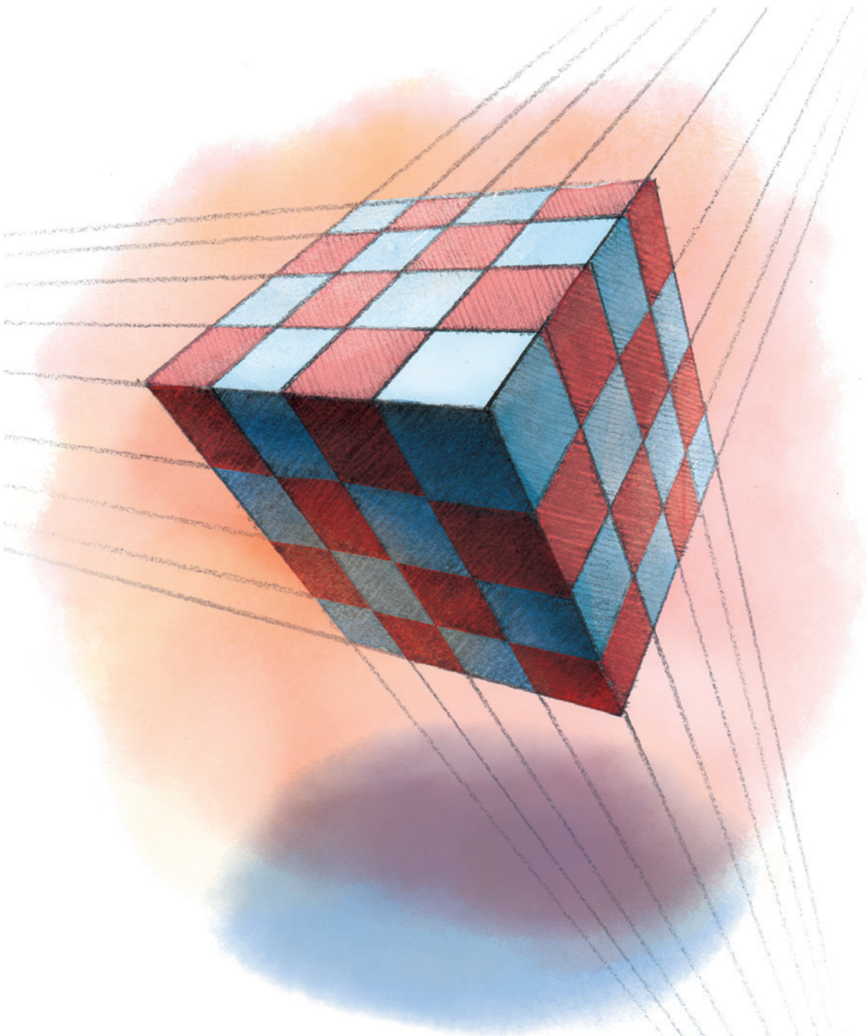
PERSPECTIVE DRAWING



SARAH HALEY

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SARAH HALEY

TEMPE DIGITAL

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CONTENTS

PREFACE

Perspective is a powerful way of seeing

Whether we are aware of it or not, perspective is a constant in our perception of the three-dimensional world. As you watch the sun set over the ocean where it appears to meet the sky, the horizon line is ever present. Driving down a long road that appears to narrow and disappear into the distance, we intuitively know that a vanishing point is an illusion of depth. As we peer at a distant mountain, atmospheric perspective cues tell us it is far away, even if we do not understand why. We move through three-dimensional space viewing everything in our world in perspective, though we may not be consciously aware of how it works. This book will open your eyes to a new understanding of your surroundings, enhancing your powers of observation to launch a unique appreciation of the world around you.

Perspective is an essential drawing and design tool

Perspective can be used to depict depth and volume and to give your visual work a convincing three-dimensional appearance of space. Perspective is one of the key principles of drawing, and better understanding of it will markedly improve your drawing skills.

Most commonly, artists use perspective to depict realistic three-dimensional spaces. However, perspective can do so much more than simply express reality. You can use perspective tools to bring to life unreal, exaggerated, and physically impossible subjects that could never exist in real three-dimensional space. This makes perspective a versatile tool for visual expression that can open doors to your imagination and expand your creative possibilities.

Perspective is for everyone

This book is for beginning and intermediate art and design students, and anyone wanting to learn or improve upon essential drawing skills. Students of the studio arts such as drawing and painting, and designers in a broad range of disciplines including graphic design, interior design, animation, web design, game art and design, and fashion design will all find this text relevant.

ACKNOWLEDGMENTS

With great humility, I have the utmost gratitude for everyone who has made this book possible.

Jeff and Tempe Digital have gently guided me through this daunting process with patience and wisdom.

Navid Baraty, Bo Bartlett, Anya Belkina, Michael Bilsborough, Andy Burgess, Katarina Burin, Thomas Burke, Christopher Najee Chandler, Jeff Clay, David Curtis, Valerio D'Ospina, Nuno de Campos, Rick Dula, Nicole Eisenman, John Finnerty, GMUNK, Nicola López, J. Diane Martonis, Shannon Rafferty, Anna Sew Hoy, Jos. A. Smith, William Steiger, Padraig Timoney, Jaime Brett Treadwell, Wayne White, Katherine Winter, Zimoun, and Marina Zurkow have been very generous with their creative talent.

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My mentors Anya Belkina and Jos A. Smith mean more to me than I could summarize here but I am forever grateful for their guidance.

My mom and dad have always known this project would eventually be completed, even when I did not.

And I would not be half the person I am without Elizabeth, Innesse, Nela, and Matt. I am forever appreciative of their love and support.

ABOUT THE AUTHOR

Photography by Kevin Nguyen

Sarah Haley has over a decade of experience teaching art and design, particularly linear perspective. She designed courses in perspective drawing for the Art Institute of Pittsburgh–Online Division, where she also taught and served as an assistant online program director for the Art Foundations department.

As a practicing artist, Sarah frequently receives commissions for architectural drawings and paintings. She earned her BA in Art History & Visual Art from Duke University in Durham, North Carolina, and her MFA in Painting from The Pratt Institute in Brooklyn, New York. Sarah currently lives in Austin, Texas, with her husband and two children.

For more information, please visit: http://sarahsfineart.com

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LINEAR PERSPECTIVE

1

1 LINEAR PERSPECTIVE

Linear perspective is a geometric method of depicting three-dimensional subjects on a two-dimensional format. Linear perspective creates the illusions of depth and dimension by modeling monocular vision. **Monocular vision** describes how one eye perceives depth. Binocular vision describes how both of our eyes in combination perceive depth (1-1).

Linear perspective operates on three basic principles that summarize how we perceive depth through monocular vision: diminution, convergence, and foreshortening. Together they

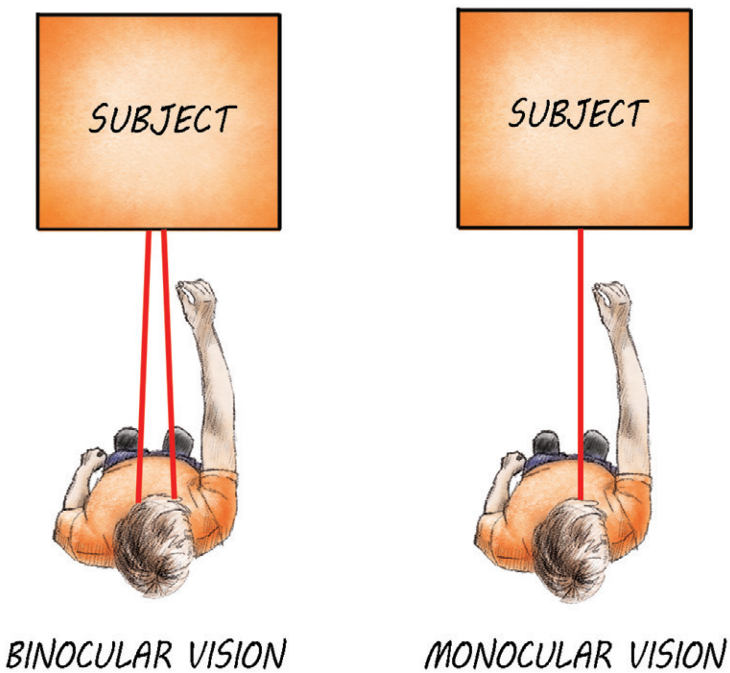


Figure 1-1

DIMINUTION. Nicole Eisenman, **Seance**, 2011. Oil on canvas, 60 x 72 inches. © *Nicole Eisenman. Photography by Robert Wedemeyer. Courtesy of the artist and Susanne Vielmetter Los Angeles Projects.*

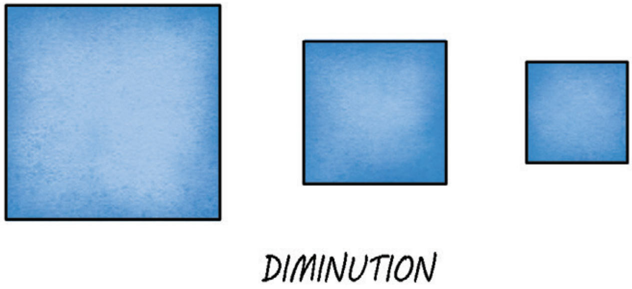
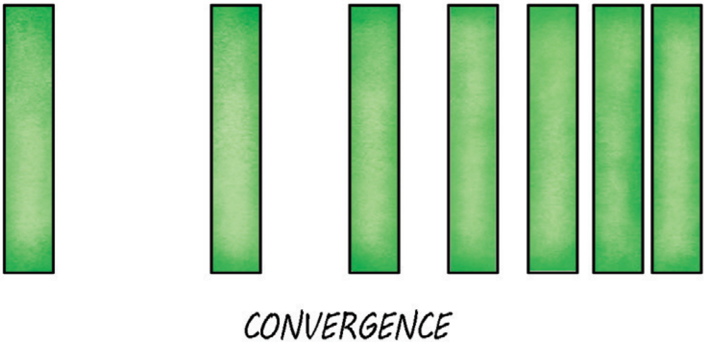


Figure 1-2

create the observable phenomenon that constitutes linear perspective. When receding forms appear increasingly smaller, we call that **diminution** (1-2). When receding forms appear

CONVERGENCE. Christopher Najee Chandler, **Foggy Night Road**, 2017. Photograph, 3456 x 5184 pixels. © *Christopher Najee Chandler. Courtesy of the artist.*



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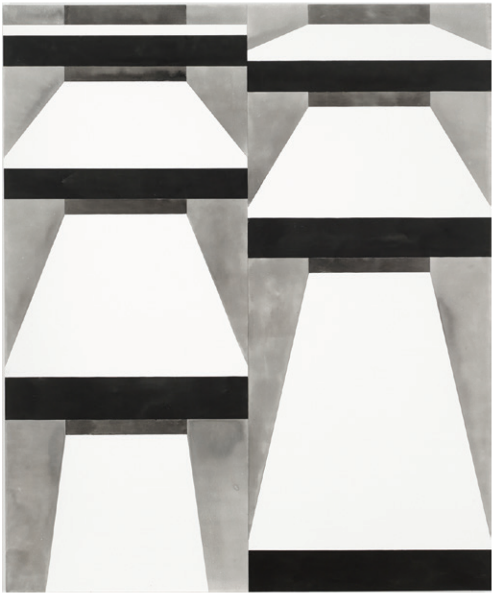


FORESHORTENING. Padraig Timoney, **Riser and Landing**, 2010. India ink on canvas, 86 ⅝ x 71 ⅝ x 2 inches. © *Padraig Timoney. Courtesy of the artist and Andrew Kreps Gallery, New York.*

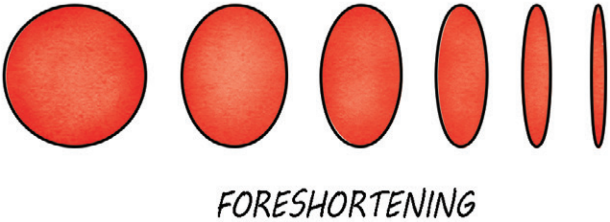


Figure 1-4

increasingly closer together, that is called **convergence** (1-3). And when receding planes appear to shorten, that is referred to as **foreshortening** (1-4).

The two-dimensional rectangular plane and its three-dimensional counterpart, the rectangular prism, are the building

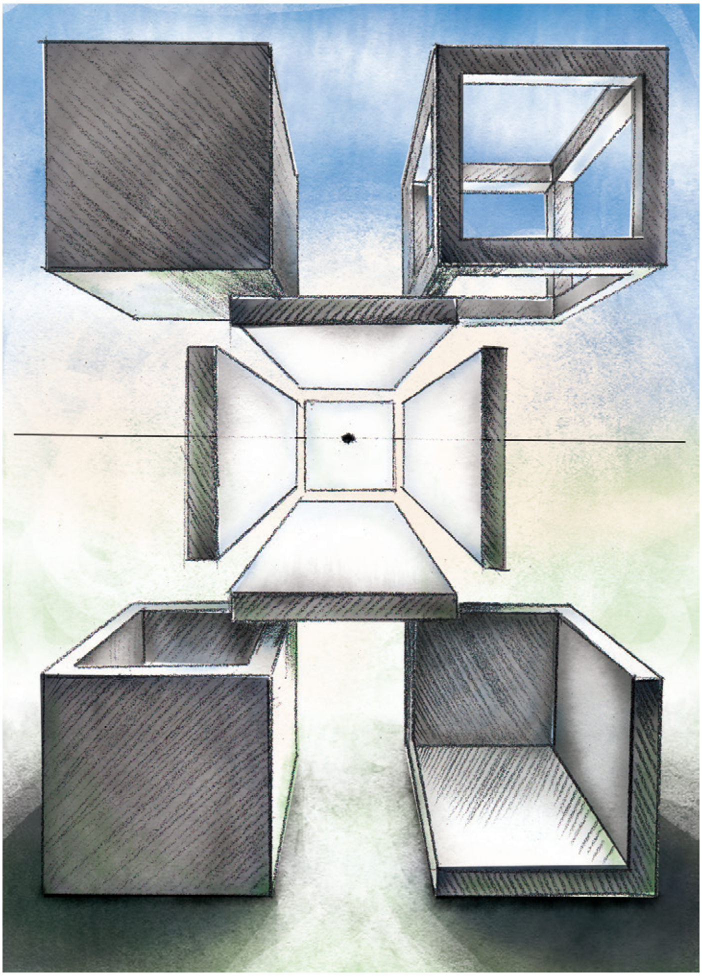
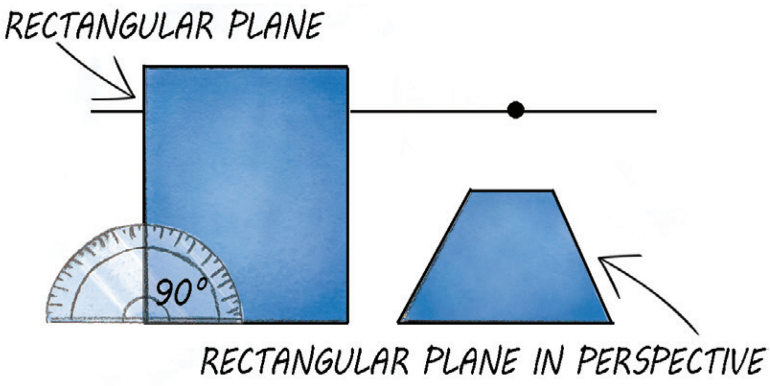


Figure 1-5

blocks from which all forms are derived in linear perspective. The presupposition of the rectangular prism is of supreme foundational significance because it models three-dimensional space, the most basic form of which is a box (1-5). A **rectangular plane** has 90-degree angles and two sets of parallel edges (1-6). A **rectangular prism** has 90-degree angles and three sets of parallel planes and edges (1-7).



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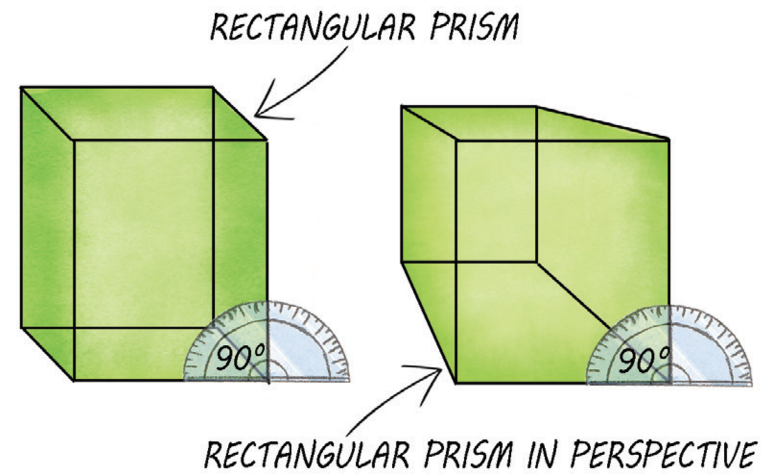
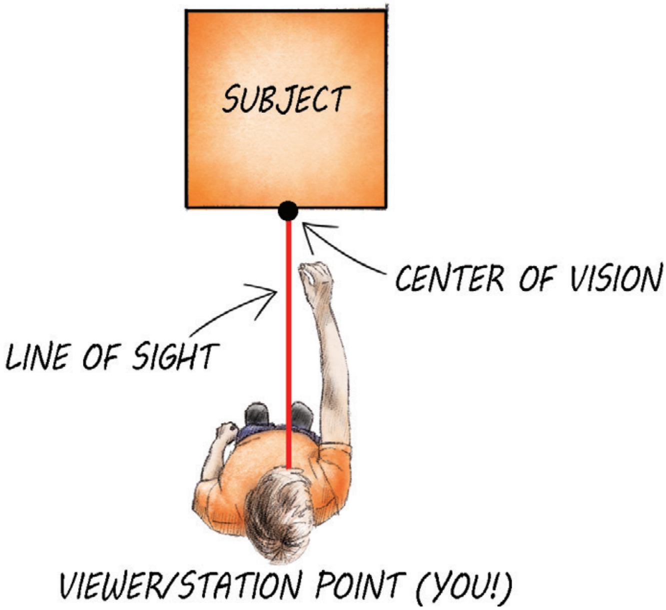


Figure 1-7

Essential to perspective is having one fixed point of observation. Think of yourself as the viewer. Choose a location, and fix your gaze in a specific direction. Your location—the viewer's location—is referred to as the **station point**. The direction in which the viewer looks is the **line of sight**. The endpoint of the viewer's line of sight is called the **center of vision**. When you combine the viewer's station point and center of vision, that's



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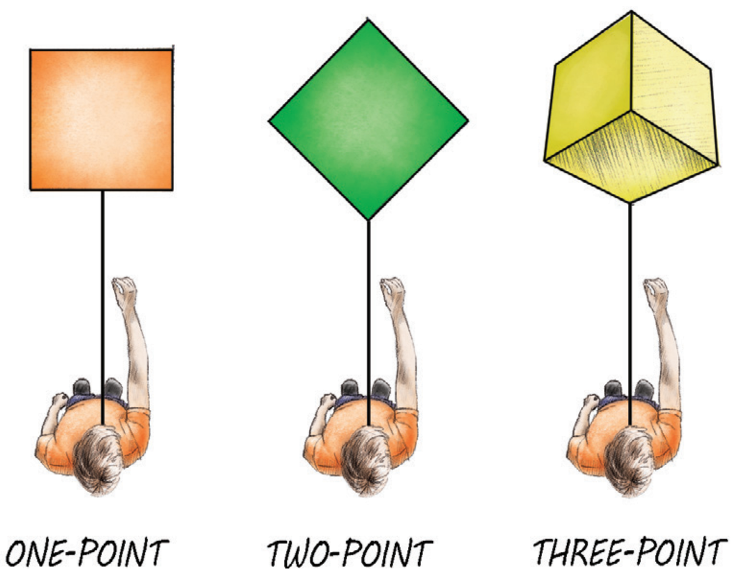

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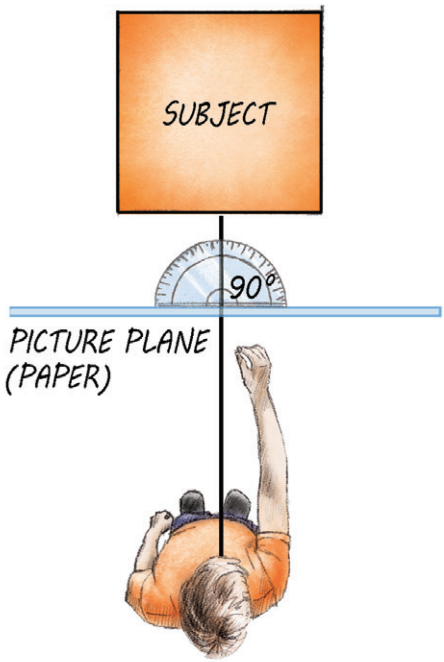

Figure 1-10

a **point of view** (1-8). If the station point, the center of vision, or the subject moves, the point of view changes. In observable linear perspective, a point of view will always be one of three major types: one-point perspective, two-point perspective, or three-point perspective. Without even taking a step in a new direction, simply shifting the viewer's gaze can alter a two-point perspective view into a three-point perspective view, for example (1-9).

The **picture plane** translates three-dimensional space onto a two-dimensional surface. The picture plane is always perpendicular to the viewer's line of sight. A **perpendicular** angle is a 90-degree angle. So the picture plane always forms a 90-degree angle to the viewer's line of sight (1-10). Think of

HORIZON LINE. Bo Bartlett, **The American**, 2016. Oil on linen, 82 x 100 inches. © *Bo Bartlett. Courtesy of the artist and Miles McEnery Gallery, New York, NY.*

the picture plane as a window or viewfinder situated between the viewer and the subject. It is also synonymous with our drawing surface, which is usually paper.

Following the viewer's line of sight through the picture plane and beyond the subject, we find that the center of vision often falls on the horizon line. The **horizon line** is a horizontal line where the sky appears to meet the ground. We know that the Earth is round and does not have a straight edge, but a horizon line is a useful perspective tool where diminution, convergence, and foreshortening are infinite. A horizon line is always optional in linear perspective. But it is used more

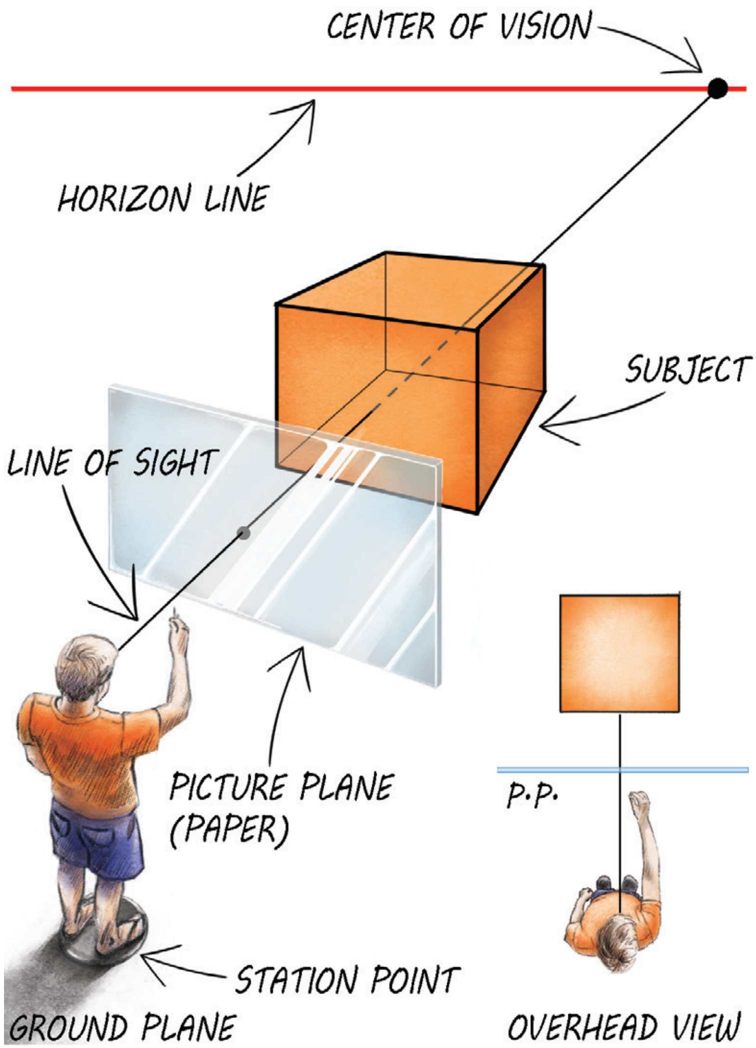

Figure 1-11

often than not to define the ground plane and to help orient the viewer. The **ground plane** is the two-dimensional plane below the horizon line representing a flat ground, or floor, upon which objects rest (1-11).

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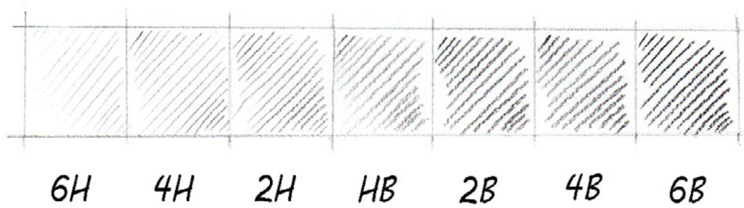
TOOLS & TECHNIQUES

2

2 TOOLS & TECHNIQUES

Perspective drawing is made easier and more enjoyable with the proper tools and techniques. Our main drawing tool is the pencil. Pencils can be soft and dark (8B), or hard and light (8H) with a numerically graded range in between (2-1). The scale from dark to light is as follows: 9B, 8B, 7B, 6B, 5B, 4B, 3B, 2B, B, HB, F, H, 2H, 3H, 4H, 5H, 6H, 7H, 8H, and 9H. Since precision is especially important when rendering in perspective, harder pencils that hold a sharp point such as 2H or 4H are recommended. Keep softer pencils like 2B or 4B on hand to darken lines. Mechanical pencils, or drafting pencils, are an



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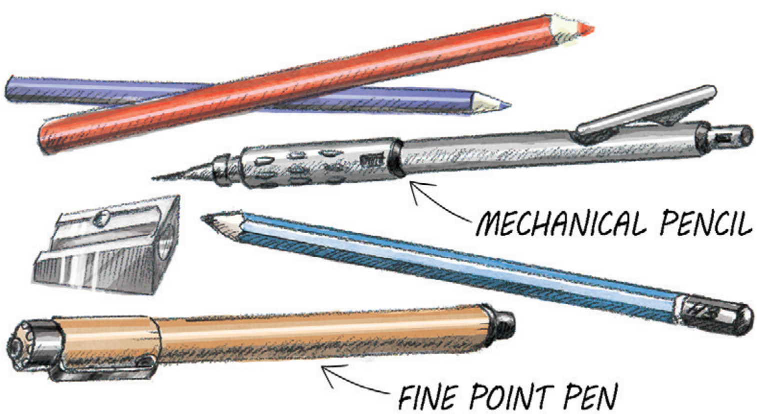


Figure 2-2

MIXED MEDIA. Nicola López, **Earth**, 2008. Etching, woodcut & collage, 41 x 41 inches, edition of 20. *© Nicola López. Published by Pace Editions. Courtesy of the artist and Pace Prints.*

excellent choice as they always hold a sharp point. You can obtain different grades and sizes of lead if you need a darker or lighter line, or thicker or thinner. You may want to use a few colored pencils for color-coding vanishing points or other important reference marks in a complex scene. And unless you exclusively use mechanical pencils, you will additionally need a pencil sharpener (2-2).

Practicing good pencil technique is important. Hold pencils firmly but not too tightly, and only apply light to medium

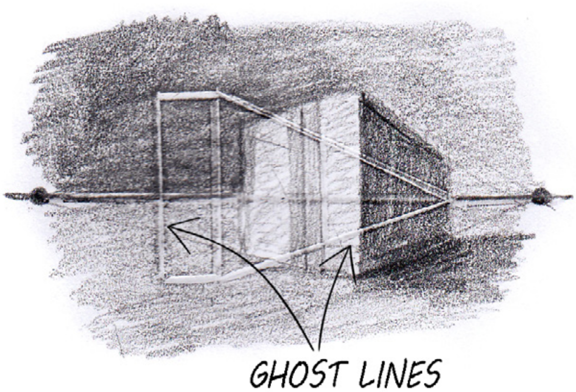


Figure 2-3

pressure. Do not seek a darker line by pressing down hard. This will only result in tired hands, achy fingers, broken pencil leads, torn paper, and—worst of all—indelible pencil marks. Not only can such marks be very hard to erase, but often they will have etched a groove so deep that it shows up on several layers of paper underneath, re-appearing as a ghost line when you shade a later drawing (2-3). To avoid these pitfalls, remember to "stop, drop, and swap." If find yourself pressing down hard to go darker, stop what you are doing, drop your pencil (carefully, so as not to break the lead!), and swap it for a softer, darker pencil. Always keep several pencils of various grades within easy reach to avoid the inclination to apply too much pressure.

Erasers are another essential. White plastic erasers intended for pencils should always be on hand. Different shaped erasers are used for different purposes. Block erasers clean large areas, whereas thin pen erasers (encased in a holder) will remove select details. You can also use metal eraser guards

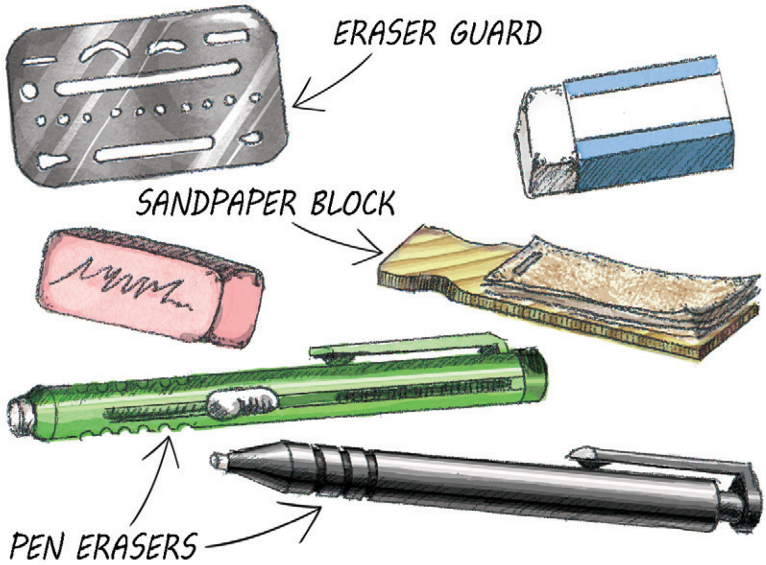


Figure 2-4

to shield areas that you do not wish to eliminate. Erasers should always be kept clean to avoid unwanted smears. Clean your erasers with a sheet of medium to fine grit sandpaper, or you can purchase a sandpaper block designed expressly to clean erasers (2-4). Get in the habit of cleaning erasers before touching them to your paper.

Another good practice for keeping your drawing clean is to keep your hands clean. The acidic oils of our skin upset the pH of paper. Oil on paper also creates a slick barrier that repels pencil marks and prevents erasing. If you want to intentionally smudge or smear graphite on paper—some shading techniques involve toning paper in this manner—do not use bare fingers. Instead, use tissue paper or a chamois cloth to blend larger areas, and use cotton swabs or a tortillion (a tightly

ANIMATION STILL. Marina Zurkow, **Mesocosm (Times Square) (detail)**, 2014. Triptych, hand-drawn animation (color, silent), custom software, computer, screen or projector, dimensions variable, landscape orientation, 73-hour cycle (12-minute day, 73-hour year), edition of 5 + 2 AP. *© Marina Zurkow. Courtesy of bitforms gallery, New York.*

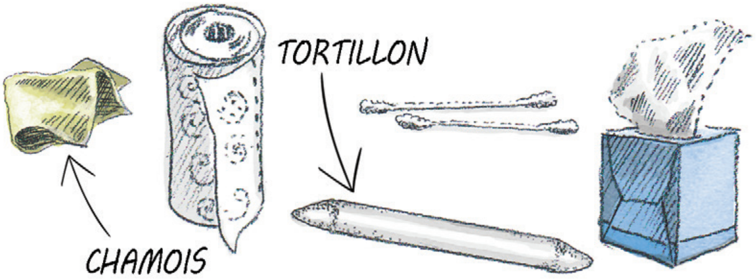


Figure 2-5

rolled paper in pencil form) for smaller areas (2-5). You also want to keep your entire hand and arm lifted off the paper if you can manage it. Try using your pinky finger as an anchor. If you must rest your hand on your paper to work comfortably, place a clean piece of scrap paper under your hand to shield your drawing.

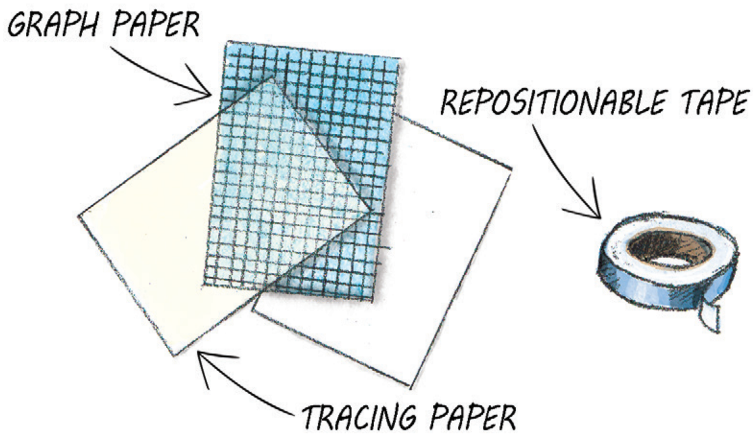


Figure 2-6

Regarding paper, a pad at least twice the size of the outer dimensions of your finished composition is recommended. An 18 x 24 inch pad will comfortably allow a 9 x 12 inch finished piece. Make sure the paper is sturdy enough that repeated erasing will not cause tears. A good choice is 60 lb. paper. Also, select a medium tooth or texture. Too much texture in the fiber of the paper will make straight lines look bumpy. Too little texture in the paper will not take pencil marks easily, and you will end up applying too much pressure to produce a line. Tracing paper and graph paper are also helpful for perspective drawing. Graph paper is great for mapping plan and elevation views. Tracing paper is an excellent organizational tool for complex subjects involving multiple sets of vanishing points, or when you're using grid overlays. You will also need repositionable artist tape; it lets you anchor layers of paper to a support but easily remove or reposition without tearing the paper (2-6). Having a couple of layers of paper under the top sheet will ensure a smooth drawing surface, cushioning the top layer from any imperfections of the supporting surface.

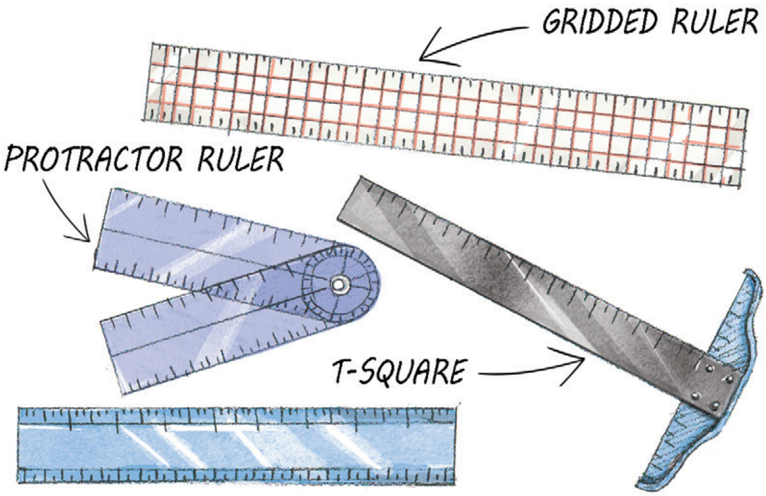
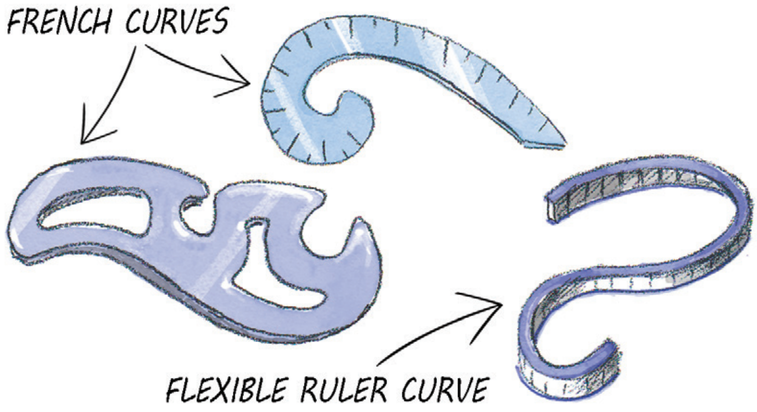


Figure 2-7

Nothing in perspective is accomplished without straight lines, which makes rulers an absolute must. At minimum, a ruler as long as the longest dimension of your paper gives you optimal reach. Although not necessary, it is very helpful to have some specialty rulers for specific tasks. You will often need to draw two lines parallel to each other, so a clear plastic gridded ruler is quite possibly the most versatile. Perspective drawing also calls for perpendicular lines. A T-square—a ruler with a perpendicular bar at one end—is therefore useful. Some rulers have a protractor built into them, which is convenient for simultaneously measuring and marking angles (2-7). If you find that your ruler slips around, put a piece of masking tape down the length of one side for more traction, or purchase a ruler with cork backing. A flexible curved ruler, or a French curve, may be helpful if you need assistance drawing curved lines (2-8).



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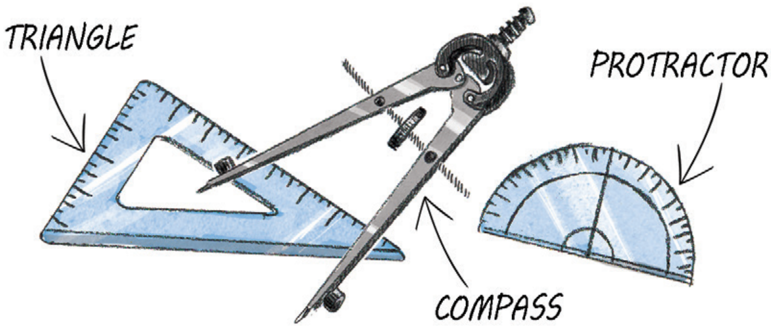

Figure 2-9

A few drafting supplies are also essential. Chiefly you need a triangle with a 90-degree angle to locate station points in two and three-point perspective. You need some form of a protractor for measuring angles for diagonal vanishing points. And a compass is needed to construct the cone of vision and locate vertices for diagonal vanishing points (2-9). Choose a compass with a threaded precision wheel to avoid the frustration of

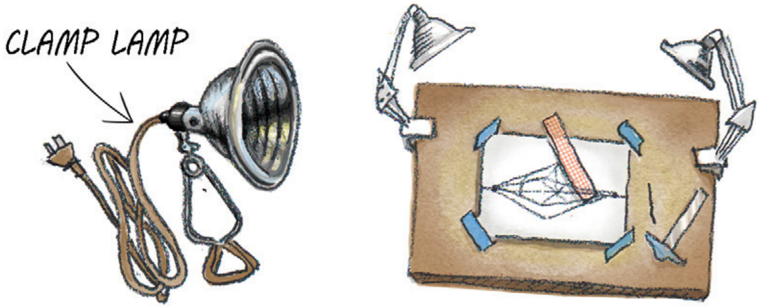

Figure 2-10

unwanted slippage. There are also compasses in ruler form that are helpful for larger circles.

Now a word about supports. An 18 x 24 inch pad of paper is not much use without a hard flat surface to support it. Make sure you have a drawing board, or a drafting table big enough to fit the largest pad of paper you plan to use. Be sure to angle your support surface to avoid the distorting effects of foreshortening; the drawing surface should be parallel to the plane of your face. This is especially important when working large. If you do not have an adjustable drafting table or easel that you can tilt, find a way to prop your drawing board at the required angle.

Lastly, good lighting cannot be stressed enough. Most people do not realize that even with large windows and skylights, the sunniest of days does not output optimal light for detailed drawing work. We supplement daylight with artificial light not only to have enough light, but also to ensure our work area is evenly lit and free from distracting shadows and glare. Lighting does not have to be expensive to be effective. Clamp lamps are a low-cost, easily positioned lighting solution that you can pick up at any hardware store (2-10). Whether you use fluorescent or LED light bulbs, be sure to choose bright bulbs that emit a full spectrum. These types of bulbs are often advertised as mimicking daylight. Position at least two lights on either side of your work area to eliminate glare and shadows. Incidentally, this is also an optimal arrangement for photographing your completed work.

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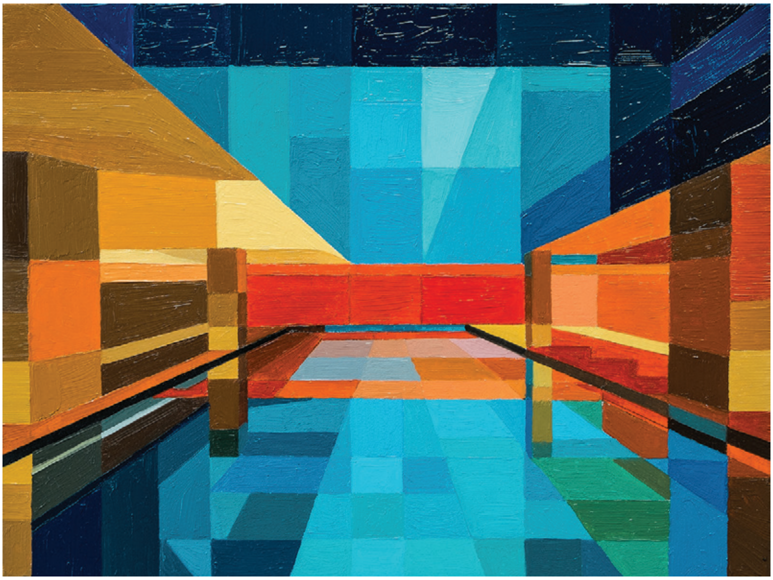
ONE-POINT PERSPECTIVE

3

3 ONE-POINT PERSPECTIVE

Essential to all forms of linear perspective is the concept of the vanishing point. A **vanishing point** is a point where any set of parallel edges appear to meet. Governing all forms of linear perspective, the **law of vanishing points** states that any set of parallel edges receding from the viewer will appear to meet at a vanishing point. Assuming a rectangular plane or prism, **one-point perspective** is a point of view in which one set of parallel edges recede from the viewer and appear to converge at a single vanishing point. The other two sets are parallel to the picture plane. Imagine the two edges of a straight road disappearing into the distance while the ground remains horizontal and the nearby lamp post vertical. Recall



ONE-POINT PERSPECTIVE. Andy Burgess, **Opposite House**, 2016. Oil on panel, 6 x 8 inches. © *Andy Burgess. Courtesy of William Havu Gallery.*

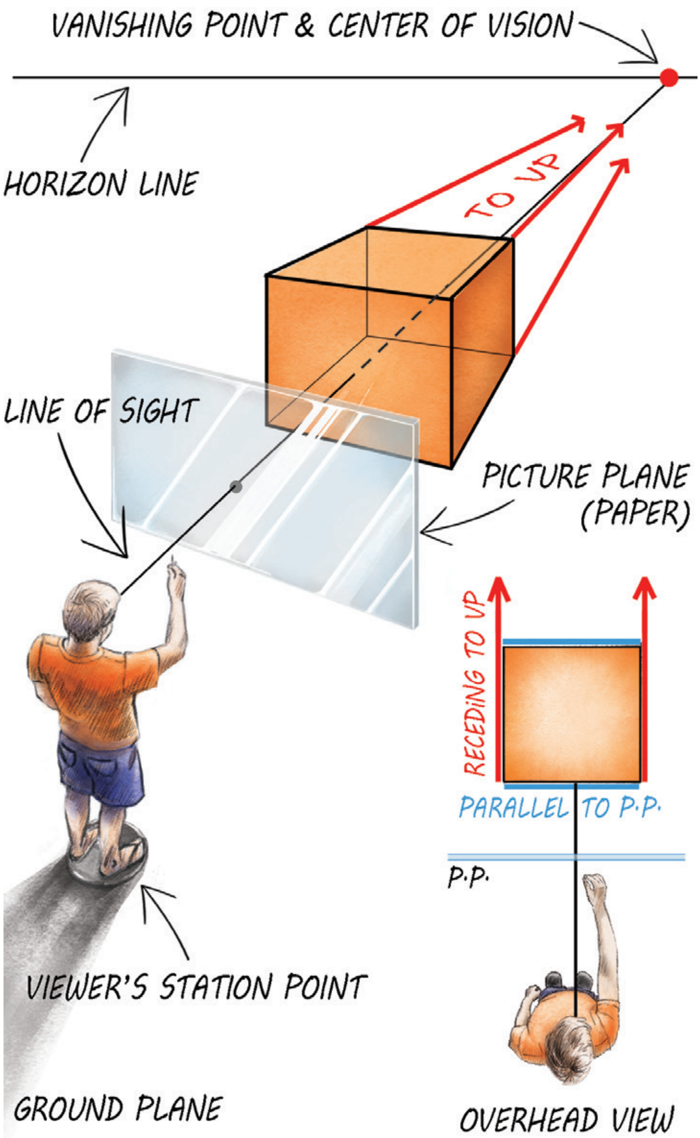


Figure 3-1

that the picture plane represents our drawing paper. In one-point perspective, the vanishing point is also the center of vision (3-1).

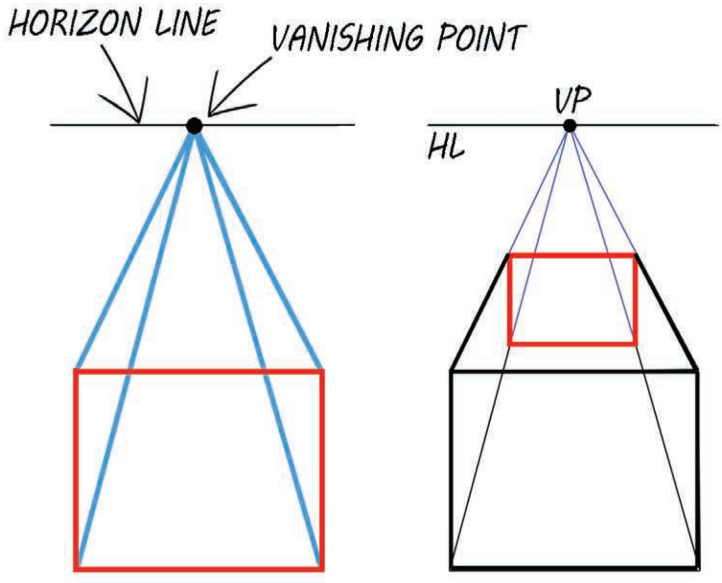
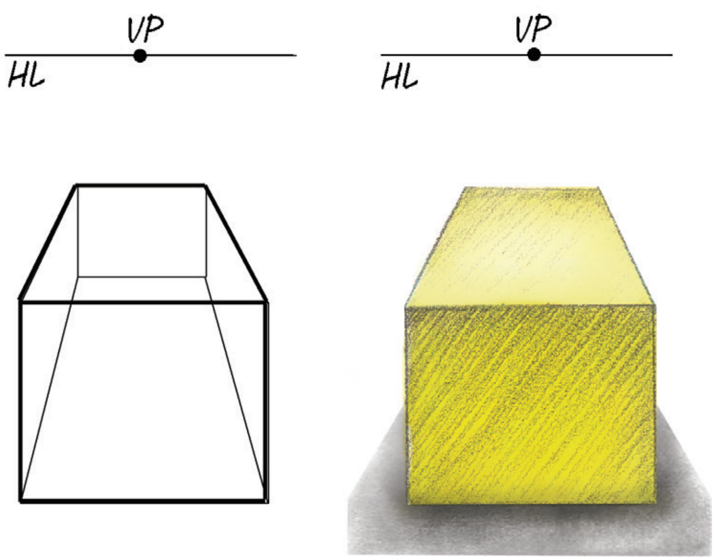


Figure 3-2



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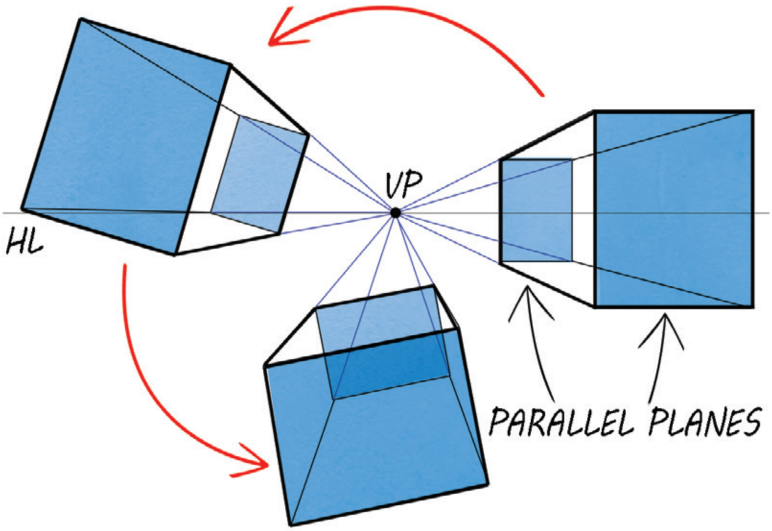
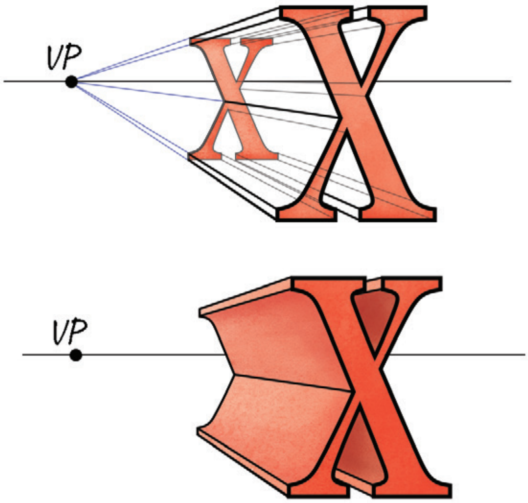


Figure 3-4

We can construct a rectangular prism in one-point perspective by first marking a vanishing point (VP) and horizon line (HL). A rectangular prism begins with any rectangle, which establishes the front plane of the form. Then connect all four corners to the vanishing point. This establishes the receding planes. We complete the shape with another rectangle, ensuring that the corners connect with the receding edges. This forms the rear plane of the shape (3-2). Then erase hidden edges to model a solid shape (3-3).

The rectangular prism can be rotated to any orientation. Just make sure the front and back planes remain parallel to each other and parallel to the picture plane (3-4). You can easily construct many forms in one-point perspective by simply remembering that the front and rear planes should be the same shape. This applies to basic forms such as triangular



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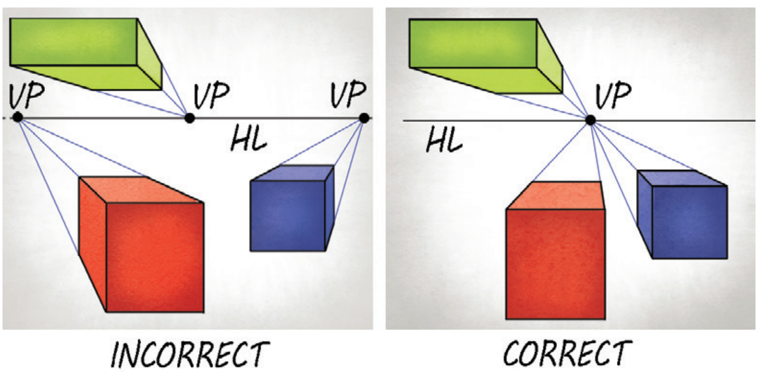

Figure 3-6

prisms and cylinders, as well as more complex forms (3-5). When you add multiple forms within the same composition, be sure to use the same vanishing point. A common pitfall is adding different vanishing points for each form. This is incorrect—there should be only one vanishing point for the entire drawing (3-6).

ONE-POINT PERSPECTIVE. Jeff Clay, **Bunker Hill Perspective 2**, 2010. Digital photograph, 3825 x 5777 pixels. © *Jeff Clay. Courtesy of the artist, ClayhausPhotography.com*

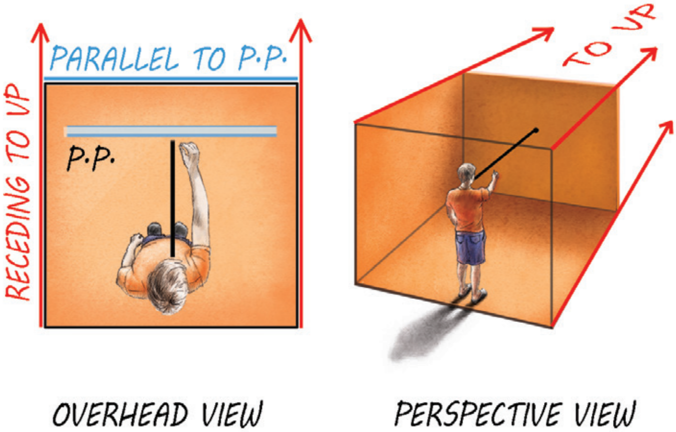

Figure 3-7

To draw a one-point perspective interior, think of the viewer as located inside of the rectangular prism. The line of sight is perpendicular to the far wall. The left and right walls, as well as the floor and ceiling, recede to the vanishing point. The far wall is a rectangle, front-facing and parallel to the picture plane (3-7). Start with a rectangle for the far wall and

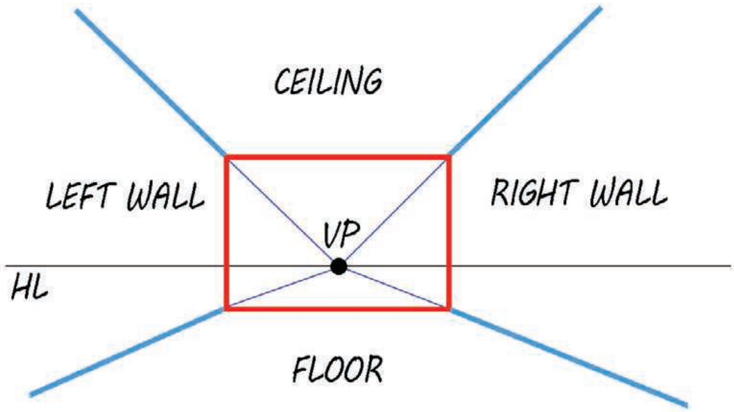

Figure 3-8

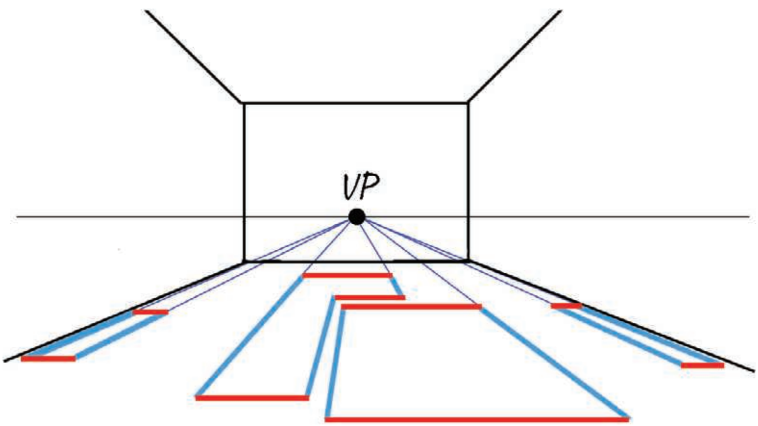

Figure 3-9

position a vanishing point and horizon somewhere on the wall. Extend lines from each corner of the rectangle to form the ceiling, walls, and floor (3-8). To construct objects within the interior space, it is best to start with their footprints, or bases. Footprints not only help with layout but also ensure that each object rests on the floor (3-9). Objects within the room can be constructed from rectangular prisms, and all will use the

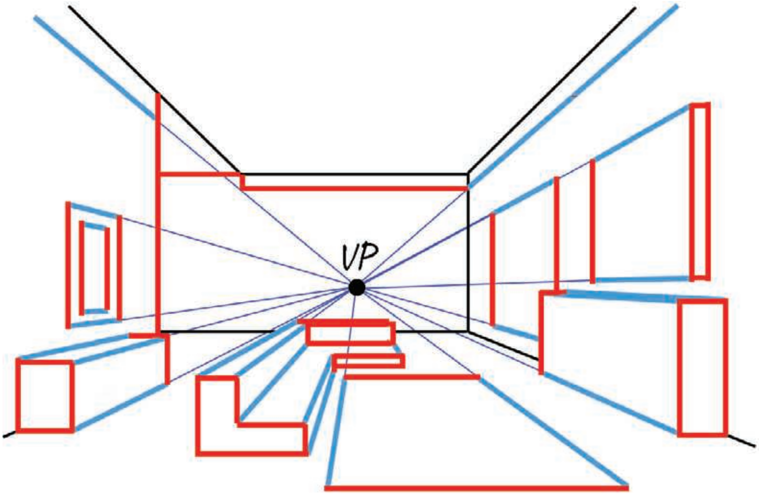

Figure 3-10

Figure 3-11

same vanishing point that was used to construct the room itself (3-10, 3-11). Take care to develop all three dimensions for each form. It is a very common mistake to leave forms flat and

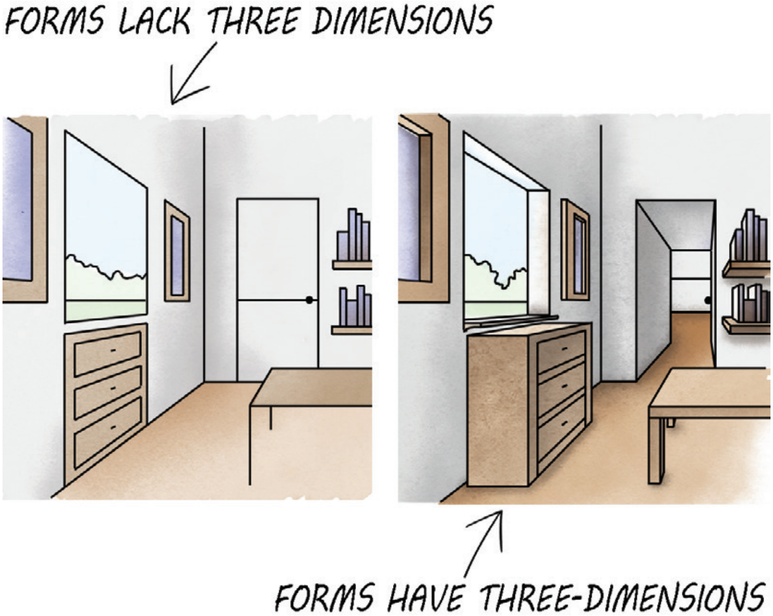

Figure 3-12

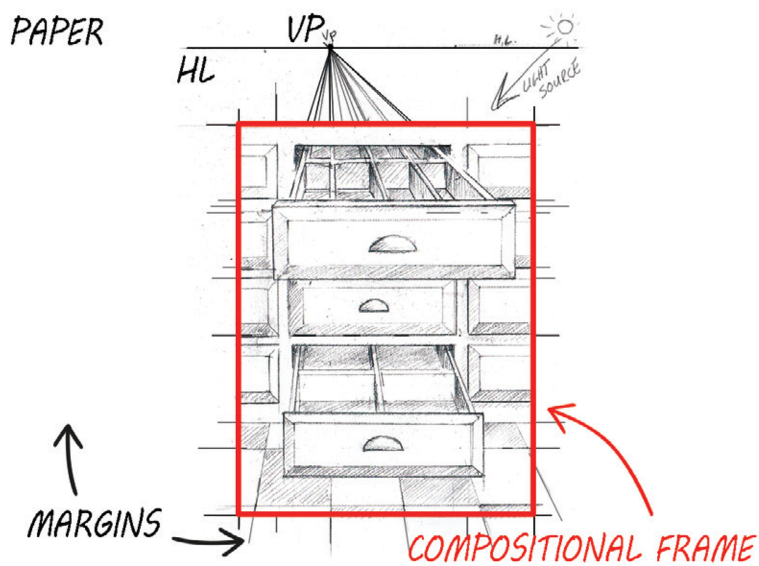

Figure 3-13

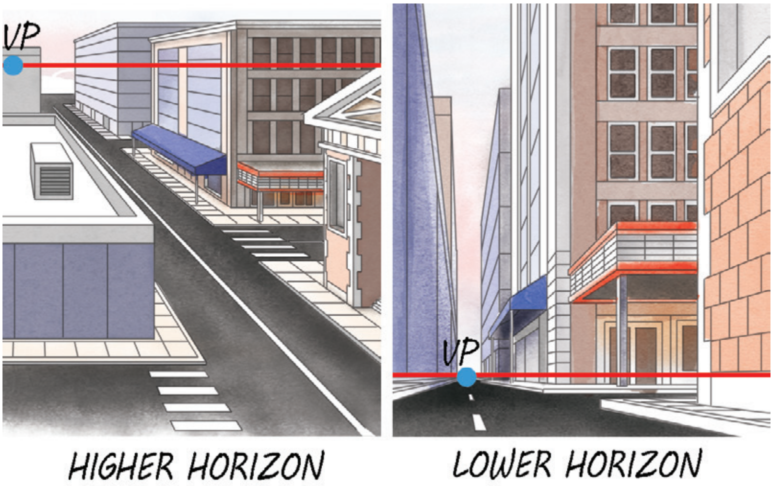

Figure 3-14

one-dimensional. Mapping footprints helps. Constructing all forms from rectangular prisms also helps. Drawing the complete form, including all the hidden planes and edges, ensures that the height, width, and depth are each addressed (3-12).

A horizon line usually defines the ground plane. You can place the horizon line anywhere on the page, and the vanishing point anywhere on the horizon line. Neither has to reside within the **compositional frame**, or boundaries, of the final drawing. Sometimes it works best to position the horizon in the margins (3-13). Carefully consider placement, because the position of both the horizon line and the vanishing point affects the angle of view. For example, a higher horizon line and vanishing point gives an aerial vantage of the top of the subject. Whereas placing the horizon line and vanishing point lower in relation to the subject is better for a ground-level view (3-14). A horizon line and vanishing point above the subject shows the topside, while a horizon line and vanishing point

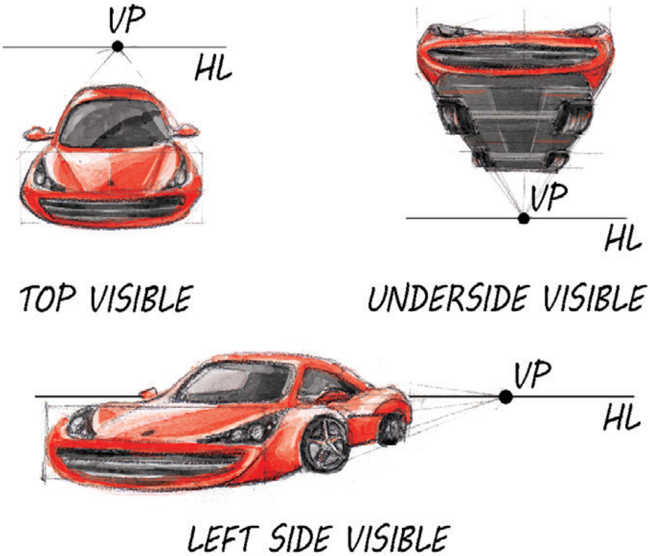

Figure 3-15

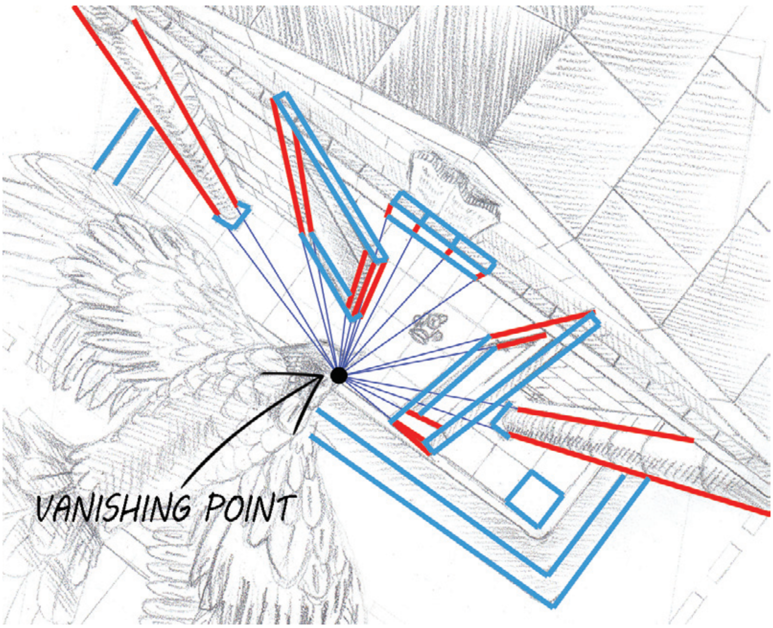

Figure 3-16

Figure 3-17

below the subject reveals the underside. Also a vanishing point to the right of the subject reveals a view of the left side and vice versa (3-15).

Remember that a horizon line is always optional in perspective. Omitting the horizon allows for creative placement of the vanishing point. Points of view like a worm's-eye (looking up) or bird's-eye (looking down) are usually associated with three-point perspective, but they can be achieved in one-point, too (3-16, 3-17).

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TWO-POINT PERSPECTIVE

4

4 TWO-POINT PERSPECTIVE

Assuming a rectangular plane or prism, **two-point perspective** is a point of view in which two sets of parallel edges recede from the viewer and appear to converge at two separate vanishing points. Only one set of the rectangular prism's edges are parallel to the picture plane (4-1).

Constructing a rectangular prism in two-point perspective requires establishing two vanishing points (VPs) on the horizon

TWO-POINT PERSPECTIVE. Katherine Winter, **Avondale Liquors**, 2010. C-print, 33 ½ x 33 ½ inches. © *Katherine Winter. Courtesy of the artist.*

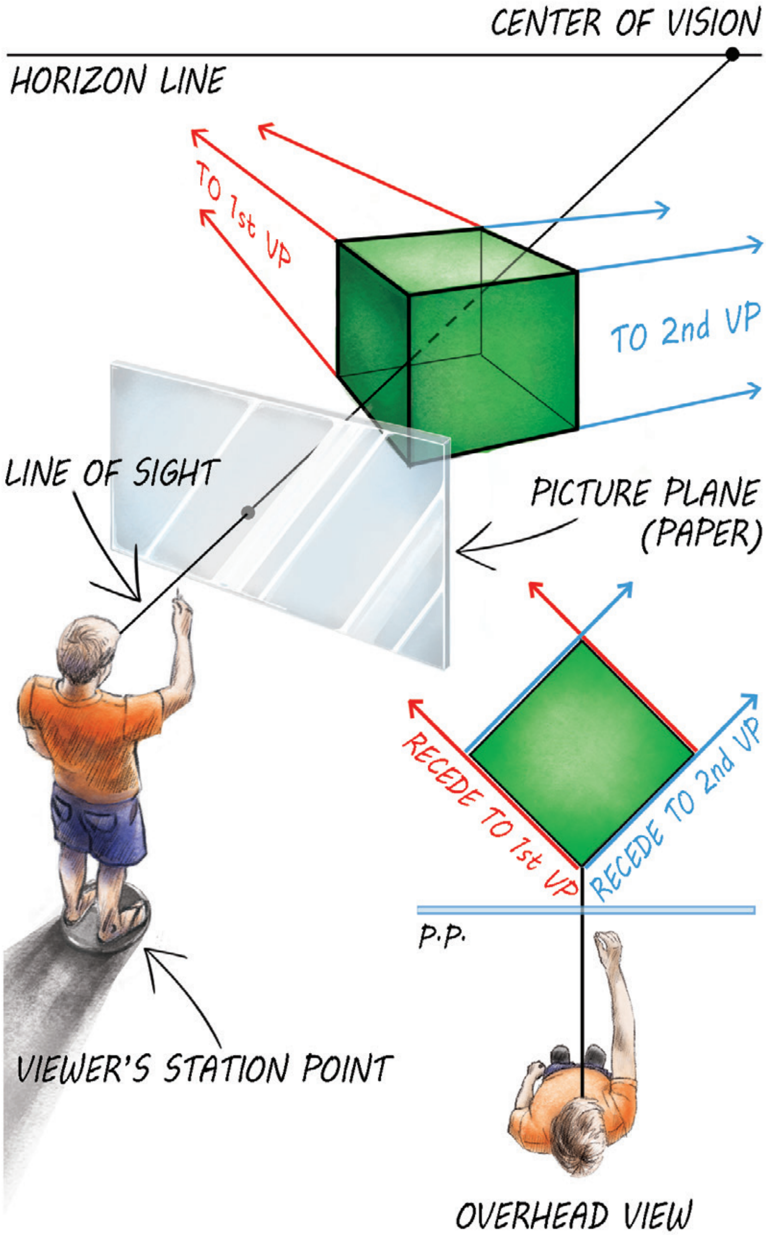

CENTER OF VISION
HORIZON LINE
TO 1st VP
TO 2nd VP
LINE OF SIGHT
PICTURE PLANE
(PAPER)
RECEDE TO 1st VP
RECEDE TO 2nd VP
P.P.
VIEWER'S STATION POINT
OVERHEAD VIEW

Figure 4-1

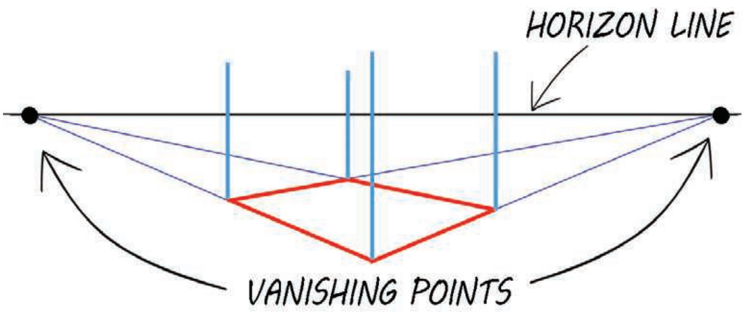


Figure 4-2

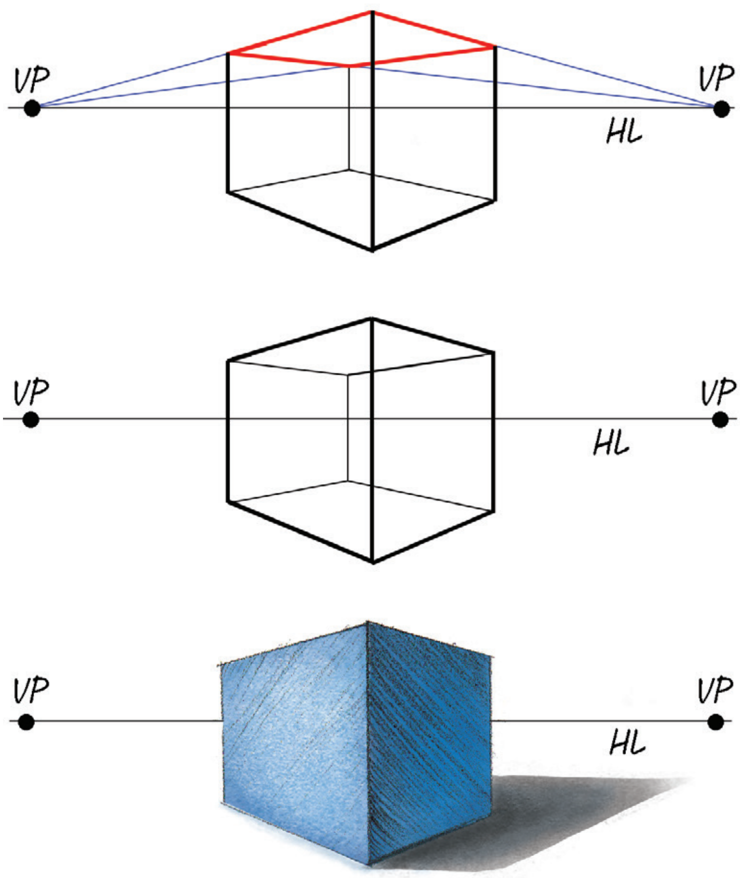


Figure 4-3

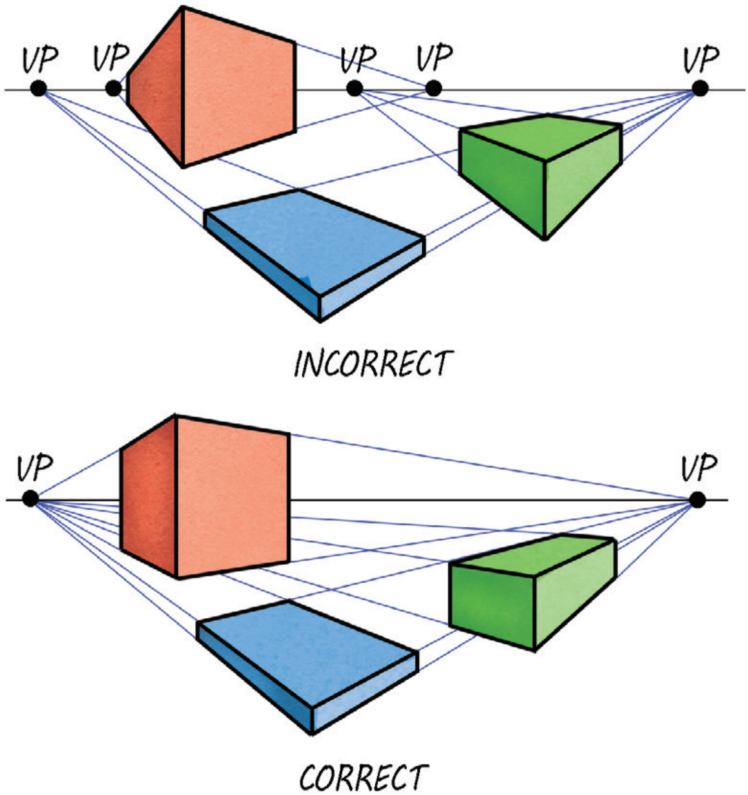


Figure 4-4

line (HL). Make the rectangular base using the right and left vanishing points. Then extend vertical edges from each corner of the base (4-2). Complete the shape by using the right and left vanishing points to form the top plane, ensuring that edges connect at the top corners. Erase any hidden edges to form a solid shape (4-3).

As always, when you add multiple forms within the same composition, you must use the same vanishing points. Do not add more—there should only be two vanishing points for the entire drawing (4-4). Also, when working with multiple forms, give

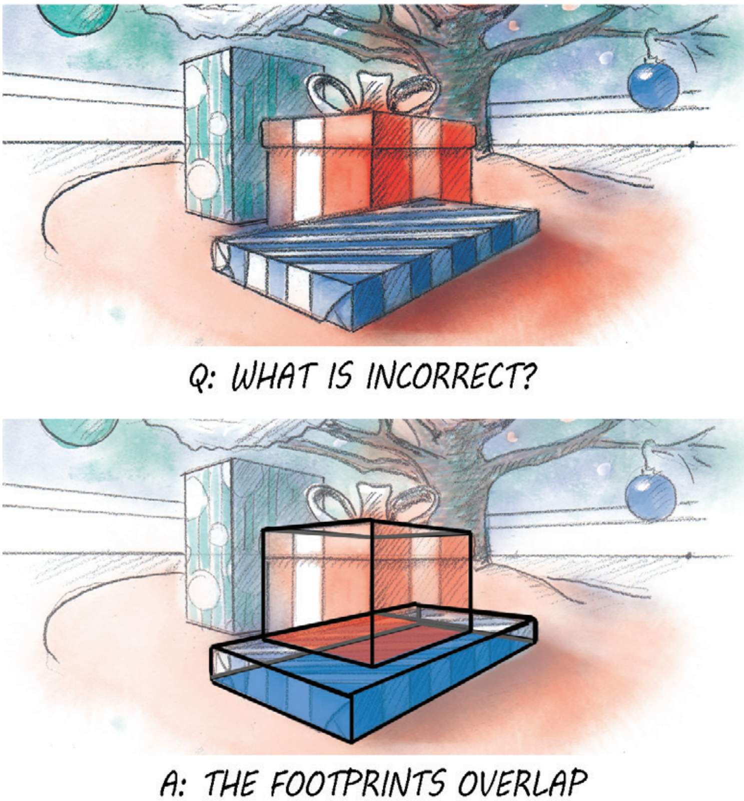
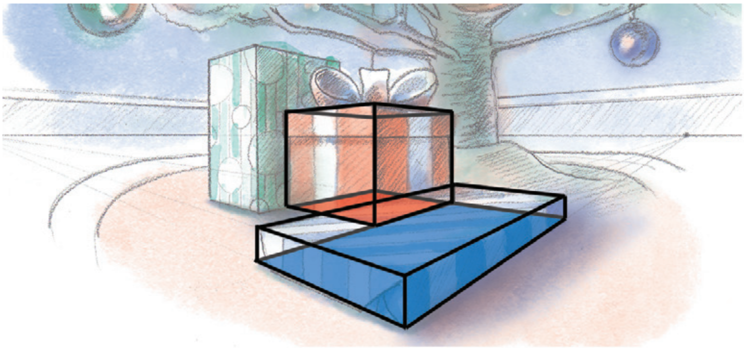


Figure 4-5

special attention to the bases, or footprints. It is an all-too-common error to overlap footprints, creating an impossible occurrence that confuses the space (4-5). We can avoid this problem by ensuring that we develop the entire structure of the form, including the base. It often helps to draw the footprints first, so that you can correctly position forms relative to one another and ensure they do not overlap (4-6).

In a two-point perspective interior, the viewer is located inside of the rectangular prism. The line of sight is perpendicular to



FOOTPRINTS ARE CORRECTED,

...SO EACH FORM OCCUPIES ITS OWN SPACE

Figure 4-6

the far vertical corner where two walls meet. Note that the right wall recedes to the left vanishing point and the left wall recedes to the right vanishing point (4-7). To draw a two-point interior, begin with the farthest vertical corner. Use the right vanishing point to draw the left wall. Use the left vanishing point to draw the right wall. Notice that this also forms the floor

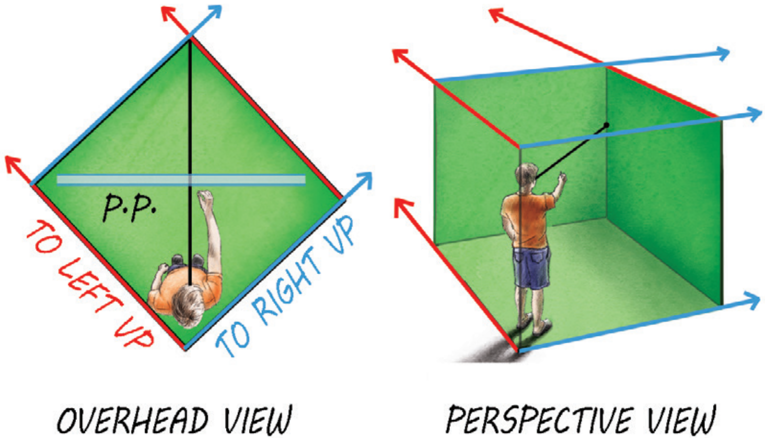


Figure 4-7

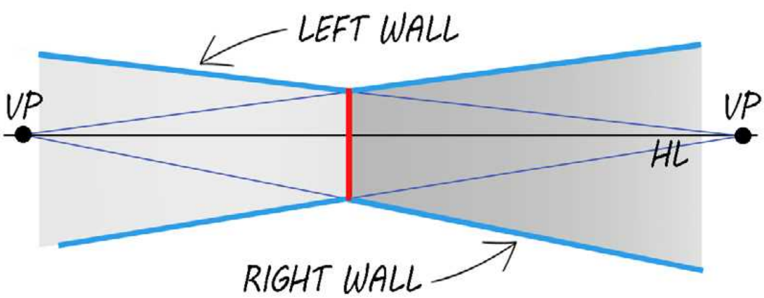


Figure 4-8

and ceiling (4-8). Three-dimensional forms can be added to the room using the same vanishing points that constructed the room itself. Take care to develop all three dimensions of forms when relevant, and pay attention to footprints for objects within the room (4-9).

Just as in one-point perspective, the horizon can be located anywhere. Placement affects the view of the subject and

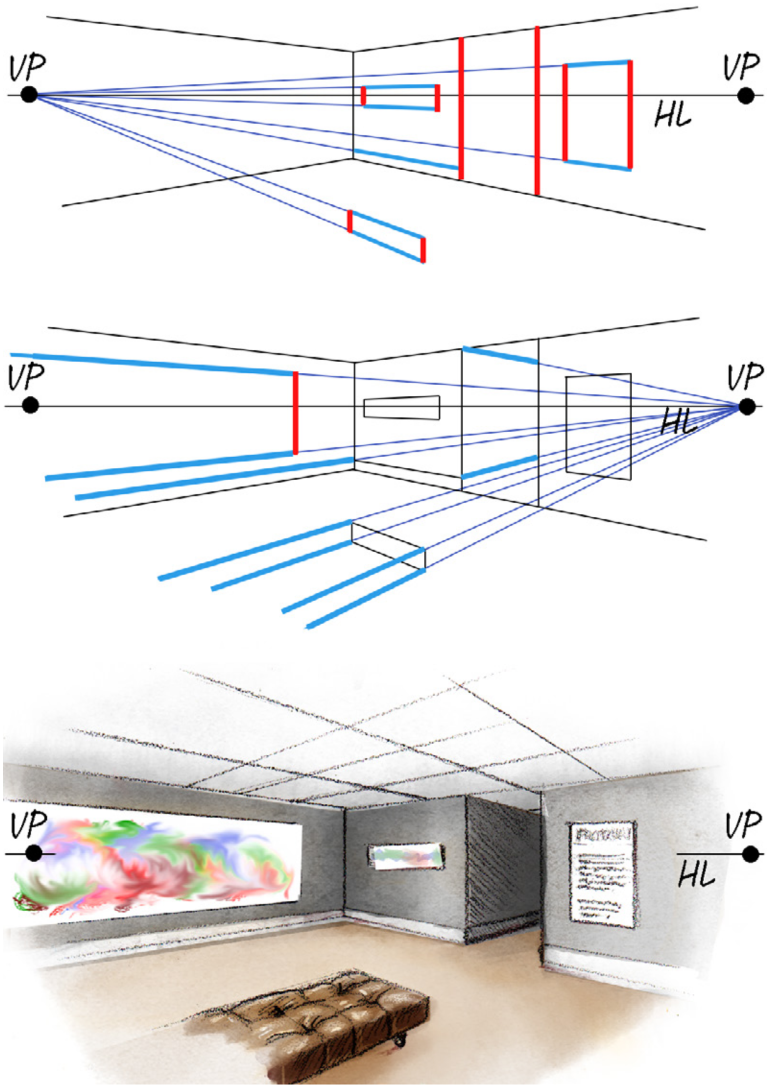


Figure 4-9

therefore impacts the entire composition. With regards to vanishing points, in two-point perspective it is usually best to position them farther from the subject in order to minimize

TWO-POINT PERSPECTIVE. Rick Dula, **LoDo Sunrise**, 2013. Acrylic on panel, 18 x 22 inches. © *Rick Dula. Courtesy of William Havu Gallery.*

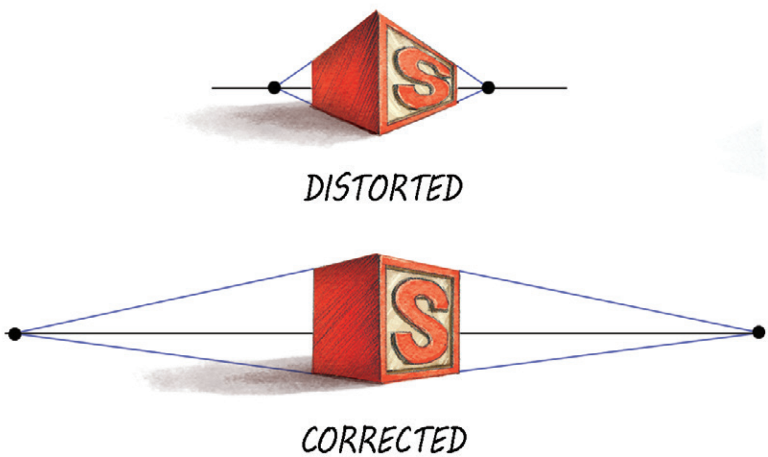


Figure 4-10

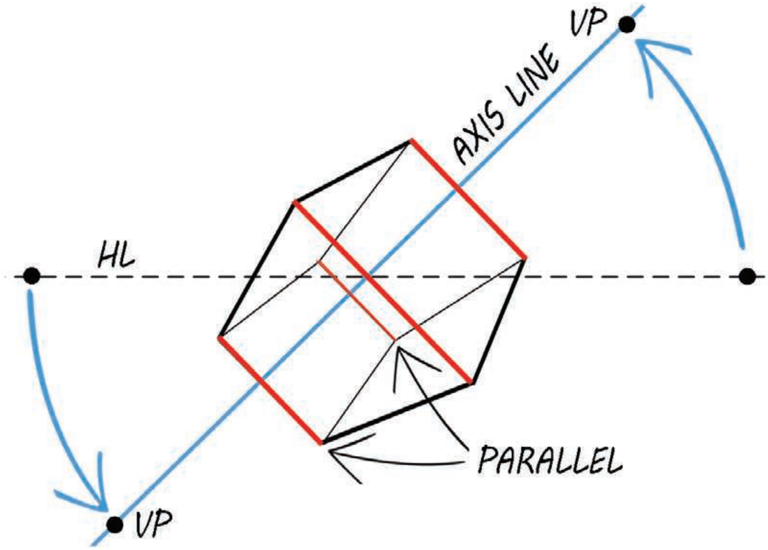


Figure 4-11

distortion. If the vanishing points are too close to the subject, the forms will be misshapen (4-10). For this reason the vanishing points in a two-point composition are usually located in the margins, outside of the composition's frame.

Also recall that a horizon line is always optional in perspective. If we rotate the form, for example, the horizon line becomes an axis line. The non-receding edges of the prism must remain perpendicular to the axis line, but the form can be rotated to any position in space. It does not have to remain on the ground plane. Just make sure that the non-receding edges remain parallel to each other and parallel to the picture plane (4-11). One creative application is a vertical axis line to create a bird's-eye or worm's-eye effect without using three-point perspective. Place one vanishing point on the horizon and the

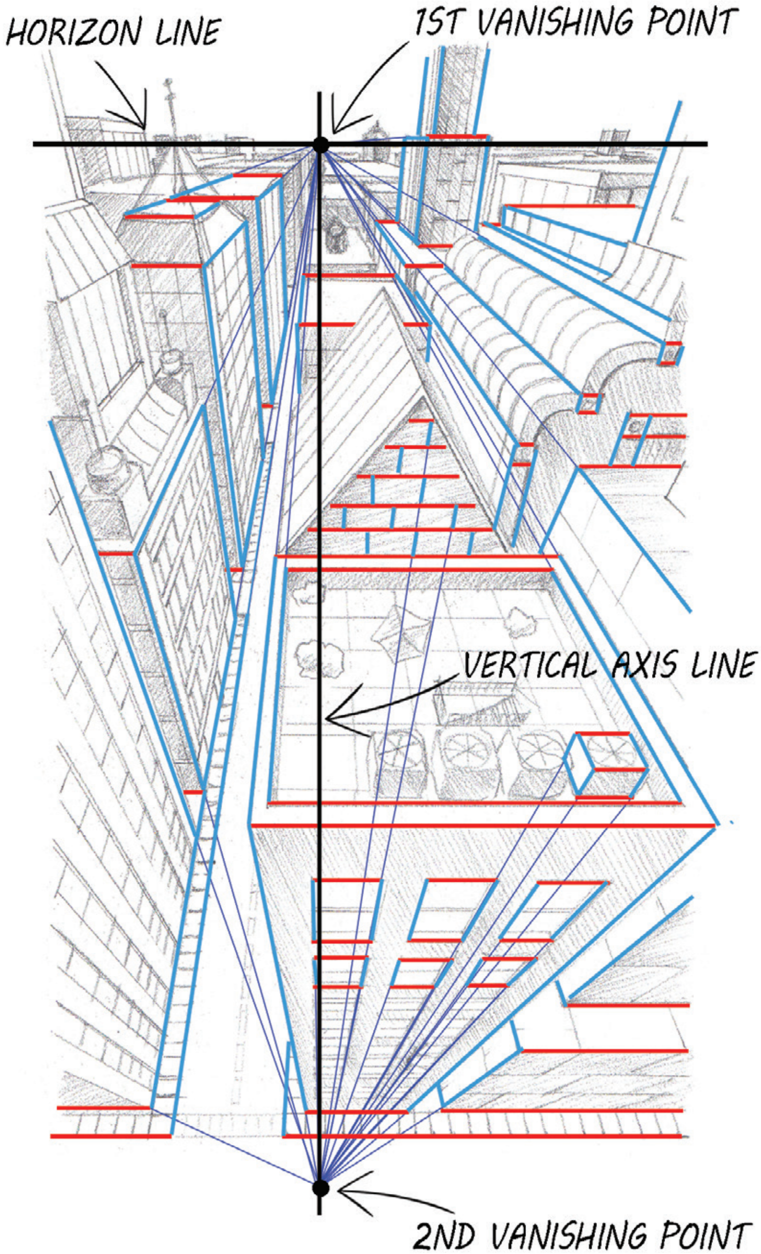

HORIZON LINE
1ST VANISHING POINT
VERTICAL AXIS LINE
2ND VANISHING POINT

Figure 4-12

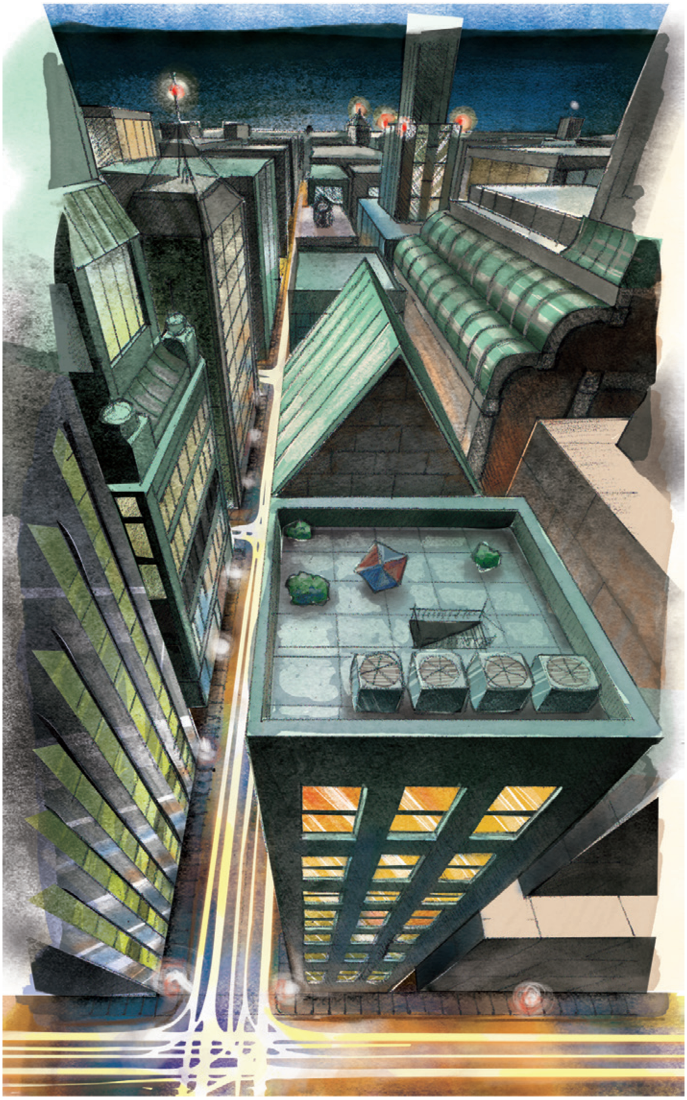


Figure 4-13

second on the axis line, either above or below the horizon. In this case the forms' horizontal edges are parallel to the picture plane instead of the vertical edges (4-12, 4-13).

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THREE-POINT PERSPECTIVE

5

5 THREE-POINT PERSPECTIVE

Assuming a rectangular prism, **three-point perspective** is a point of view in which three sets of parallel edges recede from the viewer and appear to converge at three different vanishing points. In three-point perspective, none of the planes or the edges of the rectangular prism is parallel to the picture plane. Everything recedes from the viewer (5-1).

To construct a rectangular prism in three-point, begin with a horizon line (HL) and two vanishing points (VPs). Then place a third vanishing point either above or below the horizon, roughly equidistant from the first two vanishing points. A third vanishing point above the horizon line is described as a worm's-eye view, looking up at the subject. A third vanishing point below the horizon is called a bird's-eye view, looking down at the

WORM'S-EYE VIEW. Valerio D'Ospina, **Broadway and W 25th**, 2013. Oil on panel, 24 x 16.5 inches. © *Valerio D'Ospina. Courtesy of the artist. Private collection.*

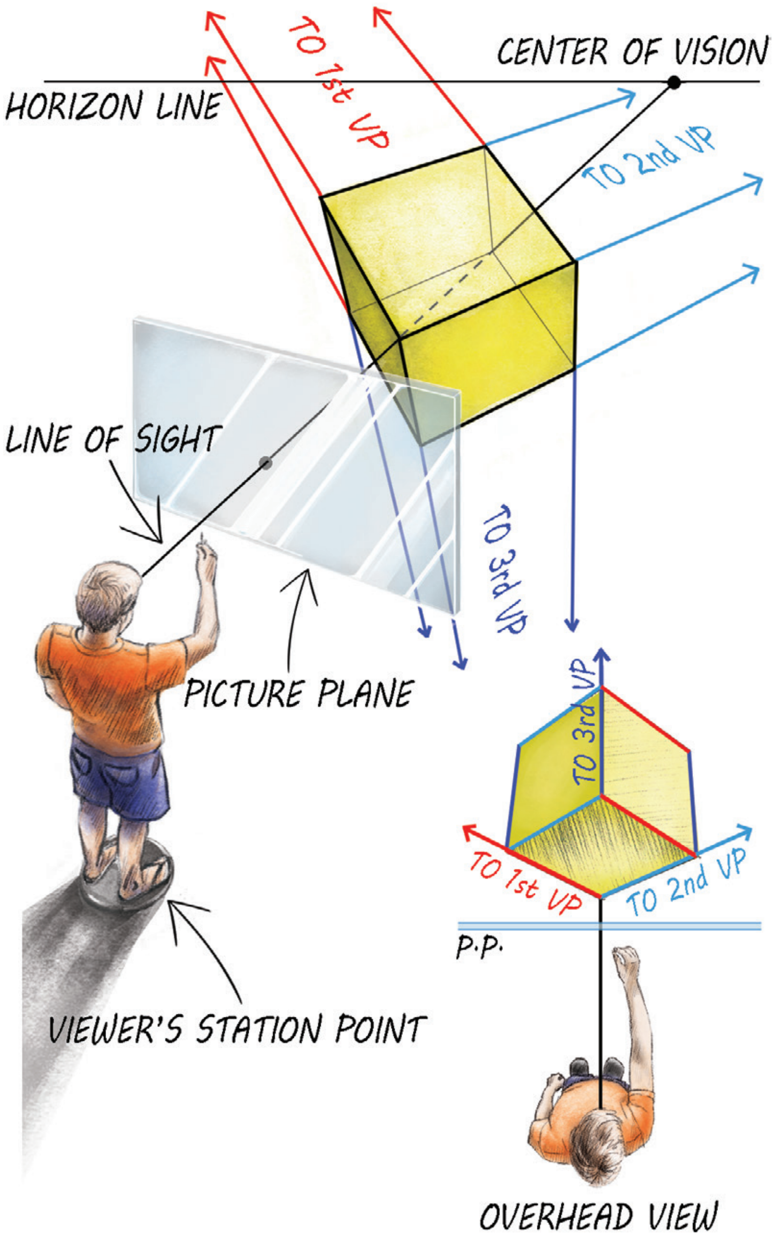
CENTER OF VISION
HORIZON LINE
TO 1st VP
TO 2nd VP
LINE OF SIGHT
TO 3rd VP
PICTURE PLANE
TO 3rd VP
TO 1st VP
TO 2nd VP
P.P.
VIEWER'S STATION POINT
OVERHEAD VIEW

Figure 5-1

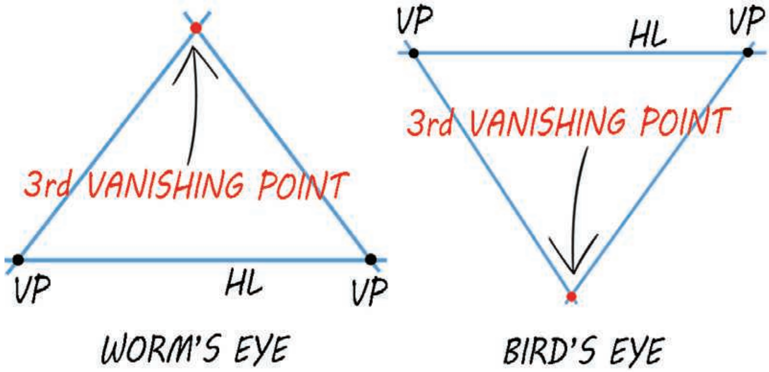

Figure 5-2

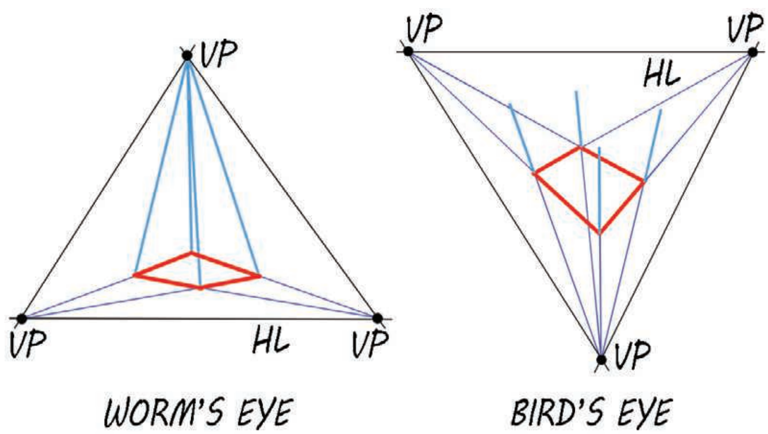

Figure 5-3

subject. In both cases, we connect all three vanishing points to form a triangle (5-2). Then use the two vanishing points on the horizon to draw a rectangular base inside the triangle. Connect the corners of the base to the third vanishing point, forming the vertical edges (5-3). Complete the shape using the first two vanishing points for the top plane, ensuring all the edges connect at corners (5-4). Hidden edges can then be erased to model a solid shape (5-5). A common modification

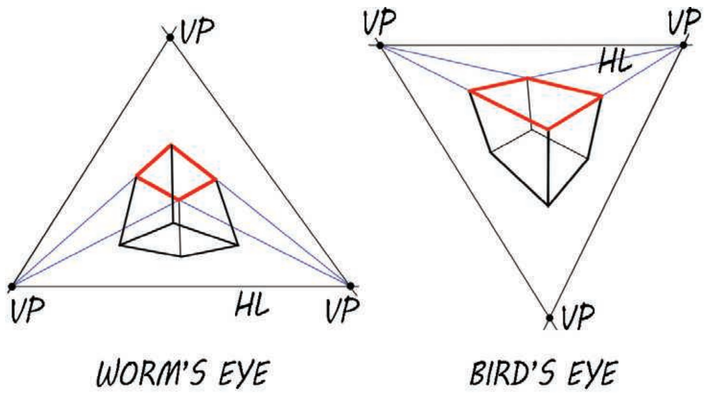

Figure 5-4

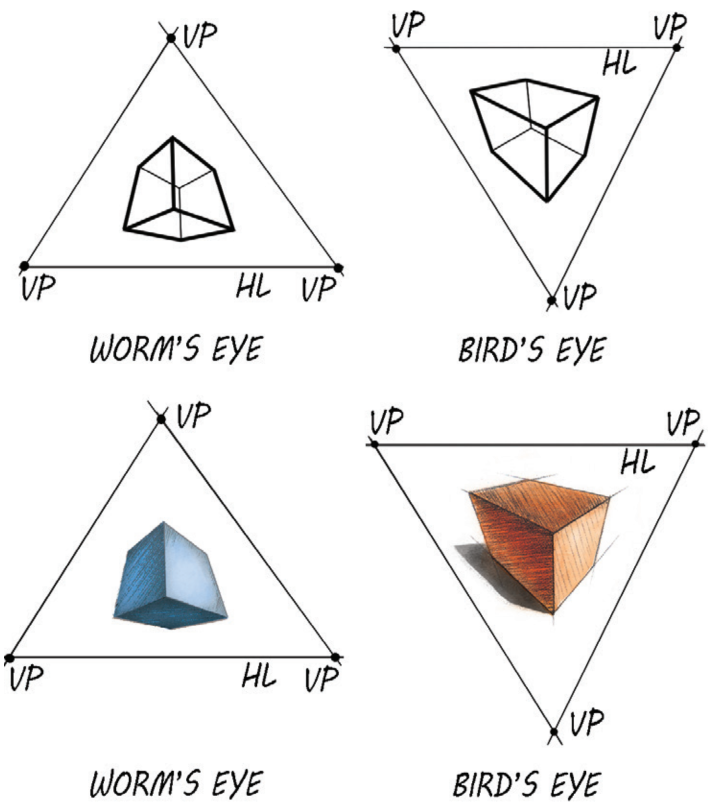

Figure 5-5

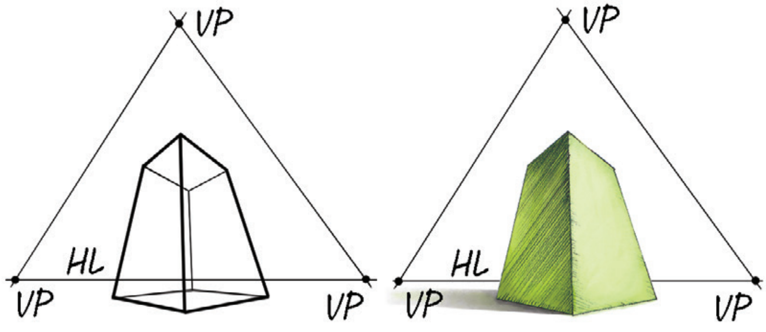

Figure 5-6

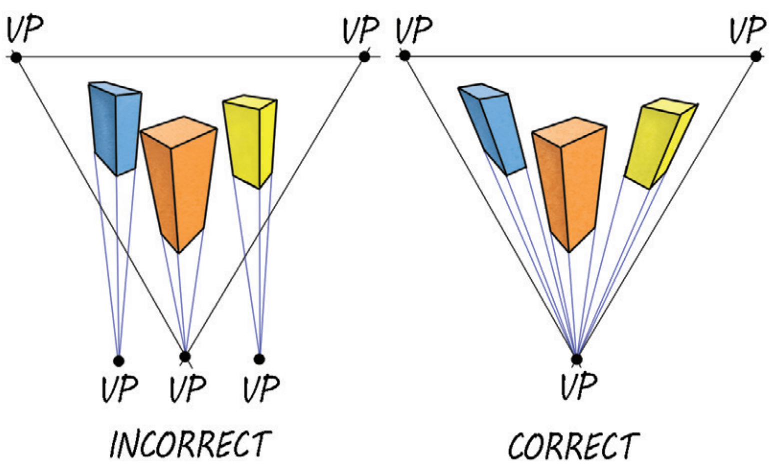

Figure 5-7

to a worm's-eye view is to extend the base of the form below the horizon so that it rests on the ground plane (5-6).

When you add more forms to the same composition, be sure to use the same three vanishing points. Beginners often try to add more vanishing points for each form. This is incorrect. There should only be a total of three vanishing points for all the forms within the same drawing (5-7).

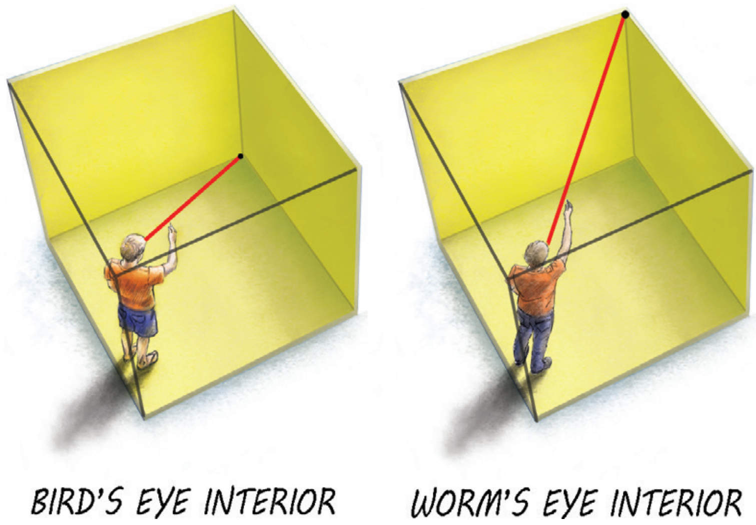

Figure 5-8

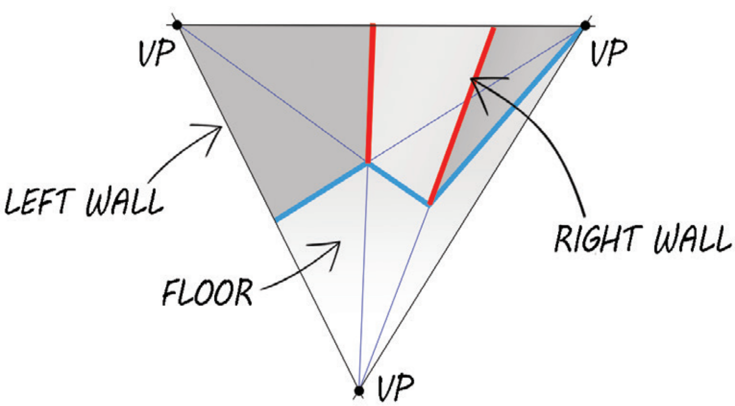

Figure 5-9

In a three-point perspective interior, the viewer is located inside of the rectangular prism. The line of sight will point either to the far bottom corner for a bird's-eye or the far top corner for a worm's-eye (5-8). A bird's-eye interior begins with the floor and walls (5-9). You can add details using the

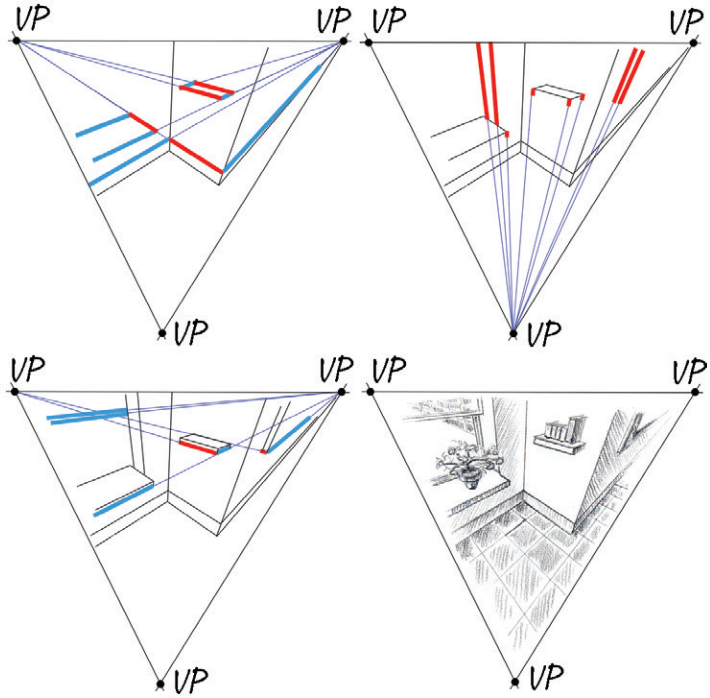

Figure 5-10

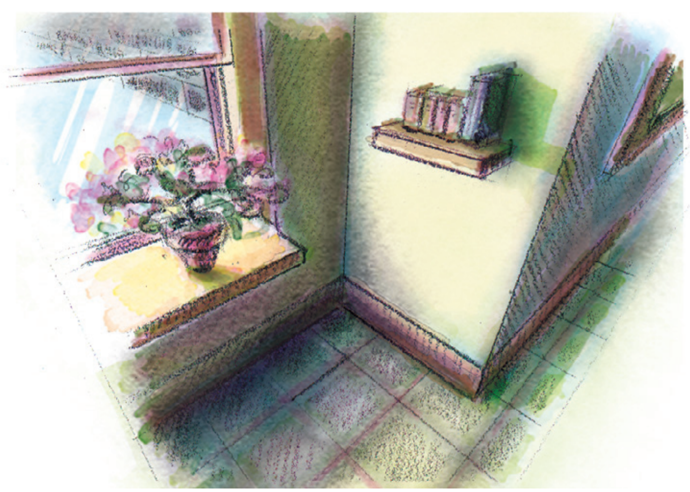

Figure 5-11

BIRD'S-EYE VIEW. Valerio D'Ospina, **Manhattan**, 2013. Oil on panel, 48 x 35 inches. © *Valerio D'Ospina. Courtesy of the artist. Private collection.*

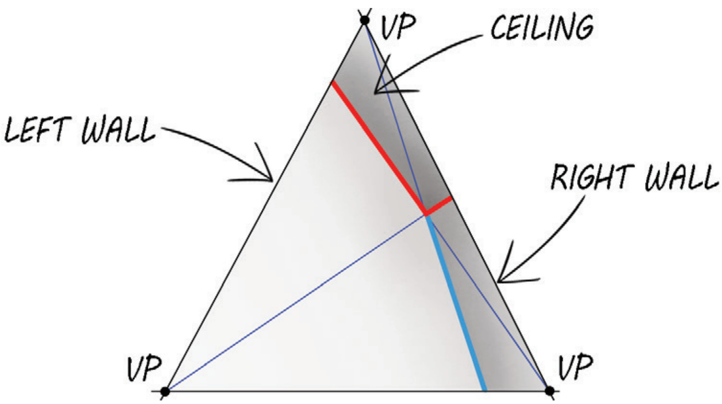

Figure 5-12

same three vanishing points. All vertical edges will originate from the third vanishing point below the horizon line. Right and left edges will originate from the left and right vanishing points, respectively (5-10, 5-11). A worm's-eye interior begins with the ceiling and walls (5-12). Details are again added using

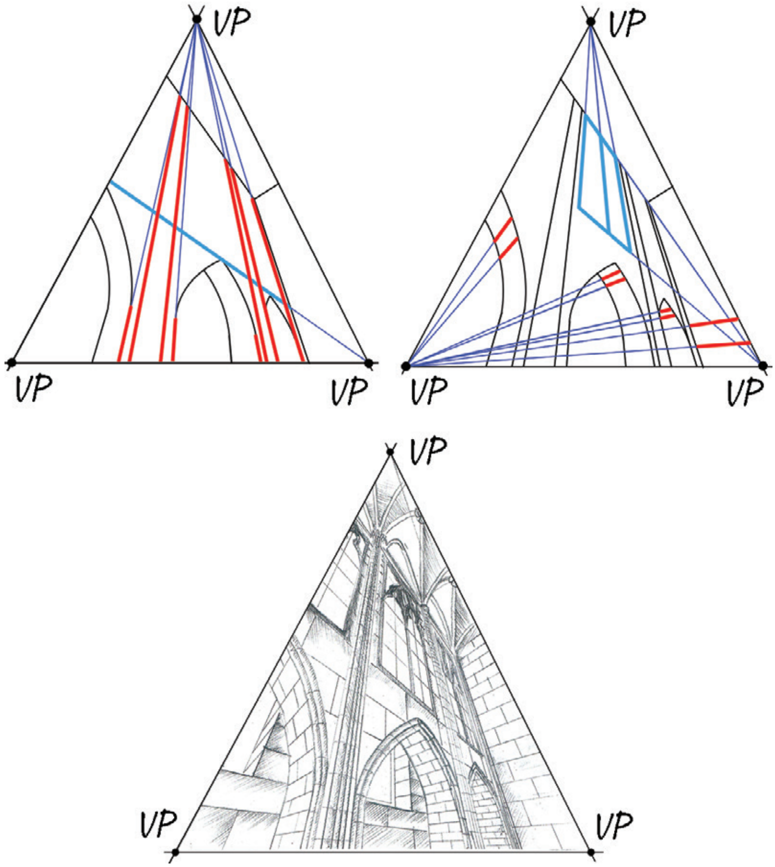

Figure 5-13

the same three vanishing points. All verticals originate from the third vanishing point above the horizon line. Right and left edges are formed by the left and right vanishing points, respectively (5-13, 5-14). In one sense, three-point perspective is the easiest form of perspective because all lines must go to a vanishing point—no need to remember which edges or planes should be kept straight because they are all angled. Keep this in mind to prevent stray lines.

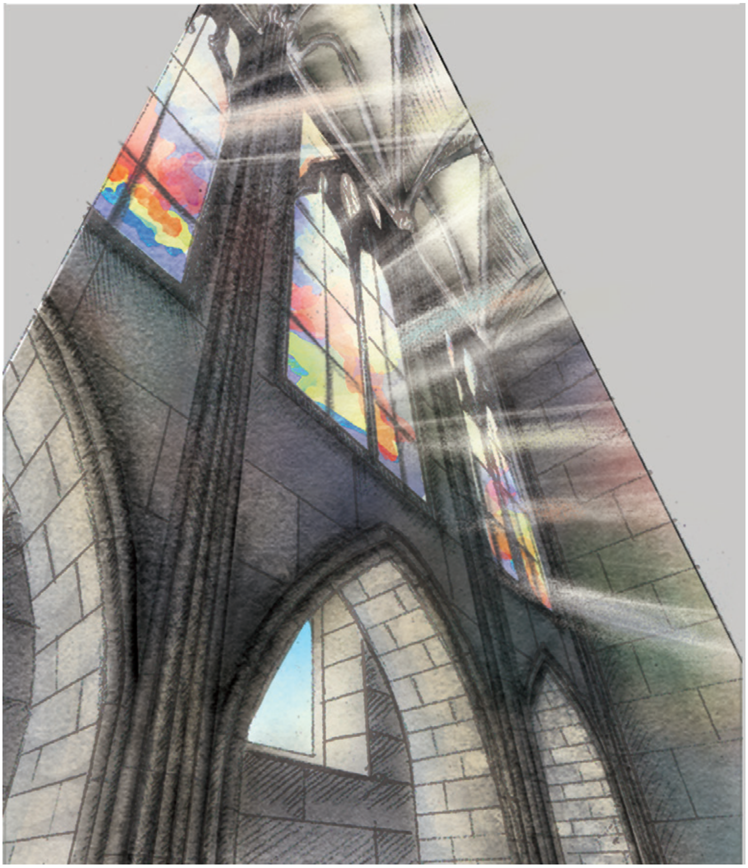

Figure 5-14

Just like two-point perspective, three-point perspective works better when the vanishing points are farther away from the subject. This helps minimize distortions, so be sure to allow adequate space to position vanishing points in the margins. The vanishing points in a three-point set are almost always outside of the frame of the composition (5-15). And just as in one- and two-point perspective, the subject can be located anywhere in relation to the horizon, and the horizon can be

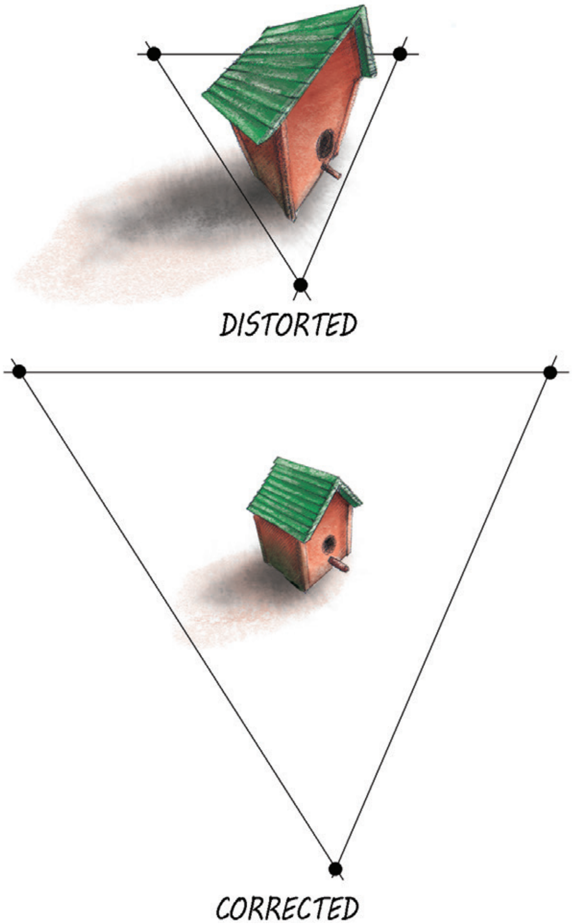

Figure 5-15

included or excluded from the compositional frame. Always carefully consider their placements.

Also recall that there are no hard and fast rules regarding a horizon line. In a traditional worm's-eye or bird's-eye, the triangle's horizontal arm is used as a horizon line. But not all subjects need to be positioned on the ground. Picture a plane flying through the air, for example. We can rotate the vanishing

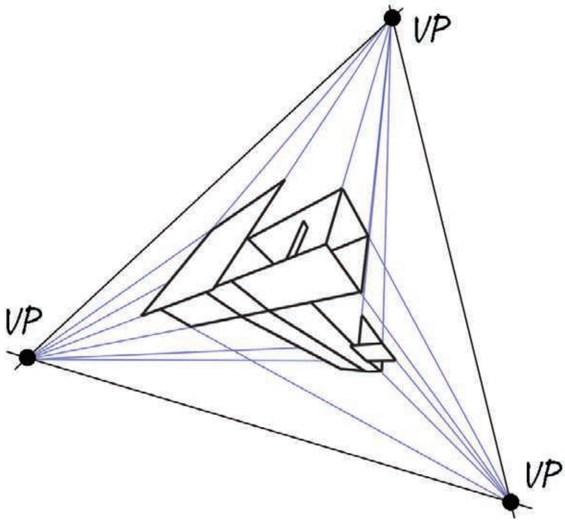

Figure 5-16

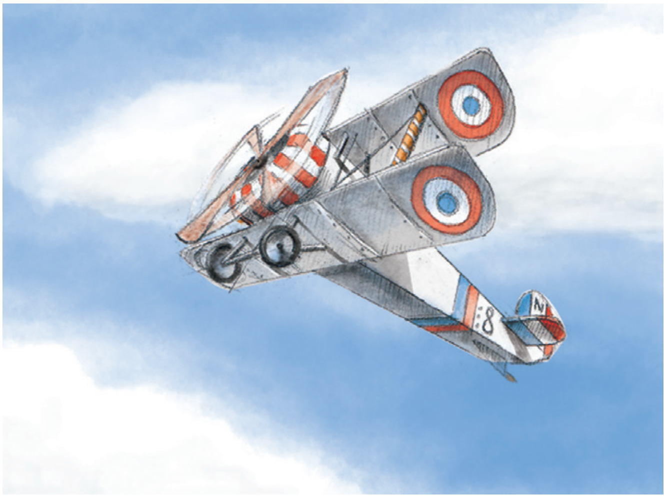

Figure 5-17

points to any position to change the orientation of the form independent of the horizon. In this manner the horizon may be excluded from the composition if desired (5-16, 5-17).

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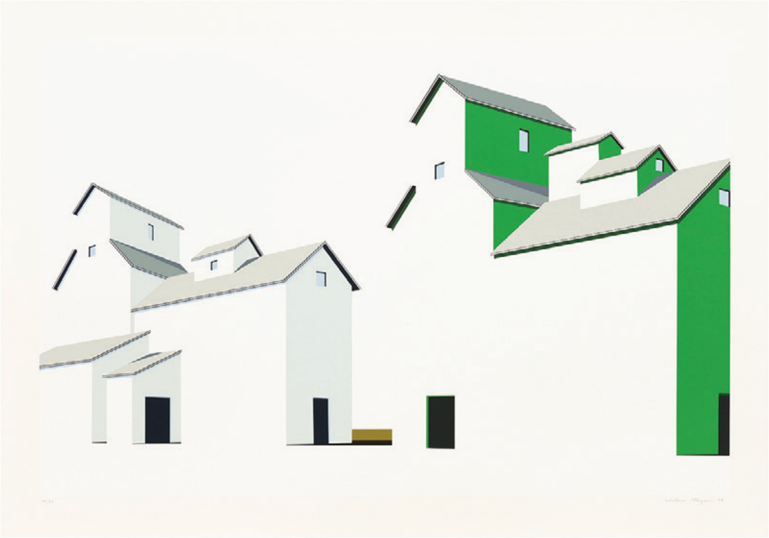
NON-RECTANGULAR FORMS

6

6 NON-RECTANGULAR FORMS

How do we create forms other than rectangular prisms in perspective? We saw that some forms, if oriented in a particular manner, can easily be rendered in one-point perspective. But most forms must be inscribed within a rectangular plane or prism to be drawn correctly in one-point, two-point, and three-point perspective. First we need to know how to find the center of a rectangle that is in perspective. To find the center of any rectangular plane, whether in perspective or not, we can inscribe an X between opposing corners. The intersection marks the center (6-1). This technique is often referred to as finding the **perspective center**. It is frequently used to divide planes in perspective (6-2).



NON-RECTANGULAR FORMS. William Steiger, **Wheat Pool**, 2008. Screenprint, 28 ¼ x 40 inches, edition of 50. © *William Steiger. Published by Pace Editions. Courtesy of the artist and Pace Prints..*

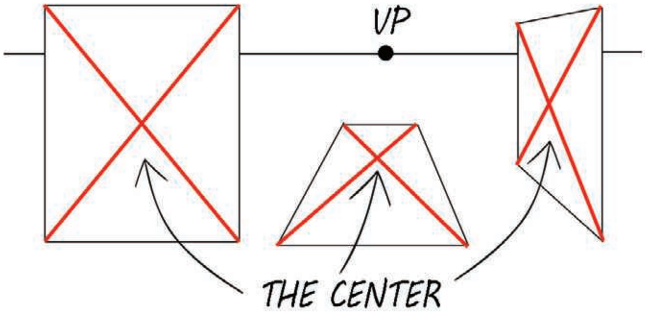


Figure 6-1

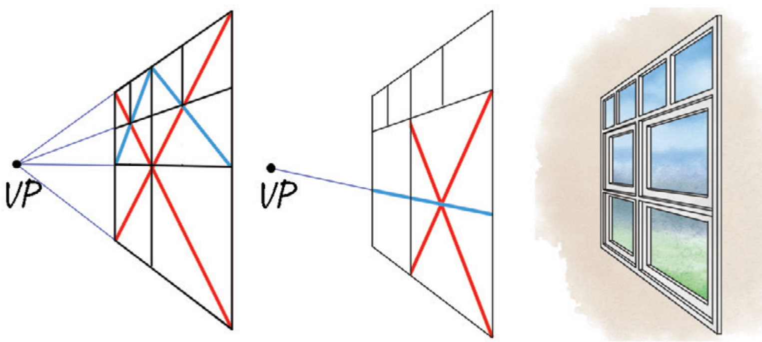


Figure 6-2

For example, we can use the perspective center to create an **isosceles triangle** in perspective. The isosceles triangle has two sides that are the same length. To construct an isosceles triangle, start with a rectangle. Find the perspective center of the rectangle, then extend a line through the perspective center and out to one edge of the rectangle; this locates the peak, or pitch, of the isosceles triangle. From the pitch, extend the legs of the triangle down to the base at each corner. Because we centered the pitch with respect to the base, we know the

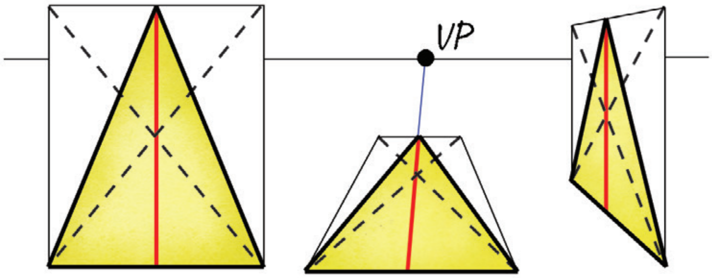


Figure 6-3

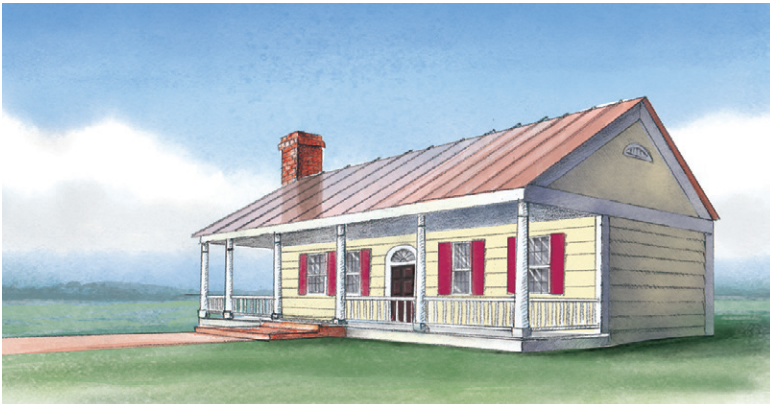


Figure 6-4

sloping legs are the same length, even though they appear foreshortened in perspective (6-3).

A pitched roof on a house is usually an isosceles triangular prism—the two sides of the roof are the same length (6-4). To construct an isosceles triangular prism in perspective, begin with a rectangular prism. Choose two opposing planes, and inscribe isosceles triangles on each side. Then join the planes at the pitch. Be sure to use appropriate vanishing points as

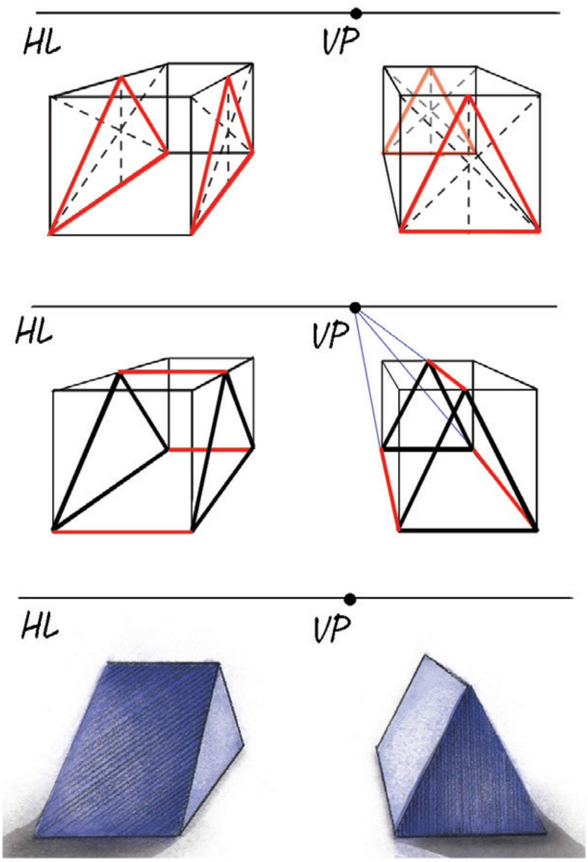


Figure 6-5

needed (6-5). An alternative approach is to first draw the rectangular prism that will form the building itself. Then find the perspective center for two opposing planes of the building. Finally extend a vertical line to the desired height for the pitch of the roof, and join the legs of the triangle to the top corners of the building (6-6).

Ellipses in perspective are also best derived from the rectangle to ensure correct foreshortening. To draw an ellipse, start

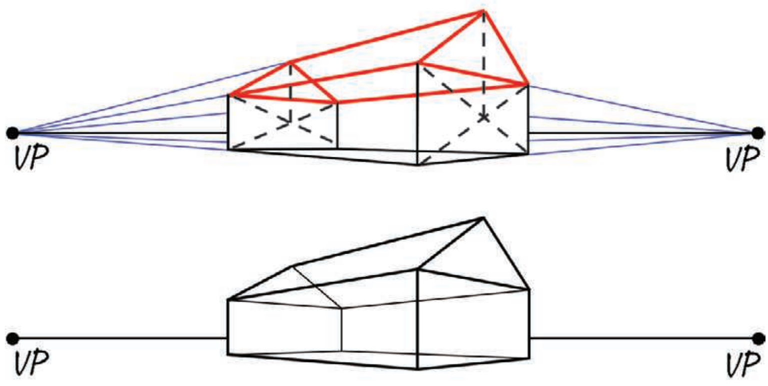


Figure 6-6

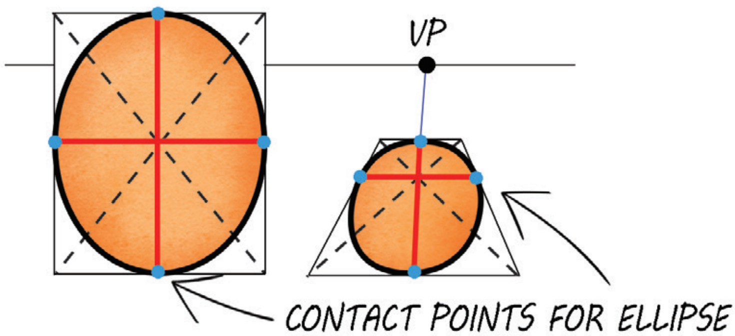


Figure 6-7

with a rectangle. Find the perspective center of the rectangle. Then make crosshairs that extend from the center to the edges of the rectangle. The crosshairs help to find the center of each side of the rectangle. Mark points at the center of each side. An ellipse inscribed inside of the rectangle will contact the rectangle at each of these points. We use these contact points to help shape the ellipse (6-7). Be careful to keep the form rounded and avoid pinched corners. Football- or

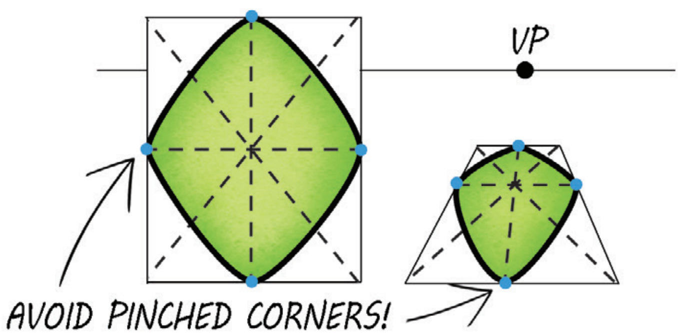


Figure 6-8

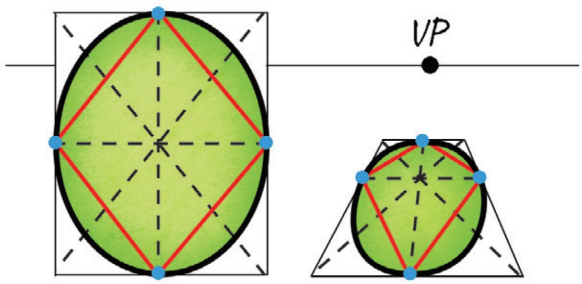


Figure 6-9

almond-shaped ellipses are a common mistake (6-8). One helpful trick for maintaining a rounded form is to first connect the contact points into a diamond. Then take care to draw the ellipse significantly rounder than the diamond. The diamond is a good guide for ensuring that the form stays round (6-9).

Creating ellipses is essential to rendering cylinders. Draw a rectangular prism. Choose two opposing planes, find the perspective center of each plane, and inscribe ellipses on each plane. The elliptical planes are then connected visually,

ELLIPSES IN PERSPECTIVE. Anna Sew Hoy, **Sight Stand**, 2015. Powder-coated steel, denim, 72 x 68 x 58 inches. © *Anna Sew Hoy. Photography by Jeffrey Sturges. Courtesy of the artist, Koenig & Clinton, Brooklyn, and Various Small Fires, Los Angeles.*

taking care to use any appropriate vanishing points. To then develop a solid form, erase the hidden edges (6-10).

Two other basic forms also rely upon finding the perspective center: the pyramid and the cone. Both originate as rectangular prisms. A pyramid has a rectangular base, and a cone has an

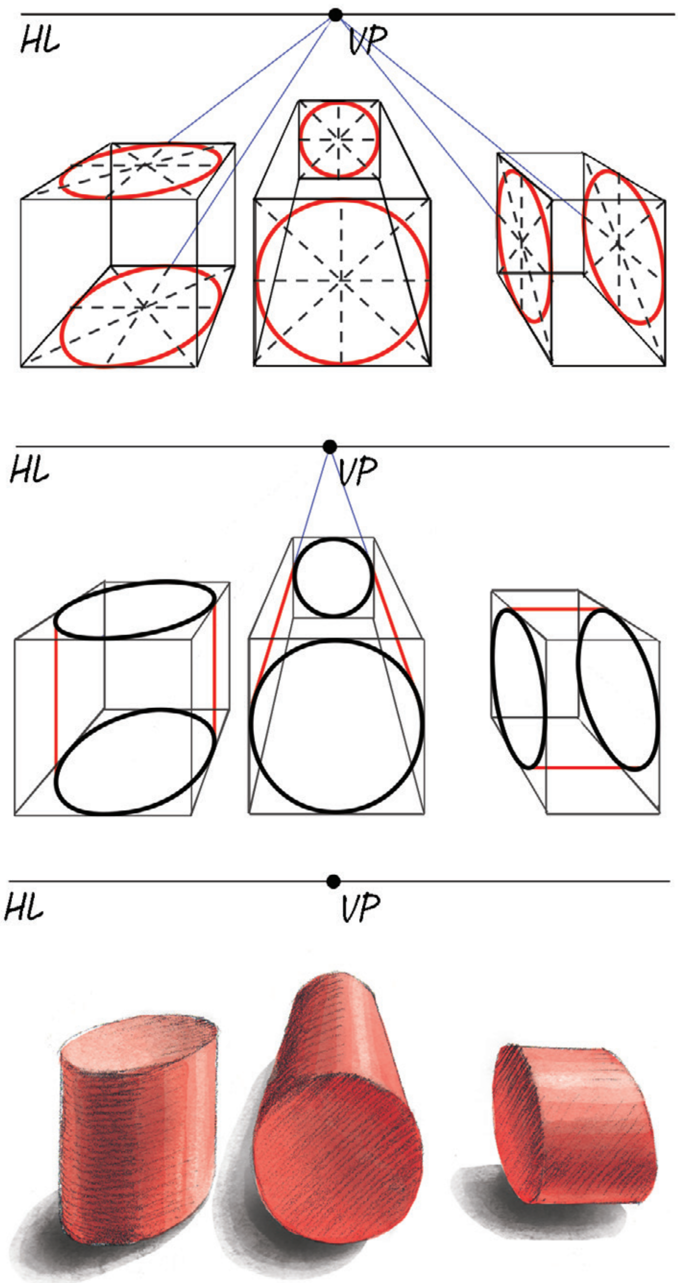


Figure 6-10

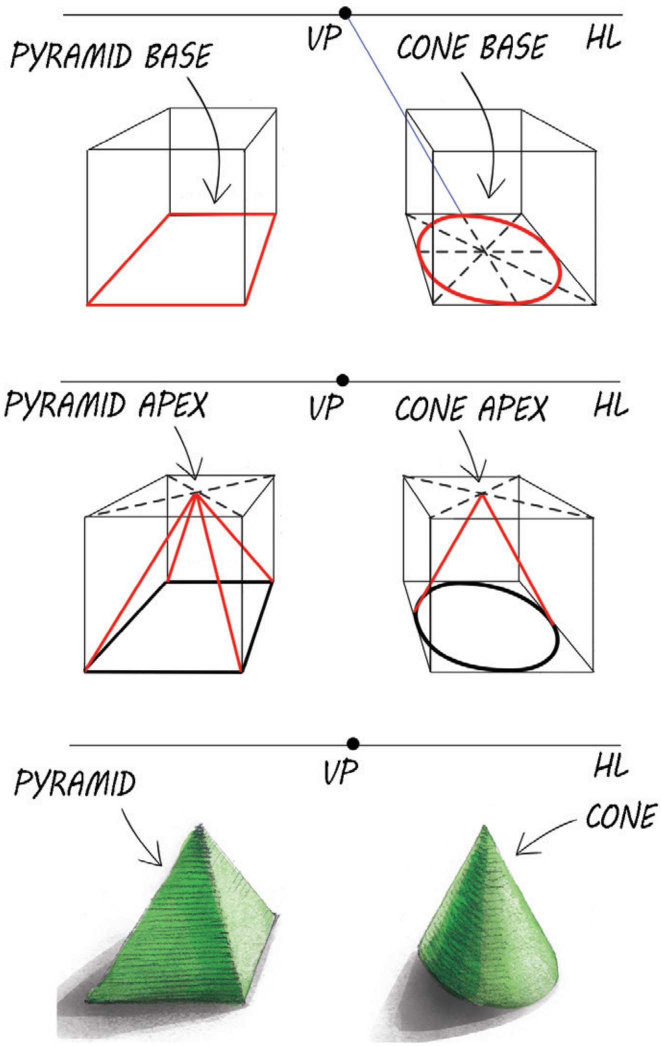
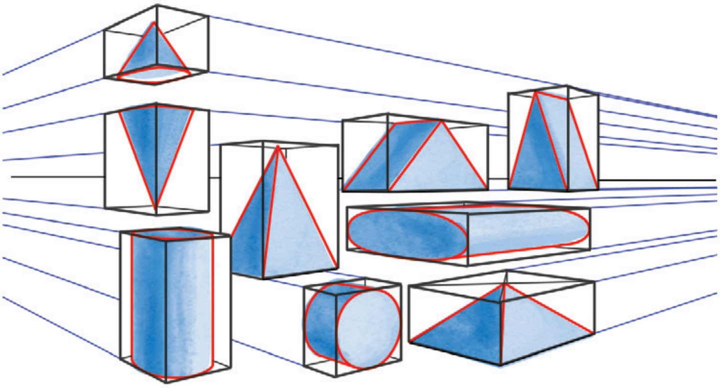
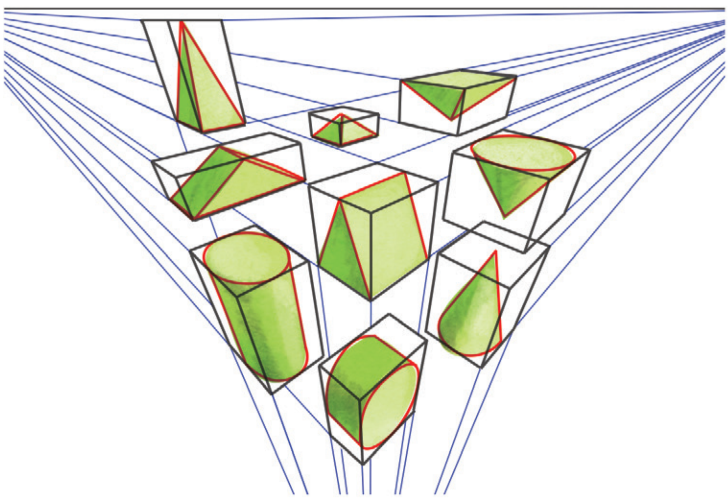


Figure 6-11

elliptical base. The apex of each is found at the perspective center opposite the base. To form the pyramid, connect the four corners of its base to its apex. To form the cone, visually connect its elliptical base to its apex. Once the form is developed, hidden edges can be erased to make a solid shape (6-11).



TWO-POINT



THREE-POINT

Figure 6-12

All of these forms can be drawn in one-, two-, and three-point perspective. You can inscribe the forms in any orientation within any given rectangular prism: top to bottom, side to side, and front to back. Note that the rectangular prism's proportions inform the inscribed shape's proportions (6-12). For all

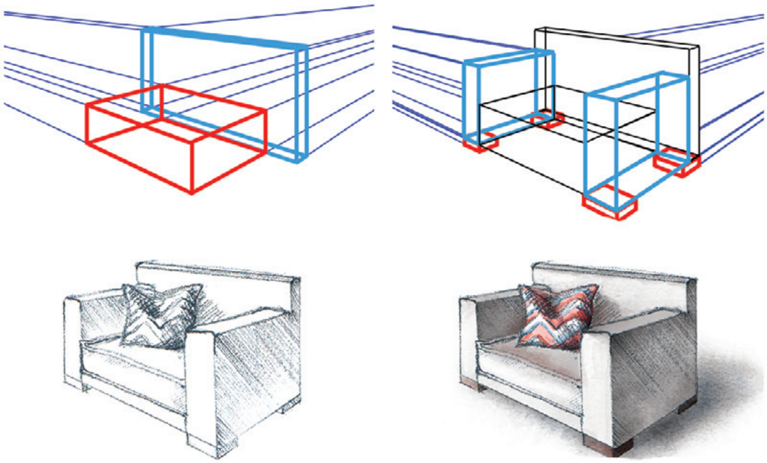


Figure 6-13

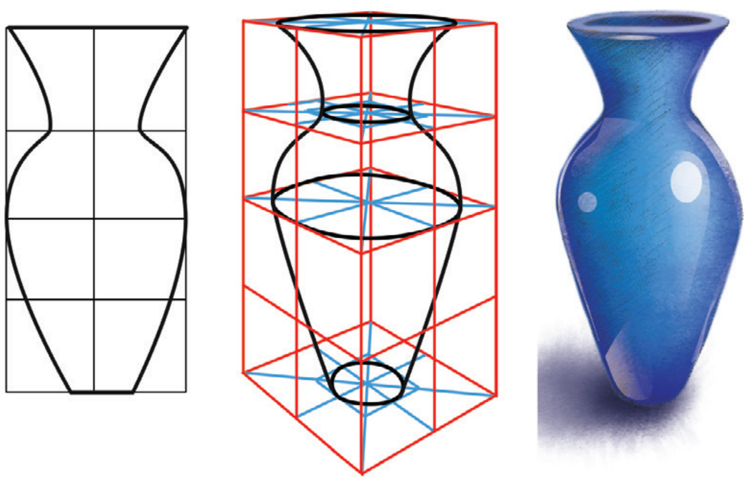


Figure 6-14

these reasons, most subjects can be reduced to basic forms, making basic forms of supreme foundational significance. The only basic forms not covered in this chapter are squares and

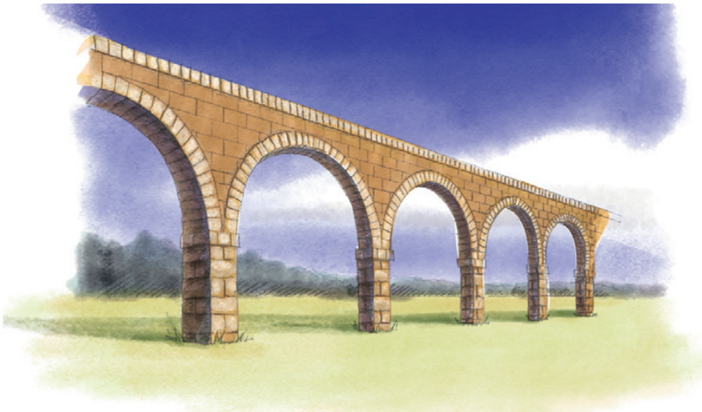


Figure 6-15

cubes, and their derivatives, circles and spheres. These are introduced in Chapter 9 when we discuss the perspective grid.

You can use basic forms to build complex forms in an infinite number of ways, but there are two main approaches: additive and subtractive. **Additive shape building** combines, or adds, smaller basic shapes together to form a larger complex shape (6-13). **Subtractive shape building** begins with a larger form, and removes pieces from it to find the final shape (6-14). Additive and subtractive techniques are often used in conjunction with each other to develop detailed forms. You may find it works best to start working additively and then refine details subtractively, or vice versa.

No matter the strategy, it is important to begin with the larger forms before moving into the smaller forms or details. An archway, for example, is composed of one half of an ellipse (6-15). We start with an ellipse and then use the technique for creating a cylinder to give the arch depth. Rectangular prisms

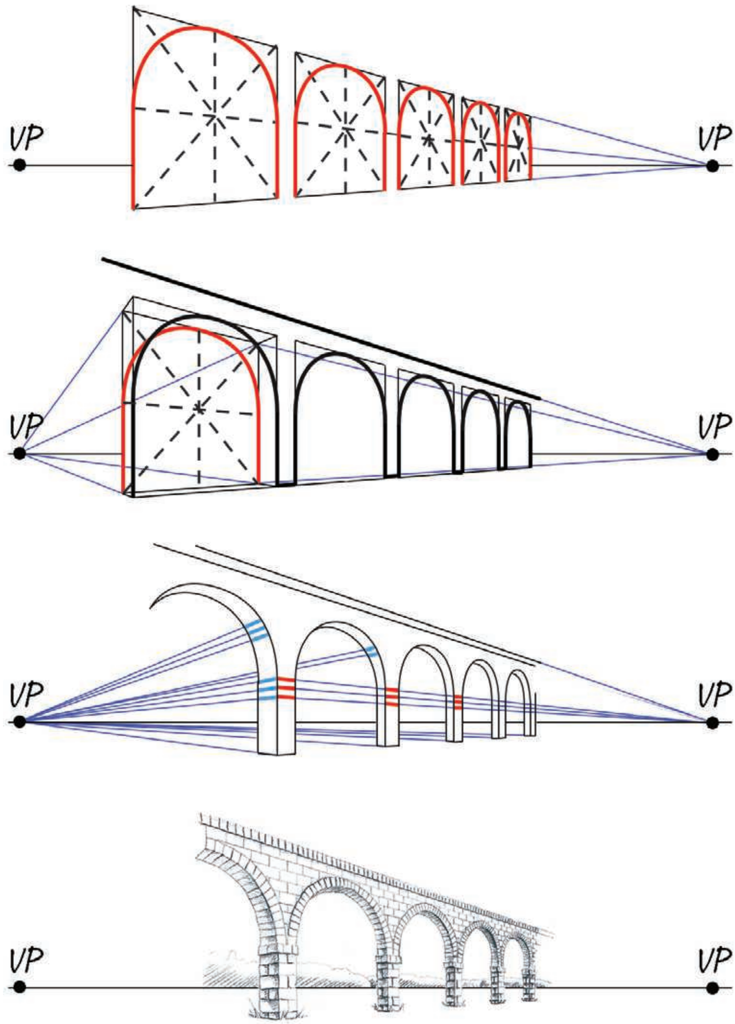


Figure 6-16

form the pillars (6-16). Close attention to the overall proportions is key. For subjects with complex proportions, it is helpful to map the proportions to a two-dimensional grid, which you can then translate into a three-dimensional rendering (6-17).

COMPLEX FORMS. Wayne White, **DUNNO**, 2013. Acrylic on offset litho, 25.5 x 45.5 inches. © *Wayne White. Courtesy of Western Project Gallery.*

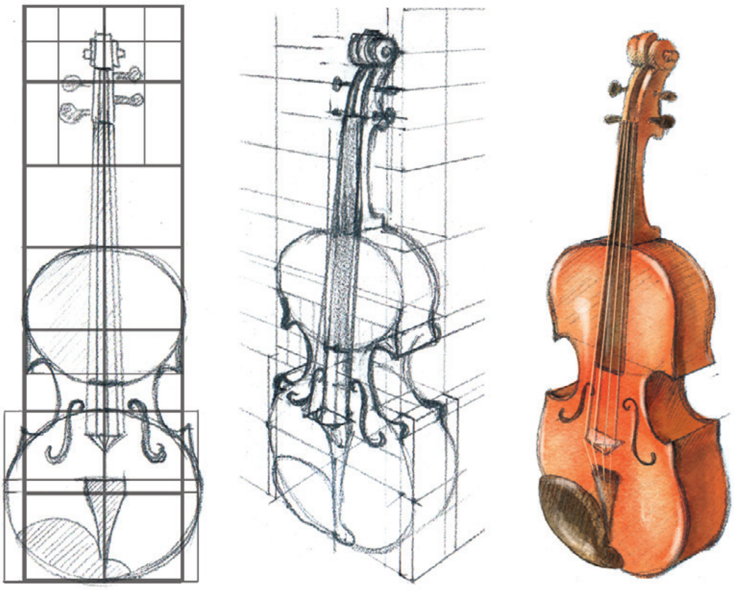


Figure 6-17

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PROPORTION & SCALING

7

7 PROPORTION & SCALING

How do we know the relative size of a subject? We compare it to another subject of a known size. Since we are intimately familiar with the size of human figures, adding a human figure to a scene is helpful in establishing the overall proportion, or relative size, of forms in a composition. A larger figure will make the subject appear smaller, while a smaller figure will make the subject appear larger (7-1). No matter the subject, careful attention to the forms' proportions is necessary to accurately communicate size and scale.

Oftentimes a composition calls for repeating forms, maintaining the same size and proportion but placing them at

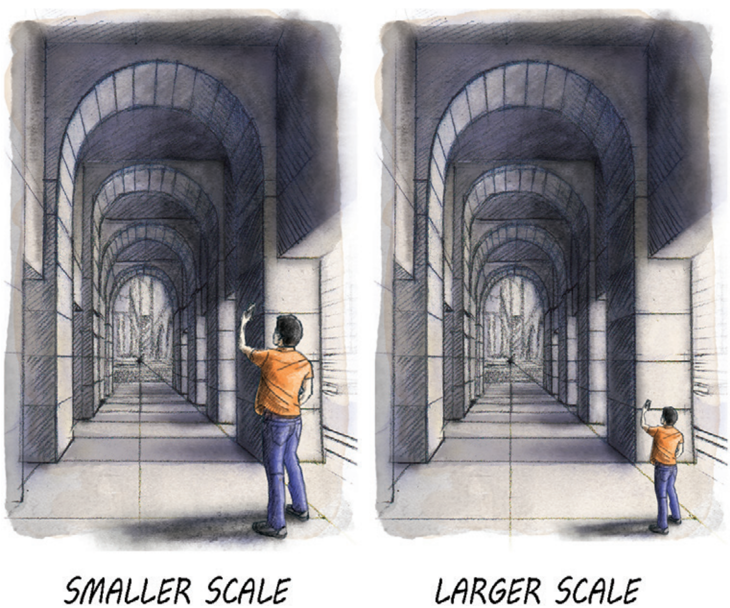


Figure 7-1

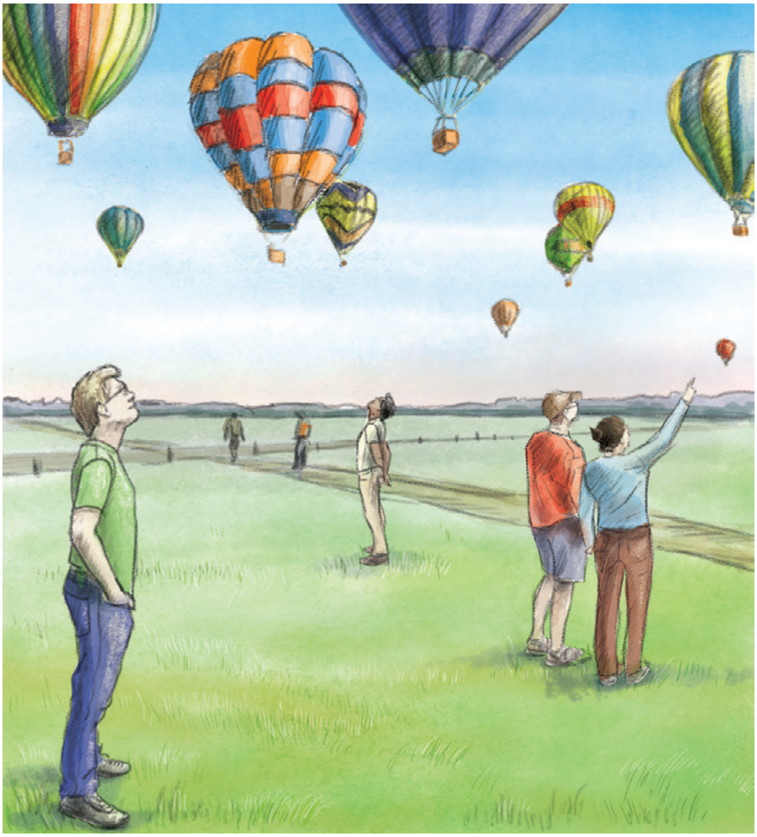


Figure 7-2

different distances and locations. To accomplish this we employ **perspective scaling**. We can scale one dimension, two dimensions, or all three dimensions in perspective. And the techniques work the same in all three perspectives.

One-dimensional scaling is often used for multiple human figures at the same height (7-2). Starting with one figure, we can easily add a second. Place a horizon line and draw the first figure. Extend height guidelines from the initial figure to

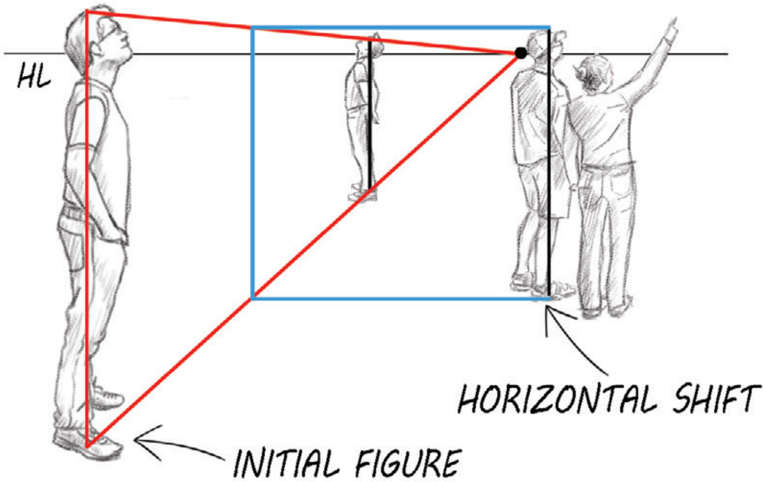
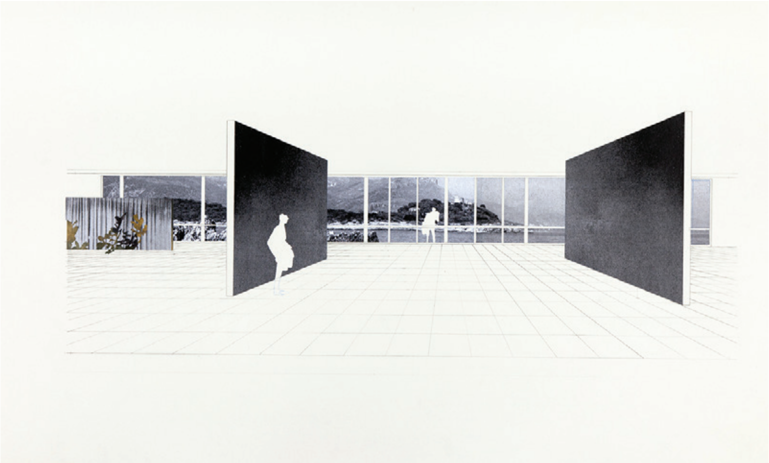


Figure 7-3

find where they intersect the horizon. Then use the guidelines to determine the height of any additional figures. Note that you can place figures anywhere on the ground plane simply by shifting the measured height horizontally from the guidelines (7-3).

Scaling two and three dimensions requires a diagonal vanishing point. A **diagonal vanishing point** is the point where a set of parallel diagonals receding from the viewer appears to converge. All rectangular planes have a diagonal, so all rectangular planes in perspective have a diagonal vanishing point (DVP) (7-4). To find the diagonal vanishing point for any plane, simply draw a line through its' diagonal. Diagonal vanishing points for horizontal planes are located on the horizon line. For vertical planes, diagonal vanishing points are located on a **vertical axis line** that extends from the vanishing point perpendicular



SCALE & PROPORTION. Katarina Burin, **Hotel Nord-Sud, Zadar Lobby Interior, alternative perspective drawing, 1932-34 / 1976**, 2012. Ink and collage on paper, 24 x 42 inches. © *Katarina Burin. Courtesy of the artist and Ratio 3, San Francisco.*

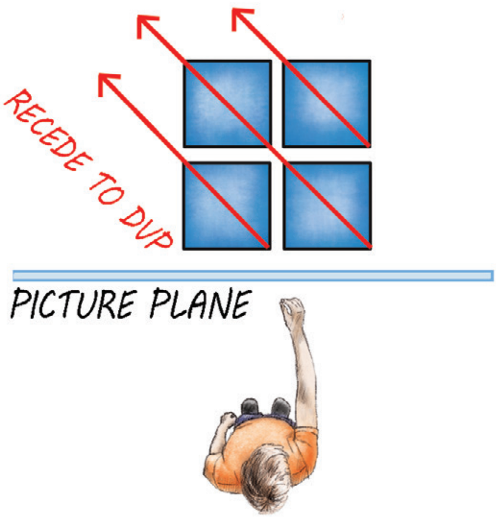


Figure 7-4

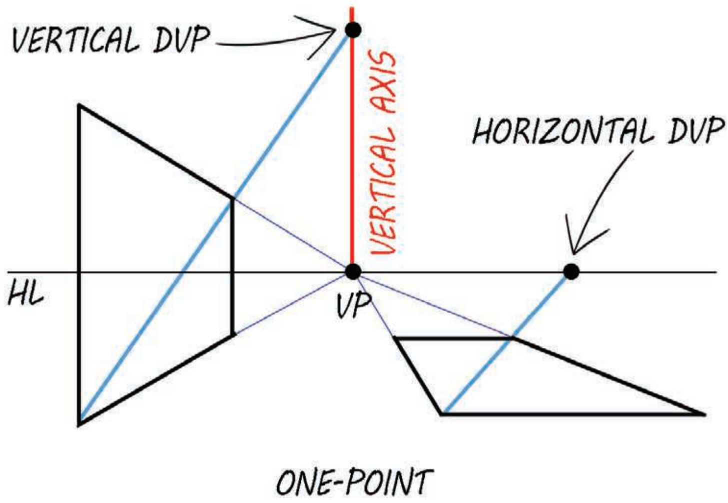


Figure 7-5

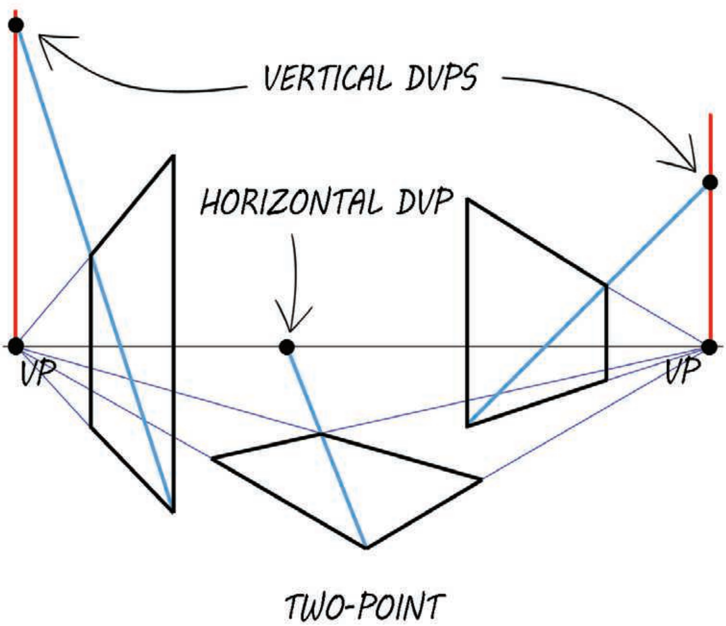


Figure 7-6

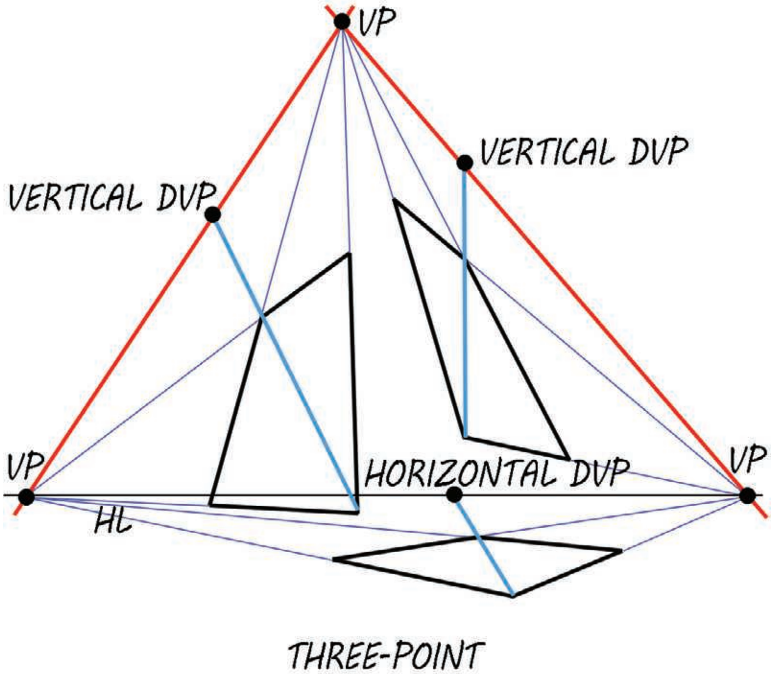


Figure 7-7

to the horizon (7-5). Recall that in two-point perspective a vertical plane can be constructed using either the right or the left vanishing point. A vertical plane constructed from the right vanishing point uses a DVP on the right vertical axis line. And a vertical plane constructed from the left vanishing point uses a DVP on the left vertical axis line (7-6). You can easily establish three-point diagonal vanishing points, too—they are located on the sides of the triangle that connect the vanishing points (7-7).

Now that we know how to find diagonal vanishing points, we can use them to scale repeating forms in perspective. Only

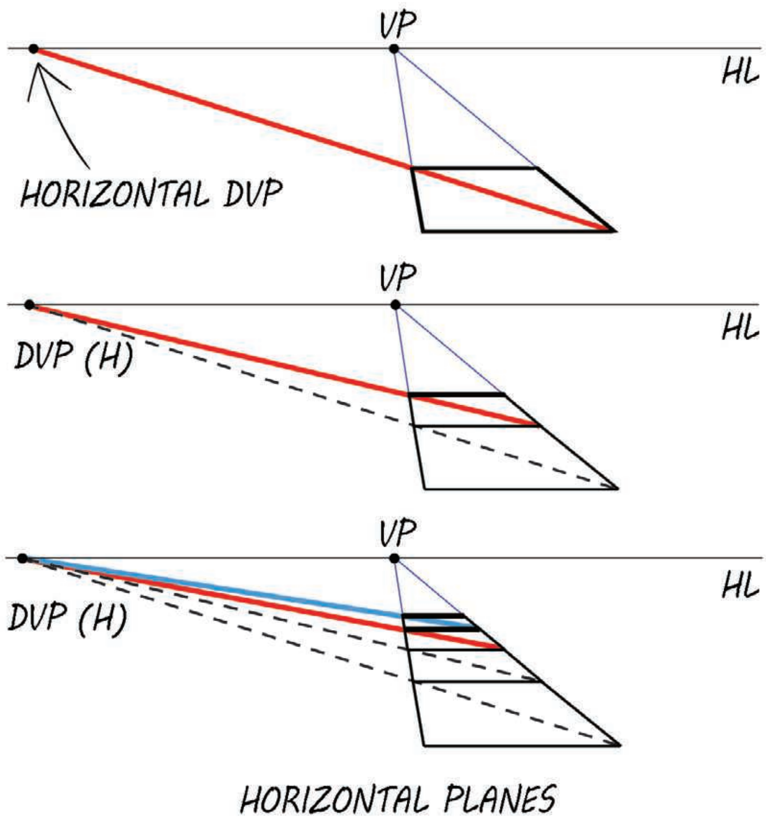
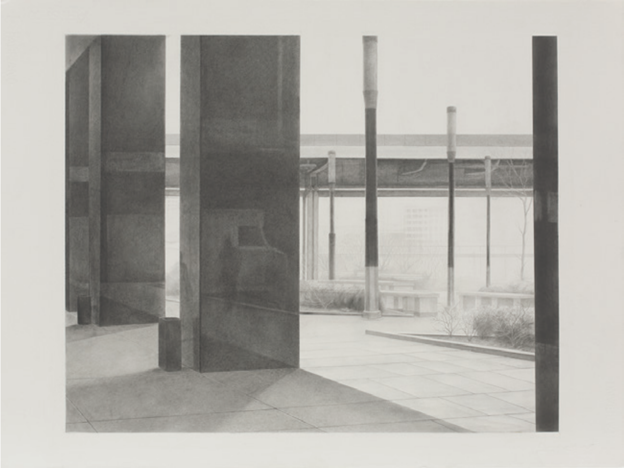


Figure 7-8

one diagonal vanishing point is needed to scale repeating two-dimensional planes. Draw the initial plane, and then locate a diagonal vanishing point for that plane. Use the diagonal vanishing point in combination with the vanishing point to draw subsequent repeating planes. The technique is exactly the same for both horizontal and vertical planes (7-8, 7-9). You would commonly apply this technique in rendering sidewalks, windows, and rows of trees, fence posts, or power lines. Note how one composition can have multiple diagonal vanishing points for each set of repeating forms (7-10, 7-11).



SCALING TWO DIMENSIONS. Nuno de Campos, **Pillars #2**, 2014. Graphite on paper, 22 ¾ x 30 ¼ inches. © *Nuno de Campos. Courtesy of the artist and Miles McEnery Gallery, New York, NY.*

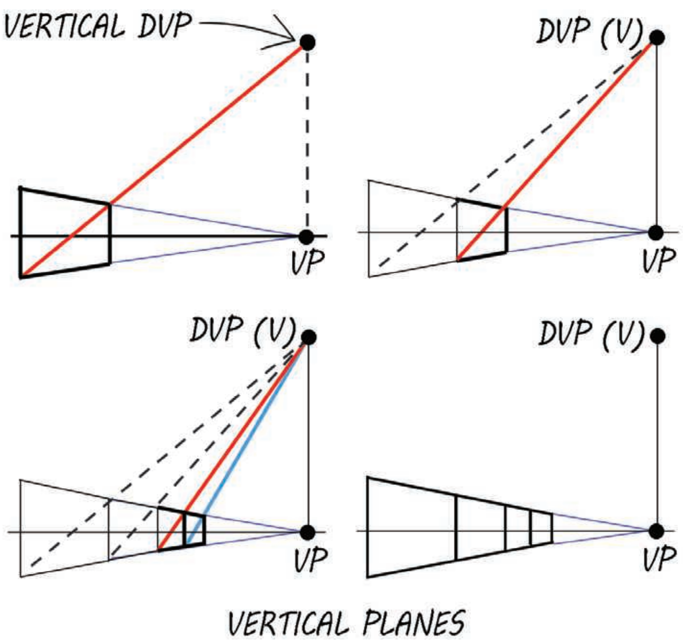


Figure 7-9

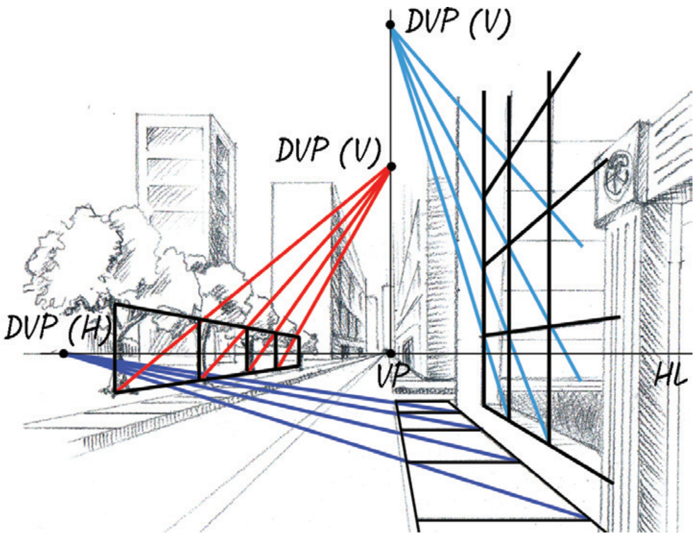


Figure 7-10

Figure 7-11

Accurate scaling of the form's height, width, and depth requires the use of two diagonal vanishing points. Draw the initial form and locate two of its diagonal vanishing points.

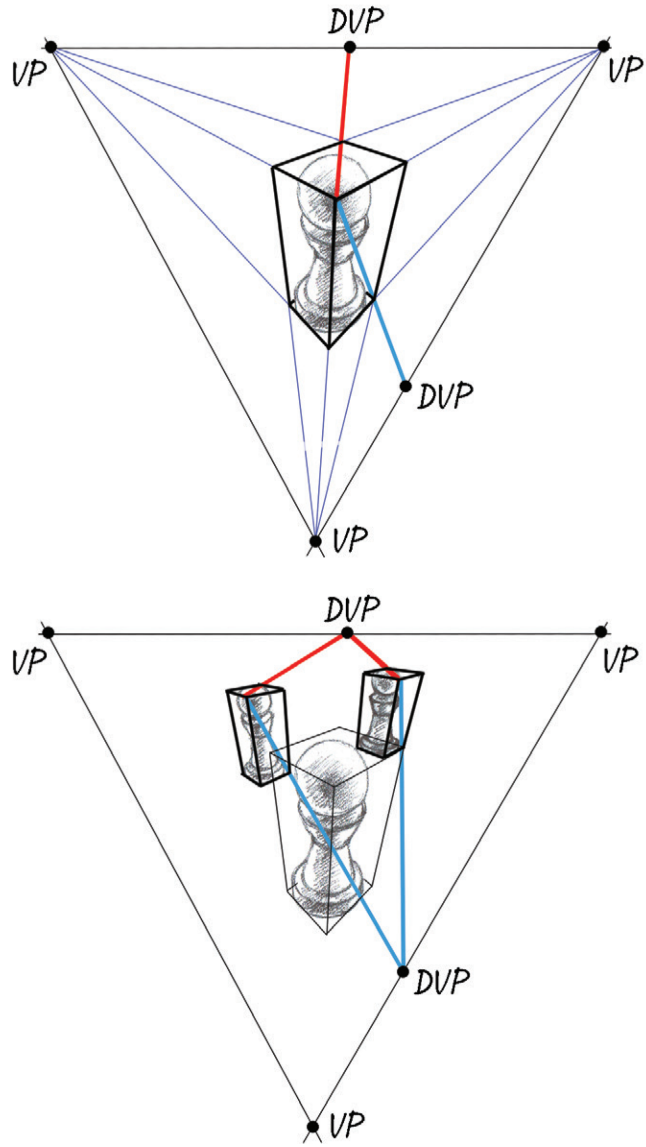


Figure 7-12

Then use the vanishing points in conjunction with the diagonal vanishing points to render another instance of the subject anywhere in the composition (7-12). This example is in three-point

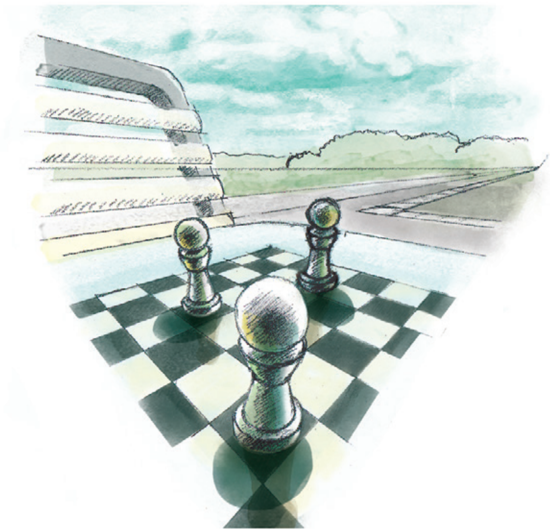


Figure 7-13

perspective, but recall that these techniques are all applicable in one-, two-, and three-point perspective (7-13).

There are many cases in which the diagonal vanishing point may fall too far out in the margins to be useable. Extremely long or tall planes produce this problem. The solution is fairly simple, though. Use a shorter segment of the plane to find a closer diagonal vanishing point. You can erase the guidelines for the shorter segment once the repeating planes are correctly scaled (7-14).

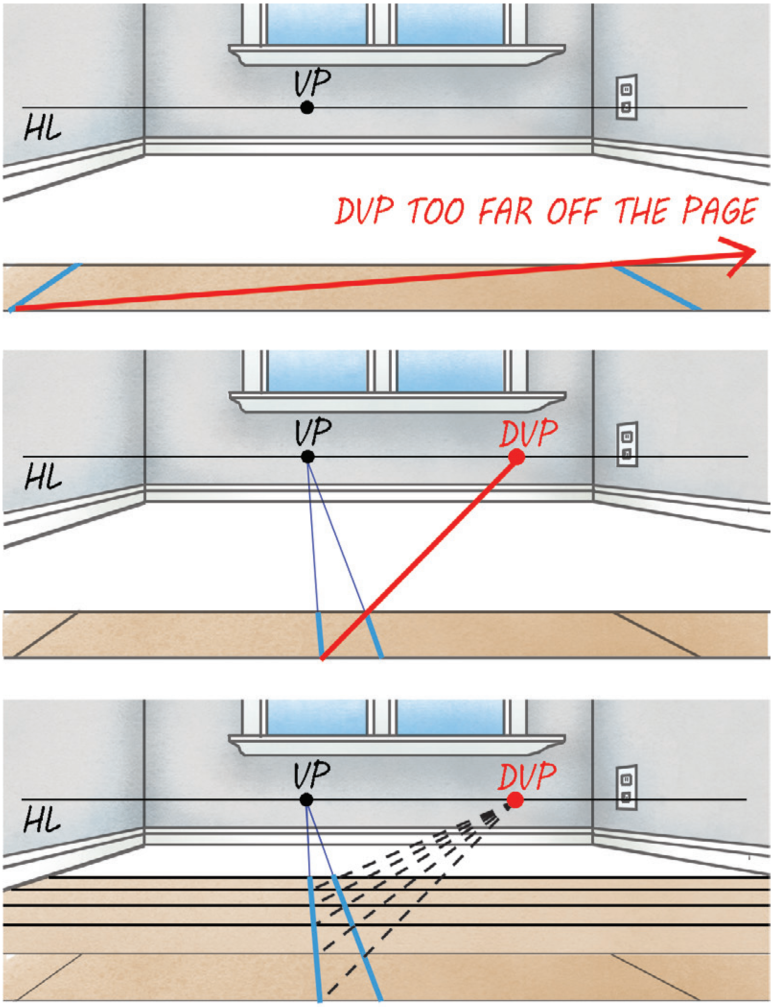


Figure 7-14

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THE CONE OF VISION

8

8 THE CONE OF VISION

Recall that the station point references the viewer's location, and the center of vision indicates the direction of the viewer's gaze with respect to the subject. We know that the location of these three components—the station point, the center of vision, and the subject—define the point of view. One-point, two-point, and three-point perspective, by definition, always have a station point and center of vision (8-1). Thus far in our applications, the station point and center of vision have been implied but not actively used. You will see shortly, though, that the station point and center of vision are key components of several perspective techniques to be discussed in subsequent chapters.

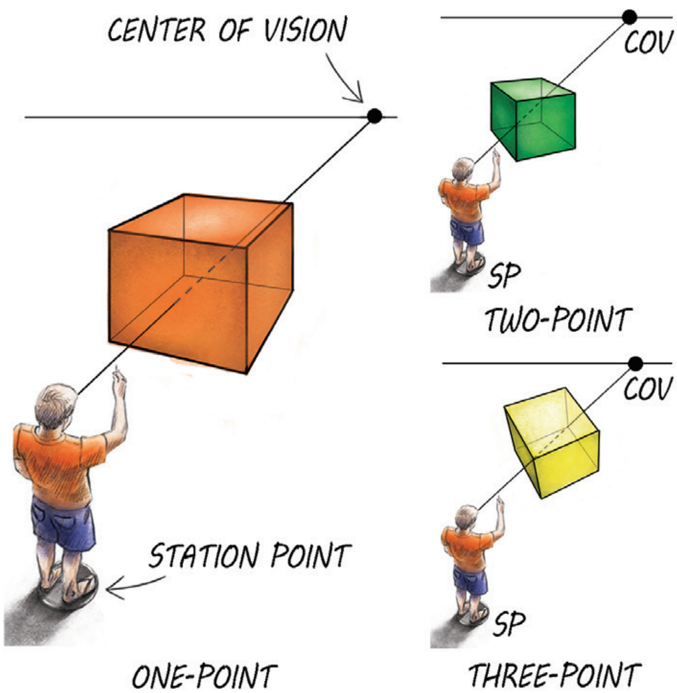


Figure 8-1

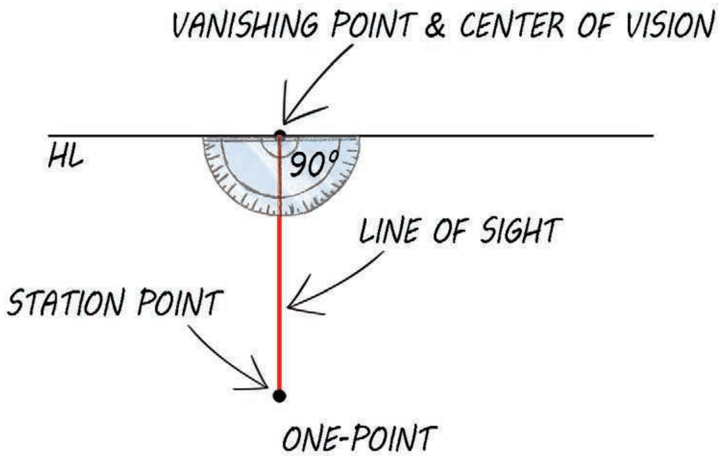


Figure 8-2

To employ a station point and center of vision requires locating what is best described as a **projected station point**. We know that the viewer's location, or station point, is always in front of the picture plane. In other words, you (as the viewer) exist in three-dimensional space and are not located anywhere on the two-dimensional plane of your drawing. That said, we can define the location of the viewer with respect to the subject by projecting a station point onto our paper. For simplicity's sake, though, we refer to projected station points simply as station points because the projection is understood.

The technique for locating a station point is slightly different for one-point, two-point, and three-point perspective. In one-point perspective we draw a vertical axis line directly below the vanishing point (VP) and perpendicular to the horizon (HL). We can position the station point (SP) anywhere along that vertical axis line. The line of sight runs from the station point up to the vanishing point. Unique to one-point perspective, the vanishing point is also the center of vision (8-2).

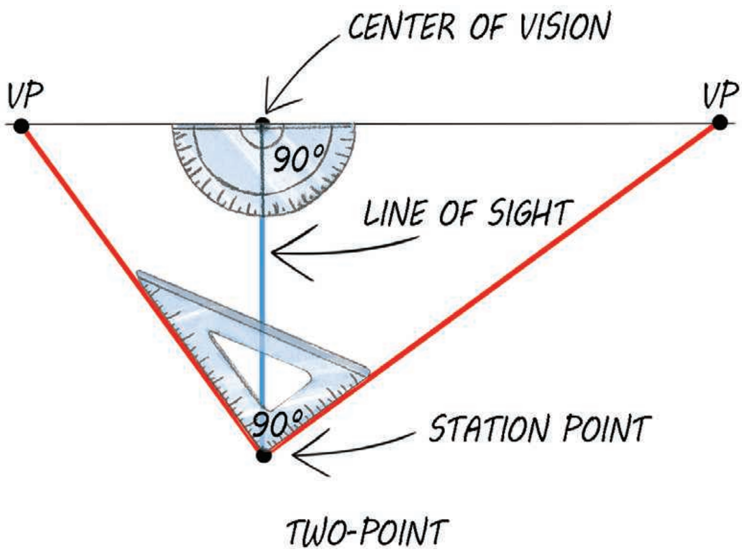


Figure 8-3

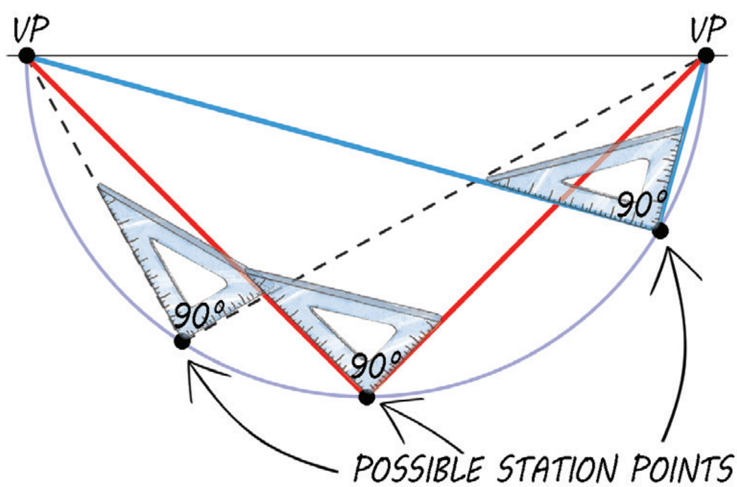


Figure 8-4

In two-point perspective, the viewer's station point is at the corner of a 90-degree angle, the arms of which connect the vanishing points below the horizon line. It is helpful to have a

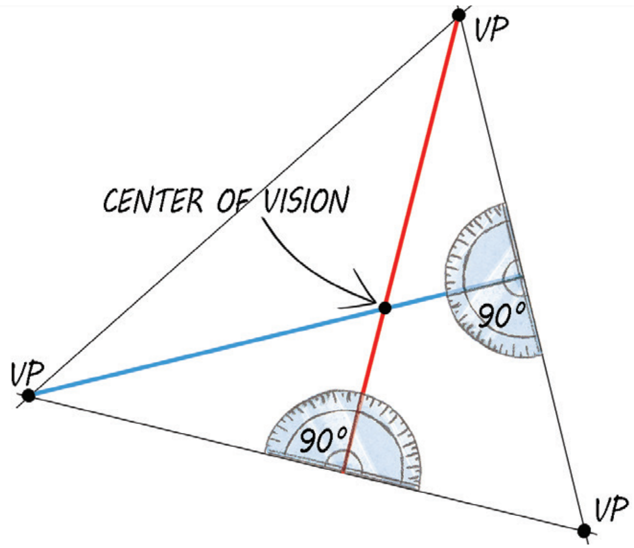


Figure 8-5

drafting tool called a 90-degree triangle to locate the station point. Position the arms of the triangle in line with the vanishing points. Mark the station point at the 90-degree corner of the triangle. Extend a line of sight up from the station point, perpendicular to the horizon. The center of vision is where the line of sight intersects the horizon (8-3). The station point in two-point perspective has a range of possible locations—anywhere along the semi-circular arc connecting the two vanishing points. This means that the center of vision also has a range of possible locations, but it will always fall between the two vanishing points (8-4).

To find the station point and center of vision in three-point perspective, first form a triangle connecting the three vanishing points. Then extend perpendicular lines from any two sides of the triangle to intersect the opposite vanishing point. The intersection marks the center of vision (8-5). We call the two

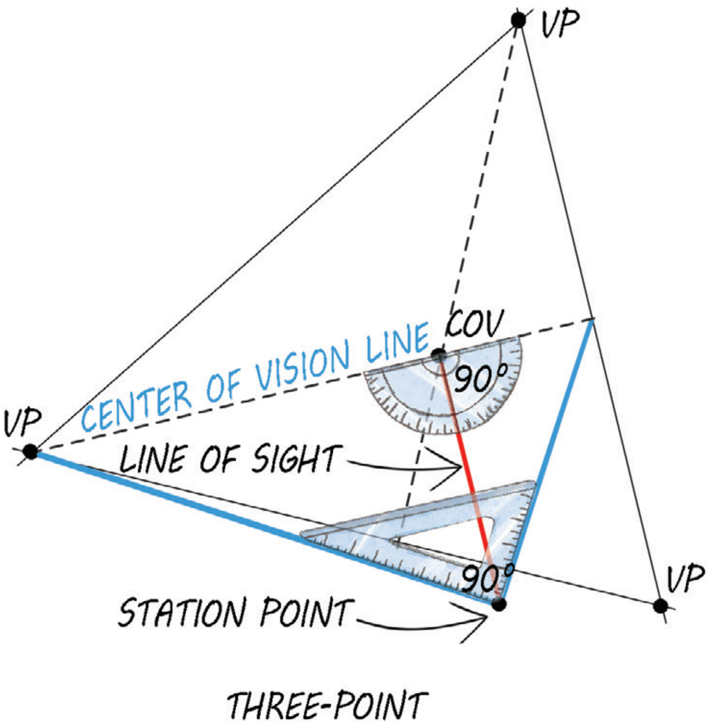


Figure 8-6

perpendicular lines center of vision lines. We can use either of the center of vision lines to locate the station point, so choose one. Referencing the chosen line, draw a perpendicular line of sight directly below the center of vision. The station point is on that line of sight at the corner of a 90-degree angle, the arms of which connect the end points of the center of vision line (8-6). The station point can fall inside or outside of the three-point triangle, and sometimes it falls on the arm of the triangle. There are many possible station points in three-point perspective, but we only need to find one of them. Thankfully, they all function the same.

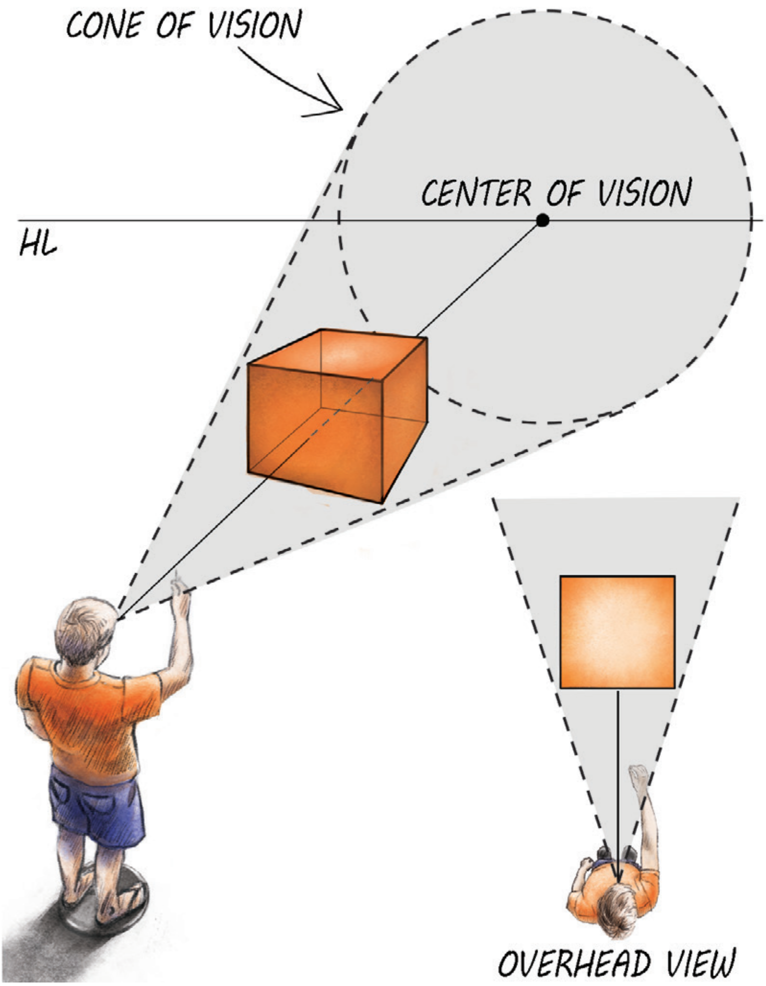


Figure 8-7

We will be using station points and a center of vision fairly often in subsequent chapters. But one application we will now look at pertains to the cone of vision. The **cone of vision** represents an observer's range of vision from any given center of vision (8-7). Our normal eyesight has roughly a 60-degree cone of

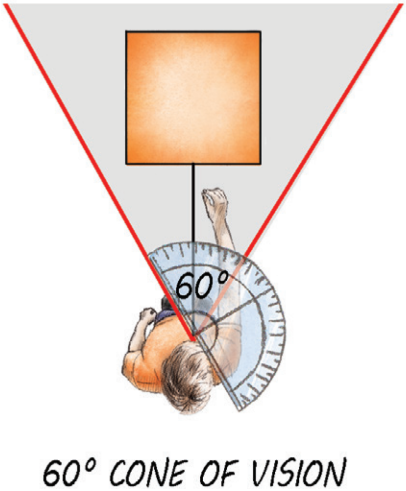


Figure 8-8

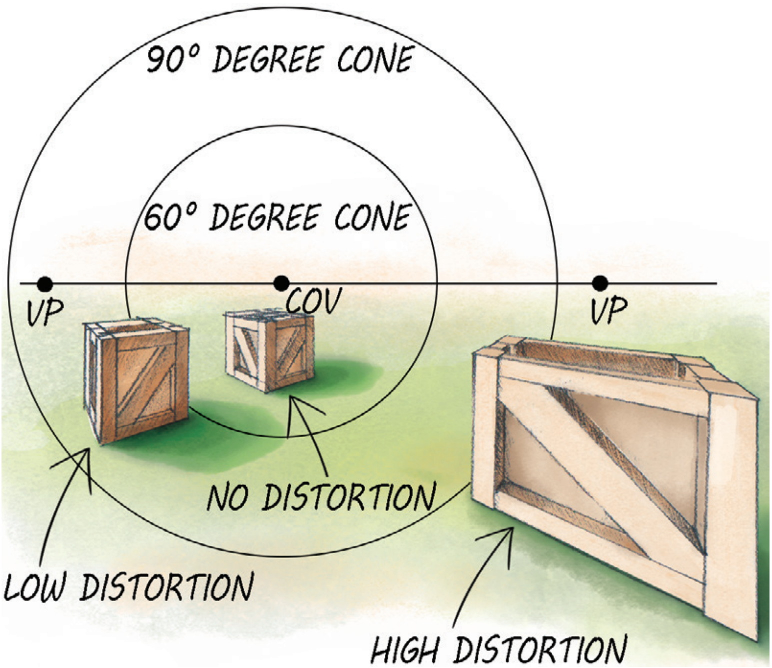


Figure 8-9

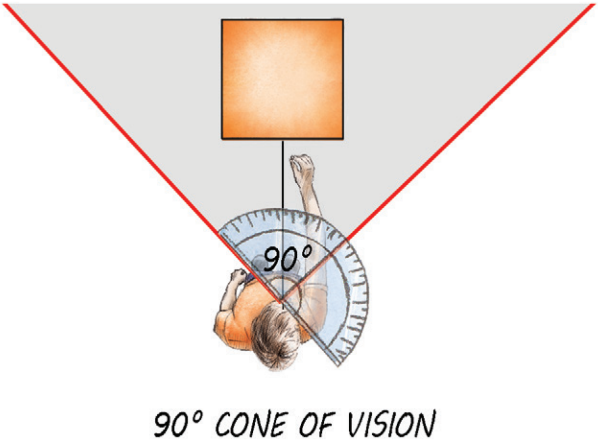


Figure 8-10

vision, excluding peripheral vision (8-8). In linear perspective, all forms rendered within a 60-degree cone of vision appear as normal without any distortion. However, forms grow increasingly distorted as they move farther out from the 60-degree cone. And all forms beyond a 90-degree cone of vision are severely distorted (8-9). A 60-degree cone of vision produces the most realistic proportions. But a 90-degree cone of vision is more commonly used in perspective applications because it maximizes compositional area with minimal distortion (8-10).

You may choose to use a 60-degree or 90-degree cone, or no cone at all, depending on your desired outcome. If the aim is to intentionally distort forms, you don't need a cone of vision. But if the end goal involves some degree of realism or precise proportions, then a cone of vision is a great aid. In previous chapters it was recommended to place two-point and three-point vanishing points farther out in the margins of the page and outside of the compositional frame to minimize distortion. That recommendation is an approximate application of a cone

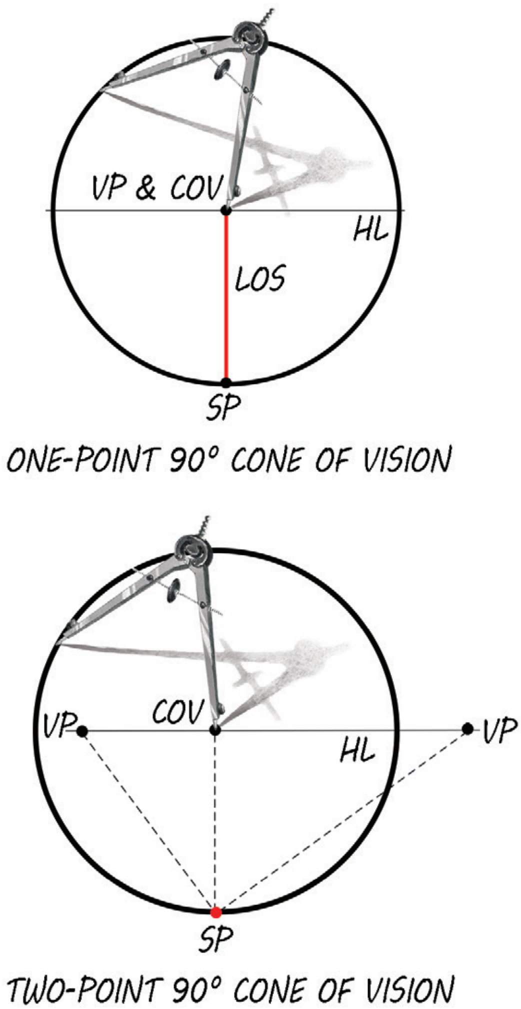
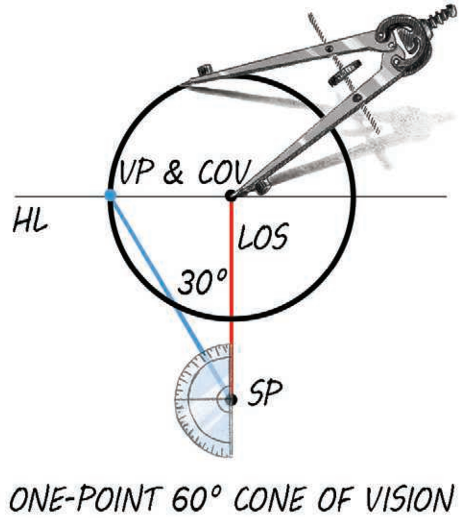


Figure 8-11

of vision. But if you wish to know the exact boundaries of distorting affects, it is best to find the actual cone.

To construct a cone of vision we first need to locate the center of vision and the station point. With a station point and center of vision established, marking a 90-degree cone of vision is as



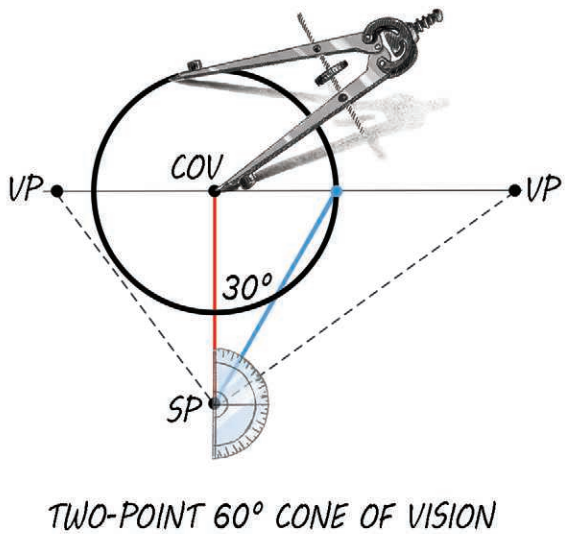
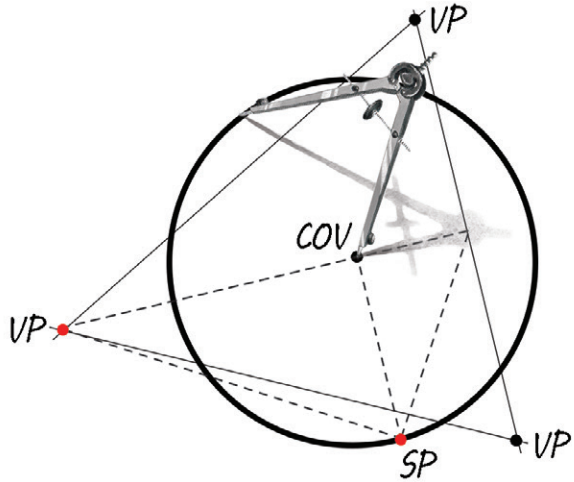


Figure 8-12

simple as drawing a circle—its center at the center of vision, and its circumference passing through the station point. A compass helps greatly with accuracy (8-11, 8-12). To draw a 60-degree cone of vision, we draw a circle with a slightly smaller radius.

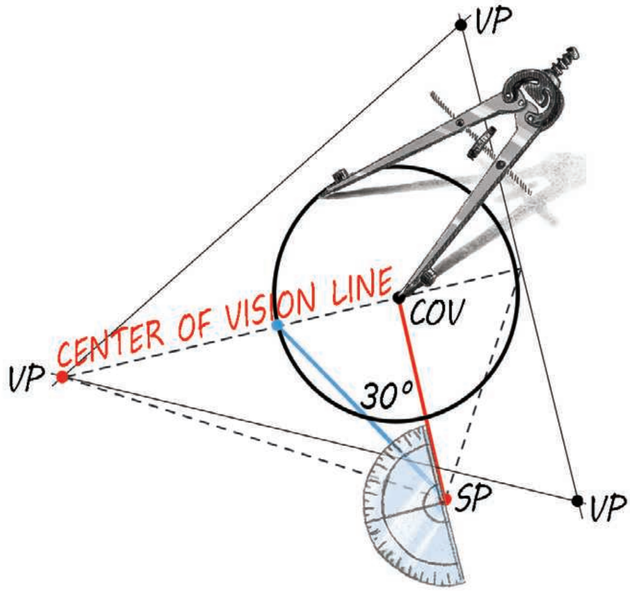
CREATIVE DISTORTION. Anya Belkina, **Genesis**, 2014. Acrylic on canvas, 36 x 108 inches. © *Anya Belkina. Courtesy of the artist.*

Extend a line from the station point 30 degrees off the line of sight. The point where that line intersects the horizon marks the radius. Draw a circle with its center at the center of vision, and the circumference passing through the marked radius (8-13). In three-point perspective, instead of intersecting the horizon, the 30-degree angle will intersect the center of vision line (8-14).



THREE-POINT 90° CONE OF VISION

Figure 8-13



THREE-POINT 60° CONE OF VISION

Figure 8-14

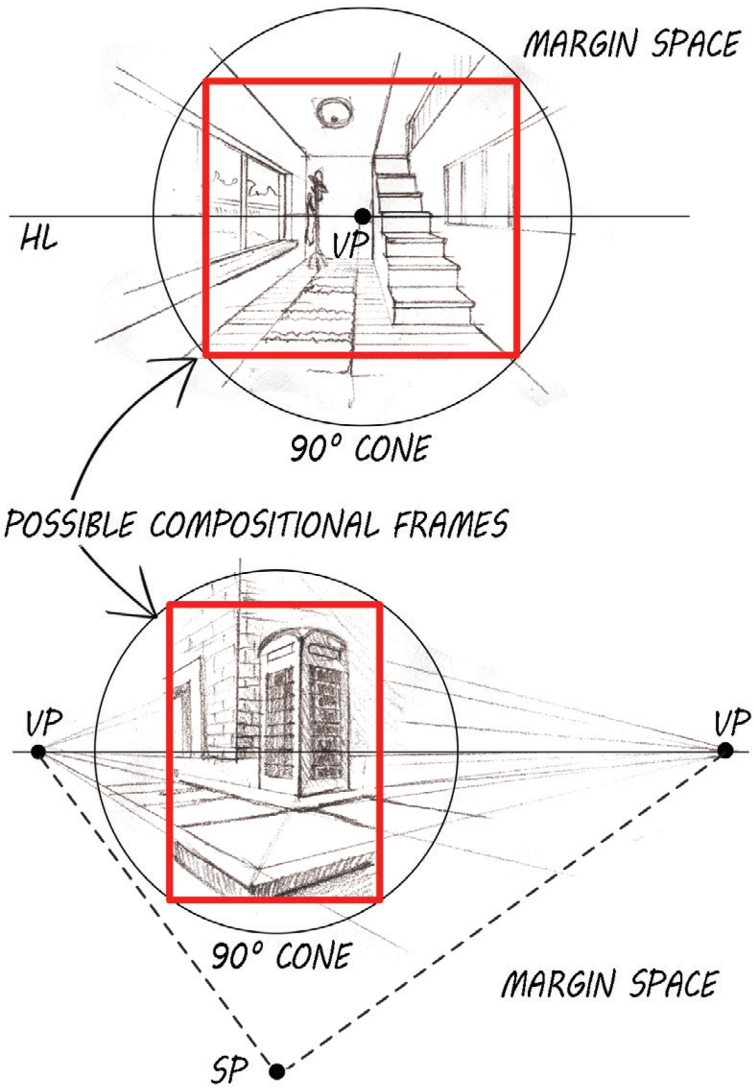


Figure 8-15

We can use this technique to draw any size cone of vision. A cone of vision always originates at the center of vision, with its radius found by measuring one-half the desired angle off the line of sight. Lastly, to ensure that our subject stays within the cone of vision, inscribe the frame of the composition within the cone (8-15). Notice that this requires a great deal of margin space, so a larger pad of paper is recommended. Compositional frames can be any size, shape, or orientation within the cone.

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GRIDS, SQUARES & CUBES

9

9 GRIDS, SQUARES & CUBES

Artists and designers use two-dimensional grids in multiple ways. Grids are helpful for scaling and proportioning, as well as for accurate placement and spacing of elements within a composition. Perspective grids help with these same concerns, and more. Perspective grids can be composed of as many planes as the subject requires. However, a grid on the ground plane is often all that you need.

To construct a perspective grid, we need just one tool: a diagonal vanishing point. Recall how we used the diagonal vanishing point to repeat forms while maintaining size and proportion in

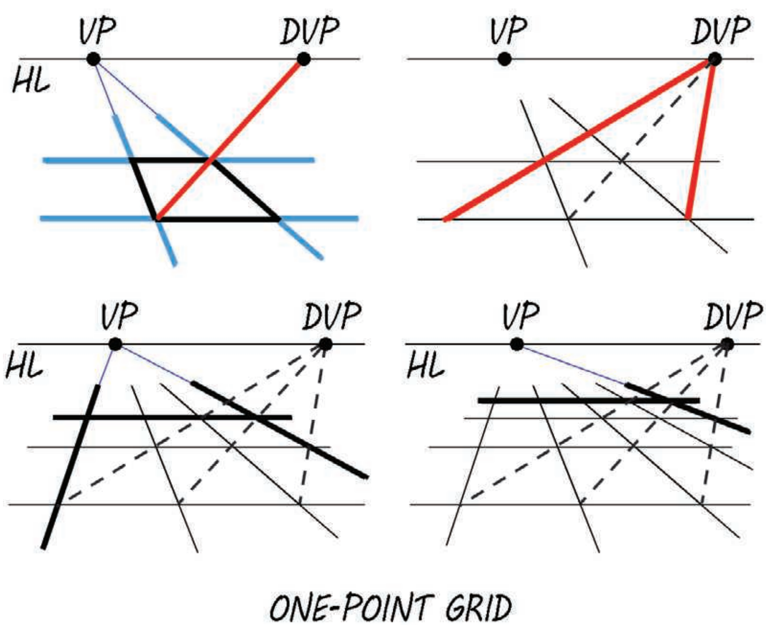


Figure 9-1

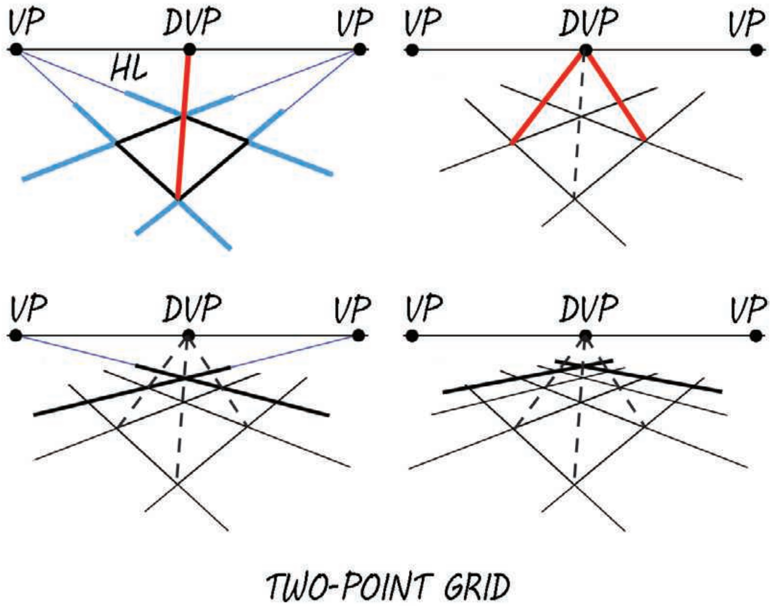
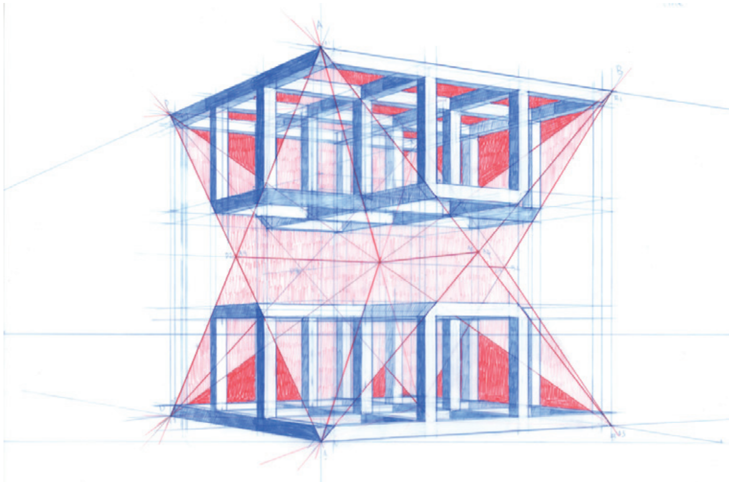


Figure 9-2

Chapter 7. A **perspective grid** expands upon that method. Start with one rectangle in perspective. Locate its diagonal vanishing point (DVP). Extend the lines of the rectangle to form grid lines. Then use the diagonal vanishing point to find additional corners to continue building out the grid. Lines extending from the diagonal vanishing point should run diagonally through all the gridded rectangles. The technique works exactly the same in one-point, two-point, and three-point perspective (9-1, 9-2).

If we wish to construct a grid of rectangles with a specific proportion, we need to find diagonal vanishing points of a specific angle. For example, a square grid is an especially useful type of grid. We know that a square has equal-length sides and a 45-degree diagonal. Therefore, a square in perspective will



TWO-POINT PERSPECTIVE GRID. Michael Bilsborough, **Minus**, 2012. Polymer pencil on drafting film and polypropylene, 11 x 14 inches. *© Michael Bilsborough. Courtesy of the artist and Invisible-Exports, NYC.*

have a 45-degree DVP (9-3). Using perspective methods, we can find the exact location of the 45-degree DVP. Incidentally, this also lets us create perfect circles in perspective, because circles are ellipses inscribed in a square (9-4).

We will start with a one-point perspective square grid. Begin with a vanishing point (VP) and horizon line (HL). Place a station point (SP) and a line of sight using the technique described in Chapter 8. Then with a ruler measure the distance from the vanishing point to the station point, and mark that same distance from the vanishing point on the horizon line. That point on the horizon is the 45-degree DVP for horizontal planes. For vertical planes, the station point can function as the 45-degree DVP. Or you can extend a vertical axis line above the horizon, and mark a separate DVP the same distance out from the vanishing point (9-5). Take care to use the vertical DVP for all

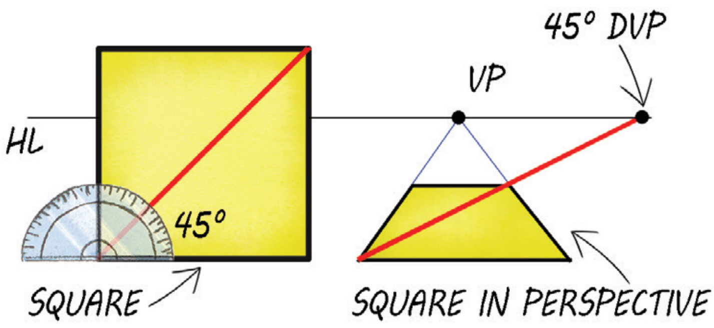


Figure 9-3

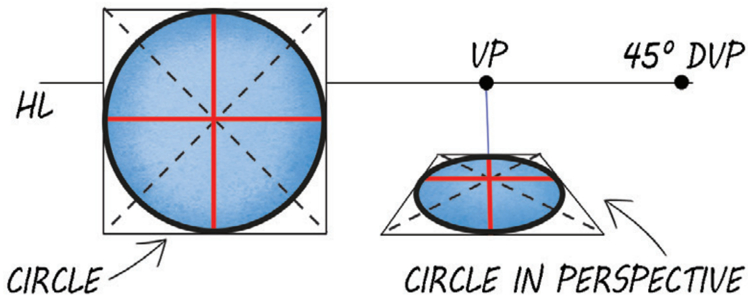


Figure 9-4

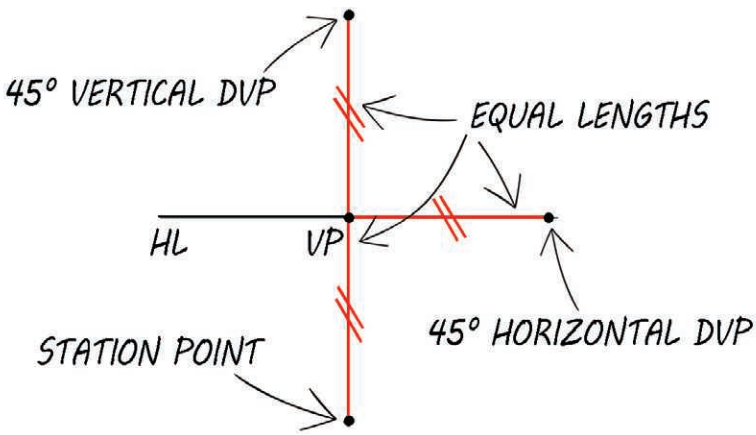
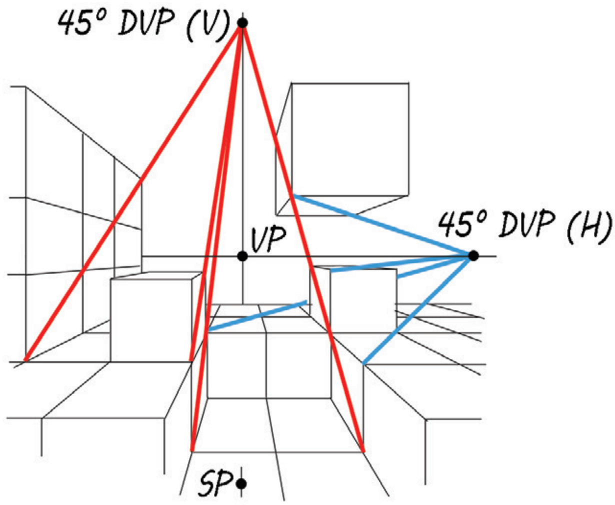


Figure 9-5



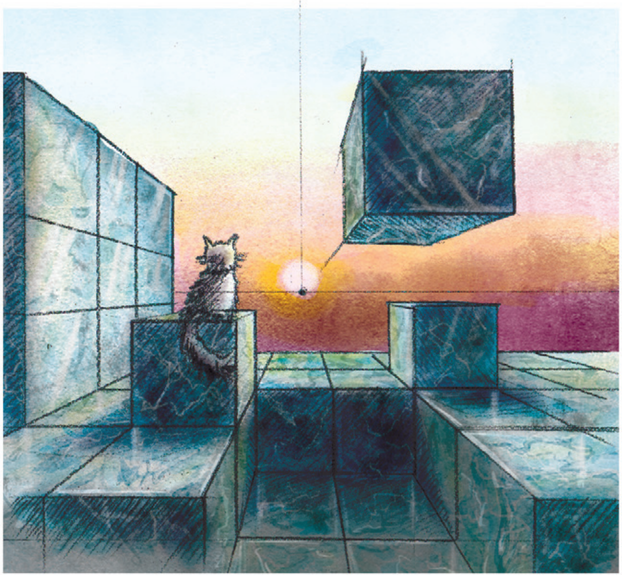


Figure 9-6

vertical planes, and the horizontal DVP for all horizontal planes (9-6). Notice that with a 45-degree DVP we can create not only squares but also cubes (9-7). Cubes are composed of both

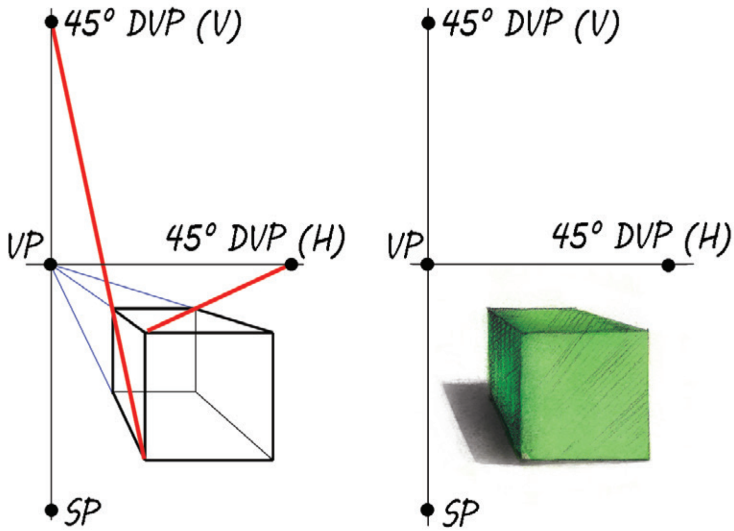


Figure 9-7

vertical and horizontal square planes, so we need to employ both a vertical and a horizontal 45-degree DVP to build them.

Now we turn to square grids in two-point perspective. Begin with two vanishing points on a horizon line, and again position a station point. Recall that the station point will be at the corner of a 90-degree angle, the arms of which connect to the vanishing points. Draw lines connecting the vanishing points to the station point. Measure a 45-degree angle through the middle, and find the point where that angle crosses the horizon. This marks the 45 degree DVP for horizontal planes (9-8). For vertical planes in two-point perspective, each vanishing point has its own 45-degree DVP. Draw a vertical axis line through the left vanishing point. Measure the distance from the left vanishing point to the station point, and mark that same distance on the vertical axis line, up from the vanishing point. That is the

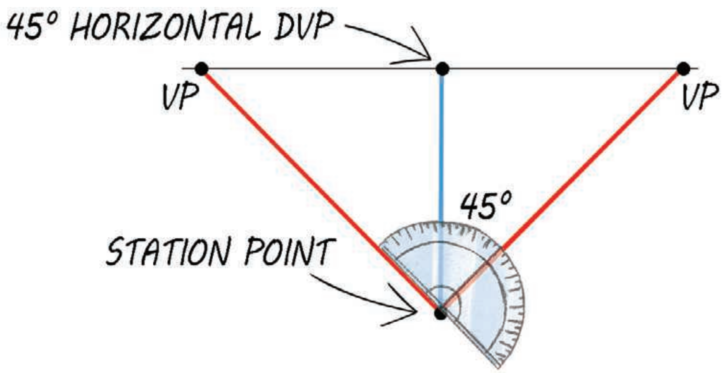


Figure 9-8

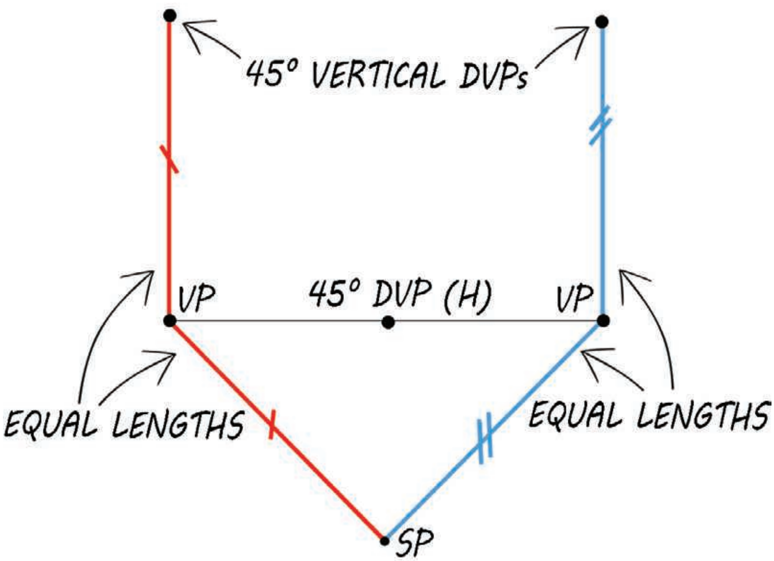
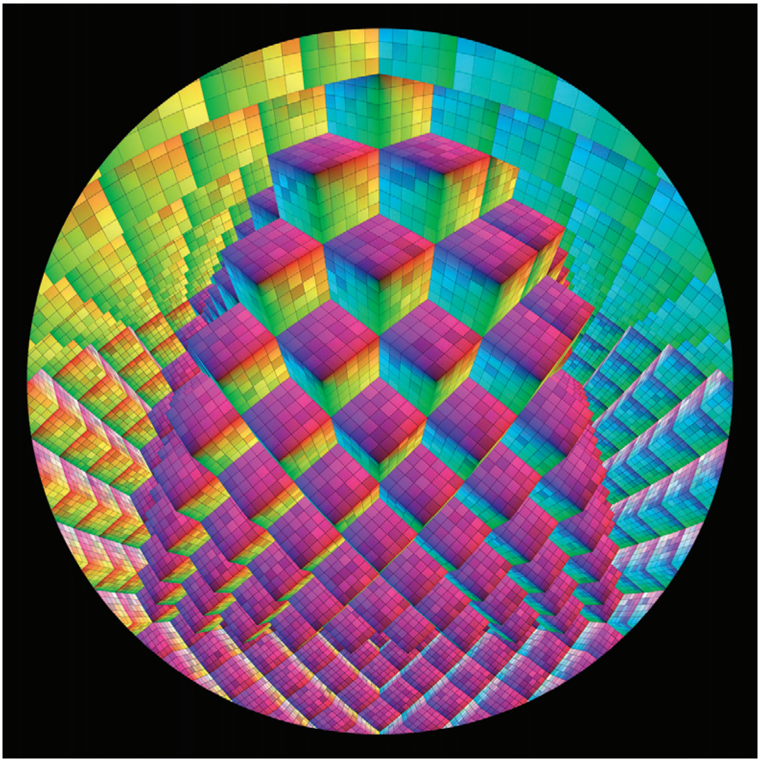


Figure 9-9

location for the 45-degree DVP for the left vanishing point. Do the same for the right vanishing point. The measurements for the left and right vanishing points may be different, because the station point has a range of possible locations. Thus the



THREE-POINT PERSPECTIVE GRID. GMUNK, **SUB.DIVISION**, 2015. Print, 9600 x 9600 pixels. © *Bradley G. Munkowitz. Courtesy of the artist.*

45-degree DVP for the left vanishing point will not necessarily be at the same vertical height as the 45-degree DVP for the right vanishing point (9-9).

Before constructing a square grid in two-point, map out a 60-degree cone of vision. A square grid in two-point perspective becomes visibly distorted beyond 60 degrees—the squares begin to look like rectangles. Use the technique described Chapter 8 to make a cone. This step is optional, but it will ensure that the grid has the correct proportions. Then

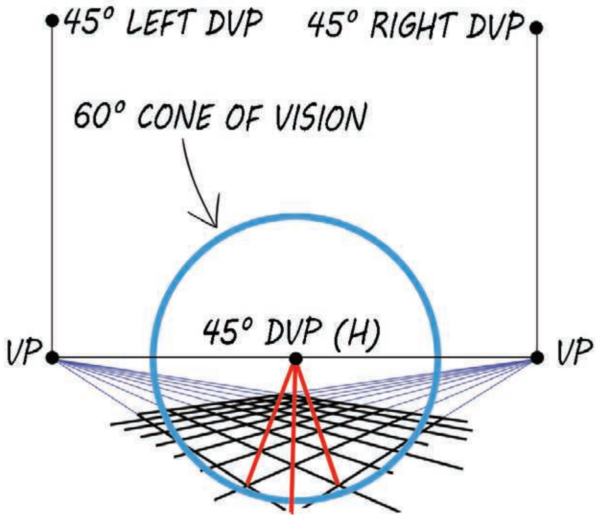


Figure 9-10

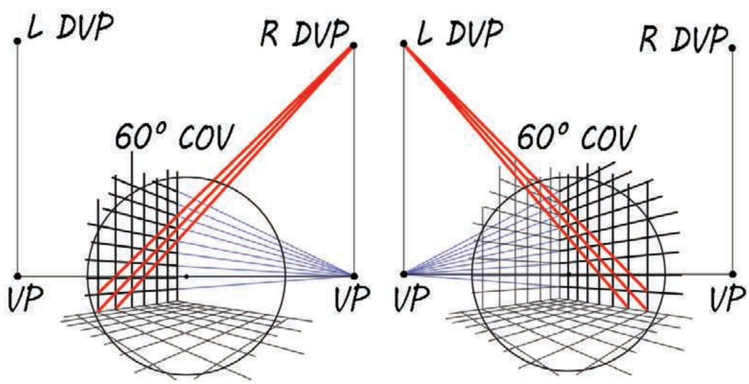


Figure 9-11

use the horizontal DVP to build a horizontal grid (9-10). Use the vertical DVPs to build vertical grids. Take care to use the right DVP for planes that recede to the right vanishing point, and the left DVP for planes that recede to the left vanishing point (9-11). If you are using a cone of vision, limit the composition to the area within the cone to avoid distortions (9-12, 9-13).

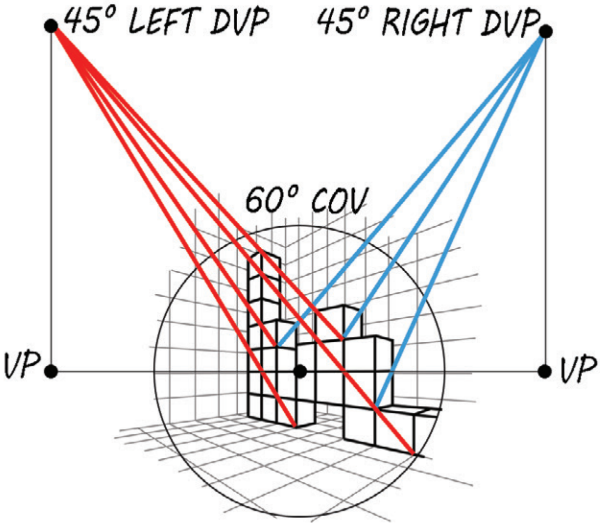


Figure 9-12

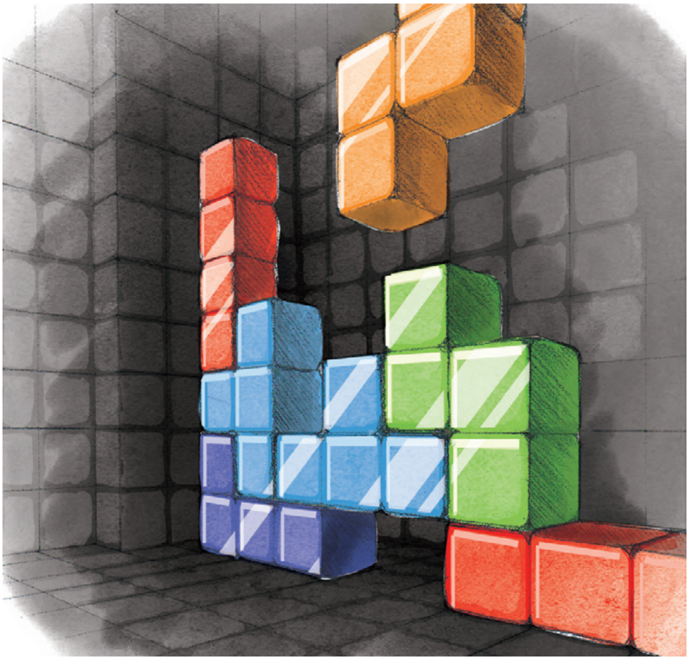


Figure 9-13

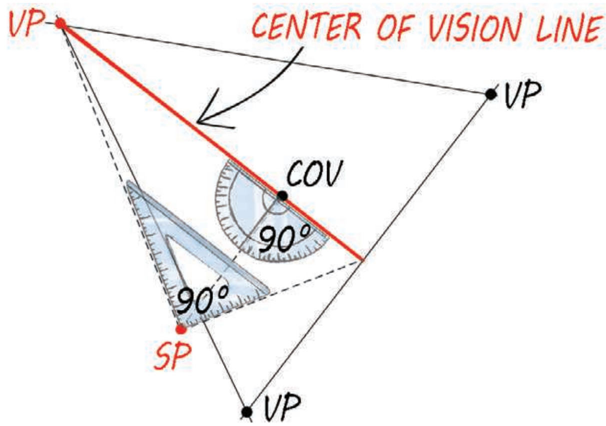


Figure 9-14

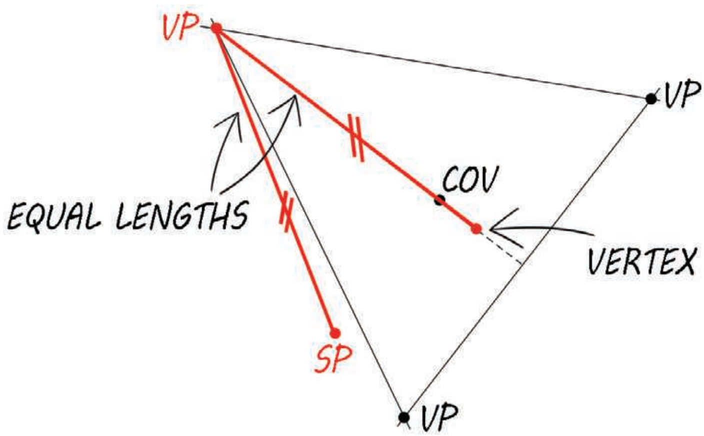


Figure 9-15

In three-point perspective, we again map the center of vision and station point to start. Recall that three-point perspective has multiple station points, each associated with a particular vanishing point. Find one station point, and make note of the vanishing point and center of vision line associated with it (9-14). Measure the distance from that noted vanishing point to the station point, and then mark the same distance on the

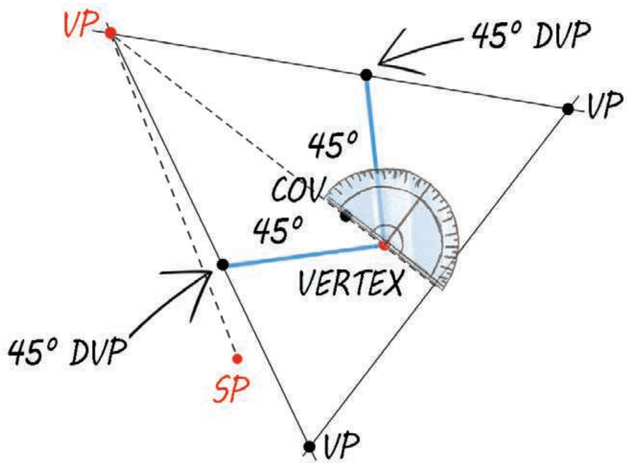


Figure 9-16

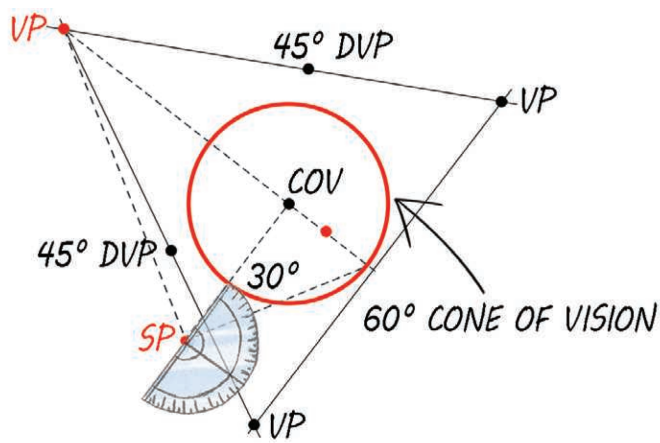
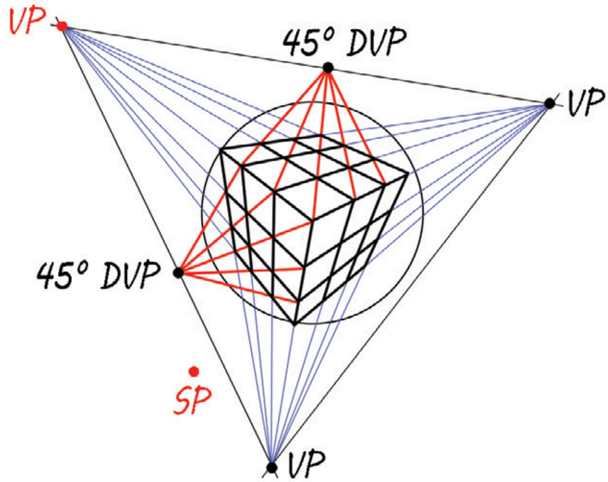


Figure 9-17

center of vision line; this locates a **vertex** (9-15). Using the vertex as the origin, measure two 45-degree angles on either side of the center of vision line. These 45-degree arms will intersect the sides of the triangle at the 45-degree DVPs (9-16). At this point it is advisable to map a 60-degree cone of vision using the technique described in Chapter 8 (9-17). Again, the



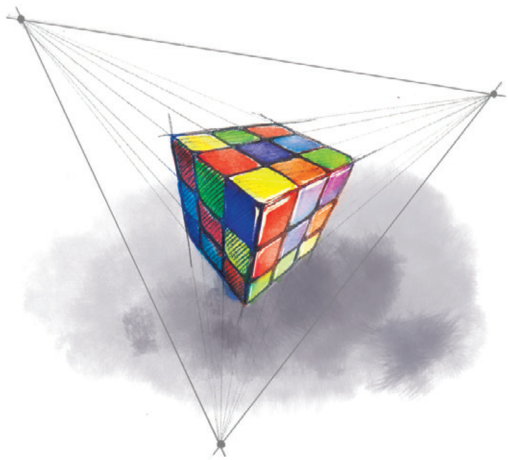


Figure 9-18

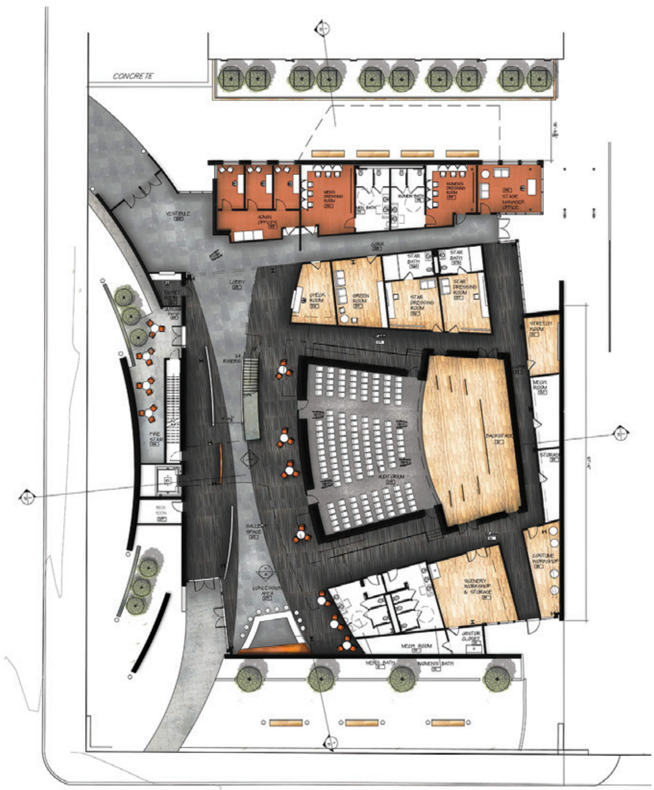
cone prevents grid distortion if the composition is constrained to the area within it. In three-point perspective, you need only two diagonal vanishing points to build a full grid (9-18).

PLANS & ELEVATIONS

10

10 PLANS & ELEVATIONS

Sometimes a subject calls for working with a plan view and an elevation view, and then translating them into a perspective view. Architects and interior designers begin with blueprints and floor plans, both of which are examples of a plan view. If a subject requires precision in terms of proportion, positioning, or point of view, then you will find it helpful to work from plans and elevations. A **plan view**, a top-down view like that



PLAN VIEW. Shannon Rafferty, **First Floor Orchestra Plan**, 2013. AutoCAD, Adobe Photoshop, 25 x 30 inches. © *Shannon Rafferty. Courtesy of the artist.*

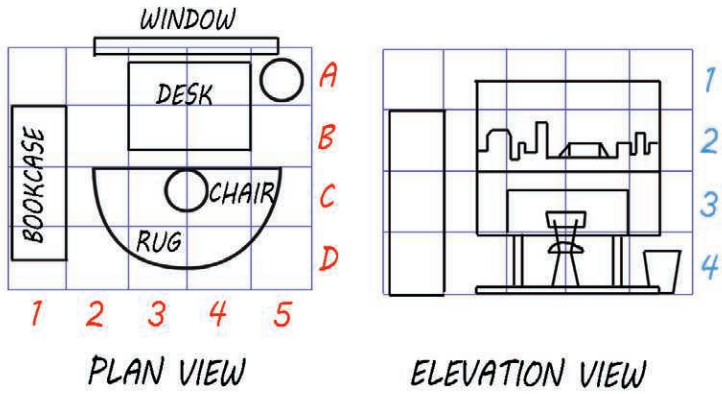


Figure 10-1

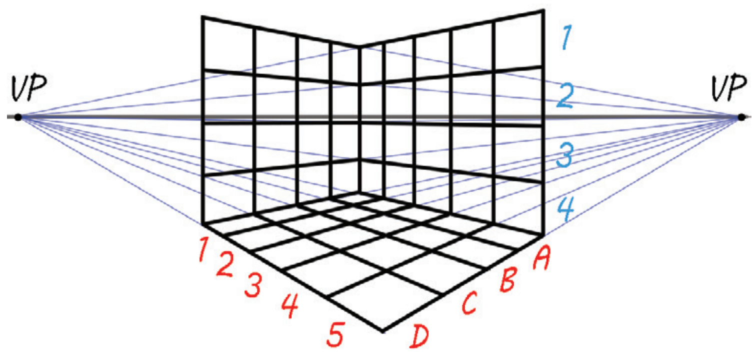


Figure 10-2

of a map, establishes relative width, depth, and location of elements within a composition. An **elevation view**, or side view, establishes their relative height.

The simplest translation method is to first lay out the plan and elevation views on grids. Take care to ensure that each grid's dimensions correspond to the others (10-1). Then create a perspective grid with the same proportions. Review Chapter 9 to understand how to create perspective grids (10-2). Lastly,

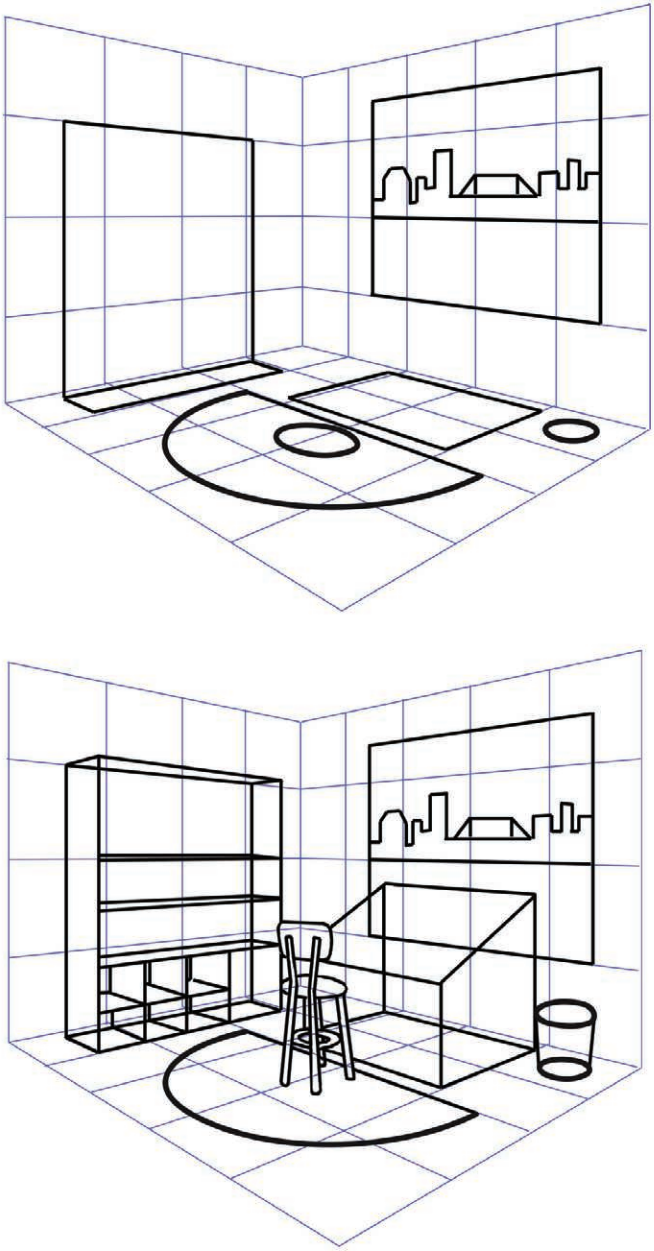


Figure 10-3

Figure 10-4

render the forms on the perspective grid, referencing the plan and elevation views for the forms' height, width, depth, and placement (10-3, 10-4). Plan and elevation views can be translated into one-point, two-point, or three-point perspective with the use of a one-point, two-point, or three-point perspective grid. This method does take some shortcuts, however. If we wish to control the point of view, for example, we need to add some additional steps.

Start with a plan view. With this method, gridding the plan is not necessary. Place a station point (SP) and picture plane (PP) to establish the viewer's position, or point of view, in relation

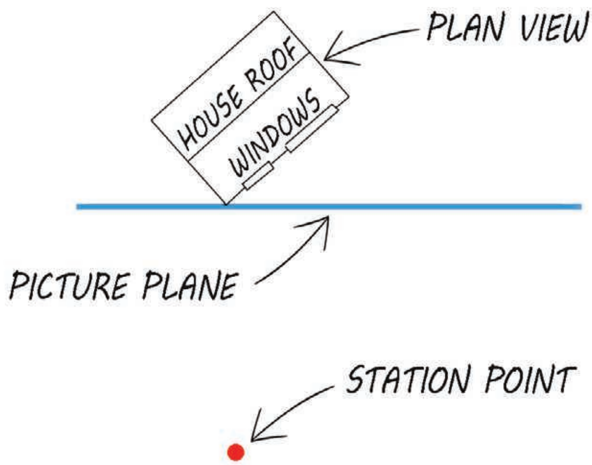


Figure 10-5

to the subject. It is most common to place the picture plane close to or even touching the corner of the subject. Note that in a plan view, a two-dimensional picture plane will appear as a line. The station point can be located anywhere. Positioning the station point too close to the subject can cause distortion, so take care to allow some space between them (10-5).

Next we need to locate the vanishing point(s) for the chosen arrangement. Examine the relationship among the station point, picture plane, and subject. Recall that these elements' relationship determines the point of view. If there is just one set of receding edges running parallel to the line of sight, the vantage is one-point perspective and the vanishing point is placed on the picture plane at the center of vision. If there are two sets of receding edges, the vantage is two-point perspective. To locate the vanishing points, it is helpful to have a drafting tool called a 90-degree triangle. A wide clear gridded ruler can also serve the purpose. Position the 90-degree corner of the

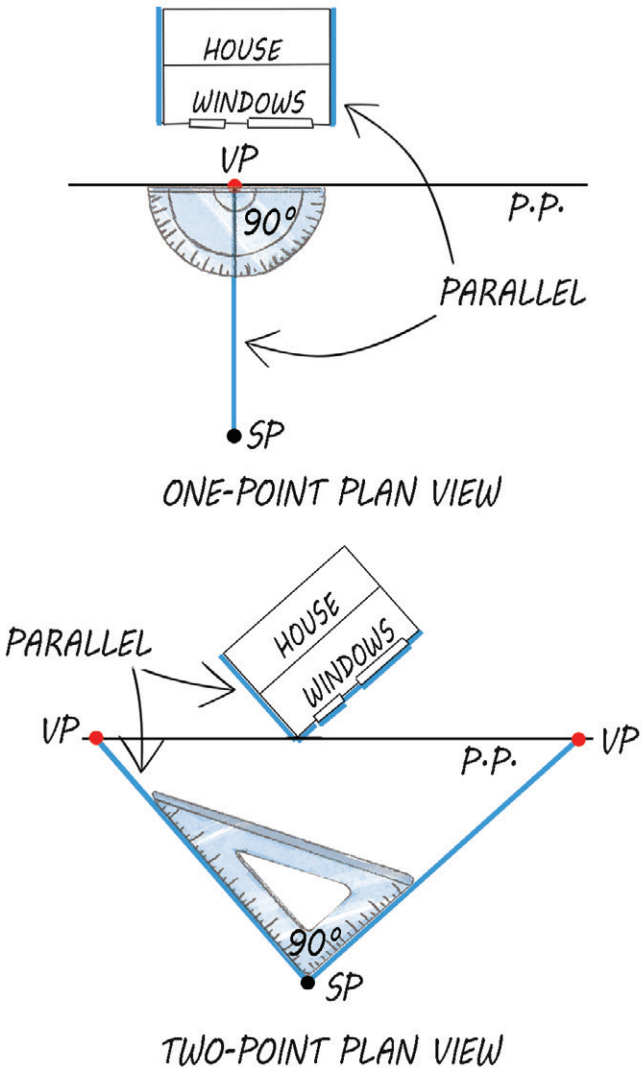


Figure 10-6

triangle at the station point, and pivot the triangle's arms until they are parallel to receding sides of the subject. The points where the arms intersect the picture plane are the locations for the vanishing points (10-6).

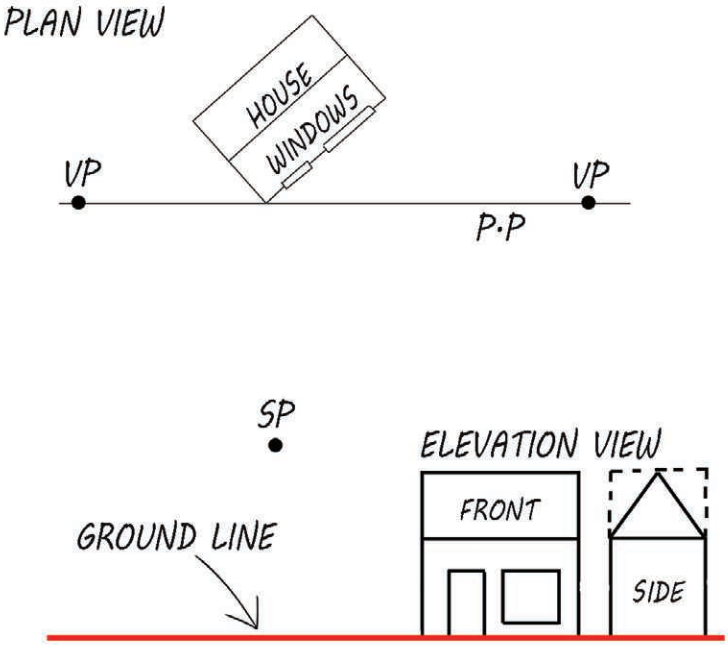
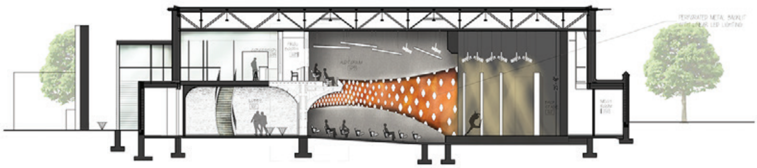


Figure 10-7

With the plan view completed, we then place the elevation view. Locate a ground line (GL) parallel to the picture plane line, leaving a generous amount of empty space between them. A **ground line** represents the ground plane in an elevation view. Draw an elevation view of the subject off to one side with its base on the ground line. Make sure the elevation view is the same scale as plan view. If the elevation view is not correctly scaled to the plan view, the proportions in the perspective view will be incorrect (10-7).

Then position a horizon line (HL) above the ground line. Note that the location of the horizon line indicates the height of the viewer in relation to the elevation view. If you want a high vantage point, position the horizon farther from the ground line.



ELEVATION VIEW. Shannon Rafferty, **Theater Cross Section**, 2013. AutoCAD, Adobe Photoshop, 6 x 24 inches. © *Shannon Rafferty. Courtesy of the artist.*

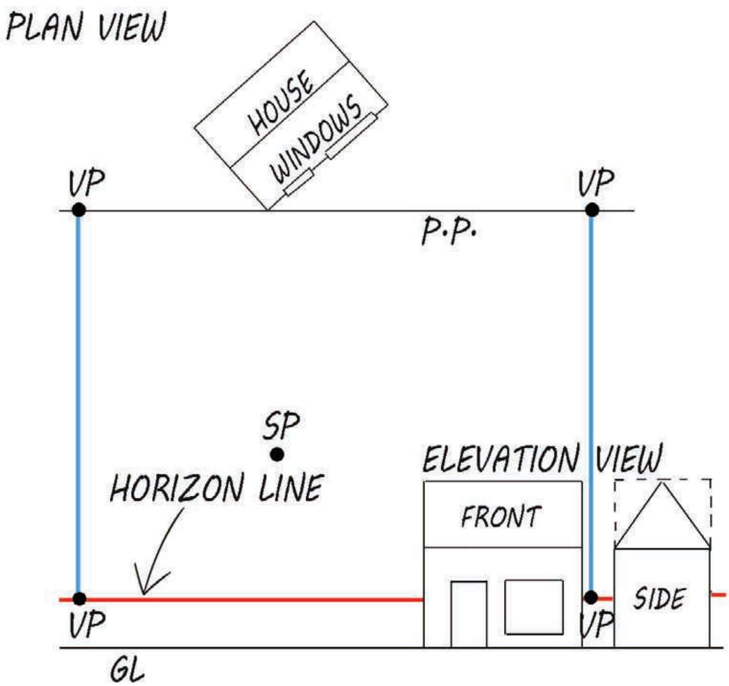


Figure 10-8

If you want a lower vantage point, position the horizon closer to the ground line. We then transfer the vanishing points by dropping verticals down to where they intersect the horizon (10-8).

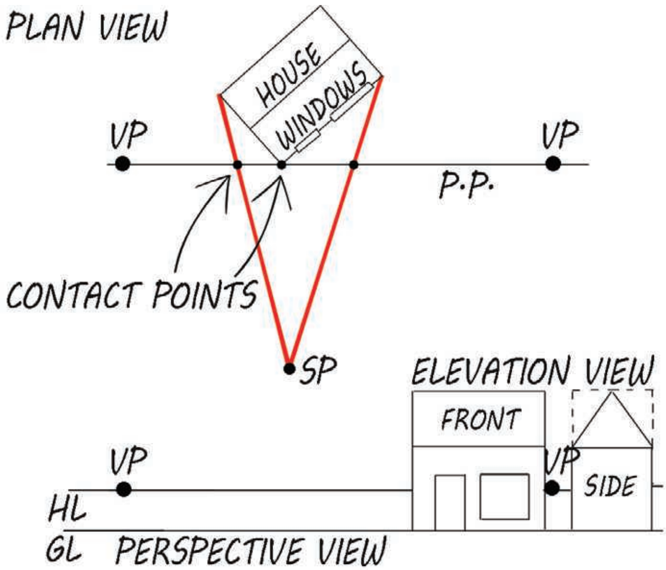


Figure 10-9

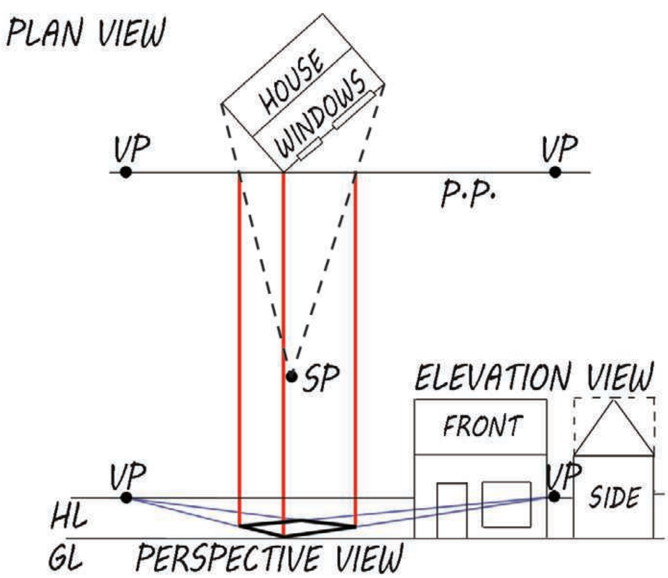


Figure 10-10

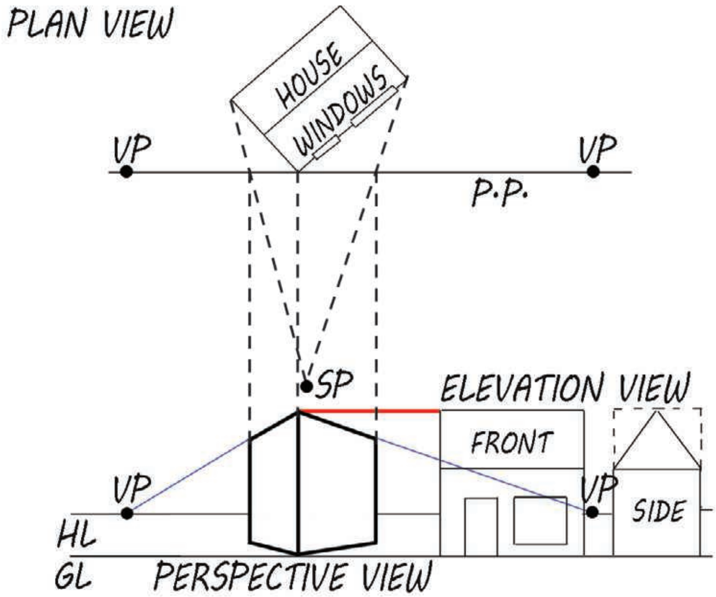


Figure 10-11

With everything set up, we can now translate the plan view to the perspective view. Return to the plan view, and construct guidelines from the form's corners passing through the picture plane to the station point. Note where the guidelines intersect the picture plane; we call these transfer points (10-9). Draw vertical lines down from the transfer points to bring the corners of the subject into the perspective view. The front-most corner will touch the ground line. Use the vanishing points to construct the subject's base (10-10). Then reference the elevation view to establish the height of the front-most vertical edge to complete the top of the shape (10-11).

You can use additional guidelines for details. A pitched roof can be inscribed within the larger form, referencing the plan view

PERSPECTIVE VIEW. Shannon Rafferty, **Theater Perspective**, 2013. Rhino3D, Autodesk 3DS Max, Adobe Photoshop, 12.5 x 16.5 inches. *© Shannon Rafferty. Courtesy of the artist.*

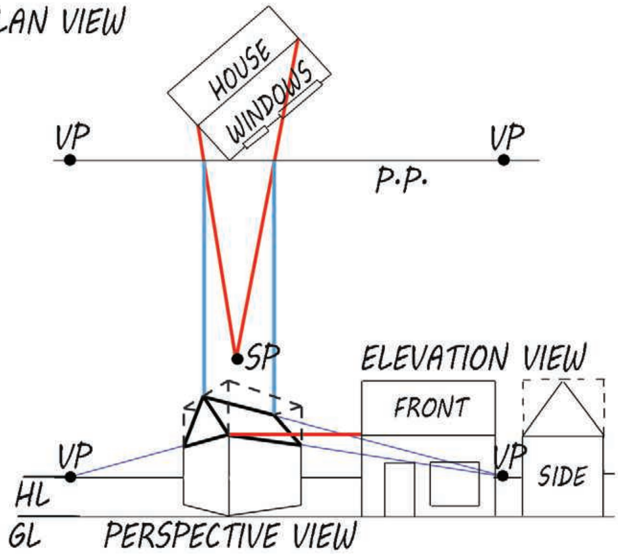


Figure 10-12

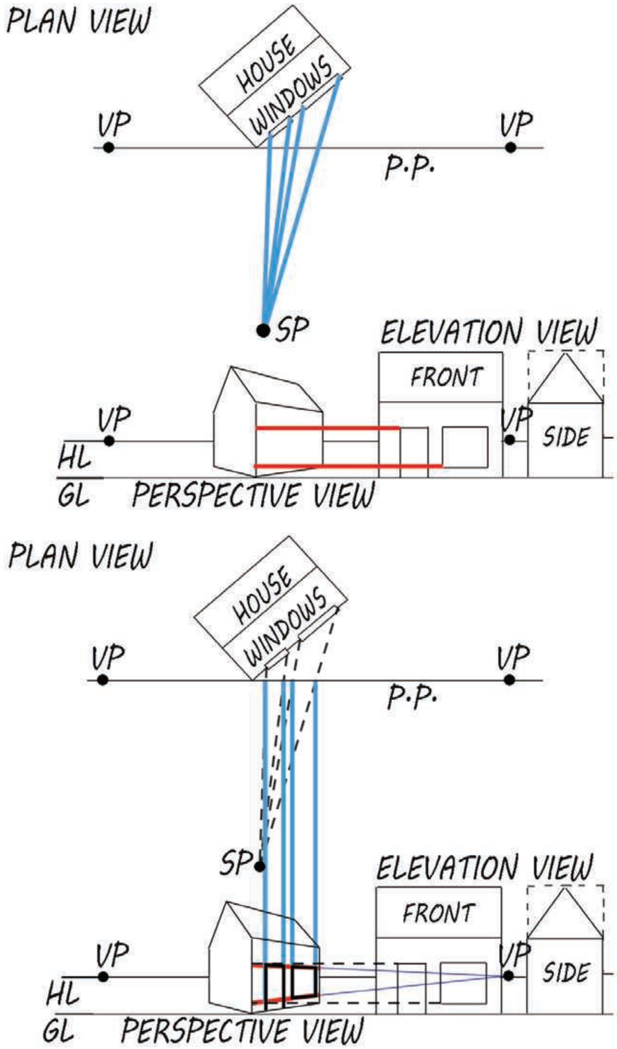


Figure 10-13

for the peak and the elevation view for the height (10-12). Add windows, doors, and other details in a step-by-step manner. Just remember that all guidelines extending from the elevation view must always go to the front-most edge of the subject before they are translated into perspective (10-13). This method

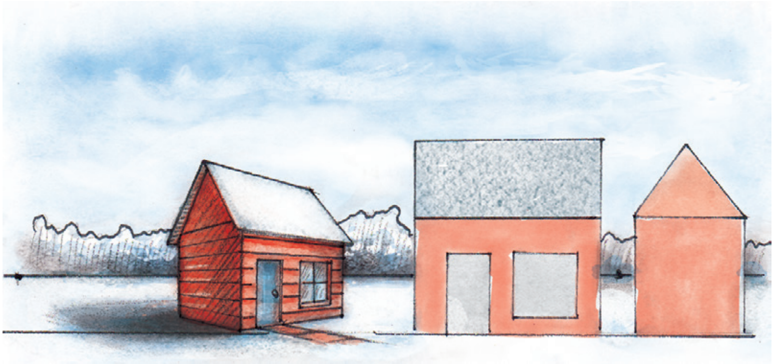


Figure 10-14

may seem complex, but if you work methodically, color-code working lines, and use a larger sheet of paper, the results are very rewarding (10-14).

DYNAMIC PLANES

11

11 DYNAMIC PLANES

We have worked under one major assumption thus far: all our forms' planes were in alignment, fitting neatly within a rectangular grid. So what happens when subjects move off the grid? Roadways, for example, are two-dimensional planes that often do not cooperate with a formal grid. They rise and fall, curving left and right over hills and valleys. The law of vanishing points governs all possibilities in linear perspective, though, so the solution to more angled planes is to locate more vanishing points.

If the plane changes lateral direction, turning left or right, we locate a new vanishing point (VP) left or right along the horizon line (HL) (11-1). If the plane changes vertical direction, tilting up

DYNAMIC PLANES. David Curtis, **The Art of War**, 2012. Mixed media and digital, 17 x 13 inches. © *David Curtis. Courtesy of the artist.*

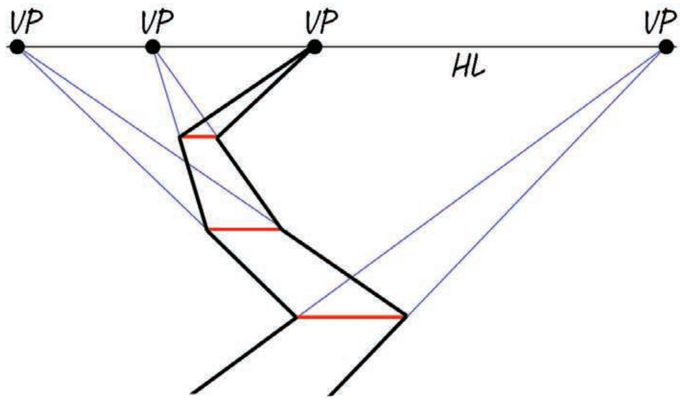


Figure 11-1

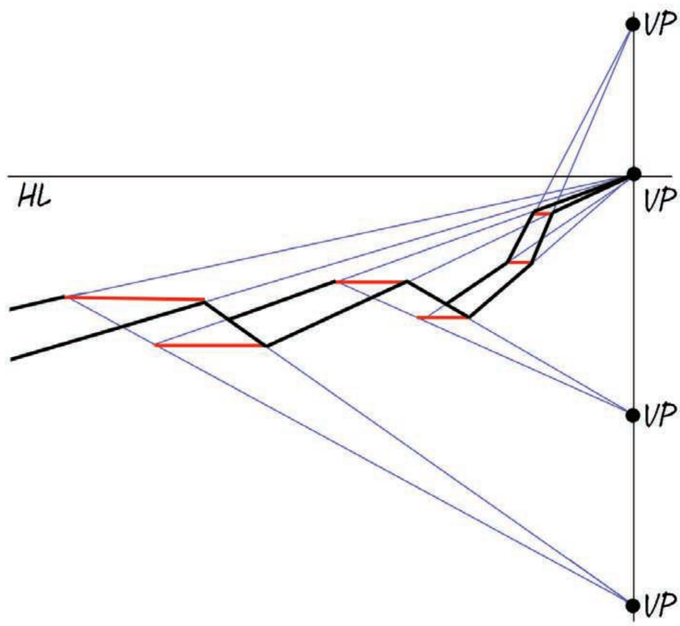


Figure 11-2

or down, we locate a new vanishing point above or below the horizon line (11-2). And if the plane changes both lateral and vertical directions, we locate new vanishing points that shift

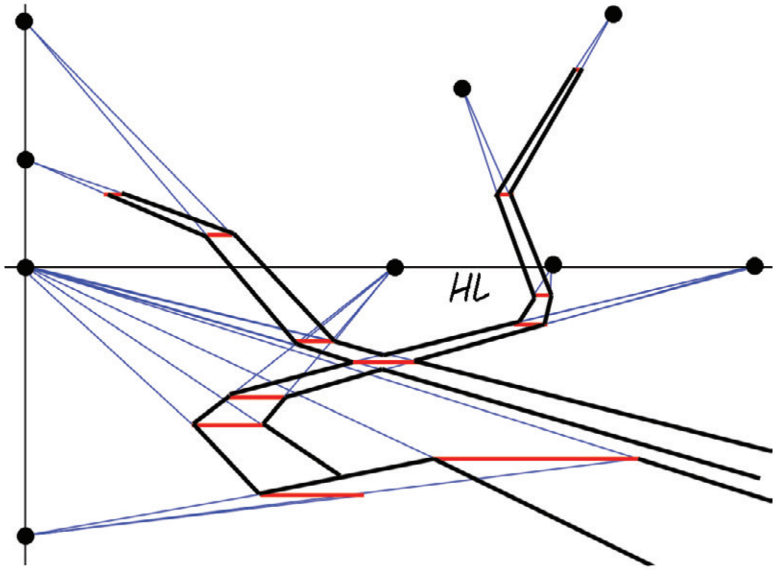


Figure 11-3

Figure 11-4

the plane in multiple directions (11-3). The only rule is that each new segment of the plane should be joined to the previous segment with a horizontal line. To gently shape curves, add more intermediate sets of vanishing points. Dynamic planes can be added to one-point, two-point, and three-point compositions (11-4).

There may be situations in which we want to specify the exact angle, or **slope**, of a plane. Take the example of planes sloping 45 degrees above the horizon. Establish a horizon line, vanishing point, and station point (SP). Then draw a vertical axis line perpendicular to the horizon and passing through the vanishing point. With a ruler or compass, measure the distance between the vanishing point and the station point. Mark that same distance on the horizon line, starting from the vanishing

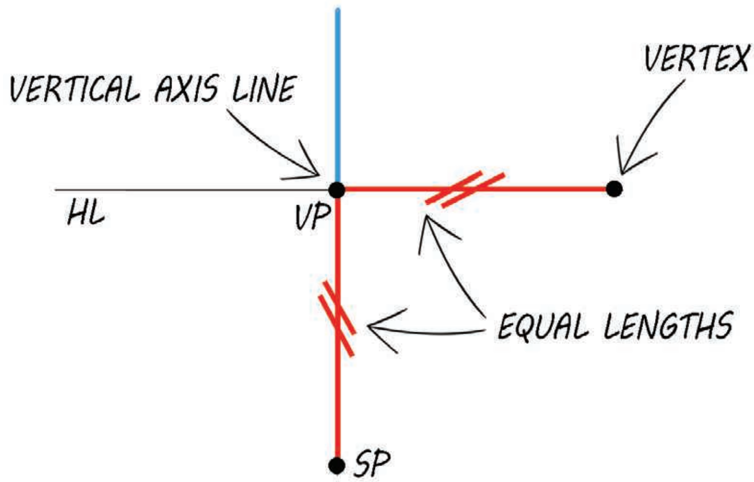


Figure 11-5

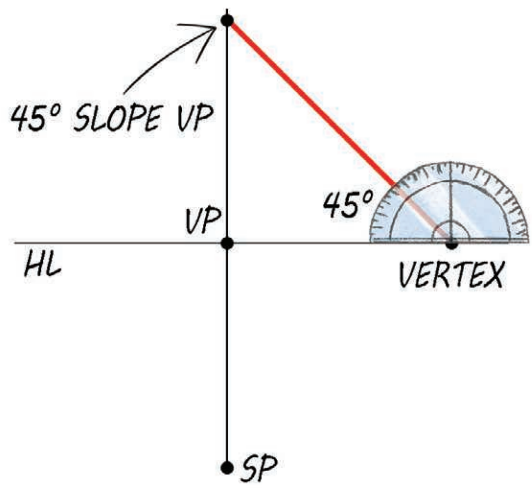


Figure 11-6

point; this locates a vertex (11-5). Measure a 45-degree angle from the vertex, off the horizon line, and find where it crosses the vertical axis line. This is the vanishing point for all planes with a 45-degree slope (11-6). Use it to draw planes as well

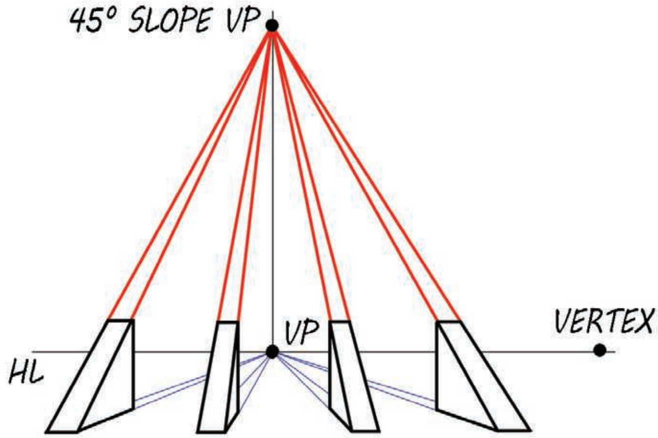


Figure 11-7

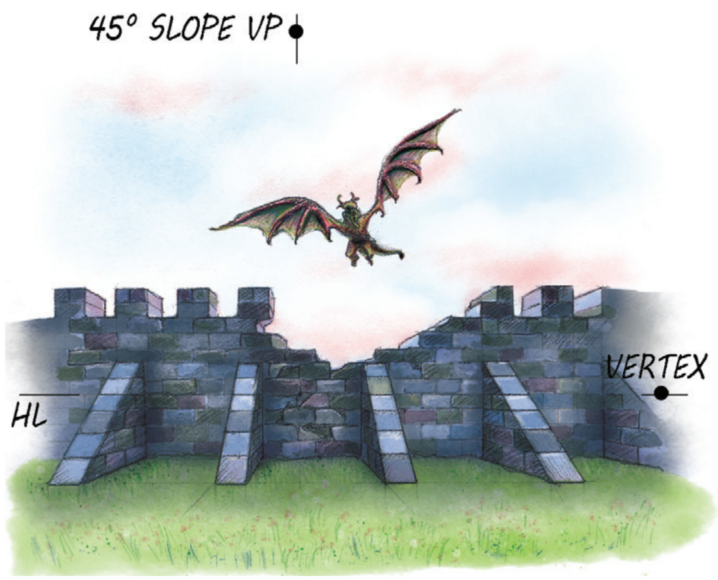


Figure 11-8

as triangular prisms having a 45-degree slope (11-7, 11-8). The technique can be used to find a vanishing point for a slope at any angle.

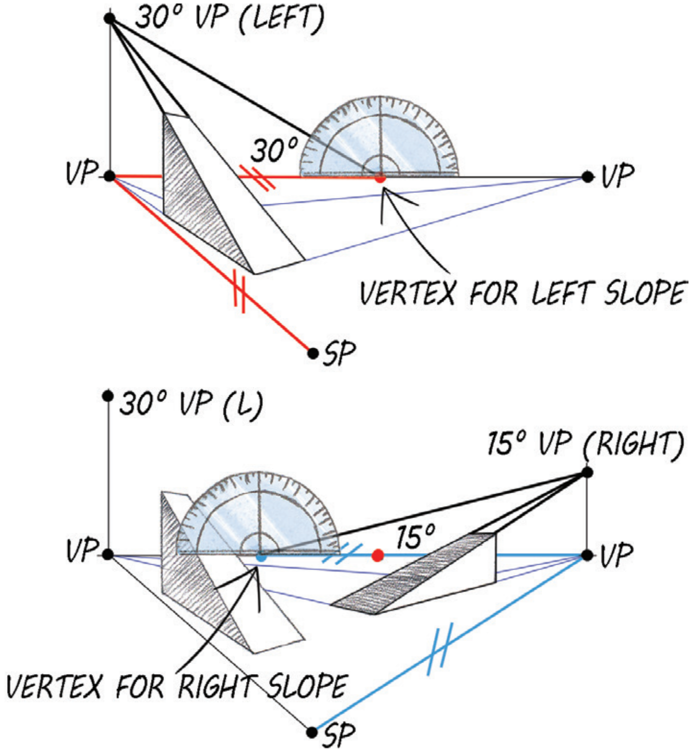


Figure 11-9

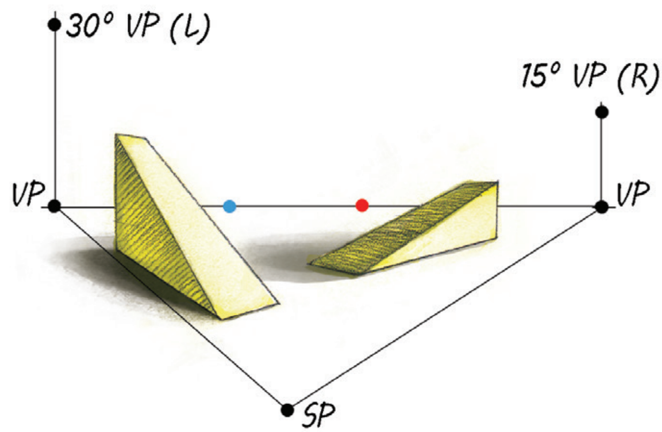


Figure 11-10

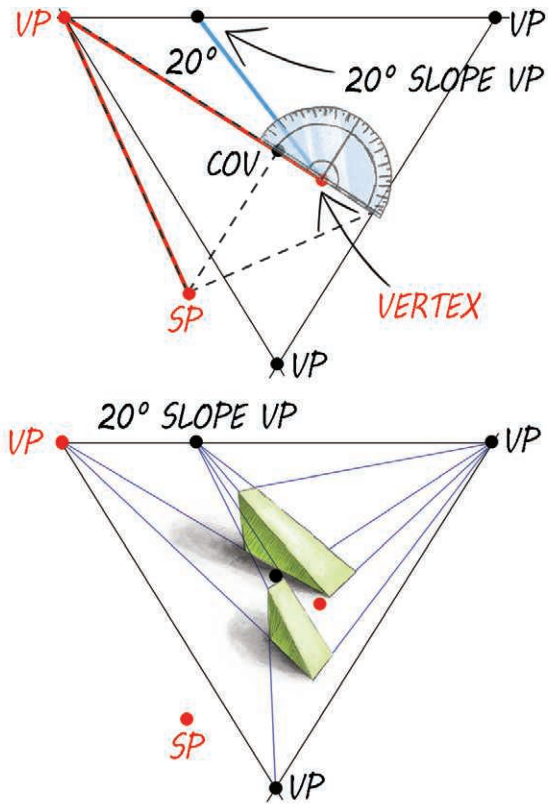


Figure 11-11

The prior example is in one-point perspective; however the technique is virtually the same in two-point perspective. Establish a station point, and use it to locate a vertex on the horizon. Measure an angle from the vertex to find where it crosses the vertical axis line. Just note that in two-point, each vanishing point will have its own vertex. Color-coding or labelling is helpful (11-9, 11-10). You can also locate slope vanishing points in three-point perspective. Use the technique described in Chapter 9 to locate a station point and vertex. Then use the vertex to measure the desired angle for the slope vanishing point (11-11).

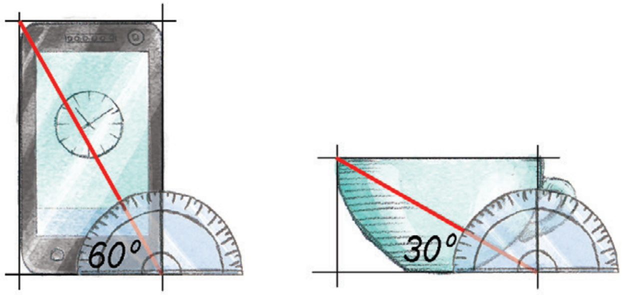


Figure 11-12

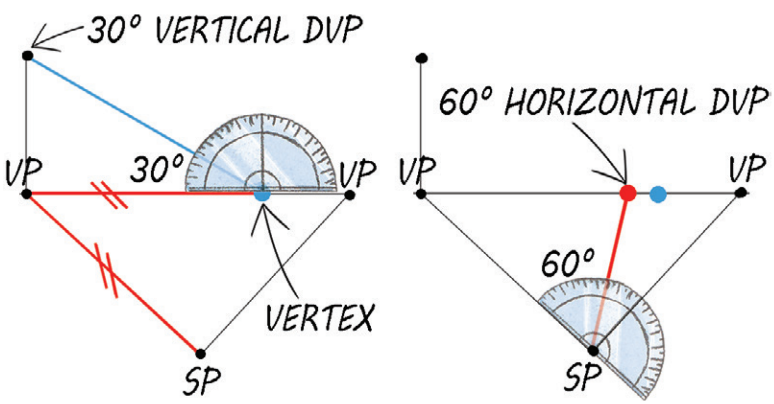


Figure 11-13

To locate diagonal vanishing points (DVPs) of a specific angle, we use the same technique that lets us locate vanishing points of a specific slope. Recall that in Chapter 9 we discussed methods to construct squares, cubes, and perfect grids by finding a 45-degree DVP. Most subjects do not have cube-like proportions, however. So how can we accurately render their proportions? First we measure the subject's diagonal with a protractor. Notice how the angle corresponds to the subject's proportions (11-12). Then locate a diagonal vanishing point for that specific angle. If the plane is oriented vertically, a vertical

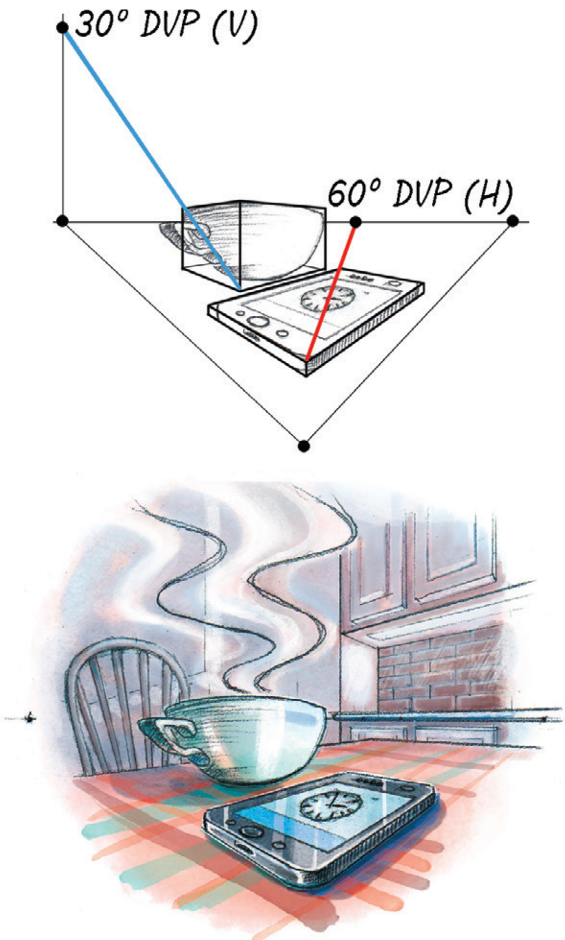


Figure 11-14

DVP is required. A horizontally oriented plane needs a horizontal DVP (11-13). When you're rendering the forms, use the diagonal vanishing points to maintain the correct proportions (11-14).

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COMBINING PERSPECTIVES

12

12 COMBINING PERSPECTIVES

In the previous chapter, we explored ways to combine multiple one-point-perspective planes. We can also combine perspectives for three-dimensional forms. Take the example of a box of cereal sitting on a kitchen table. From a given vantage point, the table may appear in one-point, while the cereal box is in two-point. And if any objects are not resting flat on the table, they could appear in three-point (12-1). We cannot, however, randomly place additional vanishing points to combine perspectives. To correctly combine perspectives, we must maintain the center of vision. In other words, for the different perspectives to be consistent, we need to keep the same angle of view with respect to the subject(s) (12-2).

Maintaining the same center of vision is a relatively straightforward process. Using blocks as an example, let us first draw a block in one-point perspective, and then add blocks in two-point perspective (12-3). Start by setting up one vanishing

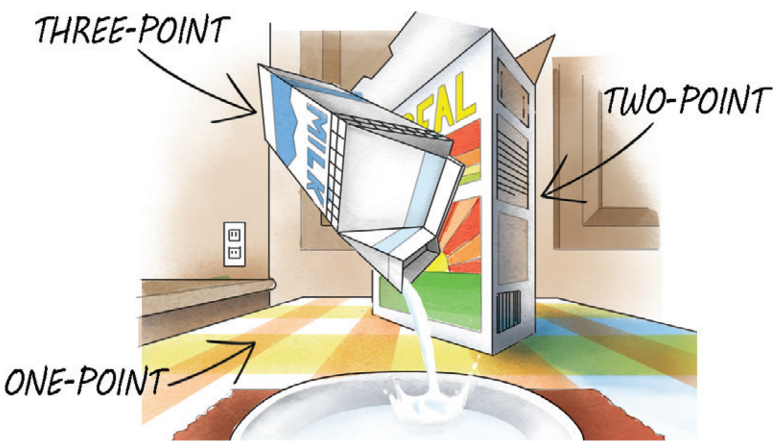


Figure 12-1

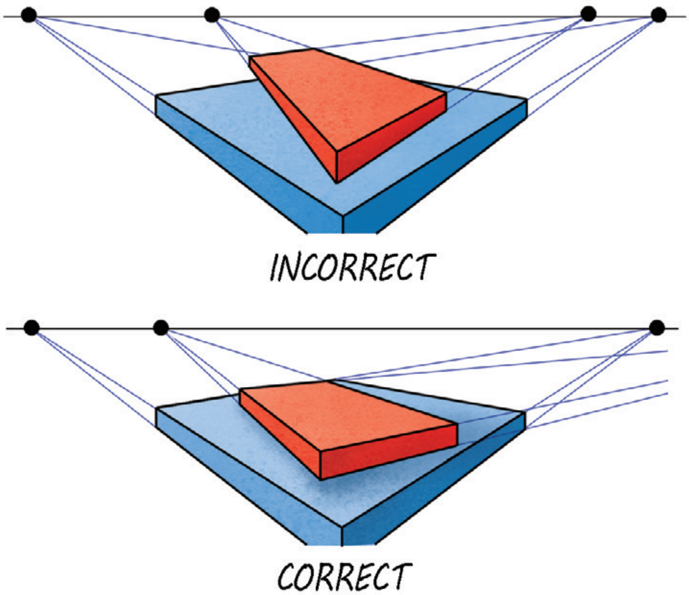


Figure 12-2

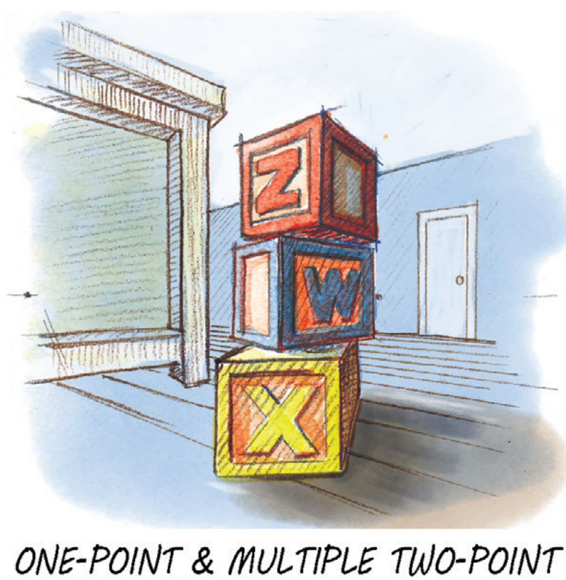


Figure 12-3

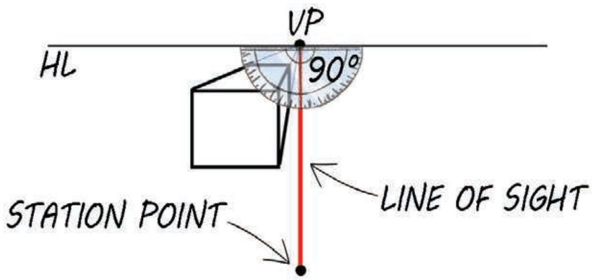


Figure 12-4

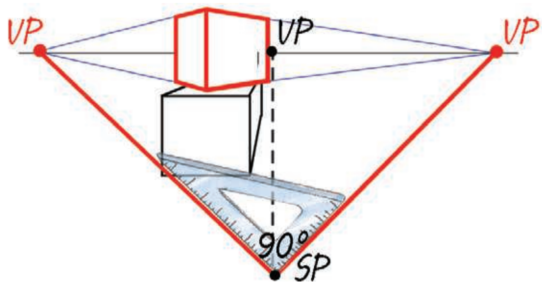


Figure 12-5

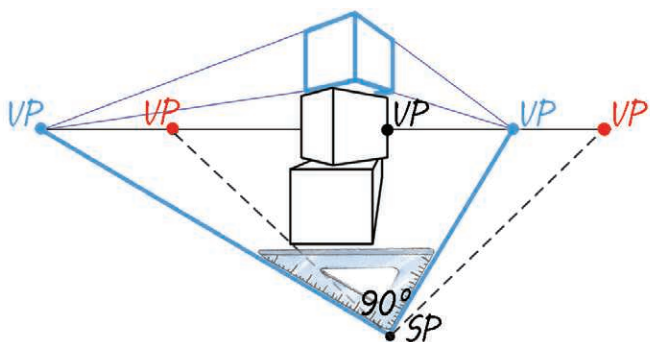


Figure 12-6

point (VP), a horizon line (HL), and a station point (SP). Draw a block in one-point perspective (12-4). To add a block in two-point, we need to locate a new set of vanishing points while

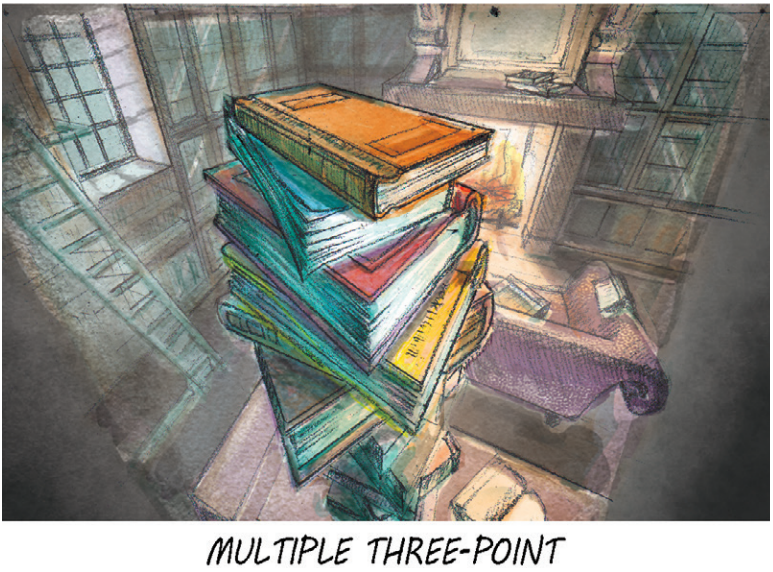


Figure 12-7

maintaining the same station point. Recall that in two-point perspective the station point is always located at the vertex of a 90-degree angle with arms extending to the two vanishing points. A drafting tool called a triangle with a 90-degree angle will help you. Position the 90-degree corner of the triangle at the existing station point, and rotate the triangle to find locations for two new vanishing points on the horizon line. Use the two new vanishing points to draw a second block (12-5). To add a third block, we can return to the station point to pivot the 90-degree triangle, and place another set of vanishing points on the horizon. Be careful not to mix up the vanishing points. Try color-coding each set (12-6).

Now let us take a similar example of books stacked high, all at different angles, but viewed from a bird's-eye vantage point (12-7). In this instance, we must combine multiple three-point

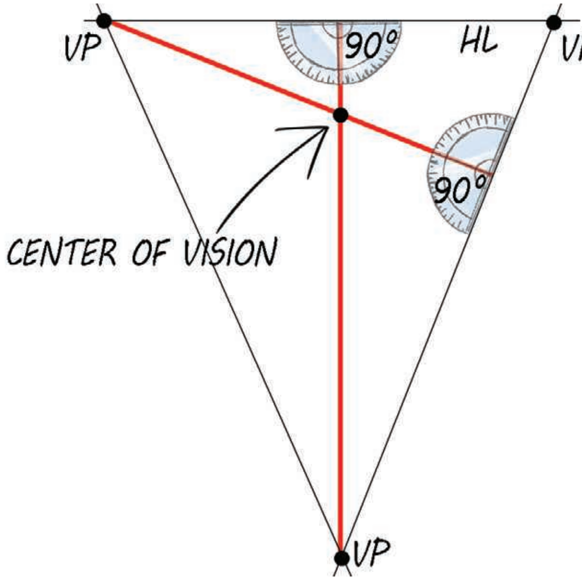


Figure 12-8

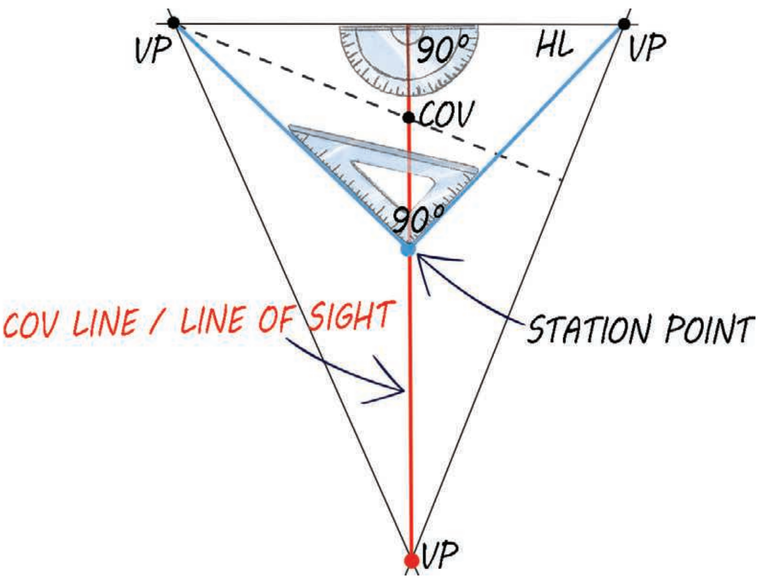


Figure 12-9

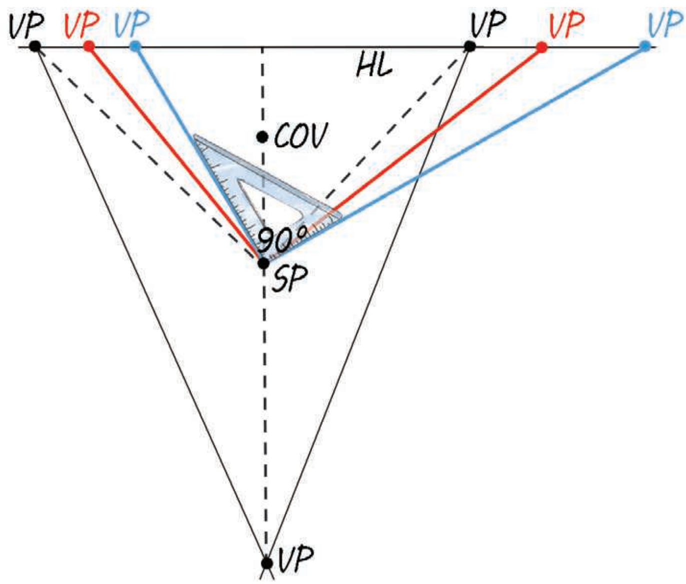


Figure 12-10

perspectives similar to the way we combined multiple two-point perspectives. Start with the vanishing points and center of vision for three-point perspective. Orient one axis of the triangle to serve as the horizon line (12-8). Before we can add a second set of vanishing points, we need to locate a very specific station point using a special technique. Recall that there are multiple ways to project a station point in three-point perspective. In this case, we use the center of vision line for the third vanishing point (either above or below the horizon line), and treat it like a two-point perspective line of sight. Locate a station point along the center of vision line at the 90-degree corner of a triangle connecting the two vanishing points on the horizon line (12-9). From this special station point, we can now rotate the 90-degree corner to locate additional sets of vanishing points on the horizon line (12-10). Notice that all the

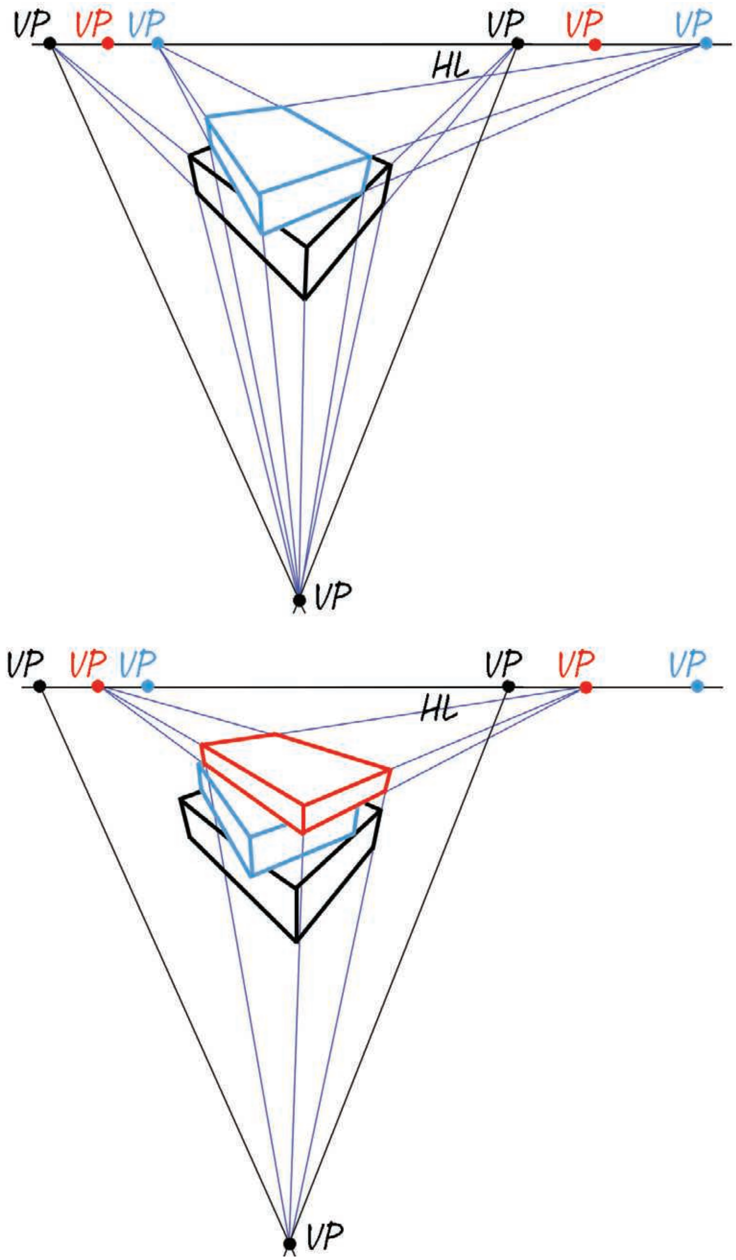


Figure 12-11

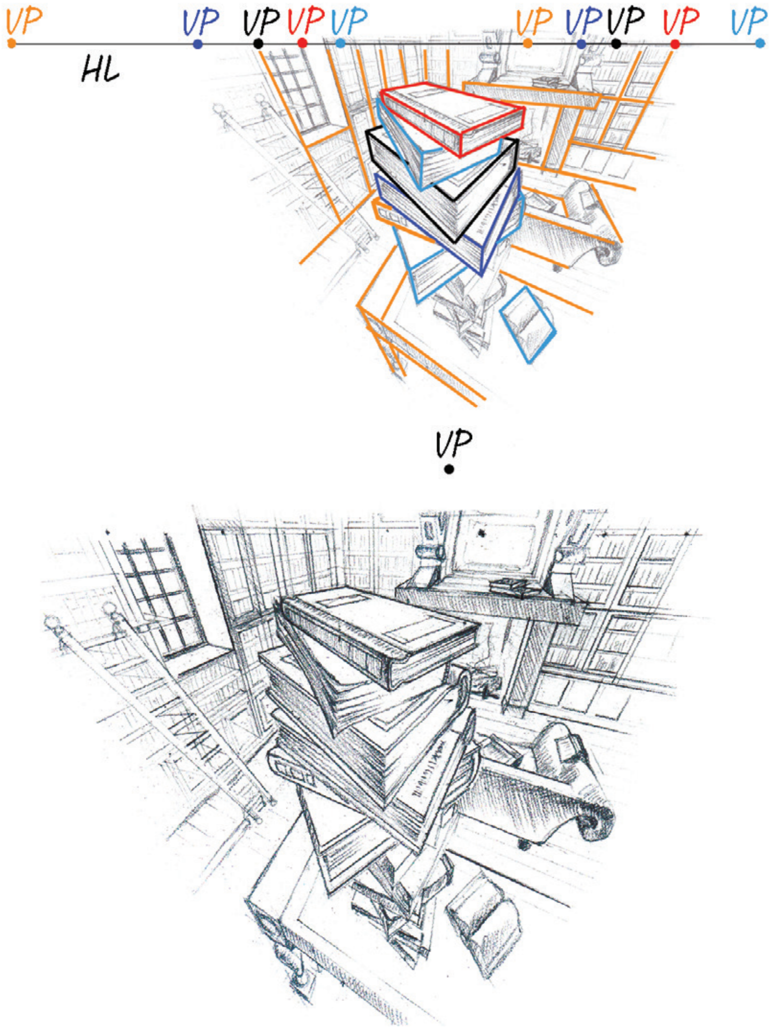
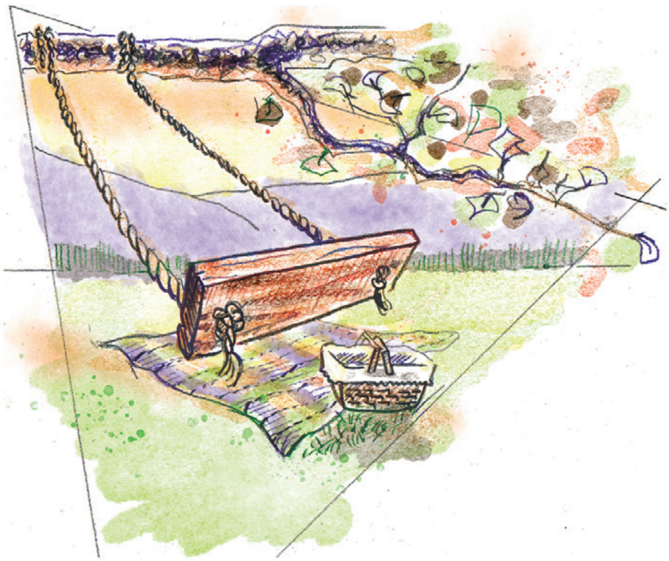


Figure 12-12

new vanishing points maintain the same center of vision, as well as the same third vanishing point. To construct forms, use each set along with the third vanishing point. Again, be careful not to mix any of the sets. Color-coding helps (12-11, 12-12).

COMBINED PERSPECTIVES. Zimoun, **259 prepared DC-motors, cardboard boxes, 140 x 35 x 35 cm**, 2014. Motors, cardboard, wire, wood, metal, tape, power supplies, dimensions variable. Installation view: Église Saint-Nicolas de Caen, France. © *Zimoun. Photography by Zimoun. Courtesy of bitforms gallery, New York.*



ONE-POINT, TWO-POINT, & THREE-POINT

Figure 12-13

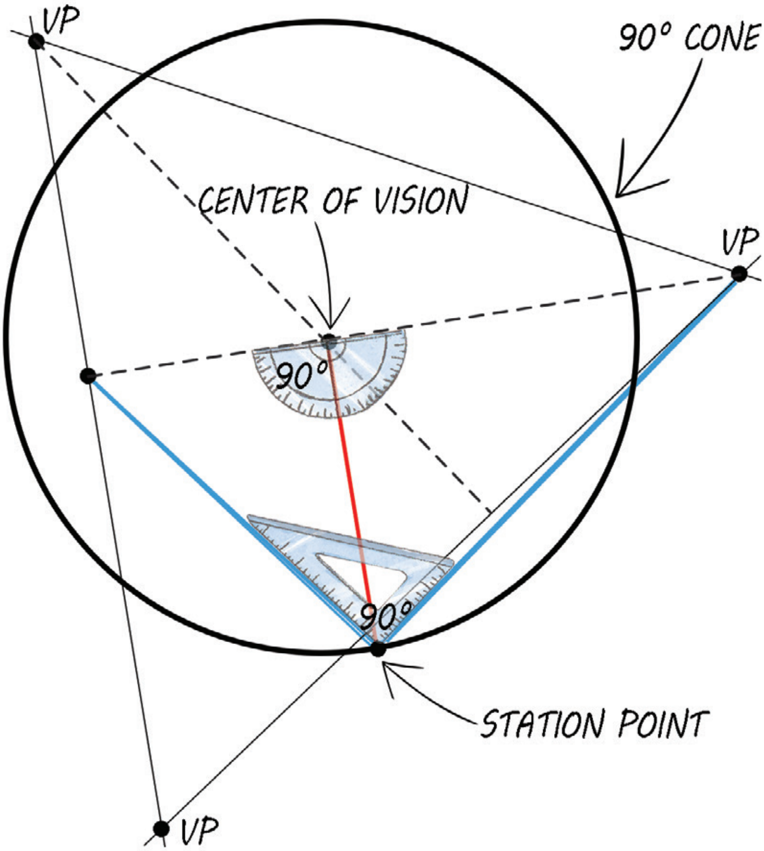


Figure 12-14

We can also combine one-point, two-point, and three-point (12-13). It is easiest to begin with three-point perspective. Draw the vanishing points and center of vision for three-point. Locate a station point, and use it to draw a 90-degree cone of vision. Recall methods from Chapter 8 to construct a cone of vision (12-14). Next, locate a horizon line that passes through the center of vision. The horizon line cannot be parallel to the triangle arms, but there are no other restrictions to its orientation as long as it passes through the center of vision. It does

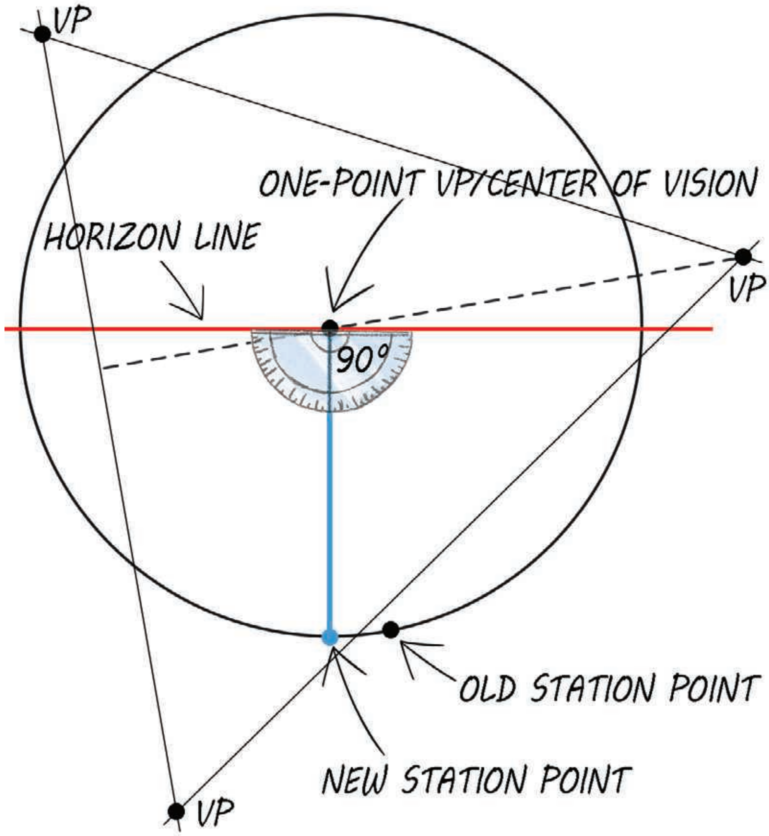


Figure 12-15

not have to line up with the center of vision lines, for example. Next drop a line below the center of vision and perpendicular to the horizon to find where it intersects the 90 degree cone. This marks a new station point with reference to the horizon line. The old station point is no longer needed. If we only wish to combine one-point and three-point perspective, we can stop here because, as we know, the center of vision is also the vanishing point for a one-point perspective point of view (12-15). But to continue adding two-point, we can use the new

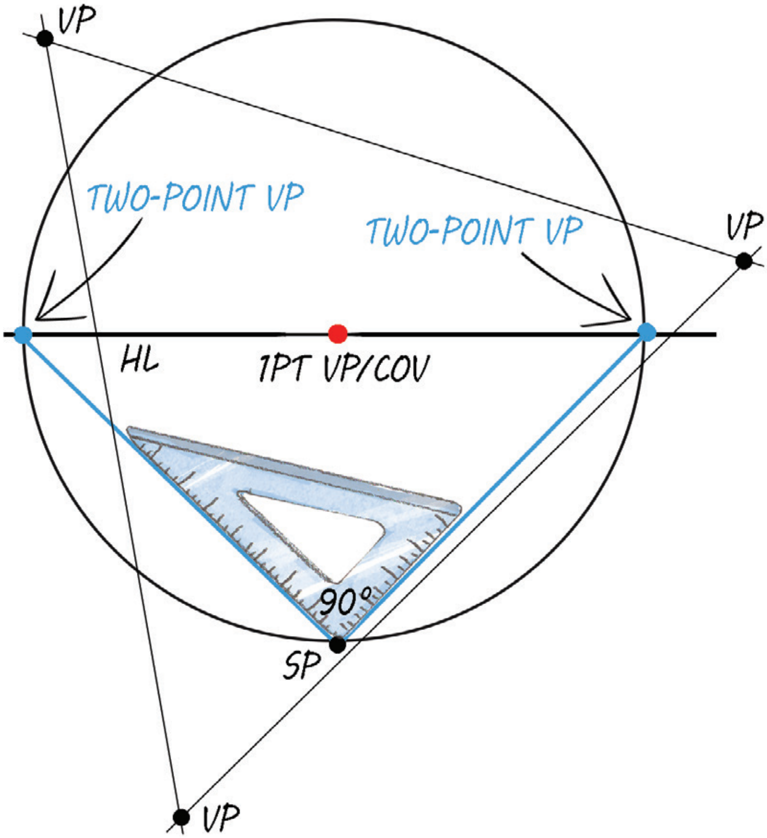
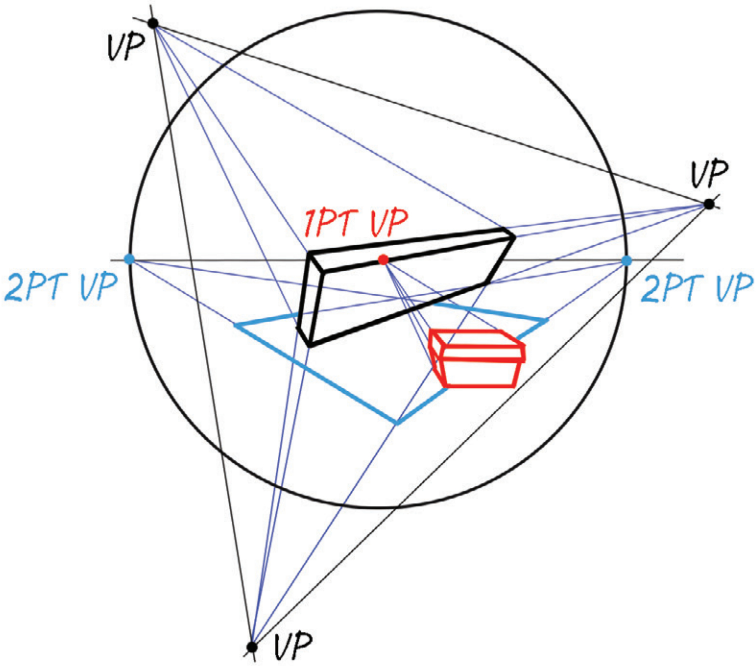


Figure 12-16

station point to locate two vanishing points along the horizon. For their placement, recall that the arms of a 90-degree angle originating at the station point must intersect the horizon. The two-point vanishing points in our example happen to fall on the cone of vision, but that does not have to be the case. They can be placed anywhere on the horizon as long as the station point is correctly referenced (12-16). Use each set of vanishing point(s) to construct forms in one-, two-, and three-point perspective. Note that rectangular forms in one-point and



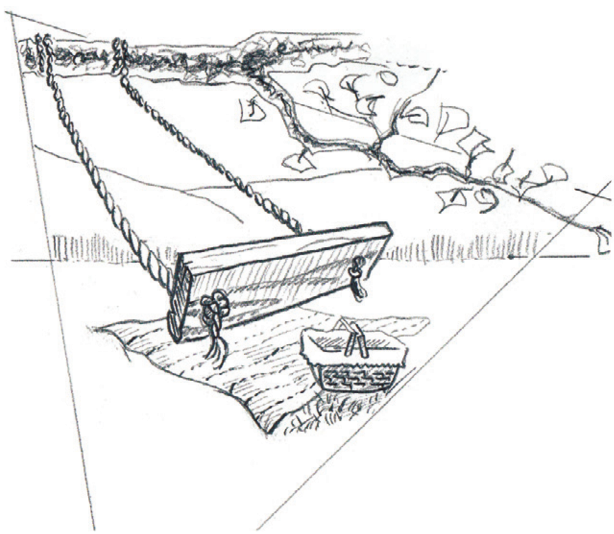


Figure 12-17

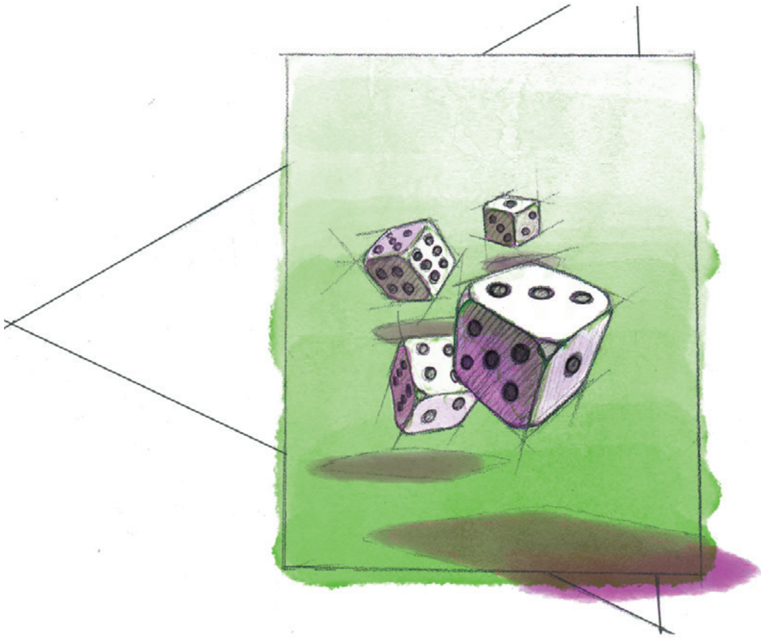


Figure 12-18

two-point rest on the ground plane, but forms in three-point do not. When three-point is combined with one-point and two-point, not all forms can be oriented flat on the ground plane. In this instance the three-point form is free floating (12-17).

If none of the forms rest on the ground plane, there is a very simple way to combine multiple forms floating, flying, or falling through space (12-18). The technique works the same for one-, two-, and three-point perspective. We will demonstrate it in three-point. Start with three vanishing points, and find the center of vision. Lay a piece of tracing paper on top, and mark the center of vision on the tracing paper. Draw the first

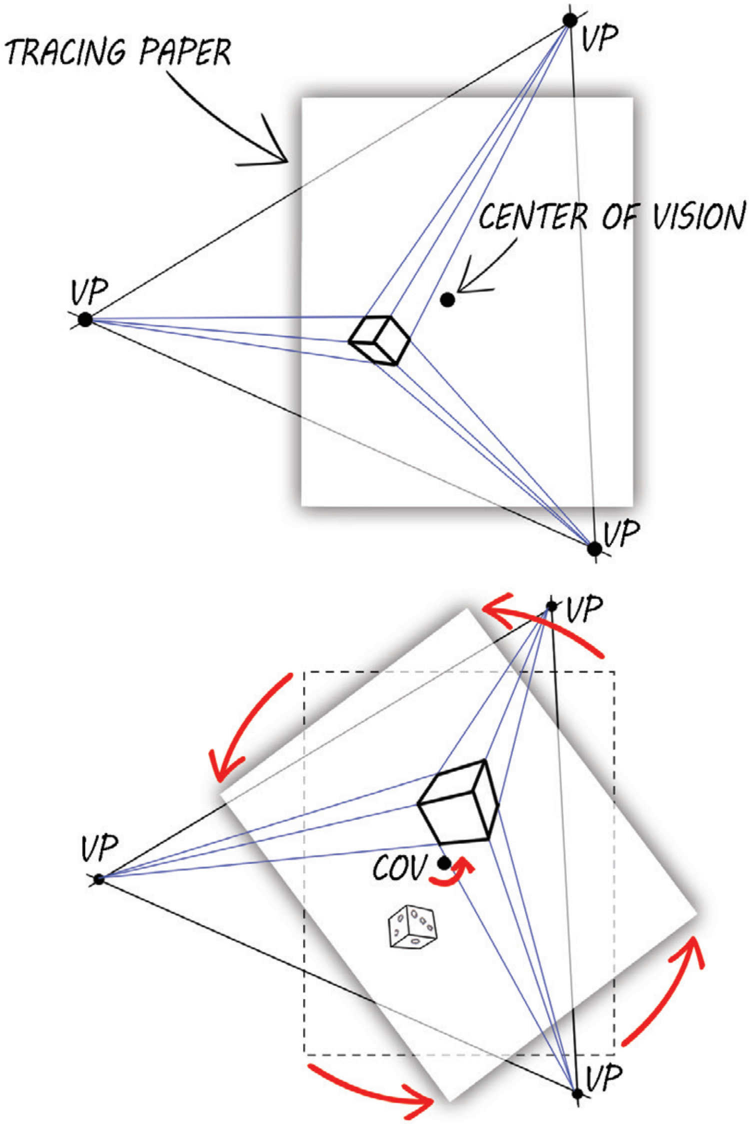


Figure 12-19

shape using the vanishing points. Then rotate the tracing paper around the center of vision, and draw a second shape using the same vanishing points (12-19). Take care to keep the

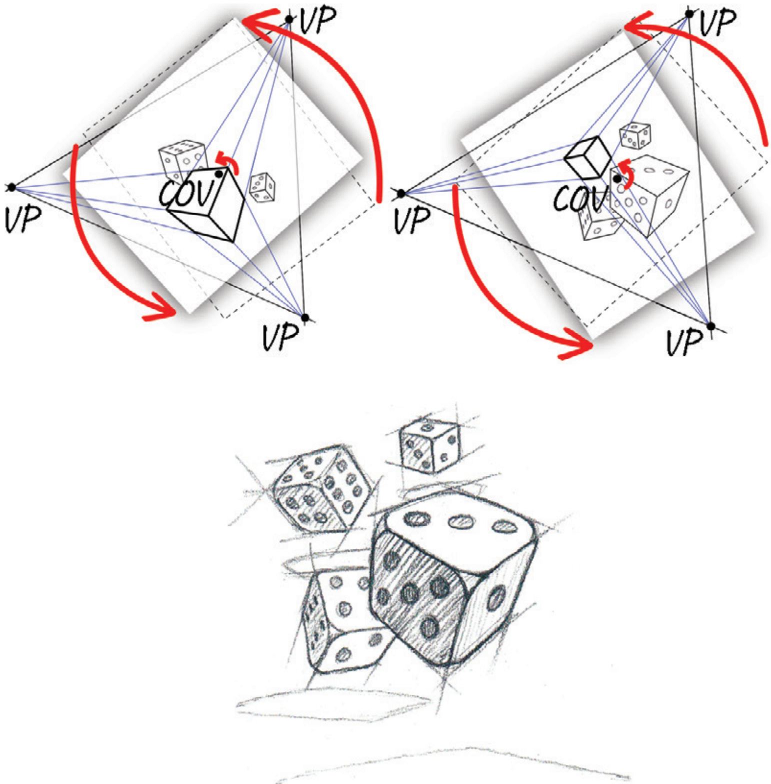


Figure 12-20

center of vision on the tracing paper lined up with the center of vision on the sheet of paper beneath it. So long as that alignment is maintained, you can rotate the tracing paper to add multiple forms in three-point perspective, all at different angles to one another (12-20). This technique is quite fun and surprisingly easy.

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CAST SHADOWS

13

13 CAST SHADOWS

Because there is light, all three-dimensional subjects have shadows. There are two major components of a shadow: the main shadow area on the subject itself, and the cast shadow. The cast shadow is the part of a subject's shadow that falls onto another surface. Cast shadows can be accurately constructed using perspective techniques.

Creating a cast shadow in perspective requires a fixed location for the light source in relation to the subject. We use two special types of vanishing points to define the location of the light source: the light source vanishing point, and the shadow vanishing point. The **light source vanishing point** represents the light source itself (the sun, a lamp). The **shadow vanishing point** defines the location of the light source in relation to the ground plane. We can connect the light source vanishing point to the shadow vanishing point with a vertical line. Think of the shadow vanishing point as the footprint for

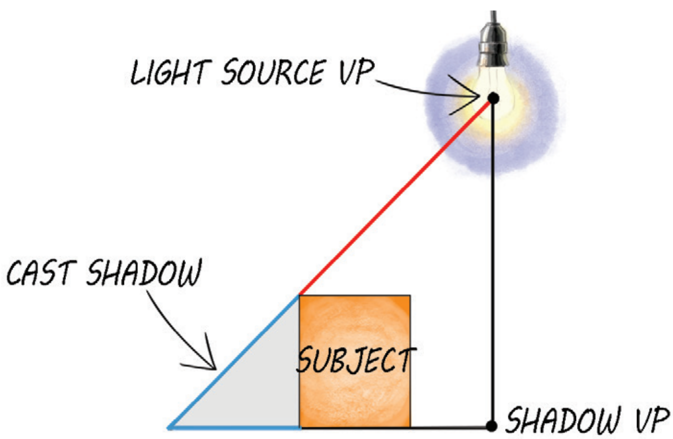

Figure 13-1

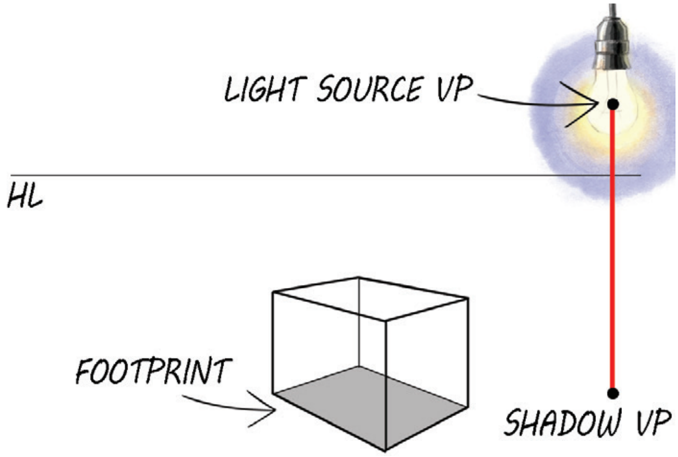

Figure 13-2

the light source, marking its relationship to the subject. For our purposes, we will assume the cast shadows are attached to the forms, meaning the subject articulates with the ground plane at its footprint (13-1).

To construct an attached shadow, first draw a form as it rests on a surface using normal perspective methods. Be sure to draw the entire footprint transparently, defining any hidden edges. Then choose a location for the light source by placing a light source vanishing point (LVP) and shadow vanishing point (SVP) (13-2). Extend lines from the shadow vanishing point, contacting the outer edges and corners of the form. Note the points where the shadow vanishing point lines intersect the footprint. Extend vertical lines up from those points to top of the form. The top of those lines marks contact points for the light source vanishing point (13-3). Now draw sloping lines from the light source vanishing point through the contact points out to where they intersect the shadow vanishing point lines. The combination of the sloping LVP line, vertical height line, and

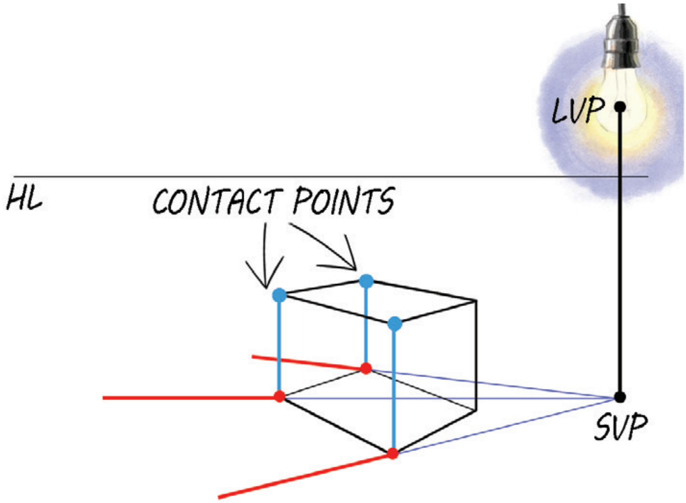

Figure 13-3

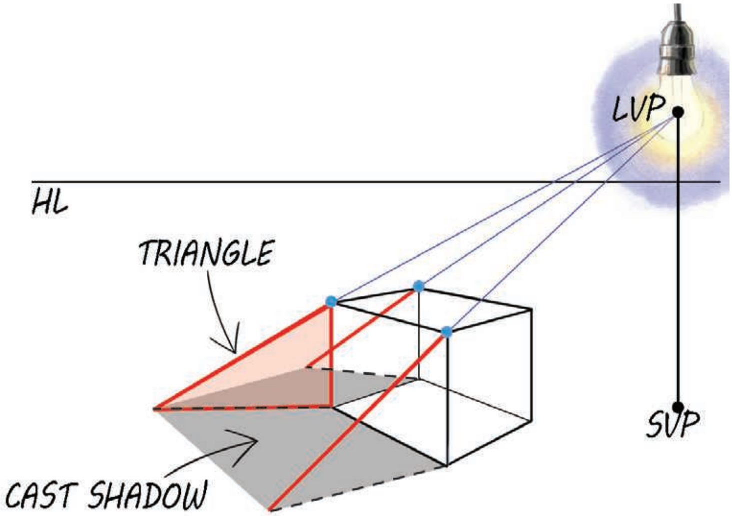

Figure 13-4

SVP line forms a triangle. This triangle describes the angle of the cast shadow. The end of the shadow is marked by the intersection of the light source vanishing point and shadow

CAST SHADOWS. J. Diane Martonis, **Wandering Thoughts**, 2015. Cut linen, installed work: 80 x 15 x 30 inches. © *J. Diane Martonis. Courtesy of the artist.*

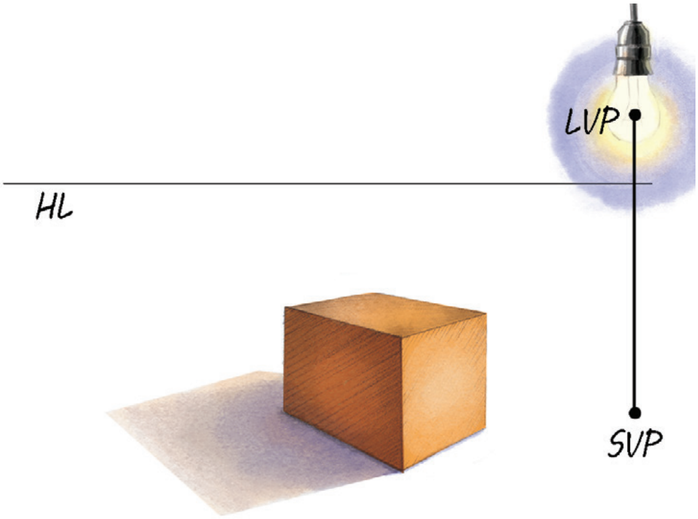

Figure 13-5

vanishing point lines. Connect the shadow's end points to complete its shape (13-4, 13-5). The technique for rendering cast shadows is virtually the same in one-point, two-point,

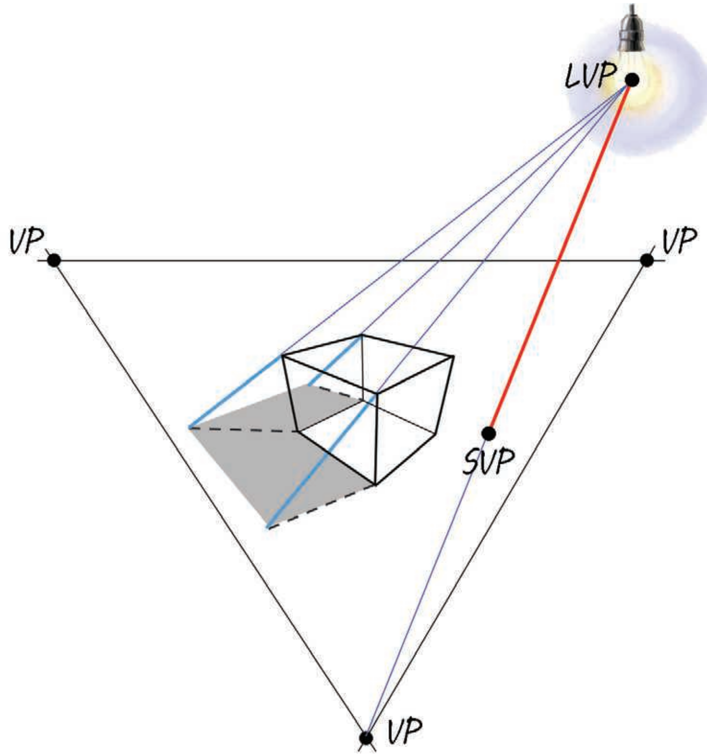

Figure 13-6

and three-point perspective. Just note that in three-point perspective the line connecting the shadow vanishing point to the light source vanishing point must originate from the third vanishing point (13-6).

For forms with sharp angles such as rectangular prisms, having a contact point and a triangle at each corner will suffice, because the corners can be connected with straight lines. For curvilinear forms such as cylinders, however, we employ multiple contact points to define the shadow's shape. The more points mapped, the more precise the cast shadow, but you must use approximation to some degree to complete the

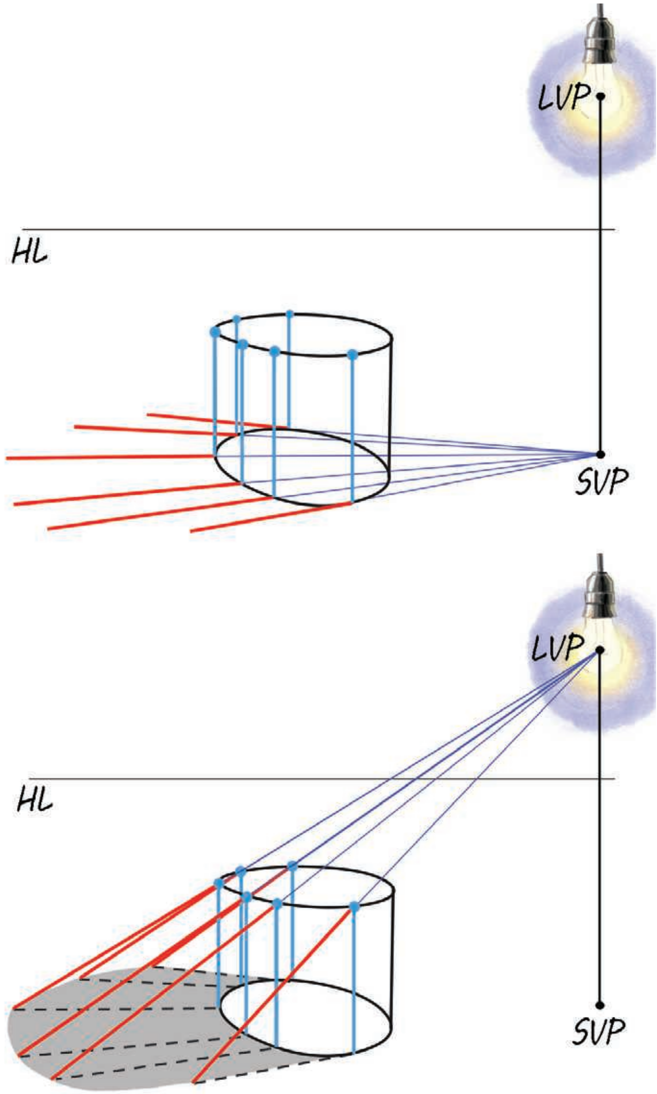

Figure 13-7

form's outline (13-7). It is helpful to determine the most relevant landmarks of a form, and then map those contact points. For a human figure, for example, locate contact points for the head and shoulders. The remainder of the shadow's outline

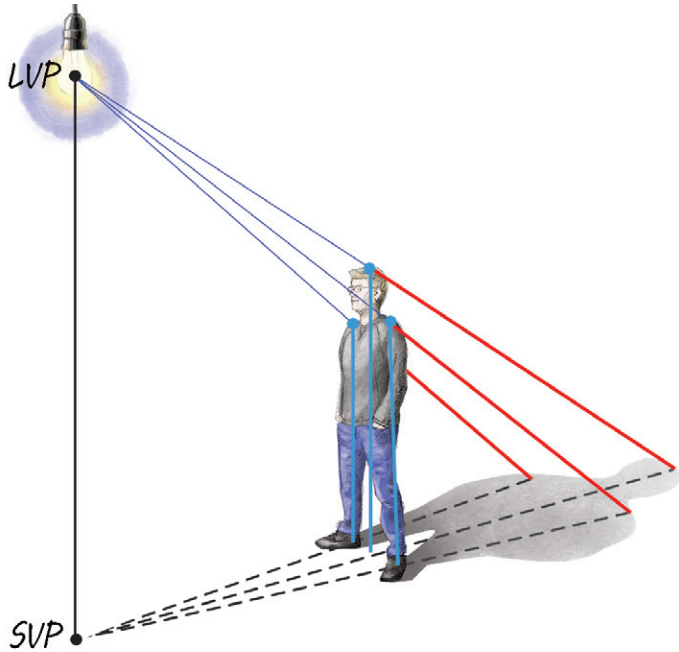

Figure 13-8

can be interpreted (13-8). Know that sometimes the edges of a cast shadow will employ the same vanishing point(s) as the subject itself (13-9). This is not always the case, however. So take care not to rely upon vanishing points as a way to shape the shadow. It is best to always use the shadow and light source vanishing points.

It is helpful, though, to understand how the light source's location in relation to the subject determines the size, shape, and direction of the cast shadow. For example, a shadow is always cast opposite the light source, such that a light source positioned left casts a shadow to the right, and vice versa. A light source placed high results in shorter shadows, whereas a light source placed low creates longer shadows (13-10). When

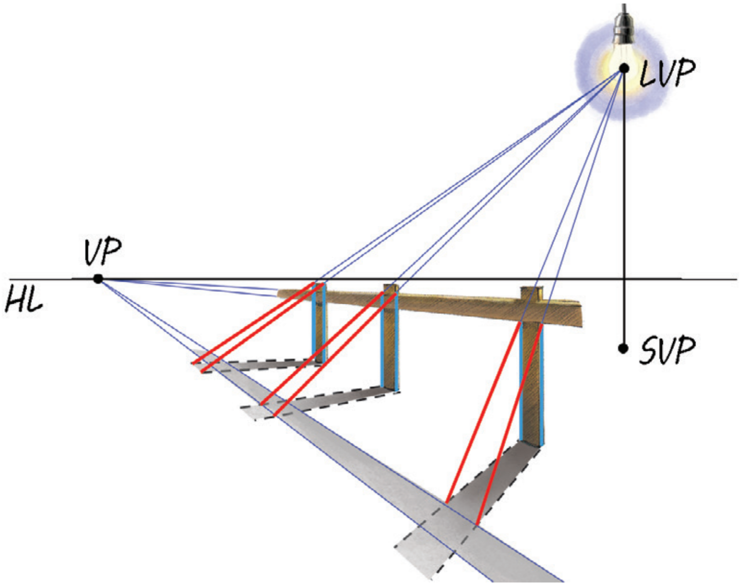

Figure 13-9

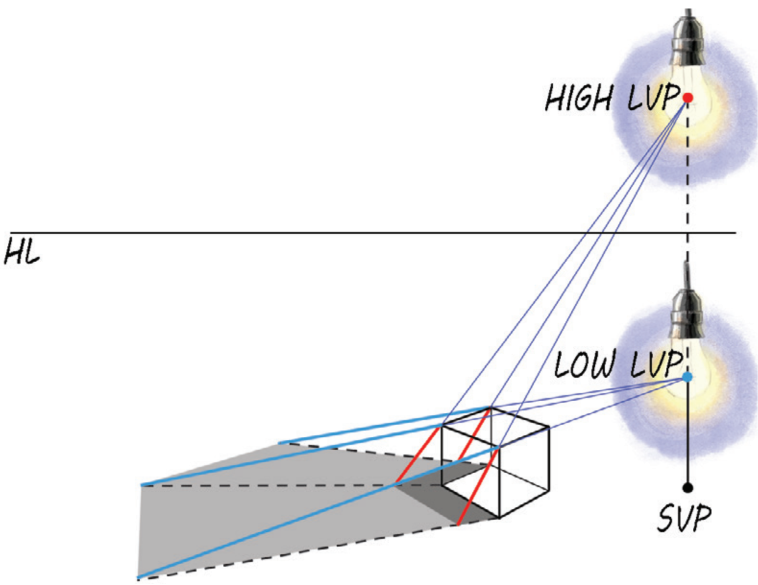

Figure 13-10

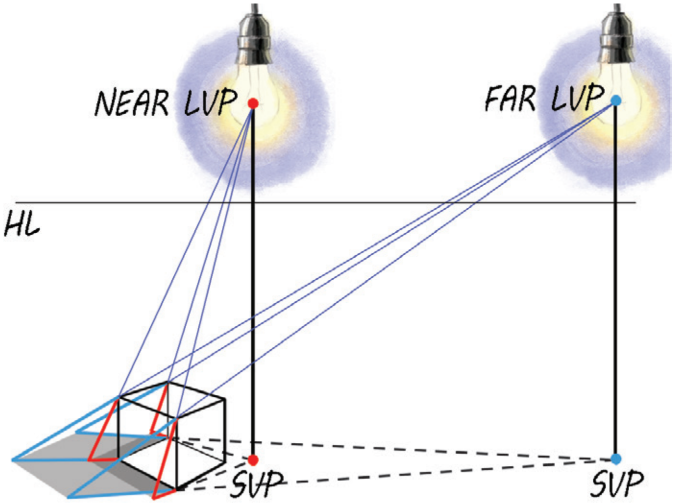

Figure 13-11

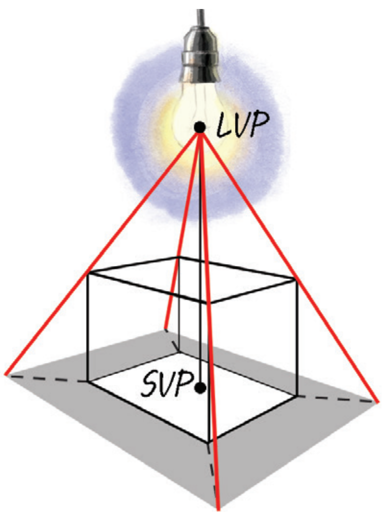

Figure 13-12

the light source is closer to the subject, it makes wider and shorter shadows, and farther away makes narrower and longer shadows (13-11). A light source directly overhead means the

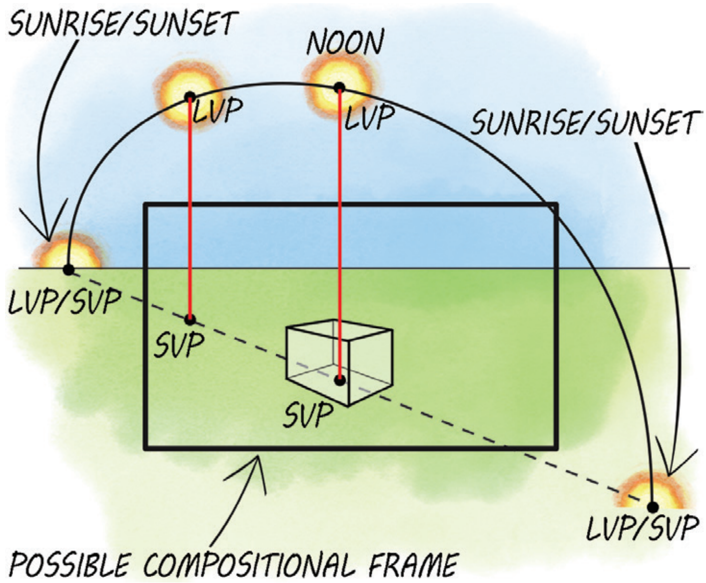

Figure 13-13

shadow vanishing point is contained within the form's footprint, and the light will cast a shadow that surrounds the form (13-12).

The light source does not have to fall within the frame of the composition. In fact, especially when the source is the sun, placing the light source vanishing point in the margins makes for more realistic shadows. The sun as a light source also produces two special conditions in which the light source vanishing point and the shadow vanishing point merge: sunrise and sunset. At sunrise and sunset, the LVP and SVP meet at one point on the horizon. Keep in mind, though, that in real space the horizon is seen in all directions. So if you want to simulate lighting conditions for a sunrise or sunset, the LVP/SVP point does not necessarily have to be placed behind the subject on the horizon line; it can exist as a point anywhere in the margins (13-13). To map this type of lighting, notice that

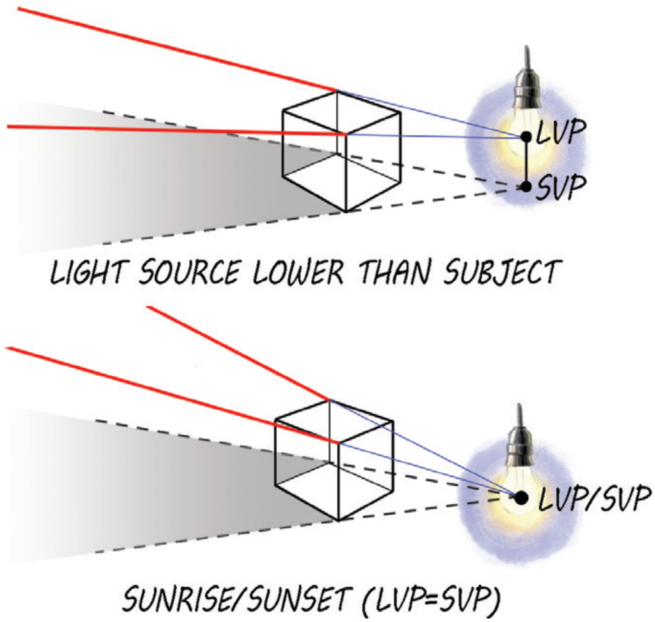

Figure 13-14

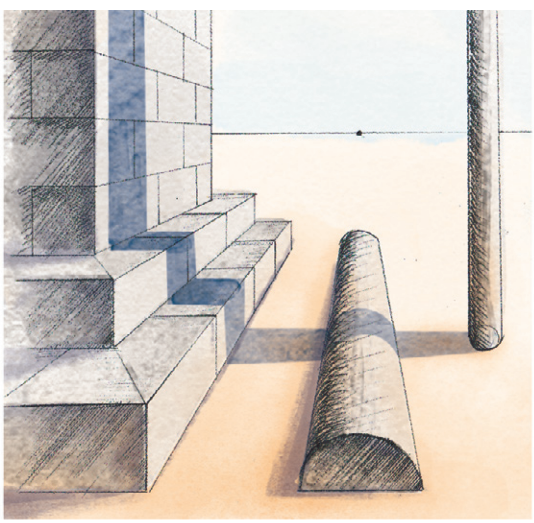

Figure 13-15

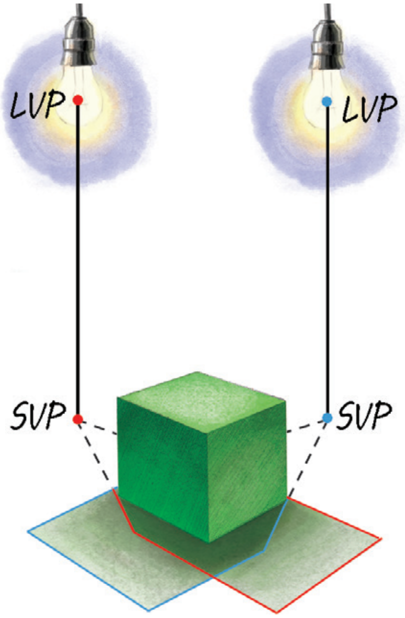

Figure 13-16

if the light source is situated lower than the subject itself, the shadow vanishing point and light source vanishing point lines will never intersect. Instead the guidelines diverge (13-14). So the shadow will be long but lack a clearly delineated ending border and simply fade at the far end.

Remember: cast shadows follow the contours of the surface upon which they fall. Be mindful when cast shadows fall on uneven ground, and sloping or vertical planes. The shadow vanishing point lines must follow the angles of the surfaces upon which they extend (13-15). Additionally if more than one light source casts shadows on the same form, map each light source independently. The shadow will be darker in the overlapping area (13-16).

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REFLECTIONS

14

14 REFLECTIONS

A reflection is a mirror image of a subject, appearing as though it were flipped on an axis. The components of a reflection include the subject, the reflective plane, or mirror, and the reflected image. The subject's angle in relation to the mirror is called the **angle of incidence**. The reflected image's angle in relation to the mirror is called the **angle of reflection**. The angle of incidence always equals the angle of reflection (14-1). Additionally, the distance from the subject to the reflective plane always equals the distance from the mirror to the reflected image (14-2).

In the simplest type of reflection, the mirror is parallel to one plane of the rectangular prism. The angle of incidence is therefore 90 degrees. The subject, its reflection, and the mirror all share the same vanishing points because they are all in

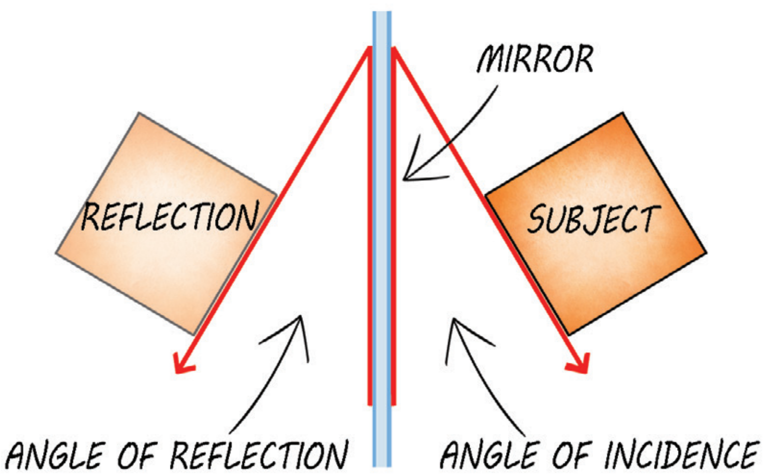


Figure 14-1

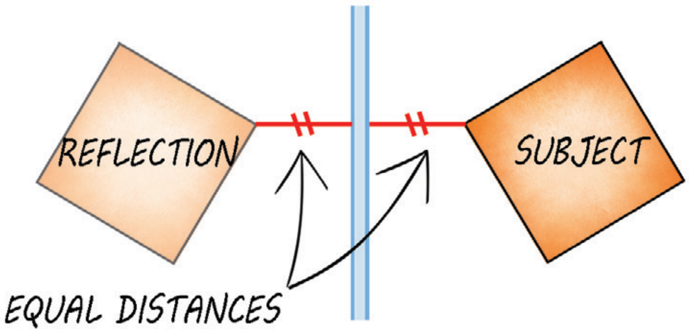


Figure 14-2

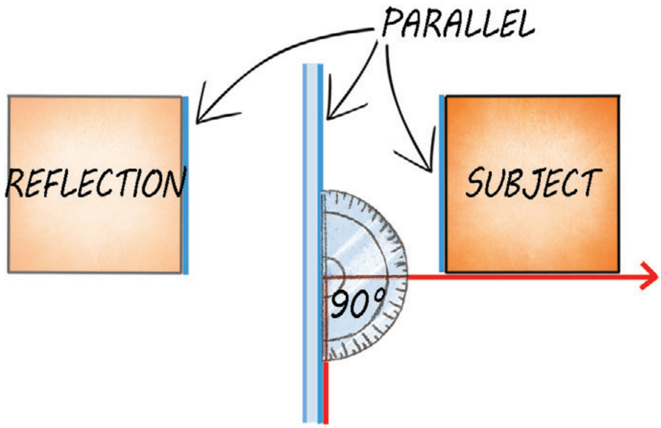


Figure 14-3

alignment (14-3). The technique for rendering is the same in one-point, two-point, and three-point perspective. First draw the subject in perspective, draw the mirror, and then draw the reflection. Use the same vanishing point(s) (VPs) for all three (14-4). Use a diagonal vanishing point (DVP) to maintain proportions in the reflection. If there is space between the mirror and the subject, use a second DVP to measure that

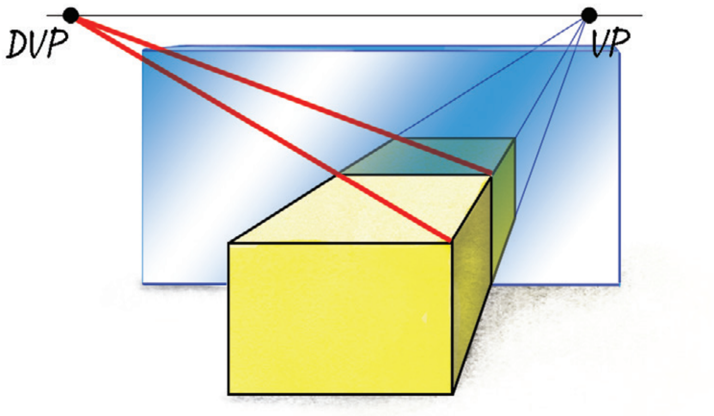


Figure 14-4

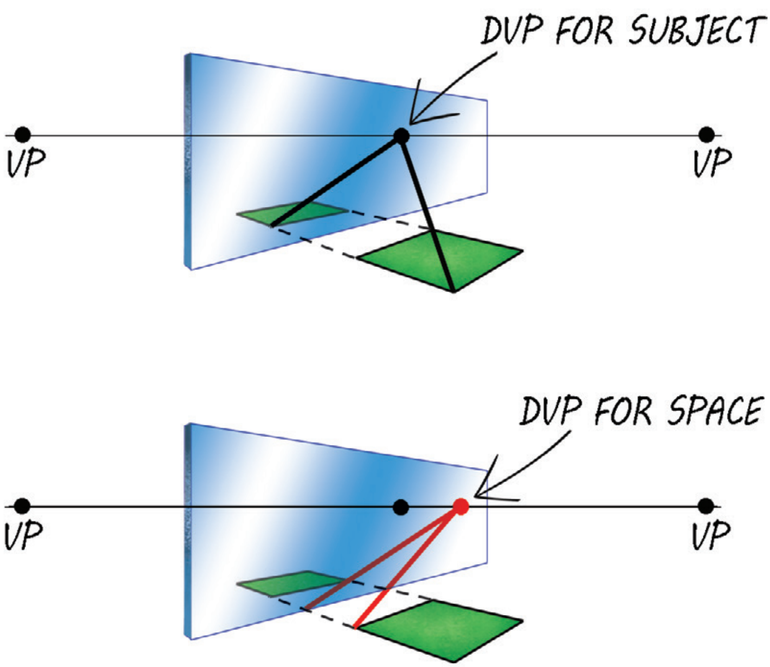


Figure 14-5

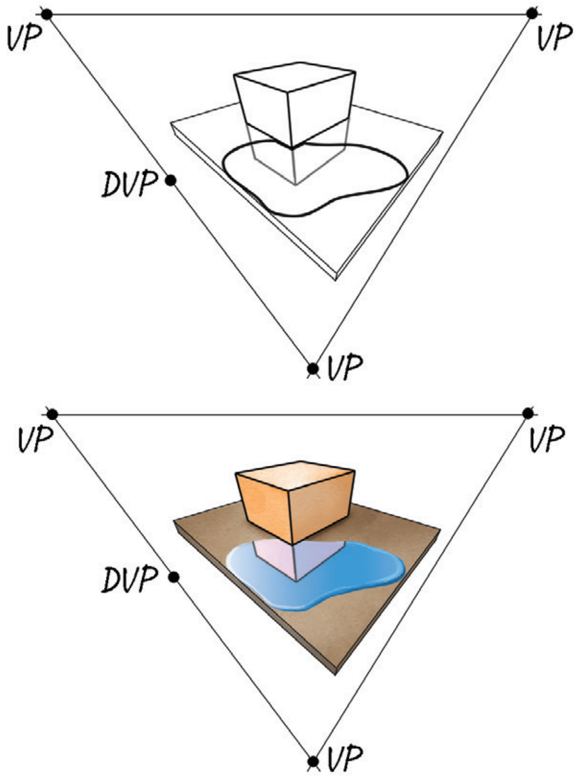


Figure 14-6

distance, and copy it into the reflection (14-5). Sometimes the reflective area is not continuous across the surface of its plane. In these cases, create the reflection in exactly the same manner, but make it visible only across the area of reflection (14-6). Keep in mind that the mirrored surface can be positioned horizontally or vertically along any of the three planes of the rectangular prism.

What if the mirror is not parallel to one plane of the subject? There are a few basic scenarios and we will start with the

REFLECTION IN PERSPECTIVE. Jaime Brett Treadwell, **Barnacle**, 2014. Oil on panel, 44 x 44 inches. © *Jaime Brett Treadwell. Courtesy of the artist.*

simplest. Take a vertical mirror with 45-degree angle of incidence to the subject (14-7). In this arrangement the subject and its reflection are both still in alignment with each other, so we can use one set of vanishing points for both of them. But for the mirror, we will need to use the subject's diagonal vanishing point(s). The technique is the same in one-point, two-point, and three-point perspective. First draw the subject, then locate its horizontal DVP(s). For a one-point subject, you need to find two horizontal DVPs. In one-point perspective, two diagonal

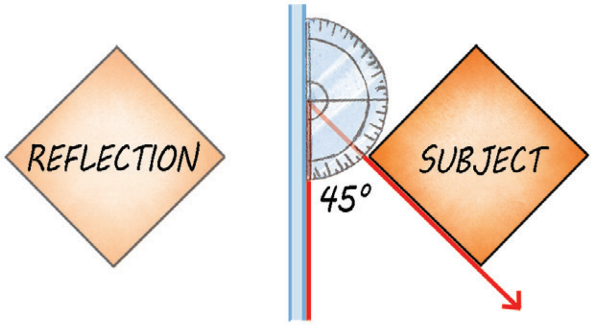


Figure 14-7

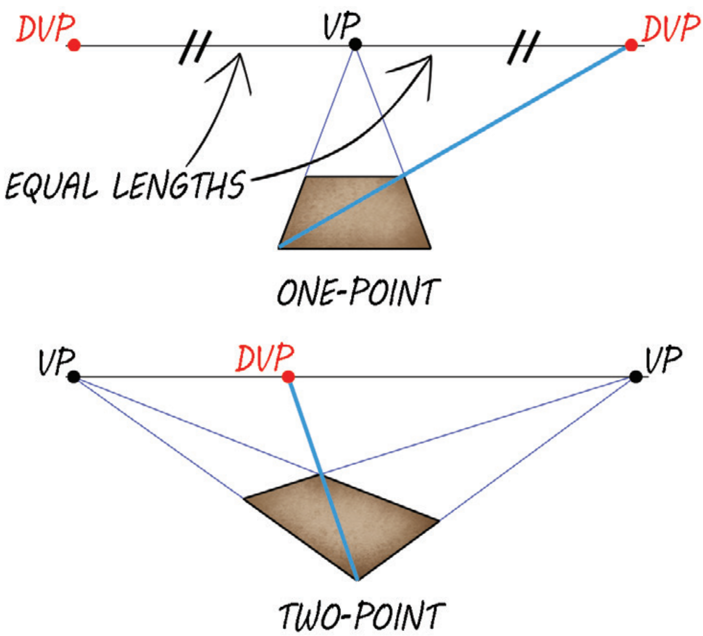


Figure 14-8

vanishing points are located equidistant from the vanishing point. For two-point perspective, we need to locate only one DVP between the two vanishing points (14-8). Then you can

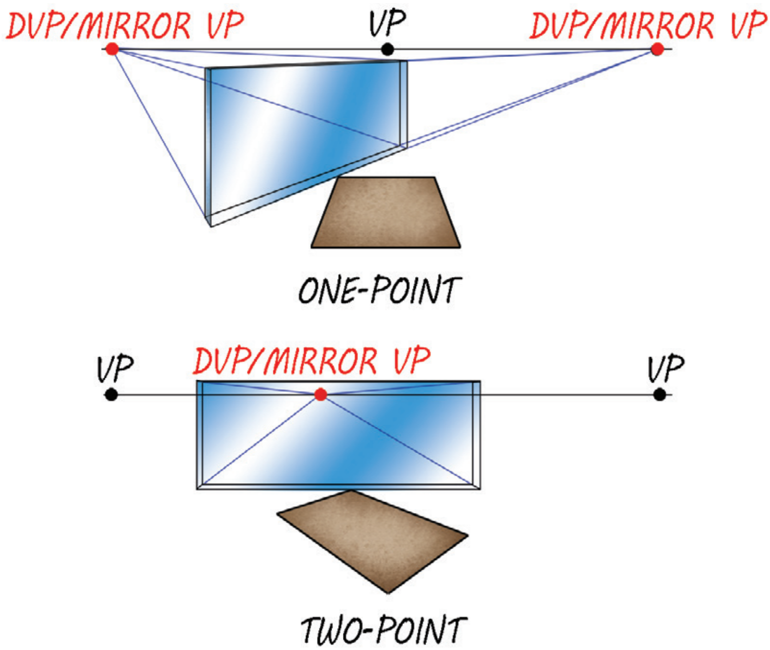


Figure 14-9

use the diagonal vanishing point(s) as vanishing point(s) for the mirror. For a one-point subject, draw the mirror in two-point perspective, using both diagonal vanishing points. For a two-point subject, draw the mirror in one-point perspective (14-9).

The next step is crucial: we must use the mirror's vanishing point to transfer the corners of the subject into the reflection. Specifically, we use the mirror vanishing point that is responsible for the depth, or thickness, of the mirror. Starting from the mirror vanishing point that creates its depth, draw lines out to the corners of the subject. These lines are important guidelines for locating the corners of the reflection. We can now use the subject's vanishing point(s) in combination with the guidelines

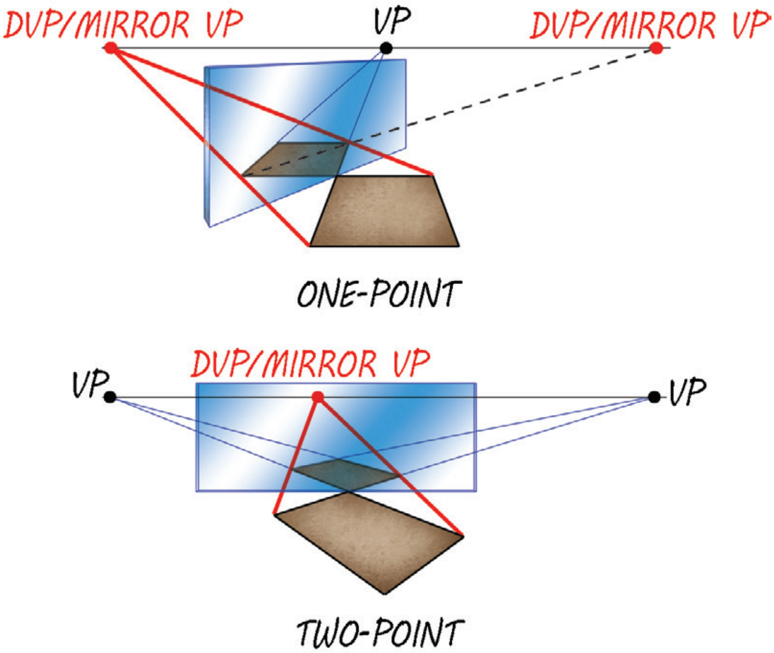


Figure 14-10

to draw the reflection (14-10). Three-point subjects essentially use the same process as two-point—just add a third vanishing point for vertical edges. In three-point, the subject, the mirror, and the reflection are all in three-point perspective.

What happens when none of the elements are in alignment? These reflections have angles of incidence that are neither 45 nor 90 degrees. In this case the subject, the mirror, and the reflection each have their own set of vanishing point(s). There are two ways to tackle this. The first method is to work from a plan view, as described in Chapter 10. Draw a plan view that includes the subject, the reflective plane, and the reflected image. Use a protractor to ensure that the angle of

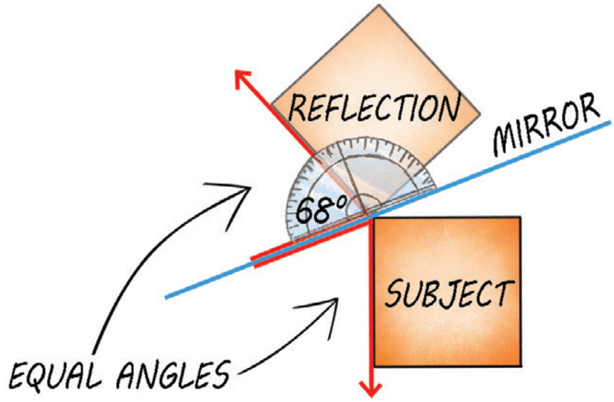


Figure 14-11

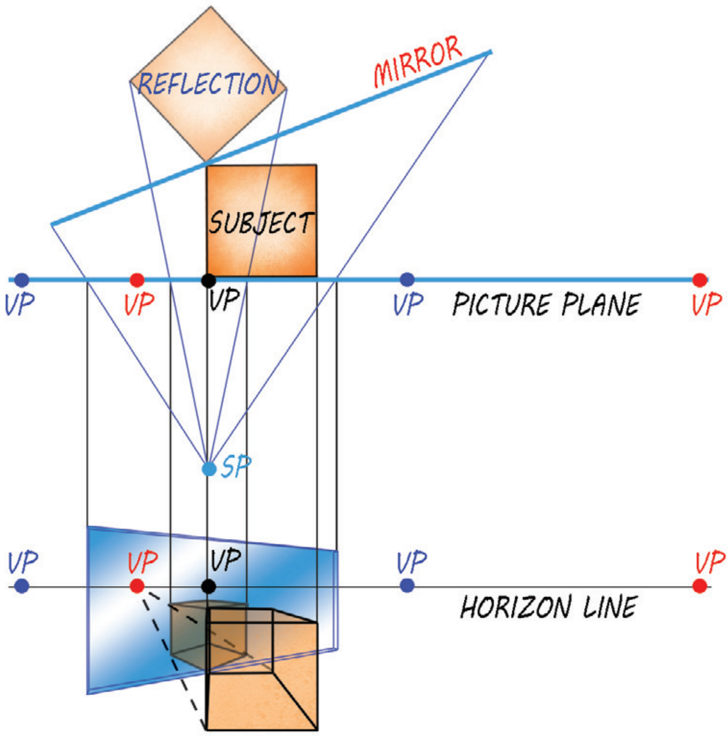


Figure 14-12

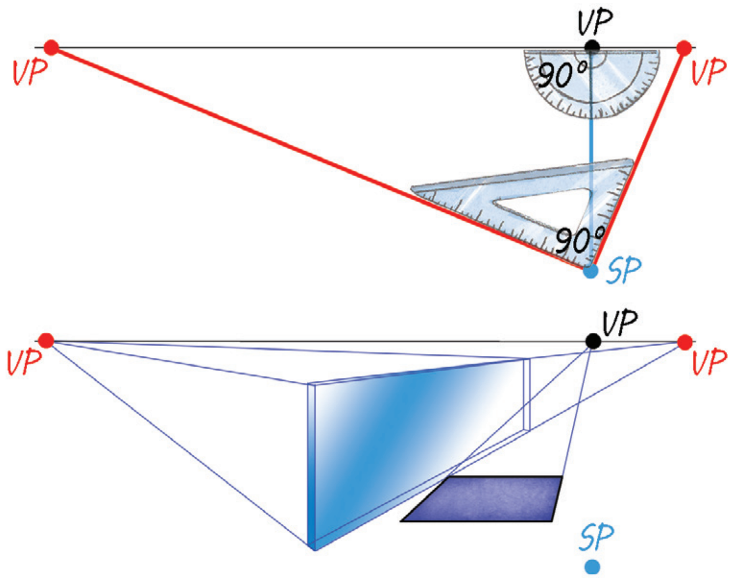


Figure 14-13

incidence equals the angle of reflection in the plan view (14-11). Then follow the method described in Chapter 10 to translate the plan view into a perspective view (14-12).

The second method eliminates the need for a plan view. Instead, you add angles on the fly in perspective. We will start with an example of the subject in one-point perspective. Mark the vanishing point for the subject and a station point (SP) directly below. Now find a set of vanishing points for the mirror by using techniques for combining perspectives from Chapter 12. Recall that this involves finding points on the horizon that form a 90-degree angle to the station point. Draw the subject and the mirror, taking care to use the correct vanishing point(s) for each. Color-coding is helpful (14-13). Next we need to find the angle of incidence between the mirror

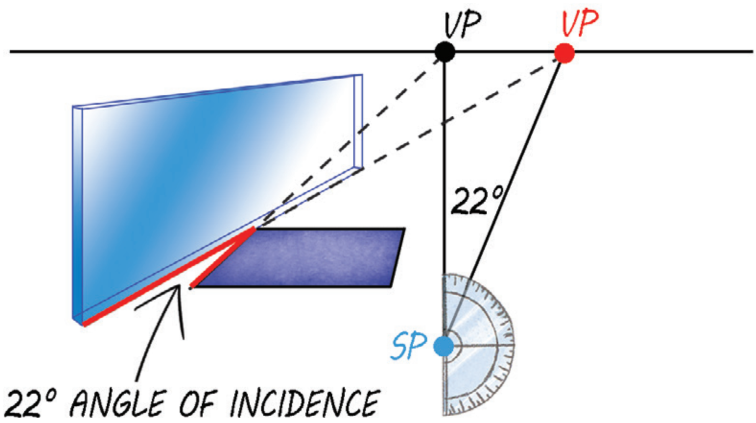


Figure 14-14

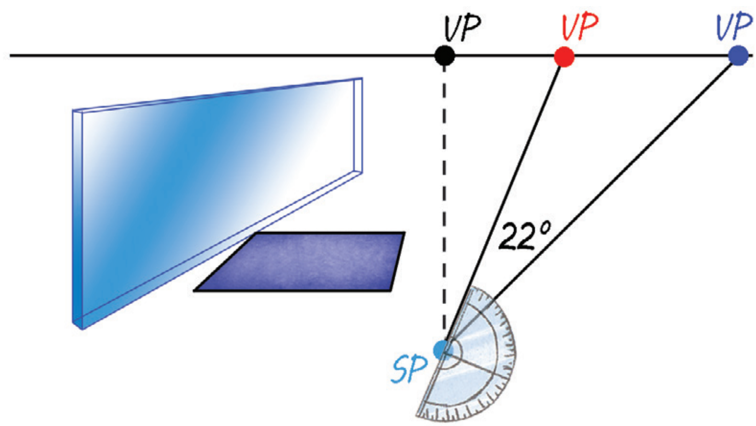


Figure 14-15

and the subject. Locate the vanishing points that form the angle of incidence. Extend lines from these two vanishing points to the station point. Then position a protractor at the station point, and measure the angle between the vanishing points. This angle corresponds to the angle of incidence in perspective (14-14). Now rotate the protractor so it rests on the mirror's vanishing point line, and add the angle of incidence to

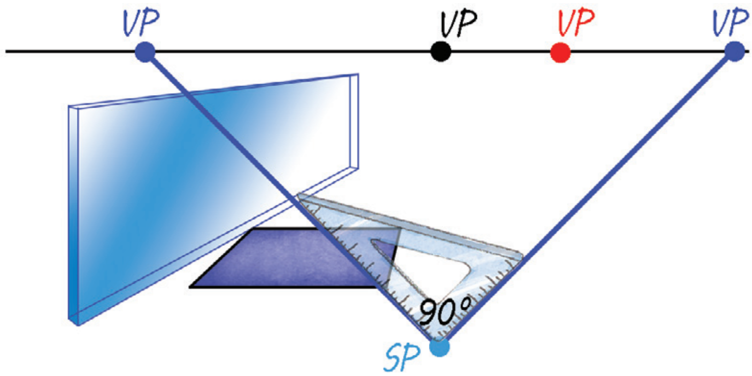


Figure 14-16

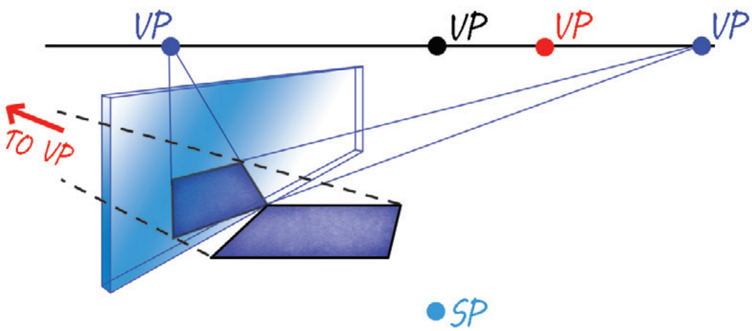


Figure 14-17

place a new vanishing point. This will be one of the vanishing points for the reflection, and will form the angle of reflection (14-15). Before we can draw the reflection, though, we must first find its other vanishing point. Again follow techniques from Chapter 12. With a protractor or a 90-degree triangle at the station point, align the arms to find the second vanishing point (14-16). We can now draw the reflection using the two new vanishing points. Remember to always use the mirror's vanishing point for depth—it properly translates the subject's corners into the reflection (14-17).

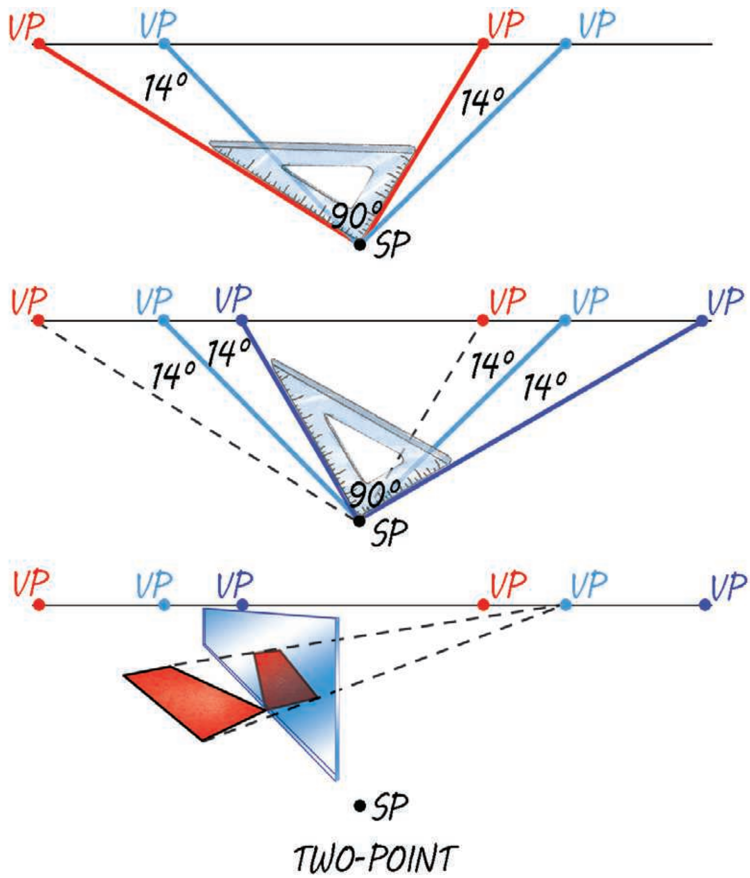


Figure 14-18

This technique works exactly the same for subjects in two-point and three-point perspective. You can start by laying out all three sets of vanishing points before drawing. This is a good approach if you know the angle you want to use. The mirror will always use the middle set of vanishing points. Again, color-coding or labeling is helpful (14-18). For three-point perspective, you will need to recall the Chapter 12 technique for combining multiple three-point forms on the ground plane.

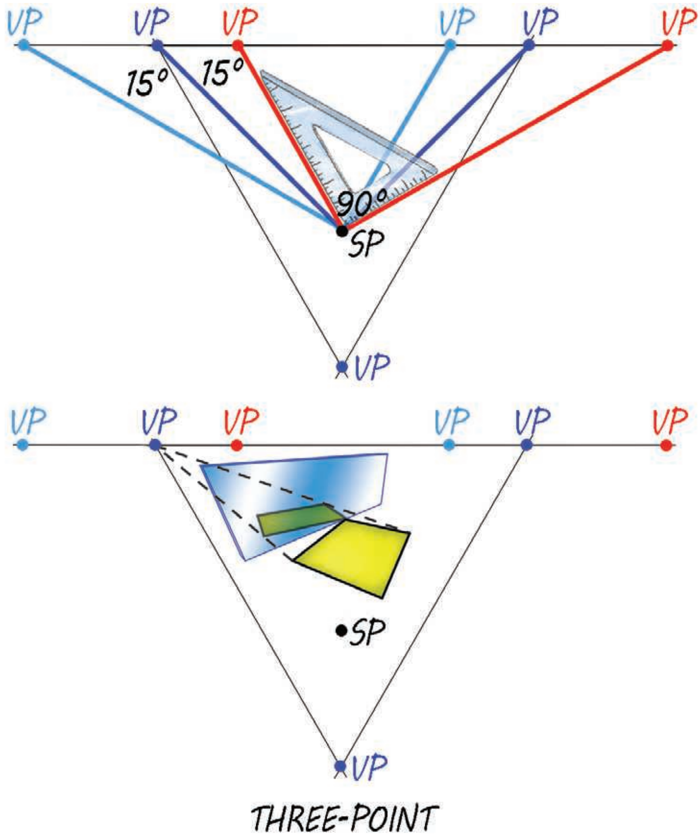


Figure 14-19

In particular, be sure to locate the correct station point to keep the perspectives consistent (14-19).

Thus far we have focused on applying this technique to vertical mirrors. But we can also use it for horizontal mirrors. We simply rotate everything on its side, so the horizon line becomes a vertical axis line. Just as before, if the angle of reflection is 45 degrees, both the subject and the reflection will use the same set of vanishing points. Otherwise, use the aforementioned

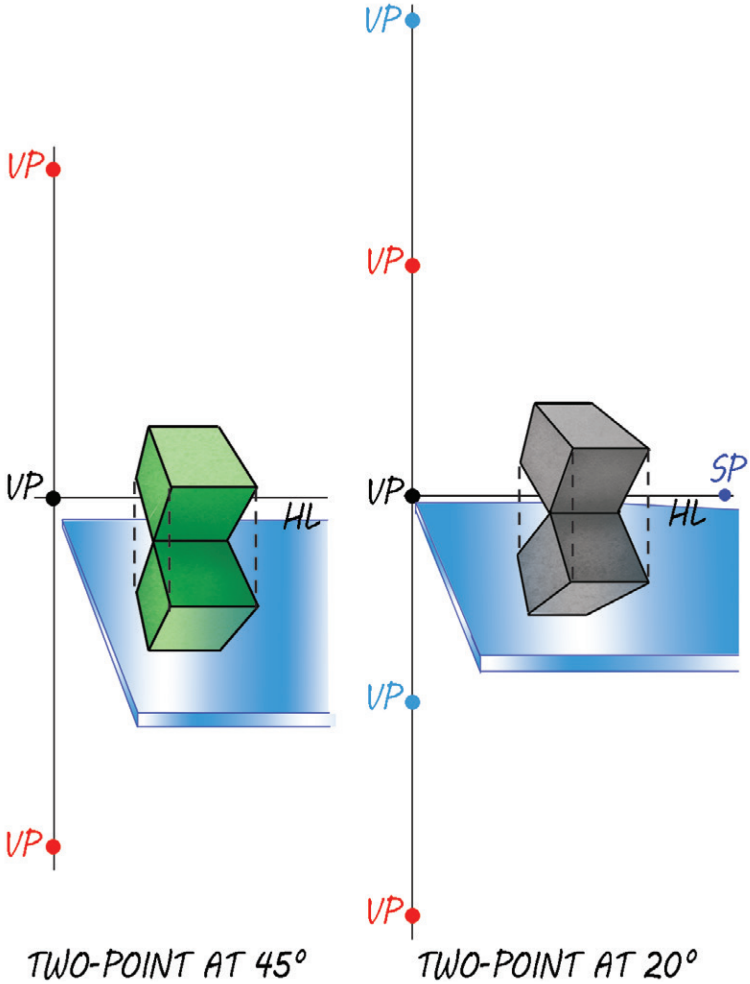


Figure 14-20

techniques to measure the angles and find a separate set of vanishing points for the reflection (14-20). In three-point perspective, we use one arm of the three-point triangle for the vanishing points. Again note that we have simply rotated everything on its side. All the same rules apply. The same

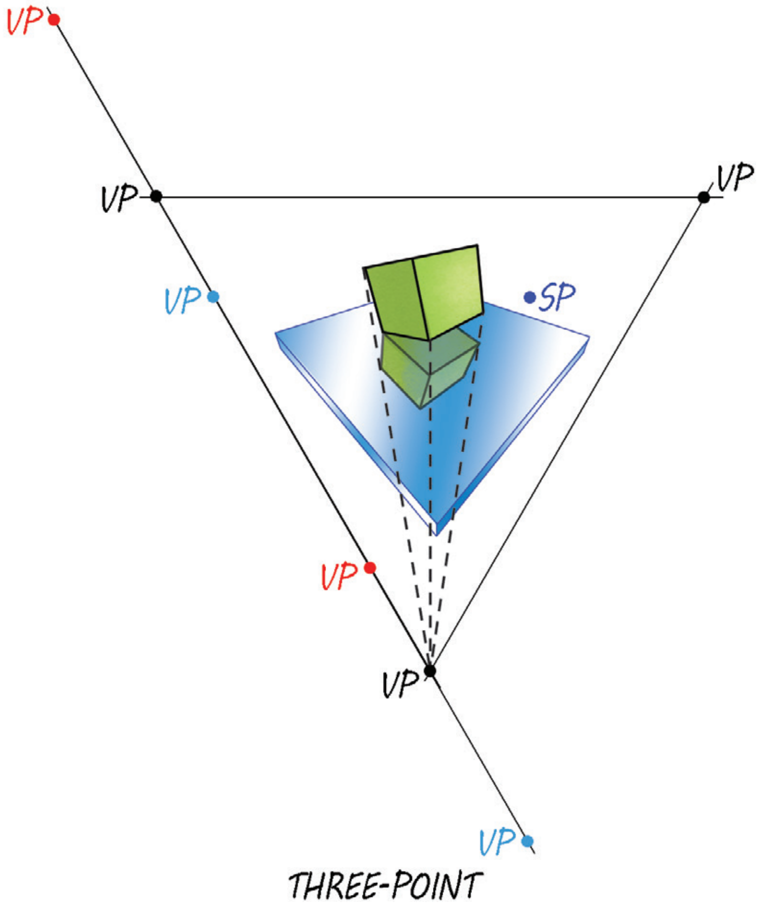


Figure 14-21

station point must be maintained to keep the perspectives consistent (14-21).

There are three more scenarios involving horizontal mirrors. In all cases, you copy the angle of incidence to create the angle of reflection. In one-point perspective, the angle can be directly applied to the forms. To create the reflection, the

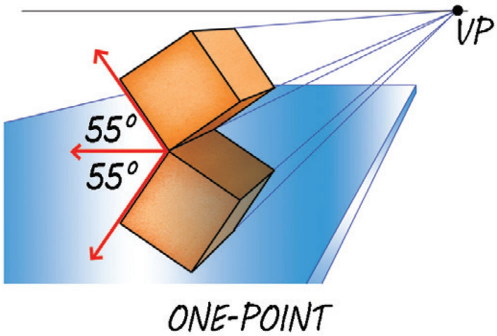


Figure 14-22

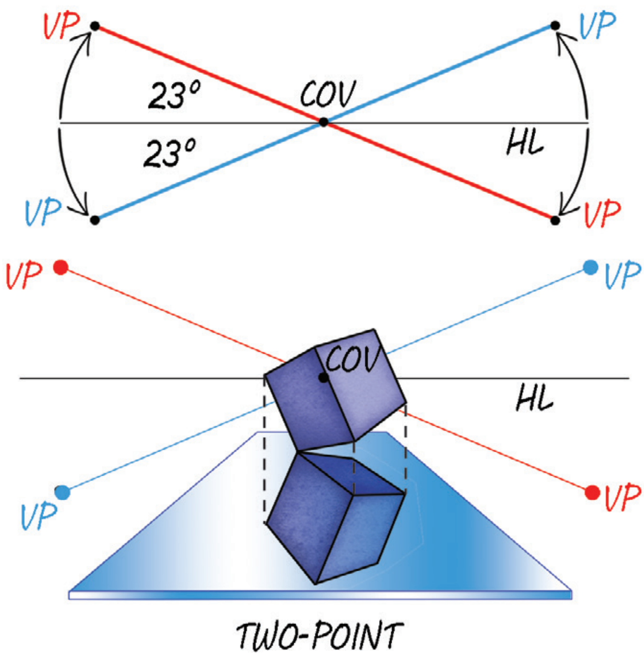


Figure 14-23

subject itself is rotated the same angle with respect to the horizon. Use the same vanishing point for the subject, the mirror, and the reflection (14-22). In two-point and three-point,

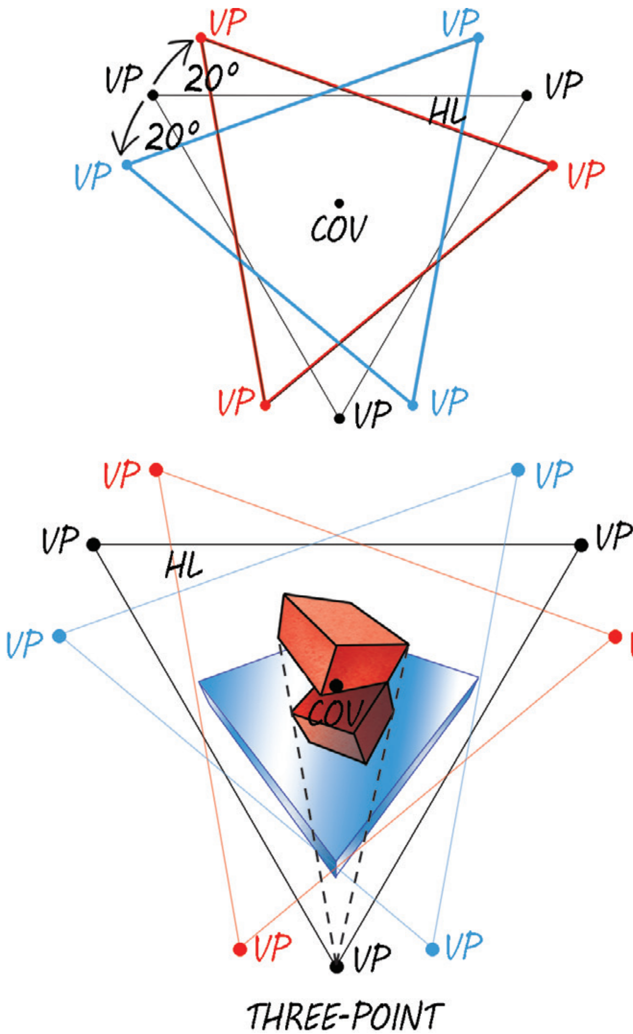


Figure 14-24

the vanishing points are rotated with respect to the horizon. We rotate from the center of vision to ensure the perspectives remain consistent. Match the angles, so that the angle of incidence equals the angle of reflection. And remember to transfer the subject's corners into the reflection (14-23, 14-24).

MULTI-POINT PERSPECTIVE

15

15 MULTI-POINT PERSPECTIVE

Normal human vision has two components: the central field of vision, which is roughly a 60-degree cone, and peripheral vision that extends to approximately 120 degrees (15-1). One-point, two-point, and three-point perspective cannot render a 120-degree field. As models for our visual perception, they fall apart beyond 90 degrees. Thus, if we wish to employ a wider viewing angle, we must use some form of **multi-point perspective**.

Five-point perspective models a 180-degree field of vision (15-2). While this is not a point of view observable by the naked human eye, a super wide-angle camera lens—called a fish-eye lens—as well as some animal species can interpret three-dimensional space in five-point perspective. As you

MULTI-POINT PERSPECTIVE. John Finnerty, **Another Perspective**, 2012. Photograph, 4619 x 3079 pixels. © *John Finnerty. Courtesy of the artist.*

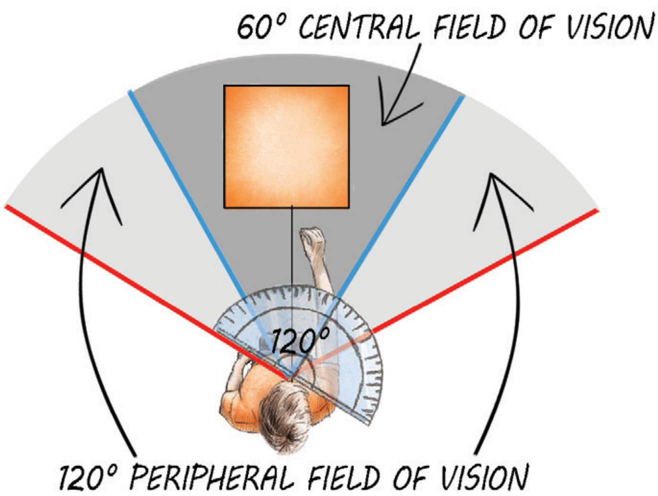


Figure 15-1

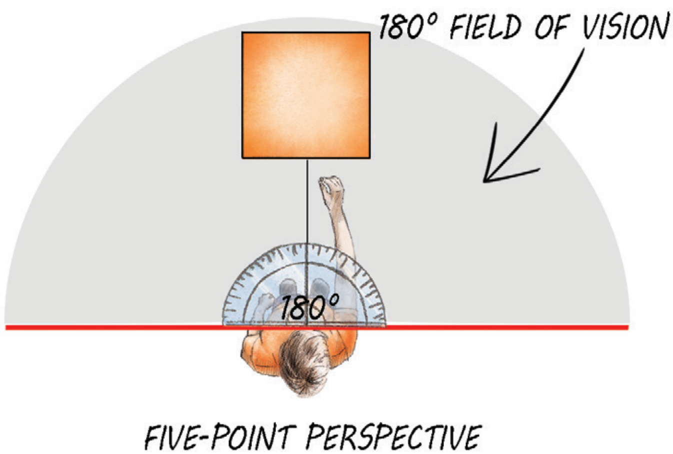


Figure 15-2

might assume, five-point perspective employs five vanishing points (VPs). There are five sets of edges receding from the viewer. Assuming a rectangular prism, you can think of these five vanishing points as mimicking a viewer simultaneously looking in all directions: up, down, left, right, and straight

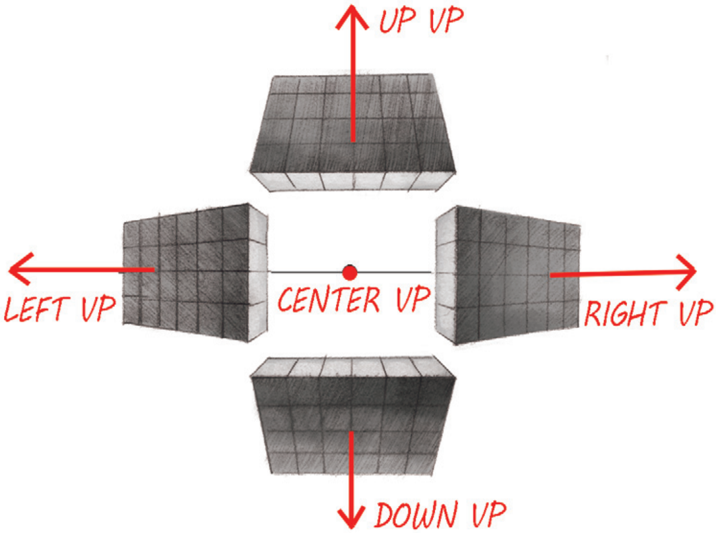


Figure 15-3

ahead. In this way, there is no single line of sight in five-point perspective, but rather a 180-degree **field of sight** (15-3).

Given the complexity of working with five vanishing points, a grid is especially helpful. The perspective grid in five-point perspective is a half-sphere, or dome, with four vanishing points equidistant on the circumference at the top, bottom, left, and right axis points. The fifth vanishing point is placed in the center (15-4). You may use the grid included here, or create your own with a compass. To make a grid, draw a circle with horizontal and vertical axis lines passing through the center. Then use a compass to build grid lines. Anchor the compass needle anywhere along the vertical axis line, and adjust the compass until the pencil point passes through the left and right vanishing points. Draw a horizontal arc between the vanishing points. Move the needle to a different position on the axis line, and re-adjust the compass to draw another arc (15-5). Always

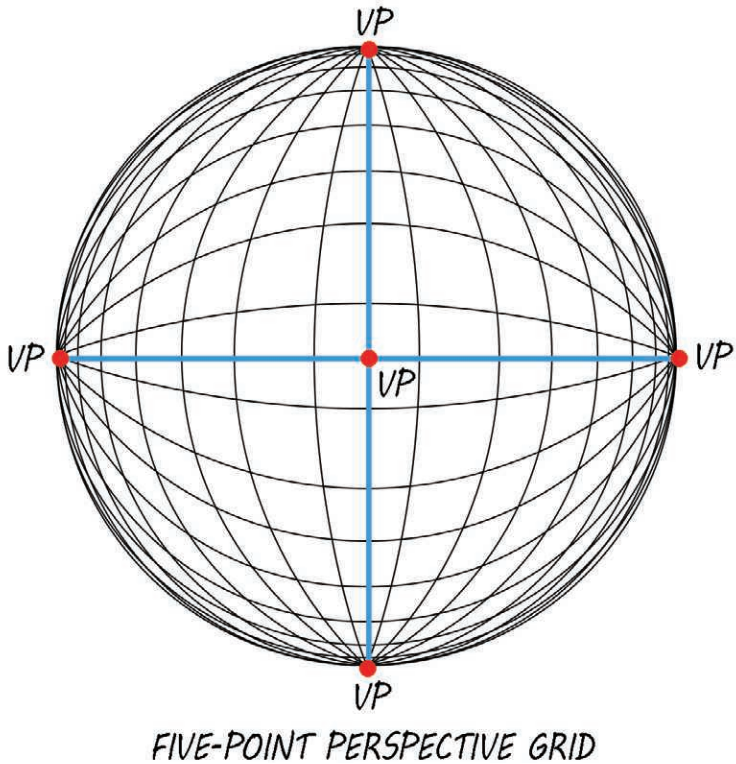


Figure 15-4

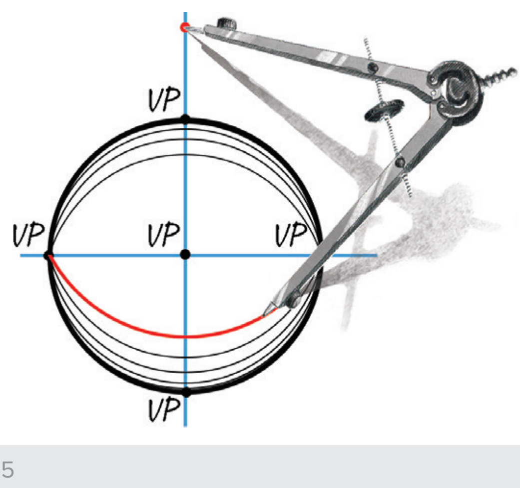


Figure 15-5

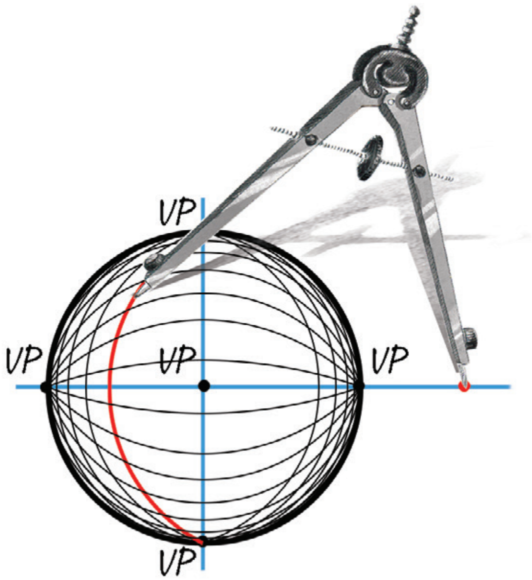


Figure 15-6

make sure the arcs pass through the two vanishing points. You must move the needle and re-adjust the compass each time you draw a new arc. Arcs near the perimeter of the grid require the needle be positioned close to the center vanishing point. Conversely, arcs near the center of the grid require the needle be much farther out in the margins. Repeat this same process for vertical arcs by positioning the needle along the horizontal axis line (15-6).

To use the grid, layer a blank sheet of drawing paper on top of it. A light box or tracing paper is helpful. Tape the sheets to the support to keep them from shifting. A bird's-eye scene is probably the most common use of five-point perspective (15-7). Note how the rectangular prisms' base and top planes both follow the curve of the grid. The vertical edges remain straight because they originate from the center vanishing point (15-8).

Figure 15-7

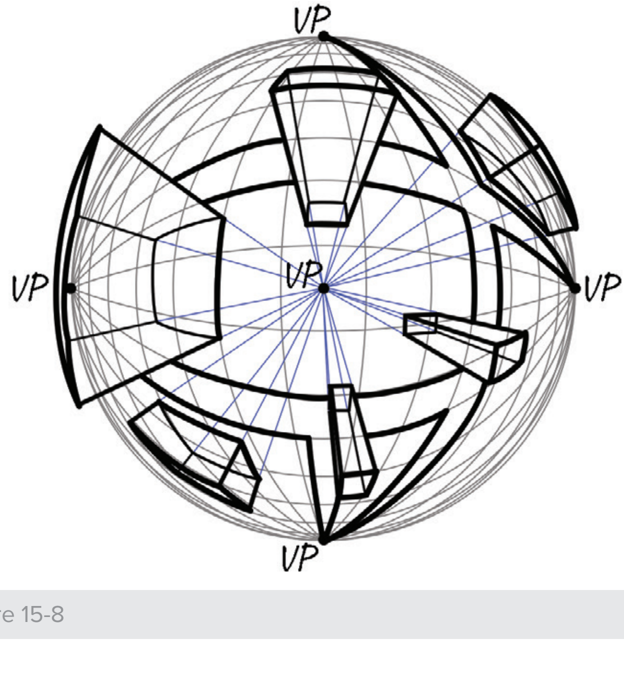


Figure 15-8

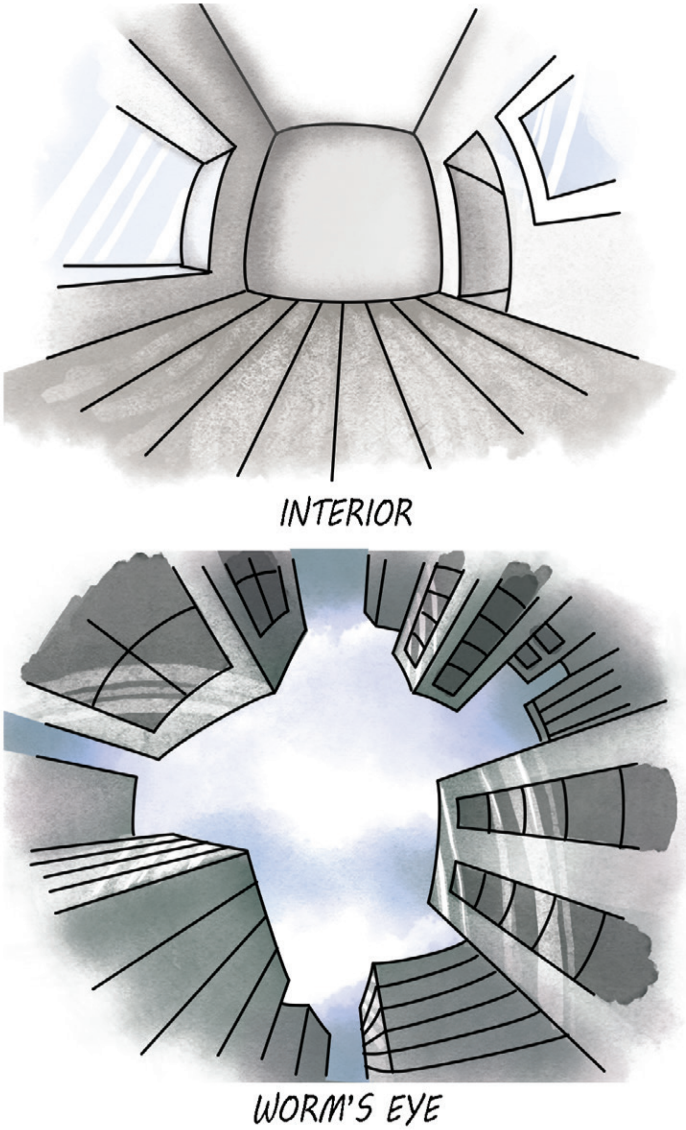


Figure 15-9

Interior as well as worm's-eye scenes are also possible with five-point (15-9). Again, all edges originating from the center vanishing point are kept straight, while the rest follow the

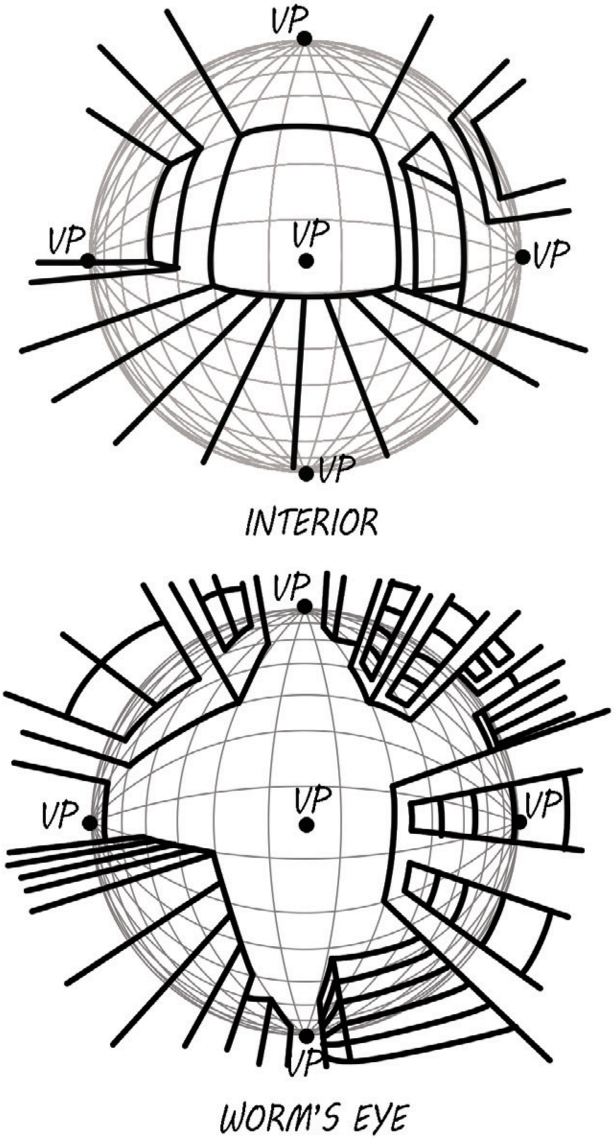


Figure 15-10

curving grid. Note that a composition need not be contained within the circle. Lines can easily be extended beyond the grid (15-10). You can also crop the grid to use just a portion of it

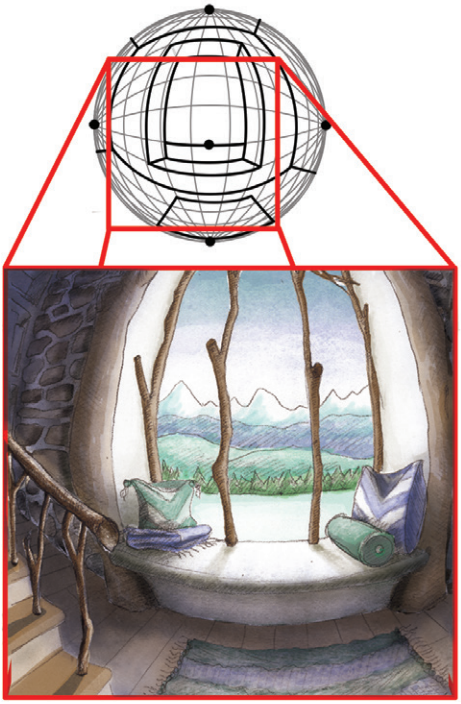
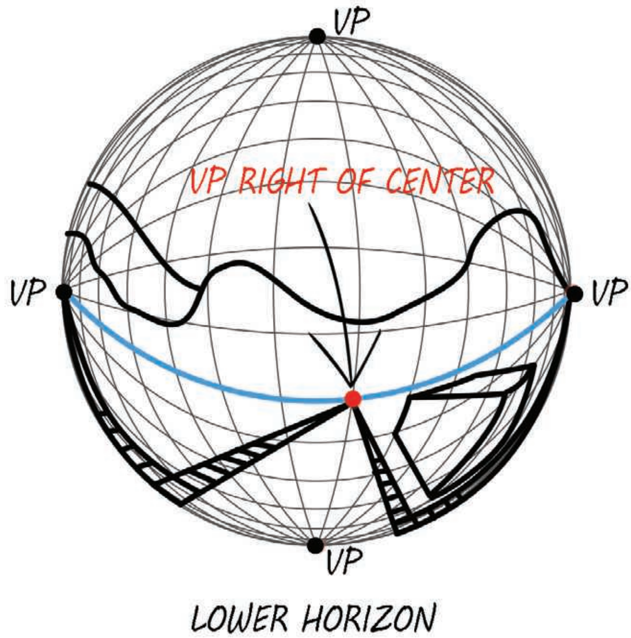


Figure 15-11

for the composition (15-11). Lastly, keep in mind that the center vanishing point need not be placed exactly in the middle. Try positioning it right or left of center, as well as higher or lower than center. Raising or lowering the vanishing point shifts the horizon line up or down (15-12).

Diagonal vanishing points (DVPs) can also be used in five-point perspective. You use DVPs in five-point in the same manner as one-, two-, and three-point perspective for convergence and foreshortening. (15-13). To find a DVP, rotate a copy of the grid to align with the diagonals of the initial rectangular plane (15-14). To draw additional lines originating from the DVP, you must rotate the grid each time to obtain the correct curve (15-15).


VP
VP RIGHT OF CENTER
VP
VP
VP
LOWER HORIZON

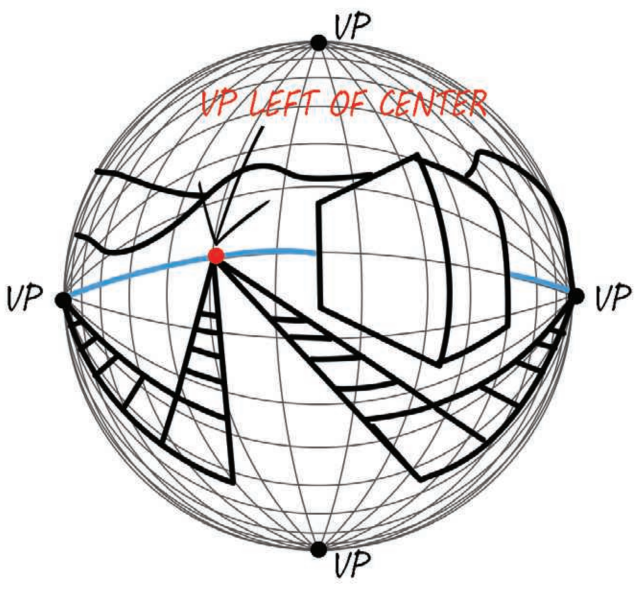

VP
VP LEFT OF CENTER
VP
VP
VP
HIGHER HORIZON

Figure 15-12

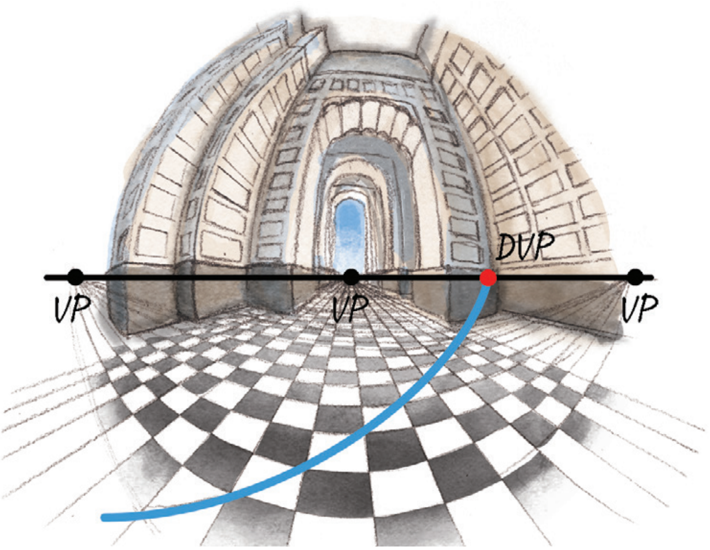


Figure 15-13

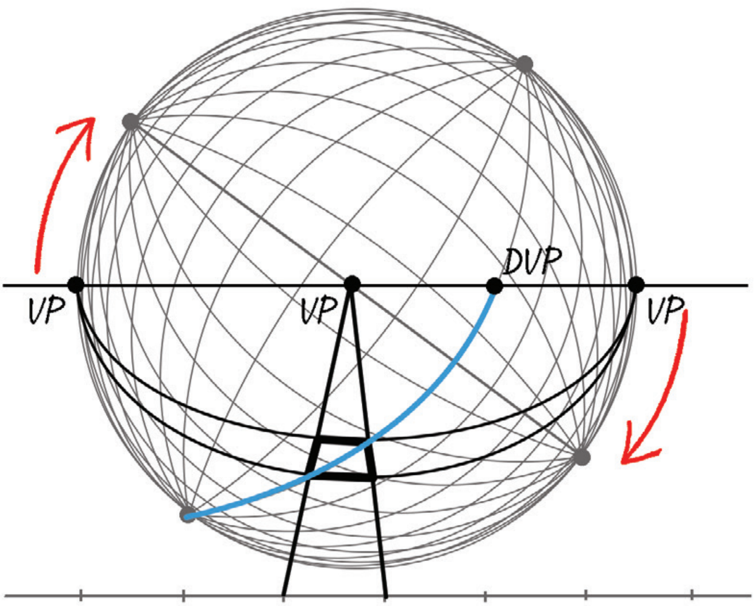


Figure 15-14

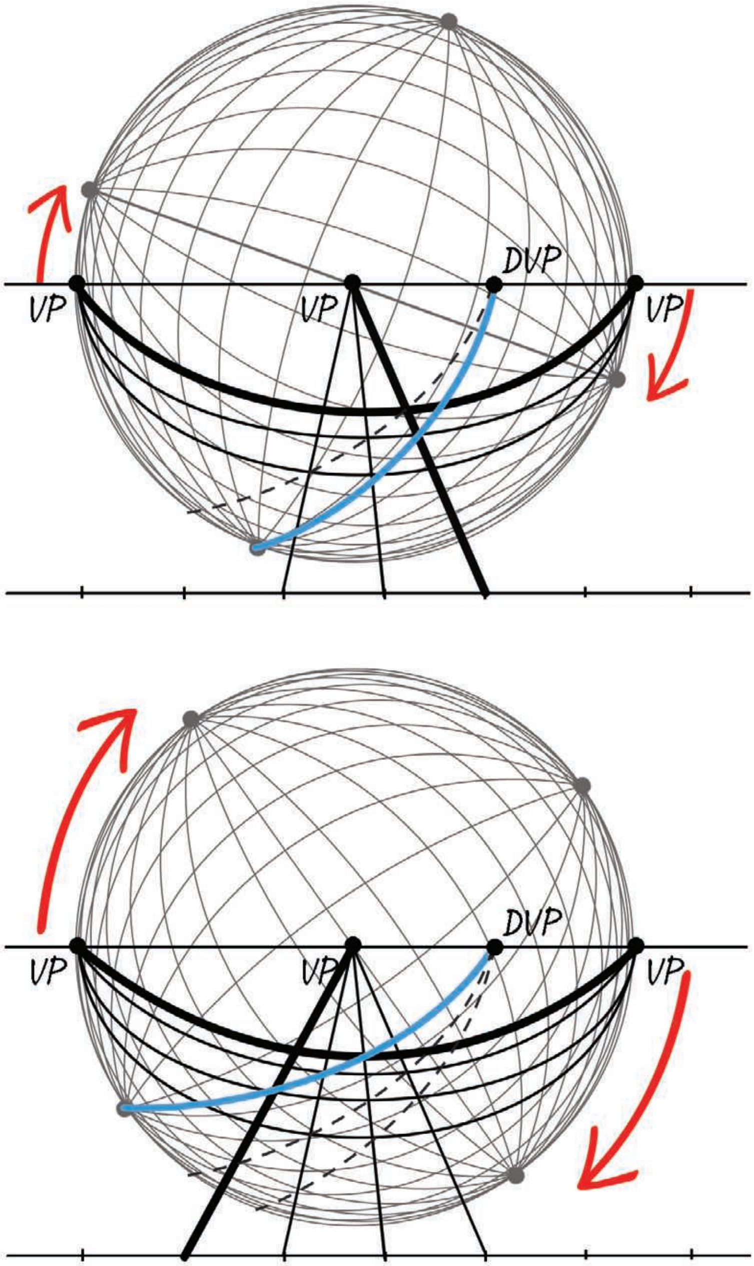


Figure 15-15

FIVE-POINT PERSPECTIVE. Thomas Burke, **Jelly**, 2013. Acrylic on canvas, 54 inches diameter. © *Thomas Burke. Courtesy of the artist.*

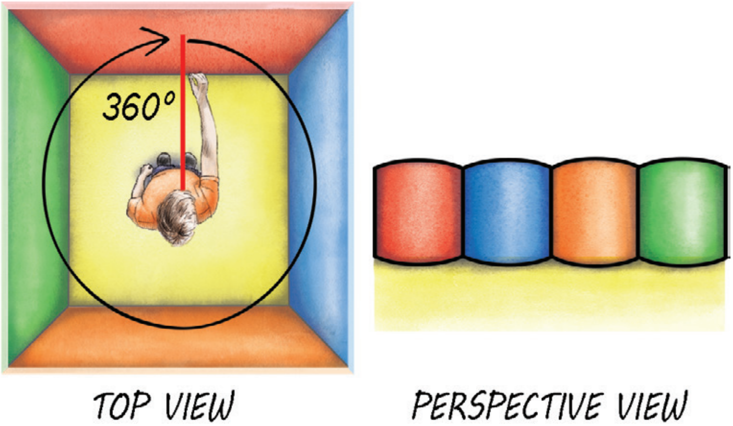


Figure 15-16

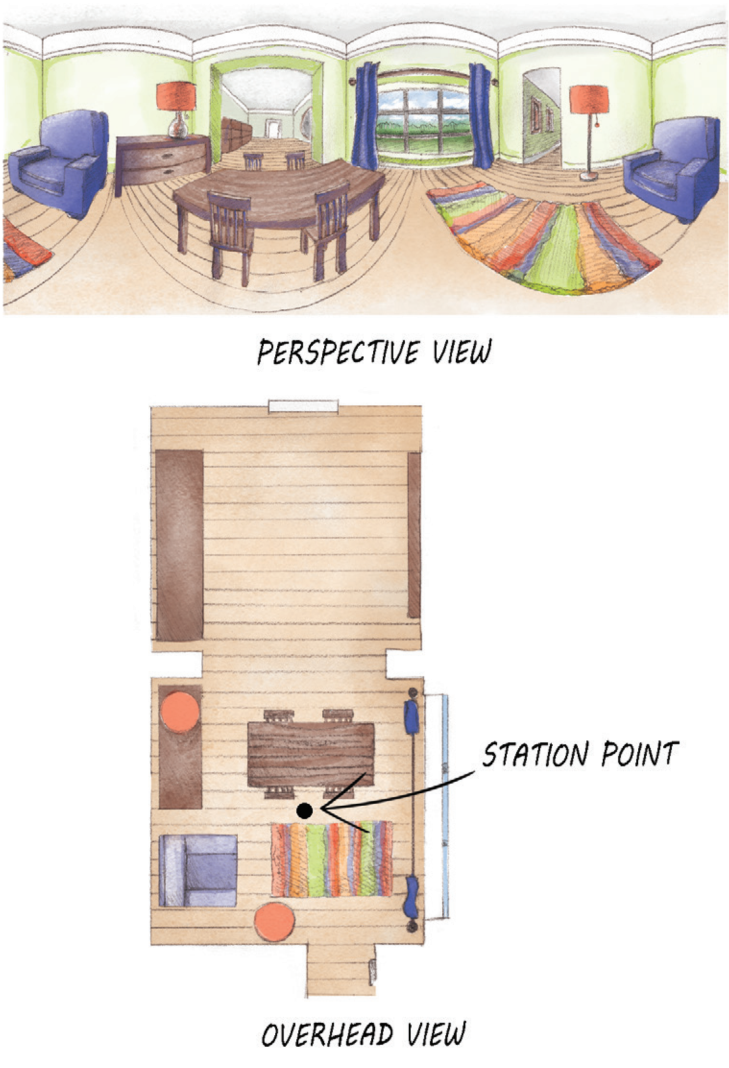


Figure 15-17

Another type of multi-point perspective creates a sweeping panorama effect with a 360-degree field of view. Envision rotating in a full circle to see a complete 360 degrees, and then stretching that view into a continuous horizontal panorama (15-16, 15-17). To draw a panorama, you must do

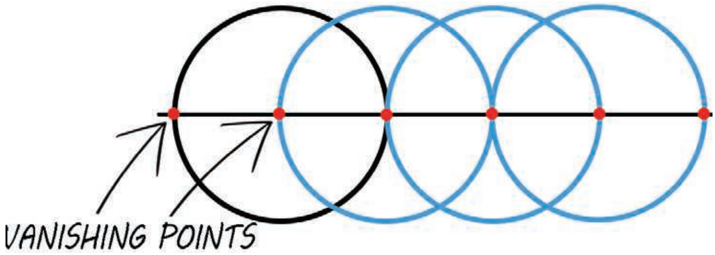


Figure 15-18

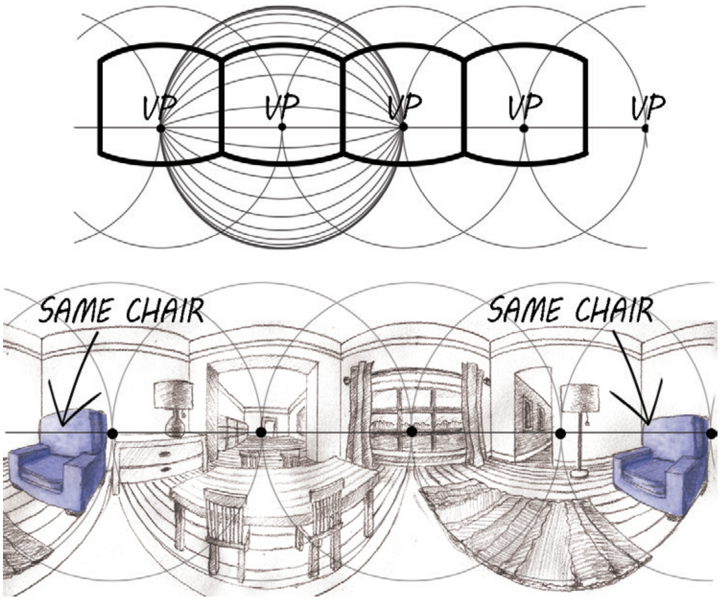


Figure 15-19

some initial framework. Start with a circle, mark its center, and draw a horizontal axis line through the center. Mark two more vanishing points where the horizontal axis intersects the circumference of the circle. Then copy the circle as many times as desired, shifting it horizontally to overlap the vanishing points along the axis line (15-18). We need a minimum of

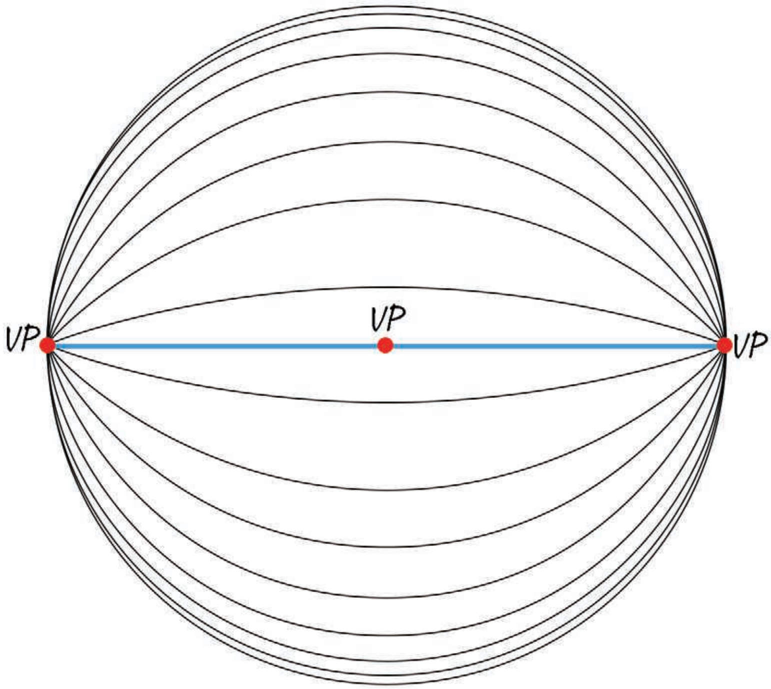


Figure 15-20

four vanishing points. A complete 360-degree view requires five or six vanishing points, depending on how the scene is framed. To use the framework, layer a blank sheet of drawing paper on top of it. Again, a light table or tracing paper is very helpful. Tape the sheets to the support to keep them from shifting. Construct a rectangular prism by drawing the vertical edges straight up and down, with all the other edges curved (15-19). To form the curves correctly, have a grid composed of horizontal arcs. The grid should be the same size as the circles. You may use the grid shown here or create your own using the technique mentioned earlier (15-20). Layer the grid underneath the drawing, and align it with each circle as you work. Again, five or six vanishing points are the minimum number needed to produce a 360-degree view. But there is no limit to the number of vanishing points with this technique, and thus no limit to the length of the rendered scene.

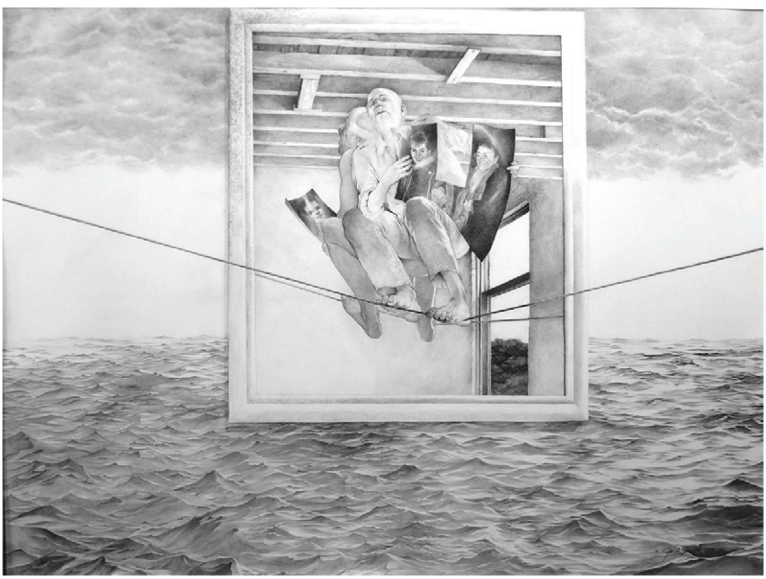
SHADE & TEXTURE

16

16 SHADE & TEXTURE

A beautifully constructed perspective line drawing possesses a great deal of depth. However, the addition of values, shadows, and textures further develops the form and defines qualities of surface and light, making subjects appear realistically tangible. This is why rendering, or shading, is usually considered to be an important finishing step.

The key to successful shading is understanding and manipulating value. **Value** is a measure of relative lightness or darkness. It can be described as a continuous range, and it is a property of everything visible (16-1). Value is called relative because darkness or lightness matters only in relation to other values. The same value may appear dark on a light background, but



SHADE & TEXTURE. Jos. A. Smith, **The Loft**, 1985. Graphite on paper, 18 x 24 inches. © *Jos. A. Smith. Courtesy of the artist.*

Figure 16-1

Figure 16-2

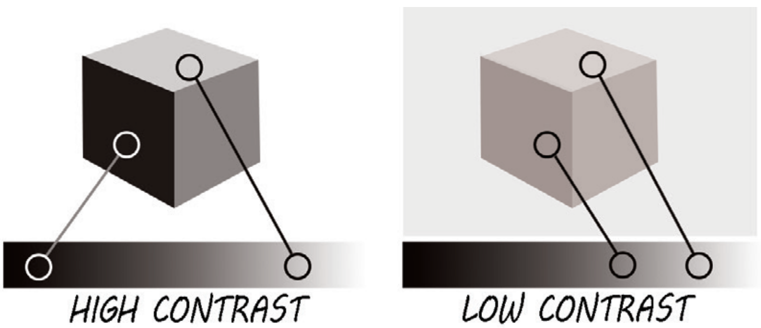


Figure 16-3

light on a dark background (16-2). When comparing two values, if the difference between them is large, the values have higher contrast. If the difference between values is small, the values have lower contrast (16-3). Value can also be thought of as the effect of light on a form. Value indicates the direction, location, and quality of light. It defines not only the shape of a form

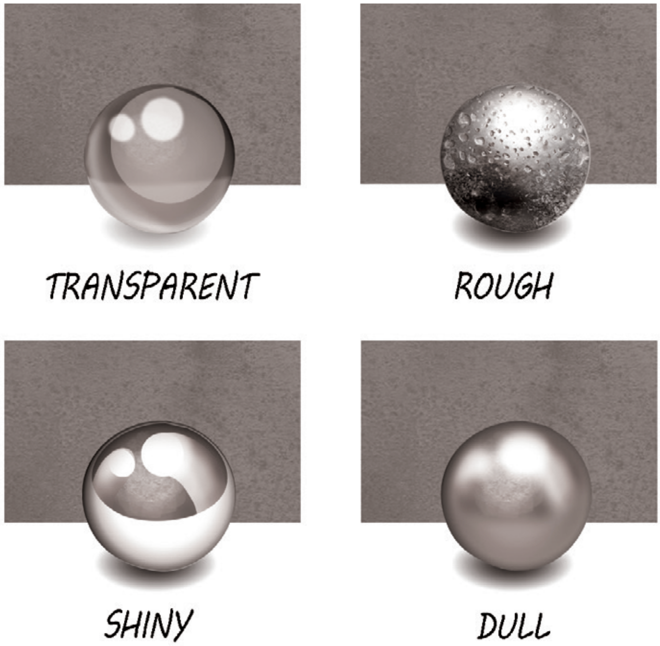


Figure 16-4

and its shadow, but also surface qualities such as textured or smooth, dull or reflective. Almost all the qualities of a form, with the exception of its hue, or color, can be described with value (16-4).

Shading, or rendering, is the application of value. Common shading techniques include hatching, cross-hatching, contouring, stippling, scribbling, toning, blending, and erasing. Hatching and cross-hatching both employ repeated strokes, or hatch marks. The marks can be unidirectional or multidirectional, short or long, thick or thin. Contouring is a particular type of line that follows the shape of a form. Stippling is the use of small dots or dabs. Scribbling is often overlooked as a

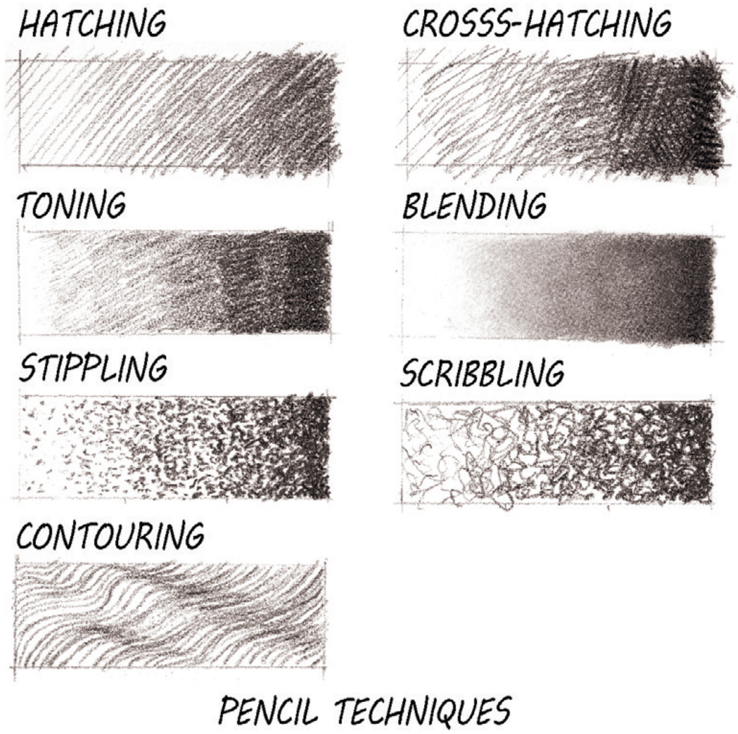


Figure 16-5

shading technique, but it has a wide range of textural applications. Toning is the even application of pencil strokes to achieve a smooth appearance, obliterating pencil marks. And blending is often associated with toning, but you can use it in conjunction with any or all of the aforementioned techniques (16-5). Use tissues, cotton swabs, chamois cloth, or tortillion to blend. Use a small, circular motion to blend evenly. Do not use bare fingers. The oils secreted by our skin will acidify and thus deteriorate the paper substrate. The oils also impede erasure and any further blending or toning by acting as a slick barrier. Keep in mind that you can use multiple shading techniques in

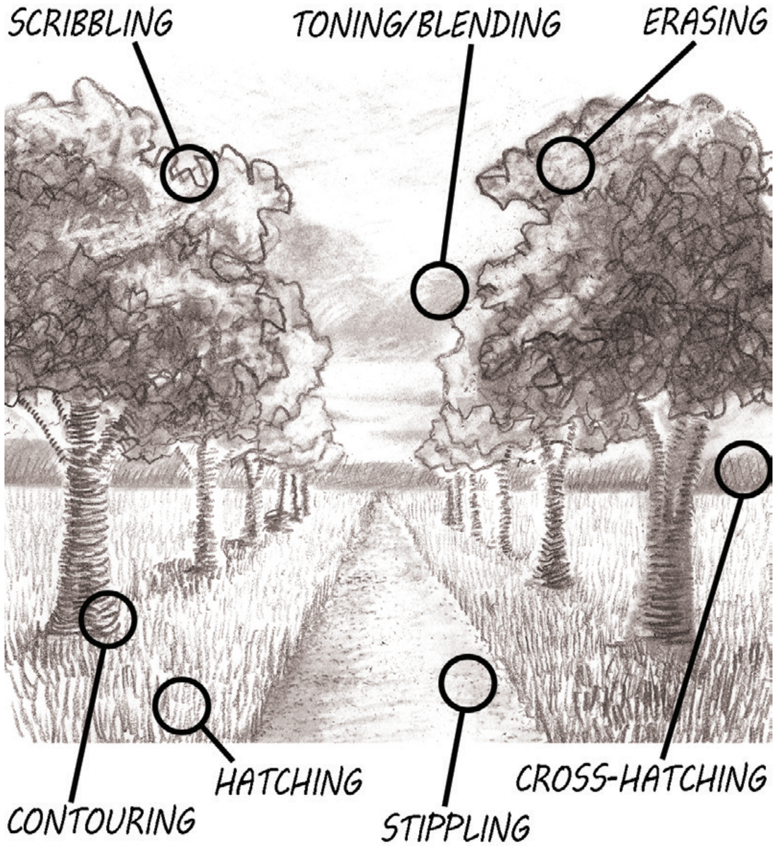


Figure 16-6

one composition to achieve different textural effects. Always consider the needs of the subject and its surface qualities (16-6).

Erasers are another important shading tool. Their uses go beyond just deleting mistakes. Whereas pencils add value, erasers subtract value. All the shading techniques we just reviewed are strongly associated with pencils. However, you

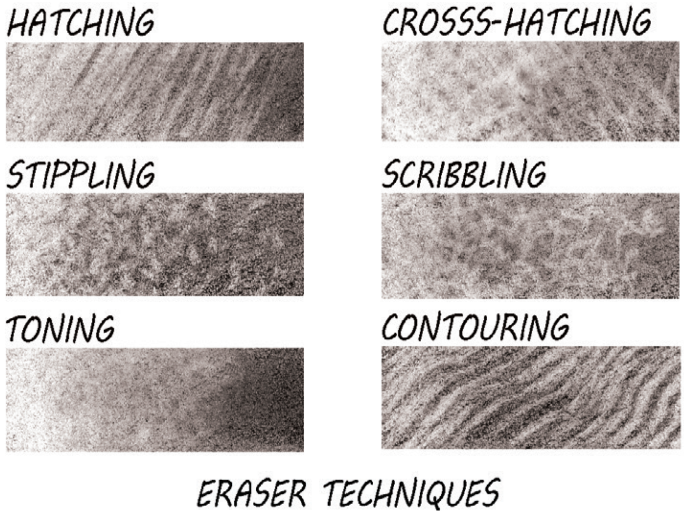


Figure 16-7

can do these same mark-making techniques just as readily with erasers (16-7). For this purpose it is very helpful to have erasers of different sizes and shapes.

Of chief importance when shading is that edges must be defined with differences in value, rather than with lines. When we observe the natural environment, value contrasts—not dark outlines—are the primary way in which our eye perceives an edge. Describing edges with contrasting areas of value, and not lines, will produce a more realistic illusion of three-dimensional form (16-8). Additionally, the greater the range of values within a form, the more lifelike the rendering. Pencil on paper has an inherently narrower value range than what the eye perceives in our surroundings. So if realism is our aim, we must strive to incorporate range and take care to approximate value relationships.

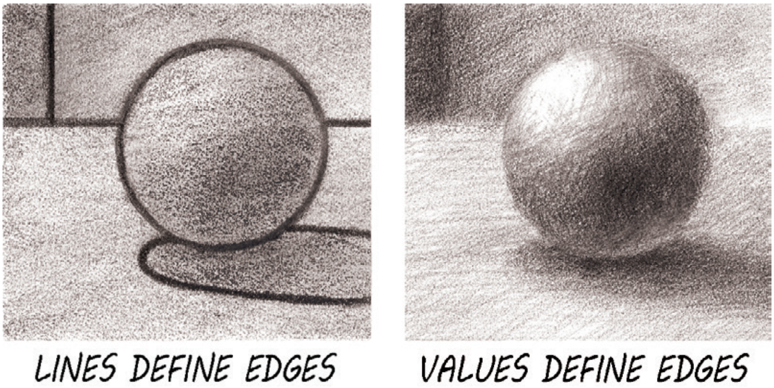


Figure 16-8

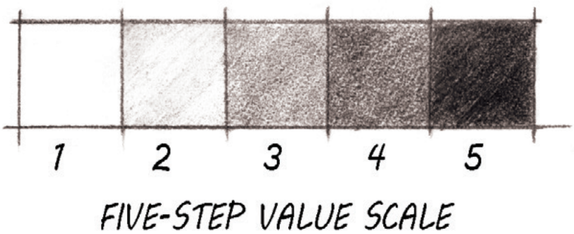


Figure 16-9

Value mapping is a step-by-step process that helps us plan how to incorporate value using shading techniques. When values are mapped onto a form, they indicate the location of the light source, and the shape of the form. We start by making a value scale. Value is a continuum, but artists often grade values into a discrete scale for ease of application. The simplest scale has five values, or tones: the lightest value or highlight (often the white of the paper), a light value, a medium value, a dark value, and the darkest or deepest value (16-9). You may choose to create a five-step scale, or add more intermediate values for a six- or seven-step scale for example. Just be sure that each value in the scale is distinct from its neighbor. Work

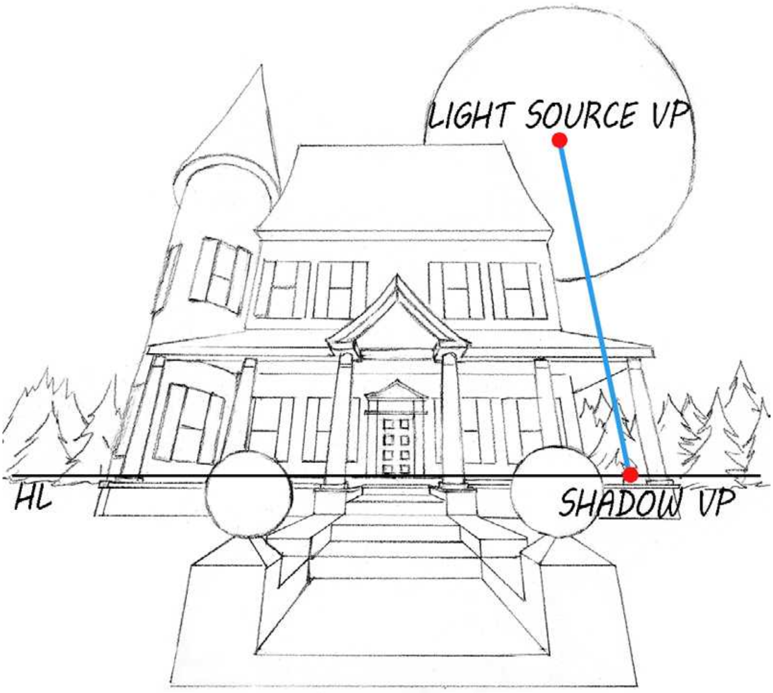


Figure 16-10

to make the progression even, such that each successive value is mid-way between its neighbors in terms of its relative lightness or darkness. This takes practice. Squinting your eyes to blur your vision while scanning the page helps to isolate the quality of value from the other optical properties. Also, always create your scale using the same medium or materials as the drawing. This ensures that the scale values can be accurately applied to the drawing.

Regarding the line drawing, it is helpful though not necessary to copy of it for this next step. A photocopy the same size as the original is recommended. Examine the drawing and mark a location for the light source in relation to the subject (16-10).

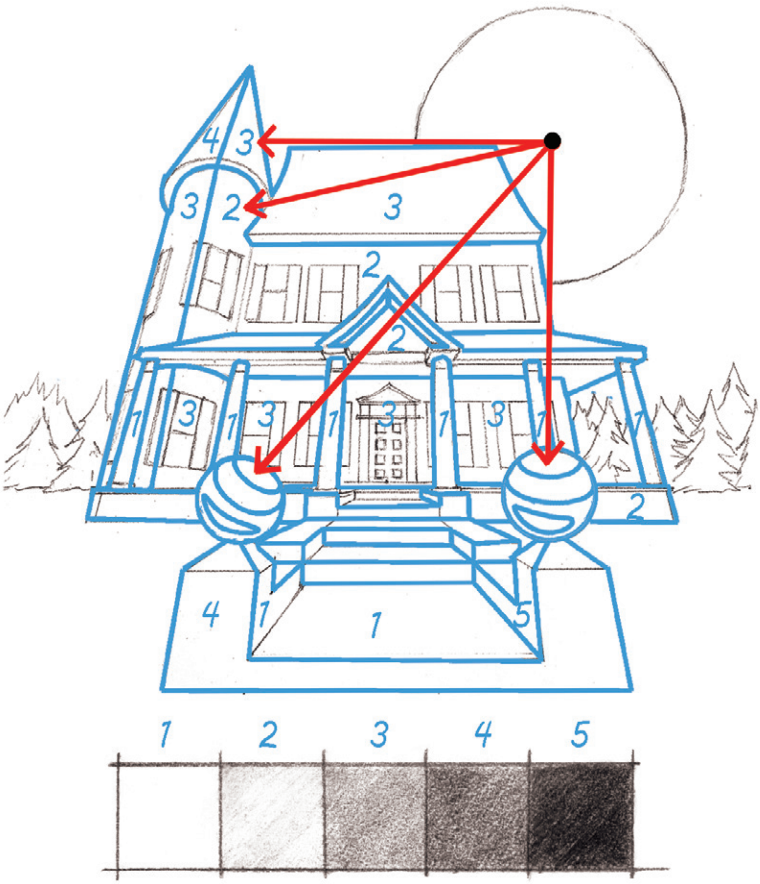


Figure 16-11

The best way to do this is with a light source vanishing point and a shadow vanishing point. Review Chapter 13 to understand the relationship between these two special kinds of vanishing points. Even if you do not intend to plot cast shadows with formal perspective methods, a light source vanishing point and shadow vanishing point are very helpful in organizing value relationships. Next, divide up large areas of the forms

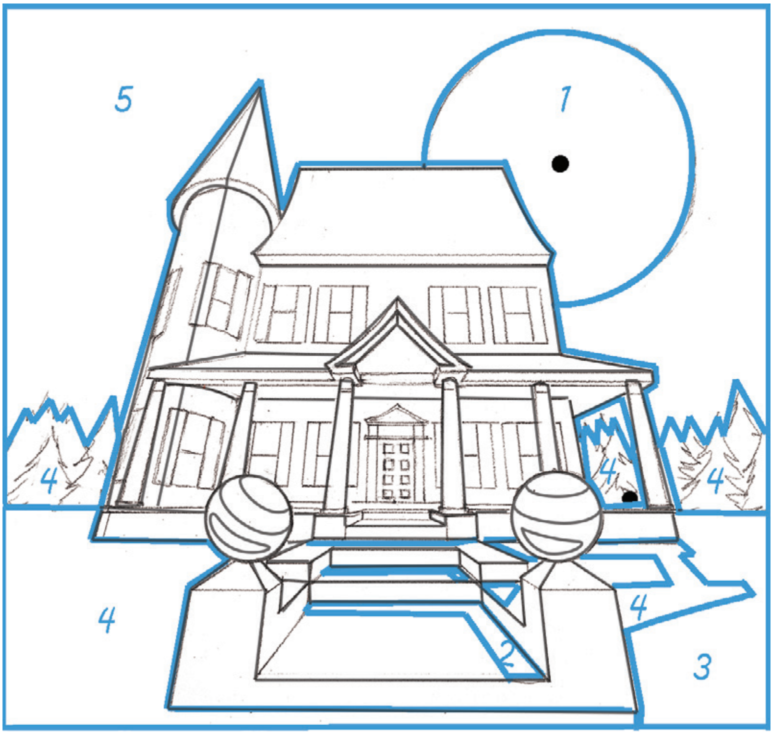


Figure 16-12

according to value, referencing the light source's location and direction. Think about how the directional light will map across the contours of each form. Number each area according to the value scale. Be mindful of areas of high versus low contrast. Some edges may have less contrast and less definition, other edges more contrast and more definition (16-11).

Map values for not only the forms but also the cast shadows, foreground, and background (16-12). Keep in mind that cast shadows are always darker than the surface upon which they are being cast, but the surface's value can affect how dark

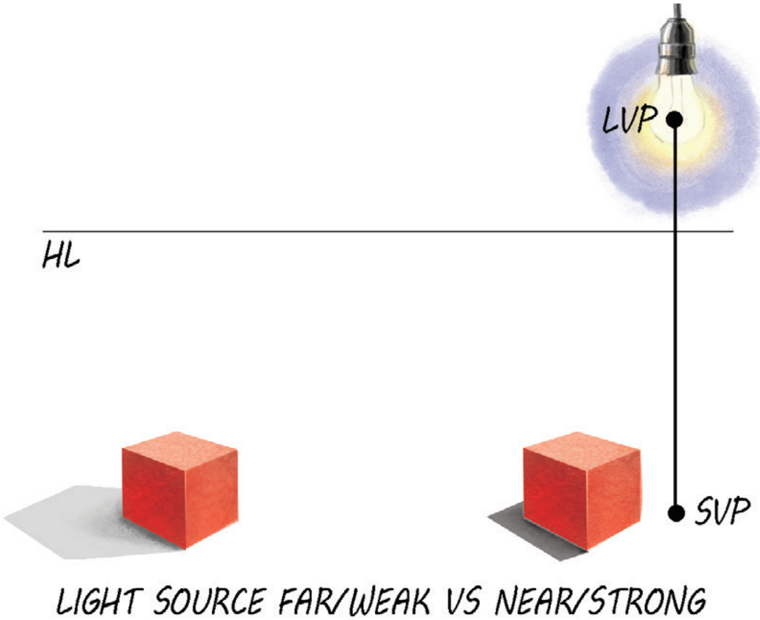


Figure 16-13

that shadow is. A shadow cast on a light surface has a lighter value than a shadow cast on dark surface. Additionally, know that a light source that is stronger in intensity, closer to the subject, or more direct creates darker shadows with harder, more defined edges. A light source that is weaker, farther from the subject, or more diffused results in lighter shadows and softer, less-defined edges (16-13). Also, when two shadows overlap, the area of overlap is generally darker (16-14). Creating a detailed value map may seem like a time-consuming exercise, but it is incredibly useful for planning a successful composition, and it makes the next step more fruitful.

When you are satisfied with your value map, you can now use all the shading techniques previously described to lay

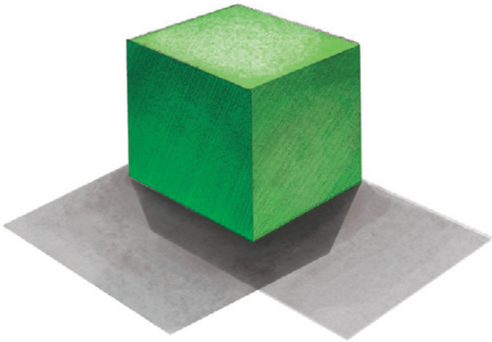


Figure 16-14

in areas of value according to the map. If your value map is drawn lightly enough, you can shade directly over it. But if you created a value map using a photocopy of the original drawing, move back to working on the original. We will now reference the value scale to block in major areas of value according to the map.

First apply the middle value to the entire drawing. Use a dull pencil and a crumpled tissue to evenly blend graphite across the whole composition. Take care to match the middle value of the scale. Do not worry if some of your linework is obliterated. So long as you can see major forms well enough, the line drawing does not need to be darkened or redrawn. (16-15). Then use erasers to lift out the two lighter values. Work only on the larger forms. Ignore details for now, and do not fret over the loss of linework. Replacing linework with differences in value is the goal of this process. You will add details back in at a later stage. For now, focus on using the value map, and match the values to the scale. Eraser pens are a helpful tool because they allow for a greater degree of precision in

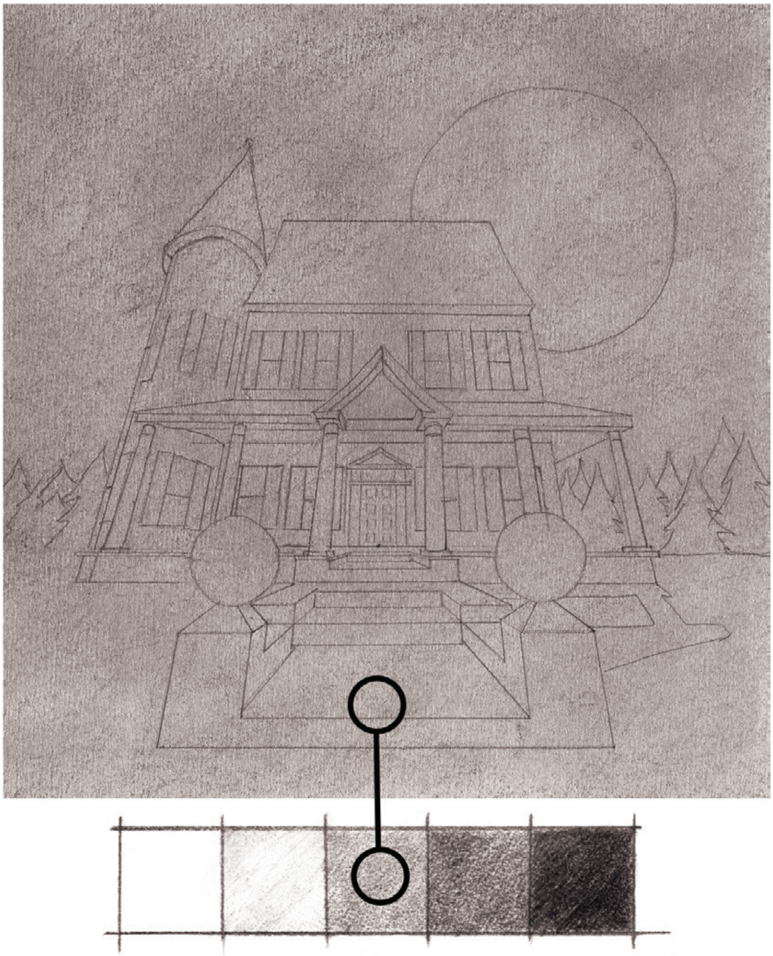


Figure 16-15

defining edges. Also, be sure to choose erasure techniques that enhance any textural qualities you are seeking (16-16).

When you are satisfied with the light values, return with pencils to lay in the darker values. Again, focus only on the larger forms, and allow the line drawing to be subsumed by the

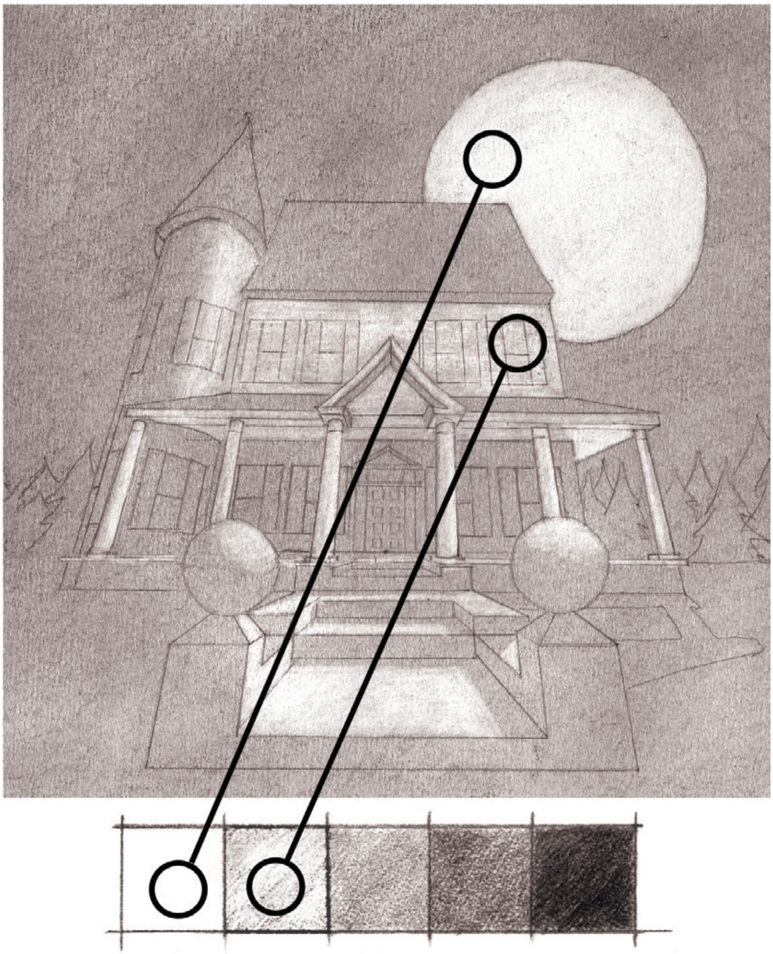


Figure 16-16

values. Consider using different shading techniques for textural effects. As you work, periodically step back and scan the entire composition—check all major value relationships. Take ample time to adjust larger forms and ensure that the overall composition is well balanced. Remember to use softer, darker pencils such as 4B or 8B to achieve darker values.

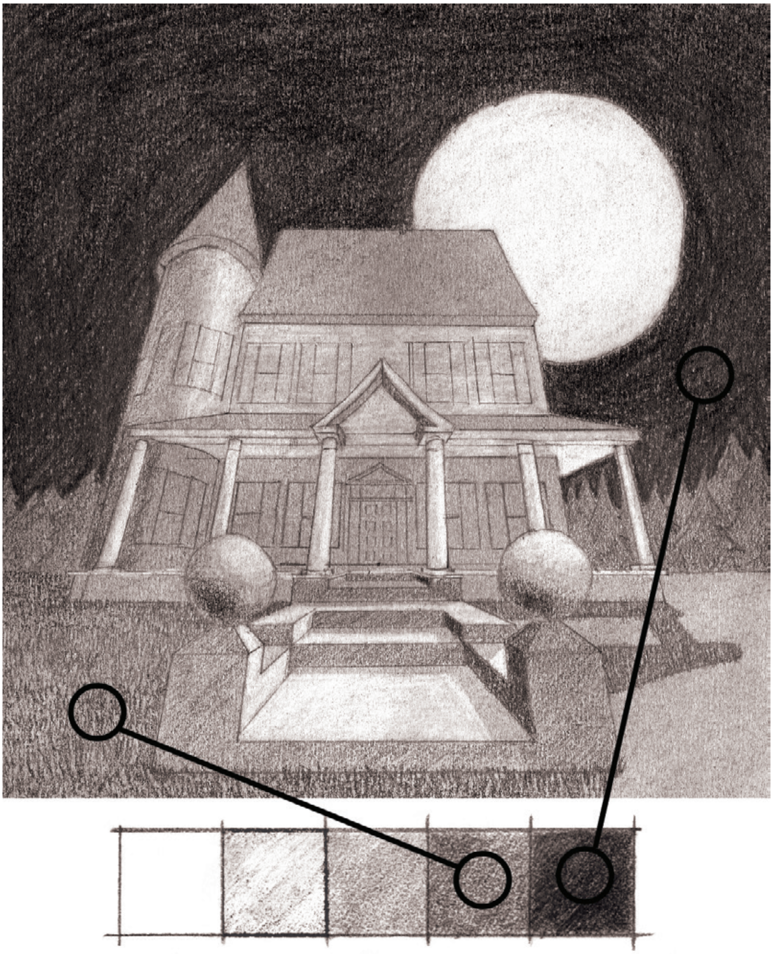


Figure 16-17

Do not be tempted to press harder for a darker value. Always use an even, medium pressure, and switch pencils for darker values (16-17).

Once all the major forms, including the background and major cast shadow shapes, have been satisfactorily defined, we then move into details. Think of details within forms as smaller

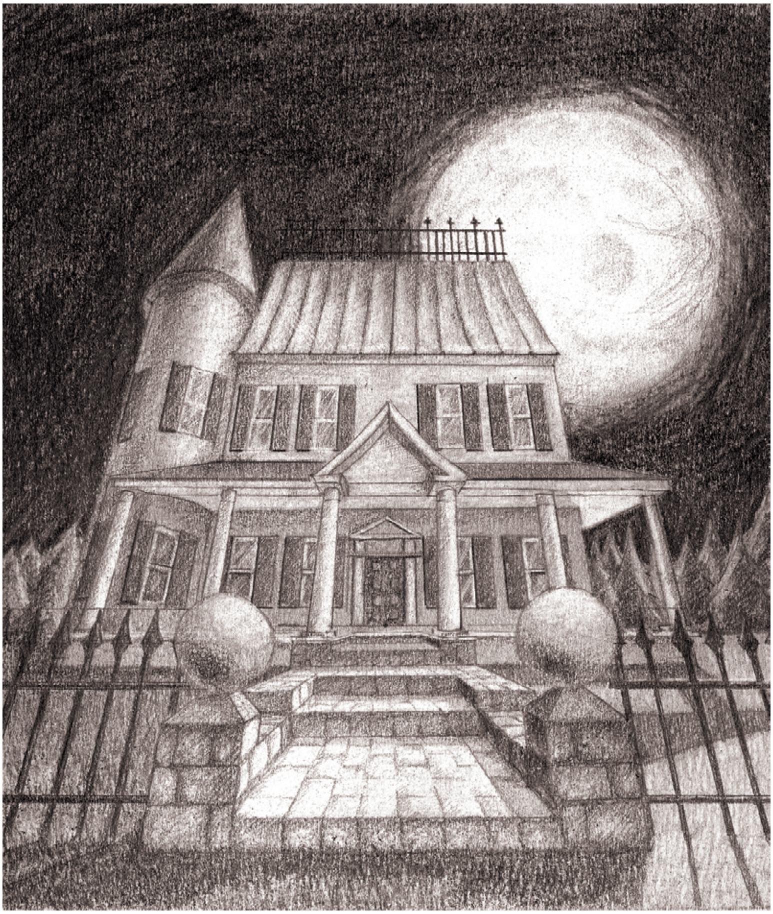


Figure 16-18

forms that require their own range of value and contrast to enhance their definition. Some details may not be included in your value map (16-18). When shading details, be careful not to shift the major value relationships of the composition. It is very easy to overwork an area of detail, making it darker and darker until its value falls out of balance. Also keep in mind that compositional details, as well as value contrast, affect the focal point. Not to be confused with a vanishing point,

ATMOSPHERIC PERSPECTIVE. Navid Baraty, **Death Valley Sand Dunes**, 2009. Photograph, 4256 x 2778 pixels. © *Navid Baraty. Courtesy of the artist.*

a **focal point** is an area of interest, detail, contrast, or anomaly within a composition that draws an oberver's attention. Use focal point to create and control a narrative, or express an idea within the work. As you develop areas with greater value contrast, or greater detail, be aware that you are pulling the audience's gaze to that area.

One final concept helpful in some situations is atmospheric perspective, also commonly referred to as aerial perspective. **Atmospheric perspective** is the perception of depth resulting from the color-shifting effects of particles dispersed in the air. Because of the way those particles interact with light, subjects at a great distance appear less distinct in value, muted in saturation, and cooler in hue. Edges also lose their definition. The greater the distance, the more pronounced the effects.

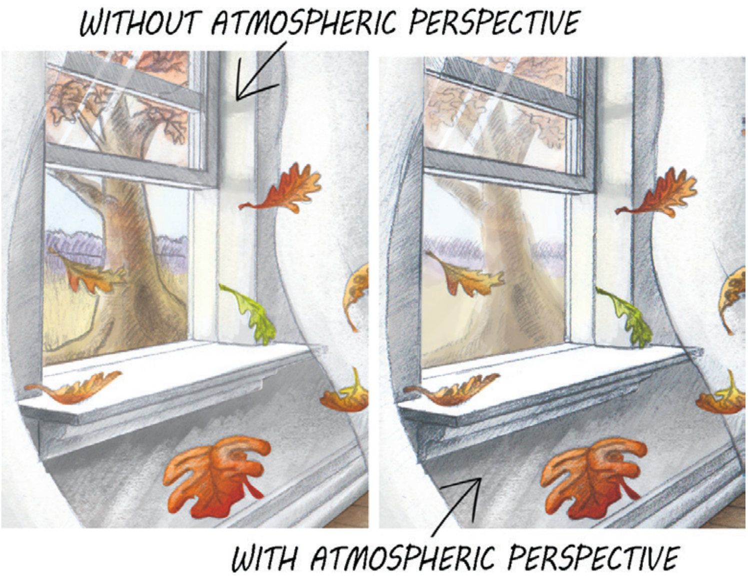


Figure 16-19

Atmospheric perspective helps to emphasize depth by contrasting the foreground with the background. Color is not within the scope of this text, but we can reduce value contrast, reduce detail, and blur edges to produce a greater impression of depth with atmospheric perspective (16-19).

Through creative exploration, you will find that linear perspective can be used to enrich visual language and communicate an endless variety of ideas. Everything from hyper-realistic still-life to fanciful landscapes are within the purview of perspective drawing. Perspective drawing significantly widens your array of possibilities in rendering everything imaginable. Nothing we see exists outside of perspective, so everything is within its domain. It can be used to tell a story, describe a reality, or invent a new idea. This book has endeavored to show the breadth and depth of visual expression conveyed through perspective, but it is not possible to describe the infinite variations that such a tool as perspective presents. Hopefully this text will be the spark that ignites your creative exploration.

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GLOSSARY

Additive Shape Building
Additive shape building is one of two basic approaches to creating complex shapes in which simple shapes are combined to make larger forms. (79)

Angle of Incidence
The angle of incidence is the angle at which a subject is positioned in relation to a reflective surface or mirror. (186)

Angle of Reflection
The angle of reflection is the angle at which a subject's reflection appears on the reflective surface or mirror. (186)

Atmospheric Perspective
Atmospheric perspective is the perception of depth resulting from the color-shifting effects of the atmosphere. The more particulate matter or the greater the distance between the viewer and the subject, the more muted in value, muted in saturation, and cooler in hue the subject will appear. (240)

Center of Vision
The center of vision is the endpoint of the viewer's line of sight, indicating the direction of the viewer's gaze. The center of vision is often, but not always, located on the horizon line. It is abbreviated as COV. (7)

Compositional Frame
The compositional frame is a drawing's outer edge that crops the scene and delineates what is presented as part of the final image versus what is relegated to the margins. Oftentimes vanishing points are outside of the compositional frame. When employing a cone of vision, you must inscribe the frame within the cone. (35)

Cone of Vision

The cone of vision is the range of sight of the viewer, with the center of vision as its center. Subjects rendered outside of the cone of vision appear distorted. Normal monocular vision is a 60-degree cone of vision, however artists more often employ a 90-degree cone of vision to maximize useable composition area. (103)

Convergence

Convergence is one of three principles of linear perspective in which receding forms appear increasingly closer together. (5)

Diagonal Vanishing Point

A diagonal vanishing point is the point where a set of parallel diagonals receding from the viewer appears to converge. We abbreviate as DVP. (86)

Diminution

Diminution is one of three principles of linear perspective in which receding forms appear increasingly smaller. (3)

Elevation View

An elevation view is a side view of the subject on a two-dimensional grid. An elevation view depicts the relative height and location of forms. (129)

Field of Sight

The field of sight is a concept specific to five-point perspective. It is analogous to the line of sight used in one-, two-, and three-point perspective. Field of sight represents an area of observation where the viewer simultaneously observes 180 degrees of the scene in all directions. (208)

Five-Point Perspective
Five-point perspective is a point of view in which five sets of parallel edges recede from the viewer and appear to converge at five vanishing points. A rectangular prism is assumed. (206)

Focal Point
The focal point is an area of interest, detail, contrast, or anomaly within a composition that draws an observer's attention. Focal point is a tool used by artists and designers to describe or express a visual idea or narrative, and it should not be confused with a vanishing point. (240)

Foreshortening
Foreshortening is one of three principles of linear perspective in which receding planes appear to shorten. (5)

Ground Line
The ground line represents the ground plane in an elevation view. The ground line is located below the horizon line, and the distance between the ground line and horizon line indicates the height of the viewer with respect to the height of the subject. We abbreviate as GL. (134)

Ground Plane
The ground plane is the two-dimensional horizontal plane below the horizon line, representing the ground or floor. (11)

Horizon Line
The horizon line is a horizontal line where the sky appears to meet the ground. The horizon line is an illusion and represents the place where diminution, convergence, and foreshortening are infinite. We abbreviate as HL. (10)

Isosceles Triangle

An isosceles triangle is a three-sided shape with two sides of equal length. (69)

Law of Vanishing Points

The law of vanishing points says that any set of parallel edges receding from the viewer will appear to meet at a vanishing point. (26)

Light Source Vanishing Point

The light source vanishing point is one of two special types of vanishing points used to create cast shadows. The light source vanishing point is the location where the light converges, aka the point of origin of the light source itself. We abbreviate as LVP (172)

Linear Perspective

Linear perspective is a geometric method of depicting three-dimensional subjects on a two-dimensional format. Linear perspective uses rectangular planes and prisms to model monocular vision, creating an illusion of depth. (1)

Line of Sight

The line of sight represents the direction of the viewer's gaze. Line of sight is usually perpendicular to the horizon line and always points to the center of vision. (2)

Multi-Point Perspective

Multi-point perspective is a form of linear perspective that uses five or more vanishing points to build the image. Multi-point perspectives mimic fish-eye (180 degree) and panoramic (360 degree) views. (206)

Monocular Vision

Monocular vision is sight from one eye with the other eye closed. Unlike binocular vision, which combines sight from both eyes for depth perception, monocular vision can be modeled with linear perspective. (2)

One-Point Perspective
One-point perspective is a point of view in which one set of parallel edges recedes from the viewer and appears to converge at a single vanishing point. A rectangular prism is assumed. (26)

Perpendicular
A perpendicular angle is a 90-degree angle. (9)

Perspective Center
The perspective center is the middle point of a rectangular plane in perspective, found at the intersection of the plane's diagonals. (68)

Perspective Grid
The perspective grid is a three-dimensional grid in perspective that can be based on either square or rectangular planes. There are one-point, two-point, three-point, four-point, five-point, and infinite-point perspective grids. (115)

Perspective Scaling
Perspective scaling is the process of repeating a form within a composition while maintaining its size and relative proportion. (85)

Picture Plane
The picture plane is the two-dimensional surface onto which three-dimensional space is translated. It is analogous to a window or viewfinder situated between the viewer and the subject. Think of the picture plane as standing in for the piece of paper onto which the subject will be drawn. Positioned between the viewer and the subject, the picture plane is always perpendicular to the viewer's line of sight. We abbreviate as PP. (9)

Plan View
A plan view is a top-down view of the subject and ground plane on a two-dimensional grid. A plan view depicts the relative width, depth, and location of forms. Floor plans and maps are examples of a plan view. (128)

Point of View
A point of view is a particular view of a subject, as defined by the viewer's station point and center of vision in relation to the subject. Observable linear perspective categorizes all points of view into one of three major types: one-point, two-point, and three-point. (9)

Projected Station Point
The projected station point is the projection of the viewer's three-dimensional location in space onto the two-dimensional surface of the perspective drawing. In perspective, the projection is understood and projected station points are functionally synonymous with station points. (99)

Rectangular Plane
A rectangular plane is a flat surface that has two dimensions and 90-degree angles at each corner. (6)

Rectangular Prism
A rectangular prism is a form that has three dimensions and 90-degree angles at each corner. (6)

Shading
Shading, or rendering, is the application of value. Pencil shading techniques include toning, blending, erasing, hatching, cross-hatching, contouring, stippling, and scribbling. (226)

Shadow Vanishing Point
The shadow vanishing point, one of two special types of vanishing points used to create cast shadows, is the location where the edges of a cast shadow converge. The shadow vanishing point is always located directly below the light source, and here is abbreviated as SVP. (172)

Slope
The slope is the gradient or steepness of a plane, as measured by an angle formed at a reference vertex. Sloping planes have special vanishing points. (145)

Station Point
A station point is the fixed location of the viewer. We abbreviate as SP. (7)

Subtractive Shape Building
Subtractive shape building, one of two basic approaches to creating complex shapes, subtracts simple shapes from a larger form. (79)

Three-Point Perspective
Three-point perspective is a point of view in which the three sets of parallel edges recede from the viewer and appear to converge at three different vanishing points. A rectangular prism is assumed. (54)

Two-Point Perspective
Two-point perspective is a point of view in which two sets of parallel edges recede from the viewer and appear to converge at two separate vanishing points. A rectangular prism is assumed. (40)

Value
Value is the relative lightness or darkness of a form. It describes the location of a light source, the shape of a form, and the texture of a surface. (224).

Value Mapping
Value mapping is a technique for planning areas of value within an entire composition using a value scale and referencing the light source(s). (230)

Vanishing Point
A vanishing point is the point where a set of parallel edges receding from the viewer appear to meet. Vanishing point is abbreviated as VP. (26)

Vertex
A vertex is the point, or corner, of two intersecting lines used to measure angles. (125)

Vertical Axis Line
A vertical axis line is perpendicular to the horizon line and intersects a vanishing point; this line is used to locate diagonal vanishing points for vertical planes. (86)

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Perspective Drawing is a definitive handbook covering all the major concepts of linear perspective. Written in a straightforward style, this textbook provides clear explanations of one-point, two-point, and three-point perspective drawing, and explores the perspective grid, shadows, reflections, plans and elevations, and fisheye and panoramic views. The book employs a highly visual design, with step-by-step illustrations and contemporary examples that connect theory with practice.

Perspective Drawing is intended for both the beginning student and the skilled practitioner. Presented in a compact format, this text covers introductory topics and more advanced techniques. The foundational skills of linear perspective are relevant to any creative field, including fine art, graphic design, advertising, illustration, animation, and interior design.

Perspective Drawing is an essential addition to any art and design library.

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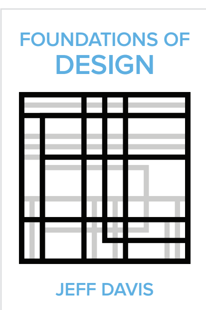

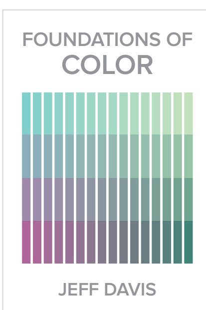

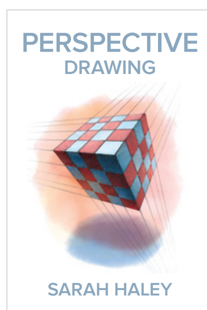

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