ARCH 1110

WEEK NINE: CUBE PART 2

NYCCT
DEPARTMENT OF ARCHITECTURAL TECHNOLOGY

Professors:
Email: Office

DESIGN I : FOUNDATIONS : CUBE ASSIGNMENT

CUBE PROJECT: Use geometric proportions to derive a 6-sided form which addresses a given use.

OBJECTIVE: Students will learn to move from 2D lines into 3D form.

DESCRIPTION: The student will use the construction lines to design new abstract three dimensional shapes.

Lab & Homework: **EXERCISE 7**

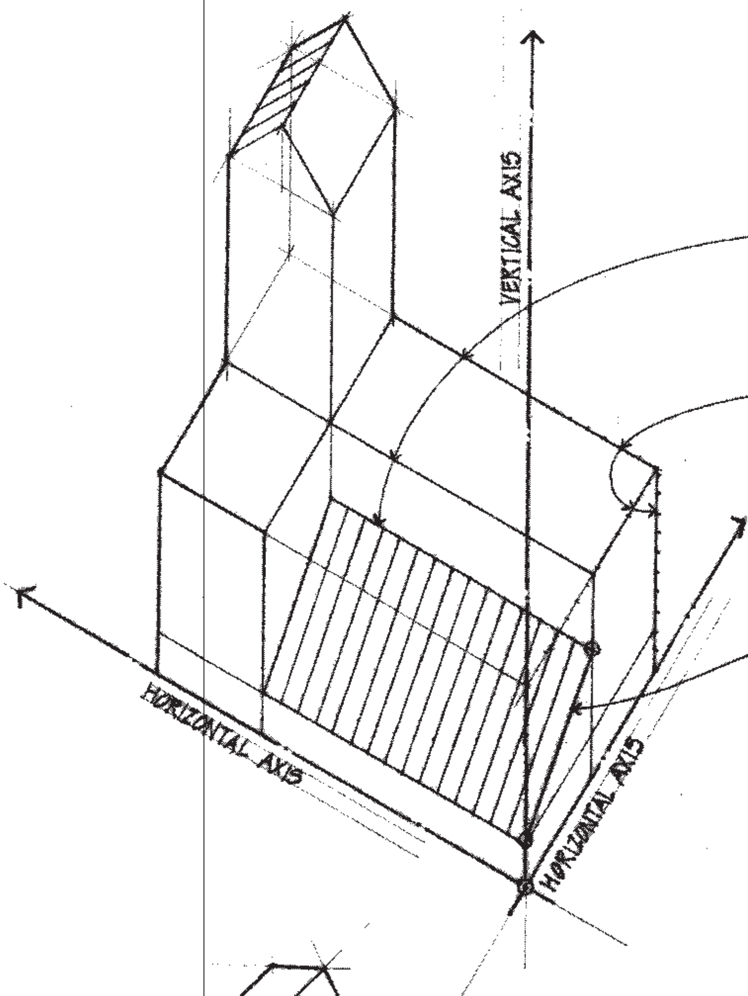
PROCESS:

1 Create an exploded isometric sectional drawing of your cube.
2 First draw an isometric of your foam cube.
3 Select sectional cuts approximately ½" from the surface of each face.
4 Use lineweights, hatching and colored lead to identify the cross sectional areas.
5 Use construction lines and heavy dashed lines to extend (explode) the section cuts away from the cube to illustrate the section clearly.
6 Final drawings should be on vellum paper sized to show all six sectional cuts clearly and with no overlaps on the original cube at the center of the drawing.

SKILLS: 3D Drafting, composition, and problem solving

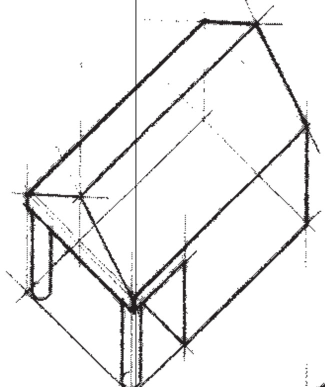
5
Paraline Drawings

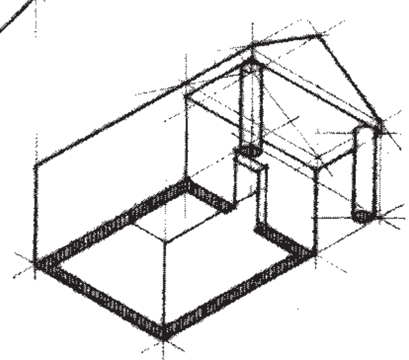
Paraline drawings include a subset of orthographic projections known as axonometric projections—the isometric, dimetric, and trimetric—as well as the entire class of oblique projections. Each type offers a slightly different viewpoint and emphasizes different aspects of the drawn subject. As a family, however, they combine the measured precision and scalability of multiview drawings and the pictorial nature of linear perspective. Because of their pictorial quality and relative ease of construction, paraline drawings are appropriate for visualizing an emerging idea in three dimensions early in the design process. They are capable of fusing plan, elevation, and section into a single view and illustrating three-dimensional patterns and compositions of space. Portions of a paraline drawing can be cut away or made transparent to see inside and through things, or expanded to illustrate the spatial relationships between the parts of a whole. At times, they can even serve as a reasonable substitute for a bird's-eye perspective.



Paraline drawings communicate the three-dimensional nature of an object or spatial relationship in a single image. Hence, they are also called single-view drawings to distinguish them from the multiple and related views of plans, sections, and elevations. They can be distinguished from the other type of single-view drawing, linear perspective, by the following pictorial effects.

- Parallel lines, regardless of their orientation in the subject, remain parallel in the drawn view; they do not converge to vanishing points as in linear perspective.
- Any linear measurement parallel to one of the three major axes—along axial lines—can be made and drawn to a consistent scale. Axial lines naturally form a rectangular grid of coordinates that we can use to find any point in three-dimensional space.
- Nonaxial lines refer to those lines that are not parallel to any of the three principal axes. We cannot measure dimensions along these nonaxial lines, nor can we draw them to scale. To draw nonaxial lines, we must first locate their end points using axial measurements and then connect these points. Once we establish one nonaxial line, however, we can draw any line parallel to that line, since parallel lines in the subject remain parallel in the drawing.
- Paraline drawings present either an aerial view looking down on an object or scene, or a worm's-eye view looking upward. They lack the eye-level view and picturesque quality of linear perspectives. They represent what we know rather than how we see, depicting an objective reality that corresponds more closely to the picture in the mind's eye than to the retinal image of linear perspective.



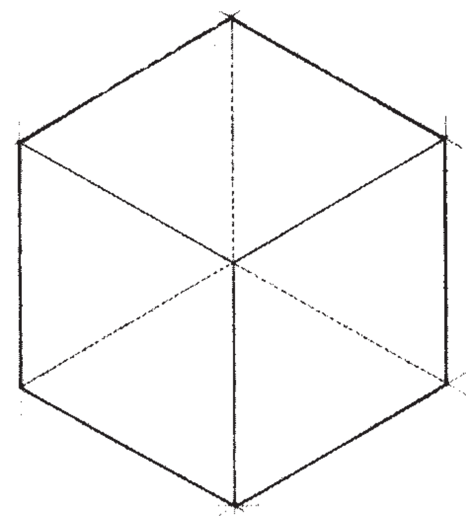


There are several types of paraline drawings, each named after the method of projection that is used to develop them. Two of the most common in architectural drawing are discussed in this chapter: isometric and oblique drawings.

In both isometric and oblique drawings:

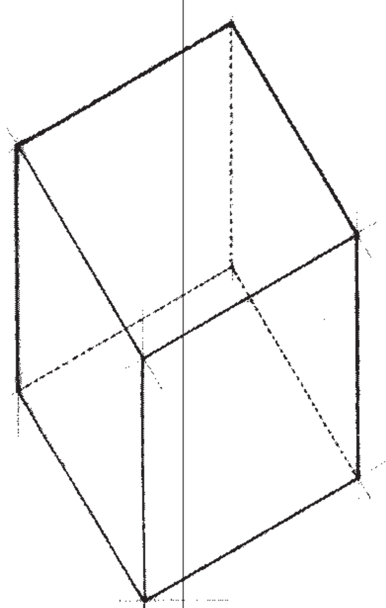
- All parallel lines in the subject remain parallel in the drawing.
- All lines parallel to the principal X-Y-Z- axes can be measured and drawn to scale.

The images that emerge from oblique projections are distinct from isometric views that develop from orthographic projection. The ease with which we can construct an oblique drawing has a powerful appeal. If we orient a principal face of the subject parallel to the picture plane, its shape remains true and we can draw it more easily. Thus, oblique views are especially convenient for representing an object that has a curvilinear, irregular, or complicated face.



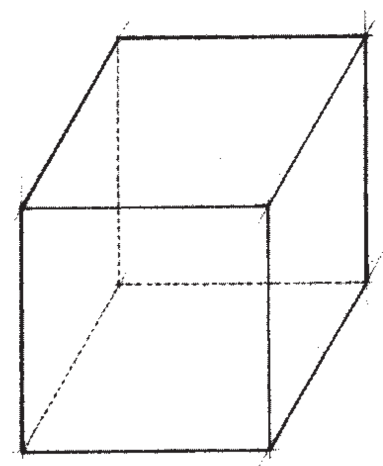
Isometric Drawings

- All three principal sets of planes share equal emphasis.
- The angle of view is slightly lower than that of plan obliques.
- Plans and elevations cannot be used as base drawings.



Plan Obliques

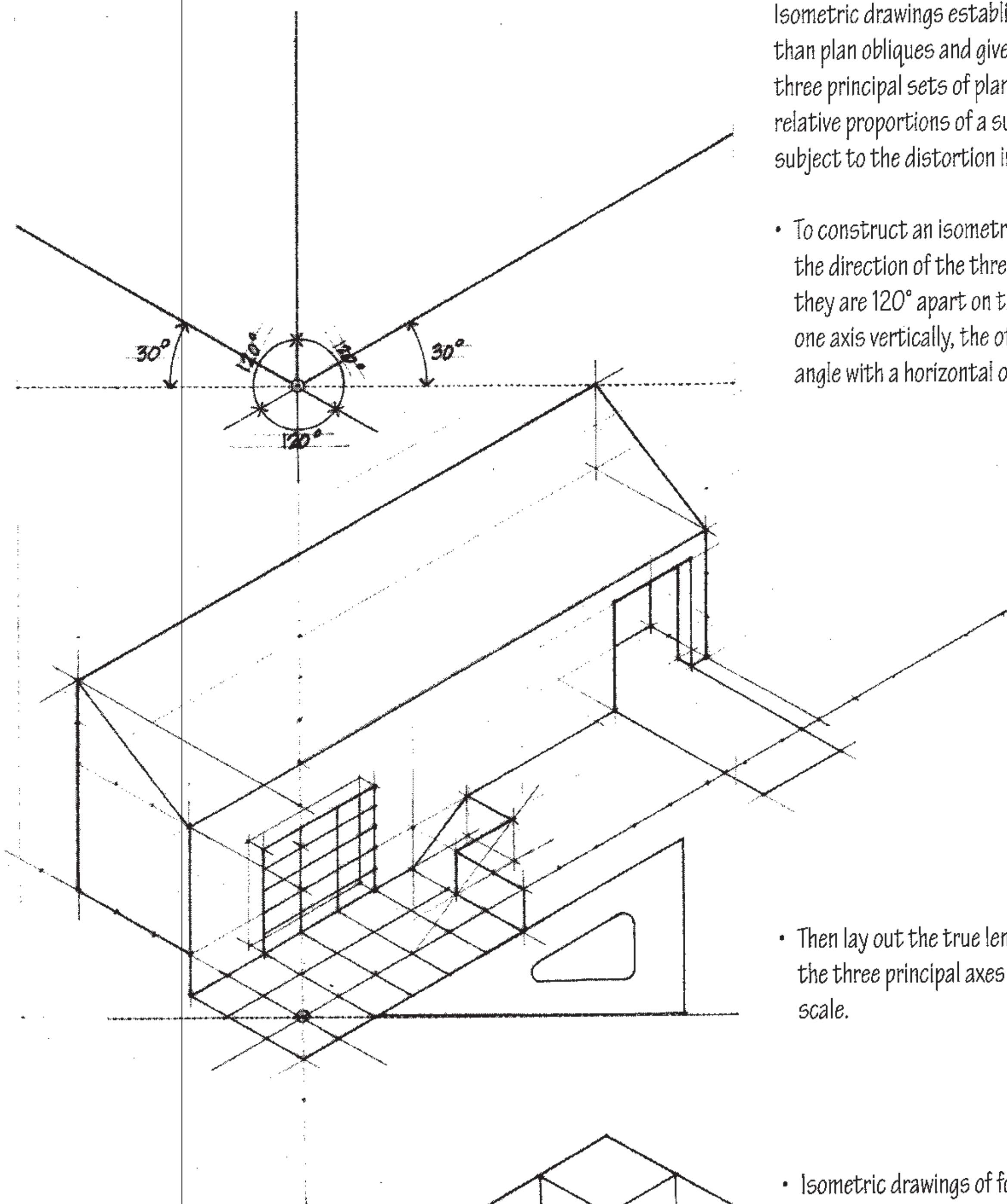
- The principal set of horizontal planes oriented parallel to the picture plane is emphasized and can be represented in true size, shape, and proportion.
- Plan views can be utilized as base drawings—a definite advantage when drawing horizontal planes with circular or complex shapes.
- Plan obliques have a higher angle of view than isometric drawings.



Elevation Obliques

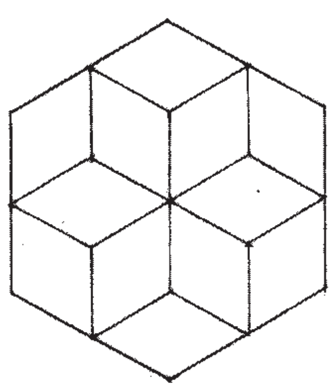
- The principal set of vertical planes oriented parallel to the picture plane is emphasized and can be represented in true size, shape, and proportion. The other vertical set and the principal horizontal set of planes are both foreshortened.
- An elevation can be used as a base drawing. This view should be of the longest, the most significant, or the most complex face of the object or building.

Isometric drawings establish a lower angle of view than plan obliques and give equal emphasis to the three principal sets of planes. They preserve the relative proportions of a subject or scene and are not subject to the distortion inherent in oblique views.



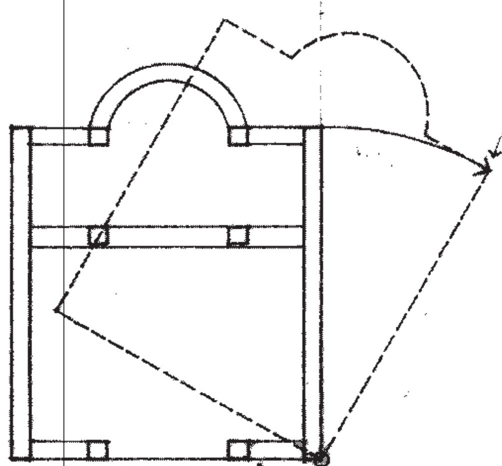
- To construct an isometric drawing, first establish the direction of the three principal axes. Because they are 120° apart on the picture plane, if we draw one axis vertically, the other two axes make a 30° angle with a horizontal on the drawing surface.

- Then lay out the true lengths of all lines parallel to the three principal axes and draw them to the same scale.

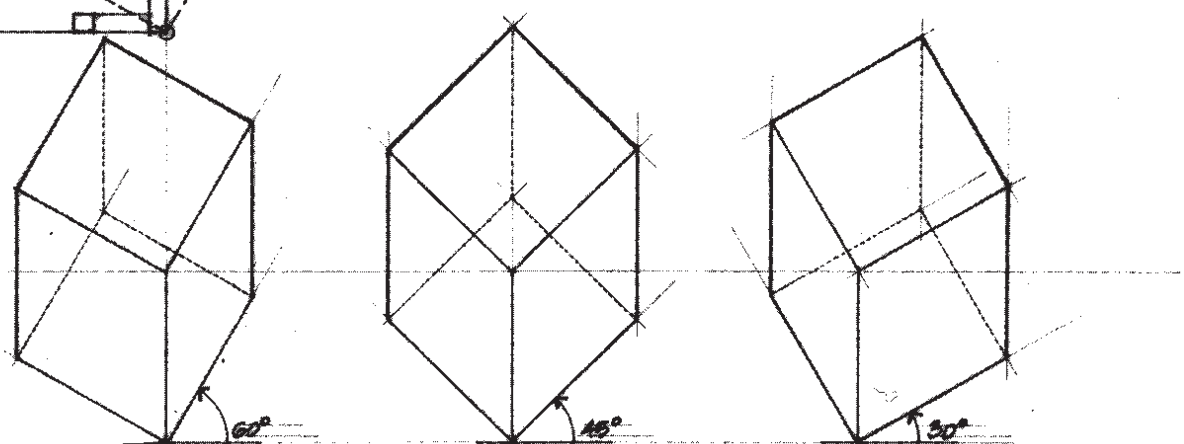


- Isometric drawings of forms based on the square can create an optical illusion and be subject to multiple interpretations. This ambiguity results from the alignment of lines in the foreground with those in the background. In such cases, a plan oblique might be a better choice.

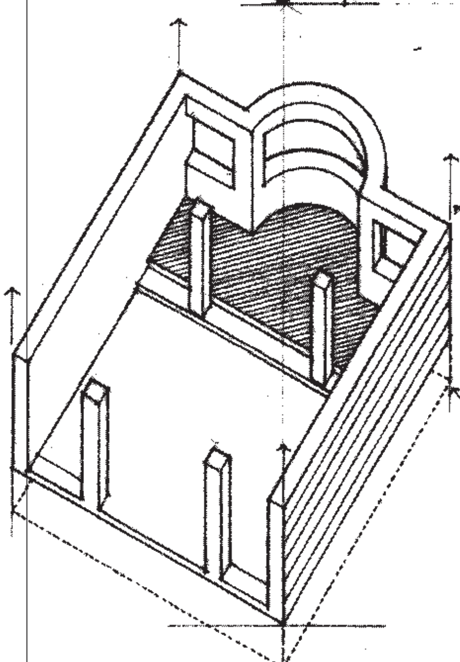
Plan obliques present a higher angle of view than isometric drawings and emphasize the set of horizontal planes by revealing their true size, shape, and proportions.



- To construct a plan oblique, begin with a plan drawing and rotate it to the desired angle relative to a horizontal on the drawing sheet or board.
- When drafting a plan oblique, the triangles encourage the use of 45°-45° and 30°-60° angles in establishing the orientation of the principal horizontal planes.
- Note that we can emphasize one of the sets of vertical planes over the other or show them to be of equal importance by varying this angle.

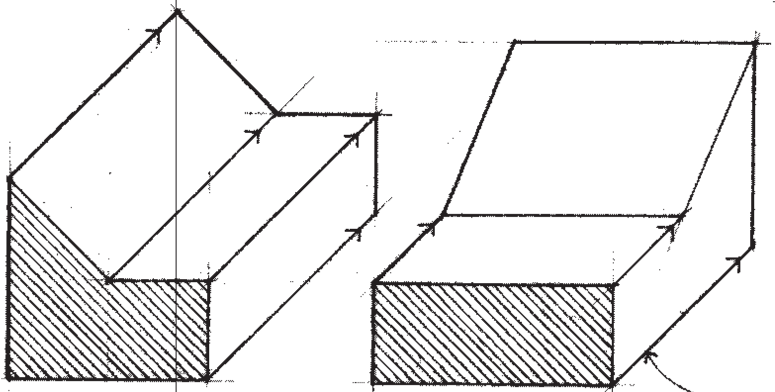


- In a 45°-45° plan oblique, both principal sets of vertical planes receive equal emphasis.
- In a 30°-60° plan oblique, one principal set of vertical planes receives more emphasis than the other.



- From the rotated plan view, we project the vertical edges and planes of the subject.
- We usually lay out and draw these vertical dimensions to their true lengths.
- To offset the appearance of distortion, we may reduce the vertical dimensions to 1/2, 2/3, or 3/4 of their true lengths.

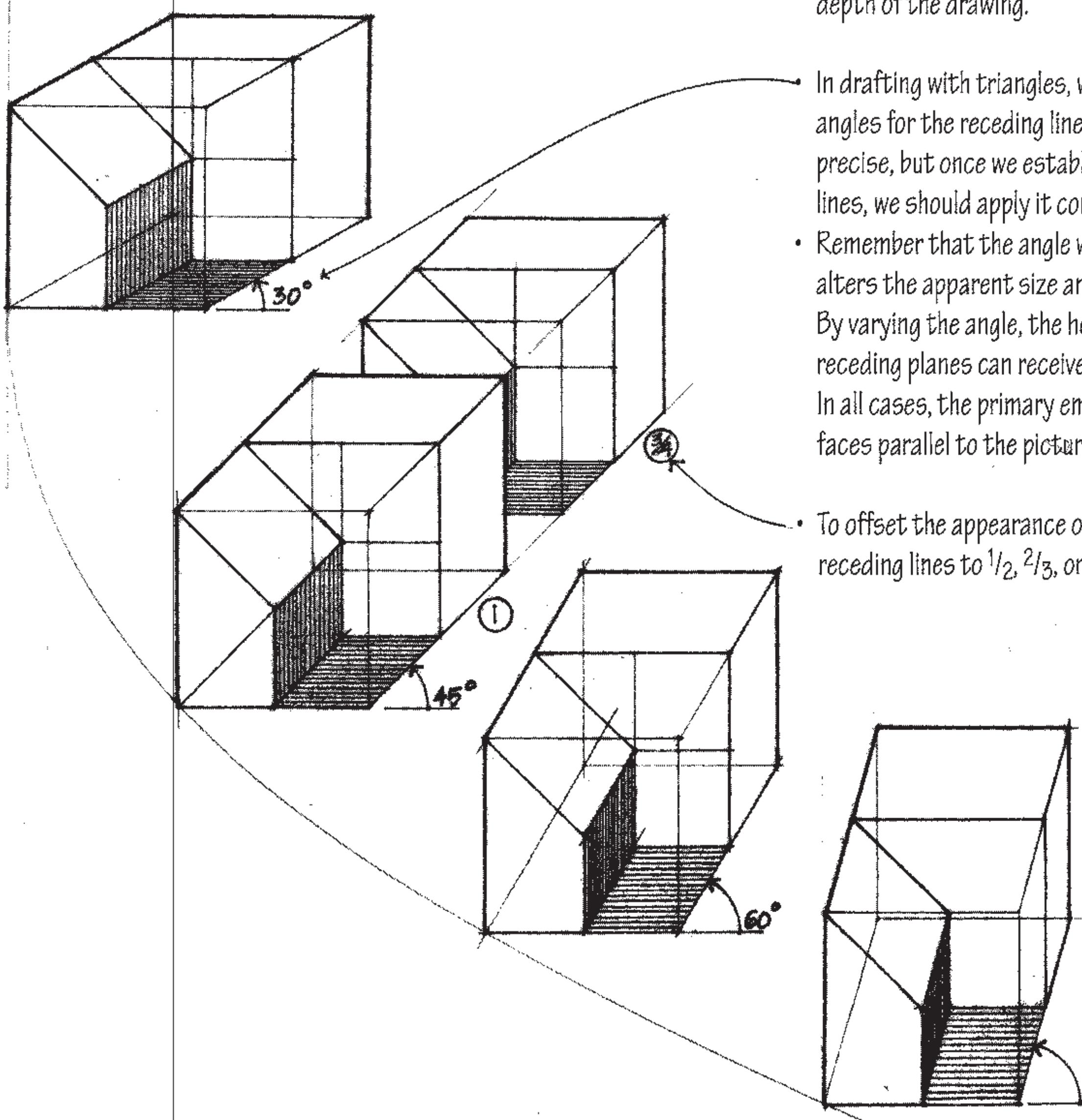
Elevation obliques orient a principal vertical face or set of vertical planes parallel to the picture plane and therefore reveal their true sizes, shapes, and proportions.



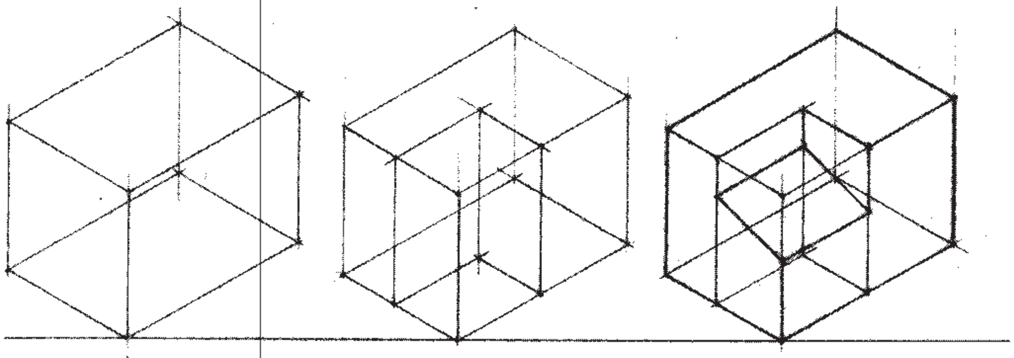
- To construct an elevation oblique, we begin with an elevation view of the principal face of the subject. This should be the longest, the most significant, or the most complex face of the subject.
- From significant points in the elevation view, we then project the receding lines back at the desired angle into the depth of the drawing.

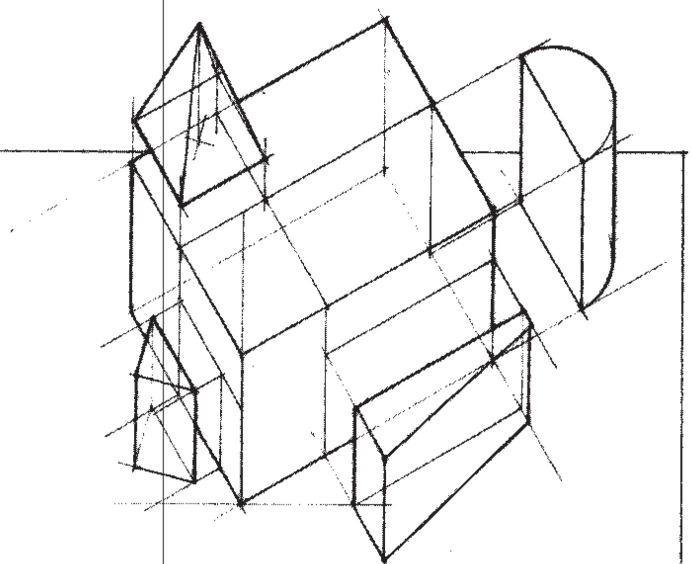
- In drafting with triangles, we typically use 45°, 30°, or 60° angles for the receding lines. In sketching, we need not be as precise, but once we establish an angle for the receding lines, we should apply it consistently.
- Remember that the angle we use for the receding lines alters the apparent size and shape of the receding planes. By varying the angle, the horizontal and vertical sets of receding planes can receive different degrees of emphasis. In all cases, the primary emphasis remains on the vertical faces parallel to the picture plane.

- To offset the appearance of distortion, we may reduce the receding lines to $1/2$, $2/3$, or $3/4$ of their true lengths.



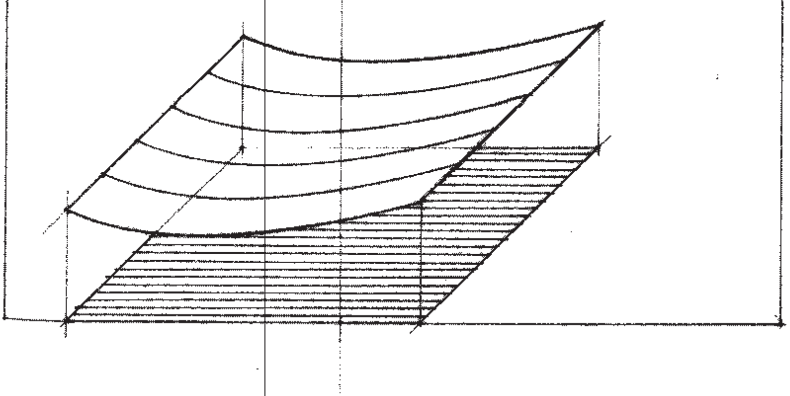
There are three basic approaches to constructing the entire class of paraline drawings. When constructing and presenting a paraline drawing, keep in mind that paraline views are easiest to understand if vertical lines in space are also oriented vertically on the drawing surface.



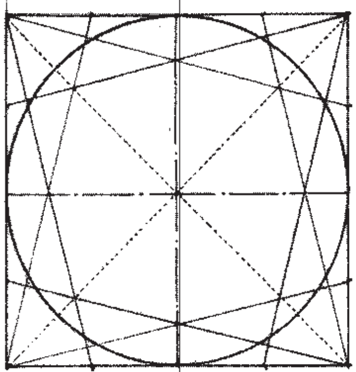


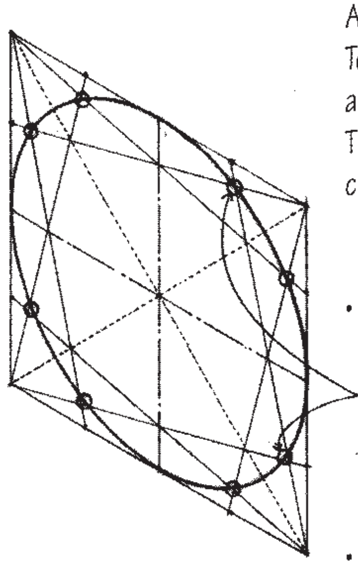
- The first is a subtractive approach appropriate for relatively simple forms. It involves constructing a paraline view of a transparent rectangular box that encompasses the entire volume of the subject, and then working in a subtractive manner to remove material and reveal the form.

- A second approach, appropriate for a composition of discrete forms, reverses the procedure of the subtractive approach. It requires drawing a paraline view of the parent form first, and then adding the subordinate forms.



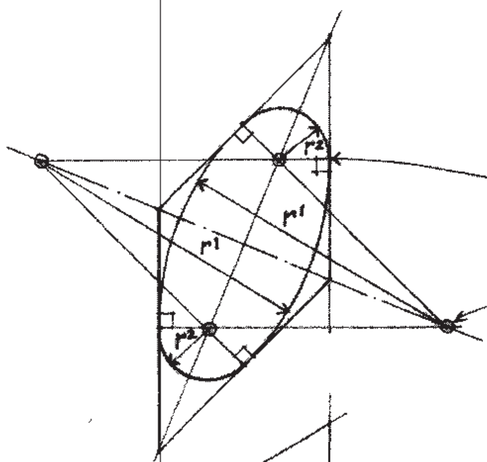
- The third approach is appropriate for irregularly shaped forms. It begins with a paraline view of a horizontal plane of the subject or the profile of a vertical section cut. We can then extrude the shape vertically or extend it back into the depth of the drawing.



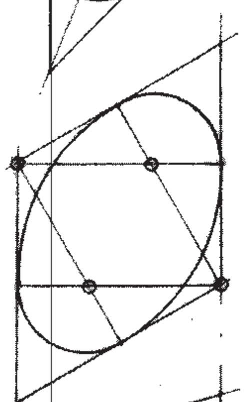


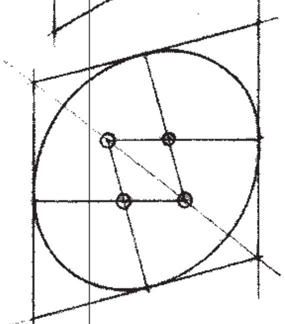
Any circles oblique to the picture plane appear as ellipses. To draw such a circle in a paraline drawing, we must first draw a paraline view of the square that circumscribes the circle. Then we can use either of two approaches to drawing the circle within the square.

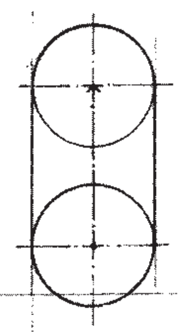
- The first is an approximate method. By dividing the square into quadrants and drawing diagonals from each corner to quarter points along the sides of the square, we can establish eight points along the circumference of the circle.



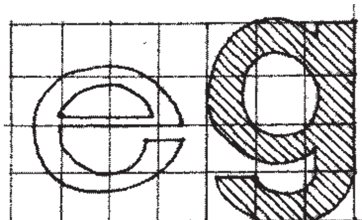
- The four-center method uses two sets of radii and a compass or circle template.
- From the midpoints of the sides of the square in the paraline view, we extend perpendiculars until they intersect.
- With the four points of intersection as centers and with radii r^1 and r^2, we describe two sets of arcs in equal pairs between the origin points of the perpendiculars.



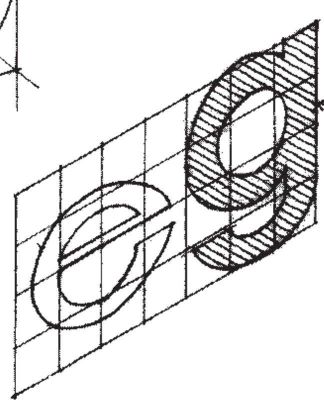




- It is often more convenient to draw a plan oblique rather than an isometric of a circular or free-form plan because the plan itself can be used as the base drawing and the horizontal shapes remain true.



We can use a grid to transfer curvilinear or free-form shapes from an orthographic view to the paraline view.



- First, we construct a grid over a plan or elevation view of the shape. This grid may either be uniform or correspond to critical points in the shape. The more complex the shape, the finer the grid divisions should be.
- Then we construct the same grid in the paraline view.
- Next, we locate the points of intersection between the grid and the free-form shape and plot these coordinates in the paraline view.
- Finally, we connect the transferred points in the paraline view.

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STUDENT WORK SAMPLES

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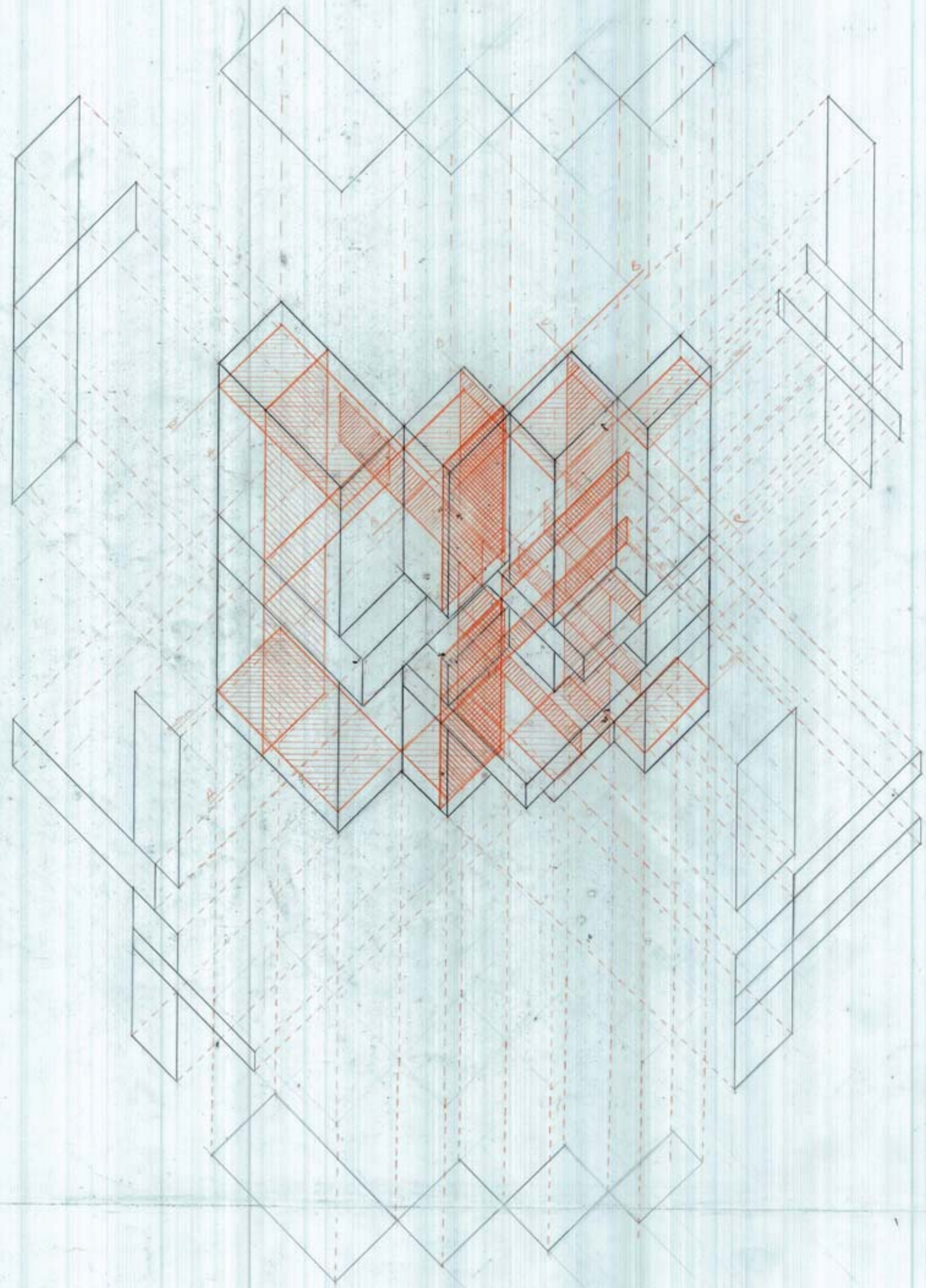

Anastasia Shaukova