Producing drawings

Drawings are produced on standard sized sheets, ranging from A0 to A4.

Drawings may be made in three ways:

- freehand sketching
- by hand with drafting equipment
- computer assisted using computer software to produce the drawing (computer aided drafting - CAD)

Copying or reproducing drawings

Depending on size, drawings may be reproduced by:

- photocopying
- dyeline reproduction
- computer plotting
- inkjet printing

Ask the teacher to show you some samples

Drawing standards

Engineering drawings and other technical drawings have to be done in ways that all engineers can recognise. These ways are called standards or conventions.

Drawings are made to standard so that they:
use the same symbols, lines, dimensioning techniques etc.
can be understood in different places, that is interstate or internationally.

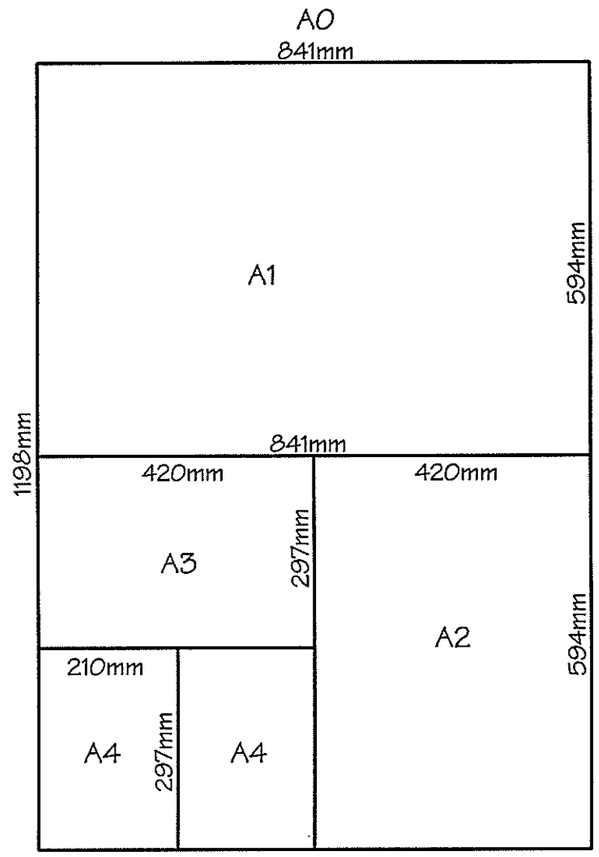
Australian Standards are usually shortened to AS. The drawings in this module are on standard sized sheets as stated in AS1100.
There are several drawing standards available both nationally and internationally. For this module all our drawings should follow the rules of:

- Australian Standard 1100 - Technical Drawing - Part 101 - General Principles
- Australian Standard 1102 - Graphic Symbols for Electrotechnology. (Parts 1 - 15 as appropriate.)

Standard Drawing Sheets

Size

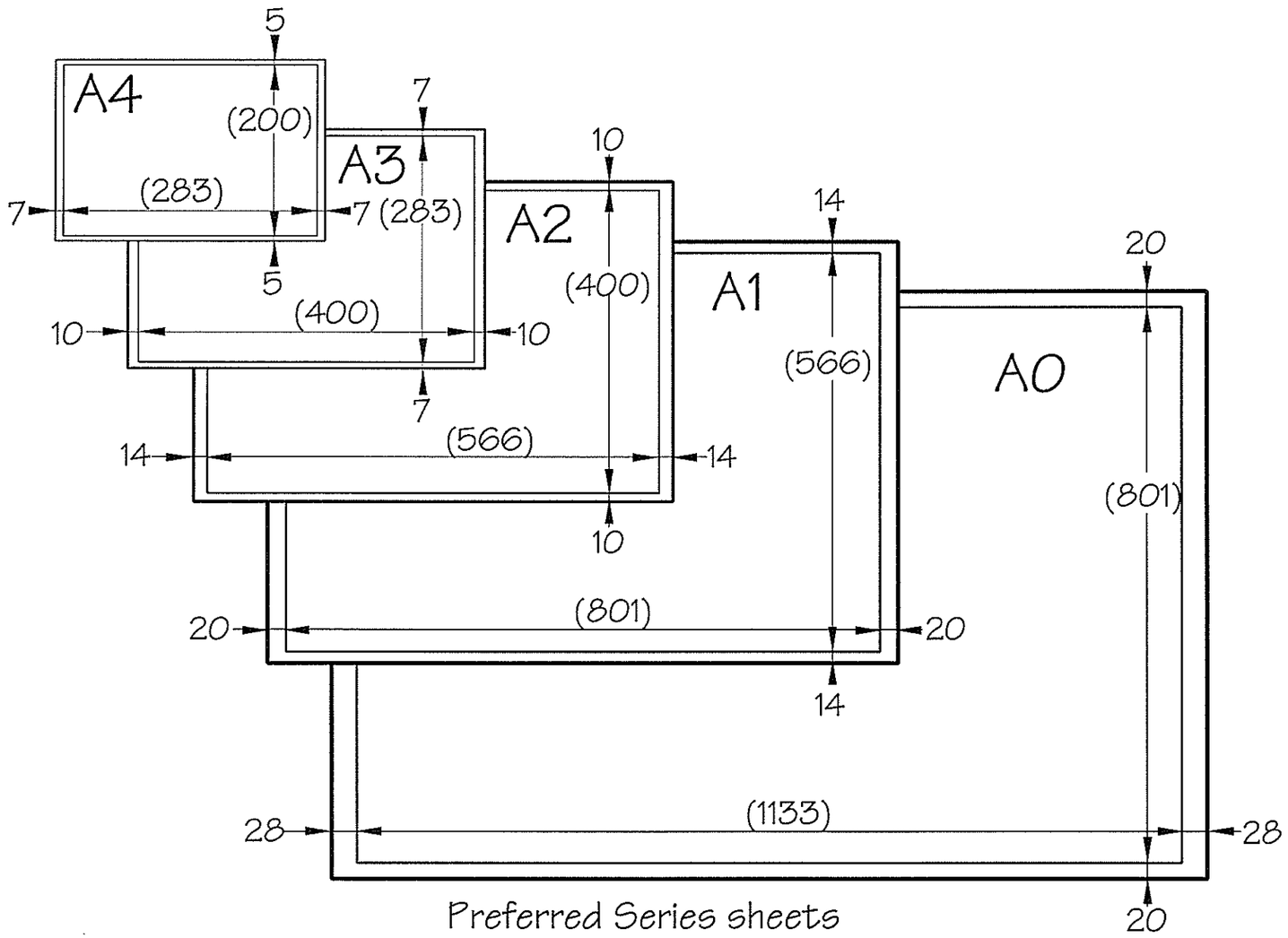
There are five sizes ranging from A0, the largest, to A4, the smallest. As you go from size A0 to size A4, each sheet is half the previous sheet. See the figure shown below.



A0 is 841 x 1198

Border

The suggested border is proportional in size to the size of the sheet. In the drawing below the borders on an A0 sheet are larger than the borders on an A1 sheet, and so on down to A4

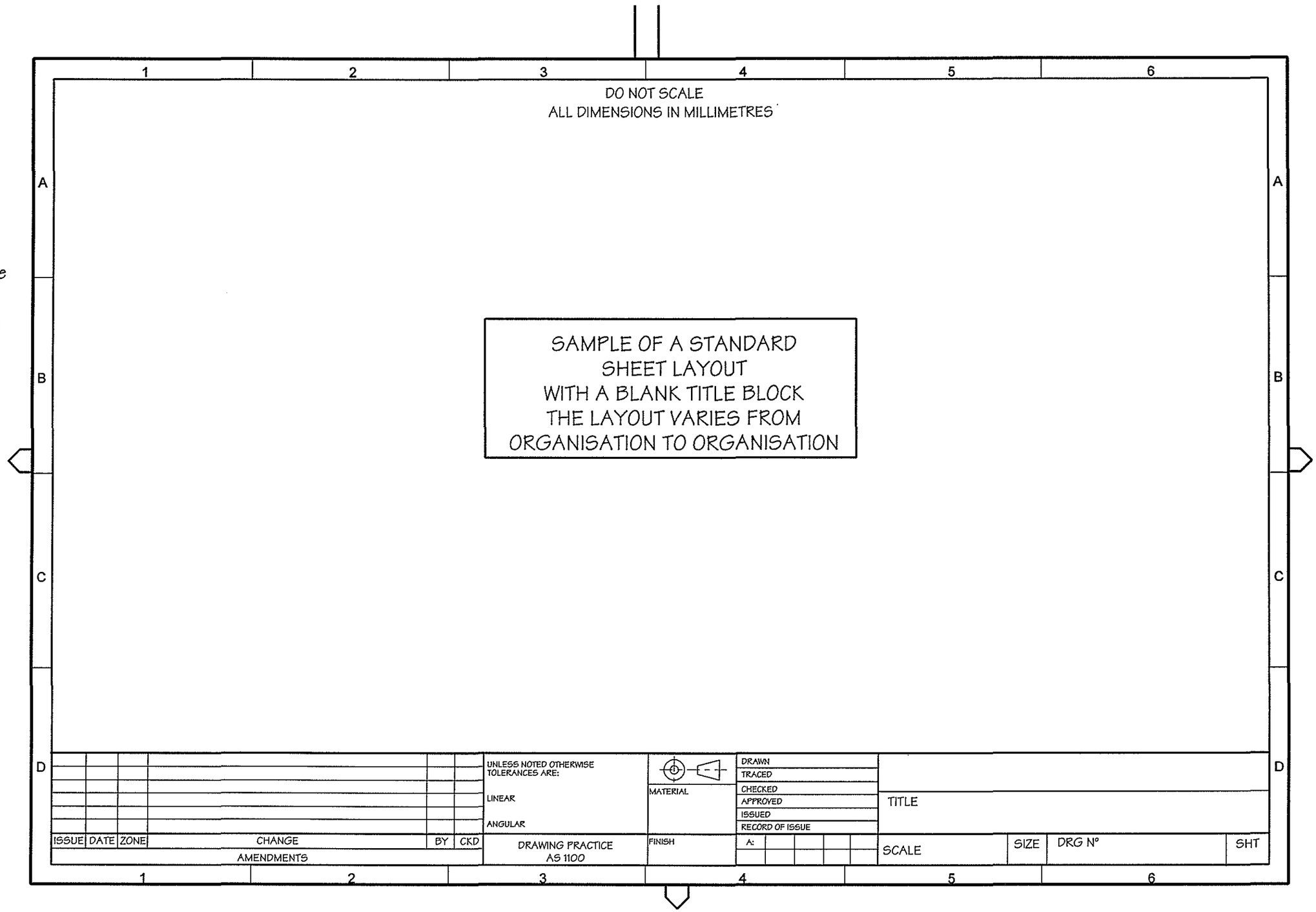


Preferred Series sheets

Title block Information

The title block identifies a range of data relating to the drawing. It includes the name of the company, the name of what is drawn, the drawing sheet number for storage and reference purposes, who drew the drawing, who checked the drawing, and other important information regarding the drawing, along with a history of any changes that have been made since the drawing was originally drawn.

Each company has its own title block.



Parts of a title block

The next few pages will explain what information is conveyed by each part of a title block.

The name of the company

Each company designs its own title block and has quantities of each size of drawing sheets printed.

TAFE ENGINEERING PTY LTD

The above designation has been used as an example to identify drawings used in TAFE, and will be seen on all the examples shown.

UNLESS NOTED OTHERWISE TOLERANCES ARE:		DRAWN	TAFE ENGINEERING PTY LTD				D
LINEAR	MATERIAL	TRACED					
		CHECKED	TITLE EXHAUST DUCTING ASSEMBLY				
ANGULAR		APPROVED					
		ISSUED					
		RECORD OF ISSUE					
DRAWING PRACTICE AS 1100	FINISH	A:	SCALE	SIZE A3	DRG N° 324	SHT 1	
3	4		5		6		

Title

This is a description of what is drawn on the sheet

Below are two examples

UNLESS NOTED OTHERWISE TOLERANCES ARE:		DRAWN	TAFE ENGINEERING PTY LTD				D
LINEAR	MATERIAL	TRACED					
		CHECKED	TITLE EXHAUST DUCT DUCTING DETAILS				
ANGULAR		APPROVED					
		ISSUED					
		RECORD OF ISSUE					
DRAWING PRACTICE AS 1100	FINISH	A:	SCALE	SIZE A3	DRG N° 324	SHT 3	
3	4		5		6		

UNLESS NOTED OTHERWISE TOLERANCES ARE:		DRAWN	TAFE ENGINEERING PTY LTD				D
LINEAR	MATERIAL	TRACED					
		CHECKED	TITLE EXHAUST DUCT FAN SUPPORT SUB-ASSEMBLY				
ANGULAR		APPROVED					
		ISSUED					
		RECORD OF ISSUE					
DRAWING PRACTICE AS 1100	FINISH	A:	SCALE	SIZE A3	DRG N° 324	SHT 2	
3	4		5		6		

Size, Scale and Drawing Number

The drawing number or sheet number may be abbreviated to DRWG N°. or DWG N° and SHT N°.

TAFE ENGINEERING PTY LTD			
TITLE EXHAUST DUCT DUCTING DETAILS			
SCALE	SIZE A3	DRWG N°. 324	SHT 3

Sheet Number. (SHT). Optional. Every sheet in a set of drawings for a particular device or assembly is numbered.

Drawing Number. (DRWG No. or DRG No.). This number is a number given by the company to a particular drawing or set of drawings for something to be constructed. Where sheet numbers are not used drawing numbers are usually in sequence, for example 1010, 1011, 1012, etc.

Size. This is the size of the original sheet that the drawing was drawn on. It is not necessarily the size of the sheet you are looking at because you may be looking at a copy that has been reduced or expanded.

Scale. Not all components or constructions are drawn full size. eg. The plans for a house are not drawn full size for obvious reasons. Hence, large objects are drawn to reduced scale such as ½ full size (1:2), 1/10 full size, (1:10) full size (1:1) etc.

The scale box for full sized drawings are usually marked 1:1 or full size. A half size drawing would be marked 1:2, a 1/10 full size 1:10 and so on.

On the other hand, very small components are drawn larger than full size. eg. Twice full size would be marked as 2:1, five times full size would be marked 5:1 and so on.

Students should now attempt questions 1 to 4 Exercise 1-1 page 14

The next section provides reference material which you may need to refer back to while completing the module.

Drawn, Traced, Checked, Approved, Issued and Record of Issue

(Refer to sample sheet on page 16)

Drawn (Zone D4)

The draftsperson places either their name or initials in this box.

Traced (Zone D4)

The tracer who made the ink tracing places either their name or initials in this box. Tracing has now virtually been replaced by CAD.

Checked (Zone D4)

The person who checks the drawing for accuracy, errors, correct quantities, spelling, safety considerations etc. places their name or initials in this box.

Approved (Zone D4)

The chief design engineer is often the one who goes over the drawings for another opinion and safeguard. They then sign or initial this box.

Issued (Zone D4)

This is the date when, after thorough checking, the drawings are issued to the workshop or subcontractors and construction started or tenders called for.

Record of issue (optional) (Zone D4)

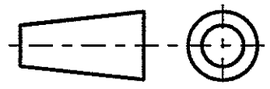
On the sample sheet there are ten small squares for this function. The first issue is A. If any changes or modifications are carried out, this is noted in the amendments box as a later issue B, C, D etc.

The drawings then have to be reissued with the amendment shown as issue B. All issue 'A' drawings, must be destroyed. Any previous 'A' issue drawings that are now incorrect and do not get destroyed could cause catastrophic problems in production.

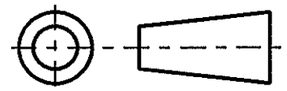
From this it becomes very obvious that it is critical that before making anything, it must be ensured that the drawings being used are the latest issues. Old drawings that have been on the bench, under the bench or in drawers for months or years pose a real threat to industry. All this can be overcome by a simple phone call to the drawing office in most cases. Otherwise if any doubt exists a check should be made with your immediate supervisor.

Projection symbols

First angle projection



Third angle projection



The two symbols shown above represent two methods of placing views on a drawing. Even though Third angle is the preferred or standard for engineering drawings in Australia, some industries still use first angle. It is imperative that both systems are understood so that costly and embarrassing errors are not made. On some drawings, even an experienced draftsperson has to look carefully to determine which system has been used. A comparison between first angle and third angle is demonstrated in the next sheet using pictures of a car.

Material (Zone D4)

This box is for listing the types of material that the object is made from. This can not always be used because there are often a number of objects made from different materials drawn on the one sheet. In this case the type of material will have to be noted under each object.

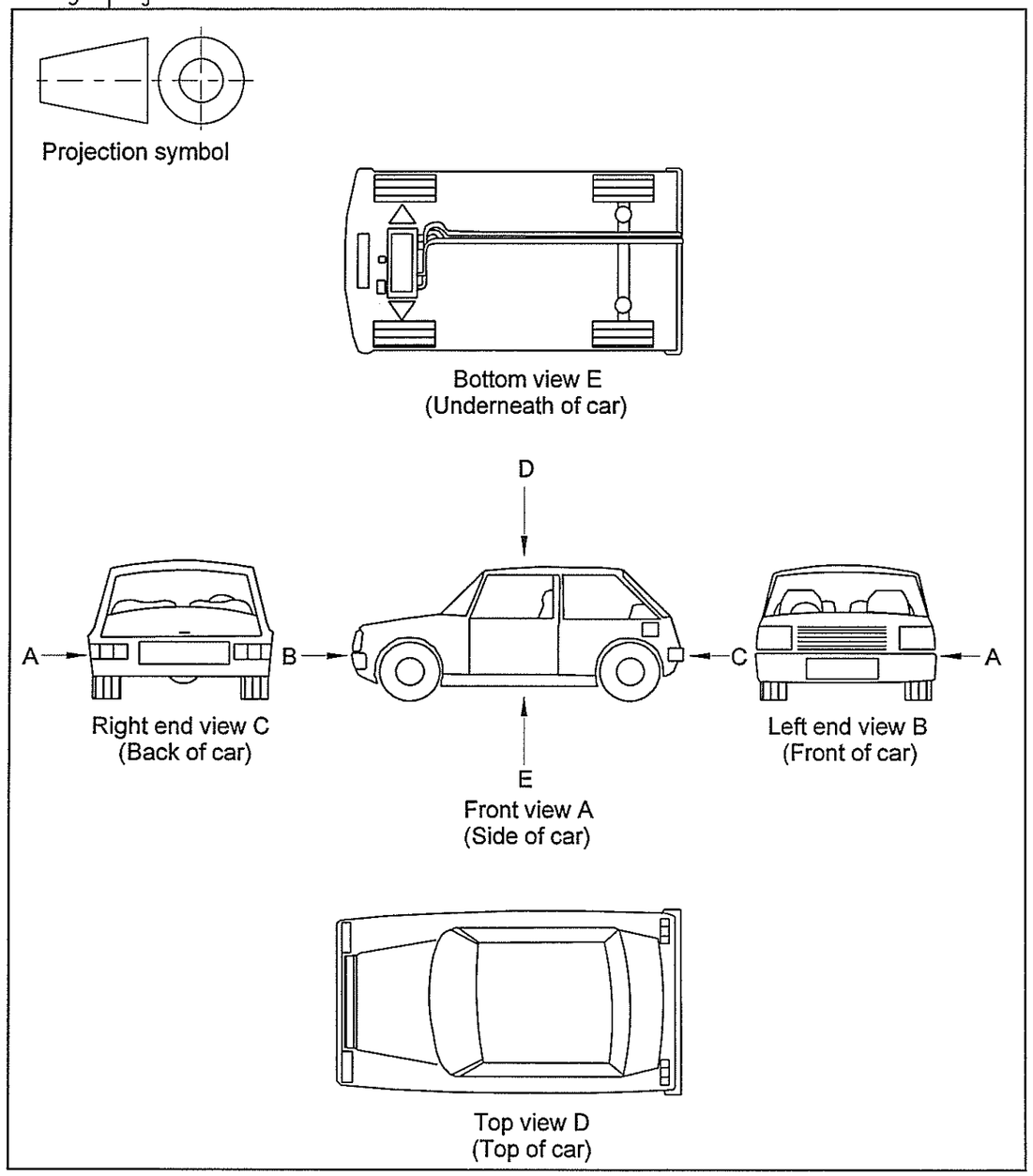
Finish (Zone D4)

The designer of any object must determine how smooth each surface has to be. Most things need to have a range of different surface finishes on them. If the object is basically the same all over the surface finish is placed in the box followed by the letters UNO. (unless noted otherwise)

Students should attempt questions 5, 6, 7 and 8 in Exercise 1-1 page 14

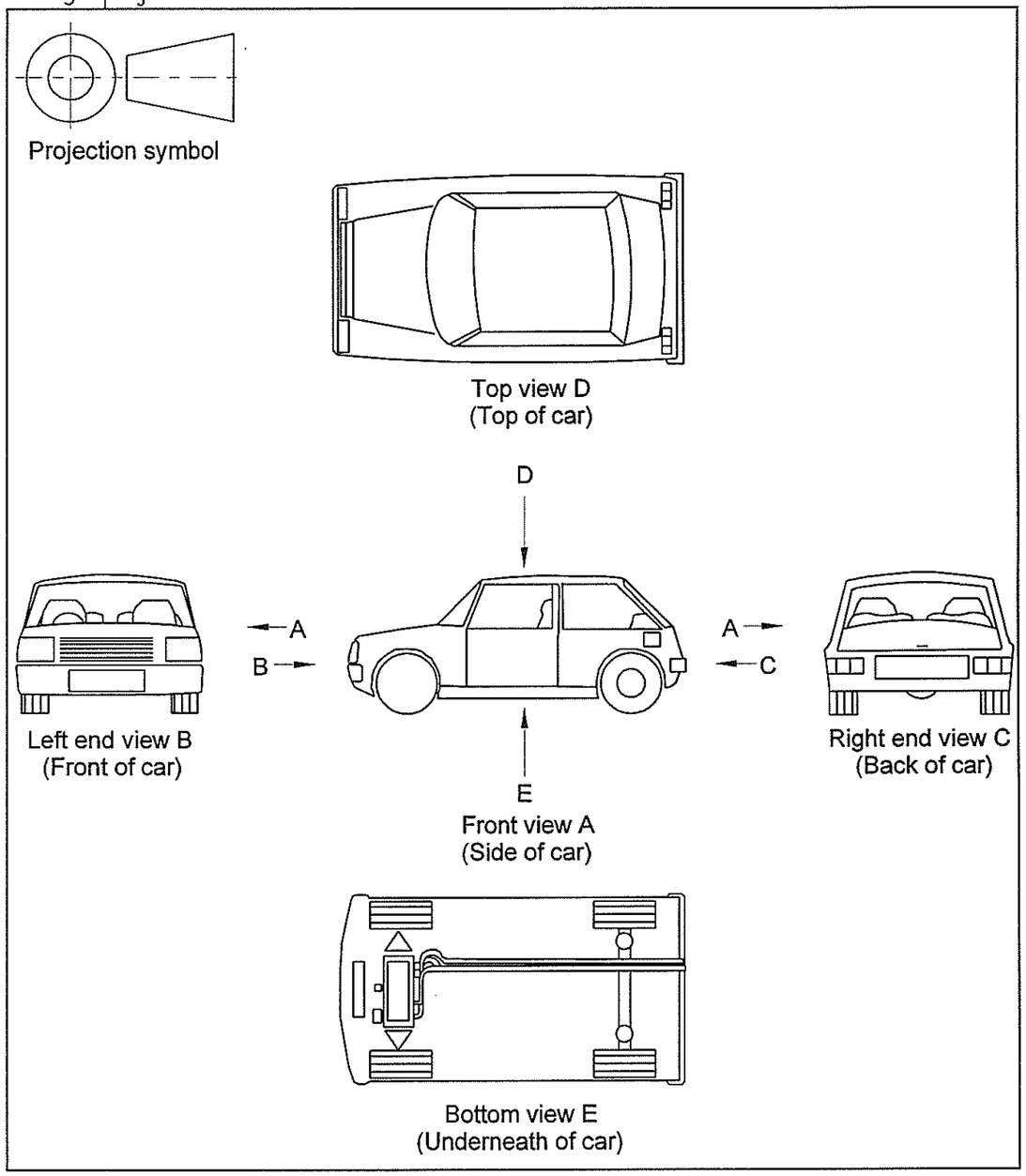
Drawn below is a practical example of first angle projection. Note that the respective view is projected to the opposite side that you are looking at.

First angle projection



Drawn below is a practical example of third angle projection. Note that the respective view is projected to the same side that you are looking at (mirror image).

Third angle projection



Note: All drawings in this book will be using third angle projection.

(Refer again to Drawing No. 5210 - 1A Sheet 2 of 4 on page 16)

All dimensions in millimetres (Zone A3, A4)

This notation saves the draftsperson from having to write 'mm' after each dimension that is placed on a drawing.

Tolerance (Zone D3)

Tolerance is the amount of variation permitted in the size of a component.

Drawing practice (Zone D1, D2)

This box denotes the standard to which the drawing is drawn.

ALL DIMENSIONS IN MILLIMETRES TOLERANCE LINEAR ANGULAR
DRAWING PRACTICE AS 1100

Amendments (Zone D1, D2)

This is a critical area on the drawing. Quite often pieces of equipment or components are modified for a wide range of reasons. When a modification is made and the modified drawing is distributed, it means that there is the possibility that the previous drawing/s are still sitting around somewhere. Unless all earlier copies are recovered and destroyed, there is the possibility that future work could be carried out using the wrong drawing/s.

Note: It is critical when working to any drawing, that it is verified that the drawing is the latest issue before commencing work. Always be careful about working from drawings that look as though they have been around for a considerable time. they may be out of date.

Issues may be recorded using the alphabet; A, B, C, D.... or numerically; 1, 2, 3, 4.....

The date the change has been made is noted.

The next column is designated 'zone'. Zone is where to find the change on the drawing. It is similar to a street directory in that there are letters A, B, C, D down the page and the numbers 1, 2, 3, 4..... across the page. This allows the draftsperson to indicate where to look on the sheet to find the change that has been made. If directly under a number and beside a letter it would be noted for example B4. If between numbers it may appear as B4 or B5 and you would need to look for it. Some companies identify changes by showing the issue in a triangle near to the change. See Zone B3.

Change is where the description of the change in the drawing is placed. It gives a record of what it was originally.

There are a number of columns that will vary from company to company, depending on what they want to record, however, the initials of the draftsperson who drew the change/s and the initials of who checked the change/s is standard procedure.
ECN = Engineering change notice. This is a form issued by some companies to drafters instructing them to carry out the change.

ISSUE	DATE	ZONE	CHANGE	ECN	BY	CKD
AMENDMENTS						

Parts list or materials list (See page 20 for an example Zone D5 and D6)

This box of information is a summary of every component that goes to make up whatever is drawn. Where there are many drawings that make up the full set for a particular construction, there is usually a column that contains the drawing number for each component or components on that sheet.

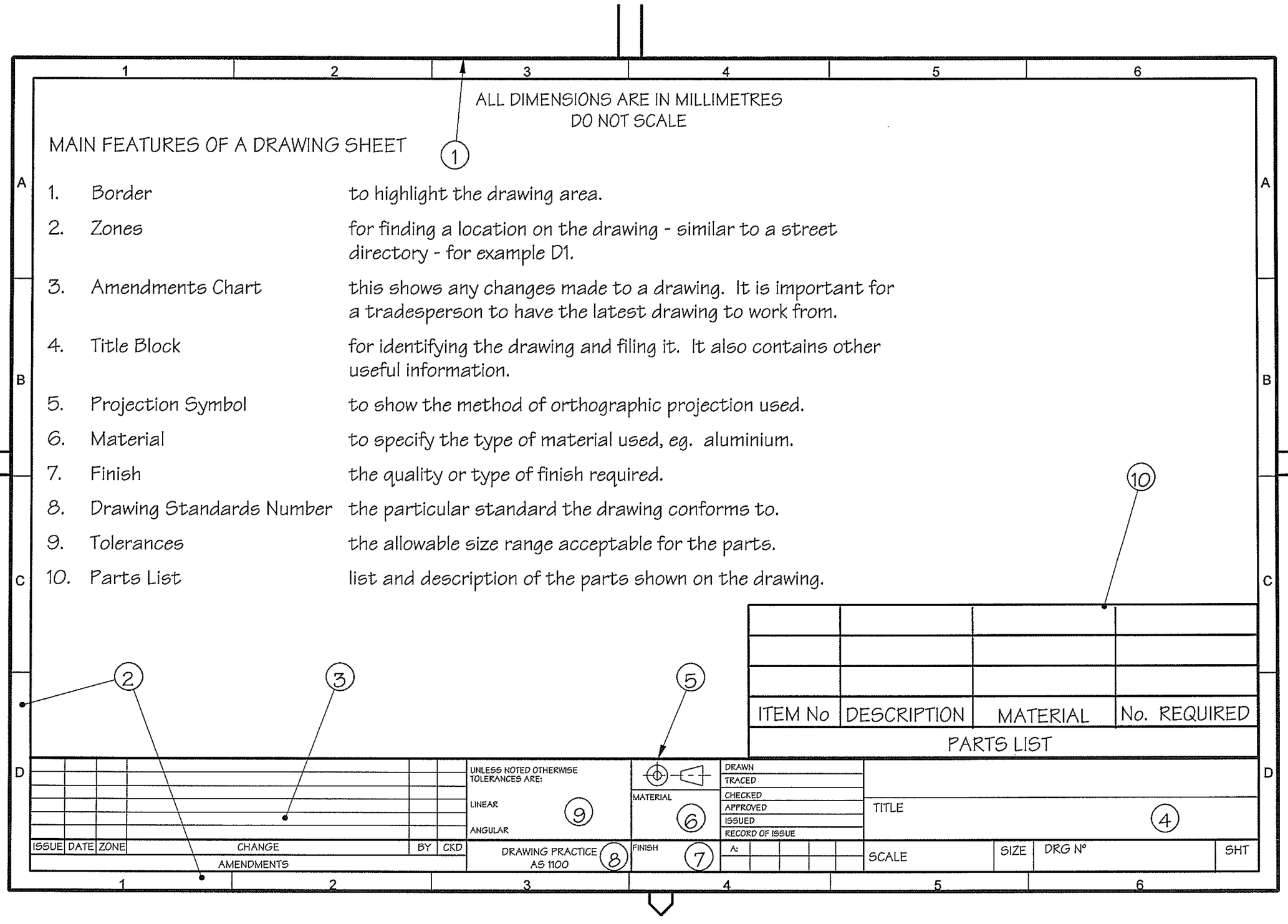
Look at the drawing on the next page for a summary of what has been covered so far.

Students should now complete exercise 1-1 on page 14 and 15

ALL DIMENSIONS ARE IN MILLIMETRES
DO NOT SCALE

MAIN FEATURES OF A DRAWING SHEET

1.	Border	to highlight the drawing area.
2.	Zones	for finding a location on the drawing - similar to a street directory - for example D1.
3.	Amendments Chart	this shows any changes made to a drawing. It is important for a tradesperson to have the latest drawing to work from.
4.	Title Block	for identifying the drawing and filing it. It also contains other useful information.
5.	Projection Symbol	to show the method of orthographic projection used.
6.	Material	to specify the type of material used, eg. aluminium.
7.	Finish	the quality or type of finish required.
8.	Drawing Standards Number	the particular standard the drawing conforms to.
9.	Tolerances	the allowable size range acceptable for the parts.
10.	Parts List	list and description of the parts shown on the drawing.



Student Exercises 1 - 1

Referring to the drawing No. 5210 - 1A sheet 2 of 4, (page 16) answer the following questions.

1. How many drawing sheets make up the full set for the hydraulic punch?

2. What company owns this set of drawings?

3. To what scale is each component drawn to?

4. What size sheet was the original drawing drawn on?

5. When were the drawings first issued?

6. Where do you find out what material each component is made from?

7. In the finish box are the letters UNO. What do the letters stand for and what do they mean?

8. The punching diameter 'C' of the punch can be made to different diameters. Referring to the chart, how many different diameters can be ordered?

9. What is the tolerance on all linear dimensions?

10. What material is the cup seal made from?

11. What is the date of the last issue of the drawing?

12. The material for the cup seal has been changed since the original issue of the drawings. What material was it originally made from?

13. What component is named at zone B5?

14. What Australian Standard has the drawing been drawn to?

15. Is the drawing drawn to first angle projection or third angle projection?

16. Can you tell if the drawing is first or third angle projection from the information in the Title Block (yes/no)

_____

17. How many of each of these components is required when assembling the finished hydraulic punch?

_____

18. What angular tolerance applies to angles on the components?

_____

19. What are the initials of the person who approves the original drawings?

_____

20. What are the initials of the person who checked the latest amendments?

_____

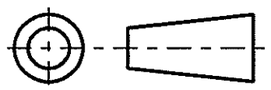
21. How are the ends of the sleeve spring and punch spring to be finished off in manufacture?

_____

22. What drawing number is shown in zone D6?

_____

23. What angle of projection does this symbol represent?



_____

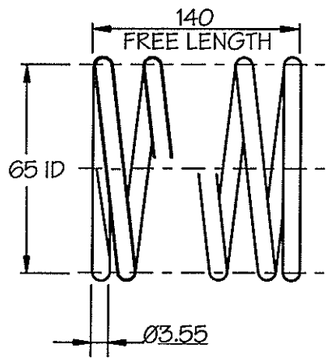
24. What units are all the dimensions in?

_____

25. What is the drawing title?

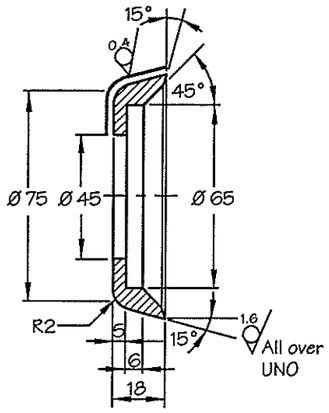
_____

ALL DIMENSIONS IN MILLIMETRES
DO NOT SCALE



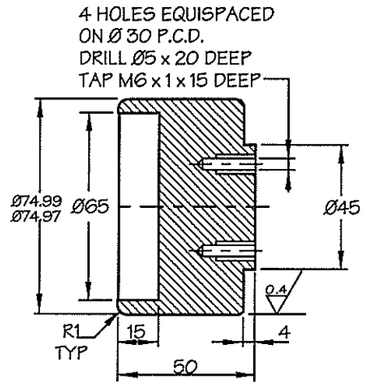
(3) SLEEVE SPRING

MATL - SPRING STEEL
TWO FULL TURNS CLOCKWISE
BOTH ENDS SQUARED & GROUND
REQD - 1 OFF



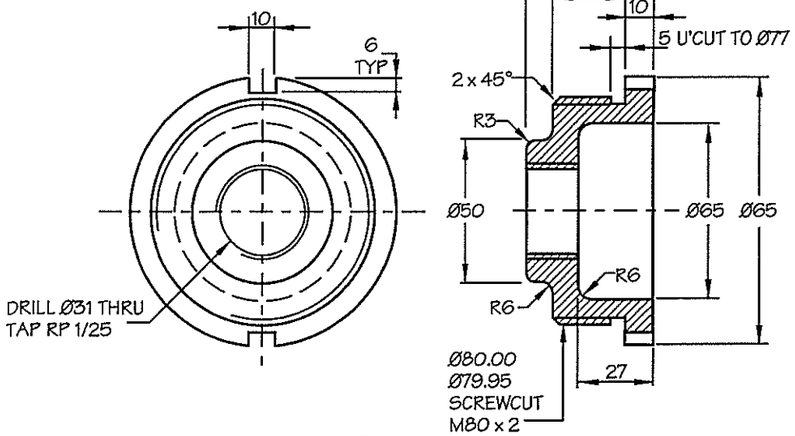
(9) CUP SEAL

MATL - MOULDED NITRILE (B)
REQD - 1 OFF



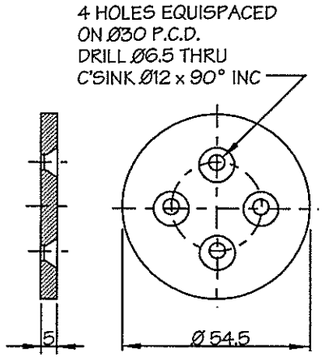
(8) PISTON

MATL - M.S.
REQD - 1 OFF



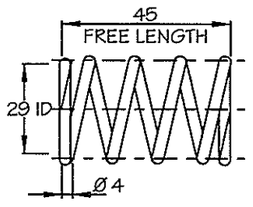
(5) CYLINDER HEAD

MATL - C.I.
REQD - 1 OFF



(10) PACKING PLATE

MATL - M.S.
REQD - 1 OFF

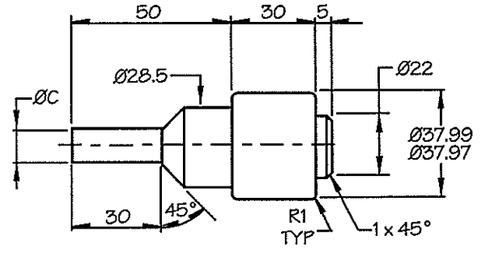


(13) PUNCH SPRING

MATL - SPRING STEEL

3.5 FULL TURNS ANTICLOCKWISE
BOTH ENDS SQUARED & GROUND
REQD - 1 OFF

PART NUMBER	ØC NOM	TOL
P521012	12	-0.01 -0.02
P521014	14	-0.01 -0.02
P521016	16	-0.01 -0.02
P521018	18	-0.01 -0.02
P521020	20	-0.01 -0.03
P521022	22	-0.01 -0.03



(14) PUNCH

MATL - DIE STEEL HEAT TREATED TO BS 1407
REQD - 1 OFF

ISSUE	DATE	ZONE	CHANGE	ECN	BY	CKD
B	18 - 12 - 97	B3	CUP SEAL WAS LEATHER	36975	TAG	DS
A	12 - 12 - 97		ISSUED FOR PRODUCTION		DS	TAG
AMENDMENTS						

UNLESS NOTED OTHERWISE TOLERANCES ARE:

LINEAR ± 0.25

ANGULAR 0° 15'

DRAWING PRACTICE AS 1100

MATERIAL: AS LISTED

FINISH 3.2 UNO

DRAWN	W L				
TRACED	S K				
CHECKED	J D				
APPROVED	A S				
ISSUED	12 - 12 - 97				
RECORD OF ISSUE					

TAFE NSW

MANUFACTURING AND ENGINEERING
EDUCATIONAL SERVICES DIVISION

TITLE: COMPONENTS
HYDRAULIC PUNCH

SCALE	SIZE	DRG N°	SHT
1 : 2	A3	5210 - 1A	2 OF 4