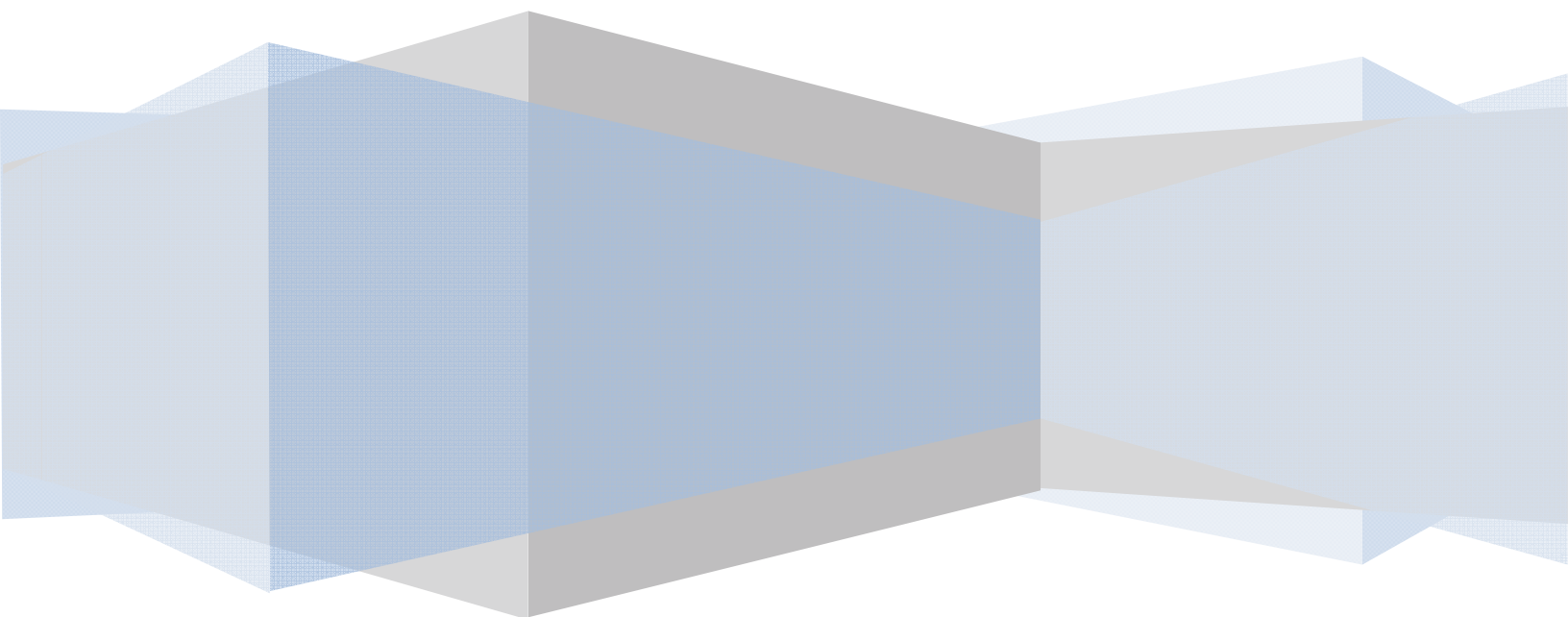




VANCOUVER ISLAND UNIVERSITY
EXPLORE. DISCOVER. EXCEL.

DESIGN GUIDELINES

New Construction & Major Renovations



DESIGN GUIDELINES

Vancouver Island University

REVISION DATE: May 7, 2009

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DESIGN GUIDELINES

INTRODUCTION – DESIGN GUIDELINES

Vancouver Island University's Facility Design Guidelines highlight important procedures and requirements for capital projects, with the objective of maximizing quality and value by ensuring uniformity, compatibility and maintainability.

The purpose of the Design Guidelines is to provide general direction to the projects design and construction; to ensure quality and consistency in the building design and to outline which products, systems and methods of construction are acceptable to the institution.

These guidelines are also intended to promote suitable design and to discourage design which causes confusion and conflict. Consultants are encouraged to propose cost effective variations that meet or exceed these standards within a project. The specified applicable elements [within these guidelines] shall be incorporated into the final design of all projects to ensure a valuable, uniform, physical environment for Vancouver Island University.

These guidelines are not intended to restrict the design and construction process, nor do they relieve the designers and contractors from their professional responsibility of complying with the applicable codes, standards or project specific requirements; but rather they are a framework for decision making.

1 CODE ANALYSIS

1.2 GENERAL

- 1.2.1 Provide a complete code analysis addressing all design criteria with the following minimum requirements:

1.3 FIRE PROTECTION, OCCUPANT SAFETY AND ACCESSIBILITY

- 1.3.1 Major occupancies and areas
- 1.3.2 Multiple occupancy requirements
- 1.3.3 Occupant loads

1.4 BUILDING FIRE SAFETY

- 1.4.1 Building size and construction relative to occupancy
- 1.4.2 Spatial separation, exposure protection and firewalls
- 1.4.3 Fire alarm and detection systems
- 1.4.4 Provisions for fire fighting including water supply for fire fighters
- 1.4.5 Lighting and emergency power
- 1.4.6 Mezzanines and openings through floor assemblies

1.5 SAFETY WITHIN FLOOR AREAS

1.6 SUITES

1.7 ACCESS TO EXIT

1.8 PUBLIC CORRIDOR SEPARATION

1.9 BARRIER FREE AREAS PROTECTION

1.10 OCCUPANCY SPECIFIC REQUIREMENTS

1.11 REQUIREMENTS FOR EXITS

1.12 SERVICE SPACE PROTECTION

1.13 HEALTH REQUIREMENTS

- 1.13.1 Ventilation
- 1.13.2 Plumbing facilities

1.14 PROVIDE STRUCTURAL DESIGN INFORMATION

- 1.14.1 Dead Loads
- 1.14.2 Live Loads due to use, occupancy, snow, ice, rain and wind
- 1.14.3 Live Loads due to earthquake

1.14.4 Corrosion Resistance

2 GEOTECHNICAL DESIGN CRITERIA

2.2 SEISMIC DESIGN

- 2.2.1 Seismic Zoning for the Project area will be as defined in the BC Building Code (BCBC, current edition).
- 2.2.2 Liquefaction potential of the sub soils will be evaluated for structures, walls and embankments, and the design will incorporate ground improvements and other methods of addressing potential liquefaction.

2.3 FOUNDATION DESIGN/RETAINING WALL DESIGN CRITERIA

- 2.3.1 The minimum Factor of Safety against bearing capacity failure under static conditions will be specified by the design Engineer. The minimum Factor of Safety against sliding under static loading will be specified by the design Engineer. The minimum Factor of Safety against overturning under static loading will be specified by the design Engineer.

2.4 SETTLEMENT ANALYSIS

- 2.4.1 Settlement analysis of structures will be performed. Foundations will be designed such that differential settlement between adjacent footings is limited to the amount tolerable as specified by the structural engineer.

4 SITE DEVELOPMENT

4.2 GENERAL REQUIREMENTS

- 4.2.1 All work will be designed and constructed in accordance with the Project Requirements as outlined in the RFP and VIU's current directives, accepted standards, specifications, practices, policies and procedures in effect at the date of execution of the Contract Agreement, or specified elsewhere.
- 4.2.2 All work shall be designed and sealed by a qualified Professional Engineer registered with the Province of British Columbia.
- 4.2.3 The contractor shall be responsible for identifying connection points for tying proposed services to existing services and location and availability of existing services.

4.3 WORK TO BE INCLUDED

- 4.3.1 The scope of work includes the provision of the full and complete design, the supply of all materials and the performance of all work necessary or appropriate for regarding the site. Provision of entrance walkways, lighting, topsoil and seed.
- 4.3.2 Provide plan(s) locating all existing and proposed site services, including:
 - 4.3.3 Fencing and Hoarding
 - 4.3.4 Water Supply
 - 4.3.5 Sanitary Sewer
 - 4.3.6 Storm Sewer
 - 4.3.7 Underground electrical Services/Conduits and Utilities
 - 4.3.8 Parking lot layout and lighting
 - 4.3.9 Drainage/holding areas for treatment
- 4.3.10 Provide cross sections of parking areas, building and site grading indicating how the site will be developed. Indicate general overall dimensions.

4.4 FENCING AND HOARDING

- 4.4.1 Supply, install and maintain a continuous construction fence around the perimeter of the work area. Fencing shall be 1800mm high portable wired fencing. Fencing shall be suitably braced. Provide, man and vehicle access gates as required for construction and emergency access.
- 4.4.2 Provide fencing and hoarding to maintain safe exit routes from existing and completed parts of the work.
- 4.4.3 Provide and maintain 1200mm high barricades around the drip lines of trees adjacent to construction activities to protect trunk, limbs and roots from damage.

4.5 DRAINAGE

- 4.5.1 Design grading to provide adequate surface drainage, do not drain onto adjacent properties or structures.
- 4.5.2 Provide supplementary drainage system where adequate surface drainage is not possible by grading alone.
- 4.5.3 Slope grades away from buildings.
- 4.5.4 Prepare and submit a formal sediment and storm water control plan for the project to VIU for review and approval. This report will address and resolve any downstream erosion concerns. As part of this exercise, the existence of any on-site springs must be confirmed and (as required) mitigation requirements addressed in the detailed design of the Project.
- 4.5.5 The standards for sediment and storm water control outlines in the jointly published MOWLAP/DFO "Land Development Guidelines for the Protection of Aquatic Habitat" must be adhered to.
- 4.5.6 The Proponent is required to complete an analysis of the downstream storm system to ensure that adequate capacity for the five-year post development flows (minor system) and 100-year post development flows (major system) is available from the site to an acceptable outfall identified for this catchment and, further, will be required to address and resolve any downstream capacity and erosion concerns identified (a formal storm water control plan must be prepared for the site and area).
- 4.5.7 Storm water quality must be addressed for all phases and/or components of the construction before any inflow is directed to the downstream creek/fish habitat and detention pond (e.g., parking lot oil and silt interceptors).
- 4.5.8 Approvals must be obtained from MOWLAP and VIU for all aspects of the drainage design.
- 4.5.9 All municipal work to be constructed in accordance with the City of Nanaimo Standard Specifications.

4.6 VEHICLE PARKING

- 4.6.1 The Contractor is not required to provide vehicle parking.

4.7 STORM SEWER

- 4.7.1 Storm sewer shall commence 1.0m outside building lines.
- 4.7.2 Design storm sewer to handle peak flows as per BC Plumbing Code and good engineering practice.
- 4.7.3 Gravity flow storm sewer shall be sloped in the direction of flow to maintain a minimum velocity of 0.9m per second.
- 4.7.4 Storm sewage system shall be designed complete with all accessories and appurtenances such as catch basins, maintenance holes, lift stations, storm drainage

ponds/lagoons, silt traps, etc. No extras will be considered during or after construction if it is established that the system as designed will not function correctly.

- 4.7.5 Where conflicts exist between local codes and standards and provincial & national Plumbing and Building Codes; design shall comply with the most stringent.
- 4.7.6 Confirm location and elevation of existing storm system. Relocate/reroute existing storm sewers located under the proposed building site, or as required to complete the work and to meet or exceed existing conditions. Any system deemed not in use to be removed or filled with grout.
- 4.7.7 Provide new catch basins and curbs/gutter as required for site drainage. Make connection to existing systems where required.
- 4.7.8 Clean, Flush and Video Inspect all pipework as follows.
 - 4.7.8.1 Before flushing and testing, ensure sewer system is completely finished and make arrangements with Contract Administrator for scheduling of testing.
 - 4.7.8.2 Water may be supplied from Municipal fire hydrants upon application for a Hydrant Use Permit.
 - 4.7.8.3 Obtain municipal approval prior to discharging flushing water to municipal sewers or drainage ditches.

4.8 VIDEO INSPECTION

- 4.8.1 The Contractor shall video inspect completed storm sewers under 900mm in diameter following completion of installation. The video inspection report shall be in the form specified by the Contract Administrator. Copies of the video tapes and written report shall be forwarded to the Contract Administrator when available.
- 4.8.2 Should video inspection indicate apparent deficiencies, Contract Administrator may direct Contractor to perform additional testing as follows.
- 4.8.3 Additional testing may include passing rubber ball, mandrel or test plug having a minimum dimension of 95% of diameter of sewer pipe completely through pipes and appurtenances. A light test may be performed in lieu of ball test at discretion of Contract Administrator.
- 4.8.4 All work shall be installed to the following standards.
 - 4.8.4.1 Repair all deficiencies and visible leaks.
 - 4.8.4.2 Repair procedures and materials subject to approval of Contract Administrator.
 - 4.8.4.3 Contract Administrator reserves right to require Contractor to replace defective installations at Contractor's sole cost.
 - 4.8.4.4 Test procedures, including video inspection, to be repeated and repairs made until satisfactory results are obtained.
- 4.8.5 Acceptable Ponding:
 - 4.8.5.1 Connections: 10mm maximum ponding over 3m length of pipeline.
 - 4.8.5.2 Mainline storm sewers.

- 4.8.5.3 300mm diameter or less: 20mm maximum ponding over 3m length of pipeline.
- 4.8.5.4 Greater than 300mm diameter: 30mm ponding over 3m length of pipeline.

4.9 SANITARY SEWER

- 4.9.1 Where conflicts exist between local codes and standards, Plumbing code and National Building Code, design shall comply with the most stringent.
- 4.9.2 The sanitary sewage system is to commence 1.0 meters outside the subject or group of buildings and must be designed to handle the peak flow as per applicable codes and standards and the National Building Code.
- 4.9.3 Gravity flow sanitary systems shall be sloped in the direction of flow to provide a minimum velocity of 0.9 m per second.
- 4.9.4 Provide design plan and profile drawings showing pipe size, type, slope and depth.
- 4.9.5 Do Field Testing of all pipe in accordance with the following:
 - 4.9.5.1 Repair or replace pipe, pipe joint or bedding found defective.
 - 4.9.5.2 When directed by Engineer, draw tapered wooden plug with diameter of 50mm less than normal pipe diameter through sewer to ensure that pipe is free of obstruction.
 - 4.9.5.3 Remove foreign matter from sewers and related appurtenances by flushing with water.
 - 4.9.5.4 Perform infiltration and exfiltration testing as soon as practicable after jointing and bedding are complete, and service connections have been installed.
 - 4.9.5.5 Carry out tests on each section of sewer between successive manholes including service connections.
 - 4.9.5.6 Install watertight bulkheads in suitable manner to isolate test section from rest of pipeline.
- 4.9.6 Exfiltration test:
 - 4.9.6.1 Fill test section with water in such a manner as to allow displacement of air in line. Maintain under normal head for 24 h to ensure absorption in pipe wall is complete before test measurements are commenced.
 - 4.9.6.2 Immediately prior to test period add water to pipeline until there is a head of 1 m over interior crown of pipe measured at highest point of test section or water manhole is 1 m above static ground water level, whichever is greater.
 - 4.9.6.3 Duration of exfiltration test: 2 h.
 - 4.9.6.4 Water loss at end of test period: not to exceed maximum allowable exfiltration over any section of pipe between manholes.
 - 4.9.6.5 Leakage: not to exceed following limits in litres per hour per mm of diameter per 100 m of sewer including service connections:
 - 4.9.6.6 Exfiltration, based on 1000mm head: 0.175L
 - 4.9.6.7 Repair and retest sewer lines as required, until test results are acceptable.

- 4.9.6.8 Repair visible leaks regardless of test results.

4.10 WATER SUPPLY

- 4.10.1 Provide domestic and fire protection water distribution system in accordance with National Building Code, B.C Fire Code and B.C. Plumbing Code and as specified herein.
- 4.10.2 Site Domestic Water Distribution:
- 4.10.2.1 System to be designed to meet current demand requirements.
 - 4.10.2.2 Piping to be provided with valved isolation in accordance with local standards. Butterfly valves shall not be used.
 - 4.10.2.3 Piping to be buried minimum 1.0 m cover.
 - 4.10.2.4 Relocate/reroute existing water mains located under the proposed building site.
- 4.10.3 Site Fire Protection Water Distribution:
- 4.10.3.1 Provide minimum 150mm fire protection service to the building separate from the building domestic water service.
 - 4.10.3.2 Provide hydrants at locations as per local code. Hydrant quick connects to local code, matching existing types.
 - 4.10.3.3 All pipe, valves, hydrants to be supplied and installed in accordance with applicable AWWA Standards.
 - 4.10.3.4 Install thrust blocks at all bends, valves, hydrants and fittings.
 - 4.10.3.5 Test all water mains in accordance with AWWA Standards.
 - 4.10.3.6 Provide all valves with Valve boxes and chambers in accordance with local authorities having jurisdiction.
 - 4.10.3.7 Provide air and vacuum release and chambers at high point in system.
 - 4.10.3.8 Complete flow test on City side.

4.11 WATER MAIN

- 4.11.1 The Contractor shall confirm water fire flow volumes required for the development due to pressure zone boundaries.
- 4.11.2 The contractor is responsible to size and connect to existing service.

4.12 SITE LIGHTING

- 4.12.1 Site lighting for parking lots, roads and pedestrian walkways to be designed in accordance with Canadian Electrical Code, IESNA Lighting Handbook., Appendix D8 Electrical and as described herein.

4.13 LANDSCAPING

- 4.13.1 Landscaping will consist of regrading the site to provide positive drainage away from building, supply and placement of a minimum of 150mm of topsoil and seeding. Provide landscape cloth in flower bed areas under growing area for weed control.
- 4.13.2 No bark mulch is to be used.

4.14 TOPSOIL

- 4.14.1 Screened topsoil for all landscaped areas: mixture of minerals, particulate, microorganisms and organic matter, which provides suitable medium for supporting intended plant growth.
- 4.14.2 Contains no toxic elements or growth inhibiting materials.
- 4.14.3 Topsoil containing crabgrass or other noxious weeds is not acceptable.
- 4.14.4 Provide amendments such as, but not limited to, peatmoss, sand, limestone, and fertilizer required by the soil analysis to promote and support healthy plant growth.

4.15 TREES

- 4.15.1 Ensure that root systems of all remaining trees will not interfere with site improvements including sidewalks, parking areas, and underground utilities

4.16 PERMITS AND APPROVALS

- 4.16.1 The Proponent will be responsible for obtaining all necessary approvals and permits from all agencies.
- 4.16.2 Outside utility agency approvals to service the site must be obtained by the Contractor (e.g., BC Hydro, Telus, BC Gas, and cable TV) prior to acceptance of the plans by VIU and the preparation of the Servicing Agreement. Location of on-site utility service pads and corridors must not conflict with any of the engineered services that have priority traversing the site. The Contractor is advised to pursue these draft designs at the same time as the on-site mains and building are being designed.

4.17 UTILITIES

- 4.17.1 Unless otherwise specified, all existing utilities are to be retained in service during and subsequent to construction. The Contractor will be fully responsible for liaison, coordination and gaining approvals from the relevant utility owners and in providing all information and plans to the agencies following relocation or accommodation. All utilities conflicting with the work must be adjusted and/or relocated. The Contractor will be responsible for the identification and resolution of all services related issues/items related to the proposed development.

4.18 ENVIRONMENTAL REQUIREMENTS

- 4.18.1 The Contractor shall obtain all necessary approvals from the City of Nanaimo, the Ministry of Water, Land and Air Protection (WLAP), and Fisheries and Oceans Canada and any other jurisdictional authority.
- 4.18.2 The Contractor shall adhere to the Memorandum of Understanding existing between the City of Nanaimo, WLAP, and Fisheries and Oceans Canada granting authority to the City of Nanaimo to review and authorize land development projects in proximity of a watercourse or any other environmentally sensitive area in the City of Nanaimo as

indicated in Schedule B, Bylaw 6000 (the Official Community Plan) or Schedule G, Bylaw 4000, (the Zoning Bylaw).

- 4.18.3 The Contractor shall act on behalf of VIU in meeting its obligations and will maintain close liaison with the Environmental Coordinator of the City of Nanaimo, WLAP, Fisheries and Oceans, and VIU to ensure that both the design and construction of the Project are environmentally sound, and meet or exceed the requirements of applicable environmental legislations. In addition, the Contractor shall comply with the requirements of the following:
 - 4.18.4 Federal and provincial environmental legislation.
 - 4.18.5 MOWLAP environmental policy and procedural guidelines.
 - 4.18.6 Any other governmental policy and procedural guidelines.
 - 4.18.7 The Contractor will secure necessary environmental permits and satisfy the requirements of government regulations and by-laws. The Contractor will be responsible for implementing erosion and sedimentation control measures during construction, including any temporary or seasonal shutdown periods and for implementing any required environmental protection measures, This will include:
 - 4.18.8 Habitat mitigation within the project requirements.
 - 4.18.9 Run-off and siltation control.
 - 4.18.10 Preservation of natural watercourses and ravines.
 - 4.18.11 Compliance with MOWLAP and Department of Fisheries and Oceans (DFO).
 - 4.18.12 Sedimentation and erosion control measures in accordance with MOWLAP/DFO "Land Development Guidelines for the Protection of Aquatic Habitat".
 - 4.18.13 Compliance with municipal environmental requirements.

4.19 SITE SERVICE DESIGN CRITERIA

- 4.19.1 The following outlines the design criteria for the services components of the Project and defines the mandatory design standards that must be adhered to.
 - 4.19.1.1 Reinforced Concrete Retaining Walls
 - 4.19.1.1.1 Design Code CAN/CSA-S6-88.
 - 4.19.1.1.2 Seismic design in accordance with current standards.
 - 4.19.1.1.3 Retaining wall type and surface treatment must be aesthetically pleasing.
 - 4.19.1.1.4 Design Service Life of 75 years.
 - 4.19.1.2 Pedestrian Facilities
 - 4.19.1.2.1 Designed to be aesthetically pleasing and to tie into adjacent pedestrian access ways in an acceptable manner.
 - 4.19.1.2.2 Concrete sidewalks to a minimum width @ 1.5m, minimum 100mm thick over 75mm of 19mm crush base compacted to 98% SPD.
 - 4.19.1.2.3 Provide broom surface finish.

- 4.19.1.2.4 Shared pedestrian/cyclist concrete pathway minimum width @ 1.8m (one-way), 2.4 m (two-way) minimum 100mm thick over 75mm of 19mm crush base compacted to 98% SPD.
- 4.19.1.2.5 Handicapped access provisions required at access points to the building in accordance with building code requirements.

6 BUILDING ENVELOPE

6.2 DESIGN CRITERIA

6.2.1 APPROVALS, DESIGN, BUILDING CODES

- 6.2.1.1 Contract documents are to be prepared in accordance with the current edition of the National Building Code, BC Building Code, the Ministry of Health, the Ministry of Water, Land and Air Protection and all other authorities having jurisdiction.
- 6.2.1.2 Include in submission, approval and payment for all necessary permits, fees and licenses from authorities having jurisdiction.
- 6.2.1.3 Provide complete functional spatial planning based on the programmed unit space sheets in this document.
- 6.2.1.4 The building life span is expected to be twenty (20) years without major repairs with a structural system designed for a life span of forty (40) years without major repairs.

6.2.2 ACCESSIBILITY

- 6.2.2.1 The buildings are to be fully accessible to people with disabilities.
- 6.2.2.2 Any deviations from the recommendations in the design are to be fully documented and discussed with Vancouver Island University's Representative.

6.3 PERFORMANCE OF BUILDING ENVIRONMENT

6.3.1 BUILDING ENVELOPE

- 6.3.1.1 Provide a building envelope that will effectively separate interior from exterior environment by controlling movement of air, water, heat and water vapour so that the interior condition can be maintained and the building assembly is not impaired.
- 6.3.1.2 The exterior envelope assemblies must effectively shed (drain away) water and utilize materials and assemblies that minimize deterioration when wetted and that have enhanced drying capability.
- 6.3.1.3 Note that the recently employed "Rainscreen" wall assembly deals with wetting and drainage but does not provide, by itself, an adequate drying capability (refer to CMHC 99-1007, Stucco Clad Wall Drying Experiment).
- 6.3.1.4 Provide effective and continuous insulation within the building envelope assembly. Insulate building envelope penetrations by pipes, ducts, conduits, etc., per building code requirements. Window and doorframes to be thermally broken. Eliminate all direct paths of head conductance by the use of adequate

insulation, air spaces between components, or other acceptable means to prevent thermal bridging through the exterior envelope.

- 6.3.1.5 The building envelope is to resist, in accordance with building code requirements, air leakage caused by static and dynamic air pressures across the exterior walls, soffits, roof assemblies, windows, glass, doors, pipe, duct, conduit or other penetrations or interruptions of the envelope system or assembly.
- 6.3.1.6 Incorporate energy conservation techniques without jeopardizing function and performance of building. Thoughtful use of the A.S.H.R.A.E. Energy Standards for the building, electrical and mechanical systems and equipment including environmental conditions and energy consumption will be criteria for evaluation. Ensure interior humidity is maintained at an adequate level to ensure condensation on or in the building envelope does not occur.
- 6.3.1.7 Provide locked access to all flat roofs from internal common area.

6.3.2 MATERIALS AND WORKMANSHIP

- 6.3.2.1 Materials and workmanship to comply with recognized Canadian Construction Standards and those of the Provincial and/or Canadian trade associations wherever possible. Where no standards are applicable, workmanship to be to best industry standards.
- 6.3.2.2 Include and specify the services of recognized, independent inspection services for the Building Envelope and for material application inspection services provided by recognized Industry Associations. These service agents are to be acceptable to Vancouver Island University.
- 6.3.2.3 Consideration should be given to selecting materials and systems, which are compatible to the various building environments. Use assembly and materials that will also minimize operating and maintenance life cycle costs and provide a service life consistent with their accessibility and expected building life.

8 STRUCTURAL DESIGN CRITERIA

8.2 CAST-IN-PLACE CONCRETE

8.2.1 SCOPE OF WORK

- 8.2.1.1 The forming, placing, reinforcing and finishing of concrete, as appropriate, to all footings, foundations, piers, caissons, columns, suspended slabs, walls and slabs on grade and deck as required to complete the project. All work to be completed in accordance with accepted standards of good practice appropriate to its intended use.

8.2.2 DESIGN STANDARDS

- 8.2.2.1 The design of all concrete elements shall conform to all applicable codes, bylaws and standards of practice

8.2.3 MATERIALS

8.2.3.1 Concrete

- 8.2.3.1.1 All concrete floors within the building to have a minimum strength 25 MPa at 28 days with a specified water-reducing admixture for slump of 80 mm +/- 25mm. Concrete to be reinforced where required.

8.2.3.2 Reinforcing Steel

- 8.2.3.2.1 Reinforcing steel shall conform to CSA Standard G30.12 and shall have minimum yield strength of 400 MPa. Welded wire mesh reinforcing to CSA G.30.5 shall be used in floor slabs. Wire mesh shall be supplied in flat sheets only.

8.2.3.3 Workmanship

- 8.2.3.3.1 All workmanship shall conform to the highest standards of practice.

8.2.4 FOUNDATIONS

8.2.4.1 Concrete Foundations

- 8.2.4.1.1 Foundations to be constructed based on soils bearing capacity at depths as indicated in Geotechnical Report. All exterior fill and placed below the frost level. Foundations to structural columns to comprise spread footings at a depth as indicated in the Geotechnical Report prepared by Lewkowich Geotechnical Engineering Ltd., dated August 22, 2002.

8.3 PRE CAST CONCRETE

8.3.1 DESIGN STANDARDS

- 8.3.1.1 All design, fabrication and erection is to conform to applicable codes, laws, bylaws and standards of practice.

8.3.2 MASONRY

8.3.2.1 *Masonry Walls*

- 8.3.2.1.1 All design and construction is to conform to applicable codes, laws, bylaws and standards of practice.

8.4 STRUCTURAL STEEL

8.4.1 SCOPE OF WORK

- 8.4.1.1 Design and supply steel framed structures comprising structural steel roof and wall framing systems to support all roof loads and lateral forces in accordance with all codes, laws, bylaws and standards of practice.
- 8.4.1.2 Design and supply of conventional structural steel framing.
- 8.4.1.3 Design and supply of all miscellaneous steel framing.
- 8.4.1.4 Design and supply of loose lintels in masonry walls.

8.4.2 DESIGN STANDARDS

- 8.4.2.1 Steel structures to be in accordance with CAN/CSA-S16, 1-94.

8.4.3 MATERIALS

- 8.4.3.1 All structural steel shall comply with CSA Standard G40.21-M92 Grade 300 W.
- 8.4.3.2 Hollow structural sections shall comply with CSA Standard G40.21-M92 Grade 350 W.
- 8.4.3.3 Cold formed sections shall conform to CSA Standard S136 Grade 450W.
- 8.4.3.4 Fasteners shall conform to ASTM standard A325 for structural connections and CSA G40.21 Grade 500W for channels, sag rods and anchor bolts.
- 8.4.3.5 Welding shall conform to CSA Standard W59 latest edition and shall be performed by qualified fabricators, licensed by the Canadian Welding Bureau and to comply with CSA Standard W47.1.
- 8.4.3.6 Hot dip galvanizing: galvanize steel, where indicated, to CSA G164-M92.
- 8.4.3.7 Shear stud connectors: to CSA W59 latest edition.
- 8.4.3.8 Plant inspections are to be arranged for the quality assurance inspection firm.

8.4.4 ERECTION

- 8.4.4.1 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.

- 8.4.4.2 Erection inspections (tolerances, bolt torque etc.) to be arranged for the quality assurance inspection firm.

8.4.5 FINISHES

- 8.4.5.1 Finish steel members appropriately for their service environment.

8.5 ROOF PURLINS/STEEL JOISTS

8.5.1 SCOPE OF WORK

- 8.5.1.1 Design and supply of roof purlins and/or open web steel joist, and diagonal and horizontal bridging members to roof to carry snow, roofing, sprinklers and mechanical equipment loads in accordance with all applicable codes, laws, bylaws, standards of practice and CSA Standard CAN3-S16.1-94 including requirements for uplift due to wind loads.

8.5.2 MATERIALS

- 8.5.2.1 Structural steel to conform to CSA Standard CAN3.G40.21 Grade 300W.
- 8.5.2.2 Cold formed shapes to conform to CSA Standard S136 - Grade 450W.
- 8.5.2.3 Welding to conform to CSA Standard W59 - Welded Steel.

8.6 STEEL DECK

8.6.1 SCOPE OF WORK

- 8.6.1.1 Supply and installation of zinc coated metal deck complete with edge supports and reinforcement at openings for all flat roof areas.

8.6.2 DESIGN STANDARDS

- 8.6.2.1 Design of deck to conform to CSA Standard S136 - Cold Formed Structural Members.

8.6.3 MATERIALS

- 8.6.3.1 Deck shall be ZF075 wipe coat steel sheet conforming to ASTM standard A464M specification for steel sheet, zinc coated structural quality.
- 8.6.3.2 Installation of deck to conform to CSSBI "Standard for Steel Roof Deck" to provide anchorage of roof deck for supporting framing to resist the uplifts specified in all applicable codes, laws, bylaws and standards of practice.

8.6.4 ERECTION

- 8.6.4.1 Erect steel deck in accordance with manufacturer's instructions.
- 8.6.4.2 Immediately after deck is permanently secured in place, touch up metallic coated top surface with primer where burned by welding.

8.6.5 CONNECTIONS

- 8.6.5.1 Install connections in accordance with CSSB1 Steel Roof Deck, 10M-86 and Composite Steel Deck, 12M-84 and in accordance with design requirements for diagram action.

10 SAFETY & SECURITY

10.2 GENERAL

- 10.2.1 Personnel safety and security are important values that can be achieved and enhanced by prudent planning and design.

10.3 AWARENESS OF THE SURROUNDING ENVIRONMENT

- 10.3.1 Is the ability to see and to understand the surrounding environment through unobstructed sightlines, adequate lighting and pointing out possible situations to avoid confined and hidden areas.

10.4 VISIBILITY OF OTHERS

- 10.4.1 The ability to be seen by others, reducing isolation, improving the land use mix, intelligent use of activity generators, and creating a sense of ownership through maintenance and management of the built environment.

10.5 FINDING HELP

- 10.5.1 The ability to communicate, find help, or escape when in danger through improved signs and design.
- 10.5.2 The following features should be paid attention to enhance personnel safety and security and respond to the planning and design factors.

10.6 LIGHTING AND VISIBILITY

- 10.6.1 Light fixtures shall be placed so as to eliminate entrapment spots and shall provide a uniform level of lighting minimizing the contrast between light and shadow. Light fixtures which can withstand vandalism and which can be easily maintained shall be provided.
- 10.6.2 Perimeter wall surfaces should be light in colour, which would improve visibility in interior public spaces.

10.7 STAIR LIGHTING

- 10.7.1 General lighting in stairways shall be connected to emergency power.

10.8 PATHWAYS (INTERIOR AND EXTERIOR)

- 10.8.1 Lighting levels must be adequate to allow an individual to see and identify a person 15 m ahead.
- 10.8.2 Lighting levels shall be adequate to provide minimum contrast between light and shadow.
- 10.8.3 Lighting levels shall be maintained along a pathway so that promise of safety at the beginning of the path is maintained along its length.

- 10.8.4 Temporary lighting shall be provided on hoarding around construction sites.
- 10.8.5 The designer shall consider providing low level lighting within the shrubbery and landscaping.

10.9 SIGHTLINES

- 10.9.1 All Vancouver Island University buildings and surrounding areas must be designed so as to maximize lines of sight ahead, behind and to the sides.
- 10.9.2 Maximize clear glazing in areas such as stairwells, elevator lobbies and entrances to offices and work areas.
- 10.9.3 Landscape material should be selected and located so as not to impede long views.
- 10.9.4 Building exterior design and placement should maximize overlook and casual surveillance of public spaces.

10.10 ENTRAPMENT AND MOVEMENT PREDICTORS

- 10.10.1 Areas of entrapment are to be avoided. Such areas are single entrance/exit offices in areas of low traffic or vulnerable areas such as where student counseling takes place or areas where researchers work at night or during off hours. Other potential areas of entrapment are: unlit recesses, comers or alcoves; small structures (sheds, storage areas) which are unlit or unlocked.
- 10.10.2 Washrooms, which are located in low activity areas, can be entrapment areas, especially if the entrance configuration is complicated and communication to a corridor is difficult. Single use washrooms are better choices in low activity areas.
- 10.10.3 Structures, which create entrapment spots, shall be avoided. In enclosed public spaces columns, rather than shear walls, should be used as structural members.
- 10.10.4 In any area where entrapment is an issue, consideration must be given to communication needs, particularly for emergency assistance.

12 FALL PROTECTION

12.2 GENERAL

- 12.2.1 Review fall protection anchorage requirements with Facilities Management. Each employee on a walking/working surface (horizontal and vertical surfaces) with unprotected side or edge, which is 1,800 mm or more above a lower level, shall be protected from falling by the use of guardrail systems with toe boards or a personal fall arrest system. Examples of such work include, but are not limited to:
- 12.2.1.1 Maintenance on rooftop, such as: roof repair, unplugging roof drains, other building system maintenance.
 - 12.2.1.2 Work platforms that are designed to access and maintain specific equipment.
 - 12.2.1.3 Or any other walking and working surface not otherwise addressed with a possibility to fall more than 1,800 mm to another level/surface.
- 12.2.2 Anchorage used for attachment of personal fall arrest equipment shall be independent of any anchorage being used to support or suspend platforms, and designed as per WCB requirements.

14 ACCESS CONTROL

14.2 GENERAL

- 14.2.1 The intent of the access control system is to control and track access and entry to the entrances of the buildings and certain interior rooms/areas.

14.3 DESIGN REQUIREMENTS

- 14.3.1 Request to Exit button is required at every magnetic lock installation. This will provide redundancy in lieu of the “unlock on rex” programming feature.
- 14.3.2 Every auto door opener must be completely integrated with the access control hardware to allow activation without the “unlock on rex” programming feature.
- 14.3.3 All conduit/wiring must be concealed with in wall/ceiling/window/door assemblies. Any exposed work must be reviewed and approved by VIU prior to installation.
- 14.3.4 At a minimum, all exterior doors shall be piped with conduit to facilitate card readers, magnetic contacts and other devices to be installed at a future date if not part of the proposed scope of work. The as-built documents shall clearly indicate the locations of the conduits and major junction boxes.
- 14.3.5 Clear approach and understanding of access control to Vancouver Island University facilities must be considered. A number of buildings are occupied during normal working hours and are secured for the evening. A large number of buildings however maintain classes at night or evenings with students accessing libraries and other support services during night and off peak hours. Vancouver Island University teaching and research staff also require various levels of access to numerous facilities each requiring various levels of security. A number of design principles need to be considered when addressing access control. These include the following:
- 14.3.5.1 Access control needs to be designed to permit staff to maintain a separation between public, semi-public and private areas. These higher levels of access should be limited to interiors of suites within a building. Direct access to secure areas from major circulation corridors within a building should be avoided.

14.4 ARCHITECTURAL

14.4.1 DOORS

14.4.1.1 *Door location definition:*

14.4.1.1.1 Card Reader Door:

- Main building entrance.
- High traffic secondary building entrances (likely to be could be used for after hour entry).

- Main entry door to Computer labs, Lecture theaters, Conference rooms & main entry door.
- Entrances to staff work areas.
- Staff room.

14.4.1.2 Auto Lock door:

- Low traffic secondary building entrances that would not be used for after hour entry.

14.4.1.3 All remaining doors to computer labs, Lecture theaters, Conference rooms.

14.4.1.4 Exit Only Door:

Exterior doors usually require by code that would only be used as exit only.

14.4.2 Door equipment requirement:

14.4.2.1 Card Reader Door:

- Card reader.
- Electronic locking device.
- Door contacts.
- REX sensor.
- Request to exit button (for magnetic lock installations).

14.4.3 Auto Lock Door:

- Electronic locking device.
- Door contacts.
- REX sensor.
- Request for exit button (for magnetic lock installations).

14.4.4 Exit Only Door:

- Standard non-electronic locking device.
- Door contacts.
- REX sensor.

14.4.5 Elevator:

- 14.4.5.1 Card reader in cab and/or corridor.

16 ROOM NUMBERING

16.2 GENERAL

- 16.2.1 All accessible enclosed spaces must have a room number approved by Facilities Services and Campus Development with or without the help of the architect or Project Manager.
- 16.2.2 The architect shall provide three half sized copies of floor plans no later than at the preliminary design submission for the assignment of numbering rooms appropriately. The assigned room numbers provided shall be incorporated in the construction document submission. The architect shall be responsible for obtaining the assigned numbers. Additional submittals are required if plans have changed since the preliminary design submission.
- 16.2.3 Door numbering shall relate to assigned room numbers in a logical sequence, such as single doors being the same as room number, such as 101, 101A where assigned room numbers have a suffix.

18 BUILDING ENTRANCES

18.2 GENERAL

- 18.2.1 Primary building entrances to be located to reflect pedestrian routes and vehicular drop off. All primary entrances to provide barrier free access.

18.3 ARCHITECTURAL

18.3.1 LOCATIONS

- 1.2.1.2 Additional free floor space is to be made available adjacent to each barrier free point of entry within the vestibule. This space is to be designated for at least two wheelchair positions for disabled adult or alternative transportation pickup. These areas are to have clear view of the designated vehicular pickup/drop off. Public telephones to be located adjacent to these locations for contacting private or public transportation sources.
- 1.2.1.3 Primary entrances to be fully glazed with a clear view into the building and to the drop off areas.

18.4 DOORS/ENTRANCES/WINDOWS

- 1.2.1.4 All exterior doors shall be of heavy-duty commercial aluminum storefront to correspond with section 08 11 00.
- 1.2.1.5 Access for glazing cleaning needs to be reviewed with Vancouver Island University.

18.5 FINISHES

- 1.2.1.1 Incorporate the floor mat (supplied by MU-C) design for all building entrances to ensure adequate function and aesthetics.
- 1.2.1.2 Ensure main entries are covered to protect occupants entering the building from the elements.
- 1.2.1.3 Design entrance protection to divert rain and snow run off.

20 OFFICES

20.2 GENERAL

- 20.2.1 Offices need to be designed as to provide maximum flexibility for future adaptation. This includes walls to underside of ceilings for ease of relocation. All services in the office walls to be fed from above (not the slab) to facilitate ease of relocation. Locating of electrical/communication services are to accommodate maximum office furniture configurations.

20.3 ARCHITECTURAL

20.3.1 LOCATIONS WITHIN A BUILDING

- 1.2.1.1 Offices should be located within department areas to reduce, control and monitor traffic by the area secretary/support staff.
- 1.2.1.2 Avoid locating offices adjacent to coffee and photocopy areas as these generate distractions and noise.

20.3.2 ROOM SHAPE

- 20.3.2.1 Typical sizes are:
- 20.3.2.2 80 square feet for standard faculty offices
- 20.3.2.3 100 square feet for a coordinator
- 20.3.2.4 120 square feet for a dean/director
- 20.3.2.5 No wall should be less than 6' in length.
- 20.3.2.6 Leave 12" clear behind the door for freestanding shelving/bookcase(s).

20.3.3 DOORS

- 20.3.3.1 Doors must have a vision panel 152mm x 609mm (6" x 24").

20.3.4 FINISHES

- 20.3.4.1 Standard floor covering is carpet tile.
- 20.3.4.2 Allow for one accent paint colour (two colours in total).

20.4 ELECTRICAL

20.4.1 LIGHTING AND LIGHTING CONTROL

- 20.4.1.1 Provide non-glare lighting.
- 20.4.1.2 Provide one light switch for each office (of up to two people). Located beside door.
- 20.4.1.3 In shared offices of three or more, individual light control should be provided (spec fixture).

- 20.4.1.4 Light switching to be fed from above for ease of future relocation. Slab feeds are not permitted.

20.4.2 POWER, DATA AND VOICE

- 20.4.2.1 Provide two (2) data, two (2) voice, and two (2) power duplex per workstation located on opposite walls at the end of the room opposite the door. These locations are to be confirmed before final drawings are issued for construction.
- 20.4.2.2 All data, power, voice outlets are to be installed 150mm (6") from finished floor to bottom of outlet box. This is to accommodate access under furniture modesty panels.
- 20.4.2.3 All outlets are to be fed from above for ease of future relocation. Slab feeds are not permitted.
- 20.4.2.4 Provide one convenience duplex outlet at opposite end of room.

20.5 MECHANICAL

- 20.5.1 No More than three offices should be on a single thermostat.
- 20.5.2 All thermostats are to be fed from above for ease of future relocation. Slab feeds are not permitted.
- 20.5.3 Return air must be ducted to a common return air plenum or system. Door grills and undercutting doors are prohibited.
- 20.5.4 Operable windows are preferred.

20.6 ACOUSTICS

- 20.6.1 Walls between offices are to go up to underside of ceiling, and having proper back loading.
- 20.6.2 Wall cavity is to have absorbent material.
- 20.6.3 Walls between offices and public corridors are to go up to underside of structure/decking for security reasons.
- 20.6.4 Office doors to public corridors or noisy areas to have a sound seal and auto door bottoms.
- 20.6.5 Dividing walls that intersect a window must be properly treated acoustically.
- 20.6.6 Acoustic ceiling tiles to be used.

22 CLASSROOMS

22.2 GENERAL

22.2.1 Classroom Sizes:

- Seminar or small classroom: up to 60 m².
- Mid-sized classroom: 61 m² to 117 m².
- Mid-sized tiered classroom: 40 m² to 100 m².
- Large classroom: over 117 m².
- Lecture theatre: over 100 m².

22.2.2 Unless otherwise noted all general purpose classrooms shall be projection capable (data/video projection)

22.2.3 Lecture rooms are to include instructional podium systems and controls for data and video projection, Internet and satellite connection, VCR or DVD drives, laptop connection, room for podium computer system, control of lighting and sound.

22.2.4 Rooms should be designed for laptop connectivity as a future option, if not programmed for immediate implementation.

22.2.5 Whiteboards will be used in all rooms. Chalkboards are prohibited.

22.2.6 All classrooms are to comply with the “Universal Design Guidelines”, and provide alternate seating locations for persons with disabilities.

22.3 ARCHITECTURAL

22.3.1 LOCATION WITHIN BUILDINGS

22.3.1.1 Large classrooms should be located near major entrances on main/ground level to enhance access and egress for both regular classes and for groups using the facilities in the evenings or on weekends through external room bookings, but far enough from noisy areas causing distractions. If classrooms are located on higher levels ensure code requirements for exiting are met.

22.3.1.2 Classrooms should be concentrated on the main floor(s) of buildings. This provides the students; disabled students in particular, better access and allow support services to be provided more conveniently.

22.3.1.3 Adequate circulation and “crush” space should be provided outside large classrooms and attention during design should be given to ensure that traffic in and out of large group spaces does not conflict, and is unimpeded by architectural obstacles, such as intricate stairs, planters, directories, displays or furnishings.

22.3.1.4 Considerations should be given to providing small group spaces adjacent to large group rooms so that discussion groups can be formed and then

reconvened into large groups easily. However, each room type must function (access, systems) independently.

- 22.3.1.5 Equipment on carts and class materials may be stored at a central lockable depot. Several smaller classrooms may share a common storage, preparation or projection room. However, care must be taken to ensure that noise does not “leak” from one classroom to another, from or through the common room or space, or through ducts or ceiling routes.
- 22.3.1.6 Halls, vestibules, lounges directly adjacent to classrooms will not contain vending machines. Noise from this equipment interferes with classroom use when doors remain open.
- 22.3.1.7 As large classrooms are often used for conference type functions having adjacent access to coffee/food preparation facilities is desirable.

22.3.2 ROOM SHAPE

- 22.3.2.1 When instruction originates from the instructor or screen, the two key factors in shape must be visibility of the demonstration area (whiteboards, screens, podium) from all points, and reasonable acoustics.
- 22.3.2.2 Room shape should be such that students can sit as close as it is feasible to the instructor.
- 22.3.2.3 A classroom must neither be too long nor too wide. It should not be echoic. Small rooms should be near square in plan, preferably slightly longer than wide. With increased size, banking (tiers) of the seats will be required and fanning of the shape, with widening towards the rear.
- 22.3.2.4 The ideal dimension ratio of a room is 1(H) : 1 ½(W) : 2 ½(L). The length of the room should not exceed its width by more than 50%.
- 22.3.2.5 Classrooms (used extensively by instructors using audio-visual/multimedia presentations) shall be designed with the length dimensions of the room approximately 1.5 times the width dimension. Rooms wider than they are long provide unacceptable viewing angles for projected media.
- 22.3.2.6 A minimum 9 foot ceiling height can be utilized for rooms with less than 20 people. For rooms with a capacity between 21-49 persons, a minimum ceiling height of 10 feet shall be used.
- 22.3.2.7 Rooms designed for groups in excess of approximately 60 people should NOT be rectangular. A “fan-shaped” room, where such is possible, is a superior shape as it provides better viewing angles and acoustics. (Parallel walls in larger rooms aggravate acoustical problems.) “Fan-shaped” rooms tend to focus student attention of the lecturer and the materials and media used, and provide as many seats as possible within the optimum viewing areas.

- 22.3.2.8 If a room has a longer dimension, the screen should be located on a narrower wall, so that views will be closer to a line perpendicular to the screen surface.
- 22.3.2.9 Lecture theatres/tired classrooms are to have low-rise step design and must allow wheelchair access to the instructor area.
- 22.3.2.10 Provide a variety of locations to accommodate wheelchair stations. These should not always be located at the front and/or rear of the room. Co-ordinate the selection of the furniture with VIU.
- 22.3.2.11 There should be no columns in any classroom. Columns placed within the rooms interior space severely hampers room arrangement and student viewing of the instructor and visual aids.

22.3.3 DOORS/ENTRANCES/WINDOWS

- 22.3.3.1 All doors must have a minimum clear width of 910 mm (36"). Double doors (each leaf minimum 910 mm) are preferred on larger rooms or where equipment movement is a concern. Mullions should not be used.
- 22.3.3.2 It is preferable to enter the room from the rear in order to minimize disruption.
- 22.3.3.3 All classroom doors must incorporate a vision panel 152mm x 609mm (6" x 24"), (same as an office), so interruptions to lectures from people "looking for the right room" are avoided.
- 22.3.3.4 There must be no threshold to obstruct rolling carts.
- 22.3.3.5 Windows and natural light are desirable in classrooms. When windows are present, they should be located on a side or rear of the room, never at the front.

22.3.4 FINISHES

- 22.3.4.1 Review floor finish options with VIU.
- 22.3.4.2 The use of quarry tile/ceramic tile and other hard, dense corridor surfaces directly outside of lecture rooms should be avoided where possible, since such surfaces generate and transmit traffic noise and because rough surfaces jar projection lamps, and optical or electronic components, when the equipment is moved on carts.
- 22.3.4.3 Classroom floors shall be carpeted (high traffic, commercial grade carpeting with no padding) or resilient flooring (high traffic, commercial grade sheet goods). If concrete floors are specified they should be free of cracks and defects, properly finished and sealed.
- 22.3.4.4 Wall finishes should be constructed from materials, which are not easily defaced or damaged, and surfaces should be easily and inexpensively refinished. Additional absorption material will be required for acoustical purposes for large instructional rooms.

- 22.3.4.5 Ceilings should incorporate acoustic tile in a suspended ceiling. Access hatches must be installed in the ceiling wherever gypsum board or plaster is used to facilitate access to the entire ceiling cavity.
- 22.3.4.6 All materials used should be capable of being matched or replaced so that repaired areas are not noticeable.
- 22.3.4.7 Avoid wall treatments, which create a visual disturbance or attraction which disrupts concentration, or promotes inattentiveness, e.g., strong colours, intricate geometric designs in masonry, and startling lighting effects that distract from the lecture or program being presented. There should be no decorative elements such as paintings or other artwork located within the classroom.
- 22.3.4.8 A variety of colours are desirable from one classroom to the next, and within each classroom. Paint finish should be eggshell or satin gloss. In classrooms painted surfaces should be light in colour and durable to allow washing. The reflectance values of paint and other finish materials should be selected to enhance ambient illumination.
- 22.3.4.9 Chair rails should be installed in all classrooms to protect the room's walls. Rails should match architectural design of room. They should be a minimum of 6 inches wide with a bottom edge approximately 25-27" AFF.
- 22.3.4.10 All Windows in classrooms must be provided with sufficient window treatments to eliminate outside light from reaching the projection screen.

22.3.5 WHITEBOARDS AND TACK BOARDS

- 22.3.5.1 The use of whiteboards (supplied and installed by Vancouver Island University) in lieu of chalkboards is preferred. Chalk dust permeates the environment and creates problems with electronics. Porcelain enamel steel whiteboards are recommended.
- 22.3.5.2 When doing preliminary design and layouts for any classroom, locations of tack boards, whiteboards and other display surfaces must be predetermined. Whiteboards will usually be at the designated front of the room. Provide as much whiteboard at the front of the room as possible. Two or three levels of sliding whiteboards may be considered. The amount of whiteboard needed depends on the subjects taught. The front wall behind the instructor should not have any protrusions (structural or otherwise) into the room so that the whiteboard, projection screen or information displays can be installed across the entire wall of the instructor's area.
- 22.3.5.3 Whiteboards should be spacious and sited for optimal visibility from all parts of the room. All classrooms to have whiteboard space that can be used when the projection screen is down.

- 22.3.5.4 Additional whiteboard space may be provided by portable whiteboards. Where such use is contemplated, entrances, (doors, steps, baffles, angled walls, sharp turns) must be planned so there is no obstruction for easy passage of large standing portable whiteboards.
- 22.3.5.5 All whiteboards to include a tack strip along the top edge and a pen tray at the bottom edge.
- 22.3.5.6 Installation of tack boards are discouraged in classrooms. Tack boards are used primarily for notices, regulations, or listings. Unless a program justifies more than incidental use of tack boards, they should be restricted to minor areas such as just outside the entranceway to classrooms or in general gathering areas.
- 22.3.5.7 Provide proper backing at front of room from 30" to 80" high and cover the entire length of the front of the classroom to accommodate slider boards.

22.3.6 FURNITURE – LECTURE THEATRE/TIERED CLASSROOMS

- 22.3.6.1 Tables are to be fixed.
- 22.3.6.2 Tables are to have modesty panels.
- 22.3.6.3 Tables to include provisions for data and power. If a wireless room then only power outlets may be required.
- 22.3.6.4 Seating is not to be fixed. Loose seating (standard classroom chair etc) is preferred. No seating should be more than 45 degrees off the centre axis of a classroom to ensure adequate viewing.
- 22.3.6.5 Aisles should be planned to ensure minimal interference to lecture by the late arrivals. They should terminate (originate) near the entrances.
- 22.3.6.6 Centre aisles should be used only after careful consideration, since normally the best seats for viewing are centrally located within the room.
- 22.3.6.7 Provide a variety of locations to accommodate wheelchair stations. These should not always be located at the front and/or rear of the room.
- 22.3.6.8 Near the primary entrance to a room provide a table/bench/ledge for placement of handouts, notices, etc.

22.3.7 FURNITURE – GENERAL

- 22.3.7.1 Tables are to not be fixed. Avoid centre aisles.
- 22.3.7.2 Seating is not fixed.
- 22.3.7.3 Room layouts should allow for a minimum of 3 feet between each row of tables.
- 22.3.7.4 Seating arrangements should allow for 8 to 10 feet from the instructional wall to the edge of the first row of tables. Room layout should allow for no more than 10 people maximum in a row of adjoining tables.

22.4 ELECTRICAL

22.4.1 LIGHTING AND LIGHTING CONTROLS

- 22.4.1.1 Lighting should include, general, high, even illumination for the whole room, plus reduced illumination during projection. Illumination of the lecturer and the lecturer's notes are important during reduced illumination. Light levels should be provided via multi-level switching rather than dimming. Whiteboards should be properly illuminated, with no "hot spots" or glare. Where fluorescent lighting is used for this purpose, a valance or trough should enclose the tubes, which should be approx. 450 mm (18") in front of the whiteboard.
- 22.4.1.2 Lighting control should be provided for at three levels. One control for board lighting, one control for the back half of the lighting fixtures and one control for the front half of the lighting fixtures to provide full and half light levels.
- 22.4.1.3 Light switches to control the general room lighting should be located by each and every entrance door and adjacent to the instructor's station (usually the front of the room).
- 22.4.1.4 Light switches to be of the toggle type - not rotary.
- 22.4.1.5 Restrict ambient light falling on Audio Visual screens and whiteboards particularly from entrance doors, windows and other variable or constant light sources.
- 22.4.1.6 Consideration should be given to providing aisle lighting in rooms having "stepped" aisles.
- 22.4.1.7 If demonstration benches are provided, special illumination for these is required.
- 22.4.1.8 Suspended light fixtures must be designed so they do not interfere with audio/visual projection angles, viewing angles or screen operations.

22.4.2 POWER, DATA AND VOICE

- 22.4.2.1 Provide a voice line for one wall mounted phone at the main door to each classroom.
- 22.4.2.2 One quad electrical receptacle should be provided at the front of the room on a dedicated circuit, and should be centered under the instruction board.
- 22.4.2.3 One electrical duplex should be centered on the back wall.
- 22.4.2.4 One electrical duplex should be centered on each of the sidewalls.
- 22.4.2.5 Provide two data lines under the instruction board or in podium connections, one to be back to communication room, and one to go to the data projector location.
- 22.4.2.6 Floor box outlets are not preferred. Surface mounted are prohibited.

- 22.4.2.7 A classroom designed for laptops must include power outlets for student connections. Review quantity and locations with Vancouver Island University.
- 22.4.2.8 Provide one duplex receptacle for data projector ceiling mounted.
- 22.4.2.9 For small to medium classrooms a ceiling mounted TV/VCR unit will require a duplex receptacle. Location of this unit must be mounted at the front corner of the room without interfering with data projection and the room's entrance(s).

22.4.3 AUDIO/VISUAL PROVISIONS

- 22.4.3.1 All classrooms, large or small, should be designed for the use of media (computer projection, slides projection and 16 mm film, the use of overhead projectors, video playback) and where necessary, sound reinforcement.
- 22.4.3.2 Provide one 50mm (2") conduit from podium in lecture theatre or centered under instruction board in general classrooms to the data projector location. No tight bends permitted. This will be used to accommodate and required AV cables
- 22.4.3.3 All audio, video and control electrical circuits should be fed from "clean" legs of the transformer free of high inductive loads. There shall be no elevator motors, compressor motors, blower motors etc on the side of the power transformer that feeds the media equipment.
- 22.4.3.4 CATV connection at all TV locations and at every instructors station location.
- 22.4.3.5 Data projectors should be ceiling mounted. Located 12' to 16' from projection surface.
- 22.4.3.6 For small to medium classrooms the projection screen will be suspended from the ceiling. Clips will be used to attach to the t-bar system. Backing will be required for hard ceilings.
- 22.4.3.7 Designers should consult with the appropriate Vancouver Island University audiovisual group when selecting and sizing projection screens.
- 22.4.3.8 Any screen 10' or wider should be motorized.
- 22.4.3.9 When screens are installed in ceiling recesses, it is important that the recess be large enough to permit maintenance of the screen, motor and fabric.
- 22.4.3.10 To facilitate maintenance on screen motors; a quick disconnection should be used.
- 22.4.3.11 The switch for electrically operated screens must be the type that returns to neutral when released and located close to the instructors station.

22.4.4 SOUND REINFORCEMENT

- 22.4.4.1 For classrooms or lecture theatres over 50 seats, voice amplification/sound reinforcement is required. This assists with the hearing impaired and ease of

instruction. The design of these systems must be undertaken with the Vancouver Island University audiovisual support services group.

- 22.4.4.2 Provision for wireless microphone capability must be included in all permanent sound reinforcement systems.
- 22.4.4.3 Four microphone inputs are to be provided.
- 22.4.4.4 Amplifiers to be "low-impedance".
- 22.4.4.5 System must have the capability of playback and recording. Balanced lines to be provided.
- 22.4.4.6 Amplifier to be located in projection booth or at the front of the classroom in service cabinet if there is no booth.
- 22.4.4.7 Speaker lines must never be included in conduit carrying electric power.

22.5 MECHANICAL

22.5.1 HVAC

- 22.5.1.1 It is important in all lecture rooms, and especially so in large group facilities, to design mechanical systems that will provide an adequate number of changes per hour, in order to exhaust stale air and avoid heat build-up from people, lights and/or equipment.
- 22.5.1.2 There must be no drafts from the HVAC diffusers ; each room is to have its own thermostat.
- 22.5.1.3 Ensure air movement from HVAC diffusers does not impinge on projector screen at front of classrooms.
- 22.5.1.4 The ventilation system must be quiet. Low velocity - large ducting systems are thus more desirable than high velocity systems.
- 22.5.1.5 Locate mechanical room or main air handling equipment away from noise sensitive areas such as instructional spaces. Ensure large equipment is equipped with vibration isolation hardware appropriate to its location.
- 22.5.1.6 Avoid locating duct shafts in classrooms.
- 22.5.1.7 Locate rooftop equipment over corridors or other non-critical areas; avoid placing equipment over instructional space. (If required for external review, have available any details describing acoustic treatment, duct configuration and roof penetrations for any rooftop installations.)
- 22.5.1.8 Locating unit ventilators in the classroom is prohibited. These units require a separate room with proper acoustic treatment. Locate units outside of lecture rooms or in suitable closet to ensure background noise level criteria are maintained. Provide adequate silencing of supply and return air from furnaces. Utilize acoustically lined plenum ducting or transfer ducts as applicable.
- 22.5.1.9 Locate thermostats as to not interfere with instruction board.

22.6 ACOUSTICS

- 22.6.1 Review acoustic design solutions proposed with VIU.
- 22.6.2 All classroom walls go to underside of structure (metal deck, structural concrete slab) and properly sealed at the decking intersection. Provide a complete air seal at metal deck, piping, ductwork and conduit junctions and penetrations.
- 22.6.3 Wall cavity should be filled with absorbent material.
- 22.6.4 A fair number of room change requests are received from those instructors assigned to rooms with poor acoustic provision because of excessive noise. It should be assumed that any classroom will eventually, if not regularly, be used for the showing of films/video, and that the noise level should be contained. Therefore, acoustic design and materials should always be incorporated in classroom construction. On larger or uniquely shaped rooms an acoustical consultant should be consulted.
- 22.6.5 In larger group lecture rooms or multi-media classrooms a stepped ceiling, which disperses sound, may enhance the acoustical setting. Avoid curved walls and ceilings, however, which may focus sound or cause unexpected echoes (in addition, care should be taken to assure that projection lines, and viewing or sightlines are not obstructed by stepped ceilings).
- 22.6.6 Do not locate doors in common wall between classrooms. Where this is necessary consider double doors or a sound-lock vestibule with full perimeter acoustic seals.
- 22.6.7 Wall baffles, and/or acoustic treatment of ceilings and walls should be considered for large group rooms.
- 22.6.8 Air condition and mechanical noise must be minimized.
- 22.6.9 Use of operable partitions will generally not provide sufficient sound isolation for adjacent classrooms to function without interruption and should be avoided. If operable walls must be provided, products with STC 50 or better must be used.
- 22.6.10 Amplification equipment should be specified when reinforcement is needed, particularly when music reproduction and film projection is undertaken. A simple portable amplification system should be available when needed. Controls should be convenient, simple and all in one place. As many controls as possible should be “pre-set” to optimum levels for the respective media to be used.
- 22.6.11 In larger classrooms wireless microphones are required where voice reinforcement is necessary, so that the lecturer’s movements are not inhibited or impeded by microphone cables.
- 22.6.12 Microphone inputs should be provided at front of rooms (instructors position) and side and/or rear wall locations in those rooms requiring sound reinforcement.

24 COMPUTER LABS

24.2 GENERAL

- 24.2.1 Computer labs have many of the same characteristics and requirements as standard classrooms. Refer to Classrooms guidelines for applicable information. This section will highlight any requirements over and above classroom design.

24.3 ARCHITECTURAL

24.3.1 LOCATIONS WITHIN A BUILDING

- 24.3.1.1 Consider computer labs high use rooms and as with large classrooms, be located near building entrances.
- 24.3.1.2 When multiple labs are located within a building, their proximity to each other should be considered with ease of computer lab monitors/supervision in mind. One person can supervise three or four labs if they are located adjacent each other. If they are on different floors or opposite ends of the building, addition resources are required.

24.3.2 ROOM SHAPE

- 24.3.2.1 The furniture style and layouts must be designed in coordination with the room shape (and services).
- 24.3.2.2 Computer labs are to have a low profile raised floor to facilitate power and data. Recessed slab with an elevation that is to be flush with adjacent floor.

24.3.3 DOORS

- 24.3.3.1 Computer lab doors must have electronic card access control. Where multiple doors enter the room, one door must be the access (card reader) door and the remaining doors must be auto lock doors.

24.3.4 FURNITURE

- 24.3.4.1 Computer lab furniture requires data and power services to each station. It is important that the furniture style and layout are confirmed before the room design is complete.
- 24.3.4.2 Allow space for a print release station either in the room (preferred) or in close proximity.
- 24.3.4.3 Allow for secure storage. Typically an 18" deep, 36" wide, 70" high cabinet will be sufficient.
- 24.3.4.4 Adjustability of desk height is preferred.
- 24.3.4.5 At least one station must be designed for wheelchair use with a hand crank operation to adjust desk height.

24.4 ELECTRICAL

- 24.4.1 Combination direct/indirect lighting is preferred.
- 24.4.2 Electrical and data services must be coordinated with the furniture before the room design is complete.

24.5 MECHANICAL

- 24.5.1 Stand-alone mechanical cooling is required and its design critical. Poorly designed HVAC systems result in doors propped open and defeat the access control system. Computer lab temperature is the major complaint in buildings.
- 24.5.2 The HVAC cooling and ventilation design is to factor the use of LCD screens in all computer labs. Less heat is generated from these types of screens.

26 SUPPORT SPACES

26.2 GENERAL

- 26.2.1 In new construction, a dedicated equipment storage room shall be provided to support general use instructional rooms. The storage room should be a separate room.
- 26.2.2 Equipment storage rooms shall have a minimum height clearance of 7 feet throughout the space (no low beams or duct work).

26.3 ARCHITECTURAL

26.3.1 LOCATIONS WITHIN A BUILDING

- 26.3.1.1 The equipment storage room should be located as close as possible to the main concentration of instructional rooms in the building.
- 26.3.1.2 Provide direct access to the storage room from a public hallway; avoid storage rooms opening off classrooms or other normally occupied rooms.

26.3.2 DOORS/ENTRANCES/WINDOWS

- 26.3.2.1 Doors into storage rooms shall be at least 42" wide with the door swinging out to allow storage inside the room.

26.4 ELECTRICAL

26.4.1 LIGHTING

- 26.4.1.1 Storage rooms shall have fluorescent lighting and occupancy sensor or timer.

26.5 MECHANICAL

26.5.1 HVAC

- 26.5.1.1 Adequate ventilation.

28 JANITOR ROOMS

28.2 GENERAL

28.3 ARCHITECTURAL

28.3.1 LOCATION WITHIN BUILDINGS

- 28.3.1.1 Custodial closets shall be located on each level of a building. With a minimum area of 3.7 sq. m. (40 sq. ft) each, there needs to be one central room of 7.4 sq. m. (80 sq. ft.) with a minimum dimension of 2440mm (8 feet).

28.3.2 ROOM SHAPE

- 28.3.2.1 Sinks in closets shall be floor mounted janitor mop sinks and located near a door.

28.3.3 DOORS/ENTRANCES/WINDOWS

- 28.3.3.1 Doors shall be 915 mm wide and open out.

28.3.4 FINISHES

- 28.3.4.1 Water resistant flooring.
- 28.3.4.2 Ceramic tile wall protected for around sink and mop area.
- 28.3.4.3 Walls should be painted plywood

28.3.5 FURNITURE – GENERAL

- 28.3.5.1 Shelving and fixtures to be all stainless steel.
- 28.3.5.2 Provide backing for all shelving and fixtures.
- 28.3.5.3 Include a slot for a 6-foot ladder (in central room only).
- 28.3.5.4 Provide hangers for wet mops over the sink and for dry mops and brooms on other walls. Towel bar to be included.

28.4 ELECTRICAL

28.4.1 EQUIPMENT

- 28.4.1.1 Provide one GFI outlet close to door.

28.5 MECHANICAL

28.5.1 HVAC

- 28.5.1.1 Closets shall be vented to the building exterior.

28.5.2 PLUMBING

- 28.5.2.1 Provide janitorial style faucet with bracing for hanging buckets while being filled.
- 28.5.2.2 Provide hose faucet with 1200 mm of hose.
- 28.5.2.3 Floor drain with 2% slope minimum.

30 MAINTENANCE ROOM

30.2 GENERAL

- 30.2.1 Provide a maintenance room adjacent to service entrance. Room to be minimum 19.3 sq.m. (100 sq. ft.) (size of room will vary dependant on building size).
- 30.2.2 All walls to be clad with fire treated 20.5mm (3/4") plywood panels covering the complete wall area.
- 30.2.3 No mechanical or electrical equipment are to be located in this room (i.e. sprinkler tree).
- 30.2.4 Provide a 1200mm (4 foot) wide door that swings out.

32 SERVICE ENTRANCE

32.2 GENERAL

- 32.2.1 Provide dedicated service entrance (loading area) at rear of building. Service entrance to be accessible from the service drive and located adjacent to the waste disposal, maintenance and holding rooms.
- 32.2.2 Access to building to be via double 1,200 mm wide doors.
- 32.2.3 Provide a 1,800 mm deep apron between access doors and face of loading dock where double doors used. Apron to have wall protection to minimum 1,200 mm above apron floor.
- 32.2.4 At loading dock, recess truck bay to accommodate flat bed of truck. Provide a dock leveler with a 2,300 kg capacity to allow roll-off from truck bed.
- 32.2.5 Provide 200 mm steel concrete filled pipe bollards adjacent to loading area to protect building.

34 MECHANICAL ROOMS

34.2 GENERAL

34.2.1 The Architect/Engineer shall, in the earliest stages of design development, be responsible for establishing and/or verifying programmatic requirements for mechanical rooms in order to:

- 34.2.1.1 Provide adequate safe access and manufacturers recommended working clearances for all equipment.
- 34.2.1.2 Provide for replacement of the largest piece of equipment without removing permanent walls or large items of equipment or equipment essential to the on going day to day building use.
- 34.2.1.3 Provide direct access from the exterior or main corridor for major mechanical rooms exceeding 9.3 sq.m. (100 sq. Ft.) suited for replacement of equipment and preventing disruption of normal building functions.
- 34.2.1.4 Assure that building mechanical air intakes are located away from loading docks, emergency electrical power generators, emergency or ambulance vehicle entrances, and other external sources or noxious or toxic fumes. Consideration also shall include proximity to windblown dust from streets, fields or ground care activities, materials related to evaporating cooling towers or intentional human contamination.
- 34.2.1.5 Mechanical rooms to be designed and constructed with adequate access to and clearance around equipment so that routine preventative maintenance can be conducted. The following list provides some examples of unsatisfactory mechanical room design and construction:
 - In order to access a piece of equipment, maintenance personnel must crawl under or over ductwork.
 - Piping is run across mechanical room floors.
 - Where light fixtures are located in high ceilings and atriums, the only way to relamp or repair the fixture is to install temporary scaffolding or use a mechanical lift.
 - Equipment is located above other pieces of equipment in such a way that it is not possible to access the upper equipment.
 - Equipment is located in such a way that maintenance personnel have to stand on other pieces of equipment or piping in order to conduct maintenance service.
 - Clearance around equipment is so inadequate a wall may need to be removed in order to access a motor for repair or replacement.

- 34.2.1.6 Provide a wall mounted service sink with hose attachment to all mechanical rooms.

34.3 ARCHITECTURAL

34.3.1 LOCATION WITHIN BUILDINGS

- 34.3.1.1 Unobstructed accesses to filters, manual valves, zone control devices, automatic control equipment etc shall be provided.
- 34.3.1.2 Access to ducted fan coils on occupied floors shall be from corridors, rather than through offices, classrooms and laboratory ceilings, or other occupied spaces.
- 34.3.1.3 Include means to provide access for future equipment replacement (access panels, knock-out panels)
- 34.3.1.4 Air conditioning compressors, condensers, and similar equipment serving buildings shall be in an exterior, ground-mounted location readily accessible for maintenance, and effectively shielded from view. Such installations may be subject to approval by Facilities Management.

34.3.2 ROOM SHAPE

- 34.3.2.1 In phased projects, mechanical rooms shall be sized to include equipment for all the phases.

34.4 ELECTRICAL

34.4.1 POWER, DATA AND VOICE

- 34.4.1.1 Electrical equipment rooms shall be provided with a data jack in locations coordinating with Building Management Systems Control.

34.5 MECHANICAL

34.5.1 HVAC

- 34.5.1.1 Mechanical rooms shall have a floor drain. Provide floor drains at all pumps, chillers and air handling units. Slope floor to drains.

36 ELECTRICAL ROOMS

36.2 GENERAL

36.2.1 Provide painted plywood backboards on all walls of electrical rooms.

36.3 ELECTRICAL

36.3.1 LIGHTING AND LIGHTING CONTROLS

36.3.1.1 Co-ordinate location of all luminaires within mechanical and electrical rooms with installed piping and conduit. Lighting controlled by occupancy sensor.

36.3.2 POWER, DATA AND VOICE

36.3.2.1 If building has emergency power, provide a minimum of one duplex receptacle serviced on emergency power within each mechanical and electrical room.

36.3.2.2 Provide oversize cable opening/conduits through walls/floors/ceiling to all data/telephone rooms to allow addition of cabling. Ensure openings are fire-stopped. Fire-stopping preferred to be reused and re-penetrated.

38 COMMUNICATION ROOMS

38.2 GENERAL

- 38.2.1 Each building must have at least one communications room designed as detailed in the requirements of this section.
- 38.2.2 Any deviation from this section requires the approval of Vancouver Island University Information Technology Services department.
- 38.2.3 Each room shall be located within the building as to not allow any Category 5 cable to extend longer than 90 meters.
- 38.2.4 All data and voice runs will terminate in a communications room.
- 38.2.5 Wall mount cabinets are not acceptable.
- 38.2.6 All communications rooms will be dedicated to voice and data communications but may include energy management, security equipment, and audiovisual equipment.
- 38.2.7 Heat-generating equipment not related to these specific functions will NOT be housed in communication room spaces.

38.3 ROOM SIZE

- 38.3.1 A minimum room size of 6 sq. m. (65 sq. ft.).
- 38.3.2 No wall to be less than 2440mm (8 ft) wide.
- 38.3.3 A 2285mm minimum clear height; 2440 preferred.
- 38.3.4 A lockable 915mm minimum width, 2035 minimum height door.

38.4 ARCHITECTURAL

- 38.4.1 Door must open out unless prohibited by building code requirements for exit access passage width.
- 38.4.2 Door access must be from exterior or a common corridor. Access through one room to the next is not acceptable.
- 38.4.3 No suspended or false ceiling unless required by building code construction requirements.
- 38.4.4 Fire treated 20.5mm (3/4") plywood panels with a dimensional height of 12200mm (4') located 760mm (2'-6") above finish floor on the three walls not having a door.
- 38.4.5 Rooms should be stacked vertically where possible and be interconnected by bushed sleeve floor penetrations extending 100mm above the floor.
- 38.4.6 Communication racks must be bolted to the floor and located in such a manner as to allow access of not less than 914mm (3') to both the front and back of the rack(s).

38.5 ELECTRICAL

- 38.5.1 50 foot candles illumination level at 915mm above floor, mounted 2285mm minimum clear above floor (no wall mounted light fixtures).
- 38.5.2 One (1) dedicated AC 15 amp circuit duplex on main power grid and One (1) dedicated AC 15 amp circuit duplex from emergency grid on each of the three walls. Where no emergency grid exists substitute 1 dedicated circuit duplex on the main grid in lieu of every emergency grid duplex.

38.6 MECHANICAL

- 38.6.1 HVAC capacity to maintain ambient room temperature over the range 50 to 85 degrees F 30-75% relative humidity, positive pressure with air exchange sufficient to dissipate heat generated by equipment (typically not less than 2500 watts).

40 EMERGENCY EYEWASH & SAFETY SHOWERS

40.2 GENERAL

- 40.2.1 Provide eyewash and/or safety showers in areas where exposure to/or contact with corrosive chemicals may occur. Possible locations include laboratories, battery recharge operation and corrosive dip tanks.
- 40.2.2 Locate eyewash and/or safety showers so that maximum distance from hazard does not exceed 30 m and can be reached within 10 seconds. Locate within same room as hazard such that occupant need not pass through a doorway or weave through equipment to reach eyewash and/or safety shower.
- 40.2.3 Locate eyewash and/or safety shower adjacent to normal path of egress, i.e. located near corridor door.
- 40.2.4 Provide tempered potable water to eyewash and safety shower.
- 40.2.5 Activation device to be uniform throughout building.

42 WASHROOMS

42.2 GENERAL

- 42.2.1 In an effort to produce a bright, sanitary environment for patrons, the washroom design must include touchless concepts, seamless surfaces and universal design.

42.3 ARCHITECTURAL

42.3.1 LOCATIONS WITHIN A BUILDING

- 42.3.1.1 Locate washrooms close to major student gathering areas, classrooms/lecture halls and/or stairs/entrances.
- 42.3.1.2 Stacking within a building is desirable.
- 42.3.1.3 Grilles for exhaust air systems serving washroom areas shall be located directly above toilet stalls.
- 42.3.1.4 Grilles for exhaust air systems serving showers shall be located directly above, or adjacent to the shower stalls.

42.3.2 DOORS

- 42.3.2.1 Access to washrooms is preferred without the use of doors. Ensure privacy by ensuring no direct line of sight from corridor to washroom.
- 42.3.2.2 If door used – must have maintenance lock.

42.3.3 DESIGN & FINISHES

- 42.3.3.1 Provide a double plumbing wall between washrooms and instruction space. Ensure structural separation is maintained and piping is attached ONLY to washroom side of the double wall.
- 42.3.3.2 Walls to be full height (to underside structural deck). If a washroom is located close to/adjacent to instructional space and access is without doors consider adding acoustical absorption to entryway.
- 42.3.3.3 All washrooms to have barrier free capability. Provide minimum one unisex washroom per building (preferred on main floor).
- 42.3.3.4 Number of fixtures per public washroom should be a minimum of 2 (1 toilet and 1 urinal for men's, exception is unisex handicapped (clean up room) where a single toilet is acceptable)
- 42.3.3.5 Ceilings to be acoustic tile and rated for a washroom environment.
- 42.3.3.6 Walls to be ceramic tile to the height of toilet partitions.
- 42.3.3.7 Floors to be seamless epoxy flooring and must have minimum of one (1) floor drain.

- 42.3.3.8 Toilet partitions are to be high-pressure plastic laminate.
- 42.3.3.9 Toilet partitions are to be floor mounted.
- 42.3.3.10 Continuous solid surface lavatory systems with integrated basins and back splashes are required. Between each basin provide a finished cut out (6" wide x 8" deep) for waste. Ensure counter supports will not interfere with waste receptacle below.
- 42.3.3.11 Confirm design of countertop accommodates barrier free requirements at all lavatories.
- 42.3.3.12 Provide bracing to countertops at minimum 1200 on centre. Bracing to be wall hung and not extending to floor.

42.4 FITTINGS & ACCESSORIES

- 42.4.1.1 Paper towel, toilet paper, provided by Vancouver Island University. Ensure backing is provided in stud partitions.
- 42.4.1.2 Provide single mirror over each basin with vandal proof clips/mounting.
- 42.4.1.3 Provide either an alcove for waste receptacle or wall area near exit. Vancouver Island University will supply freestanding units.
- 42.4.1.4 Hands free (capacitive technology) soap dispensers are required.
- 42.4.1.5 Paper towel dispensers to be hands free (supplied and installed by Vancouver Island University) and will be located between mirrors and over waste hole in counter top.
- 42.4.1.6 If soap dispensers dispense liquid soap locate the dispenser so drips are contained in sink. If the dispenser is foam soap this is not an issue.
- 42.4.1.7 Confirm all fitting/accessories are barrier free.

42.5 ELECTRICAL

42.5.1 LIGHTING

- 42.5.1.1 There must be at least two lighting fixtures, of which one should be on at all times and connected to emergency power (if available) or battery pack.
- 42.5.1.2 The light switches for the washroom must be controlled. The switches shall either be secure key switches or shall be located within a locked controlled location. They may also be located in an electrical panel, however the breakers or the panel should be locked. This would prevent a person from closing the lights when someone else is still within the washroom.
- 42.5.1.3 Lighting to be on motion detectors located such that movement in all locations of the washroom will activate the sensor.
- 42.5.1.4 Ensure one fixture is on night light at all times.

42.5.2 POWER

- 42.5.2.1 All electronic fixtures (hands free soap dispenser, hands free water faucet, etc) to be electronically powered. Battery operation is not acceptable.

42.6 MECHANICAL

42.6.1 HVAC

- 42.6.1.1 Ensure washroom is provided under negative pressure to control odors from leaving the washroom.

42.6.2 PLUMBING

- 42.6.2.1 For every waterless urinal provide waterline capped at proper rough in location for possible future plumbed urinal.
- 42.6.2.2 Hands free (capacitive technology) lavatory faucets are required.
- 42.6.2.3 Waterless urinals are desired. In a stacked washroom core consider the upper most units to be plumbed.
- 42.6.2.4

44 SHOWER ROOM

44.2 DESIGN

- 44.2.1 Provide single shower designed as per “Universal Guidelines”
- 44.2.2 Adjacent to shower area provide dry-off area
- 44.2.3 Provide one toilet, sink and a counter as per washroom design guidelines.
- 44.2.4 Grilles for exhaust air systems serving showers shall be located directly above, or adjacent to the shower stalls.

44.3 FINISHES

- 44.3.1 Floor to slope to drains. Finish to be slip resistant with integral base. Provide a waterproof membrane below floor finish.
- 44.3.2 Wall finish to be ceramic tile.
- 44.3.3 Ceiling to be impervious to water.

44.4 ELECTRICAL

- 44.4.1 Provide motion sensors for lighting located such that movement in all locations of the room will activate the sensor. Minimum one fixture to be on at all times.
- 44.4.2 GFI outlet at sink counter.
- 44.4.3 Provide built in bench suitable for change room applications.
- 44.4.4 Unless specified, a unisex shower room shall be provided for staff and a second unisex shower room for students/public.

46 UNOCCUPIED SPACES

46.2 GENERAL

- 46.2.1 Unoccupied spaces include such areas as attics, crawlspaces and areas under 2.1 m in height. Avoid creating such spaces that are to be unheated. These spaces should be made part of the overall integrated building envelope with suitable access.
- 46.2.2 Design the enclosure for unoccupied spaces to be the same as the design of the building proper. Ventilation and heating requirements for such spaces need not be the same as for the occupied space; however, some modification of humidity and temperature may still be required.
- 46.2.3 Minor features on the building exterior that enclose space, such as mansards, should be vented with exterior air. Suitable connections for air sealing are required.
- 46.2.4 Provide access to interior unoccupied spaces from the interior and to exterior spaces from the exterior.

48 CORRIDORS

48.2 RELATED WORK

- 48.2.1 Performance Specification 10 26 13 - Wall and Corner Guards
- 48.2.2

48.3 DESIGN

- 48.3.1 The corridor circulation system is to be continuous from the primary or barrier free entry to all points of the building and connect through all areas of the floor plate requiring public access.
- 48.3.2 Public corridors to be of sufficient width to accommodate the designated building occupant load with additional width requirements to accommodate wheelchair and scooter traffic in both directions.
- 48.3.3 Projections into corridors should be limited to widths not exceeding 100 mm (4"). Service elements such as fire hose cabinets, recycling centre, drinking fountains, etc., should be recessed where possible. If protruding elements must be incorporated their locations should be limited to off traffic areas.
- 48.3.4 Where possible corridors should be a minimum of 1,500 mm (5'-0") in clear width. In areas serving assembly areas (classrooms etc.) the minimum corridor width is 2,400 mm (8'-0").
- 48.3.5 Consider fabric wall coverings designed for wall protection where the damage to walls could be frequent.

50 INTERIOR STAIRS

50.2 DESIGN CRITERIA

- 50.2.1 Clear visible sight lines throughout the stair enclosure to minimize concealed enclosure or alcove configurations.
- 50.2.2 Install durable surface finishes to address a high pedestrian traffic volumes anticipated in stairs designed for vertical circulation and exiting.
- 50.2.3 Appropriate light levels to ensure clear visibility in the horizontal and verticals dimension.
- 50.2.4 View panel not less than 203mm x 1260mm (8"x32") shall be incorporated into access doors to ensure clear line of sight in direction of travel.
- 50.2.5 Selection of floor materials that incorporate a non-slip finish with visual distinctive contrast colour and/or texture incorporated into changes in vertical dimension (at stair nosing).
- 50.2.6 Consideration of use of stairs at a higher level of use than defined by the Code. (Stairs are often the preferred mode of travel by the students – the width should be size to reflect this reality)

52 VENDING MACHINE & LOCKERS

52.2 ARCHITECTURAL

52.2.1 LOCATION WITHIN BUILDINGS

- 52.2.1.1 Vending machines most likely going to be provided in each building.
- 52.2.1.2 Location of area should be carefully considered.
- 52.2.1.3 In all teaching or laboratory facilities provide vending and student locker areas. Locate close to areas of high volume traffic including elevators, stairs and entrances.
- 52.2.1.4 Design vending and locker areas to ensure good view lines from adjacent areas.
- 52.2.1.5 Trash receptacles will need to be strategically places so that those who leave the area will be able to properly dispose of waste. Hot foods not recommended.

52.2.2 FINISHES

- 52.2.2.1 Low maintenance finishes are recommended in area.
- 52.2.2.2 Within vending and locker areas consider shelving for temporary placing of knapsacks, books, etc. Design shelving to minimize vandalism.

52.3 ELECTRICAL

- 52.3.1.1 For energy management purposes, vending machines are to come with vending mizer devices.

54 RECYCLING

54.2 GENERAL

- 54.2.1 Provide niches (minimum one per floor) in central locations on each floor for recycling facilities. For large footprint building additional niches are required. Niche to be able to accommodate recycling facilities (containers for cans/bottles, newspaper, office paper and waste) without impacting on adjacent uses. Locate adjacent to major circulation routes.

56 EXTERIOR STEPS

56.2 GENERAL

- 56.2.1 All exterior stairs shall have handrails on both sides regardless of the number of risers. Where handrails would exceed 5' centre-to-centre, an intermediate handrail is required. For monumental stairs, whether required fire egress exit ways or not, handrails shall be located along the most direct path subject to approval of Vancouver Island University Facilities Management review team.
- 56.2.2 Consideration shall be given to professionally recognized proportioning of tread and riser dimensions, as well as to maximize riser and minimum tread requirements.
- 56.2.3 Positive drainage (1.5 to 2.0 percent slope) shall be achieved to prevent accumulation of water.
- 56.2.4 Where post-mounted hand railing supports occur, careful consideration with drawing details shall be given to embedment of posts to minimize deterioration of the posts and/or the concrete slab or system into which it penetrates. Whenever this embedment occurs in pre-cast concrete system specifications shall be explicit regarding galvanization of the embedded sleeve and any anchors (as a unit after any welding) prior to placed in formwork.

58 BICYCLE RACKS

58.2 GENERAL

- 58.2.1 The design of all Vancouver Island University facilities, or major site renovations shall include adequate bicycle storage with permanently installed racks.

60 WIRELESS COMMUNICATION

60.2 GENERAL

- 60.2.1 All new buildings at Vancouver Island University will have access to the campus wireless network from all areas of the building.
- 60.2.2 All new construction will allow for 1 wireless access point for every 90 sq. m. (969 sq. ft.) of floor area.
- 60.2.3 As the location of wireless access points (WAP) within a building is dependant upon building layout, construction materials and the amount of wireless bandwidth required it is not possible to specify in advance the number of wireless access points needed to meet these requirements when construction is based upon design/build.
- 60.2.4 Vancouver Island University Network Services staff will locate these data drops at the 25% drawing stage.

60.3 ELECTRICAL

- 60.3.1 Wireless access points require a data drop and will be powered over the Ethernet cable. (A nearby AC power outlet is not required).

62 PARKING CONTROL EQUIPMENT

62.2 DESIGN CRITERIA

62.2.1 Designs of new buildings must allow for a maintenance storage room for:

- 62.2.1.1 Snow blowers
- 62.2.1.2 Spreaders
- 62.2.1.3 Salt and ice melts
- 62.2.1.4 Various other seasonally required items

62.2.2 Requirements for these items should be:

- 62.2.2.1 Exterior access – double doors, grade level, door closer on right leaf, flush bolts on left leaf
- 62.2.2.2 Accessible for vehicle to back up to front of storage room to allow loading
- 62.2.2.3 Heated
- 62.2.2.4 Exhaust fan
- 62.2.2.5 Regular fluorescent internal lighting
- 62.2.2.6 15 minute crank timer located inside of door for exterior flood lights
- 62.2.2.7 Finish to withstand moisture, salt and various storage requirements
- 62.2.2.8 Bracing for equipment hanging on one side of wall
- 62.2.2.9 Nominal area (80 sq. ft.) 8' x 10'

64 ELECTRICAL

64.2 GENERAL

- 64.2.1 Provide a complete electrical system complying with the latest edition of all applicable Federal, Provincial and local Municipal codes including:
 - 64.2.2 British Columbia Building Code, Latest Edition
 - 64.2.3 I.E.S. (Illuminating Engineering Society) 8th Edition
 - 64.2.4 CSA C22.1-98, Canadian Electrical Code Part I and related BC amendments
 - 64.2.5 CAN/ULC - S524 (Fire Alarm System installation)
 - 64.2.6 CAN/ULC - S537 (Fire Alarm System Verification)
 - 64.2.7 Comply with all laws, ordinances, rules, regulations, codes and orders of all authorities having jurisdiction relating to this work.
 - 64.2.8 Obtain and pay for all necessary permits, licenses, inspections as required. Arrange for inspection of all work by the respective authorities having jurisdiction.
 - 64.2.9 Include all necessary approval certificates for the project. On completion of work present the final unconditional certificate of approval of the Inspecting Authorities.
 - 64.2.10 Design electrical system to conform with barrier free access requirements

64.3 ENERGY EFFICIENT DESIGN CRITERIA

- 64.3.1 Design shall conform to, or exceed where feasible, the ASHRAE 90.1 energy efficient design standard.
- 64.3.2 The new electrical systems in the facility shall be designed with energy-efficient, cost-effective concepts while at the same time providing a pleasant, safe and healthy environment for the building occupants.
- 64.3.3 State-of-the-art but proven technology shall be selected where possible to achieve optimum energy conservation levels.
- 64.3.4 High power factor energy efficient electronic ballasts shall be used with fluorescent luminaries and high power factor energy efficient ballast shall be used with high intensity discharge (H.I.D.) luminaries. Fluorescent lamps shall be energy efficient T-8 type with colour rendition index over 85 and lamp life over 24000 hours.
- 64.3.5 All illuminated exit signs shall be energy efficient L.E.D. type.
- 64.3.6 A centralized low voltage lighting control system with local control shall control lighting in the building with Lithonia or Douglas systems.

64.4 STANDARD OF PRODUCTS

- 64.4.1 All products and materials used shall be new and where required shall have CSA/ULC labels, or in exceptional cases shall carry special Hydro Inspection labels.

- 64.4.2 All new electrical equipment must not be older than one year from purchase order date, of current manufacture, with assurance of spare parts production availability for the foreseeable future.

64.5 IDENTIFICATION OF EQUIPMENT

- 64.5.1 Products required to have CSA, ULC, or other approval shall be properly identified or labeled indicating that the product has been approved.
- 64.5.2 Nameplates shall be provided for all electrical equipment such as power and distribution transformers power and receptacle panel boards, motor control centres, individual motor starters, fusible or non-fusible disconnect switches etc. Nameplates shall be engraved lamacoid identification plates with black letters on white background fastened by screws or self-adhesive (peel and stick).
- 64.5.3 Panelboards shall be complete with typewritten directory giving load description of each circuit controlled. Directories shall be clearly typed and shall be mounted in a metal frame with clear plastic cover on the inside of panel door.
- 64.5.4 Provide sufficient staff training on the operation of all systems.

64.6 BUILDING POWER DISTRIBUTION SYSTEM

- 64.6.1 Utilized power in the building will be:
- 64.6.1.1 347/600 and 120/208 volt, 3 phase, 4 wire, for interior/exterior lighting and mechanical equipment with motors rated 1/2 HP and over.
 - 64.6.1.2 120/208 volt, three phase, 4 wire to be provided through central or local transformation for miscellaneous incandescent lighting and power equipment with motor rated less than 1/2 HP.
- 64.6.2 Main substation electrical room - requirements:
- 64.6.2.1 Provide separate owners digital metering system on the load side of the main disconnect for instantaneous information of plant power demand, energy consumption, supply frequency, power factor, supply phase and line voltages and also plant load status.
 - 64.6.2.2 Complete L.V. switchboards shall be metal enclosed type with NEMA type 1 enclosure.
 - 64.6.2.3 All bus bars shall be high strength high conductivity copper, sized as required and braced for the approved R.M.S. symmetrical interrupting capacity.
 - 64.6.2.4 Ground bus shall be copper with demountable fixed link to the neutral bus.
 - 64.6.2.5 All main and branch circuit disconnects shall be solid state circuit breakers type with adjustable settings on long time, short time, instantaneous and ground fault to suite individual branch load capacity.
 - 64.6.2.6 Provide a high performance sine wave tracking type transient voltage surge suppressor designed to provide transient voltage suppression and high-

frequency electrical noise filtering unit for the 347/600 and 120/208 volt switchboards and on the load side of the main breakers.

- 64.6.2.7 347/600V and 120/208 V distribution/lighting/power panels are to be bolt-on molded case circuit breaker type, with copper mains, rated for the available interrupting capacity with minimum 20% spare capacity for each panel. Breakers over 200 AMP shall be solid state electronic type with adjustable trip settings.
- 64.6.2.8 Conduits shall be E.M.T. type except where susceptible to mechanical damage, whereby rigid threaded galvanized steel conduit will be used. Underground conduits for branch wiring and conduits in floor slabs to be heavy wall PVC type. Conduits are to be installed concealed in slabs, ceiling space or partitions except in unfinished mechanical, electrical and other utility or service areas where surface installation will be acceptable. Surface conduits shall be supported directly from the structure, using metal clamps or clips. Concealed conduits size will be minimum 19mm dia. or sized according to specific need.
- 64.6.2.9 Provide 3 spare 25mm conduits out of every distribution panel
- 64.6.2.10 Wiring to be copper conductors with TWH, XLPE or THHN insulation, rated 600 volt for branch wiring and RW90 insulation, rated 1000 volt, for panelboard and major equipment feeders. Armoured cable will be acceptable for feeders only.
- 64.6.2.11 H. V. wiring shall be minimum #2 ACSR 100% concentric neutral where H. V. wiring is required.
- 64.6.3 Armoured (BX) cable may be used only for fixture drops, maximum length 1500 mm, and never for branch circuit wiring runs. Provide 2M of slack to allow for future fixture relocation needs. Conduit to be used in all other locations. Connections to transformers and motors to utilize flexible conduit for the last 500mm length.
- 64.6.4 Underground wiring to utilize type RWU90 insulation.
- 64.6.5 Ground system to incorporate ground bus and ground rods in main electrical room, also connected to street side of water meter, if incoming water line is of conductive material.
- 64.6.6 Provide separate green ground wire with all feeders and/or branch wiring installed in conduit.

64.7 INTERIOR LIGHTING

64.7.1 ILLUMINANCE

space type	Requirements	Footcandles (Lux)	Work-plane Height
General Office	Provide a Maintained Illuminance of:	50 fc	30"

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space type	Requirements	Footcandles (Lux)	Work-plane Height
and Administration	Note: Illuminance ratios not to exceed 3:1 (maximum:minimum), Utilize pendant mounted direct/indirect fluorescent luminaires with 70% up and 30% down lighting where ceiling height permits	(540 lux) maintained	(760 mm)
Circulation/ Corridors/Stairs/ Washrooms	Absolute minimum Average maintained illuminance: Note: where circulation occurs within an open area, illuminance is not to fall below a ratio of 4:1 from average illuminance of adjacent area.	10 fc (110 lux) maintained	0" (0 mm)
Storage, Active Files.	Minimum average maintained illuminance:	30 fc (320 lux) maintained	30" (760 mm)
Classrooms	Illuminance ratios not to exceed 3:1 (maximum:minimum), Utilize pendant mounted direct/indirect fluorescent luminaires with 70% up and 30% down lighting where ceiling height permits	50 fc (540 lux) maintained	30" (760 mm)
Kitchen – Common Student Areas	Illuminance ratios not to exceed 3:1 (max:min) utilize a combination of architectural pendant luminaries and down lights with multiple lighting level controls	50fc (540 lux) maintained	30" (760 mm)
Conference /Meeting	Minimum Average maintained illuminance.	30-50 fc (320-540)	30" (760)

	Provide dimming controls	lux) maintained	mm)
	When low-level presentation illuminance is required in meeting rooms the low-level illuminance shall not exceed :	10 fc (110 lux)	
Exterior Exit Door	Minimum average maintained illuminance	5 fc (54 lux)	0" (0 mm)
Exterior Pedestrian Walkways and Stairs	Minimum average maintained illuminance as required by BC Building Code and Worker's Compensation Board Regulations	5 fc (54 lux)	0" (0 mm)

64.7.1.1 Notwithstanding the above, light levels must conform to all codes, laws, bylaws and regulations.

64.7.2 LIGHTING EQUIPMENT

- 64.7.2.1 Utilize cool white Type 841 florescent and or metal halide luminaries.
- 64.7.2.2 Accent and decorative lighting to be H.I.D. or compact fluorescent where possible, with minimum use of high-efficiency incandescent such as Halogen lamps.
- 64.7.2.3 Fluorescent light fixtures in general spaces such as corridors shall be 32 watt T-8 florescent lamps with matching rapid start energy saving electronic ballast, with T.H.D. below 11%. Fixtures shall utilize 4mm acrylic K12 prismatic lens in finished areas.
- 64.7.2.4 Fluorescent light fixtures in office and classroom spaces shall be 32 watt T-8 florescent lamps with matching rapid start energy saving electronic ballast, with T.H.D. below 11%. Fixtures shall be direct/indirect pendant mounted with 70% up lighting and 30% down lighting. All T-8 florescent lamps to be minimum 85 CRI and CCT of 4100K
- 64.7.2.5 Fixtures in unfinished equipment areas to be industrial florescent with reflectors or metal halide in enclosed prismatic low brightness refractors.
- 64.7.2.6 Lighting is to be controlled by building energy management system via low voltage control systems (Lithonia or Douglas) and also can be locally switched throughout the complex, utilizing occupancy sensors. Occupancy sensor to be

used to turn off lights only. Local switches to be used to turn lights on. The exception to above, is fire/security/night lighting/stairwell lighting, which should be switched only at the lighting panel. All lighting panel breakers shall be switching duty rated.

- 64.7.2.7 Lighting in meeting rooms shall be equipped with multi-level or dimming, manual, local switching.
- 64.7.2.8 Lighting in washrooms is to be controlled by occupancy sensor to turn off lights when no activity is detected after the set time period. Location of the sensor is to be in the ceiling and above washroom stalls but needs to detect movement in all areas of the washroom.
- 64.7.2.9 Bank switching in classrooms – front at whiteboard on separate switch and rest of room 100% and 50% switched levels
- 64.7.2.10 Any long linear suspended light fixtures must be specified with fixture lengths that can allow the fixtures to be removed from the room and building with out deconstructing the fixture. This would require long 20 foot sections to be made with maximum length fixture components that can be easily split apart to be removed from the room.
- 64.7.2.11 Emergency lighting shall provide a minimum illumination of 10 lux at floor level for a minimum period of 30 minutes in all instruction spaces, general office areas, exits and along the egress routes providing access to building exits.
- 64.7.2.12 Provide adequately sized local battery units with integral and remote heads, for emergency lighting. Battery units shall incorporate an automatic test feature and self-diagnostics. Connect no more than three remote heads for each emergency lighting home run.

64.8 EXTERIOR LIGHTING

64.8.1 ILLUMINANCE

- 64.8.1.1 Exterior lighting shall consist of high pressure sodium lamp sources.
- 64.8.1.2 Provide lamp standards and luminaires for roadways, parking areas and pedestrian walkways to match existing standards at Vancouver Island University. The lighting fixtures shall be of high cut-off type to provide maximum glare control.
- 64.8.1.3** Provide security lighting on the building to monitor and prevent undesirable activities along the perimeter and all entrances to the complex.
- 64.8.1.4 Minimum average maintained light levels required in lux are:
 - 64.8.1.5 Roadways - 10 lux - uniformity 3:1 (average to minimum)
 - 64.8.1.6 Parking and Service areas -22 lux - uniformity 2:1 (average to minimum)
 - 64.8.1.7 Pedestrian walkways 54 lux- uniformity 2:1 (average to minimum)

- 64.8.1.8 Provide automatic with manual over-ride switchable power supply for the exterior signage, both on and off the building.
- 64.8.1.9 Exterior lighting to be controlled by building energy management system (DDC) and manual by-pass switch in main electrical room or electrical closet.
- 64.8.1.10 Exterior lighting to be 2 separate circuits - each feeding every second fixture throughout. Controls contractor to allow for 2 individual control points for this feature along with associated programming & scheduling.

64.9 MISCELLANEOUS POWER

- 64.9.1 Wiring devices (duplex receptacles and toggle switches) shall be specification grade, white in colour. Provide Class A G.F.I. receptacles in washrooms. Provide brushed stainless steel cover plates for all flush mounted electrical wiring devices.
- 64.9.2 Connect maximum 6 duplex receptacles per 15A circuit for general power and a maximum of 3 duplex receptacles per 15A circuit for computer loads. Provide dedicated circuits as required for office computer printers, photocopiers, fax machines and kitchen areas etc.
- 64.9.3 Provide convenience housekeeping receptacles throughout complex at not more than 15 meter spacing in corridors, including one in each entrance or exit vestibule. Convenience outlets shall be connected separately from other outlets.
- 64.9.4 In offices, meeting rooms, classrooms and similar areas provide at least one receptacle per 2 metres of useable wall length. This is to be adjusted as required in specialized areas. Provide at least 2 outlets with separate circuit in each room.
- 64.9.5 Provide dedicated circuit receptacles for each indoor area vending machine.
- 64.9.6 Provide circuit breaker protected motor starters as required for mechanical systems. Starters to be grouped in motor control centres or panels, in mechanical rooms or electrical equipment areas where possible. Provide local disconnect switch for all mechanical equipment. Use CSA Type 3 enclosures where exposed to weather elements.
- 64.9.7 Heavy-duty, vandal-resistant locks shall protect all electrical equipment in public areas.
- 64.9.8 To provide separate power at rooftop.
- 64.9.9 Provide power at water fountain locations.

64.10 COMMUNICATIONS SYSTEM

64.10.1 TELEPHONES/DATA/CATV

- 64.10.1.1 Provide all materials, labour and expertise to provide telephone cabling and terminations to the main communications room.
- 64.10.1.2 Provide two (2) public pay telephone outlets and data outlets in the reception area. Rough in for two (2) exterior emergency phones (call boxes).

- 64.10.1.3 All data/voice wiring shall be installed in conduit or in cable tray. Where cable tray is used, it shall be minimum 300mm wide with 150mm rung spacing class D type ladder tray.
- 64.10.1.4 Provide data and power wiring to Computer Labs for easy adjustment when modifying and re-arranging equipment. Do not use floor boxes.
- 64.10.1.5 Provide one data outlet to each teaching space under the front instruction board.
- 64.10.1.6 Use “Spider Box” such as Hubbell Multi-Connect recessed wall boxes or equal for multiple power/voice/data/CATV outlets in all room wall outlets - face plates to be stainless steel.
- 64.10.1.7 Provide wiring for an emergency phone located at the exterior of the upper and lower entrance.
- 64.10.1.8 Provide wiring for data throughout the building to suit usage described in Appendix D.
- 64.10.1.9 Provide all materials, labour and expertise to provide CATV cabling and termination to the main communications room.
- 64.10.1.10 Provide existing incoming CATV service from local CATV provider. Provide one CATV outlet in every instructional room.

64.11 DATA AND VOICE CABLING STANDARDS

64.11.1 GENERAL

- 64.11.1.1 All telecommunications cabling at Vancouver Island University must come with a manufacturer’s warranty of at least 20 years. Cable installers must hold whatever certifications required by the manufacturer and comply with any other manufacturer’s requirements to ensure that the warranty is validated. Manufacturers that will be considered for the supply of structured wiring products in alphabetical order are: Amp, Hubbell, Lucent and Nordx. Under no circumstances will a mix of vendor products in any one building be considered.
- 64.11.1.2 In order to provide maximum flexibility all horizontal cabling must be capable of carrying voice or data traffic. All cable runs must be certified capable of handling data to Enhanced Category 5 specifications, terminated in accordance with EIA/TIA 568 A standard and arranged as shown in Figure 1.
- 64.11.1.3 Any proposed deviation from this specification must be approved in advance by Vancouver Island University Information Technology Services. **It will be at the contractor’s expense to remedy any and all installations that do not meet the requirements of this specification.**

64.11.2 COMMUNICATIONS RACKS

- 64.11.2.1 Communications racks will be Electronmetal model EM-19-77/700RR1-BK complete with model EM-05-06/77CT-BK wire management.
- 64.11.2.2 All communications racks are to be arranged as per Figure 1. New racks will leave the middle 30% of the rack or 6u, whichever is greater, available for future expansion.

64.11.3 FIBER OPTIC CABLING**64.11.3.1 Building Entry**

- 64.11.3.1.1 Building entry fiber will be outdoor rated with 12 strands of single mode fiber and 12 strands of multimode fiber. The multimode fiber must be 62.5 micron with a modal bandwidth of at least 160 MHz-km. Building entry fiber will terminate at the top of the main communications rack using ST terminations in fiber patch panels that include integrated cable management.

64.11.3.2 Vertical Cabling

- 64.11.3.2.1 All vertical cabling between communications rooms will consist of six strands of single mode fiber and six strands of multimode fiber. The multimode fiber must be 62.5 micron with a modal bandwidth of at least 160 Mhz-km. Vertical cabling fiber will terminate at the top of a communications rack using ST terminations in fiber patch panels that include integrated cable management.

64.11.4 Rack Voice Cabling

- 64.11.4.1 Voice cabling will be built up in 6u repeatable modules as shown in Figure 1. Each module will consist of:
 - 64.11.4.2 2u 48 port RJ45 patch panel to terminate copper voice feed
 - 64.11.4.3 1u cable management
 - 64.11.4.4 2u 48 port RJ45 patch panel to terminate horizontal field runs
 - 64.11.4.5 1u cable management.
- 64.11.4.6 Voice modules will begin 1u of blank space below the last fiber patch panel and repeat down the rack immediately below the preceding module leaving no vacant space between modules.

64.11.5 Rack Data Cabling

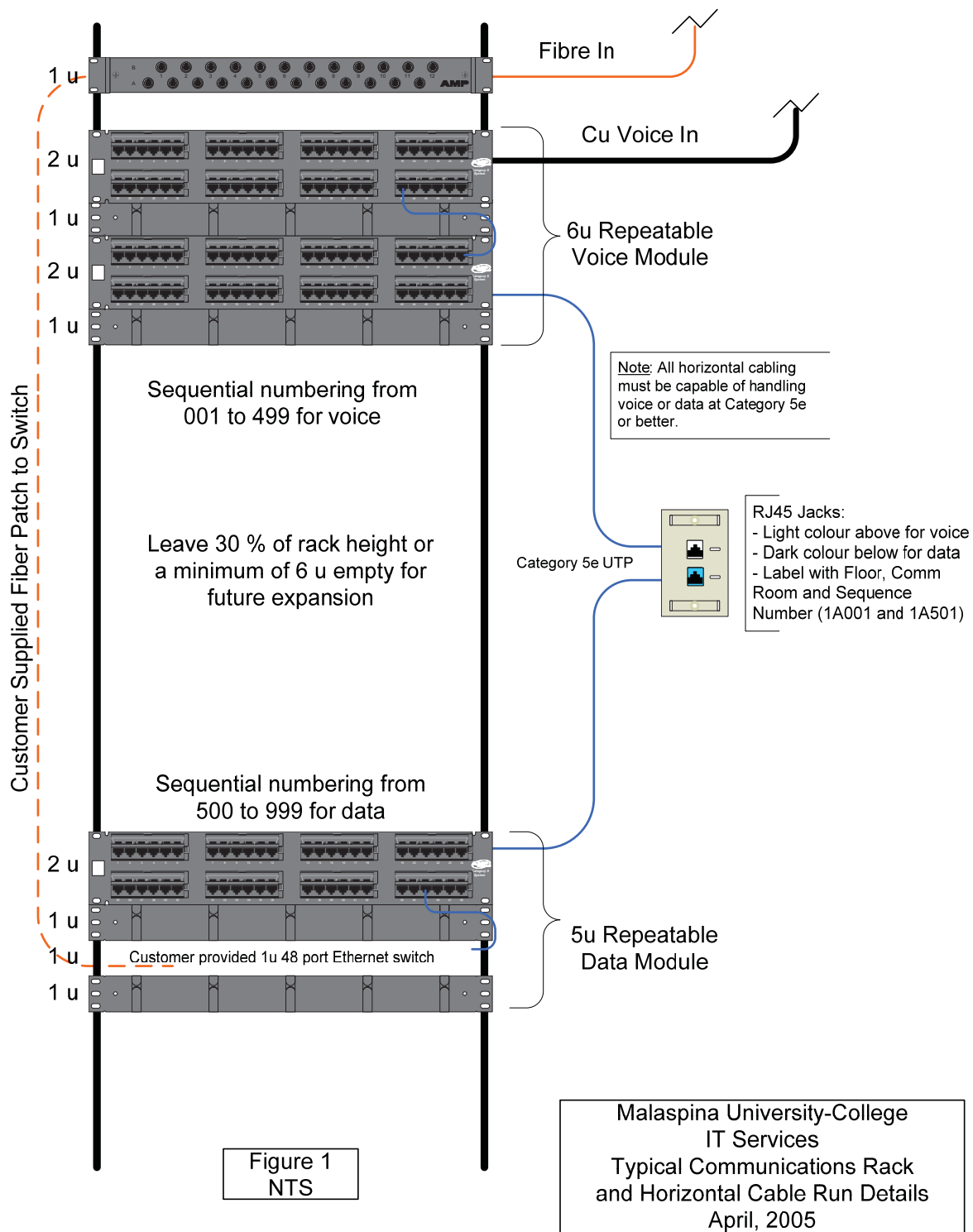
- 64.11.5.1 Data cabling will be built up in 5u repeatable modules as shown in Figure 1. Each module will consist of:
 - 64.11.5.2 2u 48 port RJ45 patch panel to terminate horizontal field runs
 - 64.11.5.3 1u cable management

- 64.11.5.4 1u blank to accommodate customer provided 48 port Ethernet switch
- 64.11.5.5 1u cable management.
- 64.11.5.6 Data modules will start 6u from the bottom of the rack and repeat up the rack immediately above the preceding module leaving no vacant space between modules.

64.11.6 *Horizontal Cabling*

- 64.11.6.1 Horizontal cabling shall be 24 AWG solid, 4-pair UTP. Cable jacketing shall be blue in colour for data, white for voice and shall be lead-free. Cable shall exceed all TIA/EIA and ISO Enhanced Category 5 (Cat 5e) requirements and be characterized to a minimum of 250MHz. Cable performance shall be verified and test results for each run delivered to the Owner. Cable runs will not exceed 90m in length.
- 64.11.6.2 Voice cabling will terminate in the field in a white or light coloured RJ45 wall jack arranged above the companion data jack as per Figure 1.
- 64.11.6.3 Data cabling will terminate in the field in a blue or dark coloured RJ45 wall jack arranged below the companion voice jack as per Figure 1.
- 64.11.6.4 All horizontal cabling will be supported on cable tray from the communications room to within 15m of the destination drop where it may branch to the destination drop. Destination wall jacks will be fed from 12 mm conduit stubbed-up above ceiling level. Installation shall conform to the following:
- 64.11.6.5 Cable shall be installed in accordance with manufacturer's recommendations and best industry practices
- 64.11.6.6 Cable raceways shall not be filled greater than the NEC maximum fill for the particular raceway type
- 64.11.6.7 Cables shall be installed in continuous lengths from origin to destination (no splices) unless specifically addressed in this document
- 64.11.6.8 Where cable splices are allowed, they shall be in accessible locations and housed in an enclosure intended and suitable for the purpose
- 64.11.6.9 The cable's minimum bend radius and maximum pulling tension shall not be exceeded
- 64.11.6.10 If a J-hook or trapeze system is used to support cable bundles all horizontal cables shall be supported at a maximum of four-foot intervals - at no point shall cable(s) rest on acoustic ceiling grids or panels
- 64.11.6.11 Horizontal distribution cables shall be bundled in groups of not greater than 40 cables (cable bundle quantities in excess of 40 cables may cause deformation of the bottom cables within the bundle)

- 64.11.6.12 Cable shall be installed above fire-sprinkler systems and shall not be attached to or come in contact with any ancillary equipment or hardware
- 64.11.6.13 The cabling system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices
- 64.11.6.14 Cables shall not be attached to ceiling grid or lighting support wires
- 64.11.6.15 Where light support for drop cable legs is required, the Contractor shall install clips to support the cabling
- 64.11.6.16 Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the Contractor prior to final acceptance at no cost to the Owner
- 64.11.6.17 Unshielded twisted pair cable shall be installed so that there are no bends less than four times the cables outside diameter (4 X cable O.D.) at any point in the run
- 64.11.6.18 Pulling tension on 4-pair UTP cables shall not exceed 25-pounds for a single cable or cable bundle
- 64.11.6.19 Labeling
- 64.11.6.20 Communications rooms will be labeled by floor number and by ascending alphabetic character per floor (e.g. 1A, 2A, 2B).
- 64.11.6.21 Patch panels will be labeled in accordance with Figure 1; sequential numbering from 001 to 499 for voice and sequential numbering from 500 to 999 for data.
- 64.11.6.22 Wall jack faceplates will be labeled with the communications room designation followed by the appropriate sequential number (e.g. 1A001, 1A500).
- 64.11.6.23 All strands of fiber optic cabling must be clearly identified by source building and room number (e.g. 355-110); mode type (e.g. MM, SM); and numbered sequentially for a given type. Please see Figure 2 for a typical fiber optic labeling sample.



Sample Fiber Patch Panel Labeling

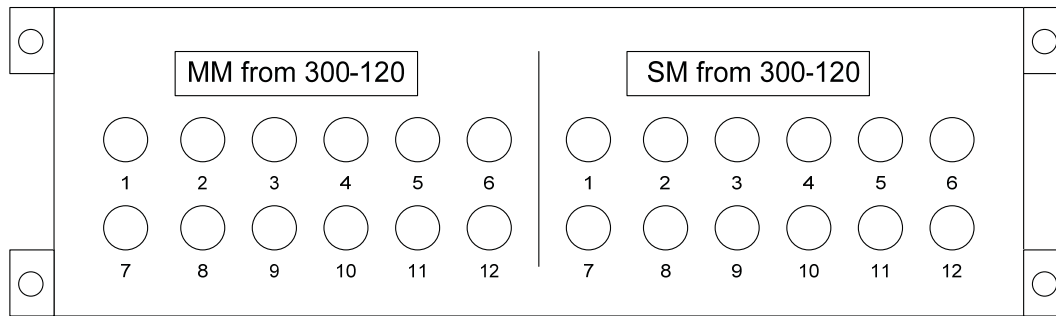


Figure 2
NTS

64.12 FIRE ALARM

- 64.12.1 Provide a complete ULC listed, indicated, multiplex addressable, non-coded, zoned electrically supervised single stage Fire Alarm System as per Building Code requirement and all other relevant regulations.
- 64.12.2 System shall utilize pull stations, alarm signal bells and, where required, smoke and heat detectors and shall be designed to meet current codes and Local Fire Department requirements. Where as areas are protected by sprinkler and standpipe systems, provide alarm and trouble monitoring of all applicable alarm flow switches, pressure switches and supervisory shut off valves, including outdoor Post Indicating Valves (P.I.V.) along the roadway and valve chamber for fire ring main. Alarm and supervisory conditions shall be displayed on an annunciator and to be transmitted to local fire department or monitoring agency. Auxiliary output to be connected to building management system – coordinate with mechanical.
- 64.12.3 Special fire protection systems such as kitchen hood with wet agent ULC 1254.6 shall be connected to the appropriate Building Fire alarm zone.
- 64.12.4 Annunciator panel c/w building floor plan and colour coded zones.
- 64.12.5 Provide connection of fire alarm system to overall campus fire alarm monitoring system. The campus wide fire alarm monitoring system shall monitor alarm and trouble status and annunciate at the main campus fire alarm panels (two panels) one in building 300 and one in building 120, as well as at the remote campus annunciators located on the concrete pedestal on the upper campus, the exterior at entrance 4C and inside building 120. Provide verification for changes to the campus wide fire alarm monitoring system.
- 64.12.6 Update the three campus wide fire alarm annunciators to match the new campus site plan.

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66 MECHANICAL

66.2 GENERAL MECHANICAL PROVISIONS

66.2.1 SCOPE

- 66.2.1.1 All mechanical systems must be designed and constructed using proven technology regarding maintaining durable and effective building envelope assemblies, energy efficiency, occupant comfort, maintainability and operation cost. In general, the approach should be to use proven available state-of-the-art mechanical systems.
- 66.2.1.2 Provide complete, fully tested and operational mechanical systems to meet the requirements described herein and in complete accordance with applicable codes and ordinances. The mechanical systems shall meet the performance guidelines of the following specification. Pay for and obtain all permits, authorizations and inspections required by the latest codes, laws and by-laws for mechanical systems.
- 66.2.1.3 The work specified in this section shall include but not necessarily be limited to:
- 66.2.1.4 Complete HVAC system supply and installation.
- 66.2.1.5 Complete plumbing and drainage supply and installation
- 66.2.1.6 Complete gas piping supply and installation.
- 66.2.1.7 Complete fire protection supply and installation.
- 66.2.1.8 Pipes and ductwork shall be installed in such a way as to conserve head room and interfere as little as possible with the free use of space through which they pass. Service lines shall run parallel to building lines. All duct and pipes at ceiling shall be kept as tight as possible to beams or other limiting members at high end. All pipes and ducts shall be coordinated in elevation to ensure that they are concealed in the ceiling space provided. And as required by code.
- 66.2.1.9 Provide seismic restraints for all equipment, piping and ductwork where required by code.

66.2.2 ENGINEERING

- 66.2.2.1 Provide the following services and submittals for review by Vancouver Island University:
- 66.2.2.2 At the time of completion of Design Development (25% complete design):
- 66.2.2.3 Submit drawings for input and review by the Owner and for coordination with other trades and the Coordinating Professional.
- 66.2.2.4 At the time of Completion of Design:
- 66.2.2.5 Mechanical drawings and specifications suitable for construction issue.

66.2.3 EQUIPMENT SCHEDULES

- 66.2.3.1 Letters of Assurance, Schedules B1, B2 for all mechanical systems;
- 66.2.3.2 During Construction Phase and prior to ordering any equipment submit to the Mechanical Engineer for review:
- 66.2.3.3 Shop Drawings of all equipment.
- 66.2.3.4 At the time of Substantial Completion:
- 66.2.3.5 Letter of Assurance, Schedule C-B;
- 66.2.3.6 As-built drawings of the mechanical systems;
- 66.2.3.7 Operation and Maintenance Manual.
- 66.2.3.8 Provide fixture catalog cuts

66.3 MATERIALS

- 66.3.1 Materials and equipment installed shall be new, full weight and of performance and approved manufacturers specified. Use same brand or manufacturer for each specified application.
- 66.3.2 Each major component of equipment shall bear manufacturer's name, address, catalog and serial number and equipment rating.

66.4 SHOP DRAWINGS

- 66.4.1 Provide shop drawings as indicated in accordance with the MCA-BC standards for shop drawings.
- 66.4.2 Identify materials and equipment by manufacturer trade name and model number. Include copies of applicable brochure or catalog material.
- 66.4.3 Clearly mark submittal material using arrows, underlining or circling to show differences from specified, e.g. Ratings, capabilities and options being proposed. Cross out non-applicable material. Specifically note on the submittal specified features such as special tank linings, pumps, seals, material, or painting.
- 66.4.4 Include dimensional and technical data sufficient to check if equipment meets requirements. Include wiring, piping, and service connection data and motor sizes.
- 66.4.5 Shop drawings shall be endorsed by the General Contractor and Mechanical Sub-contractor indicating that the shop drawings have been reviewed and submitted without qualifications.
- 66.4.6 Submit a minimum of (4) copies of shop drawings prior to ordering equipment.
- 66.4.7 Submit weights of all major equipment for review.

66.5 STANDARDS OF MATERIALS, EQUIPMENT AND INSTALLATION

- 66.5.1 Provide equipment from approved manufacturers. All mechanical equipment shall have the approved manufacturers name permanently affixed to it. Alternates to approved

manufacturers will be considered on review and approval by Vancouver Island University.

66.5.2 Alternatives to the approved manufacturers list must be equal in quality and performance to the approved manufacturers. Equipment that is not equal will be replaced with the specified equipment at no cost to Vancouver Island University. Submit sufficient information to Vancouver Island University to allow review for approval of alternate manufacturers.

66.5.3 The equipment manufacturer shall ensure that the strength and anchorage of the internal components of the equipment exceeds the force level used to restrain and anchor the unit itself to the supporting structure.

66.5.4 Approved manufacturers are as follows:

<u>Item</u>	<u>Approved Manufactures / Suppliers</u>
Access Doors	Acudor, E.H. Price, Maxam, Steel Brothers, Milcor
Actuator Motors	Belimo
Backflow Protection	Watts, Febco, Clayton, Beeco, Wilkins, Conbraco
Boilers (Natural Draft)	Burnham, Bryan, Cleaver-Brooks, Unilux Veissman
Controls (DDC)	Johnson Controls, Intelligent Building Controls, Reliable Controls
Domestic Hot Water Heater	John Wood, Elco, State, A.O. Smith, P.V.I., Ruud
Duct Spiral And Fittings	United Sheet Metal, B.C. Ventilating, Spiro-Lok
Fans – Ceiling Mounted	Greenheck, Broan, Nutone
Fans - Roof Mounted Exhaust	Cook, Greenheck, Acme, Carnes, Penn, Twin City Ventco
Filters	Farr, Continental, Cambridge, AAF, Filtration GRP
Fire Dampers	Canadian Advanced Air, Maxam, Ruskin, Controlled Air, Nailor-Hart

Fire Protection - Sprinklers	Grinnell, Viking, Star, Reliable
Flexible Air Duct	Thermoflex, Wiremold, Flexmaster
Flush Valves	Zurn 6000AV-WS1/YO (Watercloset) Zurn 6003 AV-WS1
Air Handling units/ Gas Fire Make-up Air/ Ventilation Units	Engineered Air, Haakon
Packaged Rooftop	
Grilles, Diffusers and Registers	E.H. Price, Krueger, Titus, Metalaire, Tuttle & Bailey, CARNES
Insulation - Duct/Piping	Fiberglas, Knauf, Johns-Manville, Atlas, Ppg, Manson, Armstrong, Armaflex
Jacketing Material	Childers, Fiberglas, Johns-Manville
Louvers	Airolite, Penn, Westvent, Alumavent, Ruskin
Plumbing Drainage Accessories	Smith, Zurn, Ancon
Plumbing Trim	American Standard, Crane, Cambridge, Kohler, Eljer, Alsons, Bradley, Powers, Symmons, Moen, Delta, Brasscraft, T & S Brass, Emco, Gerber.
Plumbing Fixtures (All To Be Csa Approved)	Crane, K.I.L., Fiat, Kohler, Eljer, American, Moen Standard, Aristanewman, Hytec
Pumps - In-Line	Bell & Gossett, Aurora, Armstrong, Paco, Plad, Grundfos. TACO
Roof Top Air Conditioning Units	Lennox, Carrier, Trane, McQUAY, Engineered Air
Sound Attenuation	I.A.C., Vibron, Vibro Acoustics

Balancing (Air and Water systems)	Scott Technical, Flotech, Honey's Technical, Western Mechanical, K.D. Engineering, BC Tech Engineering
Toilet Seats	Beneke, Bemis, Olsonite, Moldex, Sperze
Valves – Ball	Red & White, Grinnell, Watts, Hills Mccanna
Valves - Gate & Globe	Red & White, Crane, Jenkins, Grinnell, Kitz
Valves - Butterfly	Centerline, Keystone, Grinnell
Valves - Balancing/Flow Meter	Tour / Anderson, Bell & Gossett, Armstrong
Vibration Control Equipment	Vibro-Acoustics, Lo-Rez, Vibron, Korfund, Mason
Water Pressure Reducing Valves	Wilkins, Slinger, Watts, Clayton, Bermad

66.6 PAINTING AND IDENTIFICATION

- 66.6.1 Clean all exposed bare metal surfaces supplied by the mechanical and plumbing trade by removing all dirt, dust, grease and millscale.
- 66.6.2 Repaint all marred factory finished equipment, which is not scheduled to be repainted, to match the original factory finish.
- 66.6.3 Natural gas and sprinkler piping shall be colour banded at 6' intervals over their entire lengths throughout all exposed areas and in the mechanical room as required by code and as follows:
 - 66.6.4 Gas: Yellow - C.G.S.B. 505-101
 - 66.6.5 Fire protection (where exposed): Red 509-102
 - 66.6.6 Provide pipe markers and direction arrows - in all exposed areas and in the mechanical room:
 - 66.6.7 Pipe marker letters are to be 50mm high for pipes 75mm and larger outside diameter (including insulation) and not less than 18mm high for smaller diameters.
 - 66.6.8 Location of pipe markers and direction arrows.
 - 66.6.9 Pipe marker and direction arrow shall be placed side by side in the bottom quarter of the pipe to be identified.
 - 66.6.10 Adjacent to all major changes in direction and at connections to each piece of equipment.

66.6.11 At least once in each room that the pipe passes through.

66.6.12 Where piping passes through walls, partitions, or floors, identify piping on both sides of the section and at entry and exits to shafts.

66.6.13 Ceiling access panel identification the location of terminal units, valves, etc. Above ceiling panels shall have their location identified by means of a colored tack or data dot.

66.7 TEMPORARY HEATING

66.7.1 Do not use the permanent system for temporary heating or other purposes without written permission from Vancouver Island University.

66.7.2 All equipment used shall be returned to new condition and warranties extended.

66.8 EQUIPMENT PROTECTION AND CLEAN-UP

66.8.1 Protect equipment and material in storage on site and after installation until final acceptance. Leave factory covers in place. Take special precautions to prevent entry of foreign material into working parts of piping and duct systems.

66.8.2 Thoroughly clean piping, ducts and equipment of dirt, cuttings, and other foreign material.

66.8.3 Protect bearings and shafts during installation. Grease shafts and sheaves to prevent corrosion. Supply and install necessary extended nipples for lubrication purposes. Install for easy access by maintenance away from moving parts.

66.9 SITE UTILITY SERVICES

66.9.1 Co-ordinate and maintain liaison with Vancouver Island University to interrupt, re-route or connect to water, sewer, storm, heating or gas systems, with minimum interruption of service. Contact respective utility companies prior to starting work. Provide minimum of 72 hours notice. No disruption to campus operations during normal campus hours.

66.9.2 Designer is to confirm outgoing storm and sewer line sizes and connection points so as to meet the flow requirements of the new building.

66.9.3 Install anti-rodent measures to both ends of all utility service duct banks – consult with Vancouver Island University for detail.

66.10 ELECTRICAL MOTORS

66.10.1 Provide motors to CEMA and C.S.A. standards for hard, continuous service, designed to limit temperature rise to 40C for open housing and 50C for drip proof housing, and operate 1200 or 1800 R.P.M. unless otherwise specified. Do not use air over ratings.

66.10.2 Motors shall have ball or roller type bearings with grease lubrication fittings.

66.10.3 All belt-driven devices shall have the motors mounted on adjustable bases with adjusting screws so that proper belt tension can be obtained.

66.10.4 Where equipment has been specified to be complete with starters, disconnects and/or control panels, this contractor shall provide any required wiring and conduit between the equipment and the above items.

66.10.5 Motors of 15 kW and greater shall have capacitor and thermistor over heat protection. Motor noise criteria shall not exceed NC-60.

66.11 ACCESS DOORS AND PANELS

66.11.1 Provide access panels required in building construction including in architectural walls and ceilings for access to any concealed mechanical equipment which, in Vancouver Island University's opinion, requires maintenance or adjustment. Access panel shall match wall/ceiling finish.

66.11.2 Such panels shall be manufactured panels, with fastening devices, appropriate to the construction involved, provide access panel for hand access, 18"x 18" min. In wall / ceiling to all mechanical system (such as valve, damper) requiring access. Dry wall surface: Milcor style DW flush panel access door; masonry tile surface: Milcor style M; plastered wall: Milcor style K.

66.12 ACCESS OF EQUIPMENT

66.12.1 Make all arrangements to ensure that adequate access is available for all mechanical equipment. Do all hoisting and rigging into place of all specified equipment and be responsible for any damages incurred there from.

66.12.2 Contractor is to demonstrate reasonable access to all equipment service locations, if found otherwise, remediation will be at contractors expense.

66.13 LIABILITY

66.13.1 Assume full responsibility for laying out the work and for any damage caused to Vancouver Island University by improper location, or carrying out of the work.

66.13.1.1 Examine and be responsible for the site and the local conditions affecting the work.

66.13.2 Arrange work in co-operation with other trades in the building in such a manner as not to interfere with other work being carried on in the building and places where other pipes and equipment be installed along with the pipes and ducts pertaining to this trade. Co-operate with the other trades to get all the pipes, ducts, conduit, etc., Installed to the best advantage. When open web structural joists are used, must obtain structural shop drawings to ensure space available for installation of pipes and ductwork.

66.13.3 Where any pipes, ducts and equipment must be built into the work of other trades such as masonry, structural, or plastering, be responsible for supplying the equipment to be built in or measurements to allow the necessary openings to be left. All pipes and ducts which are to be concealed shall be installed neatly and closely to the building structure

so that the necessary furring can be kept as small as possible. Any pipes, ducts, or other work which are not, in the opinion of Vancouver Island University, installed as they should be, shall be taken out and replaced without cost to Vancouver Island University.

66.13.4 Protect finished and unfinished work from damage due to the carrying out of this work, giving special attention to the protection of building vapor barriers, waterproof membranes, etc. Cover floors and other parts of the building with tarpaulins, etc., and repair all damage to the satisfaction of Vancouver Island University. During freezing weather, protect all his materials in such a manner that no harm can be done to the installation already made and/or to materials and equipment on the job.

66.13.5 Be responsible for the condition of all materials and equipment supplied and shall provide all necessary protection for same.

66.13.6 Be responsible for the protection and maintenance of the work of this section until the building has been completed and accepted by Vancouver Island University.

66.13.7 On completion of the work, all tools and surplus and waste materials shall be removed and the work left in a clean and tidy condition.

66.14 GUARANTEE WARRANTY

66.14.1 Furnish a written warranty stating that all work executed under this division will be free from defects of material and workmanship for a period of two (2) years from the date of substantial performance, which shall include one (2) complete summer and one (2) complete winter of uninterrupted operation. Warranty shall include any part of equipment, units or structures furnished hereunder that show defects in the works under normal operating conditions and/or for the purpose of which they were intended.

66.14.2 The contractor shall at his own expense promptly investigate any mechanical or control malfunction, and repair or replace all such defective work, and all other damages thereby which becomes defective during the time of the guaranty-warranty.

66.15 PIPE CHASES AND DUCT SHAFTS

66.15.1 Unless otherwise indicated, conceal piping and ductwork in the construction of the walls and ceilings, and in pipe chases, duct shafts and furring. If it is necessary, move the location of pipes and ducts from those indicated and provided.

66.15.2 Minimize number of chases and shafts and locate in areas less likely to be affected by future renovations.

66.15.3 Roof drain lines within the building are to be carefully reviewed to ensure that their locations are in walls that are not likely to be renovated/removed/relocated.

66.16 INSPECTION

66.16.1 Vancouver Island University may choose to inspect all work prior to it being concealed.

- 66.16.2 The contractor shall notify Vancouver Island University in writing for the following minimum, but not limited to, inspections: (Required to provide a Schedule 'C' for occupancy)
- 66.16.3 Below grade piping prior to backfill.
- 66.16.4 All HVAC and plumbing rough-in prior to wall and ceiling finish installation.
- 66.16.5 Fire stopping of all openings.
- 66.16.6 Drop test all fire dampers and demonstrate access.
- 66.16.7 Trip test the fire protection system.
- 66.16.8 Pre-occupancy inspection.
- 66.16.9 Final occupancy inspection and verification of all equipment being fully operational.
- 66.16.10 All work shall be approved by any other regulatory body having jurisdiction where required.
- 66.16.11 The contractor is to provide copies of all permits, inspection reports and certificates for insertion into the maintenance manual.
- 66.16.12 The contractor is to provide Vancouver Island University reasonable notice prior to calling an inspection.

66.17 SUBSTANTIAL PERFORMANCE INSPECTION

- 66.17.1 Prior to the contractor requesting an inspection for substantial performance all the following items must be provided to permit beneficial use by Vancouver Island University:
 - 66.17.2 Maintenance and operating manuals to be submitted.
 - 66.17.3 As-built drawings submitted.
 - 66.17.4 Balancing reports (air and water.)
 - 66.17.5 All systems shall be certified in writing by the contractor as complete and fully operational.
 - 66.17.6 Instructions to Vancouver Island University operating personnel shall be provided in accordance with the specifications.
 - 66.17.7 A complete list of items which the contractor has not finished, or are deficient shall be provided. If, in the opinion of Vancouver Island University, this list indicates the project is excessively incomplete, a substantial completion inspection will not be performed.
 - 66.17.8 The contractor shall be fully responsible to accumulate all necessary data from his sub-trades and suppliers and present same in the specified format for the approval by Vancouver Island University.
 - 66.17.9 All life/safety items such as sprinkler systems, fire stopping, fire dampers, plumbing and ventilation fixtures and ventilation must be operational.

66.18 LAWS, NOTICES, PERMITS AND FEES

- 66.18.1 Give all necessary notices, obtain all necessary permits and pay all fees in order that the work specified may be carried out, and furnish any certificates necessary as evidence that the work installed conforms with the law and regulations of all authorities having jurisdiction.
- 66.18.2 All work shall be in accordance with the regulations of the following authoritative bodies, the codes in effect at the time of tender, and any others having jurisdiction:
- 66.18.2.1 Canadian Electrical Code AND BC ELECTRICAL INSPECTION BRANCH
 - 66.18.2.2 1998 B.C. Building code
 - 66.18.2.3 Worker's Compensation Board Standards
 - 66.18.2.4 Canadian Standards Association
 - 66.18.2.5 C.S.A. codes governing refrigeration plants
 - 66.18.2.6 B.C. Gas Inspection Branch
 - 66.18.2.7 B.C. Boiler Inspection Branch
 - 66.18.2.8 Canadian Gas Code B-149.1-00
 - 66.18.2.9 National Building Code of Canada
 - 66.18.2.10 National Fire Protection Association

66.19 DEMONSTRATION AND INSTRUCTION TO VANCOUVER ISLAND UNIVERSITY AND VANCOUVER ISLAND UNIVERSITY REPRESENTATIVES

- 66.19.1 Demonstrate to and instruct the representative designated by Vancouver Island University on the complete mechanical systems operating and maintenance procedures using the assistance of specialist sub-trades and manufacturer's representatives.
- 66.19.2 The following systems shall be demonstrated in regards to performance and safety features (to the fullest):
- 66.19.3 Heating, ventilation, and air conditioning systems
 - 66.19.4 Exhaust systems
 - 66.19.5 Controls system
 - 66.19.6 Plumbing Systems
 - 66.19.7 Fire protection systems
- 66.19.8 Obtain a signed statement from a Vancouver Island University representative certifying that the demonstration and instructions have been given to his satisfaction.
- 66.19.9 These requirements are in addition to those stated Operating and Maintenance Data Section.

66.20 TESTING

- 66.20.1 Perform all testing required by the authority having jurisdiction.
- 66.20.2 Obtain test certificates for all tests performed and include in operating manuals.
- 66.20.3 Perform the following tests: (where applicable)

66.20.4 Sanitary & storm hydraulic test.

66.20.5 Gas piping leakage test as per CSA Gas CODE

66.20.6 Sprinkler system tested to NFPA standards.

66.20.7 Domestic water test to 1 1/2 times max water pressure or (200psi).

66.20.8 Ductwork - test medium velocity systems to a static pressure of system + 2" of W.G.

66.20.9 Drop test all fire dampers.

66.20.10 All tests specified by equipment suppliers and manufacturers to demonstrate the equipment has been correctly installed.

66.20.11 All test shall be documented and witnessed by the Contractor Mechanical Engineer or the general contractor or the owner's representative.

66.21 BALANCING

66.21.1 Contractor is to provide the services of an approved professional testing & balancing firm.

66.21.2 Provide a balance report of all air & water balance points and performance testing & balancing of all equipment as per the AABC.

66.21.3 Balance all air and water quantities to - 5% or + 10% of the design requirement.

66.21.4 Provide all required sheave, belt and impeller changes to achieve the required fan and pump flow rates. Changes to be updated in as built documentation

66.21.5 Measure and balance the following (where applicable):

66.21.6 Supply, exhaust and return fan volumes and speeds from all equipment.

66.21.7 Airflow at each air outlet and branch connection.

66.21.8 Adjust pattern control on supply diffusers.

66.21.9 Motor amperage draw on all motors and compare with motor rating.

66.21.10 Water at each balance valve and terminal heating or cooling unit.

66.21.11 An independent commissions agent will be engaged to oversee the balancing and commissioning of the building systems. Consult with Vancouver Island University prior to selection.

66.22 PIPE & PIPE FITTINGS

66.22.1 Ensure all pipe materials and fittings are acceptable to the authority having jurisdiction.

66.22.2 All type 'K' copper must be certified to ASTM B88. Provide written guarantee that lead free solder was used on all domestic water systems.

66.22.3 Approved pipe & fittings: (Non-combustible construction)

<u>Service</u>	<u>Pipe</u>	<u>Fittings</u>
(a) Sanitary above grade	DWV copper	Wrought Copper or cast brass 95-5 solder cast iron gasket with stainless steel coupling
(b) Sanitary below grade	cast iron ABS P.V.C./D.W.V.	gasket with stainless steel coupling Solvent joint Solvent joint
(c) Storm drainage above	cast iron copper	gasket with stainless steel coupling copper or brass with 95-5 solder
(d) Storm drainage below	cast iron ABS P.V.C./D.W.V.	gasket with stainless steel coupling Solvent joint Solvent joint
(e) Footing Drainage	P.V.C. SDR#35	Solvent joint
(f) Domestic Water Above	Type 'L' Hard Copper	Wrought copper or brass with 95.5% solder (lead free)
(g) Domestic water buried	P.V.C. Ringtight Cement lined ductile iron Type 'K" & 'L'soft Copper	Grooved mechanical joints Grooved mechanical joints Wrought Copper or brass 95-5 solder
(h) Fire protection	To N.F.P.A. Standard	Screwed or mechanical joints

66.22.4 Contractor to provide drains at all low points in the piping system.

66.22.5 Alternates to approved materials will be considered on review and approval by Vancouver Island University.

66.23 SUPPORT, ANCHORS & SEALS

66.23.1 Provide all necessary supports, and hangers to secure mechanical systems and equipment.

66.23.2 Provide fire stopping at all duct and piping penetrations through rated floors/walls and shafts.

66.23.3 Provide oversize hangers on all cold pipes to fit over pipe insulation where required.

66.23.4 Provide isolation and prevent contact with dissimilar metals.

66.23.5 All sleeves for mechanical piping to extend 1" above the floor in all mechanical room, shaft and wet areas.

66.23.6 All ductwork to be supported as per SMACNA.

66.23.7 All exposed piping penetrations shall be provided with escutcheons.

66.24 VALVES

66.24.1 SCOPE

66.24.1.1 Provide valves for domestic water, gas and refrigeration systems.

66.24.1.2 Provide gate, globe, ball, butterfly, drain and check valves.

66.24.1.3 Provide all necessary valves suitable for the fluid and piping system.

66.24.1.4 All valves must be suitable for a working pressure 1380 kPa at 121%.

66.24.1.5 Install all valves in upright or horizontal position.

66.24.1.6 Provide drain valves at all low points in the piping system.

66.24.1.7 Provide isolation valve at each plumbing fixture.

66.24.1.8 Valves permitted:

	< 2" Diameter	2" Diameter >
Domestic Hot & Cold	Gate, Ball	Gate, Butterfly
Heating Water	Gate, Ball	Gate, Butterfly

66.24.1.9 Valves up to 2" diameter can be sweated or screwed connection. Valves larger than 2" diameter must be screwed, flanged or mechanically coupled to piping system.

66.25 VIBRATION ISOLATION

66.25.1 SCOPE

66.25.1.1 Provide vibration isolation for all motor driven equipment. To maintain noise criteria levels at or below ASHRAE recommended levels.

- 66.25.1.2 Provide spring isolator for all motor driven equipment larger than 1/2 H.P. For equipment 1/2 H.P. and less Neoprene isolators may be used. Unless mounted to a surface adjacent to full time occupied space then will be spring isolation, regardless of motor size.
- 66.25.1.3 All isolators provided shall incorporate seismic restraints. Isolators for base mounted equipment shall be seismic isolators.
- 66.25.1.4 Provide horizontal limit springs on all fans (except vertical discharge) in excess of 0.3" static pressure.
- 66.25.1.5 All floor mounted non isolated equipment (ie. boilers, tanks, air handling units) shall be bolted to structure and be designed for a 2g applied horizontal force.
- 66.25.1.6 Submit shop drawings of isolator, which are not supplied by the equipment manufacturer.
- 66.25.1.7 All electrical connections to equipment to be provided with flexible connectors and cable with a minimum 30° bend or flexible conduit.
- 66.25.1.8 Provide flexible ductwork and piping connections and duct vibration isolators to all equipment which incorporates vibration isolations.

66.26 SEISMIC REQUIREMENTS

66.26.1 SCOPE

- 66.26.1.1 Seismic restraints for all equipment, ductwork, and piping. Attachment to structural members.
- 66.26.1.2 Reference standards: Seismic requirements shall be in accordance with the following:
 - 66.26.1.3 1998 B.C. Building code section 4.1.9
 - 66.26.1.4 N.F.P.A. 13
 - 66.26.1.5 SMACNA "Guidelines for seismic restraints of mechanical systems and plumbing piping systems".
- 66.26.1.6 Contractor to provide professional certification from specialist seismic items trade prior to report for completion or occupancy inspection, whichever is the earlier.
- 66.26.1.7 The installation of seismic restrains shall not compromise vibration isolation capabilities.

66.27 INSULATION

- 66.27.1 Installation shall conform to the B.C.I.C.A. Quality Standards Manual for mechanical insulation.
- 66.27.2 Piping insulation
- 66.27.3 Provide vapour barrier for all cold pipes.

66.27.4 Rain water leaders to be insulated in all heated spaces.

66.27.5 All exposed piping to be complete with PF-3 economy finish. No finish required on concealed piping.

66.27.6 Provide insulation thickness and type as follows: (where applicable)

<u>Service</u>	<u>Size</u>	<u>Insulation Thickness</u>	<u>Type</u>
Domestic hot & cold	up to 1"Ø	½ "	Mineral fibre
Domestic hot & cold	1 1/2"Ø & up	1"	Mineral fibre
H/C Plumbing Traps	all	½ "	Mineral fibre (removable cap)
Storm R.W.L.	all	½ "	Mineral fibre
Condensate drain	all	½ "	Mineral fibre

66.27.7 Insulate all exposed traps under handicapped sinks with factory installation kit.

66.27.8 Insulate air conditioning unit condensate drain for the first (5'-0")

66.27.9 Domestic water piping insulation on mains and piping in ceiling space. Drops down walls to fixtures are not required to be insulated.

66.27.10 Provide heat tracing and weather proof jacketing for all piping insulation exposed to the weather including hydronic heat pump and make-up water connection to fluid cooler.

66.27.11 DUCTWORK INSULATION

66.27.11.1 Provide external ductwork insulation as per the following: (where applicable)

<u>Service</u>	<u>Thickness</u>	<u>Type</u>
Air conditioned supply	1"	Mineral fibre thermal
Heating supply air duct	1"	Mineral fibre thermal
Outside air intake	1"	Mineral fibre thermal
Ductwork in unheated space	1"	Mineral fibre thermal

66.27.11.2 All exposed ductwork in mechanical rooms to be rigid insulation with RF4 economy finish.

66.27.11.3 Provide vapour barrier in accordance with specification EF-2

66.27.11.4 Exposed heating and air conditioned ductwork installed in an exposed area in which it is serving, need not be insulated.

66.27.11.5 External insulation is not required where ductwork is internally lined.

- 66.27.11.6 Ductwork exposed to the weather shall be provided with weather proof jacketing (P.V.C. or Aluminum).
 - 66.27.11.7 Main discharge ductwork from air handling units are to be insulated. Branch run outs to diffusers less than 20 feet and flexible connections are not required to be insulated.
 - 66.27.11.8 Make-up air ventilation ductwork is not required to be insulated.
- 66.27.12 ACOUSTIC INSULATION**
- 66.27.12.1 Provide 1" internal acoustic neoprene duct liner upstream and downstream a minimum of 10'-0" from all supply, return and exhaust fans ½ hp and larger.
 - 66.27.12.2 Provide 1" internal acoustic neoprene lined return air elbow for all heat pumps and provide a minimum of 10 feet and one elbow of 1" internal acoustic neoprene lined ductwork on the discharge from all heat pumps.
 - 66.27.12.3 All insulation edges must be sealed. Provide fasteners at 12" O.C. with pins cut and capped.

67 PLUMBING GENERAL

67.2.1 SCOPE

- 67.2.1.1 Review the architectural drawings for location and number of plumbing fixtures to be provided in the building. All plumbing fixtures to be of commercial quality, with flush valve type wall outlet water closets and urinals.
 - 67.2.1.2 Provide roof drainage to new roof areas, including piping and connection to existing storm system.
 - 67.2.1.3 Provide footing drainage and sediment sump.
 - 67.2.1.4 Provide domestic cold, hot, and hot water recirculation piping to new fixtures, complete with piping insulation, isolation valves.
 - 67.2.1.5 Provide hose bibbs at exterior of building at every side of the building. Exterior hose bibbs shall be non-freeze type with vacuum breaker and lockable wall box.
 - 67.2.1.6 Provide a DHW and DCW hose bib at a central location on each roof level.
 - 67.2.1.7 Comply with BC Plumbing Code Current Version.
 - 67.2.1.8 Supply and install cleanouts on all drains, changes in direction, at base of riser and on main sanitary and storm leaving building in addition to the B.C. Plumbing Code.
 - 67.2.1.9 Supply solenoid valve, connected to DDC, to any trap primer water supply.
 - 67.2.1.10 Where drains are located over an occupied area, membrane clamp is to be provided with drain for a waterproof installation.
- 67.2.2 Prior to commencing the underground plumbing installation, excavate and verify:
- 67.2.2.1 The location, elevation and size of storm and sanitary service connections.

- 67.2.2.2 The sanitary and storm lines can be routed and sufficiently sloped with adequate cover for freezing protection to meet the service connections.
- 67.2.2.3 Inform the engineer immediately if any changes are required.
- 67.2.3 All floor drains shall have trap primer connection.
- 67.2.4 Lead free solder to be used for all potable water systems. Contractor to issue guarantee of such in maintenance manual.
- 67.2.5 Provide unions to all equipment and valved connections for 2-1/2" and below. Flanged connections for 3" and over.
- 67.2.6 Provide necessary thrust block, anchor, etc. to underground water piping at all change of direction, all tees and at the end of all mains and branches.
- 67.2.7 Provide any excavations necessary for the installation of the mechanical work. No cutting, boring or excavating necessary for this work in or about the building which may cause interference with the progress of the work or weaken the structure in any way, shall be undertaken. Trenches for all underground piping shall be excavated to a depth slightly more than required and graded so as to secure all available fall. Support each length of pipe with concrete blocks and bricks, or backfill the trench with gravel to the required depth and grade. Sanitary and storm lines outside of the building shall be kept as deep as practical.
- 67.2.8 Backfilling in all trenches shall be with sand or pea gravel where approved, 150mm below pipe and up to 150mm over top of piping.
- 67.2.9 Where sewer, water or storm pipes pass through exterior walls below grade, shall install corbels on the exterior walls and run bridging for corbel to undisturbed soil for the support of the pipes. One inch thick waterproof mastic shall be applied around the pipes which pass through the wall.
- 67.2.10 Provide chrome escutcheon plate for all plumbing rough-in. (metal only)
- 67.2.11 Gas piping shall comply with National Standard of Canada CAN1-B149.1-00 and the BC Gas Safety Branch Bulletins. Installation code of natural gas burning appliances and equipment. Provide necessary pressure regulator to suit. Prime coat and paint lines exposed to outdoor.
- 67.2.12 Provide Seismic valve to main gas feed. Re & Re existing gas utility piping to accommodate new building requirements.
- 67.2.13 Provide lead sheet flashing and sheet metal counter flashing for pipe passing through roof deck structure.
- 67.2.14 Provide non-conducting type connection for joining or supporting. Provide separation between dissimilar metals.
- 67.2.15 Provide stop valve to all equipment and plumbing fixture connection. Provide stop valve to base of water risers. Provide isolation valves for all fixture trim unless complete with integral stops.

67.3 PLUMBING FIXTURES & TRIM

- 67.3.1 Provide commercial quality drains and plumbing fixtures throughout the building. Provide low water consumption fixtures. Shop drawings and list of proposed plumbing fixtures to be submitted for review by Vancouver Island University. Refer to the list of approved manufactures.
- 67.3.2 Plumbing fixtures of the same usage and type must be of the same manufacturer. i.e. all water closets to be of the same manufacture and all sinks to be of the same manufacturer.
- 67.3.3 All plumbing fixtures to be CSA approved and meet the requirements of the BC building code for handicapped accessibility where required.

67.4 CLEANING & CHEMICAL TREATMENT

- 67.4.1 Provide for cleaning and disinfection of all domestic hot & cold water systems.
- 67.4.2 During system flushing ensure that all control valves and other system valves are in the full open position.
- 67.4.3 All domestic water piping shall be thoroughly flushed so that it is free from all scale, sediment etc.

67.5 FIRE PROTECTION

- 67.5.1 Provide complete sprinkler system complying with NFPA No. 13 1996, and local municipal by-laws and requirements. In addition, to comply with Vancouver Island University's insurance authority requirements. all material shall be listed by ULC or approved for sprinkler use. Pipe sizing by hydraulic calculations.
- 67.5.2 The Sprinkler Contractor is to include in his tender the cost of providing hydraulically calculated, engineered fire protection system.
- 67.5.3 The engineer shall obtain relevant water flow and pressure characteristics from the Owner for use in his design.
- 67.5.4 The engineer shall provide all professional letters of assurance (from the British Columbia Building Code) that may be required by the local Building Inspector, and provide site reviews of the installation sufficient to satisfy requirements of such submissions.
- 67.5.5 Contractor is responsible for obtaining water supply information and preparing hydraulic calculations accordingly. Allow 10% safety margin (or a minimum of 10 psi) on pressure at base of risers. Contractor to confirm incoming water line size required by hydraulic calculation before water connection application and installation of any on site plumbing.

- 67.5.6 Contractor to perform testing in presence of Vancouver Island University and submit NFPA Testing contractor's Certificate.
- 67.5.7 Provide spare sprinkler heads for system (less than 300 heads, provide 6 and up to 1000 heads provide 12), and turn over to Vancouver Island University at the end of construction.
- 67.5.8 Run all piping concealed. Piping subject to freezing to be insulated and heat traced.
- 67.5.9 Design standards:
- General floor areas N.F.P.A.-13, light hazard, wet system.
 - Mechanical & service rooms NFPA – 13 ordinary hazard, wet system.
- 67.5.10 Supply & install following for Fire alarm/trouble supervision:
- Valve movement supervisory switch for all moveable valves
 - Low water pressure switch.
 - Alarm flow switches for each level of the building
 - All else as required by code
- 67.5.11 Coordinate sprinkler head locations with the reflected ceiling plan and center heads on the ceiling tiles. Coordinate sprinkler head locations with other ceiling mounted devices such as lights and diffusers.

67.6 METERING

- 67.6.1 Provide digital water metering of the main water supply to the building or major zones of the building. Confirm type of meter with VIU.

68 HVAC SYSTEMS

68.2.1 SCOPE

- 68.2.1.1 The building HVAC system will consist of:
- 68.2.1.2 Natural gas fired packaged rooftop AC units with DDC controlled outside air dampers with Belimo actuator motors – factory enthalpy and economizer controls not required;
- 68.2.1.3 Heating and cooling cycles to be controlled by DDC;
- 68.2.1.4 Rooftop units to be configured/zoned to accommodate optimum zone control for the different room functions/space utilization and orientation i.e. increased heating load of computer labs, solar exposure, regular instruction space, administration, general purpose rooms, etc.;
- 68.2.1.5 Proposed design to be reviewed with Vancouver Island University ;
- 68.2.1.6 Washroom, storage and janitorial exhaust fans (door grills allowed for these locations only);
- 68.2.1.7 Return air transfer boots & grills
- 68.2.1.8 NOT APPROVED
- 68.2.1.8.1 Unit Ventilators

- 68.2.1.8.2 Door grills for return air (except as noted above)
- 68.2.1.8.3 Under cutting of doors for return of relief air
- 68.2.1.9 Design Conditions
 - 68.2.1.9.1 Outdoor design temperatures to be as per the 1998 B.C. Building Code:
 - 68.2.1.9.2 Winter 1% outdoor design
 - 68.2.1.9.3 Summer 2.5 % outdoor design
- 68.2.1.10 Indoor design temperatures to be as per the following:
 - 68.2.1.10.1 General public usage & meeting rooms 23°C Cooling
 - 68.2.1.10.2 General public usage & meeting rooms 21°C Heating
 - 68.2.1.10.3 Washrooms & changerooms 21°C Heated
 - 68.2.1.10.4 Storage rooms 18°C Heated
 - 68.2.1.10.5 Service Rooms 30°C maximum
 - 68.2.1.10.6 All areas – night set back 16°C Heated
- 68.2.1.11 Ventilation requirements as per ASHRAE 62-1989
- 68.2.1.12 Acoustic requirements as per ASHRAE standards:
 - 68.2.1.13 Finished office space NC-35
 - 68.2.1.14 Meeting rooms and classrooms NC-30
 - 68.2.1.15 Storage rooms and washrooms NC-40
 - 68.2.1.16 All other spaces NC-35
- 68.2.1.17 Provide washroom exhaust system ductwork and ceiling mounted grilles for all public washrooms, to a minimum of 15 AC/HR or 2 CFM/ sq.ft.
- 68.2.1.18 Provide rooftop mechanical equipment, complete with roof curbs, seismic restraints, equipment start-up and balancing, electrical and natural gas supply. Provide 120V utility outlet at each unit for maintenance purposes. Ensure vibration and noise isolation. Mount rooftop units over corridors and storage rooms wherever possible.
- 68.2.1.19 Provide one set of filters with each unit and a second set, to be installed at substantial completion.
- 68.2.1.20 Provide approved fall arrest anchors on each rooftop unit that requires maintenance access closer than 2 metres (6ft) from roof edge and where not provided in the roofing specification.
- 68.2.1.21 Provide ducting distribution, ceiling diffusers to suit ceiling design, and direct digital controls to meet desired operation.
- 68.2.1.22 Provide ventilation for electrical rooms, storage rooms, and elevator machine room.
- 68.2.1.23 Provide all systems with energy saving considerations.
- 68.2.1.24 Submit a list of all proposed equipment, for review by a Vancouver Island University representative.

- 68.2.1.25 Provide approved screening around rooftop units for aesthetic purposes – screens not to reduce operating efficiencies of units

68.3 SHEET METAL DUCTWORK

- 68.3.1.1 Ductwork shall be galvanized steel, lock formed 2" W.G. SMACNA standard for low velocity and medium velocity ductwork quality. Fabricated in accordance with SMACNA duct manuals and ASHRAE handbooks. Ductwork shall meet the requirements of NFPA 90A and 91 and conform to applicable codes.
- 68.3.1.2 Prior to fabrication of ductwork, check all ceiling spaces and heights and conflict with other trades. Include and provide necessary offset to maintain ceiling height, headroom etc.
- 68.3.1.3 Provide minimum 450mm x 450mm (18"x 18") access panels to manual dampers, equipment, fire dampers.
- 68.3.1.4 All ductwork shall be delivered to site in a clean condition and remain clean. During installation all open ends of ductwork shall be capped with sheet metal or poly and kept clean.
- 68.3.1.5 Provide flexible duct connections from duct branches to supply air diffusers, 915 mm (3'.0") Flexmaster "Fab-4" or equivalent, maximum. Flex shall be thermally insulated if supply ductwork is insulated.
- 68.3.1.6 All ducts associated with fans, and other vibration isolated equipment shall be installed with flexible connections on the inlet and outlet openings.
- 68.3.1.7 All ductwork penetrating fire separations shall be complete with fire dampers.
- 68.3.1.8 Provide balancing dampers where indicated on drawings and at all duct branches. Provide additional balance dampers at the request of the balancing agent to facilitate balancing.
- 68.3.1.9 Paint all visible ductwork through supply, return or exhaust grilles to background colour. Coordinate on site.
- 68.3.1.10 Size all ductwork to ASHRAE standards or 0.1 "/100 feet of static pressure and a maximum of 1200 feet per minute velocity.
- 68.3.1.11 Provide seismic supports for grilles, diffusers, and ducts where duct length exceeds 5X duct diameter (as per code).
- 68.3.1.12 Provide turning vanes for all rectangular elbows installed as per SMACNA.
- 68.3.1.13 Roof mounted ducts shall have standing seams and sealed water-tight.
- 68.3.1.14 Provide back draft damper to all exhaust outlets at exterior.
- 68.3.1.15 Provide galvanized steel screen, 1/2" x 1/2" square mesh for exterior intake & exhaust outlets.
- 68.3.1.16 Provide flashing, curb and counter flashing for all ducting passing through roof and external envelope of the building.

68.4 FIRE DAMPERS

- 68.4.1 Provide U.L.C. Approved fire dampers made of galvanized steel or prime coated black steel weighted to close and lock in closed position when released by fusible link.
- 68.4.2 Fire dampers in low-pressure ductwork may be multi blade or curtain type.
- 68.4.3 Fabricate combination fire and balancing dampers with linkage readily adjustable in open position.
- 68.4.4 Curtain fire dampers shall have blades retained in a recess so free area of connecting ductwork is not reduced.
- 68.4.5 Fusible links shall be set for 72°C.
- 68.4.6 The contractor shall drop test all fire dampers and provide a written report confirming that all fire dampers have been tested and are operational.

69 BUILDING AUTOMATION SYSTEM

- 69.2.1 Provide a Building Automation System (BAS) incorporating Direct Digital Control (DDC), energy management, equipment monitoring and control consisting of the following elements:
- 69.2.2 An extension of the campus METASYS or Reliable network of automated controls installed by the following approved contractors:
- 69.2.3 Johnson Controls Ltd.
- 69.2.4 Intelligent Building Controls Ltd.
- 69.2.5 Houle Electric (Reliable System)
- 69.2.6 Microcomputer based remote stand-alone controllers interfacing directly with sensors, actuators and environmental delivery systems.
- 69.2.7 A two-Wire communication network to allow data exchange between stand-alone controllers and between stand-alone controllers, network control processors and the central BAS computer. Existing Johnson Controls (N2) trunk cable between buildings 200 and 195 will be re-routed to SOMC communications room or main DDC panel location. Reliable System trunk will be new and fed in from building 120
- 69.2.8 All other computer hardware and software, modem interface, communication devices, controllers and field sensors and electrical components necessary to meet the specified performance.
- 69.2.9 Setting in place all field devices of valves, flow meters, water pressure and differential taps and devices, flow switches, current switches, thermal wells, dampers, air flow stations, and current transformers where required or necessary to complete a building automated control system.
- 69.2.10 The installer must be a licensed representative, affiliate or operating division of the controls manufacturer with a minimum of five (5) years experience installing BAS's. The supplier shall have a complete support facility to provide a 24 hour a day, seven days a week emergency repair service.

- 69.2.11 The system shall be installed by competent mechanics and technicians, regularly employed by the BAS manufacturer with full responsibility for proper operation of the BAS including debugging and proper calibration of each component in the entire system.
- 69.2.12 The Building Automation System shall incorporate Direct Digital Control (DDC) and provide:
- 69.2.13 Colour display graphics to monitor and control all system parameters and setpoints. Located on the campus central control computer.
- 69.2.14 Optimum start/stop and operational control sequences of HVAC equipment and interfacing of all controls as specified.
- 69.2.15 Equipment fault, fire system fault, sump pump high level and operating setpoint alarms where indicated.
- 69.2.16 Monitoring, scheduling and adjustment of operating setpoints as indicated (space temperatures, DHW temperatures, heating water temperatures, space humidity levels, supply air temperatures equipment operating status, CO2 etc.)
- 69.2.17 Modular in nature, the BAS shall be capable of expansion in both capacity and function with the addition of DDC controllers and field devices.
- 69.2.18 Each DDC controller shall have a minimum of 20% spare capacity for future I/O point connection in proportions to the specified functions. Provide a minimum of two spares for each I/O type per controller and expansion cards.
- 69.2.19 Provide sufficient internal memory to perform the specified control sequences and an additional 25% capacity for future use.
- 69.2.20 Monitoring and totalization of metering of electrical power (kW, kWh, pf), water consumption, and natural gas.
- 69.2.21 Monitoring and control of all aspects of building lighting system, fire protection system, security system and any other systems as designated.
- 69.2.22 The BAS controllers and system software shall include an operating system, data base management, communications control, scheduling applications, stand-alone equipment control and incorporate:
- 69.2.23 Dynamic colour graphic representations and menu driven, window type functions with complete mouse-activated operation.
- 69.2.24 Equipment scheduling, totalization and optimization.
- 69.2.25 HVAC energy management routines to be reviewed with owner
- 69.2.26 Preprogrammed algorithms for typical HVAC control .
- 69.2.27 Trend and history files.
- 69.2.28 Printed and audible alarm processing.
- 69.2.29 Application and custom software to accomplish all sequence of operations of the equipment.
- 69.2.30 Equipment maintenance and parts inventory program
- 69.2.31 Remote access with graphic capabilities via web browser

69.2.32 Network (Ethernet) connectivity – owner to supply IP address as required.

69.2.33 Add CO2 sensor to return air of ventilating unit.

69.2.34 The BAS will control the lighting (see section # in electrical specification for details).

69.2.35 The BAS will monitor a signal from the fire alarm panel to shutdown fan systems as required in the event of a fire.

DESIGN GUIDELINES

Vancouver Island University

REVISION DATE: May 7, 2009
