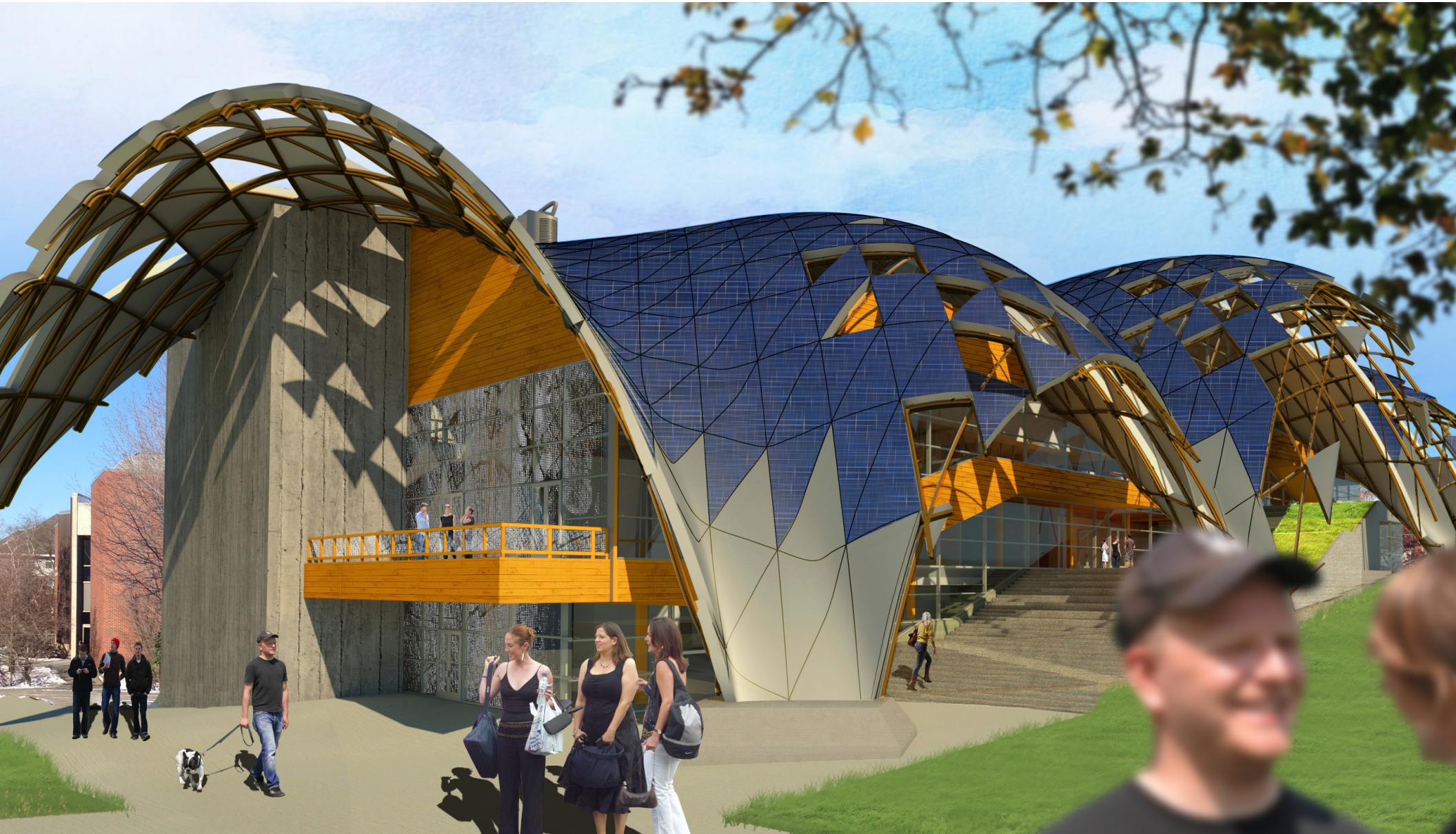
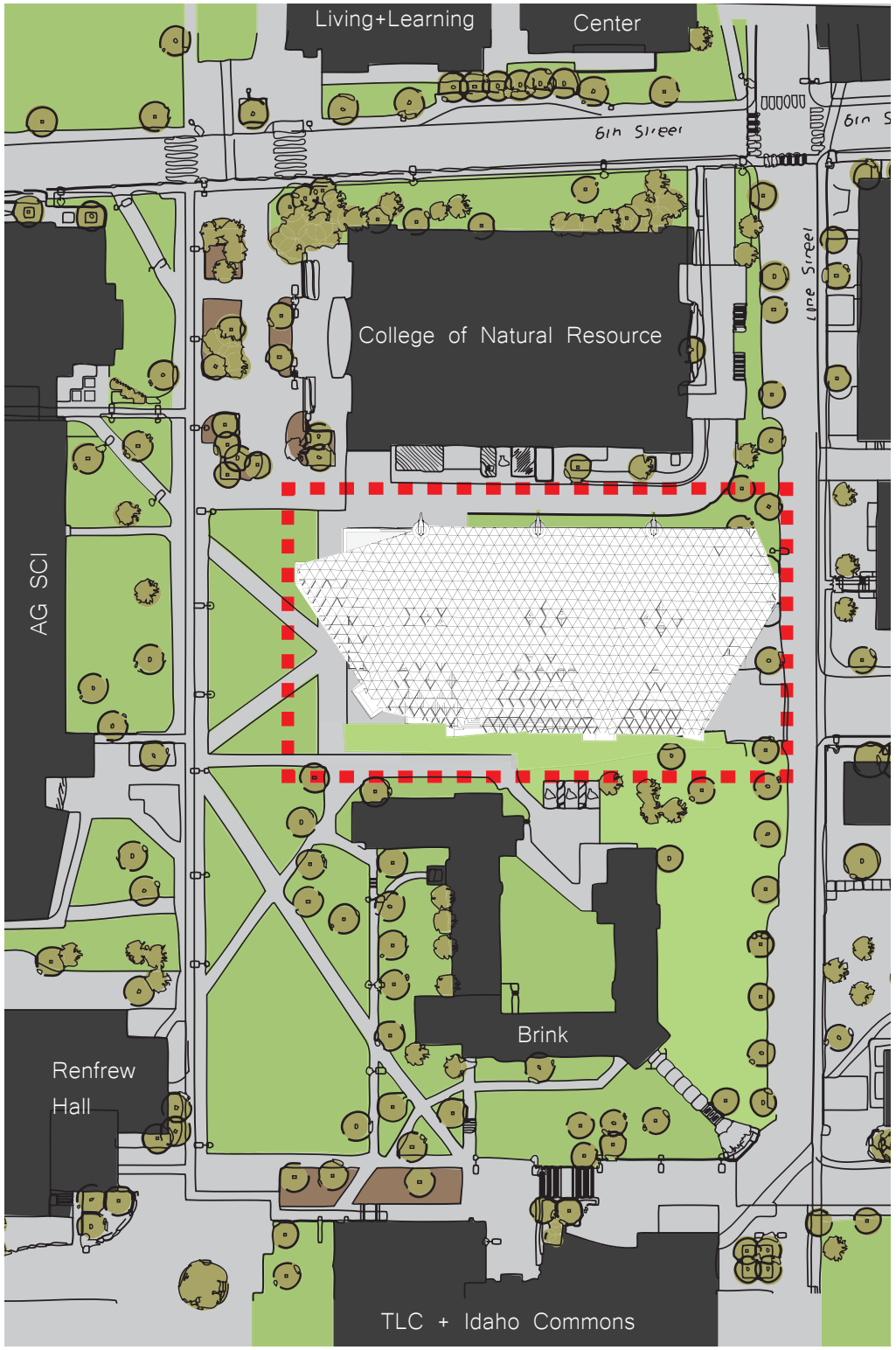
INTEGRATED RESEARCH AND INNOVATION CENTER

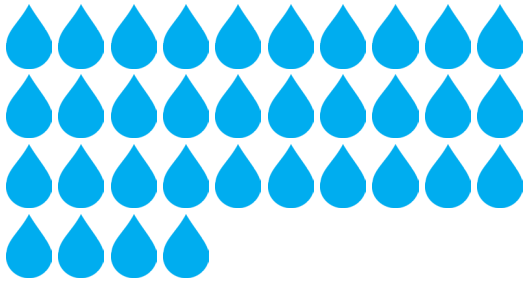
Team 14



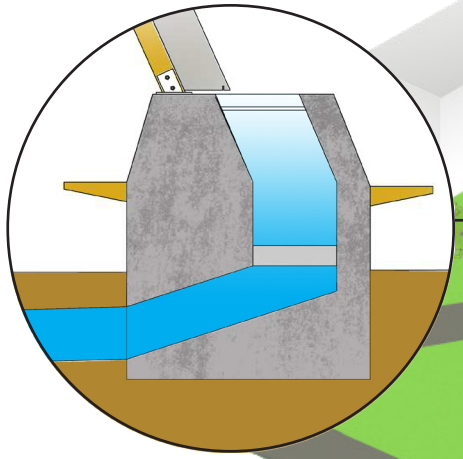
SITE PLAN


Living+Learning
Center
6th Street
College of Natural Resource
Line Street
AG SCI
Brink
Renfrew
Hall
TLC + Idaho Commons
N

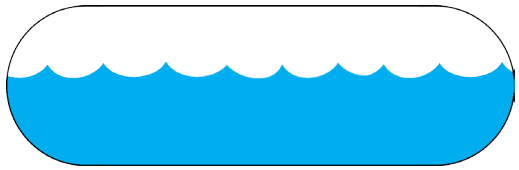
SITE DESIGN



25,000sf roof area is capable of harvesting 340,000 gallons of rainfall each year.

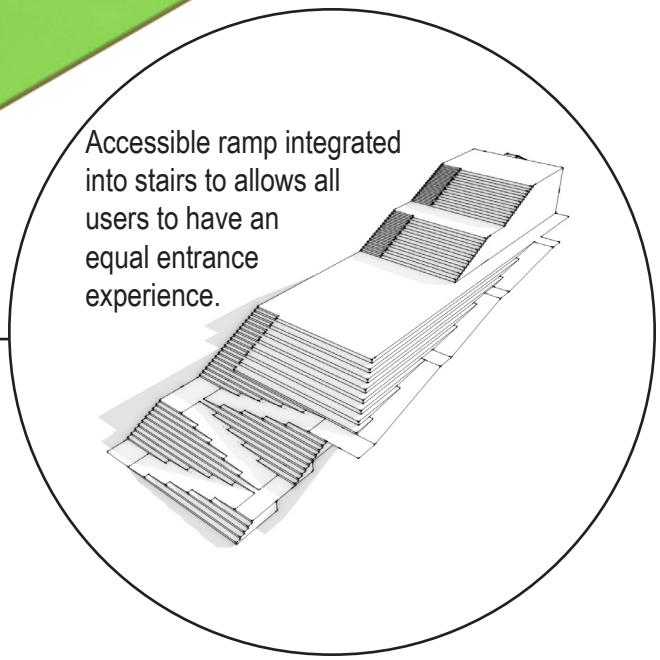


Gridshell piers collect water from roof and direct it to an underground cistern.



100,000 gallon underground cistern sized to provide water through drought.

Bioswale mitigates site storm water to prevent flooding.

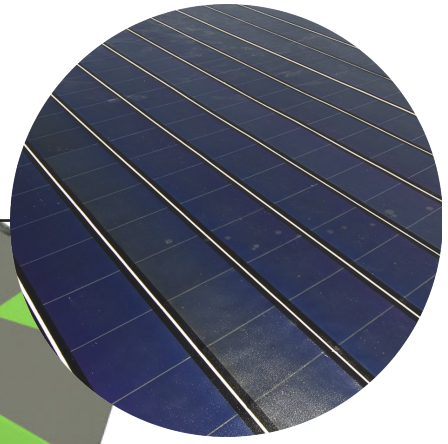


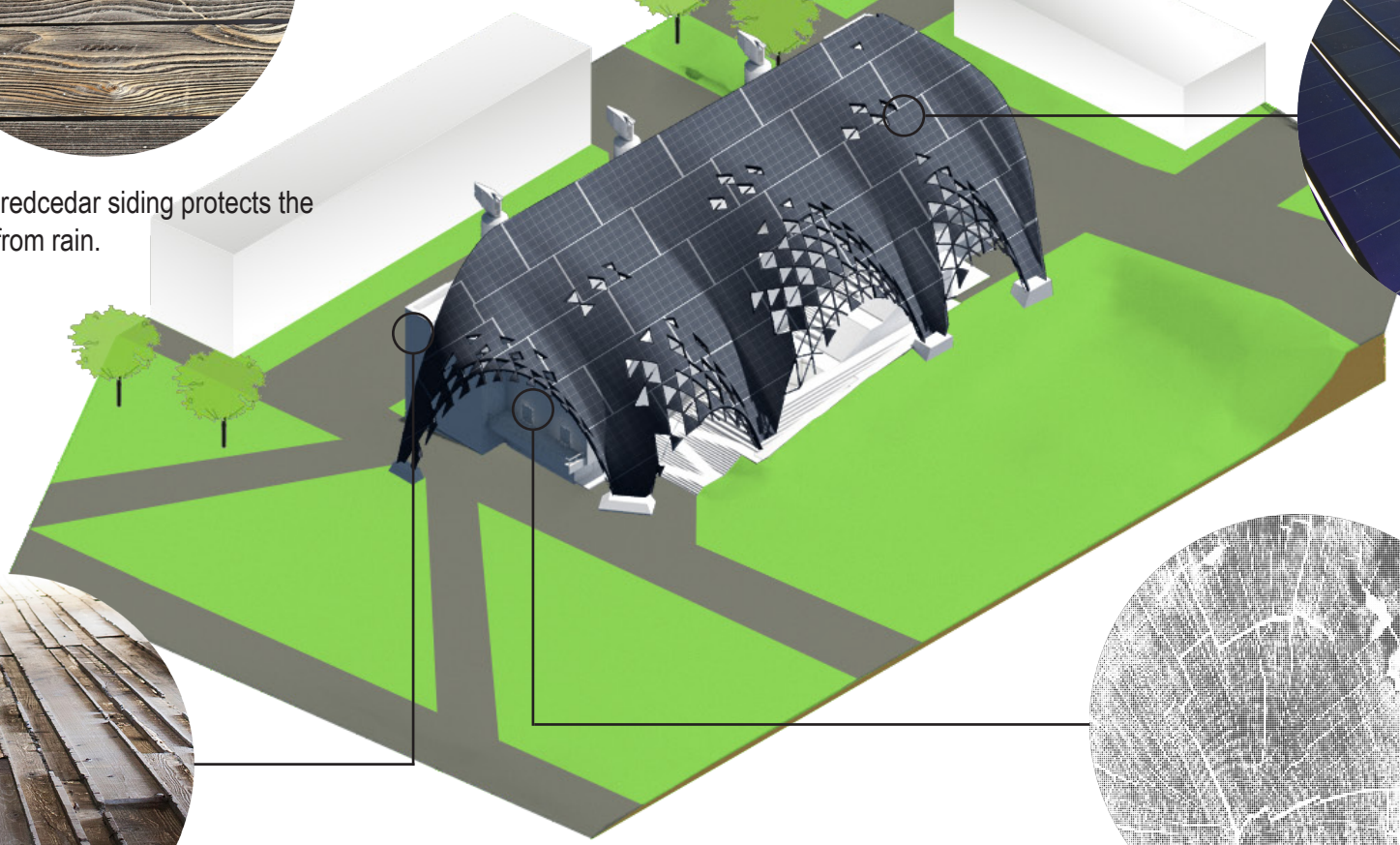
Accessible ramp integrated into stairs to allows all users to have an equal entrance experience.

BUILDING ENVELOPE

Western redcedar siding protects the building from rain.

Flexible PV panels installed into gridshell panels allow entire building surface to be used for power generation.

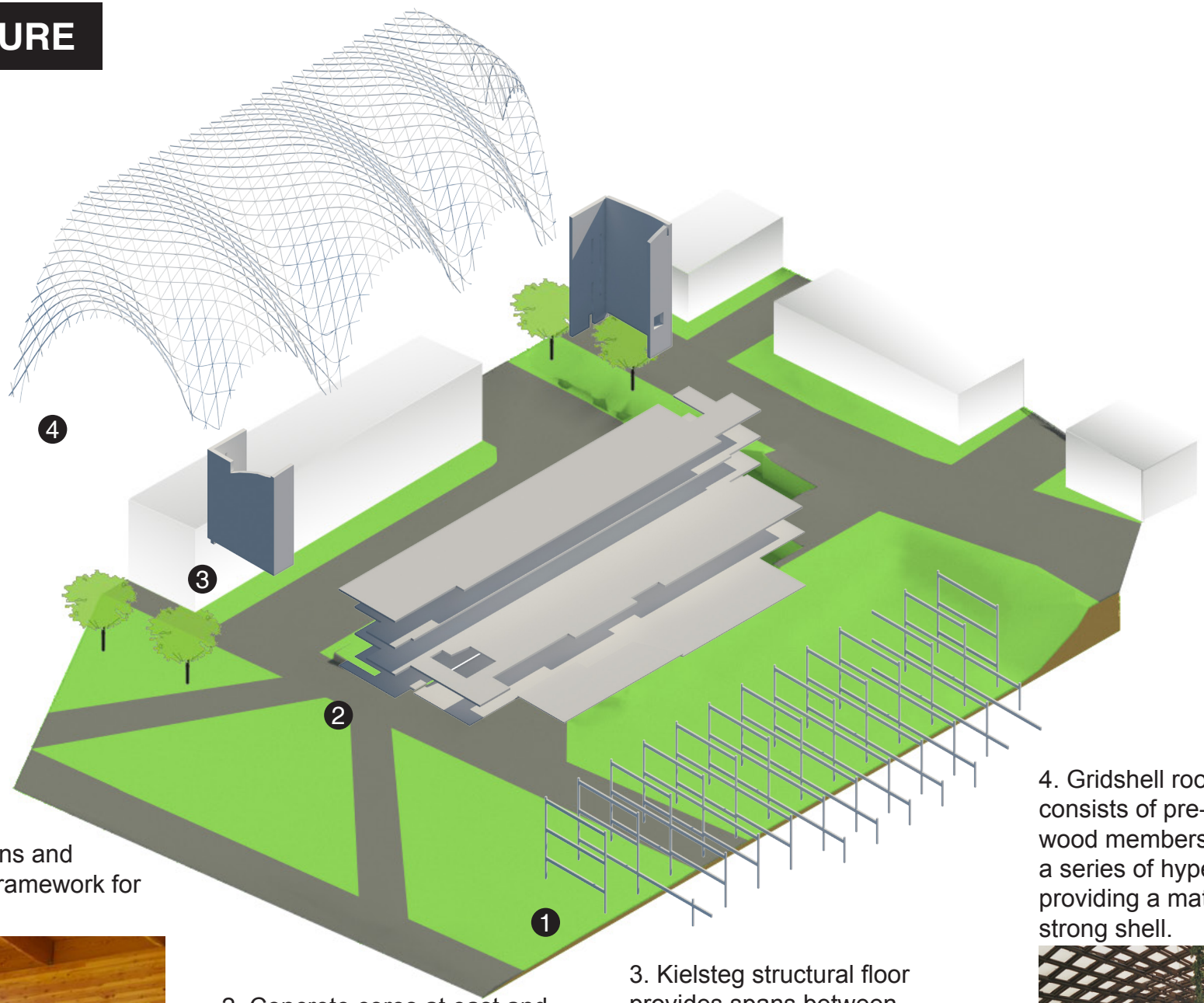




Vertical board-formed concrete on stair cores add texture to building surface.

East and west windows are shaded by fritted glass designed with a subtle wood grain pattern which can only be discerned at a distance.

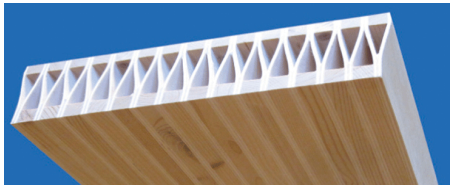
STRUCTURE



1. Glulam columns and beams provide framework for structure.

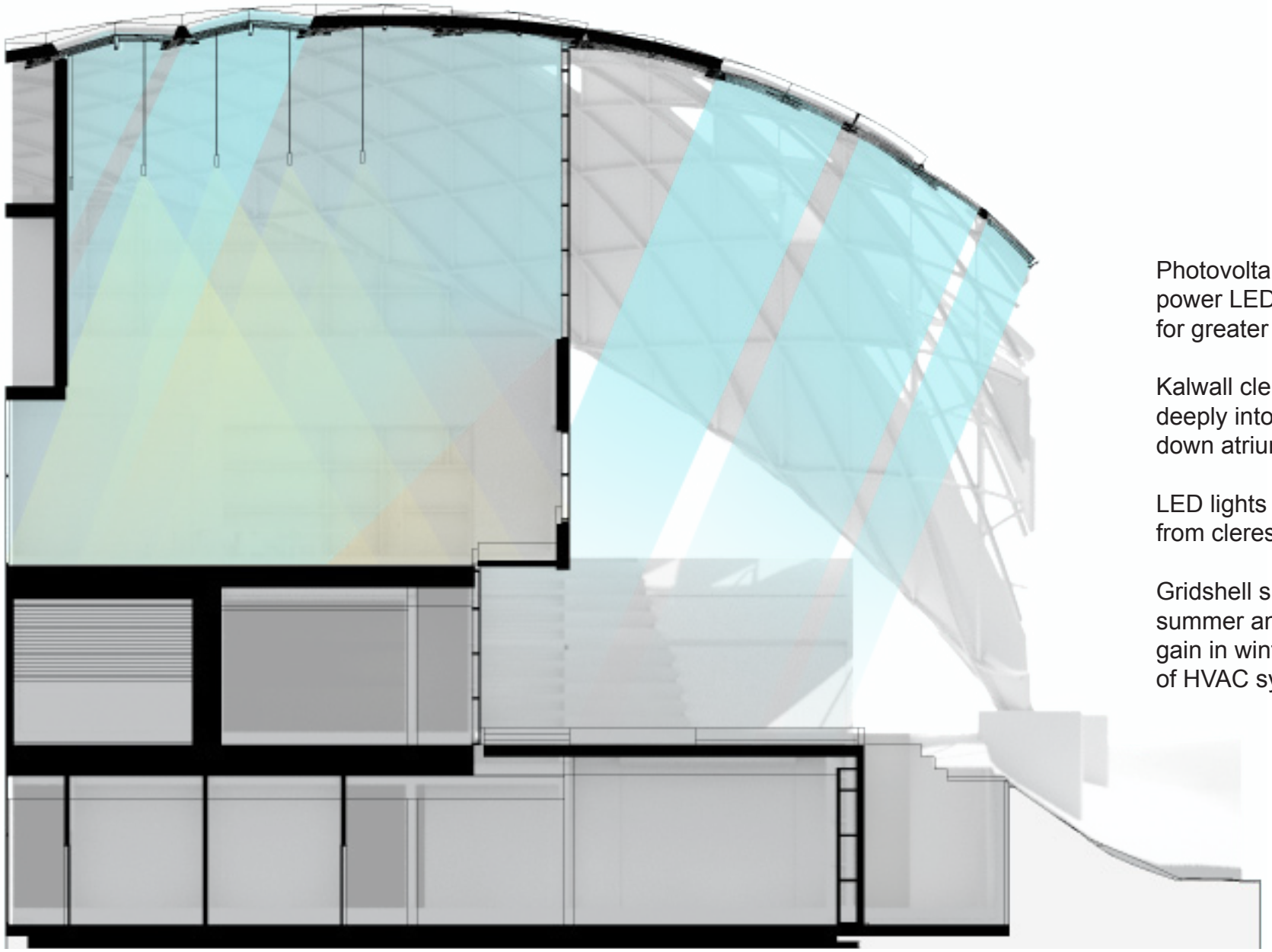
2. Concrete cores at east and west ends of building provide shear resistance.

3. Kielsteg structural floor provides spans between glulam beams.



4. Gridshell roof structure consists of pre-tensioned 2x6 wood members arranged in a series of hyperbolic curves, providing a materially efficient, strong shell.

LIGHTING DESIGN



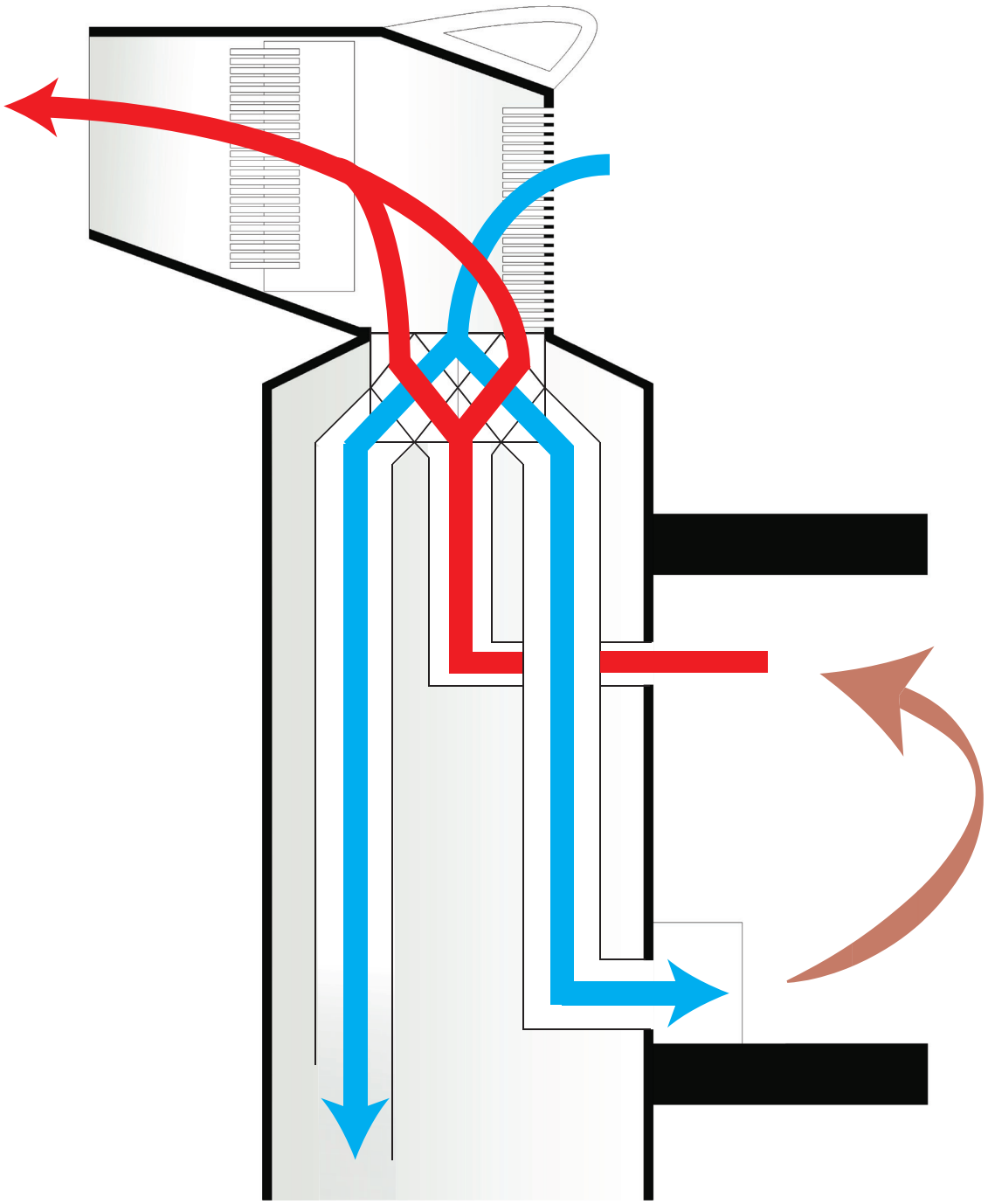
Photovoltaic panels on roof directly power LED lighting with DC power for greater efficiency.

Kalwall clerestory windows light deeply into third story space and down atrium to first floor.

LED lights controlled by light levels from clerestories and skylights.

Gridshell shades windows during summer and allows for direct solar gain in winter, increasing efficiency of HVAC system.

WIND ASSISTED STACK EFFECT HEAT EXCHANGE VENTILATION



Three wind cowls assists in capturing incoming air and expelling indoor air by rotating with the wind.

Airfoil shape causes entrainment of outside air, resulting in an increased negative pressure on the rear of the cowl, which results in a 15x performance increase.

Heat exchange captures 70% energy as conditioned air exits the building which would otherwise be lost.

Even on a windless day the stack effect will help pull air out of the building.

Together, the three wind cowls reduce the electrical load of the HVAC system by 50%.

CARBON DEBT ESTIMATION

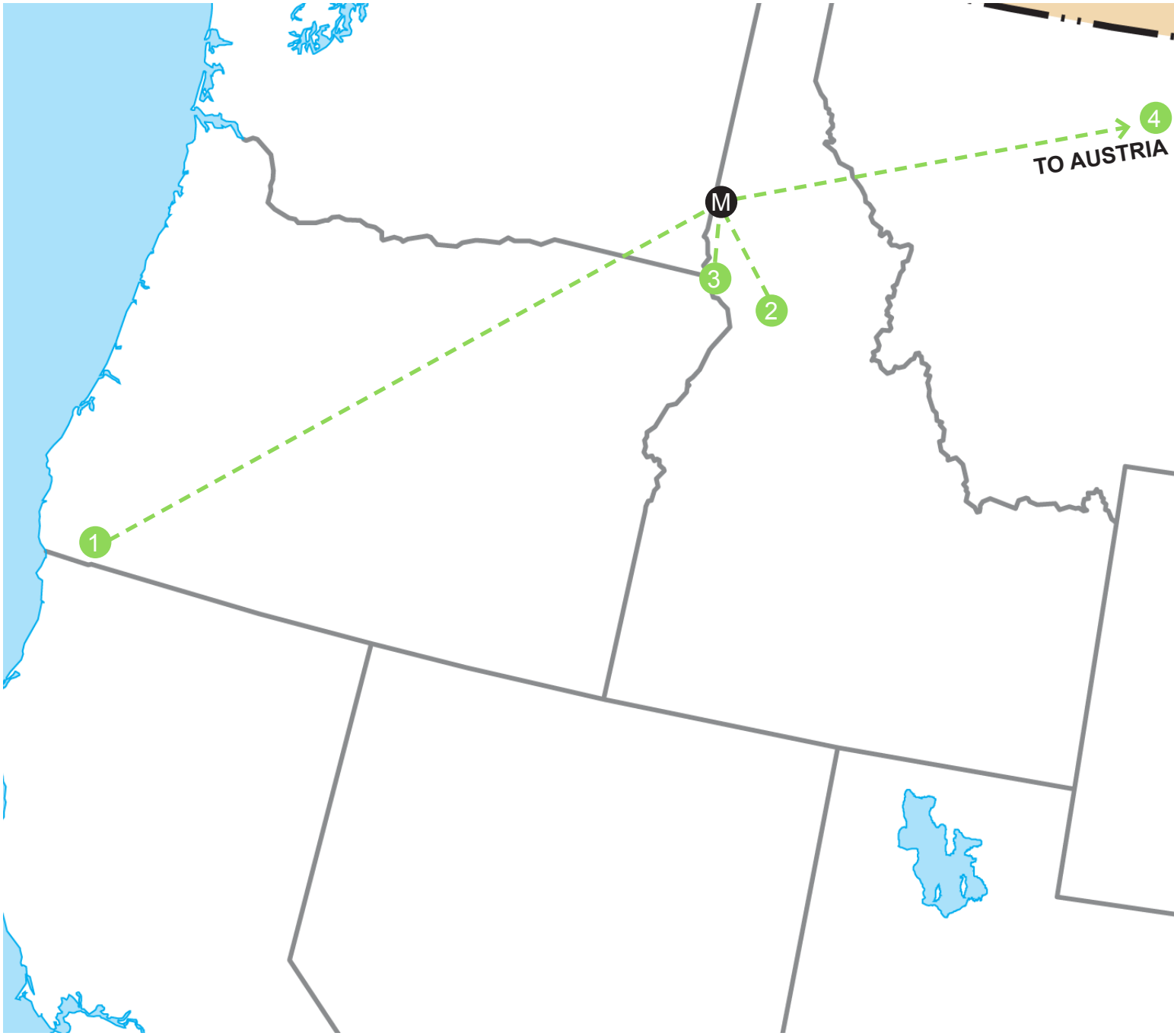
M IRIC
UNIVERSITY OF IDAHO

1 Glulam Column & Beam
BOISE CASCADE
CARBON DEBT: MEDIUM

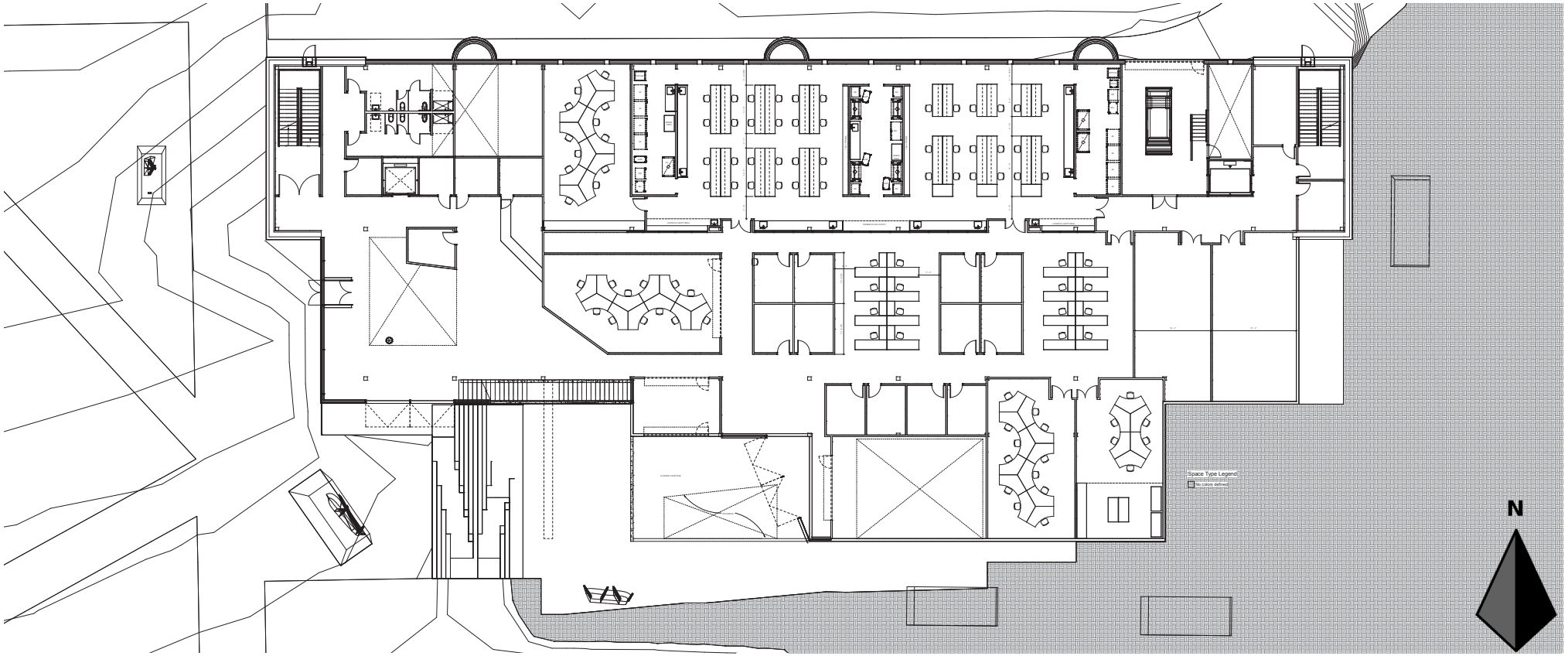
2 Sawn Lumber
IDAHO FOREST GROUP
CARBON DEBT: LOW

3 CONCRETE
ATLAS SAND & ROCK
CARBON DEBT: HIGH

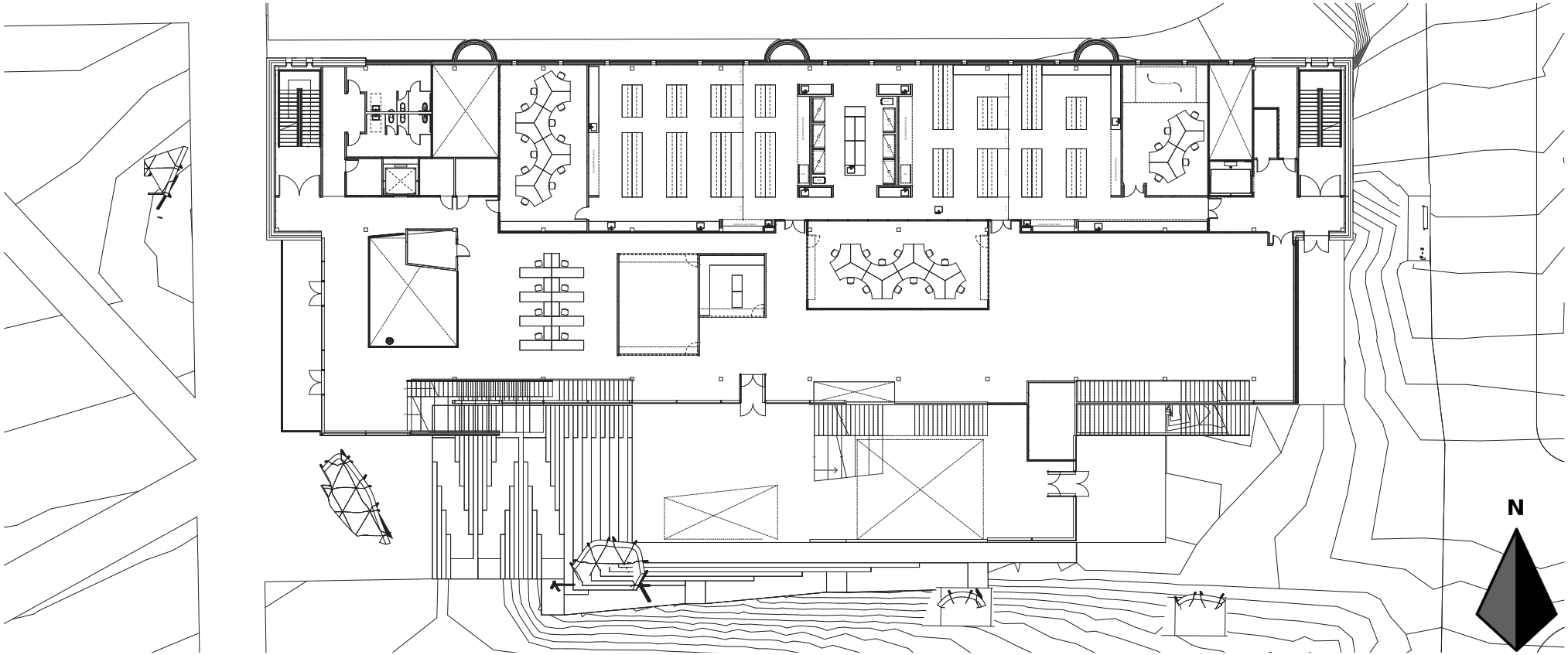
4 KIELSTEG
KIELSTEG GmbH
CARBON DEBT: HIGH



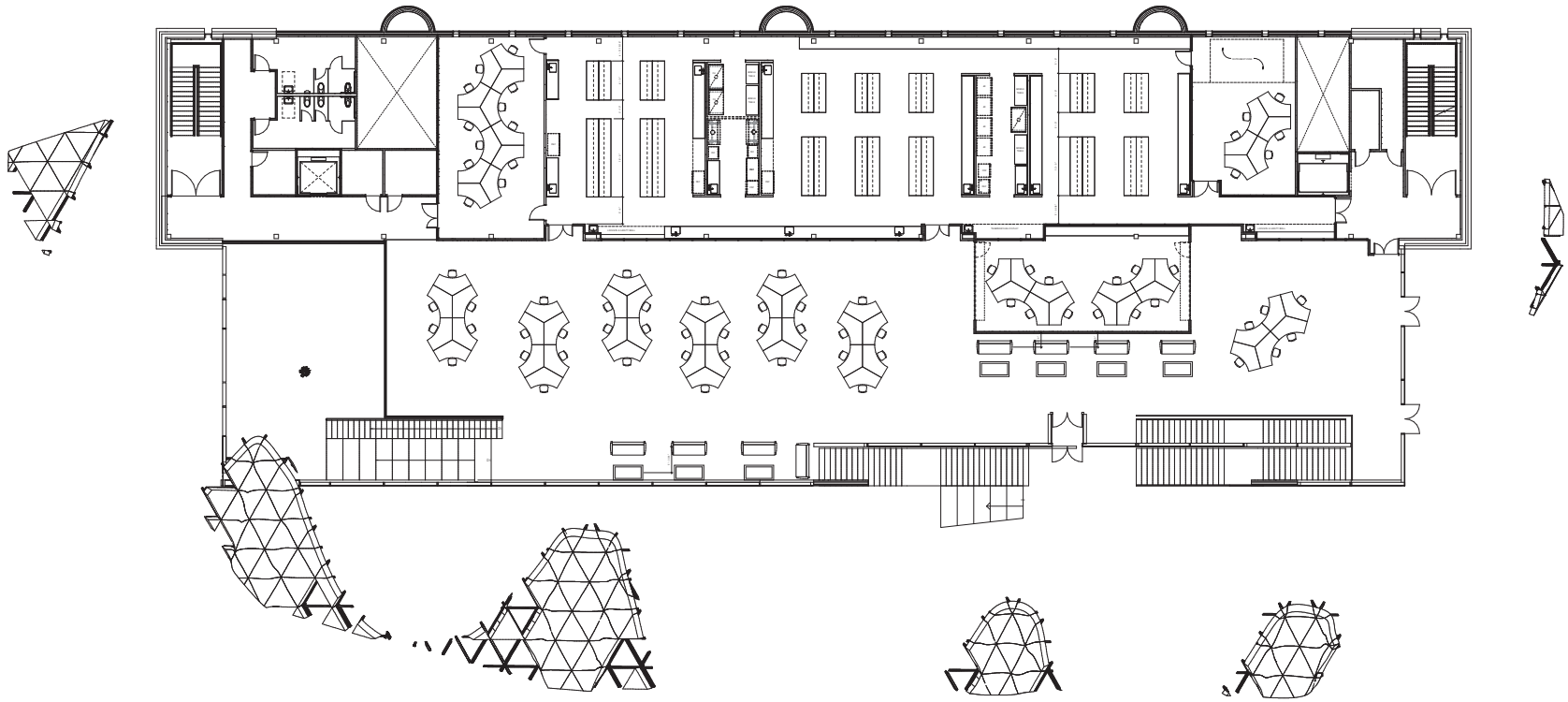
FLOOR PLANS



Floor 1



Floor 2



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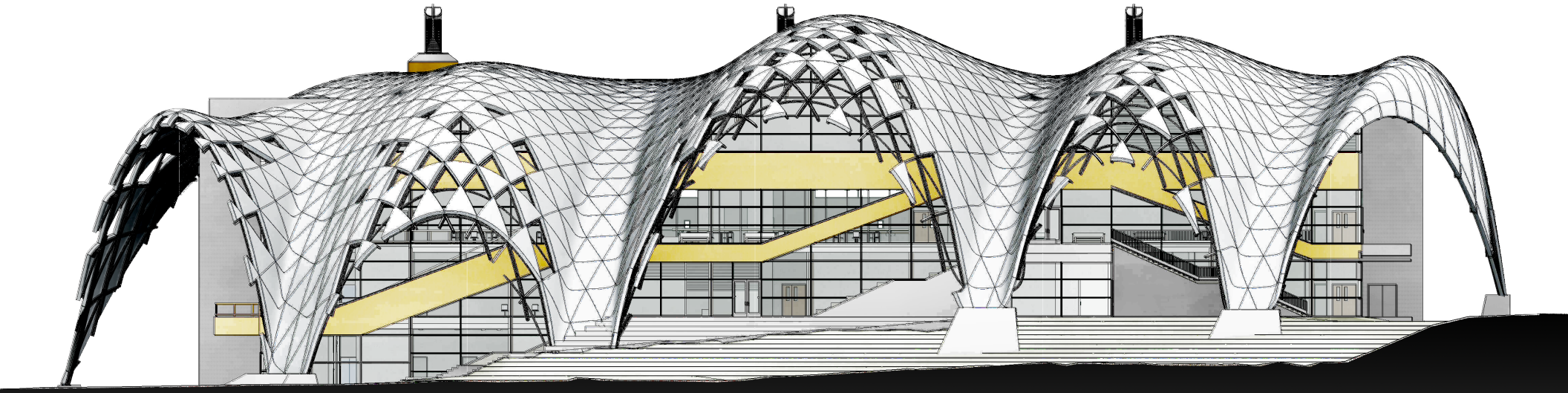
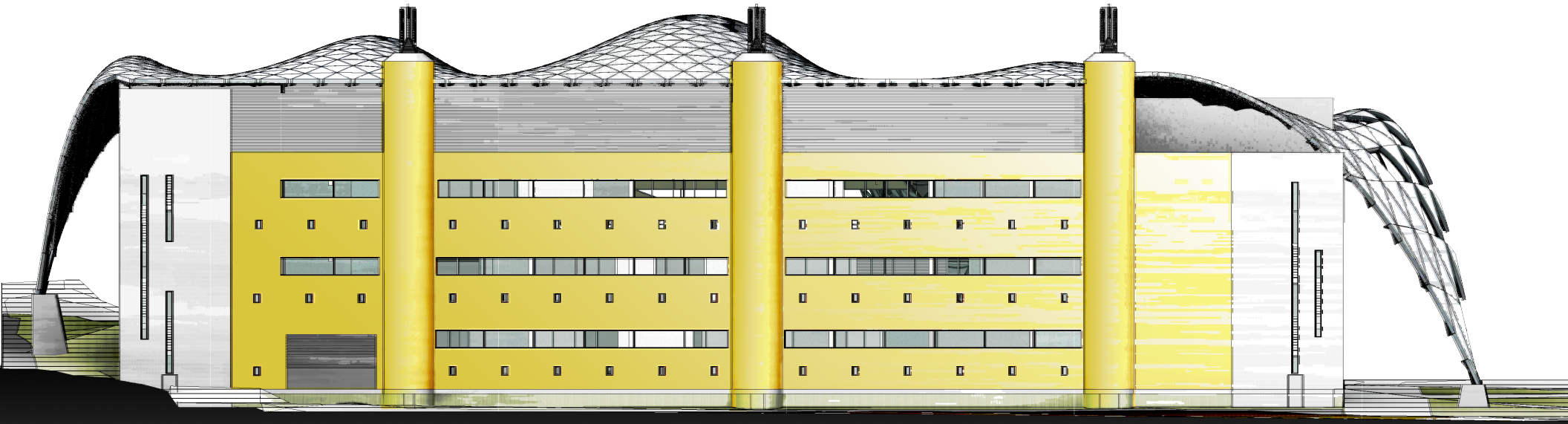
Floor 3

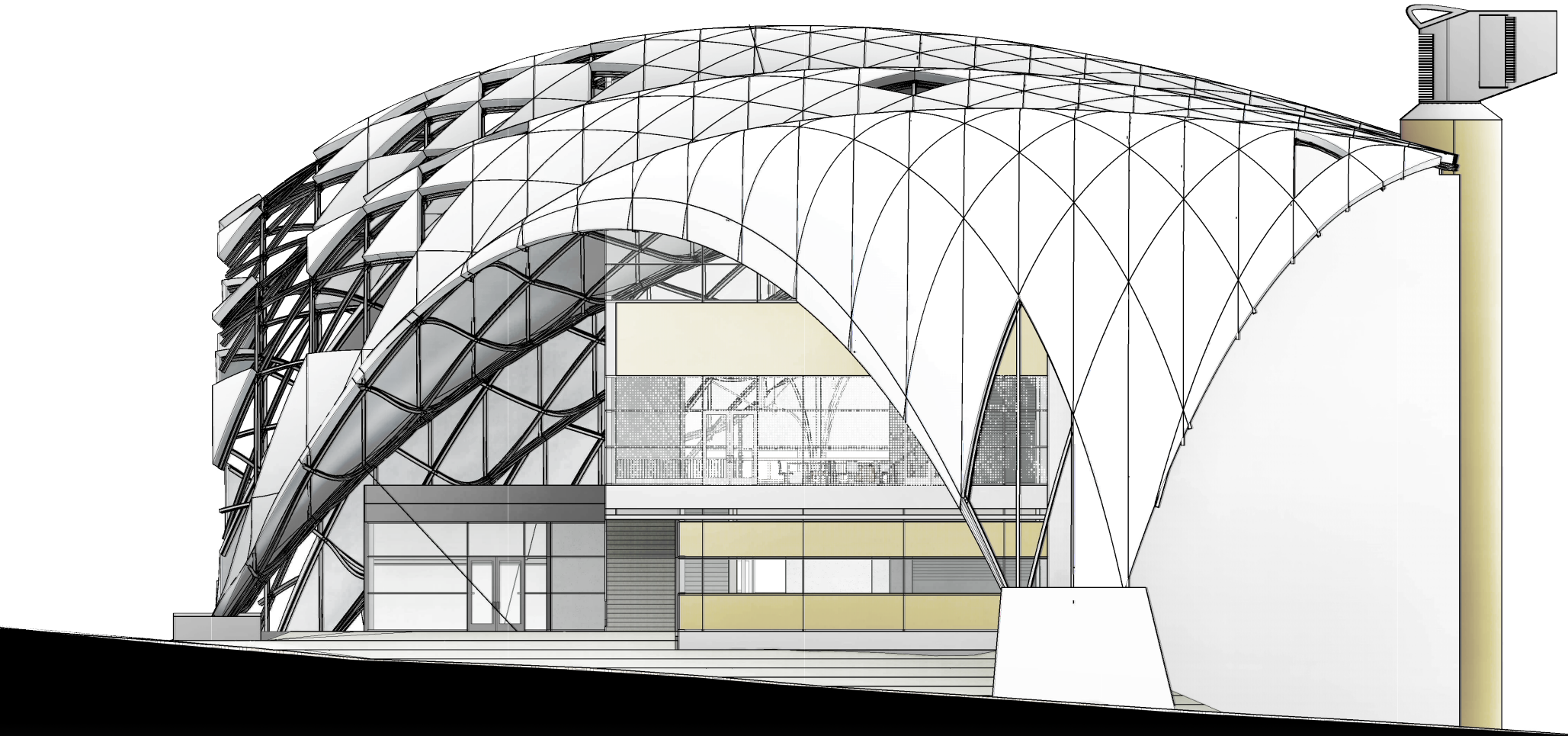
ELEVATIONS



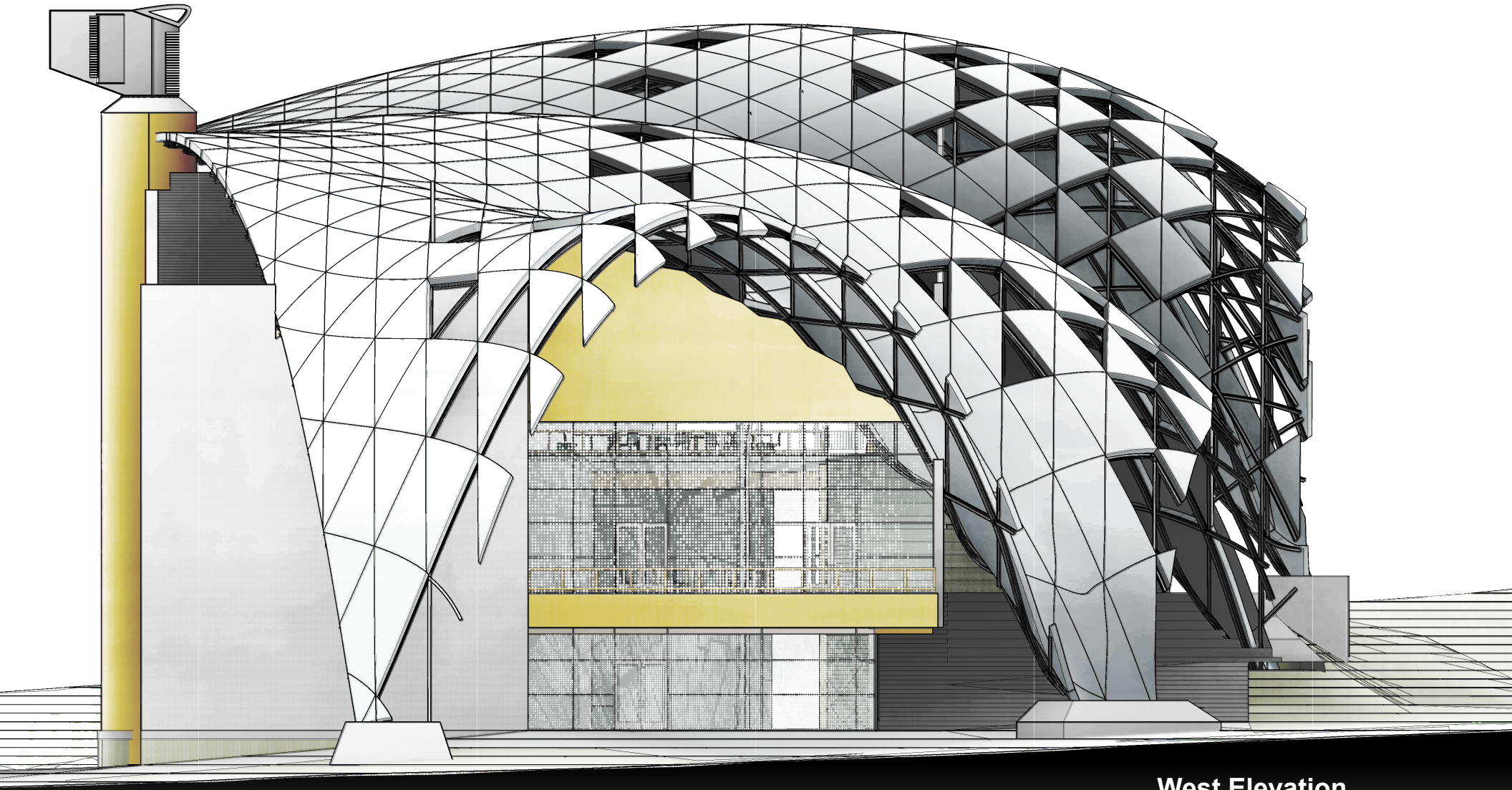
North Elevation



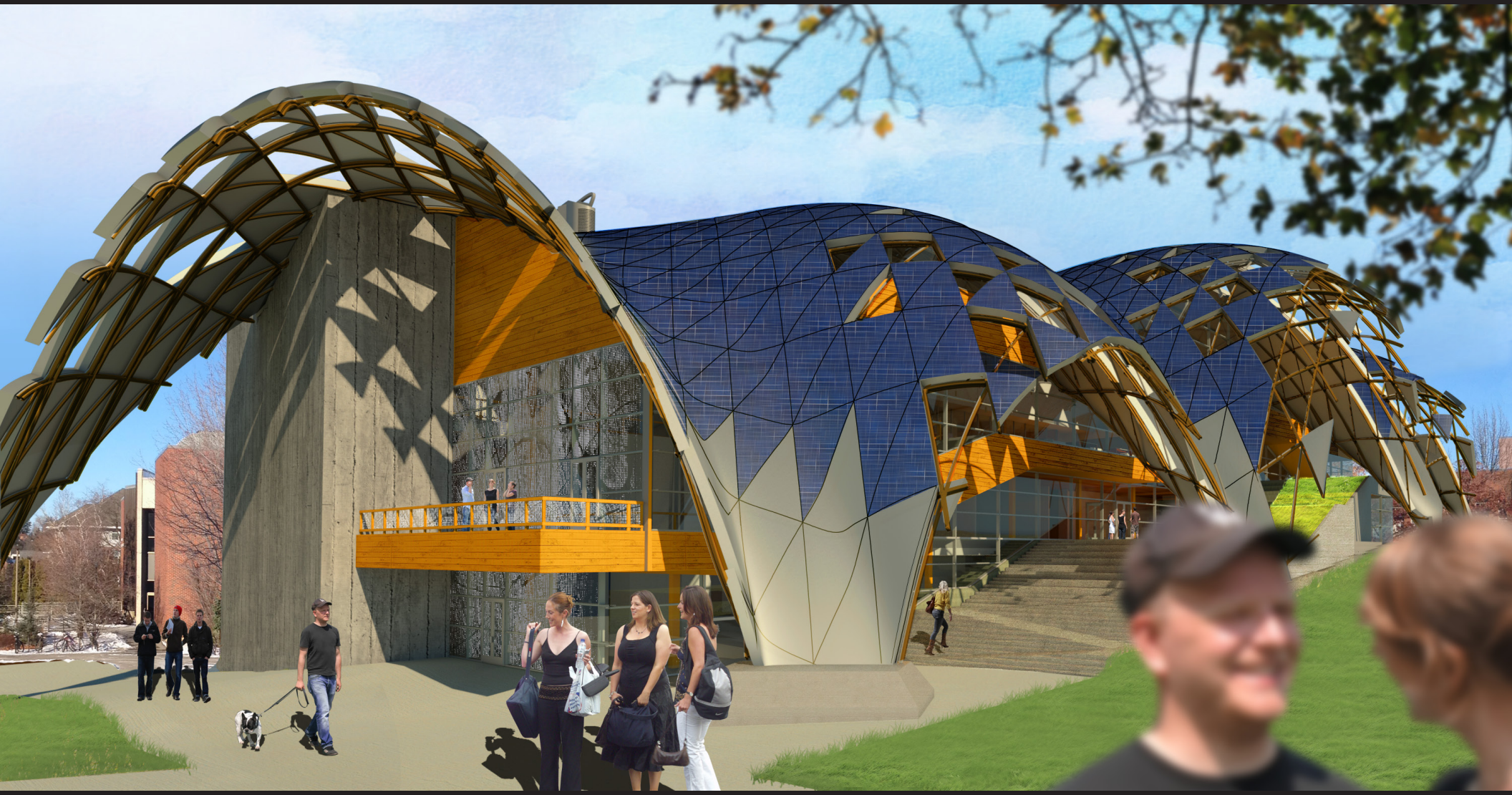
South Elevation

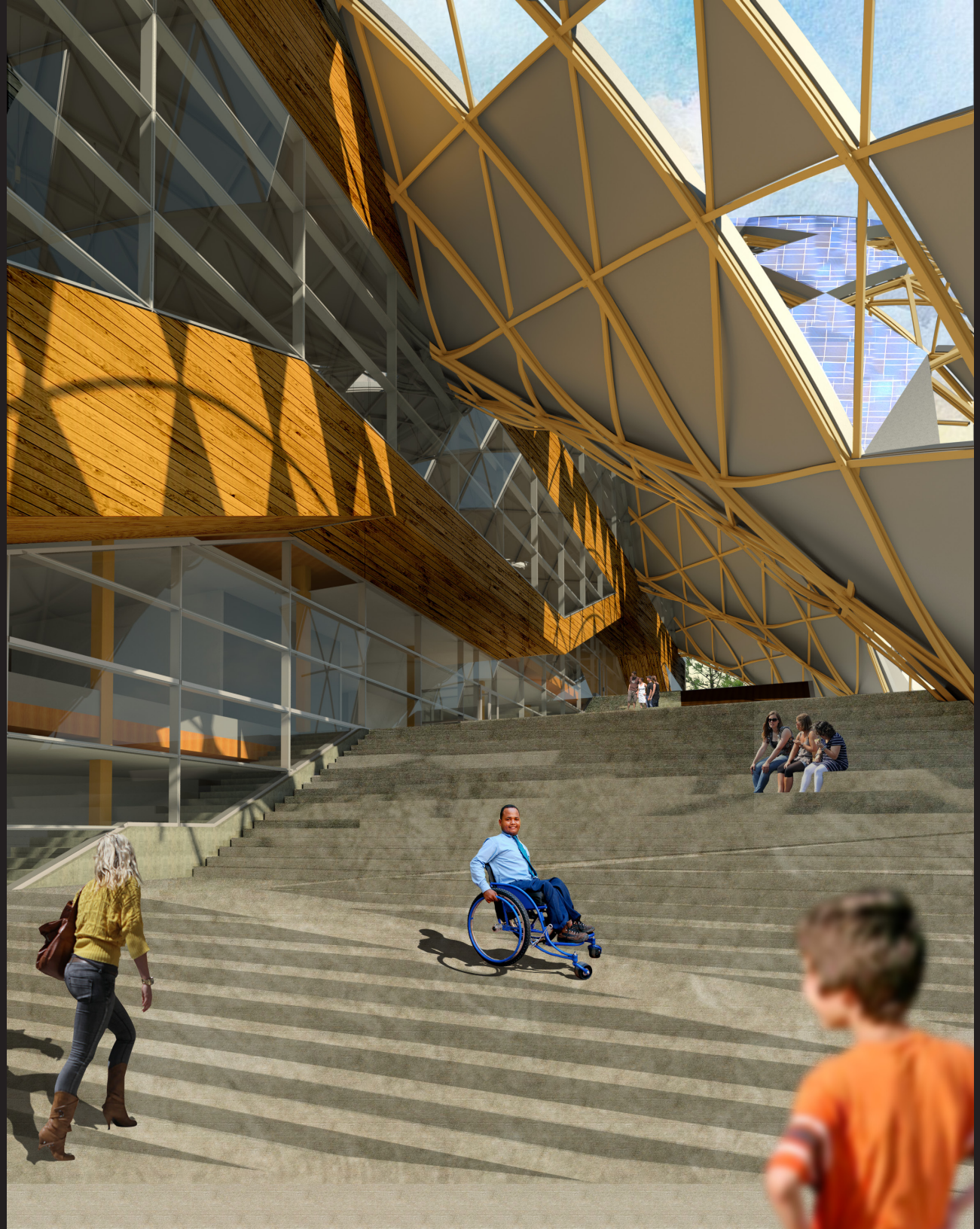


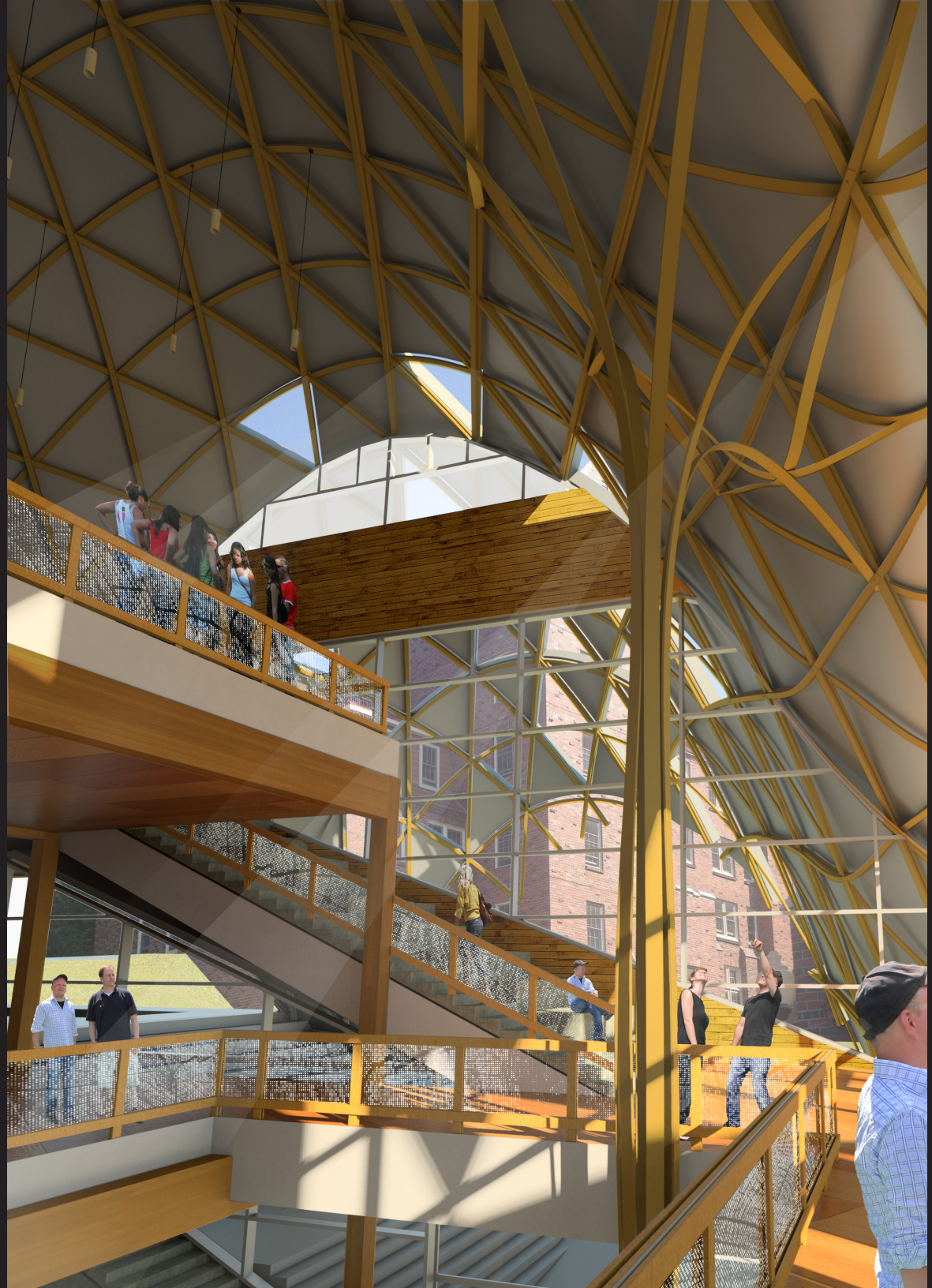
West Elevation



West Elevation

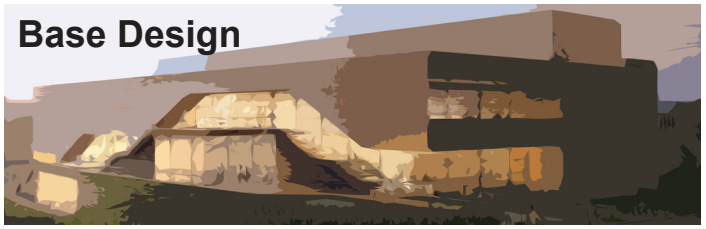






FINAL PERFORMANCE CALCULATIONS

Base Design



Base Energy Use = **2,500,000 kWh / year**

Insulation Increase

Increased Insulation = **-1,106,000 kWh / year**

Wall and ceiling insulation increased from R21 to R70.

Windows increased from R2.5 to R4.

Kalwall clerestories have are R12.

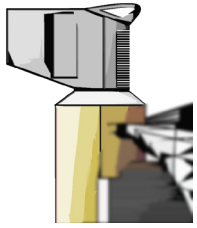
Lighting Design

More Efficient Lighting = **-120,000 kWh / year**

Direct DC powered LEDs are twice as efficient as fluorescent lights.

BMS controls lighting in daylit and unoccupied spaces.

Wind Cowl

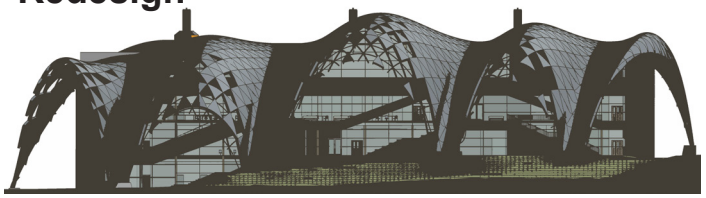


Wind Assisted Ventilation = **-86,000 kWh / year**

Wind cowls reduce electrical load of HVAC system by 50%.

BMS controls air flow rate to unoccupied rooms.

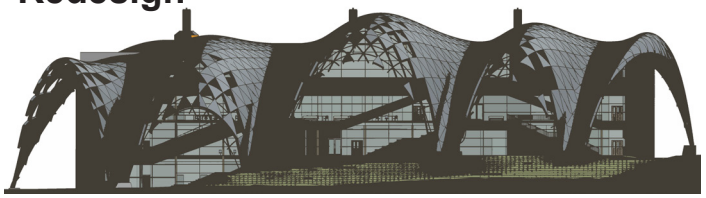
Redesign



Redesign Energy Requirements = **1,142,000 kWh / year**

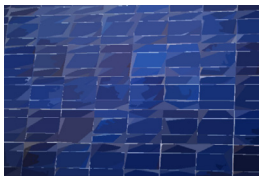
ON SITE ZERO CARBON ENERGY PRODUCTION

Redesign



Redesign Energy Requirements = **1,142,000 kWh / year**

Photovoltaic Array



Electricity Production = **-200,000 kWh / year**

25,000sf roof mounted array is conservatively estimated to operate at 5% efficiency, producing 8W per square foot.

Steam Plant

Carbon Neutral Heat = **-530,000 kWh / year**

The University of Idaho steam plant produces steam by burning locally sourced wood waste.

Chilled Water Plant

Chilled Water Energy= **-415,000 kWh / year**

Centrally chilled water is produced by low-carbon energy and is more efficient because of its size.

Total Energy Consumption

43,000 kWh / year

Resulting EUI

EUI = 2.33

Thank You.