La Trobe University Buildings and Ground Division

Design Standard - General. Issue No. 12.

Contents

This Design Standard establishes the basic building design and project administrative requirements of the University on all of its Campuses. Where a specific project brief is provided, it takes precedence over this Design Standard. All the requirements in this Design Standard are to be complied with and incorporated in the contract documents unless specifically amended and recorded in consultation with the University.

This Design Standard will introduce the consultants to some of the more general building details and operational and procedural requirements of the University from early design stages through to Project completion.

The term "Proprietor" or “Client” shall mean “La Trobe University” as represented by the Project Director.

The term “Project Manager” shall refer to the consultant engaged by La Trobe University with responsibility for the co-ordination of other consultants and for the work of sub-consultants directly under its control.

Where a reference is made to any document or standard, the reference is to the latest edition.

This Design Standard nominates minimum design standards which apply to the design and construction of all University projects. While innovative and new designs, materials and products should always be considered, any variation from the Design Standard must be approved by the University through the Project Director.

Consultants are to prepare specifications which are written specifically for each project to achieve the standards nominated in the Design Standard. The Design Standard and the documents referred to therein are not to be distributed to contractors in whole or in part and are not to be referred to or transcribed in tender or contract documentation issued to contractors.

The Design Standard will be maintained and updated by Buildings and Grounds. Comments and suggestions on improvements to the Design Standard are encouraged and should be directed to the Project Director.

REVISION HISTORY

Revision No 12	Effective from Sep 2009	Major revision	Approved: Greg Gow
Revision No 11	Effective from Nov 2007	Major revision	Approved: Jim Colebatch
Revision No. 10	Effective from Feb. 2006	Minor revision	Approved: Jim Colebatch
Revision No. 9	Effective from May 2005	Major revision	Approved: Jim Colebatch
Revision No. 8	Effective from Sept. 2000		

1.1 Rooms Sizes

For all major projects, an accommodation plan and schedule of room sizes shall be prepared as part of the specific project brief.

The following are current La Trobe University guidelines regarding Space Standards:

- **Open plan.** In new work, proposals will adhere to providing a nominal area of 6.0 Sqm UFA per workstation. This nominal space allocation will include tertiary circulation space around individual workstations, but it will exclude primary and secondary circulation. Workstations shall be provided with; 2 double GPO's and one double RJ 45 outlet.

- **Cellular offices.** In new work, proposals will adhere to providing a nominal area of 12.0 sqm UFA per office. Cellular offices shall be provided with: 2 double GPO's and two double RJ 45 outlets, one pair on each side of the office. Deviation from this standard will only take place in exceptional circumstances. Designated staff may receive an office to fit a specific need & function if this can be demonstrated. Initial layouts will provide for 12.0 sqm UFA per office unless expressly asked for at project initiation or during the Design process. 'Designated staff' is defined as: Senior Executives, Deans and Heads of School.

- Staff will be provided with only one workstation or office. Staff with dual responsibilities will be required to work from one location only and to share space at their alternative location.

- Disabilities. On notification, consideration to help facilitate the core job function of a staff member with a disability may necessitate a divergence from the Space Standards. The disability will be defined according to La Trobe University's definition and will be evaluated on a project by project basis taking into account, successful precedents.

- All Australian Standard regulations and Federal laws regarding Office and Open plan Office space creation will be adhered to and provided for.

- Standard Furniture / Office layout configuration guidelines are being created as a Document: "La Trobe Space-planning Furniture Standards". (By 2010).

1.2 Building Façade

Important considerations for building design and exterior facades shall include:

- Choice of façade materials and treatment is to be in keeping with the local built environment.
- Façade materials to be durable, economical and easily maintained.
- Resistance to water penetration and control of exterior noise.

- Windows and other façade elements should be well shaded. Windows should be located to provide good views and allow light penetration without causing glare discomfort to occupants.
- If the building is not fully air-conditioned windows should be openable for cross ventilation.
- The chosen façade materials should have thermal properties to keep excess heat out during summer and insulate effectively in winter.
- The façade system should seek to optimise the building comfort conditions nominated in the specific project brief, and assist in the Green Star rating of the building.
- The placing of protruding building services and equipment on building facades and rooftops shall be avoided, or shielded from view.
- Buildings greater than three floors in height, or where access to the façade for cherry picker is restricted, shall be designed to take swing stage scaffolding or other approved building access systems for maintenance and cleaning of windows and the external façade

1.3 Life-Cycle Costing

The University aims to achieve the optimum balance between capital and operating costs for buildings, consistent with a constant level of quality and service throughout the lifetime of its buildings.

Whilst the question of any financial return on the capital outlay and final disposal value of these facilities is not to be considered in the project budget, all other principles governing the construction of a commercial building shall be given critical consideration. These principles shall be discussed with officers of the Buildings and Grounds at an early stage in each project. For life cycle costing analysis, the University recommends a 5% discount rate over a life of 20 years. As a guide, a ratio of 30% of the total life cycle cost is represented by capital value and 70% by operating and maintenance costs.

1.4 Design Loadings

Floor loadings shall be in accordance with the relevant Australian Standard for floor loadings as specified in loading code AS 1170, except for the following minimum loads:

a	Office Floor	
-	general live load	Min 5kPa
b	Compactus areas	Min 10kPa
c	Computer equipment areas	Min 6kPa
d	Air handling, refrigeration and boiler plant rooms	Min 8kPa

Areas suitable for full compactus installations shall be readily identifiable. The total area available for such installations shall generally be not less than 5% of the gross floor area unless otherwise specified.

In additional to the live load, a dead load allowance of 1.0 kPa for suspended ceiling and services shall be provided.

Heavily loaded areas shall require computations to determine necessary loadings, eg:

- Storage
- Libraries
- Machine Rooms, etc

1.5 Materials and Finishes

Internal finishes shall be designed for low maintenance with acoustically absorbent finishes where practicable. Whilst it is desirable that surfaces be easily cleanable, they shall not be durable to the extent that they create a harsh environment.

The finish on internal walls shall follow the recommendations of the Australian Standard for Interior Lighting regarding the reflectance of surfaces. If screen-based equipment is to be used it is recommended that the wall colours have a reflectance value of between 30% - 50%.

The Consultant shall select materials and finishes which are readily available and preferably Australian made.

1.6 Concourse Areas through Buildings

The treatment of concourse areas which will pass through future stages of the building should be discussed with the University to ensure that a form of continuity is maintained in floor, ceiling and wall finishes. Security control of these areas in relation to individual departments on each level within the buildings shall also be subject to detailed discussion with the University.

1.7 Termite Control

Anti-termite treatment shall be provided to all new buildings. All workmanship and materials shall conform to the requirements of AS 3660.1 for protection of buildings from subterranean termites.

Consideration shall be given to any disruption to adjacent building users which may be required during spraying.

Consideration shall also be given to any possible discharge of chemicals into the surrounding waterways. All tree roots which have been exposed during excavation, tree stumps, logs and timber shall be fully excavated and removed from the building site.

1.8 Walkway Safety

Concrete paths should be finished in such a way that they have adequate slip resistance and low maintenance. Steel trowelled finish is not acceptable.

Timber decking shall be reeded and laid perpendicular to the direction of travel.

1.9 Child Safety

Public areas shall be designed with child safety in mind. Stairs and balconies will need special attention. The distance between vertical railings shall be no more than 80mm. Horizontal railings shall not be used where they allow a child to climb to a dangerous situation. DR88013 may assist (Draft Australian Standard Guide to Child Safety in House Design, 1.2.8).

1.10 Service Areas

1.10.1 Communications Rooms/Cupboards/Risers

A communication cupboard shall be provided on each level of new or refurbished buildings. All penetrations in floor slabs shall be filled using approved expendable foam or other approved media. For more detail on network infrastructure refer to latest version of "University Standards – Definition for the Installation of a Network Infrastructure" available from the University's ICT Department.

The Consultant shall liaise with the Project Director to ascertain whether a purpose designed communication room is required. If so, the Design Brief shall include details of air conditioning requirements, security, fire rating, floor finishes, etc.

1.10.2 Cleaners Store

A small store room should be positioned on each floor of new buildings for the storage of cleaning materials and appliances. The room shall contain a hopper sink and power point. Cupboard space sufficient to store reserve supplies of cleaning materials shall be provided. Should any controlled substances, such as chemicals and cleaning agents be stored inside the room, proper signage applicable to storage of hazardous materials shall be affixed to the entry door of the cleaner's store.

1.11 Environmentally Sustainable Design (ESD)

To achieve this objective, Consultants shall demonstrate an integrated approach to the design of this facility.

For all projects, the University will require that an ESD Consultant (or similarly qualified representative) is included in the consultant team to ensure the overarching ESD principles are considered by all stakeholders

throughout the development of the project and communicated and reported on effectively to the Project Working Group.

Latrobe University Minimum Requirements

The following ESD items must be included in all developments as a minimum requirement:

Guiding Principle

Latrobe University understands the inherent value of integrating ESD principles into a project from the early concept phase, facilitating innovative design solutions that will provide managers and users of the facility with ongoing environmental, economic and social benefits well into the future.

Compliance with this brief shall be adhered to except where specific requirements are not required by the University due to budget or size constraints of the project.

Purpose

The purpose of this Brief is to inform consultants, developers and builders of the minimum standards required for all Latrobe University building developments and refurbishments.

Environmentally Sustainable Design (ESD) - Minimum Standards

Management	ESD Budget	A dedicated component of the budget to be allocated to ESD initiatives.
	ESD Consultant	Inclusion of an ESD consultant on the Project Team for new buildings and major projects.
	Green Star Rating	A preliminary Green Star - Education assessment to demonstrate the methodology to achieve 5 Stars.
Site Selection	Orientation	Sites will be selected so as to allow optimal passive solar heat gains for that climatic region.
	Shading	Developments will be fitted with solar calculated eaves and between floor shading elements sympathetic to the local climatic conditions.
Building fabric	Insulation	BCA Section J minimum requirements +20% improvement. To be calculated according to ABCB Climatic Region. Please refer to 1.2 - Building Façade.

Energy	Glazing	Exterior windows on faces exposed to direct sunlight are to be fitted with Low-E glazing or double glazing to minimise unwanted heat transfer. Glazing to be specified where U≤3.8.
	Indoor Environment Quality (IEQ)	The provision of natural ventilation openings and daylight to all learning spaces where appropriate and practical. Please refer to 1.2 - Building Façade.
	ABGR Rating	Buildings will be designed to achieve the equivalent energy efficiency of a 4 Star NABERS (Energy) whole building rating (223kgCO_2/m^2/annum).
	Hot Water System	All hot water boiler units will be gas powered (minimum energy efficiency rating of 4 stars), with a preference for gas powered domestic hot water units (fitted with time clocks for evening shutdown). All hot water units are to be solar boosted where applicable. Please refer to 5.9 - Domestic Hot Water Systems.
	Mechanical Systems	All mechanical fans and pumps over 1kW are to be fitted with a variable speed drive (VSD). All mechanical systems will aim to achieve a minimum Coefficient of Performance (COP) of 5.0, with a minimum COP of 6.0 for chilled water systems. Please refer to 5.1 Air Conditioning Systems and 5.2 - Heating Systems.
	Lighting	T5 fluorescent lamps or better are to be used for all underground car park and common area space lighting requirements where possible. Daylight sensor lighting control systems are to be fitted to all perimeter area lighting. Please refer to 6.6 - Lighting. Lighting control systems shall be zoned and switched so that no switch controls an area >100m^2. All fluorescent lamps will be fitted with electronic ballasts. Dimmable features are preferable and to be incorporated into perimeter area lighting control systems. Please refer to 6.6 - Lighting. All external lights are to be fitted with

		daylight sensor lighting control systems.
		Consideration will be given to PIR motion detector lighting control systems in all store rooms, utility rooms, kitchens, toilets and wash rooms.
	Metering	Metering is to be provided to all substantive energy uses and connected to the Building Automation System (BAS). Typically: building plant, lighting and tenancy power. Please refer to 6.8.3 - Energy Metering.
	Rainwater Harvesting	An appropriately sized rainwater collection system, with reticulation provided back to toilets (minimum 50% of toilet water use and 100 % of irrigation requirements).
	Water Efficiency	All tapware, showers and toilets shall have a minimum 3 star WELS rating.
Water	Urinals	Preference will be given to waterless urinals where appropriate.
	Cooling Towers	Preference will be given to air cooled air conditioning systems except where size justifies the use of high water efficiency cooling towers.
	Metering	Water sub-metering is to be provided to all substantive water use areas. Please refer to 6.8.2 - Water Metering.
Materials	Internal Finishes	Preference is given to products that have lower levels of VOC emissions such as water-based adhesives, paints and sealers. E0 or E1 MDF, and alternative resilient floor coverings are preferred. Please refer to 2.14 Finishes. All developments must demonstrate achievement of the Green Star - Education PILOT IEQ-12 credit criteria.
	Construction Material - Timber	Preference will be given to construction timber that is Forestry Stewardship Council (FSC) certified timber.
	Construction Material - Concrete	Ensure that 20% of cement used for in-situ concrete and 15% of cement used for pre-cast concrete is to be replaced with industrial waste product. Note: structural requirements must still

		be met.
	Construction Material - Steel	All structural steel to contain 10% recycled content.
	Embodied Energy	Preference will be given to Australian made products to reduce transport costs and associated carbon emissions. Please refer to 1.5 - Materials and Finishes. Preference given to recycled materials, or those with low embodied energy. Examples of these products can be found on the Australian Environmental Labelling website www.aela.org.au. Please refer to 1.2 - Building Façade.
Waste	Operational Waste	All developments must demonstrate achievement of the Green Star - Education PILOT MAT-1 credit criteria.
	Construction and Demolition Waste	A site specific Construction Environmental Management Plan (CEMP) is to be formulated to indicate the approach that will be taken to manage the immediate environmental impacts of construction.
Transport	Bicycle Parking	Adequate bicycle parking will be provided in line with Green Star - Education PILOT Tra-3 credit criteria.
	Small Car parking Spaces	Ensure that 25% of the total parking spaces on the site are designed and labelled for small cars (i.e. 2.3m wide x 5.0m long) and/or mopeds/motorbikes. A minimum of 10% of the total parking spaces (i.e. 10 out of every 100 parking spaces provided) must be for small cars.
Ecology	Landscape Design	All landscape design is to take into account the locally indigenous flora and fauna, and select species from local Council indigenous species lists. Please refer to 1.15 - Landscaping and External Works.

100% of landscape irrigation will be managed by harvested rainwater. Please refer to 4.7 - Garden Watering Points.

The irrigation system will be fitted with moisture sensor controls.

Additional Latrobe University Recommended Requirements

The following ESD items are strongly recommended to be included in all developments, at the discretion of the Project Director. These recommendations are aimed as steering all Latrobe University developments towards carbon neutrality:

- Accredited Green Star - Education 5 Star rating (when available);
- Investigate the suitability to utilise photovoltaic (PV) cells, wind turbines, geothermal heap pumps, or cogeneration/trigeneration installations to harness renewable or low emission energy;
- Utilisation of a Building Automation System (BAS) to monitor energy use and optimise performance (Please refer to 5.4 Controls and Instrumentation); and
- GHG emissions target to be specified and reported against.

1.12 Acoustics and Vibration Standards

1.12.1 Acoustics

Objective Values of Sound Reduction Subjective Values
(Averaged 124-4,000 Hertz)

Privacy Classification	Sound reduction through walls and ceilings	Sound reduction through walls loss* containing doors	Sound insertion loss specification for doors only	Subjective impression of sound reduction through walls and ceilings
Class 1	40 decibels	35 decibels	25 decibels	High degree of privacy. Voices in next room may be just audible but unintelligible
Class 2	35 decibels	27 decibels	20 decibels	Good degree of privacy. Voices sometimes audible but conversation

				normally unintelligible
Class 3	27 decibels	20 decibels	no	Voices audible and specific - conversation intelligible unless persons speaking in subdued voices. Although privacy is not good the reduction in office noise is well worthwhile

*For the purpose of this Specification Sound Insertion Loss is defined as room to corridor when the door is wide open and when it is closed.

Class 1 Professorial Suites, Teaching Areas, Seminar Rooms and Conference Rooms

Class 2 Readers, Lecturers, Common Rooms

Class 3 Tutors Rooms, Stores, General Office

The class of insulation to be used for plant rooms will depend on the type of plant in the rooms, the location of the rooms in the building and the nature of adjacent rooms. The Primary Consultant shall give special consideration to sound insulation of plant rooms and discuss his proposals with the University at an early stage of documentation. Other specialist areas within a particular brief will be identified and specified as necessary in the documentation stage.

1.12.2 Ambient Sound Levels

In general it is required that the level of ambient sound, as from air conditioning and ventilating and other mechanical equipment, should be neither so high that it is objectionable nor so low that the resulting quiet causes intruding speech and other activity noise to be objectionable. The design objective figures given in the table below are not intended as absolute maxima and minima, but are preferred values. Excesses of up to two decibels may be approved if necessary to meet other requirements. The level of noise is described here by the sound level, as defined by Australian Standard AS 2107 latest revision.

Type of Space	Recommended Ambient Sound Level Design	Subjective Impression
Lecture Theatres Large Conference Rooms Specially Designated Areas	25dB(A)	Barely audible and very unobtrusive

Small Conference Rooms	30dB(A)	Audible, but noticeable only in Tutorial Rooms absence of activity noise
General Offices	35dB(A)	Audible, but not noticeable only corridors when there is little activity noise

Note:

1 Where sound levels will increase at a later date due to conversion from heating and ventilation to full air-conditioning the design objectives apply to that later time.

2 Ambient sound should be free from distinctive characteristics such as tones or fluctuations.

1.12.3 Vibration

All Mechanical Equipment shall be of such type,

- quality
- condition
- and be supported so

as to eliminate any perceptible vibration inside the occupied space of the building.

Any vibration generated noise transmitted into a building shall not cause ambient sound level to exceed the requirements described elsewhere.

1.13 Facilities for People with Disabilities

1.13.1 General

Section 23 of the Disability Discrimination Act 1992 (DDA) makes it unlawful to discriminate against people with a disability in relation to access to and in the use of premises that the public may enter.

Buildings and facilities at La Trobe University shall be designed to meet the requirements of:

- Disability Discrimination Act 1992
- Advisory Notes on Access to Premises - Human Rights and Equal Opportunity Commission - June 1997
- Australian Standard AS 1428.1-1993 Design for Access and Mobility
- Australian Standard AS 1428.2-1992 Enhanced and Additional Requirements for Buildings and Facilities
- Australian Standard AS 1428.3-1992 Requirements for Children and Adolescents with Physical Disabilities

- Australian Standard AS 1428.4-1992 Tactile Ground Surface Indicators for the Orientation of People with Vision Impairment
- Building Code of Australia 2006

Primary Consultants/Designers are requested to be mindful of the special needs of disabled people. Examples of common issues include:

- Reception counter heights (Max. 1200mm)
- Height of signage
- Height of door hardware, push buttons etc. (Max. 1000mm)
- Accessible height for GPO's and data points
- Mounting height of whiteboards
- Distance of travel to disabled toilet facilities (max. 120m)
- Automatic doors at primary buildings enhances
- Disabled car parking near primary building entrances
- 2% of car park spaces to be designated disabled car parks min. of 3.2m wide. There should be a continuous path of travel to the closest public entrance
- Door closers to conform to AS1428.1
- Provision of disabled toilet facilities
- Audio loops in teaching spaces
- Audible and visual alarms
- Audible, visual and tactile lift controls
- Tactile floor indicators
- Light paths using colour contrasted finishes
- Lever door handles
- Signage
- Temporary access during construction
- Use of lifts by disabled, refer Lift Section of the Design Standard.

1.13.2 Teaching Spaces

La Trobe University is an Equal Opportunity Employer and can expect to employ people with disabilities. Teaching areas should be designed for satisfactory access to whiteboards, podia (if these are necessary), lecterns, demonstration tables, electrical switches and points, overhead projectors, microphones, and any other facilities or equipment provided for teaching staff.

In designing tier-floored lecture theatres, provision should be made for a proportion of the seating area to be accessible to disabled persons. Space should be provided so that wheelchair users can remain seated in their wheelchairs.

1.14 Signage

1.14.1 Signage Standards

The University's Signage Standards are available from the Project Director.

1.14.2 Room and Floor Numbering Systems

The University has an established system for allocating room numbers and floor levels.

Floor levels are numbered thus:

Ground Level - Level 1

1st Level - Level 2, etc

All rooms on Level 1 start with - 101, e.g. Room 12 is 112

All rooms on Level 2 start with - 201, e.g. Room 12 is 212

Basement start below Level 1 and are designated as B1, etc.

Room numbers are allocated thus:

Room 12 on Level B.1 - B112

Room 12 on Level B.2 - B212, etc

All rooms, such as:

- Class-rooms;
- Seminar rooms;
- Offices;
- Laboratories;
- Libraries, etc

shall be numbered. Numbering is to start from side of the main entry to the level, whether from the corridor or lift lobby and to proceed in the clockwise direction.

Where a room is accessed through another room it is to be numbered with an alphabetical suffix to main room number e.g. Main room number 101, room off it to be 101a, etc.

The remaining auxiliary/service spaces shall be numbered next. These would include:

- Corridors;
- Cleaner's room;
- Storage rooms;
- Toilets, change rooms;
- Lift lobby and foyers;
- Stairs;
- Ducts; Kitchens, etc

Note that the numbers for auxiliary/services spaces are for the purposes of identifying spaces on drawings and related documentation. These numbers are generally not required on door signes under clause 1.14.3.

For specific details refer to the latest version of "University's Signage Standards" available from the Buildings and Grounds Division.

The Project Manager shall consult with the Project Director before allocating room numbers, and shall ensure that the University system is followed from the developed sketch plan stage.

1.13.3 Door Signs and Room Numbers

The Project Manager shall prepare a schedule of door signs and room numbers, with reference to the University's Signage Standards.

1.14.4 Directional Notices and Sign Systems

A Provisional Contract Sum for directional, room and door signs may be allowed for in the contract documents. The Project Manager shall produce a complete schedule of internal and external signs for approval by the University.

1.14.5 Directory Boards

A directory board shall be located near the main entrance with an explanatory floor plan. The size and type of board shall be advised by the Project Director. A similar directory board shall be placed on each floor.

1.15 Landscaping and External Works

1.15.1 Protection of General Landscaping and Trees During Construction

During the design planning stage the Consultant shall consult with the Landscape Department with regards to the impact of the proposed construction works on the trees within the construction site. An assessment of each tree within the construction zone will be carried out by the Landscape Department during the design process and any trees requiring protection will be nominated at this time. The costs and

techniques associated with providing tree protection requirements shall be considered in the project budget. Other areas requiring consideration and protection during construction are:

- Exposed and Under-ground irrigation systems;
- Drainage network;
- Underground Services Infrastructure

If during construction a protected tree requires removal a qualified arborist's assessment shall be sought, and approval to remove must be obtained. Such approval may require a replacement tree strategy.

General landscaping requirements and tree protection zones are available form the landscaping Department of La Trobe University.

2.1 Floor Slabs - Design

Floor slabs shall be designed for the most economical construction and flexibility of use with due consideration to long-term deflections and the need to provide for penetrations both initially and during the course of the building's life. The need to core holes up to 200mm diameter or for penetrations up to 1200mm square in selected areas in the future should be taken into account during design. All floors are to be finished within a maximum tolerance of ± 3mm in 3000mm in any direction.

Minimum floor loadings shall be in accordance with Design Loadings Section of the Design Standard.

2.2 Floor Penetrations

With particular reference to laboratory type buildings, all floor penetrations and associated service pipes are to be fully sealed with a flexible material to control water penetration between levels. Where wet areas occur within a building, their relationships to specialised areas are to be given consideration in the planning stage. All floor penetrations are to be fire sealed as necessary.

2.3 Slabs with a Waterproof Membrane Surface

Fall shall be provided in the surface of suspended pavement and roof slabs to ensure that the applied bituminous membrane surface will have a built-in fall upon completion. Adequate expansion joints and separation materials shall be included to allow the granolithic finish to move independently of the membrane. Coving of membrane at junctions with walls, etc. shall be included to contain seepage. Levels of drainage outlets shall be set to provide a relief point for seepage at the membrane level as well as the normal run off at granolithic level.

2.4 Floor Wastes

These are required within all wet areas i.e. laboratories, toilets, plant rooms, tunnels, laundries, etc. and care should be taken to ensure that adequate falls to these points are specified and achieved.

Floor wastes shall have a removable chrome plated brass grate. Floor waste risers shall be not less than 80mm diameter. All risers shall be fitted with an approved flange and shall be cast into the concrete floor slab. Floor wastes shall have charging provision (i.e., “trap primers”). Provide deep seal (75mm) traps to plant/air handling and laboratories. Floor shall be graded to the floor wastes. Any sub-flooring membranes shall also be graded to the puddle flange.

2.5 Membrane

All internal ground slabs shall have, as a minimum, a membrane equivalent to 300 micron Fortecon turned up at the perimeter to finished ground level and with all joints taped in accordance with good building practice. Floors and walls shall be fully tanked where below grade or subject to hydrostatic pressure.

2.6 Brickwork

Bricks approved for the Bundoora Campus are as follows:

1 Extruded grey 230mm x 110mm x 76mm

2 Pressed grey 230mm x 110mm x 76mm

New brickwork shall be subject to approval by the University of a display panel erected on site at the Contractor's expense, including type of joints and mortar colour/strength.

*Noscum cleaning fluid or approved equivalent shall be used for cleaning of the extruded brickwork.

2.7 Bird Roosting Places

The design shall eliminate the risk of roosting of nuisance birds such as pigeons (this shall include eaves, top of pillars, window sills, etc.).

2.8 Roof Design & Construction

All roofs shall include a perimeter parapet or barricade and shall comply with Occupational Health and Safety Act and Codes of Practice for working from heights and working on roofs.

Flashings and penetrations shall be free of any ponding and no flexing of sheeting beneath flashing is to occur.

Architectural drawings must notate that roofing work is to comply with the Australian Standards Association HB 39 Code of Practice for Steel Roofing.

2.9 Roof Gutters

All gutters shall be fixed independently of roof decking and over-flashings with adequate expansion joints.

Roof gutters shall be of stainless steel or “Colorbond” and shall be jointed in compliance with the Roof Code.

Gutters shall be a minimum depth of 90mm with a minimum of 25 mm freeboard. Provide removable galvanised mesh type leaf guard across the full area of all box gutter sumps.

Internal downpipes within ducts shall be sanitary plumbing class uPVC of 100mm diameter. Downpipes cast into concrete columns shall be push-fit sanitary plumbing class stainless steel or other approved material.

Downpipes shall discharge over grated pits at ground level. The grate level shall be at least 75mm above any garden mulch.

Gutter overflows shall be of the same size as down pipe (minimum) and positioned at the deepest point of the gutter and shall ensure water cannot overflow into the building and shall be located independent of down pipes.

2.10 Roof Access

Roof access hatches and access walkways shall be provided in accordance with the Code for Safe Working on Roofs under the Occupational Health and Safety Act 2006. Roof access door/hatches must be keyed alike to the Lockwood LOPA / Series 06. The University shall give written authority to the Contractor for the purchase of such keys and cylinders.

2.11 Sanitary Fixtures and Tap Fittings

Low cost readily procurable and replaceable sanitary fixtures and tap fittings are preferred to more expensive exotic selections.

WC pans shall be floor mounted exposed P or S trap. Pans shall be white vitreous China. WC seats shall be light weight, plain black double flap.

Toilet roll holders shall be Bowater Scott (or similar) multistack roll holders (capable of taking a standard size roll) with key lock top, not interleafing dispenser type.

Basins incorporating soap tray shall be vitreous China, with 3 tap holes and brackets securely fixed to a bench or a wall.

Paper towel dispenses are generally preferred to electric hand dryers. Paper towel dispensers shall be stainless steel roll dispensers (not interleafing). Electric hand dryers may be accepted by the University in high traffic areas.

Cleaner's sinks shall be stainless steel trough type with hinged chrome plated grate fixed to the wall and supported with galvanised legs from the floor. The top of the rim shall be mounted at 620 above finished floor level. Provide recessed stops and fixed spout with hose connection. Tapware shall be chrome plated.

Shower recesses shall be stainless steel base type with integral upstand flashings or other University approved base. Shower heads shall be reduced flow fixed type. Soap holders shall be provided.

Tap fittings shall be chrome plated brass "Easy clean" type with jumper type valves, Quarter turn ceramic and single lever mixer type tap fittings are not permitted.

All flushometers shall be gravity-fed Zurn or equal approved type.

The University shall review all special selection of fixtures and fittings eg. Laboratory sinks and tap fittings, prior to acceptance.

Urinals shall be stainless steel with grated step.

Space shall be provided in female water closets for free standing “Lady San” (or approved similar) sanitary bins,

2.12 Doors

2.12.1 Pressed Metal Door Frames (other than fire doors)

Door frames shall be of 1.6mm gauge, zinc chromate primed prior to delivery or powder coated aluminium.

2.12.2 External Entrance Doors

All external entrance doors shall be recessed into foyers sufficient to provide protection from prevailing wind pressure when opened. Floors of entrance door recesses shall slope away from building (i.e., provide provision to prevent rain surface water ingress). Canopies may be provided for additional protection.

Electrically operated doors shall be controlled by key operated switch located in an adjacent wall. For lock type refer Door Furniture Section of Design Standard.

Automatic door controllers shall be suitable for the installation of an access control system.

All timber external doors shall be framed and sheeted with waterproof ply in preference to solid core doors. Top and bottom edges shall be fully treated with enamel paint system. External doors shall be enamel paint finish and where required shall be of fire rated design.

Manually operated external doors shall be fitted with a lockset which after hours allows exit from the building but automatically prevents entry when the closer has closed the door.

2.12.3 Viewing Panels

All seminars, conference, teaching laboratories, computer laboratories tutorial and lecture room doors shall be fitted with a viewing panel, at a height approved by La Trobe University. The size of the panel shall insure the visibility for the disabled as well as able persons. The actual dimensions of the viewing panels shall be confirmed by the University.

A prismatic observation lens may be accepted as an alternative in special circumstances.

2.12.4 Door Furniture

The Project Manager shall co-ordinate door furniture, locks, master keying and Access Control System in accordance with the following requirements.

1 Lockwood 3572 D/L series cylinder mortice locks with satin chrome finish, lever handles series 1800/70.

2 Lever handles are preferred as these make areas accessible to persons with a physical disability.

3 All locks shall be Generation 6, 162442-series for all internal doors, with the actual Lock Code to vary between Campuses for security purpose.

4 Master keying on all projects for the Bundoora Campus property maintenance and services areas shall be Lockwood Twin Series as follows:-

- Plant Rooms LOPA 010 SER 03
- Bollards and Gates LOPA 010 SER 04
- Switchboards LOPA 010 SER 05
- Roof Access LOPA 010 SER 06
- All external doors to be fitted with Abloy cylinders
- Service tunnels Abloy cylinder code to be advised
- Communications Room Six Pin Series Profile D.E. Code 3.4.

5 All external entrance doors must be fitted with the Cardax access system compatible with the University's La Trobe Card. The system shall be supplied and installed by the University's approved contractor.

6 Access controlled doors must have one of the following locking devices fitted:

Electric Strikes; Padde ES 2000

Electric Mortice Locks: Lockwood Synergy Series

Magnetic Locks: Lockwood or equivalent

7 Access controlled doors with Magnetic locks must be fitted with emergency egress facility.

Break glass button; KAC KW200 with DPDT contracts.

8 The University shall provide special lock cylinders for high tension electrical substations where applicable.

9 All external and internal fire hose/reel cabinets shall be fitted with D handles and roller catches only with 90 degrees hold-open arms and chains. Doors to cabinets shall be painted and sign written to comply with the Commonwealth Fire Board Specifications (Fire Safety

Circular No.2), and AS1319 and other adjacent signage in consultation with Buildings and Grounds

10 All office and shower doors shall be fitted with coat hooks.

11 All doors shall be fitted with at least 2 equally spaced heavy duty door hinges

2.12.5 Door Closers

Door closers shall be "Lockwood" 426 or "Dorma" door (surface mounted only) or Dorma floor mounted where applicable. All doors fitted with door closers shall be provided with sturdy door stops securely fixed with masonry anchors. Bracket mounted door stops shall be provided at door heads where wind pressures are excessive.

All external manually operated doors shall be fitted with a door closer.

2.12.6 Toilet Cubicle Doors

Toilet cubicle doors shall be in hold open position. Hinges shall allow for the ability to remove shut doors (cubicle occupied) in an emergency situation where the occupant becomes incapacitated.

2.13 Entrance Door Mats

Mats shall be of a type and design to limit ingress of water, mud, ice and be of a light weight to enable easy removal and cleaning by one person.

The Project Manager shall recommend to the University a suitable type of entrance door matting.

Where mats are provided in mat recesses at each entrance to the building, they shall be formed by brass angle set into the floor. Mat recesses for fire-isolated areas shall be external and shall be adequately drained if exposed to weather.

Mat recesses shall extend a minimum of 2m perpendicular to the face of the door.

2.14 Finishes

2.14.1 General

When selecting floor finishes type/colour the Primary Consultant shall give full consideration to both foot noise attenuation and the ability of the covering to disguise dirt and stains.

All selected paint, sealants, coatings and adhesives shall be free of toxins and non allergy contributing.

2.14.2 Carpet

The Project Manager shall request from the University instructions as to whether carpet and carpet tiles are to be supplied by the Proprietor or included in the Contract with the Contractor to supply and lay.

The Project Manager shall specify whether carpet is to be laid on underlay or adhesive fixed.

Carpet tiles shall be 100% nylon with fibre glass reinforced backing. A ten year warranty shall be provided for wear, anti-static and dimensional stability. 5% spare material shall be provided.

Carpet on staircases shall be cut at each stair nosing to prevent pulling or bulging.

2.14.3 Slab Moisture Content

Where the construction program will not allow for the required moisture limits to be achieved through natural drying of the slab, the Project Manager shall state the use of an appropriate waterproof membrane in the Specification.

2.14.4 Floor Finishes at Entrances

Floor finishes at entrances shall be a durable non slip finish to reduce the risk of injury when surfaces are wet.

Entrances shall be free of tripping hazards.

2.14.5 Sheet Vinyl

All joints shall be welded. Vinyl to wet areas such as cleaners rooms, common rooms at servery counters and isolated basins shall be an approved non-slip sheet vinyl coved up the walls to a height of 150mm and over flashed where necessary.

2.14.6 Seamless Flooring

Polyurethane seamless flooring shall be applied in all science laboratories where damage to floor finishes is likely due to spillage of water, chemicals or other materials likely to be used in laboratory classes or research spaces. The seamless flooring application shall be coved up all walls, plinths and service pipes to a height of 150mm and shall finish above floor drains where applicable. The polyurethane material shall be UV stabilised.

2.15 Ceiling Access Hatches

All ceiling access hatches shall be the hinged drop down type eg. ‘Trafalgar’ minimum 600 mm X 600 mm.

2.16 Computer Cabling

For detailed requirements refer to University Standards – “Definition for the Installation of a Network Infrastructure” available from the ICT Department.

Any deviation from standard technical specification and design criteria must be approved by relevant personnel from ICT Department of the University through the Project Director.

2.17 Telephones

For detailed requirements refer to University Standards – “Definition for the Installation of a Network Infrastructure” available from the ICT Department.

Any deviation from standard technical specification and design criteria must be approved by relevant personnel from ICT Department of the University through the Project Director.

2.18 Audio Visual

All audio/visual installations shall be designed in accordance with the Standards Document – “Audio/Visual and Conference Technology Document and Appendices A to Y inclusive” available from the ICT Department.

The Consultant shall consult with the Audio Visual Department in the conceptual design of all new Audio/Visual installations. Particular aspects to be considered are:

- Accessibility to overhead data projectors;
- Colour schemes for paint and furniture inside video-conference facilities;
- Correct angling of Bio-box glass;

Any deviation from standard technical specification and design criteria must be approved by relevant personnel from Audio Visual Department of the University through the Project Director.

2.19 Radio Communication Equipment Infrastructure

All radio communications equipment shall be designed in accordance with the Definition for the “Installation of Radio Communication Equipment Infrastructure” available from the ICT Department.

Any deviation from standard technical specification and design criteria must be approved by relevant personnel from ICT Department of the University.

2.20 Security Access Systems

The University has a centrally controlled and integrated access and alarm system, which is in operation throughout majority of buildings on Bundoora,

Bendigo and City Campuses. It is expected that additional remote Campuses will have CARDAX System installed in the near future. All new installations shall use a CARDAX FT system for all access control and alarm installations.

General building security systems shall be integrated with the CARDAX access system. The Security System Control shall be by the La Trobe card. If direct network connection is not possible alarm indicators shall be via a telephone line.

In some refurbishment projects the fit-off and commissioning the access readers may be undertaken by the University's approved contractor.

2.21 Vending Machines/Drink Fountains

Consultant shall consider providing a space to accommodate vending machines and drinking fountains within the building.

The drinking fountain shall be a refrigerated type with power, cold water and sewer connections.

The area shall have a ceramic or vinyl tile or similar impervious floor finish for easy cleaning.

2.22 Furniture

The University may arrange for the supply and installation of some loose furniture and equipment. The University shall nominate such items prior to the preparation of Contract Documents.

All ergonomic furniture and associated equipment must comply with AS 3590.2,

AS/NZS 4442 – Office desks, AS/NZS 4443 – Office Panel System Work Stations, OH&S Safety Act, Manual Handling Regulations and relevant Codes of Practice.

2.23 Built-in Furniture

The University standard is for modular loose furniture.

Modular bookshelves are to be constructed in clear finish Vic Ash veneer on 18mm particleboard or medium density fibreboard. All facing edges, including adjustable shelves, shall have 10mm Vic Ash hardwood edge strips. The backing shall be either the Vic Ash veneered particleboard or 4mm Vic Ash plywood with a fixing rail at the top. The shelving may be fixed or adjustable depending on User requirements. If adjustable, all shelf supports and bushes must be brass. Unit heights may vary up to 2100mm to match each individual location. Overall depth shall be 300mm and unit widths shall not exceed 800mm.

2.24 Colour Scheme

The Project Manager is required to submit to the University a colour scheme and sample board for approval of all applied finishes, including recommendations for floor furnishings, carpet, upholstery, curtains and blinds. This schedule shall be submitted in sufficient time to enable the construction and furnishing of a prototype room if requested in the project brief.

It is required that the Project Manager limit his choice to standard readily available materials which shall be clearly identified on the sample board. The approved sample board shall remain the property of the University.

2.25 Anti-Graffiti Protection

Anti-Graffiti application shall be applied to brick and concrete surfaces as directed by the University.

3.1 Design and Construction

The design and installation of engineering services shall comply with the following:

- Current Australian Standards
- Building Code of Australia and Victorian Building Regulations
- Local Council Regulations
- State and/or Federal Regulations
- Water Authorities
- MFB Board Regulations or CFA Regulations
- Gas Authority Regulations
- Local Electrical network Provider
- Current SAA Wiring rules AS3000 and all current amendments
- Occupational Health and Safety Regulations
- Environment Protection Authority Regulations
- Insurance Council of Australia
- Any other relevant Acts or Regulations

Consultants shall design Engineering Services that are energy efficient, meet sustainability criteria specified by University in its Sustainability and Environmental Policy, and shall demonstrate this through a report at Design Development stage which provides an economic analysis of various options with capital and recurrent consumption and cost estimates.

The design of engineering services shall allow for each floor of a building to be isolated from adjacent floors.

Where services from one floor must pass through another floor they shall be clearly labelled and shown on “As-Built” drawings.

Where the proposed design conflicts or differs from any requirements of this Design Standard, the Consultant shall provide a detailed report on proposed non-conformance.

The Consultant shall co-ordinate and rationalise plant and equipment types to permit interchangeability of spares and simplify maintenance and operation across the University.

Where brand names are specified, these indicate the University's preference. However, consultants may permit suppliers to offer alternatives where such are considered to be superior.

Only current models of plant and equipment shall be accepted.

3.2 Roof Mounting of Services Plant

The design and location of services plant on roof areas shall be carefully considered and discussed with the University at an early stage. Approval must be obtained from the University to mount plant on a roof. Access walkways and Anchor points shall be provided, where required. All plant shall be weather protected.

3.3 Direct Access to Plant Room, etc.

Where possible, access to plant rooms, roof areas, tunnels etc. shall be achieved directly from corridors or public spaces. Ladder access is not acceptable.

3.4 Electromagnetic Compatibility

Where equipment including fittings, apparatus, appliances, wiring and the like is likely to be incompatible with emission levels, harmonics, and power quality for other areas of the building all such equipment shall be provided with suitable filtering to ensure correct operation in the environment.

3.5 Plant Rooms

Plant rooms shall be fully integrated both aesthetically and functionally into the building design. Plant rooms are required to provide protection for mechanical plant and equipment from mechanical damage, weather and tampering by unauthorised personnel. Adequate space within plant rooms shall be provided to enable access for maintenance staff.

Location of plant rooms within buildings shall take into consideration the most direct point of vehicular access which can be achieved without the introduction of extensive service road connections.

Stairway and/or full door access shall be provided to upper level plant rooms. Roller door and/or full door access shall be provided to ground level plant rooms. Accesses shall enable existing and future equipment to be removed and installed.

Plant in ceiling spaces or confined spaces will only be permitted with University approval, and must comply with Occupational Health and Safety requirements.

Basement plant rooms are not approved due to possibility of flooding.

Plant room floors shall be well graded to drain and provided with floor outlets of not less than 75mm diameter to permit hosing down. Floors shall be of impervious coat finish.

Plant rooms shall be provided (where required) with mechanical exhaust ventilation.

Plant rooms shall be well lit with fluorescent lighting to Australian Standard AS1680 Parts 1 and 2, and provided with a minimum of two (2) single phase GPO's and one (1) three phase 5 wire 30 Amp welding outlet for maintenance use. Large plant rooms may require additional single phase GPO's to ensure adequate coverage is available to all areas of the room.

A sign indicating plant room shall be provided on the face of the plant room door.

Full concrete plinths shall be provided under all floor mounted equipment. Partial concrete pads are not permitted.

The Consultant shall nominate in the schematic design the percentage allowed for future expansion.

3.6 Service Tunnels and Crawlways

These shall be in-situ reinforced concrete or waterproof pre-cast construction of the following minimum internal sizes.

Tunnels 2.56 metre high by 2.0 metre wide

Crawlways 1.5 metre high by 2.0 metre wide

Crawlways shall only be used where height limitations preclude the provision of tunnels. Both walls and ceilings of crawlways and tunnels shall be provided with cast-in "Unistrut" P1000 at 1.25 metres spacing.

Crawlways and tunnels are required to be naturally and/or mechanically ventilated to maintain temperatures below a peak figure of 350C.

3.7 Service Culverts

Culverts shall be constructed of reinforced concrete cast in-situ or pre-cast. Culverts shall be provided with removable reinforced concrete lids fitted with substantial lifting eyes along the entire length. The culverts shall be formed up internally and externally prior to casting. Piping supports and fittings shall be galvanised. Pipe supports shall be installed in slots casing the culvert walls rather than by the use of masonry anchors. All supports should be 65mm clear of the floor of the culvert so as not to impede the flow of possible seepage water. Lids on culverts should be sealed at sides and ends with an approved mastic compound. Notwithstanding, all culverts shall be laid to a grade and be provided with sumps and outlets for drainage. Piping supports should not impede the free flow of seepage water along the floor of the culvert. All piping fittings including valves, expansion bellows and flanges shall be accessible from pits brought up to ground level.

Service culverts shall be provided with natural ventilation where there is a potential for culvert temperatures to exceed 500C.

3.8 Metering

All meters shall have “pulsed” output for connection to BMS system.

Metering of services to buildings shall include the following:

- Electricity
- Gas
- Cold water
- Reticulated Domestic Hot Water (if any)
- High Temperature Hot Water (if any)

3.8.1 Power Supply Metering (Electricity)

Check metering shall be provided for all new buildings, alterations and/or extensions. Where there is more than one faculty occupying a building, separate metering shall be provided to record each faculty’s power consumption, details of faculty separations shall be provided by the University. Metering shall be Email Type Q4 smart meters. Meters shall be labelled with approved engraved labels (white labels/black lettering) to indicate the building or area metered.

Where there is multi metering required in a building, all metering shall be grouped together and shall be preferably located in the building main switch room. Dedicated current transformers shall be provided for metering where mains/sub mains cabling sizes are greater than 16mm. Where current transformer meters are used, a set (three off) of Clipsal test links for each meter shall be provided. Test links shall be labelled with approved engraved labels (white labels/black lettering) to indicate the meter protected.

Email Heavy Duty SM1 Modem shall be provided at each meter position for communication with the University’s MV90 meter monitoring system via telephone lines. A modem telephone extension adjacent to each modem shall be provided.

For multi metering installations, Email Mini gateway and Email Multi Function Units for meters shall be provided. All the necessary data cabling shall be provided between Mini Gateway and Multi Function Units. Each data cable shall be labelled to indicate the meter served.

A dedicated 10 amp double surge protected power outlet shall be provided at each metering location.

All meters and their associated equipment including the power outlet and telephone outlet shall be mounted on a hinged meter board. The meter board shall be constructed from MDF board, sealed with two coats of clear gloss enamel fitted into and hinged from an approved steel frame.

All meters shall be programmed by La Trobe University.

3.8.2 Water Metering

Water metering shall be provided for all new buildings, alterations and/or extensions.

The meter shall be a digital full flow type fitted with a facility to allow remote monitoring of the water flow and shall be integrated into the building Back Flow Prevention device to allow for maintenance works be carried out on the meter without interruption to the building water supply. Metering shall be RMC Multi-jet or approved equivalent.

3.8.3 Energy Metering

Energy metering shall be provided for all new buildings, building alterations and building extensions and shall be BMS compatible.

BMS Compatibility

The metering shall be by an energy type meter capable to indicate, integrate and record the energy consumed by various loads in buildings and provide a system of accurate measuring controls which integrate with the University Campus (BMS) Building Management System.

The BMS shall provide:

- Calculation of energy
- Calculation and storage of values
- Measurement and consumption values
- Display flow and temperature values
- Detection of faults
- Display of values, parameters and faults
- Selectable scope of display
- Transferability of data to other software packages for historical collection or bill purposes.

Field Devices

Measuring field devices shall be of type and manufacture capable to meet the requirements of flow temperature and pressure of the energy provided, to each of the buildings or system loads.

The temperature sensors shall be of industrial quality providing universal signals of 4-20MA or 0-10VDC for connection to the local direct digital control panel for control and monitoring.

The flow sensors and temperature sensors for high temperature hot water shall be suitable for and calibrated for a flow temperature of 1930C and a pressure of 2207 kPa.

High accuracy flow measurement sensors shall have no moving parts, be of stainless steel manufacture and shall be capable of providing universal control signals of 4-20MA or 0-10VDC to the local Direct Digital Controller (DDC) for monitoring and control.

The Direct Digital Controller shall be capable of gathering the information from field devices and perform all calculations and processes information for BMS.

The information reported to the BMS workstation shall be provided to operators via text or graphic format.

3.9 Services Duct Access

Allowance shall be made in the documentation of all projects for duct access to accommodate future services installation from the services tunnels to all areas within the buildings. Unrestricted access from tunnels to ceiling spaces via vertical shafts shall be incorporated in the design.

3.10 Operating and Maintenance Manuals

Refer appropriate Section of the Design Standard.

3.11 Acoustic Requirements

Refer Acoustics Section of the Design Standard.

General

This section covers the hydraulic design criteria for water supply and drainage.

The University Standard for connection of water supply to exposed fixtures and fittings shall be by way of chrome-plated soft-drawn copper pipe. Braded hose connections may be approved on case by case basis only.

Each system shall be independent with appropriate isolation, filtration and back flow prevention devices installed in accordance with National Plumbing and Drainage Code AS3500.1.

The Consultant shall investigate design options such as ring mains, reservoir storage and pumping systems and provide recommendations of the most effective and efficient solution with respect to the University's present and future supply demands.

All systems shall comply with Regulatory Authorities requirements, Building Code of Australia Regulations, local Municipal regulations, the National and local plumbing codes, current Australian Standards and MFB Board Regulations.

The Consultant shall obtain all necessary data such as mains water pressures/flows etc. to assist system design and for the submission of design for approvals.

System design and authority approval shall be completed and finalised prior to the letting of the building contract.

The Consultant shall provide full computer-designed hydraulic calculations to the satisfaction of the Regulatory Authorities and the University.

The Consultant shall arrange for preliminary testing of all water supply systems prior to final certified testing for Authority approval.

The Consultant shall specify for all necessary Plumbing Certificates pertaining to the works are obtained prior to Practical Completion.

4.1 Potable Domestic Cold Water

The Potable domestic cold water system shall include for all piping, fittings, branches, etc. supplying hand basins, drinking fountains, and kitchen sinks etc. where cold water could be consumed.

All boiling water units are to be fitted with approved time clocks.

Potable domestic cold water services below ground are to be pre-lagged type B hard drawn copper tube to AS1432. All pipe joints and fittings to be wrapped with "Denso Tape" with 55% overlap. Potable domestic cold water services are to be pre-lagged type B hard drawn copper type to AS1432 or REHAU PE-Xa cross linked polyethylene pipe with the HIS311 compression sleeve system.

Each building to be individually metered by approved metering. Each building to be provided with backflow devices as required under AS3500-1.

Water pressure available shall be between 400-650 KPa and pipe velocities shall be between 1.0 to 2.2 metres per second. Adequate fixings shall be provided to prevent water hammer.

Isolation shall be provided between dissimilar metals.

Approved exposed pipework subject to view in other than plant and service areas shall be chrome plated or painted. Penetrations through walls shall be concealed with chrome plated dome flange and backnut.

All potable water storage vessels and pipe systems shall be flushed and disinfected before being placed in service as per AS3500, and provision shall be made for easy access for periodic disinfection, as required by AS3500.

4.2 Non Potable Domestic Cold Water

The Non-potable domestic cold water system shall include for all piping, fittings, branches, etc. supplying toilets, flushometers, laboratory wash sinks, landscape irrigation etc. where cold water is unlikely to be for human consumption.

As with potable, non-potable domestic cold water services below ground shall be pre-lagged type B hard drawn copper tube to AS1432. All pipe joints and fittings shall be wrapped with "Denso" tape with 55% overlap. Non-potable domestic cold water services above ground shall be pre-lagged type B hard drawn copper tube to AS1432 or REHAVU PE-Xa cross linked polyethylene pipe with the HIS311 compression sleeve system.

Isolation valves and pressure gauges shall be provided as required.

Isolation shall be provided between dissimilar metals.

Internal pipework, flushometers, etc. exposed to view in other than plant rooms or service areas shall be chrome plated or painted.

Mains pressure garden irrigation supply from the main isolation valve and backflow prevention devices to solenoid valves may be installed in polypipe and fittings subject to approval by the University.

4.3 Isolation of Services

During construction works isolation of ALL services shall be coordinated strictly through the Project Director with the University Maintenance Department.

Provision shall be made for the isolation of all services at each floor level, so that no inter-connection between levels occurs.

Domestic hot water and domestic cold water services shall be fitted with isolating valves for each fixture or group of fixtures as applicable.

4.4 Back Flow Prevention

The following services shall have approved back flow prevention devices fitted to the supply:

- PC1, PC2, PC3 and PC4 laboratories
- Non-potable Domestic Cold Water

The back flow prevention system shall be an approved system. The devices shall be of a manufacture approved by La Trobe University complete with Tefglide gate valves and strainer.

Where balancing is critical a three pipe system shall be preferred.

4.5 Filtration

Filtration of the potable domestic water supply is required only to specific items of equipment and plant as required by the Proprietor (eg, all mains pressure flushometer supplies).

Where required a two (duplex) inline filtration systems to 50 microns or better shall be installed.

Isolation valves and pressure gauges shall be provided either side of the filters.

4.6 Valves

All valves installed with the same project shall be of similar approved manufacture and configuration where possible.

Valves selected shall meet all pressure, temperature and throttling, etc. requirements in service.

Valves shall be located in accessible locations and capable of replacement without having to modify existing pipework. Access panels of a size to permit removal and/or maintenance of the valves shall be provided.

4.7 Garden Watering Points

Garden watering points shall be installed in accordance with the National Plumbing and Drainage Code AS 3500-1 consisting of 18mm Screwed Hose Cocks with removable handles and fitted with hose connection vacuum breakers. Watering points shall be spaced at intervals of approximately 30m around the perimeter of each building.

At the University's discretion they shall be mounted:

a On copper stand pipes 500mm above ground level securely fixed to the external wall.

b In an alternative arrangement approved by the University

4.8 Stormwater Drainage

The stormwater system shall be designed for 100 years return rainfall intensity as a minimum requirement.

Underground stormwater drainage shall be rubber ring reinforced concrete class "X" pipe for sizes 300mm and greater in diameter. Pipes subjected to greater loadings or reduced cover shall be class "Y" or "Z" depending upon circumstances.

Underground stormwater drainage shall be sewer class uPVC pipes and fittings for sizes up to 300mm in diameter (minimum size of 100mm in diameter to be used).

Provide pits at changes in direction, grade, junctions and at spacing's no more than 60 metres for pipes 225mm diameter or greater.

Provide inspection openings at changes in direction, grade and junctions for pipes 150mm diameter or greater. Extend selected inspection openings to finished level when pipes are located under concrete paving.

Provide grated pits at the base of all downpipes.

Pit covers, grates and frames to be "Gatic" cast iron type. The duty shall be dependent upon location.

Pits are to be either precast or in situ concrete. In situ concrete pits to have a minimum wall thickness of 150mm and placed using inner and outer forms. PVC or poly heavy duty pits may be used for PVC drains up to 150mm diameter.

Provide step irons in pits exceeding 1.2 metres in depth.

Consideration shall be made in the design to exclude garden mulch entering the drainage system causing blockages and reducing efficiency.

4.9 Sewer Drainage

Generally heavy duty sewer class uPVC pipe and fittings are acceptable for all inground and suspended sewer drainage installation.

Sewer drainage receiving hot discharge and/or solvents shall be brass pipe and fittings or other approved material.

Inspection openings under concrete paving shall be extended to the finished level to provide access to the entire drainage installation.

Inspection chambers shall be provided at main junctions, changes in gradient and direction and at intervals not exceeding 60 metres.

Covers and frames to be "Gatic" cast iron type. Internally placed chambers shall be fitted with edge strips to accommodate floor finishes.

Step irons shall be provided in chambers exceeding 1.2 metres in depth.

Internal chamber drops shall be in cast iron pipe and fittings.

At least one overflow relief gully shall be provided for each building.

Test sumps to neutraliser pits and mixing tanks shall be easily accessible.

Placement of neutraliser tanks shall take into account the requirement for vehicular access where pumping out procedures are necessary. Associated dosing tanks shall be located where access can be gained independently of any laboratory or office areas. An adjacent cold water point shall also be provided for washing down purposes.

4.10 Landscaping Drainage

Provide sub-soil drainage to below ground building structures, back of kerbs and landscape areas where excessive ground water may be a problem.

Pipework for straight lengths shall be slotted rigid uPVC pipes and fittings and elsewhere shall be slotted flexible corrugated type pipe and purpose fittings. Pipe sizes shall be 100mm minimum diameter.

Pipework shall be surrounded in 150mm clean, washed, evenly graded, granular bedding material. The granular material and pipework shall be overwrapped with a geotextile layer to prevent fines entering the drainage system.

5.1 Air Conditioning Systems

Energy efficiency and acceptable comfort conditions shall be the prime consideration in the design of an air conditioning system. Systems shall be effective in delivering the required conditions as nominated by the University to each thermal zone and/or application. The Consultants shall assess the overall concept of system design based on all given standard and specific user information and ESD guidelines. For details refer to ESD Section of the Design Standard.

There shall be inherent design features that permit ease of modification and flexibility to suit future room or partition layout changes.

Refrigeration plant type shall be based upon a life cycle analysis of the most effective and economically viable alternative available.

Compressor or Absorption type, multi-stage or single stage, once-through or thermal storage systems, shall be considered and a report outlining the relative merits and life cycle costs of each shall be provided by the Consultant.

Closed cycle condensing systems such as evaporative condensers are preferred for heat rejection in lieu of open cooling tower systems. Adequate space shall be allocated for effective and unhindered maintenance.

5.2 Heating Systems

Heating systems shall be provided to all occupied areas or to specific applications as required. Energy efficiency is again of prime consideration. Systems shall be effective in delivering the required conditions to each thermal zone and/or application.

Boiler plant shall preferably be gas fired hot water boilers in lieu of steam systems.

Multi-boiler systems are preferred in lieu of a single boiler for standby capacity.

Heat plant, such as heat exchanges, shall have independent high temperature limit safety shut off devices, and be of shell and tube design unless otherwise approved.

Thermal expansion system for pipework and associated fittings is required to be approved by the University. Expansion loops are preferred.

Panel radiators/connectors shall be equipped with automatic temperature control valve and balancing valve. The HHW pump shall be of pressure/varied speed control type.

5.3 Ventilation and Exhaust Systems

Fresh air shall be supplied to the building in accordance with current Australian Standards design code. Air intakes shall be located away from dust or traffic zones. Air intakes must also be located away from any process which creates water vapour.

Exhaust air shall be discharged in accordance with current Australian Standards. Where emissions of obnoxious gases is cause for concern, the Consultant shall provide computer modelling of the discharge plume and submit these results to the Project Manager who shall pursue Environment Protection Authority approval.

The use of water scrubbers, filters etc. may be considered in the removal of obnoxious gases from the discharge air.

Exhaust air shall be kept at negative pressure within the building distribution system. Fresh air shall be at positive pressure within the building distribution system.

For ventilation requirements in PC1, PC2, PC3 and PC4 Laboratories refer to respective design criteria guidelines in AS 2982 – Laboratories Design and Construction, AS 2243 – Safety in Laboratories, AS 4332 – Storage and handling of gases in Cylinders and Victorian Dangerous Goods, AS 2243.8 Design of Fume Cupboards, BCA.

5.4 Controls and Instrumentation

Controls for all mechanical services plant and equipment shall be of the electronic type and be capable of being interfaced with the Siemens Building Technology “Apogee” Building Automation System (BAS). All functions shall be monitored by the “Apogee” system and accessed from centrally located terminals.

All communication links, data cables, modems etc together with any interfacing equipment and software/hardware programming necessary to enable all plant information to be displayed on the University’s computers shall be provided. The existing University’s System 600 Graphics shall be upgraded to include the new building systems.

The BAS system shall provide:

Detailed graphics showing floor plans, plant schematics and individual items of plant with all monitored points displayed shall be provided and loaded onto each building automation system terminal or PC.

Time schedules for both individual items of plant and groups of plant items.

The ability to set up data logging for any monitored points on the system.

Plant optimisation features to minimise energy consumption.

Local Instrumentation

Individual items of plant shall have local instrumentation including temperature and pressure gauges as applicable, to enable plant to be monitored locally.

All instruments and gauges shall be calibrated in SI Units as recommended by the current edition of Australian Standard AS 1000.

All gauges shall be provided with service cocks to shut off the gauge when not in use and red lines to indicate the normal operating point.

5.5 Filtration Systems

Air filters for central plant air conditioning/heating systems shall normally be of the Pyrocube four peak type. Filters shall have a minimum average of 90% efficiency in accordance with Australian Standards, and be of oil free design.

For small applications, extended surface (deep-bed) dry media filters would be considered.

For special applications, the Consultant shall submit full details of proposed air filtration methods including expected efficiencies and dust holding capabilities.

Pressure gauges shall be installed across filter banks with indication for filter replacement.

On systems with large fresh air quantities or systems subjected to dusty conditions, pre-filters shall be installed.

Full walk-in service access shall be provided for filter replacement. Filters in confined spaces shall not be permitted, and areas are to be well lit.

Potable water supplies to building shall be filtered with a duplex filter system, with perforated stainless steel brush away cartridges. Filter down to 30 micron. Boiling water units shall to be fitted with individual twin water filters.

5.6 Mechanical Services - Electrical Installation

The installation for the mechanical electrical services shall comply with the Electrical Services section of this document.

A separate mechanical services switchboard fitted with an Ammeter, Voltmeter, M.D. Meter and selector switches, auto, man, off control switches for each item of equipment and neon or led light indication shall be provided. Indicating equipment shall be 100mm square and shall be of matching make and style. All boards shall be fitted with Residual Current Devices. Each board shall have a spare capacity for additional circuit breakers of 30% to allow for future expansion.

Local electrical isolators shall be provided for all plant and equipment.

All electrical cabling shall be installed inside approved cable trays.

5.7 Corrosion Protection

All items of plant and equipment which are exposed to view by general staff shall be painted in accordance with painting schedules and Australian Standards.

Plant or equipment exposed to weather shall have special waterproofing treatment to guard against corrosion, UV sunlight and wind erosion.

Plant or equipment under particular corrosive environments shall have special corrosive protection and shall be indicated by the Consultants.

Chemical treatment to water systems shall be provided for condenser water, chilled water, heating water systems. Chemical treatment shall include corrosion inhibitor, anti-algae or bacteria growth agents (biocides) as required dependent upon pipe materials and water

All systems shall be provided with automatic refill and dosing equipment, including storage.

Chemicals used in the above treatments shall be to the approval of Melbourne Water and EPA. Where possible "environmentally friendly" chemical treatment shall be used.

Material Safety Data Sheet for each chemical used shall be specified for all plant.

5.8 Noise and Vibration

Mechanical plant and equipment shall be vibration isolated from the building structure to prevent structure borne noise.

Noise criteria for indoor/outdoor spaces shall comply with the Acoustic attenuation requirements of the Design Standard. The Consultant shall ensure independent NATA certified tests are carried out to ensure specified noise criteria had been achieved. Results of these tests shall be submitted to the University.

5.9 Domestic Hot Water Systems

Central calorifier systems are preferred. For guidelines on use of stand-alone DHW units refer ESD Section of the Design Standard.

The calorifier temperature shall be 650C to prevent Legionella build up. The supply hot water temperature at the outlet is not to exceed 500C.

Pipe-work shall be installed for temperature drop not to exceed 50C

5.10 Reticulated Cooling Water Systems

Central storage tank systems are preferred by the University. For small applications, once-through refrigeration units would be considered.

Balancing and throttle valves and in-line flow meters are required at every take-off to ensure correct flow of cooling water through apparatus.

Cooling water shall have twin 2 stage filtering down to 1 micron.

5.11 Ductwork

All ductwork shall be constructed of Galvabond or equal approved quality sheet steel to S.M.A.C.N.A. construction standards.

Ductwork systems shall have aerodynamically formed and designed transition pieces, bends and elbows.

Flexible ductwork is not permitted on exhaust systems. Only short lengths (less than 3 metres) of flexible ductwork connected to the outlet register on supply air systems is permitted.

5.12 Pipework

All materials shall be new and shall comply with current editions of the Australian Standards, or equivalent British Association codes where the former are not available.

Pipe materials for the following applications shall be:

a HTHW Piping

Seamless steel piping to A.S.T.M. A53 Grade "B" suitable for working pressure of 2200 KPa and temperature of 1930C.

b Chilled Water Piping

Copper piping to AS 1432 Type A hard drawn.

c LTHW Piping

Copper piping to AS 1432 Type A hard drawn.

d Condenser Water Piping

Copper piping to AS 1432 Type A hard drawn.

e Natural Gas

Copper piping to AS 1432 Type A hard drawn.

f Pneumatic Piping

Copper piping to AS 1432 Type A hard drawn.

g Mains Cold Water

Copper piping to AS 1432 Type B hard drawn or REHAU PE-Xa cross linked polyethylene pipe.

h Domestic Hot Water Piping

Copper piping to AS 1432 Type B hard drawn.

i Recirculated Cooling Water, Chilled Drinking Water, Vents, Drains, Wastes, etc.

Copper piping to AS 1432 Type B hard drawn / uPVC type

Alternative piping materials may be considered for underground services, mechanical protection and corrosion protection. Project Manager shall substantiate reasons for suggesting alternative material.

All joints in steel lines where possible shall be butt welded. Where welded joints are impractical and at connections to fittings or equipment, flanged joints shall be used. All bends, tees and elbows shall be of manufactured type and not pulled on site. Bends shall be standard long radius type.

All joints in copper lines shall be silver soldered. Where soldered joints are impractical and at connections to fittings or equipment, flanges shall be used.

5.13 Valves

All similar valves shall preferably be of one manufacture. Valves shall be of Australian manufacture and approved by the University.

Valves shall generally be flanged bronze globe valves, unless otherwise stated. All valves shall be fitted with brass identifying tags numbered by paint filled engraving to correspond with a valve schedule affixed to the wall of the plant room.

Control valves shall be electric motor driven proportioned control modulating globe valves provided with fail safe facility and high limit back up.

Control valves to heat exchanges and calorifiers shall be fitted with independent back up high temperature limit shut off valves.

STAT or approved balancing-isolating valves for suitable working pressures shall be used for systems balancing.

HTHW valves shall be the following:

a Cast Steel Parallel Slide Valves - Flanged ends, special alloy disc and seat, stainless steel spindle designed for use on high temperature hot water mains at a working pressure of 2200 kPa and a temperature of 1930C.

Flanges shall be to British Standard Table "H".

Shall be 65mm and over.

b Bronze Globe Valves - Flanged ends, external spindle and yoke, special alloy valve and seat, designed for use on high temperature hot water mains at a working pressure of 2200 kPa and a temperature of 1930C.

c General

All valves shall not be of the single gland nut type.

All valve gland studs and nuts shall be of Stainless Steel.

All valves shall be of approved manufacture.

Amongst the manufacturers which may be approved are:

- Pegler Hattersley
- John Dreadnought
- Dewrance
- Hopkinson

The valves shall be packed with Teflon. The Teflon shall be "Chesterton" Style 324 Super-Ion. Allowance shall be made for re-packing all the glands in valves as they settle under heat throughout the defects liability period.

Manufacture and details of all HTHW valves shall be forwarded to the Project Director for approval prior to acceptance.

All parallel slide valves 150mm and over shall be fitted with a flanged by-pass valve and connections.

5.14 High Pressure (Temperature) Pipework Special Requirements

High pressure (temperature) pipework systems shall be computer designed and results of stress analysis submitted to the University for approval.

Final pipework design shall be carried out by a suitably qualified specialist in high pressure pipework applications.

20% of high pressure welds shall be radiographed and results submitted to the University. Hydrostatic pressure tests shall be 1.5 times the working pressure.

All bends on high pressure (temperature) pipework shall have a radius of not less than five (5) times the internal diameter of the pipe.

Gasket material shall be of the stainless steel reinforced graphite type, suitable for use in HTHW systems rated for 200 degrees Celsius and 3000 kPa pressure (Utex style 1310 or similar).

Packing material used in valve glands shall be of the braided PTFE type (Utex Industries style 232 or similar).

Packing material used in HTHW circulation pumps shall be of the braided flexible graphite type (Utex style 687 or similar).

All gasket and packing materials shall be approved by the University prior to construction.

H.T.H.W. Installation Specification

General -Maximum working temperature 1930C

-Maximum working pressure 2200 KPa

Face and drill flanges shall be to British Standard Table H. All pipe joints other than at welded flanged joints or valves, bellows, strainers or pipe work that requires to be disassembled for maintenance purposes, shall be welded. No screwed joints shall be allowed without written approval by La Trobe University.

Valves - All valves shall be approved by La Trobe University prior to acceptance. H.T.H.W. valves of 50mm diameter and under shall be Bronze Globe Valves flanged ends, special alloy valve and seat, designed for a working pressure of 2200 KPa and a temperature of 1930C. Flanges shall be to British Standard Table H.

"All H.T.H.W. valves shall have flanged ends, external screwed stem and bolted yoke and be capable of withstanding test pressure of 3500 KPa". Valves to be packed with "Chesterton" Teflon packing or other approved manufacture (including drains and vents).

All valves shall not be of the single glandnut type. All gland studs and nuts to be of stainless steel.

The contractor shall allow for repacking of all valve glands as they settle under heat throughout the maintenance period.

All parallel Slide Valves 150mm diameter and over shall be fitted with a flanged by-pass valve and connections. The connections may be installed in the upstream and downstream piping. Minimum size of by-pass is to be 20mm. Amongst the manufacturers of valves that may be approved are:

Peglar Hattersley Dewrance

John Dreadnought Hopkinson

Labels shall be fixed to all valves and wherever else necessary, approved identification labels suitably engraved with the name of the valve. Each label shall be satin chrome brass with black infilled lettering.

Labels shall be fixed either direct to the valve body etc, or by means of substantial metal brackets screwed or bolted to the valve.

Cast Steel Strainers – Shall have flanged ends, Y type designed for use on H.T.H.W. at a working pressure of 2200 KPa and a temperature of 1930C shall be used where required on 65mm diameter and above.

Bronze Strainers – Shall have flanged ends, Y type designed for use on H.T.H.W. at a working pressure of 2200 KPa and temperature of 1930C shall be used where required on 50mm diameter and below.

Cast Steel Check Valves – Shall have flanged ends, with removable special alloy valve and seat designed for a working pressure of 2200 KPa and a temperature of 1930C and 50mm diameter and below. To be of non hammer design.

Bronze Check Valves – Shall have flanged ends, lifting valve type special alloy valve and seat designed for a working pressure of 2200 KPa and a temperature of 1930C for 50mm diameter and below.

Bronze Flow Regulating or Modulating Valves - Shall have flanged ends external screw, special alloy main valve and seat, bolted body, exposed packing gland with Teflon packing set designed for use on H.T.H.W. at a working pressure of 2200 KPa and a temperature of 1930C for 65mm diameter and above.

Cast Steel Flow Regulating or Modulating Valves – Shall have flanged ends, special alloy valve and seat bolted body, exposed packing gland with Teflon packing designed for use on H.T.H.W. at a working pressure of 2200 KPa and a temperature of 1930C for 65mm diameter and above.

Expansion bends, bellows, anchors and fittings - Expansion bends or approved bellows type expansion fittings shall be provided where shown on the plans and where otherwise necessary to provide for thermal expansion and contraction and shall be of a type designed for H.T.H.W. at a working pressure of 2200 KPa and a temperature of 1930C.

The piping and expansion units shall be accurately restrained by anchors and guide rollers to retain perfect alignment under all conditions.

Cold Set – Where appropriate, allowance may be made in designing expansion bends and bellows for use of “cold set”. During installation such a “cold set” shall be accurately measured and anchored in position to ensure that the cold set allowed is not exceeded in any case. The degree of “cold set” shall not be greater than that allowed by the manufacturer under applying conditions.

Stainless Steel Expansion Bellows – Expansion bellows shall be of “Beacon”, “QualiPro”, “JORD” or other approved manufacture, specially designed for the pressures and temperatures involved. Each bellows shall be installed strictly in accordance with the manufacturer’s recommendations and be fitted to the HTHW mains by flanged joints.

The piping and expansion bellows units shall be accurately restrained by anchors and guide rollers in accordance with the manufacturer’s recommendations, so as to retain perfect alignment under all conditions.

Anchors and Guides – All anchors and guides shall be of a size and design consistent with existing H.T.H.W. installations at La Trobe University

(Bundoora), or shall comply with drawings issued by La Trobe University. Any hanging support shall be approved by La Trobe University.

Variable Support Hangers – Wherever required, piping shall be supported on approved variable support spring hangers, selected for the appropriate duty. Variable support spring hangers shall be of "Vokes": Geno-Spring or other approved manufacture, suitable for the weight, expansion and situation involved.

Anchors – Anchors shall evenly distribute bearing loads to the pipes and shall not impose bending moments.

Anchors shall be designed to withstand all loads which can be applied, including expansion bend reactions, expansion bellows reactions, pressure loads and dynamic reactions on bends.

Wherever necessary the Consultant shall specify guides of approved design to maintain pipe alignment for the effective functioning of any expansion device.

Anchors shall be so located whenever practicable so as to minimise expansion stresses in valves, fittings etc.

Conditions – the following pressure and temperature conditions shall be used in the design of expansion systems :

Pressure	2200kPa
Temperature	1930C
Ambient Temperature	1.70C

Flanges – All flanges shall be forged steel S.O.W. type, Table H, designed for H.T.H.W. at a pressure of 2200 KPa and a temperature of 1930C. Flanges shall be welded internally and externally squarely on the pipe end and jointed with a full face gasket.

Bolts – All bolts shall be bright machined steel with hexagonal heads. Nuts shall be of the correct diameter to suit flanges. Threads shall protrude no more than two threads through the nut when fully tightened.

Pipes and Fittings – All pipes and fittings shall comply with all relevant codes. Pipe shall be seamless steel pipe ASTM A53 grade B suitable for W/P 2200 KPa and temperature of 1930C. Bends shall have a radius of not less than five internal diameters of the pipe size being installed.

Junctions – All junctions shall be of manufactured design, or a smaller diameter "stub" may be welded into a larger diameter pipe ensuring there is no protrusion into the larger pipe.

Welding and Radiography - All welding shall be carried out by qualified welder to comply with all relevant codes relating to H.T.H.W. at a working pressure of 2200 K.P.A. and a temperature of 1930C.

A radiographic examination shall be carried out on a nominated number of welds selected by La Trobe University. If any weld should be found faulty, the weld shall be cut out and the new section welded in and is to be radiographed along with 100% radiograph of all welds in the installation at the contractor's expense.

Radiographs of welds shall in the following proportions :

100mm and over - 50%

80mm over 50mm - 25%

above and below - 10%

A copy of all radiograph reports shall to be given to La Trobe University.

Testing - All pipe work is to be static tested to 3500 K.P.A. before insulation. Test pressure to hold for 1 hour and be sited by La Trobe University.

All pipe work is to be thoroughly flushed to remove scale, slag, etc., before any Expansion Bellows are fitted prior to testing.

Insulation - All H.T.H.W. piping shall be insulated with mineral wool to insure minimum heat loss achievable, clad with galvanised weatherproof metal sheathing where exposed to elements. All valves, strainers, flanges, dirt boxes and bellows shall have easily removable and replaceable insulation and cladding to allow for service or inspection.

Commissioning Procedure for H.T.H.W. System

Prior to operation of the system or any section, the system shall be flushed to remove any scale or debris and all dirt boxes cleaned and refitted.

The piping shall be fully charged with water and all air vented from the system. Charging water shall be from mains supply suitably protected by "Back Flow Devices" and checked for cleanliness before connecting.

The connection of new sections to the operating system shall be coordinated between Consultant and the Project Director, after commissioning of a new section has been completed.

The actual "livening" of the new section shall be done by La Trobe University Property Maintenance Department.

The temperature in the new section shall to be raised by 100C per hour to allow for gradual expansion of the system. All bellows, anchors, and supports shall be regularly monitored during this period (approximately 16 hours).

The new section shall to be monitored for 4 hours at the system operating condition and approved by La Trobe University before being left unattended.

At all times the branch isolating valves on the existing high temperature hot water system are to be operated by staff of La Trobe University only.

5.15 Pipework Insulation

HTHW piping shall be lagged with rigid pre-form mineral insulating sections of equivalent sectional type lagging, clad with galvanised iron or zincanneal.

LTHW piping shall be lagged with sectional type rockwood or fibreglass, of density 60-100 kg/m3. Exposed piping shall be clad with galvanised iron or zincanneal and concealed piping shall be covered with aluminium foil.

Chilled water piping shall be as for LTHW piping, with the addition of a vapour seal.

All valves bodies and flanges shall be insulated and provide access for glands.

DHW piping of 25mm or less shall be of pre-lagged copper. Piping above 25mm shall be lagged as noted for LTHW piping.

All HTHW pipework shall be support guided and anchored to recommended HTHW code and approved by bellow manufacturer.

5.16 Pipework Identification

All pipelines shall be identified by colour banding in accordance with the latest Australian Standard. Locate identification bands at no greater than 4.5m centres and provide arrows to indicate direction of flow. Indicate "F" and "R" as applicable on systems featuring flow and return.

The following piping identification symbols shall be used in plant rooms, pipe ducts, etc.:

High temperature hot water	HTHW	BS5252 Code 10 C31”Cream”
Heating hot water	HHW	AS1345 Code G21 “Green”
Domestic hot water	DHW	AS1345 Code G21 “Green”
Chilled water	CHW	AS1345 Code B41 “Bluebell”
Condenser water	Cond.W.	BS5252 Code 00A05 “Goosewing”
Recirculated cooling water	RCW	AS1345 Code B41 “Bluebell”
Cold water	CW	AS1345 Code G21 “Green”
Compressed air	)	
Natural gas	)	
Oxygen	)	

Carbon Dioxide	)	Apply full name as shown
Nitrogen	)	
Vacuum	)	
Other gases	)	

Where identification labels on piping, control valves, etc. are provided for the benefit of users, the labels shall spell out the full name of the service.

Labels on piping shall preferably be of the plastic adhesive type.

6.1 Switchboards

Switchboards shall comply with all the relevant requirements of AS 3439 and AS/NZS 3000. The outer door to the switchboard shall be labelled "SWITCHBOARD" in 25mm high lettering, with black on white trafolyte labels.

Air circuit breakers shall comply with AS 1930.

Busbars shall be copper, colour coded and shall comply with ASC 151. Full size neutral bars shall be installed. All busbar joints shall be electro-tinned finish and shall have lock nuts fitted to all jointing bolts. Bolts shall be high tensile and shall be torque to bolt manufacturers recommendations. Bolts shall be re-torqued to bolt manufacturer's recommendations at the end of the defects liability period. This work shall be carried out outside normal operating hours.

Busbar links shall be provided for the replacement of current transformers. Current transformers shall comply with AS 1675.

Moulded case air circuit breakers shall comply with AS 2184.

Main switchboards and mechanical services switchboards shall be fitted with multi-function energy power meter capable of measuring voltage, current, maximum demand kW (current and maximum recorded) kWh, kVA, kVAr, power factor.

Electricity retailer KWH meter (Refer to Metering in Engineering Section of the Design Standard) Cubicle to be fabricated from minimum 2mm mild steel with fully welded corners. Switchboard finish to be light grey and switchboard shall be degree of protection IP42 (min.) in accordance with AS1939.

Main switchboards shall be fitted with a surge diverter on each phase.

The surge diverters shall be designed and tested to AS3260, UL1449, AS1768 and IEC 61643.12 classes II and I.

Parameters shall be as defined in IEC 61643-1

The voltage protection level up shall be less than 800V at 3kA 8/20□s and 6kA 1.2/50□s.

The maximum discharge current shall be 100kA 8/20□s per phase. The nominal discharge current shall be 70kA 8/20□s per phase. The impulse current shall be 20kA 10/350□s per phase.

Main switchboards shall have circuit breaker and CT space provisions for the installation of power factor correction equipment.

Indicating lights shall be Neon lamps - Lumolie FP4 or equivalent, or LED cluster type.

Fuse cartridges shall comply with BS88 Class Q1. Three replacement fuse cartridges shall be proved for each cartridge rating installed.

Main switches shall be suitable for on-load switching.

Protection relays shall comply with BS 142 and be manual reset type with flat indication of tripping.

Time clocks shall be multi programmable electronic type with battery back up.

All escutcheon plates shall be hinged.

All wiring within switchboards shall be enclosed in PVC cable ducts with removable lids. Duct lids shall be labelled to indicate which cable duct they are fitted to.

Cabinet doors shall be fitted with Lenlok cabinet locked locking lever handle. Key coded CL001.

A schedule in a hard plastic covered frame shall be provided inside each switchboard door. The schedule shall indicate the fuse or circuit breaker number and details of the circuit protected.

6.2 Cabling

All cabling shall be stranded copper conductors manufactured in accordance with AS 3147, AS C3191 and/or ASC347.

Mains and sub-mains cables shall be identified by securely attached tags at each end of the cable, indicating the number of cores, size and type of conductor and the origin and destination of the cable in relation to switchboard designations, i.e. 4 - 95 sq. mm Cu XLPE MSB-DB2.

Mains and sub-main cables shall be circular supported on continuous tray or rack. Cable trays shall be labelled with white engraved labels with red lettering reading "Danger 440 Volts" at 6 metre centres and at each change of direction. All circular cabling shall be terminated in cable glands with non ferrous gland plates.

Underground cabling shall be enclosed in PVC Heavy Duty orange conduit with marker tape above. Approved cable markers shall be provided at every change of direction, each side of a roadway and at 30 metre intervals of a straight run. A drawing shall be provided showing the exact cable location with dimensions from permanent buildings, structures, footpaths or roadways.

Surface cabling in plant rooms and tunnels shall be enclosed in Class "B" galvanised steel conduits.

Corrugated PVC conduit shall only be used to change direction in difficult areas. Corrugated PVC conduit will not be permitted to be used in straight runs or where solid PVC conduit could have been installed.

Cabling in accessible false ceiling spaces shall be installed in cable ducts or supported on cable tray, sized to allow 30% future expansion. Cabling in other false ceiling spaces shall be neatly clipped to battens or tied to catenary wires with nylon cable ties.

Extra low voltage cabling shall not be exempt from AS/NZS 3000 regulations and shall comply in every respect with the regulations covering higher voltage cabling.

A full size neutral shall be installed.

6.3 Earthing

The complete installation shall be earthed to approval in accordance with current AS3000 and the requirements of the local Supply Authority. The earthing system shall be a multiple earthed neutral system.

Where entering or leaving the main switchboard and along its route length the earth cable shall be protected by means of Class 'B' PVC conduit.

Earthing electrodes shall be provided with gatic type inspection pits. The connection of the earthing conductor to the earth electrodes shall be by 'cad-weld' or equal approved. Gatic lids shall be fitted with an approved brass engraved label reading – “EARTH”.

6.4 Labelling

Labelling shall be carried out with approved machine engraved trafolyte labels. Labels shall be black lettering on a white background.

All GPO and control switches shall be identified with circuit numbers.

6.5 Permanently Wired Equipment

Isolating switches shall be provided for each permanently wired item of equipment. Each isolating switch shall be labelled to identify the equipment supplied.

6.6 Lighting

Illumination levels and design shall comply with the current Australian Standard AS 1680, Parts 1, 2.1, 2.2 and 2.3.

Installation of lighting is to comply with AS 3145.

Fluorescent lighting shall be used throughout the buildings. Lamps shall have a colour temperature of 40000K with a Colour Rendering Index of 85. PL and SL type lamps are acceptable. Incandescent type lighting would only be considered for special applications.

External security and street lighting shall be metal halide. External building security lighting shall be "Holophane Packette" or equal light fittings,

painted to match the building structure. Street lighting shall be "G.E.C." Bathurst post top light fittings with 100 watt lamps mounted on galvanised poles. Light poles shall be "Taperline" manufacture 3.5 metre taper shaped with rag bolt assemblies and inspection openings. All external security and street lighting shall be controlled by photo cell switching. By-pass switches shall be provided on all circuits. Each street light pole shall be separately fused.

Internal security lighting shall be provided in the following areas of the Buildings:

Balconies, verandas, corridors and all stairwells and exterior doors.

The lighting shall be controlled by an externally mounted photo electric cell and a bypass switch, located in the distribution switchboard cupboard.

Light Switching - Two way switching shall be provided on all stairways and all tunnels and corridors.

Light switches in tunnels shall be fitted with continuously operating amber coloured neon indicators.

Light switches in tunnels shall be the protected type.

Sufficient controls, both automatic and manual, shall be provided so that energy can be saved when spaces are not in use or when systems require modification.

Energy management timing systems shall be considered for lecture rooms, seminar rooms, laboratories and any other areas have high usage.

Rooms containing one or more light fittings shall be provided with multiple switching.

Fluorescent light fittings - All light fittings shall comply with the current Australian Standards AS 3137. Fluorescent ballasts shall comply with AS2643 and AS3168.

All fluorescent light fittings shall have electronic ballasts fitted. Ballasts shall be quiet in operation.

Each recessed luminaire to be supplied with a 7.5 Amp 2.5m flexible cord. Fixing brackets shall be retractable type so that the fittings can be readily removed. Flexible cables shall be locked into the light fittings.

Provide an approved fixed earth stud complete with washers and lock nuts on each luminaire.

Luminaires shall be bushed where wiring enters.

ELV tungsten halogen fittings shall be so mounted to allow adequate air circulation around transformers and fittings.

Emergency light fittings or fittings incorporating an additional lamp for emergency lighting shall also comply with AS 2293 complete with "NATA" Test Certificate.

Metalware shall be not less than 0.8mm thickness with adequate folds and return edges etc. to provide stiffness and rigidity. All corners and joints exposed to view shall be welded, ground smooth and filed where necessary before painting. All metal work shall be treated with a rust inhibitor or alternatively manufactured out of zincanneal.

All recessed light fitting diffusers shall be prismatic hinged frame supported.

All light fittings shall be power factor corrected to no less then 0.9 lagging.

Internal wiring of light fittings shall be minimum V105 rating.

Light fittings in computer areas shall be provided with low brightness glare control diffusers to prevent discomfort to computer operators.

6.7 Emergency and Exit Lighting

Self contained emergency and exit lighting shall be provided throughout the buildings in accordance with Australian Standard AS 2293.

The emergency and exit lighting shall be “Axium” type connected to an Area Controller located in the communication room.

All buildings that contain Axium monitored exit and emergency lighting shall be linked back to the University centralised monitored system at Property Maintenance depot. The link shall be connected to the main loop, but if this is impracticable, an electronic link via Lantronix units shall be established. The fittings shall connect the centralised monitored system.

Emergency and exit lighting circuits shall be wireless, or wired direct from distribution switchboards and shall be labelled with engraved plastic labels in accordance with AS 2293. Provide a key operated "auto-off-manual" switch adjacent the distribution switchboards for testing of emergency and exit lighting.

Emergency lighting shall be installed in every switch room. Light fittings shall be a maintained circuit minimum 36 watt, with lighting levels designed to provide adequate lighting to carry out operations under power failure conditions.

6.8 Seminar Rooms

Lighting in seminar rooms shall be step switched to provide a minimum of three levels of illumination with electronic dimming ballasts. Lighting must be capable of lowering to 10% levels without flickering.

6.9 Communications Rooms

All General Power Outlets in Communications Room/closets shall be surge protected.

6.10 Electric Motors

The following are preferred:

- Fractional H.P. - "G.M.F." Brook Crompton.
- Ball bearing 3 phase - up to 12 kW "Crompton Parkinson", ASEA.
- Ball bearing 3 phase - 12 kW to 40 kW - "ASEA"

6.12 Automatic Sliding Doors

Power to automatic sliding doors at entrance(s) to a building shall be key switch operated. The key switch shall activate a locking mechanism when the door is placed in a night mode.

The switches shall be keyed alike and shall be key coded to SF 101 from Strober Locks Limited, made in England.

A further requirement will be that the sliding door must remain in an open position during normal hours and when Fire Indicator Board is in alarm mode.

The lock control module shall provide outputs to indicate door position and door locked.

A wall mounted push button door release shall be provided on the inside of the building adjacent to the sliding door

7.1 Fire Alarm Systems

Each building shall have a strobe light as well as fire alarm bell provided to ensure both visual and audible alert is available.

A fire detection system shall be provided in each building in accordance with all the relevant rules and requirements of:

The Metropolitan Fire Brigades Board

Insurance Council of Australia

Current Edition of AS/NZS 3000

Current Edition of Australian Standards AS 1670

Any other Statutory Authority having jurisdiction over this work.

The Main Fire Indicator Sub-Panel shall be located in the main building after consultation with the MFB and the University.

On Bundoora Campus, make all arrangements for a hard line link to the Master Main Fire Indicating Panel located in the Central Control Gatehouse.

The Main Fire Indicator Sub-Panel shall be a Wormald manufacture Vigilant Series current system fully addressable type with transponder link to all buildings Main Fire Indicator Sub-Panels.

Oral communication facilities shall be provided between the Main Fire Indicator Master-Panel and all Main Fire Indicator Sub-Panels.

The Main Fire Indicator Sub-Panel shall be designed to have spare capacity for 25% of additional alarm groups.

A hard plastic covered drawing shall be provided adjacent the Fire Indicator Panel showing “as installed” drawing for the fire detection/protection system of the building.

Fire rated cabling, such as “Radox” or equally approved shall be installed, between the building Fire Indicator Sub-Panel and the Fire Indicator Master-Panel.

The Alarm Signalling Equipment of the Fire Indicator Board must have the capacity to transmit a signal to the Fire Brigade via radio link and shall have a secondary backup line.

All heat detectors shall conform to AS1603 and shall be of addressable self indicating type.

Heat detectors installed in areas not generally occupied and not visible from open areas shall be provided with a flashing indicator mounted external to that area.

Where a EWIS is not installed local fire alarm bells shall be installed in each building to ensure a fire alarm is audible from any location within the building.

Early warning digital smoke detectors shall be installed in computer rooms and electrical switch rooms. Smoke detectors shall be the two stage operation addressable type.

Smoke doors shall be installed in the building where specified. Each smoke door shall be fitted with a "Wormald" type magnetic door holder and a “Press to release” door switch.

Fire doors shall be installed in the building where specified. Door hardware shall meet required standard to allow for a single hand release.

7.2 Hydraulic Design for Fire Services

Hydraulic fire services shall include for all fittings, piping, branches, valves, hydrants, hose reels, sprinklers, etc. including provision of booster pump equipment as necessary to complete the installation.

Fire services below ground shall be “Blue Brute” Class 20, or pre-lagged type B hard drawn copper tube to AS1432. All copper pipe joints and fittings shall be wrapped with "Denso Tape" with 55% overlap.

Fire services installed above ground or in services ducts shall be approved medium grade galvanised steel pipe to AS774 with roll groove joints and fittings. Lightweight steel pipe is not permitted

Isolation between dissimilar metals shall be provided.

Hydrant systems shall be designed in accordance with AS 2419. The Project Manager shall obtain approval from the Fire Brigade for any hydrant or hose reel that short-falls. When applying for such approvals, the Project Manager shall submit a copy of the M.F.B. letter dated 9 November 1994 from the M.F.B. included in Appendix A.

At ground level external double head L-type fire hydrants shall be provided in preference to internal hydrants.

When applying for such approvals, Project Manager shall submit a copy of MFB Board Report N0. 86/2492, dated 9 September 1986, to confirm this permission. Refer Appendix A for a copy of this report.

Manual Call Points (Break Glass Fire Alarms) are not required.

Valves shall be of packed stuffing box type in preference to o-ring type. Valves below ground shall be sluice type. After installation contractor shall provide the University with at least one key, type CL 003. All below ground valves shall be located in "Gatic" type hinged valve boxes.

Exposed fire service pipe-work, cabinets, valve box covers, etc. shall be painted “Dulux Wildfire Red”.

Pressure gauges shall be installed at the supply point and at highest point on the fire hydrant riser.

The Consultant shall ensure that final documentation contains a “Sprinkler Block Diagrams” with “As Built” drawings provided by fire services contractor.

7.3 Fire Extinguishers

All fire extinguishers used by the University shall be of non – CFC type.

The Project Manager shall allow within the building budget for supply and installation of extinguishers as required by AS2444 or recommended by the MFB and in consultation with the University’s Occupational Health and Safety Section of the Design Standard. The Project Manager shall refer to Appendix A containing Commonwealth Fire Board Safety Circulars N0’s. 2, 28 and 90 for further guidelines. Consideration shall also be given when designing for storage and handling of flammable liquids.

All electrical and mechanical switchboard and sub-board compartments shall have extinguishers installed in accordance with Fire Safety Circular N0. 28. Refer to the M.F.B. letter dated 18 May 1992 which allows fire extinguishers to be installed within switchboard cupboards.

Each laboratory should have a fire extinguisher near the exit door, usually 4.5kg ABE dry chemical. The provision of fire extinguishers for laboratories shall be in consultation with the University’s Occupational Health and Safety Section of the Design Standard.

AS4224.8 requires a fire extinguisher to be located in close proximity to every fume cupboard.

Where vandalism may be a problem or inside computer centres and communication rooms, C02 type extinguishers shall be provided in preference to Dry Chemical type.

7.4 Emergency Warning and Intercommunication System

An Emergency Warning Intercommunication System (EWIS) shall be provided in all buildings where required by the Building Code of Australia.

The provision and installation of the EWIS system shall conform to the following:

a AS 1670.4 and AS 4428.4 Emergency Warning and Intercommunication Systems for buildings.

b AS 3000 Wiring Rules

c Building Code of Australia

The EWIS panels shall be of Quintrix manufacture and located adjacent the Main Fire Indicator Board and the Main Fire Indicator Sub-Boards.

The EWIS shall include:

a Main equipment rack

b Warden Intercommunication Control Panel

c Audio Speakers

d Visual Alarm lights

e Public Address Facility

f Emergency power supply

Warden Intercommunication Phones shall be installed at approved locations on each building level, with a flashing indicator lamp external to each location.

Speakers shall be positioned on site after consultation with the Project Manager. Speakers shall be selected with a frequency range to allow the Alert, Action and Speech signals to be clearly propagated.

The speakers and WIP locations shall allow the warden to communicate using the intercommunication system while either warning signal is sounding.

All EWIS/EWS messages should be the standard “Evacuate by the nearest exit”.

The time period between the alert and evacuate tones shall be set at 30 seconds.

Bendigo Campus shall forgo ALERT tone and go straight to the EVACUATION tone.

The EWIS/EWS shall be activated on all floors at the same time in the event of any fire alarm in the building.

While complying with the current edition of AS 1670.4 and AS 4428.4, options such as a visual indicator shall be considered for sound-proof rooms or rooms where the sound pressure level generated by audible warning signals is less than 10 dB(a) above maximum normal ambient sound, or where the normal occupants may be expected to have hearing difficulties.

Break glass alarms shall be white in colour and labelled "LOCAL ALARM ONLY" or coloured red and labelled "CALL FIRE BRIGADE" as appropriate. Only one type of break glass alarm shall be provided in any one building

The Project Manager shall arrange at least two training sessions to be presented to University staff on the completion of EWIS system by the supplier or installer.

8 Lifts

Where elevators are provided in the Building, they should be accessible to and useable by disabled persons including those in wheelchairs, both at entrance level and all other levels normally used by the public. The ground floor level button of the lift shall be marked with a raised symbol. The lift installation shall comply in all respects with the current edition of Australian Standard AS 1428 and AS 1735.12.

8.1 Lift Machine room

Where a life machine room is required, the design shall comply with the OH&S Guidelines 2001, AS 1735, and following requirements:

All lift relay switchboards shall be dead-run (relays covered by safety panel);

- weather and vermin proof and of fire rated construction complete with a 2 hour fire-rated lockable door;
- have uninhibited 24 hour access to the machine room'
- provided with a key-safe adjacent to the lift motor room entry door;
- the access door shall swing out and shall be complete with a suitable automatic closer;
- air conditioning or mechanical ventilation shall be provided where required;
- room shall be provided with filtered fresh air intake;
- lifting points (eyes) shall be located in the machine room roof slab over hoisting machines and access hatches shall be complete with "Safeload" notices;
- have concrete plinths for support of machine beams;
- all finishes to walls, floor and ceiling shall be durable and painted in full gloss enamel for easy cleaning. The ceiling colour shall be white and walls off-white. Floors shall be properly sealed and receive 2 coats of grey coloured paving paint;
- fire extinguishers, or a sprinkler system in compliance with S.A.A. Lift Code, shall be supplied;
- a drawing layout table (approx. 1200 x 600), an appropriate fixture to hang/store the drawings, and a wall mounted cupboard for spare parts (size to be confirmed) shall be provided;
- controls and hoisting equipment shall be well lit by room lights, which shall be energy efficient fluorescent-type fittings with protective guards. The general lighting level shall be 400 lux throughout the machine room;
- non-maintained emergency luminaire/s shall be installed in the machine room;

- permanent 415/240V 3 phase and neutral fire rated power supply connected to a dedicated lift switchboard.
- all switchboards shall be equipped with Residual Current Devices for Light and Power circuits and labelled in engraved trafolyte;
- Controller may be non-proprietary Variable Velocity Variable Frequency drive (VSD) controls, installed for accessibility in the Lift Motor Room. It shall incorporate a Solid State microprocessor control with diagnostics and programming key-board / pad system inside the cabinet. The system shall have open protocols to permit full maintenance by third parties at the expiration of the warranty period;

8.2 Lift Types

All lifts shall be suitable for continuous operation.

The following types of lifts are acceptable:

- Machine room-less lifts
- Hydraulic lifts for buildings less than 4 storeys. Nominal rated speed of approximately 0.5 metres per second minimum.
- Traction lifts for buildings greater than 4 stores or high speed applications. Nominal rated speed of 1.75 to 2.5 metres per second.

The consultant is required to support the lift selection with a whole of life (20 years) cost analysis and present this to the University for review and approval.

The cost analysis shall include an indicative cost breakdown of the whole of life costs of the lift to include the following criteria:

- power consumption, machine and control system efficiency;
- consumable items, such as ropes, sheaves, bearings, guides etc;
- expected cost for comprehensive maintenance.

8.3 Acoustics

The lift designer shall provide details of all isolation pads and mountings for review by the Acoustic Consultant during the design stage.

8.4 Security Interface

The lift controls and wiring shall allow for the connection of an access control system to control the operation of the lift including wiring for installation of a access card reader in the lift car.

8.5 Performance Schedule

The lift designer shall provide a schedule of all contract performance data for the proposed installation including the following:

- car control algorithm;
- quality of ride;
- queuing intervals;
- appointments in association with landing equipment
- rated speed;
- floor to floor times;
- design door opening/closing times;
- rated capacity of lift;
- acceleration/deceleration rates;
- expected allowable levelling variance.

8.6 Lift Car

At least one lift in every building shall be configured for stretcher use.

The lift car shall incorporate the following features:

- the interiors shall have low maintenance, high resilience type finishes;
- single point non-maintained emergency lighting;
- ceiling mounted Vent-aria exhaust fan (approx. 180mm diameter);
- hand rail;
- car position indicator (LCD Digital) shall be an integral part of the control panel, which shall be hinged;
- LCD Digital Landing indicator;
- control panel shall contain an exclusive key switch regulating ON, OFF and PARK facilities. Control buttons shall match those described above;
- tactile labelling of lift buttons;
- centre-parting stainless steel doors with electronic motor control;
- lift and counterweight guides shall be the self-lubricating roller type;
- building evacuation speaker and associated wiring;
- VCX-100 voice units for disabled passengers shall be supplied and installed;
- Intercom system to connect direct to the Campus Security Centre;
- “Fireman” operation mode
- Energy efficient lighting

All controls in the lift car shall be accessible to disabled passengers, including emergency communication and alarms.

8.7 Door Frames and Indicators

All indicating lights shall be on long-life LCD digital type. Landing buttons shall be vandal-proof.

The designer shall ensure that each level is correctly labelled according to the University's room numbering system.

In the ground floor lobby, the travel of each lift shall be displayed adjacent to the lift call buttons.

8.8 Lift Well

A sump pump pit and cover shall be installed. Concrete plinths for support of buffers, etc. shall be specified.

Means of access into the pit/overrun shall be provided.