



Langara / South Vancouver
YMCA Redevelopment
– Rezoning Application

Sustainable Strategies for Green
Buildings Policy for Rezoning

October 29, 2018

Prepared for YMCA of Greater Vancouver Properties Foundation
Prepared by Stantec



Community

A thoughtfully created environment that enhances the physical, social, and spiritual well-being of the inhabitants.

Collaboration

Relationships based on trust, contribution, and a shared commitment to building sustainable communities.

Creativity

A people-centred working environment generating thoughtful design to shape the urban landscape.

Sustainable Strategies for Green Buildings Policy for Rezoning

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Sustainable Strategies for Green Buildings Policy for Rezoning

Sustainable Design Strategies for YMCA Facilities Building

LEED

The YMCA Facilities building, including the YMCA community recreation facility and affordable housing, will be registered under the LEED V4 New Construction rating system and designed to achieve LEED Gold certification. A LEED scorecard has been created based on the preliminary assessment of the project location and sustainability strategies. A total of 64 points are targeted, which is more than the 60-point threshold for LEED Gold. See detailed scorecard below.

The key sustainability strategies include:

- Using rainwater and grey water for 100% irrigation
- Using low flush/flow plumbing fixture for 25% reduction in indoor water consumption
- Using grey water for toilet flushing
- Engaging Enhanced Commissioning, monitoring based commissioning and envelope commissioning services
- Achieving an energy performance of at least 35% reduction in energy compared to baseline building
- Installing metering devices for utility meters, all major end uses and space uses
- Conducting a whole-building life cycle assessment to evaluate environmental impact of the building
- Using low emitting materials
- Conducting indoor air quality testing at the end of construction



LEED v4 for BD+C: New Construction and Major Renovation

Preliminary Checklist for Rezoning

Project Name: YMCA Facilities Building

Date: 12-Oct-18

Y	?	N	d/c		
1	0	0	d	IPc1 Integrative Process	1

11	2	19	d/c	Location and Transportation	16
0	0	16	d	LTc1 LEED for Neighborhood Development Location	16
1	0	0	d	LTc2 Sensitive Land Protection	1
0	0	2	d	LTc3 High Priority Site	2
4	1	0	d	LTc4 Surrounding Density and Diverse Uses	5
5	0	0	d	LTc5 Access to Quality Transit	5
1	0	0	d	LTc6 Bicycle Facilities	1
0	1	0	d	LTc7 Reduced Parking Footprint	1
0	0	1	d	LTc8 Green Vehicles	1

3	5	2	d/c	Sustainable Sites	10
Y			c	SSp1 Construction Activity Pollution Prevention	Required
1	0	0	d	SSc1 Site Assessment	1
0	0	2	d	SSc2 Site Development - Protect or Restore Habitat	2
1	0	0	d	SSc3 Open Space	1
0	3	0	d	SSc4 Rainwater Management	3
0	2	0	d	SSc5 Heat Island Reduction	2
1	0	0	d	SSc6 Light Pollution Reduction	1

5	1	5	d/c	Water Efficiency	11
Y			d	WEp1 Outdoor Water Use Reduction	Required
Y			d	WEp2 Indoor Water Use Reduction	Required
Y			d	WEp3 Building-Level Water Metering	Required
2	0	0	d	WEc1 Outdoor Water Use Reduction	2
2	1	3	d	WEc2 Indoor Water Use Reduction	6
0	0	2	d	WEc3 Cooling Tower Water Use	2
1	0	0	d	WEc4 Water Metering	1

21	5	7	d/c	Energy and Atmosphere	33
Y			c	EAp1 Fundamental Commissioning and Verification	Required
Y			d	EAp2 Minimum Energy Performance	Required
Y			d	EAp3 Building-Level Energy Metering	Required
Y			d	EAp4 Fundamental Refrigerant Management	Required
6	0	0	c	EAc1 Enhanced Commissioning	6
14	4	0	d	EAc2 Optimize Energy Performance	18
1	0	0	d	EAc3 Advanced Energy Metering	1
0	1	1	c	EAc4 Demand Response	2
0	0	3	d	EAc5 Renewable Energy Production	3
0	0	1	d	EAc6 Enhanced Refrigerant Management	1
0	0	2	c	EAc7 Green Power and Carbon Offsets	2

7	3	3	d/c	Materials and Resources	13
Y			d	MRp1 Storage and Collection of Recyclables	Required
Y			c	MRp2 Construction and Demolition Waste Management Planning	Required
3	0	2	c	MRc1 Building Life-Cycle Impact Reduction	5
1	1	0	c	MRc2 Building Product Disclosure and Optimization - Environmental Product Declarations	2
1	1	0	c	MRc3 Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
0	1	1	c	MRc4 Building Product Disclosure and Optimization - Material Ingredients	2
2	0	0	c	MRc5 Construction and Demolition Waste Management	2

7	2	7	d/c	Indoor Environmental Quality	16
Y			d	Eep1 Minimum Indoor Air Quality Performance	Required
Y			d	Eep2 Environmental Tobacco Smoke Control	Required
0	0	2	d	Ee1 Enhanced Indoor Air Quality Strategies	2
3	0	0	c	Ee2 Low-Emitting Materials	3
1	0	0	c	Ee3 Construction Indoor Air Quality Management Plan	1
2	0	0	c	Ee4 Indoor Air Quality Assessment	2
0	0	1	d	Ee5 Thermal Comfort	1
1	1	0	d	Ee6 Interior Lighting	2
0	0	3	d	Ee7 Daylight	3
0	0	1	d	Ee8 Quality Views	1
0	1	0	d	Ee9 Acoustic Performance	1

5	1	0	d/c	Innovation	6
1	0	0	d	INc1.1 Exemplary Performance: Access to Quality Transit	1
1	0	0	c	INc1.2 Innovation: Purchasing - Lamps	1
1	0	0	c	INc1.3 Innovation: PBT Source Reduction - Lead, Cadmium and Copper	1
1	0	0	d	INc1.4 Innovation: Sustainable Wastewater Management	1
0	1	0	c	INc1.5 Innovation: Occupant comfort survey or Green education	1
1	0	0	d	INc2 LEED Accredited Professional	1

4	0	0	d/c	Regional Priority	4
1	0	0	d/c	RPc1.1 Outdoor Water Use Reduction	1
1	0	0	d/c	RPc1.2 Building Life-Cycle Impact Reduction	1
1	0	0	d/c	RPc1.3 Enhanced Commissioning	1
1	0	0	d/c	RPc1.4 Optimized Energy Performance	1

64 19 43 TOTALS Possible Points: **110**

Certified: 40 to 49 points, Silver: 50 to 59 points, Gold: 60 to 79 points, Platinum: 80 to 110

d/c = design or construction phase submittal
 = Prerequisite

Performance

The YMCA Facilities Building is attempting to meet the performance limits under the Low Emissions Green Buildings pathway of the Green Building Policy for Rezoning. Since the building has both residential and non-residential areas, the TEUI, TEDI, and GHGI limits are a combined area weighted average of the YMCA recreational spaces and affordable housing tower limits (City of Vancouver, 2018). The calculated building performance limits and proposed design values are presented in the table below. The proposed design values, which accounts for the exhaust heat recovery coils, meet the performance limits. Please refer to Appendix A for detailed energy model report.

	Residential High Rise	Recreational Spaces	Whole Building (Area weighted average)	Proposed Design (Adjusted TEDI)
TEUI (kWh/m2)	120	461	316	223
GHGI (kcCO2/m2)	6	96	58	6
TEDI (kWh/m2)	30	280	174	141 (Whole Building) 15 (Residential Only)

Air Tightness Testing

The YMCA Facilities Building will go through airtightness testing to demonstrate that the air leakage is within 2.0 L/s*m2 @ 75 Pa. Additionally, suite-level airtightness testing will be done on 8 randomly selected units to determine air leakage within 1.2 L/s*m2 @ 50 Pa. This testing will be performed by a qualified person in accordance to the standard stated in the "Green Buildings Policy for Rezoning – Process and Requirements".

Enhanced Commissioning

The project will be pursuing the Enhanced Commissioning credit, option 1, path 1, under the LEED v4 rating system.

A third-party commissioning authority (CxA) will be engaged to conduct enhanced commissioning activities for mechanical, electrical, plumbing systems and assemblies in accordance with ASHRAE Guideline 0-2005 and ASHRAE Guideline 1.1-2007 for HVAC&R systems. The CxA will report directly to the owner of the building.

The enhanced commissioning activities will include:

- Review owner’s project requirements, basis of design
- Review project design prior to mid-construction documents and back check review comments in the subsequent design submission
- Develop and implement Cx plan
- Develop system manual scope and format, and verify inclusion of systems manual requirements in construction documents
- Develop training requirements and verify inclusion of operator and occupant training requirements in construction documents
- Incorporate Cx requirements into construction documents
- Review contractor’s submittals
- Develop construction checklist
- Develop system test procedure
- Verify system test execution
- Document findings and coordination in issues log
- Prepare final Cx report
- Verify system manuals updates and delivery
- Verify operator and occupants training delivery and effectiveness
- Verify seasonal testing
- Review building operations 10 months after substantial completion
- Develop on-going commissioning plan

Energy System Sub-Metering and Reporting

The project will be pursuing the Advanced Energy Metering credit under the LEED v4 rating system.

The building will have main utility meters installed for electricity, gas and water, and sub-meters installed for major energy end uses and space uses. The major energy end uses will likely be lighting load, plug and process load, space heating load, space cooling load, DHW load, and major mechanical load. This list will be refined as far as energy model gets further developed. Any individual end use that represents 10% or more of the building's total annual energy consumption will be sub-metered. The major space uses are YMCA facility and affordable housing.

All metering data will be stored in a data collection system for at least 36 months and reported to the City with the assist from a professional service provider. The owner of the building will also set up an energy star portfolio manager account and fill in information as required.

Refrigerant Emission and Embodied Emission

The project will be pursuing the Enhanced Refrigerant Management credit and the Life Cycle Impact Reduction credit under the LEED v4 rating system.

The selection of mechanical equipment will be reviewed to ensure compliance with the LEED requirements. Once the mechanical design is set in stone, the following information will be collected for the refrigerant emission calculation:

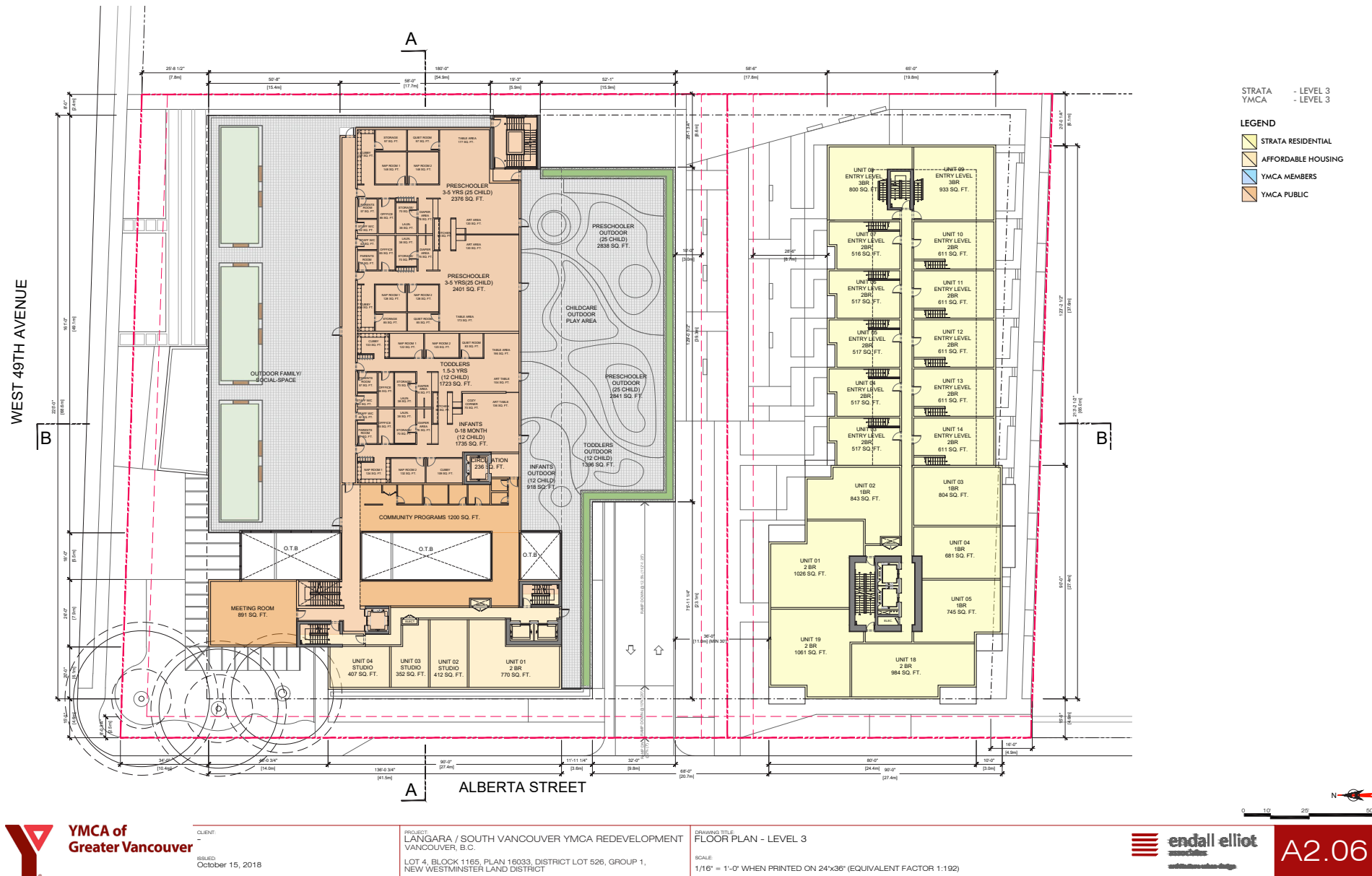
- Type of refrigerant
- Type of cooling equipment
- Total refrigerant charge
- System life, in years
- Modelled floor area of the building

A preliminary life cycle assessment has been conducted based on 60-year building service life. Below are the inputs for the life cycle assessment:

	Total Below Grade	Total Above Grade
Floor Area (m ²)	9,316	13,220
Columns	Concrete	Concrete
Foundations	Concrete Column Footings, Concrete L Footings	Concrete Column Footings, Concrete L Footings
Exterior Walls (m ²)	2,551 Below Grade Concrete	3,921 Steel Stud, Metal Cladding, Mineral Wool Batt, Air Barrier, Glass Mat Gypsum Panel 206 Opaque Glass Spandrel Panel
Floors (m ²)	9,265 Concrete	24,275 Concrete
Roof (m ²)	N/A	1,265 Concrete, Asphalt-Polyiso Foam Board Glass Facer
Glazing (m ²)	N/A	2,123 Aluminum Frame, Double Glazed Soft Coated Argon

Following life cycle assessment, the YMCA Facilities Building has an Embodied Emissions Intensity of 425.87 kgCO₂e/m².

Embodied Emissions Intensity	kgCO ₂ e/m ²	425.87
Total Life Cycle Embodied Emissions	kgCO ₂ e	9597454.65
Equivalent Annual Embodied Emissions Intensity	kgCO ₂ e/m ² /year	7.10



Integrated Rainwater Management and Green Infrastructure

The project team is committed to pursuing an integrated rainwater management strategy that corresponds to the City-Wide Integrated Rainwater Management Plan. The plan requires the project to follow different quantitative targets for rain shower, large storm and extreme storm respectively.

The proposed landscape area and permeable pavers on grade (2640 sq. m in total) will be capable of infiltrating 1" of rainfall in a day. An estimated area of 250 sq. m will be suitable for BMPs involving infiltration, such as rain gardens and infiltration swales. A detention tank will be size to hold any extra volume of the first 24mm of 24-hour rainfall that is not infiltrated. The collected rainwater will be discharged into the City's infrastructure at a controlled rate. Runoff directed to the detention tank could also be used for irrigation or non-portable water use, which will be explored during the detailed design phase.

For quality control, the proposed infiltration swale, rain gardens, vegetated roof and ground level landscaping will allow for infiltration treatment for some onsite runoff. In addition, a mechanical treatment device will be provided to treat the runoff from the development after any detention facility with 85% TSS removal.

Please refer to appendix B for detailed integrated rainwater management plan.

Resilient Drinking Water Access

Resilient drinking water access will be accommodated in the building at a place that is easily accessible to all building occupants. The fixture will be capable of operating on city water pressure alone.

Best Practice for Pool

Based on the energy model results, the pool area alone accounts for 63% of the heating load of the YMCA Facilities Building. Of the total pool water load, evaporation makes up 82%. The design takes into account the high heating demand and high heat loss features of the pool area.

The building is designed to use heat recovery chiller for base load heating and cooling, and pool area heat recovery. Auxiliary natural-gas-fired boiler is provided for supplementary heating demand from the pool area.

Verified Direct Ventilation

Direct ventilation will be incorporated into the ventilation system design and verified by the Commissioning Authority.

Low-Emitting Materials

The project will pursue 3 points through Low Emitting Material credit under the LEED v4 rating system. The Low-Emitting Materials requirements will be incorporated into the product specification and coordinated with the general contractor to ensure the following requirements are met:

- 100 % of newly installed interior paints and coatings product will meet California Air Resource Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011 for VOC content.

- 100% of newly installed interior adhesives and sealants will meet South Coast Air Quality Management District (SCAQMD) Rule 1168, July 1 2005 for VOC content.
- At least 95% of newly installed flooring products, by area, will meet the requirements of Green label, Green Label Plus, or Floor Score certifications.
- 100% of newly installed composite wood products will contain no added urea-formaldehyde resins.

Indoor Air Quality Testing

The project will pursue LEED v4 Indoor Air Quality Assessment credit, Option 2 Air Testing. Indoor air quality testing will be conducted near the end of construction for formaldehyde, particulates, ozone, total volatile organic compounds, and carbon monoxide. The result will be compared against acceptable target concentration levels and standards and be reported to the city.

Sustainable Design Strategies for Strata Building

Performance

The Strata Building is attempting to meet the performance limits under the Low Emissions Green Buildings pathway of the Green Building Policy for Rezoning. The building performance limits and proposed design values are presented in the table below, which demonstrates that the proposed design values meet the performance limits. Please refer to Appendix A for detailed energy model report.

	Performance Limits	Proposed Design
TEUI (kWh/m ²)	120	120
GHGI (kcCO ₂ /m ²)	6	2
TEDI (kWh/m ²)	30	30

Air Tightness Testing

The entire building will go through airtightness testing to demonstrate that the air leakage is within 2.0 L/s*m² @ 75 Pa. In addition, suite level airtightness testing will be done on the 8 randomly selected units and demonstrate an air leakage within 1.2 L/s*m² @ 50 Pa. This testing will be performed by a qualified person in accordance to the standard stated in the "Green Buildings Policy for Rezoning – Process and Requirements".

Enhanced Commissioning

A third-party commissioning authority (CxA) will be engaged to conduct enhanced commissioning activities for mechanical, electrical, plumbing systems and assemblies in accordance with ASHRAE Guideline 0-2005 and ASHRAE Guideline 1.1-2007 for HVAC&R systems. The CxA will report directly to the owner of the building.

The enhanced commissioning activities will include:

- Review owner's project requirements, basis of design
- Review project design prior to mid-construction documents and back check review comments in the subsequent design submission
- Develop and implement Cx plan

- Develop system manual scope and format, and verify inclusion of systems manual requirements in construction documents
- Develop training requirements and verify inclusion of operator and occupant training requirements in construction documents
- Incorporate Cx requirements into construction documents
- Review contractor's submittals
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- Develop system test procedure
- Verify system test execution
- Document findings and coordination in issues log
- Prepare final Cx report
- Verify system manuals updates and delivery
- Verify operator and occupants training delivery and effectiveness
- Verify seasonal testing
- Review building operations 10 months after substantial completion
- Develop on-going commissioning plan

Energy System Sub-Metering and Reporting

The building will have main utility meters installed for electricity, gas and water, and sub-meters installed for major energy end uses and space uses. The major energy end uses will likely be lighting load, plug and process load, space heating load, space cooling load, DHW load, and major mechanical load. This list will be refined as far as energy model gets further developed. Any individual end use that represents 10% or more of the building's total annual energy consumption will be sub-metered. The major space uses are residential space and amenity spaces.

All metering data will be stored in a data collection system for at least 36 months and reported to the City with the assist from a professional service provider. The owner of the building will also set up an energy star portfolio manager account and fill in information as required.

Refrigerant Emission and Embodied Emission

Once the mechanical design is confirmed, the following information will be collected for the refrigerant emission calculation:

- Type of refrigerant
- Type of cooling equipment
- Total refrigerant charge
- System life, in years
- Modelled floor area of the building



A preliminary life cycle assessment has been conducted based on 60-year building service life. Below are the inputs for the life cycle assessment:

	Total Below Grade	Total Above Grade
Floor Area (m ²)	6,258	16,433
Columns	Concrete	Concrete
Foundations	Concrete Column Footings, Concrete L Footings	Concrete Column Footings, Concrete L Footings
Exterior Walls (m ²)	2,087 Below Grade Concrete	3,667 Steel Stud, Metal Cladding, Mineral Wool Batt, Air Barrier, Glass Mat Gypsum Panel
Floors (m ²)	7,609 Concrete	25,524 Concrete
Roof (m ²)	N/A	1,021 Concrete, Asphalt-Polyiso Foam Board Glass Facer
Glazing (m ²)	N/A	3,667 Aluminum Frame, Double Glazed Soft Coated Argon

Following life cycle assessment, the Strata Building has an Embodied Emissions Intensity of 299.57 kgCO₂e/m².

Embodied Emissions Intensity	kgCO ₂ e/m ²	299.57
Total Life Cycle Embodied Emissions	kgCO ₂ e	6797513.87
Equivalent Annual Embodied Emissions Intensity	kgCO ₂ e/m ² /year	4.99



Verified Direct Ventilation

Direct ventilation will be incorporated into the ventilation system design and verified by the Commissioning Authority.

Low-Emitting Materials

The Low-Emitting Materials requirements will be incorporated into the product specification and coordinated with the general contractor to ensure the following requirements are met.

- 100% of newly installed interior paints and coatings product will meet California Air Resource Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011 for VOC content.
- 100% of newly installed interior adhesives and sealants will meet South Coast Air Quality Management District (SCAQMD) Rule 1168, July 1, 2005 for VOC content.
- At least 95% of newly installed flooring products, by area, will meet the requirements of Green label, Green Label Plus, or Floor Score certifications.
- 100% of newly installed composite wood products will contain no added urea-formaldehyde resins.

Indoor Air Quality Testing

Indoor air quality testing will be conducted near the end of construction for formaldehyde, particulates, ozone, total volatile organic compounds, and carbon monoxide. The result will be compared to acceptable target concentration levels and be reported to the city.

Integrated Rainwater Management and Green Infrastructure

The project team is committed to pursuing an integrated rainwater management strategy that corresponds to the City-Wide Integrated Rainwater Management Plan. The plan requires the project to following different quantitative targets for rain shower, large storm and extreme storm respectively.

The proposed landscape area and permeable pavers on grade (2640 sq. m in total) will be capable of infiltrating 1" of rainfall in a day. An estimated area of 250 sq. m will be suitable for BMPs involving infiltration, such as rain gardens and infiltration swales. A detention tank will be size to hold any extra volume of the first 24mm of 24-hour rainfall that is not infiltrated. The collected rainwater will be discharged into the City's infrastructure at a controlled rate. Runoff directed to the detention tank could also be used for irrigation or non-portable water use, which will be explored during the detailed design phase.

For quality control, the proposed infiltration swale, rain gardens, vegetated roof and ground level landscaping will allow for infiltration treatment for some onsite runoff. In addition, a mechanical treatment device will be provided to treat the runoff from the development after any detention facility with 85% TSS removal.

Please refer to Appendix B for detailed integrated rainwater management plan.

Resilient Drinking Water Access

Resilient drinking water access will be accommodated in the building at a place that is easily accessible to all building occupants. The fixture will be capable of operating on city water pressure alone.



Design with community in mind