concept
Mount Pleasant, Vancouver

Median Income $66,000  
Average Household Size 1.8  
Census Population 32,955  
Population in Low Income Households 16%

2nd least affordable market in the world
- Avg Townhouse: $1.5million
- TQD Townhouse: $1.2million

Laundry Haus
- Land Cost: $44million
- Construction Cost: $48million

Average home debt to income ratio
- Canada: 177%
- Vancouver: 208%
10 minute walk radius

daily amenities
transit network
district energy
below market ownership & rental
buildable area

maximize greenspace

north/south cross ventilation

exterior circulation

north/south exposures in units

south buffer spaces
guiding principles

Holistic

Regenerative

Comfortable

Resilient
resilient
prepared for hazards

environmental

climate

seismic
energy flow
buffered building envelope
regenerative
Reused
1. First floor columns and beams
2. Brick facade
3. Oak hardwood flooring
4. Removed beams ripped for use on Gazebo and forming material
5. Existing structural grid
6. Removed brick used to create apartment partition walls
7. Concrete from eastern half of slab retained and western half used for aggregate

Upgrades
7. Undersized columns on 1st and 2nd floor upgraded
8. CLT gravity/shear walls installed
9. Structurally separate Glulam Columns and beams used for supporting apartment decks
10. DLT with concrete topping used for new flooring system
11. Centre core and timber strong back support for existing facade
12. Reinforced concrete jacketing of piles and new foundation for west side

Removed
11. 2nd floor beams and columns removed for unken playground
12. Interior light timber framed and concrete block walls
closing the loop
virtual power plant

Legend
1. DC Driver
2. AC Distribution Panel
3. Net Meter
4. Unit Substation
5. Inverters
6. Batteries
7. AC Loads
8. DC Loads

AC Distribution
DC Distribution
comfortable
warm where it matters
naturally cool
an adaptable envelope
an adaptable envelope

Insulated Wall Assembly

Buffer Space

Movable Control Layer

Structurally Separated
holistic
serving the community
diversity of housing
day in the life
Panelized construction

Prefabrated, carefully machined CLT and DLT panels make up our project's exterior walls and floor casettes respectively. This prefab method allows for high quality, fast, and minimally disruptive construction.

Mixed-mode

The decentralized ventilation system uses heat recovery ventilators paired with natural ventilation to provide the perfect indoor climate. Using intelligent controls, cooling strategies for each space maximizes internal air quality, occupant comfort, and energy efficiency.

Generous greenspace

The greenspaces will provide both environmental and psychological benefits. They are woven throughout the building and will feature closed-loop community gardens, play spaces for children and plants which act as carbon sinks.

Smart building systems

By leveraging data collection and reinforcement learning models, the building systems adapt to occupancy patterns and external weather conditions to optimize energy efficiency without compromising occupant comfort.

Smart water management

By focusing on conservation through rainwater harvesting and in-unit grey-water recycling systems, potable water usage is significantly decreased and building occupants are rewarded with fresh produce from vertical hydroponic gardens.

Power generation

Onsite power generation comes in the form of a photovoltaic array and is optimized to specifically meet the building's energy demands associated with the high-performance building envelope on warm, sunny days.

Buffer spaces

The atrium and sunroom/porch on the south facade are unheated spaces which serve as environmental buffers that provide a gradient between the private and public realm for richer community life.

Adaptive reuse

Laundry Haus adapts key building components such as the foundation and brickwork to meet the needs of the new structure. Additionally, by reusing demolished materials, we give new life to what would usually become construction waste.

Gathering spaces

By providing a variety of formal and informal spaces to gather throughout the building, residents can create a more complete community.
APPENDICES
M1 Heating Source
M1 Cooling Source
M2 Radiant Supply
M3 Residential Ductwork
M3 Commercial Ductwork
Showing Shared HRV
Notes
All non-vertical pipe slopes = 1/50.
All waste drainage stacks are 6" in diameter.
DHW and DCW valve located at junction to each unit and at every fixture.
Fixtures are all at the same elevation but shown stacked due to section view.
15-micron bag filter included within each gray water tank.

- - - - DHW
- - - - - - DHW Recirculation
- - - - - DCW
- - - - Gray Water

Watering Connection
Joulla Heat Exchanger
In-line Centrifugal Pump
2500 gal DHW Storage Tank
95ft head, 80 gpm Booster Pump
132 gal Rainwater Tank
6 to 24 gal Gray Water Tank
Water Meter

M4 Supply Piping
M4 Drainage Piping
## Mechanical Schedules

### Pumps

<table>
<thead>
<tr>
<th>Tag</th>
<th>Location</th>
<th>Mechanical Room</th>
<th>Mechanical Room</th>
<th>Mechanical Room</th>
<th>Mechanical Room</th>
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| SERVICE | IN-FOUR/R ADIANT HEATING | PANEL RADIANT HEATING | RADIANT COOLING | DYNAMIC ROOM PRESSURE Booster | GRAY WATER |

| MANUFACTURER | ROBOTECH INC | ROBOTECH INC | ROBOTECH INC | ROBOTECH INC | ROBOTECH INC |

| MODEL | 115V LF | 115V LF | 115V LF | 120V 5-4-1 4-1 4-1 4-1 | 4 PT UPT FLUID PUMP |

| STYLE | CENTRAL | CENTRAL | CENTRAL | CENTRAL | CENTRAL |

| CLOSETS | 1-28 | 2-28 | 3-28 | 4-28 | 5-28 |

| PRESSURE DROP | KPA | 1500 | 1500 | 1500 | 1500 |

| WATER | WATER | WATER | WATER | WATER | WATER |

| CARBON STEEL | CARBON STEEL | CARBON STEEL | CARBON STEEL | CAST IRON | PLASTIC |

| STAINLESS STEEL | STAINLESS STEEL | STAINLESS STEEL | STAINLESS STEEL | STAINLESS STEEL | STAINLESS STEEL |

| 150 | 150 | 150 | 150 | 150 |

| 33.5 | 33.5 | 33.5 | 33.5 | 33.5 |

| 9.0 | 9.0 | 9.0 | 9.0 | 9.0 |

| 1 | 1 | 1 | 1 | 1 |

| 100 | 100 | 100 | 100 | 100 |

### Expansion Tanks

| LOCATION | MECHANICAL ROOM | MECHANICAL ROOM | MECHANICAL ROOM |

| SERVICE | ALL RADIANT HEATING & COOLING | ALL RADIANT HEATING & COOLING | ALL RADIANT HEATING & COOLING |

| MANUFACTURER | AO SMITH | AO SMITH | AO SMITH |

| MODEL | PM-7 | PM-7 | PM-7 |

| TANK VOLUME | L | 27.5 | 27.5 | 27.5 | 27.5 |

| ACCEPTANCE VOLUME | L | 17 | 17 | 17 | 17 |

| SYSTEM CONNECTION SIZE | mm x mm | 3/4" NPT | 3/4" NPT | 3/4" NPT | 3/4" NPT |

| SHELL MATERIAL | DRAWN STEEL | DRAWN STEEL | DRAWN STEEL | DRAWN STEEL | DRAWN STEEL |

| DIAMETRAL MATERIAL | BUTYL RUBBER | BUTYL RUBBER | BUTYL RUBBER | BUTYL RUBBER | BUTYL RUBBER |

| SHELL MATERIAL | BUTYL RUBBER | BUTYL RUBBER | BUTYL RUBBER | BUTYL RUBBER | BUTYL RUBBER |

| AIR-SOURCE CHILLER WITH HIGH STATIC DISCHARGE FANS

| LOCATION | MECHANICAL ROOM | MECHANICAL ROOM | MECHANICAL ROOM |

| SERVICE | RADIANT COOLING | RADIANT COOLING | RADIANT COOLING |

| MANUFACTURER | TANDEM CHILLERS | TANDEM CHILLERS | TANDEM CHILLERS |

| MODEL | VXR010DEZ | VXR010DEZ | VXR010DEZ |

| NOMINAL TONS | 13 | 13 | 13 |

| FLUID SOURCE | 0.1 D | 0.1 D | 0.1 D |

| AMBIENT AIR | AMBIENT AIR | AMBIENT AIR | AMBIENT AIR | AMBIENT AIR |

| COOLING CAPACITY | kW | 35 | 35 | 35 | 35 |

| COP | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |

### Gray Water Tanks

| LOCATION | LOETS | MASTER BATH, ONE BED APARTMENT | THREE BED APARTMENT | UPPER BATH, TWO BED APARTMENT | COMMON BATH |

| MANUFACTURER | BARR PLASTICS | BARR PLASTICS | BARR PLASTICS | BARR PLASTICS | BARR PLASTICS |

| SIZE | L x W | 22 | 45 | 90 | 100 | 100 |

| SHELL MATERIAL | HOPE | HOPE | HOPE | HOPE | HOPE | HOPE |
Automatic Controls for HVAC Zone

- Control Flow Charts

- Automatic Window Controls

- M6 Control Flow Charts
Natural Ventilation

The area $A$ of each opening required to give a ventilation rate $q$ for a specified value of $h$ is:

$$A = \frac{q}{C_d \sqrt{\Delta T \frac{g}{h}}} \quad (4.12)$$

**Figure 4.10** Case 2: single-sided ventilation, single opening, driven by buoyancy alone.

**Example 4.1: case 6: buoyancy alone (uniform internal temperature)**

The aim is to achieve the flow pattern shown in Figure 4.14, i.e., fresh air enters all rooms and all of the stale air exits through the upper opening. This flow pattern means that the pressure difference must change sign at a height which lies somewhere between $z_1$ and $z_2$. The height at which $\Delta p = 0$ is known as the 'neutral level', $z_0$. By specifying $z_0$, $\Delta p_0$ is specified by equation 4.11 (with wind term omitted, i.e. wind speed set to zero) by putting $\Delta p_0 = 0$ and $z_1 - z_0$, i.e.

$$\Delta p_0 = \frac{q}{C_d \sqrt{\frac{g}{h}}} \quad (4.15)$$

It then follows that $\Delta p_1$ is known and is given by:

$$\Delta p_1 = \Delta p_0 \frac{z_2}{z_1} - \Delta p_0 \frac{z_2}{z_1} \quad (4.16)$$

The required areas can then be found using a rearrangement of equation 4.10, i.e.

$$C_d/A = \frac{q}{S_i \sqrt{2\Delta p_1}} \quad (4.17)$$
E1 Electrical Power Riser
The SP PRO series of bi-directional inverter chargers is one of the most flexible and intelligent available in the market today. A modular approach can handle systems up to 240kW in 20kW blocks, whilst using sophisticated communications can manage up to 480kW of AC Coupled PV.

Battery Voltages of 24V, 48V and 120V are accommodated. Additionally, by incorporating unlimited DC Coupled solar, wind, back up generator or a grid supply, our ethos of never being without power is always met.

Selectronic inverter have been on the market since 1981 and since then have powered thousands of sites from the tropics of Indonesia, the mountains of the Philippines, the deserts of the UAE, the outback of Australia and on suburban homes throughout the world. In fact, nobody has more experience in this market sector than Selectronic.

As Selectronic we strive for lowest total ownership costs. New firmware releases are

240kW of continuous load power can be achieved, using 4 x 20kW SP PRO inverters per phase on a 3-phase system.

Power Distribution
B.C. tops North America for electric vehicle uptake in 2020, says minister

*Tesla’s Model 3* standard range tops electric cars in B.C. for rebate claimed by owners

Smart Systems
Kit of Parts

175 V (6.9') CLT Panels
- 9' 10.5" x 9' 10.5"
- 576 x Wall Panels
- 20 x Elevator Panels
- 10 x Elevator Panels

Glulam Columns and Beams
- Columns
- 36 x 6 1/2" x 7 1/2" x 14'
- 90 x 6" x 5 1/2" x 14'
- 60 x 6" x 6" x 21" (curved)
- Beams
- 45 x 3 1/2" x 12"
- 20 x 10 1/2" x 11"
- 24 x 6 1/2" x 5"

7 1/4" DLT Floor Panels
- 135 x 36" x 60.5'

Exterior
- 24 Gauge Steel Panels
- 6 x Pre-Cut Mini-Gazebo Panels
- Western Red Cedar Re-Sawn Channel Wood Siding
- 6110 x 11 x 0'

Windows
- Fixed
- 140 x 16" x 63"
- Single Hung
- 122 x 66" x 71"

Brick Retrofit
- 8' Timber Studs
- 359 x 2" x 4'
- #7 Steel Rebar
- 69 x 48' Long
- Panelized Brick Screen
- 640 x 4 x 4'

Awnings
- 32 x 40" x 134"
- Skylight
- 11 x 4" x 14.2"
Pre-made Bathrooms

- Timber Partition Wall
- Tiles
- 2 inch polished concrete with imbedded radiant heating
- Rigid Insulation
- Plywood
Demo Plan
Retrofitting

Detail 1A
1"=157"
Retrofitting Foundation Piles

Detail 2A
1"=18"
South and East Side CentreCore @5" o.c/W

Detail 2B
1"=18"
North Side Timber Strongbacks @16" o.c/W

- Retain Existing Timber Column
- Remove Floor Slab Surrounding Column, Replace with New Floor Slab
- Remove Existing Pile Cap, Replace with New Reinforced Pile Cap
- Drive New Piles
- Reinforce Existing Piles with Rebar
Full Assembly
Connections

Detail 4A
1" = 27.5"
Typical Corner
CLT-CLT
Connection

Detail 4B
1" = 27.5"
Typical CLT-DLT
Connection

Detail 4C
1" = 27.5"
Typical Balcony Connection

Detail 3A: Typical X-RAD
Connection System for
Perpendicular Wall Sections

Detail 3B: Typical X-RAD
Connection System for Parallel
Wall Sections