6

Linear Perspective Drawing

Perspective drawings seen from a fixed vantage point create the most realistic, life-like views of the built environment and the urban landscape. On a two-dimensional surface, pictorial views of three-dimensional forms can be represented in a believable manner using methods characterized by diminishing sizes and defined by converging lines.

Preliminary perspective design drawings or sketches show form, scale, texture, light, shapes, shadows, and spatial order. Presentation perspective design drawings take on a more precise character from these and related components. As a final step, they may be refined into perspective renderings to complement and enhance a presentation.

The intent of this chapter is to introduce the theory of and methods for constructed architectural perspectives. It stresses the importance of visualizing in parallel (one-point) or angular (two-point) perspective from the plan and the elevation of an object. This, of course, comes with patience, perseverance, and most of all, practice.

The following are some of the important skills, terms, and concepts you will learn:

How to use one-, two-, and three-point perspectives
How to change the pictorial effect by changing the perspective variables

Station point	Picture plane	Horizon line	Ground line
Vanishing point	Line of sight	Cone of vision	Distortion
Office method	Oblique lines	Perspective circles	Measurement systems

Linear Perspective Drawing

TOPICS: CONE OF VISION

Ching 2003, 91.

TOPICS: DIAGONALS, X-, Y-, Z-AXIS, STATION POINT, PICTURE PLANE, HORIZON LINE, VANISHING POINTS, CENTER OF VISION, VERTICAL MEASURING LINE, MIDPOINT, PERSPECTIVE FIELD, PERSPECTIVE VIEWPOINT, PERSPECTIVE SETUP

Hanks and Belliston 1992, 16–19; 21–23.

Porter and Goodman 1985, 108–15.

TOPIC: ONE-POINT PERSPECTIVE USING 45° DIAGONAL LINES

Ching 2003, 99–102.

TOPICS: VERTICAL VANISHING LINES, DIAGONAL LINES, OBLIQUE LINES, OBLIQUE VANISHING POINTS, DIAGONAL VANISHING POINTS, 45° VANISHING POINTS.

Forseth 1980, 154–58.

TOPICS: ONE-POINT OFFICE METHOD, SECTION PERSPECTIVE, PLAN PERSPECTIVE, PERSPECTIVE CHARTS

Ching 1998, 234–36.

Lin 1993, 116–20, 124–34.

TOPIC: THREE-POINT PERSPECTIVE

Gill 1980, Chapter 6.

TOPICS: MULTIPLYING AND DIVIDING, CIRCLES, CIRCLES AND ELLIPSES

Ching 2003, 116, 121.

Forseth 1980, 168–69, 170.

Hanks and Belliston 1980, 122–23.

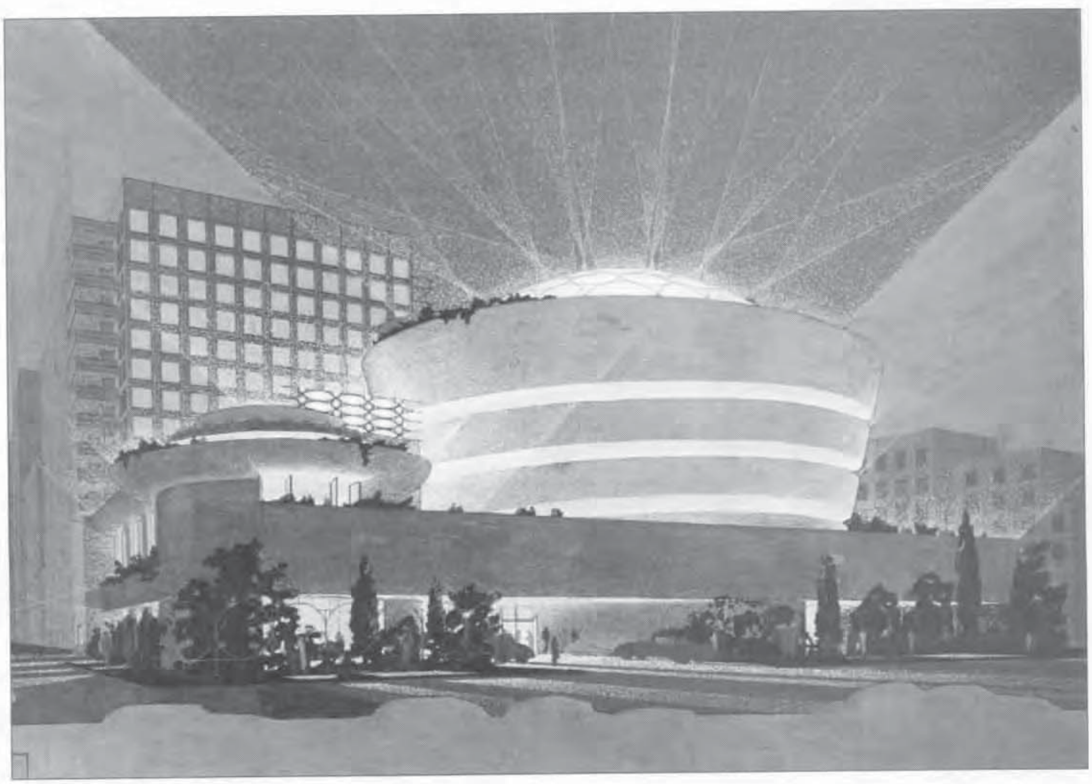
Chapter Overview

After studying this chapter and doing the related exercises in the book's final section, you will understand important perspective terms, as well as how to construct one- and two-point perspectives. For continued study of the principles discussed in this chapter, refer to Forseth's *Graphics for Architecture* and Ching's *Architectural Graphics.*

Perspective is a method of depicting the manner in which objects appear to the human eye with respect to their relative positions and distance. The optic mechanism of seeing the urban landscape is done simultaneously with both eyes, and as a result we visually experience things three-dimensionally or spatially. The term "perspective" comes from the Latin *perspectare,* which means "to view through." The origin of linear perspective theory comes from the Renaissance. The perceptual schema of Western philosophy and civilization values a drawing system that logically duplicates an individual's visual experience. Thus, linear perspective is considered "correct" in the sense that it values representation.

Architects use perspectives in both preliminary and final design stages. They utilize both drafting's traditional manual methods and computer programs to generate desired perspective views to aid in the design process. To fully appreciate perspective drawing, it is important to understand the time-consuming, hand-drawing procedures before embarking on quicker computer methods. Manually constructed methods form the basis for the computer programs used today.

In the preliminary design stages, rough freehand perspective drawings are the norm. In the final presentation stages, perspectives are accurately constructed for the purpose of rendering them (see Chapter 8). In 1949, Frank Lloyd Wright did a rendered conceptual drawing (see p. 81) for his famous Guggenheim Museum in New York City showing a tower in the background that at the time was not built. The complete dream in the perspective rendering finally came to fruition with the completion of the tower addition in 1992.

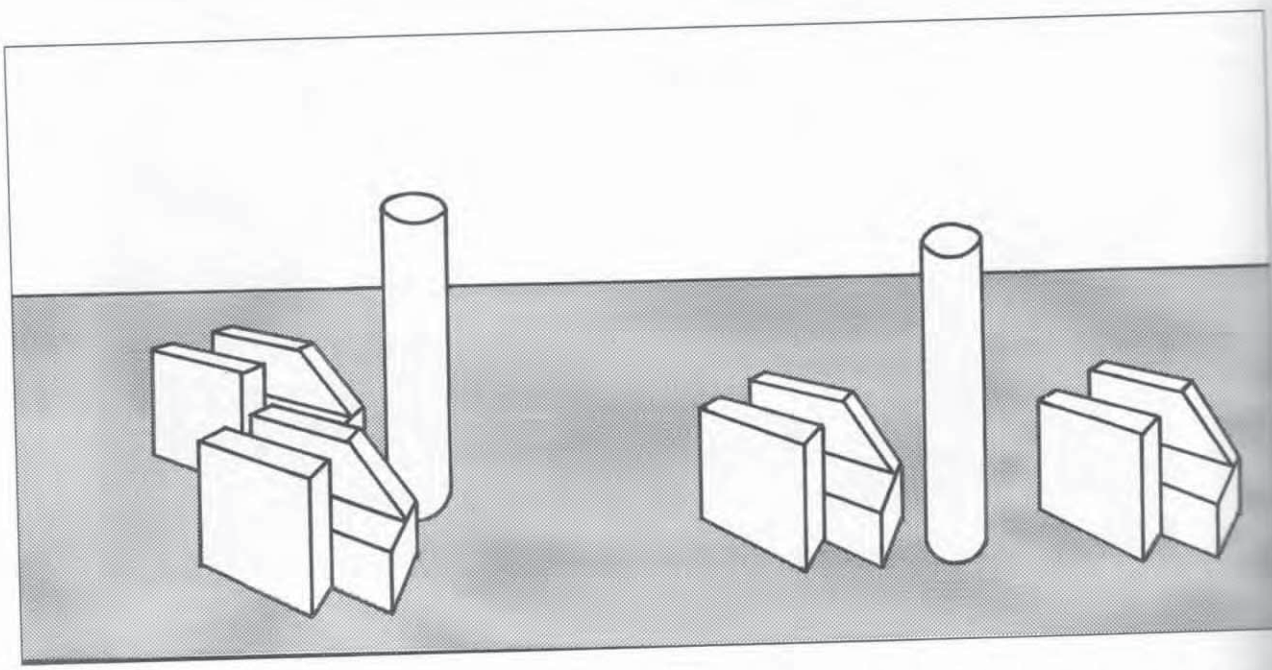


Frank Lloyd Wright
Solomon R. Guggenheim Museum (night rendering), circa 1950–1951
37" × 26" (94 × 66 cm)
Medium: Tempera and black ink on composition board
Collection Peter Lawson-Johnston
Photograph by David Heald © The Solomon R. Guggenheim Foundation, New York

Photo: Waterfront pier
San Francisco, California

© Albert Lee

Whether we are viewing the environment or attempting to realistically depict what we see on a two-dimensional, flat drawing surface, we experience four major phenomena: (1) diminution, (2) overlapping, (3) convergence, and (4) foreshortening. **Diminution** occurs when equal-sized objects, such as the lampposts above, appear to diminish in size with distance. This can be seen on the opposite page, where a fixed observer notices that columns and arches of equal size appear to diminish with distance. Photographs require the cameraperson to view from a frozen position, much like the single vantage point of any perspective drawing. Thus, perspectives have a photolike quality.

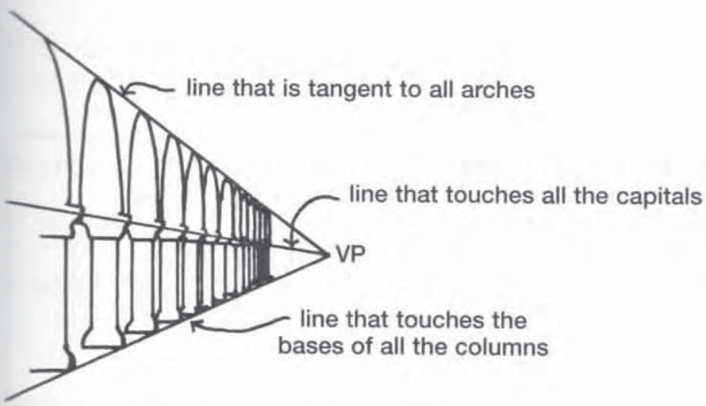


When we see objects **overlapping,** a sense of depth and space is achieved. Isolated objects provide very little sense of spatial depth—if any.

© Rendow Yee

Stanford University quadrangle, Palo Alto, California
Shepley, Rutan and Coolidge, Architects

These two photographs of a series of arches were taken from two different vantage points. The oblique angle at left is the frontal exterior side of the series of arches whereas below the angle is from behind the series of arches. In both cases a **convergence** of parallel lines occurs: the line tangent to all the arches vanishes to the same point as the line that touches the bases of all the columns.

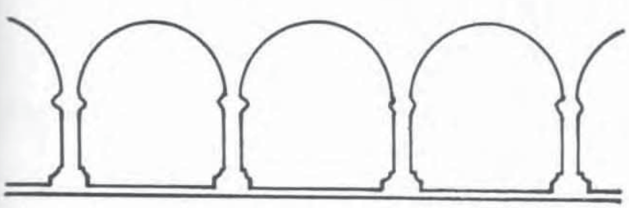


FORESHORTENED ARCHES

The three lines that converge above would be parallel if drawn in the true-size view below.

© Rendow Yee

In a head-on view, there would be no illusion of perspective space because no convergence would be evident. The arches would be seen in their maximum or true size. At an oblique angle the arch size becomes **foreshortened** since it is no longer in its true size. The semicircular arch becomes elliptical in all oblique-angle positions.



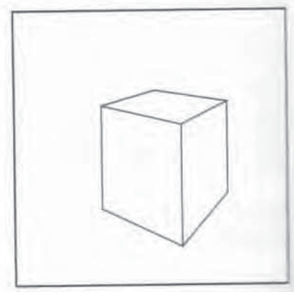
TRUE-SIZE ARCHES

PERSPECTIVE CUES

Webster's Dictionary defines "cue" as a hint or intimation. We pick up visual cues all the time. The cues may not always be exactly how we see the physical environment. In general, what we see can be called "perspective" cues. The most fundamental and efficient types of drawing cues are those that employ lines to record the edges of surfaces as we experience them in reality. These are called perspective cues because they represent the relationships between the edges of surfaces at a particular point in time and space — a particular perspective on the world. Perspective cues have been codified into three drawing systems: **linear perspective, paraline perspective** (used here to include axonometric and oblique systems), and **orthographic perspective** (multiview drawings). None of these is exactly how we see the world all the time. Each represents certain perceptual and cognitive realities — some combination of what we see and what we know about things.

Linear Perspective Cues

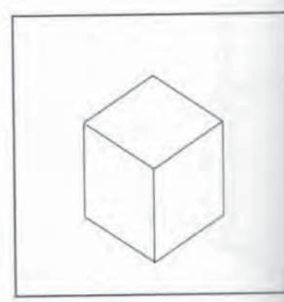
Linear perspective is most acutely experienced in places where long rectangular surfaces begin near the observer and recede into the distance, such as long, straight roads. The essential experience is that the parallel lines seem to come together in the distance. The edges of surfaces are represented by lines that follow the rules of linear perspective and each has a line grammar. One-point perspectives have vertical lines, horizontal lines, and perspective lines (lines that go to vanishing points). Two-point perspectives have vertical lines and perspective lines. Three-point perspectives have only perspective lines.



Diagrams and text: Courtesy of
William R. Benedict, Assistant Professor
California Polytechnic State University
College of Architecture & Environmental Design
San Luis Obispo, California

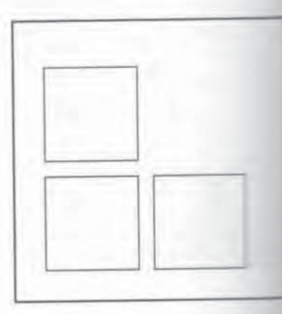
Paraline Perspective Cues

The Western perceptual schema is culturally biased toward linear perspective. To other cultures and in other times, a paraline drawing looked more "correct" than one using linear perspective. When things are small relative to our visual field, their edges and surfaces tend to retain their dimensions. The degree to which the edges vanish is so slight that our knowledge of their equality in length and angle can easily be more important than their adherence to the linear perspective. Paraline systems codify this view of reality. The edges of surfaces are represented by lines that follow the rules of paraline drawing conventions. The edges of parallel surfaces remain parallel and retain direct measured relationships to each other and the thing being represented. Verticals remain vertical and the other axes slope at specified angles.



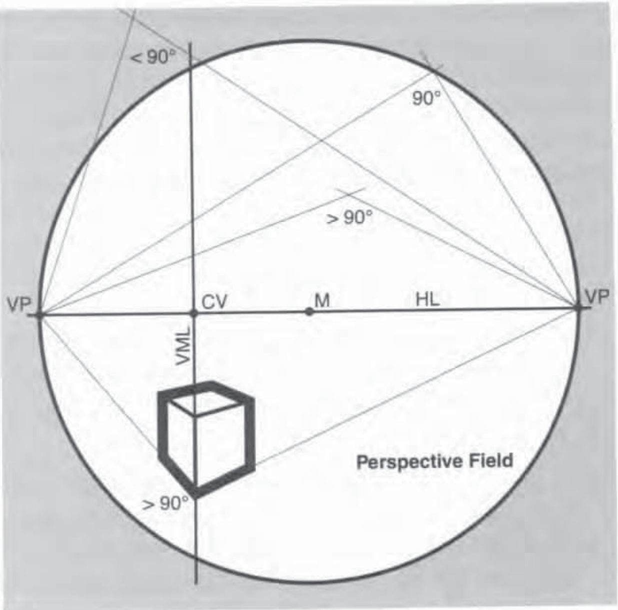
Orthographic Perspective Cues

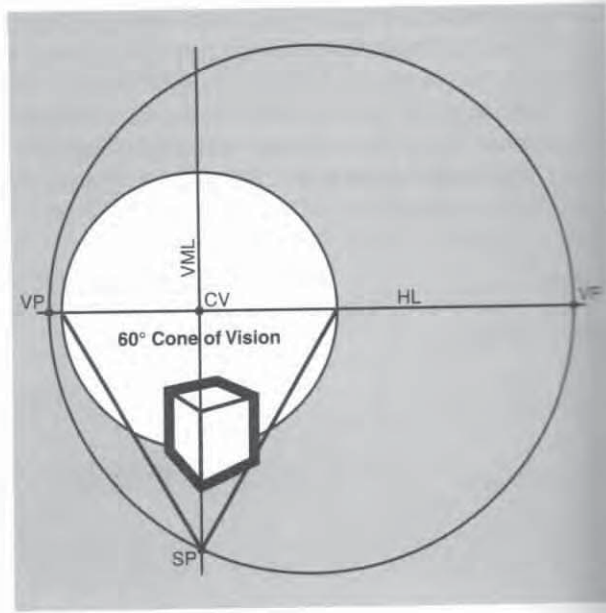
Orthographic perspective is less acceptable to our eyes and requires experience with its conventions to be able to read it. It represents a single object with multiple drawings and requires the ability to assemble the drawings in your mind. We experience things in orthographic perspective when their surfaces are relatively flat and we are standing directly in front of and facing them. As we move away from an object, our experience more closely corresponds to an orthographic drawing. The edges of surfaces are represented by lines that follow the rules of orthoghraphic drawing. Parallel edges remain parallel and retain direct measured relationships to each other and the thing being represented. Verticals remain vertical, horizontals remain horizontal, and the depth axis is represented by a point.



Linear perspective drawing is a tool used by the designer or delineator to make a reasonably accurate representation of a three-dimensional object on a two-dimensional surface (the drawing sheet). A linear perspective drawing is an image of an object projected upon an assumed plane (the picture plane, or PP) that is parallel to the observer's face or eyes. When used as a representational tool for the design-drawing process, it is of utmost importance not to misrepresent the physical appearance of buildings with inaccurate perspective representations. The following are the most commonly used terms in the vocabulary of perspective drawing techniques.

TERM	ABBREVIATION	DEFINITION
Station Point	SP	• A vantage point location to view an object or group of objects; the location of the observer's eye. Object projection lines (also termed visual ray or sightlines) converge to this point.
Picture Plane	PP	• A stationary, transparent, two-dimensional, vertical plane or "window." This window receives a true-size image from the projection lines that converge to the station point. It is perpendicular to the ground plane and parallel to the observer.
Line of Sight	LS	• An imaginary central axis line projected from the observer's eye (station point) that intersects the vertical picture plane perpendicularly. It is perpendicular to the observer.
Horizon Line or Eye-Level Line	HL	• The horizon line represents the observer's eye level and is recorded on the picture plane. It is the vanishing line for all horizontal lines and planes.
Ground Line	GL	• The line where the picture plane and the ground meet. The ground line lies within a ground plane from which vertical measurements are made.
Ground Plane	GP	• The reference plane where the observer is situated. It can be at any level (real or imaginary), depending on the vantage point of the perspective view.
Vanishing Point	VPL, VPR, and VP_o	• A point on the horizon line where any group of parallel horizontal lines converge in perspective. Groups of oblique (inclined) parallel lines vanish either above (sloping upward) or below (sloping downward) the horizon line. Parallel lines that are parallel to the picture plane do not converge.
Vertical Measuring Line	VML	• A vertical line within the picture plane. Vertical height dimensions are transferred from an elevation to this vertical true-length line in order to be projected into the perspective drawing.
Midpoint	M	• A point located on the horizon line that lies halfway between the vanishing points in a two-point perspective.
Horizontal Measuring Line	HML	• A horizontal line lying in the picture plane, it is therefore a true-length line.





Acceptable Distortion

Linear perspective formalizes through geometry a system that attempts to represent three-dimensional reality on a two-dimensional surface—that is, it attempts to place a portion of the visual field on a page. Because it is a closed system assuming a fixed, one-eyed observer, it has limitations that must be respected if the goal is to accurately represent perceived visual reality—for the drawing to "look right." The cube that is drawn with its lead edge coinciding with the vertical measuring line (VML—the line drawn through the center of vision) and centered vertically on the horizon line is the most accurate cube in the perspective. As the cubes move away from this location, they progressively become more distorted. The question, therefore, is how far from this location does a perspective retain sufficient accuracy so as not to be visually disturbing—what are the limits within which the perspective looks right?

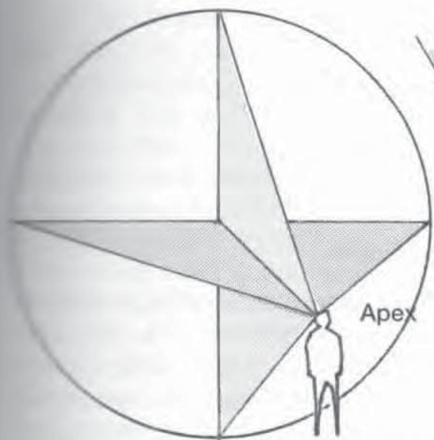
Cone of Vision

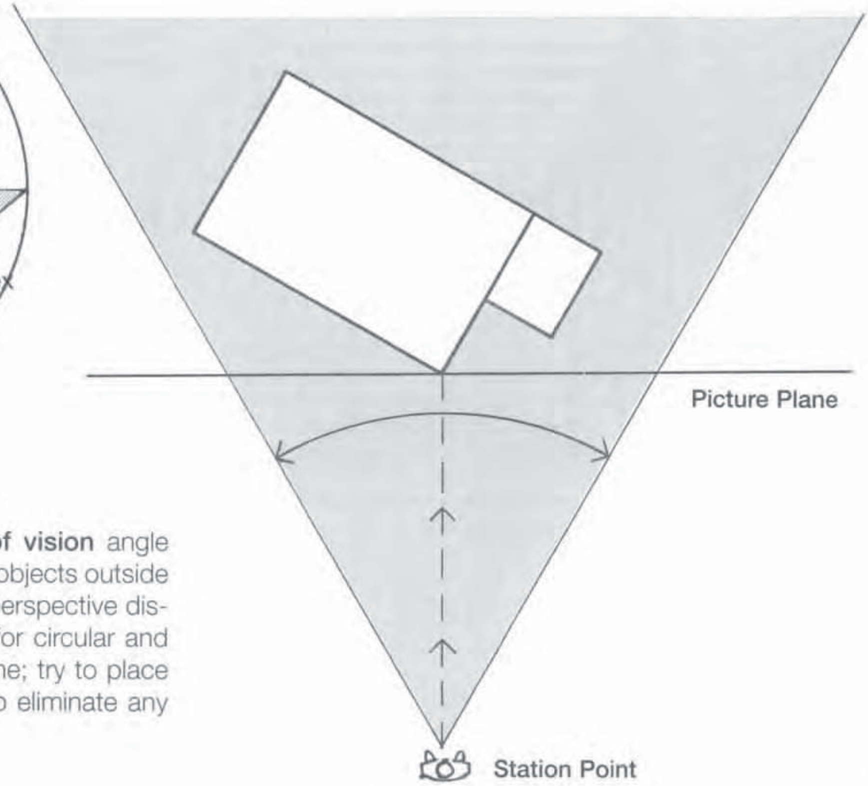
For any given perspective setup, there is a finite area surrounding the center of vision (CV), within which the perspective will look normal. The limits of this area are defined by a **cone of vision** (COV), which starts at the station point. The cone of vision links the way our eyes work and controls **distortion** within the perspective system. A 60° cone is one that extends 30° to either side of our line of sight. The illustration simultaneously shows a 60° cone of vision in both plan and perspective. For any measuring point perspective setup, the cone of vision can be constructed to establish the area within which a perspective will "look most correct."

Diagrams and text: Courtesy of
William R. Benedict, Assistant Professor
California Polytechnic State University
College of Architecture & Environmental Design
San Luis Obispo, California

Perspective Field/90° Horizontal Corner

The **perspective field** is the area defined by a circle whose center is located at the midpoint (M) and whose circumference intersects the two horizontal vanishing points in a two-point perspective. The perspective field can be used to control the near internal angle of horizontal rectangles to 90° or greater. When the angle becomes less than 90°, it does not look right. Any two lines intersecting at the circumference of the perspective field will create a 90° angle. Those intersecting beyond the circumference will create an angle of less than 90°, while those intersecting within the perspective field will create an angle of more than 90°. Therefore, the perspective field provides a guideline for establishing some limits within the linear perspective system.

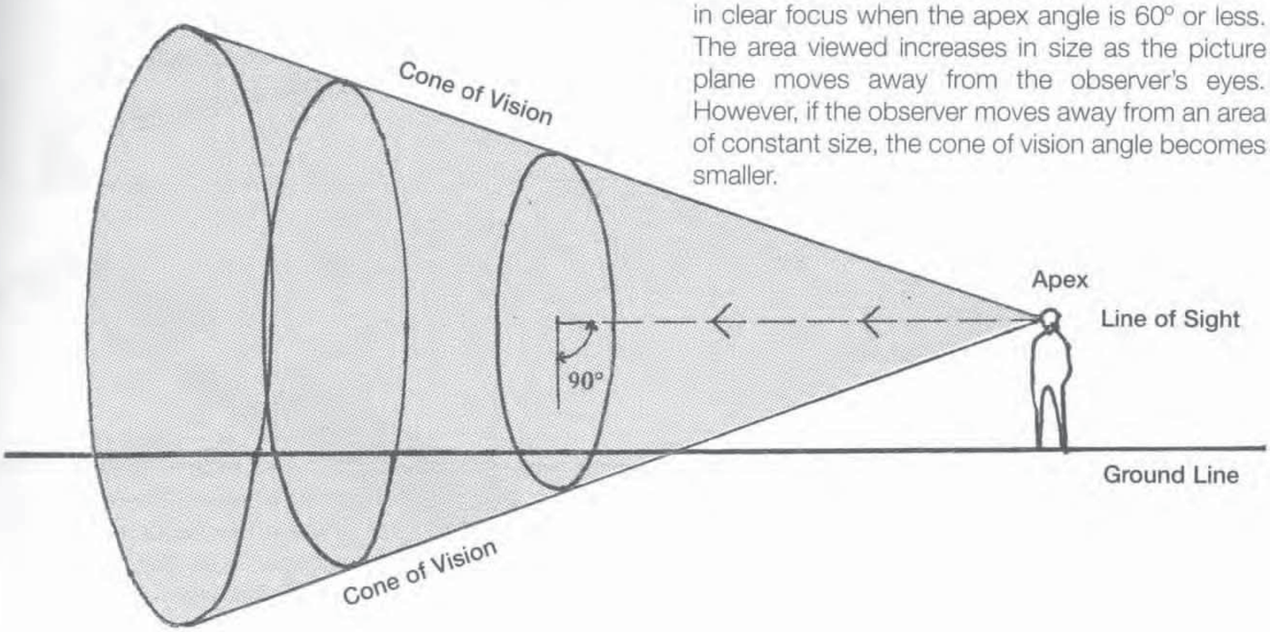


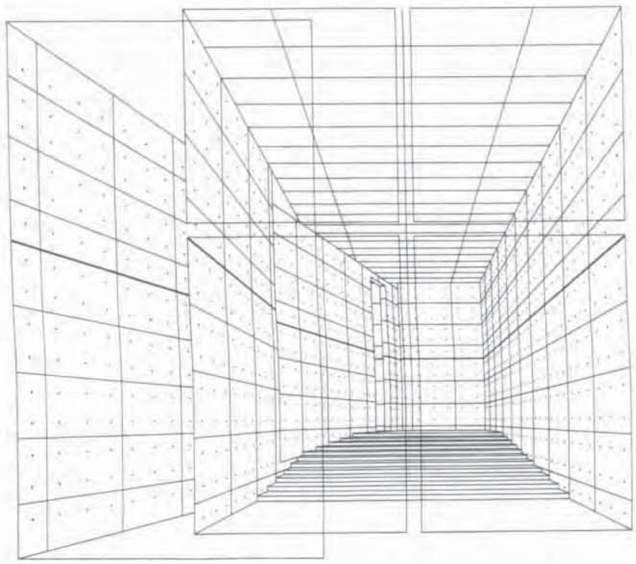


Cone of Vision

To prevent distortion, the **cone of vision** angle should not exceed 60°. Peripheral objects outside the cone of vision will suffer from perspective distortion. Minimal distortion occurs for circular and curvilinear shapes within a 60° cone; try to place these shapes within a 30° cone to eliminate any distortion.

Think of the three-dimensional **cone of vision** as what you can see without moving your eyes. The boundary of this view is the cone's surface. The area of nondistorted vision is the area of the base of the cone (a true circle) that is perpendicular to the observer's central axis line of sight. This circular area on the vertical picture plane can be seen in clear focus when the apex angle is 60° or less. The area viewed increases in size as the picture plane moves away from the observer's eyes. However, if the observer moves away from an area of constant size, the cone of vision angle becomes smaller.

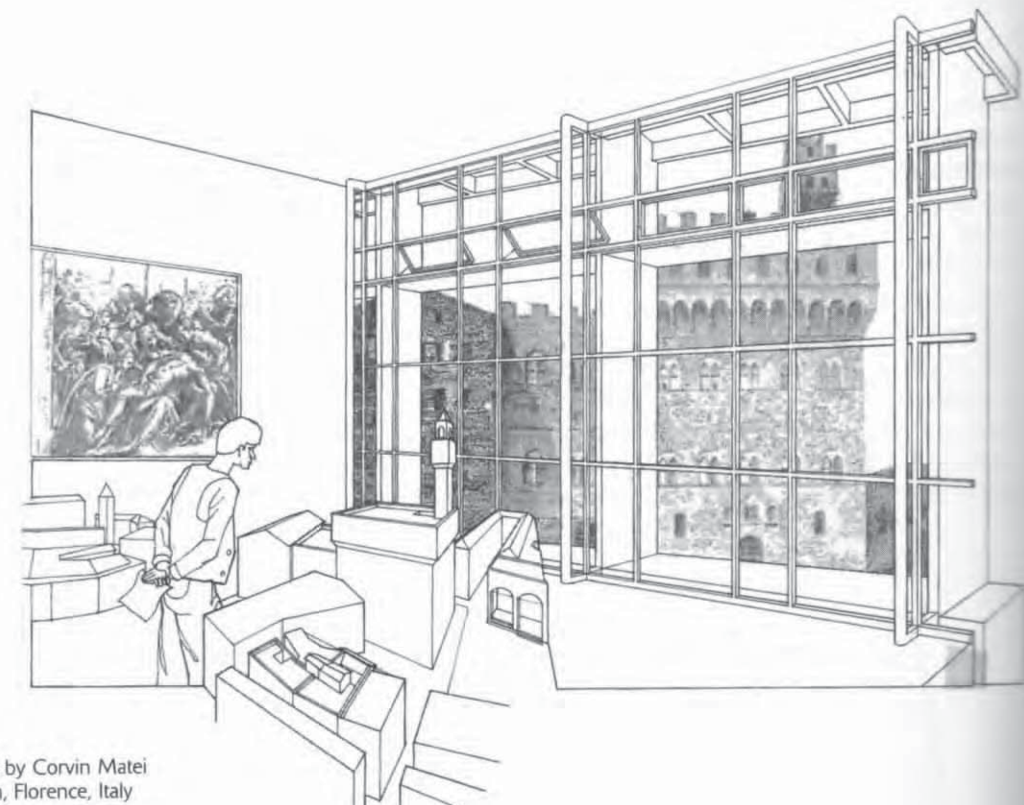




Drawing: Church of the Light, Ibaraki, Japan
23.3" × 16.5" (59.2 × 41.9 cm)
Medium: Ink
Courtesy of Tadao Ando, Architect

The Picture Plane

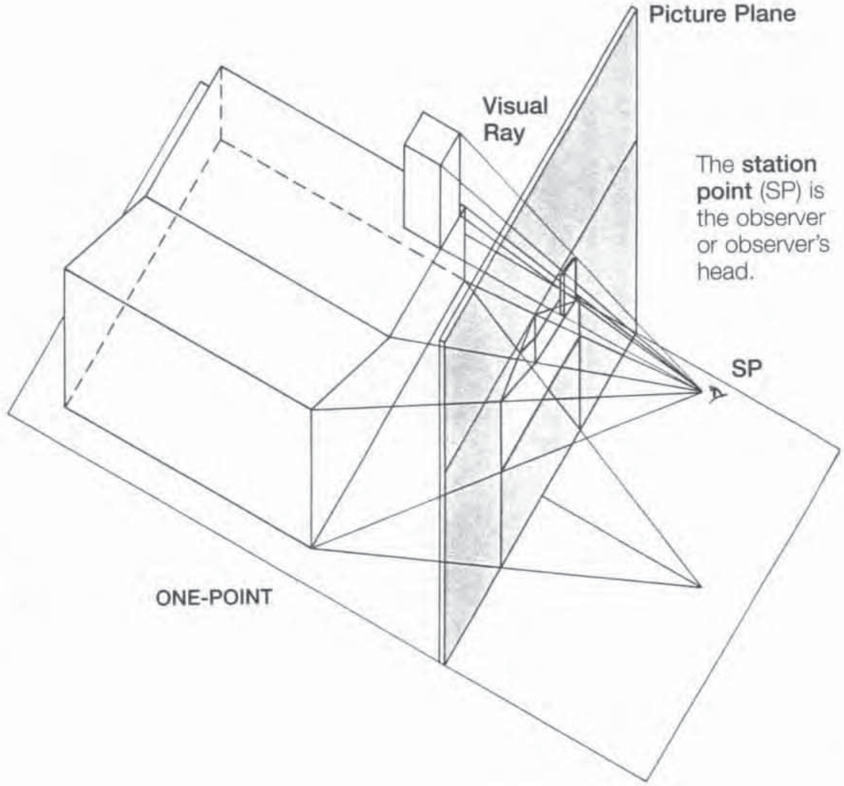
This transparent interior perspective shows the wall with a cross slit behind the church's altar. The wall simulates a vertical picture plane through which one can capture the perspective view. An exception to the flat, two-dimensional picture plane is the spheroidal (similar to a sphere but not completely round) picture plane used with a fish-eye lens view.

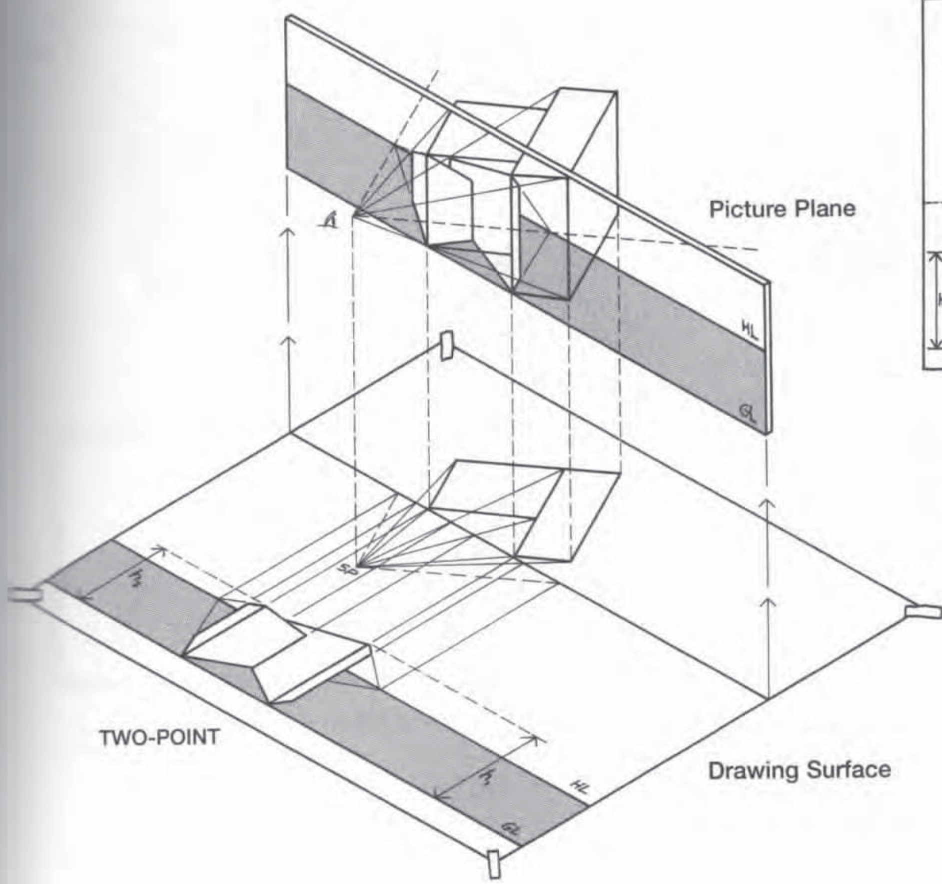


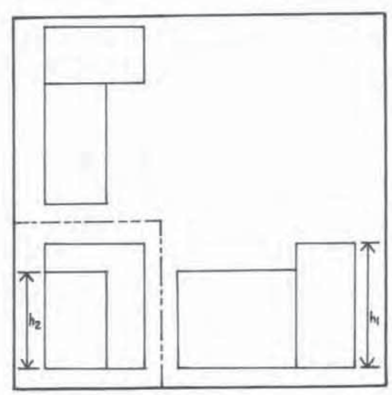
Drawing: Student project by Corvin Matei
Vasari Museum, Florence, Italy
10" × 8" (25.4 × 20.3 cm)
Medium: Ink on Mylar
Courtesy of the University of Texas at Arlington
School of Architecture

A window is a fixed transparent vertical plane. When we look through a window, our eyes receive images of the three-dimensional objects we see. These images are translated onto a two-dimensional plane (the window) at an infinite number of points when our lines of sight intersect the window. Thus, the window becomes the **picture plane.** This drawing shows the viewpoint of an observer looking through a window. Note that the observer's side with the widest upper-body dimension is always parallel to the picture plane (window).

To the right is an example of parallel one-point perspective. The image of the building form is projected on the picture plane by sight lines that intersect the picture plane. Vertical and horizontal lines in the building retain verticality and horizontality in the image. Lines in the building not parallel to the picture plane will converge at a vanishing point. Because the building form is behind the picture plane, it is projected smaller than true size on the picture plane. If it were in front, it would be projected larger than true size. A one-point perspective always has a plane parallel to the picture plane. Any planes perpendicular to the picture plane vanish to one point. A two-point perspective (below) has angled planes (not parallel) to the picture plane.



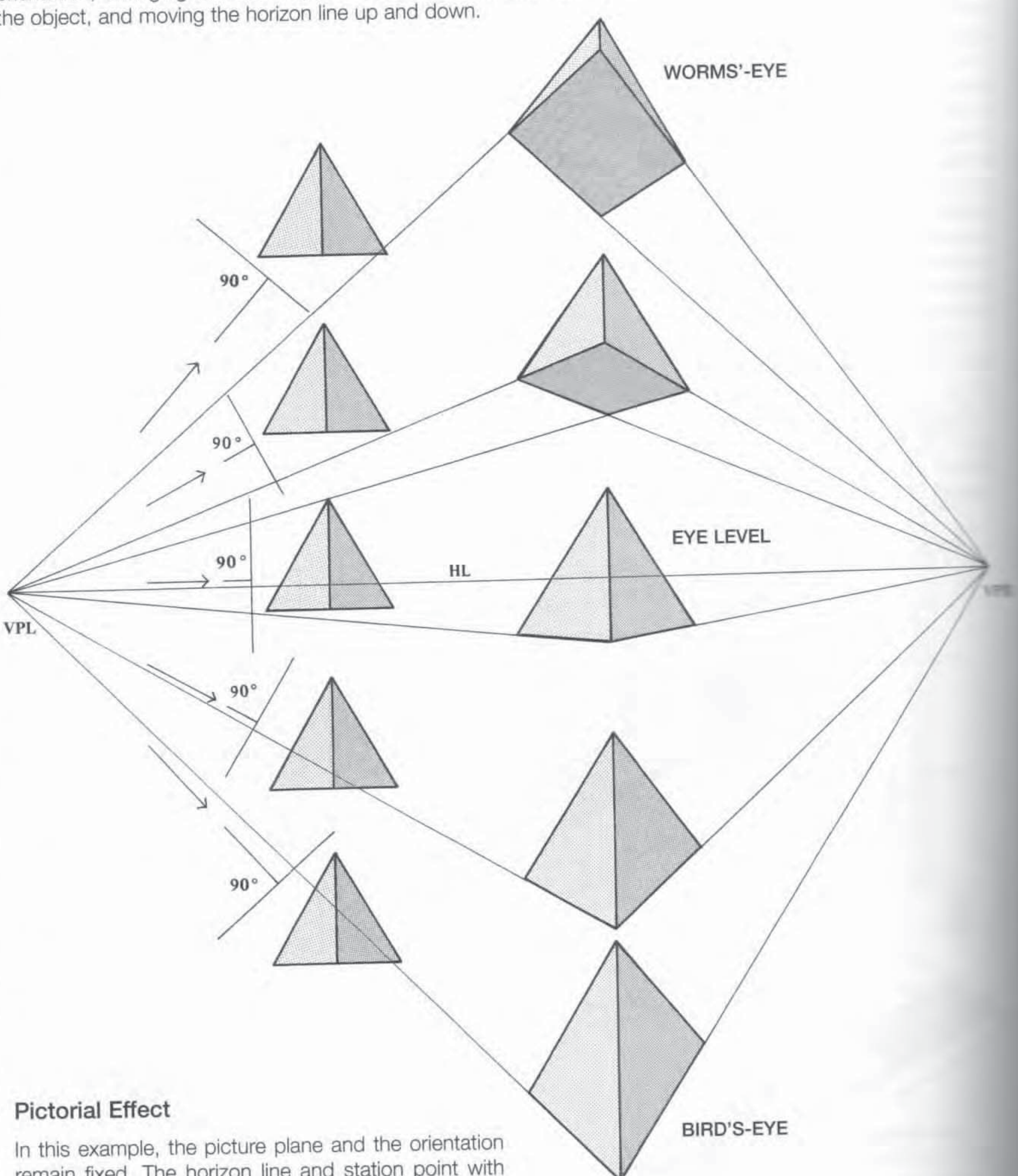




The **picture plane** is always perpendicular to the drawing surface and the central line of sight. It is represented by a **line** on the drawing. Also on the drawing, the observer reduces to a dot and the building form to a two-dimensional plan view. True heights (**h_1** and **h_2**) are always obtained from a set of orthographic drawings (plans and elevations). They are measured vertically from the ground line.

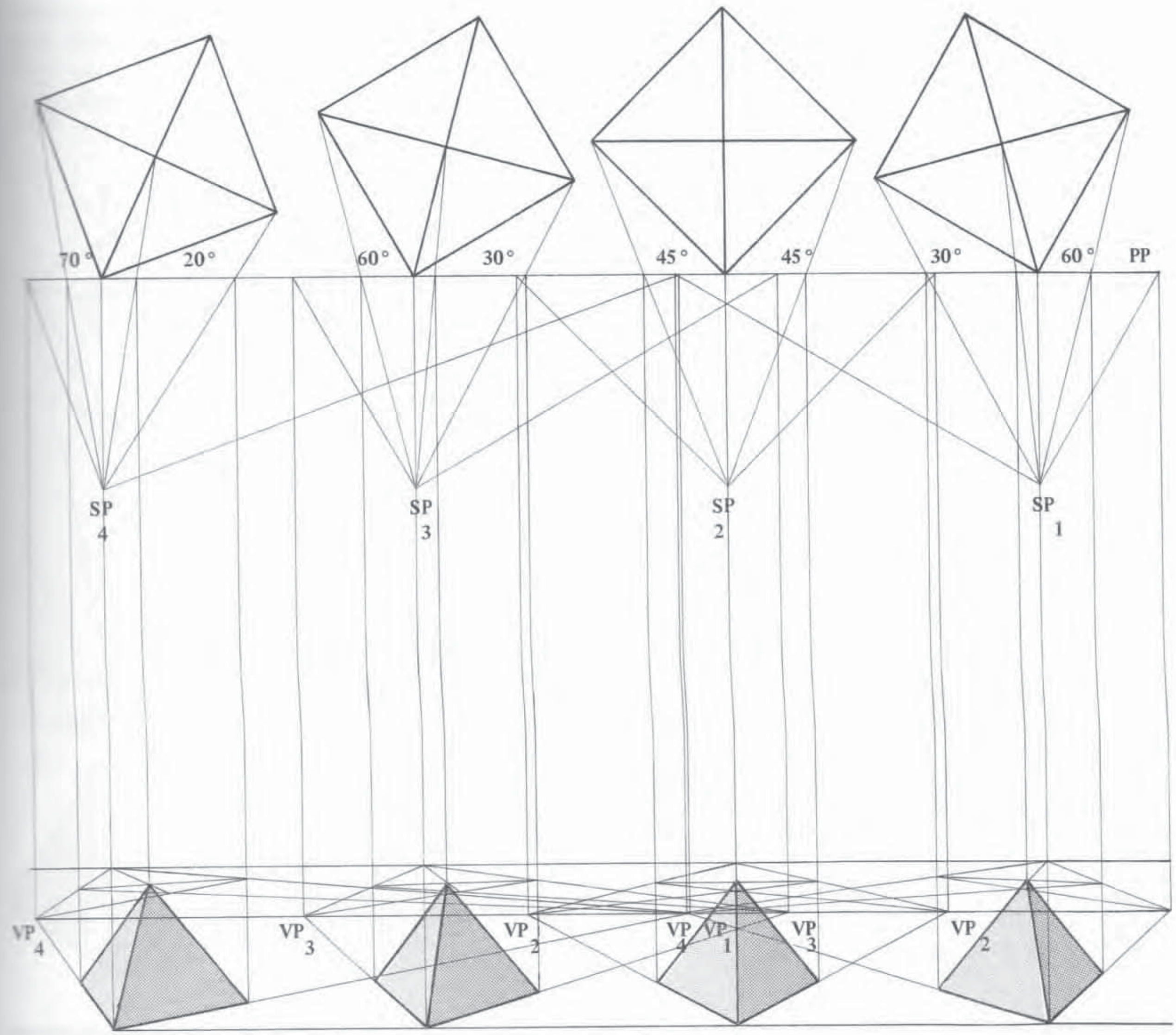
PICTORIAL EFFECT: VARIABLE SP HEIGHT AND HL

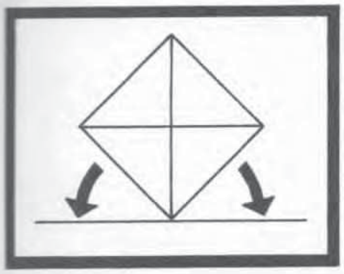
You can manipulate a perspective image by changing certain variables. These include moving the picture plane, changing the orientation, changing the station point location with respect to the object, and moving the horizon line up and down.



Pictorial Effect

In this example, the picture plane and the orientation remain fixed. The horizon line and station point with respect to the ground plane moves up and down. As they move up, an aerial view of the pyramid becomes apparent. As they move down, a greater amount of underside view becomes apparent.



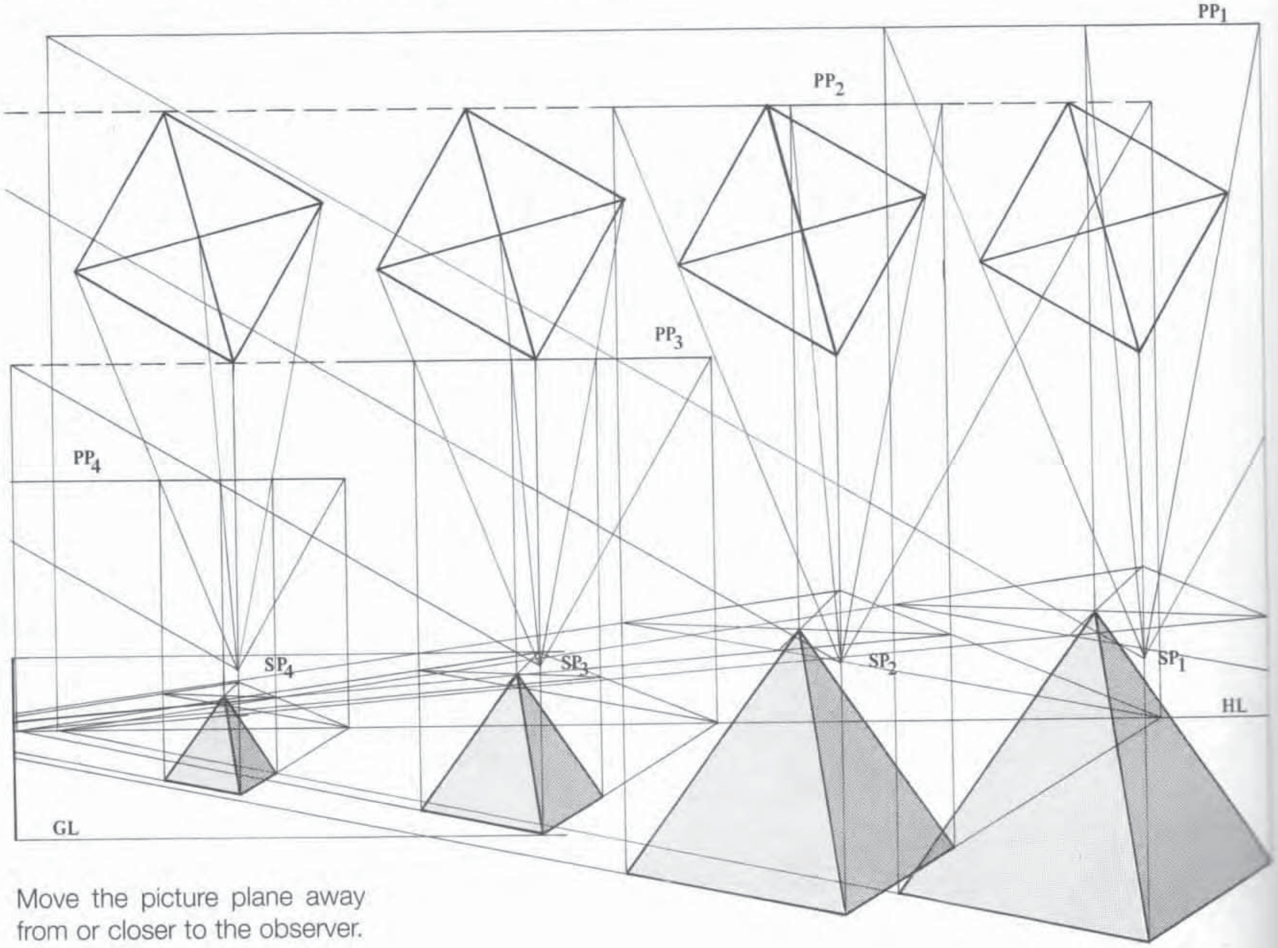


Each **orientation** change produces a new set of angles with respect to the picture plane.

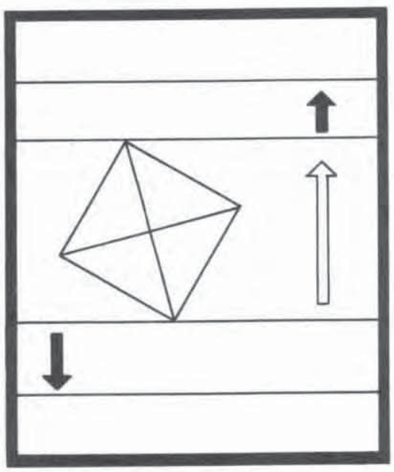
In this example, the picture plane, the station point location, and the horizon line remain fixed. The orientation changes. As the plane of the pyramid sides turn away from the picture plane, you see less of its surface. In other words, it is foreshortened more.

PICTORIAL EFFECT: VARIABLE PICTURE PLANE

Note that increasing the distance from the picture plane to the station point (**PP_4** to **PP_1**) causes a progressive enlargement of the perspective images that have a similar projection.



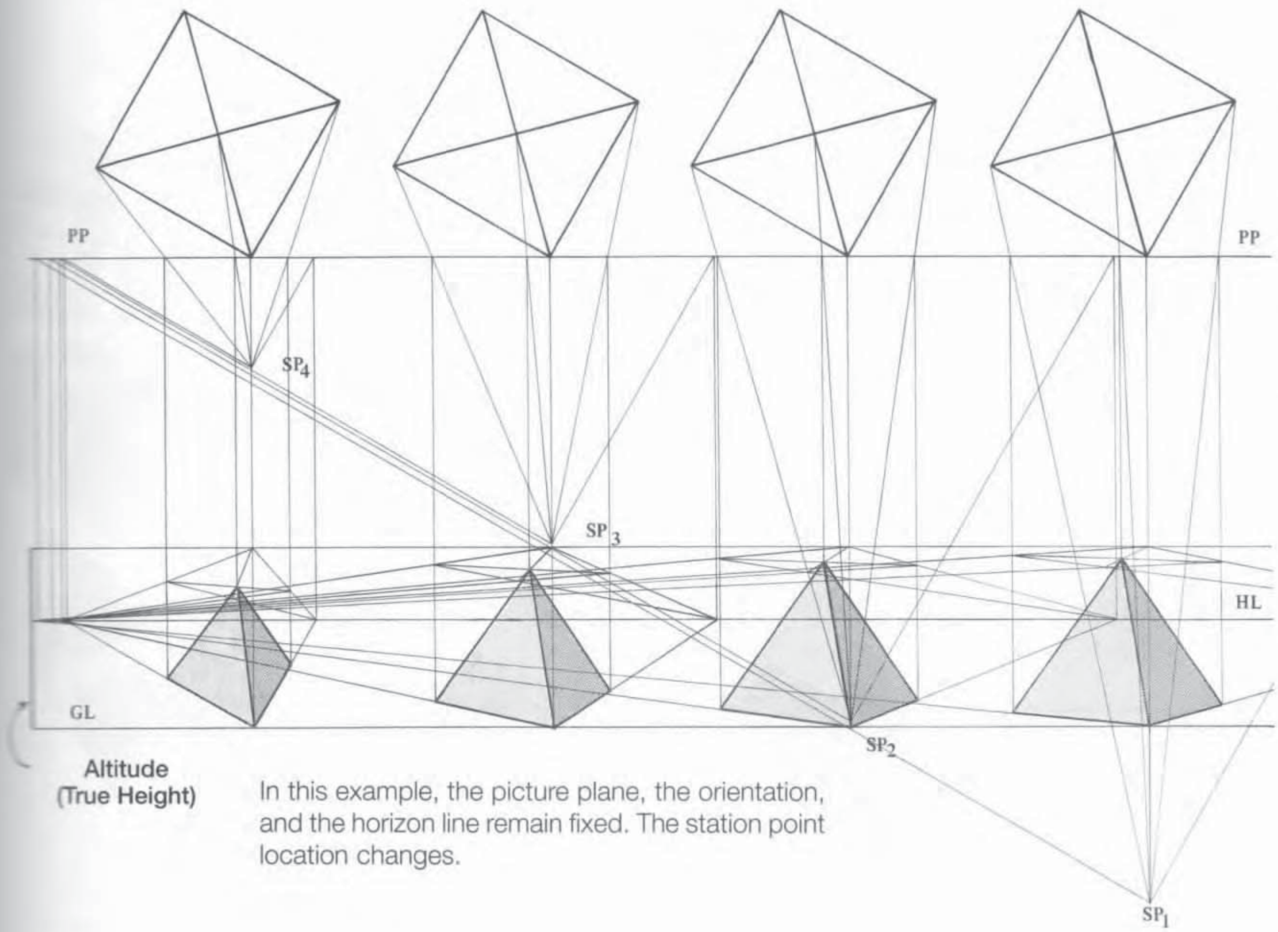
Move the picture plane away from or closer to the observer.



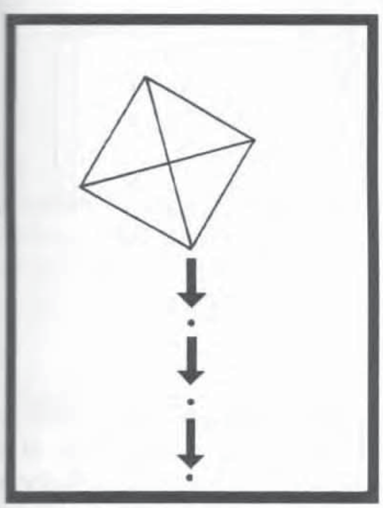
In this example, the station point location, the horizon line, and the orientation remain fixed. The **picture plane** location changes.

Drawing: The Pyramid at Le Grand Louvre, Paris, France
30" × 16" (76 × 41 cm)
Medium: Acrylic
Pei Cobb Freed & Partners / Michel Macary Architects
Courtesy of Lee Dunnette, Architectural Illustrator

Note that increasing the station point distance to the object (**SP_4** to **SP_1**) causes a decrease in foreshortening due to the two vanishing points progressively moving away from each other.

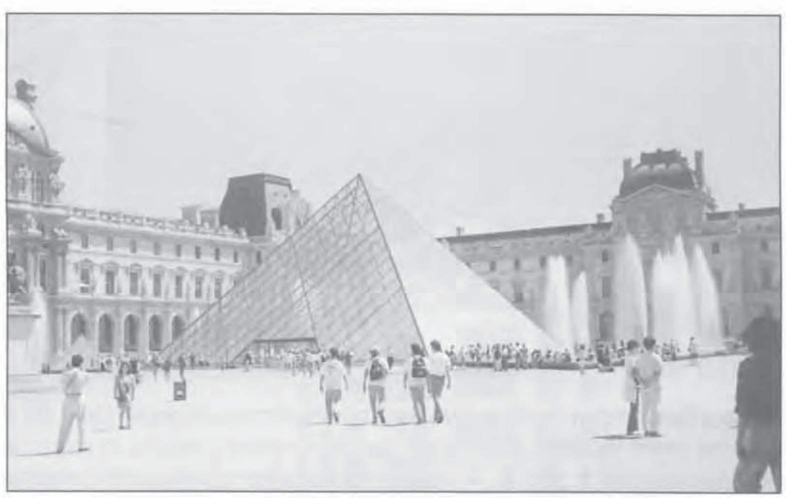


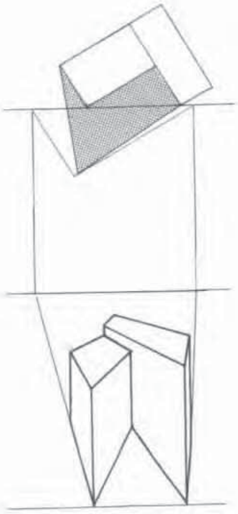
In this example, the picture plane, the orientation, and the horizon line remain fixed. The station point location changes.



The **observer moves** away from the viewed object.

© Olallo L. Fernandez





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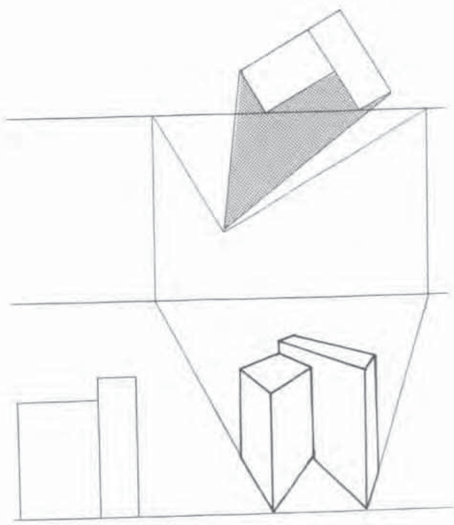

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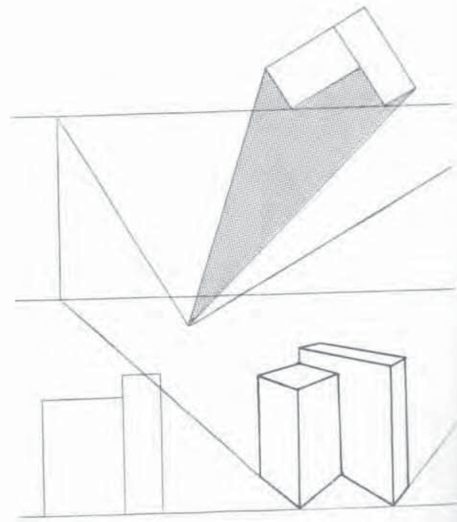

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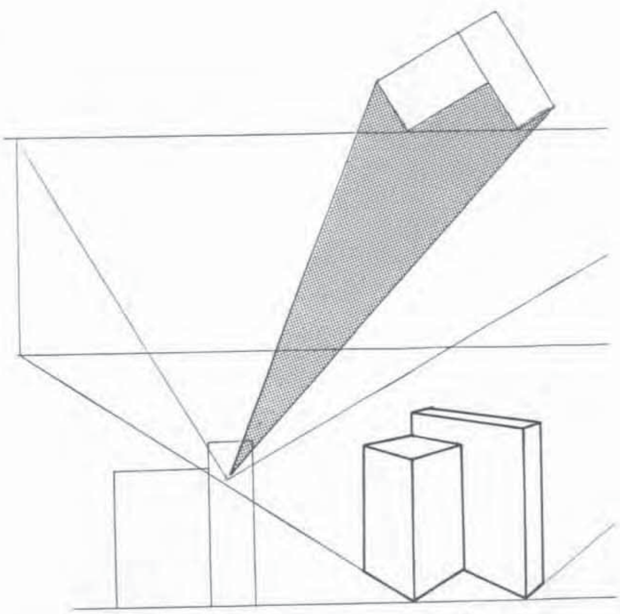

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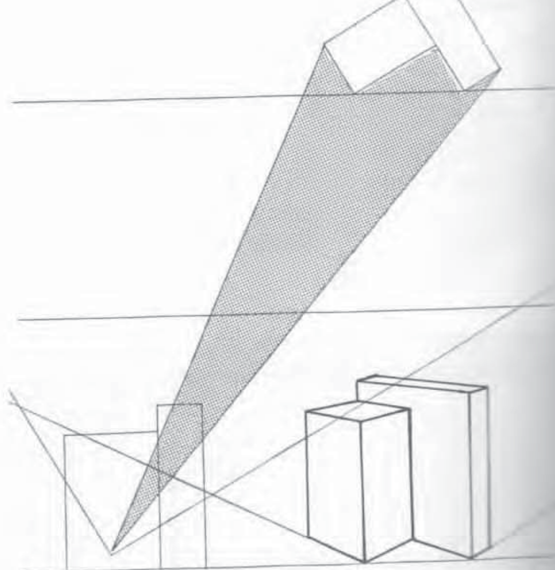
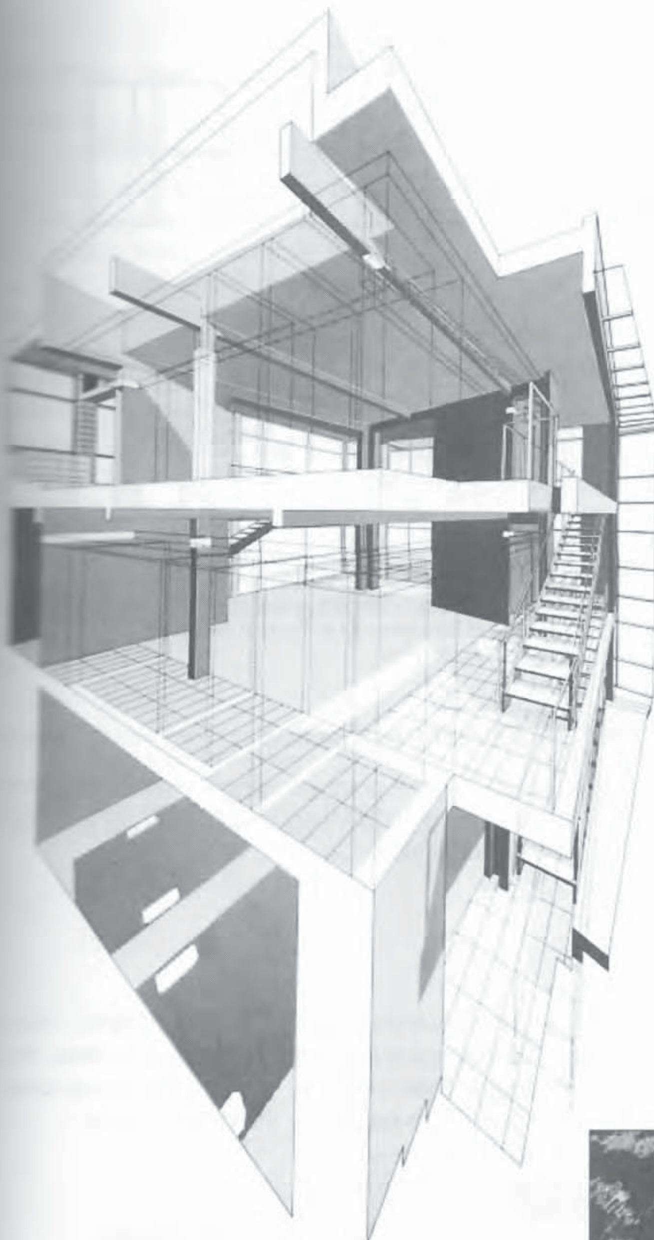


5

Distortion

Distortion, shown here in two-point perspective, is dependent on the spacing of vanishing points. A very close station point location with close vanishing points results in extreme convergence with a great amount of foreshortening (see **1** and **2**). A very distant station point results in minimal convergence with very little foreshortening. A more natural pictorial view is obtained by spreading the vanishing points apart (see **4** and **5**). However, try not to spread them too far apart or a distorted flatness will occur. A good distance from the SP to the PP is three times the object height, or 1.80 to 2.40 times the width of the scene or object.



Drawing: Burnett House addition
Lake Oswego, Oregon
24" × 36" (61 × 91.4 cm)
Medium: Ink on Mylar with Zipatone
Courtesy of David Rockwood Architects & Associates

Distortion

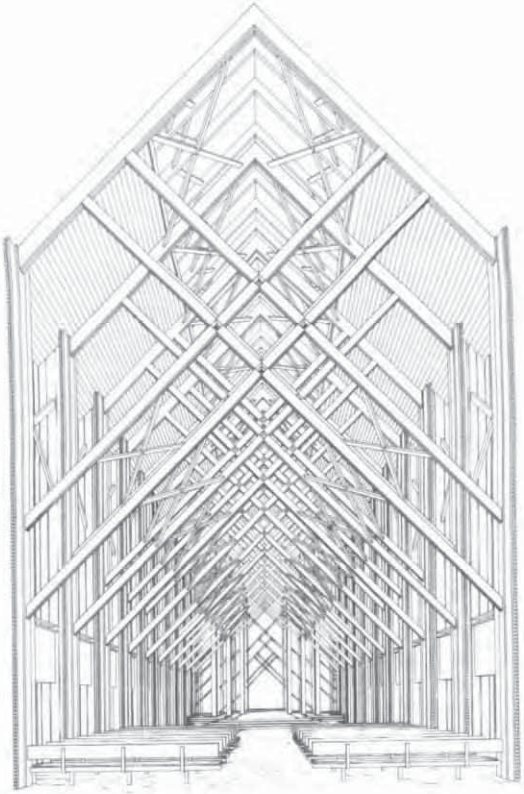
This interior perspective shows a large amount of foreshortening with conditions similar to example **1** (opposite page). There is a point at which the vanishing points become too close with respect to the height (which relates to the cone of vision). This results in a distorted view.

Example of extreme convergence

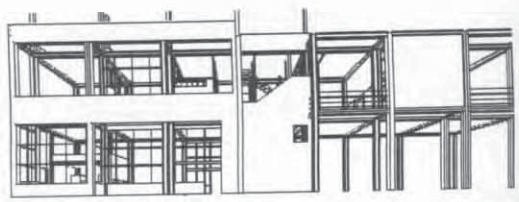
This exterior perspective shows a small amount of foreshortening with conditions similar to example **5** on the opposite page. The vanishing points are more spread apart.

Example of a closer to natural pictorial view

Drawing: Student project by Steve Gambrel
Seafarers' Church Institute
Courtesy of the University of Virginia School of Architecture



Drawing: Chapel for Rose Hills Memorial Park
Whittier, California
24" × 36" (61 × 91.4 cm), Scale: ¼"=1'0"
Medium: Pencil and ink
Courtesy of Fay Jones & Maurice Jennings, Architects
Drawn by Barry McNeill/Jones & Jennings

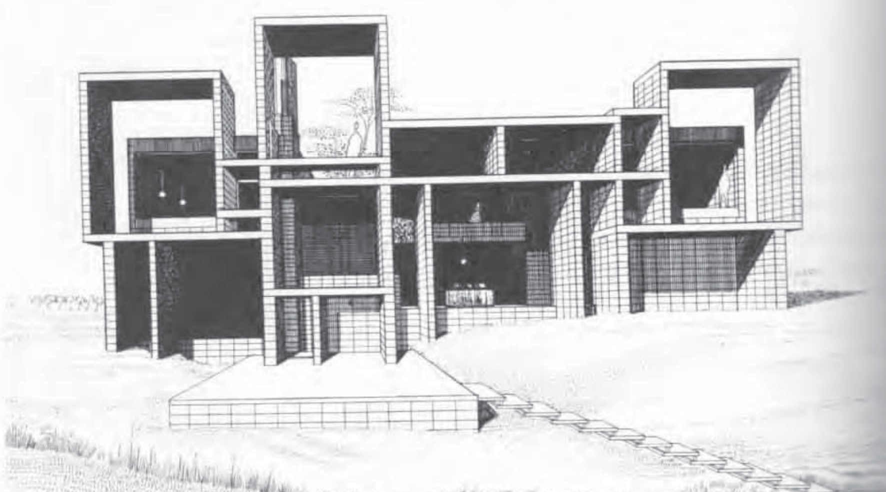


Drawings: Student project by Lois McGinnis and Michael Patrick
Shelby's Lake House—A project in CAD
Courtesy of the University of Texas at Arlington
School of Architecture

One-Point Perspective

The above one-point perspective seen at ground level is much more descriptive than its flat two-dimensional elevation.

The three main types of perspectives are classified based on the drawing's primary vanishing points. Many drawings have secondary minor vanishing points. These building examples show that all horizontal lines that recede away from the observer's eye converge to **one** vanishing point. Therefore, they can be classified as **one-point** perspectives. Note that in all three cases, one face of the building is parallel to the picture plane.



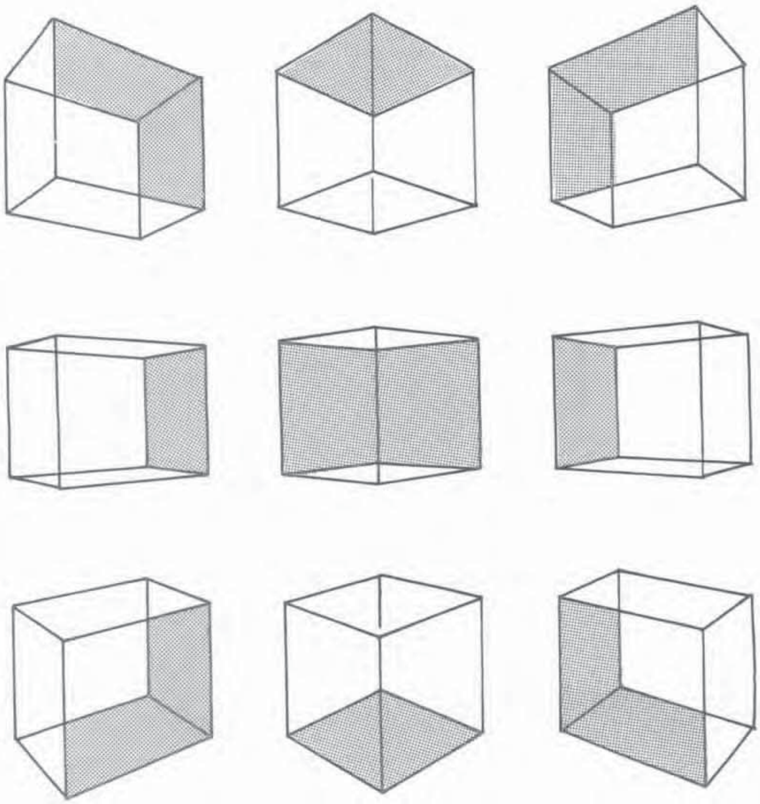
Drawing: Milam residence
St. John's County, Florida
33" × 30" (83.8 × 76.2 cm)
Medium: Ink on board,
Courtesy of Paul Rudolph, Architect

Two-Point Perspective

These building examples show their dominant facades converging on left and right sides to **two** vanishing points on their respective horizon lines. Therefore, they can be classified as **two-point** perspectives. Two-point perspectives, as in these examples, have parallel lines and edges in their dominant facades not parallel to the picture plane. With **three-point** perspectives (discussed at the end of this chapter), there is a characteristic upward or downward convergence of those same two sides to a third vanishing point (see p. 202).

Drawing: Student project by Leopoldo Chang Poet's Hotel, New York
Medium: Ink on Mylar
Excerpted from abstract, Columbia School of Architecture Planning and Preservation (CSAAP)

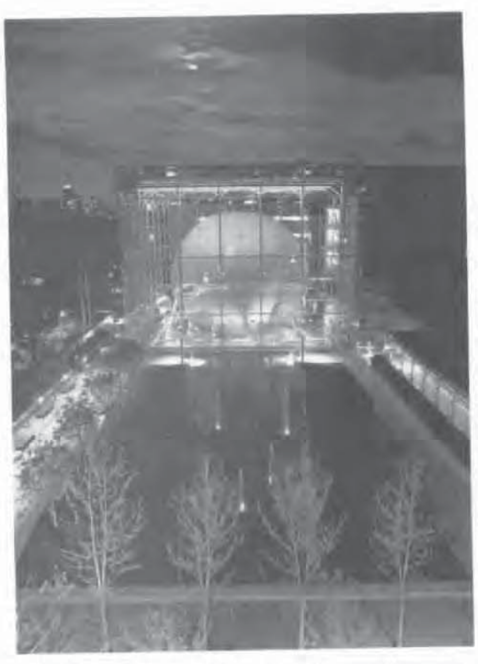
Drawing: Studio Durant (unbuilt), Berkeley, California
Medium: Computer-generated plot (size dependent on size of plot)
Courtesy of David Baker Associates Architects



Comparing Two-Point and One-Point Perspectives

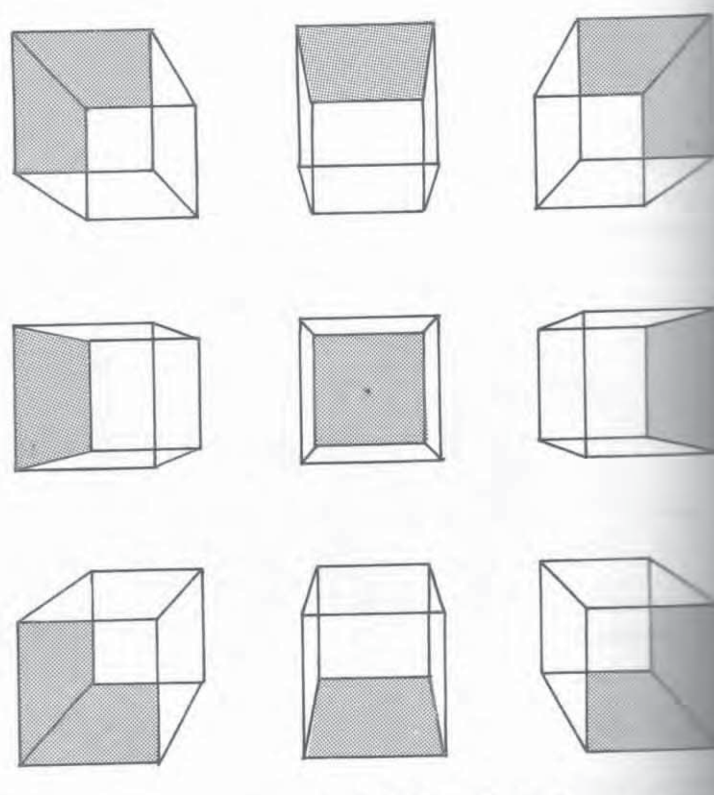
In the **two-point perspective** views shown at left, note how two sets of parallel horizontal lines converge to the left and to the right. In reality, vertical lines remain vertical only in the middle row, where the line of sight is horizontal. Looking up or down from the horizon line results in the appearance of upward or downward convergence of the vertical lines.

Look at cardboard cartons (boxes) and try to visualize them moving around in space. Visualizing and drawing a cube anywhere in space in any orientation and noticing the emphasis on different planes as the cube moves around will enhance your perspective drawing skills. Other geometric forms can be drawn and derived from a rectilinear or cubic form: the human senses of sight and touch allow us to experientially model all kinds of shapes.



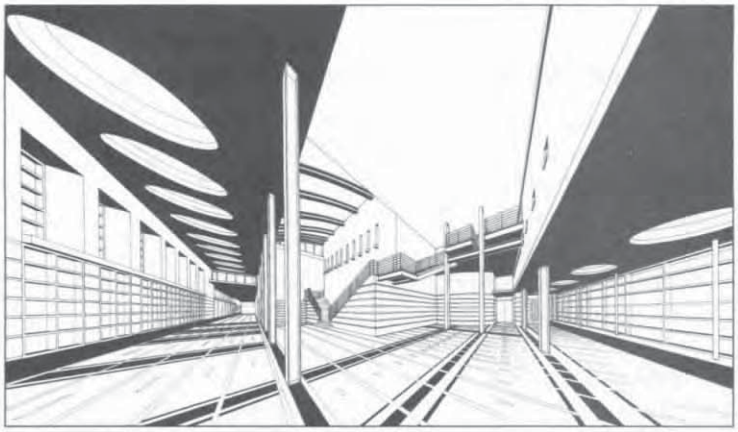
© D. Finnen/American Museum of Natural History

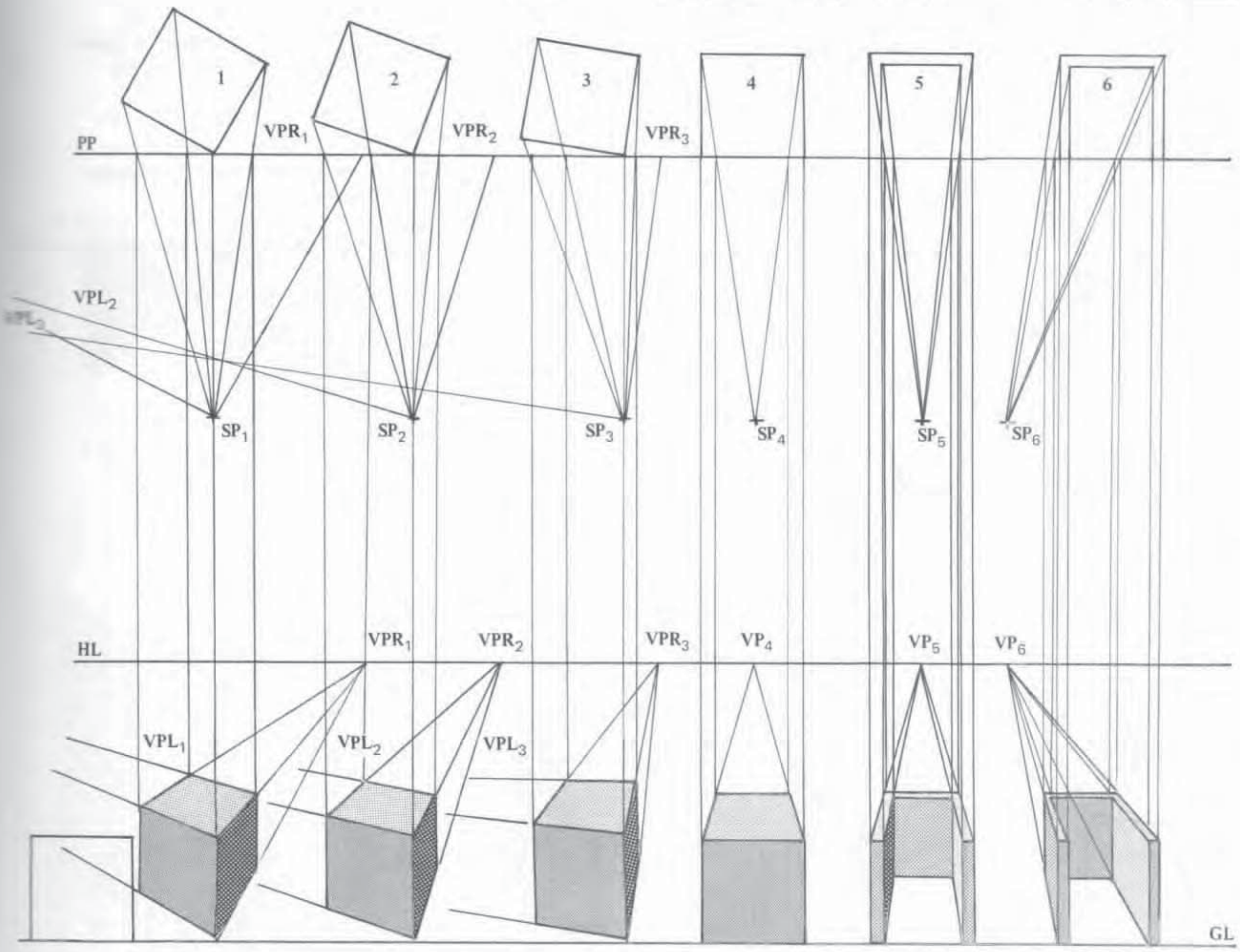
Photo: Rose Center for Earth and Space at the American Museum of Natural History (New York) by Polshek Partnership Architects



In a **one-point perspective,** the vanishing point is on a line that is perpendicular to the picture plane and intersects the observer's eyes (station point).

Drawing: Theater lobby, Perry Community Education Village, Perry, Ohio
36" × 24" (91 × 61.4 cm)
Medium: Ink on Mylar
Courtesy of Perkins & Will, Architects

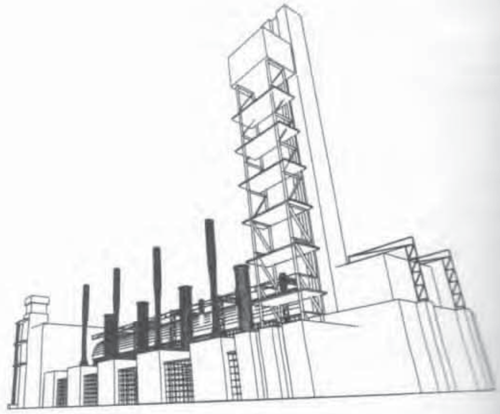




Understanding the concepts of **one-point** parallel perspective will facilitate your understanding of the construction of **two-point** angular perspectives. The construction methods of one-point perspectives are therefore presented prior to those for two-point perspectives. All horizontal and vertical lines in a one-point are parallel to the picture plane—hence the term "parallel perspective." However, all lines perpendicular to the picture plane converge to the one vanishing point (**4, 5,** and **6**). Note how the cube transforms from a two-point (**1–3**) to a one-point (**4**). The illustration at the top shows characteristics of both one- and two-point perspectives. Note the tilted ellipses (see p. 211). For both one- and two-point perspectives, construction methods using orthographic views (plans, elevations, and sections) will be shown first; this will be followed by methods used without orthographic views that use measuring points.

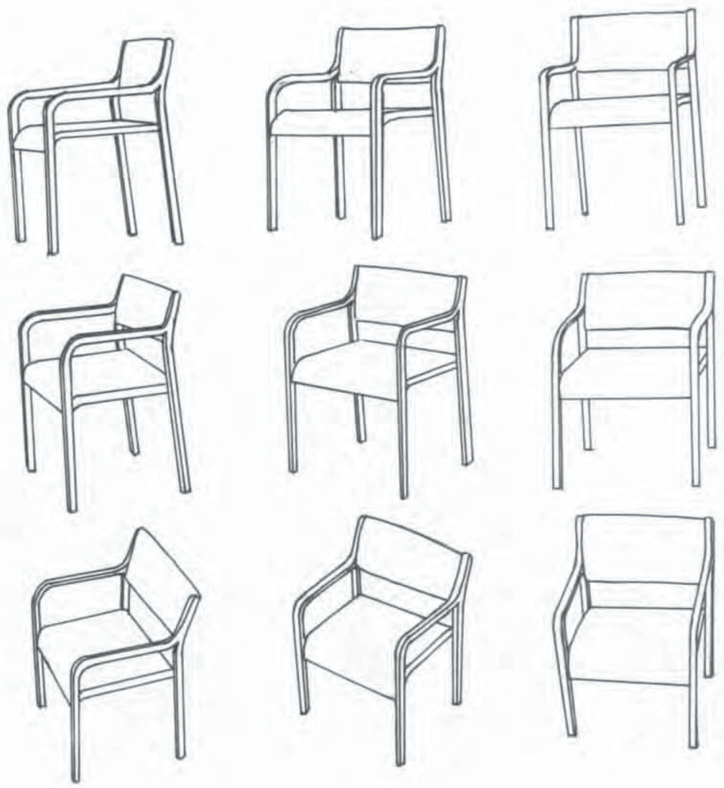
Bird's-Eye, Eye-Level, and Worm's-Eye Views

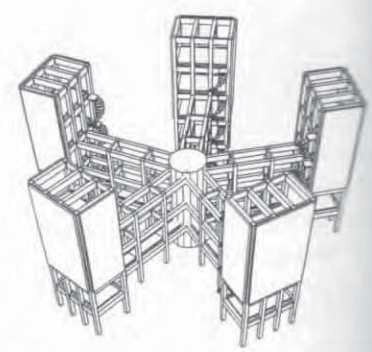
Because several people can't occupy the same physical space simultaneously, people will see the same object from different angles if they all look at it at the same time. Once we vacate a physical space, another person can experience the same viewpoint. The eye-level line would change as an observer sits down, stands up, or stands on top of an object to view the chair illustrated below. Notice the foreshortening of the legs of the chair below as an observer moves higher and higher. The eye-level line is always at right angles to an observer's line of sight and is theoretically located at an infinite distance from your eyes.



Worm's-eye view at ground level with upward convergence

CAD drawings (above and below):
Student projects by Bradford Winkeljohn and Jordan Parnass
Excerpted from abstract, Columbia School of Architecture Planning and Preservation (CSAPP)

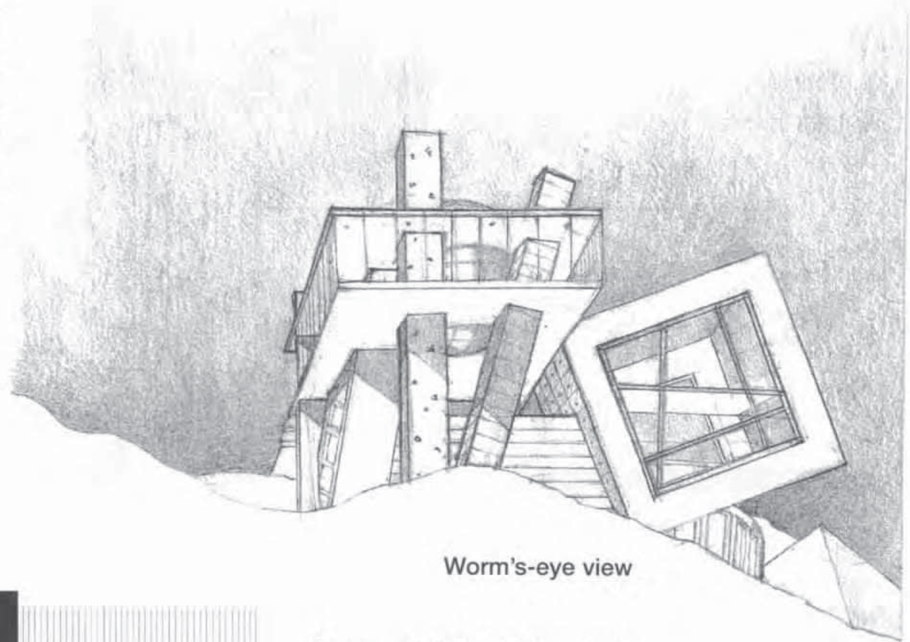




Bird's-eye view at a high angle with downward convergence

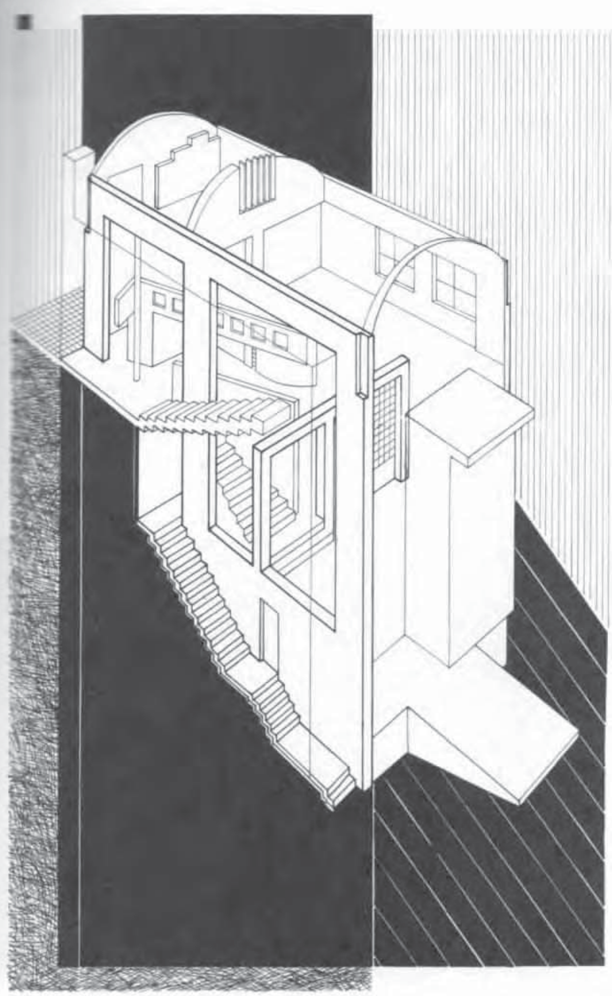
In the design-drawing process, it is important to study a design from every conceivable vantage point. For this reason, examples of other perspective views (e.g., above and below vantage points) are shown on pages 204–09.

For the most part, we view the urban environment at eye level in a standing position. The two views not at eye level are commonly termed worm's-eye and bird's-eye. Both are dramatic, although unnatural, views. A worm's-eye view can be at ground level or from below the ground plane, as shown at right.



Worm's-eye view

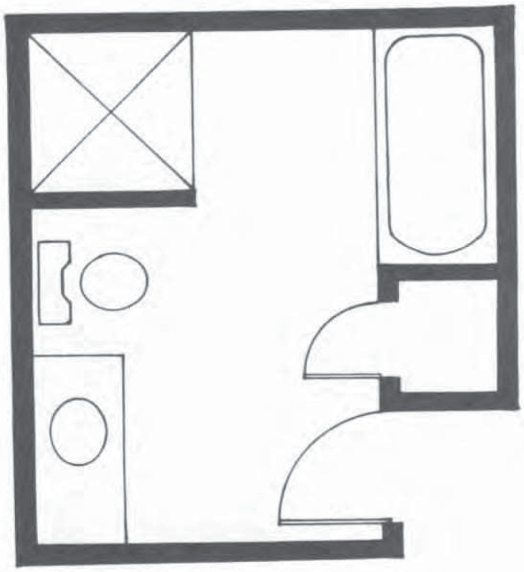
Drawing: House in Hollywood Hills
Los Angeles, California
8" × 5" (20.3 × 12.7 cm)
Medium: Pencil
Courtesy of Kanner Architects
Drawn by Stephen Kanner

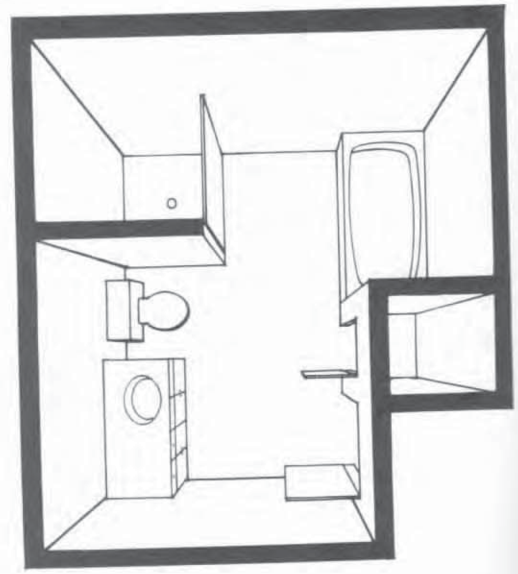


Bird's-eye view

Drawing: Shay house (1985), San Francisco, California
9.5" × 15.5" (24.1 × 39.4 cm), Scale: 3/8"=1'0"
Medium: Pen and ink
Courtesy of James Shay, AIA Architect

By stripping away exterior walls and casting the perspective as a bird's-eye, the complex interior is communicated. The rendered areas around the building are read in plan rather than perspective, creating interesting ambiguity.
[Architect's Statement]

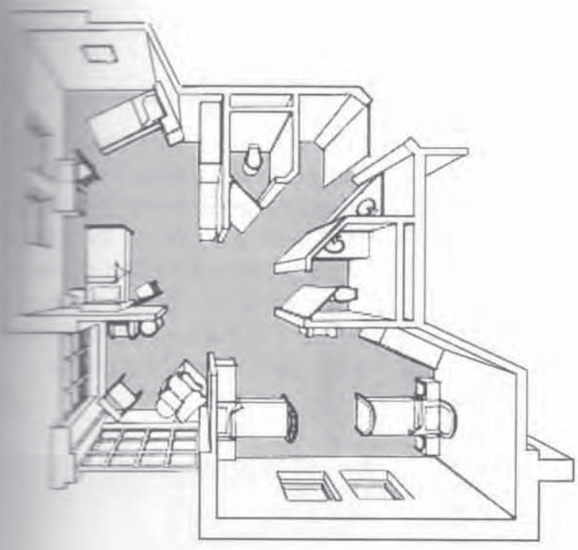


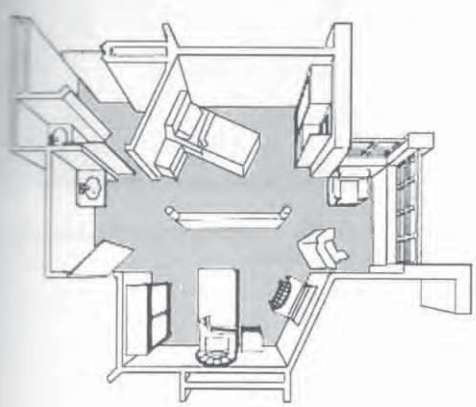


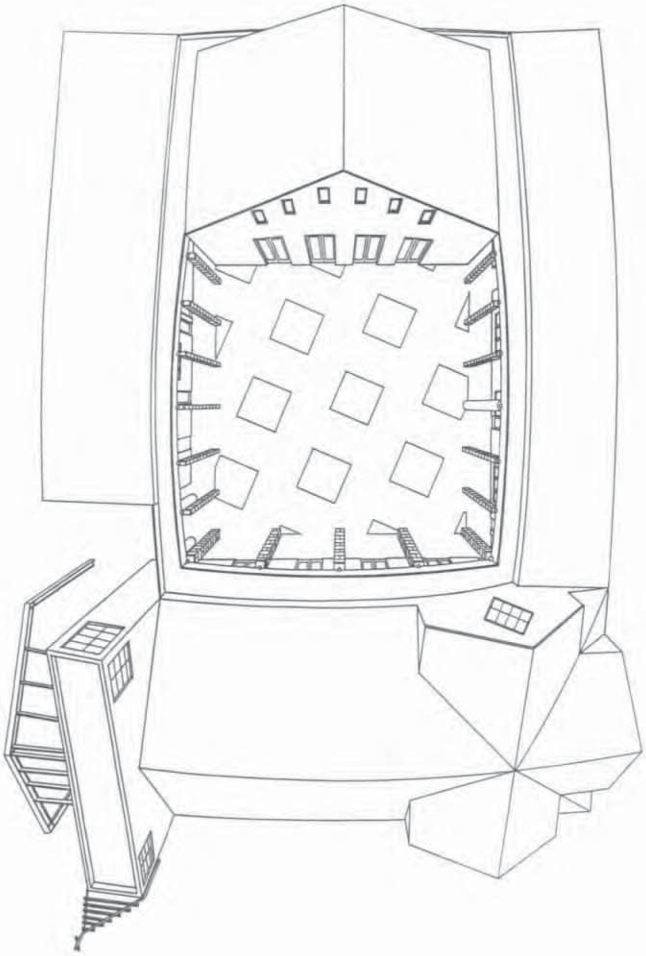
One-Point from Above

An unusual variation of the **one-point** perspective is a bird's-eye view with the line of sight perpendicular to the ground plane. This variation, which is achieved by transposing the positions of plan and elevation, is commonly used for small interior spaces and interior or exterior courtyard areas.

Drawing: Monahan residence, La Jolla, California
36" × 24" (91.4 × 61 cm)
Medium: Ink & shade-film on Mylar
Courtesy of Rob Wellington Quigley, FAIA
and Mel McGee, Illustrator

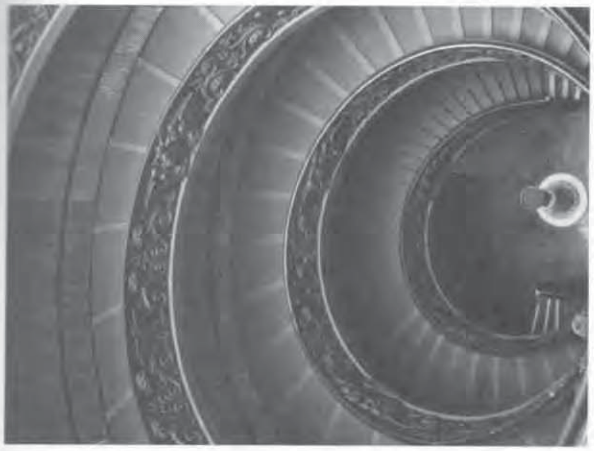






Drawings: Freeport Hospital Health Care Village, Kitchener, Ontario, Canada
Courtesy of NORR Partnership Ltd./
NORR Health Care Design Group

Drawing: New Hope Church, Duarte, California
24" × 36" (61 × 91.4 cm)
Medium: Ink on vellum
Courtesy of Rebecca L. Binder, FAIA



© Marcus Chaw

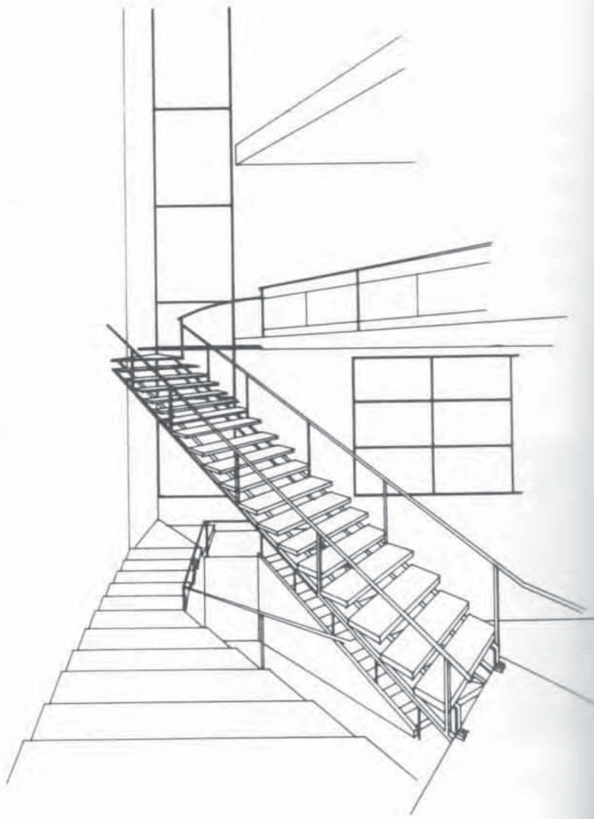
Photo: The Dueling Stairs of the Vatican Museum

One-Point from Above

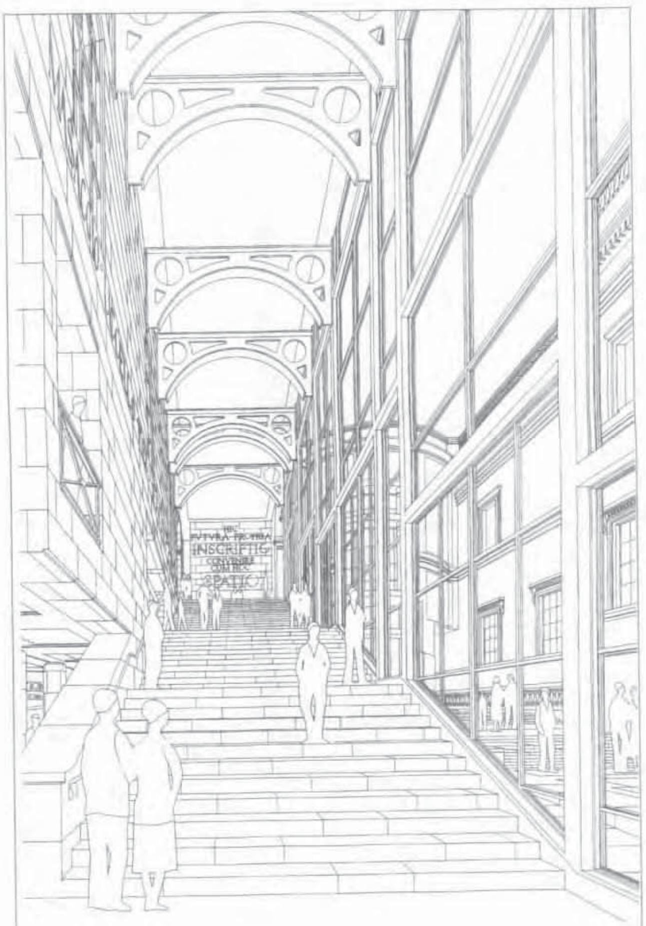
Interior views from above are very descriptive and hence quite informative, especially to a person (client) who does not completely understand an architectural plan. In most cases, they simulate a one-point perspective view that one would have if the roof or ceiling of a scale model were removed. The view can be constructed quickly by placing the plan view so that it coincides with the picture plane. Vertical height lines through all corners of the plan are then drawn converging to one vanishing point in a relatively central location. Height lines are terminated where descriptively appropriate (typically where the plan section cut is taken). With the church at right above, there is no plan section cut, and the curving of the roof elements creates a fish-eye lens effect.

Looking Downhill and Uphill

When the lines of sight of our bird's-eye and worm's-eye views are parallel to an inclined plane, we are looking downhill and uphill. We see downhill and uphill perspective views in the natural landscape as well as in street scenes in the cityscape. Downhill and uphill views inside or outside a building's environment are characterized by stairs, escalators, or ramps.



Drawing: Student project by Stacey Wenger
Barcelona studio, Barcelona, Spain
Medium: Ink on Mylar
Courtesy of Washington University
School of Architecture, St. Louis, Missouri



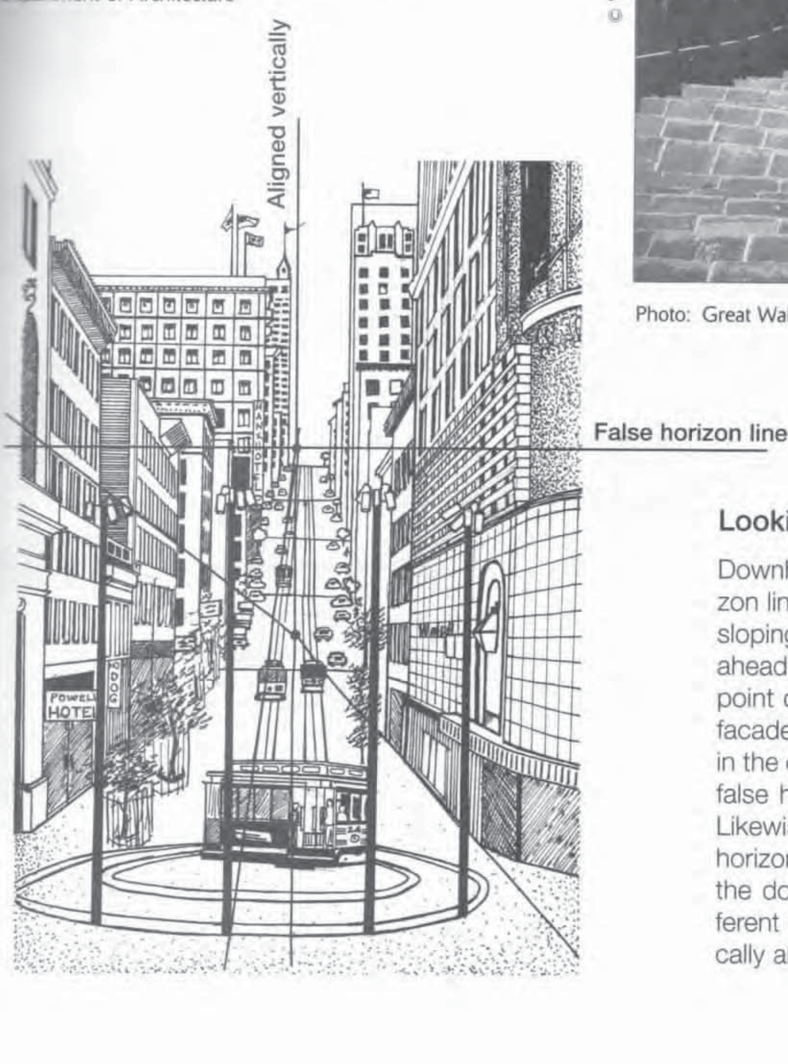
Drawing: The Sainsbury Wing: An extension to the National Gallery
London, England
28" × 40" (71.1 × 101.6 cm)
Medium: Pencil on vellum
Courtesy of Venturi, Scott Brown and Associates, Inc., Architects

Photo: The Spanish Steps leading to the Church of Trinità de
Rome, Italy

Drawings: Student project by Thanh Do
San Francisco downhill and uphill views
4" × 6" (10.2 × 15.2 cm)
Medium: Ink on vellum
Courtesy of the City College of San Francisco
Department of Architecture

© Winnie T. Leong

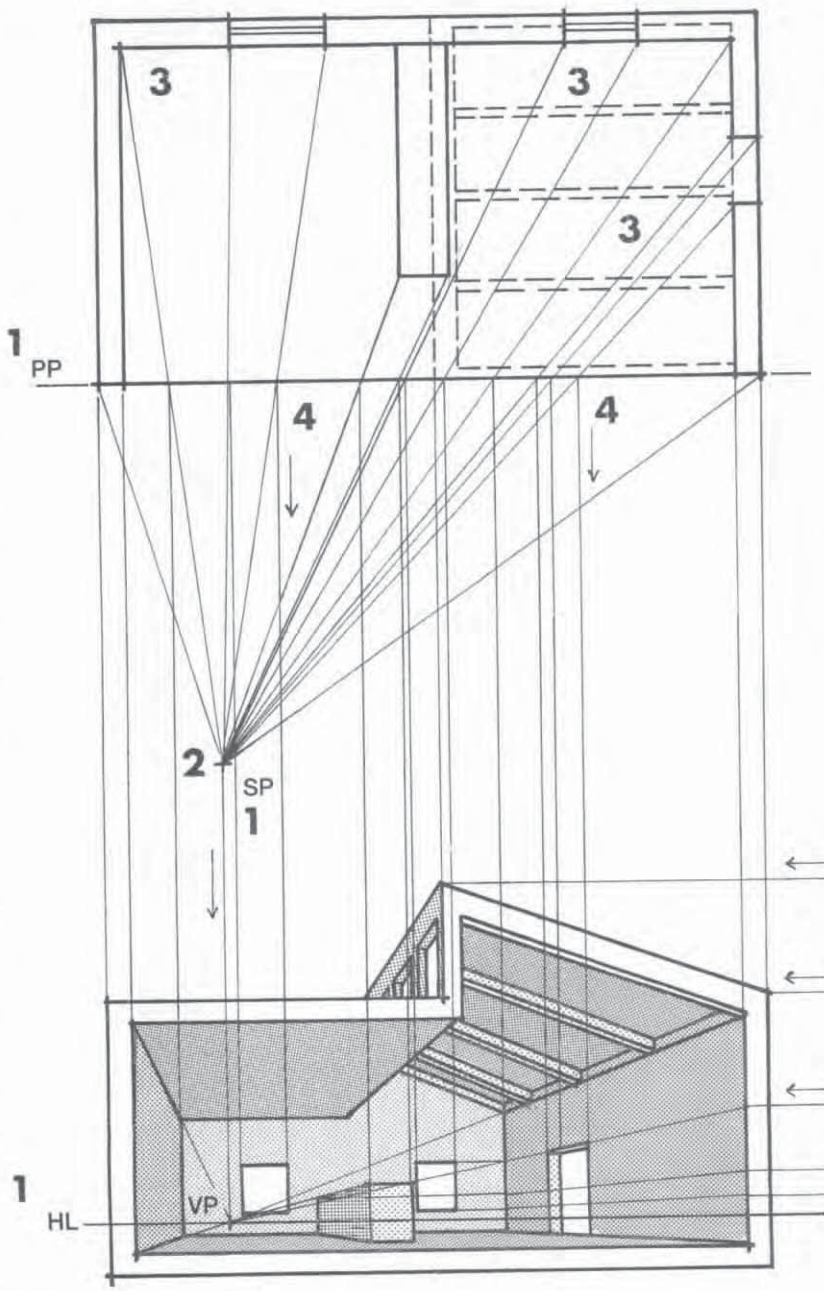
Photo: Great Wall of China near Beijing, China



Looking Downhill and Uphill

Downhill and uphill views produce false horizon lines. The observer's view is parallel to the sloping hills. The true horizon lines (straight-ahead, eye-level lines) are where the vanishing point of all the horizontal lines on the building facade rests. Horizontal lines on the streetcar in the downhill view (top) vanish at a point on a false horizon line below the true horizon line. Likewise, in the uphill view (left), there is a false horizon line above the true horizon line. In both the downhill and the uphill situations, the different vanishing points align themselves vertically above and below each other.

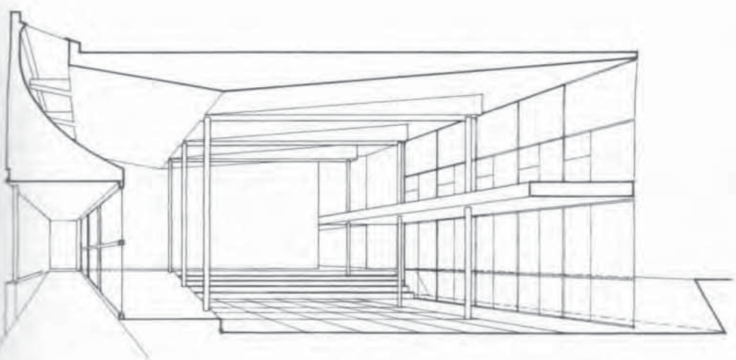
In a one-point perspective, a group of lines will vanish to one point, and this group will not be parallel to the picture plane. All vertical lines remain vertical, and all horizontal lines remain horizontal in the constructed perspective. The plan and the elevation of the room should always be traced to obtain exact dimensions.



1. The picture plane, the station point, and the horizon line locations are arbitrarily selected.
2. Locations are based on creating the desired pictorial effects. A horizon line below eye level was selected to reveal more of the ceiling detail.
3. From the station point, sight major elements in the interior, such as wall intersections, doors, and windows.
4. Where the lines of sight intersect the picture plane, drop vertical projection lines into the area of the perspective drawing.
5. Transfer true heights from the elevation to a vertical reference line in the picture plane. From these points, project back to the vanishing point. Connect proper projection lines, which will define wall, floor, and ceiling intersections.

Interior One-Point

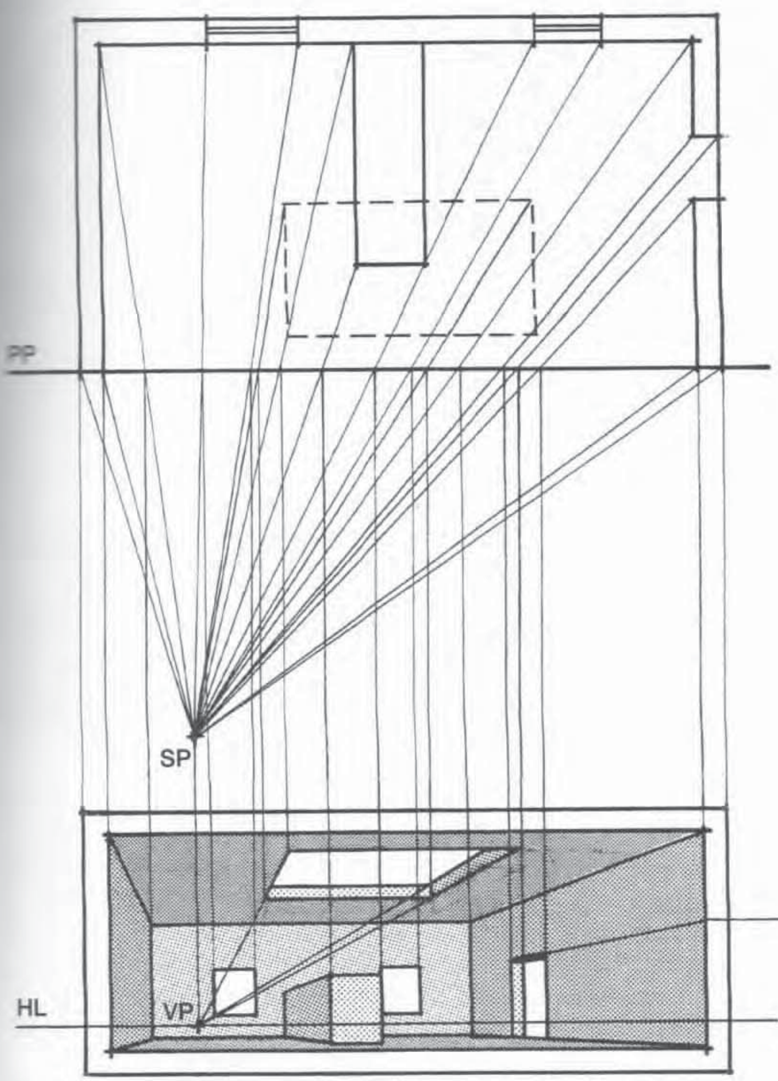
As with two-point perspectives (discussed later), the **office** or **common method** is frequently used for one-point perspectives. At least one plane of the object in a one-point is always parallel to the picture plane. This plane is always perpendicular to the observer's line of sight. For interiors, the picture plane makes a sectional cut through the building or object where the interior space to be viewed begins. See the discussion on pages 216–219.

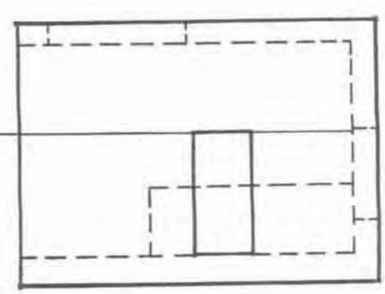


Drawing: Student project by Richard Bacino
Housing for the elderly/day care
Medium: Ink on Mylar
Courtesy of Washington University
School of Architecture, St. Louis, Missouri

One-point perspectives are mostly used to depict interior spaces. They can also be effective for urban landscape situations where a central axis may be involved (streets, large courtyards, etc.).

These two facing pages display examples of **perspective sections** (also termed **section perspectives**). As the name implies, it is the fusion of a two-dimensional sectional cut (building section drawn to scale) with a three-dimensional linear perspective view. Section perspectives can be constructed using the method with a measuring point (diagonal vanishing point), as shown on pp. 215–16. Using a similar procedure, one can construct **plan perspectives** or worm's-eye perspectives looking directly down or up (see pp. 204, 205, 207, and 220). The plan perspective uses a sectional cut, which is taken at or just below ceiling level.





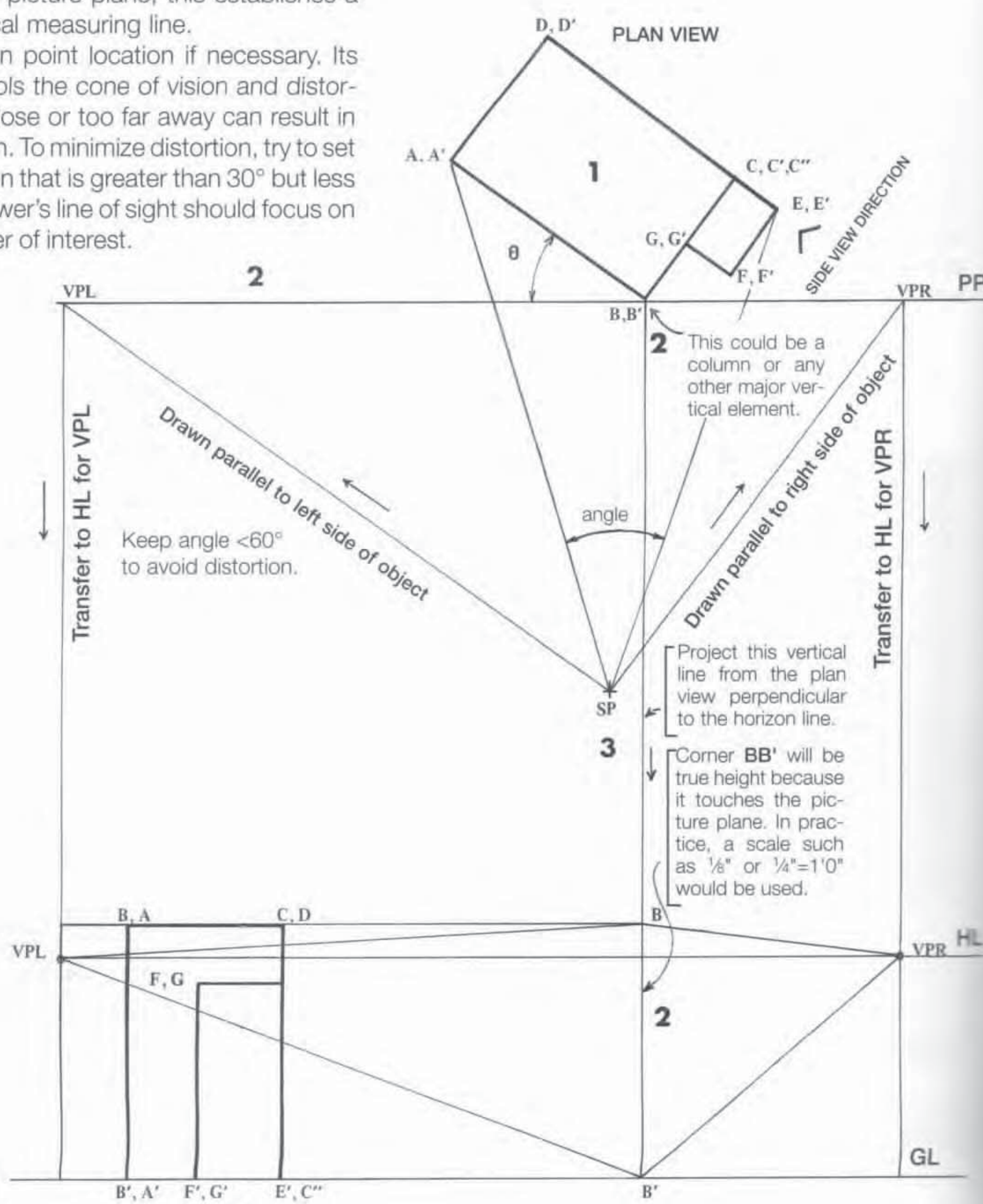
The placement of the vanishing point will govern what one sees in the interior space. If the vanishing point is high, very little ceiling will show, but much of the floor will show. If the vanishing point is near the center, an equal amount of ceiling and floor will show. If the vanishing point is low, much of the ceiling and very little of the floor will show. Moving the vanishing point to the right or to the left on the back wall has a similar effect on the side walls — that is, if near the left, more of the right wall will show, and if near the right, more of the left wall will show.

The Office Method

The **office** or **common** or **plan projection** method for constructing an accurate **two-point** perspective is a traditional one. Both sets of horizontal lines are turned at an angle to the picture plane (thus the term "angular" for the two-point system). It is dependent on both the scale of the **plan** and the scale of the **elevation.**

1. In the top or plan view, place the outline of the object or objects (buildings) with an arbitrary orientation angle θ (based on the view desired).
2. Arbitrarily locate the picture plane and the station point in the plan view to create a distortion-free view. It is advantageous to have the corner of the object touch the picture plane; this establishes a convenient vertical measuring line.
3. Adjust the station point location if necessary. Its placement controls the cone of vision and distortion. Being too close or too far away can result in extreme distortion. To minimize distortion, try to set up a cone of vision that is greater than 30° but less than 60°. The viewer's line of sight should focus on the image's center of interest.

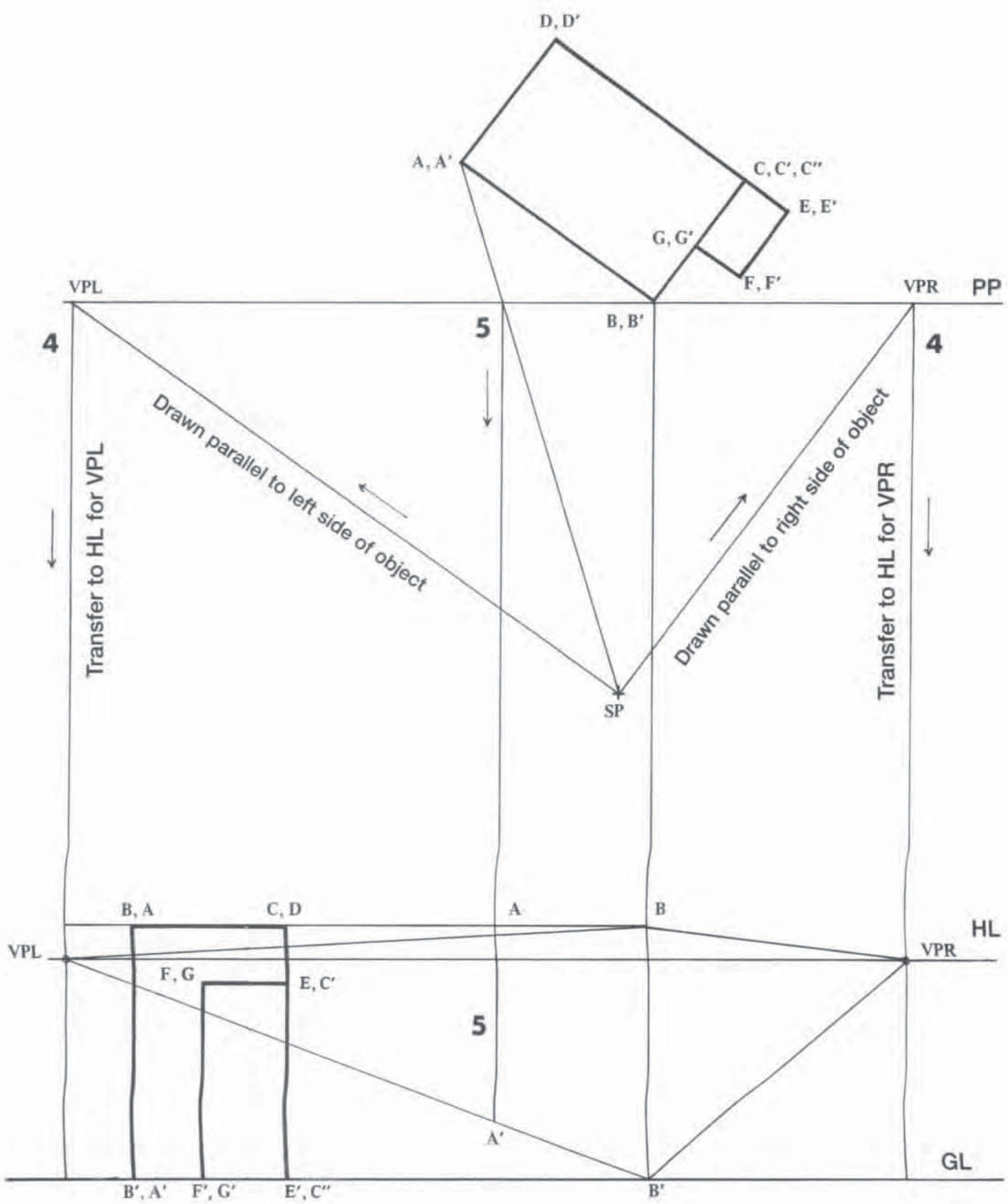
Note: In a preliminary design drawing, an overlay of the floor plan or roof plan and elevation would be made on tracing paper. Position the plan and elevation to allow adequate space for the perspective view. When space is at a premium, place the plan and elevation closer together, keeping horizontal and vertical lines in alignment.



SIDE VIEW OR ELEVATION

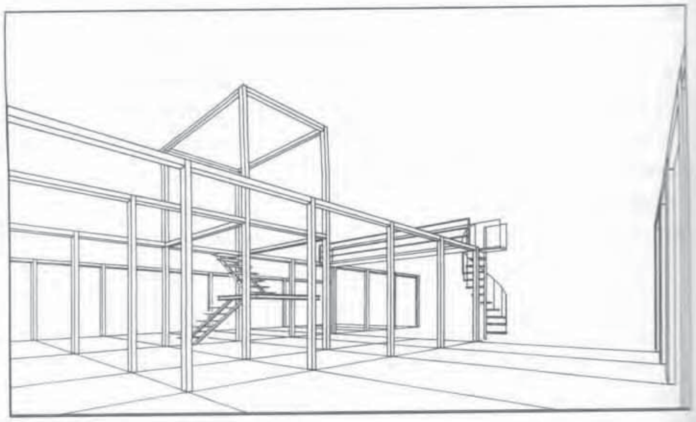
4. Draw lines parallel to the sides of the object from the station point until they intersect the picture plane. At these points, drop vertical tracer lines until they inersect the horizon line established for the perspective. The intersection points become the vanishing points for the perspective.
5. From the station point, sight all corner points, such as **A, A′**, and note where the line of sight intersects the picture plane. At this point, project a vertical line into the perspective to locate foreshortened length **A, A′**.

Note: Look for sets of parallel lines in your building or object and note where these sets will converge. **Convergence** refers to the optical phenomenon of sets of parallel lines receding to a single point at an infinite distance.

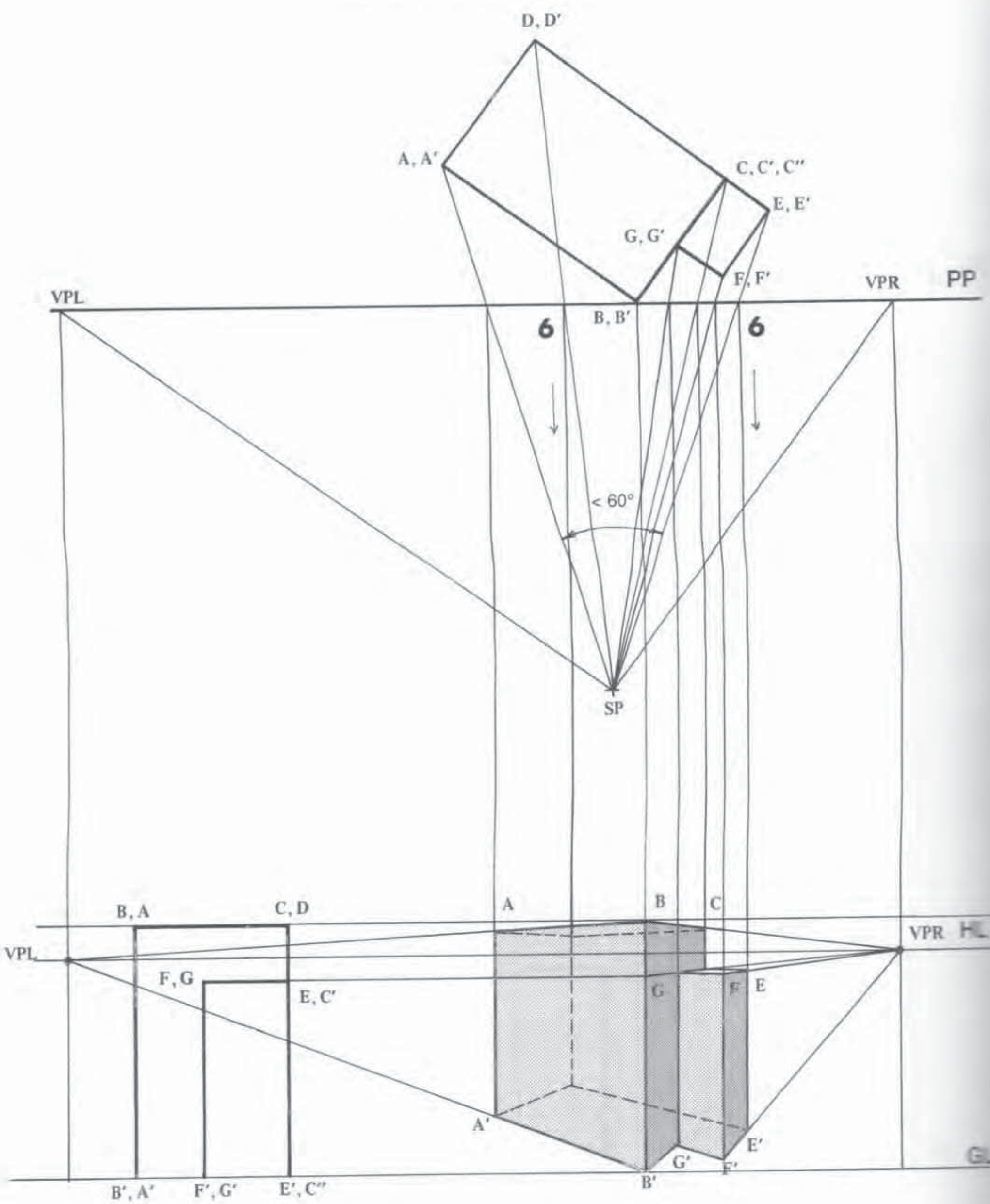


6. Project all sighting intersection points on the picture plane into the perspective in order to complete the perspective of the object. Hidden lines are optional.

Pages 230–32 show the step-by-step sequence for constructing a two-point perspective when both the building plan and the elevation are drawn at the same scale. Angular (two-point) perspective is characterized by angular planes (inclined to the picture plane) having their own separate vanishing points. All vertical lines remain vertical.



Drawing: T residence, Hayama, Kanagawa, Japan
Courtesy of Iida Archiship Studio



Drawing Perspective Circles

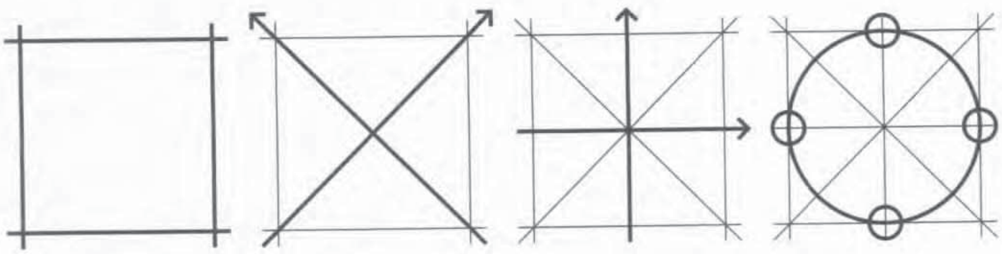
To draw a circle or a portion of a circle accurately in perspective requires that you first draw its circumscribing square. With experience and practice, you will be able to derive from the square all the reference that is needed for quick sketches. However, as accuracy requirements and circle size increase, so does the need to construct additional points of reference to assist in constructing the circle. The following sections describe the four-, eight-, and twelve-point techniques for constructing circles.

Photo: St Mark's Cathedral Venice, Italy

© Marcus Chaw

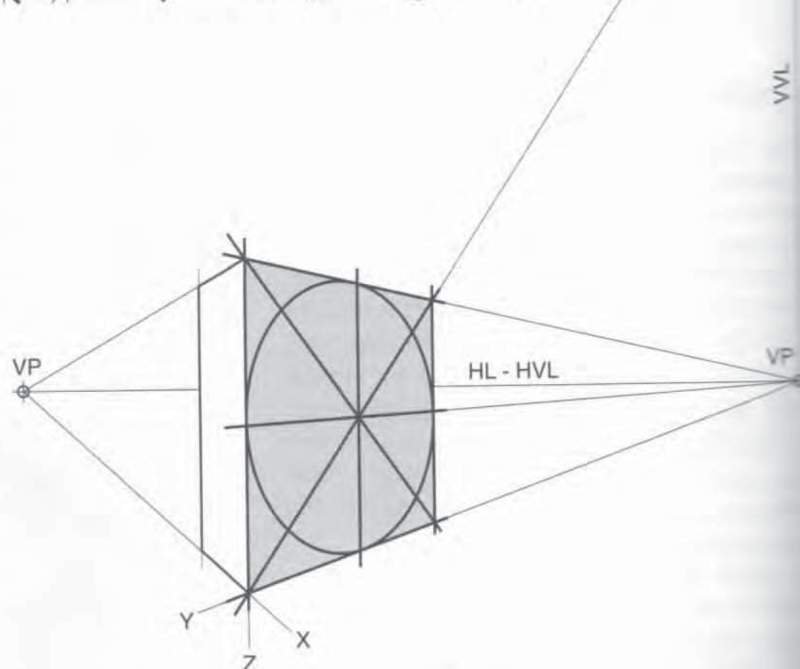
The Four-Point Perspective Circle

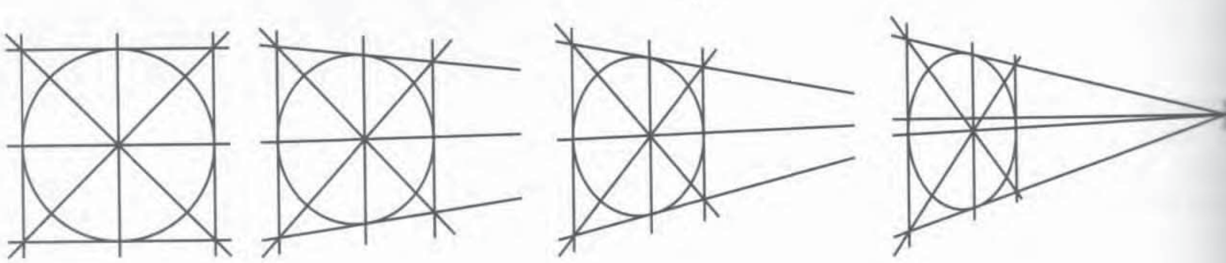
The four-point technique locates the points of tangency between the circle and square.



Draw or identify the square that circumscribes the circle. Draw the diagonals of the square to locate its center. Draw vertical and horizontal lines through the center point of the square. The intersection of these lines with the sides of the square will locate the midpoints of the respective sides, which are also the tangent points for the circle and square. Draw a smooth curve that connects the four points to create a circle in perspective. Visually adjust the circle until it looks correct.

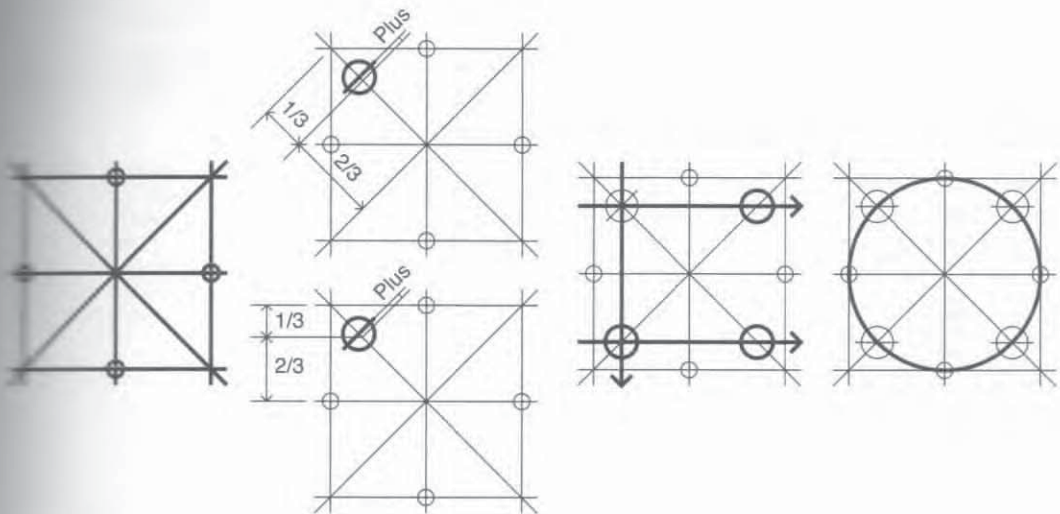
Note that the highest and lowest points of the circle are to the near side of their respective tangent points.





Eight-Point Perspective Circle

The eight-point technique builds directly on the four-point system with a visual approximation that locates four more points.



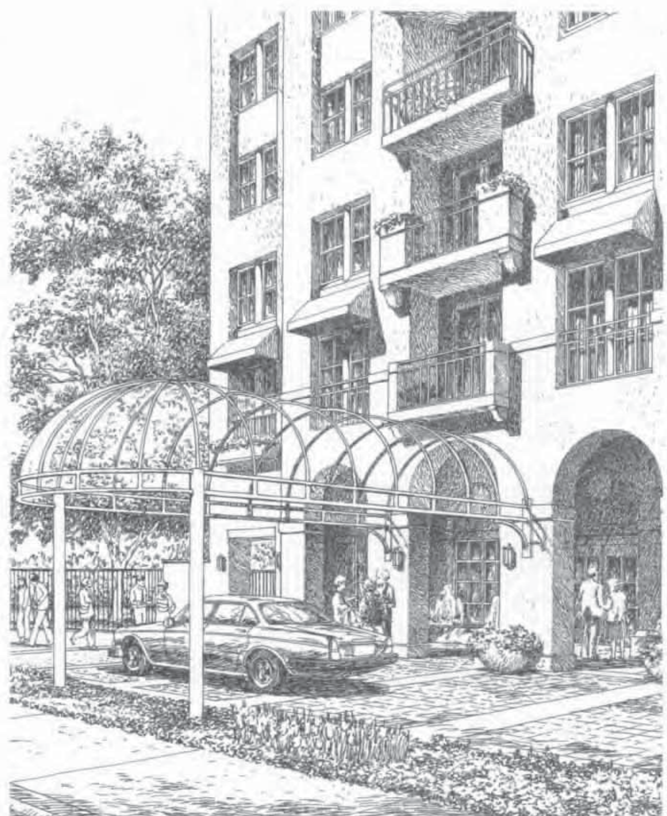
Follow the four-point procedure to locate the first four points. The diagonals used in this process are now divided to locate the additional points.

Divide the near half of one of the diagonals into thirds to locate the two-thirds point as shown. This can be done either directly along the diagonal or along the corresponding half of the square's side. If you use the square's side, you must transfer the two-thirds mark to the diagonal.

Mark a point just beyond the two-thirds point of the diagonal. This locates the point at which the circle will intersect the diagonal.

Transfer this point to the other diagonals with lines that are parallel to the respective sides. This locates the other three points, giving you eight points to guide your circle construction.

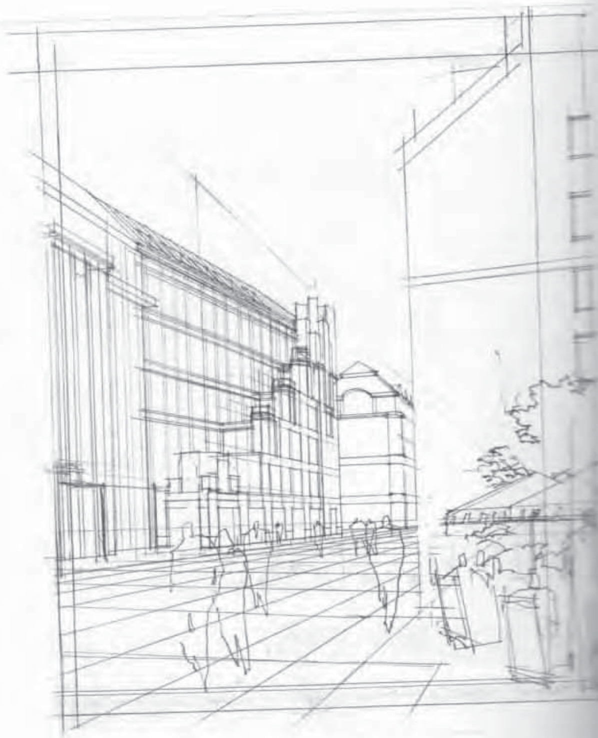
Draw a smooth curve that connects the eight points to create a circle. Visually adjust the circle until it looks correct.



Drawing (partial): The Peninsula Regent, San Mateo, California
16" × 24" (40.6 × 61 cm)
Medium: Ink on Mylar
Courtesy of Backen Arrigoni & Ross, Inc.
Architecture, Planning & Interior Design
Peter Szasz, Architectural Illustrator

VIEW DEVELOPMENT

Step 1



Step 2

Once you understand linear perspective drawing, you can develop perspective views—from the rough to the finished form. In the profession of architectural illustration, this requires an understanding of the design of the project being illustrated, as well as skills in managing the balance, composition, and arrangement of a drawing's many elements. These drawings depict the process, from a rough layout to a line transfer to a detailed line drawing. The architectural illustrator must decide which way of representing a project will be most likely to lead the client to accept the design concept.

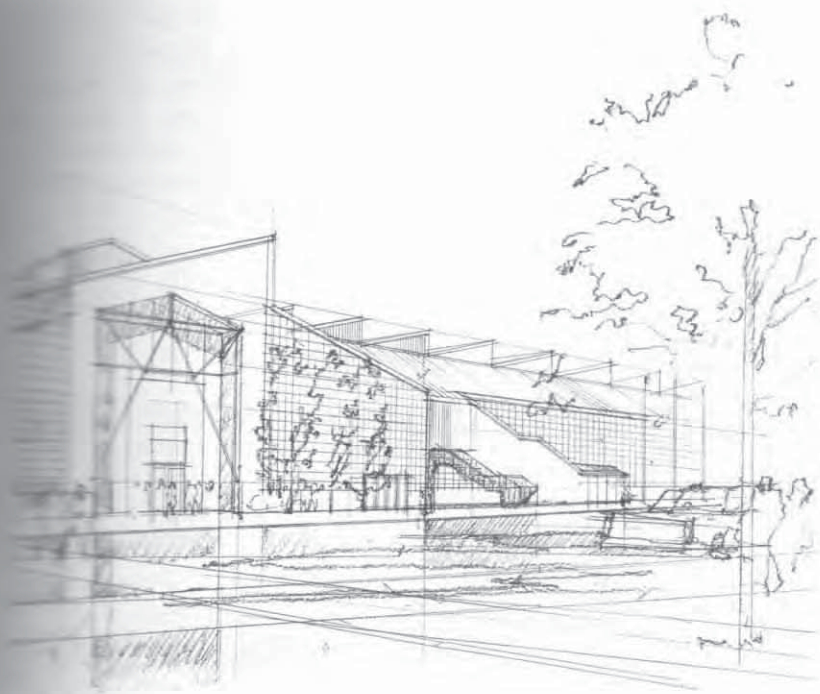
The project site was a narrow street/mall. The rough layout was done to determine the view and the relationship to the background building. The view of the final line transfer was done from a photograph supplied by the client to each competitor so that each scheme could be compared from the same fixed station point. Note the actual amount of background building that shows versus the perceived amount of the building that shows in the rough layout.
[ARCHITECTURAL ILLUSTRATOR'S STATEMENT]

Drawings: Peek & Cloppenburg Department Store competition winner
Leipzig, Germany
14" X 17" (35.6 X 43.2 cm)
Medium: Full watercolor over pencil line transfer
Moore Ruble Yudell, Architects
Courtesy of Al Forster, Architectural Illustrator

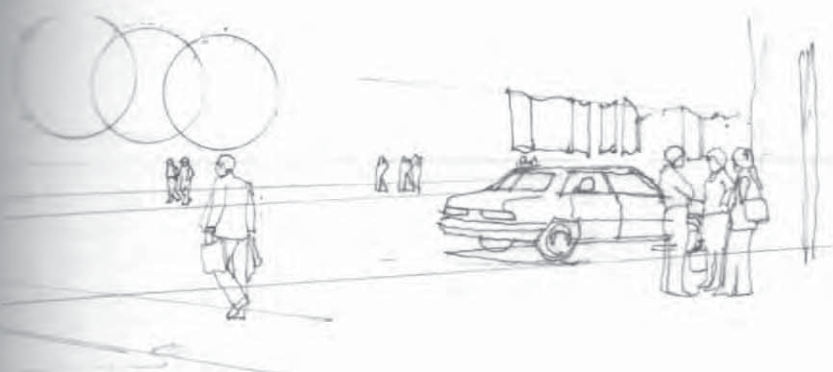
Step 3

View Development

Step 1: For the rough block-out, human figures, cars, and tree forms are sketched in for scale, depth, and possible (or actual) placement.
Step 2: An entourage tracing paper overlay is used for clean figures, cars, etc. This can be done directly onto the rough block-out from Step 1.
Step 3: A final line sketch or pencil transfer incorporates building and entourage together. More tree detail is now added, as well as small, distant hand-drawn figures not necessarily on the entourage overlay.
[ARCHITECTURAL ILLUSTRATOR'S STATEMENT]



Step 1

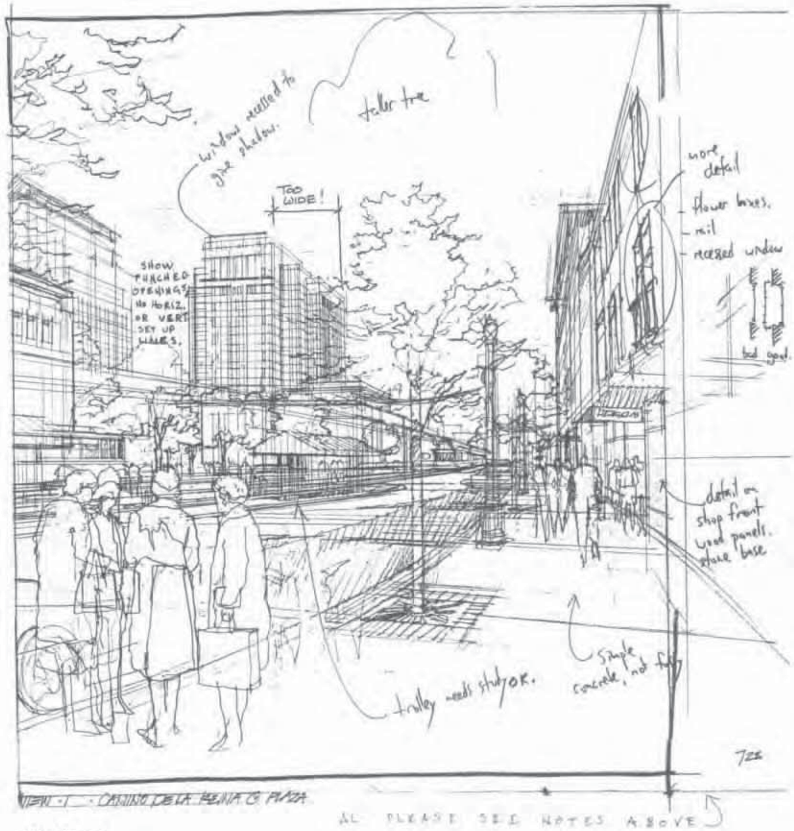


Step 2

Drawings: Sybase Hollis Street Campus
San Francisco, California
18" X 12" (45.7 X 30.5 cm)
Medium: Sketch watercolor on mounted presentation blackline print of pencil drawing
Robinson Mills & Williams, Architects
Courtesy of Al Forster, Architectural Illustrator

The advantage of a constructed perspective layout is that before the tone and values are finalized, the renderer can experiment with additions, deletions, and corrections to apparent distortions. Using overlays, tonal values and color can also be applied in varying degrees to help determine how to finalize the rendering.

Step 3



Written comments on the rough layout allow on-the-spot corrections, refinements, and adjustments and provide a record that can become a legal document for disputes that might arise later. [Architectural Illustrator's statement]

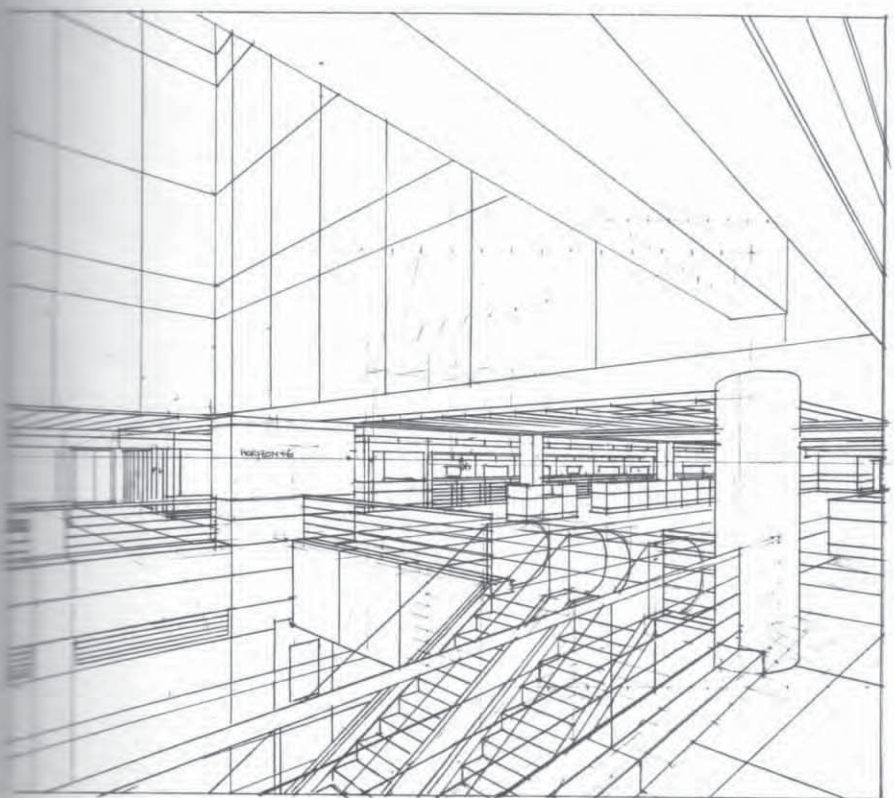
Before

Drawings: Concept study, Riverwalk
Mixed-use project, San Diego, California
14" X 17" (35.6 X 43.2 cm)
Medium: Full watercolor over pencil line transfer
Robert A. M. Stern with Fehlman LaBarre Architects
Courtesy of Al Forster, Architectural Illustrator

View Development

An architect, designer, or renderer can experiment with a perspective layout by adding accessories such as cars, trees, and human figures (see Chapter 8, "Delineating and Rendering Entourage," for a more detailed coverage of perspective accessories). Even in the age of digital imaging, it is of utmost importance that students and design professionals develop good freehand techniques to draw accessories.

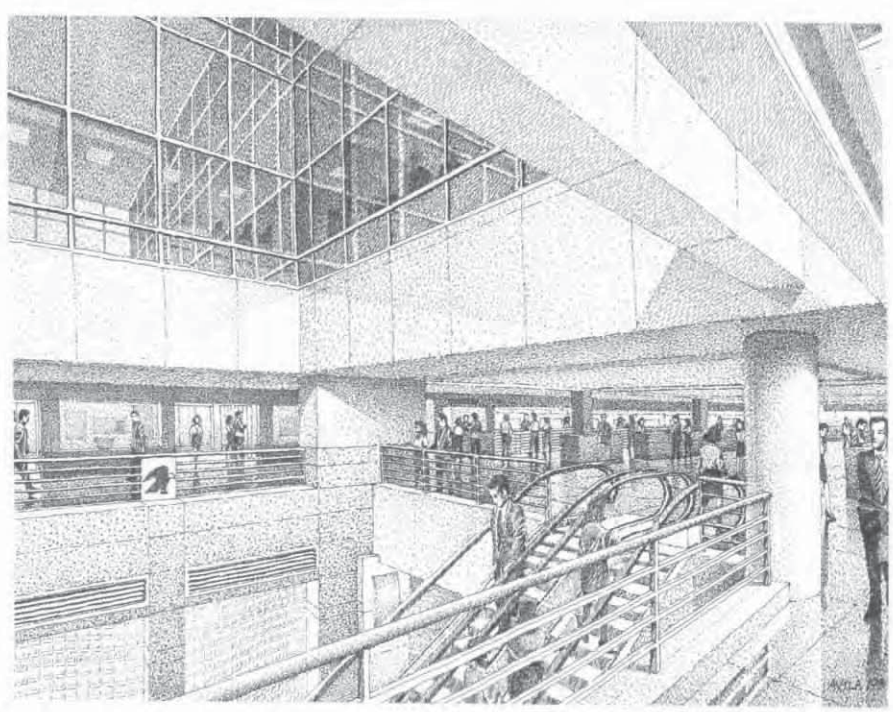
Compare the development of individual parts and pieces of the drawing in the before and after examples, as well as the illustrator's response to actual comments. [Architectural Illustrator's statement]



Before

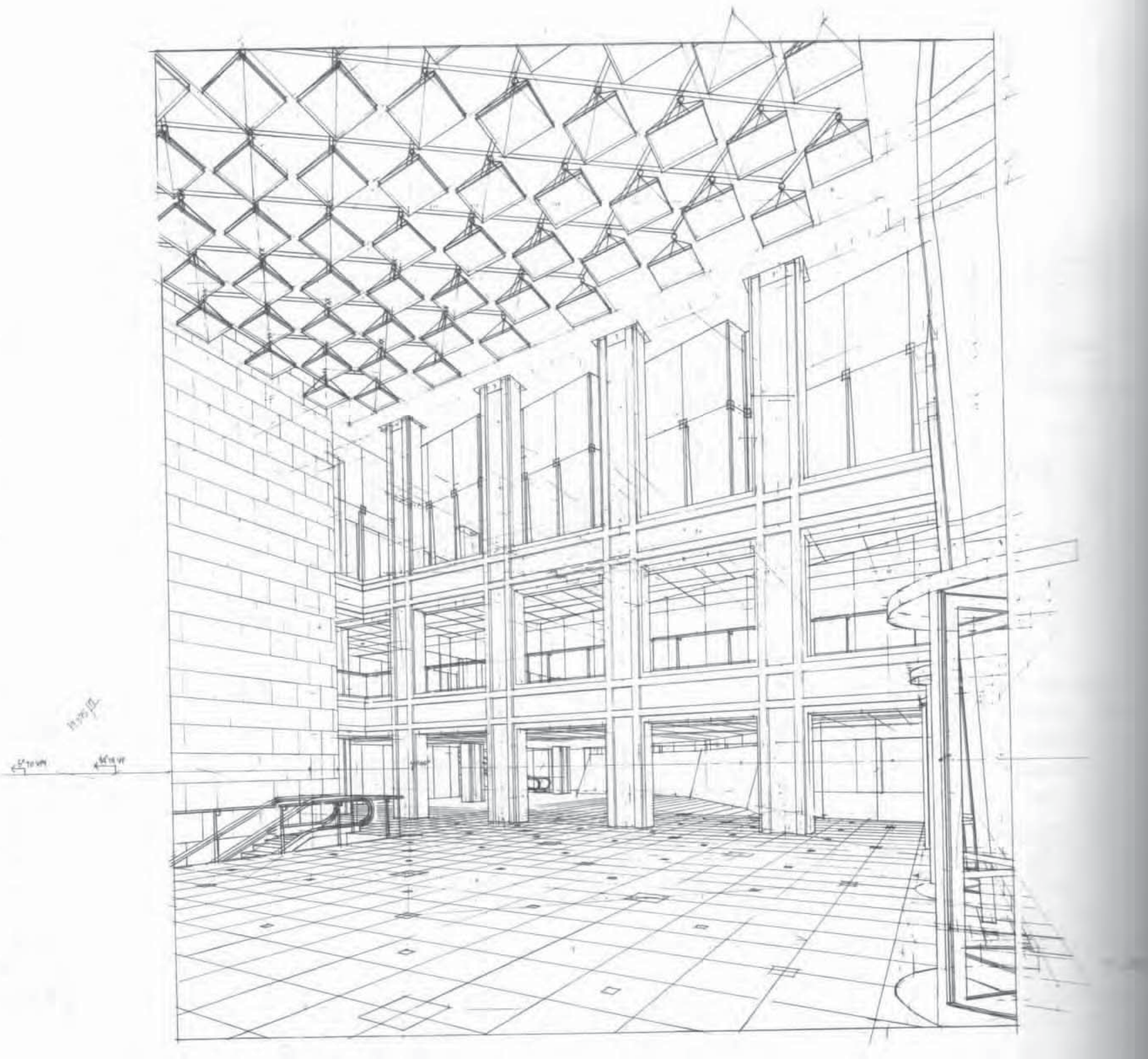
After providing a series of different preliminary layouts to find the most compelling and descriptive space view, this one was chosen for development. All the details and design elements were then drawn in collaboration with the architects so all the correct information would be included. The layout was completed by hand. By the time the illustrator was ready to draw the final black-and-white illustration, the layout was completed and ready to be rendered.
[ARCHITECTURAL ILLUSTRATOR'S STATEMENT]

After the layout is completed, the rendering is done in pen and black ink. The focus of the drawing is, first of all, to show the main floor amenities; second, to show how busy the space is—people moving, buying stamps, using mailboxes; and finally, to draw attention to the multistory lobby that precedes the main floor.
[ARCHITECTURAL ILLUSTRATOR'S STATEMENT]



After

Drawings: Sears Tower Renovation Project, Chicago Main Post Office, Chicago, Illinois
Original size: (approx.) 24" X 20½" (61 X 52.1 cm), Scale used: ¼"= 1'-0"
Medium: Pen and ink
Courtesy of Knight Architects Engineers Planners, Inc., and
Manuel Avila Associates, Architectural Illustrator



Drawing: Sears Tower Renovation Project, Chicago, Illinois
DeStefano & Partners, Architects
Courtesy of Manuel Avila Associates, Architectural Illustrator

To establish the proportions and the size of the new, enlarged interior space (the original space consisted of only two floors, not three), we set ourselves as close to the entrance wall as we could to show the full extension of the room, with all the new floor materials, new clad columns, and glass walls. We always try to show three sides of a room to communicate enclosement (see p. 264). Although the entrance wall can only be partially seen, we emphasized its presence with the sunlight coming in.
[Architectural Illustrator's statement]

Drawing: Sears Tower Renovation Project, Chicago, Illinois
DeStefano & Partners, Architects
Courtesy of Manuel Avila Associates, Architectural Illustrator

In this interior, the space was flooded with shadows to establish different levels of contrast because the materials used were basically light. The different levels of contrast in shadows and reflections were achieved first by the use of pen and ink, followed by the use of colored pencil to saturate and emphasize forms. To make the illustration more complete, people were drawn very carefully and in detail, to bring more reality to the floor activity.
[ARCHITECTURAL ILLUSTRATOR'S STATEMENT]

8

Delineating and Rendering Entourage

The major communicative drawings (plan, elevation, section, paralines, and perspectives) are part of a presentation package. It is of utmost importance to accentuate these drawings with the use of contrast so that they "read" for the prospective client. This process of delineating and rendering is critical in the presentation phase of a design project. Contrast must be properly balanced for a presentation to be clear; thus, different shades of dark values must be played against various degrees of light values. The amount of rendered contrast is based on the contextual relationship of the adjacent forms.

The intent of this chapter is to introduce techniques of delineation and rendering as applied to contextual elements — or, to use the Beaux Arts term, "entourage" — such as landscaping, human figures, furniture, cars, and building materials.