Good Environmental Choice Australia Ltd
Managers of the Australian Ecolabel Program

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The Australian Ecolabel Program
Good Environmental Choice Australia Standard

Supermarket Refrigeration Systems

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Use of This Standard

This voluntary environmental labelling standard may be used by competent environmental assessors to establish product compliance to the Australian Ecolabel Program. Products that are certified with the mark of conformity, the "Good Environmental Choice Label" have been independently tested and demonstrate compliance to the environmental and social performance criteria detailed in this standard. The overall goal of environmental labels and declarations is the communication of verifiable and accurate information, which is not misleading, on environmental aspects of products and services. This encourages the demand for, and supply of, those products and services that cause less stress on the environment, thereby stimulating the potential for market-driven continuous environmental improvement.

This standard identifies environmental, quality, regulatory and social performance criteria that products sold on the Australian market can meet in order to be considered as good "environment practice". Products that have been certified as complying to this standard may gain greater market recognition and a marketing advantage in government and business procurement programs, as well as broad consumer preference.

This standard can be used by Australian producers to guide their designs for environment programs by using the environmental criteria as key performance benchmarks to reduce the environmental loads of their product. The standard is necessarily restricted in its identification of environmental loads from the product life-cycle. Producers should consider other environmental measures along the product cycle, which are not included in this standard, in their environment program designs for and aim for even higher levels of environmental performance where technically possible.

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GOOD ENVIRONMENTAL CHOICE AUSTRALIA STANDARD

Supermarket Refrigeration Systems

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Abstract

This Standard specifies environmental performance requirements of supermarket refrigeration systems for the Australian Ecolabel Program. The Australian Ecolabel Program complies with ISO 14024: "Environmental labels and declarations - Guiding principles" which requires environmental labelling specifications to include criteria that are objective, reasonable and verifiable.

Definitions

GWP means Global Warming Potential. It is defined in this standard as the cumulative radiative forcing, both direct and indirect, integrated over a 100 year time frame, from the emission of a unit mass of gas relative to the cumulative radiative forcing or carbon dioxide. $C0_2$ has a GWP of 1.0.

Label means the Good Environmental Choice Australia Label.

MEPS refers to the Minimum Energy Performance Standards. See http://www.energyrating.gov.au/meps1.html

ODP: The Ozone Depletion Potential (ODP) is defined in this standard as the comparative ozone depleting ability of a compound in comparison to the ozone depleting ability of CFC -11, over a 100 year time frame. CFC -11, being the reference compound, has an ODP of 1.0.

RAC is an acronym for Refrigeration and Air-Conditioning, which is used a general descriptor of the whole sector.

1 INTRODUCTION

1.1 Purpose

This Standard seeks to define good environmental performance benchmarks for supermarket refrigeration systems. The voluntary environmental labelling standard implemented by Good Environmental Choice Australia (GECA) as part of the Australian ecolabel program specifies environmental performance criteria for supermarket refrigeration systems and components including, but not limited to, the refrigerant, refrigerated showcases, compressors, condensers and design elements such as plant room location and doors or night blinds for open cases. This standard stipulates the environmental load of such products and systems throughout the major aspects of their life cycle.

1.2 Background

According to a 2002 survey commissioned by the Australian Greenhouse Office, the supermarket and retail food refrigeration sector accounts for approximately a quarter of the RAC Sector in Australia. Remote refrigeration systems for display cases in supermarkets, small retail outlets, restaurants and bars typically range from small to medium (total installed refrigeration capacity of 10 to 500kW). This standard aims to provide whole-of-life environmental benchmarks for systems of this size.

Life-cycle analyses (LCA) of the various parts of the RAC Sector consistently show that the major environmental impacts associated with RAC are:

1) Refrigerant GWP and ODP
2) Energy consumption during the use phase.
3) Materials sourcing, use and disposal, including hazardous waste and further use of ozone depleting compounds.

For supermarket refrigeration systems in the drier areas of Australia, the additional factor of water use may be included alongside energy consumption due the widespread use of evaporative pre-coolers that improve energy efficiency at the expense of water use.

While the Montreal Protocol of 1986 has slowly achieved limited success reducing the use of ozone depleting compounds, the widespread replacement of CFCs (and HCFCs) for HFCs did nothing to address the global warming impacts of refrigerant gasses. In Australia, supermarket refrigeration systems typically employ exclusively fluorocarbon refrigerants in extensive direct expansion systems, using racks of semi-hermetic compressors with air- or water-cooled condensers. Whilst in the past this sector widely used R22 (an HCFC), all major retailers now require HFC refrigerants for many (but not all) new installations.

In Europe, this sector has already undergone significant change, with many new large systems installed using secondary refrigerants, and primary refrigerants such as Carbon Dioxide, Ammonia and Propane (“natural refrigerants”), virtually eliminating fluorocarbons. In Australia new stores have been built using secondary refrigerants, but with R404a as primary refrigerant, and only a handful of stores using natural refrigerants have been completed or are soon to be undertaken.

Energy consumption during the use phase of a refrigeration system’s life cycle has typically been the focus the MEPS scheme. This standard also encourages the use of other simple means to greatly reduce the environmental footprint of such systems, including, but not limited to:

- The use of doors and thermal barriers to prevent needless heat loss.
- The use of superior insulation materials to improve energy efficiency beyond MEPS requirements.
- The use of heat recovery systems to utilise waste heat for defrosting, store heating or hot water.
- The use of more efficient motors and other machinery.
- The use of programmable microprocessor control to ensure each individual installation is efficiently operated.

There has historically been a resounding lack of concern for the materials and hazardous waste impacts of the RAC sector. The use of Ozone Depleting Compounds as foam insulation blowing agents is still common practice in Australia despite the ready availability of environmentally preferable alternatives at similar cost and efficiency, and the European example of complete legislative prohibition. Similarly, the end-of-life fate for insulation material in Australia is landfill, despite the availability of naturally degradable materials displaying similar thermal characteristics. As unsustainable disposal options gradually become more expensive there will be an increasing demand for such materials. This standard prohibits the use of OD Compounds as blowing agents and encourages the use of environmentally preferable insulation materials.

2 STANDARD CATEGORY SCOPE

This standard is applicable to supermarket, grocery store, large restaurant and bar refrigeration systems and components, namely:

2.1 Installed Systems

This includes systems with a total refrigeration capacity greater than 10 kW.

2.2 Components

This includes a number of major components used in refrigeration systems, namely:

- Refrigerated showcases / merchandising cases
- Condensers
- Compressors
- Cool- and cold-rooms
- Control Systems

2.3 Refrigerants

This category includes refrigerants that may be used in any certified system.

This Standard excludes stand alone display cases, chillers, domestic refrigeration systems, mobile refrigeration systems, industrial cooling systems, air conditioning systems or any “reverse cycle” (heat pump) systems.

How this Standard relates to Australian Standards

This is a voluntary environmental labelling standard only.

All GECA voluntary ecolabelling standards require that products satisfy the relevant Australian or International Standard as a prerequisite for GECA certification.

Australian Standards typically define “fit-for-purpose” criteria but do not provide assurance of environmental preferability. This Standard seeks to define environmental performance benchmarks above and beyond the AS.

3 ENVIRONMENTAL PERFORMANCE CRITERIA

3.1 Fitness for Purpose

Certified products should be good performers in their intended application. Certain standards of quality and durability are implicit in the Label. The manufacturer must ensure that the product is fit for its intended purpose and:

3.1.1 Applicable Standards

The product meets or exceeds the requirements of the relevant Australian Standard, or the product meets the applicable and accepted standard in its target market if it is to be exported, or

3.1.2 Demonstrated Performance

If there is no relevant Australian Standard, the product can demonstrate sufficient quality by providing testing reports from an independent organisation or case studies from installations demonstrating suitability and quality, and

3.1.3 Warranty

Components (products in Category 2.2) are supplied to the customer (e.g., supermarket) with a minimum warranty period of 5 years.

3.2 Requirements for Refrigerated Showcases

3.2.1 Compulsory Requirements for Refrigerated Showcases

All cases must comply with the most recent high efficiency MEPS rating as outlined in AS 4474.2.

All cases must be equipped with doors, automated night blinds or some other means of thermal barrier that can be demonstrated to reduce energy use by at least 25 % during activation or use.

Cases must not have a vertical opening greater than 2 m in height unless a self-closing door is fitted.

Cases must not be manufactured using ozone depleting substances.

All cases must achieve a minimum of 18 points from the following section.

3.2.2 Additional Requirements for Cases

3.2.2.1 Points Available

Self closing doors	15
Air screens	10
Preferable end-of-life options	9
Preferable insulation materials	9
Defrost or anti-sweat systems that do not draw electricity	8
Preferable foam blowing agent	7
Case openings less than 1.8 m	6
Case openings less than 1.5 m	4
Efficient fan motors	4
Low energy lighting	3

3.2.2.2 Definitions

Self closing doors means a door designed to prevent heat loss from a case and which, when left unattended from any position, will close itself. Latches may be fitted to the doors to enable them to remain temporarily open during restocking. Add two points if the door is fitted with an alarm that draws attention to a door that is left open longer than 15 minutes (or the average time taken to restock).

Air screens (or better): Points for this section may be gained by any system (e.g., twin or triple air screens) that gives an efficiency improvement of at least 20 % over an open cabinet and which is operated during store opening hours. Automated night blinds must be fitted as well as air screens unless the air screen system itself satisfies the compulsory thermal barrier requirement above (i.e., 25 % efficiency improvement).

Preferable insulation materials include materials which are manufactured from natural renewable materials or greater than 50 % recycled content by weight.

Preferable end of life options refers to insulation materials that are recyclable or biodegradable at end of life. Cases must also be separable in to recyclable parts to qualify for these points.

Preferable foam blowing agent includes any blowing agent that is not a HFC, a persistent organic pollutant, an atmospheric pollutant and has a global warming potential less than 50. Materials that do not contain foams that require a blowing agent qualify for these points.

Defrost or anti-sweat systems that do not draw electricity refers to a defrost system that uses waste heat from other parts of the system or supermarket rather than using mains electricity. This also refers to low energy doors that do not contain electric heaters.

Case openings less than 1.8 or 1.5 metres refers to vertical opening heights on display cases. Wide island freezer cases do not qualify for points under this section.

Efficient fan motors refers to a fan motor that is at least 25 % more efficient than a standard motor. The most common way of achieving this is by the use of EC motors.

Low energy lighting refers to:

- LED lighting, or
- A1 electronic ballast or B1 high performance magnetic ballast with appropriate fluorescent tubes.

Add one point for the use of voltage-reducing devices that produce an energy saving greater than 20 % for the same light output.

3.3 Requirements for Cool- and Cold-rooms

3.3.1 Compulsory Requirements for Cool- and Cold-rooms

Insulation materials must not be manufactured using ozone depleting substances.

Cool room (above +6 to -2°C) walls and other insulation materials must be greater than 75 mm thickness and have a thermal conductivity (U factor) less than 0.04.
Cold room (below -2 °C) walls and other insulation materials must be greater than 100 mm thickness and have a thermal conductivity (U factor) less than 0.025.

Cool- and cold-room floors must be insulated.

All cool- and cold-rooms must achieve a minimum of 15 points from the following section.

3.3.2 Additional Requirements for Cool- and Cold-rooms

3.3.2.1 Points Available

Air curtains	8
Air locks	8
Speed doors	6
Exceeding minimum insulation requirements	7
Preferable end-of-life options	5
Preferable insulation materials	5
Defrost or anti-sweat systems that do not draw electricity	4
Preferable foam blowing agent	4
Fitted with EC fan motors	3
Low energy lighting	2
Electric floor heating	-3

3.3.2.2 Definitions

Air curtains refers to an airflow system designed to retain (recirculate) cold air in a cool- or cold-room while the door is open. Air curtains must not replace a fully insulated door and be connected to a door switch.

Air locks refers to a double door system designed to prevent heat loss and draughts. Doors must be self closing.

Speed doors refers to systems designed to minimize heat loss when vehicles are unloaded directly in to a refrigerated area.

Exceeding minimum insulation requirements: These points apply if more than 50 % of the insulation materials exceed the minimum requirements by at least 30 %, or if the floor is insulated to the minimum standard for cool room walls.

Preferable end of life options refers to insulation materials that are recyclable or biodegradable at end of life. Cases must also be separable in to recyclable parts to qualify for these points.

Preferable insulation materials include materials which are manufactured from natural materials or greater than 50 % recycled content by weight.

Defrost or anti-sweat systems that do not draw electricity refers to a defrost system that uses waste heat from other parts of the system or supermarket rather than using gas, fuel or mains electricity.

Preferable foam blowing agent includes any blowing agent that is not a HFC, a persistent organic pollutant, an atmospheric pollutant and has a global warming potential less than 50. Materials that do not contain foams that require a blowing agent qualify for these points.

EC fan motors refers to a fan motor that is at least 25 % more efficient than a standard motor. The most common way of achieving this is by the use of EC motors.

Low energy lighting refers to:

- LED lighting, or
- A1 electronic ballast or B1 high performance magnetic ballast with appropriate fluorescent tubes.

Add one point for the use of voltage-reducing devices that produce an energy saving of greater than 20 % for the same light output.

Electric floor heating may be used in certain circumstances where there is no other technically feasible alternative, such as where a cold room is suspended over an underground carpark, but this practice is discouraged with negative points. Defrost systems that do not draw electricity (see above) are preferred.

3.4 Requirements for Compressors

Compressors must be capable of "preferable unloading behaviour", using a variable speed drive (VSD) as a performance benchmark. Compressors qualify for these points if a VSD is fitted, or better.

Compressors must be capable of multi-staged capacity control. This is defined as more than six finite levels of compressor operation. Infinite capacity control systems that provide a near continuous compressor operation automatically comply with this criterion.

3.5 Requirements for Condensers

Condensers must be fitted with variable speed drives, or better.

Condensers must be fitted with motors that are at least 25 % more efficient than a standard motor (e.g., EC motors).

3.6 Requirements for Control Systems

Control systems must contain an installation specific programmable microprocessor. The supplier must offer a service to program the control system to deliver maximum energy efficiency for each particular installation.

3.7 Requirements for Refrigerants

All refrigerants used must be certified by Good Environmental Choice Australia or satisfy the requirements of GECA Standard 26 – Refrigerants.

3.8 Requirements for Installations

3.8.1 Minimum Requirements for Installations

3.8.1.1 Components

All component parts of a system must be certified under this Standard or fulfil the requirements of this Standard.

Self closing doors must be fitted to at least 30 % of display cases, by volume.

Typical "open" type merchandising cases shall not exceed 1.8 m merchandising height opening and be designed to reduce heat load infiltration through either:

- multiple air screens with automatic night blinds, or
- self closing multi paned glass doors.

All suction lines of primary refrigerant condensing systems or heat recovery delivery pipes must be fully lagged, including elbows and bends, with low permeable, sealed joint material with a thermal conductivity less than 0.04 W/mK, of not less than the following dimensions:

- 13mm thickness above -2.C evap.
- 25mm thickness below -2.C evap.

3.8.1.2 Environmentally Conscious Design

The installation owner must be able to provide evidence that the major elements of the installed system are tested and rated to industry standards and selected to operate efficiently under all load conditions. Suitable evidence may include recommendations by the component manufacturers or independent reports by qualified engineers.

The installation must achieve a minimum of 20 points from the following section.

3.8.1.3 Points Available

Doors on 100 % of chilled and frozen merchandise cases	15
Doors on 99 – 70 % of chilled and frozen merchandise cases	10
Doors on 69 – 50 % of chilled and frozen merchandise cases	6
Store environment control / cool aisle air return / air conditioning	8
Economised compressor	6
Heat reclaim and hot water systems	6
Short pipe run length	6
Medium pipe run length	3
Pipe lagging exceeding minimum requirements	4
Green Power	4
Oil disposal	2
Exceeding minimum requirements	6

3.8.1.4 Definitions

Doors on merchandise cases refers to the proportion of cases, by total store length, fitted with self closing doors as defined in Section 3.2.2.2 (Additional Requirements for Refrigerated Display Cases).

Pipe run length is defined as:

Short – no pipe run greater than 40 m to furthest case run.
Medium – no pipe run greater than 70 m to furthest case run.

Pipe lagging exceeding minimum requirements is defined as having all refrigerated and heated pipes lagged with a material with at least 30 % lower thermal conductivity than the minimum requirements. Elbows and joints need only be lagged to the minimum requirements to qualify for these points.

Store environment control refers to the use of waste heat to assist store heating and excess refrigeration capacity to assist store air conditioning.

Economised compressor refers to a stepped or variable speed compressor control that automatically adjusts to match the evaporation heat load.

Heat reclaim refers to the use of waste heat to contribute to hot water heating for general store use.

Oil disposal points are awarded if the supermarket has an arrangement with a reputable oil recycling facility with a traceable chain of custody.

Green Power points may apply if the supermarket purchases electricity consumed by the refrigeration system from a government approved renewable energy Green Power provider.

Exceeding minimum requirements: Extra points may be awarded if the component parts of the system exceed the minimum requirements by at least 15 points in total.

4 COMPLIANCE TO ENVIRONMENTAL REGULATIONS

The applicant is required to comply with relevant environmental legislation and government orders at the Local, State, and Commonwealth levels, if these have been issued. An applicant's compliance with these criteria may be established by undertaking a series of random checks; and/or by gathering samples of applicant operational procedures and documents from approved assessors as evidence to support compliance during the verification. Where an applicant is from an overseas jurisdiction, that jurisdiction's environmental regulations apply. Where the applicant is subject to a guilty verdict by a legally constituted court in the last 24 months on the basis of a breach of any environmental legislation or permits, there must be evidence of corrective action.

5 COMPLIANCE TO LABOUR, ANTI-DISCRIMINATION AND SAFETY REGULATIONS

An applicant shall demonstrate that all employees are covered by a Federal or State award or a certified industrial agreement or a registered workplace agreement as determined by the Industrial Relations Commission, the Employment Advocate or a State or Territory Workplace Relations Agency or a workplace agreement in compliance with Workplace Relations Act 1996 Part 7 – The Australian Fair Pay and Conditions Standard.

An applicant shall demonstrate general compliance to the terms of State or Territory Legislation concerning Occupational, Health and Safety and/or the *Commonwealth Safety, Rehabilitation and Compensation Act 1988,* where applicable. Where the applicant is subject to a breach order by a government agency, or a guilty verdict by an Australian Court within the last 24 months, on the basis of a breach of State, Territory or Commonwealth Occupational, Health and Safety Legislation, there must be evidence of corrective action.

The applicant shall demonstrate general compliance to the requirements of the Racial Discrimination Act 1975, Sex Discrimination Act 1984, Disability Discrimination Act 1992, Equal Opportunity for Women in the Workplace Act 1999, and complementary State Legislation. Applicants cannot be in the list of 'named' or non-compliant employers under the Equal Opportunity for Women in the Workplace Act 1999. Where the applicant is subject to a breach order by a government agency, or a guilty verdict by an Australian Court in the last 24 months on the basis of a breach of these Acts, there must be evidence of corrective action.

Where an applicant is from an overseas jurisdiction, the applicant shall demonstrate general compliance to that jurisdiction's anti-discrimination, occupational health and safety, and workers' compensations regulations. Where the applicant is subject to a breach order by a government agency, or a guilty verdict by a legal court in their respective country within the last 24 months on the basis of a the breach of anti-discrimination, occupational health and safety, and workers' compensation regulations, there must be evidence of corrective action.

An applicant's compliance with these criteria may be established by undertaking a series of random checks; gathering samples of applicant operational procedures and documents from approved assessors; and/or by providing a self-declaration document signed by an executive officer of the applicant organisation as evidence to support compliance during verification.

6 EVIDENCE OF CONFORMANCE

6.1 Audit Methodology

Conformance with this standard shall be demonstrated by undertaking an assessment under the above criteria by an approved assessor, following the certification and verification procedures detailed in the Good Environmental Choice Australia Ltd Documented Quality Management System, which generally follows the environmental auditing requirements of ISO 19 011.

6.2 Assessor Competency

The Australian Ecolabel Program classifies approved assessors as:

a. Assessors registered by Good Environmental Choice Australia Ltd as environmental professionals that hold expertise relevant for an assessment, and who have undertaken training in the procedures of the Australian Ecolabel Program; or

b. Environmental auditors accredited with the RABQSA.

6.3 Suitable Sources

Audit evidence should be of such a quality and quantity that competent environmental auditors, working independently of each other, will reach similar audit findings from evaluation of the same audit evidence against the same audit criteria.

Suitable sources of information to establish compliance may be, but are not limited to:

a. Technical specification of the product.
b. Obvious characteristics of the product under examination.
c. Scientific test results and reports.
d. Environmental management system and audit reports and results.
e. Life-cycle assessment of each stage of the product life-cycle via a physical audit and examination.
f. Life-cycle assessment via scientific testing.
g. A statement of confirmation by an executive officer.
h. An assessment of company or government records.
i. Other material that can be considered objective evidence.

6.4 Laboratory Testing

New testing shall be undertaken by a laboratory accredited by the National Association of Testing Authorities (NATA), or an ISO 17 025 registered laboratory, or a similarly independent accreditation agent who can conduct the relevant tests and/or provide documentation detailing environmental performance against the criteria of this standard. The test results should be presented on NATA-endorsed reports or from a laboratory acceptable to Good Environmental Choice Australia Ltd.

If test results or environmental auditing results are not available, and/or there is insufficient data to establish full compliance with the criteria required by this standard, then certification cannot be awarded.