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GREENHOUSE CHALLENGE PLUS



ENERGY AUDIT TOOL VENTILATION SYSTEMS

05



Australian Government
Department of the
Environment and Heritage
Australian Greenhouse Office



ENERGY AUDIT TOOL VENTILATION SYSTEMS

05



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Effective management of your organisation's energy usage is good business sense. It can produce both environmental and economic benefits – and importantly reduce your greenhouse gas emissions.

The Greenhouse Challenge Plus Energy Audit Tool has been developed to assist non-technical or semi-technical energy managers in small to medium organisations:

- identify actions to improve energy efficiency through the use of a simple but detailed audit checklist; and
- develop plans for implementing energy efficiency actions.

The checklist contains notes supplying the auditor with further explanation or hints on how to complete the tasks. It should be possible to complete the majority of tasks through simple observation.

The energy efficiency action plan – can also be utilised in the preparation of or alternatively form part of your organisation's annual progress report to the Greenhouse Challenge Plus programme—which details abatement actions.

The energy audit tool has been designed as a modular system. This means that you can utilise each of the volumes as stand-alone independent units or in combination with the other units.

This is *Volume 05 — Ventilation systems* of the Greenhouse Challenge Plus Energy Audit Tool, which includes the following 11 volumes:

- Volume 01** — Lighting (indoor and outdoor)
- Volume 02** — Lighting control
- Volume 03** — Chillers
- Volume 04** — Boilers and steam systems
- Volume 05** — Ventilation systems
- Volume 06** — Airconditioning systems
- Volume 07** — Office equipment
- Volume 08** — Domestic hot water
- Volume 09** — Building insulation
- Volume 10** — Infiltration (air leakage into buildings)
- Volume 11** — Compressed air

Your challenge to reduce energy consumption and greenhouse gas emissions starts now!

Need more information?

If you require additional information about the Greenhouse Challenge Plus Energy Audit Tool, contact your Industry Adviser on 02 6274-1229 or at email greenhouse@greenhouse.gov.au. Additional copies of the Greenhouse Challenge Plus Audit tool can also be downloaded from www.greenhouse.gov.au/challenge

A: BACKGROUND INFORMATION

There are two types of ventilation, natural and mechanical.

Natural ventilation takes advantage of the climatic conditions in the area, to cool and heat the building through effective building design such as well placed vents, doors and windows. It should be used in conjunction with mechanical ventilation where possible.

Mechanical ventilation is energy-forced ventilation by means of fans drawing outside air into the building. The cool or warm air is dispersed throughout the building via outlets such as ducts and ceiling or wall grilles. Heat is released from the building via exhaust fans.

Mechanical ventilation, as highlighted by this audit tool, can regularly replace the need for airconditioning and therefore result in energy savings. The following audit tool focuses on the operation and maintenance of the mechanical ventilation system, along with the building design influencing cooling and ventilation.

Your airconditioning system may include functions, which allow outside air to ventilate the building, which is a form of mechanical ventilation. Volume 6 provides further information on airconditioning systems.

Each question in the energy audit checklist, which follows, has a space where you can write your energy efficiency improvement ideas. You should refer to the explanatory notes when considering what can be done to improve energy efficiency. You may need to take additional notes and attach them to the checklist, or attach other relevant documentation (such as instruction sheets and site plans) in order to support your improvement ideas and completely document your audit.

Remember these are ideas, not decisions. When you have completed the energy audit checklist, select the energy efficiency improvements that are viable and enter them into the energy efficiency action plan in section C of this volume.

OPERATION AND USE

QUESTION 1: Is there a mechanical ventilation system in the building?

Yes No

Improvement ideas and notes:.....
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.....

→ A mechanical ventilation system will allow a constant supply of fresh outdoor air into the building through the use of equipment such as: wall vents, ventilation fans, exhaust fans and ceiling grilles or ducts. It requires energy to operate. The installed system should suit your climatic zone and building design. It will remove heat during summer and should be closed during winter. It can be used to offset the cost of cooling or heating by airconditioners and other conventional means. Please refer to the resource page (section D) for local supplier contacts. These can give advice on appropriate systems in your region.

MAKE SURE YOU: Consult maintenance or engineering personnel if needed.

QUESTION 2: Is there a central ventilation fan, which induces ventilation throughout the entire building?

Yes No

Improvement ideas and notes:.....
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.....

→ A central ventilation fan is usually installed in or near the roof of the building. It induces ventilation by drawing outside air into the building through the mechanical ventilation system or open windows. It provides ventilation for the whole building. It is not suitable for use on days or in regions with high humidity.
→ A central ventilation fan can reduce the need for airconditioning, or even substitute for an airconditioner in some cases if combined with ceiling fans. A filter can be installed to refrain particles or dust from polluting the air. Contact a local supplier for further advice (please refer to the resource page, section D).

MAKE SURE YOU: Consult maintenance or engineering personnel.

QUESTION 3: Can you control your mechanical ventilation system?

Yes No

Improvement ideas and notes:.....
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.....

B:

ENERGY AUDIT CHECKLIST

→ Consider installing a mechanical ventilation system that has a central controller. This will allow vents to be opened and closed, and exhaust or ventilation fans to be switched on and off automatically, depending on the type of mechanical ventilation system you have. A central controller will allow you to adjust the whole ventilation system to the actual conditions and often has a timing device for programming purposes. Automating the system for ease of use will discourage the use of airconditioning and therefore save energy. Contact a local supplier for further advice, please refer to the resource page (section D).

MAKE SURE YOU: Consult maintenance or engineering personnel if needed.

QUESTION 4: Can the various components of the mechanical ventilation system be automatically or manually closed when necessary? Please indicate by filling out the table below.

System component	Total number	Number with closing mechanism present
Exhaust fans
Ceiling mounted grilles or ducts
Wall vents
Ventilation fans
Other (specify)

Improvement ideas and notes:.....

→ The listed components can usually be closed manually or automatically when needed. Exhaust fans encourage air movement out of the building whereas ventilation fans encourage the air to move in. If a controller cannot be used, the various components of your mechanical ventilation system should be able to be manually closed when necessary using shutters or dampers (for example in winter, to reduce heat loss and therefore save energy if the building is heated).

MAKE SURE YOU: Consult maintenance or engineering personnel if necessary. If possible, mark all locations and types of ventilation systems and exhaust fans on a plan of the building.

QUESTION 5: Are all frequently occupied areas of the building ventilated where possible?

Yes No

Improvement ideas and notes:.....

→ Ventilation may be provided from a mechanical ventilation system or naturally, from external windows that can be opened. All frequently occupied areas should be ventilated, either with windows or by the mechanical ventilation system. This will reduce the need for airconditioning and thus save energy.

MAKE SURE YOU: Consult maintenance or engineering personnel if needed.

QUESTION 6: Are ceiling fans installed in the building?

Yes No

If yes, how many?:.....

Improvement ideas and notes:.....

.....

→ Ceiling fans enhance natural (open windows) and mechanical ventilation of a building and so reduce the need for airconditioning, which uses more energy. They should be installed in frequently occupied areas.

MAKE SURE YOU: Check each room and area, and tally the number of ceiling fans. Consult maintenance or engineering personnel if needed. Mark the locations of ceiling fans on the plan of the building from question 4 if available.

STRUCTURE

QUESTION 7: Do you think ventilation of the building is maximised by building design?

Yes No

Improvement ideas and notes:.....

.....

→ The building design should maximise natural ventilation, taking advantage of the natural climatic conditions in your region. To determine the best positions of building openings (such as windows and vents) for encouraging natural ventilation, computer models can be used to simulate air-flow around the building.

→ For example, if cool breezes often blow from an easterly direction, windows can be placed on the east and west side of the building, with passages made for airflow in between. When the cool breeze comes, the building can be purged of heat naturally if needed. The need for airconditioning and even mechanical ventilation may be drastically reduced or eliminated by exceptional building designs, which maximise natural ventilation in this way. Changes to the building design may only become viable when renovations or new buildings are planned. Please refer to the resources page for more information.

→ Indicate whether or not building openings have been designed and placed strategically to maximise natural ventilation. You may need to obtain relevant climate data for your region to assist you with this information.

B: ENERGY AUDIT CHECKLIST



QUESTION 8: Is achieving maximum natural ventilation taken into account when renovations or new buildings are planned?

Yes No

Improvement ideas and notes:.....
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→ Natural ventilation refers to the utilisation of well-placed openings such as windows and large vents to ventilate a building. No energy is used for natural ventilation. See also question 7.

MAKE SURE YOU: Indicate whether or not building openings are designed and placed strategically to maximise natural ventilation by taking advantage of natural climatic conditions. Consult site plans or an architect.

QUESTION 9: Is the building adequately insulated?

Yes No

Improvement ideas and notes:.....
.....
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→ The roof and ceiling should be well insulated, as this is where most heat enters or escapes from the building. Consistent heat transfer into the building will lower the cooling ability of the ventilation system and increase the need for air conditioning and energy use. Refer to volume 9 for more information about insulation.

MAKE SURE YOU: Complete the energy audit checklist for *Volume 9 — Building insulation* before answering this question.

QUESTION 10: Does the building have adequate shading for areas and rooms that receive a lot of sun?

Yes No

If yes, indicate the type.

- Trees
- Indoor curtains or shades
- Outdoor shades
- Other:

Improvement ideas and notes:.....
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→ Adequate shading from blinds, curtains, outdoor shades and trees should be provided for all rooms or areas which receive a lot of sun. This will assist the ventilation system to cool the building and reduce the need for airconditioning. Note that outside shading is more efficient than inside shading when aiming to keep heat outside.

MAKE SURE YOU: Survey each room and area in the building, evaluating the levels of sunlight and checking for shading.

MAINTENANCE

QUESTION 11: How often is the mechanical ventilation system maintained and serviced? Please tick the appropriate box below.

- Once per week
- Once per month
- Never
- Other:

Improvement ideas and notes:.....
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→ If the building has a mechanical ventilation system, the system should be maintained regularly. This includes inspecting, cleaning and repairing all components such as vents, exhaust fans, ventilation fans, filters, ceiling grilles and ducts. The system should always operate efficiently to ensure cooling is maximised and thus the need for airconditioning is reduced.

MAKE SURE YOU: Consult maintenance or engineering personnel or records.

QUESTION 12: In what time frame are repairs of the mechanical ventilation system undertaken? Please tick the appropriate box below.

- Within 24 hours
- Within a week
- Within a month
- Greater than a month

Improvement ideas and notes:.....
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.....

→ Repairs of the mechanical ventilation system should be undertaken as soon as possible to ensure that the use of the airconditioner is minimised, and therefore maximum energy efficiency is achieved.

MAKE SURE YOU: Consult maintenance or engineering personnel, or asset management or defect system.

C: ENERGY EFFICIENCY ACTION PLAN



Note: As an alternative to using this action plan, you can also enter your energy efficiency actions as objectives and targets in an environmental management system, as a work order in your maintenance management system, or in another process that ensures nominated personnel complete the actions.

GOALS AND METHODS FOR ENERGY EFFICIENCY

Your energy efficiency goals

Example: "Reduce the energy use for lighting by 10% compared to last year's consumption." Be specific where possible taking into account technical, financial and operational inputs. Goals should be measurable where practicable.

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Your preferred energy efficiency options

Chosen from 'Improvement ideas and notes' in section B.

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Target completion date

Person responsible

Goal(s):.....

ACTION STEPS TO BE TAKEN *Specific steps needed to implement the preferred energy efficiency actions stated under 'goals and methods'.*

No.	Action	Person responsible	Due date	Date completed	Initials

COMPLETION *To be signed by person nominated under 'goals and methods'.*

Signature.....

Print Name

Title Completion Date.....

Please photocopy this form if additional action steps are required. Complete the page numbering and action numbering on all forms.

Page..... of.....

D: RESOURCES

National Energy Efficiency

A comprehensive guide to the latest Commonwealth, State and Territory regulations, standards and guides on energy efficient appliances
www.energyrating.gov.au

A SELECTION OF OTHER USEFUL LINKS

1. Energy Savers: Ventilation.

US Department of Energy.

Provides useful links to two fact sheets that discuss how to cool a building effectively with both natural and mechanical ventilation through the use of existing structures (doors, windows and vents) and installed structures (whole house and exhaust fans).

http://www.eere.energy.gov/consumerinfo/heatcool/hc_cc_ventilation.html

2. Information Sheet: Cooling Your Home Naturally.

US Department of Energy.

Describes a variety of methods to cool a building through the use of reflective and light coloured paints, insulation, shading with trees, interior and exterior shades, and roof vents.

<http://www.eere.energy.gov/consumerinfo/pdfs/coolhome.pdf>

3. Advanced Buildings Technologies & Practices Webpage: Natural Ventilation & Cooling.

Describes design measures for buildings to ensure natural ventilation is maximised.

http://www.advancedbuildings.org/_frames/fr_t_vent_natural_vent.htm

4. Solar Innovation Idea Sheets.

Sustainable Energy Authority Victoria (SEAV).

Provides information about innovative ventilation design features which can be installed in the building including, solar air heaters, solar chimneys and centrally controlled roof and wall vents.

http://www.sea.vic.gov.au/buildings/vsi_initiative/infosheet.asp

5. Energy Smart Housing Manual Chapter 8: Air Movement.

Sustainable Energy Authority Victoria (SEAV).

Outlines a variety of measures to reduce air leakage and provides guidelines for designing controllable ventilation in a building.

http://www.sea.vic.gov.au/buildings/housing_manual.asp#chapter8

6. Air Infiltration & Ventilation Centre (AIVC): Publications Page.

International Energy Agency.

Lists many technical and discussion documents regarding air-infiltration and ventilation systems. Only subscribers to the AIVC can view the entire text of the documents. A fee must be paid to subscribe.

<http://www.aivc.org/frameset/frameset.html?../publications/publications.html~mainFrame>

7. Energy Smart Allies Directory.

Directory of suppliers of energy services and products including information about ventilation systems.

www.energysmartallies.com/esa/middlesub.asp

8. Low Energy Living.

Sustainable Energy Development Authority of NSW (SEDA) Energy Ally.

An Australia-wide supplier of ventilation systems and other heating and cooling installations.

<http://www.lowenergyliving.com/>

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