The Sacramento Municipal Utility District (SMUD) East Campus Operations Center was billed as a Design-Build project, but ultimately it was awarded based on a low bid. It was quickly determined by the design-build team that the bid amount would be driven by the amount of photovoltaic panels required to make the campus Net Zero. Therefore, the design challenge became finding an integrated structural and MEP system that met all code-required life safety provisions while minimizing the amount of energy required for serviceability. Dual challenges of a low bid win and requirements to meet Net Zero, as well as LEED Platinum standards required a creative approach to the structural system. The best solution was to integrate the structural and mechanical systems. Originally, the office building was anticipated to be designed out of steel, however the idea of using radiant cooling that utilized the thermal mass of a reinforced concrete structure was developed and utilized.

There were advantages to using this integrated structural and mechanical system. The thermal mass of the concrete structure allows the building itself to store and release heat at a rate similar to that of its environment. It would store heat during the warmest part of the day and release it as the ambient temperature cools which reduces the need for mechanical climate control. Secondly, the energy required to move water through radiant tubing in the slab is less than traditional mechanical systems that push air. Air is circulated within the office building but only by use of ceiling fans. Initially the team proposed that with the use of ceiling fans, the ambient temperature inside the building could be maintained at 78° Fahrenheit.

Although the use of concrete for the building structural system had many advantages from an energy standpoint, it created a tremendous challenge with regard to providing a large open meeting space at the ground level. This meeting space required 67 feet of clear spans that were not possible in utilizing a 2-way post-tensioned slab. Also due to story height limitations, using concrete beams or girders at the second floor was also not feasible. However to solve these issues, it was decided to suspend the second floor from the low roof structure. This process was achieved by providing two post-tensioned reinforced concrete girders with tube steel hangers (at third points) from which the second floor post-tensioned concrete deck was supported.

**REASONS FOR CHOOSING REINFORCED CONCRETE**

Since cost and schedule played a significant roll in the system selection as they would with all projects, the difference maker with regard to using reinforced concrete for the structural system was the ability to leverage the seismic mass of the concrete in a way that would allow for the use of radiant thermal control integrated in the structural slab. The energy required to move water throughout the building is significantly less than what is required to move air. By integrating the radiant thermal system into the structural slab, the efficiency of the mechanical system was increased to the point that it significantly reduced the amount of photovoltaic panels required to achieve Net Zero. This significant reduction led to a reduced bid number that ultimately resulted in the award of the project to the Turner Design-Build Team. The project was delivered on time and on budget.