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I General Introduction

The purpose of this document is to:-

a) Describe the CAD standards requirements of the University of Tasmania (UTAS) for the preparation of CAD drawing files by consultants, contractors and in-house personnel.

The University of Tasmania (UTAS), Asset Management Services section requires all consultants and contractors engaged on any of its building projects to provide UTAS with “As Constructed” copies of their CAD drawing files. The files form integral parts of the record of works undertaken and are used for space planning, maintenance and refurbishment works.

This document is intended to ensure the consistent standard and format of CAD drawing files prepared for UTAS by external consultants and contractors and internal CAD personnel.

b) To provide a common basis for the documentation of CAD drawings for UTAS and covers:

- The creation of CAD drawings by UTAS staff and external Consultants alike.
- The maintenance of CAD drawings by UTAS staff.
- The creation of "Archibus ready" as constructed drawings by UTAS staff and external Consultants alike.
- Transfer of information between UTAS and external Consultants.

The primary goal of using CAD is the efficient and productive use of drawing files.

This will require a major effort by all involved to coordinate standards, procedures and design methodologies, which will enhance the ability to transfer data between various users regardless of the CAD system used.

The input of all parties using these guidelines is encouraged to provide input into the formation of these guidelines, as they will be updated at regular intervals.

c) It is intended that the standards outlined in this document should apply to all “As Constructed” drawings produced for UTAS by consultants, builders/or contract

1.1 Definitions

The following are definitions of selected terms appearing in this document

Archibus Ready:	Base “As-Constructed” building drawings, which have a layer, dedicated to polylines of each accessible room (including service ducts). Refer section 1.4.8.
As-Constructed documents:	Cad drawings produced at the completion of a project based on contract document files reflecting the facility as constructed incorporating all variation orders and site instructions during the progress of the contract.
Attribute:	Text or numeric data attached to a symbol on a CAD drawing.
Base building drawings:	CAD drawings of a floor plan showing only permanent features such as columns, the building core, exterior walls (including windows), the ceiling grid and permanent internal partitioning. These drawings are extracted from information within the As-Constructed drawings.
Block:	A collection of CAD graphic elements, which are stored under a single name and can be manipulated as a group and used on other drawings.
CAD Officer:	The UTas person responsible for CAD operation. The CAD Officer is available on (03) 6226 2795 during normal business hours.
Contract Document Files:	CAD drawings developed for the purpose of producing drawings to tender a contract.
DWG:	Default AutoCAD drawing file format.
DXF:	Acronym for Drawing eXchange Format. A DXF file is a neutral ASCII text file containing CAD drawing information, which can be read by AutoCAD and other CAD applications.
Hard Copy:	A permanent copy of a CAD drawing issued on opaque bond paper or similar.
File:	A collection of data stored under a single user name in a computer.
Layer:	An attribute of an item on a CAD drawing used for grouping of related data (eg: external walls, HV cables etc.)
Plot File:	A file created by a CAD system utilising the HPGL/2 language whereby a plot is sent to a file rather than a plotter. Plot files are non-alterable, but can be viewed and plotted as required.

1.2 UTAS CAD Model

The UTAS CAD model consists of geometric information about the university's sites, buildings, grounds and services including:

- Architectural components (walls, windows, doors, columns etc)
- Engineering components (structural elements, mechanical and electrical)
- Building services components (fire, communications, water etc)

1.3 Reference Point

CAD drawings set-up in a local co-ordinate system must be related back to GDA94 co-ordinates, which is common to all UTAS sites. The individual responsible should discuss this requirement with the UTAS CAD Officer before documentation begins.

The head consultant is responsible for establishing a geometric set-out point (a 0,0 common point to all spatial data) consistent with all consultants' CAD systems. This point is to be set out with surveyor's co-ordinates as a building reference point, related to real world set-out point that enables UTAS to establish the geometric relationship with all other projects. This is to be agreed between UTAS and the head consultant before any contract drawing is to commence (and before all as built drawings commence by the contractor). The coordinating architectural consultant is responsible for the geometrical coordination of all other consultants' CAD data and all consultants agree to use the coordination plans to geometrically coordinate all data.

All drawings are to be drawn at 1 AutoCAD unit to 1 Millimetre (any CAD drawing files that are not at 1:1 scale **will not be accepted**).

1.4 Provision of University Drawings

The provision of electronic drawings by UTAS does not imply they are dimensionally correct. Contractors and consultants should confirm all dimensions prior to any work. Figned dimensions then take precedence over scaled dimensions.

1.5 Builder and Contractor Submissions

"As Constructed" drawings are required to be provided by all Builders and Contractors in accordance with the terms of UTAS building contracts and specifications for works. The drawings are to provide a complete record of all work as constructed and installed. This shall include all services installed by the Builder/Contractor and their interface with any existing service.

It should be noted that Builders/Contractors should not rely on any dimensions supplied on drawings at the time of tender by consultants, for the purposes of the preparation of "As

Constructed” drawings. All dimensions, levels and information shown on all “As Constructed” drawings shall be measured by the Builder/Contractor from adjoining buildings and/or structures. Dimensions between all new elements constructed by the Builder/Contractor shall be similarly measured.

1.6 Quality Assurance

It is the responsibility of all Consultants, Builders and Contractors to strictly maintain the layering structure and data held within the layers as set out in these Standards. The UTAS CAD officer should be contacted immediately if any doubt exists as to the requirement of UTAS in regard to either preparation or submission of drawings in accordance with these standards.

All CAD files submitted to UTAS should be labelled as described in section 1.7 of the standard. The procedure for submission of “As Constructed” drawings should be as follows;

1. The draft “As Constructed” drawings are to be reviewed by the consultants for accuracy with shop drawings, variations etc. and compliance with UTAS CAD standards.
2. The draft “As Constructed” drawings are returned by the consultant to the Builder/Contractor with the Consultants comments for any further revision and/or adjustment which may be required.
3. The Builder/Contractor /Consultant shall certify in writing that the “As Constructed” drawings are in their opinion both accurate and fully compliant with UTAS CAD standards.
4. The “As Constructed” drawings are then submitted to the UTAS CAD officer by the Project Manager for review. No drawings will be submitted unless the written certification by the consultant has first been obtained and attached.
5. If the UTAS CAD officer requires any modifications, then his/her requirements will be conveyed to the Projector Manager.
6. Once the UTAS CAD Officer has checked that the “As Constructed” drawings meet the UTAS CAD Standards he/she shall notify the Project Manager. The Project Manager will advise the Builder/Contractor that the drawings have been approved and accepted. (final payment on the project will then be released.)

1.7 Labelling of CAD Files

All CAD drawing files to be submitted on CD/DVD shall be clearly labelled with the following information;

- Region Code
- Site Code
- Building Code
- UTAS Project Number
- Professional Discipline (eg Architectural, Structural)
- Drawing Number
- Revision Number

2 Information for Consultants

2.1 CAD Requirement

The AMS section of the University of Tasmania requires all projects to be documented using a CAD system which is capable of producing an ACAD DXF compatible file.

2.2 Supply of Data

All CAD files of building floor plans shall have **BASE** set to "0,0,0" and the floor plans drawn to the same grid coordinates on each CAD file.

All entities within the drawing file shall have the colours and line types set to **BYLAYER**.

Upon completion of the project, the Consultant is responsible for providing UTAS with a CD or DVD in Windows PC format containing the following information:

"As Constructed" CAD drawing files representing the project "model" in AutoCAD Drawing format (.dwg), constructed in accordance with this document, incorporating all variation orders and site instructions. All drawing entities for each drawing are to be contained in one file, without the use of external reference files. If drawings were originally created with external reference files, the AutoCAD BIND command shall be used to include the external reference file as part of the main file. The **BLOCK** created by this command shall be **EXPLODED**.

All drawing entities are to be drawn in **MODEL SPACE** on the CAD files. Drawing title sheet information will be excepted.

AutoCAD Plot files (.plt) representing all the numbered project drawings and revisions issued during the course of the project. Plot file names are to correspond to the drawing numbering convention as described in section 3.1 Drawing Conventions.

Electronic copies of schedules eg. door & window, hardware, finishes etc., not forming part of the issued drawings.

A text file outlining a list of drawing names used, and a description of each drawing,

The CD's / DVD's are to be virus free when submitted to UTAS and all drawings contained on them are to be purged of superfluous information.

2.2.1 General Drawing Information

Floor Plan(s)

a. Architectural

Floor and reflected ceiling plans are to display the following information, on the appropriate layer(s) as described in Appendix A - Layer Naming Schedule.

- Room names and numbers,
- Fire compartmentation / smoke barriers,
- Fire hose reels, fire extinguisher locations etc,
- Electrical switchboards,
- Courtyards, paths, roadways etc,
- Eaves lines,
- Floor finishes,
- Air-conditioning / ventilation, heating,
- Fixtures,
- Fittings,
- Furniture locations

b. Mechanical / Electrical

Mechanical and Electrical drawings are to be constructed using the UTAS standards.

Mechanical and Electrical drawings are to be based on the architectural floor plan drawings for the project, together with the relevant details on the appropriate layers as indicated in Appendix A - Layer Naming Schedule.

Mechanical drawings are to indicate:

- Air-conditioning outlets,
- Heating, ventilation and associated coil pipework,
- Control equipment,
- Ductwork indicating register, grille and diffuser sizes,
- Schedule on drawings indicating; capacity / flow rates, manufacturer and model of all plant and equipment.

c. Civil / Structural

Civil and Structural drawings are to be constructed using the UTAS Standards, Drawing Numbering and layer naming as per Appendix A - Layer Naming Schedule.

Site Plans

Site plans are to include all features natural and man made, which may impinge on the site in particular; the following items are to be shown:

- All buildings (outlines only),
- Carparks, roads, paths and paved areas,
- Fire hydrants,
- Mains water,
- Natural gas,
- Drainage (sewer and stormwater),
- Reticulation valve boxes,
- External lighting,
- Shrubs, trees and garden beds,
- Retaining walls,
- Bollards,
- Screen walls and courtyards,
- Finished floor levels etc.

The site plan shall also indicate adequate description of buildings (example: Administration Building), site boundaries, street names etc.

The site plan is to be orientated so as the north point will be located pointing toward the top of the drawing sheet

Site Surveys

Should a site survey be required, the documents must be in accordance with the information mentioned in item 2.2.1 Site Plan including contours at appropriate intervals.

The relationship of all features shall be to the total boundaries horizontally (including the centre of adjacent roadway reserves), and to the Australian Height Datum vertically.

The origin of site surveys will vary according to the survey required. The origin will be the point of "best fit" in the lower left hand corner of the drawing sheet and will be related to the Campus survey data that is currently available in GDA 94 format.

There may be a requirement to physically mark the boundaries of the site in accordance with the Licensed Surveyors (Guidance of Surveyors) Regulations 1961 and as amended. The details of the work required should be investigated and confirmed with the Planning and Project Management office prior to the commencement of works.

2.2.2 Building Numbering

Where new building projects are required; the Capital Planning & Management office will issue a unique building number in accordance with the existing building numbering system.

2.2.3 Room Numbering

Room numbers must be shown on the CAD file in MODEL SPACE and as advised by Capital Planning & Management, UTAS Asset Management Services.

2.2.4 Pre-Documentation Site Inspection

Prior to the commencement of any documentation which will alter the physical appearance or function of a building / room / space in any way, a detailed site inspection shall be carried out.

The following items are to be checked on site against current documentation provided by the University:

2.2.5 Existing services.

Existing room numbering shall be checked to determine whether the room numbers noted on room doors match that which is currently documented.

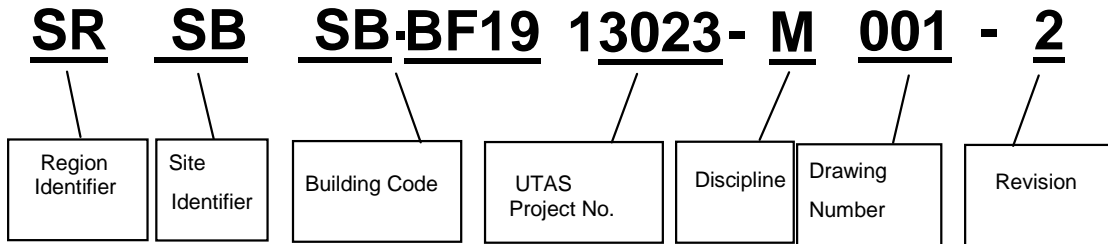
All existing services are to be checked including but not limited to the following:

- Air conditioned areas,
- Mechanically ventilated areas,
- Naturally ventilated areas,
- Heated areas, gas, electric etc,
- Power points,
- Computer network points,
- Telephone points.

3 Drawing Conventions

3.1 Drawing Numbering

All final “As Constructed” drawings are to be numbered in the following format :



Region Identifiers

Alpha Code representing the campus as follows:

Northern Region	NR
North West Region	NW
Southern Region	SR
Other Regions	OR

Examples of Site Identifiers

Alpha Code representing the sites as follows:

Newnham	NH
Anne O’Byrne Centre	AB
Inversek	IR
Launceston General Hospital	LG
Residences North Region	RE

Examples of Building Number

Use Feature Codes as shown below:

SB.AX33	Commerce
SB.AZ16	Humanities
SB.BA22	Life Sciences

Project / Job number (available from the Project Manager for each project)

Discipline, as defined by the following Letter:

Architectural	A
Structural	S
Civil Works inc. Landscaping	C
Electrical inc. Security Services	E
Mechanical	M
Hydraulic	H
Fire Services inc. Fire Alarms	F

Building Number

Building number will be provided by the University.

Drawing Number

A three digit number starting from 001.

3.1.1 Line Weights and Colours

Line weights and colours are to be assigned "by layer" in accordance with the following schedule:

AUTOCAD PEN COLOUR	ASSIGNED LINE COLOUR	PEN THICKNESS
1	Red	0.35
2	Yellow (Do not use)	-----
3	Green	0.50
4	Cyan	0.70
5	Blue	0.13
6	Magenta	0.25
7	White	0.25
8	Grey	0.18

These are the University's preferred line weights and colours. Please provide details of any alternative weights and colours that are used.

3.1.2 Line Types

In ground services are to be drawn using line types as indicated in Appendix A. To indicate additional line types and services, the line types format should be replicated e.g. dashed line with a simple alpha identifier of no more than three letters.

All line types are to be constructed in a 0.18 pen, on the relevant layer with incorporated lettering 2.5mm high.

3.1.3 Layer Naming

The number of layers used is to be kept to a minimum, with the examples of layer names as indicated in the schedule in Appendix A.

All layer names are to commence with the discipline code followed by a brief description of the layer contents.

3.1.4 Character Styles

All lettering is to be constructed in uppercase using ISO3098B font. Should the font not be available on the CAD system used by consultants, a copy of the font is available from the University.

Preferred lettering heights are to be as indicated below:

CHARACTER USE	CHARACTER HT
Titles and drawing numbers	7.0 mm
Sub-titles, headings, view and section designations	5.0 mm
Room Names, Numbers	3.5 mm
Gen notes, material lists and dims	2.0 mm

3.1.5 Blocks

Where practicable, elements of a drawing should be inserted as blocks instead of being drawn as separate entities.

All Blocks to be to the current Australian Standards

3.1.6 Polyline Boundaries

Room / Space Polylines (Floor Plans Only)

Consultants are required to produce polylines to outline the usable floor area for each area type including rooms, circulation areas, internal and external gross areas for each floor level.

The width of the polyline shall be set to 0.00

All area polylines shall be closed polylines.

Requirement	Layer Name	Layer Colour
A polyline on the inside of the external wall and	GROS	Magenta
A polyline on the outside of the external wall of the building.	GROS	Magenta
Polylines defining internal rooms and spaces	RM	Cyan

POLYLINE REQUIREMENTS

Requirement

Layer	GROS
Colour	Magenta

A closed polyline on the external wall (external outline) of the building (does not include colonnades, decks, bridges or other open spaces) and a closed polyline on the inside of the external wall.

Layer	RM
Colour	Cyan

Closed polylines on the internal walls at finished level defining internal areas:

Habitable rooms such as offices, classes, seminar rooms, staff and meeting rooms

Internal corridors and circulation spaces. A new space shall be formed when there is a change of direction or when doors delimit the circulation.

Plantrooms, ducts, lifts and other services, stores, tea, cleaner, toilets and stairs.

Note: These layer names do not conform to the layer naming structure described in Appendix A, as this is a special requirement of Archibus FM, a software product used by UTAS for space management.

APPENDIX A

Layer Naming Schedule for “As Constructed’ drawings.

The building elements listed in the table below constitute the major and key parts of the building which are to be supplied in the “As Constructed” CAD data. The table lists the minimum data expected.

Discipline	Description	Layer Name	Line Type
Architectural	Base	A_BASE	
	Grids	A_GRID	
	Walls	A_WALL	
	Doors	A_DOOR	
	Windows	A_WIND	
	Fixed Furniture	A_FFURN	
	Fixed Equipment	A_FEQUI	
	Roof & Eaves Lines	A_ROOF	
	Demolition	A_DEMO	
	Notes	A_NOTES	

Discipline	Description	Layer Name	Line Type
Structural	Base	S_BASE	
	Footings	S_FOOT	
	Slab Reinforcement Top	S_REOTOP	
	Slab Reinforcement Bottom	S_REOBOT	
	Steelwork	S_STEEL	
	Notes	S_NOTES	

Discipline	Description	Layer Name	Line Type
Civil Works	Base	C_BASE	
	Roads	C_ROAD	
	Top of Kerb	C_TOK	
	Bottom of Kerb	C_BOK	
	Paving	C_PAV	
	Chainage	C_CHAIN	
	Sewer	C_SEWER	
	Stormwater	C_STORM	
	Irrigation	C_IRRIG	
	Water	C_WATER	
	Electrical	C_ELEC	
	Fibre Optic Cable	C_FOC	
	Telstra	C_TELSTRA	----T----
	Permanent Markers	C_PERMARK	
	Contours	C_CONT	
	Boundary Lines	C_BOUNDLN	
	Natural Gas	C_NATGAS	
	Liquid Petroleum Gas	C_LPG	
	Levels	C_LEV	
	Notes	C_NOTES	

Discipline	Description	Layer Name	Line Type
Electrical	Base	E_BASE	
	High Voltage	E_HV	----HV----
	Low Voltage	E_LV	----LV----
	General Lighting	E_LIGHT	
	Power Outlets	E_POWER	
	Emergency Lighting & Exit Signs	E_EXIT	
	Fire Alarms	E_FIRE	
	Computer Cables/Points	E_COMP	----CC----
	Telephone Cables/Points	E_TELE	----T----
	Emergency Warning & Intercommunications System	E_WARN	
	Switchboards	E_SWB	
	Notes	E_NOTES	

Discipline	Description	Layer Name	Line Type
Mechanical	Base	M_BASE	
	Supply Air	M_SA	
	Return Air	M_RA	
	Exhaust Air	M_EA	
	Chilled Water	M_CHW	----MCW----
	Heating Water	M_HTW	----MHW----
	Plant	M_PLANT	
	Mechanical Switch Boards	M_MSB	
	Lifts	M_LIFTS	
	Natural Gas	M_NATGAS	----NG----
	Liquid Petroleum Gas	M_LPG	----LPG----
	Registers	M_REG	
	Notes	M_NOTES	

Discipline	Description	Layer Name	Line Type
Hydraulic	Base	H_BASE	
	Sewerage	H_SEWER	----S----
	Stormwater	H_STORM	----SW----
	Water Domestic Cold	H_DOMESTIC_C	----DCW----
	Water Domestic Hot	H_DOMESTIC_H	----DHW----
	Water Non Potable	H_N-PORT	----NPORT----
	Water Fire Service	H_FIRE	----FS----
	Natural Gas	H_NATGAS	----NG----
	Liquid Petroleum Gas	H_LPG	----LPG----
	Water Ground Irrigation	H_IRRIG	----IR----
	Valves	H_VALVE	
	Notes	H_NOTES	

Discipline	Description	Layer Name	Line Type
Fire Service	Base	F_BASE	
	Fire Sprinkler Heads & Reticulation	F_SHEAD	
	Fire Sprinkler Pumps	F_SPUMP	
	Fire Hydrants	F_HYD	
	Fire Hose Reels	F_HREEL	
	Fire Hydrant Booster Pumps	F_HBP	
	Fire Alarm Concentrators	F_ACON	
	Fire Thermal Detectors & Cabling	F_TDETC	
	Fire Smoke Detectors & Cabling	F_SDETC	
	Fire Indicator Panels	F_IPAN	
	Fire Doors	F_DOOR	
	Smoke Doors	F_SDOOR	
	Fire Dampers	F_DAMP	
	Fire Blankets	F_BLANK	
	Fire Extinguishers	F_EXT	
	Area Decibel Readings	F_ADR	