

## UC Irvine

### SSOE Research Symposium Dean's Awards

#### Title

The UnCommons: Living Bio-Based Building

#### Permalink

<https://escholarship.org/uc/item/2tp896xq>

#### Authors

Rafiee, Sagha

Borroel, Valeria Borroel

Berache, Mathewos

et al.

#### Publication Date

2024-03-15

Peer reviewed

# PJHM-181 Senior Design Project

## The UN-COMMONS

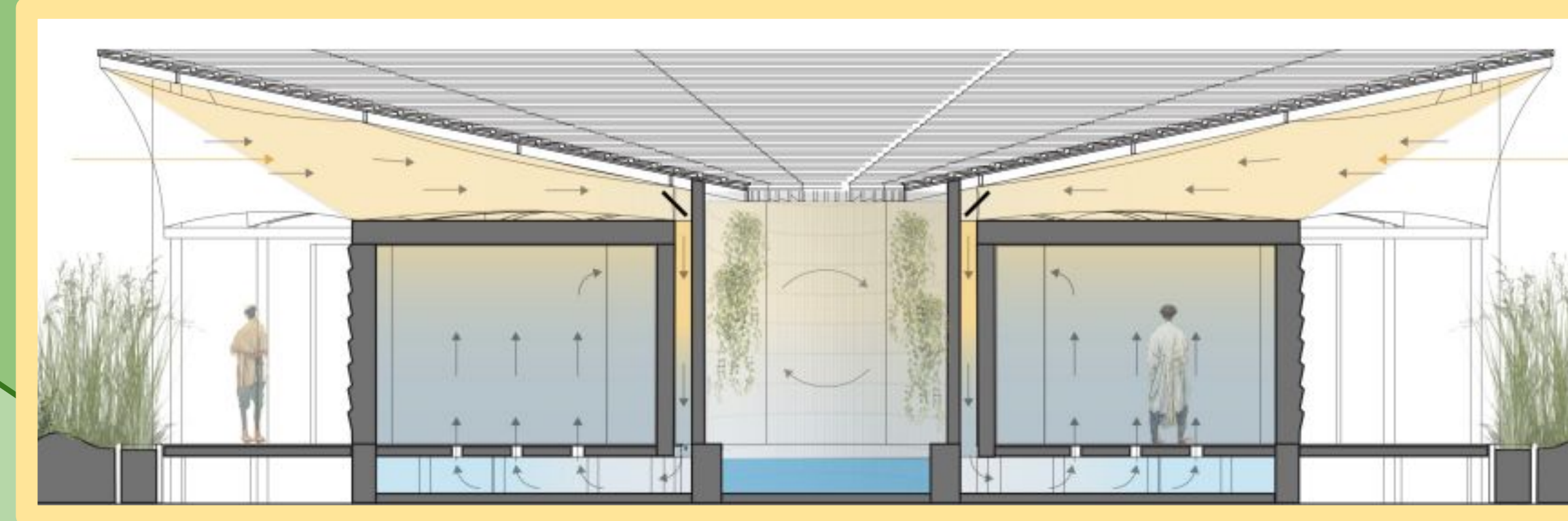


### Design Constraints:

- The first and second rings of impact are highlighted in order to minimize the environmental disruption
- Site location near UCI's Ecological Reserve requires strict regulations and considerations for material choice and construction impacts
- Localized and biodegradable materials
- Improved accessibility to campus

### Project Description

- A common area for students to hold small events or classes
- Minimal impact structure which will meld well with the pre-existing ecosystem
- A show of the combination of high tech solution (AI integration) and low impact sustainability



### Design Methods:

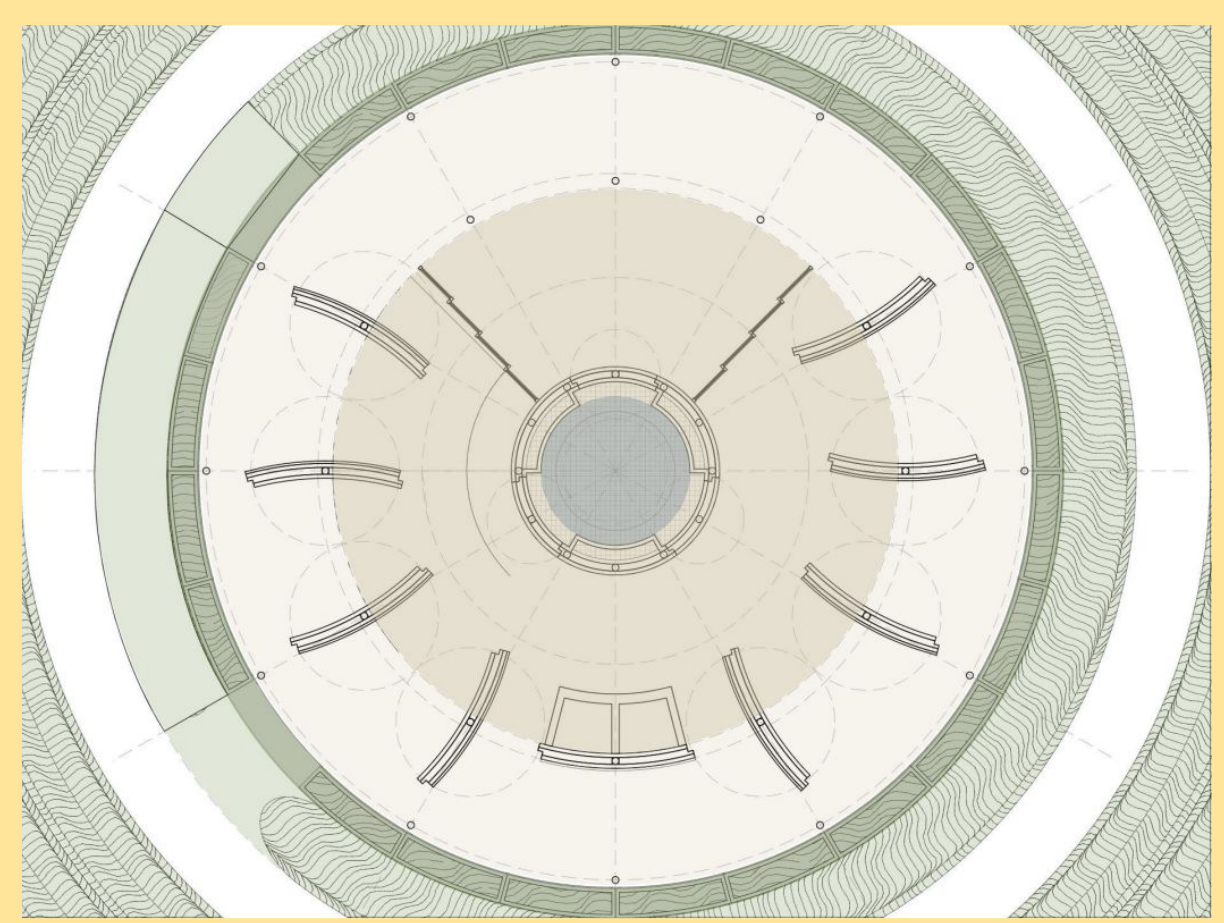
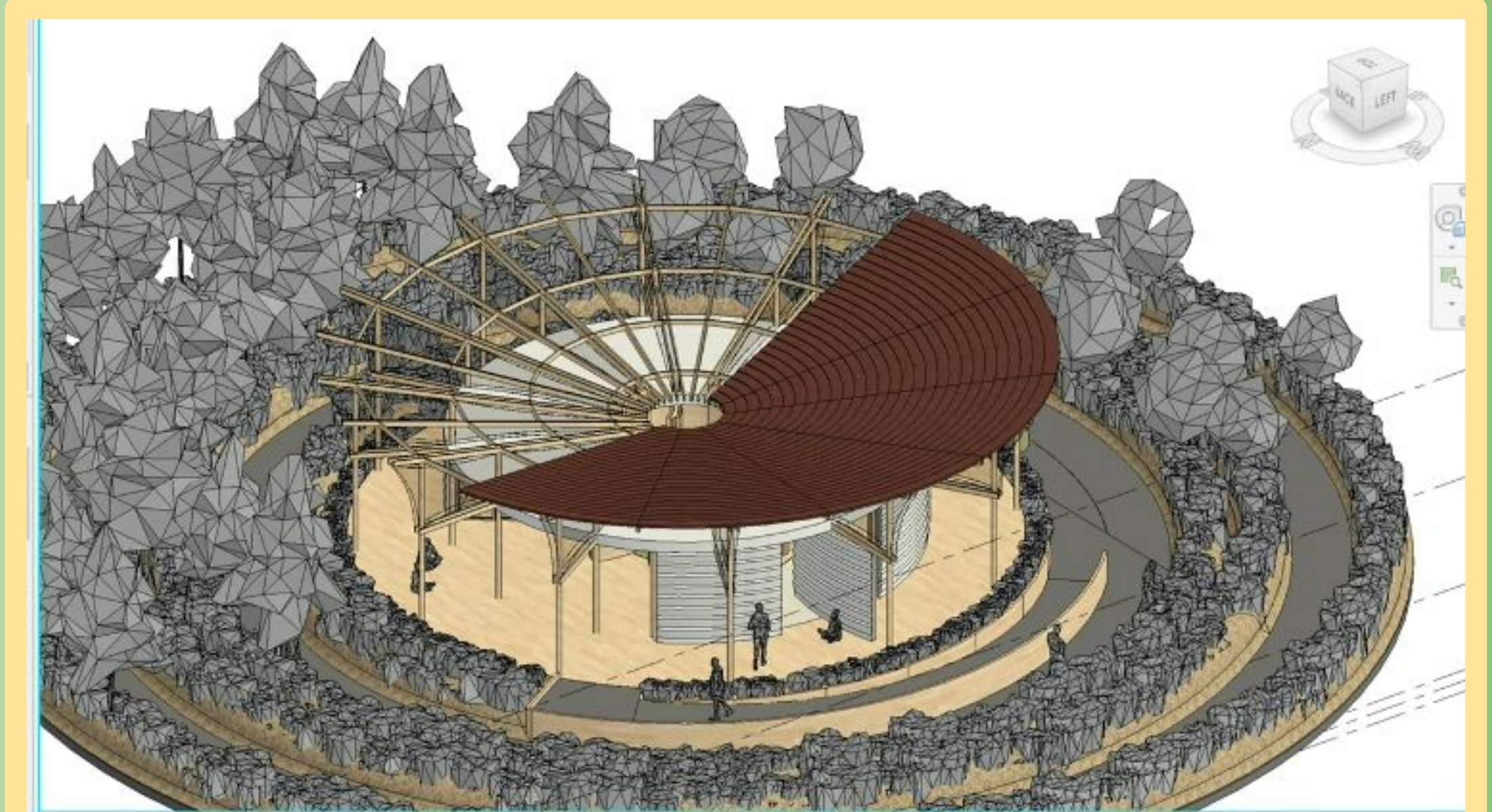
- Central core water system for internal air cooling, passive pressure systems, geothermal cooling and heating systems
- Retention basin and remediation stream (serving all 3 levels of concentric rings),
- Glass Fiber Reinforced Polymer (GFRP) - implications for global ring



BUILDING

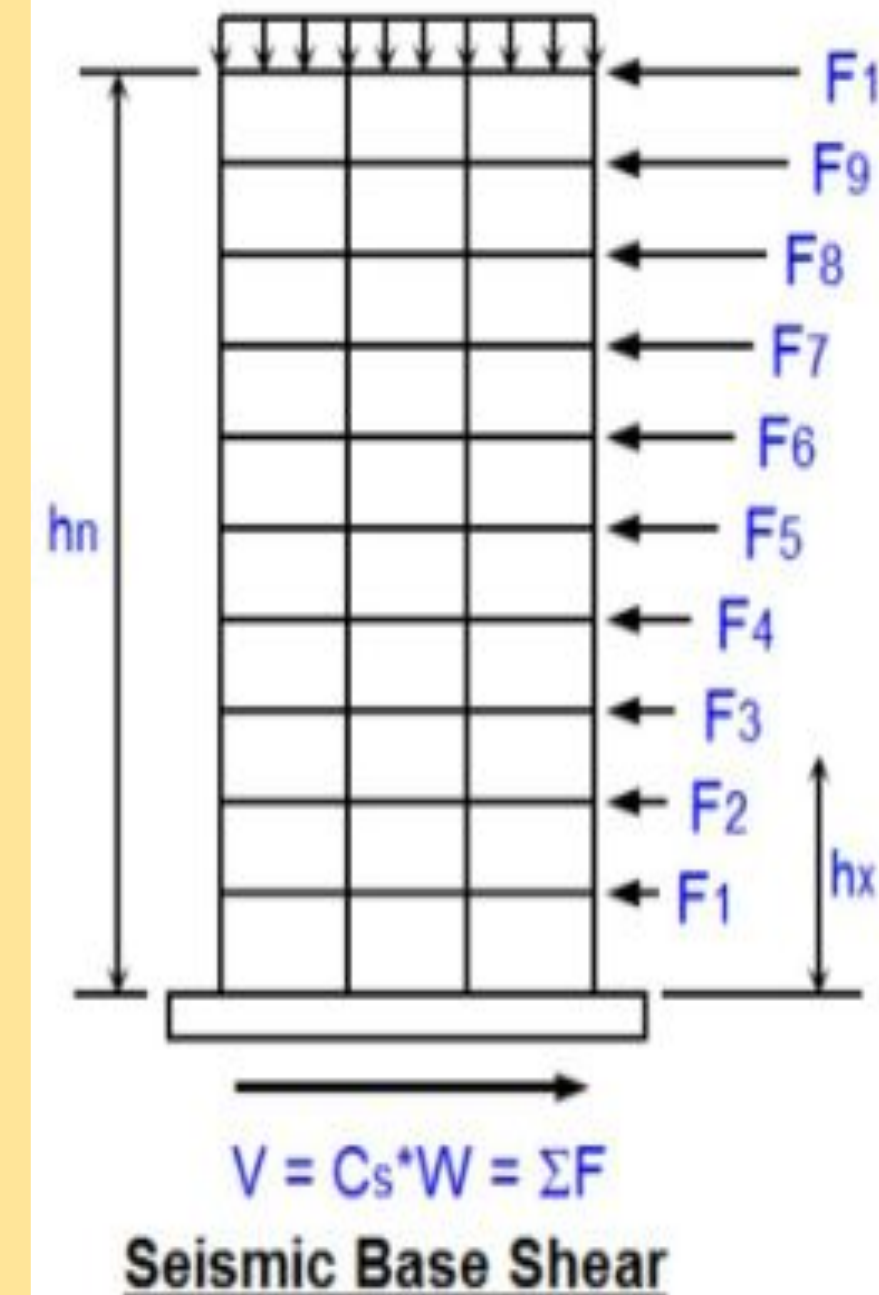
### Artificial Intelligence Integration:

- Optimize the dynamic operation of rotating walls (based on external weather conditions)
- Predict and address maintenance needs
- Data collection for research



### Structural Calculations:

- Structural Calculations were done to ensure structural stability
- Seismic :  $V = C_s * W$
- Gravitational: Involves dead load and live load. Ultimate Load:  $1.2D + 1.6L + E$
- Wind:  $q_z = 0.00256 * K_z * K_{zt} * K_d * V_e^2$



LOCAL SITE

GLOBAL IMPACT

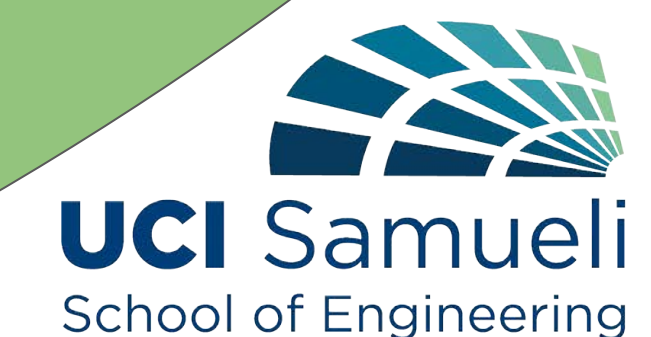
### Next Phase:

- Life Cycle Analysis, material selection, structural calculations
- Collaborations: UCI Ecological Preserve, Naturescape Vision Teams
- Lecture on AI Integration by Pat Fuscoe
- Cost-analysis and Project Schedule
- Render of site design

### Acknowledgements:

LEED AP James Bucknam  
Principal S.E. Brett Kaufmann

Saghar Rafiee  
Valeria Borroel  
Mathewos Berache  
Marc Ayoub



Department of  
Civil and Environmental  
Engineering