DESIGN CRITERIA FOR CLASSROOMS
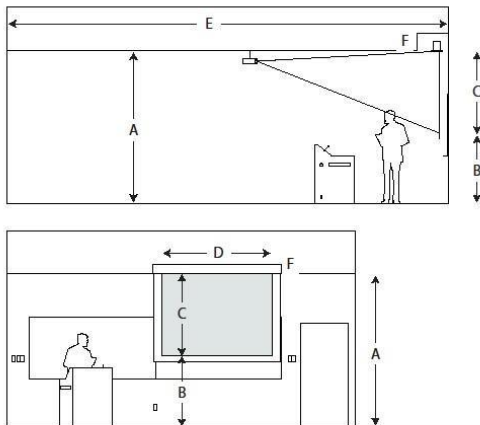
UNIVERSITY OF TORONTO

2012

A Clear ceiling height - in this example 9'9
B Image to floor - always min. 4'6
C Image height, here 5'3
D Image width, here 7' (can been read from 7x4=28')
E Room depth, here 28'
F Screen housing is inset in cove/ceiling to raise image

CLASSROOM STANDARDS 2012   http://www.osm.utoronto.ca/standards/

INTRODUCTION

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THREE CAMPUSES

These standards are assembled by the Office of Space Management at the St. George Campus, but can be applied at all three campuses. This document is a recommended guideline with all final specifications on a per project / per campus basis (i.e. for example different campus AV support groups may have some specifications that vary from this document).
Use contact information at bottom to request changes per campus / per specification.

WEBSITE
Diagrams and additional information (and new versions of this document) are available at:
http://www.osm.utoronto.ca/standards/
(July 2012 - under construction, partially complete)

METHOD
The classroom standards are a working tool for the design process, to be used in conjunction with 1) consultation with instructors for the given department and 2) administrators and facilities managers for the buildings and departments in question.

SPECIFIED PRODUCTS / PROCUREMENT
Any specific products or manufacturers listed herein can only be purchased within the confines of University procurement policy.

OBC
All standards assume the architect has ensured compliance with the Ontario Building Code.

OCCUPANT TURNOVER
The University has a 10-minute turnover between classes, and so classrooms must be located in appropriate vicinity to one another. Also, classrooms must be accessible 24/7.

SOUND ISOLATION
Sound isolation includes all HVAC, sound of adjacent rooms, and outside noise. 50 STC is required as sound blocking for classrooms.

REQUIREMENTS
Be sure to meet standards for:
Sound control
Lighting
Screen size and viewing angle
Blackboard/Whiteboard
AV control

FINISHES

Basic finishes recommended for classrooms:
- Off-white walls with black/grey baseboard
- Carpet in tiles with heavy pattern and dark colours to survive coffee spills
  Can use quarter-turn or parallel pattern, according to architect
- Kenisngton maple laminate surface tops
- 3mm Flat surface edging in grey
- Furniture frames in chrome, silver or grey. Option of sand
- Fabric all 1,000,000 double rub, recommend black or grey
Typically varied colour use dates quickly. Light finished strongly recommended on surface tops and all walls. Strong colours and accent walls are preferred in common areas, leaving classrooms simple (the presentation is the primary visual component in the classroom). If using strong colours in the classroom, recommend it being applied to fixed elements (like acoustic panels or carpet) rather than wall paint.

USE / TESTING
Client to clarify if the instructional room will also serve as a testing space - spacing and capacity may have to be shown in an alternate configuration for test/exam use.

WARRANTY
All classroom furnishings are to come with a minimum 10-year warranty.

UNIVERSITY STANDARD SYSTEMS
All classrooms are to be "support capable", that is, the systems installed will not be proprietary but among those recommended and supportable by the Office of Space Management and Computing and Networking Services (CNS).

Typical style by capacity	
0 - 30	Small classroom / seminar room
30 - 60	Medium classroom
60 - 100	Large classroom / small lecture hall
100 - 200	Medium lecture hall
200+	Large lecture hall / lecture theatre

1   PLACEMENT OF CLASSROOMS

    1.1   TRAVEL BETWEEN ROOMS

Students have a ten-minute window to get from one class to another, including travel times between buildings. Locate classrooms with good access to building entrances.

1.2   ENTRANCES AND EXITS

Doors opening into classrooms of all types are to be a minimum of 915 mm (3'0") wide. In the case of double doors, each entrance will have at least one leaf that is 915 mm (3'0") wide.

Ontario building code (Confirm per project) requires 2 out-swinging exits per room >60 capacity. Out-swing doors cannot obstruct passage in hall (use a door cove in the room). Rooms <60 capacity require only one exit door either in or out-swing.

Recommend one or more powered entrances for all halls capacity 60+

1.2.1 VISION PANELS

Doors to all classrooms are to have narrow vision panels so that one (including someone using a wheelchair) can see into the room to know if the room is occupied prior to opening the door. Alternate is to use a tall narrow window beside the door. Vision panels not to be opaque - they are to provide view in/out of room.

1.3   CRUSH SPACE

Crush space is required outside of classrooms to facilitate 1) change of occupants and 2) students waiting outside for next class. A 100-person hall during class changes (which occur many times a day) will have 200 persons in the vicinity of the main entrances.

Guideline for crush space is 50% of room size. Immediate corridor space can be counted as part of crush space. Architects are warned that reduction of crush space is easy to do in design stages but significantly reduces building performance in the long term.

1.4   BINS

Waste and recycling containers are to be located outside of classrooms.

1.5   WASHROOM FACILITIES

Washrooms to serve the classrooms are to be located immediately adjacent to the crush space.

There will be sufficient fixtures to accommodate the peak load on these facilities within the class turnover period. This fixture count will be considerably higher than that specified in the building code. What appears to work for classroom situations is one fixture per 30-40 seats (the larger number of fixtures in female dominated faculties); this concentration of fixtures adjacent to the classrooms, however, will not reduce the number of fixtures that will be available in other areas of the building.

The proportion of male to female fixtures will reflect the proportion of the anticipated users of the rooms, if known.

Single user accessible washrooms are to be provided near classrooms (accommodating the transgendered as well as the disabled).

1.6   SECURITY

Locking and unlocking of classrooms is part of a centralized security system. Projector lifts or cages are to be used if required by AV department.

2   SOUND

2.1   ACOUSTICS, SOUND TRANSMISSION AND MECHANICAL NOISE

50 STC minimum for classroom partitions.
Partitions required to extend through finished ceiling to the slab. Where this is not possible, the architect is to propose an alternate solution which will produce like results. Typical STC 50 assembly is double-drywall both sides, acoustic batt fill, 3.5" steel studs, with all seams caulked and taped. If possible, architects are encouraged to use a double offset stud wall assembly with batt fill for a greater than 50 STC assembly.

Ambient noise levels (including all HVAC) is not to exceed NC rating of 25, measured at 4' from the floor at all points in room.

Doors are to be acoustically rated and sealed; door closers and any exiting hardware are to be operationally 'silent'.

Room entrances to be located at back or room or on far side from instructor AV control location to minimize audio disturbance from entrance traffic. In large halls mid-hall entrance is preferred with corridors separating seating from doors. In 50+ capacity rooms the client may specify a short corridor entrance to buffer entrance/exit noise.

2.2 VIBRATION CONTROL AND MAGNETIC INTERFERENCE

Classrooms are to be designed to prevent vibration transmission (and any resulting sound transmission) and magnetic interference from all nearby generators of same (e.g., subways, streetcars, etc.).

3 ROOM PLAN

3.1 ROOM TYPES

Rooms are described by 4 basic criteria, none of which is dependent on capacity		
STYLE	Lecture	Seats facing the front, in rows (curved or straight)
	Seminar	Tables in 'O' or 'C' shape for group discussion. No rows
	Horseshoe/Case	Curved rows in 'C' shape, with tiered floor
	Exam/Individual	Separate individual student tables in rows facing the front
	Workshop/Skills	Multiple group tables. May have multiple room fronts
	Computer Lab	Typically extra deep rows with wide center aisle
	Mobile group	Loose tablet seats, wheeled
FLOOR	Flat	Smaller or multi-use/group rooms
	Tiered	All rooms more than 7 rows deep should be tiered
	Dais	Raised platform for instructor. Not recommended due to problems in wheelchair access
ROWS	Straight	
	Fan (gentle curve)	Usually tiered with at least one mid-aisle
	Horseshoe ('C')	Usually tiered with at least one mid-aisle
SEATING	Loose	Sled, 4-point or 5-point base, wheels or glides Upholstered or non-upholstered
	Fixed	Theatre floor mount, on bar or swing-arm Upholstered or non-upholstered
TABLES	Loose	Minimum 2' width allocation per student, prefer 2'6 minimum. Depth 18" minimum. Similar rooms should have same tables for easy exchange.
	Fixed	Usually continuous with 20" depth
	Tablet	Minimum 16"x10" / 160 sq"

3.2   ROOM PROPORTIONS

Tend all classrooms of all capacities towards square. This will provide greatest immediate performance and best long-term re-use capability.
Recommend proportion ratio should not exceed 3:4 (either width:depth or depth:width).
Proportion ratio maximum 2:3 (either width:depth or depth:width).
Narrow-deep rooms should be avoided.
Wide-shallow rooms can be effective if (a) screen viewing cones are correctly adhered to (usually requiring 2 cloned screen images) and (b) consideration is taken in the difficulty of hearing unamplified instructor voice in the front wings of the room.

3.3   SCREEN VIEWING CONE

In plan view, draw a line at 30 degrees from the left and right edges of the projected image. These lines cross in line with the screen center, and produce from that the 'Viewing Cone'.
100% of students should be within this viewing cone.
Students looking up to the top of the projected image should be looking up at no greater than 40 degrees.
See http://www.osm.utoronto.ca/standards/av.html for diagram.

3.4   PROJECTED IMAGE SIZE / WIDTH

Projected images are now standard 16:10 aspect ratio (digital projection). Image
width is minimum ¼ of room depth.
Bottom of image minimum 4'6" from floor (so students at rear can see image over heads of students seating in front); prefer 5'+

3.5   SCREEN LOCATION ON FRONT WALL

Architect should provide simple room front drawings showing location of image with dimensions showing clear ceiling height, image size and distance from floor.

Typically the screen is offset to one side to allow maximum available blackboard with screen down (minimum 6' wide of visible blackboard with screen down. 8' is preferred). For example, a regular seminar room with 16" of blackboard should have the screen offset to one side, showing 8' of blackboard when the screen is down.

If the room entrance is at the front, the AV control should be located away from the door, and the screen offset towards the door to allow the instructor working space between the image and the AV control area.

3.6   AISLES

Departments may have different preferences for mid-room or side aisles. Side aisles make it easier to get the viewers within the screen vision cone, but mid-aisles can provide better student access to seating. Center aisles are usually specified in computer labs for instructor/TA access to student desks.

Typical code requirement for aisle width (to be confirmed per project):
Classroom capacity 1-60:   side aisle 750mm/2'6, mid-aisle 750mm/2'6
Classroom capacity 61+:   side aisle 900mm/2'11, mid-aisle 110mm/3'7

Recommended maximum number of students for middle rows is 16 and side rows is 6.

3.7   TIERS / DAIS

Any classroom with more than 7 rows must be tiered/sloped.

Adequate clearance for wheelchair turnaround to be provided between fixed Teaching Stations and the screen wall (5' circle).

Tiered room must be wheelchair accessible at the front, and it is preferred also at the back (to provide a variety of wheelchair seating areas).

Dais (raised stage for presenter) is typically not recommended, as access must be provided at the front of the room to accommodate a disabled lecturer.

3.8   TEACHING AREA

The simplest possible teaching area is preferable, meaning a large, open rectangular area. Chamfering of walls (angled walls) around teaching area is discouraged, as it complicates an area that may need movable equipment or be reconfigured. Lecture halls in a trapezoid shape (in order to have the room shape conform to the vision cone) are discouraged as they reduce the width of the teaching area.

Depth of Teaching Area should be greater than the width of the projected image

Guideline for Lecture-style rooms:

Room Capacity	Minimum Depth of Teaching Area	
25	8'	2.4m
50	10'	3m
120	11'6	3.5m
250	13'	4m
500	18'	5.5m

Guideline for Horseshoe/Case rooms:

Room Capacity	'Box' teaching area, width x depth
50	4m x 4m
100	5m x 5m

*** These are MINIMUMS and may be exceeded if possible.

3.9   CEILING HEIGHT

Ceiling heights indicated are <u>clear </u>space between floor and finished ceiling, with no obstructions including light fixtures. If there is difficulty maintaining the minimums across the whole room, it may be possible to have the ceiling from the projector to the screen be higher than the rest of the room, so that a lower ceiling does not interfere with the projection image height. Screen housings are approximately 6"x6" (152mm) in height; ceiling plan should call for a custom screen housing inset in the ceiling, or (preferred) a 1' gap between the screen wall and the drop ceiling to allow for the mount of a standard screen housing above finished ceiling level.

	Minimum Clear Ceiling Height (front of room)	
Approx Room Capacity	Screen housing inset	Screen housing not inset
25	9'	9'6
40	9'	9'6
60	10'	10'6
80 11' 11'6 120 12'	12'6	
350	20'	n/a

Absolute minimums for ceiling height:

9' at room front

8' at back of tiered room

Leave 4'6 clear under projected image

*** Care should be taken by the architects that medium capacity rooms (80-150) are not squeezed into the same ceiling heights and room depths as 25-60 capacity rooms. This is a

typical fault in new classroom buildings. Medium sized classrooms are programmed into the same areas as smaller rooms and are therefore made subject to like corridor-to-window and floor slab-to-slab distances. Ensure rooms capacity 80-120 meet teaching area depth, ceiling height and room proportion standards. Halls over 200 capacity are usually not subject to this fault, as their high ceilings dictate their having their own program block in the overall building plan.

4   AUDIO VISUAL

Classrooms are to be on a network separate from departmental or faculty networks within the building.

A/V specifics to be listed in room data sheets.

4.1   A/V COMPONENTS

Classroom below capacity 35
Screen and blackboard required (can be manual screen; prefer powered)

Classroom 35-100 capacity
Standard A/V control platform is the Teaching Station Jr.
http://www.utoronto.ca/teachingstation/
Includes power screen, ceiling-mounted digital projector, wall or ceiling mounted speakers and AV control station with amplifier (the TSJr.)
Non-central rooms may contact OSM (http://www.osm.utoronto.ca) to ask about installing a TSJr, or may provide their own A/V control interface.

Classroom 100+ capacity
Standard A/V control platform is the Teaching Station http://www.utoronto.ca/teachingstation/
Includes power screen, ceiling-mounted digital projector, wall or ceiling mounted speakers and AV control station with amplifier, full computer, touch-screen, DVD player & wireless microphone.
Non-central rooms may contact OSM (http://www.osm.utoronto.ca) to ask about installing a Teaching Station.

Image to be 16:10 format (digital projection).
Image width to be minimum ¼ distance to back of room.
Distance to first row of seating should be greater than image width.

Bottom of image to be minimum 4'6 from floor.
All students within viewing cone (see above under Sightlines)
Screen location to leave minimum 6' blackboard with screen down, prefer 8'+.

4.1.1 SCREEN

Prefer powered screen in any room.
Screen gain 1.0, Matte White.

Current preferred spec: Manual screen: Da-Lite Model C with CSR (Controlled Screen Return) Power screen: Da-Lite Cosmopolitan Electrol Power inset screen: Da-Lite Advantage Electrol * include in order the built-in low voltage controller and switch

4.1.2 PROJECTOR

Current preferred spec:
Sharp PG-D40W3D Digital Multimedia Projector 4000 Lumens Throw and
mounting position can be found at:
http://www.projectorcentral.com/projection-calculator-pro.cfm

4.2   AUDIO

Wall or ceiling mounted speakers in all rooms 35 capacity or more (see A/V specs above).
Speakers at the front of the room must be located minimum 6' from the front wall to prevent
audio feedback loop when the instructor is using a microphone (i.e. mount speakers forward of
where the microphoned presenter is located)

4.3   CHALKBOARDS AND WHITEBOARDS

Chalkboards (black) are the standard specification for classrooms because (1) preferred by
many (but not all!) faculty (2) Supply of chalk is easier to maintain than markers. Typically Math
instructors will require blackboards and Management groups will expect whiteboards.

Chalkboards are typically 4' high in 8' wide sections; seamless when joined.

Preferred minimum length chalkboard:
16' width   Small classroom
24'+ width   Large classroom
Generally speaking, more is better (for the instructors)

Minimum 6' width of blackboard to show with screen down
Prefer 8'+ showing with screen down

To prevent chalk dust from interfering with electronic components in the room, the room ventilation is to be designed to draw air directly away from the chalkboards without passing over any other part of the room.

In the case of tiered classrooms, chalkboards are to be multi-tiered (triple-hung). Stacked chalkboards are to be in no more than 10' sections, to prevent mechanical difficulties in raising/lower long sections.

All chalkboards are to have a chalk tray all along the lower edge.

Mount blackboards 36" from the finished floor.

4.4 TEACHING STATION / TEACHING STATION JR.
http://www.utoronto.ca/teachingstation/
Specs and information for these 2 standard A/V control stations are available on the website. They are standard products built for UofT based on specifications from the Office of Space Management at the St. George campus and the central A/V divisions of the Scarborough and Mississauga campus'. http://www.utoronto.ca/teachingstation/tech_support.html

The Teaching Station (classrooms capacity 100+) is essentially a fixed podium 2'6W x 2'6D x 43"H located 5'+ feet from the front wall, usually to one side of the projection screen. The Station itself does not obstruct the screen or blackboard; the instructor standing behind the TS will do so. The TS uses a conduit connection through the floor and so is fixed equipment.

The Teaching Station Jr. (capacity 35-100) is fixed control stand 2'W x 2'6D x 37"H. Cables come from a wall connection to the TSJr, which is either located against the wall or 2' out from the wall and turned towards the instructor.

5 LIGHTING

5.1 LIGHTING GRIDS

LEVEL:	50 FC at desk height (<u>All desks</u>) - REQUIRED
ZONES:	(1) Blackboard zone - wall washers directed at the boards - ON/OFF (2) Student zone - Fluorescent tubes - 2 or 3 levels For larger halls these is the option of: (3) Instructor zone - Dimmable or multi-levels in teaching area (4) Perimeter zone - lighting around the room perimeter is ONLY recommended for rooms with presentation on multiple walls, as in Skills or management groupstyle rooms.

Aisle lighting and perimeter pot lights are not required, and any excessive complication of the lighting system is strongly discouraged. Workshop or Skills rooms may have multiple room fronts and postings around the room, so may use a full perimeter zone instead of a front blackboard zone.

To achieve multiple light levels in a zone, it is preferred to have multi-lamp fixtures with lamps on different switches. All rows of lamps should be parallel to the front, as shown:

A three lamp fixture can be arranged in rows as:
AAB AAB AAB AAB AAB   - 2 switches, for 0%, 33%, 66%, 100% control

A two lamp fixture can be arranged in rows as:
AB AB AB AB AB AB   - 2 switched, for 0%, 50%, 100% control

If the fixtures cannot have multiple-lamp control, use a checkerboard pattern:
A B A B A B A B A   B
A B A B A B A B
A B A B A B A B A   - 2 switches, for 0%, 0%, 100% control.

5.2   LIGHTING CONTROLS

Electronic controls from AV control podium are optional, per AV group. In addition to any AV control podium controls:

(1)   Full manual control switches on wall by AV control area (switches 4' from floor). Screen control switch in same vicinity.

(2)   Either duplicate full control or simple master on/off at main room entrance. Optional at other room entrances, per client request.

Simplest controls are better. Label if more than 2 switches. Electronic switch systems should have clear-to-read integrated labels or wall mounted diagram of switches.

Typical switch configuration (small/medium room):
(1)   Blackboard zone, on/off
(2)   Student zone a (33% level across student zone)
(3)   Student zone b (66% level across student zone)
(4)   Power screen control

If the switches are on the side wall, have the Blackboard switch located on the end closest to the blackboard.

5.3   ELECTRONIC LIGHTING

Electronic lighting systems can now have individual IP addresses allocated to each fixture, for full remote digital control. In such configurations ensure (through testing) that the switches themselves are as simple to understand as conventional light switches. Classrooms can have automatic on/off features to save power; private spaces (offices) should not have auto-on.

6   SEATING

6.1   CAPACITY

Seating capacity is to be listed on room data sheets.

Typical minimum classroom space allocation:			
Seminar or Horseshoe (Case)	2.4 m2/station	0.4 stations/m2	
Workshop (group tables)	2.4 m2/station	0.4 stations/m2	
Lecture Style, fixed or loose	1.7 m2/station	0.59 stations/m2	Tablet
Arms	1.5 m2/station	0.67 stations/m2	

These numbers affected by room shape and seating type. Can be used for gross-up (reflect net area inside the room)

6.2.1 ROW DEPTH

Clear row space between furniture:	
Loose desks	30" minimum gap between rows
Fixed continuous	30" minimum gap between rows (loose seating)
	30" minimum gap between rows (radius-arm seating)
Fixed Tablet Arm	15.75" absolute minimum (per Ontario building code)
	18" recommended minimum gap (tablet/seat retracted)

Ontario Building Code requires 400mm / 15.75" clear between rows of fixed seating for fire egress (OBC 3.3.2.3 (2)), with the seat and tablet/table in 'closed' or folded position. Loose seating is not subject to this requirement.

6.2.2 TIER DEPTH

Ideally tier depth is designed to allow changes in seating type. Functionally a 36" tier depth is the minimum (Tablet arm seats), 48" tiers will allow any of the current types of lecture hall seating. Design for 4' tiers, if possible.   Otherwise, typical tier depths:

Fixed Theatre tablet arm seats	1100mm (43" full tier depth)
Fixed tables with loose seats	46" (16" table depth+30" clear)
Horseshoe/Case	47" (as above with more clear distance due to curve)
Radius-Arm fixed seating	47" - allows clearance for exiting behind seated persons

6.3   TABLET ARM SEATING

Seat Width   minimum 22"
Include as many 24"+ wide seats as possible

Tablet size   min. 160 square inches (approx 10" deep by 16" wide) (tending to rectangular). Small pie-shaped tablets are not acceptable.

Left-Hand tablets   Last seat on right (when facing back of room) on all rows to be left-handed (no-predetermined fixed number required)

6.4   CONTINUOUS WRITING DESKS

Continuous writing surfaces are to be cantilevered from support along the front edge rather than supported on intermittent gables (posts not to determine placement of loose seating).

Depth	minimum 15" / 400mm deep

Width	minimum 26", prefer 30" per station
	36" wide for accessible stations

Length	Maximum 16 students in a row before aisle (aisle both sides)
	Maximum 8 students in a row before aisle (aisle one sides)

Modesty panel	required for first 2 rows, optional on later rows

Finish	Light colored laminate (to keep room looking bright)
	Uneven grain (to hide marking)
	Typical OSM spec is 'Kensington Maple'

Power	Optional, recommended (usually dependant on budget)
	Modules located under desk edge, facing student (not on surface)

Data	Wired data connection not required due to UofT wireless

6.5   LOOSE CLASSROOM TABLES

Exam	Typical 20"x30"+

Individual	Typical 24" x 36"

Student station	Depth 18" minimum
	Width 24" minimum/student (not to exceed 6 students in a row)
	30" Recommended

Typical classroom tables are 60" wide for each pair of students (either 24 or 30" deep);   48" (x24") for areas where capacity is a premium.

Group tables	Round - 5' diameter for 6 persons
	30"x60" - can be used for 4 persons (facing)
	36"x72" - 5 person (on on end)

6.6   POWER

Power outlets:
1 (duplex) by entrance for caretaking staff
1 in middle of presentation wall

2 (Quadplex) at AV control area
1 in ceiling at left side of screen housing (for power screen)
1 in ceiling at projector location
General - around room perimeter at 10' intervals

At student stations:
Standard does not require power at all student stations, (due to associated cost) however it is preferred if possible.

Power at fixed tables/tablet arms:
1 outlet per station or 2 between 2 stations

Power at fixed tables:
Power plug-in unit attached to UNDERSIDE of table at front edge (leaves top smooth and clear). Prefer avoid top-mounted outlets as the lids break over time and the top surface is made uneven.

Alternate options for fixed seating:
If power cannot be done at all stations, option to provide power at front row only, or power at aisle seats.

Power at loose tables:
Loose tables are by nature reconfigurable so best option is power points inset in floor with covers flush to floor. Even if tables are planned for stationary location, this is a good option for flat-floor rooms as use may change over time. If the tables have built-in power point then still use a flush floor ballast/power point with a loose plug-in extension from the table mount to the floor.

6.7   DATA / INTERNET

At the St. George campus room internet is via wireless
http://wireless.utoronto.ca/
This infrastructure is separate from the rest of room AV. Generally one wireless point (wireless router mounted in ceiling cavity) is installed for each 2 or 3 classrooms. These modems require 1 network cable/port per. Power not required. Check with network services for requirements.

Hard-wired internet for the instructor is included as part of the Teaching Station and Teaching Station Jr. control podiums.

7   OTHER

Other reference documents:

-        4.4
         Electronic Classrooms at the University of Toronto
         Final Report by the Academic Computing Advisory Committee's
         Subcommittee on Classroom Technology Standards
         30 April 2007

-        Design Criteria for Classrooms 2009