



ENVIROSPEC
THE ENVIRONMENTAL DIVISION OF ELECTRONIC BLUEPRINT

ENVIROSPEC is committed to sustainable building construction and operation. We provide assessments and specifications for sustainable building products.

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Protocol:

Sustainability of Building Products

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Disclaimer

This Protocol is intended for use by suitably qualified and experienced engineers to determine the sustainability of building materials in the specified applications. The authors, publishers and distributors of this Protocol do not accept any responsibility for incorrect, inappropriate or incomplete use of this information.

Preface

The Building Products Innovation Council (BPIC) is currently participating in the Australian Life Cycle Inventory Database Initiative (Aus LCI), to collect life-cycle sustainability data for building products. However, the results are not yet available; nor are the LCA design tools that will use the data; nor are LCA-based ecolabels. The purpose of this Protocol is to describe a credible interim approach to classifying building products, such that their contribution to sustainability is easily identifiable, until such LCA-based design tools and ecolabels become readily available.

For purposes of this Protocol, sustainability is taken as those properties that lead to:

- Reduction in green-house gas generation, which causes global warming;
- Reduction in the use of non-renewable resources upon which our society depends; and
- Reduction in land, water or air pollution or degradation, which alienates the use of these resources.

The comparison of comprehensive life cycle analyses of competing products, is the most equitable basis of selecting sustainable products. Environmental Declarations should account for the sustainability impacts of the manufacture, transport, construction, demolition and re-use of building products, together with their in-service performance. They should be determined in accordance with ISO 14044 and comply with ISO/DIS 21930, as described in Part 1 of the Protocol. The following extracts from ISO/DIS 21930 provide context for Environmental Declarations.

If possible, Type III declarations for building products should account for all life cycle stages of the product. Omissions of life cycle stages shall be justified. Where not all the necessary information is available, the PCR shall state those stages that are to be addressed and how to deal with information gaps. The declarations may be based on generic data, as defined in the PCR. Environmental impacts, e.g. energy and materials used, resulting from the installation of the building product in the building shall be identified and included in the report. If it is not included, because data is not available, this fact shall be stated.

Comprehensive life cycle analyses are controversial, because they involve numerous assumptions regarding the manufacture, transport, construction, demolition and re-use of the building products; and assumptions regarding their in-service performance in various applications.

This Protocol deals with the effects of building products on the sustainable operation of the building into which it is built, in the context of common practice and what is permissible under the Building Regulations. It provides for the collection of data for subsequent use in Environmental Benchmarking (the comparison of a product's life-cycle analyses or other environmental data to those of the most common acceptable alternative "benchmark construction").

Protocol:

Sustainability of Building Products

1. Scope

This Protocol provides guidance on the performance criteria, specifications and the methods of demonstrating compliance, for building products in specific applications.

2. Limited Sustainability Declarations Based on In-Service Function

The Building Regulations regulate particular building applications on the basis of in-service performance. Consistent with this practice, limited sustainability declarations may be provided where:

- It is apparent that the in-service aspects of a product far outweigh the manufacture, transport, construction, demolition and re-use aspects; and
- The basis and limitation of the classification is clearly stated, as provided for in ISO/DIS 21930; and
- Compliance with the relevant parts of the Building Regulations is clearly stated; and
- The product characteristics are clearly stated.

3. Sustainability Declarations based on complete Life-Cycle Analysis

Environmental Declarations for building products shall be based on complete Life-Cycle Analyses of the manufacture, transport, construction, demolition and re-use of building products, together with their in-service performance. Such environmental declarations shall be prepared in accordance with ISO 14044 and ISO/DIS 21930.

4. Benchmarking Building Product Performance

Environmental Declarations for building products shall be benchmarked against the requirements of the Building Regulations, accounting for in-service performance for a range of common applications, together with the manufacture, transport, construction, demolition and re-use considerations. This deals with the effects of a building product on the sustainable operation of the building into which it is built, in the context of what is both common practice and what is permissible under the Building Regulations. This process requires:

- Definition of Benchmark Construction for various applications; and
- Determination of the sustainability (including in-service performance) of building products in specific applications.

5. Principle

Sustainability criteria are considerations, which, through their application, lead to:

- a. Reduction green-house gas generation, which causes global warming, and/or
- b. Reduction in the use of non-renewable resources upon which our society depends, and/or
- c. Reduction in land, water or air pollution or degradation, which alienate the use of these resources.

6. Definitions

The following definitions shall apply in the application of this Protocol.

Note

To maintain consistency of definitions with other documents used in the building, environmental declarations and ecolabelling industries, some of the definitions below have been reproduced from, or adapted from, those in ISO 14024 and the Building regulations. These sources are acknowledged, and should be consulted for the context in which the definitions are commonly applied.

- 6.1. Benchmark construction – The form of building construction that is the most economic common solution permitted within the mandatory requirements of the Building Regulations and relevant Standards referred to therein. See Appendix C.
- 6.2. Building class – Types of buildings for particular applications, as defined in the Building Regulations
- 6.3. Building product – Any goods or service used in the construction of buildings
- 6.4. Commonly used alternatives – Those forms of construction and constituent building products that are in common use in particular classes of building. They may be part of either, “Benchmark Construction”, or “Enhanced Construction”.
- 6.5. Enhanced Construction – Forms of construction, which, although not the basic construction defined as “Benchmark Construction” are still in common use, and are considered to be an enhancement. The contribution to sustainability could be:
 - The use of the product, in general, could lead to a form of construction that is more sustainable, or
 - The use of one particular product could be more sustainable than their competitor products of the same type.
- 6.6. Environmental Benchmarking Statement – Document detailing the comparison of a product’s life-cycle analysis, and other environmental data, to those of the most common acceptable alternative **Benchmark Construction**.
- 6.7. Environmental Declaration - Document detailing a product’s life-cycle analysis, and other environmental data, in accordance with ISO 14044 and ISO/DIS 21930.
- 6.8. Environmental impact – Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization’s activities, products or services
- 6.9. Fitness for purpose – Ability of a product, process or service to serve a defined purpose under specific conditions
- 6.10. Product category – Group of products which have equivalent function
- 6.11. Product environmental criteria – Environmental requirements that the product shall meet in order to be awarded an environmental label
- 6.12. Product function characteristic – Attribute or characteristic in the performance and use of a product

- 6.13. Sustainability criteria – Considerations, which, through their application, lead to:
 - Reduction green-house gas generation and/or
 - Reduction in the use of non-renewable resources, and/or
 - Reduction in land, water or air pollution or degradation.
- 6.14. Sustainability specification – A building specification that details, in addition to fitness for purpose requirements, the sustainability performance requirements relevant to that particular product in the context of its intended use.
- 6.15. Type I environmental labelling programs – Voluntary, multiple-criteria-based third party program that awards a licence which authorizes the use of environmental labels on products indicating overall environmental preference of a product within a particular.

7. Sustainability Criteria

The Sustainability Criteria, against which the sustainability performance shall be assessed, shall be determined in context of the following hierarchy.

7.1. Fitness for Purpose

The principal requirement shall be that products satisfy any relevant Fitness for Purpose criteria, related to their required general performance in the context of their intended use.

Note

Failure of building products to achieve the intended fitness for purpose may lead to unsafe construction, unserviceable construction or other structural, mechanical or aesthetic failures. This invariably leads to re-construction or repair and the associated waste. Therefore, the purposes of sustainability are served by products that are fit for purpose.

7.2. Statutory Requirements

The secondary requirement shall be that building products have the requisite properties necessary to meet any relevant requirements in the Building Regulations and the relevant Standards referred to therein.

Notes

Fitness for purpose is often defined in regulatory requirements. Therefore, the purposes of sustainability are most often served by products that meet relevant regulatory requirements. Compliance with other performance requirements and other regulatory requirements, apart from those specified in the Building Regulations and the Standards referred to therein may also be satisfied, but are outside the scope of this Protocol.

7.3. Sustainability Criteria

The tertiary requirement shall be that products satisfy particular Sustainability Criteria requiring an increase in sustainability over commonly used alternatives, as set out in Appendix C. Analysis of sustainability shall consider:

- The contribution of the product to the overall sustainability of the building during the building life cycle; and
- The sustainability of the product in respect of its life cycle.

The Sustainability Criteria for building products shall be as follows

(a) Reduction green-house gas generation

The use of the product shall lead to a reduction in the greenhouse gas generation, when compared to “Benchmark Construction”.

(b) **Reduction in the use of non-renewable resources**

The use of the product shall lead to a reduction in the consumption of non-renewable resources, when compared to “Benchmark Construction”.

(c) **Reduction in land, water or air pollution or degradation**

The use of the product shall lead to a reduction in land, water or air pollution or degradation, when compared to “Benchmark Construction”.

Particular criteria are:

- Use of non-renewable material resource
- Use of renewable material resources
- Use of non-renewable energy resources
- Use of renewable energy resources
- Climate change
- Destruction of the ozone layer
- Formation of photochemical oxidants
- Acidification
- Eutrophication
- Waste to recycling/reuse or energy recovered
- Non-hazardous waste to disposal
- Hazardous waste to disposal
- Energy content of the product
- Water use
- VOC emissions to indoor air
- HCOH emissions to indoor air
- Ammonia emissions to indoor air
- Carcinogenic compounds to indoor

8. Demonstrating Compliance

8.1. Fitness for Purpose

Compliance with the relevant Fitness for Purpose Criteria shall be demonstrated by certification, based on inspection and/or test and/or engineering assessment, which confirms that the product complies with a clear and concise specification defining the required properties and/or performance of the product for its intended use.

8.2. Statutory Requirements

Compliance with the relevant Statutory Requirements shall be demonstrated by certification, based on inspection and/or test and/or engineering assessment, which confirms that the product complies with the relevant Statutory Requirements for its intended use.

8.3. Sustainability Criteria

Compliance with the relevant Sustainability Criteria shall be demonstrated by certification, based on inspection and/or test and/or engineering assessment, which confirms that the Product complies with the stated Sustainability Criteria for its intended use.

9. Environmental Declarations

Environmental Declarations shall comply with the requirements of ISO 14044 and ISO/DIS 21930, and shall include an Environmental Benchmarking Statement in accordance with the procedures in this Protocol. Environmental Declaration shall be produced for the combinations shown in the following matrix.

Energy Use Benchmarked Against Building Code of Australia				
Building Type Climate Zone	Single-storey Detached Dwelling	Sole- Occupancy Unit Building	High-rise Office Building	Low-rise Warehouse Building
1				
2				
5				
6 (also applicable to zones 3, 4, 7, 8)				
<p>Notes</p> <p>1. Negative numbers indicate good performance – i.e. A typical building with the “subject building system” <u>consumes less</u> energy over the building life, than the same building with benchmark construction.</p> <p>2. Positive numbers indicate poor performance – i.e. A typical building with the “subject building system” <u>consumes more</u> energy over the building life, than the same building with “benchmark construction”.</p> <p>3. The magnitude of the numbers express the degree of energy saving or energy expenditure associated with the “subject building system”; expressed as a percentage of the energy associated with “benchmark construction”.</p> <p>4. Description of the Benchmark Construction is set out in Appendix C.</p>				

10. Normative Appendices

The following appendices form a normative part of this Protocol

- Appendix A Certification Requirements
- Appendix B Referenced Documents
- Appendix C Benchmark Construction
- Appendix D Verification of Sustainability Criteria

Appendix A

Certification Requirements

(Normative)

Certification

Unless overridden by regulatory authorities, the following are deemed to provide suitable certification of sustainability.

- Product Certification by a Third Party Certification Body, accredited by an internationally recognised accreditation authority.
 - Australia - Accreditation by JAS-ANZ (Joint Accreditation Scheme – Australia and New Zealand), under the Australia Building Codes Board CodeMark scheme, is considered satisfactory.
- A written certificate of compliance with the relevant Fitness for Purpose Criteria, by a suitably qualified and experienced chartered professional engineer
 - Australia - Registration on the National Professional Engineers Register is considered satisfactory

Format of Environmental Declaration

The assessment, report and environmental declaration shall comply with ISO 14044 and ISO/DIS 21930.

The properties that shall be investigated and reported, and corresponding units, are:

- | | |
|--|-----------------------|
| • Use of non-renewable material resource | kg |
| • Use of renewable material resources | kg |
| • Use of non-renewable energy resources | MJ |
| • Use of renewable energy resources | MJ |
| • Climate change | kg of CO ₂ |
| • Destruction of the ozone layer | kg of CFK-11 |
| • Formation of photochemical oxidants | kg of ethene |
| • Acidification | kg of SO ₂ |
| • Eutrophication | kg of PO ₄ |
| • Waste to recycling/reuse or energy recovered | kg |
| • Non-hazardous waste to disposal | kg |
| • Hazardous waste to disposal | kg |
| • Energy content of the product | MJ.kg |
| • Water use | m ³ |
| • VOC emissions to indoor air | mg/m ³ .h |
| • HCOH emissions to indoor air | mg/m ³ .h |
| • Ammonia emissions to indoor air | mg/m ³ .h |
| • Carcinogenic compounds to indoor | mg/m ³ .h |

The report shall identify the following, which enable the reported properties to be placed in context.

- Reference service life
- Details of the representative manufacturers, geographical covering, time covering, and special conditions
- The life cycle stages that are included in the environmental profile
- The life cycle stages not included in the environmental profile. This is most importance, since it is often convenient to omit in-service considerations from broad-based sustainability claims and ecolabelling. However, since in-service performance of products associated the building envelope often affect heat flow, such omissions are often erroneous and misleading.
- Reference conditions and maintenance specified for the reference service life
- Scenarios for transportation, construction, maintenance, replacements and demolition based on the reference service life
- Scenarios for relevant recycling, energy recovery and waste treatment processes
- Qualitative information related to environmental effect
- References, standards and relevant reports

In order to properly understand the relative significance of the “embodied” effects and the “in-service” effects, each of the impacts should be reported in the following stages. The difficulties of reporting the “in-service” effects for a range of climates and application are discussed in detail in the ENVIROSPEC Protocol.

- Product stage
- Building stage
- End of life stage
- Sub-total
- In-service stage
- Total

The report shall state for each of the properties in each of the stages, the following:

- Performance (in the units stated above)
- Benchmark (in the same units as for performance)
- Comparison (Performance/Benchmark x 100) %
- Sustainability Statement

The following form, complying with ISO 14044 and ISO/DIS 21930, shall be used for the reporting of environmental Declarations.

Environmental Declaration				
Company Name				
Address				
Contact				
Date of Issue				
Product				
Product description				
Relevant Standards	ISO 14044 and ISO/DIS 21930			
	Performance	Benchmark	Comparison %	Sustainability Statement
Use of non-renewable material resource, kg				
Product stage				
Building stage				
End of life stage				
Sub-total				
In-service stage				
Total				
Use of renewable material resources, kg				
Product stage				
Building stage				
End of life stage				
Sub-total				
In-service stage				
Total				
Use of non-renewable energy resources, MJ				
Product stage				
Building stage				
End of life stage				
Sub-total				
In-service stage				
Total				
Use of renewable energy resources MJ				
Product stage				
Building stage				
End of life stage				
Sub-total				
In-service stage				
Total				
Climate change kg of CO2				
Product stage				
Building stage				
End of life stage				
Sub-total				
In-service stage				
Total				

Destruction of the ozone layer kg of CFK-11				
Product stage				
Building stage				
End of life stage				
Sub-total				
In-service stage				
Total				
Formation of photochemical oxidants kg of ethene				
Product stage				
Building stage				
End of life stage				
Sub-total				
In-service stage				
Total				
Acidification kg of SO ₂				
Product stage				
Building stage				
End of life stage				
Sub-total				
In-service stage				
Total				
Eutrophication kg of PO ₄				
Product stage				
Building stage				
End of life stage				
Sub-total				
In-service stage				
Total				
Waste to recycling/reuse or energy recov kg				
Product stage				
Building stage				
End of life stage				
Sub-total				
In-service stage				
Total				
Non-hazardous waste to disposal kg				
Product stage				
Building stage				
End of life stage				
Sub-total				
In-service stage				
Total				
Hazardous waste to disposal kg				
Product stage				
Building stage				
End of life stage				
Sub-total				
In-service stage				
Total				

Energy content of the product MJ.kg				
Water use m ³				
VOC emissions to indoor air mg/m ³ .h				
HCOH emissions to indoor air mg/m ³ .h				
Ammonia emissions to indoor air mg/m ³ .h				
Carcinogenic compounds to indoor air mg/m ³ .h				
Reference service life years				
Representative for manufacturer, geographical covering, time covering, special conditions				
The life cycle stages that are included in the environmental profile				
The life cycle stages that are not included in the environmental profile				
Reference conditions and maintenance specified for the reference service life				
Scenarios for transportation, construction, maintenance, replacements and demolition based on the reference service life				
Scenarios for relevant recycling, energy recovery and waste treatment processes				
Qualitative information related to environmental effect				
References, standards & reports				

Appendix B

Referenced Documents

(Normative)

Part 1 - Australia

The following documents are referenced in this Protocol

Building Code of Australia

Australian Building Codes Board, BCA 2007 – Building Code of Australia Class 2 to Class 9 Buildings Volume One

Australian Building Codes Board, BCA 2007 – Building Code of Australia Class 1 and Class 10 Buildings Volume Two

International Standards

ISO 14024:1999 Environmental labels and declarations – Type I environmental labelling – Principles and procedures

ISO/CD2 14025:2004 Environmental labels and declarations – Type III environmental declarations

ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines

ISO/DIS 21939-2005 Sustainability in building construction — Environmental declaration of building products

Australian Standards and Australian/New Zealand Standards

AS 3798 Guidelines on earthworks for commercial and residential developments

AS 3600 Concrete Structures

AS 3660.1 Termite management – New Building work

AS 2870 Residential slabs and footings - Construction

AS 4678 Earth retaining structures

AS/NZS 3500 (Compendium) National Plumbing Code Set

AS/NZS 3500.1 Water supply

AS/NZS 3500.2 Sanitary plumbing and sanitary drainage

AS/NZS 3500.2.2 Sanitary plumbing and sanitary drainage – Acceptable Solutions

AS/NZS 3500.3 Stormwater drainage

AS/NZS 3500.3.2 Stormwater drainage- Acceptable Solutions

AS/NZS 3500.4 Hot water supply

AS/NZS 3500.5 National Plumbing and Drainage – Domestic installations

AS 2047 Windows in buildings—Selection and installation

AS 1288 Glass in buildings—Selection and installation

AS 2208 Safety glazing materials in buildings

AS 4100 Steel structures

AS 1684.4 Residential Timber Framed Construction – Simplified – Non-cyclonic areas

AS 2049 Roof Tiles
AS 2050 Installation of roof tiles
AS/NZS 1562.1 Design and installation of sheet roof and wall cladding – Metal

AS 2179.1 Specifications for rainwater goods, accessories and fasteners - Metal shape or sheet rainwater goods, metal accessories and fasteners
AS 2180 Metal rainwater goods - Selection and installation

AS 3700 Masonry structures

AS 2588 Gypsum plasterboard
AS 2589 Gypsum linings in residential and light commercial construction - Application and finishing

AS/NZS 4859.1 Materials for the thermal insulation of buildings – General criteria and technical provisions

AS 3958.1 Ceramic tiles - Part 1 Guide to the installation of ceramic tiles
AS 3958.2 Ceramic tiles - Part 2 Guide to the selection of a ceramic tiling system
AS 3740 Waterproofing of wet areas within residential buildings

AS/NZS 3000 Electrical installations (known as the Australian /New Zealand Wiring Rules)

AS 4386.1 Domestic kitchen assemblies - Kitchen units
AS 4386.2 Domestic kitchen assemblies - Installation

AS/NZS 4505 Domestic garage doors

AS/NZS 2311 Guide to the painting of buildings

AS 1884 Floor coverings - Resilient sheets and tiles - Laying and maintenance practices

AS 1889.1 PVC floor tiles - Semi rigid
AS 1889.2 PVC floor tiles – Flexible

AS 3727 Guide to residential pavements

AS 1664 Aluminium structures – Limit state design

Appendix C

Benchmark Construction

(Normative)

Part 1 - Australia

Benchmark construction is defined as the form of building construction that is the most economic common solution permitted within the mandatory requirements of the Building Code of Australia and relevant Standards referred to therein.

Particular state regulations, which impose additional sustainability requirements, shall not be considered as benchmarks, i.e. these shall be considered to have performance superior to the benchmarks.

The following forms of construction shall be used as benchmarks for purposes of assessing sustainability impact of alternatives.

Benchmark Construction for Building Materials used in the Building Envelopes				
Benchmark Building	Single-storey Detached Dwelling	Sole-Occupancy Unit Building	High-rise Office Building	Low-rise Warehouse Building
Similar buildings to which the benchmark results may be applied	Single or two-storey detached and duplex housing	Row houses, Townhouses, Sole-occupancy units buildings, Motels	Offices, Hotels	Factories, Warehouses, Stadiums, Shopping centres Open carparks, Grandstands
Footings	Concrete slab-on-ground	Concrete beams & infill slab	Concrete piles, beams & infill slab	Concrete piles, beams & infill slab
Structural frame	NA	Concrete	Concrete	Concrete
Ground floor	Concrete	Concrete	Concrete	Concrete
Suspended floor	Timber	Concrete	Concrete	Concrete
External wall	Clay brick & timber stud frame	Clay brick & concrete masonry	Glass curtain wall	Precast concrete
Internal walls	Plasterboard on timber frame	Concrete masonry	Plasterboard on metal frame	Concrete masonry
Roof	Concrete tiles on timber frames	Concrete tiles on timber frames	Steel sheet on steel purlins	Steel sheet on steel purlins
Windows	Aluminium frames	Aluminium frames	Fixed glass	Aluminium frames

Attributes of Benchmark Construction

Particular attributes of Benchmark Construction shall be as designed to the following documents.

- Building Code of Australia Volume 1 – Class 2 to 9 buildings – Designated “Other”
- Building Code of Australia Volume 1 – Class 1 and 10 buildings – Designated “Residential”

Site Establishment & Preliminaries

“Residential” BCA Vol 2
“Other” BCA Vol 1

Assumed Reuse on Demolition

Various 0% is re-used intact, 0% of material is recycled

Earthworks & Site Drainage

“Residential” AS/NZS 3500.5 AS 2870, AS 3798 & BCA Vol 2
“Other” AS/NZS 3500.3, AS 3798 & BCA Vol 1

Assumed Reuse on Demolition

Various 0% is re-used intact, 0% of material is recycled

Concrete

“Residential” Concrete slab-on-ground & termite shields to AS 2870 & AS 3660.1
“Other” Concrete columns, beams, slabs, stairs etc to AS 3600

Assumed Reuse on Demolition

Concrete 0% is re-used intact, 10% of material is recycled

Retaining Walls

“Residential” Timber cantilever retaining walls to AS 4678
“Other” Reinforced concrete masonry retaining walls to AS 4678

Assumed Reuse on Demolition

Timber 0% is re-used intact, 20% of material is recycled
Masonry 80% is re-used intact, 20% of material is recycled
Concrete 0% is re-used intact, 10% of material is recycled
Other 0% is re-used intact, 0% of material is recycled

Drainage & Plumbing –

“Residential” to AS/NZS 3500.5
“Other” to AS/NZS 3500
AS/NZS 3500.1
AS/NZS 3500.2
AS/NZS 3500.2.2
AS/NZS 3500.3
AS/NZS 3500.3.2
AS/NZS 3500.4

Assumed Reuse on Demolition

Various 0% is re-used intact, 0% of material is recycled

Windows, Doors & Glazing

"Residential" Single glazed, aluminium sliding windows and doors to AS 2047
"Other" Glass curtain wall to AS 1288

Assumed Reuse on Demolition

Aluminium 0% is re-used intact, 20% of material is recycled
Glass 0% is re-used intact, 30% of material is recycled
Other 0% is re-used intact, 0% of material is recycled

Structural Steelwork

"Residential" Miscellaneous beams to AS 4100
"Other" Portal frames to AS 4100

Assumed Reuse on Demolition

Steel 0% is re-used intact, 50% of material is recycled
Other 0% is re-used intact, 10% of material is recycled

Wall, Roof & Floor Framing

Timber wall floor and roof framing to AS 1684

Assumed Reuse on Demolition

Timber 0% is re-used intact, 20% of material is recycled
Other 0% is re-used intact, 0% of material is recycled

Carpentry & Joinery

Timber to AS 1684

Assumed Reuse on Demolition

Timber 0% is re-used intact, 20% of material is recycled

Roof Cladding

"Residential" Concrete tiled roof to AS 2047 & AS 2050
"Other" Steel sheeting to AS/NZS 1562.1

Assumed Reuse on Demolition

Tiles 20% is re-used intact, 20% of material is recycled
Sheeting 0% is re-used intact, 50% of material is recycled
Other 0% is re-used intact, 0% of material is recycled

Roof Plumbing

"Residential" Steel gutters, downpipes etc to AS/NZS 3500.5, AS 2179.1 & AS 2180
"Other" Steel gutters, downpipes etc to AS/NZS 3500.1 to 4, AS 2179.1 & AS 2180

Assumed Reuse on Demolition

Various 0% is re-used intact, 10% of material is recycled

Masonry

"Residential" Clay brick veneer external walls to AS 3700.
"Other" Cavity walls to AS 3700.

Assumed Reuse on Demolition

Bricks 10% is re-used intact, 20% of material is recycled
Other 0% is re-used intact, 0% of material is recycled

Ceiling & Wall Lining

“Residential” 10 mm plasterboard lining to AS 2588 & AS 2598

“Other” Plasterboard lining to AS 2588 & AS 2598 and BCA Vol 1

Assumed Reuse on Demolition

Various 0% is re-used intact, 0% of material is recycled

Insulation

“Residential” Wall and roof/ceiling insulation to AS/NZS 4859.1 & BCA Vol 2

“Other” Wall and roof/ceiling insulation to AS/NZS 4859.1 & BCA Vol 1

Assumed Reuse on Demolition

Various 0% is re-used intact, 0% of material is recycled

Floor & Wall Tiling

“Residential” Bathroom floor and wall tiling to AS 3958 & AS 3740

“Other” Bathroom floor and wall tiling to AS 3958 & AS 3740

Assumed Reuse on Demolition

Various 0% is re-used intact, 0% of material is recycled

Electrical Installation

“Residential” To AS/NZS 3000

“Other” To AS/NZS 3000

Assumed Reuse on Demolition

Various 50% is re-used intact, 0% of material is recycled

Kitchen

“Residential” Basic kitchen appliances to AS 4386.1 & AS 4386.2

“Other” Basic kitchen appliances to AS 4386.1 & AS 4386.2

Assumed Reuse on Demolition

Various 0% is re-used intact, 20% of material is recycled

Vehicular Doors

“Residential” Manually operated panel-lift door to AS/NZS 4505

“Other” Electrically operated roller doors to AS/NZS 4505

Assumed Reuse on Demolition

Various 0% is re-used intact, 20% of material is recycled

Painting & Coatings

“Residential” Internal & external acrylic paint systems to AS/NZS 2311

“Other” Internal & external paint systems to AS/NZS 2311

Assumed Reuse on Demolition

Various 0% is re-used intact, 0% of material is recycled

The VOCs (Volatile Organic Compounds) within commonly used paints in building applications are generally within the following limits.

Benchmark Volatile Organic Compounds (VOCs) of Paints	
Paint Type	Benchmark VOC content of wet paint (grams per litre)
Interior - Sealer	50
Interior - Latex undercoat	60
Interior - Gloss paint	70
Interior - Flat washable paint	60
Interior - Semi gloss paint	60
Interior - Low sheen paint	50
Interior - Flat ceiling paint	50
Exterior - Latex undercoat	60
Exterior - Gloss paint	60
Exterior - Semi gloss paint	60
Exterior - Flat paint	50
Exterior - Low sheen paint	50
Exterior - Timber primer	50
Latex primer for galvanised steel and zincalume finish	50
Other paint not listed above (Note 4)	300
Paints shall not have more than 25% by weight of total formulation of hydrocarbon solvents.	
Paints shall not include aromatic hydrocarbon solvents.	
Paints shall not include formaldehyde or release formaldehyde during use.	
Paints shall not include halogenated solvents.	
Paints shall not include mercury, arsenic or selenium or their compounds, pigments of lead, cadmium, chromium VI or antimony, except that impurities of the elements listed above which are contained in the raw materials and components and which do not exceed a combined total of 0.1% by weight of non-volatile content and which have individual element contents that do not exceed the limits specified.	
Paints shall not include more than the limits specified for any of the substances listed in the Toxic Substances Regulations, and with a cumulative total of not more than 0.5% by weight of these substances, based on the total formulations.	
Paints shall not include ethylene glycol as an integral part of the paint formulation.	
<ol style="list-style-type: none"> 1. The stated values apply to any random sample within a specified lot. 2. Properties other than VOCs, are based on Environmental Choice New Zealand – Paints - Specification EC-07-O1 3. The VOCs of paints for architectural applications have based on a variety of published data for common applications. 4. The VOCs of paints for specialist non-architectural applications vary markedly depending on the particular application and are generally considerably higher than those for architectural applications. The stated value has been adopted for benchmarking purposes, and does not purport to be a specification or endorsement of suitability. 	

Resilient Floor Coverings

“Residential” Vinyl floor coverings to AS 1884 and AS 1889
 “Other” Vinyl floor coverings to AS 1884 and AS 1889

Assumed Reuse on Demolition

Various 20% is re-used intact, 0% of material is recycled

Carpets & Soft Furnishings

“Residential” Wool blend carpets
 “Other” Heavy duty short pile wool blend carpets

Assumed Reuse on Demolition

Various 20% is re-used intact, 0% of material is recycled

Window & Door Shutters

“Residential” Not common
 “Other” Not common

Assumed Reuse on Demolition

Various 20% is re-used intact, 20% of material is recycled

Mechanical Ventilation & Services

“Residential” Combination fan, light & heater, capable of achieving the following:
 “Other” Air-conditioning capable of achieving the following:

The following values shall be used for benchmarking purposes, and are based on the WHO/Europe Guidelines modified by CASANZ.

Acceptable Indoor Air Quality in Residential and Commercial Buildings		
Pollutant	Averaging Time	Air Quality Guideline value
Carbon Dioxide	8 hours	3,500 ppm (1,000 ppm as body odour metric)
Carbon Monoxide	15 minutes 30 minutes 1 hour 8 hours	90 ppm 50 ppm 25 ppm 10 ppm
Formaldehyde	30 minutes	0.1 mg/m ³
Lead	1 year	0.5 µg/m ³
Nitrogen dioxide, NO ₂	1 year 1 hour	40 µg/m ³ 200 µg/m ³
Ozone, O ₃	8 hour, daily maximum	100 µg/m ³
Particulate matter, PM _{2.5}	1 year 24 hour (99 th percentile)	10 µg/m ³ 25 µg/m ³
Particulate matter, PM ₁₀	1 year 24 hour (99 th percentile)	20 µg/m ³ 50 µg/m ³
Sulfur dioxide, SO ₂	24 hour 10 minute	20 µg/m ³ 500 µg/m ³
Total Volatile Organic Compounds	1 hour	500 µg/m ³
Notes:		
1. This table is based on WHO/Europe Guidelines modified by CASANZ, and addition of CO ₂ and Total VOCs.		
2. Environmental tobacco smoke is excluded, assuming that indoor smoking is not permitted.		

Cleaning

“Residential”	Concrete & masonry - High pressure water, Other low pressure water
“Other”	Concrete & masonry - High pressure water, Other low pressure water

Assumed Reuse on Demolition

Various	0% is re-used intact, 0% of material is recycled
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Landscaping

“Residential”	Turf, with minimal planting of native trees and shrubs.
“Other”	Planting of native trees and shrubs.

Assumed Reuse on Demolition

Various	10% is re-used intact, 20% of material is recycled
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Fencing

“Residential”	Timber lap and cap fencing
“Other”	Metal security fencing.

Assumed Reuse on Demolition

Timber	0% is re-used intact, 20% of material is recycled
Metal	0% is re-used intact, 50% of material is recycled
Other	10% is re-used intact, 0% of material is recycled

Paving

“Residential”	Stencilled concrete pavement to AS 3727
“Other”	Segmental concrete pavement to AS 3727

Assumed Reuse on Demolition

Concrete	0% is re-used intact, 10% of material is recycled
Pavers	80% is re-used intact, 10% of material is recycled
Other	0% is re-used intact, 0% of material is recycled

Metalwork & Balustrades

“Residential”	Aluminium balustrade to AS 1664
“Other”	Glass & aluminium balustrade to AS 1664, AS 1288 & AS 2208

Assumed Reuse on Demolition

Aluminium	0% is re-used intact, 20% of material is recycled
Glass	0% is re-used intact, 30% of material is recycled
Other	0% is re-used intact, 0% of material is recycled

Public Kerbs, Gutters, Footpaths & Crossovers

“Residential”	To “typical” local authority requirements
“Other”	To “typical” local authority requirements

Assumed Reuse on Demolition

Various	0% is re-used intact, 10% of material is recycled
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Note

The values of “Assumed Reuse on Demolition” are estimates of the current re-use intact and materials recycling currently undertaken for the materials used in “benchmark construction”.

Appendix D

Verification of Sustainability Criteria

(Normative)

Part 1 - Australia

D1.1 Use of non-renewable material resources

Criterion

The use of the product shall lead to a reduction in the consumption of non-renewable material resources (in kg), when compared to “Benchmark Construction”.

Compliance

Compliance may be demonstrated by the following process:

Soil

Determine, compare and report the Net Alienation of Fertile Soil (including the effects of salinity and erosion) caused by both Product and Benchmark Construction.

Note

Fertile soil is considered to be a non-renewable resource. Practices that encourage dry land salinity effectively degrade the soil rendering it infertile. In some cases, rising water table and the associated precipitation of salt within the building structure shorten the product life, thus requiring repair or replacement

Land, water or air pollution or degradation

The use of the product shall lead to a reduction in land, water or air pollution or degradation, when compared to “Benchmark Construction”, for any of the following properties:

- more easily bio-degradable
- less toxic and with lower concentrations of volatile organic compounds
- manufactured by processes that produce less air, water or land pollution and less toxic waste
- trap and treat contaminants rather than allowing them to run off or be dumped
- reduce soil salinity
- protect and promote tree and plant growth.

Compliance may be demonstrated by the following process:

1. Determine and quantify the particular property for the use of Benchmark Construction in the building.
2. Determine and quantify the particular property for the use of the Product in the building.
3. Calculate and report the Net Change in Degradation, together with full calculations.

D1.2 Use of renewable material resources

Criterion

The use of the product shall lead to a reduction in the consumption of renewable material resources (in kg), when compared to Benchmark Construction..

Compliance

Compliance may be demonstrated by the process described in D1.1 Use of nonrenewable material resources., except that only renewable resources shall be considered.

Timber products

Timber products shall be sourced from forests which are sustainably and/or responsibly managed to agreed principles of stakeholders (contained in Standards) and for which compliance is verified by independent third parties.

Evidence of compliance with this requirement includes a Chain of Custody Certificate from the Forest Stewardship Council (FSC), Australian Forestry Certification Scheme (AFCS) or other Programme for Endorsement of Forest Certification (PEFC) endorsed schemes.

Notes:

1. Certification is carried out by accredited certification bodies. FSC, AFCS or other PEFC endorsed schemes do not certify forest operations or manufacturers. This maintains independence between Standards and their requirements, and operations seeking certification. There are two types of certificates available from certification bodies:

2. Forest Management (FM) Certificate

Forest management certification involves an inspection of the forest management unit by an independent certification body accredited by FSC, AFCS or other PEFC endorsed scheme to check that the forest complies with the agreed sustainability principles of stakeholders. If the forest complies with the relevant Standards, then the accredited certification body issues a certificate for the operation.

Certified forest operations can claim the forest products they produce come from a sustainably and/or responsibly managed forest. Before a certified forest operation can sell their products as FSC, AFCS or other PEFC certified scheme they must also obtain chain of custody certification.

3. Chain of Custody (COC) Certificate

Chain of custody certification provides an independent third party verified guarantee about FSC, AFCS or PEFC endorsed scheme certified products. From a customer perspective, the AFCS, FSC or PEFC endorsed scheme labels represent a promise that is being made to them. Chain of custody standards are the mechanism these schemes have to ensure that 'promise' is delivered. Operations that have been independently verified for FSC, AFCS or PEFC endorsed schemes chain of custody certification are eligible to label their products with the FSC, AFSC or other PEFC endorsed schemes logo.

External Links

Programme for the Endorsement of Forest Certification Schemes (PEFC)

Australian Forestry Certification Scheme (AFCS)

Forest Stewardship Council (FSC)

D1.3 Use of non-renewable energy resources

Criterion

The use of the product shall lead to a reduction in the non-renewable energy use (in MJ), when compared to “Benchmark Construction”. It shall be assumed that non-renewable energy is used throughout the product life, unless there is evidence to the contrary.

Compliance Demonstrated by Life Cycle Analysis

Calculation of embodied energy shall take account of the energy used throughout the life-cycle to carry out the following processes.

- Procure and transport the raw materials to the manufacturing facility,
- Establish the manufacturing facility,
- Operate the manufacturing process,
- Transport the materials to a typical building site,
- Build the materials into a typical building,
- Demolish and dispose of the materials at the end of the building life, and
- Provide a credit for the proportion of the materials that may be recycled.

Calculation of operational energy shall take account of the climate characteristics of the intended location, acceptable comfort levels, use or otherwise of artificial heating and cooling and the characteristics of both the Product and Benchmark Construction. The verification methods set out in BCA Volume 1 JV1 and JV3, and BCA Volume 2 V2.6.2.2, are suitable methods of making the following comparisons. Compliance may be demonstrated by the following process:

1. Calculate the embodied energy of the Product throughout its life-cycle, E_{pe} .
2. Calculate the operational energy consumption of the building, incorporating the Product, throughout its life-cycle, E_{po} .
3. Calculate the embodied energy of the Benchmark Construction (that the Product is intended to replace) throughout its life-cycle, E_{be} .
4. Calculate the operational energy consumption of the building, incorporating Benchmark Construction, throughout its life-cycle, E_{bo} .
5. Determine the net increase or decrease in total energy use if the Product is used in lieu of Benchmark Construction as a percentage, from the following.

$$\text{Performance} = \text{Total energy with Product} / \text{Total energy with Benchmark} - 1$$
$$= (E_{peN} + E_{poN}) / (E_{beN} + E_{boN}) - 1$$

6. Report the Performance as a percentage, together with full calculations.¹

¹ 1. Negative numbers indicate good performance – i.e. A typical building with the “subject building system” consumes less energy over the building life, than the same building with benchmark construction.

2. Positive numbers indicate poor performance – i.e. A typical building with the “subject building system” consumes more energy over the building life, than the same building with “benchmark construction”.

3. The magnitude of the numbers express the degree of energy saving or energy expenditure associated with the “subject building system”; expressed as a percentage of the energy associated with “benchmark construction”.

Partial Compliance Inferred by Direct Comparison of Product Properties

Criterion: “ have higher thermal resistance”

The Benchmark Construction is the values given in BCA Vol 2 Part 3.12 for the benchmark construction for walls, roofs and floors.

Member	Reference	Construction	Thermal Resistance, R m ² .K/W
Walls	BCA Vol 2 Figure 3.12.1.3(c)	110 mm clay masonry veneer (including internal & external air films)	R 0.55
Roof/Ceiling	BCA Vol 2 Figure 3.12.1.1(c)	Flat ceiling with pitched tiled roof	R 0.22 or R 0.73 ^{Note2}
Suspended Floors	BCA Vol 2 Figure 3.12.1.4(a)	Enclosed suspended timber floor	R 0.7
Notes 1. These values include the internal and external air films, but exclude added insulation. 2. R 0.73 should only be used as the benchmark where construction is restricts to Climatic Zone 1 and Climatic Zone 2 below 300 m altitude. For all other applications, 0.22 shall be used.			

Compliance with this criterion shall be substantiated by evidence that the product or system has a higher thermal resistance than the benchmark. This may be based on test results, or may be derived theoretically from published data.

Criterion: “ have higher thermal mass”

For external walls, the Benchmark Construction is the BCA criterion of surface mass of 220 kg/m².

For external walls, compliance with this criterion shall be substantiated by evidence that the product or system has a higher thermal mass than the benchmark, 220 kg/m². This may be based on test results, or may be derived theoretically from published data.

Criterion: “ have a higher albedo”

The Benchmark Construction is roof and wall products with a Solar Absorptance greater than 0.55, i.e. Relatively dark colours including Slate (dark grey), Red, Green, Yellow and Buff:

Compliance with this criterion shall be substantiated by certification that the colours (of roofs or similar applications) have solar absorptance values not more than 0.55 , and are intended for use in Climate Zones 1, 2 and 3 (Generally hot climates). In the absence of more precise information, the following may be used as a guide.

<i>Typical Solar Absorptance Values</i>	
<i>Colour</i>	<i>Value</i>
<i>Slate (dark grey)</i>	<i>0.9</i>
<i>Red, green</i>	<i>0.75</i>
<i>Yellow, buff</i>	<i>0.6</i>
<i>Zinc aluminium – dull</i>	<i>0.55</i>
<i>Galvanised steel – dull</i>	<i>0.55</i>
<i>Light grey</i>	<i>0.45</i>
<i>Off white</i>	<i>0.35</i>
<i>Light cream</i>	<i>0.3</i>

D1.4 Use of renewable energy resources

Criterion

The use of the product shall lead to a reduction in the use of renewable energy (in MJ), when compared to “Benchmark Construction”.

Compliance

This criterion shall be applied only to the manufacturing processes and construction where the availability of renewable energy is identifiable and quantifiable.

Its effect may be determined by factoring the values determined for non-renewable energy.

D1.5 Climate change

Criterion

The use of the product shall lead to a reduction in the greenhouse gas generation (indicated by kg of CO₂), when compared to “Benchmark Construction”.

Compliance Demonstrated by Life Cycle Analysis

For the manufacture and use of the Product, determine whether energy consumption is an appropriate indicator of green-house gas generation.

- If so, proceed as follows.
- If not, proceed as follows, but, in addition, calculate the greenhouse gas emissions corresponding to each component of net energy, as determined below.

Calculation of embodied energy shall take account of the energy used throughout the life-cycle to carry out the following processes.

- Procure and transport the raw materials to the manufacturing facility,
- Establish the manufacturing facility,
- Operate the manufacturing process,
- Transport the materials to a typical building site,
- Build the materials into a typical building,
- Demolish and dispose of the materials at the end of the building life, and
- Provide a credit for the proportion of the materials that may be recycled.

Calculation of operational energy shall take account of the climate characteristics of the intended location, acceptable comfort levels, use or otherwise of artificial heating and cooling and the characteristics of both the Product and Benchmark Construction. The verification methods set out in BCA Volume 1 JV1 and JV3, and BCA Volume 2 V2.6.2.2, are suitable methods of making the following comparisons.

Compliance may be demonstrated by the following process:

1. Calculate the carbon liberated due to embodied energy of the Product throughout its life-cycle, C_{pe} .
2. Calculate the carbon liberated due to operational energy consumption of the building, incorporating the Product, throughout its life-cycle, C_{po} .
3. Calculate the carbon liberated due to embodied energy of the Benchmark Construction (that the Product is intended to replace) throughout its life-cycle, C_{be} .
4. Calculate the carbon liberated due to operational energy consumption of the building, incorporating Benchmark Construction, throughout its life-cycle, C_{bo} .
5. Determine the net increase or decrease in total energy use if the Product is used in lieu of Benchmark Construction as a percentage, from the following.
6. Performance = Total carbon with Product / Total carbon with Benchmark -1
$$= (C_{pe} + C_{po}) / (C_{be} + C_{bo}) - 1$$
7. Report the Performance as a percentage, together with full calculations.²

² Negative numbers indicate good performance – i.e. A typical building with the “subject building system” liberates less carbon over the building life, than the same building with benchmark construction.

Positive numbers indicate poor performance – i.e. A typical building with the “subject building system” liberates more carbon over the building life, than the same building with “benchmark construction”.

D1.6 Destruction of the ozone layer

Criterion

The use of the product shall lead to a reduction in the release of materials (CFK-11) that destroy the ozone layer, when compared to "Benchmark Construction".

Compliance

Compliance may be demonstrated by the evidence comparing the release of CFK-11 for both the Product and the Benchmark Construction.

D1.7 Formation of photochemical oxidants

Criterion

The use of the product shall lead to a reduction in the release of photochemical oxidants (ethene), when compared to "Benchmark Construction".

Compliance

Compliance may be demonstrated by the evidence comparing the release of photochemical oxidants for both the Product and the Benchmark Construction.

D1.8 Acidification

Criterion

The use of the product shall lead to a reduction in the release of acidic materials (kg of SO₂), when compared to "Benchmark Construction".

Compliance

Compliance may be demonstrated by the evidence comparing the release of acidic materials for both the Product and the Benchmark Construction.

D1.9 Eutrophication

Criterion

The use of the product shall lead to a reduction in eutrophication of waterways (kg of PO₄), when compared to "Benchmark Construction".

Compliance

Compliance may be demonstrated by the evidence comparing the release of materials that eutrophy waterways for both the Product and the Benchmark Construction.

The magnitude of the numbers express the degree of carbon associated with the "subject building system"; expressed as a percentage of the carbon associated with "benchmark construction".

D1.10 Waste to recycling/reuse or energy recovery

Criterion

The use of the product shall lead to a reduction in the quantity of material that is not recycled or reused, or from which energy is not recovered (kg), when compared to “Benchmark Construction”.

Compliance

Compliance may be demonstrated by comparing the product “% re-use intact” and “% of material recycled” to that listed for “benchmark construction”.

Compliance with this criterion shall be substantiated by evidence that the product has the properties similar to the following :

- Cladding - Is fixed by bolts or screw that can be easily removed and replaced during re-installation
- Cladding - Is not nailed or otherwise fixed such that nail holes are left in the material.
- Cladding and structural members - not fixed by adhesives, glues, mortars or grouts fixed to the body of the product.
- Mortar can be easily cleaned from masonry units (bricks and blocks).

Note:

The Benchmark Construction generally has a design life of at least 60 years. If the product has a shorter design life, this shall be considered in the assessment.

D1.11 Non-hazardous waste to disposal

Criterion

The use of the product shall lead to a reduction in the quantity of non-hazardous waste material (kg), when compared to “Benchmark Construction”.

Compliance

Compliance may be demonstrated by the following process set out in D1.10 “Waste to recycling/reuse or energy recovery”, modified to account for non-hazardous waste.

D1.12 Hazardous waste to disposal

Criterion

The use of the product shall lead to a reduction in the quantity of hazardous waste material (kg), when compared to “Benchmark Construction”.

Compliance

Compliance may be demonstrated by the following process set out in D1.10 “Waste to recycling/reuse or energy recovery”, modified to account for hazardous waste.

D1.13 Energy content of the product

Criterion

The use of the product shall lead to a reduction in the embodied energy content of the product (kg), when compared to “Benchmark Construction”.

Compliance

For external walls, the Benchmark Construction is as follows:

Clay masonry veneer walls, consisting of 230 x 76 x 110 mm extruded clay bricks, set in 1:1:6 mortar, supported by 70 mm MGP10 timber stud wall, with 10 mm plasterboard lining and incorporating bulk insulation nominated in BCA Volume 2 Part 3.12.

Climate Zone	Embodied Energy MJ/m ² wall
	Clay Masonry Veneer
1 Hot humid warm winter	590
2 Warm humid summer, mild winter	590
3 Hot dry summer, warm winter	590
4 Hot dry, cool winter	590
5 Warm temperate	590
6 Mild temperate	590
7 Cool temperate	590
8 Alpine area	610

Compliance with this criterion shall be substantiated by evidence that the product has Embodied Energy less than the relevant benchmark clay masonry veneer walls.

D1.14 Water use

Criterion

The use of the product shall lead to a reduction in the use of water associated with the product (m³), when compared to “Benchmark Construction”.

Compliance

Compliance may be demonstrated by the following process:

Determine the Net Water Use, accounting for water from both renewable and non-renewable sources as follows.

1. Calculate the water used to produce the Product, W_{pe} .
 2. Calculate the water used during the operation of the building, incorporating the Product, throughout its life-cycle, W_{po} .
 3. Calculate the water used to produce the Benchmark Construction, W_{be} .
 4. Calculate the water used during the operation of the building, incorporating the Benchmark Construction, throughout its life-cycle, W_{bo} .
8. Determine the net increase or decrease in total energy use if the Product is used in lieu of Benchmark Construction as a percentage, from the following.
9. Performance = Total water with Product / Total water with Benchmark -1
$$= (W_{pe} + W_{po}) / (W_{be} + W_{bo}) - 1$$
10. Report the Performance as a percentage, together with full calculations.³

Note

The reuse of rainwater, either with or without treatment, generally leads to a reduction in energy used to pump treated water from the storage dams.

In low rainfall areas, rainwater may be considered to be a non-renewable resource. The reuse of rainwater generally leads to a reduction in the land devoted to storage dams, and the associated loss of tree cover. Tree cover generally takes carbon dioxide out of the atmosphere and regenerates oxygen.

Compliance - Particular Applications - Water Saving Devices

Compliance shall be substantiated by evidence that the product more effectively save or recycle water, to some quantifiable extent, more than Benchmark Construction. The Benchmark Construction referred to in this statement is the common absence of any water saving or recycling devices.

³ Negative numbers indicate good performance – i.e. A typical building with the “subject building system” consumes less water over the building life, than the same building with benchmark construction.

Positive numbers indicate poor performance – i.e. A typical building with the “subject building system” consumes more water over the building life, than the same building with “benchmark construction”.

The magnitude of the numbers express the degree of water associated with the “subject building system”; expressed as a percentage of the water associated with “benchmark construction”.

D1.15 VOC emissions to indoor air

Criterion

The use of the product shall lead to a reduction in the emission of Volatile Organic Compounds (VOCs) to indoor air ($\text{mg}/\text{m}^2\cdot\text{h}$), when compared to “Benchmark Construction”.

Compliance - Paints

Compliance with the following specifications is deemed to meet this criterion in respect of paints.

Paint Requirements	
Paints shall be less toxic and have lower concentrations of volatile organic compounds than commonly used alternatives. This criterion is deemed to be achieved, if the particular paint complies with requirements listed below.	
Paint Type	Maximum VOC content of wet paint (grams per litre)
Interior - Sealer	40
Interior - Latex undercoat	48
Interior – Gloss paint	60
Interior - Flat (washable) paint	48
Interior - Semi gloss paint	48
Interior - Low sheen paint	40
Interior - Flat ceiling paint	40
Exterior - Latex undercoat	44
Exterior - Gloss paint	48
Exterior - Semi gloss paint	48
Exterior - Flat paint	40
Exterior - Low sheen paint	40
Exterior - Timber primer	40
Latex primer for galvanised steel and zincalume finish	40
Other paint not listed above	40
Paints shall not have more than 25% by weight of total formulation of hydrocarbon solvents.	
Paints shall not include aromatic hydrocarbon solvents.	
Paints shall not include formaldehyde or release formaldehyde during use.	
Paints shall not include halogenated solvents.	
Paints shall not include mercury, arsenic or selenium or their compounds, pigments of lead, cadmium, chromium VI or antimony, except that impurities of the elements listed above which are contained in the raw materials and components and which do not exceed a combined total of 0.1% by weight of non-volatile content and which have individual element contents that do not exceed the limits specified.	
Paints shall not include more than the limits specified for any of the substances listed in the Toxic Substances Regulations, and with a cumulative total of not more than 0.5% by weight of these substances, based on the total formulations.	
Paints shall not include ethylene glycol as an integral part of the paint formulation.	
<ol style="list-style-type: none"> 1. Limits apply to any random sample within a specified lot. 2. Requirements, other than VOCs, are based on Environmental Choice New Zealand – Paints - Specification EC-07-O1 3. VOC limits have been set generally at 40 grams per litre, although a concession of 80% of the stated approximate average for common applications has been granted. 	

D1.16 HCOH emissions to indoor air

Criterion

The use of the product shall lead to a reduction in the emission of HCOOH to indoor air ($\text{mg}/\text{m}^2\cdot\text{h}$), when compared to "Benchmark Construction".

Compliance

Compliance may be demonstrated by the evidence comparing the release of HCOOH to indoor air for both the Product and the Benchmark Construction. See also the procedure D1.18 "Carcinogenic compounds to indoor air".

D1.17 Ammonia emissions to indoor air

Criterion

The use of the product shall lead to a reduction in the emission of ammonia to indoor air ($\text{mg}/\text{m}^2\cdot\text{h}$), when compared to "Benchmark Construction".

Compliance

Compliance may be demonstrated by the evidence comparing the release of ammonia to indoor air for both the Product and the Benchmark Construction. See also the procedure D1.18 "Carcinogenic compounds to indoor air".

D1.18 Carcinogenic compounds to indoor air

Criterion

The use of the product shall lead to a reduction in the emission of carcinogenic compounds to indoor air (mg/m².h), when compared to “Benchmark Construction”.

Compliance

Compliance with the following specifications is deemed to meet this criterion:

Acceptable Indoor Air Quality in Residential and Commercial Buildings		
Pollutant	Averaging Time	Air Quality Guideline value
Carbon Dioxide	8 hours	3,500 ppm (1,000 ppm as body odour metric)
Carbon Monoxide	15 minutes 30 minutes 1 hour 8 hours	90 ppm 50 ppm 25 ppm 10 ppm
Formaldehyde	30 minutes	0.1 mg/m ³
Lead	1 year	0.5 µg/m ³
Nitrogen dioxide, NO ₂	1 year 1 hour	40 µg/m ³ 200 µg/m ³
Ozone, O ₃	8 hour, daily maximum	100 µg/m ³
Particulate matter, PM _{2.5}	1 year 24 hour (99 th percentile)	10 µg/m ³ 25 µg/m ³
Particulate matter, PM ₁₀	1 year 24 hour (99 th percentile)	20 µg/m ³ 50 µg/m ³
Sulphur dioxide, SO ₂	24 hour 10 minute	20 µg/m ³ 500 µg/m ³
Total Volatile Organic Compounds	1 hour	500 µg/m ³
Notes:		
1. This table is based on WHO/Europe Guidelines modified by CASANZ, and addition of CO ₂ and Total VOCs.		
2. Environmental tobacco smoke is excluded, assuming that indoor smoking is not permitted.		
3. Acknowledgement ABCB		

Compliance - Particular Applications - Timber Preservatives

Compliance shall be substantiated by evidence that the product meets these criteria.

- Copper chrome arsenate (CCA) shall not be used.
- Pentachlorophenol (PCP) shall not be used.
- The use of Creosote and Pigment Emulsified Creosote (PEC) shall be minimised where practical.
- The use of Light Organic Solvent Preservative (LOSP) shall be minimised where practical.

Notes

- The use of Copper Chrome Arsenate (CCA) is being phased out, although not yet universally banned.
- The use of Pentachlorophenol (PCP) is banned.
- Other timber preservatives are permitted, including Creosote, Pigment Emulsified Creosote (PEC) and Light Organic Solvent Preservative (LOSP).