Executive Summary:

The main goal of the Charles Pankow Foundation Design Competition is to design a building that improves upon the quality, efficiency, and value of tall buildings. These ideals are to be developed through new and innovative design ideas via construction, building systems, and structural components. These goals can only be achieved through extensive collaboration, communication, and the innovative use of new and original design methods.

The following report summarizes the strategies, rationale, and steps the mechanical team took when designing the mechanical systems for San Francisco's 350 Mission Street Project. The report also contains several appendices which outline the necessary design conditions, calculations, and sizing methods, along with construction documents summarizing system layouts and schedules.

The subsequent paragraphs summarize the main design concepts that the mechanical team implemented in conjunction with all the other disciplines to create an efficient and high quality building for San Francisco's business district.

A decision was made by the mechanical team to condition the building via a Chiller/Boiler plant located in 350 Mission's penthouse. The cooling will be handled by two absorption chiller. The two 450 ton absorption chillers will be driven by hot exhaust produced by a series of ten 65 kW electrical generating microturbines. The condensed water loop will be cooled via a two cell Evapco 700 Ton cooling tower. Any useful heat that is not used by the absorption chiller will be passed through a heat exchanger to satisfy the Domestic Hot Water (DHW) load of the building during these cooling periods. During the heating season the hot exhaust from the microturbines will pass through a heat exchanger to produce space hot water, in conjunction with three 750 MBH natural gas fired boilers.

The air side distribution for the Office spaces will be supplied via an Underfloor Air Distribution System (UFAD). It was decided by the mechanical team that two AHUs will be located on each floor to supply conditioned air to the core and peripheral underfloor plenums.

In order to take advantage of the temperate climate of San Francisco and control solar variables, a façade study was conducted. The mechanical team determined that a Double Façade System (DFS) would be beneficial to maintaining desired indoor temperatures and conditions. The DFS will accomplish this goal through passive conditioning methods such as natural ventilation and by means of a conditioned thermal layer in the heating months. Along with passive strategies the DFS will be integrated with control logic in order to maximize its efficiency.

Near immediate occupancy after a catastrophic event was a main design challenges presented in the competition. In order to satisfy this requirement the mechanical team in conjunction with the structural team researched seismic design options and construction methods utilized in industry.

The owner expressed a great desire for the building to be high-performance. This, inevitably, required the team to look into LEED certification. After analyzing our system, it was determined that our proposed design contributed 41 out of 89 points, resulting in a LEED certification of Platinum.

Lastly, algae bioreactors will be incorporated with the CHP system in order to reduce the carbon emissions from the natural gas combusted in the microturbines. The CO_2, along with other gasses and nutrients, will facilitate algae growth which can be used for research, biofuels, and other beneficial byproducts. This tactic of reducing carbon emissions is proposed to be a joint venture between the owner of 350 Mission and CAL-COM, who partner with Berkeley University, a local higher education facility that researches algae and its benefits.