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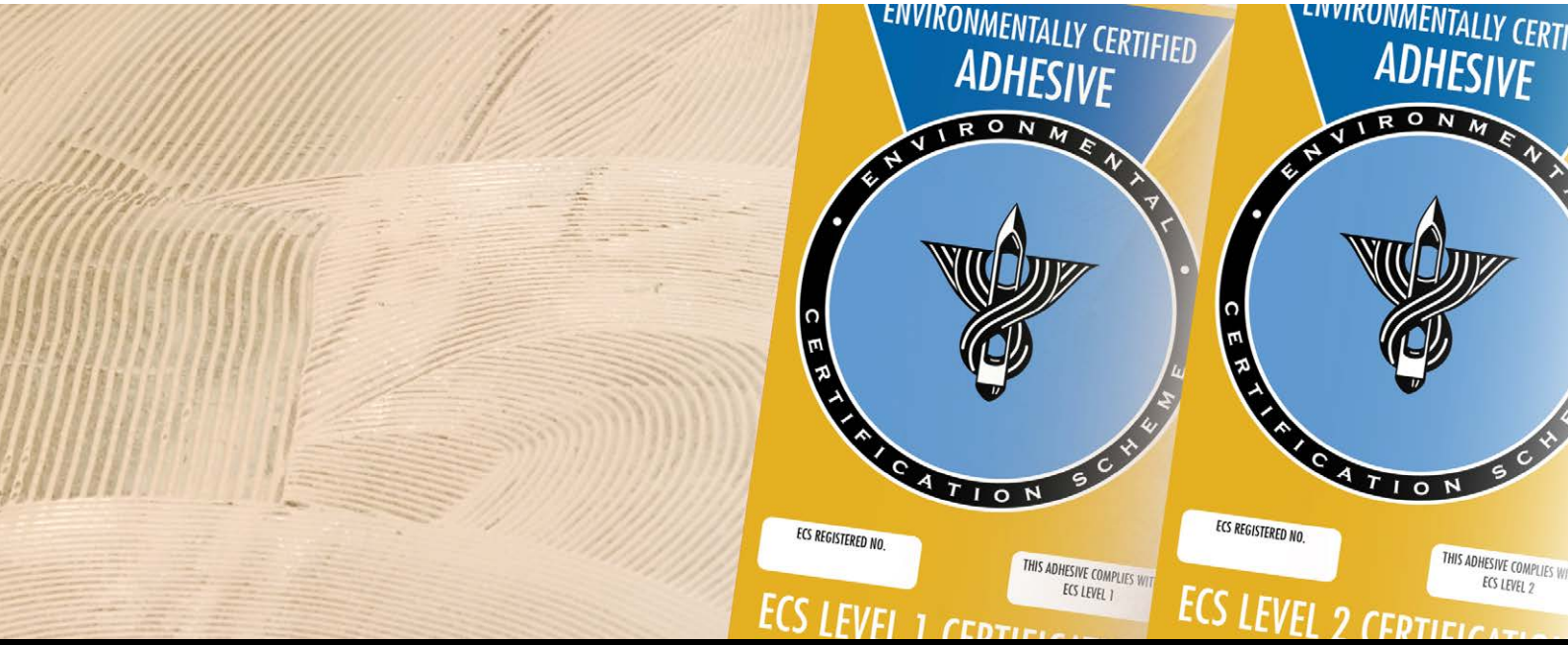


Version **1.0**

## ECS

# Adhesives Technical Specifications

## November 2023



**Administered by the CIAL**
ABN 11 006 829 303

PO Box 7172, St Kilda Road, Melbourne 3004
Tel: (03) 9804 5559
Email: info@carpetoz.com.au • Web: www.carpetinstitute.com.au


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## Product definition:

Floor covering adhesives are applied to floor coverings, underlays, and flooring substrates to provide a stable and long lasting floor covering system. Adhesives bond two surfaces together and resist mainly lateral movement.

Adhesives are usually applied in liquid form to one or both surfaces and cure to form a solid adhesive bond. Floor coverings most often use a water based formulation in which the solvents are mainly water and evaporate, leaving a solid bond. There are various forms of adhesives used in the floor coverings industry, most of which are covered as latex formulations, but may also be modified silane (MS), contact adhesives, and pressure sensitive adhesives.

This standard applies to adhesive products designed specifically for floor coverings, including resilient, carpet and underlay products.

## Objectives of the ECS for floor covering adhesives

1. **Provide consumers with a system that qualifies certified products as "good" and "best" performing in safety, health, and environmental standards.**
2. **Allow the manufacturing industry to demonstrate these credentials.**
3. **Raise the bar for flooring adhesives to meet exacting health and environmental performance standards.**

The ECS adhesives standard is structured with a series of performance criteria designed to meet the requirements of environmentally conscious procurement agencies and building standards bodies such as the Green Building Council of Australia (GBCA).

The ECS for adhesives is set at two performance levels:

**Level 1** – will meet a credit rating under the GBCA's Responsible Products Framework.

**Level 2** – will meet an exceptional performance rating under the GBCA's Responsible Products Framework, as shown in the following table.

| Criterion no. | Level achievement | GBCA RPVs |
|---|---|---|
| **1. Fit for purpose** | ECS 1 | - |
| **2. Manufacturing Environmental Health and Safety** | ECS 1 | 2 |
| **3. Low VOC content** | ECS 1 | 1 |
| **4. Raw material (low toxicity)** | ECS 1 | 1 |
| **5. Low VOC emissions** | ECS 1 | 2 |
| **6. No chemicals of concern** | ECS 1 | 2 |
| **7. Manufacturing performance** | ECS 1 | - |
| **8. Health product declaration** | ECS 1 | 1 |
| | | **(9)** |
| **9. Manufacturing efficiency improvement** | ECS 2 | 4 |
| **10. Water recovery and recycling** | ECS 2 | 5 |
| | | **(18)** |

*Table 1. Summary of criteria*

**Note:** The points provided are equivalent to GBCA Responsible Product Framework point scores (RPVs) at the time of publishing. This may change in time.


## ECS LEVEL 1 criteria

Level 1 criteria are all mandatory for a licensee to meet the requirements of the ECS. Points achieved are cumulative for each criterion.

### Criterion 1. **Fit for Purpose**

The adhesive must meet the relevant requirements set for that particular class of product under Australian conditions. The product must have suitable guarantees of performance for the intended application provided by the manufacturer or distributor.

These applications involving the adhesion of floor coverings are provided in the following installation standards:

| |
|---|
| Australian standard AS 1884 – Floor coverings – Resilient sheets and tiles – Installation Practices |
| Australian standard AS 2455 Part 1 – Textile Floor coverings – Installation practice – general |
| Australian standard AS 2455 Part 2 – Textile Floor coverings – Installation practice – carpet tiles |

*Table 2. Floor Covering installation standards*

### Criterion 2. **Manufacturing Health, Safety and Environmental Management**

The adhesive manufacturer must declare compliance with all elements of the ECS Manufacturing Code of Practice for Environmental Management. These include the provision of a safe and healthy workplace in which employees' risks from th raw materials used for the product are minimised.

This Code is available from the CIAL web site.

The manufacturing declaration template is available and this form is attached to the ECS Adhesives Guidance Manual.

### Criterion 3. **Indoor Air Quality – low VOC content**

The aim of the criterion is to ensure that adhesives have a low content of volatile organic compounds (VOCs) that do not exceed the prescribed target limit for total emissions of VOCs.

The total VOC limit is set at 50 g/L measured using test method SCAQMD Method 304-91 "Determination of Volatile Organic Compounds (VOC) in Various Materials" as per Rule 1168 Adhesive and Sealant Applications (amended 2017 – California).

The licensee shall undertake the VOC test and provide a declaration of compliance with the 50g/L limit as per the declaration in Schedule 11b – VOC content. The declaration can be as provided in the product safety data sheet.

### Criterion 4. **Raw Material (low toxicity)**

Chemical constituents of adhesives have been reviewed, and restrictions have been placed on these chemicals to ensure that the product, and manufacturers do not suffer from toxic impacts of the application of the product.

The CIAL has used health screening to establish that the potential adverse health impact of the product is kept below the No Observable Adverse Health Exposure Level (NOAEL) during the manufacturing and application of ECS certified adhesives.

It is recognized that some regulated substances may be used and/or inadvertently produced during manufacture or may be present, although not declared, in proprietary products used in manufacture. It is incumbent on adhesive manufacturers to ensure that products do not contain more than 0.1% by weight of these substances unless a lower concentration is required in other sections of this document.


Manufacturers must examine Safety Data Sheets (SDS) or other raw material technical specifications to identify chemicals that are either banned, limited in the final product, or of concern to evaluate compliance with the ECS Adhesives Technical Specifications for raw material toxicity in the adhesive product.

**Regulated Substances that Must Not be included in adhesive products.**

Attachment 2 contains a list of banned chemicals. For the purposes of the Technical Guidelines, banned substances include:

- All materials that are not registered for use in Australia by the Australian Industrial Chemicals Introduction Scheme (AICIS) in the Australian Industrial Chemicals Inventory (AICI).
- IARC classified carcinogens in groups 1 and 2A available at http://monographs.iarc.fr/ENG/Monographs/vol91/index. php
- Substances listed in the Stockholm Convention on Persistent Organic Pollutants (Annex A) available at http://chm.pops.int/Convention/tabid/54/language/en-US/Default.aspx
- Substances classified as carcinogenic, mutagenic, or reproductive toxins (CMR) Categories 1 and 2 listed in Annex 1 of EU Directive 67/548/EEC available at http://www.reach-compliance.eu/english/legislation/docs/launchers/launchannex-1-67-548-EEC.html
- Chemicals listed in Annex III of the Rotterdam Convention as toxic industrial chemicals and pesticides with impacts on human health and ecology.

**Attachment 4 contains a list of controlled or restricted-use chemicals, in the floor covering adhesives.**

A maximum level of toxic heavy metals shall be restricted to below the NOAEL as determined as the health investigation level (HIL A) for metals listed in Table 5-A of Schedule B (1) of the National Environmental Protection Measures (NEPM).

This covers the following metals: Arsenic, Barium, Beryllium, Cadmium, Chromium (III and VI), Cobalt, Copper, Lead, Manganese, Mercury, Nickel and Vanadium.

- **Monomer residues**

  The monomer residues present in the polymeric substances in adhesives shall be restricted to a maximum concentration in the finished polymer of 10 mg/kg of the polymer weight.

- **Substances of concern**

  Other substances that have an elevated level of concern may be found at: http://echa.europa.eu/chem_data/authorisation_ process/candidate_list_table_en.asp

Products containing these substances at levels greater than 0.1% by weight must be registered if entering EU countries on or before June 1, 2011 (see: http://echa.europa.eu/doc/candidate_list/candidate_list_obligations.pdf).

The EU REACH "Substitute It Now" (SIN list) reviewed as PBT, CMR or of equivalent concern should be consulted as a source of chemicals of concern - available at http://www.chemsec.org/list/use-the-sin-list.


## Criterion 5. **Indoor Air Quality - Low VOC emissions**

The aim of the criterion is to ensure that emissions of volatile organic compounds (VOCs) from environmentally certified adhesive products do not exceed prescribed target levels for total emissions and particular chemicals of concern.

The certified floor covering must pass a test in which its emissions of VOCs are assessed to be below the criteria set out in Table 3.

| **Chemical of Concern** | **Criterion Maximum Emission Factor[1] (28 day) µg/h/m²** |
|---|---|
| Acetaldehyde | 20 |
| Benzene | 10 |
| Butylated Hydroxy Toluene | 300 |
| Caprolactam | 120 |
| Chloro-benzene | 937 |
| Chloroform | 281 |
| Dichloroethylene (1,1) | 66 |
| 2-Ethylhexanoic Acid | 46 |
| Formaldehyde | 10 |
| 1-Methyl-2-Pyrrolidone | 300 |
| Naphthalene | 20 |
| Nonanal | 24 |
| Octanal | 24 |
| 4-Phenylcyclohexene | 50 |
| Styrene | 410 |
| Trichloroethylene | 562 |
| Toluene | 280 |
| Vinyl Acetate | 100 |
| 2-Ethyl-1-Hexanol | 50 |
| Hydrocarbons ($C_{10}$ – $C_{14}$) | 300 |
| Vinyl Cyclohexene | 85 |
| Xylenes | 50 |
| MAXIMUM TOTAL VOC | 500 |

*Table 3. 28 day VOC emission rate limits*

[1] The emission factor is not equivalent to the indoor concentration of the VOC of interest and can be calculated from knowledge of the room volume and air exchange rate.


*Testing must be undertaken according to the test method: ISO 16000- 9 (2016) Indoor air: Determination of the emission of volatile organic compounds from building products and furnishing — Emission test chamber method* with a 400g/m$^2$ application of the adhesive onto an inert substrate tested after a 28 day conditioning period. The emission rate is measured as an emission factor (EF) in micro grams per square metre of floor per hour.

The licensee shall provide a relevant test report from a NATA registered laboratory or another suitably registered laboratory provided as per the declaration in Schedule 11 – Product Emissions. Product certificates of compliance with the CDPH Section 1350, or EMICODE EC1, will be accepted as meeting these criteria.

## Criterion 6. **No Chemicals of concern**

Manufacturer has examined the risks of chemicals in use and has taken action to substitute out particular chemicals of hazardous nature.

Checklist of actions:

| **Tasks** | **Documents** |
|---|---|
| Identification of all chemicals used | Chemical inventory |
| Hazardous chemical list | SDS for all chemicals GHS hazard warnings |
| Review regulatory guidelines – AICI, Prop 65, SIN list, GHS, Green chem list | Hazardous chemicals listed Exposure standards |
| Classification of hazards | Hazards list |
| Priority list for action | Priority chemical list |
| Substitutions undertaken | |

*Table 4. Chemicals of concern action list*

The licensee will need to confirm that they have undertaken a review of their chemical inventory and identified the hazards associated with the chemicals used to their workforce and those using their products.

Hazardous chemical classifications will include:

- Toxicity (skin, vapour, oral – acute and chronic).
- Reactivity (flammability, oxidation/reduction, explosivity, corrosivity).
- Environmental (acute and long term, POPs, PBTs, Heavy metals).
- Inert impacts (nano particles, micro-plastics).


Elimination and replacement such that the net hazard is reduced, or classifications are reduced, through a change in chemical structure or physical form, with following options:

- Less toxic
- Less volatile
- Less flammable
- Less reactive
- Less concentrated (acid, reactive)
- Less mobile (paste or pellet over dust or powder)

Elimination is considered undertaken if the residual chemical of concern content in the product or raw material is less than 0.1% (1000ppm) of the material used. The details of the chemical of concern risk and residual risk after action should be provided in the manufacturer's risk register.

The manufacturer supplies an updated notification of their chemicals substitution program once every three years as per the declaration form supplied.

## Criterion 7. **Manufacturing Performance Efficiencies**

Manufacturers must provide data on their plant efficiencies in energy usage, water consumption, carbon emissions (tier 2) and waste/recycling performance to meet this criterion. They must provide this on an annual basis, and their plans for improvement in these facets of operations.

Manufacturers' declarations must be made using the ECS Schedule 12 Declaration of Manufacturing Performance and Efficiency.

## Criterion 8. **Health Product Declaration**

This declaration must be based on the product composition as provided in Criterion 5. The Health Product Declaration (HPD) must include all materials and substances that are a part of the product concerned (or family of products) and provide their impact to human health and the environment, even if the substances are not currently regulated. The declaration must screen all substances for toxic impacts.

The declaration must be published to the rules and in the format set out in the Open Standard for Health Product Declarations and be publicly available on the licensee's website.

**All criteria 1 to 8 are mandatory and will provide a total ECS Level 1 point score of 9.**

[2] Health Product Declaration Collaborative www.hpd-collaborative.org


## ECS LEVEL 2 criteria

All level 2 criteria are mandatory to the ECS for adhesive products and must be achieved in addition to those given in Level 1.

### Criterion 9. Manufacturing Efficiency Improvement

The aim of this criterion is to require manufacturers to achieve year on year improvements in manufacturing efficiencies per Tonne of adhesive produced. These efficiencies must include the following metrics of manufacturing at the facility that produces the certified adhesive:

a) Total energy (electricity, gas, liquid fuels and other forms of energy used in MJ/kg of product),

b) Total carbon produced as a tier 2 measure of carbon (kg $CO_2$eq/kg),

c) Water consumption expressed as L/kg of production and,

d) Total waste generated and sent to landfill expressed as kg/kg of production.

This data is to be provided on an annual basis for the manufacturing facility through the manufacturing declaration (Criterion 7 ).

To satisfy this criterion, a minimum 5% efficiency improvement over 5 years or a 1% reduction per year over the same period, must be achieved.

### Criterion 10. Water recovery and recycling

The manufacturer has established a wastewater treatment and recycling system that recovers a minimum of 50% of the wastewater for reuse/recycling. This is performed in addition to the water efficiency criterion, in which water usage efficiency is improved at the rate of 1% per year, or 5% over 5 years.

The water usage efficiency is defined as the volume of water used divided by the production of adhesive in total (kilolitres of water per tonne of produced adhesives).The is provided annually by the manufacturer through the Manufacturing Declaration in the ECS Guidance Manual Schedule 12.

**All criteria 1 to 10 are mandatory and will provide a total ECS Level 2 point score of 18. This should provide the product with an exceptional rating under the GBCA's Responsible Product Framework.**


## ATTACHMENT 1

### Evaluation of Raw Material Toxicity

**Step 1:** Identify all materials in the product

**Step 2:** Examine the chemicals identified in the Safety Data Sheets for each material

**Step 3:** If a chemical is on the banned list, replace the product and find a safer alternative

**Step 4:** If a chemical is on the control list, determine the concentration of the chemical in the product

**Step 5:** If a concentration is above the maximum level set, reduce the concentration or replace the chemical

**Step 6**: If a chemical is otherwise of concern, regularly review the chemical for updates on toxicity and hazards

**Step 7**: If a chemical is not on the banned list and is below the maximum concentration level, then the raw material is of sufficiently low toxicity to be compliant


## ATTACHMENT 2

### ECS Banned Chemicals

| Raw materials banned from use in ECS certified floor coverings* | Why | Probable Application / Source |
|---|---|---|
| 1,4-Dioxane | Carcinogenic | Solvent |
| Acetaldehyde | Probable carcinogen | Biocide / antimicrobial |
| Antimony Trioxide | Probable carcinogen | Flame retardants |
| Arsenic and arsenic compounds | Carcinogen | Filler contaminant |
| Asbestos | Carcinogen | Filler contaminant |
| Benzyl Butyl Phthalate (BBP) | Reproductive toxin | Plasticiser |
| Di Butyl Phthalate (DBP) | Reproductive toxin | Plasticiser |
| Cadmium and compounds | Carcinogen | Dyes and pigments |
| Chromium (VI) compounds<br>Chromate – Chromic Acid – Dichro-mate | Carcinogen | Dyes and Pigments |
| Chlorinated hydrocarbon waxes | Persistent, bio accumulative, toxic | Plasticiser |
| Di Ethyl Hexyl Phthalate | Reproductive toxin | Plasticiser |
| Di Isononyl Phthalate | Reproductive toxin | Plasticiser |
| Dimethyl Fumerate | Irritant | Anti-fungal agent |
| Dyes/pigments that are toxic or metabolise to toxic substances | Probable carcinogen, mutagen, toxic to reproduction | Dyes (see list in Attachment 3) |
| Dyes / pigments that are potentially sensitising | Skin and eye irritants | Dyes (see list in Attachment 3) |
| Ethylene Diamine Tetra Acetic acid (EDTA) | Toxic<br>Respiratory sensitiser | Dyeing auxiliary<br>Biocide |
| Formaldehyde | Carcinogen | Biocide/antimicrobial |
| Lead and compounds | Probable carcinogen | Heat stabilizer |
| Mineral oils (untreated, mildly treated) | Carcinogen | Lubricants, spinning oils |
| Nonyl Phenol Ethoxylates | Persistent pollutant – toxic | Surfactant |
| Para alkyl phenols | Endocrine disruptor | Surfactant precursor |
| PAHs (Polyaromatic Hydrocarbons) | Probable carcinogens | Tar constituent |
| PBDE (Polybrominated diphenyl ether) | Persistent pollutant – toxic | Flame retardants |
| PCP (Pentachlorophenol) | Persistent pollutant - toxic | Disinfectant |
| PFAs (Perfluoro alkane substances) | Persistent toxin | Stain resist treatment |
| Organotin complexes | Toxic | Biocide |
| Trichloroethylene | Probable carcinogen | Solvent degreasing |
| Tetrachloroethylene | Probable carcinogen | |
| Triclosan | Persistent pollutant | Biocide / antimicrobial |

* Other materials may be banned but not mentioned in this list as they were not identified as in current use in manufacture of floor covering products. New chemicals should be checked for safe use and health impacts.


## ATTACHMENT 3

## Chemical Control List

| May be present in raw materials[1] | Problem | Probable Application of Concern | Maximum Concentration Allowable mg/kg | Maximum Emission Factor[2] (24 hr) ug/h/m²# |
|---|---|---|---|---|
| Acetaldehyde | Probable carcinogen | Biocide | | 20 |
| Acrylamide | Probable carcinogen | Monomer of various acrylamide polymers | 10 | |
| Arsenic and arsenic compounds | Carcinogen | Filler contaminant | 20 | |
| Barium and compounds | Toxic | Filler contaminant | 300 | |
| Benzene | Carcinogen | Solvent constituent | | 10 |
| Benzo[a]anthracene | Probable carcinogen | Tar constituent | 5 | |
| Benzo[a]pyrene | Carcinogen | Tar constituent | 1 | |
| Beryllium | Carcinogen | Impurity in fillers | 20 | |
| Boron and compounds | Toxic | Pesticide | 3,000 | |
| 1,3-Butadiene | Carcinogen | Monomer in latex | 10 | |
| Butylated Hydroxy Toluene | Toxic | Antioxidant | 1,000 | |
| Cadmium and compounds | Carcinogens | Dyes and pigments | 20 | |
| Caprolactam | Toxicity | Polyamide monomer | | 120 |
| Chloroform | Toxicity | PVC breakdown | | 281 |
| Chromium (VI) | Carcinogen | Dyes and pigments | 10 | |
| Chromium (III) | Toxic | Dyes and pigments | 120,000 | |
| Cobalt and compounds | Probable carcinogen | Dyes and pigments | 100 | |
| Copper | Toxic | Dyes and pigments | 1000 | |
| DDT | Probable carcinogen / Persistent Pollutant | Pesticide | 200 | |
| Dichloroethylene (1,1) | Toxic | Solvent / PVC | | 66 |
| Diphenyl Methane Diisocyanate (MDI) | Sensitizer / Possible carcinogen | Polyurethane monomer | 10 | |
| 2-Ethyl-1-Hexanol | Toxic | Solvent constituent | | 50 |
| Formaldehyde | Carcinogen | Biocide/antimicrobial | | 10 |
| Lead and compounds | Probable carcinogen | Heat stabilizer /pigment | 300 | |
| Manganese | Toxic | Impurity in fillers | 1,500 | |
| Mercury | Toxic | Impurity in fillers | 10 | |
| Methanol | Toxic | Solvent Compound | 143 | |
| 1-Methyl-2-Pyrrolidone (NMP) | Toxic | PVC adhesive | | 300 |
| Naphthalene | Toxic/Probable carcinogen | pesticide | | 20 |
| Nickel compounds | Carcinogen | Impurity, pigments | 600 | |


## Chemical Control List (continued)

| May be present in raw materials[1] | Problem | Probable Application of Concern | Maximum Concentration Allowable mg/kg | Maximum Emission Factor[2] (24 hr) ug/h/m²# |
|---|---|---|---|---|
| Nonanal | Toxic | Solvent constituent | | 24 |
| Octanal | Toxic | Solvent constituent | | 24 |
| PAHs Polycyclic aromatic hydrocarbons | Probable carcinogen | Tar constituents | 20 | |
| 4-Phenylcyclohexene | Toxic | Latex impurity | | 50 |
| Pesticides | Probable carcinogen /Persistent pollutant | Pesticide residues | 10 | |
| Silica | Chronic toxicity | Impurity in limestone | 5000 | |
| Styrene | Probable carcinogen | Monomer in latex | | 410 |
| Toluene Diisocyanate | Sensitizer / Possible carcinogen | Polyurethane monomer | 10 | |
| Trichloroethylene | Probable carcinogen | Solvent/PVC | | 400 |
| Toluene | Toxic | Solvent constituent | | 280 |
| Vanadium | Toxic | Impurity | 50 | |
| Vinyl Acetate | Probable carcinogen | Solvent constituent | | 100 |
| Vinyl Chloride | Carcinogen | Monomer PVC | 10 | |
| Vinyl Cyclohexane | Probable carcinogen | Latex impurity | | 85 |
| Xylenes | Toxic | Solvent constituent | | 50 |

1 This list is not exhaustive and other chemicals may require controls to reduce their impact below NOAELs

2 VOC emission rate limits are designed to protect user health and are tested as a requirement of the Technical Guidelines

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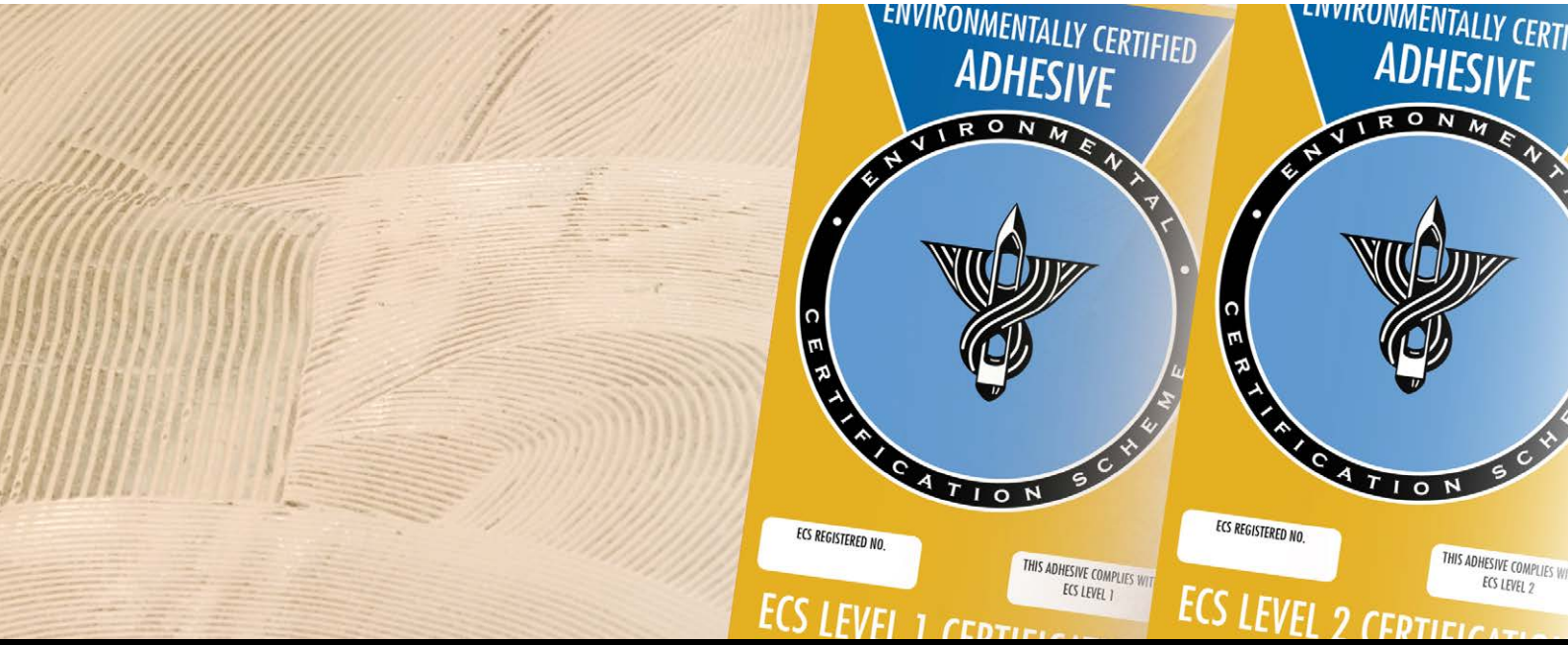




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PO Box 7172, St Kilda Road, Melbourne 3004
Tel: (03) 9804 5559
Email: info@carpetoz.com.au • Web: www.carpetinstitute.com.au

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