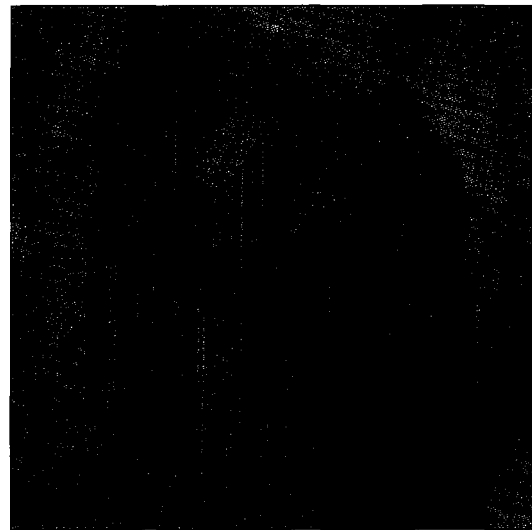
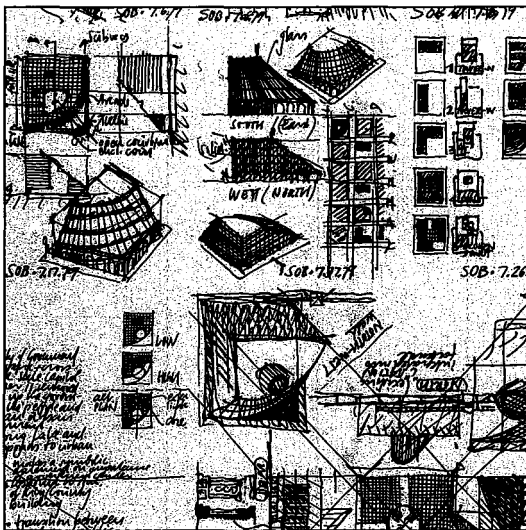
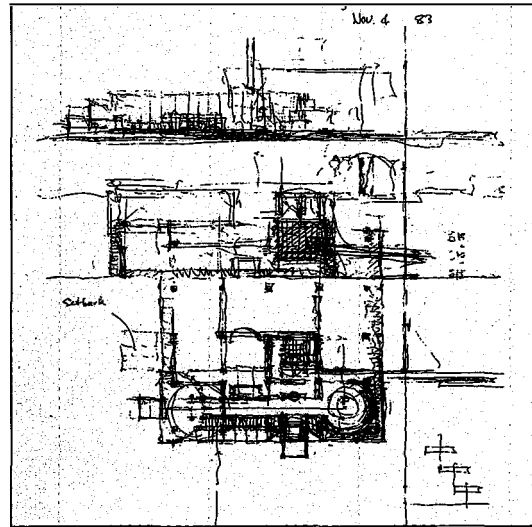


Envisioning Architecture

An Analysis of Drawing



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Explanatory Note: Orthographic Drawing

One of the biggest advantages to orthographic drawings is that they can be measured in two directions. Thus, drawing to scale (even rough scale when making a design sketch) is very important when making these drawings.

Orthographic = ortho + graphic or straight writing. Orthographic drawings use two axes of measurement, fixed at right angles to each other. In plan, the axes measure length and width, while in section and elevation the axes measure width and height. Only two dimensions are accurately measured in each drawing; there is no provision for the direct depiction of a third dimension in the construct. In orthographic drawings, projection lines are parallel and orthogonal to the picture plane. By convention, they are also parallel to the major surfaces of the depicted project. There is no diminishment in size relative to distance along any axis and every surface of the project parallel to the picture plane is represented without distortion of shape, size, or proportion.

Each orthographic drawing cuts through the building or its site. As "flat" views without direct means of representing depth, they are either parallel to the ground (plan) or perpendicular to it (section and elevation). The cut plane of the plan is horizontal and reveals the internal arrangement of spaces as laid out per floor (Figure 2.B1). The convention presumes that the cut is made several feet above the floor (usually four or five feet, or roughly eye-level) in order to show window openings, furniture, counters and low partitions, and substantial portions of stair runs. The horizontal surfaces, especially the floor surfaces, are often elaborated in detail, as though the drawing were a kind of horizontal elevation of those interior surfaces.

The plan is a very difficult depiction to visualize because it is based on an aerial viewpoint, one which is seldom actually experienced. It is a very abstract conception, one which is perhaps more commonly encountered as mapping. When one is familiar with the use of road maps, one understands location and direction and visualizes relationships to other places on the map. It is easy to transfer that reading ability to other kinds of maps, whether of a building, shopping mall, or city area, again developing a visual sense of the place and its surrounding domain. Through this kind of practice, one develops an ability to place oneself in a map (or plan) and it makes it easier to think of a plan as a map of experience, as being in a particular place at a particular time.

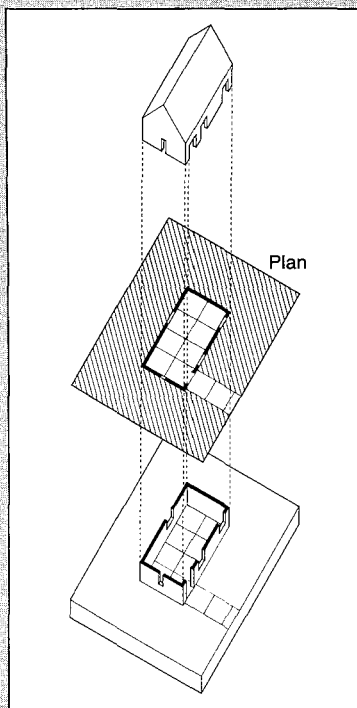


Figure 2.B1

Note what the authors are saying about what each of these drawing types are typically intended to do or show.

The section cut slices vertically from top to bottom through the building and into the ground, profiling the conditions of support, span, and enclosure (Figure 2.B2). The section reveals the interior array of space in both vertical and horizontal relationship as though the exterior wall or an even more substantial portion of the building had been removed. The section cut is placed to depict the most important spatial and connective issues, such as multilevel space, skylighting, or special conditions of vertical circulation. Again, the interior surfaces are often elaborated and detailed as though the exposed walls of each revealed space was an elevation.

<----- Thus, the "section-interior elevation" view

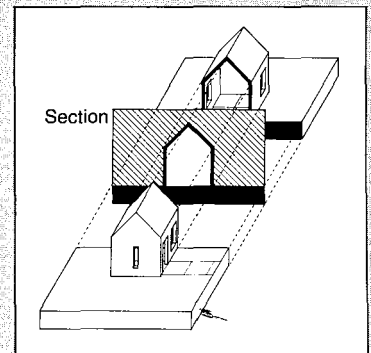


Figure 2.B2

The elevation is conceptually an exterior section, where the vertical cut is made in front of the building and cuts into the ground (Figure 2.B3). Otherwise, its conventions are virtually the same as the section.

Orthographic drawings are literally generators in that they are used to generate other drawing types such as axonometrics and perspectives which are constructed from orthographic bases plus additional third-dimensional data (as in 'plan obliques' or 'plan projection method' perspectives). Furthermore, one orthographic drawing can be the basis for another, such as a plan from which a section is projected, sharing common scale and dimensions.

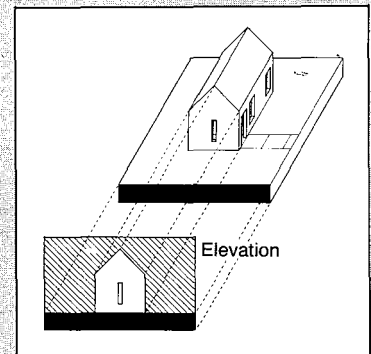


Figure 2.B3

Explanatory Note: Axonometric Drawing

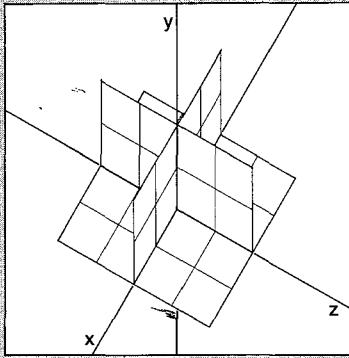


Figure 3.B1

Axonometry = axono + metry or axis measure. Axonometric drawings use three axes of length (x), width (z), and height (y) for measurement (Figure 3.B1). Using these three measuring lines (or measurements along lines anywhere in the drawing parallel to those three axes), planes with dimensions along axes x and y (length and height), axes z and y (width and height), and axes x and z (length and width) can be drawn. In this way, axonometrics are literally three-dimensional in the manner that dimensions are measured along three directions. In comparison, plans, sections, or elevations indicate two dimensions in each construction.

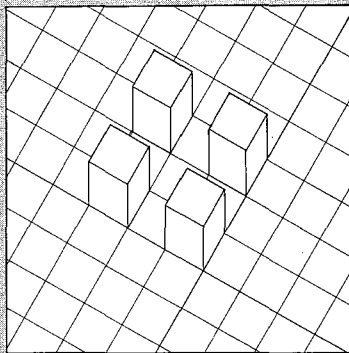


Figure 3.B2

Axonometrics retain consistent scalar measurements parallel to the three axes. Measurement remains absolute rather than the relative dimensions of the perspective. Also lines parallel in the object remain parallel in the drawing in axonometric constructions, making the drawing easier to construct than a perspective drawing. As there is no diminishment in size as the object "recedes," parts of the building shown farther away remain the same size as those in the foreground, making it easier to retain the same level of detail and information throughout the graphic (Figure 3.B2). Forms of the same size at different locations stay the same shape and size. In contrast, perspective, the other commonly used drawing construction which shows three dimensions, shows parallel lines in the object tapering toward a vanishing point (Figure 3.B3). It requires much more intricate construction and calculation. Unit measurements along the measuring lines vary dependent on location in the drawing. Thus, for example, line segment a and b in Figure 3.B3 have a different measured length even though they indicate an equal length in the object.

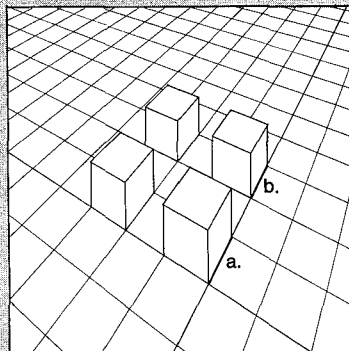


Figure 3.B3

AXON

PERSPECTIVE

In a type of axonometric projection called oblique, an orthographic drawing (plan, section, or elevation) is used as a base drawing. If the plan is used as the base, height is added, creating the plan oblique (Figure 3.B4a). If the elevation is used as the base, depth is added, creating the elevation oblique (Figure 3.B4b). A section can be used as the base, creating the section oblique. Drawings can also be used in combination, such as a plan/elevation oblique. In addition, a plan oblique can cut through the building showing a sectional condition.

In the second major type of axonometric called isometric (iso + metric = equal measure), an orthographic projection cannot be used as a base drawing. Rather the plan must be redrawn using three axes separated equally by 120° (Figure 3.B5). Height along axis y is then given similar to the plan oblique. The resultant drawing suggests a viewpoint lower than the plan oblique and most closely resembles a perspective drawing of the object drawn from a great distance.

Finally, a third type of axonometric consists of those drawings that show a view from below the object, looking upward. These drawings are commonly called "worm's-eye views," up views, or Choisy axonometrics (Figure 3.B6). As the drawing shows a view from the bottom up, the construction reveals the underside of surfaces such as ceilings or soffits in relationship to walls instead of the top side of surfaces, such as floors or roofs, which are shown by the down views of the plan oblique. Up views can be drawn in any axonometric construction (elevation oblique, isometric, etc.)

The convenience of construction of the axonometric drawing is a major advantage. As dimensional measure, parallelism, and orthogonality stay consistent throughout, the drawing is relatively easy and quick to construct. Its convenience and rendition of three dimensions allow for rapid visualization, explication to self and others, and therefore establishes its value as a design method and presentation tool.

Axons also do a good job of simultaneously showing what is inside and outside a space

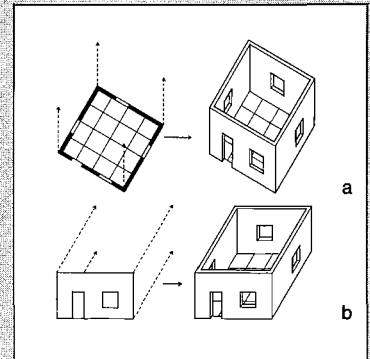


Figure 3.B4

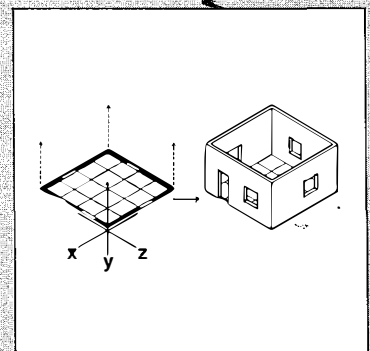


Figure 3.B5

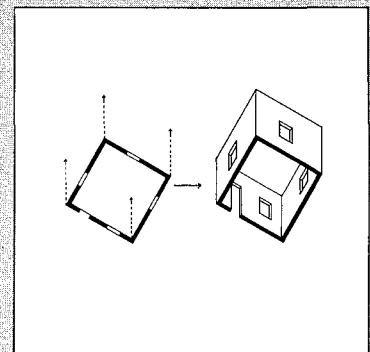


Figure 3.B6

Explanatory Note: Perspective Drawing

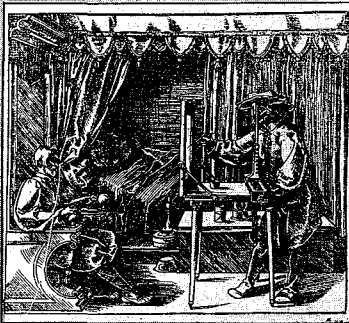


Figure 4.B1 Albrecht Dürer: "A draughtsman drawing a portrait," c. 1525. Perspective. Woodcut, $5\frac{1}{4}'' \times 5\frac{3}{4}''$. (Courtesy of the Victoria & Albert Museum).

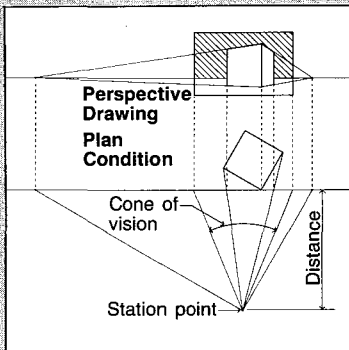


Figure 4.B2

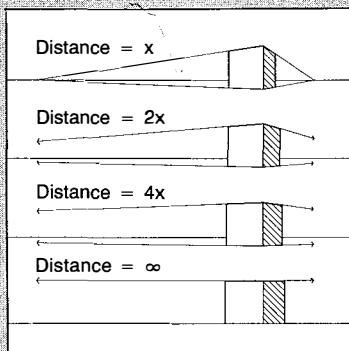


Figure 4.B3

Perspective can be defined as the plotting of points seen through a transparent plane from a specified point and is described by its Latin root, *perspectus*, or looking through (Figure 4.B1).

The diagram of the method of perspective construction called plan projection, Figure 4.B2, illustrates the variables that influence the look and tone of the resultant drawing. These are all related to the condition of the viewing subject, that is, the location of the viewer relative to the object (called the station point) and the width of the view. These variables stated briefly and explained below more fully are: distance of viewer from the object; angle of the viewer relative to the surfaces of the object; height of the viewer relative to the height of the object; and the width of the view (called the cone of vision). All of these dramatically affect the appearance of the drawing.

For example, in Figure 4.B3, the shapes of the cubes vary as the distance of the viewer from the object varies. The closer the viewer is located, the steeper the angle of vanishing lines. As the viewer moves farther and farther away from the object, the angle of the lines flattens and approaches horizontal. Eventually, for vanishing points located infinitely far away, the horizontal surfaces of the object remain horizontal in the drawing, producing an elevation view.

The second variable is the angle of view relative to the surfaces of the object. In this case, shifting the viewer changes the relative amount shown of different surfaces. For example, in 4.B4a the right surface is shown relatively flat to the viewer and a great amount of the surface is seen compared to the left side of the object. In 4.B4b, both surfaces are shown approximately equally, and in 4.B4c the left surface is shown much more. All three drawings depict the same object, but through a change of location of the viewer, the resultant representation changes the shapes and sizes of the planes and places a different emphasis on what one sees and how one sees it.

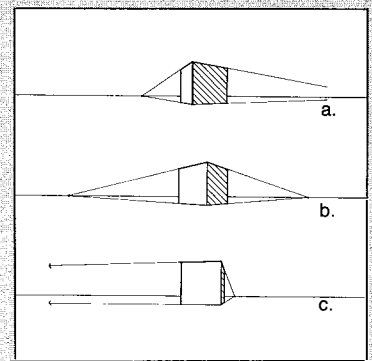


Figure 4.B4

When the line of sight is aligned parallel to one set of planes in an orthogonal building and perpendicular to the other, the resultant construction is termed a **one-point perspective** (Figure 4.B5). The drawing is distinguished by its single vanishing point and by the way that one set of horizontal and vertical lines remains parallel to a rectangular frame, establishing a formal similarity between perspective and frame. As a result, the diagonal foreshortened lines have a figural emphasis that is often stronger than in two-point constructions. That is, everything seems to lead to the single vanishing point with the rest of the drawing providing an effective background frame. The drawing appears as if the scene has attached itself to the frame and then been pulled back in depth with a center provided by the vanishing point.

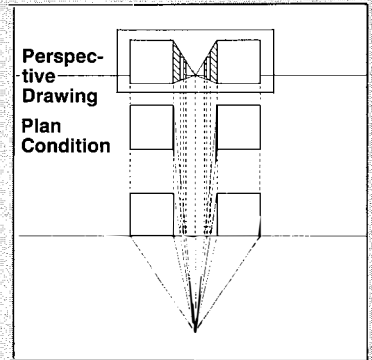


Figure 4.B5

When the height of the viewer changes relative to the height of the object, the representation also changes. In a perspective drawing, the horizon line represents the height of the station point and by implication the height of the viewer's eye. For example a 20-foot-tall cube with the viewer's eye at 5 feet high would have a horizon line located one-fourth of the way up the corner of the cube (Figure 4.B6b). Thus, 4.B6a shows a cube with a horizon line (and therefore the eye) at a height 30 feet below the base of the cube, 4.B6c shows a horizon line 30 feet above the base of the cube, and 4.B6d shows an eye height 60 feet above the base. Through the conventions of perspective, one is able to tell immediately the height of the viewer's position by comparing the horizon line location to any referent point of the object.

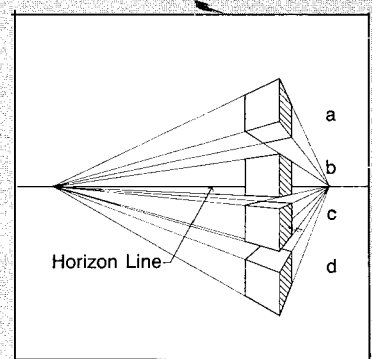


Figure 4.B6

In each perspective, the author also chooses a cone of vision, or the width and height of the view. The choice of what to include or exclude affects greatly the representational impact as the sense of context, focus, and shape are all influenced. In Figure 4.B7b, a cube is shown within a 60-degree cone of vision, which is one of the most common conventions. In 4.B7a a 120 degree cone of vision has been used, resulting in a much wider view and the inclusion of more space to the right and left of the object shown in the previous view. In 4.B7c a 20-degree cone of vision has been used resulting in a narrower, more focused view. This is a limiting of the view seen similar to the effect of a telephoto lens.

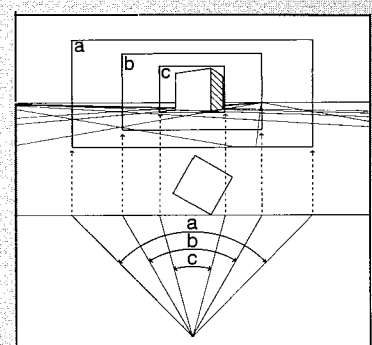


Figure 4.B7