



uOttawa

Service des immeubles
Physical Resources Service

**DESIGN and
CONSTRUCTION
STANDARDS**

Last Revision:

[Introduction](#) May 06, 2010

DESIGN STANDARDS

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CONSTRUCTIONS STANDARDS

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This document was prepared by Physical Resources Service to act as a standards reference applicable on all renovation or construction projects at the University of Ottawa. Establishing standards ensures a required minimal quality for physical installations and facilitates their maintenance.

Any gap or modification of these standards has to be **approved** by Physical Resources Service before its application.

The first part categorizes the “*Design Standards*” by use and service. Professionals need to apply each element listed and include them in their own plans and specifications. Part 2, “*Construction standards*”, regroups precise or performance specifications, classified by the National Master Specification (NMS) sections which every Professional needs to incorporate in their respective specifications.

We realize that existing situations on renovation projects may challenge the application of these standards. In which case, we will aim to attain the highest level possible to comply with them.

These standards are not meant to replace any regulation or standard issued by proper authorities. If in any case a standard described in this document contravenes with an effective regulation, that regulation overrides the standard. In which case, Physical Resources Services needs to be notified promptly.

Comments or recommendations to improve this document and its application are welcomed.

.1 GENERAL DESIGN**.2 FINISHES**

FLOOR

- .1 No wall to wall permanent carpet allowed.
- .2 Main Halls:
 - Porcelain tiles.
 - Grout color: any variation of grey.
 - Carpet in traffic area on top of tiles to install for all year long use from main entrances to elevators.
- .3 Vestibule: Foot grills and Porcelain tiles.
 - Grout color: any variation of grey.
- .4 Corridor (Main): Ceramic tiles or epoxy terrazzo.
 - Grout color: any variation of grey.
- .5 Corridor (Secondary):
 - Sheet or tile Linoleum, 2.5 mm, Linoleum Composite Tile, 2mm or VCT tile, 3.2mm.
 - No wax or other floor finish to be installed on pre-protected linoleum surfaces.
- .6 Exit Stairs:
 - If stairwell not used frequently to seal new concrete.
 - If used frequently, to paint concrete with industrial epoxy painting.

WALL

- .1 Main Halls: To be determined (resistant)
- .2 Vestibules: To be determined (resistant)
- .3 Corridors (Main): Painted gypsum.
- .4 Corridors (Secondary): Painted gypsum.
- .5 Exit Stairs: Painted concrete or gypsum

CEILING

- .1 Main Hall: High end acoustic tiles with gypsum
- .2 Vestibules: Gypsum
- .3 Corridor (Main): High end acoustic tiles with gypsum
- .4 Corridor (Secondary): 5/8 x 2' x 4' acoustic tiles
- .5 Exit Staircases: Concrete painted

.3 RECEPTION AREAS

- .1 To apply Barrier free design Refer to "Z" Barrier-Free Design.

.4 PAINTING COLORS

- .1 To apply colors hierarchy for doors, frames and walls in order to facilitate the public circulation. Corridors, WC, stairwells and Service room's doors shall have a different colors from administrative and classrooms' doors on a same floor.

.5 WINDOWS COVERING

- .1 Blinds or curtains not authorized in public spaces.
- .2 Architectural films for glass may be used.

.6 WATER FOUNTAINS

- .1 To install minimum 1 per floor in visible locations. Barrier free height installation. *Refer to sections 'Z' Barrier-Free Design and 00 00 00.*

1. GENERAL DESIGN

- .1 Dimensions to apply barrier free design (except for offices).
- .2 Reception counter to be partly lowered for accessibility.
Refer to section "Z" Barrier-Free Design.

2. FINISHES

- .1 Floor
 - .1 No carpet allowed
 - .2 Sheet or tile Linoleum 2.5 mm or Linoleum Composite Tile 2 mm or VCT tiles 3.2mm with 100mm high rubber base / 3.175mm gauge.
 - .3 No wax or other floors finish to be installed on linoleum with pre-protected surfaces.
- .2 Wall
 - .1 *Offices:* 5/8 gypsum boards / painted
 - .2 *Meeting Room:* 5/8 gypsum boards / painted
 - .3 *Reception:* 5/8 gypsum boards / painted
 - .4 *Kitchen:* 5/8 gypsum boards / painted with back-up for cabinets
 - .5 *Storage:* 5/8 gypsum boards / painted with back-up for cabinets
- .3 Ceiling
 - .1 *Offices:* Acoustic tiles 5/8 x 2' x 4' with painted gypsum.
 - .2 *Meeting Room:* Acoustic tiles 5/8 x 2' x 4' with painted gypsum.
 - .3 *Reception:* Acoustic tiles 5/8 x 2' x 4' with painted gypsum.
 - .4 *Kitchen:* Acoustic tiles 5/8 x 2' x 4' with drywall backing for acoustic tiles 5/8 x 2' x 4'.
 - .5 *Storage:* Acoustic tiles 5/8 x 2' x 4' with painted gypsum.

3. WINDOWS COVERING

1. Roller Blinds, openness 0%- 1%- 3%- 5% - 7% or 100% depending the space need.
2. Architectural film for glass may be usedNo carpet allowed

.1 GENERAL DESIGN (MULTIMEDIA CLASSROOM)

Refer to audiovisual specifications for specific requirements.

.1 Architectural

.1 General:

Classrooms and their specific requirements vary considerably based upon major users such as the Registrar or a Faculty. Classrooms are defined by types based on seating capacities; seminar rooms, regular classroom or lecture rooms, large classrooms or lecture rooms and amphitheatres.

The Multimedia Teaching Technologies and Tools are by far the major components in a classroom design. The requirements may vary between rooms and are project specific. Coordination with the University of Ottawa Teaching and Learning Support Services is mandatory; a classroom cannot be designed without their involvement.

In general Classrooms do not require a vestibule, a vestibule may be considered for very large and amphitheater type classrooms. The Classrooms is generally divided into three major components, the teaching area (normally the front of the room), the student area (normally the main body of the room) and the technical support areas.

The technical support room or Audio Visual Closet is required when a fixed podium is being installed and not required with the A/V rack. This room is needed to accommodate all electronic equipment needed for Audio Visual teaching aids. A very important coordination is required with the Electrical and Conduit requirements. The door entrance of this room shall be located outside of the classroom.

.2 Classroom Definitions:

.1 Seminar Room:

- .1 Typically 20 to 40 seats (example: Fauteux Hall room 232)
- .2 Designed for an interactive teaching environment
- .3 Generally set-up in "U" fashion or other
- .4 Can be fixed or non-fixed seating
- .5 Usually A/V media rack, sometimes fixed podium and other teaching accessories

.2 Regular Classroom or Lecture Room:

- .1 Typically 40 to 60 seats, sometimes 80

- .2 Large half circle preferred, single level configuration,
- .3 Preferred fixed seating and tables but sometimes non-fixed
- .4 A/V fixed podium and other teaching accessories
- .3 Larger Classroom or Lecture Room:
 - .1 Typically 60 or 80 seats (example Vanier Hall , Waller side, 1st floor)
 - .2 Half circle preferred , multi level configuration
 - .3 Fixed seating and tables
 - .4 A/V fixed podium and other teaching accessories
- .4 Amphitheater
 - .1 Over 80 seats (example Marion Hall or Montpetit Hall Decelles auditoriums)
 - .2 Auditorium style, multilevel
 - .3 Fixed seating with tablets sometimes fixed seating & tables
 - .4 A/V fixed podium and other teaching accessories
- .5 Specialty Long Distance Multimedia Education Rooms (Videoconference Rooms)
 - .1 Typically 60 or 80 seats (example 129 Louis Pasteur)
 - .2 Half circle multi level configuration preferred
 - .3 Fixed seating & tables
 - .4 A/V fixed podium and other teaching accessories
 - .5 Cameras & LCD screens for remote viewing & communication
 - .6 110 volt power outlet, microphones, data port connections at seats
- .3 Classroom Geometry:
 - .1 Room width to depth ratio is absolutely critical to a room to functional well. Avoid 1:1 ratio (square) or long and narrow room layout these are acoustically bad and not recommended.
 - .2 Recommended classroom proportions are to be 1/3 of front of room for instructor's station and remaining 2/3 for students.
 - .3 Depending on the room width, a single center aisle is generally the most efficient – losing space to the center aisle is often best to having two side aisles. In no case should students have to cross more than 5 other seats to reach the middle seats in that row – this often dictates the placement of aisles.
 - .4 Some classrooms have as many as 6 rows, preferred are 4 rows, of fixed seating with no steps.
 - .5 Occasionally each row steps up however having only every second row step up could be considered when headroom is an issue.

- .6 Some stepped classrooms have the main entrance at the high level or the back of the room, preferred is the low level at the front of the room as it provides better access and locations for wheelchair accessibility.
- .7 Site lines and angle of vision is such that no seat shall be outside of 45 deg off the classroom centerline on either side, (within 90 deg horizontally and 15deg vertically).
- .4 Fixed Tables & Seating, Non-Fixed Tables & Seating, Motorized Barrier Free Tables
 - .1 Fixed Tables and Seating
 - .1 Confirm with PRS which manufacturer has current standing offer with U of O (Ducharme Seating, Clarin Seating or other).
 - .2 Table are to be minimum 510 mm (20 inches) deep with modesty panels – Not 460mm (18 inches) deep which is not sufficient for knee space.
 - .3 Table top data/power outlets are to be semi-sphere type complete with intergraded under table raceways.
 - .4 Fixed Chairs are to be tilt and 180 deg swivel type – dimension and clearances vary between manufactures.
 - .5 Fixed Chairs are required to be numbered – on the back upper middle.
 - .2 Non-fixed Tables and Seating
 - .1 Refer to Furniture Standards.
 - .3 Motorized Barrier Free Tables
 - .1 Motorized adjustable height tables are required in classrooms. These vary in size. Minimum clearance of 42 inches seating area.
Refer to Section “Z” Barrier Free Design
- .5 Multimedia Technologies Presentation Tools, Tel/Data, Classroom Accessories
 - .1 General;
 - .1 This is a very specialized and essential component of classroom design. Requirements and technologies are in constant evolution. Coordination with the University’s Teaching & Learning Support Services Multimedia Section is mandatory. Refer to their established A/V Standards. Various Architectural, Mechanical and Electrical components need to be coordinated.
 - .2 Multimedia technologies & presentation tools typically found in classrooms:

- .1 Fixed Podium
 - .1 The Podium is designed to house all the electronics and computer teaching equipment and is linked to the classroom light controls, ceiling projectors and screens and other stuff.
 - .2 This is a pre-designed, prefabricated unit with a fixed non-adjustable component and an electrically adjustable component designed to meet barrier free requirements. Refer to podium sketch for general configurations. This unit is normally pre-ordered by PRS and installed by the General Contractor.
 - .3 Communication and electrical installation requirements need to be coordinated.
- .2 Multi-media Rack
 - .1 This is a non-fixed movable unit containing A/V equipment and is used in smaller type classrooms where fixed podiums will not fit and are not used. This unit is supplied and installed by TLSS group. Communication and electrical installation requirements need to be coordinated.
- .3 Computers
 - .1 Supplied and installed by TLSS group.
 - .2 Electrical requirements must be coordinated.
- .4 Projectors, (overhead, ceiling mounted) and sound systems
 - .1 Supplied and installed by TLSS group.
 - .2 Conduit and electrical requirements must be coordinated.
 - .3 Window covering requirements must be coordinated.
- .5 Screens, (manual and/or electrical)
 - .1 Sometimes included in the General Contractors' responsibilities to supply and install. Sometimes these are supplied by TLSS and installed by the Contractor.
 - .2 Mounting height requirements to be coordinated with TLSS standards.
 - .3 Architectural and ceiling requirements to be coordinated.
- .6 Chalkboards, Whiteboards, Bulletin Boards and Tack Strips
 - .1 Type, size, layout, locations, configurations and mounting heights all must be coordinated with the TLSS group and are project specific. As a general rule mounting heights for chalkboards and whiteboards to be 36" above finished floor.
 - .2 Shall be included in the General Contractors responsibilities to supply and install.
 - .3 Chalk boxes are always required. These are prefabricated units supplied and installed by the

- University. Request installation of with Physical Resources Service, Custodial section.
- .4 White boards are not allowed in Registrar classrooms, chalkboards to be installed.
- .3 Telephone requirement
 - .1 One dedicated telephone line located on the podium or at the front of the room adjacent to professors teaching station. This is required in the event of an emergency or a technology malfunction. Refer to A/V standards.
 - .4 Data requirements
 - .1 Data port required at podium or media rack.
 - .2 Fixed seats; data outlets or wireless system requirement to be confirmed on an individual project basis.
 - .5 Classroom Accessories
 - .1 Clocks
 - .1 Clock type –integrated to building with a master clock system or stand alone 120V powered clock with battery back-up.
 - .2 A minimum of one clock per room located so that is visible to both students and teachers.
 - .2 Coat hooks
 - .1 Quantity of coat hook equal to 50% of seating capacity, dispersed throughout the room, preferred front side walls or back wall.
 - .6 Architectural Components And Finishes
 - .1 Entrance Doors
 - .1 Solid core wood or steel depending on fire rating requirement or match existing building standard (i.e. – P/Lam doors at Guindon Hall, etc...).
 - .2 To have view window, minimum 4"x16"
 - .3 Lever type hardware, always to have door closers
 - .4 Coordinate with security systems – sometimes card reader systems are needed.
 - .2 Doors to A/V support rooms
 - .1 solid, no window.
 - .3 Flooring
 - .1 Resilient type, either Linoleum, VCT tiles, sheet flooring or epoxy resin.
 - .2 With or without patterns and accents, this varies and is project specific.
 - .3 Hard nosing on the steps or tiers.

- .4 No carpet.
- .4 No wax or other floor finishes to be installed on pre-protected linoleum flooring.
- .5 Walls
 - .1 Normally gypsum board partitions, floors to slab, refer to wall type standards for STC rating.
 - .2 Painting and colors vary and are project specific.
- .6 Ceilings
 - .1 Suspended acoustic tiles, generally standard basic type. On occasion special tiles types and patterns and are project specific.
 - .2 Exposed ceilings are very rare, acoustics must be considered. Architectural treatment must be considered for exposed M & E such as ductwork.
 - .3 A/V screens are concealed within the ceiling space or using gypsum board bulkheads.
 - .4 Coordinate all ceiling mounted A/V accessories; projectors, speakers screens etc...
- .7 Window coverings
 - .1 Roller Blind type.
 - .2 Opacity is project specific coordinate with Audio Visual.
- .8 Signage and way finding
 - .1 Room identification required at entrance.
 - .2 Classroom schedule holder required at entrance.
- .9 Waste Recycling station
 - .1 (Insert university standard here)
 - .2 Located on the outside of classrooms, generally to be considered with large and amphitheater classroom.
 - .3 Location to be coordinated with PRS Custodial Services,
- 7. Acoustics
 - .1 Specific requirements are relative to the type of teaching room.
 - .2 General requirements includes;
 - .3 Reverberation time of 0.8 to 1.0 seconds
 - .4 Refer to wall type standards
 - .5 Use acoustic tiles wherever possible
 - .6 Restrict exterior outside noise intrusion (ex: vehicle traffic)

- .7 Consideration to be given to A/V technologies as sources of unwanted noise
- .8 See Mechanical and Electrical portions of this sections for M & E requirements
- .8 Mechanical
 - .1 Specify proper minimum fresh air and indicate minimum and maximum design values on plans.
 - .2 Allow heat to be rejected from ceiling-mounted projector.
 - .3 A return air grille shall be installed at the ceiling above the video projector to pull out as much heat as possible from the projector.
 - .4 Specify direct ducted return air to the multimedia classroom. Air transfer duct through the walls adjacent to corridor should be avoided to prevent bad air circulation or door opening or closing problems.
 - .5 Location of mechanical equipment shall be carefully taken into consideration to provide a proper access for maintenance especially in classroom having sloped floor or stepped floor.
 - .6 Ceiling height shall also be taken into consideration if placing equipment above suspended ceiling.
 - .7 Classroom cooling and ventilation system shall generally be designed in conformance with the general building HVAC systems approach. In all cases designers shall review with the University of Ottawa Engineering staff for existing air supply quality, use of CO₂ sensors, selection of air flow and heating/cooling terminal devices, general HVAC design philosophy.
 - .8 Sound rating for classroom is 30NC. Where applicable provide sound attenuation and/or acoustical insulation inside air ducts, vibration isolators, flexible canvas connections at the inlet and outlet of the fan.
Refer to section "X" Acoustical Performance
- .9 Electrical
 - .1 Electrical Panel
 - .1 Each new multimedia classroom shall have a new electrical circuit panel where applicable.
 - .2 Preferred electrical panel type: "Cutler Hammer" Type EZ box, PRL-1a, including Bolt-on breakers.
 - .3 Show electrical panel circuits and loads identification on plans, including the circuit breaker amperage, spare breakers and blank spaces.

- .4 Electric panel shall have identification label of type “Lamicoid.” White letters on black label.
 - .5 All audio/video equipment circuits shall be connected to the same phase and same ground at the electric panel.
 - .6 Select new electrical panel to keep a total of 20% available circuits (spare breakers and blank spaces) for future use.
 - .7 Provide around 10% of 15 amps spare breakers for future use.
 - .8 The electrical panel shall be located outside the Technical Support room and the classroom to permit electricians’ access.
- .2 Electric Outlets
- .1 All electric receptacles for audio/video systems (excluding student table power pack) shall be new surge suppression duplex receptacles, 15A-125V, Specification grade, “Hubble” model HBL5260S, blue colour with stainless steel cover plate.
 - .2 Electric outlets shall be “Commercial Specification” grade minimum, with stainless steel cover plates.
 - .3 All cover plates of each existing and new outlets located in the working area shall be identified with electrical panel and circuit numbers using plastic P-Touch labels or equivalent.
 - .4 Student table electric raceway systems and top table power pack shall be approved by the University of Ottawa and authority having jurisdiction. Designs shall allow for a maximum of eight laptops per 15 amp, 1110 volt circuit or 1.5 amp draw per electrical outlet.
 - .5 All existing junction boxes that are opened in the ceiling space shall have cover plates.
 - .6 To install one semi-spheres type outlet (2 plugs) for each 2 seats. For existing fixed tables, the VIRCO type electrical outlets could be used upon PRS approval. Dimension requirement shall be considered.

Refer to Section “R”, 120 Volt Power Distribution.
- .3 Multimedia Conduits
- .1 Show on plans all EMT conduits required by audio/visual specifications.
 - .2 Show an additional EMT conduit for lighting control wiring between the main lighting controller, switches, interfaces and “Lutron” scene selectors at the podium.

- .3 All multimedia wiring shall be inside EMT conduits.
- .4 Pull cord ¼" diam. for each EMT conduits.
- .5 Terminate all ends of EMT conduits with a coupling and a plastic bushing.
- .4 Light Fixtures
 - .1 Fluorescent lighting shall be of dimmable type.
 - .2 Light fixtures shall be distributed to comply with the lighting zones requirements determined by audio/visual department for each individual project.
 - .3 Use preferably 2'x2' indirect light fixture to allow for better zone distribution application, 120V, 3-wire, "Lutron" dimmable ballasts, HI-LUME 1% for classroom area.
 - .4 On chalkboard light fixtures, the use of Compact SE 5% dimming ballast will be acceptable.
 - .5 10% dimming ballast are not acceptable.
 - .6 Where light fixtures are installed in gypsum board ceiling, specify appropriate frame from factory. Use of custom-made frame is not acceptable unless otherwise indicated.
Refer to Section "Y", Lighting.
- .5 Fluorescent Lamps
 - .1 Lamps shall be T8, 17W (or 32W), and provide 1400 (2900) lumen at 3500°K, have a triphosphor colour-improved coating and operate with a 20 000 hour life rating.
 - .2 4 pin High Lumen Biax lamps, TT5, 40W, providing 3100 lumen at 3500°K will be acceptable for chalkboard light fixtures. Lamp shall operate with a 20000 hour life rating.
 - .3 For all fluorescent dimmable light fixtures, prior to first lamp dimming, provide a minimum lamp burning period of 100 hours at 100% lighting load.
- .6 Lighting Controls
 - .1 General
 - .1 Incorporate to tender drawings a lighting control diagram. For reference, schematic presentation shall be similar to the one provided in the Desmarais building project tender documents.
 - .2 All lighting controls shall be located in the A/V room and be accessible.
 - .3 Follow installation and programming instructions from the manufacturer.

- .4 Provide plasticized lighting zones plan inside control room and affixed on the wall, including zone numbers and electrical circuit numbers.
- .2 Wiring
 - .1 Run separate neutral for dimmable lighting load circuits. No common neutral.
 - .2 “Lutron” system cable data line connected to GrafikEye controller shall be separate from line voltage wiring by at least ¼” (7mm), to avoid functioning problems.
- .3 Terminal Strip Box
 - .1 All lighting zones power circuit shall be run to a terminal strip box.
 - .2 All zones and electrical circuit shall be identified to all devices and terminal strip box.
 - .3 Provide wiring diagram on or inside terminal strip box cover.
- .4 GrafikEye Lighting Controls
 - .1 Each lighting zone connected to GrafikEye controller shall not exceed maximum recommended load per zone and per controller.
 - .2 GrafikEye lighting controller shall include external power supply when required by the manufacturer instructions.
 - .3 All necessary fluorescent dimming ballast interfaces or power boosters shall be included and shown on tender drawings.
- .5 Emergency Lighting Controls
 - .1 The GrafikEye controller (scene 16) shall be indicated to be pre-programmed by an electrician to have all emergency lighting zones on it.
 - .2 Emergency lighting circuit (scene 16) shall have a dual pole (open/close) contact to enable a closure interface to emergency power supply when there is a power failure.
- .6 Occupancy Sensor
 - .1 Classroom lighting shall be controlled by new occupancy sensors, connected to a contact closure interface controlling the GrafikEye lighting controller.
 - .2 All lighting zones need to be turned off when room is unoccupied.
 - .3 Use occupancy sensors in classrooms equivalent to “WattStopper” Dual technology ceiling mount occupancy sensor.
- .7 Lighting Panic Mode Option

- .1 Consider the requirement for lighting panic mode option in case of a fire alarm, and if the lights are OFF due to a video presentation.
- .8 Lighting Intensity Requirement
 - .1 Maximum Lighting
 - .1 On student table tops: 550 Lux or 50 FC
 - .2 At the black board 450 Lux or 40 FC

Refer to Section "Y", Lighting.
- .9 Podium
 - .1 Incorporate to tender drawings, podium services and power "D" box control drawings similar to the one supplied by the University of Ottawa.
 - .2 Identify who will supply what equipment on the drawing.
 - .3 All podium cut-out must be coordinated on site by general contractor with trades and University of Ottawa Audiovisual Services.
 - .4 Lighting scenes shall be identified on the "Lutron" scene selector located on the podium lip.
 - .5 All podium electric outlets shall be equivalent to the surge suppression duplex receptacles indicated above in the Electric Outlets section.
 - .6 Key switch controlling electrical outlet by-pass relay shall be "LEVITON," Model 1221-2KL, single pole.
 - .7 Electrical outlet by-pass relay shall be "WattStopper," Model BZ-100EP, 120VAC, Featuring hold-on inputs.
 - .8 Podium door operated contact switch shall be "LEVITON," Model 1865, momentary, metal push button, normally ON contact.
 - .9 Podium-mounted momentary contact switch for projection screen shall be 20A – 120V, spring load three-position, single pole, double throw, center OFF, including stainless steel cover plate.
- .10 Motorized Projection Screen
 - .1 Low voltage kit for motorized screen must be installed inside the A/V room and be accessible.
 - .2 Projection screen motor shall have a new 2 Poles, 1HP, 230V, ON/OFF manual motor starter switch installed at proximities and

capable of cutting both power up and power down.

.2 AudioVisual Control Room

.1 General

- .1 Incorporate to tender drawings A/V room elevation drawings showing conduits and lighting control arrangement showing the equipment location on the walls, the conduit dimensions, the layout of lighting devices and boxes, similar to the drawings supplied by University of Ottawa.

.2 Mechanical

- .1 Specify exhaust fan for A/V room acoustically insulated from factory, including vibration isolators, flexible canvas connections at the inlet and outlet of the fan, supply and return duct supported separately from the fan. Clearance for maintenance shall be respected around fan.
- .2 Consideration shall be taken for acoustic level.
- .3 Specify acoustical insulation to inlet and exhaust duct.
- .4 Exhaust fan shall have speed control switch.
- .5 Consider the cooling load required for equipment heat rejection. Provide fan coil unit if required.

.3 Power and Data Requirement

- .1 Specify and show on drawings all necessary electrical outlets connected to normal power circuits for audio/visual equipment in A/V control room.
- .2 Specify and show on drawings all necessary electrical outlets connected to emergency power circuits for lighting control system located in A/V control room. If emergency lighting to the multimedia classroom is not required, use normal power circuits for lighting control.
- .3 All necessary tel/data outlets required into A/V room by audiovisual department shall be indicated on drawings.

1. GENERAL DESIGN:

.1 Overview

Labs vary from very large, heavy equipment types such as civil engineering structural / hydraulics facilities to smaller, more precise clean areas for microbiology. Each of these labs types have their own specific requirements and the functional programs associated with these spaces must be clearly defined early in the design process since size and weight of materials being handled will affect both the structural aspects as well as location and proximity to major loading areas, some specific equipment may generate excessive noise or heat or require large amount of chilled water or domestic water. **It is very important to work with the users to define their needs.**

Laboratories are defined by the following characteristics:

2 type of laboratories: wet and dry

2 categories: research and undergraduate

5 functions: Physic, Chemistry, Biology, Medical and Engineering

Science laboratories are considered to be in the field of Physic, Chemistry, Biology or Medical fields

.2 Layout

.1 To follow CSA Z6316.5-04 "Fume hood and associated exhaust system".

.2 Fume hoods shall not be installed near doorways.

.3 When multiple laboratory working areas are located in the same space, high hazard working areas, normally dirty, should be located near the exterior wall and low hazard working areas, normally cleaner, should be located near the corridor.

.4 Window sills must be above the bench height.

.5 Benches should generally butt to exterior wall.

.6 Intensive laboratories should be located at top levels and undergraduate laboratories located on lower levels.

.7 Health and safety equipment to be located next to entrance within the lab. This should be kept consistent in all laboratories throughout building.

.3 Laboratories Handling Biological Agents

.1 To follow (1) Public Health Agency of Canada's Laboratory Biosafety Guidelines and/or(2) Canadian Food Inspection Agency's Containment Standards for Veterinary Facilities.

.4 Laboratories Handling Chemicals

- .1 To follow NFPA 45: Standard on Fire Protection for Laboratories Using Chemicals.

2. LABORATORY BENCHES & CABINETS

.1 Cabinets

In general consult users. They have been using laboratories for many years and tried different type of benches. Instead of starting from scratch, established benches used in other buildings could be chosen.

- .1 Users must be consulted in order to determine their requirements.
- .2 Benches should be 36" conventional depth to allow easy access to back section.
- .3 Shelf above bench top surface should be able to withstand the weight of equipments and products that it will support. It should be 2" thick shelves with double bracket at 30".
- .4 Cabinets above and below counter shall be manufactured from materials that will withstand the weight of equipment and product being used. Coordination with the user is imperative.
- .5 All cabinets shall have removable back for easy access to piping, conduit and wire (electrical and data/communication)
- .6 Cabinet door hardware must be equipped with 5 knuckles door hinges, locks. Doors must be able to open to 180 degrees.
- .7 Drawers shall be full extension, ball bearing type. Locks, drawer size and separations within the drawer to be coordinated with user.
- .8 Bench top shall extend 2" past cabinets and be 2" thick.

.2 Material

- .1 Lab countertops & Bench Top materials should be selected to withstand the chemicals or other various applications within the lab and be able to be easily cleaned. Acid resistant P-lam/ black with plywood backing can be used for corrosive applications. A more resistive countertop will be required when it is subjected to both a corrosive environment and high temperatures or thermal shocks that may result from laboratory operations. Designer shall consult users on countertop usage and specific user requirements.

3. FUME HOODS, CANOPIES, STORAGE CABINETS, BIOLOGICAL SAFETY CABINETS

- .1 When selecting a fume hood, user needs, type of use and type of sash must be considered. In all cases consideration shall be given to the use of low volume hoods.
- .2 Ductwork should be made of 316L stainless steel or corrosion coated galvanized for medical laboratories, biological and for chemistry laboratories.
- .3 Storage cabinets containing volatile products shall be properly ventilated.
- .4 Fume hoods shall be provided with an airflow sensing, monitoring and alarm device. Airflow sensor shall be of the direct measurement type i.e. velocity or pressure sensing. Where applicable system shall be integrated into room air supply/exhaust control system.
- .5 All new laboratory fume hoods shall conform to the CSA Standard Z316.5-04 Fume Hoods and Associated Exhaust Systems. Fume hood interior surfaces shall be constructed of corrosion resistant, non-porous, non-combustible materials and should be smooth and impermeable, with rounded corners. These materials shall have a flame spread index of 25 or less when tested in accordance with NFPA method 255, Standard Method of Test of Surface Burning Characteristics of Building Materials.
- .6 Class I and Class II biological safety cabinet installation and testing must conform to the National Sanitation Foundation NSF/ANSI 49-2004a: Class II (Laminar Flow) Biosafety Cabinetry standard. Such cabinets should be certified by the supplier at the time of installation.
- .7 Canopy hoods i.e., overhead hoods are only intended to vent heat or local processes (e.g. autoclaves) and not designed for a personal work station. Where work involves manual manipulation or release of volatile materials, a chemical fume hood shall be used.
- .8 UL/NFPA approved flammable liquid storage cabinets are required for flammable and combustible liquid storage.
- .9 Requirements applicable to the installation and field testing of biological containment cabinets are found in NSF/ANSI 49.
- .10 Ductless Fume Hoods are generally not permitted; portable hood may however be used for limited applications e.g. used for odor control.
- .11 Heated perchloric acid shall only be used in a laboratory specifically designed for its use and identified as "For Perchloric Acid Operations". Ref. NFPA 45- 6.11.1
- .12 Laboratory fume hoods shall provide a minimum face velocity of 80 feet per minute at any point. Where the required velocity can be obtained by partly closing the sash, the sash and/or jamb shall be marked to show the maximum opening at which the hood face velocity will meet the requirements.
- .13 All hoods shall have a minimum exhaust volume of 25 cfm/ft² of work surface through air by-pass as per NFPA 45.

.4 MECHANICAL SYSTEM

.1 Ventilation

- .1 Minimal ventilation rates within labs, during the occupied hours, should be based upon the type of work being done within these areas.
- .2 Outdoor exchange rates must be established in consultation with Physical Resources Service (PRS).
- .3 Air flow to the rooms should be such that a good purge of all spaces within the room is maintained while avoiding drafts.
- .4 Air flow in front of fume hoods should not cause a turbulence that will affect the operation of the hood. Supply diffusers shall be selected such that air flow in vicinity of Bio Safety Hoods is laminar.
- .5 Variable air volume system shall be used in densely spaced hood installations where design room air changes significantly exceed 5 air changes per hour.
- .6 Certain labs applications will permit air to be turned down/off when the lab is not in use.
- .7 The laboratory exhaust system shall preferably incorporate a heat recovery loop system.
- .8 Automatic fire dampers shall not be used in laboratory exhaust systems. Fire detection and alarm systems shall not be interlocked to automatically shut down laboratory exhaust fans. (Ref. NFPA 45, Chapter 6-10).
- .9 Discharge from exhaust stacks must have a velocity of 3000 fpm. This velocity should not be achieved by the installation of a cone type reducer. Exhaust duct may be reduced but the duct beyond the reduction must be of sufficient length to allow the air movement to return to a linear pattern. (Ref ANSI Z. 95-2003, 5.3.5). Strobic-type exhaust fans may be used to address exhaust velocity needs.
- .10 Laboratory ventilation exhaust fans shall be spark-proof and constructed of materials or coated with corrosion resistant materials for the chemicals being transported. V-belt drives shall be conductive.
- .11 The discharge of hoods to the atmosphere shall be engineered in a manner that prevents re-entrainment of the exhaust stream back into the building or surrounding buildings. Where there is cause for concern a wind wake analysis shall demonstrate acceptable exhaust stream dilution rates. Under no circumstances shall a lab discharge be less than 10 feet above the surface of the roof.

.2 Ministry of Environment Certification

- .1 Fume hood exhaust installations must be certified by the Provincial Ministry of the Environment (MOE). Liaison and application for MOE certification is made through University of Ottawa, Office of Risk Management.

DESIGN STANDARDS

- .3 Heating/Cooling/Humidity Control
 - .1 Hydronic heating should be designed to heat the space in order to allow the outdoor air ventilation system to be turned off/down in these labs during unoccupied hours.
 - .2 Hydronic system design should be based on low temperature (50C) hot water supply.
 - .3 In new buildings high temperature ceiling mounted hydronic radiant panels should not be utilized.
 - .4 Where applicable main outdoor air supply unit shall be equipped with additional heating coils to allow for use of chill water return to preheat air during colder seasonal weather.
 - .5 Where building application permits consideration shall be given to the use of thermal pumps.
 - .6 Humidity control shall be provided where 100% outdoor air is supplied. Minimum 18% RH shall be provided during the dry winter periods, maximum 55% shall be maintained during the wetter summer periods. More stringent humidity control ranges may be required for certain applications (animal care areas).

- .4 Control Strategies
 - .1 Control strategies must be compatible with “Delta” building automation system.

- .5 Plumbing
 - .1 Overview
 - .1 At all times, applicable current editions of codes shall be respected.
 - .2 Piping systems shall have materials selected for resistance against the types of chemicals proposed to be used within each specific lab.

 - .2 Layout- Vertical piping chase
 - .1 All piping serving laboratories should pass from floor to floor in a vertical pipe chase. These chases should be laid out throughout the floor to ease access of future connections or modifications. A good example of piping chase layout is at Roger-Guindon. To prevent water passing from floor to floor, all penetrations through slab must be sleeved and sealed properly.
 - .2 On each floor, access to vertical piping chase shall be made easy by means of access doors.
 - .3 Piping should be layout in a manner that future connections will be easy to make.
 - .4 Shut off valve should be located on each floor

3. Layout-In laboratories

- .1 Each lab should have accessible shut off valves at all time. They should be located in the wall c/w a 24"x24" access door located between 3-5 feet AFF.
- .2 All piping serving laboratories should be in horizontal pipe chases, located in the wall behind cabinets or above benches for easy access. They should not be integrated within cabinets.
- .3 Access to the horizontal piping chase should be possible throughout its full length by means of removable back panels within cabinets.
- .4 No mechanical joints are acceptable for laboratory piping. They must be socket weld, Silfoss soldered with the exception for specialty gases from cylinders. Manifolds for these cylinders, which use smaller diameter piping, typically, ¼ to 3/8 stainless steel tubing, must have swedgelock type joints rated for the pressure of the system.

.4 Pure water piping

- .1 Pure water piping system shall be design and installed with a recirculation loop.
- .2 Pure water piping shall be new, unpigmented Polypropylene to schedule 80, IPS dimensions. Joints shall be shock welded or Rionite mechanical joints. No solvents shall be used.

.5 Drainage Piping

- .1 Drainage piping for laboratories should be made of Polypropylene (brand name Blueline or Brownline), Polyvinylidene Fluoride (PVDF) (brand name is Pegas Superblue) or glass.

5. ELECTRICAL SYSTEM

- .1 General
 - .1 Circuit breaker for laboratories should be minimum 20A.
 - .2 Provide at least one 20A circuit breaker per labs on emergency power.
- .2 Lighting
 - .1 Refer to Section "Y" Lighting

6. SAFETY

- .1 Emergency showers
 - .1 If located in washrooms, Refer to Section "F" Washrooms
 - .2 All emergency showers should be on a alarm system connected to Protection Services
 - .3 They should not be located in the lab.
 - .4 Refer to Specifications, Section 22 42 01 – Plumbing Specialties/Safety plumbing
- .2 Eye wash
 - .1 They should be installed at each sink
 - .2 Refer to Specifications, Section 22 42 01 – Plumbing Specialties/Safety plumbing

7. SINKS

- .1 Lab sinks shall be selected to be resistant to the chemical proposed to be used within. Accepted materials are stainless steel 316L, epoxy and plastic.

8. BARRIER FREE DESIGN:

- .1 Refer to Section "Z" Barrier Free Design

1. GENERAL DESIGN

- .1 Where space permits, large washrooms should be barrier free labyrinth type entrance, with no entrance doors.
- .2 Avoid locating mirrors above counter sink.
- .3 Where applicable independent Universal Toilet room is to be specified in lieu of having handicap toilet for each sex. To be approved by Physical Resources Service (PRS).

2. FINISHES

- .1 Floor: Ceramic tiles
- .2 Wall
 - .1 Individual washroom: Painted gypsum board
 - .2 Other washrooms: Ceramic tiles, full height installation or minimum 1.5 m height installation + painted gypsum board. Ceramic tiles shall be installed on Fire proof plywood or lightweight Cement Board, gypsum board not allowed.
- .3 Ceiling: Painted Gypsum Board

3. ACCESSORIES

- .1 Refer to Section 10 28 10 —Toilet and Bath Accessories.
Quantity:
 - 1 Toilet tissue dispenser for each WC
 - 1 Hand paper dispenser per 2 sinks
 - 1 Soap dispenser per 2 sinks
 - 1 Hand paper waste receptacle per 2 sinks
 - 1 Sanitary napkins receptacle for each woman WC
 - 1 Wall-mounted fold-down baby change table for the Universal Toilet Room
 - + required Barrier free toilet accessories
- .2 Large washrooms (of 4 or more sinks):
Electrical hand dryers to be installed, *Refer to Specifications, Section 22 42 03*

Quantity: 1 per 4 sinks
- .3 Circular Countertop Waste Chute
- .4 Hand paper trash basket incorporated under the counter with an opening of 150mm of diameter in the top counter c/w a chrome or stainless steel finish ring.
- .5 Not acceptable:

Recessed hand paper dispenser and waste receptacle not acceptable.

4. COUNTERS (VANITIES) :

- .1 Pre-formed laminate built with plywood c/w a backslash of 35mm of height OR Solid surfaces such as "Corian" used with ceramic tiles on walls.
- .2 Structural support at the perimeter with 'C' or 'L' channel, minimum 76mm (H) X 51mm (W) anchored to the walls.
- .3 No gap between the back counter and wall.

5. HARDWARE

- .1 No locks for door entrances except for private washroom to be equipped with a thumb turn actuator inside.
- .2 Refer to Section 08 71 10 — Door Hardware – General.

6. PARTITIONS

- .1 No partition or wall between urinals.
However design should allow for future addition of partitions.
- .2 Ceiling hung Braced toilet partitions.
Material:
 - Graffiti Resistant
 - High Density Polyethylene, Solid Color Reinforced Composite OR Solid Phenolic system.

7. LIGHTING

- .1 Refer to Section "Y" Lighting

8. SINKS and FAUCETS :

- .1 Refer to Section 22 42 02 — Plumbing Fixtures.

9. URINALS and WC :

- .1 Refer to Section 22 42 03 — Washroom Fixtures.

10. SEWAGE :

- .1 Minimum 1 floor drain.
- .2 Floor drain to auto primed to maintain air lock at all times.

11. EMERGENCY SHOWERS :

- .1 For washrooms located near science laboratories, 1 emergency shower available for women as well as 1 emergency shower available for men.
Refer to Section 22 42 01, Plumbing

12. BARRIER FREE DESIGN :

- .1 Refer to Section "Z" Barrier Free Design.

13. UNIVERSAL TOILET ROOM

- .1 If a universal toilet is approved by Physical Resources Service (PRS) room and is planned, an emergency button shall be installed. *Refer to Section "U", Security Systems.*
- .2 The door shall not be acoustically isolated.
- .3 A ventilation grill should be installed on the door to permit hearing an emergency help scream.

14. WATER FOUNTAINS

- .1 Not to be installed in washrooms. Refer to section "A", Public Spaces.

1. NEW BUILDING CONSTRUCTION

- .1 Installation of final cylinders shall be part of General Contractor's lump sum tender price.
- .2 Approved tendered locksets and exit devices shall be supplied with two (2) change keys and master-keyed.
- .3 The Project Manager and Design Consultants shall provide and submit a hardware schedule indicating the type of lockset or exit device recommended and the type of Medeco cylinder required. UO-ATS (Architectural & Trade Services) will consult the potential occupying faculties or departments in order to establish their individual needs and develop a basic master-keying plan to meet these needs. The building shall be assigned to a zone which has GGMK space to include it. The master key plan shall then be submitted to Medeco Canada keying records management for comments and approval.
- .4 A "take-off" sheet, as part of the keying list, shall be prepared by UO-ATS and submitted to Medeco indicating the amount of different cylinders, and to whom the MK's must be sent. When received, the cylinder order should be checked by UO-ATS to ensure the appropriate number is received. Upon approval, the keying list shall be submitted to the Associate Director, Project Management, Physical Resources or his representative for process of purchase orders and a letter of authorization for the contractor to purchase the required cylinders from Medeco on the University's behalf.
- .5 Two (2) keys shall be supplied with each cylinder. Individual additional keys must be requested from the Coordinator, Physical Resources (2222). These requests must be made in advance of their perceived need in order for the locksmith to complete the additional work load. When received, the cylinder order should be checked by UO-ATS to ensure the appropriate number is received.
- .6 When installing the Medeco cylinders, the contractor shall use the accompanying change key to verify the cylinders are functional. Contractor shall then return the key to its original container which is returned to the university locksmith staff when the installation is complete.

2. KEY FUNCTIONS

- .1 Circuit Entry - can be unlocked for periods of time but can also be locked on a personal basis.
- .2 Classroom - can be unlocked to give access to groups of people.
- .3 Storage - always remains on the lock position – key use is essential.
- .4 Passage - no cylinder.
- .5 Privacy - no cylinder

3. COMBINATION LOCKS

- .1 Ilco Unican push button locks L1021-M have been used at strategic areas on campus where it was not feasible to issue keys to numerous authorized persons. Medeco grand master keys must be allowed to by-pass the combination key code. The preferred combination lock is King Cobra which has proven to be less expensive, more flexible and almost maintenance free.

4. MAGNETIC AND ELECTRIC STIKES

- .1 Should be applied in situations where for security concerns no other solution applies. Mechanical means of operation shall be provided to ensure security and safety in the event of a power outage. Fail safe position during power outage shall be in lock position. Doors controlled by these means shall have a Medeco cylinder keyed to the "E" GGMK only.

1. GENERAL DESIGN

1. Glazed Curtain Wall

Glazed curtain wall installations shall be of low emissivity triple glazed construction.

1. GENERAL :

- .1 This guideline has been prepared to assist in the design of 120 volt 15 or 20 amp branch circuits and receptacles that service administrative offices and computer work stations, computer classrooms, laptop power within classrooms, and computer stations and laptop power made available to the general student body in libraries, lounges or other public areas. This guideline applies to the desktop and laptop computer power supply as well as to non-dedicated power plug supply located within the above areas..
- .2 120 Volt 20 Amp circuits equipped with dual 15-20 amp receptacles shall not be used.
- .3 This guideline applies to the standard desktop computer as described below, standard laptop computer power supply and to non-dedicated 110V power plugs located within administrative, classrooms and public lounge areas.
- .4 Where applicable, the designer shall provide for separate dedicated circuits, as required, for IT offices, research/lab areas or for the following or similar type equipment.
 - Office equipment such as photocopy /fax machines
 - Projectors
 - Classroom podiums
 - Kitchen appliances
 - Food / drink dispensers
 - Wall / window mounted AC units
 - Dry/wet lab equipment
- .5 Enclosed standard office spaces shall have only 2 receptacles per office.
- .6 In classrooms, one receptacle per wall.

2. 120 V GROUND FAULT CIRCUIT INTERRUPTERS (GFI RECEPTACLES):

- .1 GFI Receptacles are to be installed in all areas that pose a hazard from potential contact with water such as bathrooms, janitor's closets, Laboratories, kitchens, and/or any other specified location. Refer to building code for exact requirements.
- .2 GFI receptacles are to be the following:
CSA approved, ULC listed, Class A, c/w Test/Reset feature and Green/Red pilot lights. Model GFST15W (15 amp circuit), Model GFST20W (20 amp circuit). Finish: White c/w stainless steel cover plate.

3. NEW ELECTRICAL DISTRIBUTION PANELS:

- .1 As it is not the policy to maximize the loads on every new 120 volt, 15 amp circuit being installed, the designer shall, where a new distribution panel is provided, install no more than four (4) computer stations per 15 amp circuit, to which he may also add a maximum of 360-VA non-dedicated receptacle outlets.

4. EXISTING ELECTRICAL DISTRIBUTION PANELS:

- .1 Where an existing distribution panel is available, the designer may install up to six computer stations per 120 volt 15 amp circuits, but without any additional non-dedicated receptacle outlets on same circuit.

5. MULTIPLE LAPTOP POWER INSTALLATIONS :

- .1 Where power for classroom or lounge area laptop applications is to be provided, up to eight laptop may be powered on a 120 volt 15 amp circuit.

6. RECEPTACLE CIRCUIT IDENTIFICATION:

- .1 All receptacle covers shall be provided with a PTouch panel and circuit # identification label.
- .2 Receptacles whose panel is supplied by an emergency power source shall be identified by a red color cover plate.

7. HALLWAY SERVICE RECEPTACLES:

- .1 Hallway service receptacles shall be of the industrial grade "T" slot type suitable for 120 volt, 20 amp circuits. A maximum of five receptacles shall be provided on any given circuit

8. POWER REQUIREMENTS FOR STANDARD COMPUTER WORK STATIONS:

- .1 While with most devices you can look at the label to determine how much energy they use, this does not work well with computer work stations because both the internal computer power box and monitor labels significantly overstate the typical amount used.

For administrative offices applications and computer clusters made available to the student body for general applications, in consideration of

their inherent load diversification, the averaged actual demand load, based on the present day basic computer requirements is expected to be 1.5 Amps or less where stations are equipped with LCD monitors, 2.0 Amps or less where stations are equipped with CRT monitors.

9. POWER REQUIREMENTS FOR COMPUTER CLASSROOMS

- .1 For computer classrooms applications it shall be expected that all of the computers may be required to work with all drives spinning, without diversification and with each computer processors undertaking intensive tasks. For computer room applications, the averaged actual demand load, based on the present day standard computer unit is expected to be 1.9 Amps or less where stations are equipped with LCD monitors, 2.3 Amps or less where stations are equipped with CRT wall between urinals.
- .2 High end computers equipped with double CD ROM, Hard Drive, Processor or RAM capacity can draw up to 3 Amps, with all drives spinning, processors undertaking intensive tasks and all cooling fans operating. In addition, gaming level graphics card can add a supplementary 2-3 Amp load resulting in a total load of 6 amps per computer.

10. POWER REQUIREMENTS FOR HIGH END COMPUTERS INSTALLATIONS:

- .1 High end computers are equipped with double CD ROM, Hard Drives, Processors and/or RAM capacity. Such computers can draw up to 3 amps each. With a gaming level graphics card the total load can increase to 6 amps per computer.

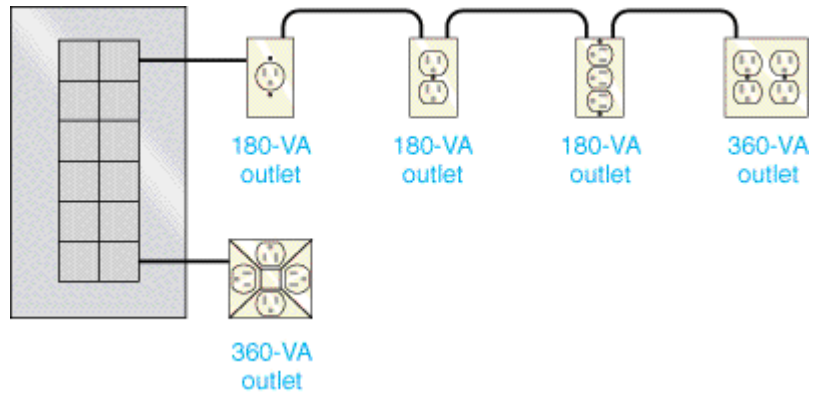
11. POWER REQUIREMENTS FOR MULTIPLE LAPTOP INSTALLATIONS:

- .1 Tests on various laptop models indicate that these units will generally draw between 0.4 to 0.7 amps, and up to 1.0 amp when operated with low batteries requiring additional charging. As such up to 8 laptops may be powered from a single 15 AMP circuit.

For electrical distribution between furniture, refer to Furniture Standards.

12. COMPUTED LOADS ON NON-DEDICATED RECEPTACLE OUTLETS:

- .1 As outlined below loads on non-dedicated receptacle outlets shall be computed at not less than 180 volt-amperes for each single or for each multiple receptacle on one yoke. A multiple receptacle comprised of four or more receptacle shall be computed at not less than 90 volt-amperes per receptacle.



GENERAL DESIGN

- .1 CO2 monitors are short life, high maintenance items. The University of Ottawa manages numerous buildings systems and to manage their ongoing maintenance requirements the University's strategy is to limit CO2 monitoring installations to the following.
 - Main AHUs to insure quality of mix air supply
 - At individual four pipe fan powered VAV terminal units servicing assembly/classroom occupancies. Sensor reading shall used to regulate VAV/fresh air supply to maintain adequate area conditions.
 - At perimeter glazed areas where occupancies can exceed more than one person per 5 m² area, where conventional VAV control boxes would fail to insure air quality under heating mode operation.
- .2 Unless approved by Physical Resources Service (PRS), CO2 monitoring should not be provided for any other than the above applications.
- .3 CO2 sensor outputs shall be accessible through building automation system. All installations shall be programmed with alert/alarm features.
- .4 For offices or similar low density occupancies, as minimal cost savings can be realized from regulating fresh air supplied, a constant rather than variable fresh air flow shall be provided in accordance to ASHRAE standards.
- .5 In all cases, during scheduled periods of occupancy, a minimal fresh air supply of 0.06 CFM/ft² shall be made available. To ensure effective air distribution, minimal mixed air supply should be no less than 0.25 CFM/ft².

1. GENERAL DESIGN

- .1 All major air handling equipment shall be installed in a mechanical room accessible from the inside of the building. Roof-top air-handling units are not acceptable on the main campus. In all cases prior approval from Physical Resources Service (PRS) for all such proposed installations.
- .2 Special attention shall be given early in the design process to provide for sufficient and safe access space for maintenance of mechanical systems. Sufficient space implies the capability to replace major components with minor impact to the Building. Equipment shall be designed to be accessible and maintainable from floor level whenever possible. When not possible, permanent structures will be designed to minimize the necessity of such tools as ladders, hoists and portable lighting (i.e.: platforms and permanent ladders for overhead work, rail systems for removal of pumps in pits, adequate permanent lighting, etc.). Drawings shall clearly indicate locations of ceiling and wall access panels and other necessary access space
- .3 When renovating or retro-fitting mechanical systems or spaces consideration shall be given to the presence of asbestos materials. Consultants are to review designated substance reports which are available for all U.O. buildings.
- .4 When equipment, wiring, piping, telecommunications cable, etc. is disconnected or "abandoned," it must be physically removed back to source of origin, made safe and disposed of as part of the project.
- .5 Unless otherwise instructed all buildings shall be metered for all utilities including electricity, gas, water, steam, or steam condensate as required, chilled water from central chiller, etc
- .6 The University is dedicated to the principle of conserving energy and will scrutinize proposed designs for means of reducing not only initial cost, but also long-range operating costs. The Architect must work in close cooperation with his Engineers to design new buildings and remodel existing buildings making the most efficient use of building materials and energy sources available.
- .7 New buildings shall be designed with the goal of achieving LEED Gold standard.
- .8 In general research laboratories, spaces for animals, and other spaces which might require 24 hours/day operation should be serviced by systems separate from classroom/office systems which may require only 12-16 hours/day operation.
- .9 Refer to Section "Q", Building Enveloppe for Glazed curtain wall.
- .10 Provide for two-stage air filtration at AHUs. Pre-Filter shall be 2 inches pleated, High Capacity, MERV 7, initial resistance 0.17" wc at 400 FPM. Final Filter shall be 12 inches pleated, V style, High Capacity MERV 14, initial resistance 0.275" wc at 400 fpm.
- .11 Pressure gages are required across all AHU coils and filter banks (filter and pre-filter combined).

- .12 For projects where no other direction is given, design for the following:
- Dry Bulb Temperature: 75 Degrees F.
 - Relative Humidity (summer): 60% maximum.
 - Relative Humidity (winter): 15% minimum.
- .13 Washroom general exhaust ductwork should be located near the fresh air ductwork to allow for energy recuperation.

2. CHILL WATER SYSTEMS

- .1 Where available utilize Central Campus chilled water for cooling. Consult with Physical Resources Service (PRS) for chill water availability.
- .2 Chill water coils shall be sized for a 9°C chill water delta-T on design day (6 C degree supply, 15 C return water temperatures).
- .3 Pressure gages are required across all AHU coils and filter banks (filter and pre-filter combined).
- .4 Specifications for all electrically-driven chillers and refrigeration units of over 40 ton capacity shall be approved by Physical Resources Service (PRS).
- .5 The central campus Power Plant houses over 6000 tons of chiller capacity. Most of the central campus buildings are provided with chill water from the central plant. Limitations exist in providing peak requirements at the north end of the campus. The Consultants will be advised if the building under discussion is to be on this system. Initial construction budget should carry the full cost of air conditioning regardless of whether the unit is located in the building or chilled water is used from the Power Plant.
- .6 Water-type cooling towers are preferred, to conserve energy, and shall generally be considered on systems 80 tons and larger. On units below 80 tons, an economic evaluation, including cost of maintenance should be made to determine if the condensing unit will be air cooled or water cooled. Cooling tower fan motor loads shall not exceed 0.06 H.P./ton of chiller capacity. Reduced condenser water temperatures should be utilized when possible to reduce the chiller electrical consumption.
- .7 Air-cooled condensers shall be capable of operating at 95°F ambient temperature with 30°F temperature difference between air entering and leaving the condenser. Air-cooled condensers on roofs shall be capable of operating at 105°F ambient temperature.
- .8 Where unscheduled shut-down is to be avoided small chillers may utilize city water for emergency condenser cooling after which the water will be disposed of the drain. Such arrangements are to be used as emergency back-up and approval by the Engineering and Quality Control Services is required.

3. HOT WATER HEATING SYSTEMS

- .1 Steam produced in the Central Heating Plant is distributed at 40 PSIG. For most of the buildings located at the South end of the main campus the steam is used at the building to produce hot water for heating purposes. North end campus buildings are directly supplied building heating water produced via large exchanger located in the Lamoureux basement area. Designers are to consult with Physical Resource Services to determine appropriate heat source for new buildings.
- .2 For new buildings, design heating system for 120 degrees F supply and 100 degrees F return water temperature.
- .3 For modifications to existing systems verify system design parameters and consult with Engineering and Quality Control Services prior to commencement of design.

4. DOMESTIC HOT WATER

- .1 Where available utilize Central Campus distributed domestic hot water system. Consult with Physical Resources Service (PRS) for domestic hot water availability.
- .2 Design domestic water systems for a supply temperature of 140° F. Provide thermostatic mixing valves to ensure proper temperatures at points of use.
- .3 Water supply at points of use shall conform to OBC requirements i.e. Max. 110° F to lavatories and showers, max at 140° F to dishwashing and laundry facilities.

5. BUILDING AUTOMATION SYSTEM (BAS):

- .1 All building DDC control systems shall be design and installed in conformance to the University of Ottawa detailed BAS System Standards and Guidelines (Installation, Graphic User Interface, Network & Alarms) which is available at the following internet site:
[HTTP://WWW.SAMULACK.NET/UDOII/STANDARDS.HTM](http://www.samulack.net/udoii/standards.htm)
- .2 All building DDC controller shall be of the DELTA Controls make.
- .3 All building DDC controllers shall be installed in a aluminum housing with dedicated 120/24 volt transformer and switch.
- .4 All DDC actuators shall be of the Belimo make.

1. GENERAL

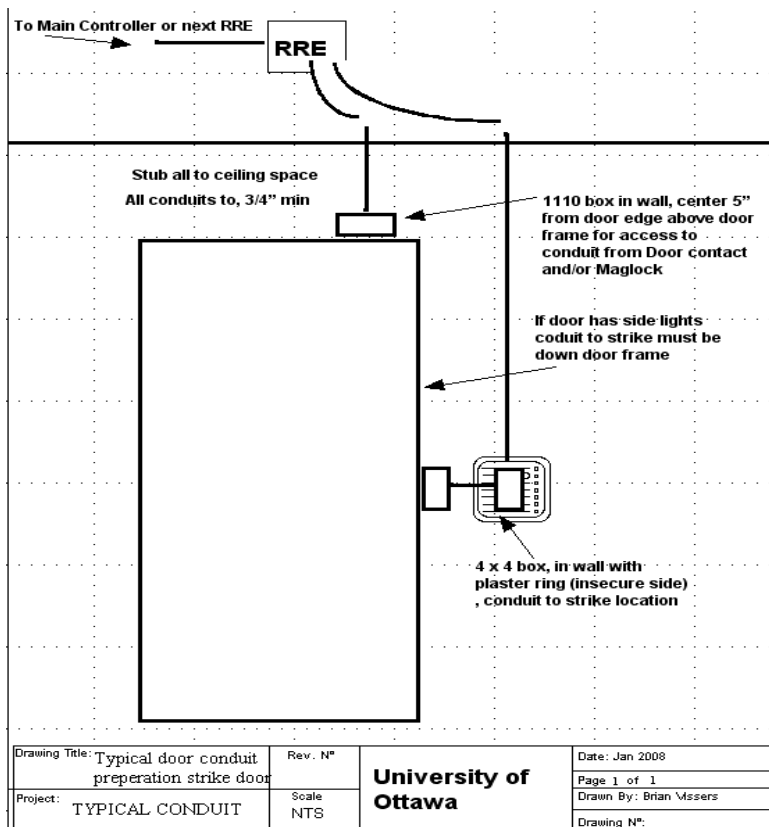
- .1 This guideline has been prepared to provide Architect and Designers with a general overview of security systems requirements in new building installations. In all cases further consultation with **University of Ottawa Protection Services** will be required to determine the specific scope of requirements suitable to the project under review.
- .2 In general the building security systems may provide for some or all of the following features.
 - Segregates the administrative areas and public / teaching areas, so that the administrative areas can easily be secured after certain hours.
 - May include electronic access control to the exterior doors of the building which will limit access after certain hours and holidays. Main access points may have CCTV coverage which will be digitally recorded and viewable live at Protection Services dispatch center.
 - Registrars controlled classrooms are typically secured with access control as per the Multimedia standard system, now in place across campus. Other areas may also be equipped with access control as requirements become identified by the clients/tenants.
 - Emergency Code Blue type Emergency telephones may be required at strategic locations within the public locations. These will all have a Pan Tilt Zoom camera associated to them.
 - Any ATM banking machines will have a PTZ camera associated as well.
 - 24 Hr computer labs will have fixed cameras installed covering the labs activity as a safety feature.
 - Where applicable elevators will be equipped with access control readers to restrict access to floors as required, cabs will be equipped with a CCTV camera. Cabs will be equipped with an emergency direct dial telephone to 5411 Protection Services.
 - Where applicable exterior Pan Tilt Zoom (PTZ) camera will be installed on the exterior wall(s).
 - Universal Toilet Rooms and other washroom which represents a security issue for the users shall be equipped with an emergency button linked to Protection Services of University of Ottawa.

2. CONDUITS / CABLE TRAYS

- .1 Security system cabling is generally installed using a combination of conduit, cable tray and free air.
- .2 Multimedia Classrooms design should generally provide conduits for related security cabling requirements.
- .3 To minimize costs free air cabling can be used in concealed ceiling space or cable trays where available.
- .4 No more than two 3/16" cables are typically required to any classroom or card reader location.
- .5 When running conduits up to 4 card readers can be daisy chained from one reader location to the next.

3. ELECTRONICALLY SECURED DOORS

- .1 A $\frac{3}{4}$ " conduit is required at each door card reader location, door strike location, and door contact location. The strike and reader conduit may be combined if done as per the configuration below.
- .2 In concrete frames a standard electrical 1100 should be placed on top of the frame to create a space to mount the conduit to and install the Door contact to. A 1" hole should be punched in the door frame for the door contact at 4" from the door frame corner (from the strike side).
- .3 For door opener systems, Division 26 (Electrical) to provide backboxes, conduits c/w pull wires and power supply (115V @ headers) . Conduits to connect door operator system with access control system to be provided. Hardware installer to install all related hardware for operation of door operators at not more than 1200mm and not less than 900mm center line above the finished floor as per O.B.C.
- .4 Wiring schematics detailing all electrical components for each door opening to be prepared by the hardware manufacture at the request and with the support of the hardware supplier.
- .5 All access controlled doors to have door closers supplied and adjusted at time of installation.
- .6 All access control hardware to installed by qualified tradesman competent in the installation of finishing hardware with minimum of (5) years experience shall be used. The installer shall adjust, clean and make good all installation of Finishing hardware to the satisfaction of the Universities Security manager or hardware consultant.
- .7 Final inspection to be carried out by the Hardware Supplier consultant whose name is written on the cover sheet and Product representative. Representative to provide written certification that hardware has been installed and adjusted as intended.



4. ELEVATORS

- .1 A one inch conduit for CCTV interface and access control with the elevators must be provided into elevator machine rooms from the cable tray system or from the main riser.
- .2 Elevator specifications shall be written so as to indicate that the elevator supplier and subcontractors are to coordinate works with Protection Services to interface all CCTV equipment and access control equipment related to elevator security (Floor and camera control). Each cab travelling cable must have 3 twisted pairs for camera operation, and 4 twisted pair for the card reader system (Gauge 2/18).
- .3 Elevator control system shall be designed such that Protection Services will be automatically advised when either of cab emergency phones or machine room fire alarm is activated. (Security system generally interfaces to telephone line and monitors for line loop activation at machine room, with an individual line activation per cab. Protection has no other requirement as to fire alarm with respect to the elevator).

5. UNIVERSITY COMMUNICATION CLOSETS

- .1 University of Ottawa communication closets shall be designed with approximately 1m² floor space to install security system controllers. (one) Dedicated four inch conduit risers shall also be provided between vertical closets for security system requirements. This requirement may vary as per number of security devices required.
- .2 University of Ottawa communication closets shall be provided with one 110 V emergency powered duplex circuit dedicated to security system. In general all secured doors driven by security controllers will operate with 24 V electrical devices at the doors. Certain doors may nevertheless require 110V /24 V power supply.
- .3 Designers shall co-ordinate with the University Communications Services for the allocation to Security Services of dedicated fiber optic cable links back to 141 Louis Pasteur. In such cases.

6. PROTECTION SERVICES REQUIREMENTS

- .1 141 LPR Communications Center may require CCTV equipment additions and minor renovations to accommodate additional CCTV Cameras and digital video recorders. The costs to provide this infrastructure shall be included in the construction project.



1. GENERAL DESIGN

- .1 To avoid having reverberation issues, ensure the spaces to have sufficient sound absorbing surfaces.
- .2 To put particular attention to the execution of work ensuring that enclosures are adequately sealed and to avoid equipment going through a STC required wall.

2. STC (SOUND TRANSMISSION CLASS)

The following STC performance is to be reached:

ELEVATOR WALLS	STC 60
SHAFT WALLS	STC 60
MECHANICAL ROOMS	STC 60
AMPHITHEATRE	STC 55
LARGE LECTURE CLASSROOMS (>80)	STC 55
CLASSROOMS	STC 50
SEMINAR ROOMS	STC 50
CONFERENCE ROOMS	STC 50
PRIVATE OFFICES	STC 45*
PUBLIC CORRIDORS	STC 45
PRIVATE CORRIDORS	STC 40
GENERAL OFFICES (NOT PRIVATE)	STC 35**

* *When confidentiality is required.*

***This STC performance could generally be reached by building a wall as follows: 1X16mm Gypsum Board on both sides until 150mm above acoustical ceiling + 92mm Steel Studs @ 400mm + Sound attenuation batt insulation inside + sealing bottom plate with acoustic caulking.*

3. MECHANICAL

Mechanical system design shall incorporate all necessary sound attenuation features (flexible connections, duct acoustic lining, mufflers, low velocity diffusers, etc...) to assure the required room acoustic performance.

1. GENERAL DESIGN:

.1 Overview

.1 The main intend of this guideline is to describe the type of lamps being used throughout the University of Ottawa.

.2 Objectives

.1 The light fixture shall be chosen base on the following objective.

.1 Lamp characteristic

.2 Usage by meeting the University of Ottawa lighting level standards

.3 Operational (maintenance and energy consumption)

2. LAMP CHARACTERISTIC

.1 Florescent lamps must be of type T8, color to match Sylvania 835, with a CCT of 3500°K , in length of 4 or 2 ft, U shape (1 5/8" to 6" spacing).

3. LIGHTING LEVEL STANDARDS:

.1 See table at the end of this document.

4. LIGHTING FIXTURE SELECTION.

.1 In selecting lighting fixtures, special consideration shall be given to accessing and maintaining fixtures. In particular:

.1 Preference shall always be given to higher rated lamp life.

- .2 Accessibility to the light fixture. Design and location of fixtures shall be such as to minimize the usage of scaffolding when changing lamps.
 - .3 In high ceiling or auditorium applications, consideration shall be given to providing a mechanism to bring down the light fixtures, or a cat walk above the light fixture. Use of scaffolding is to be avoided for light fixture maintenance.
 - .4 In stairwell, light fixture should be installed on walls or in the ceiling of the landing area, avoid installing fixtures above the stairs.
 - .5 In open space like atriums or corridors the light fixture layout should take into consideration fixed furniture (table, counter, chairs, booth) that are obstacles for maintenance.
 - .6 Select fixtures models designed with ballast, lamp and lamp socket accessibility.
-
- .2 Energy consumption
 - .1 Consideration shall be given to regulate the number of hours or lighting intensity within given areas.
 - .2 Designs should make good use of natural light, in particular lighting intensity should be modulated in large south facing glazed areas..

5. CLASSROOMS LIGHTING:

- .1 *Refer to section "C", Classrooms*

6. EMERGENCY LIGHTING:

- .1 With the exception of Main electrical and Generator rooms, battery pack type emergency lighting fixtures shall not be used.

7. EXIT SIGNS:

- .1 To provide exit signs with mention "EXIT" only. To avoid using the bilingual exit signs with "EXIT-SORTIE" mention.

LIGTHING LEVEL STANDARD

Area	Foot-candles
Main corridor	20
Secondary Corridor	10
Stairwell	10
Classroom	30
Chalk Board	50
Multi-media classroom	50
Chalk Board	40
Auditorium	30
Laboratory	50
Library	
Reading areas	30
Cubicle with window	30
Cubicle without window	30
Library circulation desk	30
Washroom	
Stall	10

Sink		30
Computer lab		20
Cafeteria		
Kitchen		50
Student Lounge		30
Faculty Lounge		30
Cash Register		30
Office		
Reception area		30
Open office		30
Private office		30
Conference room		30
Elevator		15
Storage Room		10
Loading dock		25
Machine shop		40
Electrical, Plumbing and Carpentry shops		50
Mechanical, electrical and boiler rooms		30
Book Store		
Display area		50
Cash register		30
Sports facilities		
Exercise room		30
Arena		50

Locker room	20
Gym	30
Pool	20
Indoor parking areas	5
Outdoor security light	
Perimeter	2
Walkways	5
Entrance door	10

1. GENERAL DESIGN

- .1 If not otherwise stated in the Design Standards, the Ontario Building Code applies. In case of contradiction, the Ontario Building Code prevails.

2. INTERIOR CIRCULATION

- .1 All doors in corridors between entrance and elevators/washrooms to be motorized or kept open.
- .2 All doors in main corridor to be motorized.
- .3 Eliminate doors to main washrooms and motorize others.
- .4 All door handles to be cantilever.

3. EXTERIOR CIRCULATION

- .1 Exterior ramps to be concrete heated and have a canopy.

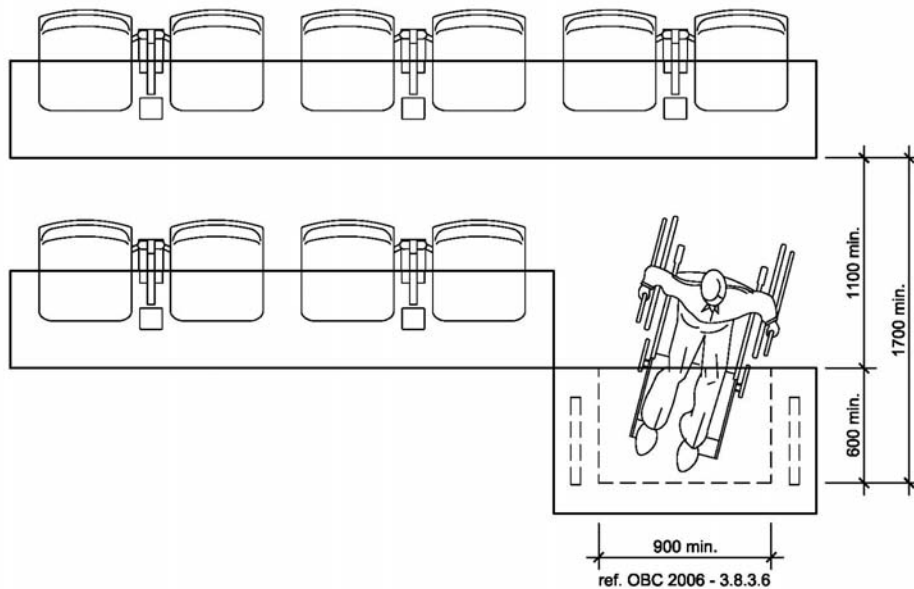
4. UNIVERSAL TOILET ROOM

- .1 One washroom near classrooms and main halls to be considered to be universal and separate from others. To be approved by Physical Resources Service.

5. CLASSROOMS

- .1 All classrooms to have accessible tables, electrical height adjustable.
- .2 Minimum Required Dimensions for one student:

Width: 900mm
 Depth under the table: 600mm
 Behind the table: 1100mm



BASÉ SUR ESSAIS EFFECTUÉS AVEC MARIE-CLAUDE ROULEAU (SASS)
 ET KRISTIANNE DORION (ÉTUDIANTE) LE 21 MAI 2008

- .3 To install a few coats hooks at an accessible height for people in wheelchairs.

6. RECEPTION AREAS

- .1 To design a low reception counter section for people in wheelchairs

7. PUBLIC ROOMS

- .1 All rooms dedicated to general public or students such as computer laboratories, seminar rooms or others, shall accommodate at least one person in wheelchair.

8. WATER FOUNTAINS

- .1 Height installation to accommodate people in wheelchair.

9. WASHROOMS DOORS

- .1 Except for individual washroom, to be equipped with automatic door operators. Refer to Section 08 71 10 Hardware

10. STAIRS

- .1 Step nosing shall have an adequate color contrast.

1. GENERAL :

- .1 Where applicable standards shall be incorporated in design tender package. Consultant shall use edited NMS specifications 08 71 10 or equivalent.
- .2 Submittals: To be determined with Physical Resources Service.

2. PRODUCTS :

- .1 The following products shall be considered as non-acceptable.
 - .1 Wireless Automatic Door Operator not allowed.
 - .2 Electric locks not allowed. To use electric strikes instead.
 - .3 Fixed central mullion on double leaves door and vertical rods used with panic bar not allowed.
- .2 The following products shall be avoided as much as possible
 - .1 Maglock installations.
 - .2 Electrical Automatic Door Operator installation. Use the pneumatic type as specified below.
- .3 Specifications

Device	Type	Manufacturer/ Supplier	Product	Finish
Aluminum Door locks	Deadlock latch paddle	Adams Rite	MS 1850 series 4710 X 4590	To match door
Automatic Door Operators	Pneumatic	LCN	4820/4811 series c/w 925 tubing	689
Automatic Door Operators Control Boxes	With or without compressor	LCN	7980 or 7900 series	
Door Closers	Surface mounted	LCN	1460 <i>Narrow styles</i> (acceptable for all doors except ext. stairwells and corridors:)	689

			4041 (acceptable for all doors)	
Controls	Barrier free	DCI Glyn Johnson		
Cylinders	Interior or Exterior	Medeco	To suit lock type	626
Coded locks	Cylindrical	King Cobra		26D
	Mailbox	Weiser, Reopel		
Dead locks	Mortise	Schlage Sargent	L460 series 4870 series	626 26D
Electric Strikes		RCI	AS65-LMKM Rim-9600	630
Electric Strikes With Fire Rating		HES	9600 Series (for panic bars)	
		HES	HES 1006 LBM (Latch Bolt Monitor, for Mortise lock)	
Exit device	Rim	Von Duprin	98 series	626
		Sargent	88 series	32D
Flatware – stops – Pulls- Bolts...etc	Kick plate Push plate Flush bolts	Gallery Specialty Gallery Specialty Gallery Specialty Hager Standard Metal CBH	GSH80A (tape) GSH81AA (tape) GSH401 Alternate Alternate Alternate	32D 32D

Hinges	Butt type	Hager McKinney Stanley	BB1279, BB1168 TA2714, T4A3786 FBB179, FBB168	26D 26D 26D
	Continuous	McKinney Roton	MCK-12HD / MCK-25D 780 112 HD(aluminium) 780 224 HD (HMD)	CLA CLA CLA
		Select	SL11HD (aluminium) SL24HD (HMD)	CLA CLA
Hold Open				
Lockset	Mortise	Schlage Corbin Sargent	L9000 series 03B ML 2200 series LWA 8200 LNB	626 630 626
	<i>Functions :</i> Office Classroom Storeroom Passage <i>with</i> Levers			
Overhead Stop	Concealed	Glynn-Johnson	100 series (alum)	US32D
Power Supply	Electric Strikes	Von Duprin Securiton		
Threshold and Weatherstripping	Weather strip door sweep threshold	K N Crowder K N Crowder K N Crowder	W20P – LTS W24S – LTS CT 11 / 12 / 32	AL AL AL
	Threshold stop	K N Crowder	CT40P - LTS	AL

3. EXECUTION:

- .1 Installation and adjusting to be done by a qualified and experienced installer.
 - .1 Final adjusting to be done when HVAC systems is in function. The door should adequately close when the door is released at approximately 30 mm from the latch.
- .2 Automatic Door Closers:
 - .1 Install two additional wires to actuator for eventual card reader installation.
- .3 Electric Strikes:
 - .1 Door frames to be at least 50mm wide for adequate installation of specified electric strikes.
 - .2 To put particular attention to frame preparation to well coordinate with the specified electric strike to be installed, specifically on Fire Rating frames.
 - .3 To install a *Classroom* function lock to permit locking the door if electric strike is out of order.
- .4 Central Mullion:
Central Mullion on Double Leaves Door shall be removable if installed.
- .5 Automatic Doors Operators:
Delays to be applied: 5 seconds before door to open after pushing on the actuator and 12 seconds to keep open before door to close.

1. GENERAL :

- .1 Where applicable standards shall be incorporated in design tender package. Consultant shall use edited NMS specifications 09 91 23 or equivalent.
- .2 Submittals: To be determined with Physical Resources Service.

2. PRODUCTS :

- .1 INTERIOR- GENERAL
 - .1 100% Acrylic painting to be generally used.
 - .2 Epoxy and alkyd painting to be approved by Physical Resource Service (PRS) under special circumstances.
- .2 INTERIOR NEW SURFACES:
 - .1 Walls:
 - 1 coat water base primer/sealer
 - 2 coats minimum, 100% acrylic painting.
 - .2 Doors, metal frames, railings:
 - 1 coat Water base Primer
 - 2 coats minimum, 100% acrylic painting, semi-gloss finishAlkyd painting must be approved by Physical Resources Service (PRS)
 - Concrete floors:
 - Seal: To be determined
 - Paint: To be determined

3. INTERIOR EXISTING PAINTED SURFACES

- .1 Walls:
 - 2 coats minimum, 100% acrylic painting.
- .2 Doors, metal frames, railings:
 - Preparation:
 - To wash with TPS (Trisodium Phosphate) all the surfaces and sand.
 - Surfaces preparation to be done adequately to obtain best performance.

Primer:

1 coat, Sherwin Williams, Acrylic, Preprite, Bonding Primer, Interior/exterior, Adhesion Promoting Primer, B51W50 OR ICI Paints, Acrylic, ICI X-Pert 250 Gripper.

Finish:

2 coats minimum, 100% acrylic, semi-gloss finish.

1. GENERAL :

- .1 Where applicable standards shall be incorporated in design tender package. Consultant shall use edited NMS specifications 10 28 10 or equivalent.
- .2 Submittals: To be determined with Physical Resources Service.

2. PRODUCTS :

- .1 General
Not allowed:
Recessed hand paper dispenser and waste receptacle not allowed.
- .2 Mirrors
Tempered glass mirrors to be used.
- .3 Toilet Tissue Dispenser



T-2 GW (white) Bathroom Tissue Dispenser

Supplier: WOOD WYANT

Reference # 903132

Installation Height: To be determined

.4 Hand Paper Dispenser

**P-17 WOOD WYANT Towel
Dispenser
#6320005 (903290)**

Roll, touch free, smoked

P-17 - 'No Touch' towel dispenser. Reliability, silent operation and a stub roll transfer mechanism are just a few of this towel dispenser's features. Constructed of tough resins and stainless steel, the HACCP compliant P-17 stands up well to most cleaning solutions. The unit's water resistant design protects the toweling from spray cleaning.

Maximum capacity: 1 - 20.32 cm (8") diameter roll towel, plus 1- 8.89 cm (3.5") diameter stub roll.

Dimensions: 40.4 cm x 32 cm x 23.4 cm.

Weight: 3.4 lb

Installation Height: 130-140 cm center above floor.

.5 Electric Hand Dryer

**MITSUBISHI Electric Jet Towel Hand Dryer
JT-SB116EH**

One unit installed per 4 lavatories in large washrooms.

Speed - From the user standpoint, the biggest advantage is fast drying time. The Jet Towel hand dryer reduces the time to approx 8 seconds. The Jet Towel blows high velocity air onto both sides of the hands simultaneously, reducing the overall drying time. Secondly, hands are inserted flat into the Jet Towel ensuring that the maximum surface area is dried quicker.

Power: 120V, 9.2A, 1100W

Dimensions: 300 cm x 225 cm x 835 cm.

Weight: 14 kg

Noise: 65dB

Installation Height: Floor mount

.6 Soap Dispenser

	<p>WOOD WYANT Aristocrat Bulk Soap Dispenser #574LR-WWG</p> <p>Push Cover, 950ml, White</p> <p>The Aristocrat Soap Dispenser features a removable reservoir to make refilling the dispenser a breeze. Simple to operate - just push the cover to dispenser the hand soap. Capacity: 950 ml. White. Weight: 0.65 lb</p> <p>Installation Height: 20-30 cm free above counter.</p>
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.7 Hand Paper Disposal

	<p>RUBBERMAID BRUTE container without lid #2620</p> <p>Durable and heavy-duty container.</p> <p>Capacity: 20 gal Diameter: 49.5 cm Height: 58.1 cm Color: Gray</p> <p>Installation: Underneath top counter.</p>
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.8 Sanitary Napkins Receptacles**RUBBERMAID 6140 Sanitary Napkins Receptacles
7206140 (110535)**

Sanitary Napkin Receptacle - Space efficient and easy to serve - Tight-fitting lid helps contain odors - Removable rigid liner is easy to clean and maintain.

White.

Weight: 1.18 lb

Installation Height: To be determined.
(minimum 300 mm free between bottom of receptacles and floor finish)

1. GENERAL :

- .1 Where applicable standards shall be incorporated in design tender package. Consultant shall use edited NMS specifications 22 42 01 or equivalent.
- .2 Submittals: To be determined with Physical Resources Service.

2. PRODUCTS :

- .1 Eye Wash
 - .1 Countertop-mount: Haws model 8904
 - .2 Polished chrome-plated, countertop mounting including all mounting hardware, flip-top-eye wash head covers, deck flanges, vacuum breaker, squeeze-handle ball valve and accompanying signs
 - .3 Wall-mount: Haws model 8905
 - .4 Polished chrome-plated, wall mounting including all mounting hardware, flip-top-eye wash head covers, vacuum breaker, squeeze-handle ball valve and accompanying signs
 - .5 Acceptable material: Chicago Faucet and Bradley
- .2 Eye Wash Mixing Valve
 - .1 Haws model TWBS.EW
 - .2 Rough bronze, maximum discharge set point of 29oC, factory set at 26oC, 12mm hot and cold water inlets; 12 mm discharge. Provide complete with bypass and temperature gauge
 - .3 Acceptable material: Powers and Bradley
- .3 Emergency Shower
 - .1 Haws model 8133H
 - .2 Horizontally-piped Emergency Shower including stainless steel head, stainless steel pipe, stainless steel valve, complete with all stainless steel flanges, stainless steel hardware, marking plates and signage
 - .3 Acceptable material: Bradley

.4 Emergency Shower Mixing Valves

.1 Haws model TWBS

Rough bronze, maximum discharge set point of 29oC, factory set at 26oC, 32 mm hot and cold water inlets; 32 mm discharge. Provide complete with temperature gauge and cabinet 300x300 mm clear opening access door. Minimum flow: 15USGPM

.2 Acceptable material: Powers and Bradley

3. EXECUTION:

- .1 No specifics. Standard examination, installation, adjusting and cleaning as recommended by manufacturer.

1. GENERAL :

- .1 Where applicable standards shall be incorporated in design tender package. Consultant shall use edited NMS specifications 22 42 02 or equivalent.
- .2 Submittals: To be determined with Physical Resources Service.

2. PRODUCTS :

- .1 Slop Sink
Terrazzo 6" drop front slop sink, 36"x36"x12", Crane model# TSB 3002, complete with s/s caps and drain. Trim to be service-sink faucet, Fiat #830-AA
- .2 Floor Drain
Floor drain with round bronze strainer, cast iron, 4" throat, reversible membrane clamp, Watts #FD-100-C-A
- .3 Area Drain
Area drain, epoxy coated cast iron, 8"x8", adjustable top, standard outlet c/w body collar with weepholes and anchor flanges, Watts #FD-330
- .4 Trap Seal Primer
Washroom/kitchen area floor drains shall be provided with a "Flush Valve Trap Seal Primer", MiFab model # MI-702 or Sloan model # VBF-72-A1. Where a floor drain is installed far away removed from a water source, a "Trap Guard" seal may be used in lieu of a Trap Seal primer.
- .5 Valves
 - .1 Ball valves in sizes 1½ through 6" (40 mm through 150 mm) to be designed for 600 psi (4140 kPa) (WOG) bubble-tight working pressures. Valve seals shall be designed for 450°F (232°C) maximum temperature. Flanged valves: Kitz 150 SCTB.
 - .2 All butterfly valves 6" through 12" (150 mm through 300 mm) to have manual gear operators. Valve bodies shall be of one piece design, zinc electroplated in accordance with ASTM A-164, and cast of ductile iron conforming to ASTM A-536 or malleable iron conforming to ASTM A-47. Valve discs to be of ductile iron conforming to ASTM A-536, 65-45-12 and plated with nickel chromium. Valve operator hubs to be cast of malleable iron conforming to ASTM A-47. Infinitely variable, extending lever handles shall be electroplated carbon steel.
- .6 Piping Systems

- .1 Hydronic piping to be steel pipe to ASTM A53 Grade B:-1 to 6" (150 mm), Schedule 40, 8" to 10" (200 mm to 250mm), Schedule 30, 12" (300 mm) and over, 3/8" (10 mm) wall thickness or copper tube piping, hard drawn, type L to ASTM B88M-99.
- .2 Domestic hot, cold and recirculating systems to be copper tube, hard drawn, type L to ASTM B88M
- .3 Drainage piping to be:
 - .1 Copper tube piping for sanitary, vent and storm, type DWV to ASTM B306.
 - .2 Cast iron for buried sanitary and vent, minimum 3"NPS to CSA B70.
 - .3 Blue line or brown line for laboratory, schedule 40, certified to CAN/CSA B1800-02.
 - .4 Plastic drainage pipe shall be used on urinals drainage system and shall be acid resistant (urine) i.e. IPEX XPR.

3. EXECUTION:

- .1 No specifics. Standard examination, installation, adjusting and cleaning as recommended by manufacturer.

1. GENERAL :**.1 Submittals**

Refer to the University of Ottawa standard tender documents to submit shop drawings and samples as requested.

2. PRODUCTS :**.1 Sensor Activated Water Closet**

Wall hung water closet, elongated bowl, high efficiency 4.8Lpf/1.06gpf capacity, direct-fed siphon jet, back spud, vitreous china, color to be white, American Standard model #3353 128, Afwall elongated flushometer, 4.8L c/w Watts water closet carrier.

Commercial flush valve, sensor activated electronic control, recessed, hardwire, vandal resistant, waterproof, field adjustable flow rate, rear connection, Aquanar model #2020R c/w #04-021-120v/24v transformer and #01-036 chrome connection. B

Barrier-free water closet to be mounted at seat height of 17" AFF.

.2 Manual Activated Water Closet

Z5610 1.6 GPF elongated wall hung flush valve toilet, direct-fed siphon jet, back spud, vitreous china, color to be white, American Standard model #3353 128, high efficiency flushometer.

Zurn Z6000AV-WS1 AquaVantage Exposed Closet Flush valve: diaphragm-type chrome plated flushometer valve with polished exterior.

Barrier-free water closet to be mounted at seat height of 17" AFF

.3 Water Closet Seat

Commercial solid plastic, heavy duty, open front elongated bowl toilet seat, c/w s/s check hinge, nuts and lock washers. Color to be black.

.4 Urinals

Washout wall hung urinal, vitreous china, integral extended shields $\frac{3}{4}$ " back spud, 14" lip, Crane Cromwell model# 7398 c/w flushing rim and trap, watts floor mounted carrier and wall clean-out with brass plug and s/s cover plate above urinal.

.5 Urinal Flush Valve

Commercial type sensor activated electronic control, recessed, hardwire, vandal resistant, waterproof, field adjustable flow rate, Aquanar model #2120 c/w #04-021-120v/24v transformer and s/s flexible hose for back connection #04-065.

.6 Lavatory

Commercial s/s sink, oval, 304 stainless steel, 18 gauge, self rimming and positive hold down clamping, undercoated to reduce condensation, 1 1/4" drain, integral overflow at back of sink, Franke/kindred #OV1821/5/3 c/w strainer

.7 Lavatory Faucet

Sensor activated electronic faucet, waterproof sensor and control module, hardwire, 4" trim plate, 0.5 usgpm vandal resistant aerator, brass body, adjustable sensing distance and auto-shutoff, Faucet height 5 3/4" max., Aquanar model #1870-4 c/w 120/24 transformer #04-021, thermostatic mixing valve #MP4 and 1/4 turn mini ball valves from Dahl.

.8 Hand Dryer

High performance automatic hand dryer, 18 gauge steel cover, chrome plated satin finish, vacuum motor/blower with automatic resetting thermal protection, 5/8 hp, 24000rpm, microprocessor controlled infrared sensor, tamper resistant, drying time 10-15 seconds, 16000 Lfm nozzle speed, 135F at 72F ambient temperature, 5yr warranty, American dryer model eXtreme Air #GXT6-C.

3. EXECUTION:

- .1 No specifics. Standard examination, installation, adjusting and cleaning as recommended by manufacturer.