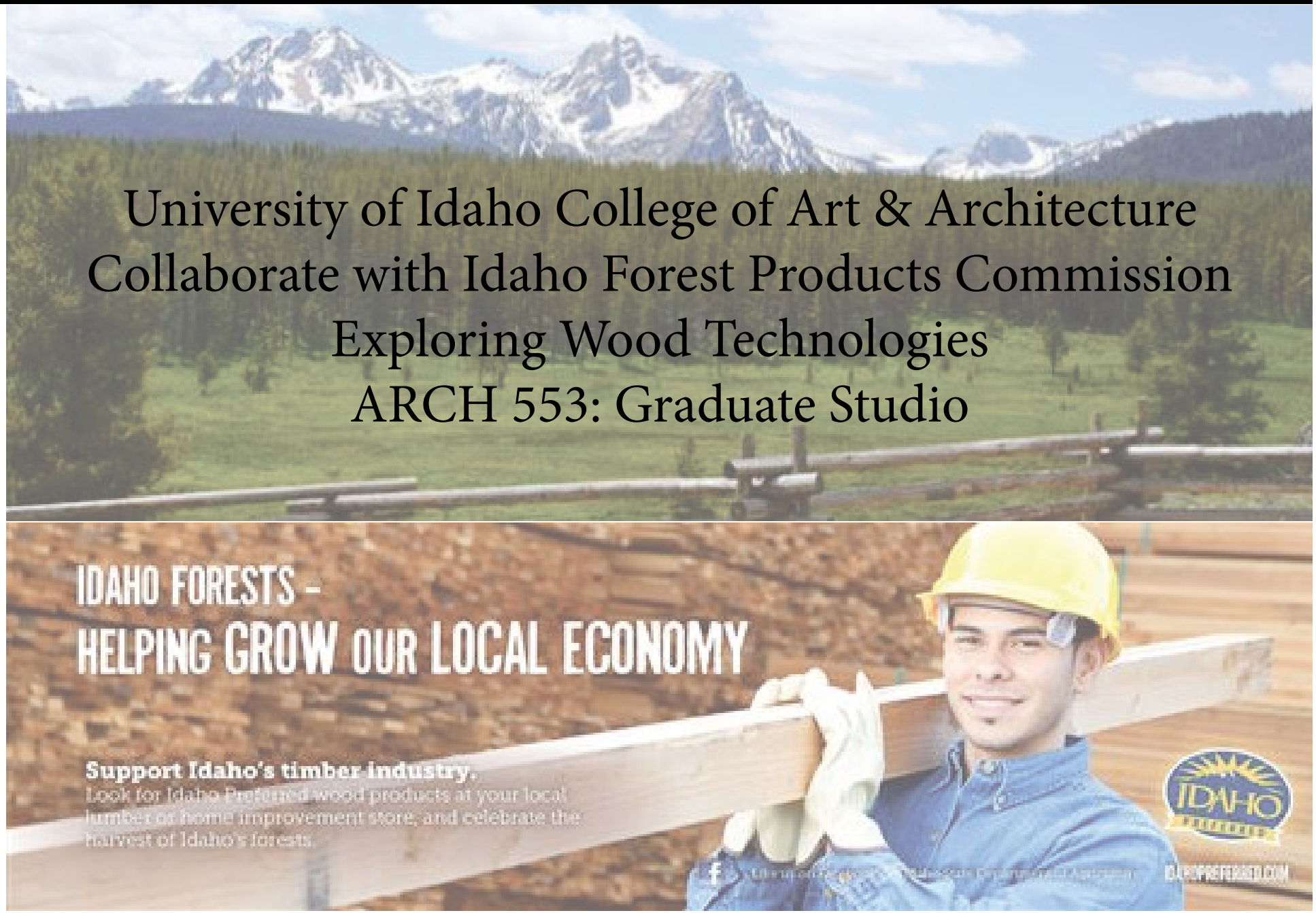
IRIC Presentation: Integrated Research & Innovation Center

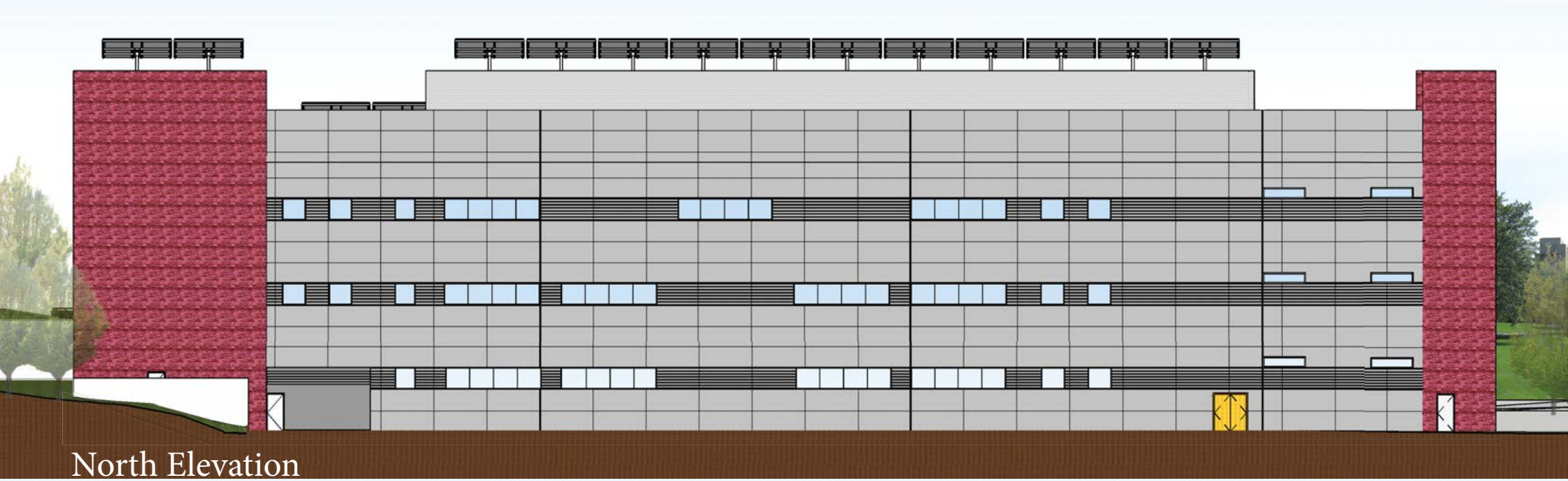


IRIC Presentation: Table of Contents

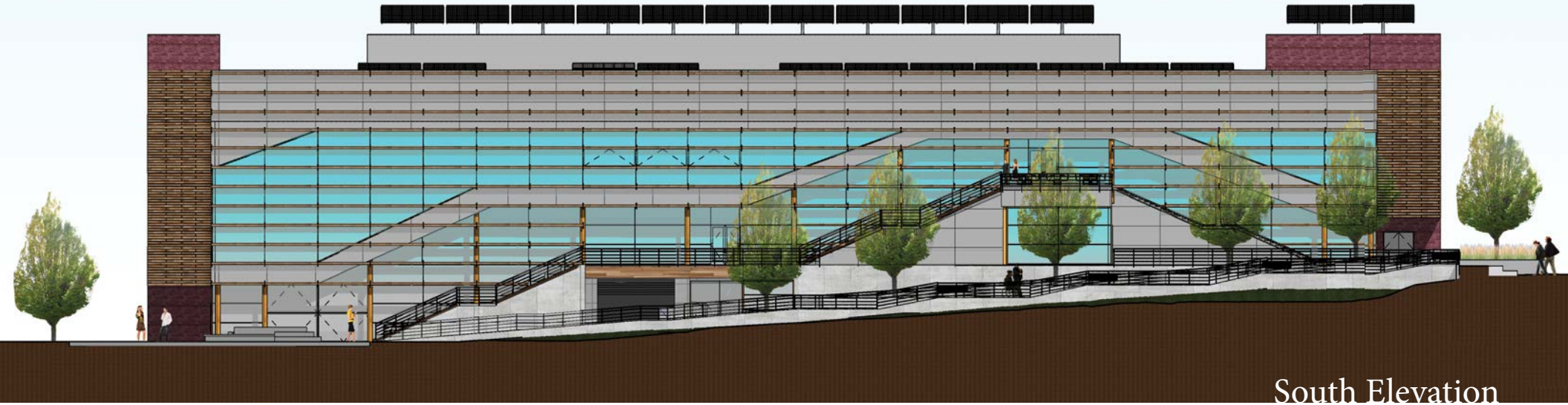
IRIC Presentation: South West Exterior Perspective

In collaboration with the Idaho Forest Products Commission our graduate studio took on the challenge to produce a wood building that has an externally low carbon foot print. Team 7 looked at combining a well insulated envelope with passive design strategies in order to reduce energy consumption. Through the use of glue laminated timber, prefabricated wood composite floor plates, dimensional lumber, and cross laminated timber shear walls, this combination provides a very strong, long lasting structure that accommodates a fast erection time. Using Idaho manufactured wood products allows the building to have a low carbon impact due to the location of site in relation to where the materials are manufactured. This building also takes advantage of the University of Idaho's facilities. This building's mechanical system utilizes steam created by the bio mass burner in the steam plant and chilled water that is also produced on campus, further reducing the energy loads this building would produce.

IRIC Presentation: Elevations



North Elevation



South Elevation

IRIC Presentation: Elevations

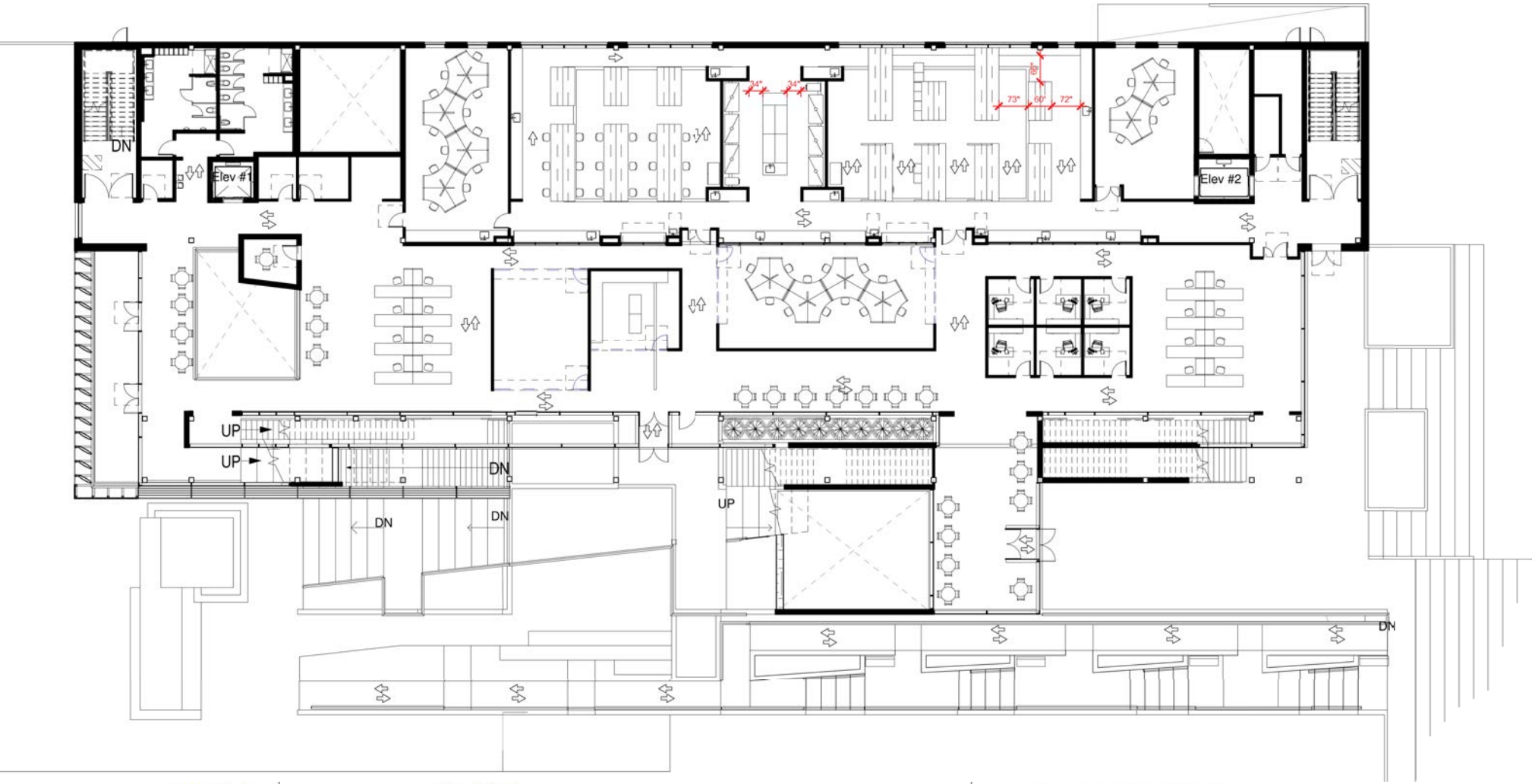
East Elevation

West Elevation

IRIC Presentation: Level 1 University Mall Entry

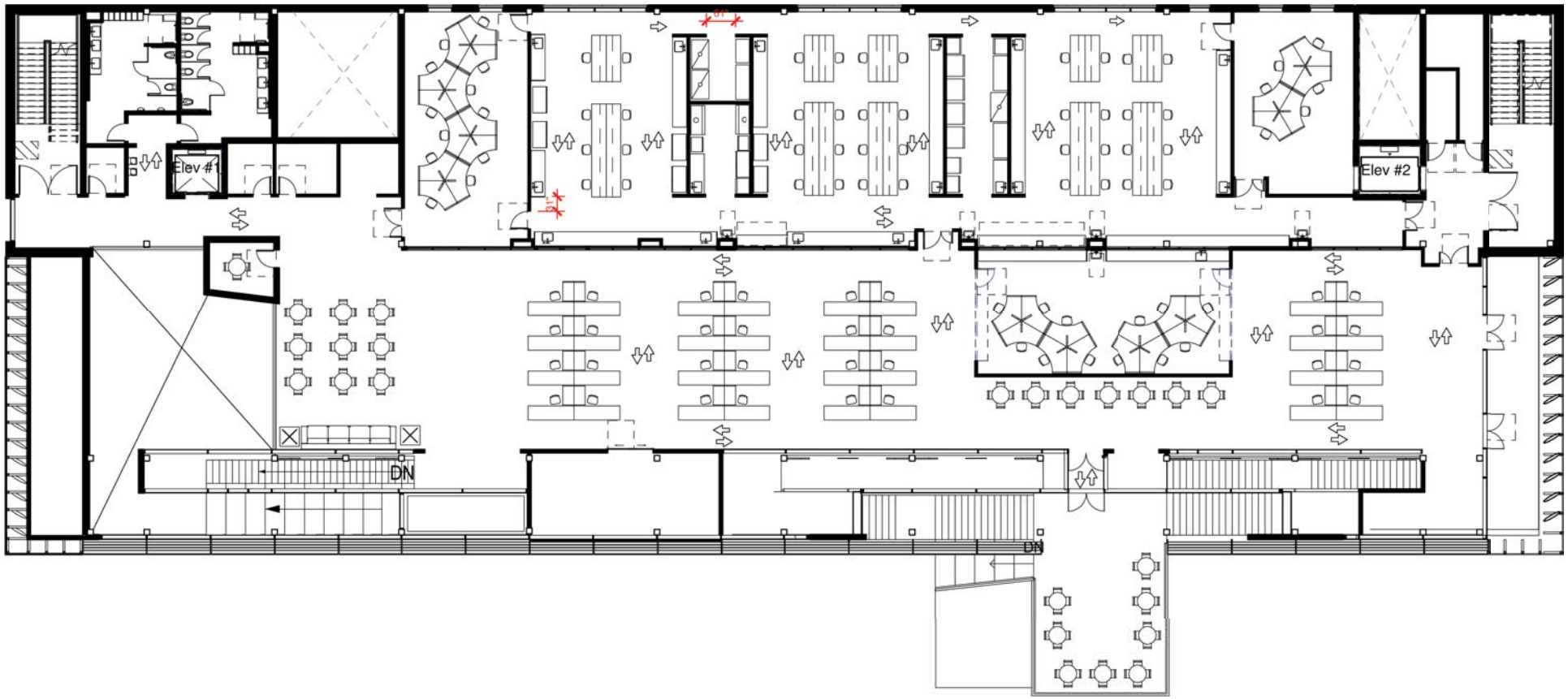
Convention	Description
36 / 915	dimension showing English units (in inches unless otherwise specified) above the line and SI units (in millimeters unless otherwise specified) below the line
6 / 150	dimension for small measurements
min	minimum
max	maximum
	boundary of clear floor space or maneuvering clearance
	a permitted element or its extension
	direction of travel or approach
	a wall, floor, ceiling, or other element cut in section or plan
	an element in elevation or plan
	location zone of element, control, or feature

IRIC Presentation: Level 2 Line Street Entry



Convention	Description
36 / 915	dimension showing English units (in inches unless otherwise specified) above the line and SI units (in millimeters unless otherwise specified) below the line
6 / 150	dimension for small measurements
min	minimum
max	maximum
	boundary of clear floor space or maneuvering clearance
	a permitted element or its extension
	direction of travel or approach
	a wall, floor, ceiling, or other element cut in section or plan
	an element in elevation or plan
	location zone of element, control, or feature

IRIC Presentation: Level 3



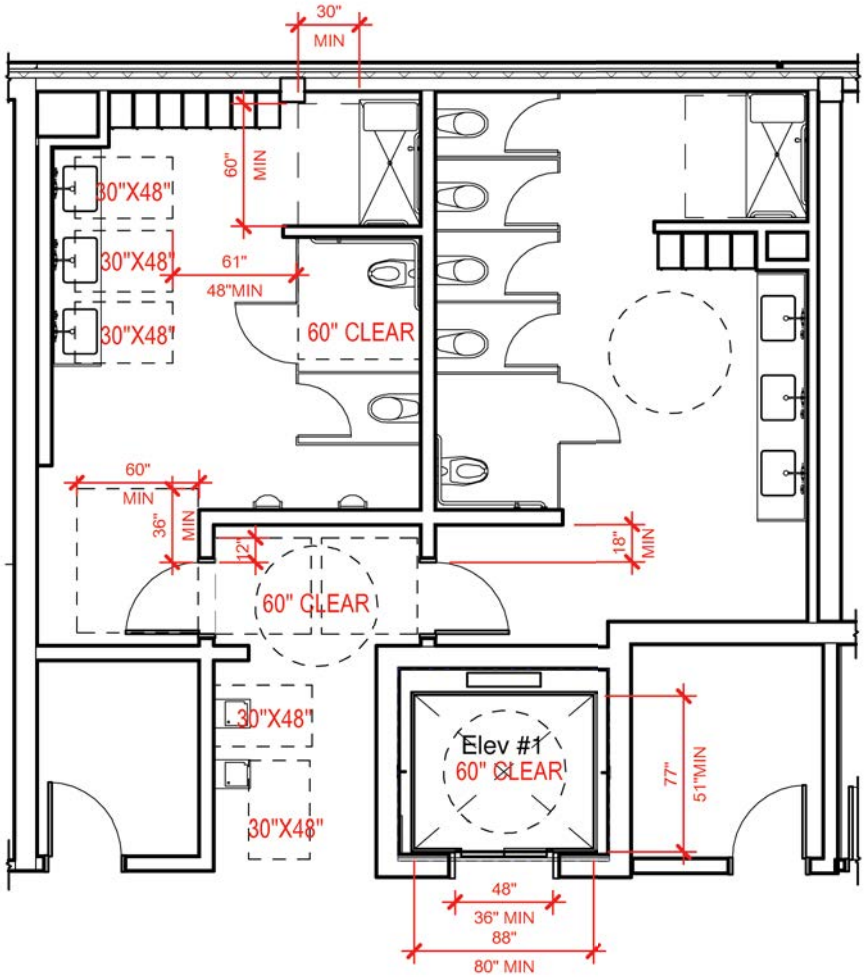
Convention	Description
36 / 915	dimension showing English units (in inches unless otherwise specified) above the line and SI units (in millimeters unless otherwise specified) below the line
6 / 150	dimension for small measurements
min	minimum
max	maximum
– – – – – – – –	boundary of clear floor space or maneuvering clearance
– · – · – · – · –	a permitted element or its extension
	direction of travel or approach
	a wall, floor, ceiling, or other element cut in section or plan
	an element in elevation or plan
	location zone of element, control, or feature

IRIC Presentation: Enlarged Restroom Plan

ADA Conventions

Convention	Description
36 / 915	dimension showing English units (in inches unless otherwise specified) above the line and SI units (in millimeters unless otherwise specified) below the line
6 / 150	dimension for small measurements
min	minimum
max	maximum
	boundary of clear floor space or maneuvering clearance
℄	centerline
	a permitted element or its extension
	direction of travel or approach
	a wall, floor, ceiling, or other element cut in section or plan
	an element in elevation or plan
	location zone of element, control, or feature

Fig. 104.2
Graphic Convention for Figures



Building Occupancy Load

Level 1: 308
Level 2: 280
Level 3: 247

Water Closets

1 per 25 for the first 50, 1 per 50 after that
Men's Only: 50% must be urinals

Lavatories

1 per 40 for the first 80, 1 per 80 after that

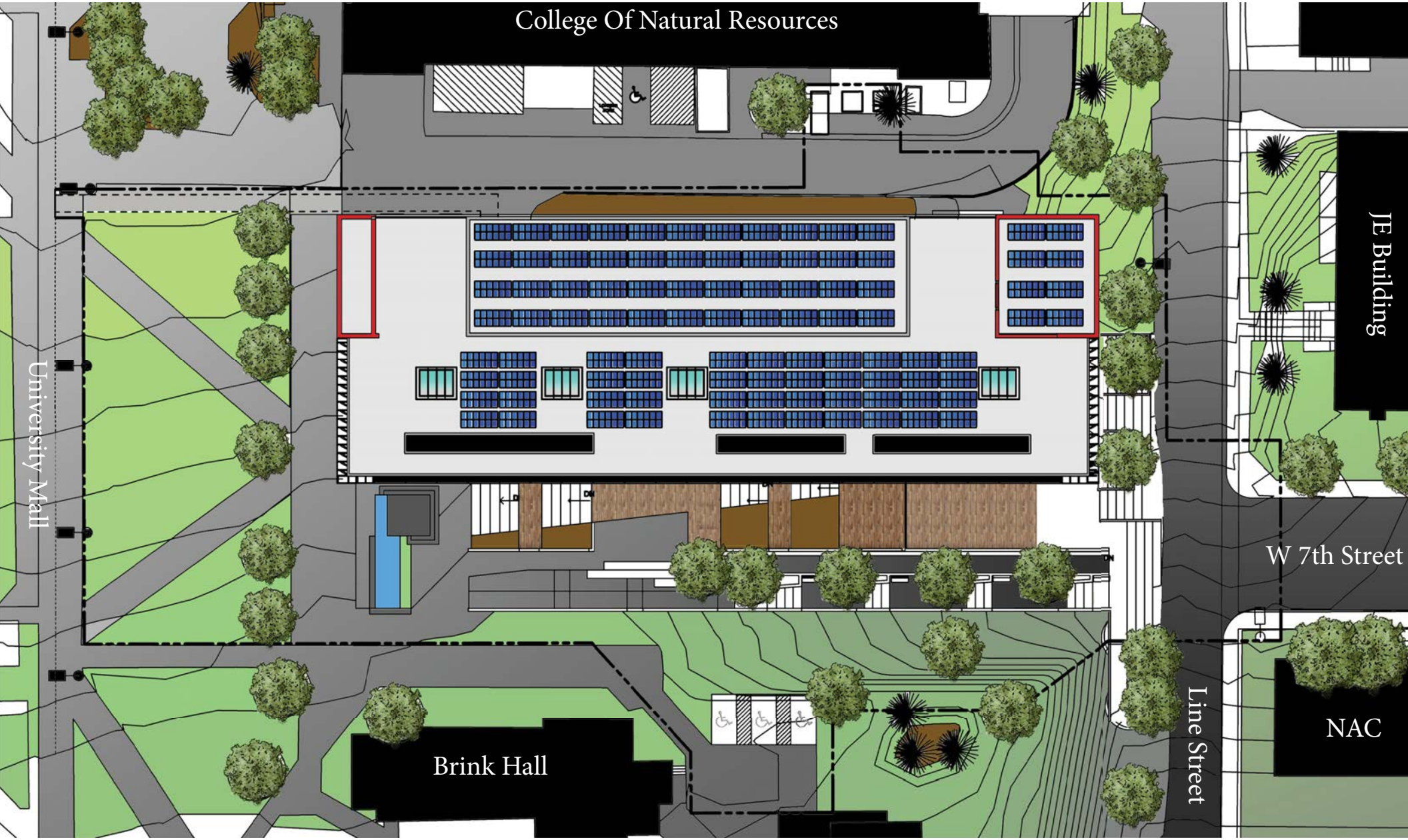
Total for All Levels

Water Closets: 4
Lavatories: 3

IRIC Presentation: Interiors Perspective Flex Lab Space

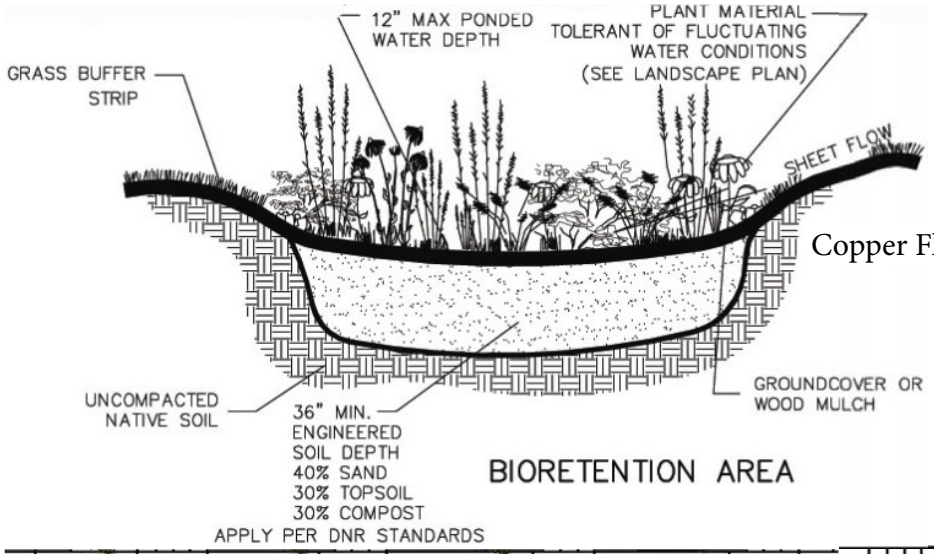
IRIC Presentation: Interiors Perspective Entry Atrium

IRIC Presentation: Site Plan

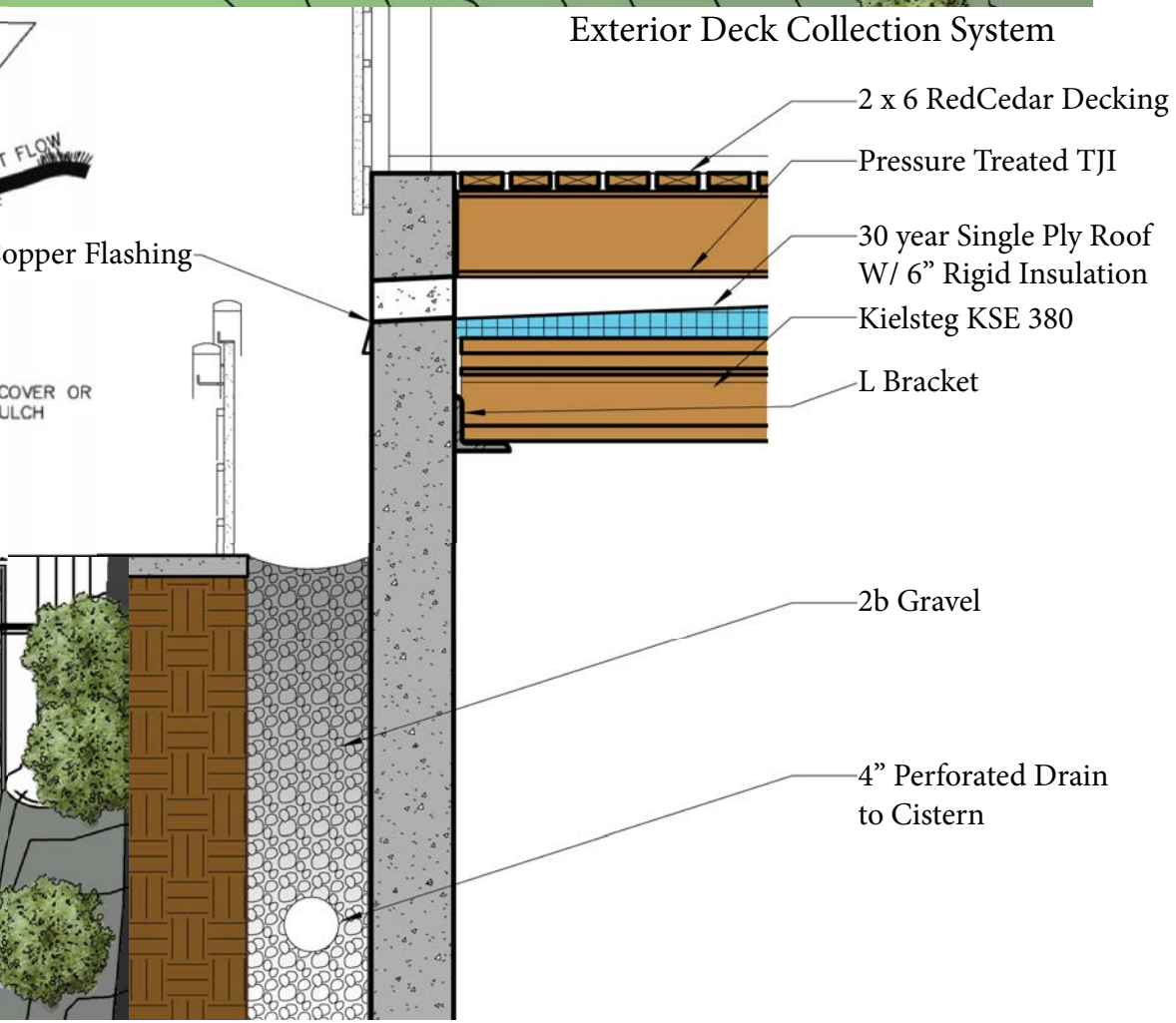


IRIC Presentation: Site Water Retention/Collection

BioSwale Retention System: Captures rain water above the site, returning water to the water table before it impacts the load on the sewer system.



Exterior Deck Collection System



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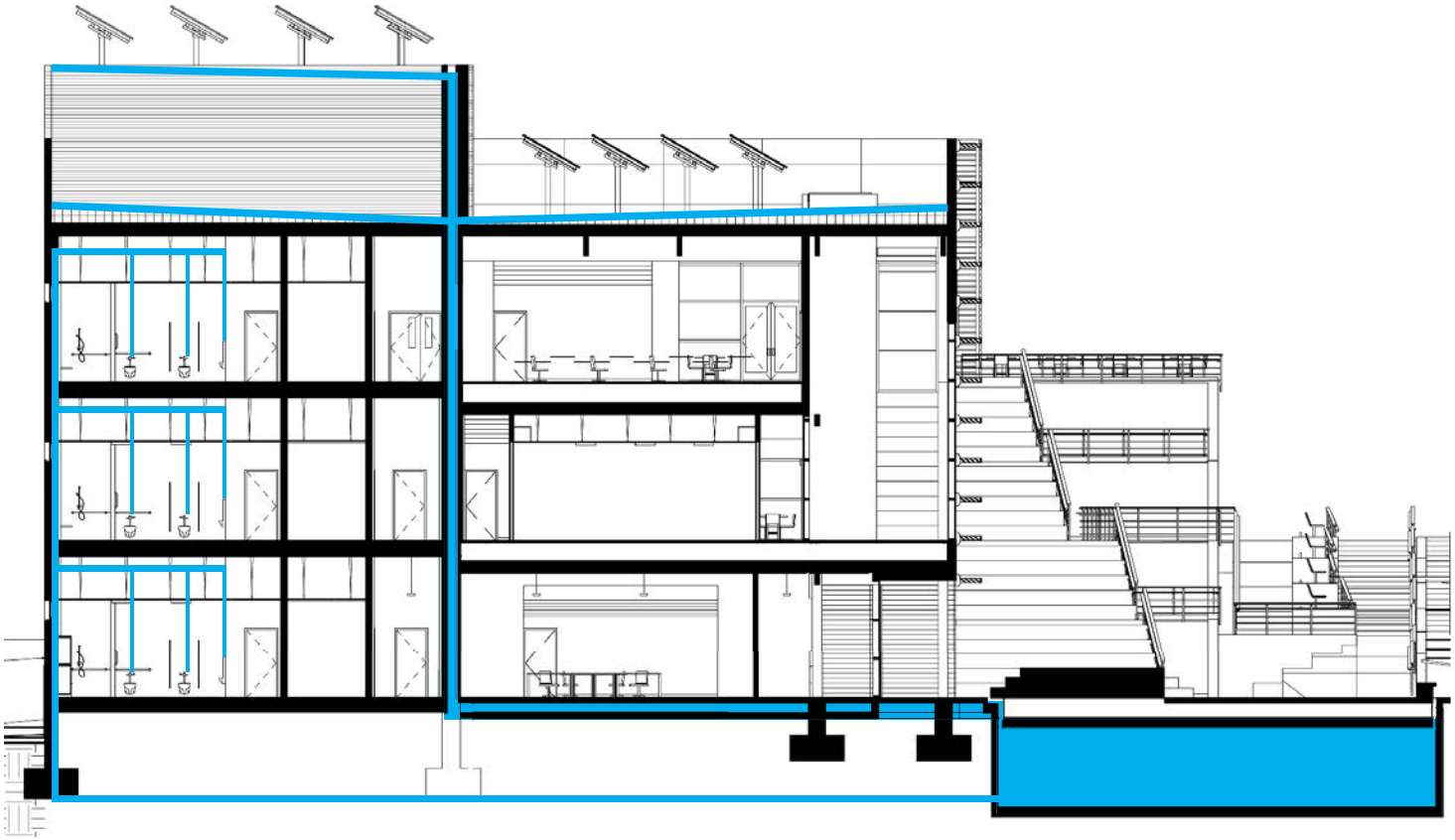
IRIC Presentation: Roof Water Collection

Possible Rainwater Harvesting: 520,000 gallons/year

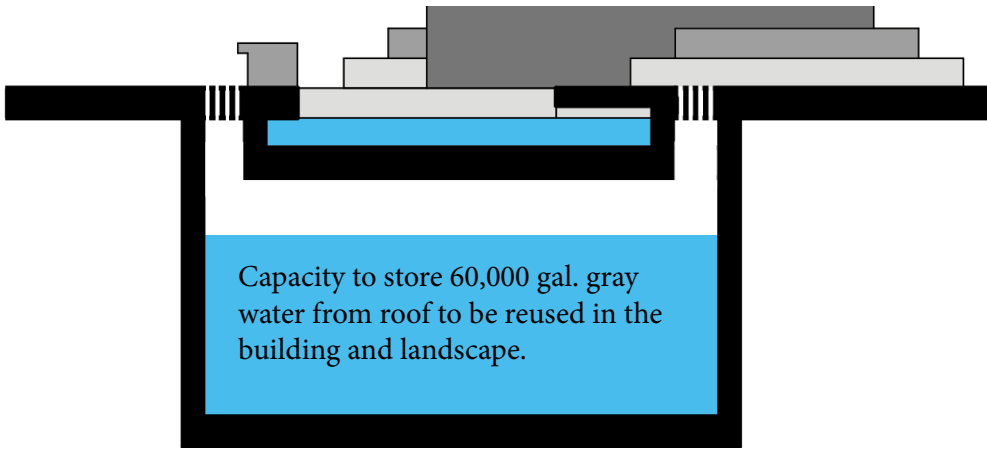


Roof water is collected and stored in a cistern under the water element on the south west corner of the site adjacent to the University mall. The water element is used to activate the space in front of the theater seating along the south facade of the building acting as a focal point while celebrating the harvesting of rain water. This water is reused within the building to flush the low flow toilets and urinals reducing potable water consumption by 265,762 gallons annually. A 90% reduction in total water consumption.

Building Summary

	Total	Male	Female	Employee Only	Efficiency	Efficiency Savings: Percent of Indoor Usage (%)	Efficiency Savings: Gallons per Year
Toilets:	21	11	10	0	Low-Flow	6.7	177,467
Urinals:	6	6		0	Low-Flow	3.3	88,295
Sinks:	69	16	16	0	Low-Flow	0.8	21,103
Showers:	6	0	0		Low-Flow	0.3	8,235
Clothes Washers:	0				Standard	0	0
Dishwashers:	0				Standard	0	0
Cooling Towers:	0				Standard	0	0
☐ Include cooling tower blowdown in sewer costs					**Total Efficiency Savings:**	**11.1%**	**295,100**

Source: 2000 Uniform Plumbing Code of the IAPMO, Tables 4-1 and 4-3.



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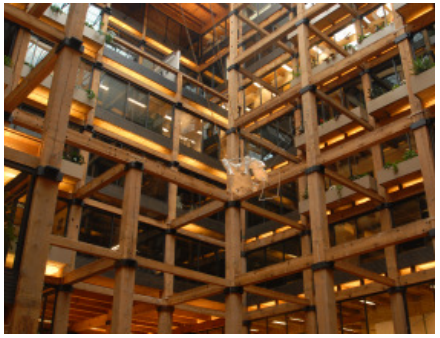
IRIC Presentation: Structural Materials

Light Wood Frame

- Economical
- Non-Load Bearing
- Infill Only



Timber Frame

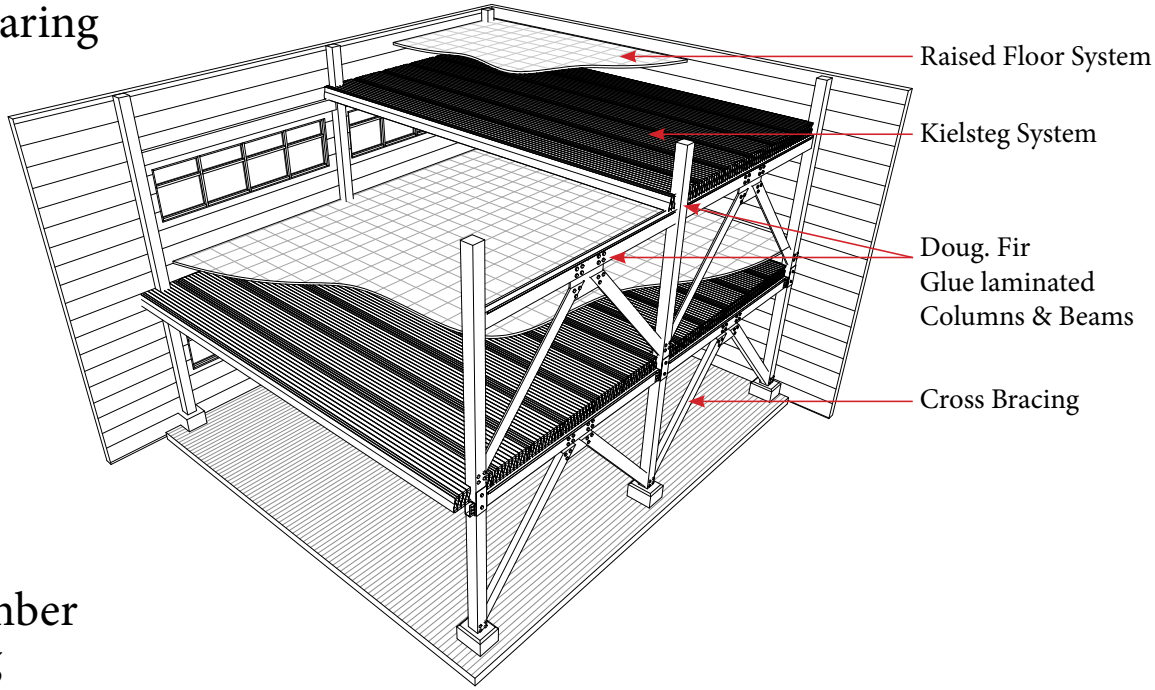
- Aesthetic
- Flexibility
- Spanning

Cross Laminated Timber

- Heavy/Strong
- Shear Wall
- Prefabricated

Kielsteg

- Long Spanning
- Light Weight
- Strong
- Prefabricated



Western White Pine

- Interior Finishes

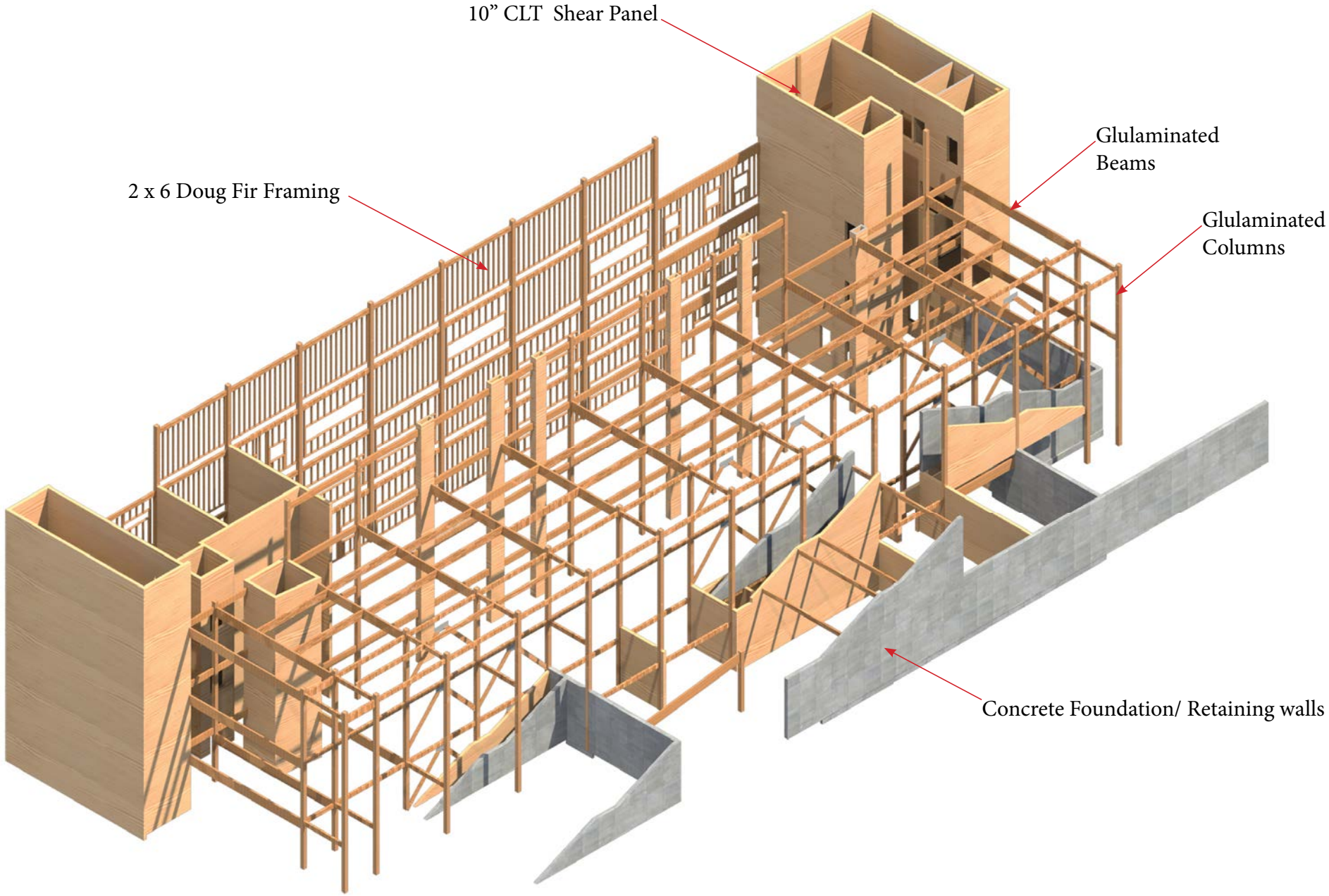
Douglas Fir

- Structure

Western RedCedar

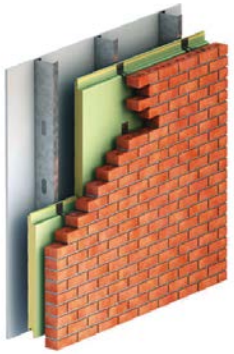
- Exterior Finishes

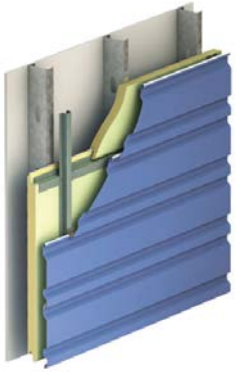
IRIC Presentation: Structural Framing

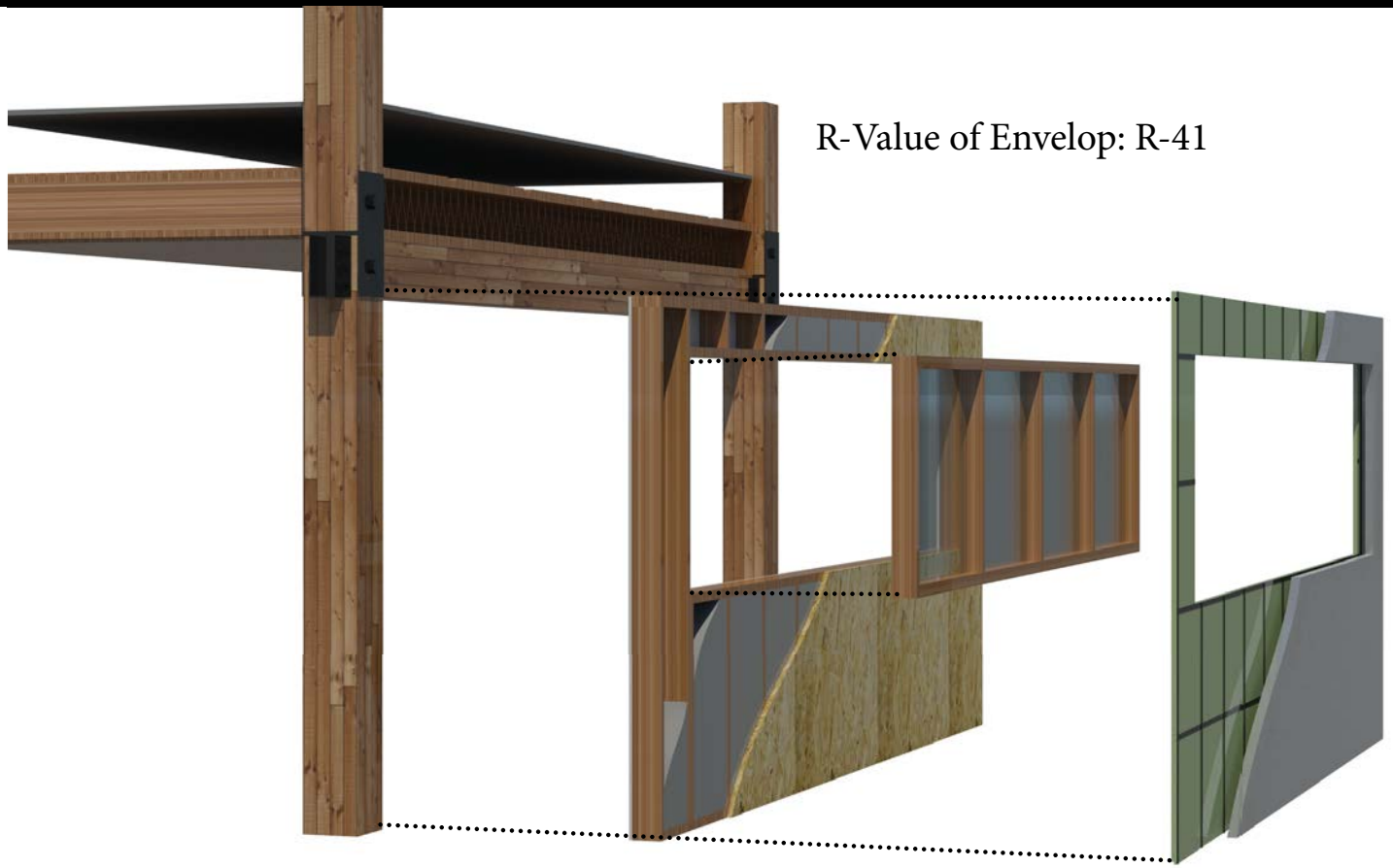


IRIC Presentation: Envelope

North Wall Detail:







R-Value of Envelop: R-41

Centria Panel:

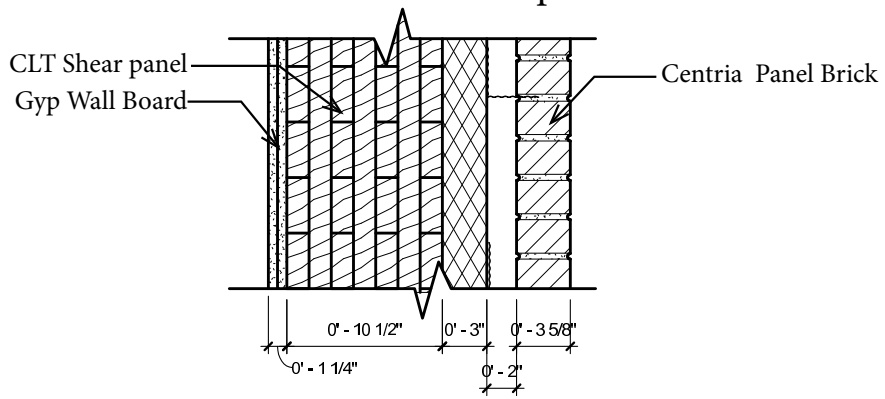
Thickness: 3”
Width: 36”, 32”, 36”
Length: 12’ or 20’
Face: 29 gage Galvalume with primer
Liner: 29 gage Galvalume with primer
Foam Insulation: Min. 2.4 pcf polyisocyanurate
R-value: 3”- R-21

6” Stud wall:

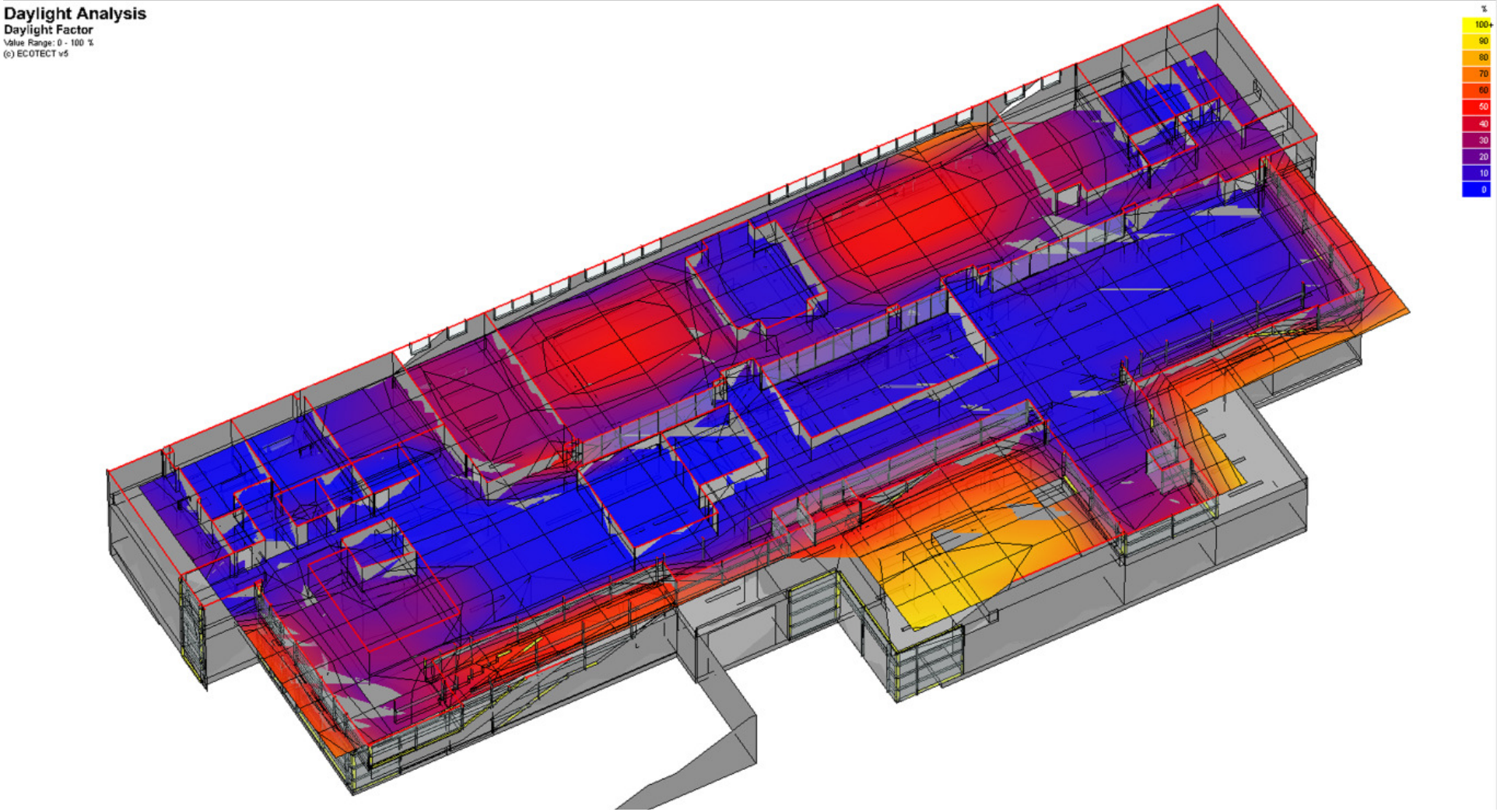
Cellulose Spray Insulation: 5.75” @ R-value of 3.6/in.= R-20

North: Triple Pane low E glazing: R-4
South: Double Pane Low E glazing
East: Double Pane Low E glazing
West: Double Pane Low E glazing

Vertical circulation envelop section:

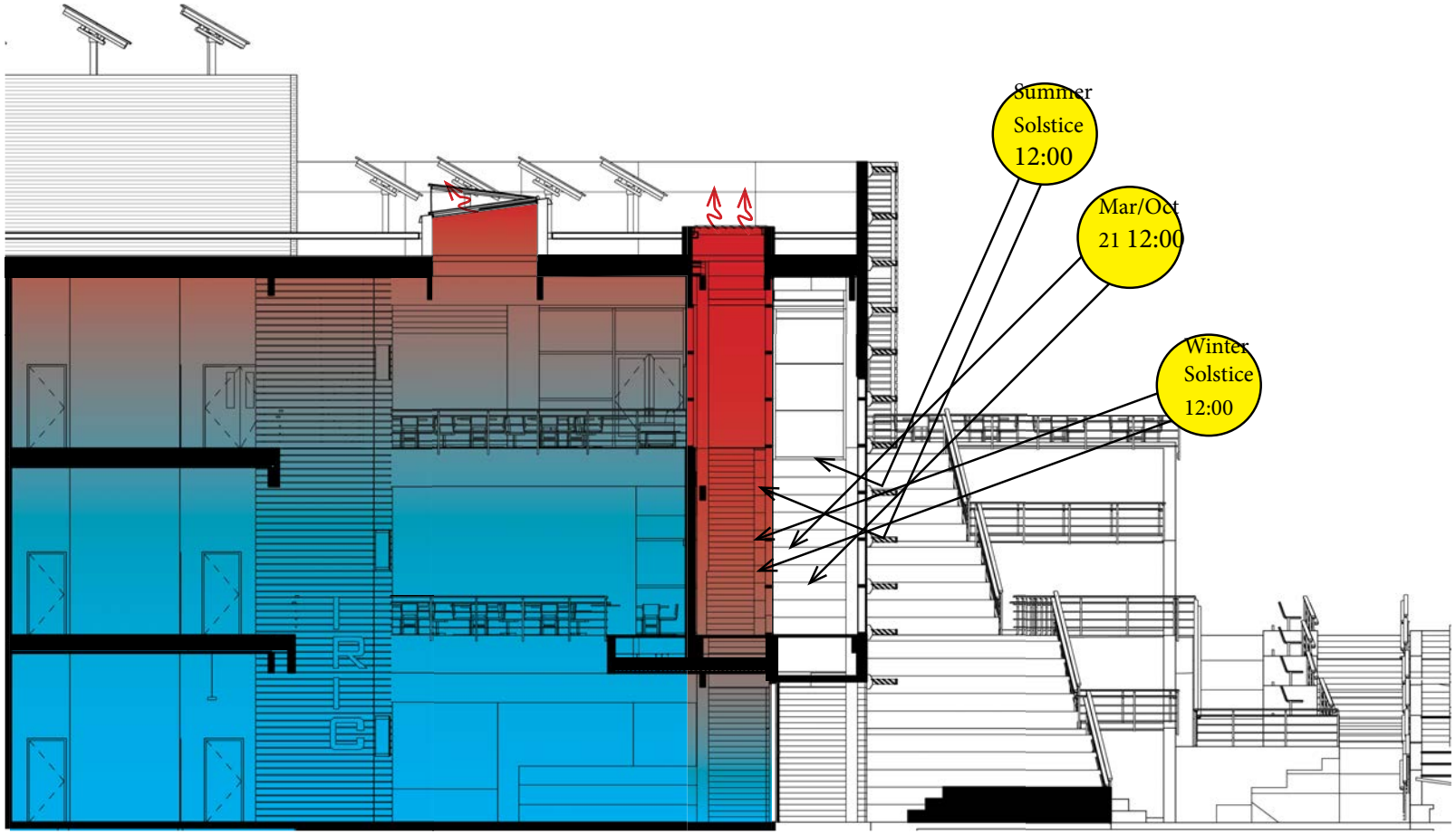


IRIC Presentation: Day Light Study



Day light studies were done using Eco-tech analysis. This Study showed that adequate day light gets to the interior of the space on cloudy days. This reduces the amount of lights that need to be on through out the day lowering the buildings energy loads. On the south facade it is clear form this graphic that the building will receive an antiquate amount of heat gain from the sun.

IRIC Presentation: Section Solar Heat Gain



The building takes advantage of this by capturing that heat in a double skinned wall ware circulation in the building happens. This function allows the building to regulate the heat gain through whats called the stack affect. In the summer the heat is allowed to escape through vents in the roof while in the winter the heat is trapped increasing the thermal resistance of the glass facade.

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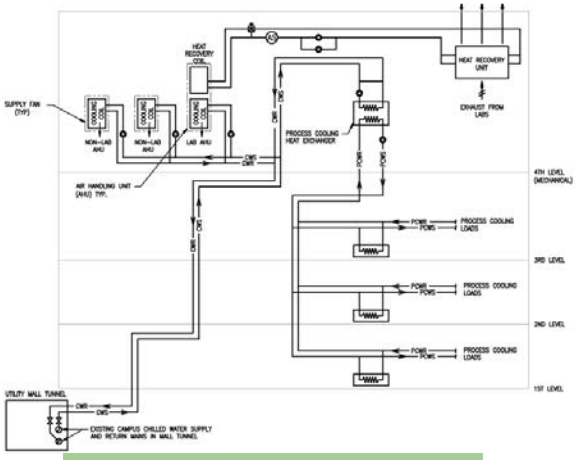
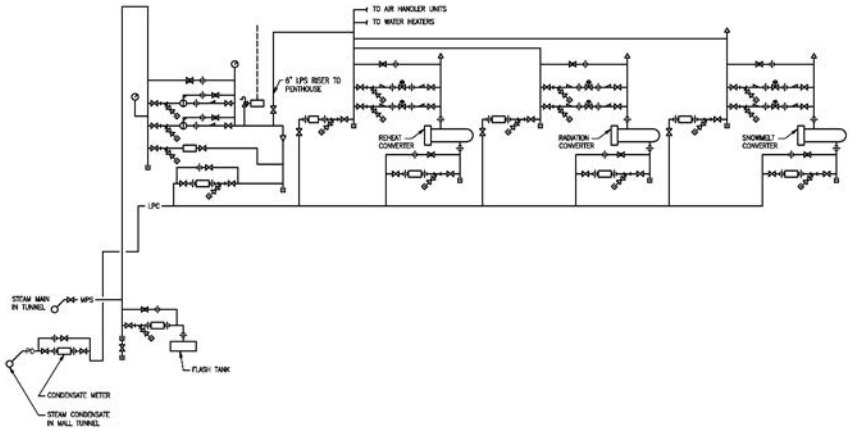
IRIC Presentation: Mechanical Plan



CHILLED WATER PIPING DIAGRAM 2
NOT TO SCALE



STEAM SYSTEM PIPING 1
NOT TO SCALE

Zone 1

Lab Supply Air

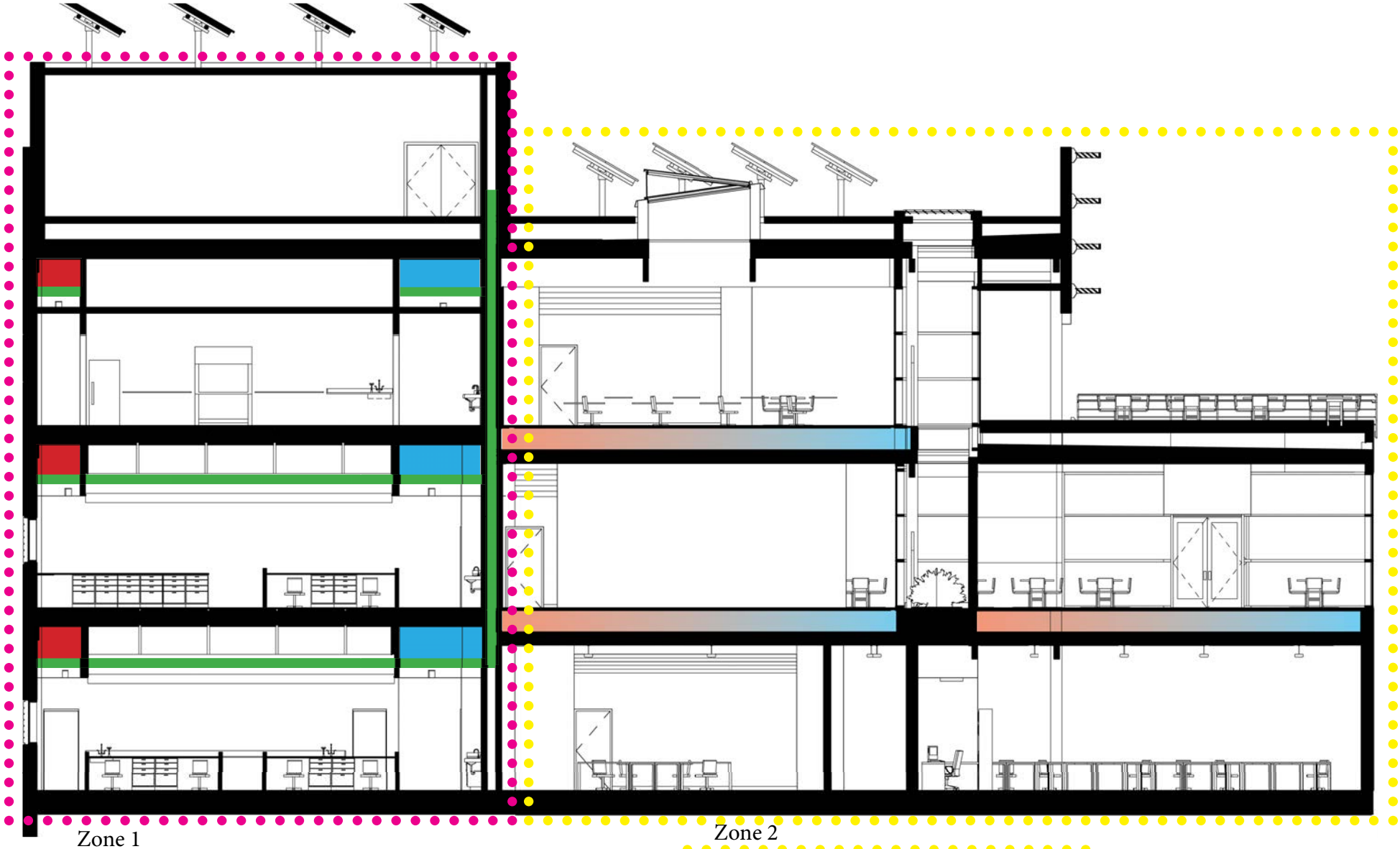
Lab Exhaust Air

Zone 2

Non Lab Return Air (In raised floor system)

Non Lab Supply Air (In raised floor system)

IRIC Presentation: Mechanical Section



IRIC Presentation: Energy Use Intensity (EUI)

	Quantity	*power load: KW/h*	*Total KW/h*	*hours*	*KWh/d*	*KWh/yr*	*KWh/Sf/yr*	*kbtu/sf/yr*
Building Energy Loads							72,000SF	
Lighting								
Rab 2x2 LED Lights	150	0.0348	5.22	8	41.76	15,242.40	0.2117	**0.72**
Rab LED Pendent Lights	216	0.048	103.68	4	414.72	151,372.80	2.1	**7.15**
Rab 6" Recessed LED	240	0.0132	3.168	8	25.34	9,250.56	0.013	**0.044**
Sub Totals	623	0.096	112.068	20	481.82	327,238.56	4.55	**7.9**
Equipment								
Refrigerators	16	3.6	57.6	8	460.8	168,192	2.336	**7.94**
Freezers	18	2.5	45	8	360	131,400	1.825	**6.21**
Incubators	5	1.452	7.26	4	29.04	10,599.60	0.15	**0.51**
Hoods	18	1.2	21.6	4	86.4	31,536	0.438	**1.49**
Sub Totals	**57**	**8.752**	**131.46**	**24**	**936.24**	**341,727.60**	**4.75**	**16.15**
Total EUI before Solar							**9.3**	**24.05**
Site Energy Production								
Solar Panels 37◦	96	0.96	92.15	8	737.21	269,083	3.74	**12.7**
Total EUI after Solar								**11.35**

IRIC Presentation: Carbon Impact

Material	*Impact (Manufacturing)*	*Impact (Transportation)*	*Amount in Building*	*Overall Carbon Impact*	*Species/Recyclable*
Beams/Columns	Low	Low	High	1	Douglas Fir
2x6 Studs	Low	Low	High	1	Douglas Fir
Kielsteg Panels	Low	High*	High	2	Douglas Fir
Centria Panels	Low	Low	High	1	Recycled Content
Louvers	Average	Low	High	1.5	Cedar
Double Pane	High	Low	High	2	NA
CLT Panels	Low	High*	Average	2	Douglas Fir
Steel Brackets	Average	Low	Average	1.5	Recycled Content
Single Pane	High	Low	Average	2	NA
Triple Pane	High	Low	Average	2	NA
Rigid Insulation	Average**	Low	Average	1.5	Recycled Content
Cellulose Insulation	Low	Low	Average	1	Recycled Content
Concrete	High**	Low	Average	1	Recyclable
Brick	High**	Low	Low	1	Recycled Material
Point Average	1.9	1	NA	**1.5**	

1=Low, 2=Average, 3=High

***Could be produced in Idaho**

**Potential to be lower

IRIC Presentation: Conclusion

Through the use of passive design strategies, the goal is to reduce the energy load requirements for the active mechanical and electrical systems. The horizontal solar shading devices on the south facade blocks direct gain in the summer, but allows diffuse light to penetrate the space. In the winter, the solar shading devices allow direct gain. To further reduce energy loads, a double wall system is used on the south facade in the circulation areas to trap heat gained in both summer and winter, adding an additional buffer zone to the building. The vertical shading devices on the east and west face of the building also block direct heat gain while allowing diffused light to penetrate the building envelope. This further reduces the electrical and mechanical system loads. The north facade is designed to provide a maximum thermal resistance of R-41 while the vertical circulation areas on the east and west facades have a thermal resistance of R-33. As a result of these combined systems and on site energy production, the energy use intensity (EUI) is reduced to 11.35 well below the Architecture 2030 Challenge of energy use.