The Design Studio of
BTH
Architects

March 11, 2024

Client: TPE Solutions Inc.
3 Patterson Rd
Shirley, MA 01464

REGISTERED ARCHITECT
BRENT T. HEINZER
No. 20581
WESTMINSTER
MA
COMMONWEALTH OF MASSACHUSETTS

Project: TPE Solutions Global Headquarters
33 Lake George St, Devens
Ayer, MA 01434

RE: Devens Enterprise Commission (DEC) and MassDevelopment Guidelines

Devens Zoning By-Laws: III. Permitting Procedures

J. Visual Impact of Buildings in Viewsheds *(Prospect Hill overview, Sears Estate and Fruitlands Museum)*

☒ a. Building materials and colors of the building façade that are darker than natural concrete or shades of white or that are earth tone in color; and

Comment: The building colors will be darker in color and wood textures and patterns and will be earth tones, shades of white and gray.

☒ Any sign proposed to be placed within a viewshed area shall be situated in a location where it will be below existing or new tree canopies, in order to result in its minimum visibility in the viewshed area.

Comment: Building signage will not exceed the existing tree lines or newly built screening tree lines provided for on the site plan.

☒ Buildings within the Viewshed Overlay District shall not have reflective metal flashing, mechanical enclosures, window frames or treatments, doors, roofing material, or building trim and all metal surfaces shall be finished with a dark, non-reflective finish. Rooftops shall not be illuminated. Signs shall be located below new or existing tree canopies.

Comment: This building is located in the Viewshed Overlay District and has accounted for no reflective materials or flashings, mechanical enclosures are provided for roof equipment, walls shielding loading docks that will be visible to the viewshed. Site directional signage will be consistent with signage through Lake George St. and Jackson Rd.

MassDevelopment Devens Design Guidelines (Jackson Technology Park)

3 Architectural Guidelines

☒ 3.1.1 Architectural Character

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Comment: This building is designed to be consistent with the corporate image of buildings that are in the immediate campus context of this building. This consists of the style, color, material, and scale.

☒ 3.1.2 Building Sitting, Massing and Density

Comment: This building will be sited with a strong façade along Lake George St. The building will step back at each corner with a change of materials and textures to address the built and natural environment. A lower soffit line will be provided at the building entrances to reduce the massing of the building and introduce a human scale to the building. Boxed windows along the street will help to provide depth to the building façade.

3.1.3 Frontage, Setbacks, Build-to Lines and Building Height

Comment: This building fits within the building envelope established by zoning setbacks, floor area ratios (FAR), building height allowance and viewshed restrictions.

☒ 3.1.4 Building Materials and Colors

Comment: The building materials will vary across the building and include high-quality masonry including brick and split-face and ground-face block at the base of the walls, with high quality architectural metal panels that are non-reflective and will provide high R-value to the building envelope. The glazing of the building will be aluminum frame fixed glass that will be tinted a dark color for privacy and solar qualities.

☒ 3.1.5 Roof Treatments

Comment: The building roofs are flat roofs to accommodate building mechanical equipment that will be shielded from view and equipment noise levels by the use of parapet walls that extend +/- 3'-0" above the high-point of the roof and by architectural screen enclosures that will be +/- 7'-0" above the high-point of the roof.

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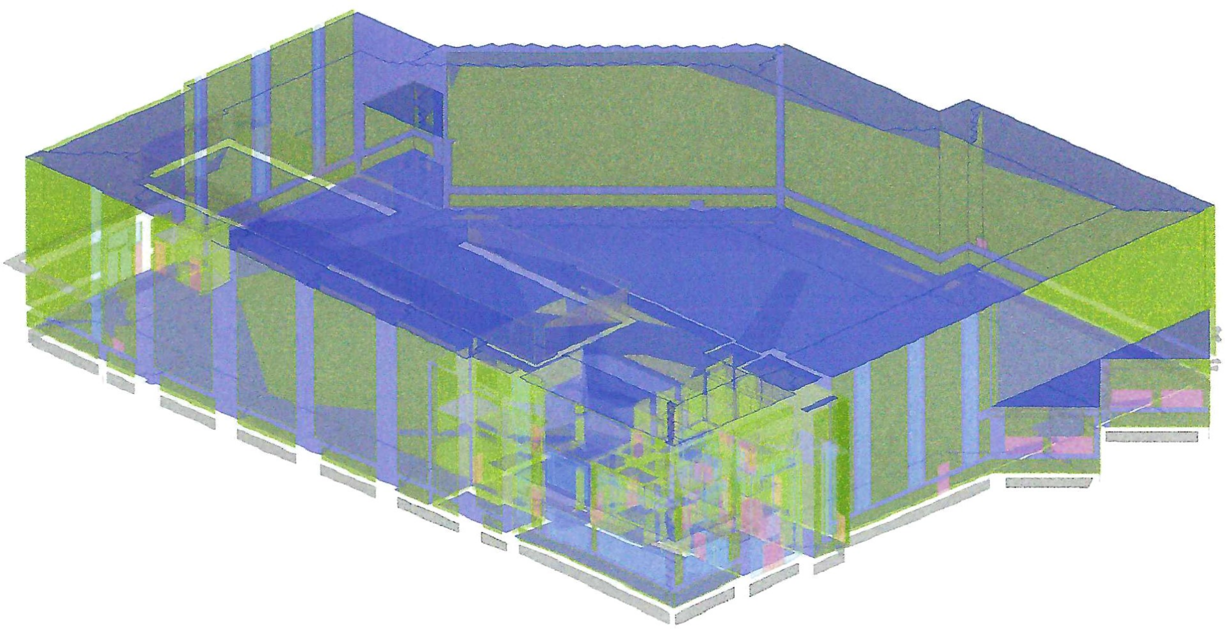
RE: Energy Model Analysis for Life Cycle Assessment (LCA) and Embodied Carbon Assessment (ECA)



Life Cycle Assessment (LCA)

The energy consumption of the building will be calculated as Energy Use intensity (EUI) in kWh/ft2 per year based on the energy setting of the project. EUI is calculated by dividing the total energy consumed by the building in one year by the total gross floor area of the building. The analysis report will have many Design options like Operating schedule, window to wall ratio, HVAC systems, building orientation, lighting efficiency to alter and control the energy consumption of the building. The analysis report not

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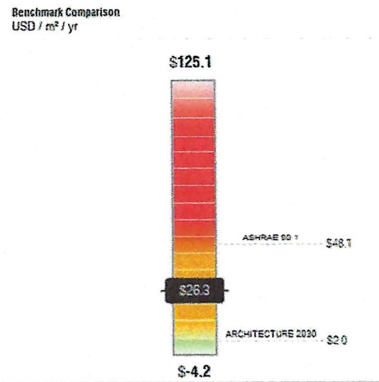
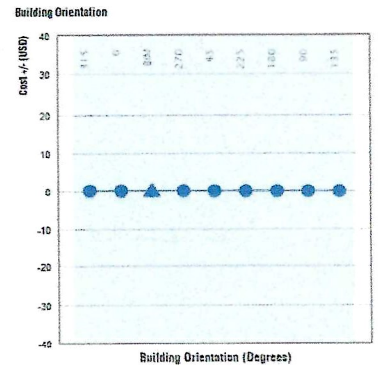
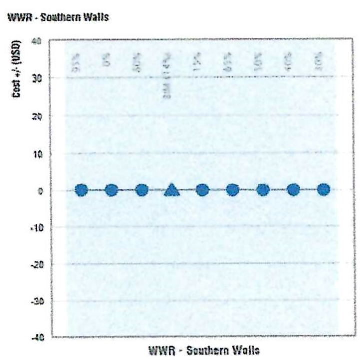
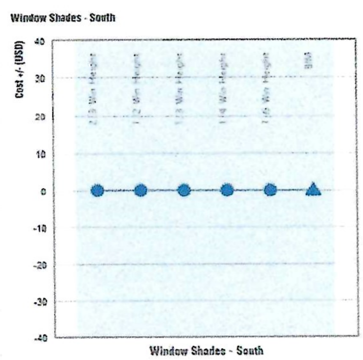
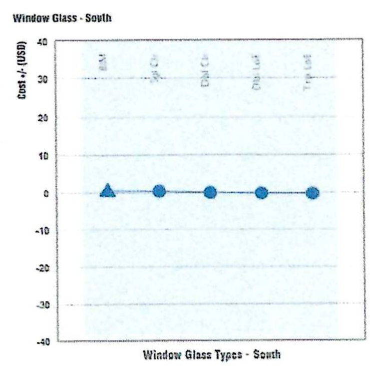
only provide us with the Energy use intensity of the project but also the energy cost of the project per square feet per year.

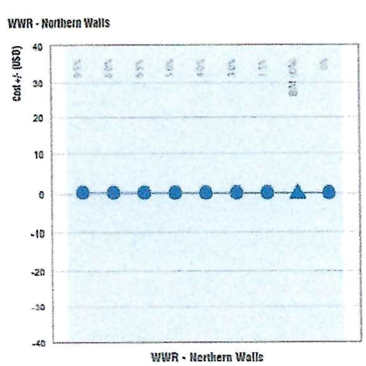


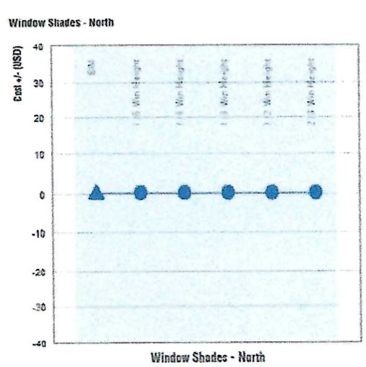


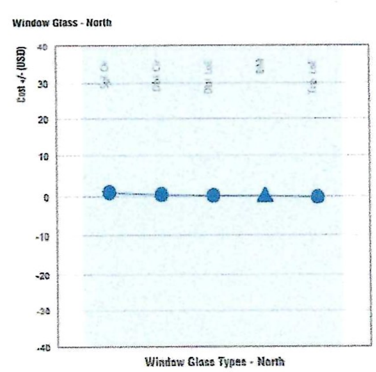












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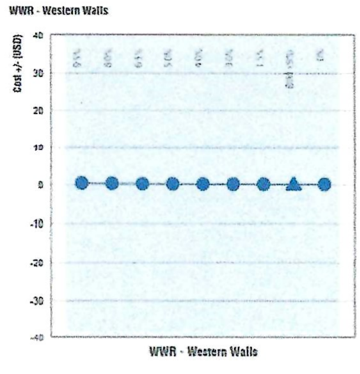

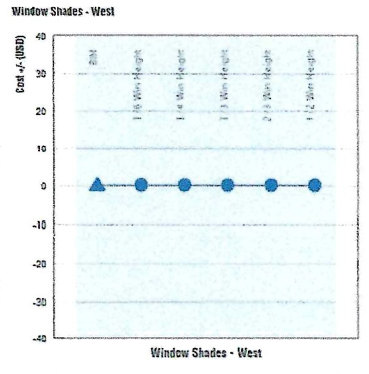

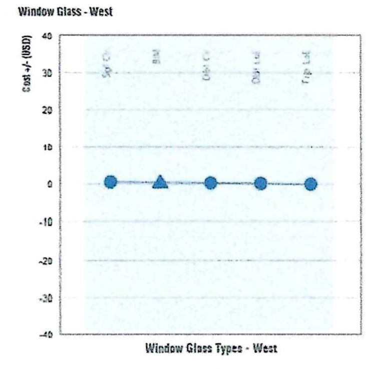

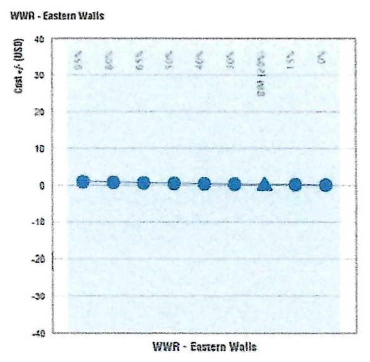

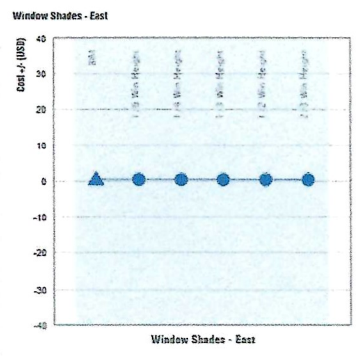

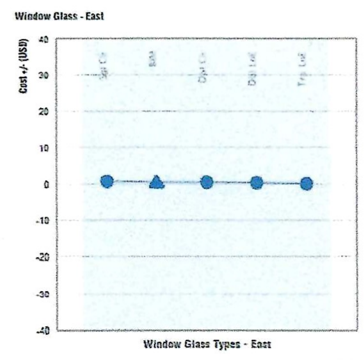

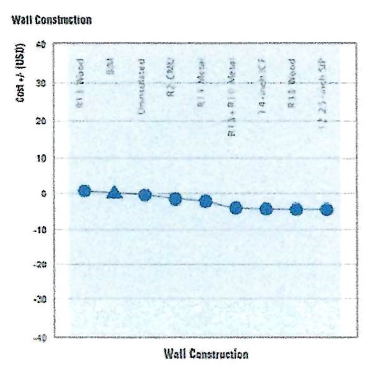

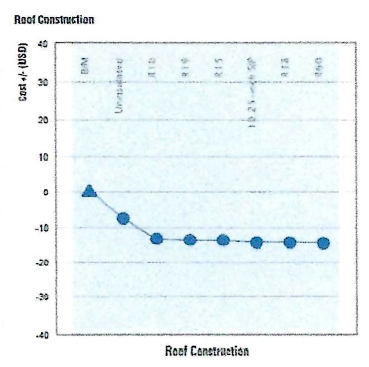

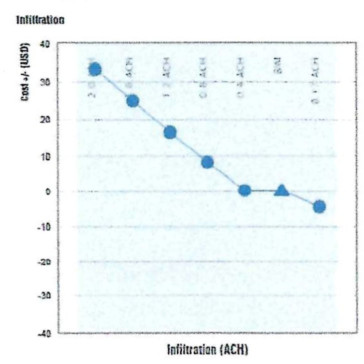

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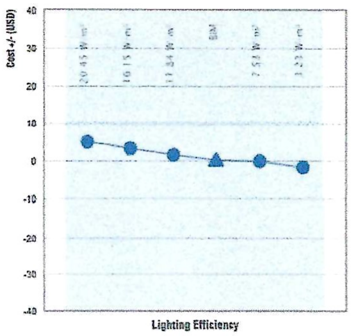
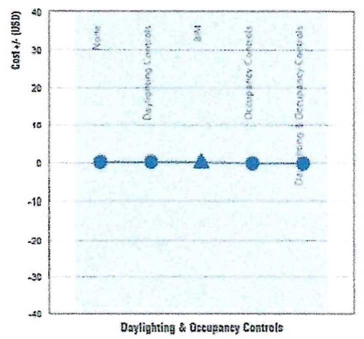
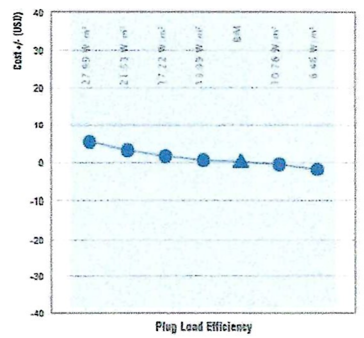
Lighting Efficiency



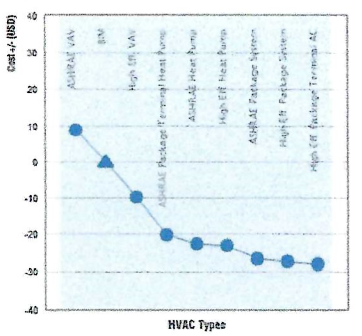
Daylighting & Occupancy Controls



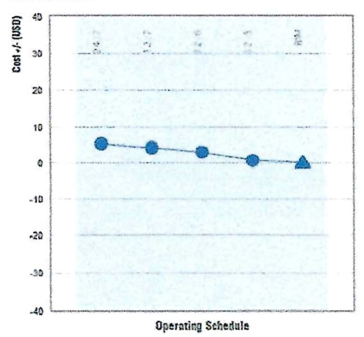
Plug Load Efficiency



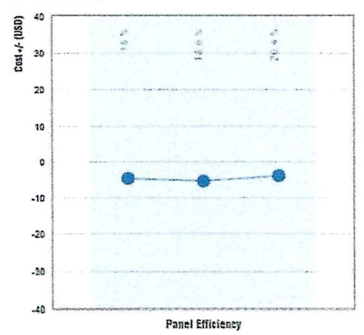
HVAC



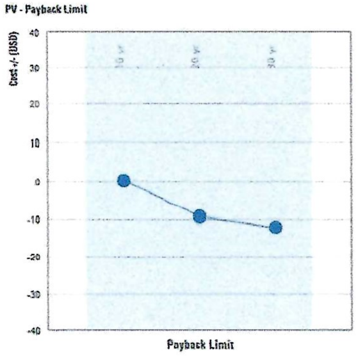
Operating Schedule



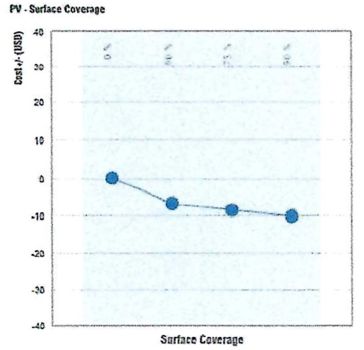
PV - Panel Efficiency



PV - Payback Limit



PV - Surface Coverage



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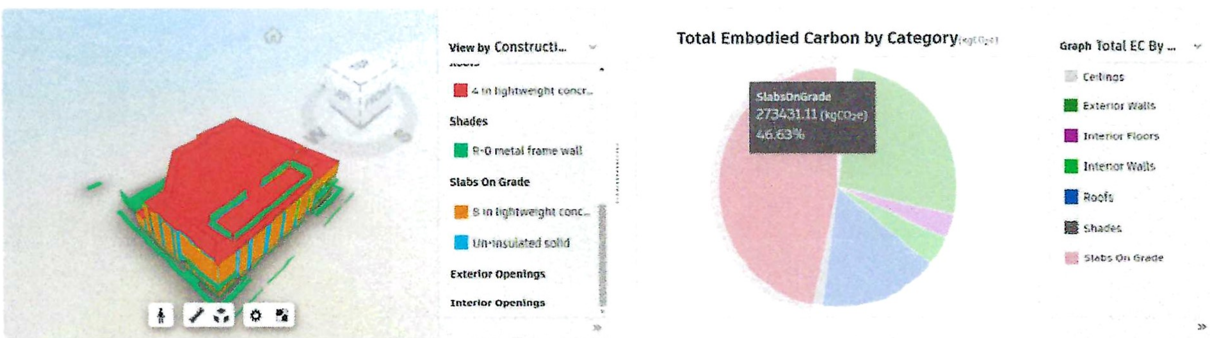
Embodied Carbon Assessment (ECA)

About this Insight

Insight scope: Envelope and Interiors subset of architectural elements based on the data included in the Energy Analytical Model Embodied carbon analysis scope: manufacturing stage (A1 - A3) + Operational energy (B6) Operational Carbon emissions relative to the first year of operation Carbon emission coefficients for 2024



Constructions Summary

Construction	Description	Detail L...	Co...	Thickne... (in)	De... (lb/...	Thermal Pe... (R: (h·ft²·°F...	Area (ft²)	Volume (ft³)	Mass (lb)	EC Definition	EC ...	EC (kgCO₂e)	EC Inte... (kgCO₂e...
4 in lightweight con	4 in (100 mm) lightwe...	Scheme...		4		U: 7.2398	29974.54	9991.51	1197599.73			95959.06	3.20
8 in lightweight con	8 in (200 mm) lightwe...	Schema...		8		U: 4.6039	21204.58	14136.39	1129607.56			155200.54	7.32
8 in lightweight con	8 in (200 mm) lightwe...	Schema...		8		U: 7.7281	3611.65	2407.76	192399.06			26434.35	7.32
Frame partition wit...	Frame partition with 3...	Scheme...		4 5/8		U: 8.3658	9977.40	3846.28	52903.97			23291.30	2.33
Passive floor, no ins	Passive floor, no insul...	Schema...		1/2		U: 16.7974	2707.99	112.83	13524.36			5333.13	1.97
R-0 metal frame wal	R0 16 in (400 mm) on ...	Schema...		1 1/4		U: 18.4753	10125.64	1055.02	52750.00			6730.40	0.66
Un-insulated solid	Un-insulated Solid-gr...	Schema...		8 3/8		U: 4.0083	29664.80	20701.12	2817104.52			273409.20	9.22
Constructions Total							**107266...**	**52250.92**	**5455955.26**			**586358.04**	

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Embodied Carbon Reduction Strategy	Checklist for Schematic Design		
Process and Tools	*Already included*	*Will pursue?*	
Identify Embodied Carbon as a Priority Communicate early in the design process that reducing embodied carbon is a design and procurement priority for the whole team (e.g., structural engineer, architect, contractor, sustainability consultants, mechanical engineers, etc.)	Yes		*This project is being designed with high R-value walls and roof panels, reduction of steel through rigid frames, high efficeintcy heating a cooling systems reducing or eliminating fossil fuel consumption or use, concrete slab-on-grade with shallow foundation design.*
Set a Project Embodied Carbon Reduction Target Align the design and construction team around an embodied carbon reduction target. Consider targets from organizations around the globe (e.g., C40, Architecture 2030, WGBC, LETI) to understand what reductions we need now to reach 2030 and 2050 goals. Use life cycle assessment tools (see Sections 0.3 and 0.4 below) to track progress towards reduction goals. See Section "4.1 Integrate Carbon Intensity Limits into Specifications" for information about setting targets for multiple building products	No	Yes	We exploring alternative assesment tools to establish a carbon reduction target for the whole building through construction calculator tools like EC3
Commit to Using Whole Building (Whole Project) Life Cycle Assessment Perform a whole building life cycle assessment (WBLCA) early in design development to identify the largest opportunities ("hot spots") for emissions reductions. Use the results from WBLCA(s) done throughout design to compare design choices and identify which reduction strategies will have the largest impact. WBLCA can be used to analyze the whole building, tenant improvement projects, or portions of a building	No	Yes	Being assessed
Use Environmental Product Declarations (EPDs) During Procurement Once a product type has been selected, ask manufacturers (via specifications and the bidding and procurement processes) to provide environmental product declarations (EPDs) of their products to help select the lowest-carbon option.	No	Yes	Final selection of product suppliers with environmental product declarations
Discuss Whether to Integrate Carbon into the Bid Process Carbon can be evaluated alongside cost, schedule, and other criteria when selecting bids for materials to be used in construction. Alternatively, performance incentives can be provided to contractors who deliver low-embodied-carbon projects or suppliers that deliver materials below a certain carbon threshold. These strategies all require discussion early in the process between the owner, design team, and contractor	No	Yes	Being assessed
Build Less, Reuse More	*Already included*	*Will pursue?*	
Reuse/Retrofit Existing Buildings Re-use or retrofit existing buildings instead of constructing a completely new building. Reductions in new square footage or new structure will translate directly to reductions in embodied carbon	No	No	*This project is entirely a new building. No existing structure exist on the site to entertain reuse.*
Design for Disassembly and Reuse Maximize the reuse potential of building components by detailing connections that can be easily disassembled and reused in future buildings. Avoid lamination and adhesion in assemblies (such as composite decks or hybrid mass timber/concrete assemblies) that prevent deconstruction and reuse. Avoid materials that are difficult to recycle, and avoid coatings that	Yes		Building material and methods that are being used to construct and sheath this building will be all mechancial connnections and bracing that will allow for easy disassembled and reused in the future.
Select Salvaged or Refurbished Materials Reuse materials, such as those onsite or from other city properties, or purchase salvaged materials rather than new ones. Consider refurbishing items, such as furniture, instead of throwing them out and re-purchasing them.	No	Yes	
Design Lighter and Smarter	*Already included*	*Will pursue?*	
Reduce [New] Floor Area Identify opportunities for design and programmatic flexibility to minimize the amount of new floor area. Similar to material and building reuse, reducing new floor area translates to material savings (as well as cost savings) and reduces embodied carbon	Yes		*Add a brief explanation here about how the project may incorporate this strategy into the project and any special considerations necessary*
Reduce Below-Grade Construction Reduce or eliminate below-grade parking or interior spaces. Subgrade construction requires a large amount of concrete (a carbon-intensive material) and releases soil carbon during excavation	Yes		No sub-grade building space being provided. The building is a slab-on-grade with shallow foundation and footings
Select Lighter Materials and Assemblies When possible, selecting lighter materials and assemblies for the structure and envelope systems can reduce the load on structural components (and therefore their size and embodied carbon). Consider lightening slabs through use of void systems, or using lighter structural materials like timber. In some cases, lighter structural loads may be decreased enough to allow for the preservation of an existing structure, unlocking additional carbon savings from building reuse.	Yes		Light weight building materials like IMP's and ACM's and reduced wieght concrete and masonry products are being used on the project.
Design Structure for Material Efficiency Using less of a material to do the same work results in large carbon and cost savings. Structural design choices -- such as bay sizing, column and beam spacing, and member cross sections, as well as avoiding structural gymnastics (like cantilevers and transfer beams) -- can all reduce carbon.	Yes		Reduction of steel through rigid frames, with light gauge cold formed steel materials are being used on the project
Choose Finishes Carefully The total impact of interior finishes adds up significantly over time. Consider the expected turnover of the space you are designing and whether that matches up with the selected products. Architects and interior designers can collaborate to use salvaged materials and minimize the need for additional finishes where not required for functional performance, particularly in spaces with high occupant turnover and frequent interior fit-outs. These considerations should be included alongside toxicity, cost, and performance requirements when choosing finishes	Yes		We are pursuing different products or the use of raw materials minus sheathing.

Strategy	Already included	Will pursue?	Notes
Minimize Construction and Demolition Waste (Waste Prevention) Before construction, design in modules to minimize waste. During construction, adopt sorting and waste diversion practices on-site to minimize construction waste.	No	Yes	Being assessed

Use Low-Carbon Alternatives:

Substitute Low-Carbon Materials/Systems for High-Carbon Ones

Strategy	*Already included*	*Will pursue?*	Notes
Consider Total Carbon when Selecting Envelope Systems Use WBLCA (alongside energy modeling) to help assess the trade-offs in embodied and operational carbon for different envelope options. Typically, lightweight envelope systems are likely to have the lowest embodied carbon (in addition to reducing the embodied carbon of the supporting structure).	Yes		*The use of light weight materials with high R-values are being considered.*
Select Carbon-Storing Structural, Envelope, and Finish Materials Bio-based materials typically have lower upfront carbon than non-bio-based products, with the added potential to store carbon over the life of the building. The availability of bio-based alternatives to conventional materials -- such as mass timber, laminated bamboo, wood fiberboard, straw, clay-straw, hempcrete, cork, wool, linoleum, cork, and more -- is increasing. Bio-based materials are also often significantly lighter than their alternatives, reducing the load and size of supporting structural members (and therefore reducing carbon).	Yes		Being assessed
Select Lower-Carbon Refrigerants Refrigerant leakage is one of the biggest contributors to climate change within the building industry. Architects can collaborate with engineers to use passive design strategies, select systems that use low-carbon refrigerants, and encourage clients to adopt building management practices to mitigate refrigerant leakage and ensure 100% refrigerant recovery.	Yes		
Eliminate HFC-Containing Insulation and Select Lower-Carbon Insulation Selecting an insulation that balances operational and embodied carbon trade-offs is key to achieving a total carbon balance for building. Generally, plastic- and chemical-based insulation will have a much higher embodied carbon than bio-based materials. In particular, avoid specifying HFC-containing rigid polyurethane spray foam, sealants, and XPS products that are being banned or significantly restricted in Canada and a growing number of states in the US (including California).	Yes		

Procure Low(er)-Carbon Products:

Specify and Source the Lowest Carbon Product Available

Strategy	*Already included*	*Will pursue?*	Notes
Integrate Carbon Intensity Limits into Specifications At a minimum, architects can use template language to incorporate requests for EPDs into their specifications as a part of bid proposal submittals. For products where EPDs are more widely available, architects can integrate carbon intensity limits into performance requirements, requiring an EPD to document compliance with a global warming potential limit (e.g. XX kg CO2e / unit of material)	Yes		*Exploring products and developing product specifications requiring EPD documentation*
Use Performance-Based Concrete Specifications Use performance-based (rather than prescriptive) requirements for concrete design that is appropriate for each component/mix. If CMU is used in construction, use a specified compressive stress method instead of a prescriptive method to proportion grout mix.	No	Yes	Exploring local suppliers and specific products
Optimize Concrete Mix Design Work with structural engineers to optimize concrete design with strategies such as reducing cement volume, allowing for longer cure times by specifying strength at 56 days instead of 28 days to allow more time for strength gain, looking at carbon implications of higher-quality aggregate, or reducing strength requirements where feasible/appropriate. Minimizing portland cement and/or replacing portland cement with other materials -- such as Type 1L Cement or supplemental cementitious materials (fly ash, slag, etc.) -- also reduces embodied carbon.	No	Yes	Being assessed
Source from Lower-Carbon Facilities and Products Manufacturers vary in the sustainability of their facilities and sourcing practices. Two materials with the same performance may differ in their embodied carbon as a result of energy source (fuel type/electricity grid mix), plant energy efficiency, product design and material efficiency, or lower-carbon ingredient sourcing (through using recycled, bio-based, or local ingredients). Due to how products are specificed and selected, EPDs are typically the best or only option for a project team to differentiate the carbon intensity of products from different facilities and manufacturers.	Yes		Being assessed
Source Climate-Smart Wood The full life cycle embodied carbon impacts and benefits of wood are difficult to quantify (and therefore difficult to optimize) because of complex supply chains and differing methods for calculating carbon benefits. Current strategies for optimizing wood sourcing include using reclaimed/salvaged wood, asking for chain-of-custody certificates or other supply chain transparency information, asking for sustainable forest management certifications (such as FSC or SFI), and specifying wood that is locally-harvested or harvested from working (not primary) forests. *(Note: An agreed-upon definition for climate-smart wood that can be used in procurement is still in development and should be included once available)*	No	No	
Integrate Carbon into the Bid Process Evaluate carbon -- in addition to cost, schedule, and other criteria -- as an awarding criteria when selecting bids for materials to be used in construction. If points are used to differentiate bids, award points for low-carbon procurement. When possible, provide performance incentives to contractors who deliver low embodied carbon projects	No	Yes	Being assessed