Definition & Types of Technical Drawing

eBook

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- **Definition of Technical Drawing.**
- **Types of Technical Drawing:**
  - **Parallel Projection (Orthographic, Oblique, and Axonometric).**
  - **Perspective Projection (1 Point, 2 Point, and 3 Point).**
- **Objectives of Technical Drawing.**
- **Purpose of Technical Drawing.**
- **Application of Technical drawing.**

Excerpt: This 17-page eBook contains information along with eleven figures that explain the definition of technical drawing; the types of technical drawing which include parallel projection (orthographic, oblique, and axonometric) and perspective projection (1-point, 2-point, and 3-point); the objectives, purpose, and application of technical drawing. The last page has a link to hundreds of images of objects in 2 & 3 dimensions, under different types of projections.

1.0 Definition of technical drawing

Technical drawing can be defined as an elaborate graphic representation of an object, concept, or idea through a universal language or code of practice that uses scales, graphic symbols, dimensions, and perspectives, either with the aid of drawing equipment/tools, freehand, or computer-aided design (CAD).

Technical drawing is used in many professions to draft ideas and different views of physical objects like drainages, culverts, septic tanks, incinerators, houses, etc. Drawing—either artistic or technical—is one of the oldest forms of communication, and is even believed to be older than verbal communication. Generally, there are two types of drawing: artistic drawing, and technical drawing.

Artistic Drawing

Artistic drawing is the type of drawing that is abstract because its meaning is in most cases unique to its creator or the person/artist who creates it. In order to understand the meaning of an artistic drawing, one has to understand the artist's point of view or motivation for producing a particular artistic drawing.

Sometimes, it is necessary to understand an artist in order to understand their artistic drawing because artists often take a unique/abstract approach when communicating through their drawings. This type of approach gives rise to various interpretations when their drawings are exposed to public view.

Regardless of how complex artistic drawings may appear, they express the clear feelings, beliefs, philosophies, and ideas of the artists who create them. Artistic drawings are generally freehand drawings or drawings created without the use of drawing instruments/tools.

Technical Drawing

Technical drawing, on the other hand, is the type of drawing that is not abstract because everyone who uses it, understands it, owing to the obvious fact that universally or widely accepted drawing instruments/tools must be employed in creating it (i.e., the drawing). In order to understand a technical drawing, one does not necessarily have to understand what its creator has in mind; rather, one needs to have a good understanding of the symbols, perspectives, scales, and universally accepted tools, codes, and conventions that are used in creating or producing technical drawings.

In addition to the previously stated definition of technical drawing, we can say that technical drawing, clearly, precisely, and concisely communicates all important information conveyed by an idea produced in graphic form by the use of universally accepted codes of practice, tools, dimensions, notes, symbols, and specifications.

Technical drawing can be done manually on paper, or technologically with the use of computers. When any idea or object is drawn/drafted on computer, it is called computer-aided drafting (CAD). One major advantage of using CAD is that revisions of drawings can be easily and speedily carried out on any draft.

Any student, architect, engineer, etc., must understand the theory behind projections, dimensioning, and conventions if they wish to become proficient in drafting and interpreting drafts. It is very important for people to understand manual (traditional) drawing/drafting before exposing themselves to CAD softwares because understanding manual drawings would make it easier to use CAD.

2.0 Types of technical drawing

Technical drawings are constructed on the basis of the fundamental principles of projection. There are two main types of technical drawing or projection: parallel projection, and perspective projection. (Note that each projection has various categories which will be illustrated further below.)

A projection is any drawing, draft, or representation of an idea or object that is carried out after considering views from various imaginary planes. Projections, which are quite similar to the direct views that one can see on televisions, can be used to represent actual objects if the following are employed:

- the eye of the viewer looking at the object.
- an imaginary plane of projection as dictated by the direction of the eye(s) of the viewer.
- projectors or imaginary lines of sight.

The theories of projection have been used to draft 3-dimensional objects on 2-dimensional media such as papers and computer screens. It is based on two variables:

- line of sight.
- plane of projection: the planes from which images can be projected—depending on the axis.

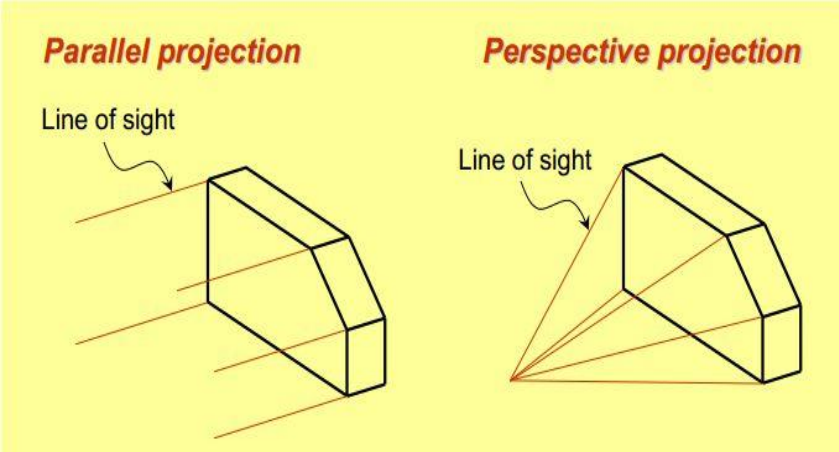

Figure 1: Lines of sight: parallel, and perspective projections

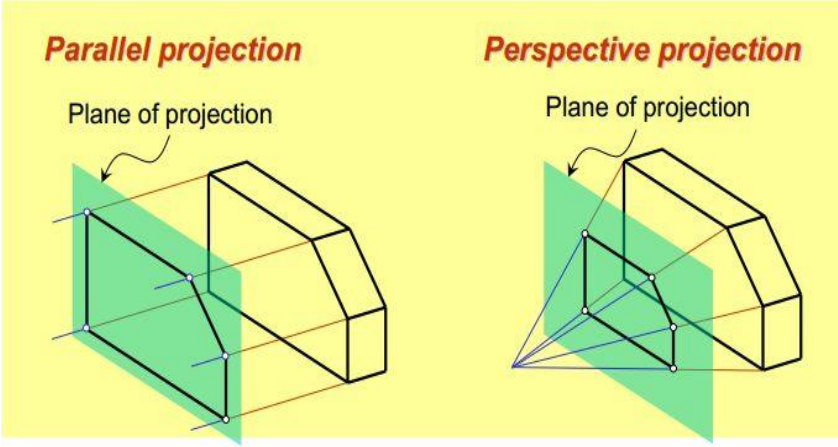

Figure 2: Planes of projection: parallel, and perspective projections

2.1 Parallel Projection

Parallel projection is the type of projection in which the lines of sight or projectors are parallel to each other, but perpendicular to the planes of objects or images. Parallel projection can be categorized or divided into orthographic, oblique, and axonometric projections.

(i) Orthographic projection

Orthographic projection (or drawing) is the type of projection in which 3-dimensional objects are represented in 2 dimensions by projecting planes (consisting of 2 major axes) of objects so that they are parallel with the plane of the media (paper, or computer) on which they are projected.

Orthographic projection can also be defined as the type of projection in which views are taken on different planes of objects and drawn (or represented) in 2 dimensions as illustrated by the principal views shown in the figures below:

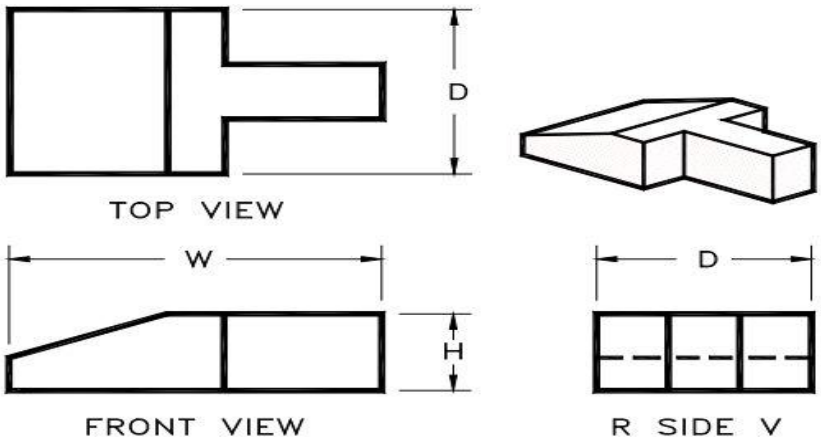

Figure 3: Three major views of orthographic projection

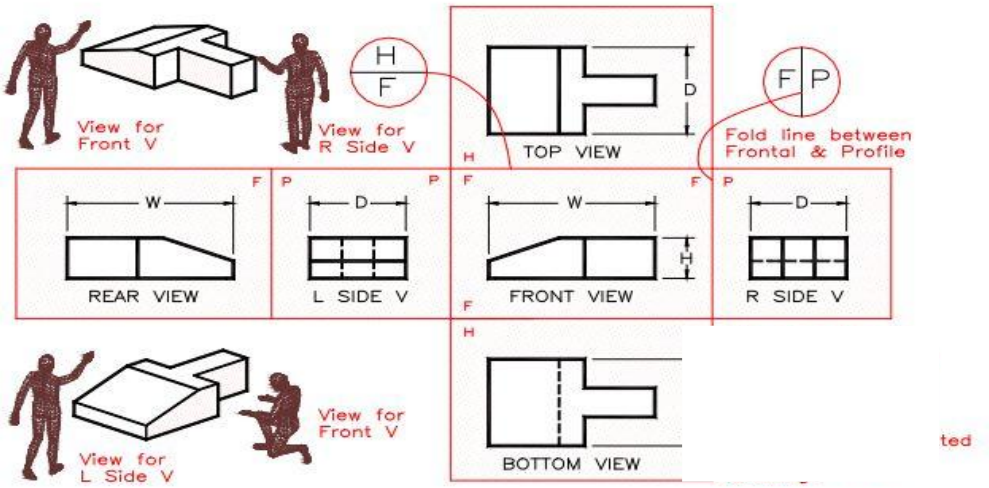

Figure 4: Six general views of orthographic projection

There are two types of orthographic projection: first-angle projection, and third-angle projection.

In first angle projection (i.e., European/international system) the front view is placed at the top of a medium (paper, computer screen, etc.) along with the right side view which is placed at the left side of the front view, while the left side view is placed at the right side of the front view, and the plan (T) is placed alone beneath the front view.

In third angle projection (i.e., American system) the plan (T) is placed alone at the top, while the front view is placed beneath the plan, and the right side view is placed at the right side of the front view, while the left side view is placed at the left side of the

front view. (Note that third-angle projection is more popular than first-angle projection.)

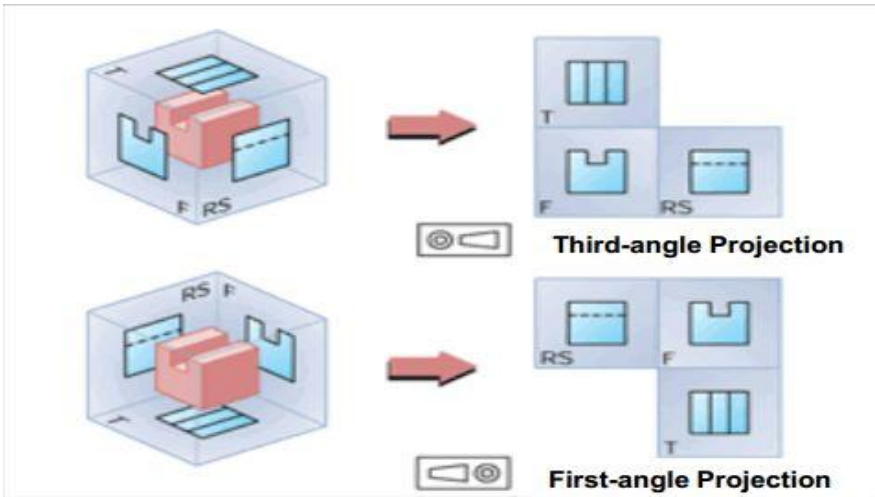

Figure 5: First-angle, and third-angle projections

(ii) Oblique projection

Oblique projection is the type of projection in which an object is drawn in 3 dimensions, with each of the 3 dimensions (or major planes) consisting of two lines (or major axes: either *xy,* or *yz,* or *xz*) perpendicular to each other (i.e. 90°), and one of the 3 planes parallel to the plane of paper or computer screen, etc. In addition, one of the 3 planes is projected at either 30°, 45°, or 60° to the *x*-axis. Oblique projection consists of 2 types: cavalier and cabinet projection, respectively.

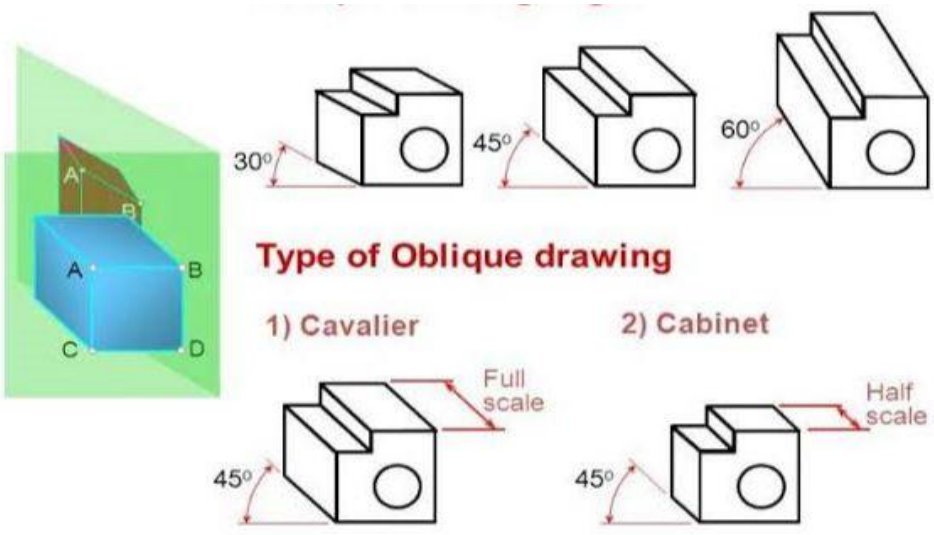

Figure 6: Oblique projection: cavalier, and cabinet projections

In cavalier projection, one of the 3 planes is drafted to represent a plane of an object "according to a given scale", while in cabinet projection, one of the 3 planes is drafted to represent half of a plane of an object "according to half of a given scale". A scale is the ratio (examples: 1:10, 1:100, 1:1000, etc.) of the size of an object on paper, to the actual size of the same object in real life.

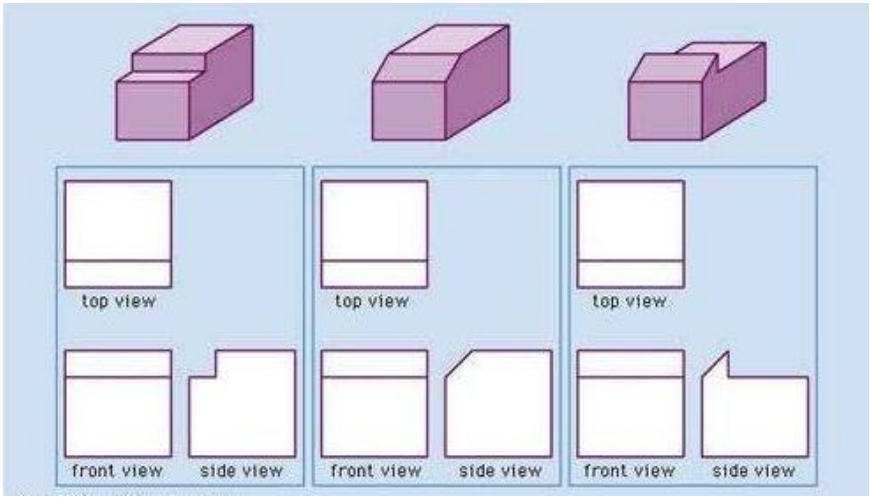

Figure 7: Oblique projection with orthographic views

(iii) Axonometric Projection

Axonometric projection is the type of projection that consists of three-dimensional drawings in which each of the 3 major axes (*x*, *y*, and *z*) of an object is drawn perpendicular to each other by either 30°, 45°, or 60°, and no plane of the object is drawn parallel to the plane of the medium—paper, computer screen, etc. Axonometric projection/drawing can be categorized into three types: isometric, dimetric, and trimetric projections.

Isometric projection is a method of projection/drawing in which the edges of 3-dimensional objects are represented by 3 axes perpendicular to each other and inclined to each other by 120° on the plane of media—paper or computer; also, 2 of the 3 axes are inclined at either 30°, 45°, or 60° to any imaginary *x*-axis on any medium.

In dimetric projection, 2 angles between any 2 major axes are unequal, while in trimetric projection, the 3 angles between the 3 major axes are unequal. Two different angles are required to construct 2 planes of objects in dimetric projections, while 3

different angles are required to construct 3 planes of objects in trimetric projections.

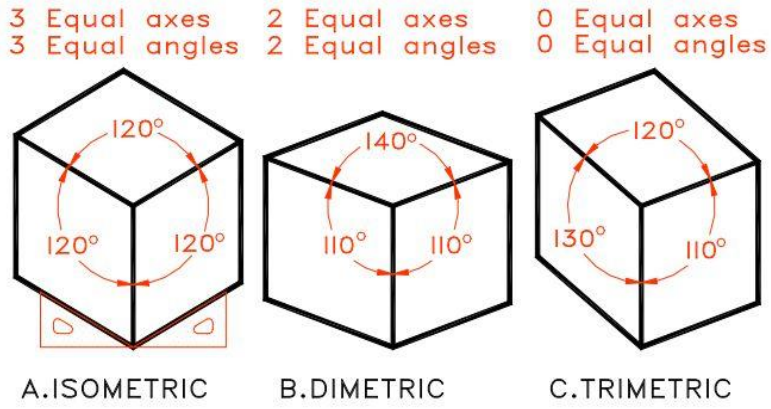

Figure 8: Isometric, dimetric, and trimetric projections

2.2 Perspective Projection

Perspective projection is the type of projection in which objects appear smaller as their distances from an observer increases: objects' dimensions along a line of sight appear shorter than they actually are.

There are 3 types of perspective projections: 1 point, 2 point, and 3 point projections. One-point perspective projections consist of 1 vanishing point, while 2-point and 3-point perspective projections consist of 2 and 3 vanishing points, respectively.

A vanishing point is a point of convergence where all lines of sight meet.

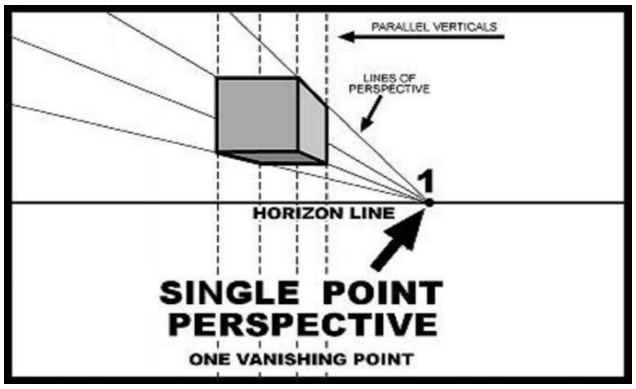

Figure 9: One-point perspective projection

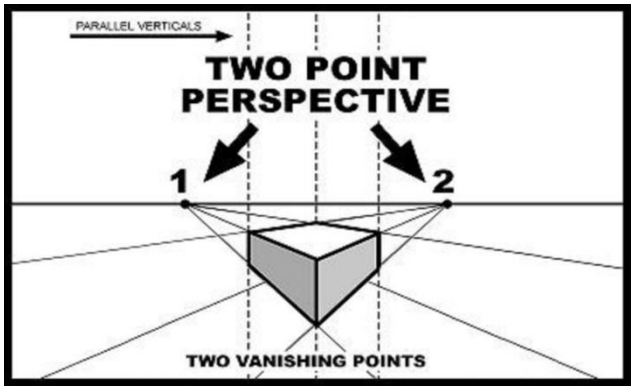

Figure 10: Two-point perspective projection

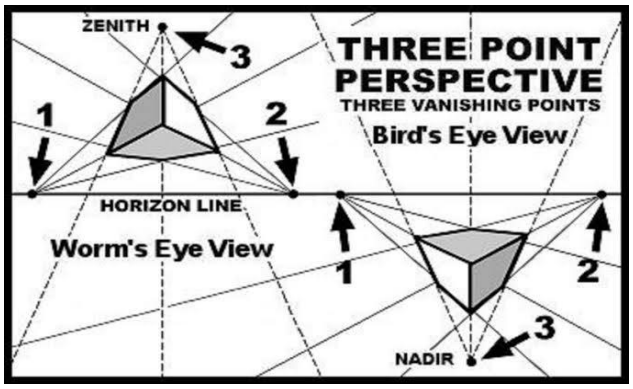

Figure 11: Three-point perspective projection

3.0 Objectives of technical drawing

The general objectives of studying technical drawing include the following:

- to develop skills in using universally accepted tools, symbols, scales, and conventions to draw any visible object or invisible idea on paper, and computer.
- to understand orthographic and isometric projections and employ them in drafting/drawing ideas and objects using both projections, respectively.
- to understand and interpret technical drawings, sketches, and working drawings.
- to develop the ability to use imagination in observing, visualizing, and drafting objects, ideas, or concepts.
- to develop the ability to produce clean, accurate, neat, and informative drawings in a moderate amount of time.
- to develop the ability to take on any projects such as environmental health science, civil and environmental engineering objects/structures.

4.0 Purpose of technical drawing

To draft and design objects or structures, and assess how they would appear in real life after they are manufactured, fabricated, assembled, constructed, or built. For example, houses, septic tanks, drainages, etc., must be drafted or drawn before they are built.

5.0 Application of technical drawing

Technical drawings have wide applications in any field that planning and design are required, such as architecture, manufacturing, engineering, construction, estate management, etc.

Sanitarians, surveyors, and civil/environmental engineers use technical drawings to supervise the construction of layouts, structures, objects, and boundaries for various types of properties (houses, etc.).

Technical drawings are also used in situations where ideas/designs for objects and structures need to be refined, and different 2-dimensional views need to be assembled into 3-dimensional views.

Generally, technical drawings are used by a variety of professions, including but not limited to:

- engineers
- architects
- contractors
- inventors
- technicians
- teachers
- etc.

For more view and further study of various shapes/types of objects, click the link below:

Hundreds of images of objects projected in 2 and 3 dimensions.

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