Pathways for achieving Green Star upfront carbon targets

Green Star Buildings upfront carbon requirements, the low-carbon materials market in New Zealand, and three possible pathways to compliance

August 2026

Beca

Executive summary

From 1 May 2026 Green Star Buildings requires a 45% upfront carbon reduction for 6-Star office buildings. This is practically achievable using today's market-ready low-carbon products, or via alternative design pathways.

46%
Pathway 1: low-carbon material procurement

>50%
Pathway 2: building reuse plus procurement

~50%
Pathway 3: mass timber

What we found

- 5 Star is comfortably achievable through procurement alone with limited cost uplift.
- Low-carbon concrete, reinforcing and steel are all market-ready in New Zealand now.
- The availability of super-low-carbon reinforcing, steel plate and welded steel will undergo a step-change when the NZ Steel EAF comes online in late 2026, making procurement pathways more straightforward.
- Building reuse (if available) remains the easiest pathway to 6-star levels of performance.

What projects should do now

- Set GWP limits with basic and stretch targets per material, and require EPDs at tender
- Engage concrete, steel and timber suppliers early - availability, not technology, is the constraint
- Test reuse and mass timber at concept stage, when the carbon decision is still cheap
- Plan procurement evidence: 80% of materials by cost is a compliance obligation

Based on Beca embodied carbon modelling, NZGBC Embodied Carbon Methodology and current NZ supplier data

Green Star Buildings: upfront carbon requirements for 5 and 6 Star

From 1 May 2026 mandatory upfront carbon reductions step up sharply — most steeply for offices — to align Green Star Buildings with a Net Zero Ready pathway.

26%	31%	38%	45%
5-star minimum (non-office)	5-star minimum (office)	6-star minimum (non-office)	6-star minimum (office)

What projects must demonstrate

- Upfront carbon is measured against an NZGBC reference building; which unless specific design initiatives have been undertaken to change the structural system, looks the same as the proposed building.
- For low-carbon material sourcing, the project must demonstrate the GWP is lower (on average) than the NZGBC 'baseline' GWP values provided in the Embodied Carbon Methodology (v2.0) document.
- Demolition of any existing building under 50 years old must be offset.
- Contractor must collect 80% of material quantities and sourcing by cost - procurement evidence is a compliance obligation, not a nice-to-have.

Upfront Carbon Emissions credit — points ladder

Points	Reduction
ME	10%
1	15%
2	20%
3	26%
4	31%
5	38%
6	45%
7	50%
8	53%

Current Market - Low-carbon concrete in New Zealand

Low-carbon concrete is mainstream in NZ — all major suppliers now offer reduced-GWP ranges nationally, with deeper Supplementary Cementitious Materials (SCMs) mixes available on a project basis.

Main Supplier Options

- Firth – EcoMix+. Uses Golden Bay cement and SCMs up to 30% replacement (Fly Ash), 60% replacement (GGBS).
- Holcim – ECOPact. Nationally available, using imported SCMs (GGBS) up to 60% replacement.
- Allied – Ecrete. Nationally available, uses imported GGBS up to 60% replacement.
- Higgins – SustainEcrete. Regionally available in North Island, FA or GGBS mix up to 60% replacement.
- Stevenson – range of options including FA. Auckland.

Pricing Considerations

- Rule of thumb, 2% cost increase per 10% reduction.
- Costs will escalate where SCMs need to be combined with specialized admixtures, e.g. for rapid set time in time-critical elements.
- Concrete NZ issuing a guide shortly.

Performance Considerations

- Slower early strength gain affects cycle times, formwork stripping and post-tensioning programmes – critical for precast elements and jump-form elements
- Plastic shrinkage cracking in large high-performance slabs can be difficult to manage with SCMs above 10% replacement

Indicative GWP benchmarks (kgCO2e / m3)

Mix	GS Baseline	30% reduced target
25 MPa	274	192
30 MPa	297	207
35 MPa	325	227
40 MPa	352	246

Practical constraints to plan for

- SCM supply is unlikely to be a major constraint given stockpiles of GGBS available, however high-replacement mixes may need early booking.
- Availability thins outside main centres and for higher strengths (40 MPa+).
- Familiarity of concrete subcontractors with a high-SCM mix is important.
- Expect pushback on core walls, precast, and high-performance slabs. Plan for these elements to not be procured with low-carbon concrete if needed.

Sources: Firth, Holcim NZ, Allied, Higgins, Stevenson Concrete product literature; engagement with above suppliers as of July 2026.

Current Market - Low-carbon reinforcing in New Zealand

Low-carbon reinforcing has long been a cost-effective reduction mechanism. With the NZ Steel Glenbrook electric arc furnace, low- and super-low-carbon reinforcing will be even more readily available.

Indicative GWP benchmarks (kgCO2e / kg)

Product	GS Baseline	Achievable max target
Reinforcing bar	3.65	0.5
Mesh	3.65	0.5*

**Pacific Steel EPDs are published for products not yet on the market (EAF billet from late 2026) - treat availability and pricing as programme risk until supply is confirmed.*

What this means for specification on projects

- A GWP target around 1.6 kgCO2e/kg is a realistic 'basic' target today; met by many imported products and from late 2026 the standard Pacific Steel product.
- Alternative reinforcing products – post-tensioning bar, fibre reinforcing – also have widely variable GWP. Fibre reinforcing ranges from 1-2 kgCO2e / kg, PT bar similar. Specifiers should be aware of the relative proportion of these products when estimating savings.
- Specifications cover A1-A3, note that imported products will increase transportation emissions somewhat (A4) – projects may choose to specify a combined A1-A4 target instead.

Availability and pricing

- Locally made: Pacific Steel (Auckland), billet from NZ Steel Glenbrook — EAF product coming to market in late 2026. No cost uplift on standard product, anecdotal 5% uplift on DCRB (super-low-carbon) product.
- Imported: multiple sources with verified EPDs, widely used on current projects – NatSteel, Hyundai, Infrabuild (slightly higher), plus European products.
- Currently, low-carbon reinforcing is available at market rates with sufficient notice (~6 weeks). At short-notice, this typically incurs cost uplifts due to depletion of ready stock, however there is no inherent additional cost yet.
- Suppliers have noted that the expectation is for cost of low-carbon reinforcing to start to incur a premium, as demand outstrips supply.

Sources: NatSteel EPD, Pacific Steel EPD (EPD Australasia), Hyundai Steel EPD; NZGBC Embodied Carbon Methodology

Current Market – Low-carbon structural steel

Hot-rolled sections are entirely imported, so low carbon is a sourcing decision; welded sections are a mix of imported and NZ-made plate, where the upcoming NZ Steel EAF will create a step-change in available reduction.

Hot-rolled sections

- 100% imported; no NZ hot-rolled section mill
- Green Star baseline 1.9 kgCO2e/kg; lower targets such as 1.0 or 1.5 are readily achievable with no price uplift
- Lowest-GWP supply comes from Tung Ho (Taiwan) and Siam Yamato (Thailand) with verified EPDs.
- Watch lead times, section availability and A4 transport when chasing the lowest GWP options

Welded sections and plate

- Locally made: NZ Steel Plate, custom-welded from various steel fabricators using this plate, or Steltech, can use super-low-carbon plate.
- Imported: GRP (Indonesia) supplies welded sections below GS baseline at ~2.4 kgCO2e / kg, European suppliers at 1.0 kgCO2e / kg.
- Fewer verified EPDs for welded sections, rule of thumb add 0.3 kgCO2e to plate GWP value for equivalent welded section.

Indicative structural steel GWP benchmarks (A1-A3, kgCO2e / kg)

Product	GS baseline	Achievable max target
Hot-rolled section (imported)	1.9	0.7
Welded section	3.41	~1 (DCRB*)
Plate steel	3.14	0.641 (DCRB*)

**Pacific Steel EPDs are published for products not yet on the market (EAF billet from late 2026) - treat availability and pricing as programme risk until supply is confirmed.*

Considerations

- Max target will restrict supply, depending on importer may apply price uplift.
- Will be a limited supply of DRCB product, and anecdotally at a 5% premium to standard.
- Easier and cheaper to procure low-carbon hot-rolled sections.

Sources: Bluescope NZ Steel EPD, GRP EPD, Tung Ho EPD, Siam Yamato EPD; supplier engagement; NZGBC Embodied Carbon Methodology

Current Market - Mass timber sourcing in New Zealand

NZ has domestic CLT and glulam manufacturing supported by a large plantation resource. Imported products are also available which provide a cost-competitive market.

Main supplier options

- Carter Holt Harvey – LVL, sawn timber, NZ made, EPD.
- Red Stag Timberlab – CLT, LVL, Glulam, NZ made, EPD for CLT and sawn timber.
- Nelson Pine – LVL, NZ made, expired EPD.
- Prolam – Glulam, NZ made, EPD.
- Techlam, Prolam, HTL – glulam, NZ made, no EPD.
- XLAM – CLT, made in Australia, EPD.
- Stora Enso, Hasslacher – CLT, made in Europe, EPD.

Pricing considerations

- NZ-sourced CLT anecdotally higher price than imported alternatives.
- Highly variable and fluctuates based on market demand
- Published sustainability and EPD data

Performance considerations

- Long-term performance of untreated mass timber unclear in NZ
- Long spans significantly drives up member sizes.
- Fire engineering design requires close collaboration and strategic alignment.

Product	GS baseline	Achievable GWP
CLT (H1.2)	290	63
Glulam (H1.2)	150	150
LVL (H1.2)	130	91
Sawn timber (H1.2)	60	34

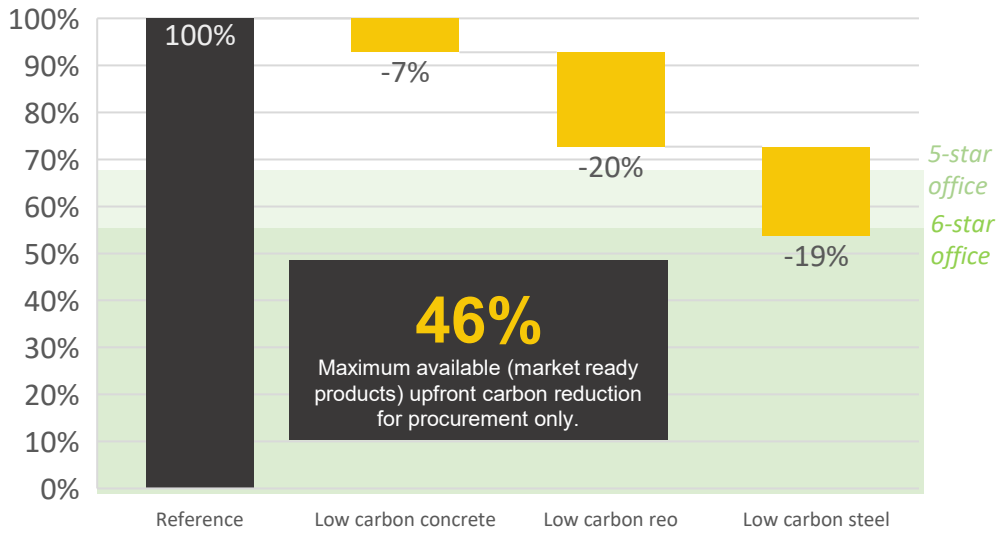
Practical constraints to plan for

- Not all councils will accept untreated mass timber –imported European timber requires early engagement of compliance officers.
- Likely most surfaces and elements encapsulated with fire stopping materials – limiting visible surfaces and biophilic benefits.
- Designing for mass timber generally requires accepting more internal columns

Sources: XLam, Red Stag TimberLab and Techlam published information; Beca structural engineering guidance

Pathway 1: low-carbon procurement

Holding the design fixed and buying the best market-ready products across concrete, reinforcing and steel delivers the largest reduction available without changing the structure – up to a current maximum of 46%.



The procurement levers

- Concrete: SCM mixes at 30% below baseline across all grades, all elements
- Reinforcing: Product at ~0.5 kgCO2e / kg (DCRB, NatSteel, Hyundai or various Europe)
- Structural steel: Hot-rolled at 0.7 kgCO2e / kg average, welded at 1.0 kgCO2e / kg average, plate at 0.65 kgCO2e / kg average.

Expected outcome

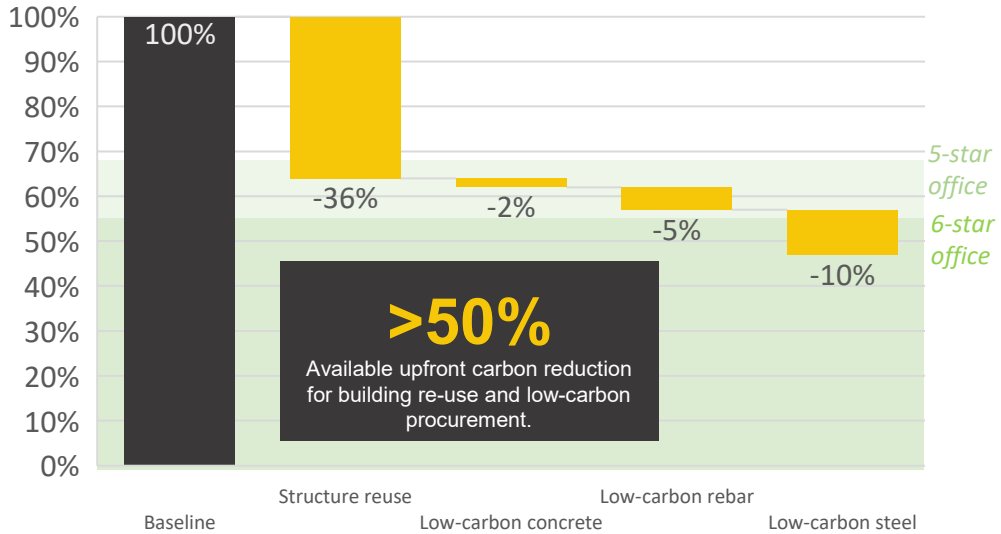
- With diligent procurement, 6-star for office building is achievable using current market-available products.
- Cost uplift expected of 5-10% across key materials (not total build cost).
- Constructability challenges will arise across time-critical elements like precast and core walls.

** We note these are not the only materials which can deliver a lower-carbon outcome through procurement. Aluminium, glass, cladding, cold-formed steel, and fit-out materials can all contribute to additional reductions.*

Illustrative envelope from Beca embodied carbon modelling and current supplier data

Pathway 2: building reuse plus low-carbon procurement

Retaining substructure, frame or core can avoid significant emissions; then the same procurement levers can be applied to everything that is new. This can provide over 50% upfront carbon reductions.



Where the saving comes from

- Retained structure will avoid the most carbon-intensive elements. Benefits depend on the extent of retained building; this could range from 10-50%.
- Green Star also requires demolition of buildings under 50 years old to be offset - reuse avoids that penalty

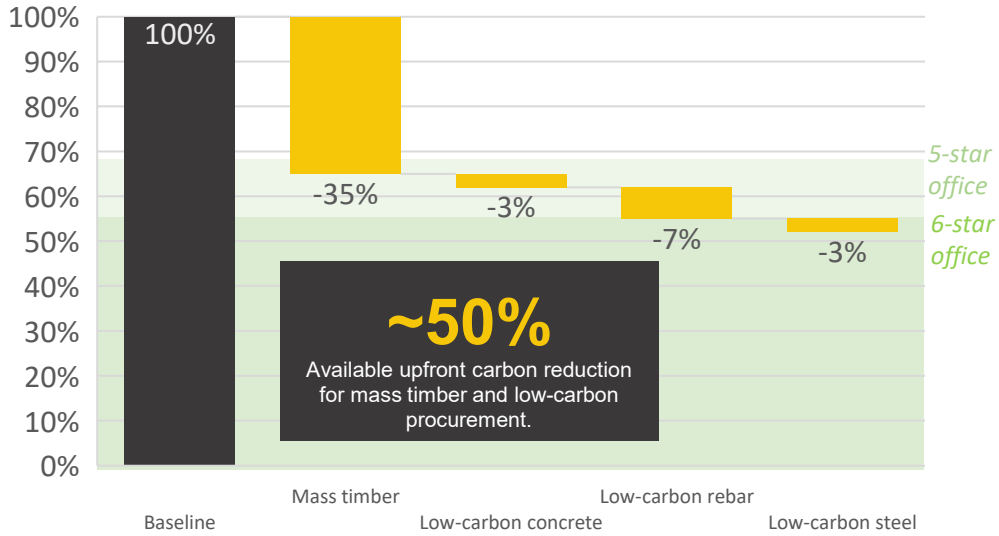
Expected outcome

- Partial reuse plus procurement can reach >50% reduction – sufficient for 6-star office building
- Only available where a suitable existing structure and seismic capacity exist
- Needs early due diligence: condition, capacity, and a realistic strengthening scope

Sources: Beca project modelling; MBIE Research report: Understanding potential avoided upfront carbon emissions through strengthening of seismically-deficient buildings

Pathway 3: mass timber and low-carbon alternatives for other materials

Substituting the structural system with mass timber frame and floors, combined with low-carbon choices across the remaining materials, can provide reductions of around 50%.



Where the saving comes from

- CLT floors and LVL or glulam framing replacing concrete and steel.
- Reinforced concrete foundations with low-carbon materials, secondary steel and connection steel with low-carbon materials.
- Lighter building typically reduces foundation size.

Expected outcome

- Mass timber plus procurement reaches up to 50%, enough for 6-star office buildings.
- May require compromises around timber visibility, vibration and acoustic performance, grid layouts
- Cost highly dependent on supply, has been priced anywhere from cost neutral to 30% uplift.

Sources: Beca structural carbon models; NZGBC Embodied Carbon Methodology; supplier EPD data

Conclusions: 6 Star is achievable via multiple pathways

There are multiple pathways available for project to reach a 6 Star upfront carbon requirement, and not just via building reuse or mass timber. Using products and technologies that are market-ready in New Zealand today.

Pathway	Available reduction	Upfront carbon points	Key dependency
1. Procurement only	~45%	5-6	SCM and low-GWP steel supply volumes
2. Partial reuse + procurement	>50%	4-8	A suitable existing structure
3. Mass timber + procurement	~50%	4-8	System choice locked in at concept stage

What this confirms

- 5 Star is comfortably achievable through procurement alone on all typologies assessed
- 6 Star is achievable on every pathway. Reuse and mass timber provide the widest margin, costs start to appear for procurement.
- The NZ Steel EAF is the single biggest market-wide shift, lifting both reinforcing and plate steel performance from 2026

What projects should do now

- If 6-star is sought, make sure the supply pathways for low-carbon products are set up for success with earlier supplier engagement. The products are there, access will be the constraint.
- Set GWP targets in specification after modelling specific building to make sure the expected reductions will be met.
- Test reuse and mass timber options at feasibility or concept stage, when the most cost-optimal solution can be found.
- Note that further reductions are available through aluminium, glass, cladding, and fit-out materials to provide compliance margin.

Indicative outcomes based on Beca embodied carbon modelling and current NZ supplier data

This document is intended to provide information on the practical achievability of recently increased upfront carbon targets in the NZGBC's Green Star Buildings framework.

The research and opinions contained in this document are provided for information only and are general in nature. Beca does not assume responsibility for the use of, or reliance on this report.

Professional advice should be sought when assessing carbon emissions for project specific design and procurement decisions, or as a means of compliance with performance-based frameworks.

For further discussion on the findings in this document, or for project specific advice, please get in touch.

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