BOZEMAN FIRE STATION #2

Community Resilience & Sustainability in Action

Building Highlights

- 53 kW Photovoltaic Array
- VRF Heat Pumps
- Heat Pump Water Heaters
- SolarWalls
- EV Charging
- High-Performance Envelope
- Heat Recovery Ventilator
- Drought Tolerant Landscaping

The new 14,000-square-foot Bozeman Fire Station 2, located in the heart of Montana State University's campus, replaces the older station on South 19th. In 2021, Bozeman voters approved a $6.7 million bond to fund the station's relocation, addressing the needs of the growing south Bozeman community and MSU's expanding campus.

Designed with resilience in mind, the station incorporates methods to ensure continued operation during extreme weather events and protection from chronic stressors. The building exemplifies sustainable practices by enhancing energy efficiency, ensuring long-term durability, and providing a healthy environment for our firefighters.

Building Electrification & Renewable Energy

The new fire station currently operates on a dual-fuel system, using both natural gas and electricity. It is designed with the capability to transition primarily to electric power, positioning the station to increase its use of renewable energy sources, aligning with the 2020 Bozeman Climate Plan's goal of reducing fossil fuel dependence.

Central to this effort is the 53.82 kW photovoltaic array installed on-site, which generates renewable energy to help power the facility through net-metering with NorthWestern Energy.

Energy Efficiency: A Whole-System Approach

The building's design embraces a whole-system approach to energy efficiency, integrating high-performance building principles with interconnected mechanical systems that work together rather than independently. This approach prioritizes the redistribution of existing heat energy to both heat and cool the building, reducing the need to generate energy through methods like natural gas combustion.

Advanced mechanical systems, such as Variable Refrigerant Flow (VRF) heat pumps, efficiently capture heat from the outside air and redistribute it within the building, with individual components working to shift and utilize this heat energy as needed throughout the building. To ensure continuous operation even in extreme weather conditions, the building is also equipped with high-efficiency electric and gas boilers, providing backup and redundancy. Additionally, a heat pump water heater system transfers residual building heat to supply hot water.

Rooftop heat pump unit at Fire Station #2

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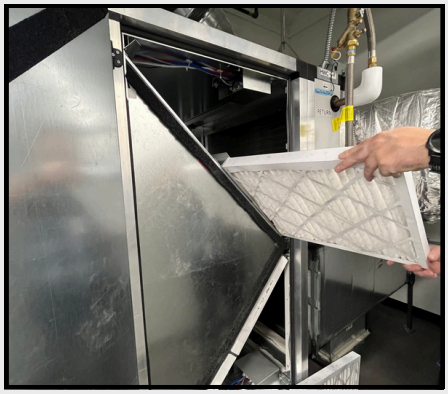
The station's high-performance exterior envelope exceeds the energy code requirements for insulation by 50% and air leakage by 45%, minimizing heat loss in winter and heat gain in summer. Additional features, including a heat recovery ventilator, passive design strategies, and SolarWalls, enhance efficiency by optimizing available heating and cooling resources such as sunlight and air that has already been conditioned.



The Heat Recovery Ventilator (HRV) maintains indoor air quality and energy efficiency by exchanging stale indoor air with fresh outdoor air while also transferring heat between them to pre-heat or pre-cool incoming air.

A strategically designed canopy over the apparatus bay blocks intense summer sunlight while welcoming it in during the winter months.

The SolarWall is an air heating system that heats ventilation air using heat from the sun before it enters the HVAC system, reducing the energy needed to heat the building during colder months.

Breathe Easy: Indoor Air Quality & Comfort Solutions

Several components of the building support indoor air quality and comfort. The dedicated outdoor air system provides fresh air to all spaces. Mechanical ventilation, operable windows, indoor air quality sensors, and low-emitting materials enhance air quality and temperature comfort. In addition to supporting energy efficiency, the VRF heat pump system enables precise temperature control in individual spaces. Special attention was given to sleeping areas, including acoustic treatments and blackout shades to help maintain healthy sleep patterns during extended shifts.

An important feature for keeping our firefighters and staff safe is an intentionally designed air barrier between the apparatus bay and living quarters to prevent toxic chemicals and pollutants from entering living areas.

Charging Ahead: Transportation

Continuing the electrification journey, the fire station was built with future needs in mind, including the capacity to host and charge electric fire trucks. While the city doesn't currently have electric firetrucks, the station is pre-equipped with conduit, wiring, and the electric capacity needed to implement charging when the time comes. Public EV charging stations are also planned, benefiting both the station and the community while saving on future retrofitting costs. The station's central location optimizes emergency response time and promotes urban infill. It is also convenient to several bus and bicycle routes.

Water Smart Practices

The outdoor area features water-smart landscaping with drought tolerant and native plants, supported by efficient irrigation systems. 60% of the landscape area consists of a drought tolerant grass seed mix. Once established, this seed mix will grow tall and natural, requiring 50% less water than traditional turfgrass. An irrigation flow meter monitors usage to optimize the system and identify water-saving opportunities. Inside the building, water efficient plumbing fixtures are installed which can reduce water consumption and minimize wastewater generation by over 25%.

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