Guidelines for Public Agencies

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
1.32 Install Movable Insulation
   Multilayer reflective roller shade device
   Operable insulating slats
   Quilted insulating draperies
1.33 Use Special Coatings or Gases
   Heat mirror
   Low-e coatings
   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