

Embodied Carbon Guidelines

UBC Addendum to the National wbLCA Practitioner's Guide

Version 2

About this update: UBC Embodied Guidelines v2

Since V1.1 of the UBC wbLCA Guidelines was published, significant evolution has occurred in the sphere of whole building Life Cycle Assessment (wbLCA). Key to this was that the National Research Council Canada published the National Whole-building Life Cycle Assessment Practitioner's Guide (2024)¹, based on Version 1 of the City of Vancouver's Embodied Carbon Guidelines. Consequently, this version of the UBC Embodied Carbon Guidelines is an addendum to the National Whole-building Life Cycle Assessment Practitioner's Guide which focuses only on UBC-specific assumptions, additional guidance, and compliance requirements to be used to demonstrate compliance with the embodied carbon requirements of UBC policies and programs.

The National Research Council Canada's (NRC) National Whole-building Life Cycle Assessment Practitioner's Guide (2024) are referred to as the "National wbLCA Practitioner's Guide" in this document.

The National wbLCA Practitioner's Guide and its referenced standards serve as the normative standard for compliance with UBC's policies.

Where there are differences between the National wbLCA Practitioner's Guide and this addendum, the provisions of this addendum shall apply.

Section	Key Additions to the National wbLCA Practitioner's Guide				
Section 2: Compliance	 UBC-specific Absolute Embodied Carbon Intensity value of 400 is provided to calculate the Embodied Carbon Benchmark using the Intensity Limit pathway. Intensity Limit is specified to be based on GFA. 				
Section 3: Specification of the Object of Assessment and Life Cycle System Boundary	 Cradle-to-grave life cycle boundary is specified to be used for the UBC requirements. Additional Environmental Impact indicators are specified to be calculated alongside Embodied Carbon 				
Section 4: Quantifying Embodied Carbon	 Short-Cycle Biogenic Carbon is defined and allowed to be optionally accounted for compliance. Acceptable wbLCA and embodied carbon assessment software tools and additional tool-specific guidance is provided. 				
Section 6: Documentation	UBC-specific documentation submission requirements are outlined.				

Table I: Summary of Key Additions to the National wbLCA Practitioner's Guide within this UBC Addendum

¹https://nrc-publications.canada.ca/eng/view/ft/?id=533906ca-65eb-4118-865d-855030d91ef2

Background and Context

UBC's Climate Action Plan (CAP) 2030² sets targets and actions toward zero operational emissions (scope 1 and 2) across the UBC institutional campus by 2035. The targets also include greenhouse gas emissions reductions for extended impact areas (scope 3), aligned with IPCC targets to keep human caused warming to 1.5°C.

In UBC's Climate Action Plan for both campuses, the specific target set for embodied carbon in institutional buildings is "to establish a baseline and align new building and renewal designs with a 50% reduction target." In order to achieve this target, incremental reductions in embodied carbon will be introduced over the years as shown in the policy pathway in Figure 1 below.



Figure 1: Incremental Embodied Carbon Reduction Targets from the UBC Climate Action Plan 2030

Complementing CAP 2030, UBC's Neighbourhood Climate Action Plan³ (NCAP) sets a pathway to a net-zero and climate resilient community for the residential neighbourhoods on the Vancouver campus. NCAP establishes a target of 10% reduction in embodied carbon for new residential construction in 2025 and a goal of achieving a 40% reduction by 2030.

² <u>https://planning.ubc.ca/cap2030</u> 3 https://planning.ubc.ca/cap2030

³ <u>https://planning.ubc.ca/ncap</u>

Application

The primary application of this addendum is for demonstrating compliance with UBC's Institutional Energy & Carbon targets⁴ and UBC's Residential Environmental Assessment Program (REAP)⁵, as well as any other applicable policies and programs. The following projects are required to perform wbLCA and achieve reductions in embodied carbon:

Institutional Buildings (Vancouver + Okanagan)

- Tier 1 and Tier 3a projects >1,000 m2: core and ancillary projects, student residences.
- In some cases, UBC Campus Planning will confirm a specific embodied carbon target or pilot target in the project.

Neighbourhood Buildings (Vancouver Only)

- Tier 1A: New multi-unit residential buildings or mixed-use/residential projects >1000m2.
- Tier 1B: Institutional buildings >1000m2.

The guidelines may also be used:

• To provide other projects with a framework to report or reduce embodied carbon in construction.

Where uncertainty exists, applicants should consult with UBC Campus Planning staff to confirm the applicability of embodied carbon requirements.

⁴ https://planning.ubc.ca/sustainability/sustainability-action-plans/green-building-action-plan/institutional-building-requirements/institutional-energy-andcarbon-targets

⁵ https://planning.ubc.ca/sustainability/sustainability-action-plans/green-building-action-plan/residential-building-requirements/residential-environmentalassessment-program-reap-40

Additions to National wbLCA Practitioner's Guide

Note:

Within this addendum, the following format is used to locate and present additions to the National wbLCA Practitioner's Guide.

Section number (where applicable) - Page number Section Path (E.g., Section > Sub-Section(s)) of the additions within National wbLCA Practitioner's Guide

Text to be added to the National wbLCA Practitioner's Guide.

Page 3

Definitions and Acronyms > Definitions

Short Cycle Biogenic Materials are biogenic materials from agricultural or forestry crops with a natural growing life cycle of 10 years or less, as well as biogenic materials from waste streams, salvage, or forestry residues.

Section 2.1 (a) (ii) - Page 9

Compliance > Calculate the Embodied Carbon Benchmark > Intensity Limits > Based on Gross Floor Area (GFA)

The Intensity Limit compliance pathway shall be based on the Gross Floor Area (GFA).

The following Absolute Embodied Carbon Intensity (*ECI*) value shall be used to determine the Embodied Carbon Benchmark (*EC*_{BM}):

$ECI = 400 \text{ kgCO}_2 \text{e}/\text{m}^2$

The ECI value (400 kgCO₂e/m²) pertains to the required scope of the object of assessment, as specified in Section 3. This value is based on data collected from embodied carbon submissions for the City of Vancouver rezoning requirements from 2017 to 2023. As more data is collected, the value may be refined to reflect new data, different building types, or other important variables in wbLCA.

Note:

The embodied carbon benchmark calculated from the intensity path is independent of the parkade area, and two buildings with the same GFA will have the same benchmark regardless of the size of the parkade.

Since all the structure is included in the object of assessment, as specified in Section 3.3 of the National wbLCA Practitioner's Guide, a building with less parkade structure will find it easier to meet the benchmark and the resulting limit compared to a building with more parkade structure. See Figure 1 for an example of the areas included in object of assessment and areas included in calculating GFA.



Figure 1: Areas Included in Gross Floor Area and Object of Assessment

By comparison, the baseline path provides more flexibility with respect to parking than the intensity path. This is consistent with the intent of the baseline path – while more complicated, it removes many variables from compliance considerations, such as parking, height, soil conditions, shape, overall material efficiency, and more.

Section 2.4 - Page 11 Compliance > Determine Compliance

The Embodied Carbon Design Report, which is one of the documentation requirements, automatically calculates the embodied carbon benchmark, limit, and determines compliance using the user inputs and the formulas in National wbLCA Practitioner's Guide and this document.

Section 3.2 (a) - Page 12

Specification of the Object of Assessment and Life Cycle System Boundary > Life Cycle Stages

Embodied carbon and the other four core TRACI v2.1 indicators⁶ & non-renewable primary energy shall be calculated using a cradle-to-grave life cycle boundary per Section 3.2 (a).

Module D shall not be included in the embodied carbon calculations used for compliance. However, embodied carbon from Module D **shall** be calculated and reported separately.

Section 3.3 - Page 13 Specification of the Object of Assessment and Life Cycle System Boundary > Building Elements

Users *are encouraged* to include some or all the optional elements in the scope of assessment when demonstrating compliance using the baseline approach, although their inclusion is not mandatory. If any optional scopes are included for demonstrating compliance, the scope of the proposed design and the baseline must be the same, and must expand the scope of assessment to include one or more building element categories in their entirety – see the **Addition to Table 4** for details.

If any optional scopes are included for compliance purposes, the embodied carbon emissions and percentage reduction achieved shall be reported both with and without the optional scopes in the spaces provided in the Embodied Carbon Design Report.

Section 4.2 (b) (ii) - Page 18

Quantifying Embodied Carbon > Establishing a Bill of Materials > Completeness > Construction Documents Stage

Calculations made as part of a Building Permit application shall comply to the completeness level described in this section.

Section 4.3 (a) - Page 21

Quantifying Embodied Carbon > Embodied Carbon Quantification > Software Tools

The default accepted wbLCA and embodied carbon assessment software tools and the criteria for accepting other tools are provided below. Users must use the latest version of the tool available, provided they remain in compliance with the National wbLCA Practitioner's Guide. Projects may use different tools for applications made at different stages of a project (Building Permit / 90% Construction Documentation, Occupancy Permit; See *Table II* below). However, the same tool must be used for both the proposed design and the baseline within a single application stage.

⁶ The other four core TRACI v2.1 Indicators are: **acidification potential** (kg SO2 eq.), **eutrophication potential** (kg N eq.), **photochemical smog potential** (kg O3 eq.), and **ozone depletion potential** (kg CFC-11 eq.) as defined in the National Research Council's National Guidelines for Whole-Building Life Cycle Assessment: https://nrc-publications.canada.ca/eng/view/ft/?id=f7bd265d-cc3d-4848-a666-8eeb1fbde910

Section 4.3 (a) (ii) - Page 22

Quantifying Embodied Carbon > Embodied Carbon Quantification > Software Tools > Construction Documents Stage

Default Accepted Tools

The following are the most common tools used in North America and are accepted for compliance with wbLCA requirements:

- 1. Athena Impact Estimator for Buildings⁷
- 2. tallyLCA⁸ (formerly known as Tally)
- 3. One Click LCA⁹

Other Tools

If other tools are used, the user must ensure that the tool and its databases align with the sections of the National wbLCA Practitioner's Guide specified under "Other Tools" in the notes to Section (ii) Construction Documents Stage above, as well as the following:

- Allows using bill of materials with the completeness level specified in Section 4.2 (b) (ii) of National wbLCA Practitioner's Guide,
- Is available for public use, and
- Uses the same databases and exports raw data in the same format as one of the "Default Accepted Tools" listed above.

Note:

Some tools, such as EC3 and tools that use the EC3 database, display Uncertainty-Adjusted GWP (uaGWP) values by default. The "Reported GWP" embodied carbon results shall be used instead of the uaGWP values in submissions.

Section 4.3 (c) - Page 23

Quantifying Embodied Carbon > Embodied Carbon Quantification > Assumptions, Data Modifications, and Manual Calculations > Material Type and EPDs

If the user modifies the default embodied carbon results from the software tool used to incorporate EPDs that are not available in the tool, the user shall ensure the EPD used complies with the standards listed in Appendix A.1 (c) of NRC wbLCA Practitioners Guide and note the substitutions in the Embodied Carbon Design Report.

If a software tool does not allow selecting specific EPDs, such as Athena Impact Estimator and tallyLCA, it is acceptable to demonstrate embodied carbon reductions through specifying low-carbon products by either submitting additional calculations of the reduction achieved outside of the default accepted software tools (either calculated

⁷ https://calculatelca.com/software/impact-estimator/

⁸ <u>https://choosetally.com/</u>

⁹ <u>https://www.oneclicklca.com/construction/life-cycle-assessment-software/</u>

manually or via GWP-only tools such as bimCAT¹⁰ (formerly known as tallyCAT) or Embodied Carbon in Construction Calculator¹¹(EC3)) or by replacing the tool default GWP with that specified in the project documents. Additionally, if showing compliance via the baseline path (Section 2.1 (b) of the National wbLCA Practitioner's Guide) and the GWP in the tool for that particular product does not match the industry-wide EPD, the baseline shall also be modified outside the software tool to replace the GWP of that product with the industry-wide EPD.

If the tool default data is replaced with a specific EPD that only includes modules A1-A3, the user shall only replace modules A1-A3 of the specified product and not data from modules B and C. If the tool does not allow separating emissions by modules and products, the user may remove the GWP impacts from all modules for that product and manually replace it using A1-A3 emissions from the EPD and calculate emissions from A4, A5, B and C modules using estimates provided in Section 4.3 (c) (iii) of the National wbLCA Practitioner's Guide.

Table 2 (Page 24): Default Materials and Product Assumptions and EPD Selection

- Insulation, XPS: Examples of XPS products that are compliant with Canadian HFC regulations include Owens Corning FOAMULAR NGX, SOPREMA SOPRA- XPS, KingSpan GreenGuard LG XPS, and DuPont's ST-100 XPS.
- **Windows and Glazing:** In the baseline, all windows and glazing products shall be assumed to be non-dynamic (i.e., not electrochromic, thermochromic, etc.).
- **Steel Reinforcement (Rebar):** The user does not need to model recycled content in the rebar, as the CRSI EPD specifies the recycled-content steel, which is 98%.

¹⁰ <u>https://www.c-change-labs.com/bimcat/about</u> ¹¹ <u>https://www.buildingtransparency.org/tools/ec3/</u>

Section 4.4 (a) - Page 30 Quantifying Embodied Carbon > Treatment of Special Topics > Biogenic Carbon

Biogenic carbon stored in *Short Cycle Biogenic Material* products can optionally be included for determining compliance, using the following formula:

 $(EC_P - BioC_{SC}) \leq EC_L$

Wherein:

 $EC_P = Embodied \ Carbon \ of \ the \ Proposed \ Design \ (in \ kgCO_2e)$ $BioC_{SC} = Biogenic \ Carbon \ Stored \ in \ Short \ Cycle \ Biogenic \ Material \ products \ (in \ kgCO_2e)$ $EC_L = Embodied \ Carbon \ Limit \ (in \ kgCO_2e)$

The Embodied Carbon Design Report calculates the *Short Cycle Biogenic Material* eligible for compliance based on based on user input quantities. Biogenic carbon results from wbLCA tools can also be reported but shall not be used for determining compliance.

Section 6 - Page 40

Documentation

Vancouver Campus instructions:

The documents specified below shall be submitted to Development Services, Campus & Community Planning UBC Vancouver at the time of Building Permit submission.

• REAP projects shall submit as required in the REAP Reference Guide. Note that this may be at both Building Permit & Occupancy Permit submission if applying for relevant points in *M&R 1.2 Optimize Embodied Carbon.*

Okanagan Campus instructions:

The documents specified below shall be submitted to the Associate Director, Sustainability Operations, Campus Planning (Okanagan) at the point of 90% Construction Documentation submission.

The documentation requirements at different project application stages should be submitted as separate files, and are summarized in Table II below:

Table II: Summary of UBC Required Embodied Carbon Documentation

Required Documents	Building Permit / 90% Construction Documentation	Occupancy Permit
Required	 Embodied Carbon Design Report (in Excel and PDF format)¹² Raw data file(s) from embodied carbon or wbLCA tool (in Excel format)¹³ 	No Requirements
Required	• If any:	 If updated from BP / 90% CD (e.g. for REAP points):
(If Applicable)	 Manual calculations (in Excel format)¹⁴ 	 Embodied Carbon Design Report (in Excel and PDF format) Raw data file(s) from embodied carbon or wbLCA tool (in Excel format) Manual calculations (in Excel format), <i>if any</i>

¹² Large developments with multiple parcels must provide at least one embodied carbon design report as a part of the final phase for each parcel of the development.

¹³ Embodied Carbon Design Report Raw Data Submission Instructions: <u>https://priopta.notion.site/COV-Embodied-Carbon-Design-Report-Raw-Data-Submission-Instructions-44469d8b2adf4d21bf835d7a77f49a6d</u>

¹⁴ See Section 6.2 (a) (i) (page 41) of National wbLCA Practitioner's Guide <u>https://nrc-publications.canada.ca/eng/view/ft/?id=533906ca-65eb-4118-865d-855030d91ef2</u>

Appendix B (B.2) - Page B-3

Additional Information on the Specification of the Object of Assessment > Building Elements, Required and Optional Scope for Compliance > Table 4: Mandatory and Optional Element Scope for Compliance

The below Table expands on the element list provided in Table 4 of the National wbLCA Practitioner's Guide to show optional sub-elements that shall be included in the assessment if any optional element scopes are included for compliance purposes. Additionally, for REAP Projects seeking to earn points under *M&R 1.2 Optimize Embodied Carbon [Inclusion of Non-Required Elements within wbLCA]*, this table lists the optional sub-elements that shall be included in the assessment.

Addition to Table 4: Mandatory and Optional Element Scopes for Compliance (Report Optional Building Elements) Legend:

	Optional	(R): Required sub-elements	if any optional el	ement scopes are included for compliance purposes.	
Exclude	Optional				
UniFormat	OmniClass				Inclusion in
Level 3	Level 3		Level 4		Scope
С	03 00 00	Interiors			
C10	03 10	Interior Construction			
C1010	03 10 10	Interior Partitions	03 10 10 10	Interior Fixed Partitions	Optional (R)
			03 10 10 20	Interior Glazed Partitions	
			03 10 10 40	Interior Demountable Partitions	
			03 10 10 50	Interior Operable Partitions	
			03 10 10 70	Interior Screens	
			03 10 10 90	Interior Partition Supplementary Components	Optional
C1020	03 10 20	Interior Windows	03 10 20 10	Interior Operating Windows	Optional (R)
			03 10 20 20	Interior Fixed Windows	
			03 10 20 50	Interior Special Function Windows	
			03 10 20 90	Interior Window Supplementary Components	Optional
C1030	03 10 30	Interior Doors	03 10 30 10	Interior Swinging Doors	Optional (R)
			03 10 30 20	Interior Entrance Doors	
			03 10 30 25	Interior Sliding Doors	
			03 10 30 30	Interior Folding Doors	
			03 10 30 40	Interior Coiling Doors	
			03 10 30 50	Interior Panel Doors	
			03 10 30 70	Interior Special Function Doors	
			03 10 30 80	Interior Access Doors and Panels	Optional
			03 10 30 90	Interior Door Supplementary Components	
C1040	03 10 40	Interior Grilles and	03 10 40 10	Interior Grilles	Optional
		Gates	03 10 40 50	Interior Gates	
C1060	03 10 60	Raised Floor	03 10 60 10	Access Flooring	Optional (R)
		Construction	03 10 60 10	Platform/Stage Floors	Optional
C1070	03 10 70	Suspended Ceiling	03 10 70 10	Acoustical Suspended Ceilings	Optional (R)
		Construction	03 10 70 20	Suspended Plaster and Gypsum Board Ceilings	
			03 10 70 50	Specialty Suspended Ceilings	
			03 10 70 70	Special Function Suspended Ceilings	
			03 10 70 90	Ceiling Suspension Components	
	03 10 90		03 10 90 10	Interior Railings and Handrails	Optional
			03 10 90 15	Interior Louvers	
			03 10 90 20	Information Specialties	Exclude
C1090		Interior Specialties	03 10 90 25	Compartments and Cubicles	_
			03 10 90 30	Service Walls	_
			03 10 90 35	Wall and Door Protection	_
			03109040	Tollet, Bath, and Laundry Accessories	_
			03 10 90 45	Interior Gas Lighting	

UniFormat	OmniClass				Inclusion in
Level 3	Level 3		Level 4		Scope
			03 10 90 50	Fireplaces and Stoves	
			03 10 90 60	Safety Specialties	
			03 10 90 70	Storage Specialties	
			03 10 90 90	Other Interior Specialties	
C10	03 20	Interior Finishes			
C2010	03 20 10	Wall Finishes	03 20 10 10	Tile Wall Finish	Optional (R)
			03 20 10 20	Wall Paneling	
			03 20 10 30	Wall Coverings	
			03 20 10 35	Wall Carpeting	
			03 20 10 50	Stone Facing	
			03 20 10 60	Special Wall Surfacing	
			03 20 10 70	Wall Painting and Coating	
			03 20 10 80	Acoustical Wall Treatment	
			03 20 10 90	Wall Finish Supplementary Components	Optional
C2020	03 20 20	Interior Fabrications	-	-	Optional (R)
C2030	03 20 30	Flooring	03 20 30 10	Flooring Treatment	Optional (R)
			03 20 30 20	Tile Flooring	
			03 20 30 30	Specialty Flooring	
			03 20 30 40	Masonry Flooring	
			03 20 30 50	Wood Flooring	
			03 20 30 60	Resilient Flooring	
			03 20 30 70	Terrazzo Flooring	
			03 20 30 75	Fluid-Applied Flooring	
			03 20 30 80	Carpeting, Athletic Flooring	
			03 20 30 85	Entrance Flooring	
			03 20 30 90	Flooring Supplementary Components	Optional
C2040	03 20 40	Stair Finishes	03 20 40 20	Tile Stair Finish	Optional (R)
			03 20 40 40	Masonry Stair Finish	
			03 20 40 45	Wood Stair Finish	
			03 20 40 50	Resilient Stair Finish	
			03 20 40 60	Terrazzo Stair Finish	
00050	00.00.50		03 20 40 75	Carpeted Stair Finish	
C2050	03 20 50	Ceiling Finishes	03 20 50 10	Plaster and Gypsum Board Finish	Optional (R)
			03 20 50 20	Ceiling Paneling	_
			03 20 50 70	Ceiling Painting and Coating	_
			03 20 50 80	Acoustical Ceiling Treatment	
			03 20 50 90	Celling Finish Supplementary Components	Optional
D	04 00 00	Services			
D10	04 10	Convoying			
D1010	04 10 10	Vertical Conveying	04 10 10 10	Elevators	Optional (R)
DIOIO	04 10 10	Systems	04 10 10 10		
		Systems	04 10 10 20	Enco	
			04 10 10 50	Dumbwaiters	Ontional
			04 10 10 50	Moving Ramos	Optional (R)
D1030	04 10 30	Horizontal Conveying	04 10 30 10	Moving Walks	Optional (R)
D1030	04 10 50	Tionzontal conveying	04102020		Optional
			04 10 30 30	i urntables	Optional
			04 10 30 50	Passenger Loading Bridges	Evoludo
D20	04.20	Dlumbing	04103070		Exclude
D2010	04 20 10	Domestic Water	04 20 10 10	Eacility Potable-Water Storage Tanks	Optional (P)
02010	04 20 10	Distribution	04 20 10 10	Domostic Water Equipment	
			04 20 10 20	Domestic Water Equipment	
			04 20 10 40	Plumbing Fixtures	Ontional
	1		04201060		Optional

UniFormat	OmniClass				Inclusion in
Level 3	Level 3		Level 4		Scope
			04 20 10 90	Domestic Water Distribution Supplementary	
				Components	
D2020	04 20 20	Sanitary Drainage	04 20 20 10	Sanitary Sewerage Equipment	Optional (R)
			04 20 20 30	Sanitary Sewerage Piping	
			04 20 20 90	Sanitary Drainage Supplementary Components	Optional
D2030	04 20 30	Building Support	04 20 30 10	Stormwater Drainage Equipment	Optional (R)
		Plumbing Systems	04 20 30 20	Stormwater Drainage Piping	
			04 20 30 30	Facility Stormwater Drains	
			04 20 30 60	Gray Water Systems	
			04 20 30 90	Building Support Plumbing System	Optional
				Supplementary Components	
D2050	04 20 50	General Service Compressed-Air	-	-	Optional (R)
D2060	04 20 60	Process Support	04 20 60 10	Compressed-Air Systems	Optional (R)
		Plumbing Systems	04 20 60 20	Vacuum Systems	
		0,	04 20 60 30	Gas Systems	-
			04 20 60 40	Chemical-Waste Systems	-
			04 20 60 50	Processed Water Systems	-
			04 20 60 90	Process Support Plumbing System	Optional
				Supplementary Components	
D30	04 30	Heating, Ventilation,	and Air Conditi	oning (HVAC)	
D3010	04 30 10	Facility Fuel Systems	04 30 10 10	Fuel Piping	Optional (R)
			04 30 10 30	Fuel Pumps	
			04 30 10 50	Fuel Storage Tanks	
D3020	04 30 20	Heating Systems	04 30 20 10	Heat Generation	Optional (R)
			04 30 20 30	Thermal Heat Storage	
			04 30 20 70	Decentralized Heating Equipment	
			04 30 20 90	Heating System Supplementary Components	Optional
D3030	04 30 30	Cooling Systems	04 30 30 10	Central Cooling	Optional (R)
			04 30 30 30	Evaporative Air-Cooling	
			04 30 30 50	Thermal Cooling Storage	
			04 30 30 70	Decentralized Cooling	
			04 30 30 90	Cooling System Supplementary Components	Optional
D3050	04 30 50	Facility HVAC	04 30 50 10	Facility Hydronic Distribution	Optional (R)
		Distribution Systems	04 30 50 30	Facility Steam Distribution	
			04 30 50 50	HVAC Air Distribution	
			04 30 50 90	Facility Distribution Systems Supplementary	Optional
D20(0	042060	Ventilation	04 20 60 10	Components	Optional (D)
D3060	04 30 60	ventilation	04 30 60 10	Supply Air	
			04 30 60 20	Return Air	-
			04 30 60 30	Outside Air	-
			04 30 60 40	Air to Air Eporgy Bocovory	-
			04 30 60 70	HVAC Air Cleaning	-
			04 30 60 90	Ventilation Supplementary Components	Ontional
D3070	04 30 70	Special Purpose	04 30 00 90	Snow Melting	Optional
03070	043070	HVAC Systems	04 30 70 10	Show Weiting	
D50	04 50	Electrical			
D5010	04 50 10	Facility Power	04 50 10 10	Packaged Generator Assemblies	Optional (R)
		Generation	04 50 10 20	Battery Equipment	
			04 50 10 30	Photovoltaic Collectors	
			04 50 10 40	Fuel Cells	
			04 50 10 60	Power Filtering and Conditioning	Optional
			04 50 10 70	Transfer Switches	
			04 50 10 90	Facility Power Generation Supplementary	
				Components	
D5020	04 50 20		04 50 20 10	Electrical Service	Optional (R)

UniFormat	OmniClass				Inclusion in
Level 3	Level 3		Level 4		Scope
	1	Electrical Service and	04 50 20 30	Power Distribution	
		Distribution	04 50 20 70	Facility Grounding	
			04 50 20 90	Electrical Service and Distribution	Optional
				Supplementary Components	
D5030	04 50 30	General Purpose	04 50 30 10	Branch Wiring System	Optional (R)
		Electrical Power	04 50 30 50	Wiring Devices	
			04 50 30 90	General Purpose Electrical Power	Optional
				Supplementary Components	
D5040	04 50 40	Lighting	04 50 40 10	Lighting Control	Optional
			04 50 40 20	Branch Wiring for Lighting	Optional (R)
			04 50 40 50	Lighting Fixtures	Optional
	0.4.50.00		04 50 40 90	Lighting Supplementary Components	
D5080	04 50 80	Miscellaneous	04 50 80 10	Lightning Protection	Optional
		Electrical Systems	04 50 80 10		
			04 50 80 10	I ransient Voltage Suppression	
			04 50 80 10	Miscellaneous Electrical Systems	
E	05 00 00	Equipment and Europic	hinge	Supplementary Components	
E E20	05 00 00		anngs		
E20	05 20 10	Fixed Eurnishings	05 20 10 10	Fixed Art	Exclude
LZOIO	052010	r ived i di filisifilings	05 20 10 10	Window Treatments	Optional (R)
			05 20 10 20	Casework	
			05 20 10 30	Fixed Multiple Seating	_
			05 20 10 90	Other Fixed Furnishings	
F2050	05 20 50	Movable Furnishings	05 20 50 10	Movable Art	Exclude
22000	002000		05 20 50 30	Furniture	Optional (R)
			05 20 50 40	Accessories	
			05 20 50 60	Movable Multiple Seating	
			05 20 50 90	Other Movable Furnishings	
G	07 00 00	Sitework			•
G10	07 10	Site Preparation			
G1070	07 10 70	Site Earthwork	07 10 70 10	Grading	Optional (R)
			07 10 70 20	Excavation and Fill	
			07 10 70 30	Soil Reinforcement	
			07 10 70 35	Slope Protection	
			07 10 70 40	Gabions	
			07 10 70 45	Riprap	
			07 10 70 50	Embankments	
			07 10 70 55	Erosion and Sedimentation Controls	Optional
			07 10 70 60	Soil Stabilization	
			07 10 70 65	Rock Stabilization	
			0/10/0/0	Wetlands	
			07107080	Earth Dams	
620	07.00	C'4. 1	07107090	Site Soil Treatment	
G20	07 20	Site Improvements	07 20 10 10	Pardura Payament	Ontional (D)
G2010	07 20 10	Roduways	07 20 10 10	Roadway Pavement	
			07 20 10 20	Roadway Curbs and Gutters	Ontional
			07 20 10 40	Roadway Lighting	Optional
			07 20 10 70	Vehicle Fare Collection	
G2020	07 20 20	Parking Lots	07 20 20 10	Parking Lot Pavement	Optional (R)
52020	0,2020		07 20 20 20	Parking Lot Curbs and Gutters	
			07 20 20 40	Parking Lot Appurtenances	Optional
			07 20 20 70	Parking Lot Lighting	
			07 20 20 80	Exterior Parking Control Equipment	
G2030	07 20 30	Pedestrian Plazas and	07 20 30 10	Pedestrian Pavement	Optional (R)
		Walkways	07 20 30 20	Pedestrian Pavement Curbs and Gutters	

UBC EMBODIED CARBON GUIDELINES VERSION 2

Addendum to the National wbLCA Practitioner's Guide

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UniFormat	OmniClass				Inclusion in
Level 3	Level 3		Level 4		Scope
	1		07 20 30 30	Exterior Steps and Ramps	
			07 20 30 40	Pedestrian Pavement Appurtenances	Optional
			07 20 30 70	Plaza and Walkway Lighting	
			07 20 30 80	Exterior Pedestrian Control Equipment	
G2040	07 20 40	Airfields	07 20 40 10	Aviation Pavement	Optional
			07 20 40 20	Aviation Pavement Curbs and Gutters	
			07 20 40 40	Aviation Pavement Appurtenances	
			07 20 40 70	Airfield Lighting	
			07 20 40 80	Airfield Signaling and Control Equipment	
G2050	07 20 50	Athletic, Recreational,	07 20 50 10	Athletic Areas	Optional (R)
		and Playfield Areas	07 20 50 30	Recreational Areas	
			07 20 50 50	Playfield Areas	
G2060	07 20 60	Site Development	07 20 60 10	Exterior Fountains	Optional (R)
			07 20 60 20	Fences and Gates	Optional
			07 20 60 25	Site Furnishings	
			07 20 60 30	Exterior Signage	
			07 20 60 35	Flagpoles	
			07 20 60 40	Covers and Shelters	
			07 20 60 45	Exterior Gas Lighting	
			07 20 60 50	Site Equipment	
			07 20 60 60	Retaining Walls	Ontional (P)
			07 20 60 70	Site Bridges	
			07 20 60 80	Site Screening Devices	Optional
			07 20 60 85	Site Specialties	
G2080	07 20 80	Landscaping	07 20 80 10	Planting Irrigation	Optional (R)
			07 20 80 20	Turf and Grasses	
			07 20 80 30	Plants	
			07 20 80 50	Planting Accessories	
			07 20 80 70	Landscape Lighting	Optional
			07 20 80 80	Landscaping Activities	

Appendix I

Embodied Carbon Reduction Strategies & Resources

To support project teams in making design and material choices that reduce embodied carbon emissions throughout a building's life cycle, the below resources have been curated. As a rapidly evolving sphere of practice, this list is intended to be introductory and not exhaustive.

Embodied Carbon Of Buildings: International Policy Review (UBC, 2024)¹⁵, Section 2 (p.16-26) provides a "Embodied Carbon

101"-style resource, and provides the below list of building design, material selection, and procurement strategies;

Design Strategies
Reuse/renovate/retrofit part or all of existing buildings
Reduce new buildings floor area
Reduce new buildings construction (such as below-grade concrete parkade)
Design lightweight and efficient building structures
Design for flexible and adaptable buildings
Use comparative WBLCAs to optimize building envelope design options
Design to optimize for prefabrication (design for modular systems, consider digital fabrication in project planning and use of
BIM)
Materials and System Selection Strategies
Select and design timber/wood structure
Select biogenic materials over typical envelope materials (e.g., replace mineral insulation materials with fiberwood insulation
type)
Choose insulation thickness and materials carefully to balance embodied and operation carbon trade-offs
Choose mechanical, electrical, and plumbing (MEP) systems with low to zero-carbon refrigerants
Select salvaged and refurbished materials that can have longer lives when repaired and recycled
Design for disassembly for the building end-life
Select building finishes or remove and minimize interior finishes where possible
Select local products to reduce transportation emissions
Procurement Strategies
Integrate EPDs and GHG emission limits into project specifications
Optimize materials specifications for use of low-carbon materials such as low-carbon concrete
Source sustainable wood materials: include procurement strategies for using salvages wood and/or locally harvested wood
materials
Use EPDs during procurement

Embodied Carbon Pilot

- The Summary Report (UBC, 2022)¹⁶ provides suggestions to practitioners on how to improve the practice of wbLCA.
- The **Bill of Materials Generation Methodology (UBC, 2021)**¹⁷ provides wbLCA practitioners with insights into the pros & cons of various methods of compiling Bills of Materials needed to complete wbLCAs.
- The Study of whole building life cycle assessment processes at the University of British Columbia (UBC, 2020)¹⁸summarizes the results of nine different embodied carbon assessments conducted on three different oncampus buildings, providing wbLCA practitioners with insights into variability of wbLCA results based on the tool used.

The Carbon Leadership Forum of BC has published a number of Case Studies (CLFbc, 2022-2025)¹⁹

¹⁵ <u>https://sustain.ubc.ca/sites/default/files/EmbodiedCarbon-InternationalPolicyReview_March2024.pdf</u>

¹⁶ https://sustain.ubc.ca/sites/default/files/files/Embodied%20Carbon%20Pilot%20Summary%20Report_final.pdf

¹⁷ https://sustain.ubc.ca/sites/default/files/ECP%20Phase%202_Methodology%20paper.pdf

¹⁸ https://sustain.ubc.ca/sites/default/files/ECP%20Final%20Report-Phase%201%20June%202021.pdf

¹⁹ <u>https://clfbritishcolumbia.com/resources/categories-case-studies-and-guides/</u>

The **BC Low-Carbon Material Sourcing Guide (CLFbc, 2025)**²⁰ highlights those low-carbon materials with EPD's (Environmental Product Declarations) that are available in British Columbia.

A Pragmatic Approach to Lowering Embodied Carbon (ZGF, EllisDon, Lafarge, & Fast+Epp, 2023)²¹ offers pragmatic options at key project decision points to support stakeholders and consultants in the development of efficient and cost-effective low-embodied carbon concrete solutions.

²⁰ https://clfbritishcolumbia.com/low-carbon-material-sourcing-guide

²¹ https://clfbritishcolumbia.com/wp-content/uploads/2023/10/Pragmatic-Approach-to-Lowering-Embodied-Carbon.pdf



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