TG21 TEACHING FACILITIES

(To replace PF50)

21.1 OVERALL GUIDING PRINCIPLES

21.1.1 Purpose

To ensure that when undertaking any new projects or all refurbishment projects, high-quality teaching and learning facilities are investigated, assessed and incorporated.

21.1.2 Sources of Information

The Teaching Facilities Technical Guide was compiled from the following sources;

(a). Denson University in Ohio - www.denison.edu/academics/learningspaces/guiding_principles.html
(b). RMIT University Design standards Brief (2003 and 2009 versions) - http://www.rmit.edu.au/browse;ID=3tpvl8cfzxuc;STATUS=A?QRY=Design%20standards%20brief&STYPE=ENTIRE
(c). Various sources from Educause - www.educause.edu. Particularly from Larry McPhee - http://www.educause.edu/EDUCAUSE+Quarterly/EDUCAUSEQuarterlyMagazineVolum/LearningSpacesATutorial/163854
(d). Design Share - http://www.designshare.com/index.php/design-patterns/learning-studio
(e). Queensland University of Technology Facilities Management – Design Standards and Guidelines Edition 3
(f). Informa Education - http://www.informa.com.au/conferences/education/higher-education-it-summit

21.1.3 Guiding Principles

An effective teaching and learning environment incorporates generous access, comfortable seating, clear sight-lines, good lighting, articulate sound, appropriate scale and agreeable spatial forms, colours and textures.

The type of work/ study being conducted also affects the type of learning spaces students seek, ranging from secluded and soundproof solitary areas for individual study to large tables and moveable chairs for collaboration. Therefore, when planning teaching and learning spaces, it is essential to consider the users of the space, what kind of spaces they are likely to require, how large or small, what facilities/ technology they will need and how they will need to interact.

In cases where existing spaces are being renovated or upgraded, it is sometimes difficult to satisfy all these requirements. As such, compromises must be made following a comprehensive evaluation of the space and the shortcomings therein. In such circumstances often A-V and presentation facility requirements form the prference of users. However, other qualities and characteristics of the space require attention and should not be overlooked.

The following principles should be utilised to guide the planning and design of learning spaces for University of Queensland campuses and properties. Learning spaces;

(a). Should support a diversity of learning styles.
(b). Must be versatile and durable.
(c). Must be comfortable and attractive.
(d). Should be information rich and technologically reliable.
(e). Should support both intellectual and social learning.
(f). Should be well resourced.

21.1.4 Standards

The standards outlined below shall, in general, be regarded as persuasive and shall be complied with except where a higher standard is called for in this document or by the University Project Manager.

(a). **Australian Standards** - AS 1428.1-2009 - Design for Access and Mobility - General Requirements for Access - New Building Work

(b). **Building Code of Australia –** All relevant building guidelines should be adhered to at all times.

(c). **Facilities for People With Disabling Conditions** - Access to lecture theatres shall generally be in accordance with AS1428-1993 Design for Access & Mobility, Parts 1 and 2, and comply with the Federal Disability and Discrimination Act 1992 and the Queensland Disability Services Act 2006.

- All teaching space designs should allow for two wheelchairs in teaching spaces of up to 200 seats and one additional space for each additional 100 seats or part thereof.
- It is important that these positions allow a clear view of all lecture theatre media and the view from wheelchair parking spaces should not be obstructed by the lectern placement.
- The front row of seats should be at the same floor level as entry doors for disabled person's access.
- Wheelchair spaces should be located towards the centre of the front row rather than near the side unless likely to be obstructed by the presenter.
- Fixed lecterns should not impede wheelchair user access.

(d). **Acoustics –** Particular attention should be paid to the acoustic treatment of all teaching and presentation spaces. Please also refer to Technical Guide 17 – Acoustics Engineering.

- Every person in the space should be able to clearly hear the presenter without the use of audio amplification.
- Isolation from external noises is essential.
- The use of modern audiovisual equipment requires short reverberation times. Mid-band reverberation times, measured as RT60, should be set at around 0.5 seconds for lecture theatres up to 150 seats. For larger theatres, slightly longer times are acceptable.
- Ambient noise from mechanical systems and adjacent areas must be carefully controlled. Steady state noise levels should be limited to NR30, though this is often difficult to achieve.
- Effective isolation assists with reduction in ambient noise. STC ratings for walls and doors must be planned to support the NR30 objective defined above. Double sheet insulated/cavity stud drywall construction is often required. All barrier walls should extend slab-to-slab in multi level buildings. Resilient mounted suspended ceiling structures with insulation over are often required to isolate low frequency sound.
- Mechanical systems noise suppression is an integral consideration to any acoustic barrier treatment design.

(e). **Projection Screens -** The projection installation should work effectively in any configuration without the requirement to tilt projection screens when moving from one presentation mode to another.

- The preferred option is to project directly onto the wall above or behind the writing board area. In most cases the writing boards must be lowered to expose the screen area.
- To provide optimum viewing angles for video/data display the projected image should be located centrally to the whole audience.
- If fixed location marker boards are required, they should be wide enough to allow for the combined media presentations to occur centrally. Alternatively a small mobile writing board may be another option.

(f). **Windows -** Any exterior windows should be treated to minimise or reduce extraneous light which will degrade projected images.

- In computer laboratories, it should be possible to darken the room to a very low level (e.g. 10 lux)
- In Lecture theatres complete blackout must be possible

(g). **Doors** - Include glazed vision "slots" in entry doors as a means of determining if the theatre or teaching space is in use.

- Slots should be approximately 40mm wide and the height should ensure that people standing and wheelchair users may all see in.
- An A4-size Perspex slot for notice insertion and a small pin board for messages may be placed on the outside of the door or on an adjacent wall.

(h). **Writing Boards -** Writing boards, whether electronic or static, are required in all teaching spaces, though their use in larger spaces is discouraged, as distant students are unable to read the written information.

- White dry erase marker boards should be used except where the nominated user department requires chalk board or an electronic board. Designers should consider the health aspect of chalkboard use.
- Electronic boards offer advantages in many situations and are becoming commonplace in teaching spaces. However, as they require IT facilities and training for users, they are not a standard item and should be considered on a case-by-case basis.
- Double-hung boards will be used in preference to fixed or "roller-boards", except for very large theatres where writing boards are not encouraged.
- Care must be taken to ensure that handles are designed to minimise risk of injury in handling boards. Where appropriate, tools for moving boards out of arm-reach should be provided.
- To reduce maintenance, motorised boards should not be used. Unless specially engineered marker board proportions of no wider than 4 to 1 should be used in order to avoid jamming and allow free travel.
- D-pull handles should be avoided.
- Except in very large theatres, where possible, a writing board shall remain accessible while other media are in use. Many theatres do not provide sufficient space at the front to achieve an ideal result, and projection screens will interfere with board usage.

(i). **Audio-Visual Facilities-** Audio-Visual Facilities may be provided in each teaching space as selected from one of five standard classification levels known as AV1 to AV5 with equipment provided as outlined below.

- AV1 - Writing board, overhead projector and screen provided. Simple light dimming.
- AV2 - Markerboard, overhead projector and screen provided. Rooms may have a mounted TV with a video player or library connection. Some rooms may include a slide projector. Simple light dimming and/or brownout.
- AV-3 - Writing board, OHP and screen provided. Rooms will have a large screen projector for display of video and data. Rooms will have a library connection and/or a playback VCR. Some rooms may have a slide projector. Light dimming and brownout should be provided.
- AV4 - Writing board and screen to be provided. An electronic projector able to play video or display computer data onto a large screen will be included. Rooms may have single or dual slide projection and single or dual overhead Projectors. Control of the AV system will be from a front of house lectern. Some rooms may also have a visualiser, radio microphone and/or a computer system incorporated into the lectern. Black-out provisions should be provided.
- AV5 - Specialist Facilities - these include already established Video conferencing facilities

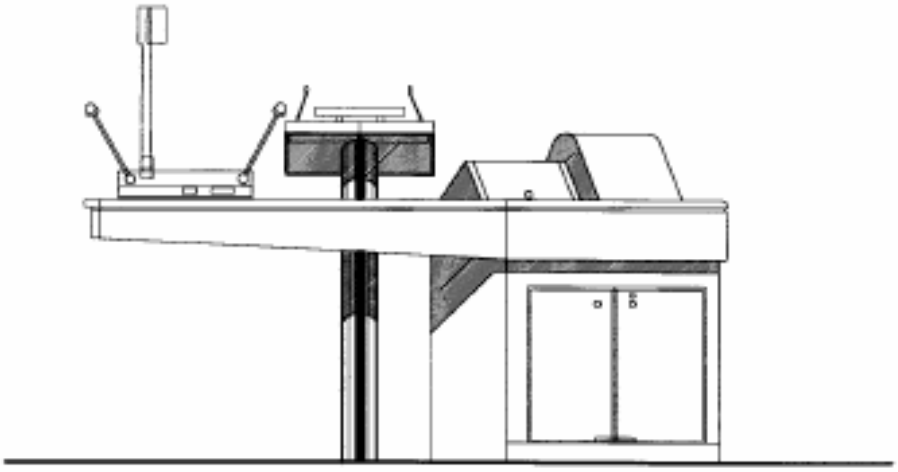
(j). **Lecterns –** An example of a possible lectern setup is provided in the illustration below. Lecterns should;

- Provide a platen with individual lighting, a bench top area for presenter's notes or document viewer, under bench shelf, microphones, a secure theatre environment and media touch control panel, secure cupboard with space for 2 computers if required, slide-out keyboard shelf and DVD deck.
- A standard fixture for main power and LAN connection and video and audio input for a lap top computer.
- Subject to user requirements, some lecterns may require even extended bench area for demonstrations and/or other special equipment. This could be in the form of loose tables which could be stored away when not required.
- The lectern design can be modified to match the aesthetics and design direction of individual lecture theatre projects. However, security principles and robust construction detailing must not be compromised.
- Construction of the unit shall provide a well damped, rigid structure without excessive resonance or box-like boominess when microphones are in use.
- The lectern must be securely fixed in position to meet electrical regulations and reduce vibration.
- A floor duct or trench may be required to carry electrical and AV wiring to the lectern unless space is available for wiring from ceiling spaces below. Ducts must be compartmented to provide separation between services.
- Where close to walls the cabling may be run in wall skirting ducts and surface mounted floor ducting if not in a pedestrian pathway.
- Microphones must be fixed to the platen with tamper-proof screws.

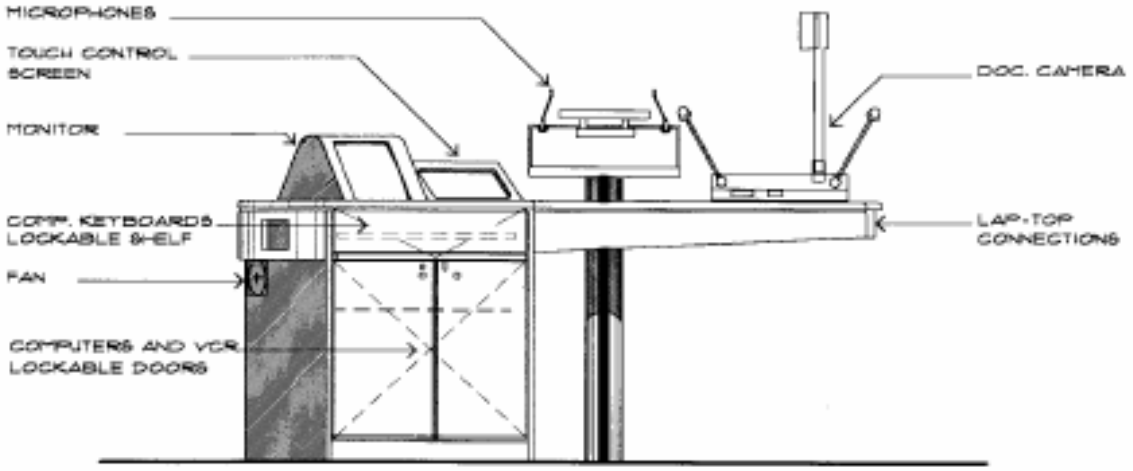
(k). **Stages and Podia** - The installation of stages and podia in all teaching spaces is discouraged.

- Flat floored presentation areas are preferred at the front of lecture theatres - best for access, flexibility of usage, safety and maximum use of space.

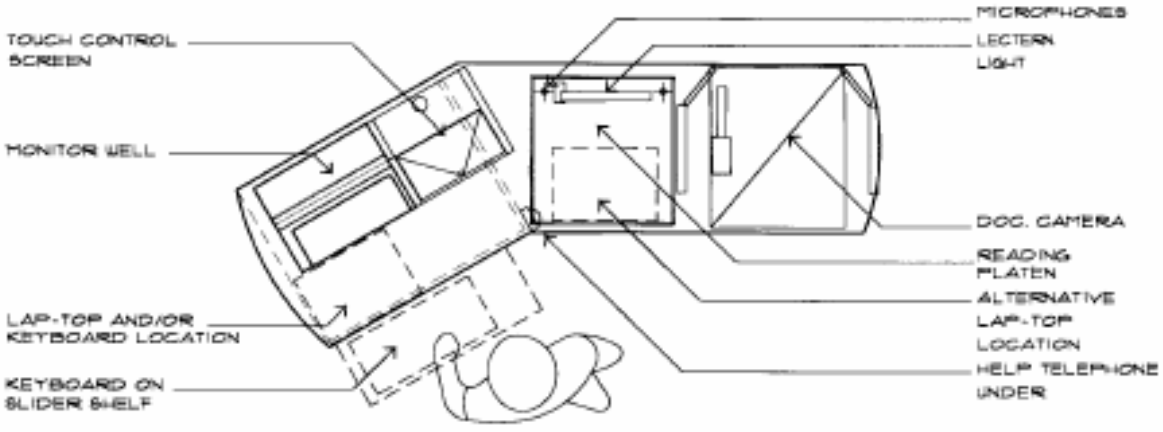
STANDARD LECTERN AND COMPUTER MODULE



ELEVATION FROM AUDIENCE SIDE



ELEVATION FROM PRESENTERS SIDE



PLAN

21.2 FORMAL LEARNING SPACES

21.2.1 Large Lecture Theatres

Lecture theatres are generally single function spaces with fixed seating and writing furniture on a terraced or sloping floor surface with a seating capacity of 60 or more and provided with a dedicated presentation wall. These spaces are generally well equipped for visual communication, with PA and all required equipment installed. Equipment and lighting is generally operated via an integrated electronic control system. Each seat should have a clear, unobstructed view to the presenter and to all boards and screens located on the presentation wall.

The equipment standard for a 'Large Lecture Theatre' will be at least the basic standard as per AV-4, but may include additional features to suit specialist user requirements.

Specialist advice on acoustic treatment, speaker selection and placement and equipment configuration is essential for this type of teaching and learning space, particularly if there are 200 or more seats.

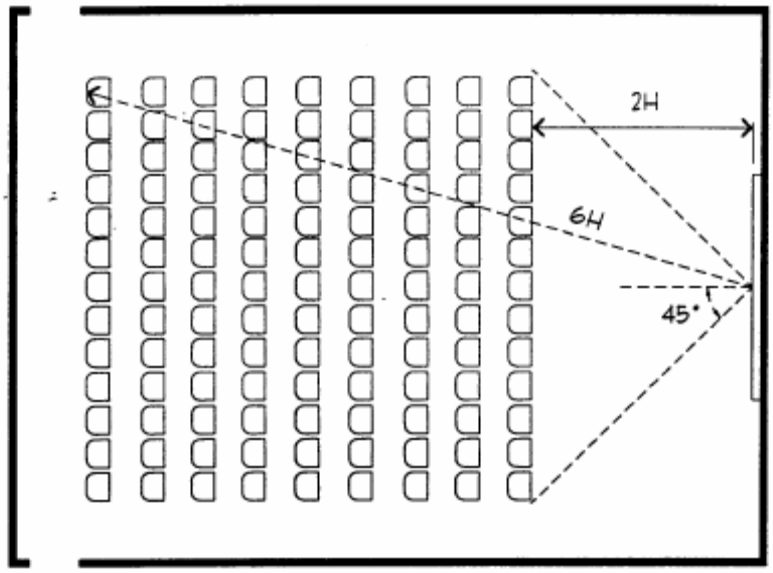
21.2.1.1 Lines-of-Sight and Theatre Proportions

Optical calculations should be performed by the audio visual consultant for each project. However, the following simple rules can be applied:

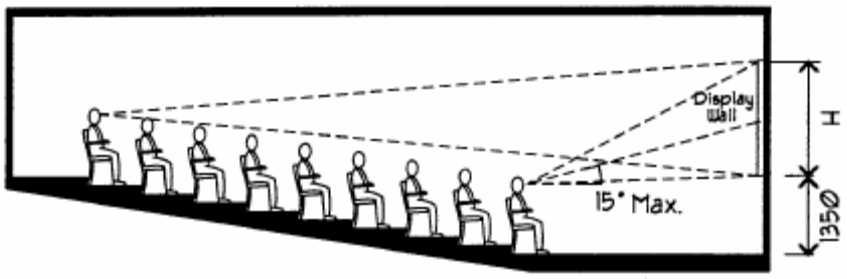
- **Rule 1. Furthest Viewer** **. No student should be positioned further than six screen image height multiples from the projection screen.
- **Rule 2. Closest Viewer**. No student should be positioned closer than two screen height multiples to the projection screen.
- **Rule 3. Horizontal Viewing Angle**. Students should be positioned within an arc of 45 degrees off the centre line of projection.
- **Rule 4. Screen Position.** The base of the screen should be at least 1350mm clear of the floor at the front of the lecture theatre.
- **Rule 5. Vertical Viewing Angle.** Students at the front of a theatre space should not have to tilt their head more than 15 degrees upward from the horizontal to reference the centre of the projection screen.

** Whilst the Horizontal Viewing Angle and Closest Viewer rules can be stretched a little, the Furthest Viewer rule must not be stretched at all. Many poorly designed theatres have required the expensive addition of closed circuit television with viewing monitors located to the rear of house to enable furthest audience members to see presentation data.

LINE OF SIGHT AND
THEATRE PROPORTION RULES



RULES 1, 2 AND 3



RULES 4 AND 5

21.2.1.2 Seating Rake, Aisles and Visibility

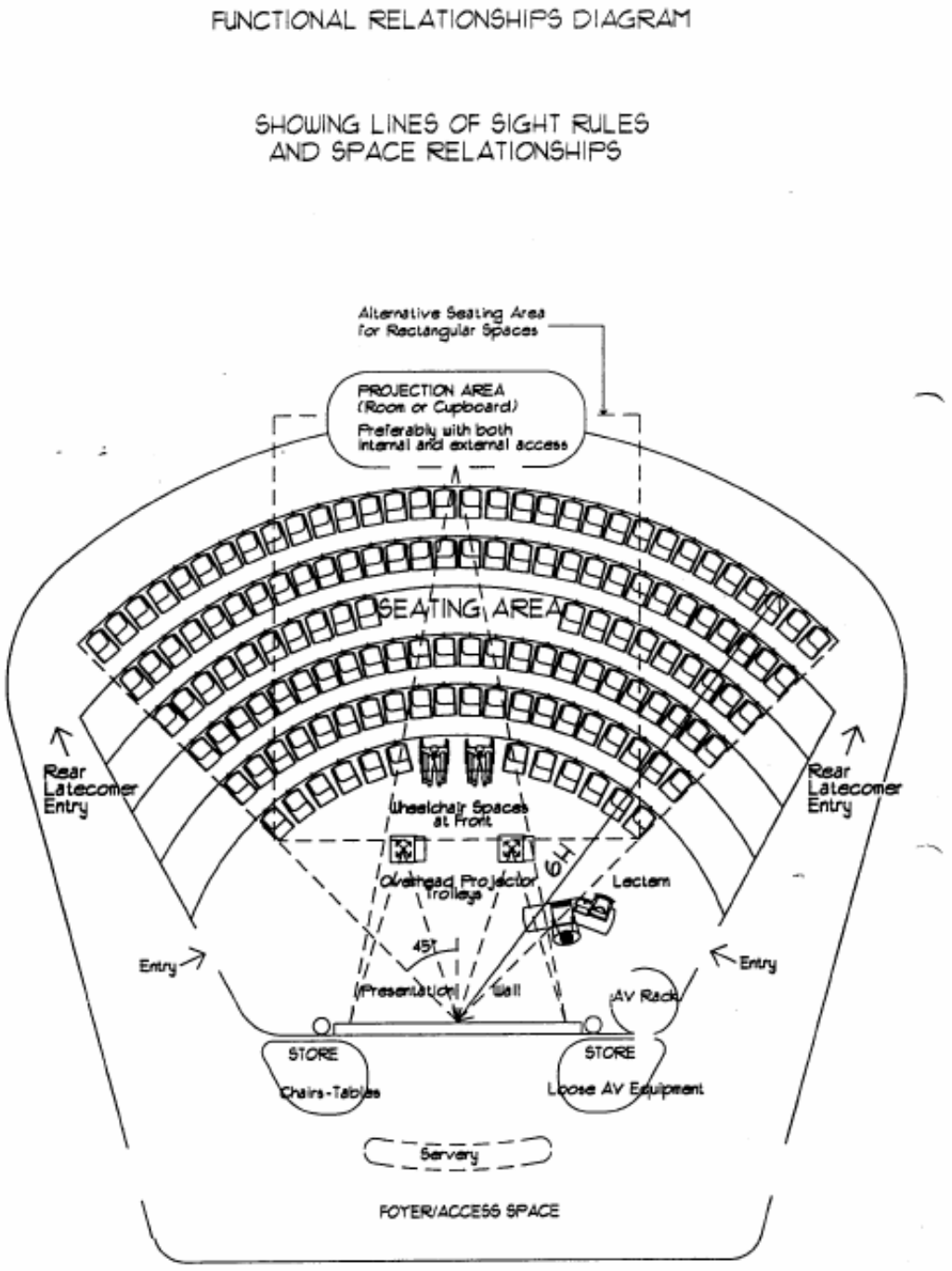
The lecture theatre floor should be raked to provide a clear view of the display areas and the presenter from every seat. The rake can be provided by terracing or sloping of the theatre floor. Aggressive tiering can create projection and screen viewing problems and should be contemplated only in very small theatres or where existing conditions must be retained. In steeply raked existing theatres, the front rows of seats may need to be tilted back slightly to compensate for excessive screen heights and vertical viewing angles.

In smaller theatres, evenly raked sloping floors are often successful where adequate ceiling height is provided for the projection images. Centre aisles should be avoided as images can be obscured easily by latecomers. Central aisles also occupy the best seating locations.

21.2.1.3 Access, Egress and Circulation

Lecture theatres shall be designed to facilitate comfortable access and egress. In addition to BCA compliance in aisle widths, distance to aisles, egress, seating row spacing and disabled persons access, designers should be mindful of other considerations including the following;

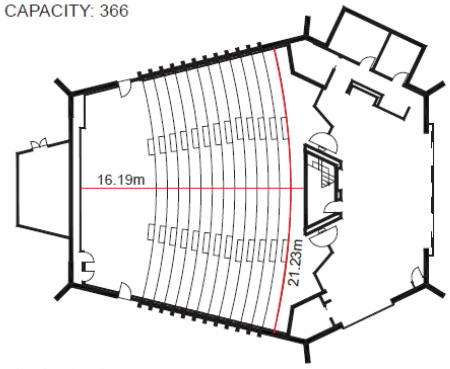
- Circulation spaces sized to allow for both easy 'departure' of classes whilst another group is waiting.
- Sufficient doors should be provided to allow for a maximum clearance time of 2.5 minutes for quick and efficient changeover between lectures.
- Door/s at or near the rear of the theatre for the entry of latecomers minimise disruption to presenters.



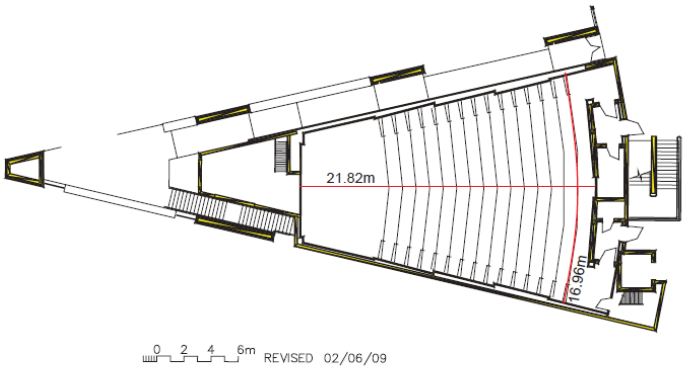
21.2.1.4 Current University Examples

Following is a snapshot of examples of current large University of Queensland lecture theatres for investigative reference.

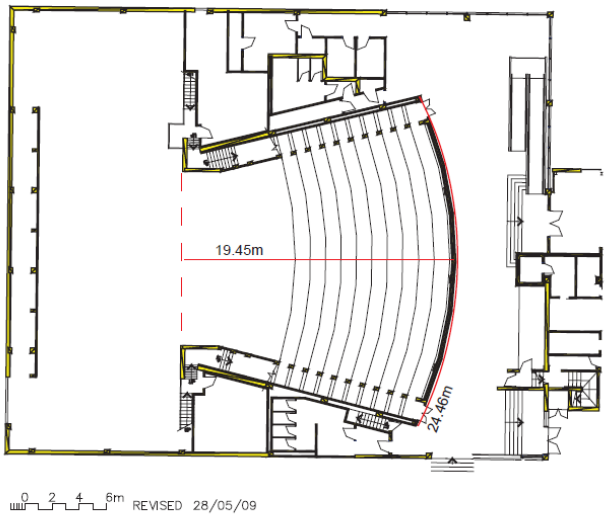
ABEL SMITH THEATRE - LEVEL 1 ROOM 101
CAPACITY: 366



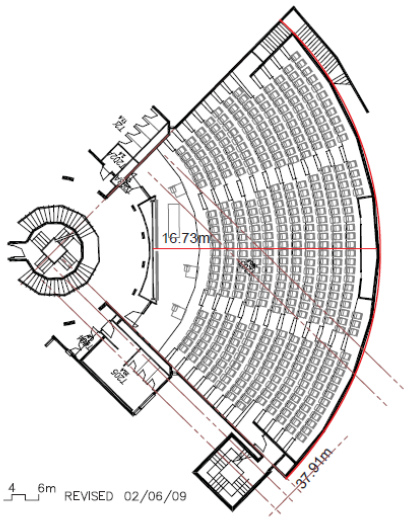
QBP - LEVEL 3 EASTBLOCK ROOM 31.64
CAPACITY: 300



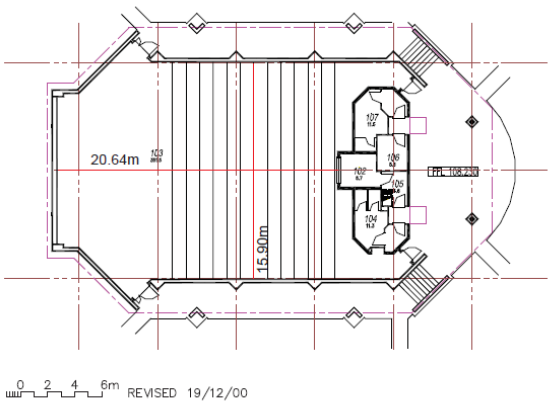
SCHONELL THEATRE
CAPACITY: 381



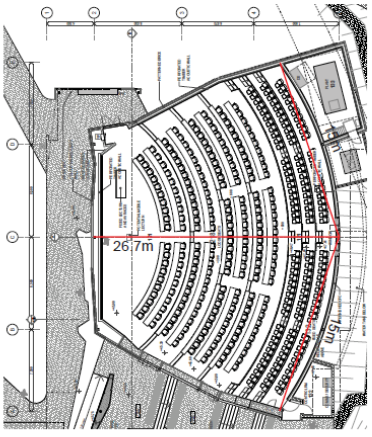
HAWKEN ENGINEERING BUILDING - LEVEL 2 T203
CAPACTIY: 411



GATTON LECTURE THEATRE
CAPACITY: 298



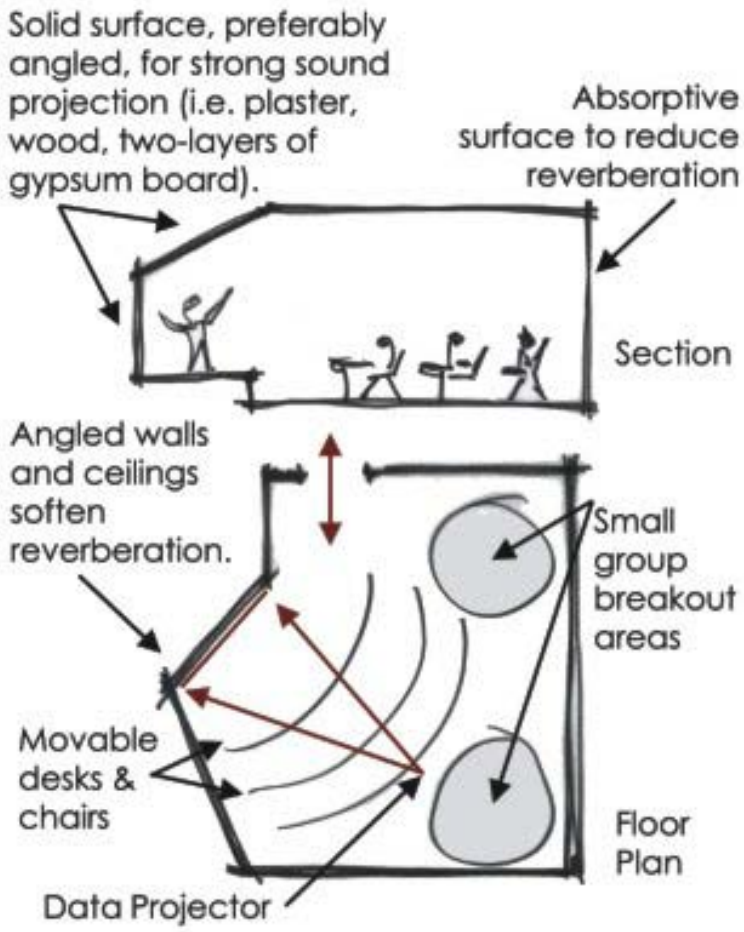
IPSWICH LECTURE THEATRE
CAPACITY: 350



21.2.2 Seminar/ Tutorial Rooms

These would effectively be considered small lecture theatres with a capacity of less than 60 and with a level floor but are primarily designed for effective presentation from one end of the room.

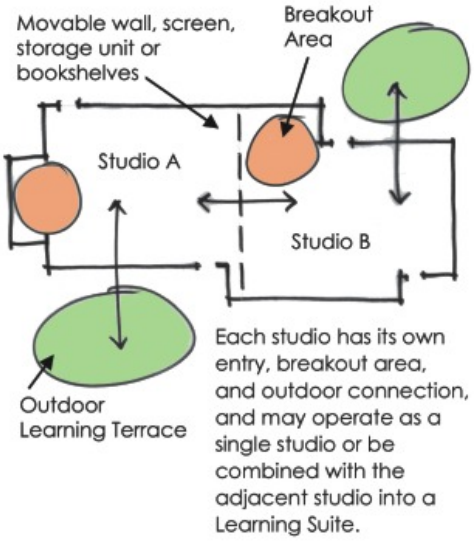
The equipment standard for a 'Seminar/ Tutorial Room' will be at least the basic standard as per AV-1, AV-2 or AV-3. It will also have controlled lighting, a PA may not be required and the use of combinations of presentation media is more restricted.



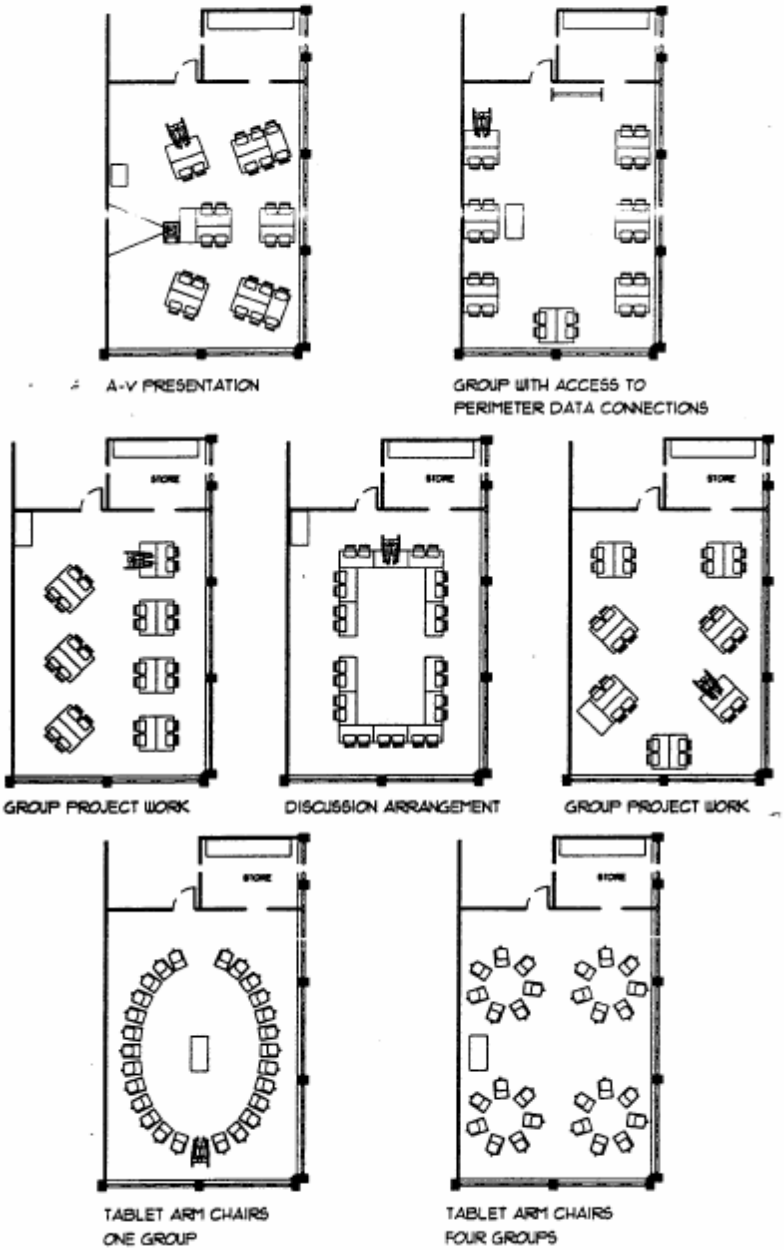
21.2.3 Flexible Teaching/ Learning Spaces

These are flat floor, multi-function spaces and generally have natural lighting and a seating capacity of up to 60. The emphasis is on active participation and contribution by all to the learning experience rather than purely presentation to the group from one part of the room. These spaces may not have an obvious "front of room". Writing boards may be fixed to more than one wall. Allowance should be made for staff to 'circulate' within the room to each student work point.

Some basic presentation furniture should be available with lighting controls located on a wall near a presenters 'home base' location. Moveable seats, tables and walls should also be provided and laptop connection for presenters is most useful.



FLAT FLOOR FLEXIBLE TEACHING / LEARNING AREA



21.2.4 Computer Laboratories

The purpose of a computer lab is to present more opportunities to use a learner-centred approach to instruction. These spaces generally have a built-in networked computer for every person as well as presentation facilities.

A good computer teaching lab layout allows the instructor easy access to each student. Wireless internet connection and unfixed tables would also allow for more flexibility of design and use.

All machines in the lab should be comparable both physically and in the kind of software installed and they should be configured consistently for connecting to servers, printers and each other. Finally, a good system for content sharing and remote control of machines is essential.

Large screen data projection within computer laboratories requires careful consideration for sightlines because many existing labs are configured without students facing a main presentation wall.

21.2.5 Laboratories

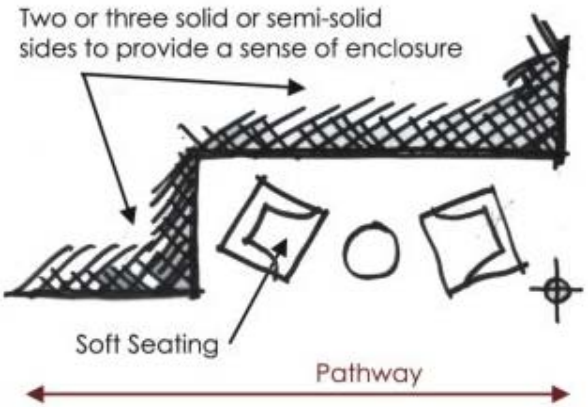
See Design Guideline 22 and Technical Guide 22 for more detail

21.3 OTHER LEARNING SPACES

21.3.1 Informal Learning spaces

Incorporating informal learning spaces is part of a strategy often utilised to make University buildings more inviting to students so that they will stick around between and after classes rather than 'learn and leave'. Informal learning spaces should be flexible and multipurpose and their use should not be restricted to intellectual learning, rather it should also include social learning.

An informal space should also enable students to work or study collaboratively. Such spaces are sometimes enclosed in glass for soundproofing or located in alcoves in hallways. Such areas sometimes include a whiteboard or a large wall-mounted computer screen to which a student can connect a laptop. Wireless internet is usually a feature of these spaces and sometimes printers are located nearby.



21.3.2 Transition Spaces

Transition spaces are typically outside large lecture theatres or formal teaching rooms, where students wait for class. These spaces are generally a fraction of the capacity of the formal teaching facility and often present problems with people movement, shelter from the rain/wind and noise. However, also consider that quick group meetings, food consumption, the checking of email and social chatter often occur in such spaces.

As such, provision of adequate toilet and washroom facilities, informal seating arrangements (e.g. bistro style or 'poofs') away from doors and movement paths, 'quick internet' access kiosk stations, extra shading/shelter facilities and power points for laptops should be considered. Carpeting or other sound-absorbing materials to mute ambient noise should also be considered.

21.3.3 External Learning Spaces

External learning spaces are often within range of the wireless internet network and have better cell phone reception than indoors. These spaces are regularly used for homework, socialising, using cell phones or iPods or reading between classes.

Planting shade trees and providing sitting areas makes these spaces more useable and attractive to individual study.

21.4 INFORMATION AND TECHNOLOGY REQUIREMENTS

21.4.1 Keeping Up With Technology

Today's students are the most technologically advanced and integrated in history. Students, academic staff, educational institutions and IT administrators are faced with new and increasingly diverse challenges in the sharing and disseminating information. Higher education institutes need to keep up with these demands and offer international standards in IT services. Advances in technology and how to effectively incorporate it into the University teaching and learning spaces need to be investigated for every project.

21.4.2 Equipment Operating Manuals

The contractor must collect, collate, assemble and bind all equipment manuals together and pass these to the University Project Manager by time of project completion. The manuals should be bound in a specially labelled 3 ring (D type) A4 binder.

21.4.3 Quick Reference Guides

New technology is often difficult for some users to navigate, especially when the technology could potentially be different in ever teaching and learning space. As such, the contractor should prepare and provide to the Project Manager four (4) copies of a single sheet A3 sized “Quick Reference Guide” for each major system.

- The A3 guides will be folded to provide four pages, and will be printed on all sides. The guides will be produced in mono (black & white) and laminated in clear plastic for protection.
- The guides will contain simple “step-by-step” instructions for the presentation systems.
- The guides will be delivered to the Project Manager prior to practical completion of the project being achieved.

21.4.4 Reactive Maintenance & Support

ITS is responsible for maintaining the Universities IT installations and will inspect new IT installations prior to hand-over to ensure that works are completed and commissioned satisfactorily and meet the standards required.

- ITS is to be available to provide recommendations for equipment selection and will provide service and support to selected/recommended brands of equipment.
- During the Defects Liability Period the contractor shall have qualified and suitably equipped service staff available, to support the following reaction times. After the Defects Liability Period, qualified and suitable equipped ITS staff from the University should be the first point of call for any technology problems.
- Telephone response, by a qualified engineer, within 90 minutes of fault report by the University ITS.
- On site fault rectification response, by qualified and suitably equipped staff, within four hours of fault report by the University ITS.