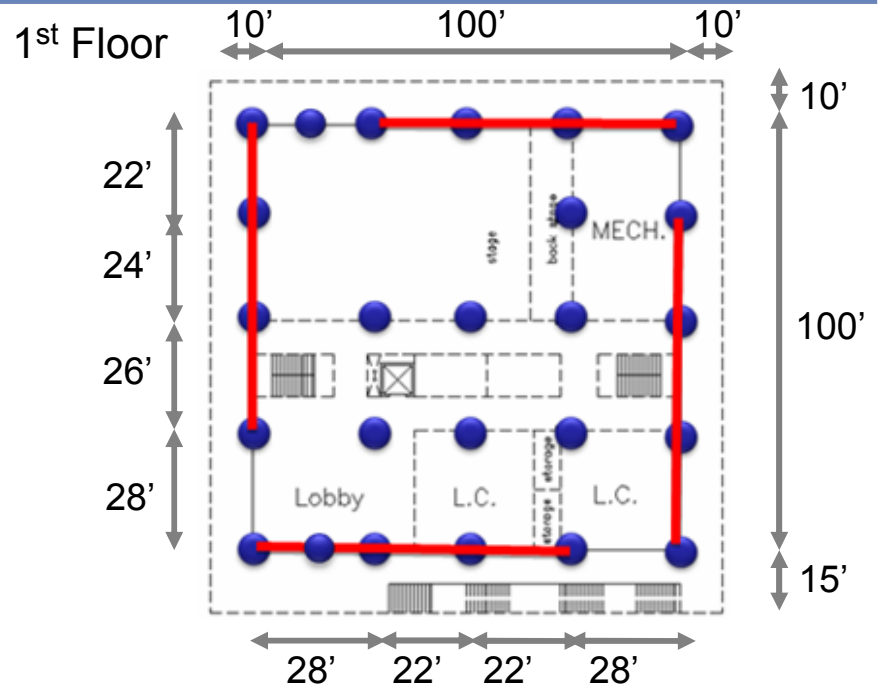
ENGINEERING

- Second Concept
  - Floor Layouts
  - Lateral Systems
  - Foundation

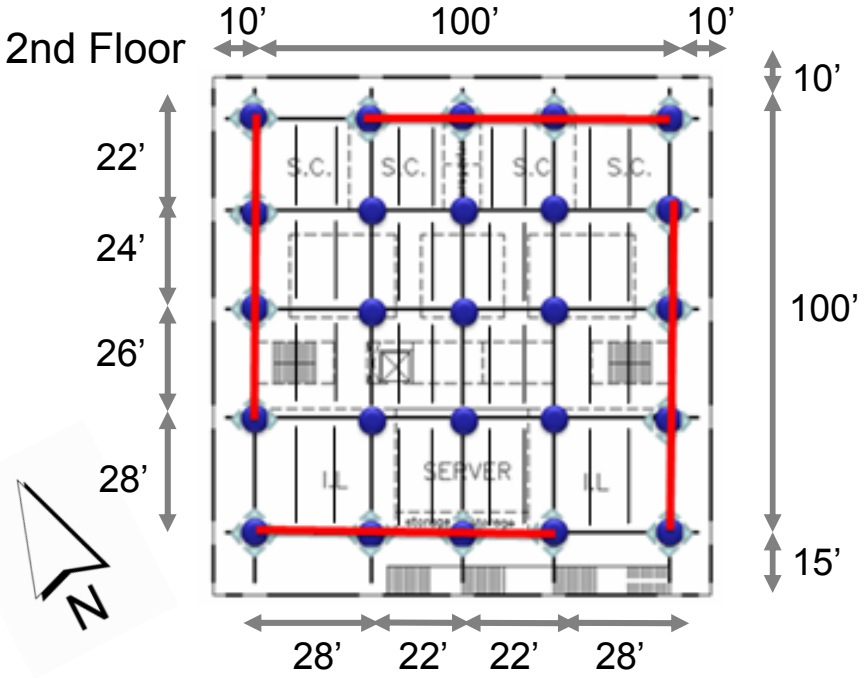
2nd Arch - Moment Resisting Frame

MRF
Cantilever
Steel Column
Moment Connection

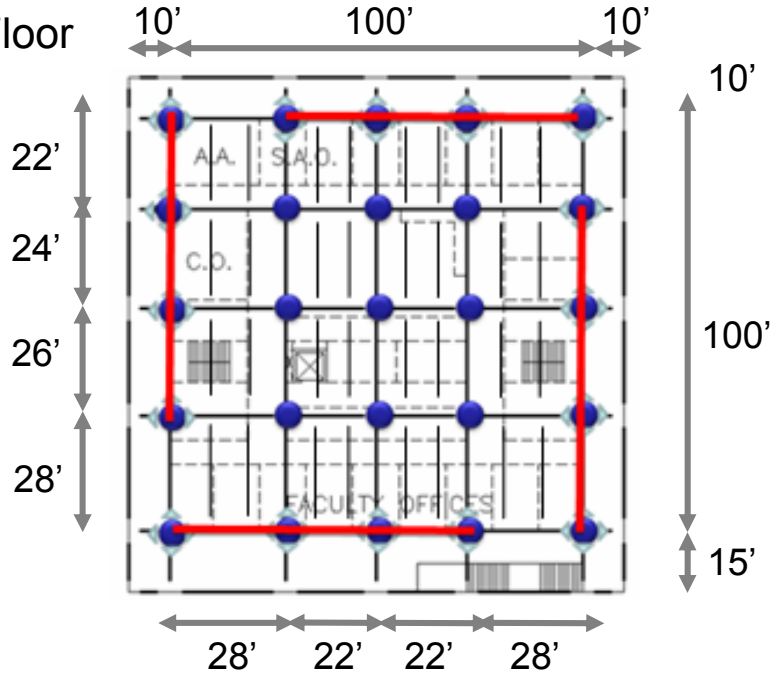
1st Floor



2nd Floor

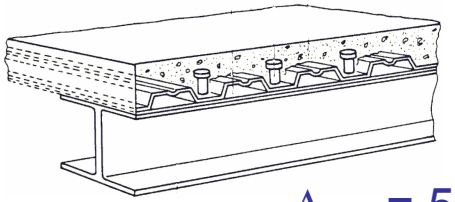


3rd Floor



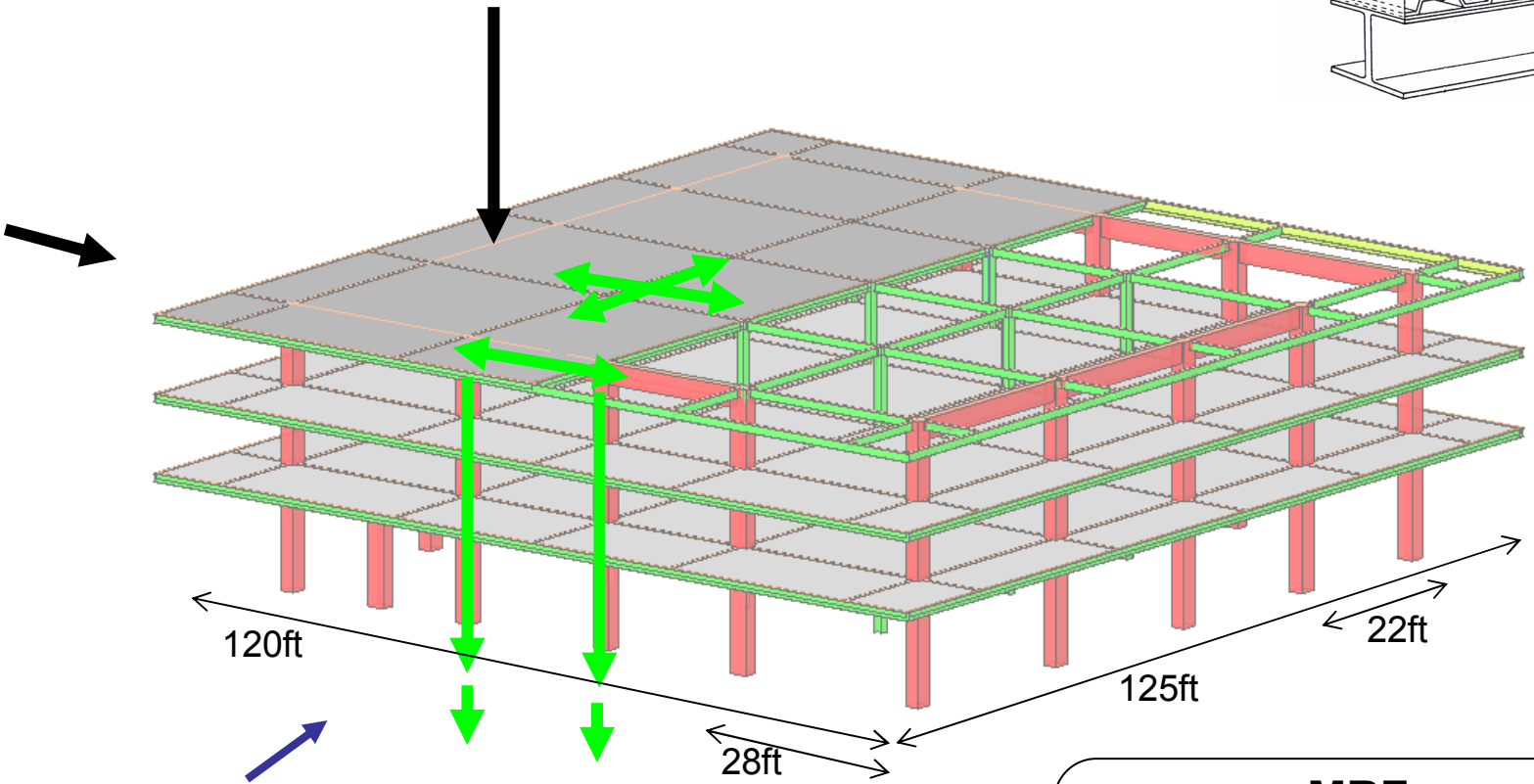
2nd Arch - Moment Resisting Frame

3VLI20 Vulcraft
Composite Floor Deck



Δ_{roof} = 5”

IDR_{max}= 0.02



Base shear, V = 600 K

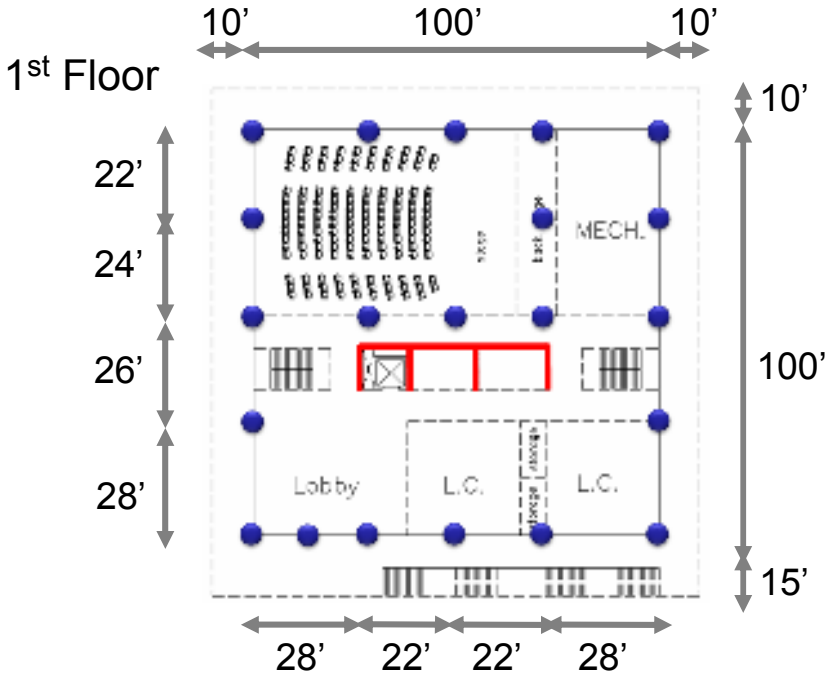
Beams W21x101
Columns W14x74

MRF
Beams W27x161
Exterior columns W24x176
Interior columns W24x229

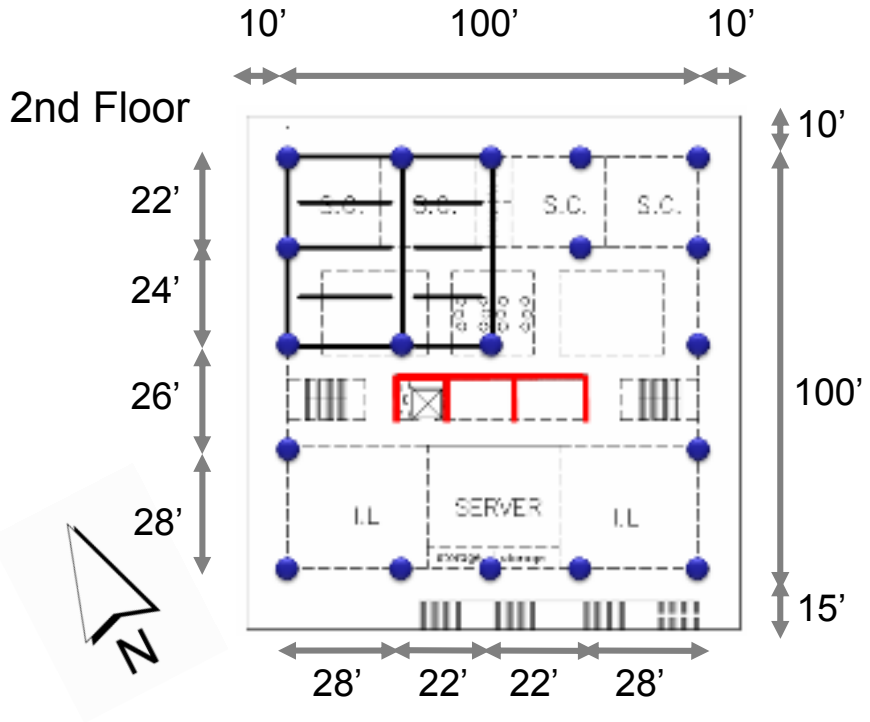
2nd Arch - Shear Walls

Shear Walls
Steel Column
Cantilever

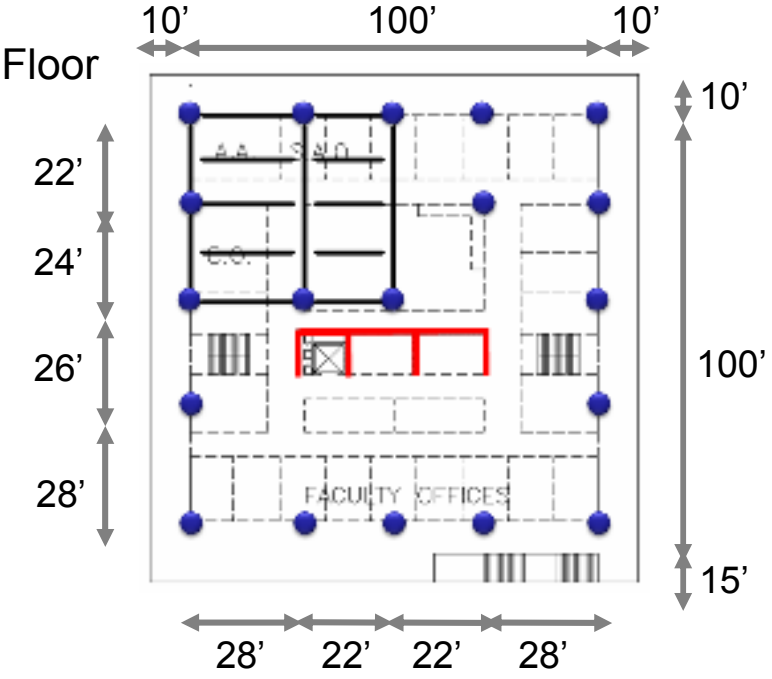
1st Floor



2nd Floor



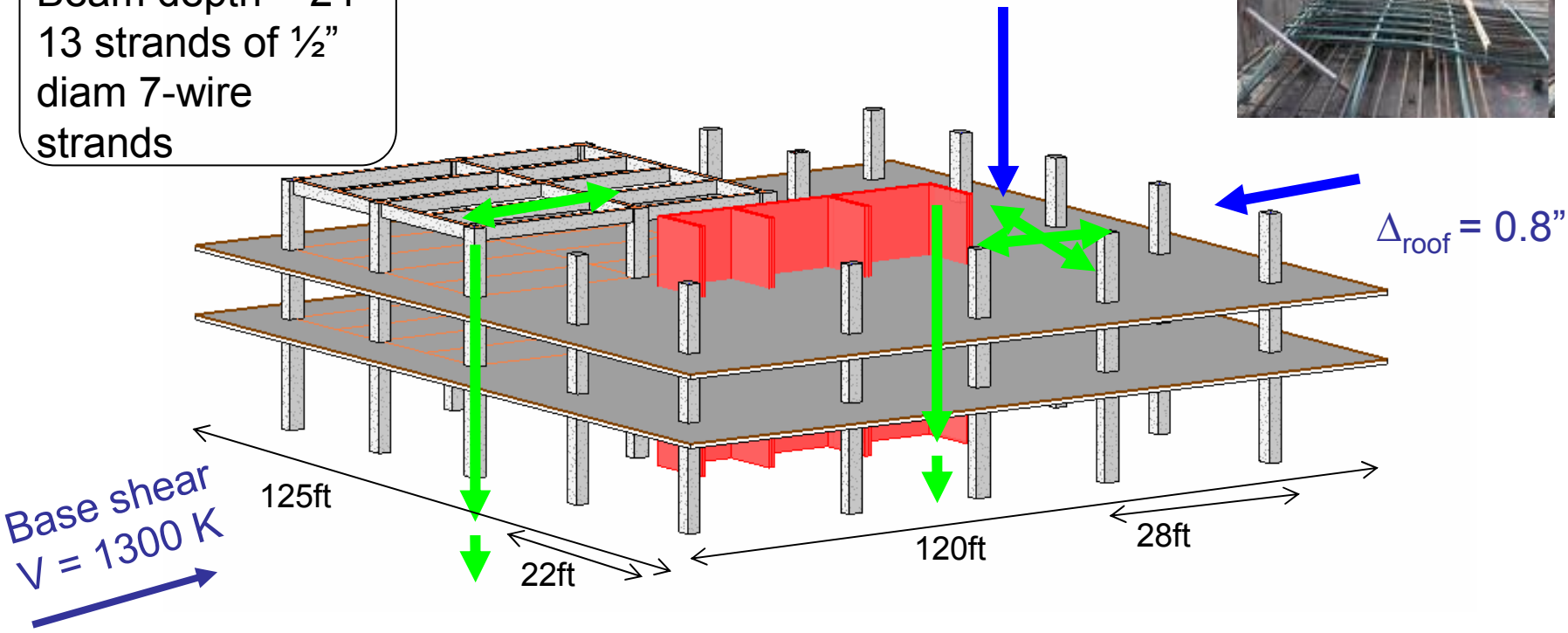
3rd Floor



2nd Arch - Shear Walls

Post-Tension Concrete Slab 7”
½” diam, 7-wire strands at 16”

Beam depth = 24”
13 strands of ½” diam 7-wire strands

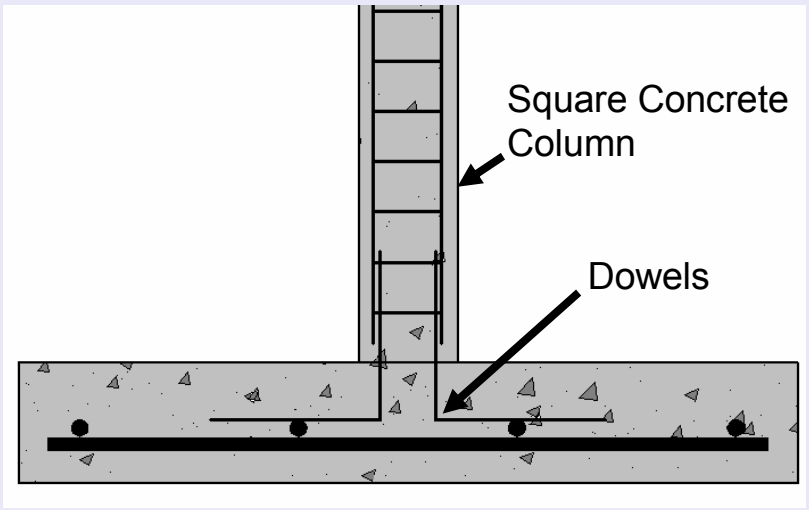


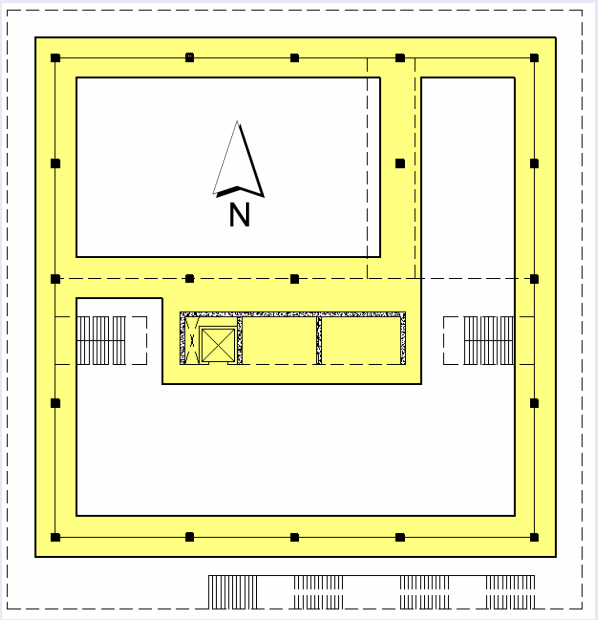
Concrete columns 16” x 16”

RC Shear Wall, t = 12”
Horiz shear reinf: #4 @ 12”
Vert flex reinf: 9 #10

2nd Arch – Strip Footing

Total load: 30 kip/ft (433 kN/m)





f'_c: 6 ksi Transverse: # 9 bar spacing 7.3 inch

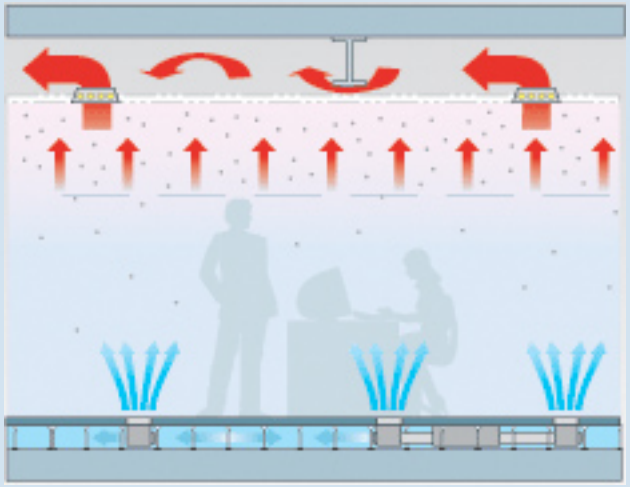
f_s: 20 ksi Longitudinell: 4 bars # 8

CONSTRUCTION MANAGEMENT

- HVAC Overview
- Cost Estimate
- Schedule
- Logistics/Methods

Underfloor VAV

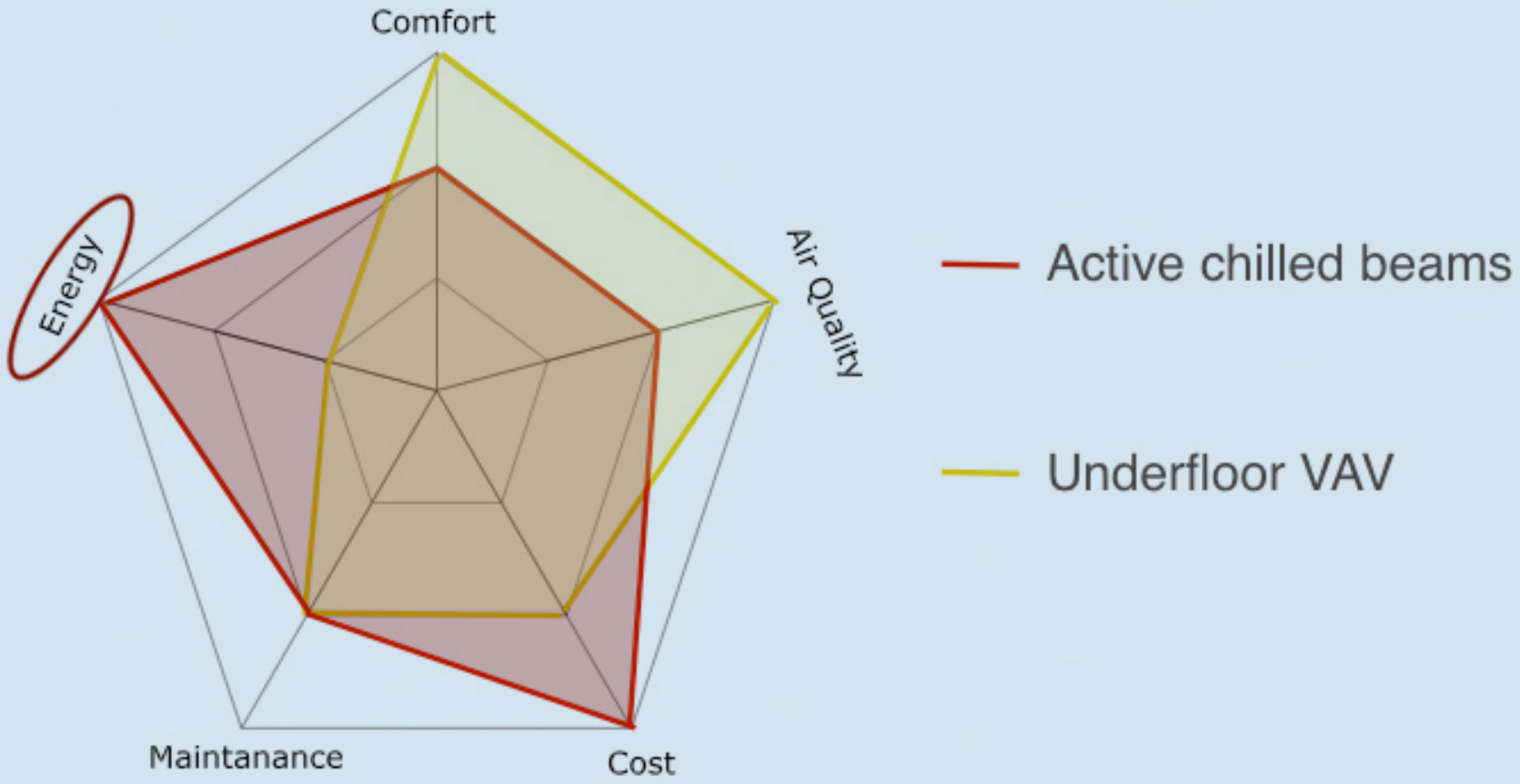
- High occupant comfort
- Less costly reconfiguration of spaces
- Better removal of contaminants from circulated air
- Poor performance if leakage exists



Active Chilled Beams

- Uses water for energy transport
- 1" pipe carries same amount of energy as 18x18" duct
- Smaller overall height
- Can contribute 4-14 LEED points
- Noise reduction

Decision Matrix



Active Chilled Beams

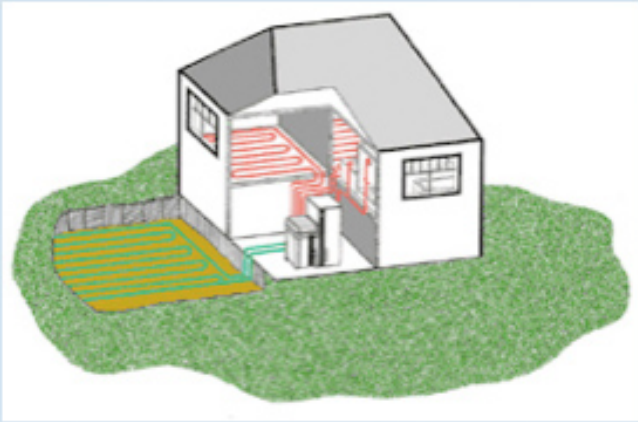
Heat Source

Heater/Chiller

- Less expensive
- No excavation
- Less energy efficient

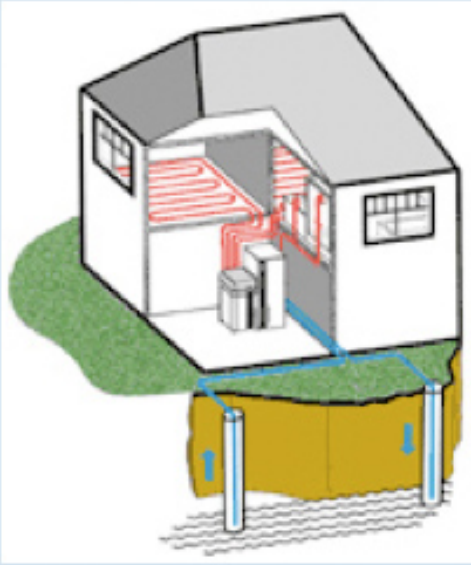
Flat collectors with Heat pump

- Uses more space
- Excavation needed
- Less expensive than earth taps

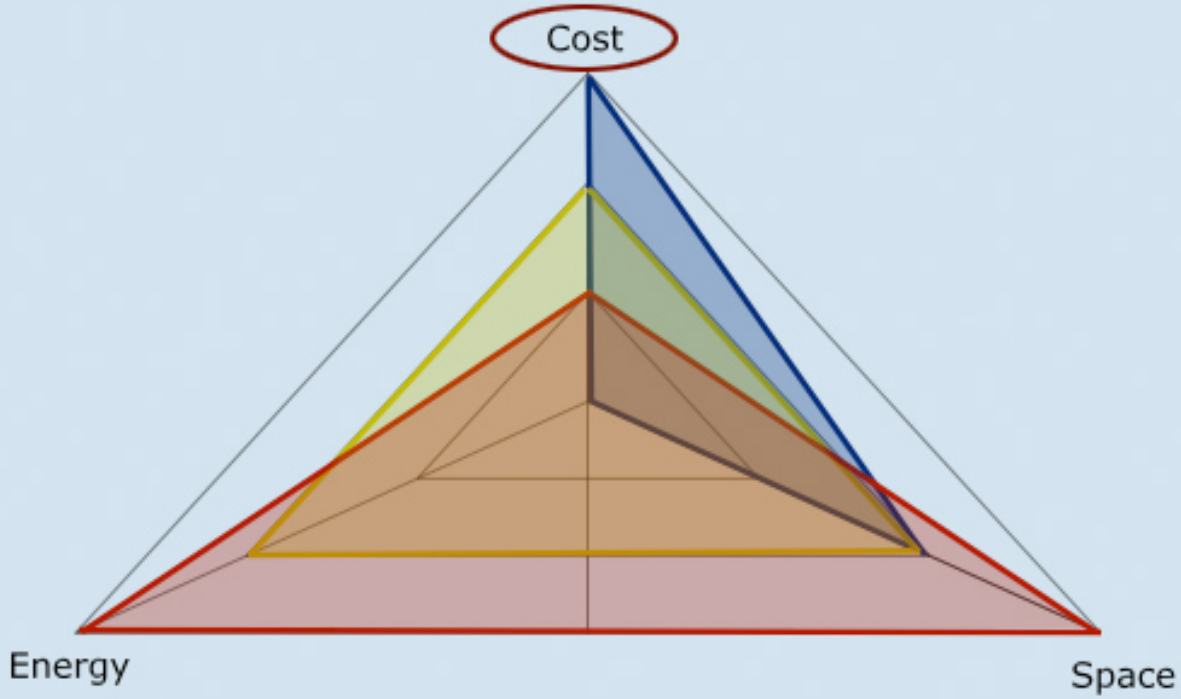


Earth Taps

- Less space usage
- Best geothermal energy usage
- The most expensive



Decision Matrix



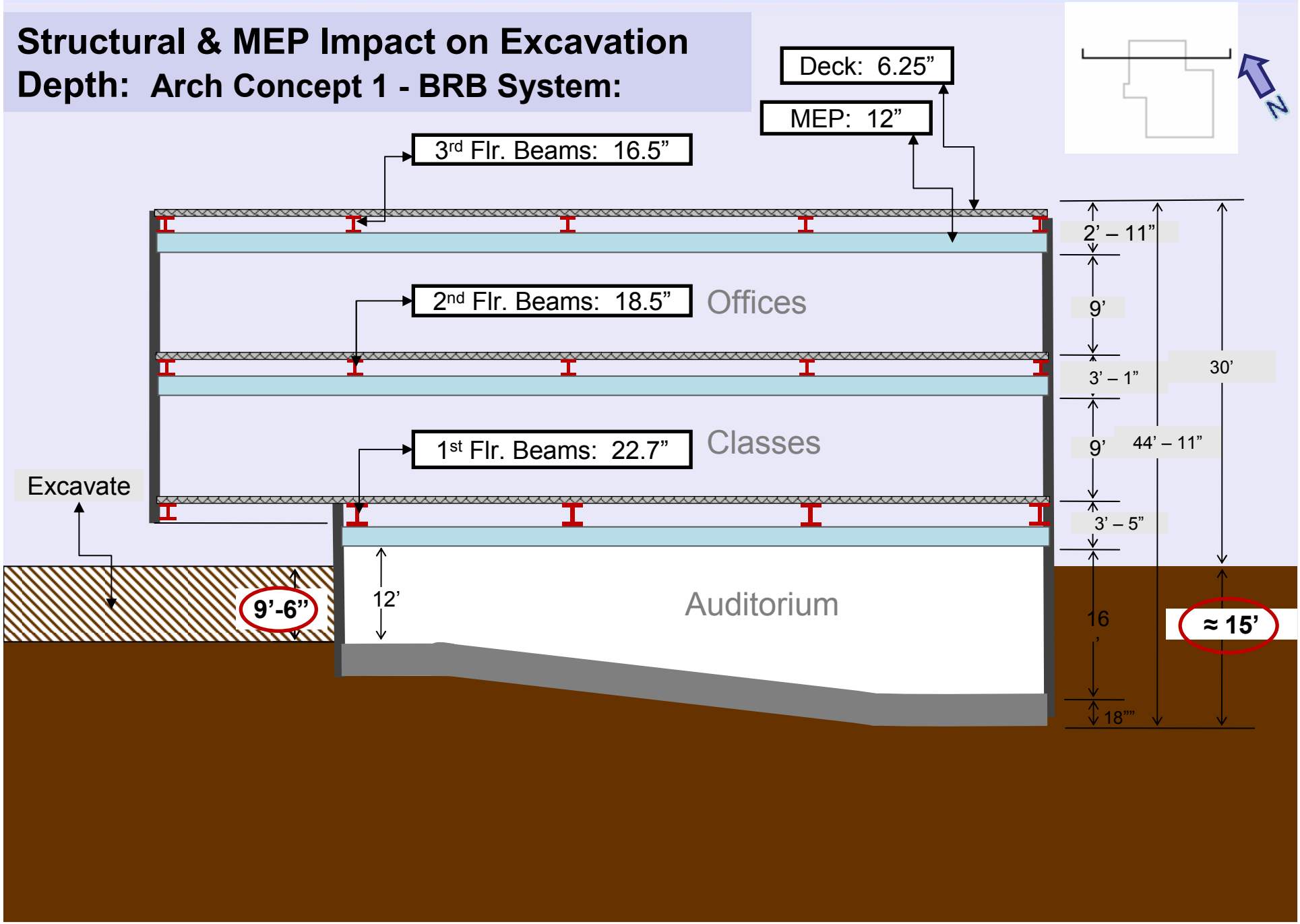
Earth Taps

Flat collectors

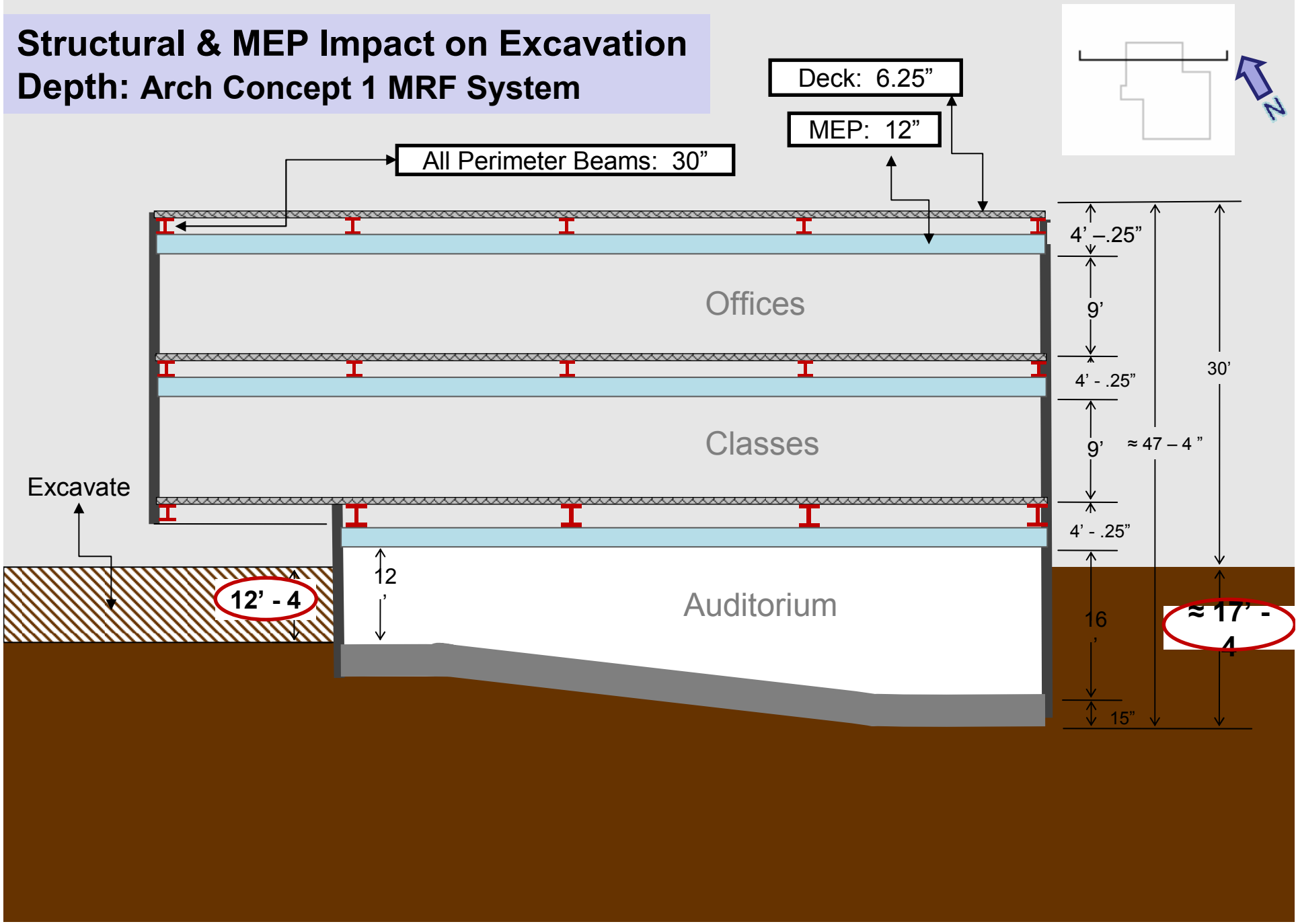
Heater/Chiller

Flat collectors

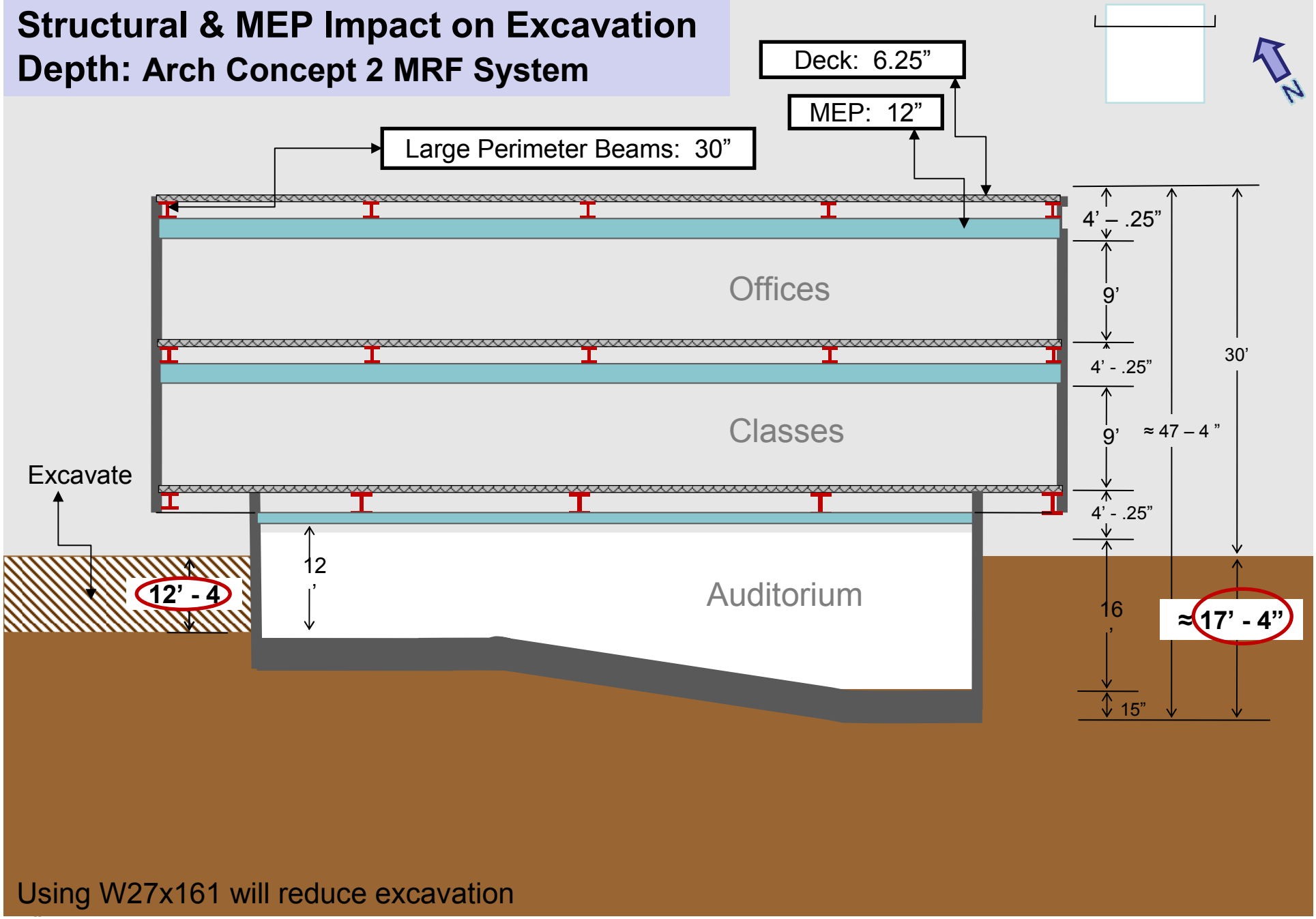
Structural & MEP Impact on Excavation Depth: Arch Concept 1 - BRB System:



Structural & MEP Impact on Excavation Depth: Arch Concept 1 MRF System

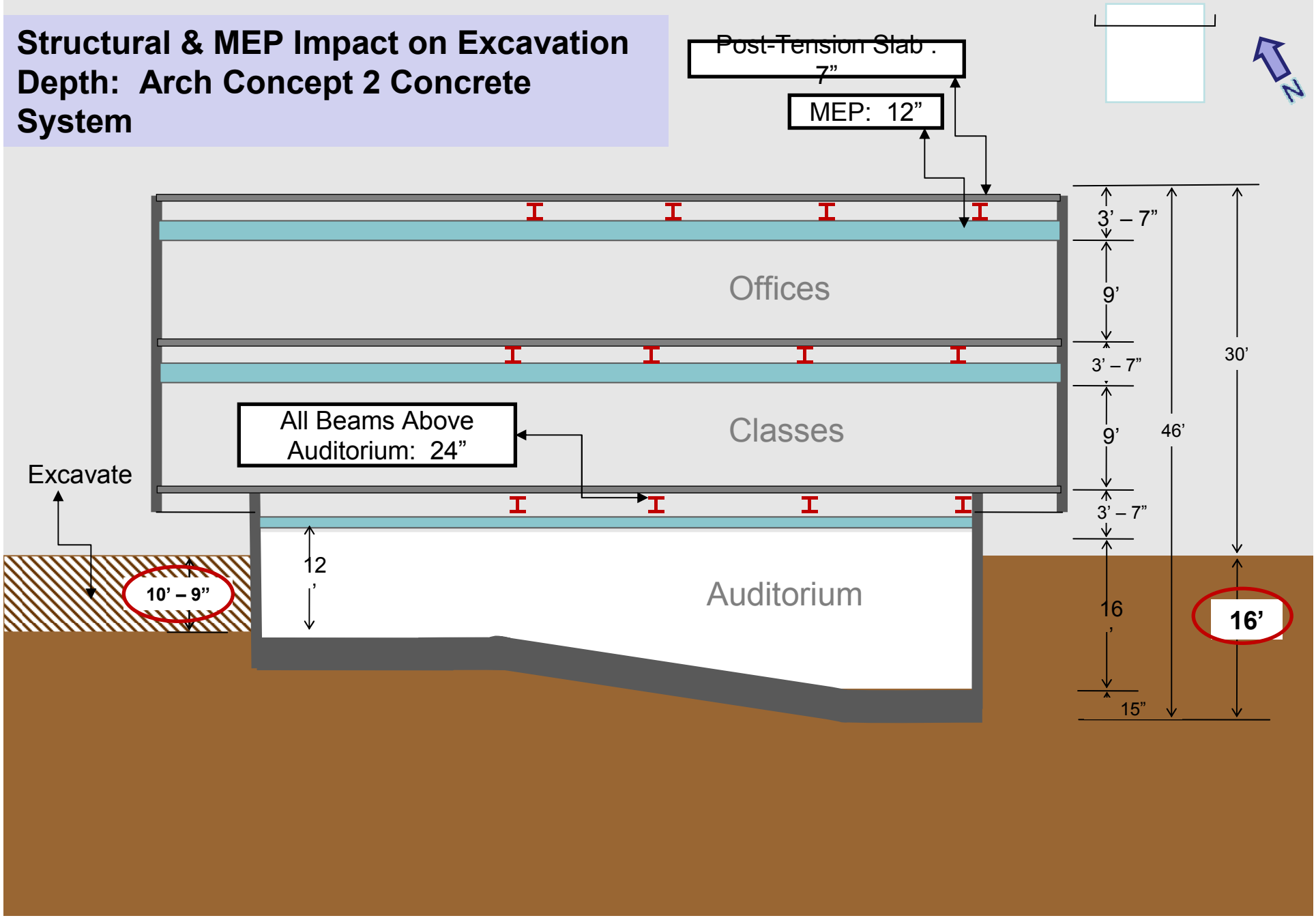


Structural & MEP Impact on Excavation Depth: Arch Concept 2 MRF System



Using W27x161 will reduce excavation

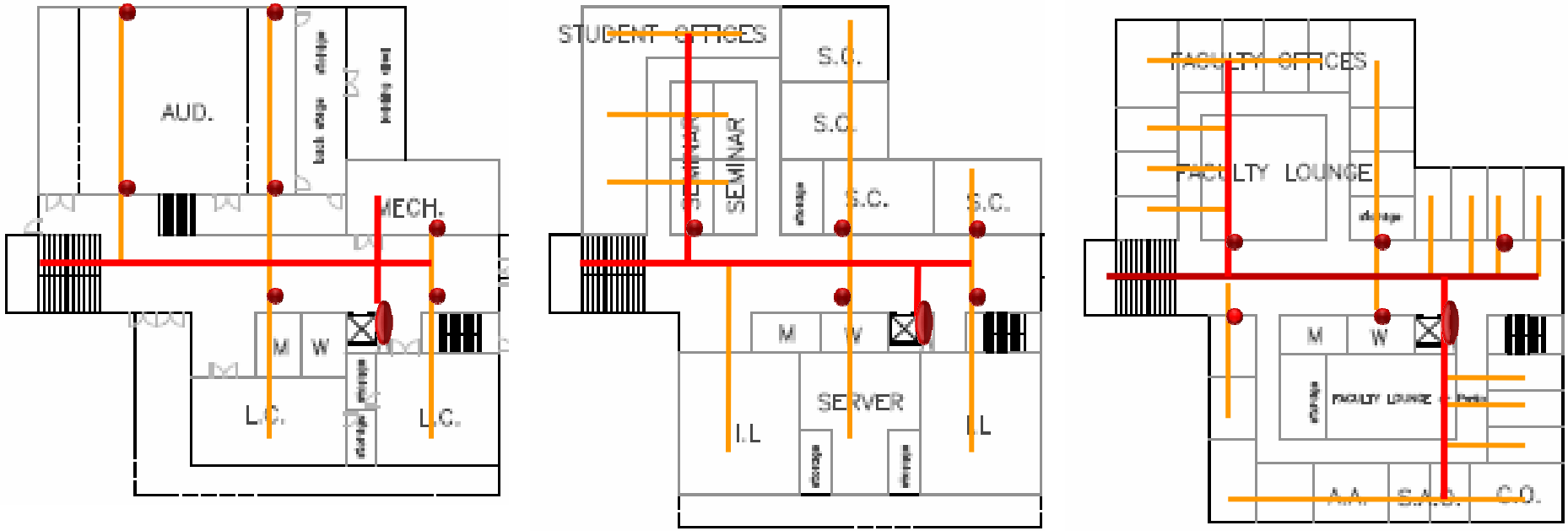
Structural & MEP Impact on Excavation Depth: Arch Concept 2 Concrete System



Chill Beam Distribution Tree:

Arch Concept 1

- Major Vertical Artery
- Minor Vertical Air Distribution (for non-chill beam areas: Auditorium & Lobbies)
- Major Horizontal Distribution
- Minor Horizontal Distribution

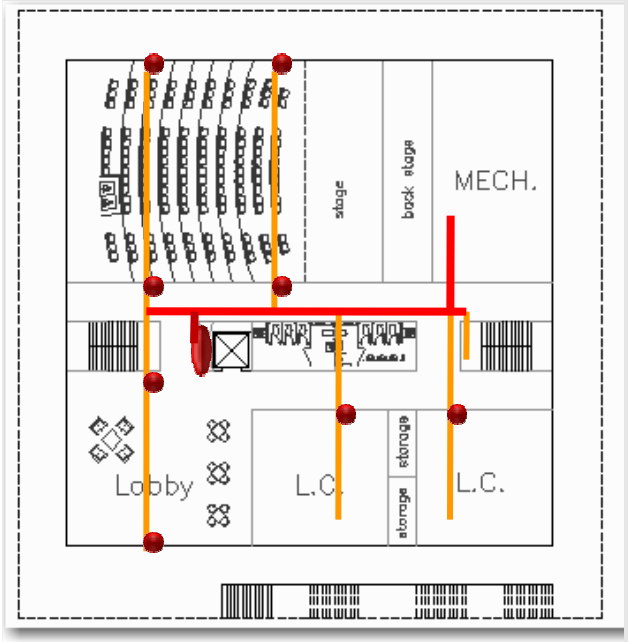


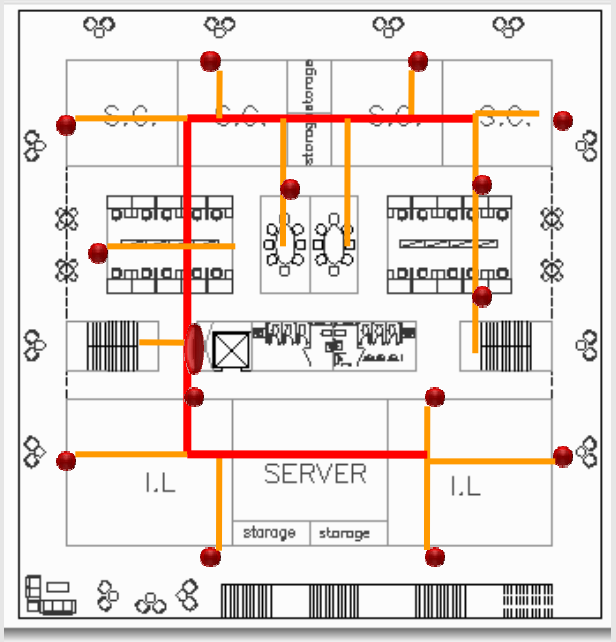
Using active chilled beams for all the rooms except the auditorium and lobby (and maybe for 2 large classrooms). In these rooms we would only use air distribution, where we would pump air into the space along one or 2 walls (ducts would go from ceiling down to the floor where air distribution unit would be located. (we would like to ensure that air is distributed as low as possible).

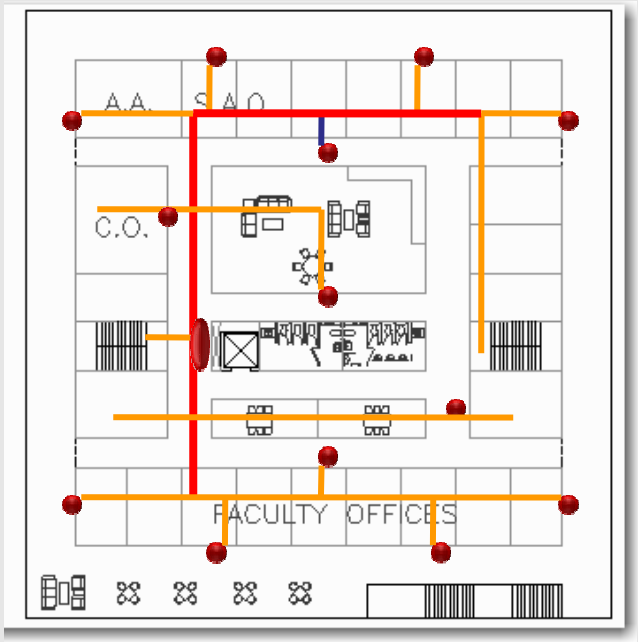
Chill Beam Distribution Tree:

Arch Concept 2

- Major Vertical Artery
- Minor Vertical Air Distribution (for non-chill beam areas: Auditorium & Lobbies)
- Major Horizontal Distribution
- Minor Horizontal Distribution







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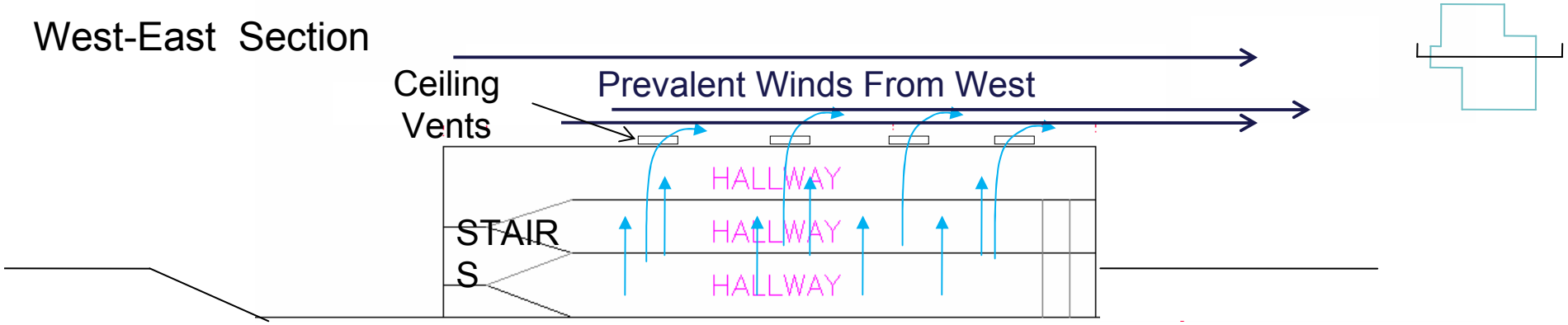
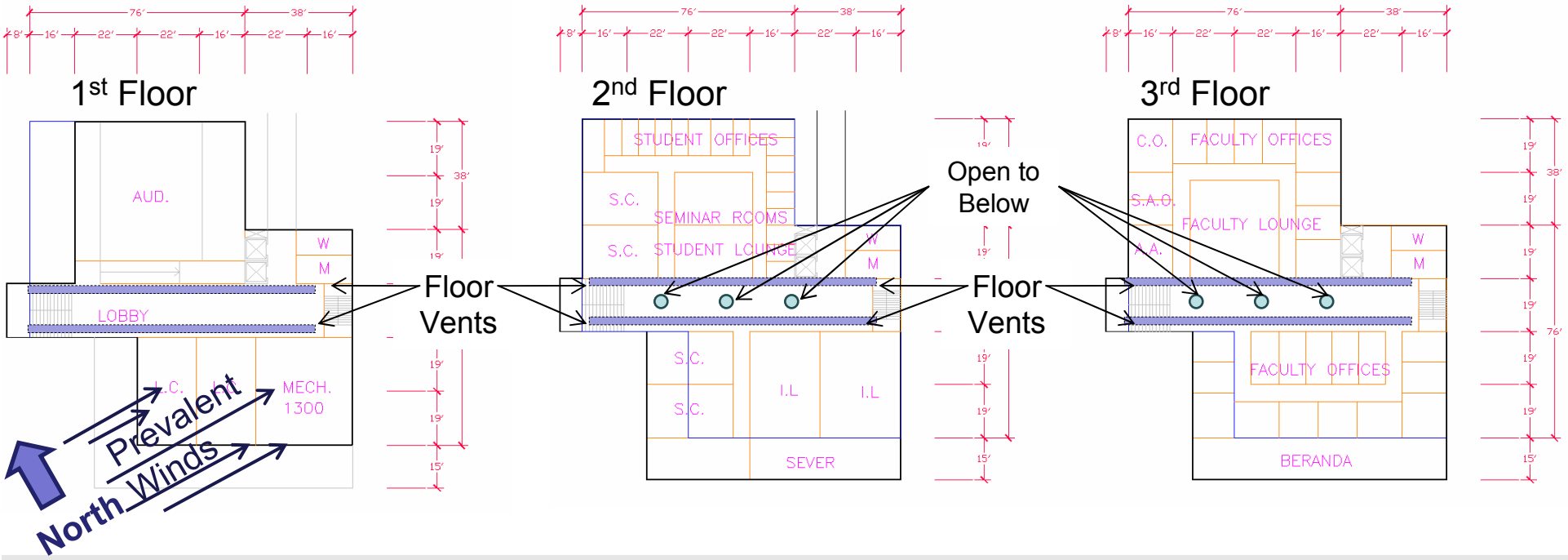
Natural Ventilation: Vertical Air flow

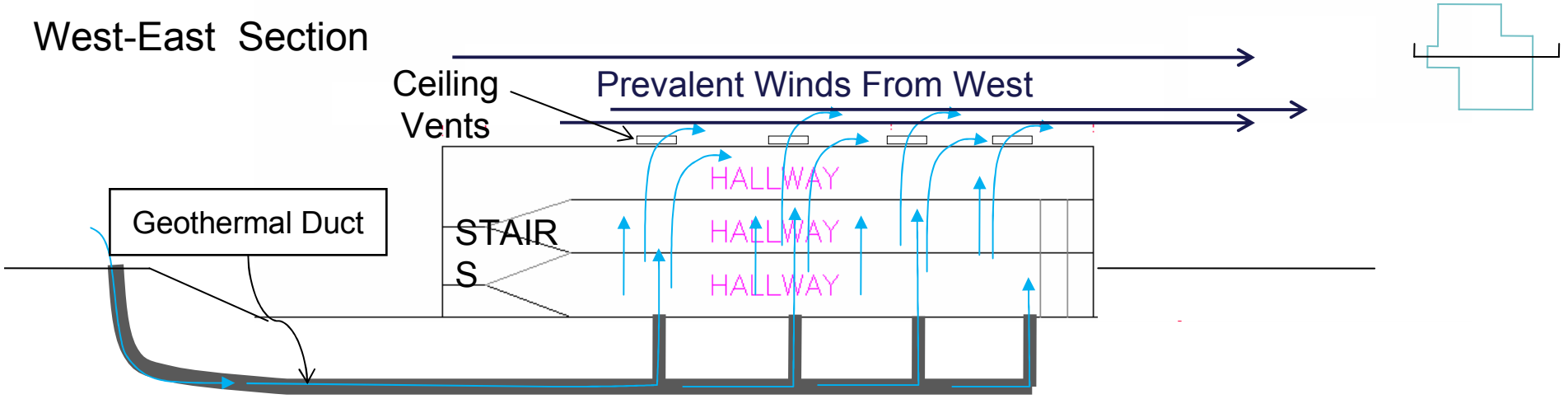
West-East Section

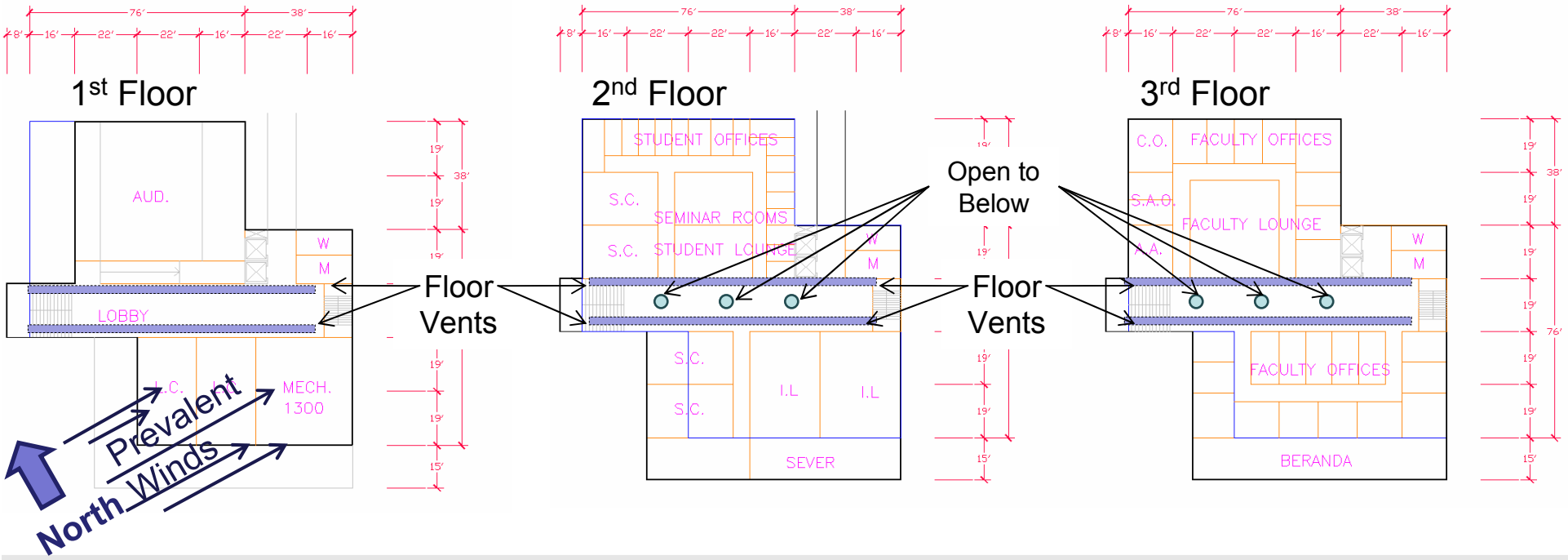




Natural Ventilation: Vertical Air flow

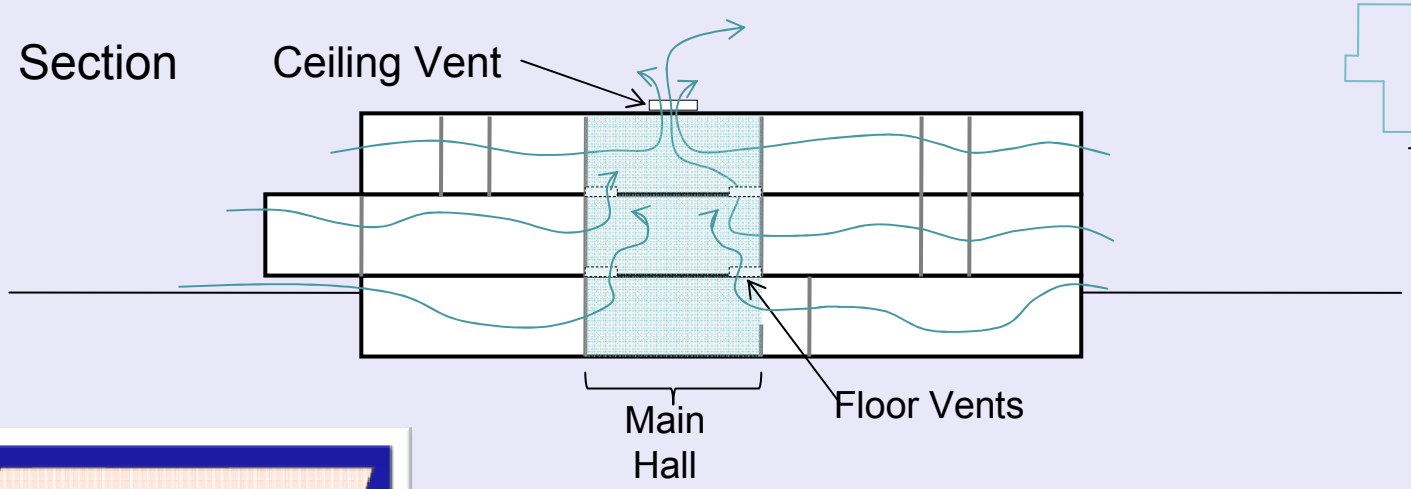
West-East Section

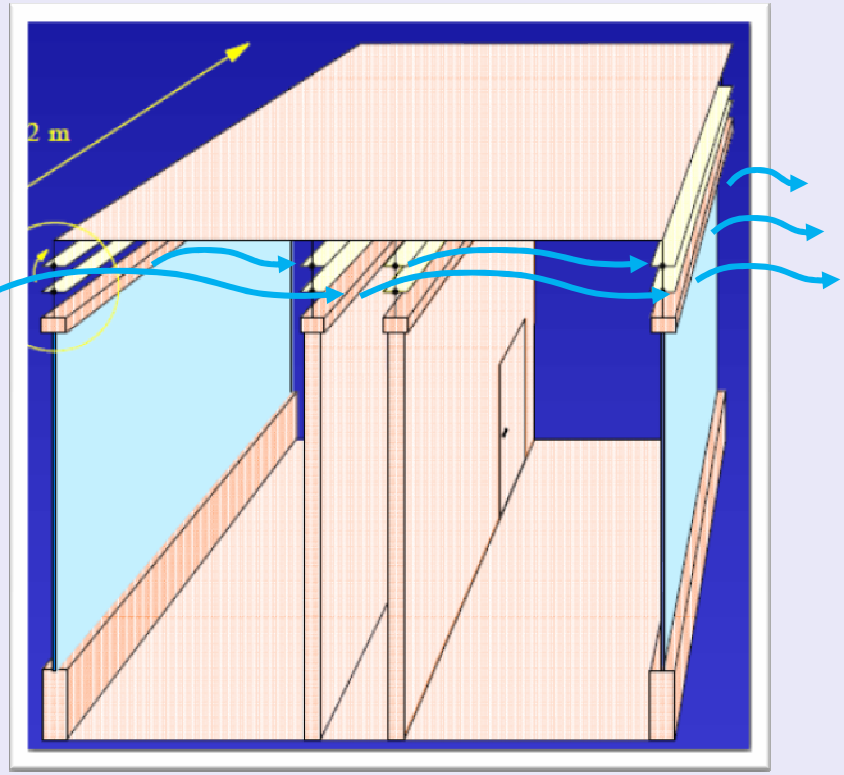




Natural Ventilation: Cross Ventilation

North – South Section

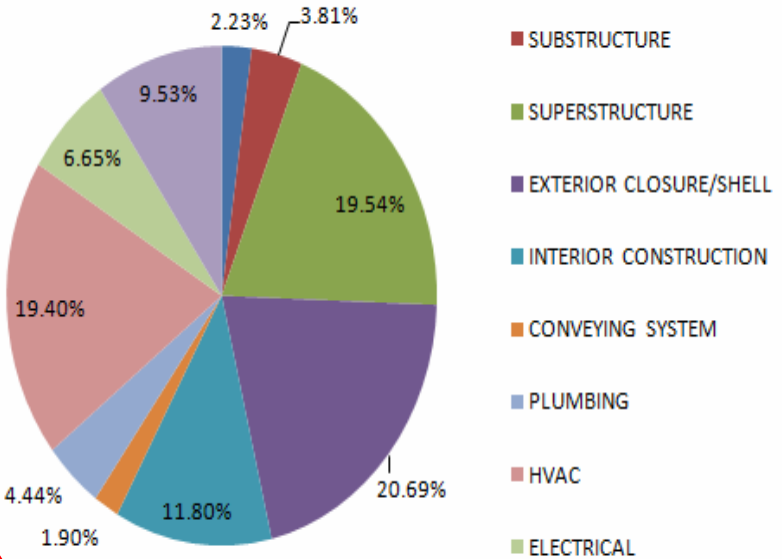




- Louvers
- Building Management System (BMS).

Preliminary Cost Estimate
Arch 1 Concept: BRBF

Item	Description		Sub Total	Cost/Sf	% Overall
	Building Gross Square Footage			**33,500.00**	**GSF**
01	**FOUNDATION**		$135,000	$4.03	2.23%
02	**SUBSTRUCTURE**		$230,000	$6.87	3.81%
03	**SUPERSTRUCTURE**		$1,180,590	$35.24	19.54%
04	**EXTERIOR CLOSURE/SHELL**		$1,250,220	$37.32	20.69%
05	**INTERIOR CONSTRUCTION**		$713,310	$21.29	11.80%
06	**CONVEYING SYSTEM**		$115,000	$3.43	1.90%
07	**PLUMBING**		$268,000	$8.00	4.44%
08	**HVAC**		$1,172,500	$35.00	19.40%
09	**ELECTRICAL**		$402,000	$12.00	6.65%
10	**SITEWORK**		$576,050	$17.20	9.53%
	INDIRECT COST		**$6,042,670**	**$180.38**	
	Overhead	15%	$906,401	$27.06	
	Fee	10%	$604,267	$18.04	
	Contingency	15%	$906,401	$27.06	
	TOTAL COST		**$8,459,738**	**$252.53**	



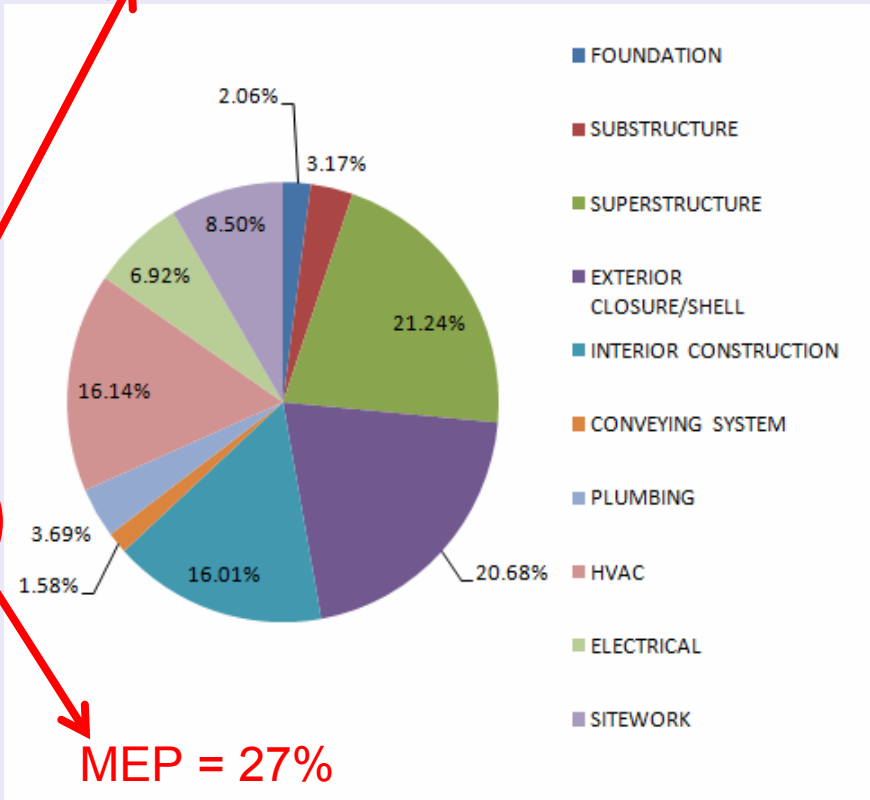
MEP = 30%

$8,500,000.00

Preliminary Cost Estimate
Arch 1 Concept: MRF

Item	Description		Sub Total	Cost/Sf	% Overall
	Building Gross Square Footage			33,500.00	GSF
01	FOUNDATION		$150,000	$4.48	2.06%
02	SUBSTRUCTURE		$230,000	$6.87	3.17%
03	SUPERSTRUCTURE		$1,543,285	$46.07	21.24%
04	EXTERIOR CLOSURE/SHELL		$1,502,390	$44.85	20.68%
05	INTERIOR CONSTRUCTION		$1,163,310	$34.73	16.01%
06	CONVEYING SYSTEM		$115,000	$3.43	1.58%
07	PLUMBING		$268,000	$8.00	3.69%
08	HVAC		$1,172,500	$35.00	16.14%
09	ELECTRICAL		$502,500	$15.00	6.92%
10	SITEWORK		$617,550	$18.43	8.50%
	INDIRECT COST		$7,264,535	$216.85	
	Overhead	15%	$1,087,430	$32.46	
	Fee	10%	$724,954	$21.64	
	Contingency	15%	$1,087,430	$32.46	
	TOTAL COST		$10,164,349	$303.41	

$945,000.00



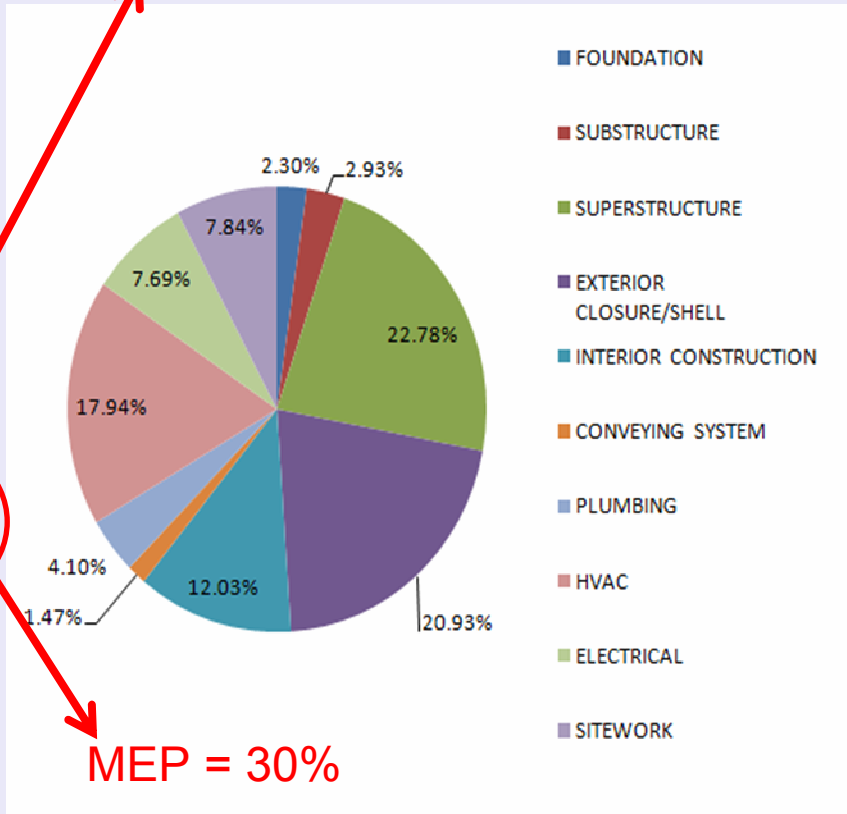
MEP = 27%

$10,200,000.00

Preliminary Cost Estimate
Arch 2 Concept: MRF

Item	Description		Sub Total	Cost/Sf	% Overall
	Building Gross Square Footage			**33,500.00**	**GSF**
01	**FOUNDATION**		$180,000	$4.48	2.30%
02	**SUBSTRUCTURE**		$230,000	$5.72	2.93%
03	**SUPERSTRUCTURE**		$1,786,450	$44.44	22.78%
04	**EXTERIOR CLOSURE/SHELL**		$1,641,000	$40.82	20.93%
05	**INTERIOR CONSTRUCTION**		$943,432	$23.47	12.03%
06	**CONVEYING SYSTEM**		$115,000	$2.86	1.47%
07	**PLUMBING**		$321,600	$8.00	4.10%
08	**HVAC**		$1,407,000	$35.00	17.94%
09	**ELECTRICAL**		$603,000	$15.00	7.69%
10	**SITEWORK**		$614,670	$15.29	7.84%
	INDIRECT COST		**$7,842,152**	**$195.08**	
	Overhead	15%	$1,176,323	$29.26	
	Fee	10%	$784,215	$19.51	
	Contingency	15%	$1,176,323	$29.26	
	TOTAL COST		**$10,979,013**	**$273.11**	

$1,050,000.00

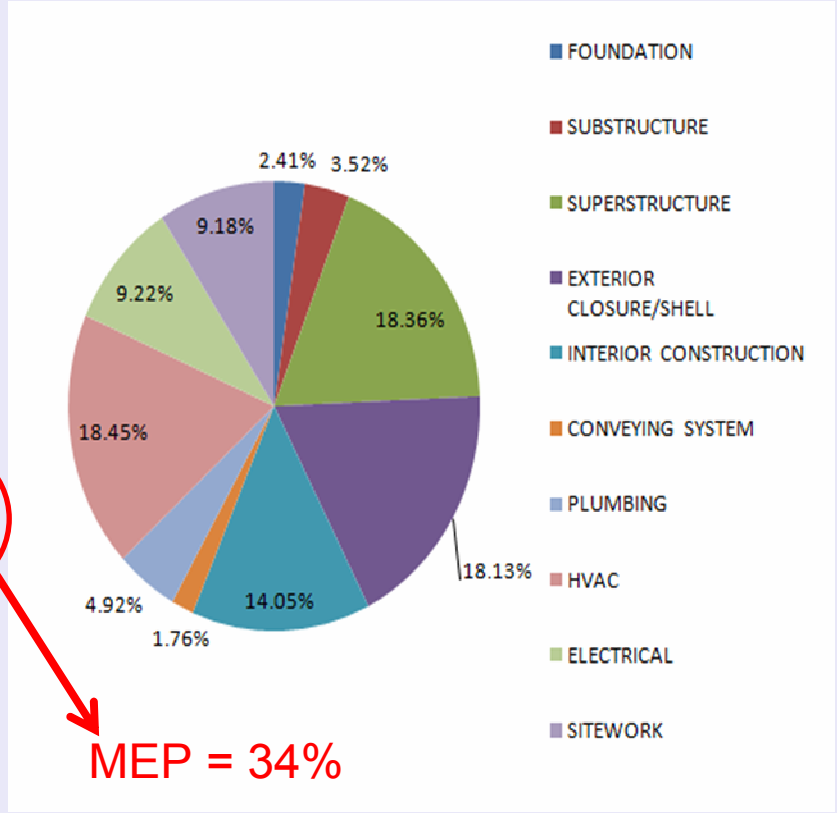


MEP = 30%

$11,000,000.00

Preliminary Cost Estimate
Arch 2 Concept: Concrete

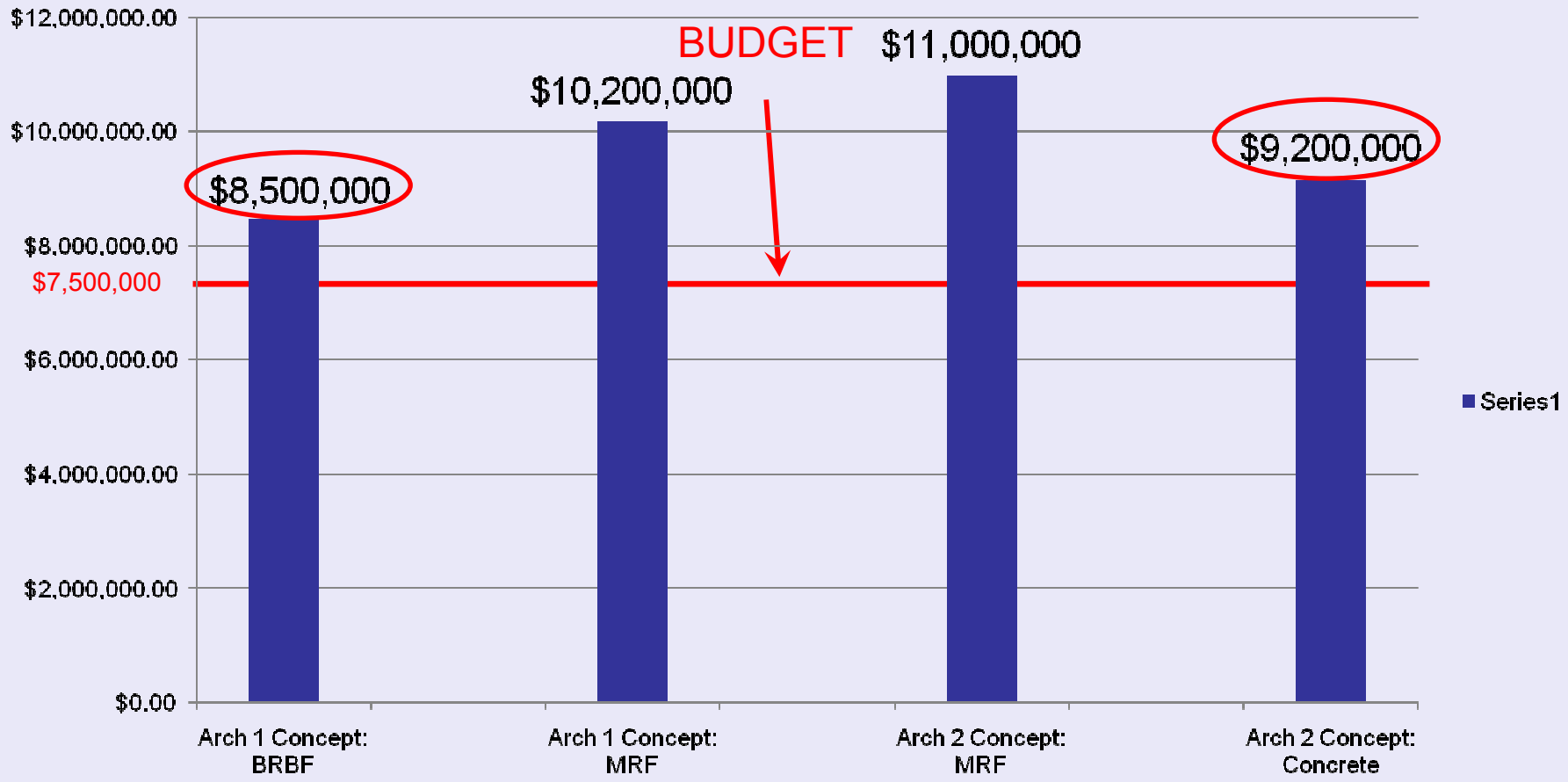
Item	Description		Sub Total	Cost/Sf	% Overall
	Building Gross Square Footage			**40,200**	**GSF**
01	**FOUNDATION**		$157,500	$3.92	2.41%
02	**SUBSTRUCTURE**		$230,000	$5.72	3.52%
03	**SUPERSTRUCTURE**		$1,200,535	$29.86	18.36%
04	**EXTERIOR CLOSURE/SHELL**		$1,185,200	$29.48	18.13%
05	**INTERIOR CONSTRUCTION**		$918,432	$22.85	14.05%
06	**CONVEYING SYSTEM**		$115,000	$2.86	1.76%
07	**PLUMBING**		$321,600	$8.00	4.92%
08	**HVAC**		$1,206,000	$30.00	18.45%
09	**ELECTRICAL**		$603,000	$15.00	9.22%
10	**SITEWORK**		$600,050	$14.93	9.18%
	INDIRECT COST		**$6,537,317**	**$162.62**	
	Overhead	15%	$980,598	$24.39	
	Fee	10%	$653,732	$16.26	
	Contingency	15%	$980,598	$24.39	
	TOTAL COST		**$9,152,244**	**$227.67**	



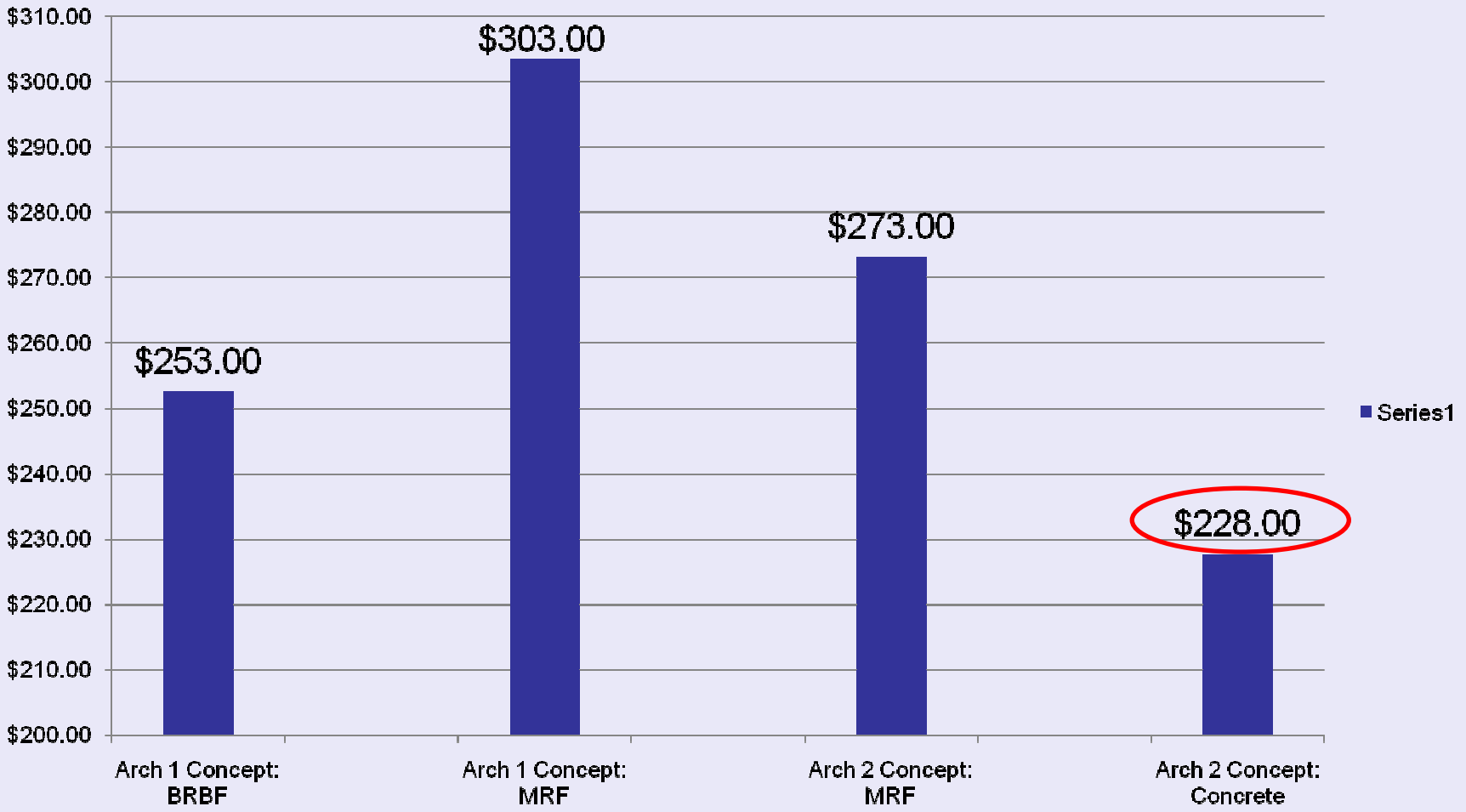
MEP = 34%

$9,200,000.00

Cost Comparison

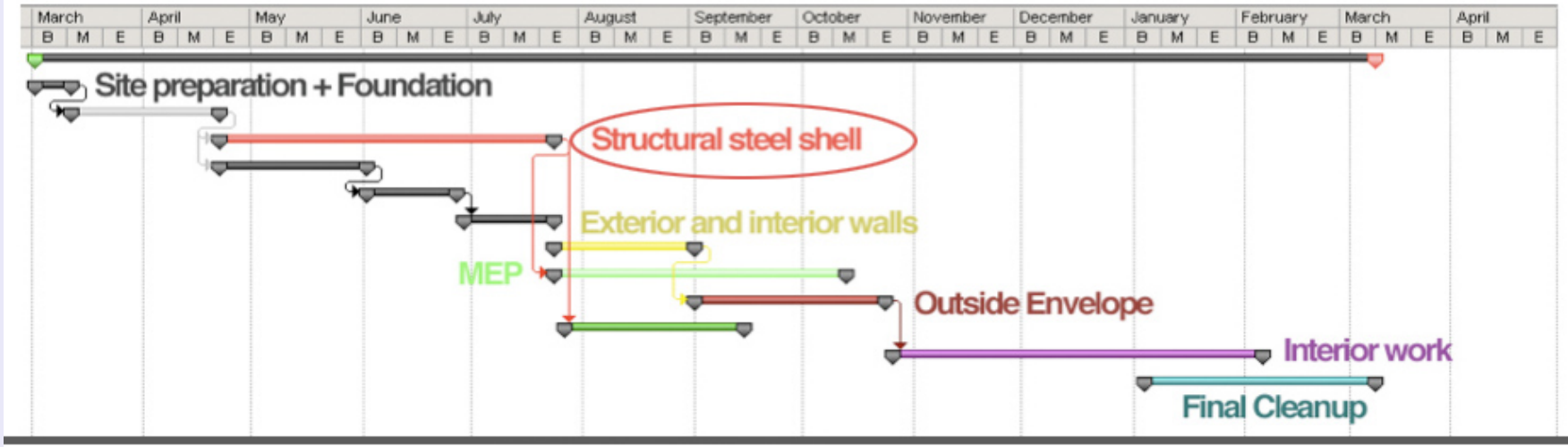


$/SF Comparison



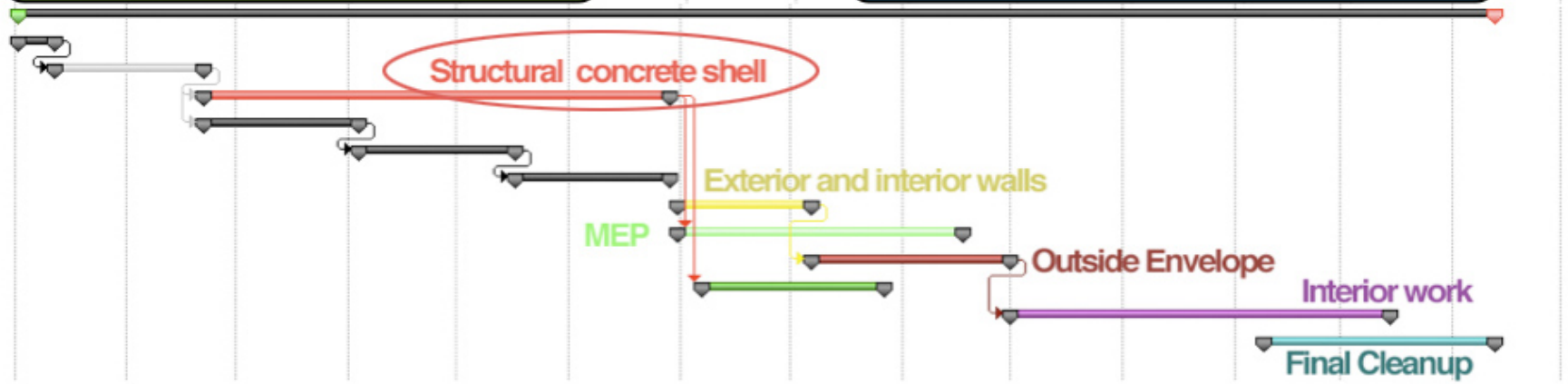
1st architectural concept - Steel 1 Year | 266 working days

Project Start - March 2nd 2015 → Project Finish - 7th Mar. 2016

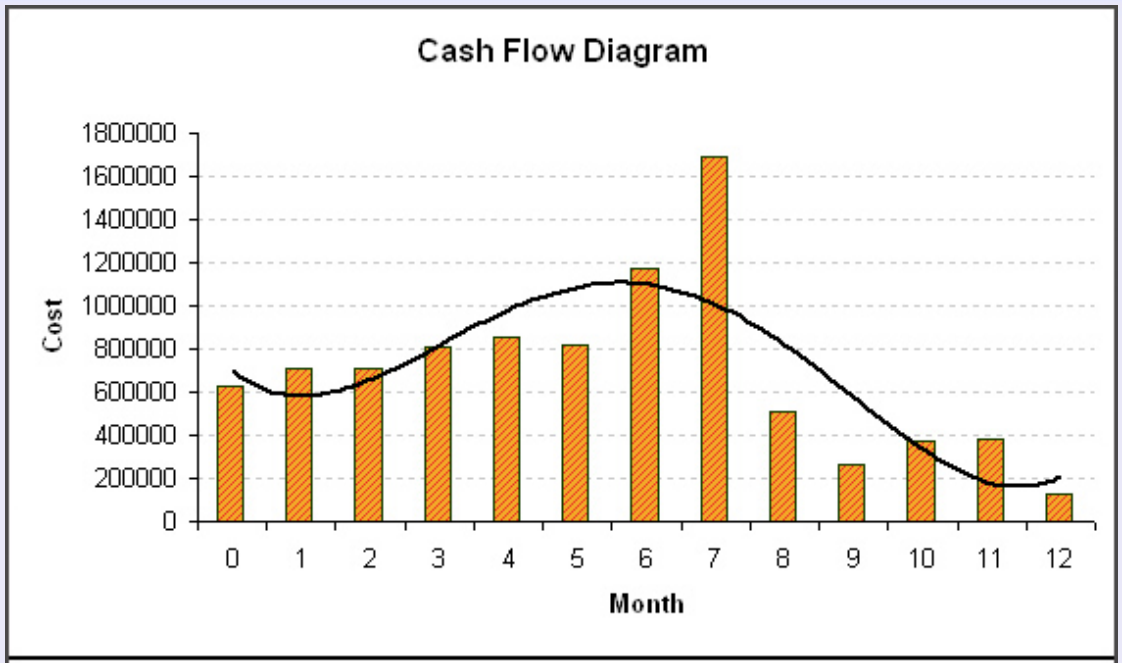


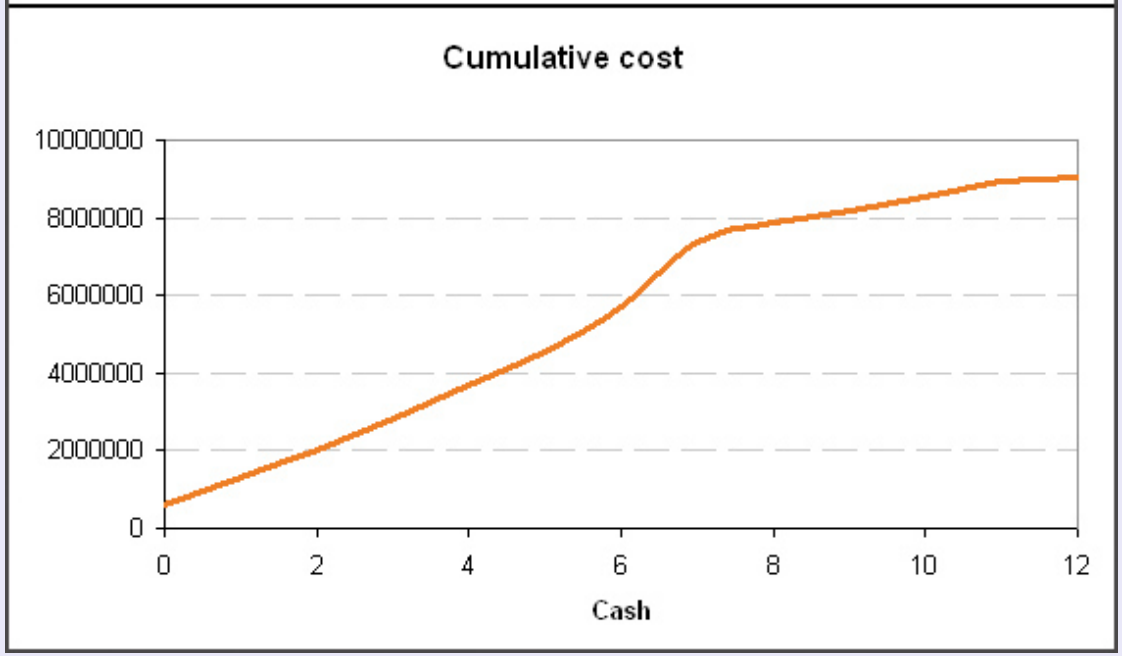
2nd architectural concept - Concrete 1 Year, 1 month | 292 working days

Project Start - March 2nd 2015 → Project Finish - 12th Apr. 2016

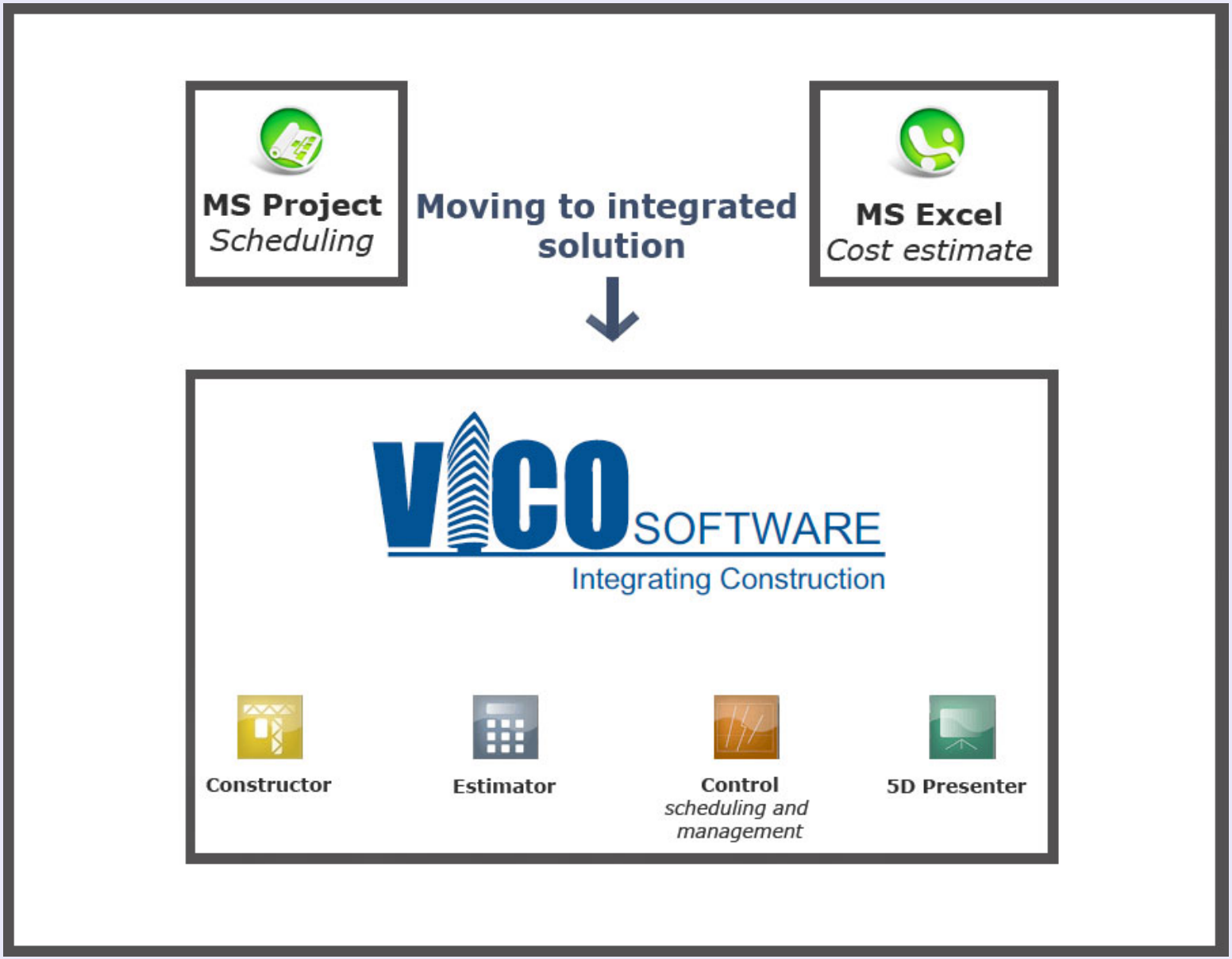


Pacific Team

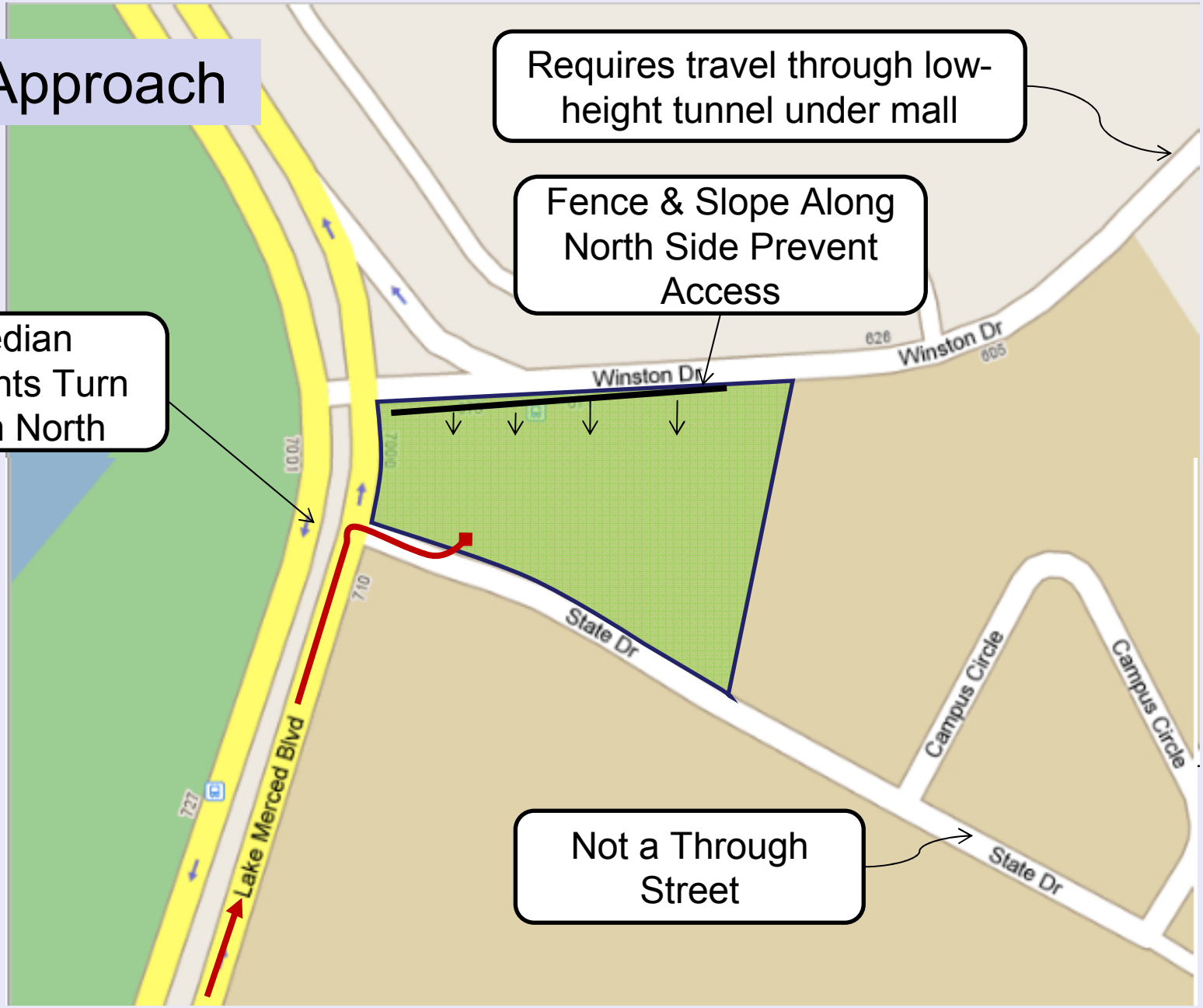


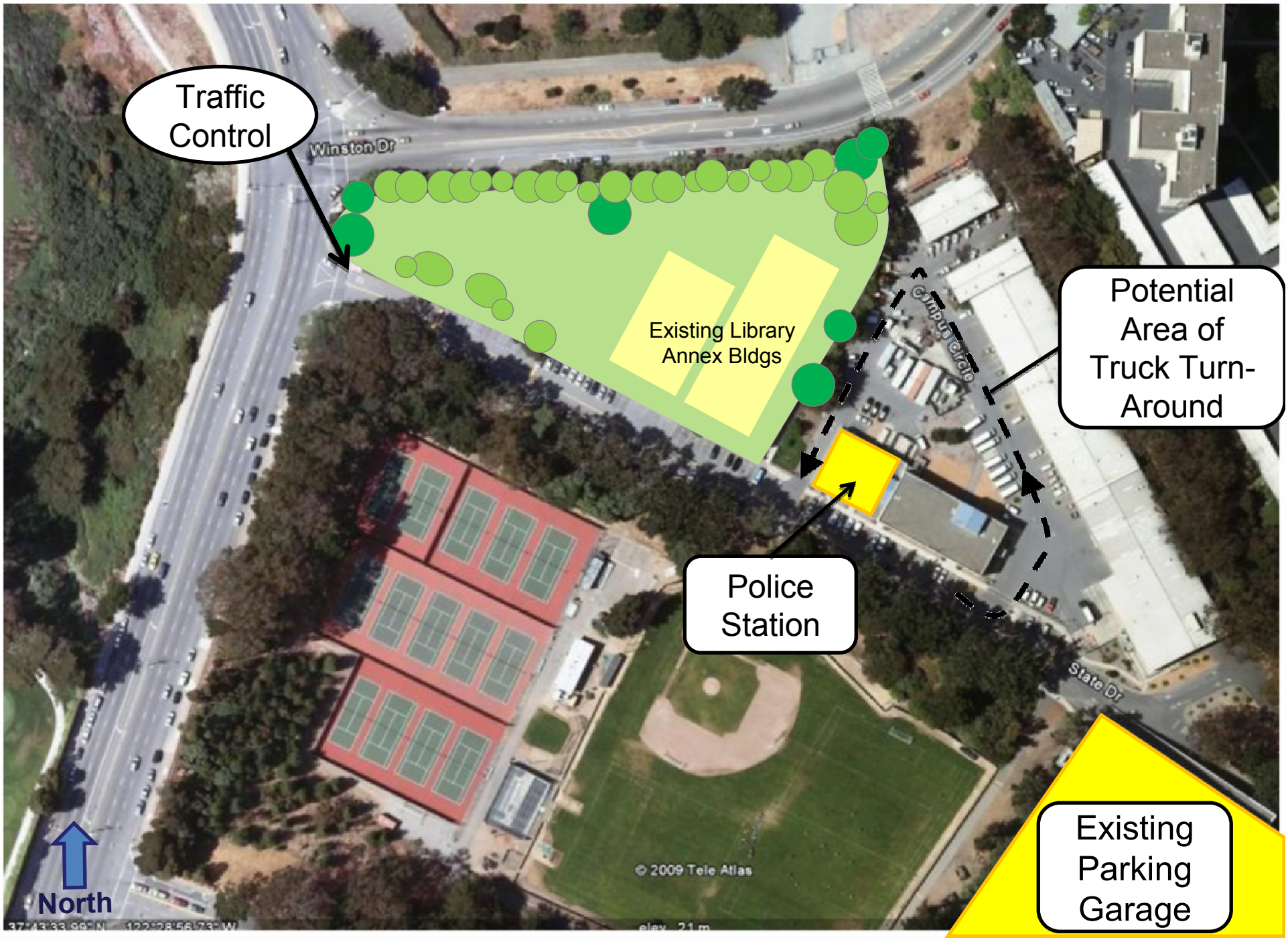


Moving Forward

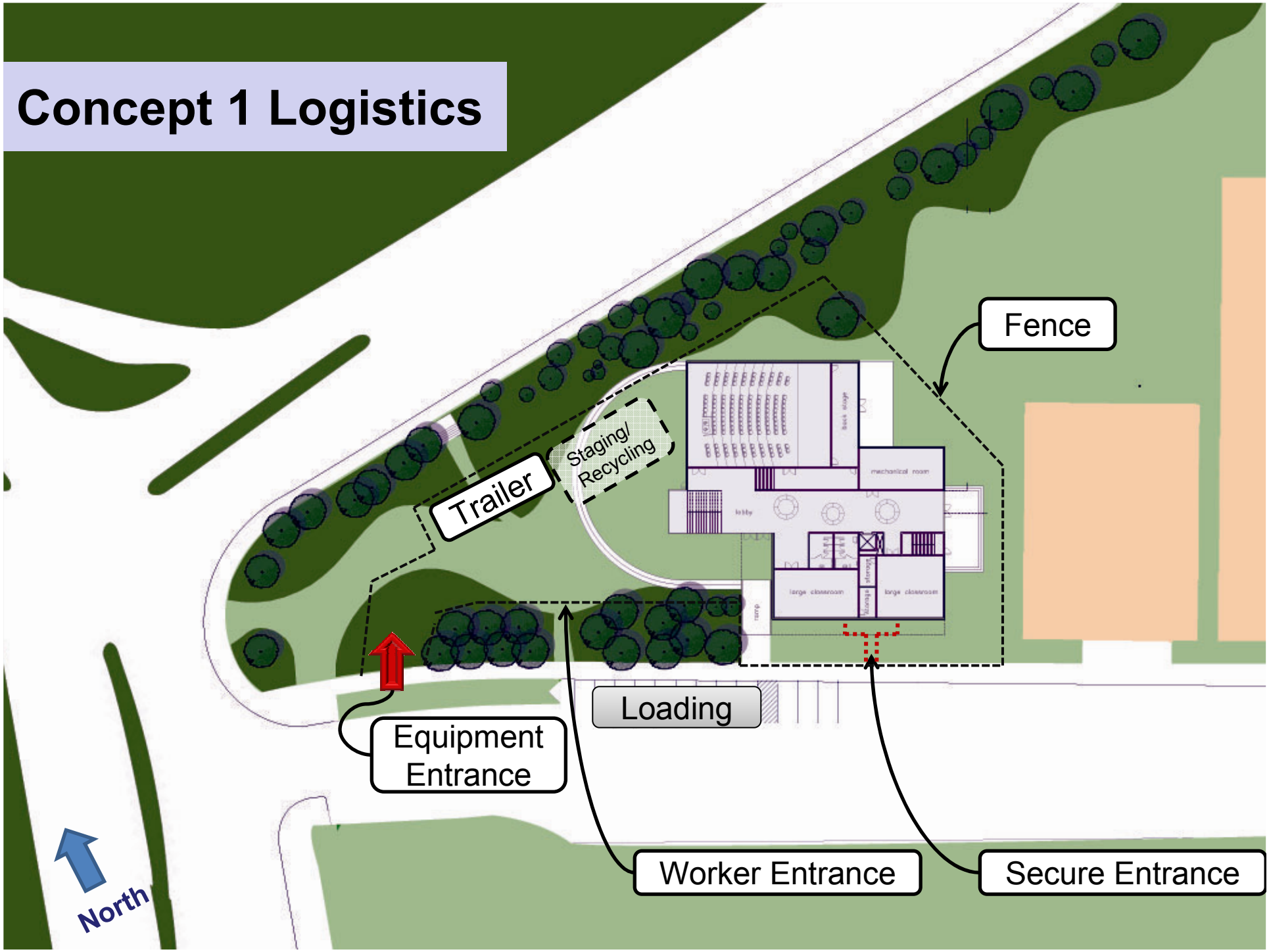


Site Approach

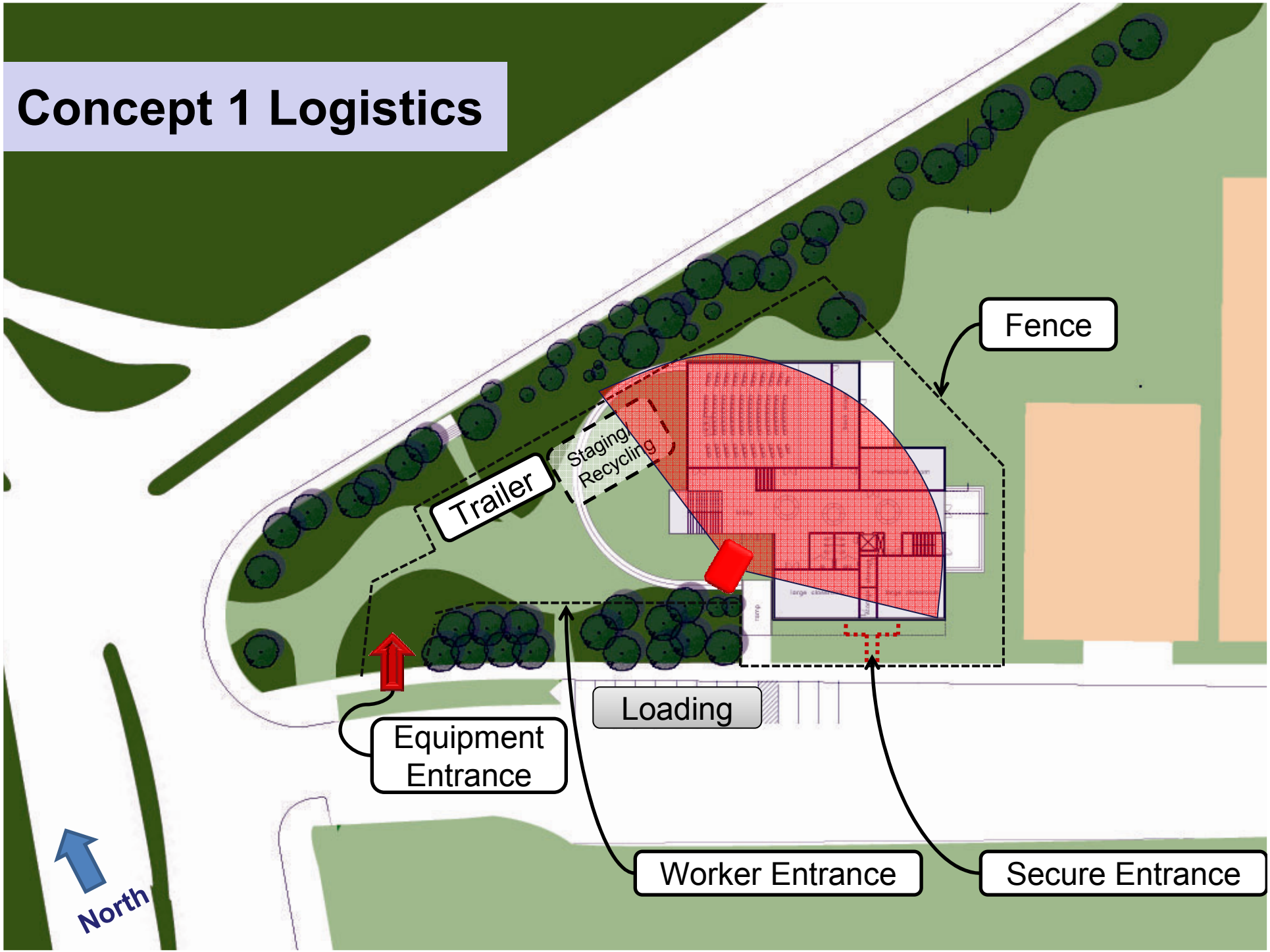



Traffic Control
Winston Dr
Existing Library Annex Bldgs
Potential Area of Truck Turn-Around
Police Station
State Dr
Existing Parking Garage
North
© 2009 Tele Atlas

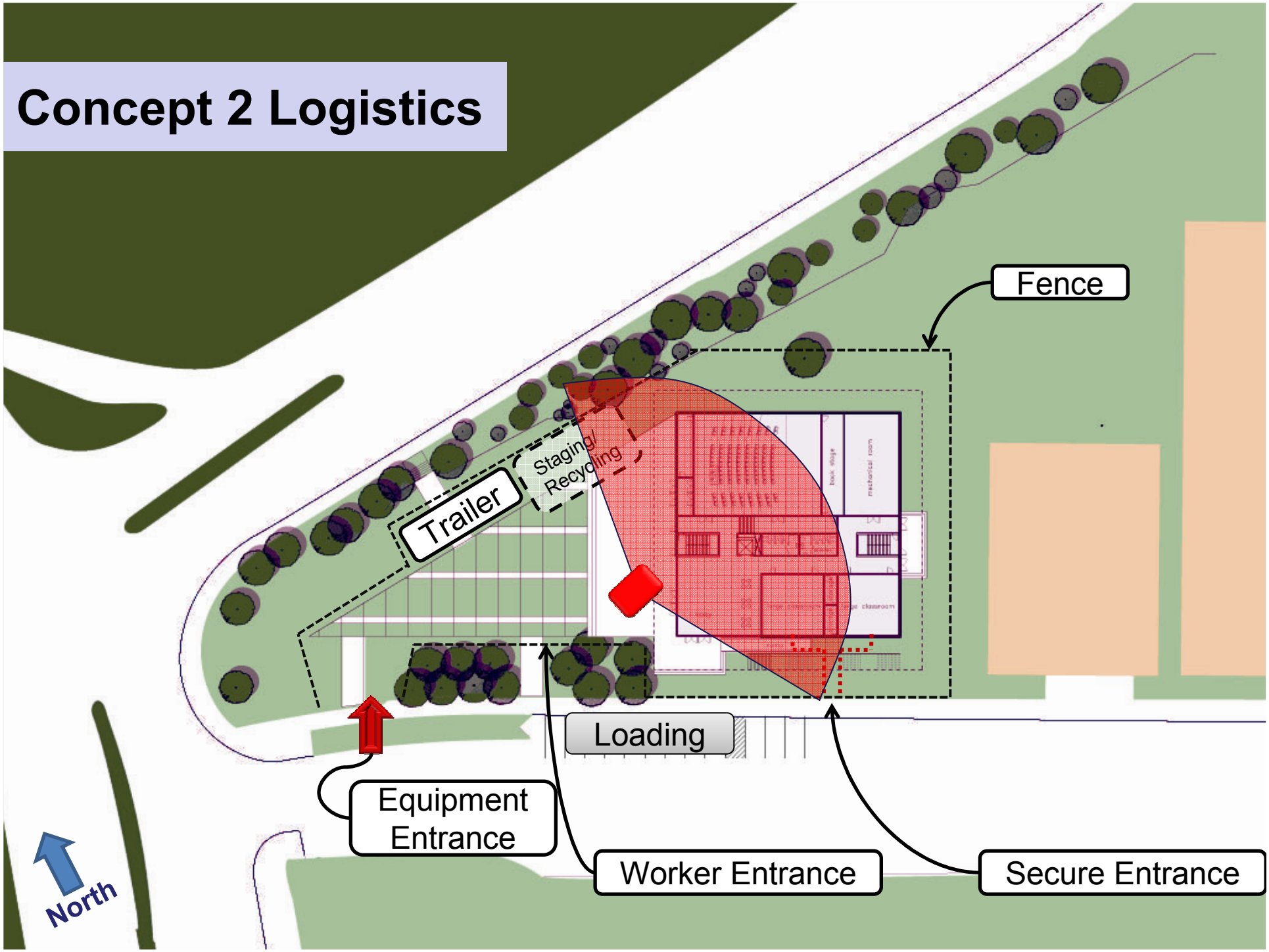
Concept 1 Logistics



Concept 1 Logistics



Concept 2 Logistics



TEAM PROCESS

- Process & Progress
- SimVision

Process & Progress

Synchronous Communication:

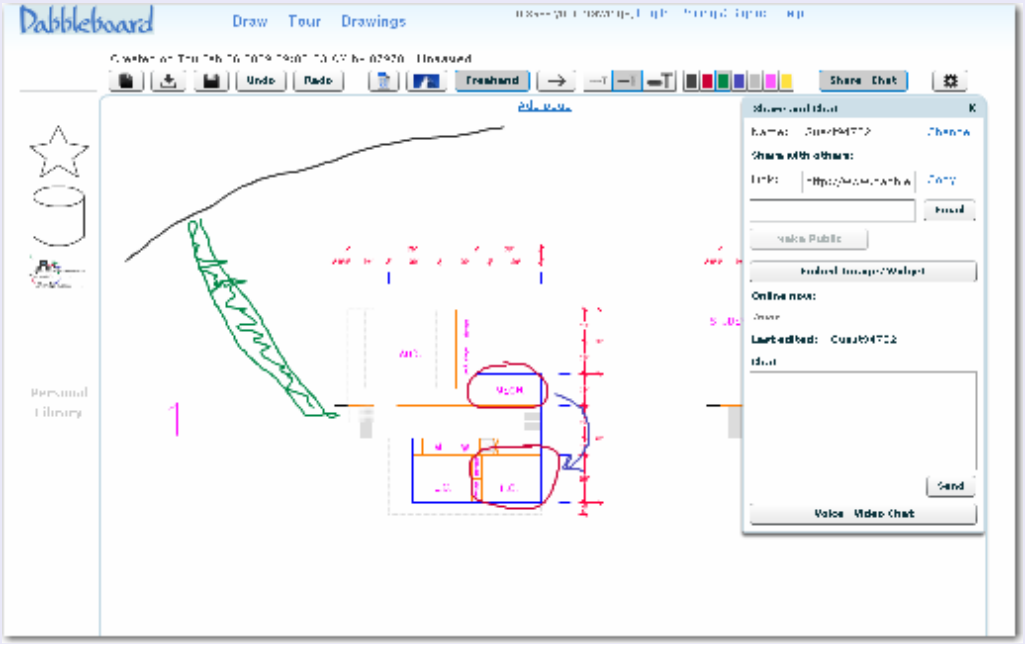
Skype – Audio and some textual

Netmeeting & Recall – Graphic visual & audio recording

Vsee - Video during Friday meetings

QWAQ – Team building

DabbleBoard – for real time graphic visual discussions during discipline specific meetings when netmeeting is unavailable



Process & Progress

Asynchronous Communication:

Google Group:

- Tracks all communication
- Consolidates longer discussion threads and informal chatting in one spot
- Includes Calendar
- Easily allows Google Doc sharing

Google Docs:

- Allows multiple parties to view an edit
- Used for:
  - developing meeting agendas
  - tracking task list
  - sharing developing information and notes

Oslo:

- for sharing finalized information and files

Process & Progress

Rules:

- Weekly update of task list (google docs)
  (when, who, what, status, notes log includes links to further documentation)
- Standardized methods of :
  - Weekly meeting role assignments
  - Agenda organization
  - Documentation naming and sharing for oslo & Google docs
  - Sharing of all meeting minutes
  - Slide show development

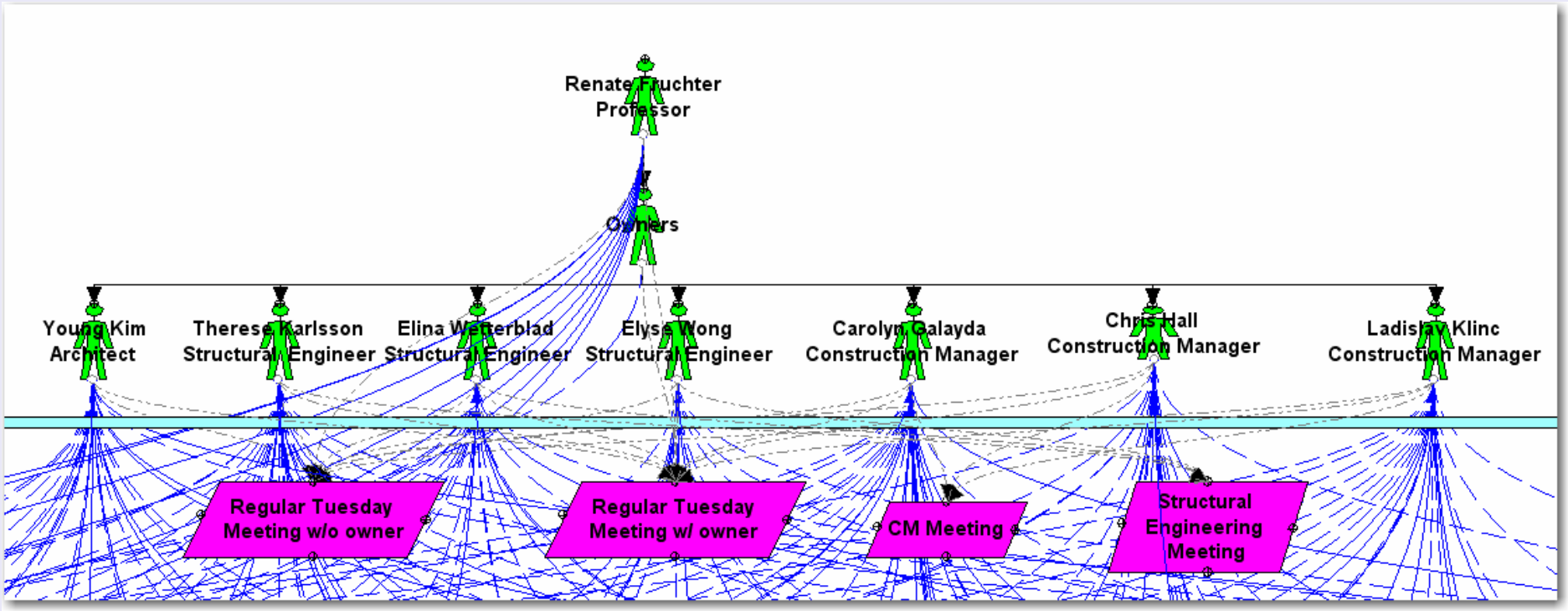
Date Created	Date Due	Status	Assigned To	Task Description	Requestor	Log
				- Cost of Ceiling vs. Floor equipment		
1/20/2009	1/27/2009	In Progress	Tess	Structural Research: Due next meeting 1/27- Tess - building frame systems- pro & cons - elevator: what type and where - structural preferences of location of required rooms	General	
1/20/2009	1/27/2009	Complete	Elyse	Structural: - Soil research: USGS visit w/ Carolyn 1/23/09 - type (sand or clay) - water table location, affects - pipes/ducts in ground - initial load table/calcs - structural preferences of location of required rooms	General	- USGS site visit, soil type and water table maps: uploaded to oslo - initial load calc spreadsheet includes dead, live, earthquake, and wind loads with prelim factors: uploaded to oslo
1/30/2009	2/6/2009	Complete	Ladi	HVAC Pro/Con Matrix		
1/30/2009	2/10/2009	In progress	Carolyn	Begin Logistics/Access Diagram (Site Plan)		2-2-09: sketchup issues kept me from completion; will discuss usabilty of Revit at 2-3-09 mtg. 02-03-09 reasigned due date from 02-03-09 to 02-10-09 will draw on Revit as per group voted consensus 2-10-09: finished and uploaded to oslo site model (revit, CAD (2&3D), and select JPG views available)
1/30/2009	2/3/2009	Complete	Carolyn	Reformat Adjacency Diagram		(includes affinity & rejection sheets uploaded to oslo: CG-Chart-Room Adjacency-v1-020109
1/30/2009	2/6/2009	Complete	Chris	Budget Template		
1/30/2009	2/10/2009	In Progress	Chris	Research Work Hrs./Arch& Design Restrictions		
1/30/2009				Research Inflation (yr 2015)		

Process & Progress

- **Improvement Moving Forward**
  - Weekly multi-disciplinary meeting
  - Update task list more frequently
  - Post log from inter-disciplinary meetings
  - Leave Skype on when possible
  - More contact with owners & mentors

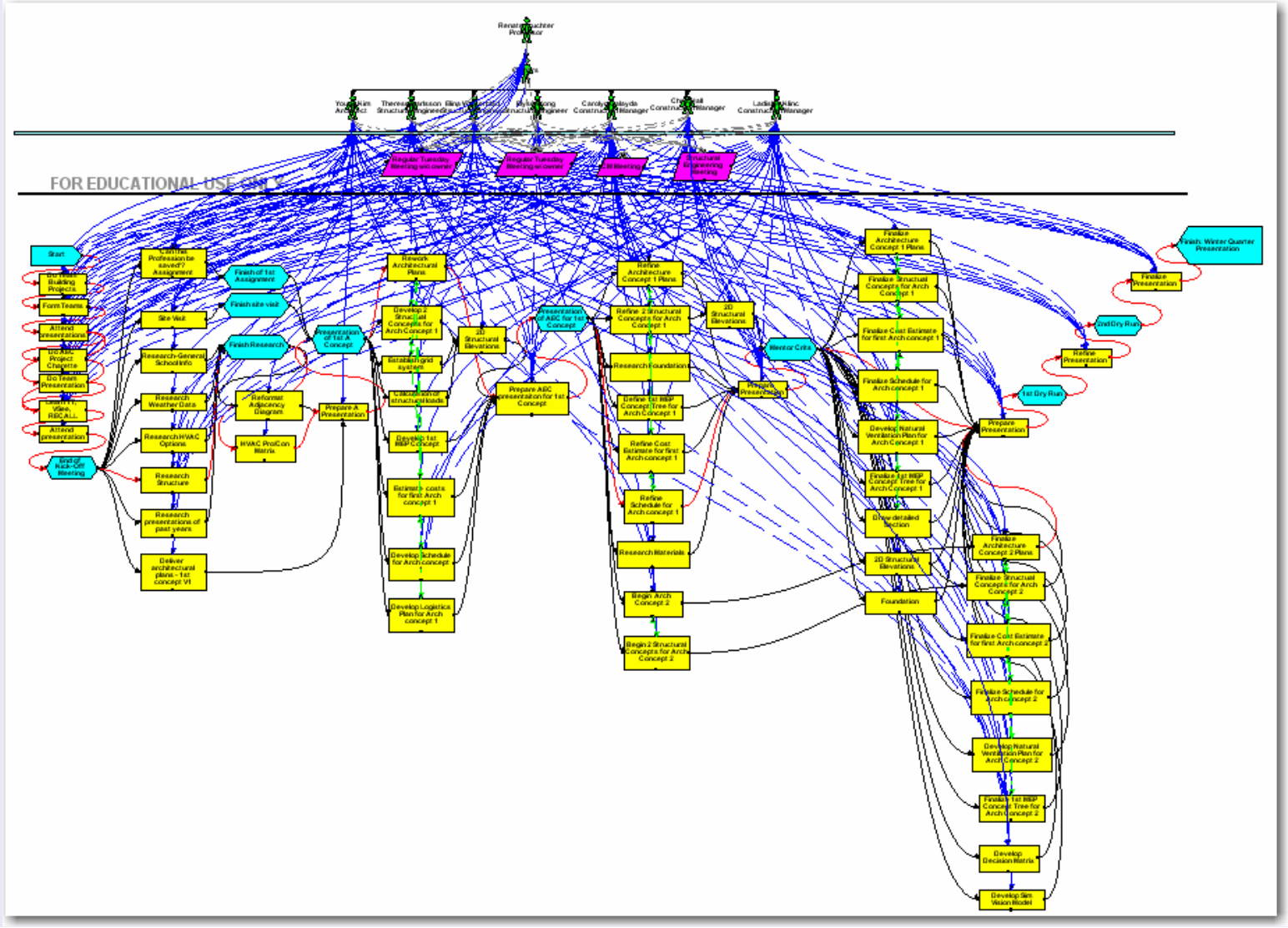
SimVision Model

Team organization and meetings

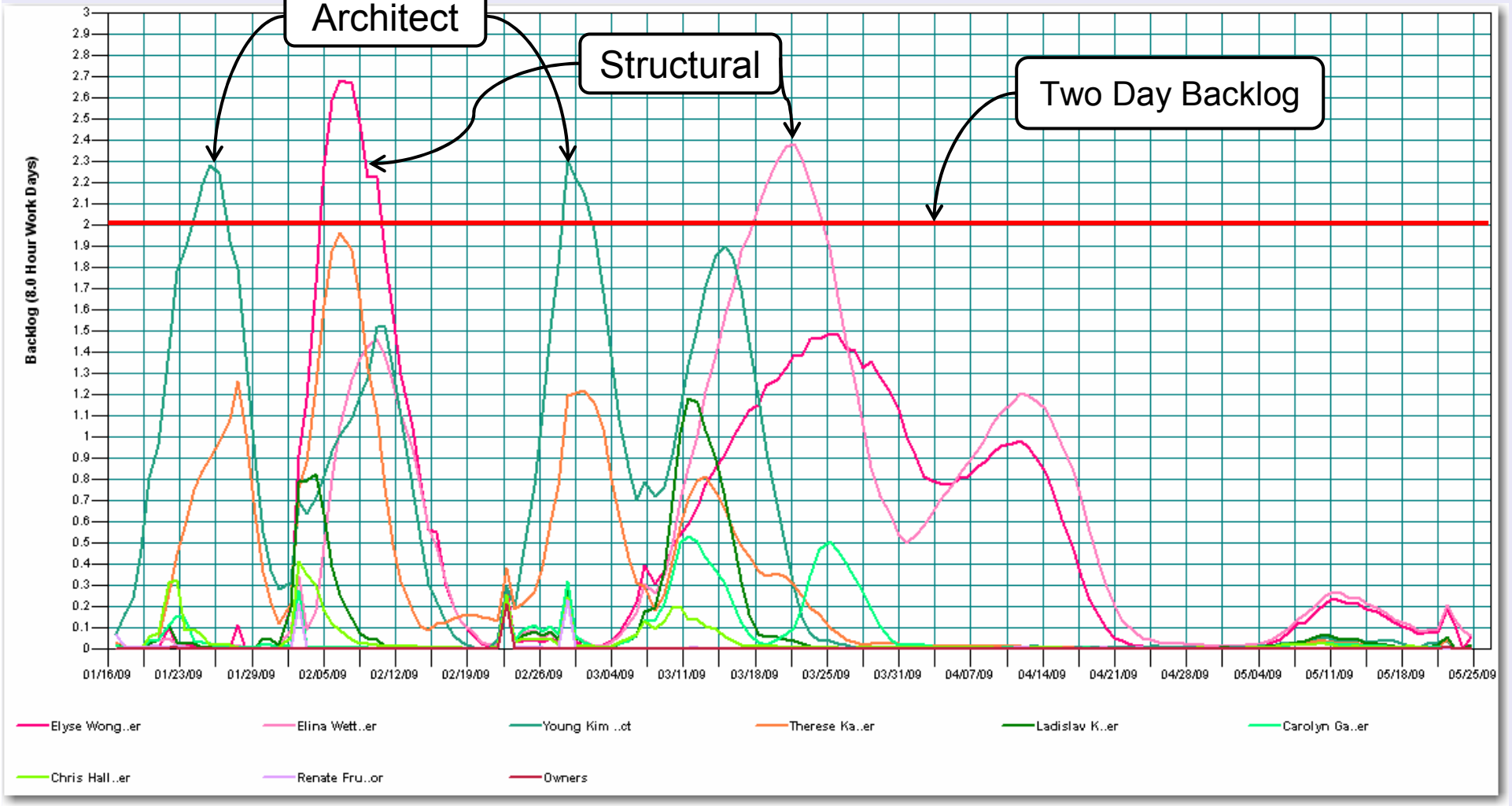


SimVision Model

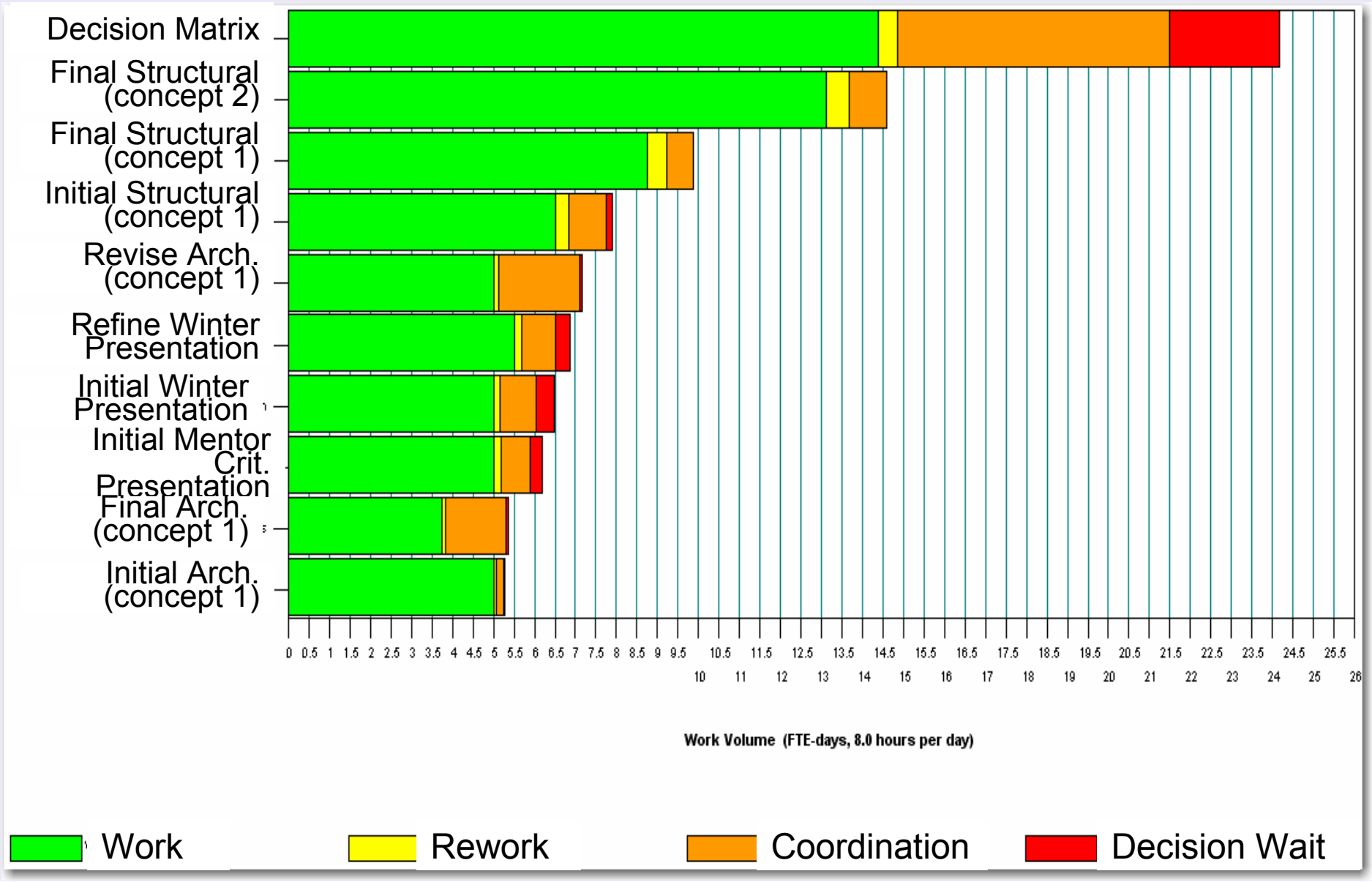
Tasks



SimVision Position Backlog



SimVision Work Distribution



FINAL PRODUCT

- Focal Points
- Spider Diagram
- Decision Matrix
- Recommendation

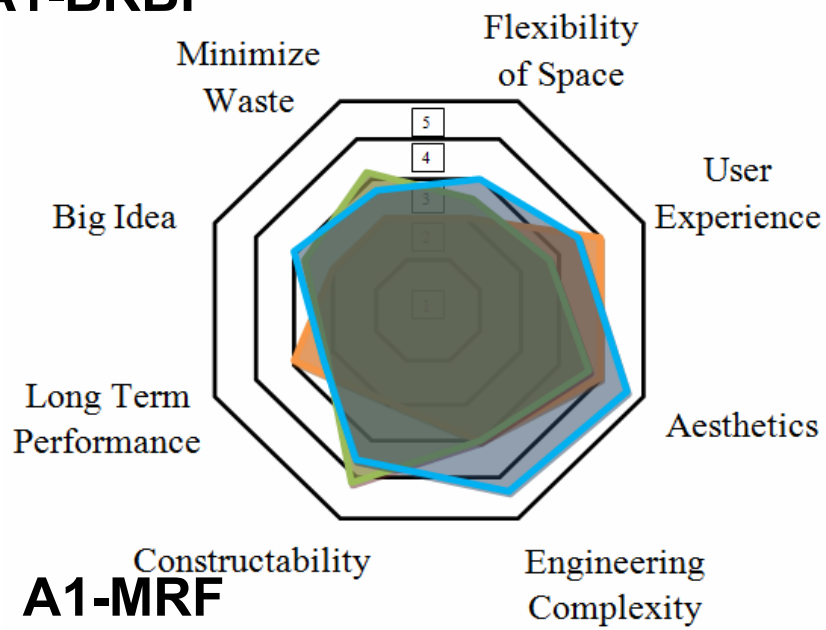
Focal Points

	A1-BRBF	A1-MRF	A2-MRF	A2-Concrete
Big Idea		C	A/E	A/E
User Experience	A	A	A/E/C	A
Aesthetics	C	E	A	A
Flexibility of Space			A/E/C	E/C
Engineering Complexity	A/C		E	
Constructability	E		C	A
Long Term Performance	A		A/C	A/E/C
Minimize Waste	E		A	C

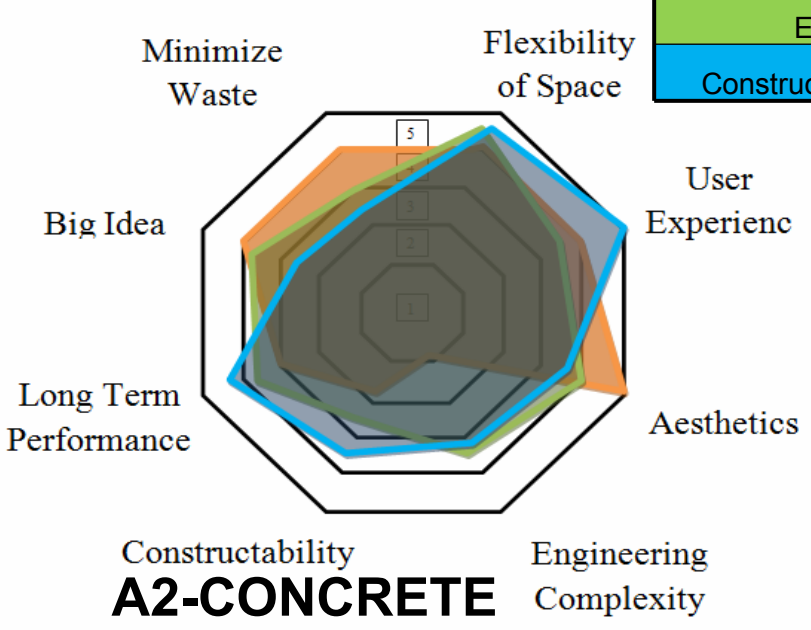
Pacific Team

Architect
Engineer
Construction Managers

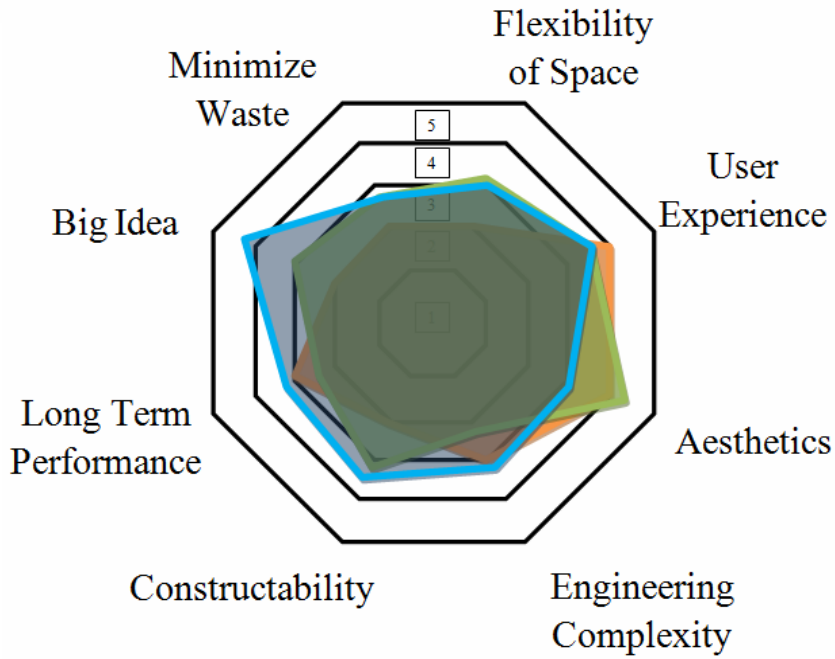
A1-BRBF



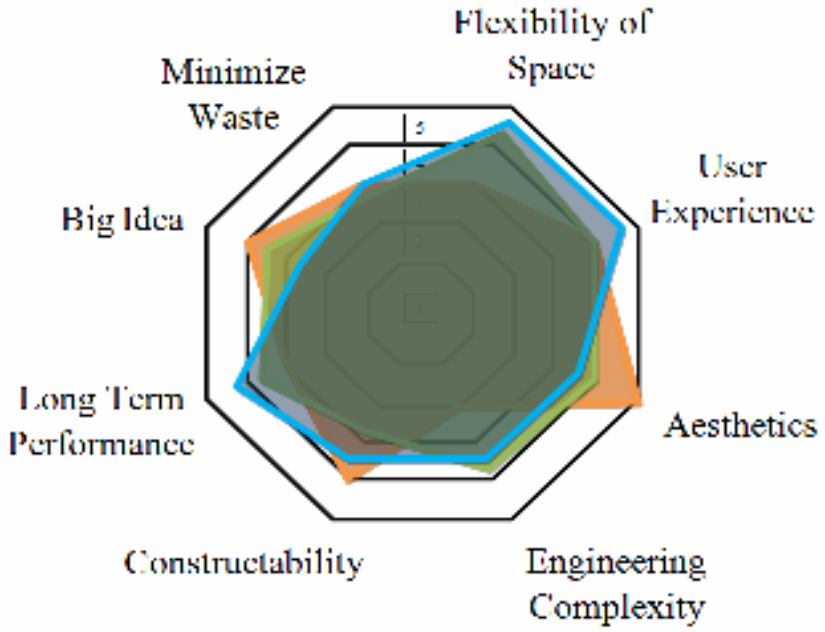
A2-MRF



A1-MRF



A2-CONCRETE



Decision Matrix

	A1-BRBF	A1-MRF	A2-MRF	A2-Concrete
Big Idea	8	10	10	10
User Experience	11	11	13	13
Aesthetics	13	13	13	13
Flexibility of Space	8	8	13	12
Engineering Complexity	10	8	8	9
Constructability	10	9	8	11
Long Term Performance	9	8	11	11
Minimize Waste	8	7	9	9
TOTAL	75	74	86	87

Recommendation

Thank You!

Questions?