

Exposure to Toxins

Healthy

Credit: 13

Points: 2

Outcome

The building's occupants are not directly exposed to toxins in the spaces they spend time in.

Criteria

Minimum Expectation	Nil	<ul style="list-style-type: none"> The building's paints adhesives, sealants, and carpets are low in TVOC or non-toxic; and, The building's engineered wood products are low in TVOC or non-toxic; and, Occupants are not exposed to banned or highly toxic materials in the building.
Credit Achievement	2 points	<ul style="list-style-type: none"> On-site tests verify the building has low Volatile Organic Compounds (VOC) and formaldehyde levels.

Additional information

Stage implementation

Strategy	Brief	Concept	Design	Tender	Construction	Handover	Use
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Synergies with other credits

- Amenity and Comfort
- Responsible Finishes

Sustainable Development Goals

- Goal 3 (Good Health and Wellbeing)

Relevant reporting initiatives

- None

Regularly occupied areas

This credit applies to all regularly occupied areas in the building – those continuously occupied or occupied for more than two hours (previously known as 'primary' and 'secondary' spaces) including living and sleeping areas. Areas that are either transient or accessed intermittently such as corridors, storage, back of house or plant rooms can be excluded. Spaces can also be excluded if the use of the space (for example, a laboratory) justifies specific ventilation conditions – a Technical Question must be submitted to the NZGBC for confirmation. A space can be excluded if the applicable Standard recommends that specialist advice be sought, such as in a theatre.

Requirements

Minimum Expectation

The project must comply with **all three** of the following criteria:

- Paints, Adhesives, Sealants, and Carpets
- Engineered Wood Products
- Banned or Highly Toxic Materials

Paints, Adhesives, Sealants, and Carpets

At least 95% of internally applied paints, adhesives, sealants (by volume) and carpets (by area) must meet stipulated 'Total Volatile Organic Compounds (TVOC) Limits' below.

Compliance can be demonstrated in the following ways:

- The product(s) are certified under a Recognised Product Certification Scheme listed in the 'Exposure to Toxins Product Certifications Schemes Index'. The certificate must be current at the time of purchase
- The product(s) are tested in a laboratory
- There are no paints, adhesives, sealants, and carpets in the building at practical completion

Compliance with this criterion is considered to be met if the TVOC limits in the Credit Achievement are demonstrated through on site testing. It is noted that compliance with the Minimum Expectation through on site testing may add significant risk to the projects Green Star eligibility. If VOC limits are exceeded during testing, and product compliance has not been demonstrated through documentation, the Minimum Expectation will not be met, and the project will not be eligible for a rating. A technical question should be submitted to the NZGBC to explain why the prescriptive requirements of this minimum expectation cannot be demonstrated.

Total VOC limits

Paints, Adhesives and Sealants

Product category	Max. Total Volatile Organic Compounds (TVOC) content in grams per litre (g/L) of ready to use product
General purpose adhesives and sealants	50
Interior wall and ceiling paint, all sheen levels	16
Trim, varnishes, and wood stains	75
Primers, sealers, and prep coats	65
One and two pack performance coatings for floors	140
Acoustic sealants, architectural sealant, waterproofing membranes and sealant, fire retardant sealants and adhesives	250
Structural glazing adhesive, wood flooring and laminate adhesives and sealants	100

Carpets

Compliance option	Test protocol	Limit
	ASTM D5116 - Total VOC limit*	limit* 0.5mg/m ² per hour
ASTM D5116	ASTM D5116 - 4-PC (4-Phenylcyclohexene) *	0.05mg/m ² per hour
ISO 16000 / EN 13419	ISO 16000 / EN 13419 - TVOC at three days	0.5 mg/m ² per hour
ISO 10580 / ISO/TC 219 (Document N238)	ISO 10580 / ISO/TC 219 (Document N238) - TVOC at 24 hours	0.5mg/m ² per hour

* mg/m²hr may also be represented as mg/m²/hr

Engineered Wood Products

Either no new engineered wood products are used in the building, or at least 95% (by area) of all engineered wood products meet specified formaldehyde emission limits, as per the following page. The largest face of each product can be used instead of calculating all of the surfaces.

Where there are engineered wood products, compliance to emission limits can be demonstrated in two ways:

- The product(s) are certified under a recognised Product Certification Scheme. The certificate must be current at the time of purchase
- The product(s) are tested in a laboratory.

Formwork, car parking applications, and non-engineered wood products (such as milled timber) are excluded from the credit.

Test protocol	Emissions Limit / Unit of Measurement
AS/NZS 2269:2004, testing procedure AS/NZS 2098.11:2005 method 10 for Plywood	≤1mg/L
AS/NZS 1859.1:2004 - Particle Board, with use of testing procedure AS/NZS 4266.16:2004 method 16	≤1.5 mg/L
AS/NZS 1859.2:2004 - MDF, with use of testing procedure AS/NZS 4266.16:2004 method 16	≤1mg/L
AS/NZS 4357.4 - Laminated Veneer Lumber (LVL)	≤1mg/L
Japanese Agricultural Standard MAFF Notification No.701 Appendix Clause 3 (11) - LVL	≤1mg/L
JIS A 5908:2003- Particle Board and Plywood, with use of testing procedure JIS A 1460	≤1mg/L
JIS A 5905:2003 - MDF, with use of testing procedure JIS A 1460	≤1mg/L
JIS A1901 (not applicable to Plywood, applicable to high pressure laminates and compact laminates)	≤0.1 mg/m ² hr*

Test protocol	Emissions Limit / Unit of Measurement
ASTM D5116 (applicable to high pressure laminates and compact laminates)	$\leq 0.1 \text{ mg/m}^2\text{hr}$
ISO 16000 part 9, 10 and 11 (also known as EN 13419), applicable to high pressure laminates and compact laminates	$\leq 0.1 \text{ mg/m}^2\text{hr}$ (at 3 days)
ASTM D6007	$\leq 0.12 \text{ mg/m}^{3**}$
ASTM E1333	$\leq 0.12 \text{ mg/m}^{3***}$
EN 717-1 (also known as DIN EN 717-1)	$\leq 0.12 \text{ mg/m}$
EN 717-2 (also known as DIN EN 717-2)	$\leq 3.5 \text{ mg/m}^2\text{hr}$

** The test report must confirm that the conditions of Table above comply for the particular wood product type, the final results must be presented in EN 717-1 equivalent (as presented in the table) using the correlation ratio of 0.98.

*** The final results must be presented in EN 717-1 equivalent (as presented in the table), using the correlation ratio of 0.98.

Banned or Highly Toxic Materials

A comprehensive hazardous materials survey must be carried out on any existing buildings or structures on the project site, in accordance with the relevant Environmental and Work Health and Safety (WHS) legislation.

Where the survey identified asbestos, lead, or PCBs in any existing buildings or structures, the materials must be stabilised or removed and disposed of in accordance with best practice guidelines.

Credit Achievement

The project must comply with the following criteria:

- TVOC and Formaldehyde Levels

TVOC and Formaldehyde Levels

A test must be undertaken to verify that the TVOC and formaldehyde levels are within the concentration limits stipulated below:

Element	Concentration
TVOC	0.27 ppm
Formaldehyde	0.02 ppm

All sample measurements taken must be below the levels listed above.

Samples must be collected in regularly occupied areas based on the following table:

Occupied area	Floors	Number of floors to be sampled
< 2,000m ²	< 2	1
< 5,000m ²	< 8	2
< 10,000m ²	< 15	3
< 20,000m ²	< 25	4
< 40,000m ²	< 35	5
> 40,000m ²	> 35	6

The required samples are determined by whichever is larger between occupied areas or floors. At least three samples are to be taken per floor. These must be representative of where the occupants are likely to spend a majority of their time.

Testing must be conducted:

- Under designed project conditions. For example, for naturally ventilated spaces, the windows should be open during testing
- At a minimum, the lowest (that is, the ground floor entrance) and highest floors must have measurements taken, as well as floor with the highest estimated occupants
- In areas representative of the regularly occupied areas on the floor
- Before 12pm

Samples must be taken through an active collection method in accordance with the following standards:

- ISO 16000-6
- ASTM D5197
- EPA TO-17

Testing must take place after practical completion and prior to occupants moving into the building.

Submission content

Submissions for this credit must contain:

- **Submission form**
- **Evidence** to support claims made in the submission

Recommended evidence:

- Extracts from contract specifications for adhesives and sealants
- Specifications that demonstrate emission levels or formaldehyde contents
- Safety Data Sheets that demonstrate the compliant emission levels or formaldehyde content
- Product VOC test certificates that demonstrate emission levels or formaldehyde contents
- Product certificates that demonstrate certification under a recognised product certification scheme or recognised standard
- Invoices and proof of purchase to demonstrate costs of compliant materials
- Bill of Quantities from Quantity Surveyor or Cost planner, demonstrating material costs

- Hazardous materials survey
- On-site VOC test results
- As built drawings showing the location of the test samples

Alternate documentation can also be used by project teams to demonstrate compliance.

The recommended evidence listed above is applicable to the as built submission. See the Design Assessment section in the Introduction for more information on submitting evidence for the Design assessment.

The key requirement is that evidence is provided to support each claim made within the Submission form.

Guidance

Paint and adhesives testing methods

The following VOC test methods are relevant to paints:

- ISO Method 17895 (2005), for a material with a presumed VOC content <1%
- ISO Method 118902 (2006), for a material with a presumed VOC <15%
- ISO Method 118901 (2007), for a material with a presumed VOC content >15%
- ASTM D3960, which is comprised of four individual testing procedures that measures TVOC (D2369) as well as density (D1475) and water content (D4017). Exempt compounds (D4457) must not be subtracted in the calculation of VOC content.

The testing method for adhesive and sealants is the ASTM D3960 as detailed for paints. For more information on ASTM D3960 refer to South Coast Air Quality Management District Rule 1168.

Lead, asbestos, and PCBs

In the case of a refurbishment, this credit element is deemed to be satisfied if the existing building on the project site began construction after 1 January 2005. This includes projects that are refurbishments or building extensions of existing buildings for which construction started after 1 January 2005.

Relevant standards and legislation

Hazardous materials

Relevant Standards and Legislation

Asbestos	Occupational Health and Safety (OH&S) legislation, Work Health and Safety (WH&S) legislation and relevant environmental legislation
Lead	AS4361 Guide to Lead Paint Management
Polychlorinated Biphenyls (PCBs)	ANZECC Polychlorinated Biphenyls Management Plan

VOC emission testing

To mitigate the risk of failing the VOC on-site test, it is recommended that projects specify products that have undergone an emissions test in accordance with the following Standards:

- ANSI/BIFMA e3-2011 Furniture Sustainability Standard sections 7.6.1 or 7.6.2, tested in accordance with ANSI/BIFMA Standard Method M7.1-2011
- California Department of Public Health (CDPH) Standard Method v.1.1-2010

Device requirements

Laboratory materials and/or samplers must be prepared according to the referenced testing methodology and meet the referenced testing methodology requirements.

Earliest stage for testing

For the purposes of this credit, testing must occur once all finishes and furniture have been installed.

Fitout Scope – *Minimum Expectation*

Project teams may use a Tenancy Fitout Guide and Model Lease Clauses to demonstrate compliance for any cold shell or excluded tenancy spaces in the *Minimum Expectation* only. Any fitout works within the scope of the rating, including those used to target *Credit Achievement* must meet the requirements for *Minimum Expectation*.

Fitout scope – *Credit Achievement*

Projects must include tenant fitouts for at least 80% of GFA to target points in the *Credit Achievement* requirement. For more information, see the Fitout Scope section.

Definitions

VOC test certificate

A test certificate by a laboratory accredited by National Association of Testing Authorities (NATA) or other ISO/IEC 17025 accredited laboratory. The test certificate must include:

- The numerical result
- The test method used to obtain the results
- For tinted products, the TVOC value must be inclusive of tints

For paints, adhesives and sealants, a safety data sheet (SDS) that includes VOC information is also an acceptable test certificate. The TVOC content of the product must be presented numerically in grams per litre of ready-to-use product and also include a statement as to how the results was obtained, meaning either through experimental testing or theoretical calculations.

Supporting information

The following resources support this credit:

- ISO 16000-6
- ASTM D5197
- EPA TO-17
- The 'Exposure to Toxins Product Certification Scheme Index' available from Green Star resources