AGUA VIENTE

ASHRAE LowDown Showdown

2021 Building Performance Analysis Conference

Building Type: Residential Care Center

Total Floor Area: 72,163 ft2

Location: Puerto Rico

Total Site Energy Usage

3,906,703 kBtu

Site EUI

18.6 kBtu/ft²

Source EUI

32.15 kBtu/ft²

Total Operational Carbon

1.64 kgCO2e/ft²

Total Energy Storage Capacity

25,843 kBtu

Annual Water Usage

927,860 Gallons

Annual Energy Costs

0.598 $/ft²

Annual Water Costs

0.0185 $/ft²

Total Annual Costs

0.617 $/ft²

Total Energy Generation

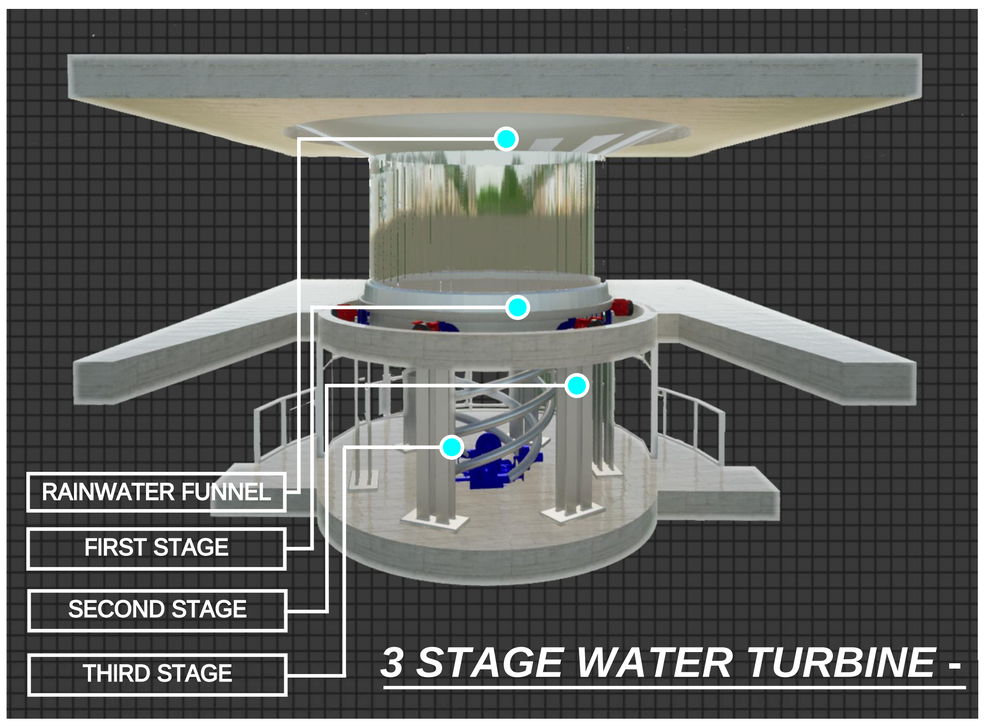
4192720 kBtu

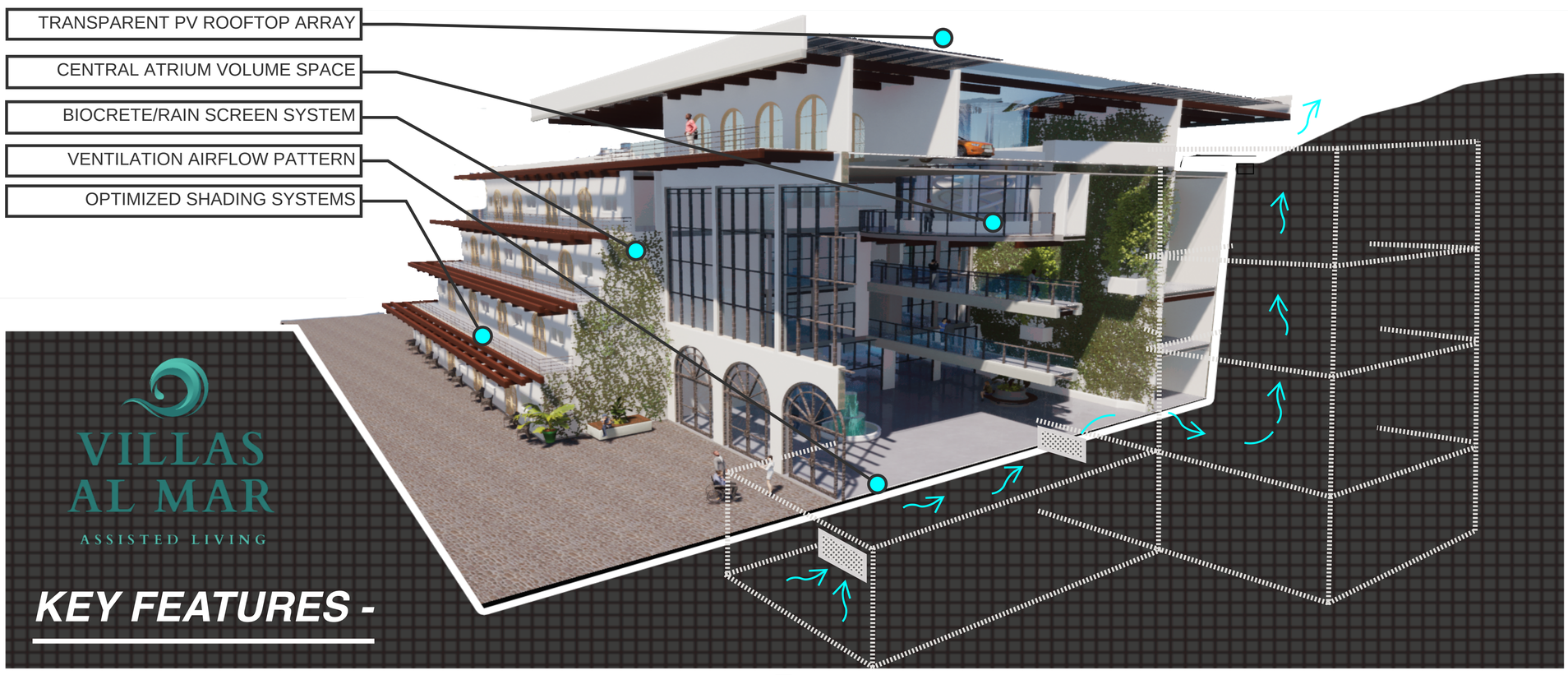
MODEL DESCRIPTION

The oceanfront residential care center is located on the west coast city of Aguadilla, known for its crystal clear waters and compelling downtown center. The site of this facility is predicated on four criteria: historical hurricane tracks, senior well-being, total population, and emergency response time. Villas Al Mar is designed to be an assisted living center as well as an inviting destination for visiting relatives and locals alike. With 19 beaches on Aguadilla, the most in Puerto Rico, one of the best for surfing Crash Boat Beach is just minutes north of the facility. In addition to a local hub with stunning views, surrounding wilderness, and modern amenities, Villas Al Mar will be a safe place for residents and locals during the unlikely instance of a hurricane. With state-of-the-art energy production technology, not only will the power sustain during such an event, but energy generation will be at peak production. This is due to a 3-stage water turbine energy generation system which draws power from a man-made waterfall integrated within the atrium. Located at the entrance of the building, the atrium is designed to be a grandiose welcome with the serene sound of water falling, a bright living wall, and refreshing natural light. The building is equipped with extensive solar panel arrays which generate energy during days of copious sunshine. Excess energy will be stored in batteries to maintain facility operations during times of minimal renewable energy production. The facility will employ a water-cooled VRF system to condition the space, giving residents the ability to set the temperature to their individual comfort.

ENERGY SAVING STRATEGIES

PV panels are integrated into the rainwater collection roof which reduces the temperature of the atrium as well as the 5th-floor patio in addition to generating renewable energy. Energy saving strategies in the atrium include a four-story tall living wall which reduces noise pollution from the indoor driveway and waterfall, moderates indoor temperature during the summer, insulates heat during the winter, and filters airborne pollutants. During days of light to heavy rainfall, about 207 days a year in Aguadilla, the 3-stage water turbine energy generation system will produce energy from rainwater falling through the atrium roof opening. An additional employed energy saving strategy is a rain screen cladding in the building facade which evokes the chimney effect that helps keep out heat in the summer and retain heat during the winter. Light shelfs are implemented throughout the building which enhances natural light and well-being while reducing energy consumption from light bulbs. Low light plants are arranged throughout the building to further improve indoor air quality by reducing heat and CO2 while cultivating a tranquil environment throughout the facility. The three-stage generator runs on the conversion of potential energy to electrical energy. Power is transferred from the vertical kinetic energy to rotational energy via a rack and pinion gear-set attached to six motors along the perimeter of the fountain. When the fountain fills up to max capacity, it is released to allow it to drop and generate power for the building. Once the fountain has bottomed out, the water will flush down through the flexible pipe cyclone down to two stages of turbines. The empty fountain is now substantially lighter and can be raised back up to prepare to refill with rainfall. The process will repeat throughout the year, with an estimated 72 full cycles during one year of average rainfall.





Team

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