APPENDIX E:

Directed Approach to Embodied Carbon in Healthcare New Construction

Compared to operational carbon emissions, embodied carbon emissions are primarily due to construction and contribute up to 50% of the building's lifetime emissions, causing a time-concentrated, near-term impact on global warming.

Embodied carbon refers to the Global Warming Potential (GWP) of carbon emissions during the extraction, manufacture, transportation, maintenance and disposal or recycling of materials needed for construction, and is measured as an intensity, relative to the floor area (kg CO2e/m2).

Tools, processes and industry data have evolved to support a reduction in embodied carbon, which is coordinated through design, specification and procurement project phases.

Key Considerations

- ✓ Focus early in Schematic Design on major carbon contributors: concrete, steel and insulation.
- ✓ Coordinate materials, quantities and Environmental Product Declarations (EPD) collection with designers and procurement, as early as possible in the design process.
- ✓ Follow all steps from "*A Pragmatic Approach to Lowering Embodied Carbon: Concrete*", developed by ZGF Architects, Fast + Epp, EllisDon and Lafarge.
- ✓ Adapt all steps from "*A Pragmatic Approach* ..", for steel, insulation, wood and all materials identified as in-scope
- ✓ Where possible use local EPDs, such as EPDs developed by Concrete BC.

Target

- It is expected that a 10 to 20% reduction in embodied carbon is achievable at no additional cost, and a 30 to 40% reduction is achievable at low cost.

Innovation

- As a stretch goal, consider embodied carbon reduction for interior finishes, furniture and equipment subject to availability of EPDs. While the overall reduction target compared to baseline may be reduced, the actual impact in terms of carbon reduction is higher.

Actions:

Request for Proposal

- ✓ Include RFP language for Prime architects, engineers, costing consultants, procurement specialists to support an integrated approach to reduction in embodied carbon
- ✓ Engage services of sustainability consultant to guide integrated embodied carbon strategy, and to conduct LCA:
  - During Schematic Design

- Updated at 100% Detailed Design and IFC.

Schematic Design

Early Design Embodied Carbon Calculations:

- ✓ Gain approximate concrete and steel quantities from structural engineer or contractor (if available) during early design (schematic design and design development phases).
- ✓ Run baseline calculations in bid form using Environmental Product Declarations (EPDs). Request sample bid form from EES.
- ✓ Establish concrete, steel and insulation Embodied Carbon reduction targets from baseline.

Baselines and Targets

- ✓ Set carbon reduction goals and targets with the team no later than Schematic Design.
- ✓ Report and discuss targets with Owner's reps: EES and Facilities User Groups

Efficient Structural Use

- ✓ Engage in early investigations to optimize design (see *A Pragmatic Approach*)

Optimize Concrete Mix Design

- ✓ Engage in early conversations with concrete suppliers and contractor (see *A Pragmatic Approach*)

Whole Building Life-Cycle Analysis (LCA)

- ✓ Follow "Scope and Parameters for LCA", at end of this Section.
- ✓ Gain updated in-scope material quantities from either structural engineer or contractor. It is recommended to work with the contractor estimators' team as early as possible to attain more realistic concrete quantities.
- ✓ Update baseline GWP and targeted values using concrete, steel and other material supplier EPDs.
- ✓ Calculate initial LCA for proposed building based on updated materials information.

Deliverables:

- ✓ Report to include design strategies, and target discussion.
- ✓ LCA Report
- ✓ Initial embodied carbon target

Detailed Design, Construction Documents

Actions:

Specifications

- ✓ Develop concrete performance based specifications that include strength, exposure class and cure time required.
- ✓ Specify provision of EPDs for each concrete mix design

- ✓ Specify provision of EPDs for steel, insulation and each material in scope for embodied carbon reduction.

Procurement

- ✓ Contractor to issue bid form as part of tender package and communicate to concrete supplier the desire for lower carbon options. See Sample bid form here.
- ✓ Concrete Supplier to complete bid form, with alternative low carbon mixes in support of GWP targets.
- ✓ Structural Engineer, Contractor and Concrete Supplier to review mixes and optimize for all performance expectations through Post Contract Award.
- ✓ Concrete Supplier and Contractor to track actual concrete volumes supplied, by mix and identify any change from early design agreements.
- ✓ Contractor to follow similar process for steel, insulation and other in-scope materials. See sample "Spec sheet for embodied carbon" for each material. (link)

Deliverables:

- LCA Report at 100% Detailed Design
- LCA Report at IFC

Construction Admin

Deliverables:

- Optional: LCA Report with as-builts

Scope and Parameters for Whole Building Life Cycle Assessment

Inclusions

- All envelope and structural elements (including parking structure)
- Footings and foundations
- Complete structural wall assemblies (from cladding to interior finishes, including basement)
- Structural floors and ceilings (not including finishes)
- Roof assemblies
- Stairs construction

Exclusions

- Excavation and other site development, partitions, building services (electrical, mechanical, fire detection, alarm systems, elevators, etc.), and surface parking lots.

System Boundary

- System boundary is Module A1 to C4 (cradle to grave), and does not include Module B6 (operational energy).

- Report on Module D (Beyond the Building Life Cycle Stage) separately.

Impact Assessment Categories

- Report on six Impact Categories, as a minimum.

Service Life

- Use service life of 60 years for all LCA models