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1.0 GENERAL

.1 Vapour barriers are required in all UBC buildings and they shall be located on the warm side of insulation.

.2 All heated occupied buildings on campus shall have a competent air barrier system, which requires integration into the plane of air tightness early in the design development process.

.3 Input from a Building Envelope Professional (BEP) is required at an early stage in the design development process.

1.1 Exterior Metal Fabrications

.1 Canopies, railings, safety anchors, signage and art work to be designed to resist damage from exterior exposure by being made of corrosion resistant materials, adequately coated, or sheltered from wetting.

.2 Glass used as guards or canopies to be tempered and laminated.

.3 All structural penetrations to support exterior metal fabrications to be designed to integrate with air and vapour barrier systems, cladding systems, and be protected from corrosion where exposed in the wall cavity.

.4 All roof furniture to be mounted on curbs at least 100mm above scupper level.

.5 All steel exposed outdoors is to be hot dip galvanized. Paint, if applied should consist of a marine/industrial grade coating system (a typical system would consist of an epoxy barrier coat and aliphatic urethane topcoat).

.6 All inserts set into masonry or concrete, used to affix exterior metal fabrication, to be stainless steel.

1.2 Roof Parapets and Canopies

.1 Roof and parapet design should plan for safe and efficient roof maintenance working conditions. Working areas are recommended to be secured with minimum 1,067 mm (3'-6") high insulated or thermally broken parapets or guardrails. These are required for all new buildings. Fall restraint and fall arrest systems are to be used only if the design cannot accommodate parapets or guardrails.

.2 Canopies (overhead protection) must be provided over every exterior door to reduce the risk of water ingress into the building and provide protection of the public against the elements.

The overhead ratio is defined as the length of the overhang (distance from jamb outwards and to the side) to the height of the overhang above threshold of the door. The extent of the overhang recommended depends on the door type:

.1 If the doors meet the required water ingress rating (using the Canadian Supplement to NAFS or based on the recommendations of the enclosure consultant for the project),
the overhead ratio = 1:4

.2 If the door does not meet the required water ingress rating but exceeds 100Pa and is an outswing door, then the overhead ratio = 1:2

.3 If the doors cannot pass a water ingress test at 100 PA or is an inswing door, then the overhead ratio = 1:1
1.3 Roof leak detection Systems

.1 Roof Leak Detection Systems are required in some locations; see Section 07 50 00 Membrane Roofing.

1.4 Roof Usage Policy - OVERVIEW

.1 Buildings having roofs that allow public access may be one of the following categories:
   .1 Privately owned and maintained, (market housing, faculty and staff housing).
   .2 Privately-owned but maintained by UBC Building Operations (Student Union Building “the Nest”, Hillel House).
   .3 UBC-owned and maintained buildings. This comprises all core-funded, as well as ancillary, campus buildings.

   .2 All roofs that are maintained by UBC Building Operations are also controlled by UBC Building Operations. This is not only to protect the assets and to limit the exposure of liability to UBC, but also to protect the public from hazards. This roof usage policy governs all roofs maintained by UBC Building Operations.

   .3 Roof tops which are accessible by the general public, (non-maintenance personnel), require protection for roof-mounted assets and for people to safely access the roof.

1.5 Roof Usage Policy - POLICY

.1 Requirements:
   .1 Where public access is anticipated on any roof maintained by UBC Building Operations, this policy may require that architects and engineers minimize UBC’s exposure to liability by including any or all of the following in their roof design:
       .1 The remote location of roof-top equipment that is vital to the function of the building or equipment that is vital to research. (Refer to 1.3 above).
       .2 Flexible and safe methods of restricting and controlling public access at the perimeter.
       .3 Un-climbable guard rails around the perimeter to prevent falls from the roof, and which conform to the latest BC Building Code.
       .4 Robust protection of all roof membranes and flashings, drainage planes, roof barrier membranes and roof drains.
       .5 The provision for extending one nearby passenger elevator to roof level to provide full accessibility for handicapped visitors and staff.
       .6 The provision of a dedicated freight elevator solely servicing all the uses taking place on the roof.
       .7 A leak detection system of flat-wire grids.

   .2 Early discussion, at the Planning stage, is required with UBC Building Operations.

***END OF SECTION***
1.0 GENERAL

1.1 Related UBC Guidelines

.1 Section 07 00 10 Building Envelope – General Requirements

1.2 Coordination Requirements

.1 Coordinate design with Building Envelope Consultant.
.2 Coordinate design with Structural Engineer.
.3 Coordinate design with Mechanical Consultant.

1.3 Performance Requirements

.1 Membranes under landscaping require access for maintenance and replacement. Membranes are not to be buried under cast-in-place concrete except as absolutely necessary at sidewalks and driveways. Pavers or other material that can be removed and re-used for hard landscaping is preferable.

.2 For soft landscaping (plants etc.) over membranes use materials that can be removed with light excavation equipment and be disposed of. More valuable plants can be placed in movable planters.

.3 Membranes should be fully bonded to the surface of the concrete structure to help isolate leak locations.

.4 Concrete structures under the membrane should be sloped to drains at about 2%. Account for deflection or other subsidence of the structure when specifying and designing slopes.

.5 Apply hot rubberized asphalt membranes only after sustained intervals of dry weather. If construction schedule dictates application during poor weather season, select alternate waterproofing type.

.6 Membranes to terminate at least 100 mm higher than the finished grade surfaces of any landscaping. Use termination bars or reglets to finish the top edge of the membrane and install counter flashing to cover and protect membrane above grade.

.7 Sills at service doors to be raised 100 mm above finished grade surfaces and be provided by ramps to grade if required to be accessible.

.8 Sills at main public access doors and at exit doors must be located flush with exterior walkway pavers. Provide a 3/4" deep recessed pocket immediately beneath the door threshold. Extend the waterproofing membrane into the recessed pocket and upturn at the back and sides of the pocket. Threshold to be set on shims to provide a flush installation with interior finishes and to reduce the risk of any tripping hazard. Exterior pavers will be installed on pedestals to promote drainage and pavers are to be provided with adequate spacing or provide trench drains to prevent ponding nearby doorways. Floor finishes on the interior of these doors should not be moisture sensitive type products.

.9 Door sills to be integrated with terminations of roofing membranes using a liquid waterproofing flashing membrane (PMMA).

.10 Check scuppers for height relative to door sills.
.11 Subgrade membranes to be drained to perimeter drains via a permeable fill or geotextile system placed on top of the membrane.

.12 The installation is not to leak at terminations, drains, upturns, or splices.

.13 The installation is to be impermeable to chloride ions.

.14 The system must be able to withstand active cyclical crack movement to a maximum of 1.5 mm and remain waterproof.

.15 The membrane, primer, and or surface patching material shall fully adhere to the substrate concrete.

.16 Adhesion of all layers of the system is to exceed 1.0 MPa.

.17 Cold joints at below grade foundation concrete walls should be detailed with vertical reveals to control crack propagation. All below grade foundation walls to be designed with waterstopped crack control joints, located at a minimum of 15'-0" on centre. Spacing to be confirmed with project structural engineer.

1.4 Quality Control and Assurance

.1 Quality Assurance
   .1 Testing of permeability, bond strength, material thickness, and flood testing will be carried out by the Owner at his expense.
   .2 Applicator to provide material submittal and drawings showing any deviation from RCABC Waterproofing Standards.

.2 Quality Control
   .1 Contractor to test moisture content of concrete substrate to verify that substrate moisture content does not exceed manufacturer’s specifications.
   .2 Submit results to consultant prior to application of membrane.
   .3 Flood testing and EFVM scans are to be performed prior to installation of overburden.

.3 Warranties
   The following warranties and guarantees are required:
   .1 First two years - Guarantee, secured by Performance Bond, commencing on the Final Holdback release due date.
   .2 Third year to fifth year - Extended Guarantee, unsecured by Bond, commencing on the expiration of the Performance Bond. Joint and Sealant guarantee by Coating applicator and Manufacturer.

.4 Horizontal waterproofing: 5 year RCABC waterproofing warranty and detailing; 10 years Manufacturer material warranty. These warranties only apply to horizontal applications, RCABC does not cover vertical waterproofing of foundation walls. In the case that a 5 year RCABC waterproofing warranty is provided the Performance Bond (1.4.3.1) and Extended Guarantee (1.4.3.2) are not required.

.5 Submit the RCABC RoofStar “Roofing Assignment and Guarantee Request” sheet with all roof guarantee certificates.

.5 Submit signed certificates to Consultant.
.4 Commissioning
   .1 Contractor to repair any defects found in membrane as a result of flood testing or Electric Field Vector Mapping (EFVM) scan.

2.0 MATERIALS

.1 UBC-required sub-grade waterproofing system for horizontal surfaces:
   .1 Waterproofing systems to consist of two ply thermo fusible membrane for flat applications (low slope) under landscaping.
   .2 Waterproofing systems to consist of three ply thermo fusible membrane under hard landscaped areas and roadways constructed of cast-in-place concrete topping.
   .3 All membranes to be covered with 3mm minimum protection board for horizontal application.
   .4 At landscaped areas, root barrier to be provided and consist of minimum 10 mils HPDE or 30 LPDE complete with taped seams or membrane manufacturers recommended product for use with specified vegetation (whichever is more stringent) – 80 mils welded HPDE for very invasive roots such as bamboo.
   .5 Curb on “starter-curb” details to be used for all curbs and planter walls.
   .6 All penetrations for irrigation, electrical or gas services to extend into a roofing jack that terminates into a drained, accessible garden box.
   .7 Pond liner: 80 mils fully welded HDPE.

.2 UBC-required sub-grade waterproofing system for vertical surfaces:
   .1 Based on results of geotechnical report and occupancy the following membrane should be considered as a minimum:
      .1 Drained and cast in place wall: 1-ply Torch SBS
      .2 Drained and blind side formed wall: preprufe 200 or Bentonite/HPDE Composite
      .3 Drained and shotcrete wall: preprufe 160
      .4 Drained and high risk occupancy: 2-ply and/or double wall with drainage
      .5 Hydrostatic pressure and cast in place wall: 2-ply torch
      .6 Hydrostatic pressure blind side: preprufe 160
      .7 Hydrostatic pressure shotcrete: preprufe SCS
      .8 Hydrostatic occupied or high risk: not allowed

.3 Other membrane systems possible:
   .1 Hot applied rubberized asphalt, 2 ply, fully reinforced; can be used where SBS is impractical. Minimum 215 mils thickness.
   .2 Hot rubber products to conform to CGSB-37.50, Standard for “Asphalt, Rubberized, Hot Applied, for Roofing and Waterproofing” (i.e. Hydro tech Membrane Corp. PQ, c/w protection and drainage course, 20-year manufacturer Water tightness Warranty).

.4 Drain bodies to have clamping ring to receive membrane.

3.0 EXECUTION

.1 All substrate cracks in concrete substrates to be pretreated by sawing out crack, installing bridging sealant, and reinforcing waterproofing system over the crack.

.2 Concrete bonding surfaces to be cleaned and prepared by shot-blasting, sand blasting, or water blasting.

***END OF SECTION***
1.0 GENERAL

1.1 Coordination Requirements

.1 Section 07 00 10 Building Envelope – General Requirements

1.2 Performance Standards

.1 Exceed the minimum prescriptive requirements of ASHRAE 90.1-2010 or 2011 NECB per 2012 BCBC.

.2 The maximum overall effective thermal transmittance of building assemblies (or equivalent minimum effective R-value) should be as follows (based on NECB effective prescriptive requirements for climate zone 4):

.1 Above-ground opaque walls: 0.315 W/m²-K (R-18)
.2 Roofs: 0.227 W/m²-K (R-25)
.3 Exposed floors: 0.227 W/m²-K (R-25)
.4 Fenestration and Doors: 2.4 W/m²-K (U-0.42)
.5 Walls in contact with ground: 0.568 W/m²-K (R-10)
.6 Floors in contact with ground: 0.757 W/m²-K for 1.2m (R-7.5)

.3 Thermal bridging effects shall be accounted for when calculating the overall thermal transmittance of assemblies (or equivalent minimum effective R-value) using one of the following techniques:

.1 If the assembly matches one of those available in the online, “Building Envelope Thermal Bridging Guide: Analysis, Applications & Insights” document, then use calculated values in the document. This document is available at https://www.bchydro.com/powersmart/business/programs/new-construction.html#thermal or

.2 Use two-dimensional heat transfer modeling performed by a qualified professional for thermal bridges that are continuous along one axis such as studs, exposed slab edges, balconies, z-girts, etc. or

.3 Use three-dimensional heat transfer modeling performed by a qualified professional for intermittent or point thermal bridges including repetitive penetrations such as cladding attachment screws or clips, beam penetrations, multiple canopy penetrations etc.

One-off penetrations such as roof drains, louvers, scuppers or single canopy penetrations etc. need not be modeled.

.4 Spray Polyurethane Insulation shall meet the requirements of CAN/CGSB-51.39, Spray Polyurethane Insulation.

.5 Wall assembly thermal insulation is typically located outside the air barrier and inside cladding materials, neither of which are intended to be disturbed for 75 years or more. The performance of the insulation must be sustained during this service life.

.6 Insulation and other thermal separations are to be located so that the interior surface temperature of all building envelope assemblies is maintained above 6°C (above dew point temperature) during 2½% winter design temperature conditions.
1.3 Quality Control and Assurance

.1 Quality Control
   .1 During construction, contractor to arrange for a 3rd party review of Spray Polyurethane insulation installation. Cost of 3rd party review to be paid by contractor.

.2 Commissioning
   .1 Cost of scans to be paid by contractor.

2.0 MATERIALS

2.1 Performance Requirements

.1 None

2.2 Prescriptive Requirements

.1 Materials
   .1 For plastic foam insulations, AN/ULC-S770 Standard shall apply for establishing the required "R" value (known as LTTR "Long Term Thermal Resistance" value in this standard).
   .2 Expanded polystyrene insulation may not be used where in contact with ground, below-ground or wet locations.
   .3 Provide spray-in-place polyurethane insulation at intersecting building assemblies (refer BCBC 5.3.1.3).
   .4 Materials considered to have sufficient service life include:
      .1 For rainscreen walls: semi rigid rock wool and fiberglass.
      .2 For roofs: refer to RCABC’s list of approved products.
      .3 Foams should only be used when protected by concrete or masonry such as in a precast or cast in place sandwich application.
   .5 Fasteners (attachment of cladding, sub-girts, flashings, etc.) located in the exterior wall cavities shall be of stainless steel or PVC.

***END OF SECTION***
1.0 GENERAL

1.1 Related UBC Guidelines

.1 Section 07 00 10 Building Envelope – General Requirements

1.2 Coordination Requirements

.1 Coordinate design with Building Envelope Consultant.

.2 Identify air / vapour / moisture barrier systems location and all materials on drawings.

.3 Provide details showing the continuity of the air / vapour / moisture barrier systems at all joints and junctions between enclosure assemblies (windows, doors, walls, roofs, penetrations, foundations, etc.) in the building.

.4 Coordinate details of drainage, venting, insulation, and cladding of enclosure assemblies.

1.3 Performance Standards

.1 All heated occupied buildings on campus to have an air barrier system.

.2 The air barrier must be located at a thermally protected location in the assembly and must be continuous across all parts of the building above grade.

.3 Penetrations by structural elements, electrical, mechanical services through the building enclosure, and interfaces at windows and doors are the most common sources of service life and performance related problems with air, vapour and moisture barrier systems.

.4 Production of a durable air barrier requires selection of durable materials and location of the air barrier within the building enclosure where it will not be rapidly deteriorated by the elements.

.5 The air barrier is to be integrated with all components of the building enclosure such as walls, windows and door frames, roof, foundation, and service penetrations.

.6 The air barrier shall have a service life equal to cladding or be maintainable from inside the building. UBC will not accept air barrier assemblies that are not visible and require maintenance in the expected service period.

.7 Air and moisture barrier must be the same material and have the following properties:

   .1 Material air tightness: 0.02 l/sm² @75pa
   .2 System air tightness: 0.2 l/sm² @75pa
   .3 Building air tightness: 2.0 l/sm² @75pa

.8 The air barrier system is to have a comprehensive air tightness of 0.2 l/s.m² unless otherwise specified below or unless mechanical system specifications override this requirement.

   .1 Air tightness for other specific assemblies:

      .1 Walls behind masonry cladding 0.3 l/sm².
      .2 Walls enclosing heated spaces with sustained high air borne moisture loads:
          Air tightness to be increased as required to protect the wall assemblies.

.9 The air and vapour barriers are to be located close together in the assembly, or be of one material if possible. Any materials located between separate air and vapour barriers must be immune to moisture damage (100% inorganic).
.10 The air barrier is to be structurally supported to resist maximum wind loads, 30 year return. This is particularly important at movement joints where fatigue caused by excessive movement cycles of an unsupported membrane may fail the seal.

.11 The air barrier shall resist cyclic deformations caused by structural or other movement at all joints.

.12 Air barrier system shall be tested and rated in advance of construction and/or by testing in the field during construction and commissioning to check compliance with air tightness requirements.

.13 The vapour barrier is to be located on the warm side of insulation.

.14 The moisture barrier must be continuous and flashed to the exterior to prevent entry of water.

1.4 Quality Control and Assurance

.1 Submittals
   .1 Certification for Air barrier assembly (CCMC or equivalent).

.2 Quality Assurance
   .1 Construct mock-up of assemblies to check contractor's procedures.
   .2 Test mock-ups to verify air tightness and resistance to structural loading.

.3 Quality Control
   .1 Test random portions of the assembly to verify air tightness.

.4 Commissioning
   .1 Carry out fan depressurization test with smoke to verify air tightness of completed building. Air tightness testing to also include positive and negative thermographic scans of building.
   .2 Air barrier components or assemblies that are not visible or accessible and require maintenance in the expected service period of the exterior wall are not acceptable.

2.0 MATERIALS

2.1 Prescriptive Requirements

.1 Identify all air seal materials that form the air barrier assembly.

.2 Show location and continuity of all critical barriers on detail drawings and sections.

.3 Air barrier materials vulnerable to moisture damage, or heat and UV aging, must be located in the assembly so as to be protected from damaging levels of wetting and radiation over the service life.

.4 Organic materials lose strength and ductility as they age. Use 25% to 50% of the manufacturer's published data values in design to account for decline in tensile strength, adhesion and ductility of these materials over the service life.

.5 Air and Vapour barriers:
   .1 Exterior insulated rainscreen walls: self-adhesive SBS modified asphalt sheet acting as both air and vapour barriers.
.2 Interior insulated rainscreen walls: smart vapor retarder such as Membrane by CertainTeed.

.3 Hybrid insulated (insulation inside and outside of stud wall) rainscreen walls: Self-adhesive waterproof membrane which are vapour permeable.

.4 All other walls: properties and location of the vapour barrier in the assembly must comply with: ASHRAE 160 provide model results showing where the dew point will be located.

***END OF SECTION***
1.0 **GENERAL**

1.1 Related UBC Guidelines

.1 UBC Vancouver Campus Plan: Design Guidelines
.2 Section 07 00 10 Building Envelope – General Requirements
.3 Section 08 00 10 Openings - General Requirements

1.2 Coordination Requirements

.1 Coordinate design with Building Envelope Professional.
.2 Integrate design with design of windows, doors, flashing and other penetrations.
.3 Identify all materials that form the cladding assembly and required support system.
.4 Coordinate the Air tightness, drainage, venting, and insulation of enclosure assemblies.

1.3 Performance Standards

.1 Cladding shall be designed to be weather tight under sustained conditions of combined wetting and 50 Pa wind pressure.
.2 Cladding shall be designed to resist 1/30 return wind loading.
.3 Cladding shall be designed to resist lateral and vertical deformations of the primary structure without loss of attachment to the building.
.4 The cladding is to be integrated with all components of the building enclosure such as window and door frames, roof, foundation, and service penetrations to provide a weather tight system.
.5 Choice of cladding materials governed by UBC Vancouver Campus Plan: Design Guidelines.
.6 Masonry is a recommended cladding on campus. Stone or thin brick (20 mm or thinner tile) adhesively bonded to stucco or sheet materials are not to be substituted for masonry.
.7 Design service life of claddings to be 75-Years.
.8 All masonry accessories to have design service lives compatible with masonry.
.9 Window and door installations should be designed to allow replacement of the units without dismantling masonry wall.
.10 Cavities built behind the cladding shall be drained and ventilated to the exterior.
.11 Cavities built behind the cladding shall be compartmentalized as required at least every second floor level, beneath the parapet, and at the outside corners of the building.

1.4 Quality Control and Assurance

.1 Quality Assurance

.1 Construct mock-ups of all assemblies to check contractor’s procedures.
.2 Test mock-ups as required to verify water tightness and resistance to structural loading.
.2 Maintenance

.1 Windows have a shorter design service life than cladding. Make provision for replacement of windows and other penetrations before renewal of cladding is due.

2.0 MATERIALS

.1 Identify all materials that form the cladding assembly and closures to adjacent systems.

.2 Cladding materials considered to have sufficient design service life include:

.1 Masonry
.2 Concrete, precast
.3 Anodized aluminum composite panels, class I or thicker anodizing
.4 Stainless steel
.5 Terne coated stainless steel
.6 Zinc
.7 Exterior tile, glazed/unglazed
.8 Slate or clay tile
.9 Fiber cement boards

.3 Wall systems allowed:

.1 Vented rain screen systems with min 3/4" capillary break and cross cavity flashings at every second floor minimum.
.2 Unvented mass wall systems with insulation separating exterior wythe and interior moisture barrier or mass wall and vented rain screen joints
.3 Coated architectural concrete with interior insulation under 1:4 overhang ratio

.4 Prohibited wall systems:

.1 Exposed architectural concrete with interior insulation (unless coated and under a 1:4 overhang ratio). The recommended approach is to use exterior insulated precast concrete or precast sandwich panels
.2 EIFS
.3 Stucco
.4 Exposed glulam elements

***END OF SECTION***
1.0 GENERAL

1.1 Related UBC Guidelines

1.1 Section 07 00 10 Building Envelope – General Requirements

1.2 Coordination Requirements

1.2 Coordinate design with Building Envelope Consultant.

1.3 Description

1.3 Roofing system complete with all related assembly components, fasteners, adhesives, cover boards, underlays, insulation, membranes and all roof related hardware and flashings as appropriate to the building and as specified.

1.3 In addition to the above, and in the case of re-roofing, the assembly shall include wood blocking additions and/or modifications as required to meet the requirements of the new roofing assembly.

1.4 Design Requirements

1.4 Roofing is to be designed to meet Guarantee Standards of the Roofing Contractors Association of British Columbia Guarantee Corp. (RoofStar Guarantee) as published in the "RGC Roofing Practices Manual" ("RPM") and requires a minimum 5 (five) year RoofStar Guarantee.

1.4 Roofing is to be designed to CSA 123.21 Wind Uplift Standards.

1.4 New and re-roof assemblies shall have a minimum of 2% slope "to drain". This can be achieved by structural slope, sloped insulation, cricket and back slopes or any combination of these.

1.4 Deviation from this requirement must be obtained from UBC in writing prior to design. Consideration will only be given where existing building conditions will not allow for excessive tapered insulation elevations, for example, low window sills, low door thresholds or poor drain locations.

1.4 The design service life of low-sloped roofs is to be a minimum of 25-Years.

1.5 Low Slope Roofs: exposed 2 ply SBS is the minimum requirement. A variance is required for the use of an inverted roof. (See 1.4.16 below)

1.6 At inverted roofs, a RoofStar Guarantee approved leak detection system must be included in the assembly. See 2.2 Prescriptive Requirements, .4 Leak Detection Systems for further details.

1.7 Monitored leak detection is required in the following situations:

1.7 All heavy wood roofs, conventional and inverted

1.8 All green roofs over conventional

1.9 All conventional roofs with occupied spaces above (decking, landscaping etc.)

1.10 Anything hardscaped

1.8 Initial EFVM scan and leak locate system only is required in the following situations:

1.8 All green roofs over inverted -fully bonded to sloped concrete deck.
.9 Monitored leak detection is NOT Required in the following situations:

.1 Conventional roofing over steel deck or vented wood space.
.2 Conventional roofing over concrete deck.

.10 Performance Standards for roof insulation to be those set out in Section 07 21 00 Thermal Insulation.

.11 The installation of concrete or asphalt topping over 2 ply membrane roofing is not permitted without prior approval and written confirmation from UBC. (refer to 2.1.2 in Section 07 10 00)

.12 For use of hot rubber type membrane refer to Section 07 10 00.

.13 Vapour retarders are to be included in all assemblies and shall be fully adhered to the substrate. Products shall be appropriate to the building envelope configuration and be installed so as to wrap and envelop the insulation, compatible for connection to the building envelope air barrier, and be sealed at all penetrations. Laminate Kraft paper and adhesive is not an acceptable vapour retarder.

.14 In conventional roof assembly, insulation is to be adhered with two part urethane adhesive. In the case of conventional roof assembly over wood frame decking, screw fasten the first layer and adhere the upper layers (reduces thermal bridging and eliminates washer heads at fasteners from showing through the roofing membrane).

.15 Insulation overlay board is to be installed over the insulation and under the roof membrane in all cases despite manufacturers’ minimum standards that do not require it. This requirement would also apply with mineral fiber insulation board which have an integral facer to receive the membrane.

.16 Roofing membranes are to be fully adhered, or torched applied 2 ply SBS modified bitumen membrane. Alternative membranes are not permitted without prior approval and written confirmation from UBC.

.1 In the case of re-roof construction UBC requires the use of systems and assemblies that do not require the use of hot asphalt, kettles or tankers.

.17 Drains

.1 For new construction all drains shall be cast iron and include all appropriate hardware.

.2 Cast iron drains shall be re-used when re-roofing, and complete with drilled and tapped stud holes and new hardware as required to function as originally designed and installed.

.3 At all cast drains, tie-in is to be done with the application of reinforced PMMA stripped into the drain.

.4 All drain baskets, strainers or screens shall be cast iron or aluminum, plastic will not be permitted.

.5 The use of drain inserts will only be considered when dictated by building configurations or circumstance. Written permission is required from UBC prior to design.

.6 If drain inserts must be used a “U-Flow” or Menzies “Blue Seal” connection seal shall be utilized when a hard plumbing connection is not possible. O-rings are not acceptable.
.7 All drains are to be sumped with sumps turned 45° degree to direction of roofing plies.

.18 Membrane plies are to extend over the top of all parapets and 50 mm down past blocking and lapped over the outside surface of the wall finish. Where nail-able substrates exist the membrane shall be mechanically secured (nailed) on the outside face.

.19 Where the top edges of the stripping plies terminate on higher walls the stripping plies are to terminate in such a way as to obtain two seals on the vertical wall face (cap stripping to extend up past base sheet and obtain a separate seal to the substrate.

.1 All stripping plies shall be mechanically terminated to the substrate at least 200 mm above the roof surface.

.2 Top edges of membranes are to be protected by counter flashings.

.3 In new construction, reglets will be installed to allow for the installation of membrane plies and or flashings. Gumlip flashings will not be permitted.

.4 In re-roofing, where reglets cannot be re-used or are not present and gum lip flashings must be used, installation shall be “double gum lip” as per RCABC Guarantee standards RPM detail.

.20 For all landscaping over membranes see requirements for Sub-grade waterproofing system – Section 07 10 00.

.21 See sections on Wall Cladding Systems for other detailing requirements of air/vapour barrier and insulation systems.

1.5 Quality Control and Assurance

.1 Quality Assurance

.1 Meet or exceed the RoofStar Guarantee 5-Year guarantee standards All roofing system products to conform to the RoofStar Guarantee Standards and to the appropriate CSA, CGSB, ULC, CULC, and ASTM Standards for the materials used in the roofing system; products to be listed in the RGC Accepted Materials List of the RoofStar Guarantee Roofing Practices Manual, and to be in conformance with the manufacturers' published product and performance data.

.2 Quality Control

.1 An Independent Inspection Agency acceptable to RoofStar Guarantee, and assigned by RoofStar Guarantee on acceptance by the Consultant and the UBC Development Manager, to conduct field review inspections as per the minimum protocols as set forth by the RoofStar Guarantee for their 5 Guarantee Program. It is understood that in addition to these responsibilities the independent inspection agency will provide re-inspection services at the 2 year anniversary – in the case of the 5 year warranty.

.1 Cost for the warranty and inspections are to be included in the contract sum.

.2 UBC reserves the right to increase the field review inspection frequency to FULL TIME site inspections while the work is in progress. Extra costs for this to be borne by UBC.
.3 Added inspections just prior to the expiration of the warranty, if required, will be arranged and the costs borne by UBC.

.4 A manufacturer’s representative to also inspect the work as required for the purposes of providing the manufacturer’s labour, material and workmanship warranty upon completion.

1.6 Submittals

.1 Manufacturer Product Data, including MSDS data, for each product proposed.

.2 Samples of membrane, flashings, cladding and/or pavers as required for color selection.

.3 Sloped insulation, cricket and/or back slope plan.

.4 Sheet metal flashing shop drawings.

.5 Manufacturer’s leakproof warranty.

.6 Manufacturer’s confirmation of training.

.7 Fastening patterns and sheet layout for mechanically attached membrane assemblies.

1.7 Warranties

.1 Provide the RoofStar Guarantee Roofing System Record, to include the RoofStar Guarantee standard 5-Year Guarantee, copies of Inspection Reports, listing and literature of all products used, and Roof Maintenance Guide.

.2 Provide a written and signed Membrane Manufacturer’s Warranty in the name of the Owner. The warranty to include for removal and replacement of the defective membrane including labour, for a non-prorated ten-year period. The membrane warranty to not be limited by other components that are only available or manufactured by the membrane manufacturer. Letters modifying the manufacturer’s standard warranty are not acceptable.

.3 Provide the manufacturer’s labour, material and workmanship warranty leakproof warranty for a period of 10 years.

.4 Where adhesive is used in the assembly, include and provide the adhesive manufacturer’s warranty.

.5 All warranties to commence at Date of Substantial Performance.

2.0 MATERIALS

2.1 Performance Requirements

.1 Life Cycle Expectation

.1 Minimum 25-Year service life expectancy
2.2 Prescriptive Requirements

.1 Preferred System at Low-Slope Roofs

.1 2-Ply SBS Bituminous Modified Flexible Membrane Roofing System, exposed, insulated, adhered, generally torch-applied. Refer to RoofStar Guarantee Manual TAB 5.0.2 Section 07535, Outline Specification for this system, from which the following are preferred options.

.2 Thermal barrier/underlay at steel deck to be provided where required by code: shall be minimum 1/2 inch gypsum board.

.3 Vapour retarder is required on all roofing assemblies and shall be SBS modified bitumen sheet.

.1 Steel or wood decks shall receive primer as prescribed by the membrane manufacturer. Membrane shall be peel and stick, self-adhered or adhered appropriate to the membrane manufacturer and the specified roofing assembly. Kraft vapor retarders are not acceptable.

.2 Concrete decks shall receive primer as prescribed by the membrane manufacturer. Preferred membrane application shall be fully adhered and torch applied.

.4 Insulation overlay shall be ¼" inch or ½" inch “Dens Deck” and be adhered or mechanically attached through to the substrate as determined by the substrate and the requirements of the assembly.

.1 Note that 2 (two) layers of insulation overlay are required when installed over heat sensitive insulations.

.5 Insulation shall achieve a minimum value of R=25 for both new and re-roof assemblies. The effective R value is to be measured at 0°C.

.1 Insulation for use in conventional assemblies, the preferred roofing configuration, is polyisocyanurate or mineral fibre.

.2 Type I and II EPS (expanded polystyrene) insulations are permitted however are intended to be used to provide slope to drain in combination with polyisocyanurate insulation.

.3 Type IV XPS (extruded polystyrene) is intended for use only in inverted roofing assemblies and is to be considered only when inverted roofing is unavoidable.

.4 Insulation installed in conventional assemblies shall be installed in two layers with a minimum 12 inch offset and stagger between layers (for example 2 layers of 2 inch as opposed to 1 layer of 4 inch).

.5 Insulations installed in adhered assemblies are to be maximum 4’ X 4’ in size. Insulation installed in mechanically attached assemblies to be a maximum of 4’ X 8’ in size.
.6 Attachment

.1 Fasteners: minimum number of fasteners and stress plates for installation on wood or steel decks to be as specified by the RoofStar Guarantee Manual for 5/10 Year Guarantee standards and/or as required to FM (Factory Mutual) 1-90 whichever is greater.

.2 Adhesives: adhesive application rates when used in adhering insulations and coverboards on concrete decks shall meet or exceed the requirements of the RGC, the manufacturer and FM requirements for 1-90.

.1 The preferred adhesive for all assemblies is a two component polyurethane such as Insta-Stik by Dow Chemical or similar.

.2 Materials

.1 Insulation: refer to Section 07 21 00 Thermal Insulation.

.3 Components

.1 Install walkway pads at all access door and hatches, around all rooftop mechanical and other equipment requiring maintenance, and from there leading to the main roof access stairs, ladders, or roof hatch.

.1 Walkways to be either a reinforced walkway, cap sheet manufactured by the same manufacturer as the roof membrane, or 2'x2'x2" precast plain finish concrete paver slabs on pedestals (no substitutes such as duckboards or poured-in-place concrete).

.2 Install approx. 2" inch apart and away from cants and flashings, in a regular and uniform pattern.

.2 Provide overflow scuppers in accordance with the British Columbia Plumbing Code 2012, section 2.4.10.4. Hydraulic Loads from Roofs or Paved Surfaces.

.3 All penetration hardware to have only one line or cable per flashing installation and shall incorporate a gooseneck hood, heat shrink or uncured EPDM membrane wrap c/w stainless hose clamps. Tape, putty or caulking is not acceptable.

.1 Multiple lines or cables installed in only one penetration flashing is only acceptable when a purpose made hood or gooseneck is installed and that said lines or cables are slack enough to allow for a significant downward belly in the lines/cables.

.4 Leak Detection Systems

.1 The leak detection system must meet RoofStar Guarantee requirements as laid out in the RCABC Roofing Practices Manual.

.2 The leak detection system must have the capability of issuing email alerts complete with a graphic of the roof indicating the location of the leak and must also be capable of issuing alarms to the BMS system.

.3 The leak detection system can be hard wired or connected via BACnet to the UBC BMS system.

***END OF SECTION***
1.0 DESIGN REQUIREMENTS


.2 Projects with green roof systems and/or landscaping on slab require close and early coordination among the Landscape Architect, Architect, Structural Engineer and UBC Technical Services to ensure that the landscape design objectives are integrated into the structural design.

.3 Design should take into account the need for routine horticultural maintenance. Even extensive green roof plantings may require periodic maintenance to remove weeds and volunteer species, rejuvenate grass-scapes, renew plantings or service irrigation components. Consideration should also be given to access and removal of gardening debris and fall protection appropriate for landscape staff.

.4 Consideration should be given to the pollen production of plant cover in relation to air intakes.

.5 For grade level green roofs, consideration should be given for the structural loading and access for large equipment such as elevated work platforms (boomlifts, scissor lifts, etc.) to facilitate maintenance of adjacent building facades.

***END OF SECTION***
1.0 General

1.1 Design Requirements

.1 Roofing is to be designed to meet Guarantee Standards of the Roofing Contractors Association of British Columbia Guarantee Corp. (RGC) as published in the "RGC Roofing Practices Manual" for a 5-Year guarantee.

.2 Roof covering to conform to CAN/ULC-S107-M "Standard Methods of Fire Tests of Roof Coverings" for a Class A, B or C classification.

.3 Roofing is to be designed to minimum Factory Mutual wind uplift standards, Class I90 windstorm.

.4 Sheet metal roofing systems are to be concealed fastener type.

.5 The design service life of sheet metal roofs is 30 years to first major maintenance/replacement.

.6 The air barrier system in a sheet metal roofing systems is to function as a secondary drainage plane. All fastener penetrations are to be sealed and clamped, and the air barrier plane is to be water tight over the design service life of the roofing.

.7 All sheet metal roofs must be designed to consider potential snow slumping hazards. Snow retention stops must be incorporated into roof slopes where there is the potential for public injury from sliding snow.

1.2 Materials

.1 Insulation to be rockwool or polyisocyanurate types.

.2 Sheet metal accessories for low slope roofs are to be a minimum 0.71 mm thick (24 ga), Z275 (G90) galvanized. Prefinished metal work to have Dofasco Series 5000 paint finish over galvanizing or equivalent.

.3 Sheet metal roofing is to be a minimum 0.71 mm thick (24 ga.), Z275 (G90) galvanized. Prefinished metal work to have Dofasco Series 5000 paint finish or equivalent applied over galvanizing.

.4 Other sheet metal roofing systems to be approved by Technical Services (Phone: 604-822-9510). If approved, other sheet metal roofing systems to be selected with design service life and maintenance considerations foremost.

.5 Metal work concealed in the roof assembly is to be at a minimum 18 gauge Z275 (G90) galvanized sheet metal, protected with a bituminous coating where in contact with damp materials.

.6 Metal work is to be provided with electrolytic isolation between dissimilar metals including fasteners.

.7 Air barrier/roof underlay membrane systems considered to have adequate design service lives for use under sheet steel roofing systems are:

   .1 Single ply polyester-reinforced torch applied SBS modified bitumen roofing membrane; fully reinforced 180 g felt weight.

   .2 Some high melting point, adhesively applied bitumen membranes, fully reinforced 180 g weight.

***END OF SECTION***
1.0 GENERAL

1.1 Related UBC Guidelines

1.1.1 Section 07 00 10 Building Envelope – General Requirements
1.1.2 Section 07 50 00 Membrane Roofing

1.2 Co-ordination Requirements

1.2.1 Coordinate design with Building Envelope Consultant.

1.3 Performance Standards

1.3.1 Meet the Guarantee Standards of the Roofing Contractors Association of British Columbia Guarantee Corp. (Roofstar Guarantee) as published in the "RGC Roofing Practices Manual" for a 5-Year guarantee.

1.3.2 Fabricate to SMACNA (Sheet Metal and Air Conditioning Contractor’s National Association) – Architectural Sheet Metal Manual Standards.

1.4 Quality Control and Assurance

1.4.1 Quality Assurance

1.4.1.1 Refer Section 07 50 00 Membrane Roofing.
1.4.1.2 Follow all recommendations of the “RGC Roofing Practices Manual”, as a minimum.

1.4.2 Quality Control

1.4.2.1 Refer Section 07 50 00 Membrane Roofing.

1.5 Submittals

1.5.1 Provide samples for colour selection.

2.0 MATERIALS

2.1 Base metal for sheet metal accessories and for sheet metal flashing and trim to be:

2.1.1 Zinc coated sheet steel conforming to the requirements of ASTM A653 (or A653M as applicable) with a minimum zinc coating of G90 (Z275), or

2.1.2 Aluminium-zinc coated (Galvalume) steel sheet conforming to the requirements of ASTM A792 (or A792M) with a minimum coating of AZ50 (AZM150).

2.1.3 Aluminum sheet conforming to CSA HA Series1975, plain:

2.1.3.1 Generally minimum 0.81 mm (20 gauge), 1.02 mm (18 gauge) at parapets and flashings 200mm (8") width or wider

2.1.3.4 Minimum 24 gauge thickness.

2.2 Exposed Coil-Coated Finish metal used for fabrication of flashings to be:

2.2.1 Two-Coat Fluoropolymer: AAMA 621.
.2  Three-Coat Fluoropolymer: AAMA 621.
.3  Mica Fluoropolymer: AAMA 621.
.4  Metallic Fluoropolymer: AAMA 621.
.5  FEVE Fluoropolymer: AAMA 621.
.6  Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat: Cascadia Metals SMP Series.

.3  Provide continuous clip-type fasteners at all parapet flashings, of same material as flashing.
.4  Provide overflow scuppers whenever perimeter walls exceed 100 mm (4") in height, to BC Building Code requirements. Refer to SMACNA Appendix A-7, Scupper Sizing.
.5  Fabrication shall be standing seams only at inside and outside corners, S-Lock at all other locations.

3.0  EXECUTION

.1  Apply isolating coating to all metal surfaces in contact with cementitious materials.
.2  Avoid the use of reglets as roofing membrane terminations.
.3  Avoid surface fasteners.
.4  Provide 10% slope towards roof at all parapets, min. 2% elsewhere.

***END OF SECTION***
1.0 GENERAL

1.1 Access to roof is required for the purpose of maintenance and for servicing mechanical equipment where applicable.

1.2 Performance Requirements

   .1 General

   .1 All roofs to be provided with access from interior of building, as follows:

   .1 Roofs with no rooftop equipment requiring maintenance may be accessed using an internal ship’s ladder and roof hatch, size 3’0” x 2’-6”, integral curb and flashing, insulated, c/w externally mounted safety grab handle, NRP hinges, and provision for padlock.

   .2 Roofs having rooftop equipment requiring occasional maintenance may be accessed using an internal ship’s ladder and roof hatch, size 2’ 6” x 4’ 6” or a service stair and roof hatch size 2’ 6” x 8’ 0”. Hatch to have, integral curb, insulated, externally mounted safety grab handle, NRP hinges, and provision for padlock.

   .3 Roofs having rooftop equipment requiring regular maintenance or to a penthouse are to be accessed via normal stairway extending to the roof.

1.3 Prescriptive Requirements

   .1 Safety Note

   .1 Where maintenance personnel would need to work close to parapets less than 1,070 mm (3’ 6”) high, guard rails are to be provided. Alternatively, Fall Protection may be required; (refer to Section 11 81 29 Facility Fall Protection).

***END OF SECTION***
1.0 **GENERAL**

1.1 **Co-ordination Requirements**

1.2 **Description**

1.3 **Performance Standards**

1.4 **Quality Control and Assurance**
.3 Commissioning

.1 At the time of building commissioning, provide a comprehensive seminar to UBC's maintenance and electrical staff on the purpose and nature of the firestop systems used. Include a "hands-on" session on re-entry, re-sealing and all safety aspects of the firestops.

.4 Maintenance

.1 Tag service penetrations and every 3.0 meters of joint seal with printed tags indicating name and phone number of subcontractor and the following statement: "CAUTION! FIRESTOP: DO NOT RE-ENTER, PUNCTURE OR DESTROY UNLESS PREPARED TO RE-SEAL IMMEDIATELY WITH PROPER, UBC-APPROVED METHOD!"

2.0 MATERIALS

.1 Product preference:
   .1 General fire stopping, products manufactured by Hilti (Canada) Limited.
   .2 Zone pathways for Division 27 – specifically use Hilti CFS-SL GP system.

.2 Use low VOC products.

3.0 EXECUTION

.1 Use primers whenever recommended by manufacturer.
1.0 GENERAL

1.1 Co-ordination Requirements

.1 Coordinate design with Building Envelope Consultant.

1.2 Description

.1 Sealants (caulking) at all project locations.

1.3 Performance Standards

.1 UBC observes that:

.1 The University experiences continual failures in exterior caulking on door and window frames, louver frames, cladding joints and other areas of non-movement. Consequently, joint sealants are not to be used as a primary method of waterproofing or shedding water. Appropriate counter flashings and cladding details to be provided.

.2 Only high performance elastomeric sealants are to be used. Sealants must be capable of withstanding dynamically moving joints in exterior applications for long periods of time (typically 20+ years).

.3 All joints to receive sealant shall be designed to be 4 times as wide as the anticipated movement. This should include movement due to thermal expansion and contraction as well as structural movement. This is of particular importance at window and door perimeters.

.4 The consultant is therefore to develop details, select sealants, and involve manufacturers so as to obtain high performance, durability, and low-maintenance, incorporating quality assurance programs in the contract documents particular to the project and developed in concert with manufacturers and specialist companies of this trade, and the envelope consultant.

1.4 Quality Control and Assurance

.1 Submittals

.1 Before Start of Work

.1 List of all proposed sealant materials and installation instructions for review, and colour samples for selection by Consultant.

.2 MSDS Material Data Sheets for review and posting at jobsite.

.3 Certification reports of VOC content.

.2 At Completion

.1 Maintenance data shall be an itemized list:

.1 C/W manufacturer / distributor name / sealant type / color formulation / warranties.
.2 Quality Assurance
  .1 Trade contractor who specializes in the application of sealant systems.

.3 Warranties
  .1 Extended warranties for each product as offered by sealant manufacturers to apply.

2.0 MATERIALS

.1 Materials
  .1 Exterior weather seal sealants shall be high performance neutral cure silicone such as:
     Dow Corning 991, 790 and 795 or GE SILPRUF and GE SILPRUF NB.
  .2 Use non-staining sealants for sensitive substrates such as stone unless testing has been done to ensure compatibility with regular sealants.

***END OF SECTION***