

PRPS Reporting Station, Dockstader

Life Cycle Assessment Report
September 9, 2024

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FORMERLY



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Issue	Description	Date	Prepared By	Signed Off
1	Issued for Review at 100% DD	2023-12-08	GC	EC
2	Issued for Tender	2024-09-09	GC	EC

Project Number: 0010086.000

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1 Executive Summary

The following executive summary provides an overview of the comprehensive Life Cycle Assessment (LCA) conducted for the Region of Peel Paramedic Services (PRPS) Reporting Station Docksteader in Brampton, ON. This LCA was undertaken to evaluate the embodied carbon of the proposed building.

The LCA includes the structural and envelope building elements. Most of the material takeoff was conducted using the architectural Revit model last updated June 6th, 2024, and the structural Revit model last updated June 6th. The LCA software tool used for the assessment is One Click LCA.

The building shall be designed to meet the Region of Peel Net Zero Emissions Building Standard for New Construction and achieve CaGBC Zero Carbon Building (ZCB) Design Standard version 3 certification. Below are the Canada Green Building Council Zero Carbon Building Standard targets for reference:

- The Zero Carbon Building Standard sets a maximum intensity of 500 kg CO₂e/m² or 10% reduction from baseline and awards points for 20% reduction/350 kg CO₂e/m² (1 point) and 40% reduction/240 kg CO₂e/m² (2 points).
- This project is targeting 20% reduction/350 kg CO₂e/m² for 1 impact and innovation point.

The assessment performed to date includes a sensitivity analysis with options for lower carbon options, which have been used to calculate a theoretically achievable embodied carbon performance. The design team will need to use their judgement to determine if these products are suitable for this project.

Table 1: Total Embodied Carbon Summary

Life Cycle Stage	Baseline	Proposed
Upfront Carbon (A1-A5) (t CO ₂ e)	2996	2271
Upfront Carbon Intensity* (A1-A5) (kg CO ₂ e/m ²)	383	290
Percent Upfront Carbon Reduction (A1-A5)	-	24%
Embodied Carbon (Stage A-C)	3398	2673
Embodied Carbon Intensity* (Stage A-C)	434	341
Percent Embodied Carbon Reduction (A-C)	-	21%
External Impacts (Stage D)	-1056	-1056
Biogenic	450	450

*Intensity calculations based on a life cycle assessment area of 7,826 m².

Based on the analysis, this project can comply with the zero carbon building requirements achieving the target 20% reduction from the baseline.

2 Applicable Terms and Definitions

The following terms and definitions have been sourced from the “National guidelines for whole-building life cycle assessment” and the “Carbon Definitions for the Built Environment, Buildings & Infrastructure”.¹²

Absolute Zero Carbon: Eliminating all carbon emissions without the use of offsets.

Baseline: A benchmark derived from a single building; may be derived from a theoretical design or a constructed building.

Benchmark: Reference point against which comparisons can be made. (ISO 21678:2020)

Benchmarking: Process of collecting, analyzing and relating performance data of comparable buildings or other constructed assets. (ISO 21677:2020)

Biogenic Carbon: ‘Biogenic Carbon’ refers to the carbon removals associated with carbon sequestration into biomass as well as any emissions associated with this sequestered carbon. Biogenic carbon must be reported separately if reporting only upfront carbon but should be included in the total if reporting embodied carbon or whole life carbon.

Biomass: ‘Biomass’ is material of biological origin excluding material embedded in geological formations or transformed to fossilized material and excluding peat. (ISO 21930:2017)

Carbon Neutral: All carbon emissions are balanced with offsets based on carbon removals or avoided emissions.

Contribution Analysis: The process of grouping indicator results together in different ways to better understand what is driving them.

Embodied Carbon: ‘Embodied Carbon’ emissions of an asset are the total GHG emissions and removals associated with materials and construction processes throughout the whole life cycle of an asset (Modules A0-A5, B1-B5, C1-C4, with A2 assumed to be zero for buildings)

Environmental Product Declaration (EPD): Environmental declaration providing quantified environmental data using predetermined parameters and, where relevant, additional environmental information. (ISO 21930:2017)

Greenhouse Gases (GHG): ‘Greenhouse Gases’ are constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth’s surface, the atmosphere, and clouds.

Life Cycle Assessment (LCA): Compilation and evaluation of the inputs, outputs and potential environmental impacts of a product system throughout its life cycle. (ISO 21930:2017)

Life Cycle Impact Assessment (LCIA): Phase of LCA aimed at understanding and evaluation the magnitude and significance of the potential environmental impacts for a product system throughout the life cycle of the

¹ Bowick, O’Connor, Salazar, Meil, and Cooney, “National guidelines for whole-building life cycle assessment,” Canada.ca, <https://nrc-publications.canada.ca/eng/view/object/?id=f7bd265d-cc3d-4848-a666-8eeb1fbde910> (accessed Jul. 25, 2023).

² “Carbon Definitions for the Built Environment, Buildings & Infrastructure.” LETI [Online]. Available: https://www.leti.uk/_files/ugd/252d09_04f3ex91a9a1a431b8dbaf35a0a1a81f3.pdf (accessed Jul. 26, 2023).

product. (ISO 21930:2017)

Life Cycle Inventory (LCI) Analysis: Phase of LCA involving compilation and quantification of inputs and outputs for a product throughout its life cycle.

Net Zero (Whole Life) Carbon: A 'Net Zero (whole life) Carbon' Asset is one where the sum total of all asset related GHG emissions, both operational and embodied, over an asset's life cycle (Modules A0-A5, B1-B8, C1-C4) are minimized, which meets local carbon, energy and water targets or limits, and with residual 'offsets', equals zero.

Net Zero Embodied Carbon: A 'Net Zero Embodied Carbon' asset is one where the sum total of GHG emissions and removals over an asset's life cycle (Modules A0-A5, B1-B5 and C1-C4) are minimized, which meets local carbon targets or limits (e.g kg CO₂e/m²), and with additional 'offsets', equals zero.

Net Zero Upfront Carbon: A 'Net Zero Upfront Carbon' asset is one where the sum total of GHG emissions, excluding 'biogenic carbon', from Modules A0-A5 is minimized, which meets local carbon targets or limits (e.g kg CO₂e/m²), and with additional 'offsets', equals zero.

Operational Carbon: Energy, Buildings – 'Operational Carbon – Energy' (Module B6) are the GHG emissions arising from all energy consumed by an asset in-use, over its life cycle.

Reference Service Life (RSL): Service life of a construction product which is known to be expected under a set of reference in-use conditions and which can form the basis for estimating the service life under other in-use conditions. (ISO 21930:2017)

Reference Study Period: The period over which the time-dependent characteristics of the object of assessment are analyzed. (EN15978:2011)

Required Service Life: Service life required by the client or through regulations. (EN 15978:2011)

Sensitivity Analysis: The process of changing a parameter in a LCA model and recalculating indicator results to determine its effect on the building.

System Boundary: Interface in the assessment between a building and its surroundings or other product systems. (EN 15978:2011)

Upfront Carbon – Buildings: 'Upfront Carbon' emissions are the GHG emissions associated with materials and construction processes up to practical completion (Modules A0-A5). Upfront carbon excludes the biogenic carbon sequestered in the installed products at practical completion.

Whole-building LCA: Life cycle assessment applied to a building-related functional equivalent (a whole building, or part of a building).

Whole Life Carbon: Whole Life Carbon' emissions are the sum total of all asset related GHG emissions and removals, both operational and embodied over the life cycle of an asset including its disposal (Modules: A0-A5; B1-B7; B8 optional; C1-C4, all including biogenic carbon, with A2 assumed to be zero for buildings).

3 Introduction

This section summarizes the methodology, scope, and purpose of the preliminary whole-building life cycle assessment (LCA) for the PRPS Reporting Station, located at the corner of Dixie Road and Dockstader Road in the City of Brampton, Ontario.

3.1 Purpose of Assessment

This assessment was conducted to provide an estimate of the whole life embodied carbon of the current design to inform further design and ensure compliance with ZCB v3. A contribution analysis identifies most contributing materials to the whole life embodied carbon. A sensitivity analysis extends beyond the contribution analysis and provides suggestions for reducing resource use and selection of resources with lower global warming potential.

3.2 Life Cycle Assessment Methodology

Though often considered alone, operational carbon is only part of a building's whole life carbon story. Embodied carbon represents the cradle-to-grave life cycle impacts of the products and materials used within a building: the effects of resource extraction, product manufacturing and transportation, building construction, product maintenance and replacement, and building demolition/deconstruction/disposal. In high-performance buildings, embodied carbon makes up a significant portion of a building's carbon footprint and can equal (or exceed) lifetime operational carbon emissions of the building. Trade-offs that improve building performance and reduce operational carbon, such as improved glazing and increased insulation, can often increase the associated embodied carbon; therefore, it is important to consider both together to understand whole-life carbon of a building and optimize design.

Life cycle assessments categorize the environmental impact of a building into various stages from raw material extraction to end of life. The separation of impacts into various categories can help inform which products or processes result in the largest impact at a certain point in time.

The stages, or modules, of a standard LCA are shown in Figure 1. For a new construction project, the accounting is relatively straightforward: the effects of all materials within the scope of the LCA are calculated for all life cycle stages and added together to calculate the total embodied carbon.

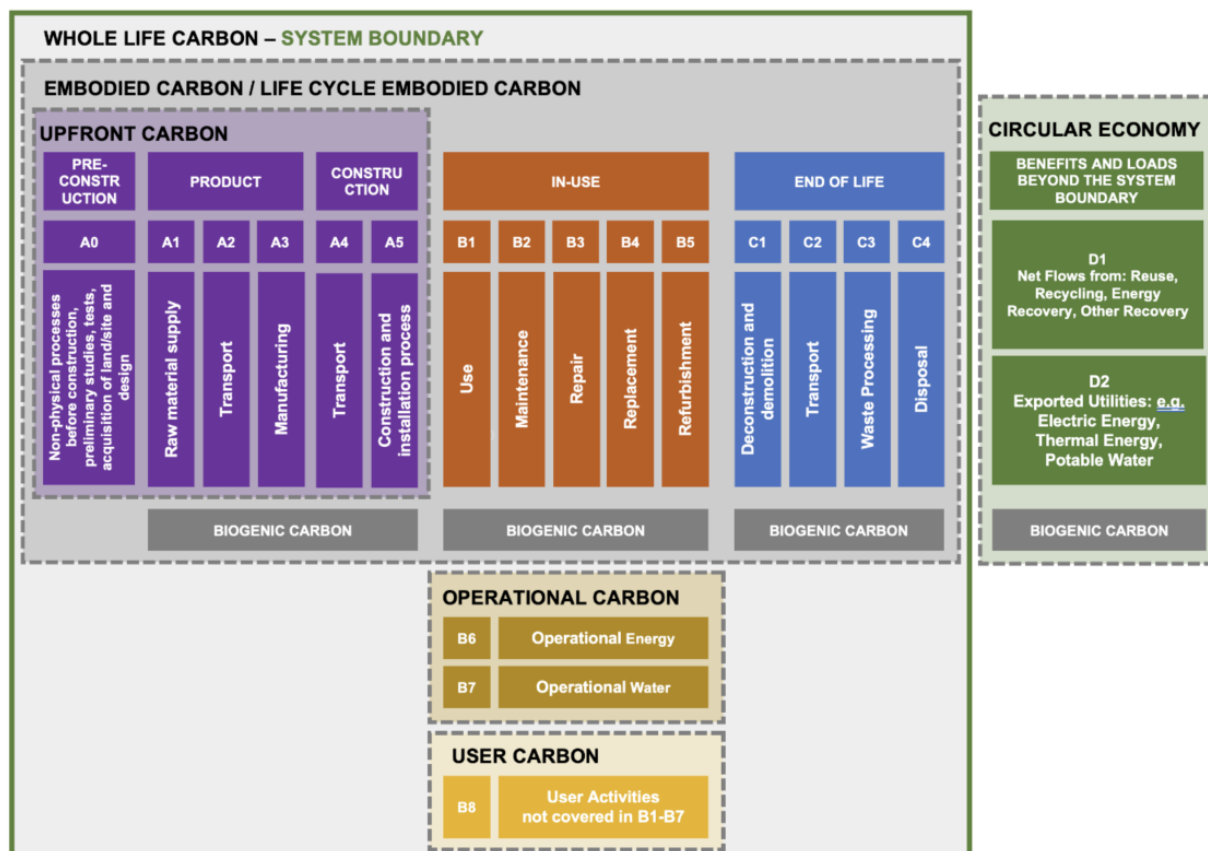


Figure 1: Life Cycle Modules from Carbon Definitions for the Built Environment, Buildings & Infrastructure developed by a working group with the Whole Life Carbon Network and adapted from BS EN 15978, BS EN 174742, PAS 2080: 206 and expected future updates.³

³ "Carbon Definitions for the Built Environment, Buildings & Infrastructure." LETI [Online]. Available: https://www.leti.uk/_files/ugd/252d09_04f3ex91a9a1a431b8dbaf35a0a1a81f3.pdf (accessed Jul. 26, 2023).

4 Details of Assessment

4.1 Data Sources

The LCA was developed from the Architecture Revit Model current as of June 6th, 2024, and the Structural Revit Model current as of June 6th, 2024. Modelling was conducted using One Click LCA. Quantity takeoffs were recorded using Revit. At this stage of the assessment, material assumptions were used for most product selections and quantities. Estimates based on industry knowledge were used, as described in Appendix A.

The environmental data has been sourced from environmental product declarations (EPDs) in One Click LCA. EPDs summarize the results of a life cycle assessment of a product or service. Most EPDs have been source from Ecoinvent, GaBi, and USLCI. In cases where no EPD was available, projected estimates were included instead.

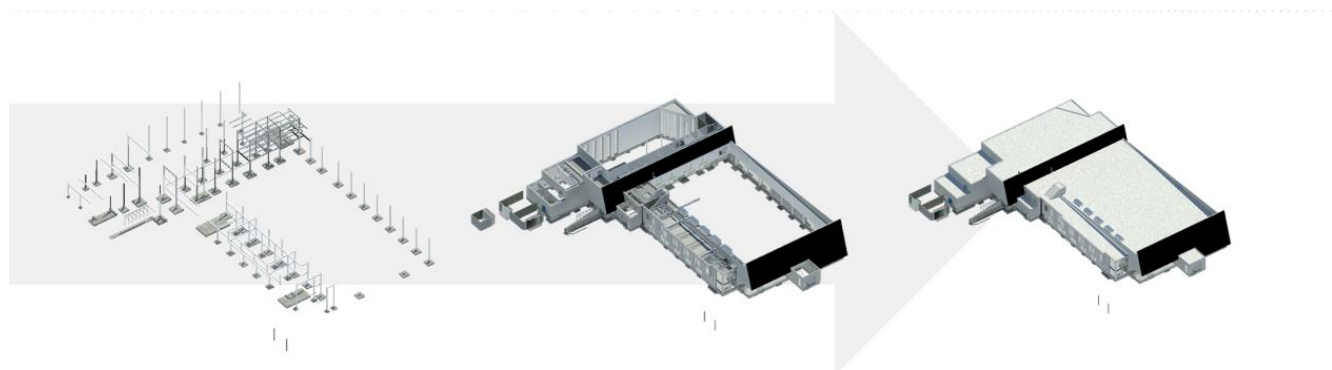
4.2 Reference Study Period

The reference study period is the calculation period based on the declared service life of the building. Product replacements and maintenance are calculated for this period. The declared service life of 60 years was used for this assessment.

4.3 Scope of Assessment

The LCA is a preliminary assessment of the impact of envelope and structural elements only. Interior fit outs and finishes, MEP systems, and landscaping are outside the scope of this assessment and are not included. Appendix A describes the exact material takeoff in more detail.

Operational carbon was considered outside the scope of this LCA and is excluded from the results. Operational water use was not calculated and is excluded from overall life cycle effects.



4.4 System Boundary

The system boundary defines which life cycle assessment stages are included in the analysis. The life cycle stages have been identified by One Click LCA and Table 2 identifies the specific modules included in the assessment.

Table 2: Activities Included in the System Boundary

Module	Module/Activity	Included
A1-A3	Raw material supply, Transport, Manufacturing	
A1-A3	Production, building materials	×
A4	Transport	
A4	Transport to the building site	×
A5	Construction-Installation Process	
A5a	Site operations & site waste handling	
A5b	Site waste transportation	
A5c	Construction site – material wastage - materials	×
A5d	Construction site – material wastage - transport	×
A5e	Construction site – material wastage - waste	×
B1	Use	
B2	Maintenance	
B3	Repair	
B4-B5	Material Replacement and Refurbishment	
B4-5a	Material replacement - materials	×
B4-5b	Material replacement - transport	×
B4-5c	Material replacement - waste	×
B6	Operational energy	
B7	Operational Water	
C1-C4	End of life	
C1	Deconstruction/demolition	
C2	Transport to waste processing/disposal, building materials	×
C3	Waste processing, building materials	×
C4	Disposal, building materials	×
D	Benefits and loads beyond the building lifecycle (not included in totals)	
D	Installed materials – benefit	×

4.5 Gross Floor Area Estimate

Based on the “National guidelines for whole-building life cycle assessment”⁴, gross floor area (GFA) for a LCA should measure within the outside face of enclosing walls on each floor area. See Table 3 below for the GFA calculation and Appendix A for more detailed calculation.

Table 3: External Gross Floor Area Summary

Level	Area (m ²)
Floor 1	5,381
Floor 2	1,808
Floor 3	637
TOTAL	7,826

⁴ Bowick, O'Connor, Salazar, Meil, and Cooney, “National guidelines for whole-building life cycle assessment,” Canada.ca, <https://nrc-publications.canada.ca/eng/view/object/?id=f7bd265d-cc3d-4848-a666-8eeb1fbde910> (accessed Jul. 25, 2023).

4.6 Environmental Indicators

The life cycle assessment (LCA) has been conducted in accordance with the Life Cycle Carbon – Global tool. The life cycle assessment is compliant with EN 15978, EN 15804, ISO 14040, ISO 14044 and ISO 21929. For the purposes of this study, global warming potential and biogenic carbon are the only factors being compared.

4.6.1 External Impacts

Module D accounts for potential environmental benefits and loads that occur beyond the stages A-C. This may include the use of recycled material from the site, reuse of site material elsewhere, energy recovery, or exported energy. This category is used to understand the implications beyond the system boundary which may have further impact on initial design decisions.

4.6.2 Biogenic Carbon

Biogenic carbon refers to carbon dioxide (CO₂) that is absorbed and released during the natural carbon cycle through the growth and decay of plants and other organic matter. Biogenic carbon is distinct from fossil carbon, which involves the release of CO₂ from long-term geological storage of carbon, such as burning fossil fuels like coal, oil, and natural gas.

In most LCAs, biogenic carbon is accounted for as carbon neutral. The carbon neutrality assumption assumes that biogenic carbon operates in a closed loop system. Plants and trees absorb CO₂ from the atmosphere through photosynthesis, and this carbon is stored in their biomass. An assumption is made that emissions released from harvest and use of biomass will be released back into the atmosphere in the same quantity and form as when absorbed (either naturally decomposed or burned). Therefore, there is no net increase in atmospheric carbon emissions.

While some may argue that biogenic carbon has negative effects of whole-life GWP because carbon is stored in the building, it is not accounted for as a reduction in GWP because:

- Biomass must come from certified sustainable sources (i.e. FSC wood) to be considered.
 - If not sustainability sourced, impacts on climate change and biodiversity loss can result from land use change and the various effects on the forest carbon cycle.
- The reuse/recyclability of many mass timber elements is limited because of the adhesives used in products (i.e. CLT, glulam, etc.). Therefore, at end of life, the carbon stored in the building could be released if the timber is landfilled and allowed to decompose. The opportunity to continue to store this carbon is limited to ensuring the building longevity or reuse of the structural members.

With the complexities of accounting for biogenic carbon, special consideration should be made under specific contexts, assumptions, and guidelines. Following international standard ISO 21930, biogenic carbon can be considered carbon neutral, however, it is recommended that biogenic carbon be reported to provide transparency in reporting.

Awareness of biogenic carbon and its potential value in reducing the GWP of a building. It is recommended to use design for disassembly principles (mechanical fasteners) to allow building materials to enter the circular economy.

5 Results

5.1 Baseline Whole Building Life Cycle Assessment

The DD-Stage LCA estimates a total global warming potential of 3398 t CO₂e for the embodied carbon of the structure and enclosure using baseline GWPs for the proposed materials.

Table 4: Embodied Carbon During Life Cycle Stages

Stage	Stage Description	Embodied Carbon (t CO ₂ e)	Carbon Intensity (kgCO ₂ e/m ²)	Biogenic Carbon (t CO ₂ e)
A1-A3	Raw materials extraction, transport, and manufacturing	2693	344	450
A4-A5	Transportation to site and construction/installation process	303	-	-
A1-A5	"Upfront Carbon"	2996	383	450
B	Use phase, maintenance, repair, material replacement and refurbishment	189	-	-
C	End-of-life demolition and waste processing	213	-	-
A-C	"Embodied Carbon"	3398	434	-
D	External Impacts; reuse/recycling - not included in embodied carbon total	-1056	-	-

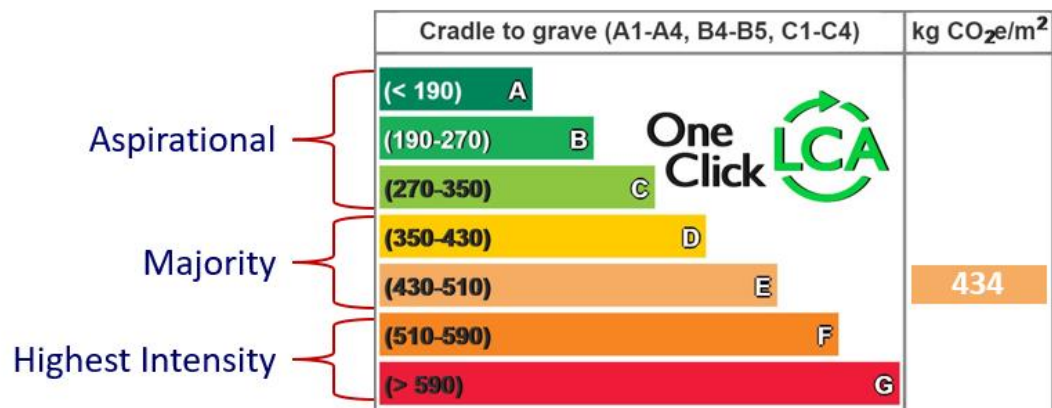


Figure 2: Comparison between all types of buildings.

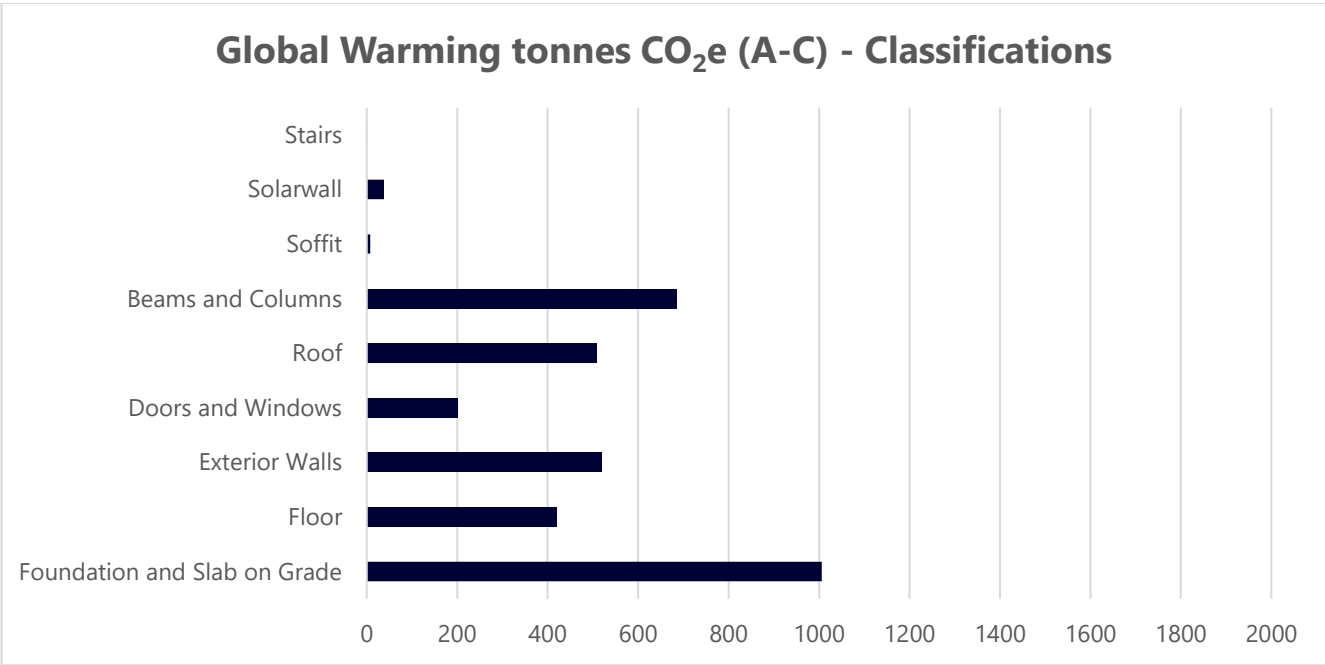


Figure 3: Global warming potential by classification

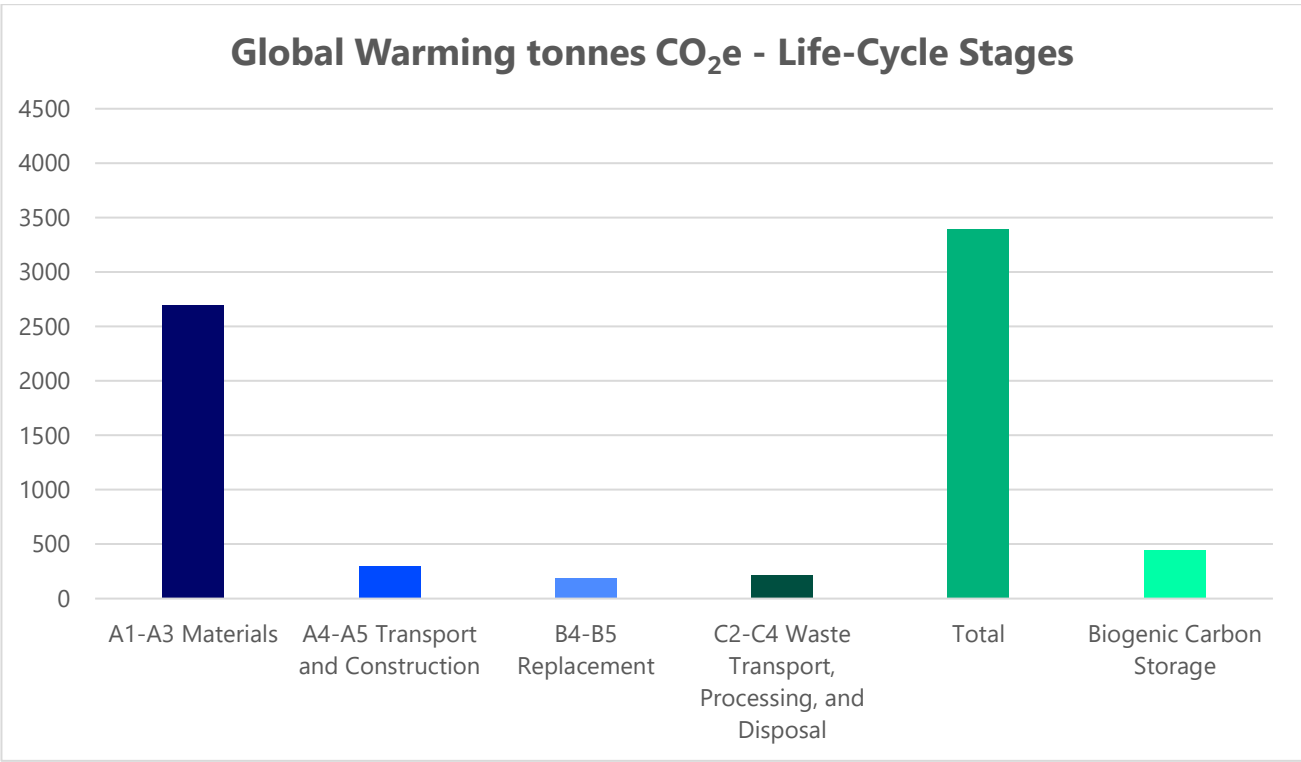


Figure 4: Global warming potential by life cycle stage

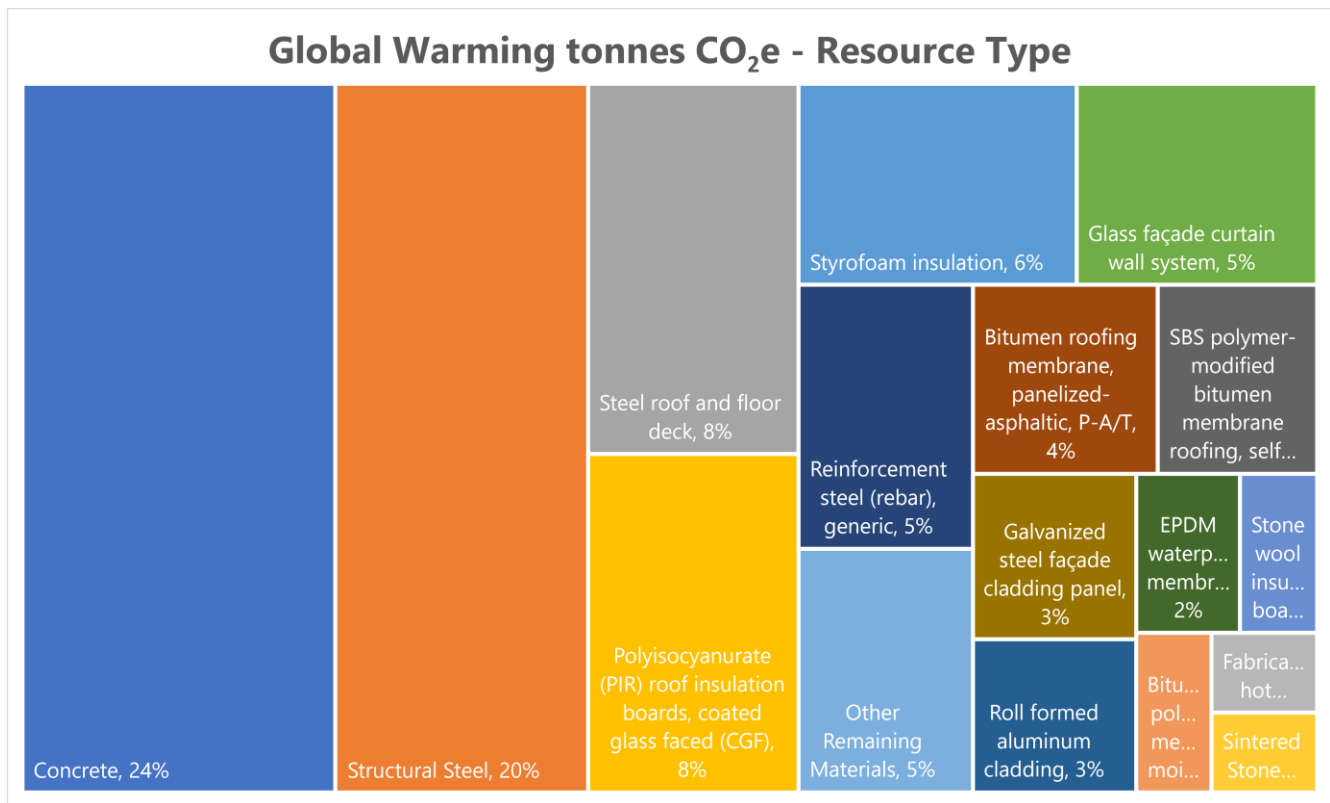


Figure 5: Global warming kg CO₂e by resource type, stages A-C

5.2 Most Contributing Materials and Low GWP Alternatives

Table 5 lists the materials with the highest upfront carbon (A1-A3) in the baseline scenario. Low GWP alternatives can be used to reduce overall upfront carbon.

Table 5: Embodied Carbon During Life Cycle Stages

Number	Resource	Cradle to Gate Impacts (A1-A3) (t CO ₂ e)	Of Cradle to Gate (A1-A3)
1	Ready-mix concrete, Ontario industry average	575.2	26.9 %
2	Fabricated hollow structural steel sections, unpainted	572.4	26.8 %
3	Glass façade curtain wall system	178.8	8.4 %
4	Reinforcement steel (rebar), generic	157	7.3 %
5	XPS Insulation	130	6.1 %
6	Galvanized steel façade cladding panel	92.3	4.3 %
7	Roll formed aluminum cladding	85.9	4 %
8	Polyisocyanurate (PIR) roof insulation boards, coated glass faced (CGF)	74.5	3.5 %

Number	Resource	Cradle to Gate Impacts (A1-A3) (t CO ₂ e)	Of Cradle to Gate (A1-A3)
9	Stone wool insulation board for exterior cavity wall and rainscreen applications, moisture resistant, with bitumen facing or no facing	41.9	2 %
10	Bitumen roofing membrane, panelized-asphaltic, P-A/T	38	1.8 %

5.2.1 Concrete

In the baseline scenario, concrete accounts for 575 tonnes of upfront carbon dioxide using the Ontario industry average EPDs. Less carbon-intensive concrete is readily available, and reductions are possible by setting “Allowable kgCO₂e” limits. Alternative concrete mixes exist with higher supplementary cementitious material and other mix alternatives. Using the upper range of Lafarge ECOPact concrete alternatives, the project can save at least 105 tonnes CO₂e compared to the current Ontario industry average benchmark. Further reductions are possible with higher supplementary cementitious material and/or extending cure times.

5.2.2 Structural Steel

Structural steel with 60% recycled content is used in the baseline scenario and accounts for 572 tonnes of upfront carbon dioxide. Structural steel with higher % recycled content and less energy intensive manufacturing processes (e.g. electric arc furnace rather than basic oxygen furnace) can save at least 434 tonnes CO₂e reduction in emissions. Further reductions are possible by using products with EPDs that demonstrate lower GWP.

5.2.3 Rebar

Rebar with 60% recycled content accounts for 157 tonnes of upfront carbon dioxide in the baseline scenario. Locally produced rebar can be sourced with higher recycled content and reduce rebar upfront carbon by at least 82 tonnes. Further reductions are possible by using products with EPDs that demonstrate lower GWP.

5.2.4 Insulation

Extruded polystyrene (XPS) in the roof, slab on grade, and foundation walls contributes to a third of the total embodied carbon. In the baseline model, the Dow Highload 40 XPS material baseline embodied carbon intensity was used to determine the XPS GWP. The baseline is 11.19 kg CO₂e /m² @RSI-1 (North America). There are alternative product options available, such as the Soprema XPS with an embodied carbon of 1.8 kg CO₂e /m² @RSI-1 (Canada) and an 104 tonne reduction in upfront carbon.

The GWP of insulation can vary widely depending on material type, thermal resistance, and manufacturer; nuances which are difficult to capture through early-stage LCA modelling. Generally, rigid foam insulations such as extruded polystyrene (XPS) and spray foam insulation that use blowing agents have higher GWPs than loose fill and batt insulations of 4 kg CO₂e / m² @RSI-1; however, all petroleum-based products have non-negligible carbon footprints because end-of-life processes typically involve incineration or landfill. Specific product EPDs should be reviewed before selecting insulation to allow only the most environmentally friendly options.

5.3 Proposed Building Whole Building Life Cycle Assessment

Specifying low carbon concrete, steel, and XPS can meet the 20% target, with a 21.3% or 725 tonnes carbon dioxide

reduction.

Refer to Appendix C for a detailed table showing the alternative product EPDs suggested for the proposed design.

Table 6: Embodied Carbon During Life Cycle Stages

Life Cycle Stage	Baseline	Proposed
Upfront Carbon (A1-A5) (t CO2e)	2996	2271
Upfront Carbon Intensity* (A1-A5) (kg CO2e/m²)	383	290
Percent Upfront Carbon Reduction (A1-A5)	-	24%
Embodied Carbon (Stage A-C)	3398	2673
Embodied Carbon Intensity* (Stage A-C)	434	341
Percent Embodied Carbon Reduction (A-C)	-	21%
External Impacts (Stage D)	-1056	-1056
Biogenic	450	450

*Intensity calculations based on a life cycle assessment area of 7,826 m².

Appendix A: Material Quantity Takeoff and Assumptions

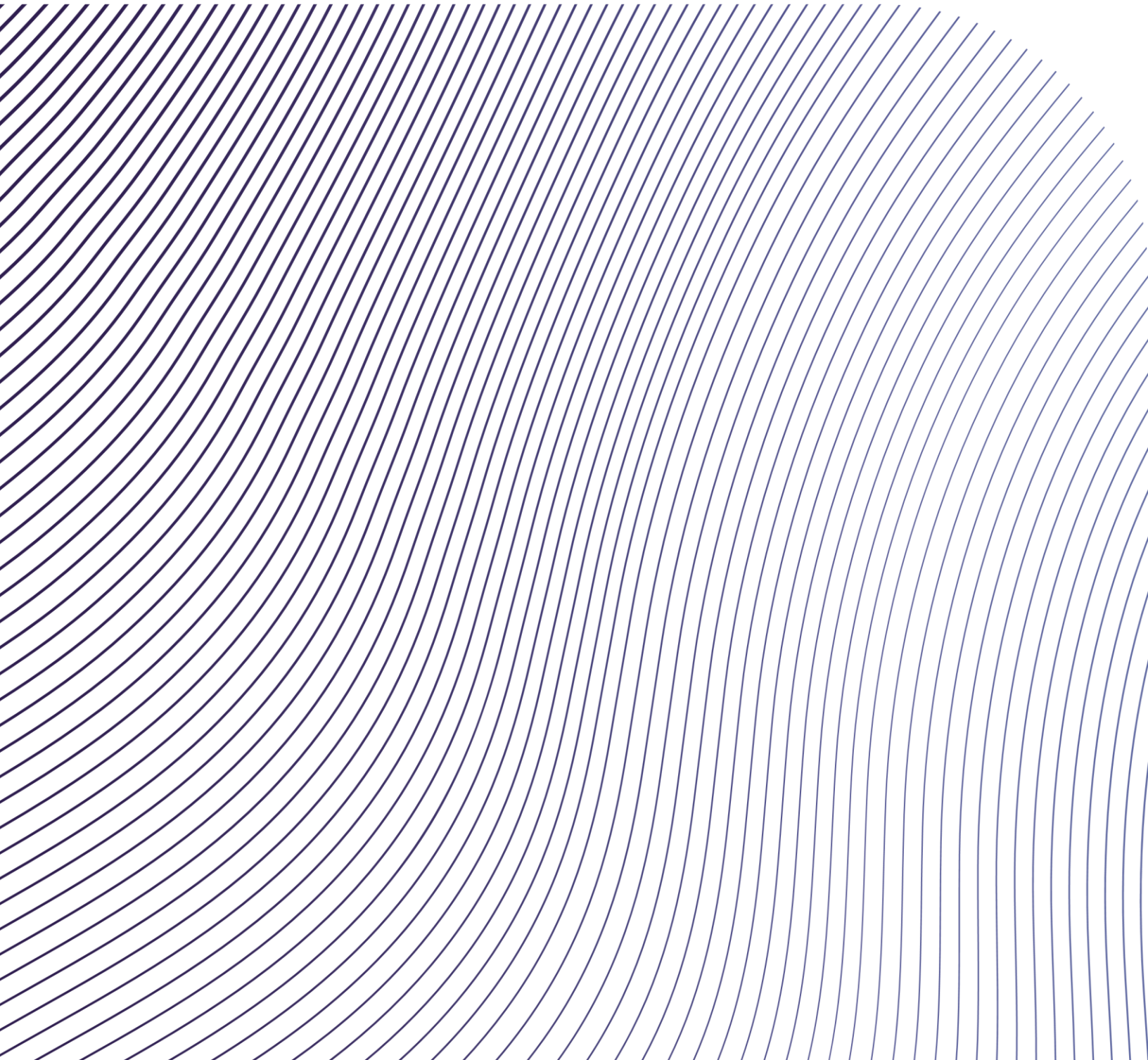


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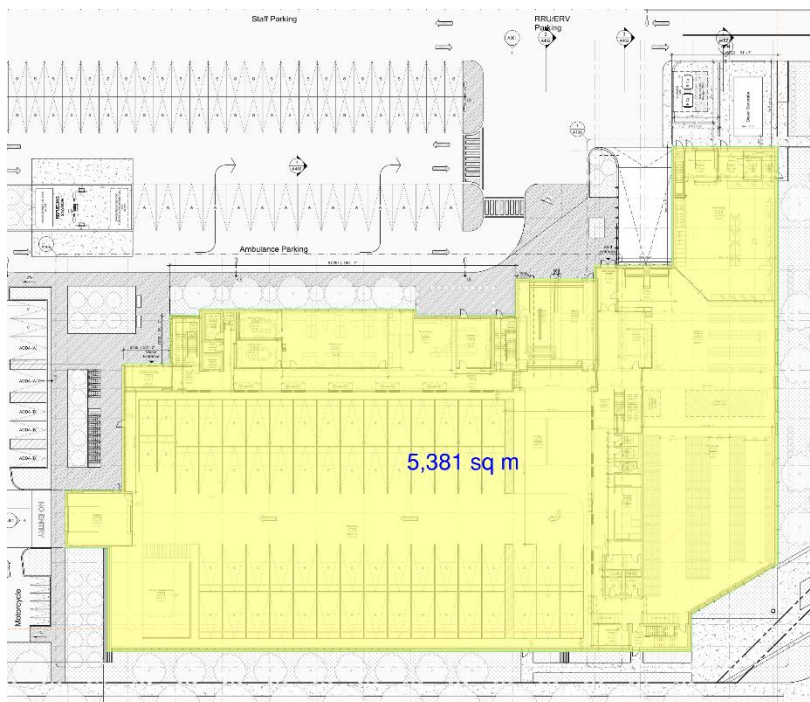
1 Building Parameters

Modelled External GFA	7826 m ²
# Floors (above grade)	3
# Floors (below grade)	0
Building Height	13 m
Building Footprint	5381 m ²

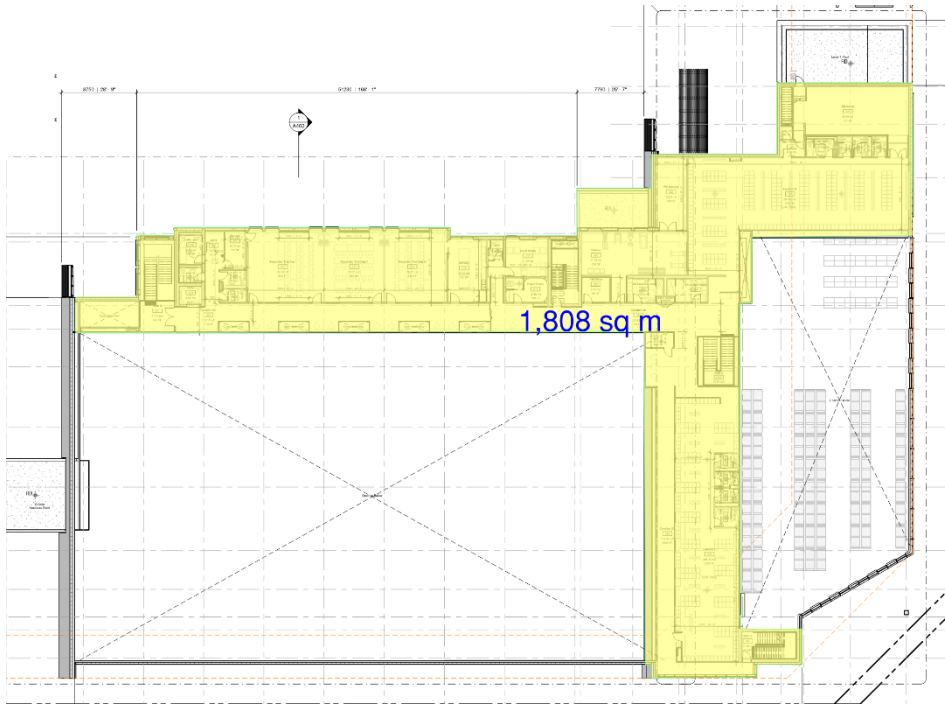
1.1 Gross Floor Area Estimate

Level	Area (m ²)
Floor 1	5,381
Floor 2	1,808
Floor 3	637
TOTAL	7,826

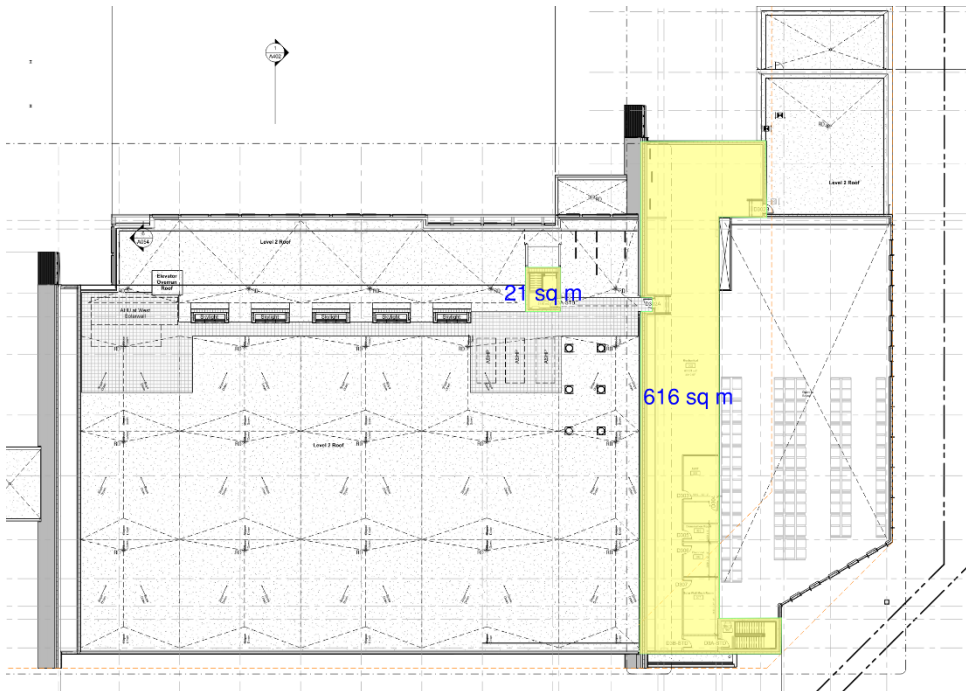
1.1.1 Floor Area Takeoff



Level 1



Level 2



Level 3

2 Building Envelope Assumptions

Classification	Assumption
Exterior Walls	Metal studs are spaced at 400mm
Stairs	Metal staircase has mass of 91 kg/step and 8000 kg/m ³

3 Building Materials

ID	Component	Assembly Details	Quantities	Notes
3.1.1	EW1A/B- Metal Cladding System	Prefinished Metal Cladding Panel	21255 kg	Steel 8000 kg/m3
3.1.2	EW1A/B- Metal Cladding System	Engineered Cladding Rails	5314 kg	Assumed there are 2 rails in a 9m2 area and each rail is 0.15m*3m. Steel 8000 kg/m3
3.1.3	EW1A/B- Metal Cladding System	Insulation Type INS-1	443 m3	
3.1.4	EW1A/B- Metal Cladding System	Engineered 300mm Thermal Clip System	2044 kg	Steel 8000 kg/m3
3.1.5	EW1A/B- Metal Cladding System	Membrane Type AVBM-1	2214 m2	
3.2.6	EW2 - Metal Cladding System - Uninsulated	Prefinished Metal Cladding Panel	3575 kg	Steel 8000 kg/m3
3.2.7	EW2 - Metal Cladding System - Uninsulated	Engineered Cladding Rails	894 kg	Assumed there are 2 rails in a 9m2 area and each rail is 0.15m*3m. Steel 8000 kg/m3
3.3.8	EW3 - Solar Wall	22mm 24 Gauge Corrugated Perforated Rolled Steel Wall Cladding	4752 kg	Steel 8000 kg/m3
3.3.9	EW3 - Solar Wall	26 Gauge Galvanized Steel Solarwall Liner	3523 kg	Steel 8000 kg/m3
3.3.10	EW3 - Solar Wall	Insulation Type INS-1	196 m3	
3.3.11	EW3 - Solar Wall	Membrane Type AVBM-1	979 m2	
3.4.12	EW4 - Metal Panel Cladding System	Composite Metal Panel	0 m3	

ID	Component	Assembly Details	Quantities	Notes
3.4.13	EW4 - Metal Panel Cladding System	Engineered Cladding Rails	202 kg	Assumed there are 2 rails in a 9m2 area and each rail is 0.15m*3m. Steel 8000 kg/m3
3.4.14	EW4 - Metal Panel Cladding System	Insulation Type INS-1	17 m3	
3.4.15	EW4 - Metal Panel Cladding System	Engineered 300mm Thermal Clip System	78 kg	Steel 8000 kg/m3
3.4.16	EW4 - Metal Panel Cladding System	Membrane Type AVBM-1	84 m2	
3.5.17	EW5 - Composite Metal Panel - Uninsulated	Composite Metal Panel	1 m3	
3.5.18	EW5 - Composite Metal Panel - Uninsulated	Engineered Cladding Rails	4369 kg	Assumed there are 2 rails in a 9m2 area and each rail is 0.15m*3m. Steel 8000 kg/m3
3.6.19	EW6 - Stone Panel Cladding	Sintered Stone Panel	8 m3	
3.6.20	EW6 - Stone Panel Cladding	Engineered Cladding Rails	3074 kg	Assumed there are 2 rails in a 9m2 area and each rail is 0.15m*3m. Steel 8000 kg/m3
3.6.21	EW6 - Stone Panel Cladding	Insulation Type INS-1	38 m3	
3.6.22	EW6 - Stone Panel Cladding	Engineered 300mm Thermal Clip System	177 kg	Steel 8000 kg/m3
3.6.23	EW6 - Stone Panel Cladding	Membrane Type AVBM-1	12 m2	
3.7.24	EW7 - Roof Parapet and Curb - Inside Face	SBS Roof Membrane	89 m2	
3.7.25	EW7 - Roof Parapet and Curb - Inside Face	Polyisocyanurate Insulation	9 m3	
3.8.26	EW8 - Corrugated Metal Cladding	Corrugated Aluminum Cladding	22674 kg	Aluminum 2700 kg/m3
3.8.27	EW8 - Corrugated Metal Cladding	Engineered Cladding Rails	504 kg	Assumed there are 2 rails in a 9m2 area and each rail is

ID	Component	Assembly Details	Quantities	Notes
				0.15m*3m. Steel 8000 kg/m3
3.8.28	EW8 - Corrugated Metal Cladding	Insulation Type INS-1	42 m3	
3.8.29	EW8 - Corrugated Metal Cladding	Membrane Type AVBM-1	210 m2	
3.9.30	EW10 - Glass Faced Rainscreen Cladding Panel	Glass Faced Rainscreen Panel	66 m2	
3.9.31	EW10 - Glass Faced Rainscreen Cladding Panel	Engineered Cladding Rails	158 kg	Assumed there are 2 rails in a 9m2 area and each rail is 0.15m*3m. Steel 8000 kg/m3
3.9.32	EW10 - Glass Faced Rainscreen Cladding Panel	Insulation Type INS-1	13 m3	
3.9.33	EW10 - Glass Faced Rainscreen Cladding Panel	Engineered Cladding Rails	1054 kg	Assumed there are 2 rails in a 9m2 area and each rail is 0.15m*3m. Steel 8000 kg/m3
3.9.34	EW10 - Glass Faced Rainscreen Cladding Panel	Membrane Type AVBM-1	66 m2	
3.13.35	MS1 - Steel Stud Back-Up Wall	Exterior Sheathing Board	0 m3	
3.13.36	MS1 - Steel Stud Back-Up Wall	Lateral Load-Bearing Cold Formed Metal Framing	96 kg	Assumed 18 gauge steel and 400mm o.c.
3.13.37	MS1 - Steel Stud Back-Up Wall	Gypsum Board	0 m3	
3.42.38	MS2 - Steel Stud Back-Up Wall	Exterior Sheathing Board	36 m3	
3.42.39	MS2 - Steel Stud Back-Up Wall	Lateral Load-Bearing Cold Formed Metal Framing	11226 kg	Assumed 18 gauge steel and 400mm o.c.
3.42.40	MS2 - Steel Stud Back-Up Wall	Gypsum Board	36 m3	
3.43.41	MS3 - Steel Stud Back-Up Wall	Exterior Sheathing Board	16 m3	
3.43.42	MS3 - Steel Stud Back-Up Wall	Lateral Load-Bearing Cold Formed Metal Framing	5871 kg	Assumed 18 gauge steel and 400mm o.c.

ID	Component	Assembly Details	Quantities	Notes
3.43.43	MS3 - Steel Stud Back-Up Wall	Gypsum Board	16 m3	
1.14.44	FW1 - Typical CIP Concrete Foundation Wall	16 Gauge 316 Stainless Steel Flashing to Grade	0 m3	
1.14.45	FW1 - Typical CIP Concrete Foundation Wall	XPS Insulation	21 m3	
1.14.46	FW1 - Typical CIP Concrete Foundation Wall	Damp Proofing Membrane	142 m2	
1.44.47	FW2 - CIP Foundation Wall	XPS Insulation	109 m3	
1.45.48	FW3 - CIP Foundation Wall	XPS Insulation	2 m3	
6.37.49	Concrete Column	Concrete Column	24 m3	Baseline 35MPa concrete with air & 0.40 w/cm (C-1) GU 25 SL
5.19.50	38mm Steel Roof Deck	Steel Deck	18645 kg	Multiply by 1.3 for corrugation. Steel 8000 kg/m3
2.18.51	64mm Concrete Topping on Steel Deck	Min. Depth Poured-In Place Concrete	1 m3	
2.18.52	64mm Concrete Topping on Steel Deck	Steel Deck	151 kg	Multiply by 1.75 for corrugation. Steel 8000 kg/m3
2.48.53	75mm Concrete Topping	Self-Levelling Concrete Topping	147 m3	
2.48.54	75mm Concrete Topping	Rebar	442 kg	3 kg/m3
5.49.55	76mm Steel Roof Deck	Steel Deck	62899 kg	Multiply by 1.75 for corrugation. Steel 8000 kg/m3
2.47.56	89mm Concrete Topping on Steel Deck	Min. Depth Poured-In Place Concrete	234 m3	
2.47.57	89mm Concrete Topping on Steel Deck	Steel Deck	33818 kg	Multiply by 1.75 for corrugation. Steel 8000 kg/m3
1.50.58	100 Slab	Foundation Slab	1 m3	
1.50.59	100 Slab	Rebar	66 kg	55 kg/m3
1.51.60	150 Deep	Foundation Slab	13 m3	

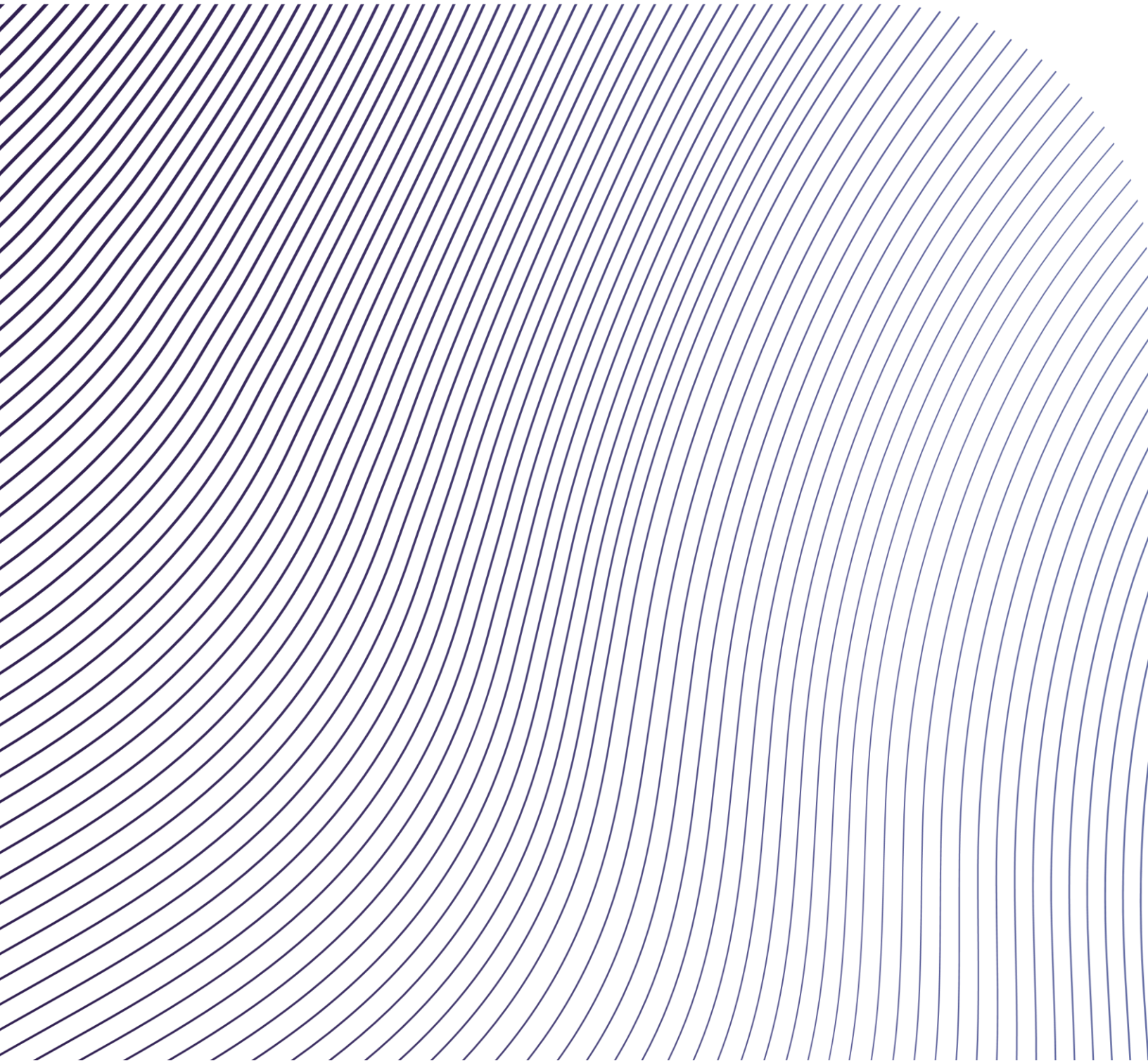
ID	Component	Assembly Details	Quantities	Notes
1.52.61	317 Deep	Foundation Slab	0 m3	
1.52.62	317 Deep	Rebar	19 kg	60 kg/m3
1.53.63	250 Slab	Foundation Slab	9 m3	55 kg/m3
1.16.64	SOG1 - 175	XPS Insulation	279 m3	
1.16.65	SOG1 - 175	Damp Proofing Membrane	2785 m2	
1.16.66	SOG1 - 175	Foundation Slab	487 m3	
1.16.67	SOG1 - 175	Rebar	26806 kg	55 kg/m3
1.17.68	SOG2 - 125	XPS Insulation	59 m3	
1.17.69	SOG2 - 125	Damp Proofing Membrane	592 m2	
1.17.70	SOG2 - 125	Foundation Slab	74 m3	
1.17.71	SOG2 - 125	Rebar	3700 kg	50 kg/m3
1.54.72	SOG2 - 175	XPS Insulation	26 m3	
1.54.73	SOG2 - 175	Damp Proofing Membrane	255 m2	
1.54.74	SOG2 - 175	Foundation Slab	45 m3	
1.54.75	SOG2 - 175	Rebar	2454 kg	55 kg/m3
1.55.76	SOG3 - 175	XPS Insulation	133 m3	
1.55.77	SOG3 - 175	Damp Proofing Membrane	1325 m2	
1.55.78	SOG3 - 175	Foundation Slab	232 m3	
1.55.79	SOG3 - 175	Rebar	12753 kg	55 kg/m3
1.56.80	SOG5 - 175	XPS Insulation	23 m3	

ID	Component	Assembly Details	Quantities	Notes
1.56.81	SOG5 - 175	Damp Proofing Membrane	226 m2	
1.56.82	SOG5 - 175	Foundation Slab	40 m3	
1.56.83	SOG5 - 175	Rebar	2175 kg	55 kg/m3
1.57.84	SOG6 - 240	XPS Insulation	23 m3	
1.57.85	SOG6 - 240	Damp Proofing Membrane	226 m2	
1.57.86	SOG6 - 240	Foundation Slab	54 m3	
1.57.87	SOG6 - 240	Rebar	3254 kg	60 kg/m3
1.36.88	Footing	Footing	210 m3	
1.36.89	Footing	Rebar	14571 kg	
1.40.90	Foundation Slab	Foundation Slab	143 m3	
1.40.91	Foundation Slab	Rebar	17134 kg	
1.41.92	Wall Foundation	Wall Foundation	200 m3	
1.41.93	Wall Foundation	Rebar	10085 kg	
9.21.94	S1 - Interlocking Metal Panel Soffit	Fibreglass Faced Gypsum Sheathing	2 m3	
9.21.95	S1 - Interlocking Metal Panel Soffit	Polyethylene Vapour Barrier	96 m2	10mm
9.21.96	S1 - Interlocking Metal Panel Soffit	Insulation Type INS-1	19 m3	
9.21.97	S1 - Interlocking Metal Panel Soffit	Galvanized Steel Girts	38 kg	Assumed there is 1 rail per 1m2 with cross section area of 1.3*0.025 and length of 1m. Steel 8000 kg/m3
9.21.98	S1 - Interlocking Metal Panel Soffit	Interlocking Pre-Finished Galvanized Metal Panel	553 kg	Multiply by 1.2 for corrugation. Steel 8000 kg/m3
9.58.99	S2 - Interlockig Metal Panel Soffit - Uninsulated	Fibreglass Faced Gypsum Sheathing	1 m3	
9.58.100	S2 - Interlockig Metal Panel Soffit - Uninsulated	Polyethylene Vapour Barrier	46 m2	10mm
9.58.101	S2 - Interlockig Metal Panel Soffit - Uninsulated	Galvanized Steel Girts	18 kg	Assumed there is 1 rail per 1m2 with cross section area of 1.3*0.025 and length of 1m. Steel 8000 kg/m3

ID	Component	Assembly Details	Quantities	Notes
9.58.102	S2 - Interlockig Metal Panel Soffit - Uninsulated	Interlocking Pre-Finished Galvanized Metal Panel	264 kg	Multiply by 1.2 for corrugation. Steel 8000 kg/m3
5.22.103	R1 - SBS Membrane - Low Slope	SBS Roof Membrane	5126 m2	2-Ply
5.22.104	R1 - SBS Membrane - Low Slope	Asphaltic Roof Protection Board	67 m3	
5.22.105	R1 - SBS Membrane - Low Slope	Polyisocyanurate Insulation	1302 m3	
5.22.106	R1 - SBS Membrane - Low Slope	Polyethylene Vapour Barrier	5126 m2	10mm
5.22.107	R1 - SBS Membrane - Low Slope	Fibreglass Faced Gypsum Sheathing	82 m3	
5.23.108	R2 - SBS Membrane - Low Slope, Reduced Insulation	SBS Roof Membrane	49 m2	2-Ply
5.23.109	R2 - SBS Membrane - Low Slope, Reduced Insulation	Asphaltic Roof Protection Board	1 m3	
5.23.110	R2 - SBS Membrane - Low Slope, Reduced Insulation	Polyisocyanurate Insulation	6 m3	
5.23.111	R2 - SBS Membrane - Low Slope, Reduced Insulation	Polyethylene Vapour Barrier	49 m2	10mm
5.23.112	R2 - SBS Membrane - Low Slope, Reduced Insulation	Fibreglass Faced Gypsum Sheathing	1 m3	
4.24.113	Door - Swing Single Framed	Heavy Metal Door	34 m2	
4.27.114	Glazed Aluminum Framed Door	Glazed Aluminum Framed Door	108 m2	
4.25.115	Industrial Door	Industrial Door	59 m2	
4.29.116	CW3 - Vestibule Curtain Wall	Curtain Wall	114 m2	
4.11.117	CW2 - IGU in Insulated Fibreglass Frame	Curtain Wall	222 m2	IGU in Fibreglass Frame - Okalux, Bird Frit on Surface
4.10.118	CW1 - IGU in Insulated Fibreglass Frame	Curtain Wall	412 m2	IGU in Fibreglass Frame - Bird Frit on Surface
7.31.119	Stair - Folded Metal - Wood Tread	Wood Tread	1 m3	
7.33.120	Stair - Folded Metal - Stringer	Metal Tread	2 m3	
6.35.121	Steel Column	Steel Column	89540 kg	7850 kg/m3
6.38.122	Steel Framing	Steel Framing - HSS	248675 kg	
6.38.123	Steel Framing	Steel Framing - OWSJ	3219 kg	
7.32.124	Stair - Cast-in-place	Cast-in-place Concrete	1 m3	Baseline 25MPa concrete without air GU 10 SL

ID	Component	Assembly Details	Quantities	Notes
7.39.125	Rebar	Rebar	63 kg	60 kg/m3
3.59.126	Shear Wall	Shear Wall	165 m3	
3.59.127	Shear Wall	Rebar	14886 kg	90 kg/m3
3.60.128	Above Grade Concrete Wall	Above Grade Concrete Wall	337 m3	
3.60.129	Above Grade Concrete Wall	Rebar	16846 kg	50 kg/m3

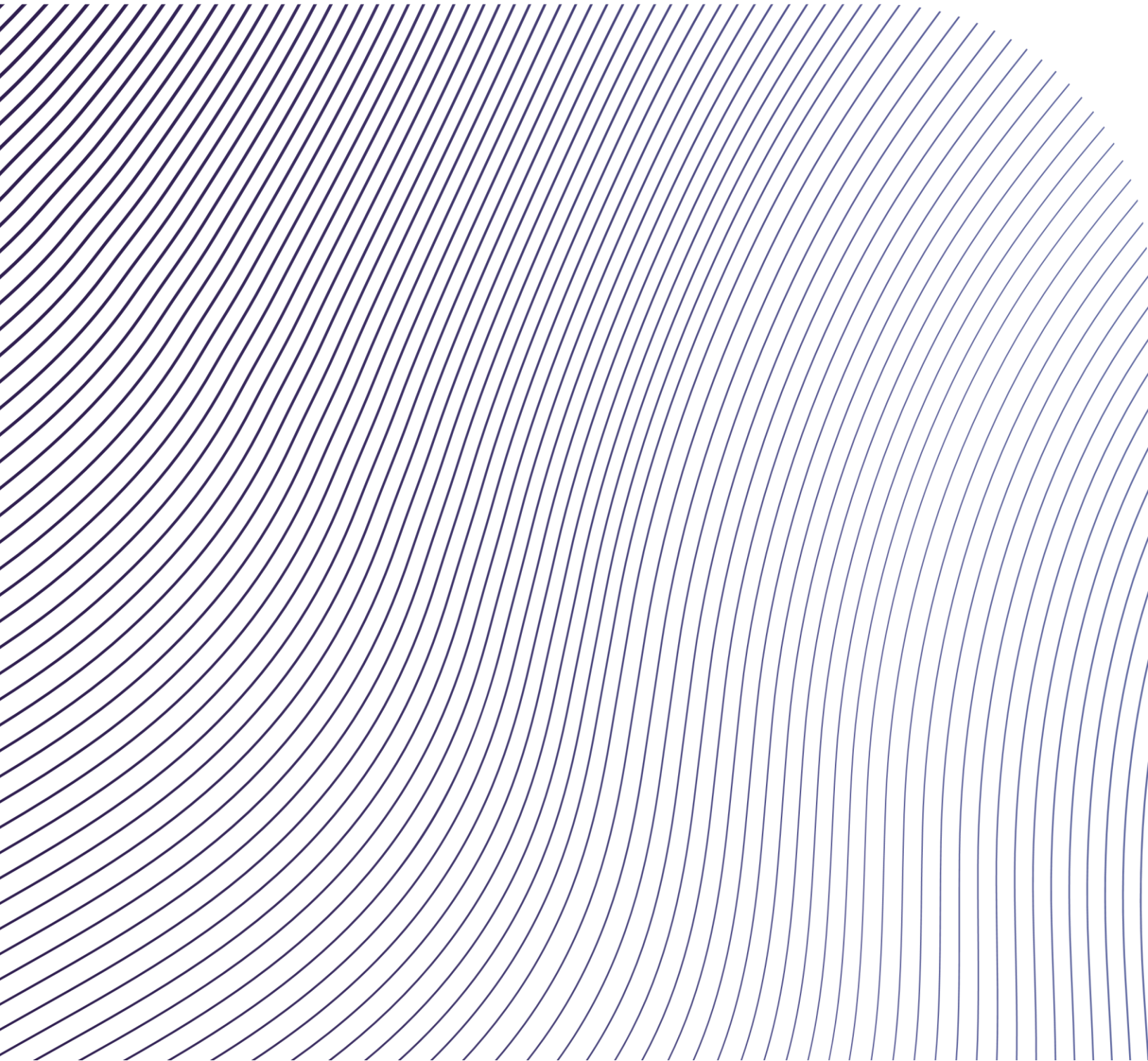
Appendix B: Contribution Analysis



Appendix B: Baseline Upfront Carbon Breakdown by Material

Component	Cradle to gate impacts (A1-A3) (tCO2e)	Of cradle to gate (A1-A3) (%)
Ready-mix concrete, Ontario industry average	575	28
Fabricated hollow structural steel sections, unpainted	572	27.9
Glass façade curtain wall system	179	8.7
Styrofoam insulation	130	6.3
Galvanized steel façade cladding panel	92	4.5
Roll formed aluminum cladding	86	4.2
Polyisocyanurate (PIR) roof insulation boards, coated glass faced (CGF)	75	3.6
Reinforcement steel (rebar), generic	71	3.5
Stone wool insulation board for exterior cavity wall and rainscreen applications, moisture resistant, with bitumen facing or no facing	42	2
Bitumen roofing membrane, panelized-asphaltic, P-A/T	38	1.9
SBS polymer-modified bitumen membrane roofing, self-adhered	36	1.7
Sintered stone slabs, for internal and external cladding	30	1.5
Fabricated hot-rolled structural steel sections, unpainted	30	1.4
Hot-dip galvanized steel sheets	26	1.3
EPDM waterproofing membrane	25	1.2
Gypsum plaster board, regular	22	1.1
Bitumen-polymer membrane, moisture control layer	13	0.6
Aluminium framed double glazed doors, per m2	9	0.4
Steel, stainless, 304	7	0.3
Insulated glass unit (IGU), two or more panels	5	0.2
Roll formed steel cladding	5	0.2
Expanded polystyrene (EPS)	4	0.2
Double metal door (for technical premises, cellars, service ...)	3	0.2
Aluminium composite panel, polyethylene core	3	0.1
PIR (polyisocyanurate foam) insulation panels, unfaced, generic	2	0.1
Industrial and garage doors from steel panels, per m2	2	0.1
Gypsum board with glass mat sheathing	1	0

Appendix C: Proposed Prescriptive Example and Performance Table for Compliance with Target



OPTION 1: PRESCRIPTIVE TABLE

Baseline Embodied Carbon of All Materials (A-C)															3,398,000 kg CO2e						
															434 kg CO2e/m2						
Upfront Carbon (A1-A3) of Most Contributing Materials																					
Column A		B	C	D	E	F	G	H		I	J	K	L		M	N	O	P	Q	R	S
Category		Materials	Estimated Material Qty	Estimated Wastage 4%	Total Estimated Material Qty	Unit	Material Description	Baseline		Allowable GWP Limit		Proposed Material		Product Name	EPD Number	GWP (A1-A3)	Units	Total (kg CO2E)	Reduction (kg CO2E)	Project of Embodied Carbon	
Calculation Reference			Per takeoffs	= C x 0.04	= C+D			GWP (A1-A3)	Units	Total (kg CO2E)	GWP (A1-A3)	Units						= E x O	= J - Q	= R / 3,398,000 kg CO2E	
Insulation		Extruded Polystyrene (Foundation)	541	21.6	562.6	m3	XPS - Dow Highload 40	220.3	kg CO2e/m3	123,920	131.9	kg CO2e/m3					kg CO2e/m3				
			10648	425.9	11074.2	m2 @ 1 RSI	XPS - Dow Highload 40	11.19	kg CO2e/m2 @ 1 RSI		6.7	kg CO2e/m2 @ 1 RSI	Soprema XPS	EPD-283		1.8	kg CO2e/m2 @ 1 RSI	19,933	103,986	3.1%	
Rebar		Rebar	125253	5010.1	130263.1	kg	60% Recycled Content Rebar (Canada)	1.41	kg CO2e/kg	183,671	0.92	kg CO2e/kg	Gerdau Long Steel Rebar, Whitby, ON Steel Mill	SCS-EPD-07290		0.78	kg CO2e/kg	101,605	82,065	2.4%	
Structural Steel		Steel Plate	179	7.2	186.2	tonne	CISC Industry Average	1710	kg CO2e/tonne	318,334	1710	kg CO2e/tonne	CISC Industry Average	SCS-EPD-07593		1710	kg CO2e/tonne	318,334	-	-	
		Rolled Steel Sections	172	6.9	178.9	tonne	CISC Industry Average	1720	kg CO2e/tonne	307,674	1720	kg CO2e/tonne	Structural steel product, hot-rolled, North America average, 7850 kg/m3 (Gerdau)	SCS-EPD-07504		820	kg CO2e/tonne	146,682	160,992	4.7%	
		HSS	338	13.5	351.7	tonne	CISC Industry Average	1860	kg CO2e/tonne	654,214	1860	kg CO2e/tonne	CISC Industry Average	SCS-EPD-07425		1860	kg CO2e/tonne	654,214	-	-	
		OWSJ	322	12.9	334.7	tonne	SJI Industry	1430	kg CO2e/tonne	478,581	1430	kg CO2e/tonne	Fabricated open-web steel joists and joist girders, 7800 kg/m3 (Nucor)	EPD-394		840	kg CO2e/tonne	281,124	197,456	5.8%	
		Steel Deck	116	4.6	120.1	tonne	Steel Deck Institute	2370	kg CO2e/tonne	284,684	1800	kg CO2e/tonne	Steel roof and floor deck using electric arc furnace (EAF) technology, North America average, 7800 kg/m3 (Nucor Corporation's Vulcraft Group)	SCS-EPD-09144		1740	kg CO2e/tonne	209,009	75,675	2.2%	
Concrete		Piers	24	0.9	24.6	m3	Ontario Industry Average Concrete Baseline 35MPa concrete with air & 0.40 w/cm (C-1)GU 25 SL	313.07	kg CO2e/m3	7,717	270	kg CO2e/m3	Lafarge ECOPEACT GWP Range (Upper)			270	kg CO2e/m3	6,655	1,062	0.0%	
		Topping on Steel Deck	234	9.4	243.4	m3	Ontario Industry Average Concrete Baseline 25MPa concrete without air GU 10 SL	254.05	kg CO2e/m3	61,826	215	kg CO2e/m3	Lafarge ECOPEACT GWP Range (Upper)			215	kg CO2e/m3	52,322	9,503	0.3%	
		Topping	147	5.9	152.9	m3	Ontario Industry Average Concrete Baseline 25MPa concrete without air GU 10 SL	254.05	kg CO2e/m3	38,839	215	kg CO2e/m3	Lafarge ECOPEACT GWP Range (Upper)			215	kg CO2e/m3	32,869	5,970	0.2%	
		Foundation Slab	1098	43.9	1141.9	m3	Ontario Industry Average Concrete Baseline 35MPa concrete with air & 0.40 w/cm (C-1)GU 25 SL	313.07	kg CO2e/m3	357,501	270	kg CO2e/m3	Lafarge ECOPEACT GWP Range (Upper)			270	kg CO2e/m3	308,318	49,182	1.4%	
		Footing	210	8.4	217.9	m3	Ontario Industry Average Concrete Baseline 30MPa concrete without air GU 15 SL	313.07	kg CO2e/m3	66,212	236	kg CO2e/m3	Lafarge ECOPEACT GWP Range (Upper)			236	kg CO2e/m3	51,420	16,792	0.5%	
		Foundation Walls	200	8.0	207.7	m3	Ontario Industry Average Concrete Baseline 32MPa concrete with air & 0.45 w/cm (C-2) GU 10 SL	326.46	kg CO2e/m3	67,802	326	kg CO2e/m3	Ontario Industry Average Concrete Baseline 32MPa concrete with air & 0.45 w/cm (C-2) GU 10 SL			326	kg CO2e/m3	67,802	-	-	
		Stairs	1	0.0	1.0	m3	Ontario Industry Average Concrete Baseline 25MPa concrete without air GU 10 SL	254.05	kg CO2e/m3	264	215	kg CO2e/m3	Lafarge ECOPEACT GWP Range (Upper)			215	kg CO2e/m3	224	41	0.0%	
		Core Walls	502	20.1	522.1	m3	Ontario Industry Average Concrete Baseline 35MPa concrete with air & 0.40 w/cm (C-1)GU 25 SL	313.07	kg CO2e/m3	163,448	270	kg CO2e/m3	Lafarge ECOPEACT GWP Range (Upper)			270	kg CO2e/m3	140,962	22,486	0.7%	
Total Column J										3,116,685						Total Column Q		Total Column R		= Total Column R / 3,398,000 kg CO2e	
																2,391,473		725,212		21.3%	
																				Must be greater than 20%	

OPTION 2: PERFORMANCE TABLE

Baseline Embodied Carbon of All Materials (A-C)															3,398,000 kg CO2e 434 kg CO2e/m2					
Upfront Carbon (A1-A3) of Most Contributing Materials																				
Column A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S		
Category Calculation Reference	Materials	Estimated Material Qty	Estimated Wastage 4% =C x 0.04	Total Estimated Material Qty =C+D	Unit	Material Description	Baseline		Allowable GWP Limit		Proposed Material				Upfront Carbon Reduction (kg CO2e) =E x O	% Reduction Project Embodied Carbon =R / 3,398,000 kg CO2e				
							GWP (A1-A3)	Units	Total (kg CO2e) =E x H	GWP (A1-A3)	Units	Product Name	EPD Number	GWP (A1-A3)			Units	Total (kg CO2e) =E x O	=J - Q	
Insulation	Extruded Polystyrene (Foundation)	541	21.6	562.6	m3	XPS - Dow Highload 40	220.3	kg CO2e/m3	123,920	131.9	kg CO2e/m3									
		10648	425.9	11074.2	m2 @ 1 RSI	XPS - Dow Highload 40	11.19	kg CO2e/m2 @ 1 RSI		6.7	kg CO2e/m2 @ 1 RSI									
Rebar	Rebar	125253	5010.1	130263.1	kg	60% Recycled Content Rebar (Canada)	1.41	kg CO2e/kg	183,671	0.92	kg CO2e/kg									
Structural Steel	Steel Plate	179	7.2	186.2	tonne	CISC Industry Average	1710	kg CO2e/tonne	318,334	1710	kg CO2e/tonne									
	Rolled Steel Sections	172	6.9	178.9	tonne	CISC Industry Average	1720	kg CO2e/tonne	307,674	1720	kg CO2e/tonne									
	HSS	338	13.5	351.7	tonne	CISC Industry Average	1860	kg CO2e/tonne	654,214	1860	kg CO2e/tonne									
	OWSJ	322	12.9	334.7	tonne	SJI Industry	1430	kg CO2e/tonne	478,581	1430	kg CO2e/tonne									
	Steel Deck	116	4.6	120.1	tonne	Steel Deck Institute	2370	kg CO2e/tonne	284,684	1800	kg CO2e/tonne									
Concrete	Piers	24	0.9	24.6	m3	Ontario Industry Average Concrete Baseline 35MPa concrete with air & 0.40 w/cm (C-1)GU 25 SL	313.07	kg CO2e/m3	7,717	270	kg CO2e/m3									
	Topping on Steel Deck	234	9.4	243.4	m3	Ontario Industry Average Concrete Baseline 25MPa concrete without air GU 10 SL	254.05	kg CO2e/m3	61,826	215	kg CO2e/m3									
	Topping	147	5.9	152.9	m3	Ontario Industry Average Concrete Baseline 25MPa concrete without air GU 10 SL	254.05	kg CO2e/m3	36,839	215	kg CO2e/m3									
	Foundation Slab	1098	43.9	1141.9	m3	Ontario Industry Average Concrete Baseline 35MPa concrete with air & 0.40 w/cm (C-1)GU 25 SL	313.07	kg CO2e/m3	357,501	270	kg CO2e/m3									
	Footing	210	8.4	217.9	m3	Ontario Industry Average Concrete Baseline 30MPa concrete without air GU 15 SL	313.07	kg CO2e/m3	66,212	236	kg CO2e/m3									
	Foundation Walls	200	8.0	207.7	m3	Ontario Industry Average Concrete Baseline 32MPa concrete with air & 0.45 w/cm (C-2) GU 10 SL	326.46	kg CO2e/m3	67,802	313.07	kg CO2e/m3									
	Stairs	1	0.0	1.0	m3	Ontario Industry Average Concrete Baseline 25MPa concrete without air GU 10 SL	254.05	kg CO2e/m3	264	215	kg CO2e/m3									
	Core Walls	502	20.1	522.1	m3	Ontario Industry Average Concrete Baseline 35MPa concrete with air & 0.40 w/cm (C-1)GU 25 SL	313.07	kg CO2e/m3	163,448	270	kg CO2e/m3									
Total Column J										3,116,685		Total Column Q		Total Column R		= Total Column R / 3,398,000 kg CO2e				
*XPS is reported in either m3 or m2 @ 1 RSI. Fill only one of the two																			Must be greater than 20%	

OPTIONAL: ADDITIONAL OPPORTUNITIES FOR IMPROVEMENT ABOVE 20%

Material Name	Qty	Unit	GWP (A1-A3)	Unit	Resulting Total GWP	Resulting Savings (kg CO2e)	Cost Premium (\$)

Add additional pages as required.

