

BUILDING SPECIFICATION FOR THE

WET WEST COAST

October 2019



Acknowledgements

This work would not be made possible without the vision and leadership Nuxalk Hereditary Chief Smawn (Richard Hall).

Richard works to create healthy sustainable homes for the First people. His hardest challenge is to change the hearts and minds of those caught in the past.

Let this work enable other First Nations to lead their communities towards independence.

We acknowledge the contributions of the following collaborators:

- The People of the Nuxalk Nation
- Dave Rickets, Graham Finch, and Byron Searle | RDH
- Rob Pope | Ecolighten
- Gillian Aubie Vines | Great Bear Initiative
- David Wong | Sea to Sky Architecture and Urban Ecology
- Bertine Stelzer, Amy Seabrooke, Gary Hamer | BC Hydro
- Wilma Leung | BC Housing

Stutwiniitscw | Thank you

Residential Construction Specification

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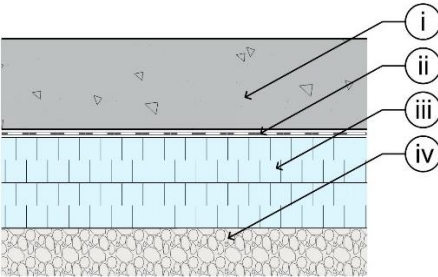
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General

- i) The Authority Having Jurisdiction adopts the 2018 British Columbia Building Code (BCBC).
- ii) Where contradictions exist between the BC Building Code and this specification the most stringent requirement shall apply.
- iii) House site to be cleared of surface vegetation within property boundaries, except for significant trees as determined by the Owner.
- iv) Each site to be reviewed by a geotechnical engineer. Recommended site improvements and building performance considerations to be incorporated into the project. Existing soil to be piled and stored on site and re-distributed following construction of the dwelling.
- v) Each building and site is to be reviewed by a structural consultant, or the prescriptive requirements of BCBC 2018 are to be followed.
- vi) The building shall be situated no closer than 30’ from the side boundaries and 50’ form the rear and front boundaries.
- vii) Grade to be sloped away from the building at minimum 3%.
- viii) Buildings are to be designed and constructed to meet or exceed Step Three of the BC Energy Step Code.
- ix) Whole building air leakage testing to be performed prior to occupancy and at an interim stage once the components of the air barrier are fully installed. Target airtightness is <2.5 air changes per hour at a pressure differential of 50 Pa (ACH50). Testing to be in accordance with CAN/CGSB 149.10, or ASTM E779, or USACE Ver 3 (as noted in BCBC 9.36.6.5).
- x) Author and designer(s) assume no liability.
- xi) This specification is a live document and should be developed for use per the Nations autonomy and region.

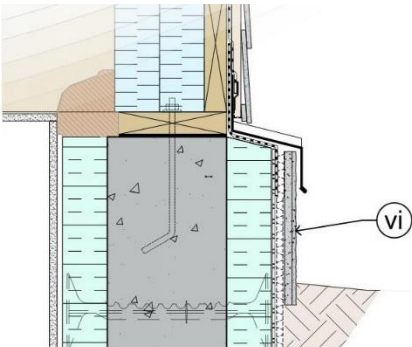
Crawl-Space Floor

- i) 4” thick unreinforced concrete floor slab.
- ii) 10mil polyethylene sheet. Joints, transitions and terminations taped with 3M 3015 Flashing Tape or equivalent. Seal poly sheet to the concrete foundation at the perimeter with acoustical sealant.
- iii) 4” (R-20) extruded polystyrene insulation – Dow Styrofoam (or similar). Two layers of 2” thick with joints offset minimum 12”.
- iv) Compacted gravel base per geotechnical.



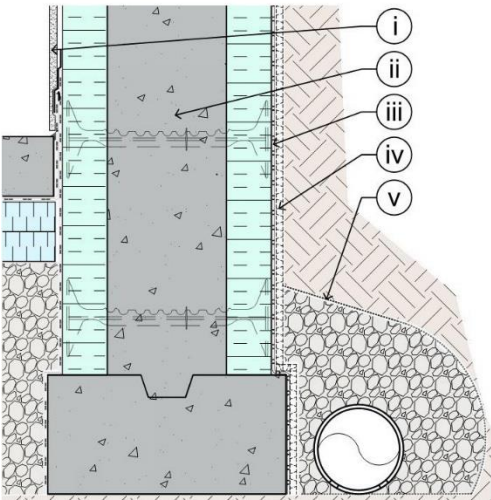
Below-grade Foundation Wall and Footing

- i) ½” thick M2Tech gypsum wall board with mould resistant joint compound and fire tape.
- ii) Insulated Concrete Form (ICF) – Quadlock, or approved alternate. Structural to confirm size and reinforcing. Installation to be in accordance with manufacturers published instructions.
- iii) Soprema ICF self-adhered waterproofing membrane or as approved by ICF manufacturer. Waterproofing membrane to extend from top of ICF to bottom of footing. Installation to be in accordance with manufacturers published instructions.
- iv) Composite drain mat installed with integral filter cloth at exterior – Soprema Sopradrain 10-G or approved alternate.
- v) Free-draining gravel fill. Filter cloth to separate soil from gravel.
- vi) Above grade: Fibre cement board or stucco parging.



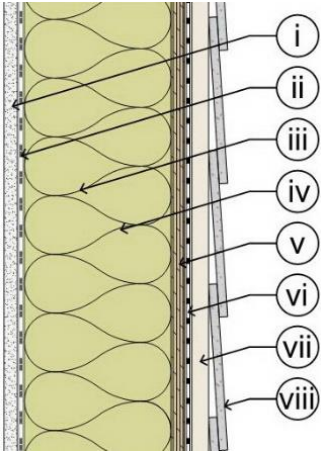
General Notes:

- Refer to site specific geotechnical assessment report for confirmation of drainage, waterproofing and frost protection requirements.
- Refer to structural drawings for concrete and reinforcing requirements. Basis of footing design: ICF wall to bear on 8”x16” concrete footing reinforced with two rows of #4 – ½” diameter deformed reinforcing steel tied together and spaced 3” from the outside edges.
- Footing to be located below frost line. Footing trench to be reviewed with the geotechnical consultant to confirm bearing capacity.
- Refer to architectural drawings and the 2019 Building Enclosure Design Guide (BC Housing) for installation details.
- Extruded polystyrene to be installed at the interior of the rim joist with transitions and terminations sealed with closed cell spray foam.



Exterior Wall – Fibre Cement Cladding

- i) ½" thick M2Tech gypsum wall board with mould resistant joint compound and tape. Gypsum board to be primed and painted in accordance with the paint section of this specification.
- ii) 6mil polyethylene sheet. Joints and transitions to be sealed with Tremco Acoustical sealant or approved equivalent sealant or tape. Seal to wood plates at eaves and base of wall. Seal to studs, headers and sill plates at windows and doors. Seal to wall penetrations including vents and electrical fixtures.
- iii) Refer to structural drawings for wood framing. Basis of design: 2x6" SPF wood studs (#2 or better) at 16" on center.
- iv) Rockwool Comfortbatt R-24 (nominal) mineral wool batt insulation. Installation to be in accordance with manufacturers published instructions.
- v) 1/2" thick exterior fir plywood. Refer to structural drawings for additional information including attachment and bracing.
- vi) Tyvek House-Wrap vapour permeable sheathing membrane (or equivalent) installed in accordance with manufacturers installation (see notes below) for air and moisture barrier continuity.
- vii) 3/4" thick x 2" wide CCA pressure treated plywood vertical strapping at 16" on center attached with 3" hot-dipped galvanized (minimum G90) nails at 16" on center.
- viii) James Hardie lapped siding attached with hot-dipped galvanized nails in accordance with manufacturers installation instructions. Smooth finish to compliment the wood finishes.



General Notes:

- Refer to the architectural drawings and the 2019 Building Enclosure Design Guide (BC Housing) for exterior wall details.
- Exposed fasteners to be stainless steel or hot-dipped galvanized.
- Cascadia SMP galvalume (AZ50) pre-finished sheet metal flashings as shown on the drawings. Flashing joints to be standing seams and/or S-lock.
- Warranty: Fibre cement cladding manufacturer to provide 30-year material warranty.

Sheathing membrane installation notes (refer to manufacturers published installation instructions):

- Horizontal joints to be shingle lapped
- Minimum of 6" horizontal and 12" vertical laps.
- All lap joints to be sealed with Tyvek Tape or alternate approved by the manufacturer.
- Install capped staples per manufacturers for temporary attachment where rainscreen strapping is not immediately installed.

Exterior Wall – Cedar Siding

- i) ½" thick M2Tech gypsum wall board with mould resistant joint compound and tape. Gypsum board to be primed and painted in accordance with the paint section of this specification.
- ii) 6mil polyethylene sheet. Joints and transitions to be sealed with Tremco Acoustical sealant or approved equivalent sealant or tape. Seal to wood plates at eaves and base of wall. Seal to studs, headers and sill plates at windows and doors. Seal to wall penetrations including vents and electrical fixtures.
- iii) Refer to structural drawings for wood framing. Basis of design: 2x6" SPF wood studs (#2 or better) at 16" on center.
- iv) Rockwool Comfortbatt R-24 (nominal) mineral wool batt insulation. Installation to be in accordance with manufacturers published instructions.
- v) 1/2" thick exterior fir plywood. Refer to structural drawings for additional information including attachment and bracing.
- vi) Tyvek House-Wrap vapour permeable sheathing membrane (or equivalent) installed in accordance with manufacturers installation (see notes below) for air and moisture barrier continuity.
- vii) 3/4" thick x 2" wide CCA pressure treated plywood vertical strapping at 16" on center attached with 3" hot-dipped galvanized (minimum G90) nails at 16" on center.
- viii) Cedar siding to be stained on all sides (refer to paint specification section) and fastened with hot-dipped galvanized nails. Refer to images at right for the wood siding options noted below:

1. Nominal 1x6" cedar vertical boards with 1x2" vertical battens at board joints. Vertical boards to be installed over CCA pressure treated cross strapping.
2. or horizontal lapped bevelled boards.

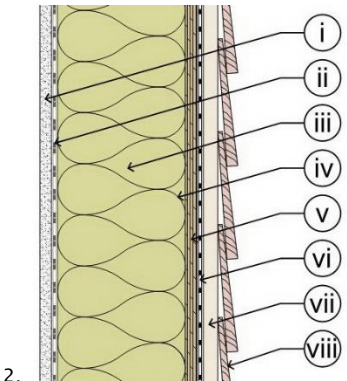
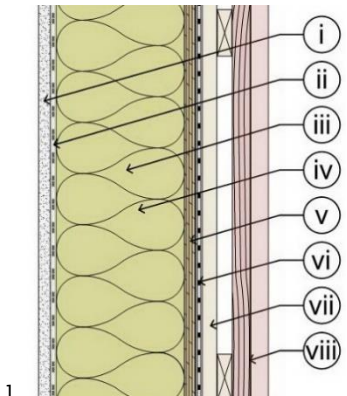
General Notes:

- Refer to the architectural drawings and the 2019 Building Enclosure Design Guide (BC Housing) for exterior wall details.
- Exposed fasteners to be stainless steel or hot-dipped galvanized.
- Cascadia SMP galvalume (AZ50) pre-finished sheet metal flashings as shown on the drawings. Flashing joints to be standing seams and/or S-lock.

Sheathing membrane installation notes (refer to manufacturers published installation instructions):

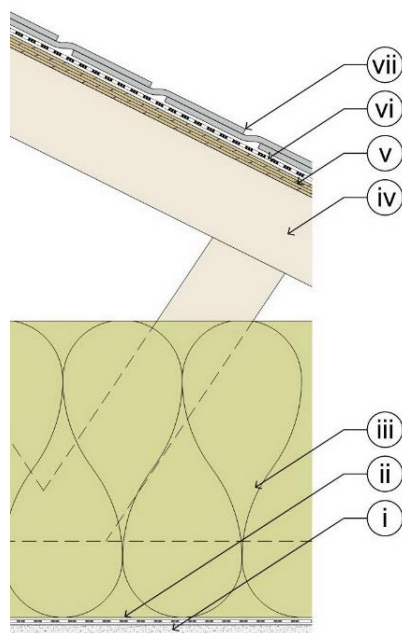
- Horizontal joints to be shingle lapped
- Minimum of 6" horizontal and 12" vertical laps.
- All lap joints to be sealed with Tyvek Tape or alternate approved by the manufacturer.

Install capped staples per manufacturers for temporary attachment where rainscreen strapping is not immediately installed.



Asphalt Shingle Roof

- i) ½" thick M2Tech gypsum board with mould resistant joint compound and approved tape. Gypsum board to be primed and painted in accordance with the paint section of this specification.
- ii) 6mil polyethylene sheet. Joints and transitions sealed with Tremco Acoustical sealant or approved alternate. Seal to wood plates at eaves and base of wall. Seal to studs, headers and sill plates at windows and doors. Poly boots to be installed at ceiling penetrations including recessed light fixtures and mechanical equipment for air/vapour barrier continuity. Poly boots to be sealed or taped to the poly sheet.
- iii) R-52 mineral wool batt insulation (Rockwool Comfortbatt or approved alternate). Refer to roof insulation instruction below.
- iv) Wood trusses – refer to structural.
- v) ½" plywood sheathing – refer to structural.
- vi) No. 15 non-perforated roofing felt underlay. Self-adhered rubberized asphalt sheet eave protection membrane to be installed at eaves and valleys – Titanium PSU30 or approved alternate. Eave protection to extend minimum 36" and no less than 12" inside the inner face of the exterior wall as required by BCBC 9.26.5. Installation to be in accordance with manufacturers published instructions.
- vii) Laminated, fiberglass asphalt roof shingles – GAF 3-Tab Marquis Weathermax or approved alternate. Installation to be in accordance with manufacturers published instructions and RCABC manual of practice (which ever is more stringent).

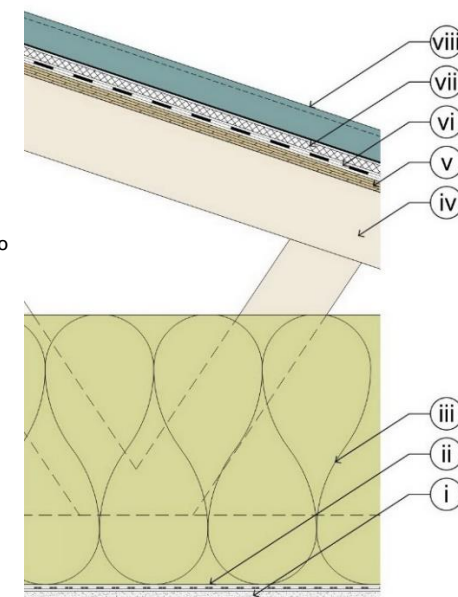


General Notes:

- Minimum roof slope is 5:12 for asphalt shingle roof areas. Warranty: Shingle manufacturer to provide minimum 15-year warranty. Roofing subcontractor to provide 1-year warranty against water leakage.
- Shingle roofing to include Cascadia SMP galvalume (AZ50) pre-finished sheet metal flashings at valleys, rake and eaves as detailed.
- Roof accessories to include: galvanized roofing nails, flanged metal pipe flashings, galvanized steel storm collar, and sealant as noted in Joint Sealant specification section.
- The first row of R-22 mineral wool attic insulation shall be placed parallel to truss and to outer edge of top plate. Second row of R-30 mineral wool batt to be placed perpendicular to the first row. Install with joints butted tight, flush and uniform in accordance with manufacturers instructions. The gable ends to be insulated with extruded polystyrene (XPS) to match mineral wool depth. XPS to be cut and fit into the truss cavities and tight/flush to wood framing.
- Roof ventilation in accordance with British Columbia Building Code. Louvred vents to be located at gables – refer to architectural drawings. The unobstructed vent area shall not be less than 1/300 of the insulated ceiling area.
- Stepped apron flashings to be installed at wall interfaces and extend minimum 5" up the wall and 4" onto the roof shingle. Wall interface detailing to including water diverter flashings in accordance with RCABC details.
- Plumbing vent flashings to include minimum 4" flange and galvanized steel storm collar sealed to the pipe.

Metal Roof

- i) ½" thick M2Tech gypsum board with mould resistant joint compound and approved tape. Gypsum board to be primed and painted in accordance with the paint section of this specification.
- ii) 6mil polyethylene sheet. Joints and transitions sealed with Tremco Acoustical sealant or approved alternate. Seal to wood plates at eaves and base of wall. Seal to studs, headers and sill plates at windows and doors. Poly boots to be installed at ceiling penetrations including recessed light fixtures and mechanical equipment for air/vapour barrier continuity. Poly boots to be sealed or taped to the poly sheet.
- iii) R-52 mineral wool batt insulation (Rockwool Comfortbatt or approved alternate). Refer to roof insulation instruction below.
- iv) Wood trusses – refer to structural.
- v) ½" plywood sheathing – refer to structural.
- vi) Titanium PSU30 self-adhered rubberized asphalt sheet underlay, or approved alternate. Installation to be in accordance with manufacturers published instructions.
- vii) Drainage medium – Enkamat or similar.
- viii) Cascadia SMP galvalume (AZ50) pre-finished metal roofing and flashings. Installation to be in accordance with manufacturers published instructions and RCABC manual of practice (which ever is more stringent).

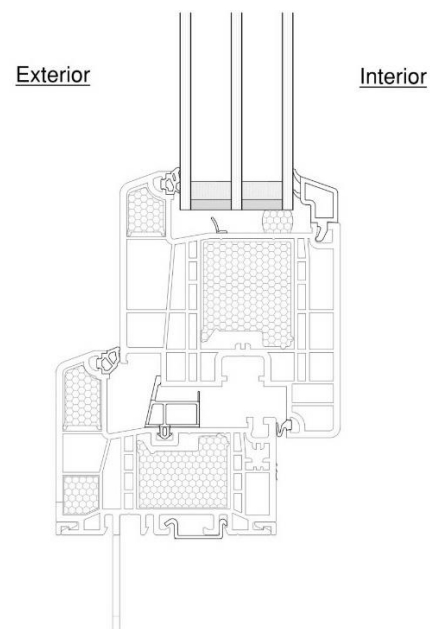


General Notes:

- Minimum roof slope is 3:12 for profiled metal roof areas.
- Warranty: Metal roofing manufacturer to provide 20-year warranty. Roofing subcontractor to provide minimum 1-year warranty against water leakage.
- The first row of R-22 mineral wool attic insulation shall be placed parallel to truss and to outer edge of top plate. Second row of R-30 mineral wool batt to be placed perpendicular to the first row. Install with joints butted tight, flush and uniform in accordance with manufacturers instructions. The gable ends to be insulated with extruded polystyrene (XPS) to match mineral wool depth. XPS to be cut and fit into the truss cavities and tight/flush to wood framing.
- Roof accessories to include: gasketed screws (Leland Ind. Master Grippers DT2000 or approved alternate), flanged metal pipe flashings, galvanized steel storm collar, sealant as noted in Joint Sealant specification section.
- Roof ventilation in accordance with British Columbia Building Code. Louvred vents to be located at gables – refer to architectural drawings. The unobstructed vent area shall not be less than 1/200 of the insulated ceiling area.
- Flexible boot flashings to be installed at pipe penetrations and bed in sealant. Refer to RCABC installation details.

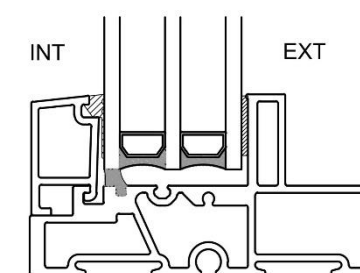
PVC Framed Windows

- i) Windows to be PVC framed. Acceptable manufacturers: Jeldwen or approved alternate.
- ii) Refer to architectural drawings for window dimensions, operable vent and fixed lite configurations. Operable vents to be awning type.
- iii) Window performance required by BCBC Table C-4:
 - (1) Design pressure: 960 Pa
 - (2) Performance Grade: PG20
 - (3) Water Resistance Test Pressure: 360Pa
- iv) Window thermal performance:
 - (1) Max. U-Value, 1.16 W/(m².K)
 - (2) Solar heat gain co-efficient, 0.4.
- v) Refer to architectural drawings and the 2019 Building Enclosure Design Guide (BC Housing) for rough opening preparation and installation details. Prepare the rough opening by installing 40mil thick asphaltic self-adhered membrane (Blueskin SA or equivalent) at the sill and base of jambs and wrapping the sheathing membrane (Tyvek or equivalent) into the rough opening at the head and jambs beyond the innermost plane of the window. Refer to joint sealant specification.
- vi) Warranty: manufacturer to provide 10-year material warranty, 5-year warranty on insulated glazing units (IGU), 2-year warranty on hardware.
- vii) Windows to include insect screens on all operable vents.
- viii) Glazing units to be triple glazed, argon filled, with warm edge spacer bars and silicone dual edge seals. Glazing to include a low emissivity coating on the #2 surface



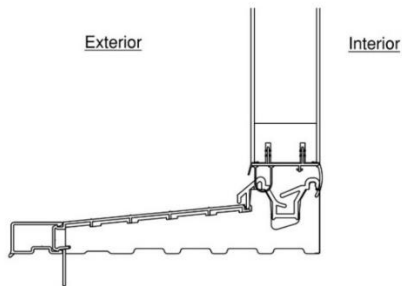
Fiberglass Framed Windows – Improved Performance

- i) Windows to be fiberglass framed. Basis of design: Cascadia Universal Series.
- ii) Refer to architectural drawings for window dimensions, operable vent and fixed lite configurations. Operable vents to be awning type.
- iii) Operable vents to include locks, solid handles and insect screens.
- iv) Window performance required by BCBC Table C-4:
 - (1) Design pressure: 960 Pa
 - (2) Performance Grade: PG20
 - (3) Water Resistance Test Pressure: 360Pa
- v) Window thermal performance:
 - (1) Max. U-Value, 0.965 W/(m².K)
 - (2) Solar heat gain co-efficient, 0.37.
- vi) Refer to architectural drawings and the 2019 Building Enclosure Design Guide (BC Housing) for rough opening preparation and installation details. Prepare the rough opening by installing 40mil thick asphaltic self-adhered membrane (Blueskin SA or equivalent) at the sill and base of jambs and wrapping the sheathing membrane (Tyvek or equivalent) into the rough opening at the head and jambs beyond the innermost plane of the window. Refer to joint sealant specification.
- vii) Warranty: manufacturer to provide 10-year material warranty, 5-year warranty on insulated glazing units (IGU), 2-year warranty on hardware.
- viii) Windows to include insect screens on all operable vents.
- ix) Glazing units to be triple glazed, argon filled, with warm edge spacer bars and silicone dual edge seals. Glazing to include a low emissivity coating on the #2 surface



Side-hinged Exterior Doors

- i) Steel clad wood doors in a wood frame: Masonite Wood-Edge Steel Doors or approved alternate.
- ii) Doors to include deadbolt locking hardware (Weiser or approved alternate) with three keys. Satin chrome or stain brass finish to be selected by Owners.
- iii) Doors to include combination screen/storm door with self-closer and Alcan finish.
- iv) Door performance required by BCBC Table C-4:
 - (1) Design pressure: 960 Pa
 - (2) Performance Grade: PG20
 - (3) Water Resistance Test Pressure: 360Pa
- v) Door thermal performance as required by BCBC 9.36.2.7:
 - (1) Max. U-Value, 1.8 W/(m².K)
 - (2) Min. Energy Rating: 21
- vi) Refer to architectural drawings and the 2019 Building Enclosure Design Guide (BC Housing) for rough opening preparation and installation details. Prepare the rough opening by installing 40mil thick asphaltic self-adhered membrane (Blueskin SA or equivalent) at the sill and base of jambs and wrapping the sheathing membrane (Tyvek or equivalent) into the rough opening at the head and jambs beyond the innermost plane of the door. Refer to joint sealant specification.
- vii) Warranty: manufacturer to provide 15-year warranty on material and workmanship.



Wood Framing

- i) Refer to structural drawings for wood framing member dimension, spacing, material and connections. The following wood framing basis of design is to be confirmed with the structural consultant:
 - (1) Exterior wall framing to be 2x6" #2 grade SPF or better installed at 16" on center Performance Grade: PG20
 - (2) Floor joists to be 2x10" #2 grade SPF or better installed at 16" on center.
 - (3) Floor sheathing to be 5/8" thick tongue and groove fir plywood installed perpendicular to the joist.
 - (4) Roof trusses to be sloped at 5:12 and designed to BCBC 2018 and minimum 5 kPa (100 lbs per sft).
 - (5) Roof sheathing to be ½" fir exterior grade plywood with H-clips. Refer to structural drawings for attachment.
 - (6) Interior partition walls to be framed with 2x4" SPF wood stud framing at 16" on center.
 - (7) Bathroom service walls to be framed with 2x6" SPF wood studs.
- ii) Refer to BC Housing Illustrated Guide – Seismic Bracing Requirements.
- iii) Wood framing to be air or kiln dried and maximum 15% moisture content. Protect wood and ensure moisture content is at or below 15% at installation of interior finishes.
- iv) Wood plates at concrete foundations and slabs to be borate treated to a net retention of 2.7 Kg/m³. Sill gasket to be installed between wood plate and concrete – Owens Corning FoamSealR or approved alternate.
- v) Install solid wood blocking to support interior fixtures as indicated on the architectural drawings.
- vi) Door rough opening widths shall be typically 32" (810mm) as shown on architectural drawings.

Wood Fascia and Soffit

- i) Wood fascia to be SPF dimensional lumber all sides and cut edges to be primed prior to installation. Fasten with hot-dipped galvanized nails.
- ii) Wood soffit to be nominal 1x6" tongue and groove cedar with alkyd wood stain. Include 2" vent strip at eaves with perforated galvanized steel or aluminum strip.

Gutters and Rainwater Leaders

- i) 5" pre-finished aluminum gutters and rainwater leaders – Kaycan, Gentek or approved alternate.
- ii) Installation to be in accordance with manufacturer's published instructions. Seal joints to make watertight.
- iii) Provide a leaf filter at gutter droppers and cleanouts at the base of each rainwater leader.

Paint

- i) The following paint types are to be applied in accordance with the MPI painting manual and the manufactures instructions including substrate preparation. Basis of design products are provided in brackets.
 - (1) Exterior fibre-cement wall cladding: MPI System EXT 3.3A – G2. Three coats latex (MPI 214 – Cloverdale Ecologic).
 - (2) Exterior painted wood trim and fascia: MPI System EXT 6.3A – G5. Two coats latex (MPI 11 - Cloverdale WeatherOne) over alkyd primer (MPI 5 – Cloverdale PrimeSolution).
 - (3) Exterior stained wood: MPI System EXT 6.2L. Two coats transparent/semi-transparent stain (MPI 13 – Benjamin Moore Arborcoat Exterior Oil Stain Translucent).
 - (4) Interior gypsum wall board: MPI System INT 9.2A – G3. Two coats interior acrylic latex (MPI 52 - Cloverdale Premium Classic) over latex primer/sealer (MPI 50 – Cloverdale Premium Classic).
 - (5) Interior wood trim: MPI System INT 6.3T – G5. Two coats interior latex (MPI 54 - Cloverdale Premium Classic) over latex primer (MPI 39 - Cloverdale PrimeSolution).
- ii) Paint to be applied by brush or roller only.

Joint Sealant

- i) Exterior painted joints: single component polyurethane – Masterseal NP100, Tremco Dymonic 100 or equivalent.
- ii) Exterior joints (non-paintable): single component neutral cure silicone – Tremco Spectrem 2 or equivalent.
- iii) Window and door interior perimeter seal: Thermoplastic – Tremco 830, DowSil 758 or equivalent.
- iv) Interior finish accessory sealant (painted): single component acrylic – DAP or equivalent.
- v) Poly vapour barrier accessory sealant at lap joints and transitions: Tremco Acoustical Sealant or equivalent.

Interior Finishes

- i) Interior gypsum board to be installed at walls and ceilings - ½" thick M2Tech gypsum board with mould resistant joint compound and tape. Gypsum board to be primed and painted as noted in Paint specification section.
- ii) Cedar strips to be located at inside corners at walls and ceilings as shown on the architectural drawings.
- iii) Interior wood trim to be primed softwood lumber with a moisture content of 15% or less fastened with steel brad nails. Refer to architectural drawings for locations, extent and profile of interior wood trims. Mitre joints to be adhered with polyvinyl acetate (PVA) adhesive or approved alternate. Nail heads to be filled and joints caulked with paintable acrylic caulking as noted in Joint Sealant specification section.
- iv) Vinyl and hardwood flooring to be installed as shown on the architectural drawings. Vinyl flooring in bathrooms to extend minimum 4" up the interior wall.

Interior Doors

- i) Interior doors to be 32" (810mm) Masonite pre-hung, primed wood doors in a wood frame. Solid core doors are to be located at bedrooms.
- ii) Door style, finish, glazing and configuration to be selected by the Owners.
- iii) Lock sets to be Weiser A101 (lever type) for passage doors and Weiser A301 for privacy doors.
- iv) All doors to include stops and wooden panels to prevent wall damage.

Heating and Ventilation

- i) Refer to building specific mechanical drawings and energy model documentation, as applicable.
- ii) Design, installation and commissioning of ventilation, heating and/or cooling systems is to be guided by the standards set by industry organizations such as TECA (<http://teca.ca>) or HRAI (<http://hrai.ca>). In-class training and certification through simple workshops are available.
- iii) **Load Calculations** are to be performed to determine the heat loss and gain of the building and size ducting capacity appropriately. Load calculation methodology is to adhere to CSA F280-12 standard. Software and technical support for this method can be obtained through the industry organization TECA with the following link: <https://www.teca.ca/products/quality-first-companion-software/quality-first-heat-loss-heat-gain>. Any equipment with performance equivalents is acceptable, provided that heating/cooling capacities match load requirements at design conditions and fan speeds are compatible.
- iv) **Space Heating System:** Single-family one, two and three bedroom units are to be heated with a Thermolec FER 12-6-240/1 electric furnace (or equivalent), controlled by a single-zone programmable thermostat. Triplex suites are to be heated with electric baseboards.
Optional heat pumps for space heating & cooling -- where budgets permits, with improved energy efficiency of 50% or more in operating costs: Mitsubishi SEZ-KD184A4 (indoor unit) and SUZ-KA18NAH2 (outdoor unit) at single-family one, two and three bedroom units, Mitsubishi MSZ-GE12NA-8 (ductless split indoor unit) and MUZ-GE12NAH2 (outdoor unit) at one bedroom units within the triplex building. Again, equivalent alternative equipment is acceptable provided that heat pump capacity at design conditions meets the peak load requirements.
- v) **Ventilation:** Single-family one, two and three bedroom units shall comply with BCBC 9.32.3.4 (3) & (4) for centrally ducted HRV integrated with forced air heating system and are to be ventilated with Venmar K7 heat recovery ventilators. One bedroom units within triplex building to have passive ventilation: i.e. per BCBC 9.32.3.4 (6), "Small Dwelling Unit with Non-Forced Air Heated Dwellings in Mild Coastal and Moderate Interior Climates". Will consists of a continuously running principal fan (bath fan), and 4 sq. inch openings to occupied rooms at minimum of 6' above floor. Principal ventilating fan to be provided by Panasonic FV-05VQ5 (or equivalent).
- vi) **Refer to mechanical drawings for duct design guideline.**
 - a. All duct and piping to be sealed at every joint, longitudinal and transverse seam.
 - b. All duct and piping sealing to be performed with duct mastic and/or non-reinforced aluminum tape.
 - c. Any ducting and pipe penetrating the building envelope to be insulated with duct wrap at minimum thermal value of R-3.1 ($\text{hr} \cdot \text{ft}^2 \cdot \text{°F} / \text{BTU}$) or use insulated flex at a diameter one size larger than the equivalent rigid pipe size.
 - d. Any ducting and pipe installed outside of the building envelope in an unconditioned space (such as attic, within an exterior wall), shall be insulated at a minimum thermal value equal to the required effective R-Value of above grade walls (Eff. R-16.9.1 $\text{hr} \cdot \text{ft}^2 \cdot \text{°F} / \text{BTU}$ for Climate Zone #5).
 - e. Any use of flexible pipe must be sized one diameter larger than the equivalent required rigid pipe. Care must be taken to fully stretch piping and avoid creating 'pinch' points due to sharp turns or poor fastening.
 - f. All duct branch runs shall have simple volume balancing dampers at the point of take-off from supply trunks.
 - g. All duct and pipe shall not be less than 30 gauge.
- vii) **System Commissioning:** Thorough commissioning before occupancy shall include:
 - a. Verify all system components are installed and completed.
 - b. All manuals, specification sheets, warranty documents, and maintenance schedules combined into a single binder or envelope.
 - c. All ducting and pipe have been cleared of any construction dust or debris.
 - d. All manufacturers' 'Start-up' procedures are followed and recorded.
 - e. Provide two years of air filter replacements (typically 5 extra filters) for ease of basic furnace maintenance.
 - f. Measure and balance air flow throughout the system supply registers and return grilles
 - g. Measure and record furnace temperature rise and total external static pressure (ESP).
 - h. Perform a 'walk-through' with the homeowner to understand the system, thermostat control, and particularly HRV & Furnace filter change procedures and requirements.

Plumbing and Drainage

- i) Refer to building specific geotechnical report and mechanical drawings, as applicable.
- ii) Perimeter drains to be 6" diameter perforated PVC with minimum 0.5% slope and cast iron cleanouts at each change in direction as shown on the mechanical drawings.
- iii) All domestic water piping is to be polyethylene-cross (PEX) as shown on the mechanical drawings.
- iv) Domestic hot water tanks are to be Rheem Pro+50 T2 RH9SEC1 (or equivalent) and to include a drip pan connected to the nearest drain.
- v) Back-flow preventers to be Watts Regulator Series #757OSY Double Check Valve Assembly (or equivalent).

Electrical

- i) Contractor to supply and install all electrical wiring and fixtures as shown on plans and connection to BC Hydro including payment of connection fees and expenses.
- ii) Refer to architectural and/or electrical plans for fixture type and locations.
- iii) Electrical wiring to be 12 – 25 gauge copper. Home runs to have no more than six (6) fixtures per line.
- iv) Electrical service to be 200 amp at units with a heat pump.
- v) Interior and exterior lighting to be LED type.
- vi) Cash allowance for light fixtures is \$1,200 per unit to be selected by the Owner.
- vii) Supply and install two (2) 110V hardwired smoke alarms at each unit.
- viii) Refer to architectural drawings and the 2019 Building Enclosure Design Guide (BC Housing) for building enclosure installation details.

Concrete

- i) Refer to structural drawings for concrete strength, and reinforcement location, size, spacing and layout.
- ii) Concrete to be vibrated to ensure good consolidation as required by the structural consultant.
- iii) Refer to geotechnical for sub-grade bearing and requirements.