ENVIRONMENTALLY CONSCIOUS STRUCTURAL DESIGN
CORDOBA CULTURAL COMPLEX

Juan M. Alonso, E.I.T., Manuel Macias, Itzel Guerrero, Samyam Manandhar, Abdulfahsen Alkhairafi, Anthelia Li
University of California, Irvine, CA 92627

DESIGN & DEVELOPMENT

DESIGN APPROACH

- Schematic drawings created to portray Architectural Concept
- Concept transferred into AutoCAD for Construction Documents
- Floor occupancies & live loads were assigned based on ASCE 7-10
- Dead loads were assigned based on various structural insufficiencies
- Steel/Concrete members were designed based on ASCE-31
- Foundation and Seismic design meet constraints required by the site location

CONTRASTS & PARAMETERS

In Structural Engineering, there exist many parameters and constraints that must be considered in design. Geology design is constrained by the placement of structural elements like beams and columns, as well as the capacity of the metal decking that supports the loads above. Earthquake design parameters are set by the location of our structure. Since our location is in California, more stringent seismic constraints are being implemented. Foundation design is constrained by the present and conserved loads onsite and reported by the Geotechnical engineer. Based on these parameters, the foundation will be designed such that the loads will be distributed efficiently along the subgrade.

ALTERNATIVES CONSIDERED

- Round "Acoustic Guitar" Building
  - This alternative was rejected due to cost
  - This alternative was rejected due to ecological constraints
- Timber Wall surrounding structure
  - This alternative was considered to reorient the rejected alternative above, but was also rejected due to seismic parameters and live loads

GREEN ROOF ADVANTAGES

The future of structural building design heavily rests with green roof design to mitigate environmental impacts that new structures impose. Green roofs will address stormwater runoff and urban heat island effects while providing energy solutions for buildings.

In traditional structure construction, a parcel becomes impermeable, creating heat islands. Green roofs mitigate heat island effects through evaporative cooling, dissipating heat while cooling the structure below. In the winter, green roofs provide a windbreak for the structure. This results in a reduced energy demand for the structure through the management of its internal temperature.

Green roofs also allow for runoff reduction and peak flow attenuation. Figure 3 shows how the precipitation and storage are directly correlated to temperature through the use of roof that is designed to be sustainable. Peak flow attenuation allows for a lag time to exist between the rainfall hydrograph and the runoff hydrograph. This allows additional energy to be used, creating sustainable infrastructure that is environmentally friendly.

PROJECTED DELIVERABLES

- Structural Framing Design .................. April 1st
- Foundation drawings .......................... May 1st
- Structural Modeling/Analysis ................. June 1st
- Construction Documents ....................... June 1st
- Estimated Project Cost with Contingency: $500 million

REFERENCES