MEM09002B
Interpret technical drawing (Mechanical Edition)
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Reference texts:
Boundy AW
Standards Australia/Institute of Engineering Australia
Standards Australia
Standards Australia Technical Drawing for Students
Engineering Drawing
Engineering Drawing Handbook HB7
AS 1100 Parts 101 and 201
AS 1101 Part 3
HB1

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Topic 1: Drawings

Required skills

- Identify features of the Border, Title Blocks, Revision Block and Parts/Cutting/Material Lists
- Identify an Assembly Drawing, Sub-Assembly Drawing and a Detail Drawing from a list of drawings
- Identify the types of lines used in producing the views on a drawing.

Required knowledge

- Reasons for using drawings in industry
- Standard sizes of ISO drawing sheets
- Features of a drawing sheet (border and associated blocks)
- Lineweights and construction of various lines used in producing a drawing.

Print reading and interpretation

Print reading and interpretation is the study of workshop drawings by having a complete understanding of the terminology specified on a drawing. The tradesperson should be able to translate the intentions of the designer into a functioning component.

The study of this unit will involve “learning by doing”. A working knowledge of the same basic geometrical principles required for workshop marking achieved by the apprentice/trainee producing their own workshop drawings, which conform to the requirements of the Australian Standards 1100 – Drawing Practice.

Initial setting out of these drawings will entail an application of the same basic geometrical principles required for workshop marking off. Drawing a variety of components taken from actual industrial workshop situations, which show proportion, shape and relative location of features, will develop logic and skill in the selection and application of dimensions and specifications. Finer detailing will require the learner to interpret and apply information as presented in trade manuals, data sheets and component catalogues.

It is intended that by the completion of this unit the competent learner will be able to:-

1. Relate the need for proficiency in print reading and interpretation to effective performance as a fitting and machining trade operator.
2. Recognise the importance and advantage of having engineering drawings and documents conform to AS1100.
3. Apply fundamentals of geometric construction to simple marking out applications.
4. Correctly interpret outline shapes of parts from one, two and three-view orthogonal drawings.
5. Extract, from typical workshop drawing prints, detailed information pertaining to:-
   (a) standard tabulated data (b) special notations (c) shape of part (d) sizes and tolerances specified
6. Integrate specific details sufficient to produce a simple dimensioned three-view orthogonal drawing of a typical component.
7. Demonstrate correct interpretation of common symbols and abbreviations used on engineering drawings which conform to AS1100.
8. Identify and correctly translate standard diagrammatic references of common threaded fasteners and relate these references to written specifications.
9. Extract from typical workshop prints of parts drawn sectioned, data specifying:
   (a) internal details
   (b) changes of cross section
   (c) assembly of component parts
   (d) dimensions and tolerances.
10. Correlate details of shape, cross-section, methods of assembly and details of size and tolerance sufficient to draw three-view orthogonal drawings of components and simple assemblies in section.

Purpose of drawings in industry

There are three main reasons for drawings in industry. They are:

Communication

Engineering drawing is the main method of communication between all people concerned with the design and manufacture of components, building and constructions, and engineering projects. Drawing is a form of communication that can be effective between people who speak different languages.

Discussion

Developing ideas and theories and discussing them with colleagues. For instance, a manufacturer might discuss the problems of a manufacturing process with an engineer.

Records

Drawings are kept for:
   (a) extra orders of components
   (b) recording previous specifications
   (c) records of current job specifications in case of faulty manufacture or design.
Types and functions of engineering drawings

The basic types of drawings used in the metal and engineering disciplines are:

(a) assembly
(b) sub-assembly
(c) detail assembly
(d) detail.

Assembly drawings

Assembly drawings contain depictions of discrete sub-systems, and how they fit together. Assembly drawings include a Parts List identifying all of the member details with materials, quantities and supply details.

Assembly drawings only display three overall sizes and any dimension critical for the assembly, eg. distance between gears or shaft centres.

Figure 1.1 Assembly Drawing shows the Assembly of a vintage car and its sub-assemblies consisting of the rear axle, steering, engine, gearbox and brakes.

Sub-assembly drawings

Sub-assembly drawings only show the arrangement of a particular part, or a few parts, of the general assembly. Again, they do not show any fabrication details or dimensions. Sub-assembly drawings show how a part of the job is assembled, not fabricated.

Figure 1.2- Sub-assembly drawing shows the components necessary to assemble a starter motor. The starter motor is one sub-assembly of many sub-assemblies that comprise an engine; other sub-assemblies include the pistons, clutch and generator/alternator.
Detail assembly drawings

A detail assembly drawing shows how all components are assembled and provides all the necessary details, dimensions and joining techniques (including welding) to fully assemble all or part of the project. It has several detailed drawings within it.

- One or more of the components are drawn in more detail
- All the individual components have item numbers, i.e. Item 1, Item 2 etc
- The detail for these components is shown in the assembly drawing or in separate views, or on a separate detail drawing
- All the views necessary to gain a good understanding of the drawing are shown
- The measurements to manufacture the project are given.

Detail drawings

Detail drawings show all the details, dimensions, tolerances, surface finishes, materials and geometric tolerances you need to do the job. Detail drawings only show a part of the job, and do not show the complete assembly of the finished product. Some drawing offices elect to have separate components drawn on individual sheets while others may produce one drawing sheet with the details of all the components required for an assembly.
**Drawing sheet size**

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

AO = 1188 x 840 (1m²)

![Diagram of sheet sizes](image)

**Note:** The ratio of the long side to the short side is $\sqrt{2}$ in all cases.

The standard sheet sizes are:

<table>
<thead>
<tr>
<th>Sheet Size</th>
<th>Landscape</th>
<th>Portrait</th>
</tr>
</thead>
<tbody>
<tr>
<td>A0</td>
<td>1188 x 840</td>
<td>840 x 1188</td>
</tr>
<tr>
<td>A1</td>
<td>840 x 594</td>
<td>594 x 840</td>
</tr>
<tr>
<td>A2</td>
<td>594 x 420</td>
<td>420 x 594</td>
</tr>
<tr>
<td>A3</td>
<td>420 x 297</td>
<td>297 x 420</td>
</tr>
<tr>
<td>A4</td>
<td>297 x 210</td>
<td>210 x 297</td>
</tr>
</tbody>
</table>

Drawings may be made in three ways:

- freehand sketching
- by hand with drafting equipment
- computer assisted (Computer Aided Design - CAD).

**Copying or reproducing drawings**

Depending on the size, drawings may be reproduced by:

- photocopying
- dyeline reproduction
- computer plotting
- computer scanning.

**Drawing standards**

Engineering drawing 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 conventions so that:

- they all use the same symbols, lines, dimensioning techniques etc
- they can be understood in different places e.g. interstate or internationally.

Although there are several drawings standards available both nationally and internationally, for this module all our drawings should follow the rules of:


Australian Standard is usually shortened to AS. The drawings in this module are on standard size sheets, as stated in AS 1100.