Worksheet 3.5B

Energy checklist – base building

This checklist should be read in conjunction with AS 3598:2000 *Energy Audits*. It sets out issues to be investigated as part of a comprehensive energy audit for an existing commercial building. This is an example only – adapt this worksheet to suit your organisation's requirements, e.g. delete items not applicable to the audit type or scope, or property being audited.

Item check	Yes, No or N/A	Recommended actions
Lighting		
Calculate the installed lighting power densities and compare to Green Star best practice. Consider using Green Star Office Existing Building Energy Calculator and Lighting Calculator to identify performance, including a preliminary NABERS rating and office lighting power density. See www.gbca.org.au/green-star/rating-tools/		
Based on the above analysis, are there areas where lighting power density can be reduced?		
Are switched lighting zones appropriate to floor occupation patterns? Is there an opportunity to adjust zones to reduce energy consumption?		
Do occupants understand and use the controls for switching circuits? Can on-floor location or labelling of controls be improved?		
Are power reduction devices installed to reduce power to fluorescent lighting once turned on?		
Are triphosphor lamps installed or can they be installed? Can 'de-lamping' be implemented?		
Are diffusers needed? Are existing diffusers efficient? Are diffusers and fittings clean?		
Are surface finishes light in colour to reflect light?		
Can incandescent lamps be replaced with compact fluorescent lamps or similar? (high efficiency, low wattage)		
Are lights left on in unoccupied areas for more than 30 minutes?		
How and when are lights switched on and off each day? Are automatic lighting controls installed and how well to they relate to hours of occupation?		
Are after-hours lighting control schedules adequate to avoid unnecessary energy use?		
Is there reduced perimeter lighting capability?		
Are light levels (lux) suitable for the tasks and can they be reduced?		
Can automatic controls be permanently overridden by mistake?		

Item check	Yes, No or N/A	Recommended actions
High density discharge lighting – is it the most efficient possible? (e.g. can low pressure sodium be used?)		
Check need for controls in specific areas using occupancy detectors, clockwork (e.g. switches where user dials up time required) or time delay switches in rooms not in constant use.		
Are there low voltage halogen lights, and can these be replaced by more efficient lamps?		
Are there decorative lights, and can these use more efficient lamps or be switched off during normal operation?		
Other:		
Other:		
Heating, ventilation and air conditioning (HVAC)		
Are any peak energy demand reduction measures in place? (distributed energy systems, cogeneration etc). If so, to what % capacity?		
Is fresh air supply adequate for demand?		
Check that on/off programming is appropriate to building use.		
Are after hours and holidays programmed correctly?		
For after-hours use, does HVAC operate only for the spaces required?		
Does cooling or heating occur while building is generally unoccupied?		
Can automatic controls be manually or permanently overridden?		
Are there any heaters that are not thermostatically controlled?		
Are personal radiators or fans used anywhere?		
Are northern or western facades separately controlled?		
Are HVAC components appropriately sized?		
Could higher efficiency motors be used?		
Is a low load chiller present for after-hours use?		
Should room air conditioners or split systems be installed in small areas with frequent after-hours use to avoid the need to turn on the full system?		
How old is the HVAC plant? What is its expected economic life?		
Is it a cost effective HVAC solution for this application, considering whole of life costs?		
Is the control system able to be operated by building engineers and capable of achieving reasonable economy?		

Item check	Yes, No or N/A	Recommended actions
Are thermostats located away from heating and cooling devices or external facades?		
Are temperature set points appropriate? Do occupants generally report they are comfortable all year around? Should the range of acceptable temperatures be expanded?		
Is there floor zoning with accessible controls accessible to users?		
Can automatic doors, air curtains or weather screens in front of doors be used to reduce heat loads or losses in foyers?		
Can heat loss or gain be reduced by insulating ducts, pipes, walls or floor spaces; painting outside surfaces with light colours; tinting windows or closing drapes at certain times; or installing building shading devices (inc. trees)?		
Could external shading be improved?		
Are outside doors fitted with automatic door closers?		
Would ventilation of equipment rooms and roof spaces be cost effective?		
Are high efficiency filters used and replaced regularly?		
Are outdoor air volumes increased or reduced appropriately?		
Are outside air levels appropriately matched to the need for outside air at different times?		
Can carbon dioxide sensing or other methods be used to alter the amount of fresh air intake?		
Are processes that contaminate the air isolated so that air changes for other areas are not excessive?		
Is there excessive heat build-up in air plenums due to machinery or solar heat loads?		
Is an economy cycle present or appropriate?		
Can evaporative cooling be used, either as the only source of cooling or to pre-cool outside air for a refrigeration system?		
Is there any reheating of air carried out that could be further developed or avoided?		
Are humidity controls present that can be avoided, relaxed or accomplished more efficiently?		
Is there a time delay on after-hours air conditioning controls? What is the time delay period? Can it be shortened?		
Can the after-hours conditioning button be used to manually turn equipment off?		
Are users aware of this feature? Can labelling be improved?		

Item check	Yes, No or N/A	Recommended actions
Have you considered hybrid cooling tower alternatives that provide lower energy or water conservation options?		
Is all equipment accessible for maintenance?		
Have you considered recommissioning your HVAC and controls system?		
Do you understand how your building automation system operates and how to get the best energy performance from it?		
Have you considered trimming pump impellors?		
Are there opportunities for variable speed drives and variable expansion valves?		
Have you considered using variable speed drives for fans pumps where applicable?		
Can access to after-hours air conditioning be controlled by building managers, and users charged directly for after-hours air conditioning use?		
Are there opportunities for heat recovery (e.g. run-around coils)?		
When were air conditioners last maintained? How often are they maintained? Can maintenance procedures be improved?		
Are dampers well maintained and operating correctly?		
Are filters, fins and heat exchange coils cleaned?		
Are valves checked for leakage?		
Is any air leaking from ducts, doors or windows?		
Check duct insulation by checking for a rise or drop in temperature by measuring temperature at the beginning and end of pipe runs. (A significant temperature change means that insulation needs upgrading, especially if pipes are exposed to the outdoors or enclosed in a hot roof space.)		
Perform an operational and staging check on chillers and boilers. (Analyse equipment that measures all significant operating parameters and calculate a chillers actual coefficient of performance.)		
Are fan static pressures too high? Can duct resistance be reduced by reducing or removing sharp bends or modifying acoustic silencers?		
Check thermostat calibration and that sensors and controllers are operating correctly. Are moving parts properly lubricated?		
Can you implement or optimise existing stop/start or other ‘start up later/switch off earlier’ operating time strategies?		
Is any form of flushing/night purge used?		

Item check	Yes, No or N/A	Recommended actions
Can heaters or chillers be switched off earlier because the building's thermal inertia maintains conditions for some time?		
For leased buildings, check that metering of after-hours air conditioning use and calculation of bills for after-hours air conditioning use is according to actual energy use + 10%.		
For leased buildings, should a kilowatt hour meter be installed to log after-hours air conditioning use instead of an hours-run meter?		
For leased buildings, check that programmed air conditioning start and stop times are not outside the hours of operation being paid for by the building owner.		
Metering, tariffs and billing issues		
Is submetering provided to all high-energy uses in the building? Describe.		
Are tenancies submetered?		
Is carpark energy use metered separately?		
Is load shifting, shedding or power factor correction feasible to reduce energy costs?		
Should a tariff shift be adopted?		
For leased buildings, check which circuits are on which billing meters (to avoid paying for someone else's energy).		
Domestic hot water		
Are all hot water heaters needed? Are any over-sized?		
What hours do hot water heaters run? What hours do they need to run? Can time switching be justified?		
Are existing hot water units efficient? What are their likely economic lives? What should they be replaced with when they reach the end of their lives? Should they be located closer to usage points?		
Are showerheads 3-star and taps 4-star WELS-rated or greater?		
Are flow-restricting valves used on hot water taps?		
Is there any leakage of hot water? (e.g. taps, pipes or valves)		
Do circulating pumps operate when the building is unoccupied? Are they necessary at all times during occupation?		
Is the water temperature unnecessarily above 60-65 degrees?		
Are pipes insulated (min. 10 mm) between hot water heater and taps?		
Should the hot water tank be insulated or more insulated?		

Item check	Yes, No or N/A	Recommended actions
Is heat reclamation from other equipment on site a possible source of water heating?		
Other		
Are lifts programmed to minimise excess travel?		
Are lift motors high efficiency?		