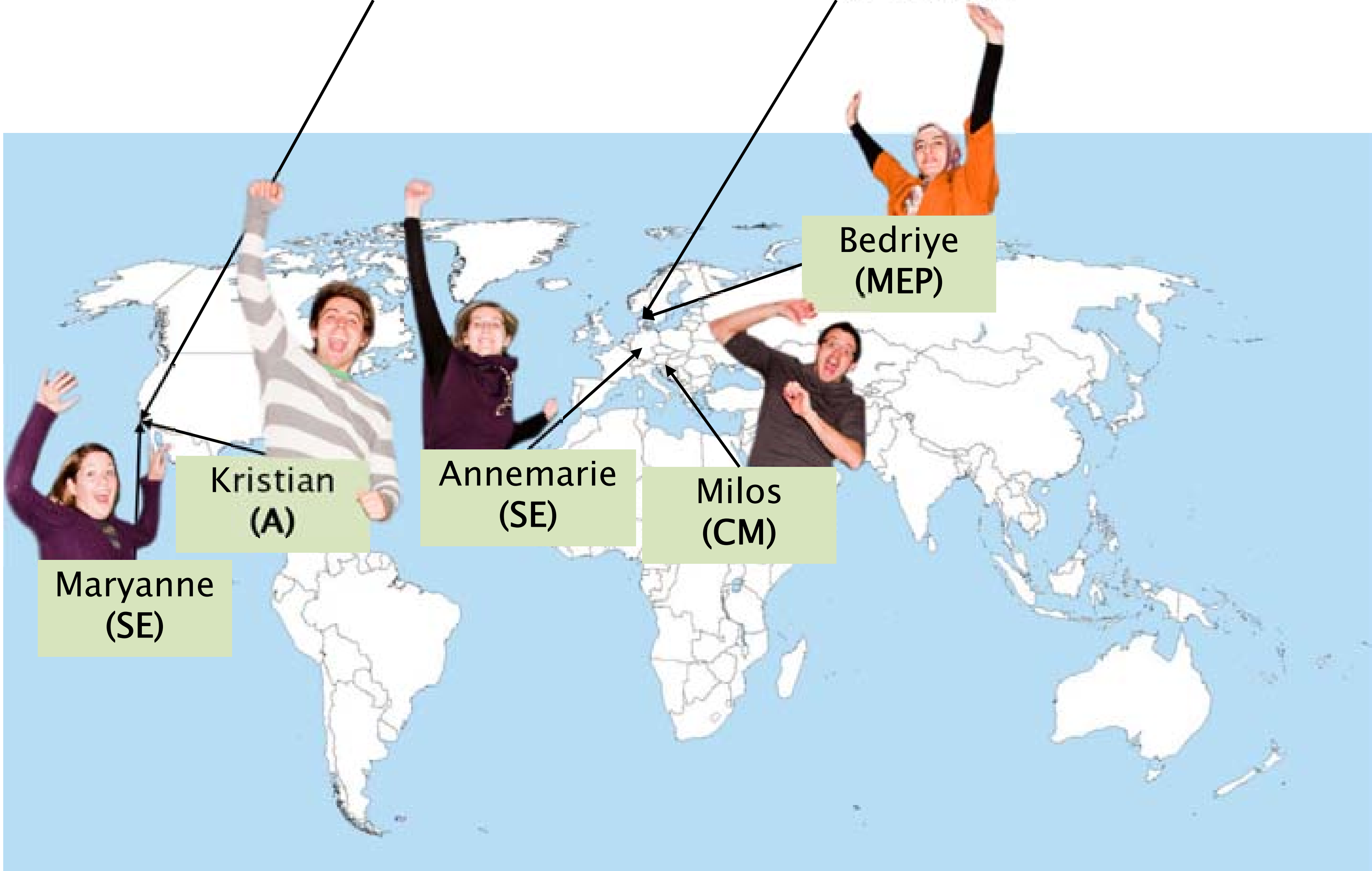
RidgeRS with the RIDGE

kristian
maryanne
annemarie
bedriye
milos

RidgeRS and global teamwork

With Lauren Scammell and Gitte Sørensen as owners.



SITE LOCATION

Where is The Ridge?

There is some existing slope, but not much.

„We ‘re RidgeRS, so **let ‘s make some slope**!“

SOIL PROFILE

Grade at 5,580 ft. Elevation

Depth of Excavation	Soil Type	Thickness	Bearing Capacity
0 inches (0 ft.)	Stony Sandy Loam and Heavy Loam	19 inches (1.58 ft.)	1,500 psf.
19 inches (1.58 ft.)	Sandy Clay Loam	10 inches (0.83 ft.)	1,500 psf.
29 inches (2.42 ft.)	Clay and Clay Loam	27 inches (2.25 ft.)	1,500 psf
56 inches (4.67 ft.)	Very Gravelly Sandy Loam and Very Gravelly Loam	28 inches (2.33 ft.)	5,000 psf
84 inches (7 ft.)	Volcanic Rock	Unknown	8,000 psf

Water Table
48 inches (4.0 ft.)

excavation
construction

pre-draining (–)
retaining walls (–)
higher building (+)

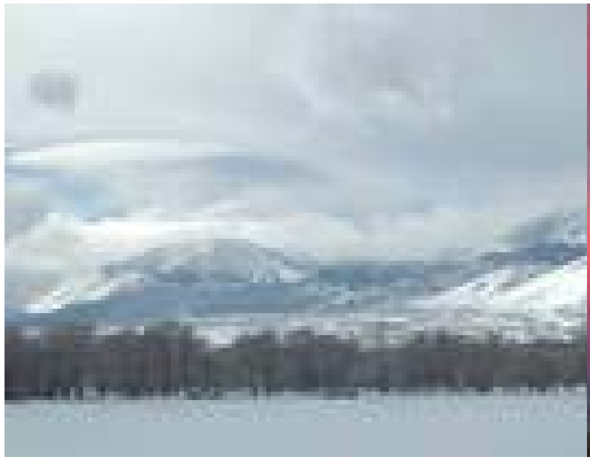
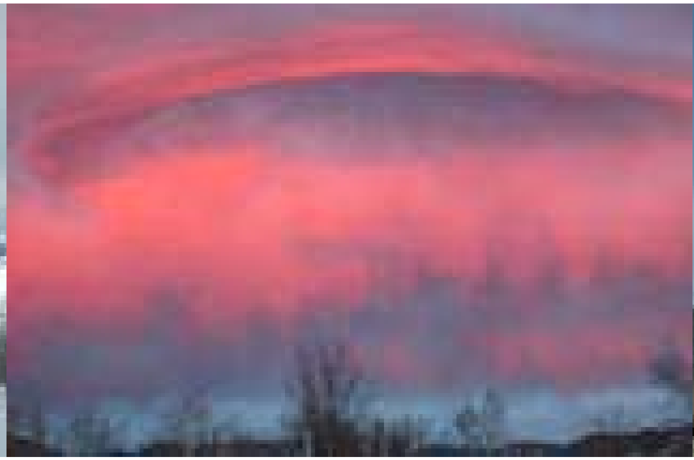
LOCAL HAZARD

-Highly seismic area

-Large fluctuation in temperatures (daily and seasonly)

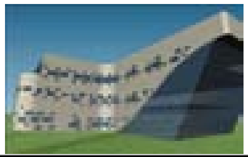
-High desert winds – average windspeed 60mph

-"Rain shadow"


the DECISION MATRIX

	PINE CONE		HARDSCAPE	
	concrete	steel	concrete	steel
Discipline Based				
building concept clarity	4,8	5,0	3,0	3,2
perceived value & aesthetics	4,2	4,2	3,8	3,8
exposed structure as aesthetics	2,8	2,8	4,0	4,0
constructability	3,4	3,4	4,4	5,0
prefabrication & shorter schedule	3,6	3,8	4,0	4,0
Biomimcry Challange				
biomimetical form innovation	4,2	4,2	2,0	2,0
possibilities for new biomimetical technologies integrations	3,4	3,4	3,6	3,6
TVD Challenge - Local & Natural Factors				
local community/environment interaction	3,8	3,6	4,4	4,2
water collection and reuse	4,2	4,2	4,0	4,0
renewable on-site energy production	3,8	3,4	3,8	3,4
	38,2	**38,0**	**37,0**	**37,2**



TARGET VALUE DESIGN

TVD: LOCAL

TVD: NATURAL

TVD: TEAM PROCESS

TVD: BIM MANAGEMENT

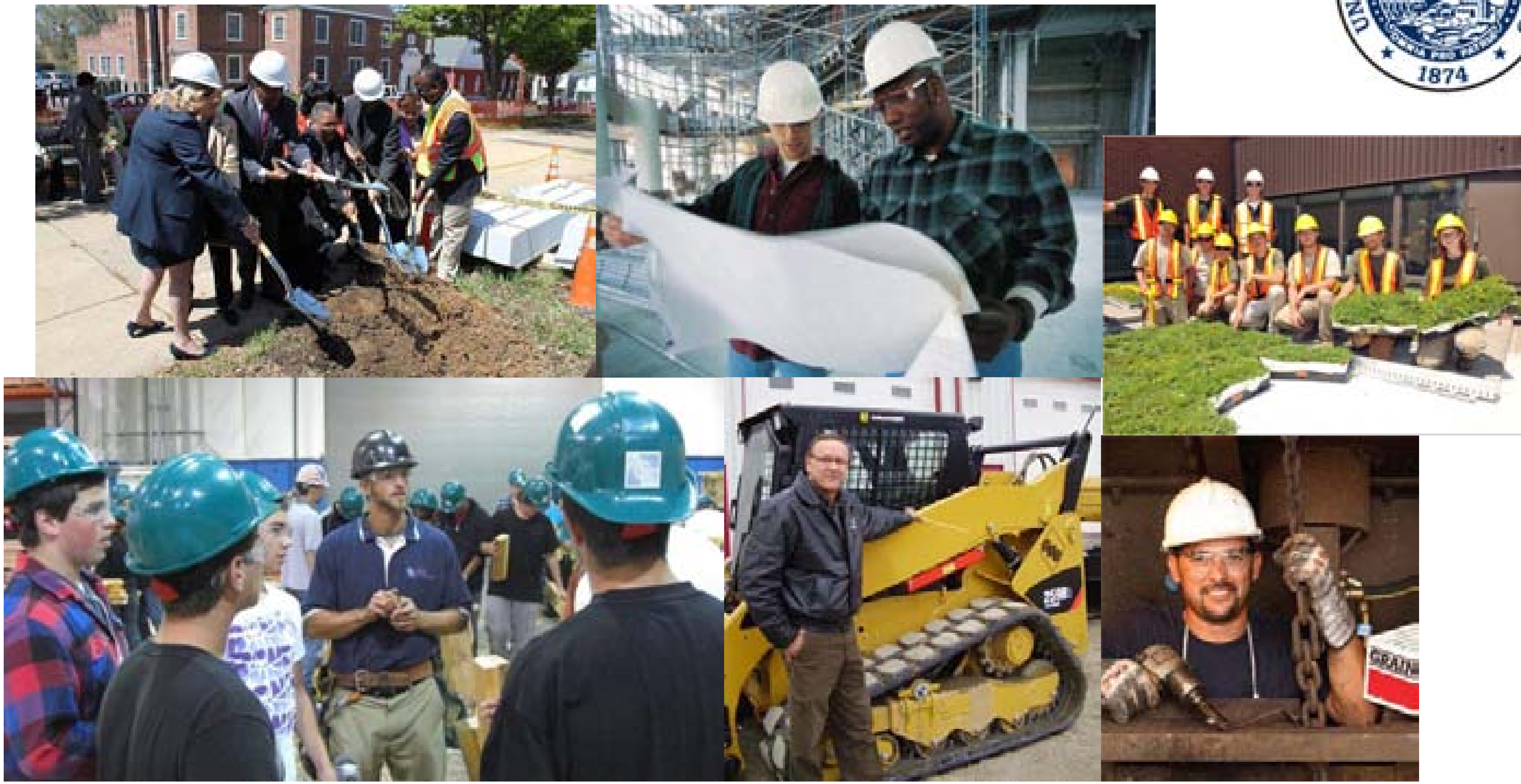
RidgeRS

BRISTLECONE PINE – Nevada state tree

LOCAL – community & labor

One of the mottos of the University of Nevada Reno:

„A Nevada education stresses conceptual, **hands-on learning.**“

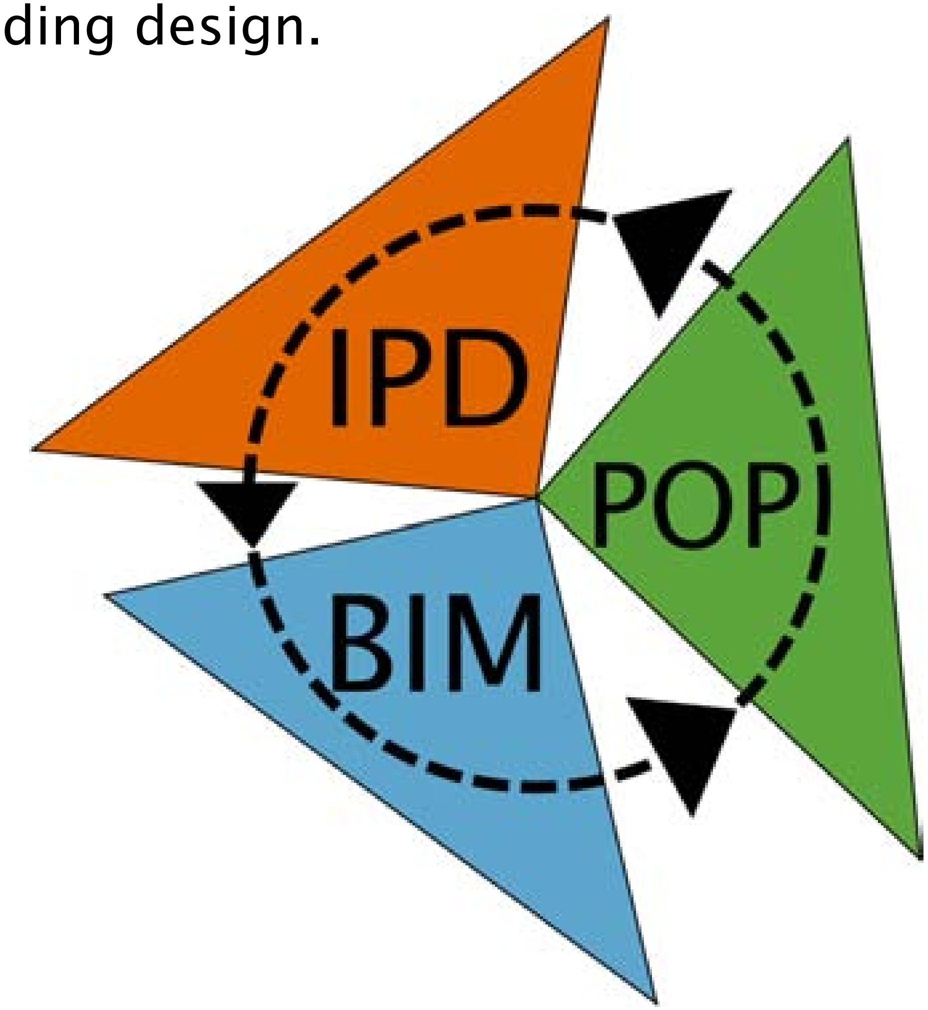


LOCAL – social aspect

More than just a studying and working place …

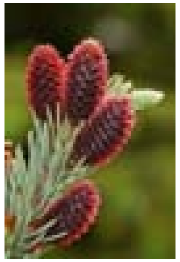
TEAM PROCESS

The power of team workflow and using new technologies for achieving higher standards in building design.

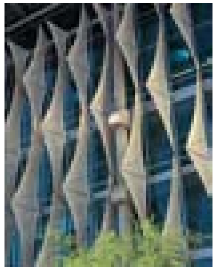


Architectural Target Values

Biomimicry



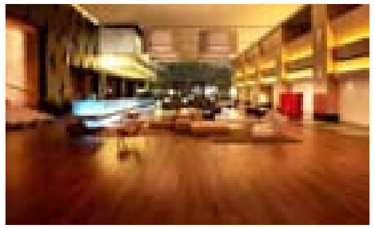
Sustainability



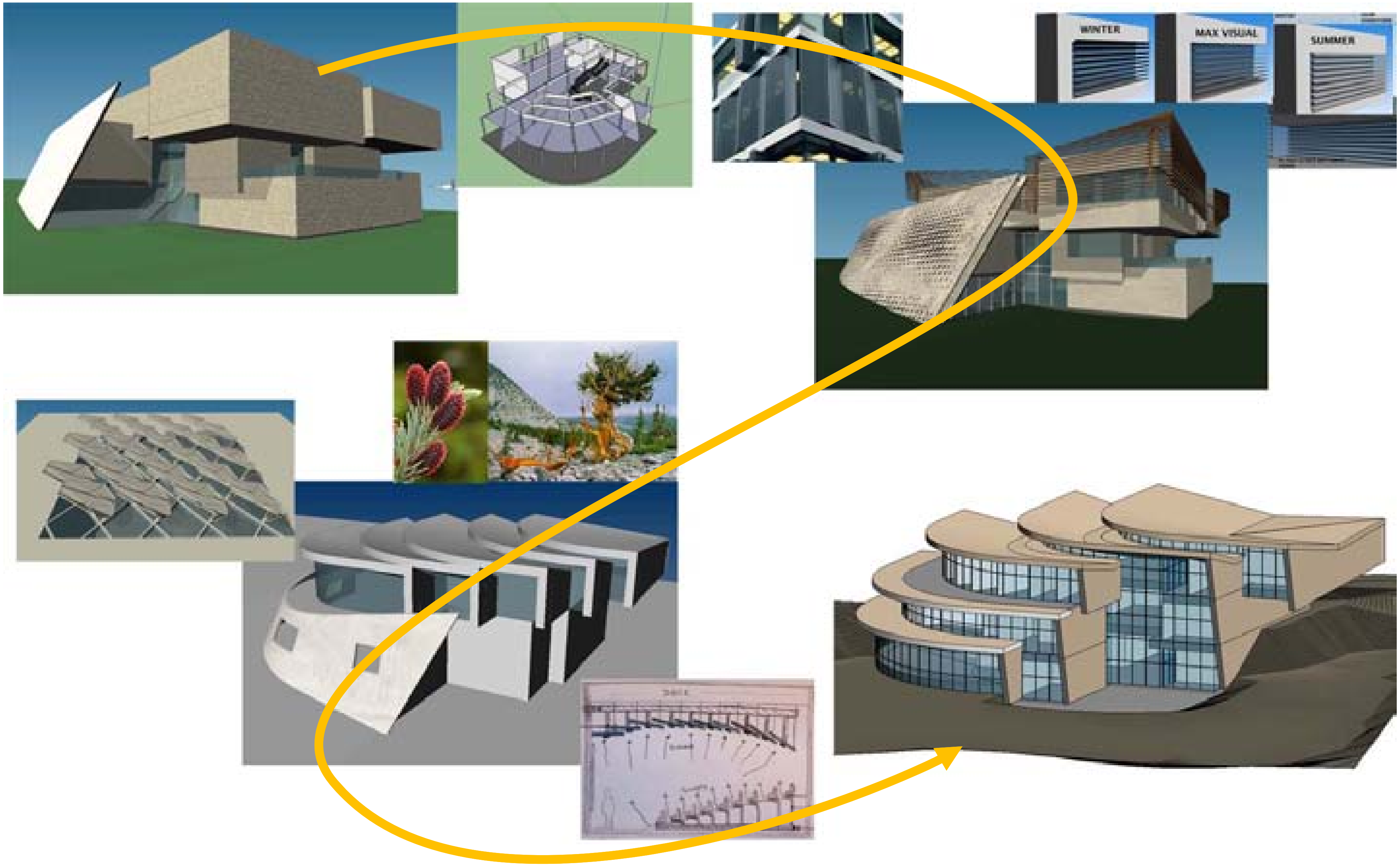
Social/Collaborative Space

Local/Community Atmosphere

Functional Exterior and Warm Interior

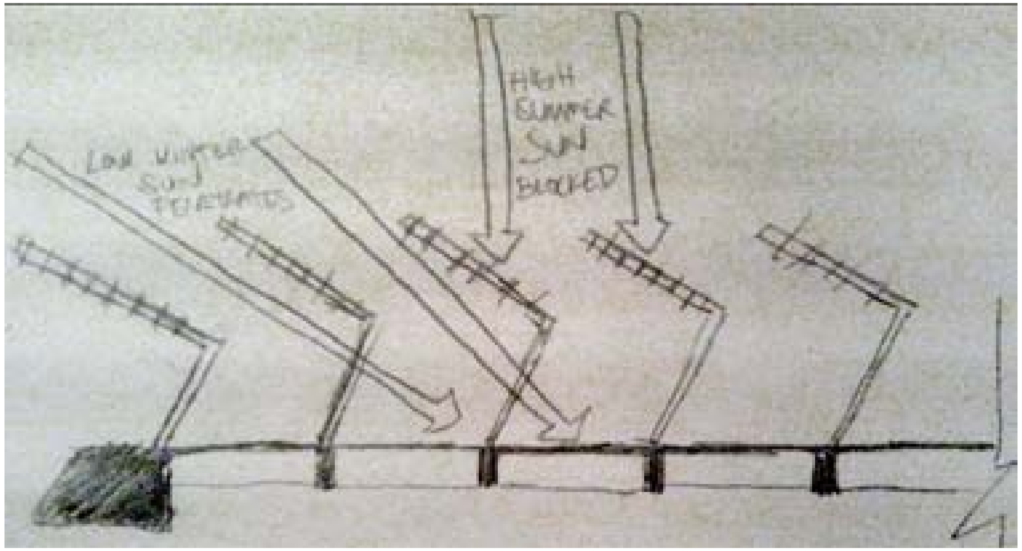


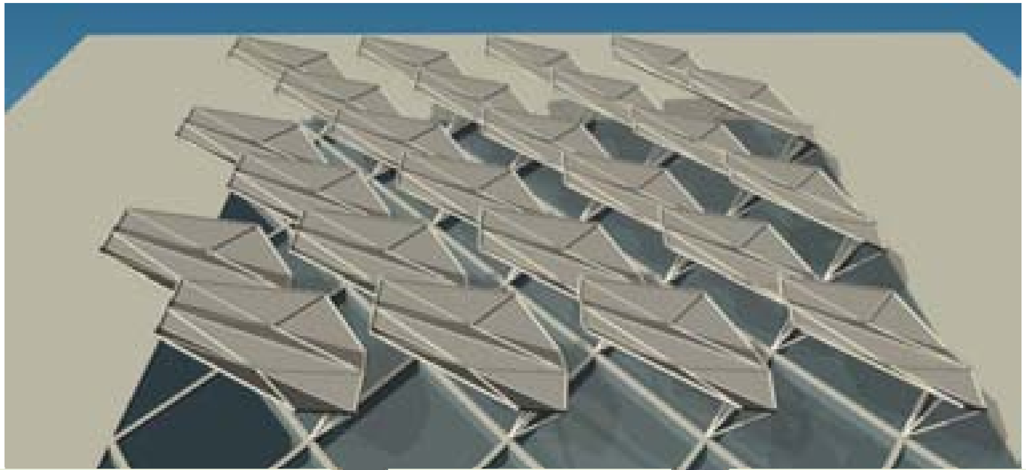
PINE CONE CONCEPT EVOLUTION



BIOMIMICRY CONCEPT EVOLUTION

Initial Pine Cone Idea – Combine local TVD with Sustainable TVD



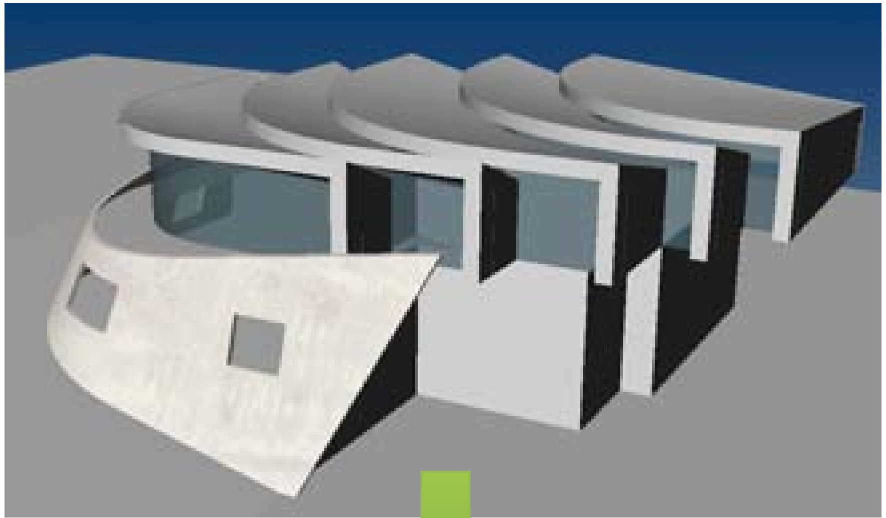


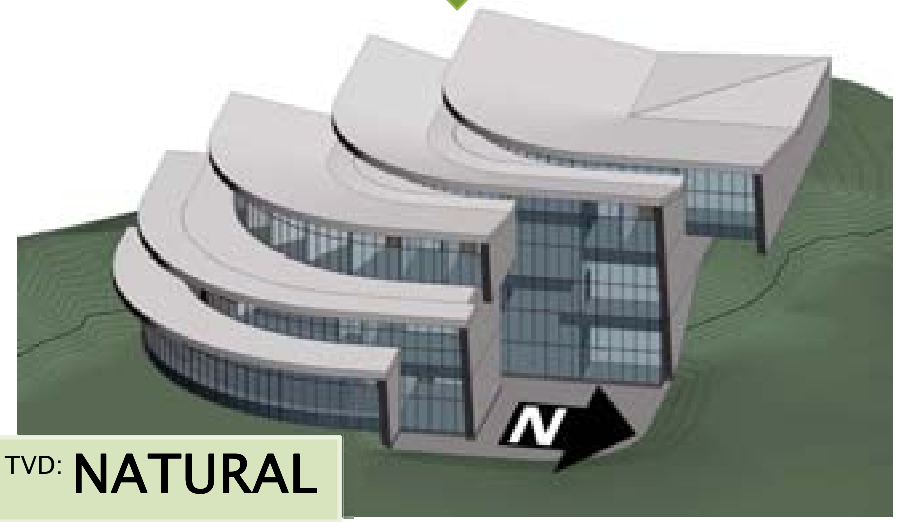
Utilization of Pine Cone Forms

- Solar Shading
- Diffused Natural Lighting

TVD: **NATURAL** TVD: **LOCAL** TVD: **SUSTAINABLE**

Concept Evolution – Pine Cone Form Integrated into Design Language



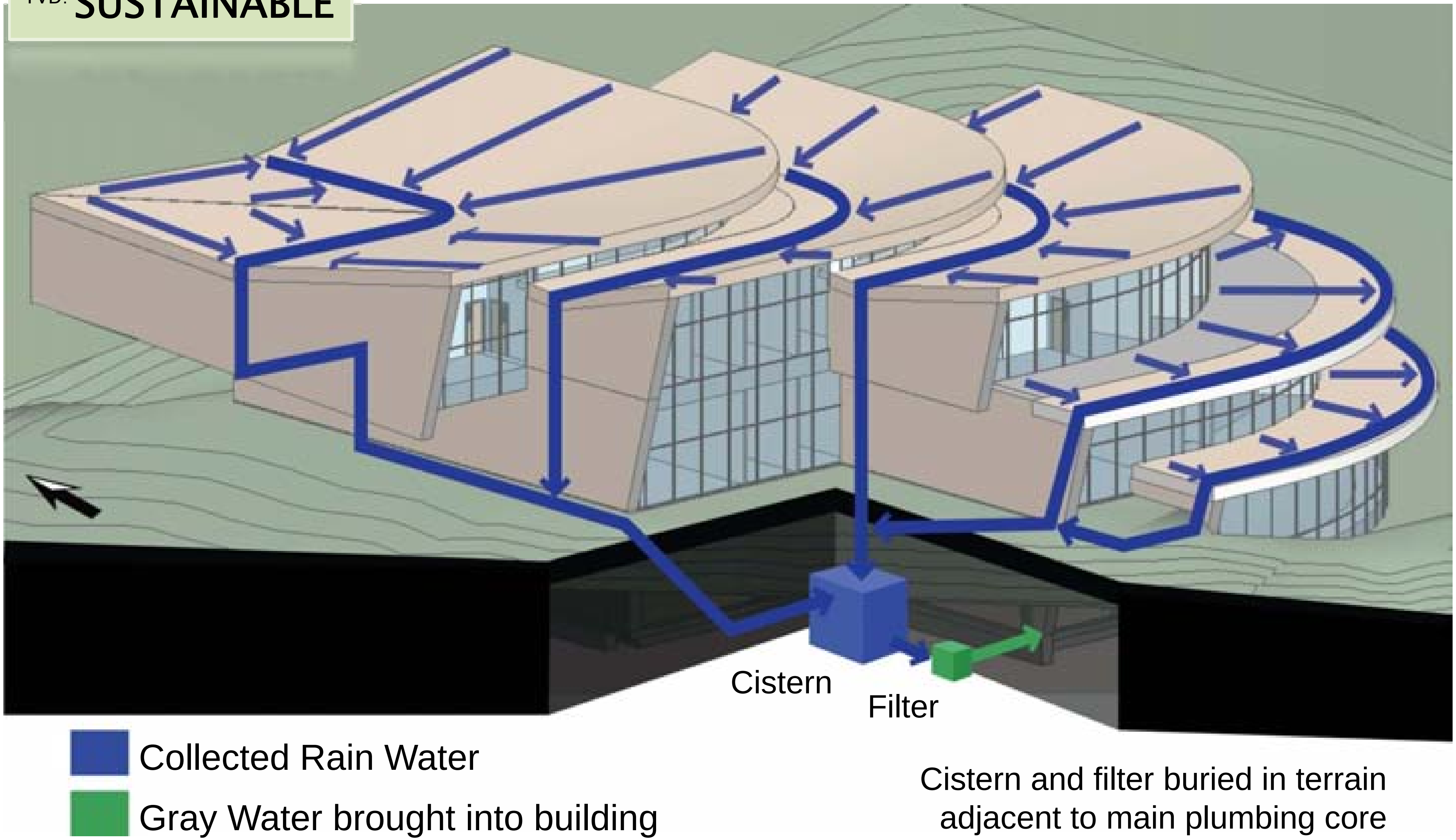


TVD: **NATURAL**

Pine Cone Water Collection/Reuse

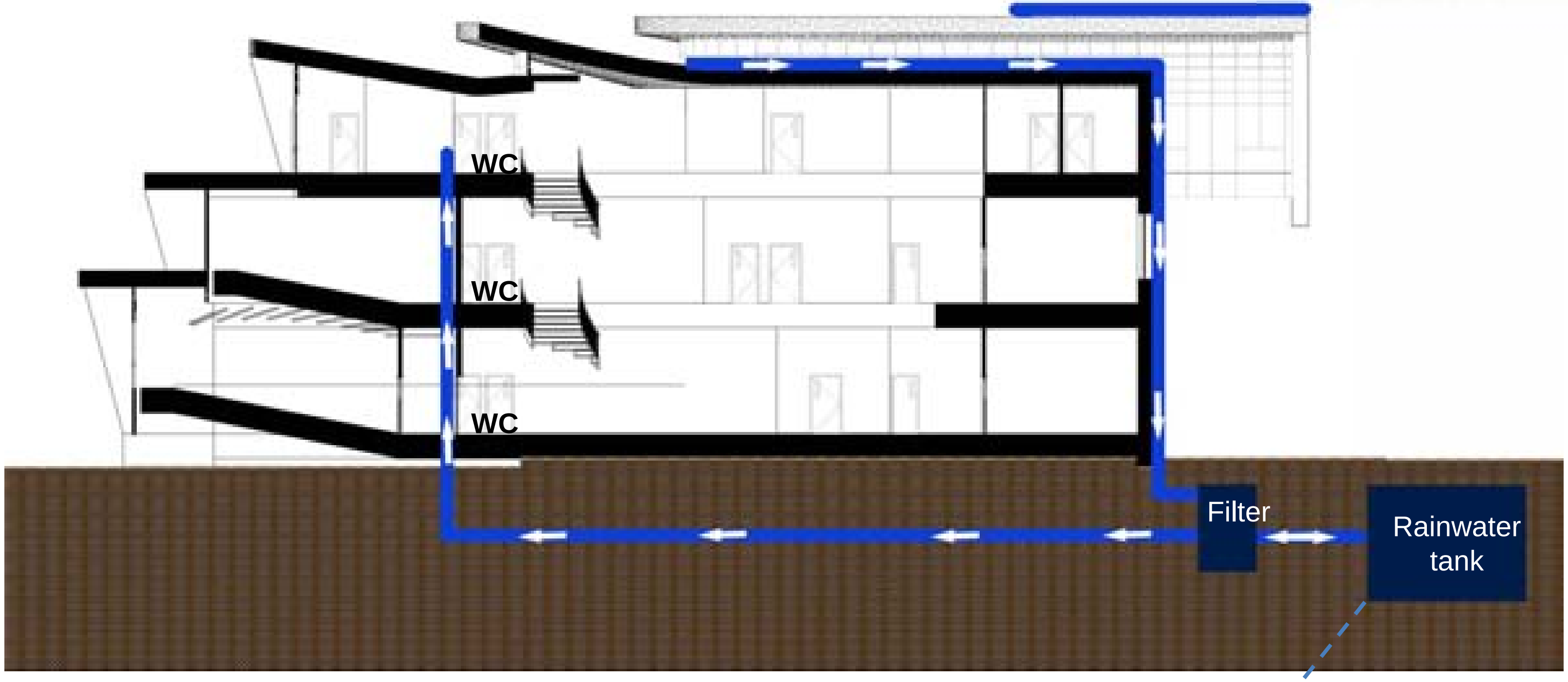
Concept Evolution – Onsite Water Collection

TVD: **SUSTAINABLE**



ENERGY CONCEPT

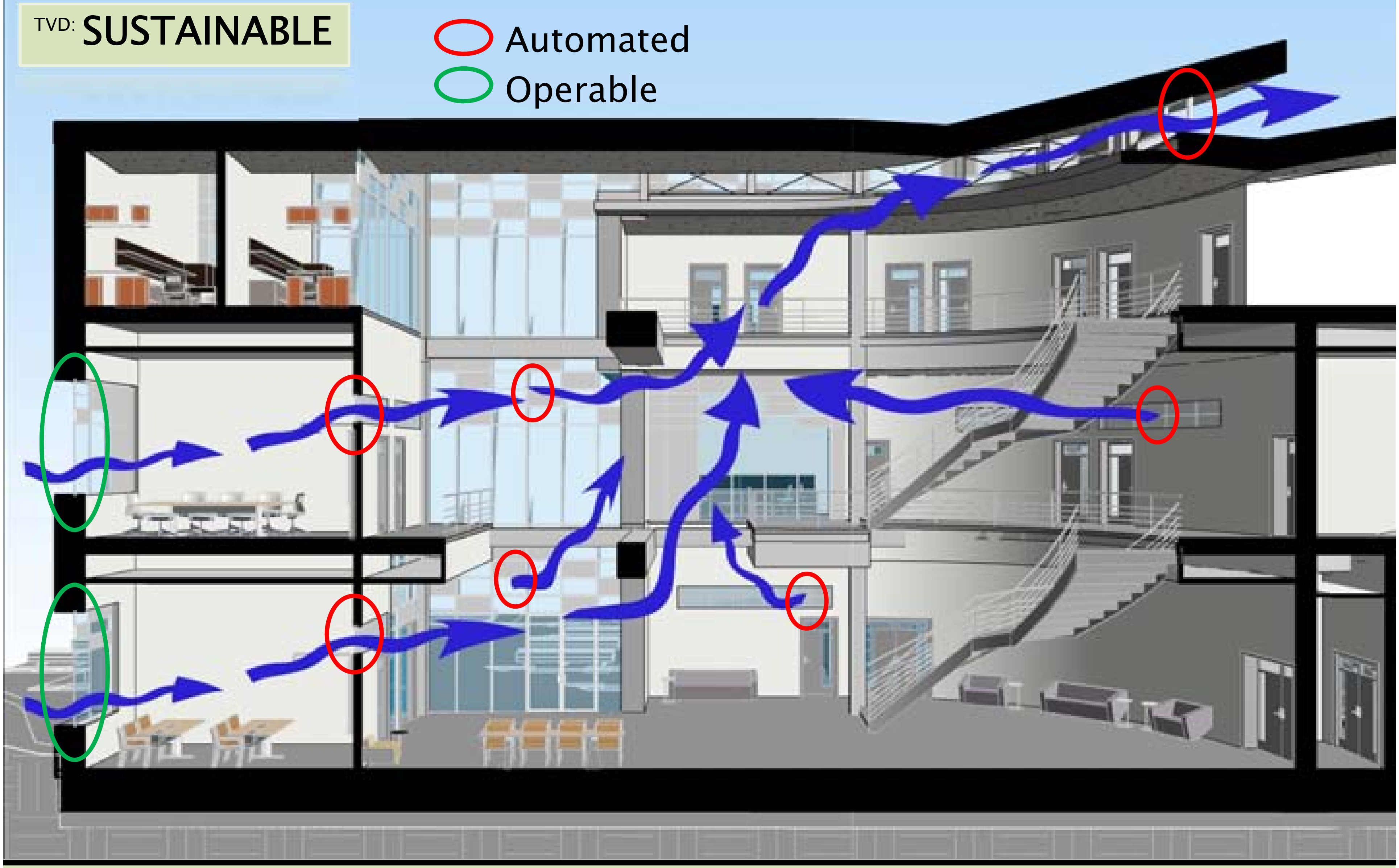
TVD: **SUSTAINABLE**



Rainwater collection to reuse
The flushing of toilets with rainwater collected from roofs makes a significant saving in the use of potable water.

Pine Cone Biomimicry – Natural Ventilation

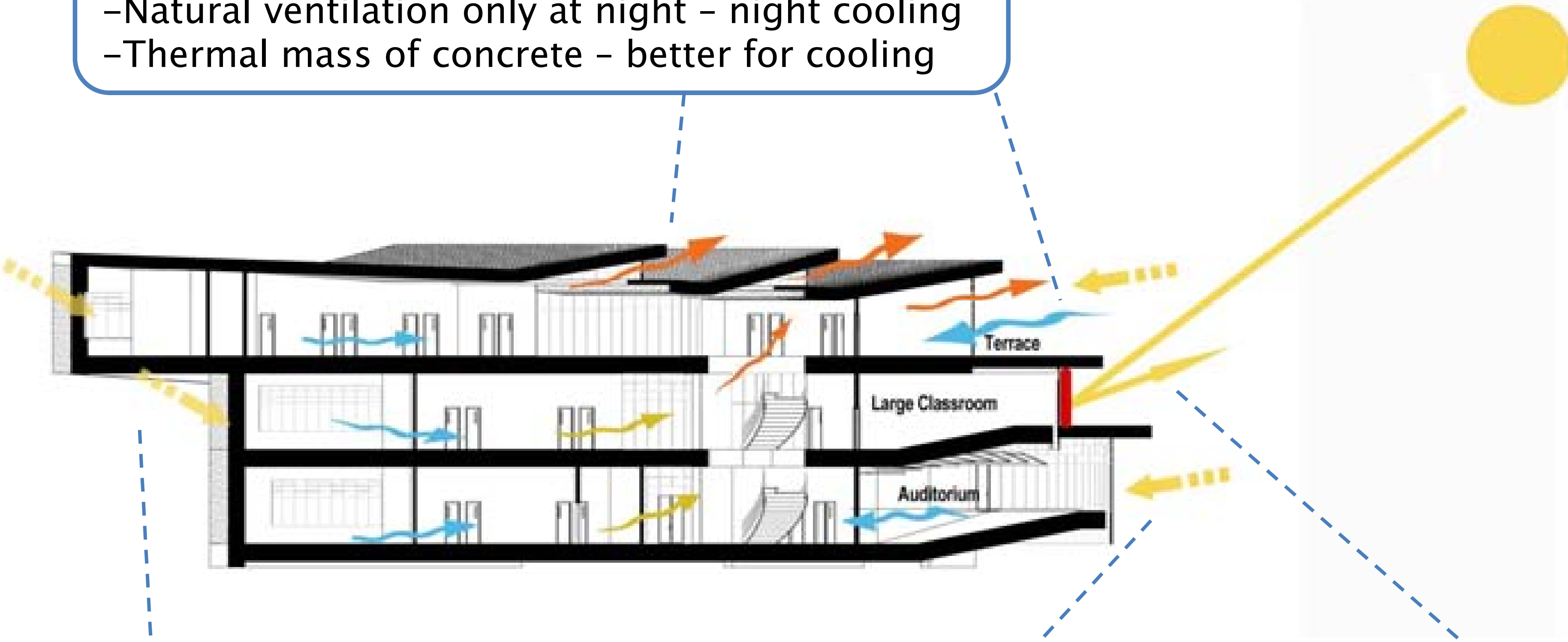
Concept Evolution – Mixed Mode: Adaptive System w/ Stack Ventilation



ENERGY CONCEPT

TVD: **SUSTAINABLE**

Ventilation
-Combined natural and mechanical ventilation
-Natural ventilation only at night – night cooling
-Thermal mass of concrete – better for cooling

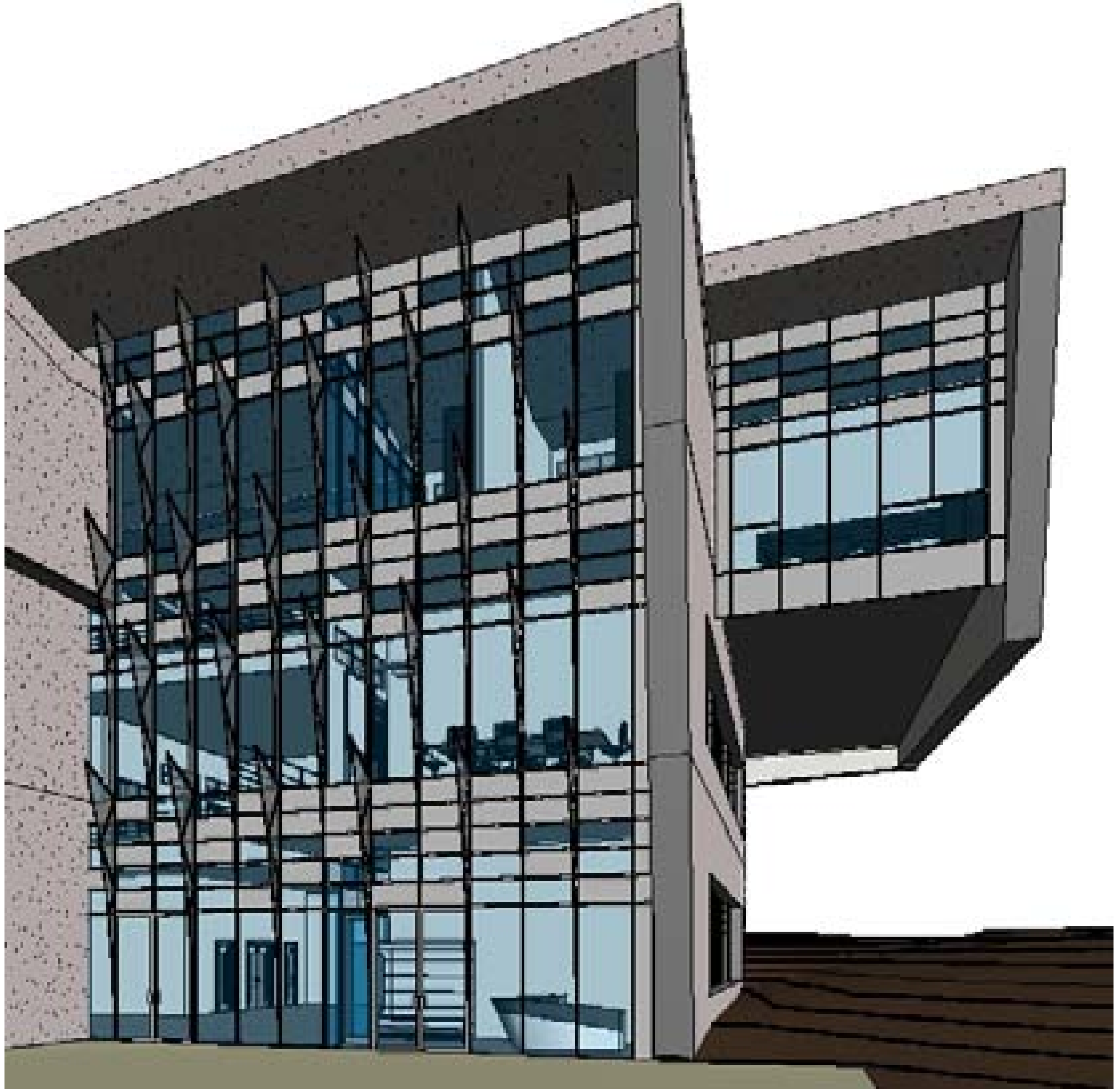


Daylight
Power consumption for daylight is minimized due to:
-Efficient use of daylight
-Electric lighting controlled by monitoring daylight
-Workstations located close to the windows

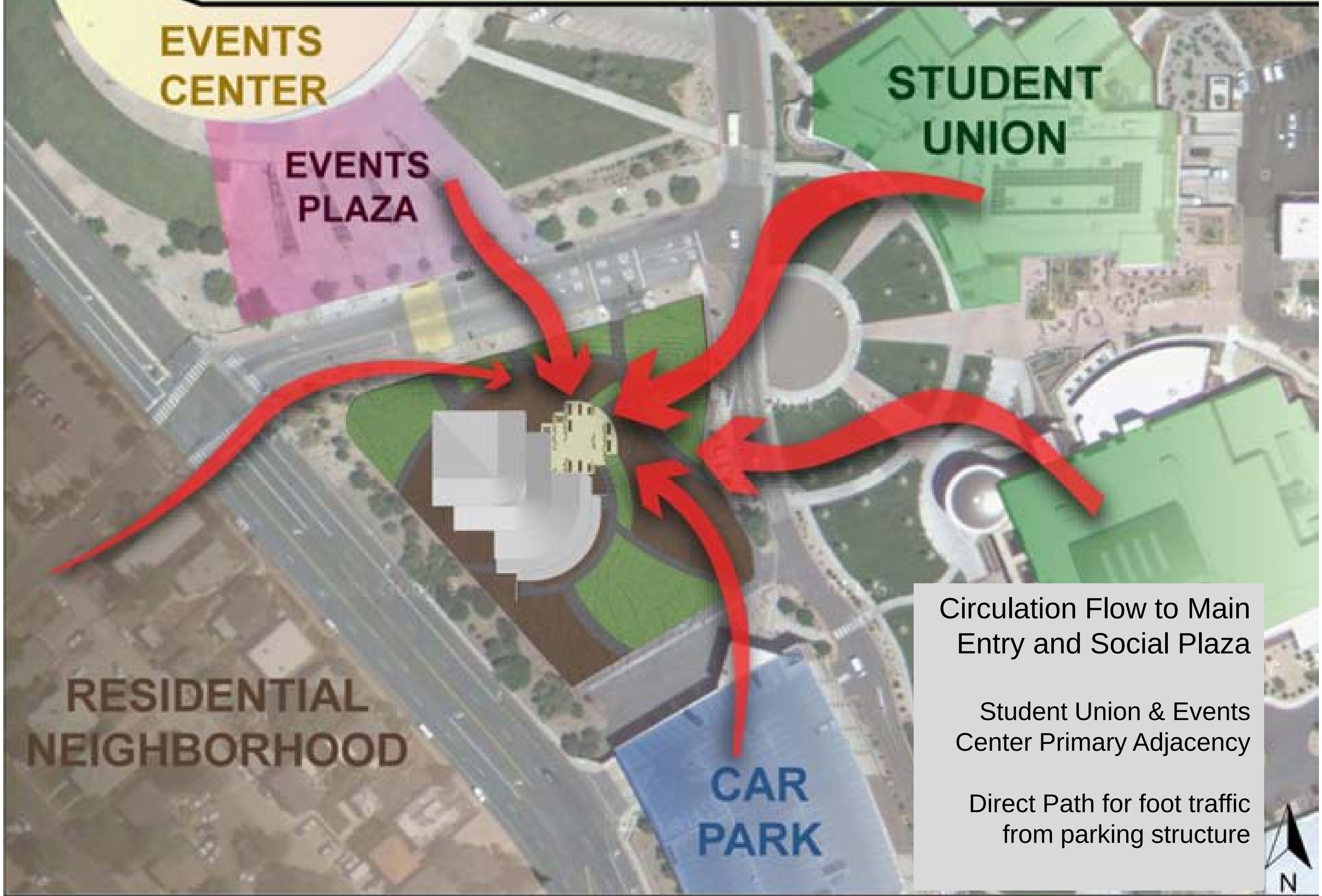
Solar control
-By exterior shadings and cantilever
- Power consumption for cooling is minimised

PINE CONE – FAÇADE INSPIRATION

Seed Arrangement



CONTEXT AND ORIENTATION



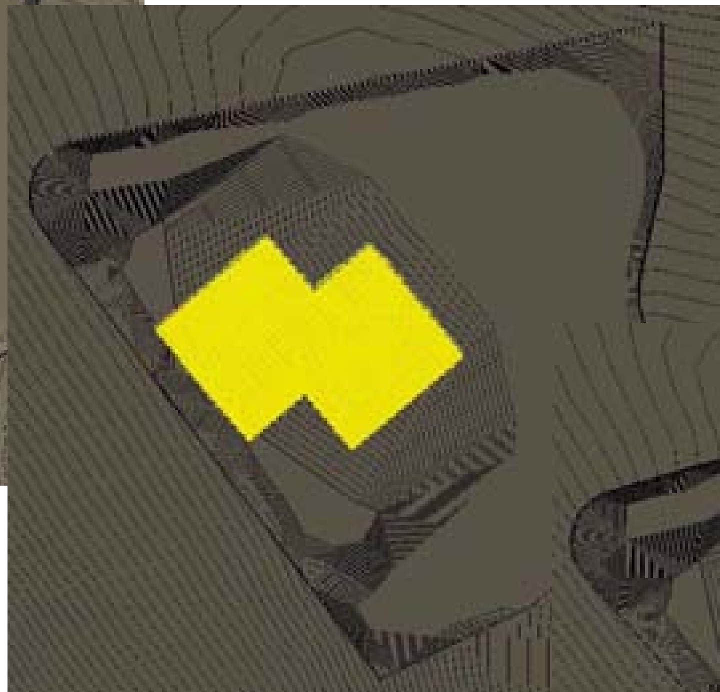
Circulation Flow to Main Entry and Social Plaza

Student Union & Events Center Primary Adjacency

Direct Path for foot traffic from parking structure

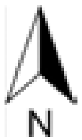
ORIENTATIONS – PINE CONE

1st orientation



2nd orientation

3rd orientation



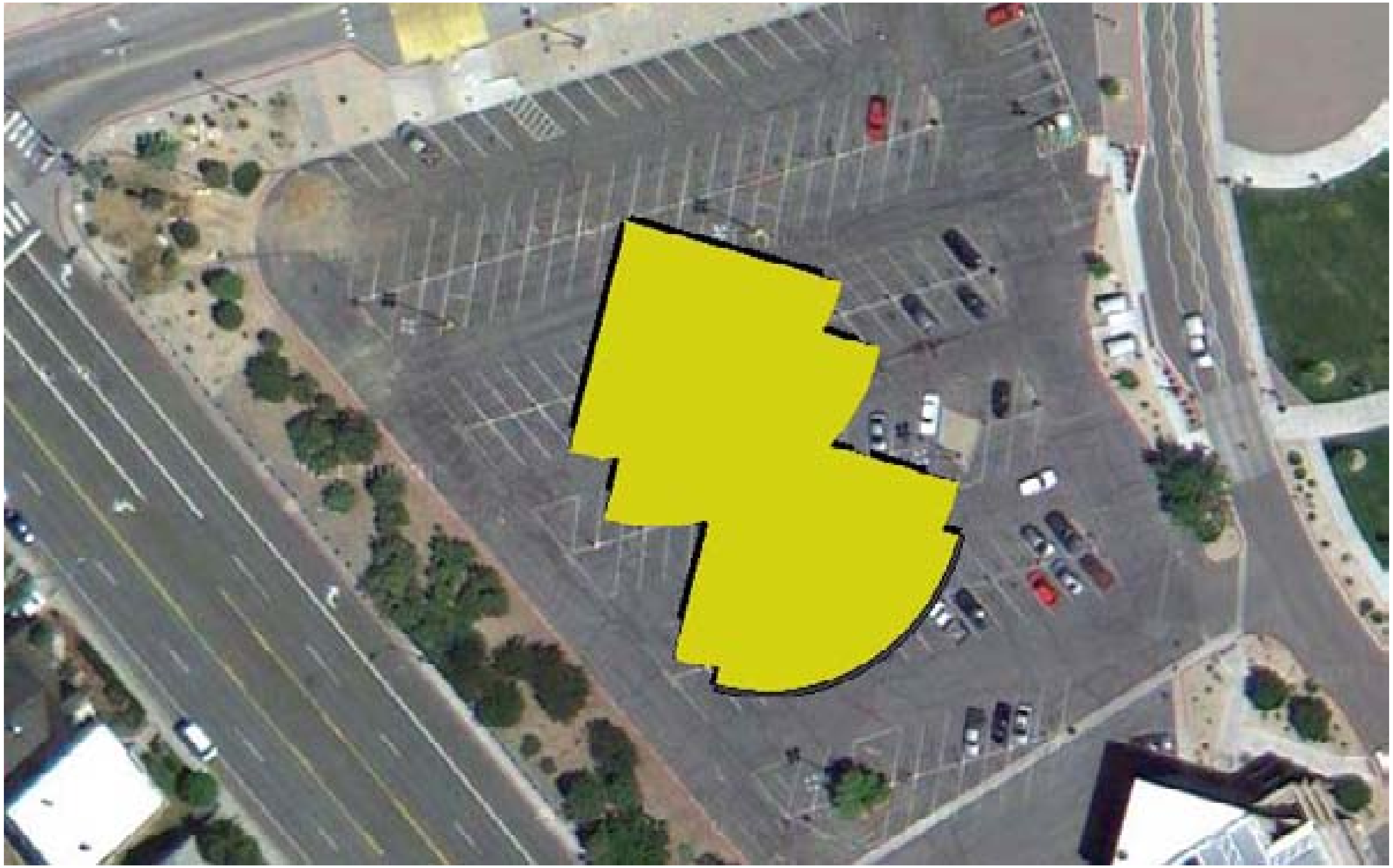
ORIENTATIONS

	1st orientation	2nd orientation	3rd orientation
Electricity	454,028 kWh	449,479 kWh	447,070 kWh
Fuel	16,968 therms	17,027 therms	16,097 therms
CO2 – conc.	92 tons/yr	84 tons/yr	78 tons/yr
HVAC, Lightning, Equipment	449,152 kWh	444,605 kWh	442,196 kWh

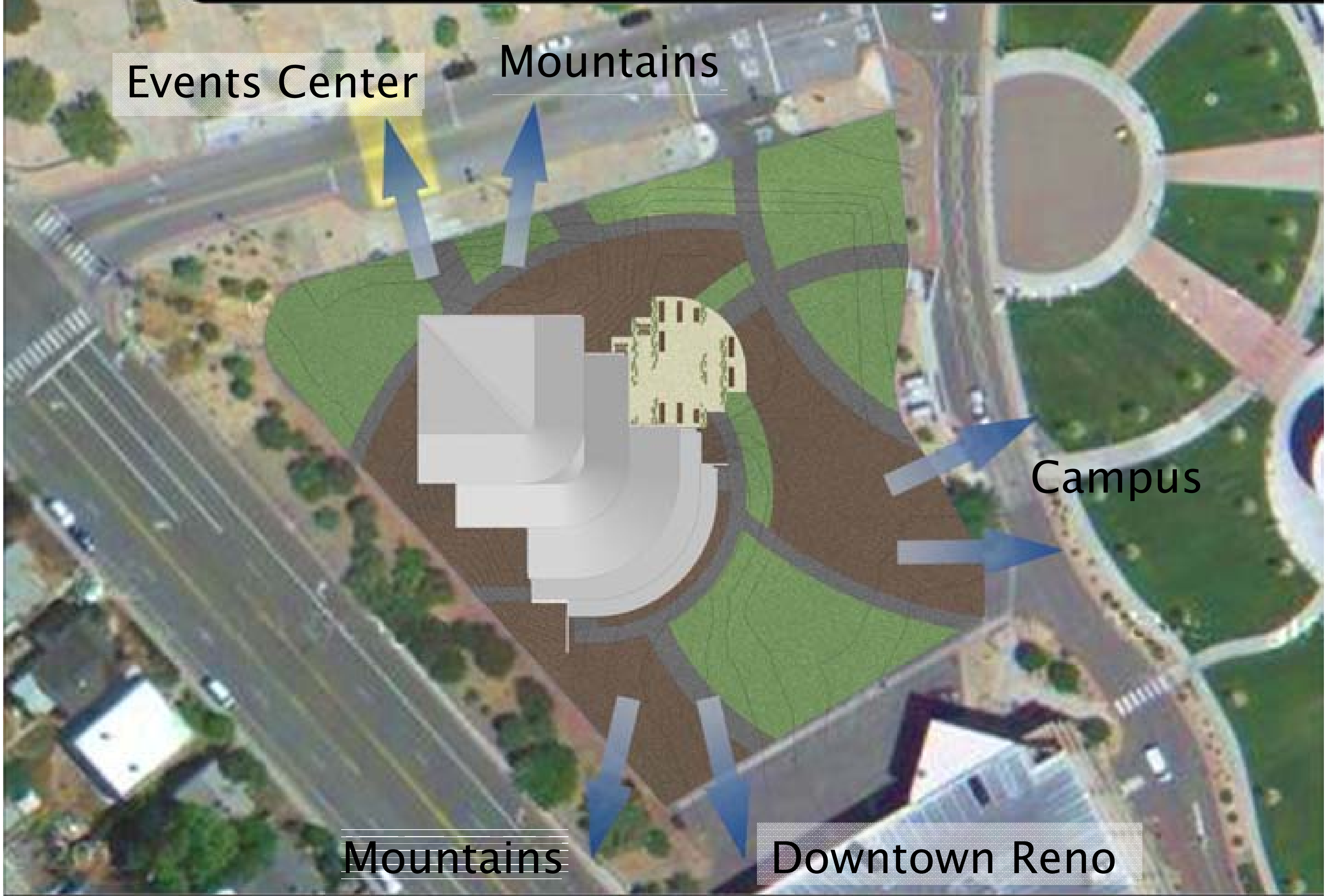
1st orientation → Good
2nd orientation → Good
3rd orientation → Best

3rd orientation has low el, fuel and HVAC consumption and also low CO_2 emission than the other two orientations.

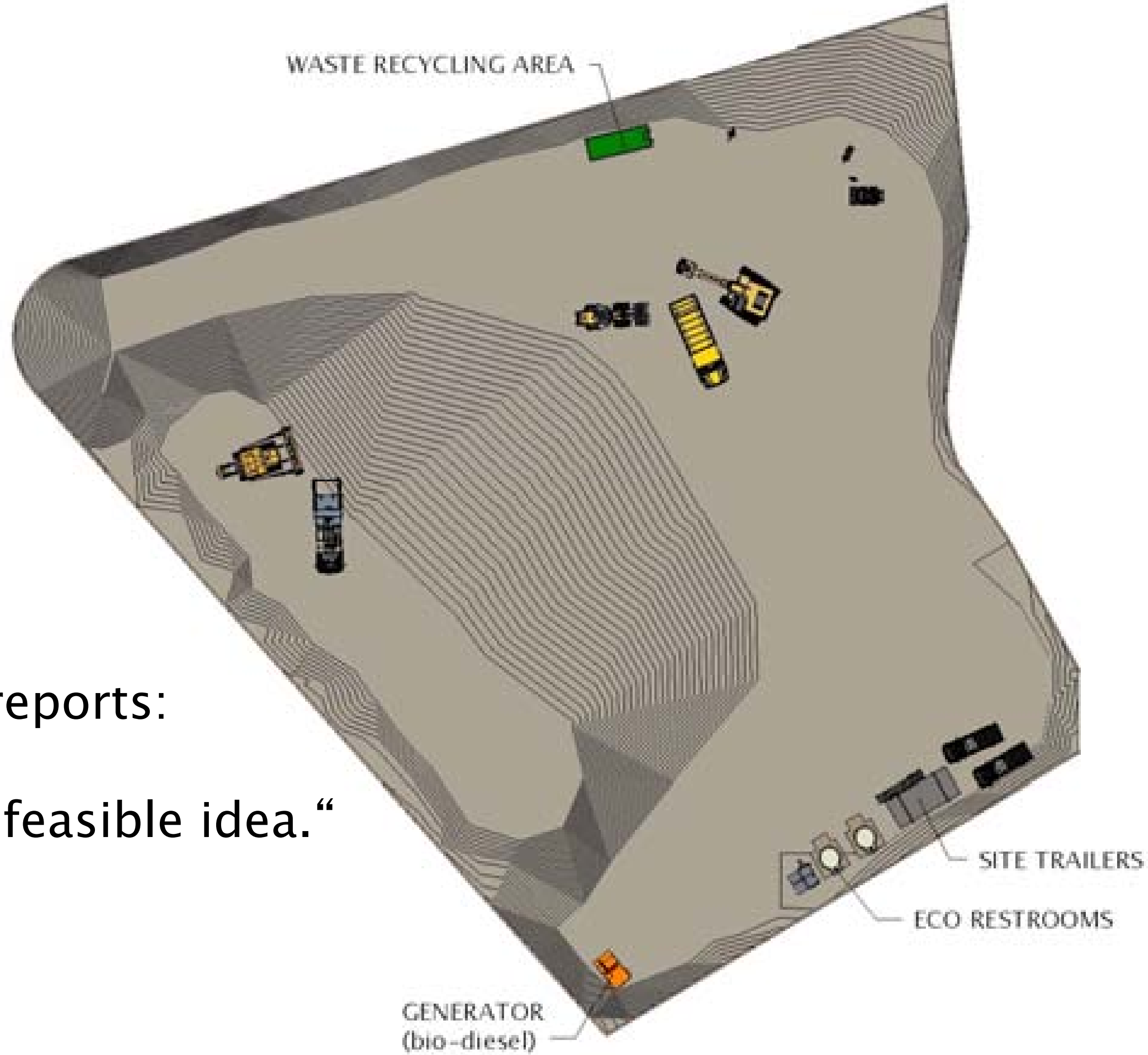
3rd orientation – Pine Cone



SITE PLAN



EXCAVATIONS POSSIBILITES STUDY



Revit analysis – cut/fill reports:

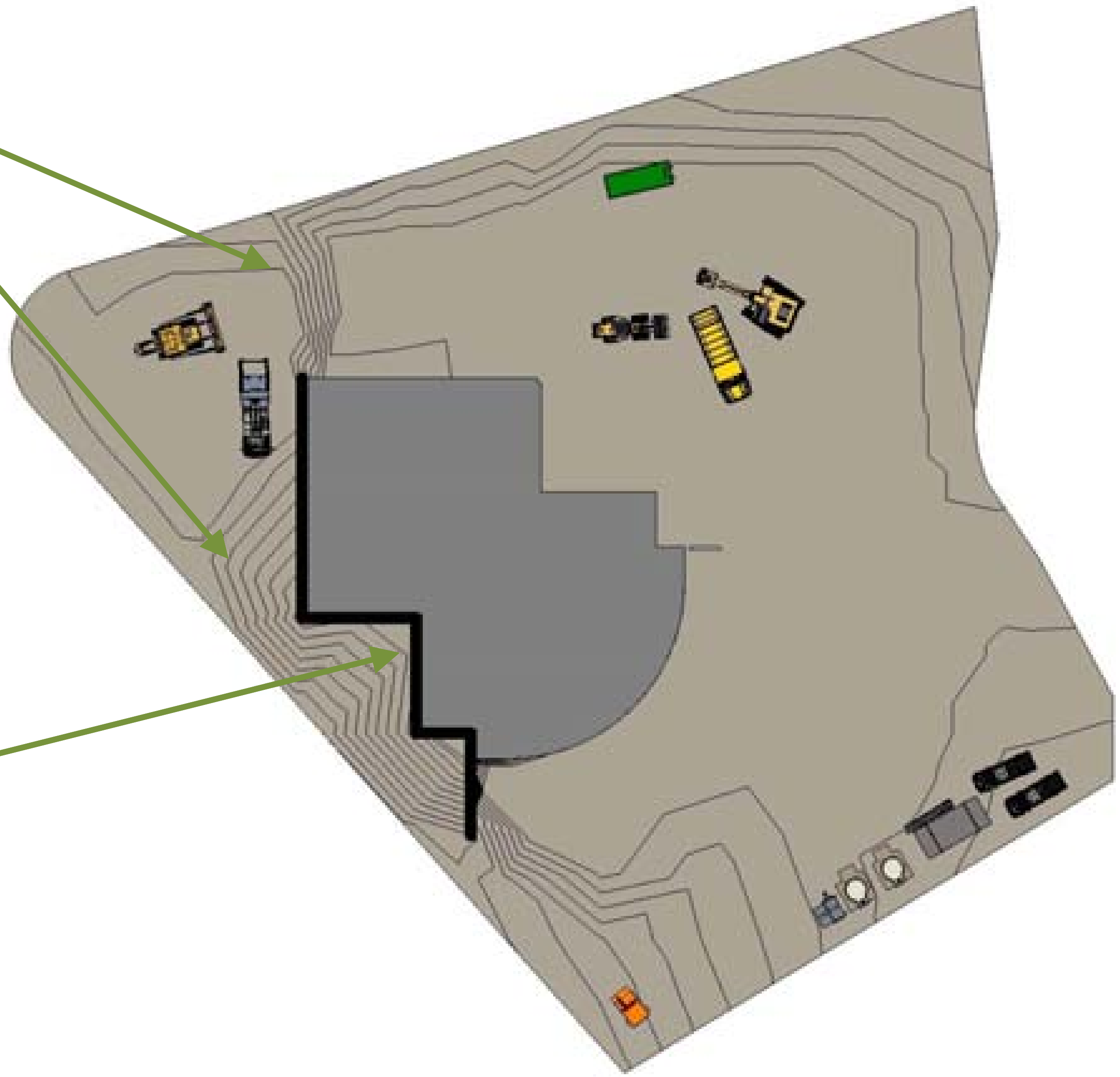
„Using existing soil is a feasible idea.“

1st STAGE – EXCAVATION AND LANDSCAPING

Establish sloped landscaping

TVD: LOCAL

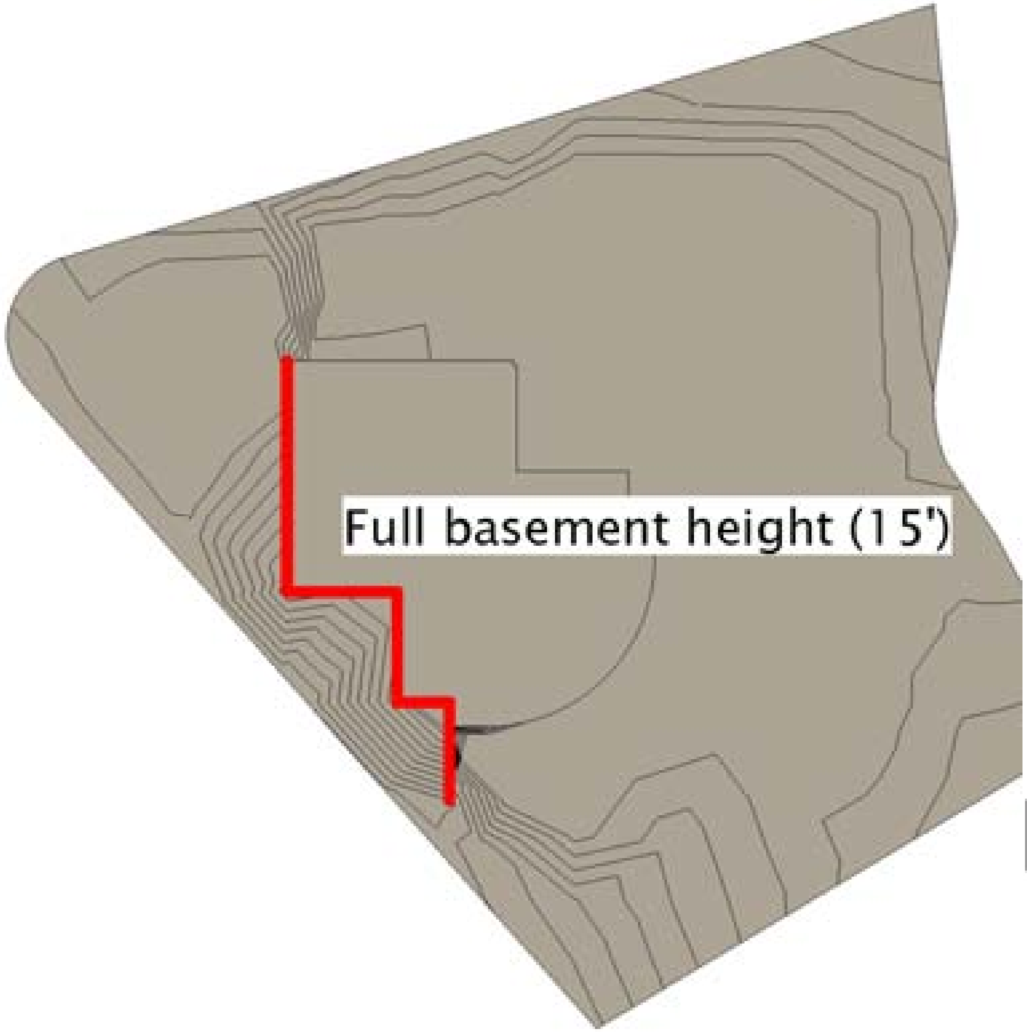
TVD: NATURAL



Retaining walls

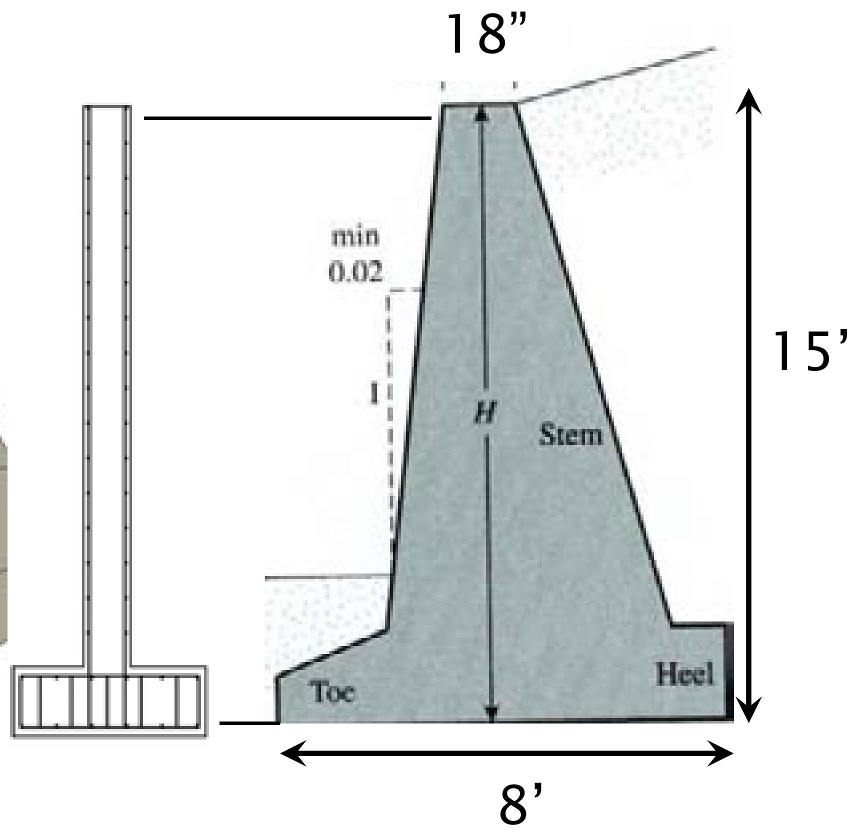
RETAINING WALL

Full Height Retaining Wall ~ 15'



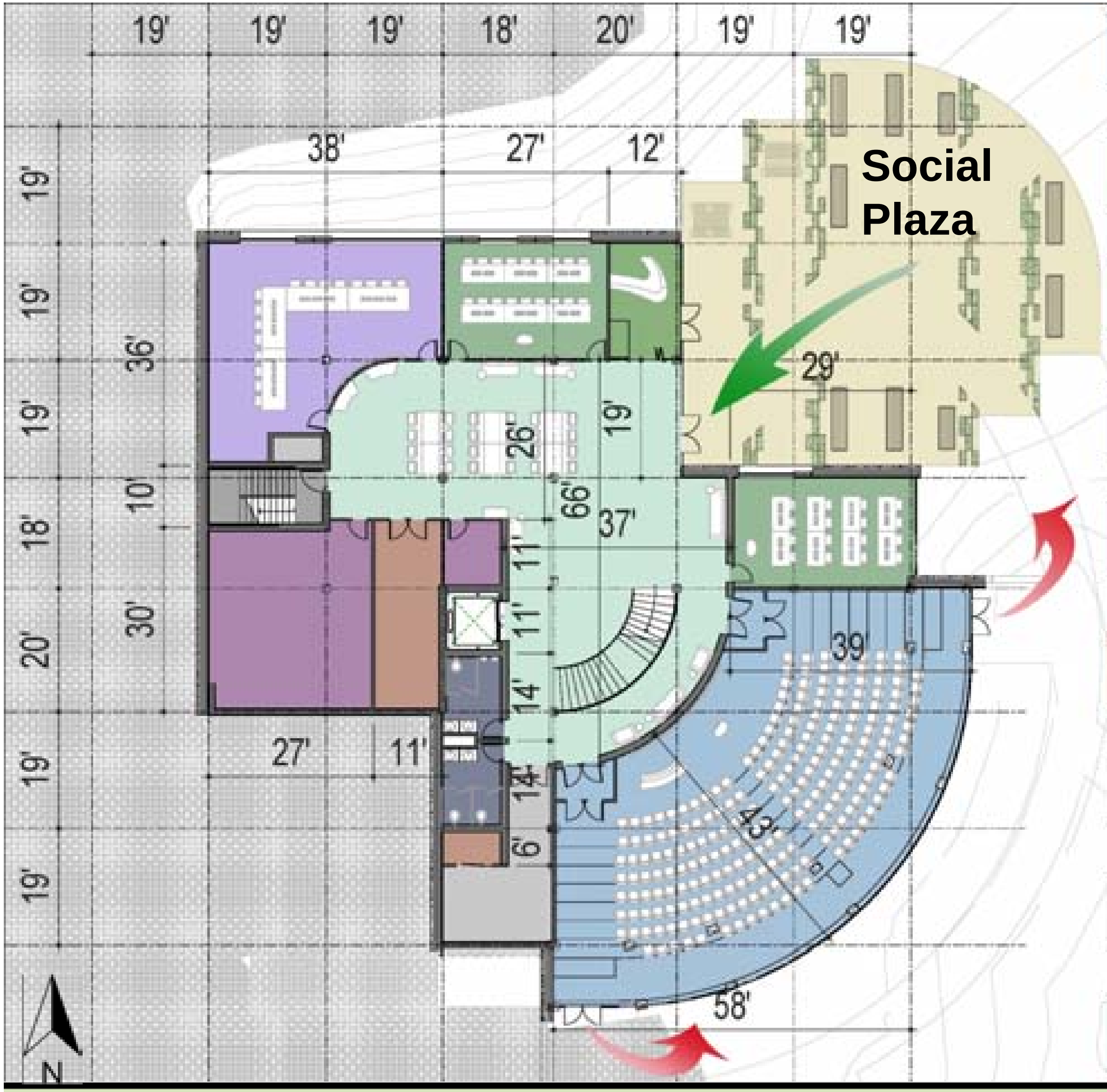
Detailing

15' Gravity Retaining Wall



ENTRY FROM SOCIAL PLAZA South East Side

BASEMENT LEVEL



Auditorium
3,000 SF

Sm. Classrooms
1,000 SF

Cafe
3,000 SF

Lab
1,000 SF

Server/IT
900 SF

Storage
400 SF

Vert. Circ. & WC
570 SF

Mechanical
400 SF

Collaboration Space
2,800 SF

GROUND LEVEL

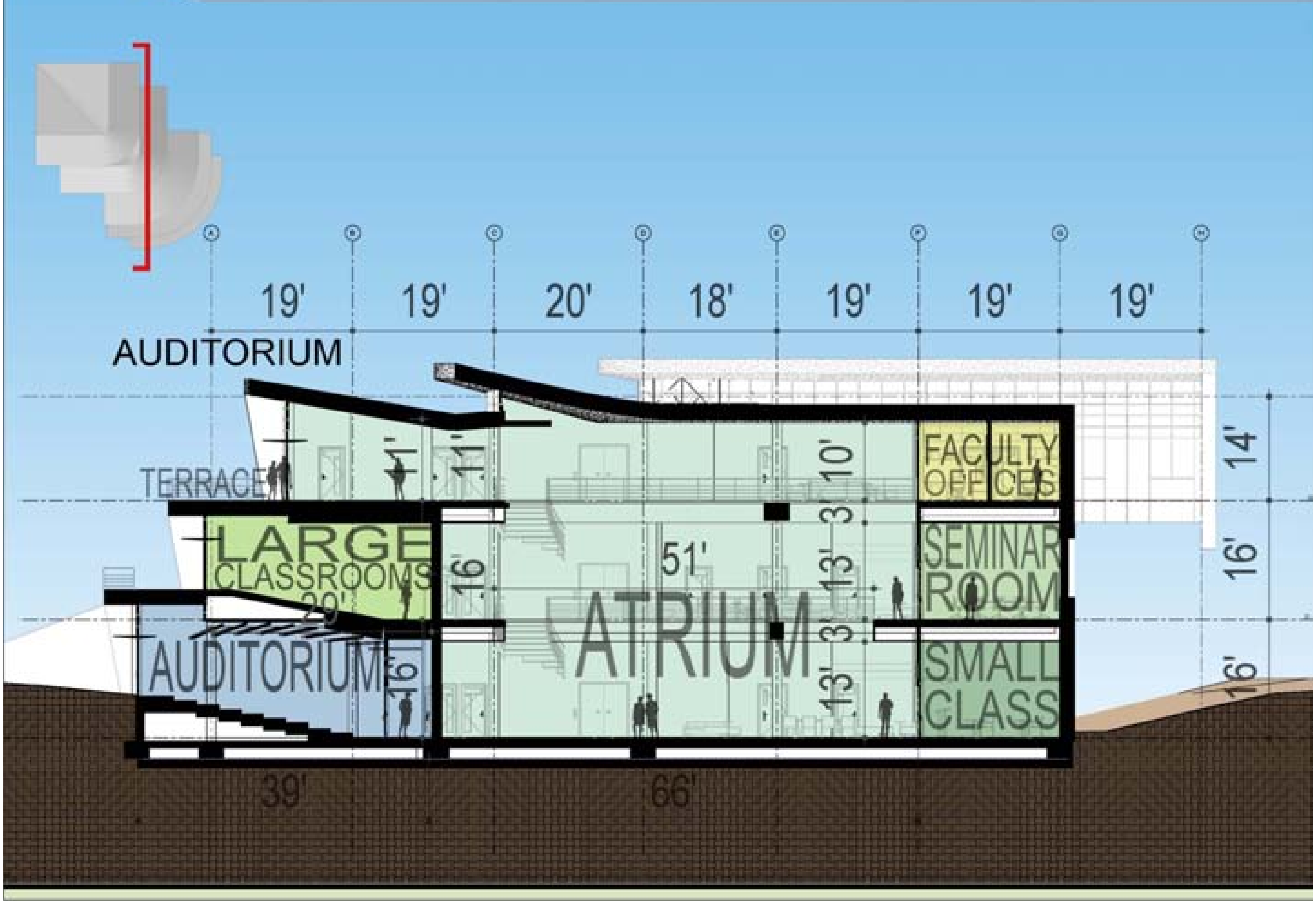
Lg. Classrooms	1,600 SF
Sm. Classrooms	1,040 SF
Seminar Rooms	800 SF
Lab	1,000 SF
Student Offices	1,050 SF
Storage	200 SF
Vert. Circ. & WC	570 SF
Mechanical	120 SF
Social Space	2,000 SF

OFFICE LEVEL

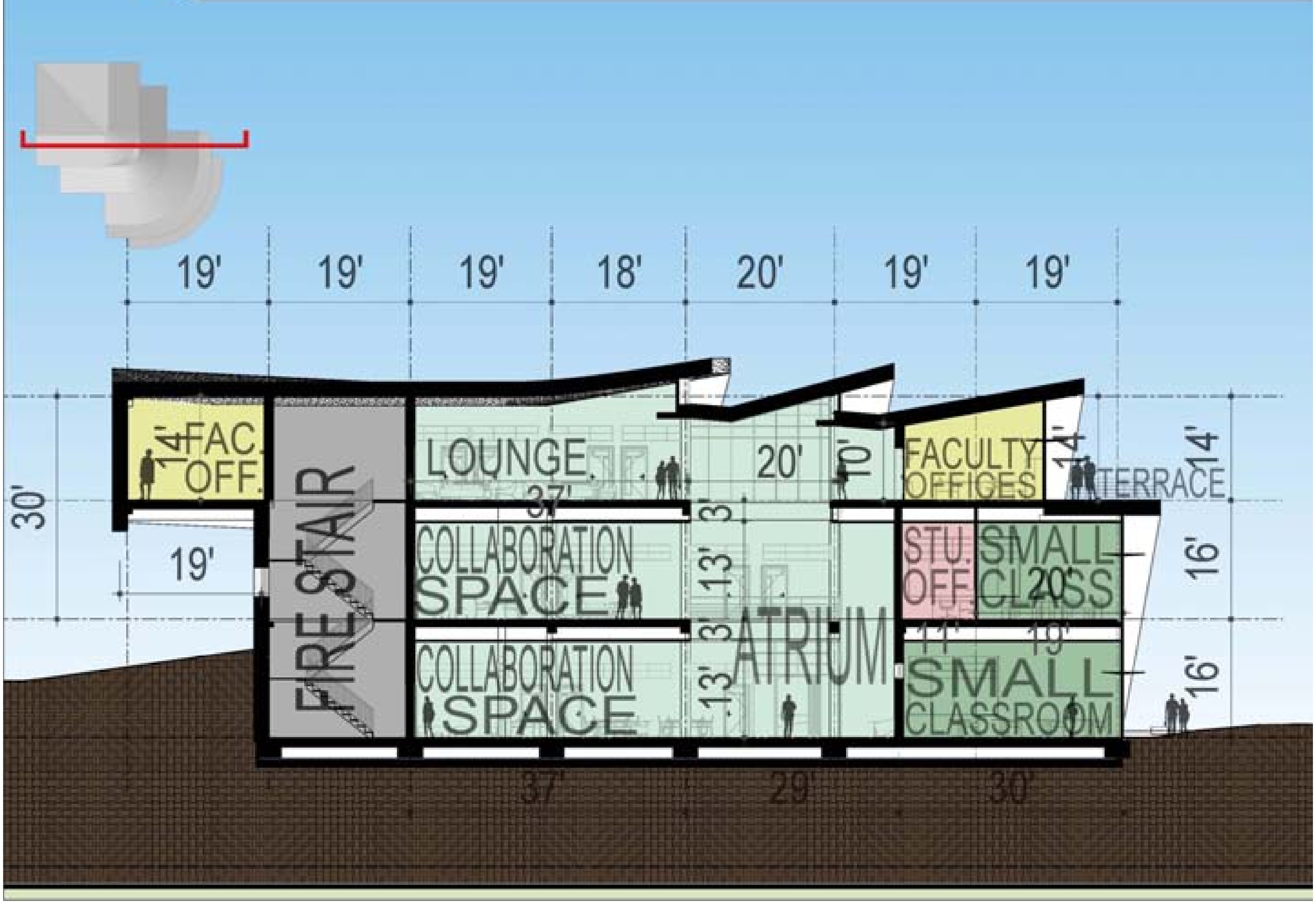
Department Chair	300 SF
Faculty Offices	3,600 SF
Senior Admin.	320 SF
Admin. Assistants	300 SF
Student Offices	170 SF
Storage	200 SF
Restrooms	570 SF
Collaboration Space	3,700 SF
Terrace	

ENTRY FROM SOCIAL PLAZA South East Side

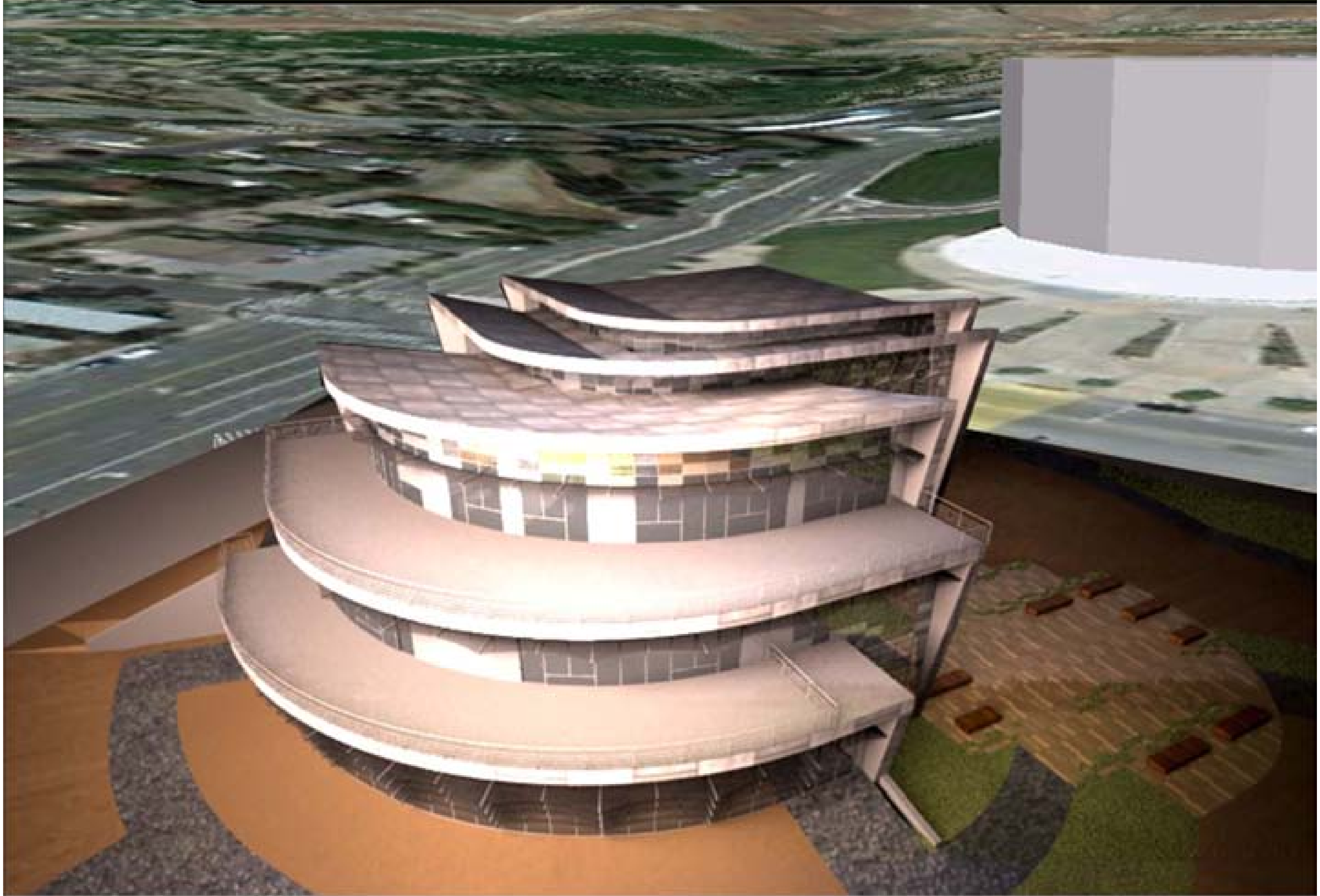
SECTION 1


19'
19'
20'
18'
19'
19'
19'
AUDITORIUM
TERRACE
11'
11'
10'
FACULTY OFFICES
14'
LARGE CLASSROOMS
20'
16'
51'
3'
13'
SEMINAR ROOM
16'
ATRIUM
AUDITORIUM
16'
3'
13'
SMALL CLASS
16'
39'
66'

SECTION 2


19'
19'
19'
18'
20'
19'
19'
30'
14'
FAC. OFF.
FIRE STAIR
LOUNGE
37'
20'
10'
FACULTY OFFICES
14'
TERRACE
14'
19'
COLLABORATION SPACE
3'
13'
STU. OFF.
SMALL CLASS
20'
16'
3'
ATRIUM
11'
19'
COLLABORATION SPACE
13'
SMALL CLASSROOM
16'
37'
29'
30'

PINE CONE ROOF FORMS

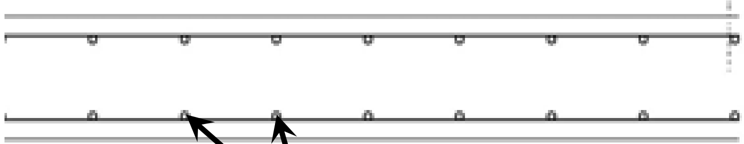


PINE CONE ROOF FORMS

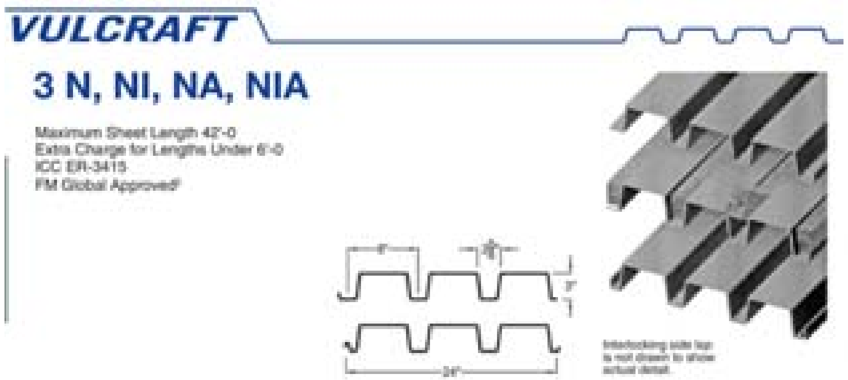
Concept Evolution – Integration of Pine Cone Form as Design Language

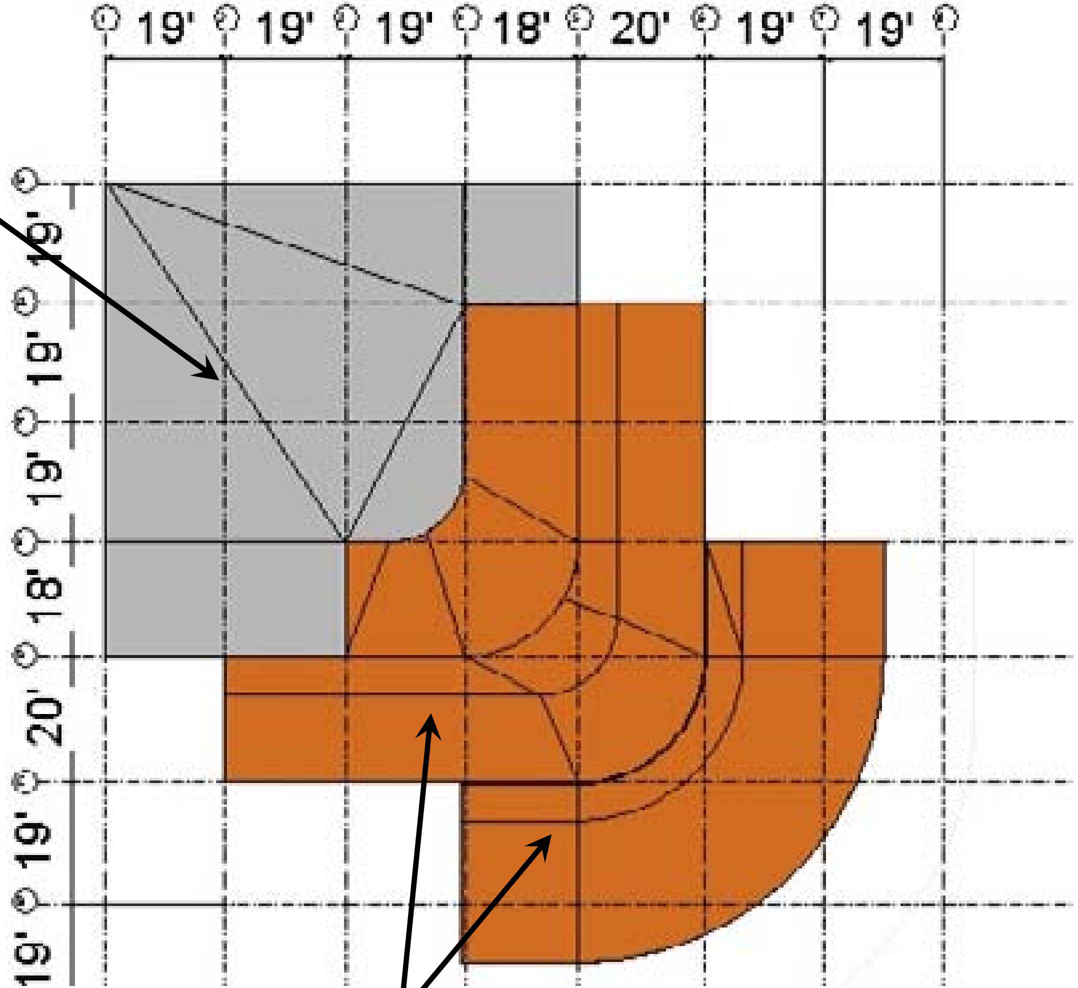
ROOF SYSTEM

8" RC Slab:
Typ. Span 19'



#5s @ 6"



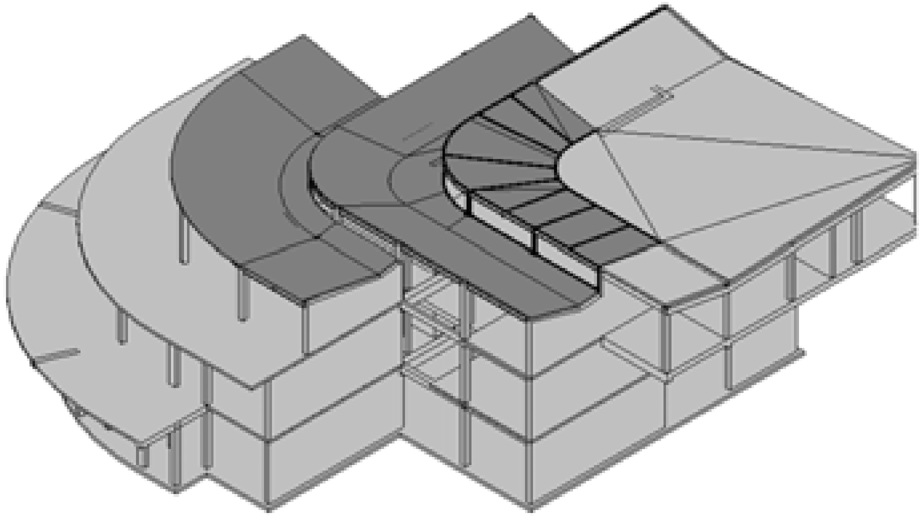


3" Steel Deck:
Typ. Span 10'

ROOF SYSTEM

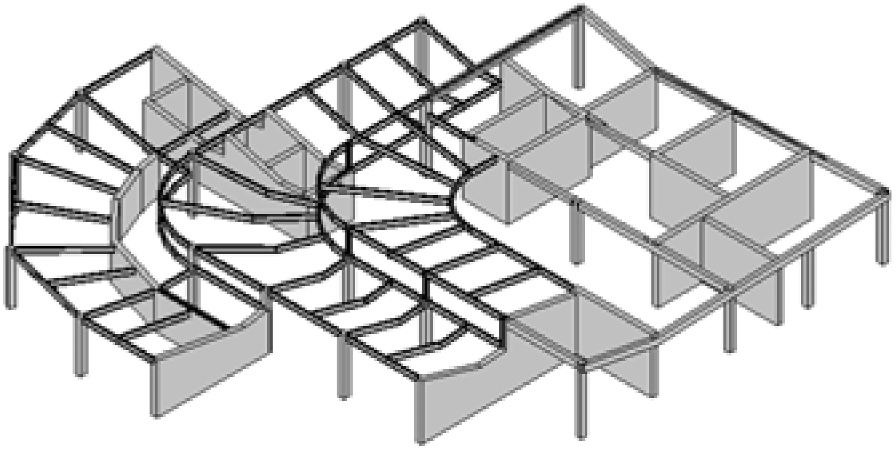
Loads – 3" Steel Deck	
Dead Load	30 psf
Live Load	20 psf
Snow Load	10.5 psf

Loads – 8" Concrete Slab	
Dead Load	115 psf
Live Load	20 psf
Snow Load	10.5 psf

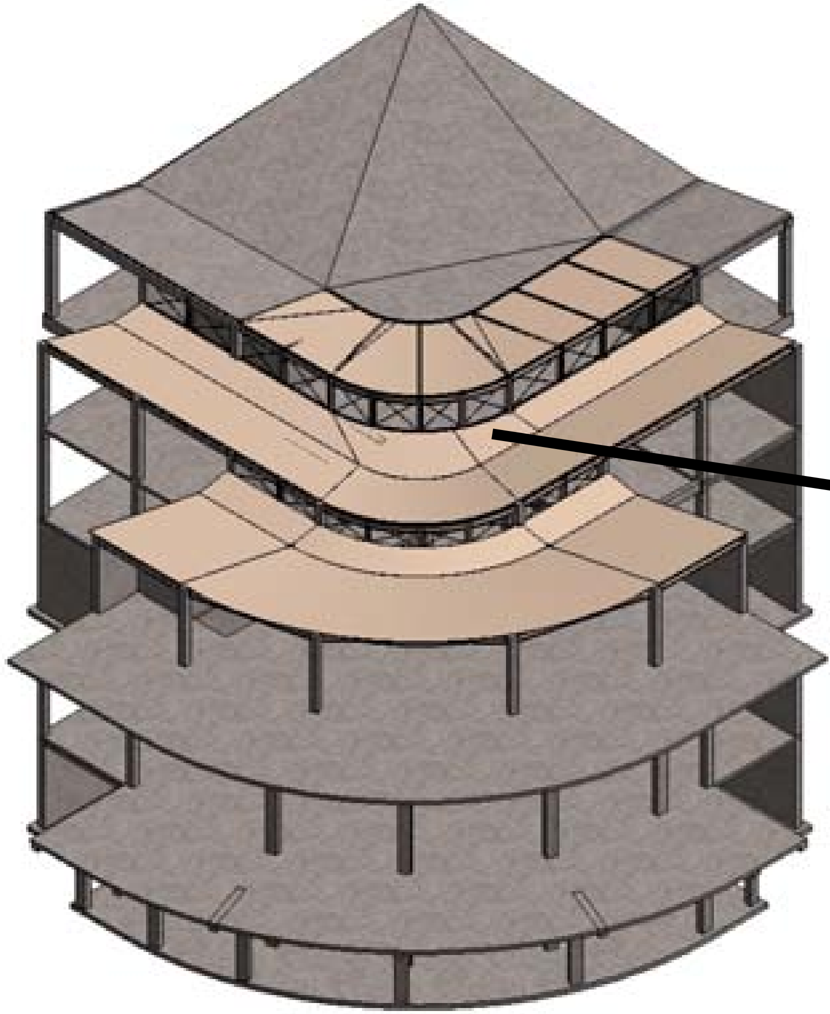


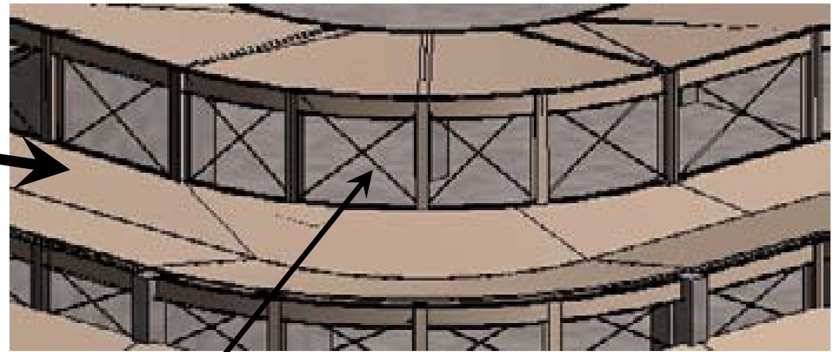
Steel Purlins –
W14x48 Typ. Span 20'

Dogleg Beams –
W14x48Typ. Span 20'



ROOF SYSTEM DETAILS

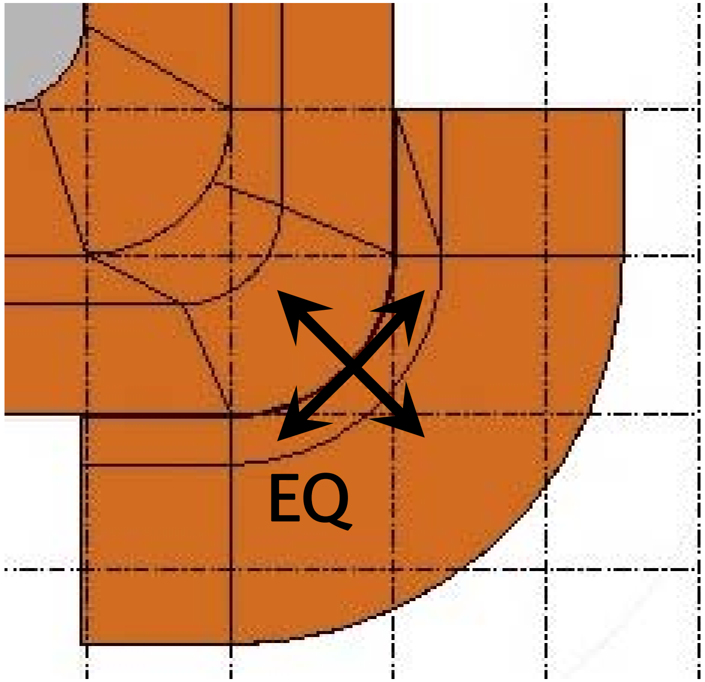


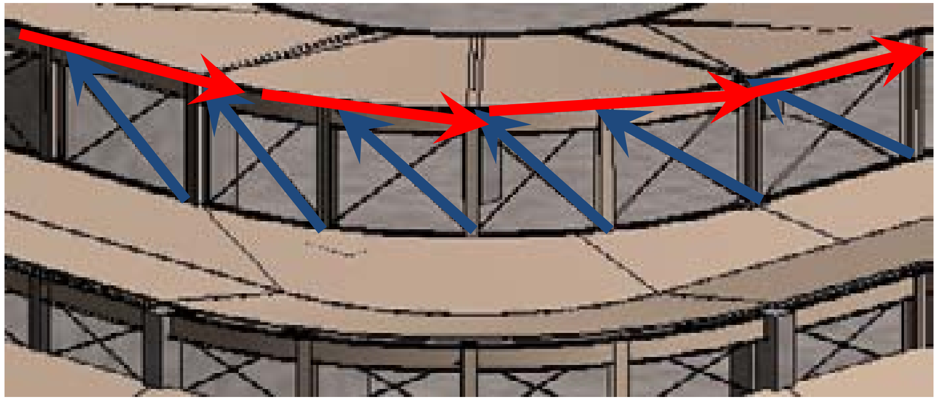


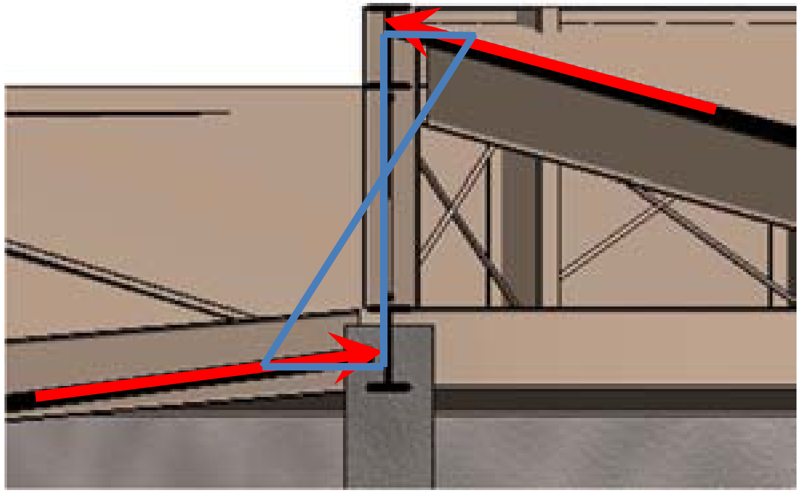
Tension Rod Detail:
1 ¼" Square Steel Section
Placed in front of glazing
W10x33 Vertical Elements

ROOF SYSTEM DETAILS

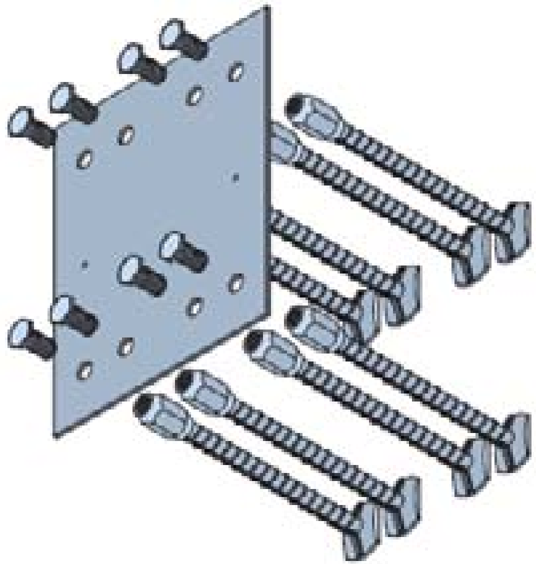
LOAD PATHS

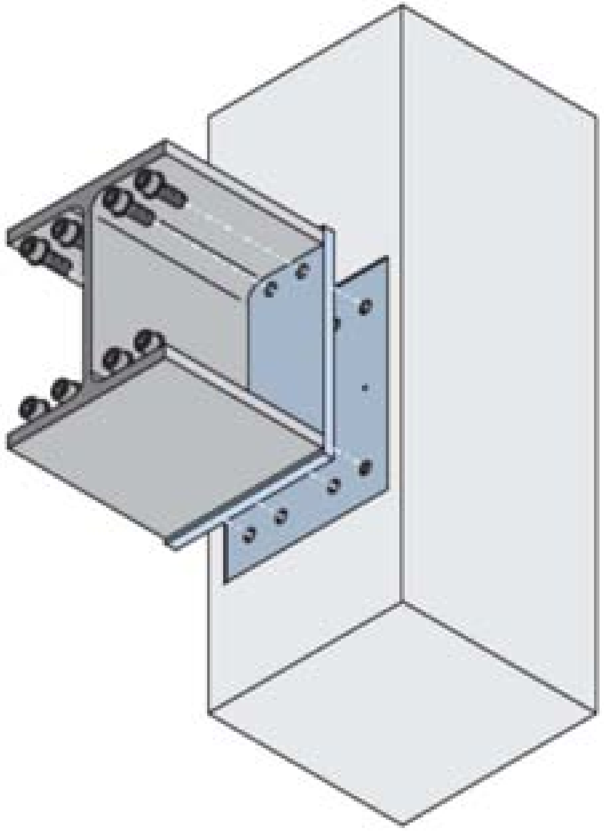






Connect steel beams to concrete column with HALFEN HUC or similar

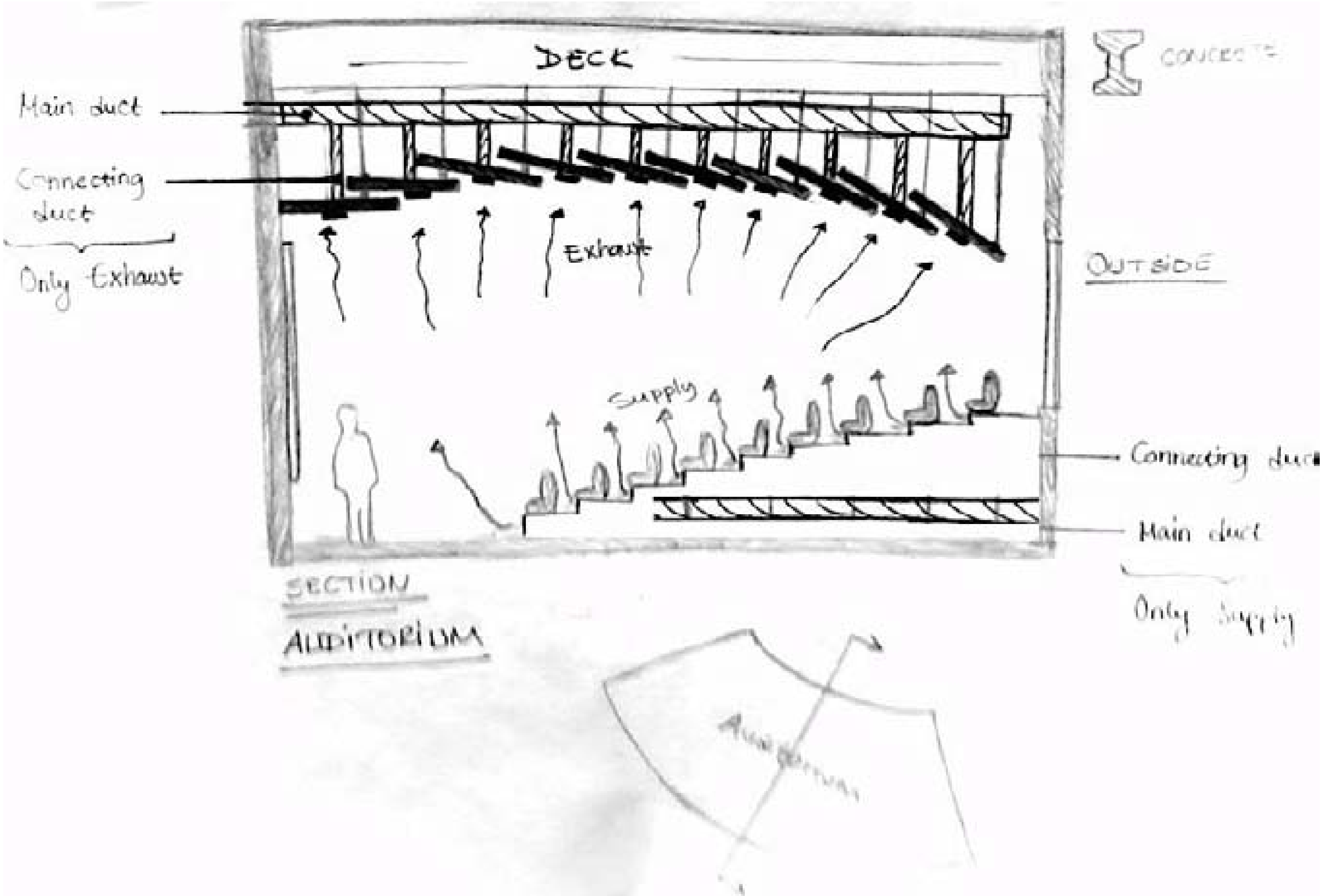




AUDITORIUM

AUDITORIUM 3D SECTION

AUDITORIUM MEP IDEA



AUDITORIUM CEILING

ATRIUM

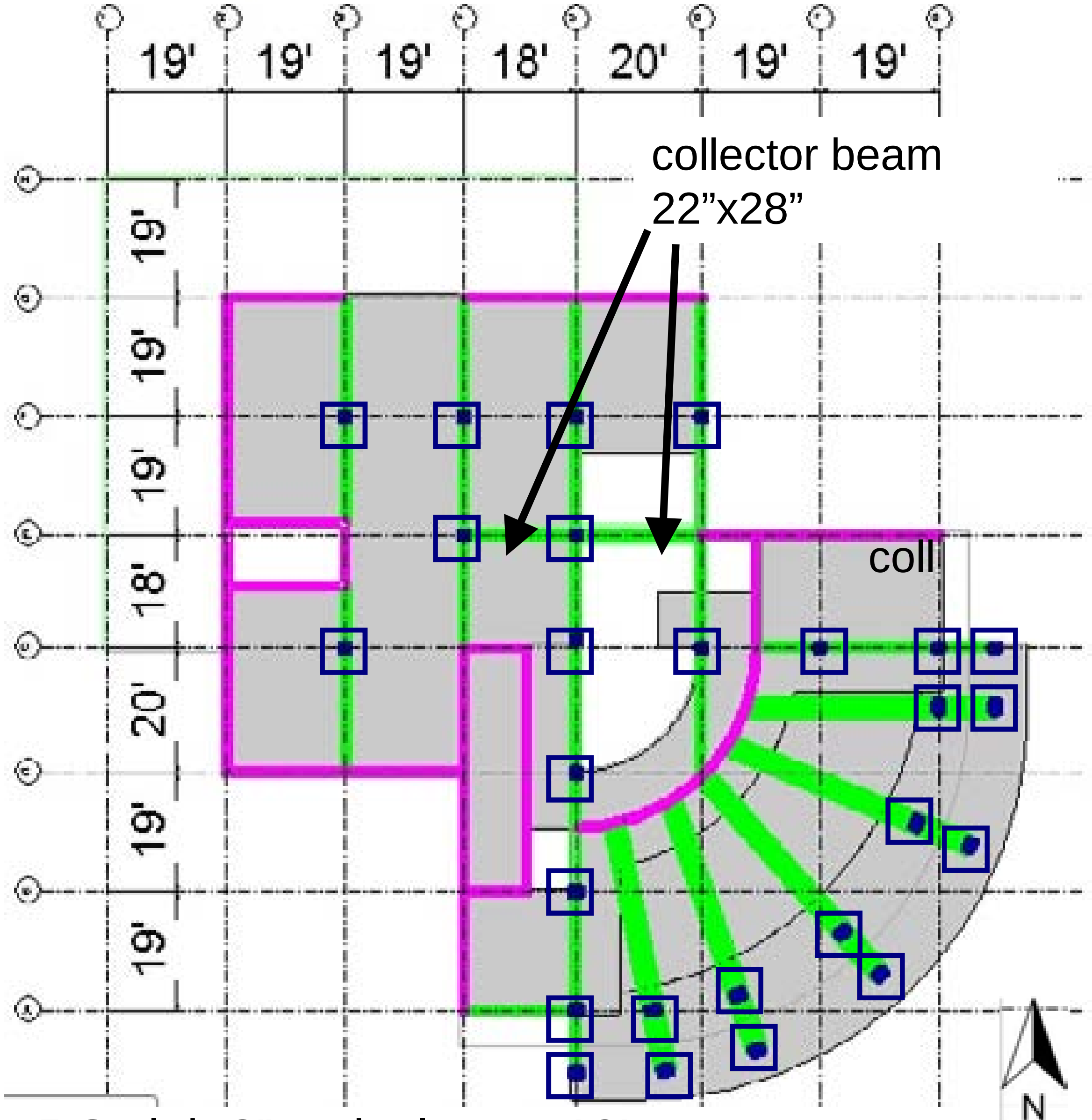
ATRIUM

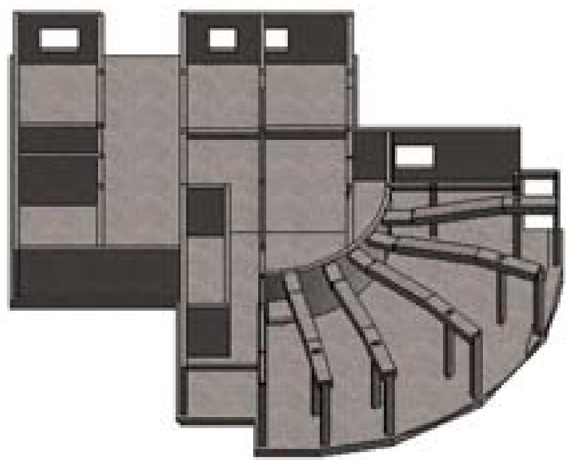
VIEWS – Office Level

SOUTHWEST AERIAL

ENTRY FROM SOCIAL PLAZA South East Side

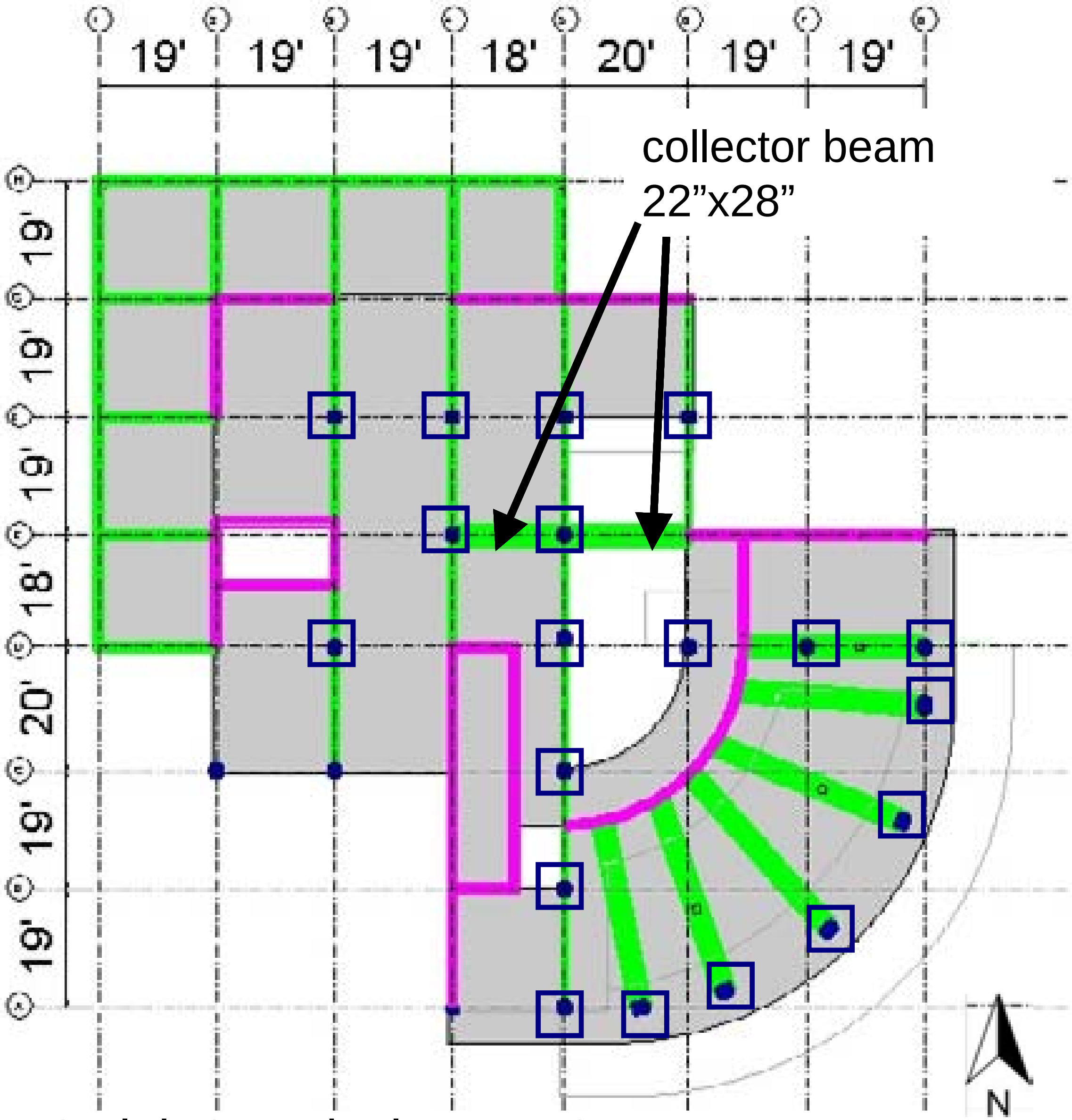
FLOORPLANS basement level





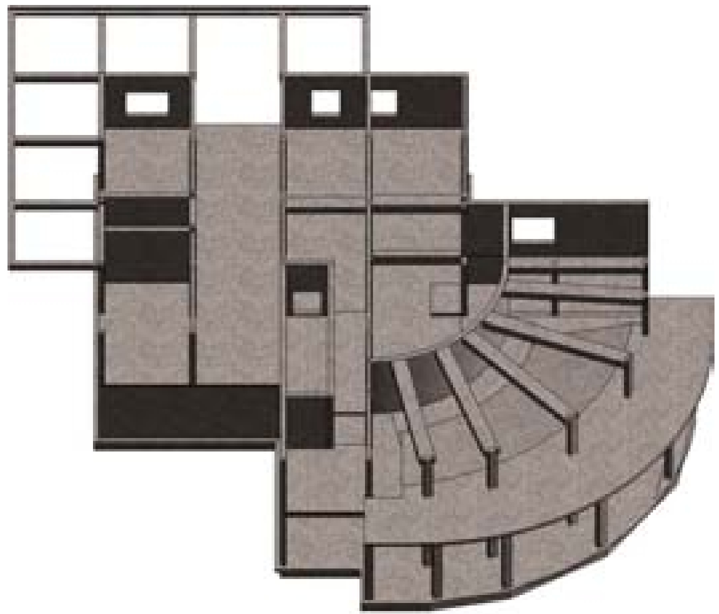
RC slab 8",typical span 19'

FLOORPLAN ground level

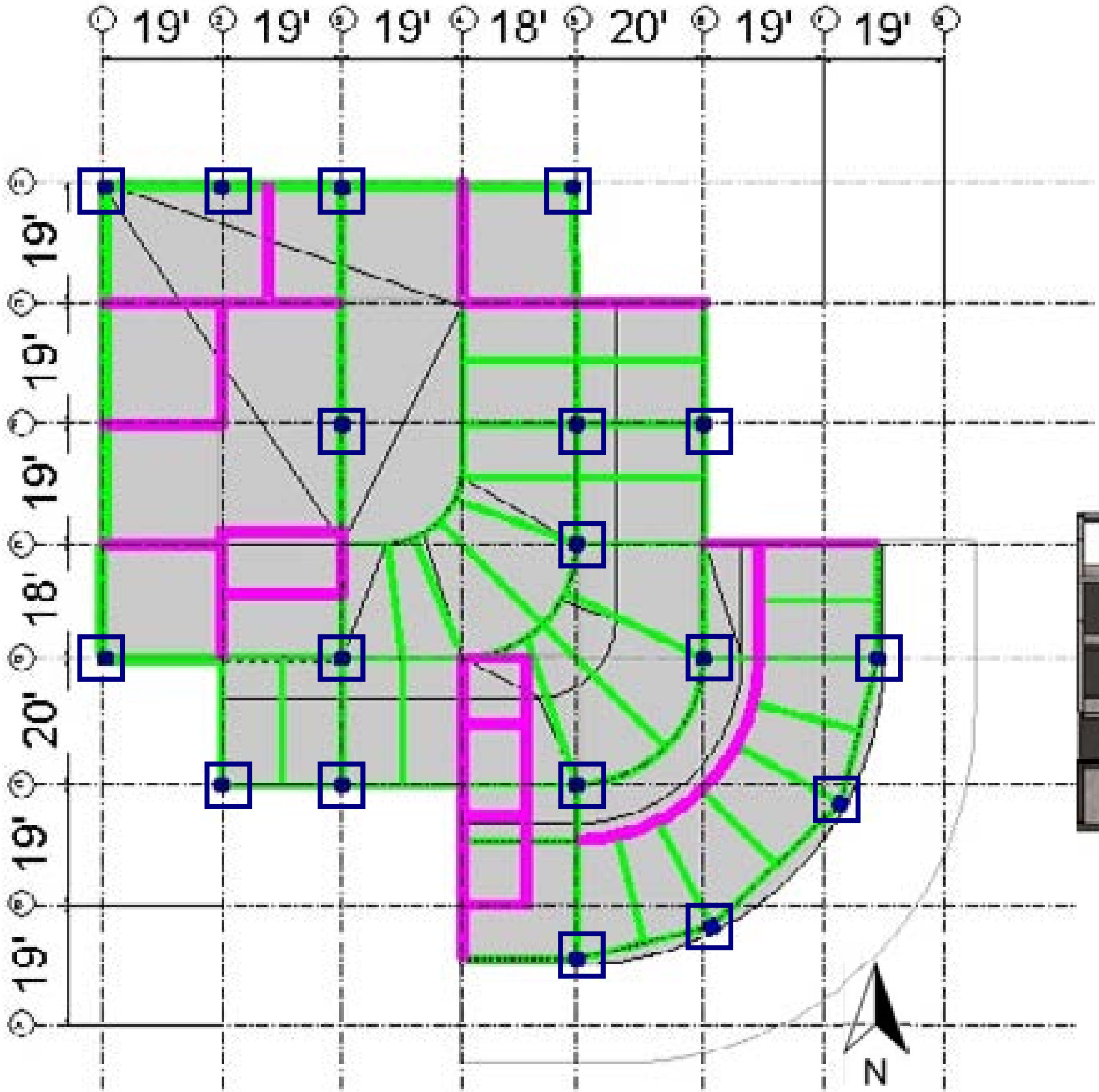


RC slab 8",typical span 19'

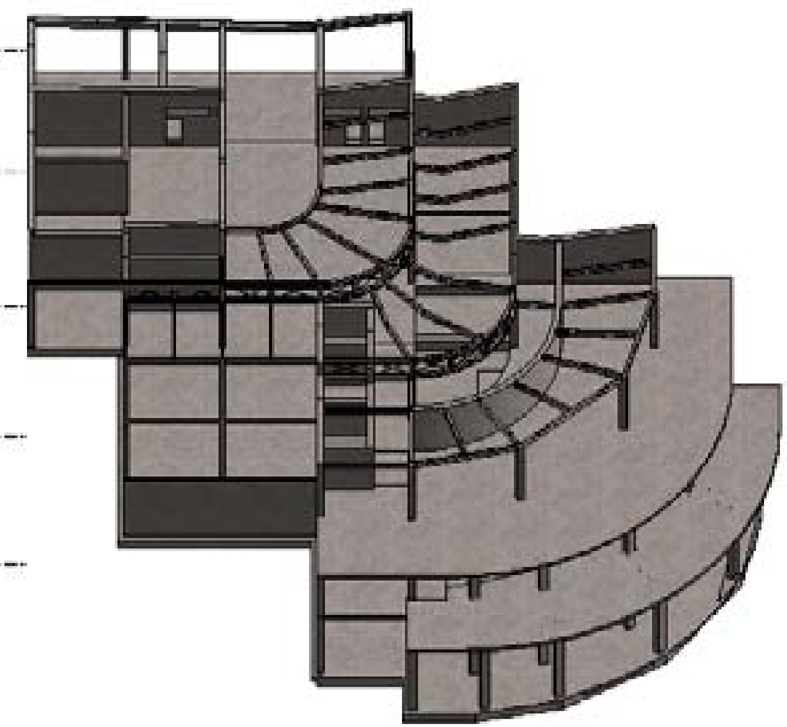
- columns 16"x16"
- gravity wall 16"
- beam
  typ. span 20' 16"x18"
  typ. span 30' 18"x24"



FLOORPLAN office level

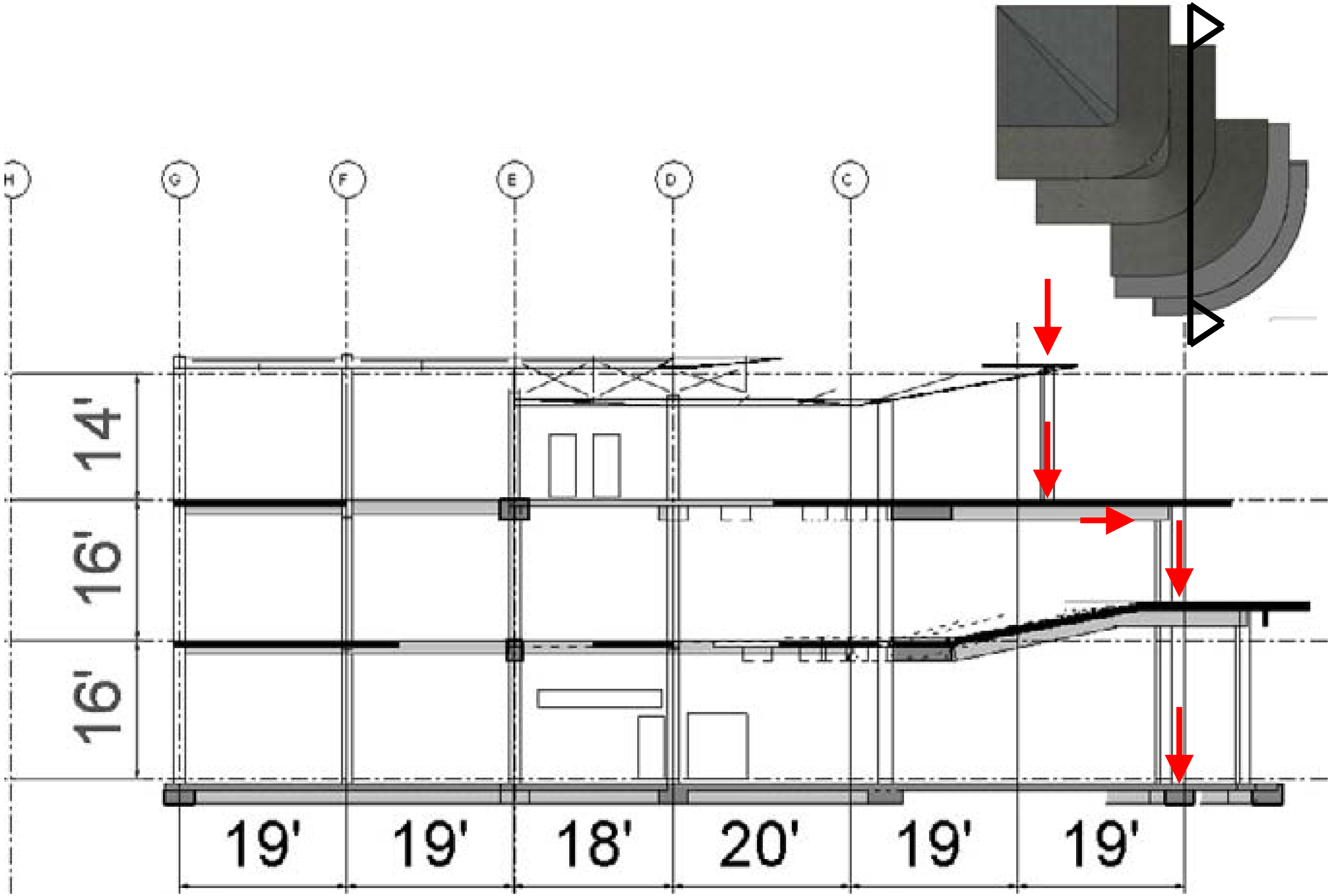


- columns 16”x16”
- gravity wall 16”
- beam
  - typ. span 20’ 16”x18”
  - typ. span 30’ 18”x24”

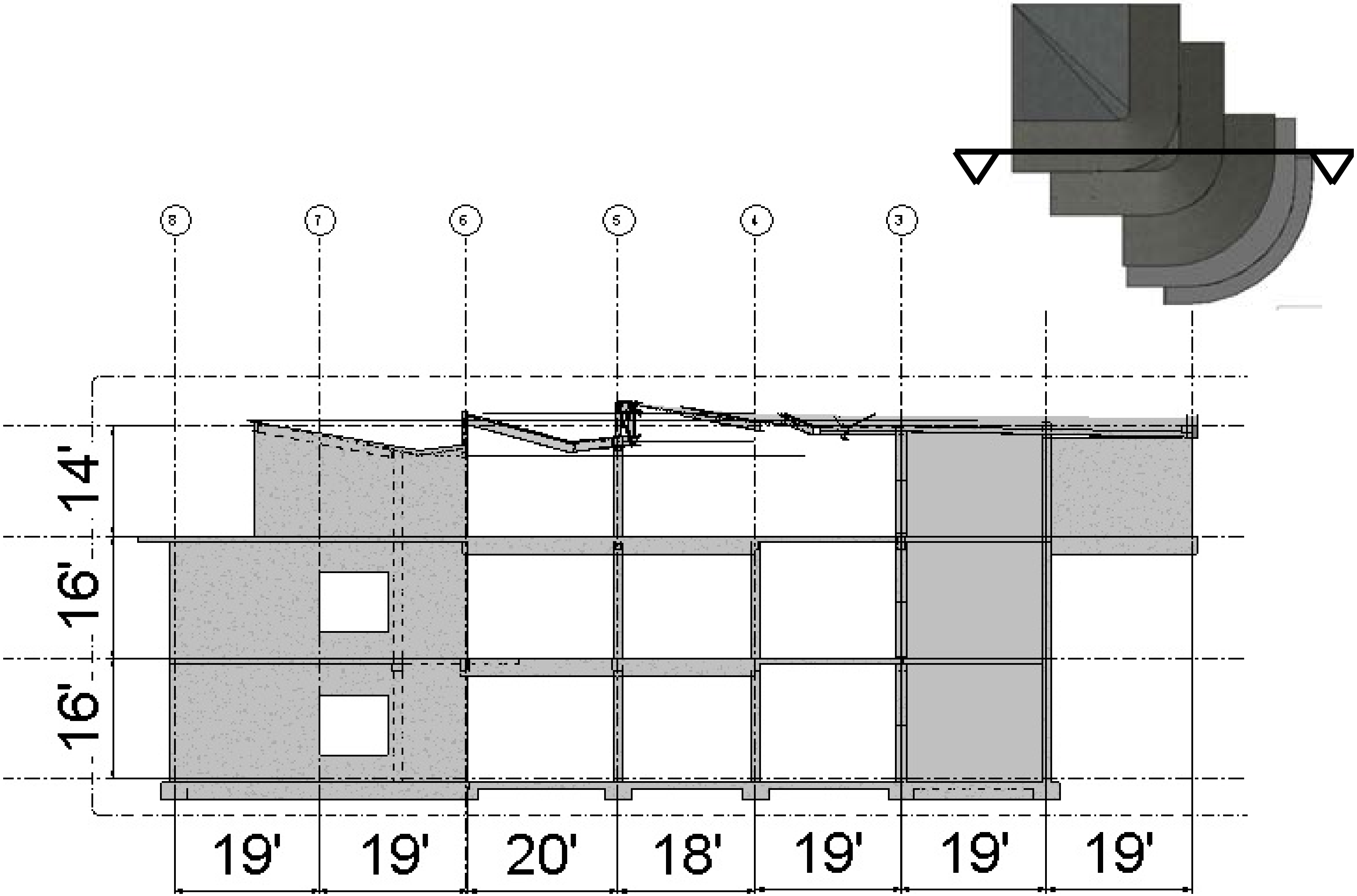


RC slab 8”,typical span 19’

Section load path



Section load path



GRAVITY DESIGN

PT Beam
Prefab Beam
PT slab
RC slab
RC shear walls

!

Too much disciplines on site

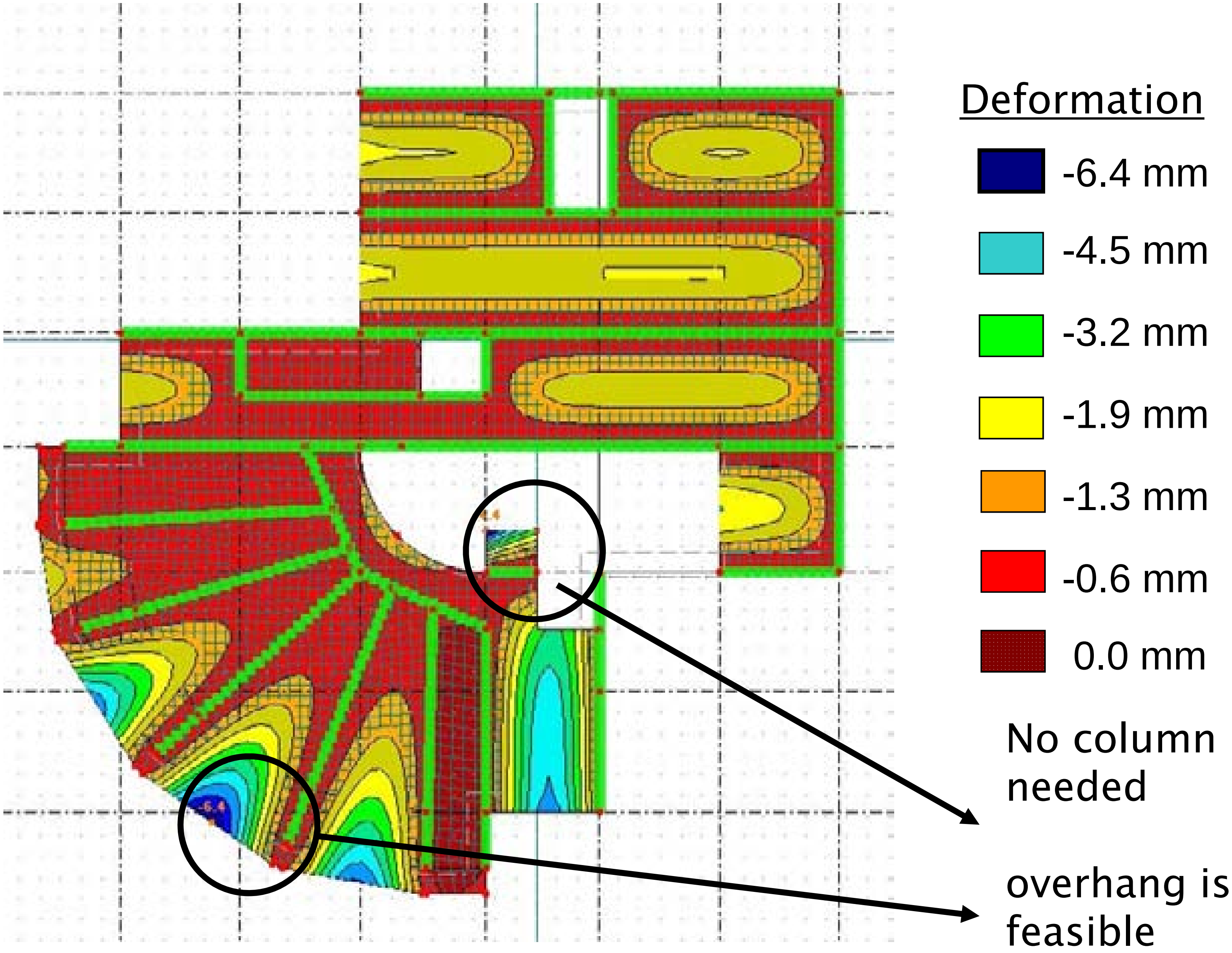
What does really fit our requirements?

?

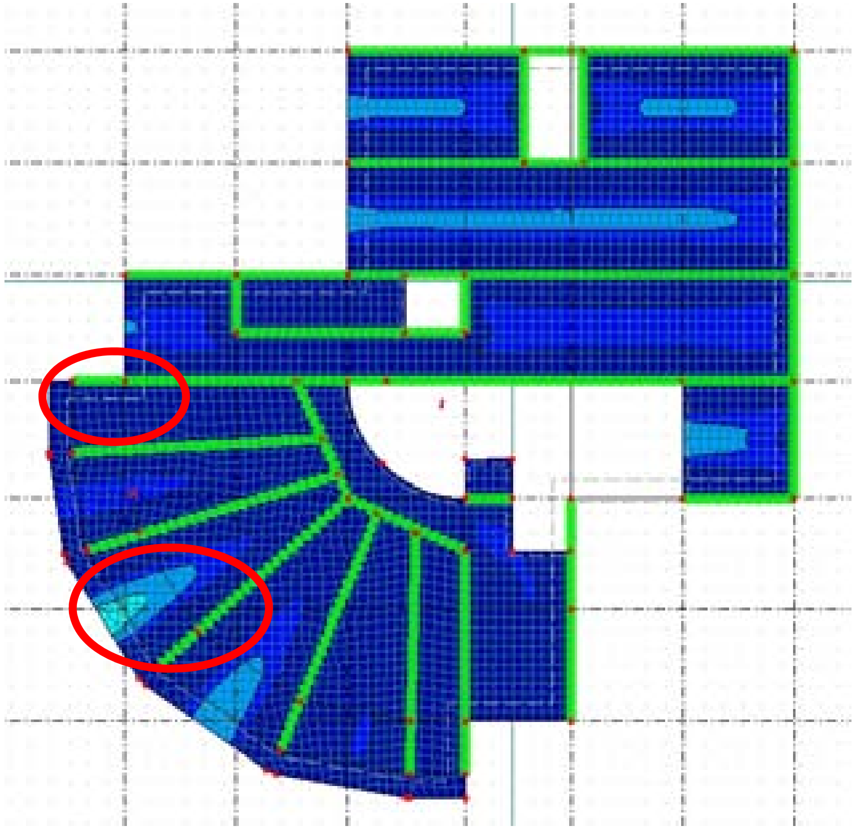
PT Beam
RC slab
RC shear walls

GRAVITY DESIGN slab – ground level

DIN



GRAVITY DESIGN slab – ground level



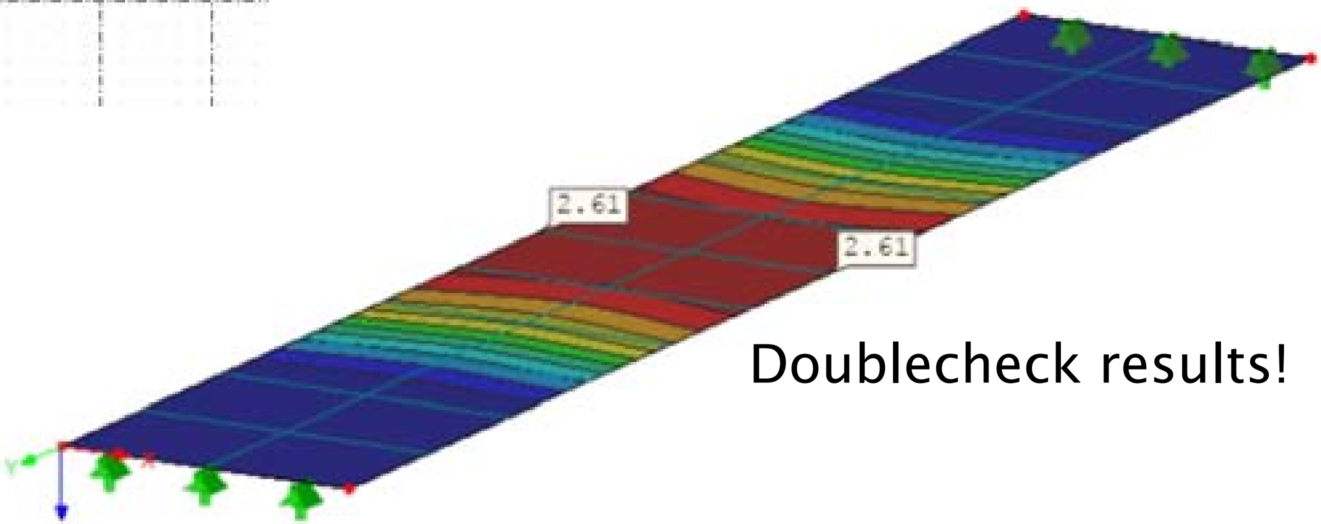
Reinforcement bottom

DIN

(dark navy)	0.00 – 1.15 cm²/m
(blue)	1-15 - 2.30 cm²/m
(light blue)	2.30 - 3.45 cm²/m
(cyan)	3.45 – 4.6 cm²/m

constant rebar,
strengthen in high stressed area

RC slab 8“,
Uniaxial,
Typ. Span 19‘

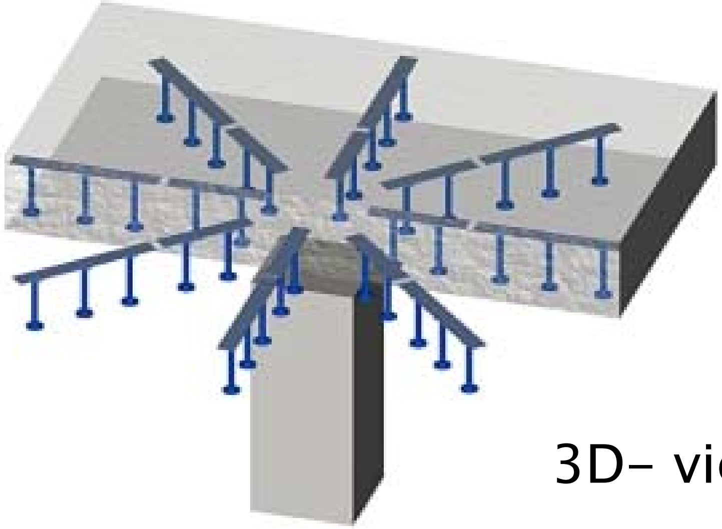


Doublecheck results!

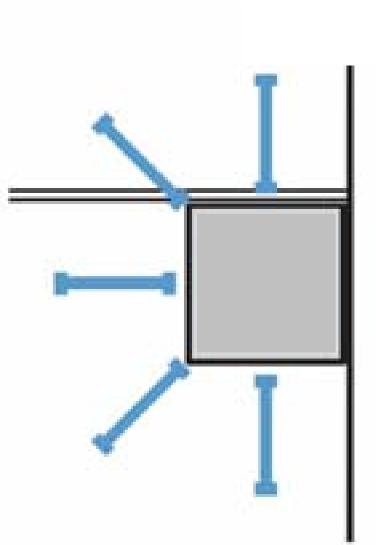
DESIGN DETAILS slab - overhangs

Shear and punching reinforcement

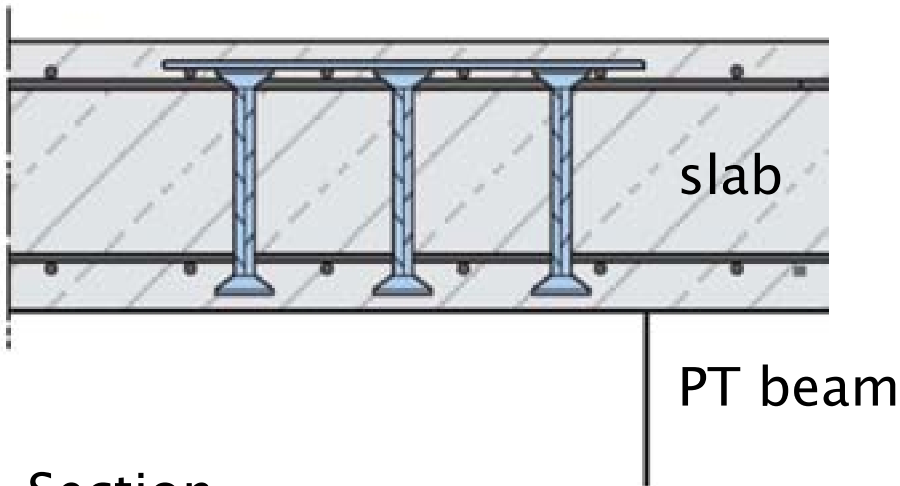
HALFEN
YOUR BEST CONNECTIONS



3D- view



Position in floorplan

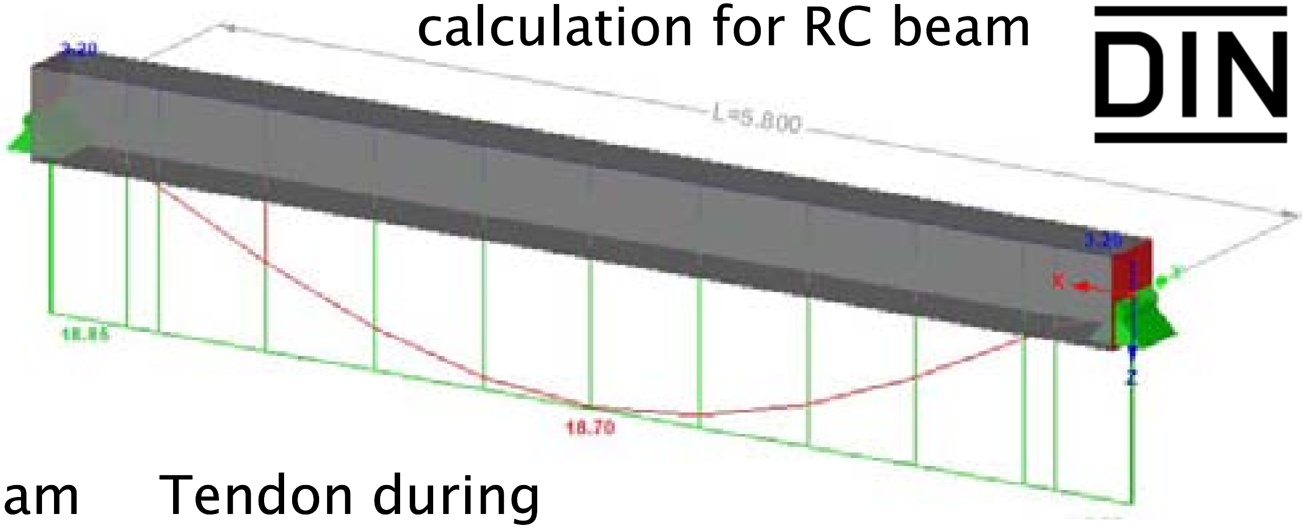


Section

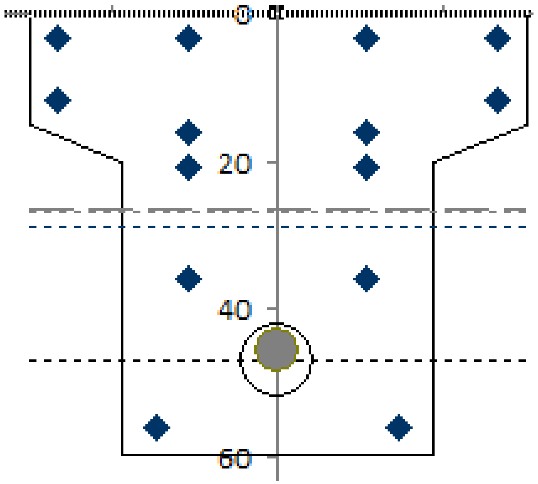
RC vs. PT

calculation for RC beam

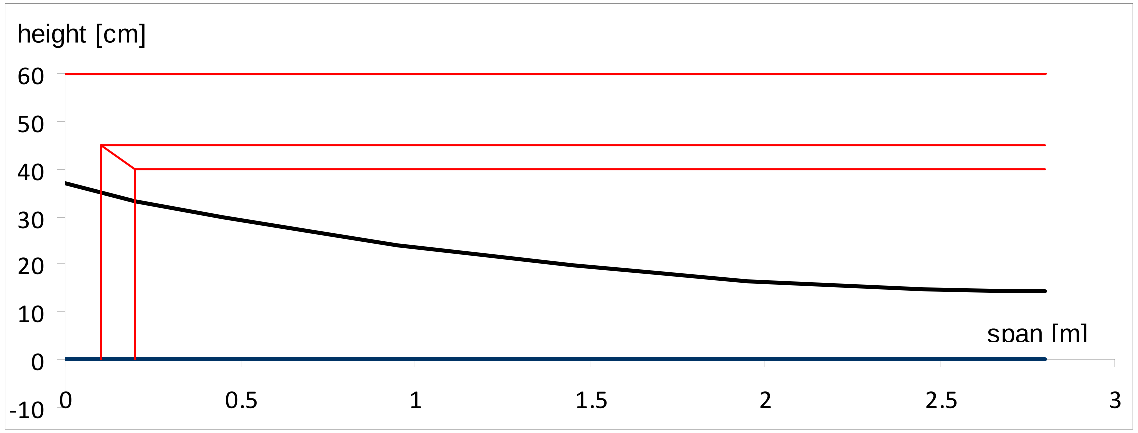
DIN



Cross section PT beam



Tendon during



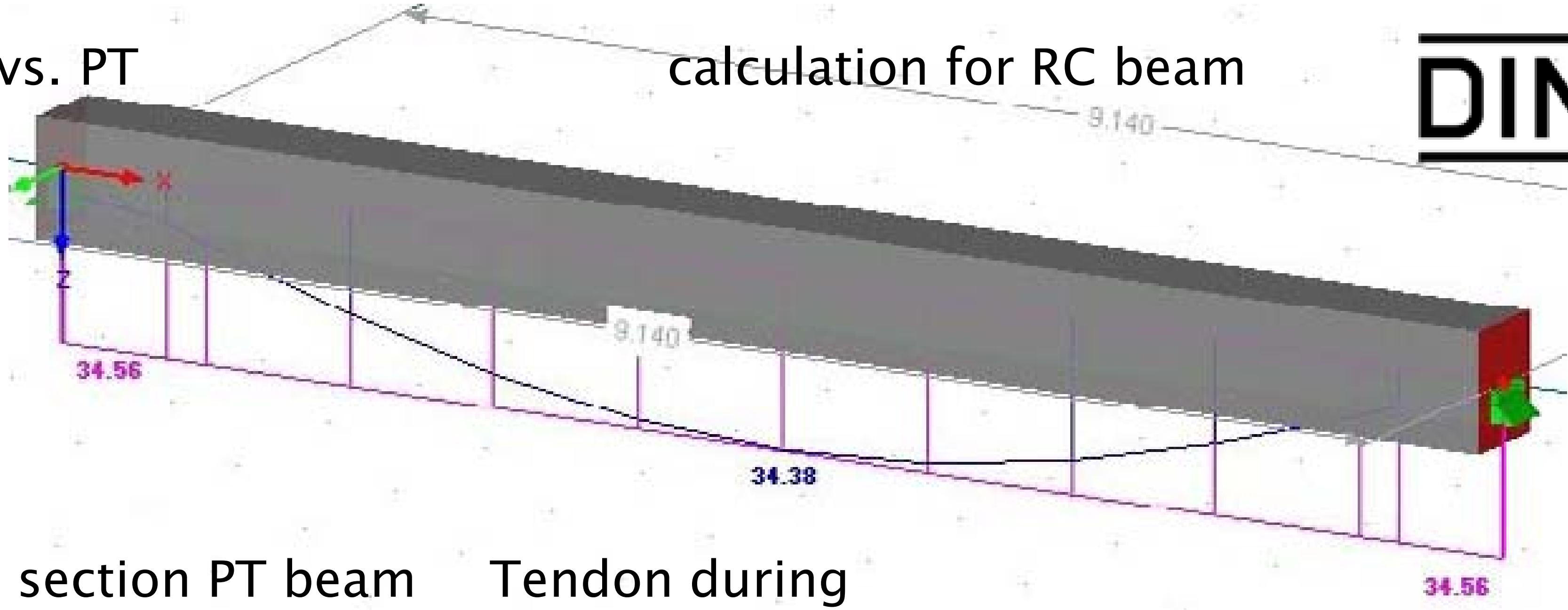
→ PT beam 16“x16“

→ RC beam 16“x18“

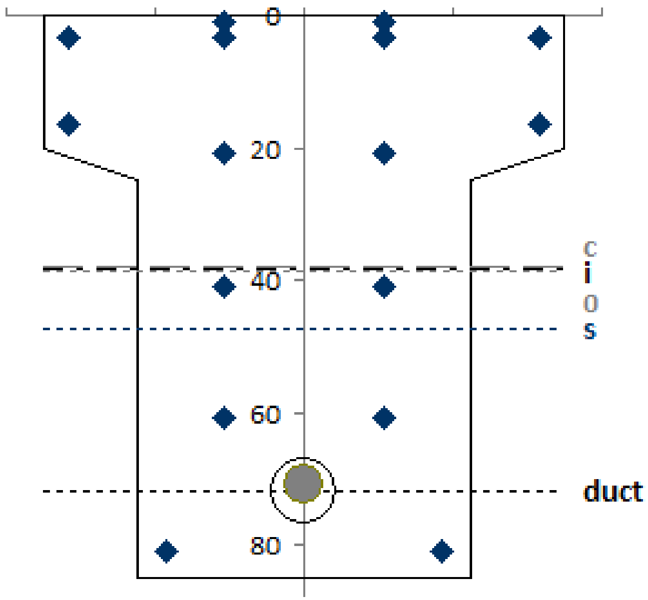
GRAVITY DESIGN 30‘ Beam

RC vs. PT

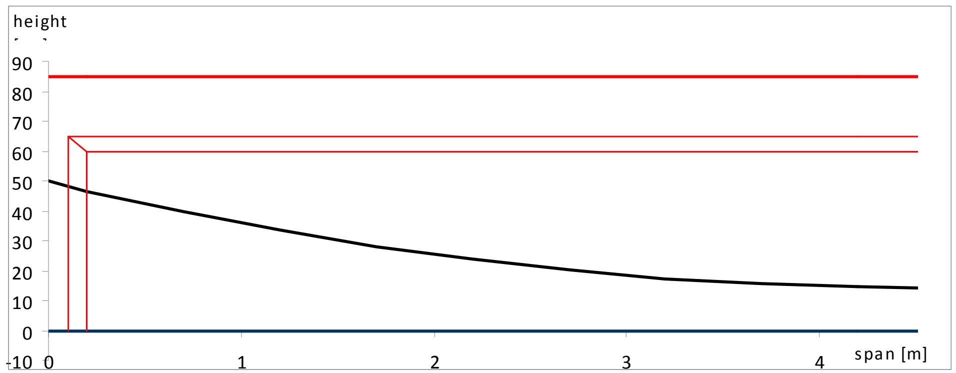
calculation for RC beam



Cross section PT beam



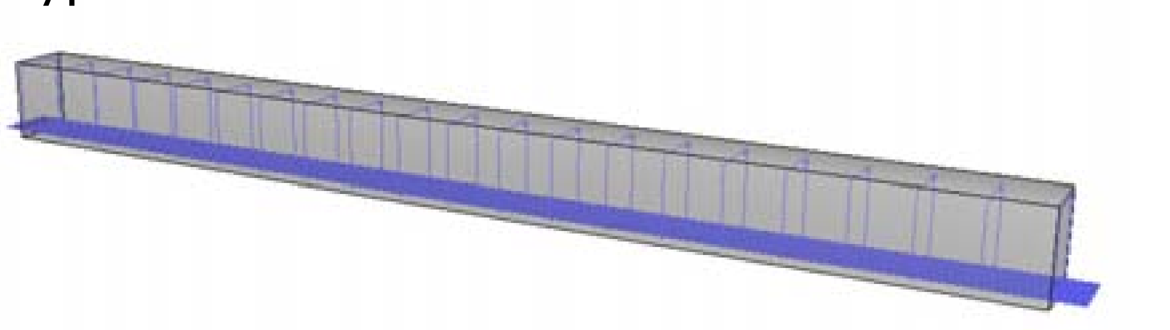
Tendon during

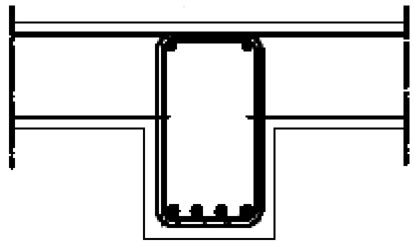


PT beam 18“x26“

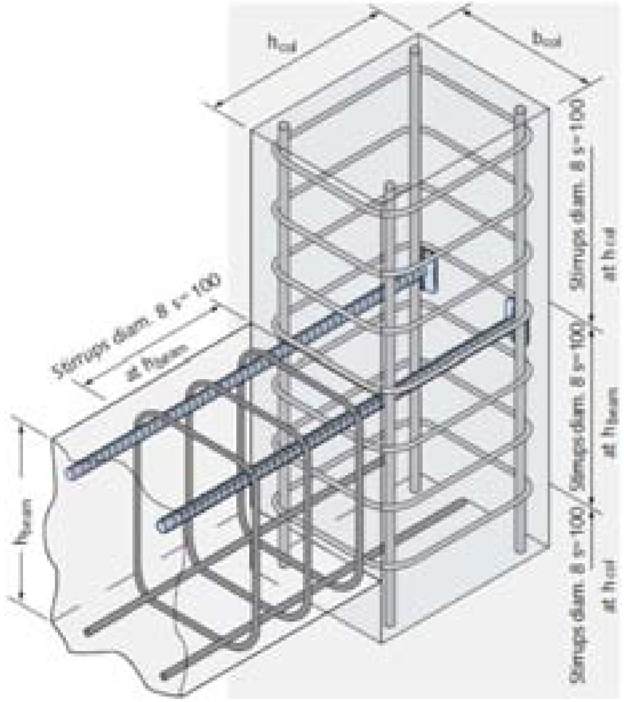
RC beam 24“x30“

Typical RC beam reinforcement





Typical connection from RC beam to RC column

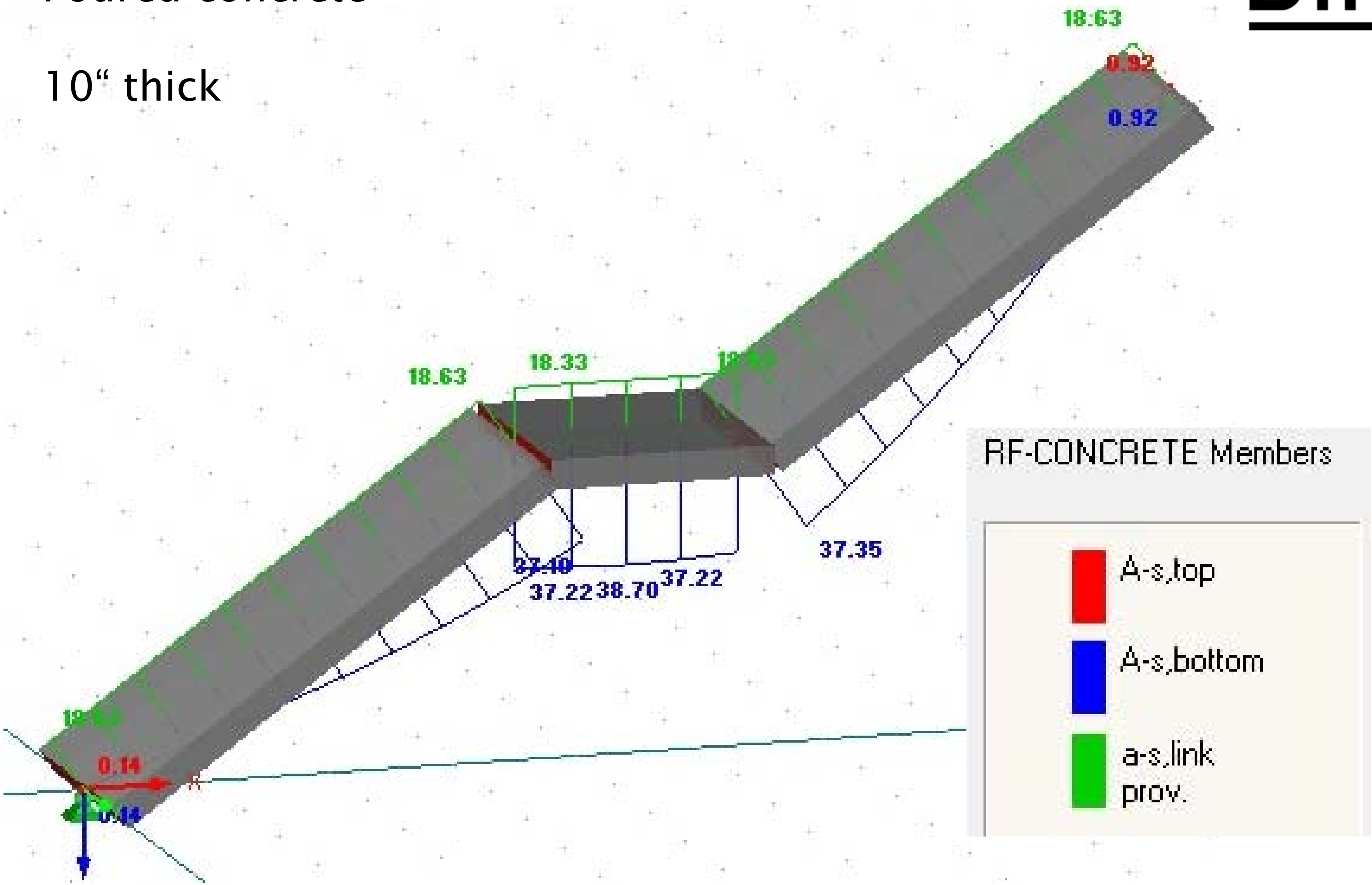


DESIGN DETAILS staircase

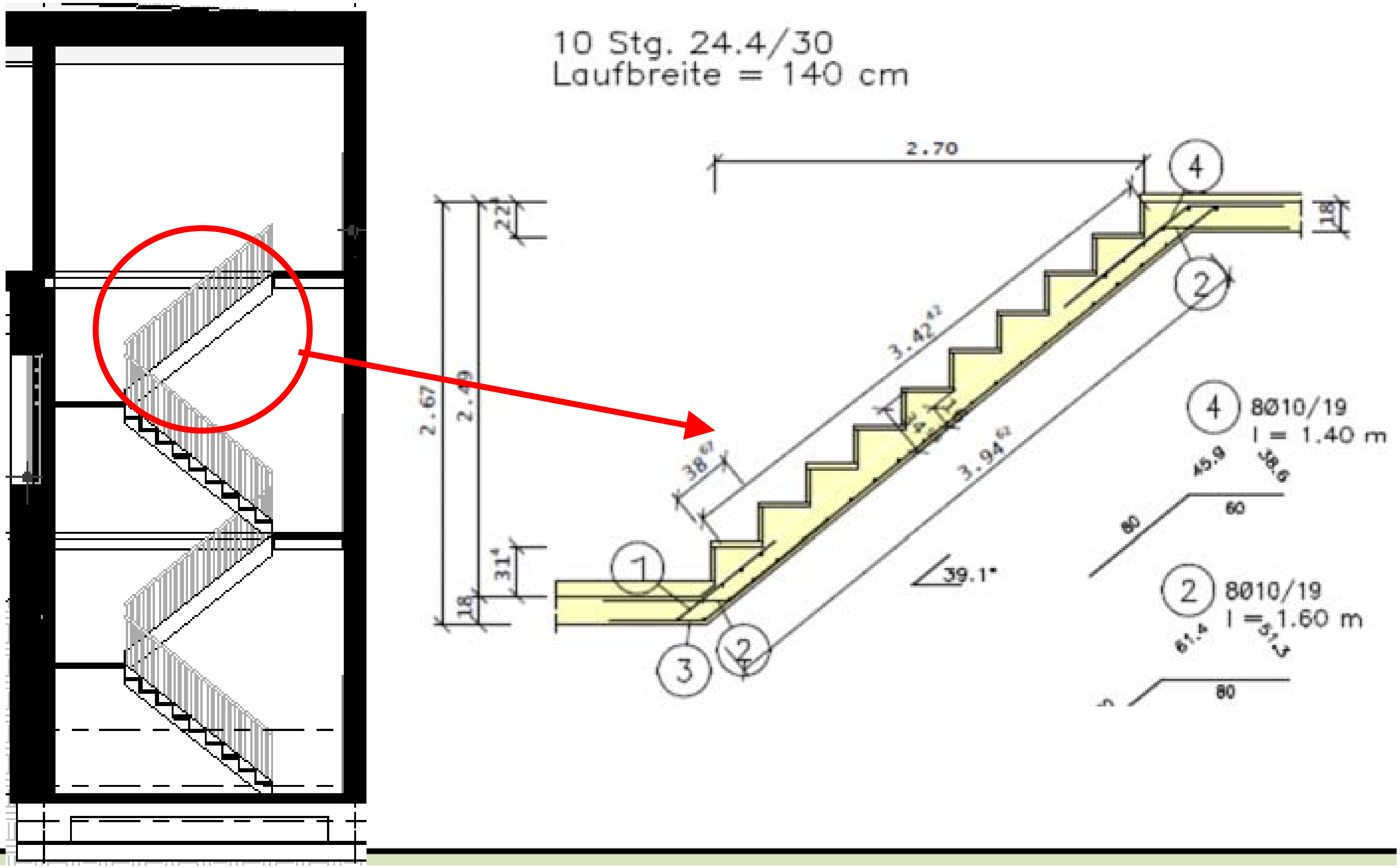
DIN

Poured concrete

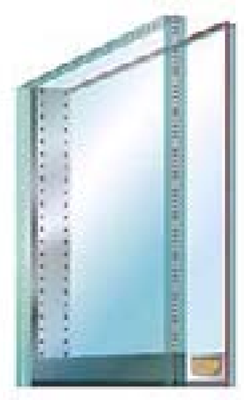
10“ thick

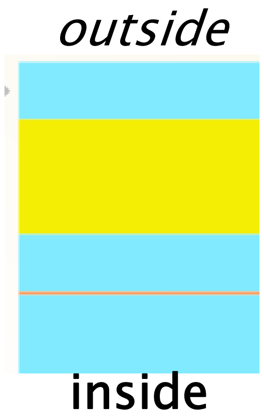


fire stair design

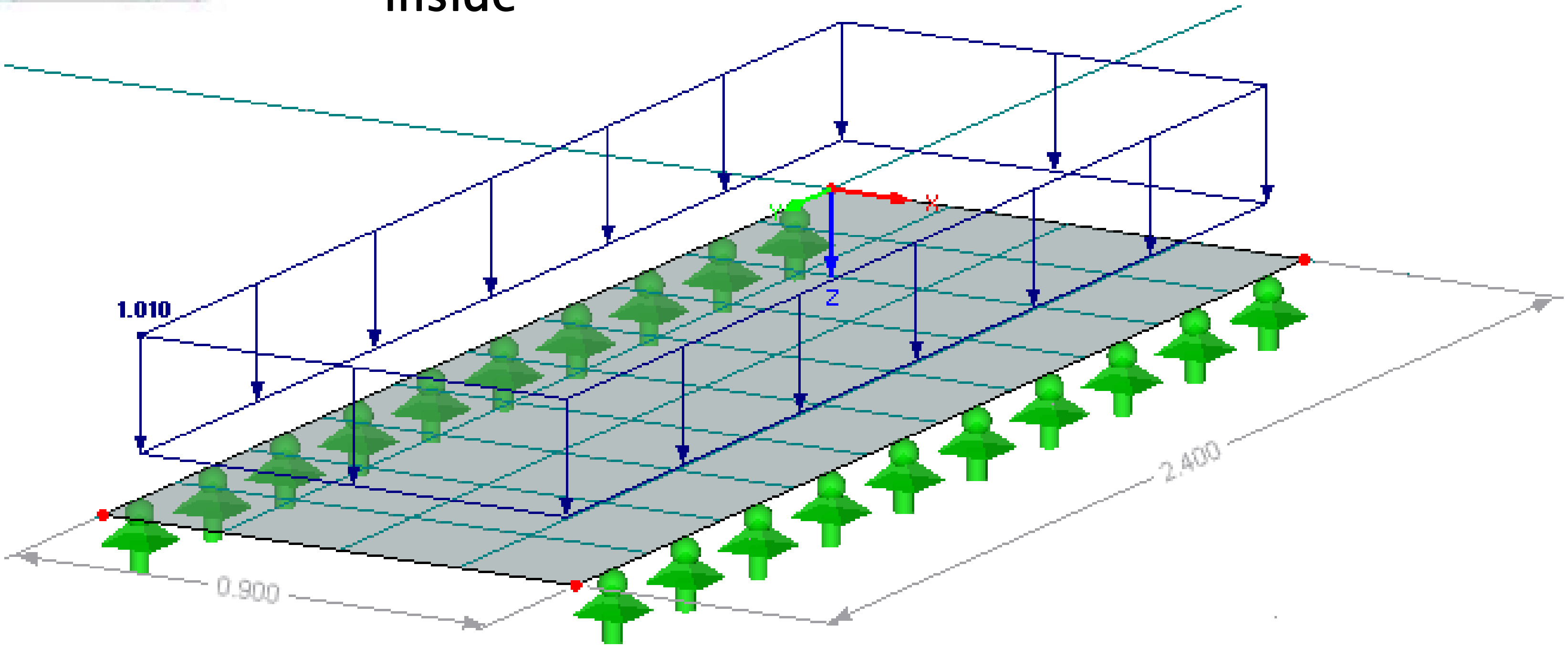


Glazing – Thermo glass

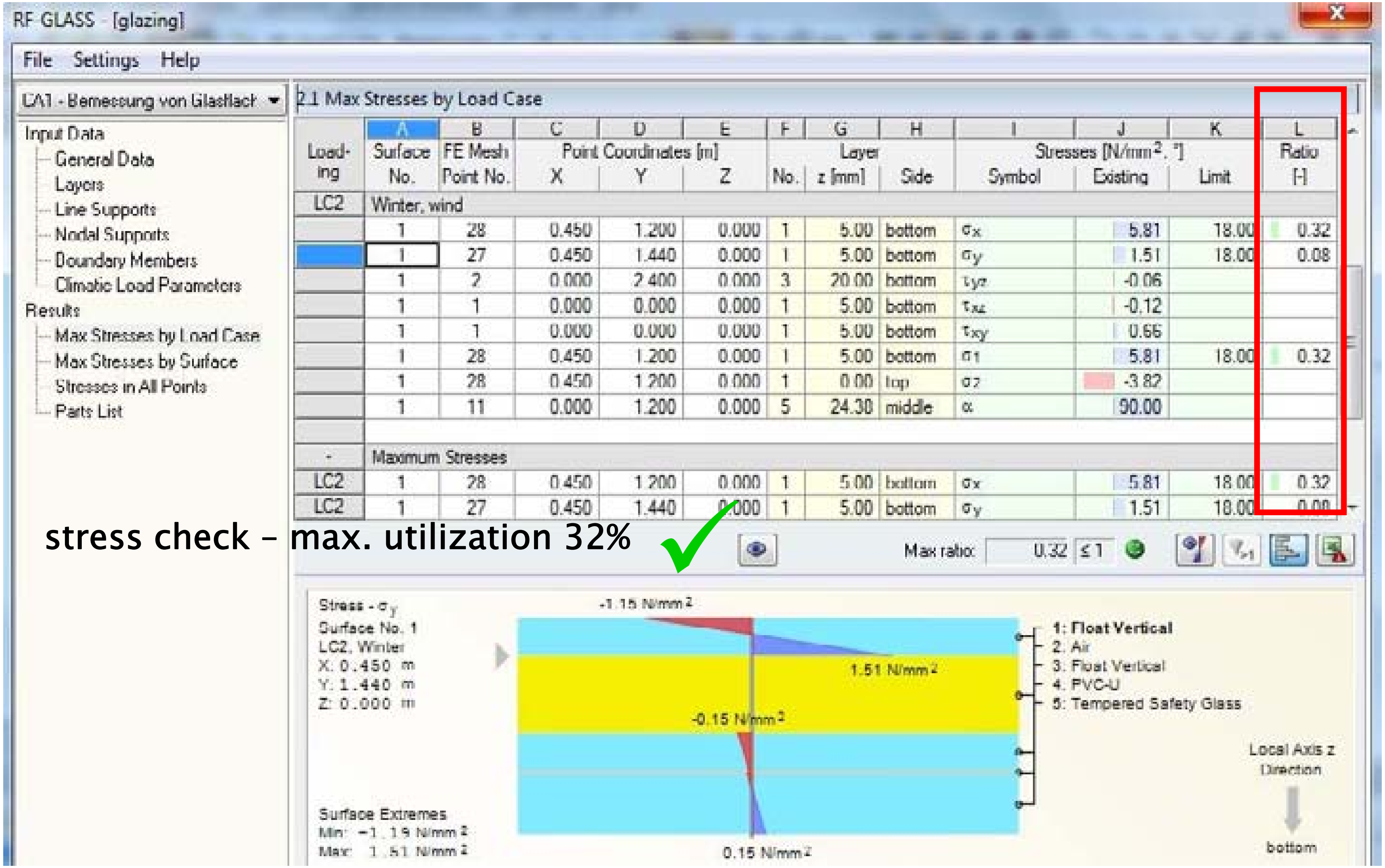




5.00 mm Float glass
10.00 mm Air
5.00 mm Float glass
0.38 mm Foil
8.00 mm tempered safety glass



DESIGN DETAILS glazing

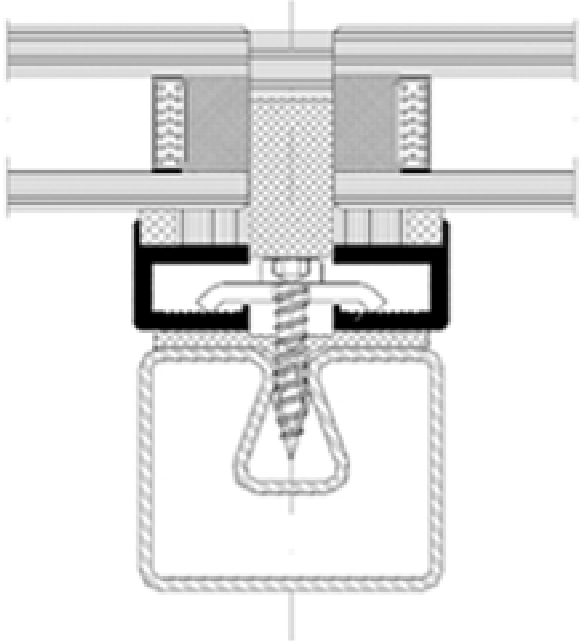


Loading	Surface No.	FE Mesh Point No.	Point Coordinates [m] X	Y	Z	Layer No.	z [mm]	Side	Stresses [N/mm², °] Symbol	Existing	Limit	Ratio [-]
LC2	Winter, wind											
	1	28	0.450	1.200	0.000	1	5.00	bottom	σx	5.81	18.00	0.32
	1	27	0.450	1.440	0.000	1	5.00	bottom	σy	1.51	18.00	0.08
	1	2	0.000	2.400	0.000	3	20.00	bottom	τyz	-0.06		
	1	1	0.000	0.000	0.000	1	5.00	bottom	τxz	-0.12		
	1	1	0.000	0.000	0.000	1	5.00	bottom	τxy	0.66		
	1	28	0.450	1.200	0.000	1	5.00	bottom	σ1	5.81	18.00	0.32
	1	28	0.450	1.200	0.000	1	0.00	top	σ2	-3.82		
	1	11	0.000	1.200	0.000	5	24.30	middle	α	90.00		
-	Maximum Stresses											
LC2	1	28	0.450	1.200	0.000	1	5.00	bottom	σx	5.81	18.00	0.32
LC2	1	27	0.450	1.440	0.000	1	5.00	bottom	σy	1.51	18.00	0.08

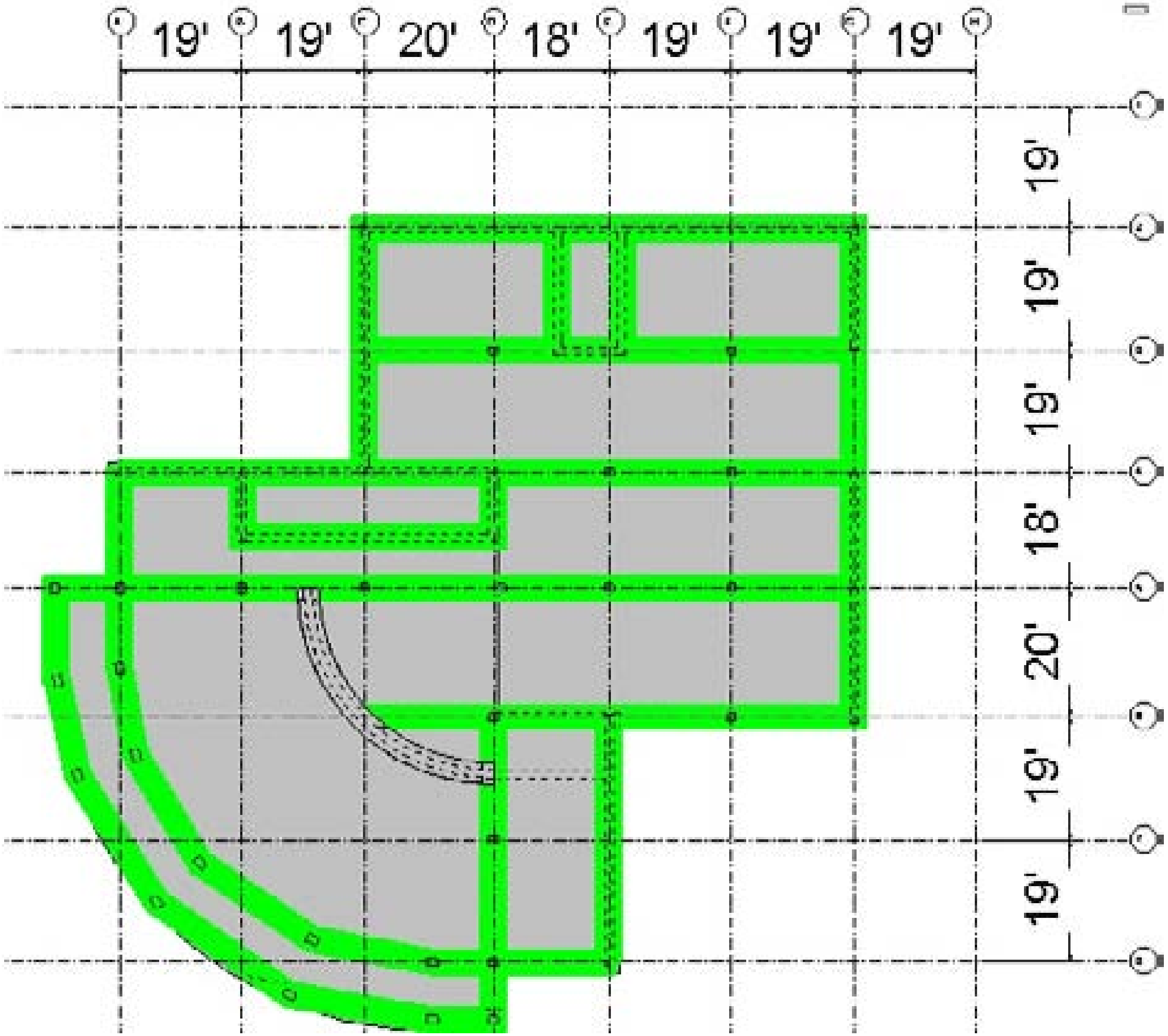
stress check – max. utilization 32% ✓

DESIGN DETAILS glazing

Fixing detail



Reference building

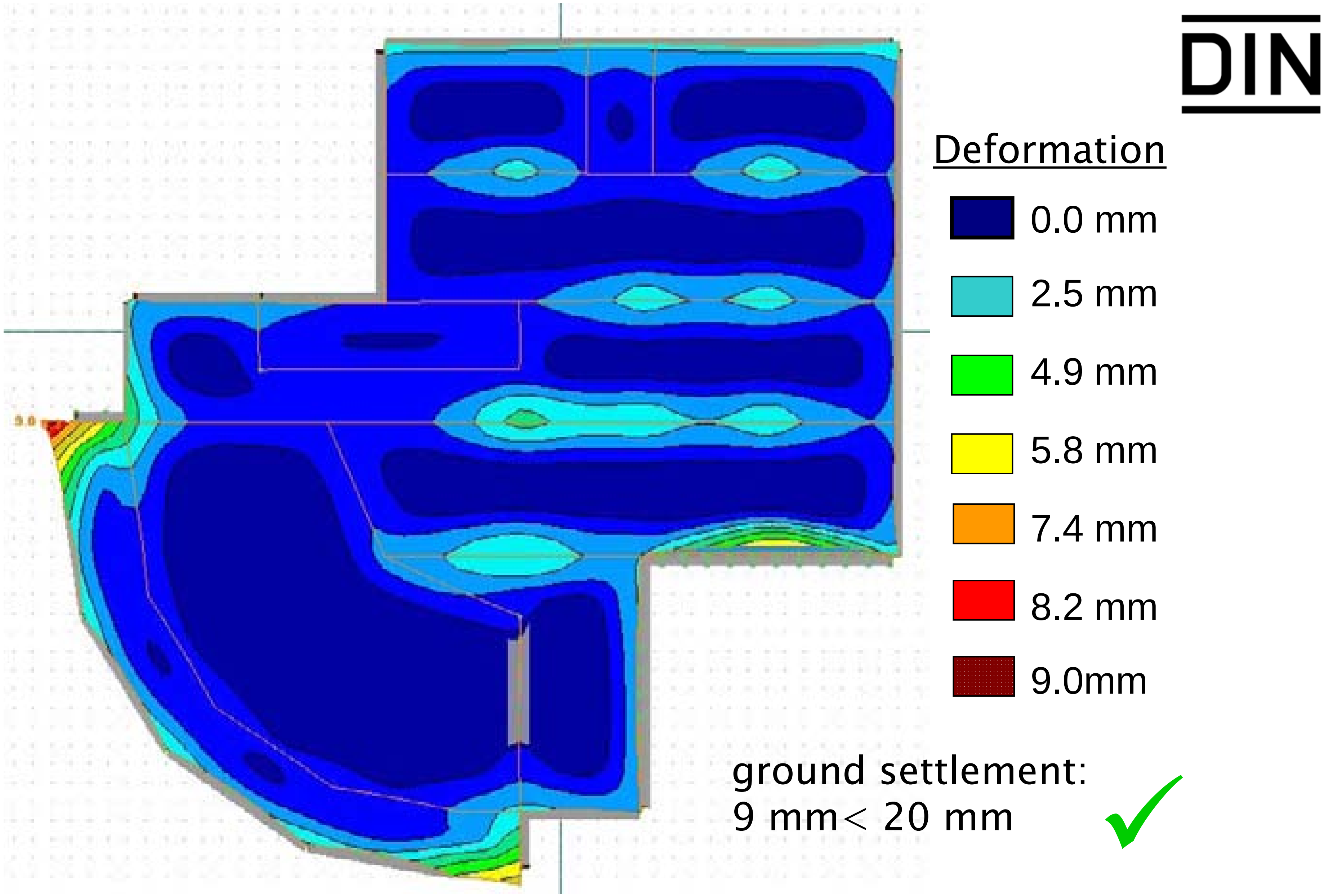


Strip foundation
40” x 28”

Foundation slab
10” thick

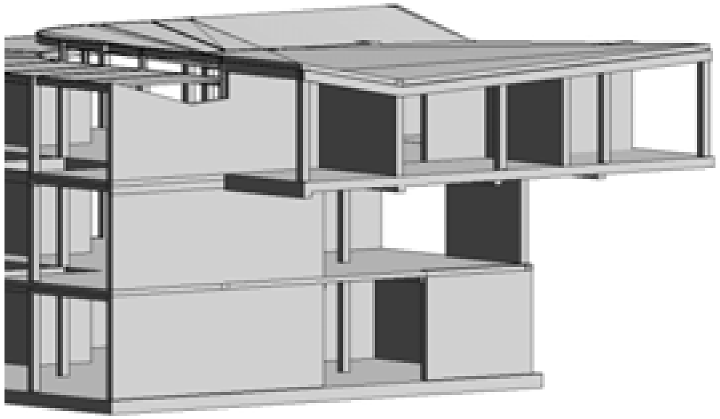
Bearing Capacity:

300 kN/m³



ground settlement:
9 mm< 20 mm ✓

A/E SHEAR WALL DEVELOPMENT



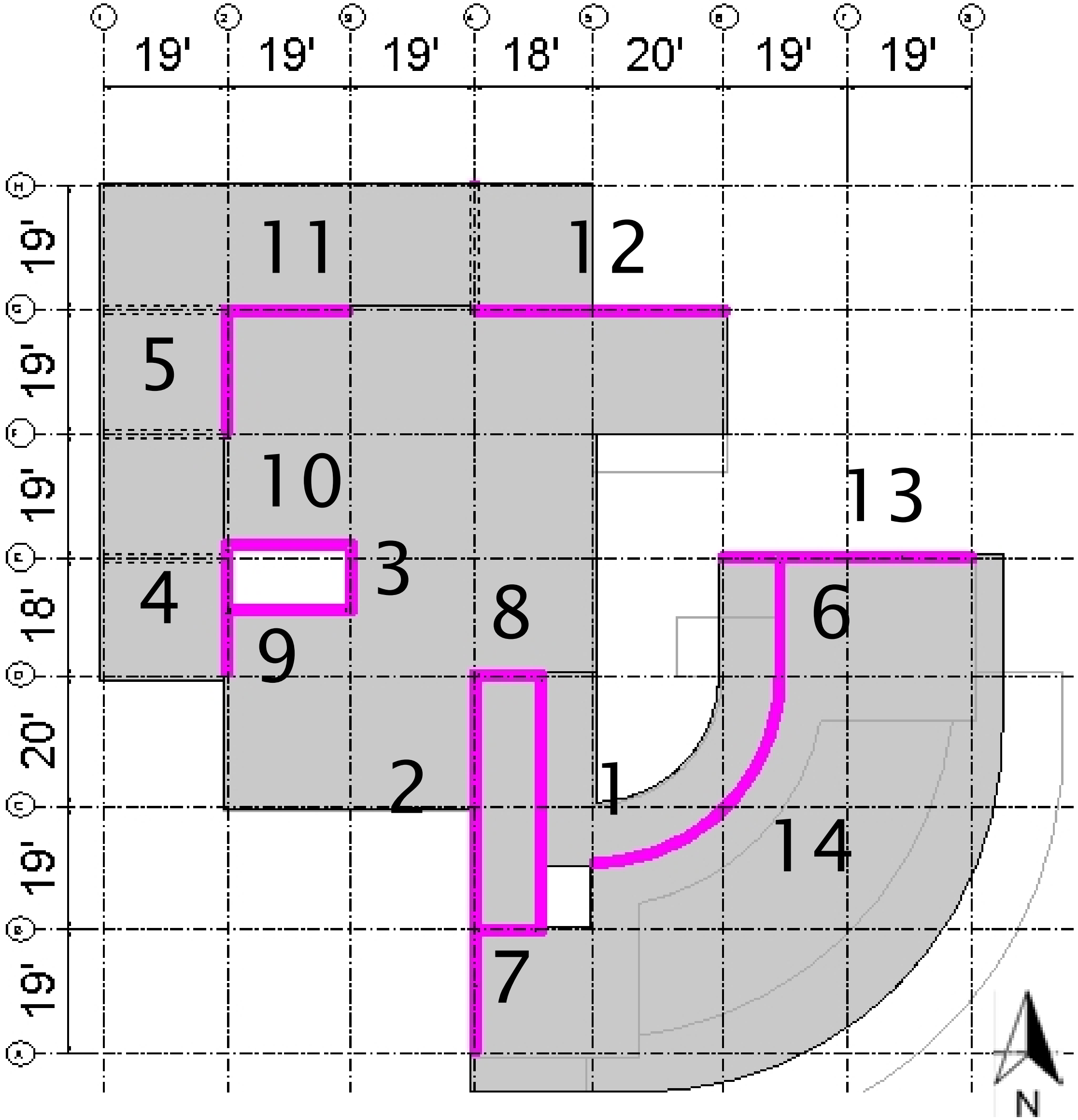
Initial Structural Design
- No cuts
- Too rigid
- Needed windows

Initial Architectural Design
- Maximum desired windows
- Not rigid enough
- Needed window reduction

Integrated Design
- Adequate rigidity
- Enough windows for all rooms
- Office level window maximization

Special RC Shear Wall Lateral System

- Designed using Equivalent Static Force Method (ASCE 7-10)

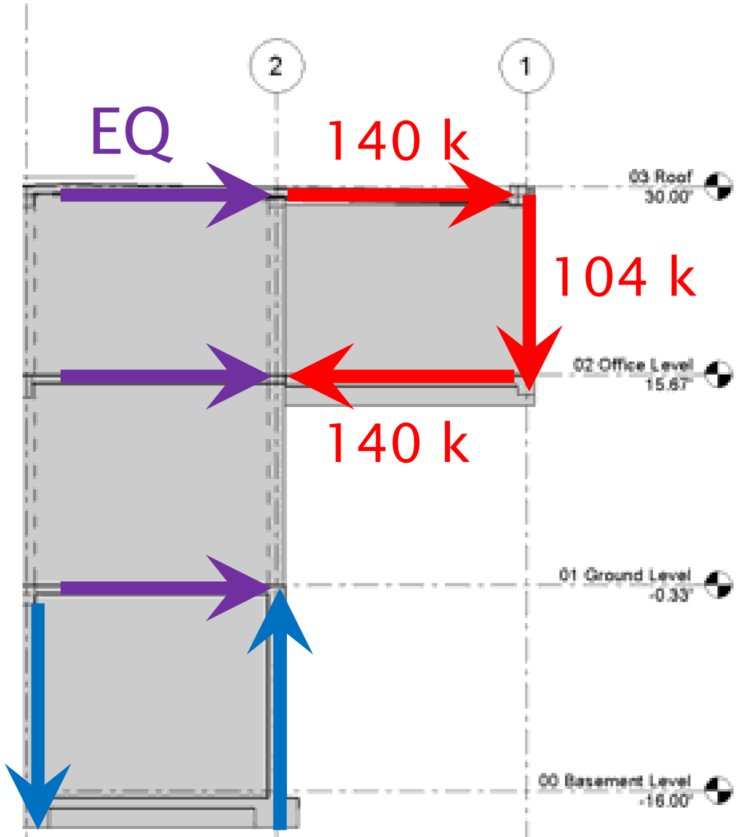


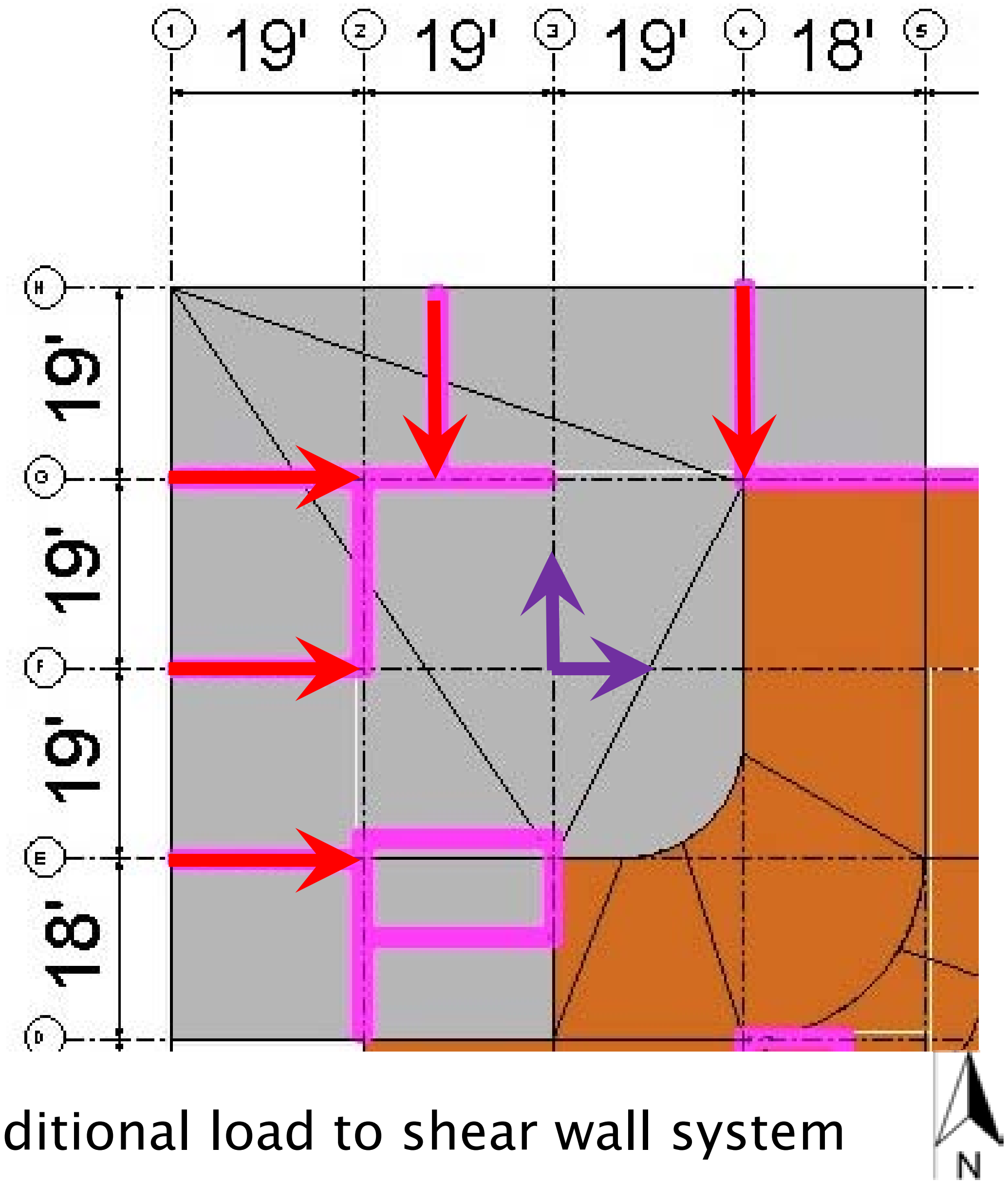
Story Shears	
Roof	729 k
2nd Floor	1216 k
1st Floor	1457 k

No.	length [ft]	Mmax [k-ft]	Vmax [kips]
1	39.0	17786	505
2	47.5	20491	579
3	10.0	808	22
4	22.8	5030	125
5	19.0	3521	88
6	38.0	11761	293
7	10.5	2225	43
8	10.5	1555	31
9	19.0	5550	113
10	19.0	4861	101
11	19.0	3724	95
12	38.0	12438	319
13	20.0	7732	152
14	38.0	13619	326

CANTILEVER SUPPORT – Office Level

Unreduced Loads	
Dead Load	120 psf
Live Load	50 psf

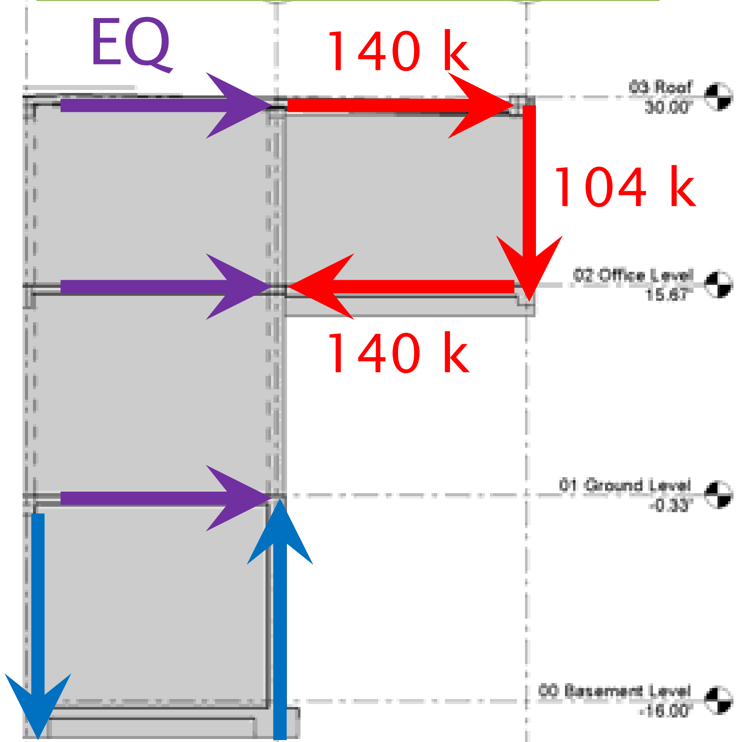


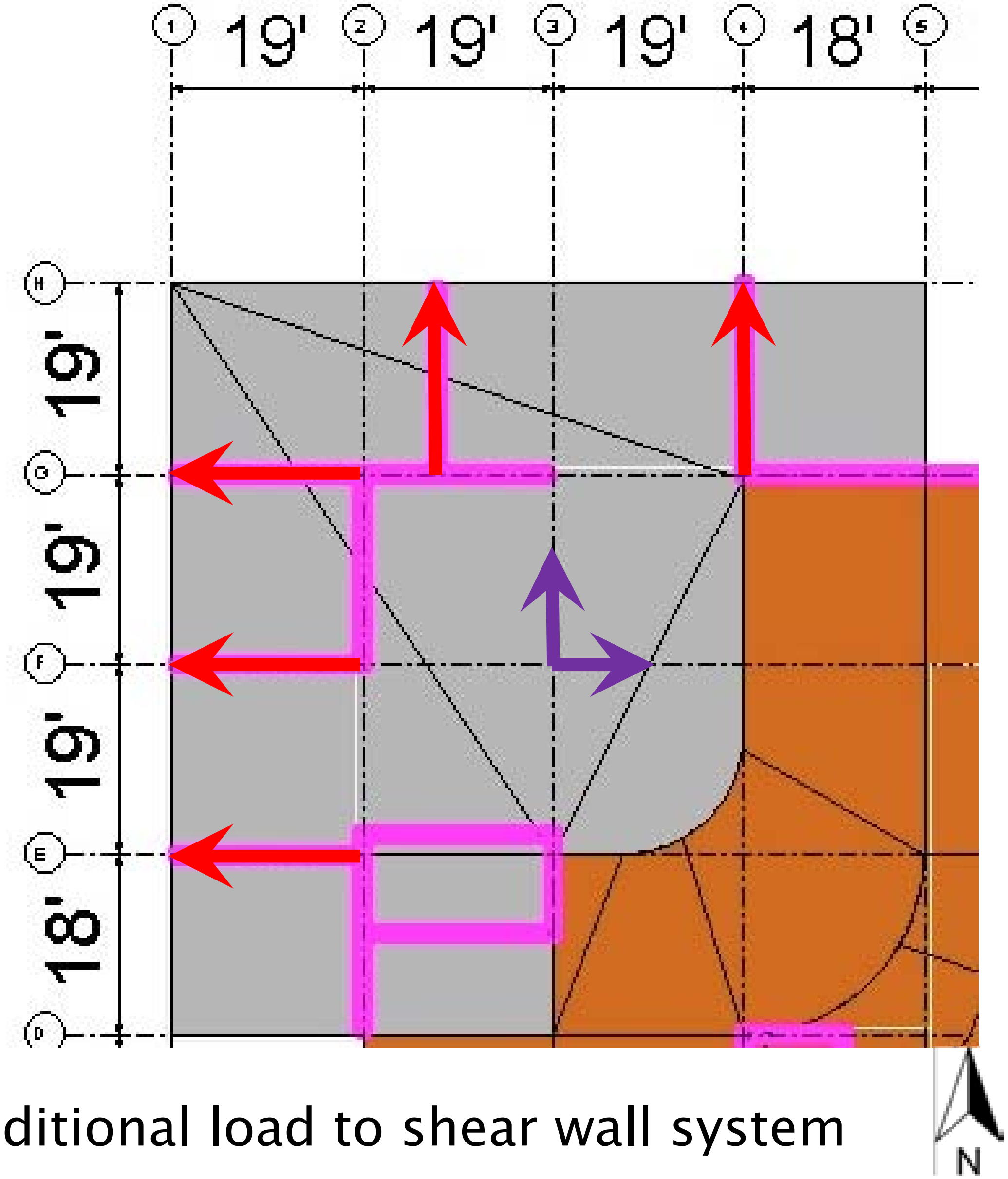


Example of Load Path – Adds additional load to shear wall system

CANTILEVER SUPPORT – Roof

Unreduced Loads	
Dead Load	115 psf
Live Load	20 psf
Snow Load	10.5 psf



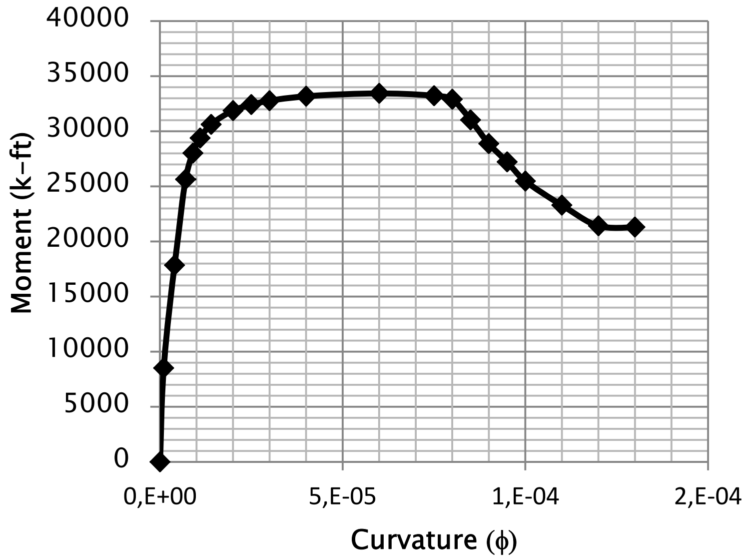


Example of Load Path – Adds additional load to shear wall system

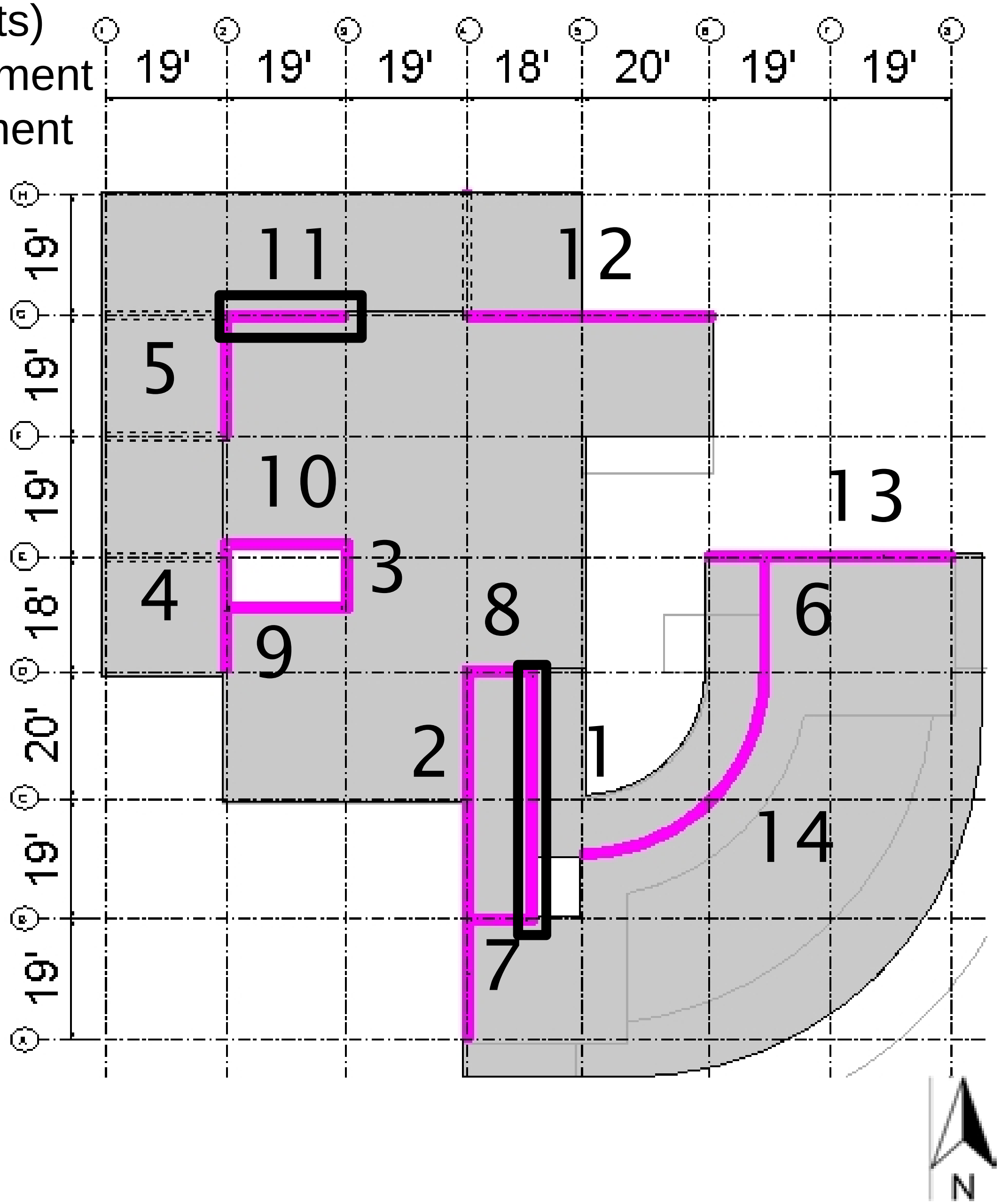
LATERAL SYSTEM – Shear Wall Design

12” thick (typ. 16” boundary elements)
2 #5s @ 12” Longitudinal Reinforcement
#5s @ 12” Transverse Reinforcement

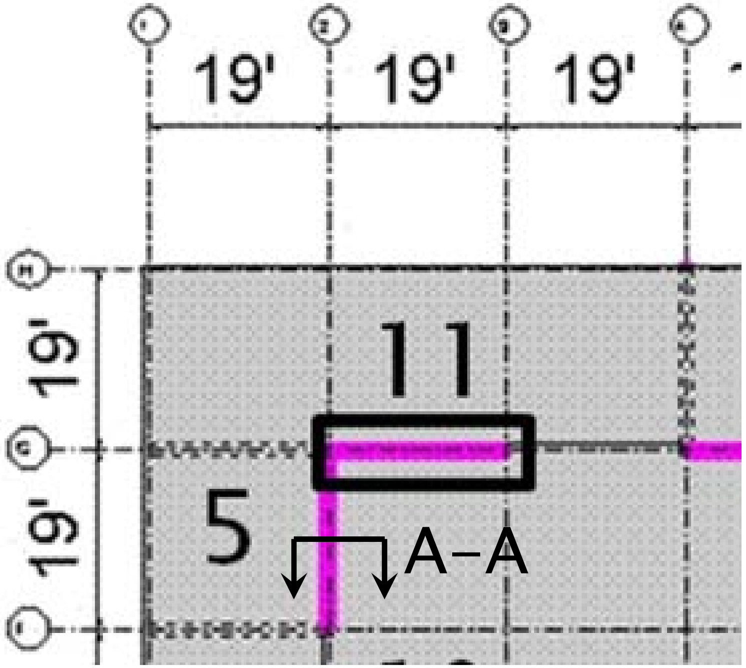
Moment Curvature of Wall 1

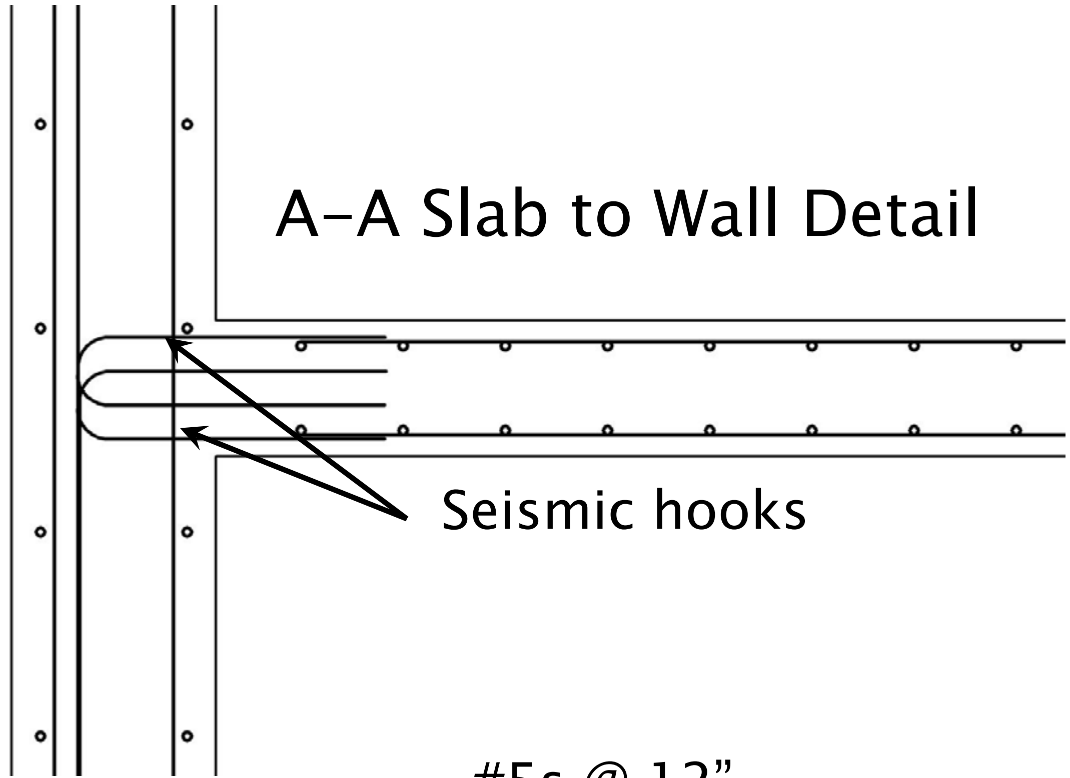


Wall No.	ϕMn (k-ft)	Δy (in)
1	30000	0.91
11	16000	1.42

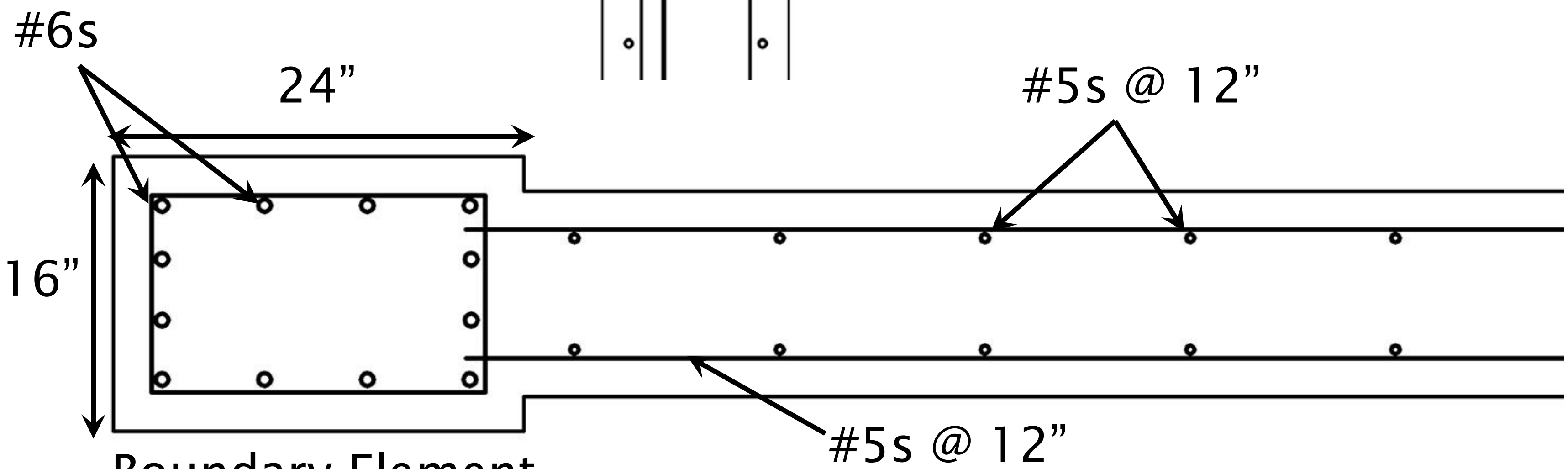


LATERAL SYSTEM – DETAILS





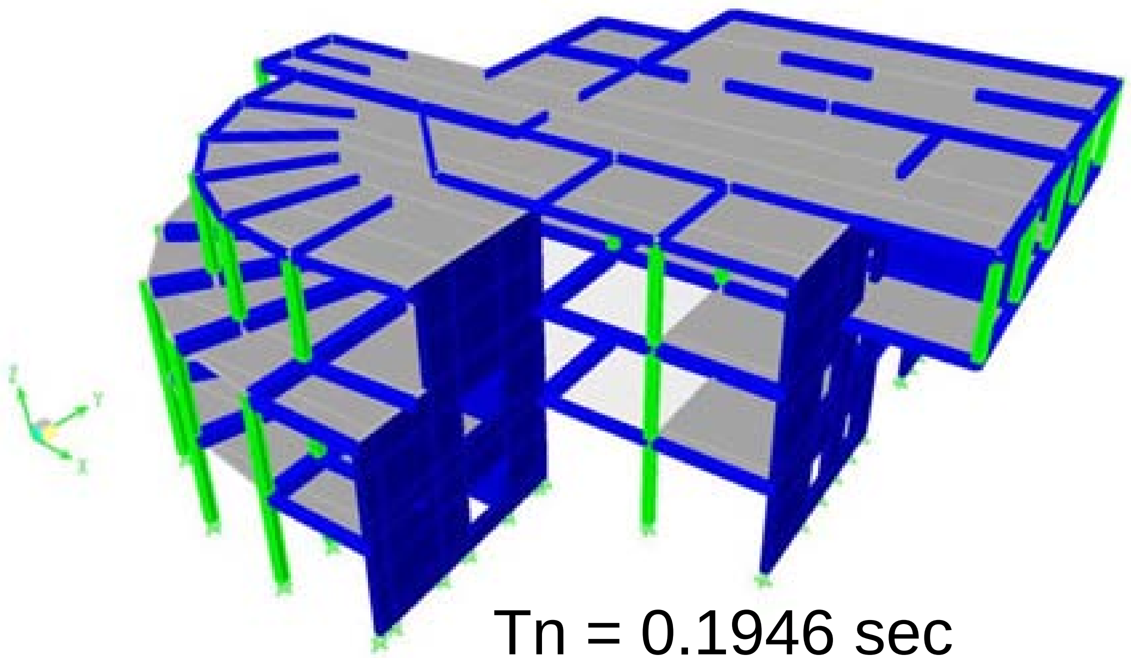
A–A Slab to Wall Detail



Boundary Element

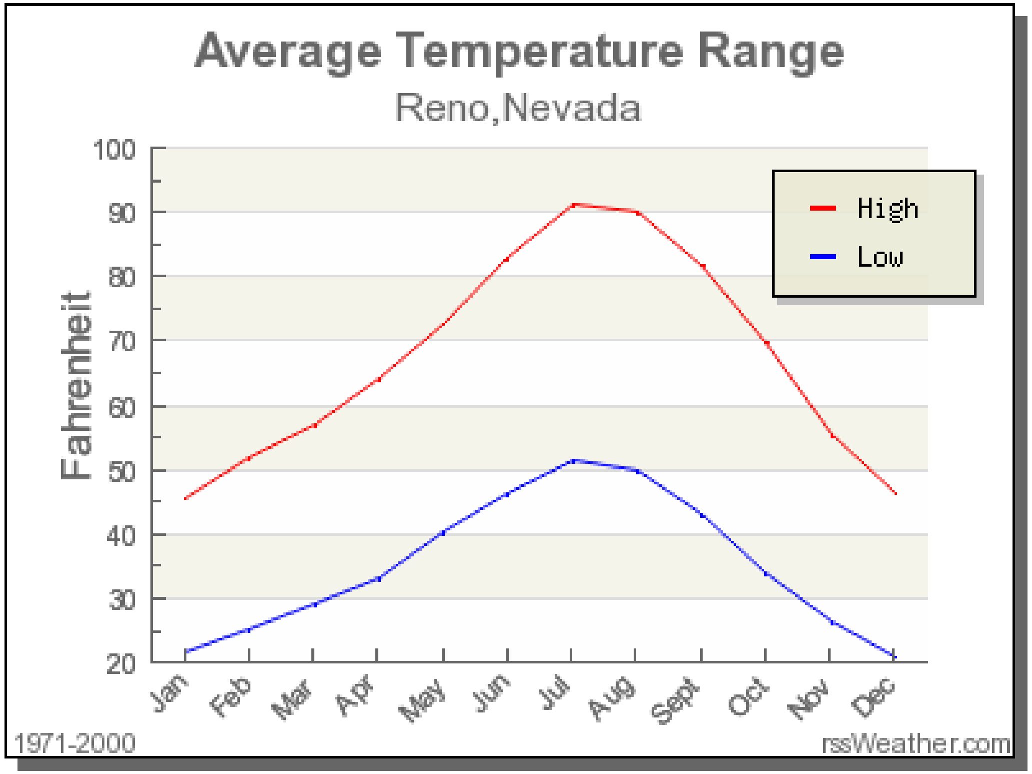
ETABS ANALYSIS

Equivalent Static Force Method
Force Amplification due to Torsional Irregularity
Some simplifications made in modeling
Verification Of Shear Wall Design



Tn = 0.1946 sec
Δmax drift = .000247
Max elastic roof displacement = 0.28 in

CLIMATE CONDITIONS



Climate conditions

99% heating design
Temperature: 14.9F

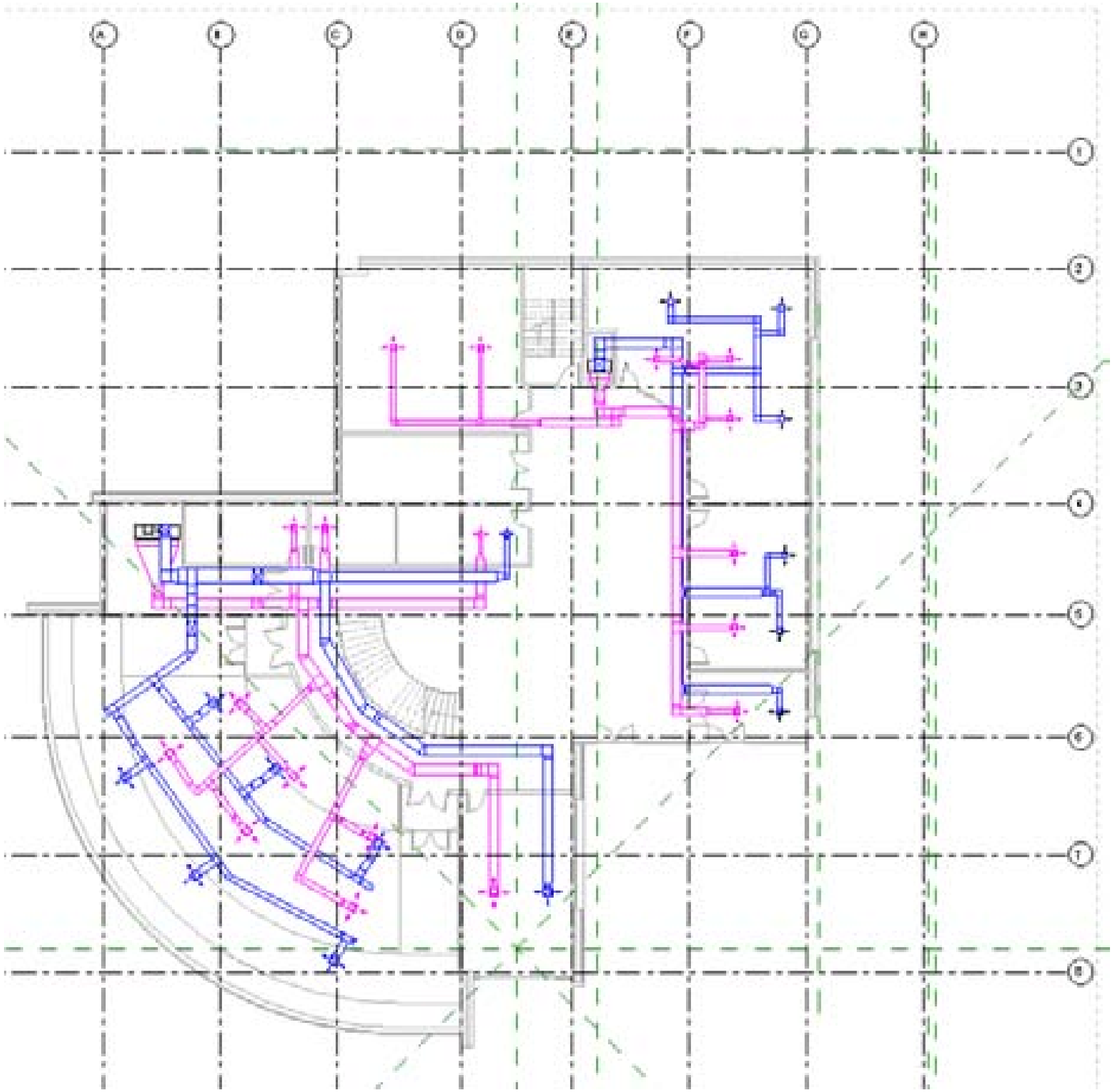
1% cooling design
Temperature: 92.5F

Average humidity: 60%

Indoor design conditions

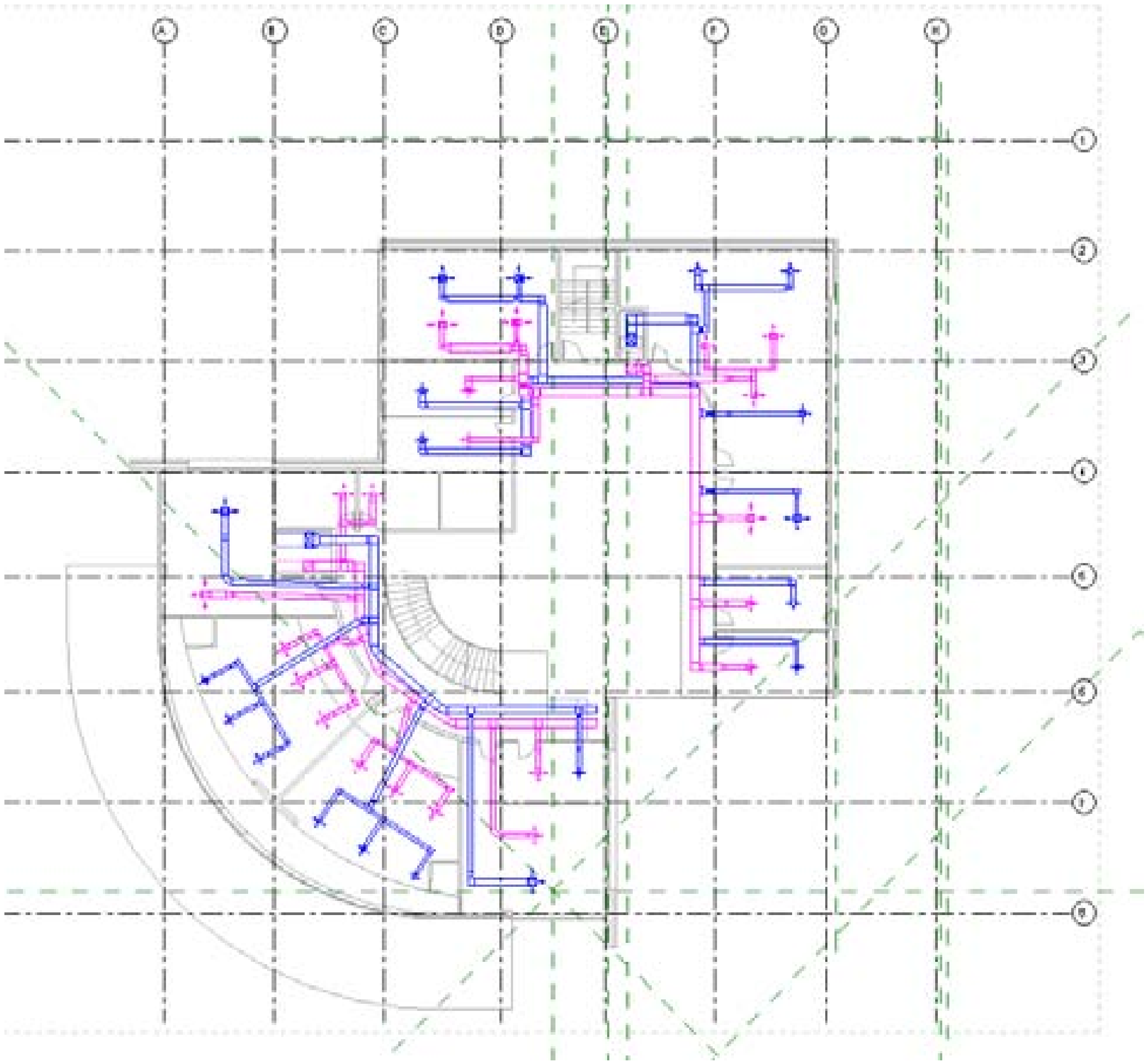
RH: 50% for comfort
Design temp setpoint for heating: 68F
Design temp setpoint for cooling: 74F

DUCT NETWORK | Basement level



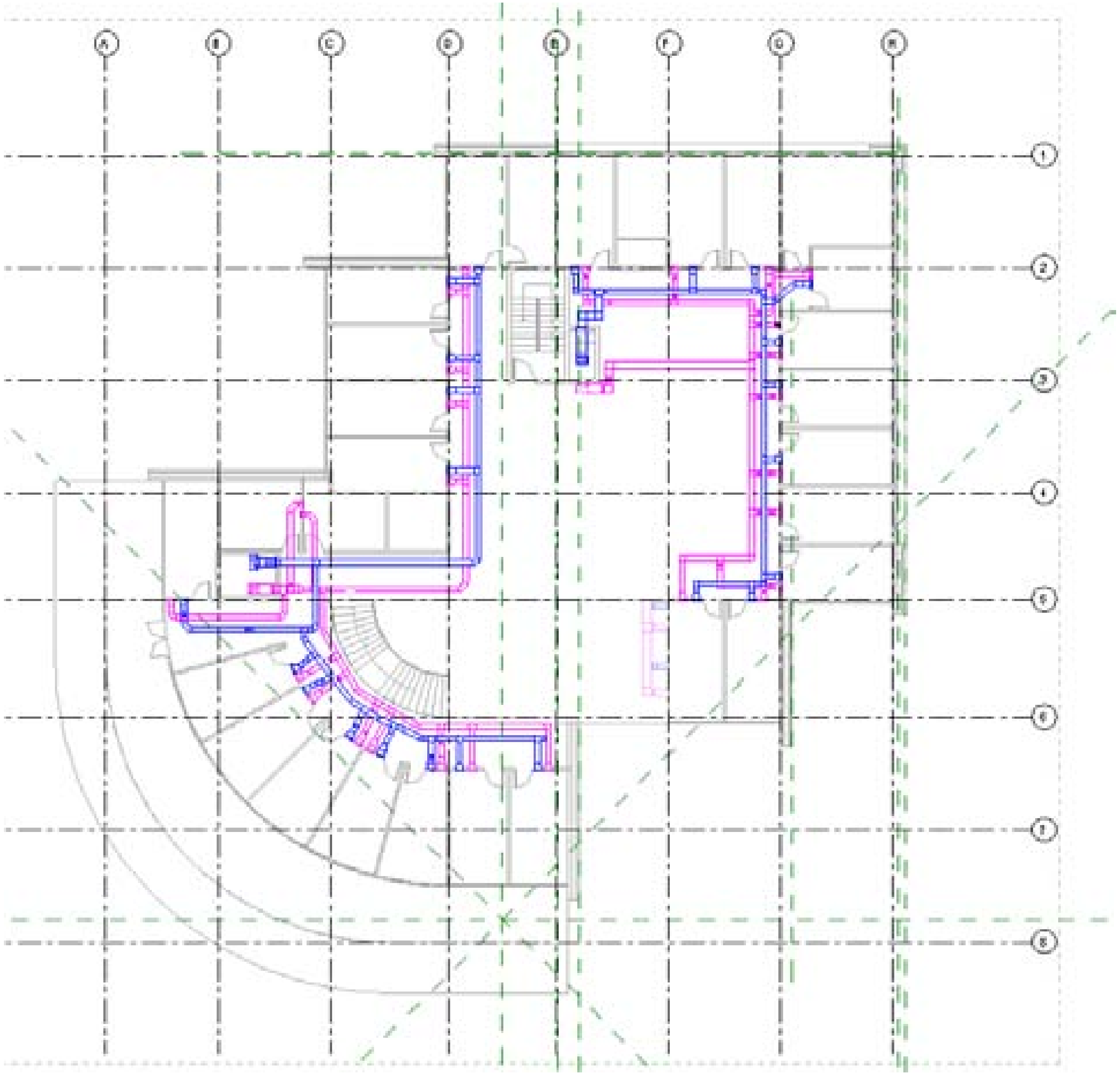
Supply
Exhaust

DUCT NETWORK | Ground level



Supply
Exhaust

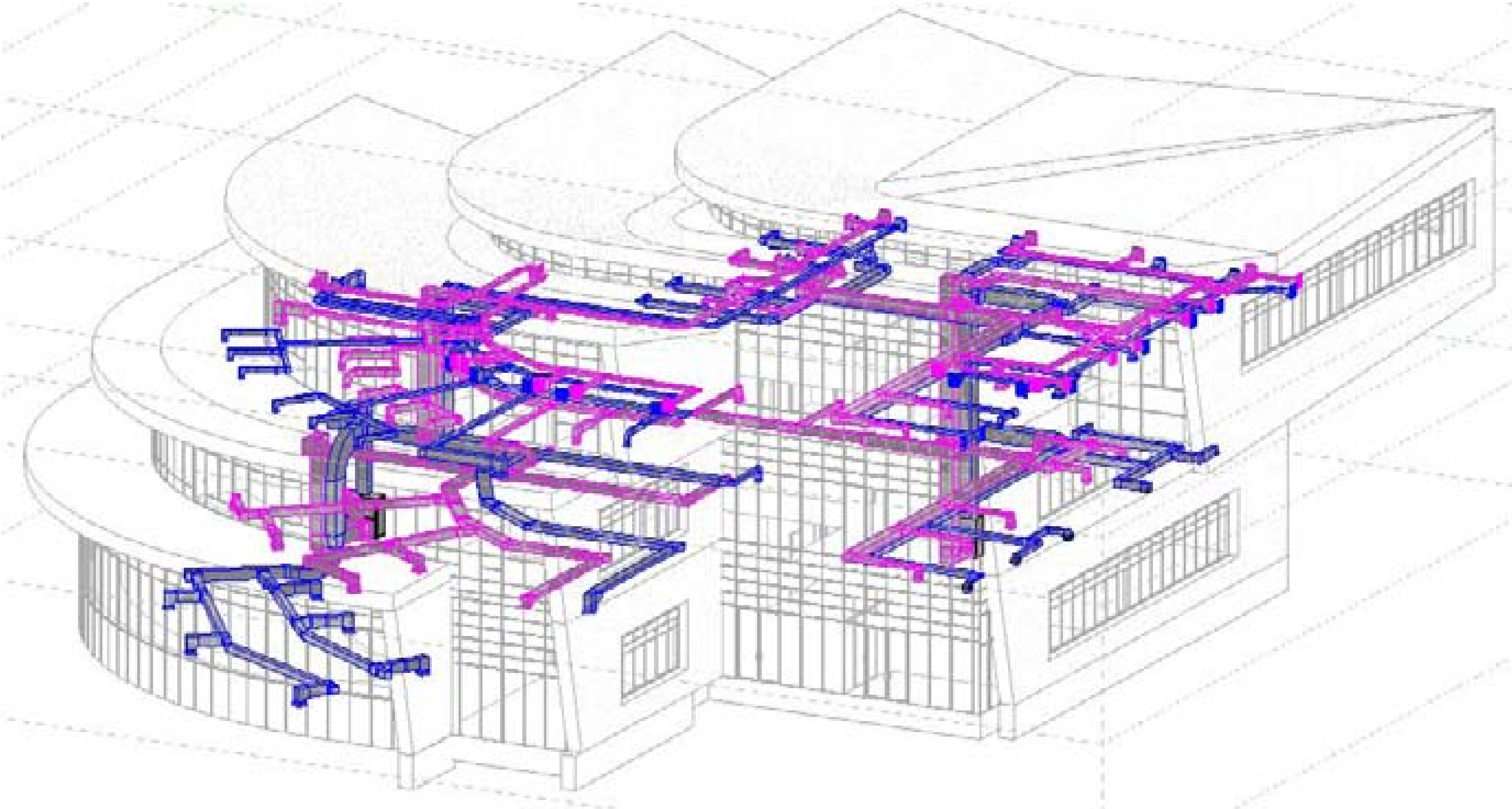
DUCT NETWORK | Office level



Supply

Exhaust

MEP 3D



Supply
Exhaust

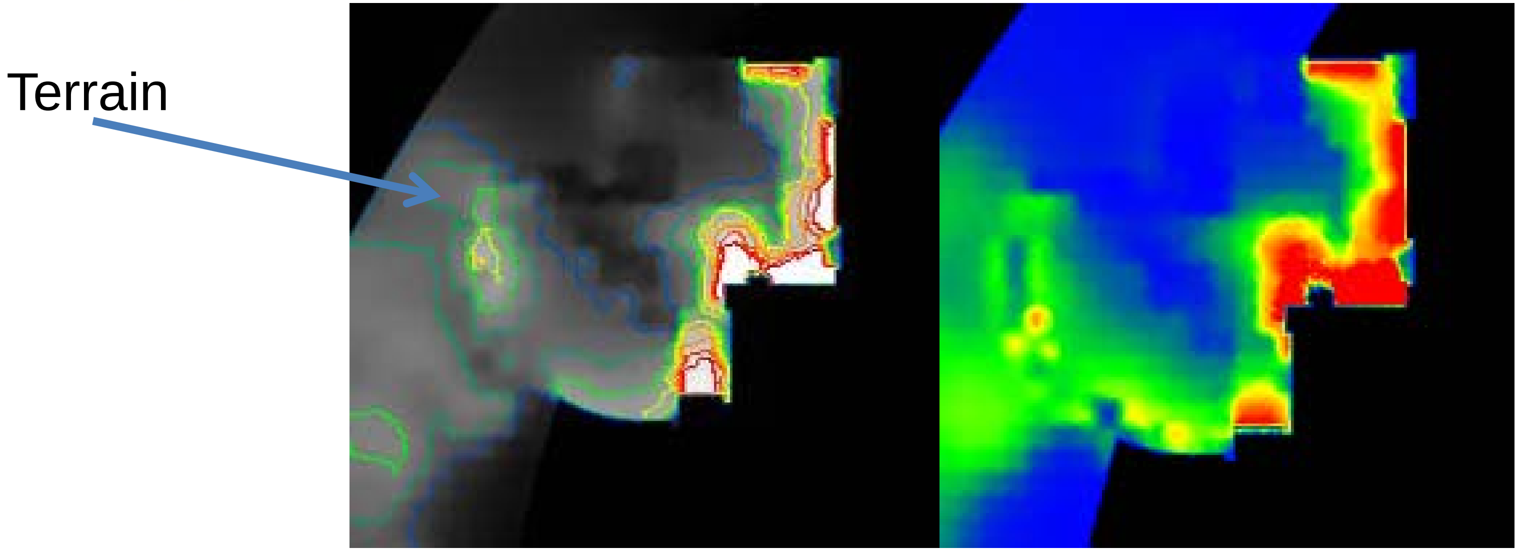
MEP 3D

Main duct: 6 - 8 m/s

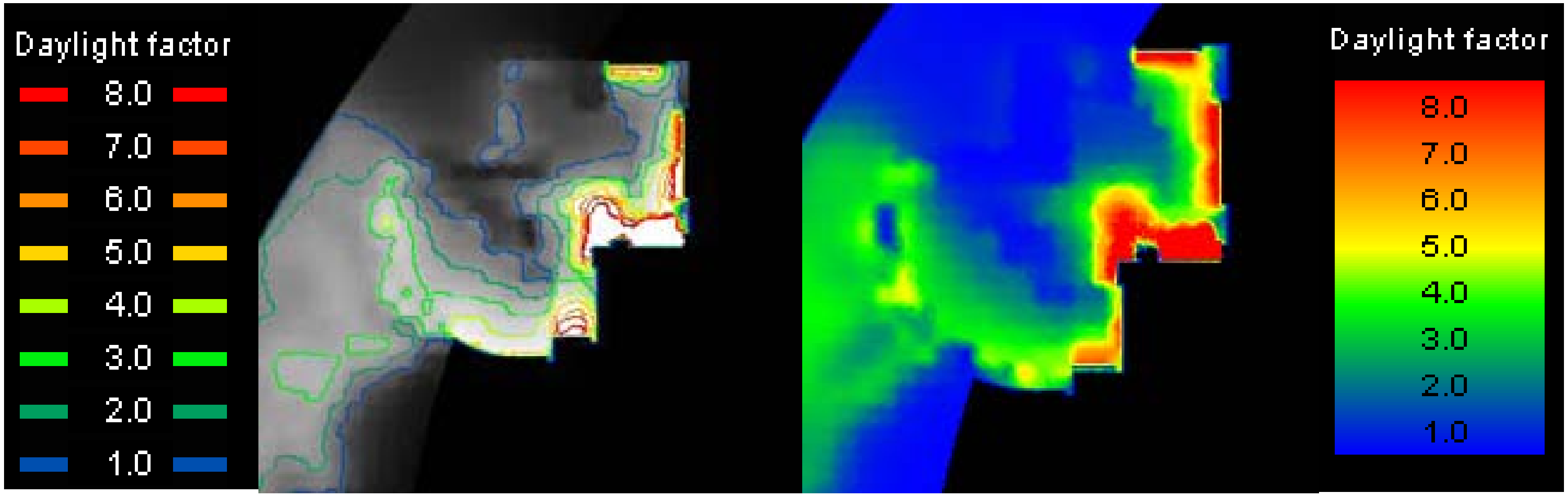
Distribution ducts in rooms: 3 - 4 m/s

Distribution ducts between rooms: 4 - 6 m/s

DAYLIGHT ANALYSIS | Basement level

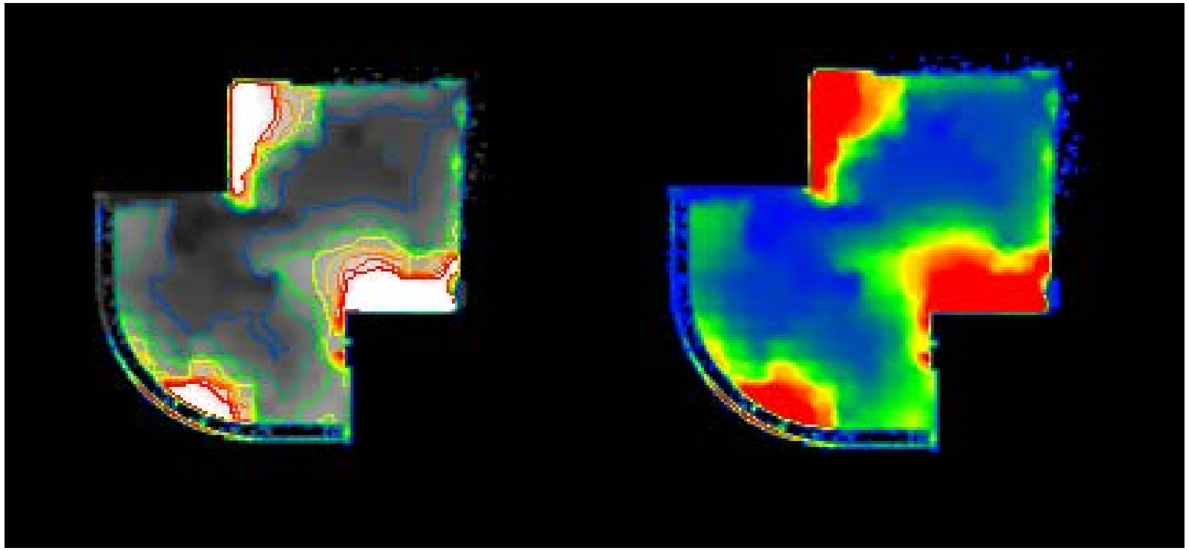


January 21

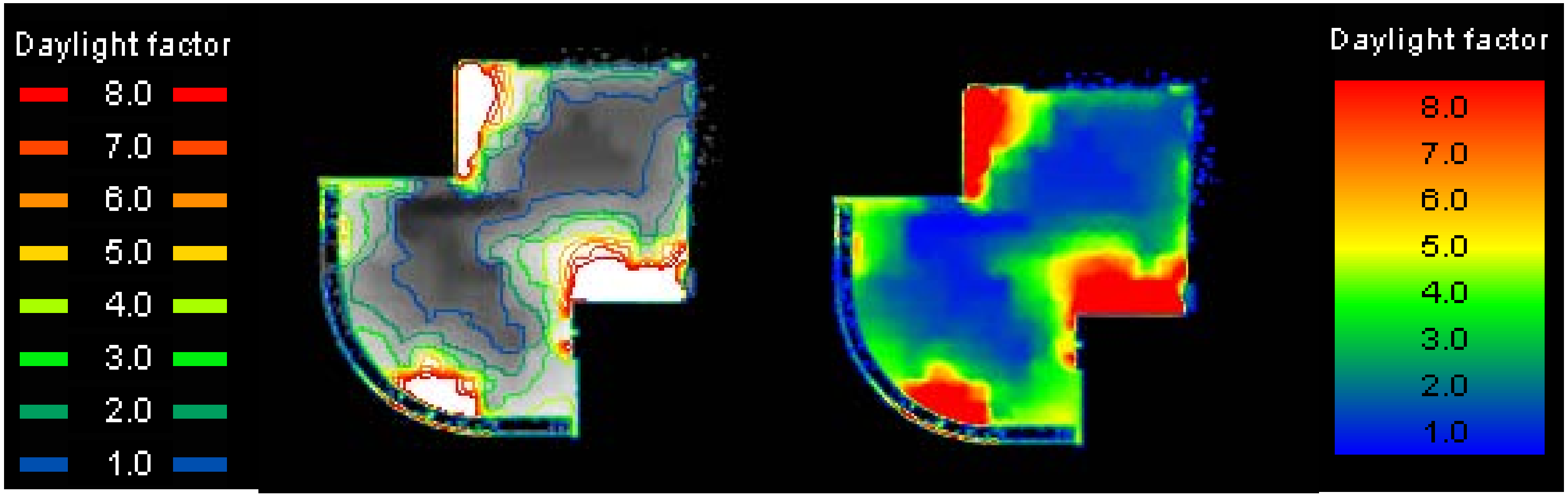


July 21

DAYLIGHT ANALYSIS | Ground level

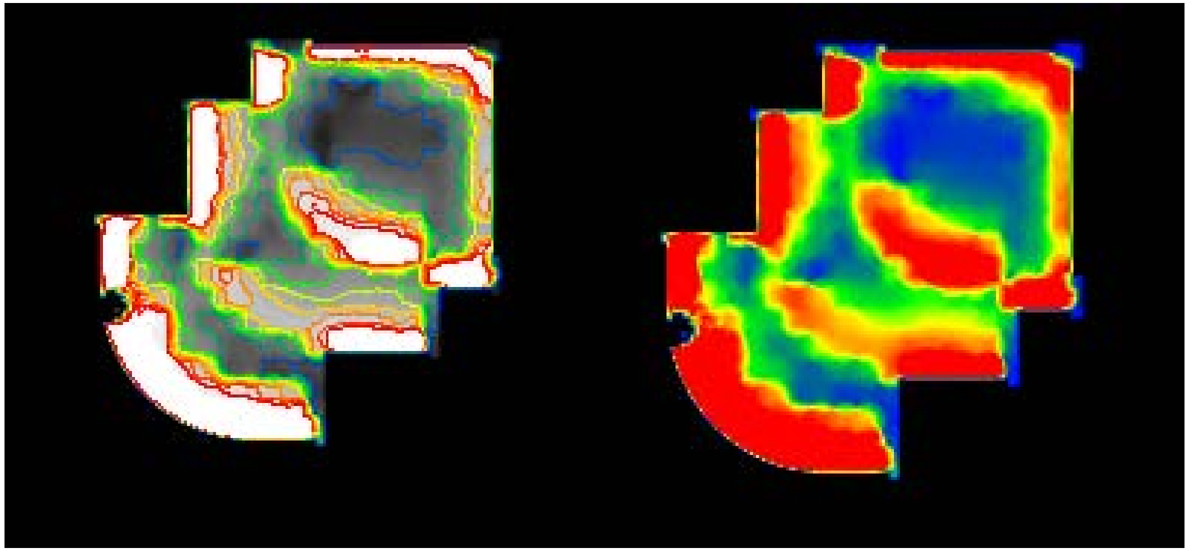


January 21

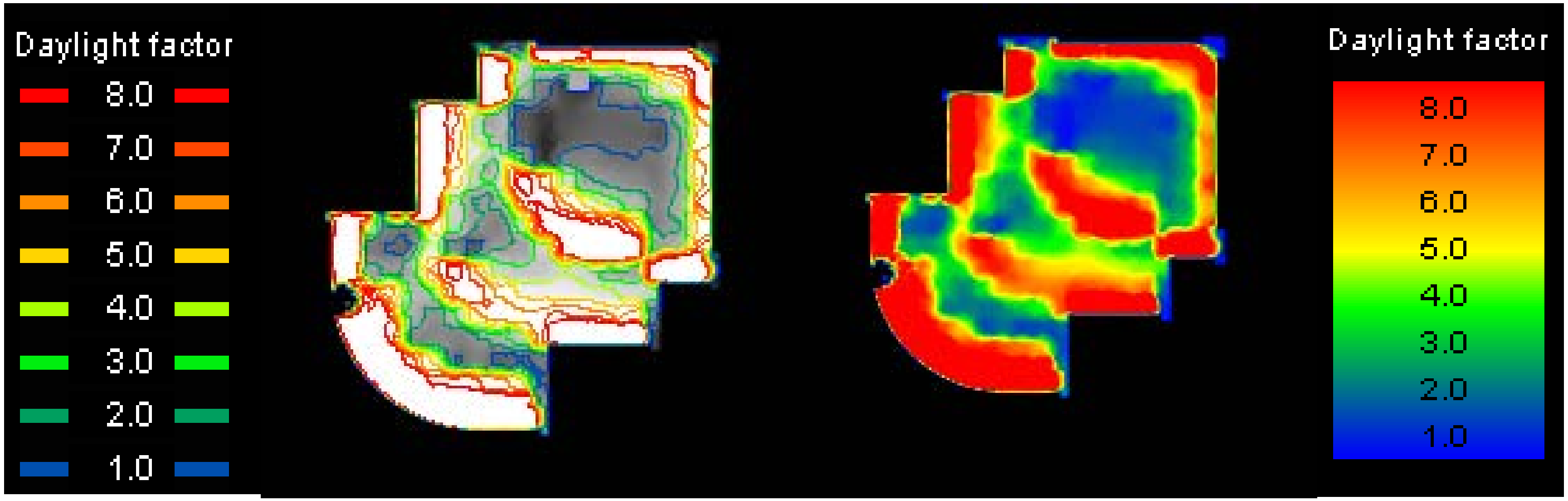


July 21

DAYLIGHT ANALYSIS | Office level



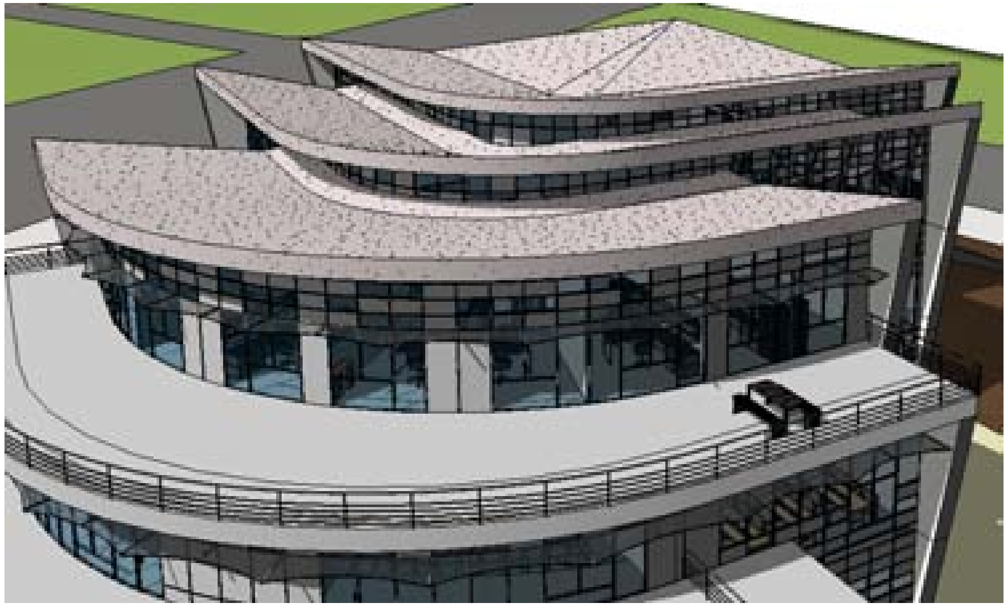
January 21



July 21

MEMBRANE SHADING COMPONENTS

South Façade

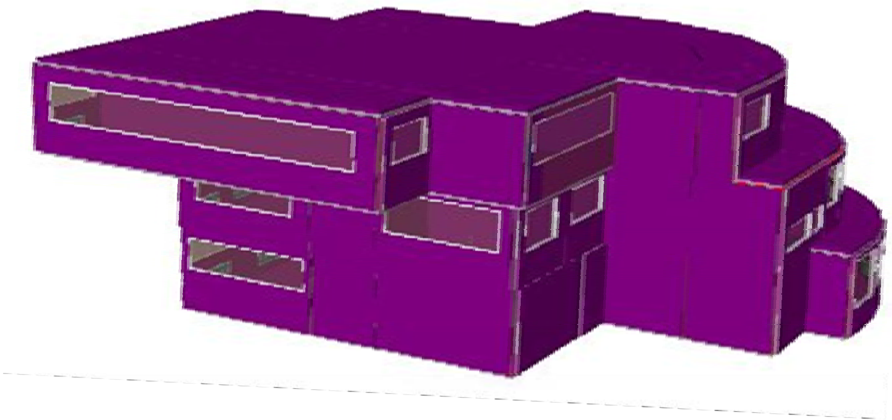


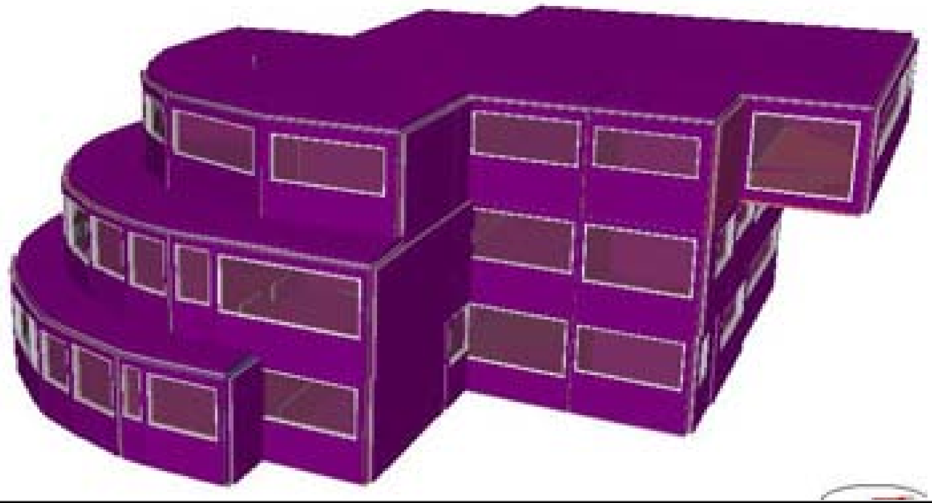
East Façade

INPUT to IDA ICE | Building Information Data

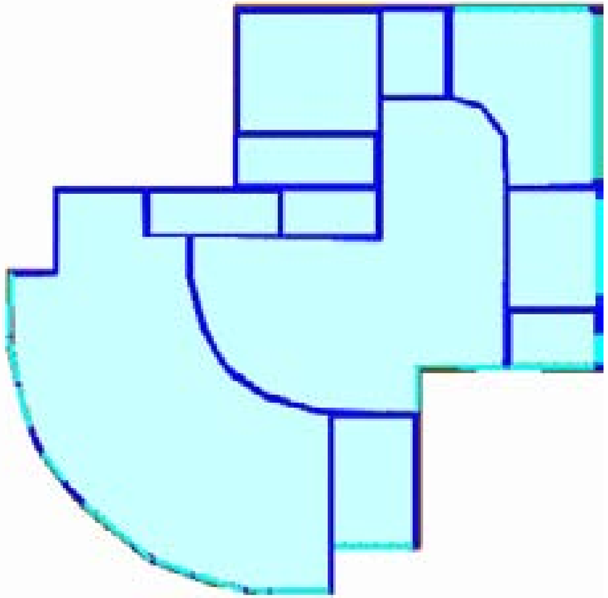
Building type	University
Area	2814.6 m^2
Volume	13508.9 m^3
Heating setpoint	68F
Cooling setpoint	74F
Ventilation	VAV
Solar shading	External shading

Glazing	1.9 W/(K*m2)
Facade	0.5 W/(K*m2)
Occupancy	Weekdays: 7am – 6pm Weekends: 0 July: Vacation
Lighting	Weekdays: 7am – 6pm Weekends: 0 July: Vacation
Equipment	Weekdays: 7am – 6pm Weekends: 0 July: Vacation
Heating system	District heating

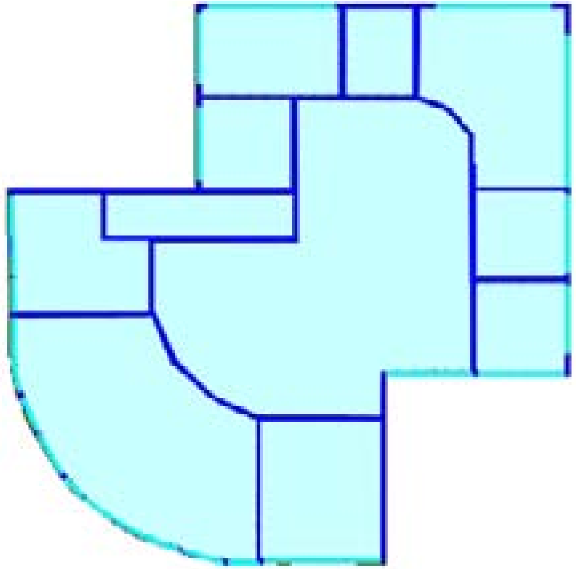




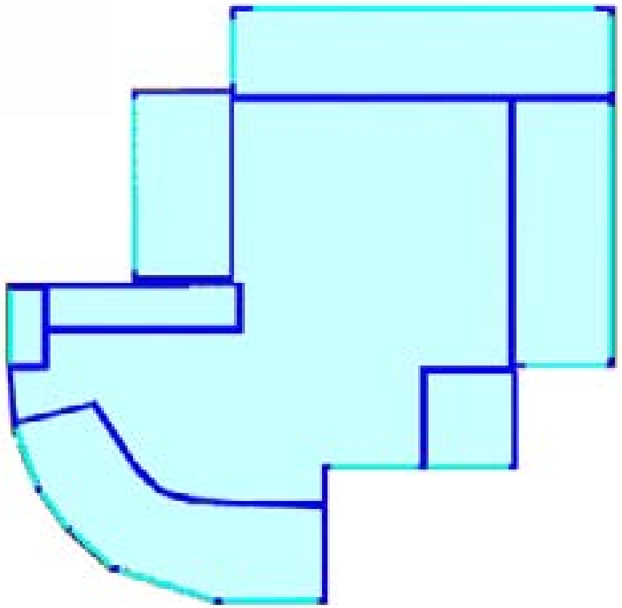
INPUT to IDA ICE | Thermal Zones



Basement level



Ground level

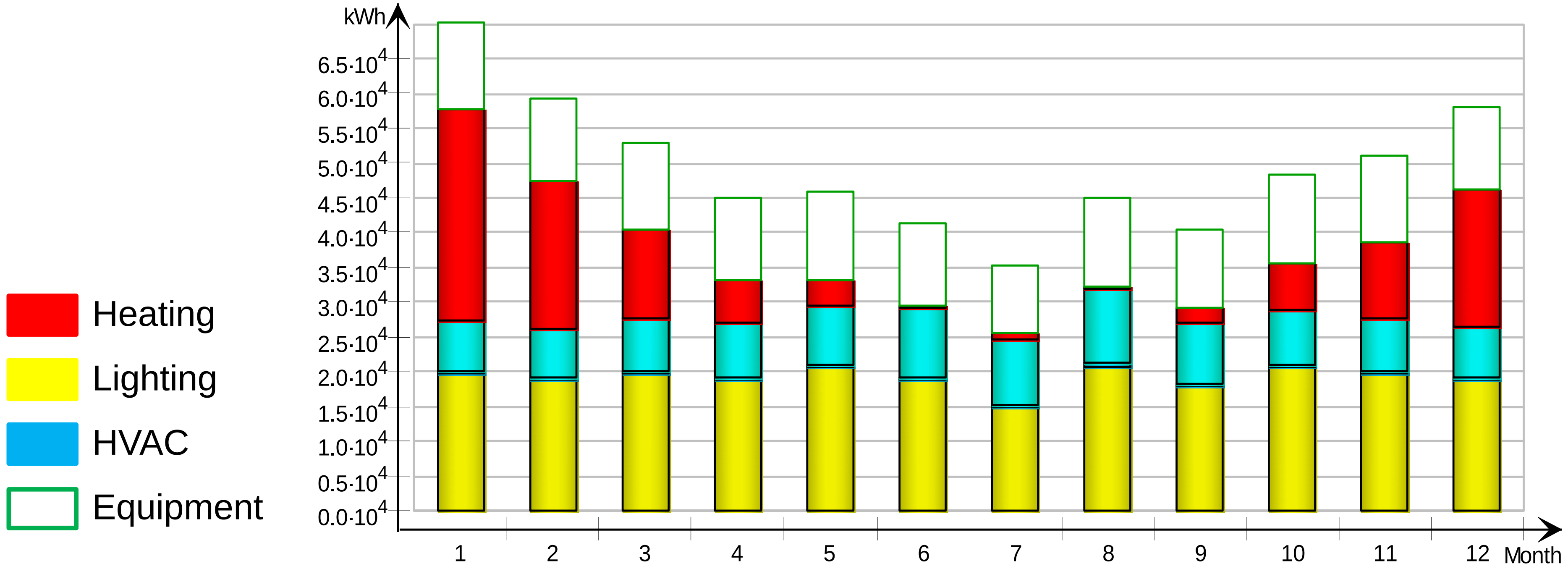


Office level

RESULTS | Energy Consumption

	Delivered energy	
	kWh	kWh/m^2
Lighting, facility	229301	82.8
Cooling	3641	1.3
HVAC aux	100276	36.2
Total, Facility electric	333218	120.3
Heating	115455	41.7
Domestic hot water	0	0.0
Total, Facility district	115455	41.7
Total	448673	162.0
Equipment, tenant	143656	51.9
Total, Tenant electric	143656	51.9
Grand total	592329	213.9

RESULTS | Monthly Delivered Energy



	Lighting, facility	Cooling	HVAC	Heating	Equipment, tenant
	(kWh)	(kWh)	(kWh)	(kWh)	(kWh)
Total	229301.0	3641.0	100276.0	115455.1	143656.0

RESULTS | Indoor Climate

Pine Cone – Building Comfort Reference	
Percentage of hours when operative temperature is above 27° C in average zone	3 %
Percentage of total occupant hours with thermal dissatisfaction	31 %

RESULTS | Indoor Climate in Auditorium

Max. temperatures for thermal comfort in 3 different categories:

Category	Winter [F] (max)	Summer [F] (max)
I (best)	73.4	77.9
II (good)	75.2	78.8
III (Acceptable)	77	80.6

Results:

Comfort Category	No. of occupancy hours on a year
I (best)	3727
II (good)	4483
III (Aceptable)	5566
IV (Unacceptable	698

The room temperature isn't acceptable about 29 days, where it's above 80.6 F in summer and 77 F in winter.

RESULTS | Indoor Climate in Large Classrooms

Max. temperatures for thermal comfort in 3 different categories:

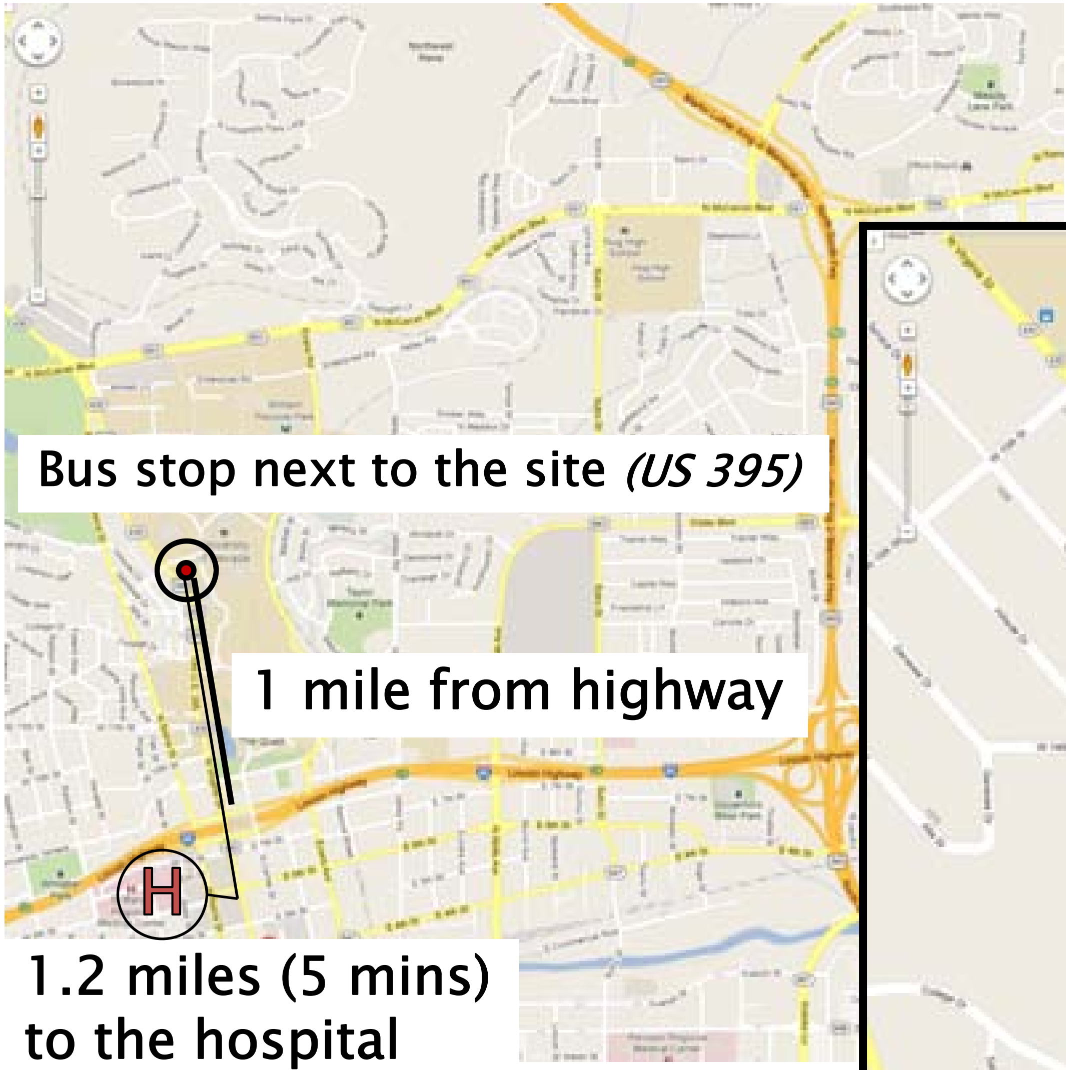
Category	Winter [F] (max)	Summer [F] (max)
I (best)	73.4	77.9
II (good)	75.2	78.8
III (Acceptable)	77	80.6

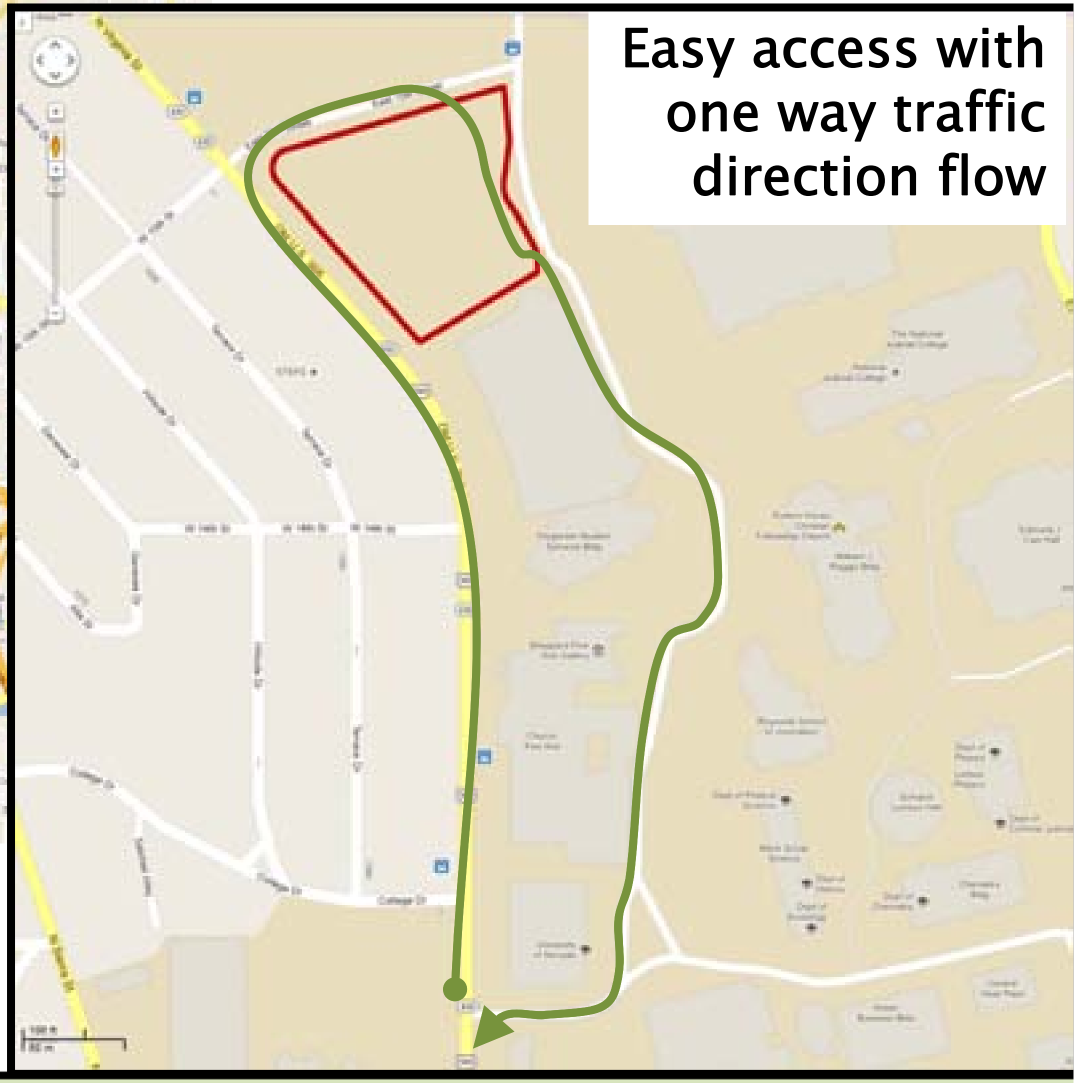
Results:

Comfort Category	No. of occupancy hours on a year
I (best)	1327
II (good)	1592
III (Aceptable)	1970
IV (Unacceptable	901

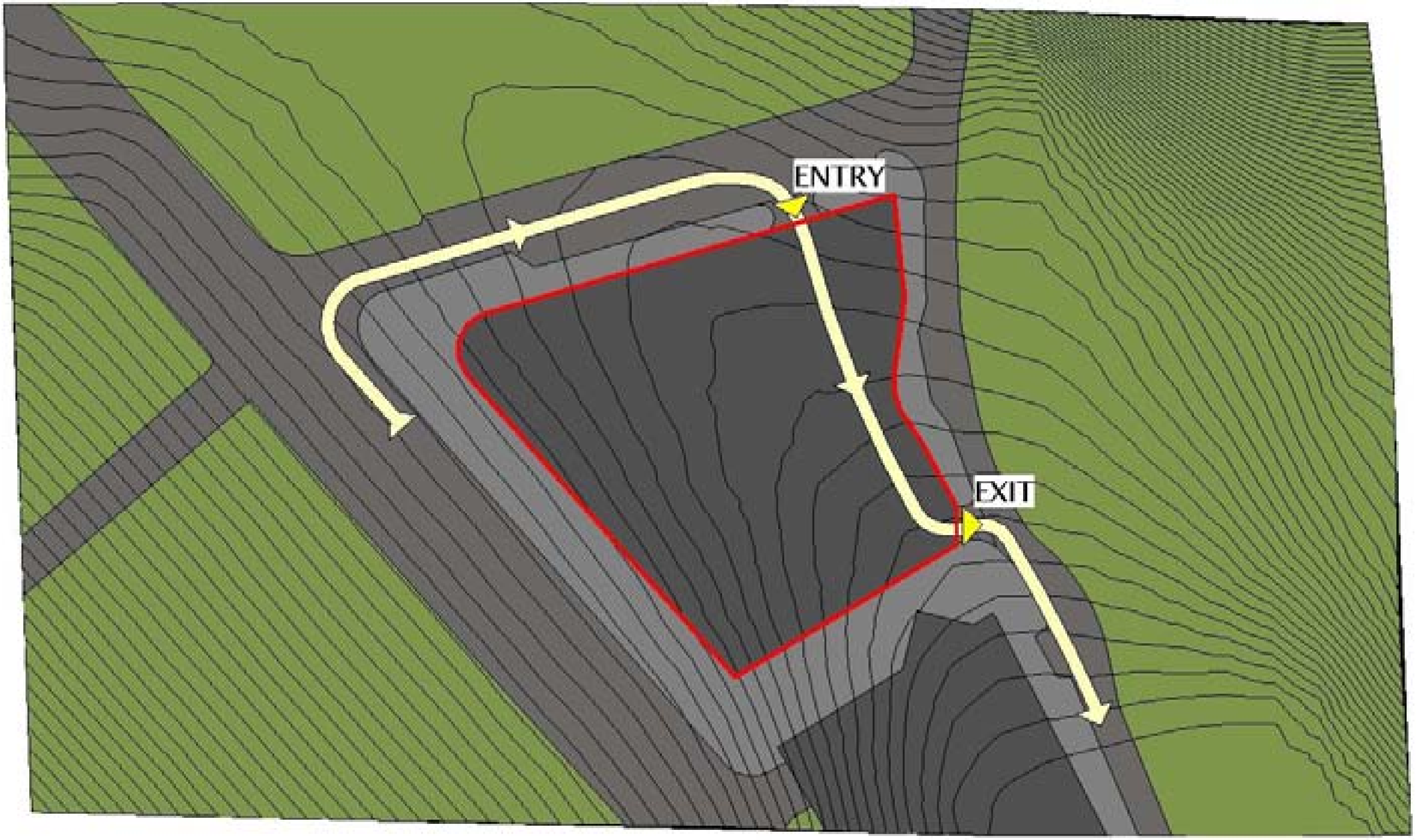
The room temperature isn't acceptable about 38 days, where it's above 80.6 F in summer and 77 F in winter.

CONSTRUCTION SITE ACCESS





CONSTRUCTION SITE ACCESS

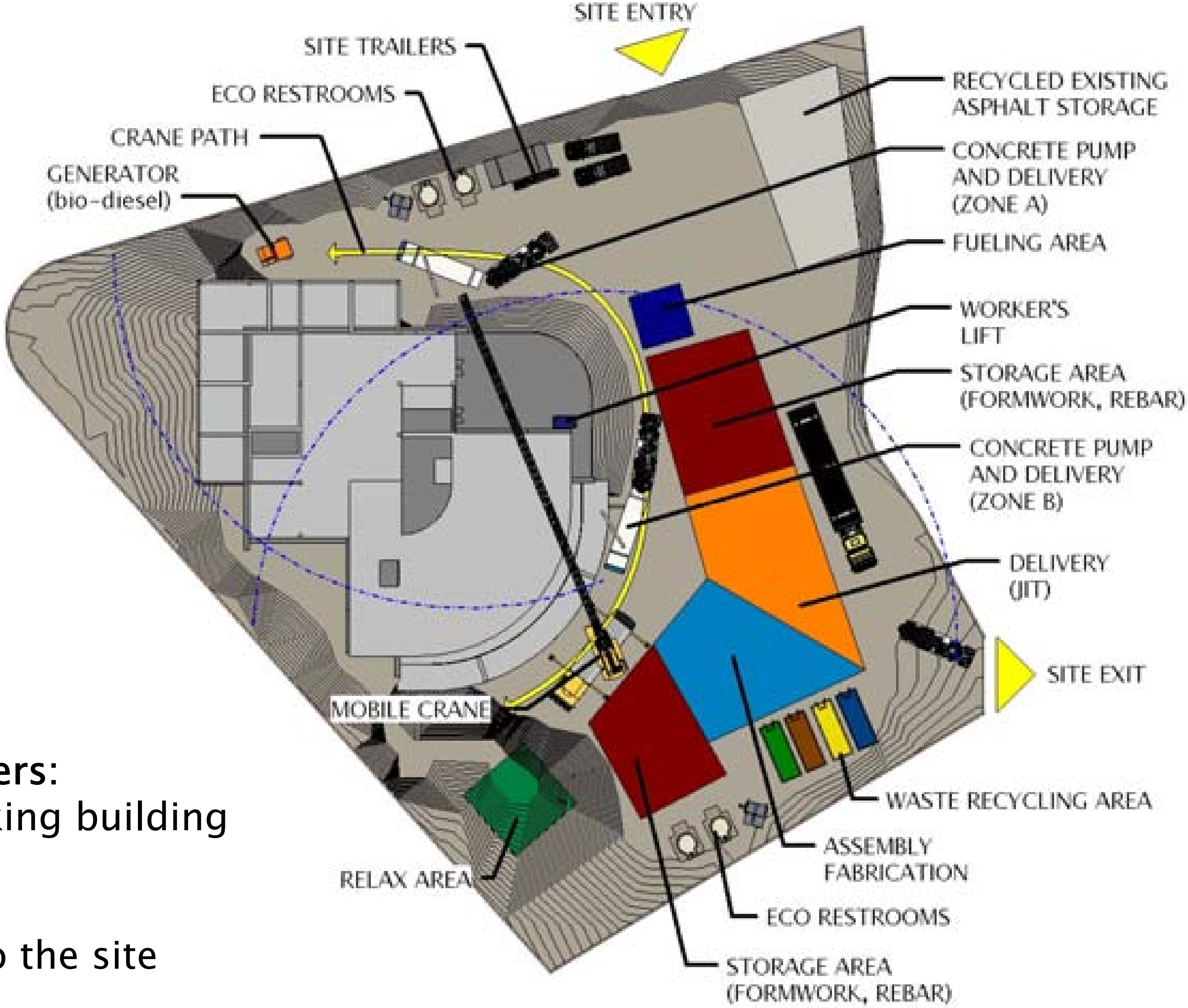


Easy construction site access.
One way traffic direction – more space for construction process.

2nd STAGE – CONSTRUCTION SITE LOGISTIC

TVD: LOCAL

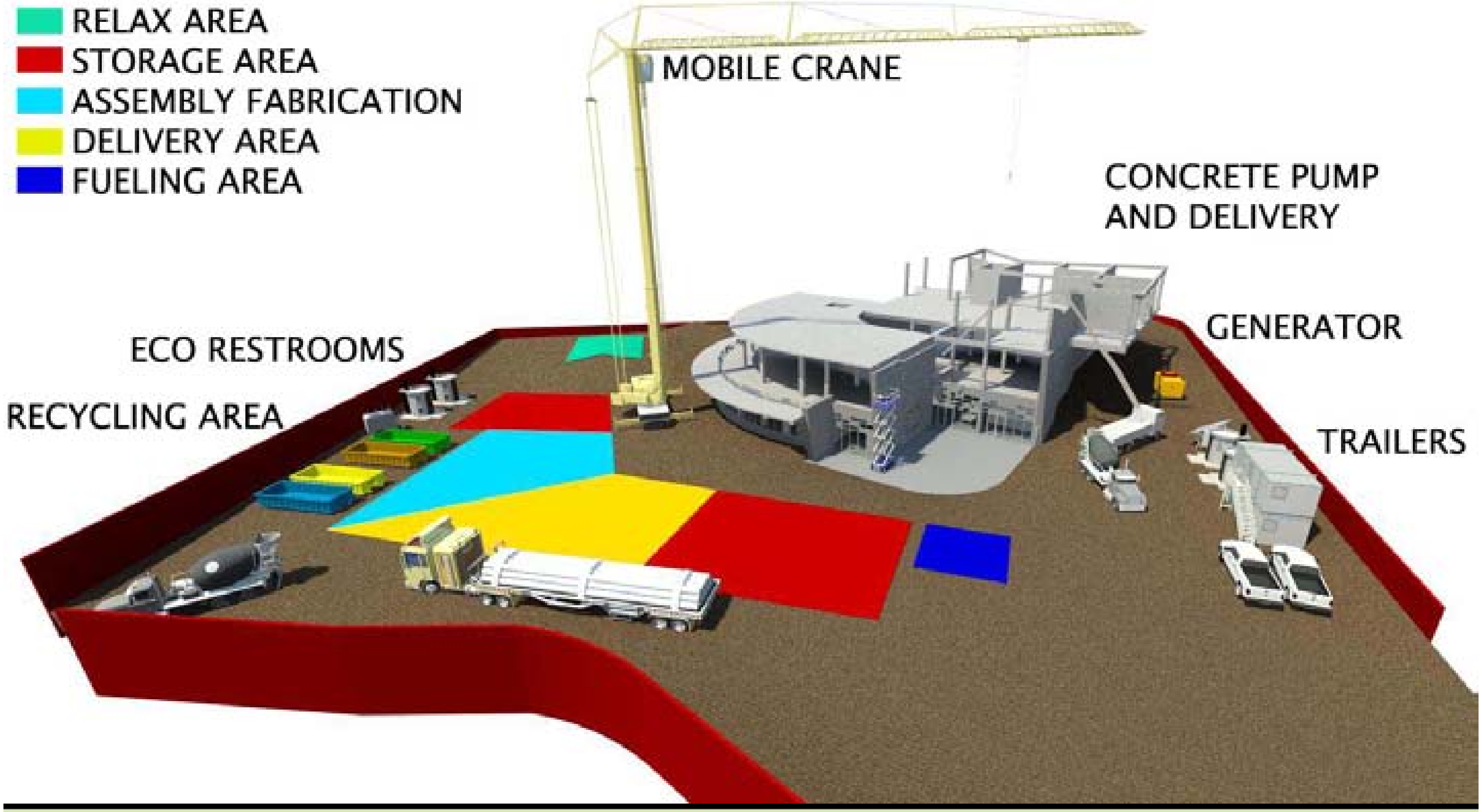
TVD: NATURAL



Parking for workers:
neighboring parking building

Bus access:
bus stops next to the site

CONSTRUCTION SITE VISUALIZATION



LOCAL PROVIDERS

CONCRETE

TVD: LOCAL

Weigl Concrete & Construction
approx. 1.1 miles / 3 mins

STEEL

TVD: LOCAL

Martin Iron Works, Inc.
approx. 1.4 miles / 4 mins

MEP

TVD: LOCAL

Heating & Air Conditioning Contractors
approx 5,6 mil / 9 minutes

CONSTRUCTION SITE EQUIPMENT

EARTHWORKS

TVD: LOCAL

A&K Earth Movers, Inc.
approx. 11.7 miles / 15 mins
(engineering office)
**also asphalt recycling*

CONSTRUCTION EQUIPMENT

TVD: LOCAL

United Rentals
5 branches within a 97.4 mile radius

Bragg Reno
Approx. 8 miles / 15 mins

CONSTRUCTION SITE EQUIPMENT

Equipment rental

United Rentals

Dozer

John Deere 650J
Power: 90 hp
Blade Capacity: 2.6 cu. yd.
Powered By: Diesel

Wheel Loader

JCB 436ZX
Horsepower: 150 hp
Operating Weight: 31,458 lb.
Bucket Capacity Heaped: 3.5 cu. yd.
Powered By: Diesel

Mini-Excavator

Kubota KX161-3 5.5 Ton
Power: 42 hp
Operating Weight: 11,345 lb.
Powered By: Diesel

Excavator

John Deere 120
Power: 89 hp
Operating Weight: 28,840 lb.
Bucket Capacity: 0.79 cu. yd.
Powered By: Diesel

Roller

Wacker RD12A 35IN Double Drum Vibratory Roller
Operating Weight: 2,171 lb.
Vibration Frequency: 4,200 vpm
Centrifugal Force: 3,400 lb.
Powered By: Gasoline

CONSTRUCTION SITE EQUIPMENT

Equipment rental

TVD: LOCAL

BRAGG COMPANIES Reno, NV

Mobile Hydraulic Crane

Grove TM 9120 120 Ton

American Ready Mix Offers Mixed Concrete & Concrete Products

American Ready Mix

Sparks, NV - Ready Mix Concrete

Also serving Greater Reno, Sparks, Carson City, Dayton, Lake Tahoe, Spanish Springs & Virginia City

Concrete Pump

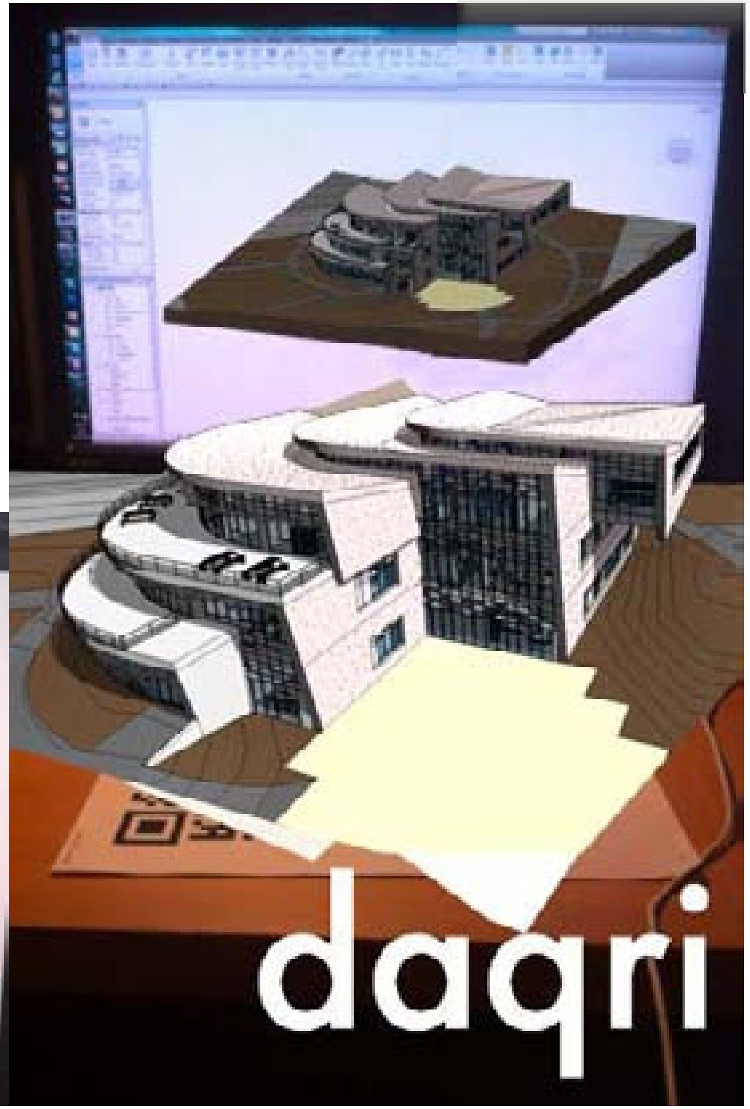
CONNECTING WITH THE COMMUNITY

Construction site – <u>OPEN/VISITING DAYS</u> – education

TVD: LOCAL

<u>Augmented reality</u>

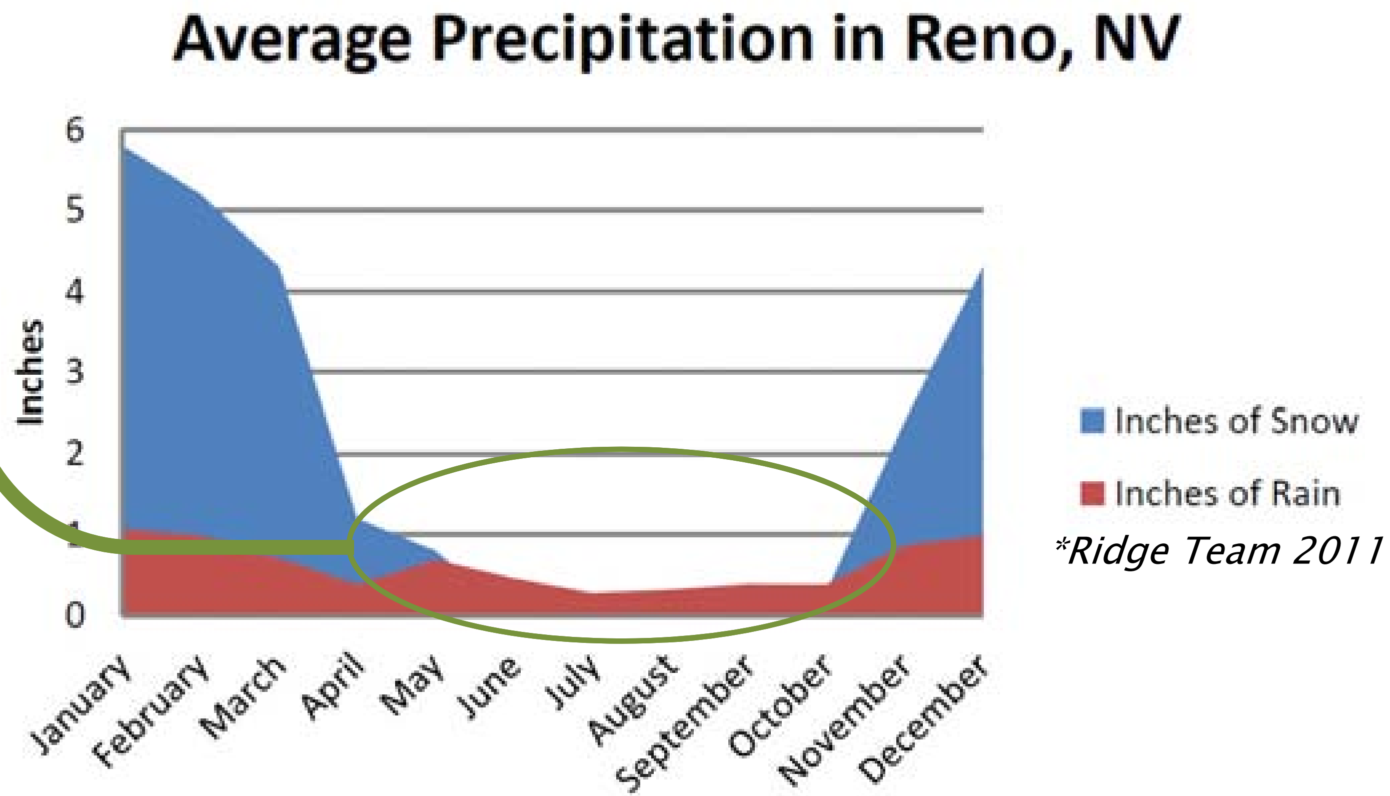
Using QR codes around construction site for visualizing the building being build.



SCHEDULING – START

Goal: Enclose the building between May and October to avoid snow slowing the construction.

PLAN

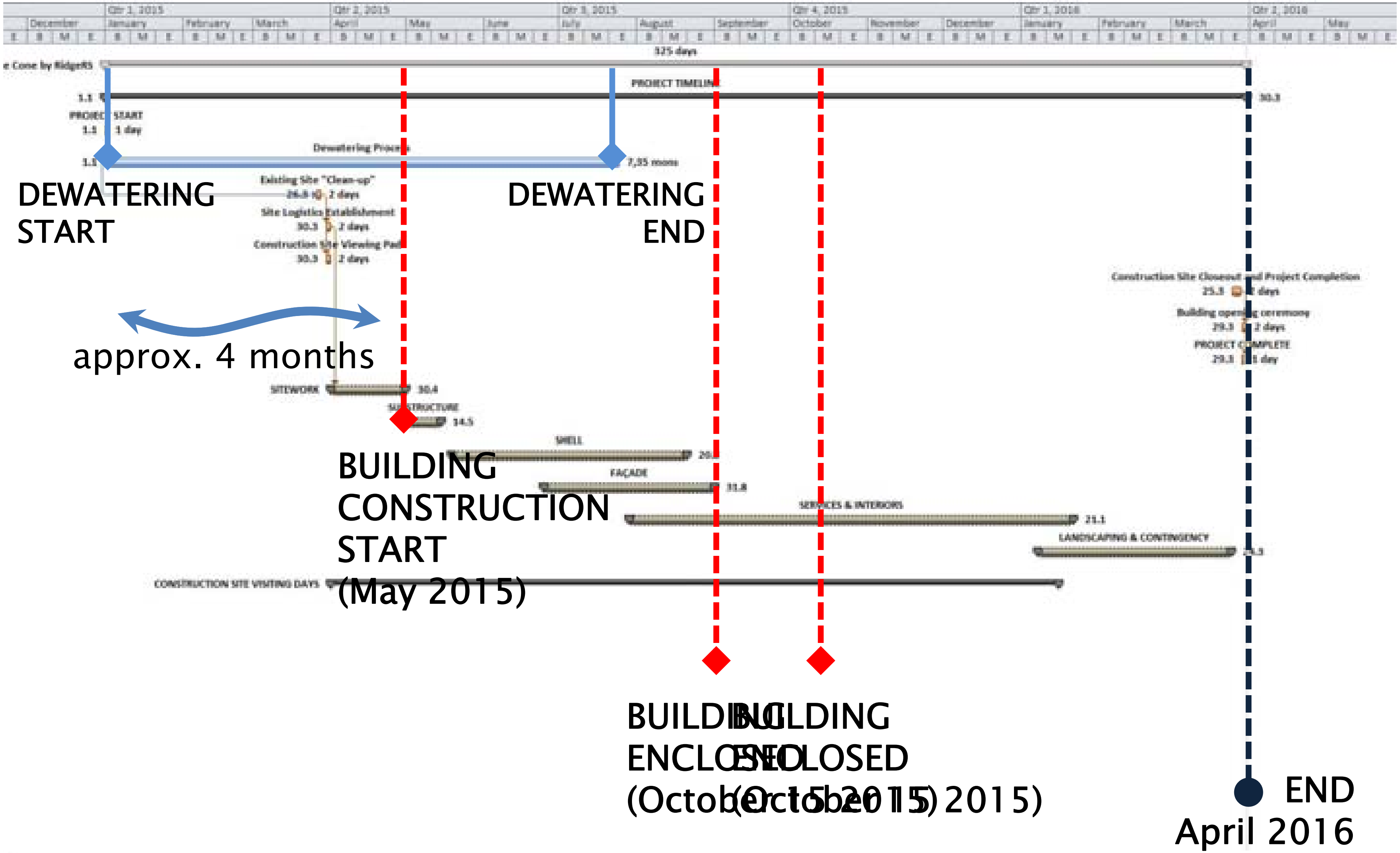


May 1st 2015

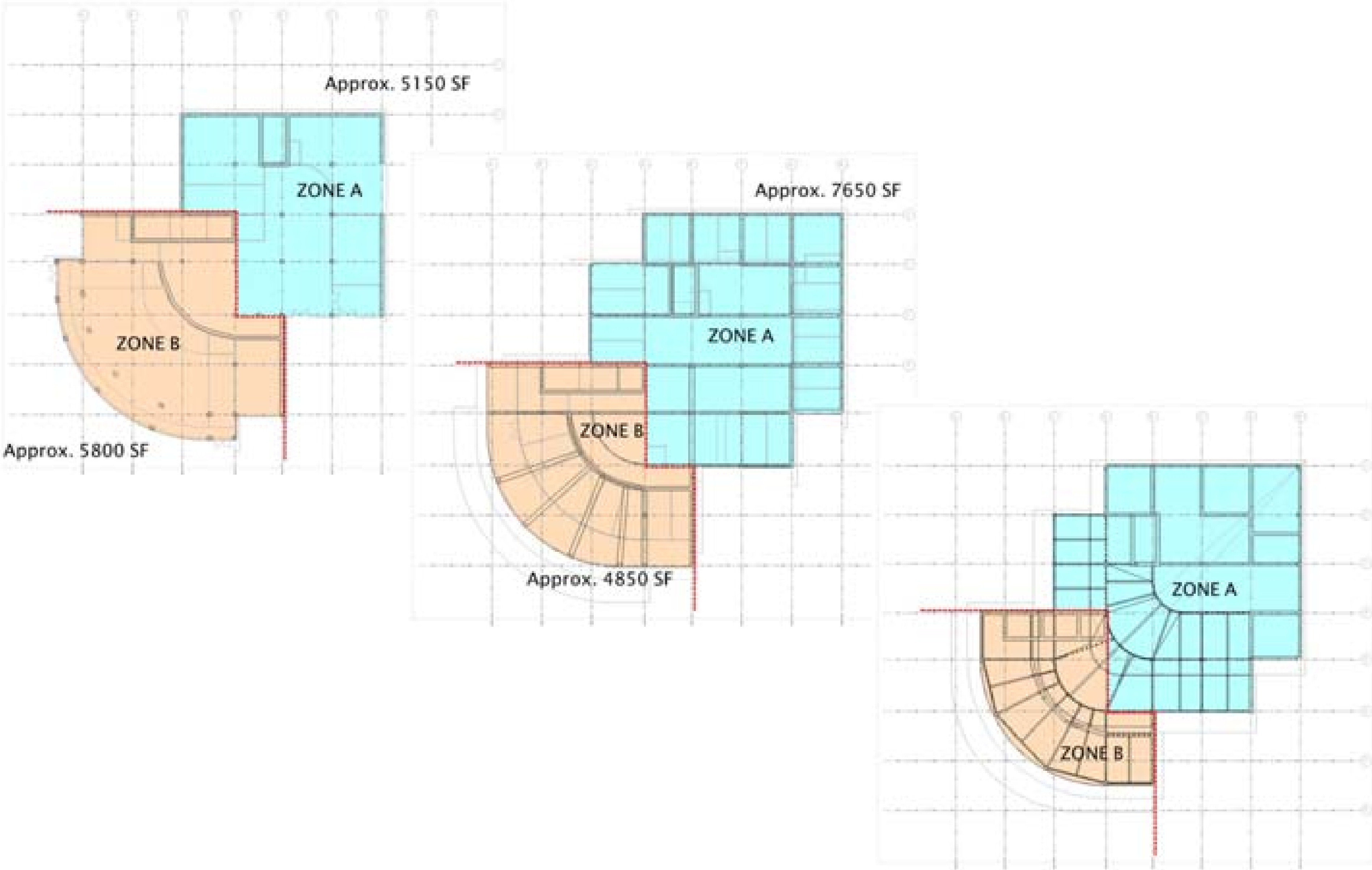
MAIN CONSTRUCTION START SHIFT DUE TO BETTER CONDITIONS

Owners have agreed.

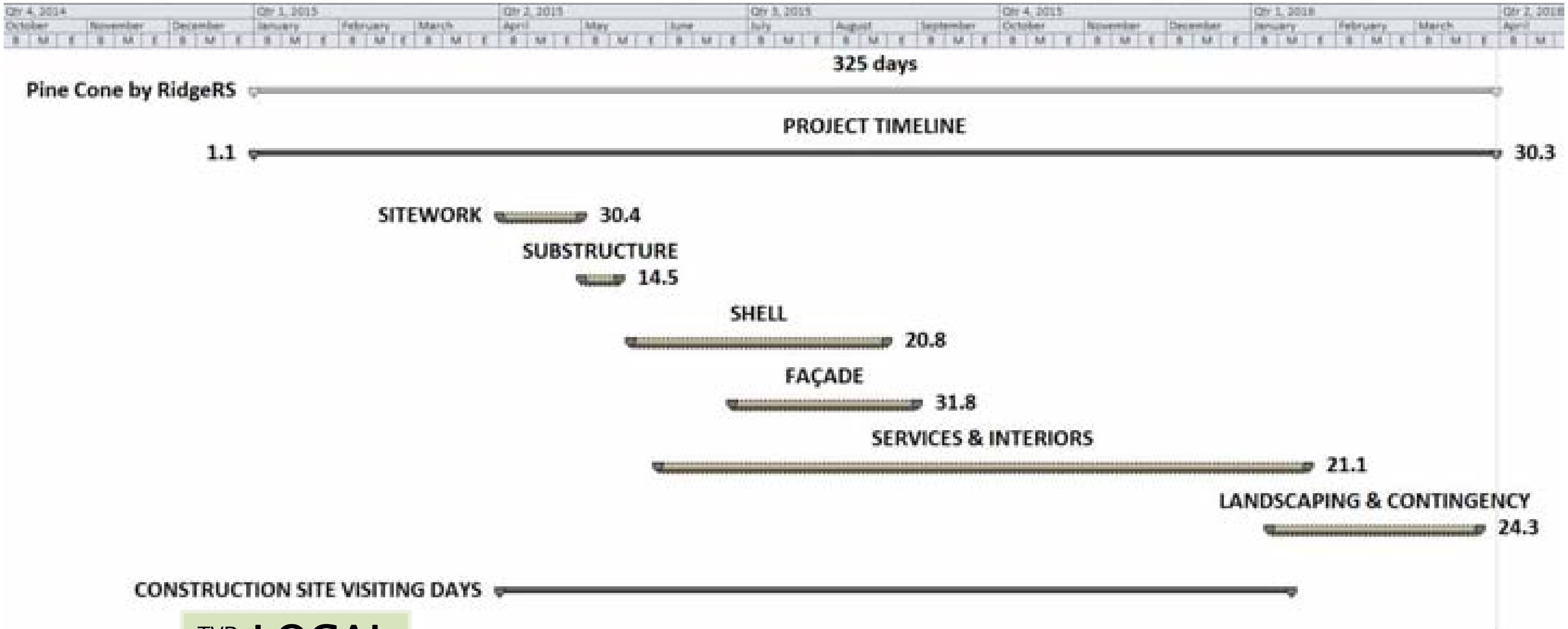
Timeline – Winter vs. Spring Quarter



BUILDING ZONING

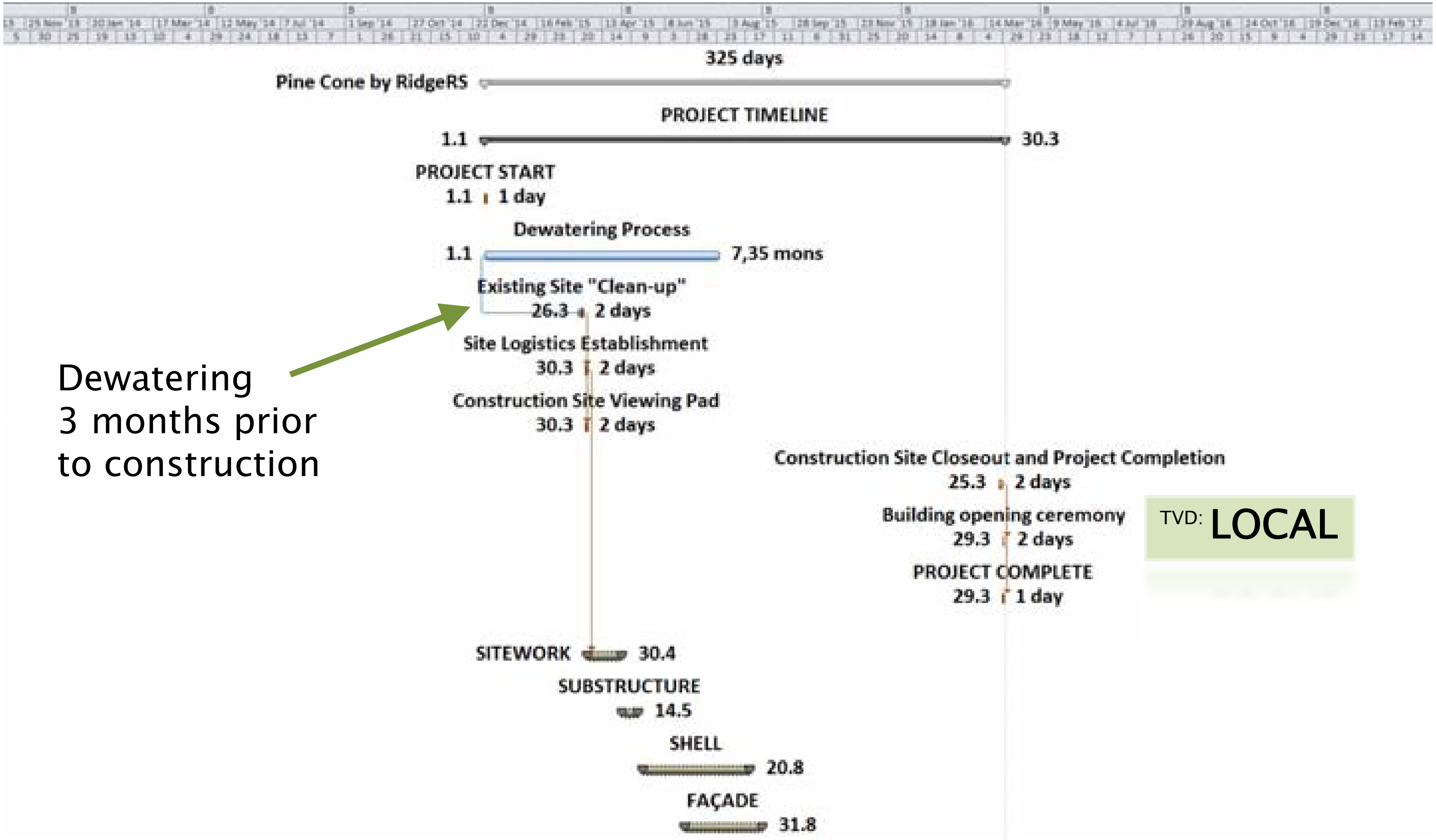


SCHEDULING - LAYOUT



TVD: LOCAL

SCHEDULING – START & END

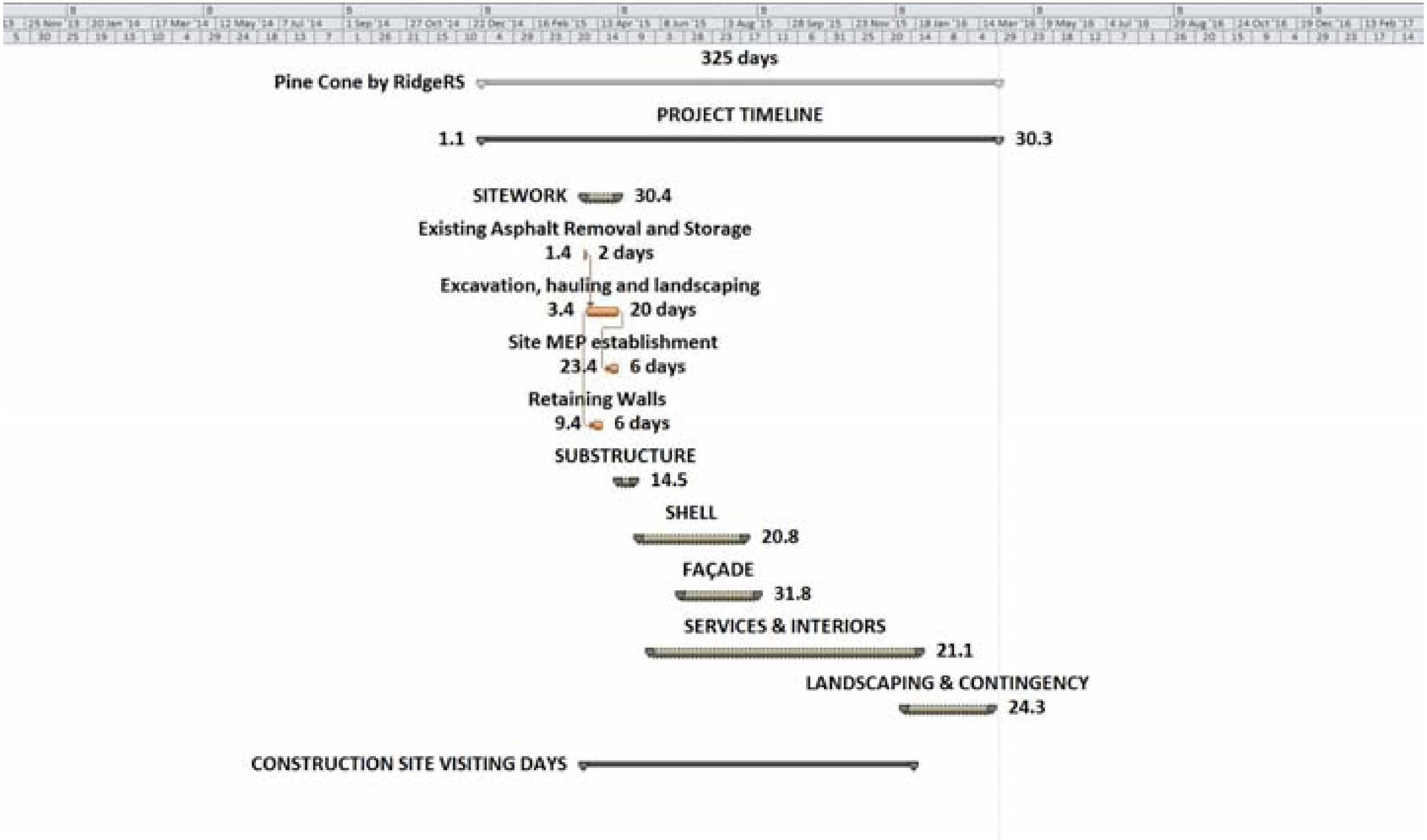


Dewatering
3 months prior
to construction

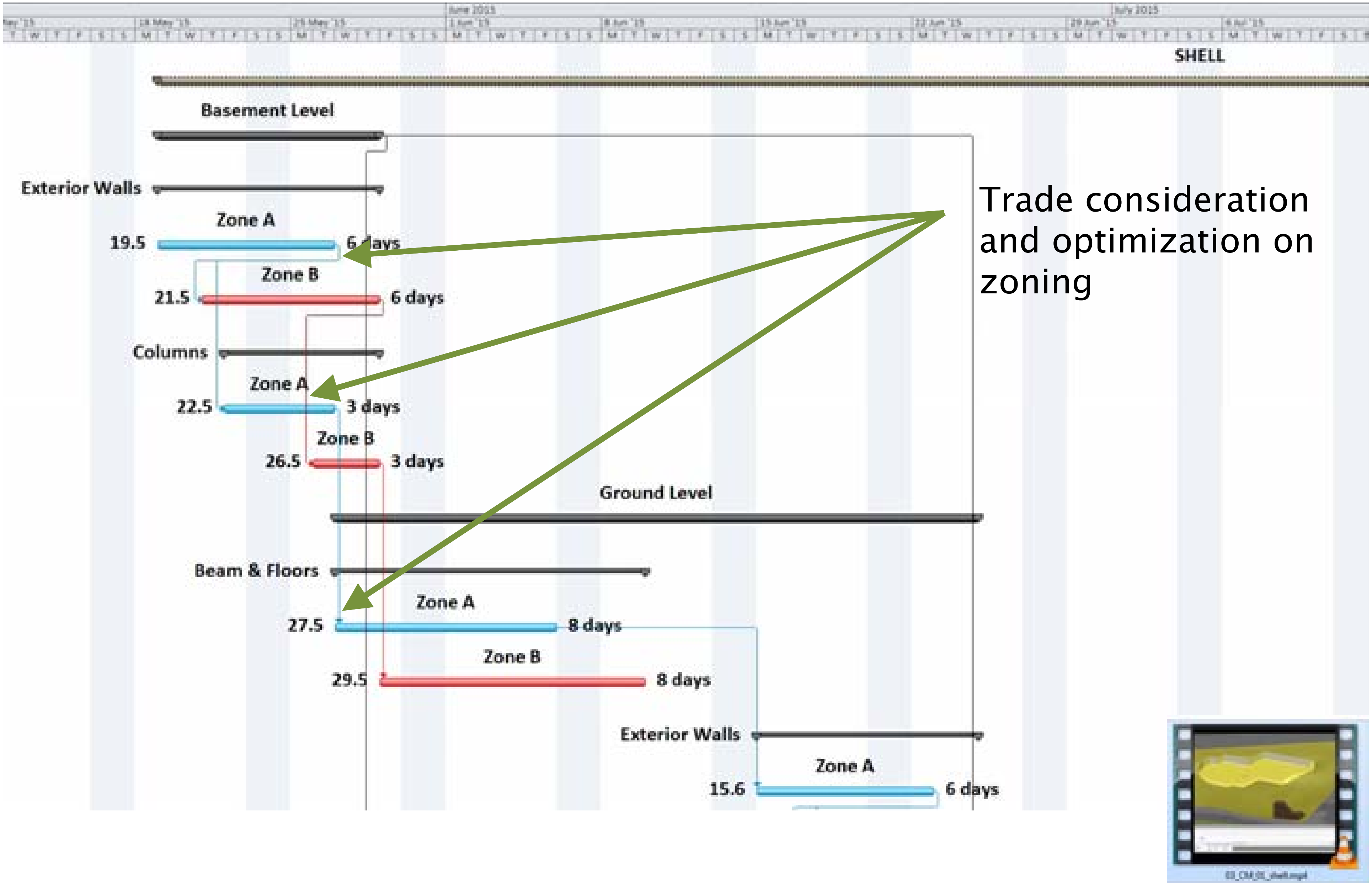
TVD: **LOCAL**

SCHEDULING

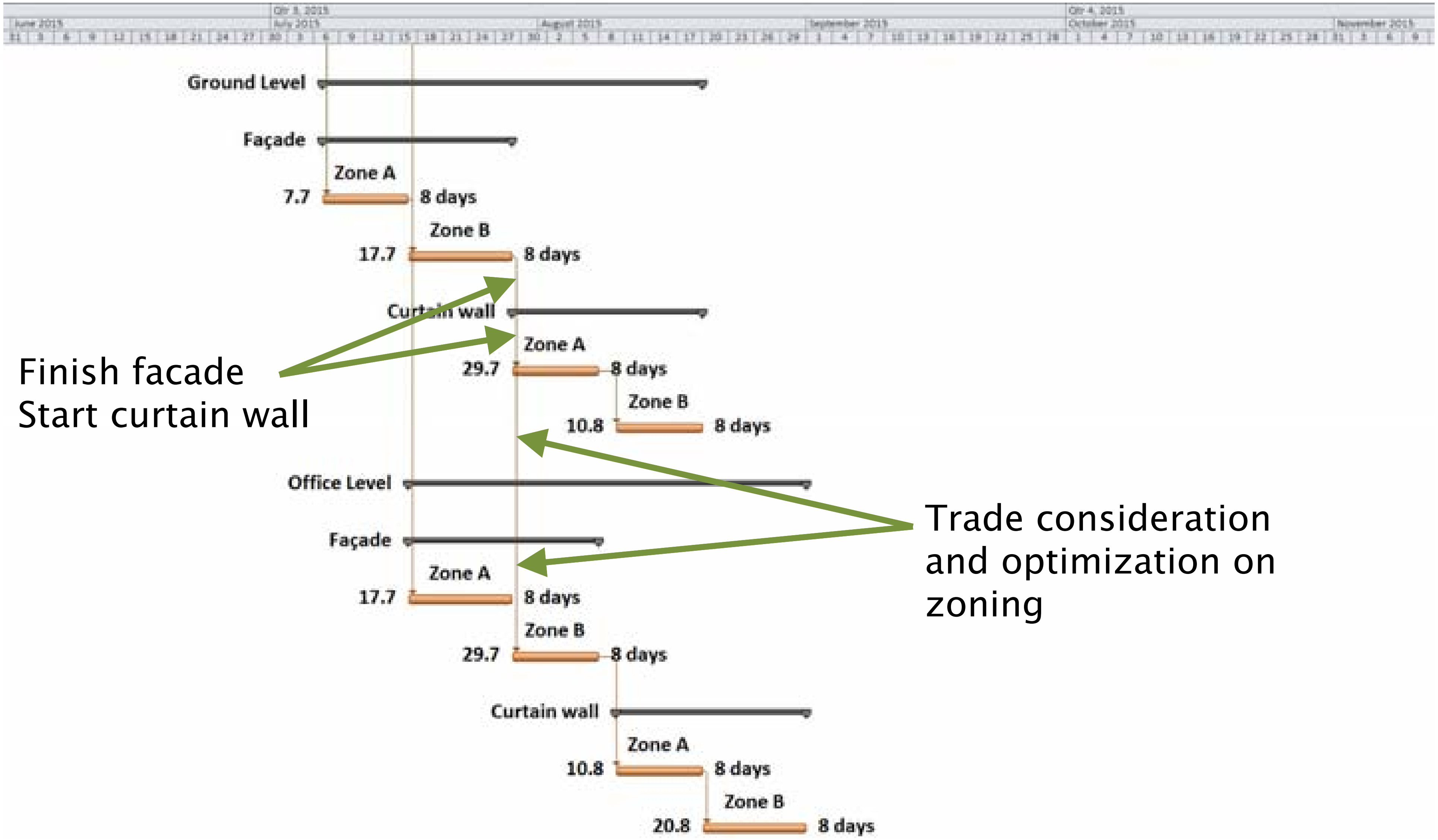
SCHEDULING - SITEWORK



SCHEDULING - SHELL



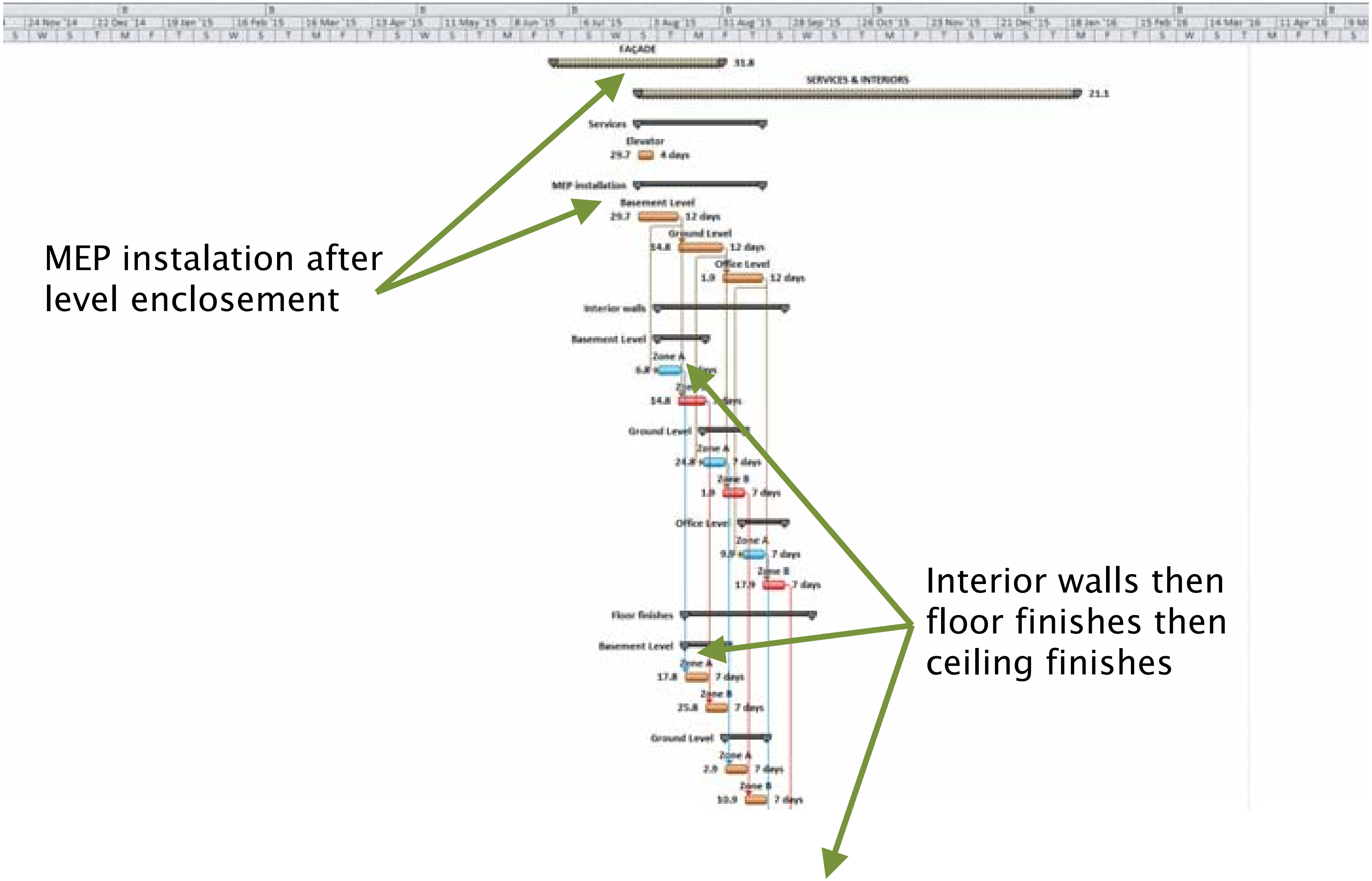
SCHEDULING – FACADE



Finish facade
Start curtain wall

Trade consideration and optimization on zoning

SCHEDULING – SERVICES & INTERIORS



CLASH DETECTIONS

- Early BIM integration – awerness of other disciplines – less clashes

REVIT

- Linked model – possible clash awareness

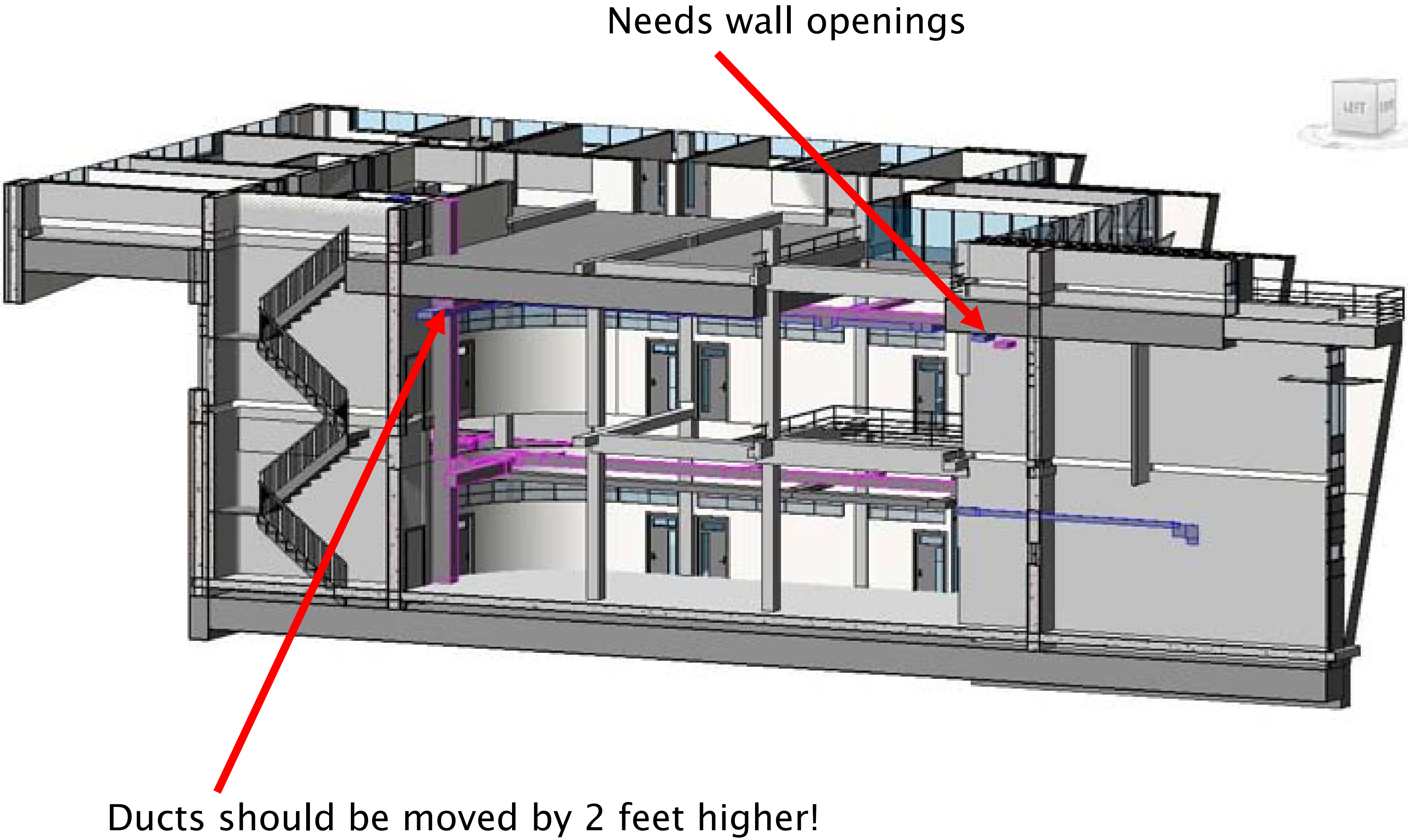
NAVISWORKS

- Explicit clash detection – two models at a time, by level, etc.
- Clash report – high number, but more logical clashes than critical

REAL-TIME VIRTUAL WALKTHROUGH (3D ICC & OTHER)

- Experience and live solving of problems

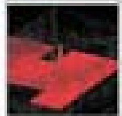
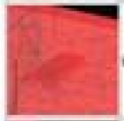
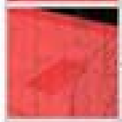
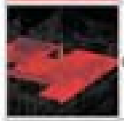
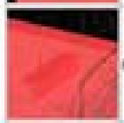
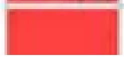
CLASH DETECTIONS – REVIT



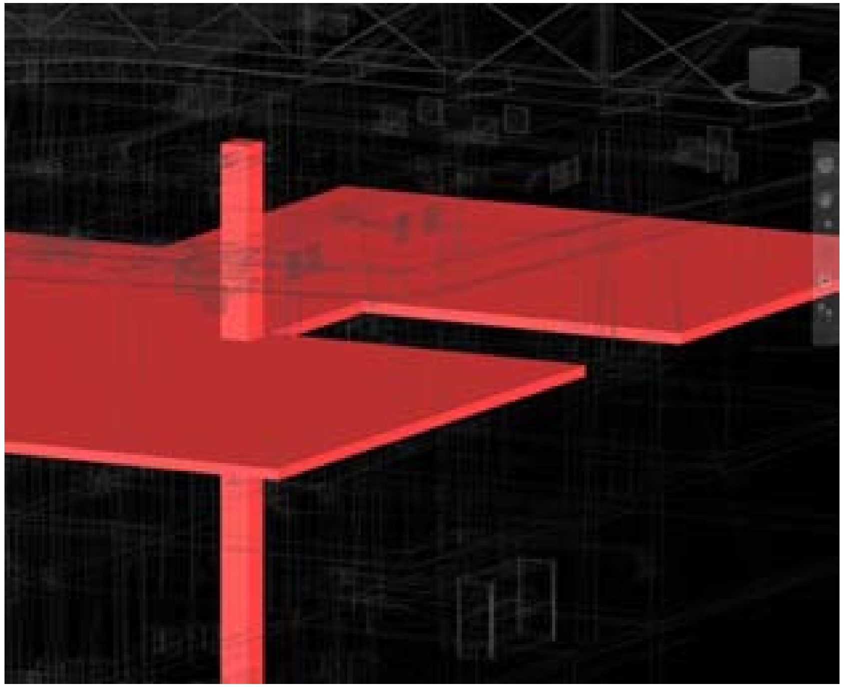
CLASH DETECTIONS - REPORTS

Autodesk Navisworks **Clash Report**

Test 1	Tolerance	Clashes	New	Active	Reviewed	Approved	Resolved	Type	Status
	0.01m	201	201	0	0	0	0	Hard	OK

							Item 1				Item 2			
Image	Clash Name	Status	Distance	Description	Date Found	Clash Point	Item ID	Layer	Item Name	Item Type	Item ID	Layer	Item Name	Item Type
	Clash1	New	-1.01	Hard	2012/5/8 17:50.24	x:-18.29, y:1.38, z:1399.54	*Element ID:* 359392	01 Ground Level	8" Concrete	Solid	:	<No level>	Mitered Elbows / Tees	Solid
	Clash2	New	-0.83	Hard	2012/5/8 17:50.24	x:-19.94, y:1.38, z:1404.42	*Element ID:* 359627	02 Office Level	8" Concrete	Solid	*Element ID:* 694757	<No level>	Mitered Elbows / Tees	Solid
	Clash3	New	-0.74	Hard	2012/5/8 17:50.24	x:-19.94, y:1.23, z:1399.34	*Element ID:* 359392	01 Ground Level	8" Concrete	Solid	*Element ID:* 694757	<No level>	Mitered Elbows / Tees	Solid
	Clash4	New	-0.72	Hard	2012/5/8 17:50.24	x:-9.57, y:-12.66, z:1398.62	*Element ID:* 249302	00 Basement Level	Generic - 16"	Solid	*Element ID:* 689502	<No level>	Mitered Elbows / Tees	Solid
	Clash5	New	-0.72	Hard	2012/5/8 17:50.24	x:-9.57, y:-14.18, z:1398.68	*Element ID:* 249302	00 Basement Level	Generic - 16"	Solid	*Element ID:* 689465	<No level>	Mitered Elbows / Tees	Solid
	Clash6	New	-0.62	Hard	2012/5/8 17:50.24	x:-18.08, y:1.38, z:1404.42	*Element ID:* 359627	02 Office Level	8" Concrete	Solid	:	<No level>	Mitered Elbows / Tees	Solid
	Clash7	New	-0.55	Hard	2012/5/8 17:50.24	x:1.63, y:-3.90, z:1398.65	*Element ID:* 333540	00 Basement Level	Generic - 16"	Solid	*Element ID:* 690711	<No level>	Mitered Elbows / Tees	Solid
	Clash8	New	-0.42	Hard	2012/5/8 17:50.24	x:-9.57, y:-14.12, z:1403.83	*Element ID:* 260965	01 Ground Level	Generic - 16"	Solid	*Element ID:* 774593	<No level>	Radius Elbows / Tees	Solid
					2012/5/8	[illegible]	*Element ID:*				*Element ID:*			

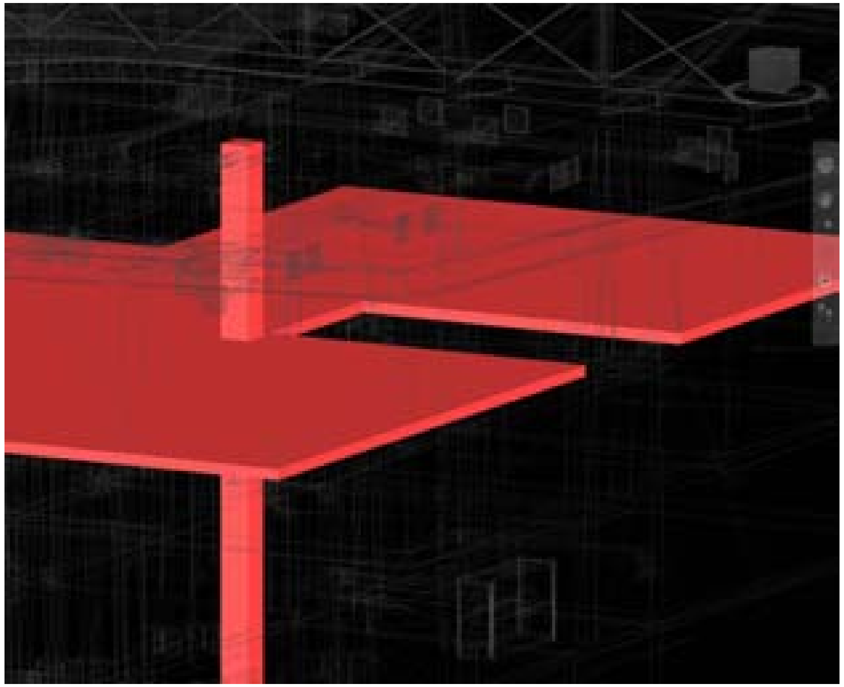
CLASH DETECTIONS – S vs. MEP



Duct though a floor slab.
BIG DEAL / EASY FIX

Exhaust hitting column.
SMALL PROBLEM / EASY FIX

CLASH DETECTIONS – A vs. S



Duct though a floor slab.
BIG DEAL / EASY FIX

Exhaust hitting column.
SMALL PROBLEM / EASY FIX

CLASH DETECTIONS – 3D ICC

LABS RENTING

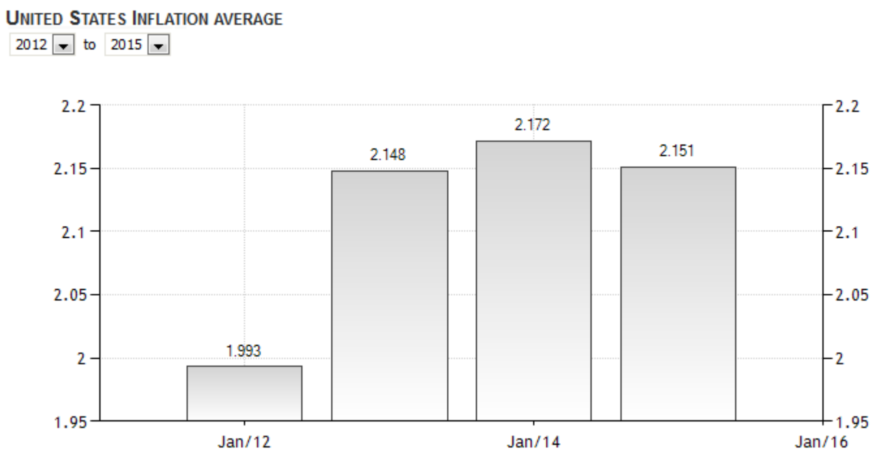
Target Value: Renting labs for the whole period of construction.

Pros and cons:
(+) easier transition **for students** who use labs
(+) easier scheduling – **faster construction**

(–) more expensive
$450 per day > 365 days (max. construction time) > $164,250

Cost: $165,000

BUDGET vs. INFLATION

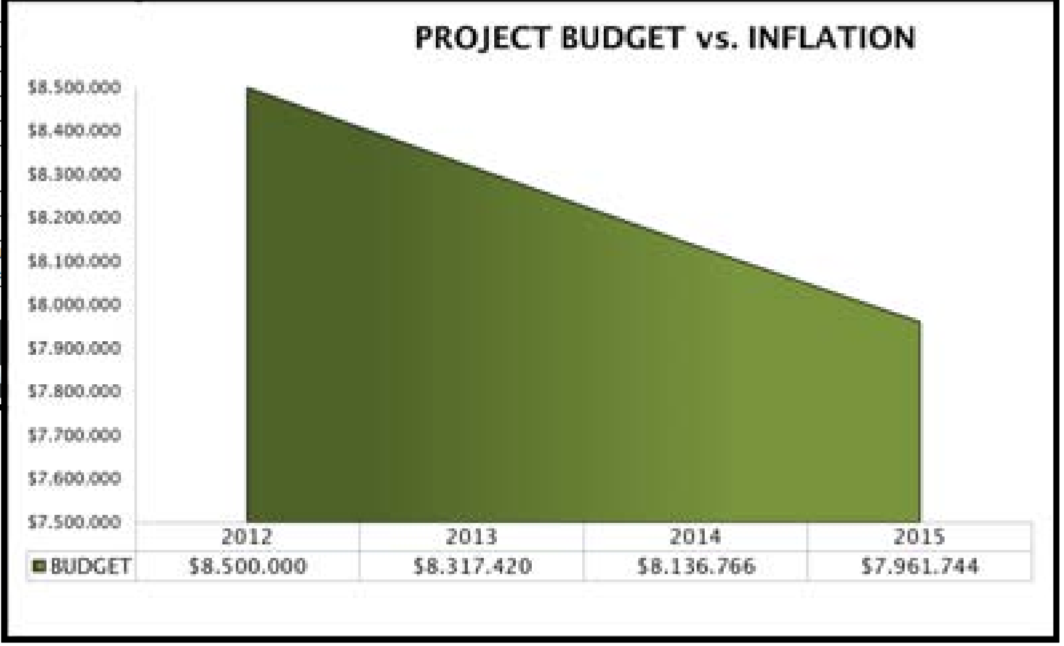


IMF Data Specifications

Country	United States
Subject Descriptor	Inflation; average consumer prices
Subject Notes	Data for inflation are averages for the year; not end-of-period data.
Units	Percent change
Scale	
Country/Series-specific Notes	See notes for: Inflation; average consumer prices (Index; 2000=100).
Estimates Start After	2009
Title	United States Inflation average
Keywords	United States Inflation average, United States Inflation average data,United States Inflation average chart,U Inflation average historical data,United States Inflation average graph,United States Inflation average forec

Proposed inflation rates in US from 2012 to 2015
(Source: Trading Economisc)

Budget loss on inflation



BY-PASSING INFLATION

$8,500,000	donation
~~- $500,000~~	~~inflation~~ *
-$165,000	lab rent
- $335,000	contingency

> Target Value: **$7,500,000**

*IDEA:
With investments into safe „risk free“ plans we can bypass inflation-based budget loss.

Ask mentors
Axel Seifert and Matthias Ehrlich

> **Investment in goverment bonds**

$8,500,000	donation
~~- $500,000~~	~~inflation~~
-$165,000	lab rent
- $335,000	contingency

> Target Value: **$8,000,000**

POSSIBLE TARGET VALUE
TREATED AS ANOTHER CONTINGENCY FACTOR

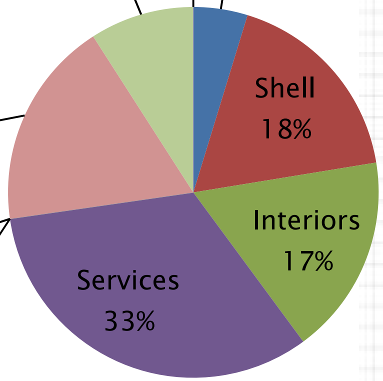
Winter Quarter 's Modified cost estimate

RS Means

Square Foot Cost Estimate

CONCRETE STRUCTURE

Building cost:...



BUDGET & TARGET VALUE					
			$8.500.000	donation	
			-$500.000	loss on inflation	
			-$165.000	lab rent	
			-$311.400	4% budget contingency factor	
			$7.521.600	Target value	
Dewatering			$25.000	per month	
			7,35	Scheduled months	
		$183.750		Cost	
Green Roof	Hardscape		$25	per square foot	
			11000	Roof square feet	
		$275.000			
PINE CONE					
CONCRETE STRUCTURE	estimate		$928.315	Revit	$650.698
concrete (m3)		1800,00			
concrete (CY)		2354,31			
steel (t)		70,00			
steel (pounds)		154321,40			
Revit concrete (CF)		41253,20			

Reduction of RS Means estimates due to use of precast concrete

		Estimate	Modified value using 70% precast New value	Delta
Shell				
	Floor Const.	$541.000	$389.520	$151.480
	Exterior Walls	$201.500	$145.080	$56.420
	Cost	$1.198.500	**$990.600**	
Interiors				
	Partitions	$251.500	$181.080	$70.420
	Stair Constr.	$95.500	$68.760	$26.740
	Cost	$1.183.000	**$1.085.840**	

Reduction of RS Means estimates due to applying own estimates values
CONCRETE

		Pine Cone	Hardscape
Shell			
	Cost	$1.198.500	$1.198.500
	Floor Const.	-$541.000	-$541.000
	Exterior Walls	-$201.500	-$201.500
	Own estimation	$650.698	$775.804
	New Cost	**$1.106.698**	**$1.231.804**

Both reductions were used to decide on a new estimate for shell partition c

Reduction of RS Means estimates due to applying own estimates values
STEEL

		Pine Cone	Hardscape
Shell			
	Cost	$1.420.500	$1.420.500
	Floor Const.	-$751.000	-$751.000
	Own estimation	$843.166	$864.379
	New Cost	**$1.512.666**	**$1.533.879**

CONCRETE STRUCTURE
70% precast
30% cast in place

PINE CONE			
Dewatering		$183.750	2%
Substructure		$320.500	4%
Shell		$1.100.000	15%
Interiors		$1.085.000	14%
Services		$2.224.000	29%
Special Construction	PV and shading	$400.000	5%
Building Sitework	Landscaping	$100.000	1%
Contractor Fees		$1.231.500	16%
Architectural Fees		$616.000	8%
Contingency		$300.000	4%
			100%
Building cost		**$7.560.750**	
		$7.260.750	

Estimation process

RS Means – **Square Foot Estimator**

(College, Classroom, 2-3 Story with Decorative Concrete Block.)

Past years Ridge teams estimates comparison

(Setting up average building cost estimated value.)

Estimations for **dewatering process**

Material take-offs from Revit

(Substructure and shell components)

RS Means **Cost Books**

(Renting equipment, sitework, special construction, etc.)

Budget consideration

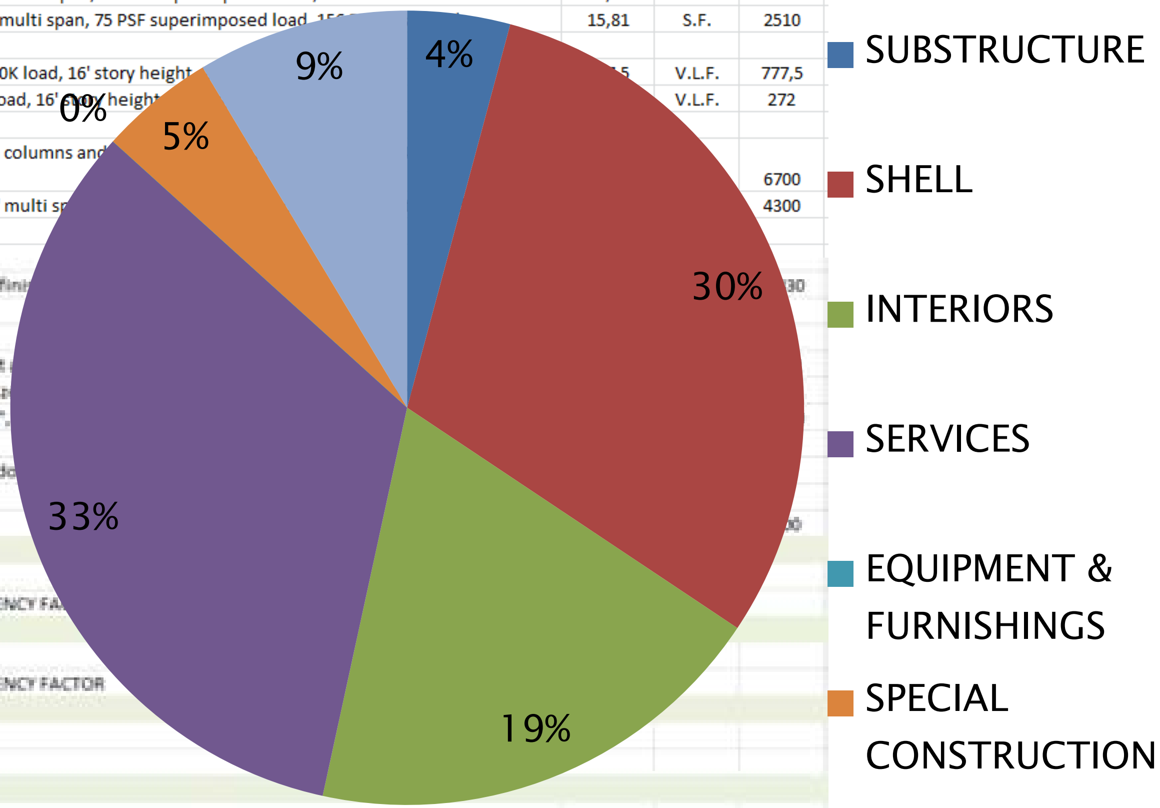
Modified cost estimate

Cost estimate

FINAL COST ESTIMATE $ 7,694,472

Target value budget $ 7,500,000

TOTAL	**$7.694.472**				
4%	**SUBSTRUCTURE**				
TOTAL	**$308.496**				
		Foundation slab			
	$160.744	Slab on grade, 24" thick, non industrial, reinforced	14,2	S.F.	11320
		Basement walls			
	$59.850	Foundation wall, CIP, 16' wall height, pumped, 23.99 PLF, 16" thi			
		Retaining walls			
	$87.902	Concrete retaining wall, reinforced, level backfill, 16' high, 8'-6"			
29%	**SHELL**				
TOTAL	**$2.224.609**				
		Floor construction			
	$274.207	Cast-in-place concrete slab, 6.5" thick, one way, 20' multi span, 75 PSF superimposed load, 156 PSF total load	14,81	S.F.	18515
	$39.683	Cast-in-place concrete slab, 10" thick, one way, 20' multi span, 75 PSF superimposed load	15,81	S.F.	2510
		Columns			
	$83.581	Cast-in-place concrete column, 16" square, tied, 400K load, 16' story height		V.L.F.	777,5
	$37.536	Cast-in-place concrete column, 16x22", tied, 400K load, 16' story height		V.L.F.	272
		Roof construction			
	$37.319	Floor, steel joists, beams, 1.5" 22 ga metal deck, on columns and superimposed load, 60 PSF total load			6700
	$63.683	Cast-in-place concrete slab, 6.5" thick, one way, 20' multi sp			4300
		Walls			
		Bearing walls			
	$755.091	Concrete wall, reinforced, 16' high, 16" thick, plain fini			
	$0	Exterior walls			
		Exterior windows			
	$375.854	Glazing panel, insulating, 1" thick units, 2 lites, light			
	$83.589	Sandwich panel, 1-1/2" fiberglass, 22 gauge galvaniz			
	$437.225	Aluminum flush tube frame, for 1/4"glass,1-3/4"x4",			
		Exterior doors			
	$27.682	Door, aluminum & glass, with transom, full vision, do			
		Roof coverings			
	$9.159	RS Means value estimate			
18%	**INTERIORS**				
TOTAL	**$1.404.725**				
	1404725	RS Means Square Foot Estimator Value + CONTINGENCY FA			
32%	**SERVICES**				
TOTAL	**$2.454.100**				
	2454100	RS Means Square Foot Estimator Value + CONTINGENCY FACTOR			
0%	**EQUIPMENT & FURNISHINGS**				
TOTAL	**$0**				
	0	RS Means Square Foot Estimator Value			
4%	**SPECIAL CONSTRUCTION**				
TOTAL	**$345.342**				
	$35.000	Integrated shaders			
	$150.000	Rainwater collection			

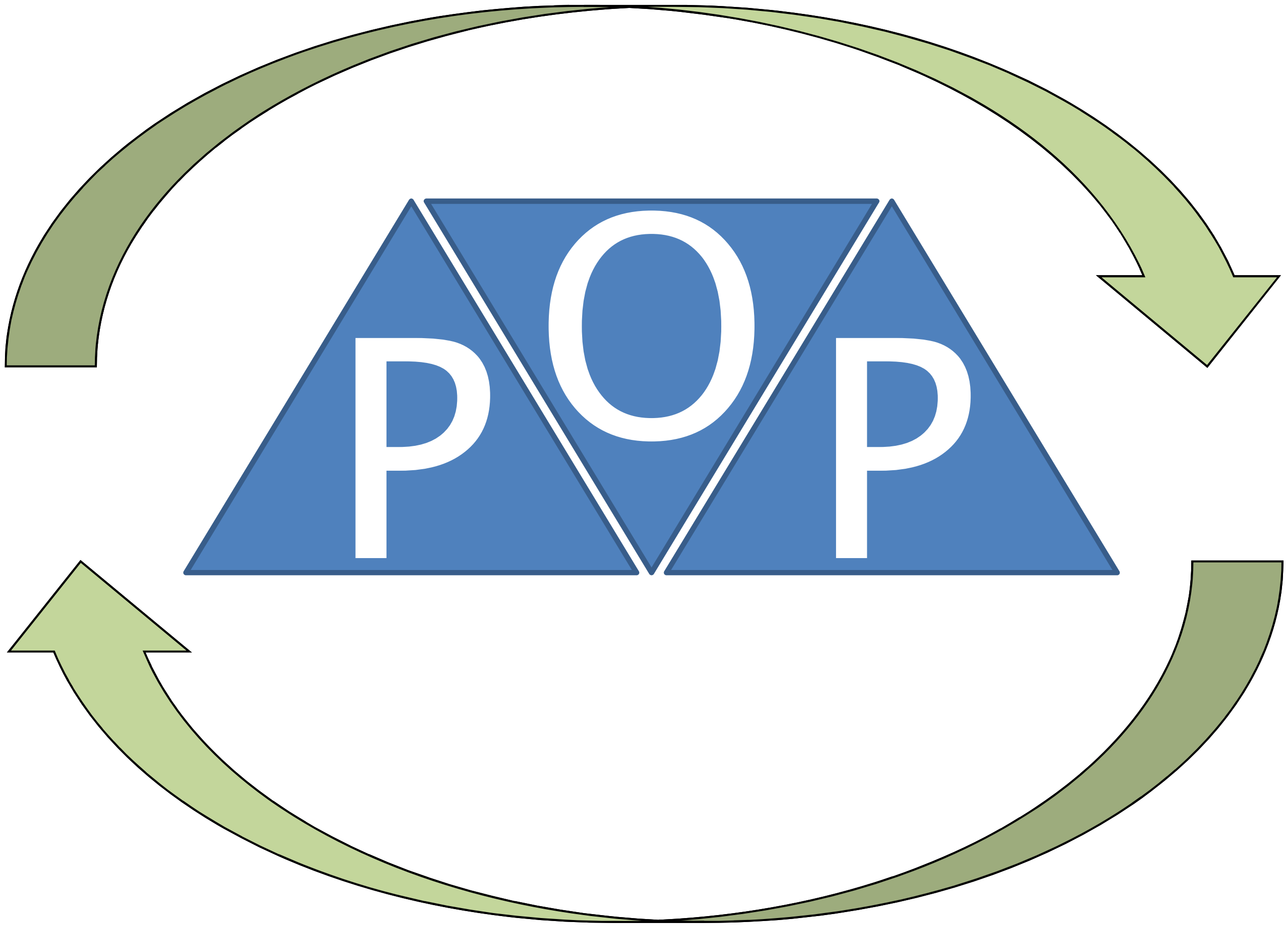


LEED POTENTIAL – PINE CONE CONCEPT

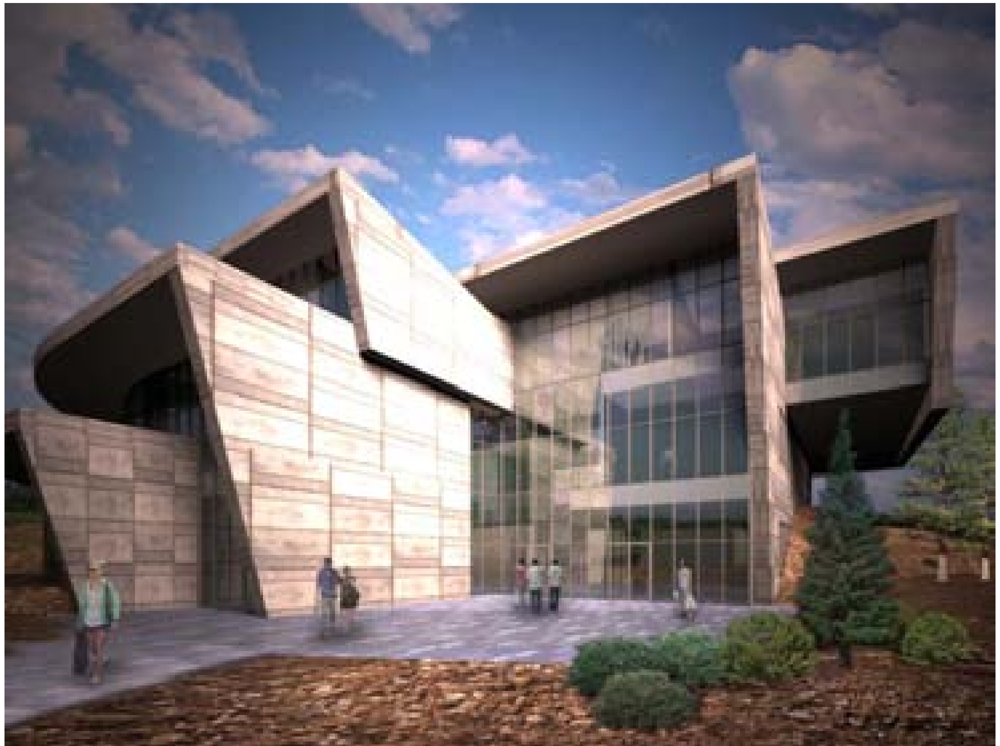
Yes	?	No		
9	3	2	**Sustainable Sites**	**14** Points
5	0	0	**Water Efficiency**	**5** Points
9	1	0	**Energy & Atmosphere**	**17** Points
6	3	4	**Materials & Resources**	**13** Points
11	2	2	**Indoor Environmental Quality**	**15** Points
0	2	0	**Innovation & Design Process**	**5** Points
40	**11**	**6**	**Project Totals (pre-certification estimates)**	**69** Points

Projected Value of LEED Gold Certification

OUR POP



OUR PRODUCT

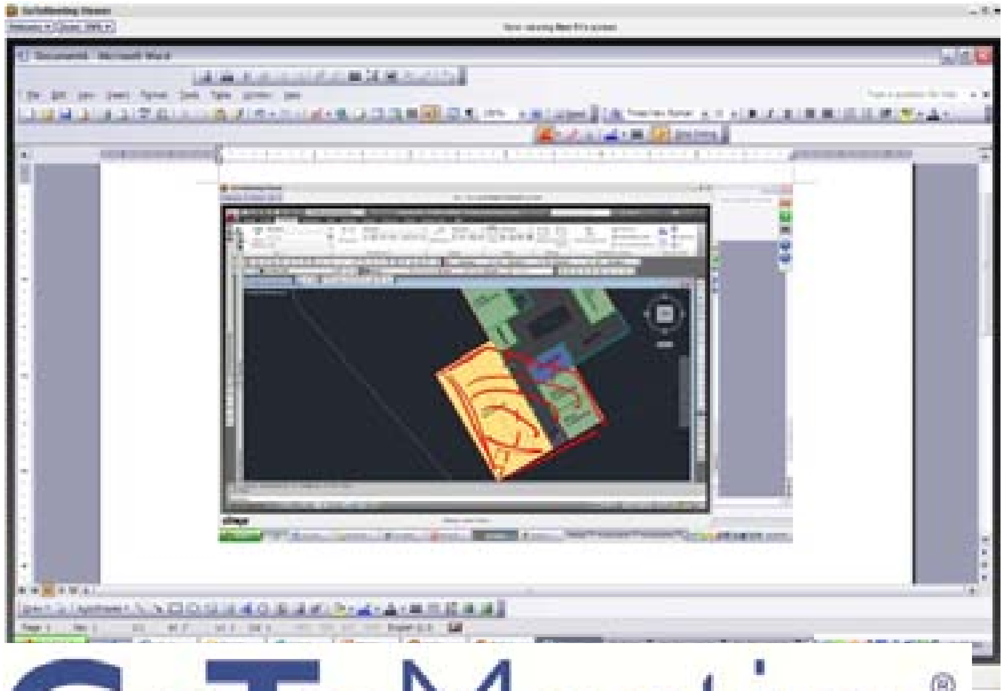


OUR ORGANIZATION

O

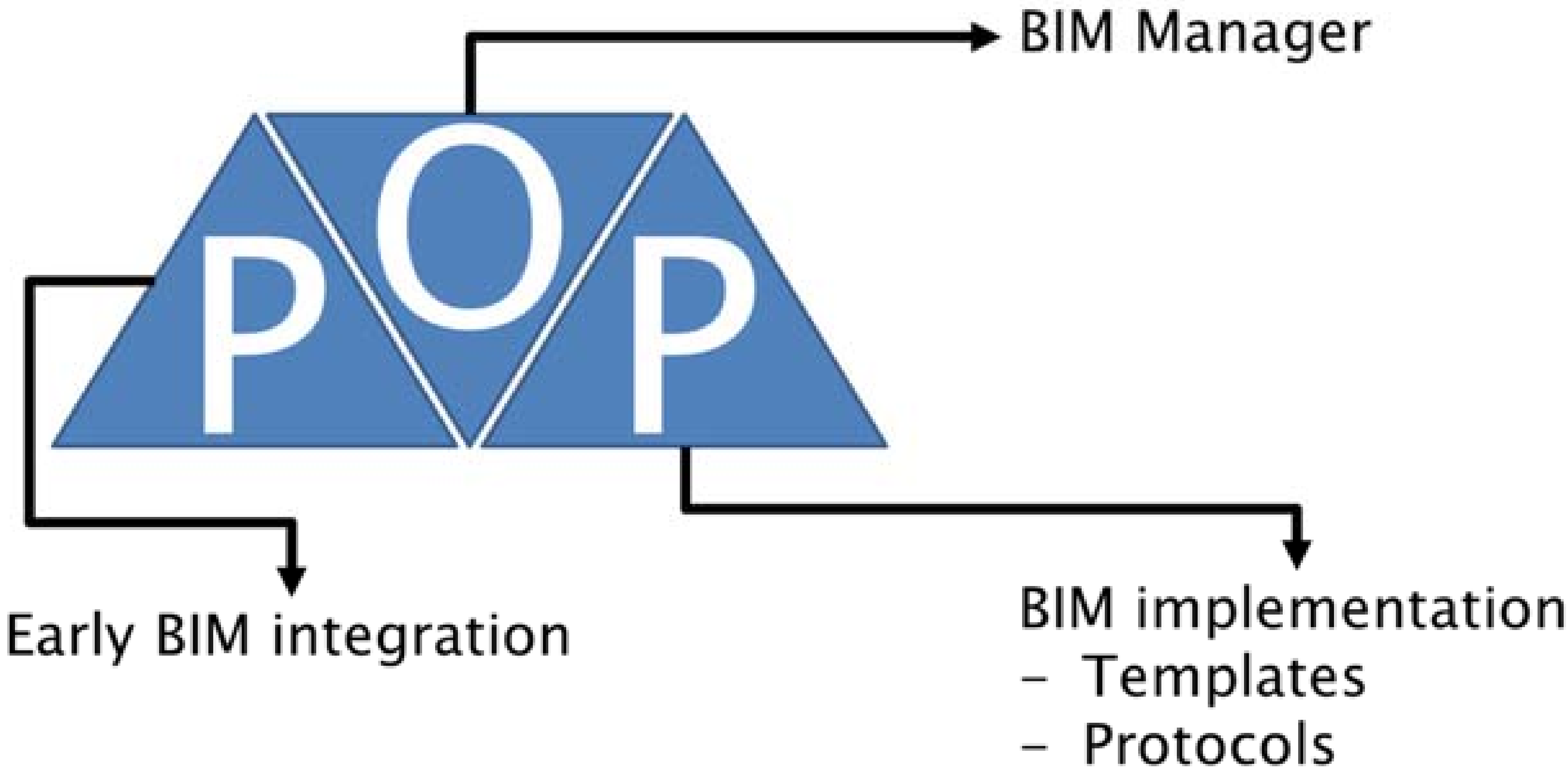
OUR PROCESS

skype™

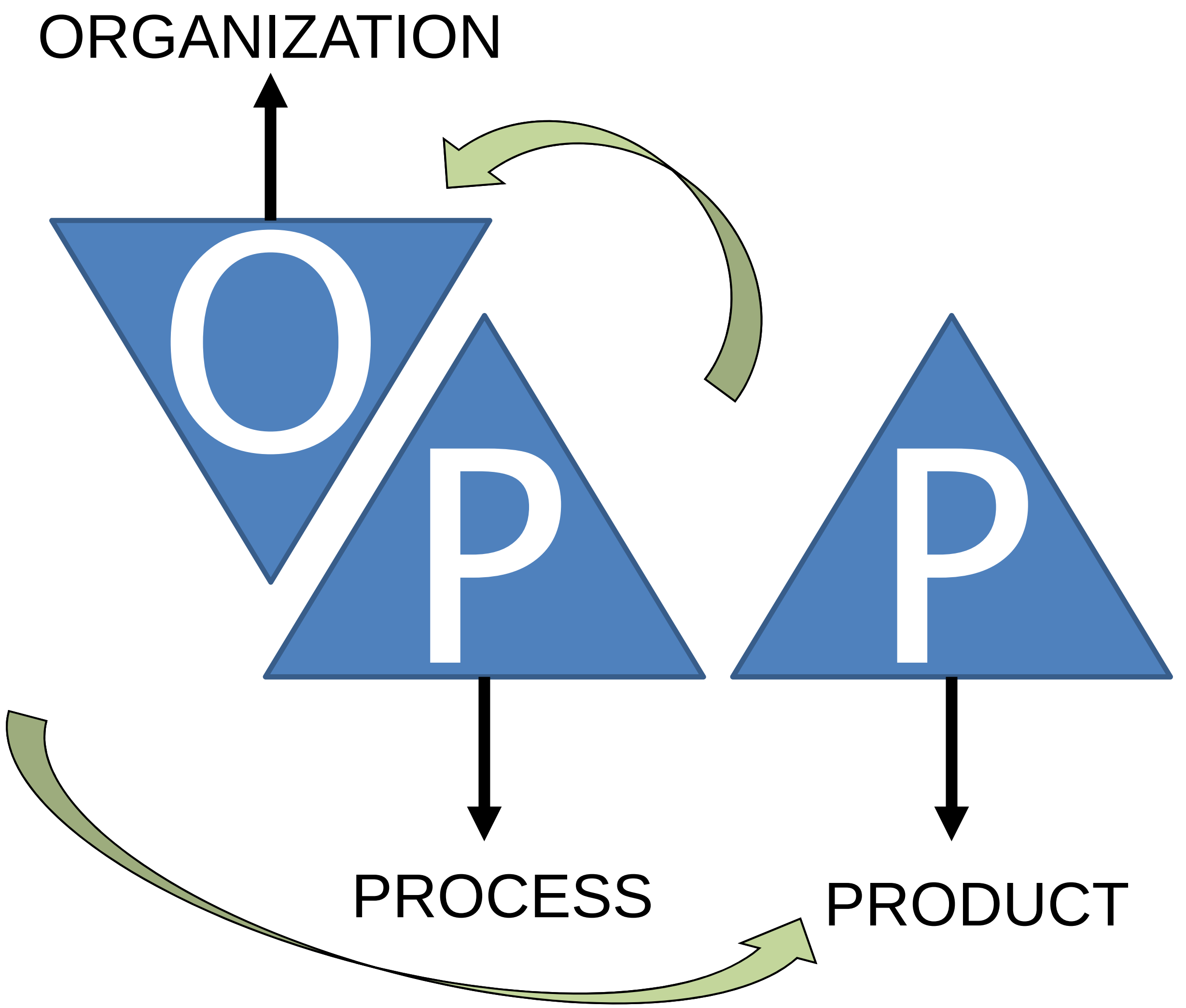


GoToMeeting®

OUR POP


BIM Manager
P
O
P
Early BIM integration
BIM implementation
- Templates
- Protocols

OUR POP „TRIANGULATION“



BIM MANAGER – NEW ROLE

TVD: TEAM PROCESS

TVD: BIM MANAGEMENT

- Everybody **agrees** on using Revit in the early stages
- Prepare Revit **project templates**
- Prepare user **guidelines** on how to use templates
- Prepare **tutorials** (linking, view depth)
- Establish **sharing/linking** of models

BIM IMPLEMENTATION

1

*Box: PBL-RidgeRS/BIM Management

Revit Workflow for RidgeRS

One of the basics in effective and collaborative BIM workflow is to establish it.

This document is a combination of standardization, tutorials and advices for each team member on how to utilize Revit in her/his process and design to establish an effective BIM workflow for the whole team.

1 BASIC REVIT TEMPLATE

*Box: PBL-RidgeRS/BIM Management/Revit Project Templates

Each Revit (Architecture, Structure or MEP) user starts his project with a project template. The template is not the same, but it is a program specific one, with some arrangements made so that the collaboration and the linking of different discipline's files go together as fluent as possible.

These project templates will be updated probably many times. That doesn't mean that the user will have to start the design and the modeling process all over again. It will just be used with the tool called "Transfer Project Standards" from the template file to the latest file of design. That is how all the important new properties of the template will be copied with the design preserved as it was before.

The template serves as the organizational structure of our Revit projects.

2

2 1ST STEPS OF DESIGN

Each discipline will start the design process basically from scratch. At first no linking will be established. Maybe just an underlay or a reference of other discipline (i.e. Architecture) will be used for guidance.

That reference can be a Revit model or preferably DWG underlay.

2.1 Standardizations

2.1.1 File naming

File naming of the models will be the same as established for the whole project.

2.1.2 Materials

When modifying existing materials or adding new ones please use the following naming:

"R - glazing - blue"

R – stands for our Ridge team and for sorting in the dialog box.

\- – please use space & dash & space

glazing – name of material, short and understandable

2.1.3 Building orientation

Everyone should start the modeling in Project North orientation. It is not a true north. It's the orientation that we agree on. For now we use the orientation of the grids that exist in the template.

3 1ST STAGE OF LINKING MODELS

After the basic architectural and structural models will be prepared, BIM Manager will take those models and establish the linking. Those models will be then shared back again to each discipline to enable further design process.

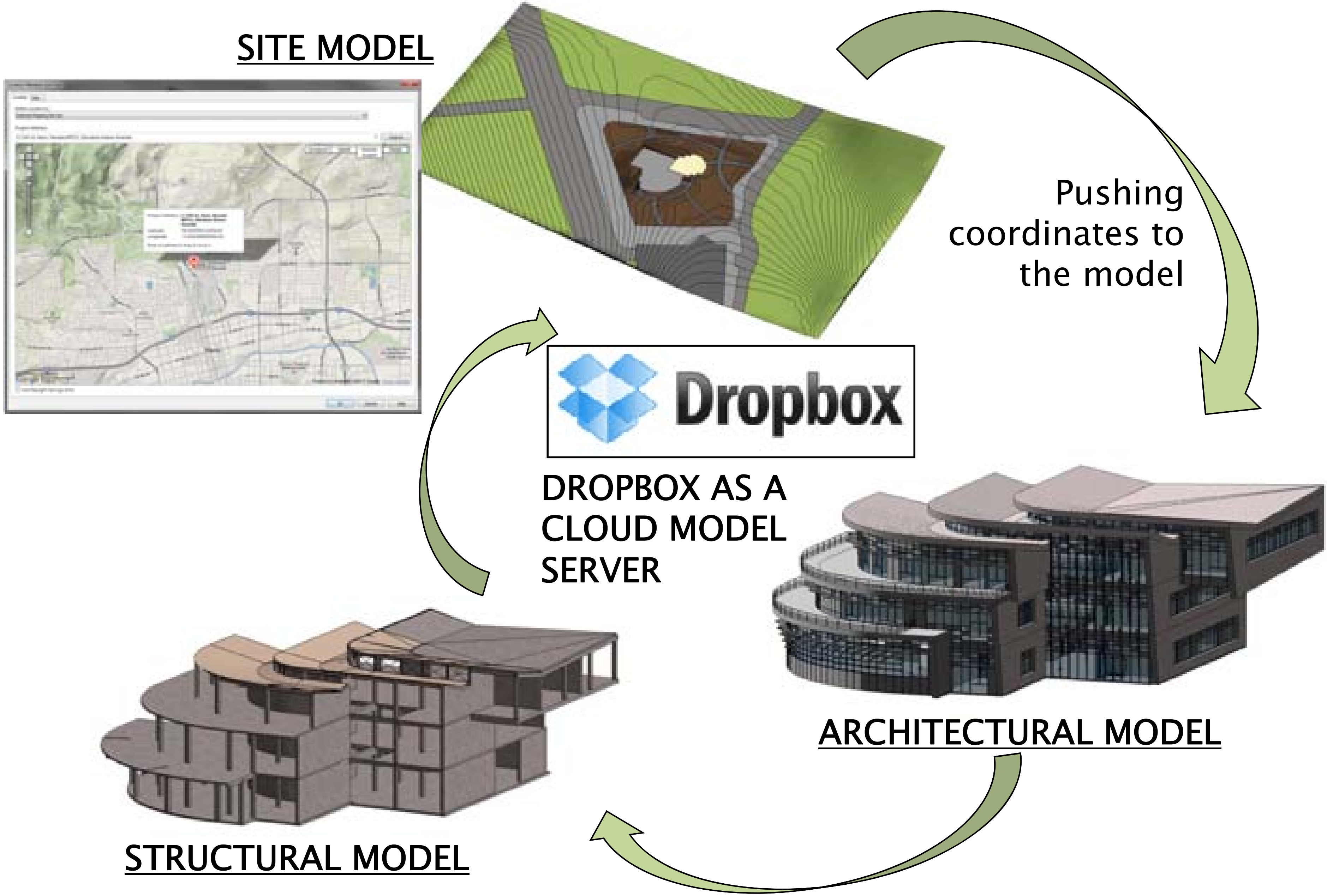
BIM IMPLEMENTATION

REVIT MODEL LINKING

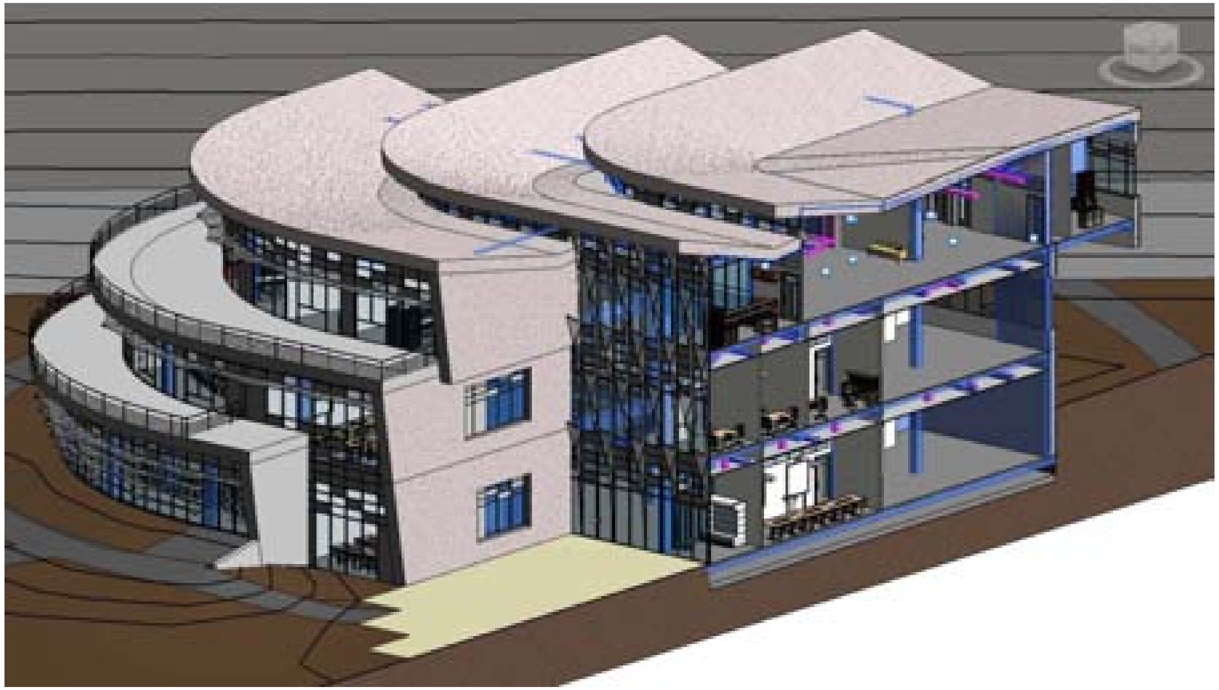
Problem When You Open Project

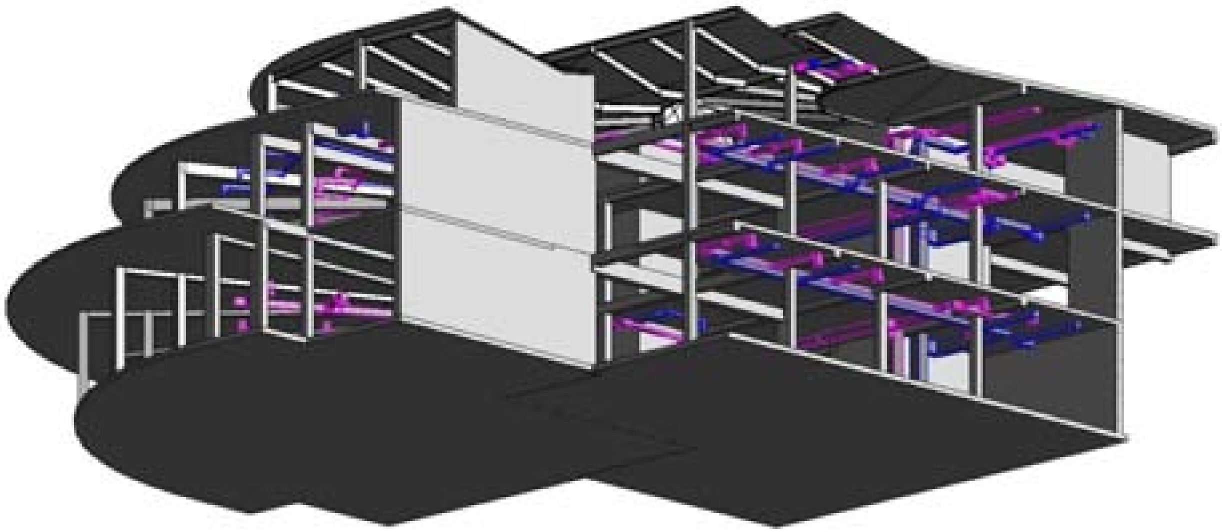
If you get this notification, you should Open Manage Links...

BUILDING MODELS



LINKED MODELS

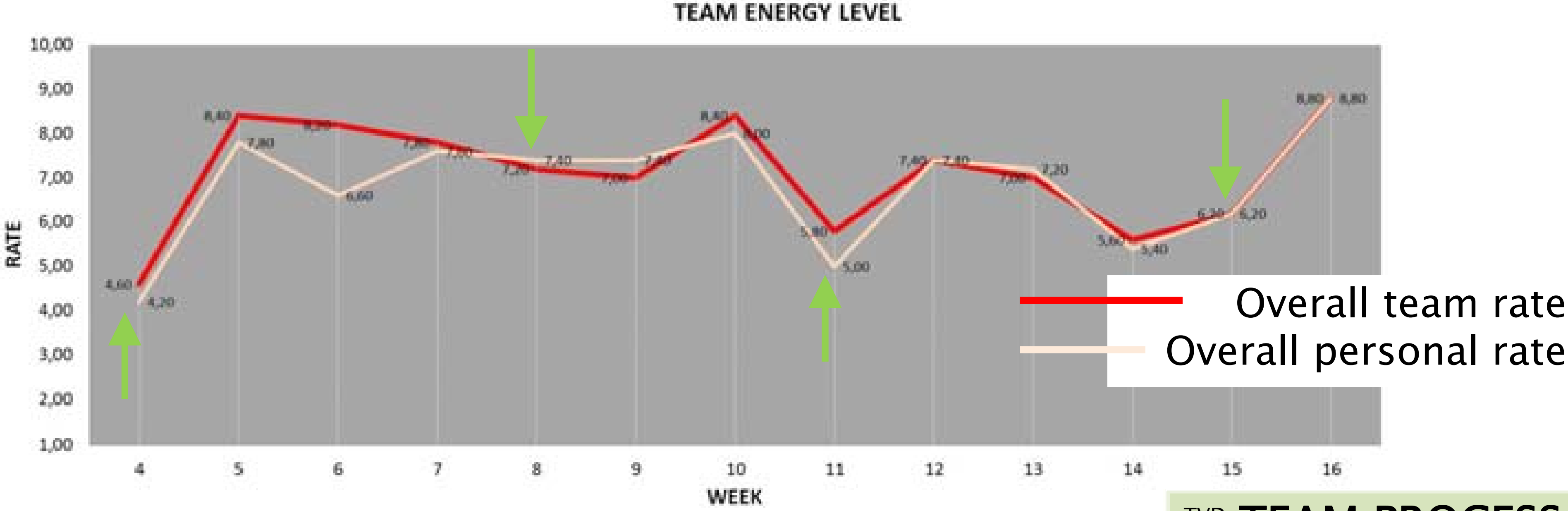




INTERACTIONS

- SOCIAL FACTOR OF BIM INTEGRATION
- MEETINGS
- MENTOR MEETINGS RECORDINGS

WEEKLY TEAM ENERGY SURVEY – ANALYSIS



TVD: **TEAM PROCESS**

PRODUCT WALKTHROUGH

GO RIDGERS!

GO PINE CONE !

THANK YOU RENATE!

& THANK YOU:

Gitte Sørensen, Lauren Scammell, Greg Luth, Axel Seifert and Matthias Ehrlich, Henry Tooryani, David Bendet, Glenn Katz, Frank Scheiber, Guido Morgenthal, Daniel Gonzales, Tomo Cerovsek, Martin Lah, Ziga Turk, Erik Kneer