VOLUME 1

BRIEF FOR SURVEYORS

DEFINITION

In this CADD Manual for Data Exchange, the acronym **FAC** means the Federal Airports Corporation.

In this CADD Manual for Data Exchange, the word **Surveyor** means a firm approved by FAC to prepare as-installed information (which may also be referred to in this or other documents as as-built or as-constructed surveys or information or drawings) for a third party (generally a contractor) which is obliged to furnish such information to FAC.

For the purposes of any contract to which these brief for surveyors may be attached, the word **Surveyor** means the **Contractor**.

1.0 DIGITAL DATA SPECIFICS

1.1 CADD Hardware

FAC uses Intergraph Clipper based workstations and IBM PCs.

1.2 CADD Software

Microstation CADD software running on Unix Operating System, Windows NT and DOS.

1.3 Acceptable File Formats

All CADD data files must be in Microstation **.dgn** format.
Submission of all CADD data files must be in one of the following software formats; in order of preference:-

- Intergraph Microstation UNIX cpio/scpio format, /mnt, fr-flop/to-flop copy, TAR copy format; or
- Intergraph Microstation PC; DOS copy format, and must be in uncompressed form.

1.4 File Delivery Media

Files must be delivered on either of the following media:

- 60 or 150 mb cartridge tape using UNIX SCPIO /CPIO format, or TAR format; or
- High density floppy diskette, 3.5" for DOS copy or UNIX copy format.

Magnetic Media must be labelled and dated, and format type specified on the label.

1.5 Database Information

If any alphanumeric data files have been generated for the project (reports databases, co-ordinate geometry, etc.) these files must be included. Files must be in ASCII format.

Attribute data describing the various facilities will be provided in ASCII format.

1.6 Documentation

The following information must be submitted with the magnetic media:

- Contract number(s) pertaining to each disk/tape;
- List of computer file names with descriptions;
- Drawing name listing (if different from file name);
- Reference files used;
- ASCII file data structure; field character size, description (if any); and
- A hard copy of each file (to permit checking of data integrity during the transfer process).

1.7 Standard Libraries

1.7.1 Cell Libraries

In Microstation, a feature such as a pit, light, etc, can be created as a cell and stored in a library called a cell library. This Microstation feature is used if the symbol is repeated more than once. Sydney Airport is currently collating its symbols and will make available the relevant cell libraries required for the project when it becomes available.

Any symbol not available from FAC at Sydney Airport and created by the Surveyor to produce the drawing must be made available to FAC at Sydney Airport.

Each symbol must be documented with:

- Name of cell;
- Origin; and
- Size.

Standard symbols are documented in the relevant sections.

1.7.2 Pattern Libraries

All services are symbolised using a Microstation command called patterning. Prior to patterning, a line is placed using the symbology as defined in the level specification for each file.

FAC at Sydney Airport will "pattern" or symbolise the lines. Elements that are to be patterned must be placed as line strings in the design file.

1.7.3 Font Library

FAC at Sydney Airport has customised the standard Microstation Font library. Fonts are documented in Appendix 1 - General Symbols.

1.8 Microstation Design Files

1.8.1 File Structure

FAC accepts both 2d and 3d design files depending on the type of data. However, all surveyed information must be presented in a 3d design file.

Reference files are used extensively to compile a drawing. For example, the following information is stored in separate files:

- Water, sewerage, drains, building layouts, border sheets, air-conditioning ductwork, etc; and

- Digitized data and precision input data.

File names for each discipline are discussed in detail in the relevant sections below.

1.8.2 Global Origin

The global origin for all files must be set to the Aerodrome Datum Point (ADP). The coordinate system used is Universal Transverse Mercator MGA94 Zone 56 coordinates, based on the ADP.

The ADP is located at:

MGA94 Coordinates	Geographical Coordinates
N 6242334.670 m	(GDA94 / WGS84)
E 331542.904 m	Lat S33^{o} 59' 45.60078"
Height (for 3d files) = 6.335 m	Long E151^{o} 10' 37.59889"

1.8.3 Working Units

CIVIL

Working area: 429496 * 429496 m
Sub units/Master Units: 1000 mm
Positional Units/Sub Units: 10

ARCHITECTURAL/MECHANICAL

Working area: 429496729 * 429496729 mm
Sub Units/Master Units: 1
Positional Units/Sub units: 10

ELECTRICAL

- APL, cabling
- APL, light positions and orientations
- Elect/communications underground reticulation
- APL, surveyed positions
- High/medium voltage distribution

Working area: 429496 * 429496 m
Sub Units / Master Units: 1000 mm
Positional Units/Sub Units: 10

ELECTRICAL

- Fire alarm files
- Medium voltage installation
- High voltage installations
- Circuit diagrams

Working area: 429496729 * 429496729 mm
Sub units / Master Units: 1
Positional Units/Sub Units: 10

The FAC standard seed files must be obtained and used to ensure these standards are met.

1.8.4 Level Structure

If additional features are picked up and they are not documented in the CADD level specifications, the Surveyor can add these features to the appropriate design file. The design file levels used for the new features must be documented and handed over with the design file.

Sometimes it is not possible to accommodate all the features in the 63 levels of a Microstation design file. When this occurs, the Surveyor must:

- Group elements together, eg, windows and louvres on the same level; and
- For each element that is grouped, ensure that as much as possible, they have unique symbology. Microstation symbology is shown in Appendix 1 - General Symbols, page 2 of 2.

  Eg: windows have wt = 0
  louvres have wt = 1

This enables easier manipulation of elements at a later date.

1.9 Exactly Reproducible

"Exactly reproducible" means that the design files are set up in a way that the data, when plotted, reflect the hard copy plans.

- All pertinent files must be attached as reference files and if essential, clipped and rotated to depict all possible composite drawing configurations in that area.
- The file must contain title block information, design and construction notes, dimensioning etc, using separate Microstation levels.

1.10 Use of Microstation Reference Files

- Elements must be drawn once only and must not be reproduced. Instead, extensive use must be made of reference files.
- When a reference file is attached to a design file more than once, the logical name must be alphanumeric and incremented by one for each attachment.
- The description field must be used extensively for reference files.
- Any rotation of a design file, including reference files must be done around the ADP.
- The rotation angle must be recorded in the file.

1.11 Re-used as Standard (drawings that can be re-used)

- All details which are considered to be standard details should be grouped and drawn in files which are appropriately named.

- The final drawing must be composed as described in sections 1.9 and 1.10 above.

- Any cell libraries, menus, tutorials, user commands, programs, etc, which have been created for use on the project must be documented and handed over to FAC.

1.12 Survey Data

Raw survey data (x, y, z coordinates, etc, and related data, eg, digital terrain models, etc) must be supplied in ASCII format.

The raw survey data must contain :

- Coordinates (Easting, Northing, height);
- Survey codes with description of codes listed separately;
- Point number;
- An indication whether each point is contourable or not; and
- An indication whether each line is a breakline or not.

1.13 Data Integrity

The Surveyor must ensure that all digital data supplied are free from corrupted elements.

1.14 Categories of Digital Data

Survey information must be provided in the format as detailed in Section 3.0, and must conform to the CADD level specification. The drawings listed below will still be required in MicroStation .dgn format; as they do not fall into the same category as survey information:-

- Manhole details (sewerage, drainage, services, telecom etc)
- Cover sheets
- Long Sections, Cross Sections
- Pit details
- Kerb details

The following rules apply to these drawings:-

- In the CADD file, information must be stored on several layers and documented.

- The categorising of the information across several files must be consistent. For example, if two people are drawing a long section on CADD in two different files, the placement of say, the sections must be on the same layer for both files.

- A level specification must accompany each file.

2.0 DETAIL FIELD SURVEY

2.1 Unit of Measurement

The following units must be adopted:-

- Linear measurements must be in metres
- Vertical measurements must be in metres
- Angular measurements must be clockwise from 0 degrees to 360 degrees
- Azimuth must be on the local plane rectangular grid system

2.2 Accuracy of As-installed Surveys

All accuracy stated are 2.45 standard deviation or giving a 95% confidence region of accuracy.

The accuracy of location of information must conform with the following:

Feature	Horizontal Accuracy	Vertical Accuracy
• Stormwater Drains	± 50 mm	± 10 mm
• Service Ducts	± 50 mm	± 10 mm
• Structures	± 25 mm	± 10 mm
• Groundworks	± 100 mm	± 10 mm
• Pavement layers	± 50 mm	± 5 mm
• Grass surfaces	± 100 mm	± 50 mm

Initial checks on neighbouring points and intermediate check rays require a horizontal accuracy of ± 20 mm.

2.3 Survey Control Network

Survey control is maintained throughout the site and is detailed on location drawings and an associated register of coordinates. Copies of these are available on request.

Should the existing control be insufficient to meet the requirements of the survey, further control must be added as necessary. In this event, the Surveyor must submit with the survey, a record of all field measurements associated with the control including:

- Instrument type
- Current calibration certificate
- Dates of observation
- Each individual angle and distance measurement
- Existing control marks used
- All trigonometrical heighting or levelling information
- A record of the adjustments made

The basis for the grid system at Sydney (Kingsford-Smith) Airport is a local plane rectangular grid, based on AMG at the ADP. Levels are referred to Australian Height Datum (AHD).

Field techniques must incorporate adequate and regular checks on the currency and validity of the control used. A record of such checks must be supplied by the Surveyor with the survey information. Because of the frequent presence of heavy machinery and the likelihood of movement, all marks must be checked against other control to confirm reliability.

2.4 As-installed Surveys

As-installed surveys providing a description (size, number of, and material type) and horizontal and vertical locations of the following services and features must be done in accordance with the following requirements:

2.4.1 Services and Utilities

Prior to any backfilling or covering, information on all underground services must be obtained in situ including:

Hydraulic services:

- Sewer pipes and stormwater pipes - invert and surface levels
- Water mains
- Fuel lines
- Gas lines

Electrical mechanical services:

- Electrical cables
- Telecom cables
- Service duct banks

- Communication cables

Where immediate backfilling is essential, suitable lengths of minimum 50 mm PVC pipes vertically plumbed down must be placed onto the service prior to backfilling. The PVC pipes are to be at least 0.5 m above finished surface level, the frequency of placement to be at 25m intervals and at each change of direction and at existing service crossing. The pipe size and colour must be such as not to conflict with other services e.g. electrical. The Surveyor shall number the pipes and maintain a log or marked up plan detailing the service and the service material type that number refers to.

2.4.2 Surface and Above Ground features

Survey information about the following surface and above ground features must be obtained in situ immediately after each part of the work is complete.

Structures - all above/on ground features including (without limitation):

- Buildings, concrete slabs and building detail
- Fences and gates
- Pits and manholes and the like
- Valves and the like
- Headwalls and drainage structures
- Service markers, poles, etc
- Road and site signage

Siteworks and drainage including (without limitation):

- Finished earthworks surface
- Finished pavement surface
- Roads, shoulder edges, kerbs
- Open lined and unlined drains

2.4.3 Buildings

Building internal details including (without limitation):

- External/internal walls
- Toilet partitiions
- External/Internal windows
- Doors (external/internal)
- Ramps/Stairs
- Alterations to column facings/columns
- Toilet facilities - W.C, basins, urinals
- Kitchen facilities - sink, hotplate, etc.
- Floor surface, eg, tiles, carpet

2.4.4 Electrical

Electrical details for building works including (without limitation):

- Switchboard/distribution board layouts
- Material lists
- Manufacturing details
- Installation details/layouts
- Location of power outlets, light switches, light fittings, emergency lights, PA system, EWIS (Early Warning Intercommunication System) and any other electrical equipment.

- Location of telephone or video outlets
- Identification of circuits supplying light fittings power outlets etc

Electrical details for cable reticulation including (without limitation):

- Cable details - size, cores, colour, insulation, route
- Cable identification number
- Cable depth, protection
- Ducting
- Duct numbers and configuration
- Manhole details i.e. conduit entry configuration and manhole numbers
- Cable protection settings i.e. relays, circuit breakers

3.0 PRESENTATION OF DIGITAL DATA

3.1 Presentation of As-installed Survey Data

Survey information must be presented in the following forms:-

- Computer generated (not digitised) or manually enhanced computer plots at scales as per section 5.0 of this document;

- Key plans showing areas covered and services located; and

- Field book sketches showing all located points as well as their relationship to relevant features on feature strings.

3.2 Presentation of Architectural As-installed Drawings.

Text must be in separate file to Detailed/BOMA information.

Information must be supplied in a separate file showing new work only.

Information must be orientated to the ADP.

Plot scale must be 1:100, with text placed for this scale.

BOMA areas must be supplied as "shapes" only. "Complex shapes" are unsuitable for the Corporation's purposes and cause file corruptions.

3.3 Drawing Sign Off

Each as-installed drawing must to be stamped with the Surveyor's company name, must show it is "As Installed" and must be signed off by a person who is a licensed surveyor.

4.0 BOMA SURVEY

Survey of the interior of the International Terminal building must be done to BOMA (Building Owners and Managers Association of Australia Ltd - 1989 Revision) standards.

All sites are measured NLA (Net Lettable Area). Sites are numbered.

Retail sites are measured NLA and GLAR (Gross Lettable Area Retail).

For the apron level, sites are measured NLA and GLA (Gross Lettable Area).

5.0 DRAWING STANDARDS

5.1 Relevant Codes and Standards

Where a drawing standard to be followed is not specified elsewhere, the contents of drawings supplied must conform to the standards as stated below. However, the lettering used must conform to the FAC CADD specification.

AS1000	The International System of Units (SI) (latest issue)
AS1100	Technical Drawing (and all associated parts) - latest issue
AS1102 -	Graphical Symbols for Electrotechnology (and all associated parts) latest issue.

5.2 Drawing Sheets

All drawings must be plotted using a drawing sheet. The sheet sizes used must be B1,A1,A3,A4.
All drawings must have an FAC border, an FAC logo, and an FAC copyright notice.

5.3 Drawing Scales

5.3.1 Preferred Scales

The following scales are preferred;

1:1	1:2	1:5	1:6000
1:10	1:20	1:50	
1:100	1:200	1:500	
1:1000	1:250		

Other scales being multiples of the above (e.g. 1:500 for site plans, 1:2500 for locality plan etc), may be used, provided the written approval of FAC is obtained beforehand.

Text sizes used in drawings that are supplied electronically must be drawn to suit 1:250 scale for civil/electrical drawings and drawn for 1:100 scale for architectural, mechanical and electrical installation drawings.

5.3.2 Specific Scales

Scales for drawings showing the following specific features must be those stated for each feature, below:

- Airport lighting layouts 1:1000
- Airport lighting intersection details 1:500
- Building layouts 1:100
- Underground reticulation 1:250, 1:500

5.4 Layout

Drawings must be laid out to be clear, concise, balanced, well defined, understandable, with minimal duplication of detail and practicable use of reference drawing numbers.

Legends must be located in the bottom right section.

Notes must be placed in bottom right hand corner of drawing, but must not extend closer than 50mm toward title block. For electrical drawings, notes may be placed in any available space on the drawing.

A clear space of 50mm is to be allowed above title block for notations concerning the status of the drawing (e.g. "not for construction", "preliminary", "for tender only", etc).

5.5 Text

Text must be done using distinct uniform letters and figures which will be clearly legible in reproductions from original drawings.

All lettering by electronic methods must be to ISO 3098/ B, DIN 6776 standard.

Vertical characters only must be employed for general use throughout a drawing. Character heights must conform to those indicated in the level specifications.

Red ink must not be used to notate values on as-installed drawings.

5.6 Line Styles

In general, line styles must conform to those indicated in the level specifications.

If a reference cannot be found in the level specification for a particular line style, immediate consultation with FAC must take place.

5.7 Section Marks and Titles

Sectional views must be oriented as for normal views for third angle projection.

Each sectional view or section must be identified with its appropriate cutting plane, where identified, by inscribing a sub-title below the view or section (e.g. Section 1).

All hidden outlines in the sectional view must be omitted.

All drawings must have the details, sections and elevations indicated using the appropriate symbols.

5.8 Abbreviations

Symbols must be inscribed strictly in accordance with appropriate standards. Upper case and lower case letters must not be altered in any way as there may then be a significant difference in their meaning.

Abbreviations must only be used when their meanings are unquestionably clear to the intended reader - WHEN IN DOUBT, SPELL IT OUT.

Care must be exercised in the use of abbreviations to avoid the possibility of mis-interpretation by others reading the drawing.

Upper case letters must be used except where lower case symbols are used for conventional signs and symbols normally using characters (e.g. mm, kg, kPa, etc).

6.0 SUBMISSION OF DRAWINGS AND DIGITAL DATA

Unless otherwise stated in contract documents, in briefs or in instructions to the Surveyor, digital data and drawings must be supplied when a project is 30% complete and again when it is 70% complete.