Beneficial Use Case Study

San Francisco Public Utilities Commission Headquarters

Coal Combustion Product Type
Fly Ash

Project Name
San Francisco Public Utilities Commission Headquarters

Project Location
San Francisco

Project Participants
KMD Architects, Stevens + Associates JV, Tipping Mar Structural Engineering, SOHA Engineers, Webcor Builders/Concrete, Central Concrete Supply, Lehigh Southwest Cement Company

Project Completion Date
2012

Project Summary
Initial plans for what would become the headquarters of the San Francisco Public Utilities Commission were to construct a steel-framed, base-isolated building capable of withstanding the area's seismic activity with minimal damage. However, projected cost overruns led to the project being put on hold after completion of the design development phase. A new, more affordable design was developed that opted for a post-tensioned concrete shear-wall system with composite link beams.

Photo: CC BY 2.0 - UC Davis College of Engineering

Project Description
From the outset of its involvement in the project, the San Francisco Public Utilities Commission aimed for its headquarters to achieve optimal structural and environmental performance. The structural objectives included the ability for the building to be easily repaired and immediately reoccupied following a major seismic event. The environmental objectives included optimizing the building's energy consumption, indoor air quality, and water conservation.

Once the decision to switch to concrete construction had been made, the choice to use supplementary cementitious materials was an obvious one. In all, six mix designs were formulated to reduce CO2 emissions in pursuit of a LEED Platinum rating—including a ternary mixture of 30% fly ash (and 40% slag cement) that was used for core wall concrete, mat slab, and columns to achieve a specified compressive strength of 8000 psi at 90 days. These elements, which support the vertically post-tensioned concrete structure, are designed to give the building the ability to re-center after an earthquake to minimize damage. Moreover, the lower-cement concrete mixes reduced embodied carbon by roughly half over conventional concrete—and lowered CO2 emissions associated with the building materials by 7 million pounds.

Use of concrete over steel framing yielded additional advantages to both the construction process and the finished design. The (50 percent) reduction in the use of structural steel helped reduce both wall congestion and construction time, lowered building costs, allowed for the construction of a 13th floor within the same zoning envelope (by decreasing the floor heights by one foot throughout the building) and improved daylighting (courtesy of the exposed concrete ceiling and walls).

The building received a host of plaudits, including the American Institute of Architects Committee on the Environment's Top Ten Green Projects, the Structural Engineers Association of California's Award of Excellence in Sustainable Design, and the National Council of Structural Engineers Associations' Outstanding Project Award: New Buildings Over $100M.