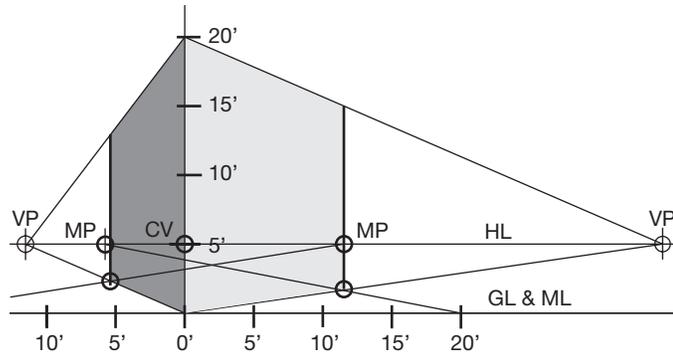
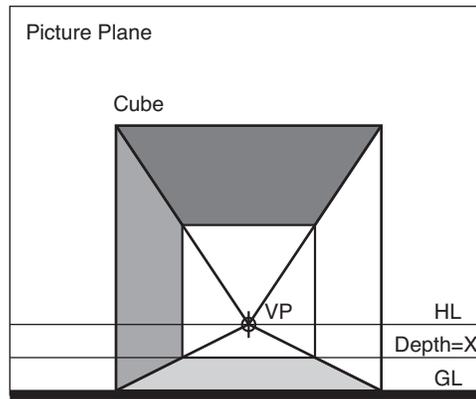
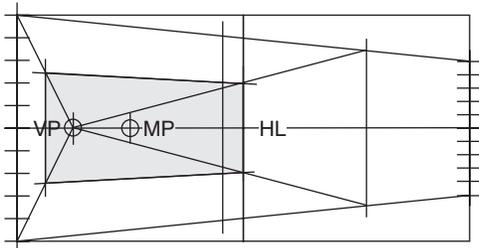


# DRAWING FORM



A primer for creating the illusion of three-dimensional form and space on two-dimensional surfaces



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*Drawing by: Karl Johnson*

## Acknowledgements

I am indebted to those who have studied and written on the subjects of perception and linear perspective. Those who have been of particular inspiration include:

Francis D. K. Ching,  
Nicholas T. Dines,  
Jay Doblin,  
Michael E. Doyle,  
Kevin Forseth,  
James J. Gibson,  
Michael E. Helms,  
Kirby Lockard,  
Lou Michael, and  
Jack Fredrick Myers.



# SEEING & DRAWING



*How can the illusion of three-dimensional form and space be created on two-dimensional surfaces?" The answer to this question requires an understanding of how we see and how drawing can represent what we see on a two-dimensional surface. This section will identify the fundamental visual depth cues and describe ways that they can be represented in drawings.*

## Seeing Depth Cues

The establishment of spatial relationships is one of the most dominant and automatic goals of the perceptual process. As a result, we consistently find our way through the world without bumping into things. In perception, the concepts of visual world and visual field differentiate between what there is to see and what is being seen. These terms were defined by James J. Gibson as part of his theory of perception. (Gibson 1974) The visual world consists of all the objects, surfaces, edges, shapes and interspaces that surround us. The visual world is perceived as a person's eyes, head and body moves through the environment. It has no central vanishing point and is continuous and panoramic in character.

The visual field is a single stop-action view within the visual world—it is like a photograph. It is virtually theoretical, because unlike a camera, it is difficult to keep the eyes trained in a certain direction for very long. The visual field is bounded—it contains only what can be seen at a given point in time and space with the head and eyes in a fixed position. The visual field is sharp and detailed at the center, and progressively becomes less detailed and vague as peripheral vision takes over until the limits of our cone of vision are reached or some other boundary is encountered. It is a visual field that is being represented with a drawing.

Depth cues are signals that the brain recognizes and interprets in order to determine spatial relationships. In drawing, some combination of the depth cues is represented in order to create an illusion of three-dimensional form and space. In doing so, our personal experience of living in the world and drawing are related—we recognize the relationship between the marks on the paper and what they represent in the world.

## Binocular Cues

Binocular vision is seeing with two eyes and therefore, includes those depth cues that result from our having two eyes. These cannot be directly represented in drawings and include muscular and parallax cues.

### Muscular

The muscles of the eye can change the shape of the lens and the convergence of the eyes. This muscular activity provides subtle depth cues.

### Convergence

"Because of the distance between the eyes, the closer an object is to the viewer, the more the two eyes must turn toward each other to focus." (Wallschlaeger & Busic-Snyder 1992, 310)

### Accommodation

The movement of the ciliary muscle surrounding the eye that change the shape of the lens to assist in focusing on an object. (Wallschlaeger & Busic-Snyder 1992)

## Parallax

Parallax is defined . . . as an apparent change in the view of an object resulting from a change in the position of the viewer, which creates a new line of sight of the object." (Wallschlaeger & Busic-Snyder 1992, 311) The change in what is seen results from both the fact that we have two eyes and movement. Each of these involves the appearance and disappearance of distant objects from behind the occluding edges of nearer objects. This causes us to pay particular attention to the edges of objects because they are potentially sources of new information.

## Disparity

Our eyes are located two to three inches apart and therefore, see slightly different views of the visual world. Disparity operates out of awareness but is sensed because the location of the edges of a surface as seen by our eyes do not match. The nearer the surface is to us the greater the disparity. This can be dramatized by rapidly closing one eye then the other.

## Movement

Movement parallax is the apparent change in the view resulting from the movement of the viewer. This can result from movement of the eyes, head and/or body. The result is that things closer to the viewer move (change relative position) faster than things farther away.

Hold one finger close to your face and focus on the another one held at arm's length. Move your head from side to side. Notice the apparent movement of the near finger.

Shift in the rate of motion addresses the relationship between the viewer's motion and the corresponding relative movement of edges in the visual field. If two objects are seen as overlapping and their edges do not shift position relative to each other when the viewer moves they are either on the same plane or so far away that the movement is not perceived. If one object is close and the other far away a great deal of shift between their edges will be perceived.

## Monocular Cues

Monocular vision is seeing with one eye and therefore, includes those depth cues that are not dependent on two eyes. Monocular cues are the primary means for interpreting intermediate-to-far distances. They are particularly important for drawing because they are the primary tools available for creating the illusion of three-dimensional form and space on two-dimensional surfaces. This is because they can be directly represented in drawing. The mark (line and/or value) and the experienced reality share similar qualities—they look like each other. For example, surfaces that possess different values can be represented by areas of corresponding value in a drawing. Finally, monocular cues can be categorized as those affected by environmental conditions and position.

## Environment

Regardless of the position of the viewer or the things of the visual world there are two environmental conditions that provide important depth cues. They include the nature of the light that makes visual perception possible and the nature of the atmosphere that exists between the viewer and the things being seen. The first will be referred to as "Light" and the second "Aerial Perspective."

## Position

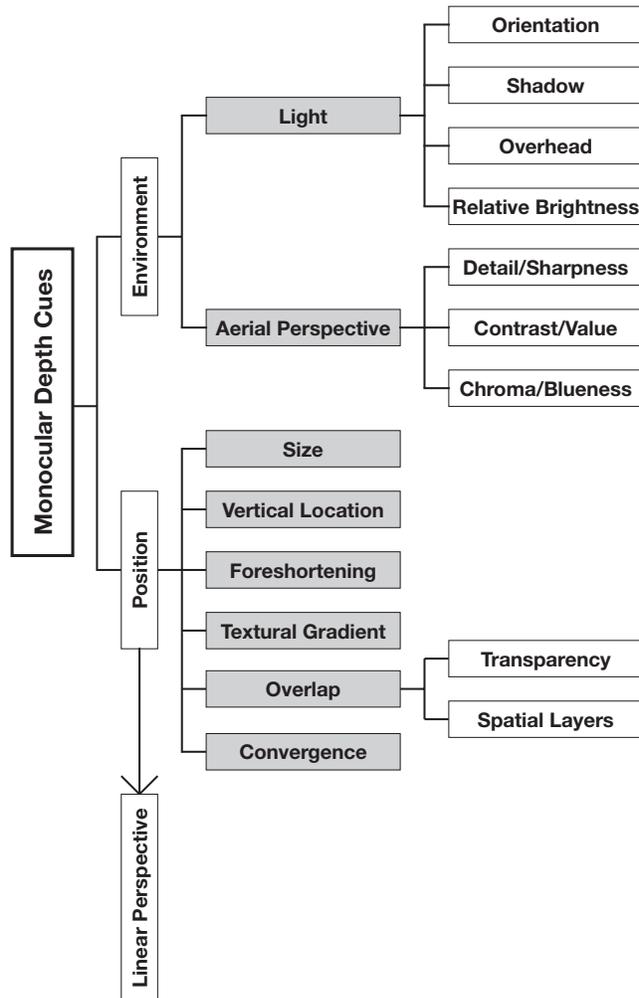
The things of the visual world have some position relative to one another. As we move through the visual world our position changes and the perceived relationship between the things of the visual world changes. These physical relationships between the viewer and things provide important depth cues including size, overlap, vertical location etc.

## Linear Perspective

Linear perspective is a drawing system based on our visual experience of the world. It has the capability to systematically producing many of the position cues. It is the best drawing system available for creating the illusion of being in a three-dimensional world.

## Concept Map

The concept map below identifies the key concepts and illustrates their relationships. The terms in gray boxes are the key cues that will be described. The following text and illustrations address each of the concepts contained in the map and describes strategies for their use in drawing.



## Light

Perception of the visual world is based on the very consistent patterns of light reflected from surfaces. The retina is primarily sensitive to grades of light and therefore, a sudden break in the gradient of light received is perceptually dramatic. The perception of edges is based on seeing the limits of continuous gradients. A continuous gradient is any constant or smoothly changing value. The eye sees such gradients as “flowing along a continuous surface.” (Michel 1996, 11) An edge is perceived when there is an abrupt change in the gradient that can be caused by the physical edge of an object or a shadow, shape, or color pattern lying on the plane of a surface.

Illumination produces value changes that reflect the spatial relationships of surface's to the light source(s) and each other. We perceive surfaces not because of their absolute but their relative value which is a function of their orientation to the light source, the surface's inherent properties and the context or adjacent surfaces. A surface that is perceived as light in value is one that is both more highly illuminated and reflective than the adjacent surfaces.

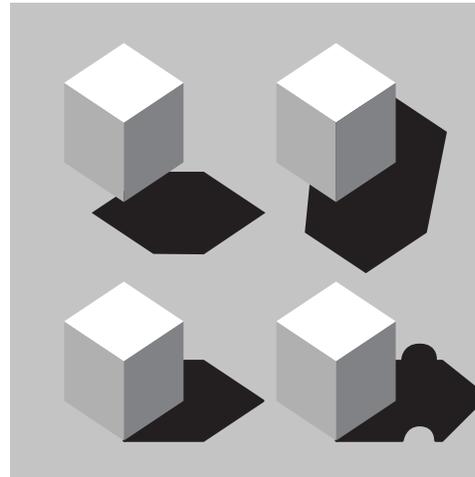


## Orientation

An abrupt shift in brightness within a visual field is perceived as an edge. When the edge is created by the intersection of two surfaces at different angles to the light source they present different values. A gradual transition in brightness indicates a curved or round surface. In more general terms the existence of value changes indicates surfaces in some varying spatial relationship with respect to the light source and each other. The more directly a surface faces the light source the brighter it will appear. The more a surface turns away from the light source the darker it will appear.

### Orientation in Drawing

Make the surface that most directly faces the light source white and give progressively darker values to surfaces as they turn away from the light source. Use as full a value range as possible and appropriate.

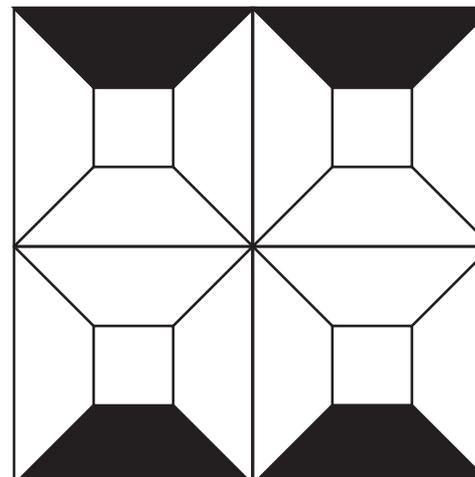


## Shadow

Shadows tell us about the three-dimensional form of its casting object and the surface upon which the shadow falls. Edges of an object that are hidden from our view may be disclosed in the shadow of the object. If the shadow and the object touch we know that the object is touching the surface that is receiving the shadow. For example, in the illustration, the top two cubes are floating and the bottom two are resting on the ground plane. The shadow can indicate the relative orientation of the object and surface upon which the shadow falls. What relationships are indicated in the illustration? The shape of the shadow can also make visible the shape of the surface receiving the shadow. For example, the lower right shadow shows that there is a semi-circular ridge on the ground. Finally, shadows are the strongest indicators of the location of the light source.

## Sun, Shade and Shadow in Drawing

Surfaces can be categorized as those facing the light source (Sun), those turned away for the light source (Shade) and shadows. In creating a drawing, start sun surfaces as white, shade surfaces as 30% gray and shadows as 60% gray. Build the values to create clear differentiations. Keep the most highly illuminated surfaces white. Shadows should strongly contrast with the illuminated surface upon which they fall.

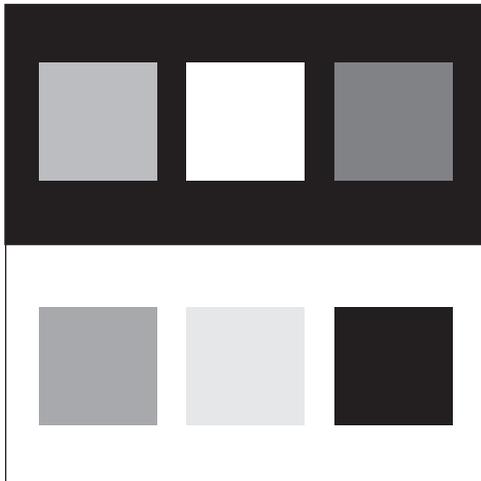


## Overhead Light

The sun and most artificial light sources are overhead and therefore cast shadows down. We are used to interpreting the orientation of surfaces in the environment with respect to overhead illumination. This is why a person's face looks strange when lit from below. In the illustration, our tendency is to read the top two forms as being recesses and the bottom two as projections.

## Overhead Light in Drawing

Make the underside of things dark unless there is some other strongly established light source operating within the drawing.

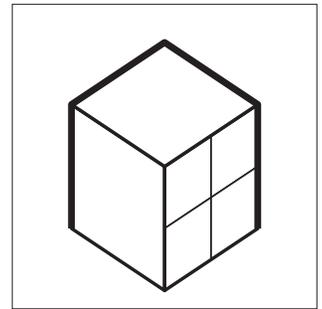
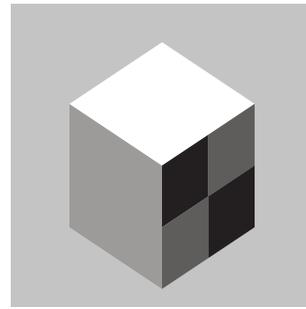


## Relative Brightness

When all other cues are equal, the object that is perceived as brightest will appear closest. This is especially true at night or in environments with a low level of illumination. In these cases we experience the illumination of surfaces diminishing as their distance from the light source increases. Therefore, given a dark environment those things that are more strongly illuminated are perceived as closer to us. Another more general way of stating this cue is; the object that creates the greatest contrast with its environment will appear closest.

## Relative Brightness in Drawing

Within a drawing context that is predominantly at the darker end of the value scale, make surfaces lighter as they move closer in space. In a context that is white or light in value the darkest surfaces will appear closest. Use relative contrast to control the perception of things in space and their relative importance.



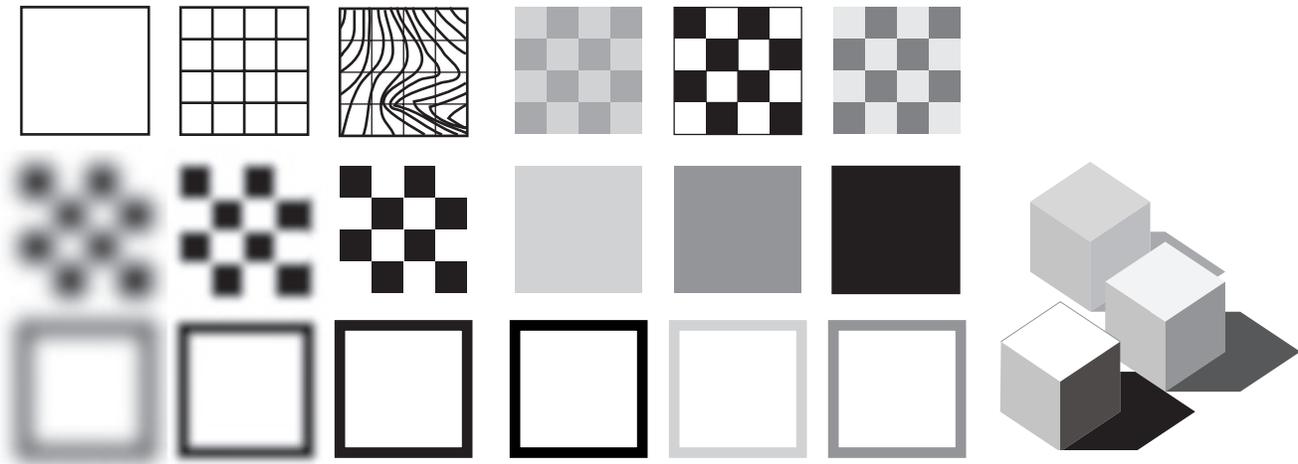
## Values, Edges & Lines in Drawing

Values and lines are used in drawings to represent things. Values can directly represent the qualities of a surface by simulating its value in the drawing. However, there are times when creating values is too time consuming or inappropriate for the desired communication. At these times, we use lines to represent abrupt changes in value—the edge of a value. Obviously values and lines can be used in many combinations to represent the visual world.

A language of line weights can be used to represent the spatial meaning of different value changes as shown in the illustrations. Primary or profile lines represent occluding edges. Secondary lines represent the meeting of two surfaces with different orientations. Tertiary lines represent changes of value on a surface.

The occluding edges of objects are of particular perceptual importance because it is at these edges that new information appears. This new information may appear because something moves from behind the object or because we move and therefore can see what was previously concealed. Both involve the appearance and/or disappearance of distant objects from behind the occluding edges of nearer objects.

Primary or profile lines representing occluding edges can be made heavier to give them a strong contrast with their surroundings. In representing occluding edges of things we are enhancing an edge to acknowledge its meaning as a source of new information. In addition, the heavier profile line creates a stronger contrast that enhances the differentiation of the object and moves it forward in space.



## Aerial Perspective

Aerial perspective address the phenomena produced by dust, smoke, water droplets, etc. in the air. The result is that as things move farther away they loose detail, sharpness, contrast, value and chroma and turn blue. The six concepts are being presented as pairs (detail/sharpness, contrast/value and chroma/blueness) because of their close interrelationships.

## Detail/Sharpness

The intervening atmosphere tends to obscure detail and reduce the sharpness of edges. When this is combined with the effects of size and the limitations of our eyes this cue can become very pronounced. Therefore, what has sharp and distinct (hard) edges and greater detail advances or appears closer and what has soft or fuzzy edges and less detail recedes or looks farther away.

### Detail/Sharpness in Drawing

Provide greater detail on near surfaces and less as they recede back in space. Render near surfaces with precise well defined lines and edges and reduce the precision as they recede into the distance. Near objects and surfaces are more photographic while far objects are more suggested or implied.

## Contrast/Value

As things move farther away from us the intervening atmosphere reduces contrast by making surfaces lighter and more similar in value. A wide range between light and dark values (strong contrast) is seen to advance and appear closer. Conversely, a narrow range of values (weak contrast) recedes. In the illustration, note the figures that contrast greatest with the background appear closest and that the checkerboard figures appear closer than the figures with less internal contrast.

### Contrast/Value in Drawing

Give near surfaces the greatest internal contrast in value using the full range from black to white. Make far surfaces low in internal contrast using a limited range of values from medium to light. Give near figures the greatest contrast with the ground and far figures less contrast.

## Chroma/Blueness

Just as the intervening atmosphere obscures detail it also obscures or reduces the apparent chroma of a surface. The atmosphere is perceived as having a purple-blue color that veils everything in the landscape and tends to make all colors more blue and neutral. The result is that pure saturated colors and especially warm (red) colors advance while unsaturated (low chroma) and cool (blue) colors recede.

### Chroma/Blueness in Drawing

Make the colors on near surfaces their full strength and chroma. Reduce the chroma of surface colors as they recede into the distance and also make them progressively cooler. High chroma warm colors (e.g., bright red) will always appear closer and more dominant than low chroma cool colors (e.g., pale blue).

## Color, Light & Drawing

In the second edition of *Color Drawing* (1999), Michael Doyle describes the phenomena of light and color that surround us each day and admonishes us to carefully observe how they work as a basis for creating the illusion of three dimensional form and space on two-dimensional surfaces. In the following, Michael Doyle focuses our observation of the world and identifies implications for color drawing.

### Local Tone

Every surface has some intrinsic value—it falls somewhere between white and black on the value scale—based on its inherent color and regardless of its illumination. When illuminated, a white surface will always be lighter than a red surface no matter what its orientation to the light source.

### Chiaroscuro

“The term chiaroscuro refers to the light-to-dark shading of an illustrated form in order to make it appear three-dimensional. . . . [When creating chiaroscuro,] the color of a surface in shade or shadow usually remains the same color as its illuminated sides, only darker, and that the degree of darkness depends on the” intrinsic value of the surface. (Doyle 1999, 6) Surfaces in shade and shadow should not be drawn as gray or black, but darker versions of the surface in sunlight.

### Color of Shade & Shadow

There are conditions when the shades and shadows on surfaces take on subtle colorations other than darker versions of the illuminated surface. This occurs when the source of the surface's illumination is colored. The illuminating source may be a colored light or indirect light reflected off a colored surface. This includes the light from a bright blue sky. The effect is particularly evident on neutral white or gray surfaces such as concrete.

## Gradation

Most surfaces appear uneven in color and value—surfaces graduate from one color to another and from one value to another. This visual quality is the result of a surface's orientation to a light source, distance from a light source and the colors reflected onto them from other surfaces.

The use of gradations in drawing is essential to making surfaces appear more realistic. For example, shadows should be graded to be darker toward their boundary with illuminated surfaces and illuminated surfaces should be graded lighter toward the same boundary.

The surface of an element in the background may gradually be darkened and cooled as it moves toward its boundary with the surface of a foreground element. At the same time, the surface of the foreground element may be gradually lightened and warmed as it approaches its boundary with the surface of the background element.

## Multiplicity of Color

The color of any surface or area when seen from a distance appears to be a single color. The reality is that the surface or area is comprised of many colors that are averaged or mixed together in the visual process. Closer inspection will find the variations in color that the impressionist painters such as Seurat utilized in their paintings.

A key technique to building this richness into drawings is to create surface colors from many colors that are placed side by side. This is accomplished by layering several colors with one or more media (e.g., marker and colored pencil).

## Atmospheric Perspective

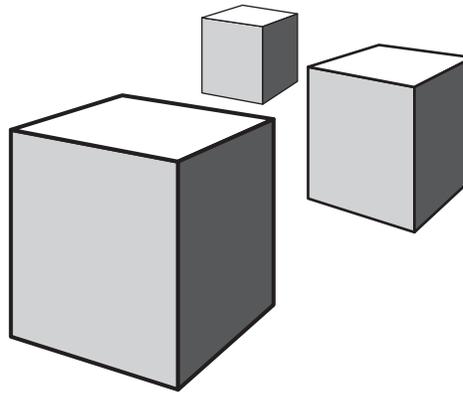
This is the same as the Aerial Perspective cue discussed earlier. As elements recede into the distance their surfaces tend to become lighter, cooler and more grayed. The surfaces of elements that are closer tend to be darker, more vivid in color, warmer and contain greater contrast.

Our life long experience in the world which is supported by the way our eyes function results in cooler colors appearing to recede and warm colors appearing to advance. This is especially true when the two are used in relationship to each other.

## Reflections

Reflective surfaces reflect the colors they see back to the viewer. In most cases the reflected colors are less intense than those of the objects being reflected. When the reflecting surface is darker than its surroundings (e.g., a window in a sunlit wall) the reflected colors will be less intense and darker than those of the object being reflected. Mirrored or highly polished surfaces usually distort the shape of the object but reflect its color exactly.

“As windows in a building become higher and more oblique to the viewer’s sight line, they progressively reflect more sky.” (Doyle 1999, 11) They change from darker and/or transparent areas reflecting their surroundings to opaque and lighter surfaces reflecting the sky.



## Luminosity

“Light colors and strong, vivid colors appear to be illuminated, or to glow, when they are surrounded by darker values or applied to or seen against toned backgrounds. The darker the background, the more luminous the color appears.” (Doyle 1999, 12)

## Color & Light Level

The intensity and amount of color that is visible is directly related to the intensity and amount of light present. Color is at its maximum on a sunny day and is disappears in moonlight. In night scenes, color is limited to illuminated surfaces and diminishes rapidly with distance from the light source.



## Arrangements of Light & Dark

There are an infinite number of values in the visual world. Your interpretation of these values is essential to making a successful drawing. Squinting your eyes is one way to reduce the number of visible values. In the process, tones can be grouped into three categories: light, medium or dark.

Each scene can be divided into three spatial layers: foreground, middle ground and background—those things that are in front of the subject, the subject and those things that are behind the subject.

Arrangements of light and dark in a drawing can be achieved by combining these two strategies. First, divide the scene into foreground, middle ground and background layers. Second, assign one of the three value categories to each spatial layer (e.g., foreground is dark, middle ground is medium and background is light). Third, divide each spatial layer into three values within its value category (e.g., light/light, medium/light and dark/light). The result will be a nine step value strategy for creating the drawing.

## Size or Size Constancy

In the simplest terms, things appear smaller in proportion to their distance from us and if two objects appear to be the same size, the one known to be larger must be farther away. Size and size constancy affect our interpretation of what we see based on what we know about things. We know that the relative size of objects indicates their relative position in space because we know the actual/experienced size of many things and treat them as constants in our visual field—we do not see a person as other than about five to six feet tall no matter how they appear. We use these constants to estimate distances and the relative position of things in space.

## Size in Drawing

Draw objects larger when they are closer and smaller when they are more distant. This also applies within an object. For example, a far vertical edge of a cube is shorter than a near one. Place an object of known size (i.e. a human figure) to give scale to the other elements in a drawing—to provide a reference against which the size of other elements can be judged.

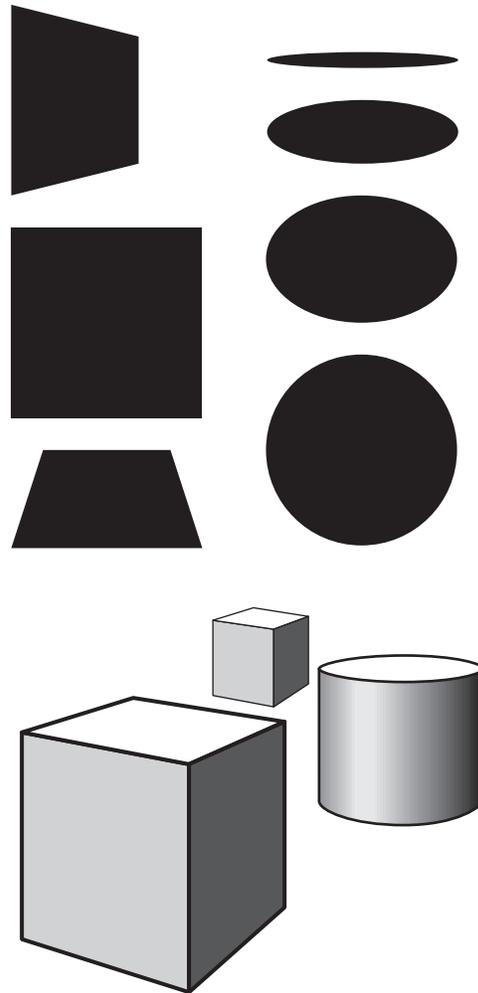
## Vertical Location

We look down at objects that are at our feet (near) and up at objects that are far away. When our viewing angle (angle of regard) is downward we expect to see things that are close and when we look up we expect to see things far away. The angle of regard refers to the angle at which we hold our head to see a figure. This is so strongly ingrained in our experience that figures set low in a drawing are presumed to be closer while those set high are farther away.

The ground plane tends to be our focus because we must pay attention to it as we move about and it dominates our experience of the visual world. However, as we spend more time in man-made environments overhead or ceiling planes play a more important role in spatial perception. Vertical location also operates in terms of overhead planes but it is reversed—near things on the overhead plane are higher. Vertical location works in relationship to an assumed or perceived reference ground or overhead plane.

### Vertical Location in Drawing

When the ground plane is dominant, place objects lower to make them appear closer and higher to make them appear farther away. When both the ground and ceiling plane are active, objects placed both high and low appear closer while those in the middle appear farther away.



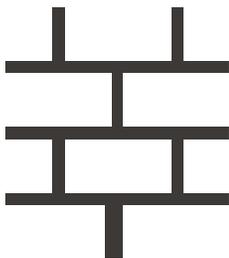
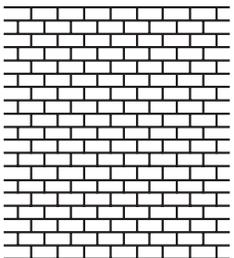
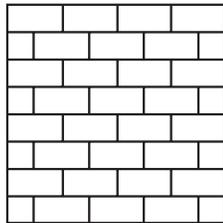
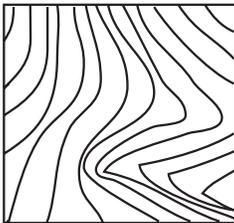
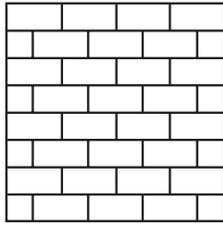
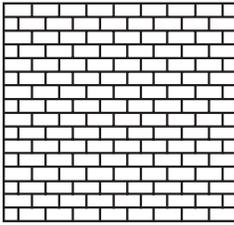
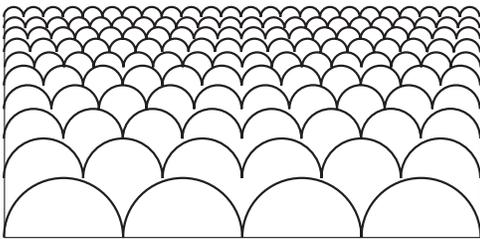
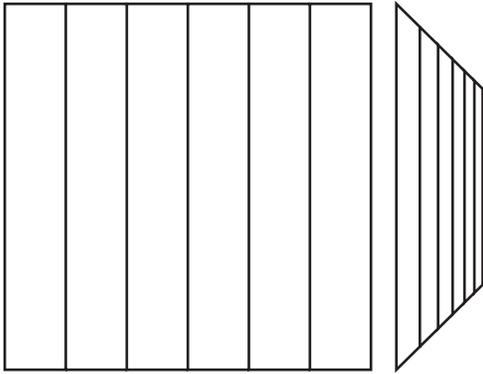
## Foreshortening or Shape Constancy

The only time that the true shape and proportions of a surface are visible is when it is parallel to our face—when it is at right angles to the direction in which we are looking. At all other times, one or more dimensions of a surface appears shorter than it actually is in direct relationship to the angle at which it is turned away from us. This apparent change in shape is called foreshortening.

Shape constancy is when our knowledge of things overrides the actual retinal image. For example, our brains assume that an ellipse is a circle turned in space unless specific information contradicts this position. We know many basic shapes and how they appear from different angles and tend to interpret surfaces as being some basic shape turned in space. This is especially true for circles.

### Foreshortening in Drawing

Reduce the dimensions of surfaces as they turn in space. This foreshortening of known shapes supports the perception of spatial depth.



## Textural Gradient

Texture is the character or structure of a surface that affects its appearance and/or feel. The perception of surfaces and edges is based on seeing continuous gradients and abrupt breaks in gradients respectively. Texture is the primary source of gradients and often displays size constancy and foreshortening cues. This makes it an important cue to a surface's location, orientation and limits.

A surface that is perpendicular to our line of sight (parallel to our face) projects a uniform gradient. A surface that is oblique to our line of sight presents a gradual increase in the density of the texture as it recedes into the distance. This is produced by a diminution of size and the foreshortening of the intervals—a densification of the texture. This causes the texture on oblique surfaces to appear roughest and most pronounced when they are closest to us and to become progressively smoother as they recede in space. The more the surface is slanted the more dramatic the gradient. The sense of depth is strongest when a surface is deeply textured (e.g., a stone wall).

### Textural Gradient in Drawing

Draw uniform textures and values on surfaces that are parallel to your face (the picture plane) and gradations on those that are at a slant. The more dramatic the gradation the more the surface is angled away from the viewer.

Texture also responds to the cue of size. A coarse or large scale texture will appear closer than one that is finer or smaller in scale as illustrated by the two brick patterns illustrated above. Therefore, draw textures at a size and scale that indicates their relative position in space.

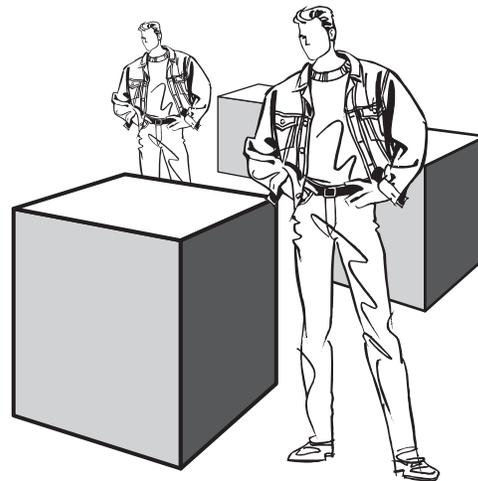
The texture presented by a surface is one of the key ways we determine its material nature because of our experience with and knowledge of the world. At the most basic level the scale of the texture indicates if the surface is smooth or rough and coarse or fine. At the next level we can determine its material (e.g., if it is brick or wood). Based on our understanding of the material we make aesthetic judgements and determine the desirability of touching or being near the surface because we know the surface is going to be hard or soft, warm or cold, rough or smooth, etc. Furthermore, based on how the material is rendered we can determine its illumination, reflectance, color and transparency. Therefore, choose and draw textures that support the communication goals of the drawing.

The scale of the texture on a surface can affect our perception of the surface. A small scale pattern maintains visual attention on the surface as a whole whereas a larger pattern can cause us to see the individual elements more readily than the surface. If we want to make the perception of surfaces primary, the scale and contrast of surface textures and patterns should be visually secondary to the surface. The scale of surface textures and patterns should not be too big and/or their contrast too strong.

## Overlap

The visual field is seldom without many instances of things covering portions of other things. Overlapping is so dominant a quality of the visual world that we always assume the physical integrity of objects. If we recognize something we assume that the whole object is present even if a part of it is obscured by another object—we assume that objects have continuity. In the illustration, we always assume that the square is covering a portion of a circle and not that a square and three-quarters of a circle lay on the same plane.

The effect of overlap on perceived size can be demonstrated by holding one hand straight up at the end of your arm, and the other hand straight up at only half the distance of the other one. Move the near hand to partially cover the other. It instantly appears much larger. Move it back and it appears reduced in size.



### Overlap in Drawing

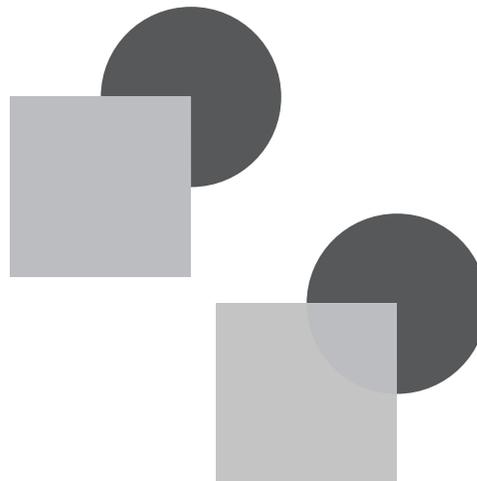
Draw forms so that they overlap each other to greatly increase the apparent depth in a drawing.

## Transparency

Transparency is overlap that is affected by the nature of the overlapping material. The degree to which we can see through a surface to surfaces beyond or behind determines its degree of transparency.

### Transparency in Drawing

Transparency can be best indicated with value and/or color changes. The area shared by the overlapping and overlapped form can have a unique value, color and/or graphic technique. In line drawings, those lines seen through the transparent material can also change value, weight, form and/or continuity.

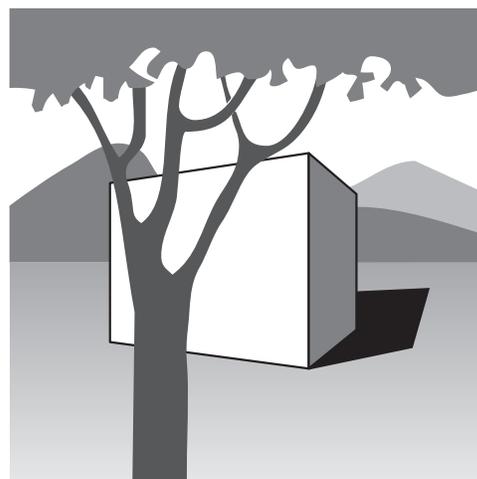


## Spatial Layers: Foreground, Middleground, Background

A spatial layer is a grouping of things within our visual field that we categorize as being at a similar distance or within a given range of distance from us. We tend to group things into three overlapping planes: the foreground or those things that are near to us and in front of that which has our attention: the background or those things that are far from us and in back of that which has our attention: and the middle ground or those things that have our attention. The perception of these layers is a function of the spatial relationship between the things and our attention. Things separated by large distances tend to organize on separate planes while the things we focus on tend to be assigned to a single layer.

### Spatial Layers in Drawing

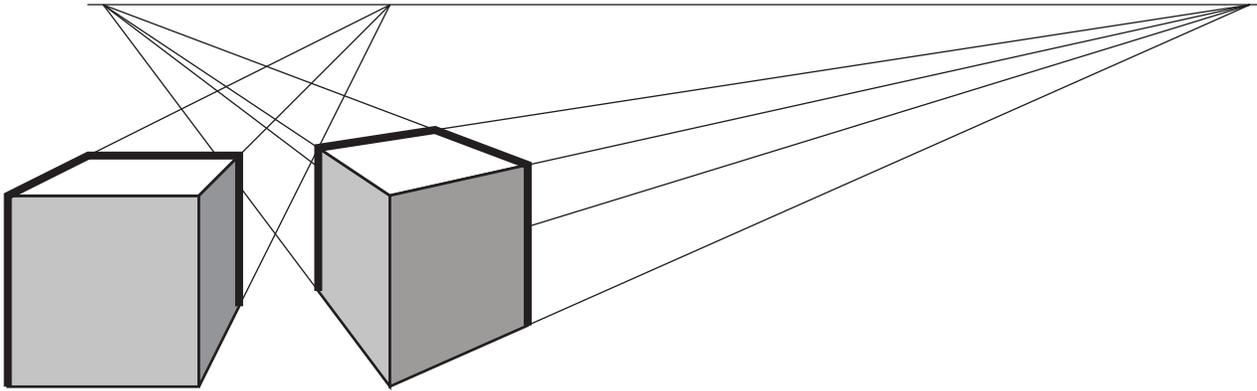
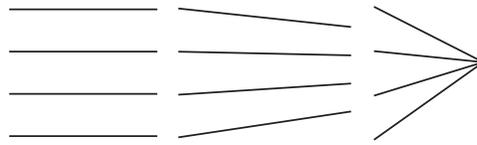
A spatial layer is created by the first mark made on a two-dimensional surface. It is a figure floating above the surface. Visualize the relative layer of space occupied by each new mark. Depth in a drawing can be dramatically enhanced by establishing overlapping layers. In architectural drawings this usually takes the form of



foreground (tree), middleground (cube) and background (mountains) layers as indicated in the illustration.

## Convergence

The essential experience of convergence is that parallel lines seem to come together in the distance. This cue is most pronounced in human environments because they are typically constructed of things that have flat rectangular surfaces and parallel edges.



### Convergence in Drawing

Make each set of parallel lines appear to converge to a common point. Depending on the orientation of the set of lines their vanishing point can be located anywhere.

## Summary

To create the illusion of three dimensional form and space on a two-dimensional surfaces some combination of the visual cues previously described must be represented. The particular combination of cues chosen should depend on time, energy and the desired communication. The greater the number of cues that are used to reinforce the illusion the clearer the illusion will be—greater redundancy produces greater clarity. When cues contradict each other the clarity of the illusion is diminished. The goal is to communicate with maximum clarity and efficiency the desired quantitative and qualitative information.

# PERSPECTIVE BASICS



*Linear perspective is a drawing system based on our visual experience of the world that can systematically produce the position cues. It is used in quick pencil sketches, photo-realistic renderings and 3-D digital modeling. The presentation of the perspective concepts and techniques will start with those that support sketching and progress to those that support more photographic renderings—a sequence that parallels the design process.*

## Approach

The approach to presenting perspective concepts that will emphasize the approximate and proportional as opposed to the measured and accurate. This approach supports investigating possibilities as opposed to representing defined solutions without precluding more precise perspective construction. The goal is to present basic concepts and strategies and to protect against becoming entangled in the web of linear perspective construction.

Fundamental concepts will be introduced and then specific perspective construction methods will be described. The approach simultaneously introduces both one- and two-point perspective, facilitates the understanding of both the parts and the whole and supports choosing from among alternative approaches.

## Squares to Cubes

If you can visualize and draw a square, you can visualize and draw a cube. If you can visualize and draw a cube in perspective, you can construct anything in perspective. The approach to drawing perspectives that will take advantage of our understanding of squares and cubes and ability to visually estimate and draw them with great accuracy.

## Looking Right

Linear perspective is concerned with the appearance of things to the eye and is a system for representing what we see on a two-dimensional surface. If a drawing does not look right, it is not right, no matter how precisely the rules of perspective were followed. Train your eye to recognize when things don't look right. You will find that this sense will help you draw perspectives correctly.

## Principles

There are only a few fundamental principles to perspective. It is helpful to remember that no matter how complicated or perplexing linear perspective seems to get it can be simplified by referring to one or more of these fundamental principles.

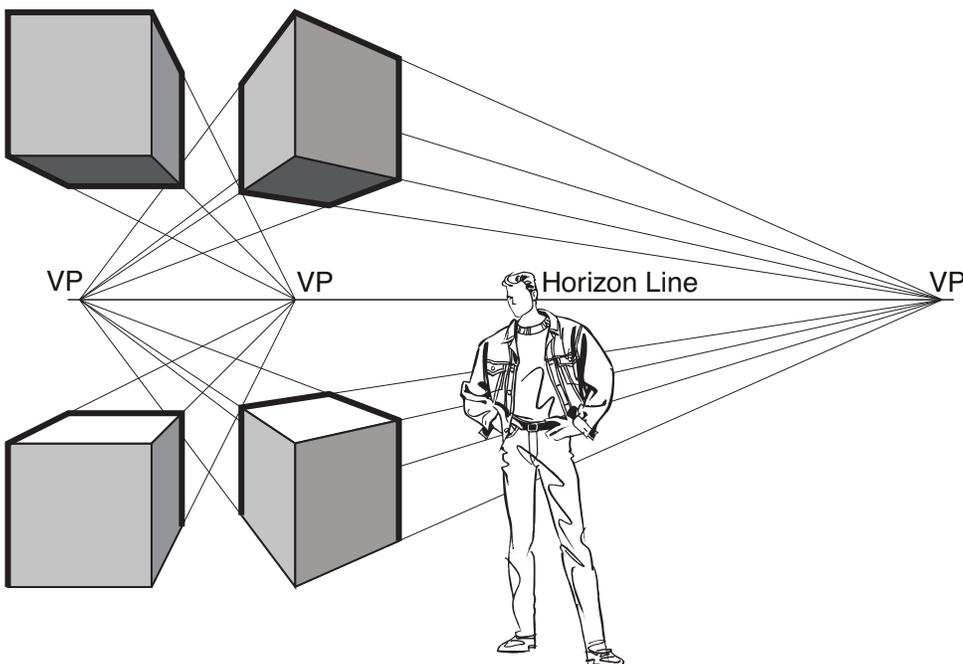
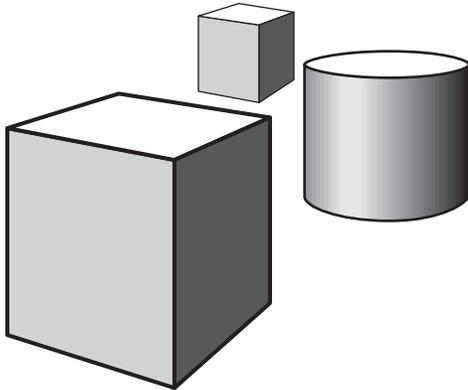
**Principle 1:** Things appear smaller in proportion to their distance from us and if two objects appear to be the same size, the one known to be larger must be farther away. In the illustration we assume the two cubes are the same size and therefore the smaller one is farther away.

**Principle 2:** The only time that the true shape and proportions of an edge or surface are visible is when it is parallel to our face—when it is at right angles to the direction in which we are looking. Surfaces not parallel to our face appear either narrower or shorter in proportion to their angle to our face. This is called foreshortening. The sides and top of the cubes do not appear as the squares we know they are—their dimensions are foreshortened. The greater the angle, the greater the foreshortening. When a surface becomes perpendicular to our face it appears as a line—we see only its edge. Therefore, based on our understanding (shape constancy) we perceive them as rotated in space.

Note the scale giving affect of having people in a drawing. If the person shown is six feet tall, how big are the cubes? Architecture is for people—put people in the spaces you drawings.

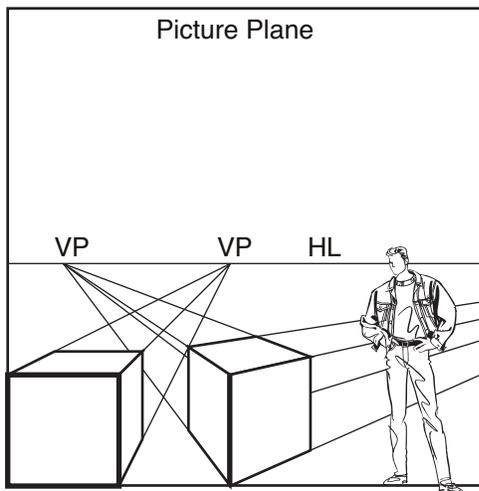
**Principle 3:** Sets of parallel edges/lines appear to converge to a common Vanishing Point (VP) in the distance. For example, the horizontal edges that define the right sides of the cubes appear to vanish toward a common point to the right of the cubes. The more general form of this principle is that any set of parallel lines/edges not parallel to the observer's face will vanish to a common vanishing point somewhere.

Although we commonly speak of one- or two-point perspectives this does not mean that there are only one or two possible vanishing points in the perspective. It simply means that the primary form we are drawing is generally rectilinear and that it therefore has one or two sets of parallel horizontal lines or edges that vanish. There can be as many sets of vanishing points as there are sets of parallel edges at different angles. It is also possible for a drawing to contain objects that are in one-point along with objects that are in two-point perspective as illustrated.



**Principle 4:** The Horizon Line (HL) is an imaginary horizontal line located at the height of the observer's eyes—the observer (the person viewing the scene) establishes the vertical location of the horizon line (HL). Objects or edges below the observer's eye level occur below the HL and objects or edges above the observer's eye level occur above the HL.

A horizon line can be experienced at the ocean. If you stand at the water's edge and look out over the ocean, the ocean's surface will create a line (HL) at your eye height as you look straight ahead. If you stand on a pier above the ocean, the ocean's surface will again create a line (HL) at your eye height as you look straight ahead. The location of the horizon line follows the height of the viewer's eyes.



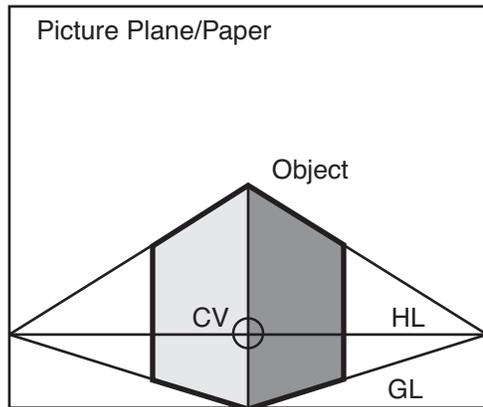
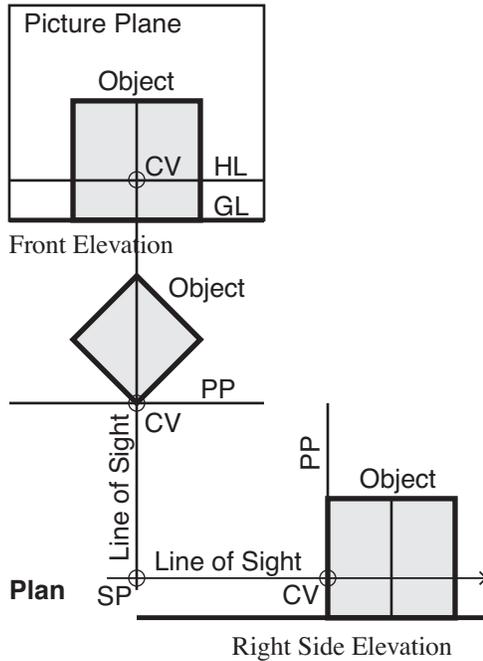
**Principle 5:** All lines parallel to the observer's face retain their true orientation, proportion, dimension and shape. Because these lines retain their true dimensions they are used to establish measurements and proportions in perspectives and are some of the first that are drawn.

In one- and two-point perspectives all vertical edges/lines remain vertical because they are parallel to the observer's face that is looking straight ahead. This is not true if we tilt our heads up or down but our visual perceptual system compensates and they appear to remain vertical because we know they are. The exception is when we look up at very tall buildings or down into a very deep hole.

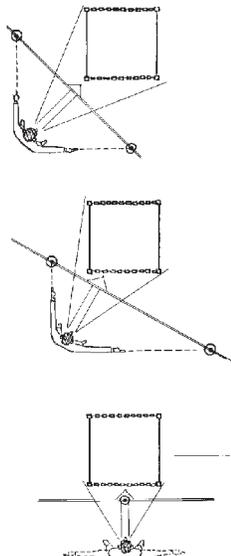
**Principle 6:** There is only one plane within a perspective on which dimensions can be entered. This plane is called the Picture Plane, exists between the observer and what is being drawn, is parallel to the observer's face and is established by the person drawing the perspective. The sizes/proportions of all elements within a perspective are relative to those established on the picture plane.

The approach that will be described is based on two assumptions. First, the view being drawn starts at the picture plane and extends back into space. This approach ensures that the perspective will fit on the sheet of paper being used.

Second, each perspective begins by drawing an edge and/or plane that is parallel to the observer's face. This initial edge and/or plane is assumed to be on and therefore defines the picture plane for the drawing.



### Perspective



## Perspective Terms, Concepts, Positions & Assumptions

There are a series of terms, concepts, assumptions and positions associated with linear perspective that should be defined and stated. The drawings to the left illustrate the essential elements of lineal perspective.

Every perspective begins with a Station Point (SP) that sets the location of the perspective's viewer. From the Station Point the viewer looks at the subject. The Line Of Sight is a horizontal line from the viewer to the subject that establishes the views direction. The approaches and methods that will be used will not actually draw a Station Point or Line of Sight but instead will be based on assumptions about these two elements.

I take the position that the only perspectives worth drawing are eye-level perspectives. Therefore, one assumption is that the Station Point is located 5 or 6 feet above the plane on which the viewer is standing.

The Picture Plane (PP) is an imaginary plane upon which the perspective is projected. It is perpendicular to the Line of Sight and parallel to the viewer's face. I take the position that the Picture Plane is coincident with the paper on which the perspective is being drawn and the subject starts on the Picture Plane and moves back in space. The assumption is that the first edge or plane drawn is on and therefore defines the Picture Plane. This means that the portion of the subject drawn is touching the Picture Plane (e.g. the lead edge of the object is on the Picture Plane in the illustration).

If the first edge or surface drawn touches the ground, the bottom of the edge or surface defines the Ground Line (GL) which is the line of intersection between the Picture Plane and the ground.

The Horizon Line (HL) is established by the vertical location of the viewer's eyes. The intersection of the Line Of Sight and the Picture Plane defines the height of the Horizon Line (HL) and the Center of Vision (CV) which is the intersection of the Line of Sight and the Horizon Line. The Center of Vision (CV) is the point on the horizon line that is directly in front of the observer.

The Vanishing Points (VP) for horizontal edges fall on the Horizon Line and reflect the relative angle of the edges to the observer's face and thereby the picture plane which is parallel to the observer's face.

We can estimate the relative location of the vanishing points by raising our arms so that they are approximately horizontal and parallel to the vertical faces of surfaces being drawn. In this position our fingers will be pointing at the vanishing points for the horizontal edges of the faces. If our finger tips represent the vanishing points and we imagine a line drawn between them then we can proportionally estimate the distance from finger tips to the center of vision for the each vanishing point. By transferring this proportional relationship to a sheet of paper we have the basic setup for the perspective. In a one-point perspectives we would be pointing straight ahead so the center of vision and vanishing point would coincide.

## Vanishing Lines

Vanishing Lines (VL) are lines along which the vanishing point for a given set of parallel lines will fall. Perspectives consist of horizontal lines, lines parallel to the picture plane or the viewer's face and/or oblique lines.

All horizontal lines vanish to a point on a vanishing line called the Horizon Line.

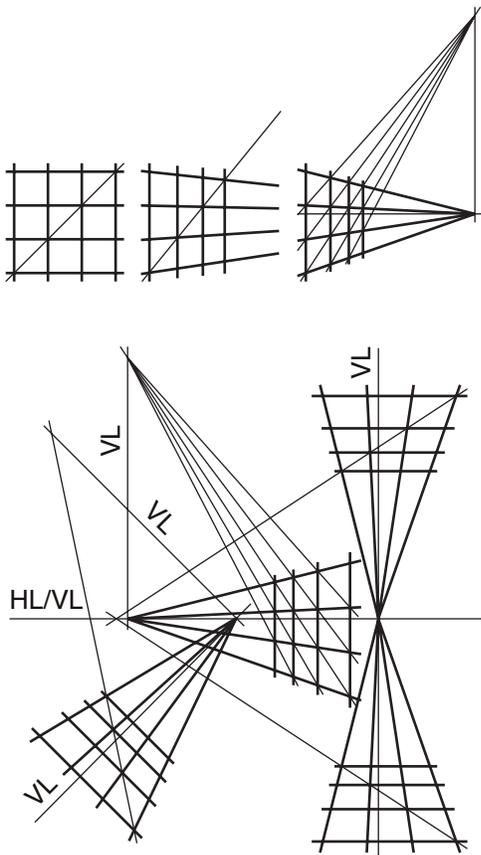
All lines parallel to the picture plane do not vanish. They retain their true angle, shape and proportions. In one- and two-point perspectives these include all vertical edges.

Oblique lines are lines that are not parallel to the Picture Plane but lay on a plane defined by two or more horizontal lines.

For any set of parallel horizontal and vertical lines there are two Vanishing Lines that are at right angles to each other and intersect at the Vanishing Point for the horizontal lines. One of the Vanishing Lines will be the Horizon Line.

For any set of parallel oblique lines there are two vanishing lines that are at right angles to each other and intersect at the Vanishing Point for the horizontal lines. One of the Vanishing Lines will be parallel to the set of lines and the other will be perpendicular to the set of lines. The Vanishing Line that is parallel to the set of lines can be thought of as the Horizon Line for that set of lines.

The Vanishing Point for a set of oblique lines can be found by locating two points along the line and projecting the line until it intersects with the appropriate Vanishing Line.



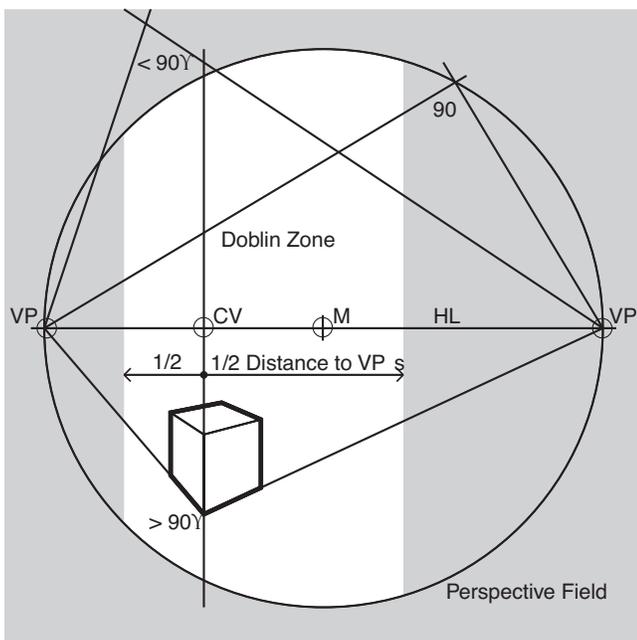
## Distortion

Linear perspective formalizes through geometry a system that attempts to represent three-dimensional reality on a two-dimensional surface. Being a finite system fitting on a sheet of paper that assumes a fixed one-eyed observer it has limitations that must be respected if the goal is for the drawing to look right.

The object that is drawn directly in front of the viewer is the most accurate in the perspective. Distortion occurs with progressively greater impact as the subject grows vertically and/or horizontally from the Center of Vision (CV).

## 90° Horizontal Corner

The Perspective Field can be used to control the near internal angle of horizontal rectangles to 90° or greater. When that 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 lineal perspective system.



The Perspective Field is defined by finding the midpoint (M) on the horizon line between a given set of vanishing points. This point is then used to construct the Perspective Field by drawing a circle whose center is at the midpoint and whose radius is the distance from the midpoint to either of the vanishing points

## Half the Distance

Jay Doblin (1956) investigated the relationship between the degree of distortion produced as a cube moves away from the center of vision and its visual acceptability. He found that when the cube became distorted by 25% or more it did not look right. Based on when a cube displays distortion of 25% or more he established the limits of a zone of acceptable distortion as defined by a pair of vertical lines located half way between the center of vision and the vanishing points for a particular setup.

Combining the limits of the Perspective Field and the half the distance rule of thumb provides an way of estimating the area within which a perspective will appear correct. The assumption is that if a perspective is constructed within these limits it will appear visually correct. If the perspective of an object extends beyond the limits set by the guidelines you can make the object smaller rela-

tive to the existing vanishing points or you can move the vanishing points farther apart and keep the drawing the same size. You can also decide that the perspective looks appropriate and is communicating what you want and therefore, the guidelines should be ignored in a particular situation.

# FUNDAMENTAL TECHNIQUES



*There are a few fundamental perspective techniques that form the foundation for all perspective drawing. They can be used to create both freehand and constructed drawings as well as to draw over perspectives generated from 3-D modeling programs.*

## Introduction

Each technique will be illustrated through both plane geometry and linear perspective. This not only helps clarify the explanation but emphasizes the point that the techniques are applicable to all drawing systems (orthographic, axonometric and linear perspective).

The techniques may be used for vertical and horizontal planes in both one- and two-point perspective. In fact they can be used on a plane in any orientation. Turn the pages to help visualize the techniques operating for surfaces in different orientations.

Although the techniques are individually described they can be used in many combinations. In each situation there will be more than one technique that produces the desired results. The goal is to make choices that achieve the desired construction as quickly and easily as possible.

All examples will be based on squares and cubes. However, remember that a square is just a particular rectangle and therefore, all the techniques can be used to multiply or divide any rectangle.

The fundamental techniques link sketching with the computer. The ability to quickly and accurately sketch within and extend a computer generated perspective supports the exploration of alternatives and the development of presentation drawings. It allows three-dimensional modeling programs to be used to create simpler and more efficient mass models that provide perspective frameworks for elaboration by hand.

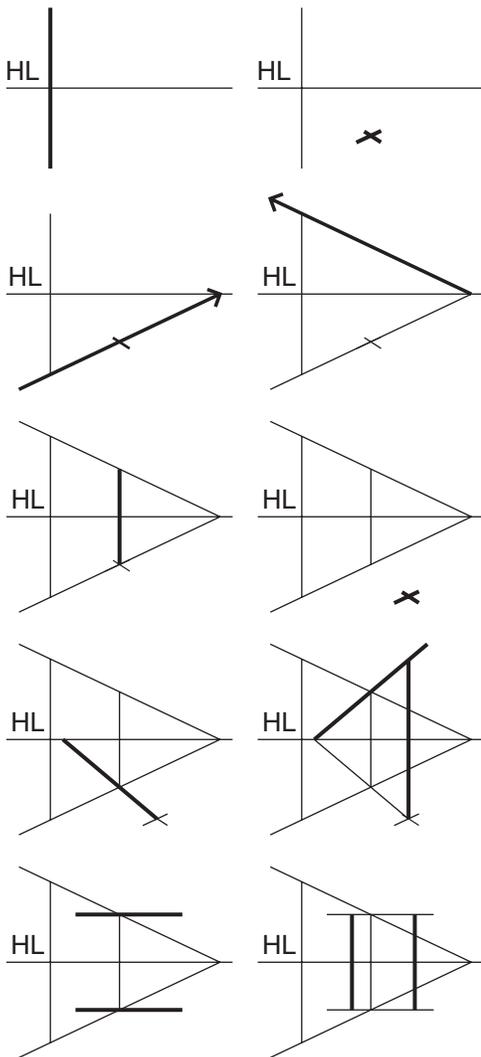
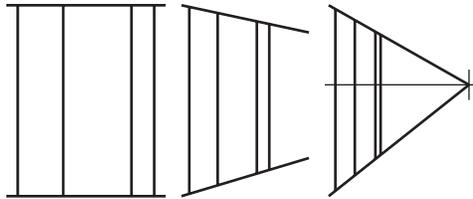
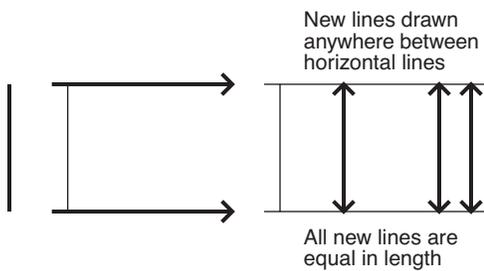
The techniques have the following advantages.

They support the development of a perspective without adding to its constructional framework.

They build and reinforce an understanding of perspective and the relationships between things within it.

They do not require additional drawing space beyond the perspective itself.

They can be applied to any part of any existing perspective.



## Horizontal Transfer

The assumption is that you have a line or element of a known or established length that you want to move through space horizontally to locate other like elements.

Draw or identify the base line or element that is parallel to the picture plane.

Draw horizontal lines through either end of base line (orthographic) or lines that go to the vanishing point for the plane (perspective).

Draw lines that have the same orientation as (are parallel to) the original line at any location between the parallel lines. These lines will all be the same length as the original.

Any vertical dimension located anywhere within a perspective can be moved through space using this technique.

## Moving Horizontally in Perspective

When you move in perspective you are either moving parallel to or at some angle to the picture plane. In one-point perspective the vertical (Z) and one of the horizontal axes (X or Y) are parallel to the picture plane. In two-point perspective only the vertical (Z) axis is parallel to the picture plane.

The assumption is that you have one vertical element and want locate another of the same size on the same plane.

Draw or identify the base vertical element in relationship to the horizon line (HL).

Locate where you want the second element to be positioned. The mark (X) will represent location of the bottom of the new element. It is somewhere on the same horizontal plane as the bottom of the original line or element.

Draw a line that passes through the bottom of the original line and the "X" that marks the bottom of the new line. The line should extend to intersect the horizon line (HL). The intersection with the HL creates a vanishing point.

Draw a line from the top of the original line to the vanishing point.

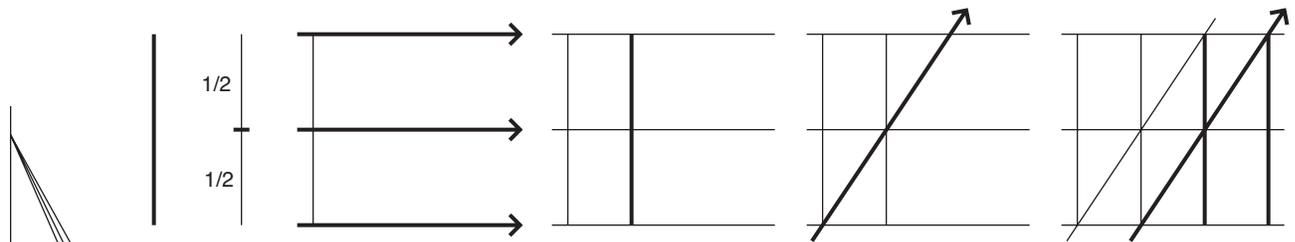
Draw a vertical line through the "X" to establish the new line or element.

This process may be repeated as many times as needed. Each new location develops a new plane with its vanishing point. The result could be thought of as a series of intersecting walls of the same height that all rest on a common horizontal plane.

You can also move parallel to the picture plane. In this case you draw horizontal lines to establish the height of the new elements.

## Distribute

The assumption is that you have an element that you want to distribute along a plane at an even increment. This works very well for elements such as columns, fence posts, trees, railroad ties, cracks in sidewalks, etc.



Draw or identify the base element that is parallel to the picture plane.

Divide the length of the element in half.

Draw lines that extend from the top, bottom and middle of the element.

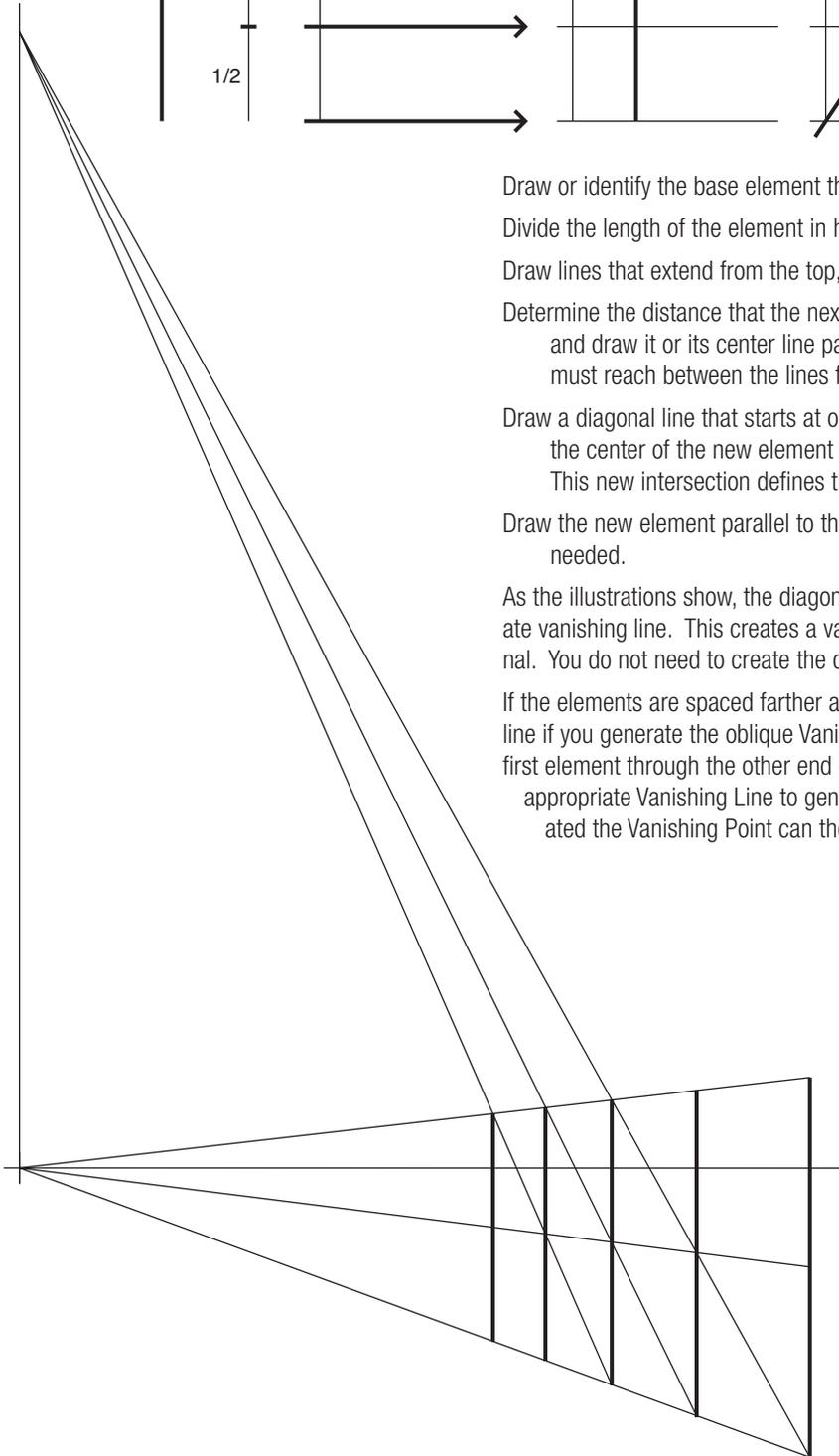
Determine the distance that the next element should be placed along the plane and draw it or its center line parallel to the original element. The new element must reach between the lines from the top and bottom of the original element.

Draw a diagonal line that starts at one end of the original element, crosses through the center of the new element and extends until it intersects the opposite line. This new intersection defines the location for the next element.

Draw the new element parallel to the first and repeat the process as many times as needed.

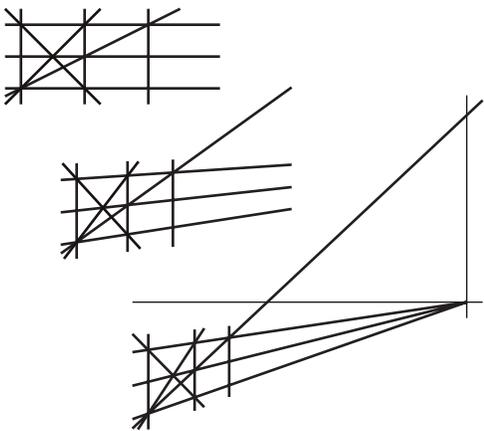
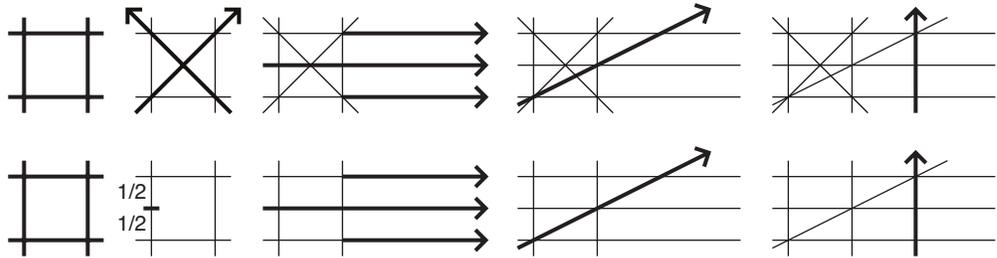
As the illustrations show, the diagonal can be extended to intersect a the appropriate vanishing line. This creates a vanishing point for all lines parallel to the diagonal. You do not need to create the diagonal vanishing point to use this technique.

If the elements are spaced farther apart, there is no need to develop the half way line if you generate the oblique Vanishing Point. Extend a line from one end of the first element through the other end of the second element until it intersects with the appropriate Vanishing Line to generate the oblique Vanishing Point. Once generated the Vanishing Point can then be used to distribute more elements.



## Add One

The assumption is that you have a visually and proportionally correct rectangle and wish to generate an additional rectangles to either side, above or below.



Draw or identify the base rectangle whose vertical edges are parallel to the picture plane. All edges are parallel in orthographic drawings.

Draw the rectangle's diagonals. The intersection of the diagonals of a rectangle locate its center.

Extend the appropriate edges of the base rectangle.

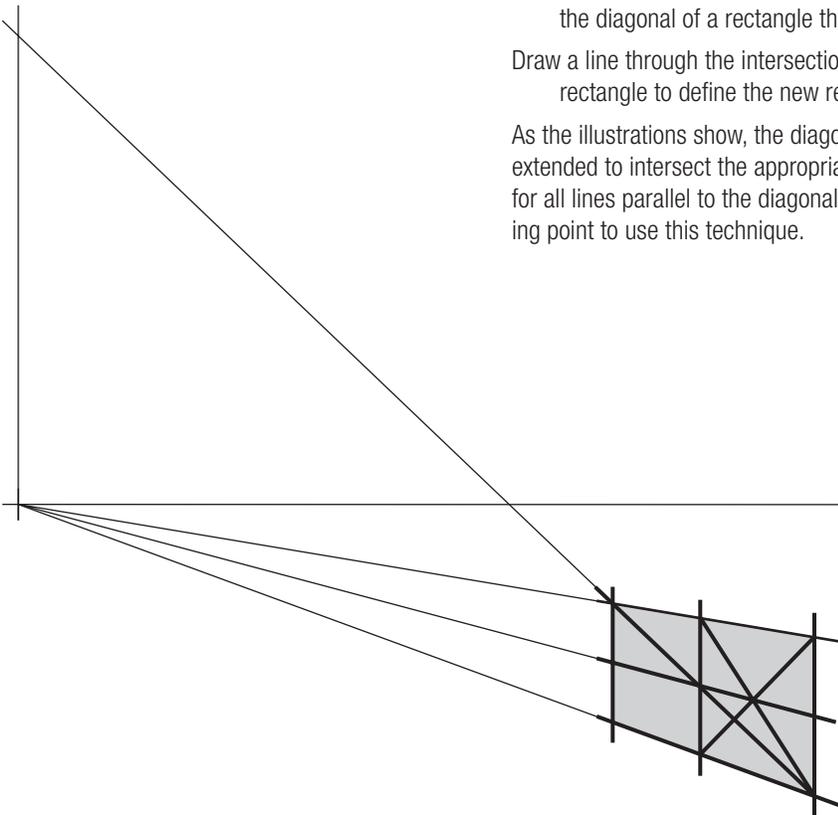
Draw a line through the center of the rectangle (the intersection of the diagonals) that is parallel to the extended sides. A line drawn through the center of a square that is parallel to two of its sides will bisect the other two sides.

Alternative (bottom illustration): Some times it is faster to divide a vertical edge with a scale or by visual judgement. In this case draw a line through the center of the side that is parallel to the extended sides.

Draw a line from one corner of the rectangle through the center of an opposite side. Extend this line until it intersects one of the extended sides. This line is now the diagonal of a rectangle that is twice as wide as the original one.

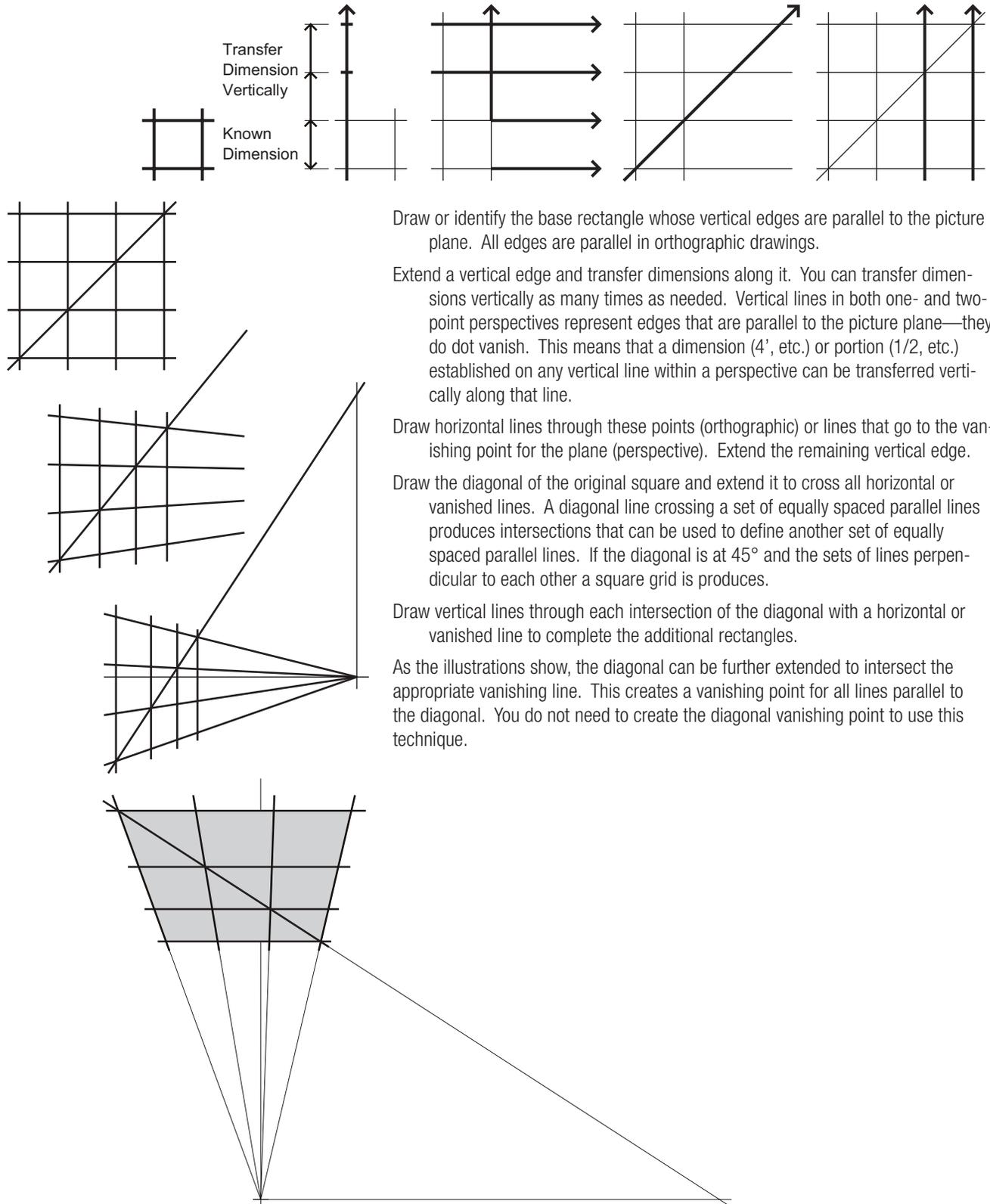
Draw a line through the intersection of the line just completed and the side of the rectangle to define the new rectangle.

As the illustrations show, the diagonal of the double wide rectangle can be further extended to intersect the appropriate vanishing line. This creates a vanishing point for all lines parallel to the diagonal. You do not need to create the diagonal vanishing point to use this technique.



## Multiply

The assumption is that you have a visually and proportionally correct rectangle and wish to generate additional rectangles to one or more sides.



Draw or identify the base rectangle whose vertical edges are parallel to the picture plane. All edges are parallel in orthographic drawings.

Extend a vertical edge and transfer dimensions along it. You can transfer dimensions vertically as many times as needed. Vertical lines in both one- and two-point perspectives represent edges that are parallel to the picture plane—they do not vanish. This means that a dimension (4', etc.) or portion (1/2, etc.) established on any vertical line within a perspective can be transferred vertically along that line.

Draw horizontal lines through these points (orthographic) or lines that go to the vanishing point for the plane (perspective). Extend the remaining vertical edge.

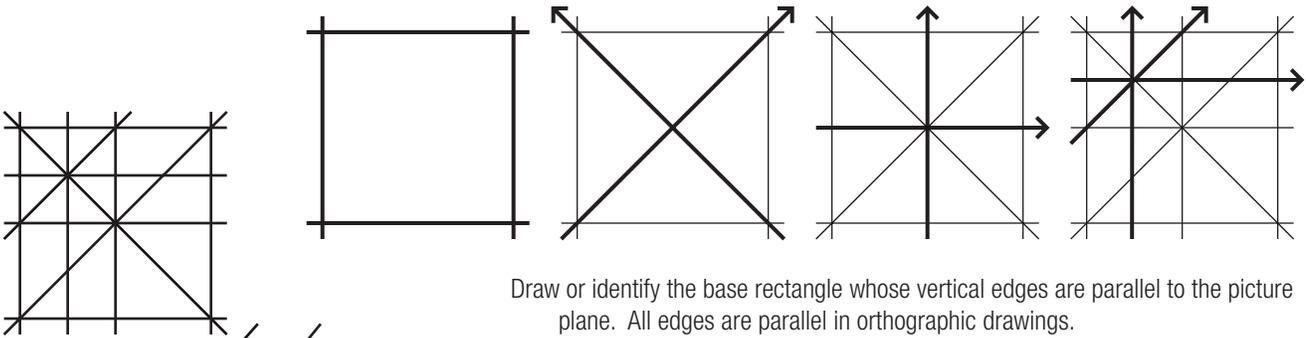
Draw the diagonal of the original square and extend it to cross all horizontal or vanished lines. A diagonal line crossing a set of equally spaced parallel lines produces intersections that can be used to define another set of equally spaced parallel lines. If the diagonal is at 45° and the sets of lines perpendicular to each other a square grid is produced.

Draw vertical lines through each intersection of the diagonal with a horizontal or vanished line to complete the additional rectangles.

As the illustrations show, the diagonal can be further extended to intersect the appropriate vanishing line. This creates a vanishing point for all lines parallel to the diagonal. You do not need to create the diagonal vanishing point to use this technique.

## Subdivide

It is a good strategy to draw the largest inclusive form possible as a first step in constructing a perspective and then proceed to subdivide that form to locate smaller elements. Therefore, this technique assumes that you have a visually and proportionally correct rectangle and wish to divide it into halves, quarters, eights, etc.



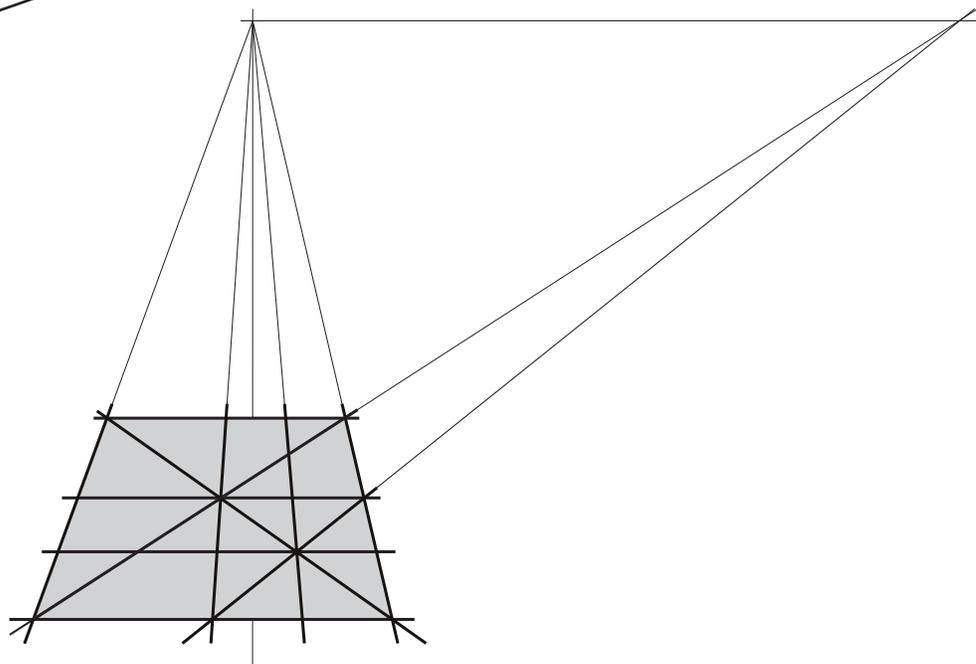
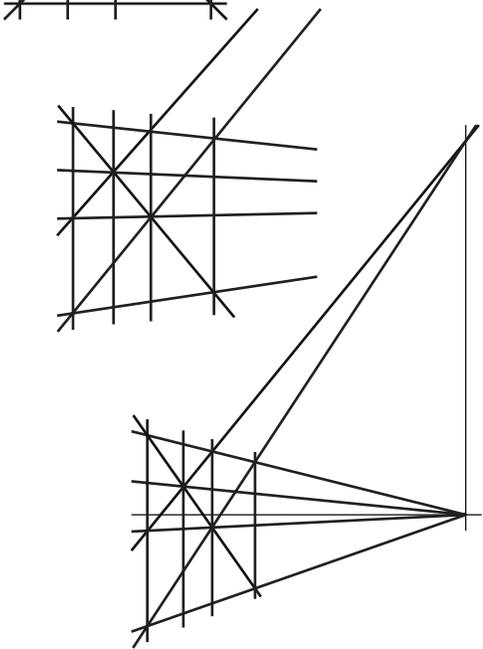
Draw or identify the base rectangle whose vertical edges are parallel to the picture plane. All edges are parallel in orthographic drawings.

Draw the rectangle's diagonals.

Draw a vertical and a horizontal line through the intersection of the diagonals. In perspective the horizontal line vanishes to the vanishing point for horizontal lines on that surface.

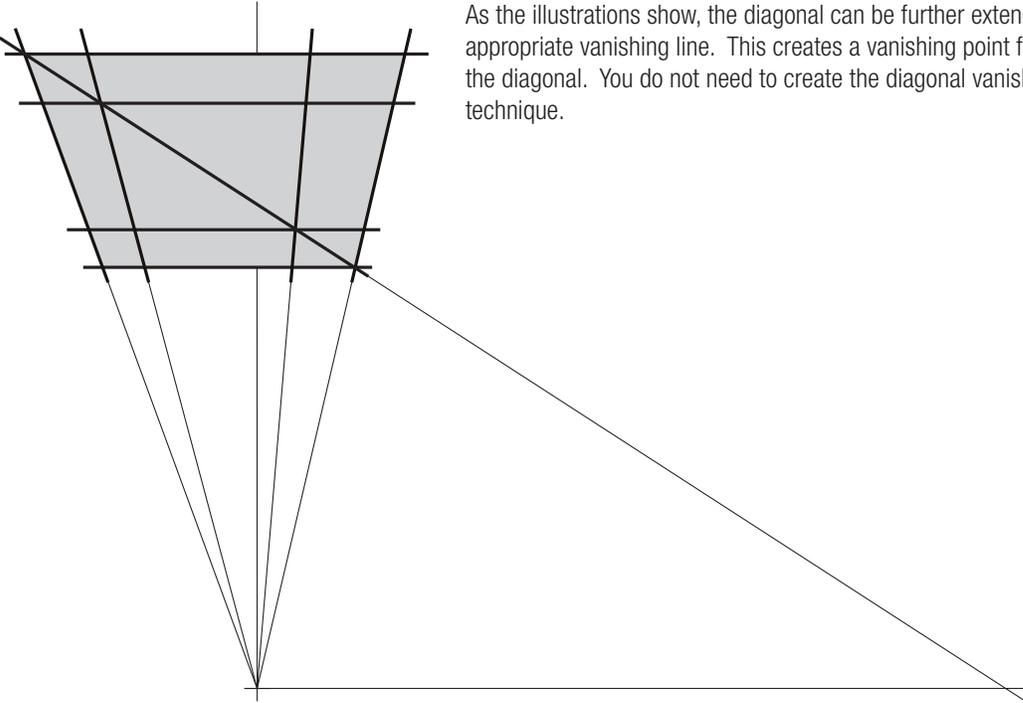
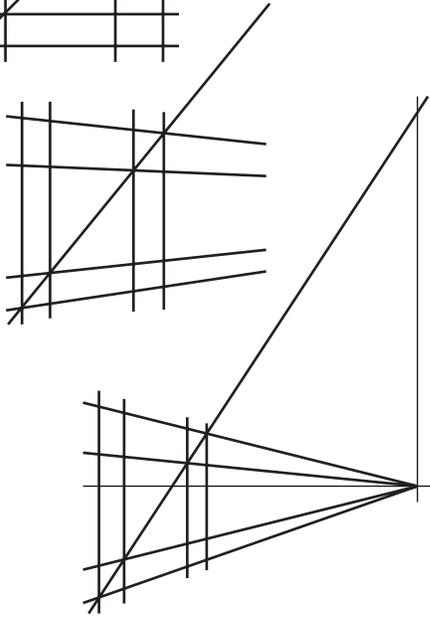
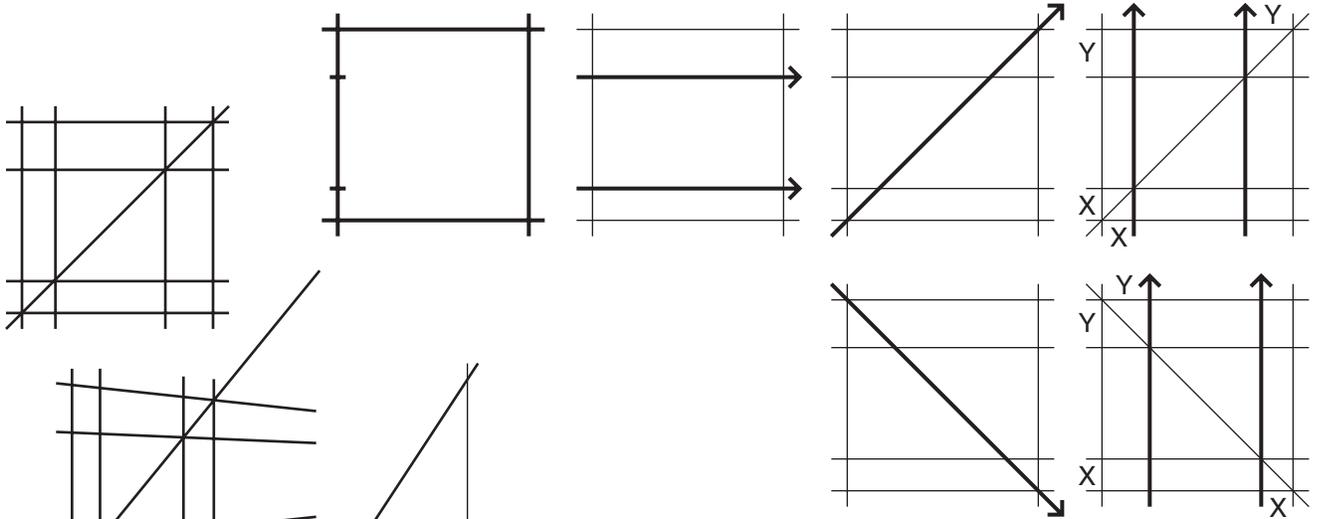
The vertical and horizontal lines have defined four smaller rectangles that have the same proportions as the original but are one-quarter the size. This process can be repeated within each progressively smaller rectangle until the desired subdivision is produced. Each subdivision halves the rectangle.

As the illustrations show, the diagonal can be further extended to intersect the appropriate vanishing line. This creates a vanishing point for all lines parallel to the diagonal. You do not need to create the diagonal vanishing point to use this technique.



## Diagonal Transfer

The assumption is that you have a visually and proportionally correct rectangle with dimensions located on one side that you want to transfer to an adjacent side.



Draw or identify the base rectangle and the dimensions. The vertical or horizontal edges are parallel to the picture plane in perspective.

Extend the dimensions across the rectangle.

Draw one of the diagonals of the rectangle.

Draw lines through appropriate intersections. A diagonal line will transfer proportions from one side of a rectangle to another. If the rectangle is a square, the transferred dimensions will be the same (e.g., 2' will be transferred as 2').

The diagonal you choose to draw will control the side to which a dimension is transferred.

As the illustrations show, the diagonal can be further extended to intersect the appropriate vanishing line. This creates a vanishing point for all lines parallel to the diagonal. You do not need to create the diagonal vanishing point to use this technique.

## Dimensioning Edges

A common need in drawing is to establish dimensions along or proportionally subdivide an edge or line. The assumption is that you have an existing line that you wish to subdivide into 1 quarter and 3 quarters (1 foot and 3 feet if the original line is actually 4 feet long).

There are three techniques that can be used that I call Direct Measurement, Vanished Transfer and Parallel Transfer because of how the dimensions are located. All three techniques are intended to give a line scale and locate specific dimensions. Once this has occurred, other techniques must be used to move the dimensions within the drawing.

### Direct Measurement

This technique can use either visual judgement or measurement with a scale.

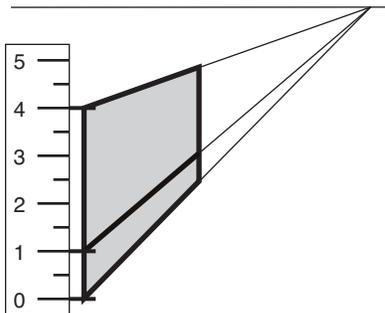
Direct measurement can be used for any line that is parallel to the picture plane including all horizontal and vertical lines in orthographic, axonometric and perspective drawings.

### Visual Judgement

Measurement with the eye involves making visual judgements that proportionally divide the line. For example, visually divide the line in half and then half again to locate the one quarter or 1 foot mark. This works very well because we can accurately judge the middle of things. With practice you can also divide a line into thirds or fifths. By combining judgements of halves, thirds and fifths you can easily and accurately use your eye to establish dimensions in a drawing.

### Scaling

A scale can be used to directly measure the line and establish the proportions or dimensions. This only works when the line is a length that can be measured. For example, a line that actually measures 4" or 8" is easily divided at the one quarter or one foot point.



## Vanished Transfer

The assumption is that the existing line that you want to dimension cannot easily be scaled.

Identify the line that is parallel to the picture plane that you want to dimension.

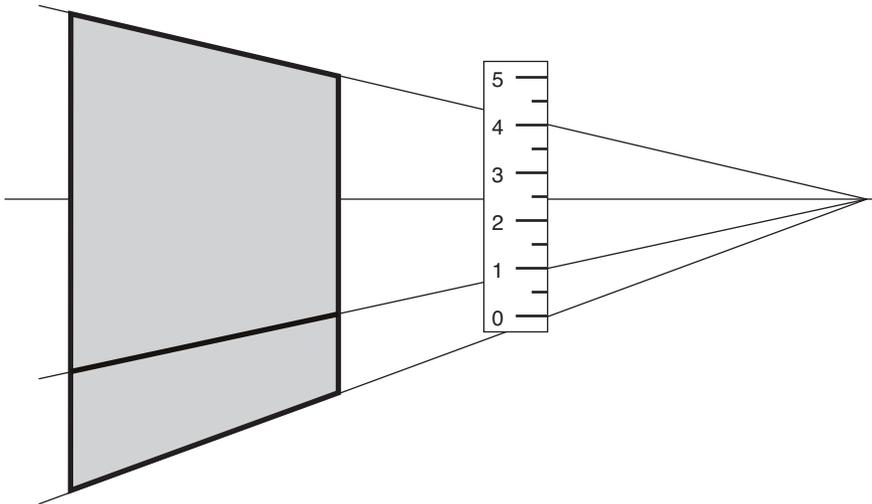
Vanish lines from either end of the line that you want to dimension or use existing vanishing lines. Lines that intersect near the middle of the original line work best.

Holding the scale parallel to the original line, slide it along the vanishing lines until the distance between the lines measures a useful dimension.

Mark the desired dimensions/proportions along the edge of the scale.

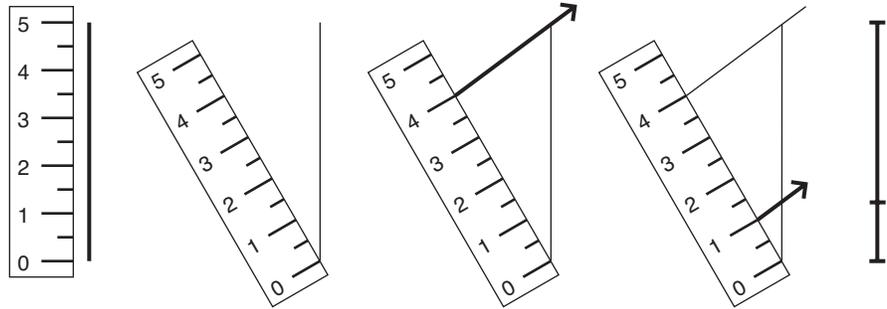
Extend lines from the vanishing point, through each mark until it intersects with the line you are dimensioning. You have proportionally dimensioned the base line and can proceed with the drawing's construction using other techniques.

This technique is particularly easy to use in perspective because the vanishing point and lines often already exist as in the example shown below.



## Parallel Transfer

The assumption is that the existing line that you want to dimension cannot easily be scaled.



Identify the line that is parallel to the picture plane that you want to dimension.

Choose a scale that is reasonably close to the actual length of the line.

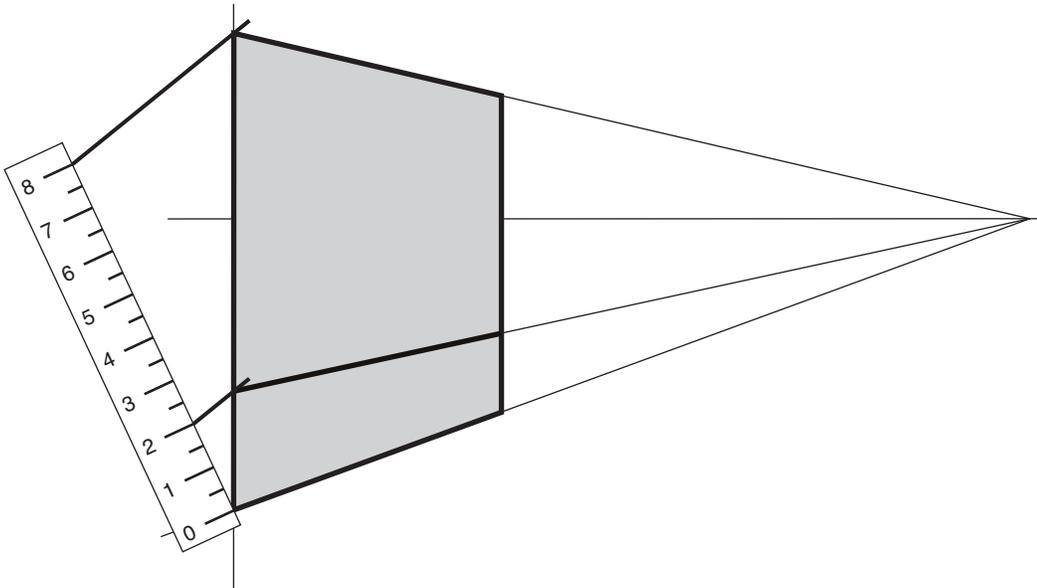
Align the zero mark on the scale to one end of the line to be dimensioned.

Angle the scale away from the line.

Mark the desired dimensions along the edge of the scale including the one that corresponds to the full length of the line.

Draw a line from the full length dimension along the scale to the end of the line you want to dimension. The angle of this line will be used to transfer all other dimensions from the scale to the line.

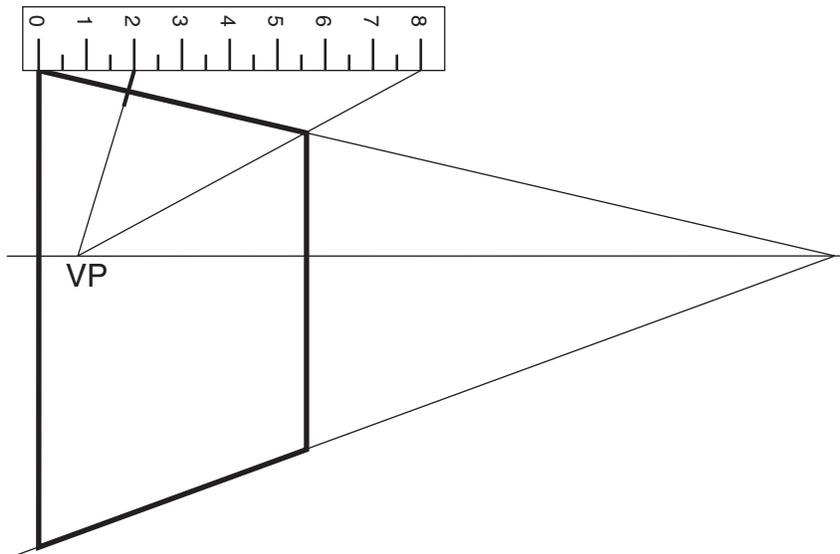
Draw lines that are parallel to the line created in the preceding step between all dimensions along the scale and the line you are dimensioning. You have proportionally dimensioned the base line and can proceed with the drawing's construction using other techniques.



## Dimensioning Edges That Vanish

A common need in drawing is to establish dimensions along or proportionally subdivide an edge or line. The assumption is that you have an existing line that you wish to subdivide into 1 quarter and 3 quarters (2 foot and 6 feet if the original line is actually 8 feet long).

A variation on the parallel line technique previously discussed can also be used to dimension lines that vanish—lines that are foreshortened.



Identify the vanishing line. If it is of known dimension you can determine specific dimensions otherwise it can be proportionally subdivided.

Choose a scale that is reasonably close to the actual physical length of the line.

Align the zero mark on the scale to one end of the line to be dimensioned. It is most convenient if it is the end farthest from the horizon line.

The scale must be held horizontally—parallel to the horizon line or the eventual vanishing line.

Mark the desired dimensions along the edge of the scale including the one that corresponds to the full length of the line.

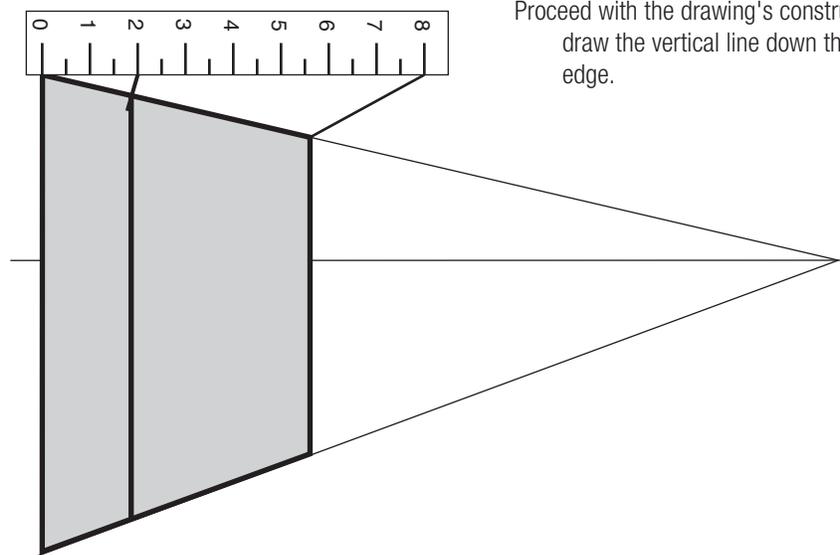
Draw a line from the full length mark through the end of the line you want to dimension and extend it until it intersects the vanishing line. The auxiliary vanishing point (AVP) you have created will be used to transfer all other dimensions from the scale to the line.

Remember that sets of parallel horizontal lines not parallel to the picture plane vanish to a common point on the horizon line.

What you have done is create a special horizontal plane that the line you want to dimension crosses. The lead edge of this plane (the edge of the scale) is parallel to the picture plane.

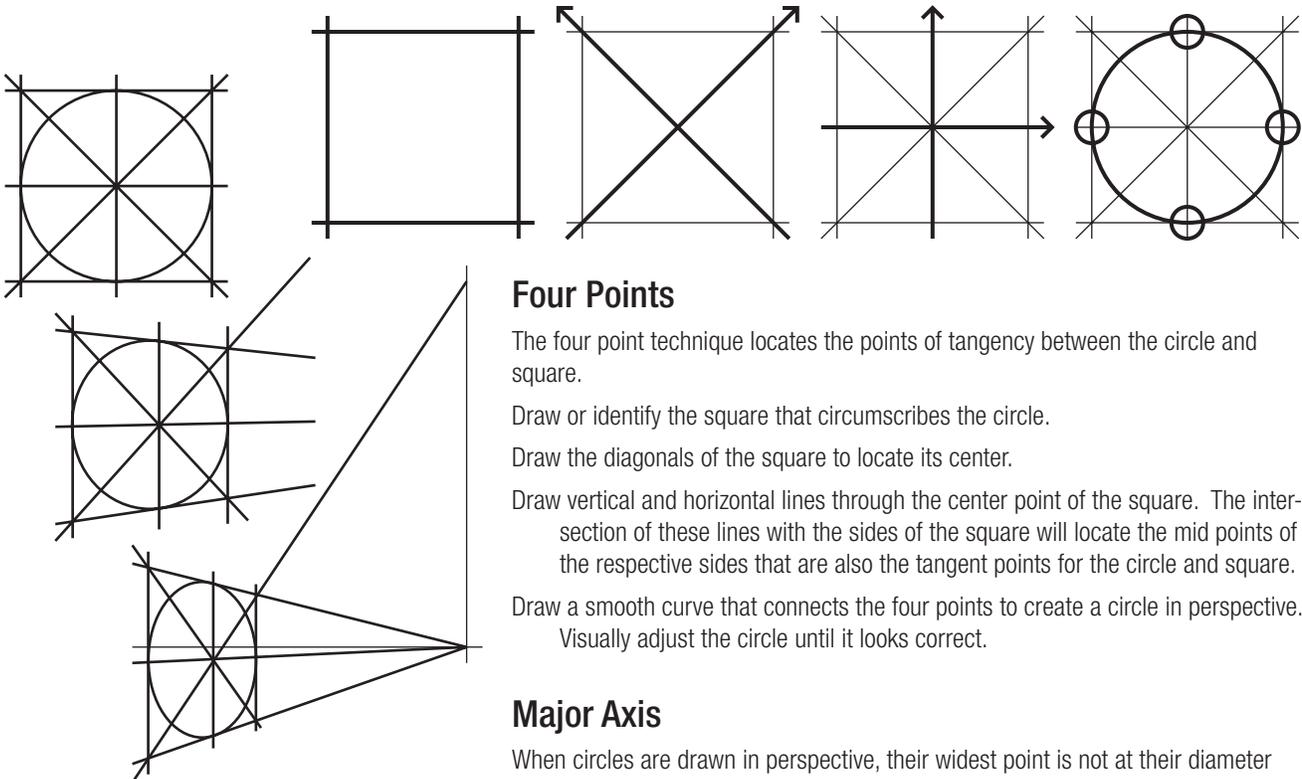
Draw lines that vanish to the VP from all dimensions along the scale. The vanishing lines transfer the dimensions proportionally to the edge you want to dimension.

Proceed with the drawing's construction using other techniques. For example, draw the vertical line down the face of the volume that is one foot from the left edge.



## Circles

Drawing circles is a special application of dividing and transferring techniques introduced earlier. 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 the square will provide 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 will describe the four, eight and twelve point techniques for constructing circles.



### Four Points

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

Draw or identify the square that circumscribes the circle.

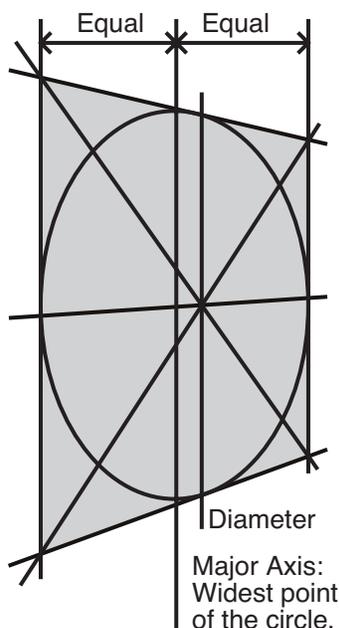
Draw the diagonals of the square to locate its center.

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 mid points of the respective sides that 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.

### Major Axis

When circles are drawn in perspective, their widest point is not at their diameter but at their major axis which is located at the midpoint of the



## Eight Points

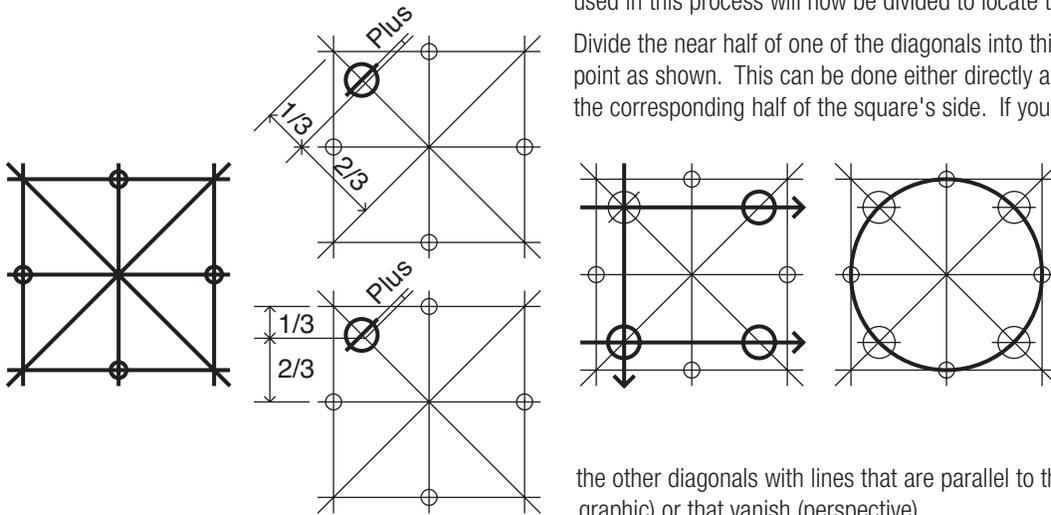
The eight point technique builds directly on the four point system with a visual approximation that provides four more points.

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

Divide the near half of one of the diagonals into thirds to locate the 2/3rds 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 2/3rds mark to the diagonal.

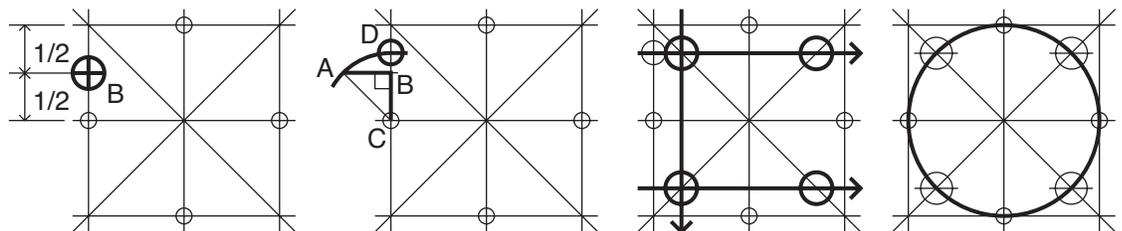
Mark a point just beyond the 2/3rds point of the diagonal. This locates the point that the circle will intersect the diagonal.

Transfer this point to the other diagonals with lines that are parallel to the respective sides (orthographic) or that vanish (perspective).



## Eight Point Alternative

Another approach to constructing the second four points uses a vertical or horizontal edge of the square that is parallel to the picture plane as shown in the illustration. This technique will not work on edges that vanish.



Follow the four point procedure to locate the first four points.

Divide the distance from the midpoint of the side to a corner in half to locate point "B."

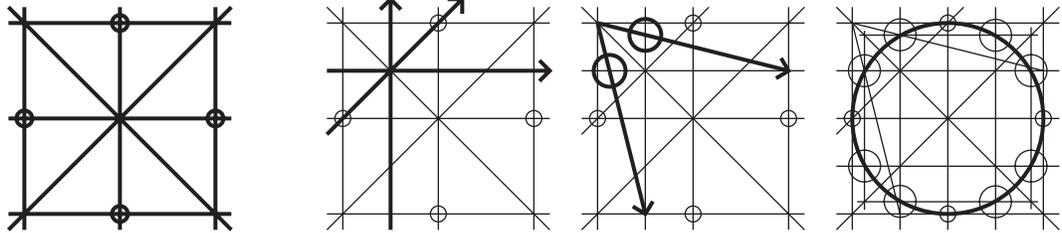
Draw line AB equal to BC at right angles to the side of the square.

Draw an arc with the radius AC whose center is at C so that it intersects the side of the square creating point D.

Transfer point D to the diagonals using a combination of lines that are parallel to the respective sides (orthographic) or vanishing lines (perspective). This locates the other four points on the diagonals giving you eight to guide your circle construction.

## Twelve Points

The twelve point technique builds directly on the four point system with the construction of eight more points.

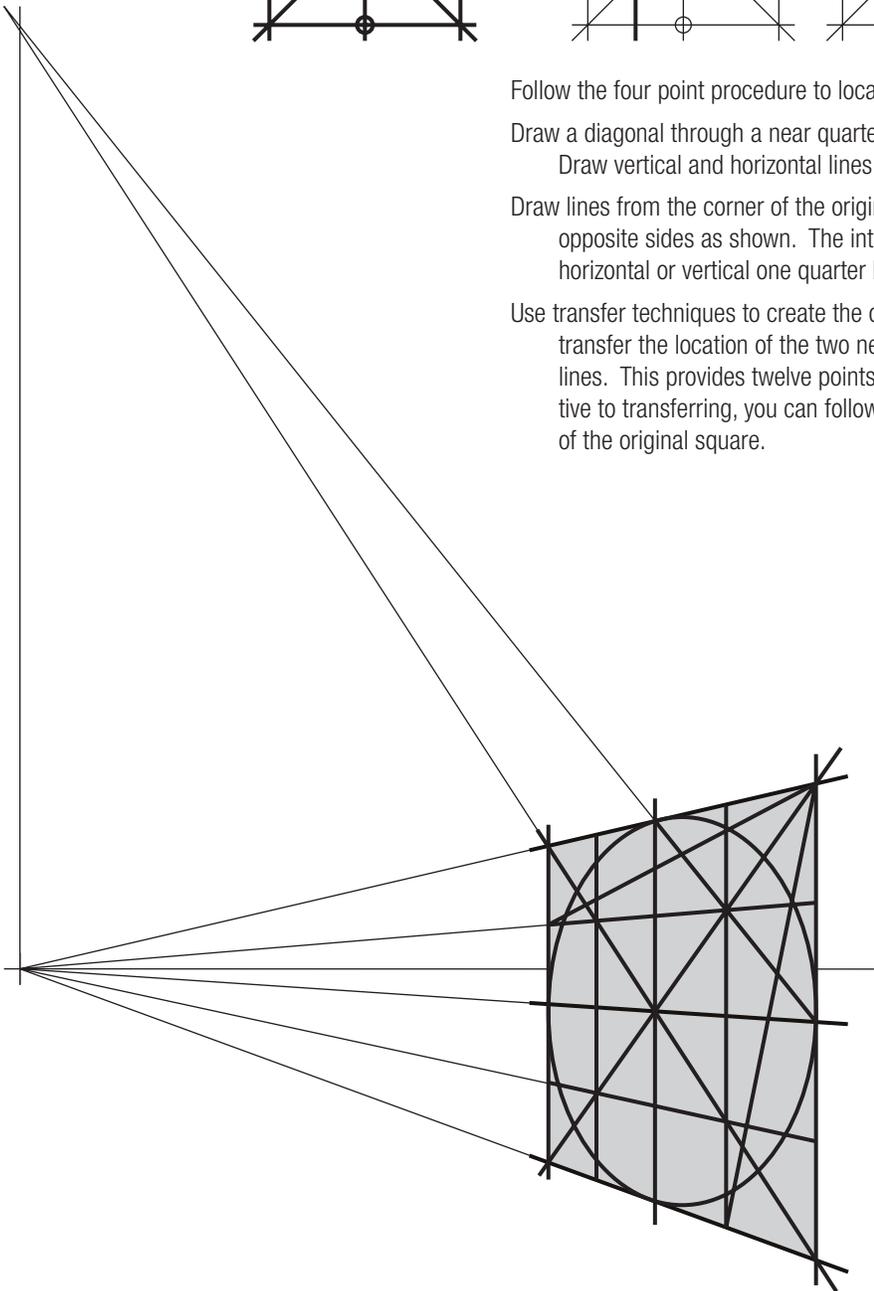


Follow the four point procedure to locate the first four points.

Draw a diagonal through a near quarter of the original square to find its center.  
Draw vertical and horizontal lines through this point.

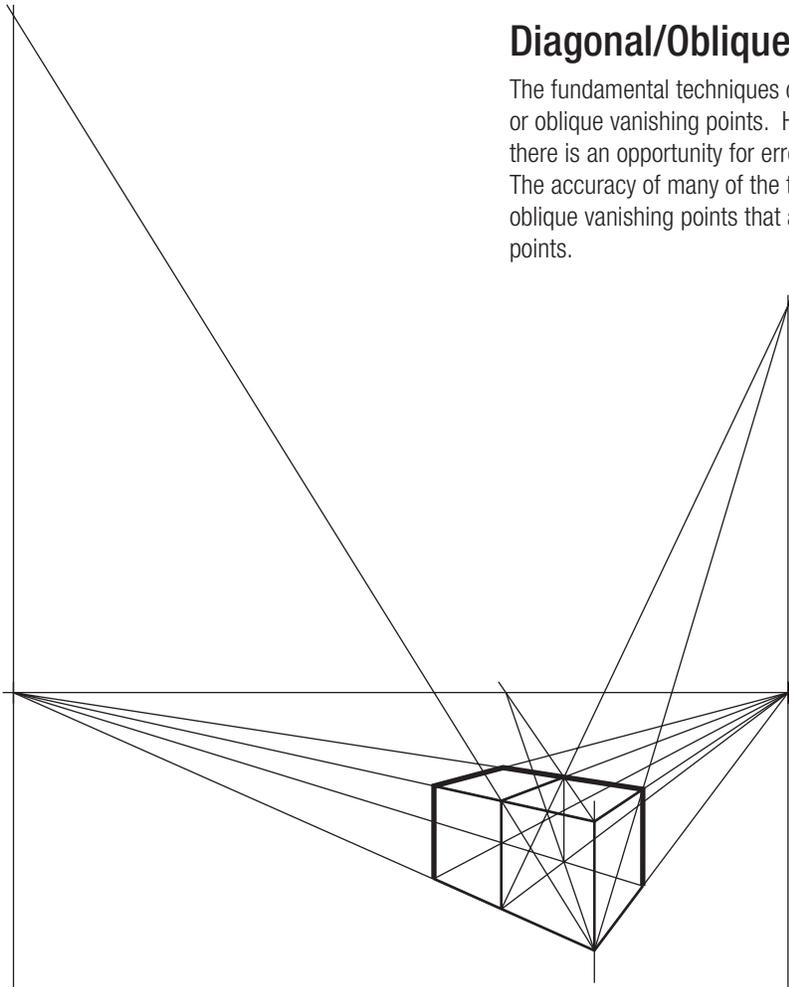
Draw lines from the corner of the original square to the one quarter points on the opposite sides as shown. The intersection of these lines with the nearest horizontal or vertical one quarter lines define two new points on the circle.

Use transfer techniques to create the other vertical and horizontal lines and then transfer the location of the two new points on the circle to the appropriate lines. This provides twelve points to guide circle construction. As an alternative to transferring, you can follow the preceding process for all four quadrants of the original square.



## Diagonal/Oblique Lines

The fundamental techniques can be used with and without the creation of diagonal or oblique vanishing points. However, each time two points are joined with a line there is an opportunity for error and the shorter the line the greater the opportunity. The accuracy of many of the techniques can be improved by generating diagonal or oblique vanishing points that allow the use of longer lines and common reference points.



All rectangular forms have three inherent sets of parallel lines (those parallel to the X, Y and Z axes) that define three sets of parallel planes (one horizontal and two vertical). Diagonals of rectangles on each of these sets of parallel planes create additional sets of parallel lines. These diagonals are oblique lines (lines that are not horizontal or vertical) that lay on the three basic planes of the rectangle.

When the rectangular volume is a cube the diagonals are at  $45^\circ$  to the lines defining their respective squares. This means we are finding the vanishing points for sets of  $45^\circ$  lines on each of the faces of the cube.

### Constructing Diagonal/Oblique Vanishing Points

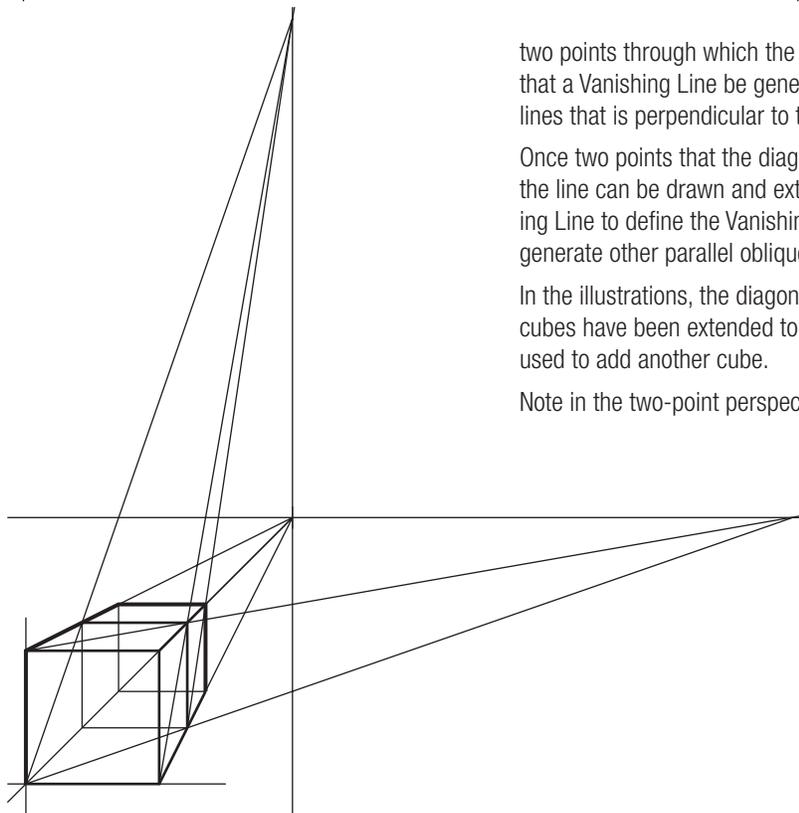
To construct diagonal or oblique Vanishing Points requires that a basic perspective structure be established that includes a set of horizontal lines that vanish to a Vanishing Point on the Horizon Line. Construction next requires the location of

two points through which the diagonal or oblique line passes. Finally, it requires that a Vanishing Line be generated through the Vanishing Point for the horizontal lines that is perpendicular to the Horizon Line.

Once two points that the diagonal or oblique line pass through have been located, the line can be drawn and extended until it intersects with the appropriate Vanishing Line to define the Vanishing Points. These Vanishing Points can then be used to generate other parallel oblique lines and develop the perspective.

In the illustrations, the diagonals of the faces of one- and two-point perspective cubes have been extended to define their Vanishing Points that have then been used to add another cube.

Note in the two-point perspective illustration that there is a diagonal Vanishing Point that falls on the Horizon Line for the horizontal faces of the cube.





# THREE DIRECT PERSPECTIVE SETUPS



*There are three perspective setups that can be constructed directly without using an existing plan or elevation drawing. They provide a variety of points of view and support the use of perspective as a design tool.*

## Introduction

The three setups include a one-point and two, two-point perspective configurations. In terms of angles they reflect an orientation of  $90/0^\circ$ ,  $68/22^\circ$  and  $60/30^\circ$  for the two vertical faces of a rectangular volume. The first two setups are most often used for interior while the third is used for exterior views. All three setups assume that you have a given sheet of paper upon which you want the perspective to fit. Therefore, each setup starts with the assumption that the Picture Plane and the piece of paper are coincident and the perspective will extend back from the Picture Plane into the paper.

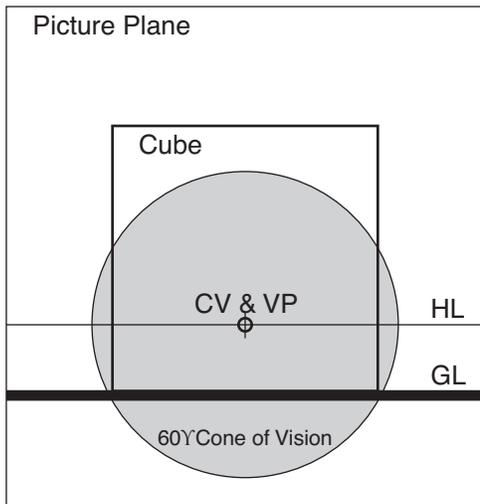
All perspective setups will be introduced as eye-level perspectives although they can be used to create points of view from other levels. It is my firm conviction that the only reason for drawing a perspective is to show the experiential quality of a form or space.

The description for each perspective setup will start by defining the relationship between the subject, Picture Plane and Station Point. If you reproduce these relationships in a 3-D modeling program you will find that the setups use rules of thumb that closely match accurate linear perspective construction.

## One-Point Perspective

This section will identify the relationships and geometry of linear perspective that can be used to setup and construct eye level perspectives. The relationships will be investigated in terms of one-point perspectives that start at the Picture Plane (PP) and extend back in space.

The essential elements of linear perspective are indicated in the drawings that include a Front Elevation (what is seen from the Station Point) and a Plan and Right Side Elevation that share the same Station Point. The subject (e.g., Cube) is viewed from the Station Point (SP) that is five to six feet above the assumed Ground Plane. The intersection of the Picture Plane and the ground plane defines the Ground Line (GL).



Front Elevation

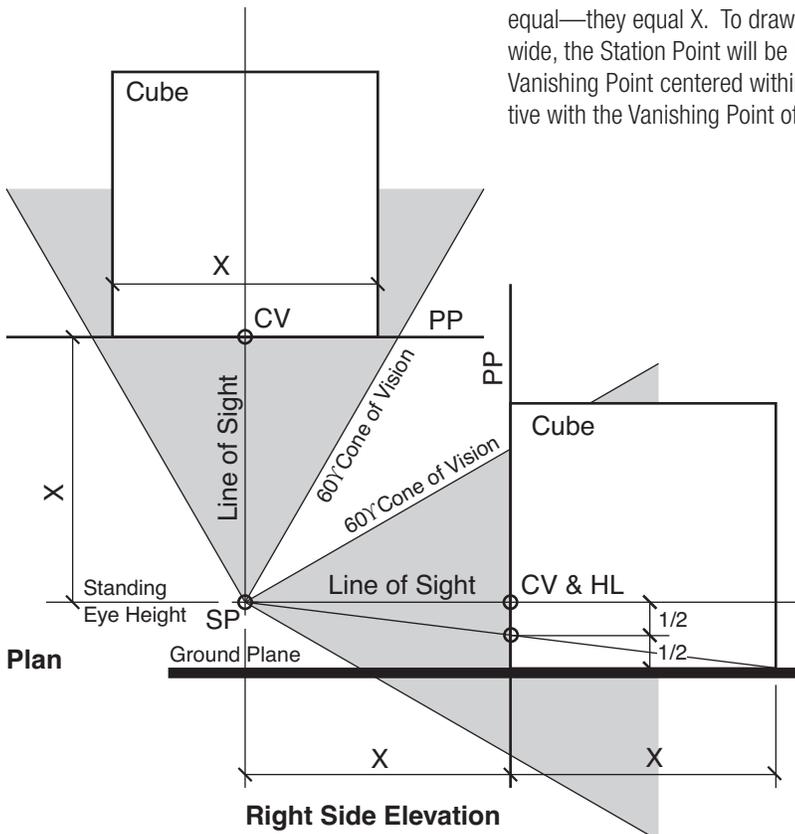
The Line of Sight is horizontal, perpendicular to the Picture Plane (PP) and its height establishes the Horizon Line (HL) and Center of Vision (CV) at the point it intersects the Picture Plane. The Center of Vision is always directly in front of the viewer (SP) and in one-point perspectives it is also the Vanishing Point (VP) for all horizontal edges parallel to the Line of Sight. The Horizon Line lays on the Picture Plane and passes through the Center of Vision.

Linear perspective is a geometric system that attempts to represent visual reality—the world—on a very finite piece of paper and therefore, it can produce representations that do not look right. A Cone of Vision centered on the Line of Sight is a mechanism for limiting the subject area of a linear perspective. Convention and experience sets the standard Cone of Vision at 60°—if the subject of the perspective is kept within the 60° Cone of Vision it will generally look right.

**Rule Of Thumb 1: The distance from the Station Point to the Picture Plane is equal to the width of the subject.**

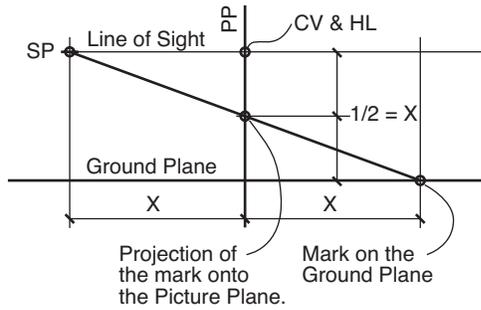
The width of the subject, the width of the Cone of Vision at the Picture Plane and the distance between the Station Point and the Picture Plane are approximately equal—they equal  $X$ . To draw a one-point perspective of a subject that is 40 feet wide, the Station Point will be located 40 feet in front of the Picture Plane with the Vanishing Point centered within the subject's width. To draw a one-point perspective with the Vanishing Point off center, the width of the subject ( $X$ ) must be set at

twice the greatest distance from the CV to the edge of the subject. For example, if the CV is 25' from one side of a 40' wide subject (the CV is 5' off center), the width of the subject must be set at 50'.



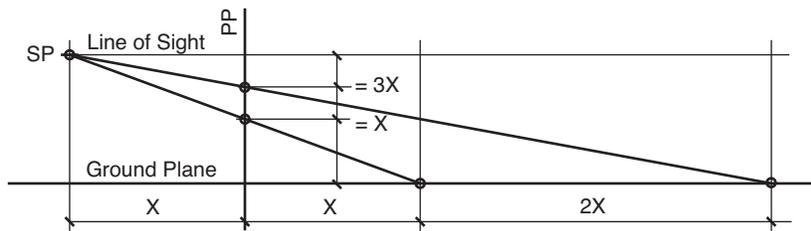
Right Side Elevation

**Rule Of Thumb 2:** If the subject is taller than it is wide, use the height of the subject to set the distance from the Station Point to the Picture Plane.



**Rule Of Thumb 3:** A horizontal line drawn half way between the Horizon Line and the Ground Line on the Picture Plane will mark a distance back into the perspective equal to the distance the Station Point is in front of the Picture Plane.

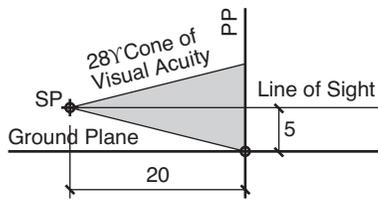
If a mark on the Ground Plane is the same distance from the Picture Plane as the Station Point, its projection on the Picture Plane falls half way between the Horizon Line and the Ground Line. The diagonal of a rectangle must cross a line bisecting the rectangle at its middle.



Note: The half way system works between any subject edge parallel to and drawn on the Picture Plane and the Vanishing Point.

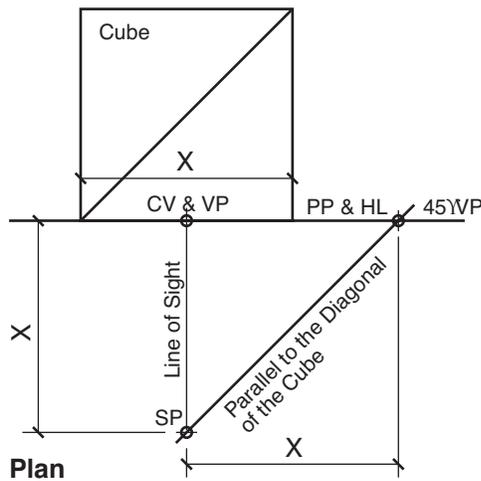
If you divide the remaining distance between the Horizon Line and the previous half way line in half the distance back into the perspective is equal to 3X.

**Rule Of Thumb 4:** Use 20 feet as the minimum distance between the Station Point and the Picture Plane.

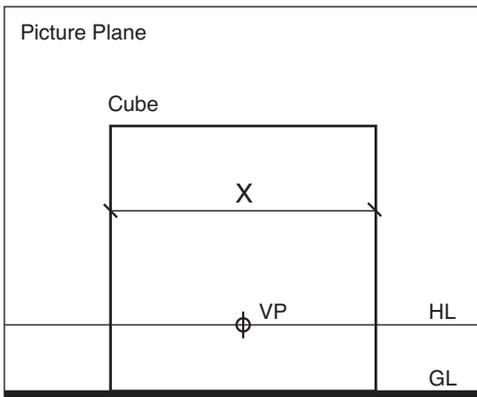


The human eye's cone of visual acuity has a 28° vertical limit. Given an eye height (SP) of 5', the 28° Cone of Visual Acuity intersects the ground plane 20' in front of the Station Point (20.0539 to be exact (Dines 1990)).

**Rule Of Thumb 5:** In one-point perspectives, the vanishing points for 45° lines are located a distance equal to the width of the subject to the left, right, above and below the Center of Vision/Vanishing Point.



The vanishing point for any horizontal edge in a subject is found by drawing a line in plan that starts at the Station Point and extends parallel to the edge. The intersection of this line and the Horizon Line/Picture Plane locates the VP for the edge. Given that the distance from the Station Point to the Picture Plane is equal to the width of the subject, the distance from the Center of Vision/Vanishing Point to the 45° Vanishing Point is equal to the width of the subject.



## Half Way One-Point Perspective

The assumption is some plane that is part of or within the subject lays on the Picture Plane. The perspective structure and the elements of the subject touching the Picture Plane can be drawn to scale and/or in proportion using orthographic techniques. The perspective will be projected back from the Picture Plane (into the paper).

The overall width and height of the subject must be known or estimated. The subject can include a single continuous element or a set of elements. When it is a set of elements, the width includes all elements.

### Process

Draw those portions of the subject that fall on the Picture Plane at an appropriate scale (e.g., the near face of the cube).

Establish the Center of Vision/Vanishing Point (e.g., 5 to 6 feet above the Ground Line) and draw the Horizon Line.

Vanish appropriate horizontal edges to the Vanishing Point (e.g., the four edges of the cube in the example). These edges are perpendicular to the Picture Plane.

One approach is to draw the limits of the volume that will contain the subject on the Picture Plane and vanish its edges to the Vanishing Point. This approach is supportive of generating a perspective grid that can then be used to draw the subject.

Note: If the VP is off center, the width of the subject will be set at twice the greatest distance from the CV/VP to the edge of the subject or volume.

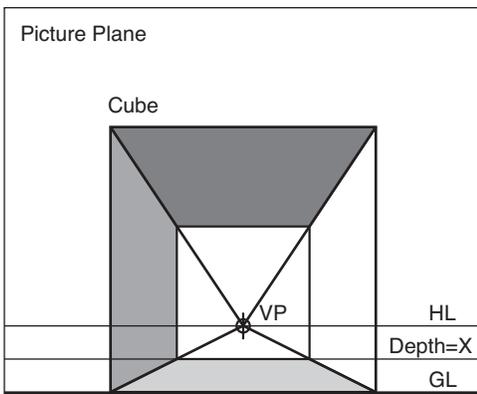
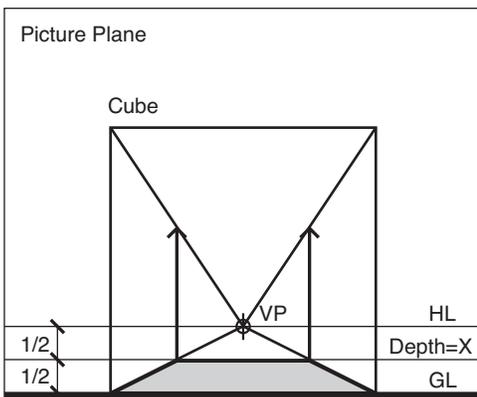
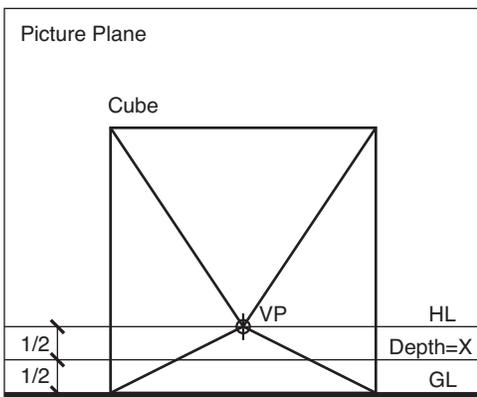
Draw a horizontal line half way between the Horizon Line and the Ground Line.

The intersection of this horizontal line with the vanishing lines define points in space that are a distance back into the perspective equal to the width of the subject and the distance from the Station Point to the Picture Plane (Refer to Rule Of Thumb (ROT) 3).

If you have drawn and vanished lines that define the limits of the overall volume, the intersection of the vanished lines that define the width of the volume on the ground and the depth line defines a square on the ground in perspective. The corners of the square can then be projected vertically to create the overall volume of space that will contain the subject.

Once a depth dimension has been established, any of the perspective techniques previously described can be used to subdivide and/or extend the dimension.

If the overall volume has been drawn, a perspective grid can be created on its surfaces to assist in sketching the subject.



## Diagonal One-Point Perspective

The assumption is that some plane that is part of or within the subject lays on the Picture Plane. The perspective structure and the elements of the subject touching the Picture Plane can be drawn on the paper to scale and/or in proportion using orthographic techniques. The perspective will be projected back from the picture plane (into the paper).

The overall width and height of the subject must be known or estimated. The subject can include a single continuous element or a set of elements. When it is a set of elements, the width includes all elements.

### Process

Draw those portions of the subject that fall on the Picture Plane at an appropriate scale (e.g., the near face of the cube).

Establish the Center of Vision/Vanishing Point (e.g., 5 to 6 feet above the Ground Line) and draw the Horizon Line.

Draw a vertical Vanishing Line (VL) through the Vanishing Point. From previous discussion (refer to page 43) we know that the DVPs for the vertical planes will be on a VL that passes through the VP for horizontal lines on that same plane.

Vanish the desired horizontal edges of the subject to the Vanishing Point. These edges are perpendicular to the Picture Plane. In the example, the four edges of the cube are vanished.

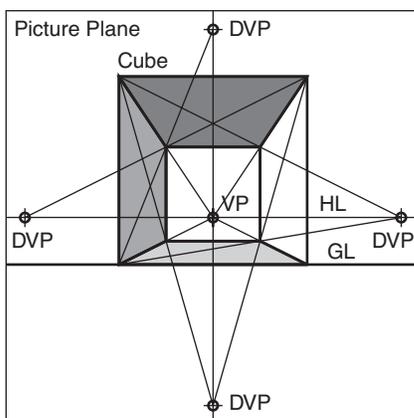
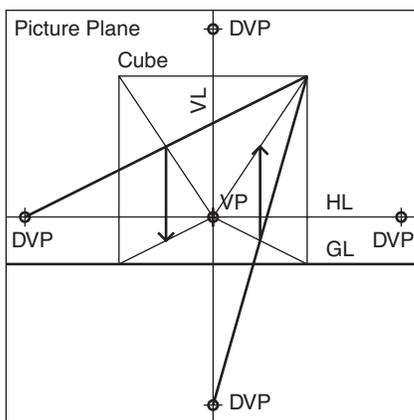
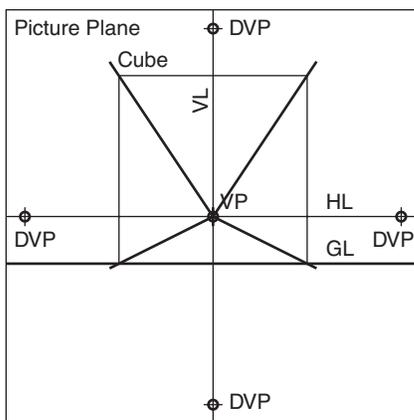
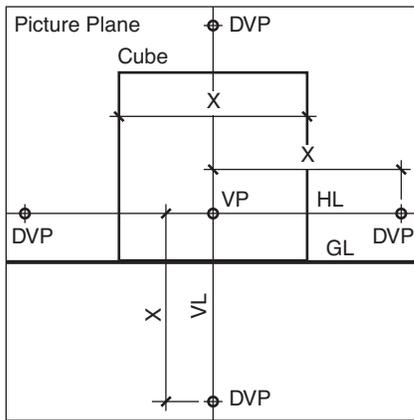
Locate the desired number of Diagonal Vanishing Points on the Horizon line and/or Vanishing Line. The distance from the Vanishing Point to any of the Diagonal Vanishing Points is equal to the width of the subject (Refer to ROT 5). Note: These are 45° vanishing points. It is not necessary to find all the DVPs—one will often do the job.

Use the Diagonal Vanishing points to transfer dimensions back into the perspective. In the example they complete the construction of the cube.

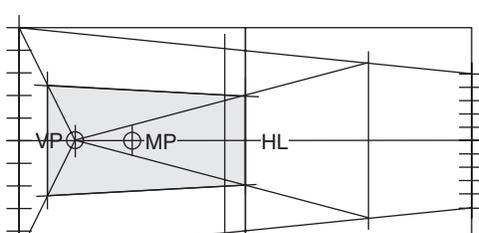
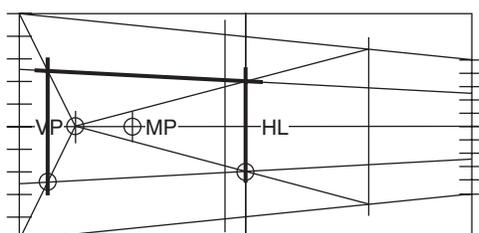
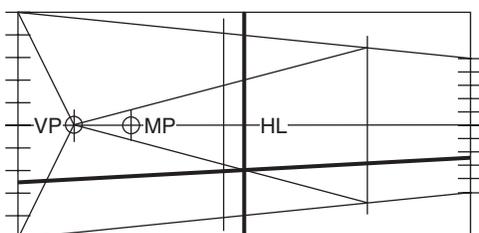
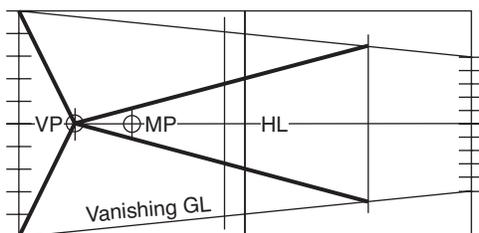
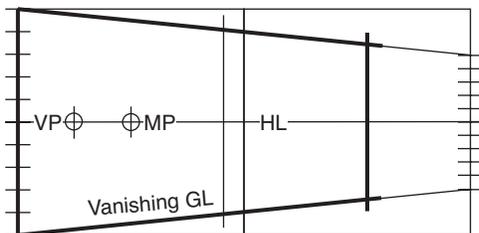
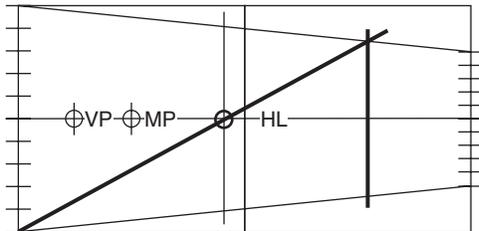
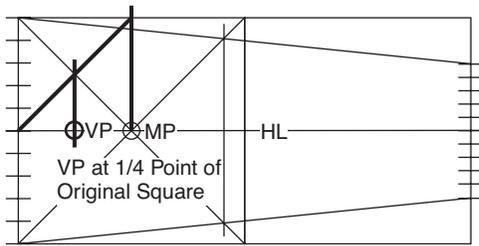
At this point, any of the perspective techniques previously described can be used in conjunction with the Diagonal Vanishing points to complete the perspective.

Dimensions can be entered on the picture plane and transferred using the Diagonal Vanishing Points.

Note: The Diagonal (45°) Vanishing Points in a one-point perspective are the Measuring Points for the perspective. Measuring Points will be further discussed under 68/22° and 60/30° perspective setups that follow.







The intersection of the diagonals and the Horizon Line defines a Measuring Point (MP). Refer to the fundamental technique called “Dimensioning Edges That Vanish” (page 42) and “Using Measuring Points” (page 52).

Subdivide the original square to the near side of the perspective to find where its quarter point hits the Horizon Line. This is the Vanishing Point for horizontal lines perpendicular to the sloping plane. Along with the distant vanishing point for lines parallel to the sloping plane they are the two essential vanishing points for this two-point perspective setup.

Once an initial foreshortened square is created on the vanishing plane, an additional foreshortened square can be generated on the plane as show to the left to set the width of the subject (e.g., 20’). Refer to the fundamental technique called “Add One” (page 32).

The Vanishing GL (Ground Line) of the sloping plane, is below the Horizon Line a distance equal to the eye height of the perspective (e.g., 5’). Note: For wider subjects, the Vanishing GL will not pass through a corner of an original square.

Draw the rectangle that defines the face of the space on the sloping plane. For an eye-level perspective it starts at the Vanishing GL and extends vertically a distance not to exceed the width of the subject. If the subject is taller than it is wide, use its height as the width in the perspective setup (ROF 2, page 51).

Vanish the four corners of the subject area to the Vanishing Point within the perspective (e.g., 20’ wide by 10’ high). This creates a tube of space extending to infinity. The next task is to establish a depth measurement.

Depth can be established using a variation of the approach previously introduced in one-point perspective that uses the half way point between the GL and HL concept to establish depth. The difference is that the half way line vanishes.

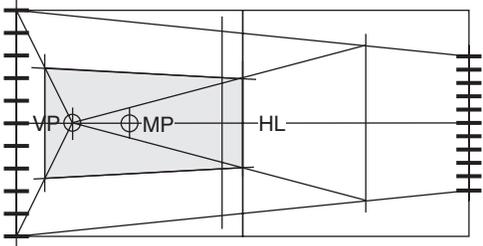
Draw a vanishing line located half way between the Vanishing GL and the Horizon Line. This sets a distance back into the perspective equal to the width of the subject—equal to the distance from the Station Point to the Picture Plane.

Note that the vertical line between the two original squares intersect the half way line and vanishing line at one side. Therefore, it can also be used to define the depth.

Draw a half way line between the top of the vanishing plane and the HL to locate the top of the wall.

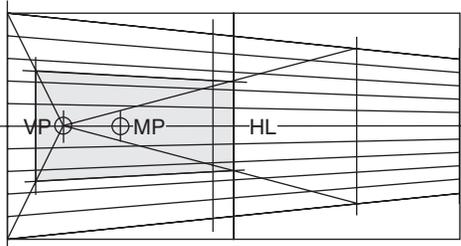
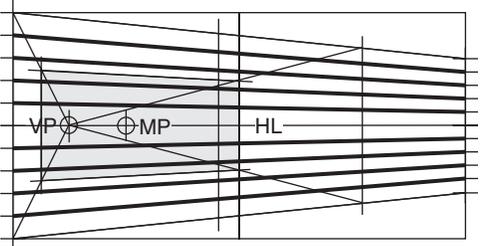
The intersection of the half way lines and the lines vanished from the four corners of the subject area define a plane a distance back into space equal to the width of the subject.

At this point, the volume has been defined and you can construct lines on its surfaces to create a perspective grid that supports drawing the desired subject. You can also draw a set of vanishing lines on the vanishing plane as described on the next page to support perspective construction.

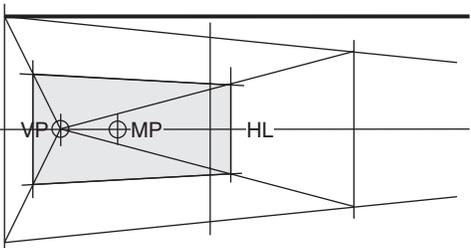


Draw lines that connect corresponding one foot marks along the two sides of the perspective plane that have previously been created. This establishes a plane of converging lines that can be used to guide the direction of all lines vanishing to the distant vanishing point.

Note: The dimensions that set the slope of the converging lines at either side of the perspective can be transferred vertically to increase the height of the perspective.

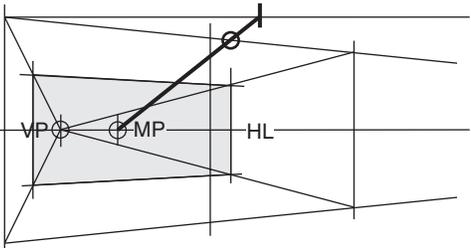


## Measuring Points



A Measuring Point is a specific case of the type of vanishing point described earlier in “Dimensioning Edges That Vanish” (page 42). A Measuring Point is a vanishing point for a set of parallel lines used to transfer dimensions from a Measuring Line on the Picture Plane to a line in perspective. In two-point perspectives there are two MPs that can be used to transfer dimensions from horizontal Measuring Lines on the Picture Plane to lines that vanish to the two Vanishing Points for the perspective.

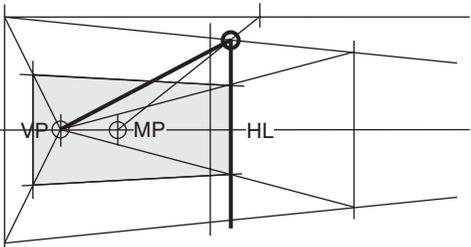
To use a measuring point a horizontal Measuring Line and a vanishing line must meet on the picture plane.



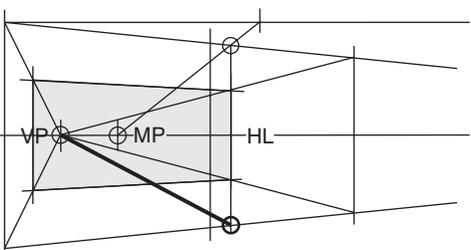
The dimension to be transferred is scaled from the point of intersection.

For example, a distance of 11 feet is measured along the horizontal Measuring Line. A line from the 11' mark to the Measuring Point is drawn. The intersection of this line with the appropriate vanishing line transfers the dimension into the perspective—it foreshortens the dimension.

The dimension can then be transferred vertically with a vertical line or back into the perspective using a Vanishing Point.

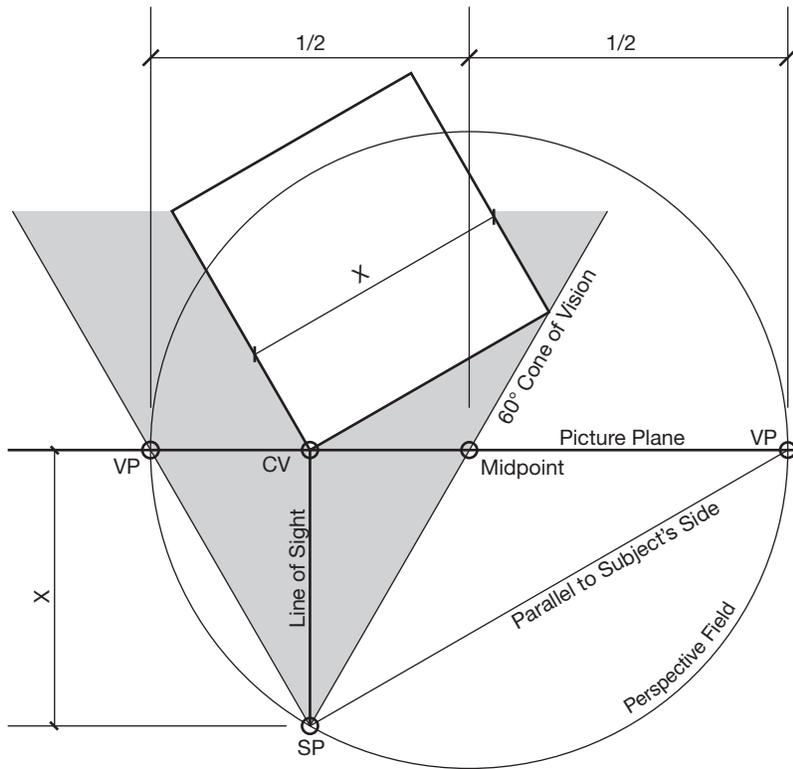


When the vertical line hits an appropriate vanishing line (e.g., the one that coincides with the floor plane) it can be vanished back in space using the appropriate Vanishing Point.



## 60/30 Perspective

The geometric relationships of the 60/30° perspective setup were described by Jay Doblin in *Perspective: A New System for Designers* (Doblin 1956) and provide the basis for the following. As with the One-point and 68/22° perspective setups, the 60/30° method allows the establishment of a perspective structure without needing a plan.



The geometric setup is illustrated to the left. The assumption is that the Station Point is directly in front of the near corner of the subject or the volume containing the subject. Once the Subject, Station Point and Picture Plane locations are established, Vanishing Points are located by extending lines through the Station Point, parallel to each side of the subject or volume until they intersect with the Picture Plane. The Midpoint is located half way between the Vanishing Points and is the center of the Perspective Field.

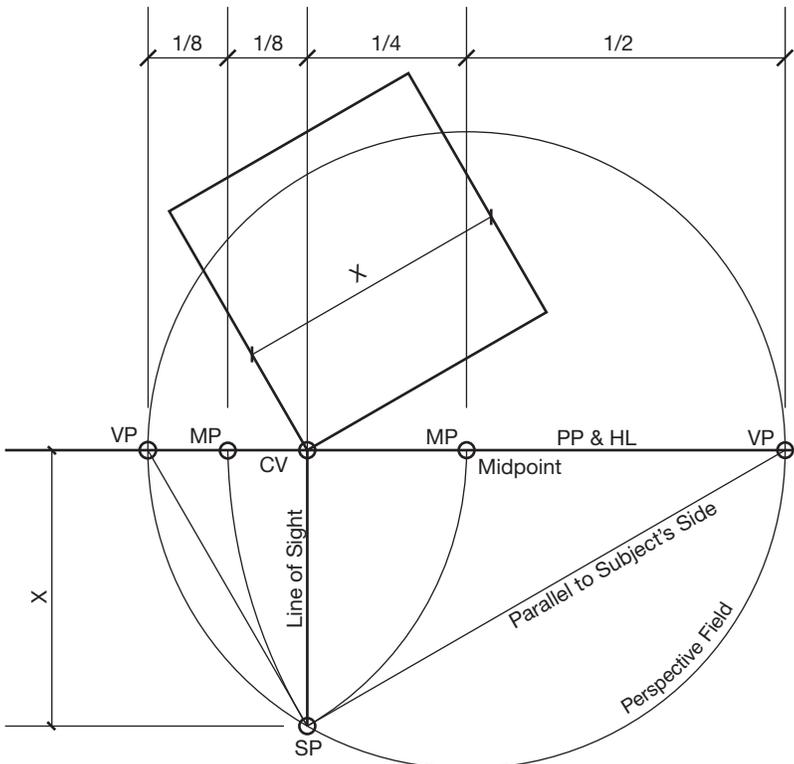
The relationships to notice are that the width of the subject and the distance between the Picture Plane and the Station Point are equal (distance X) when the subject fits within a 60° cone of vision. This matches Rule Of Thumb 1: The distance from the Station Point to the Picture Plane is equal to the width of the subject, noted earlier under "One-Point Perspective Geometry."

Rule Of Thumb 2: If the subject is taller than it is wide, use the height of the subject to set the distance from the Station Point to the Picture Plane and Rule Of Thumb 4: Use 20 feet as the minimum distance between the Station Point and the Picture Plane continue to apply.

## Measuring Points

The location of depth dimensions within a perspective is facilitated with the use of Measuring Points (MP). A Measuring Point is a vanishing point for a specific set of parallel lines in perspective that can be used to transfer dimensions entered on the Picture Plane to one of the vanishing lines. Measuring Points are special cases of the perspective technique described earlier under "Dimensioning Edges That Vanish."

In two-point perspective, there are two measuring points for transferring dimensions from horizontal lines on the Picture Plane to horizontal lines vanishing to the two vanishing points. They are located along the Horizon Line. Their location is set by transferring the distance from the Vanishing Points to the Station Point to the Horizon Line. Refer to the arcs in the illustration at the top of the next page.



### Setup Proportions

The key to setting up a 60/30° perspective are the relationships between the Measuring Points, Center Of Vision and the Vanishing Points. Note that for a 60/30° perspective one Measuring Point coincides with the Midpoint—it is located half way between the two Vanishing Points. The Center Of Vision is located at the 3/4 point and the other Measuring point is at the 1/8th point.

### Setting Scale

In the middle illustration, the points identified as SP, CV and VP define two right triangles. In a 60/30° perspective the internal angles of the two triangles will be 30°, 60° and 90° respectively. The hypotenuse of a right triangle establishes a proportional relationship between the two legs of the triangle. Therefore, if a line parallel to the hypotenuse is drawn through the center point of one leg it will pass through the center of the other leg as illustrated.

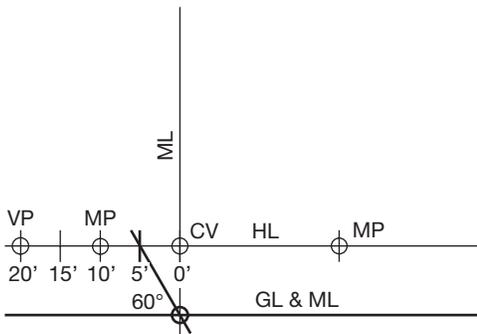
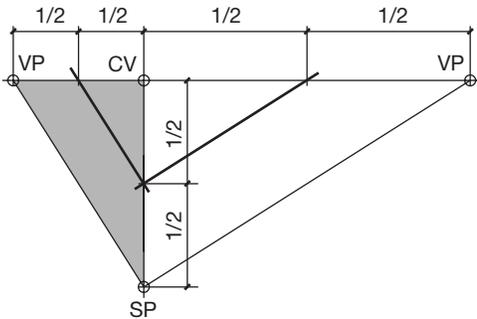
If Rule Of Thumb 1 states that the distance from the Station Point to the Picture Plane is equal to the width of the subject and the hypotenuse proportionally relates the legs of a right triangle

then, the distance from VP to CV is proportional to the distance from SP to CV.

Therefore, if you make the distance from VP to CV equal to the width of the subject or the volume containing the subject then that distance can be proportionally transferred to a line passing through CV using a line at either 60° or 30° as appropriate.

In the bottom illustration, a 30/60° shortcut setup has been created and vertical line drawn through the CV. This line is assumed to be on the Picture Plane and therefore is a Measuring Line in the perspective.

The width of the object is assumed to be 20 feet and the desired eye height is 5 feet. The distance from VP to CV (e.g., 20 feet) is proportionally divided to produce the desired dimension (e.g., 5 feet). The dimension is transferred to the Measuring Line passing through the Center of Vision by drawing a line parallel to the hypotenuse through the known dimension so that it intersects the ML. For a 30/60° perspective the hypotenuse will be at either 30° or 60° (the 60° angle is being used in the example). In the illustration, a five foot distance is being transferred to locate the Ground Line (GL) and establish the eye-level of the perspective.



## 60/30° Shortcut Setup

Drawing the Horizon Line and locate the Vanishing Points to fit on the sheet of paper being used. Locate the Measuring Points and Center of Vision by dividing the distance between the Vanishing Points into successively smaller halves—divide distance between the Vanishing Points in half, then a half into half and then the remaining quarter into half. The result is a line (Horizon Line) with VPs, MPs and a CV as illustrated.

Draw a vertical line through the CV to create a vertical Measuring Line.

Determine the width of the subject or the volume that contains the subject.

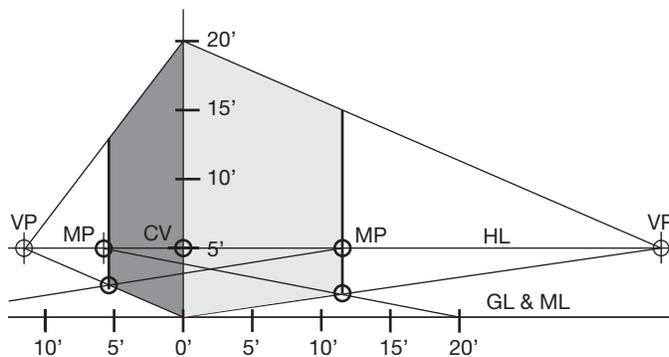
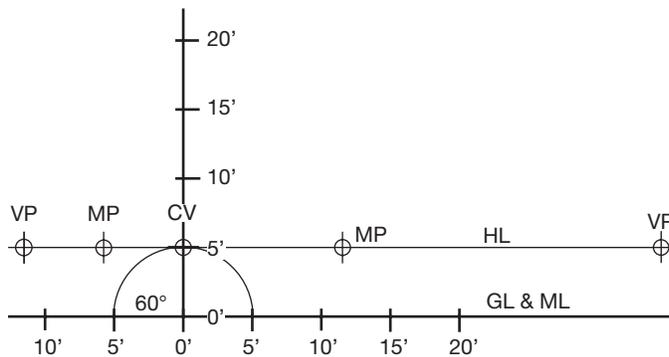
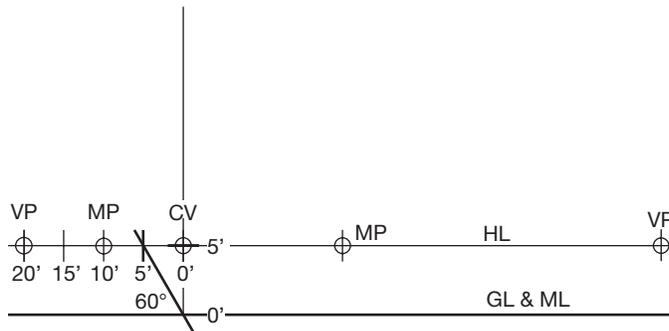
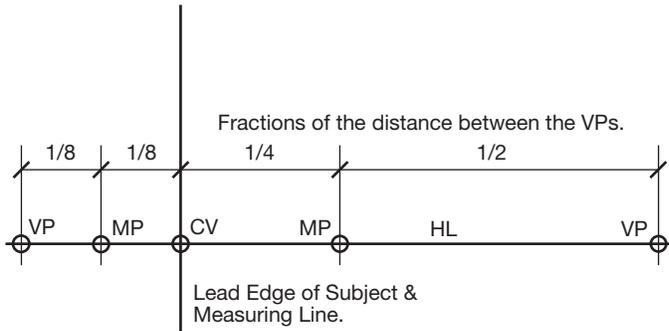
Determine the eye-height for the perspective. For eye-level perspectives use 5 or 6 feet.

Assume the distance from the VP to the CV on the 60° side of the setup is equal to the width of the subject.

Proportionally subdivide the distance between VP and CV to arrive at the eye-height for the perspective.

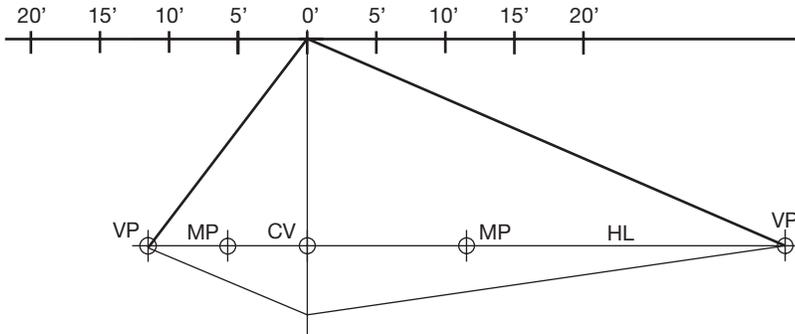
Draw a line at 60° as shown to proportionally transfer the eye-height from the HL to the vertical ML and establish the location of the Ground Line. The dimension transferred to the vertical Measuring Line establishes a scale for the drawing. This dimension can then be transferred along the vertical Measuring Line and Ground Line or horizontal Measuring Line to locate the needed dimensions. Once the dimensions have been established the perspective can be developed using the Vanishing Points and the Measuring Points.

Note: The vertical line that represents the lead edge of the subject does not have to pass through the Center of Vision. However, if it is going to be dimensioned it must lay on the Picture Plane and the subject should stay between the two Measuring Points for the perspective to look right.



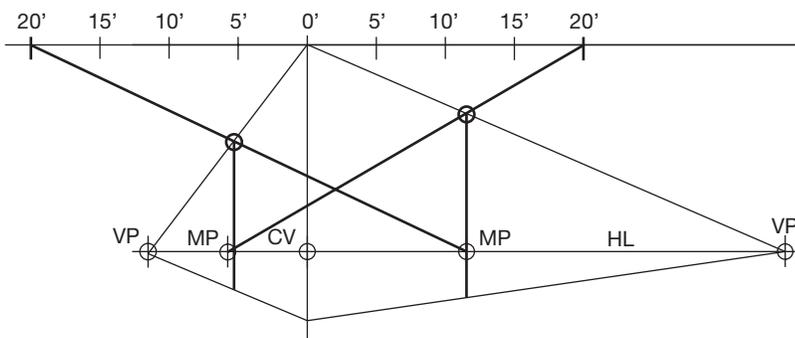
## Using Measuring Points

Measuring Points require an intersection between a horizontal Measuring Line on the Picture Plane and a horizontal line vanishing to one of the two Vanishing Points. This intersection may occur anywhere on the Picture Plane.



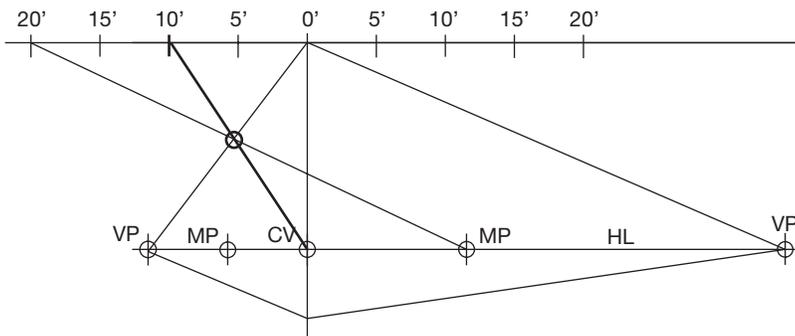
The point of intersection becomes the zero point for entering dimensions along the Measuring Line.

To transfer a dimension, draw a line from the desired dimension on the Measuring Line to the opposite Measuring Point. The intersection of this line and the line vanishing in perspective transfers the dimension to the vanishing line. In the example, the 20' marks are transferred to the corresponding vanishing lines.



The transferred point can be used to draw vertical lines and/or vanish edges to appropriate Vanishing Points. It is important to remember that the Measuring Points are only used to transfer dimensions. They are not vanishing points for lines within the perspective.

Note: When transferring a dimension back into the perspective—when making it smaller—you use the Measuring Point farthest from the corresponding Vanishing Point. When transferring it forward—making it bigger—you use the Measuring Point closest to the corresponding Vanishing Point.



Note: If there is not room to measure the distance on the horizontal line, the distance can be halved and the corresponding distance between the MP and VP can be halved.

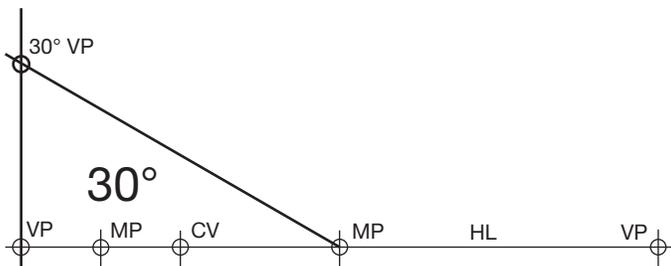
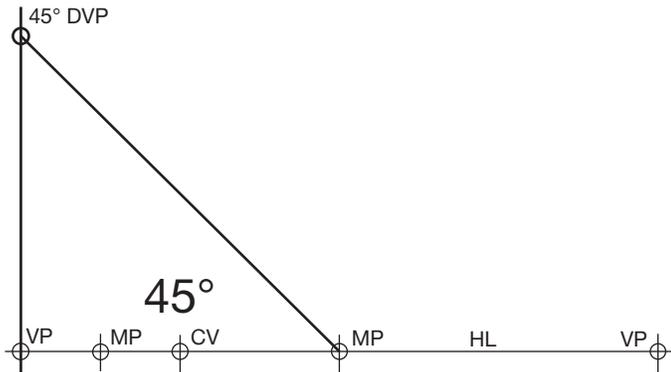
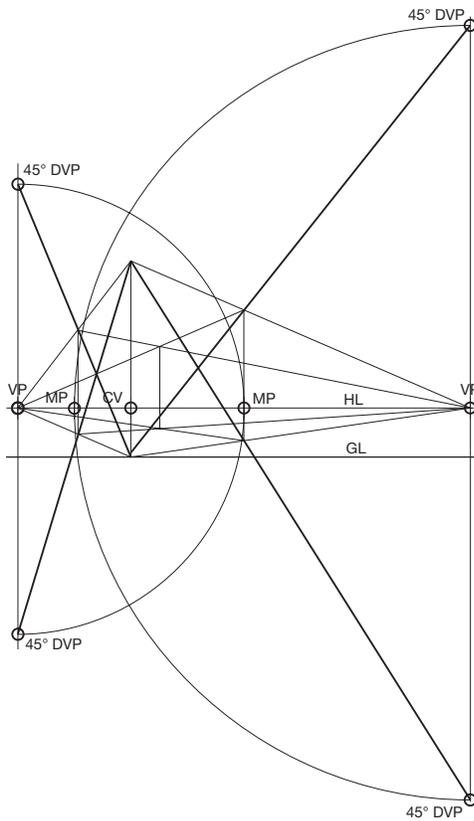
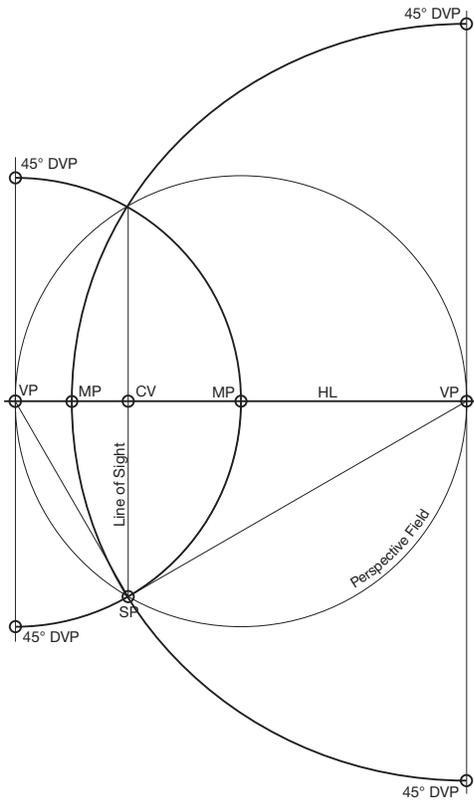
## Oblique Vanishing Points

There are times when oblique vanishing points may be helpful in constructing a perspective. To construct the Vanishing Points for oblique lines, a vertical line must be drawn through the Vanishing Point for the horizontal lines on the same plane. In the 60/30° setup, the vertical lines must be drawn through the two Vanishing points.

Transfer the distances from the Vanishing Point to the Station Point to the corresponding vertical lines passing through the respective Vanishing Point. This can be done with a compass as shown in the illustration or with a scale. This process creates two 45° Diagonal Vanishing Points for each plane—one will be above and one below the respective Vanishing Points.

If you examine the construction process for determining the location of the 45° oblique vanishing points you will realize that a 45° line will connect the corresponding MPs and DVPs. This means that if the location of the Measuring Points are known you can construct the 45° diagonal vanishing point by drawing the vertical lines and then extending 45° lines through the Measuring Points until they intersect their respective vertical lines as shown below.

The construction of the Measuring Points is necessary before this technique can be employed. The concept works for any set of oblique (sloped) lines that lay on planes parallel to the X or Y axes. The vanishing point for oblique lines can be found by drawing a line at the corresponding slope/angle through the appropriate measuring point until it intersects with the corresponding vertical line (e.g., 30°).

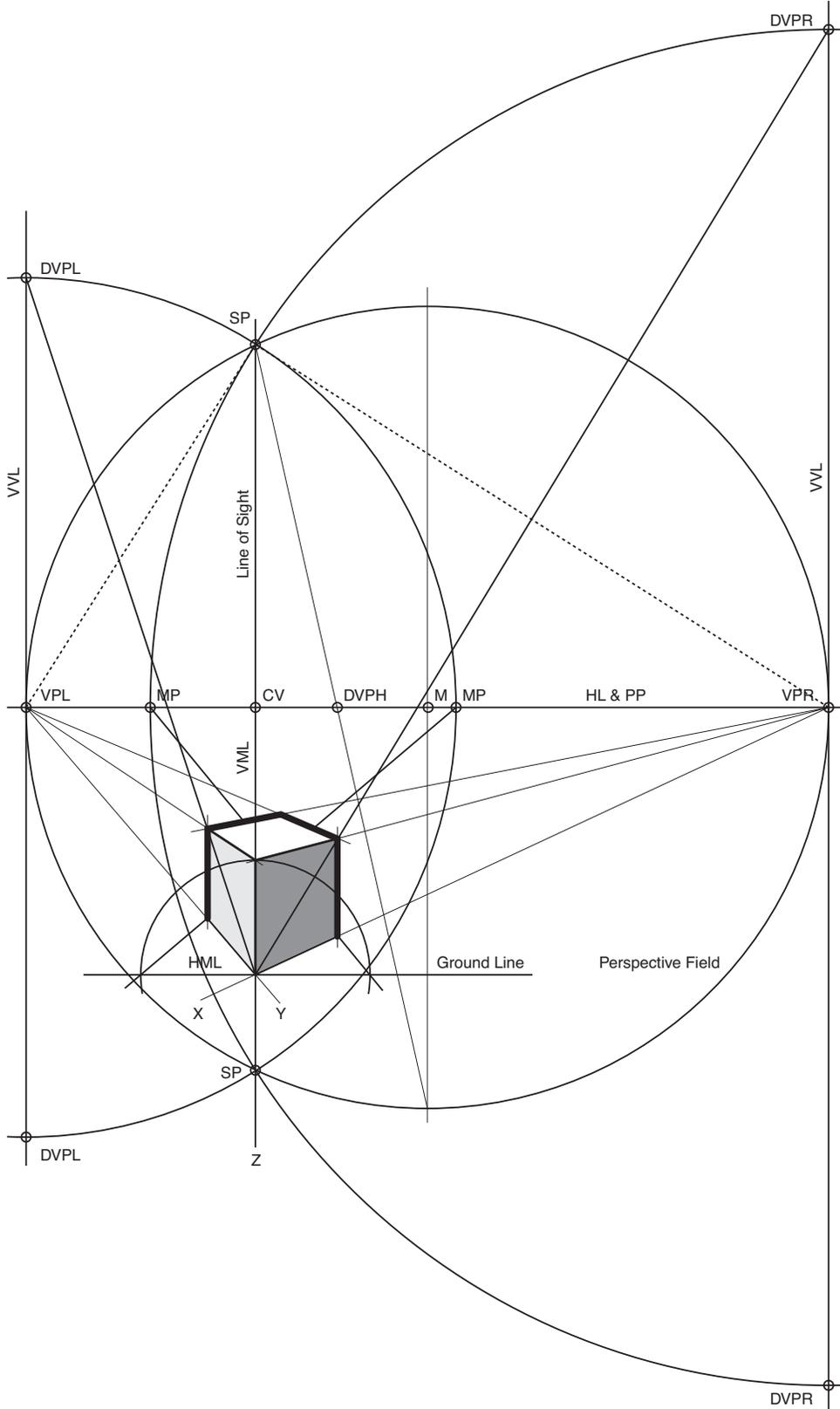


## The Complete System

The illustration on the facing page brings together all the elements of perspective construction that we have been discussing into what is called the Measuring Point System.

There is a link between diagonal vanishing points and the measuring points—they are both established with the same dimension. The arc used to transfer the distance from a vanishing point to the station point to a vertical line through the Vanishing Points to establish a diagonal vanishing point can also be used to intersect the picture plane and establish the location of the Measuring Points. Together, the DVPs and the MPs create the two ways that dimensions can be entered into a perspective and are the heart of the measuring point system of perspective construction.

You can employ the diagonal vanishing points, measuring points and the fundamental techniques in any perspective construction. The choice as to which to use should depend on the strategy that will produce the desired results with the greatest efficiency.

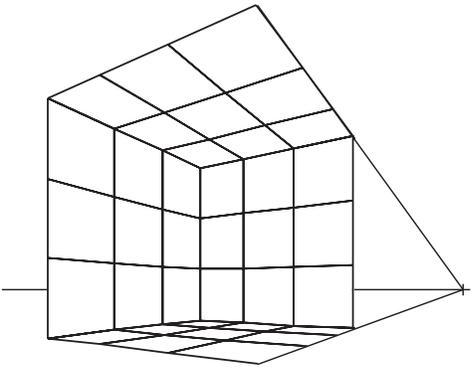
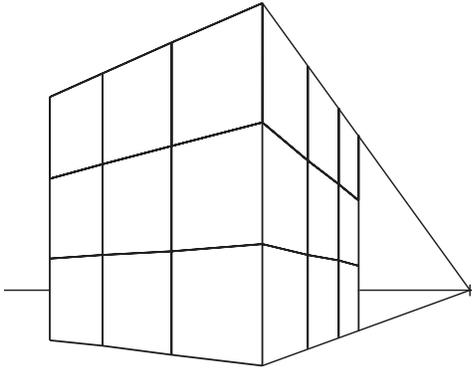


## Perspective Grids

Developing a perspective grid begins with the construction of the desired volume of space using one of the three direct perspective setups previously described. Once the volume is developed it can be subdivided to produce a perspective grid—a volume whose surfaces are girded.

Grids can be tailored to support the unique dimensions and proportions of the subject being explored. The major advantage of grids is that they provide a spatial framework within which design ideas can be developed. Their liability is the time required to develop the grids. This liability can be overcome by being efficient in how you develop the grids and keeping them to use again and again.

Grids can be developed on the exterior or interior surfaces of a volume as shown in the illustrations to the left.



## Using Grids

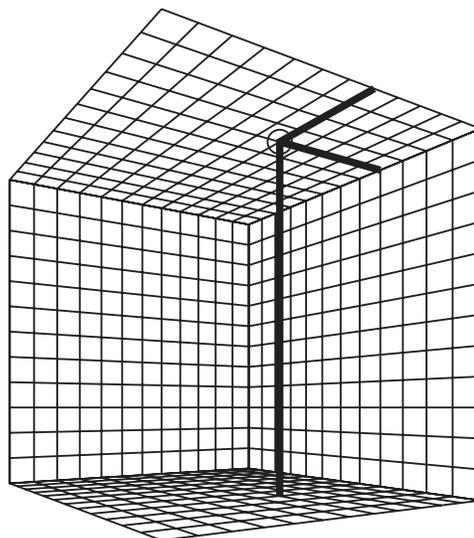
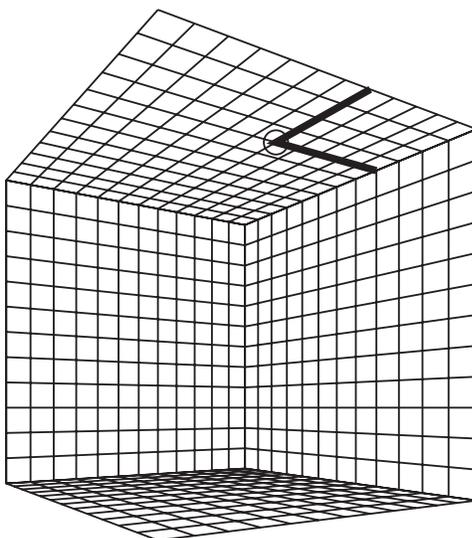
Once a grid is constructed the creation of a perspective is simply a matter of counting units and working within the perspective structure of the grid.

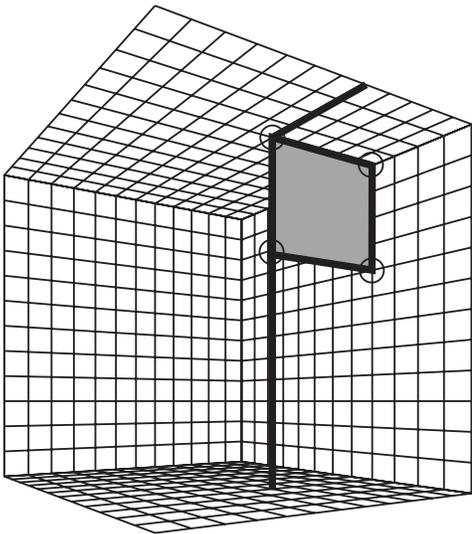
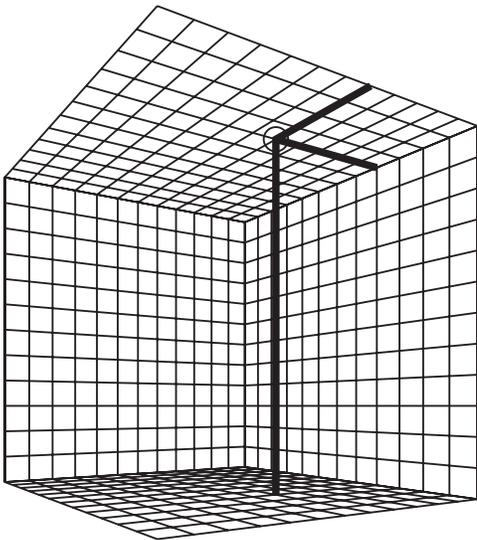
The grid shown below will be used to describe the most fundamental way that grids are used to find points in space. Any point in space can be described by its Cartesian coordinates (X, Y, Z). That is, any point is some dimension back, to the right or left and up or down.

### Horizontal Location

It usually makes sense to locate the point horizontally in space as the first step. This should be done on the surface that most directly faces the viewer. In the example it is the ceiling plane. The point in the circle is five modules in from the right wall and four modules back from the near right face.

Because we are working on the ceiling we know that the point we are interested in is somewhere directly below the one that we have located on the ceiling. Draw a vertical line through the point on the ceiling. We know that the final point will be located along this line.





### Vertical Location

Vertical dimensions are recorded on the vertical surfaces of the perspective grid. Therefore, using the perspective structure, a line is drawn from the point on the ceiling to one of the vertical surfaces. The line vanishes to a point on the horizon line. In most cases it will be one of the vanishing points for the perspective grid as it is in the example.

Draw a vertical line through the intersection of the previous line with the vertical surface.

Mark a point on the vertical line representing the desired distance down. In the example, the final point will be four units below the point on the ceiling.

Vanish a line through this point on the surface back to the vertical line through the point on the ceiling. The intersection of these two lines defines the location of the final point in space.

We have defined a plane in space that connects the original point on the ceiling with a vertical surface. The plane's height is equal to the vertical distance we wanted to find. The plane vanishes to a point on the horizon line. In this case it is the right hand vanishing point for the perspective grid.

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# GOOD GRAPHIC COMMUNICATIONS



*Graphic communications include some combination of drawings, diagrams, images, text and other visual elements that are related through a layout and graphic decisions. Designers use graphic communications to communicate ideas to themselves, colleagues and clients. The key issues in graphic communications are efficiency, content, clarity and quality—the desired information must be clearly communicated with appropriate quality in the shortest time.*

## Introduction

Graphic communication, for this discussion, is defined as the display of quantitative and/or qualitative information on a two-dimensional surface. The surface may be a piece of paper or a computer screen and the information may be visual and/or verbal. In creating a graphic communication there are four issues that must be addressed: Efficiency, Content, Clarity and Quality. This chapter will explore these four issues as a way of establishing the value system and priorities for design communication.

The focus will be on communications that support the design process as opposed to those that support production. Design process communications include those used in the analysis, alternative generation, visualization and development of design solutions. They are the kinds of graphic communications that you will be using in school. However, the majority of the ideas presented apply to all graphic communications.

## Efficiency

*"Graphical excellence is that which gives the viewer the greatest number of ideas in the shortest time with the least ink in the smallest space."*

Tufte 1983, 51

The essence of efficiency is achieving the most with the least—the most information with the least expenditure of time. Designers create graphics to communicate and not as ends in themselves. This does not mean that their drawings cannot be appreciated in and of themselves. It means that the primary goal is efficient communication.

## Drawing Media & Techniques

A key part of efficiency is choosing the appropriate media and techniques. This makes developing capabilities in a wide range of media and techniques an important goal for any designer. If the only tool that we have is a hammer then we see every problem as a nail. Working smart means seeing the problem for what it is and choosing the most efficient tools and techniques for its solution. Becoming focused on any tool will sooner or later cause problems. You must learn to use the tools at your disposal in the proportions and combinations that are efficient for you. For example, the computer can be inefficient if used to produce what Communication Arts calls "Chrome Robots." These are drawings that result from spending too much time caught up in the "sex appeal" of the computer. Just because the computer can do something doesn't mean it should be done given the communication goals.

The way a tool is used can also affect efficiency. Just as you can sketch or draft with a pencil you should be able to use all the tools available in a variety of ways. For example, just because the computer pushes us to be precise does not mean that it cannot be used for sketching. For example, choose simpler versus more complex functions and be willing to approximate, suggest, fake, guess and experiment with digital tools. Ignore the coordinates and respond to the proportions of what you see just as you would in a pencil sketch.

Another source of inefficiency is the choice of technique in relationship to the communication goals. For example, if the goal of the drawing is to communicate a sense of spatial definition then drawing every brick on a surface when simple shading will do is a waste of time. Use media and technique decisions to save rather than waste time. Keep focused on communication goals.

## Draw It Now

An idea that is not made visible does not exist. You cannot fully understand an idea if you do not make it visible to yourself. **Draw the idea now.** Draw it in whatever form you can. What is in your head takes form because your hand and eye provide information needed for its understanding and development.

Draw an idea so that you can generate another. Drawing an idea is a way of noting it so that you can clear your mind for a new idea. We can only hold a few ideas in our short term memory so drawing an idea makes room for another.

Draw ideas so they can be evaluated and combined. You cannot simultaneously hold two ideas in your mind and therefore you cannot compare ideas in your head. Drawing allows comparison and supports evaluation and the synthesis of ideas.

Therefore, draw now and draw often and show your in-progress drawings to yourself, fellow students and teachers to receive valuable perceptions and reactions. In the profession, designers should show clients preliminary ideas to involve them early in the design process and build a sense of involvement and ownership of the ideas. The sharing of preliminary ideas also allows inappropriate directions to be caught before time is wasted on their development.

Drawing the idea now has a very positive impact on efficiency. Procrastination is the greatest enemy of design and communication efficiency.

## Draw New Information

A communication is most efficient if each piece presents new information—if there is minimal redundancy. For example, models, bird's-eye perspectives and plan oblique drawings can all show the overall organization of a design and therefore are redundant if that is their primary role in the communication. Redundancy expends valuable time and resources and gains nothing.

Another type of redundancy is redrawing the same image. "Do not redraw something unless it adds significant new information or value to the presentation." (Communication Arts 1996) This is a very important concept. All too often students redraw things only to be "neater" or "more precise." This may not improve a drawing's impact and certainly does not add information. If you want to make a new drawing choose a point of view that teaches you something new about the design and helps others to understand it more fully. This is not to say that you never redraw something from the same point of view. It does propose that this should not be undertaken unless significant new information can be added. Also, always consider what inclusion of the original drawing could add to the overall presentation.

## Your Capabilities

When do you try something new and when do you use your existing capabilities? As students, this is a difficult decision because one of your goals is to learn new tools to expand your capabilities. Plan for the learning time and mistakes that will inevitably occur and keep your sights on the communication goals.

## Time

Making good decisions concerning media and techniques requires that you know how long it takes you to do things. As beginning students this is very difficult because you do not have the experience. However, every related task can be a source of knowledge if you keep track of your time—always note how long it takes you to complete a drawing or presentation.

## Content

Being efficient—working smart—requires thinking and planning before you begin to create a drawing or presentation. This begins with defining what you want to communicate because you cannot hope to communicate anything without first understanding the message you intend to send. Goals must be defined for the communication as a whole and for each part in terms of both quantitative and qualitative (thinking and feeling, intellectual and emotional, analytical and intuitive) information. The result of setting goals is that every drawing in a communication has a specific purpose—it meets some goal. The main purpose of any drawing is to communicate information about an idea. If the drawing does not do this, it is a wasted or nonproductive use of time.

## Set Priorities

There is never enough time to communicate everything in a design presentation and, if you could, it would not be a design presentation, it would be a construction document. A design presentation provides the qualitative and quantitative framework for future development. It communicates your approach to the significant problem issues. Therefore, the first step in defining the content of a graphic communication is to prioritize design ideas to determine which ideas are drawn first and given the most time and attention. The "Big Picture" or "Big Idea" drawings usually top the list. These are the ideas that set the context for and shape, control or affect the greatest number of other ideas. If the most important ideas are not understood the less important ideas do not make sense or seem like so many unrelated pieces. The priorities for a design communication acknowledge the relative importance of the ideas being presented and provide a guide for the sequence in which the parts of the communication should be executed and the relative time that they should be allotted.

## Record Goals & Priorities

Do not assume that you can keep your goals and priorities in your head. They are easily lost in the intensity of the moment and current problems and possibilities. Write them down and reinforce them with sketches or diagrams. Keep them in front of you at all times to maintain your focus. Use them to test decisions. Is this helping me meet a goal? Does it address a priority? Meet primary goals and priorities before secondary ones are addressed.

## Clarity

*"Central to maintaining clarity in the face of the complex are graphical methods that organize and order the flow of graphical information presented to the eye."*

Tufte 1983, 154

*"What is to be sought in designs for the display of information is the clear portrayal of complexity. Not the complication of the simple; rather the task of the designer is to give visual access to the subtle and the difficult—that is, the revelation of the complex."*

Tufte 1983, 191

Graphic clarity, or the clarity of any visual communication, results from an appropriate response to the concepts of pattern, hierarchy and contrast. The manipulation of pattern, hierarchy and contrast in a presentation directs the viewer's attention and gives order to the information. A presentation's clarity can be further clarified by redundancy, the elimination of visual noise, differentiating between essential and referential information, graphic hyperbole and the use of multiple channels of communication.

### Pattern, Hierarchy & Contrast

Create pattern, hierarchy and contrast in a drawing or presentation to support communication priorities and goals and reflect the structure of the information being presented.

A pattern is a predictable relationship between things. If a clear pattern exists, you can recognize if something is missing or would know where to put a new piece. All patterns are the result of following some rules for the choice and placement of elements. Recognizing a pattern is understanding the underlying rules. Pattern is most easily perceived at a distance when the whole presentation or subject can be seen and produces a sense of overall structure. It is the most fundamental quality needed for clarity.

Hierarchy is the relative importance of things. Its visual effect is to direct the viewer's eye from the most to the least important. It is the creation of primary and secondary focal points.

While pattern creates a sense of whole and knits all elements together, hierarchy differentiates groupings or elements within the whole. Hierarchy provides a means for gradually breaking down larger ideas or concepts into its constituent parts. It allows the presentation of fine detail within its context.

Contrast is created by the unexpected or a change in amplitude. It denotes difference between things. It is the surprise or change that catches the eye. If pattern holds elements together and hierarchy differentiates the element's relative inclusiveness and importance then contrast is the most powerful tool for creating hierarchy. The breaking of a pattern creates a focal point. The more pronounced the break the stronger the focal point—the more the eye is drawn to it. By modulating contrast from subtle variation or gradation to complete opposition a clear visual hierarchy can be created.

The manipulation of pattern, hierarchy and contrast has the most fundamental and powerful impact on the clarity of a drawing, presentation or anything that is designed. Decisions concerning their

presence in a design most directly control its perceived complexity and aesthetic impact.

### Reinforcement/Redundancy

Use as many visual clues as possible to reinforce a communication. If a message is expressed through size, shape and color it will be more likely to be read correctly than if it is only expressed through size—redundancy increases clarity and the probability that the message will be understood. In addition, the messages that receive the greatest visual reinforcement will be perceived as the most important.

Visual clues should all express the same meaning. Avoid the use of conflicting visual clues that send confusing and contradictory messages. You cannot afford to incorporate visual clues into presentations or drawings that don't contribute to the clear communication of the intended message. Noncontributing clues are, at best, dead weight in the drawing and, at worst, senders of confusing signals. For example, proximity and shape could say that some things are important while color and size indicate that others are important. If they are in competition they confuse the message. If they possess a clear hierarchy they can communicate a more complex message.

### Visual Noise

*"Graphical displays should induce the viewer to think about the substance rather than about the methodology, graphic design, the technology of graphic production, or something else."*

Tufte 1983, 13

*"Show data variation, not design variation."*

Tufte 1983, 77

Visual noise is any graphic decision or element that does not contribute to the communication of the intended qualitative and quantitative information. All the elements of any drawing and presentation must be studied closely to determine if they are truly contributing to the communication of intended meanings. If they are not, they should be eliminated to reduce confusion, distraction and the sending of unintended messages.

Visual noise includes such things as a fancy border that is added to the presentation because it "looks bare," coloring things different colors when they are part of the same group, drawing four circles when two will communicate the information, using shapes that are visually interesting but not related to the qualitative or quantitative information and changing something because you are tired of it.

Make all graphic decisions work together to meet the priorities and goals that have been set.

### Context Versus Message

All drawings include both elements that function as background or context and elements that are the focus and carry new meaning. Which are which in a given drawing is established by the priorities and goals for the particular drawing. Differentiation of the context

and message can be enhanced to focus on, strengthen and clarify the information.

Another way of describing this is to say that every drawing has essential components that are critical to the visual expression of intended meaning and referential components that serve as background or context for the essential components. Essential components are always visually emphasized (heavier lines, darker tones) and referential components are always de-emphasized (lighter lines, lighter tones.) This visual inflection is important to the clear expression of meaning.

### Graphic Hyperbole

Exaggerate aspects of a drawing or communication for emphasis and a stronger clearer expression of meaning. All drawings are interpretations of what is seen or what will be seen—they edit existing or proposed reality in some way. Graphic hyperbole suggests that this can be done to strengthen the communication value of a drawing. It involves making decisions concerning what is included and excluded, size and graphic weight. You are searching for opportunities to drive the messages home with more force and focus by adjusting the relative intensity of the visual elements.

### Multiple Channels

Include drawings, diagrams, text, photos, movies and anything else that helps you communicate your ideas. Design presentations have traditionally been dominated by original drawings supported by a limited quantity of text and photos. The focus on one channel of communication—original drawings—reduces the potential richness of the communication and efficiency.

Drawings are not self explanatory, they support many possible interpretations and allow the viewer to focus on their interests. Adding information in the form of notes or general text can focus attention, expand ideas, identify implications and describe things not visible or only suggested. Physically associate text and drawings so that they work together. Use them in concert to test and clarify each other and to produce the richest communication in the least time.

A direction or intention can be effectively illustrated by a photo of some existing thing that has the qualities being sought. Find the right photo or image to combine with a drawing to help explain a concept or idea. Consider the image research time part of your design education. The best designers are those that have a rich visual reference library of ideas in their heads.

### Quality

Quality does not mean drafted or photographic. A quick sketch and a detailed rendering can be of equal quality. The issues are control, consistency and appropriateness and the addition of value.

### Control

Control is the ability to use the media. For example, being able to create an even gradation with a fat 6B pencil or draft a line that is

consistent in thickness and density with an HB mechanical pencil. It is the ability to make the media do what you intend.

### Consistency

Constancy is the maintenance of a given kind and level of technique or skill throughout a drawing or presentation. For example, a precisely drafted drawing with uneven and misaligned lettering or some lines that are consistent in width while others vary. The effect is always for the more precise technique to be negated by the quality of that which is done poorly. Do not undercut high quality work by rushing at the end. A presentation is not done until every part is completed.

### Appropriateness

Appropriateness addresses the fit between the message and the skills, techniques and design approach employed. Knowing the audience, subject and place in the design process can all affect the appropriateness of presentation decisions.

### Value Added

Finally, quality addresses the ability of a presentation as a whole and in its parts to add a sense of value to a communication. It is when the presentation puts the viewer in a positive frame of mind relative to whatever the information might be. It makes you look forward to what is to come. It says that this person or firm is professional, skilled and creative.

Adding value also includes the testing and adjustment of the drawings on simply a visual design basis. Ensuring good composition, proportion, figure-ground, rhythm and style are some of the concerns that affect the design of the presentation.

Projects should exhibit the best craftsmanship and design that you are capable of achieving. You should be proud of your work and conclude each project with no regrets and no excuses.

### Closing

Good graphic communications efficiently communicate intended content with clarity and quality—they present the "greatest number of ideas in the shortest time with the least ink in the smallest space." (Tufte 1983, 51) This chapter has described the qualities that will be valued in presentations made for the Design & Communication studio series. They identify a key area of exploration and learning. Strive to develop an understanding of the principles and their implications. Bring the ideas presented in this chapter up for discussion and debate.

### References

- Communication Arts. January 1966. *Streamlining the Sketchpak*. Handout that supported a presentation made at the 7th Conference of the Design Communication Association, College of Architecture, University of Arizona.
- Tufte, Edward R. 1983. *The Visual Display of Quantitative Information*. Cheshire, Connecticut: Graphics Press.

# FREEHAND DRAWING: CONTOUR & GESTURE



*Everyone can learn to draw and experience the joy and magic of making form come alive—of creating personal visions. Drawing is the application of a few simple concepts and strategies in the service of perception. Freehand drawing is a category of drawing that includes those images created without the aid of drafting instruments (triangle, scale, etc.). This chapter describes the two basic types of freehand drawing (gesture and contour) and introduces some fundamental strategies for translating what you see to a sheet of paper.*

## Introduction

The category of freehand drawing includes a wide range of drawings in terms of content, intended audience, media and approach. Content can vary from simple abstract representations of an idea to near photographic simulations of completed designs. Audiences can range from the person making the drawing to lay people with no previous knowledge. Media can range from the traditional pencil and paper to a pressure sensitive pen, graphics tablet and computer screen. And finally, approaches can range from contour to gesture.

## Contour & Gesture

The terms “contour” and “gesture” identify the ends of a continuum of drawing speeds, attitudes and goals. The qualities associated with contour drawings are: analytical, slow, evaluative, subtle, precise, careful, patient and deliberate. The qualities associated with gesture drawings are: intuitive, quick, sketchy, assertive, nervy, sweeping, connected, impulsive, and loose. The contour seeks the specific while the gesture senses the essence.

We move our bodies or make gestures to point, give direction, visually punctuate a statement and describe shapes or movements. Drawing is a direct extension of this movement and the empathy we have with the world through our haptic sensory system. In drawing we can move in a free or control manner. These are associated with contour and gesture drawings respectively. Contour, is an intense, slow inspection of the subject, a careful examination of its parts. Gesture, is a quick, all-encompassing overview of forms in their wholeness. These two establish the poles of a drawing continuum. All drawings can be discussed and approached in terms of these qualities.

## Seeing

Freehand drawing is intimately tied to the process of perception. You should spend as much or more time looking at the subject as you do making marks. The goal of all freehand drawing is to communicate what you perceive and not what you know about something based on its name.

## Contour Drawing

Contour drawings describe the shape and qualities of an object’s surfaces as they wrap or bend to define it. The shape of a surface is perceived as you move across the surface. A flat surface does not deform movement. A round surface deforms movement smoothly. A faceted surface deforms movement abruptly at corners or edges. Contour drawings respond to and record the movement encountered at edges and surface textures and irregularities. The qualities are made visible by light which creates variations in value. Contour drawings grow out of slow and accurate observation and offer a means to intense inspection of the parts. It improves our ability to see and leads to a more detailed understanding of how the parts relate to the whole.

Contour drawing combines the senses of touch and sight. An empathy for what it would be like to touch the path the eye is tracing enriches the drawing. A contour drawing is a record of what you see as though you were tracing the object with the drawing implement. Your eye on the subject and your implement on the paper become one. As your eye moves along an edge it provides a stream of both visual and tactile information. Because contour drawings are representative of both sight and touch they must respond to the irregularities of a form as they are seen and would be felt.

Contour drawings do not appear at once. A drawing starts with a single line or shape and builds gradually through a series of simple decisions. The strategies that will be described provide approaches to making those decisions. Finally, drawing is a process of refinement. The first line starts you on the path but is unlikely to be the perfect line. Drawing is a process that uses the preceding marks to build toward the desired result. Enjoy the process.

### Contour Drawing Suggestions

1. Look at the subject you are drawing. Your eyes should spend as much time on the subject as on the drawing.
2. Do some small study sketches to investigate form, value, point of view and composition.
3. Do some small technique and media studies.
4. Keep your eyes and hand coordinated. Do not let your eyes move more quickly than you can draw.
5. Start with light lines that establish the structure of the drawing. If the first light line is not satisfactory, draw one that is better. Do not erase for correction. Incorporate construction lines into the final.
6. Draw slowly; search for details.
7. Imagine that the drawing tool is in actual contact with the subject. How would it move as it traces over a surface or along an edge? What would my finger feel as it moved over the surface?
8. Amplify those shapes and values that represent important qualities and contrasts within the subject.
9. Draw only lines and tones that communicate some intended quality. Do not make meaningless lines and tones.
10. Vary the weight of the line or the value of a tone to relay information about space and light and to offer contrast. Heavier, darker lines and tones may mark changes of direction and/or shade or shadow; lighter lines and tones may describe the less important forms, near forms and/or brightly illuminated surfaces or edges.

### Gesture Drawing

The gesture drawing strives to capture the essence of the subject in the quickest and most economical way. It employs marks aimed not so much at what the subject is but what it is doing. A gesture drawing captures the weight, movement or energy of a form. A gesture drawing suggests rather than documents.

*The hand duplicates the motion of the eyes, making a gesture that quickly defines the general characteristics of the subject—placement, shape, proportion, relationship between parts, its arrangement in space, and so on.*

Betti & Sale 1986, 25

A gesture drawing is a record of the energy that went into making the marks—it is a visual connection between artist and subject. It encourages empathy with the subject and seeks the essential underlying structure of the whole. What we see we can trace

with our arm and finger in space and we can empathize with each shape through our kinesthetic experience. This empathy allows us to translate the form we see into a drawing motion. These quick movements of the arm and hand can capture the form, movement and weight of the subject.

### Gesture Drawing Suggestions

1. Gesture drawing should involve large arm movements. The hand and arm should be free to move and the whole body should respond. A standing position is recommended when beginning.
2. Use the whole sheet of paper. Make the drawing as large as possible.
3. Time is an essential issue. Gesture drawings should be done quickly and timed (15 seconds to a few minutes maximum).
4. Keep your eyes on the subject and your drawing tool in contact with the paper and moving. Look at the drawing only to establish relationships.
5. Look for the longest lines or dominant forms in the subject. Do not draw their edges but capture the sense of shape, direction and weight.
6. Draw each form as a whole even though other forms or objects overlap it—draw all forms as though they were transparent.
7. Let the lines correspond to the movement of your eyes and their weight relate to the sense of energy and mass that the eyes perceive.

### References

- Betti, C., and T. Sale. 1986. *Drawing: A Contemporary Approach*, 2nd ed. New York: Holt, Rinehart and Winston.

# GRAPHIC LANGUAGES



*Perception and drawing are interdependent processes—they affect and inform each other. We see surfaces and edges and draw lines and values. The choice of marks and the rules we establish for their usage constitutes a drawing's graphic language.*

## Introduction

A graphic language brings together what we perceive and how we draw. Any language requires a set of symbols and a set of rules that control the relationships between the symbols. The symbols of verbal language are its words while those of a graphic language are the marks we make on a surface. The rules for a verbal language are its grammar or syntax—the culturally accepted sequences that relate the words. The rules for a graphic language are the patterns of usage established for the marks and the relationship of the marks to the perceived world. Meaning is communicated because the grammar or patterns are respected and the symbols and relationships have some connection to a shared reality—we do things consistently and the way we do them corresponds our experience and knowledge.

Graphic language has one great advantage over verbal. It is simultaneous and multidimensional—all information and relationships are presented at once. Verbal language, on the other hand, is sequential and information and relationships must be presented lineally—one at a time. An affect of the simultaneity of graphic language is that its marks and rules are relative and must be adjusted in relationship to each other and the context created by each drawing. The perception of the whole provides an opportunity for the internal consistency to make evident the language.

## Graphic Vocabulary

In a graphic language the lines, values and marks create the vocabulary. Lines are the outline of our experience of the visual world—they condense and emphasize the cues of spatial perception by representing edges. Values are the richness of our visual experience—they present surface—texture, color, etc. Marks are figures that are perceived as entities within the drawing and

may be composed of lines and/or values. A verbal vocabulary has nouns that identify things, adjectives that qualify or modify things and prepositions that make connections between things. In a graphic vocabulary the choice and combination of lines, values and marks is used to identify elements and describe and modify relationships.

### Nouns: Graphic Elements

An identify is any graphic element that affords the perception of an element (dot, line, value, square, circle, letter, number, face, car, etc.). It is important that it appear as a element smaller than and contained within the communication's field of reference. For example, a word or a one inch long line within the context of this page. The graphic element is a component part of a drawing like a word is a component part of a sentence.

### Adjectives: Graphic Modifiers

A modifier is any graphic element that indicates the relative quantity, importance or quality of an element. Modifiers often communicate the hierarchical relationship between elements. We can modify the size, shape, surface, substance and relationship to communicate hierarchy. This could include elements being of different size, placed higher or lower, consisting of fat versus thin lines, etc.

### Prepositions: Graphic Relators

A relator indicates some interconnection between elements. This relationship can be indicated by the elements having the same attributes (size, shape, surface, substance), being close to each other, being connected by another element, being contained within a common boundary or being perceived as part of a larger organization. Being part of a larger organization can be communicated

by the elements forming a line, circle, grid, sequence, face etc. In these cases we perceive the relationship because we recognize the line, circle, face, etc. that the elements are forming.

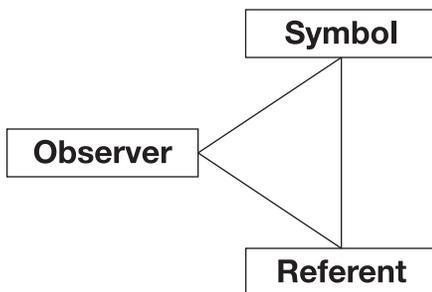
## Graphic Grammar

A language must have a grammar that is understandable and consistently followed for communication to occur. The grammar must establish the patterns (the normal and predictable ways that elements are to relate) and hierarchies (the ways that relationships of relative importance will be encoded). In addition, it must allow for the disruption of the system or the introduction of contrasting elements to communicate the unique or unexpected. The disruptions or exceptions in a grammar permit growth and evolution and response to new contexts and communications.

One of the patterns that a grammar must establish is the relationship between a symbol and the aspect of the referent it will represent. In drawing we are creating a representation of something and not the thing itself. No matter how detailed the drawing or great our skills we are making some symbolic mark on a surface that is intended to represent some aspect of the thing we see.

For a language to function there must be a relationship between what is being referenced (the thing), what is representing the thing (the symbol) and the person that is interpreting the representation. This can be modeled by a triangle which connects the three components.

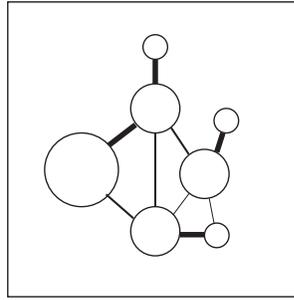
The observer is looking at the symbol that stands for the referent. For meaning to be communicated the observer must associate the symbol with the intended referent. For example, the word "tree" will evoke images of real trees just as will a vertical line with a circle on top. As the symbol takes on a form that is more like the referent the clearer and more specific the communication becomes until the symbol and referent are one—the communication becomes direct experience. Drawing as a visual language requires that elements (lines, values and marks) be put on a surface that evoke images and associations with direct experience—the thing represented.



The choice of elements (graphic symbols) will result in the drawing being more abstract or representational. The choice and appropriateness of the symbols—the level of abstraction—is related to the time it takes to make the drawing, the information that is to be communicated and the clarity of its communication. There is no reason to draw all the leaves on a tree if a line with a circle on top

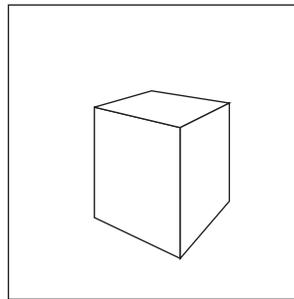
will communicate the intended meaning—the graphic language is selected to fit the communication.

A chosen set of graphic elements (a vocabulary) and the rules for their use (a grammar) constitute a graphic language. Below is illustrated an abstract to representational continuum for a tree and two common graphic languages to clarify the ideas that have been discussed.



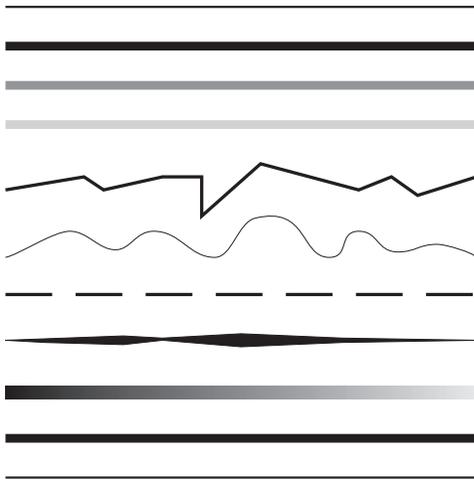
### Bubble Diagram

A graphic language that is used to communicate abstractly about rooms in a building is called a bubble diagram. It establishes the basic identity for a room as a circle. The size of the identity (its modification) would indicate the relative square footage of the room. Relationship between rooms could be indicated by connecting lines. The relationships could be modified through the thickness of lines—the thicker the line the greater the relationship.



### Perspective Drawing

A graphic language that is used to communicate the form of a cube might establish the basic identity as a line. A line would be used to represent the edges of a plane. These lines are modified in length and orientation to correspond to the relative lengths and orientations of the edges of the cube given the observer's point of view. Furthermore, a two-point perspective system is used to control the orientation of the lines. The lines are related because together they are perceived as representing the cube—there is a recognition by the observer of a relationship between the drawing and the referent.



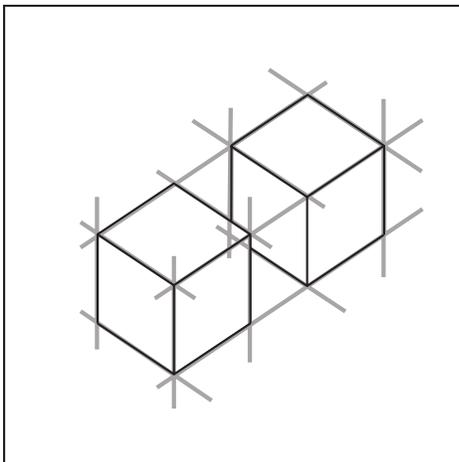
## Basic Line Types

Lines occur in many forms and can be categorized as even-weighted (having a consistent width and density), thick-to-thin (varying in width), light-to-dark (varying in density or value) and broken (a line may be intermittent or composed of overlapping segments). Each line type has an expressive content and role in drawing. Furthermore, lines are efficient—they communicate with a minimum of graphite, ink or pixels. Therefore, it is often desirable to represent as many surface qualities and spatial cues as possible with lines.

The lines used in drawings can be classified as either contour or regulating lines. Contour lines can further be differentiated by the aspect of the thing that they are representing—they can be classified as primary, secondary and tertiary. In this section each of these line types will be defined and their use in languages described and illustrated.

## Illustrations

The examples will use simple cubes to illustrate the concepts. The goal is to represent their contours and surfaces. The examples employ several spatial cues in addition to the isometric drawing system and the contour cues being illustrated. These include vertical location, overlap and aerial perspective in terms of detail.



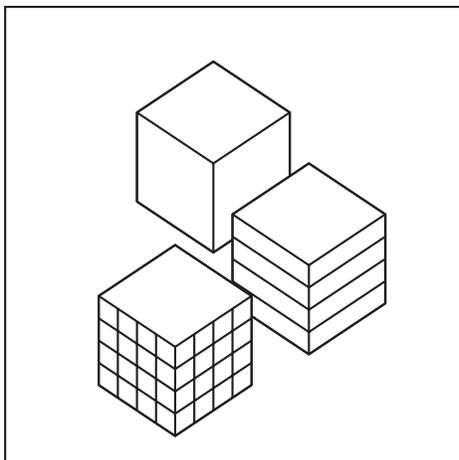
## Regulating Lines

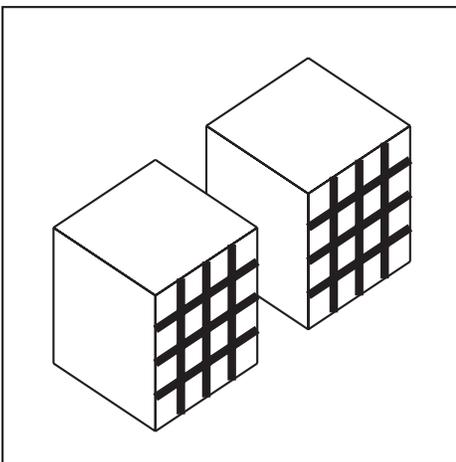
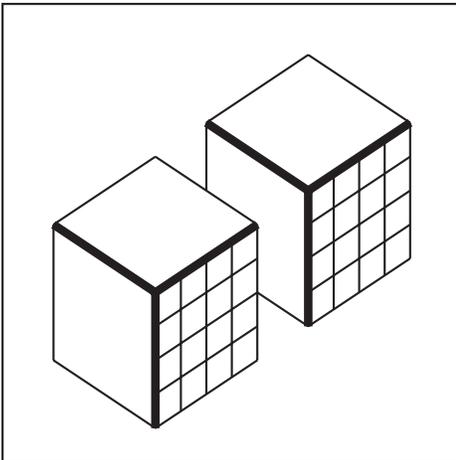
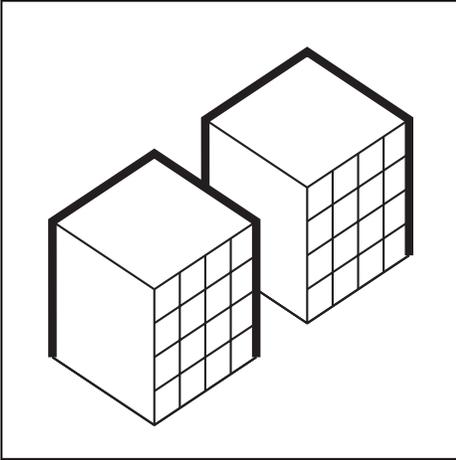
Regulating lines (construction lines) record the more abstract underlying structures of things and are usually drawn first. They establish a framework for the remainder of the drawing. They describe and establish the size, scale and proportional relationships of both forms and spaces. They indicate alignments, offsets and diagonal and tangential relationships between the important points and surfaces of things. They are usually drawn lightly and represent visual judgements that will be confirmed or adjusted. They can be removed but often remain part of the finished drawing. When removed they are implied by the surfaces they relate and their presence can be felt.

## Contour Lines

Contour lines are those lines that define the edges of surfaces and/or perceived irregularities within surfaces. The most basic line language uses a single line weight to represent all contours—all edges.

In the above example contour lines are used to record the edges of the faces of the cubes and irregularities on the surfaces. The vertical sides of the near cube contain black and white squares in a checkerboard pattern that are recorded with a grid of lines. The middle cube has horizontal lines on its vertical faces that are recorded by lines in the drawing. In this way the edges of surfaces and their irregularities are translated into contour lines.





## Contour Types: The Basic Language

There are three types of contour lines that correspond to the three edge conditions found in things. The contour types use a vocabulary of three line weights—primary contours are heavy, secondary contours are medium and tertiary contours are light. The relating of the contour types to the edge conditions constitutes the basic contour language.

Note: The use of line weights indicates whether the cubes are sitting on the ground or floating in the air. Are the three cubes sitting on the ground or floating in the air and why?

### Primary Contours

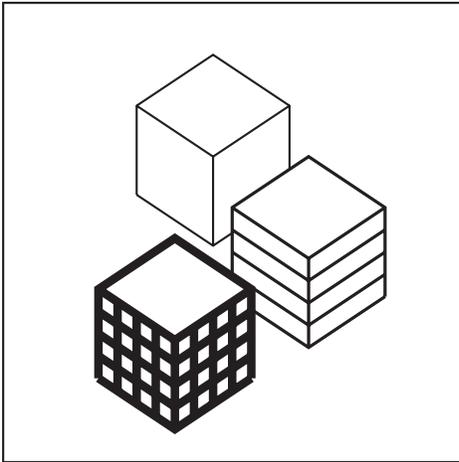
Primary contours (occluding edges) are those which define the outermost extremities of a form—they record the outline or profile of an object. They are edges formed by the meeting of two surfaces when only one surface can be seen. They respond to and record edge irregularities. Drawing only the profile of an object tends to flatten the object.

### Secondary Contours

Secondary contours describe the edges of surfaces when both surfaces are visible. They respond to and record edge irregularities.

### Tertiary Contours

Tertiary contours describe changes in the uniformity of a surface or plane. They respond to and record linear markings on a surface and the edges of values, shadows, textures and colors. Tertiary contours disclose the volume of an object. They are plastic and emphasize the three-dimensionality of the object as they move across a surface.

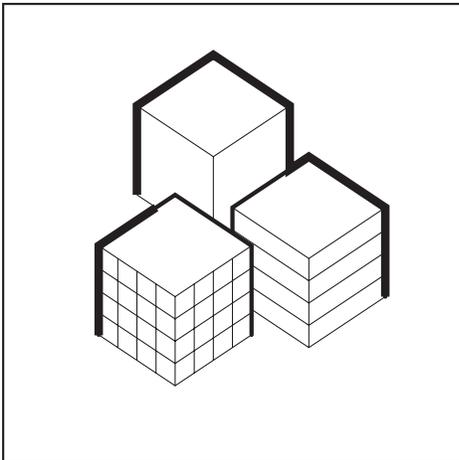


## Contour Language Variations

The basic contour language provides a starting point for locating lines and assigning weight. However, the language can be modified to respond to additional considerations including distance, depth and focus.

### Contours & Distance

A heavy black line on a white sheet of paper reads as closer than a light line due to its size and our experience with the affect of aerial perspective on contrast. A thin black line appears as lighter in value than a thick black line because it has less surface area with which to communicate its value. From these cues we can establish a language that says the closest contours are the heaviest and weight decreases with distance. Lines of varying distance can taper. The illustration simply categorizes all the lines of a cube as the same but the language can be much subtler by further varying the line weights within each cube.

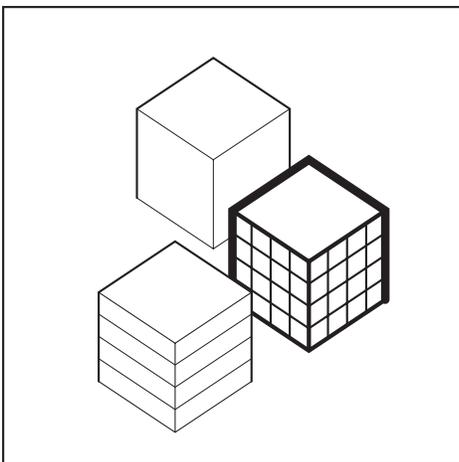


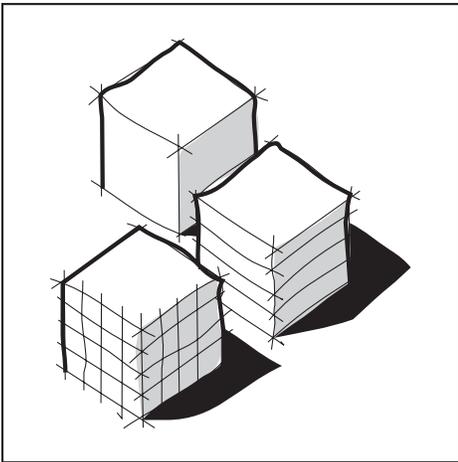
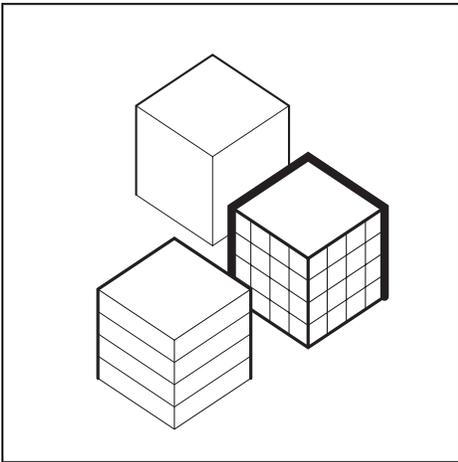
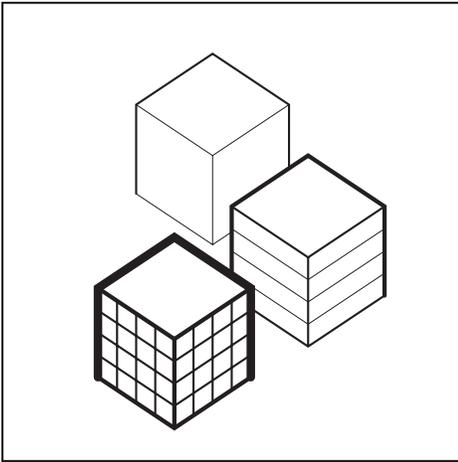
### Contours & Depth

Primary contours record edges where only one of its defining surfaces can be seen. Therefore, to one side of the contour is the surface that the contour is defining and to the other there is some distance or depth through space until another surface is encountered. The greater the depth the heavier the contour line. This language is a development of the spatial profiling cues.

### Contours & Focus

To this point the subject has controlled the grammar (i.e., if the subject has a primary contour it must be a heavy line). However, one of your responsibilities is to establish the visual focus of the drawing. To do this you can adjust the graphic language to control the focus. In a contour drawing this means employing the heaviest line weights and/or lines of greatest contrast in the area that is to be the focus.





## Composite Contour Languages

The preceding contour languages can be used by themselves or in combination. In different combinations they can create more sophisticated graphic languages that begin to communicate the many subtleties of form.

Keep in mind that the examples employ spatial cues in addition to those communicated by the contours. These include axonometric perspective, vertical location, and overlap.

Two typical combinations are illustrated but many more are possible and the ones illustrated can be treated with greater subtlety. However, the four issues of primary/secondary/tertiary, distance, depth and focus are the fundamental ones driving most line weight decisions.

### Form & Distance

The language uses form (heavy line for primary contours, a medium line for secondary contours and a light line for tertiary contours) and distance (the closer the line is to the viewer the heavier) These two syntactic structures can work in coordination as indicated in the illustration.

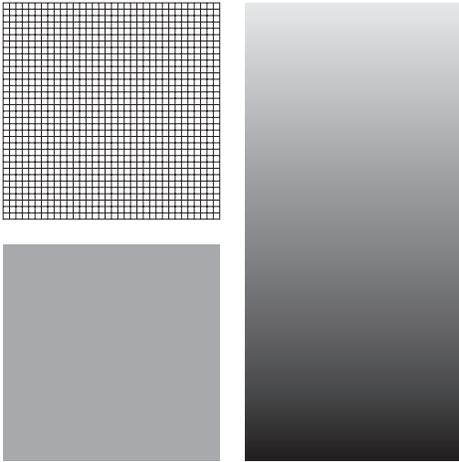
### Form, Distance & Focus

In the example the focus is controlled both through detail and line weight. The aerial cue of detail has been adjusted to reinforce the desired focus by placing maximum detail in the middle ground. In addition, the maximum line weight and contrast also occurs in the middle ground.

In the example the graphic languages classify the near cube as being in the foreground with the middle in the middle ground and the far in the background. However, the cubes present so close a grouping that this classification is an exaggeration to make the point. It is more likely that the cubes would be viewed as all being in the middle ground which would require the addition of foreground and background elements—a more typical architectural situation.

### Line & Expression

The line quality used in a drawing can support different expressions or styles. The differences between drafted and freehand, uniform weight and varying weight, continuous and broken, etc., support a different interpretations. They further have the capability of imparting subtle and complex information about the subject—edge conditions, textures, movement, etc. Compare the effect of the last sketch and the previous drafted illustrations. They have very different feelings. Choose or create a mood that is appropriate for a given communication.



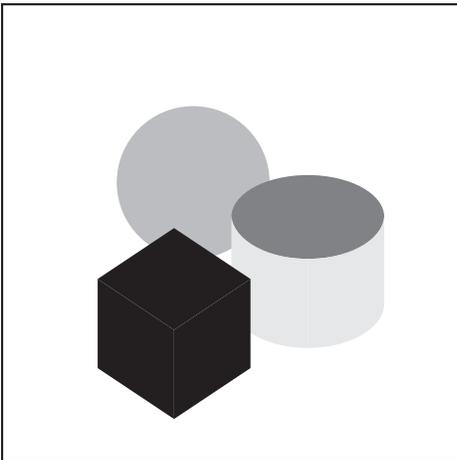
## Basic Value Types & Languages

A value is created by any technique that directly describes a surface rather than its edges. The edges are made visible by the limits of and/or a sharp change in the value. A value (sometimes called a tonal value or tone in drawing) can be continuous or created by lines. A continuous value is even, small in scale and fine in implied texture. A value created by lines is one whose texture is significant in scale and composed of individual marks that retain their identity within the value. These marks include stippling, lines, cross hatching, scrubbing, scrubbing over texture and scribbling. The classification of a value as one or the other is dependent on the media and application technique employed.

The roles of value in a drawing includes describing the area of a surface, the gradations produced by surface's texture, the orientation of the surface to the light source and the surface's attributes—materiality, texture, uniformity, reflectance, transparency, color, etc. In representing these qualities the scale, coarseness, form, lightness and hue of the value can be manipulated.

### Illustrations

The examples will again use simple geometric forms to illustrate the concepts. The goal is to represent their surfaces. The examples employ several spatial cues in addition to the isometric drawing system and contour cues being illustrated. These include vertical location and overlap. The isometric drawing system establishes the rules for the construction and dimensioning of the drawing. It establishes the location size and shape of each value.



### Value Languages

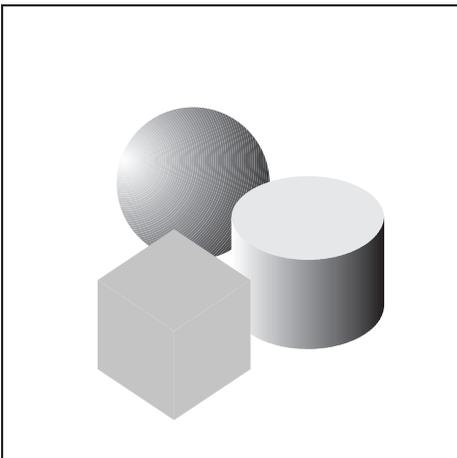
Value can be associated with many of the properties of things including color, form, texture, orientation, shadow, distance and focus. Value can represent more surface qualities than line and therefore is a powerful component of any drawing. However, it also takes longer to create and therefore should be used efficiently.

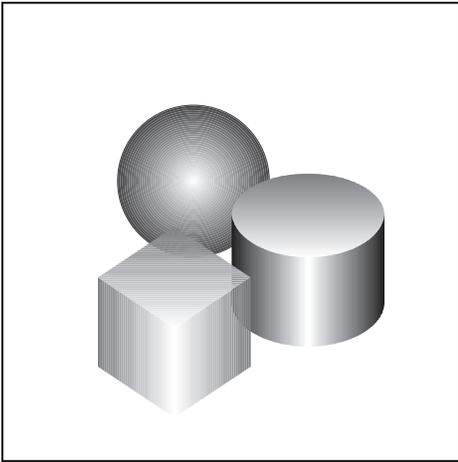
### Value & Color

In the simplest value language directly represents the color of the surface. Whatever color (value, hue, chroma) that a surface possesses is represented in the drawing. If the surface is dark red the surface is drawn dark red. Issues of relative illumination and orientation of the surface are not considered. The liability of this language is that it tends to flatten and disguise form.

### Value & Form

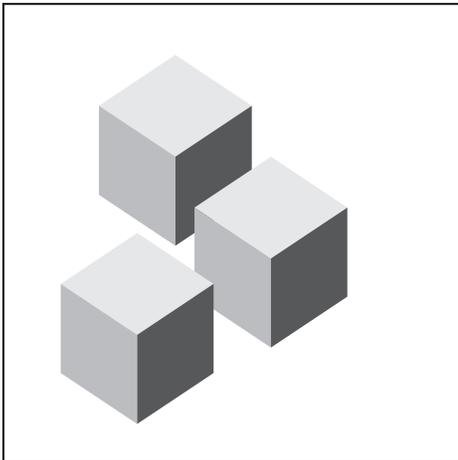
Value can delineate form by defining and differentiating surfaces. The simplest value and form language represents flat surfaces with uniform values and curved surfaces with tonal gradations. As in the value and color language, issues of relative illumination and orientation of the surface are not considered and the liability of the language is that it can flatten forms composed of planes.





## Value & Texture

If a surface has some perceivable textural qualities then value can represent the surface's textural gradients. A surface that is facing directly at the observer has a uniform textural gradient and is represented by a uniform value. A surface that is oblique to the observer has a varying textural gradient and is represented by a gradation that goes from light to dark as it moves away from the observer. A textured surface will also appear darker as it turns away from the observer—as it moves from perpendicular to parallel to the observer's line of sight.

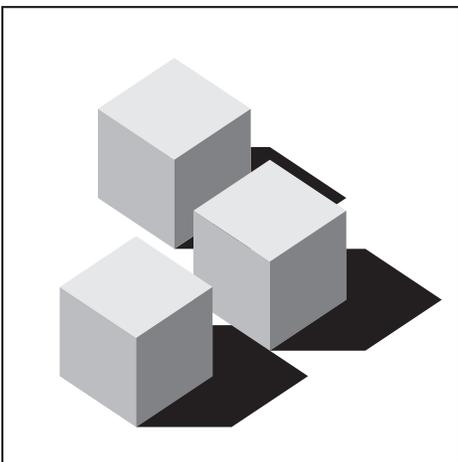


## Value & Orientation

Using value to represent orientation requires the assumption of a light source. A surface's value corresponds to its orientation to the light source. In this example flat surfaces are represented by uniform values. The values are then adjusted to represent the surface's orientation to the assumed light source. The surfaces most directly facing the source are the lightest and the surface facing most directly away from the source is darkest. Surfaces with the same orientation receive the same value no matter where they are within the drawing.

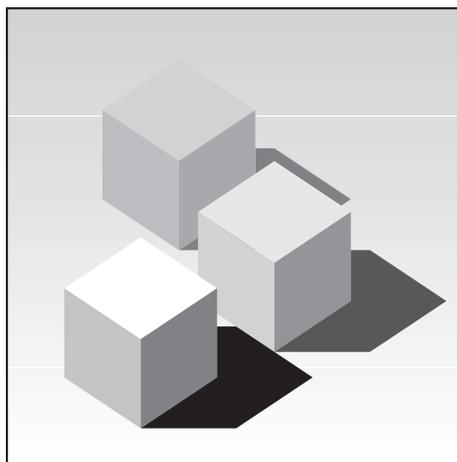
## Value & Shadow

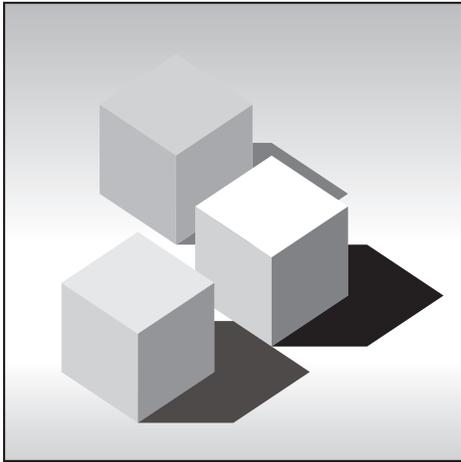
This language builds on the orientation language. The orientation of the surfaces to the light source must be established before shadows can be cast. Once the orientation is established shadows are cast and values adjusted for reflected light. The example shows all values as flat or even. In reality, bounced light modifies the values.



## Value & Distance

Value will also be affected by the aerial cues of contrast and blueness. The cubes closest will have the greatest contrast within themselves and with the environment while those farther away will have less. Furthermore, as the cubes get farther away they move toward a middle gray because of the intervening atmosphere as illustrated below.





## Value & Focus Language

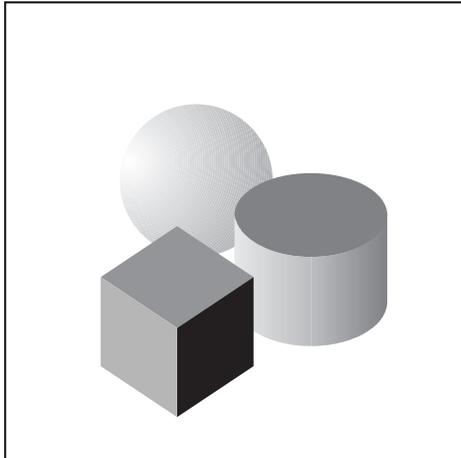
To this point the subject has controlled the grammar (i.e., if the subject is near it has greater contrast). However, one of your responsibilities is to establish the visual focus of the drawing. To do this you can adjust the graphic language to control the focus. In a value drawing this means employing the darkest values and/or values of greatest contrast in the area that is to be the focus.

Focus is often a function of contrast. In a drawing that is dominated by similar values (e.g., all dark) a dramatically different value (e.g., white) will create a strong contrast and thereby become a focal point.

## Composite Tonal Languages

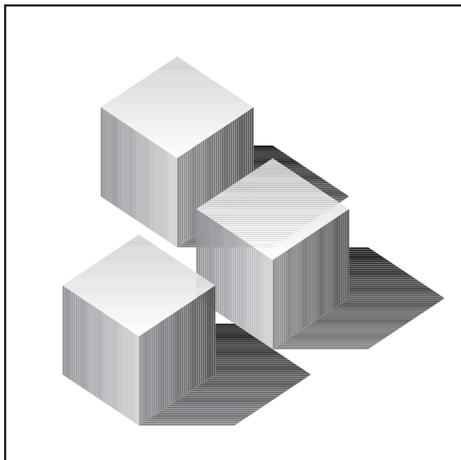
The preceding value languages can be used by themselves or in any combination. In different combinations they can create more sophisticated graphic languages that begin to communicate the many subtleties of form. The preceding examples for distance and focus are such composite languages in that they also employ orientation and shadow grammars.

As stated earlier, the examples employ several spatial cues in addition to those communicated by the values. These include axonometric perspective, vertical location and overlap. The axonometric (parallel line) perspective establishes the rules for the construction and dimensioning of the drawing. It establishes the shapes of the values. Vertical location places near objects lower and far objects higher within the frame of reference while overlap requires that near objects cover portions of farther objects.



## Color & Orientation

In this combination the color language has been modified by adding surface orientation to the light source. The result is that the black cube is given surfaces that are varying shades of the darkest values to retain its darkness while addressing its surface's orientation to the light source. This is a good example of creating a language that communicates what you intend to say without including unwanted information. The goal here would be to retain the general sense of light and dark forms while creating the illusion of three-dimensions.



## Orientation, Shadow & Texture

In this combination the orientation and shadow languages have been enriched to include gradations created by the surface's textures. The textural gradations cause the surfaces to get darker as they move away from the viewer. This is true for all surfaces not parallel to the face of the viewer. The greater the angle the more dramatic the gradation.



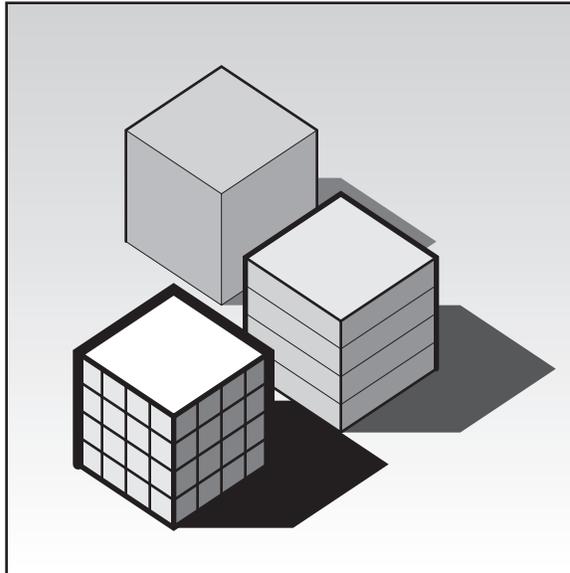
## Value & Expression

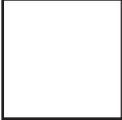
All the examples have used a similar technique for the creation of the values. Therefore, the drawings have a consistent style and similar feeling—they are stiff and mechanical. The technique used, media, key (value or tonal range) and distribution of values within a drawing can support different moods—freehand is different from drafted, pen is different from pencil, high key is different than low key and variegated is different from uniform. Each combination will create a different mood.

The scale and shape of the marks—the style or techniques used to create the values—also influence the expression of the drawing as well as communicate additional meaning. The example below feels very different from the previous drawings.

## Line & Value Languages

The preceding line and value languages can be used by themselves or in any combination. In different combinations they can create more sophisticated graphic languages that begin to communicate the many subtleties of form.



	<b>1 White</b> <b>K: 0%</b> <b>L: 100%</b> <b>B: 65535</b>	<b>Light</b>
	<b>2</b> <b>K: 12%</b> <b>L: 87%</b> <b>B: 57344</b>	
	<b>3</b> <b>K: 25%</b> <b>L: 75%</b> <b>B: 49152</b>	
	<b>4</b> <b>K: 37%</b> <b>L: 62%</b> <b>B: 40960</b>	<b>Shade</b>
	<b>5</b> <b>K: 50%</b> <b>L: 50%</b> <b>B: 32768</b>	
	<b>6</b> <b>K: 62%</b> <b>L: 37%</b> <b>B: 24576</b>	
	<b>7</b> <b>K: 75%</b> <b>L: 25%</b> <b>B: 16384</b>	<b>Shadow</b>
	<b>8</b> <b>K: 87%</b> <b>L: 12%</b> <b>B: 8192</b>	
	<b>9 Black</b> <b>K: 100%</b> <b>L: 0%</b> <b>B: 0</b>	

### Value Settings

The values are numbered 1 (White) through 9 (Black). The percentages and numbers that follow give the corresponding settings for the CMYK (K: Black), HLS (L: Lightness) and Apple (B: Brightness) color specification systems.

## Light, Shade, Shadow Languages

The most common value languages are those that address the affect of light on surfaces. These languages use the orientation and shadow languages previously discussed as their base that is then modified by the number of values to be used. Light, Shade, Shadow languages can easily be combined with other value as well as line languages to create as complex and subtle a language as desired.

The Light, Shade, Shadow languages vary in the degree to which they require the simplification of the thing being represented. The products range from abstract to representational depending on the degree to which they simplify or faithfully delineate the subject's detail and subtlety.

The languages will be presented from the one using the fewest values to the one that uses the most. They create a continuum from two to nine values and although the languages presented will only demonstrate those using two, three and nine any number can be used based on the subject and the intended communication.

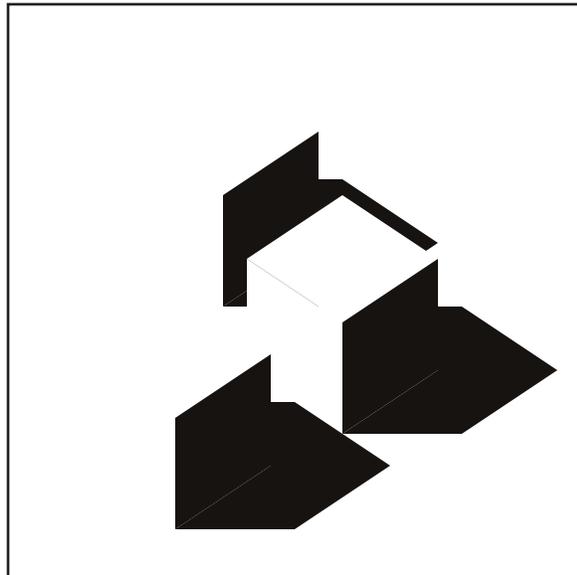
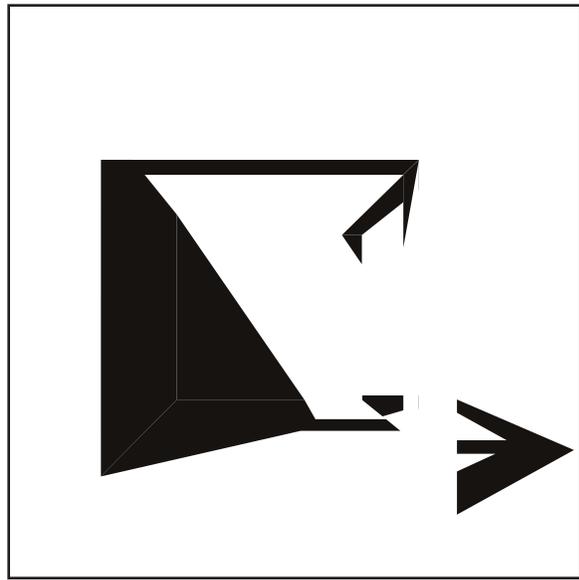
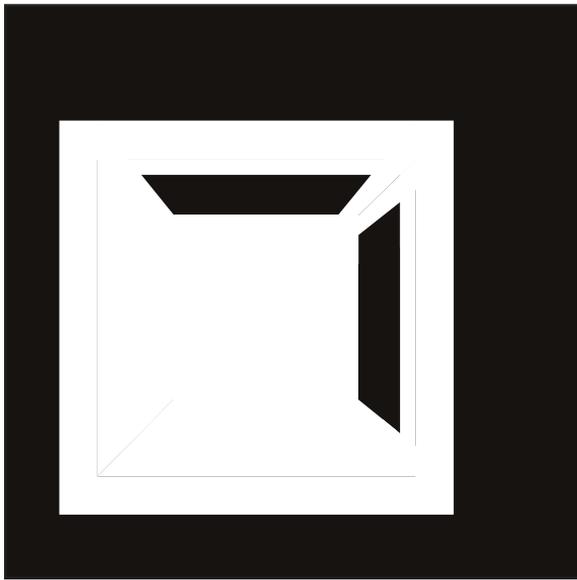
### Value Scale

When we make a drawing one of the fundamental decisions is the number of values that will be used because it controls the level of abstraction and the time it will take to complete the drawing. The number of values that can be created and seen in a drawing is not infinite. A nine step value scale will support most drawing.

There are three basic surface lighting conditions that must be represented with values. Surfaces that receive direct illumination (Light), surfaces that face away from the light (Shade) and surfaces that would be in direct light but the light is being blocked (Shadow). The nine step scale works very well for the three lighting conditions in that each can have three values. Given that there are only three possible orientations for surfaces within any one lighting condition when representing rectilinear forms the nine step scale provides a different value for each possibility.

### The Languages & Process

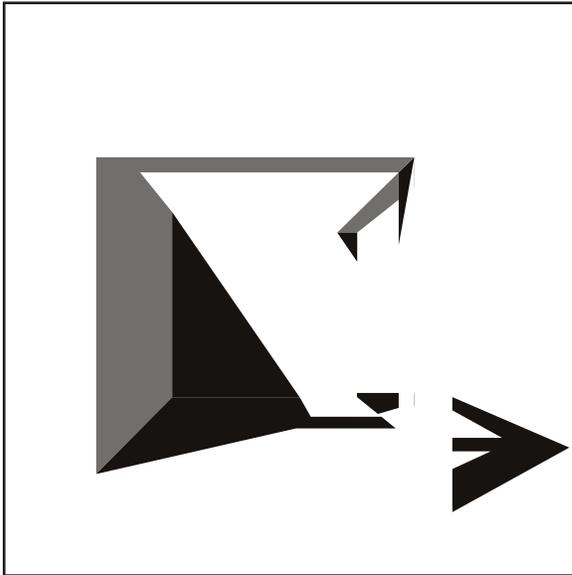
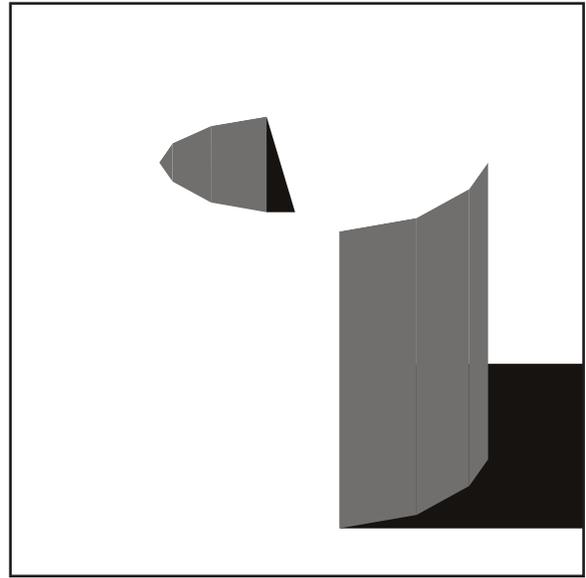
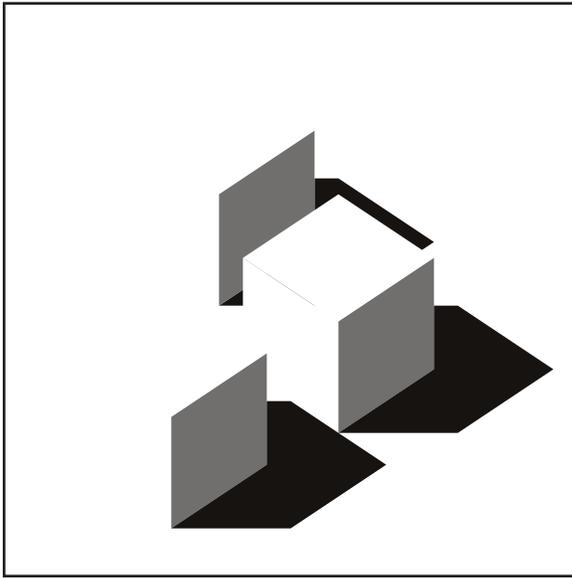
The languages can provide a strategy for developing a drawing. Their sequence from abstract to representational can be used in developing a drawing. The two and three value languages can be used in creating preliminary studies that examine composition, form and value distribution. The three value language can be used to establish initial values. For example, when applying values to a drawing begin by applying the lightest value in each category (1:Light, 4:Shade, 7:Shadow). This allows you to establish the three lighting conditions without precluding subtlety within them. The values within each category can then be gradually darkened to create differentiation and enhance the illusion of three-dimensional form.



## Two Values

The minimum number of values is two. The contrast between the values can be subtle or dramatic. The vocabulary usually employs values of high contrast consisting of #1 White: 0% and #9 Black: 100%. The grammar or rules for their use can take two forms. The first (top left) is to use them to differentiate between positive and negative areas. In the examples the positive areas (things) are white and the negative areas (spaces) are black. This language flattens three-dimensional form, creates the highest contrast and the strongest graphic images. These drawings can be very intriguing when there is an ambiguity as to which of the values (white or black) is representing the subject of the drawing.

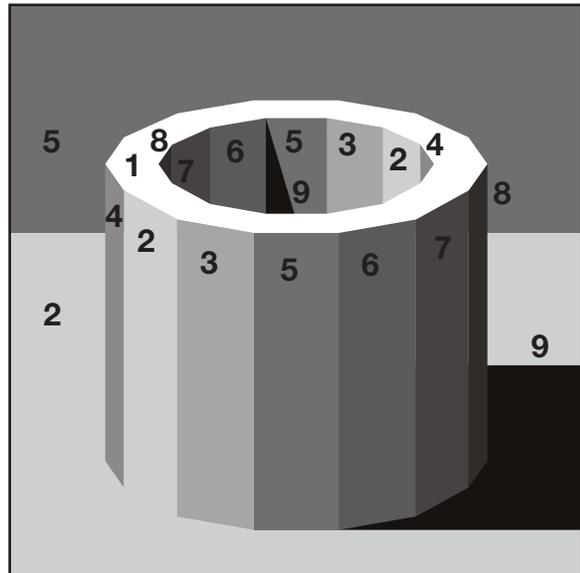
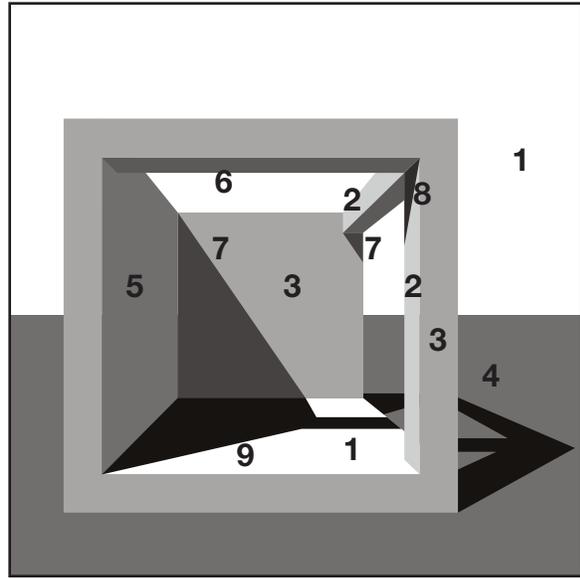
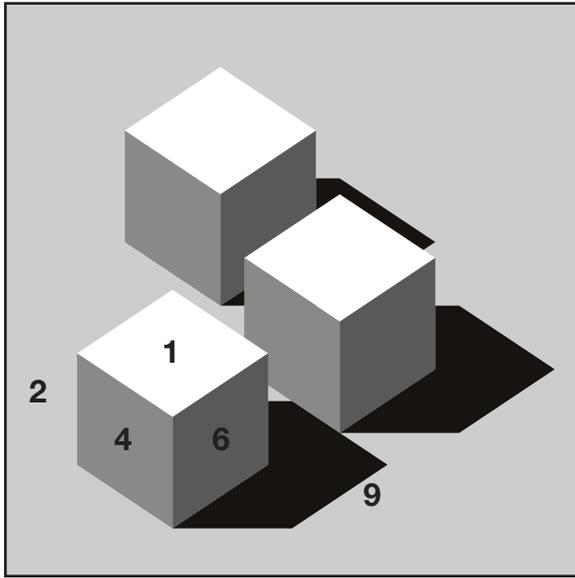
The second approach (the other three illustrations) is to make all light surfaces #1 White: 0% and all shadow surfaces #9 Black: 100% and then make some judgment as to which shade values in a scene will be represented by black and which by white. In the examples, all shade surfaces are represented in black.



### Three Values

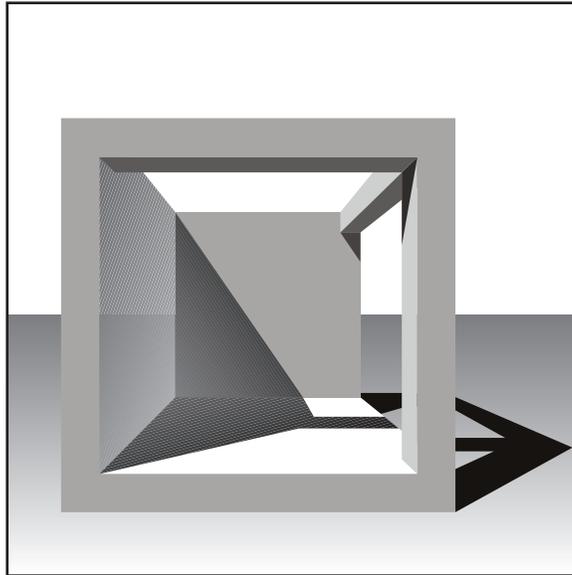
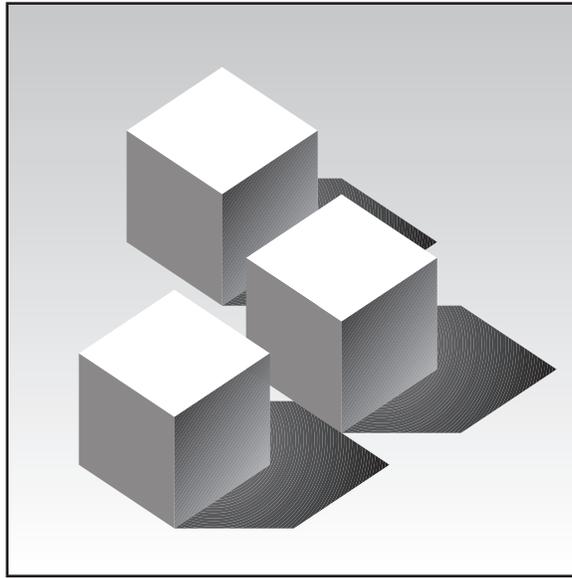
The vocabulary consists of three continuous values that can be chosen to minimize or maximize contrast. As with the two value language, values that maximize contrast are usually chosen (1, 5 and 9).

The grammar is that surfaces in direct sunlight are to be #1: White, those in shade are to be #5: 50% gray and those in shadow are to be #9: 100% black. This language also tends to abstract reality and create strong graphic images with sharp contrast. It is useful in compositional and massing studies.



## Nine Values

This language can use any number of values between four and nine. The number chosen to be used will depend on the number and orientation of the subject's surfaces, what is needed to create appropriate differentiation and the desired communication. The values were chosen to maximize the contrast between light, shade and shadow and the steps within. With nine values you can show a great deal more variation and suggest more detail as in the tree drawing.



## Gradations

Gradations are a way of extending the value range and representing reflected light. An example of extending the value range would be to use a #7 to #3 gradation for a shaded surface instead of #6 to #4. This would be a way of representing reflected light while maximizing contrast with adjacent surfaces.

## Creating Values

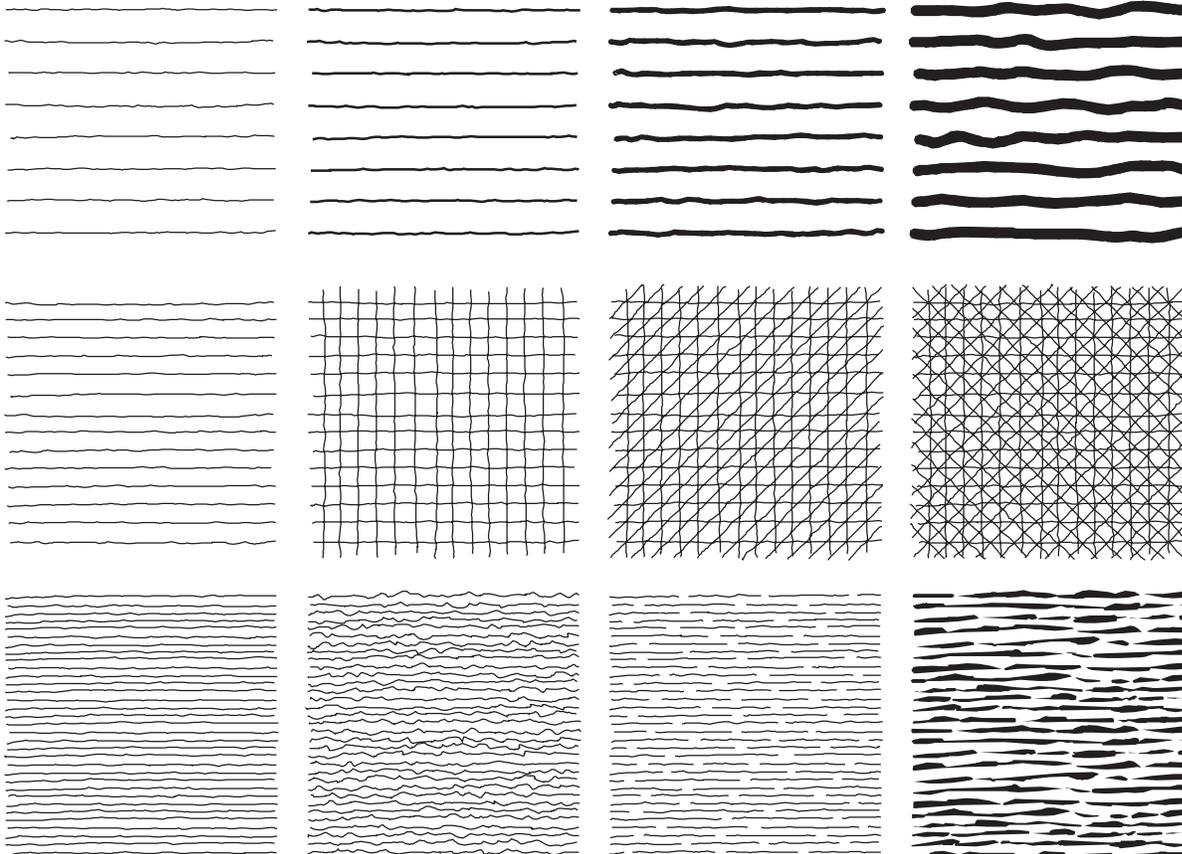
In the illustrations for the languages presented so far all values have been shown as continuous (smooth) tones. The marks creating the values have been invisible or small enough not to be noticed. However, given that textural gradation is a key visual cue in perceiving the orientation of a surface and that contour lines can describe the form and quality of a surface it is desirable to create values with marks that are visible. Values created using marks can be categorized as hatching, textures or stippling.

### Hatching

The use of straight lines that cross the entire surface to create a value is called hatching. It is one of the most basic drawing techniques for creating values. The matrix below identifies the variables that can be combined and manipulated to create values with lines. The variables include line spacing, line weight, line layers and line quality.

#### Line Spacing

Given a constant line weight, value can be increased or decreased by varying the spacing of the lines as shown below down the left hand column.



### Line Weight

Given a constant line spacing, value can be increased or decreased by varying the line weight as shown below across the top row.

### Line Layering

Given a constant line weight and spacing, value can be increased or decreased by varying the number and direction of layers of hatching as shown below across the middle row.

### Line Quality

The quality of the lines used in hatching can affect value to some extent however, the most important contribution that line quality makes is in communicating something about the nature of the surface itself. Line quality can indicate the texture and uniformity of a surface. Lines used in hatching can vary in their straightness, continuity and weight as shown below across the bottom row.

The four factors of line spacing, weight, layering and quality can be combined in many combinations to support the creation of values, the communication of surface qualities and the illusion of three-dimensional form and depth.

## Texturing

The use of lines that do not cross the entire surface will be called texturing. The values created by texturing are affected by line spacing, weight and layering as described under hatching.

Texture's most dramatic impact is in the area of expression. Decisions concerning the technique used (line quality, length, weight and organization) can communicate feelings of relative freedom, hardness, weight, etc.

## Line Organization

Given constant weight lines their organization can range for rows of parallel lines to overlapping lines with random orientations as shown below across the top row.

## Line Length

Given constant weight lines they can range from short to continuous as shown below down the left column.

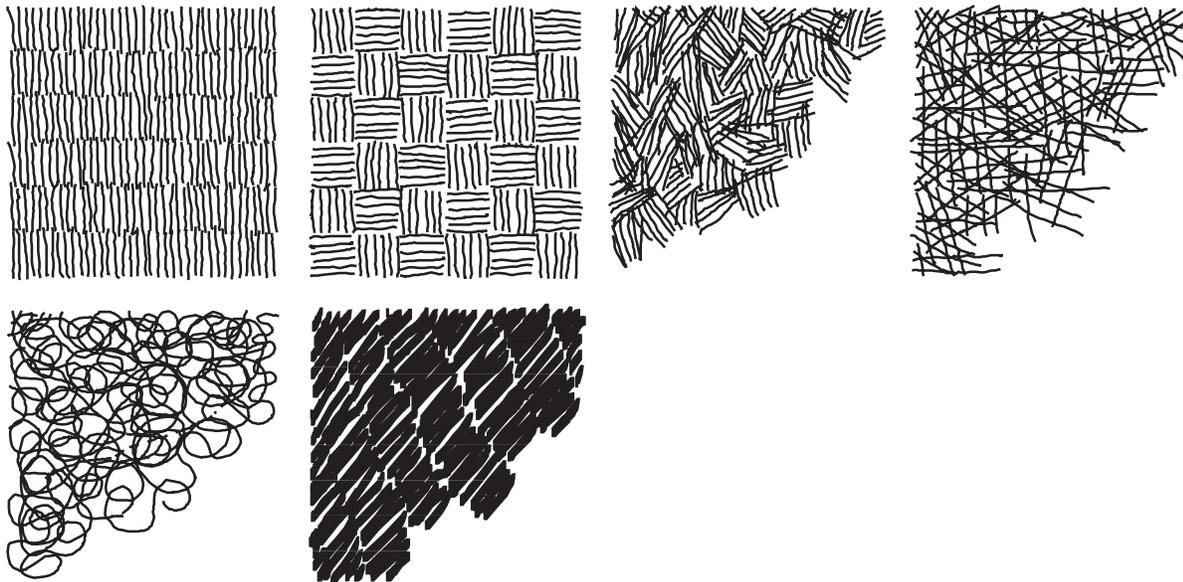
## Line Quality

As described under hatching, the quality or form of the line can strongly affect the feel of the texture. For example, in the left column, the smooth flowing line used in the continuous scribble has a very different feel when compared with the rows of lines above.

## Line Weight

Line weight strongly affect the visual weight and scale of a texture. The right hand example on the bottom row below feels bolder and closer than the other examples. It is important to consider the scale implications of line weight when making graphic decisions.

The examples touch on only a few of the possible textures that can be created using lines. Look for other possibilities in drawing books and publications. Make copies of the textures that you find and build a reference library that you can choose from to meet time and expression constraints of a given presentation. Remember that decisions must always be made in relationship to the drawing as a whole and the creation of the illusion of three-dimensional form and depth.



## Stippling

The use of dots to create a value is called stippling. It and lines are the most basic drawing techniques for creating values. The illustration below identifies the variables of spacing and size that can be combined and manipulated to create values with dots.

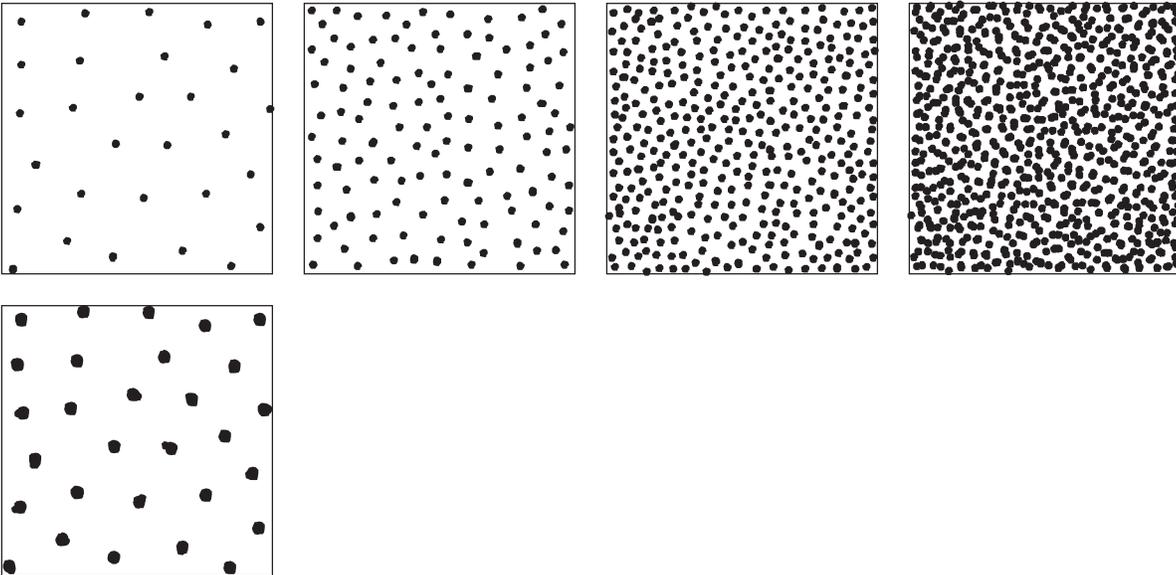
### Dot Spacing

Given a constant dot size, value can be increased or decreased by varying the spacing of the dots as shown below across the top row.

### Dot Size

Given a constant dot spacing, value can be increased or decreased by varying the dot size as shown below down the left column.

The factors of dot spacing and size can be combined to support the creation of values, the communication of surface qualities and the illusion of three-dimensional form and depth. They can also be combined with hatching and textures to further extend the possibilities.



# ENTOURAGE



*The inclusion of entourage in a drawing is important because it gives the drawing scale and moves it toward a more realistic representation of the design proposal. Entourage includes people, trees, cars, furnishings, etc. There are many good books that provide examples of these for you to trace. This section gives you a brief introduction and provides a few examples of people and trees. Use the examples to practice drawing and as a tracing file.*

## People

People are an important part of any architectural drawing—architecture's essential function is to support human activity. Their inclusion in a drawing indicates how a space is to be used, they suggest action, participation and involvement, they demonstrate spatial qualities and most important they give scale. In fact, people are the most important scale giving elements in a drawing. As you begin learning to include people it is efficient to trace them into your drawings. This gives you drawing practice and presentations do not suffer from poorly executed people. With time you will be able to construct figures from scratch.

## General Recommendations

The following is a list of the most common guidelines that appear in texts on drawing people in architectural sketches.

The degree of detail that the people exhibit should be at the same level as the remainder of the drawing.

Keep the drawings of people simple with authentic characteristics. They should remain secondary to the architecture or design idea that you are presenting. They should be drawn with a minimum of detail. Outline figures are very appropriate.

Evolve the figures in a series of steps as you evolve your sketch.

Place people so that they demonstrate (occupy) the different kinds of spaces and places in the design. Do not place them so that they hide space-defining intersections.

Show people in groups interacting (talking) with each other. The angle of the head can indicate this but you should avoid the profile in favor of a three-quarter view.

Show both back and front views of people.

Show people doing something. However, the activity should not be exaggerated or it will call attention away from the idea you are presenting. Also, have the people relating to something within the sketch or attention will be diverted out of the drawing.

Show background people in groups.

Avoid abrupt change in the scale of figures. Have figures gradually get smaller and thereby draw your eye into the space of the sketch.

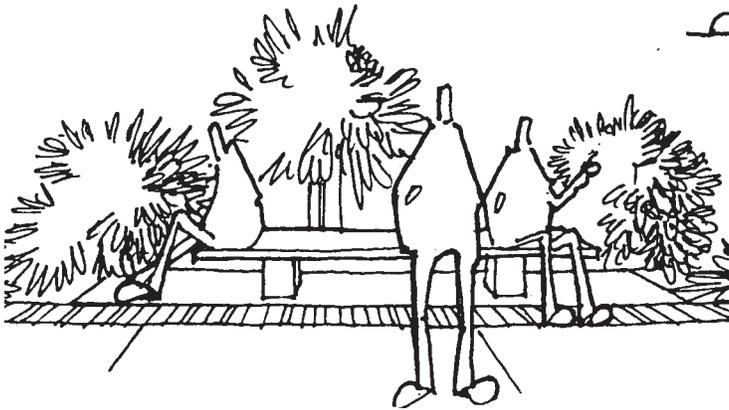
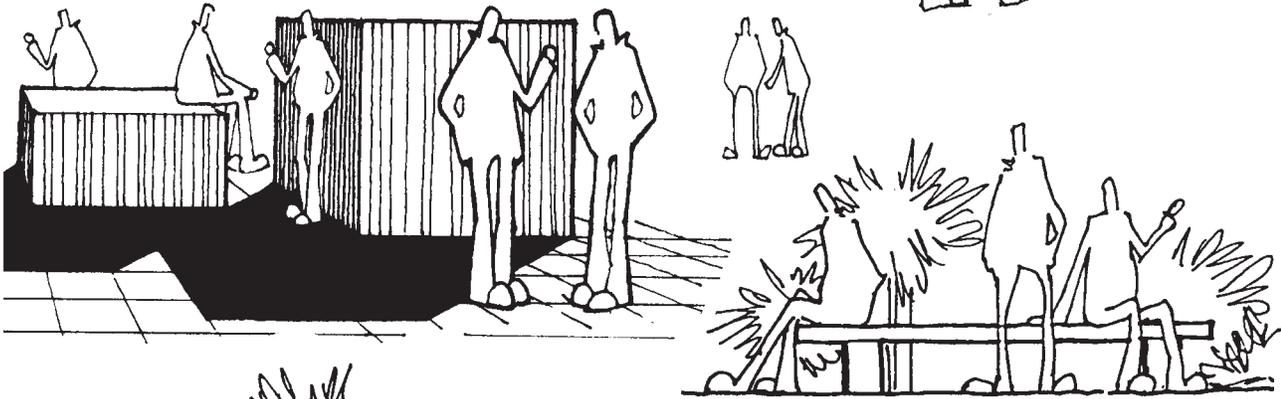
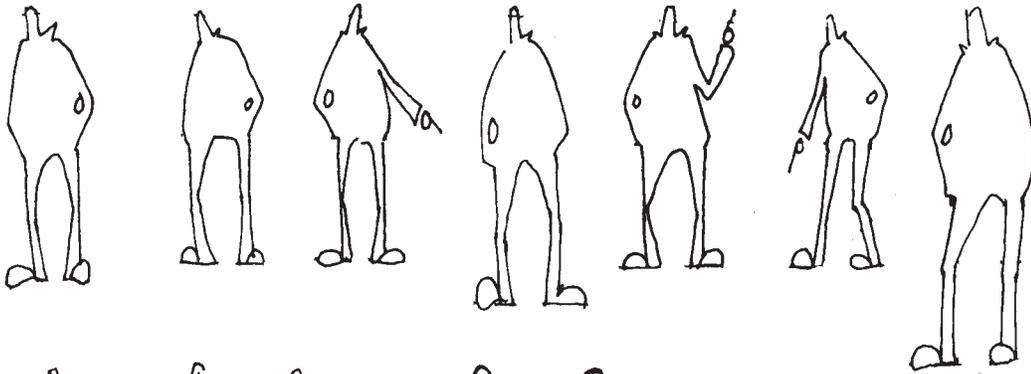
Show people with gestures such as waving hands or hands in their pockets.

Show both sexes and kids but make sure the average person predominates.

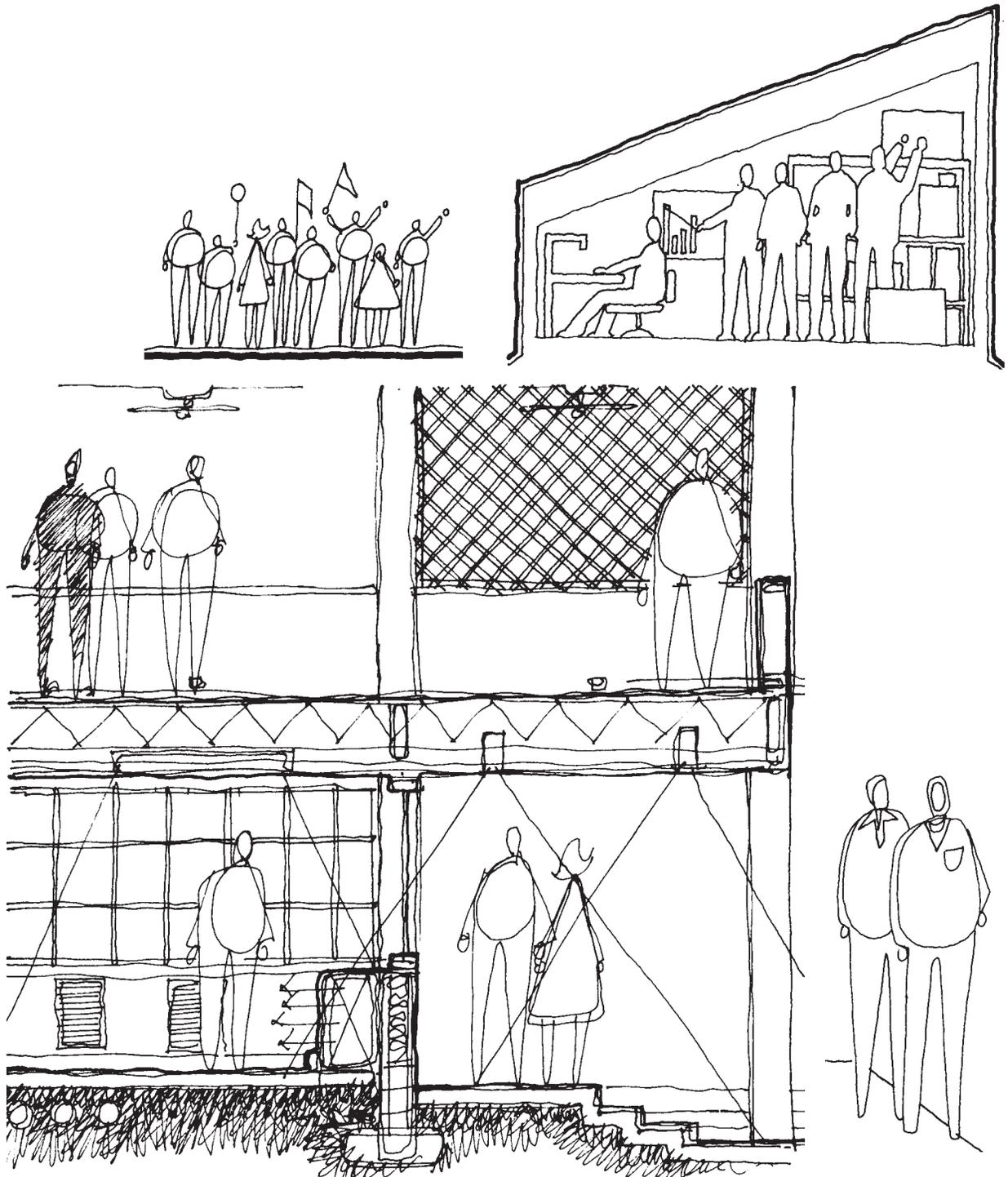
Show people carrying things in their hands.

Show people interacting with the environment. For example, sitting on chairs or walls, looking at or examining things or leaning against things. Have seated people with their elbows on a table or over the back of the chair.

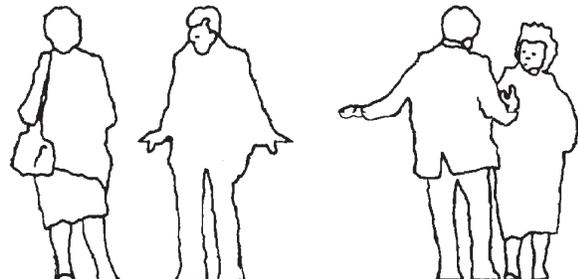
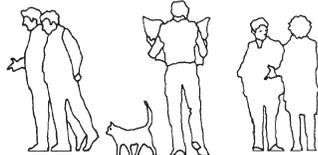
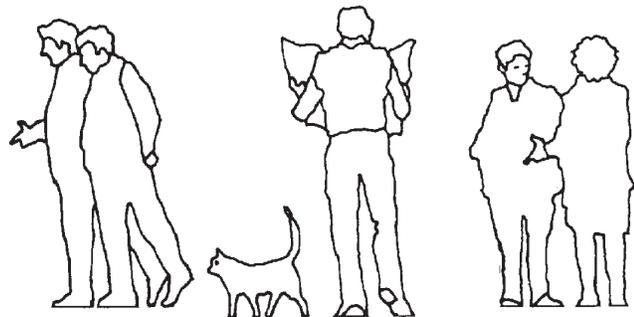
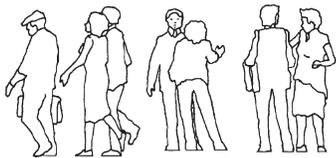
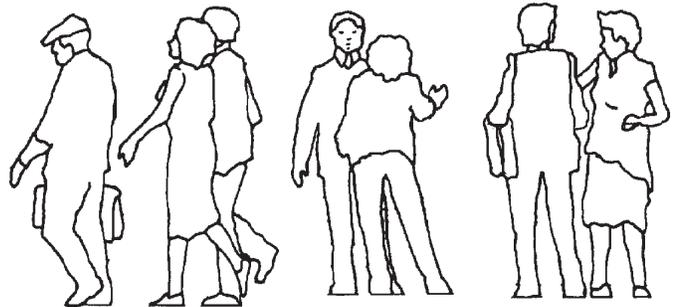
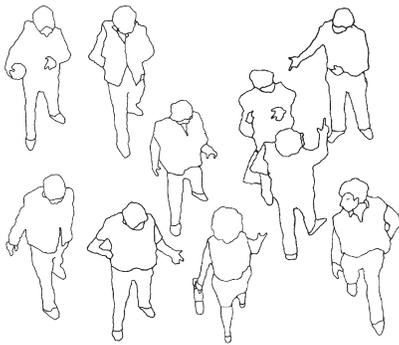
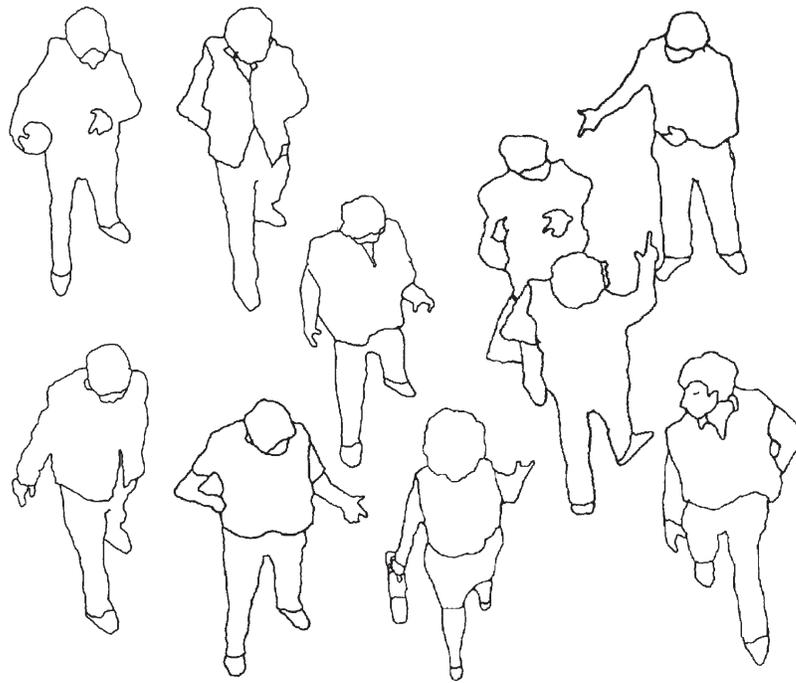
The human figure should seldom be drawn symmetrically. We tend to stand with our weight distributed off center, our shoulders sloped to one side and our arms in different positions.



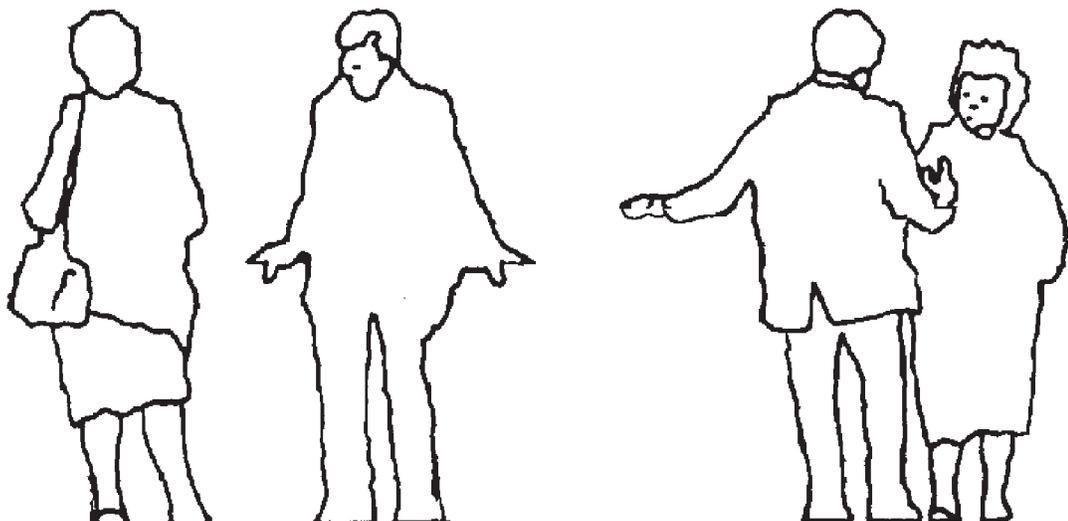
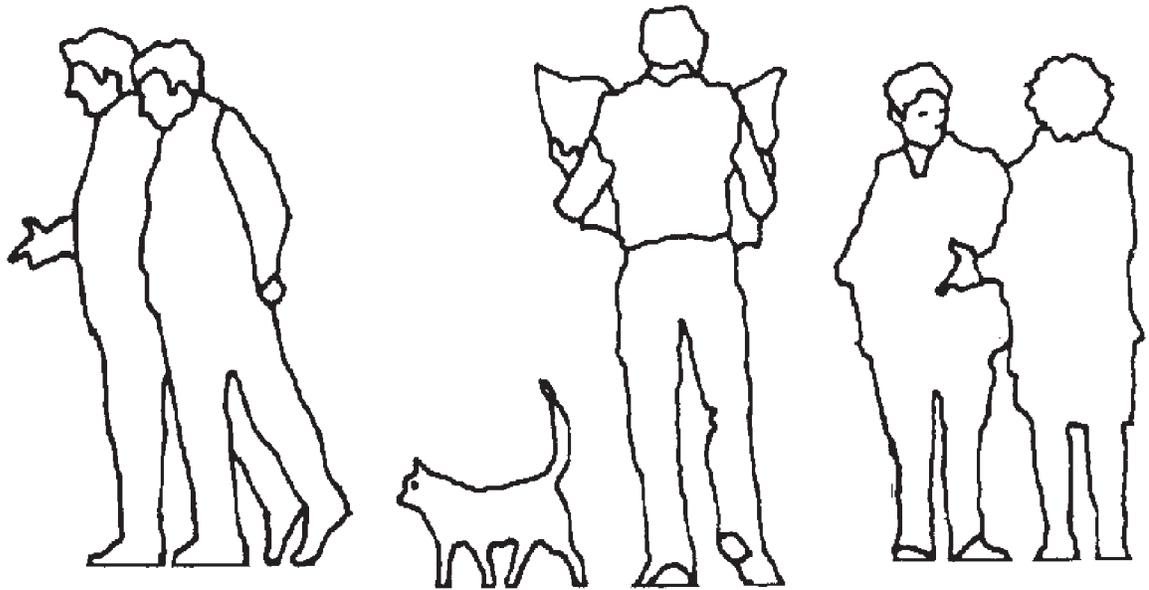
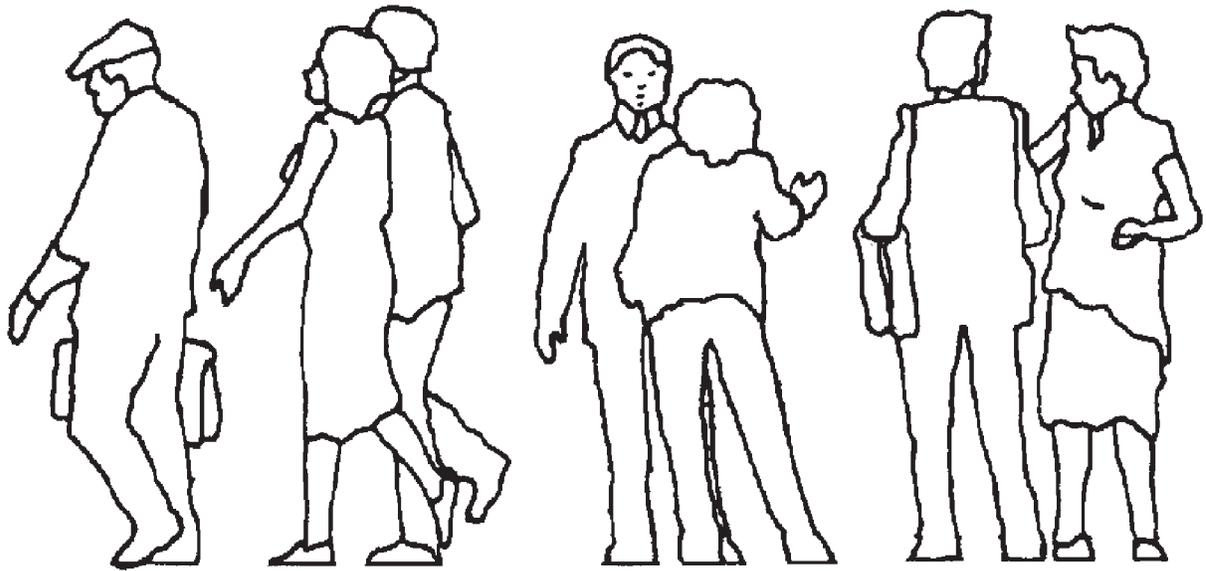
People by Lari M. Wester



People by Edward T. White

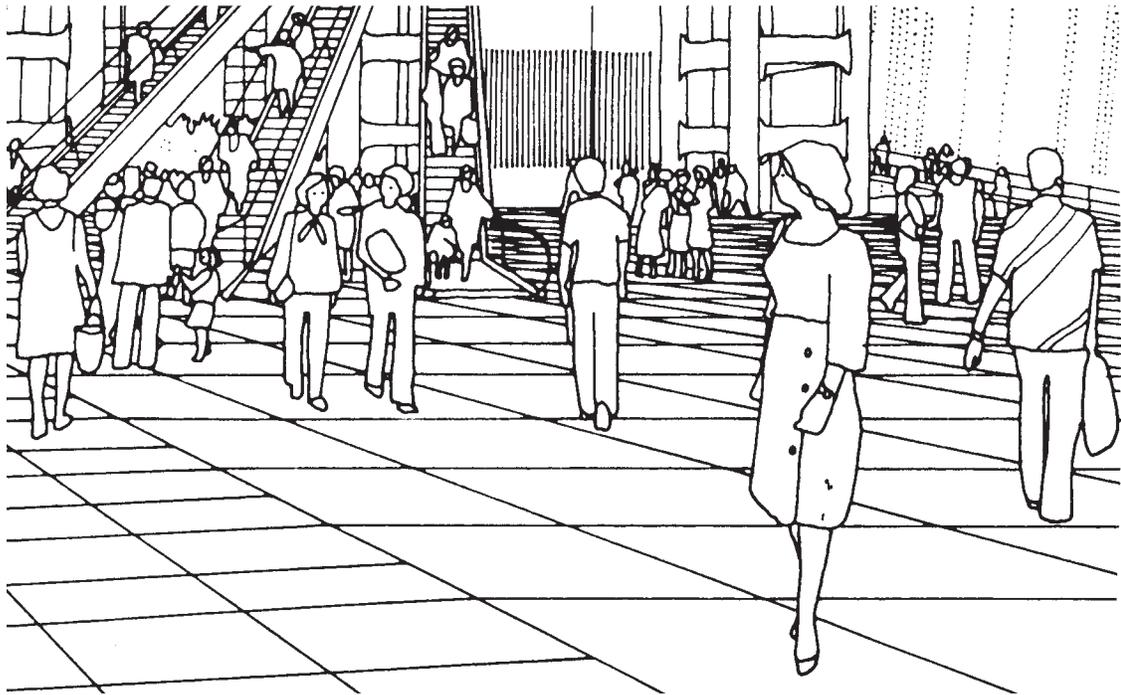
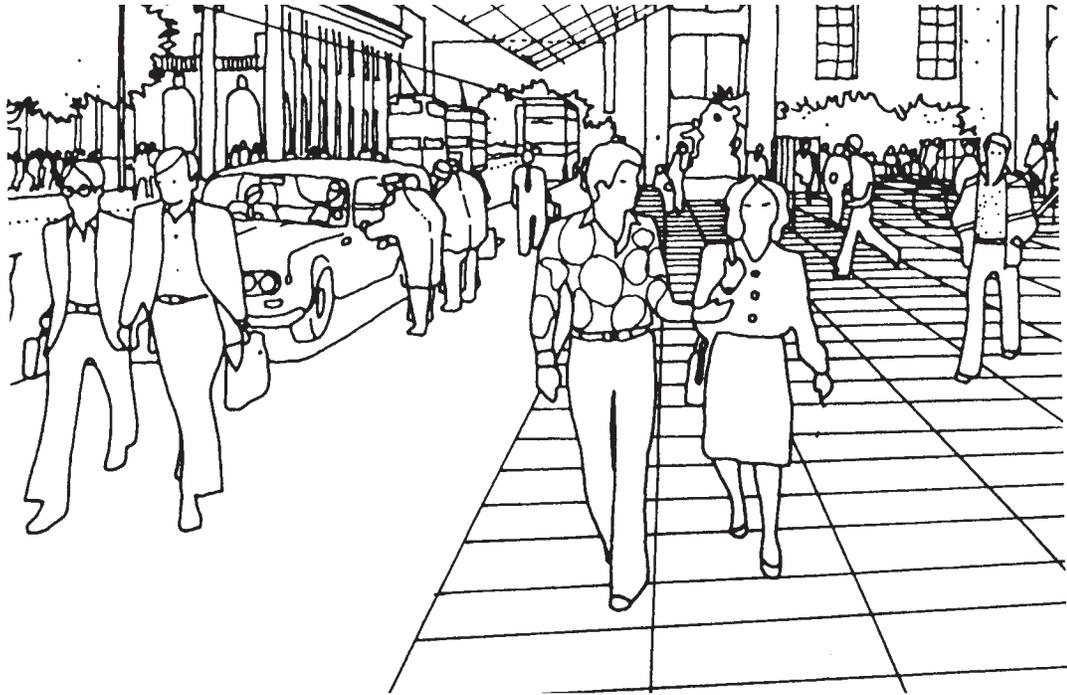


People by Porter & Goodman, 1991





People by Porter & Goodman, 1991



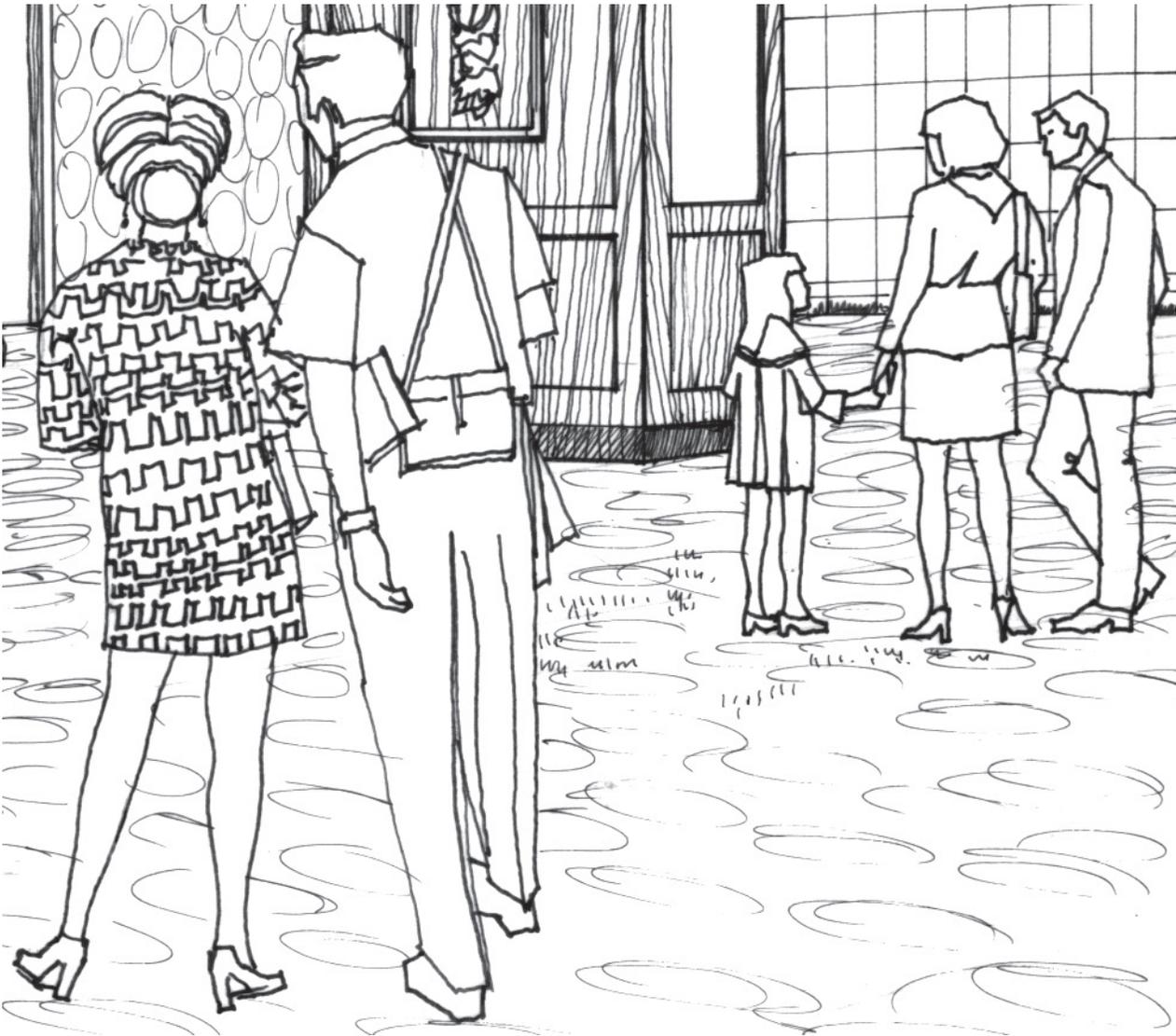
*People by Porter & Goodman, 1991*



*Drawings by Segedin & Associates*

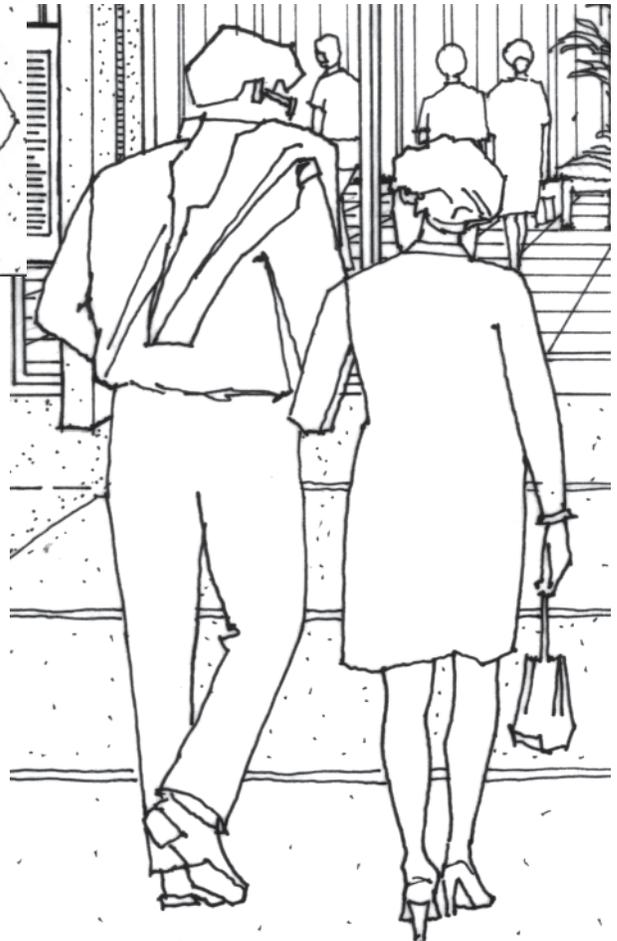
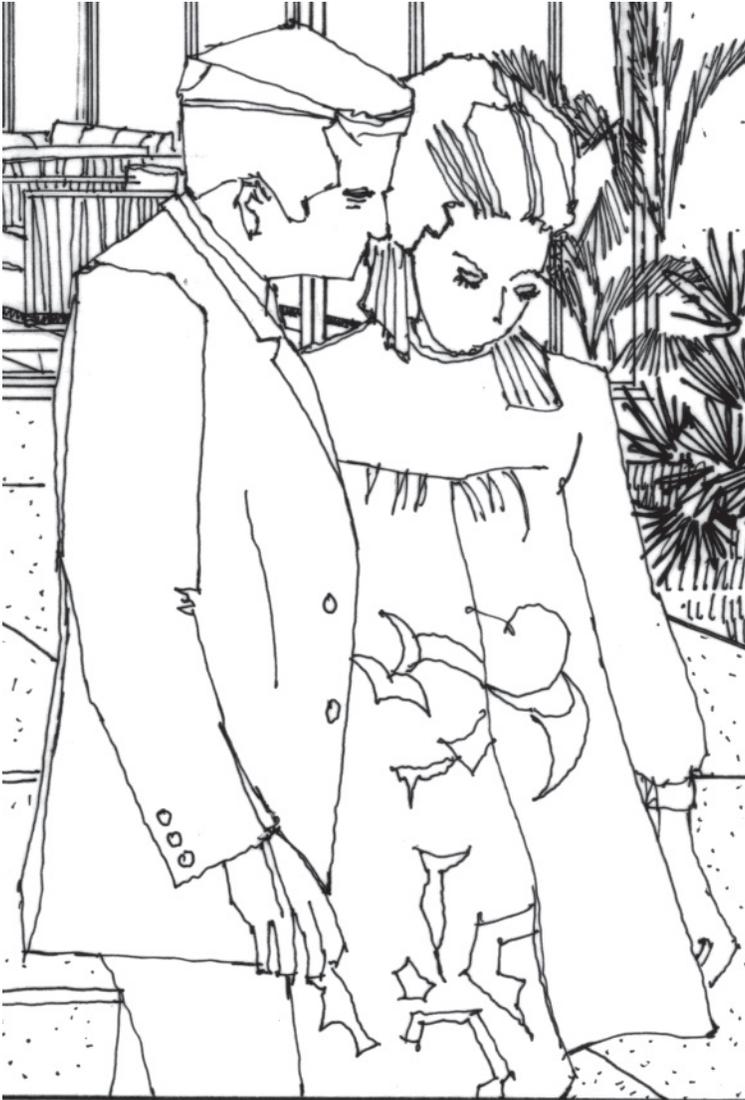


*Drawings by Segedin & Associates*





*Drawings by Segedin & Associates*



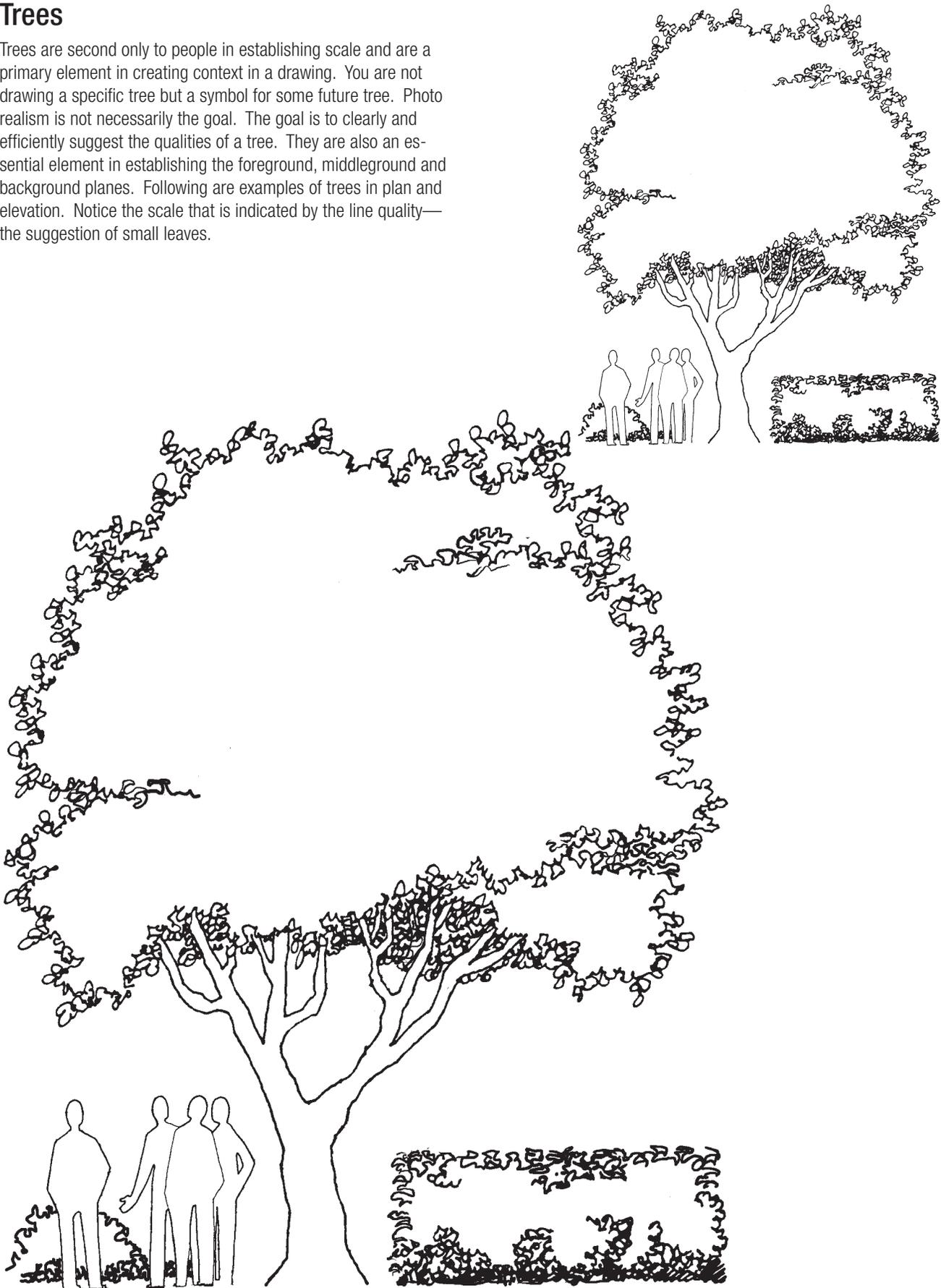
*Drawings by Segedin & Associates*



*Drawings by Segedin & Associates*

## Trees

Trees are second only to people in establishing scale and are a primary element in creating context in a drawing. You are not drawing a specific tree but a symbol for some future tree. Photo realism is not necessarily the goal. The goal is to clearly and efficiently suggest the qualities of a tree. They are also an essential element in establishing the foreground, middleground and background planes. Following are examples of trees in plan and elevation. Notice the scale that is indicated by the line quality—the suggestion of small leaves.



## References

Wester, Lari M. 1990. *Design Communication for landscape Architects*. New York: Van Nostrand Reinhold,

Porter, Tom & Sue Goodman. 1991. *Design Drawing Techniques for Architects, Graphic Designers, & Artists*. New York: Charles Scribner's Sons.

White, Edward T. 1972. *A Graphic Vocabulary for Architectural Presentation*. Tucson: Architectural Media.

