Classroom Planning Sub-Committee

DISCUSSION PAPER
ON CLASSROOM DESIGN GUIDELINES

January, 2001

TABLE OF CONTENTS

1.1 Introduction

The purpose of this discussion paper is to outline elements, which require consideration in classroom design, operation and maintenance at York University. In a higher education environment, changes in technology, teaching methodology and the student body, to name a few factors, necessitate that classroom design be a dynamic function. It is necessary then that any 'standards' produced be viewed not as rules so much as guidelines.

Beginning with the premise that instruction is central to the role of the University and that much of that formal instruction occurs in classrooms it can be concluded that the quality of the classroom facility is central to the student experience at York.

Regardless of the method of instruction a student should expect to be able to see clearly any visual presentation, to hear clearly any audible presentation free from background noise, distortion and distraction and to be physically comfortable, in terms of furnishings, air quality, temperature etc.

While a discussion could produce a set of guidelines for the ideal classroom environment the final product will have to surrender to compromises arising from conflicting agendas and circumstances. In new construction, the design and allocation to classrooms is moderated by budget and the interests of other building users.

For classrooms being renovated, budget and the existing building conditions often require compromise in design.

Maintenance and operation practice and budget are huge considerations in the design of any project and will influence decisions on layout, systems and materials incorporated in classrooms.

One of the benefits of this discussion will be the illumination of the various issues in classroom design so that the compromises necessitated by circumstances can be made with an awareness of the impact of the various components on the overall teaching and learning environments.

The classrooms considered are general use, undergraduate classrooms. Since the classroom stock serves many types of instruction and many different instructors a mixture of classroom types and levels of classroom technology is recommended. It is also expected that some disciplines may require unique features in instruction space. Any design principles or guidelines are intended to provide a resource for the design of those facilities.

The paper is split into a section on general conditions, which apply to most rooms and a section listing suggestions for rooms, by specific room capacity. Sample room layouts are also supplied. Please note that these are examples of classroom layouts illustrating general spacing, orientation and configuration, and should not be considered prescriptions for classroom layout.

In the general condition portion of this report, small classrooms will be any rooms in the range of 0-80 seat capacity, medium size rooms will be from 80-150 seats and large rooms will be considered as anything above that capacity

1.2 Location of Classrooms

When locating classrooms in a building the primary objective is the ease of student and instructional support access. This usually results in classrooms being concentrated in the lower floors of buildings.

It is important to separate classrooms from sources of internal and external noise, which are distractions from instruction. Among sources of noise to be considered are traffic, parking lots, and recreational activity, pick up and drop off areas, and loading docks. Internal sources include mechanical rooms, elevators, vending and eating areas and high traffic areas.

Consideration for ease of access often results in the location of classrooms near building entrances and along main corridors. The resultant noise from high student traffic in these areas must be mitigated through the design of the room entrances and the wall construction that separates the classrooms from the corridors.

1.3 General Orientation and Configuration

The shape and configuration of classrooms, no matter the size must permit the connection of the student to the instructor and any visually or audibly presented material. To accomplish this, there must be clear lines of sight from student seating to the front of the room, permitting an unobstructed view of the instructor and any visual presentation.

The shape and arrangement of rooms is determined to some degree by capacity. For smaller rooms there are arguments for square or rectangular shaped rooms. There is also an argument for a long and skinny versus a wide and shallow orientation. For visual presentation viewing angles are better in a rectangular room with a long and skinny orientation while a square or wide and shallow configuration allows for closer proximity of the course leader to the students. Generally the layout must avoid acute viewing angles (over 45degrees), and permit views without obstruction from the seats to the front of the room.

In medium and larger rooms the rectangular shape does not function well. Some shaping of the room is required to afford better viewing angles and acoustic performance. In larger rooms the sidewalls should be angled to create a narrower front wall and the ceiling should be somewhat angled to better reflect sound to the rear of the lecture hall.

The shape and amount of space at the front or sending end varies considerably as the capacity of the room increases. The sending end of the room must be adequate for the

course leader, in terms of space and equipment. Comfort is compromised when the first row of seating is right under the nose of the instructor. Since classrooms will continue to be used in traditional as well as technologically enhanced fashions, the front of the room will need to accommodate chalkboards, desk, dais, open space for displays and demonstrations as well as room for the pacing instructor.

The amount of space, from the front wall to the first row of seating is also a function of the overall room size and the size of projected images that will be used. Generally the first row of seats should be at least twice the height of the projected image from the front wall and the last row of seats should be no more than 8 times the height of the image from the front wall. The last row must also be able to see clearly the smallest digit or figure projected. The limit in this case is 400 times the height of the smallest digit. For example, if the last row of seating were 66 feet from the front wall, the projected text image would require 2" tall characters. As room size and projected images increase the ceiling height will also increase to comfortably accommodate the size of projected images required.

See appendix A and B for tables of suggested setbacks, ceiling heights and projection screen sizes for various room capacities.

1.4 Entrances and Exits

Aside from life safety issues which are legislated by building codes, the entry and exit from classrooms has to allow for coming and going almost simultaneously, quick seating of students, and discreet entry of late participants. Though the number of exit doors is governed by the Ontario Building Code, these should be considered the minimum, as it is not uncommon for a class to be entering a room just as the previous class is exiting. Entrances to classrooms must also be easy for disabled persons to use and handy to the location of accessible seating in classrooms. Allowances for crush space at exits from large rooms must be considered. The location of entrances and exits from classrooms must also take in to account their affect on the circulation in the rest of the building.

In rooms with up to 49 occupants, only 1 entrance/exit is required. Locating this entry at the back of the room on the rear or the sidewall, creates less distraction from late arrivals. In rooms requiring more than one exit, one at least should remain at the rear of the room for the same reason.

Lecture halls require several entrances and exits to conform to building codes. There should be a main entry, preferably at the rear, with a significant crush space.

Entry doors should also include a small 75x250 window at eye level, which permits those outside the class to check on the class without disturbing it. On the main room entry doors include a 400x400 chalkboard on the exterior, for notices of last minute changes, notes to the students and the like. This installation of this chalkboard has become common practice at York, after years of the doors themselves being used as chalkboards for the same purpose.

1.5 Accessibility

In classrooms accommodation of persons with disabilities should be an integral part of the design. There should be options for seating locations and easy access at entrances.

Classrooms must conform to the CAN/CSA-B651-M90 standard for barrier free design. Accessibility must be considered in the path of travel from the building entrance to the classrooms. Locate doors to permit operation by persons in wheelchairs without need for automatic door operators. Locate accessible seating so that there are options, particularly in medium and large rooms. There should be accessible seating at the front, middle and rear of rooms. Accessible seating cannot infringe on aisle widths or seating egress and should be located adjacent to an accessible route to the means of egress. Persons in wheelchairs often sit higher than people in standard seating. This must be kept in mind when locating accessible seating to avoid obstructions to viewing the front of the room.

Accessible seating stations are identified with an accessibility logo inlaid in the top. In rooms with tablet armchairs provide a 600 x 900mm table with a 300mm modesty panel as accessible seating.

In rooms with fixed writing surfaces increase the depth of the top to 500mm at wheelchair seating stations. When a room is equipped with theatre style seating provide either fixed writing surfaces or loose tables for accessible stations.

Accessible seating in new classrooms is legislated in the Ontario Building Code in table 3.8.2.1 as follows:

Number of seats	Minimum number of spaces for wheelchairs
Up to 100	2
101 to 200	3
201 to 300	4
301 to 400	5
401 to 600	6
over 600	not less than 1% of seating capacity

There should be at least one accessible station in each room, in small and medium rooms provide 1 accessible station per 50 seats in the room and at least 1 per 100 seats in large rooms.

1.6 Acoustic Treatment

Ideally natural acoustics will be sufficient to permit unaided projection of the human voice in classrooms up to 120-seat capacity. The student should be able to hear any audible presentation free of distracting noises and echoes.
The natural acoustic performance of the room is critical for clear, strong voice delivery. A sound reverberation that approaches 0.7 seconds is a realistic target for classrooms.

Noise distractions must be limited. In classrooms the main contributors to excessive background noise are mechanical ventilation systems and lighting. As lighting systems are replaced with fixtures using electronic ballasts the later has become less of a contributor. Mechanical systems should be designed to generate a background noise of no more than NC 20-35. Once systems rise above that level they become a distraction and interfere with audibility of presented material.

In small classrooms a carpeted floor acts as a sound deadener but wears poorly and detracts from room appearance quickly unless expensive maintenance practices are followed. Consequently hard finish floors such as linoleum or VCT are often installed. A hard ceiling with perimeter sound absorption is also preferred as it directs sound from the speaker down to the listener, however to make up for the lost deadening of the carpet, a greater area of lay-in tile ceiling is required. A room fitted with a hard floor and an absorptive ceiling, actually operates in reverse of the ideal acoustic model and may present a problem, even in small rooms, to some speakers.

Some absorption may be required in small rooms at the top of the rear walls. In some rooms the entire rear wall may be treated.

In every size room acoustic performance is an important component of effective teaching environments. In larger rooms greater attention to this aspect of the design is critical. It is expected that the services of consultants specializing in this discipline will be engaged as part of the design team.

For basic planning of large halls, sidewalls should not be parallel, nor should they be a continuous hard surface. The front of the room should be hard surfaced and shaped to project sound to the back of the room. The top of the sidewalls and often the entire rear wall (and in some cases a rear portion of the ceiling) will require absorptive material. Ceilings will be mainly hard surface and shaped to project sound to the rear of the room.

In rooms equipped with speakers the acoustic modeling of the room remains an important issue. Greater power does not necessarily mean clearer delivery. A basic requirement of classrooms is that students can hear clearly any audible presentation.

1.7 Lighting

Lighting systems in classrooms must provide adequate levels of light for note taking provide clear visibility of the instructor and be capable of producing light levels that permit the clear visibility of projected images.

There are two major concerns that must be addressed, the adequacy and control of lighting and the ease of maintenance of the system so that it continues to perform as designed.

At York we have been using classroom lighting that is 347 volt, with low voltage relays and switches. The lighting should be designed to limit glare. Generally lighting is arranged in rows parallel to the front wall. Fixtures should be 1.2m modules with deep cell parabolic lenses with a semi-specular finish (no K12 lenses), T8 lamps at 3500 Kelvin and electronic ballasts. In larger lecture halls spot lighting should be provided for the lecturer to allow the lecturer to be visible and to provide the lecturer adequate light to read when the room lighting is set for audiovisual presentations. The lamp temperature is between cool white 4100 Kelvin, the temperature used in schools for younger children and warm lights of 3000 Kelvin. Somewhere between the two seems to be the ideal for university classroom environments

With the exception of the spot lighting of podiums the use of incandescent lighting is discouraged, as it is not energy efficient and is generally not required to achieve proper light levels, or light control.

In certain room layouts illumination of the chalkboard will be required. This lighting should be part of the overall design and incorporated into the ceiling system.

All rooms should have some level of lighting control. At its simplest a room should be switched so that lighting can be at 100% (about 500-lux minimum at desk height) 67% and 33%. The lower levels are required for different audiovisual presentations. At the lower levels the projection screen should have no more than 100-lux illumination and preferably below 40 lux.

Currently the method of lighting control in classrooms renovated at York, is a system of switching lights, via relays, in patterns, which achieve even, general light at the level, required. It is not acceptable to switch off rows of alternate lighting, creating illuminated and un-illuminated areas. The intent is to create even distribution of light at different levels almost equal in effect to dimming.

In rooms equipped with more comprehensive systems, podium lights, chalkboard lights, and vestibule lights would all be separately switched while the general room lighting would have 100%, 67%, 33% and 15% settings.

At each room entry, in every case there should be an illuminated switch, which will turn the room lights on at 100% for caretaking services. Alternately rooms can be equipped with occupancy sensors that automatically turn off lights when the room is empty and on

when there is a sensed occupancy. All other controls should be located for convenient operation by the course instructor. When the controls are switches, they should be illuminated and the switch plate engraved with the function of that switch.

1.8 HVAC

The heating, ventilation and air conditioning system is expected to circulate air in the classroom with fans and distribution systems that generate background noise between NC20-35.

Heating and ventilation systems must conform to the Ontario Building code requirements for fresh air volume per occupant. The most stringent of the applicable standards of Health and Welfare Canada, the Ministry of Labour, the Canadian Standards Asc, ASHRAE (The American Society of Heating, Refrigeration and Air Conditioning Engineers) and air quality standards that are part of collective agreements at York University must be adhered to in the design of air handling systems.

1.9 Electrical

Electrical power should be available in all classrooms to meet anticipated needs of the users, with convenience.

The requirements for each room will vary dramatically depending on the built in equipment, size of the room and the intended use. For instance, in some cases it is expected that each student will be equipped with a laptop computer in the class. Given current battery technology each student station in this case will require an outlet.

Generally smaller rooms should have a pair of duplex outlets near the center of the front wall and at least one duplex receptacle on each of the other walls. In new rooms it is expected that the power requirements for classroom technology would be hardwired to the equipment. There must also be adequate receptacles to serve caretaking equipment used in routine maintenance.

1.10 Connectivity

Although we have yet to hardwire any more than the presentation equipment at the front of classrooms to network service, classrooms should be capable of meeting the needs of users. The possible need for network drops at each student station in certain classrooms should not be ruled out.

It is expected that by the time there is any significant demand for on line capability at the seats, wireless technology will be readily available. Currently the norm at York is to install a wireless compatible network connection at the front of each room. Currently we have a DHCP protocol ethernet drop in each classroom assigned by the Room Allocation Center.

It is expected that in new rooms the equipment will all be hardwired, including cable TV service where available and network connections. Please see the section on Technology for more detailed information on connectivity.

Some telephone connection to Help Services will be important as we move to more equipped classrooms. In the midst of a sophisticated electronic teaching suite it would be ironic if the only way an instructor could get help and guidance on the equipment was to walk to the Instructional Technology offices.

1.11 Technology

Technology available in classrooms should meet the requirements of the users. User friendly systems that permit the use of various instructional aids and materials should be the norm.

It is expected that a mixture of levels of classroom technology will be used. Security of equipment must be considered. In rooms with more sophisticated equipment it is suggested that it be enclosed in locked cabinets permanently attached to the building and equipped with fibber-optic security systems. Following is a list of the equipment that would be included in a 5 level menu of classroom technologies.

Level 1: A 1.8m manually operated matte white projection screen and a live net drop. This is the basic seminar room or classroom.

Level 2: A 1.8m manually operated matte white projection screen, a live net drop and a permanent overhead projector.

Level 3: A manually operated matte white projection screen, a live net drop, an overhead projector, a VHS and a television.

Level 4: An electrically operated matte white projection screen, a live net drop, an overhead projector, a VHS and a permanent Data Projector with an interface box for PC or MAC. Technology used in these rooms requires a significant level of manual intervention to set-up the portable components, switch video sources and power the projectors.

Level 5: Fully equipped room with built-in PC, VHS, electrically operated matte white projection screen, overhead projector, sound system with wireless microphone, touch screen room control and data projector. The PC and VHS are built into a teaching podium or console. All the background switching of video and audio sources and power is handled through a touch screen interface to the various pieces of equipment. This is designed to be an elegant interface for non-technical users.

1.12 Finishes

Classroom finishes are to some degree multi-purpose. Overall their appearance contributes to the room atmosphere, which should be pleasant, creating no visual distraction or discomfort. The finishes also affect the acoustic performance of the room and can influence the lighting design.

Generally room finishes should be employed which contribute to a pleasant visual atmosphere, appropriate acoustic performance, are durable in nature and can be kept in good condition with a minimum of maintenance.

Ceilings

Acoustic performance is greatly affected by the orientation, configuration and finish of the ceiling. Acoustically it is a major component of the entire package of the room.
The ceiling height affects lighting and must be considered in the overall context of the room particularly in relationship to projected images.

Generally as the room increases in size, the ceiling height, at least at the front of the room must increase to provide adequate visibility of project images. See Appendix A and B for sample tables of room sizes, ceiling height and projection screen sizes.

In larger rooms the shape of the ceiling should reflect sound to the rear of the room. Hard finishes such as plaster, concrete or gyproc help deflect sound back down to the listener. In smaller rooms, depending on other room finishes, it may be desirable to have the ceiling act as a sound absorber to reduce echo. In such cases lay in tile ceilings or applied absorptive panels could be used.

In every case the ceiling must be considered for its affect on the room's scale, light and acoustic performance.

Walls

As with ceilings, walls affect the overall acoustic and lighting performance of classrooms. Unlike ceilings the walls are greatly affected by the traffic in the rooms. The finishes must therefore be extremely durable.

The orientation of the walls is important in the acoustic design of larger rooms. The sidewalls at the front should be shaped to reflect sound from the front to the rear, while the rear wall and often the top of sidewalls at the rear, require acoustic treatment to reduce echo.

Acoustic treatment is frequently in the form of fabric-covered sound absorbing panels. Very little vandalism quickly diminishes the appearance of these panels. Some older buildings used a slatted wood finish over the acoustic absorptive material. This type of detail seems to have fared much better as a long term, low maintenance finish, though the initial capital cost was significantly higher.

In smaller classrooms, again depending on other room finishes; the finish of the walls is less critical acoustically. Hard, extremely durable finishes such as painted concrete block are attractive from a maintenance point of view and not unsightly or distracting from a user point of view.

Floors

Floor finishes must also be considered in the context of each classroom, for their role acoustically, their appearance and ease of maintenance. Ideally floor finishes will contribute positively to the overall appearance, require minimal maintenance and provide a safe walking surface.

Many users prefer and some Institutional Classroom Standards recommend the use of carpet flooring for classrooms under 80 seats. This mitigates issues in the acoustic performance of smaller rooms. Acoustically it serves two purposes, stifling noise generated at floor level and absorbing sound deflected down from ceilings before it becomes a distracting echo. Other design standards frown on carpet, as it is expensive to maintain at an acceptable level of appearance. Environmentally carpet is an unfriendly finish as it is generally not recycled and does not biodegrade.

Hard finishes on floors such as linoleum, vinyl or rubber tile are recommended in ' Design of General Purpose Classrooms, Lecture Halls and Seminar Rooms' 2nd Edition because of maintenance issues with carpet.

The use of hard floors creates a different acoustic model with sound absorption required at ceilings and possibly on walls. This acoustic model is not ideal and even in small rooms can be difficult for some users.

In large lecture halls the floor is quite a different matter. To create proper sight lines the floor is usually stepped down to the front. The seating or writing surfaces are fixed in place and make cleaning in the seating area extremely difficult. Hard flooring, such as sealed concrete, in these areas is the norm. The density of seating is higher in lecture halls which helps the acoustics. Carpet is often installed in the main aisles and at the front stage area of the lecture halls. It provides a more comfortable walking surface and stifles noise from movement in the room.

In stepped floor arrangements risers should be identified with a contrasting strip at the leading edge of the riser. This helps draw attention to changes in plane that might be overlooked.

1.13 Furnishings

Furnishing in classrooms should provide a reasonable level of comfort and adequate writing surface to the student, so that the furniture itself does not become a distraction from instruction. The furnishings should also contribute positively to the overall appearance of the room.

Smaller classrooms are outfitted either with loose tables and stacking chairs or chairs with tablet arms. Medium size rooms and some specially equipped smaller rooms use continuos fixed writing surfaces with loose stacking chairs. Large lecture halls are fitted with continuos fixed writing surfaces with loose stacking chairs or theatre style seating with flip up tablet arms. Generally theatre style seating is only used in very large lecture halls of 400-seat capacity or more.

In rooms funded by a specific user group the quality of furnishing is often upgraded. A higher quality of furnishing is only provided where there is adequate security and the use of the room is more controlled.

All of the furnishing must be designed with heavy-duty service conditions in mind. All writing surfaces, tablet arms, fixed writing surfaces and loose tables should be high-pressure plastic laminates on a substantial substrate such as plywood, solid phenolic or mdf with no formaldehyde added in the binders. Expect every surface to be sat on. Use laminates that are smooth surfaced.

For simplicity and flexibility all stacking chairs should be to a standard colour, size and type. Furnishings should draw from a coordinated palette that permits interchanging of the various components from room to room.

Stacking chairs;	injection molded polypropylene seat and back, continuous painted tube legs and frame, with nylon glides
Tablet armchairs;	chair construction as the stacking chair Tablet arms, high-pressure laminate, plywood or equal core, edge and back, polyurethane coated, minimum writing surface area .1sq.m. , minimum of 10% in each room with left handed tablets
Tables;	Tops, high-pressure plastic laminate, smooth with heavy vinyl ‘D’ edge moldings. Minimum 25mm thick, with sufficient support to prevent sagging. Legs should be painted ‘T’ base pipe style with adjustable nylon glides.
Fixed writing surfaces:	tops constructed as the tables, minimum width 380mm, legs of welded steel and or sheet metal construction with integral cable chases, powder coated black, floor mounting flanges and connections to tops which present no sharp edges or protrusions
Theater style seating:	fabric, if upholstered, must conform to fire retardant and flame spread requirements of the building code, very stain resistant, seat and back upholstered sections must be removable however only with special tools. Underside of seat and rear of the back should be metal or FRP or other hard, difficult to mark, easy to clean surface. Tablet arm

should be as for the tablet armchairs. The tops must be designed to fold completely out of the way. The tops should also be anti-panic, that is if one were to stand up the top would flip up on contact with ones leg. Allow a minimum 540mm wide seat. All seats should have arms. 10% of seats should have left hand tablets.

Chalkboards: porcelain enamel writing surface on ground coat with a steel and fiberboard laminated core. Aluminum edge trim and chalk ledge. All boards are to be black, 1.2m height, in standard modules of 1.2m, 1.8m or 2.4m joined without trim when longer continuous surfaces are required. Mount chalkboards at .9m above the floor.

Whiteboards: Are not recommended for general classroom use. They are readily damaged with the use of improper markers. The reliable supply of markers in the classroom is difficult, without the instructor making specific arrangements for them. In general use classrooms the contrast from chalkboard writing is adequate.

In meeting rooms and special user controlled classrooms they may be desirable but are not considered necessary or advantageous in regular classrooms.

1.14 Signage

Besides exit signage required by the O.B.C. York has a signage standard, which applies to labeling rooms and doors. Each classroom will also have a schedule holder on the wall outside the room by the entry and another in the room, usually near the main entrance, which holds a classroom configuration drawing.

1.15 Waste and Recycling

Each room must have containers for waste, paper, aluminum and glass recycling. These should be located in alcoves or recesses inside the rooms, near the entrances. Their location can not infringe on egress routes. Typical waste containers are 370 x 370mm. Recycle containers are 300 x 540mm.

1.16 Additional Considerations

Green Architecture

The University has begun a practice of considering sustainability and environmental impact of the methods and materials used in construction. As this practice is implemented fully alternatives to environmentally unfriendly finishes

such as our standard carpet will have to be developed and explored. Many common methods and materials are likely to require review as our expertise in Green Architecture develops.

Maintenance

There must be considerable attention paid to the ease and expense of maintenance in all aspects of the design of classrooms, from lighting and ceiling systems to wall and floor finishes. The quality and durability of materials and finishes are of paramount importance. With current limited caretaking budgets the use of durable and very easy to maintain finishes is an important consideration. No matter how well any room is finished, without appropriate maintenance it will take on a dowdy appearance quickly.

2. CLASSROOM CONFIGURATIONS BY SIZE CATEGORIES

2.1 0-24 Seat Classroom

Configuration:

- Seminar or discussion type of room.
- Allow visual contact between all occupants.
- Square or rectangular set up preferred.
- Avoid long narrow rectangles.
- At front at least 2.4m between edge of table and front wall.
- From face of table to side and rear walls; for wheelchair access a wall with an entry door should be at least 1.5m from the edge of tables.
  1.1m between tables and walls is acceptable elsewhere.
- Room entry if only one should not be at the front.
- Windows if included can be in any wall, except the front and should be equipped with vertical blinds or black out drapes.
- Include an alcove near the entrance for waste, paper, aluminum and glass recycle containers.

Furnishings:

- Tables should be of standard top sizes 750x 1500mm and 750 x1800mm
- Chairs, stacking type
- Note that in up scaled, special or more controlled use environments, the type and quality of chair may be significantly improved.
- No special seating is required for course instructor.
- For wheelchair access, configuration should have adequate space to allow a stacking chair to be placed to the side without compromising circulation in the room.
- Chalkboards at front and along side walls

Finishes: Walls

- Any of, painted or sealed concrete or concrete block, or other hard wearing finish such as lacquer finished panels
- Some acoustic treatment to the rear wall is acceptable. Cloth covered absorption panels are recommended. Design for absorption at the human voice frequencies

Floors:

- Carpet is recommended
- If a hard floor is used, recommend linoleum. Note that this requires additional acoustic finish elsewhere.

Ceiling:

- Gypsum board or plaster ceiling with perimeter sound absorptive finish
- A ceiling height of 2.7m to 3m is preferred.

Doors and Frames: Conforming to the building codes and standards of the building:

- ‘Classroom Function’ locking.
- 400x 400mm chalkboard on the exterior face.
- A small window, 75 x 250mm in the door or eye level.

Miscellaneous: York’s standard signage includes:

- A room number
- A schedule holder by the entrance
- A classroom configuration holder, inside by the entry door.

Lighting:

- Fluorescent, electronic ballasts T8 lamps, 3500 Kelvin and deep cell semi-specular parabolic lenses, 347 volt.
- Fixtures to suit ceiling and use standard 1.2m lamps.
- Switch at each entry to turn on lighting to 100%.
- Switch at front of room to allow 100% illumination and switch to reduce to 30% illumination level.
- At 100%, minimum illumination 500 lux at table tops.
- At 30% maximum illumination on projection screen of 4 lux and 300lux at tabletops.
- Engrave cover plates for switches indicating their use when the switch is for any use other than 100% illumination.

Electrical:

- 1 duplex outlet minimum in each wall.
- If room is minimally equipped with technology devices add a quad receptacle to the center of the front wall end

Technology:

- A mix of rooms including Level 0 through Level 5

2.2 25-49 Seat capacity

There are two common room set-ups in this size range. One is a seminar room configuration for up to 35 participants the other a standard classroom configuration. The seminar room is set up as the 0-24 seat room described previously. Following are the parameters for a classroom layout.

Configuration:

- Seats laid out in rows facing front of room
- Chairs require a minimum spacing of 600mm center to center from side to side and 1.1 to 1.2 m center to center spacing from front to back
- At front at least 3m between edge of front edge of tablet arm and front wall.
- As the capacity of the room increases and the front to back room dimension increases, increase the space at the front for the course leader, as follows:
  8.2 to 9.6m deep classroom, 30 –50 seats, 3m at front
  9.6 to 11.3m deep classroom, 30 –50 seats, 3.5m at front
- For wheelchair access allow an aisle 1.5m wide from the front to back of the room.
- Room entry if only one should not be at the front.
- Windows if included can be in any wall, except the front and should be equipped with vertical blinds or black out drapes.
- Include an alcove near the entrance for waste, paper, aluminum and glass recycle containers.

Furnishings:

- Tablet arm chairs or fixed writing surfaces and stacking chairs
- 750 x 1500mm table and seating for course instructor. A portable dais is required at the front of the room
- A stacking chair should be placed at the accessible seating station. The configuration should have adequate space to allow the stacking chair to be placed to the side without compromising circulation in the room.
- Chalkboards at front and along side walls

Finishes: Walls

- Any of, painted or sealed concrete or concrete block, or other hard wearing finish such as lacquer finished panels
- Some acoustic treatment to the rear wall is acceptable. Cloth covered absorption panels are recommended. Design for absorption at the human voice frequencies

Floors:

- Carpet is recommended

- If a hard floor is used, recommend linoleum. Note that this requires additional acoustic finish elsewhere.

Ceiling:

- Gypsum board or plaster ceiling with perimeter sound absorptive finish
- A ceiling height of 3m is preferred. See Appendix A and B

Doors and Frames: Conforming to the building codes and standards of the building:

- 'Classroom Function' locking.
- 400x 400mm chalkboard on the exterior face.
- A small window, 75 x 250mm in the door or eye level.

Miscellaneous: York's standard signage includes:

- A room number
- A schedule holder by the entrance
- A classroom configuration holder, inside by the entry door.

Lighting:

- Fluorescent, electronic ballasts T8 lamps, 3500 Kelvin and deep cell semi-specular parabolic lenses, 347 volt.
- Fixtures to suit ceiling and use standard 1.2m lamps.
- Switch at each entry to turn on lighting to 100%.
- Switch at front of room to allow 100% illumination and switch to reduce to 30% illumination level.
- At 100%, minimum illumination 500 lux at table tops.
- At 30% maximum illumination on projection screen of 4 lux and 30 lux at tabletops.
- Engrave cover plates for switches indicating their use when the switch is for any use other than 100% illumination.

Electrical:

- 1 duplex outlet minimum in each wall.
- If room is minimally equipped with technology devices add a quad receptacle to the center of the front wall end.

Technology:

- A mix of rooms including from Level 0 through Level 5
- As the depth of the room increases, increase the size of projection screen. At 9.6 to 11.3m room depths increase the screen to 2.4m wide. As the screen increases in size raise the mounting height. See appendix A and B

2.3 50-80 Seat capacity

Configuration:

- Seats laid out in rows facing front of room
- Chairs require a minimum spacing of 600mm center to center from side to side and 1.1 to 1.2m center to center spacing from front to back
- At front at least 3m between the front row and front wall.
- As the capacity of the room increases and the front to back room dimension increases, increase the space at the front for the course leader, as follows:
  9.6 to 11.3m deep classroom, 50-100 seats, 3.3m at front
  11.3 to 12.8m deep classroom, 50-100 seats, 4m at front
- For wheelchair access allow an aisle 1.5m wide from the front to back of the room.
- Room entry; prefer main entrance at rear, additional entry/exit can be on sidewall at front.
- Windows if included can be in any wall, except the front and should be equipped with vertical blinds or black drapes.
- Include an alcove near the entrances for waste, paper, aluminum and glass recycle containers.

Furnishings:

- Tablet arm chairs or fixed writing surfaces and stacking chairs
- 750 x 1500mm table and seating for course instructor. A portable dais is required at the front of the room
- A stacking chair should be placed at the accessible seating stations. The configuration should have adequate space to allow the stacking chair to be placed to the side without compromising circulation in the room.
- Chalkboards at front and along side walls

Finishes: Walls

- Any of, painted or sealed concrete or concrete block, or other hard wearing finish such as lacquer finished panels
- Some acoustic treatment to the rear wall is acceptable. Cloth covered absorption panels are recommended. Design for absorption at the human voice frequencies

Floors:

- Carpet is recommended
- If a hard floor is used, recommend linoleum. Note that this requires additional acoustic finish elsewhere.

Ceiling:

- Gypsum board or plaster ceiling with perimeter sound absorptive finish
- A ceiling height of 3m is preferred. See Appendix A and B

Doors and Frames: Conforming to the building codes and standards of the building:

- ‘Classroom Function’ locking.
- 400x 400mm chalkboard on the exterior face.
- A small window, 75 x 250mm in the door or eye level.

Miscellaneous: York’s standard signage includes:

- A room number
- A schedule holder by the entrance
- A classroom configuration holder, inside by the entry door.

Lighting:

- Fluorescent, electronic ballasts T8 lamps, 3500 Kelvin and deep cell semi-specular parabolic lenses, 347 volt.
- Fixtures to suit ceiling and use standard 1.2m lamps.
- Switch at each entry to turn on lighting to 100%.
- Switch at front of room to allow 100% illumination and switch to reduce to 30% illumination level.
- At 100%, minimum illumination 500 lux at table tops.
- At 30% maximum illumination on projection screen of 4 lux and 30 lux at tabletops.
- Engrave cover plates for switches indicating their use when the switch is for any use other than 100% illumination.

Electrical:

- 1 duplex outlet minimum in each wall.
- If room is minimally equipped with technology devices add a quad receptacle to the center of the front wall end.

Technology:

- A mix of rooms including from Level 0 through Level 5
- As the depth of the room increases, increase the size of projection screen. At 9.6 to 11.3m room depths increase the screen to 2.4m wide. As the screen increases in size raise the mounting height. See appendix A and B

2.4 Over 80 Seat capacity

Configuration:

- Shape the front of room to improve acoustic performance
- Slope ceiling to reflect sound to rear of room
- Taper side walls in at front of room to improve viewing and acoustic performance
- Seats laid out in rows facing front of room
- Fixed writing surfaces require a minimum spacing of 1.2m center to center spacing from front to back
- Chairs require a minimum 600mm center to center spacing from side to side
- For front row setback and the amount of space at the front of the room see attached Appendix A
- Install accessible seating at front and rear of room as a minimum
- Room entry, prefer main entrance at rear, additional entry /exit can be on sidewalls at front.
- Avoid including windows in design of large rooms.
- Include an alcove near the entrances for waste, paper, aluminum and glass recycle containers.

Furnishings:

- Fixed writing surfaces and stacking chairs
- 750 x 1500mm table and seating for course instructor. A portable dais is required at the front of the room and /or
- Control console and cabinets for classroom technology and touch screen control
- On the side at the front include built in cabinetry to house equipment such as VHS, PC and sound system
- A stacking chair should be placed at the accessible seating stations. The configuration should have adequate space to allow the stacking chairs to be placed to the side without compromising circulation in the room.
- Chalkboards at front and along side walls as the layout permits

Finishes: Walls

- Any of painted or sealed concrete or concrete block, or other hard wearing finish such as lacquer finished panels
- Acoustic treatment to the rear wall. Cloth covered absorption panels are acceptable. Other wall treatments, that contain absorptive material behind a wearing finish such as perforated metal or wood slats, are also acceptable. Design for absorption at the human voice frequencies

Floors:

- Carpet is recommended for entrance vestibules, aisles and the presentation area. In the seating area, hard, easy to maintain floors are recommended.

Ceiling:

- Gypsum board or plaster ceiling with absorptive finish if and where required.
- Ceiling height to vary according to room capacity and size and shape.

Doors and Frames: Conforming to the building codes and standards of the building:

- 'Classroom Function' locking.
- 400 x 400mm chalkboard on the exterior face of the main room entry.
- A small window, 75 x 250mm in the door or eye level in the main room entry door.

Miscellaneous: York's standard signage includes:

- A room number
- A schedule holder by the entrance
- A classroom configuration holder, inside by the main entrance.

Lighting:

- Fluorescent, electronic ballasts T8 lamps, 3500 Kelvin and deep cell semi-specular parabolic lenses 347 volt.
- Chalkboard lighting, switched separate from room lighting
- Entrance vestibule lighting switched separately
- Podium spot lighting switched separately
- Fixtures to suit ceiling and use standard 1.2m lamps.
- Switch at each entry to turn on vestibule and room lighting to 100%.
- Touch screen control for minimum 4light levels
- At 100%, minimum illumination 500 lux at table tops.
- At 66% and 30% maximum illumination on projection screen of 4 lux.
- Engrave cover plates for switches indicating their use when the switch is for any use other than 100% illumination.

Electrical:

- duplex outlets in each wall at maximum 6m intervals
- special outlets as required for cleaning equipment

Technology:

- Larger rooms should be fully equipped with level 5 technology
- As the depth of the room increases, increase the size of projection screen. At 9 to 10.6m room depths increase the screen to 2.4m wide. As the screen increases in size raise the mounting height. Appendix A and B

APPENDIX A

The following table has been extracted from the Guidelines for Smarter College Classrooms Homepage - http://www.classrooms.com/guidelines.html

Room Depth	**Ceiling Height**	**Projection Screen (width x height) in millimeters**	**Screen Mounting Height**	**Front Row Set Back**
7.62	2.7	1829 x 1372	2.6	2.4
7.6 - 9.1	3	1829 x 1372	2.8	2.4 - 3.0
9.1 - 10.7	3.0 - 3.4	2438 x 1829	3.0	3.0 - 3.4
10.7 - 12.2	3.4	2743 x 2438	3.3	3.4 - 3.7
12.2 - 13.7	3.7	3048 x 2286	3.5	3.7 - 4.0
13.7 - 15.2	4	3353 x 2286	3.8	4.0 - 4.6
15.2 - 16.8	4.0 - 4.3	3658 x 2743	4.0	4.6 - 5.2
16.8 - 18.3	4.3 - 4.6	4267 x 3200	4.5	5.5

APPENDIX B

The following table has been extracted from the Guidelines for Smarter College Classrooms Homepage - http://www.classrooms.com/guidelines.html

Depth		No of Students	Space at front of room
8.23		30	2.74
8.23	9.75	30 - 50	3.05
9.75	11.28	50 - 100	3.35
11.28	12.80	100 - 150	3.96
12.80	14.63	150 - 210	4.57
14.63	16.46	210 - 300	4.88
16.46	18.29	300 - 400	5.49

BIBLIOGRAPHY

1. Classroom Guidelines for the design and construction
   of Classrooms at the University of California at Santa Cruz
   Janis L. Dickens
   David J. Tanza
   UCSC Media Services 1994, 1996

2. Design of General Purpose Classrooms,
   Lecture Halls and Seminar Rooms
   2nd Edition
   Sue Clabaugh
   University of Maryland at College Park
   Educational Technology Centre

3. http://www.classrooms.com/guidelines.html

4. Guelph/ Humber Learning Space Improvement project
   Draft Classroom Standards