Concepts I
Principles of Engineering Drawing

Tuesday 1st Week

Introduction

- Today it is common for a part to be designed in one country, manufactured in another and assembled in a third
- This can be done efficiently with engineering communication via drawings
- Engineering drawings communicate product design and manufacturing information in a reliable and unambiguous manner regardless of language
- Information in engineering drawings are a legal specification that carry a binding contract

Standards

- Engineering drawings are a language in its own right
- As in any language certain rules (or standards) must be followed
  - Defines how shape and form of object is to be represented [i.e., the order of orthographic views and different line types]
  - Defines how the part is to be dimensioned and toleranced
- Standards are updated on a 5 year basis

BSI - British Standards Institute

ANSI- American National Standards Institute

DIN - Deutsches Institut fur Normung

ISO - International Standards Organization

Engineering Drawing Requirements

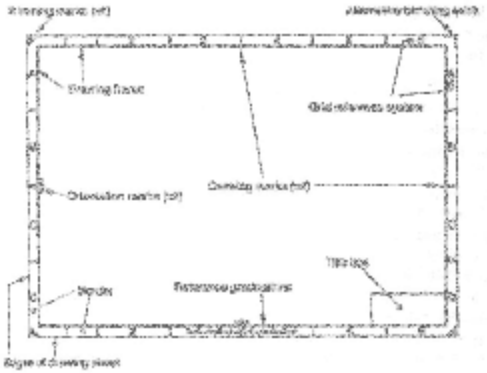
- Unambiguous and clear
  - [only one interpretation possible]
- Complete
  - [Provide all information for all stages of manufacture. i.e., detailed drawings, assembly drawings, bill of materials]
- Suitable for duplication
  - [Suitable scale and clarity that the drawing can be copied – even micro copied – with out losing quality]
- Language independent
  - [Words dependent on a language should only be used in the title block; words should be replaced by symbols]
- Conforms to standards
  - [Highest standards are ISO as numerous countries learn these rules]

Types of Drawings

- Design Layout Drawing
  - Represents broad principles of feasible solution
- Detail Drawing
  - Single part drawing containing all information for fabrication
- Assembly Drawing
  - Shows how individual parts are combined, refers to parts list]
- Arrangement Drawing
  - Shows finished arrangement of assemblies, includes functional and performance requirements
- Diagram
  - Drawing depicting the function of a system
- Parts List [Bill of Materials]
  - A parts this including material, number and provides reference number
- Drawing List
  - Cross references drawings that all combine to produce an single product

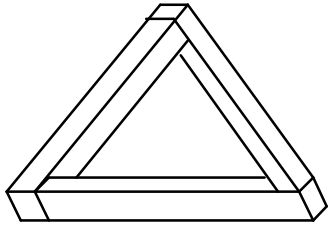
Layout

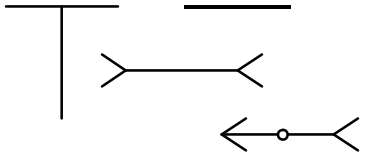
- Conventional ‘A’ sizes of drawing paper
- Blank drawing sheets contain the following
  - Title block
    - [includes organization, drawing number, title, date, name of draftsman, scale, copyright, projection symbol, units, reference to standard, sheet number, number to total sheets]
  - Frame
  - Centering marks
  - Orientation marks
  - Metric reference graduation
  - Grid reference
  - Trimming



Illusions

- Despite rules in defining a language, whether spoken or drawn, errors can be made
- 3-D objects presented in 2-D paper can lead to confusion and even illusion

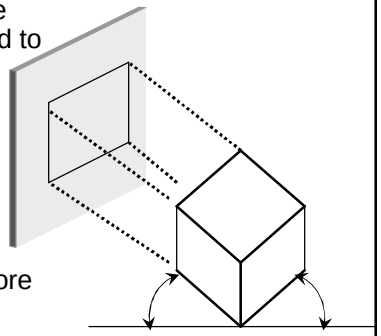




- Engineering drawings ignore perception by representing objects in orthographic projections [series of 2D images on 2D paper]

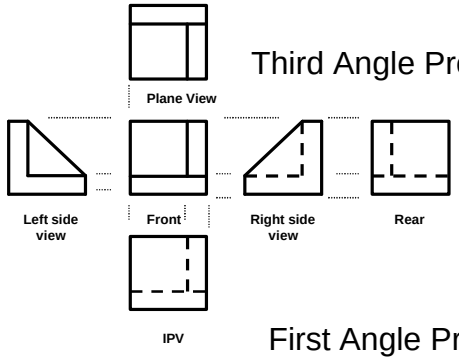
Projection Methods

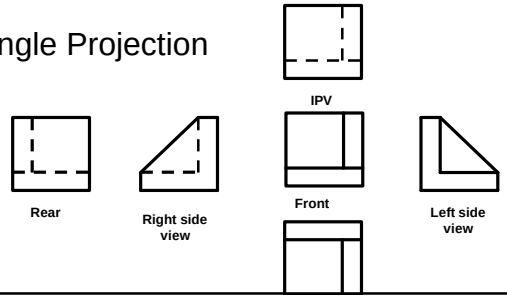
- Isometric projections
  - Represents how a 3D object appears on 2D paper using three equal angles
  - Useful for giving manufactures some perception of the object, but not used to convey manufacturing information



- Orthographic projections
  - Front face always parallel to frame, projections are perpendicular therefore receding faces are not seen

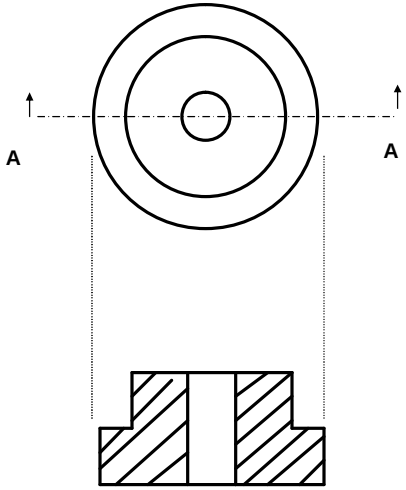
Orthographic Projections





Sectional Views

- When parts are have complex internal geometries knowing the interior is as important as knowing the exterior



Number of Views

- Maximum 6 views
- Minimum 3 views
- Typical 4 views
- Central view is always the front view
- Engineering drawings can be produced by hand or by computer
- We will begin with hand drawings for two weeks then move into computer aided drawing