

CASE STUDY

JACKSON APARTMENTS

THE BUILDING

Located in Seattle's bustling Central District, Jackson Apartments is a multifamily residential building complex seated in the heart of a vibrant artistic, entrepreneurial and eco-friendly community. Featuring a permanent art collection highlighting the cultural legacy of the neighborhood and African American artists of the community, the Jackson Apartments are as much an architectural achievement as they are energy efficiency trendsetters. Within the mechanical workings is an ultra-efficient commercial heat pump water heater system. This system reliably delivers hot water at a fraction of the cost of traditional domestic hot water systems.



"The Jackson project is truly special: Its design is the culmination of listening to the voice of the community and bringing those ideas together in a unified vision to enhance the neighborhood's health, culture and vitality."

- Brian Runberg, Runberg Architecture Group

BUILDING OVERVIEW

Totaling 763,379 sq ft, the Jackson Apartment complex consists of an east and west building containing 532 residential units and 47,991 sq ft of commercial space.

SYSTEM CONFIGURATION

While this case study focuses primarily on the west hot water plant, both commercial heat pump water heater (CHPWH) systems are single-pass with hot water circulation return to an in parallel temperature maintenance tank with a dedicated multi-pass HPWH.

HPWH EQUIPMENT

Two (2) Colmac single-pass CxA-15 heat pumps serve the west building HW system and utilize R-134a refrigerant. Additionally, one (1) Colmac multi-pass CxV-5 HP provides dedicated reheating for the temperature maintenance system. It uses R-410a refrigerant.

STORAGE

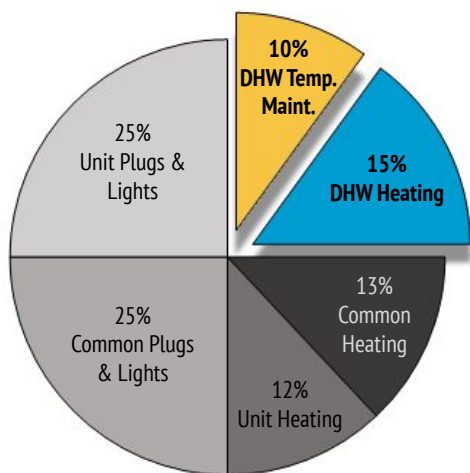
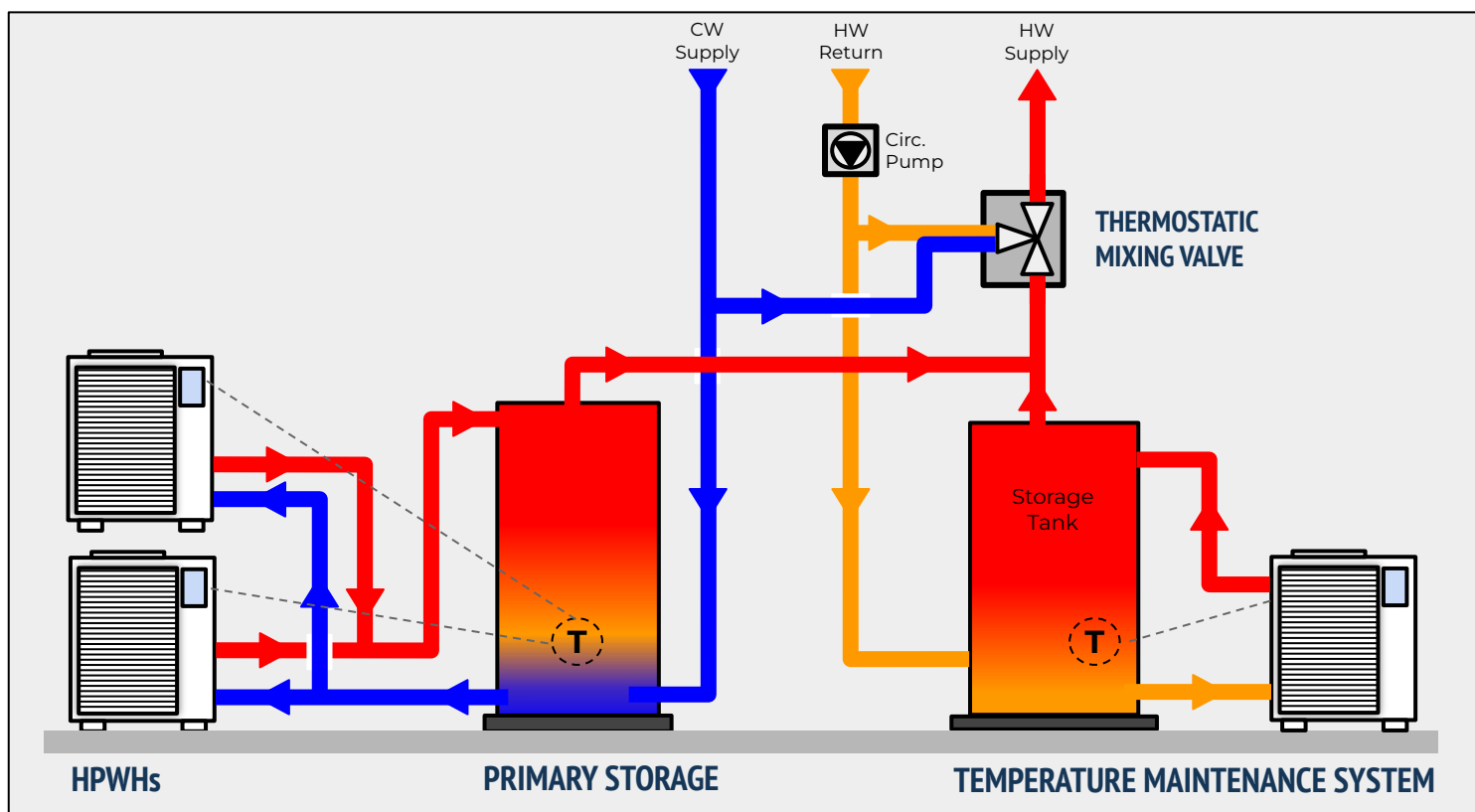
In total, the Jackson Apartments west building water heating plant has 2000 gallons of hot water storage. Three (3) 500 gallon tanks act as primary hot water storage while one (1) 500 gallon tank serves the temperature maintenance system.

SYSTEM DESIGN

With 532 residential units and just over 375,000 sq. ft., the commercial heat pump water heater system of Jackson Apartments accomplishes an impressive task: it meets all domestic hot water needs with an estimated **15.1% annual energy savings and zero carbon emissions**. Like the building itself, with an east and west wing, there is an east and west hot water plant. Shown to the right is the west system, housed in a mechanical room in the under-ground parking garage. The air buffer zone, a seasonally stable temperature zone surrounding the heat pumps, is afforded by the thick layers of earth and concrete. This design ensures the system functions reliably year-round, at an average COP of 3.3.



SINGLE-PASS PRIMARY HPWH SYSTEM W/PARALLEL TANK & MULTIPASS HPWH



BASELINE ENERGY USE IN MULTIFAMILY BUILDINGS

THE TEMPERATURE MAINTENANCE SYSTEM

Temperature maintenance can pose a significant energy draw for any CHPWH system. When hot water leaves the primary storage it circulates through the building distribution system. When the water returns, it is 10-15°F cooler from heat losses incurred. This temperature difference can have catastrophic effects on primary storage stratification and system efficiency. To mitigate the negative impact of returning cool water, a temperature maintenance system is dedicated to storing and reheating the building return water. For Jackson Apartments, this includes a dedicated temperature maintenance storage tank and a multi-pass heat pump water heater.

“Large, central systems using commercial equipment , like in Jackson Apartments, can be effectively designed and utilized to deliver year-round, high efficiency water heating.”

-Colin Grist, Ecotope PE