18.00 Mechanical Services

The requirements of this Section are generally Mandatory (Refer to Section 1.00)

18.01 Air conditioning & Ventilation

18.01.01 Generally

natural ventilation. A changeover system suitable for the application shall be included via the TAC central control and monitoring system.
Data Rooms – Data rooms with a floor area equal to or greater than 4m^2 shall be air-conditioned via a cool only wall mounted inverter style split DX system. The air conditioning system shall run continuously and automatically restart upon power failure. Data rooms less than 4m^2 shall be ventilated with an extraction fan, drawing air form an adjacent air-conditioned space. In refurbishment projects, if a data room is already on a chilled water system, then consideration shall be given to maintaining that system and adding a DX system as a back-up.

Photocopy / Print Rooms – Photocopy and print room shall be air-conditioned. Supply and exhaust ventilation rated shall be in accordance with AS1668.2.

Laboratory Space – Any building or part of a building used or intended to be used for scientific or technical work which may be hazardous, including research, quality control, testing, teaching, preparation, analysis, support areas etc must comply with the Building Code of Australia, AS 2982, AS 2243 Parts 1-10 inclusive, AS 1940, AS 4332, AS 2430, AS/NZ 2982.1 and referenced and related documents including the Workplace Health and Safety Act and regulations.

Where laboratory space is not designated PC2, provisions shall be built in which allow the upgrade to Physical Containment Level 2 (PC2) standards as defined in AS 2243-3. Provisions shall include, but not be limited to, ductwork for extraction systems, discharge stacks, plant room space, electrical capacity, plumbing and drainage and other building related items. Design of laboratory space shall also be mindful of this requirement.

For Physical Containment (PC) laboratory spaces, the design consultant shall provide an air flow schematic drawing detailing the method of achieving a negative differential air pressure in the laboratory relative to the spaces outside the boundary of the PC space. It may be necessary to achieve an air pressure differential between adjoining rooms and air locks. The method of achieving the pressure differential for various spaces must be discussed with and approved by the CLF mechanical Engineer and the space User. In some instances it may be necessary to install specific exhaust systems to achieve a negative air pressure in the laboratory. This exhaust system shall be controlled by the CCMS and linked to pressure sensors mounted on each side of any door in the laboratory perimeter walls. The exhaust and air conditioning systems shall be linked via the BMS so that should the negative pressure within the laboratory spaces fail, then the air conditioning will shut down and an alarm will be generated. On completion of the project and during the commissioning of the facility, an air pressure differential test shall be carried out to confirm the design and compliance with physical containment requirements.

UVC System for Kitchen Hoods – All kitchen exhaust hoods shall be installed with a water wash system combined with a UVC system similar to the ‘Capture-ray’ technology manufactured by Halton. The UV lights shall be capable of easily maintenance and replacement. Alternative similar technology with equal and proven performance will b0029 Tc .hum oeeudi15.4( )-C.s7r6.4.1(ie).1(si8(p)-6.5 TD2iorb .hume.2(1tt)5.5(h)-6.7(eth)7.9(e (c)1(

- All campuses 6.0°C

Hours of Operation – Normal hours of operation for teaching areas are between 8.00 am and 10.00 pm

All screwed valves and fittings shall have unions for easy removal without cutting the pipework.

'Binda' cocks shall be fitted to all at all air-handling units, fan coil units, pumps etc and shall extend a

- Design and installation of the pipework must identify and seek to strategically locate these potential weak points to provide easy accessibility for both installation and servicing.
- Drip trays with gravity drainage shall be provided under all weak points to eliminate the potential for damage as previously described.
-

Filter banks shall be provided with manometers. The manometers shall be mounted in an easily accessible and visible location and shall be 'Dwyer Magnahelic' or equal. The initial and final pressure drop reading shall be clearly marked adjacent the gauge on a fixed label of approved type.

Before starting any air handling system, install the correct filters in their frames together with a rough filter across the face. Upon completion of commission, the rough filter shall be removed and the manometers calibrated to show clean filter pressure setting. Filters shall be replaced at the end of the defect liability period.

Chiller Sets – Chillers of 'York', 'Trane' or approved manufacture. Chiller Sets when installed on site shall be complete with a communications port for connection to the BMS, and shall conform to an open standard protocol e.g. Backnet (preferred), Lon, Mobus etc. Additional chillers shall be compatible with existing equipment. All chiller units shall be raised above plant room/enclosure floor slabs on corrosion protected supports to allow easy removal of leaf litter and the like which may accumulate under the unit. All chillers installed in a corrosive environment shall have enhanced corrosion protection to painted and galvanised surfaces, and the condenser coil fins to air cooled units shall be protect with a factory applied treatment to the approval of CLF.

Cooling Towers – cooling Towers shall be stainless steel or fibre glass. Towers shall comply with all relevant codes, standards, acts and regulations. Particular care is to be taken with respect to the possibility of introducing Legionnaire's Disease as a result of tower placement. Particular care shall also be taken to ensure that statutory requirements relating to noise levels are met. Cooling Tower fan motors shall be provided with variable speed drives for controlling purposes.

Water treatment systems of the highest quality are required. The details shall be agreed with the superintendents' representative in advance.

Air Cooled Condensers – Air Cooled Condensers shall be of approved manufacture and should preferably be of the vertical airflow type. Where multiple compressors are installed, each compressor shall be capable of being individually isolated of maintenance and for fault.

Belts and Pulleys – All belt driven equipment shall have a minimum of two vee belts. All equipment pulleys shall be equivalent to 'Taperlock". Pulleys shall be arranged to allow future adjustment in either direction at commissioning. Pulley systems, which are at the extreme of adjustment, will be rejected.

Unitary Fan Coil Units – Unitary Fan Coil Units shall by 'Sinko' brand (or similar approved by CLF), either floor mounted or suspended below the false ceiling. Units provided with wall mounted fan speed control e.g. Faculty Offices, could be selected at high speed. Units serving all other spaces shall be selected at medium speed. Please note, the final unit selection may be dictated by its heating capacity.

Air Handling Units – Air handling units shall be of 'Fan Coil Industries', 'Colair', 'Air Design' or 'Walker' manufacture, designed for easy, safe access to all internal components. Access panels shall have at least two (2) D handles and be locked with spring loaded 'Larkspur' catches. Access panels larger than 600 x 600.

The use of screw fixings in the manufacture of the units is not acceptable.

Any internal insulation subject to damage shall be protected by the use of perforated metal or other means. Drip trays shall be stainless steel, formed to provide a sump and shall be adequately drained. Drip trays, which hold water, will be rejected and replaced by the Contractor. Drains shall be trapped and treated as Trade Waste, run to the Sewer system by means of a tundish. Traps shall be easily removable by means of pressure barrel unions. The face velocity at the cooling coil shall not exceed 2.3 m/s.

Equipment Location – All equipment shall be located in easily accessible adequately sized plant rooms unless otherwise approved by CLF. Clearances around the mechanical switchboards shall meet the requirements of AS 3000.

18.01.10 Air-Conditioning Electrical System

Switchboards and Motor Control Centres shall normally be of type-tested construction with IP rating approved by the superintendent prior to tendering. Switchboards shall be electrical orange (X15 to AS 2700) externally and white internally.

All components shall be located on the rear panel in orderly manner. No components are to be mounted on the sides or base of the switchboard and they shall be mounted not less than 300mm above the floor.

Permanent, clearly legible traffolyte labels screw fixed to all internal and external controls.

Fire Alarm Relays shall be provided in accordance with the requirements of AS 1668 and AS 1670 as applicable.

Provide spare space and capacity in all switchboards, sub-boards and control panels to allow for future expansion. This spare capacity also applies to the switchboard sub-mains etc. The amount of spare capacity shall suit the situation and be agreed upon and approved by the Superintendent prior to manufacture, but in no instance shall be less than 10%.

A Polyphase kilowatt-hour meter complete with pulsed output to the CCMS shall be provided to the air-conditioning section on the main electrical switchboard. This meter shall be suitably labelled and grouped with all other meters. Refer to Section 20.00 Clause 20.08 for further details of meter installation.

All cables shall be run on cable trays, ladders, catenary wire etc and terminated in terminal strips. All cables entering switchboards shall enter the switchboards through a gland nut and be terminated on a terminal block, labelled as to its origin and numbered. All active, neutral, earth and control wiring shall be number ferruled both in the switchboard and at field terminations corresponding to circuit breaker numbers. Wrap around tape numbering systems are not acceptable to the Superintendent. Multi-joining of cables prior to termination on bars is not acceptable. Neutral and earth bars shall have the same number of terminations as circuit breaker positions and shall include two grub screws per terminal. All cabling shall comply with the requirements of Section 20.00 Electrical Services .

The MSSB shall include ‘Auto/Off/Manual’ switches for each piece of equipment served except for VAV boxes which will have a common heater ‘Auto/Off/Manual’ switch (refer to GU Standard Drawing No. GSD–600). For all VAV heater banks, a HPT fault indicator light for each VAV unit shall also be provided on the MSSB fascia.

Approved electrical and control drawings shall be prepared and supplied with the switchboard by the Date of Practical Completion.

Provide a GPO in all switchboards and a fluorescent lamp in each switchboard cupboard greater than $2m^2$ in face area.

All mechanical switchboards shall have a lamp test facility incorporated into the control system via relays and not diodes.

18.01.11 Identification of Equipment

All items of equipment, both in plant rooms and in the field, shall be suitably identified with traffolyte labels of an approved size and type. All mechanical and control items shall be similarly labelled to indicate their function.

Provide ceiling markers to locate services and equipment above ceilings. All valves within the chilled water system shall be tagged and scheduled in the maintenance manuals for future reference.

Number mechanical equipment according to the room number or area which it serves.

18.01.12 Identification of Pipework & Ductwork

All pipes and ductwork shall be identified in accordance with AS 1345 – Identification of the contents of

Special Days – Air conditioning equipment with a time schedule start/stop shall incorporate a Special Day program to deactivate the plant at 12.05am except for plant types FCU-C, VAV-c and AHU-A2 which shall have a special day entry equal to their Norman time schedule enable. Air conditioning plant and equipment shall not operate according to their standard time schedule on the following days via the Special Day function – Christmas day to New Years day.
Temporary Time Schedule – Types FCU-B and VAV-B equipment shall include the following temporary time schedules.

- Temporary 1: 7.30 am to 12.30 pm
- Temporary 2: 2.30 pm to 5.30 pm

Plant Operating Continuously – Air conditioning plant and equipment operating continuously (24 hours a day, 365 days a year) shall also incorporate a suitable time schedule for future flexibility. This plant shall include a Special Day time schedule entry equal to the normal time schedule start.

18.01.17 Control – Ventilation Fans

Provide controls to ventilation fans as follows;

Sij 3.1537(18)-5 n schedule e

VAV-B

Economy Cycle and CO_2 Control – CO_2 control shall have precedence.

Provide time schedule control of AHUs as follows;

AHU-A1 (Single zone unit) – Provide a daily time schedule to limit the operating hours of the unit. Activation of the unit outside the scheduled hours shall be via a push button, and the unit shall run for a maximum period of 2 hours. A sensor shall monitor the room temperature and the set point shall be maintained by modulating the chilled water valve to cycle with the heater bank/coil.

AHU-A2 (Single zone unit) - Provide a daily time schedule to limit the operating hours of the unit. Activation of the unit shall be via a motion detector, and the unit shall stop if no motion is detected after 20 minutes. A sensor shall monitor the room temperature and the set point shall be maintained by modulating the chilled water valve to cycle with the heater bank/coil.

AHU-B (VAV unit) - Provide a daily time schedule to limit the operating hours of the unit. Activation of the unit outside the scheduled hours shall be via a push button, and the unit shall run for a maximum period of 2 hours. VAV cooling demand shall be determined by selecting the highest reading from multiple sensors and reset the supply air temperature set point between 12^0C and 20^0C as the maximum cooling demand varies from maximum to nil. The supply air temperature set point shall be maintained by modulating the chilled water valve to cycle with the heater bank/coil. Modulate the VSD to the supply fan to maintain supply air pressure at the set point.

AHU-C (Multi zone face and bypass unit) - Provide a daily time schedule to limit the operating hours of the

The following control points shall not be changeable from the graphics page and shall be dynamic;

- Set Up time
- Step Down time
- Settle time

Chiller Units Graphics Page – Each chiller unit shall have its own graphics page.

If a chiller is in fault or fails to start then a command to start shall be passed to the next chiller in available sequence.

The sequence in which the chillers are operating shall be highlighted on each chiller graphics page.

Chilled Water Reticulation Graphics Page – The sequence in which the chillers are operating shall be highlighted on the page.

The following points shall be able to be forced with an indicator;

- Change lead chiller/pump
- Secondary chilled water pump start/stop
- Pump VSD speed
- Cooling call

If secondary chilled water pumps in a building on the chilled water loop are running, and the building return water temperature is greater than the Step Up temperature set point for more than ten (10) minutes and no chillers are running, then a signal shall be given to start the lead chiller.

Primary/Secondary/Tertiary CHW System – Modulate CHW pump VSD speed to maintain differential

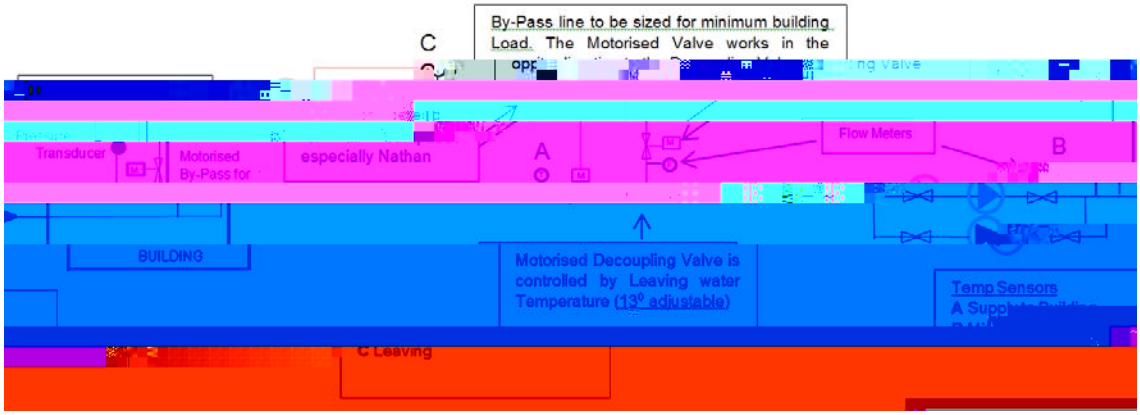

Diagram 18.iii

For multiple VSD fans, modulate the first fan to 50% speed, then the next, etc. until all fans are running at 50% speed, then modulate all fans simultaneously to maintain condenser water temperature entering chiller set point.

Chiller condenser water entering temperature set points shall be dynamic, varying in accordance with chiller load. Temperature set points shall modulate within a range acceptable to the respective chiller manufacturers.

18.01.22 Underground Services

All underground services including pipework, conduits etc, shall be installed and identified as described in Section 17.00 Hydraulic Services and Section 20.00 Electrical Services .

18.01.23 Temperature and Pressure Pr -1.(n)-6.(Pres)-5.2(sure)-5.2( )6.7(i)4(s)Pgu.(Pres)-P2( )897(tifi2(e)6.)6.r -1.(n (1(c)-6C.1(a5.8(l)-1ur

- Demineralised water, fault/ext

B. For refurbishment projects

- For any major refurbishment of a substantial area of an existing building, the same requirements as for new buildings shall apply, and the existing old graphics shall be totally discarded.
- For minor refurbishment

18.01.27 Energy Management

All air conditioning system designs shall be assessed for the potential to introduce an Economy Mode. The mechanical consultant shall consult with CLF to establish which areas within a building are appropriate for utilising this Mode. Refer to Subclause 18.01.20 for controls to be provided to operate this system feature.

Seminar, Lecture Theatre and Tutorial style rooms shall be controlled by the use of infra red motion detectors specially designed for energy management purpose with the overall hours of operation controlled by the CCMS.

Staff offices shall be fully air conditioned with individual controls as described in Subclauses 18.01.18 and 18.01.19.

Units serving general offices, laboratories and any other area not specifically mentioned, shall be provided with time-switch control via CCMS.

Limits on the hours of operation of all units shall be provided by the time-switching function of the CCMS.

All lecture theatres capable of seating 100 or more persons shall incorporate use of enthalpy control and/or heat transfer systems on outside air where a cost analysis proves the inclusion viable. The fresh air quantity to these theatres is to be controlled via CO_2 monitors.

Electric heaters in all air-conditioning systems shall be able to be shed for maximum load demand control purposes via the CMS using an event program. Refer to Subclause 18.01.09 .

Face and by-pass type units are to be used wherever possible to obtain the required temperature. Controls, thermostats and motorised dampers to allow for automatic operation on all outside air whenever

be activated to bring the temperature up. Conversely, the same principal shall apply when heating in winter in that the room must never be cooled if the temperature is slightly above 21.C°C.

period of five (5) minutes after the shutdown of all VAV boxes in order to dissipate the residual heat from the heater bank.

- The fresh air supply to the AHU shall be maintained by a dedicated fan such that the design flow rate of fresh air will be fairly constant even when the supply/return air flow of the AHU is low. The fresh air fan shall operate whenever the AHU fan is on.
- The indoor design temperature shall be 23.5°C in summer and 21.0°C in winter. During summer cooling, the VAV damper shall have a minimum opening on 30% when the temperature is at or below 23.5°C, and fully open at 24.5°C. During winter heating, The VAV damper shall always be open at 30% minimum.
- The summer and winter indoor design temperatures shall subject to Global Reset as outlined in the previous Clause.
- To minimise the overcooling of partial load areas during summer cooling, the supply air temperature set point shall be adjusted upward when all the VAV boxes are below 100% opening for a programmed time period. For instance, the control system shall check the VAV boxes every 2 minutes, and if all boxes are below 100% opening, the supply air temperature shall be increased by 1.0°C. If any one or more boxes are at 100%, the temperature shall be decreased by 1.0°C. Thus the supply air temperature shall slide up and down between the usual design temperature range of 13.0°C to 14.0°C, and the upper limit of 20.0°C.
- The heaters shall not operate when the indoor temperature is at or above 21.0³C. When the indoor temperature drops to 20.0°C, the heater shall start and step up to full load when indoor temperature drops to 19.0°C. The heater shall switch off when temperature rise to 21.0°C.

18.02 Fume Exhaust & Fume Cupboards

18.02.01 General Requirements

The fume cupboard installation and associated services shall be designed, supplied, installed, tested and maintained to the requirements of AS 243.8 – Safety in Laboratories, Fume Cupboards, AS 2982 – 2 -1.1479 TD .00 -.0049 Tw [(f)4.-6.2(147.7(n).3Wi)6.2(gn)7-6.1(e.7( )(e)7.1(n)7.i)-131(-66(ll s2(e)-6.6(rpres)-5.0c)-Tf -2-66(llb)7

18.02.03 Fume Cupboard Construction

Inner Chamber – The inner chamber shall be a one piece moulded design from chemical resistant glass

Fans shall be belt driven with drives designated for the motor starting torque and not less than 150% of the motor rated kW. Belts shall b matched sets, and a minimum of two belts shall be used on each fan. Motors shall be of totally enclosed fan cooled, running at not more that 24 rev/s and suitable for operation on 3-phase, 415 volt, 50Hz supply. Provide belt guards on all fan drives with DZUS fasteners. Pulleys shall be 'Taperlock'.

Provision shall be made in each exhaust duct on the discharge side of the fan for the insertion of pitot

- Multiple arms in separate rooms may be connected to a common mechanical fan extraction system. Where this occurs, a 100% standby fan shall be provided to enhance reliability of the system. The fans shall be controlled by VSDs with pressure sensors such that when all arms are working, the minimum flow of each arm can be maintained, and when only one arm is working, the flow shall be under the maximum design value. If the above cannot be achieved due to too many arms, then multiple separated extraction systems shall be adopted.
- A motorised zone damper for each room shall be provided to close off the branch duct when the system in the room is not being used. Each arm shall also come with an integrated manual damper, and the Users are to be encouraged to close it when not in use.
- An ON/OFF push button with light indicator shall be provided in the room for the users to activate the system. When the button is pushed ON, the zone damper shall open and the fan shall start. When the button is pushed for OFF, the zone damper shall close and the fan shall stop (note the fan will still run if arms in other rooms on the same system are in use). If the button is ON for a period in excess of 3 hours (this time period shall be adjustable), the room will be switched OFF automatically by the BMS control. The Users have to push it ON again if they wish to continue using the arms.
- The whole extraction system shall be connected to the building BMS system for control and monitoring. The BMS graphics shall include a schematic of the system showing all the fans, zone dampers and push button status.
- For a system where a common exhaust fan services multiple arms in a number of separate rooms, the fan shall be started when the arms in any one of the rooms is being used. To avoid dead flow of the fan in the case where all manual dampers are closed, at least one arm damper in each room shall be locked open permanently to maintain the air path.
- Note that the extraction system shall not be used to maintain any negative pressure requirement of the room such as for PC2 or PC3 labs.
- Please refer to the drawing GSD-601 for the indicative schematic of the extraction system with multiple room application.
- A smoke test to verify the performance of each Nederman arm shall be carried out in addition to the overall system air flow testing and balancing works as specified in other Sections of the DG&P.

18.04.03 Compressed Air

Compressed air shall be supplied from a central air compressor station comprising duplicate air compressors and other necessary equipment such as refrigerated dryers, water/oil separators and

Appendix A

GRIFFITH UNIVERSITY STANDARD POINTS LIST

Point Description	Type	DI	DO	AI	AO	Field Device	Comments
VENTILATION FANS							
GENERAL VENT FAN	VF-A						
Fan Start/Stop			1			MSSB terminal strip	
Fan status		1				Air flow or DP switches	From fan contactor
THERMOSTATIC VENT FAN	VF-B						
Fan Start/Stop			1			MSSB terminal strip	
Fan status		1				Air flow or DP switches	From fan contactor
Room Temperature				1		Room Temperature sensor	
LIFT MOTOR ROOM VENT FAN	VF-C						
Fan Start/Stop			1			LMR control panel	
Fan status		1				Air flow or DP switches	From fan contactor
LMR temp				1		Room Temperature sensor	
Alarm Mode			1			LMR control pane	
FUME CUPBOARD	VF-D						
Fume cupboard status		1				Fume cupboard terminal strip	
Fume cupboard fault		1				Fume cupboard terminal strip	
Fume cupboard fan speed				1		Fume cupboard terminal strip	Signal from fan speed controller
CEILING FAN COIL UNITS							
FCU-A	FCU-A						Eg Faculty Offices
Fan S/S			1			FCU terminal strip	
Unit command to start		1				Push button	Integral with room control panel
Room temperature				1		Room temperature sensor	Integral with room control panel
Room temperature set point adjust				1		Pot	Integral with room control panel
CHW valve			1			Valve actuator	

GRIFFITH UNIVERSITY STANDARD POINTS LIST

Point Description	Type	DI	DO	AI	AO	Field Device	Comments
Command to start outside time schedule		1				Push button	
Unit operation			1			Light on push button	
Room temperature				1		Room temp sensor	
CHW valve					1	Valve actuator	
Heater			N			MSSB terminal strip	N steps of electrical heating
SINGLE ZONE UNIT	AHU-A2						
Fan Stop/Start			1			MSSB terminal strip	
Fan status		1				Air flow or DP switches	
Motion detector		1				Motion detector	Motion detectors wired in parallel
Room temperature				1		Room temp sensor	
CHW valve					1	Valve actuator	
Heater			N			MSSB terminal strip	N steps of electrical heating
VAV AIR HANDLING UNIT	AHU-B						
Fan Stop/Start			1			MSSB terminal strip	
Fan status		1				Air flow or DP switches	
Command to start outside time schedule		1				Push button	
Unit operation			1			Light on push button	
Supply air duct temperature				1		Duct temp sensor	
CHW valve					1	Valve actuator	
SA duct static pressure				1		SP sensor	Locate sensor 2/3rds along duct run
VSD control, fault		1			1	VSD	
MULTI ZONE-FACE AND BYPASS AHU	AHU-C						

GRIFFITH UNIVERSITY STANDARD POINTS LIST

Point Description	Type	DI	DO	AI	AO	Field Device	Comments

SITY STANDARD POINTS LIST

					AO	Field Device	Comments
						Room temperature senor	Integral with room panel. Wired to VAV controller
						Pot	Integral with room panel. Wired to VAV controller
						Pilot tube	Connected to VAV controller
					1	Damper actuator	Integral with VAV controller
Heater							
VAV-B	VAV-B						Eg General area
Room temperature				1		Room temperature sensor	Integral with room panel, wired to VAV controller
Primary air velocity				1		Pilot tube	Connected to VAV controller

GRIFFITH UNIVERSITY STANDARD POINTS LIST							
Point Description	**Type**	**DI**	**DO**	**AI**	**AO**	**Field Device**	**Comments**
CW pump status		1				Terminals in MSSB	DP switch
Entering & leaving CW temperatures				2		Pipe temp sensors	Assumes one CT per chiller
FOR A PRIMARY ONLY CHW SYSTEM:							Control valve in bypass
CHW common leaving, return and entering temps				3		Pipe temp sensors	
Bypass valve(s)					1or2	Valve actuator(s)	One output per valve
Outside air temperature				1		OA temperature sensor	If none already exists
Refrigerant leak detector		1				Terminals in MSSB	
FOR A PRIMARY/SECONDARY CHW SYSTEM:							Open pipe bypass
CHW common leaving temperature, before bypass				1		Pipe temp sensor	
CHW return temperature, before bypass				1		Pipe temp sensor	
CHW entering temperature, after bypass				1		Pipe temp sensor	
CHW bypass flow & direction		1		1		Magnetic flow meter	
Secondary CHW DP				1		DP sensor	Locate on index run
Outside air temperature				1		OA temperature sensor	If none already exists
Refrigerant leak detector		1				Terminals in MSSB	
SECONDARY CHW PUMP							

GRIFFITH UNIVERSITY STANDARD POINTS LIST							
Point Description	**Type**	**DI**	**DO**	**AI**	**AO**	**Field Device**	**Comments**
DECOUPLING							
Entering CHW temperatures before and after bypass				2		Pipe temp sensors	
Leaving CHW temperature				1		Pipe temp sensors	
Bypass flow and direction		1		1		Magnetic flow meter	Sized to take full building water flow
Mixed Bypass/Supply temp				1		Pipe temp sensors	
Motorised decoupling valve					1	Valve actuator	
Motorised decoupling bypass valve					1	Valve actuator	
Flow meter, bypass & pump supply		2		2		Flow meter	
Low load motorised bypass					1		Located in building
Throttling valve and position				N	N	Valve actuator	N valves
Mixed Bypass/Supply temp				1		Pipe temp sensors	
Motorised decoupling valve					1	Valve actuator	
Motorised decoupling bypass valve					1	Valve actuator	
Flow meter, bypass & pump supply		2		2		Flow meter	
Low load motorised bypass					1		Located in building
MISCELLANEOUS							
MECHANICAL							
MSSB common fault		1				Terminals in MSSB	One per MSSB
MSSB or MSB KWh		1				Terminals in MSSB	
Fire Alarm		1				Terminals in MSSB	One per building
ELECTRICAL							
MSB KWh		1				Terminals in MSB	
External lighting control			1				

GRIFFITH UNIVERSITY STANDARD POINTS LIST							
Point Description	**Type**	**DI**	**DO**	**AI**	**AO**	**Field Device**	**Comments**