Importance of engineering drawing in Prototyping

In the product development, prototype helps in evaluating the feasibility of design and performance which helps to take decisions for necessary modifications

Engineering drawing play a major role in validating the design and developing the prototypes. By providing detailed visual representation, and comprehensive details including dimensions, tolerances and material specifications, these drawing help identify and fix defects in the design early in the process ensuring that the final products meet all requirements and reduce risk of errors during production.

In the prototyping and product development process, engineering drawing act as a Universal language for effective communication among designers, engineers and manufacturers.

Engineering drawings are useful records of all design changes and revisions. They help as a future reference for repair, maintenance, and improvement. These drawings also serve as important documents to show how the design was developed and followed properly.

With the integration of CAD (Computer-Aided Design), engineering drawings have become more accurate, faster to create, and easier to modify. This also allows for 3D visualization and easy sharing of files, improving design quality.

Drawing standards in engineering drawing

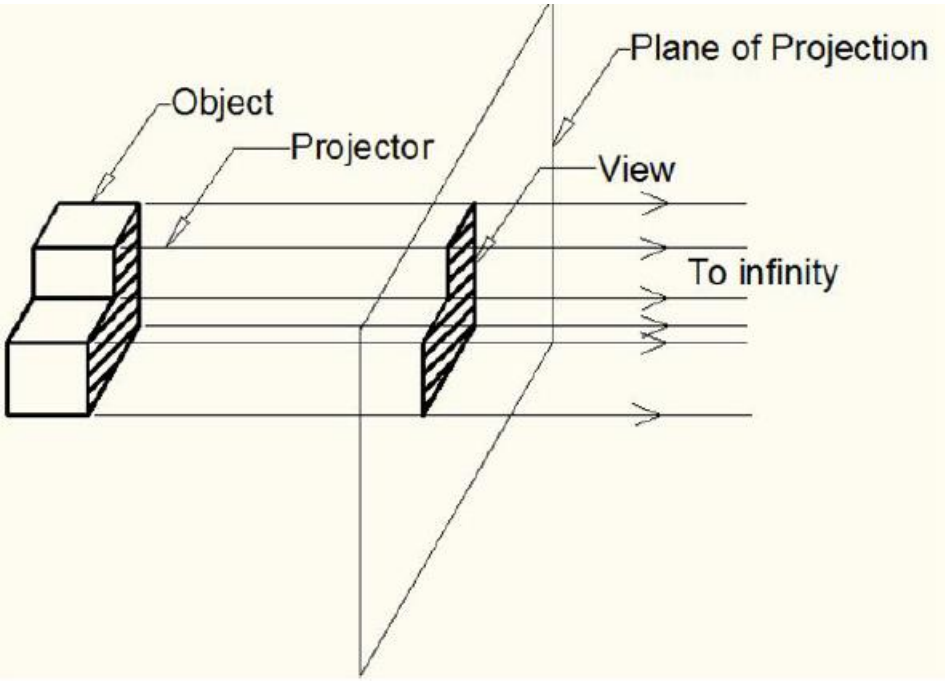
An engineering drawing should be well specified and universally acceptable. There are some specified rules for engineering drawing. Engineering drawing follows certain codes of practice. International Organisation for Standardisation (ISO) recommended international standards for engineering drawing.
Each country has its own standard organisation. In India, the Bureau of Indian Standards (BIS) is engaged in the preparation and implementation of standards, operation of certification schemes both for products and systems, organisation and management of testing laboratories, creating consumer awareness and maintaining close liaison with international standards bodies.
Following drawing standards in engineering drawing is important for clear communication among all stakeholders. It ensures that symbols, dimensions, and notations are universally understood, reducing the chances of errors and misunderstandings. This helps maintain accuracy, improves efficiency, and ensures that the design can be correctly manufactured anywhere.

Projections and type of projections

Projection: Defined as an image or a drawing of an object made on a plane. All drawings used in the engineering are based on the principles of projection.

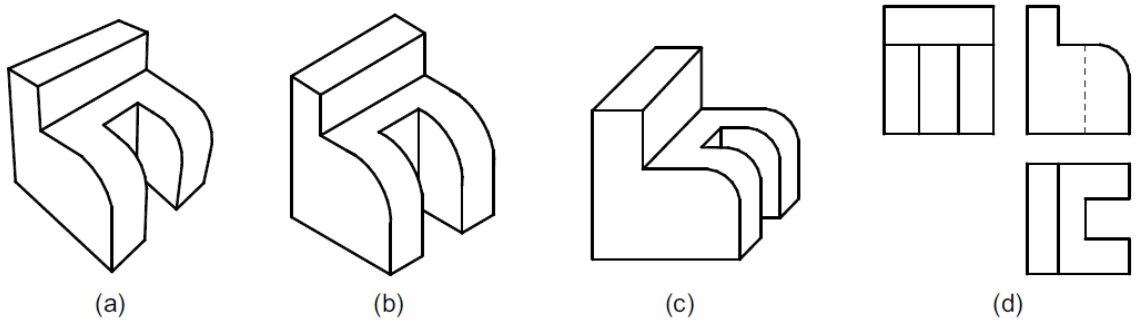
If straight lines are drawn from various points on the contour of an object to meet a plane, the object is said to be projected on that plane. The figure formed by joining in correct sequence,

the points at which these lines meet the plane, is called the projection of the object. The lines from the object to the plane are called projectors.



In Engineering drawing following four methods of projection are commonly used. They are:

a) Perspective Projection
b) Isometric projection
c) Oblique projection
d) Orthographic (Multi-view projection)



In the above four methods, Perspective, Isometric and Oblique projections represents the object by a pictorial view as eyes see it and the Orthographic projection is a multi-view drawing which represents a three dimensional object in two dimensions.

In Oblique, isometric and perspective projections, a three dimensional object is represented on a projection plane by one view only. While in the orthographic projection, an object is

represented by two or three views on mutual perpendicular projection planes. For the complete description of the three dimensional object at least two or three views are required. Hence Orthographic projections (which are multi view drawings) are universally adopted.

But to read the orthographic drawings, thorough understanding of the principles of projections and a great practice of interpreting multi-views are required.

Definitions:

Perspective projection: Object is viewed as the human eye sees it, with the lines converging at one or more vanishing points to give a 3D appearance.

Isometric projection: object is tilted so that all three axes (length, width height) are equally inclined at 120^{o} and the dimensions are drawn to scale without distortion.

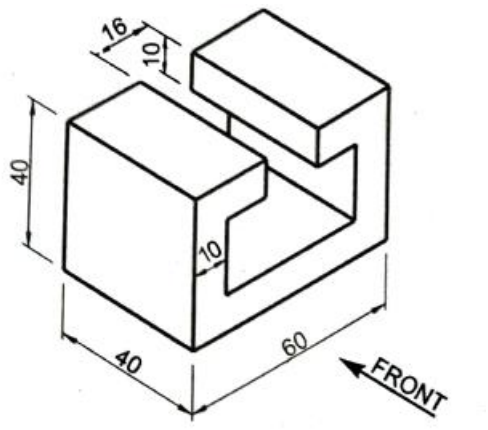
Oblique projection: Front face of the object is drawn in true shape, and the depth is represented by lines drawn at an angle (usually 45^{o}) making it easy to sketch but slightly distorted

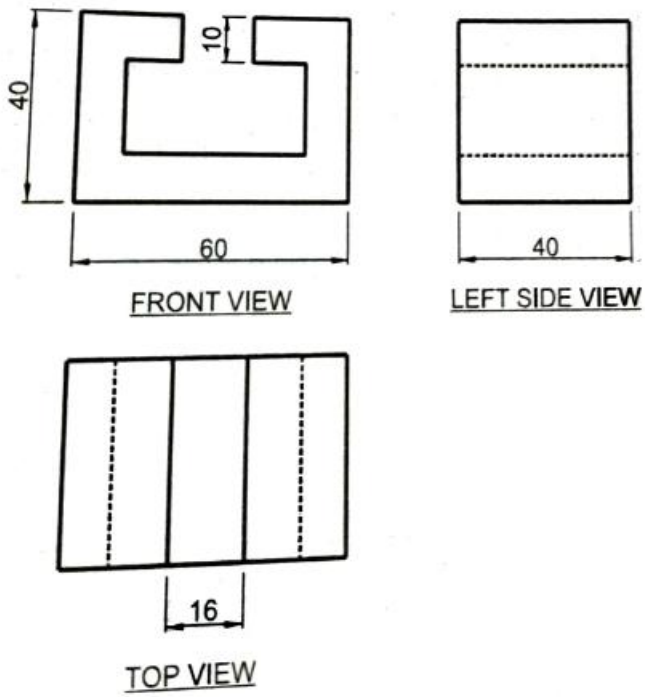
Orthographic Projection: representing an object through multiple 2D views (like front, top, and side) where each view shows one face of the object without any perspective distortion.

Six standard views in Orthographic projection:

1. Front view
2. Top view
3. Left hand side view
4. Right hand side view
5. Back (Rear) view
6. Bottom view

Draw an orthographic projection of a simple object and label its views correctly.





Role of CAD and CAM in reducing production time and errors

Computer-aided design is the use of computer systems to aid in the creation, modification, analysis, or optimization of a design.

Computer aided manufacturing is an application technology that uses computer software and machinery to facilitate and automate manufacturing processes.

CAD is used to make and change designs on a computer, which saves time and reduces mistakes in drawing. CAM uses these designs to control machines automatically, making the work faster and more accurate. When CAD and CAM are used together, there are fewer chances of errors, and changes in design are easily updated in the manufacturing process. This helps to finish products faster with better quality.

Users can easily send CAD designs to the CAM system without problems or errors. In some systems, if you change the CAD design, the tool path in the CAM system updates automatically.