PART C: DESIGNING FOR BURNABY CAMPUS

SUSTAINABILITY AND GREEN BUILDING STANDARDS

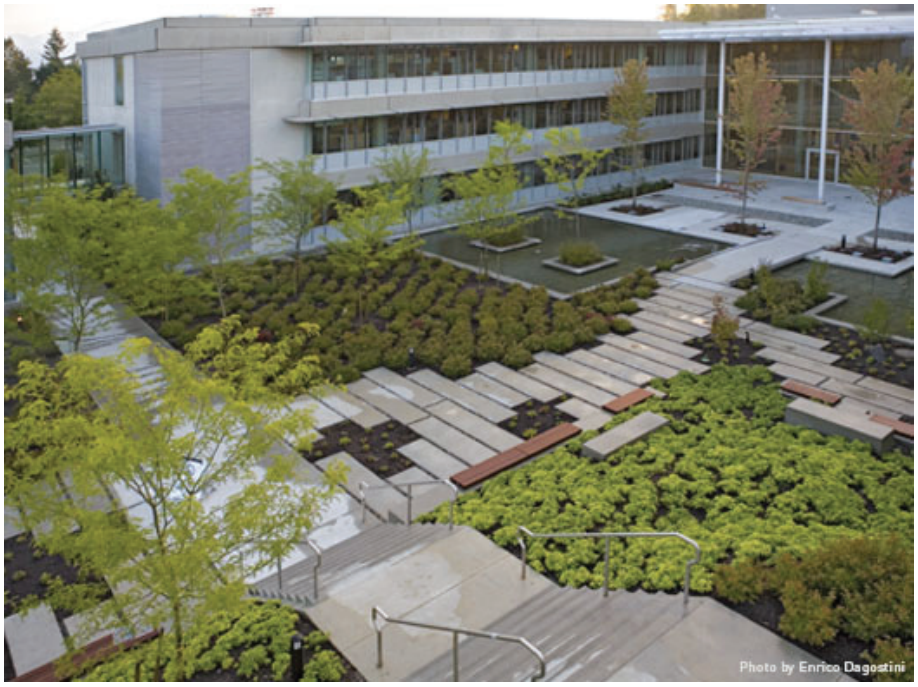

figure C-1: Blusson Hall Courtyard

In addition to LEED certification requirements for major capital projects, Facilities Services upholds these green building principles to be applied in designing projects:

- Design and construct green building projects that meet the highest environmental standards as project budget allows
- Select environmentally preferable products wherever feasible
- Design to minimize waste (water, material and energy waste), using integrated design of systems to reduce life cycle costs
- Optimize and manage water use

The design team is encouraged to integrate these principles into the design processes from the beginning to maximize benefits of integrated design.

See ***Appendix C-3: SFU Energy Standards***.

NAMING SYSTEMS ON CAMPUS

Assigning Building Names

The University Architect/Chief Facilities Officer, in consultation with the Board of Governors, President and Vice-Presidents can provide and approve official building names.

At the same time, each building name is assigned a commonly used acronym and 3-digit building number. Obtain these from Records staff.

Campus Reference Levels

Every level of every building on campus is placed relative to a campus reference level that ranges from Level 00 (approximately 305 m) to Level 17 (about 370 m), representing the almost 70 m rise in elevation in the site. Consult with the Project Representative to designate the reference floor levels.

See ***Appendix C-4 : SFU Building Floor Reference Level***.

Space Standards

See ***Appendix C-5 : SFU Space Guidelines***.

Room Numbering

Tip:

Have room numbers assigned as soon as plans are fixed so that floor plans and drawings, door and equipment schedules and signage packages can all be referenced to the one set of room numbers from Send the request to ssuh@sfu.ca

Building room numbering and floor level standards are critical to provide a consistent way finding identification system across campus. The same methodology is applied to both stand alone buildings and to interconnected buildings. To ensure standards are consistent, Records staff is responsible for assigning all room numbers. The following is provided for general guidance on basic principles applied:

- The main building ground entry level is always designated as 1000 level, ascending by 1,000's i.e. 1000 level, 2000 level, etc.
- In a terraced building where grade access might occur at more than one level, the lowest grade access level is designated as the 1000 level
- The first level below ground is 100 level and floors below this descending by 100's i.e. 100 level, 00 level, 0 level.

Exceptions: In service or maintenance buildings, parkades and open air or slab on grade structures, etc., the ground entry level is designated as 100 level, floor levels ascending by 100's, i.e. 100 level, 200 level etc.

- Each building floor level is also referenced back to a campus wide Reference level, so that every building on the campus has a reference level relative to the floors of adjacent buildings. This is a useful mechanism due to the terraced buildings on Burnaby Mountain.
- Consultants are not allowed to assign construction numbers to room floor plans. All

construction drawings must incorporate the final, approved room numbers.

In assigning the room numbers, Records staff will also automatically "reserve" the room numbers in Archibus, the university space inventory records. Do not assign (temporary) Project room numbers. See ***Appendix C-6: SFU Room ID Standards.***

Door Numbering

Following Guidelines ***Appendix C-7 : Door Numbering and Labeling Requirements.***

DESIGNING FOR UNIVERSAL ACCESS

This requirement applies to the design and construction of new buildings and renovation work on existing buildings on campus to make buildings fully accessible and usable by all the public, including, disabled persons.

SFU's long term strategic plan is to provide and maintain a primary east west circulation corridor at the 3000 level as a wheel chair accessible corridor across the campus. Design attention must be given to circulations paths from parking areas to building entrances, circulation routes between buildings, as well as circulation corridors within buildings. The many terraced levels on Burnaby campus can also pose unique circulation challenges for wheelchair users and special attention must be paid to the proximity of elevators and appropriate coordination of door hardware with security access controls along the travel path of wheelchair users.

All Consultants must ensure that all design work (in both new and existing building projects) provides handicap accessible design as required by current codes, including but not limited to British Columbia Building Code and Master Municipal Construction Documents (MMCD). In addition, comply with any additional requirements over and above code, where directed by SFU project representative.

It is also the responsibility of the primary consultant to incorporate design specifications that include way finding signage directing persons with disabilities to the accessible areas and features. All sign work is to comply with SFU Sign Standards as outlined elsewhere in this document.

During the design phase, the Consultant should arrange with the Project representative to review access design specifications with SFU Director, Centre for Students with Disabilities.

DESIGNING PUBLIC AREAS & SPECIFIC FUNCTIONAL SPACES

Public Circulation and Study Areas

Facilities Services manages all public spaces such as public corridors, atrium, lobbies, lounges and study spaces. Since campus buildings are often open 24/7, these public spaces are heavily used, and attention should be paid to designing durable, functional spaces that are well lit and designed appropriately.

See ***Appendix C-8 : SFU Green standard - Common Area***.

figure C-2: Blusson Hall Corridor

Offices

See ***Appendix C-9: Green Standard - Offices***

Wet -Labs

See ***Appendix C-10: Green Standard - Wet- Labs***

Link to Green Fume Hood web-site .

Washrooms

See ***Appendix C-11 Green Standard - Washrooms***

Recycling

Within interior spaces, waste receptacles and recycling containers are provided by Facilities Operations. Convenient Recycling Centers should be created for separating recyclables including mixed paper, returnable bottles and pop cans, and for other recyclables such as plastic containers, tin cans, etc.

See ***Appendix C-12: Burnaby Campus Recycling Bin location Map_2010***).

The building loading dock is also the collection point for recyclables. Provision should be made for the containers for recycling materials which include cardboard, Styrofoam, etc. Consult with Facilities Waste Management for space arrangement and requirements.

figure C-3: Central Stores Loading Bay

Custodial Rooms

Custodial rooms are required for every building, equipped with:

- Slop sink: 3'-0" large on the floor, concrete or a durable fiberglass material with one temperature control tap, a faucet, and a hose connection.
- Walls: Locate the slop sink in the corner with ceramic tile (or other completely water repellent material) on both walls out at least a foot past the edges of the slop sink. The backer board behind the ceramic tile is Hardy plank.
- Flooring: Non slip vinyl with an abrasive strip embedded to prevent slipping.

- Shelving: A minimum of five wall mounted shelves for storage of janitorial material and enough space on the floor to store both a janitors mop pail, a cleaners cart with cleaning supplies and a large garbage can.

- Lighting: The lighting should be energy efficient and is auto on/off....controlled off door position indicator switch.

- Electrical: Duplex outlets, no more than 6 m apart, are required in the corridors and the classrooms for vacuuming/floor washing machines. Do NOT put janitorial outlets on any circuits that are used for classrooms, a/v or data.

SPECIFYING ARCHITECTURAL SYSTEMS

Exterior Glazing Systems

Aluminum frames on campus buildings are typically PPG Canada K61213ZX D600 EZX Dark Moss Green. The alternate is anodized aluminum.

Ceilings (T-bar and drywall systems):

The original campus buildings built in the 1960's and 70 were imperial. The buildings after 1990 are metric. Specify matching system grids, and do not use soft conversions for dimensions.

Ceilings in typical areas are a suspended T-bar system on a 610 x 1220 mm grid for ceiling tile and light fixtures (except for older buildings which are on an imperial 2' x 4' grid)

Limit the use of inaccessible (drywall) ceilings because of the following:

- There is difficulty in accessing sprinkler and electrical components above drywall ceiling for maintenance and future renovations.

- It limits the flexibility of the occupancy of the space on the floor above regarding changes (i.e. HVAC and electrical).

Access panels (600 x 600 mm. minimum) must be provided as required for access to electrical, mechanical and sprinkler. Plans must specify, where necessary, access panels to all valves, fire and balancing damper, VAV boxes (including isolation valves), sprinkler mains, clean-outs, telephone conduit, etc., in all G.W.B. ceilings and walls. This includes stubbed-out drainage, vent, and cold water pipes.

Specifying Interior Doors

Matching existing standards within a building is imperative to maintain the consistent aesthetic across the campus, and should be followed unless impractical, out of production or non-code complying.

Non-building standard doors may be used only if approved by Facilities Services. Glass entry door hardware must be ADA compliant and conform to the BC Building Code 2004

▶ Tip:

As an alternative to the standard single door application and depending on the application and location, the Project Representative may approve the installation of a combination wood and glazed sidelight in wood frames, glass entry door, glass entry door and sidelight or double glass entry doors.

Note that any of these alternatives will increase project cost to the department.

and SFU's Hardware standards.

Due to security failures use of aluminum frames is generally discouraged and should only be used in places approved by Facilities. When they are used, aluminum frames must be reinforced with a cross bar or steel, to prevent break-ins.

All interior doors are solid core, and alternatives must be approved by both the department and the Project Representative.

Door Hardware and Secure Access

Campus Security is the authority to guide the determination of an appropriate security plan for the building and the appropriate level and type of security measures to apply. Campus Security must be consulted regarding all access control devices.

The following general guidelines are provided:

- Wherever possible, all exterior building entrance and exit doors must have a proximity card reader and be wired back to Campus Security for electronic lock-down.
- Campus Security provides the Project (as a Project cost) with permanent Abloy cores and specifies the key schedule. The Contractor as part of the Project cost installs the permanent cores. All lock sets must be keyed to the building master system.
- Locking hardware on required egress doors from a suite are required to comply with BCBC Article 3.3.1.12 and shall be operable with one hand and one releasing operation. If / where threat of break in is a concern, request to exit devices should be installed to send an alarm back to Campus Security.

Keys & Cylinders

Facilities Services through Campus Security will provide building standard cylinders and two keys for each building standard demising door which must be keyed to the Building master system. Construction cores are provided by the GC in Major Projects. Lockable interior door(s) must have the lock(s) key-coded to the Building master-key system, for maintenance and emergency access. Any 'exception' requiring special or high security locking must have the approval of Facilities Operations to ensure janitorial and/or emergency access are provided as required.

Standard specification is for Permanent Schlage lock sets (installed by General Contractor) with Abloy keyways (installed by the university).

Door numbering is done early in the project and alphanumeric door tags related to the room numbers are assigned at that time. Door tags are installed by the project and coordinated with Campus security.

All requests for keys should go through Campus Security, who will require written authorization and a deposit from the User. All doors are required to be on the building standard key system.

User Individual Access Control / Security Systems

Campus Security must be notified if any 'individual security system' is being contemplated by a Departmental office. In general, the Burnaby Campus has an open door 24/7 policy and corridors are treated as streets, allowing access through to a variety of Departments. Access control on corridors is not generally encouraged and will only be granted on an exceptional basis.

If requested, the Campus standard security card access system can be extended to the Departmental User entry door at the User's expense. The installation must include tying into the Building fire alarm system so the lock will release upon a fire alarm signal. Refer to Sentence 3.4.6.15(4) of the BC Building Code 1998 regarding releasing requirements for the electromagnetic locking devices on exit doors.

Campus Security and Facilities Services must ensure verification that the installation has been tested and operates correctly. Note that electromagnetic locking devices on exit doors may have been provided on the buildings on an equivalency basis.

Interior Finish on Exterior Walls

The interior finish on exterior walls 5/8" or more shall be drywall with a paint finish. Contractors shall not fix to or puncture the exterior drywall membrane for the installation of partitions, furniture, electrical outlets, etc.

Demising Partitions (between Departments and as designated)

As a standard, demising partitions to delineate between Departmental areas must be full height and typically 64 mm steel studs, with 64 mm batt insulation fill (where required) and 16 mm drywall each side; taped, up to the slab above, as a minimum on one side. Apply acoustic sealant along the perimeter.

Inter office security is paramount in faculty offices and the demising walls should continue to underside of the slab, not stop at the suspended ceiling.

Corridors and/ or any paint in common areas is generally required to be SFU white.

Deviations may be allowed in paint colour finishes on the interior side of the demising partitions, subject to Facilities Services' approval. Costs are estimated not only to paint initially, but to repaint, should the room occupant and/or department is moved.

Confirm if fire fighting provisions pertaining to distances for access by a fire hose might impact the requirement for fire separations. Contractor should confirm dimensions on site when abutting existing walls. Gypsum board surfaces are generally NOT to receive vinyl, fabric, or other wall covering.

Partition walls should be aligned with window mullions, but should not be attached to the mullion. Care should be taken in the connection design to permit removal of interior partitions without damaging the mullions.

Sound Transmission

The following methods are acceptable to reduce sound transmission between offices:

- Additional layers of G.W.B. applied to partitions above and below ceiling.
- Acoustic wall covering applied on Departmental side of area.
- Studs increased to 89 mm with 89 mm acoustic batt insulation.
- Lead sheath laminated between G.W.B. and extended above ceiling.

Flooring

Typically resilient flooring is either sheet vinyl with heat welded seams, linoleum heat welded sheet goods or tiles such as rubber. Bases are typically 4" black rubber. Resilient flooring (including seams) should be sealed. Flooring with raised profiles are discouraged at this time.

Polished concrete floors are a good option for corridors and public circulation areas for maintenance as well as a environmentally preferred choice. Polished concrete floors must have a 2" topping, poured separately from the structural slab.

Carpet is generally discouraged and will be provided only if funded by the Department. This is due to higher cost to replace, maintain and clean carpets and the higher custodial costs which may be charged back to the Department. Where carpet is requested, only modular carpet tile should be specified.

Where carpet tiles are to be installed, use a premium grade, low VOC (solvent free) acrylic waterproof release type adhesive as recommended by carpet tile manufacturers. The User shall tape all raised floor joints with painters tape prior to carpet installation.

Finished flooring in office and classroom areas should be installed before the walls are installed, allowing for ease of removal and adjustment back to the original configuration.

▶ Tip:

Furniture and case goods are provided as part of major capital projects. Minor capital projects do not fund furniture ; these must be paid for by the department. To assist users in maintaining and keeping up the furniture on campus, Facilities Services maintains a Furniture Access database of furnishings acquired in major projects.

Generally, purchasing agreements negotiated during tender will include buying agreements for some of the specified products for fixed periods of time following completion of the project.

Departments can take advantage of this preferred pricing for procurement of small quantities not originally supplied with the project. Contact the Project Representative or Procurement Buyer for details.

Furniture and Case Goods

Systems furniture is generally discouraged because of their high initial capital cost, the increased maintenance costs to stock parts and replace broken components and the costs to reorganize new layouts.

Many of the case goods for classrooms and offices are supplied by Calstone which has a reliable track record for institutional quality furnishings. Consultants and users are encouraged to consider specifying these products as Calstone has a take back policy that returns goods rendered surplus due to reconfiguration of space. The products are returned to the plant for refurnishing and reassembly into new product.

Millwork

For major projects such as new buildings and major renovations, new millwork should be specified as Custom or Premium Grade, as outlined in the AWMAC (Architectural

Woodwork Manufacturers Association of Canada) Standards Manual, complete with a two year AWMAC Guarantee on all millwork and wood doors and frames. In minor projects and small renovations, often involving existing millwork to be modified, this requirement does not apply.

Tip:

Blinds can help keep heat in (in winter) and help to save energy. Departments and individual Users are requested to close the blinds at the end of the day

Blinds and Sun Control

Standard window coverings on the campus are roller shade blinds which should be provided on all exterior windows. The roller shade blinds typically are not to be removed or altered by Contractors or its sub contractor(s).

Departmental generated projects must protect the blinds with plastic bags, as part of their projects expense, during renovations. If existing blinds need to be taken down to install partition walls, the cost is borne by the project.

Departmental and Room Signage

SIGNAGE PROVIDED BY THE PROJECT:

- Standard elevator lobby directional signage
- Departmental entrance door

SIGNAGE PROVIDED BY THE DEPARTMENT/USER (COORDINATED BY FACILITIES):

- Departmental/ User ID signage on the main floor lobby directory.

Irrespective of who funds the signage, all Departmental signage must be approved by Facilities Services before installation. Departmental signage requests can be made online by completing a sign request form to Facilities Operations. For departmental funded signage, it is recommended that the Department provides drawings of the proposed signage to the Facilities Services representative before fabrication begins.

SFU Burnaby signage standards are currently being updated with the new SFU logo.

Departments are strongly discouraged from using scotch tape etc to tape paper signs to the walls and doors as they destroy the wall surface and ultimately, detract from the overall appearance.

Room and Door Numbering/Labeling

For rooms within a larger room and which are only accessible through the larger room, the interior rooms have a decimal designation off the main room number (e.g. 103.1).

Room doors should have the same number as the room (e.g. 103A door for 103 room). For rooms with more than one entry door, add a unique alpha reference (e.g. 103A, 103B, etc.) for each door.

Every Project must provide and install lamacoid labels designating the door number on every door supplied on the project. The label is to be applied on the upper hinge side of the door. Consult with the Project Representative on labelling standards and supplier .

See ***Appendix C-7 : Door Numbering & Labeling Requirements***.

Specifying Elevator and Loading Dock Equipment

ELEVATOR SPECIFICATIONS

There are about 65 elevators of various types and manufacturers on campus. The range of elevators include hydraulic and traction type, accessible and freight elevators. The majority of these units are maintained by Kone under the current maintenance contract. There are 7 elevators in the Residence buildings that are currently maintained by Otis. There are projects budgeted each year to upgrade elevators, as well as aesthetic improvements.

There are loading docks and receiving areas at most of the academic buildings on campus. The main receiving point on campus for deliveries is Central Stores in the Facilities Services Building.

SPECIFYING HEATING AND VENTILATION SYSTEMS

Specifying systems to be compatible and consistent with existing mechanical systems is essential. Systems must integrate high efficiency performance standards to save energy for the University wherever possible. Components must be of industrial quality and designed and installed to facilitate access for maintenance.

Refer to ***Appendix C-13: SFU Mechanical systems Design Checklist***

See ***Appendix C-14: 2011 Energy Efficiency Act*** for standard regulation.

Central Heating and Ventilation system

The majority of the campus is heated from 5 gas fired boilers in the Heating Plant centrally located in the basement of the Library building. There are 4 main campus heating zones. The heating mains are typically not buried underground but run through the interconnected buildings, parking garages and service tunnels. Recent progress has been made to provide sub-meters at each building entry point to better understand the energy consumption on campus and contain rising energy costs.

Individual buildings are serviced by Air Handling Units (AHU's) to distribute conditioned air throughout the space. Air Handling Systems generally control the temperature of the spaces and the amount of fresh air make up required. These functions are generally controlled through the Building Automation Systems or DDC system.

Piping

All heating, chilling and domestic water lines must be insulated regardless of the length of run and must be labelled to SFU standard pipe and duct labelling requirements

See ***Appendix C-15: SFU Standard Pipe and Duct Labeling Requirements***.

Cooling

No cooling is generally required or provided for general use spaces; cooling is restricted to spaces with specific user requirements e.g. for controlled environmental needs to support research and equipment. This no-cooling policy reduces energy consumption and energy costs of the university by taking advantage of the cooler temperatures of the mountaintop campus to maintain temperatures at a comfortable level.

DDC Temperature Control

The temperature control or Direct Digital Control (DDC) system is part of the **Building Management Control System** across campus. The DDC system has been installed to gain more efficient control of heating, ventilation and air-conditioning (HVAC) systems. Wall mounted temperature sensors have been located on each floor and all sensors, controllers and actuators are electronic and tie directly into the control system for quick response and

figure C-4: DDC Control System

reporting. The control system is monitored at Facilities Services during normal hours and at Campus Security offices during off hours.

GENERAL

All DDC based controls shall be interfaced with the existing **DDC Andover** and/or **Delta control** systems. Andover system shall be installed and/or installations supervised by **Houle Electric Ltd.** Delta system shall be installed and/or installations supervised by **ESC Controls Ltd.** The company present service contracts guaranty the system operation.

All installed control equipment shall be of the same manufacturers with the latest technology updates and backward comparable capabilities.

All control software shall have existing/comparable control algorithms and logic that can be easily custom built or adjusted by users.

All modifications of the existing DDC controls and new controls shall be updated with the latest available technologies and revise existing graphics to include changes.

All new control points shall be connected to the closest existing or new **Infinity Andover** or **Delta control** panels if spare points are available. When existing panels are full, then new Infinity Andover or Delta control panels with minimum 8 input/output points shall be installed. New panels shall be capable of interfacing with existing systems.

Any new panels shall be located in the mechanical rooms.

All required up-grade of existing controls graphical displays and all related cost shall be included in the project scope of work.

COMMISSIONING

Commissioning shall meet ASHRAE Commissioning standards. For new buildings or major renovations, commissioning shall comply to LEED requirements.

The Controls Contractor shall assist Electrical Contractor during the variable frequency drive start-ups and testing.

Controls Contractor shall assist Balancing Contractor during the balancing, start-ups and testing of mechanical systems.

See ***Appendix C-16 : Burnaby Campus Mechanical Standards***.

DESIGNING WATER, SANITARY AND STORM SYSTEMS

Water Tower

The City of Burnaby supplies the Water Tower which acts as the reservoir to provide domestic water as well as water provisions for fire fighting for campus buildings. From the Water Tower, water is distributed to campus buildings and is limited to a constant pressure of about 80 m(68-110 psi).

Water, Sanitary and storm systems

Domestic water, sanitary and storm systems are connected to the City of Burnaby services. Back flow protection is provided on the domestic water service.

Facilities Services is a certified Water Purveyor for the campus and does regular water quality testing of the potable water supplied on campus.

Refer to ***Appendix C- 16 : Burnaby Campus Mechanical Standards.***

Specifying Plumbing Systems

Connection points for water, ventilation and sanitary stacks are to be centralized in building core service areas. Departmental renovations affecting plumbing should always be coordinated through Facilities Services to ensure that system compatibility is maintained.

Water supply lines to User facilities shall be tied into existing valves located in the Building core service areas. Separate isolation valves are to be provided for each User premises. Hot and cold water lines must be insulated with preformed fiberglass insulation.

Plumbing fixtures for washrooms and shower stalls must be low flow type to conserve water.

SPECIFYING FIRE PROTECTION SYSTEMS

The buildings pre 1990 are generally not-sprinkled. Facilities Services is working to increase the number of sprinkled buildings on campus.

SPECIFYING ELECTRICAL SYSTEMS (FIRE ALARM, POWER AND LIGHTING)

Fire Alarm Systems

SFU is equipped with Simplex and Honeywell Fire Alarm Systems.

Each building has a standalone single stage addressable fire detection and alarm system. The fire system panels are generally either Honeywell CLS 3000, FS 20, FS 90 and Simplex 4100 models. The annunciator panel is situated at each building entrance. All Honeywell panels are networked together to the ebi front end monitored by security. The Simplex panels are similarly monitored by a separate head end at Campus Security. Some buildings are sprinkled, most are not.

Gas detection systems exist in some labs, the boiler plant and in cafeteria kitchens.

Honeywell currently holds the contract to perform annual testing services on the Honeywell and Simplex fire systems. Facilities electricians perform the monthly tests and the end device testing for the annual verification. Honeywell reviews this testing and signs off, noting any deficiencies. Any emergency maintenance or repair on either system requires a call out to Honeywell or Simplex.

Power Distribution System - High Voltage

The main incoming electrical service is dual 64 kV fed overhead up the east side of Burnaby Mountain to a main substation. Two 20 mVA transformers step this down to 12 kV. Three sets of dual 12 kV underground feeders run from the substation to three receiving substations (Transportation Centre, Saywell Hall and TASC1). From there the 12 kV main and transfer feeder daisy chain from building to building using junction boxes to tap off.

Each building has a 12 kV substation fed from the main and transfer feeder through load breaks and 12 kV main breakers. Most building substations use EPE supplied equipment so the architecture and equipment is standardized across the campus. Over time, most of the original 12 kV oil breakers have been upgraded to more reliable vacuum breakers.

The step down transformers are cast coil, a longer lifetime variation of the dry type units. Transformers mostly step down to 480 Volts which is the standard building distribution level. There is virtually no 347/ 600 V distribution at SFU Burnaby. Some transformers step down to 120/ 208 V directly.

There is a capital plan to pro-actively replace substation transformers in the 6 or 7 oldest buildings with new units due to the fact that they exceed their rated lifetime.

Power Distribution System- Low Voltage

From 480 V, buildings use smaller distribution transformers ranging from 30 kVA to 225 kVA to convert to 208 V. These are gradually being replaced with more energy efficient harmonics mitigating units as they reach end of life. There is a capital plan to replace the bus and breakers in large 480 V and 208 V panel boards in the oldest buildings, as these components have reached end of life.

The 480 V panels have recently been scanned with infrared to find overheating points. The report listed deficiencies which are being rectified by electrical staff. The 208 V panels have not been infrared scanned, but will soon have PM routines applied to them.

Due to the architecture of many of the buildings there is a significant amount of surface mounted lighting and electrical components on concrete. There is very little raised floor area except for data centre floors.

All power wiring must be in conduit with the exception of drops to luminaires. The length of BX cable in the ceiling space per drop is not to exceed 10 feet. Where aesthetics of running surface mounted power is important, Wire mold (not panduit) shall be installed rather than conduit. Where there are visible junction boxes recessed in concrete, they should have a decorative cover, not a galvanized metal cover.

Emergency Power

Most buildings have a dedicated standby emergency generator that serves the life safety and other power requirements of the facility. The generator may be either 480 V or 208 V and range from 25 kW to 1000 kW. They feed the emergency load through one or more transfer switches. Generators are tested monthly on load, and annually using a dummy load. There is about 7000 kW of diesel generator capacity over 19 units. Average

loading levels on these units is about 50 %. Some generators only serve life safety (fire system, emergency lighting) and others serve elevators, lab equipment etc as well. A few generators serve more than one building. Three Residence buildings have no generator backup, McTaggart Cowan, Hamilton Hall and the Townhouses.

Generators are designed to start automatically and power the load within a minute of a power outage.

figure C-5: Interior Lighting in TASC 1

Lighting- Interior

(Refer to ***Appendix C-17: Interior Light Fixture Standard Products***)

The following is a minimum standard base building lighting standard. The User's lighting layout shall be reviewed and approved by the Facilities Services' electrical consultant.

Building standard office/ classroom floor light fixture is a recessed fluorescent 2X2 fixture with one electronic 120/ 277 V ballast per fixture. Preferred fixture for this application is the Ledalite Pure FX line. Basic design lighting level will be an average minimum of 50 foot candles at desk level on an open floor basis.

All recessed or suspended fluorescent light fixtures must be seismically restrained. Most base building fixtures are connected to a low voltage lighting control system. Some of the older buildings use GE relay panels, others use Douglas panels. A few buildings have no low voltage control. One renewed building is using a new "Encilium" lighting control system that does not use relays, but networked control devices on each fixture.

Existing building 4 foot fluorescent fixtures are lamped with 2 x 28 Watt - T8, 3500 K, 85-87 CRI lamps. Most buildings use T8 fixtures, but several newer buildings have T5 fluorescent lamp systems.

There are a large number of compact fluorescent recessed and surface mount fixtures, particularly in public areas. Most mercury vapour fixtures have been replaced with newer type lamp sources. There is minimal incandescent used on campus with the notable exception of lecture theatres. The perceived requirement to use dimmable lamps has hindered the replacement of these incandescent with a more efficient alternative. There is much research underway to find a more efficient dimmable light source for lecture theatres, art galleries and display areas.

Lighting – Exterior

(Refer to ***Appendix C- 17 : Exterior Light Fixture Standard Products***) Until recently, most street, parking lot and walkway lighting used pole mounted high pressure sodium and metal halide fixtures. Much of the system is fed from 277 and 480 V circuits, controlled by time clocks in various electrical rooms. This plant is at an age where there is significant maintenance to keep fixtures operational. Some fixtures are in poor condition, and many did not meet the "Dark Sky" requirements.

Over the last few years there has been an initiative to gradually replace the oldest poles/ fixtures and lighting bollards with new technology LED fixtures. Some streets and walkways have been converted to LED with great success, improving aesthetics as well as safety and security at night. Some parkade fixtures have been converted to LED fixtures, and there are plans to complete the conversion in future. Parking lots have not yet been upgraded to LED, but several areas are being tested with new fixtures on existing poles. Some street sections that were not previously illuminated have had new poles and fixtures installed.

Wall mounted high pressure sodium fixtures on building perimeters are gradually being replaced with compact fluorescent wall pack fixtures.

figure C-6. RUUD / BETA Exterior Lighting Fixture

Lighting – Controls

Most buildings with GE or Douglas systems were standalone, with no remote monitoring or control. The policy now is to interface these lighting control systems to the building DDC system. This allows remote monitoring and control of lighting zones from one point. Sweep off schedules for evenings and weekends are applied to these buildings. As well, touch screen light control points are being trialed as an alternative to central switches.

Buildings without central low voltage lighting control, such as the Academic Quad require

a different solution. Concourse 3000 level lights have had no control except at the circuit breaker. These breakers are being replaced with motorized type that can be controlled remotely through connection to the DDC system.

There have been recent projects to greatly increase the number of occupancy sensors controlling lighting in offices, classrooms, washrooms and other spaces. There will be more application of occupancy sensors in the near future. Photocell sensors have not been widely used to control lighting in areas that have a large daylight component. Gradually these lighting zones will be upgraded to day lighting control.

Outdoor lighting is controlled by individual time clocks in various electrical rooms, with the inevitable problems in adjusting schedules. A wireless clock system is proposed to replace wired clocks on campus with wireless equivalents. The radio transmitter that would sync the clocks could also control wireless relays, which could replace the individual time clocks. Central control of outdoor lighting circuits would be possible for the first time.

Plenums

All exposed wiring located in a supply or return air plenum is required to have a FT-4 rating or enclosed in a noncombustible raceway (conduit). Other requirements for plenum spaces must comply with Article 3.6.4.3 of the BC Building Code 1998.

Heating, ventilation and air-conditioning (HVAC) and plumbing specifications

SPECIFYING DATA AND TELECOMMUNICATION SYSTEMS

Consult with Information Technology (IT) Services on specific requirements.

Network Cables and Wires

Any cables and wires should be installed and secured in an orderly, logical manner. Neither exposed wires nor exposed BX are allowed. All exposed wiring must be run in conduit, perpendicular and parallel to walls and ceilings. Routes of any exposed conduit, particularity in public corridors, must be reviewed and approved by the Owner's Representative prior to proceeding with the installation. All possible measures should be taken to avoid ever exposing conduit in a public area.

Telephone/Communications

Departments/ Users are required to make arrangements directly with Information Technology (IT) Services for supply and installation of their voice and data systems. Plenum approved cable must be used when a conduit system is not installed.