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**UNSW DRAFTING STANDARDS – SCHEDULE OF CHANGES – Jan 2017**

As a guide only, attention is drawn to changes that have been made in the following clauses since the last revision

Clause	Revision	Date
General revision		
Changes have been made throughout this document. Clauses App 4.8 to 4.9 have been relocated to Section B	Rev 1	August 2004
General changes including AutoCAD version, reference to 3.5 disk removed. Fire compartment details added	Rev 2	December 2006
Changes made throughout document. Separated CAD standards into disciplines	Rev 3	June 2014
General revision /update site services	Rev 4	July 2015
General revision /update site services	Rev 5	January 2017
General Revision,3D Revit requirements, GIS requirements, electronic media & storage format review and UNSW CAD standards template files.	Rev 6	January 2018

## UNSW DRAFTING STANDARDS

**APP 4.1 GENERAL**

The following requirements form part of the University of New South Wales (UNSW) Design and Construction Guidelines and outline the minimum acceptable standards for documents submitted by consultants and contractors for UNSW projects.

**APP 4.1.1 Scope**

All documents created in relation to work carried out on behalf of UNSW Facilities shall be provided in electronic format for all disciplines and services. Documents shall include:

- Drawings
- Operating & Maintenance Manuals
- Equipment/Asset Schedules
- Technical Reports

**APP 4.1.2 Document Transmittal**

All documents shall be supplied with an accompanying document transmittal. The transmittal shall include details of:

- Details of sender
- UNSW Project name
- Date of issue/rev
- Reason for issue
- Acknowledgement of receipt
- Index/description of each item detailing exactly what has been provided
- Supplier Project Name

If the transmittal provided contains insufficient information a Facilities "Document Register and Transmittal" form F16 shall be completed by the sender. Documents will not be accepted until an appropriate transmittal is provided.

Letters identifying drawing disciplines:

A	Architectural
S	Structural
M	Mechanical & Lifts
E	Electrical
H	Hydraulic
DC	Data & Communications
C	Civil & Survey
F	Fire (including Fire Compartment plans)

CAD files shall follow the UNSW naming standard:

**Drawing discipline – Building grid code – floor code** E.g. A-C20-G (Architectural – Building Code: C20 – Ground Floor)

### **APP 4.1.3 Drawings**

Drawings are to be provided in Electronic format with drafting work presentation that is in accordance with Australian Standard AS1100; that is printable to scale, on ISO size sheet which is legible.

Electronic CAD drawings shall be provided in AutoCAD format (minimum version 2010).

The file extension “.dwg” is mandatory.

If additional linked files, being information, or specific software that is contractually inclusively used, eg; such as Building Information Modeling (BIM) are part of performance documentation, then the native file is also required as a deliverable.( 3d Revit models)

### **APP 4.1.4 Operating and Maintenance Manuals**

Operating and maintenance manuals shall be provided in electronic format for all disciplines and services as described in APP 4.1.2. Electronic format copies shall be provided in native files format for each discipline and combined into a single Adobe PDF file incorporating click-able navigation hotlinks between the table of contents and subject headings. Complete manufacturer or supplier catalogue incorporated in a manual may be incorporated or provided as a separate PDF file as necessary.

The Contractor shall provide three electronic copies of each manual.

### **APP 4.1.5 Equipment/Asset Schedules**

Equipment/asset schedules incorporated in operating and maintenance manuals, specific to the project/UNSW, shall also be provided in electronic format as a Microsoft Excel spreadsheet. The format of this spreadsheet shall be consistent with the UNSW Asset Data Template. A copy of this template is available from the CMMS Administrator on request.

### **APP 4.1.6 Technical Reports**

Technical reports shall be provided in hardcopy and electronic format. Electronic format copies shall be provided in native files format for each discipline and combined into a single Adobe PDF file incorporating click-able navigation hotlinks between the table of contents and subject headings. Complete manufacturer or supplier catalogue incorporated in a manual may be incorporated or provided as a separate PDF file as necessary. UNSW Asset Barcode identification shall be included as reference in reports for assets that are barcoded.

### **APP 4.1.7 Information Requests and Distribution**

All documents shall be forwarded to the responsible Facilities Management Works Supervisor for distribution to the relevant persons for checking and approval of the content, such as the design, detail, accuracy and correctness.

Consultants and contractors appointed to carry out work on behalf of the University are requested to familiarise themselves with the documents prior to preparing designs or documents for new work.

In general existing drawings consist of a mixture of hardcopies, CAD files and raster images. General enquiries and requests for information shall be directed to the Facilities Management Works Supervisor via email.

**APP 4.2 ELECTRONIC MEDIA AND STORAGE**

All electronic files shall be provided on USB drive with a drawing schedule. Hand written labels shall not be accepted

All USB's submitted shall be clearly labelled to display the following minimum details:

Heading	Value (Example)
USB No:	1 of 2 etc.
Date:	Date of dispatch
Attention:	UNSW Representative
Project:	Project name, campus, building, room
Details:	USB contents, files, discipline etc.
Contact:	Name and phone no:
Supplier details:	Name of company responsible for delivery

All media submitted for acceptance shall be enclosed in a suitable protective cover to prevent physical damage. Electronic files and media shall be tested for effective operation and scanned for viruses prior to dispatch to Facilities Management.

### APP 4.3 DOCUMENT SUBMISSION

Unless otherwise advised all documents shall be submitted in electronically in accordance with the items specified in these requirements including all Drawings, Operating & Maintenance Manuals, Equipment/Asset Schedules and Technical Reports for all disciplines and services as required.

The submission of documents for review purposes are to be in an electronic file format that is capable of being read without editing in compatible software used by the University.

The review documentation deliverables are to be on USB drive unless specified differently in the contract. Review of work in-progress files shall be supplied in the following electronic formats:

Document Types	File Formats
Drawings	dwg, pdf, rvt
Graphics/Images/Photo's	jpg
Text/Documents	doc, docx
Spreadsheets	xls,
GIS shapefiles	Shp,shx,dbf

### APP 4.4 DRAWINGS REQUIREMENTS

CAD files shall be in AutoCAD drawing (DWG) format. The version required is AutoCAD 2010 or onwards. If AutoCAD is not the contractor's primary software CAD files need to be converted to DWG format. Drawings are to be in 2D format.

3D BIM models should be submitted in Revit format (rvt)

The following drawing requirements must be met:

- All CAD drawings must be drawn as one continuous and uniform plan in MODEL SPACE. PAPERSPACE should only be used as an outlet for the ability to plot
- Plans are to be drawn at the following scales:
  - Architectural 1:1 - 1 drawing unit to 1 millimetre in model space
  - Site Services 1:1000 - 1 drawing unit to 1000 millimetre in model space
- Each CAD drawing file showing building plans is to contain only the plan information for that level.
- Multiple drawings shall not be permitted on one CAD file
- All text, dimensions, drawing reference symbols, hatching and border sheets are to be on separate layers
- Text for services to be in the same layer of the service.
- Text Style to be use: UNSW (Arial), Text height 0.350.
- All Text services to Include: Service identification, Diameter and Material, Example: FSØ100Cu (Fire service, (%%c)100mm Pipe in cooper)
- UNSW Layers must be used as outline in discipline CAD standards – refer to App 4.7 & 4.9
- UNSW Plot Style Tables (.ctb) files will be supplied and must be used, please see attached folder with **(UNSW standards drawing template)** included
- No external references (x-refs) to be used on main drawing (If x-refs exist, they are to be bound and delivered separately)
- All AutoCAD files (plans) must have the base reference set to "0,0,0".
- Revit Drawings shall be prepared at UNSW Revit version. Consult UNSW FM CAD staff for further information on Revit Version.

- Revit Drawings shall be converted to AutoCAD format with all layers as per UNSW specifications.
- All entities in the drawing file must have the colours and line types set to BYLAYER.
- Blocks may be used: Any identical group of entities, objects or symbols in a drawing shall be removed.
- All CAD files are to be accompanied by the corresponding PDF drawing
- All CAD files shall be purged of any unused blocks, fonts, layers, line types, external reference files, objects, images and any non-relevant line work etc. and zoomed to the drawing extents prior to submission.

#### **APP 4.5 FILE FORMAT**

- CAD files shall be in AutoCAD drawing (DWG) format
- The version required is to be no later than AutoCAD 2010
- If AutoCAD is not the contractor's primary software CAD files need to be converted to DWG format delivering UNSW layers attributes.
- Drawings are to be in 2D format
- If drawings were created from a #D model, the model shall be provided in Revit format(rvt)

**APP 4.6 DISCIPLINE SPECIFIC REQUIREMENTS**

External plans, Site Surveys & As-Constructed Services, drawings shall include the following:

Item	What to include	Survey	Architectural	Site Services
Buildings	<ul style="list-style-type: none"> <li>▪ Footprints</li> <li>▪ Basements</li> <li>▪ Facades</li> <li>▪ Awnings</li> <li>▪ Overhangs</li> <li>▪ External Columns</li> <li>▪ Steps &amp; Building Thresholds</li> </ul>	X	X	X
Hardstand Areas	<ul style="list-style-type: none"> <li>▪ Concrete-trafficable or footpath</li> <li>▪ Paving-trafficable or footpath</li> <li>▪ Paving Type:- Terrazzo/Brick/Sandstone/Exposed Aggregate/Pervious Paving</li> <li>▪ Bitumen-trafficable or footpath</li> </ul>		X	
Roads	<ul style="list-style-type: none"> <li>▪ Kerb &amp; Gutters</li> <li>▪ Car Parking Bays</li> <li>▪ Stormwater Pits (Inverts/Pipe sizes)</li> </ul>	X	X	X
Spot Levels	<ul style="list-style-type: none"> <li>▪ Australian Height Datum (AHD)</li> <li>▪ Contours at appropriate intervals</li> </ul>	X	X	X
Trees	<ul style="list-style-type: none"> <li>▪ Showing Trunk <math>\phi</math> / Spread / Height</li> <li>▪ (Trunks greater than 100mm &amp; 3m in height)</li> </ul>	X	X	
Services	<ul style="list-style-type: none"> <li>▪ Any visible service, pit and/or box</li> </ul>	X	X	
Services as constructed	<ul style="list-style-type: none"> <li>▪ New services by layer</li> <li>▪ Services identifiers (pipe, size &amp; Material)</li> <li>▪ Invert levels</li> <li>▪ Services structures</li> </ul>			X
Disused Services	<ul style="list-style-type: none"> <li>▪ All disused services by Layer</li> <li>▪ Services identifiers (pipe, size &amp; Material)</li> <li>▪ Disused Services structure</li> </ul>			X
Features	<ul style="list-style-type: none"> <li>▪ Garbage Bins</li> <li>▪ Seating Benches</li> <li>▪ Fixed Tables</li> <li>▪ Bollards</li> </ul>	X	X	X
Landscape	<ul style="list-style-type: none"> <li>▪ Retaining Walls</li> <li>▪ Gardens/Lawns</li> <li>▪ Top &amp; Toe of banks</li> <li>▪ Statues</li> <li>▪ Fountains</li> </ul>	X	X	X



**APP 4.7 SURVEY & SITE SERVICES LAYER PROPERTIES TABLE**

GENERAL LAYERS		
Layer Name	Colour	Line Type
Bin	82	Continuous
Bollards	2	Continuous
Building	7	Continuous
Building hatch	254	Continuous
Contours	253	Continuous
Detail (anything else not covered)	8	Continuous
Fence	50	Fence
Furniture –seat	253	Continuous
Garden	66	Dashed
Grids	14	Continuous
Grids Text	7	Continuous
Hand railing	254	Fence line 2
Levels	9	Continuous
Roads	25	Continuous
Text (General)	7	Continuous
Vegetation	74	Continuous
Wall	253	Continuous
Wall hatch	254	Continuous
SERVICES LAYERS		
Layer Name	Colour	Line Type
Borewater Main	195	Continuous
BoreWater Treated	211	Continuous
Borewater Irrigation	211	Hidden
Communications	6	Continuous
Disused Services	9	Disused Services
Electrical	1	Continuous
Electrical HV Cable	1	Continuous
Gas	3	Continuous
Sewer	34	Continuous
Stormwater	4	Continuous
Trade Waste	76	Continuous
Water main	5	Continuous
Water and fire	5	Continuous

**APP 4.8 SURVEY / SITE SERVICES REQUIREMENTS – LAYERING GENERAL**

UNSW layers and layer properties shall be included on all UNSW survey and as builds plans. A UNSW CAD standard template files Package will be supplied. this will include DWT, ctb & layers.

UNSW layers shall be applied to all design drawings, working drawings, contract drawings and “As-Constructed” drawings.

No other layers shall be used for Survey or as constructed drawings, than the ones provide on UNSW CAD standards.

If additional layers are needed, layer naming shall follow the procedures in Appendix 1 according to the American Institute of Architects (AIA) which consists of Major Group (1 character) – Minor Group (4 characters) - Modifier (4 characters-optional).

E.g. A-WALL (architectural-walls), A-DOOR-NO (architectural-door-number)

**APP 4.9 ARCHITECTURAL LAYER PROPERTIES TABLE**

Name	Colour	Linetype	Line weight	Description
0	white	CONTINUOUS	ByLineWeightDefault	Layer 0
A-ANNO-DIMS	cyan	CONTINUOUS	ByLineWeightDefault	Architectural - Annotation, Dimensions
A-ANNO-LEGN	cyan	CONTINUOUS	ByLineWeightDefault	Architectural - Annotation, Legends, Symbol keys
A-ANNO-TEXT	cyan	CONTINUOUS	ByLineWeightDefault	Architectural - Annotation, Text
A-ANNO-TTLB	cyan	CONTINUOUS	ByLineWeightDefault	Architectural - Annotation, Border and title block
A-AREA-PATT	white	CONTINUOUS	ByLineWeightDefault	Architectural - Texture or hatch patterns
A-CLNG	white	CONTINUOUS	ByLineWeightDefault	Architectural - Ceiling
A-COLS	green	CONTINUOUS	ByLineWeightDefault	A-COLS
A-DOOR	150	CONTINUOUS	ByLineWeightDefault	Architectural - Doors
A-EQPM	red	CONTINUOUS	ByLineWeightDefault	Architectural - Equipment
A-FLOR-EVTR	10	CONTINUOUS	ByLineWeightDefault	Architectural - Floor, Elevator cars and equipment
A-FLOR-HRAL	10	CONTINUOUS	ByLineWeightDefault	Architectural - Floor, Handrails, guard rails
A-FLOR-STRS	10	CONTINUOUS	ByLineWeightDefault	Architectural - Floor, Stair treads, escalators, ladders
A-FURN	242	CONTINUOUS	ByLineWeightDefault	Architectural - Furniture
A-GLAZ	92	CONTINUOUS	ByLineWeightDefault	Architectural - Glazing
A-ROOF	red	CONTINUOUS	ByLineWeightDefault	Architectural - Roof
A-WALL	50	CONTINUOUS	ByLineWeightDefault	Architectural - Walls
A-WALL-MOVE	50	CONTINUOUS	ByLineWeightDefault	Architectural - Walls, Moveable equipment
A-WALL-PATT	32	CONTINUOUS	ByLineWeightDefault	Architectural - Walls, Texture or hatch patterns

Name	Colour	Linetype	Line weight	Description
S-SITE-WALL	50	CONTINUOUS	ByLineWeightDefault	Structural - Site plan, Walls
S-WALL	yellow	CONTINUOUS	ByLineWeightDefault	Structural - Walls
SPACE-GBA	blue	CONTINUOUS	ByLineWeightDefault	UNSW Space -Gross Building Area
SPACE-GFA	cyan	CONTINUOUS	ByLineWeightDefault	UNSW Space - Gross Floor Area
SPACE-ROOM	green	CONTINUOUS	ByLineWeightDefault	UNSW Space - Net Room Area
SPACE-ROOM-AREA	255	CONTINUOUS	ByLineWeightDefault	UNSW Space -Gross Building Area
SPACE-ROOM-NO	yellow	CONTINUOUS	ByLineWeightDefault	UNSW Space -Gross Building Area
SPACE-UCA	magenta	CONTINUOUS	ByLineWeightDefault	UNSW Space - Unenclosed Covered Area

Name	Colour	Linetype	Line weight	Description
DEFPOINTS	white	CONTINUOUS	ByLineWeightDefault	DEFPOINTS
E-COMM	white	CONTINUOUS	ByLineWeightDefault	Electrical - Communications
E-LITE	white	CONTINUOUS	ByLineWeightDefault	Electrical - Lighting fixtures
E-LITE-CLNG	white	CONTINUOUS	ByLineWeightDefault	Electrical - Lighting fixtures, Ceiling
E-POWR	white	CONTINUOUS	ByLineWeightDefault	Electrical - Major -POWR
F-CO2S-EQPM	white	CONTINUOUS	ByLineWeightDefault	Fire - Equipment CO2
H-HYD	white	CONTINUOUS	ByLineWeightDefault	Hydraulic
I-FURN-CASE	242	CONTINUOUS	ByLineWeightDefault	Interiors - Furnishings, Casework
M-EXHS-DUCT	white	CONTINUOUS	ByLineWeightDefault	Mechanical - Major -EXHS, Minor 1 -DUCT
M-FUME-EQPM	white	CONTINUOUS	ByLineWeightDefault	Mechanical - Major -FUME, Equipment
M-HVAC-DUCT	white	CONTINUOUS	ByLineWeightDefault	Mechanical - HVAC, Minor 1 -DUCT

### APP 5.0 ARCHITECTURAL REQUIREMENTS – LAYERING GENERAL

UNSW layers and layer properties shall be included on all UNSW architectural plans. A UNSW CAD Standards file (DWGs) will be supplied as part of the UNSW CAD standards.

UNSW layers shall be applied to all design drawings, working drawings, contract drawings and “As-Constructed” drawings.

### APP 5.1 ARCHITECTURAL - SPACE LAYERS

In addition to building information, space information is recorded on UNSW CAD plans. This includes room areas, GBA, GFA and UCA. Closed polylines shall be used to define these areas.

Polylines determining UNSW Space shall be placed on the corresponding SPACE- layer as outlined in table below:

Name	Layer Name	Definition
Gross Building Area (GBA)	Space-GBA	Measured from the outside face of exterior walls including any projections such as columns.
Gross Floor Area (GFA)	Space-GFA	Measured from the inside face of the exterior walls including minor projections such as columns. This total is the sum of FECA (Fully Enclosed Covered Area) and UCA (Unenclosed Covered Area).
Unenclosed Covered Area (UCA)	Space-UCA	Measured between the exterior wall and balustrade, edge of paving or cover (roof or upper roof). UCA includes any trafficable uncovered and unenclosed areas such as verandas, balconies, under crofts, car parking stations and attached covered walkways.
Net Room Area	Space-Room	Measured from the inside face of a room or space excluding structural projections such as columns which cannot be useable.
Space Room No.	Space Room No	Displays the room number of a room or a space
Space Room Area	Space Room Area	Displays the area of a room or a space

## **APP 5.2 OPERATING AND MAINTENANCE MANUALS**

Operating and Maintenance Manuals shall be created with a view to addressing operating and maintenance requirements for all disciplines and services including architectural, structural, electrical, mechanical, hydraulic, fire, communications and essential services

Each manual shall include but not be limited to the following items:

- a) A contents index complete with subject headings.
- b) Details of all consultants, project managers, contractors and subcontractors.
- c) A comprehensive system description including drawings or diagrams for clarification purposes, as required.
- d) Operating and maintenance instructions for all plant and equipment including plant faults and failures.
- e) Full details of commissioning, testing, and balancing reports, certificates and warranties.
- f) Manufacturer and supplier information with the installed equipment clearly identified
- g) A register of all maintainable plant and fittings including description, type, make, model, serial no, location, area served and frequency of cleaning and replacement. (Also to be provided separately in electronic format as a Microsoft Excel spreadsheet in accordance with 4.1.5).
- h) Shop drawings, schematic diagrams, wiring diagrams, design data, performance curves, control system details, flow rates, methods of control, measuring and control instruments and their locations, schedules of settings for all control and alarm devices, inputs and outputs to BAS etc
- i) As-built drawings shall be provided in accordance with the standards specified in this document; however hardcopy drawings need not be incorporated in the electronic manual so long as they are provided within the manual.

APP 5.3 DOCUMENT REGISTER AND TRANSMITTAL – F16



Estate Management

# Drawing Transmittal

<b>TO</b>		<b>FROM</b>	
<b>PROJECT NAME</b>		<b>BUILDING/CAMPUS</b>	
<b>MAJOR PROJECTS</b>	<b>CAPEX</b>		
	<b>ENGOPS</b>		
	<b>SIB</b>		

<b>TRANSMITTED BY</b>	<input type="checkbox"/>	<b>Mail</b>	<input type="checkbox"/>	<b>Hand</b>	<input type="checkbox"/>	<b>Facsimile</b>	<input type="checkbox"/>	<b>Courier</b>	<input type="checkbox"/>	<b>Email</b>	<input type="checkbox"/>
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We enclose \*controlled/uncontrolled copies of documents listed below: *(\*circle if applicable)*

DATE OF ISSUE									
<b>DAY</b>									
<b>MONTH</b>									
<b>YEAR</b>									

DRG/DOC/ITEM #	TITLE	REVISION									

DISTRIBUTION/ADDRESS	ATTENTION	NUMBER OF COPIES									

<b>Media/Purpose/Delivery</b>											
<b>A - Approval, C – Construction, I - Information , T - Tender, X - As-Built/Installed</b>											
<b>Media Information:</b>											
<b>A1 - Print, A3 - Print, M - Memory Stick, P - PDF, W – DWG</b>											
<b>Issued by:</b>											

**ADDITIONAL COMMENTS**

**DISCLAIMER**  
 Documents created by The University of New South Wales (UNSW) remain the property of UNSW as does any media issued. All data files have been checked and confirmed as being virus free prior to issue. UNSW does not accept any liability for any damage or disruption to the recipients computer system or any resident files as a result of the use of any files provided.

<b>SIGNED BY THE RECIPIENT</b>		<b>DATE</b>	
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**APP 5.4 GLOSSARY**

Expression	Definition
AS100	Australian Standards for Technical Drawing
AutoCAD 2010	Preferred CAD program
Block	A generic term for one or more AutoCAD objects that are combined to create a single object
Bylayer	A special object property used to specify that the object inherits the colour or linetype associated with its layer
CAD	Computer Aided Drawing (Design/Drafting)
DGN	Standard file format for saving vector graphics from within the Microstation CAD program
DOC	Standard file format for saving documents from within the Microsoft Word program
DWF	For Drawing Web Format. A highly compressed file format that is created from a DWG file
DWG	Standard file format for saving vector graphics from within AutoCAD
DXF	For Drawing Interchange Format. An ASCII or binary file format of an AutoCAD drawing file for exporting AutoCAD drawings to other applications or for importing drawing from other applications.
Drawing Extents	The smallest rectangle that contains all objects in a drawing, positioned on the screen to display the largest possible view of all objects. (ZOOM)
FFL	Finished floor Level
FIC	Facilities Information Centre (located in Building B13 on the Kensington campus)
HP2	Plot file format for saving vector graphics from within AutoCAD.
ISO	For International Standards Organization. The organization that sets international standards in all fields except electrical and electronics.
JPG (JPEG)	Joint Photographics Expert Group standard file format.
Layout	The tabbed environment, in which paperspace floating viewports are created, designed and plotted.
Linetype	How a line or type of curve is displayed.
Lineweight	A width value that can be assigned to all graphical objects except truetype fonts and raster images.
Model space	One of the two primary spaces in which AutoCAD objects reside. Typically, a geometric model is placed in a three-dimensional coordinate space called model space. A final layout of specific views and annotations of this model is placed in paper space
Native File Format	Native file format refers to the default file format that an application uses to create or save files. For example Word and Excel files
Object	One or more AutoCAD graphical elements, such as text, dimensions, lines, circles or polylines, treated as a single element for creation, manipulation and modification. Also called entity.
Object Snap mode	Methods for selecting commonly needed points on an object while you create or edit an AutoCAD drawing
Paper space	One of the two primary spaces in which AutoCAD objects reside. Paper space is used for creating a finished layout for printing or plotting, as opposed to doing drafting or design work. Paper space viewports are designed using a layout tab
PDF	Standard file format for saving documents from within the Adobe Acrobat program
PLT	Standard plot file format for saving vector graphics from within AutoCAD.
Raster	Raster images consist of a rectangular grid of small squares or dots known as pixels
RL	Reduced Level
SMU	Space Management Unit
Viewports	A bounded area that displays some portion of the model space of a drawing.
XLS	Standard file format for saving documents from within the Microsoft Excel program
XREF	A drawing file linked (or attached) to another drawing.
Zoom	To reduce or increase the apparent magnification of the drawing area.