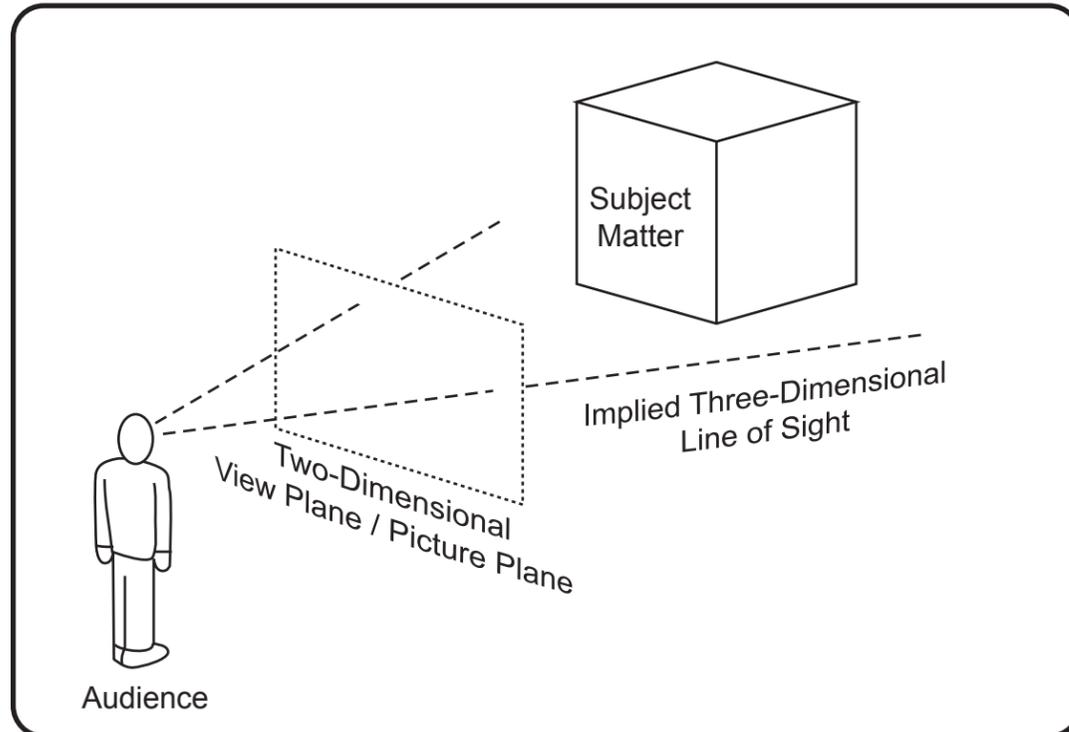


Types of Projection in 3-D Drawing

Before attempting to define the various projection styles, the concept of a View Plane (also referred to as a 'Picture Plane') should be established first. The View Plane of any image is the implied flat, two-dimensional area where the subject matter is being 'projected' onto. The View Plane could be compared to a window through which the subject matter is viewed. Common examples are images viewed on paper or on an electronic screen.



The 3-D subject matter displayed on the View Plane is always artificial since it is depicted on a 2-D surface and is not being observed first hand in the natural world. This means that it is important for the designer to convey sufficient information about the 3-D subject matter so that it can be interpreted correctly when it is viewed by others. There are several ways to present a 3-D object. Some methods might use exaggerated or controlled vantage points, others may attempt to more accurately simulate what the human eye would actually see in the natural world. Either way, describing 3-D objects in 2-D space requires strategic utilization of lines, shapes, angles, and points of reference such as center lines, horizons, etc.

In general, the styles of 3-D drawing methods fall into one of the two categories (**paraline** and **perspective**) shown in the boxes below:

Paraline Views

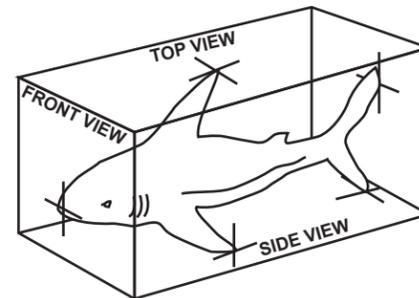
Perspective Views

Paraline Views

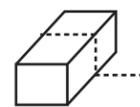
Paraline views rely on the Cartesian coordinate system of x, y, and z, planes/grids. All 3-D objects depicted in this system are assumed to fit within boxes (see the Box Method below). Since the implied boxes surrounding 3-D objects are defined on a grid for reference, the edges of those boxes are aligned parallel to the x,y, and z planes. The edges of those boxes, as well as the planes that make up their parallel sides are therefore considered infinitely parallel to each other in space. This is why the term 'Paraline Views' applies to these types of images.

The Box Method

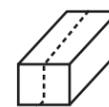
The Box Method is a tactic that allows us to envision 3-D objects, even complex forms, within a defined 3-D box. Once the implied box is envisioned with the 3-D object, we can proceed with translating the object into orthographic views:



Sections are cut-away views of a 3-D object. Most sections are either **transverse** or **longitudinal** and are used to reveal interior details of the 3-D object.



Transverse Section



Longitudinal Section



Plan View (Aerial)



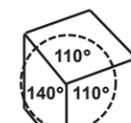
Front View (Elevation)



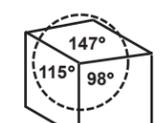
Side View (Elevation)



Isometric



Dimetric



Trimetric

Orthographic Views (also known as Multi-View drawings)

Orthographic views occur from one of two angles as follows: A face-on or "**principal view**" occurs when a plane of the 3-D object's surrounding box is parallel to the Viewing Plane. A corner-on or "**axonometric view**" occurs when none of the sides on a 3-D object's box are parallel to the Viewing Plane.

Principal Views

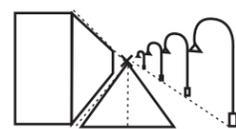
Top view (known as a **Plan View**) is like any basic floor plan or aerial view of a 3-D object. The side Views and Front Views are referred to as **Elevation Views (example: Side Elevation)**. Often, three principal views are provided and then accompanied by an axonometric view of the object to help fully define the object's shape. **Note: Principal views are always flat and should never be rendered to show more than one surface of a 3-D object, or use perspective.**

Axonometric Views

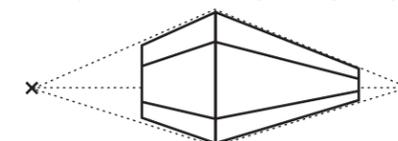
Axonometric views rely on the Box Method, where any 3-D object is implied to be contained inside of a 3-D box surrounding it. Most axonometric views show three sides of an object at various rotations. If the foreground convergence point occurs between three equal angles of 120 degrees, it's called an **isometric** view. If only two angles are equal, it is a **dimetric** view. If none of the angles are equal, it is called a **trimetric** view.

Perspective Views

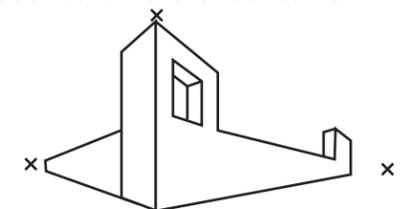
Perspective views are rendered by strategically drawing lines that all converge at points (known as vanishing points). Perspective drawings can be one-point, two-point, or even three-point, and each version is used to represent how an object or scene recedes into space. Perspective drawings are usually assisted with the presence of reference items such as a center line of view, and a horizon line (one and two point perspective).



One-point Perspective



Two-point Perspective



Three-point Perspective