



plummer.augelli.landmann.delgado.yuen.kOde9



Stanford



UW Madison



CSU Chico



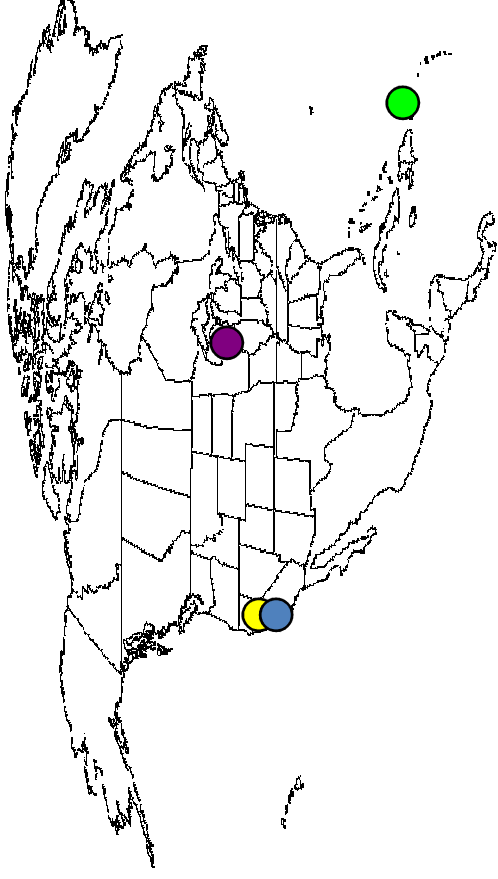
UPR



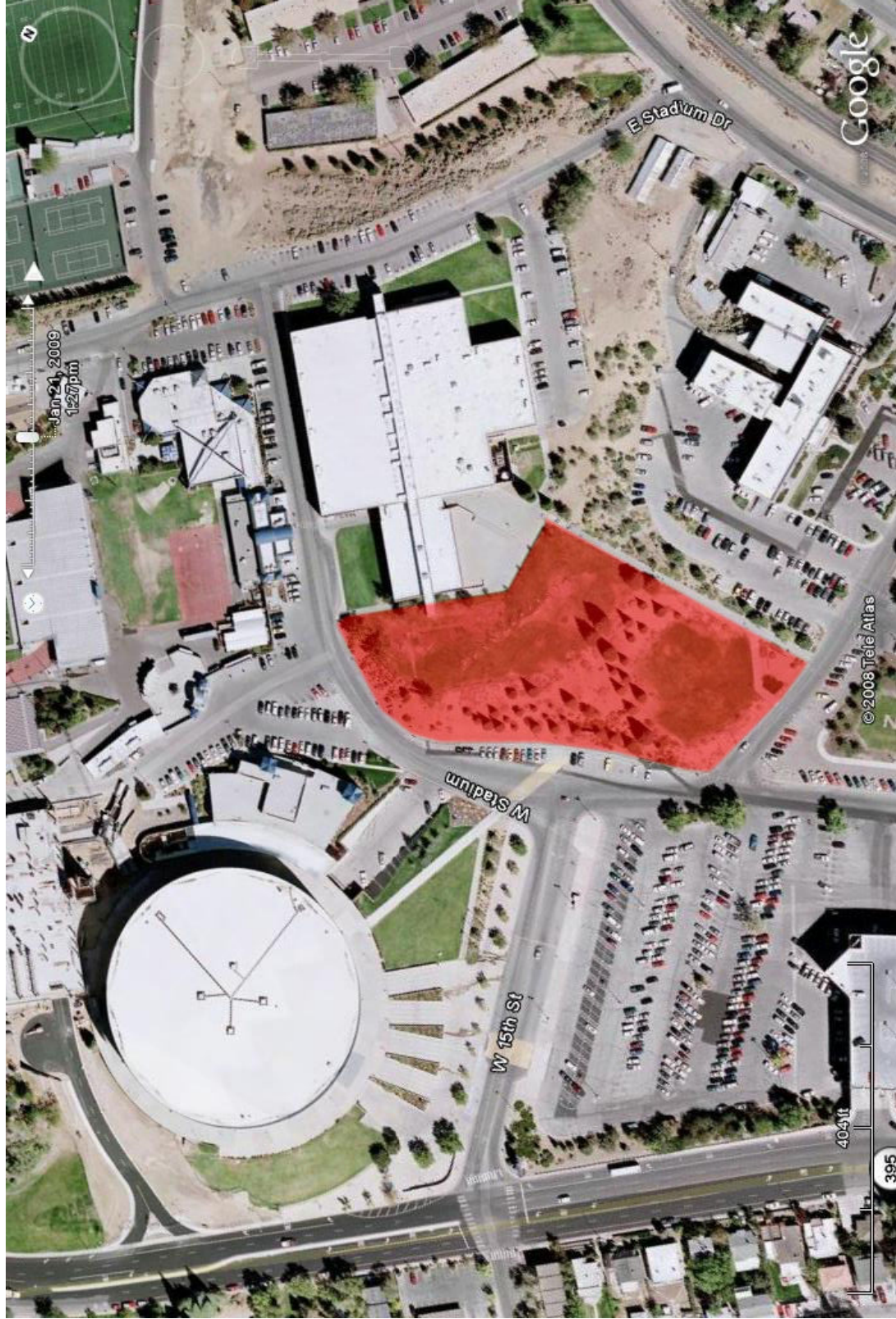
Stanford



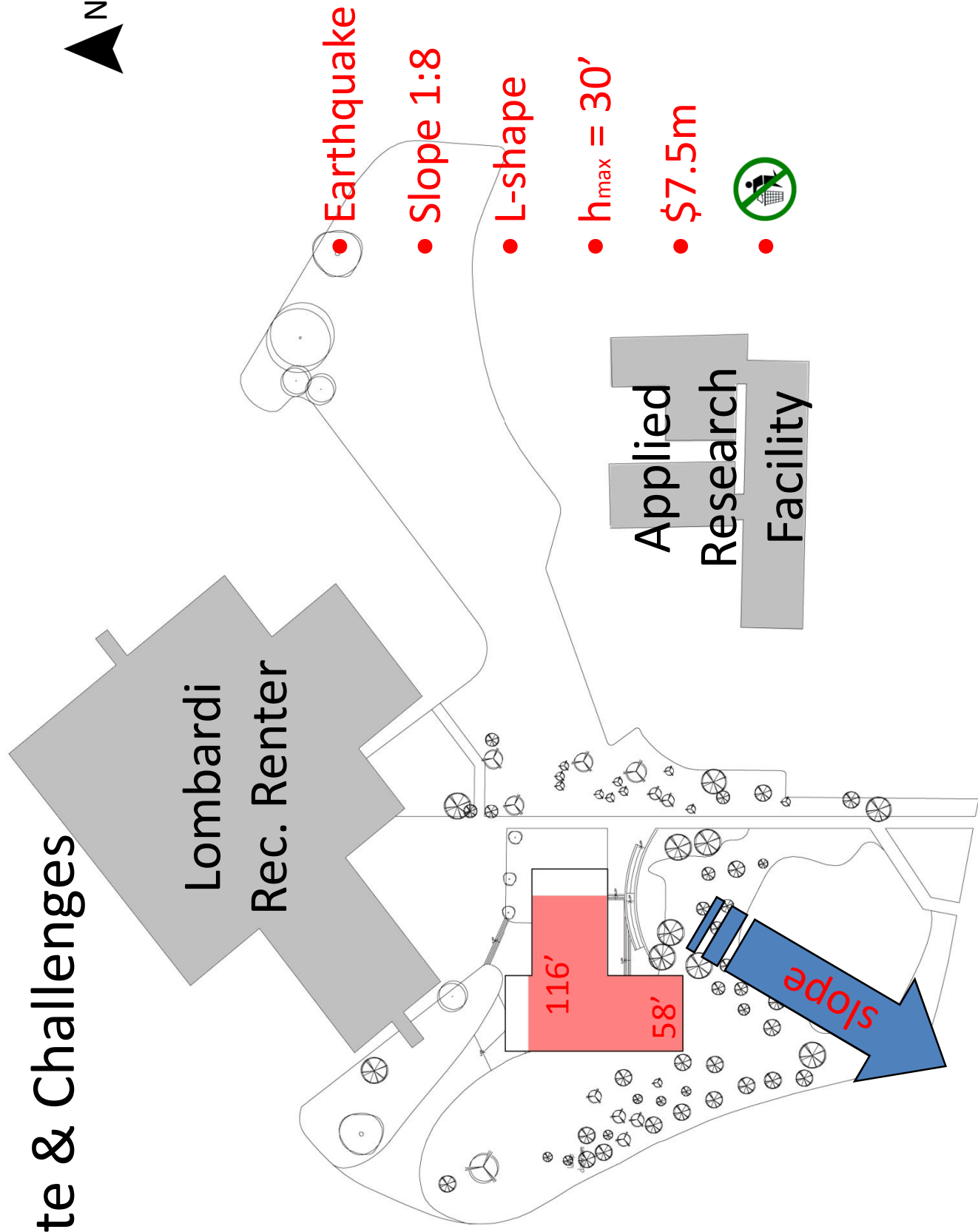
Stanford



Site Conditions

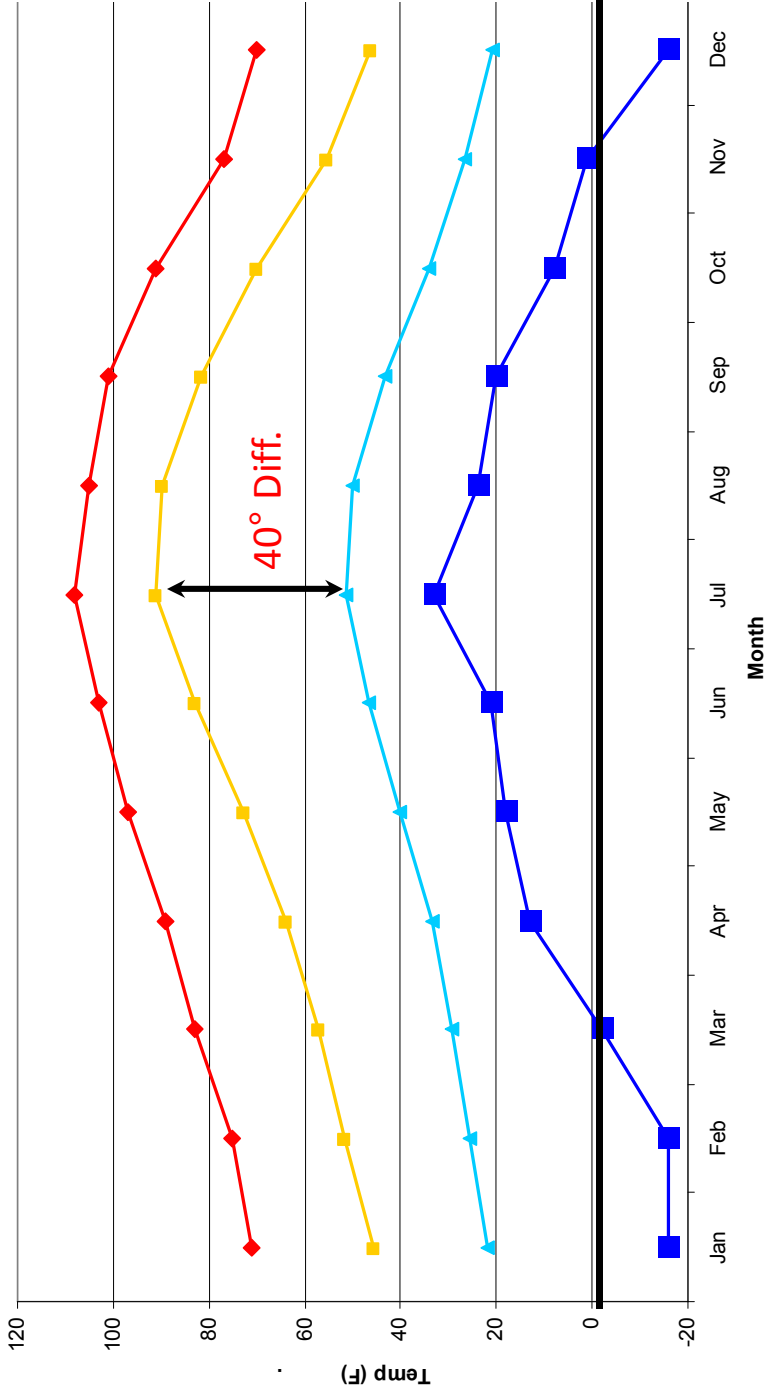


Site & Challenges



Site & Challenges

Temperature



Annual Precipitation

7.48"



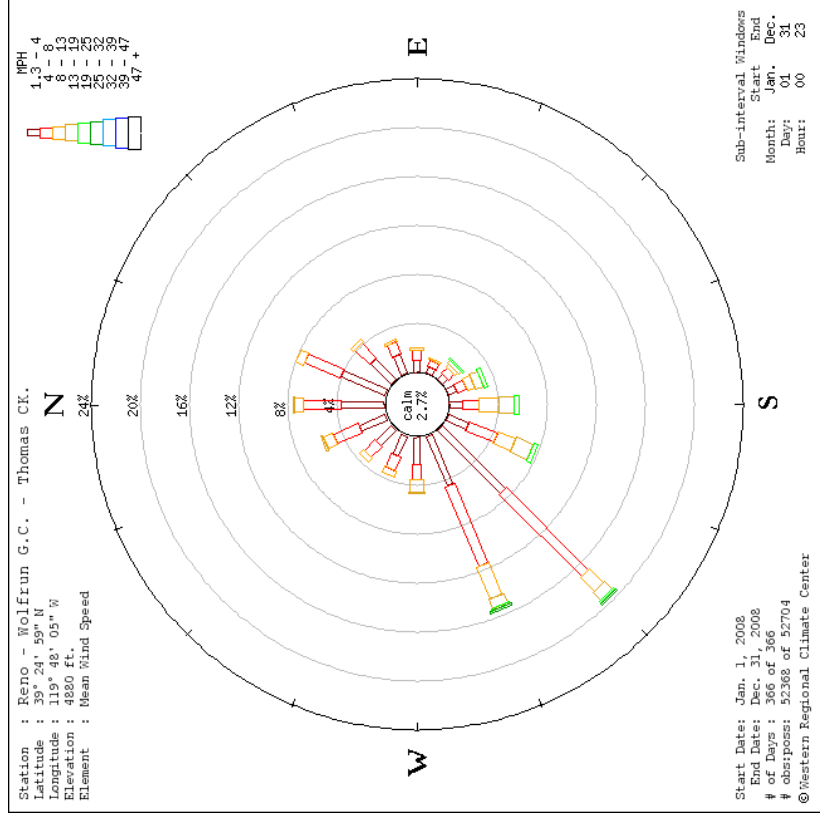
24"



Night flushing

Site & Challenges

Wind Rose



Other Reno Weather



Indicators

158 - Clear Days

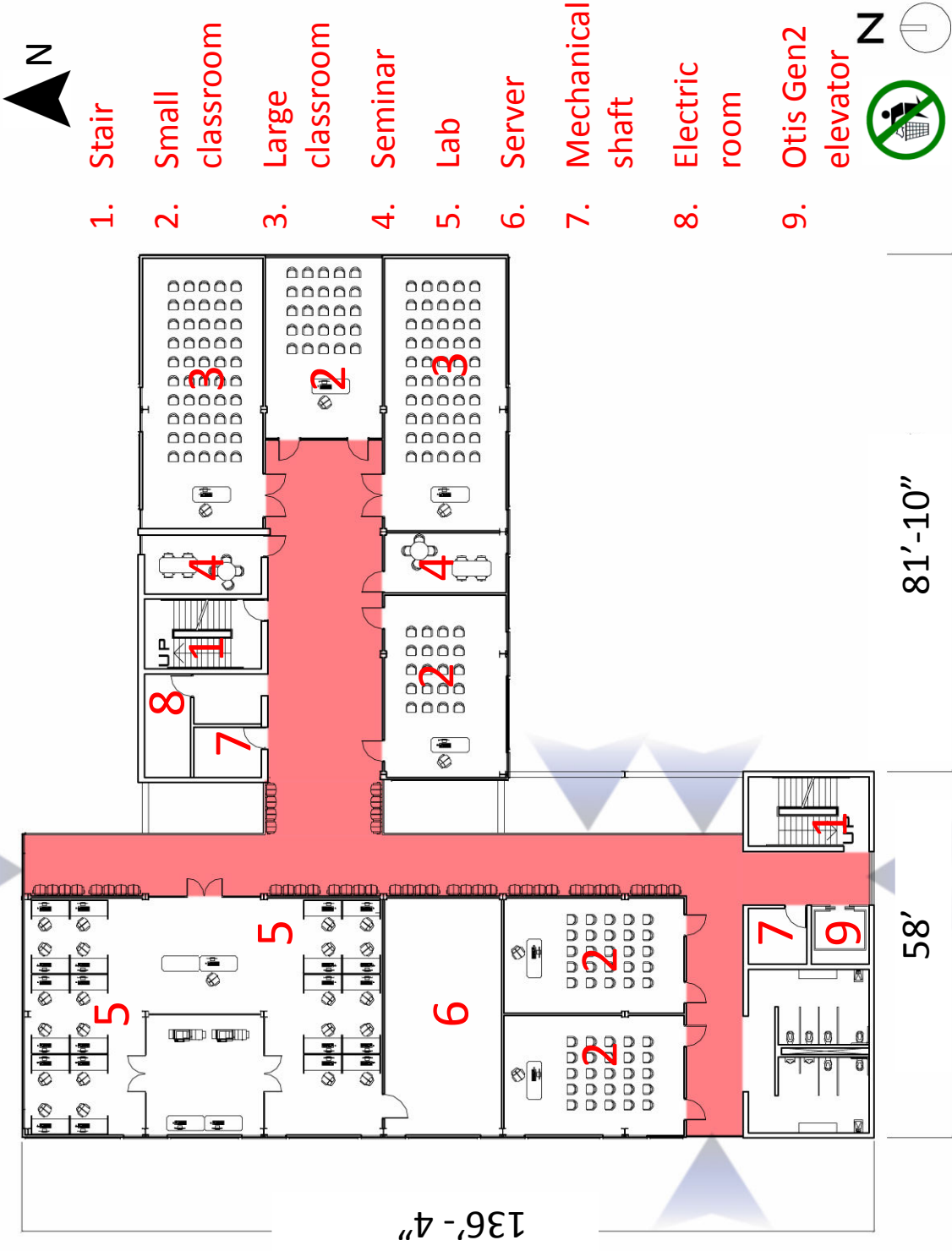
93 - Partly Cloudy Days

114 - Cloudy Days

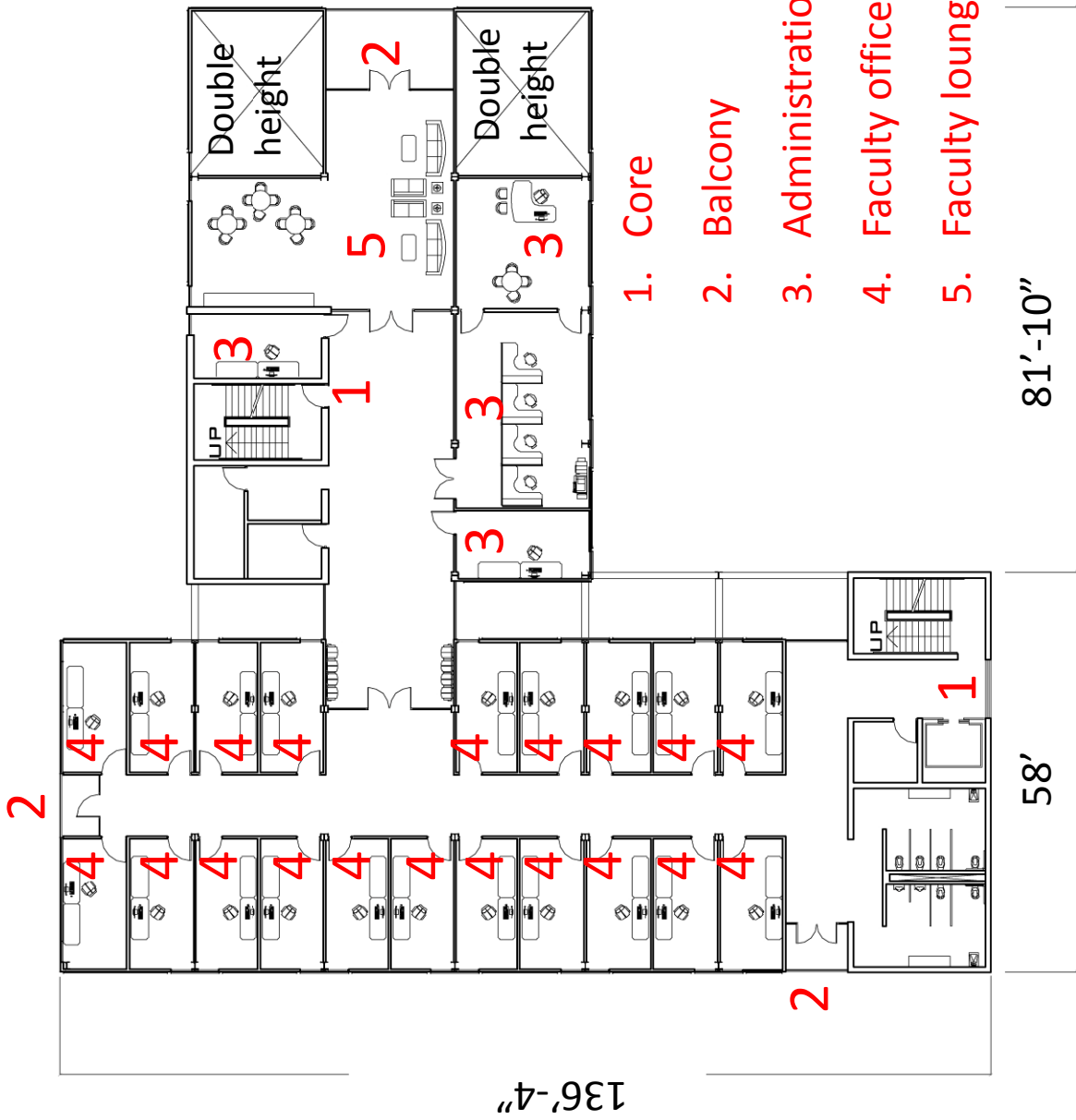
79% - Sunny

60% - Humidity

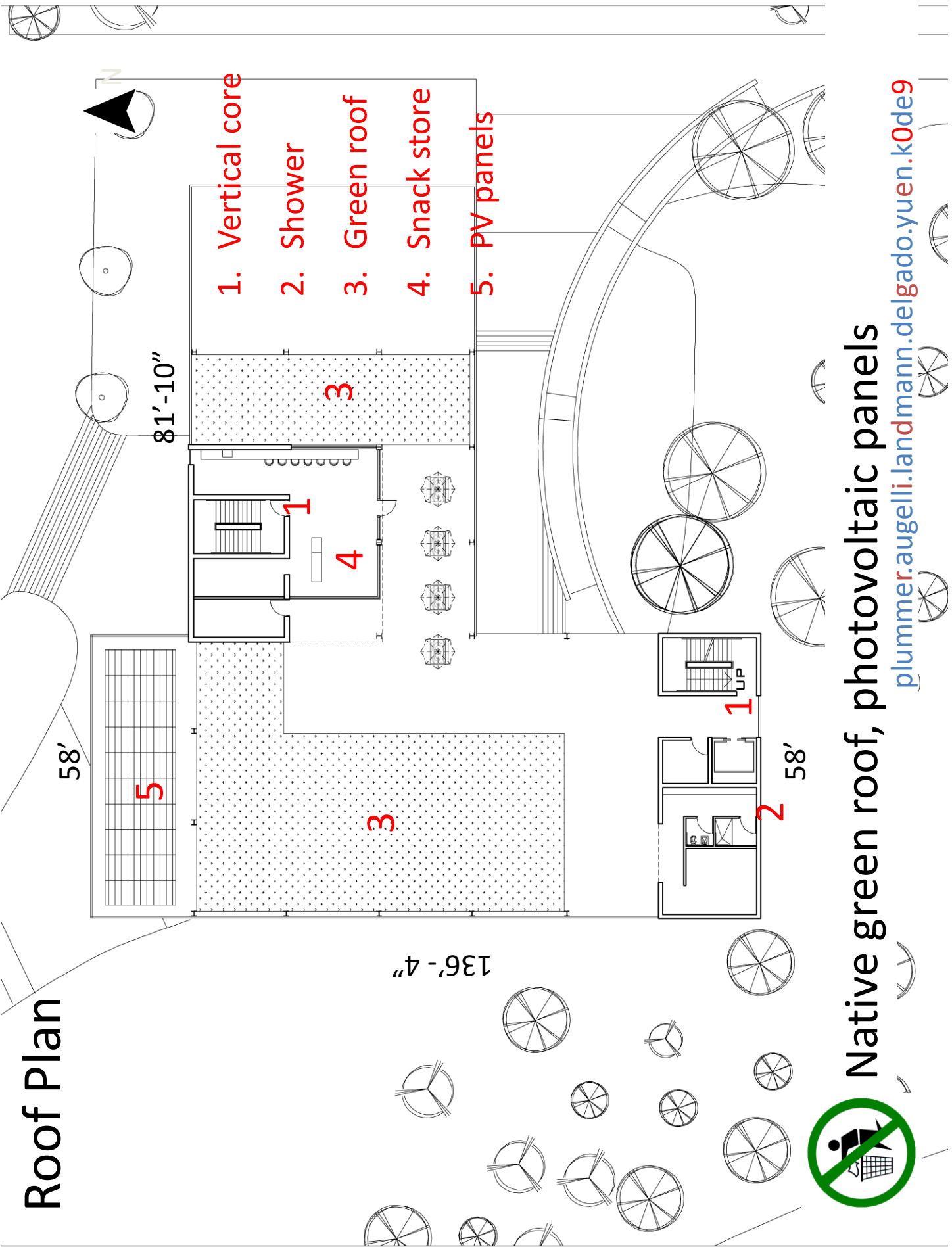
Floor 2



Floor 3



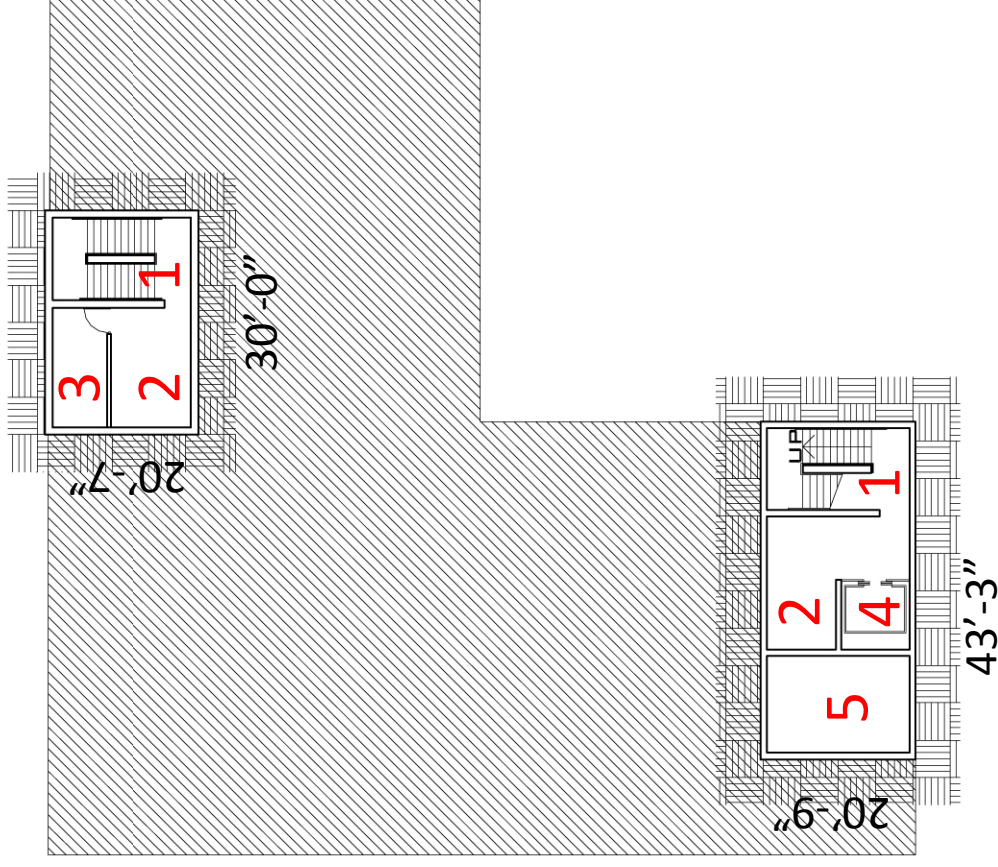
Roof Plan



Native green roof, photovoltaic panels

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Basement



1. Vertical core
2. Mechanical
3. Electrical
4. Elevator
5. Grey water tank

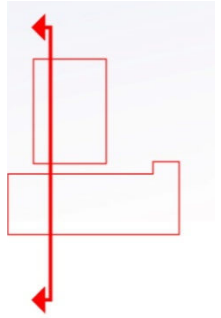
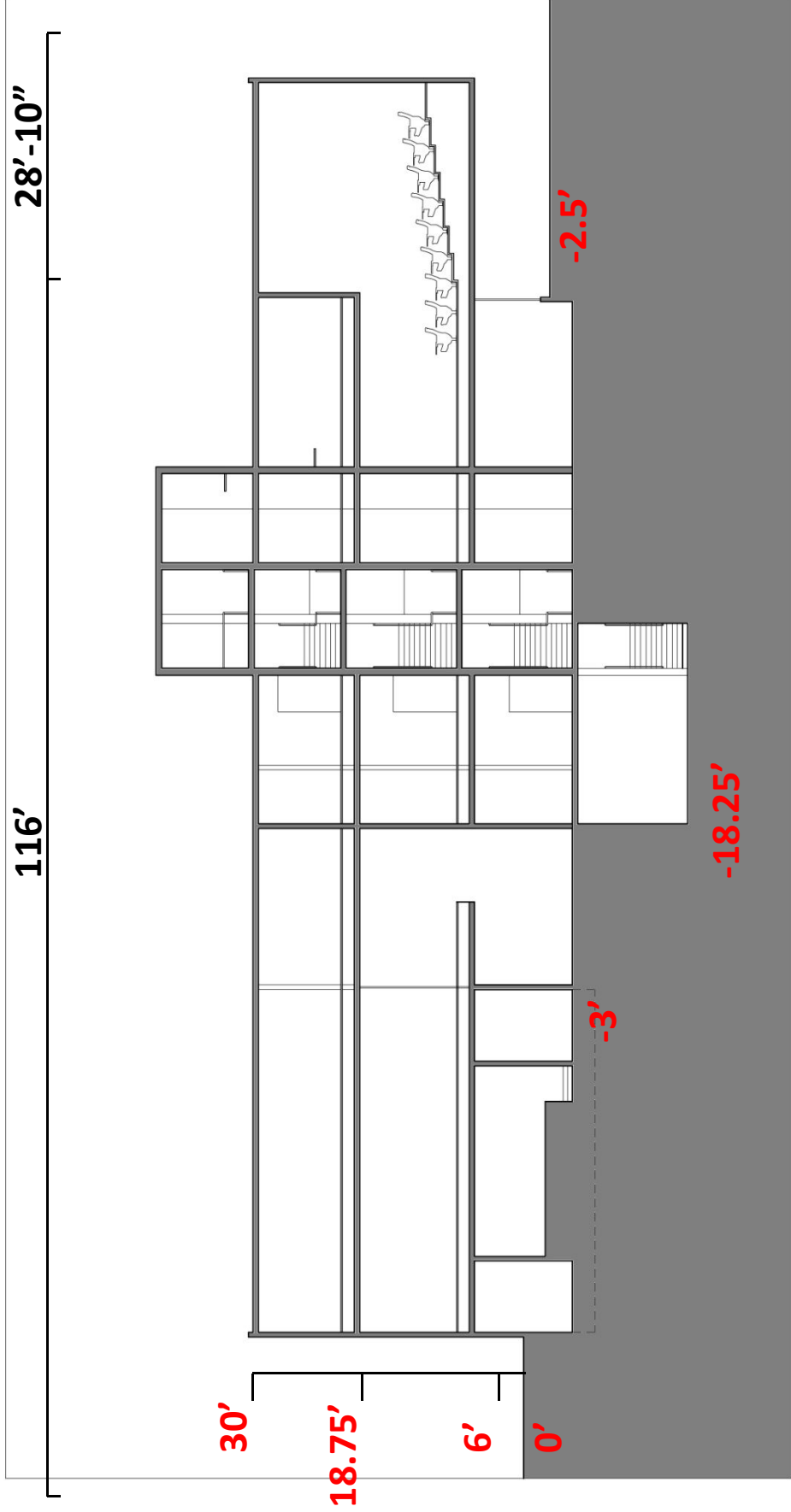


Grey water reuse system, Otis Gen2 Machine Room-less elevator

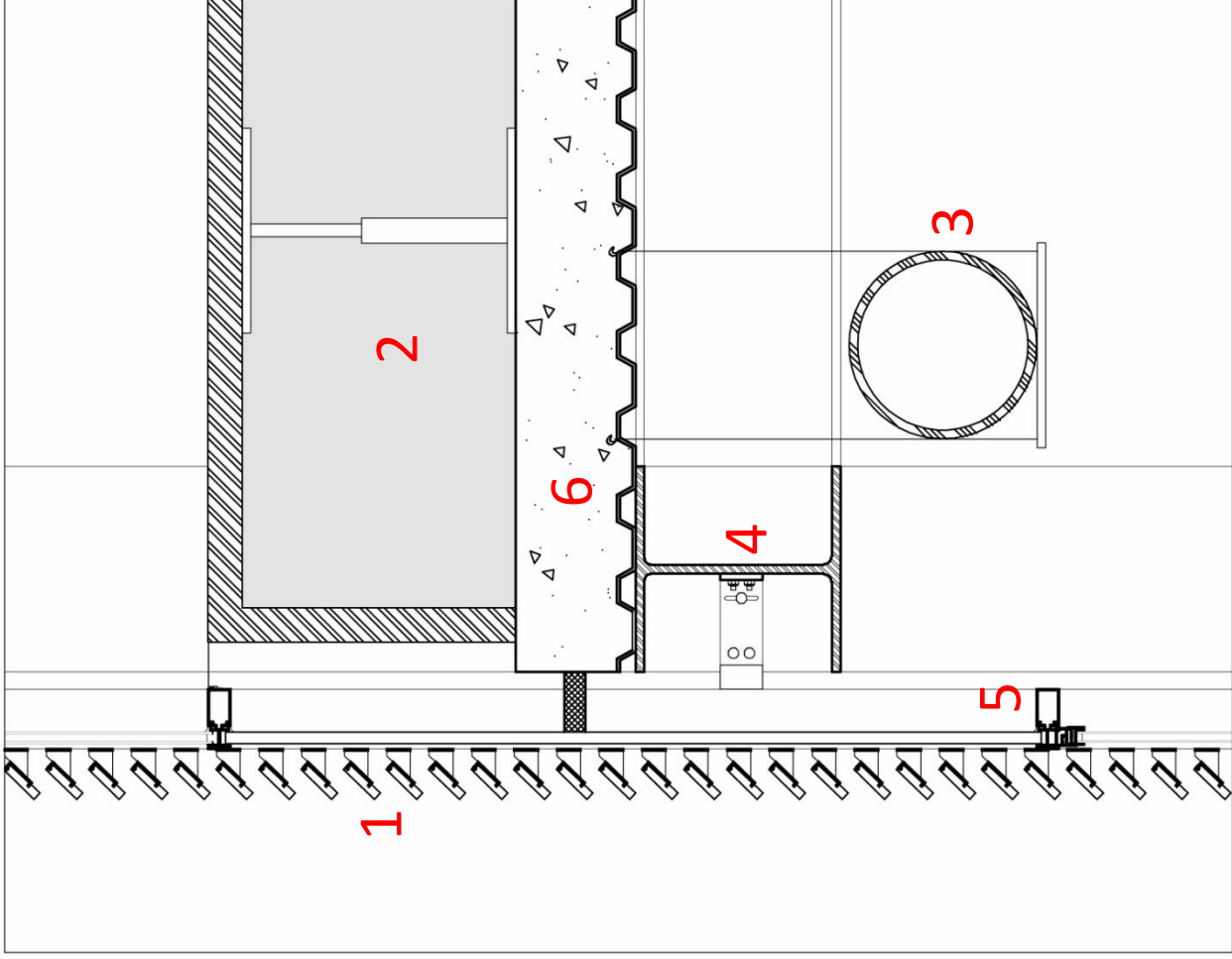
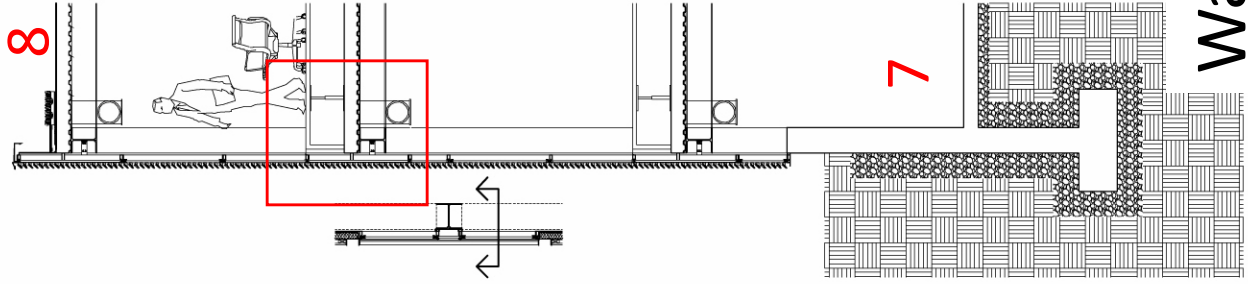
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Section

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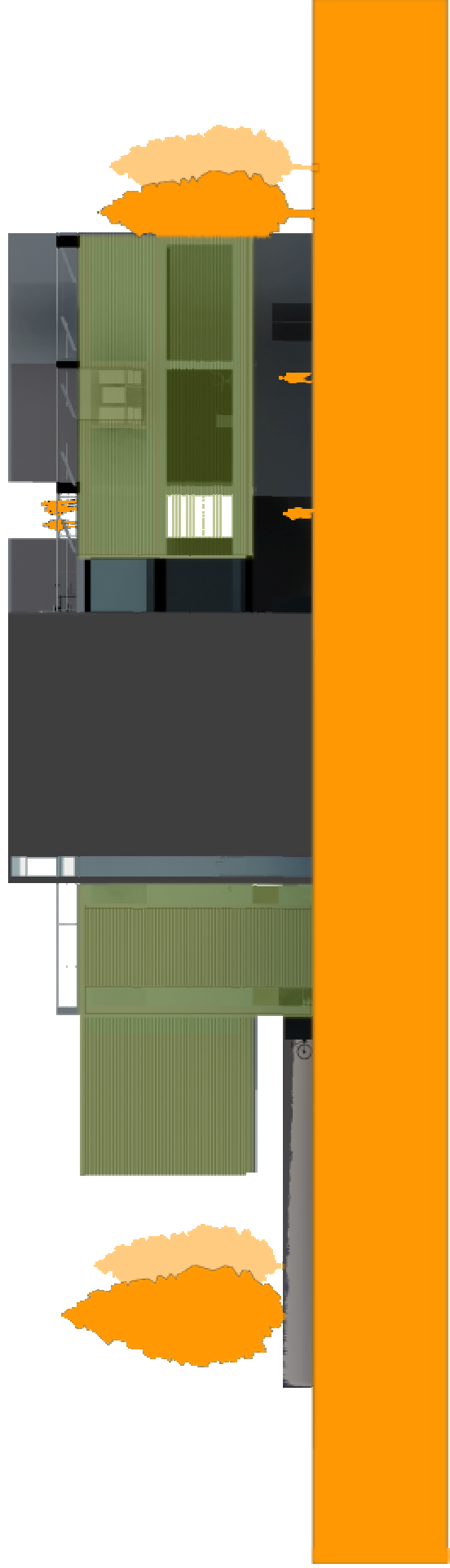
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1. Wood
2. Under floor
3. Expose return duct
4. Beam
5. Curtain wall
6. Concrete floor slab
7. Retain wall
8. Green roof

Wall Section

North Facade



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South Facade

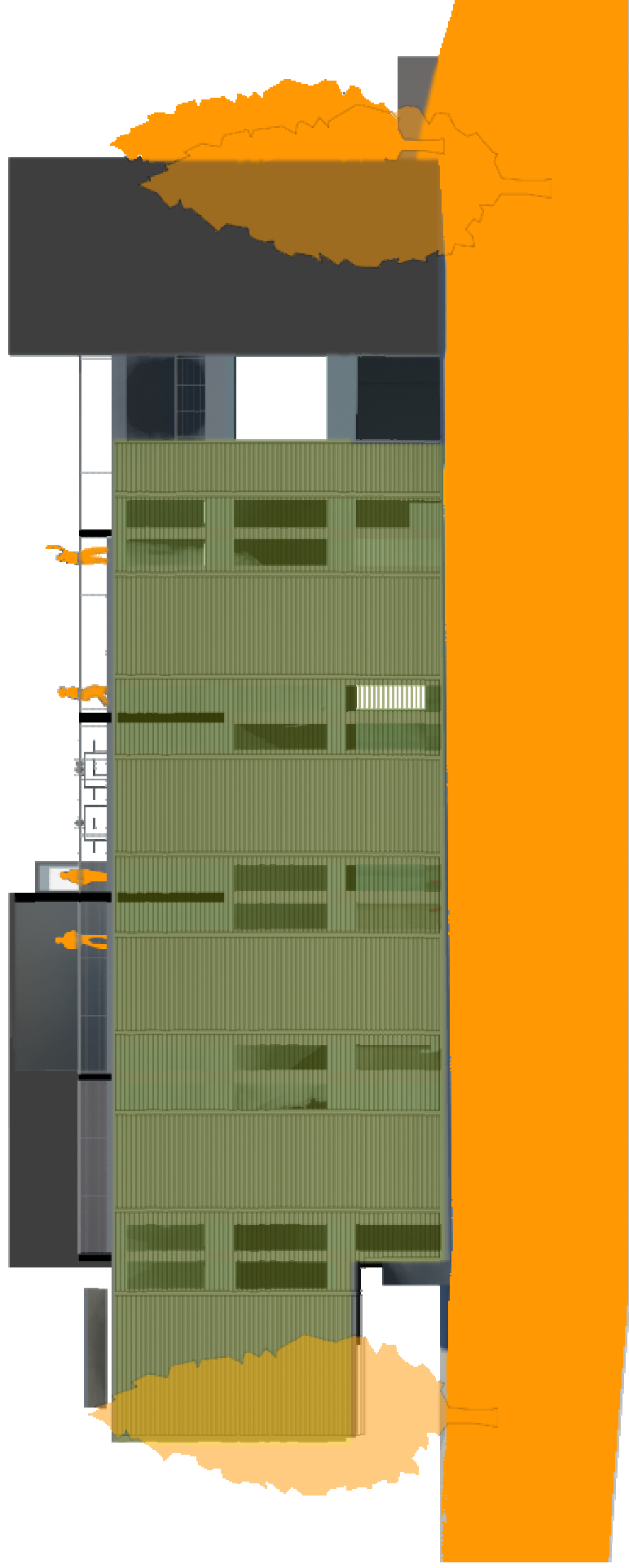


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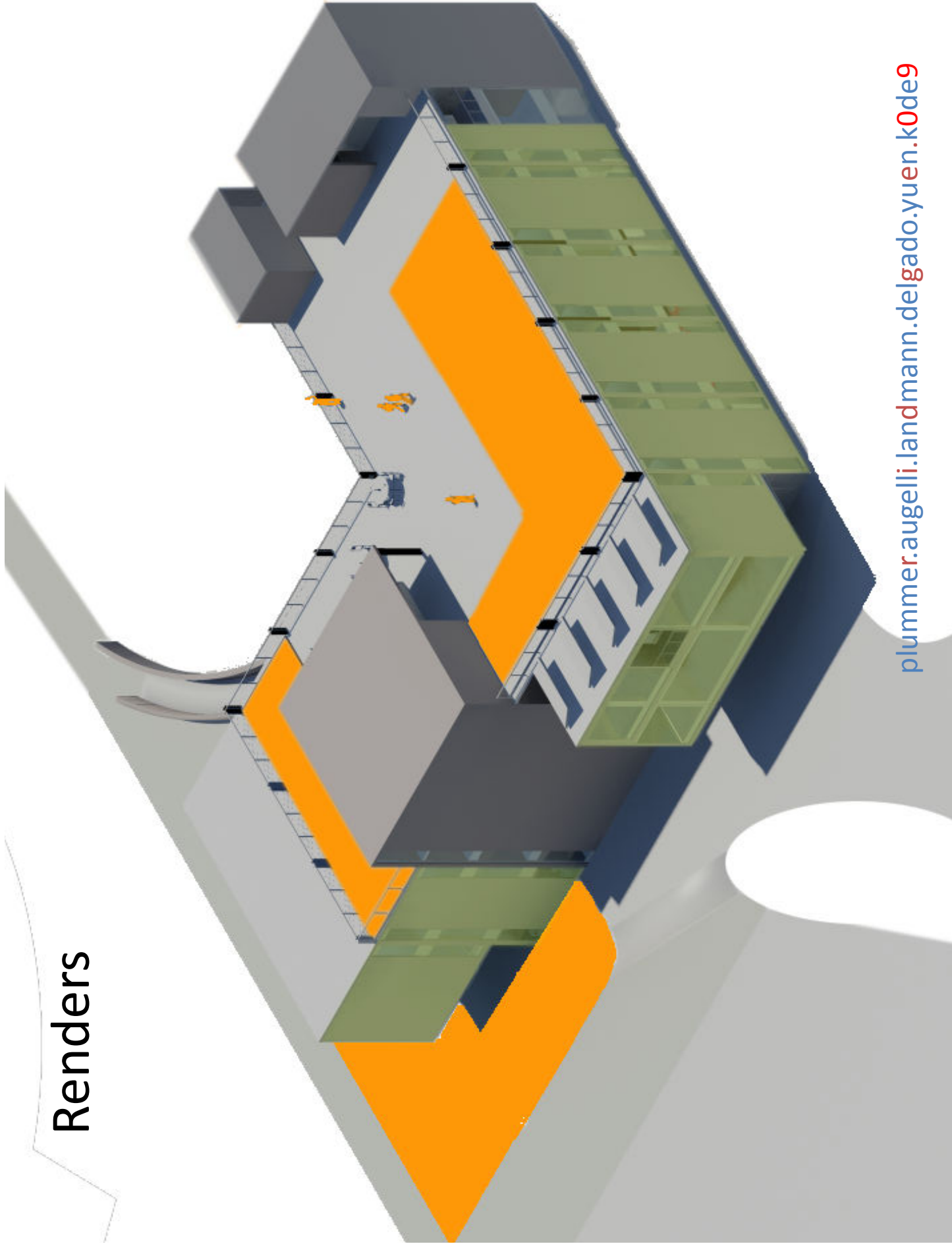
East Facade



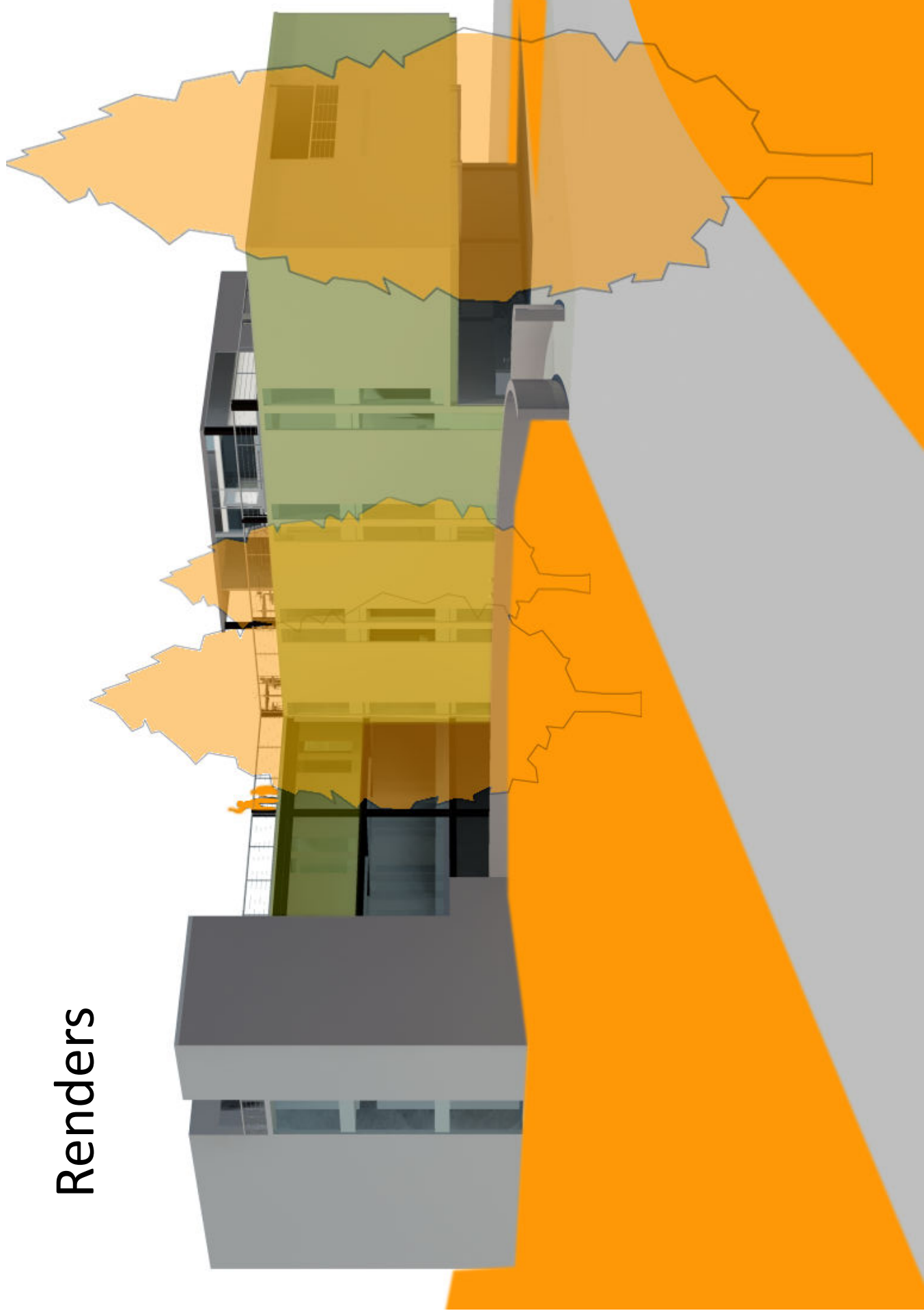
West Facade



Renders



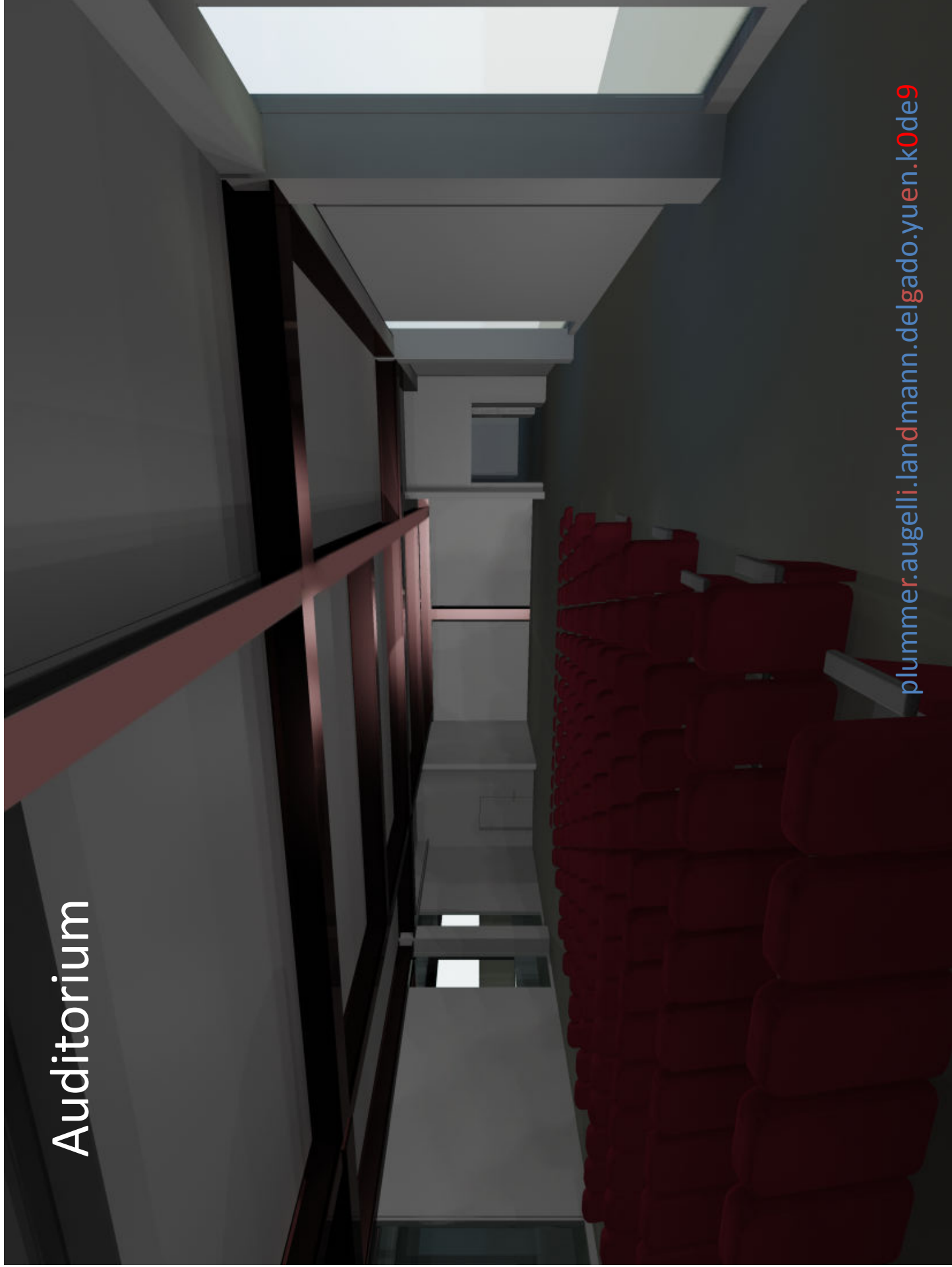
Renders



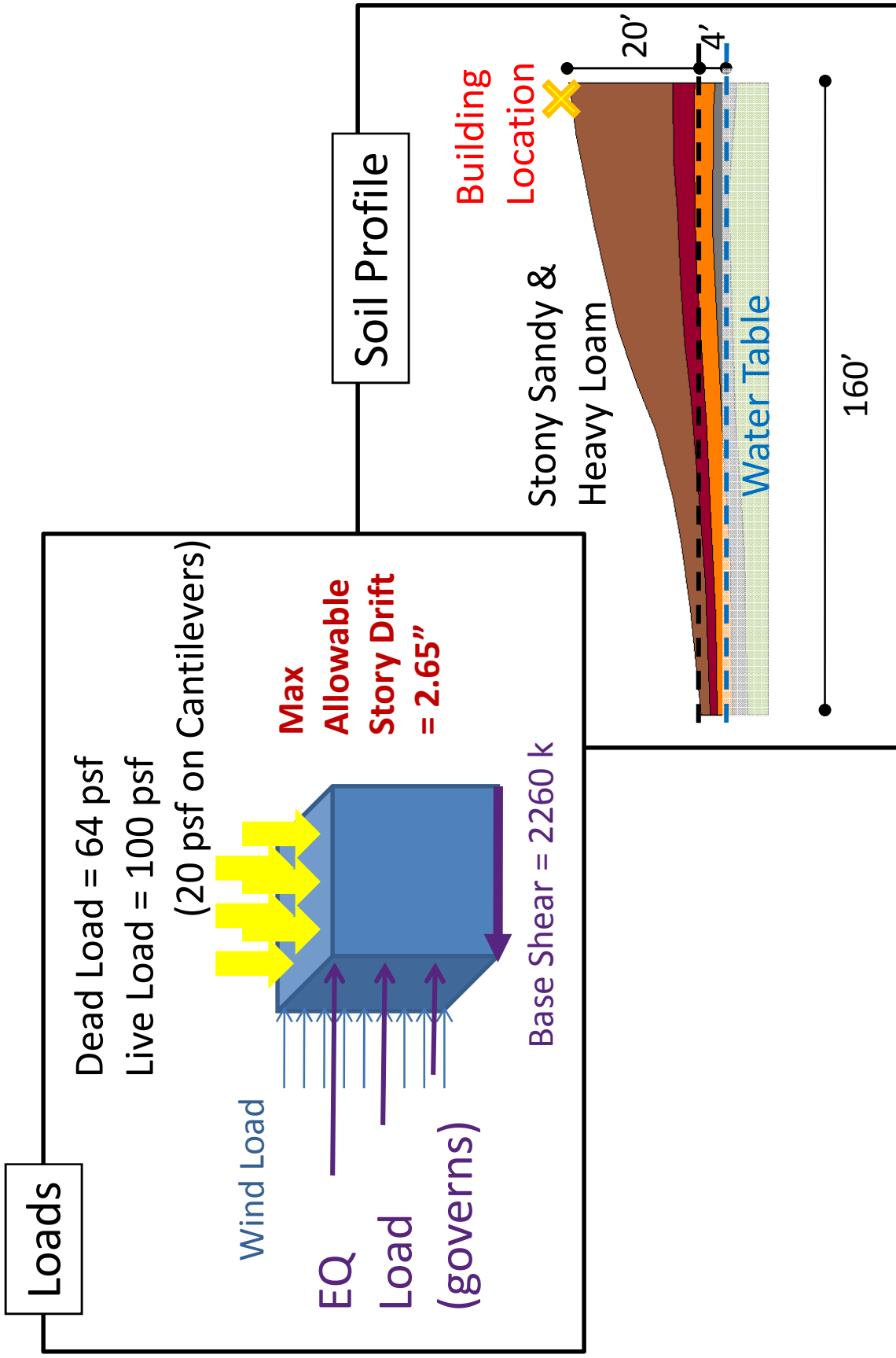
Plaza

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Auditorium



Design Loads



Gravity System Evolution



Zero Waste

Recycling
< 150 miles

Acquisition and
decommissioning

3 weeks
No formwork
AISC ease

Construction and design

Floor height constraint

Initial lateral system
integration

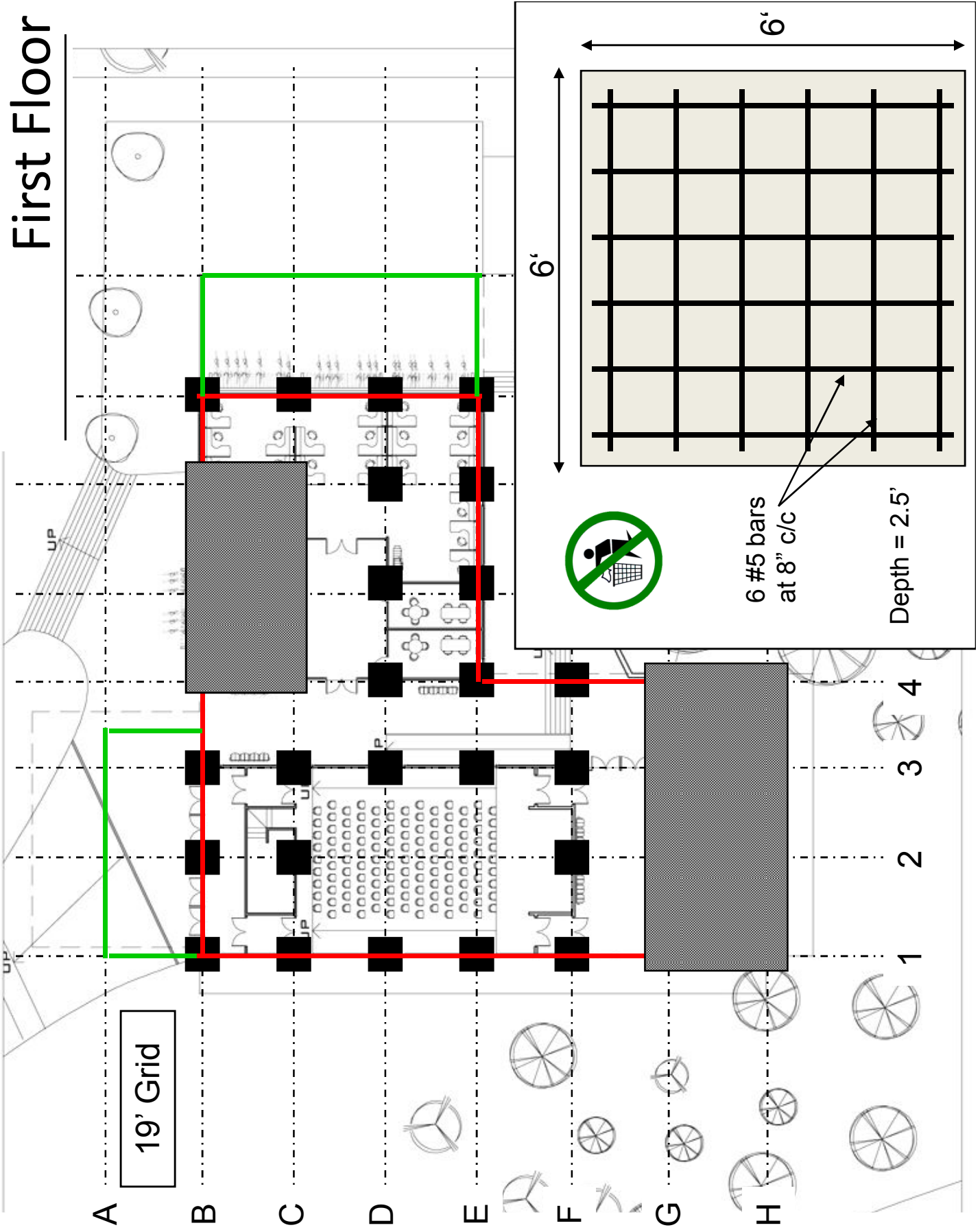


Lateral System Evolution
A – E – C

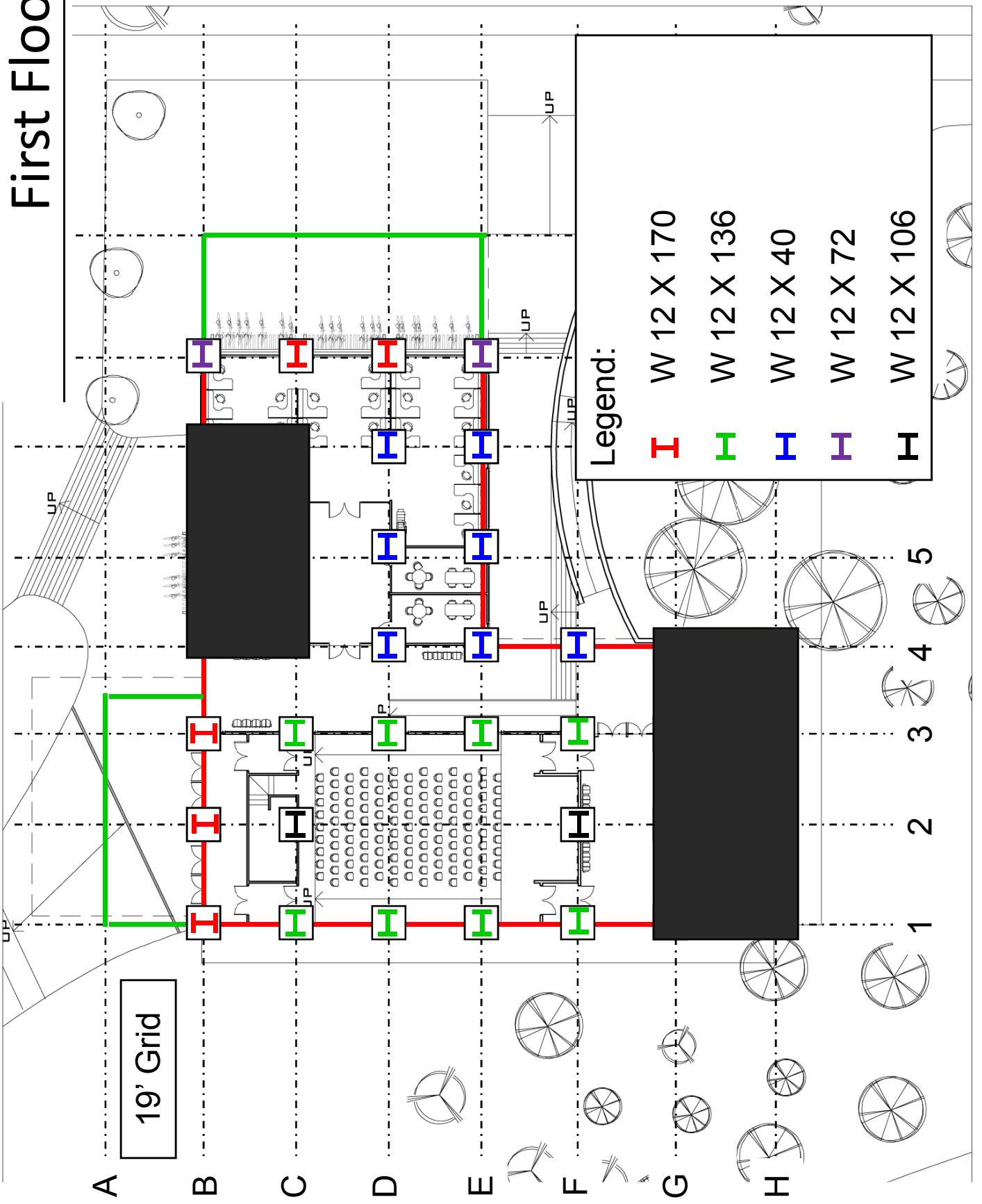
Lateral System Evolution



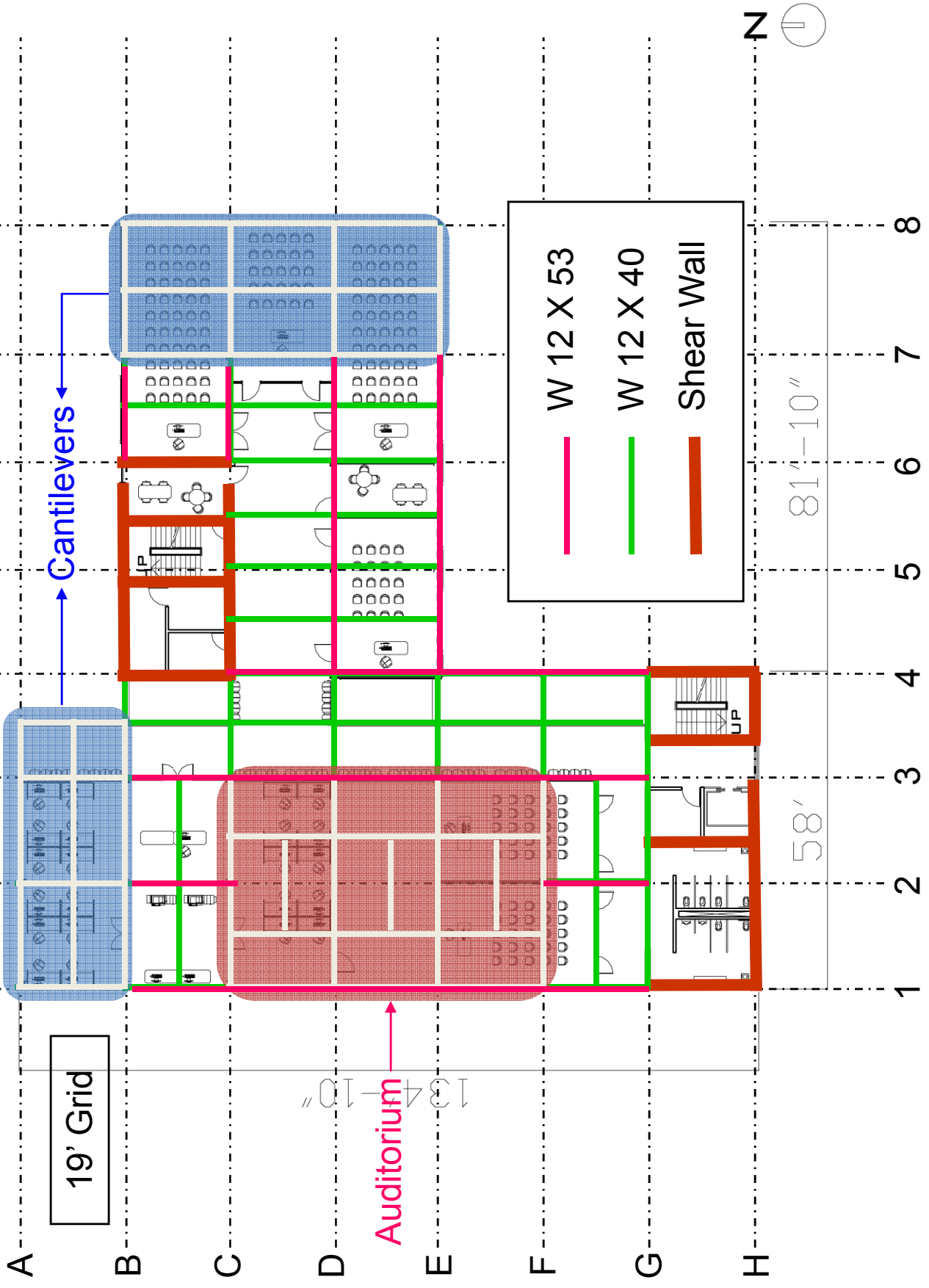
First Floor



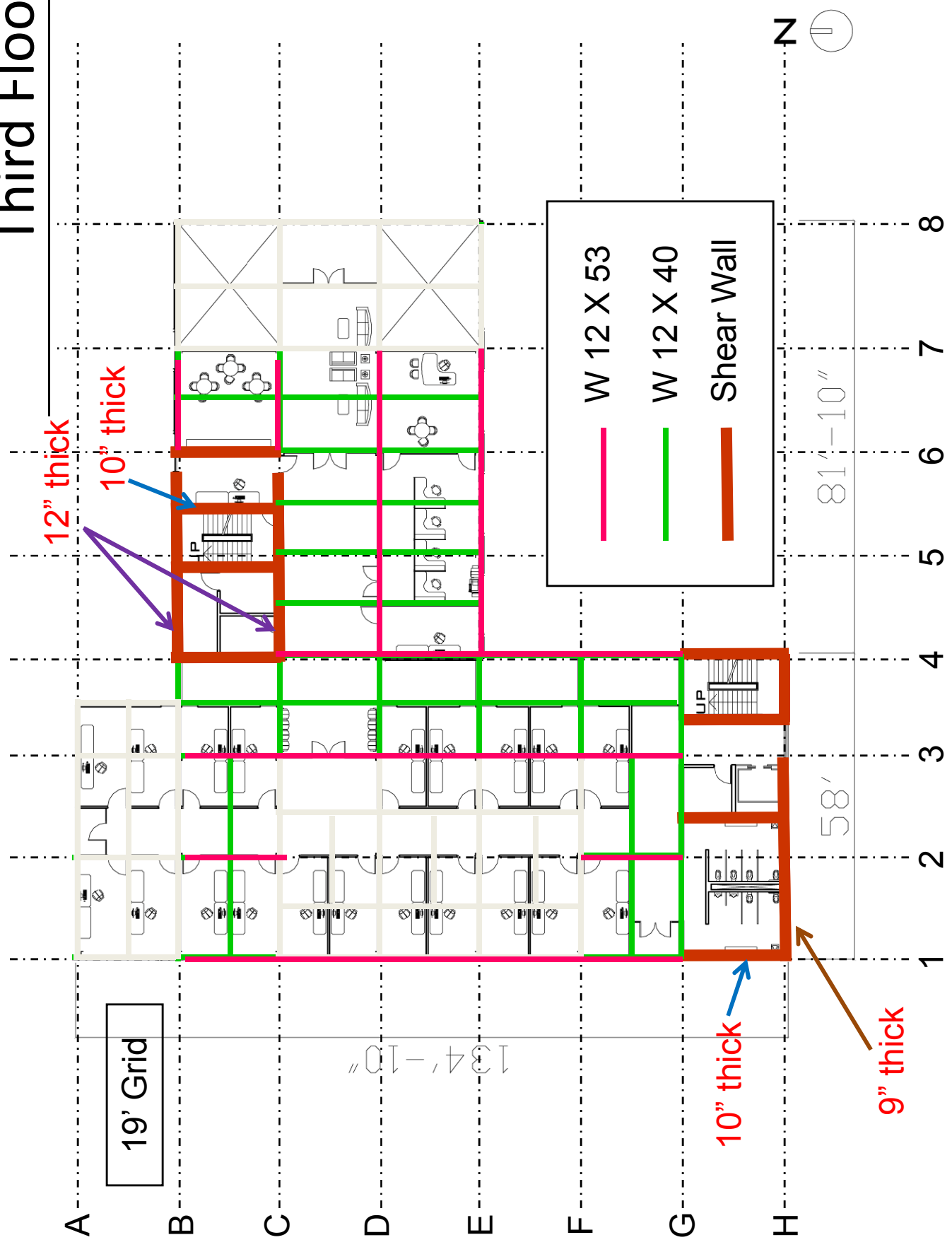
First Floor



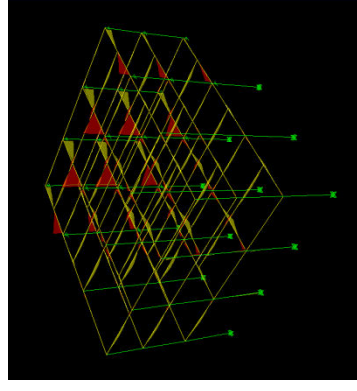
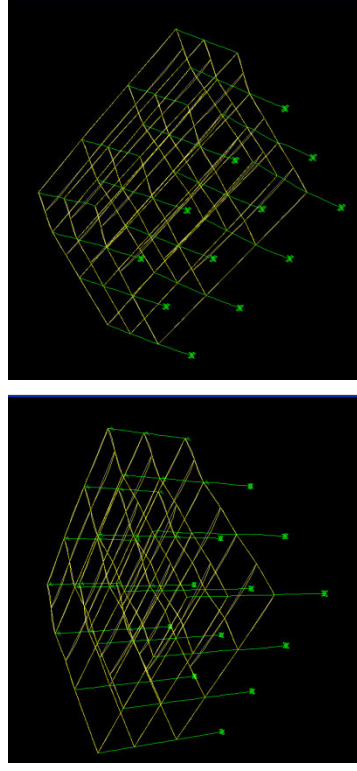
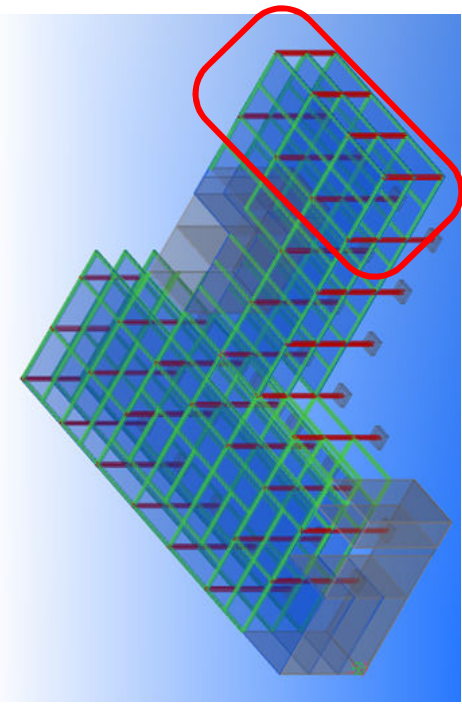
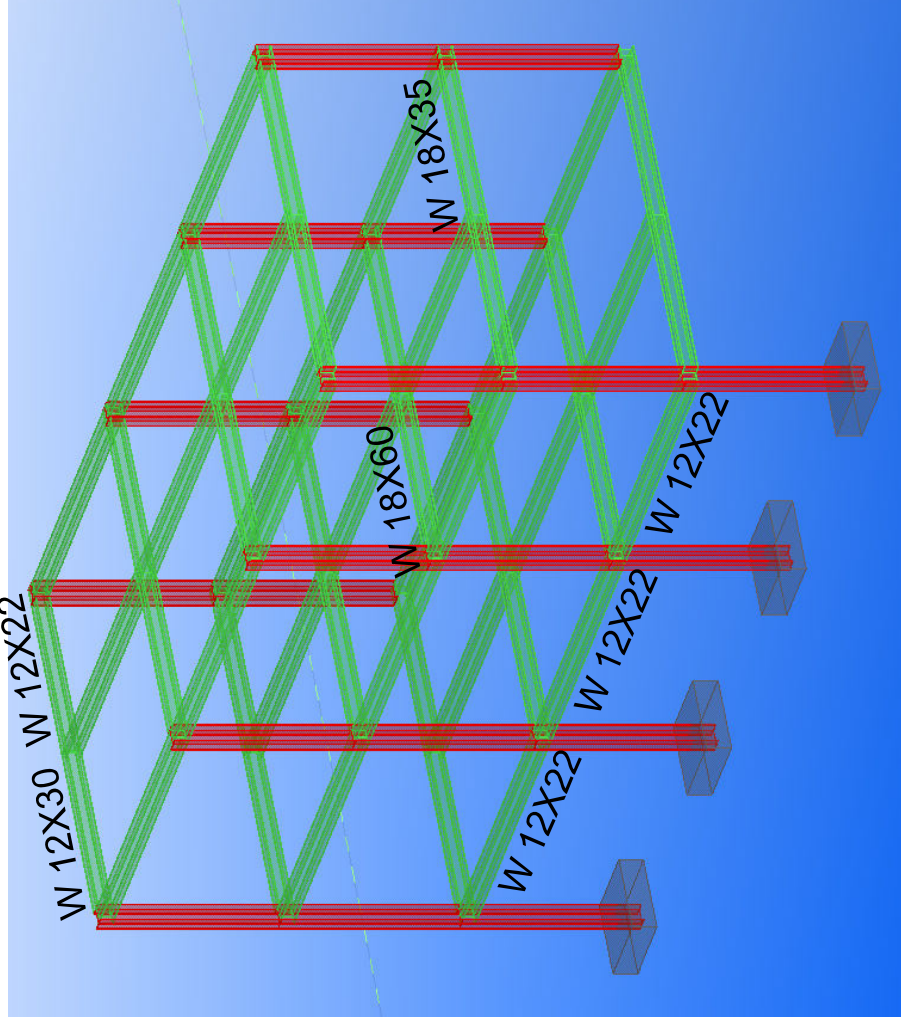
Second Floor



Third Floor



East Cantilever



Final Design

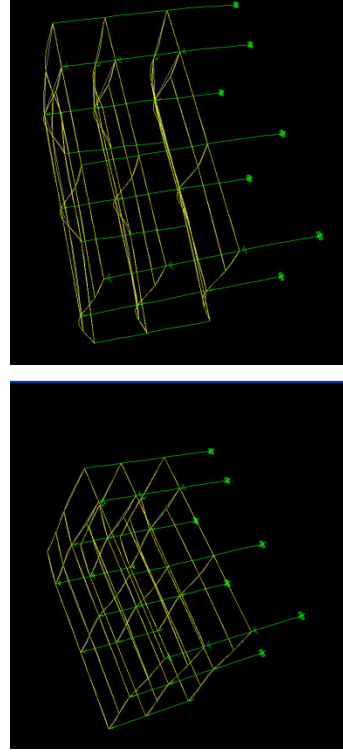
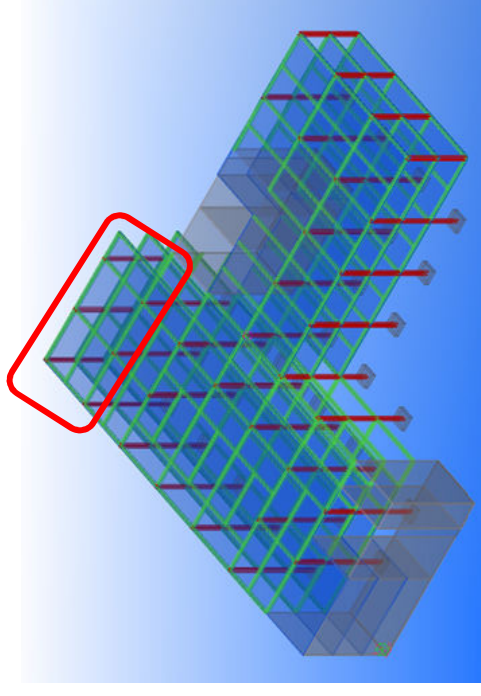
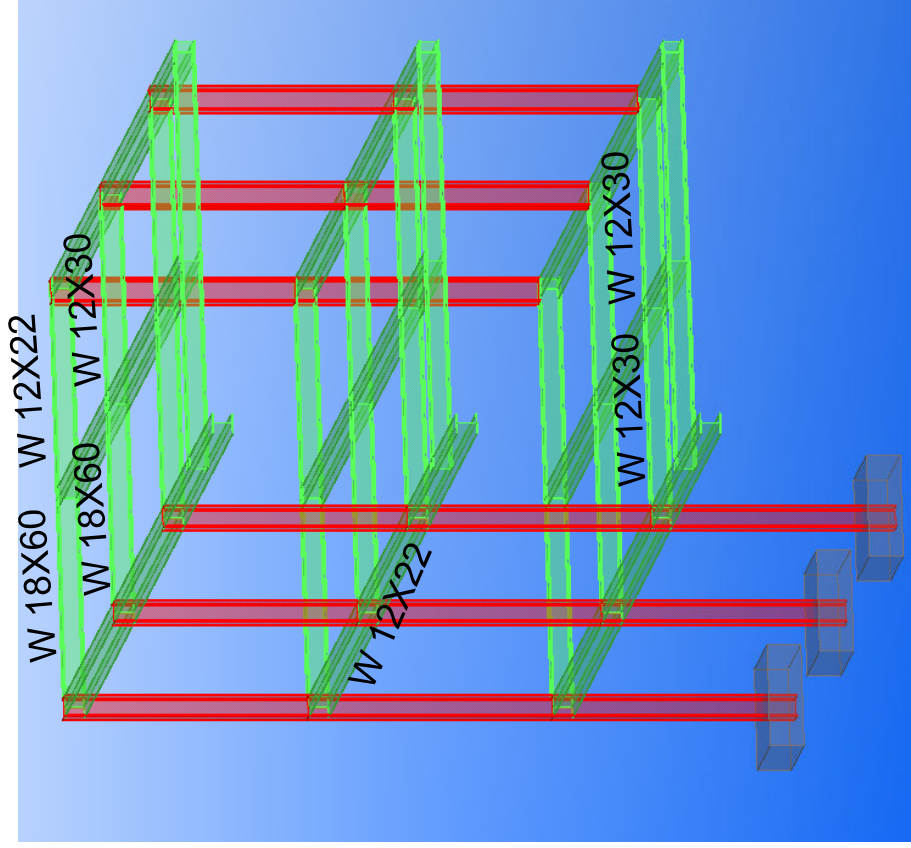
Initial Design



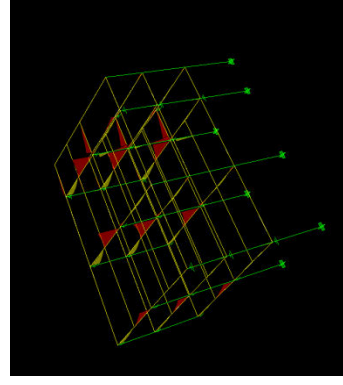
Final Design

Initial Design

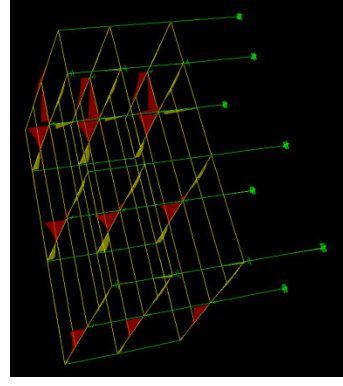
North Cantilever



Final Design

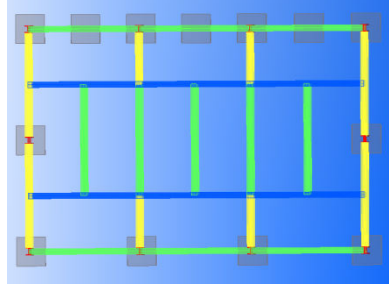
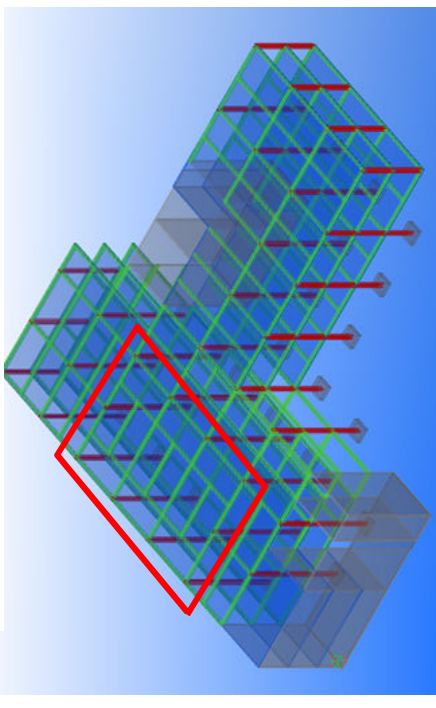
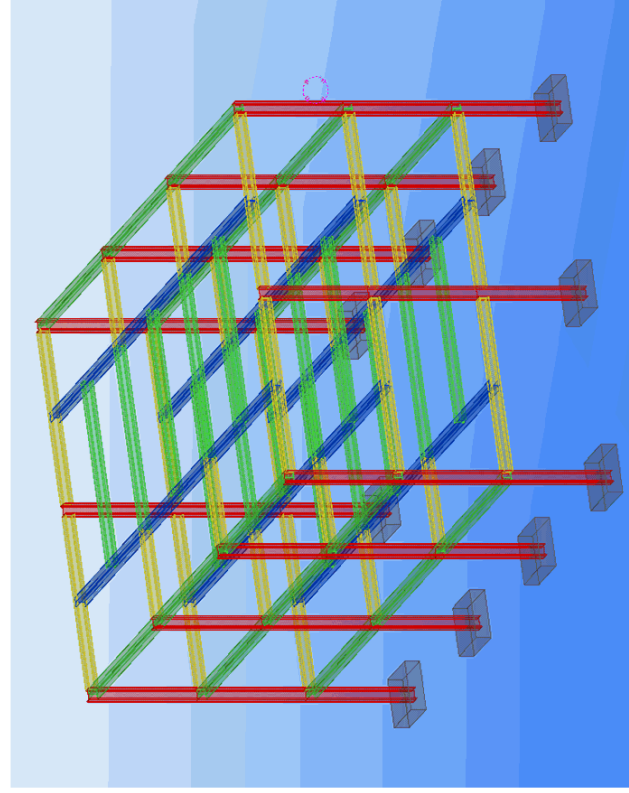


Final Design

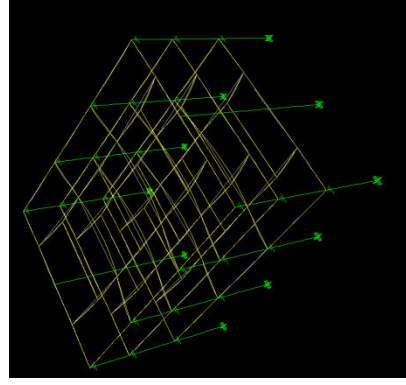


Initial Design

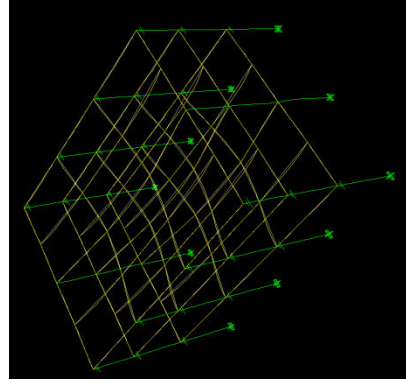
Auditorium



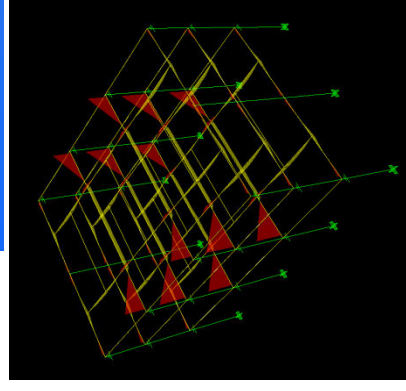
- W 12 X 22
- W 12 X 26
- W 12 X 106



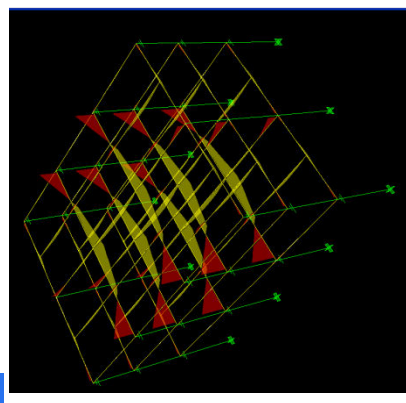
Final Design



Initial Design

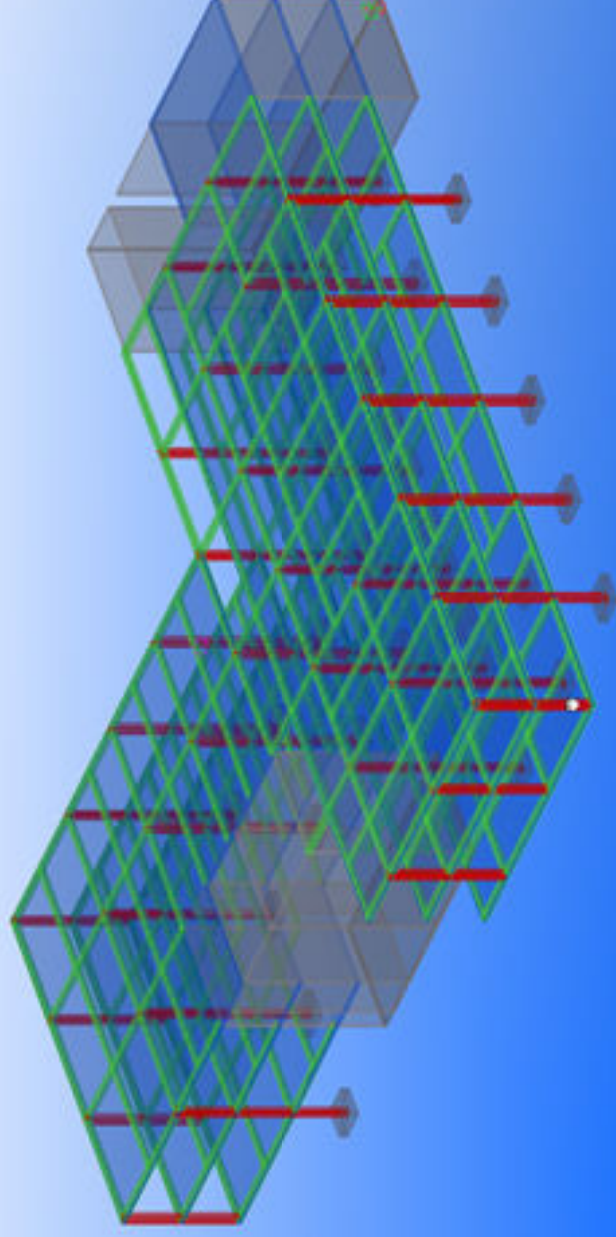


Final Design



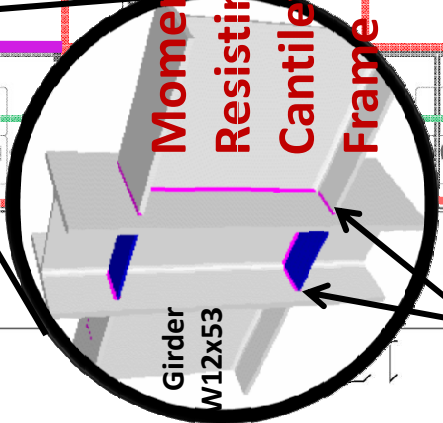
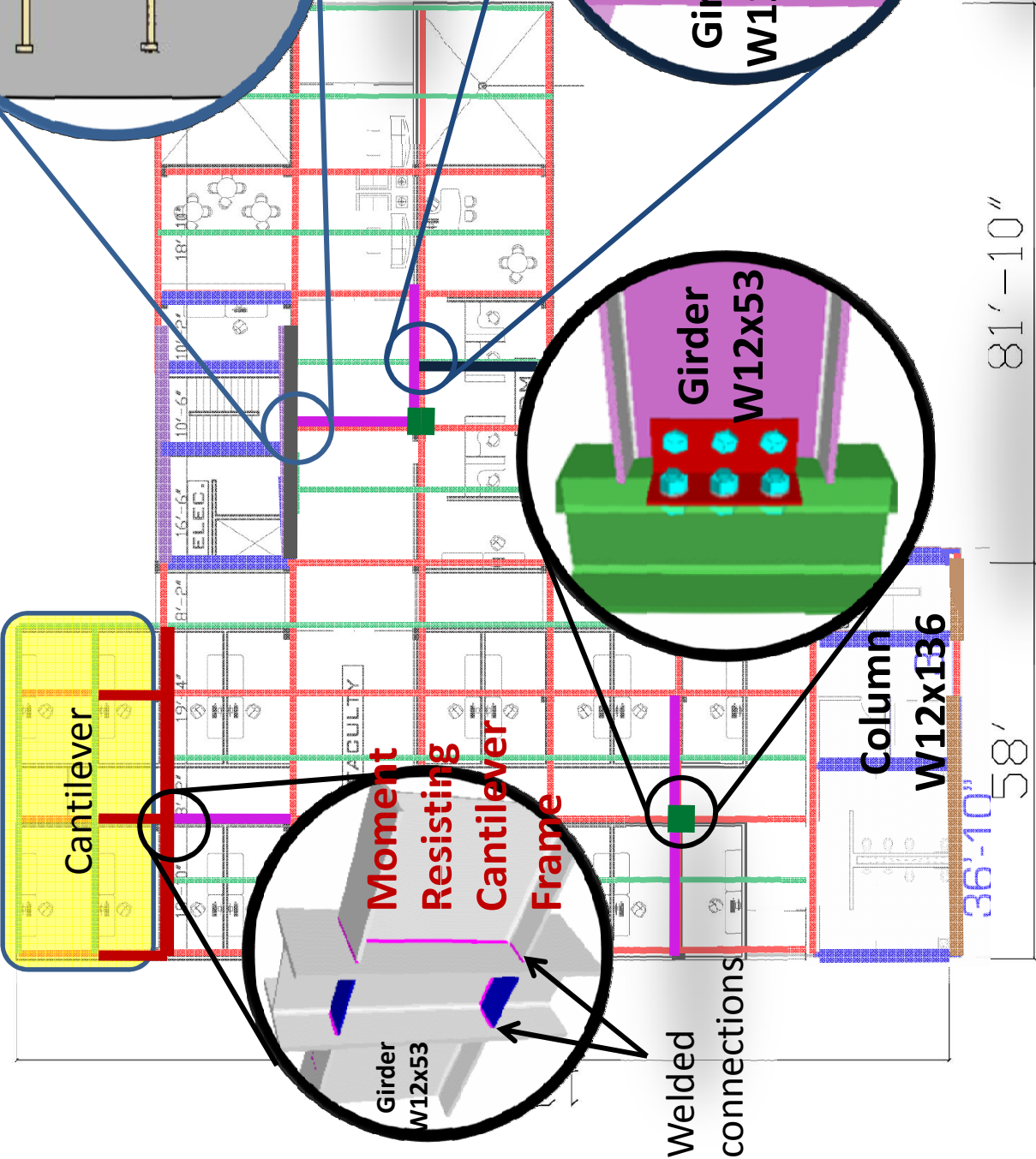
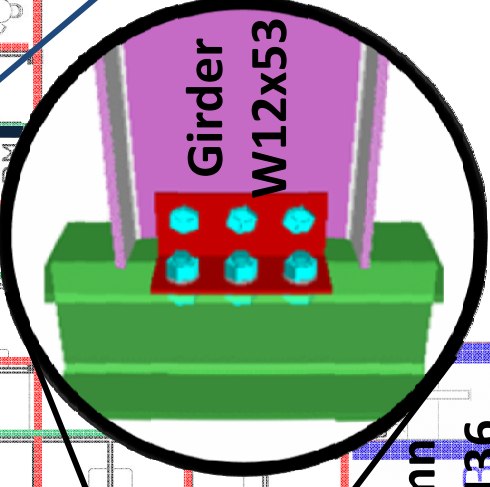
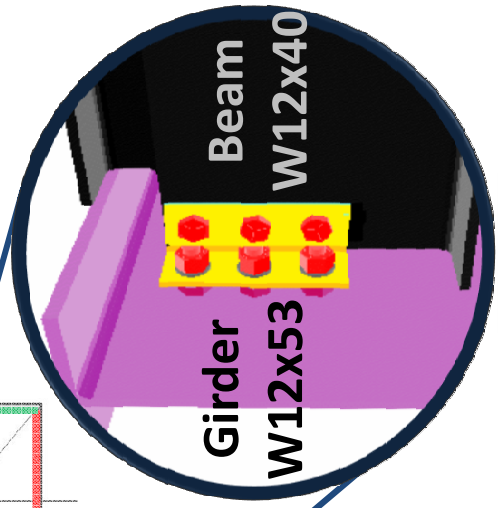
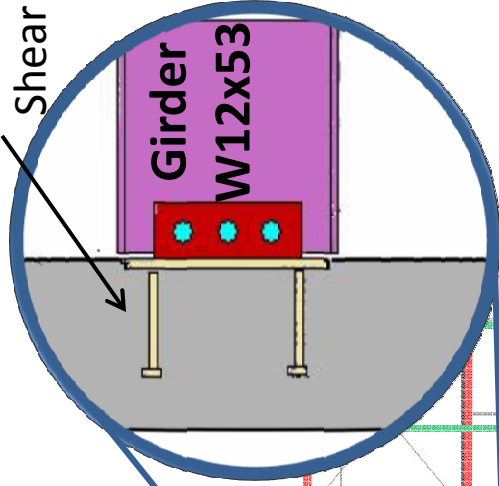
Initial Design

Tekla Animation



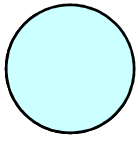
Typical & Special Connections

12" Shear Wall Embedded Shear Tabs

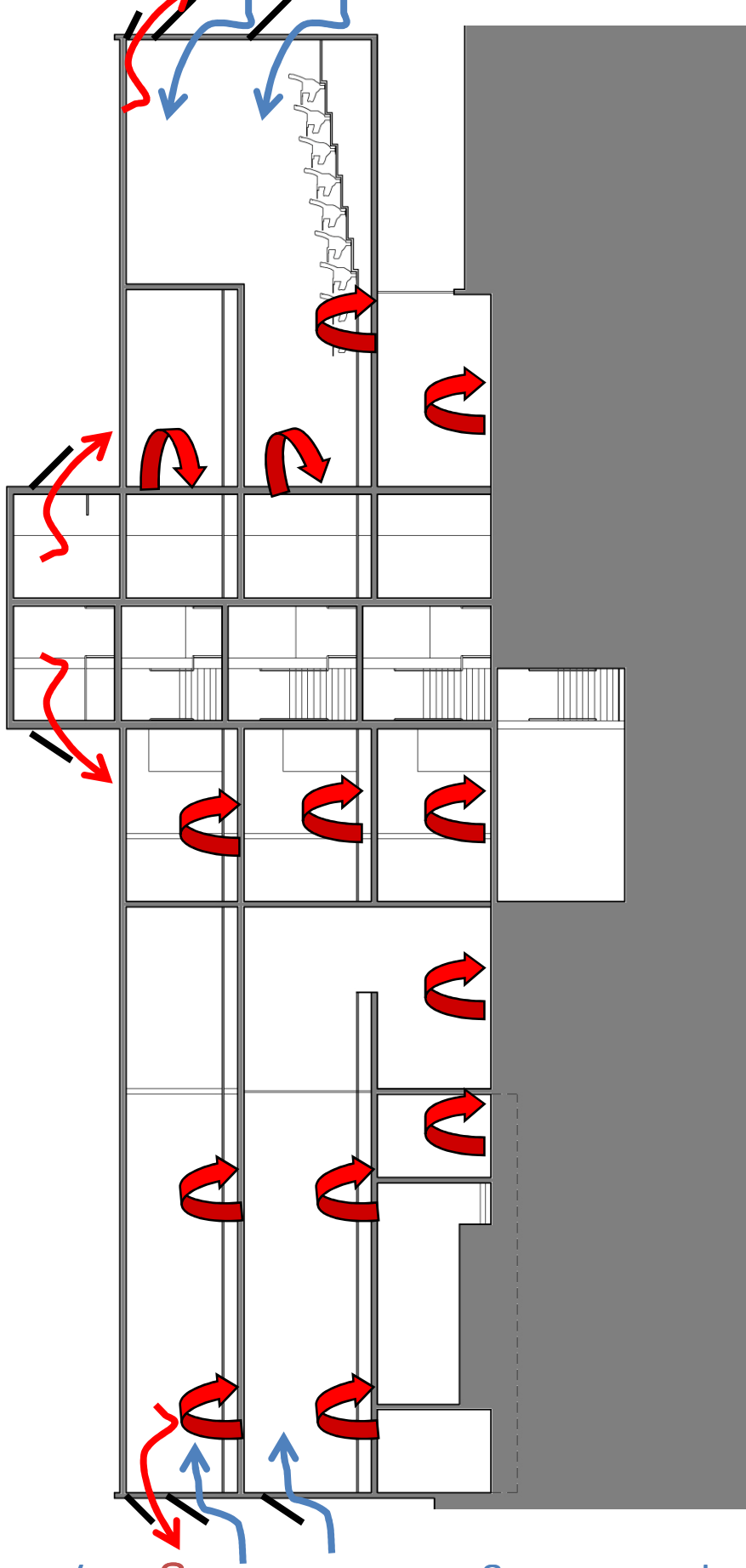


Welded connections

MEP - HVAC



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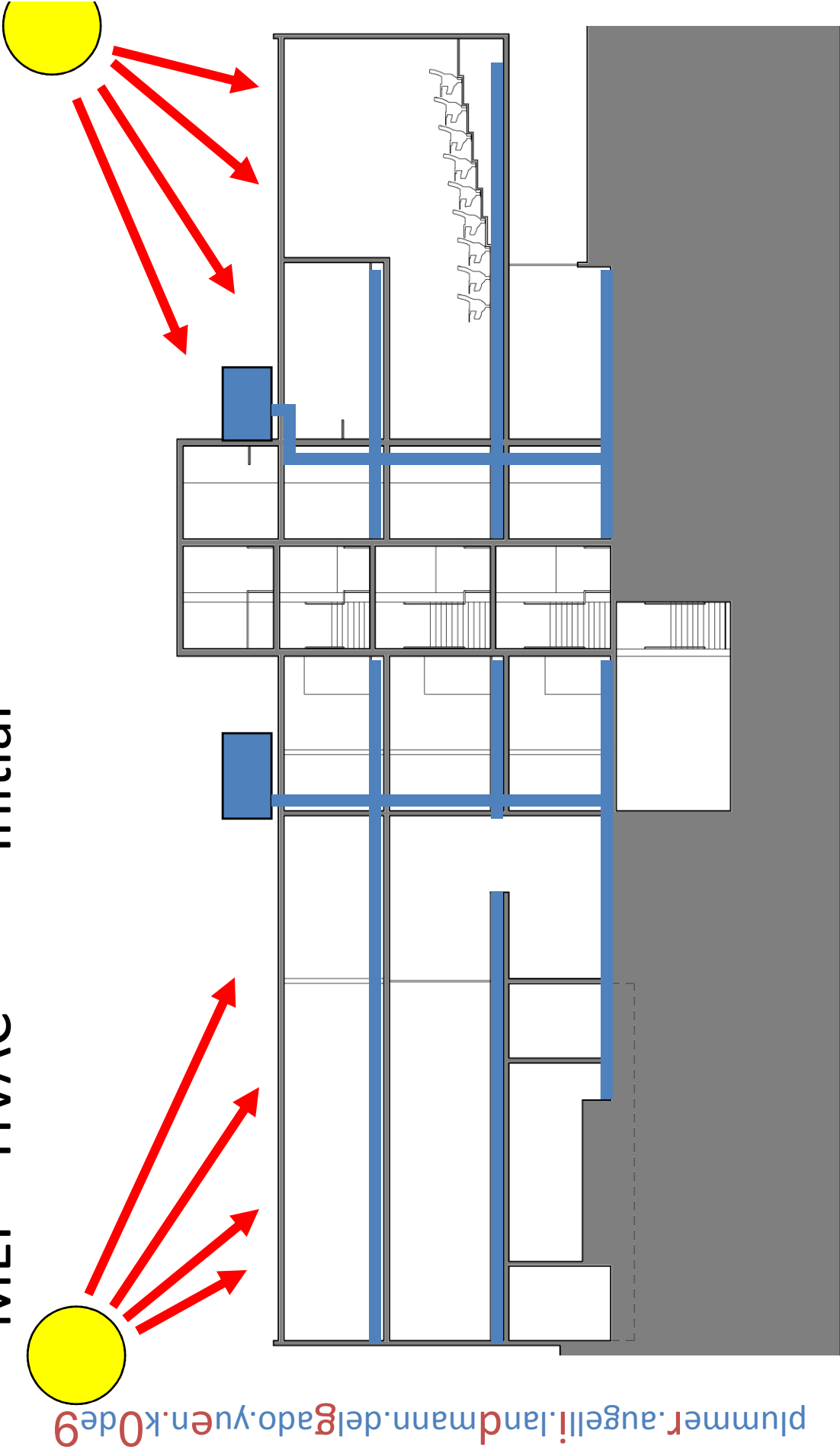
Night flushing, geothermal, underfloor

Initial Zones



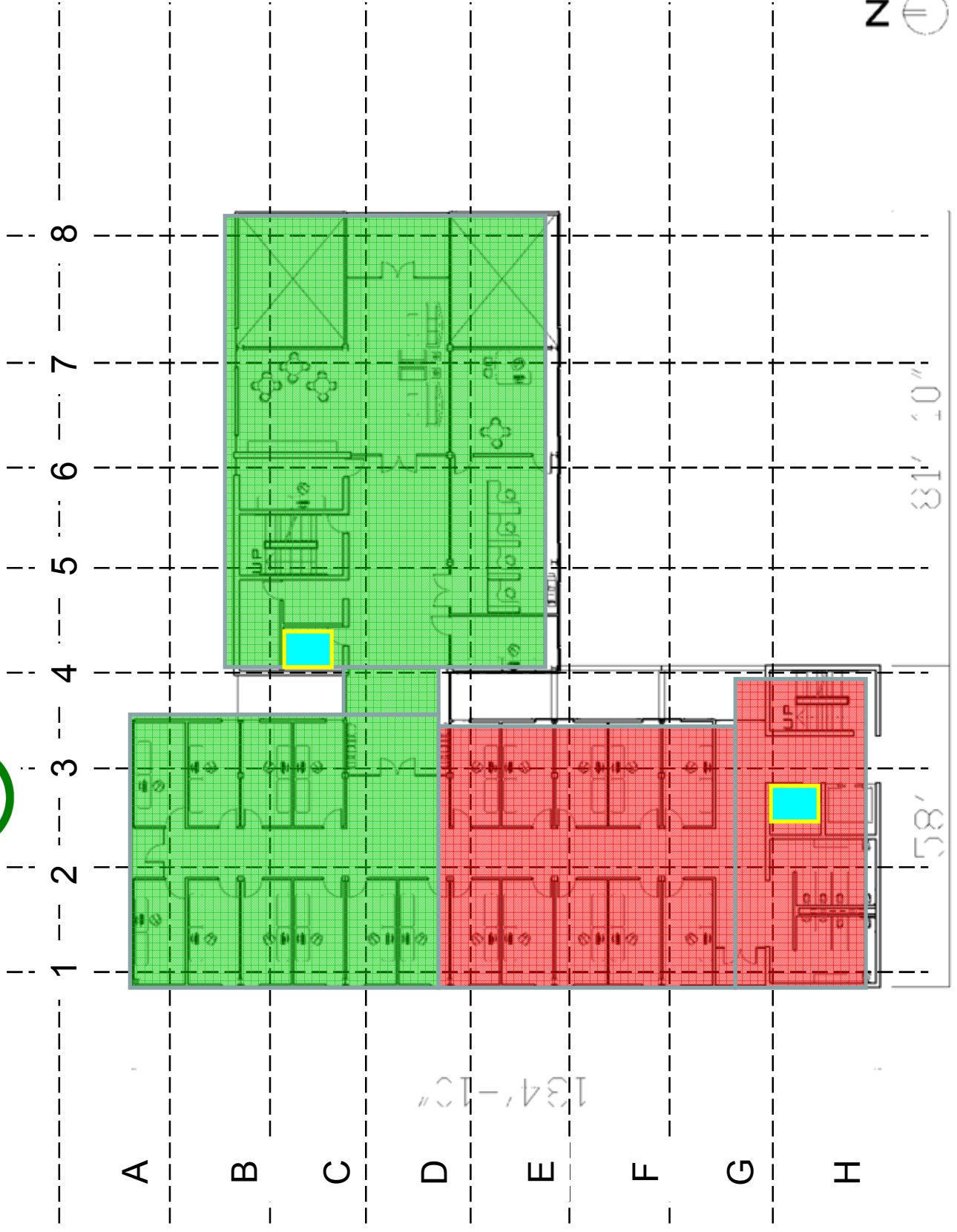
MEP - HVAC

Initial



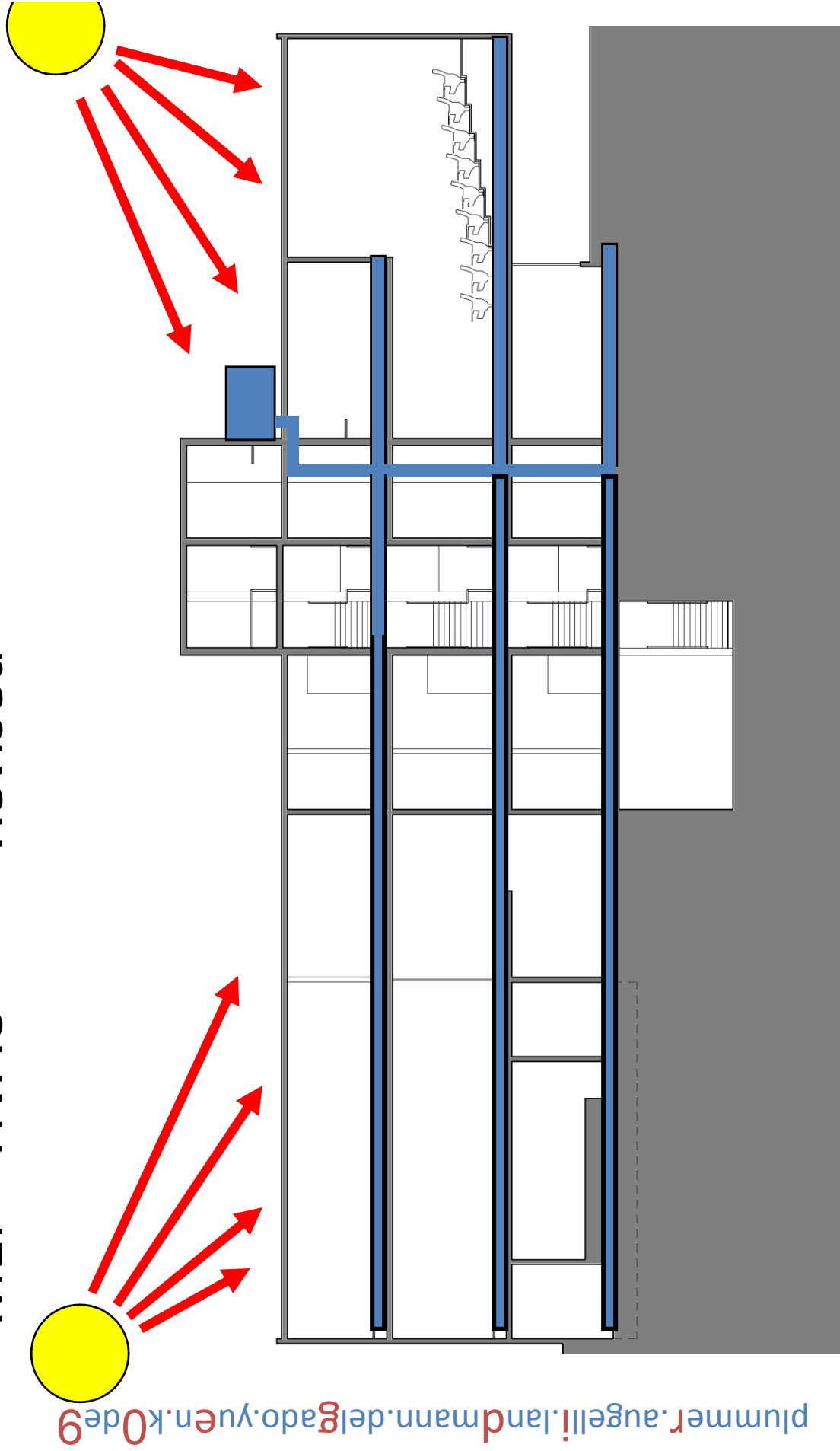


Revised Zones

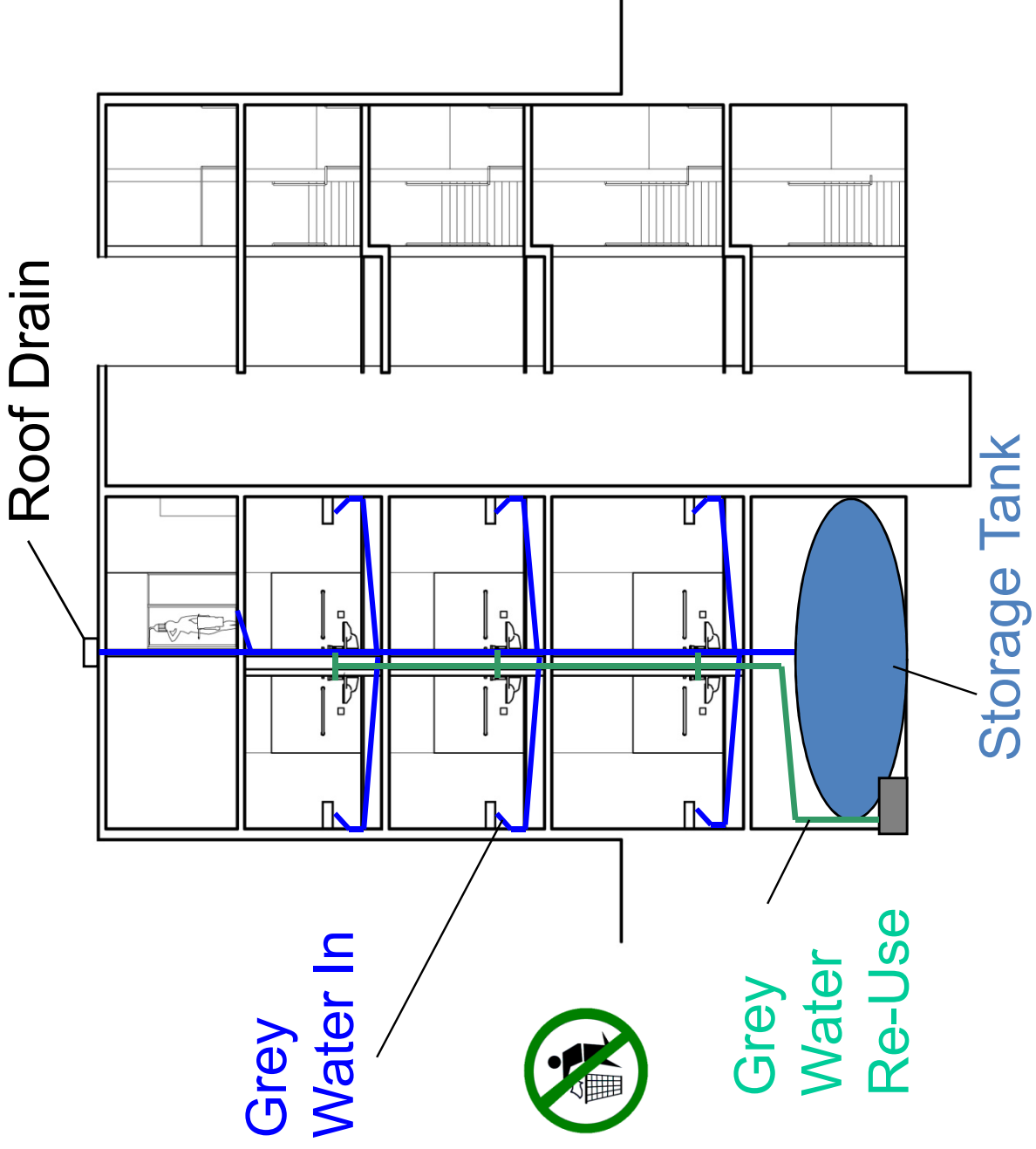


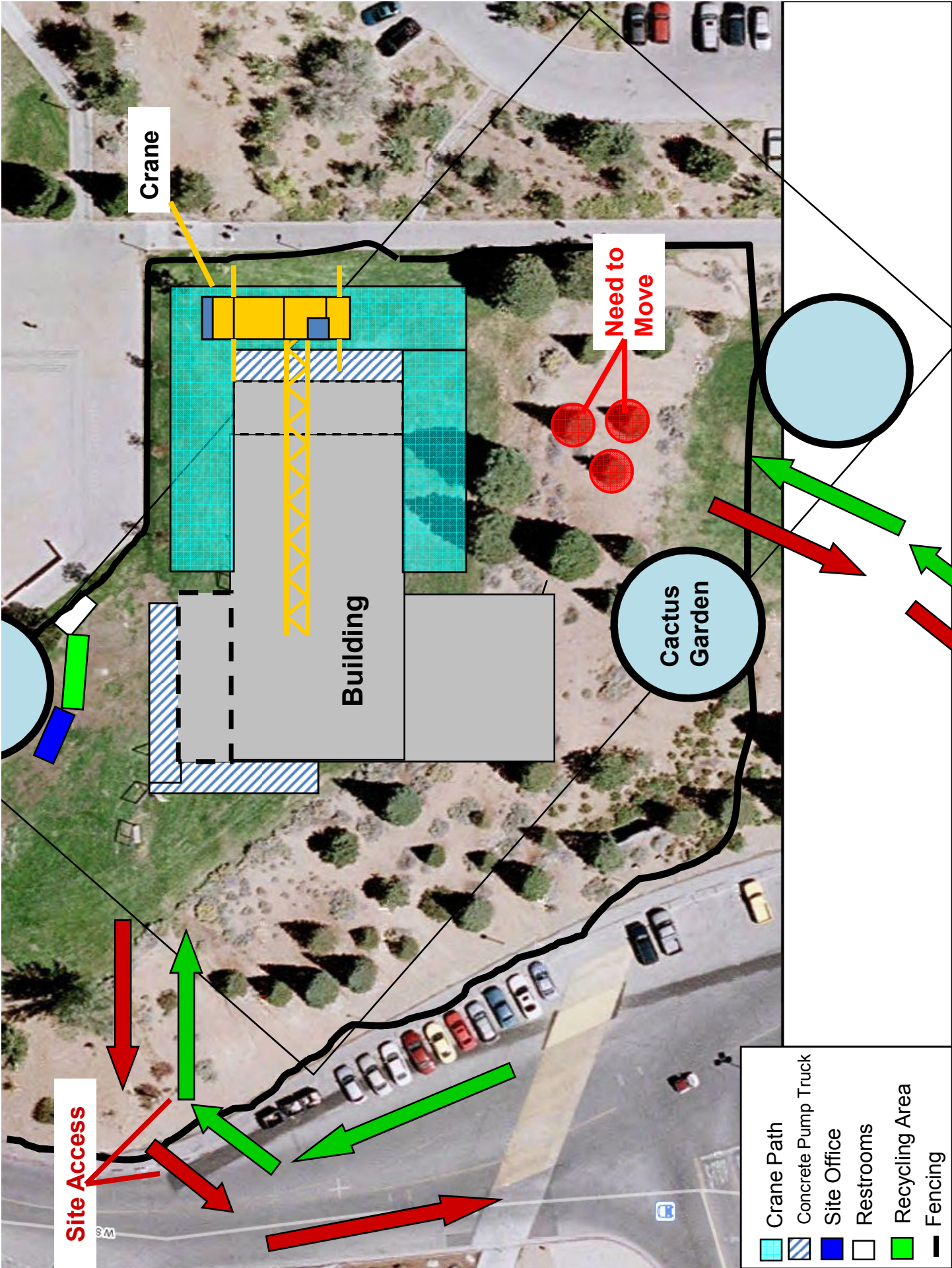
MEP - HVAC

Revised

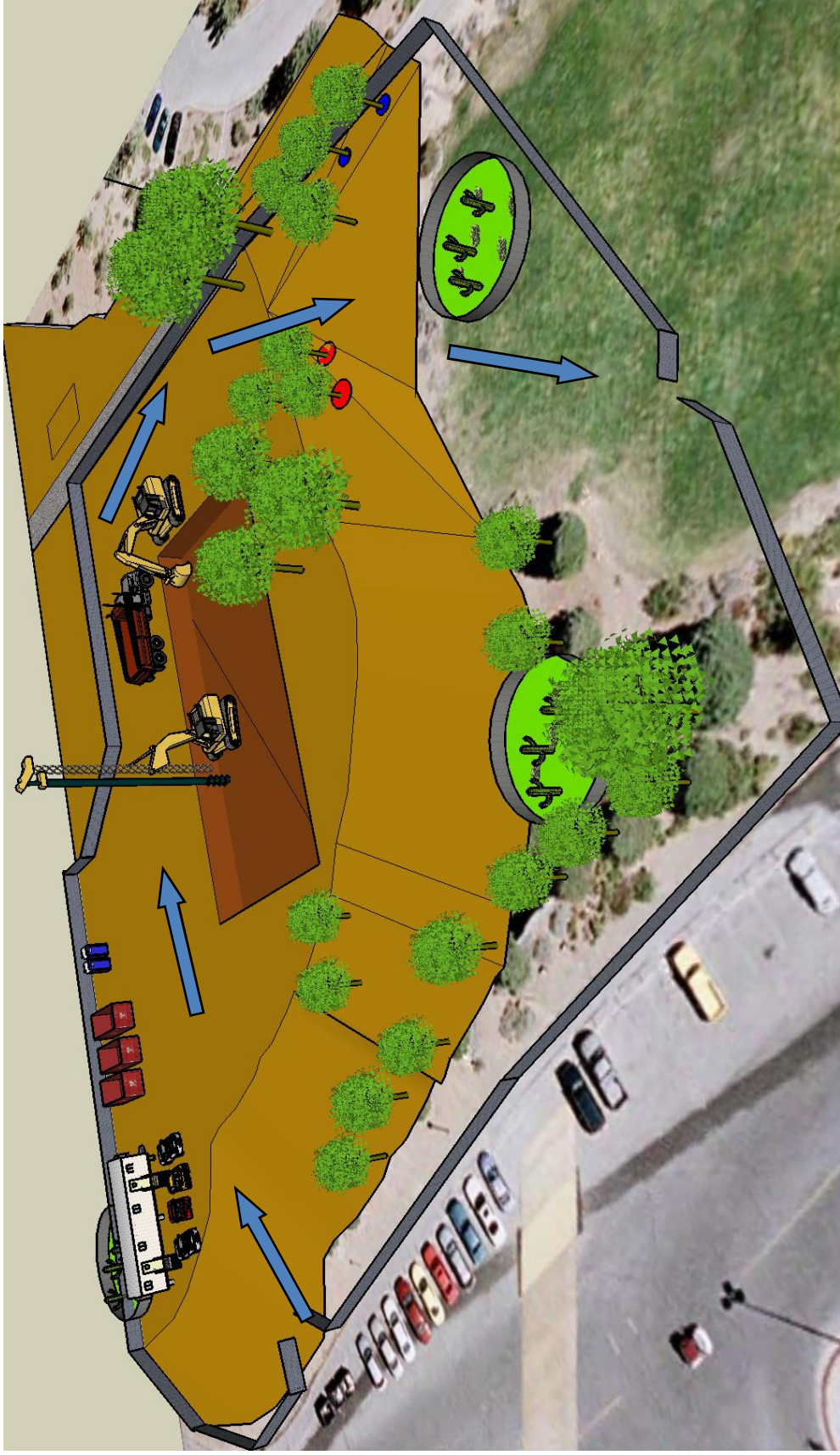


MEP - Plumbing



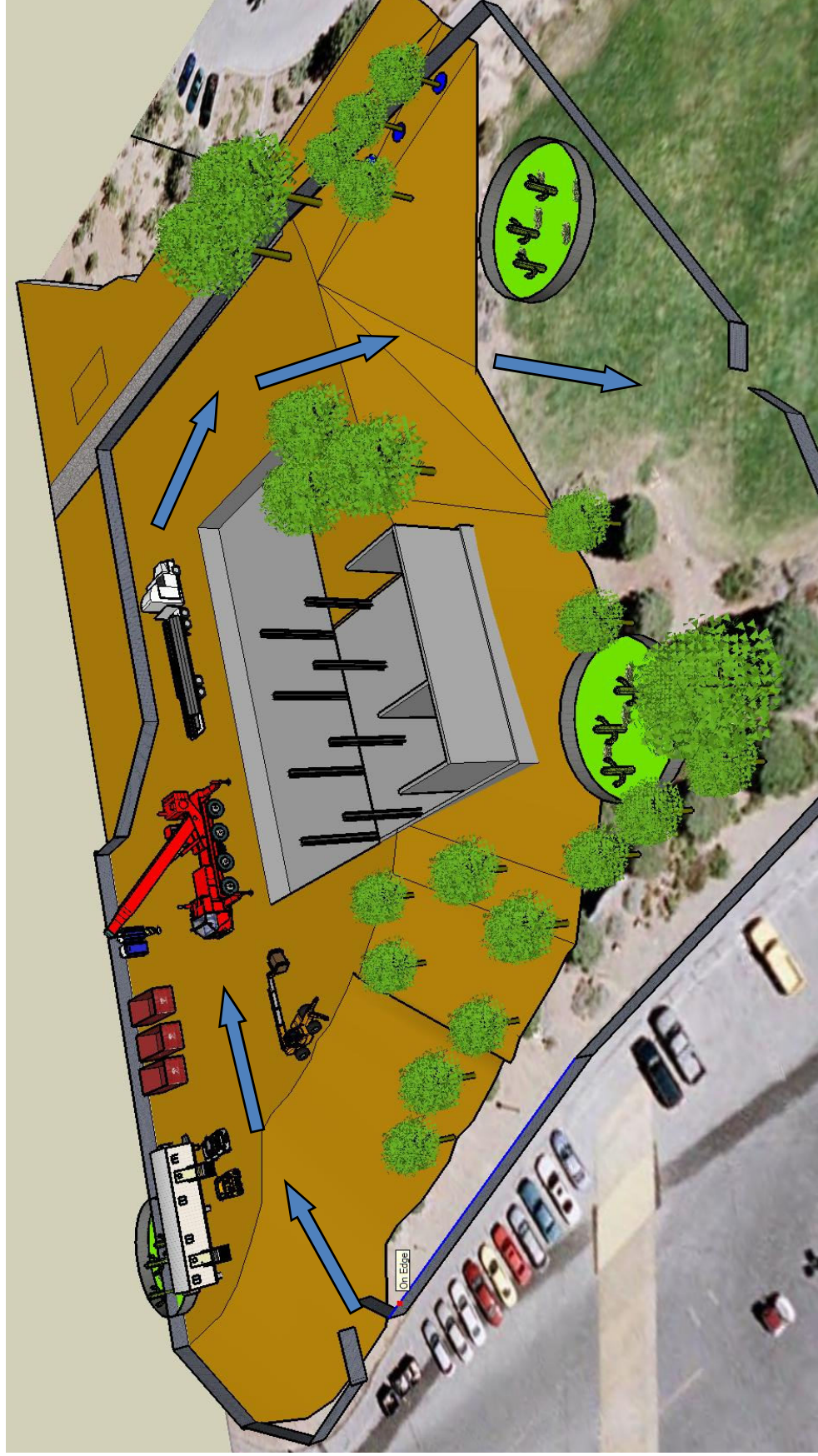


Site Plan Excavation



Greenery preservation

Site Plan Erection



JiT, scrap art, 75% recycled material

Safety Considerations

Safety Training

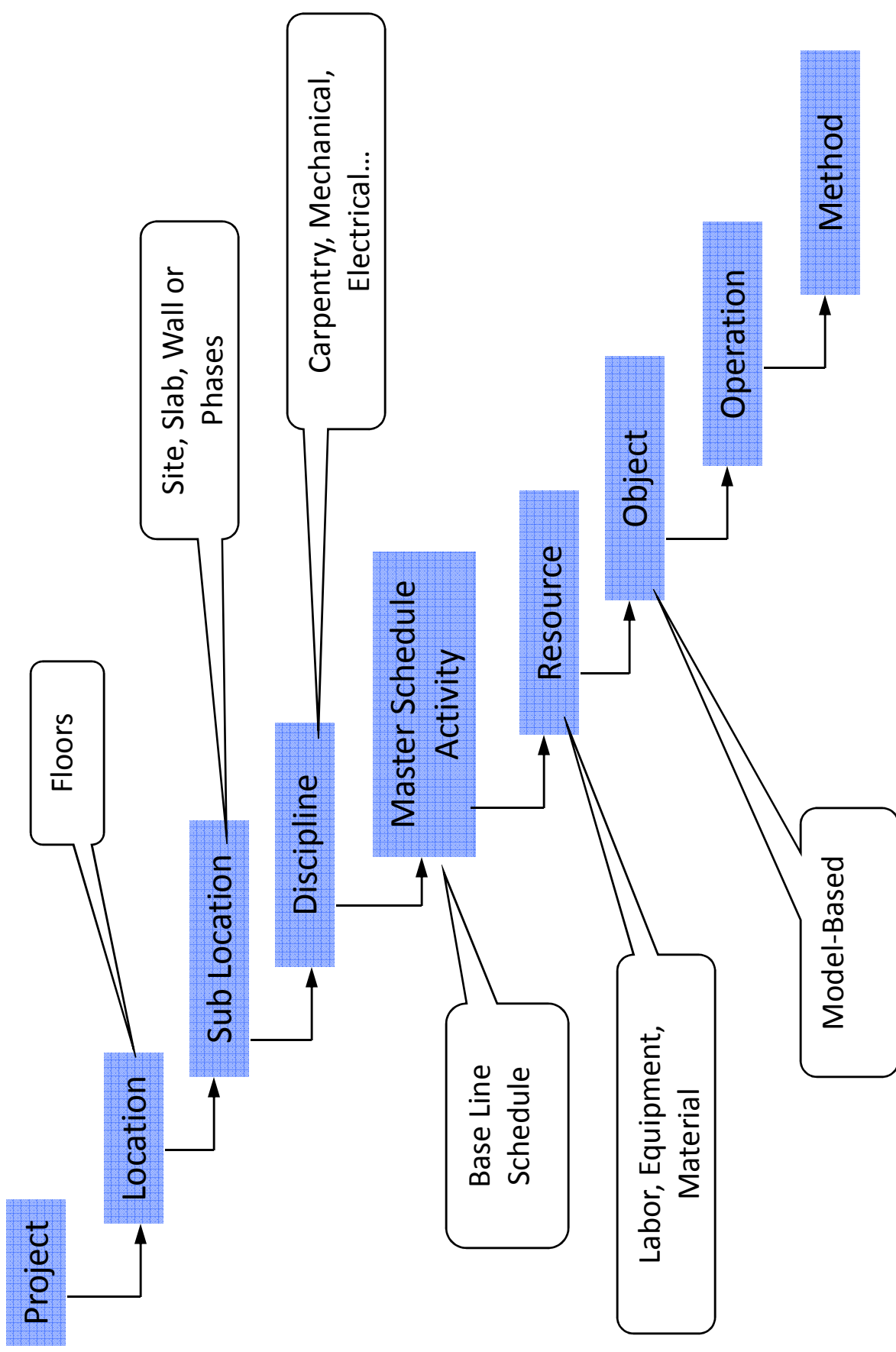
Keep People Informed

Emergency Escape Routes/Exits

Re-Route Pedestrian Traffic



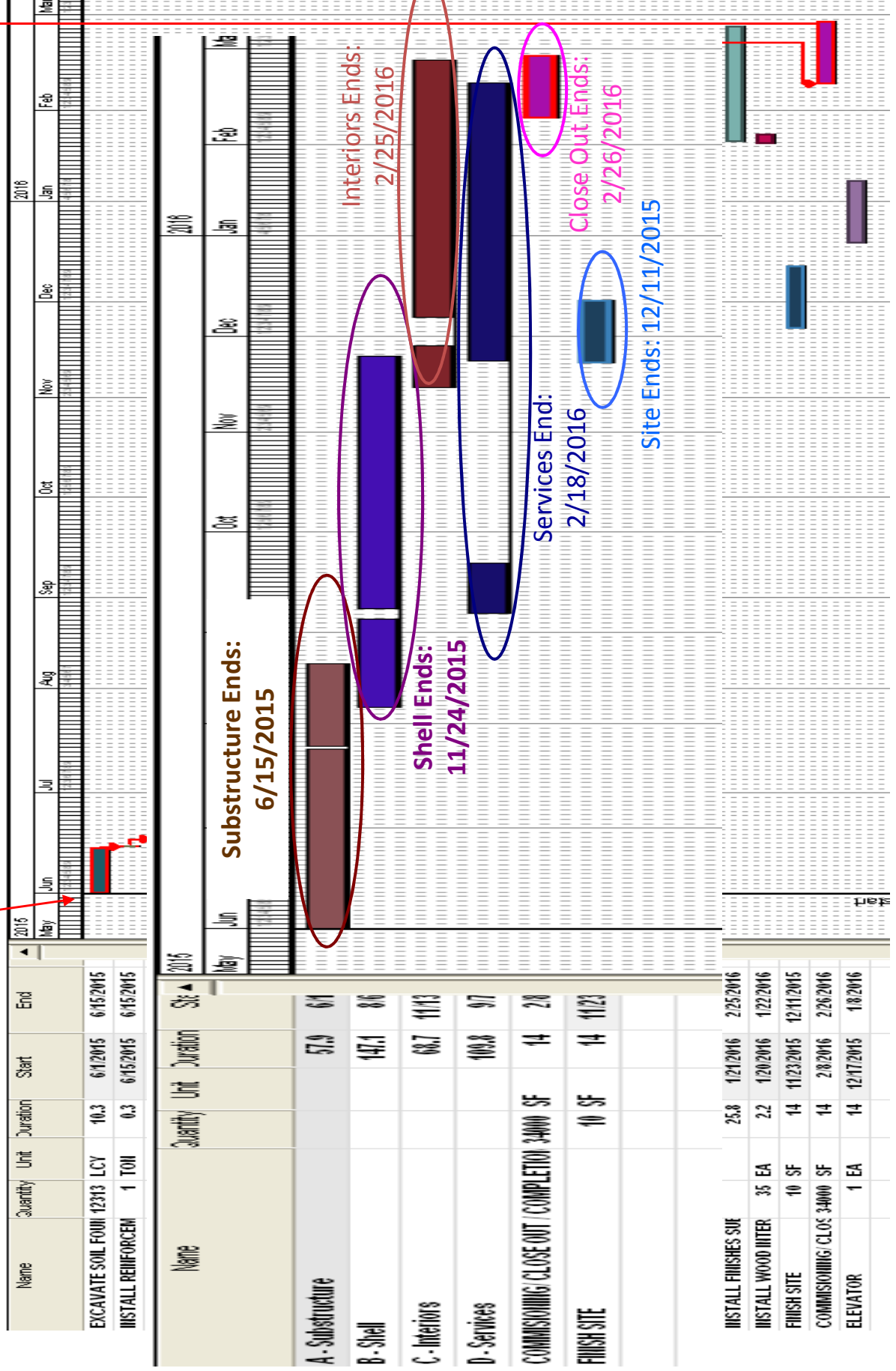
Work Breakdown Structure



Schedule

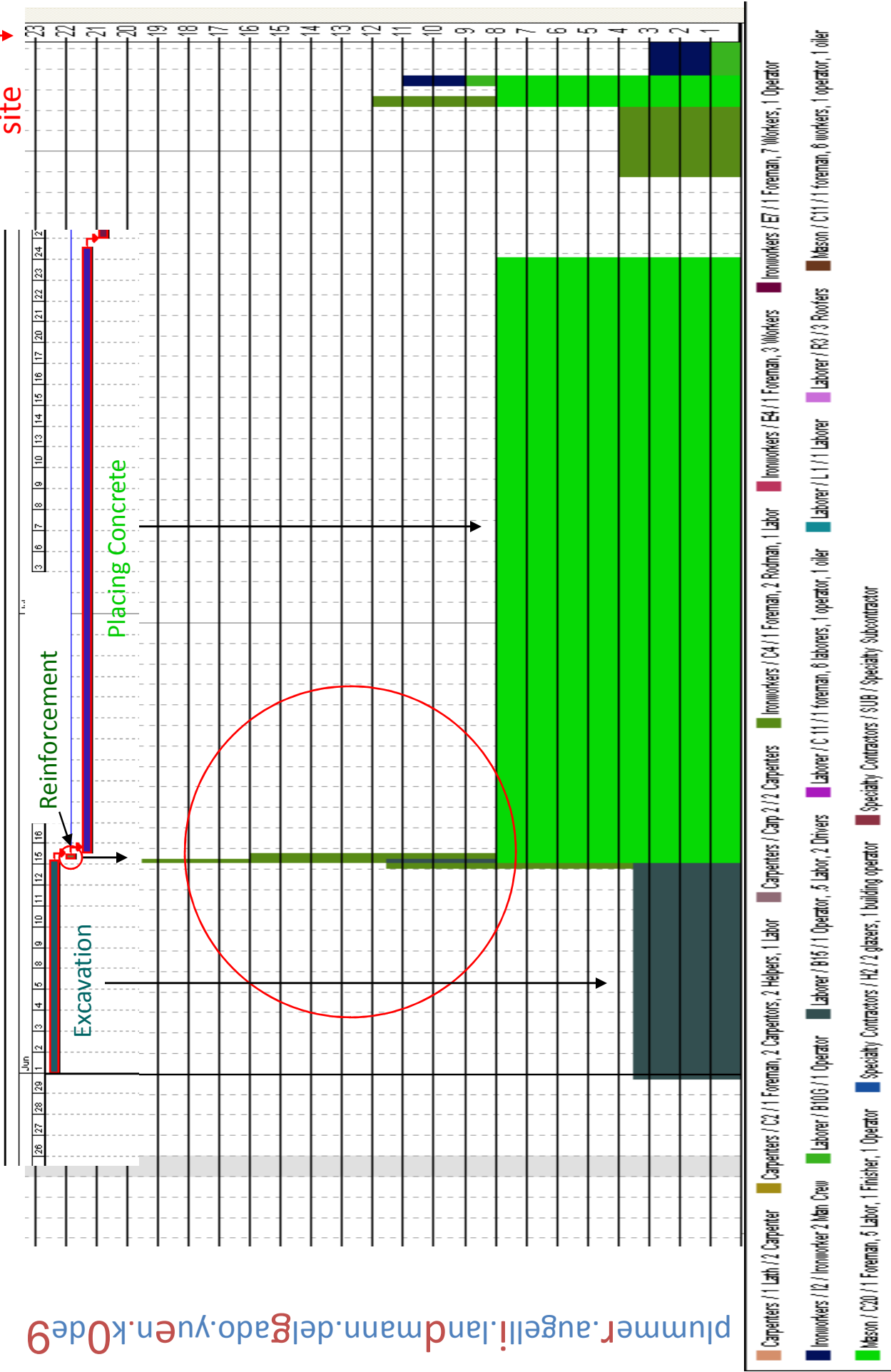
Start: June 1, 2015

End: February 26, 2016



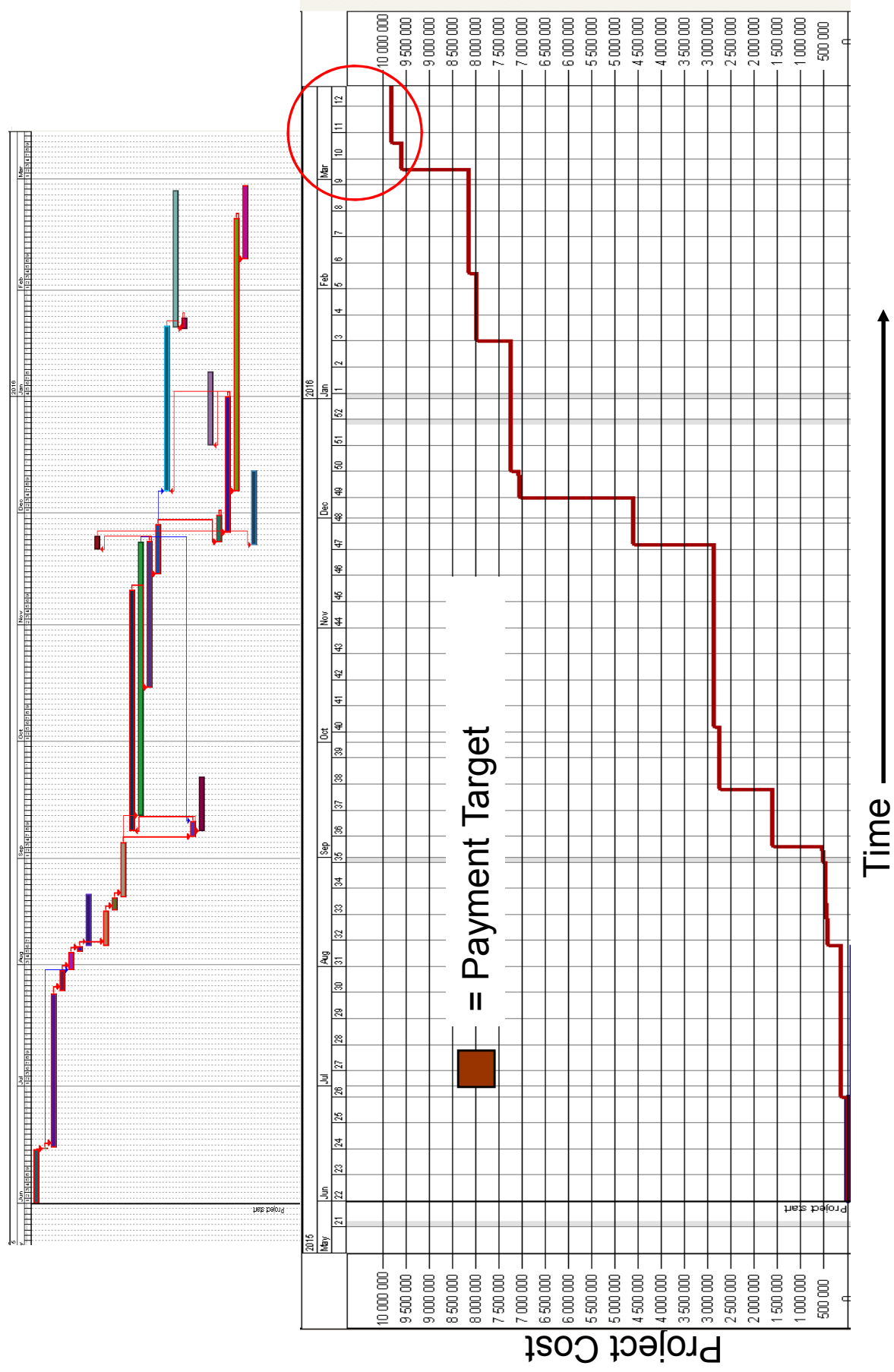
Resource Leveling

Number of workers on site



- Carpenters / Lath / 2 Carpenter
- Carpenters / C2 / 1 Foreman, 2 Carpenters, 2 Helpers, 1 Labor
- Carpenters / Carp 2 / 2 Carpenters
- Carpenters / C4 / 1 Foreman, 2 Rodman, 1 Labor
- Ironworkers / I2 / Ironworker 2 Men Crew
- Ironworkers / I3 / 1 Foreman, 2 Workers
- Ironworkers / E5 / 1 Foreman, 3 Workers
- Ironworkers / E7 / 1 Foreman, 7 Workers, 1 Operator
- Mason / C20 / 1 Foreman, 5 Labor, 1 Finisher, 1 Operator
- Specialty Contractors / H2 / 2 glazers, 1 building operator
- Specialty Contractors / SUB / Specialty Subcontractor
- Labormen / B10 / 1 Operator
- Labormen / B15 / 1 Operator
- Labormen / C / 11 / 1 foreman, 6 laborers, 1 operator, 1 oiler
- Labormen / C11 / 1 Laborer
- Labormen / R3 / 3 Roofers
- Mason / C11 / 1 foreman, 6 workers, 1 operator, 1 oiler

Cash Flow



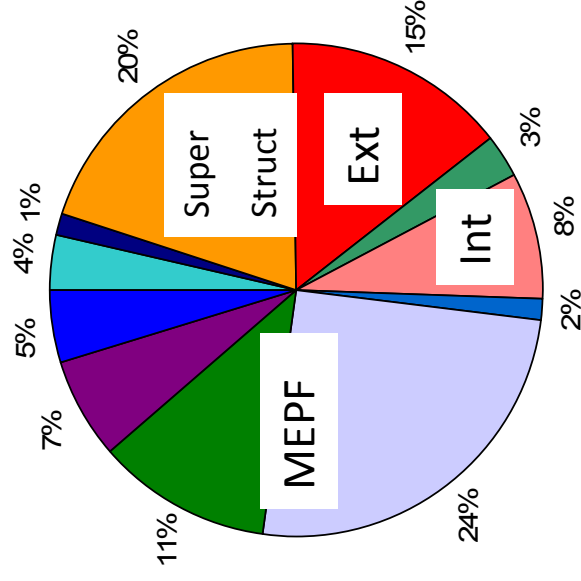
Time →

Monday June 01, 2015
Schedule tasks [Contract 2.0%]
Excavate Soil Foundation [0%]
Basement -> Sitework [Demolish 0%]



Estimate

Description	Cost	Cost/Sf	Comments
FOUNDATION	\$332,381.63	\$10.07	3.68%
SUBSTRUCTURE	\$86,083.02	\$2.61	1.29%
SUPERSTRUCTURE	\$1,316,579.23	\$39.90	19.68%
EXTERIOR CLOSURE	997,795.96	30.24	14.91%
ROOFING & WATERPROOFING	\$187,385.97	\$5.68	2.80%
INTERIOR CONSTRUCTION	\$539,431.14	\$16.35	8.06%
CONVEYING SYSTEM	\$102,279.25	\$3.10	1.53%
MECHANICAL	\$1,687,883.88	\$51.15	25.22%
ELECTRICAL	\$759,000.00	\$23.00	11.34%
SITWORK	\$450,000.00	\$13.64	6.73%
LEED Markup (5%)	\$318,636.85	\$9.66	4.76%
INDIRECT COST	\$6,691,373.91	\$202.77	
General Conditions	\$669,137.39	\$20.28	
Fee	\$334,568.70	\$10.14	
Contingency	\$669,137.39	\$20.28	
TOTAL COST	\$8,364,217.39	\$253.46	
inflated to 2015 (3% inflation rate)	\$9,800,000		



Model-Based Estimate

Estimate Totals

Description	Amount	Cuts/Adds	Net Amount	Totals	Hours	Rate
Labor	1,596,727		1,596,727		43,919.427 hrs	
Material	2,808,618		2,808,618			
Subcontract						
Equipment	217,741		217,741		1,891.232 hrs	
Other						
	<u>4,623,086</u>			4,623,086		
Total				4,623,086		

+ 2,646,558 (MEPF + Misc. Ints)

Tocoman

7,269,644

Timberline

ArchiCAD

+ Inflation to 2015

+ 12% M.U. & Cont.

Vico

Constructor

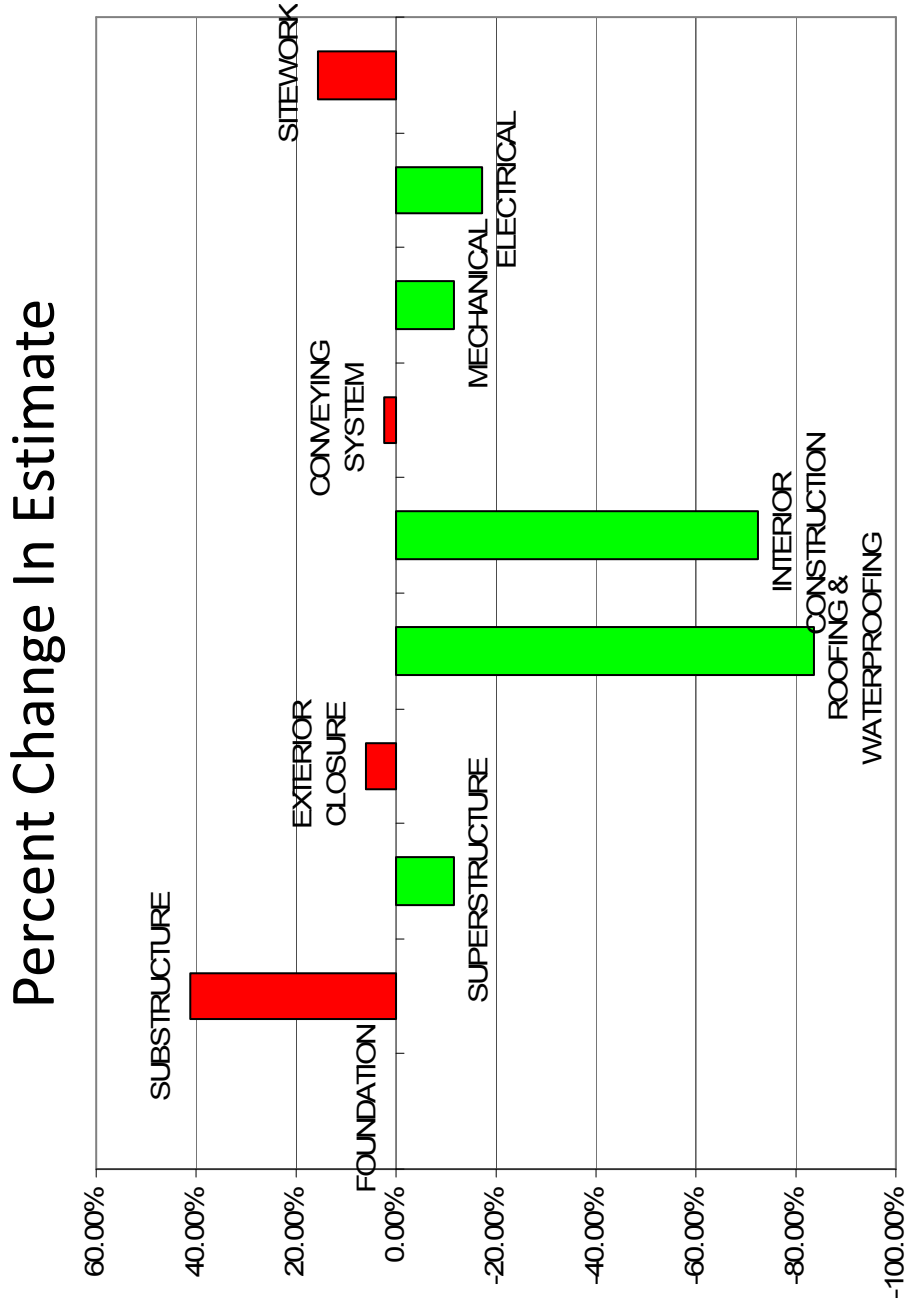
9,720,000

Equipment

Excavator	LPSM	\$9,570	
Skip Loader	\$250/day	\$17,500	
Back Hoe	\$250/day	\$17,500	
Bobcat	\$175/day	\$14,700	
Truck Crane	LPSM	\$122,312	
Other Equip	LPSM	\$201,496	
Totals		262,544	(inflated) 2015

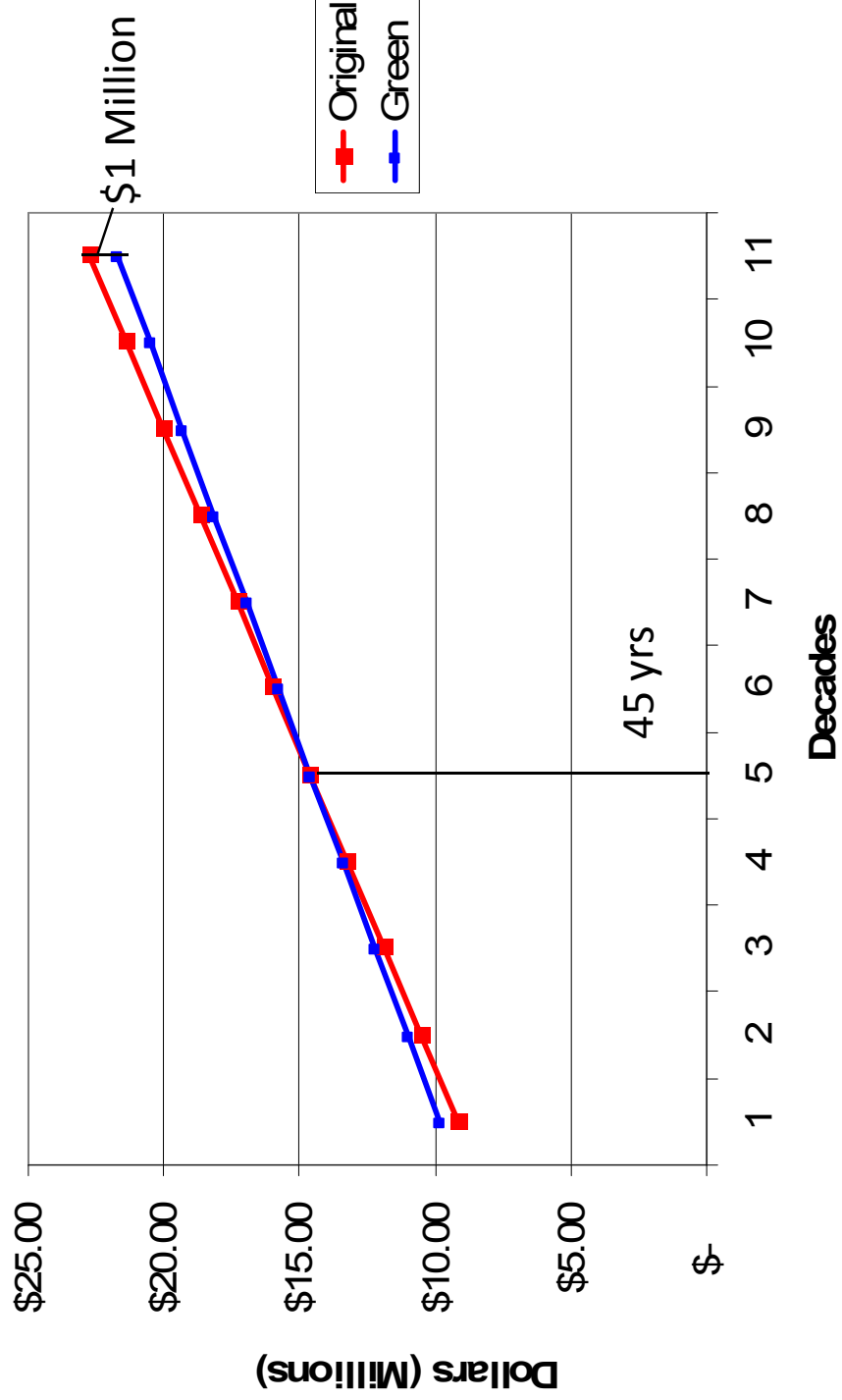


Estimates Progression



10% total cost reduction, volunteer labor

LCCA



Initial Building

Construction : \$9.1M

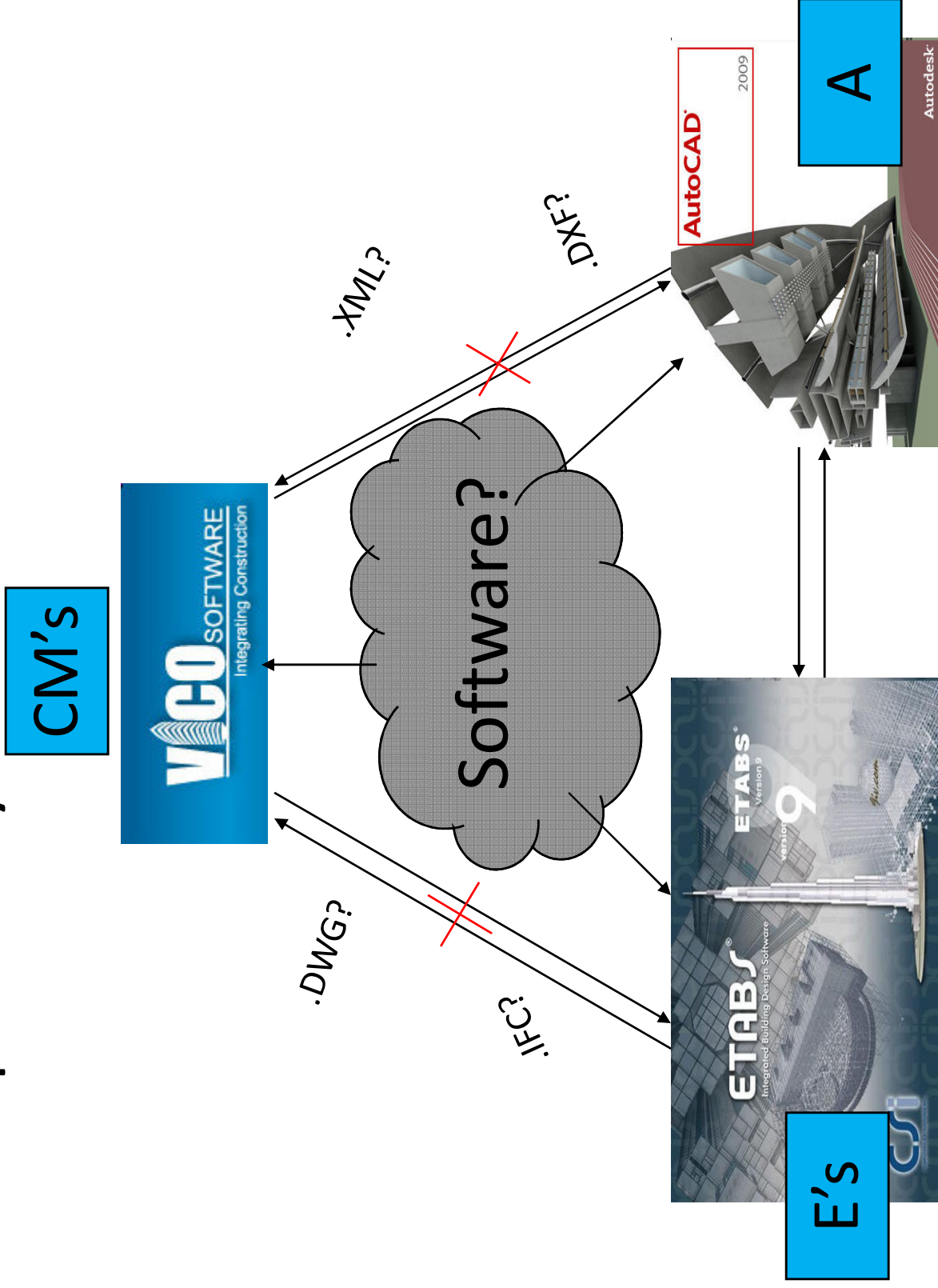
Life Cycle Cost : \$22.8M

Green Building

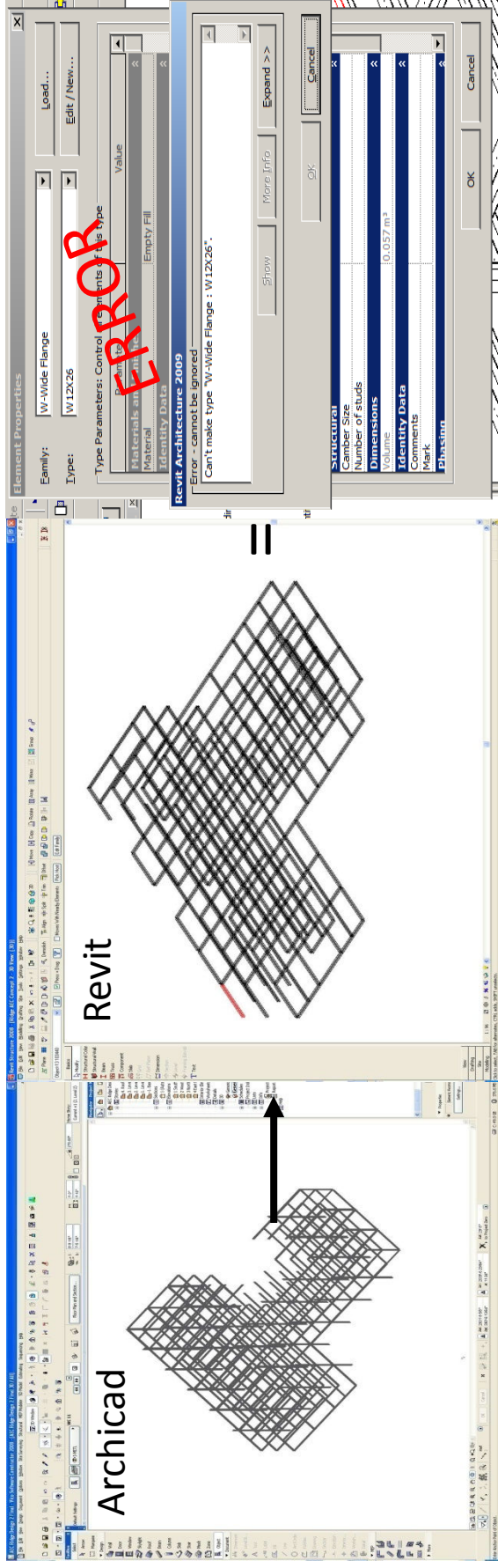
Construction : \$9.8 M

Life Cycle Cost : \$21.7 M

Interoperability

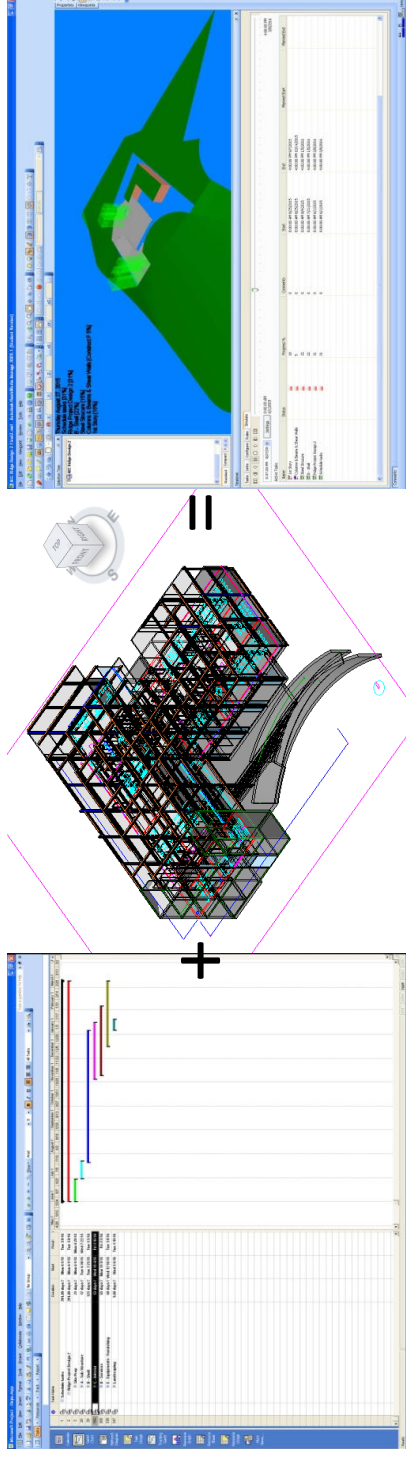


For The Win



- ✗ ArchiCAD → IFC, .dwg, .dxf → E-Tabs, Revit
- ✗ Revit 2009 → E-Tabs
- ✓ Revit 2008 E-tabs
- ✗ Revit 2009 → Revit 2008
- ✗ Bi-directional Revit ↔ E-Tabs
- ✓ AutoCad to Revit

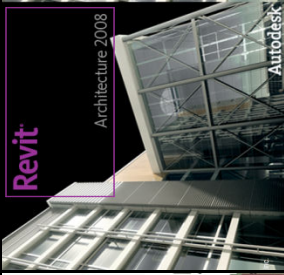
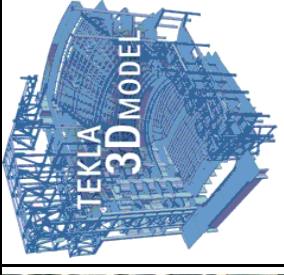

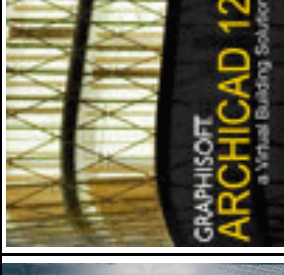
For The Win



Process Model

- ✓ 2007 MS Project mpp → mpx
- ✗ MS Project mpp → Primavera
- ✓ MS Project mpx → Primavera P6.2
- ✓ Ms Project mpx → Vico Control
- ✓ Primavera → Navisworks
- ✓ MS Project → Navisworks
- ✓ Vico Control → Project | | Primavera
- ✗ Vico Control → Navisworks

Models Used By Trade

					
A	X	X			X
E's		X	X	X	X
CM's					X
# of Models	1	1	1	1	2

Total: 6 models

Team Process



Deadline completion (W)

Communication (W)

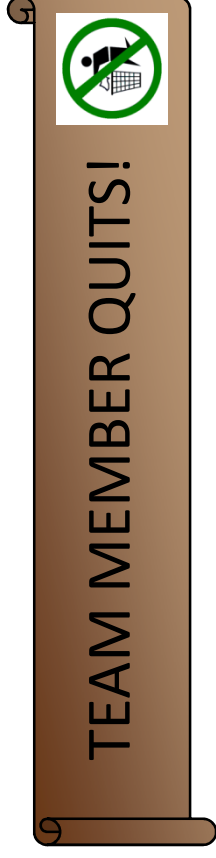
Member participation



Naming and filing convention

Meeting facilitation

AEC/Personal Google calendars



To-do list updates (W)

100% follow-through

1:1, Sub-group, Team Communication

Asynchronous
A/E
Debugging



Synchronous
Group
Decision
Alerts

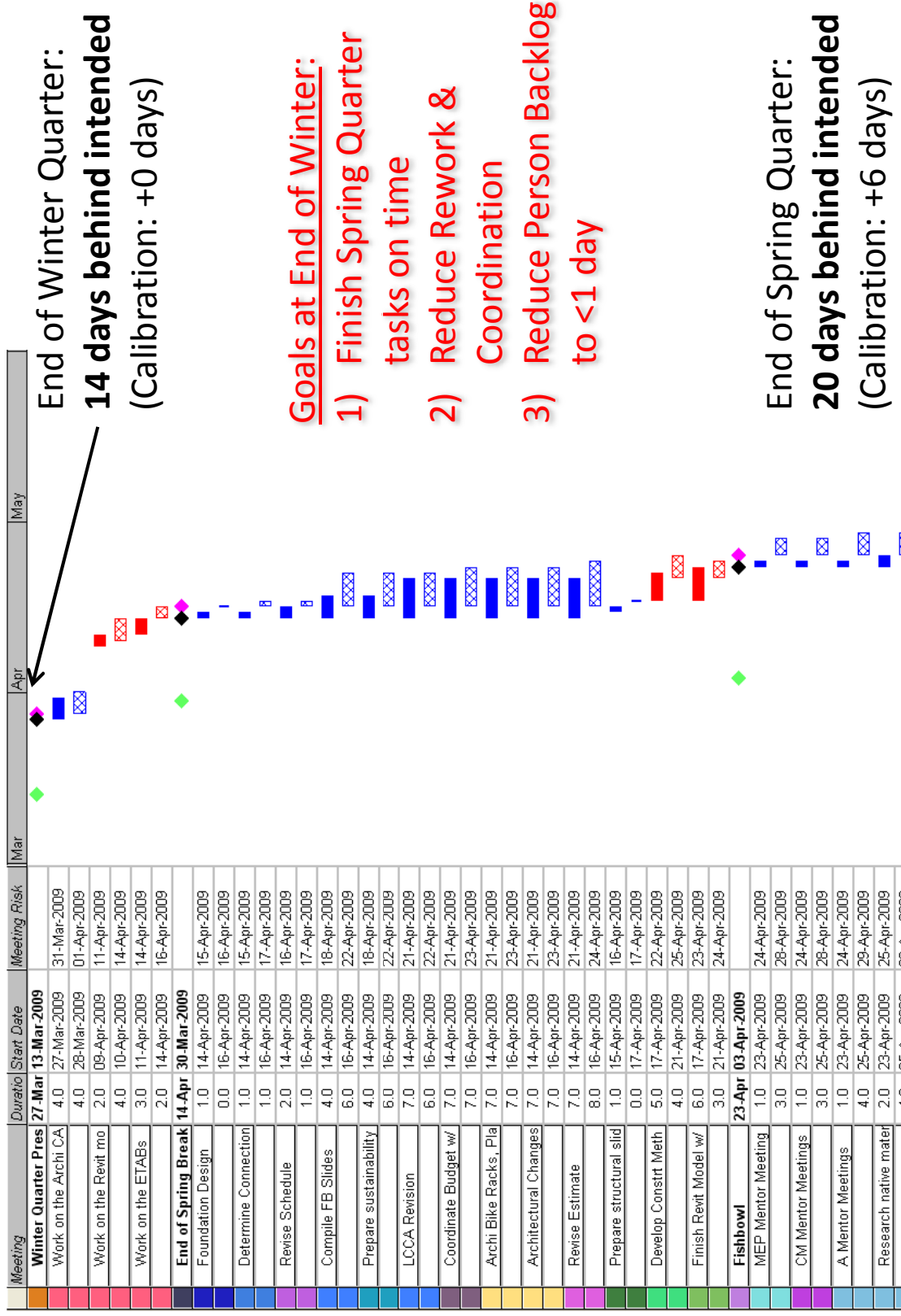


+ Recall



Real-Time
Desktop
Updates

SimVision – Baseline Simulation



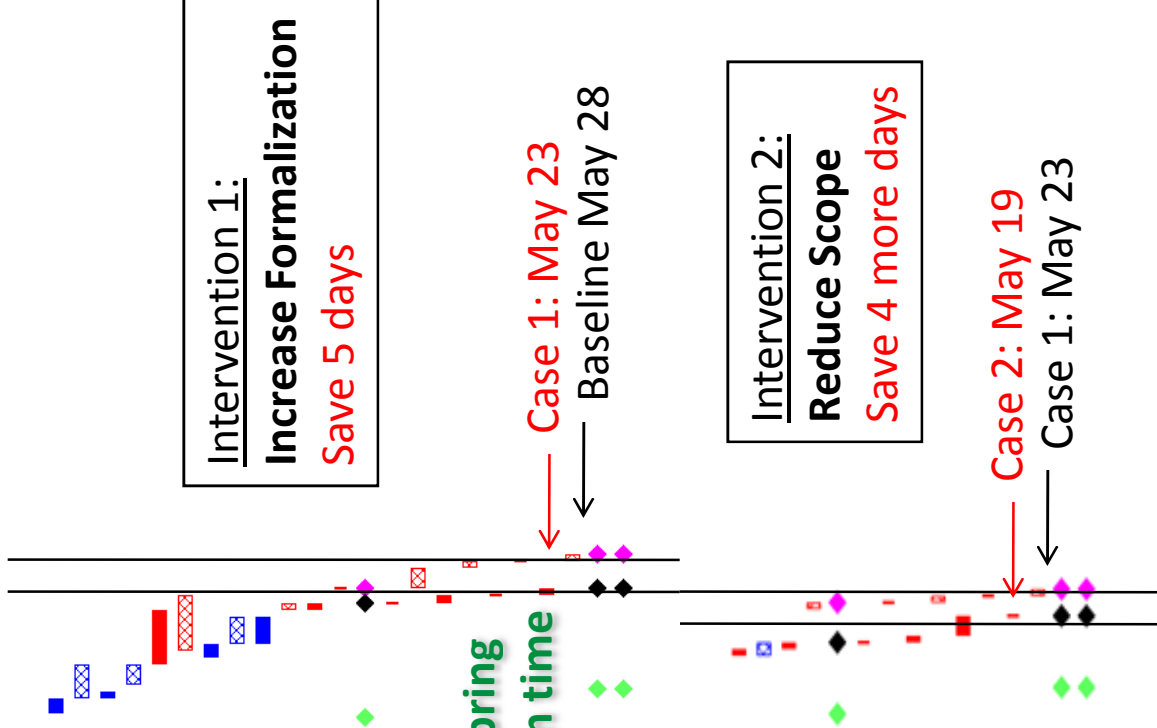
SimVision – Interventions

Prepare Arch Slides	2.0	05-May-2009	07-May-2009
Revise LCCA	5.0	07-May-2009	12-May-2009
MASTAN Analysis	1.0	07-May-2009	08-May-2009
Learn Tekla & Model	3.0	08-May-2009	12-May-2009
Prepare CM Slides	8.0	12-May-2009	20-May-2009
Compile Presentation	8.0	14-May-2009	22-May-2009
Collocation of all pa	2.0	13-May-2009	15-May-2009
Do 1st Dry Run	4.0	15-May-2009	19-May-2009
Improvements for 2nd	1.0	20-May-2009	21-May-2009
2nd Dry Run	0.0	23-May-2009	23-May-2009
Prepare for Final Pres	0.0	04-May-2009	21-May-2009
Final Presentation	23-Ma	08-May-2009	
Finish	23-Ma	08-May-2009	

Program Gantt: Program (Compare to: Baseline)

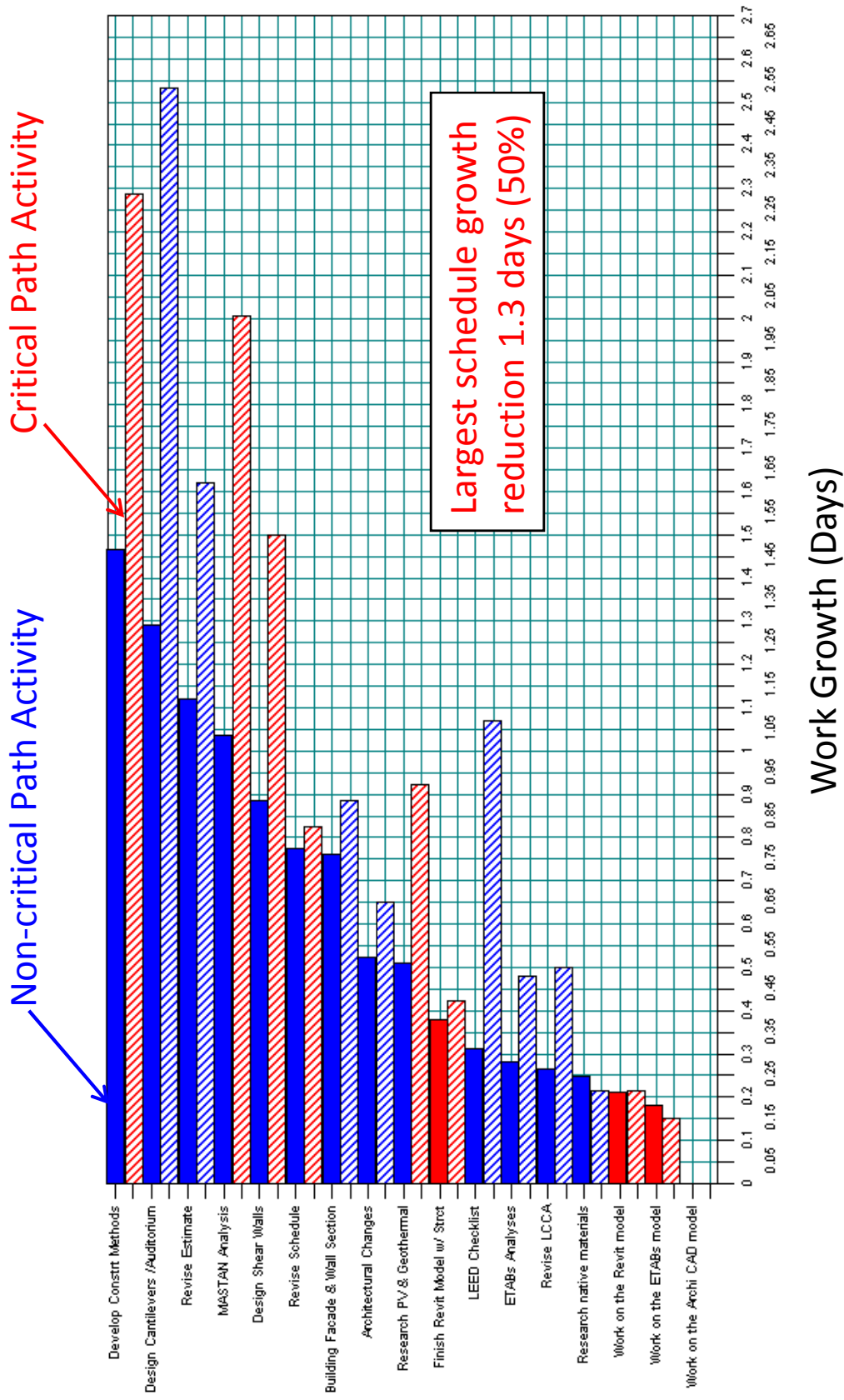
Learn Tekla & Model	1.0	13-May-2009	14-May-2009
Compile Presentation	2.0	13-May-2009	15-May-2009
Collocation of all pa	1.0	14-May-2009	15-May-2009
Do 1st Dry Run	1.0	20-May-2009	21-May-2009
Improvements for 2nd	0.0	15-May-2009	15-May-2009
2nd Dry Run	0.0	21-May-2009	21-May-2009
Prepare for Final Pres	1.0	15-May-2009	16-May-2009
Final Presentation	3.0	16-May-2009	22-May-2009
Finish	0.0	19-May-2009	19-May-2009
Final Presentation	0.0	19-May-2009	19-May-2009
Finish	1.0	22-May-2009	23-May-2009

Program Gantt: Program (Compare to: Formalization)



SimVision – Schedule Growth

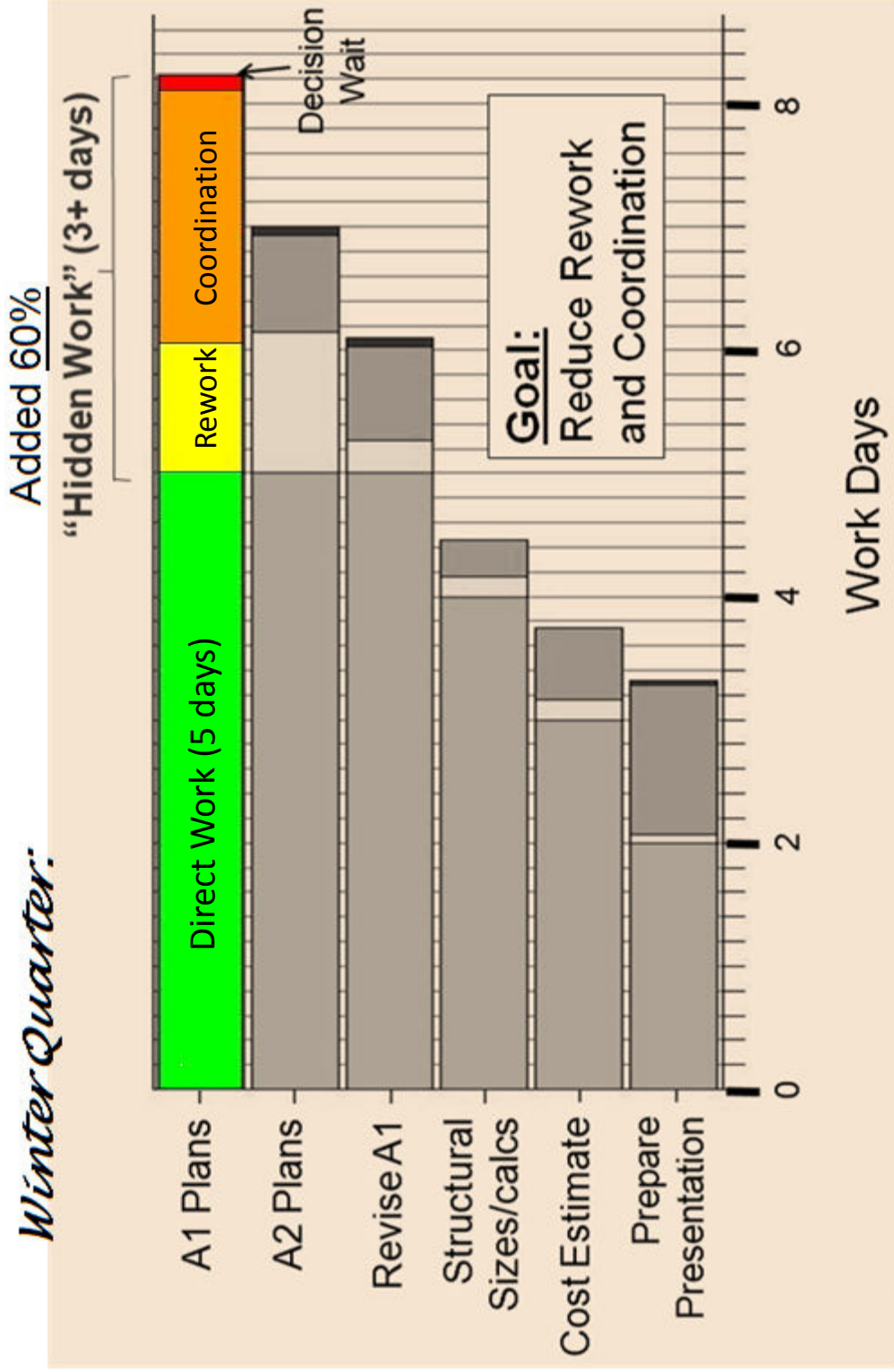
Goal 1: Finish Spring
Quarter tasks on time



SimVision – Work Breakdown

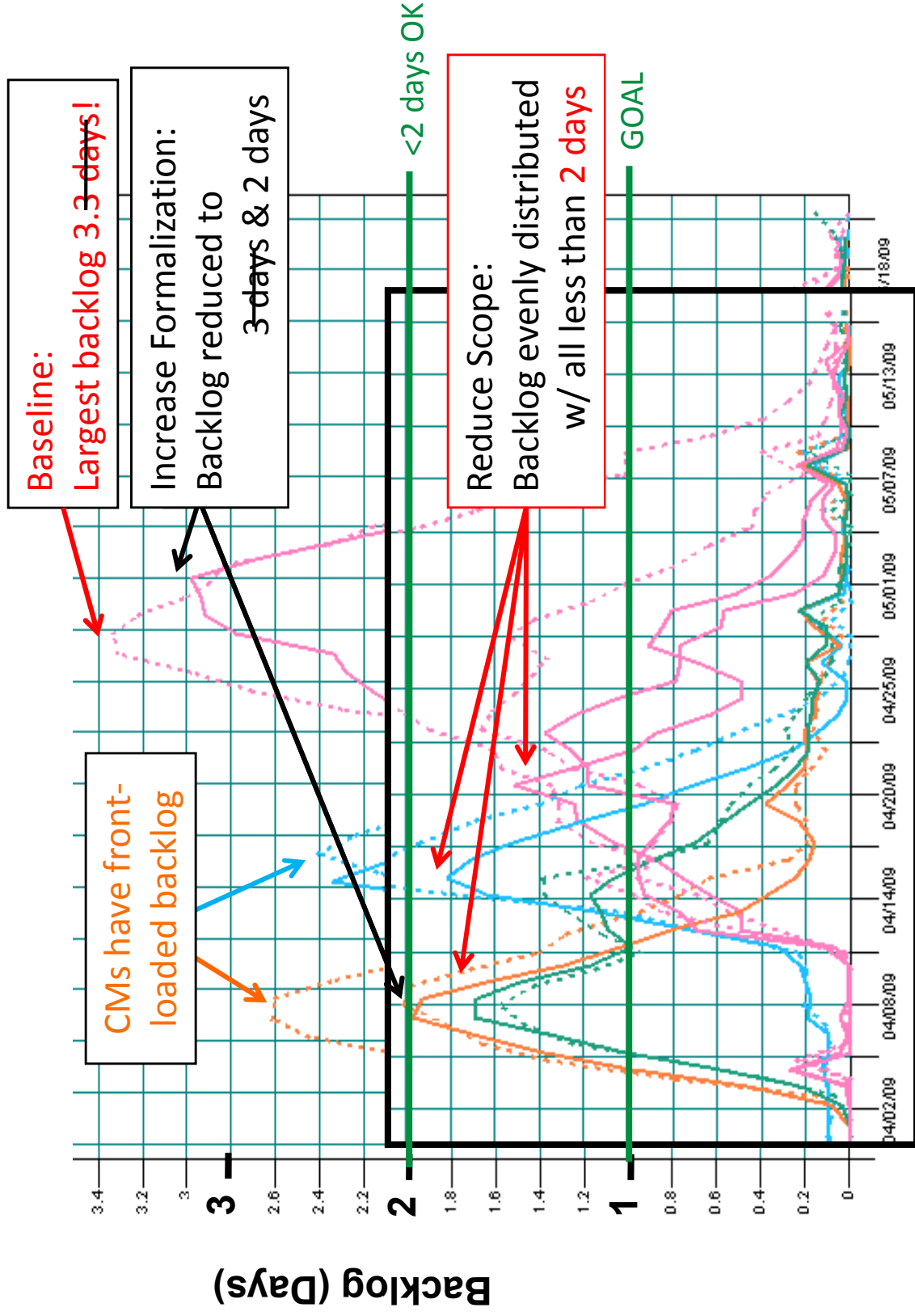
Goal 2: Reduce Rework & Coordination

Winter Quarter:

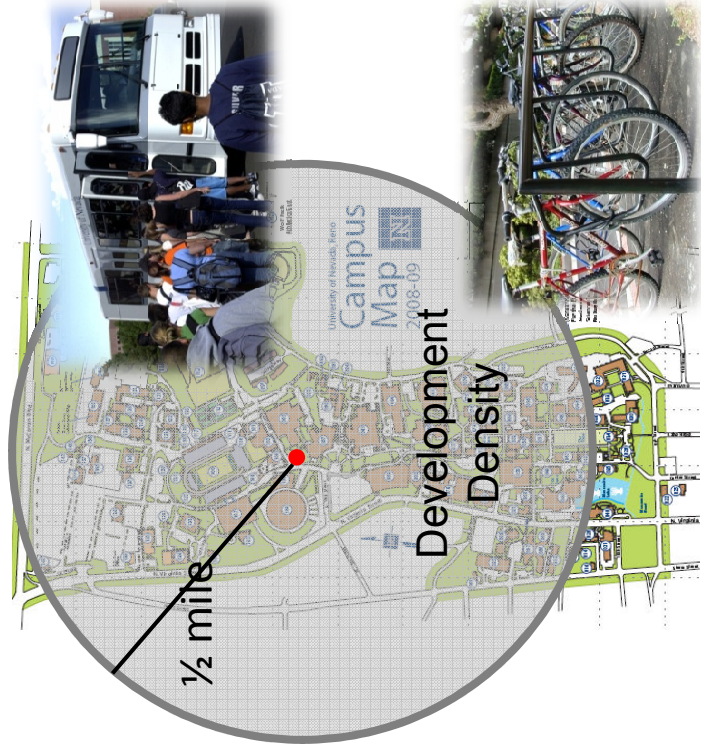


SimVision – Person Backlog

Goal 3: Reduce Person Backlog to <1 day



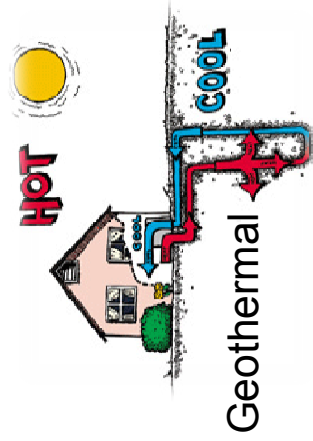
LEED Consideration



Native Roof Gardens

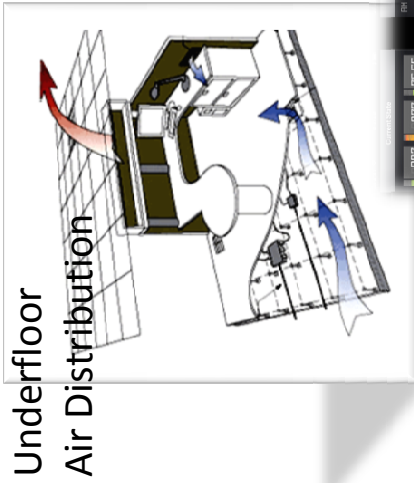


Photovoltaic

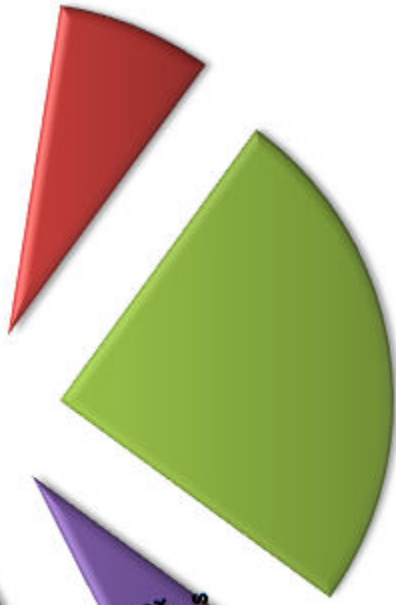
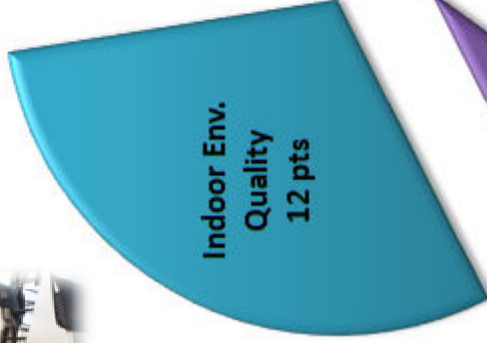
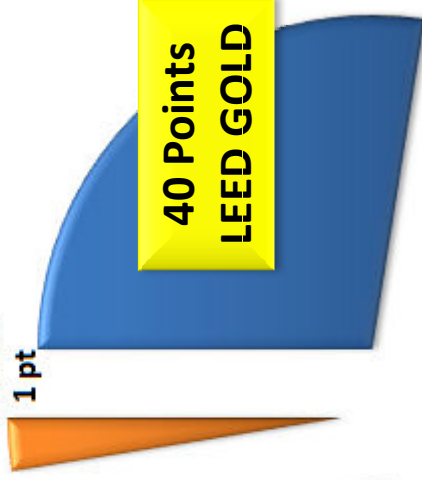


Geothermal

LEED Consideration



Innovation & Design Process
1 pt



Lessons Learned

“Never too late to start from scratch.”

“An elegant solution satisfies everyone.”

“90% done does not equal 100% done.”

“Zero Waste is a State of Mind.”



“Each discipline has a different definition of elegance.”

“IPD requires communication, coordination, and patience given current software.”

Ridge 2009

plummer.augelli.landmann.delgado.yuen.k0de9

Supplemental Slides

plummer.augelli.landmann.delgado.yuen.k0de9

A

- Building Orientation <-----
- Night Flushing
- Efficient space planning
- Leveraging existing infrastructure
- Greenery preservation in layout
- Otis Gen2 elevator
- Native green roof
 - PV panels
 - Gray water reuse
- Sustainable, treated wood exterior
 - 90% recycled glass

E

- Local materials
- No formwork/curing time

Championing Zero Waste



A

- Building Orientation
- Night Flushing
- Efficient Space Planning
- Leveraging Existing Infrastructure
- Tree Preservation -Gray Water Reuse
- Otis Gen2 Elevator -Renewable Wood
- Native Green Roof Exterior
- PV Panels -90% Recycled Glass

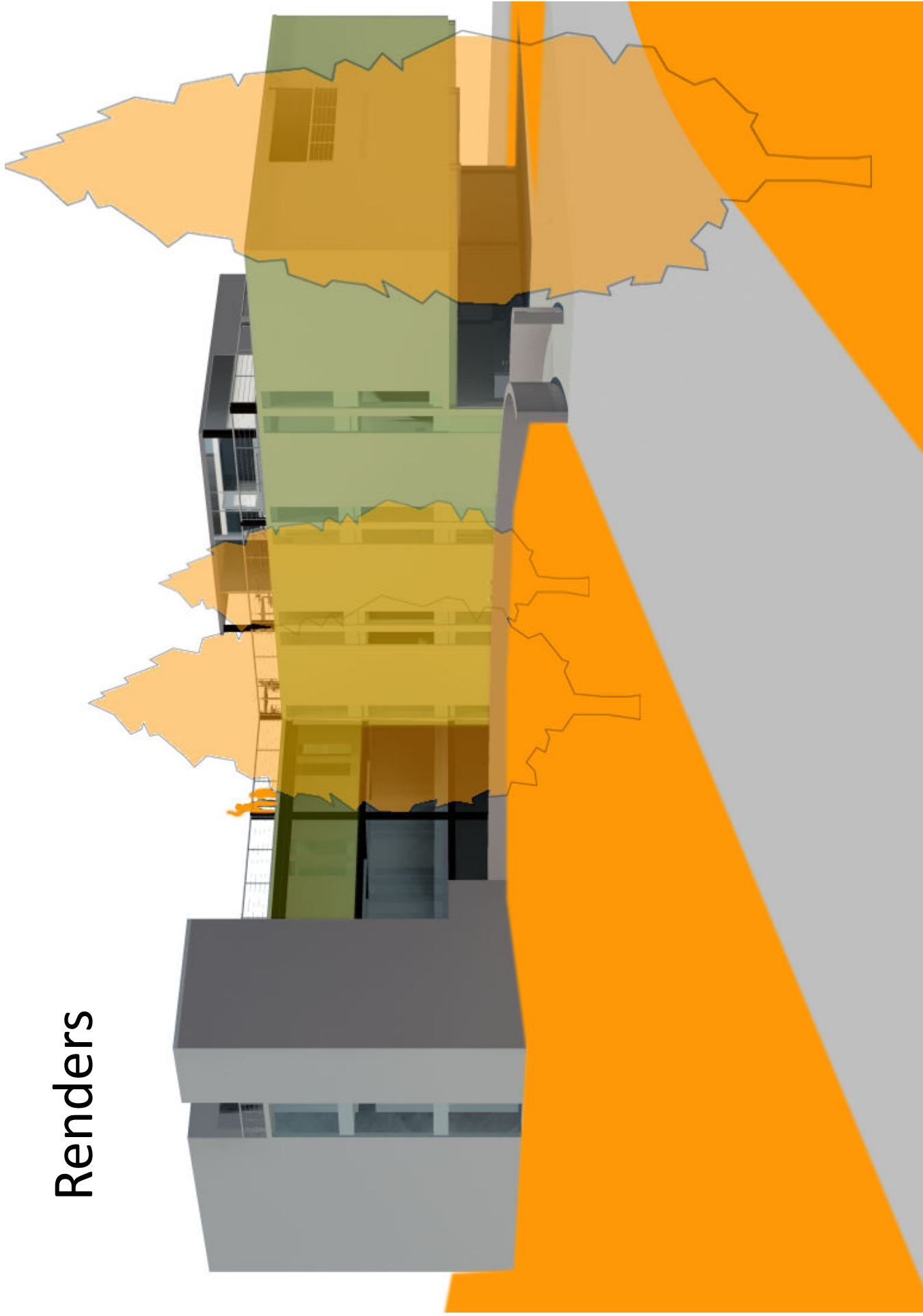
E

- Local Materials
- Reclaimed Aggregate
- Lightweight Concrete
- Spread Footings
- Thermal Massing
- Adaptable Modular Grid
- Reduced Cantilever
- Modular Steel Trees

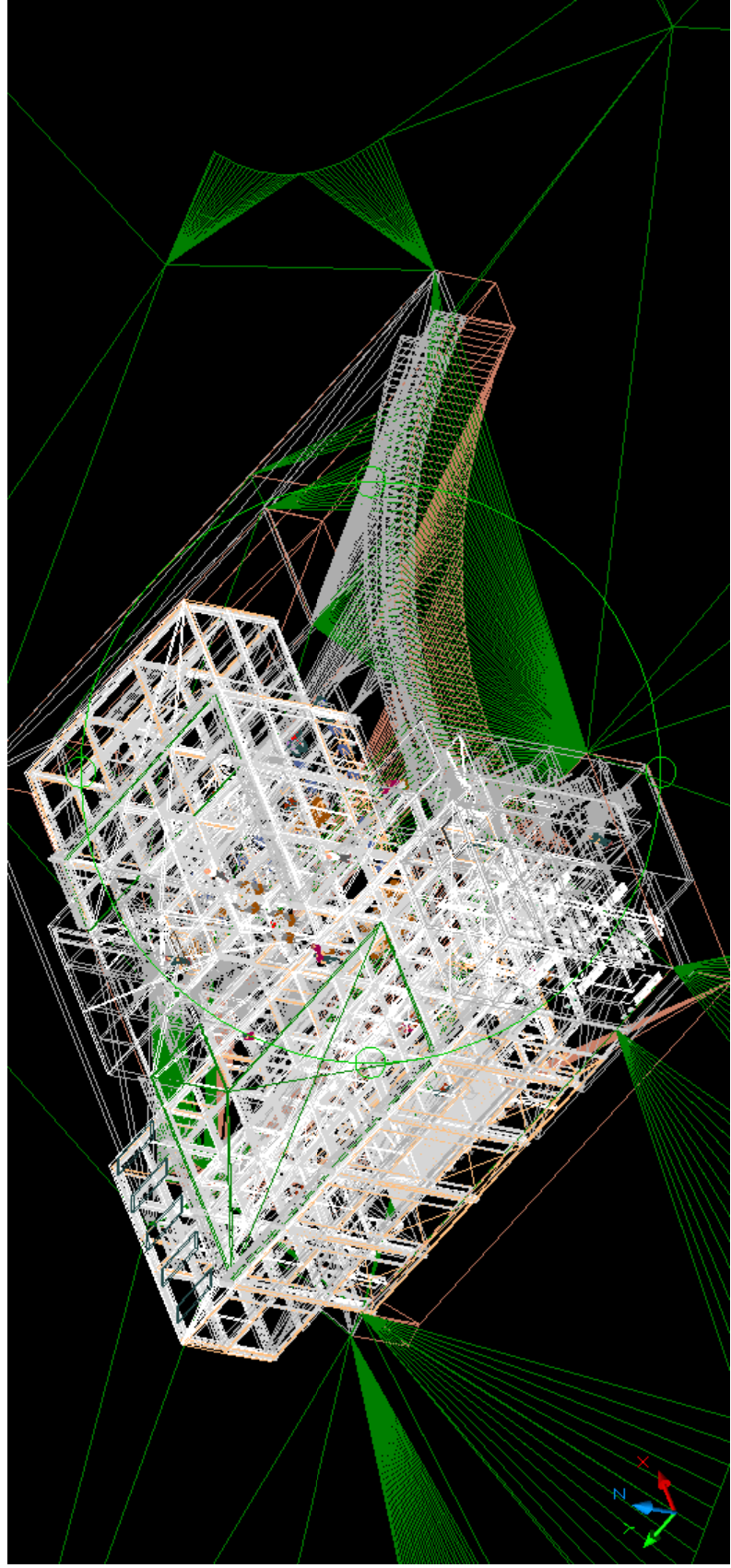
C

- Geothermal
- Underfloor VAV
- MP Zone Design
- Low Flow Fixtures
- Cactus/Trees Salvaged
- JiT/On-site BiM
- Scrap Art
- 75% Recycled Construction
- Volunteer Labor
- Soil Reuse
- Motion Sensors
- Energy Monitoring

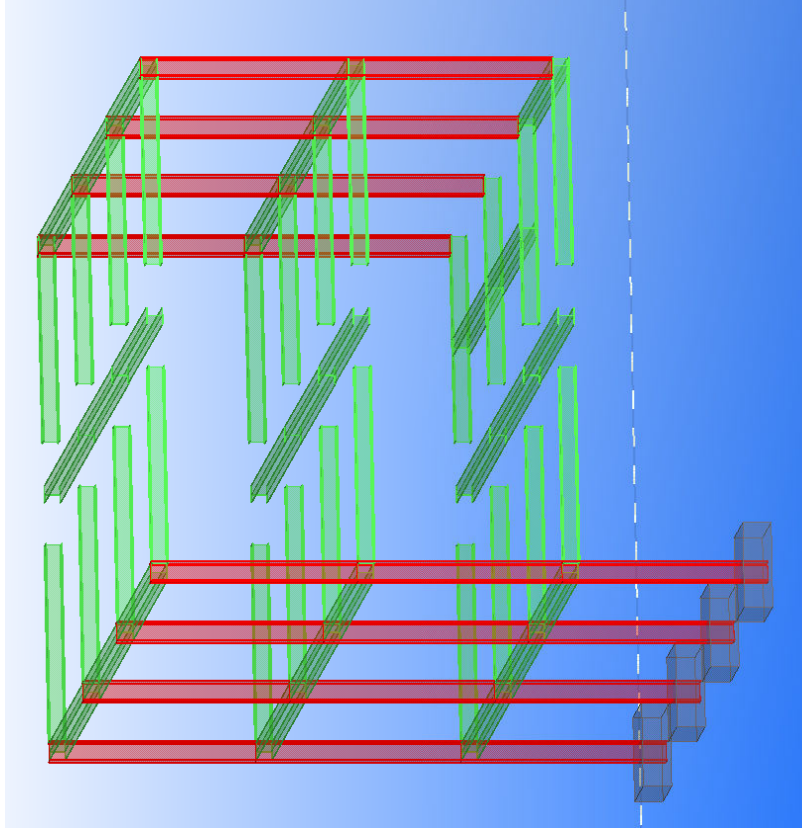
Renders



A – AutoCad Model

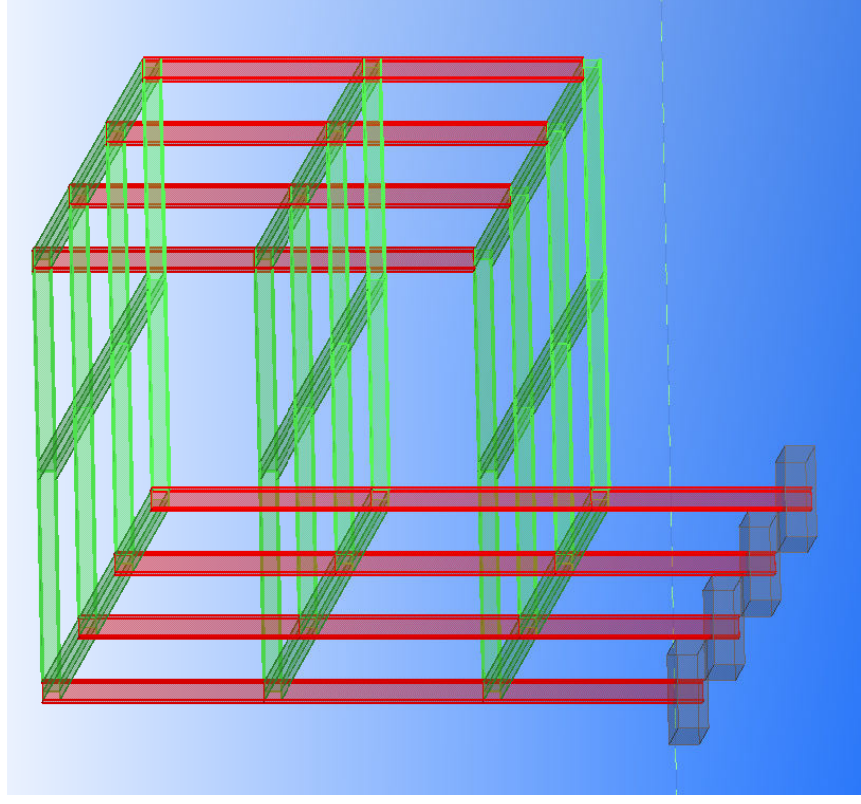


Modular Steel Trees

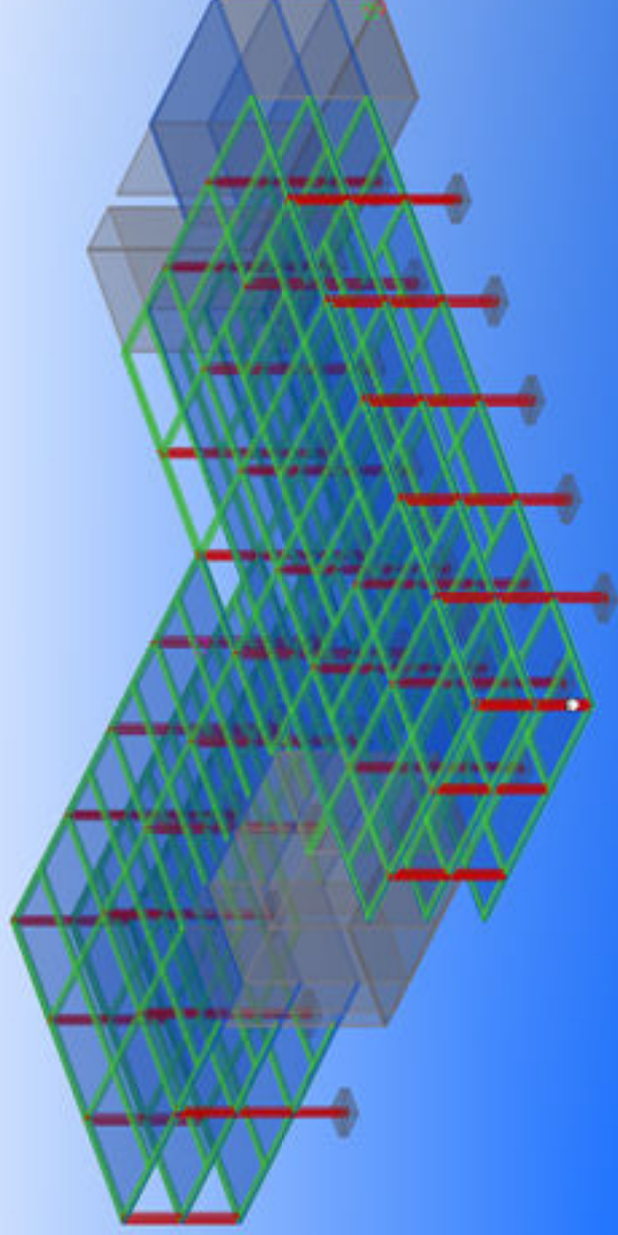


Prefabricated Sections

Assembled On-site



E – Tekla Model



Tuesday November 24, 2015

Schedule tasks [62%]

Ridge Project Design 2 [62%]

B - Shell [74%]

Steel Structure [72%]

Roof [92%]

C - Interior [27%]

Basement [71%]

D - Services [17%]

Basement [53%]

1st Floor [32%]

Interior Walls [58%]

Sheetrock [64%]

Installation [98%]

1st Floor [20%]

Rough-in [49%]

1st Story->Phase A [97%]

Water Proof [65%]

2nd Floor [12%]

Interior Walls [26%]

3rd Floor [41%]

Exterior Wall [41%]

Frame [80%]

Basement->Phase B [96%]

Tape / Mud [69%]

3rd Floor [8%]

Interior Walls [15%]

Framing [65%]

3rd Story->Phase A [Construct 95%]

2nd Floor [2%]

Rough-in [6%]

2nd Story [6%]

Water Proof-2 [Construct F 3%]

Roof->Phase B [3%]

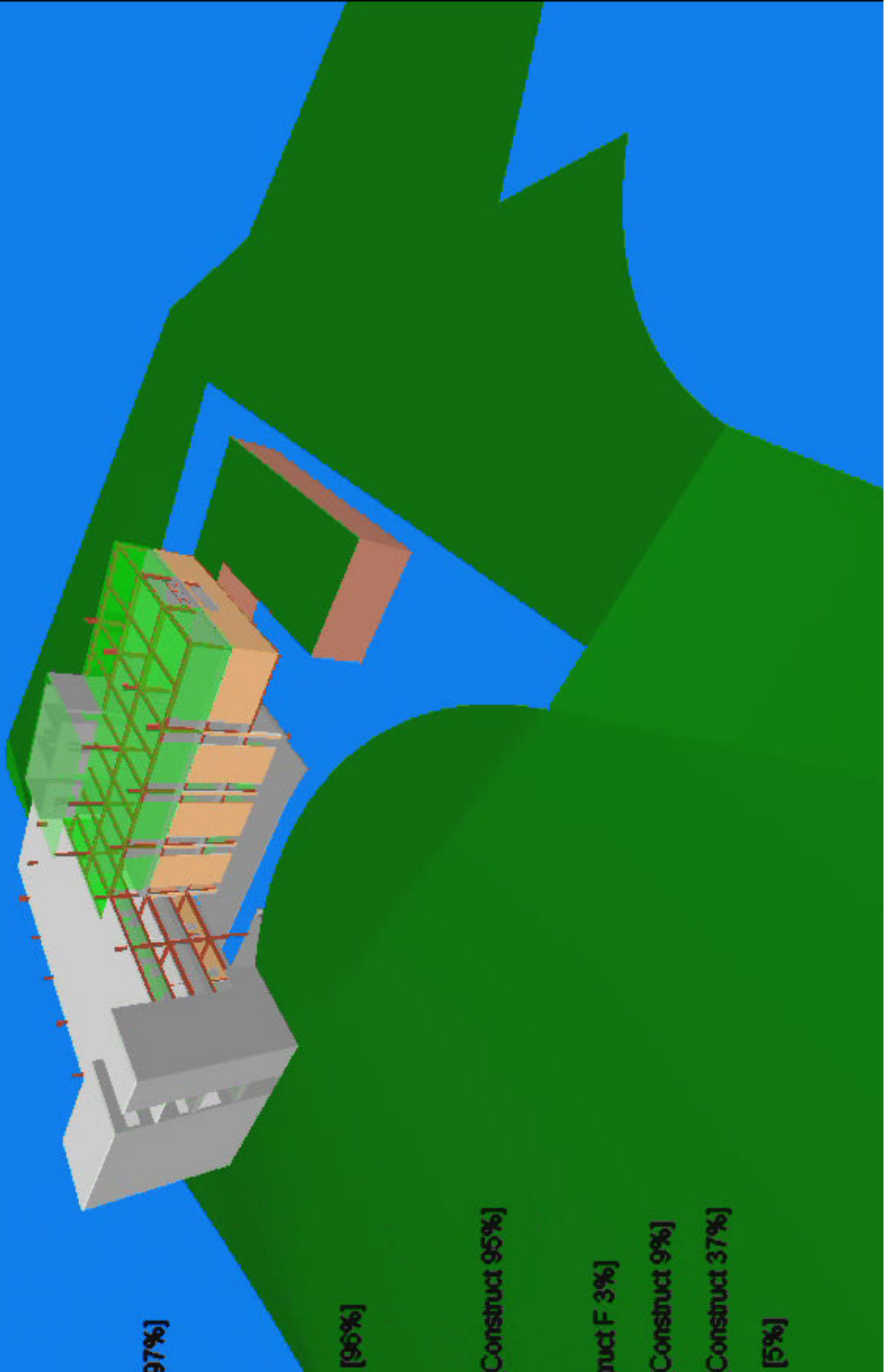
3rd Story->Phase B [Construct 9%]

Sheeting [5%]

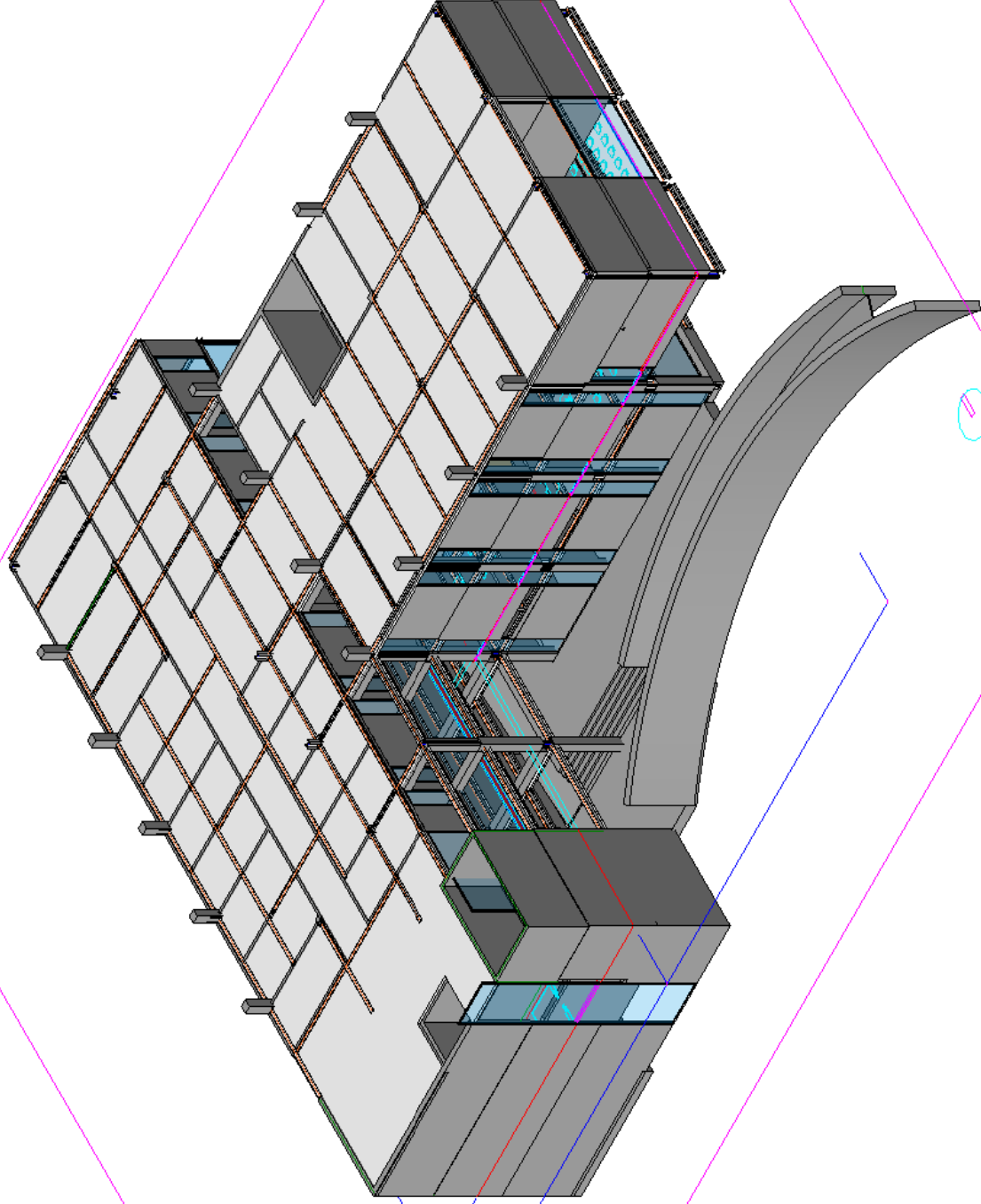
3rd Story->Phase A [Construct 37%]

Paint [1%]

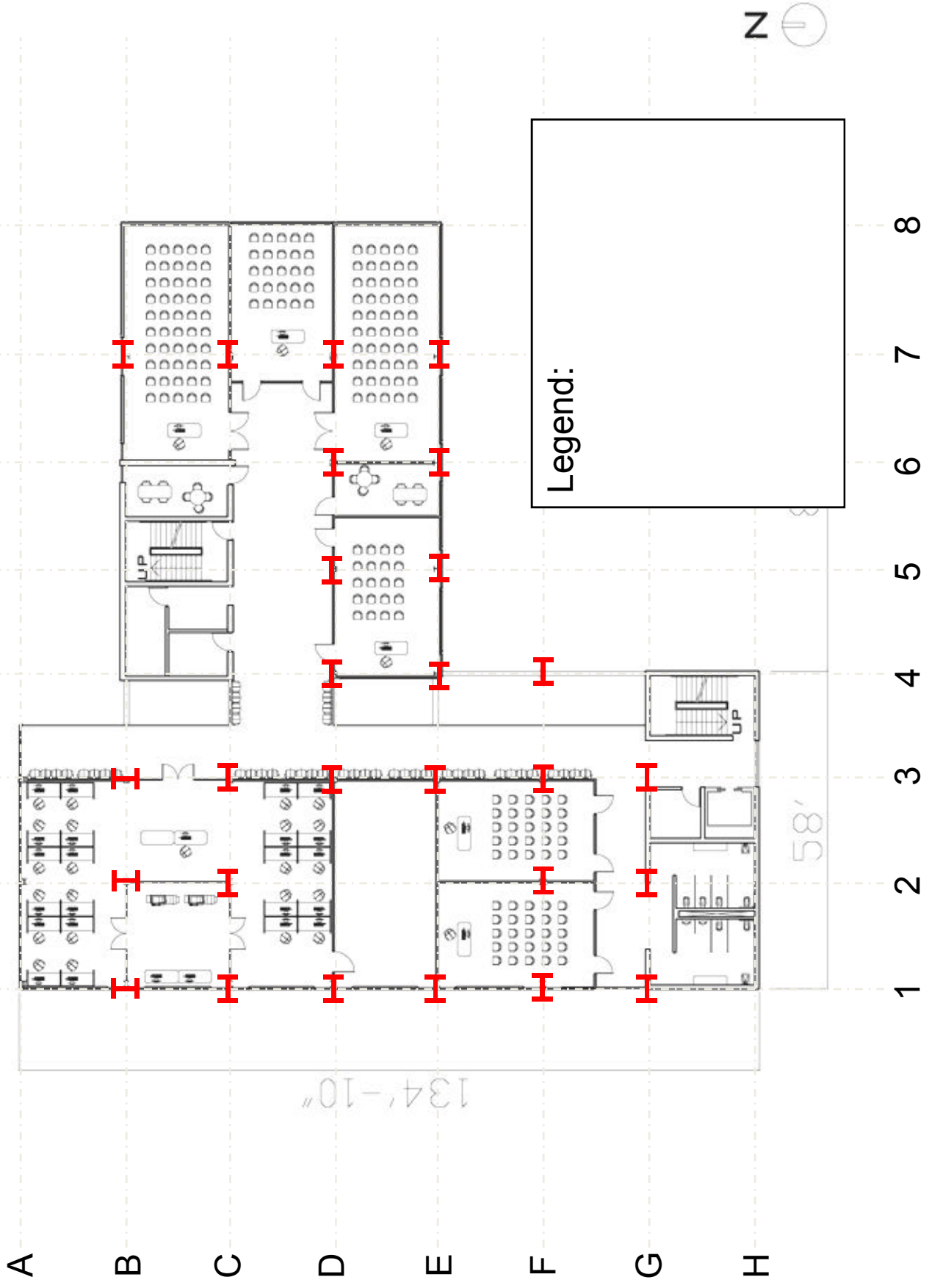
Basement->Phase A [5%]



CM – Revit Model



Second Floor



Legend:

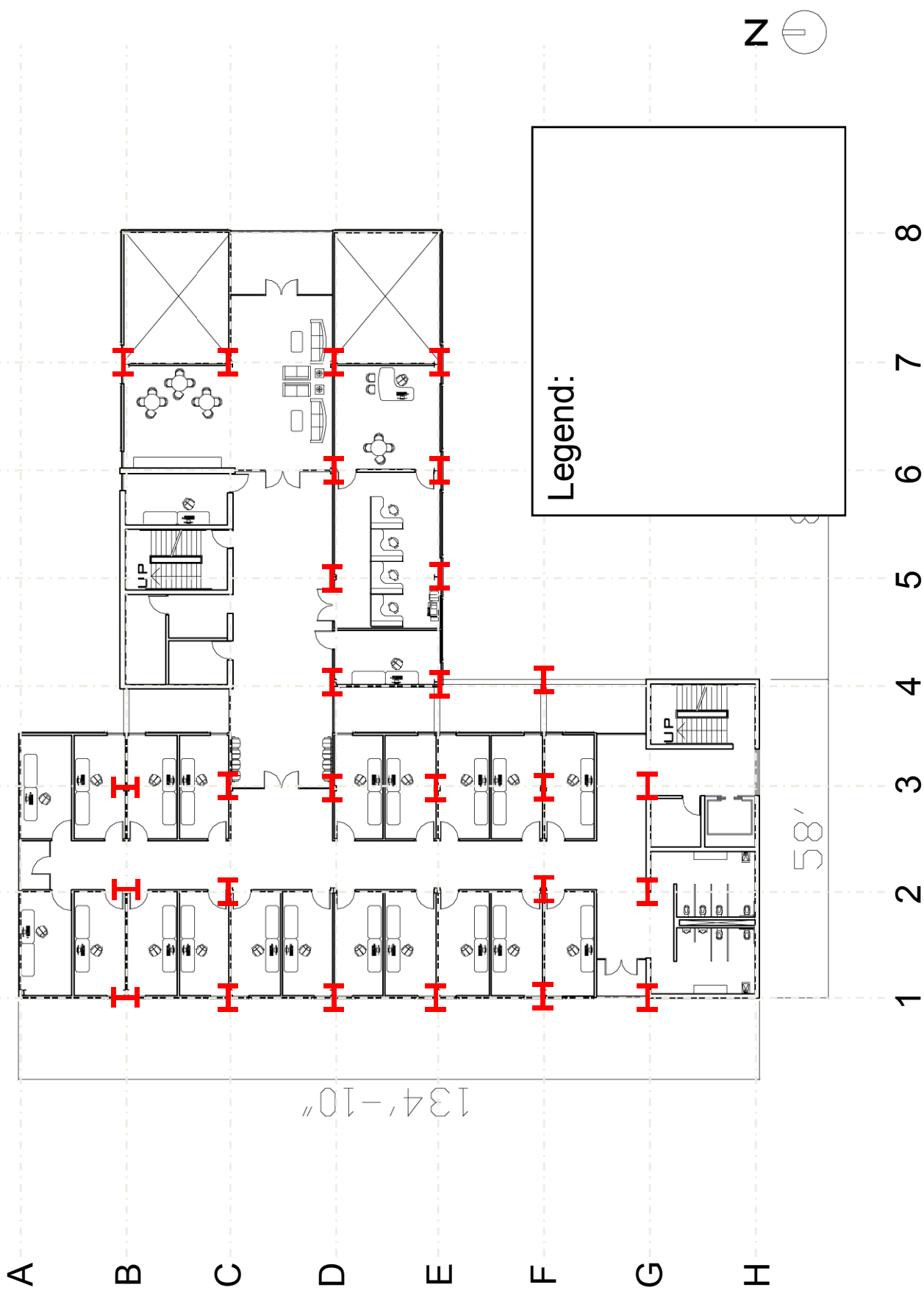
134'-10"

58'

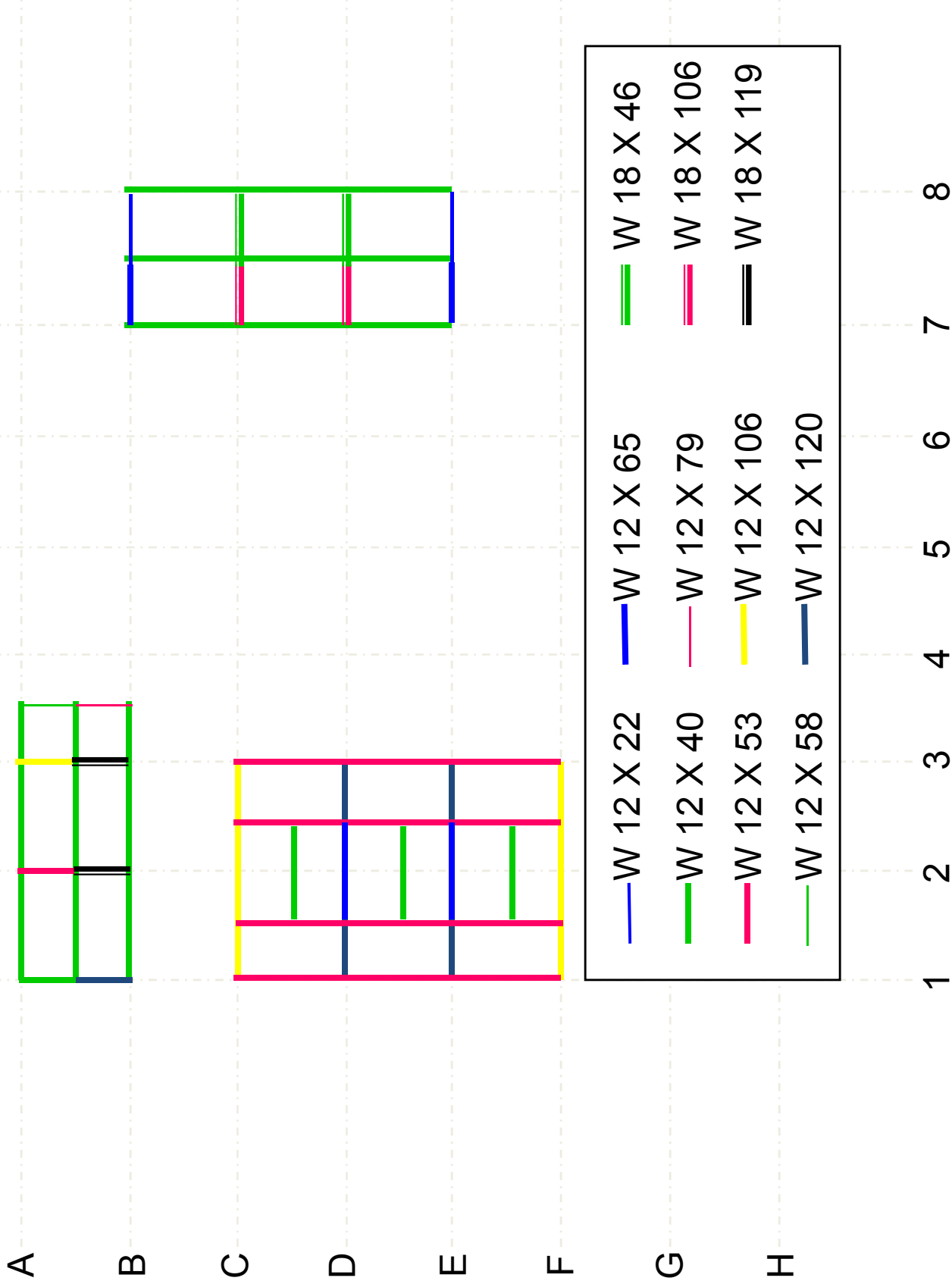
A B C D E F G H

1 2 3 4 5 6 7 8

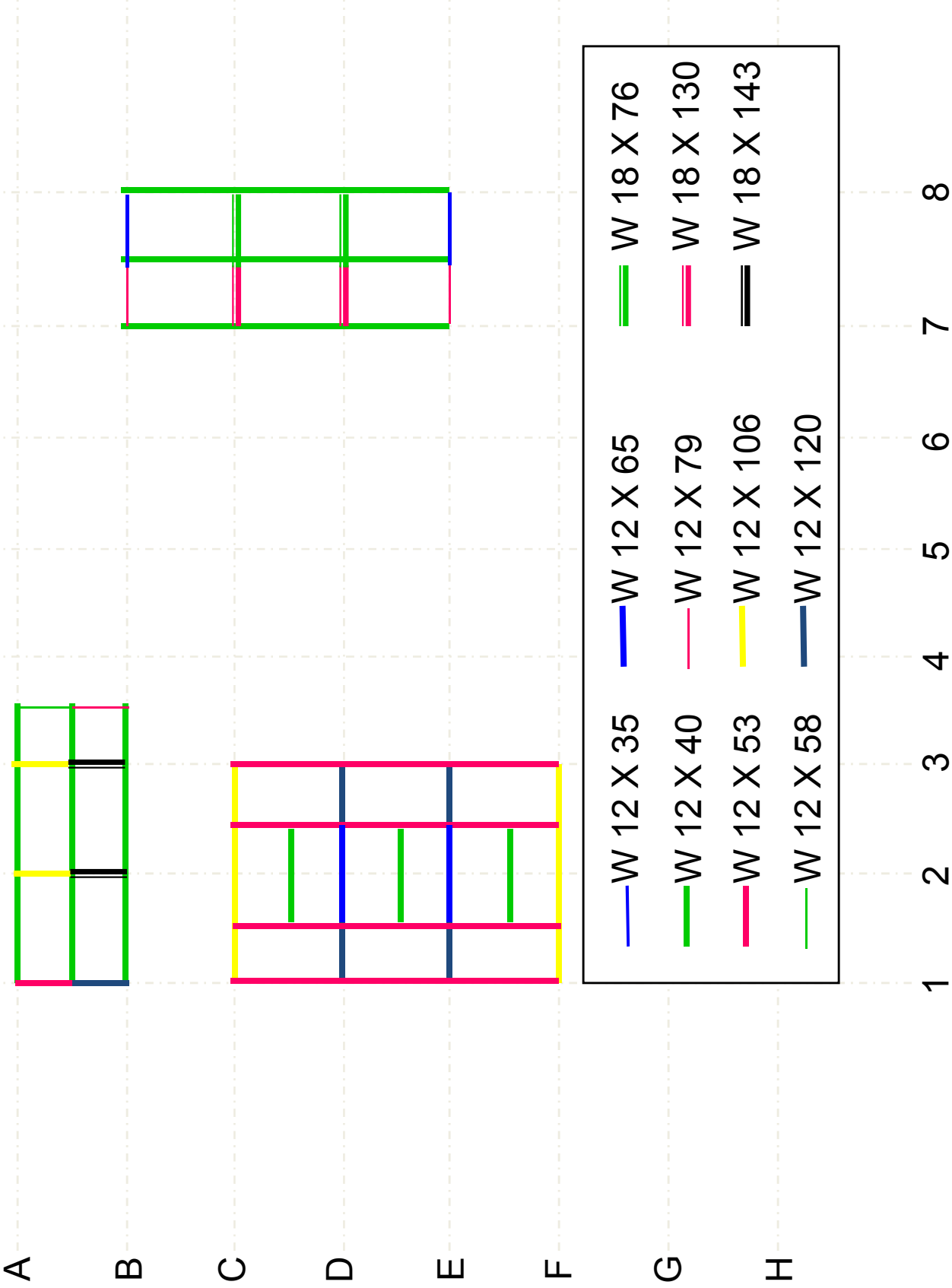
Third Floor

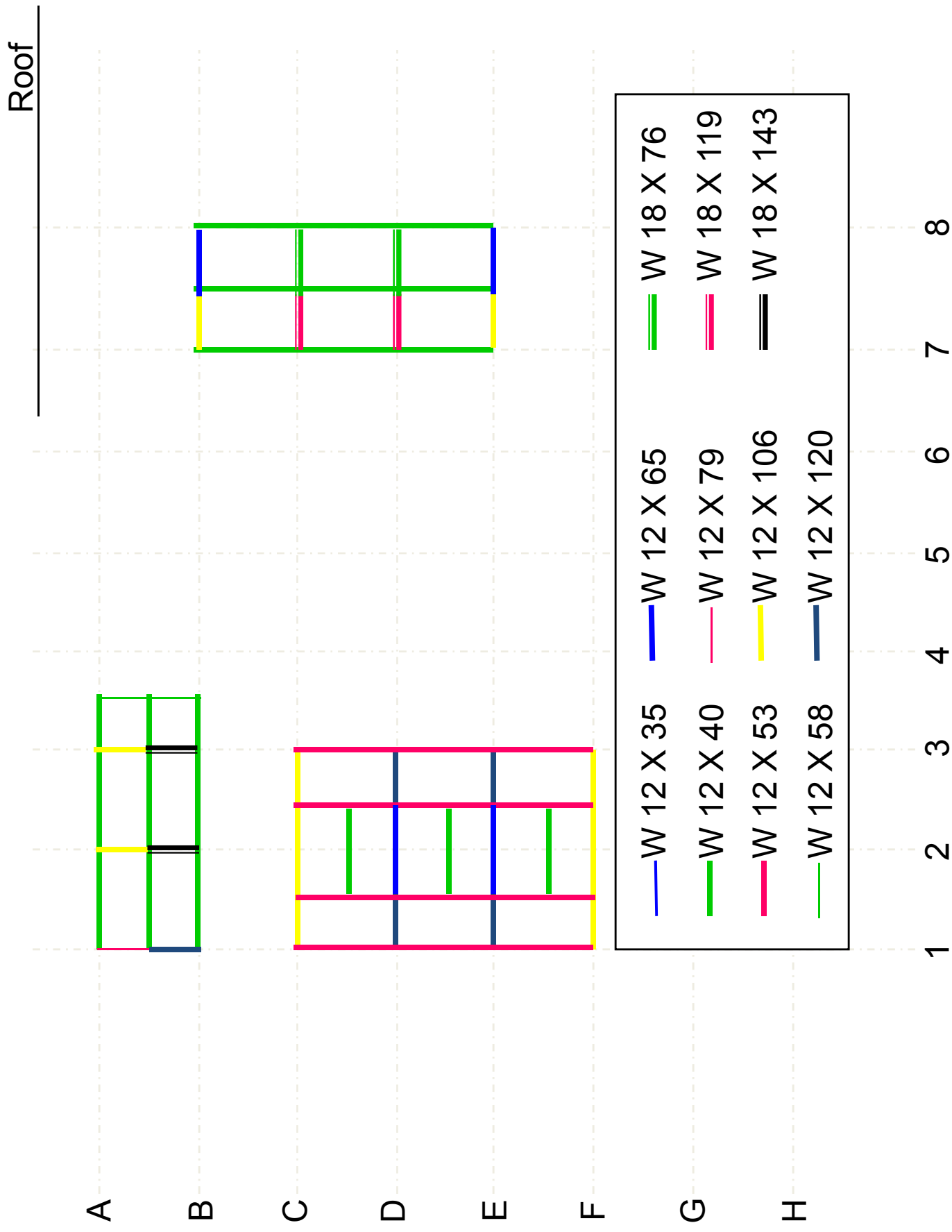


Second Floor




Third Floor





LEED Points – Sustainable Sites

 LEED-NC LEED-NC Version 2.2 Registered Project Checklist		Sustainable Sites		14 Points
Yes	?	No		
1	1	2	Prereq 1 Construction Activity Pollution Prevention	Required
1			Credit 1 Site Selection	1
1			Credit 2 Development Density & Community Connectivity	1
		1	Credit 3 Brownfield Redevelopment	1
1			Credit 4.1 Alternative Transportation, Public Transportation Access	1
1			Credit 4.2 Alternative Transportation, Bicycle Storage & Changing Rooms	1
		1	Credit 4.3 Alternative Transportation, Low-Emitting and Fuel-Efficient Vehicles	1
1			Credit 4.4 Alternative Transportation, Parking Capacity	1
1			Credit 5.1 Site Development, Protect of Restore Habitat	1
1			Credit 5.2 Site Development, Maximize Open Space	1
		1	Credit 6.1 Stormwater Design, Quantity Control	1
1			Credit 6.2 Stormwater Design, Quality Control	1
1			Credit 7.1 Heat Island Effect, Non-Roof	1
1			Credit 7.2 Heat Island Effect, Roof	1
1			Credit 8 Light Pollution Reduction	1

LEED Points – Water Efficiency, Energy & Atmosphere

Yes	?	No		5 Points
3	1	1		Water Efficiency
1				Credit 1.1 Water Efficient Landscaping, Reduce by 50%
1				Credit 1.2 Water Efficient Landscaping, No Potable Use or No Irrigation
		1		Credit 2 Innovative Wastewater Technologies
1				Credit 3.1 Water Use Reduction, 20% Reduction
		1		Credit 3.2 Water Use Reduction, 30% Reduction
Yes	?	No		10
				Energy & Atmosphere
10				17 Points
Y				Prereq 1 Fundamental Commissioning of the Building Energy Systems
Y				Prereq 2 Minimum Energy Performance
Y				Prereq 3 Fundamental Refrigerant Management
5				Credit 1 Optimize Energy Performance
1				Credit 2 On-Site Renewable Energy
1				Credit 3 Enhanced Commissioning
1				Credit 4 Enhanced Refrigerant Management
1				Credit 5 Measurement & Verification
1				Credit 6 Green Power
				Required
				Required
				Required
				1 to 10
				1 to 3
				1
				1
				1
				1

LEED Points – Materials & Resources

Yes ? No		Materials & Resources		13 Points
3	5	5		
Y			Prereq 1 Storage & Collection of Recyclables	Required
		1	Credit 1.1 Building Reuse, Maintain 75% of Existing Walls, Floors & Roof	1
		1	Credit 1.2 Building Reuse, Maintain 100% of Existing Walls, Floors & Roof	1
		1	Credit 1.3 Building Reuse, Maintain 50% of Interior Non-Structural Elements	1
		1	Credit 2.1 Construction Waste Management, Divert 50% from Disposal	1
		1	Credit 2.2 Construction Waste Management, Divert 75% from Disposal	1
		1	Credit 3.1 Materials Reuse, 5%	1
		1	Credit 3.2 Materials Reuse, 10%	1
		1	Credit 4.1 Recycled Content, 10% (post-consumer + ½ pre-consumer)	1
		1	Credit 4.2 Recycled Content, 20% (post-consumer + ½ pre-consumer)	1
		1	Credit 5.1 Regional Materials, 10% Extracted, Processed & Manufactured Regi	1
		1	Credit 5.2 Regional Materials, 20% Extracted, Processed & Manufactured Regi	1
		1	Credit 6 Rapidly Renewable Materials	1
		1	Credit 7 Certified Wood	1

LEED Points – Indoor Environmental Quality

Yes ? No		Indoor Environmental Quality		15 Points
12	3			
Y		Prereq 1	Minimum IAQ Performance	Required
Y		Prereq 2	Environmental Tobacco Smoke (ETS) Control	Required
1		Credit 1	Outdoor Air Delivery Monitoring	1
1		Credit 2	Increased Ventilation	1
1		Credit 3.1	Construction IAQ Management Plan, During Construction	1
1		Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1
1		Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	1
1		Credit 4.2	Low-Emitting Materials, Paints & Coatings	1
1		Credit 4.3	Low-Emitting Materials, Carpet Systems	1
1		Credit 4.4	Low-Emitting Materials, Composite Wood & Agrifiber Products	1
1		Credit 5	Indoor Chemical & Pollutant Source Control	1
1		Credit 6.1	Controllability of Systems, Lighting	1
1		Credit 6.2	Controllability of Systems, Thermal Comfort	1
1		Credit 7.1	Thermal Comfort, Design	1
1		Credit 7.2	Thermal Comfort, Verification	1
1		Credit 8.1	Daylight & Views, Daylight 75% of Spaces	1
1		Credit 8.2	Daylight & Views, Views for 90% of Spaces	1
Yes ? No		Innovation & Design Process		5 Points
1		4		
Yes ? No		Project Totals (pre-certification estimates)		69 Points
40	10			

Certified 26-32 points Silver 33-38 points Gold 39-51 points Platinum 52-69 points