Schematic Design Report

Oak Bay United Church Neighbourhood Housing

1355 Mitchell Street, Oak Bay, BC

Prepared for:

HDR|CEI Architecture
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PROJECT BACKGROUND

Avalon Mechanical Consultants is working with HDR|CEI Architecture to provide the design of the mechanical systems serving the proposed neighbourhood housing facility at 1355 Mitchell Street in Oak Bay. The new building will be built adjacent to an existing church at the property with provisions for interconnecting the two buildings. The building will be approximately 57,000 ft^2 with four aboveground stories, containing affordable suites, market suites, long term suites, and church program space. The building will contain 98 residential units. There will be two levels of parking located beneath the building which will expand beyond the building footprint.

RELEVANT CODES AND STANDARDS

All spaces of the building will be designed to meet the following codes, standards, and by-laws, as applicable:

- British Columbia Building Code - 2012 Edition
- National Energy Code of Canada for Buildings – 2015 Edition
- NFPA 13 Standard for the Installation of Sprinkler Systems - 2013 Edition
- NFPA 14 Standard for the Installation of Standpipe and Hose Systems - 2010 Edition
- ASHRAE 62.1 Ventilation for Acceptable Indoor Air Quality - 2001 Edition
- ASHRAE 90.1 Energy Standard for Building Except Low-Rise Residential Buildings - 2010 Edition
- CAN/CSA B64.10 Selection and Installation of Backflow Preventers - 2007 Edition
- CAN/CSA B149.1 Natural Gas and Propane Installation Code - 2015 Edition
- CRD Bylaw No. 3516 Cross Connection Control Bylaw No. 1 – 2008 Edition
- CRD Bylaw No. 2922 Sewer Use Bylaw No. 5 – 2006 Edition

REFERENCED DRAWINGS AND DESIGNS

The mechanical systems proposed are to suit the architectural layouts proposed by HDR|CEI Architecture. Refer to architectural drawings for further details of the proposed architectural design.

The schematic design presented will be based on the information above. Detailed design of the project will continue based on the general acceptance of this schematic design report. Coordination with all other consultants will take place during the detailed design.

ENERGY

Step Code

It is understood that this project is to meet Step 1 of the BC Energy Step Code (BC Building Code Subsection 10.2.3). Step 1 requires compliance with Part 8 the National Energy Code for Buildings (NECB). NECB Part 8 is the 'Performance Path' of the NECB, allowing design flexibility provided that the achieved energy performance is equal to or better than that which would have been achieved by following the prescriptive requirements of the NECB.

Compliance with NECB Part 8 requires a comparison of two energy models, the proposed building against a

reference building. The reference building shares the geometry of the proposed building and is a baseline representation that follows the prescriptive requirements of the NECB.

Avalon Mechanical Consultants will complete the model using Integrated Environmental Solutions (IES) software Virtual Environment 2018. A virtual representation of the building will be constructed using the proposed materials, each with their associated thermal properties. The U-values for each construction assembly will be determined using the values given in ASHRAE 90.1. The mechanical ventilation and heating systems will be included in the model according to the mechanical design. The internal loads will be included in the model according to the intended occupancy.

Operation of both the proposed and reference buildings will be simulated for a period of one year. Compliance is demonstrated when it is shown that the annual energy consumption of the proposed building is less than the reference building, and the requirements for unmet hours are satisfied by both models.

Where construction details or intended occupancies are not yet known, it is permissible to use the minimum requirements of the NECB prescriptive path. If these parameters change during the project, the model will be updated to ensure compliance.

FIRE SUPPRESSION

General

The fire suppression system will be designed to NFPA 13 as it includes both residential and church program spaces. Standpipes will be provided to serve each exit stairwell, and on both sides of the fire wall, in accordance with NFPA 14.

Water Entry, Zoning, and Hazard Classification

The fire suppression system will be served by either a dedicated fire suppression system or a combined domestic water and fire suppression service; this is to be determined by the civil engineering consultant in consultation with the city's engineering department. The fire suppression system water entry will be located in the mechanical room on the upper parking level. A double check valve assembly will be used to isolate the fire suppression system water. The minimum service size will be determined as the design progresses.

The fire suppression system will be comprised of several wet zones; two zones per floor, one per side of the fire wall. A dry sprinkler zone may be required to serve the attic space depending on the final architectural and structural designs. Covered patios will be served by dry sidewall sprinklers on the appropriate floor zone.

All areas in the building will be considered Light Hazard with the exception of mechanical/electrical rooms and covered parking which are considered Ordinary Hazard Group 1, and storage rooms which are considered Ordinary Hazard Group 2. Hazard classifications are defined in NFPA 13.

Standpipes, Zone Valves, and Fire Department Connection

Standpipes will be required in each stairwell and on both side of the doors at the fire wall. Fire hose connections will be installed on the intermediate floor landings in the stairwells and on the floor level beside the fire wall doors, unless directed otherwise by architectural or the authority having jurisdiction. Sprinkler system zone valves will be located at a high level in the stairwells.

The location of the fire department connection is yet to be determined. It is to be in an unobstructed,

conspicuous location on the front road access side of the building and within 150 feet travel distance of a fire hydrant.

Materials and Routing

Exposed sprinkler piping, standpipe supplies, and piping in the parking areas will be steel. Plastic pipe will be used in all light hazard areas above the parking level. Sprinkler pipes will be routed in the floor assembly of the floor above for all the residential levels. For the top floor, piping will be routed in the roof assembly below the roof insulation.

Alternative Solution

Alternative solution sprinklers will be provided if required, as directed by a code consultant. Alternative solution sprinklers may be required to for several reasons (reduction of separation distances, exiting requirements, maintenance of fire separations, etc.). Determining whether alternative solution sprinklers are required, and where these sprinklers are required, is outside the mechanical design scope.

Recommendations

Outdoor combustible overhangs exceeding four feet will require sprinkler coverage underneath; therefore, overhangs that do not exceed four feet are recommended. The use of TJI structural members considerably increases the sizing of the sprinkler system or requires additional architectural detailing and installation costs.

PLUMBING

General

The domestic water, sanitary sewer and venting, and storm water drainage systems will be designed in accordance with the BC Pluming Code; a division of the BC Building Code. Natural gas piping and venting will be designed in accordance CSA B149.1.

Fixtures and Accessibility

Standard mid-level residential plumbing fixtures will be specified within the mechanical scope. Otherwise, fixtures may be selected by the architect or interior designer and coordinated with mechanical.

Accessible fixtures will be provided for washrooms as required. Residential suites will receive standard non-accessible fixtures unless directed otherwise by architectural.

All fixtures will be lead free, CSA approved, and meet flow / flush volume requirements of the BC Building Code. Toilets are assumed to be flush tank and the domestic water and sewer services will be sized as such. Flush valve fixtures will be provided if directed by the architect.

Domestic Water System

The domestic water entry point will be located in the mechanical room on the upper parking level with the fire suppression system water entry. The preliminary domestic water load estimate is based on the Development Permit architectural submission drawings. The domestic water load is estimated for the building to be upwards of 750 fixture units. A 3"Ø domestic water service at full capacity would be required for the building based on this load estimate: a 4"Ø service may be required depending on the final fixture count and types.

Domestic hot water to the residential suites will be provided by domestic hot water heaters located in a

mechanical room located on the second floor. Due to the high occupancy of the building, gas fired boilers are recommended. A hot water storage and recirculation system will be used to maintain the hot water system temperature throughout the distribution. Venting for the boilers will be routed up to the roof, chases will have to be provided from the mechanical room to the roof to facilitate their routing. This is primarily to avoid the condensation 'smoke effect' created when the hot water system is operational during winter months and condensate is exhausted from the vents, occasionally mistaken as smoke by building residents. Given the residential setting of the buildings, it would be undesirable to have a large plume of condensation in the vicinity of balconies and operable windows.

Domestic cold and hot water mains will be routed on the main floor with risers passing through the floors serving individual suites. Cold and hot water would then be distributed within the suites. A hot water recirculation main will be routed on the third floor with a single riser returning to the boiler room.

Storm Water

Perimeter drainage will be provided for protection of the underground foundation walls and parking level slab, and as directed by the geotechnical engineer. Deck drains, roof drains, canopy drains, and rainwater leaders will be picked up by the storm system at locations indicated by architectural. Parking area drainage will be collected in catch basins and routed through an oil interceptor before being directed to the storm system.

Sump pumps are expected to be required for elevator pit sumps and for footing perimeter drainage. These may be eliminated depending if main service connections are low enough to be connected to with gravity drainage.

The storm water load is estimated at 25,000 litres per 15 minutes; an 8"Ø storm water service connection will be required for the building.

Sanitary Sewer

Sanitary drainage and vent plumbing piping will have to be coordinated during the detailed design phase to determine the best options for routing. Typically pipe routing should avoid insulated and shear walls, furred walls may be required to facilitate the plumbing in certain locations. Depending on the floor assembly, dropped ceilings and bulkheads may be required in certain areas to serve plumbing fixtures on the floor above.

The sanitary load is estimated at 850 fixture units for the building; an 8"Ø sanitary drainage service connection will be required.

Natural Gas

Natural gas distribution will be provided on this project for any gas-fired equipment. It is expected that the domestic hot water heaters and corridor ventilation make-up air units will be gas-fired. Natural gas is not expected for any of the residential suites. Additional gas appliances and fixtures may be determined in the detailed design phase of the project.

HVAC

General

The HVAC system will be designed in accordance with the BC Building Code, ASHRAE 62.1 (ventilation and air quality requirements), ASHRAE 90.1 (energy standards), best engineering practice, and in consultation with the

project stakeholders.

Existing Church

It is understood that the existing church has existing HVAC equipment serving it, located on the ground adjacent to the church. To accommodate the new building, this equipment will have to be relocated to one of the roofs on the new building and services reconnected to the existing system within the church. Details of the relocation will be further developed during the detailed design phase of the project.

Parking Level Ventilation

The parking levels require ventilation in accordance with the BC Building Code. Gas sensors will be located throughout the parking areas which will sense harmful gases and activate the exhaust fans as required. Additional transfer fans will be added as necessary to provide adequate air movement throughout all areas of the parking levels. Shafts will be required for the exhaust air fans to discharge air from the parking levels to the outdoors.

Corridors, Vestibules, and Common Areas

Ventilation will be provided for the building corridors, vestibules, and common areas. A make-up air unit will be required for the corridor on each side of the firewall. Make-up air units will require a shaft for delivery of make-up air from the roof to the corridor on each floor. The pressurization air volume will be determined during the design phase.

Vestibules to the parking levels are required to be pressurized. This pressurization air will either be from dedicated supply fans and duct heaters or potentially from the make-up air units for the upper floor corridors.

Ventilation will be provided for all other common areas as required per ASHRAE 62.1, the ventilation standard.

Elevators

Elevator machinery releases heat into the elevator shaft, the elevator machine room, or both depending on the type of equipment that is specified. Cooling and ventilation of these spaces will be provided. Options for cooling range from natural ventilation to dedicated air conditioning units. The type of cooling solution depends on the heat load gained from the elevator equipment, where that gain is, and the building configuration. Solutions will be determined during the design phase and are expected to include exhaust fans and/or air conditioning equipment.

Garbage Rooms

The garbage rooms are maintained at a negative pressure and exhausted to the outdoors to reduce the emission of odours within and outside of the room. The air exhausted from the garbage room will be carbon filtered to reduce the odours in the airstream. A shaft should be provided to the roof of the building to allow for the odours to be discharged as far from sidewalks, windows, and balconies as possible.

Program Area

The program area will contain offices, learning spaces, classrooms, and additional support spaces. Heating and ventilation are required for these spaces, and air conditioning is highly recommended due to the potential occupant density of the spaces.

Common options for these spaces include packaged rooftop heat pumps, split systems, or a variable

refrigeration flow (VRF) system. All these systems have advantages and disadvantages which can be investigated further during the detailed design of the project. Cost, control, capacity, and building construction are all equipment attributes which will be further reviewed.

Exhaust will be provided for all washrooms and kitchen range hoods, as required.

Residential Suites

Space heating of the residential suites is proposed to be provided by electric baseboard heaters. The heating loads and distribution will be determined during the design phase and is expected to include individual heating units in each bedroom, den, main living and washroom space. This information will be indicated on the mechanical plans for implementation by the electrical engineer. At this time, cooling of the residential suites has not been requested, and will be not be included.

Per the requirements of the BC Building Code, each occupied space of the residential suites is required to be ventilated with a fresh air source in conjunction with exhaust air from washroom and kitchen spaces. Individual and central heat recovery ventilator (HRV) options have been discussed, but it has been decided to proceed with gas-fired rooftop make-up air units on the roof which will be ducted to the bedrooms and common areas of each suite. An HRV, split system, furnace, or other form of ducted HVAC system will be required for any multi-story suites.

The principal ventilation system exhaust fan for the suites is the washroom exhaust fan. The fan operates continuously at a minimum speed to maintain ventilation rates. Fan models are available with options to provide increased airflow upon activation of a motion sensor, humidistat, or otherwise. Ventilation air to the spaces would be by supply air grilles in the bedrooms and living spaces. The ventilation air will be provided by gas-fired rooftop make-up air units.

Some suites will contain clothes dryers with the remainder located in common space laundry rooms. Venting will be provided from these rooms to the exterior.

All suites will contain range hoods which will be vented to the building exterior.

CLOSURE

This report is for the use of the intended client only and was produced in accordance with good engineering practice. Avalon Mechanical Consultants Ltd. will not be responsible for any unauthorized third-party use of this report.

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