Project Narrative:

The building is a three-story structure located in San Juan, Puerto Rico. The building is divided into four wings with a central connector between the four wings. The site was selected based on ease of access to local hospitals, schools, churches, and act as a community engagement center with shared outdoor spaces. The outdoor areas have an opportunity for a food hall, community garden, and recreational field.

Apartments are located on the second and third floor with the common amenity spaces on the first floor. While second and third floor amenity spaces could be used just for the apartment occupants. The building was designed in keeping with a high flood plain level and being able to operate during emergency conditions. The building envelope has a higher R-value wall and roof insulation along with 30% WWR that create a high-performance envelope. Green roof and walls further improve the building envelope thus reducing cooling loads. Since San Juan has a tropical climate with ample rainfall, the expanded roof helps with rainwater collection to reduce about 40% annual water consumption.

The apartments have a double pane low-e window with overhangs and light shelves. The curtain walls in the lobby are high performance biochromatic algae windows that provide better insulation U- value than double pane windows along with dynamic shading and daylighting. The Algae walls provide fresh oxygen to the lobby spaces while reducing carbon dioxide levels. Daylighting is achieved in the corridor spaces with asymmetric light tubes. The corridor spaces are also designed for cross-ventilation and to take advantage of the natural breeze from the east. Smart carbon capture concrete reduces the carbon emissions associated with the building structure.

The HVAC systems were designed to first reduce cooling loads (thereby reducing carbon footprint) and then use efficient control strategies to reduce the energy consumption. The cooling system consists of two high efficiency air cooled chillers (Low GWP refrigerants) that provides chilled water to the zone level cooling equipment. One heat recovery chiller runs continuously while acting as a heat source for the domestic water loop. The second chiller provides redundancy and supplemental capacity during peak load conditions. The chilled water system is a variable primary with VFD pump motors to reduce the pump speed/flow to conserve energy. Each zone (room) is provided with dedicated 2-pipe cooling only Fan Coil Unit (FCU) which is controlled by its own wall mounted temperature sensor. DDC controls are provided, and each equipment and devices are mapped to central Building Management System (BMS).

The ventilation air for the spaces is provided by a 6000 cfm Dedicated Outside Air System (DOAS), consisting of a Total Energy Recovery Wheel. The exhaust from the space is routed through DOAS Energy Recovery Unit to pre-condition the outside air. DOAS supply air temperature is controlled between 55-58 °F which does not add to space cooling load. The lobby areas are provided with ceiling fans to have better air circulation and provide comfort conditions to meet ASHRAE 55 requirements. Using a Demand Controlled Ventilation strategy reduces the outdoor air delivery rate during partial occupancy and saves energy.

Renewable energy is generated by continuous rooftop solar panels (15,000 sq.ft.) providing onsite electricity generation. A double roof structure provides building shading while increasing the available area for solar energy generation. A solar panel parking lot canopy helps achieve a net zero energy operational building. The east facing horizontal fins are additional semi-transparent solar panels which add to capacity and provide diffuse lighting to the open corridor.

Combining active and passive energy efficiency measures, an integrated sustainable building is created which engages the community and provides a comfortable residential space for people. This building is a good example of how sustainable design features can be implemented in the buildings depending upon the building use and achieve net zero goal - “Power of Zero”