

## Green heating ventilation and air conditioning

Efficient use of resources necessary to heat and/or cool a building can be a source of significant energy savings. While continued use of existing equipment (boilers, air conditioners, furnaces, and air handlers) may condition the building, replacement or upgrading the equipment may result in major energy savings.

[http://doas-radiant.psu.edu/DOE\\_report.pdf](http://doas-radiant.psu.edu/DOE_report.pdf)

## Replacement

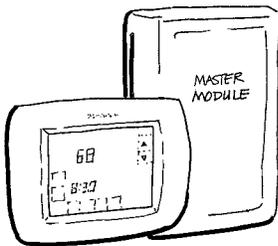
Replacement of standard efficiency (80% AFUE) furnaces or boilers with 90-96% efficiency equipment; anecdotal evidence suggests energy savings of up to 40% by utilizing condensing heating appliances with no other modifications to the existing HVAC system.

### Modular boilers

Replacing a large boiler with a series of high efficiency smaller boilers can save money in multiple ways. The boilers can be set so that in mild weather only one comes on and as the temperature drops the others come on line. This can be done using a control called a 'cut-out' which stops the boiler from coming on above a set temperature. You can use this control on each boiler and you can rotate which boiler comes on first each year so that there is even wear and tear on each boiler. Proper control of the heat supplied prevents overheating and reduces the likelihood of open windows during the heating season.

## Controls

### Energy management systems (EMS)



Automated control systems can rely on timers, occupancy sensors, out door temperature sensors and/or computer programming. This is a rapidly expanding field. Matching a system to your needs will be very important in achieving the desired results.

### Individual tenant control and sub-metering of fuel usage.

By making each tenant responsible for paying for the energy they use, consumption drops because they each see costs reflected in their gas or electric bills. Even if the tenant is not paying the bills, sub metering can help by alerting you to sudden increases in usage.

### Hydronic controls

Indoor/outdoor resets for boilers work by raising the boiler water temperature as the outdoor temperature drops lower. When temperatures are mild this allows the boiler to work less and avoids over-shooting of indoor temperatures.

[http://www.pmengineer.com/Articles/Feature\\_Article/cdd55d5472298010VgnVCM100000f932a8c0](http://www.pmengineer.com/Articles/Feature_Article/cdd55d5472298010VgnVCM100000f932a8c0)

## Heat recovery

### Air exhaust systems

When environmental air exhaust systems are being installed or replaced, an air to air heat exchanger should be included to recover the energy needed to condition the outside air that replaces the exhausted air.

[http://en.wikipedia.org/wiki/Heat\\_recovery\\_ventilation](http://en.wikipedia.org/wiki/Heat_recovery_ventilation)

### Waste heat

Most companies actually increase their energy consumption by installing separate cooling systems just to remove the heat generated by computers and server rooms. For example, this excess heat could potentially be diverted to the building's hot water. In an existing building the layout of rooms and piping greatly affect the feasibility of some adaptations like this.

## Distribution

### Zoned heating and air conditioning

Have a card activating device or switch that renders the fresh air damper shut and controls the thermostat to provide a lower energy use setting when rooms are not in use. If possible, create more zones that can control separate areas for spot usage of air conditioning systems. Mini-split systems are more efficient and can control the air at the points that need it the most.

<http://www.toolbase.org/Technology-Inventory/HVAC/ductless-mini-split-heat-pumps>

### Variable air volume controls (VAV)

Systems utilizing VAV controls fine tune air flow to occupied spaces rather than having just one thermostat sensing temperature in just one location.

<http://highperformacehvac.com/ddc-variable-air-volume-systems-vav-boxes>

### Ductwork and air supply

Investigate ductwork and diffusers optimum routing and insure that all joints are sealed. Sealing leaky ductwork, shortening ductwork and removing unnecessary bends will reduce the energy consumed.

Placing grills and diffusers in locations that deliver better coverage will keep the occupant more comfortable and eliminate the need for electric heaters or additional fans.

### Blower replacement upgrades

When replacing blower motors make sure to use the more efficient DC type whenever possible. DC motors can be wired to reduce air movement providing a quieter operation, achieve more comfort, and deliver cleaner air by filtration plus fresh air at a constant flow.

## Other energy resources

Geothermal systems can be used for space heating and air conditioning plus water heating. The State has excellent information at:

[http://www.nextstep.state.mn.us/res\\_detail.cfm?id=267](http://www.nextstep.state.mn.us/res_detail.cfm?id=267)

Solar systems can be used for space heating and water heating also. The State has technical information and funding-incentive information available at:

<http://www.state.mn.us/portal/mn/jsp/content.do?subchannel=null&programid=536917482&sc3=null&sc2=null&id=-536893812&agency=Energy>

### Technical resources

Xcel Energy, a design assistance partner that works to meet energy conservation goals, offers a new construction program and ASHRAE requirement assessment for commercial buildings. Xcel Energy's Business New Construction Program and ASHRAE requirements – [www.Xcelenergy.com](http://www.Xcelenergy.com)

[http://www.xcelenergy.com/Minnesota/Business/Programs\\_Resources/Pages/Programs\\_and\\_Resources.aspx](http://www.xcelenergy.com/Minnesota/Business/Programs_Resources/Pages/Programs_and_Resources.aspx)

National Environmental Balancing Bureau could be a good source for professional assessments or commissioning of existing systems used in commercial buildings. They provide training and certification in testing, adjusting and balancing of heating, ventilating and air-conditioning systems, building systems commissioning and more. At their web site is a list of certified companies.

[www.nebb.org](http://www.nebb.org)

**Disclaimer:** Green Building Ideas for Existing Commercial Buildings contains links to many outside sites. These links are set up to provide information that is currently available. The City of Minneapolis cannot guarantee the accuracy of information found at any linked site. Providing links to outside sites does not constitute an endorsement by the City of Minneapolis



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Questions? Contact [Vicki.Carey@ci.Minneapolis.mn.us](mailto:Vicki.Carey@ci.Minneapolis.mn.us) or visit the website at <http://www.ci.minneapolis.mn.us/ccs/greenbuilding.asp>

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