

AuditAC

A full list of energy conservation opportunities (ECO) for air-conditioned buildings

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Team

The logo for AuditAC, featuring the word "AuditAC" in a blue, sans-serif font on a yellow rectangular background.

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For more details you can also look at the AuditAC documents :

- Technical guides for owner/manager of an air conditioning system : volume 4 - AN AUDITAC PROPOSED PRELIMINARY AUDIT METHODOLOGY FOR AIR-CONDITIONING FACILITIES
- Technical guides for owner/manager of an air conditioning system : volume 5 - ENERGY CONSERVATION OPPORTUNITIES FOR AC AUDITORS

ENVELOPE AND LOADS			
CODE	ECO	BEMS control	
SOLAR GAIN REDUCTION / DAYLIGHT CONTROL IMPROVEMENT			
E1.1	Install window film or tinted glass		
E1.2	Install shutters, blinds, shades, screens or drapes		
E1.3	Operate shutters, blinds, shades, screens or drapes	Y	
E1.4	Replace internal blinds with external systems		
E1.5	Close off balconies to make sunspace/greenhouse		
E1.6	Modify vegetation to save energy		
E1.7	Maintain windows and doors		
VENTILATION / AIR MOVEMENT / AIR LEAKAGE IMPROVEMENT			
E2.1	Generate possibility to close/open windows and doors to match climate	Y/N	
E2.2	Ensure proper ventilation of attic spaces	Y	
E2.3	Optimise air convective paths in shafts and stairwells		
E2.4	Correct excessive envelope air leakage		
E2.5	Roll shutter cases: insulate and seal air leaks		
E2.6	Generate possibility of night time overventilation		
E2.7	Add automatic door closing system between cooled and uncooled space		
E2.8	Replace doors with improved design in order to reduce air leakage		
ENVELOPE INSULATION IMPROVEMENT			
E3.1	Upgrade insulation of flat roofs externally		
E3.2	Upgrade attic insulation		
E3.3	Add insulation to exterior walls by filling cavities		
E3.4	Add insulation to exterior wall externally		
E3.5	Add insulation to basement wall externally		
E3.6	Upgrade insulation of ground floor above crawl space		
E3.7	Locate and minimize the effect of thermal bridges		
E3.8	Cover, insulate or convert unnecessary windows and doors		
E3.9	Use double or triple glaze replacement		
OTHER ACTIONS AIMED AT LOAD REDUCTION			
E4.1	Reduce effective height of room		
E4.2	Use appropriate colour exterior		
E4.3	Employ evaporative cooling roof spray		
E4.4	Provide means of reducing electrical peak demand through load shedding	Y	
E4.5	Replace electrical equipment with Energy Star or low consumption types		
E4.6	Replace lighting equipment with low consumption types		
E4.7	Modify lighting switches according to daylight contribution to different areas		
E4.8	Introduce daylight / occupation sensors to operate lighting switches	Y	
E4.9	Move equipments (copiers, printers, etc.) to non conditioned zones		

PLANT			
CODE	ECO	BEMS control	
BEMS AND CONTROLS / MISCELLANEOUS			
P1.1	Install BEMS system		
P1.2	Define best location for new electrical and cooling energy meters		
P1.3	Modify controls in order to sequence heating and cooling	Y	
P1.4	Modify control system in order to adjust internal set point values to external climatic conditions	Y	
P1.5	Generate the possibility to adopt variable speed control strategy	Y	
P1.6	Use class 1 electrical motors		
P1.7	Reduce power consumption of auxiliary equipment	Y/N	
COOLING EQUIPMENT / FREE COOLING			
P2.1	Minimise adverse external influences (direct sunlight, air flow obstructions, etc.) on cooling tower and air cooled condenser (AHU, packaged, split, VRF systems)	Y	
P2.2	Reduce compressor power or fit a smaller compressor		
P2.3	Split the load among various chillers		
P2.4	Repipe chillers or compressors in series or parallel to optimise circuiting		
P2.5	Improve central chiller / refrigeration control	Y	
P2.6	Replace or upgrade cooling equipment and heat pumps		
P2.7	Consider feeding condenser with natural water sources	Y	
P2.8	Apply evaporative cooling	Y	
P2.9	Consider using ground water for cooling	Y	
P2.10	Consider indirect free cooling using the existing cooling tower (free chilling)	Y	
P2.11	Consider Indirect free cooling using outdoor air-to-water heat exchangers	Y	
P2.12	Consider the possibility of using waste heat for absorption system	Y	
P2.13	Consider cool storage applications (chilled water, water ice, other phase changing materials)	Y	
P2.14	Consider using condenser rejection heat for air reheating	Y	
AIR HANDLING / HEAT RECOVERY / AIR DISTRIBUTION			
P3.1	Reduce motor size (fan power) when oversized		
P3.2	Relocate motor out of air stream		
P3.3	Use the best EUROVENT class of fans		
P3.4	Use the best class of AHU		
P3.5	Consider applying chemical de-humidification		
P3.6	Apply variable flow rate fan control		
P3.7	Consider conversion to VAV		
P3.8	Exhaust (cool) conditioned air over condensers and through cooling towers	Y	
P3.9	Introduce exhaust air heat recovery	Y	
P3.10	Consider applying demand-controlled ventilation	Y	
P3.11	Generate possibility to increase outdoor air flow rate (direct free cooling)		
P3.12	Replace ducts when leaking		
P3.13	Modify ductwork to reduce pressure losses		
P3.14	Install back-draught or positive closure damper in ventilation exhaust system	Y	

WATER HANDLING / WATER DISTRIBUTION			
P4.1	Use the best class of pumps		
P4.2	Modify pipework to reduce pressure losses		
P4.3	Convert 3-pipe system to 2-pipe or 4-pipe system		
P4.4	Install separate pumping to match zone requirements	Y	
P4.5	Install variable volume pumping	Y	
TERMINAL UNITS			
P5.1	Consider applying chilled ceilings or chilled beams		
P5.2	Consider introducing re-cool coils in zones with high cooling loads		
P5.3	Increase heat exchanger surface areas		
P5.4	Consider displacement ventilation		
P5.5	Install localised HVAC system (in case of local discomfort)	Y	
SYSTEM REPLACEMENT (IN SPECIFIC LIMITED ZONES)			
P6.1	Consider water loop heat pump systems	Y	
P6.2	Consider VRF (Variable Refrigerant Flow) systems		

O&M			
CODE	ECO	BEMS control	
FACILITY MANAGEMENT			
O1.1	Generate instructions (“user guide”) targeted to the occupants		
O1.2	Hire or appoint an energy manager		
O1.3	Train building operators in energy – efficient O&M activities		
O1.4	Introduce an energy – efficient objective as a clause in each O&M contract		
O1.5	Introduce benchmarks, metering and tracking as a clause in each O&M contract, with indication of values in graphs and tables		
O1.6	Update documentation on system / building and O&M procedures to maintain continuity and reduce troubleshooting costs		
O1.7	Check if O&M staff are equipped with state – of – the – art diagnostic tools		
GENERAL HVAC SYSTEM			
O2.1	Use an energy accounting system to locate savings opportunities and to track and measure the success of energy – efficient strategies	Y	
O2.2	Shut off A/C equipments when not needed	Y	
O2.3	Shut off auxiliaries when not required	Y/N	
O2.4	Maintain proper system control set points	Y	
O2.5	Adjust internal set point values to external climatic conditions	Y	
O2.6	Implement pre-occupancy cycle	Y	
O2.7	Sequence heating and cooling	Y	
O2.8	Adopt variable speed control strategy	Y	
COOLING EQUIPMENT			
O3.1	Shut chiller plant off when not required	Y	

O3.2	Sequence operation of multiple units	Y	
O3.3	Operate chillers or compressors in series or parallel		
O3.4	Track and optimize chillers operation schedule	Y	
O3.5	Maintain proper starting frequency and running time of (reversible) chillers	Y	
O3.6	Improve part load operation control	Y	
O3.7	Maintain proper evaporating and condensing temperatures	Y	
O3.8	Raise chilled water temperature and suction gas pressure	Y	
O3.9	Lower condensing water temperature and pressures	Y	
O3.10	Check sensor functioning and placement for (reversible) chillers	Y	
O3.11	Maintain efficient defrosting (reversible chillers)	Y	
O3.12	Maintain proper heat source/sink flow rates	Y	
O3.13	Maintain functioning of (reversible) chiller expansion device	Y	
O3.14	Check (reversible) chiller stand-by losses	Y	
O3.15	Maintain full charge of refrigerant	Y/N	
O3.16	Clean finned tube evaporator / condenser air side and straighten damaged fins		
O3.17	Clean condenser tubes periodically		
O3.18	Repair or upgrade insulation on chiller		
O3.19	Clean and maintain cooling tower circuits and heat exchanger surfaces		
O3.20	Apply indirect free cooling using the existing cooling tower (free chilling)	Y	
FLUID (AIR AND WATER) HANDLING AND DISTRIBUTION			
O4.1	Consider modifying the supply air temperature (all-air and air-and-water systems)	Y	
O4.2	Perform night time overventilation	Y	
O4.3	Shut off coil circulators when not required	Y	
O4.4	Replace mixing dampers		
O4.5	Adjust fan belts (AHU, packaged systems)		
O4.6	Eliminate air leaks (AHU, packaged systems)		
O4.7	Increase outdoor air flow rate (direct free cooling)	Y	
O4.8	Adjust/balance ventilation system	Y	
O4.9	Reduce air flow rate to actual needs	Y/N	
O4.10	Check maintenance protocol in order to reduce pressure losses		
O4.11	Reduce air leakage in ducts		
O4.12	Clean fan blades		
O4.13	Maintain drives		
O4.14	Clean or replace filters regularly		
O4.15	Repair/upgrade duct, pipe and tank insulation		
O4.16	Consider the possibility to increase the water outlet – inlet temperature difference and reduce the flow rate for pumping power reduction		
O4.17	Balance hydronic distribution system	Y	
O4.18	Bleed air from hydronic distribution system	Y	
O4.19	Switch off circulation pumps when not required	Y	
O4.20	Maintain proper water level in expansion tank	Y	
O4.21	Repair water leaks		
O4.22	Reduce water flow rates to actual needs	Y/N	