

# Upfront Carbon Emissions

## Positive

Credit: 21

Points: 8

## Outcome

The building's upfront carbon emissions from materials and products have been reduced and offset.

## Strategy

Registering from 2024 onwards	4 Star	Meets the <i>Minimum Expectation</i>
	5 Star	
	6 Star	Meets the <i>Credit Achievement</i>
Registering from 2026 onwards	4 Star	Meets the <i>Minimum Expectation</i>
	5 Star	Meets the <i>Credit Achievement</i>
	6 Star	
Registering from 2028 onwards	4 Star	Meets the <i>Credit Achievement</i>
	5 Star	
	6 Star	Meets the <i>Exceptional Performance</i>
Certified after 1 <sup>st</sup> January 2030, regardless of registration date	All certifications	Meets the <i>Exceptional Performance</i>

## Criteria

Minimum Expectation	Nil	<ul style="list-style-type: none"> <li>A minimum upfront carbon reduction compared to a reference building has been demonstrated.</li> </ul>
Credit Achievement	3 points	<p>– Climate Positive Pathway –</p> <p>In conjunction with the <i>Minimum Expectation</i>:</p> <ul style="list-style-type: none"> <li>The building's upfront carbon emissions are at least 20% less than those of a reference building.</li> <li>Demolition works are offset.</li> </ul>

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<b>Exceptional Performance</b>	<b>3 points</b>	In conjunction with the <i>Credit Achievement</i> . <ul style="list-style-type: none"> <li>The building's upfront carbon emissions are at least 40% less than those of a reference building.</li> </ul>
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2 additional points are available for Long-term Carbon Storage.

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<b>Credit Achievement</b>	<b>1 points</b>	<ul style="list-style-type: none"> <li>The building demonstrates between 50 and 100 kg CO<sub>2</sub>/m<sup>2</sup> of atmospheric carbon storage</li> </ul>
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<b>Exceptional Performance</b>	<b>1 points</b>	In conjunction with the <i>Credit Achievement</i> . <ul style="list-style-type: none"> <li>The building demonstrates at least 100 kg CO<sub>2</sub>/m<sup>2</sup> of atmospheric carbon storage</li> </ul>
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## Additional information

### Stage implementation

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

- Energy Use
- Energy Source
- Life Cycle Impacts
- Responsible Products

### Sustainable Development Goals

- Goal 7 (Affordable and Clean Energy)
- Goal 13 (Climate Action)

### Relevant reporting initiatives

- GRESB
- TCFD

### Climate Positive Pathway – Leadership point

This credit is part of the *Climate Positive Pathway* in Green Star Buildings. When the pathway is achieved, a *Leadership Challenge* point is awarded to the building for a total of 14 points for this path.

## Requirements

### Minimum Expectation

The project must comply with the following criteria:

- Reducing Upfront Carbon Emissions

### Reducing Upfront Carbon Emissions

The building's upfront carbon emissions are reduced as per the below table when compared to a reference or benchmark building. The building's upfront carbon emissions reductions must occur through good design and material selection.

The reduction targets do not include demolition works.

Projects registered after 1st of January 2024	Conditional Requirement – 4 Star	A minimum reduction in upfront carbon emissions of 10% is required to achieve 4 Star Green Star rating.
	Conditional Requirement – 5 Star	A minimum reduction in upfront carbon emissions of 15% is required to achieve 5 Star Green Star rating.
	Conditional Requirement – 6 Star	A minimum reduction in upfront carbon emissions of 20% is required to achieve 6 Star Green Star rating.
Projects registered after 1st of January 2026	Conditional Requirement – 4 Star	A minimum reduction in upfront carbon emissions of 15% is required to achieve 4 Star Green Star rating.
	Conditional Requirement – 5 Star	A minimum reduction in upfront carbon emissions of 20% is required to achieve 5 Star Green Star rating.
	Conditional Requirement – 6 Star	A minimum reduction in upfront carbon emissions of 25% is required to achieve 6 Star Green Star rating.

### Calculating upfront carbon emission reductions

To demonstrate compliance, project teams can either:

- Model the proposed and reference buildings following the methodology of the *Life Cycle Impacts* credit for modules A1 to A5
- Complete the Embodied Carbon Emissions calculator. The NZGBC's *Embodied Carbon Emissions calculator* uses Modules A1 to A5 to calculate compliance.

Projects must document a reduction in upfront carbon according to the materials and products in the scope. Modules B to D are excluded.

### Credit Achievement

In conjunction with the *Minimum Expectation*, the project must comply with **both** of the following criteria:

- Reducing Upfront Carbon Emissions
- Offsetting Demolition Works
- Long-term Carbon Storage

### Reducing Upfront Carbon Emissions

The building's upfront carbon emissions are at least 20% less than those of a reference building. The building's upfront carbon emissions reductions must occur through good design and material selection.

The reduction targets do not include demolition works (i.e., demolition works are not included in the reference or proposed building).

Carbon offsets purchased against the building's upfront carbon emissions from construction cannot be used to show compliance against the 20% reduction.

See *Minimum Expectation* requirements for further information on calculating upfront carbon emission reductions.

## Offsetting Demolition Works

Where an existing building less than 30 years old has been fully or partly demolished for construction, an embodied carbon calculation must be done for the demolished portion and these emissions offset.

Where the existing building is between 30 to 50 years old, the contribution must be calculated and discounted at 10% for every two additional years past year 30.

Beyond 50 years, there are no requirements.

To demonstrate compliance, project teams can either:

- Model the existing building following the methodology of the Life Cycle Impacts credit in the Climate change impact category for modules A1 to A5
- Complete the 'Existing building' section of the Embodied Carbon Calculator.

In the absence of available data, the existing building can be assumed to follow modern code-compliant construction techniques for the purposes of this calculation. The project teams must justify any simplifications or approximations made.

Offsetting must be done in line with guidance in the *Other Carbon Emission* credit.

## Long-term Carbon Storage

Buildings incorporate the long-term storage of carbon previously removed from the atmosphere into the fabric of the building. This is to encourage the use of materials which have intrinsic carbon storage properties, for example, wood/biomass. Note, such storage of carbon is excluded as an upfront carbon emissions reduction method in the Upfront Carbon Reduction Assessment; however, is rewarded here separately.

The separation of carbon emissions from carbon removals is in line with the latest consultation documents produced by the New Zealand Government under its draft Building for Climate Change policy framework.

One (1) point will be awarded to those projects which demonstrate between 50 and 100 kg CO<sub>2</sub>/m<sup>2</sup> of atmospheric carbon storage for a forecasted period of at least 50 years.

If these points are pursued, the long-term carbon storage is to be calculated and reported separately from the upfront carbon emissions calculations so as not to be included as a method of reduction. For long-term carbon storage arising from wood sources, the timber is required to have a Forest Stewardship Council (FSC), Programme for the Endorsement of Forest Certification (PEFC), or Responsible Wood chain of custody certification.

## Exceptional Performance

In conjunction with the *Credit Achievement*, the project must comply with the following criteria:

- Reducing Upfront Carbon Emissions
- Long-term Carbon Storage

## Reducing Upfront Carbon Emissions

The building's upfront carbon emissions are at least 40% less than those of a reference building. The building's upfront carbon emissions reductions must occur through good design and material selection.

The reduction targets do not include demolition works.

Carbon offsets purchased against the building's upfront carbon emissions from construction cannot be used to show compliance against the 40% reduction.

## Long-term Carbon Storage

In conjunction with the *Credit Achievement*, the project must comply with the following criteria:

One additional point will be awarded to those projects which demonstrate at least 100 kg CO<sub>2</sub>/m<sup>2</sup> of atmospheric carbon storage for a forecasted period of at least 50 years.

### Calculating upfront carbon emission reductions

To demonstrate compliance, project teams must model the proposed and reference buildings following the Green Star NZ Embodied Carbon Methodology

Projects must document a reduction in upfront carbon according to the materials and products in the scope.

For projects demonstrating a 40% reduction in upfront carbon emissions or more, or demonstrating any carbon reduction using a calculator (or software) other than the Green Star NZ Embodied Carbon Calculator, the calculations should comply with quality assurance requirements by meeting one of the following two options:

- Option A: The report is produced by an LCA Certified Practitioner, subject to organisational quality assurance, which has been certified in accordance with ISO9001.
- Option B: The report is produced by an Experienced Individual and is peer reviewed by an LCA Certified Practitioner or independent Experienced Individual

## Submission content

### Submissions for this credit must contain:

- **Submission form**
- **Evidence** to support claims made in the submission
- **Embodied Carbon Emissions calculator** (if pathway used)
- **Life Cycle Assessment** report (if pathway used)

### Recommended evidence:

- Bill of quantities showing materials used.
- Standard practice reference building documentation
  - Signed declarations from the principal architect and engineer for the project, confirming that the reference building was constructed in accordance with the specific requirements and guidance of this credit.
  - Also confirming the reference building design, technologies and construction are true representation of contemporary practice for the type and function of the project.
- Actual reference building documentation
  - Signed declarations from the principal architect and engineer for the project, confirming and demonstrating how the reference building meets the specific guidance above.
- LCA practitioner competencies statement or certificate
- Peer Review Statement (if applicable)- A peer review statement is a summary of the peer review findings signed by the peer reviewer, it must be clear that the peer reviewer statement refers to the final embodied carbon calculation report for the project, the same report which is submitted for this credit, by reference to specific document versions, dates or other means.
- Other documentation as per *Life Cycle Impacts* credit (if pathway used).

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 documentation* 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

### Upfront Carbon Emissions

Upfront carbon emissions are those from modules A1 to A5 as defined in EN 15978. For the purposes of this credit, the NZGBC's *Embodied Carbon calculator* uses Modules A1 – A5. When using an LCA in accordance with the Life Cycle Impacts credit, the scope is modules A1 to A5. Refer to the Green Star NZ Embodied Carbon Methodology

#### Pathways to demonstrate compliance

##### Life Cycle Assessment (LCA) calculator

If a project team has completed a LCA in accordance with the *Life Cycle Impacts* credit, results from that assessment can be used to demonstrate compliance with this credit.

In this case, the project team shall report on the climate change impact category for modules A1 to A5 as defined in EN 15978. This result shall be entered into the NZGBC's *Life Cycle Impacts calculator*. The calculator will show the percentage reduction.

##### Embodied Carbon Emissions calculator

The NZGBC's *Embodied Carbon Calculator* provides a simplified methodology for calculating the embodied emissions of a building. It calculates the emissions associated with Modules A1-D (including Modules A1 to A5 but excluding Modules B6 and B7) associated with the scope as set in the Green Star NZ Embodied Carbon Methodology.

#### Offsets

Residual upfront carbon emissions beyond the *Credit Achievement* reduction target, and carbon emissions from demolition works, may be offset through verified offset schemes.

#### Bio-based materials in 'Upfront Carbon Emissions'

Global Warming Potential Biogenic (GWPB) should be reported separately under Modules A1-A5. These (usually negative) emissions should not be netted off the A1- A5 total in pursuance of Green Star upfront emissions targets.

GWPB can only be taken into account in any full life cycle calculations that include the end of life stage, and where the timber has an FSC, Responsible Wood, or PEFC chain of custody. They are also awarded separately through Long Term Carbon Storage.

#### Project scope

In tenanted buildings, upfront carbon emissions from tenant fitouts are considered in the sector-specific credit *Tenant Emissions*.

#### Qualifications

##### *LCA Certified Practitioner*

A person who is qualified as an "LCA Certified Practitioner" by LCA NZ, ALCAS, ACLCA, or another similar scheme.

##### *Experienced Individual*

An individual who has produced, co-produced and/or independently reviewed at least three LCA or carbon footprint studies of buildings or building products in accordance with EN15804/EN15978 and either ISO14040/14044 or ISO14067 within the past three years.

##### *Independent Practitioner*

An external Competent LCA Practitioner, independent of the LCA for the project. The LCA practitioner and peer reviewer cannot be the same individual or organisation.

#### Absolute Value Pathway

As data is obtained there is an intent to develop benchmarks and provide an Absolute Value Pathway that will be required as the compliance pathway for buildings that have a published benchmark based on kg CO<sub>2eq</sub>/m<sup>2</sup>. These absolute benchmarks will be used in place of a reference building and will be published in updated versions of the Green Star NZ Embodied Carbon Methodology.

## Supporting information

The following document(s) are referenced in this credit:

- Green Star NZ Embodied Carbon Methodology
- NZGBC Embodied Carbon Calculator Guide