

Low-Carbon Concrete: 7 EPD Checks for Architects

A low number is useful only when its boundary is clear. This seven-check method helps architects compare concrete EPDs fairly and carry a carbon target from concept to delivery.

By World Arch Journal · 2026-10-07

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Project file

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“Low-carbon concrete” is not one recipe and an Environmental Product Declaration is not a universal scorecard. An EPD reports environmental information for a stated product, unit, geography, time period and set of life-cycle modules. It can make procurement more transparent, but it does not automatically prove that one mix is structurally equivalent, locally available or lower impact across an entire building.

The distinction matters more in 2026. The Global Cement and Concrete Association has

low-carbon ratings that classify concrete by reported global-warming
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gth. The framework is a useful common language, yet the design team still

has to compare like with like, protect technical performance and document what was actually supplied. The seven checks below turn a marketing claim into a reviewable architectural decision.

The quick answer

Check	What the EPD may establish	What it cannot establish alone
Declared unit	The basis for the reported result, often kg CO ₂ e per m ³ for concrete	That two differently defined results are comparable
Strength and performance	The product or family covered by the declaration	That the mix meets the project's structural, durability and finish brief
Life-cycle modules	Which stages are included in each reported value	Impacts outside the declared boundary
Geography and plant	The production data and market represented	The exact delivery distance or site practice unless those are included
Verification and validity	Whether the declaration follows a programme and third-party review	That the document is current for the supplied product
Calculation rules	The standard and product-category rules used	Direct comparability when rules or assumptions differ
Whole structure	A product-level input for life-cycle assessment	Whether the building uses the least material for the required service

1. Match the declared unit

Start with the denominator. Ready-mix concrete is commonly reported per cubic metre; cement may be reported per tonne. A project team can create a dramatic but meaningless comparison by placing those values in the same spreadsheet without conversion. Even two cubic-metre values may describe different product families, production averages or characteristic strengths.

Write the comparison basis at the top of the schedule before collecting numbers. For concrete, that basis should normally identify volume, specified strength, exposure or durability requirements, intended application and the life-cycle modules being reviewed. If a supplier offers only a broad industry-average EPD, label it as such. Product-specific and plant-specific declarations may provide more relevant evidence, but only when the actual order matches their stated coverage.

The GCCA's 2026 rating system is helpful because it uses global-warming potential in kilograms of CO₂ equivalent per cubic metre and evaluates it in relation to concrete strength. It does not remove the need to read the declaration. A rating simplifies communication; the EPD and project records provide the audit trail.

2. Hold strength and performance constant

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Carbon should not be lowered by quietly changing the job the material must do. Compare alternatives that satisfy the same verified structural, fire, durability, workability, curing and architectural-finish requirements. A mix for a lightly loaded internal element is not a fair benchmark for a marine exposure, a transfer structure or a fast-cycle precast operation.

At the same time, do not freeze unnecessary constraints. Very high early strength, narrow cement-content limits, an assumed percentage of supplementary cementitious material or a cosmetic colour requirement can reduce the supplier's room to optimise a mix. MECLA's low-carbon concrete guide recommends setting an embodied-carbon target while maintaining technical performance, and warns against relying only on a prescribed percentage of cement replacement. That is a useful international principle even though its compliance references are Australian. Embodied carbon is, after all, only one side of the ledger that net zero architects must balance against operational energy.

The best specification separates outcomes from means. State the required performance, define the carbon metric and boundary, then invite compliant proposals. Let the structural engineer, contractor and supplier review programme and testing implications early enough for trial mixes. A lower-carbon option discovered after the formwork cycle has been fixed may be rejected because the programme cannot absorb a different strength-development curve.

3. Read the life-cycle boundary

The headline global-warming-potential number may cover only product stages A1–A3: raw-material supply, transport to manufacturing and manufacturing. Another declaration may also report transport to site, construction, use, demolition, waste processing or potential benefits beyond the system boundary. Adding unlike columns produces false precision.

For an early product comparison, A1–A3 can be a disciplined common boundary. It captures major production impacts and is often the most consistently available dataset. But it is not the whole project. A distant mix with a good plant-stage result may lose part of its advantage through delivery. Waste, temporary works, rejected loads, curing, service life and end-of-life assumptions can also matter.

Record each module separately rather than merging everything into one unlabelled number. If a study uses A1–A5, say so every time the result is shown. If module D is reported, keep it visible as a scenario beyond the product system rather than automatically subtracting a future benefit from present emissions. The boundary diagram below is deliberately qualitative: the correct numerical scope depends on the project, methodology and jurisdiction.

4. Check geography, plant and supply route

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Concrete is local in a way that many finish products are not. Aggregate sources, cement chemistry, electricity, transport, plant efficiency and available supplementary materials vary by region. An EPD based on a national average may be suitable for a concept baseline but weak evidence for a plant-specific procurement claim.

Ask four direct questions: Which plant or plants are represented? What production period underlies the data? Does the product family include the proposed mix? How will the delivery distance and mode be treated? If the answer changes between tender and construction, the carbon calculation should change too.

Regional availability is not a footnote. MECLA notes that achievable reductions can vary between metropolitan and remote areas and between ordinary and specialist applications. A responsible target therefore combines ambition with a documented market test. The point is not to excuse a high-impact option; it is to prevent a global benchmark from becoming an impossible local instruction.

5. Verify date, programme and third-party status

An EPD has a publication date, validity period, programme operator and verification statement. Confirm all four. A polished PDF hosted on a product page is not necessarily current, independently verified or applicable to the item being ordered. Save the exact declaration used for the decision rather than only a hyperlink that may later change.

Look for the declared standard, product-category rules, verifier, registration number and expiry date. Check whether the document is product-specific, plant-specific, manufacturer-average or industry-average. None of those categories is inherently dishonest; they simply answer different questions. Label the evidence correctly in the design model and tender return.

At handover, reconcile the proposed product with delivery tickets, approved substitutions and final quantities. The design-stage EPD remains useful, but it should not be presented as an as-built result if the supply changed. Evidence quality is part of the architecture because it connects the published intention to the physical material.

6. Check the standard and calculation rules

EPDs are produced under standards and product-category rules that define data, allocation and reporting conventions. Two valid declarations can still differ in ways that limit direct comparison. Review whether the same generation of rules, indicators and module definitions has been used. Where the programme operator provides comparison guidance, follow it.

[Skip to main content](#) Carbonation, recovered fuels, recycled content, allocation of industrial by-products and end-of-life scenarios can be treated differently across datasets and standards.

Concrete also absorbs some carbon dioxide through carbonation over time, but that process does not erase production emissions. If a claim includes uptake, state the method, timing and life-cycle module; do not convert it into the phrase “carbon neutral” without a complete, verified basis.

Architects do not need to become life-cycle-assessment auditors, but they do need to recognise a boundary mismatch and involve a competent specialist when the decision is material. The same discipline applies across the mass-timber specification process: a material label is less useful than a transparent, comparable dataset.

7. Test the whole structure, not only the mix

A lower-impact cubic metre can still create a higher-impact building if the design needs substantially more of it. Conversely, a higher-strength or post-tensioned system may use less total concrete and produce a lower structural total. MECLA makes this distinction directly: the real aim is a low-carbon structure, not merely a low-carbon product.

Begin with the highest-leverage questions. Can an existing structure be retained through adaptive reuse? Can spans, grids, loads or basement depth be reduced? Can the same brief be met with less floor area or fewer transfer elements? The AIA–Carbon Leadership Forum toolkit places reuse, building less, lighter design, material substitution and lower-carbon procurement in a sequence for good reason. Product optimisation should follow, not distract from, structural efficiency.

Measure both intensity and quantity. Track kilograms of CO₂ equivalent per declared unit, but also multiply by realistic quantities and compare complete structural options. Keep structural service life, robustness and future adaptability in view. A small numerical win that shortens service life or makes future change impossible is not automatically responsible.

Turn EPD evidence into procurement

The most credible low-carbon concrete strategy is a chain of decisions rather than a paragraph in a sustainability report. Establish a baseline at concept stage. Set a project-specific limit or reduction target with the structural and life-cycle teams. Market-test it with suppliers. Define acceptable evidence and the procedure for substitutions. Allow trial mixes and mock-ups where appearance, finish or programme is sensitive.

During tender, request the EPD, proposed plant, mix reference, declared unit, strength class, relevant durability characteristics, life-cycle modules and stated GWP. Ask bidders to identify assumptions rather than hide them. During construction, require approval before a change to

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plant or mix and keep records of delivered quantities. At completion, distinguish design, tender and as-built results.

The site photograph in this feature is an editorial illustration, not proof of a specific product. It shows the real coordination problem: a surface, sample, structural requirement and carbon dataset have to agree. The same approach should be carried into the project's BIM information workflow without turning a provisional figure into a fixed truth.

A one-page architect's low-carbon concrete brief

1. **Define the element and outcome.** Record application, quantity, structural and durability requirements, finish and programme.
2. **Set the comparison basis.** State declared unit, life-cycle modules, strength and geographic relevance.
3. **Establish the baseline.** Name the dataset, date and assumptions; do not use an invisible "typical mix."
4. **Set a measurable target.** Use a maximum GWP or project reduction method reviewed by the responsible specialists.
5. **Request verified evidence.** Require a current EPD and confirm its programme, scope and product coverage.
6. **Engage the supply chain early.** Test availability, trial-mix needs, curing, finish, cost and programme.
7. **Protect the target through change.** Define how substitutions are evaluated and approved.
8. **Reconcile delivery.** Use final quantities and accepted product records to report the as-built position honestly.

The useful question is not "Is this concrete green?" It is: *lower than what, for the same job, across which boundary, based on whose verified data, and was that product actually delivered?* When those answers stay attached to the number, an EPD becomes a design and procurement instrument rather than a badge.

Continue exploring: specification numbers only matter when they reach the drawing — our 30 September briefing is devoted to measuring what buildings claim, and the material library publishes the surface data behind our own product studies.

From the library: Concrete was already an architectural material two thousand years ago — read Ancient Rome, Book XX of the Architectural History Series, free to read online, on the builders who cast it at imperial scale.

Read the boundary before the number

ONE PRODUCT · DIFFERENT ACCOUNTING WINDOWS

A1–A3

PRODUCT STAGE

Raw materials
Transport to plant
Manufacturing
Common comparison boundary

A4–A5

DELIVERY

Site distance
Placement
Waste

B

USE

Maintenance
Repair
Service life

C + D

AFTER USE

Demolition
Processing
Benefits beyond

Compare products only when the declared unit, strength, geography, date and life-cycle modules align.

FIG. 02 · READ THE DECLARED LIFE-CYCLE BOUNDARY BEFORE COMPARING GWP VALUES · ORIGINAL WORLD ARCH JOURNAL DIAGRAM, 2026.



FIG. 03 · SAMPLE, PERFORMANCE BRIEF AND ENVIRONMENTAL DATA MUST REFER TO THE SAME PROPOSED MATERIAL · ORIGINAL AI-ASSISTED EDITORIAL ILLUSTRATION, 2026.

Seven checks before “lower carbon”

LIKE-FOR-LIKE OR NOT COMPARABLE

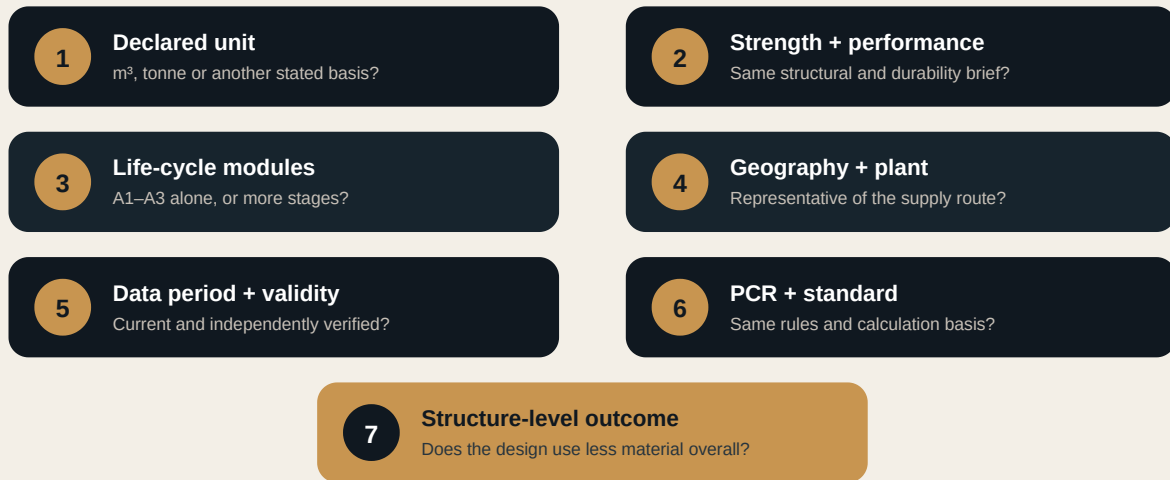


FIG. 04 · SEVEN LIKE-FOR-LIKE CHECKS FOR CONCRETE EPD REVIEW · ORIGINAL WORLD ARCH JOURNAL DIAGRAM, 2026.

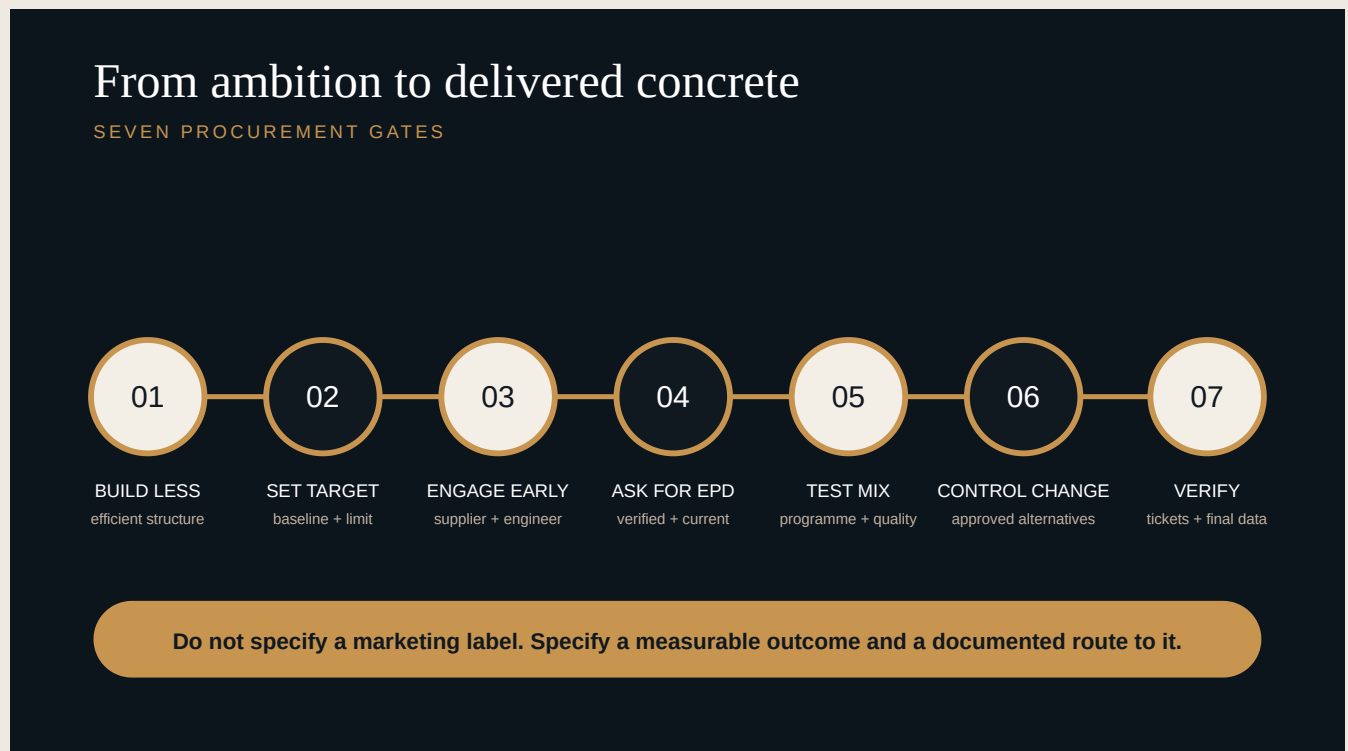


FIG. 05 · CARRY THE CARBON INTENT FROM CONCEPT TO DELIVERY · ORIGINAL WORLD ARCH JOURNAL DIAGRAM, 2026.

Frequently asked questions

- Does an EPD prove that concrete is low carbon?
 - Can two concrete EPD numbers be compared directly?
 - Should architects specify a cement-replacement percentage?
 - Is the lowest GWP per cubic metre always the best structural choice?
- ↖ (environmental product declaration)?
Skip to main content mean in a concrete EPD?

Evidence and source notes

1. Global Cement and Concrete Association — Introduces 2026 global low-carbon ratings for concrete based on GWP per cubic metre and concrete strength, using EPD-reported data.
2. Materials and Embodied Carbon Leaders' Alliance — Recommends verified EPDs, outcome-based targets, early supply-chain engagement and whole-structure thinking.
3. AIA and Carbon Leadership Forum — Organises embodied-carbon reduction strategies around reuse, building less, system choices, procurement and measurement.
4. NSW Government — Provides a worked public-sector approach to lower-carbon concrete requirements and procurement guidance.
5. Global Cement and Concrete Association EPD Tool — Explains EPD generation, verification and use for cement and concrete reporting.
6. International Energy Agency — Tracks cement-sector emissions and decarbonisation pathways in the wider energy transition.

Related architecture stories

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A carbon budget treats a building's CO₂ like its construction budget: fixed early, tracked relentlessly, and defended against every design change. How architects set the number, calculate it, and hit it.

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