EPHC Environment Protection and Heritage Council

Incorporating NEPC National Environment Protection Council

NEPC SERVICE CORPORATION

Investigation of Options for Noise Testing and Labelling of Air Conditioners

Consultancy Brief

---

1. OBJECTIVE

The key objective of the consultancy is to review relevant Australian/New Zealand and International Standards related to air conditioner noise tests and labelling and identify the best options for application to a possible Australian and New Zealand (ANZ) wide noise labelling scheme. The implications of adopting these standards also need to be examined and advice provided on the application of labelling to evaporative air conditioning units.

The outcomes of the consultancy are to inform policy and regulatory/enforcement options for consideration by the Environment Protection and Heritage Standing Committee (EPH Standing Committee).

2. BACKGROUND INFORMATION

In April 2008 the Environment Protection and Heritage Council (EPHC) agreed to form a Working Group to scope out a consistent noise labelling scheme for noisy domestic articles. In November 2008 the EPHC agreed to investigate domestic air conditioners for inclusion as these articles are commonly used outdoors in residential areas, are relatively noisy and labelling would be a straight forward and effective mechanism to reduce their noise nuisance.

The Working Group conducted preliminary consultation with the air conditioner industry from May to June 2009. A preliminary industry consultation paper was provided to the Air Conditioning and Refrigeration Equipment Manufacturing Association of Australia (AREMA) and responses related to the questions in the paper were received from Panasonic, Actron, Daikin and EBM-PAPST A&NZ Pty Ltd.

After completion of the preliminary consultation, a number of technical issues related to the testing and labelling of air conditioners remained. In September 2009 the EPH Standing Committee agreed to engage an appropriately experienced and qualified acoustical/mechanical engineering consultant to undertake research to provide advice on these issues. This advice will inform the development of policy and regulatory/enforcement options for consideration by the EPH Standing Committee. (A summary of the responses to the preliminary industry consultation paper will be provided to the successful consultant.)

It is proposed that the ANZ noise labelling scheme will define air conditioners as follows: "Domestic air conditioner means a split, packaged or ducted mechanical system: that is capable of controlling air temperature and distribution and that may also control the humidity and cleanliness of the air, and the nominal cooling capacity of which does not exceed 25 kilowatts, but does not include a device that is designed exclusively for heating."

3. SCOPE OF WORK

The consultant will conduct research and consult with industry where necessary to:

1. Assess whether AS3781-1990, an updated AS3781 or ISO4781:1996 (or some other standard) should be referenced in relation to the labelling of air conditioners. The assessment must briefly detail the advantages and disadvantages of each option and recommend a preferred option with a justification for the selection of that option. (see Attachment 1)
2. Assess whether the cooling capacity of air conditioner units should be determined in accordance with AS/NZS 3823.1 for non ducted systems and AS/NZS 3823.1.2 for ducted systems, or some other standards should be applied. The assessment must briefly detail the advantages and disadvantages of each option and recommend a preferred option with a justification for the selection of that option. (see Attachment 2)
3. Assess which test method standards may be applied to accurately determine the sound power level of units with a capacity up to 12 kW. The assessment must detail the advantages and disadvantages of each option, including information related to the accuracy of the tests for units with different capacities, and recommend a preferred non sound intensity test method standard and sound intensity test method standard as a labelling test method with a justification for the selection of these options. (see Attachment 3)
4. Assess which test method standards may be applied to accurately determine the sound power level of units with a capacity between 12 and 25 kW and any special requirements necessary to ensure the results are accurate. The assessment must detail the advantages and disadvantages of each option, including information related to the accuracy of the tests for units with different capacities, and recommend a preferred non sound intensity test method standard and sound intensity test method standard as a labelling test method with a justification for the selection of these options. (see Attachment 3)
5. Assess the viability of using a sound intensity test method or survey test method (and any other methods considered appropriate) as a relatively quick and inexpensive screening tool for compliance purposes. The assessment must detail the advantages and disadvantages of viable options, including information related to accuracy (including suggested triggers for further testing), complexity and time to complete tests etc. If possible, recommend a preferred screening check test method with a justification for the selection of this option. (Note: The screening check test method would not need to be as accurate as the recommended labelling test methods, but would be used by compliance officers as an indicator that a test as established in (2) and (3) above should be performed.)
6. Report on the size of the common range of production runs and the number of units that need to be tested to accurately establish the sound power level of models in accordance with the recommended option from (1) above, and assess and report on the likely costs to industry (for each test and for each unit within a production run when the cost of the test is spread across the applicable units) when using the recommended test method options established in (3) and (4) above. (see Attachment 4)
7. Report on the availability in Australia and New Zealand of noise testing facilities where the recommended labelling test methods could be undertaken and the cost to have a unit tested at these facilities.
8. Report on the approximate cost to establish, maintain and staff a facility where the recommended labelling test methods could be undertaken, if new facilities are needed.
9. Assess and report on any issues related to requiring evaporative systems to be noise tested and labelled. (See Attachment 5)
10. Assess and report on any issues related to requiring quiet or night-time mode levels to be noted on labels. (see Attachment 6)
11. Report on any information obtained during the course of this project relevant to determining an appropriate cut off point for the cooling capacity of domestic air conditioners – e.g 12 kW, 20 kW, 25 kW or some other level (see Attachment 7)

12. Report on any information obtained during the course of this project relevant to any issues related to the suggested definition for domestic air conditioners within the proposed ANZ noise labelling and limit scheme. (see Attachment 8)
13. Report on any information obtained during the course of this project relevant to any issues related to the use of the suggested label for air conditioners for the proposed ANZ noise labelling and limit scheme. (see Attachment 9)

4. OUTPUTS

The products of the consultancy will be:

(1) A verbal update on progress to the Tender Group technical advisor identifying work completed to date and any issues likely to arise in preparation of a draft report.

(2) Draft Report that includes but is not limited to:

- Identification of options for standards and individual tests to:
  - apply to the information to be noted on air conditioner labels,
  - establish the cooling capacity of air conditioners
  - establish the noise level of small and large domestic air conditioners for labelling purposes.
- Identification of options for a compliance screening tool to check the noise level noted on air conditioner noise labels.
- Wherever options are noted, details of the advantages and disadvantages of these options and a recommended option with a justification for the selection of that option.
- Identification of the approximate cost to industry of determining the noise level of air conditioners for labelling purposes when applying recommended standards.
- Identification of the availability in Australia and New Zealand of noise testing facilities where the recommended labelling test methods could be undertaken and the cost to have a unit tested at these facilities.
- Identification of the approximate cost to establish, maintain and staff a noise testing facility where the recommended labelling test methods could be undertaken, if new facilities are needed.
- Identification of any issues related to the noise testing of evaporative air conditioner units for labelling purposes.
- Identification of any issues related to requiring both standard mode and quiet mode air conditioner noise levels to be noted on labels.
- A summary of any relevant information that is identified related to the size in terms of cooling capacity of domestic air conditioners used in Australia and New Zealand.
- A summary of any issues related to:
  - the suggested definition for air conditioners
  - the suggested label for air conditioners.
- A summary table noting relevant information relating to points (3), (4), (5) and (6) listed under "Scope of Work" – for example:

Summary of Key Information				
Standard & Test Method	Applicability to different cooling capacities	Assessment of Accuracy	Estimated cost per test	Comments: e.g. usefulness as a compliance screening tool etc

(3) Final Report based on the Draft Report, that also addresses issues raised in the comments on the Draft Report by the Project Steering Committee

5. PROJECT MANAGEMENT

5.1. Timeframe and Milestones

The Final Report is due by COB **Friday, 19 February 2010**. The schedule to the consultancy contract will include milestones and timeframes taken from the table below.

Milestone	Timeframe
Meeting (or teleconference) to clarify Scope and Outputs	10 December 2009
Update on Progress by Consultant	22 December 2009
Provision of Draft Report by Consultant	22 January 2010
Comments on Draft Report by EPHC Working Group	5 February 2010
Meeting (or Teleconference) to Clarify Comments	12 February 2010
Provision of Final Report by Consultant	19 February 2010

5.2. Management of the project

The contact for technical matters will be: Mr Grant Harper
The contact for contractual matters will be: Ms Susan Whitehead

See below for contact details.

5.3. Contract

The successful consultant(s) will be required to sign a standard NEPC Service Corporation consultancy contract.

The project and the satisfaction of contract conditions will be oversighted by a Project Steering Committee in conjunction with the NEPC Service Corporation.

6. PROJECT BUDGET

The budget for the project is $20,000 (excluding GST).

7. SUBMISSION OF TENDERS

7.1. Information Required at Tender

The consultant will need to demonstrate their ability to meet the objective of the project by:

- Providing details of the proposed methodology to be used in the provision of the services, together with a project plan that details how your organisation would provide the services including timeframe and project budget.
- Providing details of the experience and necessary skills your organisation has in desktop research.
- Describing how your organisation would go about researching and providing a review of current standards and tests related to air conditioner noise tests and labelling.
- Describing how your organisation would go about determining the likely cost to industry of establishing the noise level of air conditioners for labelling purposes.

In addition, the tender should clearly:

- demonstrate understanding of the requirements of the consultancy (including any suggested variations or innovations)
- provide a profile of the tendering group (including brief curriculum vitae of personnel to be engaged in the consultancy; and any other information pertinent to quality assurance)
- document previous relevant experience
- provide a declaration of any conflict of interest or risk of conflict of interest.

7.2. Tender Evaluation Criteria

The selection criteria used to award this consultancy will be:

- understanding of the task
- quality of the proposed method and approach to the project
- the relevant expertise of the proposed consultants
- ability to perform the work within the timeframes
- value for money
- experience in similar tasks and/or demonstrated capacity to undertake the consultancy
- possession of additional or unique skills or resources of use to the consultancy
- high level of report writing and communication skills
- financial stability.

7.3. Lodgement of Tender

Tenders should be lodged with:

Ms Susan Whitehead
Project Support Officer
NEPC Service Corporation
Level 5, 81 Flinders Street
ADELAIDE SA 5000

by COB **27 November 2009**.

Tenders may be lodged via email (swhitehead@ephc.gov.au) or by fax (08) 8224 0912.
If you are lodging your tender in hard copy format, please provide five copies.

7.4. Further Information

Tender submission/contract inquiries
Ms Susan Whitehead
Project Support Officer
NEPC Service Corporation
Level 5, 81 Flinders Street
ADELAIDE SA 5000

Telephone: (08) 8419 1206
Email: swhitehead@ephc.gov.au

Technical matters
Mr Grant Harper
Senior Noise Officer
NSW Department of Environment Climate Change and Water
59-61 Goulburn Street
SYDNEY NSW 2000

Telephone: (02) 9995 5996
Email: grant.harper@environment.nsw.gov.au

ATTACHMENT 1: AUSTRALIAN STANDARD AS3781-1990

Australian Standard AS3781-1990 "Acoustics – Noise labelling of machinery and equipment" is based on ISO 4871-1984 "Acoustics – Noise labelling of machinery and equipment" applies to machinery and equipment which is essentially stationary in nature". Therefore consideration needs to be given to ensuring any labelling of air conditioners meets the requirements within this standard. The standard sets out, for example:

- the test codes that need to be used to determine the sound power level of the equipment;
- the factors that need to be considered when testing only a sample of the total lot to ensure reproducibility including repeatability (the standard refers to ISO 7574 Acoustics – Statistical methods for determining and verifying stated noise emission values of machinery and equipment);
- the manner in which the noise emission of machinery and equipment is to be expressed for labelling purposes; and
- the minimum information to be given in a label attached to the machine or in commercial or technical documents supplied to consumers by the manufacturer.

A number of the standards noted in AS3781-1990 (particularly those referenced in relation to the test codes) have been revised since the standard was published. ISO 4781 – 1984, which AS3781-1990 is based on, has also been replaced by ISO 4871:1996 "Acoustics - Declaration and verification of noise emission values of machinery and equipment". This 1996 standard gives information on the declaration of noise emission values, describes acoustical information to be presented in technical documents and specifies a method for verifying the noise emission declaration.

The use of Australian standards is voluntary, and rather than base relevant requirements for fixed articles within the proposed ANZ noise labelling and limit scheme on AS3781-1990, or arrange for this standard to be updated so it is reproduced from the revised ISO 4781:1996 standard (which could be a costly exercise for no real gain), it may be more appropriate to base any labelling requirements for the fixed articles directly on ISO 4781:1996.

ATTACHMENT 2: COOLING CAPACITY TEST PROCEDURES FOR AIR CONDITIONERS

The Australian Institute of Refrigeration Air conditioning and Heating (AIRAH) has indicated in the past that "input power" could be used as the measure rather than "cooling capacity", as the level of noise emitted from units is likely to correlate more closely with the input power. AIRAH noted that, for example, of two units with equal cooling capacity, the unit with the lower input power would be more efficient and is therefore likely to be quieter. However, the preliminary industry consultation indicated that cooling capacity should continue to be used as this is the first selection criteria used by consumers and to get high efficiency some manufacturers increase the air flow across the condenser resulting in increased noise levels.

For the purpose of determining the cooling capacity of the device, the AEC test procedure refers to:

- AS1861-1981 however, this standard has been superseded by: AS/NZS3823: Performance of household electrical appliances - room air conditioners Part 1.1: Non ducted air conditioners and heat pumps - Testing and rating for performance; and
- AS/NZS3823: Performance of electrical appliances – air conditioners and heat pumps Part 1.2: Test Methods - Ducted air conditioners and air-to-air heat pumps - Testing and rating for performance

AS/NZS 3823.1 parts 1 and 2 are used when units are assessed for the Minimum Energy Performance Standard (MEPS) requirements and therefore it is proposed that to minimise costs to industry the proposed ANZ noise labelling and limit scheme require the same standards to be used as the MEPS scheme to prevent test duplication.

ATTACHMENT 3: NOISE LEVEL TEST PROCEDURES FOR AIR CONDITIONERS

The existing NSW labelling scheme includes a noise test procedure for air conditioners based on the Australian Environment Council (AEC) "Technical basis for the regulation of noise labelling of

new air conditioners in Australia - July 1984". It is understood that this procedure only applies to units with a cooling capacity up to 12 kW as there is uncertain validity for the test when applied to more powerful units. The existing WA labelling requirement for this equipment does not specify a test procedure and the EU Directive does not cover air conditioners.

Australian Standard AS3781-1990 "Acoustics – Noise labelling of machinery and equipment" sets out the test codes that need to be used to determine the sound power level of equipment. However, a number of the standards within these test codes have been revised since AS3781-1990 was published.

A relatively new Irish standard for the measurement of noise from air conditioners was published in July 2008: I.S. EN 12102:2009 "Air Conditioners, Liquid Chilling packages, heat pumps and dehumidifiers with electrically driven compressors for space heating and cooling – Measurement of airborne noise – Determination of the sound power level". This standard indicates that for labelling purposes the following standards may be applied:

- ISO 3741:1999 "Acoustics – Determination of sound power levels of noise sources using sound pressure – Precision methods for reverberation rooms"
- ISO 3743-1:1994 "Acoustics - Determination of sound power levels of noise sources - Engineering methods for small, movable sources in reverberant fields - Part 1: Comparison method for hard-walled test rooms"
- ISO 3743-2:1994 "Acoustics - Determination of sound power levels of noise sources using sound pressure - Engineering methods for small, movable sources in reverberant fields - Part 2: Methods for special reverberation test rooms"
- ISO 3745:2003 "Acoustics - Determination of sound power levels of noise sources using sound pressure - Precision methods for anechoic and hemi-anechoic rooms"
- ISO 9614-1:1993 "Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 1: Measurement at discrete points"
- ISO 9614-2:1996 "Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 2: Measurement by scanning"
- ISO 9614-3:2002 "Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 3: Precision method for measurement by scanning".

Preliminary industry consultation indicates that ISO 3741, ISO 3743-1, ISO 3743-2 and ISO 3745 should be applied as appropriate and that these standards can also be applied to units with a capacity greater than 12 kW, but that a larger reverberation room needs to be used than specified in the standards. Industry has also noted that several acoustical testing facilities are available within Australia, but it is uncertain whether they have reverberation rooms large enough to perform tests on equipment with a capacity greater than 12 kW. It currently costs approximately $6,000 for a noise test for one unit at these facilities.

The use of sound intensity probes to measure the sound power level also needs to be investigated. For example, the Irish standard notes: ISO 9614-1, ISO 9614-2 and ISO 9614-3 which use sound intensity may be applied and standards such as ISO 11205:2003 "Acoustics - noise emitted by machinery and equipment - engineering method for the determination of emission sound pressure levels in situ at the work station and at other specified positions using sound intensity" may also be relevant. The use of sound intensity probes may, in particular, be a useful screening tool for enforcement agencies to use when checking compliance with the proposed ANZ noise labelling and limit scheme.

The use of survey methods also needs to be investigated. For example, ISO 3746:1995 "Acoustics – determination of sound power levels of noise sources using sound pressure – survey method using an enveloping measurement surface over a reflecting plane" could be relevant. It is understood that the use of survey methods would be less expensive than methods that use reverberation or anechoic rooms and these methods may also be particularly useful as a compliance screening tool.

ATTACHMENT 4: NUMBER OF UNITS TO BE TESTED

Australian Standard AS3781-1990 "Acoustics – Noise labelling of machinery and equipment" sets out how the labelled value needs to be determined and notes that the manufacturer needs to take into account the possibility that the labelled value might be verified by methods in accordance with ISO 7574 "Acoustics – Statistical methods for determining and verifying stated noise emission values of machinery and equipment" parts one to four. AS3781 also requires labels for fixed articles to contain the "Noise output (LWA)", followed by the labelled value (the numerical value which indicates, as an integer, the limit below which the A-weighted sound power level of the single machine and/or a large proportion of the lot shall lie when the machine is new.

ATTACHMENT 5: EVAPORATIVE SYSTEMS

Although evaporative systems are not included within the definition used for the existing NSW labelling scheme, these systems can also be noisy. To ensure a level playing field for industry, it is proposed that evaporative models used in domestic situations also be included within the proposed ANZ noise labelling and limit scheme. However, there may be issues around the validity of applying labels to evaporative systems as the noise levels may easily be altered if the units are tampered with.

ATTACHMENT 6: QUIET OR NIGHT TIME MODES

The preliminary industry consultation indicated that where models have quiet or night time modes that result in the outside units having different noise levels, these should be noted on the label for conditioners in the proposed ANZ noise labelling and limit scheme. For example:

NOISE OUTPUT (LWA): STANDARD: 75, NIGHT-TIME: 70

ATTACHMENT 7: CAPACITY OF UNITS TO BE INCLUDED WITHIN THE SCHEME

A 2005 submission to DECCW by AIRAH indicated units with a higher capacity than 12 kW are being installed in some residences and suggested the upper capacity limit be raised to, for example, 20 kW. The preliminary industry consultation indicated that domestic units currently range up to 25 kW. Therefore the definition of domestic air conditioners within the proposed ANZ noise labelling and limit scheme may include models with a cooling capacity up to 25 kW.

ATTACHMENT 8: DEFINITION FOR AIR CONDITIONERS TO BE INCLUDED WITHIN THE SCHEME

It is proposed that the ANZ noise labelling scheme will define air conditioners as follows:

"Domestic air conditioner means a split, packaged or ducted mechanical system:
that is capable of controlling air temperature and distribution and that may also control the humidity and cleanliness of the air, and the nominal cooling capacity of which does not exceed 25 kilowatts, but does not include a device that is designed exclusively for heating."

ATTACHMENT 9: SUGGESTED LABEL

Australian Standard AS3781-1990 "Acoustics – Noise labelling of machinery and equipment" requires labels for fixed articles to contain at least the following information:

- the wording "Noise output (LWA)", followed by the labelled value (the numerical value which indicates, as an integer, the limit below which the A-weighted sound power level of the single machine and/or a large proportion of the lot shall lie when the machine is new);
- the reference to the appropriate labelling code, or in the absence of a labelling code, the appropriate measurement test code;
- identification of the labelled product (lot), for example, by the serial number or date of manufacture/delivery; and
- information on whether lot labelling "(L)" or whether individual labelling "(I)" was prescribed.

It is proposed that the ANZ noise labelling and limit scheme air conditioner label:
(a) have dimensions of 7 x 11 cm;
(b) have the following words (including the sound power level number(s) in figures at least one cm high):

- ANZ noise label
- Noise Output (LWA): XX
- a lower sound power level means less noise
- the level shown may be used to estimate whether the outside noise level from this unit will meet any local noise requirements
- check any local noise requirements before purchasing or installing
- for further information refer to: www.anznoiselabelling.gov.au
- the number of the ISO test used to establish the level
- the serial number and "(L)" or "(I)" to indicate whether lot labelling or individual labelling was prescribed
- that, if products have quiet or night-time modes that result in the outdoor unit having different noise levels, these be noted on the label (See Attachment 6).

For example:

NOISE OUTPUT (LWA): XXX

A LOWER SOUND POWER (LWA) LEVEL MEANS LESS NOISE

THE LEVEL SHOWN SHOULD BE USED TO ESTIMATE WHETHER THE OUTSIDE NOISE LEVEL FROM THIS UNIT WILL MEET ANY LOCAL NOISE LAWS

CHECK ANY LOCAL NOISE LAWS BEFORE PURCHASING OR INSTALLING

FOR FURTHER INFORMATION REFER TO:
www.anznoiselabelling.gov.au

ISO xxxxxx **Serial No: xxxxxxx(L)**