



Energy-Efficiency Measures List

1.0 Envelope



1.1 Reduce Heat Losses-Ceiling/roof

- 1.11 Additional Ceiling/Roof Insulation
- 1.12 Exhaust Attics
- 1.13 Use Light-Colored Roof Surfaces
- 1.14 Roof Sprinkling/Spray System

1.2 Reduce Heat Losses-Walls/floors

- 1.21 Additional Wall Insulation
- 1.22 Additional Floor/Slab Insulation
- 1.23 Use Light Colored Exterior Surfaces
- 1.24 Thermal Mass/Passive Solar Heating

1.3 Reduce Heat Losses-Windows/Doors

- 1.31 Install Additional Glazing Layer
 - 1.31.1 Multilayer reflective roller shade device
 - 1.31.2 Operable insulating slats
 - 1.31.3 Quilted insulating draperies
- 1.32 Install Movable Insulation
 - 1.32.1 Heat mirror
 - 1.32.2 Low-e coatings
 - 1.32.3 Argon gas window fill

1.4 Reduce Heat Gain--Windows/Doors

- 1.41 Install Exterior Shading
- 1.42 Install Interior Shading
- 1.43 Use Tinted or Reflective Coatings or Films
- 1.44 Optimize Window Sizing and Orientation

1.5 Reduce Infiltration

- 1.51 Caulk and Weatherstrip Doors and Windows

Dock shelters/seals

Install air curtains

1.52 Install Air-Lock Vestibule System or Revolving Doors

2.0 Lighting

2.1 Reduce Lighting Required

2.11 Utilize Task Lighting

2.12 Lighting Controls

Selective switching

Programmable timing control

Occupancy sensors

Energy management system

2.13 Use Light-Colored Interior Wall Finishes

2.2 Install More Energy-Efficient Lighting System

2.21 Use High-Efficiency Fixtures

HID fixtures in selected locations

Efficient exit signs

Self-ballasted compact fluorescents

2.22 Use Efficient Exterior Fixtures

High-pressure sodium HID fixtures

Metal halide fixtures

2.23 Use High-Efficiency Ballast

Electromagnetic/hybrid.

Electronic

2.3 Use Daylighting

2.31 Install Dimming Controls

2.32 Architectural Modifications

3.0 HVAC Systems

3.1 Air Distribution Systems

3.11 Reduce Energy Losses

Increase duct insulation

Install air-to-air heat recovery

Runaround loop heat recovery

3.12 Reduce System Flow Rates

- Airflow and fan speed reduction

- VAV system to reduce fan energy use

- Variable speed drive motor for VAV

3.13 Reduce System Resistance

- High-efficiency filters

- Improve design and balance of duct system

3.14 Reduce Ventilation Loads

- Reduce ventilation rate to minimum

- Install local ventilation and makeup air hoods

3.15 Air Destratification

- Enclosed high-velocity fan

- Open propeller fans

- Ductwork system with centrifugal or vane axial fans

3.2 Water/Steam Distribution

3.21 Reduce Energy Losses

- Increase pipe insulation

- Steam-trap monitoring system

3.22 Reduce System Flow Rates

- Primary/secondary pumping with variable speed motors

- Isolate off-line equipment in parallel piping circuits

- Time control or interlocks on circulating pumps

3.23 Reduce System Resistance

- Install booster pumps

3.3 Heating Plant

3.31 Improve Boiler or Furnace Efficiency

- Match boiler size to load

- Install multiple boilers

- Condensing hydronic boiler

- Increase heat transfer area

- Preheat combustion air or fuel supply

- Boiler water treatment

3.32 Install High-Efficiency Heat Pump

- Air-to-air heat pump

- Dual-fuel heat pump

Water-source heat pump

Ground-source heat pump

3.33 Install Radiant Heating System

3.4 Cooling Plant

3.41 Select More Efficient Cooling System

Use evaporative cooling

Use cooling tower instead of air-cooled system

Use heat recovery chiller

Direct cooling: well, pond, lake, or river

3.42 Improve Cooling Efficiency

Optimize chiller efficiency with temperature controls

Use multiple chillers and optimization controls

Increase chilled water design temperature

Optimize cooling tower flow controls

3.43 Increase Condensing Efficiency

Lower condenser water design temperature

Reset controls on water temperature

Tube-brush cleaning system

Chemical washing system

3.44 Improve Part-Load Performance

Select chillers based on Integrated Part Load Value (IPLV)

3.5 Control Systems

3.51 Demand Limiting EMCS/DDC

3.52 Optimize Start/Stop

3.53 Duty Cycling Control System (Reduce unoccupied ventilation)

3.54 Supply Temperature Setup/Setback Control System

Install programmable thermostats

Install controls and hardware to optimize hot-and-cold deck reset

3.55 Install Economizer Control System

3.56 Boiler Control Strategies

Draft control modifications

Barometric or flue shutoff dampers

Outside air temperature reset or heating lockout

Boiler optimization controls

Hi/low, modulating, or reduced excess air burner

Install flu gas analyzer-trim control

3.6 Thermal Storage Systems

3.61 Water Storage Tanks

3.62 Ice Storage Systems

3.63 Rock Bins

4.0 Water Heating

4.1 Reduce Water Heating Loads

4.11 Use Low Water Use Devices

4.12 Use Local Booster or Point-of-Use Heaters

4.13 Preheat Feedwater with Reclaimed Waste Heat

4.14 Timeclock Controls to Reduce Unoccupied Loads

4.2 Reduce System Losses

4.21 Increase Insulation on Hot Water Pipes

4.22 Increase Insulation on Water Storage Tanks

4.3 Install More Energy Efficient Water Heating System

4.31 Use Heat-Pump Water Heaters

4.32 Solar-Assisted Water Heater

5.0 Power Systems

5.1 Reduce Power System Losses

5.11 Correct Power Factors

5.12 Install Energy-Efficient Transformers

5.2 Install Energy-Efficient Motors

5.21 High-Efficiency Motors

5.22 Multispeed. Motors

5.23 Variable-Speed Motors

5.24 Optimize Motor Sizing

5.3 Reduce Peak Power Demand

5.31 Demand Limit Controls (See 3.5 1)

6.0 Refrigeration

6.1 Improve Controls

6.11 Optimize Defrost Cycle Control

6.12 Optimize Condensing Unit Capacity Control

6.13 Install Floating-Head Pressure Control

6.2 Reduce Refrigeration System Losses

6.21 Install Refrigerated Space Doors or Curtains

6.22 Increase Insulation of Refrigerated Area

6.3 Improve Refrigeration System Efficiency

6.31 Multiple Compressors and Controls

6.32 Increase Condensing Unit Efficiency

6.33 Select High-Efficiency Compressor

 Reciprocating compressor

 Screw compressor

 Rotary compressor

 Parallel unequal reciprocating compressor

7.0 Miscellaneous

7.1 Heat Recovery

7.11 Install Double-Bundle Chillers

7.12 Reclaim Heat from Combustion System Flue

7.13 Reclaim Heat from Steam Condensate

7.14 Reclaim Heat from Waste Water

7.15 Laundry Process Heat Recovery

7.16 Reclaim Heat from Exhaust Air (See 3.11)

7.17 Pool Dehumidification Heat Recovery System

7.2 Install More Efficient Ancillary Equipment

7.21 Elevator/Escalator Optimization

7.22 Install Pool Cover