3 Supporting Material

Supporting Material

Glossary

AHU: See Air Handling Unit.

Air Diffuser: A device used to distribute heated or cooled air to a space.

Air Handling Unit (AHU): A unit that usually contains filters, fans, and other components to heat, cool, humidify, or dehumidify interior air.

ASHRAE: American Society of Heating, Refrigerating, and Air-Conditioning Engineers.

Ballast: A device in fluorescent and high-intensity discharge (HID) lighting units that modifies incoming voltage and controls current.

Blending Valve: A valve that mixes hot and cold water to provide water at a lower temperature.

Boiler: A vessel designed to transfer heat produced by combustion or electric resistance to water. Boilers may provide hot water or steam, depending on design and settings.

British Thermal Unit (BTU): A unit of heat energy equal to the amount of heat required to raise the temperature of one pound of water by one degree Fahrenheit at sea level. This is roughly equivalent to the heat given off from burning a wooden match.

Building Envelope: The exterior surface of a building's construction—the walls, windows, doors, roof, and floor. Also called the building shell.

CFL: See Compact Fluorescent Lamp.

CFM: Cubic Feet per Minute, a measure of air flow.

Chiller: A device that generates a cold liquid that is circulated through an air-handling unit's cooling coil to cool the air supplied to the building.

Color-Rendering Index (CRI): A scale indicating the effect that a given light source has on the apparent color of objects viewed under it. It is expressed on a scale of 0 to 100, where 100 represents the color appearance of the object in daylight or under incandescent lights. Values of CRI above 80 indicate good color rendition.

Compact Fluorescent Lamp (CFL): Small fluorescent lamps frequently used as more efficient alternatives to incandescent lighting. They typically have 10 times the rated life and 3 to 4 times the efficacy of incandescent lamps.

Condensate Return System: A system of piping that returns the heated water condensing within steam piping to the boiler and thus saves energy.

Glossary

Condenser: Heat exchanger in a refrigeration system that rejects heat from the system.

Convector: A heating unit that circulates heated air by means of natural convection. Normally consists of a heating element within an enclosure, with an air inlet below and an air outlet opening above.

Cooling Tower: A device that dissipates the heat from water-cooled systems by spraying the water through streams of rapidly moving air.

CRI: See Color-Rendering Index.

Dampers: Single or multiple blades that are opened or closed in order to control the amount of air entering or leaving an air-conditioning system. Control can be either manual or automatic.

Deep-Cell Parabolic: A type of fluorescent fixture recommended for areas with computers. These fixtures direct light down, minimizing glare and reflections in computer monitors. See also louvers.

Degree-Day: A rough measure used to estimate the amount of heating required in a given area. A degree-day is defined as the difference between the mean daily temperature and 65 degrees Fahrenheit (F). This is based upon the assumption that no heating is required when the temperature is above 65º F, and that proportionately more heating is required the further the average temperature is from 65º F. Cooling degree-days may also be calculated to estimate cooling requirements.

Demand: The average rate of electrical usage used over a specified period of time (typically a 15-minute, 30-minute, or 1-hour period). Measured in kilowatts (kWs).

Demand Charges: Fees charged by a utility company for electric demand. These charges are often highest during weekdays in summer.

Desiccant: A substance that is capable of extracting and retaining water from humid air.

Dual Duct: A type of heating, ventilating, and air-conditioning (HVAC) distribution system that involves simultaneous heating and cooling. Two supply ducts (a "hot deck" and a "cold deck") serve each space, and the hot and cold air from them are mixed in the appropriate proportions before being supplied to the space.

Economizer: A mode of HVAC operation using outdoor air for cooling when outdoor temperature and humidity levels are suitable.

Efficacy: A measure of how efficiently a light source can produce light, expressed in lumens (of light output) per watt (of power input). For example, a 100-watt light source producing 9,000 lumens of light output has an efficacy of 90 lumens per watt.

Glossary

Efficiency: A measure of how much of a desired output is produced per unit of input; typically calculated as the amount of useful energy supplied divided by the energy consumed.

Electric Resistance Heat: Heat produced by a flow of electricity through high-resistance wire, tape, or film.

Electronic Ballast: A ballast for fluorescent lights that uses semiconductor components to increase the incoming electrical frequency from 60 hertz (Hz) to much higher levels (20,000 to 40,000 Hz), allowing lamps to operate with virtually no flicker and consume 12 to 25 percent less power than with standard ballasts.

Electronic Dimming Ballast: An electronic ballast that allows variable levels of light output.

EMS: See Energy Management System.

Energy Management System (EMS): A control system capable of monitoring environmental and system loads and adjusting HVAC operations accordingly in order to conserve energy while maintaining comfort. It may also be used for other control and monitoring, such as lighting and security.

Engine-Driven Chiller: A type of chiller that uses an engine fueled by natural gas, fuel oil, or diesel fuel instead of an electric motor.

Envelope (Building): The exterior surface of a building's construction—the walls, windows, doors, roof, and floor. Also called the building shell.

Feedwater: The water that is fed into a boiler to be heated.

Filter: A device that removes fine particles from the air stream in an air-handling system.

Footcandle (fc): A unit of measurement of the lighting levels on a surface, equal to one lumen per square foot.

Geothermal Heat Pump: See Ground Source Heat Pump.

GPM: Gallons Per Minute, a measure of flow rate for water or other liquids.

Gravity Dampers: Devices that close off a duct automatically by force of gravity when not kept open by fan-forced air flow.

Ground Source Heat Pump: Also called "Earth Coupled" and "Geothermal," these heat pumps use underground coils to transfer heat from the ground to the inside of a building. Compared with conventional heat pumps, ground source heat pumps can have 40-percent higher efficiency but cost more to install. See also Water Source Heat Pump.

Halogen: A type of incandescent lamp with higher efficiency than standard incandescent lamps. Halogen produces a bright white light ideal for retail applications.

Glossary

Head: Pressure that a pump or fan has to work against for liquids to flow.

Heat Pipe: A passive heat exchanger that uses a refrigerant as the heat transfer medium.

Heat Pump: An electric device with both heating and cooling capabilities. It extracts heat from one medium at a lower temperature (the heat source) and transfers it to another medium at a higher temperature (the heat sink), thereby cooling the first and warming the second.

Heat-Transfer Coils: A component of heat pumps, air conditioners, and chillers that is used to transfer heat. They must be kept clean and clear of obstructions to operate efficiently.

HID: See High-Intensity Discharge.

High-Intensity Discharge (HID): A generic term used to describe mercury vapor, metal halide, and high-pressure sodium lamps and fixtures. Low-pressure sodium lamps, although not technically HID, are sometimes informally included in the use of this term.

High-Pressure Sodium (HPS): An efficient type of lighting often used for warehouse and exterior lighting. HPS fixtures emit a slightly yellow-orange light.

HPS: See High-Pressure Sodium.

Humidifier: A device that adds moisture to air.

HVAC: Heating, Ventilating, and Air Conditioning.

Hydronic: A ventilation system that uses heated or cooled water circulated by pumps throughout the building.

Illuminance: A measure of the amount of light incident on a surface or plane, expressed in lumens per square foot (footcandles) or lumens per square meter (lux). Commonly referred to as "light level."

Internal Rate of Return (IRR): IRR is the interest rate that is equivalent to the present value of expected future cash flows after considering the initial cost of the project.

IRR: See Internal Rate of Return.

Kilowatt (kW): Unit of power (demand) equal to 1,000 watts.

Kilowatt-hour (kWh): A unit of electric energy equal to the energy consumed by a 1-kilowatt load operated for one hour.

LED: See Light-Emitting Diode.

Lens: A translucent or transparent piece of glass or plastic that shields the light source and redirects and scatters light passing through it.

Light-Emitting Diode (LED): An illumination technology used for exit signs that requires very little power and has a rated life greater than 80 years.

Glossary

Louver: Grid type of optical assembly used to control light distribution from a fixture. Can range from small-cell plastic louvers to the large-cell anodized aluminum louvers used in parabolic fluorescent fixtures. See also Deep-Cell Parabolic.

Low-Emissivity (low-E) Windows: A new window technology that lowers the amount of energy loss through windows by inhibiting the transmission of radiant heat while allowing plenty of light to pass through.

Low-Voltage Halogen: An incandescent lamp that produces bright white light at a higher efficiency than standard incandescent lamps. The high "sparkle" from low-voltage halogen lamps makes them well suited for retail spot lighting.

Lumen: A unit of measurement of light flow or luminous flux (the quantity of light emitted from a light source).

Luminaire: A complete lighting unit, consisting of one or more lamps, a housing, the optical components to distribute light, and electrical components (ballasts, starters, etc.) necessary to operate the lamps.

Megawatt: One million watts.

Metal Halide (MH): A type of lighting that combines high efficiency and an appealing bright white light. MH fixtures can be used for interior and exterior lighting. They are becoming the fixture of choice for retail areas with high ceilings.

MH: See Metal Halide.

Mixing Box: A component of an air-handling system in which air streams from two different sources are combined to form a uniform air stream.

Modified Bin Method: A method for calculating the required heating or cooling for a building based on determining how much energy the system would use if outdoor temperatures were within a certain temperature interval (or "bin") and then multiplying that energy use by the amount of time that the temperature interval typically occurs at the site. Bin weather data for a variety of sites are tabulated by both the U.S. Air Force and ASHRAE. The energy use for all of the applicable temperature bins is summed to determine the total estimated energy use by the system.

Multizone: A type of HVAC distribution system that involves simultaneous heating and cooling. Hot and cold air are supplied at the multizone unit and mixed in appropriate proportions to provide the supply-air temperatures needed in each zone.

Occupancy Sensor: A device that detects the presence (or absence) of occupants in an area and causes equipment to be adjusted accordingly.

Payback, Simple: A traditional measure of the economic viability of a project, generally defined as the length of time it takes for savings from an investment to equal the cost. Although frequently used because of its ease of calculation,

Glossary

payback frequently does not give an accurate representation of the total lifecycle value of an investment.

Photocell: A light-sensing device used to control light fixtures and dimmers in response to detected levels.

Prismatic Plastic Lens: The cover installed on many standard fluorescent fixtures. These lenses are often bright light sources that create uncomfortable reflections in computer monitors.

Programmable Thermostat: A control device for HVAC systems that allows the user to program in various temperature and fan settings for various times.

Radiant Heaters: A technology that heats building occupants by radiating heat from an electric or combustion source. Because radiant heaters use radiation instead of convection to transfer heat, they are very efficient in areas where high ceilings or high infiltration make heating the air costly.

Refrigerant: A substance used to provide cooling, either as the working substance of a refrigerator or by the direct absorption of heat.

Reheat: A type of HVAC air distribution system in which air maintains comfort in a building by cooling the air to a low temperature (typically 55 degrees F) at the air handler and then reheats it near its point of use. This system provides good temperature and humidity control but wastes considerable energy.

Retrofit: Upgrading a fixture, room, or building by installing new parts of equipment.

R-Value: A measure of thermal resistance or the ability of a material or group of materials to retard heat flow.

Setback: Setting a thermostat to a lower temperature when the building is unoccupied to reduce heating energy consumption. This may also refer to setting the thermostat to higher temperatures ("setup") during unoccupied periods in the cooling season and operating the fan in "auto" mode (rather than constant operation) during unoccupied periods.

Shading Coefficient: The amount of the sun's heat transmitted through a given window compared with that of a standard 1/8-inch-thick single pane of glass under the same conditions.

Static Pressure: The condition that exists when an equal amount of air is being supplied to and removed from a space.

Steam Trap: A valve that allows condensed water to flow out of a steam supply line without allowing any of the steam to escape.

Supply-Air Diffuser: A device used to evenly distribute supply air to a space.

Tandem Wiring: A wiring option in which a ballast is shared by two or more fixtures. This option reduces labor, material, and energy costs.

Glossary

Thermostat: A device typically contained in heating, cooling, and refrigeration systems which automatically responds to temperature changes and activates switches controlling the equipment.

Ton: A unit of measure of refrigeration or air-conditioning capacity; by definition equal to 12,000 BTU/hour. This is a holdover from when refrigeration was primarily used to make ice (for people to use in home iceboxes). A "three ton" refrigeration unit could make three tons of ice from 32 degrees F water in a day.

T-12 Lamp: Industry standard nomenclature for a fluorescent lamp which is twelve 1/8 of an inch (1 1/2 inch) in diameter. Other standard lamp sizes include T-8 (1 inch), T-10 (1 1/4 inch), and T-5 (5/8 inch).

Variable Air Volume (VAV): A type of air-handling system that maintains comfort in a building by supplying varying quantities of air throughout the building based upon the needs of individual spaces.

Variable-Speed Drive (VSD): A device that is used to adjust the speed of an AC motor to match load requirements. Since motors require less power to operate at slower speeds, this provides energy savings.

VAV: See Variable Air Volume.

VSD: See Variable-Speed Drive.

Waste Heat Recovery: Recovering heat that is discharged as a byproduct of one process to provide heat required by a second process. For example, recovering heat going up the flue of a boiler to be used to preheat boiler feedwater.

Water-Side Systems: HVAC systems in which water is used to provide heating or cooling, including pumps, chillers, boilers, and other equipment.

Water Source Heat Pump: Heat pumps that use wells or heat exchangers to transfer heat from water to the inside of a building. Although most of these units use ground water, a small number of installations use surface water, such as ponds or streams. Compared with conventional heat pumps, water source heat pumps can have 50-percent higher efficiency, but cost more to install. See also Ground Source Heat Pump.

Watt (W): A unit of electric power. It defines the rate at which electric energy is consumed.

Xeriscaping: (From the Greek *xer*, which means dry.) A technique of utilizing native, hardy, low-maintenance plants for landscaping. Xeriscaping reduces water, pesticide, and fertilizer requirements.

Zone: A distinct area to which heating or air conditioning is supplied.

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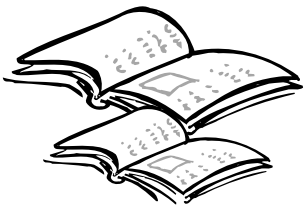


Average Energy Use and Costs Throughout the United States

Calculate Your Total Energy Intensity Here

(or visit the online calculator at www.epa.gov/smallbiz/calculate.html)

1. Collect one year of bills for each energy type and multiply by these conversion factors:

   Annual kWh of electricity x 3.4 _____

   Annual therms or ccf of natural gas x 100 _____

   Annual gallons of #2 fuel oil (diesel fuel) x 140 _____

   Annual gallons of #6 fuel oil x 150 _____

   Annual Mlb. of purchased steam x 1040 _____

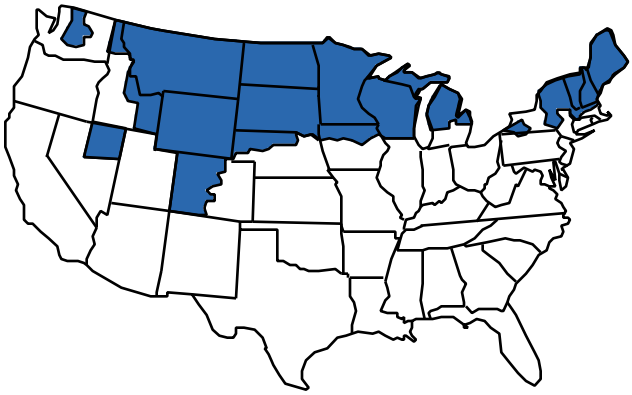
   Annual gallons of propane x 91 *or*
   Annual pounds of propane x 22 _____

   Total (A) _____ kBtu/year

2. Write down the size of your facility, in square feet (B) _____ square feet

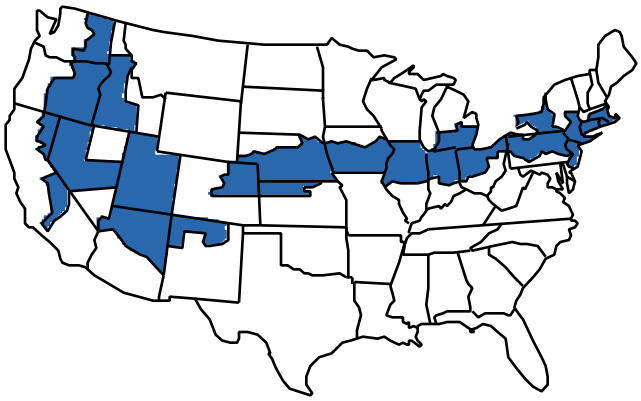
3. Calculate your total energy intensity by dividing (A) by (B), and write this number on line (C). (C) _____ kBtu/sq.ft./year

4. Find the climate map with your location shaded. Then find the average energy use and costs for similar buildings on the adjacent table and compare them with your energy use from line (C). How do you rate?



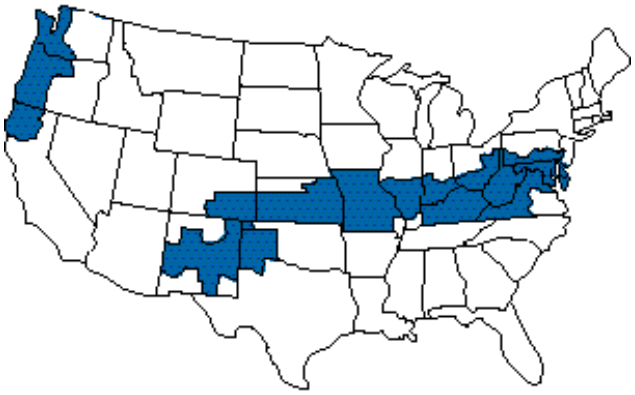
U.S. Climate Zone 1

Building Type	Annual Energy Use (kBtu/sq.ft.)	Annual Energy Cost ($/sq.ft.)
Education	77	$0.93
Food service	155	$2.32
Health care (inpatient)	270	$2.65
Health care (outpatient)	118	$1.33
Lodging	133	$1.42
Office	93	$1.46
Public assembly	66	$0.95
Religious worship	53	$0.48
Restaurant	250	$3.99
Retail	77	$0.99
Warehouse (non-refrig.)	59	$1.09
Warehouse (refrigerated)	65	$1.45

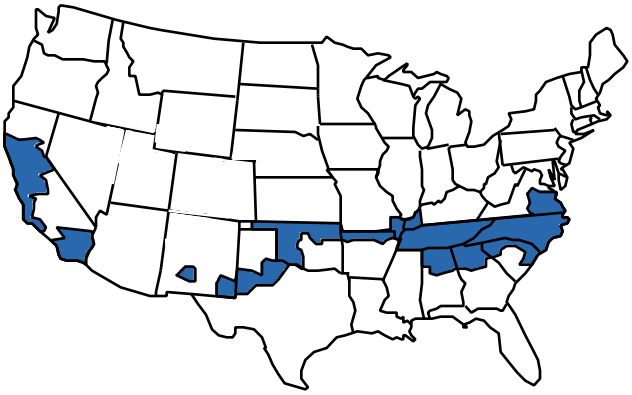


U.S. Climate Zone 2

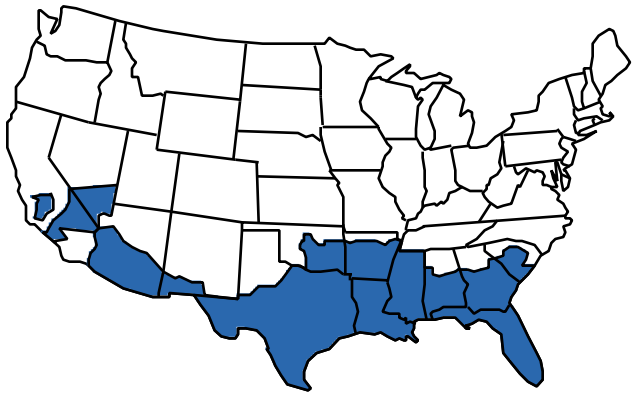
Building Type	Annual Energy Use (kBtu/sq.ft.)	Annual Energy Cost ($/sq.ft.)
Education	88	$1.08
Food service	169	$2.19
Health care (inpatient)	269	$2.63
Health care (outpatient)	84	$1.25
Lodging	92	$1.54
Office	95	$1.49
Public assembly	77	$1.26
Religious worship	61	$0.68
Restaurant	250	$3.99
Retail	87	$1.21
Warehouse (non-refrig.)	64	$0.80
Warehouse (refrigerated)	65	$1.45



U.S. Climate Zone 3		
Building Type	**Annual Energy Use (kBtu/sq.ft.)**	**Annual Energy Cost ($/sq.ft.)**
Education	69	$0.99
Food service	213	$2.73
Health care (inpatient)	204	$2.35
Health care (outpatient)	80	$1.30
Lodging	96	$1.86
Office	80	$1.59
Public assembly	66	$1.19
Religious worship	35	$0.45
Restaurant	226	$4.16
Retail	64	$1.25
Warehouse (non-refrig.)	51	$0.93
Warehouse (refrigerated)	65	$1.47



U.S. Climate Zone 4		
Building Type	**Annual Energy Use (kBtu/sq.ft.)**	**Annual Energy Cost ($/sq.ft.)**
Education	66	$1.17
Food service	232	$2.49
Health care (inpatient)	227	$2.89
Health care (outpatient)	74	$1.36
Lodging	115	$1.65
Office	72	$1.54
Public assembly	72	$1.32
Religious worship	38	$0.59
Restaurant	134	$3.03
Retail	68	$1.36
Warehouse (non-refrig.)	36	$0.83
Warehouse (refrigerated)	96	$2.02



U.S. Climate Zone 5		
Building Type	**Annual Energy Use (kBtu/sq.ft.)**	**Annual Energy Cost ($/sq.ft.)**
Education	56	$1.11
Food service	195	$2.89
Health care (inpatient)	202	$2.76
Health care (outpatient)	100	$1.67
Lodging	102	$1.62
Office	68	$1.55
Public assembly	54	$1.17
Religious worship	34	$0.59
Restaurant	161	$3.20
Retail	56	$1.26
Warehouse (non-refrig.)	33	$0.77
Warehouse (refrigerated)	55	$1.17

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Energy-Efficiency Quicklist

This guide recommends a lot of different energy upgrades. Where should you start? First walk through your business with this Quicklist in hand and use it to identify money-saving opportunities. Then post the Quicklist on your wall and check off items as you perform upgrades to keep track of your progress.

Lighting

- [ ] Replace incandescent light bulbs with compact fluorescent lamps.
- [ ] Convert exterior lighting to high-pressure sodium or metal halide lighting.
- [ ] Upgrade fluorescent fixtures with T-8 fluorescent lamps and electronic ballasts.
- [ ] Remove or disconnect unnecessary lights.
- [ ] Convert exit signs to LED.
- [ ] Lower light levels where appropriate, such as around computer monitors.
- [ ] Install occupancy sensors in areas such as bathrooms that are frequently unoccupied.
- [ ] Install timers or photocells on outside lights.

Water Use and Water Heating

- [ ] Install a water heater insulating blanket and wrap the first three to six feet of hot water supply pipe with pipe insulation.
- [ ] Install faucet aerators and efficient showerheads.
- [ ] Select native or other low-water plants for landscaping.
- [ ] Find and fix leaks.

Refrigeration

- [ ] Repair doors and seals so they close tightly.
- [ ] Make sure fans and equipment are not obstructed.
- [ ] Combine refrigerated goods and disconnect unneeded refrigerators.

Building

- [ ] Install weather stripping, caulking, or seals on openings that create drafts.
- [ ] Add or repair insulation to create a continuous blanket around building.

Heating and Cooling Systems

- [ ] Clean and replace filters regularly.
- [ ] Set back your heating, ventilating, and air-conditioning (HVAC) systems when the building is unoccupied. This includes setting the fans to “auto” rather than “on.”
- [ ] Repair leaks in system components such as pipes, steam traps, and couplings.
- [ ] Make sure radiators, convectors, air intakes, and air diffusers are not obstructed so that air can flow freely.
- [ ] Reduce your water heater settings to the minimum required temperature.

ENERGY STAR for Small Business Building Shopping List

Buying or leasing a building with these preferred technologies can lower your operating costs and may give you a competitive advantage. Use this list when walking through a prospective building to see if the building will help or hurt your profit. Call 1-888-STAR YES if you have any questions.

Lighting

		Yes	No
General	T-8 Fluorescent Lamps	___	___
	Compact Fluorescent Lamps	___	___
	Occupancy Sensors	___	___
	LED Exit Signs	___	___
	Low-Glare Daylight	___	___
Warehouse	High-Pressure Sodium (HPS) or Metal Halide (MH) Lighting	___	___
Retail	Halogen	___	___
Office	Light Level Below 75 Foot-candles	___	___
	Deep-Cell Parabolic Fixtures	___	___
Exterior	HPS or MH	___	___
	Photocells or Timers	___	___

Hot Water

	Yes	No
Insulated Pipes	___	___
Water Heater Insulating Blanket	___	___
Faucet Aerators	___	___
Efficient Showerheads	___	___
Solar Hot Water	___	___

Building

	Yes	No
Low-E Windows	___	___
Awnings To Block Summer Sun	___	___
Window Film	___	___
Roof Insulation	___	inches
Wall Insulation	___	inches
Tight-Closing Doors/ Windows	___	___
Reflective Roof	___	___
Operable Windows	___	___

Heating and Cooling Distribution

	Yes	No
Energy Management System	___	___
Programmable Thermostats	___	___
Variable-Speed Drives	___	___
Energy-Efficient Motors	___	___

Heating

	Yes	No
High-Efficiency Gas Furnace	___	___
Pulse Combustion Boiler	___	___
High-Efficiency Heat Pump	___	___
Insulated Pipes/Ducts	___	___
Ducts All Inside Building Envelope	___	___
Electronic Ignition (No Pilot Light)	___	___

Cooling

	Yes	No
Newer High-Efficiency Cooling Units	___	___
Economizers/"Free Cooling"	___	___
Coils Clean and Free of Moisture	___	___

Other

	Yes	No
Locker Room	___	___
Access to Bike Path	___	___
Subway or Bus Nearby	___	___
Xeriscaping	___	___
Lease That Rewards Efficiency	___	___

Notes

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