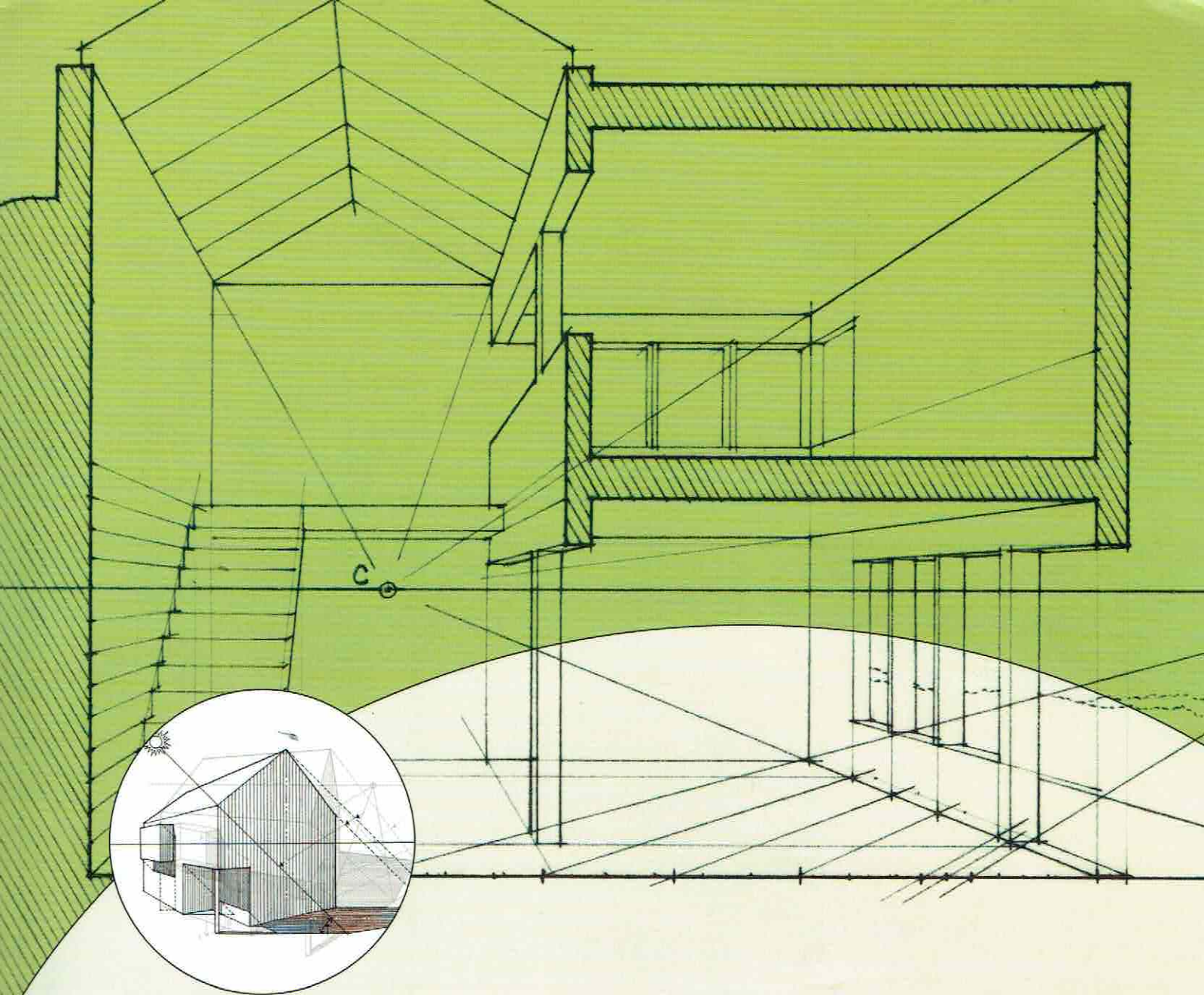




FOURTH EDITION

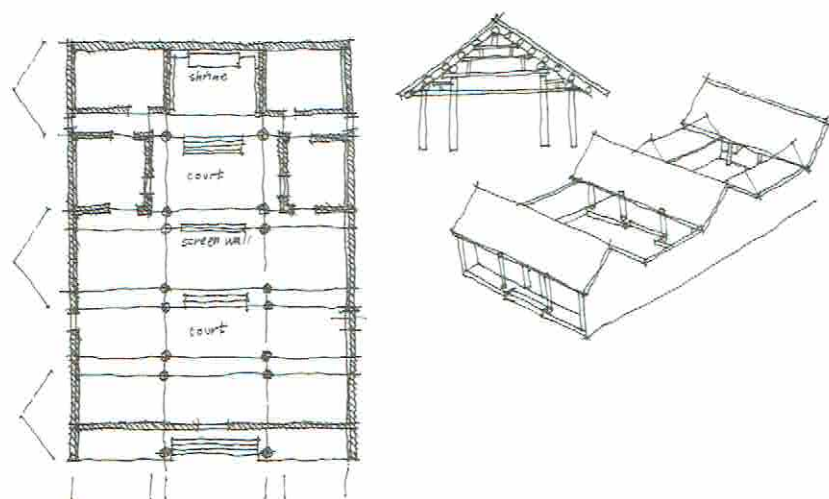
ARCHITECTURAL GRAPHICS

FRANCIS D.K. CHING

10

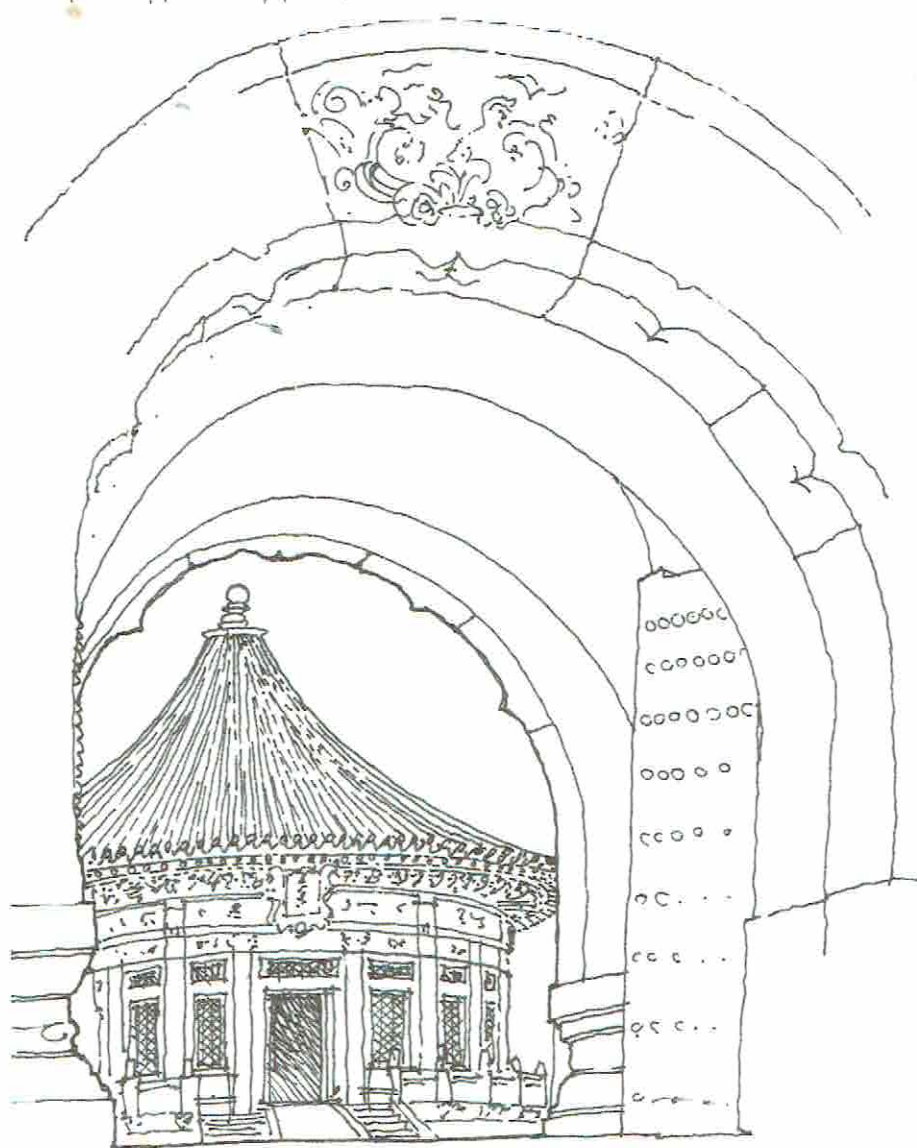
Freehand Drawing

Despite rapid advances in digital imaging technology, drawing with a free hand holding a pen or pencil remains the most intuitive means we have for graphically recording observations, thoughts, and experiences. The tactile, kinesthetic nature of freehand drawing in direct response to sensory phenomena sharpens our awareness in the present and enables us to collect visual memories of the past. Freehand drawing also enables us to initiate and freely work through ideas of a possible future that we imagine in the mind's eye. During the design process itself, the freehand drawing of diagrams allows us to further explore these ideas and develop them into workable concepts.



Drawing from observation sharpens your awareness of environmental settings, enhances your ability to retain visual memories, and helps build up your design vocabulary.

- Drawing from observation is most meaningful and rewarding when you draw what interests you. If assigned a subject to draw, consider what aspect or quality of the subject attracts your attention.
- Possible subject matter includes the relationship between interior and exterior or public and private spaces, spatial sequences, and urban patterns.
- Other worthwhile explorations include studies of proportion, scale, light, and color, how materials meet in construction assemblies, details, and other sensible qualities that contribute to the character of a place.
- Do not neglect to look at architecture in relation to the landscape.



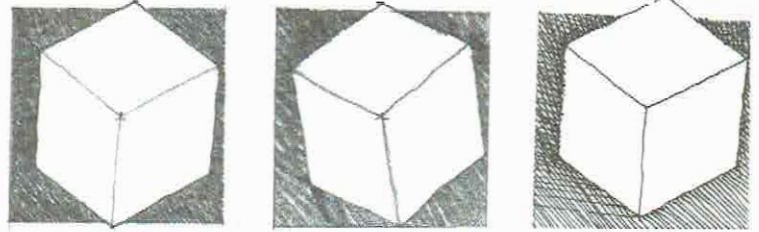
Imperial Heavenly Vault of the Temple of Heaven
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The process for drawing from observation is to look, respond, and record.

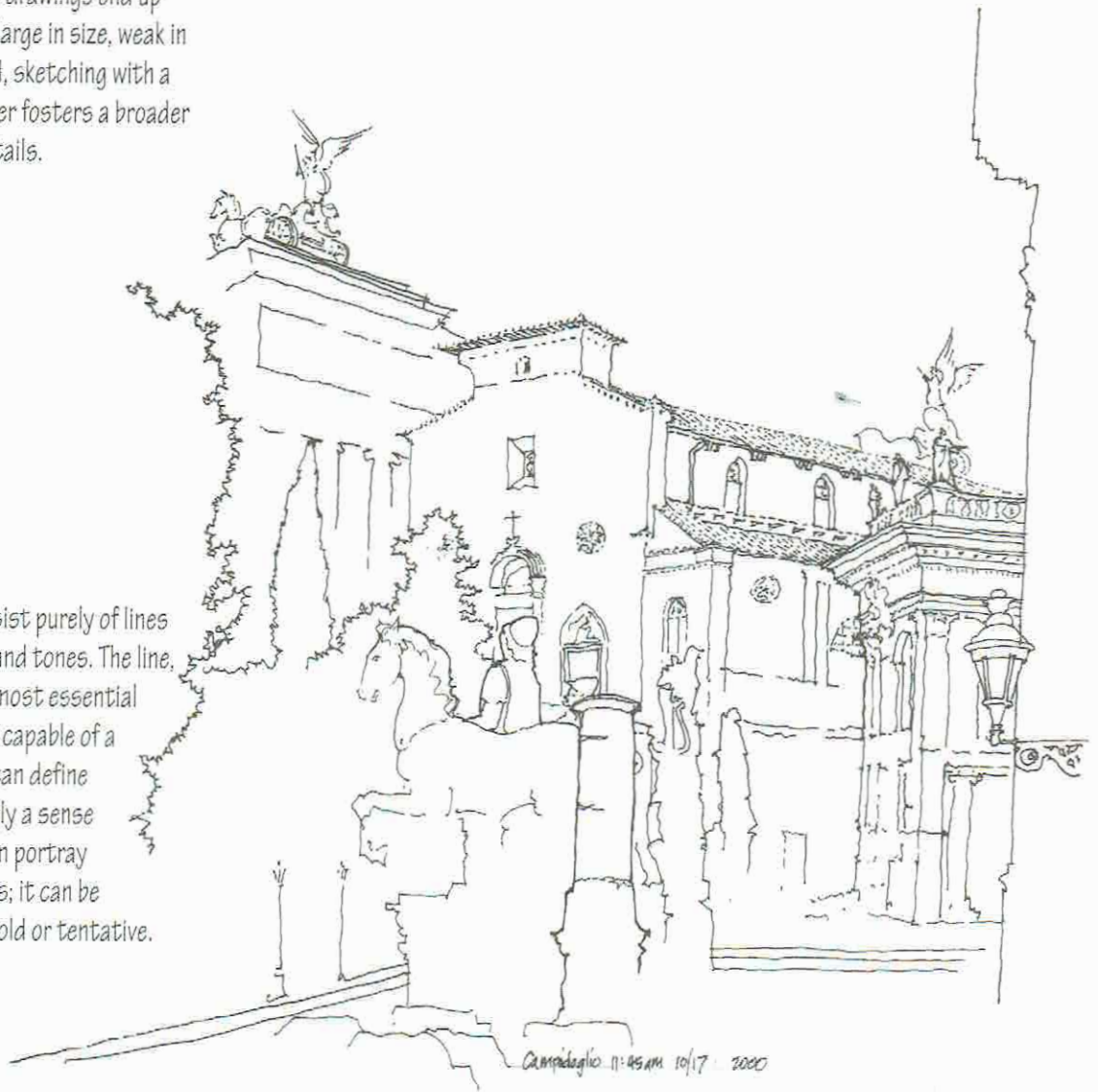
- First pay careful attention to the subject.
- Respond by recording not simply the optical image but also your thoughts and impressions.
- The constant challenge is to select a point of view, medium, and technique appropriate to describing the selected aspect, characteristic, or quality of the subject.
- Do not be overly concerned with technique; each one of us inevitably develops a personal style of drawing.

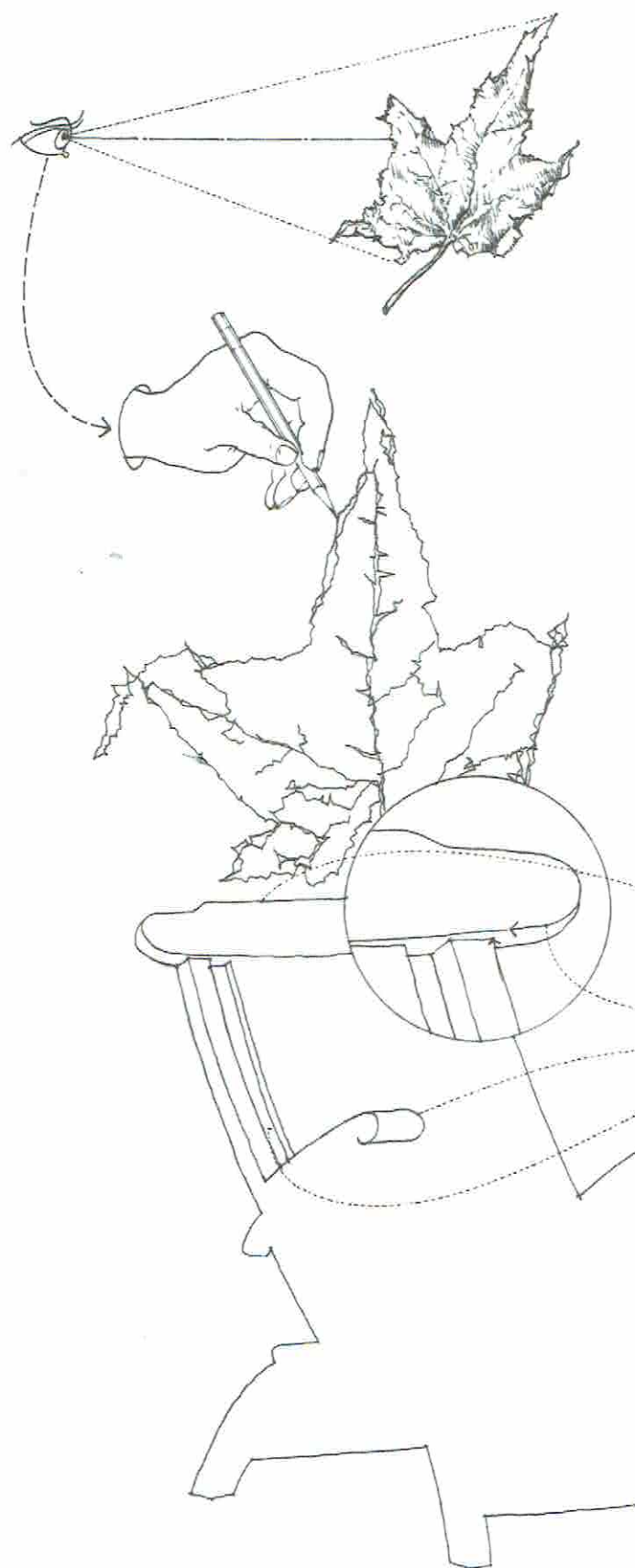
Drawing from observation requires simple equipment: a pen or pencil and a pad of paper or sketchbook suitable for both dry and wet media.

You may want to experiment with the feel and capabilities of other media, such as charcoal pencils and markers. Try to determine the limits of expression of which each is capable and how its characteristics affect the nature of a drawing. For example, you should find that a fine-tipped pen or pencil encourages you to focus on minute details. Because it takes innumerable fine lines to cover a given area, many line drawings end up smaller than intended or, if large in size, weak in intensity. On the other hand, sketching with a broad-tipped pencil or marker fosters a broader view and the omission of details.



Freehand sketches may consist purely of lines or be a combination of lines and tones. The line, however, remains the single most essential drawing element, one that is capable of a wide range of expression. It can define shape and form and even imply a sense of depth and space. A line can portray hard as well as soft materials; it can be light or heavy, limp or taut, bold or tentative.



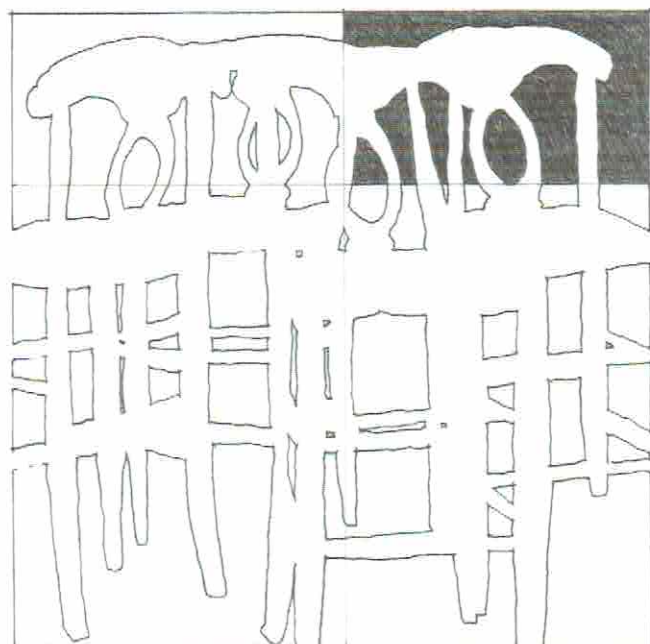
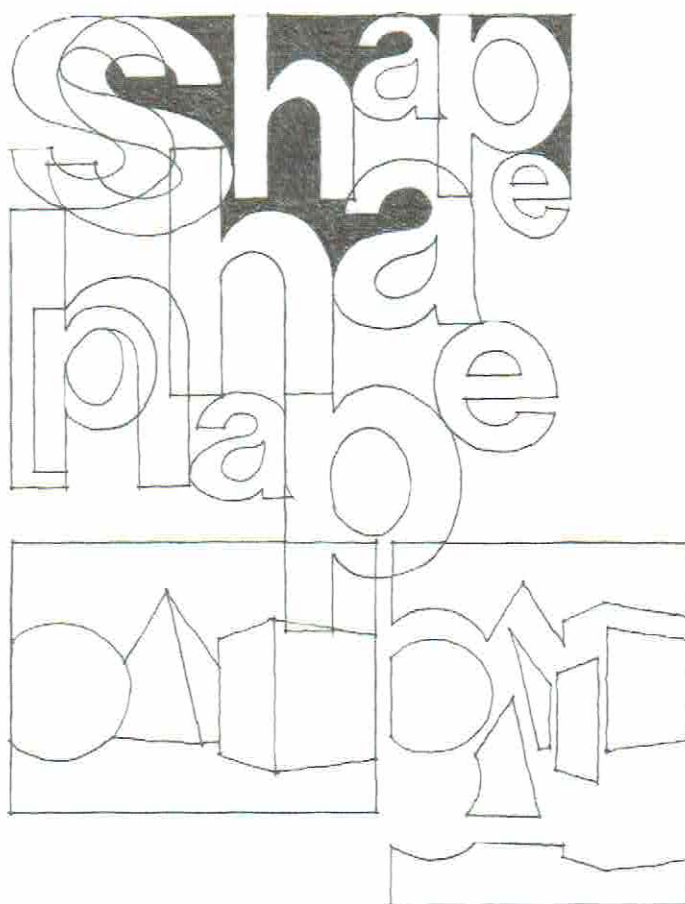


Contour drawing is one approach to drawing from observation. Its primary purpose is to develop visual acuity and sensitivity to qualities of surface and form. The process of contour drawing suppresses the symbolic abstraction we normally use to represent things. Instead, it compels us to pay close attention, look carefully, and experience a subject with both our visual and tactile senses.

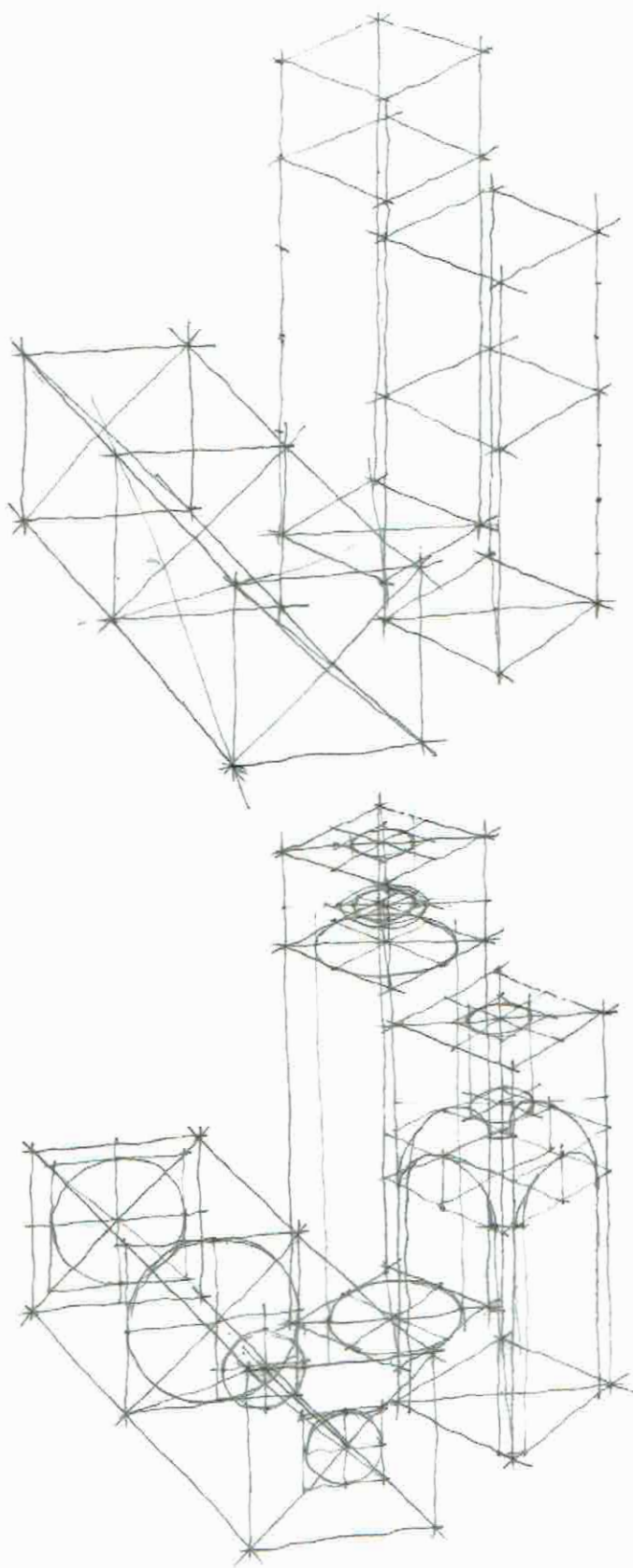
- Contour drawing is best done with either a soft, well-sharpened pencil or a fine-tipped pen that is capable of producing a single incisive line. This fosters a feeling of precision that corresponds to the acuity of vision that contour drawing requires.
- Imagine the pencil or pen is in actual contact with the subject as you draw.
- As the eye carefully traces the contours of a subject, the hand moves the drawing instrument at the same slow and deliberate pace, and responds to every indentation and undulation of form.
- Avoid the temptation to move the hand faster than the eye can see; examine the shape of each contour you see in the subject without considering or worrying about its identity.
- The most noticeable contours are those that circumscribe an object and define the outer boundary between the figure and its background.
- Some contours travel inward at folds or breaks in a plane.
- Others are formed by overlapping or projecting parts.
- Still other contours describe the shapes of spaces and shadows within the form.

We are conditioned to see the shapes of things rather than the shapes of the spaces between them. While we normally perceive spatial voids as having no substance, they share the same edges as the objects they separate or envelop. The positive shapes of figures and the shapeless spaces of backgrounds share the same boundaries and combine to form an inseparable whole—a unity of opposites.

In drawing, also, negative shapes share the contour lines that define the edges of positive shapes. The format and composition of a drawing consists of positive and negative shapes that fit together like the interlocking pieces of a jigsaw puzzle. In both seeing and drawing, we should raise the shapes of negative spaces to the same level of importance as the positive shapes of figures and see them as equal partners in the relationship. Since negative shapes do not always have the easily recognizable qualities of positive shapes, they can be seen only if we make the effort.

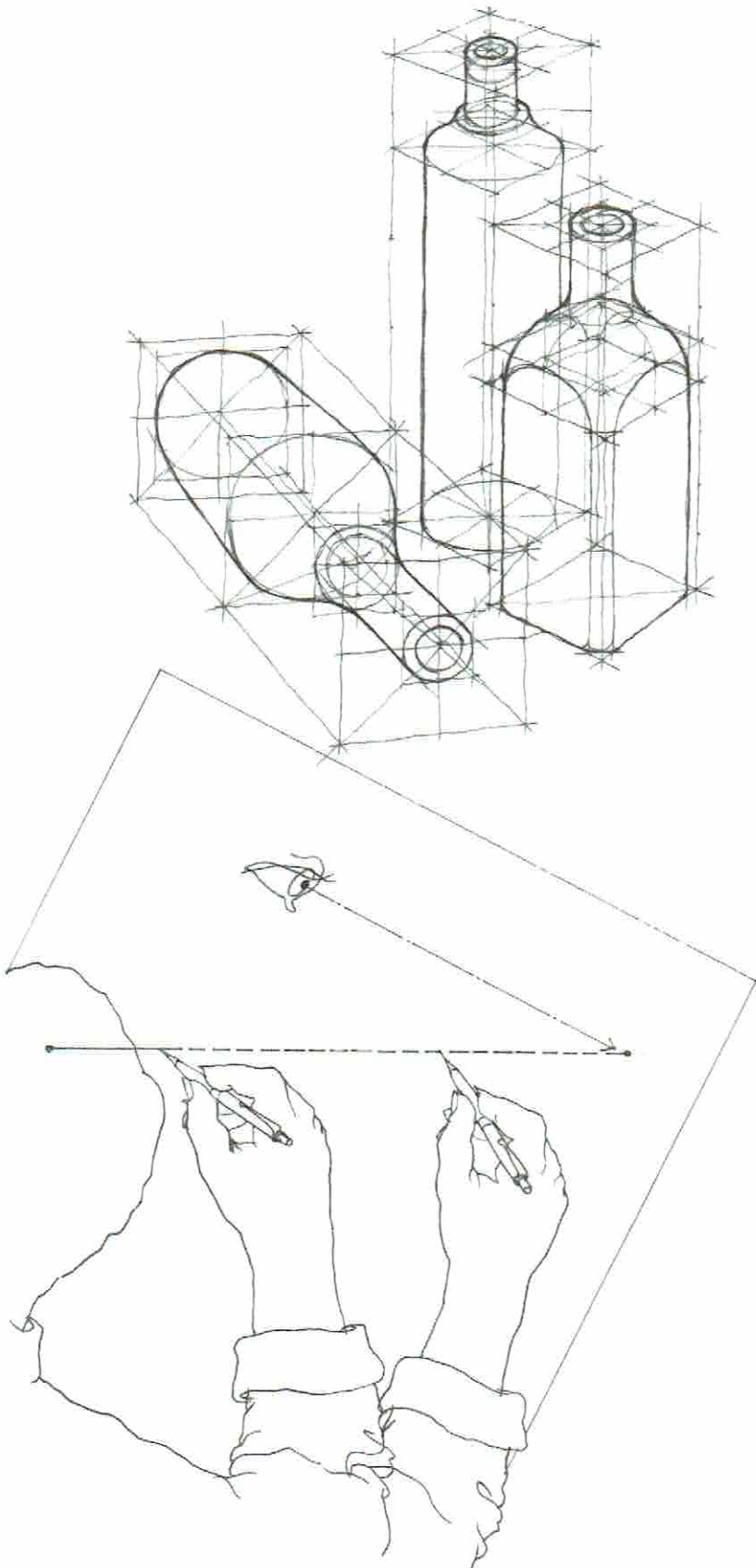


- We should carefully observe the interconnected nature of positive and negative shapes.
- As we draw the edges of positive shapes, we should also be aware of the negative shapes we are creating.
 - Focusing on the shapes of these negative spaces prevents us from thinking consciously about what the positive shapes represent, and we are free to draw them purely as two-dimensional figures.

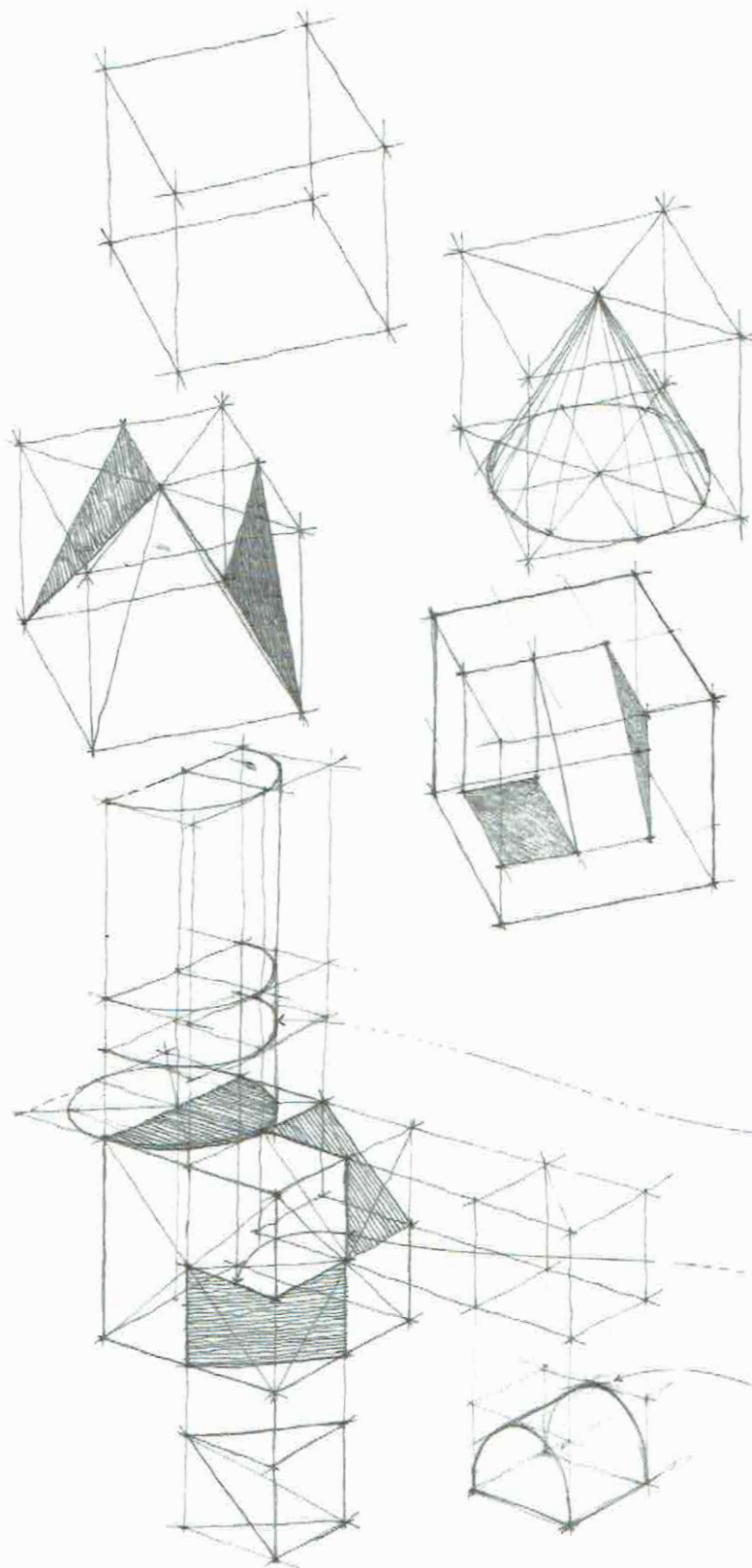


In drawing analytically, we seek to merge two approaches—describing the outer configuration of surfaces of an object and explaining its inner structural nature and the way its parts are arranged and joined in space. Unlike contour drawing, in which we proceed from part to part, analytical drawing proceeds from the whole to the subordinate parts and finally the details. Subordinating parts and details to the structure of the overall form prevents a piecemeal approach that can result in faulty proportional relationships and a lack of unity.

- Begin an analytical drawing with light, freely drawn lines. Draw these lines in an exploratory manner to block out and establish a transparent volumetric framework for a form or composition.
- These exploratory lines are diagrammatic in nature, serving to establish and explain the underlying geometry and structure of the subject.
- These initial traces are also called regulating lines because they can be used to locate points, measure size and distance, find centers, express perpendicular and tangential relationships, and establish alignments and offsets.
- Regulating lines represent visual judgments to be confirmed or adjusted. Do not erase any previously drawn lines. If necessary, restate a line—correcting basic shapes and checking the relative proportions between the parts.
- Always strive for incremental improvement over the last line drawn.



- Because of their constructive nature, regulating lines are not limited by the physical boundaries of objects. They can cut through forms and extend through space as they link, organize, and give measure to the various parts of an object or composition.
- Drawing both unseen and visible parts of the subject makes it easier to gauge angles, control proportions, and see the optical appearance of shapes. The resulting transparency also conveys a convincing sense of volume occupied by the form. Working in this way prevents the appearance of flatness that can result from concentrating too much on surface rather than volume.
- Through a continual process of elimination and intensification, gradually build up the density and weight of the final object lines, especially at critical points of intersection, connection, and transition.
- Having all lines remain visible in the final drawing intensifies the depth of the image and reveals the constructive process by which it was generated and developed.
- The closest analogy to analytical drawing is the wireframe model produced by 3D CAD and modeling software.
- Before actually drawing a line, practice the eye-mind-hand movement by marking the beginning and end of the intended line with dots. Avoid scratching in lines with short, feeble strokes. Instead, draw lines as smoothly and continuously as possible.
- For short strokes or when applying considerable pressure, swing the hand at the wrist or let the fingers perform the necessary motions.
- For longer strokes, swing the entire forearm and hand freely from the elbow, with a minimum of wrist and finger movement. Only as you approach the end of the stroke should you bring the wrist and fingers into motion to control where the line ends.



In the analytical process of drawing, we build on geometry. If we are able to break down what we see into regular geometric volumes or a geometric arrangement of parts, we can more easily draw them. We can reorganize the forms in an additive manner or transform them in a subtractive manner. The resulting structure can then serve as a framework for the development and refinement of the forms and intervening spaces.

- The cube is a convenient three-dimensional unit with which to begin.
- From the cube, we can use geometric principles to derive other basic geometric volumes, such as the pyramid, cylinder, and cone. Mastery of drawing these simple forms is a prerequisite for drawing a variety of derivative compositions.
- We can extend a cube horizontally, vertically, as well as into the depth of a drawing. A number of cubic volumes or derivative forms can link, extend, or grow into centralized, linear, symmetrical, or clustered compositions.
- Working from a cubic form, we can selectively remove or carve out portions to generate a new form. In this subtractive process, we use the solid-void relationship between form and space to guide us as we draw the proportion and development of the parts.

In drawing complex forms, keep the following points in mind:

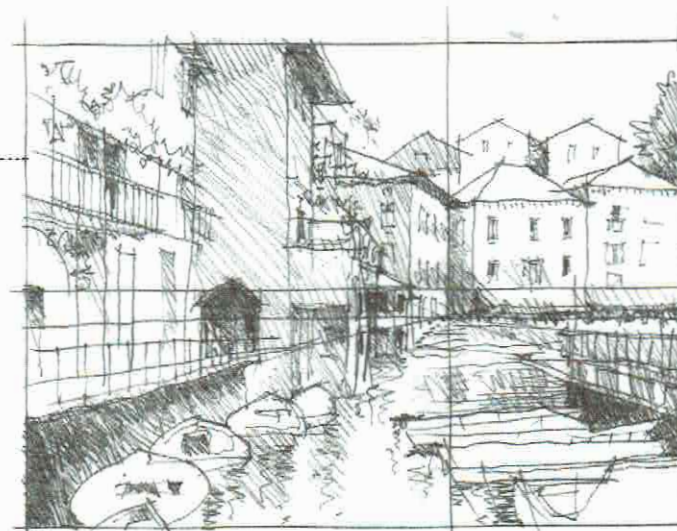
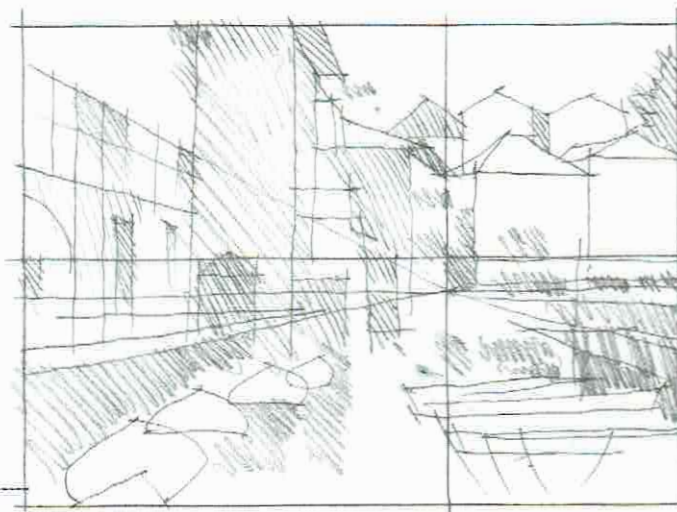
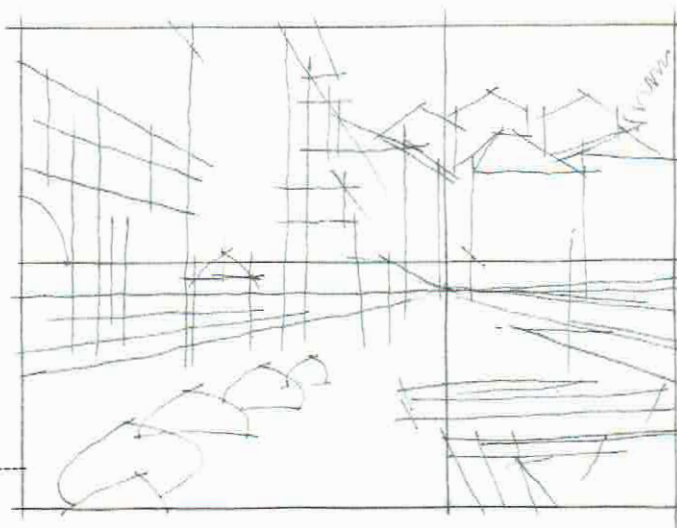
- Use cross-sectional contours to develop the form of complicated shapes. These imaginary slices strengthen the dimensional effect of the drawn and show the volume of the object.
- Pay close attention to overlapping forms and negative spaces in the composition.
- Distinguish overlapping forms with linear accents.
- Use scattered lines to indicate the transitional surfaces of curved forms.
- Subordinate details to the overall form.

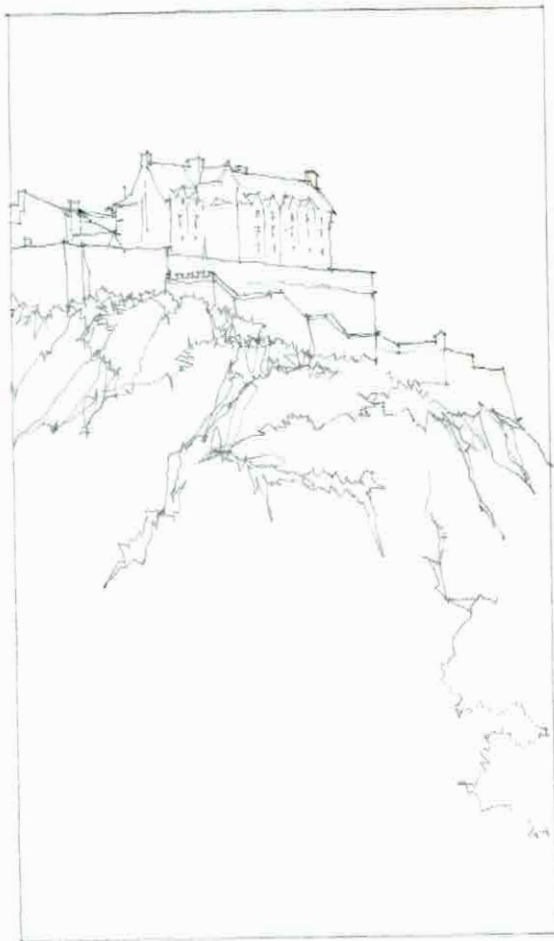
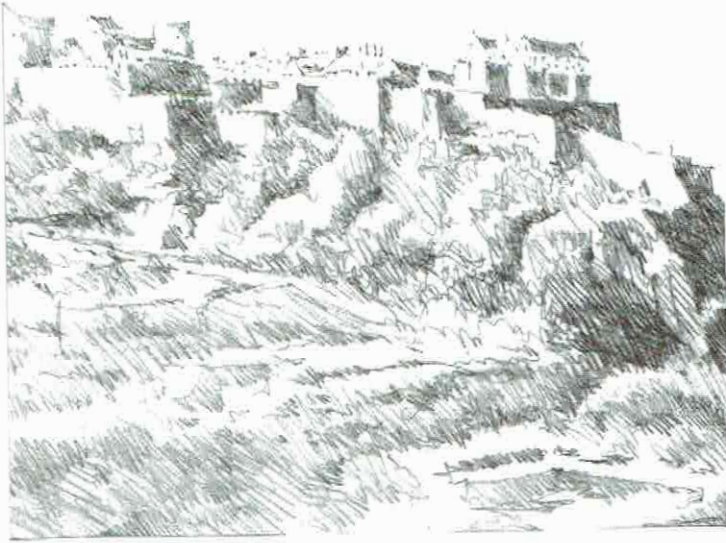
Every drawing evolves over time. Knowing where to begin, how to proceed, and when to stop are crucial to the process of drawing. Building up a drawing in a systematic way is an important concept. We should advance by progressive stages and construct a drawing from the ground up. Each successive iteration or cycle through the drawing process should first resolve the relationships between the major parts, then resolve the relationships within each part, and finally readjust the relationships between the major parts once again.

Tediously finishing one part of a drawing before going on to the next can easily result in distorting the relationships between each part and the rest of the composition. Maintaining a consistent level of completeness or incompleteness across the entire surface of a drawing is important to preserving a unified, balanced, and focused image.

The following procedure prescribes a way of seeing as well as drawing. It involves building up a drawing in the following stages:

- Composing a view and establishing structure
- Layering tonal values and textures
- Adding significant details

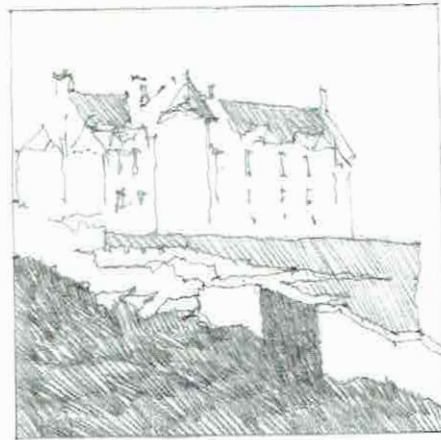




Composing a View

We normally select out from what we see what is of interest to us. Since our perception is discriminating, we should also be selective in what we draw. How we frame and compose a view, and what we emphasize with our drawing technique, will tell others what attracted our attention and what visual qualities we focused on. In this way, our drawings will naturally communicate our perceptions with an economy of means.

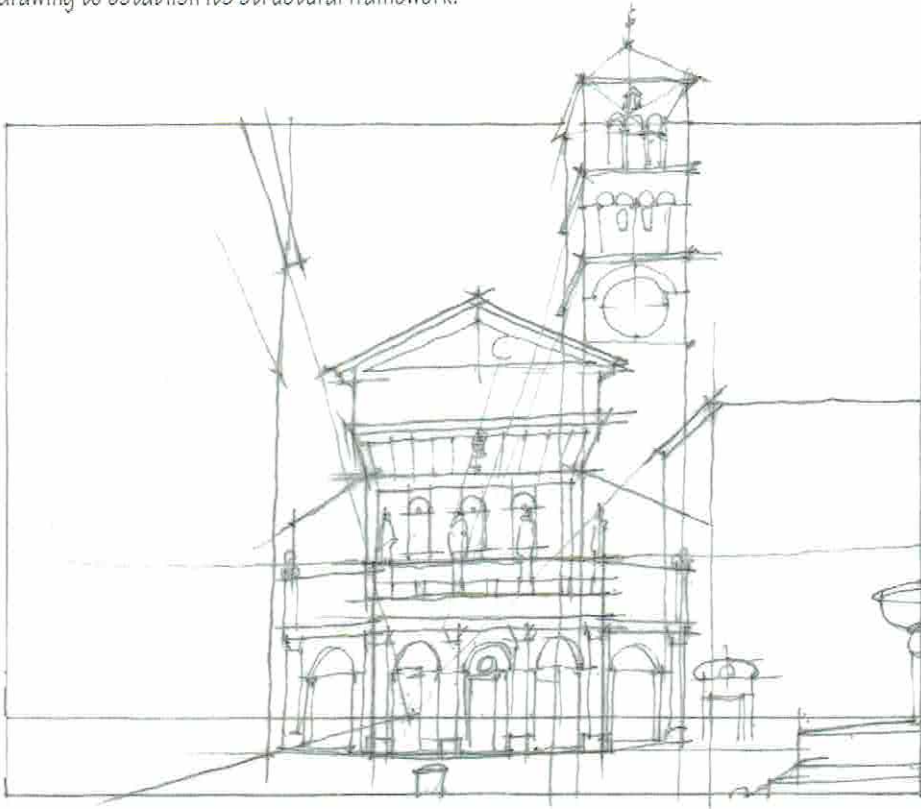
Composing a perspective view of a scene involves positioning ourselves at a particular point in space and deciding how to frame what we see.



- To convey the sense that the viewer is within a space rather than on the outside looking in, we must establish three pictorial regions: a foreground, a middleground, and a background. All three should not have equal emphasis; one should dominate to heighten the pictorial space of the drawing.
- When portraying a specific aspect of an object or scene, a closer viewpoint may be necessary so that the size of the drawing can accommodate the rendering of tonal value, texture, and light.

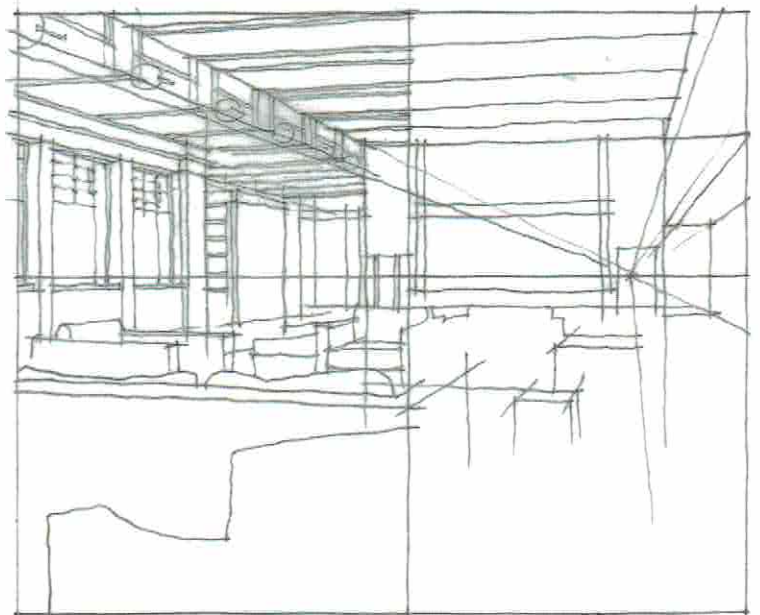
Establishing Structure

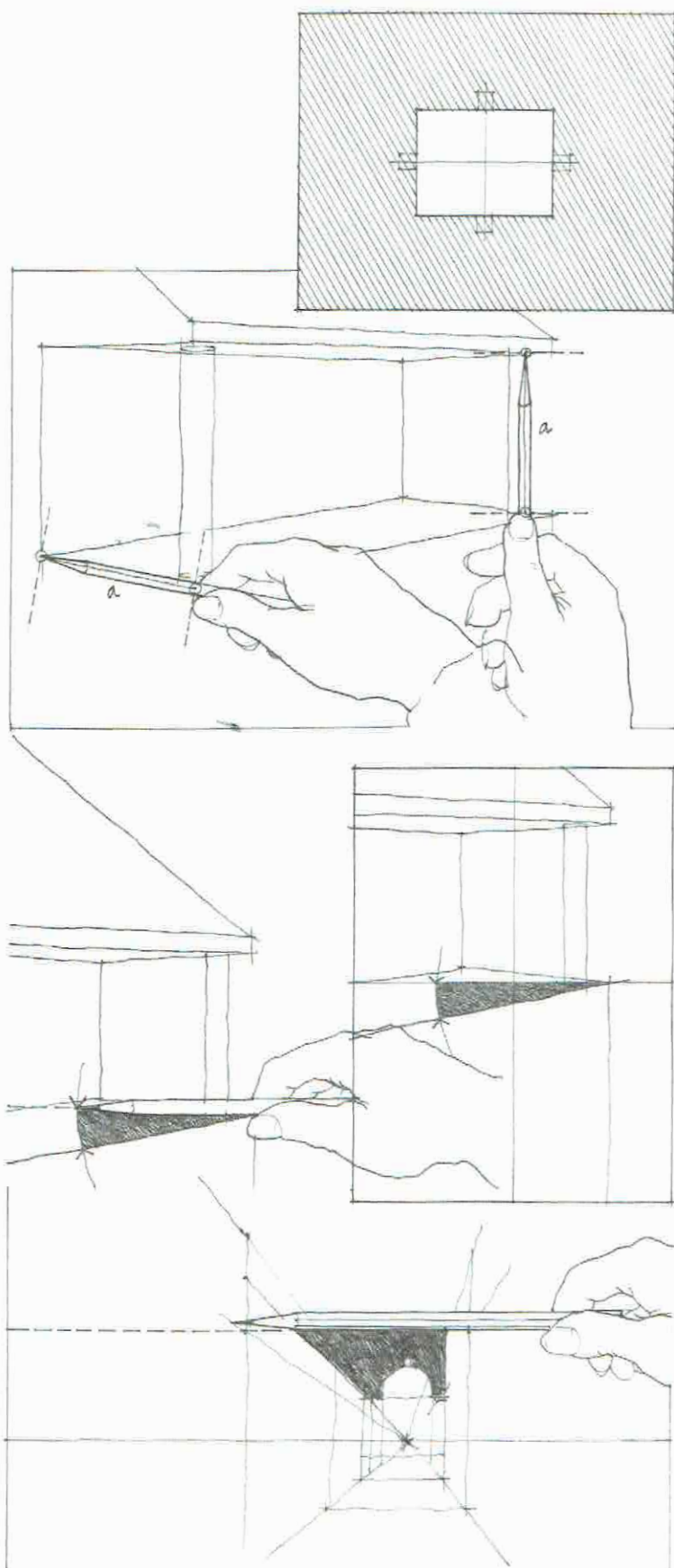
Without a cohesive structure to hold it together, the composition of a drawing collapses. Once the composition for a view is established, we use the analytical process of drawing to establish its structural framework.



- We begin with regulating lines that examine and verify the position, shape, and proportions of major elements.
- As we establish these first few lines, a tentative armature emerges that both holds and guides further observations and ideas.
- We draw further perceptions over this framework, which in turn is adjusted in response to our perceptions. Let this structure remain visible, for it clarifies pictorial relationships and serves as a preparatory underdrawing for what comes later.

In drawing an environmental setting—an outdoor space or an interior room—we view the scene from a fixed position in space. The structure must therefore be regulated by the principles of linear perspective. We are concerned here principally with the pictorial effects of linear perspective—the convergence of parallel lines and the diminishing size of objects with depth. Our mind interprets what we see and presents an objective reality based on what we know of an object. In drawing a perspective view, we attempt to illustrate an optical reality. These two are often at odds, and the mind usually wins out.



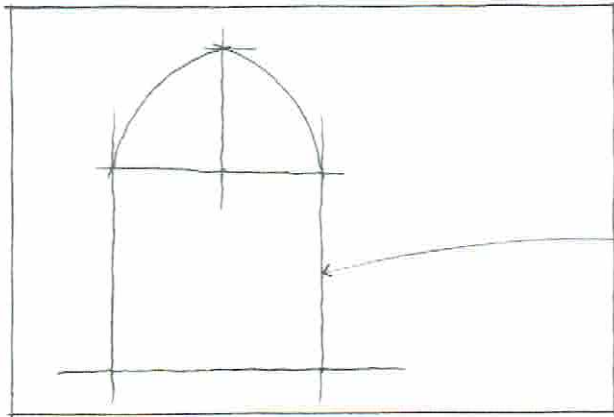


- To help us frame and compose a view as well as gauge the relative lengths and angles of lines, we can construct a viewfinder out of dark gray or black cardboard.
- Another convenient sighting device is the shaft of the pencil or pen with which we are drawing.

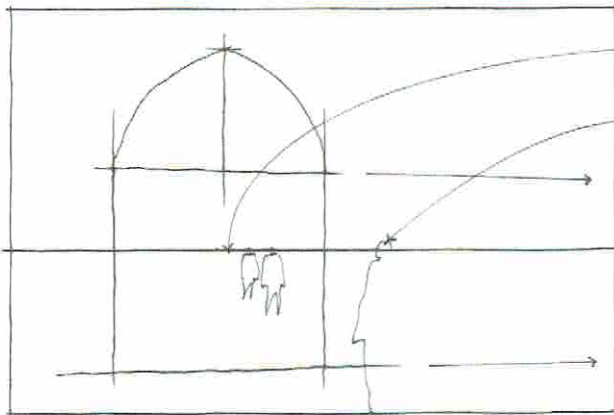
- We hold the pen or pencil out at arm's length, in a plane parallel with our eyes and perpendicular to our line of sight.
- To make a linear measurement, we can align the tip of the pen or pencil with one end of an observed line and use our thumb to mark the other end. Then we shift the pencil to another line and use the initial measurement to gauge the length of the second line.

- To gauge the apparent slope of a line, we can align one end of an inclined line with the shaft of the pen or pencil held vertically or horizontally. We gauge the angle between the two visually. Then we transfer this angular measurement to the drawing, using as guides the edges of the drawing surface that correspond to the vertical or horizontal reference line.

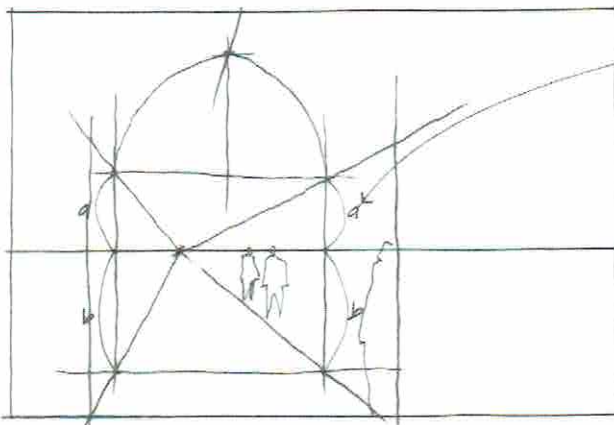
- We can use the same reference lines to see which points in the image align vertically or horizontally with other points. Checking alignments in this way effectively controls the proportions and relations of both positive and negative shapes.



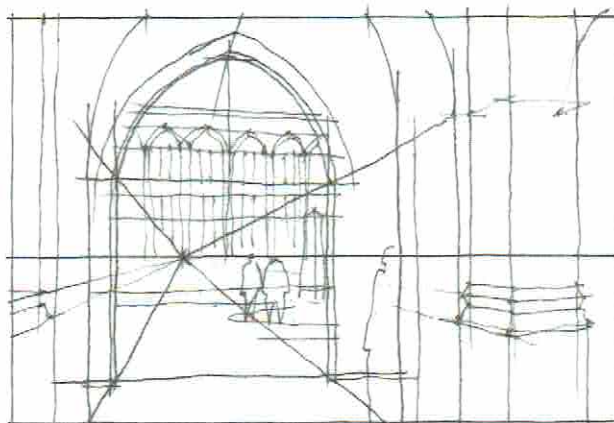
- We begin by drawing the perceived shape of a vertical plane that we face. This plane may be the wall of a room, the facade of a building, or an implied plane defined by two vertical elements, such as the corners of two buildings.



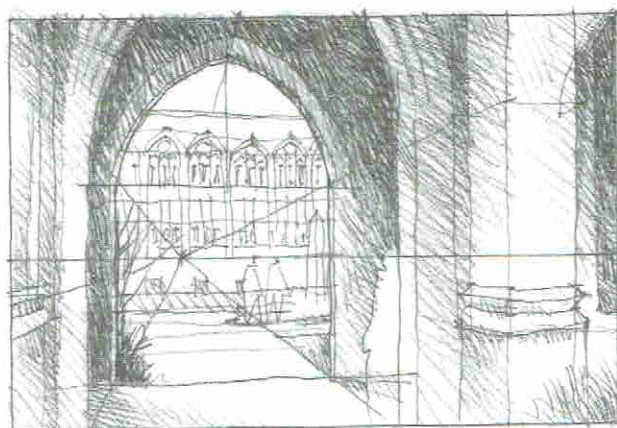
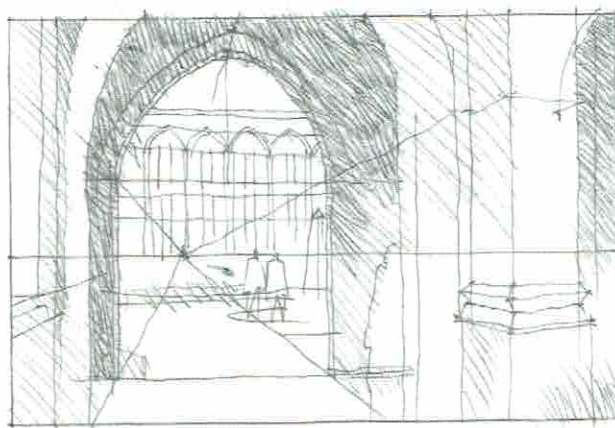
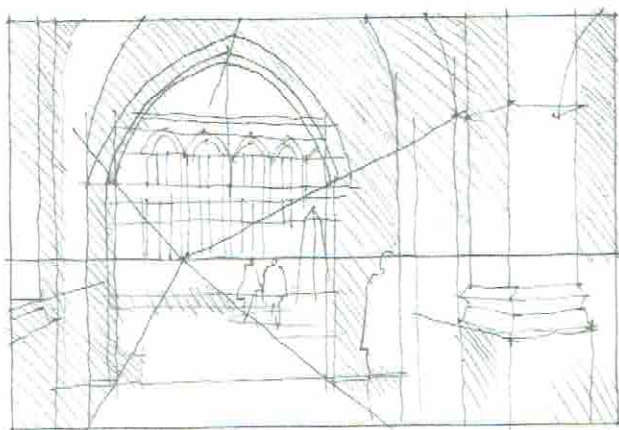
- We need to establish our eye level relative to the vertical plane we have chosen. We focus on a specific point and draw a horizontal, or horizon line, through that point.
- Notice that horizontal elements situated above our eye level slope downward toward the horizon, whereas horizontal elements that are below rise upward.
- We can establish human figures in the foreground, middleground, and background to establish a vertical scale.



- If the vanishing points for a set of horizontal lines lie off the sheet of the drawing, we can draw the front and rear vertical edges of a receding face and judge what proportion of the vertical leading edge lies above the horizon line and what lies below. We can then reproduce the same proportions for the rear vertical edge.



- We use the established points to guide the drawing of the inclined lines in perspective. These receding lines along with the horizon line then serve as visual guides for any other lines that converge at the same point.



Layering Tonal Values

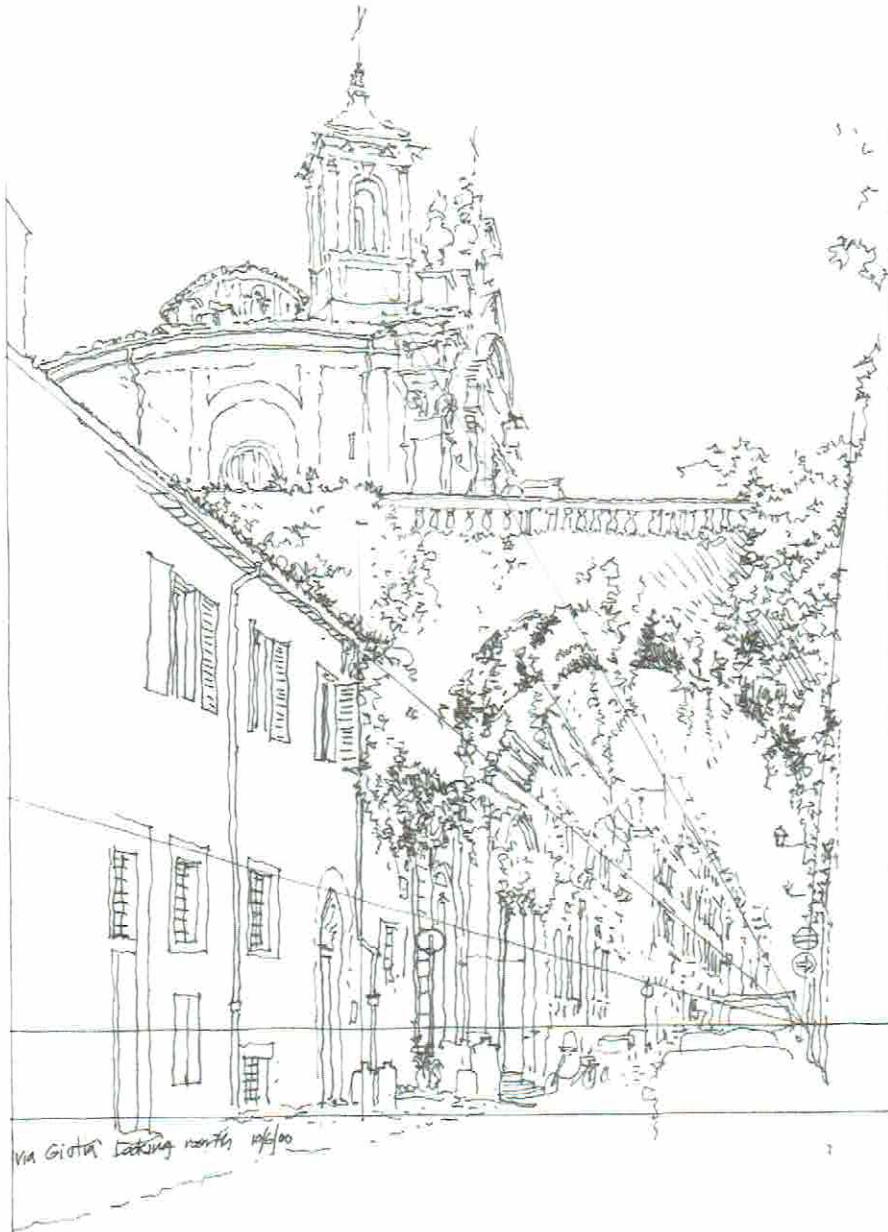
In composing and establishing the structure of a drawing, we create a framework of lines. To this scaffolding, we add tonal values to represent light and dark areas of the scene, define planes in space, model their form, describe surface color and texture, and convey spatial depth.

Work from light to dark by mapping layering shapes of tonal value over preceding areas of value. If an area is too light, we can always darken it. But once an area has been darkened too much and becomes muddy, it is difficult to correct. The freshness and vitality of a drawing is fragile and easily lost.

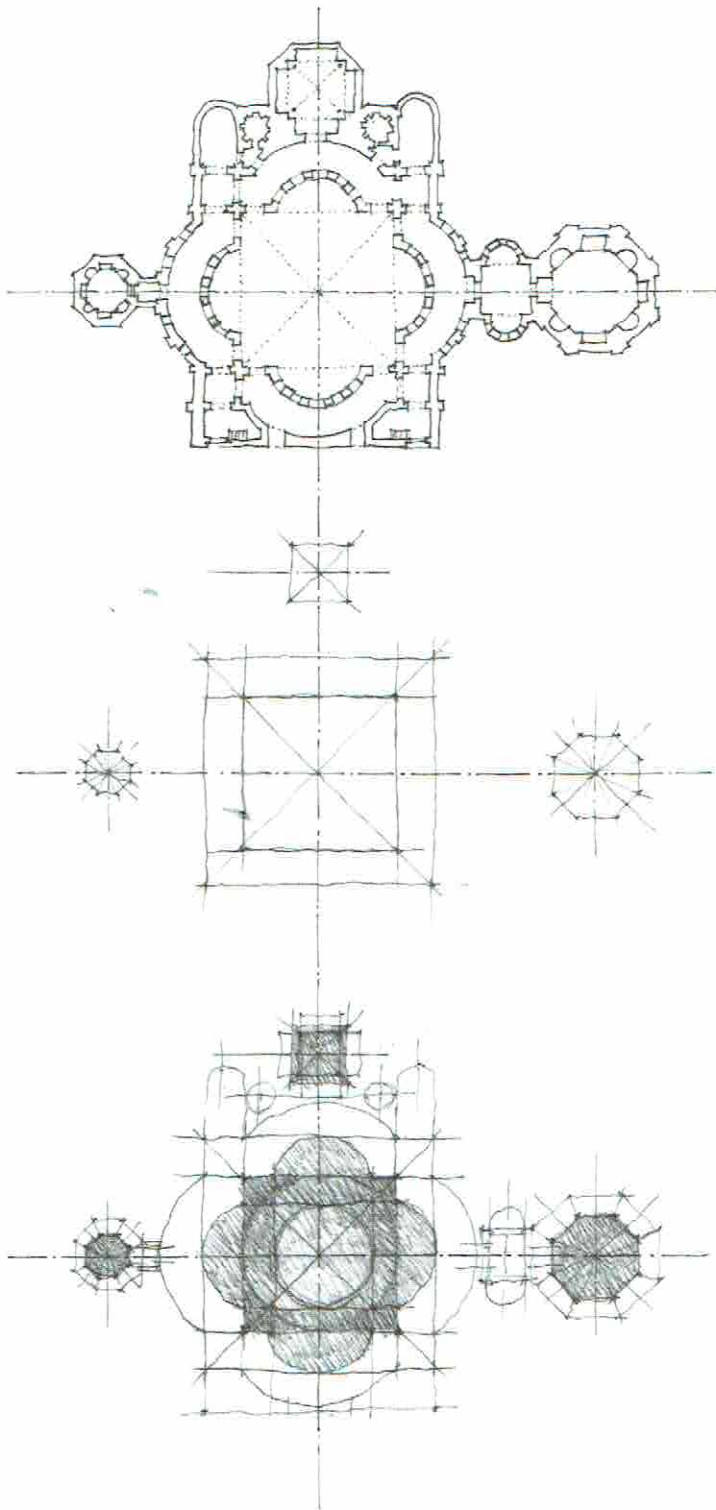
- Shaded surfaces and cast shadows are neither opaque nor uniform in value. Avoid employing large areas of solid dark tones, which obliterate detail and disrupt our reading of the form of a surface.
- Light reflecting back from nearby surfaces illuminates surfaces in shade or on which shadows are cast. To depict the modifying effects of reflected light, we vary the tonal value of surfaces in shade and those on which shadows are cast. The effects of reflected light, however, should be suggested in a subtle way, so as not to disrupt the nature of the surface in shade or shadow.
- Shades and shadows can be applied as transparent tones that belong to the form and through which we can read the texture and local color of the surface.
- The boundaries of cast shadows are distinct in brilliant light, but softer in diffuse light. In either case, we can define the outer edges of shadows with a contrast in value, never with a drawn line.
- The way light illuminates a color and makes it visible affects its apparent value. A highlight on a colored surface will appear much lighter than the same hue seen in shade or within a shadow.

Adding Details

The final stage in the building of a drawing is the addition of those details that help us identify the various elements of an object or scene. It is through these details that we sense and communicate the inherent qualities of a subject or uniqueness of a place. The smaller parts and details of a drawing must join in a way that further explains the whole.



- Details must be placed within a structured pattern to make sense. This structure provides a framework for a particular area or feature to be worked on in greater detail and more elaborately.
- At the same time, a drawing needs contrast with areas of little or no detail. By this contrast, those areas with detail will naturally be given more emphasis.
- Remember to be selective. We can never include every detail in a drawing. Some editing is necessary as we attempt to communicate particular qualities of form and space, and this often means tolerating a degree of incompleteness.
- The very incompleteness of a drawn image involves and invites the viewer to participate in its completion. Even our perception of optical reality is usually incomplete, being edited by the knowledge we bring to the act of seeing and our momentary needs and concerns.



All drawings are, to some degree, abstractions of a perceived reality or an imagined conception. In design drawing, we operate at varying levels of abstraction. At one end of the spectrum lies the presentation drawing, which attempts to simulate as clearly as possible the future reality of a design proposal. At the other end is the diagram, which has the ability to explain something without necessarily representing it in a pictorial way.

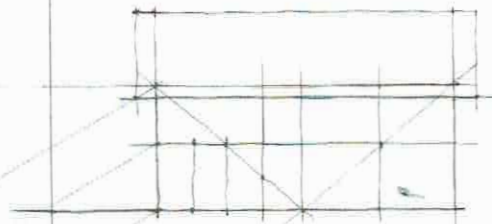
- The hallmark of a diagram is its ability to simplify a complex notion into essential elements and relationships by a process of elimination and reduction.
- The abstract nature of diagramming enables us to analyze and understand the essential nature of design elements, to consider their possible relationships, and to quickly generate a series of viable alternatives to a given design problem.

Digital Diagramming

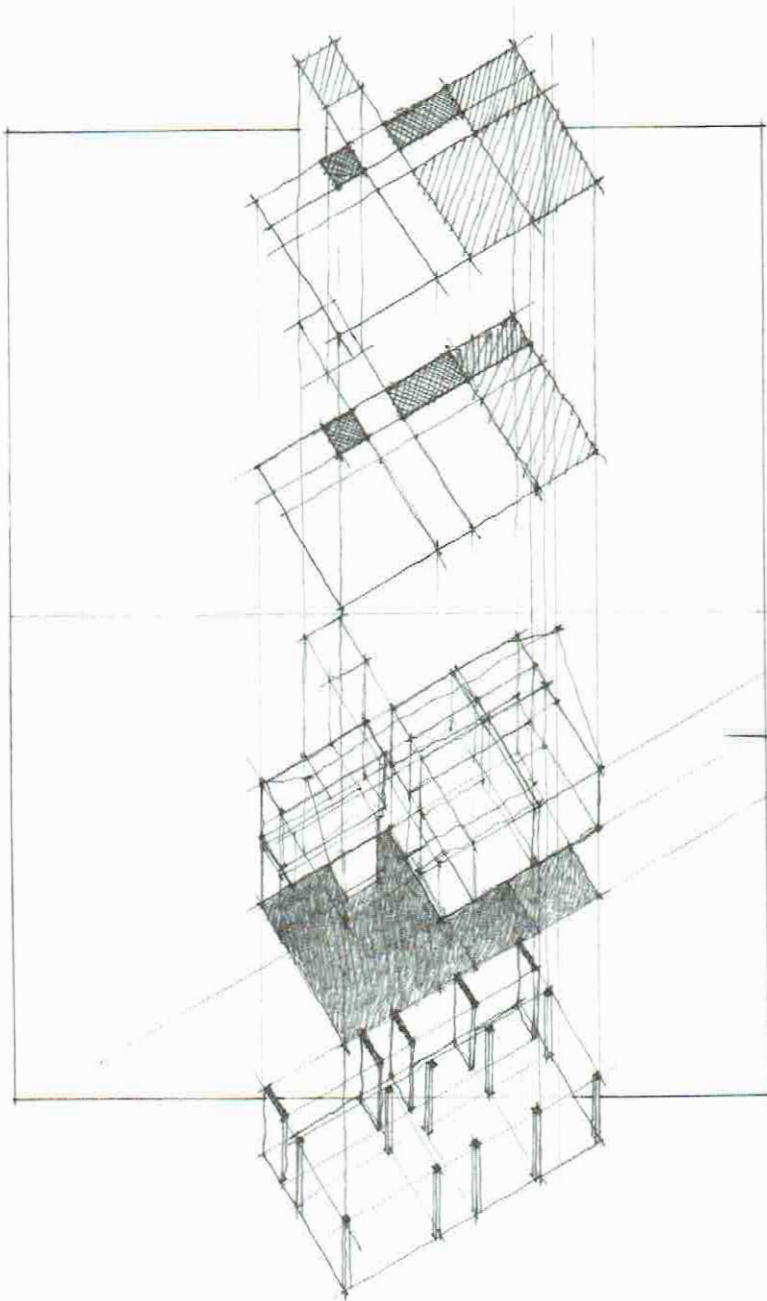
A distinct advantage of digital technology is its ability to accept and process information in a precise and accurate manner. We should not allow this capacity for precision to induce premature closure when exploring ideas with graphics software in the ambiguous, early stages of the design process.

We may use any of the drawing systems to stimulate our visual thinking and to initiate, clarify, and assess ideas.

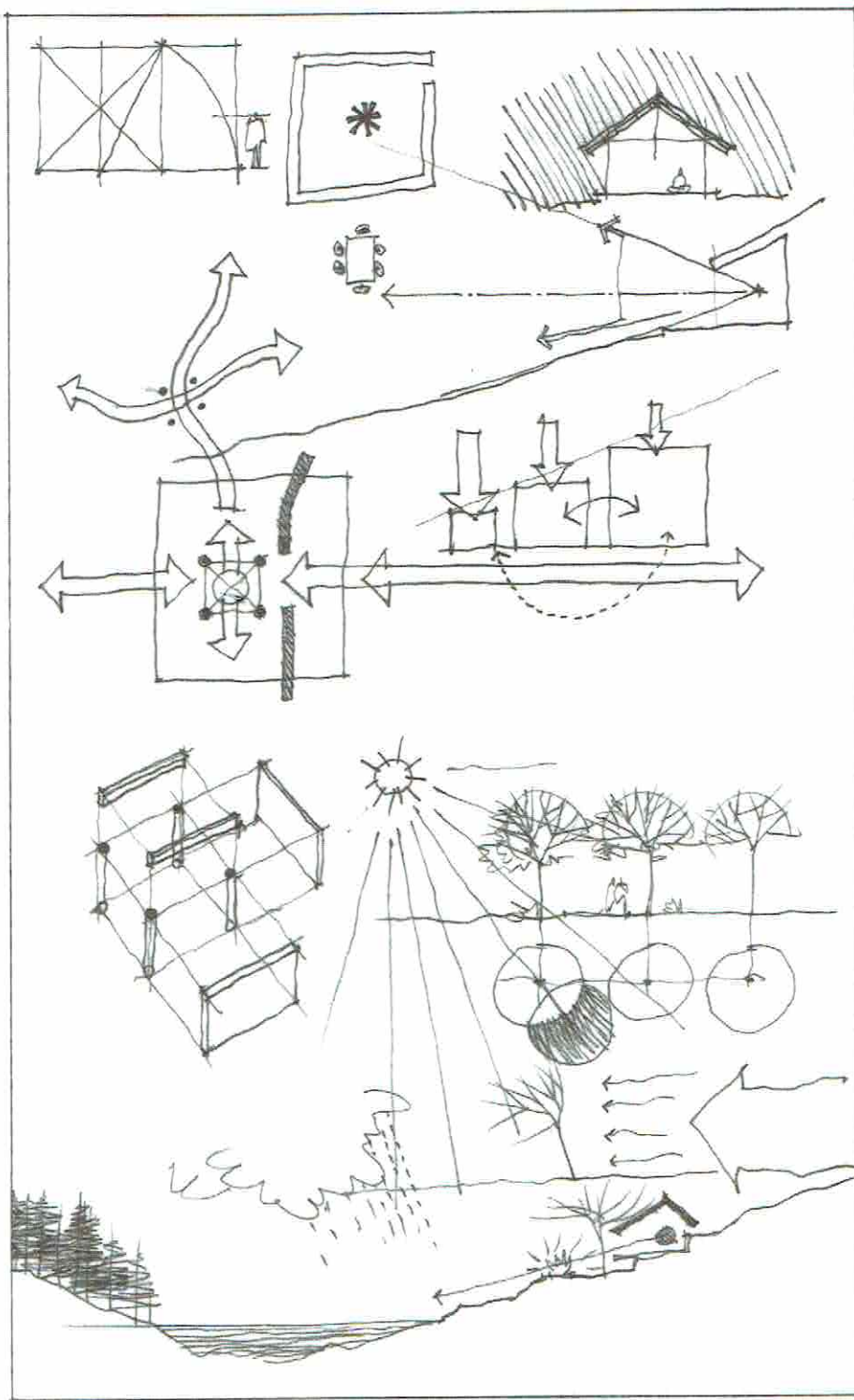
- When a diagram isolates a single issue or set of relationships for study, a two-dimensional format is usually sufficient.



- However, when we begin to explore the complex spatial and relational attributes of a design, a three-dimensional drawing system becomes necessary.
- Particularly effective vehicles for studying the volumetric massing and spatial dimensions of a design are cutaway, expanded, and phantom views.



Diagrams are visual abstractions that can depict the essence of concepts and things.



Concepts

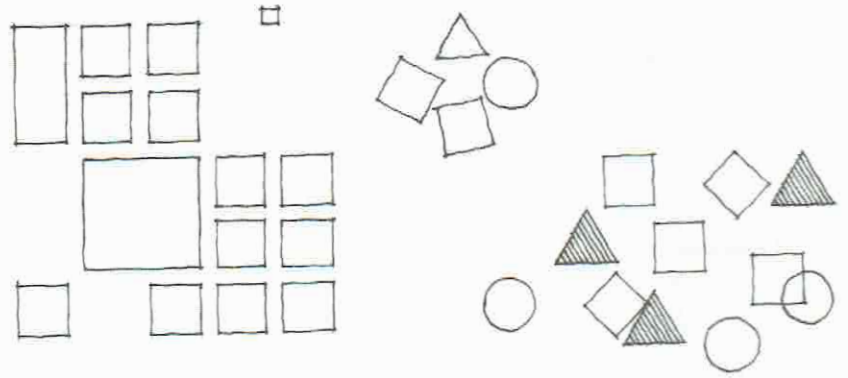
- Scale
- Proportion
- Boundaries
- Shelter
- Outlook
- Axes
- Emphasis
- Hierarchy
- Entry and path
- Nodes
- Similarity
- Connections
- Movement
- Process
- Forces
- Zones

Things

- Structure
- Enclosure
- Landscape elements
- Sun
- Wind
- Rain
- Topography
- Light
- Heat

In addition to describing the essence of design elements, diagrams effectively examine and explain the relationships among these elements. To maintain a manageable level of abstraction in a diagram, we utilize the grouping principles of size, proximity, and similarity.

- Relative size describes quantifiable aspects of each element as well as establishes a hierarchical ranking among a number of elements.
- Relative proximity indicates the intensity of relationship among entities.
- Similarity of shape, size, or tonal value establishes visual sets that help reduce the number of elements and maintain a manageable level of abstraction.



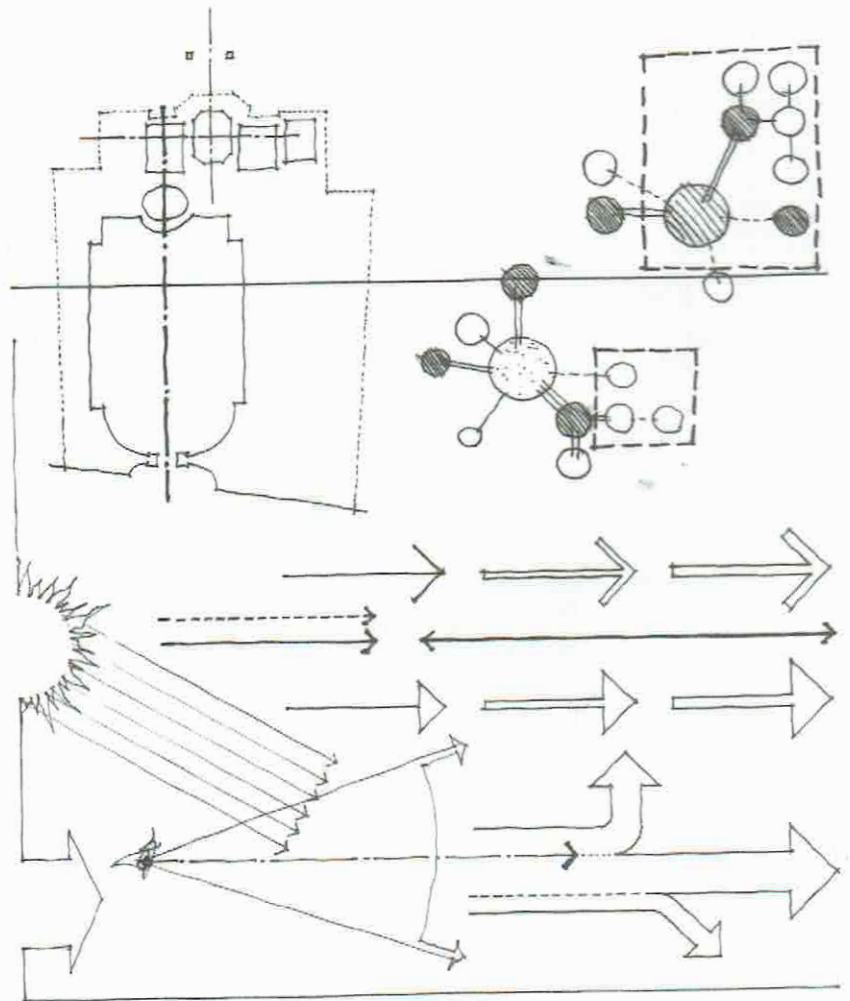
To further clarify and emphasize specific types of linkages or the nature of interactions among the entities, we can employ a variety of lines and arrows. And by varying the width, length, continuity, and tonal value of these linking elements, we can also describe varying degrees, levels, and intensities of connection.

Lines

We use the organizing power of lines in diagramming to define the boundaries of fields, denote the interdependencies of elements, and structure formal and spatial relationships. In clarifying the organizational and relational aspects of a diagram, lines make both abstract and pictorial concepts visible and understandable.

Arrows

Arrows are a special type of connecting line. The wedge-shaped ends can signify one- or two-way movement from one element to another, indicate the direction of a force or action, or denote the phase of a process. For clarity, we use different types of arrows to distinguish between the types of relationships as well as varying degrees of intensity or importance.



Diagrams can effectively address a diversity of design issues.

Site diagrams explore how the siting and orientation of a design respond to environmental and contextual forces.

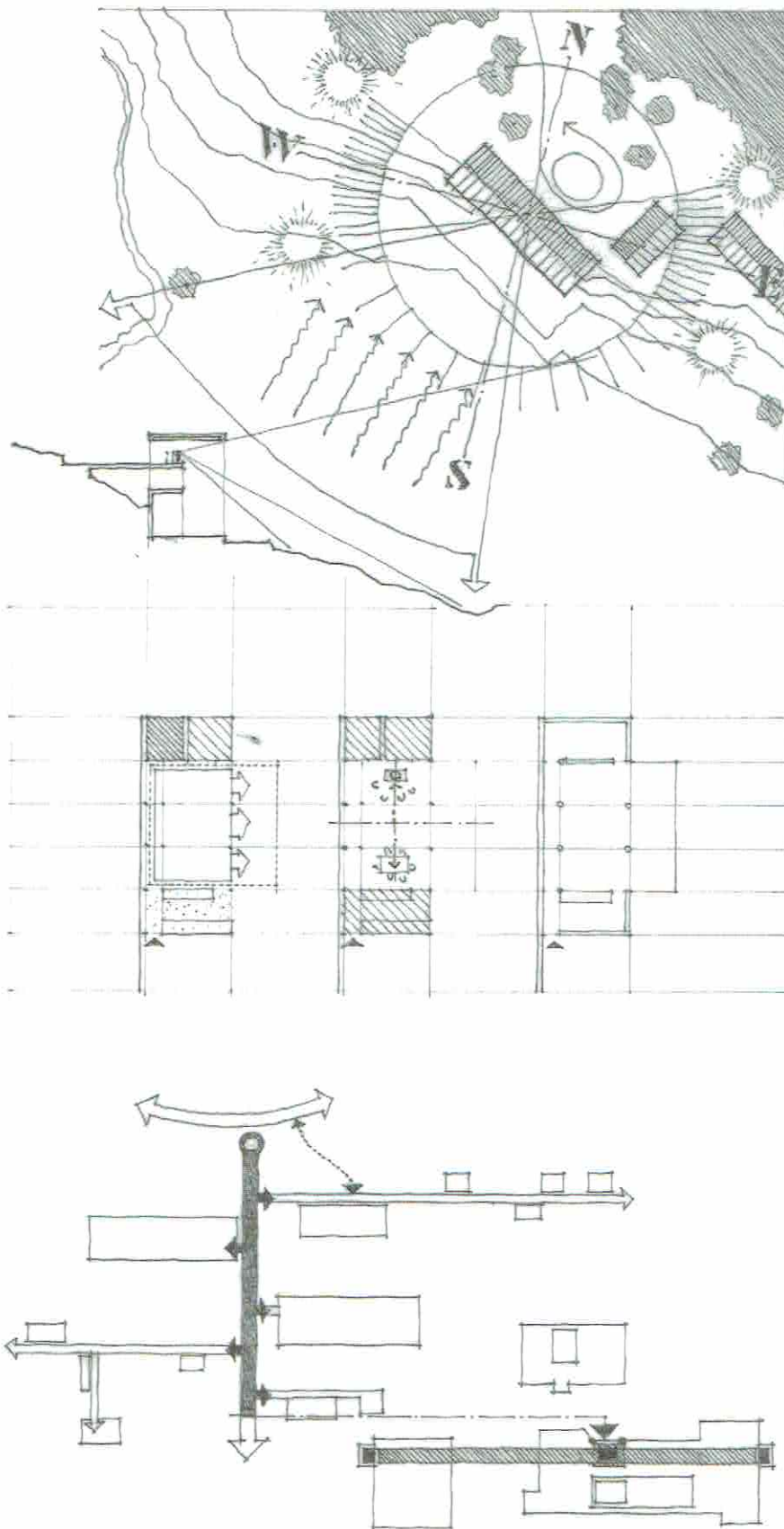
- Contextual constraints and opportunities
- Environmental forces of sun, wind, and precipitation
- Topography, landscape, and water features
- Approach, access, and paths through a site

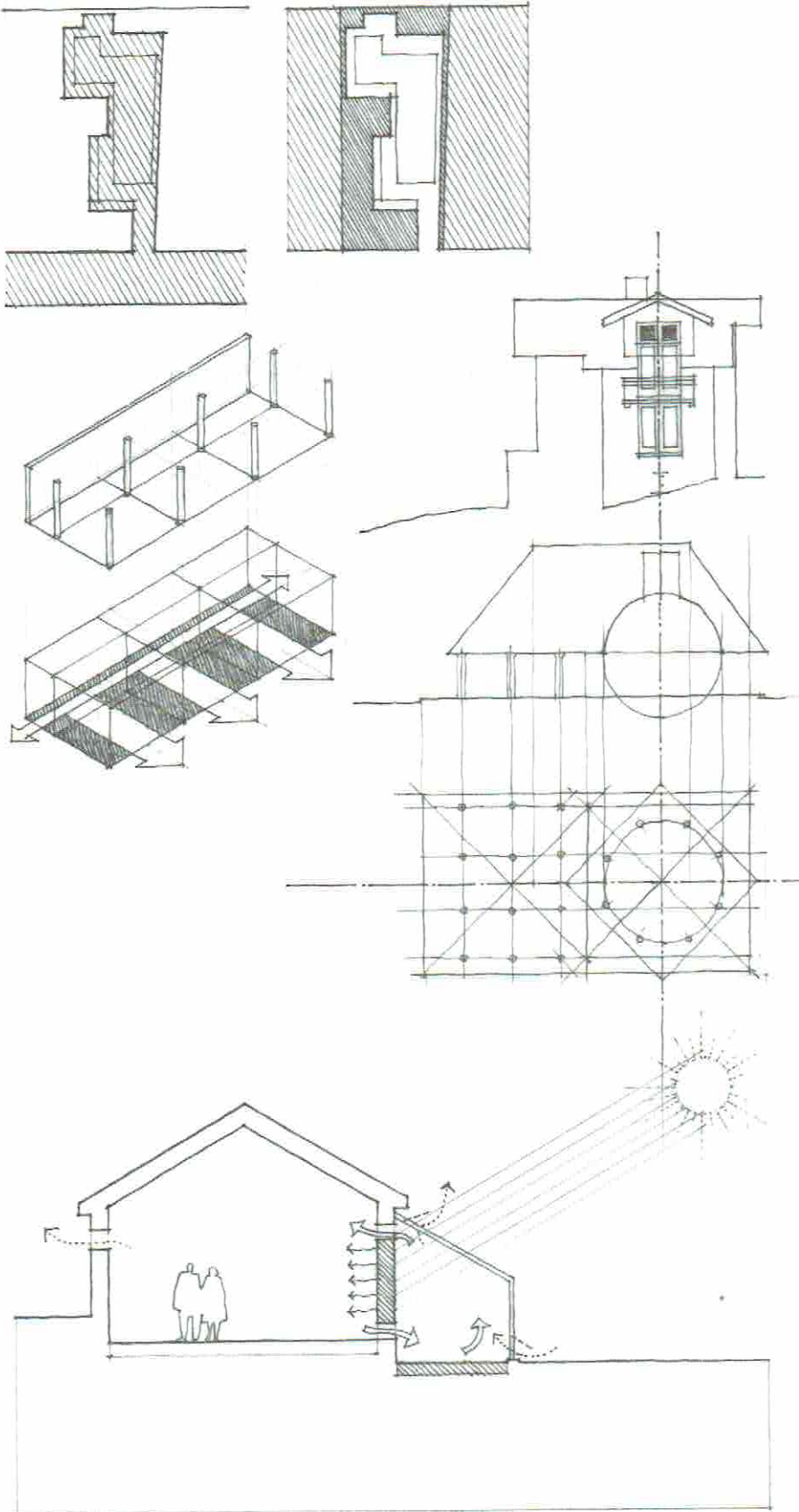
Programmatic diagrams investigate how a design organization addresses programmatic requirements.

- Spatial dimensions required for activities
- Functional proximities and adjacencies
- Relationship between served and service spaces
- Zoning of public and private functions

Circulation diagrams study how patterns of movement influence and are influenced by program elements.

- Modes of pedestrian, vehicular, and service travel
- Approach, entry, nodes, and paths of movement
- Horizontal and vertical paths



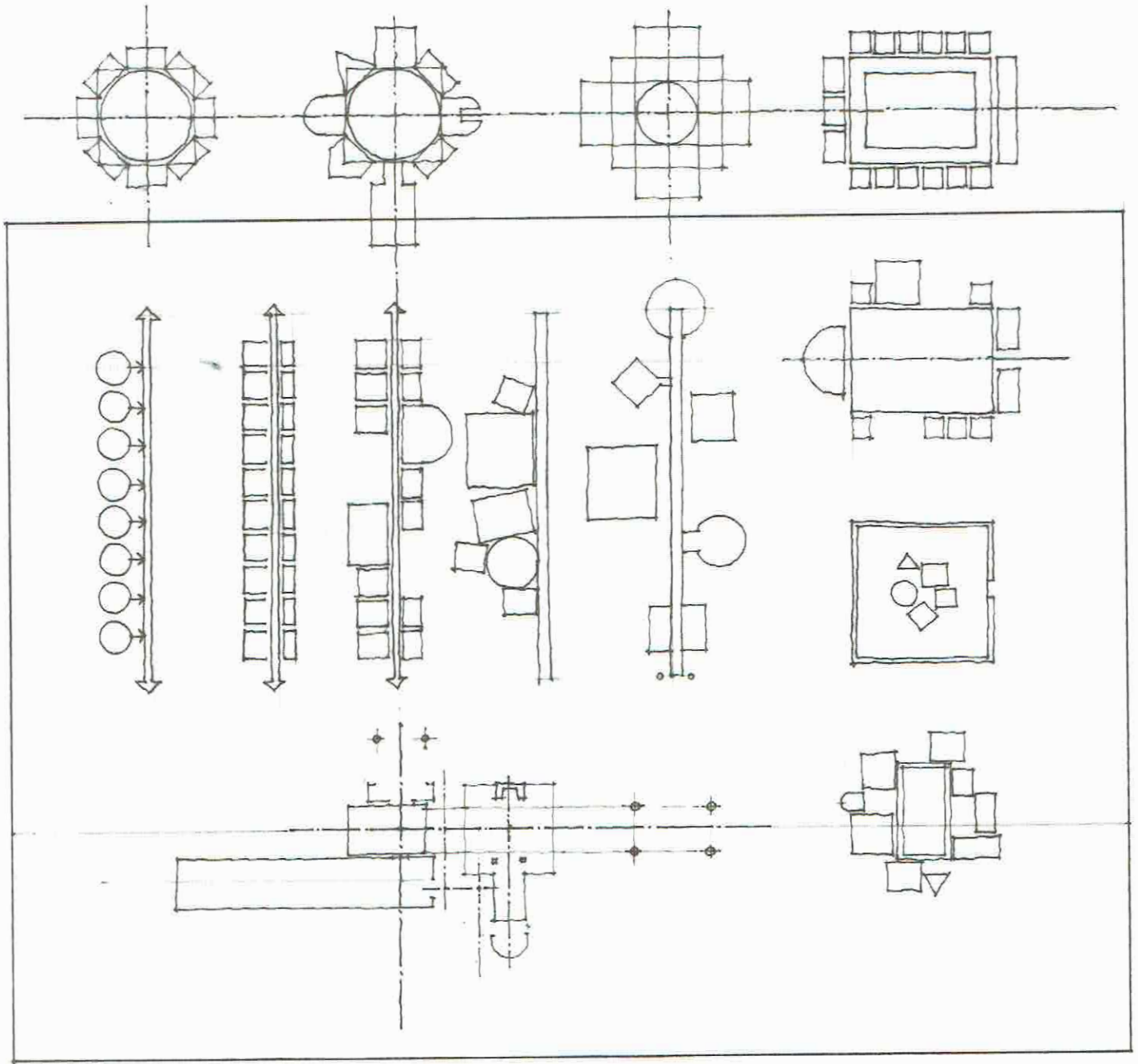


Formal diagrams examine the correspondence between structural pattern, spatial volumes, and elements of enclosure.

- Figure-ground and solid-void relationships
- Ordering principles, such as symmetry and rhythm
- Structural elements and pattern
- Elements and configuration of enclosure
- Spatial qualities, such as shelter and outlook
- Hierarchical organization of spaces
- Formal massing and geometry
- Proportion and scale

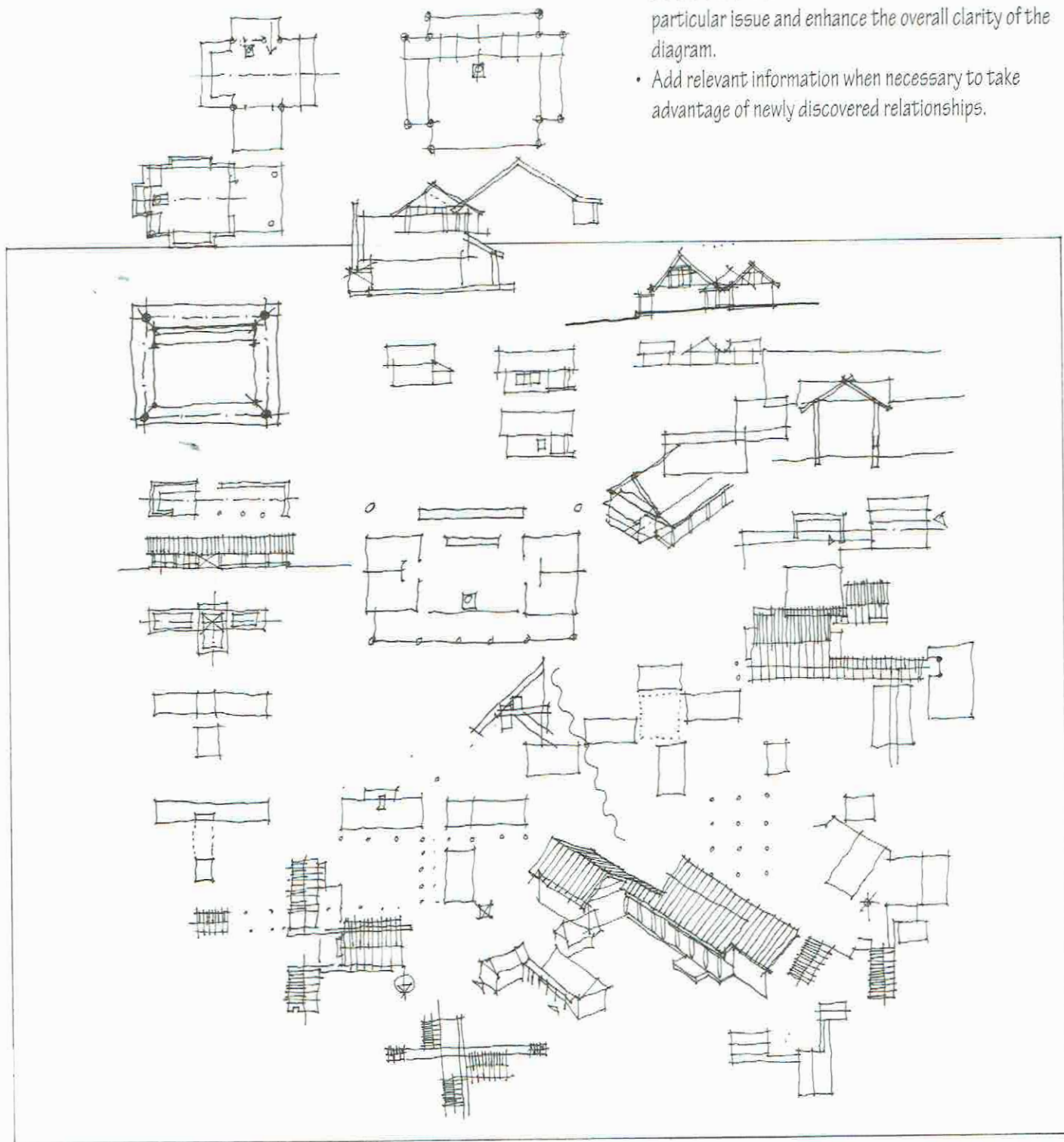
System diagrams study the layout and integration of structural, lighting, and environmental control systems.

The term "parti" refers to the concept or primary organizing idea for an architectural design. Drawing a concept or parti out in diagrammatic form enables a designer to quickly and efficiently investigate the overall nature and organization of a scheme. Instead of concentrating on how a design might appear, the concept diagram focuses on the key structural and relational features of an idea.



In generating, developing, and utilizing diagrams, certain principles can help stimulate our thinking.

- Keep concept diagrams concise. Drawing small condenses the information to a manageable level.
- Delete extraneous information as needed to focus on a particular issue and enhance the overall clarity of the diagram.
- Add relevant information when necessary to take advantage of newly discovered relationships.



- Utilize the modifying factors of size, proximity, and similarity to reorganize and prioritize the elements as you search for order.
- Overlay or juxtapose a series of diagrams to see how certain variables affect the nature of a design, or how the various parts and systems of a design fit together to form a whole.
- Reverse, rotate, overlap, or distort an element or linkage in order to provide new ways of viewing the diagram and to discover new relationships.

