

**ENERGY AUDITOR CHECKLIST \*\***

A. BUILDING ENVELOPE	Does this problem exist?		Recommended		N/A
	Y [ ]	N [ ]	Y [ ]	N [ ]	
1. Improper alignment and operation of windows and doors allows excessive infiltration.  Suggested O & Ms: a. Realign or re-hang windows or doors that do not close properly. In extreme cases, consider permanent sealing of windows.  b. Make sure automatic door closing mechanisms work properly.  c. Replace or repair faulty gaskets in garage or on other overhead doors.  Suggested ECMs: a. Resize exterior doors; i.e., delivery doors, making them smaller to reduce excessive infiltration.*  b. Add expandable separate enclosures, where practical.  c. Install self-closing doors on openings to unconditioned spaces.  d. Install a switch on overhead doors that prevents activation of heating and cooling units when doors are open.  e. Install vestibule doors at major entrances.*	[ ]	[ ]	[ ]	[ ]	[ ]
2. Weather-stripping and caulking around windows, doors, conduits, piping, exterior joints, or other areas of infiltration where it is worn, broken or missing.  Suggested O&Ms: a. Replace worn and/or broken weather-stripping and caulking.  b. Replace broken or cracked windows. (Air leakage is most evident when wind is blowing against the side of the building.)  Suggested ECMs: a. Where practical, cover all windows and through the wall cooling units when not in use. Specially designed covers can be obtained at relatively low cost.  b. In areas with constant strong winds, install wind screens to protect exterior doors from direct blast of prevailing winds. Screens can be opaque, constructed of metal framing with armored glass. Careful positioning is necessary for infiltration control.	[ ]	[ ]	[ ]	[ ]	[ ]

\*Measures marked “\*” may have an adverse affect on indoor air quality. Implementation of these measures is not required.

\*\*All ECMs listed here are potential energy conservation opportunities.

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	Y	N	Y	N	
<p>3. Doors and /or windows separating conditioned from non-conditioned areas (including outdoors) are left open.</p> <p>Suggested O&amp;Ms:</p> <p>a. Post instructions.</p> <p>b. Assure that automatic door closers function properly.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>4. Excessive expanses of glass exist on exterior walls.</p> <p>Suggested O&amp;Ms:</p> <p>a. When replacing windows, replace with thermopanes, utilizing the same casings. *</p> <p>b. Keep curtains and drapes closed in unoccupied spaces.</p> <p>Suggested ECMs:</p> <p>a. Totally or partially insulate non-operable windows. Consider replacing non-operable window with walls.</p> <p>b. Install double-pane windows.</p> <p>c. Consider adding reflective or heat absorbing film to minimize solar gain in summer and heat loss in winter. (Note: Any window film reduces natural lighting and winter solar gain.)</p> <p>d. Install adjustable outdoor shading devices.</p> <p>e. Attach storm glazing to moveable sash of operable windows.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>5. There is no insulation between conditioned and unconditioned spaces.</p> <p>Suggested ECM:</p> <p>a. Insulate between heated/cooled spaces and unconditioned or outside areas such as parking garages, porticos, storage, basements and attics.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>6. Ceiling/roof insulation is inadequate or has been water damaged.</p> <p>Suggested O&amp;Ms:</p> <p>a. Before replacing water damaged insulation, repair roof where required.</p> <p>b. Verify that vapor barrier faces the conditioned space and is intact.</p> <p>Suggested ECM:</p> <p>a. Add new insulation to meet recommended standard. (check the cost effectiveness of this measure particularly if your facility is over there stories.)</p>	[ ]	[ ]	[ ]	[ ]	[ ]

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	Y [ ]	N [ ]	Y	N	
7. Blinds and curtains are not used to help insulate the building.  Suggested O&Ms: a. Instruct personnel to close interior shading devices to reduce night heat loss in winter and to reduce solar heat gain during the summer.  b. Repair or replace damaged or missing shading devices.  c. Place reminders where appropriate.  Suggested ECMs: a. Add reflective or heat absorbing films to reduce solar heat gain in summer. (Caution: Natural lighting and solar heat gain in winter will be reduced. Also, unless protected by an additional layer of glass, these films are subject to damage.)  b. Install outdoor shading devices.	[ ]	[ ]	[ ]	[ ]	[ ]

B. BUILDING OCCUPANCY	Does this problem exist?		Recommended		N/A
	Y [ ]	N [ ]	Y	N	
8. Off-hour activities extend operating hours for energy using systems.  Suggested O&Ms: a. Reschedule off-hour activities to accommodate partial shutdown of building systems other than ventilation systems.  b. Reschedule custodial and cleaning activities during working hours whenever possible.  c. Re-examine original assumptions regarding occupancy patterns and building usage. Modify patterns for increased energy efficiency.  Suggested ECM: a. Install an automated energy management system that will control all spaces in accordance with usage.	[ ]	[ ]	[ ]	[ ]	[ ]
9. Building has extended occupancy areas such as computer rooms.  Suggested O&Ms: a. Isolate these spaces (including related support services such as restrooms and break areas) from the portion of the building having fewer operating hours.	[ ]	[ ]	[ ]	[ ]	[ ]

## ENERGY AUDITOR CHECKLIST

C. HVAC -- CONTROLS	Does this problem exist?		Recommended		N/A
	Y [ ]	N [ ]	Y [ ]	N [ ]	
<p>10. Thermostats on heating/cooling units are vulnerable to occupant adjustment.</p> <p>Suggested O&amp;Ms:</p> <p>a. Reset thermostats to correct settings.</p> <p>b. Install or replace locking screws to prevent tampering.</p> <p>c. Install tamper-proof locking covers on thermostats.</p> <p>Suggested ECMs:</p> <p>a. Install pre-set solid-state electric thermostats if existing controls are electric.</p> <p>b. Relocate thermostats in return air ducts where they will be inaccessible to occupants.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>11. Space temperatures are higher or lower than thermostat settings.</p> <p>Suggested O&amp;Ms:</p> <p>a. Recalibrate thermostat.</p> <p>b. Blow out moisture, oil and dirt from pneumatic lines (for pneumatic systems); clean contacts if electrical control system.</p> <p>c. Recalibrate controllers.</p> <p>d. Ensure that control valves and dampers are modulated properly.</p> <p>e. Ensure that heat generating device is producing heat and that heat distribution to the space is unobstructed.</p> <p>f. Make sure that air intake volume is not excessive.</p> <p>Suggested ECM:</p> <p>a. For electric control system, install pre-set solid-state thermostats which do not require calibration.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>12. Thermostat settings have not been adjusted for change in seasons.</p> <p>Suggested O&amp;Ms:</p> <p>a. Adjusted thermostats to 68°F in heating season<sup>1</sup> and to 78°F during cooling season.<sup>2</sup></p> <p>b. Change the location of thermostats from areas subject to extreme temperature fluctuations, such as next to window, or over a heating or cooling unit.</p> <p>Suggested ECM:</p> <p>a. Replace existing thermostat with a thermostat which has a separate setting for cooling and a separate setting for heating or use one thermostat to control heating and one thermostat to control cooling.</p> <p><sup>1</sup> except for interior zones requiring cooling</p> <p><sup>2</sup> except for reheat systems</p>	[ ]	[ ]	[ ]	[ ]	[ ]

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C. HVAC -- CONTROLS	Does this problem exist?		Recommended		N/A
	Y [ ]	N [ ]	Y [ ]	N [ ]	
<p>13. Control devices are not inspected on a regular basis.</p> <p>Suggested O&amp;M:</p> <p>a. Routinely check all time clocks and other control equipment for proper operation, correct time and day and for night and proper programming of on-off set points. Protect from unauthorized adjustment.</p> <p>Suggested ECM:</p> <p>a. Use an automated energy management system.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>14. Building temperatures are not adjusted for unoccupied periods.</p> <p>Suggested O&amp;Ms:</p> <p>a. Reduce thermostat settings by a minimum of 10°F at nights, for weekends and holidays during heating season, but maintain ventilation..</p> <p>b. Shut down air conditioning units at night, on weekends and holidays.</p> <p>Suggested ECM:</p> <p>a. Install automatic controls such as time clocks or automated management systems.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>15. Unoccupied or little used areas are heated or cooled unnecessarily.</p> <p>Suggested O&amp;Ms:</p> <p>a. Reduce winter thermostat settings to 55°F in unoccupied areas.</p> <p>b. Where possible, turn off heating systems if nothing ;in space can freeze.</p> <p>c. Use spot heaters/coolers in large spaces with low occupancy.*</p> <p>d. Increase summer thermostat setting, in unoccupied areas, if possible.</p> <p>Suggested ECM:</p> <p>a. Install system controls to reduce heating/cooling of unoccupied spaces.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>16. Heating/cooling equipment is started before occupants arrive and/or is operating during last hour of occupancy.</p> <p>Suggested O&amp;M:</p> <p>a. Experiment with star-up times and duration of operation to determine satisfactory comfort levels for occupants. Reduce or turn off heating and cooling during the last hour of occupancy, allowing the building to “coast.”</p> <p>Suggested ECM:</p> <p>a. Install a time clock or an automated energy management system that will reduce heating and /or cooling. Maintain ventilation rates.</p>	[ ]	[ ]	[ ]	[ ]	[ ]

## ENERGY AUDITOR CHECKLIST

C. HVAC – VENTILATION	Does this problem exist?		Recommended		N/A
	Y	N	Y	N	
<p>17. Air flow to space feels unusually low or is inconsistent from one space to another.</p> <p>Suggested O&amp;Ms:</p> <ul style="list-style-type: none"> <li>a. Utilize ductwork access openings to check for any obstructions such as loose hanging insulation (in lined ducts), loose turning vanes and accessories, and closed volume and fire dampers. Adjust, repair or replace as necessary.</li> <li>b. Inspect all room air outlets and inlets (diffusers, registers and grilles). They should be kept clean and free of all dirt and obstructions. Clean and remove obstructions as necessary.</li> <li>c. Clean or replace dirty or ineffective filters on a regular basis.</li> <li>d. Post signs instructing occupants not to place objects where they will obstruct air flow.</li> <li>e. Rebalance system.</li> </ul>					
<p>18. Large spaces having low occupancy are maintained at comfort conditions.</p> <p>Suggested O&amp;Ms:</p> <ul style="list-style-type: none"> <li>a. Reduce overall ventilation in space. *</li> <li>b. Consider regrouping activities into smaller areas which can be conditioned separately from remainder of building.</li> </ul>					
<p>19. Heating/cooling equipment is operating in lobbies, corridors, vestibules and /or other public areas.</p> <p>Suggested O&amp;Ms:</p> <ul style="list-style-type: none"> <li>a. Lower heating set points in the above areas if there is no possibility of freeze-up. Disconnect electrical heating units (or switch off at breaker box). Maintain ventilation.</li> <li>b. Close HVAC supply ducts serving the above areas.*</li> </ul> <p>Suggested ECM:</p> <ul style="list-style-type: none"> <li>a. Properly adjust and balance air/water systems and controls.</li> </ul>					
<p>20. An excessive quantity of outdoor air is used to ventilate the building.</p> <p>Suggested O&amp;Ms:</p> <ul style="list-style-type: none"> <li>a. Reduce outdoor air quantity to the minimum allowed by codes by adjusting outdoor air dampers during hours of occupancy.</li> <li>b. Repair any malfunctioning ventilation equipment.</li> </ul> <p>Suggested ECM:</p> <ul style="list-style-type: none"> <li>a. Replace old style dampers with new high quality opposed-blade models with better close-off ratings.</li> <li>b. Repair leaking or failed dampers.</li> </ul>					

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C. HVAC – VENTILATION	Does this problem exist?		Recommended		N/A
	Y [ ]	N [ ]	Y [ ]	N [ ]	
<p>21. Outdoor air intake dampers open when building is unoccupied.</p> <p>Suggested O&amp;Ms:</p> <p>a. Close outdoor air dampers when building is unoccupied. Be sure dampers have proper seals and adjust to ensure complete closure.</p> <p>b. Where codes permit, close outdoor air dampers during first and last hours of occupancy to permit fast warm-up and cool-down.</p> <p>Suggested ECM:</p> <p>a. Install controls which will automatically close dampers during unoccupied periods.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>22. Return, outdoor air and exhaust dampers are not sequencing properly.</p> <p>Suggested O&amp;Ms:</p> <p>a. Adjust damper linkage.</p> <p>b. Be sure damper motors are operating properly.</p> <p>c. Readjust position indicators to accurately indicate damper positions.</p> <p>d. Reset linkage, repair or replace dampers if blades do not close tightly.</p> <p>e. Close all outdoor air intake dampers when equipment is shut off and when building is unoccupied.*</p> <p>Suggested ECM:</p> <p>a. Replace old style dampers with new high quality opposed-blade models with better close-off ratings.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>23. Ventilation systems are not utilized for natural cooling capability.</p> <p>Suggested O&amp;M:</p> <p>a. Whenever possible, use outside air for cooling rather than using refrigeration. (use economizer cycle, if available.)</p> <p>Suggested ECM:</p> <p>a. Install an economizer cycle with enthalpy control to optimize use of outside air for cooling.</p>	[ ]	[ ]	[ ]	[ ]	[ ]

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	Y [ ]	N [ ]	Y [ ]	N [ ]	
<p>24. Exhaust system operation is not programmed.</p> <p>Suggested O&amp;Ms:</p> <p>a. Discontinue use of unnecessary exhaust fans.*</p> <p>b. Re-wire restrooms' exhaust fans to operate only when lights are on. (Fans are often wired in reverse. Correct as needed.)*</p> <p>c. Establish schedules so that exhaust fans run only when needed.*</p> <p>d. Group smoking and other areas with similar exhaust requirements so that they may be served by one exhaust system. Reduce ventilation in remaining non-contaminated areas.*</p> <p>Suggested ECMs:</p> <p>a. Install time clocks or other controls to shutoff exhaust system when not needed (when permitted by code).*</p> <p>b. Install a rheostat in series with exhaust fan to modulate fan speed so that no more than the necessary amount of air will be exhausted.*</p> <p>c. Install chemical or electronic odor or particulate remover to reduce the need for using outside air for ventilation.*</p> <p>d. Install controlled or gravity dampers on all exhaust ducts to close ducts when fan is not operating.*</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>25. Air filters and heating/cooling coils do not receive scheduled maintenance.</p> <p>Suggested O&amp;Ms:</p> <p>a. Develop maintenance schedule.</p> <p>b. Install filter pressure-drop gauges.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>26. Duct or pipe insulation is damaged or missing.</p> <p>Suggested O&amp;Ms:</p> <p>a. Repair.</p> <p>b. Replace.</p> <p>c. Protect.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>27. Fan drive belts deflect excessively. (assure fan motor circuit is locked out before testing.)</p> <p>Suggested O&amp;M:</p> <p>a. adjust fan belt tension.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>28. Air leaks from ducts and plenums are noticeable.</p> <p>Suggested O&amp;M:</p> <p>a. Repair leaks.</p>	[ ]	[ ]	[ ]	[ ]	[ ]



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C. HVAC -- HEATING	Does this problem exist?		Recommended		N/A
	Y [ ]	N [ ]	Y [ ]	N [ ]	
29. Air inlets or outlets are dirty or obstructed.  Suggested O&Ms: a. Clean b. Remove obstructions. c. Remove access covers and inspect turning vanes, fire dampers, and splitters.	[ ]	[ ]	[ ]	[ ]	[ ]
30. boiler combustion efficiency is not tested on a scheduled basis.  Suggested O&Ms: a. Prepare testing schedule and log of test results. b. Conduct combustion efficiency tests.	[ ]	[ ]	[ ]	[ ]	[ ]
31. Boilers are not maintained on a scheduled basis.  Suggested O&M: a. Perform maintenance per manufacturer's instructions.	[ ]	[ ]	[ ]	[ ]	[ ]
32. Multiple boilers or heaters fire simultaneously.  Suggested O&M: a. Adjust controls so that boiler #2 will not fire until boiler #1 can no longer satisfy the demand.  Suggested ECM: a. Purchase and install automatic staging controls, if applicable.	[ ]	[ ]	[ ]	[ ]	[ ]
33. Stack temperature appears excessively high (greater than 400°F plus room temperature).  Suggested O&Ms: a. Ensure that proper amount of air for combustion is available in furnace room. b. Examine and clean air intake filters. c. Perform flue gas analysis on a regular basis to ensure proper air to fuel ratio. d. If furnace is over-firing, verify that spuds and nozzles are properly sized. Also check that fuel pressures are not too high.  NOTE: Checks and maintenance of boiler operations should be performed by qualified personnel. If there are none on the staff of the institution, consideration should be given to obtaining assistance from a service contractor.  Suggested ECM: a. Purchase kit for flue gas analysis if frequent testing is anticipated.	[ ]	[ ]	[ ]	[ ]	[ ]

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C. HVAC -- HEATING	Does this problem exist?		Recommended		N/A
	Y [ ]	N [ ]	Y [ ]	N [ ]	
<p>34. Water in heating system is heated when there is no need.</p> <p>Suggested O&amp;M: a. Turn off boiler, pumps or heat source.</p> <p>Suggested ECM: a. Install control to automatically shut down heat generating device when outside air temperature reaches 60°F.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>35. Condensate from street stream is being discharged to sewer drain.</p> <p>Suggested ECM: a. Install pump to return condensate to boiler or return condensate by gravity, if possible. Condensate can also be used to heat domestic water or boiler combustion air prior to its return to the boiler feedwater system.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>36. heating pilot lights are on during cooling season.</p> <p>Suggested O&amp;M: a. Turn pilots off. (Enter shut-off and turn-on dates in your log book and post a notice in the boiler/furnace room.)</p> <p>Suggested ECM: a. Replace worn units with new electronic ignition models to avoid unnecessary fuel consumption.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>37. Steam radiators or other steam equipment fails to heat, or is operating erratically.</p> <p>Suggested O&amp;Ms: a. Check the temperature of the pipe on the downstream side of steam traps. If it is excessively hot, the trap probably is passing steam. This can be caused by dirt in the trap, a valve off the stem, excessive steam pressure, or worn trap parts (especially valves and seats). If the pipe is moderately hot (as hot as a hot water pipe), it probably is passing condensate, which it should do. If it's cold, the trap is not working at all, and should be replaced or repaired. Initiate a steam trap maintenance program.</p> <p>b. Clean or replace thermostatic control valves on radiators.</p> <p>c. Check air vent valve. If not operating properly, replace.</p> <p>d. If thermostatic trap is malfunctioning, clean or replace bellows element.</p> <p>e. Water pockets may be obstructing steam flow. Correct by re-pitching or rerouting pipes.</p>	[ ]	[ ]	[ ]	[ ]	[ ]

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C. HVAC -- HEATING	Does this problem exist?		Recommended		N/A
	Y [ ]	N [ ]	Y [ ]	N [ ]	
<p>38. Steam, condensate and heating water piping insulation is in disrepair or missing.</p> <p>Suggested O&amp;M:</p> <p>a. Inspect pipes for broken or missing insulation. Repair or replace as needed.</p> <p>Suggested ECM:</p> <p>a. Install additional pipe insulation in accordance with design specifications and energy conservation codes.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>39. Operation of oil burner is accompanied by excessive smoke and sooting.</p> <p>Suggested O&amp;Ms:</p> <p>a. Inspect burner nozzles for wear, dirt and incorrect spray angles. Clean and adjust as necessary.</p> <p>b. Verify that oil is flowing freely and that oil pressure is correct.</p> <p>c. Perform flue gas analysis to set proper air to fuel ratio.</p> <p>d. If burning heavy oil, check oil temperature.</p> <p>e. If steam atomizing burners, check steam-oil differential pressure.</p> <p>Suggested ECMs:</p> <p>a. Purchase kit for flue gas analysis if frequent testing is anticipated.</p> <p>b. Purchase new burner nozzles or tips.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>40. Soot and odors are detected in areas where they are not expected.</p> <p>Suggested O&amp;Ms:</p> <p>a. Heat exchanger may have burned out. Replace.</p> <p>b. Stack draft may be inadequate. Clean and correct as necessary.</p> <p>c. Perform flue gas analysis to obtain proper air to fuel ration.</p> <p>d. Check operation of furnace draft controller.</p> <p>e. Check boiler setting for leaks.</p> <p>Suggested ECM:</p> <p>a. Purchase kit for flue gas analysis if frequent testing is anticipated.</p>	[ ]	[ ]	[ ]	[ ]	[ ]

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C. HVAC -- HEATING	Does this problem exist?		Recommended		N/A
	Y [ ]	N [ ]	Y [ ]	N [ ]	
<p>41. Evidence indicated faulty or inefficient boilers or furnaces.</p> <p>Suggested O&amp;Ms:</p> <p>a. Remove scale deposits, accumulation of sediment and boiler compounds on water side surfaces. Examine and treat rear portion of boiler (the area most susceptible to scale formation).</p> <p>b. Remove soot from tubes.</p> <p>c. Observe the fire when the unit shuts down. If the fire does not cut off immediately, it could indicate a faulty solenoid valve. Repair or replace as necessary.</p> <p>d. Inspect all boiler insulation, refractory, brick work and boiler casing for hot spots and air leaks. Repair and seal as necessary.</p> <p>Suggested ECMs:</p> <p>a. Replace dangerous or ineffective units with more efficient modular type units. (Note: Do not install oversize unit.)</p> <p>b. If applicable, install baffle-type devices in the tubes to improve efficiency.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>42. Air is humidified.</p> <p>Suggested O&amp;M:</p> <p>a. Discontinue or reduce humidification where possible.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>43. Burner short-cycles.</p> <p>Suggested O&amp;Ms:</p> <p>a. Start-stop limit switches may be set too closely. Reset as required.</p> <p>b. Thermostat may be faulty. Replace if necessary.</p> <p>Suggested ECM:</p> <p>a. Employ control specialist to adjust control.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>44. Combustion air to boiler/furnace is not preheated.</p> <p>Suggested ECMs:</p> <p>a. Utilize heat from flue gas to preheat combustion air by means of a heat recovery device.</p> <p>b. Consider economizer to transfer heat form flue gas to feed water.</p> <p>c. Consider heat recovery from continuous blowdown.</p>	[ ]	[ ]	[ ]	[ ]	[ ]

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	Y [ ]	N [ ]	Y [ ]	N [ ]	
<p>45. Hot water radiation units fail to operate.</p> <p>Suggested O&amp;Ms:</p> <p>a. Radiators are air-locked. Open air vents and bleed off air until water appears.</p> <p>b. Bleed off water in pneumatic air lines if necessary. (Pneumatic lines may be frozen.) Check for air leaks.</p> <p>c. Repair or replace faulty thermostats.</p> <p>d. Hot water pump or booster pump may not be functioning. Repair or replace as necessary.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>46. Radiators, convectors, baseboards and finned-tube heaters are not providing sufficient heat.</p> <p>Suggested O&amp;Ms:</p> <p>a. Boiler temperature may have dropped. Correct as necessary.</p> <p>b. Bleed air from units.</p> <p>c. Establish a systematic cleaning schedule.</p> <p>d. Remove items obstructing discharge grilles.</p> <p>e. Bleed off water in pneumatic air lines if necessary. (Pneumatic lines may be frozen.) Check for air leaks.</p> <p>f. Repair faulty valves.</p> <p>g. Repair or replace faulty thermostats.</p> <p>h. Hot water pump or booster pump may not be functioning. Repair or replace as necessary.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>47. Condensers and cooling towers are not maintained on a scheduled basis.</p> <p>Suggested O&amp;Ms:</p> <p>a. Prepare maintenance schedule. Perform maintenance per manufacturer's recommendations.</p> <p>b. Maintain cooling tower water.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>48. Circulating pump operation is manually controlled.</p> <p>Suggested O&amp;M:</p> <p>a. Develop operating schedule.</p>	[ ]	[ ]	[ ]	[ ]	[ ]

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	Does this problem exist?		Recommended		N/A
	Y	N	Y	N	
<b>C. HVAC -- COOLING</b>					
49. Multiple air conditioning compressors start simultaneously.  Suggested O&M: a. Adjust controls to stage compressors.  Suggested ECM: a. Should automatic controls not exist, purchase and install. This will allow compressor #2 to cut in when compressor #1 can no longer satisfy space conditioning load.	[ ]	[ ]	[ ]	[ ]	[ ]
50. Chiller evaporating and condensing temperatures are not optimized.  Suggested O&Ms: a. Increase chiller evaporator temperature following manufacturer's recommendations. b. Decrease chiller condensing temperature following manufacturer's recommendations.	[ ]	[ ]	[ ]	[ ]	[ ]
51. Chiller is operating during cold weather to provide air conditioning.  Suggest ECMs: a. Provide a water temperature system injecting cooling tower condenser water directly into the system's chilled water circuits. Except for pumping and cooling tower fan horsepower, this provides free cooling. Special care must be taken in treating and filtering condenser water. b. If system is forced air, using DX coils and air cooled condenser, install economizer cycle to obtain free cooling.	[ ]	[ ]	[ ]	[ ]	[ ]
52. Reheat coils are used to maintain zone temperatures.  Suggested ECM: a. Convert to variable air volume system if the reheat coils are not necessary to supply heat during the heating season.*	[ ]	[ ]	[ ]	[ ]	[ ]
53. Building utilizes a dual duct or multizone system.  Suggested ECMs: a. Convert dual duct or multizone systems to variable air volume, if building has a separate heating season.* b. Install controls to automatically reset hot and cold deck temperatures.	[ ]	[ ]	[ ]	[ ]	[ ]

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	Does this problem exist?		Recommended		N/A
	Y	N	Y	N	
<b>C. HVAC -- COOLING</b>					
<p>54. Air conditioning load trips circuit breaker on extremely warm days.</p> <p>Suggested O&amp;Ms:</p> <p>a. Tighten wire lugs if loose.</p> <p>b. Replace defective circuit breakers.</p> <p>c. Clean condenser on air cooled systems.</p> <p>d. Clean Scale build-up in condenser on water cooled systems.</p> <p>Suggested ECM:</p> <p>a. Consider installing insulated underground storage tank that would allow night operation of chiller when electrical demand is low. This reservoir tank would be a source of supply of chilled water for daytime operation. Chiller would not be operated during the day.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>55. air of inadequate volume or temperature is being discharged through grilles.</p> <p>Suggested O&amp;Ms:</p> <p>a. Defrost evaporator coil if iced. Determine cause of icing and correct.</p> <p>b. Clean evaporator coil, fins and tubes.</p> <p>c. Clean or replace air filters.</p> <p>d. Fire damper may be closed. Open and replace fusible link if necessary.</p> <p>e. Balancing damper may have slipped and closed. Open to correct position and tighten wing nut.</p> <p>f. If fan is rotating backwards, reverse rotation by reversing electrical contacts.</p> <p>g. Clean condenser coil and /or water tower nozzles.</p> <p>Suggested ECM:</p> <p>a. Install differential pressure-sensing switches to alarm when air flow drops significantly.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>56. Refrigeration condensers or coils are dirty, clogged and/or not functioning efficiently.</p> <p>Suggested O&amp;Ms:</p> <p>a. Determine if normal operating temperatures and pressures have been identified and if all gauges are checked frequently to ensure design conditions are being met.</p> <p>b. Increased system pressure may be due to dirty condensers which will decrease system efficiency. High discharge temperatures often are caused by defective or broken compressor valves. Repair or adjust as required.</p>	[ ]	[ ]	[ ]	[ ]	[ ]

## ENERGY AUDITOR CHECKLIST

	Does this problem exist?		Recommended		N/A
	Y	N	Y	N	
<b>C. HVAC -- COOLING</b>					
56...					
c. Inspect the liquid line leaving the strainer. If it feels cooler than the liquid line entering the strainer, it is clogged. It is very badly clogged if frost or sweat is visible at the strainer outlet. Clean as required.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Clean coils and /or other elements as needed on a scheduled basis. Include dehumidification coils.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
57. Chilled water piping, valves and fittings are leaking.	<input type="checkbox"/>	<input type="checkbox"/>			
Suggested O&Ms:					
a. Repair joint or piping leaks.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Repair or replace valves.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
58. chiller operation is not optimized. (Listen for short-cycling.)	<input type="checkbox"/>	<input type="checkbox"/>			
suggested O&Ms:					
a. Raise chilled water supply temperature. (NOTE: This is especially important if system was designed for a 75°F space temperature and the space setting has been raised to 78°F for energy conservation purposes.)			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Remove scale deposits from condensers.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Check refrigerant charge.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Suggested ECM:					
a. Reduce peak loads with electric load limiters. (this option saves money but not energy.)			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
59. Refrigeration compressor short-cycles.	<input type="checkbox"/>	<input type="checkbox"/>			
Suggested O&Ms:					
a. Refrigerant charge is low or refrigerant is leaking. Find and repair leak. Recharge system.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Repair electrical control circuit if required.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Reset high/low pressure control differential settings if needed.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Evaporation coil may be iced up or dirty. Defrost and clean.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Liquid line solenoid valve may be leaking. Repair or replace.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. If frost is detected on the liquid line strainer, it is clogged. Clean strainer.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Clean condenser coil.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. If condenser is a cooling tower, ascertain if spray nozzles are plugged. Make sure water flow is unobstructed. Clean towers of leaves and debris.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. Remove scale deposits form shell/tubes on water condensers.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. Repair suction valves in compressor, if needed.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



## ENERGY AUDITOR CHECKLIST

	Does this problem exist?		Recommended		N/A
	Y	N	Y	N	
<b>C. HVAC -- COOLING</b>					
60. Multiple parallel chillers have no isolation schedule for extended light-load operation.  Suggested O&Ms: a. Develop load vs. capacity matrix. b. Isolate unneeded chillers.	Y [ ]	N [ ]	Y [ ]	N [ ]	[ ]
61. Steam, hot or chilled water leaks are evident.  Suggested O&M: a. Repair leaks	[ ]	[ ]	[ ]	[ ]	[ ]
62. Steam, hot or chilled water valves do not shut off tight.  Suggested O&M: a. Repair or replace valve.	[ ]	[ ]	[ ]	[ ]	[ ]
63. Conditioned air or heated water is discarded.  Suggested ECM: a. It is important for building owner to be aware of heat recovery; measures. However, it is not wise to install such equipment without first analyzing the energy characteristics of the building, performance of the hardware, and how it fits into the overall energy plan.	[ ]	[ ]	[ ]	[ ]	[ ]
<b>D. DOMESTIC HOT WATER</b>					
64. Hot water temperature is excessive.  Suggested O&M: a. Lower thermostat or controller set point to 105°F to 115°F for general purposes. Consult appropriate codes and regulations for permissible water temperatures for sanitation, health and medical purposes.	[ ]	[ ]	[ ]	[ ]	[ ]
65. System insulation is damaged or missing.  Suggested O&M: a. Repair, replace. Protect as necessary to prevent recurrence of damage.	[ ]	[ ]	[ ]	[ ]	[ ]

## ENERGY AUDITOR CHECKLIST

	Does this problem exist?		Recommended		N/A
	Y	N	Y	N	
<b>D. DOMESTIC HOT WATER</b>					
66. Water temperatures are not reduced during unoccupied periods.	[ ]	[ ]	Y	N	
Suggested O&M: a. Schedule setbacks (either manually or with existing time clock). Consider schedule's impact on electrical demand.			[ ]	[ ]	[ ]
Suggested ECM: a. Install and appropriate automatic control device.			[ ]	[ ]	[ ]
67. Water leaks are evident.	[ ]	[ ]			
Suggested O&M: a. Repair leaks and defective faucets.			[ ]	[ ]	[ ]
68. Heat pump water heater coils are not maintained on scheduled basis.	[ ]	[ ]			
Suggested O&M: a. Schedule maintenance following manufacturer's recommendations.			[ ]	[ ]	[ ]
69. Hot water recirculating pumps run continuously.	[ ]	[ ]			
Suggested O&M: a. Develop operating schedule to match occupancy.			[ ]	[ ]	[ ]
70. Drips or leaks are evident in hot water systems.	[ ]	[ ]			
Suggested O&M: a. Repair all leaks including those of the faucets and pumps.			[ ]	[ ]	[ ]
71. Electric water heater has no time restrictions on heating cycle.	[ ]	[ ]			
Suggested O&M: a. Utilize "vacation cycle" on water heater when not needed during extended periods. (Note: Complete deactivation could cause leaks.)			[ ]	[ ]	[ ]
Suggested ECM: a. Limit the duty cycle with a time clock or other control devices to avoid adding the water heating load to the building during peak electrical demand periods. (additional hot water storage capacity may be required.)			[ ]	[ ]	[ ]
72. Devices to conserve heated water have not been utilized where practical.	[ ]	[ ]			
Suggested ECMs: a. Install mixing valves.			[ ]	[ ]	[ ]
b. Replace standard faucets with self-closing, flow restrictor valves. (Note: Highly mineralized water or water containing sediment can cause blockages.)			[ ]	[ ]	[ ]
c. Install a solar water heater to assist in meeting building hot water demand. This will reduce significantly consumption of traditional energy fuels in facilities which are large users of hot water.			[ ]	[ ]	[ ]

**ENERGY AUDITOR CHECKLIST**

	Does this problem exist?		Recommended		N/A
	Y	N	Y	N	
<b>D. DOMESTIC HOT WATER</b>					
73. Storage tanks, piping and water heaters are utilized inefficiently.	[ ]	[ ]			
Suggested ECMs:					
a. Install a small domestic hot water heater to maintain desired temperature in water storage tank. This could eliminate the need for operating one of the large space heating boilers during summer months.			[ ]	[ ]	[ ]
b. Install de-centralized water heating.			[ ]	[ ]	[ ]
<b>E. LIGHTING</b>					
74. Incandescent lamps are used in offices, workrooms, hallways, and gymnasiums.	[ ]	[ ]			
Suggested O&Ms:					
a. Where possible use a single incandescent lamp of high wattage rather than two or more smaller lamps of combined wattage.			[ ]	[ ]	[ ]
b. Discontinue using extended service lamps except in special cases such as recessed directional lights where short lamp life is a problem.			[ ]	[ ]	[ ]
c. Discontinue using multi-level lamps. The efficiency of a single wattage lamp is higher per watt than a multi-level lamp.			[ ]	[ ]	[ ]
Suggested ECM:					
a. Replace non-decorative incandescent lamps with more energy conserving types such as fluorescents in general purpose areas and HID's in large group areas.			[ ]	[ ]	[ ]
75. Lamps and fixtures are not clean.	[ ]	[ ]			
Suggested O&Ms:					
a. Establish a regular inspection and cleaning schedule for lamps and luminaires (fixtures). Dust buildup reduces effectiveness.			[ ]	[ ]	[ ]
b. Replace lens shielding that has turned yellow or hazy with new acrylic lenses which do not discolor.			[ ]	[ ]	[ ]
c. Replace outdated or damaged luminaires with modern typed that are easy to clean.			[ ]	[ ]	[ ]
76. Lamps are replaced individually as they burn out.	[ ]	[ ]			
Suggested O&M:					
a. Establish a group relamping schedule. Lamp manufacturer's sales offices can provide a computerized relamping schedule at minimal or no cost.			[ ]	[ ]	[ ]
77. Ceilings and other room surfaces have reduced reflectivity due to dirt.	[ ]	[ ]			
Suggested O&Ms:					
a. Clean surfaces.			[ ]	[ ]	[ ]
b. When repainting or recovering, use coatings or coverings with good reflectance.			[ ]	[ ]	[ ]

## ENERGY AUDITOR CHECKLIST

E. LIGHTING	Does this problem exist?		Recommended		N/A
	Y [ ]	N [ ]	Y [ ]	N [ ]	
<p>78. Daylight is not used effectively.</p> <p>Suggested O&amp;Ms:</p> <p>a. Locate work stations requiring high illumination adjacent to windows.</p> <p>b. Switch off lights when daylight is sufficient.</p> <p>c. Clean windows and skylights.</p> <p>Suggested ECM:</p> <p>a. Install light sensors and dimming equipment which automatically compensate for varying natural lighting conditions.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>79. Decorative lighting is excessive and/or not controlled optimally.</p> <p>Suggested O&amp;Ms:</p> <p>a. Replace burned out lamp with lower wattage lamps.</p> <p>b. Establish schedule for manual control or control operation with existing photoelectric or time clock controls if practical.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>80. In fixtures where fluorescent lamps have been removed, the ballasts have not been disconnected.</p> <p>Suggested O&amp;M:</p> <p>a. Disconnect ballasts, which still use significant amount of energy even though tubes have been removed.</p> <p>Suggested ECM:</p> <p>a. Replace unnecessary tubes with “dummy” types which draw little current and yet provide uniform lighting effect.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>81. When burned out fluorescent lamps and/or ballasts have been replaced, more efficiently lights have not been installed.</p> <p>Suggested O&amp;Ms:</p> <p>a. When relamping, replace fluorescent tubes with more efficient and lower wattage types such as 35-watt instead of 40-watt to achieve a reduction in electrical energy consumption. Wherever possible, replace burned out ballasts with more efficient, lower wattage, energy conserving ballasts.</p> <p>b. Consider not replacing burned out bulbs or lamps, and disconnecting ballasts in areas where delamping is possible. For example, in four-lamp fixtures allow two lamps to remain, disconnecting appropriate ballasts.</p> <p>Suggested ECMs:</p> <p>a. Install more efficiently fluorescent tubes and ballasts in all existing luminaires (fixtures). (NOTE: Verify that new lamps will work with existing ballasts.)</p> <p>b. Lowering luminaires (fixtures) will increase illumination levels on the task area, and may permit a reduction in the number of fixtures or the wattage of lamps.</p>	[ ]	[ ]	[ ]	[ ]	[ ]

## ENERGY AUDITOR CHECKLIST

E. LIGHTING	Does this problem exist?		Recommended		N/A
	Y [ ]	N [ ]	Y [ ]	N [ ]	
<p>82. Lighting is on in unoccupied areas.</p> <p>Suggested O&amp;Ms:</p> <p>a. Post instruction to turn off lights when leaving area.</p> <p>b. Identify areas being controlled by ganged switches.</p> <p>c. Assure wall switch timers function properly.</p> <p>Suggested ECMs:</p> <p>a. Rewire switches so that one switch does not control all fixtures in multiple work spaces.</p> <p>b. Provide timer switches in remote or seldom used areas where there will be brief occupancy periods.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>83. Security/outdoor lighting is not automatically controlled and /or lighting levels are excessive.</p> <p>Suggested O&amp;Ms:</p> <p>a. Replace burned out lamps with lower wattage lamps.</p> <p>b. Establish manual operation schedule considering change in daylight with season.</p> <p>c. Control lighting with existing photoelectric or time-clock controls if practical.</p> <p>d. Eliminate outdoor lighting where practical.</p> <p>Suggested ECM:</p> <p>a. Replace exterior incandescent lamps with more efficient types such as HPS or MH.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>84. Deep baffled downlighting fixtures have conventional "R" reflector lamps installed.</p> <p>Suggested O&amp;M:</p> <p>a. Replace burned out "R" lamps with elliptical reflector "ER" lamps which yield approximately the same average light level for half the energy cost.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>85. Two lamps have not been removed form four-lamp fixtures where possible.</p> <p>Suggested O&amp;M:</p> <p>a. Remove two lamps and disconnect ballasts.</p>	[ ]	[ ]	[ ]	[ ]	[ ]

## ENERGY AUDITOR CHECKLIST

F. POWER	Does this problem exist?		Recommended		N/A
	Y [ ]	N [ ]	Y [ ]	N [ ]	[ ]
86. Transformers remain energized when serving no load for extended periods.  Suggested O&M: a. Disconnect transformer.	[ ]	[ ]	[ ]	[ ]	[ ]
87. Transformer ambient temperature is high.  Suggested O&M: a. Assure that a forced ventilation system serving space is functioning or that natural ventilation system openings are not obstructed.	[ ]	[ ]	[ ]	[ ]	[ ]
88. Vending machines remain energized during unoccupied periods.  Suggested O&M: a. Provide manual operation schedule or connect to existing time clock if practical. Consult with vending company prior to implementation.	[ ]	[ ]	[ ]	[ ]	[ ]
89. Refrigerator drinking fountains or recirculating chilled drinking water systems are not controlled for occupancy.  Suggested O&M: a. Develop schedule for manual control or connect to existing time clocks or programmable controllers, if practical.	[ ]	[ ]	[ ]	[ ]	[ ]
90. Elevator operation is not optimized for occupancy variations.  Suggested O&M: a. Consult with manufacturer for possible operating changes.	[ ]	[ ]	[ ]	[ ]	[ ]
91. Lubricants used on major rotating equipment with high load factors have not been optimized for reduction of friction losses.  Suggested O&M: a. consult with equipment manufacturers and lubricant manufacturers to determine if lubricant change is cost-effective.	[ ]	[ ]	[ ]	[ ]	[ ]
92. Substantial electricity demand charges are incurred.  Suggested O&M: a. Determine if use of major electrical equipment can be scheduled to reduce demand.	[ ]	[ ]	[ ]	[ ]	[ ]

## ENERGY AUDITOR CHECKLIST

	Does this problem exist?		Recommended		N/A
	Y	N	Y	N	
<b>F. POWER</b>					
<p>93. No records of maintenance for motors and motor driven equipment are available.</p> <p>Suggested O&amp;Ms:</p> <p>a. Using name plate data, prepare an up-to-date list of all motors and pumps used in the facility and list routing maintenance to be performed on each.</p> <p style="padding-left: 40px;">Check regularly for:</p> <ol style="list-style-type: none"> <li>1. Correct motor voltage and amperage.</li> <li>2. Loose connections and worn contacts.</li> <li>3. Unbalanced voltages on 3-phase motors.</li> <li>4. Improper grounding.</li> <li>5. Packing wear.</li> <li>6. Wear and binding on bearings and drive belts.</li> <li>7. Proper sequencing of pumps and motors.</li> </ol> <p>Suggested ECM:</p> <p>a. Replace worn equipment with more efficient units, if available.</p>	Y [ ]	N [ ]	Y [ ]	N [ ]	[ ]
<b>G. REFRIGERATION</b>					
<p>94. Evaporator coils have heavy ice build-up.</p> <p>Suggested O&amp;Ms:</p> <p>a. Defrost coils regularly.</p> <p>b. Determine if automatic defrost system is improperly adjusted or defective.</p> <p>c. Determine if air is leaking into refrigerated area from defective door gaskets or poorly sealed wiring or piping penetrations.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>95. Evaporator temperature is lower than required for produce or process.</p> <p>Suggested O&amp;M:</p> <p>a. Increase temperature set-point.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>96. System insulation is damaged or missing.</p> <p>Suggested O&amp;M:</p> <p>a. Repair or replace. Protect vulnerable sections from future damage. (Do not insulate hot gas piping unless required for safety.)</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>97. Condensing temperature is excessive.</p> <p>Suggested O&amp;Ms:</p> <p>a. Reset following manufacturer's recommendations.</p> <p>b. Clean condensing fins or tubes.</p> <p>c. Assure that ventilation for compressor rooms is adequate.</p>	[ ]	[ ]	[ ]	[ ]	[ ]
<p>98. Ice-makers are not turned off during extended unoccupied periods.</p> <p>Suggested O&amp;M:</p> <p>a. Develop schedule for manual operation.</p>	[ ]	[ ]	[ ]	[ ]	[ ]

## ENERGY AUDITOR CHECKLIST

	Does this problem exist?		Recommended		N/A
	Y [ ]	N [ ]	Y [ ]	N [ ]	
<b>H. ANCILLARY SYSTEMS</b>					
99. Kitchen equipment is not used efficiently.  Suggested O&Ms: a. Cook with lids in place on pots and kettles. b. Preheat ovens only for baked goods. c. Reduce temperature or turn off frying tables and coffee urns during off peak periods. d. Provide ovens and fryers with loads all of the time they are heated and on. e. Use dishwasher for full loads only. f. Shut down exhaust hood fans when not required. g. Use microwave ovens for small orders.	Y [ ]	N [ ]	Y [ ]	N [ ]	[ ]
100. In-house laundry equipment is not used efficiently.  Suggested O&Ms: a. Develop concise operating procedures for each piece of equipment. b. Iron only items which require it. c. Wash and dry full loads only. d. Consider rescheduling laundry work hours to avoid periods when building experiences its peak electrical load if electricity demand charges are significant. e. Consider cold water detergents.	[ ]	[ ]	[ ]	[ ]	[ ]
101. Swimming pool water temperature is too high.  Suggested O&Ms: a. Reduce water temperatures to 80°-84°F if users can accept it. b. Indoor pool: turn off heater and circulating pumps during periods of non-use.	[ ]	[ ]	[ ]	[ ]	[ ]
102. Use of equipment associated with laundry and custodial services coincides with heavy electrical demand periods.  Suggested O&M: a. Require that major electrical equipment be used in accordance with guidelines that avoid peak electrical demand periods.  Suggested ECM: a. Install a demand control system to automatically monitor power demand and to shut off assigned secondary loads to lower demand peaks to pre-established level.	[ ]	[ ]	[ ]	[ ]	[ ]