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HVAC CASE STUDY

# 19th-century buildings pioneer future of HVAC efficiency



Photo: Doug Walker

## The Metropole sets a new standard for integrated design, whole-building efficiency, and historic preservation

Driven by the Satterberg Foundation's vision for community-centered design, the Metropole project reimagined a set of 19th-century buildings in downtown Seattle to create a vibrant, sustainable hub for community, culture, and collaboration. Built in 1892 and unoccupied for 17 years, the Metropole buildings were heavily damaged by earthquakes, fire, and weather when the Satterberg Foundation committed to revitalizing the historic structures to bring new life to the area near Seattle's Pioneer Square.

With equally ambitious energy efficiency and historic preservation goals, the interdisciplinary Metropole project team used innovative integrated design techniques to achieve the ambitious LEED Platinum Certification, preserve and highlight the building's historic aesthetic, and provide modern occupants with healthy and vibrant indoor spaces.

The interaction of innovative energy-efficient technologies became crucial to the project team's successful strategy to balance performance with preservation. By selecting the ideal combination of technologies, the team was able to achieve an Energy Use Index (EUI) of 18 while maintaining and highlighting the property's exposed 1892 masonry and old-growth timber. Working together to reduce the overall heating and cooling load, the Metropole's building renewal technologies include triple-pane windows, photovoltaic solar panels, and a cutting-edge advanced performance dedicated outside air system (DOAS) utilizing natural ventilation, air-sourced radiant heating, and zonal hydronic distribution.

## Project Overview

Customer:
**The Metropole**

Location:
**Seattle, WA**

Building type:
**Multi-use community space**

Year built:
**1892**

Project floor area:
**34,800 sq. ft.**

Whole-building EUI:
**18**

**The high-efficiency heat recovery provided by advanced performance DOAS allowed the team to reduce the system's load so the buildings could be effectively heated and cooled with smaller ducts and pipes and lighter weight equipment on the roof—all essential considerations when historic preservation is a key project goal.**



## Year-round efficiency, comfort, and historic beauty

The Metropole team knew that advanced performance DOAS was their best option to meet their ambitious project goals. With the following HVAC equipment and design principles, advanced performance DOAS allowed the team to maximize the buildings' efficiency and comfort without requiring excessively large equipment or invasive ductwork that might disrupt the property's historic look and feel:

- Heating and cooling air completely separated from ventilation air
- High-performance heating and cooling equipment
- High-efficiency heat recovery ventilators (HRVs) that recover more than 82% of the sensible heat from the stale indoor exhaust air, while delivering 100% fresh, filtered outdoor air at neutral temperatures through the buildings
- Right-sized heating and cooling equipment

The high-efficiency heat recovery provided by advanced performance DOAS allowed the team to reduce the system's load so the buildings could be effectively heated and cooled with smaller ducts and pipes and lighter weight equipment on the roof – all essential considerations when historic preservation is a key project goal. Separation of ventilation air from heating and cooling air is another crucial feature that allows system right-sizing. With the airflows separated, the heating and cooling system can be turned off entirely when not needed, avoiding an oversized system that is constantly running even when the zones are empty.

### Renewal Summary

New HVAC system:

- Counterflow HRV with >82% sensible effectiveness
- Sized to ASHRAE 62
- Featuring passive and active modes and zonal control
- Air-water heat pumps with modular design
- Hydronic distribution with passive chilled beams

3x heat pump water heaters

Photovoltaic solar rooftop solar panels

Triple-pane windows with a U-value of <0.2

## The quiet efficiency of hydronic distribution

As with many building renewal projects, the team had three options for distributing heating and cooling throughout the structure: ducts (i.e., using air), refrigerant piping, or hydronic (i.e., using water). With historic preservation and efficient performance top of mind, the team determined that hydronic distribution was their best bet. Using passive chill beams, radiators, and fan coils, the buildings' heating and cooling system uses hydronic distribution to efficiently and effectively heat and cool rooms throughout the buildings, with benefits including:

- **High efficiency:** Water-powered heating and cooling distribution uses 5-to-10 times less energy than duct-based distribution.[1]
- **Small footprint:** By avoiding the need for large ducts to move air, the hydronic distribution system uses 300-times less space inside the buildings.[2]
- I**ncreased comfort:** Moving hot and cool air through water is very effective, allowing zones to be heated or cooled quickly and precisely.
- **Quiet operation:** Hydronic distribution is nearly soundless, as opposed to the potentially loud and distracting sound of air traveling through ducts.



*Photo: Doug Walker*

### Project team

**Satterberg Foundation**

**BuildingWork** (architect)

**Ecotope** (engineer)

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[1,2] Jonathan Heller, Ecotope. *The Metropole Project: Setting a new standard for community spaces, building restoration, and whole-building efficiency.* BetterBricks, 2025.

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To learn more about advanced performance DOAS, visit **betterbricks.com/apdoas**