05 HVAC
HEATING, VENTILATION & AIR-CONDITIONING

Overview

Heating, ventilation and air-conditioning (HVAC) systems impact the comfort and health of building occupants, the cost to operate buildings and energy use. HVAC controls help determine how efficiently these systems operate.

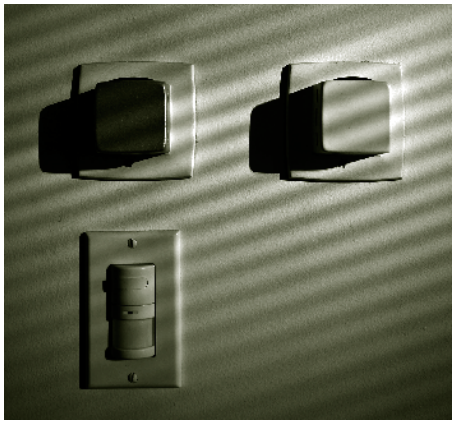
HVAC accounts for approximately 40% of the energy used in U.S. commercial and residential buildings, roughly twice the energy used for lighting systems. Since heating and cooling equipment consume the most energy in leased spaces, energy-efficient HVAC systems provide an excellent opportunity to control costs. An evaluation of the condition and efficiency of existing HVAC systems should factor into leasing decisions given that tenants typically have little or no control over their operation.

Strategy

If a new HVAC system is being considered, engage the mechanical and electrical engineers early in the design process. Their expertise will help optimize the selection of efficient and cost-effective mechanical and ventilation systems. On existing retrofits, perform an energy analysis during the schematic design phase. This will help predict the energy behavior of the building's structure, HVAC systems, and central plant equipment. When possible, the engineer should work with the building's facility staff to calculate the building's "Energy Use Index" (EUI). This data can then be input into the EPA Energy Star "Target Finder" which will compare it to the average building in that zip code. The technology/solution chosen for energy efficiency depends on the building type and tenant usage requirements.

Benefits

- Reduces energy consumption
- Reduces greenhouse gas emissions
- Reduces utility costs
- Increases thermal comfort
- Improves indoor air quality



Money Back

Seattle City Light has a variety of incentive programs that can help pay for a portion of the up-front costs for efficiency upgrades to HVAC equipment. Reimbursements are offered on:

- *Chillers*
- *Air conditioners*
- *Air-to-air heat pumps*
- *Hydronic heat pumps*
- *Variable speed fan drives*

Call (206) 684-3761 or visit ***seattle.gov/light/conserve/business***

LEED®-CI v2.0: Commercial Interiors

By implementing various energy efficient HVAC strategies, your project may be eligible for the following:

Energy & Atmosphere

EA Credit 1.3: Optimize Energy Performance, HVAC

CASE STUDY

Pierce County Environmental Services

The building employs a relatively simple mechanical concept incorporating several sustainable design features. Delivering supply air through a raised-floor plenum allows cool air to be supplied at higher temperatures and lower velocities, resulting in smaller HVAC equipment and lower energy costs. This system also significantly improves indoor air quality, as exhaust air is not mixed with fresh supply air, as it is in a conventional ceiling-supplied ventilation system. The raised-floor air distribution system also provides for future flexibility and gives individuals direct control over the immediate environment.

Nighttime flushing moves cool night air through the raised floor plenum, lowering the temperature of the concrete structure by several degrees. This concept, called fabric energy storage, provides "free" cooling at the beginning of the day, resulting in significant energy savings over the life of the building. Through modeling of the raised-floor system, the design team was able to reduce the design cooling load from 150 tons to 90 tons when compared to a conventionally designed facility. Designing around 63-degree supply air allows for greater airside economizer usage, providing additional energy savings and prolonging the life of the refrigeration equipment.

Checklist

- ☐ **Zone the system** to serve different functions and solar conditions. This can prevent the system from overheating or overcooling select areas.
- ☐ **Install occupancy sensors** tied to the existing HVAC system to reduce airflow when spaces are not occupied.
- ☐ **Deliver only the volume of air needed** for conditioning the actual load by using local variable air volume (VAV) diffusers for individual temperature control. VAVs consume less energy by reducing unnecessarily high fan speeds. Ceiling diffusers ducted from the VAV box into individual rooms give occupants comfort control, helping to eliminate overheating or overcooling.
- ☐ **Increase duct size** to reduce the required pressure and fan speed. In addition, avoid sharp turns in duct routing to increase efficiency. Small increases in duct diameter can yield large pressure drops and fan energy savings.
- ☐ **Specify low-face-velocity air handlers** to reduce air velocity across coils. When air travels at a lower velocity, it remains in contact with cooling coils longer. This can yield additional savings realized by using a smaller chilled water plant.
- ☐ **Replace oversized fans** with units that match the load. If the speed and power of the fan motor are electronically controlled to continually match fan speed with the building-load conditions, inefficient mechanical controls can be eliminated.
- ☐ **Consider a raised access flooring system**, which permits air distribution to occur below the floor, provides each occupant with their own HVAC controls and increases energy efficiency. Raised access flooring reduces fan energy, increases ventilation effectiveness and provides more hours of economizer operation. See the Tenant Improvement Guide for Adaptable Design for more information on raised access floors.
- ☐ **Consider a 'mixed mode' system** with operable windows, under-floor air supply, thermal mass, and nighttime flushing—a strategy well-suited for Seattle's temperate climate.
- ☐ **Consider systems that allow users to control space temperatures** within a pre-set range (±3 degrees F) of the building's set temperature.
- ☐ **Consider establishing a broader comfort range** for occupants. Allowing for slightly warmer temperatures in summer and cooler temperatures in winter is possible if occupants are educated regarding the reason for this, and encouraged to dress appropriately for the seasons.

Resources

www.seattle.gov/light Search for financial incentives.

www.betterbricks.com Search in "Building Operations" for "Tools and Technical Advice."

www.energystar.gov Click on "Building & Plants," then "Purchasing & Procurement" for guides and resources on energy efficient buildings.

www.newbuildings.org/mechanical Review studies and reports on HVAC efficiency.

www.buildinggreen.com Search for HVAC to view articles, relevant product specifications and case studies.