

EXECUTIVE SUMMARY

The following report details the mechanical system design of 350 Mission, San Francisco.

With the end goal of designing a net-zero high-rise building in the heart of San Francisco, **AEVITAS** developed the overarching attitude of [ZERO**impact**], encompassing four design goals of [ZERO**interruption**], [ZERO**energy**], [ZERO**waste**], and [ZERO**emissions**]. Through integrated design analysis, **AEVITAS** achieves these goals through effective and efficient collaboration. **AEVITAS** is an integrated design team, composed of representatives from the construction, structural, electrical, and mechanical disciplines. Through a unified effort, 350 Mission’s environmental impact has subsided. Information about the design of 350 Mission can be found in **AEVITAS’** reports as detailed in Table 1.

TABLE 1: SYSTEM OVERVIEW BREAKDOWN

<i>ARCHITECTURAL</i>	Floor Plan Changes, Vestibule Addition, Integrated Public Art Piece
<i>FAÇADE</i>	Natural Ventilation Louvers, Seismic Connections, Electrochromic Glazing
<i>MECHANICAL</i>	Radiant Floor System, Natural Ventilation Louvers, Dedicated Outdoor Air System
<i>LIGHTING</i>	LED Lighting, DALI Controls Responsive to Daylighting and Occupancy, Task Lighting
<i>ENERGY GENERATION</i>	Onsite Solar Array, Offsite Solar Array, Human Waste to Power Converter
<i>ELECTRICAL</i>	AC and DC Distribution, Natural Gas-Powered Fuel Cells, Dual Electrical Risers
<i>STRUCTURAL</i>	Steel Superstructure, Braced Frame Core, Composite Beams and Deck, Outrigger System, Concrete Substructure
<i>CONSTRUCTION</i>	Production Planning, Matrix Scheduling, Waste Management, BIM Execution Planning, Site Planning

350 Mission is located in the South of Market (SoMa) district of downtown San Francisco, a diverse neighborhood housing several prominent high rise buildings. The area is subject to microclimates and sub-microclimates due to the city’s dynamic topography and marine layer.

Preliminary design identified energy efficient and sustainable mechanical systems and components that meet **AEVITAS’** objectives. Through energy conservation measures, life cycle cost (LCC) analyses, and energy performance, a mechanical system of primarily on slab radiant heating and cooling, dedicated outdoor air systems (DOAS), and natural ventilation proved energy efficient while integrating with the building design. This combination resulted in an 82% reduction of energy usage in comparison to the baseline building. The remaining energy usage is returned to the grid through a human-waste bioreactor, onsite solar collection, and offsite solar collection. The design offers a payback period of 10.6 years with a savings to investment ratio of 152%.

The indoor air quality analysis and acoustical analysis verify the positive contributions of the natural ventilation integration into the design. When open, the acoustical louvers have an NC-36 rating, slightly higher than the NC-35 standard. With regards to ASHRAE Standard 62.1 compliance, the office floors require 3500 CFM of outside air. Pressure differences draw the outside air into the space during natural ventilation conditions. Fire and smoke control, and robust design features provide analysis for limited building use and interruption in the case of emergency or seismic disturbance.

This approach allows successful reduction of the building’s emissions, energy usage, waste, and interruption. Incorporating with the rest of the building, 350 Mission can achieve Platinum LEED accreditation. Balancing a net-zero design and an attainable life cycle cost results in an exceptionally energy efficient building, for both the owners and occupants.